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RadioWorld®



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Radio's Best Read Newspaper

August 9, 1995

Supreme Court Ruling Important to Radio

by Lynn Meadows

WASHINGTON A recent Supreme Court decision is likely to impact Federal Communications Commission (FCC) minority ownership and equal employment policies.

All bets are on for what repercussions the Supreme Court decision in the Adarand Constructors Inc. vs. Peña case will have on broadcasters.

Although the case involved a construction company, the ripples of the five-to-four decision are expected to be felt throughout all federally mandated affirmative action programs and policies.

In her majority opinion, Justice Sandra Day O'Connor wrote, "We hold today that all racial classifications, imposed by whatever federal, state or local government actor, must be analyzed by a reviewing court under strict scrutiny."

Broadcasters are waiting to see how the Adarand decision will play out at the Federal Communications Commission (FCC). Many are hoping to be relieved of the extra Equal Employment Opportunity paperwork that is a required part of every license renewal.

Industry followers point out that the decision will probably affect minority ownership policies at the FCC more than the commission's equal employment policies.

"It is my view that Adarand does not implicate the FCC's EEO program," said William Kennard, general counsel at the FCC. "The FCC does not mandate any licensee hire anyone based on race," he said.

Equal employment

National Black Media Coalition Chairman and CEO, Pluria W. Marshall Sr. said he did not think Adarand would affect the commission's EEO policy. Asked if the FCC should be involved in EEO policy, he said "absolutely."

Given the existence of the Equal Employment Opportunity Commission (EEOC), many others question whether the FCC should be involved in EEO monitoring. "I think the FCC should certainly be a monitor and enforcer of the Equal Employment Rules of companies which receive licenses through the commission," said Marshall.

Some in Congress disagree. Rumblings for abolishment of the FCC have quieted, but Congressman Jack Fields (R-Texas) is expected to call for a top-to-bottom review of the FCC after the August recess.

Sources say the congressman wants to find out what the FCC is doing that it

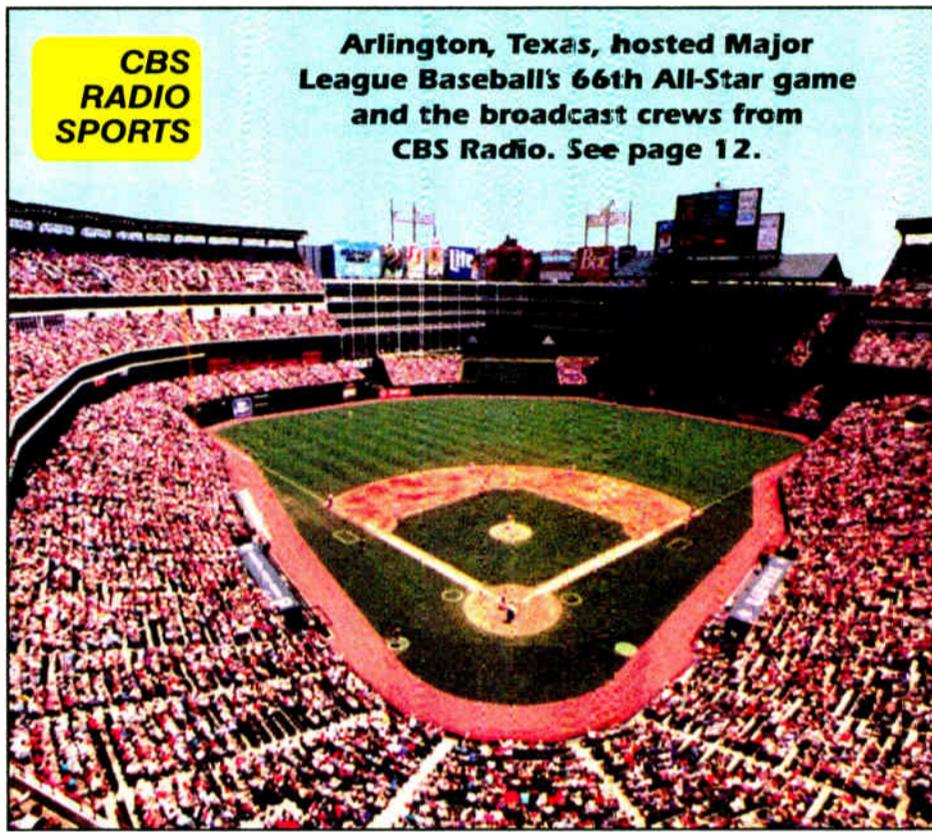
should not be doing. The review will examine if the FCC's EEO policy duplicates the Equal Employment Opportunity Commission's mission.

Marshall counters that the FCC "does a much better job than the EEOC could ever hope to do because its energies are targeted specifically towards its licensees." He said the EEOC "stays backlogged sometimes as much as two-to-three years."

Bottomline concerns

Since 1987, the FCC's EEO rules require a review of licensees' recruitment efforts at renewal time. Reviewers do not look at the number of women and minorities actually employed by a station. Instead, they look at what Kennard calls "meaningful outreach efforts."

continued on page 12 ►



Radio Embraces Internet

by Frank Beacham

NEW YORK RealAudio, a new software unveiled at this year's NAB spring show, has piqued the interest of broadcasters from around the globe (see RW, May 31). Using real-time audio technology for the Internet, radio stations are

embracing the World Wide Web as a new outlet for audio programming. week of March. Other U.S. broadcasters now delivering real-time programming over the Internet are ABC News, National Public Radio, C-SPAN,

WWOZ-FM (Metairie, La.) and KSCO(AM) (Santa Cruz, Calif.). Also on the Web are Radio Canada, Deutsche Welle, Nexus-IBA (Milano, Italy) and KBS (Seoul, South Korea).

All of the broadcasters are using software continued on page 6 ►



RealAudio's Home Page

embracing the World Wide Web as a new outlet for audio programming.

KPIG-FM (Freedom, Calif.) and WKSU-FM (Kent, Ohio) were the first call letter stations in the United States to offer a range of their audio programming real-time over the Internet's World Wide Web. Both began the service in the last

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NEWSWATCH

CCS Audio Products Becomes MUSICAM USA

HOLMDEL, N.J. VirteX company CCS Audio Products, has become MUSI-



CAM USA. At the same time VirteX, which acquired CCS in February, appointed Sean Bowers to General Sales Manager for MUSICAM Audio Products.

MUSICAM USA will continue to market its Prima ISDN codecs and the FieldFone single-line phone codec. The company will also promote its new products including MUSICAM Starguide satellite receiver, WinDaX and PACE.

The renamed company will also continue to develop MUSICAM EXPRESS, the joint venture between VirteX and Infinity Broadcasting which will provide instant digital audio to 3500 radio stations in the United States.

Bowers will work on the MUSICAM EXPRESS rollout slated to begin this month as well as promote MUSICAM as the digital audio standard for broadcasters and consumers.

Evergreen Acquires Pyramid In \$306 Million Deal

IRVING, Texas Evergreen Media Corp. inked a deal to acquire Pyramid Communications Inc. for \$306.5 million dollars cash plus an adjustment for net working capital. The transaction is expected to close early next year.

Scott Ginsburg, chairman and CEO of Evergreen, said the acquisition will accomplish several objectives "including providing Evergreen with duopoly entrees into the Philadelphia and Boston markets" and "round out our presence in all of the nation's top 10 radio markets."

Because the Pyramid acquisition would bring the number of properties owned by Evergreen above the current national ownership and duopoly limits,

the company plans to divest stations or seek waivers. Once the deal is complete, Evergreen will own five FM stations in Chicago and four in Charlotte, N.C. The corporation will also own a total of 23 stations nationwide, three more than the current limit allows.

At the time the agreement was signed, legislation lifting those ownership caps had passed the Senate but had not reached the House floor for debate.

Changes at Harris Allied

QUINCY, Ill. Harris Corp. named Chester A. Massari vice president-general manager of its broadcast division in Quincy, Ill. Massari replaces Joe Huie, who is retiring after 30 years.

Massari, who has been with Harris for 25 years, will leave his position as vice

continued on next page ▶

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

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

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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.

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president of operations for Harris' RF Communications Division in Rochester, N.Y., a position he has held since 1992.

Expanded Band Used

ALEXANDRIA, Va. While the Federal Communications Commission hashes out permanent assignments to the expanded AM band, the Army Broadcasting Service will test a new studio on 1670 kHz.

The Army will use the frequency to test its new Mobile Radio Station in the coming months. It expects to broadcast for a week and perform tests on the signal. A spokesman said the signal could possibly travel 2,000 miles at night. The Army is hoping to hear from DX'ers.

World Radio Communications Conference

WASHINGTON Officials held a press conference days ahead of schedule last month to announce the United States' final proposals for the World Radiocommunications Conference (WRC-95) scheduled to begin in Geneva in October.

The focus of WRC-95 will be satellites. The United States released proposals for spectrum requirements and allocations and simplification of the Radio Regulations to the WRC-95. Ambassador Mike Synar, one of the members of the proposal team, will travel this fall to generate support from other countries for the U.S. proposals.

Future Fund At CPB

WASHINGTON The board of directors of the Corporation for Public Broadcasting (CPB) approved an \$11 million "Future Fund" to begin in fiscal year 1996. The fund is meant to provide strategic assistance to the Public Broadcasting System by increasing its efficiency and reducing its dependency on federal tax dollars.

In the first year, \$7.25 million will come from CPB's discretionary budget with Community Service Grant pool kicking in the rest. The Future Fund was recommended after an eight month collaboration between CPB and a task force comprised of station and industry representatives.

Transmitter School

ATLANTA CCA Electronics will hold its next semi-annual service school at the company plant Jan. 18-20, 1996. The service school covers installation, operation, service, troubleshooting and repair of CCA's line of FM broadcast transmitters.

Attendance at the school is limited to the first 25 applications. The \$250 registration fee includes a complete operating manual on any CCA transmitter and lunch each day.

Revenue Picture Looks Rosy in 1995

Increases Outpacing December Predictions

by Lynn Meadows

NEW YORK Radio advertising continues to enjoy "amazing" revenue increases in 1995, according to advertising expert Robert Coen who updated his annual forecast.

According to a report issued in June by advertising agency McCann-Erickson, total domestic advertising revenue for 1995 will be up 7.9 percent over last year. That is 1.2 percent higher than the company originally forecasted in

December 1994.

Robert J. Coen, senior vice president and author of the report, admits that when predictions were being made in December, no one expected such strong growth after last year's 8.7 percent increase in ad revenues.

"The relatively large gains of the first quarter were somewhat of a surprise in comparison with the year-ago quarter when the Winter Olympics and the primaries fueled extraordinary increases that were not expected to be easily matched this year," explained Coen.

Coen predicts that in the United States, total advertising revenues will reach \$161.9 billion in 1995. Overseas, he predicts advertising revenues will jump 8.4 percent generating revenues around \$193.4 billion.

According to the report, radio has been a big winner in 1995. The Radio Advertising Bureau (RAB) released figures last month indicating radio ad revenue for May increased 10 percent over the previous May. Although national spot revenue only increased by four percent in May, January and February saw amazing advances of 38 and 19 percent respectively.

National television ad growth declined by 4 percent in the first quarter. But Coen says its nothing alarming. "The net-

works' 4 percent decline in this year's first quarter is really insignificant because the Winter Olympics had helped them post a nearly 20 percent gain a year earlier."

The RAB reports that year-to-date revenues through May are up 11 percent over the first five months of 1994. Said RAB President and CEO Gary Fries, "We are well on the course to see a \$1 billion increase for 1995."

Several factors are at work in the current boom in advertising. Says Coen, a marketplace where competition stresses brand building rather than pricing increases ad growth. He adds that in the present climate, he sees marketers ready to increase spending rather than "risk being competitively outspent."

The report concludes that next year will be another good year for advertising revenue. "In 1996 there will be the usual extra stimulus from presidential year election contests. The summer Olympics in Atlanta will undoubtedly fuel even greater than usual extra U.S. advertising than would occur when the Olympics are in another country."

The Atlanta games, which will be broadcast on NBC, have sold more than \$600 million dollars for the 1996 Olympics.

EAS Patent Dilemma

WASHINGTON EAS technology could rank as a patent examiner's nightmare with repercussions that could shift right down to the individual station owner's bottom line. And the bureaucrats are simply not sure what to do.

When the Federal Communications Commission (FCC) chose the standard for the Emergency Alerting System (EAS) last December, it had on file a copy of Patent Number 5,121,430 which covers geographically specific alarm codes in a very general sense.

The patent was issued in 1992 to Quad Dimension Inc. during the time the EAS standard was being selected. The patent appears to cover technology that the National Weather Service has been using since the 1980s. This is the same technology the FCC wants implemented in EAS.

The plot thickened in June when Quad Dimension sent a letter to EAS manufacturers informing them they will require a licensing agreement to use its patented technology. As mandated by the FCC, manufacturers will have little choice but to use the technology.

Frank Lucia, acting chief of EAS, received a copy of the patent with a videotaped demonstration of the technology from Quad Dimension during the Notice of Proposed Rulemaking in 1992. According to Lucia, the matter is now in the hands of the Department of Commerce (DOC) and the National Weather Service.

John Raubitschek, patent council for the DOC was in the early stages of an investigation at press time. "We are trying to understand what impact that patent may have on the Department of Commerce," he said. No one knows if the National Oceanic and Atmospheric Association will also have to pay royalties because its system so closely matches the patented technology.

Lucia says the FCC is moving ahead with EAS regardless of the patent. "We are aware of the patent issue," he said, but could not elaborate what this would mean for EAS manufacturers who had expected the new system to be non-proprietary and are uncertain about paying royalties to Quad Dimension.

At press time, the EAS equipment certification process was at a standstill while the FCC continued to sort through paperwork.

—Lynn Meadows

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When Proverbial Shift Hits the Ceiling Fan

WASHINGTON I know—shift happens. Oops, I mean, well, you know what I mean. Did you see that? The misspelling of Frequency Shift Keying on the front page of the July 12 issue of *RW*? We innocently (I swear) let one of George Carlin's seven dirty words into the paper. Sorry.

Thankfully, those of you who did catch the typo were very good-natured about it. It sure provided some comical relief from these uninspired dog days of summer. I promise to be more alert in the future ...

★ ★ ★

One of *RW*'s writers is working on a story about digital audio satellite radio (DARS). As you know, the Federal Communications Commission (FCC) recently issued its long-awaited and much-dreaded Notice of Proposed Rulemaking (NPRM) on DARS. But what we at *RW* did not know was how



few of you seem to be doing anything about this opportunity to have a say in the regulation of a technology that could pose a serious challenge to the way you conduct business.

Now, I just spent the morning writing an editorial that talks about some of the programming tactics that can help ameliorate the impact of satellite programming.

But there also are pro-active, political steps you can take to at least nudge the process in favor of existing broadcasters.

The commission is seeking comments on a variety of issues surrounding DARS, including:

1) How many nationwide licenses should

be awarded;

2) How much spectrum each licensee should be assigned;

3) How licensees should be elected if mutually exclusive applications are filed;

4) How the service should be regulated, and

5) Whether licensees should be permitted to use some of their spectrum for non-DARS services.

There are any number of options the commission is considering, and you should definitely weigh in with an opinion. Among the options for licensing under consideration are: To assign all the spectrum to only the four current applicants for DARS; license some of the spectrum now and hold some in reserve for future applicants, and open up the spectrum to all interested parties.

It's not like you don't have commissioners on your side. In the original NPRM, Commissioners Quello and Ness both raised the issue of DARS' impact on terrestrial broadcasters. Ness favors making DARS a subscription-based service.

The National Association of Broadcasters (NAB) is pulling out all the stops to have its voice heard. And although the NAB represents broadcasters, it cannot hurt to voice an opinion, in writing with the FCC.

Comment date for the NPRM is Sept. 15. If you have not done so already, contact your communications attorney and let your voice be heard. The reply comment period ends Oct. 13.

★ ★ ★

And while we are on the subject of the future, what better way to ensure its brightness than with talent, talent and more talent. I've said it before, mentoring, safeguarding the education and training of new generations, and caring about the future of radio is as important as guarding today's bottom line and next quarter's profits.

You've read, on this very page, about the John Bayliss Broadcast Foundation.

Lady Thatcher on CBS



NEW YORK Lady Margaret Thatcher paid a visit to the CBS Radio studios as a guest on "The Gil Gross Show." Britain's former prime minister made select appearances as she promoted her new book "The Path to Power." She is shown here, with host Gil Gross, taking calls from listeners across the country.

Established in 1985, the foundation honors the life and work of one of radio's most dedicated and respected executives, John Bayliss.

The Bayliss Foundation just awarded 19 college and graduate-level students at 14 colleges and universities across the United States with \$2,000 Bayliss Scholarships for the 1995-96 academic year.

The 19 recipients were selected for the scholarships because of their high academic achievement, extracurricular radio activities and a passion for a career in radio. Their fields of interest span the spectrum, from programming, announcing and engineering to journalism to station management.

The foundation will hold its annual fundraiser on Oct. 25, at the Waldorf-Astoria in New York. All proceeds benefit the scholarship fund. For information, contact Kit Hunter Franke at 408-624-1536.

Country radio and country music in general have received a lot of attention lately. There is, in fact, as you all know, a whole new generation of country converts, fans of the new school of country music.

Of course, country music has been popular for a long time—way longer than the recent converts realize—and radio and country music have been friends for many decades. Country artists, more than musi-

cians from any other music genre, visit radio and count country program directors among their friends.

It is a mutually beneficial relationship that shows in the enthusiasm of the fans, stations and performers alike. Case in point



Pictured l to r: Glenn R. Jones, chairman and CEO, Jones Intercable Inc., Tanya Tucker and Eric Hauenstein, vice president and general manager, Jones Satellite Networks.

is Tanya Tucker's recent visit with Jones Satellite Networks. While in Denver, Tucker made it a point to drop in on JSN's U.S. Country and CD Country formats. She reached more than 400 affiliate stations.

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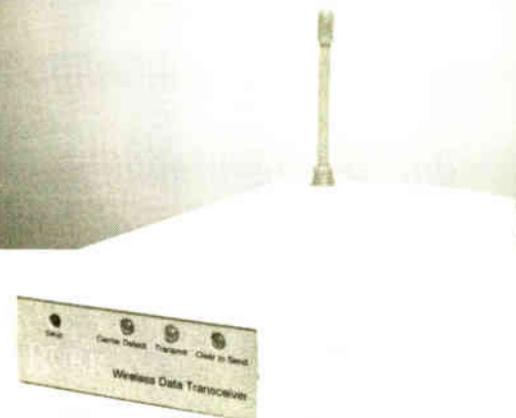
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Food for thought

Dear RW,

When you published the article and editorial (RW, March 8) on the subject of cellular towers near AM antennas, I refrained from comment despite several errors of fact and misleading statements. Re-radiation of an AM directional station's energy by a cellular tower certainly can cause serious distortion in the pattern's null structure, creating a major problem for the AM broadcaster. But to say a cellular tower might "totally prevent AM signals from reaching certain listeners ..." or that an AM signal might be "interrupted by the closer-in, strong paging/cellular transmission ..." grossly overstates the problem.

To suggest the requirements of the 1987 and 1989 Public Notices were not enforceable is simply wrong, as is any suggestion that cellular operators have been building towers willy-nilly in AM stations' front yards without any consideration for the station. This firm provides engineering services to many cellular operators who cooperate with nearby AM stations and take their responsibilities as commission licensees very seriously.

The *Guest Commentary* by Morgan Burrow Jr. (RW, June 14), while clarifying some issues, also presented misleading information which requires a response.

The highlighted statement that "The AM license has the right to insist that the tower proponent retain the station's consulting engineer to handle detuning matters and make partial proof measurements" is incorrect. Cellular operators, like any commission licensee, may retain any consulting engineer, or none should they choose so.

While the parties may start with a common interest in resolving whatever problems may occur, disputes as to specific

problems, causes, resolutions and financial responsibilities are not unusual. A consulting engineer retained by both parties could end up with a conflict of interest.

Each party should continue to use consultants of their own choosing. For this part, the cellular operator should understand that the costs of a review of the proposed tower, procedures, and final report by the station's consulting engineer is an expense generally considered to be reimbursable to the station.

As Burrow notes, Section 73.154 of the commission's rules sets forth the requirements for a partial proof, as required by the commission's policies described in the 1987 and 1989 Public Notice. The pertinent cellular rule, 22.371, was a part of the rewrite of the cellular rules adopted on August 2, 1994 (Common Carrier Docket 94-201). The proposed rule essentially adopted the language of the Public Notice, including the reference to "partial proof" and to section 73.154. However, as adopted, the rule specifically refers to "measurements" rather than to "partial proof" and the accompanying comments in the Report and Order (page A-25) make clear that this change was intentional. In the discussion of 22.371, reference is made to the 1989 Public Notice, with the following text:

"The comments (in the Rulemaking proceeding) persuade us to modify the rule in one respect. Although we believe before and after measurements are a feasible way to determine whether a pattern distortion results from a particular tower construction, the proposed rule is too specific concerning measurement techniques. Accordingly, we are rewording the rule to refer to the measurements in more general terms. Requirements for measurement techniques for AM stations are provided in part 73 of our rules."

Since the adoption of the new rules, we no longer recommend that cellular operators make measurements in the stations' major lobes. The effect of a re-radiator in an AM station's pattern minima, while significant, will be virtually undetectable in the major lobe(s). If the purpose of the measurement program is to determine the effect of reradiation on a station's pattern, then we should look where the effect can be found, in the pattern minima.

The magnitude of re-radiation from a tower or similar structure is determined principally by the height of the tower and the excitation or "illumination" on it. Towers less than 50 degrees are generally not capable of significant re-radiation. Cellular towers tend to be short with respect to the nearby AM station's frequency. A 100-foot monopole is 58.5 degrees at 1600, and 20 degrees at the low end of the band. Further they are often situated in the station's pattern minima where excitation is relatively low. In such cases, the cellular tower may not be capable of significant re-radiation, and measurements of the station's monitor points (perhaps combined with a computer modeling study) may suffice to make the required study.

Contrary to the assertion in paragraph 8,

Look No Further

Some radio broadcasters provide their own answer to how radio can survive the digital onslaught from satellite and cable audio services. Major market stations such as WPGC-FM, KKBT(FM), KMEL(FM) and WKDX(FM) prove day after day that effective radio is intrinsically woven into the daily life of an average person (see story, page 9).

The loom masters are the program directors and general managers willing to program community-specific events when listeners might actually hear it—not in the wee hours of a Sunday morning. Active, forthright involvement with listeners harkens back to the days of full-service radio stations that served as beacons of information for the community at large.

These stations cited serve a very targeted audience with an old-fashioned charter: community service. Urban-formatted stations are not the only ones doing radio right—but they certainly are a segment from which others could take lessons. Talk stations to an extent dabble in community activism (when not entirely programmed from a satellite feed of talk show syndicators); stations targeting the Hispanic communities tend to be pro-active, as do some of the hipper alternative stations.

Noteworthy, too, is that all of the stations noted are ratings leaders in their respective markets as well as giant revenue-generating machines. Listener loyalty? They draw crowds and responses like few dare to dream.

Although the era of mass-appeal, full-service radio stations has long since become the era of narrowcasting, the basic premise of serving your listeners better than anyone else has not changed.

Seventy-five years into its history, radio is facing the most serious technical challenges to its survival yet. The advent of digital audio satellite radio and digital cable radio-type services is but a precursor to untold programming services coming into listeners' homes via fiber optic lines plugged into the telephone or the PC.

Your best defense will be a strong offense. Pre-emptive programming now can secure your lock on listeners hearts and minds before the radio fabric starts fraying at the edges.

—RW

a properly constructed NEC or MININEC model of a re-radiation situation can be an excellent predictor of these effects. If anything, it will likely over-predict the effect since it is customary to assume perfectly conducting earth in the path from the source to the re-radiator. Excitation of the re-radiating structure and the resulting reradiation will be overstated.

We believe broadcasters and cellular operators should remember each has a right to exist and pursue business. Neither party has any right to dictate choice of consultants, plans or procedures to the other. Both parties have an overriding interest in meeting their respective obligations to the commission, and get on with their respective businesses. This can only occur in an atmosphere of cooperation where each party understands the others' needs and makes an effort in good faith to accommodate them.

J.M. Bixby, engineering manager
Moffet, Larson and Johnson Inc.,
Falls Church, VA

Thanks a million

Dear RW,

Just a note to say thanks a million for a wonderful article on Dan Ingram (RW, May 3). Growing up in Savannah, Ga., I knew that radio here was not what it really should be. From the time I was in grammar school, at night I would see what else I could find from our clear channel stations.

My sophomore year in high school I stumbled across WABC(AM) and Cousin Brucie. The first radio personality I had ever heard (down here we just had announcers) and I never laughed so hard in my life. What a hoot. Instantly I said,

"This is it! This is how radio is supposed to be."

Well it was not long before I was tuning in WABC every night as soon as the signal would start coming in near sunset. I thrilled to all those golden voices—among them Dan Ingram. Usually I could catch the last few minutes of his show and then heard promos with that wonderful voice and marvelous sense of humor.

It was that experience that set a great example for those of us who were considering broadcast careers. Dan Ingram set such a wonderful example for us all. His voice and wit have been an inspiration too.

It is nice to know that he is alive and well and playing the hits on WCBS-FM New York. I regret only that I cannot hear Dan on a regular basis down here. He is truly marvelous.

Thanks very much for bringing us up to date on Dan. Keep up the good work. I always look forward to your publication and its great articles on my heroes like Dan Ingram that make it so much fun to read. I would like to think that I too am inspiring some young person out there to choose radio and/or television for a career. Godspeed and warmest wishes.

Bill Edwards, news director
WGCO-FM
Savannah, GA

Omission

The July 12 issue *RBDS Roll Call* should have included RBDS equipment manufacturer and distributor Belar Electronics, 119 Lancaster Ave., Devon, PA 19333-0076; telephone: 610-687-5550; fax: 610-687-2686.

Radio World

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**Next Issue of
Radio World
August 23, 1995**

Era of Internet Broadcasting Begins

► continued from page 1

called RealAudio from Progressive Networks, a Seattle-based startup headed by Rob Glaser, a former multimedia executive at Microsoft Corp.

RealAudio is an audio-on-demand system that overcomes the need for Internet users to download audio files for later listening. RealAudio enables users equipped with conventional multimedia personal computers and standard phone lines to browse, select and play back audio content on-demand. The technology is optimized to work with standard 14.4 kilobits per second (kbps) modems.

"The clear advantage is the ability to have radio-on-demand," said Bernard Gershon, general manager of news operations at ABC Radio News in New York. "I can go to a Web site, click on the ABC icon and hear the most recent ABC network newscasts."

RealAudio allows Internet users to point and click on audio content of interest. "It will take you immediately to any point in a story, allowing you to listen only to the parts you are interested in," said Robert Holt, Webmaster at National Public Radio. "Traditional radio is ephemeral. This way it's not. People from all over the world can hear it whenever they want to."

Another feature soon to be added to RealAudio is the ability to embed a URL, or Internet address, into the audio stream. This feature will allow the audio to trigger a succession of on-screen visuals as it plays. Such visuals could be used to provide stats during sports broadcasts, on-screen results during election night news coverage or even advertising messages pegged to specific audio passages.

One limitation

The biggest limitation with the current version of RealAudio is sound quality, all the broadcasters agreed. This is because the sound files are highly compressed in order to work over 14.4 kbps modems. However, the company said,

the technology is scaleable and will attain true music quality when the standard modem speed reaches 28.8 kbps in the next year or so.

"I think it's a good start," said Chuck Poulton, computer systems specialist at WKSU-FM, a non-commercial station in Kent, Ohio. "I'd like to see a little bit better audio quality over time. It works pretty well now with news clips and voice but there are definitely artifacts with music."

WKSU currently programs newscasts and public affairs programming over the Web. "All the feedback we've gotten from listeners has been very positive," he said. "We've been getting about 1,000

hits for audio each week."

KPIG-FM, a free form adult rock station serving the Santa Cruz, Monterey, Salinas market, is getting about 2,000 hits each week to its "Cyber Swine World Headquarters" Web site, said William Goldsmith, the station's operations manager (see *Haber Space*, RW July 12).

Voice grade

"At this point RealAudio is a voice grade service," he said. "It cannot handle really complex waveforms. If something has very pronounced vocals in the mix, that comes across just fine. But if you throw a guitar in there on top of

How RealAudio Works

RealAudio's compression packs a full hour of programming into only 3.6MB, allowing a radio station to maintain an archive of programming on a single server. The technology's underlying protocol supports such features as random access, whereby a listener can jump to any point within a given audio program and listen only to the portions of interest.

Enabling such capabilities within the constraints of the existing Internet infrastructure proved a significant engineering challenge. The TCP protocol on which most Internet applications are built guarantees in-order delivery of packets and provides error-correction; however it does not guarantee timely delivery of the information. For a real-time application, a late data packet is no more useful than a

missed packet.

To achieve real-time, continuous playback, the RealAudio technology goes below the TCP layers to the UDP (User Datagram Protocol) level. Using packets of quarter-seconds of sound, RealAudio provides automatic flow regulation so that the client and server work together to ensure that audio continuity is maintained without dropout and without absorbing additional bandwidth above the audio requirement.

Sophisticated buffering is another important aspect of ensuring quality audio over varying delivery lines. Using a technique similar to skip-elimination buffers on advanced CD audio players, RealAudio always maintains a minimal buffer of data to assist smooth playback.

—Frank Beacham

the vocal, the whole thing turns to moosh.

"You can't really use the normal frequency response and normal signal-to-noise figures on something like this," Goldsmith continued. "They (RealAudio) are taking the waveform totally apart and disassembling it and encoding for particular speech patterns. You throw it something that's not speech and it sometimes comes up very close and sometimes very far off approximations of that waveform."

With music, Goldsmith said he can do a lot to improve RealAudio programming by using EQ prior to encoding. "I try to emphasize the voice range and try to bring the vocals out of the mixes on music," he said. "I'm also experimenting by using an expander before encoding to try to bring vocals and other prominent features of the music up out of the mix so they cut through better."

The RealAudio system consists of three components: the RealAudio Player, the RealAudio Studio and the RealAudio Server. The Player, which is free to end users over the Internet, allows full control of RealAudio programming. It has traditional tape recorder-like controls and can instantly jump to any part of a program, much like that of a CD player. It also has the ability to queue up a "playlist" of several RealAudio clips that be played in order.

Create and publish

The Studio allows a radio station or audio producer to create, encode and "publish" RealAudio programs. No price has been set for the Studio product but a Progressive spokeswoman said parts of it may be given away free or for a modest price of between \$50 and \$100.

The Server software is used to deliver RealAudio clips from a server connected via high speed data lines to the Internet. This software is sold on the basis of how many simultaneous "streams" it can handle. The software ranges in price from a 10-stream system for about \$1,400 to a 100-stream system at about \$8,500. The number of streams available over a server determines how many people may actually listen to an audio program at any given moment.

"(With a 10-stream system) it's like there are 10 headphone jacks on the server," said Martin Dunsmuir, manager of the RealAudio server product. "That means that no more than 10 people can have their headphones plugged in at any one time." However, said Dunsmuir, the future direction of his company is to have support for thousands of simultaneous streams.

The first release software limitation of 100 streams is comparable to the capacity of a single T1 circuit, he said. "We have a few customers—ABC included—who are spending big bucks for a T3 or multiple T1s and we are able to address their requirements," he said. "But it's not part of the standard product line yet." As for KPIG, Goldsmith said his station sees RealAudio as a solid technology with a promising future.

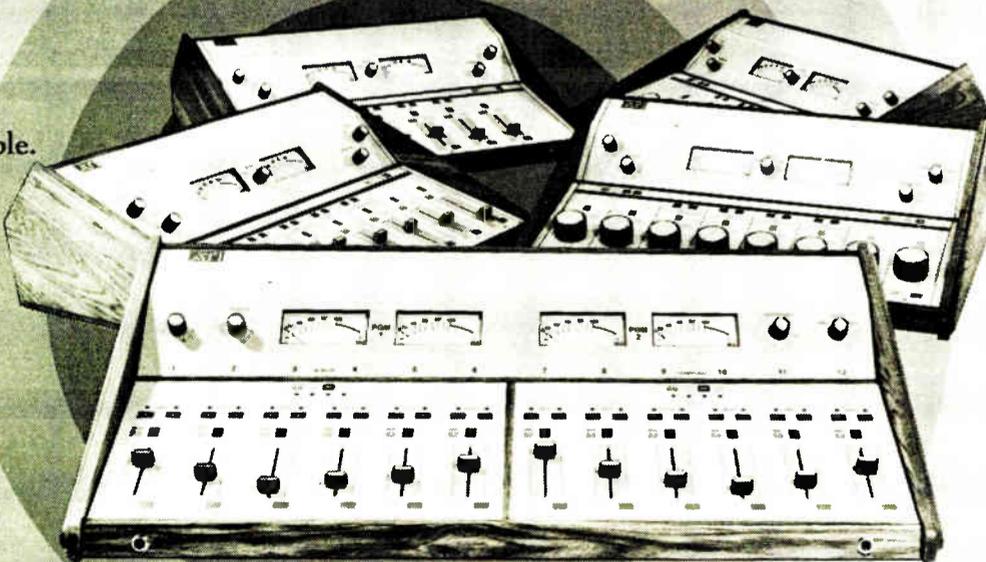
"Using this technology there is absolutely nothing to stop a radio station from reaching a world market," he said. "The most severely limiting factor right now is modem speeds. But just about everyone is in agreement that five years down the line that is simply not going to be an issue." 

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World Radio History

Urban Programming in Prime Time

by Lynn Meadows

WASHINGTON Sixteen-year-old Tawdra walks up to the microphone and waits to be acknowledged. She directs her question towards the city councilman, "You keep on saying bad kids, but everyone is not bad. I don't see why everyone is getting punished and has to be in the house by 11:00."

It is 8:05 p.m. on a muggy Monday night in June and Tawdra's concern about the new curfew can be heard by thousands listening to the top-rated station in Washington D.C.

The show is "Yo Listen Up," and it airs every Monday evening from 8-9 p.m. on Infinity Broadcasting's WPGC-FM, interrupting the station's well researched music playlist. Operations Manager, Jay Stevens says he got the idea for the show when he read about a similar show being broadcast in San Francisco.

Out on the West Coast, that show, "Street Soldiers" will air a few hours later. Both are public affairs programs but neither is buried in the traditional Sunday morning slot.

Beginnings

"Street Soldiers" began in San Francisco on KMEL(FM), an Evergreen Media Corp. station, as a one-time special in November 1991. Thanks to the tremendous response, Joe Marshall, co-founder and executive director of the Omega Boy's Club, was asked to become the permanent host of the show in January, 1992.

The show is broadcast every other Monday night from 10 p.m.-2 a.m. on KMEL(FM) in San Francisco and sister station KKBT(FM) in Los Angeles. Unlike "Yo Listen Up," the format is a mix of 75 percent talk and 25 percent music. This is the same show that made history in 1993 when shortly after the Los Angeles riots, it aired a discussion between the "Crypts" and the "Bloods."

In Rochester, on WDKX(FM), another call-in show "Dialogue" is also broadcast Monday evenings from 9-10 p.m. Host Andre Marcel, program director for the station, says the impetus for the program came from the listeners.

During Marcel's long-running Saturday classic soul music show, people would call to talk about what was on their mind and start a dialogue on the air. Finally, at the beginning of this year, he decided to do the show as an actual talk show on Monday nights.

He chose Monday nights figuring he could use the Saturday morning show to plug "Dialogue" and stir up listeners. Plus, the typical Sunday time slot was not an option. "I couldn't put it

on at 6 a.m. on Sunday. That's Gospel time," he said.

Prime Time

Jay Stevens admits he was concerned about how listeners would respond to a prime time talk show when he started "Yo Listen Up." Injecting an hour of talk into a time frame when the listeners expect Hip Hop was daring. Now, he says, "The response that we get is all positive."

Marshall says he never questioned if "Street Soldiers" would have listeners. It is a violence prevention show, said Marshall,

"So I knew kids were going to listen."

"People do more than dance," said Andre Marcel from

an audience. "People want to vent," he said, adding that the ratings on Monday night actually went up.

Injecting an hour of talk into a time frame when the listeners expect Hip Hop was daring.

WDKX(FM). "They want information." Marcel was not concerned about eating up music time with talk. He knew from experience that there would be

Lorraine Ballard Morrill, news director for EZ Communications' urban contemporary station, WUSL(FM) in Philadelphia was intrigued that top-

rated WPGC-FM would broadcast a public affairs program during prime time.

"The conventional wisdom is that that's not an audience builder," she said. WUSL airs a call in show Sundays from 7-9 a.m. directed at 18-to-34 year olds. Ballard Morrill says the response has been excellent, but added that moving the program to a more popular hour is "food for thought."

Topics

In Dallas, KJMZ(FM) has been broadcasting "What's Going On" during prime time Mondays nights for two years. Although, the show originally aired once a

continued on page 11 ▶

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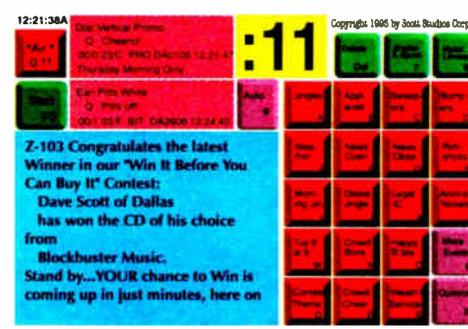
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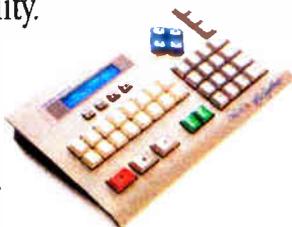
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World Radio History

Yamaha Unveils All-digital Mixer

by Mel Lambert

LONDON In just 12 short months, Yamaha's ProMix 01 mixing console has established new benchmarks in cost-effective, all-digital radio production. A compact, automated 18-input mixer equipped with four aux sends, two stereo effect returns, parametric EQ, solo and three stereo outputs for under \$2,000? Just what the digital doctor ordered!

One potential drawback, however, was that the 01's I/O configuration was a shade restricted, and it did not offer digital interconnects for some of today's popular low-cost modular digital multitracks. It would appear that Yamaha Corporation's R&D Department has been listening carefully to our industry's myriad comments.

Special gathering

At a special gathering at London's famed Air Lyndhurst Studios in mid-June, the company unveiled the much-awaited 02R Digital Recording Console. The new all-digital mixer's topology features 24 analog sources and 16 digital tape returns for a total of 40 inputs, routing to a total of eight bus outputs, eight digital direct outputs and eight aux sends. The projected price within North America is expected to be under \$10,000. Deliveries of the Yamaha 02R should begin during the fourth quarter of this year.

Offering a realistic solution for the radio production studio using modular digital multitracks or hard-disk systems, the Yamaha 02R includes four plug-in card slots that can accommodate a choice of Alesis ODI (ADAT), Tascam TDF (DA-88), AES/EBU or Yamaha Y1-format digital interfaces. Analog connection to a

multitrack is also possible utilizing an analog I/O card. A built-in RS422 serial port provides external control of important mixer functions. An optional meter bridge is also available.

"Now the production process can be kept entirely within the digital domain right up to (replay to air)," said Peter Chaikin, Yamaha's Product Manager for Professional Audio Recording Products. "By eliminating multiple A-to-D and D-to-A conversions inherent in analog mix-down, (users) will now witness superb sonic transparency."

New converters

The 02R's analog mic and line inputs incorporate new 20-bit, eight-times oversampling A/D converters. Alternately, digital I/O cards make it feasible to route digital sources to channel inputs in place of analog mic/line sources. Of the 24 analog inputs equipped with converters, 16 offer built-in microphone preamps; eight with individually switchable phantom power plus analog inserts. A total of eight output busses, a stereo analog (20-bit, eight times oversampling D-to-A converters) and digital (consumer S/PDIF plus AES/EBU formats) outputs are available simultaneously. Each input channel (plus the stereo output) features four-band, fully parametric, automated digital EQ. Each band extends from 20 Hz to 20 kHz, with bandwidth (Q) control and 18 dB boost/cut in 0.5 dB steps.

An EQ library allows equalization settings to be stored for instant recall to any channel. EQ snapshots can be held in the library to allow quick A/B comparisons between different settings, or for long-term storage of frequently used EQ curves. The mixer's automation system enables EQ Library settings to be recalled, in addition to dynamic automation of all EQ parameters.

In addition, a comprehensive, programmable dynamics processing function,

including compression and limiting, is available on all input channels and output busses. Eight aux sends (selectable pre/post fader) on every input channel directly routed to a pair of internal multi-effects processors, with two stereo effect returns.

System command

System command is via an intuitive control surface layout featuring a large back-lit central LCD display screen. The screen provides detailed parameter information and graphic display of all console functions including EQ curves, dynamics processing characteristics, effects parameter settings, and so on.

Comprehensive input and output metering, plus parameter status monitoring, is provided. Motorized faders on every channel can be toggled to control and automate tape returns. Multiple 02R consoles can be cascaded with full 24-bit signal precision.

The new console features real time automation with snapshot memory and instant reset of all console parameters, including internal compressors and effects. The on-board automation provides real time automated operation of mix parameters, including programmable fader groups, mute groups and stereo pairs. External computer control is also possible.

"At the heart of the 02R is Yamaha's latest 32-bit digital signal processing LSI," Peter Chaikin said. "This new chip

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Prime Time Programming

► continued from page 9

week, the station eventually decided to do the show "once a month on a grander scale" from different places in the community.

"It had just gotten to a point where the same things kept coming up," said Assistant Program Director and Music Director Keith Solis. Solis said the scope of the show has ranged from standard teenage topics like teen pregnancy and gang violence to topical issues like the Oklahoma City bombing.

Marcel at WDKX(FM) in Rochester said he has no shortage of topics, but admits he has a great respect for people who do talk shows now. He said it is hard work because as host, he always has to be on top of the issues of the day.

Joe Marshall approaches "Street Warriors" from a different angle. The show always focuses on violence prevention although he and his co-host cover many issues. He stresses this on every show saying, "We are here to keep people alive and out of jail."

All the stations are closely tied to their communities even without the talk shows. "We do it because as the leading radio station in Washington, we owe it to the community," said Stevens of the show that gives people like Tawdra a forum. ☺



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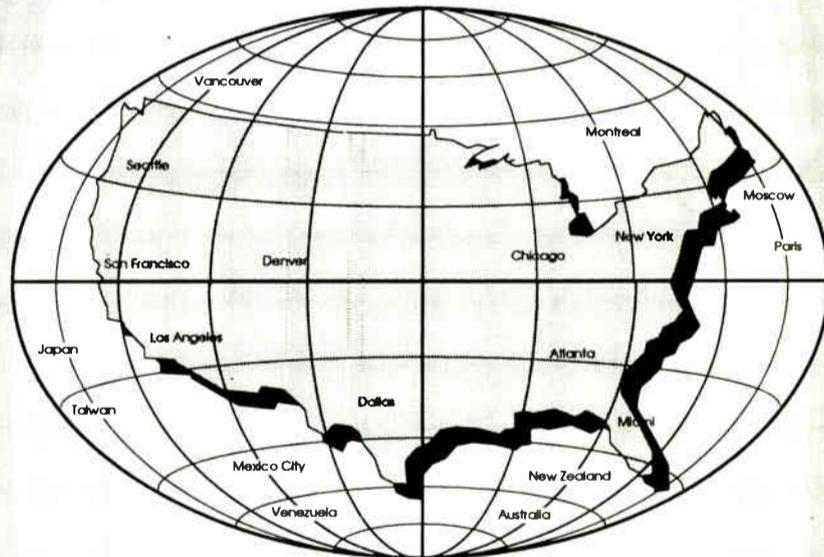
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CBS Radio's All-Star Broadcast

by Lynn Meadows

DALLAS This year, CBS Radio broadcast the 66th annual All-Star Game in English and Spanish on July 11. The English version reached 300 radio stations in the United States and 400 Armed Forces Radio Network outlets around the world. The Spanish broadcast reached 45 stations in the United States and about 200 more via satellite in Puerto Rico, Mexico, and South America.

After 20 years of calling the first pitch and every crack of the bat down to last pop fly slapping into an outfielder's glove, CBS Radio has the All-Star broadcast down to a science-almost.

It all starts weeks before the game with the site survey. Someone checks out the stadium, finds the studio with the best site line, and tries to get assigned to that booth. Next, he or she takes pictures of the studio layout and sends them back to New York City.

The pictures of the studio generate a discussion as to where to seat clients, engineers and talent. An engineer orders all the Switched 56 and ISDN lines necessary for the return feed to New York. Finally, a week before showtime, three equipment kits were sent to the ballpark in Arlington, Texas.

These kits hold Sennheiser headset mics, mixers, return cues, codecs to digitize sound, and all the spares one could want. They are shipped all over the country to do sports and news coverage. When an event is finished, they are returned to New York to be refurbished.

One kit was used for the "Meet the All-Stars" show aired the night before the game. The other two were used for the Spanish and English broadcasts of the play by play. For the All-Star game, CBS also sent a dozen more headphones than normal and many more speakers and feeds.

Three days before the game, when every-

thing was moving as smoothly as a batter with a home run, there was a change. Japanese TV needed to use the Spanish booth because it was bigger. CBS graciously agreed and Bruce Berenson, manager of traffic operations, who had helped set up

the booths spent most of the night moving equipment and wires three studios away.

That was the only glitch, said Andy Vallon, manager of technical operations for CBS Network. Even the 96 degree heat did not affect the setup or the

equipment. "The heat affects the talent more than the equipment," he said.

Vallon, who is used to two to three games a day on a weekend does not dwell on baseball nostalgia. Asked the best part of doing the All-Star game, he says "saying it's over and congratulations." Over, that is, until next year when the American and National Leagues will meet in Philadelphia. ☺

Yamaha 02 Mixer Debuts

► continued from page 11

represents a giant step forward in DSP technology, specifically designed for audio applications. By developing proprietary DSPs that are optimized to perform audio processing functions, Yamaha has achieved a significant competitive advantage in the field of digital mixing."

The 32-bit DSP provides enhanced processing precision and internal dynamic range, while twin RISC-technology CPUs drive the 02R's system control and dynamic automation.

A central control function serves as a "Virtual Channel Module," allowing all key channel functions, including routing, EQ, aux send and pan settings, to be assigned to a designated channel. The Selected Channel module provides immediate access to the most frequently adjusted parameters of a channel. Rotary encoders are provided to control EQ, pan and aux-send levels, with dedicated switches for routing assignments, pre/post fader aux send, and EQ on/off.

Yamaha will also provide a dedicated "02R Project Manager" program for Apple Macintosh PCs, which will include comprehensive project management plus editing, librarian, and remote-control facilities. Additionally, the software program will enable multiple mixers to be

controlled as a single, multichannel digital mixing system. The 02R is also completely controllable via MIDI, allowing third-party software to support and control the mixing console. (A MIDI Local Off mode allows the 02R's motorized faders to be used as remote controllers for external equipment within a production studio.)

In a nutshell, the new Yamaha 02R is remarkable in many respects, including its highly affordable price. It is no exaggeration to say that the mixer provides the type of mix automation and audio

DSP capabilities only found in high-ticket systems. I am convinced that the 02R will offer immediate potential to a growing number of radio facilities that are looking to move towards all-digital production, using either DATs, MDM decks such as the ADAT and DA-88, or hard disk devices. For me, the Yamaha 02R introduces all-digital signal processing and recording as a powerful yet cost-effective alternative to current analog techniques.

□ □ □

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

Supreme Court on EEO

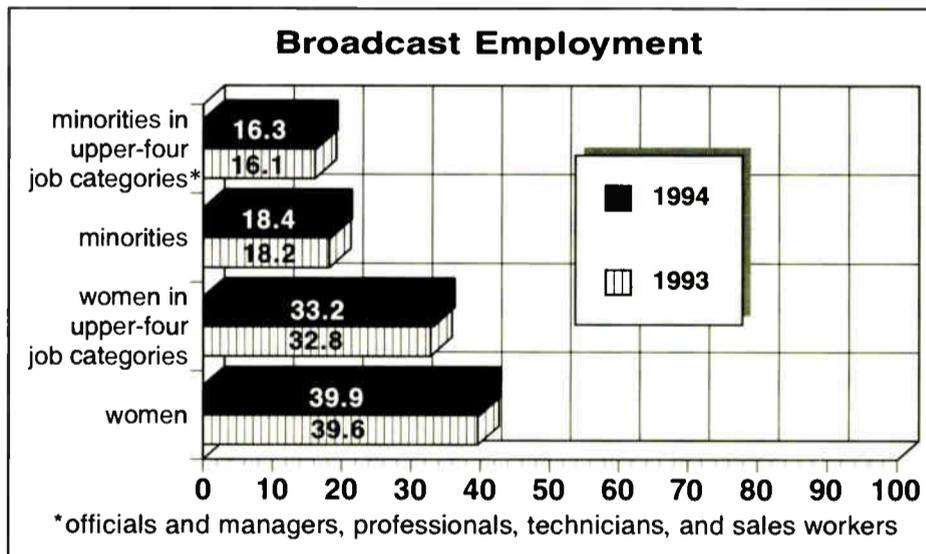
► continued from page 1

That review can be costly as Golden West Broadcasters found out in February. The commission fined the group \$20,000 for the failure of KMPC(AM) and KLIT(FM) to contact minority specific sources when filling 42 of its 62 jobs openings between 1987 and 1990.

What may be interesting to other broadcasters is that 18 of the new employees hired by KMPC(AM)-KLIT(FM) were minorities. According to the report, however, the FCC had noted during the 1984 renewal period that it "expected the

(see bar graph). As the graph illustrates, representation of these groups in the broadcast industry lags behind their numbers in the total workforce.

The five year report indicates that most gains made by various constituencies (women, blacks, Asians, etc.) in broadcast fields since 1990 have been one percentage point or less. The percentage of women officials and managers did increase 2.1 percent between 1990 and 1994. The percentage of minorities working as broadcasting professionals, however, had increased only 0.9 percent from 1990.

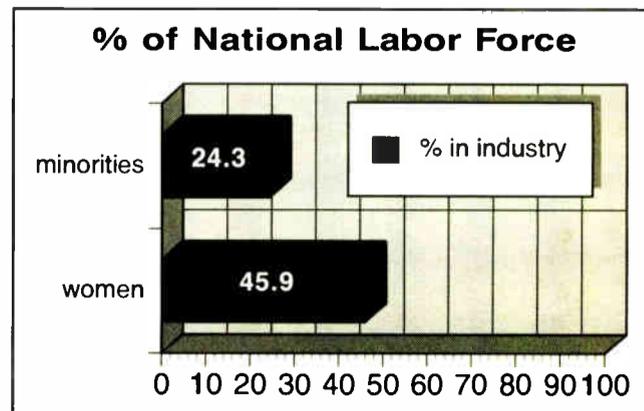


licensee to make reasonable, good faith efforts to recruit Asian/Pacific Islander and Hispanic applicants during the coming license term."

In a similar case, KSBW-TV was fined for failing to engage in adequate recruitment efforts. The FCC charged that the station used minority sources for only 47 of its 72 full-time positions. Although the station hired fifteen minorities, it had to pay \$15,000 for poor recruiting practices.

The FCC released figures in June to show the number of women and minorities in broadcasting

"I think it has been a significant program," said Kennard of the FCC's EEO program. He believes some of the increases over the five year period are directly attributable to the program. ☺



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INSIGHT-ON-RULES

Leafing through Internet Resources

Part 1

by Harold Hallikainen

SAN LUIS OBISPO, Calif. Another valuable resource is now available on the Internet. The full text of the Code of Federal Regulations (including the FCC Rules) and the U.S. Code (including the Communications Act of 1934) are now available through the House of Representatives Law Library.

The Uniform Resource Locator for the CFR is <http://www.pls.com:8001/his/cfr.html> and the URL for the USC is <http://www.pls.com:8001/his/usc.html>. Each of these includes a search engine where you enter a few key words, and it gives you a list of likely sections. You can force it to search for a particular phrase by surrounding the phrase with single quotes (''). For example, I used 'blanketing interference' to get the text of 73.318 for this article.

Note that new resources are showing up on the Net all the time. You can find them by doing a search (using Yahoo or Web Crawler) or by reading e-mail mailing lists, Usenet newsgroups or print publications (like **RW**).

When I find something interesting, I add it to my bookmark file, which I have made public. You can check out my bookmark file at <http://slonet.org/~hhallika/>.

In an unusual case of FM blanketing interference, the FCC revoked the Program Test Authority for a new transmitter site for a New York FM station (see 9 FCC Rcd. No. 24, page 6873) in July 1994. The station had to move back to its old transmitter site.

New resources are showing up on the Net all the time.

Section 73.318 defines (for nondirectional FM stations) the area within the 562 mV/m contour as being subject to blanketing interference. After Jan. 1, 1985, any station that commences program tests, replaces its antenna or is issued a construction permit for modification of facilities must satisfy all complaints of blanketing interference received during a one year period, starting when the new facilities are put into operation.

Resolution of complaints shall be at no cost to the complainant. These requirements specifically do not include interference complaints resulting from malfunctioning or mistuned receivers, improperly installed antenna systems, or the use of high gain antennas or antenna booster amplifiers.

Mobile receivers and non-RF devices such as tape recorders or hi-fi amplifiers (phonographs) are also excluded. Stations collocating with existing stations must assume full financial responsibility for remedying new complaints of blanketing interference for one year.

Two or more stations collocating concurrently assume a shared responsibility to remedy blanketing interference complaints unless an offending station can be readily determined, and then that station assumes full financial responsibility. Following the one year period of full financial obligation to satisfy blanketing complaints, licensees shall provide technical information or assistance to complainants on remedies for blanketing interference. The station began program test operation in March 1990. The station received 139 complaints of blanketing interference. All but four had been resolved by March 1994. In inspecting the homes of the complainants, the FCC determined that one of the four outstanding complaints was indeed resolved. The other three remained unresolved.

The station did quite a bit of work to eliminate interference at this residence. A "master antenna," its mast, guy wires, and coaxial lead-in cable were all replaced. A ground rod was installed. An antenna rotor was repaired. FM traps were installed. Coaxial jumpers between VCRs and televisions were replaced with

100 percent shielded cables. The antenna lead-in on an FM tuner was replaced with coax. Ferrite chokes were installed on all telephone and answering machine cables.

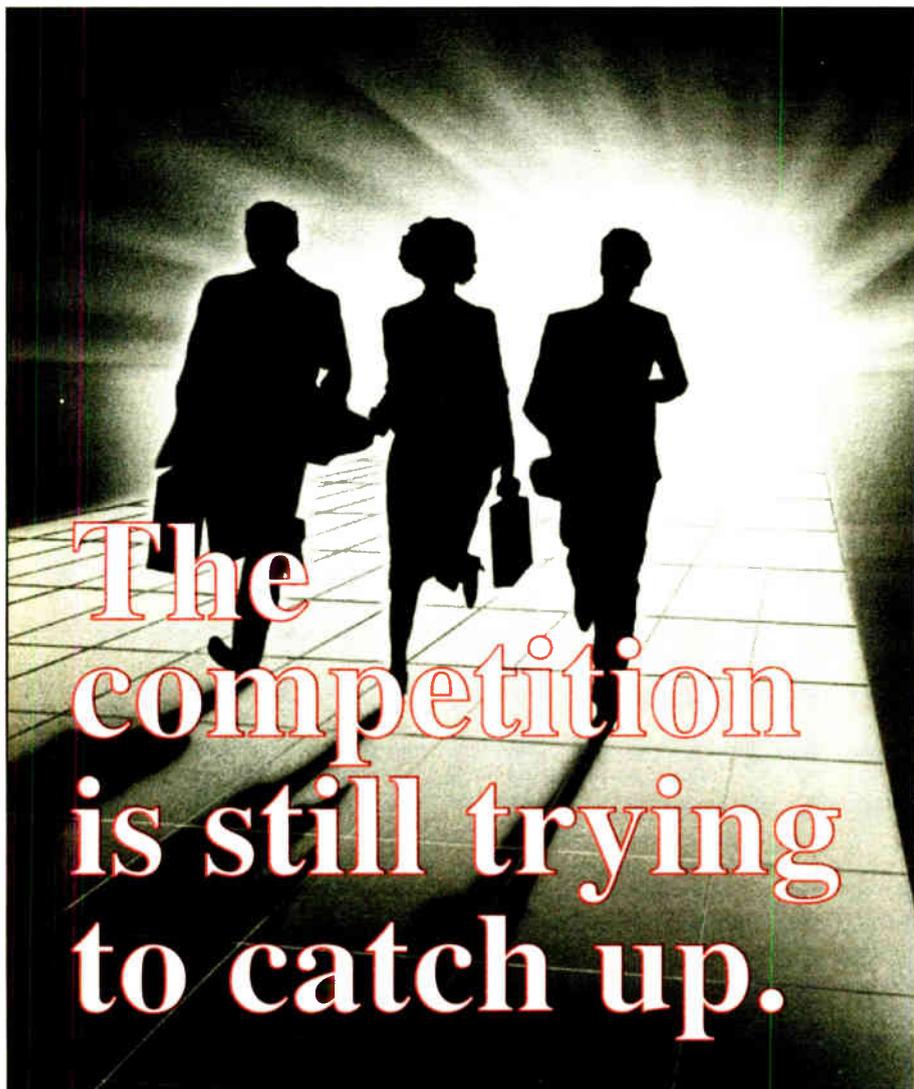
The station stated that it observed no difference in the operation of the home equipment (televisions, radios, telephones, etc.) with the station transmitter on or off. The FCC verified these results and also found that the home owner's VCR was interfering with the AM radio next to it. The FCC also determined that "static" and occasional interruption of telephone calls was due to problems with the telephone company, not the radio station.

The home owner disputes these findings, claiming that reception on one television channel is still not satisfactory, the VCR taping and playback is not satisfactory, AM stereo reception is not satisfactory, and her telephones were still not operating properly. The FCC, however, decided in favor of the station. Operation of the consumer equipment did not appear to vary between when the FM transmitter was on or off.

Next time out, we'll look at some unresolved complaints.

□□□

Harold Hallikainen is president of Hallikainen & Friends, a manufacturer of transmitter control and telemetry equipment. He also teaches electronics at Cuesta College and is an avid contradancer. He can be reached at 805-541-0200 (voice), 805-541-0201 (fax), and on the Internet at hhallika@slonet.org and <http://slonet.org/~hhallika/>.



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WORKBENCH

Remember Fine Points of NRSC Measurements

Practice Good Engineering and Avoid Getting Caught in Tangle of Regulatory Ambiguities

by John Bisset

SPRINGFIELD, Va. For most AMs, the 14-month time limit for NRSC measurements is nearly up. As you make the measurements, remember that you must also measure and record the station's harmonics (73.1590). We encountered a number of stations that made the NRSC measurements last year, but neglected to measure the harmonics, thinking this requirement "disappeared" with the audio proof requirements of years ago.

With the NRSC measurements in mind, I received a fax from Neil Schwanitz at Infinity's WXYT in Detroit. Neil wrote seeking some clarification of the NRSC rules as they pertain to AM directional stations. Specifically, is it true both day and night patterns are to be measured? And if main and auxiliary transmitters are used, that measurements be included for both, in both modes?

Unfortunately, the rules shed no light on this subject, other than to say the measurements are to be made. While working for Delta (the Splatter Monitor folks), we were asked this question a lot. I asked it a lot at conventions or symposiums where FCC representatives spoke. If the truth be known, I'm not aware of specific answers to your questions, Neil. It seemed my requests were always met with the "good engineering practice" cliché.

So no one is caught in an embarrassing situation. Delta recommended making the measurements in all modes and for all transmitters. The rationale was that during Splatter Monitor field tests, we noted differences in splatter measurements, using the same test signal, when different patterns were selected. That your older back-up transmitter could have some problems brought the auxiliary transmitter measurements into the picture. Possible differences, yes; probable for most stations, no—but given the

few technical issues an inspector can bring a station for, it makes sense to do more than less.

You are right that the rules are ambiguous. It is my personal opinion that they were written this way on purpose. The commission was charting new waters with NRSC, and perhaps was not sure what the future would hold. The "good engineering practice" disclaimer gave them time to clarify the rules based on some good field experience. Hopefully, we'll see the changes soon.

We've recommended to our clients to measure all transmitters, all modes—just to be safe. If your measurement man is already in the field, the extra measurements shouldn't be that costly. In the meantime, you might want to contact your engineer in charge at the local FOB, and get his or her opinion—understanding that until we see it in the rules, it will be just that.

Comments from our readers are welcome. You can reach *Workbench* via America Online at wrbench@aol.com, or use our fax.

★ ★ ★

Speaking of Delta, you may remember my AM Stereo associate, Chris Wilk. Chris went to work for Group W a few years back, and now chiefs an AM/FM combo in Fredericksburg, Va. I had a chance to visit with him recently, and he showed me a simple mod that was made to his Harris FM transmitter to permit switching the exciter on with the filaments.

Relay K-1 is the primary relay which pulls in when the filaments are turned on. An AC relay was paralleled across the K-1 coil and run to the +24 VDC and the mute contacts on the exciter. For stations running a "hot standby" where the filaments are on continuously, the relay can be hung across the plate relay coil.

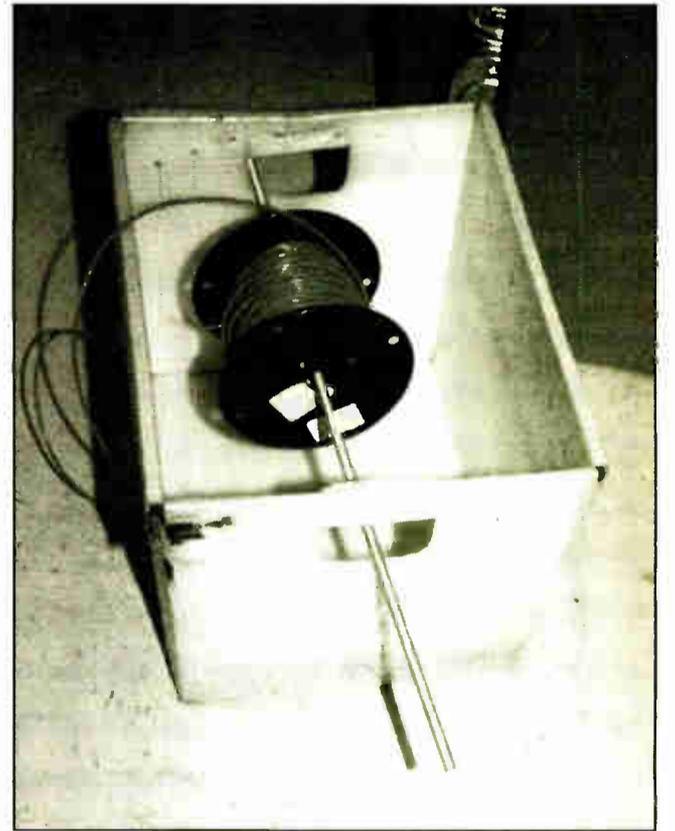
One of Chris's recent projects was to construct a portable mast stand for the many remotes the station handles. Chris selected a diameter of pipe that permitted a snug fit for a Channel Master 1650 50-foot mast. He removed two sections, to give him a 30 foot total height. The total cost for the mast and welded mast stand was about \$150 and some station t-shirts to the local welding shop. If you're doing remotes on a budget, this is the way to go.

Chris Wilk can be reached at WBQB at 703-373-7721. If you call, ask him to tell you the story about the bandits stealing his suitcase full of clothes out

of the back of his van while he was inside a deserted transmitter building installing a Delta C-QUAM system!

★ ★ ★

Wayne Kirkwood from Media Technology in Dallas faxed news of an adapter that anyone who plays with opamps should own. It substitutes 8-pin



A simple trick for unrolling wire

DIPS for "TO" cans. Manufactured by Aries Electronics in Frenchtown, N.J., the "Correct-a-chip" adapter socket will accept an 8-pin DIP socketed chip on top, and has the TO can footprint on the bottom. ICs available only in the 8-pin DIP configuration can now be readily mounted on boards having holes for the TO cans.

NE5534Ts are hard to find, and Raytheon is the only vendor. To make matters worse, Wayne reports their quality are less than satisfactory. Both Pacific and MCI used the TO metal can versions in their consoles, so owners of these products may want to stock up on a few. The adapter is \$2 in large quantities. For more information, circle **Reader Service 78**.

★ ★ ★

Looking to unroll some wire for your next electrical project? Figure 1 shows a cheap but effective way using a piece of all-thread and a mailer box borrowed from the promotions department. The hand-holes in the box are ideal for securing the all-thread, and the reel spins freely.

□ □ □

John Bisset is a principal with Multiphase, a contract engineering firm based in Washington, DC. He can be reached at 703-323-7180. Fax submissions for the Workbench column to 703-764-0751, or through America Online at wrbench@aol.com. Printed submissions qualify for SBE Certification credit.

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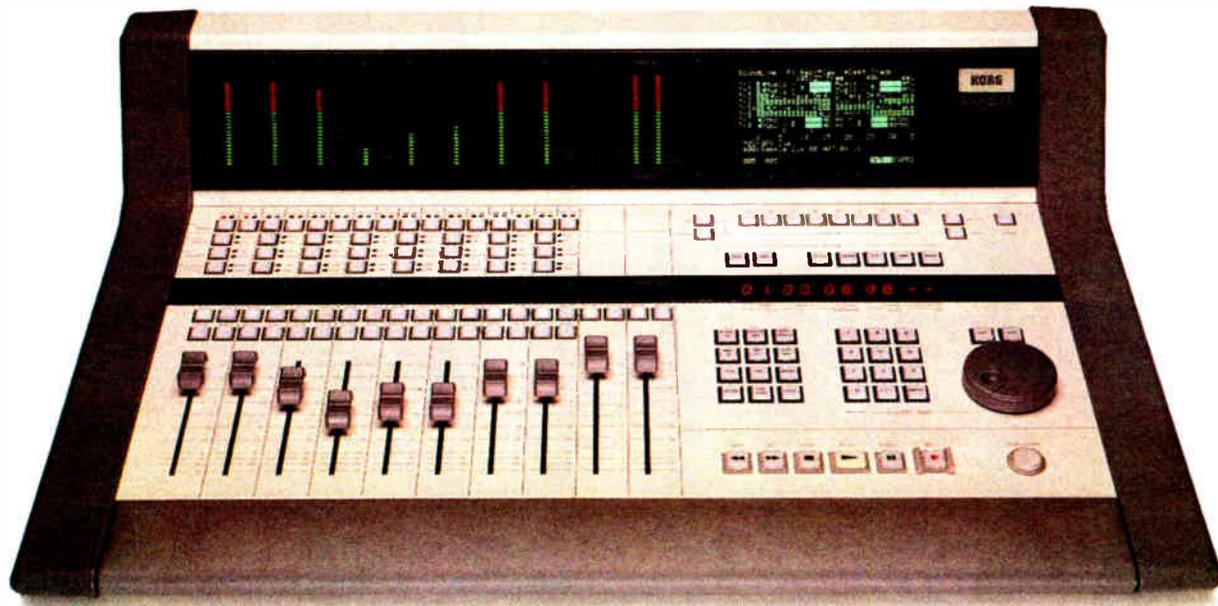


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Circle (23) On Reader Service Card

World Radio History

Studio Sessions

DA-30 DAT
from Tascam
See page 19

Equipment and Applications for Radio Production and Recording

DIGITAL DOMAIN

BBC Commits to Digital with Axiom

by Mel Lambert

LONDON BBC staffers are justifiably proud of the corporation's new Digital Sound Vehicle (DSV), featuring a 48-channel SSL Axiom digital production system with DiskTrack. It made its first public appearance during the recent ITVS Convention in Montreux, and attracted avid attention from broadcasters from around the world.

commitment to the widespread application of digital technology in the production chain," said Gerry Glancy, head of operations, BBC Radio Outside Broadcasts.

Committed to digital

"While our new Axiom-equipped mobile will be used extensively for the broadcast and recording of operas, classical and pop concerts, it will also be available during certain periods for external projects. There is already considerable interest from some of the classical labels."

"Also, the new audio vehicle complements (the BBC's) recently completed Digital Wide-screen TV outside broadcast Control Vehicle, and will provide high-quality source material for the corporation's DAB transmissions and the existing transmissions in NICAM digital stereo."

The Digital Sound Vehicle features a 48-channel SSL Axiom equipped with 108 remote mic pre-amps housed in three 36-input stage boxes, plus a removable wing to enable use within the narrow confines of the OB vehicle. The 48-channel mainframe features 40 mono plus the movable bank of eight stereo channel strips.

Because the truck has to meet fairly stringent European regulations relating to vehicle width, the truck was fabricated with two side sections that extend outwards to provide additional room within

the control room area. A rear section holds outboard digital/analog multitracks, a continuity/announce area plus other system equipment. During transport, the additional eight-channel strips travel as a self-contained removable wing mounted behind the main console, connecting to the latter via a retractable umbilical.

Design philosophy

Primary digital I/O to the Axiom console is handled by a multichannel AES/EBU digital interface. In addition to its integral DiskTrack hard-disk recording and editing system, the all-digital mixer will also interface directly with a wide range of tape machines, from Sony PCM-3348 DASH-format digital multitracks to Tascam DA-88 modular digital multitracks.

"We selected an SSL Axiom Digital

Production System for our all-digital mobile primarily because of its design philosophy," said Glancy. "Which involves 'one control per function; one function per control.' During a live broadcast or classical recording session, our sound engineers do not have the time to scroll through menus or access layer buttons; each and every control has to be available instantly!

"For the wide spectrum of classical music, jazz, pop and opera assignments we need to handle, a familiar user interface was considered essential. The BBC currently owns a wide selection of analog SSL G-Series consoles throughout its various regional production centers, as well as at London's Television Center and Broadcasting House, plus five mobile units.

"And because all user controls are totally resettable, we can store system setups between concerts; for example, operators can also memorize their favorite I/O console layouts. The instant recall and reset

continued on page 21 ▶



Photo by Mel Lambert

The BBC debuts the new Digital OB Vehicle at Montreux.

The DSV is intended to handle a wide cross section of radio and audio-for-TV broadcasts in addition to location recordings. One of its first assignments was live audio production for the annual nine-week Promenade Concerts from the Royal Albert Hall here in London.

The outside-broadcast vehicle will also figure prominently in the BBC's initial series of DAB (Digital Audio Broadcast) transmissions scheduled to begin in England's capital area during early fall.

"Establishment of a fully digital audio mobile unit is part of the BBC's

E-mu Debuts DARWIN



At press time, E-mu Systems of Scotts Valley, Calif., announced the debut of the long-awaited DARWIN eight track digital audio hard disk recorder.

The DARWIN (formerly code-named "Buckeye" during R&D phase) is a self-contained recorder/editor featuring tape machine-style control buttons, graphical user interface, and eight digital audio tracks sampled at 44.1 kHz and 48 kHz.

Future options for the DARWIN include SCSI connections to external computers, sync cards to link four DARWINs together for 32-track operation, and digital I/O to interface with the Alesis ADAT recorder.

E-mu Systems will be shipping the DARWIN during the fourth quarter of 1995. Watch for a review and evaluation in a future issue of *RW*.

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World Radio History

PRODUCT EVALUATION

Solid Performance from Tascam DA-30

by Alan Peterson

WASHINGTON Station DAT machines are commonly used for "master reel" archiving; saving finished production for future reference or reuse. Control room use includes playback of local artist material. Newsroom machines can complement portable field DAT packs and remote vans need one to provide long music tracks at live events.

Whatever your station's requirements, consider the Tascam DA-30 MKII: a well-stocked professional DAT recorder with the features, speed and clean sound desired by production directors and jocks. Priced around \$1,499, it will appeal to the accounting department as well.

The numbers

Claimed specs, needless to say, are superb for a deck at this price. Response is 20-20,000 Hz in Standard play, 20-14,500 Hz in Long play (more on this below). Total Harmonic Distortion (THD) and wow and flutter barely exist. Channel separation is better than 85 dB (at 1 kHz) and dynamic range checks in at 93 dB. Depending on console configuration, Tascam provides both unbalanced and balanced (pin 2) analog I/O as well as AES/EBU XLR and coaxial ports for digital audio. When you upgrade to a digital console, the DA-30 MKII will be ready.

The front panel includes tape transport controls and large concentric Data and Shuttle knobs for fine control over tape motion. To the right, a complement of buttons select Renumbering and ID functions. A well-designed display window with big peak meters and status indicators

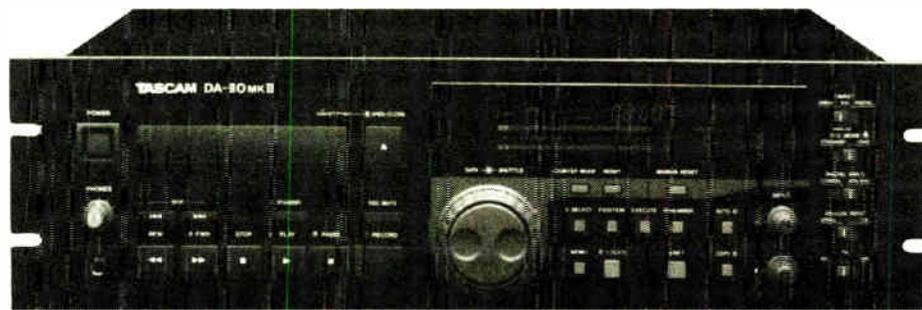
is immediately above. Further to the right are individual analog Input Level controls (in my opinion, more desirable than a single Input control with a balance pot), easily overridden by a slide switch to choose

use of the Open/Close button.

If you are used to DAT machine operation, recording and playing back with the DA-30 MKII is as with any other recorder. However, you will also find some pleasant

unstripped tape and has a rough time with similar tapes from other machines.

The solution is simple. Make it standard practice to leave the station overnighter a new tape along with instructions to record silence from start to finish. The tape is now striped with absolute time and you may use it as new.



Tascam DA-30 MKII DAT Recorder

Cal or Uncal levels. Other sliders select analog or digital inputs, AES/EBU or coaxial digital inputs, standard or long record mode and sampling rate.

Jock proof

The transport buttons on the DA-30 MKII feel well-braced and able to absorb a few good hits. Big points, considering jocks are not kind to any audio equipment. This is a big change from the old days where earlier Tascam reel decks ended up on the bench to replace transport buttons shattered by impatient DJs. Knowing this, a more logical choice would have been the soft rubber buttons Tascam puts on its analog cassette decks, especially for the DA-30 MKII's Open/Close button.

Having said that, I think Tascam should beef up the tray mechanism for jocks that shove tapes home instead of allowing the motor to do the job. We know jocks should not do that—but they will—and a seemingly niggling design point now may come back to the bench with stripped gears. Until sturdier transports come along, educate your jocks on the

extras on the DA-30 to appreciate.

For instance, the Auto ID threshold normally defaults to -54 dB, but is resettable to four other levels. Should source audio start low, an ID written at -54 dB will result in upcut playback. Use the Shift and Auto ID buttons to select a new sensitivity level, so softer passages are properly identified.

Start and Skip index positioning is accurate down to five frames, but requires absolute time (referred to as ABS in the manual) to be on the tape. Using a combination of the ID Select and Position buttons along with the Data Wheel, cue points can be accurately placed along the tape where desired.

Got the time?

A note on absolute time. In order for the DA-30 MKII to properly execute many of its functions, it needs to read ABS data from the tape. Unfortunately, most station archiving is done one cut at a time. Time-stripping a DAT is hardly ever done or gets interrupted along the way. With no reference to absolute time, The DA-30 MKII does its best when scanning an

Long mode

The Rec Mode switch doubles recording time. Sixty-minute tapes become 120s, a 120 becomes a 240 and so on. The tradeoff? Quantization goes from 16- to 12-bit, the sample rate defaults to 32 kHz, and frequency response scopes out to 14,500 Hz. While beneficial for long background music tracks or public affairs programming, this is not entirely so for commercial archiving.

Here is why: A standard 120 DAT holds just under two hours of :60 second spots and promos, but recorders commonly number only up to 99 cuts. In Long mode, storing and searching through 240

Product Capsule: Tascam DA-30 MKII DAT Recorder

 Thumbs Up	 Thumbs Down
<ul style="list-style-type: none"> ✓ selectable speeds and sample rates ✓ analog bal/unbal and digital I/O ✓ jock-proof buttons 	<ul style="list-style-type: none"> ✓ no error rate display ✓ light-duty feel to tape tray

For more information, circle Reader Service 193, or contact Tascam at 213-726-0303.

cuts with no point of reference past 99 is not a practical use of this feature (see sidebar). For long-form program storage however, it is a good feature to have.

Note the time display does not change when the slower speed is selected; you need to multiply displayed time by two to continued on page 24 ▶

Why Not Cut No. 100?

The 99-cut limitation of DAT recorders is a standard design specification for all machines (not just this model). This limitation leaves lots of time on standard 120 tapes after 99 spots have been saved. Ten such tapes equal more than three hours of unused space; more if :10 and :30 second spots make up most of the log. Not very economical.

The cost comparison of one-hour DAT tapes versus two-hour versions makes it likely most stations will continue to use 120 length tapes due to price and availability.

There is little sense in going back to redesign DAT architecture, but there has to be a way recorders could be "fooled" into thinking cut 100 is a new Zero location. Unused tape can be recorded and indexed in the same manner as a new tape. In so doing, more economical use of digital tape can be realized. Both general managers and production directors would appreciate this.

If you have found a way, write to the Technical Editor, c/o RW. Describe your method, and the model machine it works on.

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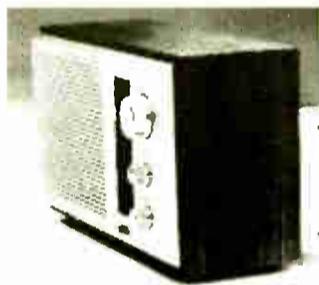
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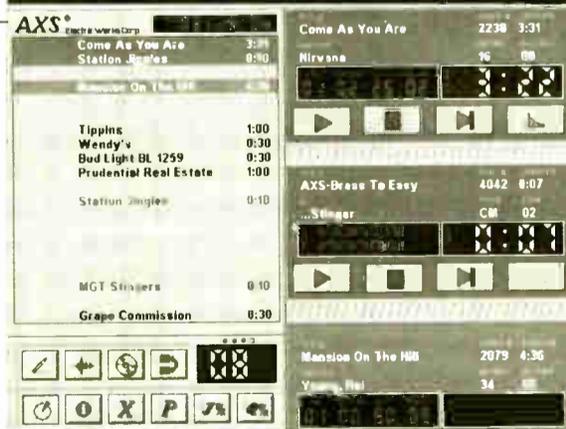
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SIGNAL-TO-NOISE

CDs: The Lowdown on High Prices

by Frank Beacham

NEW YORK In the mid-1980s, the Media Lab at the Massachusetts Institute of Technology proposed a concept called the "paperback" movie. The whole idea of paperback movies was that copyrighted programs—both audio and video—would be distributed on a medium so inexpensive that the vendor would really sell only the license to view or hear it.

The term "paperback" was used because it is cheaper to buy a paperback book than to spend the time and money to copy one to avoid the purchase price. The super cheap medium the lab had in mind was the then-new digital disc.

Well, an odd thing happened on the way to the future.

The digital disc arrived, just as the Media Lab predicted. But the purchase

price of the copyrighted works—as with paperback books—has gone up, not down, with no end in sight.

In a recent article titled "Why CDs Cost So Much," the New York Times did a revealing breakdown of where the money goes in the typical CD audio release which lists in record stores for about \$17. What they found is the average CD by an established artist sells for more than 100 times the cost of the materials used to manufacture it.

As an example, the Times used Rod Stewart's recent CD release, "A Spanner in the Works" (Warner Brothers), which lists at retail for \$16.98. The journey for what was to become Stewart's CD began, said the Times, at a giant offshore oil field in Marjan, Saudi Arabia, and wound its way through Chevron's oil refinery and chemical company in Pascagoula,

Miss., a General Electric plastics factory in Pittsfield, Mass., and finally, to WEA Manufacturing in Oliphant, Pa.

Heavy crude to Lexan

The manufacturing process starts with the heavy crude pumped in the oil fields. At a refinery, the oil is processed for the removal of the byproduct benzene, which is used for the creation of a plastic polycarbonate called Lexan. Next, the super-clear Lexan is formed into thin five-inch discs. At the pressing facility, the music is encoded onto the discs and each disc is coated with aluminum to give it a reflective surface.

The total cost of raw materials throughout the entire process is between 10 and 15 cents (By comparison, the raw materials necessary to make a single vinyl album costs 40 cents).

Add to that another 30 to 35 cents for the CD jacket and plastic jewel box.

There's more ...

Some other interesting numbers. Warner Brothers charged large record chains from \$10.72 to \$11.20 for the Stewart CD. Smaller stores had to buy the CD from independent distributors, which raised the price an additional 5-to-10 percent. Rod Stewart gets about \$2.50 for each CD sold.

In general the breakdown on the sale of a CD goes something like this: 35 percent of retail to the record store, 27 percent to

the record company, 16 percent to the artist, 13 percent to the manufacturer and 9 percent to the distributor.

Death of a legend

Marvin Camras, the man whose is known as the father of magnetic tape recording, has died at the age of 79 in Evanston, Ill. Camras, an electrical engineer and inventor, began his work on magnetic recording as a student in the late 1930s when he built a magnetic wire recorder for a cousin who was an aspiring opera singer. Later, he discovered that using magnetic tape instead of wire made it easier to edit the recordings.

In 1944, Marvin Camras was awarded a patent on "method and means of magnetic recording," a forerunner of modern tape recorders. Over the years, he was awarded more than 500 patents for the invention and refinement of technology that is the basis for today's audio and video recording and computer data storage. Magnetic coatings developed by Camras are now used for tapes in video and cassette recorders, computers and on hard and floppy disks for computer storage. "Marvin Camras is a legend, and we are all grateful for what he did," said Ray Dolby, chairman of Dolby Labs in a New York Times obituary. "The basic principles he explored and designed are used in the tapes and recorder designs in our machines today."

□ □ □

Frank Beacham's address is 163 Amsterdam Ave. #361, New York, NY 10023. E-Mail: beacham@radiomail.net. Visit his World Wide Web site at: <http://www.beacham.com>.

BBC Digital Vehicle

► continued from page 17

functions will save a great deal of time between sessions." Axiom's color schemes and channel strip layouts closely mimic existing SSL analog consoles.

Single-cable connections

"In addition, the three 36-input stage boxes hook up to the OB vehicle using simple single-cable connections; digital multitracks also plug in via Multiple Audio Digital Interface (MADI) links. Rigging for a concert recording or live broadcast will now require far less time than in the past, when we had to pull large reels of screened analog cable and break-out boxes from the truck to the stage area. Now, for 72-input dates, we just need to unreel a single cable—the two stage boxes link together! It is a remarkable development."

Axiom I/O resources, including microphone pre-amplifiers, can be located more



Photo by Mel Lambert

Sue McDonald trains BBC technicians at the SSL Axiom console.

than 500 feet from the main digital processor rack, and connect via a simple coaxial cable. Each audio source is digitized at its source, with gain and other system parameters implemented remotely. Signal degradation can be dramatically reduced. SSL developed a proprietary A-to-D topology specifically for

Axiom, which offers a quoted -104.5 dB CCIR-weighted noise floor. All internal mixing and signal-processing within the all-digital console is said to be greater than 24-bit precision; Axiom features user-selectable 16/20-bit recording to hard disk.

Dedicated controls

Each Axiom channel strip provides dedicated controls for a four-band parametric digital EQ section, eight auxiliary sends, a digital dynamics section offering gating, expansion, compression and limiting; digital effects processing, including reverb, delay and ambiance generation; plus full panning between several stereo program output busses.

The EQ section provides four identical bands that extend from 5 Hz to 20 kHz, and which can be set to high-pass, low-pass, high-shelf or low-shelf profiles, a deep notch, or to one of four fully parametric settings. All user controls are totally resettable, and feature circular LED displays around the skirt to show current settings of each knob. Signal processing applied during recording or overdubbing can be saved as snapshots or dynamically automated without affecting the recorded signal.

"Axiom is a landmark product," says SSL's Group Marketing Director, Colin Pringle, "since this is the industry's first opportunity to have a digital audio production system built to order, according to the application. The inclusion of hard disk storage and editing differentiates Axiom from other digital consoles. It also provides greater speed, efficiency and creative power."

□ □ □

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

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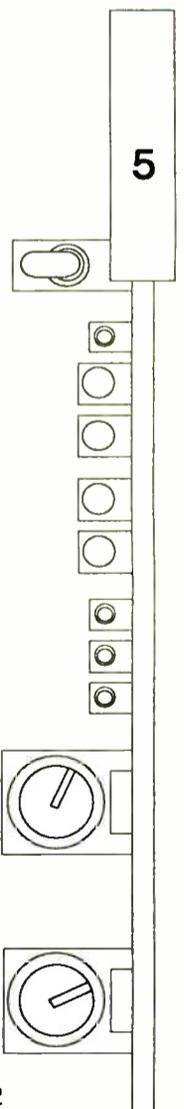
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Kaye Tube Tester Worthwhile

by John Diamantis

WASHINGTON Allow me to "geeze" for a moment.

In the old days before solid state, you either whipped out the Hickock 539 Transconductance Tube tester or traipsed down to the TV repair shop or drug store to pop those fire-bottles in the large free-standing checker, waiting for "Good," "?" or "Bad."

I spent many Saturday afternoons at the pharmacy with my dad and a wrinkled brown paper bag full of tubes from the family Zenith, plugging them into the tester, one by one.

These days, when a piece of gear goes bonkers, you are usually notified by an acrid aroma emanating from the vicinity of the culprit, now reduced to mere plastic-encased sand. A "chip checker"? Who needs one? For that matter, who needs a tube checker?

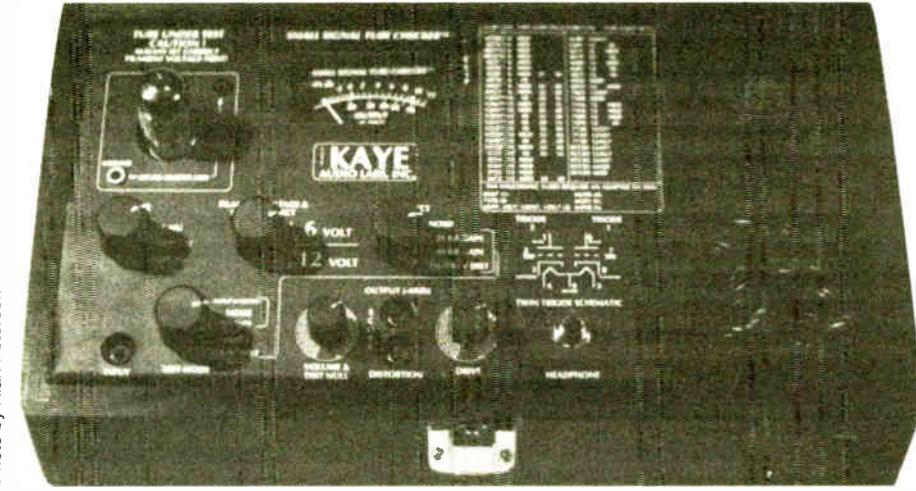
You do, if you use tube type gear and want maximum performance out of it.

If you've been lucky, said your prayers and eaten your greens, you might have

stumbled across an old working tester at a hamfest or in an attic. You won't find many new tube checkers in equipment

prone to shipping damage, but I understand a stronger case is now standard.

The George Kaye tester will check most



Kaye Audio Labs' tube tester: If you use tubes you will need this.

Photo by Alan Peterson

catalogs either, although an outfit like Fair Radio Sales might have a used one from time to time. Even if you do find a working one, the tests it will perform will probably not be relevant to your needs or your gear.

There is a device out there that just may suit your needs. I had a chance to evaluate the new Small Signal Tube Tester from George Kaye Audio Labs and I liked it.

My unit came in a handsome wood carrying case that opened to reveal the tester, with the instructions affixed to the inside of the lid. The wood case was

dual and twin triode nine-pin miniatures utilized in audio equipment like the 12AX7, 12BH7, 6DJ8, etc; several twin octals such as the 6SN7 and the odd hi-fi piece (7199, triode-pentode dual) tested

with an adapter. Unfortunately, there is no provision for testing power tubes.

The tester evaluates tubes for gain in dB and gain matching between sections; noise with shorted input grid and with 47 kilohm resistance (especially for phono preamps); microphonics and maximum output level. Typical values are supplied for most tube types that will fit in the unit, but there are several omissions.

The Kaye tester also has a built in speaker, headphone jack, and an input for injecting test signals. The meter is calibrated in dB for noise measurements with a separate scale for gain measurements. There are output jacks to view the signal or distortion products on an oscilloscope.

Construction quality is good, but the unit seems more appropriate for the home enthusiast rather than industrial use. Some care in handling and operation is required.

I spent two weeks with The George Kaye Audio Labs tester, going through several of my best and not-so best tubes. With the help of the tester, a box of "pulls" I bought for ten bucks at a hamfest netted several high quality, low noise tubes. After running several dozen tubes

continued on page 24 ►

PRODUCER'S FILE

Step Back, Be Wrong: Production Room Zen

by Ty Ford

BALTIMORE Some of us do not know the difference between hearing and listening. We suppose that because we are in a business whose content is delivered as audio, that we are professional listeners. Certainly we are professionals in a business that is about audio, but hearing and listening are different. Very different.

Think of it as a two-part system; the hearing apparatus is the collector, the listening apparatus is the processor. Any malfunction in either process produces distorted, non-linear results.

Hearing is the ability of the organs to work their magic: sending amazingly complex electrical impulses for processing by the brain. Our hearing apparatus is as individual as it is complex. Consider the pinna. That is the visible part of the ear (sometimes all too visible) that is attached to the sides of the head. The pinna is shaped differently for each person. In fact, no two pinnae are the same.

Mechanical filters

The pinnae are basically mechanical filters that alter frequency response and create time-domain information that allows us to locate sound sources.

If you reversed your pinnae—if your left was switched with your right—you would be disoriented to say the least. The reason being that as we live and learn and listen, we get used to having sound bounce off of our own pinnae and into our ears. The listening part is even more complex. All kinds of interesting things happen when the brain starts moving its focus of attention. With well-developed listening skills, the slightest glitch in the edit of one track of a 24-track production may stand out as painfully obvious to one person, while remaining inaudible to another. Likewise, it sometimes takes months of repeated listening before small anomalies in a mix

are discovered. It is a miracle that we achieve the consistency we do.

Because both systems are organic, they are subject to changes in barometric pressure, blood pressure and air pressure as well as fatigue, over-stimulation, chemical interaction and visits from relatives. So in the strictest (and most other) senses of the word our hearing and listening are prone to be anything but linear.

That's the down side. That is why the mix you made before you had an anchovy pizza for lunch sounds different when you listen to it after lunch. Yet we unabashedly maintain that, as professionals in an audiocentric industry, we are supremely suited to make decisions about the quality of audio listened to by millions of people. That is *chutzpah*.

A learned experience

Listening is a cumulative, learned experience. We learn how to listen, and, over time, our listening hopefully becomes more discriminating. This is why we cringe at old air checks, demo tapes and mixes. Part is due to the fact that, when the recording was originally made, we truly thought it was our "personal best." I always try to put a positive spin on the cringe by celebrating the fact that I am doing much better work now than when I started.

This does not explain, however, the problem we face in integrating the "more is better" and "mine is bigger (louder) than yours" mentalities we so liberally apply to the processing of audio chains at radio stations. Here the situational ethics prescribe that, as the listener runs up and down the dial, the station that cuts a wider swath or is louder, is better. In this "quantitative universe," qualitative properties such as distortion and content are deemed less important.

The problem with this approach is that adjustments are made not relative to a

continued on page 28 ►

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Kaye Checks Out Tubes

► continued from page 22

through the tester, some sort of benchmark for noise was needed for grading and comparison. I selected several tubes I knew were quiet from previous tests and, utilizing the meter and built in speaker, noted the quantity and quality of noise produced. After testing them for microphonics and noting the results, I dove into my treasure box.

The tubes ran the gamut from practically new with low noise, to units so microphonic the meter would move when I spoke two feet away. I kid you not! Other tubes were quite noise free, and when checked for microphonics (by gently tapping the envelope), produced no more than a single

"clunk." Others rang like churchbells while a few broke into oscillation.

Determined to see if there was a correlation between tests and actual use, I retested several tubes from different noise and microphonics categories in a phono preamp stage, then a line level preamp stage while listening to the results.

True to form

True to previous testing, those with lowest noise and microphonics produced the cleanest sound in the phono stage. The noisy tubes began to interfere with reproduction as we got to the middle of the stack. Tubes free of microphonics sounded clean while those with moderate to severe

microphonics tended to sound bright or "zingy." If used in a circuit, these tubes would always produce a microphonic sound when the chassis was tapped.

As expected, the noise didn't seem to play as important a role in the line stage test due to the lower gain requirements. But the more microphonic tubes exhibited nearly the same characteristics as in the phono stage.

The tests for gain and maximum output helped weed out those tubes that were spent. Double-checking those against results from my Hickock 539 showed the George Kay Labs Tester to be an accurate indicator of tube condition.

I could probably get similar results testing tubes in-circuit, but it would take an inordinate amount of time, not to mention

the difficulty in quantifying results without some sort of outboard metering. Also, additional switching for different heater voltages would be required and testing away from the bench would be out of the question.

There is no doubt the George Kaye Audio Labs Small Signal Tube Tester is an accurate, easy to use, and time saving piece of test gear. It is pricey at \$549, but if you are using tube equipment and are interested in getting the best sound out of it, the George Kaye tester is one of the best ways of doing it. Contact Kaye Labs at 212-779-3713.

□ □ □

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

DA-30 DAT Performs

► continued from page 19

get actual elapsed or remaining time.

Tascam's Data and Shuttle wheels are immensely useful. Selecting a cut is done by dialing it in via the Data knob. The Shuttle wheel "nudges" the playback point, and moves tape at up to 16 times normal speed to new locations. After using Skip keys and up/down buttons for a long time, it will be easy to get spoiled by wheels.

Auto off

Other spoilers? Ignore the machine for a while, and the DA-30 MKII takes itself out of Pause mode after eight minutes. Fast rewind takes just over a minute with a 120 DAT and ID Locate is accurate. A contact-closure connector on the back panel allows control from the console's fader Start switches. These are highly practical and desirable studio features to expect from a DAT recorder.

Tascam put a great deal of thought into the DA-30 MKII for pro use, which is why I favor it highly for both +4 balanced and backup -10 production rooms. As any other piece of audio equipment for the station, I recommend calling Tascam to get the service manual for the DA-30 MKII.

There are conditions unique to broad-

casting which should be considered here by Tascam.

Jocks are rough on transport controls but rougher on audio levels. Raised on analog tape, many still red-line their meters and completely ignore the demands of digital recording. The DA-30's display has a Margin peak-hold feature that warns of saturation and a red field for levels that exceed 0 dB, but by that time it is too late. It would be beneficial if the DA-30's display had a marker right around the -14 to -18 dB position or was red for levels between -18 and 0 dB.

Many articles on DAT maintenance refer to Error Rate displays that show when data integrity is being compromised by dirty heads. The DA-30 MKII does not have one. Strange, because the similarly-priced Fostex D-5 does have this feature. My feeling is there should be one on the Tascam as well.

These concerns will not stop me from recommending the DA-30 MKII DAT recorder for your station. It is a solidly made, reasonably priced, good sounding machine to consider for your radio production facility.

For more information, contact Tascam at 213-726-0303.

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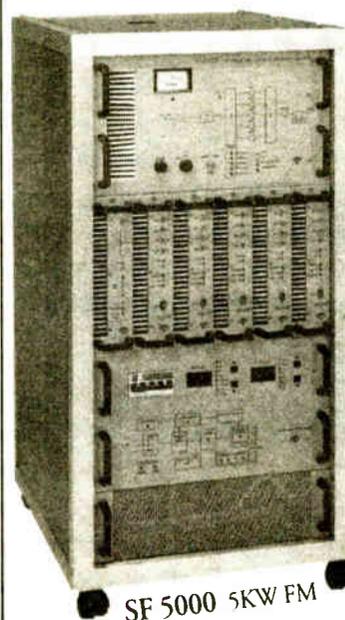
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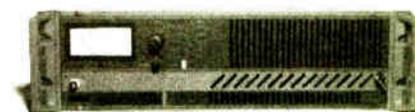


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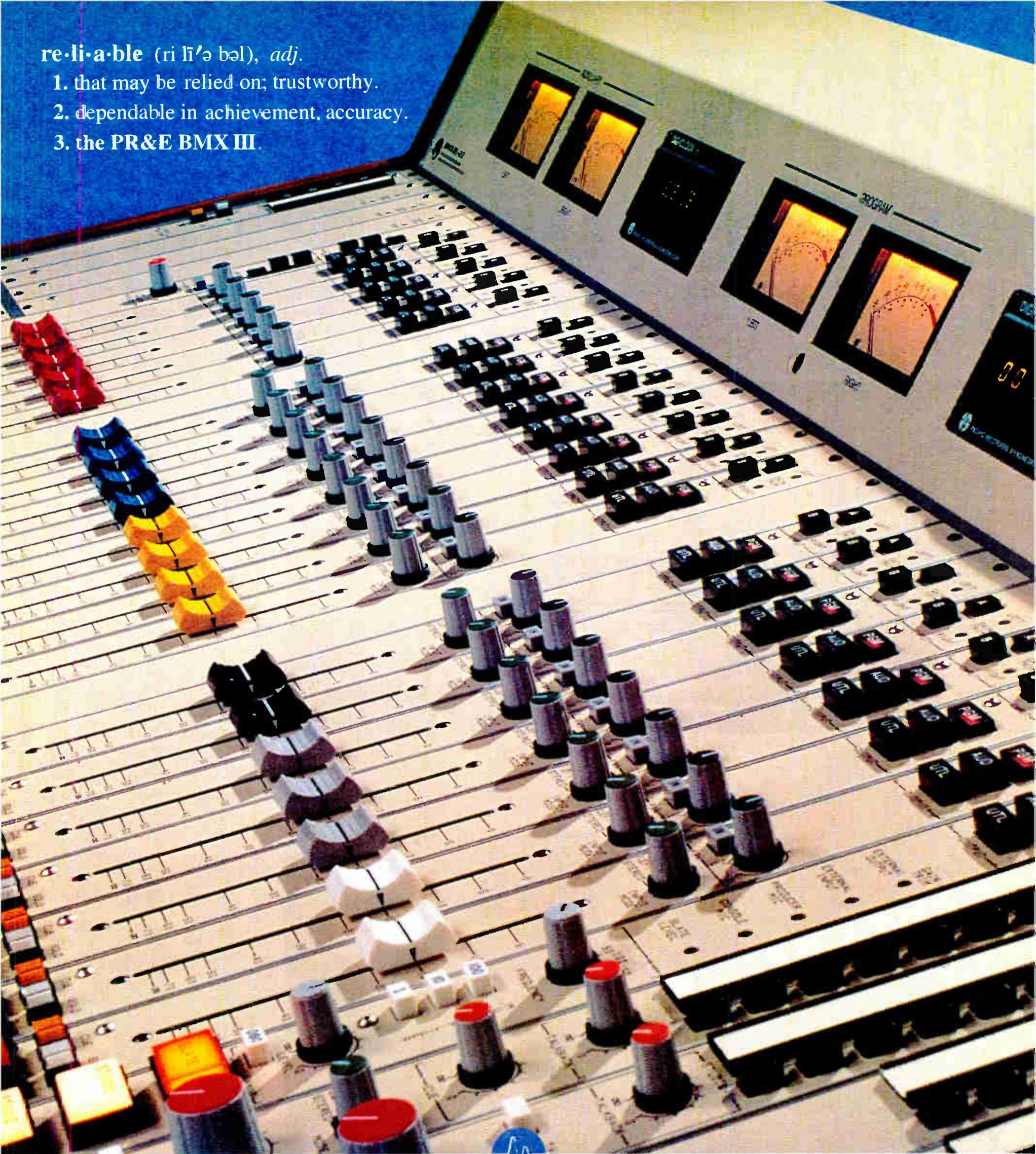
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re·li·a·ble (ri lī'ə bəl), *adj.*

1. that may be relied on; trustworthy.
2. dependable in achievement, accuracy.
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World Radio History

PRODUCT EVALUATION

Quad Studio: Turtle in Your PC

by Bruce Bartlett
with Jenny Bartlett

YORK, Pa. Imagine a software version of a four-track multitrack cassette machine. That is the Quad Studio by Turtle Beach. It is a sound card and software package you install in your PC. With Quad Studio, you can record four CD-quality mono tracks, edit the tracks on screen, bounce them, and do an automated mix-down with panning and parametric EQ.

For \$499, you get the Turtle Beach Tahiti card and the software (the software works only with Turtle Beach sound cards). The Tahiti is a basic

recording card with two analog ins and outs; similar to Turtle Beach's

minus the MIDI voices. If you already have one of these cards, the software alone costs \$199.

Because the card lacks digital I/Os, you cannot record digital audio directly off your DAT. But the sound is still CD quality.

Quad Studio is easy to install and use. It took about an hour to install the card and software, including tweak-

Product Capsule: Turtle Beach Quad Studio



Thumbs Up

- ✓ easy to install and use
- ✓ cd-quality
- ✓ automation well done
- ✓ very good value

Thumbs Down

- ✓ no digital I/O
- ✓ mouse time-control coarse
- ✓ no source mon for rec level
- ✓ ragged time compression

For more information, circle **Reader Service 194**, or contact Turtle Beach at 800-645-5640.

Multisound and Monterey cards but



Turtle Beach Quad Studio main screen

couple of hours.

Like many cassette recorder-mixers, Quad Studio lets you record up to two tracks at a time, overdub, punch in, and mix four tracks in real time. But you can do much more with Quad: edit each track, time-shift selected tracks and mix with real time automation of level, pan and mute. You can record several takes of each track, then use only the takes you want in the final mix.

The main screen looks like a cassette multitracker, so operation is intuitive. Each track has a fader, Record/Play/Punch switch, track title, Pan Pot, Solo, Mute, and Edit buttons. The Output or Global section has a master fader, bargraph level meters, 14 marker selectors, punch-in/out time display, group and sync switches, and transport controls.

When you click on a track's Edit button, a program called Wave/SE pops up. It lets you edit the track's audio with a mouse. You can mute unwanted sentences, delete them, reverse segments of audio, invert polarity, change gain, add echo, and so on. Mute edits are very fast. But the Delete edits—where you remove goofs and tighten up space—take several seconds to calculate. You can use other .WAV editors though. Quad Studio does not include a playlist editor.

Each track can be offset (delayed) by several seconds to adjust timing. Also, you can bounce tracks without generation loss. The program lets you group the controls of two or more tracks.

Quad Studio will not slave to a tape deck or SMPTE, but can easily sync to a MIDI sequencer that receives MIDI Time Code.

How useful is the program for radio production? It works very well to create short spots consisting of stereo music, voice and effects. I tried to use Quad Studio to post-produce a concert program of stereo music, audience noise, and studio announcer. It was slower and more cumbersome than using three DATs and a mixer. However, Quad Studio let me edit tracks and do an all-digital mix with automation.

Here is how you might use Quad Studio to record a simple one minute radio spot. Say you will record music on tracks No. 1 and 2, announcer on 3, and sound effects on 4. Start with a music intro, fade it under voice and effects, and fade the music up and out at the end.

Recording the stereo music is straightforward. Select Record mode, enable the track to record on, name the .WAV file (sound file) you want to record, set levels, and click on Record. If you record a stereo program, it is split into two mono

continued on page 28 ►

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Quad PC Multitrack

► continued from page 26
tracks after recording.

Repeat the same process to record the announcer on track No. 3. When done, click on track 3's Edit button to edit the voice track. You must edit this track before adding sound effects, otherwise the effects timing will be off.

Now you are ready to mix. Reset the counter to zero and click on the Mix button. Group together faders 1 and 2 so you can adjust the stereo music level with one fader. Pan tracks 1 and 2 hard left and right. Set all faders to 0 dB. When you click on Play, you will instantly hear the mix of music and voice.

Probably the voice comes in right away,

rather than after the intro music. Offset or delay the voice track by enough time to allow for the intro.

Now play the mix again. Let the music intro play a few seconds, then duck it under the voice by pulling down track 1's fader with your mouse. If the voice is not loud enough, start over and push up its fader. Bring up the music near the end, then pull down the master fader to fade out.

Next you will overdub the sound effects. Start recording on track 4. While listening to the music and voice tracks, cue the effects at the right times or punch them in. Repeat the mix, tweaking faders and EQ, until you are done. Then play the final automated mix and copy it to a cart.

It is all easy to do.

Quad Studio is great for stations on a low budget who want to get started in digital production.

Minimum system requirements: 486-SX/33 with Windows 3.1, 4MB RAM (8MB recommended) 2MB hard disk space for program, 5.5MB per track-minute, 1200 kilobits per second (kbps) throughput and 16 milliseconds access time, Turtle Beach Tahiti, Multisound, or Monterey sound card.

Specs: Quantization: 16- and 8-bit. Sample rates: 44.1, 22.05 and 11.025 kHz. A/D: 64x oversampled sigma-delta with 16-bit 8x interpolating filter. D/A: 64x oversampled sigma-delta, 18 bits. S/N: 89 dB A-weighted.

Turtle Beach Systems is at 52 Grumbacher Rd., York, Pa. 17402; telephone: 800-645-5640.

Studio Zen

► continued from page 22

baseline of absolute fidelity, but in comparison to the relative loudness and distortion of the competition. The changes are so gradual that we accommodate them, not realizing that we too are turning out increasingly nasty sounding audio. Acceptance and justification of the distortion becomes part of our learned listening.

Trust me on this one. If I took five of the biggest proponents of major dynamic processing and sequestered them on a desert island for as long as it took for them to forget their respective hearing models, they would be totally disgusted by the processing that they themselves created before leaving town.

Entertain the possibilities

So where am I going with this? I want you to accept that we are all very capable of deluding ourselves. I want you to allow yourself the possibility of being wrong, without having it plunder your self-confidence. The pay-off is that you will be amazed at the additional number of viable possibilities that occur to you.

The more possibilities you entertain, the richer your work is likely to be. This point is especially important to audio people approaching burn-out. Burn-out happens when you get locked into a restricted mode of operation. Although alluring at first, due to the high degree of efficiency afforded by the restriction, the price paid for that efficiency inevitably becomes creativity.

Coming to terms with that, relighting your passion and forging new solutions can be extremely stressful. Do not misunderstand me, stress can be good when employed properly by you. The problems don't start until stress becomes the controller and you allow yourself to become the tool. That is the way it is. However, it is also our right to make fundamental changes in our lives.

Fresh look

Periodically, it is a really good idea to step back from what you do in hopes of getting fresh perspectives. The daily crush of work, and the self-punishment we prescribe for ourselves seldom provides us this opportunity. I am saying: Go ahead. Defragment your brain. Completely reformat it if you want to. Start playing with the results of those processes. Don't be surprised by your own contradictions. Envision their differences as the poles of a vast cosmic battery of infinite power that can be applied to the creation of new possibilities. If it doesn't kill you, it will make you stronger.

□□□

Ty has been a little spooky ever since returning from quantum physics summer camp. While we're not quite sure what he was trying to get at with the preceding tone poem, we liked the way the words went together.

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If you can get the DA-P1 back from your field personnel, you'll find it performs outstanding in the studio, too.



With a built-in S/PDIF direct digital I/O, it integrates with DAWs, and other digital gear. Also, it supports multiple sample rates (48, 44.1 and 32 kHz)

DA-P1

and utilizes next-generation A/D and D/A converters delivering studio-DAT quality sound.

Standard accessories include a shoulder belt, AC adapter and battery — carrying case optional.

So if you're torn between a new recorder for the field, or a DAT for the "B" suite, think no more. Pick up a DA-P1. You get the best of both worlds. In fact, once you get your hands on a DA-P1, you may want to buy two. So get to your dealer today and order your new portable DAT from TASCAM.

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Inside the DG Systems Receiver

by Alan Peterson

WASHINGTON DGS receiver terminals from Digital Generation Systems of San Francisco are now in use in 2,500 radio production rooms and more are coming. This is a radio commercial distribution system that digitizes CD-quality stereo audio and sends it down telephone lines to participating stations.

DG Systems deliberately designed its equipment to be easily understood and used. Screen prompts are simple and to the point. The operations manual contains very little shop talk that could confuse the end user (normally jocks, continuity and production directors). But this

also means there is no source of "casually interesting" information, short of removing the cover.

In the course of this article, you will find out more about what is inside the DG Systems receiver and how it operates.

Pet names

The receiver is known by pet names such as "The ATM Machine" at subscriber stations, but according to Ann Marie McGee, director of marketing for DG Systems, the device is known as an RPT, or Receive/Playback Terminal. This is the back-end unit stations are familiar with (see photo).

Since their first stations went on line in

June 1992, Digital Generation RPTs have been placed at stations all over the United States. Milestones observed by the com-

Because fancy screen redraws and slick graphics are unnecessary, running the RPT under DOS keeps things fast and simple. The rubber buttons on the front panel connect to the motherboard as a normal QWERTY keyboard would.

Because the front panel buttons dupli-



Digital Systems' RPT; 2,500 stations have one.

I COULD HAVE BOUGHT A DIGILINK!

Are you thinking about replacing your old cart machines with 'Digital Carts' such as floppies, flopticals, Bernoullis, or Opticals??? 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...

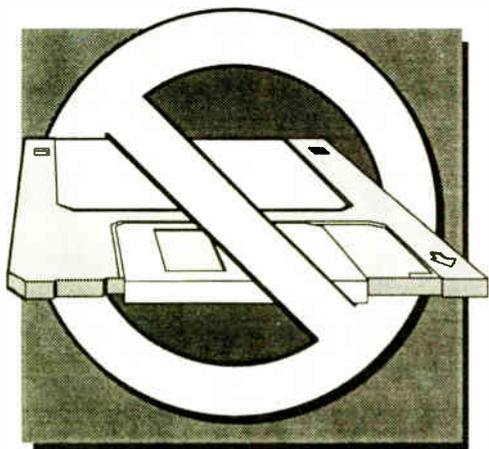
Also with a Digilink, you get much more! You can stack up hundreds of 'carts' in the play list and just walk away. You get satellite automation in the Digilink workstation and can optionally add CD players. A digital audio cut and splice editor even comes standard with Digilink. Because Digilink will 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...

(303) 224-2248

ARRAKIS



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Circle (48) On Reader Service Card

pany include its 1,000th station (KDKA(AM) Pittsburgh), its 2,000th station (WMEE Fort Wayne, Ind.) and an incredible 10,324 digital spot deliveries in one week. Imagine the awesome amount of fossil fuel saved in not flying and trucking 10,324 reels to their destinations!

DG System's electronic delivery process makes it possible for radio stations to receive CD-quality audio in several minutes instead of third-generation analog dubs overnight or second-day delivery. Advertisers can use the DG System for rapid schedule changes or "just-in-time" advertising (campaigns created to seize the moment). This fast distribution gives advertisers a tactical advantage over competitors.

So how exactly does that commercial get from San Francisco to you?

How it works

Ad agencies and production studios are equipped with more elaborate DG Systems terminals, known as Record/Send Terminals (RSTs). Once a spot is produced, the RST digitizes the audio and transmits it to DG's network operations center. From there the audio is distributed via ISDN or conventional telephone lines to participating stations, where the RPT in the production studio stores and converts the information back to audio.

Network operations can deliver to 160 stations simultaneously, and with ISDN lines it is possible for stations to download 24 CD-quality stereo spots in one hour.

In areas where ISDN is not yet available, stations are being equipped with V.34bis lines, an alternative high-speed phone delivery technology.

Naturally the system requires a station to have a dedicated phone line, because deliveries are transmitted around the clock. Sharing a phone line with another station device (PC modem, fax, etc.) is unacceptable and is discouraged by DG Systems.

Inside the box

According to McGee, the basic RPT in current use at most stations is built around a stock 486-33 OEM computer motherboard running DG System's proprietary DOS-based audio software.

cate certain QWERTY key functions, customized input circuitry is not needed and allows emergency use of a conventional PC/AT keyboard in the unlikely event the panel buttons should fail.

Storing audio

Data is received by modem, converted by an Antex soundcard and stored on a 340MB hard disk (newer versions of the RPT use a 420MB drive). Using Dolby AC-2 compression, an RPT hard disk can contain up to 200 60-second spots, and an automatic "housekeeping" feature eliminates the oldest audio on the hard disk. DG System's software allows the soundcard and hard disk to record and play back audio simultaneously; dubbing across to cart or studio hard disk can be done while the RPT is downloading a new spot.

You will notice the absence of floppy drives on the RPT; software enhancements are written by DG Systems and downloaded by phonenumber directly to each terminal.

Notice too, the Digital Generations receiver functions exclusively as a receiver only. In its present form, an RPT cannot transmit audio down a phone line; according to McGee, the hardware is designed this way. No amount of software hacking will convert an RPT to a transmitter (and may result in some unpleasant action taken by Digital Generations). There are no immediate plans to convert current boxes to duplex operation, but DG Systems recognizes the desire for stations to have the capability to send as well as receive and are investigating ways to do it. Presently a separate agreement with DG Systems and its RST device are necessary to transmit audio.

Since 1991, DG Systems has established itself as the leading provider of electronic spot delivery. Advertisers such as Pepsi, Mitsubishi Motors and Montgomery Ward use DG Systems to execute complex radio campaigns quickly, with the time margin necessary for turn-on-a-dime changes that ad strategies require.

With 2,500 stations now on-line with Digital Generations receivers, the technology is proving itself and it may not be long before DGS can boast of its 3,000th participating station.

Safe



LAYER III

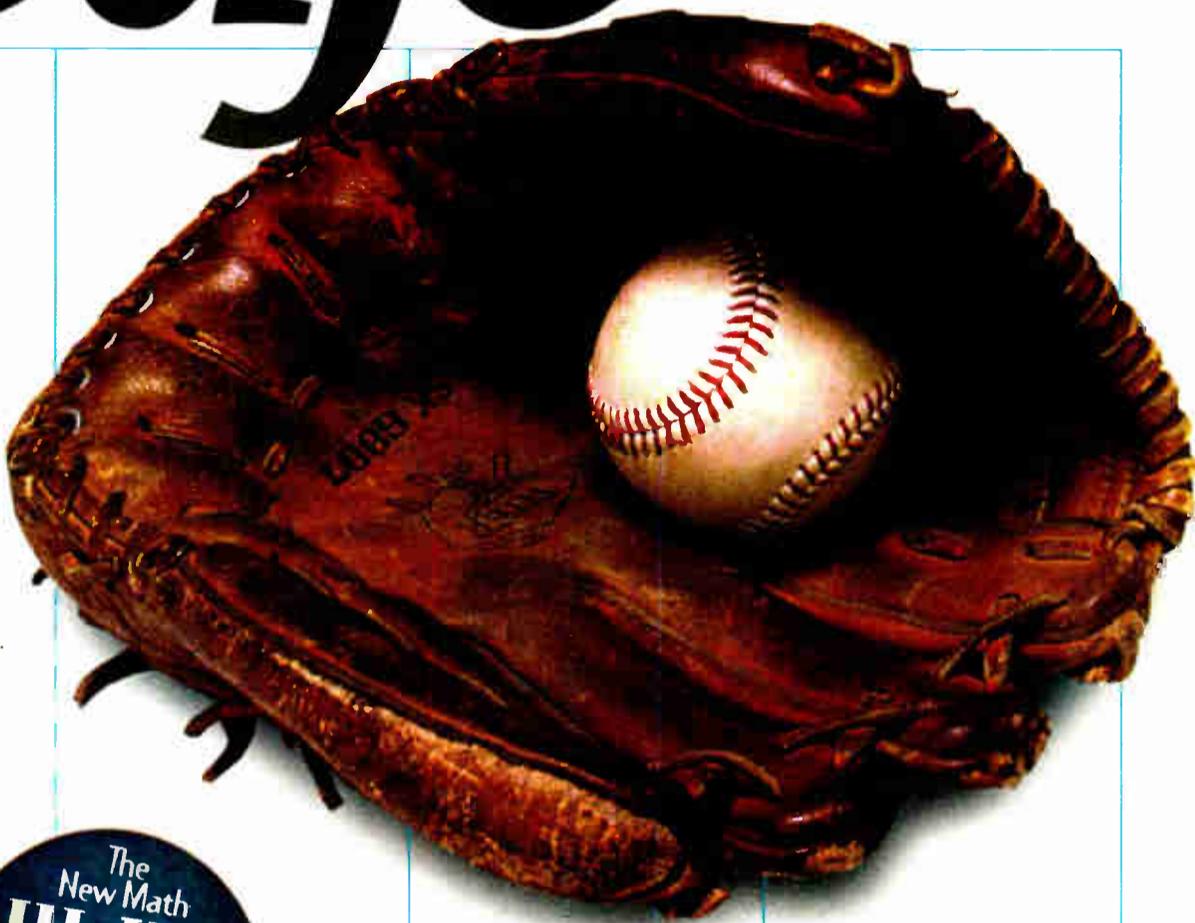
- Both the superior audio of Layer III and compatibility with installed Layer II-only codecs. Zephyr costs about the same as Layer II-only equipment.
- Only Layer III permits mono 15kHz operation on a single ISDN "B" channel or one Switched 56 line. This can greatly reduce your transmission costs.
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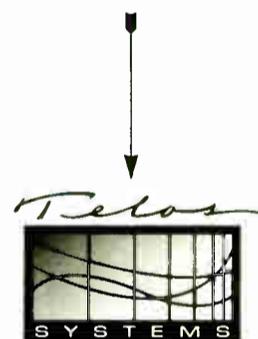
It's full duplex, so cues can be sent from the studio without the cost of additional phone lines.

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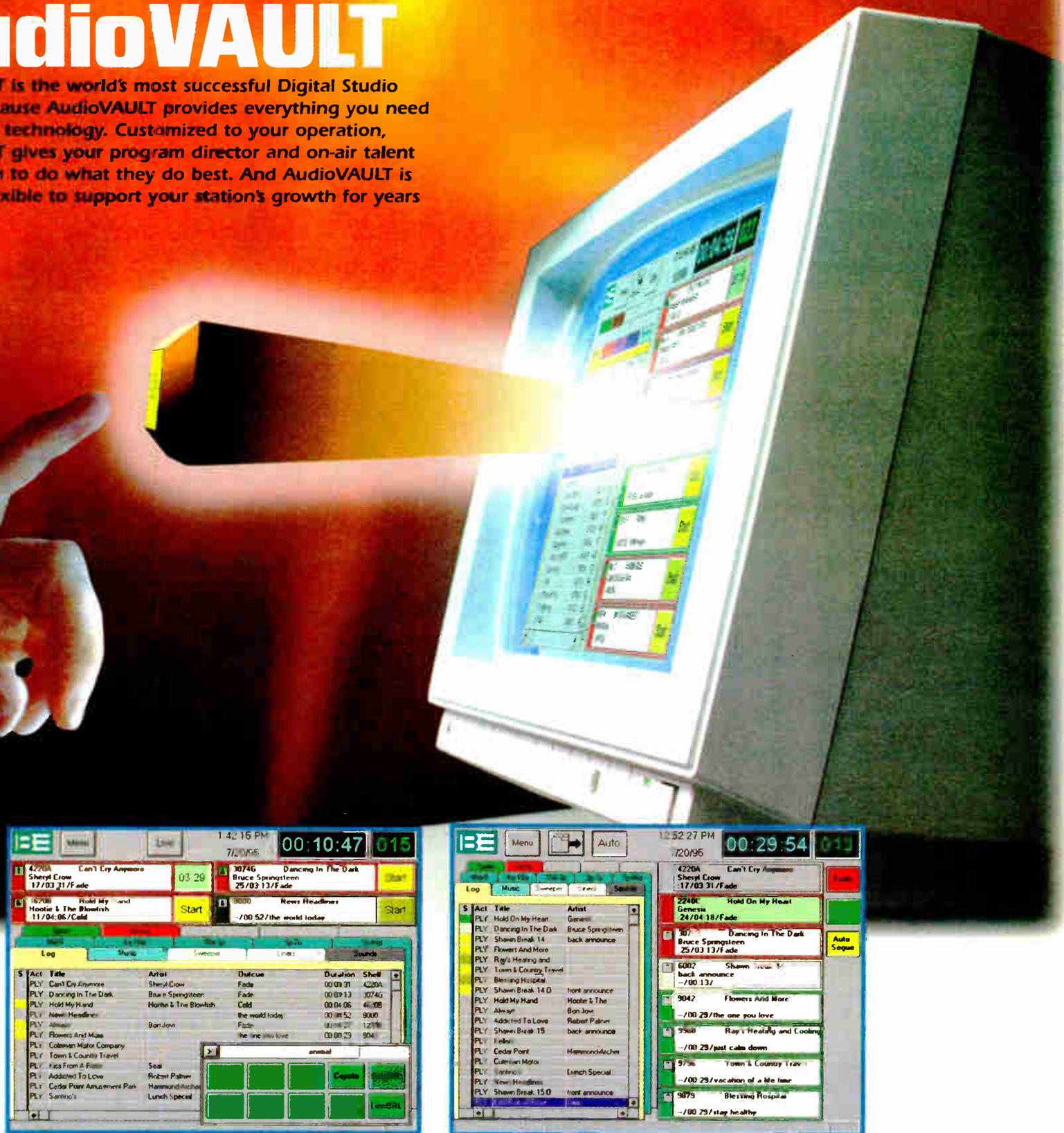
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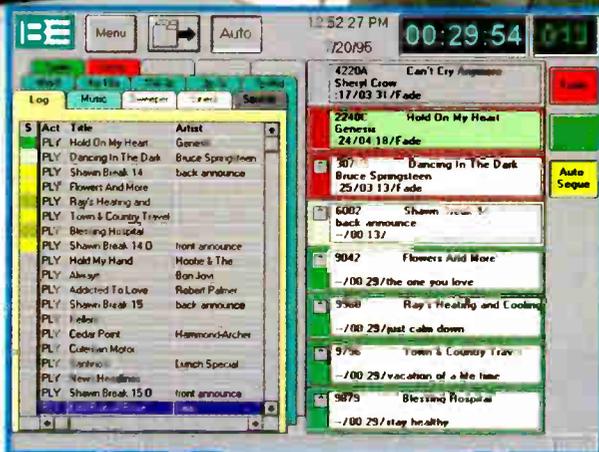
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USER REPORT

Station Finds Best Value in Arrakis

by **Edd Monskie**
Vice President/Engineering
Hall Communications Inc.

LANCASTER, Pa. When it is time to build a new studio or rebuild an existing one, the console is perhaps the most important purchase. The console has been the centerpiece of control rooms since the beginning of broadcasting. This may change as new generations of digital audio systems develop, but for now, it remains the foundation of the room.

Somewhere in between

Over the years I have seen control rooms that were built with a primary focus on the lowest overall cost, and the console chosen reflected that philosophy. There are also the showcase control rooms where the console alone costs more than most stations' annual engineering budgets.

Somewhere in between is the control



Arrakis 12,000 series console

room where you get the best value for the dollar.

Roughly six years ago, our Lancaster station changed from a fully automated station to a live station. We began looking at the various consoles that would fit within the budget of our medium-size market station. The console we chose had to be functional, easy for the air staff to use, easy for engineering to work on, easily reconfigured should any operational or format changes be made and, above all, impeccably clean in its audio specs. The console should be viewed as nothing more than a large switch between the various audio sources and the transmitter.

Reputation

We wanted a console manufactured by a company with a good reputation, a company that not only has been in business for some time but also is active in the broadcasting arena and will be around years from now. Although a number of companies met these criteria, we finally selected **Arrakis**. Its 12,000 series consoles offer the best combination of price, features, dependability and overall appearance.

The basic 12,000 series console has a modular, low-profile design and is available in three sizes. You can purchase a mainframe that holds 8, 18 or 28 modules. Along with those modules is one for the program amplifier, and one for the combined monitor, headphone, timer and talkback functions.

The console motherboard is something that Arrakis calls a "universal mainframe bus." What that means is that any type of module can be placed anywhere in the mainframe. If your air staff is used to having the microphone pot on the left, you can place it there. Or, if you have the 28-input mainframe and the air staff wants the microphone in a more central, comfortable location, you can place it elsewhere.

A wide array of input modules is available

for the mainframe, from a straight mic module to one with a pan control, a straight stereo line module, one with stereo/left/right/mono mode control, 1-in/4-out distribution amp, 1-in/5-out switch module and more if you start to combine the console with the Arrakis Gemini series of digital audio systems and the Gemini Command Center, which takes up nine of the module slots. Turrets of various sizes are available to match the console.

The power supply comes in a separate box that can be put far away from any audio wiring in your counters. There are three stereo program busses, both a program and an audition mix-minus bus, mono bus, 60-minute timer and a dual option for the cue channel. You can cut some jumpers and add your own cue amp and speaker, or you can leave it in the default setting.

In the default setting, the cue audio appears in the regular monitor speakers and the volume of the normal audio in those speakers drops. How much the regular audio dims and how much cue audio

continued on page 34 ►

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Arrakis Offers Best Value

► continued from page 33

is mixed in is adjustable. We have tried both methods, and the air staff overwhelmingly prefers to have a separate cue speaker somewhere in the room away from monitor speakers.

The console was extremely easy to install. Arrakis uses a large AMP connector for all of the connections in and out of the console. The various wiring harnesses for each module can be time-consuming to construct, but I have found them to be much easier to work with than consoles using DB15 or DB25 connectors. No matter what happens, you somehow need to put more than one wire to a pin, which can get messy with the DB connectors. Arrakis provides a more-than-ample supply of connectors and pins. It also includes the crimp tool you need for assembling the wire harnesses.

The one thing the company does not include, which it should, is a tool for extracting the pins from the connectors should you need to make a change, or if you make a mistake, such as reversing the red/black wires after spending hours putting them together. Pre-made wiring harnesses for popular source equipment are also available at additional cost.

Other features

Arrakis uses Penny & Giles faders to control VCAs. Audio does not run through the fader. Other normal features, such as remote start and stop, cough switching and remote channel on/off, are all available. If your source equipment allows, you can wire the tally lamps of the equipment to be mirrored in the module on/off switches. You can assign any module to mute as needed, and any module can be assigned to the mix-minus busses—either program or audition, or both.

The manual that comes with the console is a bit confusing at first look, but after working with it a while, all makes sense. The manual explains in detail how to avoid ground loops, the proper way to work with audio wiring shields and how to best handle the grounding during installation. Along with the console you receive a small kit of spare parts. Arrakis only sells spare or replacement parts on a C.O.D. basis, but this method helps to keep prices reasonable.

Final audio specs

The final audio specs are the proof of a successful installation. As we set levels and balanced channels in each module, the console proved to be as clean as we expected. Noise, IM distortion and harmonic distortion all fell into the residual levels of our Potomac test equipment. Frequency response was flat from 20 Hz to beyond 20,000 Hz within less than 1 dB.

Two years ago we purchased a new building and relocated the consoles to the new site. At that

time we upgraded them with the newest version of the input modules. The original input modules had on/off switches that made an ungodly clicking noise. That type of switch should never be put in a control room. The most recent version is much quieter. After running these consoles for several years, they still hold the same specs as the day we installed them.

Some advice

If you choose a 12,000 console, I offer you some information that is not in the manual. On microphone modules you should ground the

shield of the input cable directly to the console chassis. Do not ground the shield through the ground pin in the input connector. You will have much better static protection that way. On the TCRM module, which controls headphones, monitor feeds, etc., there is an audio ground pin available. You could get some strange crosstalk if you do not ground that to the console chassis as well.

Bulb life in the on/off switches seems shorter than I would expect, but sometimes the air staff can have a heavy hand, and I am not sure the bulbs are

shockproof. As I mentioned before, a pin extraction tool should be included with each installation kit. You will need it. If you have to do any extensive repairs on the PC boards, you may want to have a magnifying light handy. There is a lot stuffed into that module.

With this console, as with many others, you should have separate select switches for the headphones and monitor speakers. We try to keep the speakers set to the on-air position so that you know immediately if there is a problem. However, some announcers have trouble listening to headphones set to the on-air position when the program chain includes some digital STL systems.

We have six years' experience with the Arrakis 12,000 series of consoles, with seven now in operation in the group. Two of those are of the new Gemini design, which is a lower-profile, more high tech-looking mainframe. It still uses the same complement of 12,000-style modules, but it is designed more with a digital audio system in mind. The Gemini series even comes with a computer monitor mount on top of the console. Would we buy Arrakis consoles again? Yes we would, and we have.

For information, contact Jon Young in Colorado at 303-224-2248; fax: 303-493-1076; or circle Reader Service 97.

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World Radio History

USER REPORT

Broadcast Works! Hails R/TV's Assets

by **Wayne Blackwelder**
Owner
Broadcast Works!

TYLER, Texas Our company currently provides technical support for 34 radio stations on a regular basis, serving many others on an occasional basis. In the course of our business, we have worked on just about every console available. We tend to develop favorites based on experience and familiarity.

Among our regular clients, 26 **Autogram** consoles are in operation today. Some are as old as I am;

others are recent installs. Three new consoles just arrived and are being installed as you read this.

We most recently installed the R/TV-12. As the model number would imply, the R/TV-12 is a 12-channel console. The four separate multi-input selectors on the front panel are deceiving. Each is factory labeled, assigning them to channels 9 through 12. When the console arrives from Autogram, you will find these are in fact connected to the last four channels on the console.

What Autogram does not advertise

is that you can assign these multi-selectors to any channel, or any outboard equipment. Here's an example of one of our recent installations: channels 1 and 2 are studio mics; two of the multiselectors are assigned to channels 3 and 4 for such things as telephone, EBS, production studio, etc.; channels 5 through 12 are dedicated to sources, such as CD players and cart machines.

Built-in routers

Now we have two multiselectors left. The outputs of the remaining

two multi-switchers are routed to outboard equipment. One selects the source to be recorded (phone, radio processing unit, audition, etc.) on the studio reel-to-reel. The other is used to select what feeds the phone interface (announcer mic, mix-minus, audition, etc.). These four multi-input selectors are actually mini-routers, utilizing solid state switching.

The console also features assignable mic pre-amps. Traditionally, you could set up a channel for mic or line level. Autogram changed this. The R/TV-12 and Pacemaker

consoles have separate mic pre-amp cards, four pre-amps per card. You connect your mic and then assign it to the channel you want. Even better, you can go from the pre-amp to external processing equipment and then to the channel of your choice.

The inputs of this console are individually configurable for just about any type of input. Bridging or terminating, -10, 0 or +10, pre- or post-fader mix-minus, you name it. The inputs of each multi-selector are also individually configurable, as are the outputs.

Remote control connections are logic level with an optional relay interface. You can even feed information back to the console's start and stop switch so the switch lamps follow your equipment status.

The switch

The first time I experienced a failure on an R/TV it was in the middle of the night on a console four-and-a-half hours away. One channel would not turn on after a power failure. After a few minutes on the phone, the station's program director and I determined that the channel would work in audition but not in program. The immediate solution was to turn it on in audition and (remember the mini routers?) select "audition" on one of the multi-selectors and pop it up in program.

The following morning, we opened the console. The program and audition switches are identical and connect to the channel card with short cables and slip-on connectors. We switched the connectors—program for audition. Doing so meant that the audition switch could turn on the program bus.

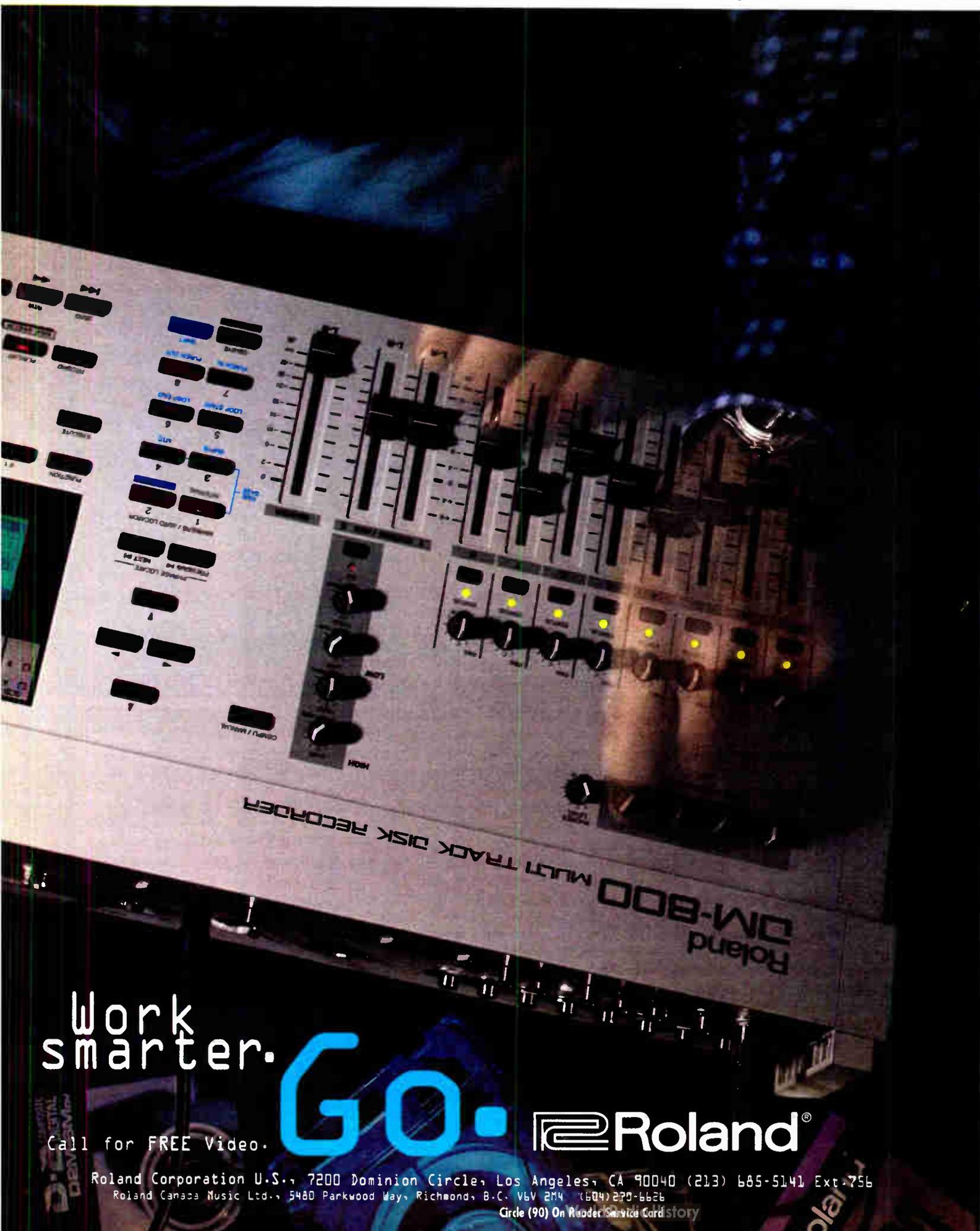
The problem was the program switch. The program director then switched the lenses. We ordered the switch and installed it on our next scheduled trip. Installing the new switch took only four minutes and required no tools.

Built like a brick

By the way, if you are using the older Autogram consoles and have a cue speaker that sizzles or a channel that drops out, there are two good solutions. If it is the middle of the night, tell the announcer to hit the countertop with his or her fist. Also, CAIG Laboratories in Escondido, Calif., sells an anti-oxidizing solution called Cramolin. Spray this solution on the Jones connectors and module sockets.

If I had to say something negative, it would be that the features of these consoles have not been adequately promoted. At first glance, they look like modern versions of what Autogram is known for: equipment "built like a brick." But once you scan through the manual and consider all the headache-relieving flexibility that comes with them, you see that people at Autogram are truly out-of-the-box thinkers.

For information, contact John Hutson in Texas at 800-327-6901, or circle Reader Service 71.



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USER REPORT

A-6000 Appeals to DJs, Engineers

by Ron Russ
Director of Engineering
Embarcadero Media Inc.

LOS ANGELES I am delighted to have the opportunity to review the Wheatstone A-6000 mixing console because it stands alone as being, perhaps, the closest thing to a perfect product I have ever encountered in my career as a professional broadcast engineer.

I have to admit, the Wheatstone was not my first choice—it was not my choice at all. I joined Embarcadero Media after initial studio designs and equipment purchases for their Los Angeles-area station, KVAR(FM). The selections were made by a consultant whom I recognize as top in his field. Therefore, I did not question his preferences. I looked forward to the challenge of dealing with a product that, at the very least, had a good reputation among colleagues. As it turns out, the consultant earned his keep on that recommendation alone.

Two A-6000s were ordered for KVAR(FM): one for the control room and a second for the main production room. Both boards were ordered pre-wired to telephone-type punch blocks. I am always a little reluctant to have pre-wired products because they seldom meet my stringent quality requirements.

This was not the case with Wheatstone. Every wire to every block was perfectly trimmed, terminated, heat-shrunk and documented. There were no mistakes. In fact, they did a better job than I would have been able to do—not an easy admission. Together with positive coupling DB-25 connectors for each module, hookups are predictable and reliable.

Mind readers

The consoles seem to have been designed by mind readers. Everything that I want in a broadcast console was standard. Frequently in studio installations, I have to “homebrew” quite a number of things, such as mix-minus,

control interfaces and intercoms.

With the A-6000 I found four independent mix-minus busses; four independent tallies for on-air lights, “skimmers,” etc.; switch-selectable patch-point insertion options; and four assignable stereo output busses. There was a complete list of features I deemed necessary for our applications.

Wheatstone’s so-called bus-minus design is intuitive. Each input module in the console has DIP switches so that you can create groups of sources for driving the mix-minus busses. All four busses are then switched in or out on the telephone module. Our setup is as follows: bus “A” is for the announcer mic only; bus “B” is for bunch, all four studio mics at once; bus “C” for contest, all four mics plus cart playback so that callers can hear music samples, sounders or other pre-recorded material.

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All the features Ron Russ wanted in a console are standard on the A-6000.

USER REPORT

Audioarts R-60 Heart of BBN On-air Studios

by Timothy D. Young
Engineer
Bible Broadcasting Network

CHARLOTTE, N.C. The Bible Broadcasting Network (BBN) is a non-commercial, listener-supported Christian network that owns and operates 27 radio stations, with seven affiliates. We raise our annual operating budget by way of a “share-a-thon,” where we take time from a normal broadcast week and appeal to our listeners for contributions to help support our ministry.

Frugal with funds

It is because we are listener supported that we must be frugal with the gifts our listeners donate to us. We must also pacify an economically minded business manager in our accounts receivable department, whom we have nicknamed “Ebenezer.”

In addition to our many tasks in the engineering department, we must continually search for equipment that works with us. Rarely do we find a piece of equipment that fits within our budget and meets the particular demands required at each of our stations. Experience has taught us to stay away from those manufacturers whose technical support is less than adequate. That is why we have chosen the Audioarts R-60 broadcast console as the heart of our local station on-air studios.

We first met the Audioarts people when we tried their A-50 console in 1991. Prior to that time, we tried a myriad of consoles with less-than-favorable results. We were so impressed with the A-50 that we decided to install it in nine of our stations.

In December 1994, Audioarts unveiled its R-60 broadcast console, an upgraded version of the A-50. Bernie O’Brien of

SCMS Inc. informed us of the new console and wanted to know if we would like to be one of the first broadcast facilities to try it out. At the time, we were putting together a list of equipment needed to rebuild a station. We were pleased with the opportunity and agreed to give the R-60 a run for its money.

Metamorphosis

When we received the R-60 and removed it from the shipping carton, we immediately realized a metamorphosis. Unlike the A-50, the R-60 has a fully modular design. The A-50 has a main motherboard that holds most of the electronics. Each of the input and output modules simply plug into the motherboard.

The R-60 does not have a main motherboard. Each of the modules incorporates its own electronics and plugs into the open bus frame. This is particularly useful if an input module goes bad. With the A-50 you would have to shut down the console to make repairs. The R-60 allows you to remove the module from the main frame and take it to your workbench or send it to Audioarts for necessary repairs. Another plus for the R-60 are the Penney & Giles long-throw faders. Those of you who are A-50 owners probably recall replacing the incandescent lamps constantly. A six-source line selector is standard and assignable to any input module. The R-60 is available in eight-, 12- or 18-channel configurations, and options include a telephone module, as well as machine control modules.

Installation of the R-60 is straightforward and simple using the step-by-step instructions provided. Since it is a tabletop console, it requires no holes, other than cable access holes in your studio furniture. It employs the same AMP MR

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USER REPORT

Ward-Beck Customizes System for WBZ

by Mark Manuelian
Radio Engineering Manager
WBZ(AM)

BOSTON WBZ(AM), one of the oldest commercial broadcast stations in the United States, is an all-news station, with talk at night and sports programming throughout the weekend.

This summer WBZ upgraded its newsroom and studio facilities as part of a project to move WBZ news and WBZ-TV news into a new shared facility.

Our fast-paced news department requires studios that are very flexible yet simple to operate. The critical features

we needed in audio consoles were not available in off-the-shelf units.

Several years ago I participated in rebuilding KYA-FM in San Francisco. The state-of-the-art consoles installed at that time were made by Ward-Beck Systems. In that project the Ward-Beck sales and engineering staff played a key role in the design of our custom consoles. Every modification was designed, implemented and documented in such detail that it appeared they were standard products.

Solid construction

These consoles were in service until last

year when KYA-FM was sold. Because of their solid construction, the consoles still look and perform as they did when they were new.

The major issue at WBZ was intelligent mix-minus facilities for the telephone hybrid system in each studio. We needed two mix-minus busses, one for each hybrid, that automatically followed the program bus to which the hybrid was assigned.

Additionally, our operation often has programming originating from two or three studios simultaneously. The custom mix-minus system provided by Ward-Beck interfaces with our Sierra

Automation Systems studio delegate switcher, providing a mix-minus feed to the phone system that automatically includes all other studios feeding the same air chain.

Changes without delays

Our staff wanted the console modules arranged differently than the standard Ward-Beck layout, and the design required more input modules than the frame normally accommodates. Ward-Beck's engineering department made the necessary design changes cheerfully, without delays and at a reasonable cost. I was pleasantly surprised to find that despite the 15 years and many changes, Ward-Beck Systems has kept its commitment to sound engineering practices and well-designed, quality products. Most importantly, the company is still willing to work with clients to address their specific needs.

Ward-Beck has made improvements that I believe will significantly reduce the most common failures in broadcast consoles. All audio switching is electronic, and the monitor volume controls use optical encoders rather than conventional pots. This will eliminate the all-too-common problem of noisy pots and switches. The low profile of the console, its uncluttered appearance and operator-friendly controls are a real plus.

A total of six consoles were purchased to serve our on-air and news production needs. The order was placed in early December 1994 and the first console arrived January 1995. The documentation, which was customized for each

Features we needed were not available in off-the-shelf units.

console, simplified the installation.

All of the consoles worked properly when first turned on, with the exception of one console that was obviously dropped in its crate during shipping.

Minor problems

As with any major installation, there were a few minor problems. Access to +24 volt console power for the turrets provided by Ward-Beck could have been more convenient. The single console-mounted headphone jack, while adequate for many applications, did not meet our needs. A line level headphone output to feed a headphone distribution amplifier would be desirable.

The internal talkback system for the studio monitor is very nice, but most of our consoles do not have this optional module. An external talkback input on the control room monitor module that feeds both the headphones and the cue speaker would be a good addition.

The consoles are well designed and built with quality parts throughout. The custom modifications to our consoles were done thoughtfully and clearly documented. The pricing, including all the custom work and changes, was extremely competitive.

I am satisfied that we got the right consoles for our operation and the best value for our budget.

For information, contact Eugene L. Johnson in Canada at 416-438-6550; fax: 416-438-3865; or circle Reader Service 69.

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USER REPORT

WMC Finds Auditronics 801, 851 Flawless

by Paul Barzizza
Chief Engineer
WMC-AM-FM-TV

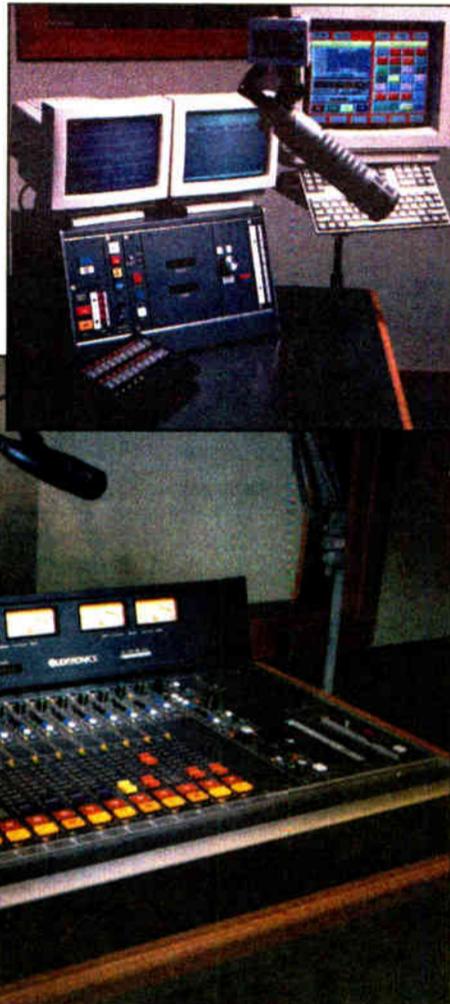
MEMPHIS, Tenn. The year 1994 was one of massive change for the WMC stations. Our sale to Atlanta-based Ellis Communications has resulted in a shot in the arm stationwide. For number-one-ranked news-talker WMC(AM), a massive rebuild has taken place.

The project entailed stripping 2,000 square feet to the concrete and building four news-rooms, master control, talent studio and a production room. As in any radio station, the core of the studios is a solid broadcast audio console. For WMC, nothing but perfection will suffice. Perfection in broadcast audio consoles means Auditronics 801 and 851.

As with any equipment purchase, I researched all of the consoles large enough for our needs, from the lesser known units to those widely known. Although I gave

and an 851 for production. My choice was based on overall system specifications that are compatible with digital technology and that meet or beat any other manufacturer's specifications.

The options are the best available (and too numerous to mention here). The customer service is second to none, pricing is quite good and because the console is the centerpiece of the radio station, its good looks do not hurt.



The 801 and 851 let the talent concentrate on performance.

every one a fair look, I decided to purchase two consoles from our Memphis neighbors at **Auditronics**: an 801 for master control

I recently found out that Auditronics has been manufacturing broadcast consoles for more than 25 years. The service one receives with an Auditronics console reflects that track record. When I outlined our demanding needs with Bob Greenwald and Duncan Fuller, the most common phrase I heard was "that's not a problem." This attitude led to the custom design of an item that I call the 801 Talent Turret.

The turret is a standalone console that contains everything an active talk show host needs in one neat package. You see, our talent studio is on television often, so the desire to keep the clutter to a minimum was great.

The turret contains modules that allow the host to turn on or off any combination of five microphones in the studio with one button, as well as view master clock time, time events and dump delay, select different sources to headphones, key multiple two-way frequencies and select any of several intercom positions. Considering all of the items in the new talent studio, the "Talent Turret" is a favorite of the hosts.

The 801 and 851 consoles are modular in design and are available in 12, 18, 24 or custom input mainframe sizes. The modules for both consoles are identical, so moving modules from one console to another is not a problem if you find yourself in a pinch.

The 801 in our master control is perfect

for WMC in that the amount of stereo and mono busses (four stereo, two mono) allows great flexibility in feeding transmitters, routing switchers, sister stations, etc.

The integration of our multiple hybrid phone system is straightforward and simple with the 801 TEL module. In the engineering department at WMC, we feel that the less our talent has to think about technical voodoo, the more they can think about delivering excellence over the air.

This task is accomplished easily, thanks to the most extensive user-programmable logic system of any console on the market. This system allows any configuration of

modules in the console.

WMC-AM is a demanding facility. We are a full-service, 24-hour station, providing live shows, traffic, news, weather and sports. All this activity can take its toll on a station's console if it is less than perfect. With our 801 and 851 consoles, routine maintenance has dropped to a minimum and repairs number zero to date. At WMC we want perfection, so we chose consoles from a company that will not settle for less than that.

For information, contact Bob Greenwald in Tennessee at 901-362-1350; fax: 901-365-8629; or circle Reader Service 54.

Quantum FM

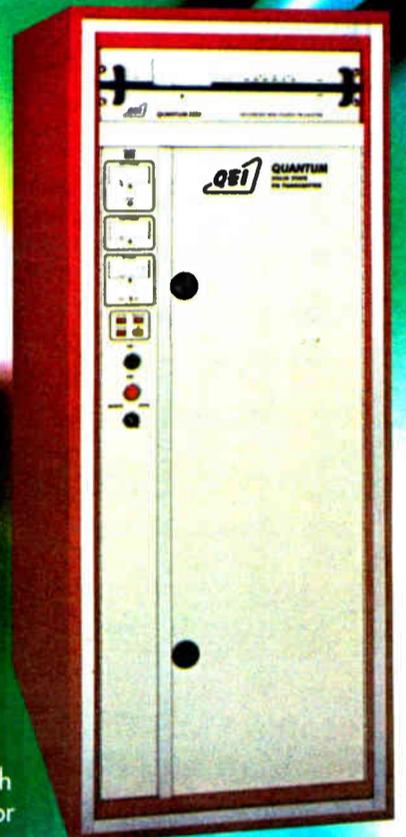
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USER REPORT

Special RS Setup for Jersey Duopoly

by Bill Levine
Chief Engineer
WJLK(AM)

OCEAN, N.J. After more than 50 years in our original location in Asbury Park, N.J., WJLK Radio, along with our new sister station WQNJ(FM) and an AM affiliate, moved into new facilities at Seaview Square Mall.

To store commercials, jingles and liners for all three stations, I selected Radio Systems' DDS digital storage system for its ability to multitask all operations simultaneously. But this story is not about the DDS but rather how we used our new

Radio Systems RS-series console to solve one of those last-minute oh-my-Gods that always pop up in the middle of a major installation.

All breaks would now be split via the dual output of the DDS to feed separate spots to our FM transmitters. While I could have used the console's standard program and audition channels for this purpose, I did not want to tie up the board. Also, I did not want our jocks to have to do special input and output assignments to run a standard air shift.

Even though it was late the night the Radio Systems crew was there to install the digital systems, I pulled them together

to help design a special console modification that would both simplify and expand our new console's capabilities.

What we came up with is simple, effective and may fit the bill for other stations in a duopoly. First, I specified that two input channels be broken away from the mix busses and each of their outputs routed to separate line/mixing amplifiers.

Next, we combined each output with the program feed, thereby creating a separate mix-minus feed for each station. Finally, we routed each feed to its own console turret meter and monitor output and then sent it on its way to each station's processing chain and STL.

Radio Systems agreed to make all these modifications in the factory and have the console back to me in two days so that our installation schedule was not affected. This sort of service from a manufacturer is unusual, and is one of the main reasons that we have decided to install Radio Systems boards throughout the chain.

If you have special requirements for your new console but you still want an economical solution, consider Radio Systems.

For information, contact Dan Braverman in New Jersey at 609-467-8000; fax: 609-467-3044; or circle Reader Service 56.

Mass Appeal Of A-6000

► continued from page 37

The optional superphone module is all you need for even complex phone system interfacing. It has provisions for two separate phone hybrids with internal conferencing standard.

Independent hybrid outputs, as well as composite mix-minus plus caller outs, are available for outboard phone recorders/editors.

The off-air and on-air operations of the module are identical, making its use effortless for the DJ.

The four DIP switch-selectable tallies are handy. You can preprogram tallies for on-air lights, skimmers, etc. The module provides opto-isolated, open-collector type switches for outside connections. The switches are high gain opto-couplers that can sink up to 80 ma of current, plenty for garden-variety relays or indicator lamps.

Inaudible switching

All console-mounted switching is based on a series shunt scheme that lends itself to extremely quiet operation (both electrical and mechanical). While listening with headphones on full-blast, switching is absolutely inaudible. This feature is enhanced by beefy, well-isolated and separated control and audio power supplies. We purchased the optional backup power supply and switching unit, which provides the console with instantaneous "hot" backup.

Although we have no use in our application for sequencing, the consoles come armed and ready to trigger events using standard end-of-message (EOM) technology. Each module is equipped with an arm button that causes the next module to fire in order, left to right. The modules are also able to mute themselves upon termination of an EOM. This would be handy in a live-assist environment with carts and/or CDs, enabling operators to pre-load breaks.

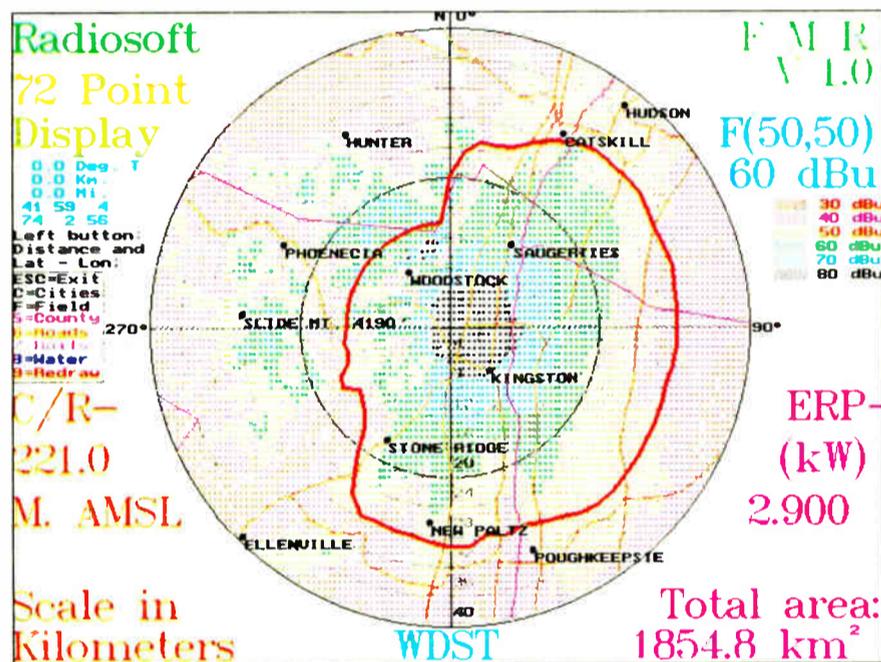
I also have found the quality of construction to be outstanding. The circuit boards, modules and connectors all have the appearance of so-called mil-spec standards. Nowhere can I detect any cutting of corners.

The console also offers superior sonic performance. All inputs use low-noise, high-slew-rate DC-coupled amplifiers.

I can make an unqualified recommendation of the A-6000 to anyone who wants the very best radio/production console that appeals equally to disk jockeys and engineers.

For information, contact Ray Esparolini in New York at 315-455-7740; 315-454-8104; or circle Reader Service 61.

RadioSoft FMR Database — Allocations

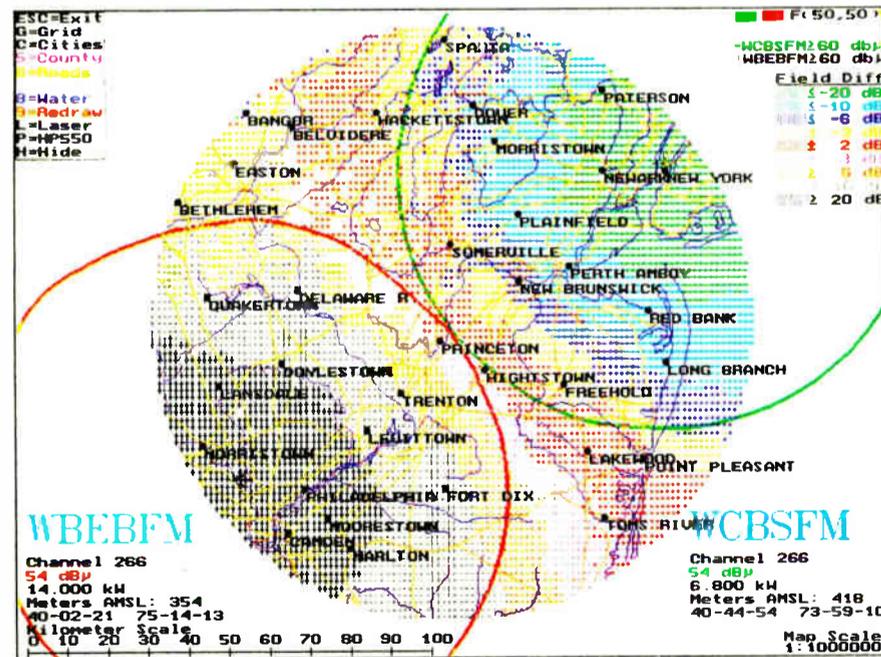


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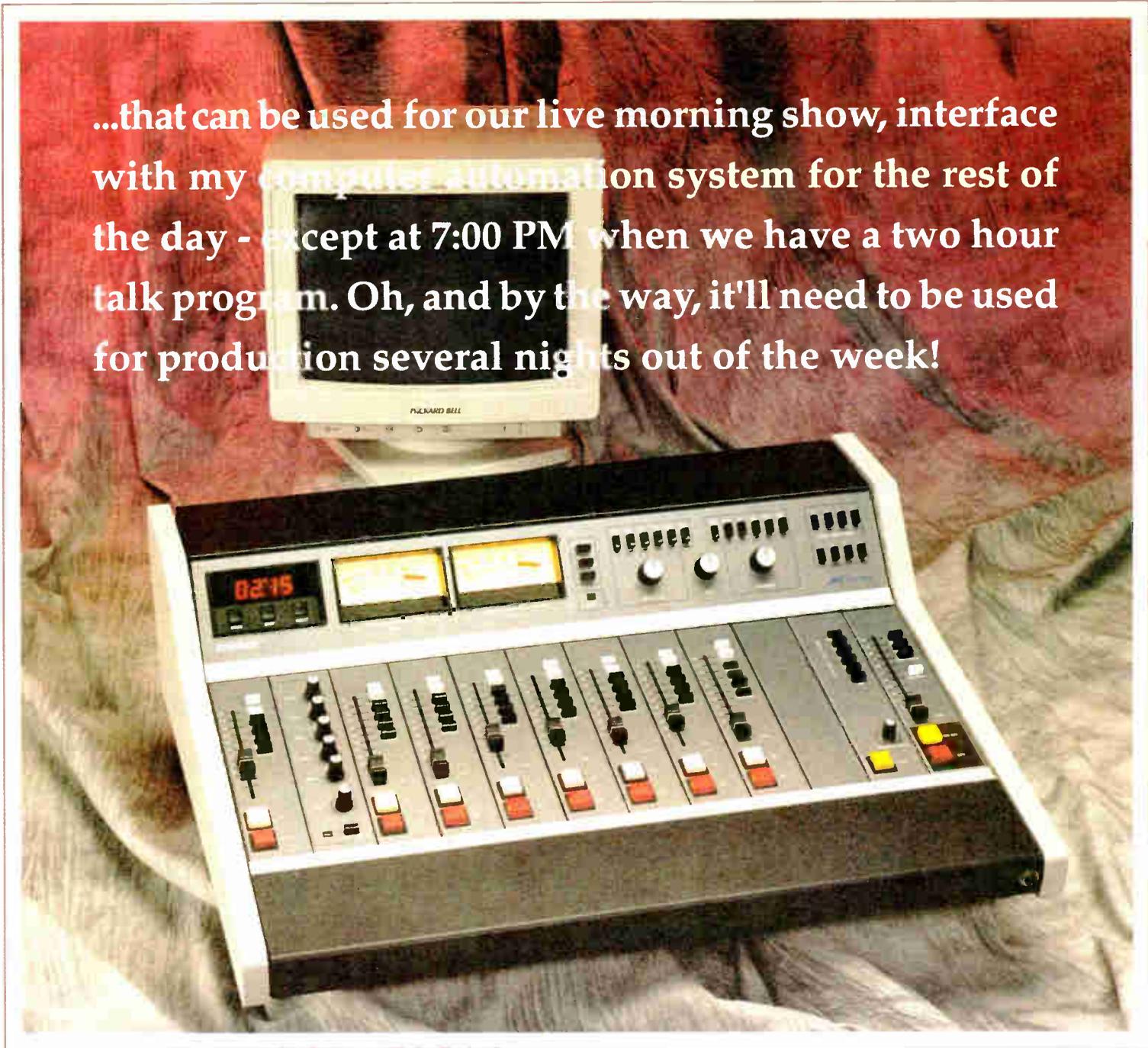
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The MXE's multiple output capability and optional telephone interface help make talk shows a breeze. With pre-fader patch points for outboard processing, optional 5-Band mic EQ and the ability to wire each input for mono or stereo these consoles can be effectively used for

production when not being used on the air.

Regardless of your application, Dynamax MXE Series consoles provide bullet-proof reliability due to true modular motherboard design, superior components such as P&G faders, dbx VCA's, AMP connectors, plated steel construction and Lexan control surfaces. Available in versions from 8 to 18 channels starting at about \$4,000, the MXE Series consoles provide a tremendous value.

So if you're looking for a great all-around console you don't have to pay an arm and a leg for - the Dynamax MXE Series console is the obvious choice!

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USER REPORT

LPB 7000 Passes Rigid RF Tests

by Phillip J. Fraley
Chief Engineer
WLAP(AM)-WMXL(FM)-
WWYC(FM)

LEXINGTON, Ky. Sports Radio 630 WLAP is an all-talk sports station that recently outgrew its 10-year-old, five-channel audio console. We needed a console that could handle studio recording production work while at the same time operating live, with an automation system as a source on one of the console channels. Most of all, the console had to resist a high AM/FM RF environment.

WLAP is a directional AM station, with power at 5 kW day and 1 kW night. WLAP shares a building with its sister FM stations WMXL (100 kW ERP) and WWYC (32 kW ERP). All studios and transmitters are located in the same building, and all the antennas are on the same property. As you can tell, RF fields are a big concern when purchasing audio equipment. The LPB 7000 series 12-channel audio console passed our rigid RF tests.

Easy operation

At the top of each channel on the console is a pushbutton for selecting the A or B input. Below that switch

are program, audition, utility and cue switches. Then you find your traditional slide control and channel on and

such as program, audition, utility, etc. There is a switch to select what you want to listen to, whether it be the on-air signal, program, audition, utility or other feeds assigned to the console.

The headphone circuit operates in the same manner with a pushbutton switch. On the VU meter, speaker monitor and headphone monitor select switches, an LED illuminates beside the position marked on the console as you

Transformers help to isolate RF and other noise ensuring a clean-sounding console.

off switches. The console is extremely straightforward and uniform in its operation. While one channel is operated in program for our on-air automation network satellite feeds and commercials, another channel or channels are switched into the audition mode for recording other satellite features or for recording talk show interviews.

During a live call-in talk show, we use the utility switches on the console to feed audio to our telephone hybrid system so that the callers who are on hold, waiting their turn to speak to the host, can listen to the show and know what topics are being discussed when their call is placed on the air.

This console features two sets of VU meters. One set displays program output, and the other set shows whatever is switched in via the meter select switch,

press the momentary pushbutton switch, toggling up or down.

Technical aspects

The 7000 series console uses transformers on its input and output modules. These transformers help to isolate RF and other noise from their associated circuits, therefore ensuring a clean-sounding console.

The input and output wiring connections are a breeze. All connections inside the audio console are identified, thus eliminating confusion and guesswork.

Quad Bilateral IC switching is used for channel remote control to the outside world of equipment. This type of remote control switching has proven to be highly stable and reliable. I have not had any problems interfacing remote

continued on page 53 ▶

R-60 Heart of Studios

▶ continued from page 37

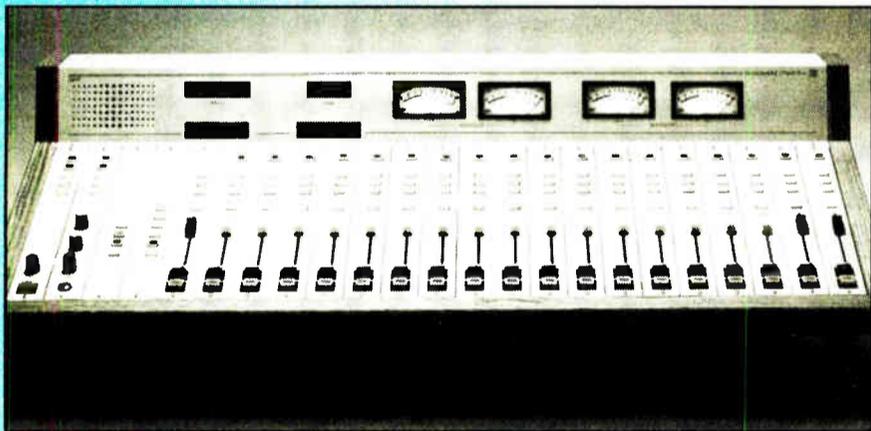
series connectors, with crimp-style, open-barrel pins, as the A-50.

The right tools

Included in the installation kit are a crimp tool and extracting tool. Each is useful; however, I recommend purchasing a ratchet-style, open-barrel crimp tool

Remember how the output modules were removed, because they are not interchangeable and can be plugged into the wrong slots with unpleasant results.

If there were any changes to be made to the R-60's design, one would be the grounding point located on the back of the chassis. We always install braid to connect our consoles to a four-inch cop-



BBN staff appreciate the modular design of the R-60.

per strap used for the studio ground. It is impossible to fit the braid or copper strap into this grounding point, so we drill a hole into the chassis and bolt the braid to it. This provides adequate grounding for our consoles.

Through the years I have been impressed with the Audioarts consoles because of their ease of installation, operation and cost. We now have 11 in service, with plans of purchasing more in the near future. If you are looking for a console with these characteristics, I recommend the Audioarts R-60.

For information, contact Rick Strage in New York at 315-455-7740; fax: 315-454-8104; or circle Reader Service 80.

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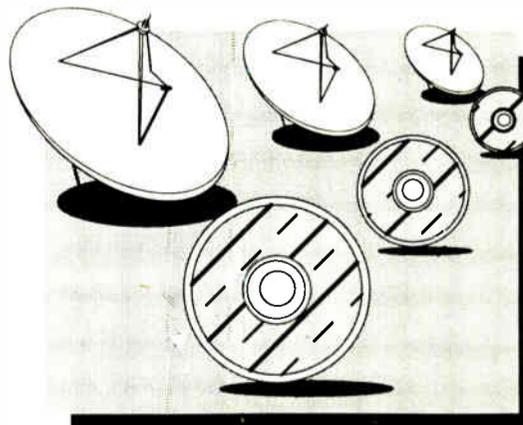
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USER REPORT

PR&E Boards Meet WYNY's Standards

by Alan D. Kirschner
Chief Engineer
WYNY(FM)

NEW YORK We are approaching that time of the year when many radio engineers are preparing their annual requests for equipment capital expenditures. This process is usually easy because most engineers, with the help of their program directors, can quickly decide what new audio processor, digital editor and other ancillary equipment will best meet the needs of the station.

However, when it becomes necessary to replace the heart of the broadcast studio, the on-air console, the engineer

now has a difficult decision to make. The engineer's choice of console will affect the operation of the radio station for many years.

Determining which audio console to purchase is as difficult for large-market stations as it is for stations in small markets. Although a large-market station may have a bigger budget, the engineer still wants to be sure that the station is getting the best value for its dollar.

I have always found it effective to determine the needs of the station before approaching console manufacturers. Whenever possible, I survey the program director and on-air talent as to

their specific needs to facilitate the on-air execution. I then observe each air shift (including overnight shifts) to get a better idea of how each person functions in the studio.

After I have determined the number of input and output channels needed, I list the technical and mechanical specifications I want in a console. I take a close look at mechanical specifications, as I generally do not wish to be called into the station in the middle of the night or on weekends to repair broken switches, headphone jacks, faders, etc.

In recent projects, I decided on technical specifications of at least 25 dB of headroom, noise -70 dB (with one mic

channel on), less than 0.05 percent THD and 0.01 percent IMD, crosstalk of -65 dB all at +4 dB output. All inputs and outputs should be balanced. Mechanically, I wanted a console with switches and faders that would take the abuse of normal everyday operation (including dropping the occasional cart on the console switches). I wanted readily available input/output connectors and a solid motherboard that would accept the various modules.

I also wanted to be able to service the console while it is on the air, removing modules without powering down the whole console. To facilitate on-air operations, I needed a console with up to 26 input faders, multiple program and audition busses, and at least one additional output bus for mix-minus feeds to accommodate remote broadcasts.

The next step was to gather the spec sheets from various console manufacturers. After carefully evaluating all consoles that met my specifications, I chose BMX-III and AMX consoles from Pacific Recorders & Engineering. Although I had purchased many of their consoles in the past, I felt it necessary to evaluate the other consoles available to be certain I was making the right selection.

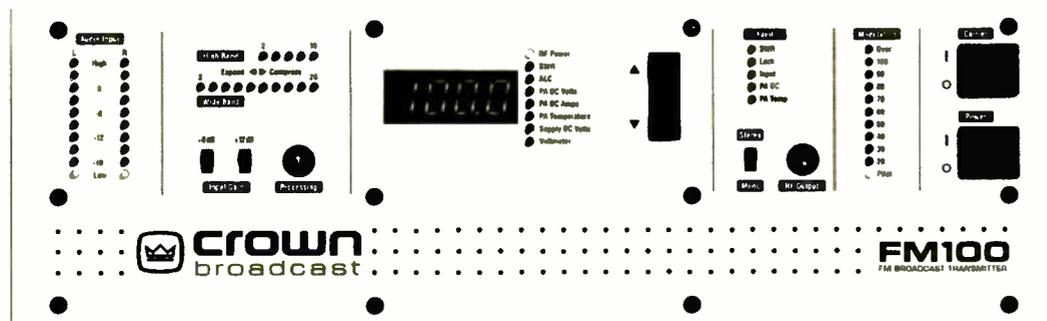
The PR&E consoles met or exceeded all my specifications. Because the station already had a BMX-III console, the transition to the new BMX-III was easy, even though it had eight additional input channels.

I must admit that I was leaning heavily toward the PR&E consoles from the start of the selection process. I have installed numerous BMX and AMX series consoles and have consistently found the installations to proceed smoothly. The Molex connectors used for inputs/outputs and logic control are easy to wire and allow quick changes in wiring when necessary. The manual is straightforward and facilitates the installation.

Both the BMX-III and AMX series consoles have two sets of logic control on

continued on next page ▶

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each channel that follow the A/B selector switch for inputs, allowing two audio sources to have remote control on each channel. They have three audio output busses, as well as cue and solo features.

There are a vast number of remote control panels for outboard equipment that can be placed in the spare option card slots of the console. Some of the specialized cards for the console that make operation easier are telephone line selection cards for the Telos and Gentner telephone hybrids, as well as customized selector panels for the SAS audio switcher.

All PR&E consoles that I have installed and maintained have proven

to be reliable. The main on-air console has redundant power supplies with a PR&E automatic transfer panel; however, the primary supply has not failed.

The worst problem I encountered was related to the switches. A staff member felt he was helping one day when he sprayed a chemical cleaner into the switches. Within a few months the switches were destroyed due to an adverse reaction of the switch contacts to the harsh cleaner. I called PR&E and new switches were on the way to me the next day. Over the next two days we replaced all the destroyed switches.

The station still uses an older BMX-II

in the backup production room. This console, with its related furniture and wiring harnesses, has been moved twice to different facilities. When installed in its current home, the console worked as soon as it was turned on and needed only some minor recalibration of input and output levels. PR&E continues to support this console even though it is 14 years old.

Maybe a BMX or AMX console is not in your budget. I have had the opportunity to work with the PR&E Radiomixer console at a station where I did contract work. Some people refer to this console as the "cheap" BMX,

but I have found it to be an excellent choice for stations that do not need the extra bang of a BMX. Although it costs less than a BMX, the Radiomixer does not sacrifice audio quality for a lower price. Its audio specifications are as good as those for the BMX and AMX lines.

Although I will always go through the same evaluation process when purchasing audio consoles, PR&E consoles will be the consoles of choice.

For information, contact Ed de la Fuente in California at 619-438-3911; fax: 619-438-9277; or circle Reader Service 111.

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RESOURCE GUIDE

Furniture, Acoustic Tile & Studio Components

The following mini-directory lists manufacturers of furniture, acoustic tile and studio components (i.e., patch bays, clocks, connectors, audio routers, etc.) who responded to **RW's** request for information.

ABG Audio Broadcast Group Inc.
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Contact: Dave Howland
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Acoustic Systems has been providing acoustical solutions to the broadcast recording, industrial and medical markets for more than 20 years. Our on-site NVLAP-accredited laboratory is used to evaluate and enhance product performance.

Acoustical Solutions Inc.
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Arrakis Systems Inc.
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Audioarts Engineering
7305 Performance Dr.
Syracuse, NY 13212
Contact: Rick Strage, sales mgr.
315-452-5000 fax: 315-452-0160

Audioarts manufactures radio broadcast audio consoles that provide better than 16-bit digital quality audio and totally modular construction, as well as the SDA-8400 audio distribution amplifier.

Connectronics Corp.
300 Long Beach Blvd.
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Contact: Richard Chilvers, pres.
203-375-5577 fax: 203-375-5811

Connectronics Corp. manufactures and directly imports a wide range of British-designed, professional audio interconnect products, including specialized audio wire cables and patch bays.

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Arlington, TX 76003
Contact: A.T. White, ass't. mgr.
800-292-2834 fax: 817-473-7712

Deltron connectors, including XLRs (cable, panel, universal), quarter-inch plugs and a wide assortment of professional RCA connectors. Gotham Cable offers ultra-flexible double Reussen-shielded microphone cable from single conductor to 34-pair.

ESE
142 Sierra St.
El Segundo, CA 90245
Contact: Norbert Perez, mktg.
310-322-2136 fax: 310-322-8127

ESE offers master clock systems, digital clocks and timers, programmable clocks and timers, audio and video distribution amplifiers, audio level meters and indicators, and timecode generators and readers.

Harris Allied
P.O. Box 1487
Richmond, IN 47375-1487
Contact: Scott Beeler
800-622-0022 fax: 317-966-0623

Audio-Metrics furniture is a series of modular, mix-and-match components that are easily assembled into the needed configuration. Attractive and durable, this standard off-the-shelf, ship-now furniture generally costs less than custom furniture.

illbruck inc.
3800 Washington Ave. N
Minneapolis, MN 55412
Contact: Eric W. Johnson, nat'l sales mgr.
800-662-0032 fax: 612-521-5639

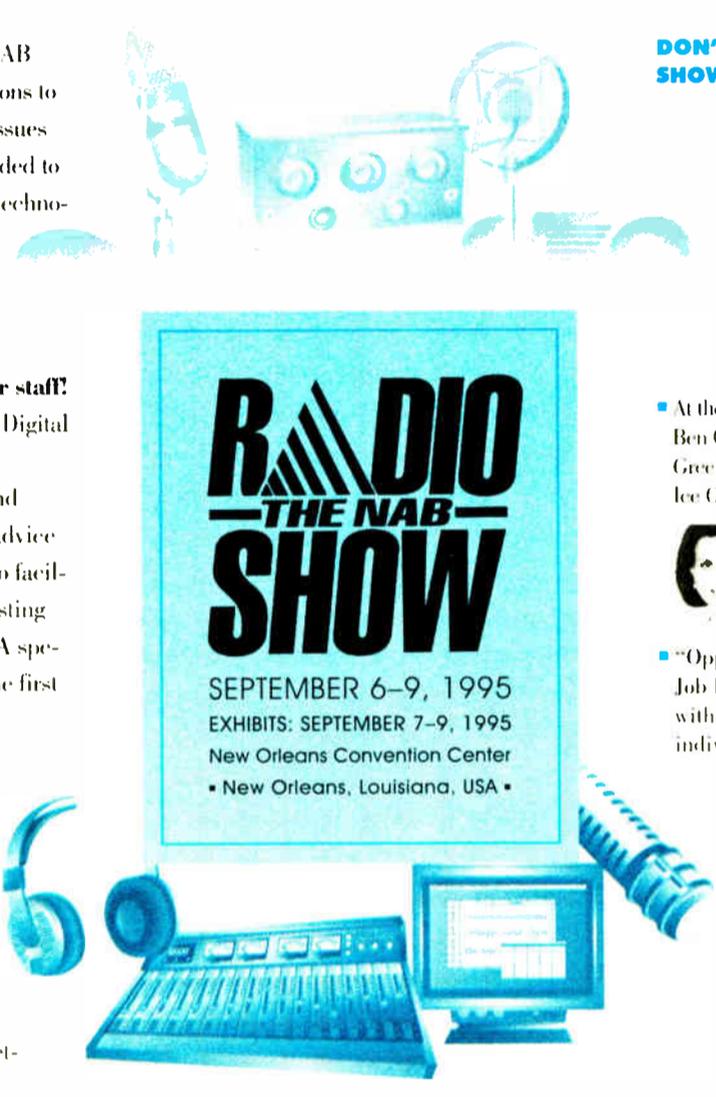
illbruck Acoustical Products manufactures Sonex acoustical materials for the complete sound treatment of radio, audio recording and video studios. The product line includes Sonex wall treatments, Sonex ceiling tiles, ProSpec sound barrier and composite materials, and Fabrix acoustical wall panels.

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Join the industry's best at The NAB Radio Show and find real solutions to real problems. You'll address the issues of today and discover the tools needed to ensure your future success. From technological issues, new revenue streams and duopolies to creative leadership techniques and regulatory issues—**there is something here for everyone on your staff!**

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SEPTEMBER 6-9, 1995
EXHIBITS: SEPTEMBER 7-9, 1995
New Orleans Convention Center
• New Orleans, Louisiana, USA •

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- Mel Karmazin and Lowry Mays, CEOs of two of the world's largest, most influential radio groups, explore "Radio: Today's Trends, Tomorrow's Opportunities."



- At the NAB Radio Luncheon Ben Cohen and Jerry Greenfield of Ben & Jerry's Ice Cream share their



- secrets to success and Nancy Widmann, President of CBS Radio, receives the National Radio Award.

- "Opportunity '95 the Complete Radio Job Fair" provides managers and owners with an opportunity to meet qualified individuals seeking careers in radio.

- Join FCC Chairman Reed Hundt at the Friday morning FCC Chairman's Breakfast and meet Commissioners James Quello and Susan Ness, along with other high level FCC



- staff, as they take part in a variety of regulatory sessions.



- Celebrate everything that makes radio great today at the NAB MARCONI Radio Awards Dinner & Show. Entertainment provided by Premiere Radio Networks.



- "Radio: Profiting From Technology in the '90s." In an exciting FREE session for all World Media Expo and NAB Radio Show attendees, Dr. John D. Abel, NAB's Executive Vice President of Operations, will show you, through entertaining demonstrations, how innovations like data broadcasting, the Internet, the World Wide Web, digital compression and other exciting opportunities made possible by digital technologies can impact your business and your bottom line.



SEPTEMBER 6-9, 1995
Exhibits: September 7-9, 1995
New Orleans Convention Center
New Orleans, Louisiana, USA

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You can also receive information from:

Fax-on-Demand—dial (301) 216-1847 from the touch-tone handset of your fax machine and follow voice instructions.

World Wide Web <http://www.nab.org>

To speak with an NAB staff member call (800) 342-2460 or (202) 775-4970.

To learn more about exhibiting at World Media Expo, call (202) 775-4988.

continued on page 54 ►

Products & Services Showcase

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Airborne Pattern Studies

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READER SERVICE NO. 164

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3CX10,000A7	4CX400A	4CX250B/7203
3CX3000F7/8162	4CX350AC	4X150A
3CX3000A7	4X350A/8321	5CX1500B
3CX2500H3		5CX1500A
3CX2500F3/8251		YC130/9019
3CX2500A3/8161		8560AS
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Broadcasters

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Excalibur Electronics

CDA-1

Composite Distribution Amplifier



This 1 in, 3 out distribution amplifier allows you to distribute stereo composite and/or subcarrier signals as easily as audio.

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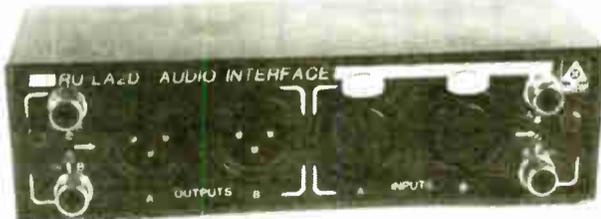
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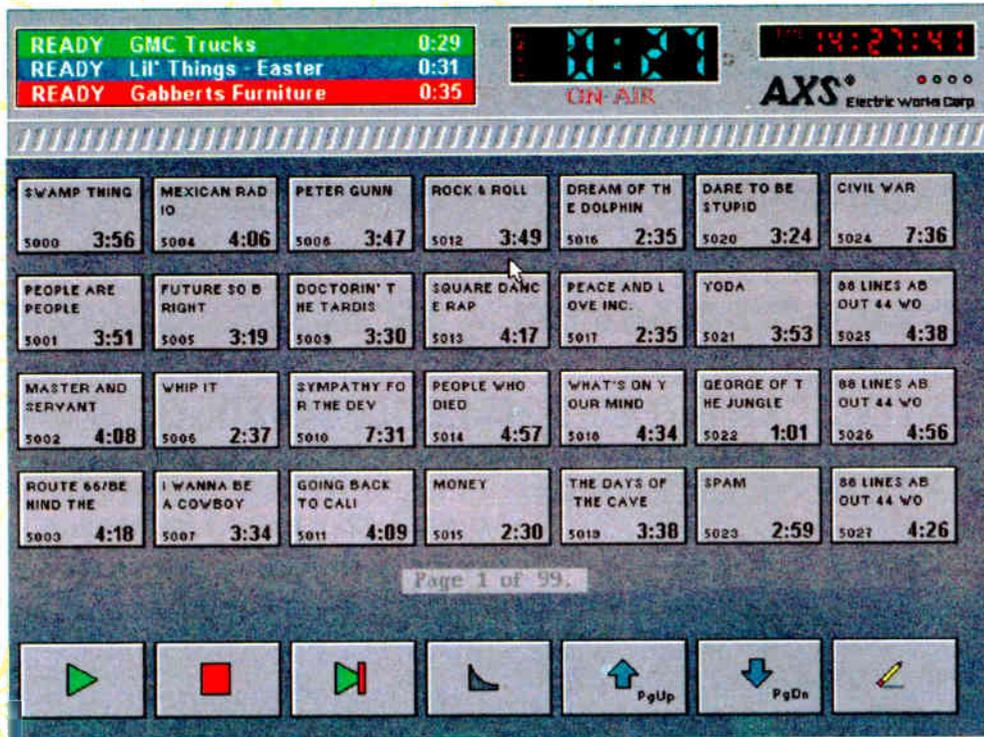
Conducto-Lube

COOL-AMP

READER SERVICE NO. 202

AXS...is awesome!

Look carefully at this page. The screen shots tell it all.



Now you see why AXS™ is the most powerful digital hard disk control system in the world. AXS does it all.

AXS is a powerful audio Cart replacement system.

AXS is a superb-CD and HD music and live system.

AXS breezes through complex news/talk, feature and long form programming.

Live Operation

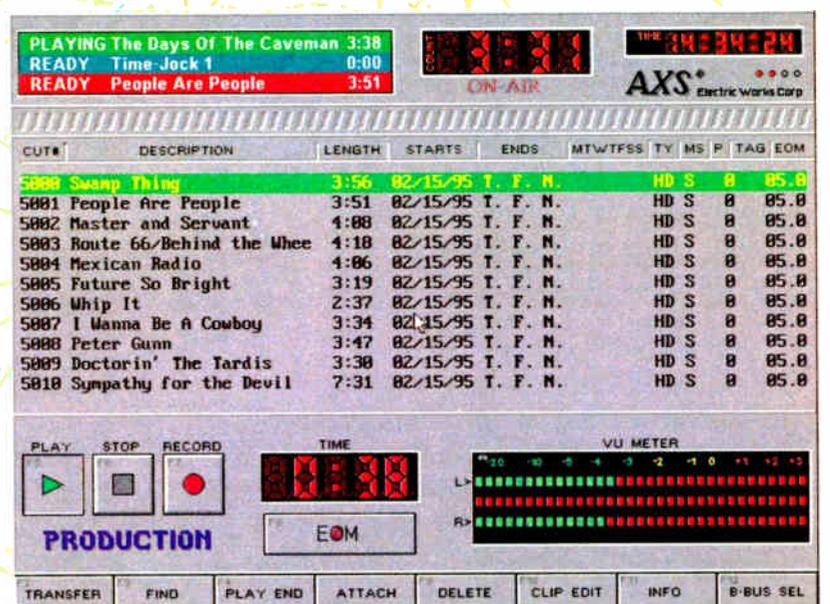
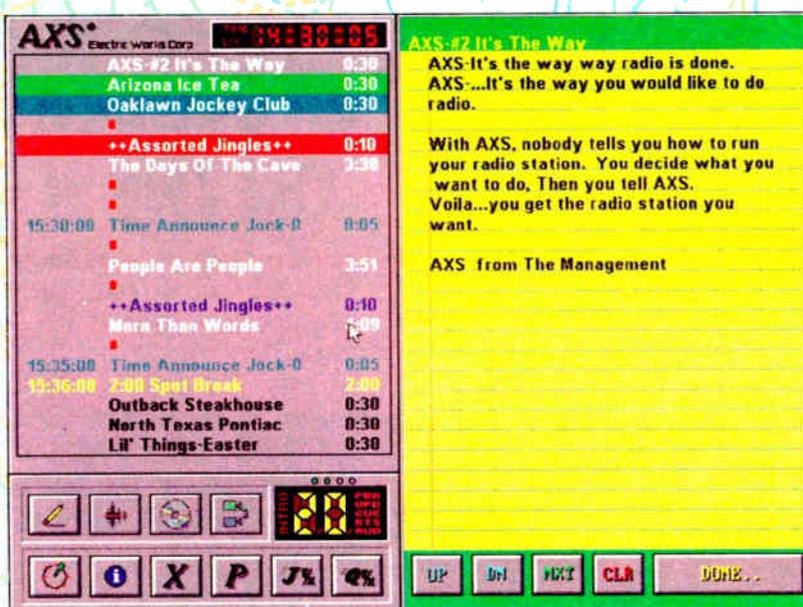
The Jock F/X screen is a part of all AXS systems. Live shows are a snap with 99 pages of 28 instant touch screen, touch pad or click buttons ready at any time.

Copy-Tags and Text

All AXS systems are complete with Text writing and display so that rotating live Copy, Weather, News, Promos, Tags and other Text are always ready.

Audio Production

AXS offers simultaneous device independent Production and/or PBR background recording for time shifting audio Cuts. Audition any cut before it is aired.



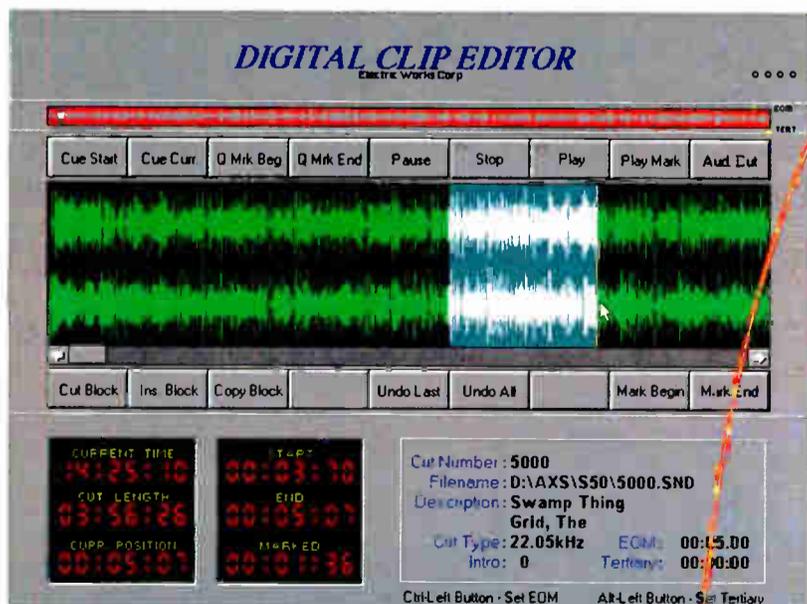


The AXS Main screen:

The AXS Main screen: Full program log display with quick editing and total audio control, including fade and overlap.

Options:

Other audio options include a digital clip editor and WAV2 APT file conversions.



The Management

A Division of

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Fax: 817-624-9741



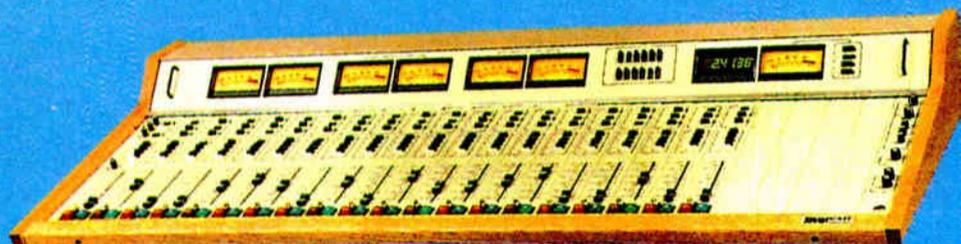
SYSTEM 12



SYSTEM 16



SYSTEM 20



SYSTEM 24



SYSTEM 8

Broadcast Audio Series VI Dependable, Affordable, Practical

Broadcast Audio consoles sound great, are easy to use and employ proven reliable electronics for absolute dependability. What's more, they offer blue chip value at new economical list prices with an extended warranty.

Top quality construction is a hard and fast rule. Double-sided ground plane motherboards assure minimum noise and cross-talk as well as superior RFI immunity. Premium Penny & Giles faders are standard. VCA's are not used. Ribbon cables aren't used for audio signal paths. The no-nonsense design doesn't cut corners.

All mixer modules can be interchanged freely

because console logic is not programmed on the module and each module is switchable between mic and line levels. Mixers and output amplifiers can be removed or inserted with power on. Additional flexibility is provided by three stereo busses and a mono mix-minus bus which are standard in all units. In short, high-grade construction and audio performance are uncompromising.

Broadcast Audio consoles are installed in every one of the 50 states in the USA. During the past 13 years, over 1,400 consoles have been delivered and virtually every one remains in use today. A 5-year warranty is provided on all new units.

Call Fidelipac for the name of your authorized Broadcast Audio dealer.



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Circle (125) On Reader Service Card
World Radio History

TECHNOLOGY UPDATES

HARRIS ALLIED

DRC1000 in Price Range For Radio Broadcasters

QUINCY, Ill. Until recently—despite the proliferation of digital products in the radio studio—audio mixing, routing and distribution remained in the analog domain. Although digital consoles were available for television and video production, their price put them



out of reach for radio broadcasters.

All of this changed at NAB '95 when Harris Allied demonstrated an affordable (under \$20,000) digital on-air mixing console developed specifically for radio. The DRC1000 is manufactured by Zaxcom Audio, a leader in digital audio television and production consoles.

The DRC1000 offers the functionality expected and required in a radio broadcast console while still taking advantage of the power of operating in the digital domain. The console's input and

output structure are controlled by user-defined software, not hardware.

While \$20,000 may seem expensive for a 10-channel console, it becomes a bargain when its capabilities also include routing, audio processing, digital delay, mix-minus and the ability to function as a control surface for digital hard-disk storage.

The basic DRC1000 has two main components: a controller and an audio processor. The controller works much like any

other console, with familiar Penny and Giles faders, on/off buttons, meters, input select, output bus select, etc.

The 17-inch-by-19-inch controller has 10 faders, each with a bright, eight-character LED display showing the input name. Other features include a numeric keypad and an LCD screen to set up EQ, compression/gating and pan, as well as standard machine control and RS-422 serial ports for interfacing to other equipment.

The 5 RU audio processor unit, which uses four 32-bit Analog Devices SHARC digital signal processors (DSPs), includes 10 AES/EBU digital audio inputs, seven AES/EBU outputs and seven analog outputs.

The unit generates its own synchronization, and each input provides automatic sample rate conversion so the system can stand alone or be integrated into a larger digital facility with an external clock. In addition to the seven AES/EBU outputs, there are 18-bit and 20-bit analog outputs. EQ, compression/limiting, filtering, selectable delay, pan and other DSP functions are provided for each channel. Analog inputs are added by specifying the required number of optional A/D converters.

Up to four audio processors and/or four controllers can be linked, allowing flexible configurations of up to 40 stereo inputs and 40 faders. Regardless of the number of controllers or audio processors, any input can be assigned to any fader. Since all of the controllers do not have to be located in the same studio, the need for a router or duplication of audio around the facility may be eliminated.

For more information, contact Harris Allied Richmond at 800-622-0022 or your Harris district sales manager; contact John Haronian at 317-962-8596; or circle Reader Service 116.

AEQ

Logical Design of BC-500 Ensures Easy Operation

TEMPE, Ariz. The AEQ BC-500 mixing console is designed for radio stations seeking high-quality audio at a competitive price. The designers of the BC-500 paid great attention to the control layout. The logical control design ensures a quick learning period, as well as trouble-free operation. Advanced true modular design allows total flexibility. The BC-500 has built-in meters and

speakers and comes in two standard configurations. One configuration has 16 channels, the second has 12 channels. Both come with a telephone hybrid interface, and capabilities are expandable in 100-percent modular design. Again, all



AEQ-AMERICA, Inc.

these capabilities are available to broadcasters at a competitive price.

For information, contact Gerardo Vargas in Arizona at 602-431-0334; fax: 602-431-0497; or circle Reader Service 123.

8 TRACK DIGITAL EDITING BREAKS PRICE BARRIER \$5,495*

- A digital audio editor designed for Radio production
- Learn to use in minutes, *much faster than tape*
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- Add Trak*Star-8 software to a Digilink for only \$2,000

Trak*Star-8 is the first cost effective multitrack digital audio editor designed for the radio broadcast professional. Fast and easy to use, produce your commercials on Trak*Star and then transfer them in digital straight to the Digilink in your On Air studio. Dramatically reduce production time and save money !!!

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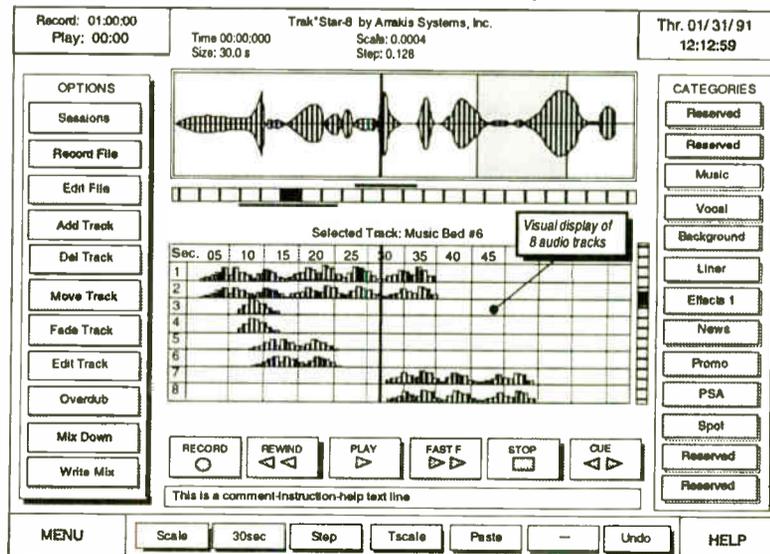
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Products & Services Showcase

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NEW!!



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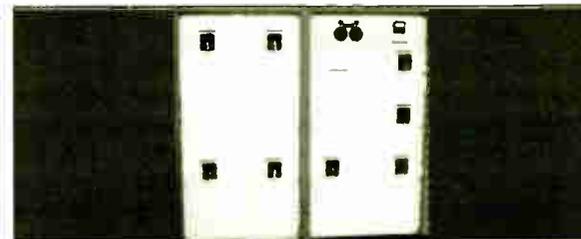
- ◆ HI-GAIN mode for digital editors
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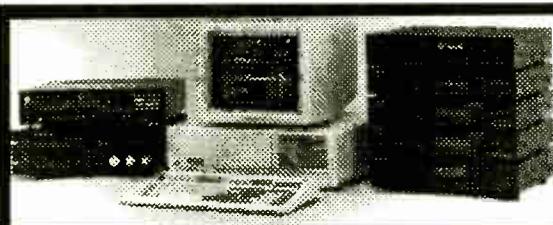
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READER SERVICE NO. 152

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Inexpensive & Convenient Control

- Decodes all 16 DTMF tones.
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The DTMF-16 is perfect for interfacing networks to your automation, controlling remote satellite receivers, repeaters, etc. With a list price of only \$199, the compact, light & rugged DTMF-16 can be put almost anywhere to provide the remote controls that you need. For more info, contact your favorite broadcast supplier or call us.

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READER SERVICE NO. 177

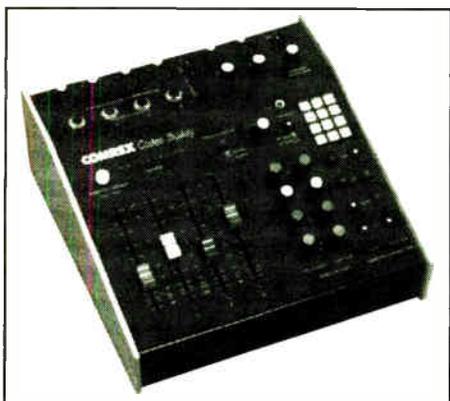
COMREX**Codec Buddy Condenses Remote Equipment into Box**

ACTON, Mass. Designed specifically for use with ISDN/SW56 remotes with digital audio codecs, the Codec Buddy from Comrex provides audio mixes for program feeds, communications, headphones and public address systems. This rugged, compact console condenses the various mixers, amplifiers and complex cabling required for these remotes into one small box.

The heart of the Codec Buddy is a high-quality, four-channel mixer with slide faders. Channels 1 and 2 are mic level inputs, and channels 3 and 4 are mic/line switchable.

A versatile headphone mixer and monitor matrix allow headphone listeners to make customized cue selections (program audio, telephone line, spotter/producer and return codec channel) and adjust levels individually. Channel 1 has a separate mix, while channels 2, 3 and 4 share a common mix.

Along with all these headphone mixes,



the Codec Buddy supplies a separate mix designed specifically to feed PA systems, with the ability to adjust relative levels of these two signals through rear panel controls.

An analog telephone interface is built in with dial pad, tone/pulse switch and a line ring/seize indicator. This line can be used for communication with the receiving site or for emergency backup. There is a built-in single-line frequency

extender for program transmission.

For information, contact Lynn Distler in Massachusetts at 508-263-1800; fax: 508-635-0401; or circle Reader Service 59.

DDA**Network 7 Easily Connected To External Equipment**

BUCHANAN, Mich. The Network 7 from DDA was designed from the ground up to provide a station with a range of features and options. The completely modular design may be custom-configured for use in any application.

Frame sizes of 16, 24 or 32 modules are available, all with desktop, semi-flush and flush-mounting options. In addition, the console may be ordered with any combination of mono, stereo or telephone input modules, each of which can be supplied with or without EQ, routing and ducker controls.

The Network 7 has extensive remote-start logic electronics that allow easy interconnection with external equipment such as CD, gram and cart machines. All console inputs and outputs are fully balanced, with an audio limiter built into the mono and telephone inputs.

A separate record bus allows independent recording while the console is on-air. The console also features four clean-fader busses, three of which can be routed to the telephone module caller output.

For information, contact Peter Igel at Mark IV Pro Audio Group in Michigan at 800-695-1010; fax: 616-695-0470; or circle Reader Service 92.

ATI**Aspects of Vanguard Series Examined for Improvement**

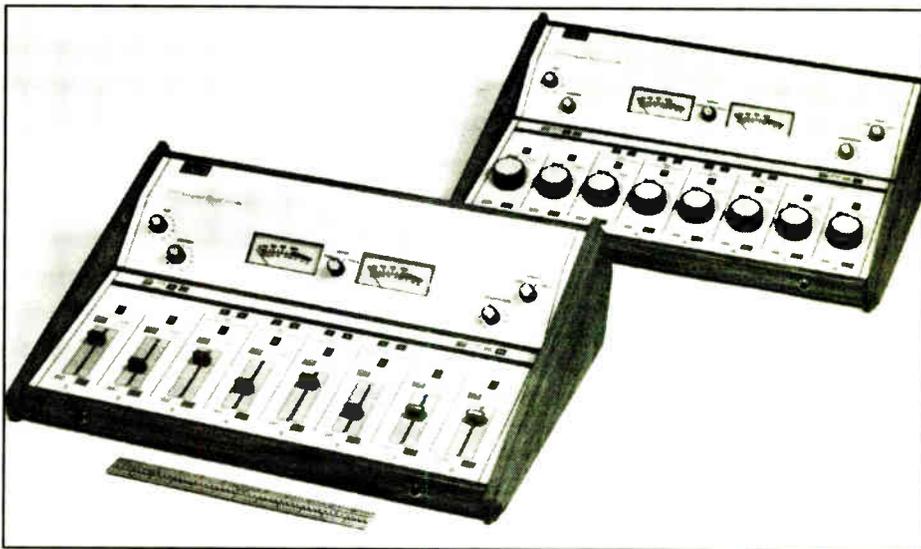
HORSHAM, Pa. The Vanguard series consoles from ATI are available as a six-mixer, 10-input board (BC6), an eight-mixer, 12-input board (BC8) and a 12-mixer, 24-input board (BC12). Linear faders are standard. Rotary faders are also available in the BC6 and BC8 consoles. All models feature dual stereo and

for maximum on-air and production flexibility.

In addition to these internal busses, the monitor module allows for the monitoring of up to 12 external stereo

dual mono-sum program outputs with four line input selectors for both the headphone and muted monitor outputs. Two transformerless, discrete, low-noise microphone preamplifiers may feed any stereo input through internal pan pots. A high output cue amplifier and built-in speaker are included.

Options available include bright LED bargraph output displays with simultaneous VU and PPM peak readout, a two-channel, mix-minus telephone adapter,



start-stop switches, additional microphone preamplifiers and a dual, five-line stereo input expander.

Every aspect of the Vanguard consoles has been scrutinized to discover better and more cost-effective alternatives. A digitally scanned matrix of long-life, sealed membrane switches controls distortion-free current mode IC audio switches. These switches replace conventional pushbutton and lever key switches for all input selection and output bus assignment.

DC-operated VCAs are used for all level control functions and eliminate the need for expensive audio faders by completely removing the faders and their potential noise from the audio signal path. Exclusion of all program audio signals from the panel area greatly improves RF immunity and allows a simple console package design.

A four-layer horizontal mother-daughter

circuit package with alternate layers of ground plane shielding forms a modular, shielded audio system with none of hand-wiring of traditional consoles. All studio wiring is made directly to the motherboard edges with punch-down-type connectors.

The input, program, cue and monitor driver amplifier boards plug into the motherboard for easy serviceability and minimum downtime.

The power supply is an external module

to eliminate heat build-up, ground loops, hum and AC line exposure within the console. All fuses have LED indicators, and all regulators include diagnostic LED indicators for quick replacement in the event of damage due to a lightning-induced power line surge.

For information, contact Ed Mullin in Pennsylvania at 800-959-0307; fax: 215-443-0394; or circle Reader Service 162.

LPB 7000 Aces Test

► continued from page 43

starts to my equipment or failures in the console.

Everyone at one time or another has ordered a piece of electronic equipment and opened the technical manual only to find that you should have ordered a road map as well. Fortunately, LPB created a technical manual for the 7000 series console that is easy to read and understand, from how the console works to the schematic and parts lists.

Bleed-over

I do want to point out that nominal input levels must be kept at -10 dBm for 600 ohm loads. Failure to observe this caution will cause crosstalk and channel bleed-over problems. One section of the technical manual gives information on designing H pads if you do not have enough control on your source equipment output audio levels.

I am extremely pleased with the design and operation of the 7000 series console. I had one minor problem with low-level FM RF audio bleeding into the headphone circuitry. I eliminated this problem by installing ferrite beads on the stereo wires at the headphone jack itself, and replacing the plastic stereo headphone jack with an all-metal type so that the headphone circuit ground would not be floating, but rather connected to chassis ground.

For information, contact John E. Devecka in Pennsylvania at 610-644-1123; fax: 610-644-8651; or circle Reader Service 165.

OTARI**B-10 Functions As On-air Or Production Console**

FOSTER CITY, Calif. The Otari B-10 broadcast audio mixing console is compact yet full featured. Custom configurations using any combination of VCA-controlled mono or stereo input and group modules allow for fader start/stop and external control. These modules, in combination with the master, monitor and talkback/oscillator modules, allow the board to function as either a high-quality off-line production console or an on-air board.

For production, the console features direct outputs from the group modules for eight-track recording. Each mono input module features +48 phantom power supply, phase reversal, three-band EQ and high pass filter.

A stereo aux send, plus three mono sends, in combination with the group, mix-minus, and pre- and post-fader busses, permits up to 18 busses

on-air mode, the test oscillator and talkback become inoperative, and the studio monitor lines (except for headphone lines) are muted. Three frame sizes allow for a 14-, 24- or 34-module configuration.



inputs—two for the studio, 10 for the control room.

The master module has three sections: on-air, aux master and master fader. In

For information, contact James Goodman in California at 415-341-5900; fax: 415-341-7200; or circle Reader Service 120.

SOUNDCRAFT**10s Console
Configured for
Any Application**

NORTHRIDGE, Calif. The new Series 10s from Soundcraft USA is a modular mixing console that may be custom configured for virtually any specialized on-air broadcast or production application. Three frame sizes (12, 20 or 28 inputs) are available for loading with the user's choice of mono mic/line, stereo line, telco or eight-input source-select modules.

The 10s offers separate program and audition busses, and Penny & Giles long-throw faders are standard. To ensure goof-proof on-air operation, the 10s features large, backlit on/off buttons and auto muting of the pre-fader cue circuit when the channel fader is open. Full logic interface for machine start/stop is provided, along with a sophisticated interlock system to prevent a tape machine from going on-air while in fast wind mode.

The large meter bridge on the 10s may be custom-configured to specific user needs. Options include small or large analog meters with VU or PPM ballistics, special high-resolution bargraph meters, built-in cue loudspeaker and dual digital timer.

Two master modules are available: the production version with long-throw Penny & Giles faders for program and audition master outputs, and the on-air version with no master faders. Both ver-

sions provide five stereo monitor outputs and comprehensive studio communications/talkback facilities.

For information, contact Shannon T. Celia in California at 818-895-3426; fax: 818-830-1220; or circle Reader Service 216.

BE**Mixtrak Offers
Control of Wide Variety
Of Sources**

QUINCY, III. Mixtrak consoles from Broadcast Electronics (BE) provide the perfect control surface for the ultimate analog device—the human being. To handle digital audio, talent has to hear it, see it and feel it. The Mixtrak console makes it easy.

A wide variety of versatile input modules accommodate any combination of line level, mic level and remote sources. Built-in equalizers and custom processing modules tailor the sound to exactly what the ears demand. Laser-trimmed faders and long life hall effect switches ensure low maintenance and superior performance.

These same modules offer effortless control for an enormous variety of sources. Field-configurable interface modules offer easy connections of devices, ranging from turntables and cart machines to CD players and digital workstations.

Special purpose modules include control panels for digital telephone hybrids, routing switchers and codecs. One special

module even includes a trackball to control digital editing systems.

The monitoring system is also flexible. Standard modules include a control room unit with selectable muting, ducking and headphone equalization. Studio modules feature built-in intercom and talkback logic. A series of mono and stereo auxiliary busses provide creative mix-minus feeds to remotes and easy routing to external effects devices for production or on-

the-fly digital effects. Traditional analog or advanced LED metering allow precise level control and headroom management.

BE Airtrak series consoles offer similar capabilities in a non-modular form and a compact frame for easy installation.

For information, contact Bill Harland in Illinois at 217-224-9600; fax: 217-224-9607; or circle Reader Service 28.

RESOURCE GUIDE

► continued from page 46
Industrial Acoustics Co.

1160 Commerce Ave.
Bronx, NY 10462
Contact: Robert J. Buelow, vice pres. architectural prod's
718-931-8000 fax: 718-863-1138

In business since 1949, IAC manufactures a complete line of high-quality, high-noise-isolation, modular broadcast studios, voiceover booths, music practice rooms and other architectural noise control products.

Martinson-Nicholls Inc.

7243A Industrial Park Blvd.
Mentor, OH 44060
Contact: Dan Ruminski
216-951-1312 fax: 216-951-1315

Martinson-Nicholls offers NDM, a liquid solution that can replace Latex-based paints to cover floors, walls and machinery. When applied, it helps absorb sound and reduce vibration. The company also distributes 3M Safety Walk, Nomad Matting and other safety products.

Murphy Studio Furniture

4153 N. Bonita St.
Spring Valley, CA 91977
Contact: Dennis W. Murphy, pres. or Sandy Berenics, sales rep.
619-698-4658 fax: 619-698-1268

Murphy Studio Furniture designs and produces Elegant Studio Furniture for radio stations and production facilities. We offer six modular furniture designs and do complete custom layouts.

Neutrik USA

195 Lehigh Ave.
Lakewood, NJ 08701
Contact: Ellen A. Wagner, mktg. comm's mgr.
908-901-9488 fax: 908-901-9608

Innovative XLR audio connectors, including solderless; quarter-inch phono/jack combo connectors; bantam and quarter-inch jack panels; patch cords; miniature and sub-miniature; jacks; plugs; speaker connectors and a full line of XLR accessories.

Pulizzi Engineering Inc.

3260 S. Susan St.
Santa Ana, CA 92704-6865
Contact: Peter S. Pulizzi
714-540-4229 fax: 714-641-9062

Pulizzi offers AC and DC power distribution and control systems for main-frame system applications. The company also provides EMI and RFI filtering, spike and surge protection, and remote power on/off that is agency-approved for domestic and international use.

Sandar Electronics A/S

P.O. Box 1733
N-3208 Sandefjord
Norway
Contact: Tore G. Naess
+47-3345-9600 fax: +47-3345-9333

Since 1970, Sandar has been devoted to the development and manufacturing of professional routing switchers, analog/digital audio, distribution equipment and remote-controlled amplifiers, audio conferencing and control panels.

Studio Technology

#2 Pennsylvania Ave.
Malvern, PA 19355
Contact: Vince Fiola, dir.
800-676-0216 fax: 610-296-3402

Studio Technology designs, manufactures and installs custom furniture for radio and television. We also manufacture the Audiometrics line of furniture as a private label item exclusively for Harris Allied.

Switchcraft Inc.

5555 N. Elston Ave.
Chicago, IL 60630
Contact: Jennifer Murphy, mktg. comm's spec.
312-631-1234 fax: 312-792-2129

Switchcraft has been manufacturing quality components since 1946. Today, our extensive product line includes audio and video patch panels, patch cords, jacks, plugs, connectors, jack fields, jack panels and switches. We serve a variety of markets, including audio/video, telecommunication, computer, medical, military, appliance, transportation and instrumentation.

USA Foam

11571 E. 126
Fishers, IN 46038
Contact: Dave Harbison, nat'l sales mgr.
317-842-2600 fax: 317-842-2760

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Wheatstone

7305 Performance Dr.
Syracuse, NY 13212
Contact: Ray Esparolini, dir. of sales
315-452-5000 fax: 315-452-0160

Manufacturer of high-quality broadcast audio consoles, both analog and digital. Radio control room and studio furniture, as well as compressor/limiter/de-essers and distribution amplifiers. Provider of control console, furniture and console pre-wire systems for turnkey applications.

Z-Systems Inc.

4641-F NW 6th St.
Gainesville, FL 32609
Contact: Glenn Zelniker, pres.
904-371-0990 fax: 904-371-0093

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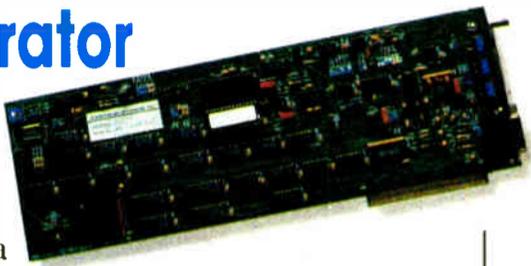
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World Radio History

SONY

DMX-B4000 Incorporates Sony's Digital Signal Processing Technology

MONTVALE, N.J. Sony has played a leading role in the digital audio revolution since it shipped compact disc players to U.S. radio stations in 1983. Because digital audio broadcasting standards were first adopted in Europe, much of Sony's product development for full digital radio broadcast suites initially focused on the needs of broadcasters there. For example, the Sony DMX-B4000 digital audio radio console has already found acceptance by European broadcasters and is beginning to create a presence in the United States.

American broadcasters begin to look

seriously at digital radio, they can benefit from the European experience of integrating digital radio suites and, specifically, the DMX-B4000 as an integral part of the whole.

This console incorporates Sony's advanced digital signal processing technology, provides superior audio quality, flexible routing through multiple inputs, an easy-to-use graphical interface and a control surface that fully supports the typical hierarchy of



operation in on-air production.

The DMX-B4000, available in eight- and 16-channel stereo configurations, delivers 32-bit digital signal processing accuracy with 24-bit AES/EBU I/O for

pristine audio quality across multiple generations of editing and dubbing. Digital signal processing also facilitates an advanced style of audio mixing in which most operations can be fully automated, integrated and centrally controlled via a graphical, touchscreen interface.

For example, equalization settings for each input channel can be accessed from the touchscreen, allowing a simple, uncluttered control surface. Other automated functions include routing, programmable presets for news applications, a 3.5-inch floppy disk drive for storing console setting snapshots and a lockout function.

For information, contact the company in New Jersey at 800-635-SONY(7669), or circle Reader Service 157.

YAMAHA

O2R Features Real-time Automation, Instant Reset of All Parameters

BUENA PARK, Calif. Yamaha Corp. of America has introduced the O2R digital recording console. Consisting of 24 analog inputs and 16 digital tape returns for a total of 40 inputs, the O2R features eight digital bus outputs, eight digital direct outputs, eight aux sends, digital inputs and outputs, using four card slots for Alesis ADAT, Tascam DA-88, RDAT, professional AES/EBU and Yamaha recording formats. Analog mic/line inputs incorporate new 20-bit A/D converters.

The O2R is equipped with real-time automation with snapshot memory and instant reset of all console parameters, including internal compressors and effects. A limiter/compressor/gate is available on every input channel and every output bus. Two internal digital effect processors and two stereo effect returns are also included.

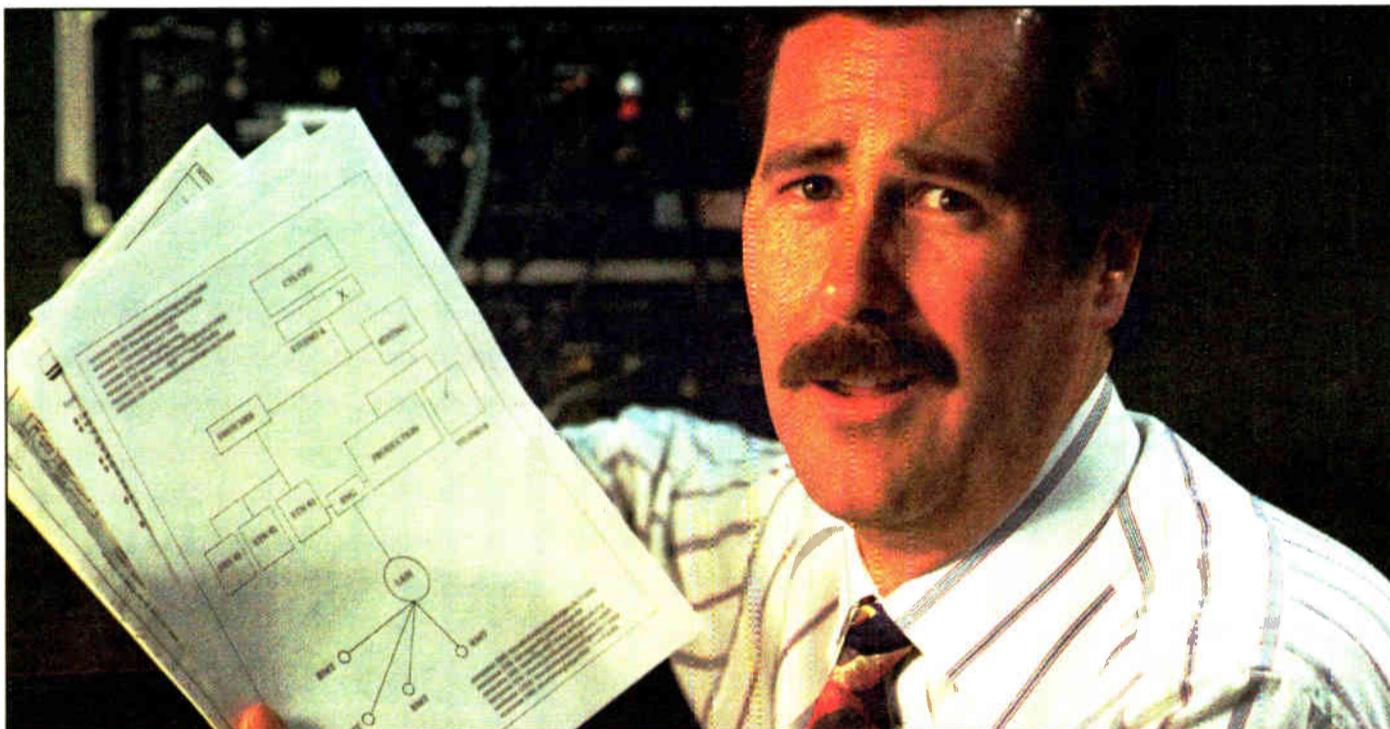
Complete cascading of multiple consoles is achieved via bus, aux send and solo system. All console functions, EQ curves and numeric settings can be quickly viewed via a graphic LCD screen. 100mm motorized faders on every channel can be toggled to control and automate tape returns. Central con-



trols act as a virtual channel module, providing all key channel functions, including bus assignment, EQ settings, aux send levels and panning.

Additional features include four-band parametric EQ on each channel and tape return, fader grouping and stereo pairing, channel dynamics linking and a built-in RS422 port for external control. A comprehensive meter bridge is optional. Tape I/O cards are available for Alesis 8 in/out, Tascam 8 in/out, AES/EBU 8 in/out, Yamaha 8 in/out and analog TRS 8 in/out.

For more information, contact the company in California at 714-522-9011, or circle Reader Service 145.



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It's not easy trying to understand the conflicting claims made by different manufacturers when you're buying a Digital Audio On-Air & Production System, whether a single, multipurpose Workstation or an integrated, multiple studio setup. At one end of the spectrum, you're faced with a wide variety of simple "Cart Machine Replacements," and on the other, products whose complexity confounds even the most seasoned broadcast engineer.

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*The 18 Channel 7000 Series Console pictured above was used for live US/Hong Kong broadcast from BSW's booth at the 1995 NAB Convention.

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complete pre-shipment performance test report, fully socketed ICs and RF immunity that's second to none. The 7000 Series offers programmable remote starts and muting, as well as a 5,000,000 operation rating on all switches used.

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Want To Buy

Tube type audio amps, preamps, output transformers & power transformers. M Vincent, 804-276-3983.

Record Cutting Equipment. 612-869-4963.

Tube HiFi/Commercial amplifiers, preamplifiers, compressors, speakers etc. Altec, JBL, McIntosh, Marantz, Western Electric, Pultec, Ampex, etc. 405-737-3312 FAX: 405-737-3355.

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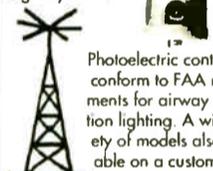
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Jampro JLCP-7 7 bay circular polarized tuned to 106.3 MHz, BO. R Meyers, Sound Masters Inc, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

Pirod/Harris 2-tower directional antenna syst, 2-198' Pirod guyed towers on ground, Harris phasers & BTUs, BO. J Stitt, 606-282-1160.

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Shively 4 bay CP antenna tuned to 97.7, BO. 910-754-5582.

Want To Buy

Horizontal antenna, lightweight, tunable to 98.5 MHz, 6-8 bay. F Hollon, WAHL, Rt 1 Bix 72, Plymouth IL 62367-9730. 217-392-2340.

AUDIO PRODUCTION

Want To Sell

AKG D-190E headphones (2), in box, \$40/ea. D Jackson, 203-762-9425.

Crown DC-150As (2), great condition, \$200/ea, \$350/both. K Thomas, Rebel Recording, 5555 Radio Ln, Jacksonville FL 32205. 904-388-7711.

dbx 180 stereo NR, \$225; dbx 208 NR system, \$495. J Price, 214-321-6580.

Roland 6209 1 octave pro EQ, rack mounts with parallel low noise filters, \$50. E Davison, 217-793-0400.

Roland SRV-2000, \$525; dbx 503 expander/comp, \$290; Orban 414-A stereo compressor, \$425/BO; UA 565-filter, BO; Orban 245-E stereo synth, BO; Ross 15 band stereo EQ, BO. T Coffman, 619-571-5031.

DeltaLab Effectron I digital delay, \$250. J Price, 214-321-6580.

Valley People 440 monophonic audio proc, passes proof, great condition except paint around rack holes, \$400; ARP Odyssey 2800 keyboard synth, 3 octave keyboard, completely programmable with foot pedal, manuals & patch sheet, \$500. F Vobbe, 419-228-4199.

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Yamaha RM-804 recording mixers (2), 8-chnl, \$400/ea; Shure SE-20 mixer/gated compressor, \$100; Shure M-68P mic submixer, \$75; Yamaha SPX-90 Type II, \$400; Audiologic NT66 stereo compressor limiter, \$200; DOD R-830B graphic EQ, \$125; Spectro Acoustics 210 stereo graphic EQ, 10 bands, \$100; Furman LC-2 compl/limiter with de-ess, adj attack & release, \$300; DBX 2-124 NR system, \$75; Teac AN-180 NR unit, \$75. D Jackson, 203-762-9425.

Digidesign ProTools 2.51 4-chnl workstation incl disk I/O card, 4-chnl audio interface, cable & software for both ProTools & Sound Designer, \$4500. Paul, Pissaurus Prod Inc, 402-341-9153.

Technics SH-9010 stereo parabolic EQ, rack mount, 2-channel, 5 bands +/- 12 dB/chnl, adj freq/bandwidth each chnl, unbal in/out, good condition, \$225/BO+shpg. E Heivey, 703-877-2717.

Bulk eraser, \$49; Stewart 4 ch D-box, \$95; Cue command decoder, \$125; NEW Tascam midizer MTS1000, \$450; Infonics 7" reel copier 1-3 copies, 2@ \$125 ea; Furman elec crossovers, \$95; Peavey M2600 pwr amp, \$375; Crest FA800 PWR AMP, \$475. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

ADC 1/4" patchbays and cords, NEW, UNDER HALF PRICE, ADC TT patchbays, \$129 up, NEW cords, \$9.95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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

Allison Gain Brain/Kepex (6), 4 Kepex, 2 LX-100 power supplies, rack-mount with supply, Molex connectors, pins & crimp tool, BO; Fairchild 659A older 3 spring reverb unit, 3 amps, sounds like old WABC AM, BO; UREI 535 stereo EQ, like new in original box, \$350. L Prezant, 718-248-1623.

Want To Buy

MXR-Neve-API EQs, mic-pres, delays, etc. T Coffman, 619-571-5031.

Ampex tube mixers, plug-in mic pre-amp modules for PR10's, Altec or other tube compressors, Mackie mixers. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

AUTOMATION EQUIPMENT

Want To Sell

25 Hz tone gen, good cond, downlink TC, \$440. J Gelo, 941-642-6899.

SMC 350 RSB 24-tray Carousels (3), xint cond, installed in compl SMC rack unit, \$350. B Christie, Grande Rio Group, POB 907, LaGrande OR 97850. 503-963-4121.

SMC Carousel 452 stereo Carousels (3) w/Sentry Sysfs FS-Latch cards, xint cond, BO. P Dixon, Bomar Bdctg, POB 1538, Marion IN 46953. 317-664-7396.

SMC Carousels (4), mono, BO. GM, KWED-AM, 210-379-2234.

SMC 1984 10-chnl MSP syst, bi-directional Carousels (2), ARS 1000 reels (3), snl cart PB (2), SMC racks (3), now on-air & works good, compl syst w/all manuals & 25 Hz/1 kHz tone gen, p/u in S VA, \$4000. H Espravnik, WVCP-FM, 1360 Nashville Pike #A-201, Gallatin TN 37066. 615-452-8600.

Conex CG-25R 25 Hz gen, BO. C Mandel, 619-352-2277.

Digilink automation syst, compl w/keyboard, mouse & monitor expander/doubler, 6 hr SCSI drive incl, BO. D Gaydos, WNYU, 721 Broadway 11th fl, NY NY 10003. 212-998-1663.

Arrakis Digilink DL2-600, 540 MB HD, 15" color monitor, keyboard, mouse, etc, 6 mos old, BO. 904-477-6688.

Digital DJ computer, monitor, stereo switcher, 1991 model, xint cond, BO. V Zandt, WLGm, 15 Walnut Hills, Springfield IL 62707. 217-487-7711.

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Sentry FS-12B automation system, good condition, including 2 stereo 48 Instacart, 4 stereo Go-Carts (2-24s, 1-48 & 1-42), computer, interfaces, manuals & cables, BO; IGM-EC automation system, good condition, including 2 stereo Instacart 48s & 1 stereo Go-Cart 24, computer, interfaces, manuals & cables, BO. C Mandel, 619-352-2277.

Want To Buy

All types & vintages, repairable OK. FAX 715-359-8213.

Conex CS-25 or other, will pay \$100 for working Conex 25 Hz tone sensor, will consider others, need 6. J Nichols, Rosemond Radio, 313 S St, Gastonia NC 28052. FAX 704-853-1776.

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Want To Sell

Gates mono triple ply cart decks (2), both work OK, BO. CE, Eclipse Bdctg Inc, 207-947-4487.

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ITC Omega mono PB cart machines (3), work fine with manuals, will include 50 Audiopak A-4 carts free, \$500/ea+shpg. R Hendryx, KVLf, PO Drawer 779, Alpine TX 79831. 915-837-2144.

IGM 12 tray InstaCart model 12 STK, \$250; SMC Carousel model 250, \$100; Master Carts, various lengths, 40 cents/ea; cart racks hold 24 carts, table top, \$10; Model RP ITC R/P cart machine, mono, \$450; Harris Criterion 90, mono ply, \$250; BE 2000s (2), parts, \$25; BE cart rewriter, \$150. Tony, 402-371-0780.

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

Audi-Cord TDS-1 dual mono PB, BO. AM Eich, 502-428-3655.

ITC S/P stereo PBs (6), snl stereo, 3 tone cart machines, \$395/ea. D Matyis, KEVT/KASE, 512-495-1300.

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ITC System 99B stereo record/play: tones, ELSA, auto head: \$1200/firm. C Scott, WKYU-FM, (502) 745-5489.

Want To Buy

ITC 99B mono or stereo R/P, must be in working cond, good heads, will pay good money. J Ambrutis, WJTO, POB 308, Bath ME 04530. 207-443-6671.

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CD PLAYERS

Want To Buy

CD plyrs (3) w/remote start capabilities. C Bullock, WEJT, Decatur IL, 217-428-4487.

COMPUTERS

Want To Sell

Radio Shack 1000 computer, used for Sentry Automation, no HD, no OPTO interface, extend memory to 640K, floppy drive, works, \$200/Best Offer. A Wasilewski, 509-248-1460.

Anderson AJ1256 modem, \$20; TEC F10 daisy wheel printer, \$75; Extel printer, model AH11R, \$25; TI 810 printer, \$75; Dysan 8" discs, cheap. Tony, 402-371-0780.

Radio Shack 1000 computer, used for Sentry Automation, working, no HD, no opto interface, extended mem to 640K, one floppy drive, \$200/Best Offer. A Wasilewski, 509-248-1460.

CONSOLES

Want To Sell

BA-44 monitor amp for RCA board for parts, \$25. Doug, 616-782-5106.

Arrakis 5000 SC, circa 1986, 13-chnl linear fader, some spare parts, new hi current power supply, works well, \$2000. M Martindale, KVON, 1124 Foster Rd, Napa CA, 94558. 707-252-1440.

McCurdy audio board, good shape with 18 inputs, 1 echo return, SA 1371-06 timer, 4 banks of monitor buttons, EQ 1550, RTG mod, CM 7441 mod, OT 157B mod, intercom mic, 5 patch bays with small rack, needs 3 PS boards, \$5000/Best Offer. Doug, 616-782-5106.

McMartin 10-chnl mono console, cosmetic condition fair, proofs well, solid state, BO. CE, Eclipse Broadcastin g Inc, 207-947-4487.

RCA BA-7 console, 2-chnl mono, dual chnl mono, or stereo, 1st 5 chnls mic inputs, next 3 line inputs, last 2 remote/line inputs, internal speaker amps, cue, muting relays, passes proof, clean cond, \$850+shpg; Gates Gatesway mono console, mic & line inputs, 2 holes in front panel where automation & 2-way cntrl was, passes proof, clean, \$500+shpg. F Vobbe, 419-228-4199.

Collins IC 6 audio console, BO. C Mandel, 619-352-2277.

Gates 10-chnl Executive consoles (2), works except for monitor amps, some spare parts, \$300/ea+shpg. F Hogan, WGLS-FM, Rowan College of NJ, 201 Mullica Hill Rd, Glassboro NJ 08028. 609-863-9457.

Roland 49 cardframe (2) with 9 mic/line inputs, 600 ohm bal line output with VU meter, rack mounts, \$100/ea. E Davison, 217-793-0400.

Sparta Cetec A-15B 6-chnl mono console, \$400. Tony, 402-371-0780.

Ramsa WR 8118 18-channel, 4 bus, great condition, \$900. Brent, 800-359-9302.

Tangent 1202A 12-channell mixing board, slide pots, reverb, pre- & post-FX, send & return, EQ, excellent condition, \$1000/BO. L Prezant, 718-248-1623.

Tascam M208 with rack mounting kit, 8 in x 4 out, FX buss, foldback, low, mid, hi EQ with parametric on mid, mic, line or tape inputs, very good condition, \$450/BO+shpg. E Helvey, 703-877-2717.

Ramsa 820 20x8x16 w/meter bridge, \$1795; Quantum 23x16x24 as used by LA Philharmonic, \$3750. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Want To Buy

API/Neve, whole or parts, working or not. T Coffman, 619-571-5031.

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Want To Sell

EV MS-802 monitor speaker systs (2), wood grain, beautiful, \$550/pr; Jensen bookshelf speakers (2), approx 12"x20", \$50; Bose Model 901 active EQ, \$40. D Jackson, 203-762-9425.

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CRL 400 Series AM limiter syst, also Harris syst, BO. J Stitt, 606-282-1160.

MAP II audio chassis (2), partially wired, 16 slots per, Molex connector, 19" rack mount, \$20/BO. A Wasilewski, 509-248-1460.

Optimod-FM 8100A, new in 1983, manual incl, \$1000. KC Stuart, WFKZ, 93351 Overseas Hwy, Tavernier FL 33070. 305-852-9085.

MAP II audio chassis (2), partially wired, 16 slots ea, Molex connector, 19" rack mount, \$20/BO. A Wasilewski, 509-248-1460.

Orban 9100A AM stereo multiband proc, \$2500/BO. D Matyis, KEVT/KASE, 512-495-1300.

Orban Optimod 8000A, perfect working order, \$1500. P Lopeman, 414-482-1959.

Orban 8100A, box & manual, \$2800. J Katz, KKJG, 396 Buckley Rd, San Luis Obispo CA 93401.

UREI 1178 silver face, xlnl cond, \$1700/BO. M Schackow, 307 4th Ave E, Lemmon SD 57638. 605-374-3424.

Want To Buy

Gates, Inovonics, Fairchild, RCA, UREI, Teletronics, all types, solid state and tube. T Coffman, 619-571-5031.

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 460-EB/EV RE-27, more, BO. T Coffman, 619-571-5031.

AKG D-190E mics (2), \$80/ea; EV RE-15 mics (2), \$150/ea; Sennheiser MD-421 U5 mic, no clip, \$200; Shure 555W unidyn dynamic mic, vintage, \$50; 3 sets lapel mics, condensor/piezoelectret, in pouch w/3 Canons out, 2 w/phone plugs, \$75; Shure 571 dynamic lapel mic w/lie clip, long cord, Canon out, red velvet-type bag, \$35; Shure 444T cntrl magnetic desk mic, grey w/PTT bar & gain cntrl grey, \$25; Astatic T-UGB-D104, chrome finish, stand w/PTT bar, new in box, BO. D Jackson, 203-762-9425.

HME-WM 252 wireless w/SM58 mic xmt, \$150; Telex xmt & mic WT-200, \$195; Telex xmt & mic WT-50, \$150. J Price, 214-321-6580.

Nady 1200 wireless mic sets (2), diversity receivers, EV N/Dyne heads, \$600/ea/BO. D Williams, KSJO/KUFX/KSJX, 1420 Koll Cir, San Jose CA 95112-4601. 408-451-7780.

EV RE-20, re-cond & new paint, \$300. M Miller, WSDM Radio, POB 650, Brazil IN 47834. 812-446-2507.

RCA Varicoustic, 2 in Smithsonian condition, individual ATA cases, \$900 ea. Klay Anderson, 801-272-1814.

Sony ECM377 large dia. cond mic, \$495; RCA 77DX w/new ribbon, Crown GLM200 lavalier like new, \$125. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Want To Buy

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.

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RCA 44 black/chrome mic, CBS/NBC or radio station call letter plate/flag. M Harrington, 501-223-9056.

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RCA ribbons, AKG 451's, Neumann KM84's, U87's AKG 414's. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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Giant radio boom box trailer w/4 kW gen, BO. D Matyis, KEVT/KASE, 512-495-1300.

MCI JH 110B 2-trk roll-around metal cabinet, good cond, BO. J Gelo, 941-642-6899.

Roll-around racks for R-R (2), housed Ampex 440, 3.5" overhead bay, 7" bay, \$75/ea, \$100/both, you ship; 6" rack cabinet, Timmerman clips for mounts, \$10+shpg. F Vobbe, 419-228-4199.

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

1/4" tip, rim, sleeve patch bays (6) w/X-Mas trees, misc broadcast carts, wire, connectors, etc, BO. L Prezant, 718-248-1623.

Bell & Howell 385 16mm movie projector, Best Offer; DuKane 14A390E micromatic filmstrip projector with record player, BO. AM Eich, 502-428-3655.

DB Products pass cavaties 4001 adjustable 2 loop, 2 dB max loss in/out, tunes 130 MHz to 175 MHz, \$90/ea. W Moring, WITV/WSCI, 2187 Wappoo Dr, Charleston SC 29412. 803-795-9401.

Harris 992-5118-001 encoder for System 90, \$50. Tony, 402-371-0780.

Powerpak SMG-400 excellent condition with manuals, schematics, \$400/Best Offer. D Thomp-son, 510-609-8631.

Western Union clock, no glass, OK condition, \$350/ofr. Klay Anderson, 801-272-1814.

Want To Buy

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

MONITORS

Want To Sell

RCA BW-50 (Belar AMM-1) AM mod monitor, calibrated 1/95, very good cond, \$75. F Vobbe, 419-228-4199.

Harris AM 80 air monitor, mono, \$150; TI 700 data terminal, \$40; Panasonic 920ma monitor TTL, \$20; Panasonic 930 monitor TTL, \$20; NEC monitor FVM125A TTL, \$20; TEC smart monitor model 70x, \$40; TEC screen & keyboard 1440-003, \$40. Tony, 402-371-0780.

RECEIVERS & TRANSCEIVERS

Want To Sell

Dayton AF161 SCA receiver, wall mount, DIP switch selective carrier & SCA freq w/pwr sply, \$75/BO. A Wasilewski, 509-248-1460.

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Zephyrus 304 receiver-audio card-tone decoder, never used, BO. D Magnum, 800-736-9264.

Dayton AF161 SCA receiver, wall mount, DIP switch selective carrier & SCA freq w/pwr sply, \$75/BO. A Wasilewski, 509-248-1460.

Delta: RG-1/D15-1 receiver, \$2650; Operating Bridge OIB-1, \$1600. Good condition, Harry, 904-735-1099.

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Otari MTR10-2C stereo rcd, \$2195; MCI Sony JH110 B stereo in console, xint cond, \$1250; MCI JH110 stereo in console, xint cond, \$1000; Otari 5050 2SHD2 stereo in console, \$1000; Ampex 440 stereo in console, xint cond, \$995; Ampex & Scully motors, parts, 8- & 16-trk heads, BO. J Price, 214-321-6580.

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Teac Tascam 80-8 8-chnl 1/2" tape R-R, \$1500; Crown 800 Series stereo R-R 10", \$200; Ampex 1091 stereos (2), \$50/ea; Wollensak 2770 cass duper, stereo unidirectional, \$150; Pentagon 1100 Series 4-chnl cass duper, \$250; Sony TC-142 port cass deck, \$150; Sony TC-152SD 2-spnd stereo cass deck, \$150; Wollensak Model 2851 cass R/PB, heavy duty, BO; ITC Encore R/P mono cart R/P, S/N 434, \$300; Dukane Model 28A18 R/pulsers (2), 50 Hz @ 0.45/2.0 sec, BO. D Jackson, 203-762-9425.

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Ampex 350 rcd/PB deck, \$200/BO; Ampex 350 PB deck, \$200/BO; Inovonics 355/905 rcd/PB for Ampex 350 w/pwr sply & manuals, \$260. D Thompson, 510-609-8631.

Ampex AG-350 deck w/2-trk R/P heads, Inovonics 3-spnd elect, 3-spnd reversible capstan motor, mounted in AG-440 studio console, \$600/BO+shpg; VSC C-4 Soundpacer cass rcd w/variable speech ctrl to PB up to 2X spd & retain orig pitch, AC/DC, can feed thru R-R deck to edit R-R tapes @ high spd. EC, \$50+shpg; Otari 5050BH deck w/2-trk RP + 1/4-trk ply, 3-spnd capable, manual, vgc, \$1500/BO+shpg. E Heivey, 703-877-2717.

Ampex ATR 102 stereo R/P w/VSO & locator, rare metal heads, xint cond, needs xport work, \$2000/BO; MCI JH-110 4-trk in Russlang cabinet, good cond, \$1500/BO; Scully 280-B 4-trk in cabinet, good cond, \$1000/BO. You ship. W Wawro, 214-977-6260.

Eumig FL-1000U rackmount cass deck, optical xport, Dolby, built-in reverb & mic mixing, very good cond, BO; Revox B77 1/2-trk R-R, 7 1/2-15, port, xint cond, \$600/BO over; Pioneer RT-1050 1/2-trk R-R, 7 1/2-15, port, xint cond, \$500/BO over. L Prezant, 718-248-1623.

Otari ARS 1000 open reel machines (5), BO. C Mandel, 619-352-2277.

Otari MX 5050 MKIII/8-trk 1/2", mint cond, low hrs, full remote & 8-chnl dbx NR, \$2900. Brent, 800-359-9302.

Scully 270 R-R stereo tape machine, ply, \$200; ITC 750 stereo R-R, ply, \$500; Scully 280 R-R, R/P stereo, \$300; Ampex 440 R-R stereo ply model 4020293-01, \$150. Tony, 402-371-0780.

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

Studer A710 stereo cass deck, Dolby B & C, \$595. R Sumner, 703-450-2288.

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.

Tascam ATR 60 8 track with stand, remote, \$2250; Otari 5050-8 new heads, rebuilt, \$1595; Ampex 440B-8, \$1950; Tascam 25-2, \$495; Ampex ATR700, \$495; Scully 16 track 2", \$2950; Tascam 52 top of line, \$650; M79-24 fully rebuilt, \$9,500; Tascam locator for 85-16, \$375; Fostex E22 1/2" timecode deck, \$950; Fostex A80 8 track with 450 mixer, \$995. W Gunn, POB 2902, Palm Springs, CA 92263. 619-320-0728.

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Moseley TAU-2 tolerance alarm unit, very good cond, \$125. A Wasilewski, 509-248-1460.

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Moseley 505C xmtrs & receivers, all oper with manuals, \$1000/BO; TFT 8301 composite receivers (2), \$1000/ea/BO. D Matyis, KEVT/KASE, 512-495-1300

Moseley TAU-2 tolerance alarm unit, very good cond, \$125. A Wasilewski, 509-248-1460.

Studer auto hybrid 2-line phone interface with manual, \$495; Comrex PLX port single line frequency extender, \$250. R Sumner, 703-450-2288.

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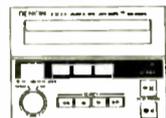
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Microphase Comm 2030S, 1 yr old, BO. D Magnum, 800-736-9264.

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Gates BCIF 1000 W AM xmt, works great, spares, will demonstrate, BO; Gates BC5B 5000 W AM xmt, many spares, good working order, BO. W Osenga, 970 WWIT, Box 1369, Canton NC 28716. 704-648-3588.

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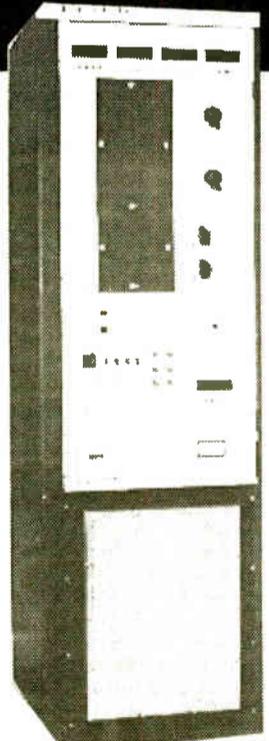
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