

SOUND & COMMUNICATIONS

Volume 37 Number 3

March 22, 1991

BASEBALL IN BALTIMORE

A hometown old-fashioned ballpark is planned to include distributed sound and a video monitor every few feet. The fans will never be out of touch. And a full complement of audio and video sources will provide the information. Scheduled to open in 1992, this brand new stadium will be the home for the Baltimore Orioles. **26**



IN THIS ISSUE

• Ceiling Speakers, Part 2

Upscale, high power, high style. Ceiling speakers join the esthetic revolution where looks and quality count. **42**

• Software Review

Hyperception's Workstation is an interactive Digital Signal Processing software package. Mike Klasco does a hands-on review on this "wondrous tool for audio wizardry" and tells what it can and cannot do. **59**

• Comiskey Park

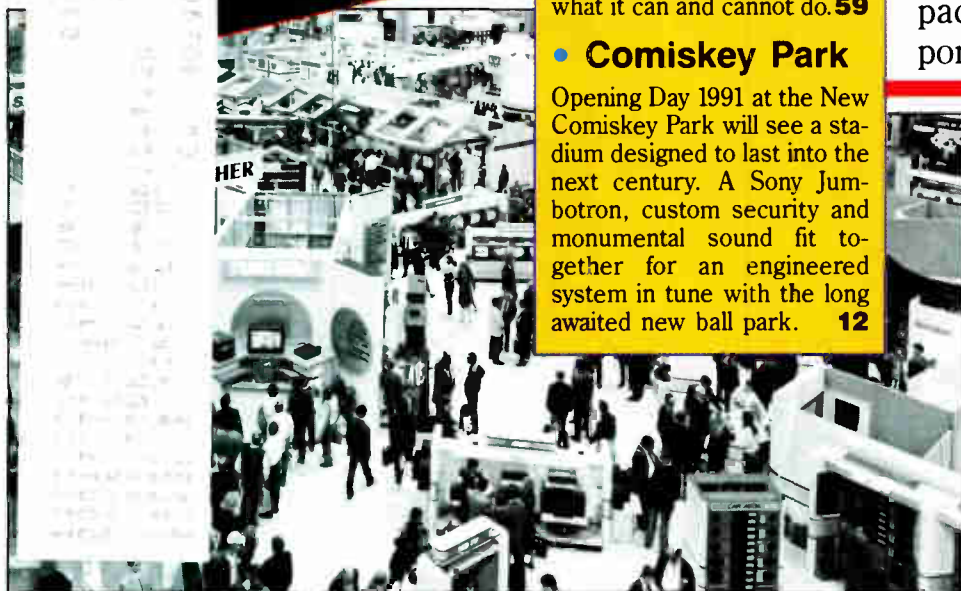
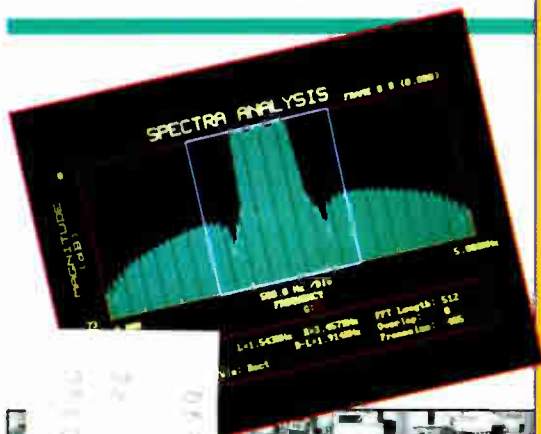
Opening Day 1991 at the New Comiskey Park will see a stadium designed to last into the next century. A Sony Jumbotron, custom security and monumental sound fit together for an engineered system in tune with the long awaited new ball park. **12**

CONSULTANTS ON STADIUMS

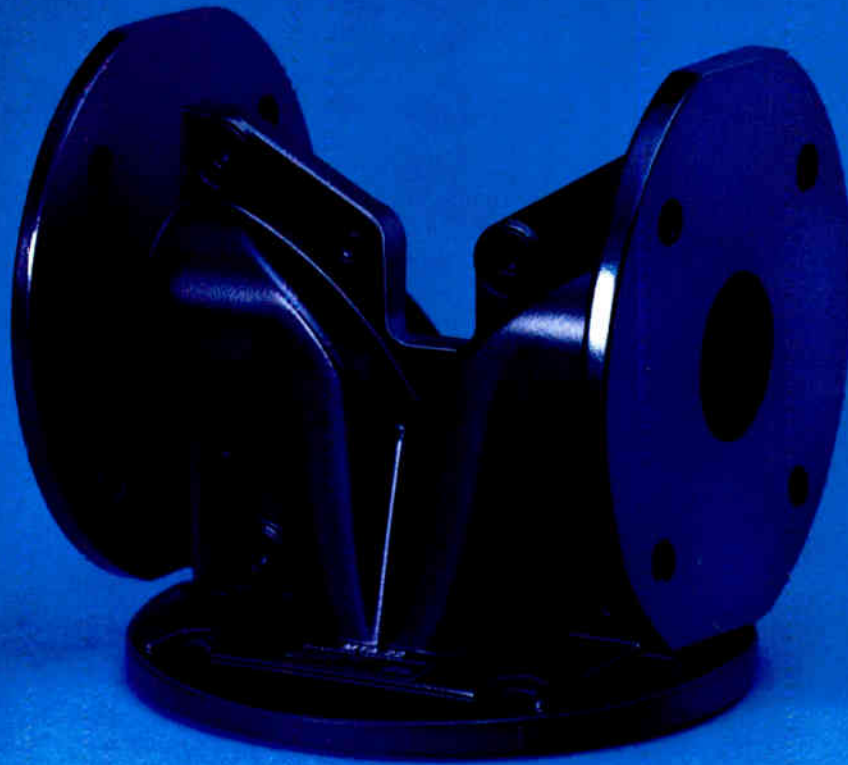
The stadium and arena sound system consultants are as diverse in their opinions as they are in their projects. They all agree on what but they all differ as to how. Central cluster or distributed? With separate, packaged—processed, or custom components? Find out the latest. **18**

CONSUMER GULCH

The Consumer Electronics Show again offers a hint of what's to come — CD libraries, multiroom systems, in-wall speakers and home automation. The annual Las Vegas extravaganza was more upbeat than many observers had predicted. And many of the 1500 exhibitors had new products of interest to other markets. **49**



ADAPTING TO FLAWLESS SUMMATION

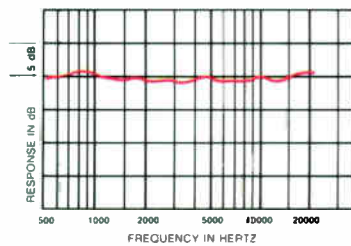


Model N/DYM® 1/2MT-16

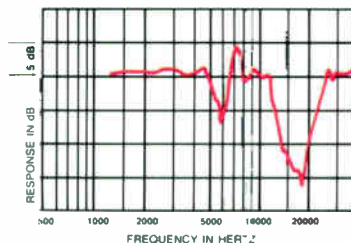


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MTA-22 Summation Response



Y-Adapter Summation Response

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The Manifold Technology concept was first introduced by Electro-Voice in the MT-4 four-way concert sound system where manifolding was applied in each of the four frequency ranges. The MT-4 has garnered considerable success in touring applications, worldwide. The recently introduced MT-2 compact concert system and the MTS-1 high-performance stage system feature Manifold Technology throughout. Now, with the driver packages featuring the MTA-22 Manifold Technology adapter, you can apply the same performance and physical size advantages of Manifold Technology to any of the our HP series constant-directivity horns.

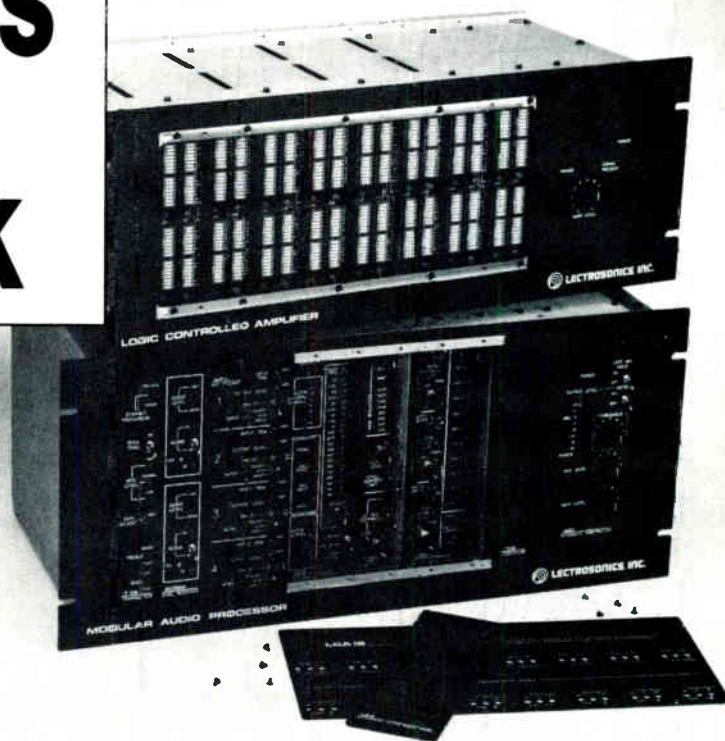
For additional information, contact an Electro-Voice sound contractor or John Murray, Electro-Voice market development manager for professional sound reinforcement at 616/695-6831.



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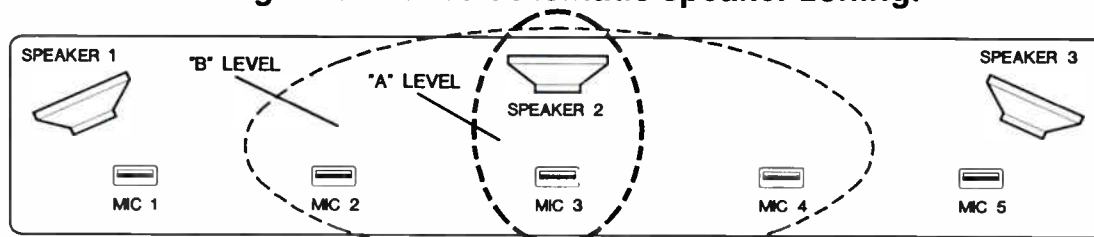


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As technology advances, conference room, courtroom and council chamber sound systems have become increasingly complex. Presentations have become more important and the form, in some cases, has become as important as the function. This rising technical complexity of automatic sound systems has created the need for automatic operations which can be operated with the touch of a switch.

The use of automatic mixers has become standard in "unattended" sound systems but there are other aspects to be considered in a fully automatic system besides simply turning microphones on and off. Lectrosonics has integrated advanced automatic mixing with automatic EQ and notch filtering and added auto speaker zoning, creating the most advanced, user friendly automatic sound systems available.

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Current Concerns and Future Plans

This month we inaugurate a new department in Sound & Communications. It's called the Question of the Month, and it's exactly what it says — a question we've asked of several people equipped to answer it.

This month's question concerns rigging — and new developments thereof. Five manufacturers have answered the question, and we invite your comments in response.

Future questions will deal with compatibility and standardization of hardware, engineering concerns, and just about anything we, and you, can think of.

The point is, if you have any questions you'd like to see answered in these pages by those involved, let us know. We welcome controversy and your participation. After all, we view Sound & Communications as the intra-industry communicator. And your communication is solicited.

We've been communicating with many of you in the past few months over licensing requirements and proposed changes in some states that could affect sound contractors and anyone else dealing with low voltage equipment. We've kept you up to date in these pages, and this month there is an update in our newsletter on the status in several states, and a new organization formed in Michigan.

The point here is that astute sound contractors should be on the alert for changes within their states' regulations, or of new enforcement policies of old disadvantageous regulations. While no one with whom we've spoken is flatly against licensing or registration, the fear is everywhere of state — or federal — regulations promulgated with no sense of what this business is about. Well-meaning legislators could inadvertently put you out of business.

This month's editorial coverage concentrates on stadiums and arenas. This busi-

ness covers a vast ground, encompassing equipment and venues of more types than most industries would ever consider. While we try to cover all aspects of the business each month, we try to concentrate on one type of venue in each issue. In the February issue we concentrated on board rooms. In January we concentrated on clubs. And in December we focused on hospitals.

This month we present several articles on stadiums and arenas. Mary Gruszka interviewed several of the consultants most active in this end of the business to ascertain the state of the market and current design thinking. Dave Jacobs writes of the plans for the new ballpark for the Baltimore Orioles — an old-fashioned park with new-fashioned equipment. And John Frantz writes on the heralded new home of the White Sox — Comiskey Park.

Next month we'll be focusing on churches, and after that on theme parks. So send us your experiences. Virtually all of you have worked on church jobs, and many of you are doing installations in theme parks, museums and the like. We're interested in what you're doing — and how you're doing. And what you think.

Last month, after we returned from the Consumer Electronics Show, we promised you a more complete account of the relevant points of that show. In this issue, Ed Foster covers those points in "Las Vegas Upbeat." Ed has written in these pages before, covering events and concerns of the Audio Engineering Society and developments in the electronics industries. He is the owner of Diversified Science Labs, which has for many years been one of the primary testing labs in consumer electronics. He has also acted as a manufacturers' consultant in commercial sound. And we always welcome his input.

(continued on page 5)

SOUND COMMUNICATIONS

Publisher/Editorial Director
Vincent P. Testa

Editor-in-Chief
Judith Morrison

Technical Editor
Mike Klasco

Associate Editor
Steve Jacobs

Contributors
**Wes Alderson, Ed Foster,
John Parris Frantz, Mary C. Gruszka,
David Jacobs, Pamela Michael,
Steven J. Orfield, Neil Shaw**

Technical Council
Dr. Mort Altschuler

*Professor Audiology, Hahneman University, Chief of
Audiology, V.A. Hospital, Phila, PA*

C. Leroy James
Rees Associates, Inc.

Richard N. Jamieson
Jamieson and Associates, Inc.

Russell Johnson
Artec Consultants, Inc.

Joel Lewitz
Lewitz and Associates

William Parry
Maryland Sound Industries, Inc.

Daniel Queen
Daniel Queen Associates

Jon Sank
Cross Country Consultants

Neil Shaw
Paul Veneklasen Associates

William R. Thornton
Phd, PE

Art Director
Joyce Dolce
Artists

**Alicia Celli, Janice Pupilis,
Scott Schlemmer, Colleen Warenik**

Florence French
Production Manager

Christina Buckley
Diane Catanzaro

Arturo Lizarraga
Circulation Director

John Carr
Advertising Manager

David Saraf
Classified Ad Manager

Ron Perone
Traffic Coordinator

Director of Sales and Marketing
Nancy Davis

Editorial and Sales Office
Sound & Communications
25 Willowdale Avenue
Port Washington, New York 11050
(516) 767-2500
FAX: (516) 767-9335



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On Wireless and Quality

This month's letters concentrate on our wireless issue in December. A manufacturer explains its solution to a common drawback.
— Editor

WIRELESS SOLUTION

The article by Allan Varela, "The Perils and Triumphs of Wireless Technology" was an interesting and informative overview of the challenges and limitations of wireless microphone use.

One note I found particularly interesting was that "the biggest drawback . . . is that a good many of the wireless systems have a small, flush slide mute switch" on the transmitter. This causes difficulty when trying to mute the system to allow for coughs or comments aside.

To overcome this problem, we offer the Shure WA360, a wireless microphone in-line audio switch designed to operate with the Shure L1 body-pack transmitter. The WA360 adds remote continuous or momentary audio on or off capability to wireless lavalier microphone systems by combining a large push-button switch with a two-position function selector. The push-button can also be locked in the on position for non-switched operation. In addition, the WA360 contains circuitry to prevent pops and clicks and provide protection from unwanted RF interference. The WA360 can be attached to a pocket or belt via the rotatable stainless steel clip. This allows it to be concealed and, with the large push-button switch, still remain operable through a robe or overgarment.

Thanks for the chance to present our solution to one of the problems encountered when dealing with wireless microphone systems.

Shawn Stahmer
Microphone Products Coordinator
Shure Brothers Incorporated
Evanston, IL

QUALITY AND STANDARDS

Regarding the increased sensitivity of component pricing and its impact on the reliability and safety of a completed project, I feel compelled to communicate my personal convictions as it relates to the Telecommunications/CATV markets.

American Electric is a leading manufacturer of quality bonding and grounding products. Bonding and grounding are a vital part of any electrical system and becoming more important as today's electronic equipment becomes more sensitive. And, let us not overlook the importance of using good grounding principles as it relates to worker safety.

What is the issue? My opinion is that altogether too much emphasis is being placed on the initial purchase price of a product, often overlooking the installed cost or, more importantly, the component product quality and overall installed system reliability. Simply put, substituting lesser quality parts!

Hardware bolts have been the subject of intense discussions more recently due to inferior quality. If you cannot relate to a high voltage line descending upon your families' backyard due to a bolt failure, think of it as applied to a key component on a commercial airliner the next time your travels find you at 35,000 feet.

Is it not time for specifiers to become more involved in assuring that products comply with nationally accepted standards? And should we not, as manufacturers, distributors and installers, want to assure our common end-users that the best quality materials at the most reasonable cost have been used?

If we do not change the path on which we are proceeding, we could be replacing many of these installations before their planned useful life has been realized.

Roger J. Montambo
American Electric
Memphis, TN

EDITOR'S LETTER

(continued from page 4)

As those of you on the convention circuit know, after CES many of you (and Sound & Communications) went on to NAMM and Infocomm. The first piece of news that came out of the NAMM show is that the M.I. business is now a one-show business. The summer NAMM show has been cancelled — not very surprising to many observers. Chicago's NAMM in June of 1990 had charitably been referred to as the Wake by the Lake. Given the high attendance figures at winter NAMM and the reluctance on the part of both exhibitors and attendees to go to summer NAMM, the show organizers accepted what seemed to be a consensus.

All this discussion and consternation didn't seem to impact upon the January NAMM Winter Market where attendance was high and enthusiasm equal despite the simultaneous start of war.

On the exhibit floor, Alesis had a much controlled and much discussed first showing of a working prototype of an eight-track digital audio recorder using S-VHS tape. Across the aisles, Soundcraft introduced a new series of consoles. Ramsa was offering a software toolkit for its computer controlled DAT product. Crest showed its computer controlled amplifier. Casio had musical keyboards incorporating CD, Sony had R-DAT with SMPTE time code, and Yamaha had what can only be called a hand-held digital audio workstation. Microphones were the story of the show, with all the major players introducing new models.

IBM, which had a larger booth than usual, devoted its space to demo-ing various programs using multiple mediums of interests to musicians and more.

Which brings us to the issue of multimedia. Which brings us to Infocomm where the cutting edge was razor sharp — not necessarily in technical innovation, but in applications innovation and integration of media.

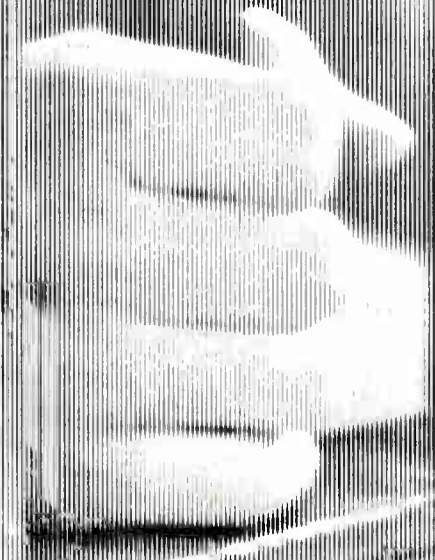
We'll talk more about these shows, and NSCA (coming up) next month. Till then. . . .

Best Regards,



Judith Morrison
Editor in Chief

NEW QUAM BAFFLES BAFFLE VANDALS

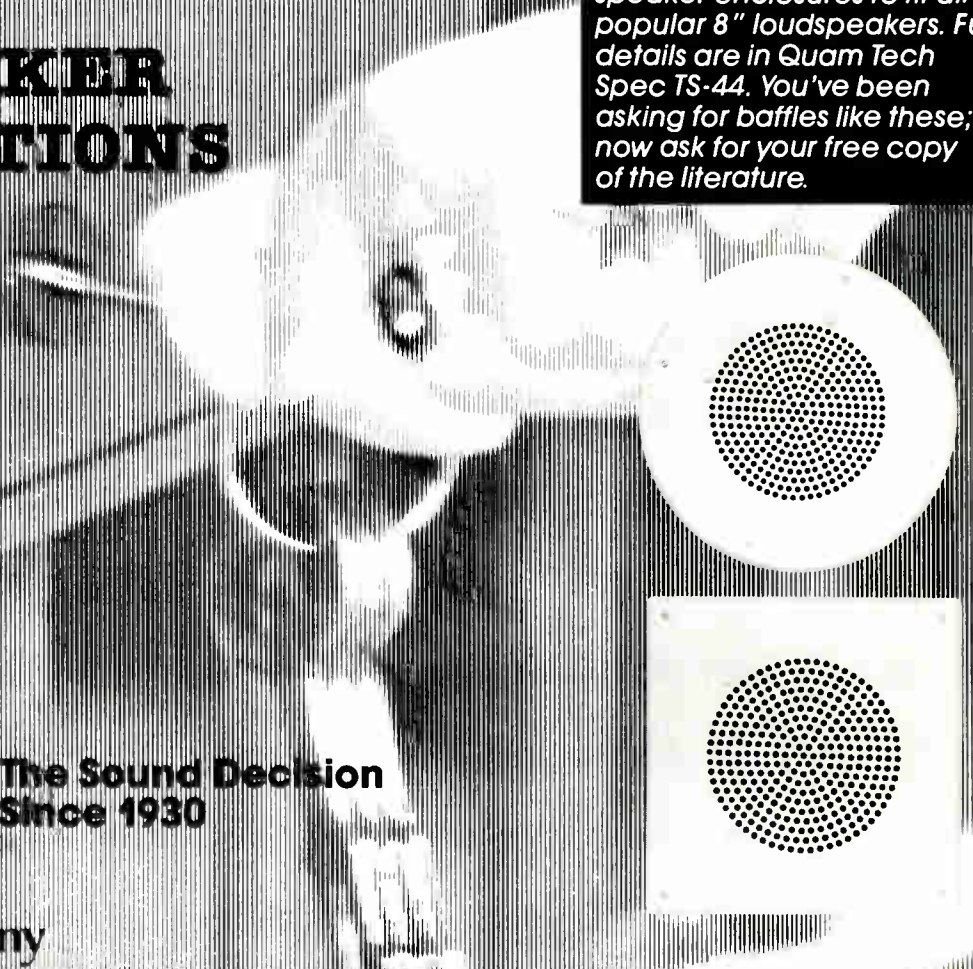


These new Quam baffles frustrate vandals while they build and protect your profits. Because they protect your loudspeaker installations, you can use them effectively in prisons, subway stations, stadiums, parks — anywhere there's a good chance of bad behavior.

The security secret of these new vandal-proof baffles is the potent combination of high tensile strength 14 ga. carbon steel, plus a durable interior steel screen to give the speaker further protection, and security socket screws for mounting. The white powdered epoxy finish is virtually chip-proof and scratch-proof.

Round and square baffles are available with recessed speaker enclosures to fit all popular 8" loudspeakers. Full details are in Quam Tech Spec TS-44. You've been asking for baffles like these; now ask for your free copy of the literature.

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SOUND
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NEWSLETTER

ASSOCIATION WATCH

In the wake of a state-by-state activity apparently designed to impact negatively upon the viability of sound contractors and other professionals dealing with low voltage electricity, a new group has been formed in Michigan. The Electronic Communications Organization of Michigan. One catalyst for forming the association was the introduction of legislation that would have drastically rewritten the state electrical code. According to William McCall, president of Shalco and spokesperson for E.C.O.M., "If those individuals working with electronic communications are to be licensed, it should be in the technology they are working with, not high-voltage technology. . . . We believe in mandating qualifications and safety requirements, but we may want to accomplish that in our own act, not the state electrical code, which doesn't specifically address our industry." According to Mel Weirenga, who was instrumental in the formation of E.C.O.M., and active in the NSCA, the organization is working with the U.S. Department of Labor in establishing what the federal government has on the books. "We are trying to get national standards and a certification program so that each state doesn't have to reinvent the wheel."

In Virginia, a similar association has been formed, the Electronic Contractors Association of Virginia (ECAV). According to Ron Pusey of Communications Specialists, who is active in ECAV, "We are in favor of regulation and inspection; however, we don't want to be 'lumped in' with any and all electrical regulation." The Virginia group is battling the Virginia Tradesmen Certification Standards Act, under which, reportedly, sound contractors have actually been stopped on the job. Both groups envision their associations as becoming trade groups that go beyond one issue, and may become affiliated with NSCA.

In New Jersey, a group of sound contractors have been sounding the alarm. While no formal passage of new laws has taken place, the situation may be a volatile one. John Holmes of The Service Company and Bill Riches of db Electronics have been counteracting proposed regulations and enforcement.

In Connecticut, such a law has been in existence, where sound contractors must pursue a license from the Board of TV and Radio Examiners of the state of Connecticut. The license costs \$100 per year and is issued after an exam is passed.

CEDIA and NSCA are reportedly monitoring the situation. As it is a state problem, though, contractors should be wary of possible damage to their livelihood.

YORK ACQUIRED

AMX has acquired York Controls. No details were available at press time. Peter York is expected to continue as a consultant. And current York products will be supported by AMX. AMX President Scott Miller said, "This is a unique opportunity for combining the sales, engineering, and customer support resources of both companies."

TRADEMARK GRANTED JBL FOR TWO LINES

JBL has been granted trademark registration for Bi-Radial horns and the Control Series line of studio monitors loudspeaker systems. According to the company, the company "owns" the name "Bi-Radial" as it relates to the Flat-Front and Constant-Coverage horns, and "Control" as it relates to the Control Series line of loudspeaker systems and the technology inherent in those products.

AKG RESTRUCTURES MARKETING AND SALES

AKG Acoustics, Inc., which markets AKG, dbx, Orban, BSS, Turbosound, Queded, and Precision Devices lines in the United States, has restructured its sales and marketing operations. According to Richard Ravich, president of AKG Acoustics, "We are creating a separate marketing department . . . to serve all our individual product lines more effectively. . . . Our sales efforts will now be spearheaded by independent sales managers."

NEWSLETTER

David Roudebush has been promoted to the newly created position of corporate marketing manager; David Angress has been promoted to director of national sales for the dbx, AKG and Quested product lines; Howard Mullinack has been promoted to director of international sales for Orban domestically, Orban and dbx throughout the rest of the world, and all the company's lines in central and South America. Jesse Maxenchs works with Mullinack as international sales manager — western hemisphere. And David Talbot is now national sales manager for BSS Audio, Turbosound and Precision Devices.

BOB DAVIS IN MEMORIAM

Robert Trabue Davis, who died on January 23, 1991, was at the time of his death manager of promotions and advertising for the Yamaha Professional Audio Products division. An accomplished musician, Bob began studying piano at the age of five, and switched to the clarinet while still in grade school. By the age of eleven, he was studying with Keith Stein of the Chicago Symphony. Through junior and senior high school he studied at the Cincinnati Conservatory of Music. He received his B.A. in 1959 from the University of Kentucky with a major in broadcasting and communications, and a minor in music. He received a master's in musicology at the University of Kentucky and joined the faculty of the music department. He was principal clarinetist with the Lexington Philharmonic. And he became interested in performing vocal music.

He later left the university and worked with several commercial sound contractors (his father was an audio/visual dealer in the southeast). In 1975 he joined Altec Lansing in Anaheim. In 1983, he joined Yamaha where he was first product specialist in the Yamaha Music Corporation and later was with the Professional Audio Products division. He was a member of the AES, ASA, and SMPTE. He will be missed.

NEW DIGITAL AUDIO FORMAT

Alesis has introduced an eight-track digital tape recorder that operates on Super-VHS tape. Price is expected to be under \$4,000 and availability is promised by the end of the year. The A-DAT Digital Recording System was shown as a working prototype at the winter NAMM show. The product will have an optical digital interface and an optional remote control with SMPTE time code, MIDI time code and MIDI clock.

CONVENTION SPLITS

The International Communications Industries Association (ICIA) and the Association for Educational Communications and Technology (AECT) have agreed to end their ten-year partnership in staging a trade show (Infocomm). Their last combined show will be held in 1993. After that date, Infocomm International will continue to be managed by ICIA, while AECT will hold its annual convention separately and will establish its own trade event. Infocomm International was formed by the two associations in 1982.

ICIA and AECT will sponsor Infocomm in 1992 (Washington, D.C., February 5 through 10) and 1993 (New Orleans, January). In 1994, AECT will hold its event. Infocomm will open in June 1994 in a new combination with the International Television Association (ITVA).

NEW ICIA PRESIDENT

The International Communications Industries Association has named Don Blumberg of Blumberg Communications in Minneapolis ICIA president. Blumberg replaces Jack Culp of Audio-Visual Systems in Dayton, who becomes ICIA's chairman of the board.

'MISS SAIGON' SOUND

Details of the equipment being used for the much-publicized Broadway production of "Miss Saigon" are becoming available. ProMix, the pro sound service in New Rochelle, New York, is working with Andrew Bruce of Autograph Sound Recording, Ltd, sound designer. The speaker system is by Meyer. The console is a Cadac 'E' type with 70 inputs, a 12 x 12 matrix out, computer interface, two sub-mix boards and 16 moving faders. There are 25 UHF wireless mics (19 Micron, six Sennheiser) all with outputs displayed at the console.

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The New Comiskey Park

Security, Video, Sound

BY JOHN PARRIS FRANTZ

It's still undetermined whether the weak-hitting White Sox will manage to muscle out many home runs when they open their very large "New" Comiskey Park against the Detroit Tigers April 18.

But, the new park's sound and video systems are destined to be a hit with fans who attend games regardless of where they sit. They'll get few souvenir home run balls, but even fans in the very distant outfield stands are expected to hear crystal clear announcements and organ music.

The New Comiskey Park system designed by Dallas-based Joiner-Rose's Christopher (Topper) Sowden, will use a distributed system that eliminates echoes and adds other up to date methodologies.

National anthem singers will find delight in the New Comiskey Park's sound system response, according to Joe Ging, project engineer at Tech Electronics, St. Louis. While Tech helped supply most of the New Comiskey Park equipment, Ging saw the distributive system work in action when they installed a similarly designed Joiner-Rose system in St. Louis' Busch Stadium a few years ago.

Instead of cluster systems in centerfield delayed to match general infield horns, each of the 75 clusters in Joiner-Rose's distributive design services only fans in the immediate area. A minimal amount of delay time via Audio Digital ADD-3 digital delays is used to synchronize upper, middle and lower decks vertically, not

horizontally.

White Sox management had to settle for a few cost cutting measures to bring the project in under the \$120 million mark. While some aspects of the new park are thrifty measures such as the 43,000 seating capacity—10,000 less than the old Comiskey Park next door—the sound and video systems are first rate.

White Sox management had to settle for a few cost cutting measures to bring the project in under the \$120 million mark.

The New Comiskey Park is the complete opposite of the old 80-year-old park, which before its retirement last September, was Major League Baseball's oldest stadium.

For example, the New Comiskey Park uses more than 70 Crown power amplifiers to drive 75 speaker clusters totaling literally hundreds of speakers—quite a change from the old park's sporadic placement of a few individual horns, which one observer declared as a dead spot chamber of horrors. "The old park had a nickel and dime [sound] system because the previous owners never had money to spare and

were even on the verge of a bankruptcy at times," recalls former White Sox Publicity Director, Charles Shriver, Meridian Creative Group, Schaumburg, Illinois.

To finance the new stadium, present White Sox owners pulled off a political coup that reaped many public funds. Threatening to accept the city of St. Petersburg's (Florida) enticing offers of a new stadium, White Sox management opened the wallets of the State of Illinois and City of Chicago in the \$160 million joint effort.

Sound installer Gurtz Electric in Chicago, hasn't stepped up to the plate too many times on ballpark sound installation jobs. Therefore they pulled in a consortium of experts to supplement their installation know-how. The New Comiskey Park is the largest sound installation to date for Gurtz, a 50-year-old electrical contracting firm that's more accustomed to conventional electrical work such as the contracts they've completed for Arlington Park Race Track, Arlington Heights, Illinois, and Chicago's 500 W. Monroe Building, the new home of Kent College of Law. Gurtz, which only began sound work a few years ago with smaller installations, brought in the needed expertise for the complicated requirements of state-of-the-art baseball park communications in the form of Tech Electronics, St. Louis; and Modular Sound Systems, Barrington, Illinois.



Although the White Sox management was able to bring the project in under the \$120 million mark, the sound and video systems are first rate.

Since Joiner-Rose specified a sound installer with previous experience, Tech Electronics was an important addition to the consortium because of its Busch Stadium experiences.

Both Modular and Gurtz were interested in the job, which had only one other bidder, but felt their efforts would help win the contract versus individual bids. Both firms had successfully collaborated on the sound system at the Chicago Place Mall, on Chicago's affluent North Michigan Avenue. But for the New Comiskey Park bid, both firms felt they needed another player that could demonstrate past ballpark experience. Tech Systems, whose resume includes prestigious sound work on the Busch Stadium retrofit, agreed to join the line-up. Television and surveillance equipment expertise was sought from Roscor Inc., Mt. Prospect, Illinois.

Because of the unique application of the project, all cluster frames and hardware were custom designed to meet the project's unique specifications and requirements, which was mainly the ability to withstand high winds and resist corrosion from the elements.

Aluminum was chosen for the frames which were designed to fit a variety of applications ranging from spanning six feet between concrete beams protruding from the grandstands to other adaptable applications such as under roof hanging. Henry Heine, a design engineer for Modular Sound Systems, used AutoCad 386 software to design the frames.

Although aluminum increased material costs 15 to 20 percent over a stainless steel option, labor fabrication costs were reduced because the required 2,400 holes were drilled considerably quicker through

the softer metal.

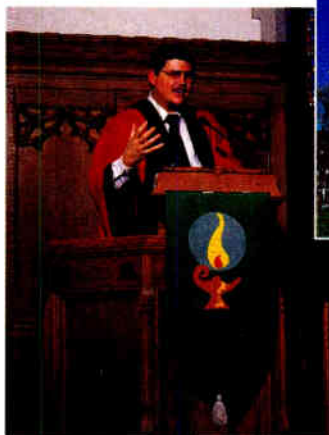
The computerization also provided three-dimensional views to help determine approximately 10 different cluster arrangements. Horns and drivers are secured with both a bracket and 1/8-inch stainless steel aircraft cable secured on each end with threaded studs. All cable lengths were calculated on computer, cut and installed on the frames in Modular Sound Systems' shop to save on-site installation labor and time.

Modular Sound Systems also used its

Bag End loudspeaker manufacturing division to provide its D-12C bass speaker cabinets for the pairs of 12-inch JBL 2204 woofers.

The park has nine different cluster configurations that include the bass speakers and one to four Electro-Voice DH-1A drivers used with any of the project's 31 HP940, 97 HP640 or 48 HP420 horns, depending upon the throw coverage and cluster location.

The major challenge on the project was cluster hanging. Each cluster required a



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room handles all the requirements between first and third base. The remaining three handle the right field foul line, left field foul line and the outfield grandstands, respectively.

All equipment—ranging from 50 Crown CT-800, 22 Crown CT-1600, 24 TOA

as monumental a task as the sound system for Gurtz.

The magnitude of the park's video emphasis isn't felt until one views the impressive terminal box where broadcast feeds are distributed. Located under the stadium in a ground-level garage area that



The New Comiskey Park seats 43,000 at capacity, (right) and uses more than 70 Crown power amplifiers (above).



Each of the clusters services only fans in the immediate area.

different scaffolding execution due to the unique stepped contours of the stadium floor in the seating areas. Gurtz found it difficult to safely stack the towering scaffolding several stories high in many instances, while still keeping it level and maintaining stability.

Even though the scaffolding towers were tied temporarily into the stadium with security cables, installation crews had to abandon cluster hanging on two separate occasions due to high velocity winds off nearby Lake Michigan, according to Tim Nelson, a Gurtz installation crew foreman.

Although most of the clusters were hung by press time, Gurtz was still undecided on the installation approach of the remaining clusters on light towers in the outfield. If scaffolding proves unwanted, costly crane time will be rented.

To drive all those speakers, four separate rooms provide amplification and signal processing. The main and largest sound

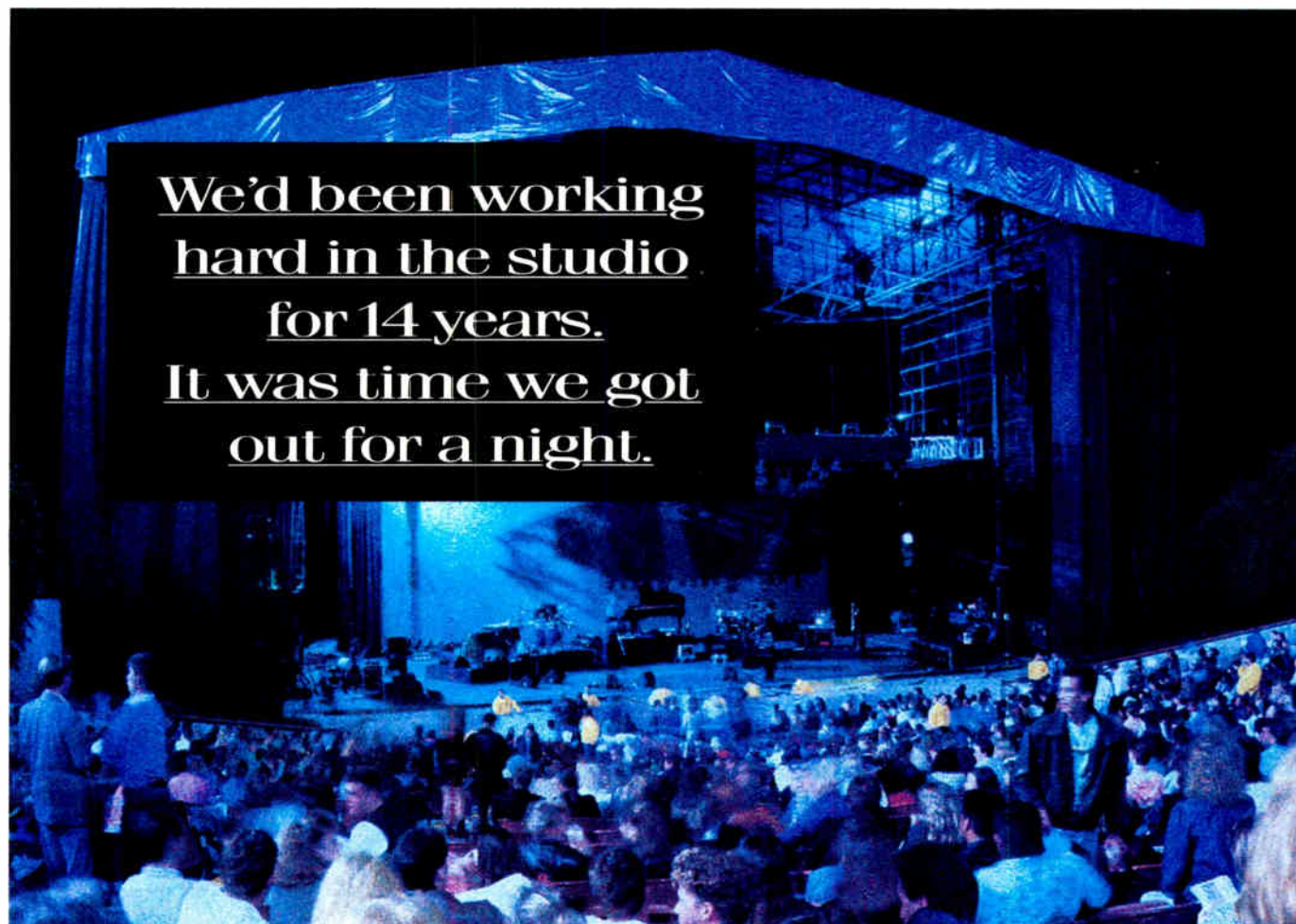
M-900A preamplifiers, 21 Altec Lansing 1753A $\frac{1}{3}$ -octave equalizers, six Audio-Digital ADD-3 digital delays, and four Brooke Siren FDS-360—is mounted in Soundolier equipment cabinets and racks.

The speaker requirements of New Comiskey Park are more than just clusters however. In fact some 70 percent of the sound system is ceiling and paging horns. The professional sound, while prestigious because it affects the fans during the game, is a small portion of the design. Hungry fans will know what live action they've missed as they walk under one of 1,921 eight-inch, two-way Model CP-802 ceiling speakers by Soundolier in the common areas under the grandstands.

And if they've tuned out the audio, nearly 700 televisions placed throughout the park (168 are in the 84 skyboxes) supplied by Zenith, keep fans updated on the latest action.

Wiring for that many television sets was

will accommodate several broadcasting trucks simultaneously, the termination box is large by any standard. Acting as the hub of truck broadcast, link-up area termination is centered around two wall-mounted 18 X 72-inch custom-made steel Roscor junction boxes with over 180 terminals. Over 400,000 feet of cable interconnects



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the junction boxes with 11 camera locations inside the park, coaching video rooms, and the distribution center—the scoreboard control room.

Video is a main impetus for the entire stadium audio and video systems, according to Ging. "It's definitely more of a video system than an audio system," comments Ging. "Some stadiums are more into sound than video. This stadium is really set up for video, and the sound is an accessory to the video. In fact the whole sound system has an alternate remote control panel that's operated from the video room. So if the video guys are running their system, you don't even need a sound operator.

Another example of the simplicity of operation that was designed into the system is the fact that the entire sound system from the stadium sound to the paging and individual suite sound is all adjusted



The hanging of the Upper Deck clusters is not a job for the faint of heart.


Over 400,000 feet of cable interconnects the junction boxes with 11 camera locations inside the park. Longevity of the system is the key.

by means of six controls. "This system is designed so the peanut vendor could literally go up and adjust the sound on the system," Ging said.

More sophistication, such as mixing a small on-field band or multiple mic'ed choir singing the national anthem, is possible simply by patching in and using the Soundcraft Delta Series 16-channel mixer provided in the contract. Although much of the MATV wiring is part of Gurtz' contract, antennas and transmitters were installed by other firms. The bulk of the MATV system equipment is supplied by Roscor.

The New Comiskey Park uses a sophisticated surveillance and security system. Controlled in the security room during games, or from the administrative offices during the off-season, Roscor provided eight (five have remote capabilities) Vicon VC-10024N one-inch black/white security


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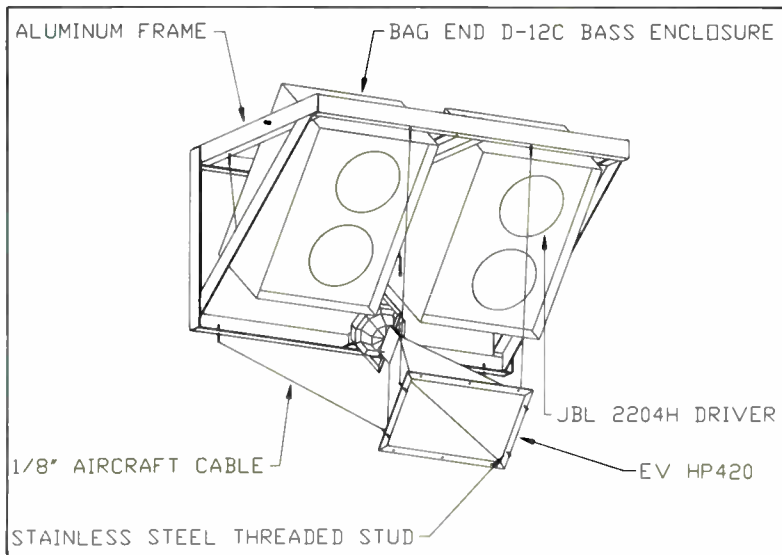


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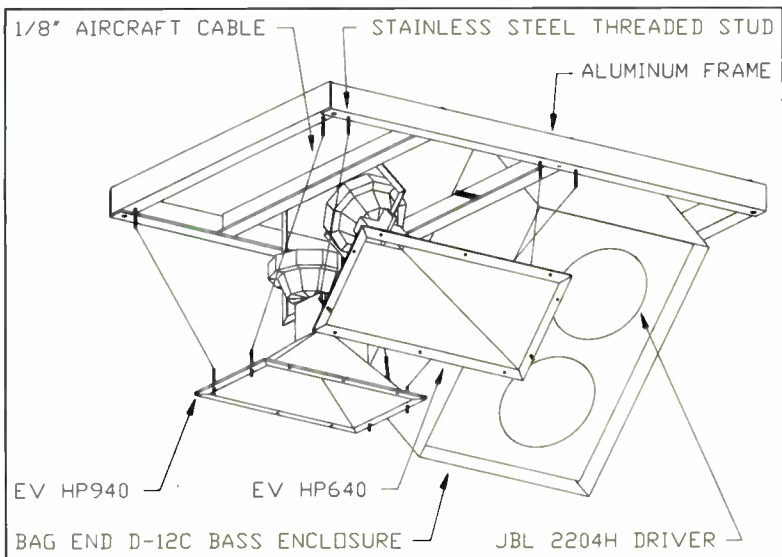
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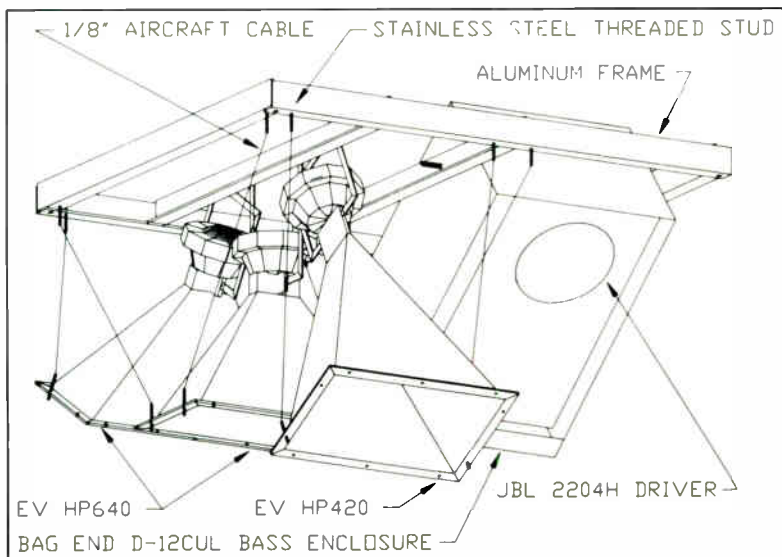
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Center field loudspeaker system.



Lower deck loudspeaker system.



Upper deck loudspeaker system.

cameras in areas surrounding the exterior of the building, entrances and common areas. Roscor custom made a console for the system which includes four Sony color monitors and 10 Panasonic black/white monitors. Another security measure is what the White Sox management terms Day of Gain. Three Hitachi FPC-1UHs are mounted on the Sony Jumbotron pyrotechnic scoreboard and will be used to monitor the crowd along with a single Hitachi camera in the press box area. Aided by four timelapse 1/2-inch Panasonic AG-6050 VCRs and an IBM PC computer

“The previous owners never had money to spare and were even on the verge of a bankruptcy.”

with software custom written by Roscor, security people will monitor the crowd for fights and illegal activities via the Hitachi cameras. Monitors will display immediately the section and seating of a disturbance to immediately facilitate assistance to that particular area.

Head end equipment was also provided by Roscor in the form of Scientific Atlanta racks of channel modulators and channel processors in the scoreboard control room which links up four exterior installed satellite dishes. Aside from all the sophistication, the ballpark MATV system is state-of-the-art but also very conventional, according to Larry Tanaka, engineer for Roscor, which put together a 1,000-unit television monitoring system at the new Arlington Race Track, in the northwest Chicago suburb of Arlington Heights, Illinois.

Longevity of the system is the key. Nobody knows what technology the 21st Century will bring, but the New Comiskey Park system should still be functional 50 years from now. As James Wischmeyer, President of Modular Sound Systems summed up, “The long-term goal of a functional sound system 50 years from now is a credit to Joiner-Rose’s design.” ■

Ball Park Solutions

Trends in Stadium and Arena Sound System Design

BY MARY C. GRUSZKA

Ask any number of audio or acoustical consultants involved in stadium and arena sound system design about what the trends are in this area, and you will likely get an agreement that the requirements for speech intelligibility and full-range sound quality plus the need for some kind of amplifier control and monitoring system play an important role in their designs. However, when discussing what kinds of sound systems are being designed, whether central cluster or distributed, with separate, packaged-processed, or custom components, you will likely hear a diversity of opinions.

A stadium, according to Bob Coffeen, Principal Consultant, Coffeen Fricke and Associates, Lenexa, Kansas is a facility that holds 40,000 or more people and is primarily used for sporting events such as football, full-field soccer, and baseball. These can either be open or enclosed. An arena or coliseum, on the other hand, is an indoor facility that holds a smaller number of people than a stadium and is typically used for sports like basketball, hockey, and indoor soccer plus other events like conventions and concerts.

SOUND QUALITY

Whether a project is a new-build or a renovation, consultants who were surveyed for this article agreed that the clients and architects they work with are becoming much more aware of sound quality and the importance of the sound system in the overall performance of a facility.

"The touring sound industry pushed that," commented David Marsh of Pelton, Marsh, Kinsella, of Dallas, Texas. "Touring sound systems have made an impact

in the kind of sound that people expect." Stephen Siegel, Project Manager Sports Facilities Team, Acentech, Inc., Cambridge, Massachusetts agrees. "We find that people want rock concert sound out of the types of loudspeaker systems that are used for permanent installation," he said.

"People are not satisfied with a plain old public address system anymore," said Bob Thurmond, owner, GR Thurmond & Associates, Austin, Texas. "They want to hear decent music with a more full range sound." "People are trying to get more sonic performance," said Siegel. "Productions are becoming more sophisticated."

Music is now being played from a greater variety of sound sources such as CDs and DAT players. In addition, musical performance is also being featured at more and more sporting events. Because of these factors, it is necessary to provide for high level reinforcement of music as well as speech, according to Siegel.

Craig Janssen, Associate at the Joiner-Rose Group, Dallas, Texas, and designer of the sound system for the Anaheim Stadium system said that for that project the focus was on musical production. "Music fidelity was critical," Janssen commented.

Speech intelligibility is, of course, still a very important consideration in sound system design. "We design our systems for speech and music," Coffeen stated. "Our systems are full range. We don't think of them as just speech or just music systems." Sound systems are high profile items according to Janssen. "There tends to be one-upmanship in the pro leagues to get the best sound system," Janssen noted.

WHAT KINDS OF DESIGNS

To achieve the goals of music and speech fidelity, what types of sound systems are being designed? Some consultants preferred the central cluster approach, while others favored distributed systems. Often, however, hybrid systems are used by both groups. Many consultants felt that the packaged box systems with processors will be used more, even as some of these same consultants said that they personally preferred designing systems using separate horns and bass cabinets. And some of the consultants specialized in custom and special application designs.

CLUSTERS

David Marsh used a central cluster plus a ring of satellite clusters properly delayed in the design for the renovation of the highly reverberant Houston Astrodome. Marsh's approach to systems design is to "try to get as much directivity as we can and use the least number of devices."

Marsh sees a trend in the use of coaxial mounted horn systems like those made by Renkus-Heinz, Community, and Frazier. "They provide high level over a wide bandwidth," he commented. They also have the advantage in that the designer doesn't need to create an array of mid and high horns to accomplish the same performance as a coax.

Bob Coffeen also uses clusters in his designs. "There are problems with distributed systems in a large open air stadium," he explained. People hear the speakers on the opposite side of the field. "They hear them delayed and this muddies the sound," he said. "There is

also a loss caused from aiming the speakers over people's heads at a grazing angle.' In addition, Coffeen feels that sound coming from behind a listener sounds unnatural.

For the 50,000 seat San Diego Jack Murphy Stadium he designed a large end zone cluster because there were no roof supports in this open air stadium on which to mount a central or satellite cluster. "We used constant directivity high frequency horns with bass loudspeakers," he said. "The system includes an underbalcony system that is delayed, since some of the seats are shielded from the end zone cluster."

Clients are becoming much more aware of sound quality and the importance of the sound system in the overall performance of a facility.

Coffeen gets involved in some creative moveable cluster designs as well. For the Jack Breslin Student Events Arena at Michigan State University, Coffeen designed a central cluster that moves along a rail to six different positions and can move up and down as well. In addition to the central cluster the sound system includes 26 fixed-location satellite clusters. This arena, like most other such facilities, is used for a variety of events from sports to theater.

For the 22,000 seat America West arena in Phoenix, Coffeen used a central cluster for the floor area and the close-in seats, plus 20 satellite clusters to cover the rest of the seating area. For budgetary reasons, the central cluster was designed to only move up and down. The central cluster provides the one source location and is the reference for the delays.

Dr. Gene Patronis, Professor of Physics at Georgia Institute of Technology is another consultant who feels that central source systems are important. He has

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designed systems for such facilities as the Georgia Tech basketball arena and the University of South Carolina football stadium.

In addition to the usual kinds of central cluster arrays, Patronis has designed some clusters using Bessel arrays. For large football stadiums, "I've had success in

controlling atmosphere effects that cause the sound to drift in and out," he said. He was also able to achieve high speech intelligibility in seats that were over 500 feet away from the sound system. The 90,000 seat University of South Carolina stadium uses Bessel arrays that are each made up of five horns. Each Bessel array is then

treated as a single unit as it is interfaced with the rest of the components in the cluster.

DISTRIBUTED SYSTEMS

Another group of consultants are working mostly with distributed systems for their stadium and arena designs. "We're seeing a trend away from central clusters and more toward distributed systems," Janssen said. According to Janssen, central clusters have three main problems: long time arrivals making it difficult for singers, high frequency air absorption, and wind shift. With a central cluster, "we can't get enough high frequency sound at the seats," Janssen said. With a distributed system, "it is easier to get smooth response, but the system is more expensive," Janssen added. Time arrivals can also be a problem here, and delays need to be setup carefully.

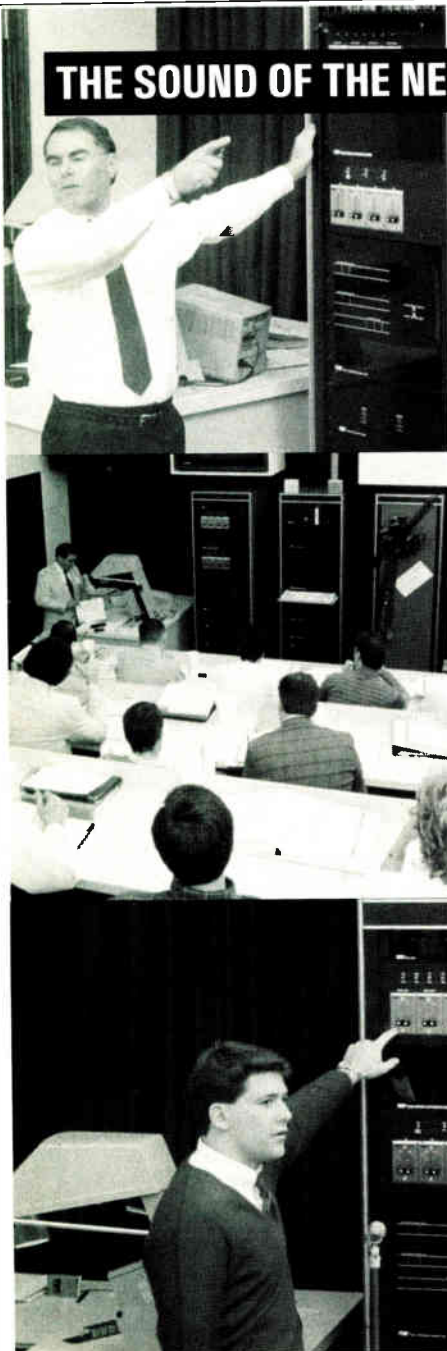
"People are not satisfied with a plain old public address system anymore."

Ron Baker, Senior Associate at Wrightson, Johnson, Haddon and Williams in Dallas, Texas is also seeing "less and less central clusters." He feels that distributed systems can provide the overall high fidelity his clients are demanding. In addition, these systems "lessen the noise impact into the neighboring community where a facility is located," Baker said. Baker concurs with Janssen that the cost of these systems is higher.

BOXED SYSTEMS VS. COMPONENTS

For either a central cluster or distributed system, the designer must decide which components will make up the system. The choices range from separate horns and drivers and bass boxes to packaged systems to custom designs.

Siegel sees that both boxed and component systems have their place. In one



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arena they worked on, both kinds of systems were used. The directivity that was required was provided by the part of the system that used horns, while the boxed system was used for music. He has used the JBL Concert Series, E-V DeltaMax, and EAW systems in his designs.

"We don't see the need for designing our own box systems. The cost wouldn't be worth it," Siegel said. "The manufacturer already worked out the rigging points and studied the loads."

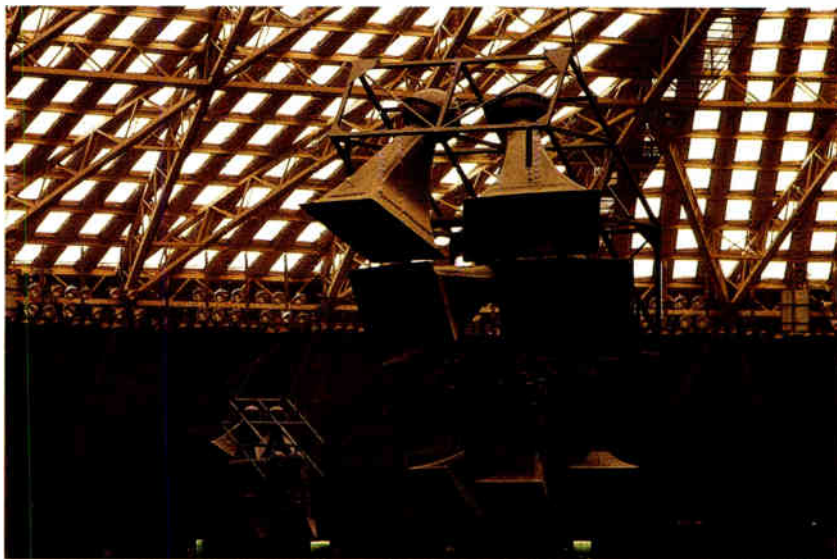
Siegel thinks that the trend to use more box systems will continue. "I don't know how far it will go. In acoustically difficult stadiums, it is tough to make a system work with the box systems," he commented. "You can't get uniformity and directivity." However, "it is easier to put a box in, but a person may get into trouble using them."

It is necessary to provide for high level reinforcement of music as well as speech.

Marsh agrees that more boxed systems will be used instead of systems designed with discrete components. "The ease of rigging is a factor even for permanent installations," he said.

Coffeen, on the other hand, "doesn't know why you would want to use a box. Typically the box will have one high frequency horn and a bass driver. If you need another horn, you have to hang another package box, but you many not need the bass. The horns in the box are small and have less pattern control than separate horns used in a component cluster system. They are handy to hang, but they are expensive." For a typical satellite cluster, "I use one bass box and three horns to cover the real estate," he said.

Baker feels that "the size and shape [of packaged systems] are designed more for touring and concert type of applications." In addition, "the packaged systems are



One of 12 satellite loudspeaker clusters used along with a central cluster at Houston's Astrodome. The 12 arrays were built around parameters which stressed light weight, high intelligibility and high output.

built more ruggedly than is usually needed in a permanent installation. This costs more," he said. These cabinets are designed so that more cabinets can be hung off of them and this is rarely needed for his applications.

Baker specializes in the design of custom boxes to work with the architecture of a particular arena or stadium. He feels that packaged systems don't have enough flexibility to work in spaces like overhung decks.

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High-Directivity loudspeaker arrays were used to improve speech intelligibility and fidelity at the Hoosier Dome in Indianapolis.

“Most of my designs are custom units that are customized for each location and are contractor fabricated or custom made by manufacturers,” he said. “We frequently attempt to mock-up the system by using sample components. We set up demos for the users and get them to listen so that they can agree on what they want.”

MONITORING AND CONTROL

For any of these facilities, the sound system must be full-range systems that handle different types of events, according to Patronis. “Facilities are designed for multipurpose and not just strictly for sports,” Siegel noted.

“The most difficult are the large domed stadiums where they hold a multitude of events such as football games, tractor pulls, conventions, and exhibits,” Baker added.

For this reason, the sound systems usually need to be reconfigurable. Computer based amplifier and system monitoring and control systems, such as those made by Crown, IED, QSC, and Crest, in addition to custom ones, are being used in most of the stadium and arena systems, and it looks like that trend will continue.

Marsh feels that there is a strong trend

towards centralized control of amplifiers to allow not only signal monitoring, but to provide the ability to set levels, balance the system, and reconfigure the system by switching off the feeds to the speakers that aren’t needed for a particular event.

Other types of remote control are important as well. The Myriad Arena’s system (Oklahoma) was designed so that cluster selection and timing would be easy for the operator to make. “We designed a configuration panel with a few simple buttons so it would be obvious what system was selected,” Marsh explained. The panel not only controlled which cluster was on, but also controlled the resetting of the signal delays.

For the Anaheim Stadium, Janssen used the Crown IQ System. “We used the first system that had complete software control

(continued on page 28)

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Work in Progress

Baltimore Orioles Stadium at Camden Yards

BY DAVID JACOBS

The Baltimore Orioles Organization is currently overseeing a massive project that will ultimately result in what the organization expects to be a spectacular new ballpark. The idea is to construct a stadium that has the feel of an old-fashioned ballpark — a hometown field so to speak — with the most modern amenities and comforts that today's technology can provide. The facility will occupy an 80-acre site and will seat approximately 47,000 people. One estimate puts the cost at \$105 million. The park is targeted to open in 1992.

Says technical director Eli Eisenberg "The new Camden facility has not been named yet, so you can call it the Stadium in Downtown Baltimore for now. It will be a very old-fashioned ballpark in terms of architecture though there will be a lot of the modern amenities. This should be the first stadium of its kind in a long time. The real attraction is that this stadium will fit into a downtown setting — it's not a dome that you're going to see for miles — it's going to blend right in."

Eisenberg says that the new park will be designed with trusses and seats with slats in them "that will be very wide and comfortable." The stadium is being built with cantilevers as opposed to columns to eliminate obstructions. "The idea behind the new stadium will make it one of the greatest — if not the greatest — stadiums built to date," boasts Eisenberg.

"In terms of the audio, it was decided that the ballpark would have a distributed sound system, a two-way system with speaker clusters encircling the stadium, firing to the patrons on the lower deck and the upper deck, as well as to the top level or mezzanine level," explains Eisenberg.

"It will provide an evenly distributed sound source throughout the facility."

Each of these clusters will be relatively small — clusters of three speakers on the average — and will be 28 feet apart throughout the stadium's seating areas. Thus all sound will be distributed at lower,

The speaker clusters are being designed to blend right in with the architecture.

more comfortable levels. "There is not going to be a single-point cluster like in some of the older ballparks," Eisenberg emphasizes. "Essentially, with sound systems of this magnitude, there are basically three types that you can have: a single-point cluster which is essentially one group of speakers firing out to the masses; a dis-

It will be a very old-fashioned ballpark in terms of architecture though there will be a lot of the modern amenities.

tributed sound system, which is becoming very popular; and the third one is a combination of single-point and distributed, with the single-point reinforcing the distribution clusters around the park. This distributed system that we're building will allow for the warmth and richness of the music source or voice message to be heard comfortably in the seats.

"There isn't as much of a concern with wind direction," Eisenberg adds, "because the speakers are either directly in front of the patrons or within the throw of the speakers every 40 or 50 feet, so you have a very short throw." Eisenberg says that this type of system is becoming more of the norm, rather than the exception. "It is a higher cost factor. I don't know the cost breakdowns exactly, but it is a much more enjoyable system.

"To reinforce [the system], the public access ways; the ramps, the promenades, the rest rooms, will all have sound reinforcement. We will have selectability in each of those areas as to whether we want to have those speakers in those areas to distribute the stadium system — either PA or music — or the radio broadcast or a TV broadcast. So as soon as you step onto the stadium premises you're engulfed in the atmosphere. Whether it be a pre-game show on radio or TV, or you're hearing pre-game announcements by the PA announcer, or pre-game ballpark music, or if you arrive late, you're immediately thrown into the game. [The patrons] will always know what's going on. We feel that this is very important. In many stadiums you don't know where the game stands until you reach wherever you're sitting."

The new stadium will also feature a plaza with shops outside the stadium proper alongside right field. That area is still being designed, but Eisenberg predicts there will be communications in that area as well.

Central control of the audio and video systems will consist of several head-end sites where the amplifiers will be located. There will be a head-end site at every level of the structure. This includes the basement level, where the dugouts and produc-

tion trucks will be located; the main concourse; the press box areas; directly above the press will be the private luxury box level where there will be 72 luxury "sky boxes;" and the upper deck seating level. The origination source for the music and video will be in the Communications Control Room. This room will control the video scoreboard, the matrix scoreboard, PA, and all the sound.

The control center will employ a 24-channel mixing console that will feed the in-stadium speakers from various sources. These sources can originate from the field or from any audio source format. In the control room will be CD, cassette, turntable, cart, and videotape machines. Additionally, a large patch bay will enable the sound operator to zone-out different sources to the ancillary areas.

The Orioles' director of productions, Charles Steinberg supervises an on-site staff of three full-time, and several freelance, video and audio creative technicians who give the audience the particular audio and video programs at the moment. These sources include those mentioned as well as cable and broadcast TV — any of the eight-camera pool's feeds — radio and others. Steinberg reiterates the philosophy of the distributed sound system. "The idea is to have a rich, robust, warm sound



Model of the new stadium at Camden Yards, Baltimore.

that can really let the secondary forms of entertainment at the ballpark be maximized. We're really looking forward to the new park where we will have a sound system that can really excite the fans."

Eisenberg says that a 28-channel cable TV system will be on site. "During the games themselves there will be television broadcasting from the TV production truck and this will be fed to the video monitors throughout the stadium. But in the luxury sky suites the people in those areas will have the option to see ESPN or WTBS, etc., and we will also be feeding in our own satellite signal. We also have the capability to put that information out to our patrons

in the promenades should a playoff or something of that nature warrant it in Charles [Steinberg]'s judgement." All of the video and audio sources can be recorded within the control room. Every camera angle is recorded. All audio and video feeds are recorded. A minimum of eight VTRs are in use at any given time.

As soon as you step onto the stadium premises you're engulfed in the atmosphere.

Two television monitors will be at every concession stand with an average of 12 concession stands on each level. Thus every 30 feet or so there will be video sources for the patrons. This combined with the audio system is designed to guarantee that no patron will lose touch with the game no matter where he or she might go within the facility.

Manufacturers are not being mentioned at this stage although it appears that some bids have been taken. Eisenberg says he doesn't want to etch any manufacturer's name in stone at this juncture because while certain specs have been determined, the choice of manufacturers may change.

"The consultant who is designing the site makes recommendations as to what the specifications need to be and it's up



Demonstration at Memorial Stadium of a similar cluster as the one designed for the new stadium.



The cluster demo took place on March 22, 1990.

to the vendors who end up with the contract in terms of cost effectiveness and that sort of thing, who, with the approval of the consultant, can make changes." The communications system is being designed by Joiner-Rose of Dallas.

Much of the equipment is being custom made. The speaker clusters are being designed to blend right in with the architecture. "We didn't want speakers hanging or blocking views so everything is taken into perspective. The clusters have to fit into the facades," says Eisenberg. "For

every component in the stadium, the aesthetics are just as important as the technical considerations." Written into vendor contracts is a provision that guarantees that the aesthetics of each component are designed into them — not added later. Materials, colors, and physical appearance are all specified.

Besides the Orioles, the Maryland Stadium Authority and the City have all participated in insuring that every aesthetic detail has been looked at. The facility was designed by architects HOK

(Hellmuth, Obata & Kassabaum Inc.) of Kansas City, Missouri.

The central scoreboard is being made of the same steel trusses as the rest of the stadium, so that it will not be one large block. The central matrix board and the

Every 30 feet or so there will be video sources for the patrons.

video board will both be part of this structure. On top some kind of a marquee will be placed. An additional smaller scoreboard will be on the right field wall.

The new matrix board will be designed to inundate fans with information. The same video board that is currently in use will be moved to the new stadium. It measures 25 feet high by 33 feet across.

With the way this project is expected to look and feel, it seems that beginning in 1992, Baltimore will be more fun to be in. ■

BALL PARK

(continued from page 22)

of power amp sequencing," Janssen said. "We also used the system to provide zonal mutes and system reconfiguration."

Patronis has used the Crown IQ and IED systems on projects. He noted in addition to providing the ability to reconfigure the sound system, these control systems can help the operator easily locate problems. "The computer printout tells when problems occur and where," he said.

Siegel is seeing the trend for more sophisticated signal control like crowd noise control compensation. Another advantage of the control and monitoring systems is that "you can install the amplifiers in the cheap real estate, since floor space is expensive," Siegel said. Only the control panels need be installed in the audio booth.

Coffeen designs his own microprocessor

control system to reset delays on his satellite clusters and noted that "now IED has the same thing available." "We do a lot of work with IED," Coffeen remarked. "I used the first IED system ever built. You have to have some way of monitoring a lot of amps to know if things are working. Now you can monitor more aspects of the whole system. It has to be convenient for the operator or they won't use it. The operator interface just can't be too complex."

"Look for continuing growth in the development of monitor automation," Baker said.

BUDGETS

Although facility owners and users are demanding higher sound quality, are they willing to pay for it?

Most of Coffeen's clients are "willing to pay for something that works because they have had something that didn't." He continued: "We use proven techniques and don't do too much experimenting on any one system. We get a proper budget. The

competitive bid situation with sound contractors helps to keep a control on the costs."

"Stadium operations people are more aware how important the sound is in the overall spectator experience," Baker said. "The sound system has a high profile and there is more recognition of what it takes to do a system. We are getting enough to do a good job and juggle some of features to provide the essential requirements."

CLOSING THOUGHTS

Coffeen would like to see more cooperation between the arena sound people and the touring sound companies. "There seems to be a popular assumption that the house system must be no good," he said. Both types of systems should be able to work together.

However, after hearing consultants describe their systems and design goals, it is apparent that the house systems are getting better and better. And that trend is likely to continue. ■



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WHAT'S NEW IN RIGGING? WE ASK THE MANUFACTURERS

For our periodic department "Question of the Month," we asked several manufacturers for their views on rigging. Companies that agreed to participate are: Renkus-Heinz, Electro-Voice, ATM Fly-Ware, Sound Manufacturing, Apogee and Yamaha. Their comments follow.

Andrew T. Martin
ATM FlyWare
Carson, California

One of the latest revolutions in loudspeaker rigging hardware is the modular loudspeaker rigging systems such as the AMFS Series loudspeaker rigging hardware manufactured by ATM Fly-Ware. Modular loudspeaker rigging hardware increases portability, strength, arrayability, and predictability of loudspeaker arrays by treating each loudspeaker as an independent component of the array until the array is complete. In essence, the modular loudspeaker rigging hardware systems equip each loudspeaker with rigging hardware which can be used individually or in conjunction with other loudspeakers to build any array configuration.

The loudspeaker is equipped with a low profile steel truss that is no larger than the footprint of the loudspeaker: this truss can be mounted semi-permanently for touring use. The truss serves as the center for the flexibility of the system. Solid pieces called connecting bars put multiple trusses (loudspeakers) rigidly together while maintaining a coherent wavefront. The connecting bars determine the splay between loudspeakers, and are constructed at pre-

determined angles to optimize loudspeaker performance by reducing comb filtering and lobing effects.

Since the loudspeaker array is rigid, it can be treated as one large loudspeaker. Acoustic coupling is increased between loudspeakers, in addition to a more directed power transmission. The rigid array becomes a much stronger structural unit as well.

Suspension, tilts, and multiple rows of loudspeakers are easily achieved with the

The applications for this type of loudspeaker flying hardware system are vast. Portable system operators benefit greatly by a combination of improved sound system performance and sound system predictability. Also, assembly of modular systems of this variety take only about half the time of conventional rigging systems. The unobtrusive appearance of the system is a considerable advantage as well. Permanent installers can reap the benefits of a ready made modular system that can be



An example of ATM's modular loudspeaker rigging system.

use of a shackle mount that attaches directly to the loudspeaker truss, thereby eliminating the need for an overall top grid truss. Only a few shackle mounts are necessary for array adjustment and suspension. A multitude of tilt angles are obtainable since the loudspeaker truss allows the shackle mount to be placed toward the rear, center, or front of the loudspeaker. Additionally, the shackle mount itself offers three different attachment points. In many cases, even multiple row arrays do not require an adjustable pull strap to tilt the loudspeakers.

assembled on an as needed basis. There are no limitations as to how large or small an array must be. The modular systems are at home in an arena, stadium, convention hall, theatre, or place of worship.

Since the modular systems are rigid and predictable, it is possible to use computer simulation software to design arrays before the sound system arrives at the venue. For permanent installations, computer aided design programs are able to calculate tilts, splays, and attitude for each array: and, in conjunction with simulation software, array dispersion, directivity, and intelligibility

estimates are easily performed.

Stanley R. Miller
Sound Manufacturing
North Hollywood, California

Contractors have for many years been faced with the dilemma of getting loud-speaker systems hung properly and safely in all kinds of venues. In many cases this part of the project was the most difficult for the contractor to accomplish and to make matters worst, often it was not done safely. You would be amazed at the poor quality cabinet construction, hardware, and materials that is often used. As times change and the number of people requiring rigged and hung sound systems has in-

**THE TRUSS SERVES
AS THE CENTER FOR
THE FLEXIBILITY OF
THE SYSTEM.**

creased, safety has become of paramount importance. Rigging hardware has and is being adapted and developed specifically for the sound industry.

In the past, most rigging hardware was available only from aircraft and truck cargo-control manufacturers and distributors.

Sound Manufacturing, Inc. originally worked with JBL to research and develop the Concert Series and a rigging system that exhibited the ultimate safety and ease of installation, whether it was used for portable or fixed installation. Extensive stress testing was used to determine the design factors and safety limits. The Concert Series system utilizes the 'Aeroquip' Pan/Stud Bolt and related Grabber System. This grabber system was modified, after stress testing showed on a right angle pull, early failure of the pan/stud. To minimize this problem, Concert Series rigging hardware was redesigned with a special longer bolt/pan/stud which would go through the pan fitting and through a steel plate on the inside of the cabinet. The right angle pull was dramatically increased.

JBL, in the interest of industry wide safety, has made this special proprietary fitting available, through Sound Manufacturing, Inc., to any manufacturer that wishes to use it.

Most manufacturers have gone to great lengths to insure that systems are structurally safe, reliable, and easy to install in

an effort to minimize their own, as well as the contractors and owners, liability. Still careful proper installation is necessary. The system is only as good as the weakest link. Great speakers and hardware don't necessarily make great safe installs.

Permanent installation sound contractors and installers, as well as rental sound com-



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THE APPLICATIONS FOR THIS TYPE OF LOUDSPEAKER FLYING HARDWARE SYSTEM ARE VAST.

panies, are most often stuck with a local hardware store as a source of supply for rigging parts. Usually these sources are not the best and many times have inferior grade hardware as well as not having the right parts available.

As an example, it is usually difficult to get hardened shouldered eye bolts, which is the only type of eye bolt that should ever be used. It is also not uncommon to find inexpensive 'off-shore' poor quality shackles and other accessory parts in the standard modern home supply hardware store.

At SMI, I am trying to have available the best quality parts specialized to the sound industry and at a fair price. Most of all, I am trying to keep the parts in stock for

quick turnaround and delivery. Most of our customers, unfortunately, are not able to plan too far ahead and it is not uncommon for them to receive stock of new speakers from a manufacturer a couple of days before intended use or install on a job. They then discover that rigging hardware is needed and that the local supplier does not have the parts or quantities needed. FedEx and UPS RED are the saviors.

We do not just automatically sell to a first time customer. I want to personally discuss with the customer uses of parts requested and share information. I want to be sure in my own mind the installer is practicing good, proper, proven safety procedures. Sometimes customers are offended that I ask so many questions, but it is important to share information and procedures. Education is our best weapon against a disaster.

I WANT TO PERSONALLY DISCUSS WITH THE CUSTOMER USES OF PARTS REQUESTED AND SHARE INFORMATION.

Barry Luz
Apogee Sound Incorporated
Petaluma, California

To complete the total system approach to loudspeaker design and installation, Apogee Sound manufactures a wide variety of factory authorized mounting and flying hardware suitable for applications ranging from professional sound contracting to concert touring.

All Apogee enclosures are equipped with steel nutplates as rigging points; Aeroquip fittings may be substituted on most models for more rapid setup and teardown. The fittings are backed with heavy gauge internal steel brackets for structural integrity and all fasteners are stainless steel. A wide variety of yokes, fly bars and radial rigging beam assemblies have been designed, built and tested to provide safe, proper and economical methods of deploying Apogee speaker systems.

For portable applications not requiring hanging, AE-3, AE-4 and AE-5 loudspeakers can be equipped with internal fittings for use on tripod stands. The AE-1, AE-2, AE-3, AE-4 and AE-5 Yoke Assemblies offers pan and tilt flexibility when hanging a single speaker and can be wall or ceiling mounted. Additionally, the Yokes readily accept a theatrical C-clamp. A pair of AE-5s can be hung with the Apogee Adjustable Rigging Beam allowing the loudspeakers to be adjusted from a tight array to a wide spread configuration. The Apogee Stacking Bracket enables a pair of AE-5s to couple in a powerful vertical array.

The AE-5 was designed for bi-planar arrayability. This loudspeaker is unique in its ability to array in the horizontal plane, the vertical plane, or both. This 20 degree trapezoidal enclosure forms smooth, predictable dispersion patterns when combined with additional units offering unprecedented versatility from small, modular building blocks. To assist the

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designer, Apogee publishes a booklet of polar response data for many typical array configurations.

Data is also available for popular CAD (Computer Assisted Design) programs.

Apogee has simplified rigging for touring shows with the Modular Arrayable Rigging System (MARS). Each AE-5 or 3 x 3 loudspeaker has its own steel frame module attached to its top using factory supplied nutplate type rigging points or, optional Aeroquip pan fittings. The frames are then easily joined into horizontal arrays with quick-release pins and steel coupling brackets. Vertical arrays are quickly formed with Aeroquip "grabber-ring-grabber" couplers or Apogee stacking brackets.

Mars clears away the unwieldy "bumpers," trusses and grids of conventional rigging. Each frame adds only nominal height to a cabinet and can remain attached to the loudspeaker between shows. This compact design eliminates the need to find truck space for heavy, irregularly shaped steel rigging beams which could damage the rest of the load.

THE "BALANCED" LOAD PRESENTED TO THE FLY BAR REDUCES TIPPING.

The Mars system joins multiple speakers into properly aligned arrays with an ease and flexibility not found in usual designs, achieving a variety of acoustically correct system configurations. Mars supports both tight-packed arrays and clusters in which the speakers are splayed apart with the rear corners touching. Additional speakers may be added or taken away simply by coupling or uncoupling the speakers on either side of the array and redistributing the hang points.

Mars gives the touring sound engineer the distinct advantage of being able to react quickly and readily to changes in system requirements from venue to venue. Decisions regarding the total speaker complement can be made on the fly because Mars never runs out of rigging beam. This allows

AEROQUIP FITTINGS MAY BE SUBSTITUTED ON MOST MODELS FOR MORE RAPID SETUP AND TEARDOWN.

any number of speakers to be added into the array in minutes. From a simple horizontal pair of loudspeakers to a full circular array twenty-four wide and four high, Mars handles the task simply and safely.

Todd Rockwell and John Murray E-V Professional Sound Products Buchanan, Michigan

Electro-Voice has been concentrating on simplifying rigging systems, both for permanent installations and touring systems. The primary focus of this effort has been to make rigging systems that offer increased safety while still being cost effective.

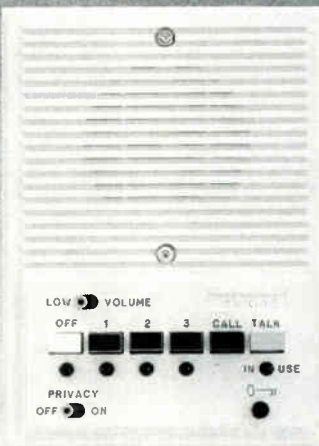
A recently introduced rigging system for

E-V Manifold Technology (MT) systems illustrates this point. A two-point flying system for the MT cabinets, both the MT-4 and smaller MT-2 systems, has been designed for attachment to a grid. Because the cabinets are smaller and lighter than most competitive systems delivering the same spls, as well as being identically dimensioned they lend themselves very well to this simplified rigging system.

MT systems are becoming an increasingly popular choice for concert touring as well as fixed installation applications. In both cases, this simplified rigging apparatus means major time savings, which translates into reduced installation costs. For example, dB Sound, a major concert touring company based in Des Plaines, Illinois, can hang 80-plus MT cabinets in less than two hours.

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Several MT boxes can be hung vertically utilizing the two-point system and connecting the boxes via Aeroquip "L-track" hardware. Aeroquip brackets, offering ten attachment points, are pre-mounted on all MT boxes. In addition, E-V offers a "Hang" computer program which displays the enclosures with proper hanging angles and weight limitations, further enhancing the convenience of this rigging system.

EACH SPEAKER ENCLOSURE HAS ITS OWN RIGGING BRACKET WHICH CAN BE USED ALONE.

E-V has also been equipping TL-series low-frequency enclosures with propeller nuts. The propeller nuts are more resistant to spinning and torque, caused by over-tightening. To provide further security, the bolts have been upgraded to $\frac{3}{8}$ " thick, up from $\frac{1}{4}$ " thickness.

While there has been some controversy surrounding particle board enclosures, E-V's engineers have found that TL cabinets submerged in water for three days still emerged requiring a 2,000-pound pull before failure.

An E-V BMK-1 box mounting kit has been designed to work with the propeller nuts. The BMK-1 offers two brackets that can be fastened to the appropriate nuts that are pre-installed on the cabinets. In addition, the BMK-1 comes with a forged eyebolt that can be installed on the rear of the cabinet. This allows for solid three-point mounting of the boxes in either a vertical or horizontal position.

One thing we must stress is the importance of including vibration-isolation systems for mounting all woofers. This is a key factor in eliminating "early sound"; in other words, preventing a smearing of the bass frequencies. Because bass frequencies travel faster through structures than through the air, it's crucial to curtail this problem by isolating vibrations.

Several mounting kits for E-V's HP horns have also been recently introduced, offering many options. For mounting on

TL boxes, the HMK-1 kit features bolts and propeller nuts that have been pre-installed on the boxes. Together with the hardware supplied with the kit, the horn and driver can be easily mounted in a three-point configuration to the enclosure.

The HMK-2 kit also features bolts with nuts already attached to the TL enclosures, but it offers a mounting board with two sets of holes. The first is used for mounting the horn mouth flush with the front of the enclosure; the second set positions the horn mouth nine inches in front of the enclosure and allows the horn to be rotated 25 degrees to each side of the horizontal plane.

The HMK-3 kit is the mounting arrangement for horn/driver combinations. It's especially useful in large horn cluster systems, with a C-bracket that provides mounting points behind the center of gravity of the horn and driver. Hardware is supplied with the HMK-3 for attaching the C-bracket to pre-drilled holes in any E-V HP-series horn.

Sufficient clearance makes it possible to mount or remove the driver from the horn/C-bracket combination after it has been aligned in a cluster arrangement. The C-bracket also features holes in the rear position for the attaching of cable.

USING A FIXED BRACKET ALLOWS THE LOAD TO BE DISTRIBUTED EVENLY OVER ALL THREE ATTACHMENT POINTS ON THE SPEAKER.

**Carl Dorwaldt
Renkus-Heinz
Irvine, California**

Any answer to the question "What's new in rigging?" would be incomplete without first addressing the question of what's new in array design and construction. Several years ago, our investigation into the performance of multi-speaker arrays revealed that the "tight pack" 15° per side trapezoidal cabinet arrays being touted

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as the ultimate by many manufacturers were not ideal for all applications. Specifically, we discovered that although these arrays produced the highest on-axis spl levels, they also exhibited a large amount of lobing (comb filtering). Further investigation led to the conclusion that increasing the included angle from 30° to 60° produced a more ideal array. The coverage was much smoother and the on axis spl was only slightly recorded.¹

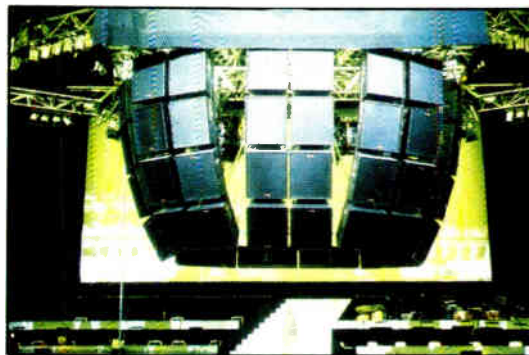
This led to the development of our C-1 modular loudspeaker system which could easily be used in either 30° or 60° close coupled arrays. (See figures 1 and 2.)

The enclosures used are normally provided with top and bottom mounted “fly points” and flown from a specially constructed “fly bar” using either carabiners or shackles for attachment. (See figure 3.)

The aiming tilt is controlled by the design of the fly bar or by a rear strap attached to the fly bar and to the bottom rear fly point on the lower cabinet.

During development of this concept, Eric de Bruyn, President of AMPCO, our dealer in Holland, approached us with an idea for an even more versatile and easier to use method of flying our C-1s in large arrays and offered to work along with us in developing this system. We accepted their offer, since AMPCO is one of Europe’s best known and most experienced concert sound companies and we felt our joint efforts would result in a better way to meet the widely varying needs of the many different venues encountered by touring sound companies. The result is our new C-1A Concert Sound Loudspeaker system.

This new loudspeaker system concept is based on the use of side mounted Aeroquip tracks on modules having identical weights and identical balance points. Having identical weights allows the mixing of Mid-High and Low Frequency modules in any combination in side by side vertical stacks suspended from a single hang point! This enables the sound company to easily configure the ideal array for each venue. The “balanced” load presented to the fly bar reduces tipping and eliminates the need for multiple truss hanging points and



The C-1A Concert Sound loudspeaker system.

multiple chain motors.

Identical balance points provide a predetermined angle of aiming tilt and allow both straight and curved arrays to be constructed with only a simple rear strap that ties the cabinet rears together and determines the amount of arc provided. (See figure 4.)

The tracks are also mounted at the cabinet balance point to reduce stress on the rear strap and to make sure the arrays always hang straight and true.

The tracks are recessed in the side of the cabinets to allow close spacing of side by side C-1A stacks and have 16 clearly labeled attachment positions. The multiple attachment points allow a great variation in aiming angles with only a single set of hanging cables or chains, reducing the amount of hardware that must be taken on tour.

INCREASING THE INCLUDED ANGLE FROM 30° TO 60° PRODUCED A MORE IDEAL ARRAY.

Michael MacDonald
Yamaha Pro Audio
Buena Park, California

As an extension of the system approach, which has recently yielded the S1520S Speaker System Yamaha has developed the Component Suspension System, a highly efficient rigging package that we feel not only reduces setup time, but maximizes the performance of speaker arrays.

The Component Suspension System allows the user to define the size of the suspension grid for any application. Each speaker enclosure has its own rigging bracket which can be used alone, such as for distributed systems, or with additional units to any array configuration. It allows the user to choose the center of gravity pick-up point, thus adjusting the forward pitch of the loudspeaker array.

Because the user is able to attach the rigging bracket to the motor hook directly using only a shackle, the vertical dead height of the array is minimal thus allowing the system to be “trimmed” close to the ceiling or other vertical obstruction, and the need for an overall top grid truss is avoided.

Horizontally, the rigging bracket permits the option of “tight pack” configurations where both the front and rear edge of the enclosures are touching. The rigging bracket has been specifically engineered to draw the sides of the enclosures tightly together, to eliminate vibration and cavity effects. Using a fixed bracket allows the load to be distributed evenly over all three attachment points on the speaker, enhancing the load capability of the fittings and providing redundancy for improved safety. The S1520S is outfitted with Aeroquip fittings as standard equipment to expedite setup and teardown. The assembled array is quite rigid and repeatable, resulting in more efficient low frequency reproduction and consistent coverage pattern.

CONSTRUCTION

The hardware consists of an ‘I’ shaped rigging bracket and yokes. One bracket is required for the top and bottom of each cabinet in the array. The rigging bracket footprint is no larger than the speaker itself. The brackets are fabricated of tubular steel. Pivot blocks that secure cabinets vertically are CNC milled from solid bar stock. Stainless steel Avibank pins secure each speaker’s rigging bracket to form one unitized element. The entire assembly is finished in a black powder coat. Internally, steel brackets insure the enclosure’s structural integrity.

The Component Suspension System is designed specifically for the Yamaha S1520S speaker system, with additional dedicated elements to be introduced for future members of the YST Sound Reinforcement product line. ■

ACOUSTICAL ROOM SIMULATION PART TWO: IMPLEMENTATION

By Steven J. Orfield and Richard G. Pierson

Previously, we discussed two different views regarding the evaluation of "acoustic quality": psychoacoustics and room response. As was noted, recent advances in basic research in the area and development of inexpensive, portable acoustical test instrumentation have brought on a new age with regard to these issues.

Additionally, testing metrics and data directly or indirectly convertible to psychoacoustic information have recently become more a part of the professional design and verification process. The 1990s is becoming the most fertile period in acoustic history for the simulation and recreation of acoustical signals.

Part II of this series of articles will provide an initial look at the implementation of an Acoustical Simulation Room (ASR) at Orfield Associates' new laboratory facility, along with a look at some of the specific adjustments and performance attributes of such a room. Acoustical Room Simulation (ARS) is of interest to the design community, the electronics community, the performance community and the acoustical research community.

FACILITIES INTRODUCTION

A number of years ago, Orfield Associates began a site search for a new multi-disciplinary laboratory in which to

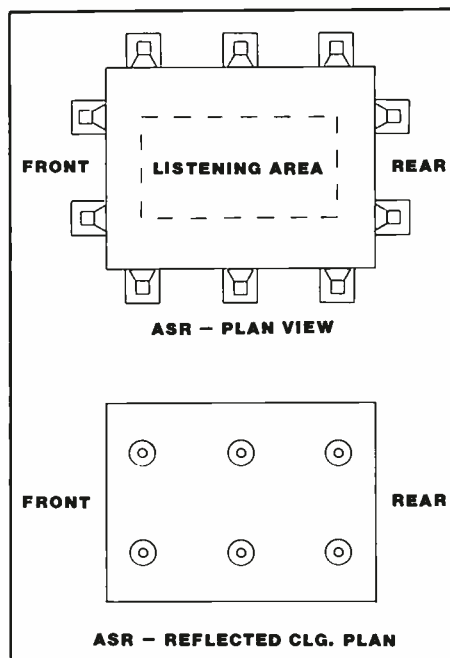


Figure 1: ASR Room Plans.

provide formal testing and research in our fields of practice. This past summer, a decision was made to purchase the former Sound 80 studios facility, the world's first digital multi-track recording studio. This studio was originally designed to provide a high degree of acoustical isolation; in its initial design, a noted acoustical consultant, Robert Hanson, was retained to insure multiple, non-competitive, simultaneous studio uses, and the building has been verified to perform quite well in accordance with his original plans. Thus, our ASR room project was simplified by the availability of a very competent basic acoustical studio design.

ROOM DESCRIPTION

The room used as a basis for ARS is an isolated (block enclosed) studio at Orfield

Associates lab which has initial dimensions of 18.3 feet (length) \times 9 feet (width) \times 8 feet (height). The room is isolated via placement, with adjoining rooms including an anechoic chamber, a corridor (two sides) and an exterior wall.

Also, all walls surrounding the rooms are high attenuation combination masonry and gyp constructions with a concrete deck and multiple gyp layer ceiling. Within this room, 16 full-range speakers have been mounted. (At positions as noted in the plans shown in Figure 1.)

During the initial testing, the only absorption present in the space was carpet at the floor. After this testing, fabric covered fiberglass was installed at all wall and ceiling surfaces in order to provide a semi-anechoic room. Figure 2 shows the initial time arrival response of the 16 loudspeakers at the center of the room. Figure 3 shows the same measurement after time alignment of all of the speakers (note that these measurements were taken before the addition of absorption in the room).

ROOM ACOUSTICS

The Audio Simulation Room described in our last article has now been constructed and is in the process of being tested and calibrated. This 16 channel room will be the focus of research into specific uses of psychoacoustic demonstrations over the next six months. This room will also be valuable for providing an extreme range of acoustical environments for psychoacoustic and intelligibility research. Our initial testing and research is based on the desire to demonstrate certain characteristic acoustical performance variables which contribute to "acoustical quality" so that we may quantify performance prior to more in-depth experimen-



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tation. The initial variables tested and documented in this initial installation phase were:

- Anechoic versus reverberant performance (basic room performance shifts)
- Source arrival and time alignment
- Reverberation time phenomenon (room volume and characteristic response)
- Source position (directionality) (source identification and binaural effects)
- Source Condition (live or reinforced)
- Echo and time delay
- Room surface reflections/phase shift (surface treatment effects)
- Room frequency response
- Dynamic source movement (Time-based delay)

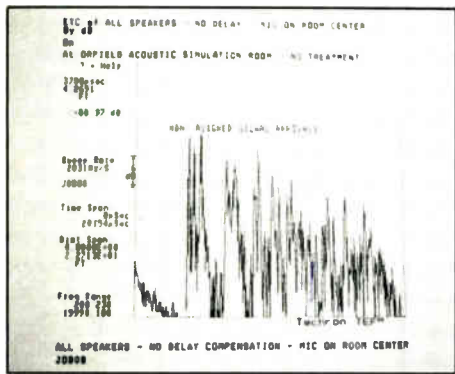


Figure 2: Loudspeaker time arrival before alignment.

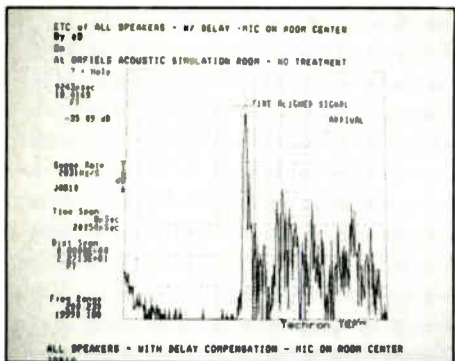


Figure 3: Loudspeaker time arrival after alignment.

- Intelligibility (performance based on amplitude, frequency and time distortions)
- Noise criteria (background noise level)

Figures 4 and 5 show the arrival of early reflections and reverberation, respec-

THE 1990s IS BECOMING THE MOST FERTILE PERIOD IN ACOUSTIC HISTORY FOR THE SIMULATION AND RECREATION OF ACOUSTICAL SIGNALS.

tively for one of the concert hall programs for the ASR. Figure 6 shows the spectrum for a mechanical noise simulation, based on an actual measurement, in the ASR.

The acoustical simulation room will also be an extremely valuable tool for acoustical research projects, especially in the fields of intelligibility and binaural audio. At the touch of a button, a variety of acoustical environments are now available to the user. Intelligibility factors such as

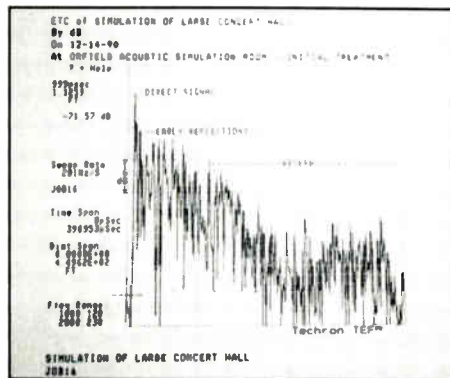


Figure 4: ASR Concert Hall — Early Reflections.

reverberation, background noise, time delays and multiple path interference can be easily programmed and evaluated. Directional information can also be presented to listeners in the room over a complete hemisphere.

Although our uses of the ASR room are primarily research oriented, the acoustical simulation room (ASR) also lends itself as an excellent effect for music playback and recording. The various concert hall programs we have implemented add incredible depth and spatiality to vocal and instrumental music. Used in conjunction

ASR OPERATION AND DOCUMENTATION

In order to develop the above variable measurements, control options existed, in terms of component variables and control. (See chart.)

CONTROL OPTIONS	
Component	Variables
Multi-effects processor (Yamaha SPX 1000)	Reverberation/Delay
Equalizer (DEQ7)	Frequency Response/ Delay
Amplifier (Yamaha P2160)	Level
Loudspeaker (Yamaha NS10MC)	Source/Direction
Mixer (Yamaha DMP7D)	Source/Level/ EQ

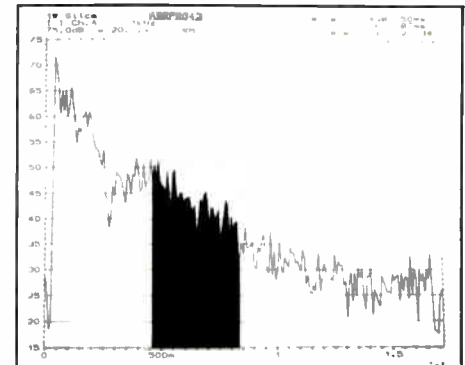


Figure 5: ASR Concert Hall — Reflections and Reverb.

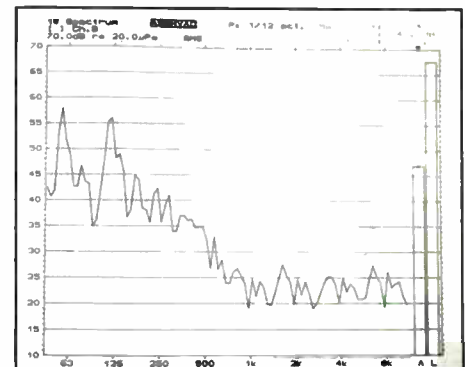


Figure 6: ASR Mechanical Noise Simulation Results.

with live microphones, this provides more natural sounding room effects than attainable direct signal processing, plus it gives the musicians the "feel of the room" which lets them incorporate this in their playing/singing. By playing relatively dry

recordings through the various concert hall programs, binaural recordings can be produced which sound as if they were actually recorded live in a concert hall, complete with directional and spatial cues.

THE CONSULTANT WILL SHORTLY BE ABLE TO DEMONSTRATE THE INTENT OF THE DESIGN BY ALLOWING THE CLIENT TO LISTEN TO THE RESULT.

SUMMARY

Acoustic room simulation (ARS) will provide the acoustic and audio practitioner

with a powerful new tool which will bring him far closer technically to his client. Instead of describing in technical terms what a newly designed church, concert hall or sound system should technically accomplish, the consultant will shortly be able to demonstrate the intent of the design by allowing the client to listen to the result. Such questions as "Is this room shape as important as the architectural design issues?" or "Will the last \$100,000 spent provide significant benefit?" will suddenly be resolvable by a client decision based not on faith but on professional practice.

Conversely, the consultant who does not involve himself fully in the problem may well be embarrassed by the resulting demonstration. This simulation practice will certainly be applauded by many in the con-

sulting community and be opposed by others; it may also draw legitimate distinctions between professionals and in a more common parlance, "separate the men

A DECISION WAS MADE TO PURCHASE THE FORMER SOUND 80 STUDIOS FACILITY, THE WORLD'S FIRST DIGITAL MULTI-TRACK RECORDING STUDIO.

from the boys." As a result, "accuracy" may begin to enter the standard language of the acoustical professional. ■

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Ceiling Speakers, Part 2

High Power, High Performance, Unusual Models

BY PAMELA MICHAEL

This month, in our continuing examination of new trends and applications in the ceiling speaker market, we'll take a look at upscale, higher powered, and high-style speakers. The increasing move toward foreground music in many facilities demands loudspeakers with larger capacities and improved fidelity. Sound contracting is not always just a matter of fulfilling a bid requirement with the least expensive, most basic unit. As expectation and audio sophistication increases, higher quality sound is assuming greater importance in the marketplace. It is no longer only the Las Vegas show lounges or the rare job with open-ended budgets that call for high end equipment.

A trend toward smaller, higher powered speakers has been a market factor for several years in Europe. Recently, in the United States, too, architects, clients and listeners are seen to be developing a taste for either cosmetically attractive speakers, or speakers that are almost invisible: architectural considerations are more important than ever. As Helge Fischer, Vice President of Sales and Marketing of Jamo puts it, the priorities of most manufacturers are "to make it sound good, be reasonably priced, and either look good or do a disappearing act. No one wants to look at a bunch of boxes; the days of sticking a lot of tin cans up on the ceiling are over." Unconventionally sized and unusual

looking speakers are showing up in increasing numbers, as well.

One of the driving forces behind this steadily expanding mid-to-high priced loudspeaker proliferation is the fact that that quality of sound sources is improving at a dizzying rate. Indeed, the 1990s may well see the demise of "background" music; consumer exposure to CDs has upped the "ear standard" forever.

A number of the new, higher performance speakers on the market are coaxial, consisting of a bass driver with a concentrically mounted high frequency transducer. The 12-inch standard coaxial size is becoming a thing of the past, however. Coaxials as small as four inches are now being offered.

The speaker and system choices a sound contractor makes depends on how high the ceiling is, how loud the system needs to be, and how many speakers you want to use. Often the savings realized by using fewer speakers (capitalizing on a wider dispersion pattern) can be applied to quality. If the ceiling is very high, as in a convention center, for instance, you need a speaker that can project 30 feet or 40 feet clearly, down to the ground—a very directional speaker. For a cruise ship, on the other hand, with 8-foot or 10-foot ceilings, you don't want to blast the person directly below the speaker while leaving the person standing next to him/her unable

to hear. Here you want a small speaker with very wide coverage.

Some of the new high performance coax speakers are simply dome tweeters attached to a woofer; some are actually compression drivers, like Radian's new 500-2 Series, Models 508, 510, and 512. These are compression drivers that use the woofer's cone as an extension of the high frequency horn and give wide angle dispersion. The company offers a choice of stamped basket steel or cast basket. Radian's Buddy Frisbee says he thinks "Power for Dollar" sums up the new push for 1991. Priced at \$125—\$190, these speakers certainly fit the profile.

Many manufacturers are finding ways to reduce price and improve quality at the same time by using advanced assembly techniques. Quite a few new models often combine easy-to-install characteristics with enhanced performance. The connection between higher quality, higher output and higher price is indisputable, but there is a new breed of speaker priced somewhere between a \$20 generic unit and a \$1000 plus Altec Lansing 604, the first coaxial speaker, designed by Jim Lansing in the '40s. Long an industry standard, the 604-8K is not really a ceiling speaker at all, but rather a studio monitor bolted into a ceiling box. Considered by many to be the ultimate high output ceiling speaker, this unconventional application is being ag-

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gressively marketed for high fidelity hotel installations.

JBL's recently introduced 15-inch and 12-inch coaxials are seen as a bid to challenge the 604 with a lower priced option. The JBL 2155H (15 inches) and the 2152H

The savings realized by using fewer speakers can be applied to quality.

(12 inches) both contain JBL's 2416H compression driver featuring their titanium diaphragm and diamond surround contour.

Both Altec Lansing and JBL also offer coaxes with direct radiator tweeters. The Altec coaxes are part of their Duplex speaker line. (Duplex is Altec's trademarked name for coaxial.)

The 920-8B Duplex is the new and improved version of the 920. It has a 12-inch driver with dome tweeter and 125 watt rating, and lists for about \$340. It was designed to operate in a sealed enclosure, with two cubic feet as optimum size. Gary



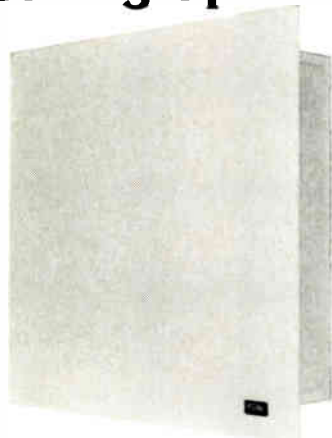
Radian's 508 and 510 loudspeakers.



JBL 8100 series ceiling speakers.

Jones, National Sales Manager for Altec, suggests it be used in installations with ceilings below 28 feet. For jobs with ceilings over 28 feet, he recommends the 617-8A, a Duplex 12-inch. At \$490, it's more expensive than the 920 and doesn't

The KSI 8081-CS Ceiling Speaker



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handle as much power, but the compression driver and horn give it a narrower, more focused punching pattern for reaching down from high ceilings.

Altec's 409E Series, 8-inch Duplex was designed for sealed enclosures of one cubic foot. This is a versatile speaker which comes in six different models ranging from a \$56 version, without transformer, to a \$116 model with 32 watt transformer already mounted.

JBL has recently introduced the 2142H 12-inch with a 1.75-inch diameter titanium dome coaxially mounted tweeter.

Atlas/Soundolier is another industry standard in this market. Its EQ Series was developed in response to the needs of users like Muzak and AEI who didn't have

Manufacturers are finding ways to reduce price and improve quality.

access to good high quality recessed ceiling speakers that would handle increased power during the years when the industry

was moving in more of a foreground music direction. Contractors were resorting to using bookshelf speakers, mounting them in corners. This placement lowered intelligibility due to the uneven distribution and was often less than desirable. The 4-inch EQ 410 at 25 watts and the 8-inch EQ 818 at 50 watts list at \$90 and \$130, respectively, have an integrated back baffle, and come with square or round grilles. National Sales Director Bud Waters points out that the bookshelf-type cabinet speaker is also still produced by Atlas/Soundolier, the EQ-S line, for those who



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prefer the non-recessed configuration.

Although not high output, Soundolier's DC Series is an attractively-styled speaker that looks like track lighting. Both the 4-inch and 8-inch models come in white, ebony, or brushed aluminum.

Bose also offers a track lighting styled ceiling speaker, the AM-5-BP, which con-

sists of two tiny cubes (about 3 inches x 4 inches) on bendable stems, one for left channel, one for right channel, and a bass box, the Acoustimass Module, which must be built into the wall, floor or ceiling and looks like an air or heat register. All that's visible is the track array, as Product Manager James Cappellini calls it, the

cubes on a track or monopoint mount. This system—and it is a system, sold only with an amplifier—is marketed through Bose's Residential division as a built-in system for residential use.

Chicago's Jamo calls their track lighting-styled speaker the Converta because of the variety of ways it can be mounted. One can choose to hang it from the ceiling on

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The 409-8E from Altec Lansing is an 8 inch Duplex ceiling loudspeaker.

a cord, like a hanging lamp; or on a stand that comes in the package; on a swivel ball joint; or on a wall mount. This 50w, very eye-pleasing speaker is half-sphere-shaped and comes in six different colors: white, black, mauve, teal, chrome, and violet. Suggested retail price is \$199 each.

On March 1, Jamo introduced a lighting-

Contractors were resorting to using bookshelf speakers.

look-alike speaker that actually is a halogen lamp, as well as a loudspeaker that handles up to 80 watts. These wall sconce-shaped speakers are styled to find a market for restaurant and hotel users, even at \$799 a pair retail.

Jamo also offers a couple of impressive flush mount speakers that have a steel cap on the back, a 1-1/2 mm metal cabinet that conforms to fire regulation guidelines. The white metal grilles are attached by magnets (no screws) and are easy to snap on and off. Special mounting gear allows these

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speakers to fit almost any ceiling, from 8mm—60mm in thickness. Model numbers for these pre-assembled speakers are U70, a 50 watt 5 inch full range system; and the U80, a 2 way, bass/tweeter system. Retail prices are about \$100.

Pascal Delbuck, the President of Environmental Sound avers the company can match the paint and fabric grille to any color specified, a sometimes critical requirement in a job. Their rectangularly shaped, two way ES Series has models ranging from 5 to 200 watts; and the units

The white metal grilles are attached by magnets.

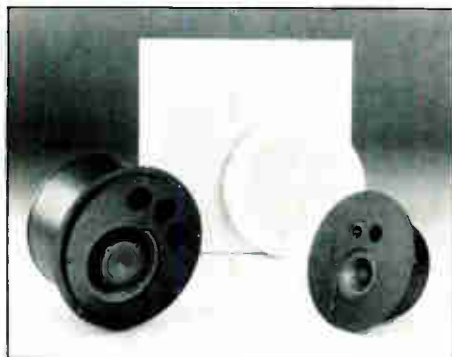
come pre-assembled. The ES 502 is a 5-inch; ES 602, 6-inch; ES 802, 8-inch; ES 1002, 10-inch; and the ES 2802 has two 8-inch woofers. Prices range from \$85-\$250 per unit.

Also introduced recently (December '90) and very attractively priced and designed is Karibu's 80-81CS, made to come out of the box and pop into a 2 foot x 2 foot ceiling tile space. The 8-inch bass driver is acoustically coupled to a 10-inch passive radiator which extends the low frequency response. Extended top end and wide dispersion is achieved through the use of a 3/4-inch diameter dome tweeter.

As with all specs quoted here, including power ratings and dispersion patterns, often there is room for interpretation in deciphering these figures.

Housed in a fire retardant flake board enclosure, the unit comes complete with back box—\$69.95 list. Two tie points for installation of safety wires are included. President Larry Kirchner cites the growing trend toward "invisibility" for the attractive styling.

Soundsphere's omnidirectional, fiberglass round speaker is being used by



The Atlas/Soundolier EQ series.



The Bose AM-5-BP is a track lighting styled ceiling speaker, which consists of two cubes.

sound contractors partly because of the even dispersion in the horizontal plane. A sphere potentially does offer very smooth frequency response characteristics—there are no sharp corners to cause diffraction effects. A product like this must be handled with care, however—it is not a panacea. It is useful in fairly dead environments and in special applications where wide horizontal coverage is useful, but keep in mind that filling the room with sound is not the same as having highly intelligible sound for all listeners. The Soundsphere can be suspended from a cable or chain, or ceiling mounted, and comes in any color specified. Model 110

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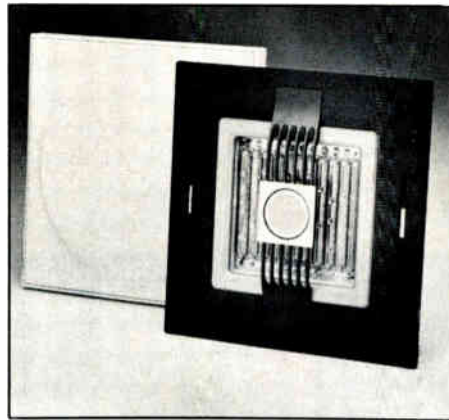
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is about 12 inches in height and 15 inches wide; it has 35 watts. Model 168 is about 20 inches x 20 inches and has 55 watts. Model 2212-1 is 26 inches x 26 inches and has 200 watts.

Another wide dispersion application speaker is LA East's Super Dispersion Series—SD48. This unusual speaker array, which is being patented, fits into a 2x2 ceiling space and includes four 8-inch drivers arrayed in a pyramid shape, giving a 360 degree dispersion pattern. The unit is intended for positioning in the center of the room; for larger environments a corner module, the SD 28, can be used to provide wider coverage.

The DECO 7 from Creative Acoustics is modeled from hi-hat lighting and is available in a variety of finishes. It uses a 6.5-inch coaxial speaker with a 7.5-inch



OWI's Thindy model 2300 two-way wall mount loudspeaker.

mounting flange in the ceiling. Power handling is 35 watts.

For ceiling installation situations where you have limited depth, OWI, Inc.'s new wafer-thin (1 3/4-inch) Thindy II speaker might be just the ticket. Available in black or ivory, this "flat wave" speaker measures 9 inches x 9 inches and has a 140 degree dispersion pattern and a power handling capacity of 60 watts.

Some Other speakers that fall into the high performance, high-style category

were profiled last month in Part One—Installed Price Versus Raw Price. These include J.W. Davis's CSS-50, a pre-assembled closed system that fits into a 2x2 ceiling tile grid, and B.E.S.T.'s CT-76D and CT-72, which can be silk screened to match any ceiling tile pattern and the Bose (Pro) 101 ceiling speaker model.

A note about the numbers in this article. I have refrained from citing frequency response for individual products to avoid confusion. Some manufacturers use AES terminology in their ratings, others do not. And, as with all specs quoted here, including power ratings and dispersion patterns, often there is room for interpretation in deciphering these figures. Prices quoted are of course subject to change.

Next month, I'll be taking a look at the wonderful world of wall speakers. ■



“...SOUNDSPHERE LOUDSPEAKERS ARE THE REASON FOR THE CLARITY OF SOUND?”

Don Hartley/President • Dynamic Sound • Exeter, NH

Comments Mr. Hartley on the Sun Foods store, “The Lowell store has approximately 76,000 square feet and is the largest supermarket in New England. It contains 24 checkout counters....

...This store is owned by Hannaford Brothers and they basically have three or four names that they use for different stores. In 1984, they built a store similar to this, with a 22-foot ceiling and at that time we were just completing a new installation at their warehouse, which comprised of twelve 250-watt amplifiers and approximately 80 Soundspheres. Since the ceiling in their new store was going to be 22-feet high, we strongly recommended Soundsphere #110's and guaranteed equal sound in each and every part of the store. This installation was completed; and last year when another store was planned in Lowell, they called us for an installation similar to Keene....

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TRADE SHOWS

CES: LAS VEGAS UP-BEAT

By Ed Foster

I made my annual pilgrimage to Glitter Gulch expecting the worst. I've yet to figure out what the economists have been smoking. I've been in recession for more than a year and it's downright depressing. But we're not supposed to use words that are just one letter different from the big "D," and I don't mean Dallas.

Thankfully, I came back in better shape than I left. I've come to view Consumer Electronics Shows as bellwethers of where the economy is heading. If it holds true this time, we've bottomed out and are on the way up. There were actually more buyers at this show than booth personnel and, wonder of wonders, they seemed to be buying. Or, at least, that's what I've been told. No, this isn't the Sound & Communications report on the economy. It's a once over lightly on what was new at the '91 Winter CES in Las Vegas and how it might impact the sound contracting market.

The biggest splash came from Philips who finally released some technical tidbits on the much-leaked DCC (Digital Compact Cassette) story. Frankly, the relevance that DCC has to the custom-installation market is tenuous. Suffice it to say that, to the extent that DCC stalls (or dare I say, kills) DAT, CD will remain the unquestioned king of the digital hill. CD changers (like the 100-disc unit from German-based NSM Lowen, distributed here by Euroson America, and now part of the



The '91 Winter Consumer Electronics Show in Las Vegas.

Audioaccess lineup) will be the mass-storage media of choice for high-end custom installations. That would be true whether DAT or DCC wins the digital tape battle, since neither is as easily handled in a jukebox as a CD. But consumers may eventually give up waiting for digital tape and just settle for what's here, now and best — CD. That would at least clear the air.

The Audioaccess CD Library System sprang from a joint effort by Audioaccess, NSM and Gefen Systems, who developed the software. At minimum, the system consists of NSM's CD2100 two-piece remote-controlled jukebox with 100-disc capacity, Audioaccess' newly introduced SEI Infrared Source Equipment Interface Module, their PX-6 Multi-Room Remote Controller with one or more KP1 Keypads, and Gefen's CD Sound Music System Software complete with laptop computer and Infrared Remote Keyboard. Together, the system permits users to order random playback from preprogrammed lists

(categorized by type of music — Rock, Jazz, Blues, etc.), select any CD at will, and create multiple playlists with unlimited music selections. Disc access time is a pretty snappy six seconds. Customers can input the system via the laptop keyboard or the infrared remote keyboard.

Audioaccess' SEI Module enables the company's PX-6 (and older PX-4) control systems to interface with any infrared-controllable source equipment using light instead of wire. With the SEI's friendly menu and built-in LCD, Audioaccess claims that an installer can program the device for a custom home system in as little as five minutes. Battery backup for its non-volatile memory enables the SEI to retain information for as much as 10 years.

The SEI provides four inputs (FM, CD, Tape and Video) and three IR outputs for flasher LEDs. The system can be programmed for up to 210 commands, offers 12 presets and is capable of storing multiple command sequences to enable use, for example, with tuners that require a two-

digit preset code plus enter for operation. A General Purpose Input (GPI) provides one-touch triggering of sequential events. For example, the SEI can be programmed so that when the user selects VIDEO, the system turns on the TV, then the VCR, puts the TV on Channel 3, the VCR in play, and powers up the Surround Sound unit in the Prologic mode. When VIDEO is

wide audience.

In addition to its six-preset AM/FM tuner (AM stereo as well as FM stereo), the system handles five audio inputs and has IR control of all source equipment (assuming, of course, that the sources are IR controllable). Six zone preamp outputs are available so power amps can be added to expand beyond the capabilities of the in-

MCX-10 controls and distributes audio from as many as five sources to any one of five zones. Two MCX-10s can be linked to double the input and output capability. The MCX-10 works with the RCX-10 programmable remote-control transmitter and the WCX-10 zone-control/sensor. Operation of IR-controlled sources is either via the IRX-10 (a small infrared emitter designed to be mounted over the sensor in the source device) or via the IRX-20, a high-power, flood-the-room type. The Yamaha system isn't capable of delivering different sources to different zones simultaneously, but it's a first step from a well-known company with more promised in the future.

Russound, known mainly for patch panels and switchers, showed the SDB-4

THE SYSTEM CAN BE PROGRAMMED FOR UP TO 210 COMMANDS.

and SDB-4 120 Stereo Speaker Control Centers. Each has an internal power amp (30 watts/channel on the SDB-4, double that on the SCB-4 120) in a 2-inch high package. Both are designed for use with four stereo speaker systems and provide individual control of volume (and speaker defeat) for each. Control and switching are via front panel knobs and pushbuttons, so this is not for remote operation. The system is designed with a 4 ohm/8-16 ohm switch that inserts resistance to keep amplifier loading at 4 ohms even when four pairs of 4-ohm speakers are in use. For local volume control, the company offers the TBL-50 Table-Top Attenuator, a 10-position switched affair (24 dB in 3-dB steps plus 30 dB and off) rated at 50 watts rms (150 watts audio) with 8-ohm loads.

Niles Audio introduced the IRD-8 Infrared Routing System. The IRD-8 is the exact opposite of "flood-the-room" repeaters in that it directs infrared control messages to up to eight destinations in the system. Each of the eight IR outputs is ad-



Opening ceremony of CES.

deselected, the appropriate "off" commands are generated.

Also new from Audioaccess is the MRX Multi-Room Receiver, claimed to be the first complete multi-zone/multi-source receiver using the EIA CEBus format. The six-zone system is compatible with the twisted-pair (4-conductor) wiring format defined by the EIA CEBus standard and is equipped with six 40-watt/channel stereo amplifiers and six separate controllers to provide independent control of source and volume at each zone. According to the company, the MRX Receiver was designed to provide Audioaccess dealers with an easy-to-install, compact, cost-effective solution to providing whole-house home-entertainment control to a

ternal ones. In either case, the user has independent control of volume, balance, bass and treble for each zone and can turn the system on and off from any zone via

THE USER CAN TURN THE SYSTEM ON AND OFF FROM ANY ZONE VIA THE REMOTE KEYPAD.

the remote keypad, which also sports an IR receiver for wireless operation.

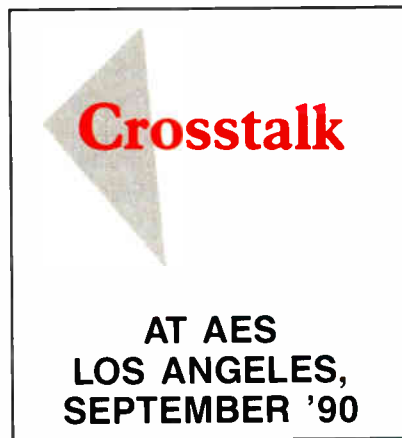
Yamaha dipped its toe into the custom-installation market at the '91 WCES with the MCX-10 Master Zone Controller. The

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justable, so that each flasher targets a specific component without affecting others nearby. Thus, the IR-8 makes it possible to control each of a stack of identical components separately, and from a remote location, even though the components themselves use identical control codes.

Also new in the Niles lineup are the HC-1 Hand-Held Controller, the IRC-2 Micro Flasher (claimed to be small enough to attach directly over the IR sensor window of a component without detracting from its appearance), and the CMS-3 Ceiling Mount IR Sensor. The CMS-3 is said to be so sensitive that firing a handheld remote in any direction within an average room will trigger the system.

Fleshing out Niles '91 WCES introductions were four manually operated speaker-selection systems, a sound-signal-activated switching system, and an in-wall amplified subwoofer. The SMS-10 Speaker Distribution and Impedance-Matching System connects up to 10 pairs of speakers to a single stereo amplifier through an autoformer matching arrangement. Volume control for each pair of speakers

BOTH ARE DESIGNED FOR USE WITH FOUR STEREO SPEAKER SYSTEMS.

can be added but isn't included.

The SPW-6 Wall-Mount Speaker Selector fits a two-gang plaster ring (or into a deep two-gang box) and handles six pairs of speakers. Grounds are routed separately so the SPW-6 can be used with bridged amplifiers. It's rated at 100 watts/channel continuous and has internal protection to keep the amplifier running safely when all speakers are active. The HDS-6L is a similar device in a low-profile (2 1/2-inch high) box and carries a greater power rating (250 watts/channel rms). The SVC-4L offers the individual volume control that the above systems lack. It's in a low-profile walnut-side cabinet and handles four pairs of speakers.



Gefen's CD Sound Music System Software complete with laptop computer and infrared keyboard.

The Niles SAS-1 Sound Activated Switch is an automatic audio/video A-B switcher that triggers on a 30 mV line-level (or 0.25-watt speaker-level) signal. A control-input connector also permits switching via a 5-20 volt ac or dc signal. Switching delay is adjustable from 1/4 second to 30 seconds. The SAS-1 is powered by an external wall-mount supply and handles speaker levels up to 600 watts/channel continuous. The SPK-1 Voltage Activated Speaker A-B Switch carries a similar rating but is activated by a 12-volt dc control line derived from the SAS-1. In a similar manner, the AVS-2 Voltage Activated Audio/Video A-B Switch uses 12-volts dc to switch line-level audio and composite video. Finally, the AC-3 Voltage Activated ac Outlet Strip can be added to switch two ac lines from a 12-volt dc signal. A third outlet on the AC-3 is unswitched.

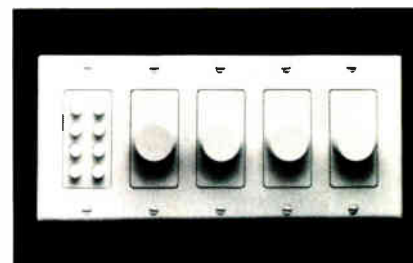
The Niles NSW-100 In-Wall Amplified Subwoofer system consists of the (separately available) NSW-8 eight-inch acoustic suspension subwoofer (mounted in its own in-wall enclosure) and the SA-100 stackable amplifier (also available separately). The SA-100 outputs 100 watts rms, can drive



Audioaccess' SEI Module enables the company's PX-6 control systems to interface with any infrared-controllable source equipment using light instead of wire.

a second subwoofer if desired, and measures 17" x 3 1/2" x 10" (WxHxD). It features a level control, bypass and phase-reversal pushbuttons, status indicators, auto turn-on, and operates on either 110 or 220 volt power.

Needless to say, Niles was not alone in introducing in-wall speakers. BIC America showed two models, the M5 and M6. The smaller uses a 5 1/4-inch polycarbonate-cone woofer with a 1/2-inch soft dome tweeter; the M6 uses a 6 1/2-inch woofer and 1-inch tweeter.

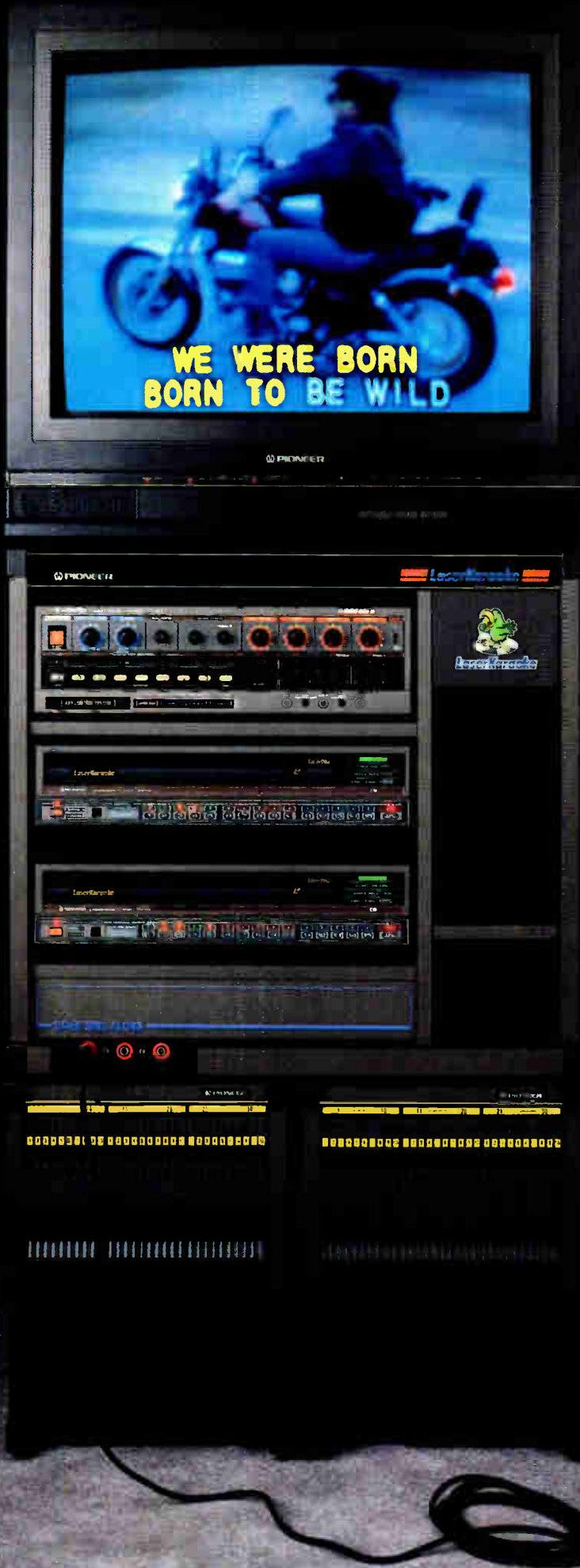


Sonance's VC504 speaker distribution/volume control system.

Boston Acoustics introduced "The Invisible Subwoofer," a self-enclosed Power-Vent Bass Module configured to mount to floor or ceiling joists. The system uses twin 6 1/2 inch woofers in a push-pull configuration and mounted in an enclosure with two internal chambers: one vented, one sealed. The system is said to be flat to 45 Hz (± 3 dB) with an 18 dB/octave acoustical crossover at 150 Hz (presumably achieved by the cabinet design). Quoting the spec sheet: "to combat typical midrange coloration caused by vent noise and resonance, Boston engineers

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have developed a unique air trap (patent pending). This series of outer-cabinet Helmholtz resonators traps stray frequencies. So no midrange frequencies above 150 Hz 'pollute' the sound.'

KEF's Uni-Q drivers now have been adapted for in-wall installation. As you may know, KEF Uni-Q drivers mount a 3/4-inch polyamide dome tweeter within the voice-coil structure of the woofer to create a coincident-source two-way system with excellent dispersion over a ± 30 degree angle. The technology was made possible by the development of very high energy Ne-Fe-B magnetic materials which reduce the size of the tweeter magnet so that it fits within the woofer voice-coil former. The tweeter's high-temperature voice-coil and magnetic fluid cooling keep the spl up to desirable levels despite the small package size. The CR160 Uni-Q uses a 6 1/4 inch polypropylene woofer which, together with the tweeter, provides response from 60 Hz to 17 kHz, ± 2 dB out to 30 degrees off-axis in any direction. Sensitivity is rated at 88 dB spl at 1 meter from 2.83 volts, with a maximum output of 104 dB spl on program peaks.

THE TWEETER'S HIGH-TEMPERATURE VOICE-COIL AND MAGNETIC FLUID COOLING KEEP THE SPL UP.

Canadian high-end speaker designer Paul Barton also has an in-wall speaker, the PSB HW-I. Design was refined at the Canadian National Research Council's speaker testing laboratory (arguably the most advanced facility in North America). The HW-I sports a 6 1/2 inch woofer crossed over to a 3/4 inch tweeter at 2400 Hz.

Although Sonance had no new speakers at the '91 WCES, the company did introduce the VC504 and VC504P speaker distribution/volume control systems. The new models are similar in concept to the Sonance SDS series of stackable switchers but are wall-mount rather than self en-

closed. Both systems can be used to select one of two sources and route the program to four speaker systems in any combination. Each speaker is switched separately, so activation, source selection and volume can be set independently for each. The

FIRING A HANDHELD REMOTE IN ANY DIRECTION WITHIN AN AVERAGE ROOM WILL TRIGGER THE SYSTEM.

VC504 and VC504P differ only in that the "P" version has constantly engaged protection circuitry that permits four pairs of 8-ohm speakers to be on while maintaining a 4-ohm load on the amplifier. The new

models fit a standard 5-gang plaster ring or masonry box. On the simpler side was Sonance's ABW1HPO, an in-wall device that permits deactivating the speakers while keeping a local headphone jack "live."

Finally, International Jensen, parent of venerable Advent, announced development of a new line of loudspeakers that work in conjunction with Square D's ELAN Advanced Home Network. The ELAN system consolidates telephone, audio, video and electrical services at one point. From this hub, the necessary telephone, audio and electrical wires and coaxial cables are routed to all areas of the house. Jensen ceiling-mount speakers and Advent Illusion in-wall speakers will now be part of the ELAN Advanced Audio System. ■

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Audio Analysis

Hyperception's Digital Signal Processing Workstation

BY MIKE KLASCO

At the Los Angeles AES Convention in September, the Committee on Acoustics and Sound Reinforcement hosted a full day of invited papers on developments in room modeling. Apparently this aspect of the show created quite an impact, and there has been much coverage of the work presented. Ken Jacob of Bose is the Chairman of the committee, and I had the good fortune to be the session organizer. Dr. Manfred Schroeder was the honorary session chairman. Helping to organize this session was exciting, and provided many insights into future developments in this field.

Unfortunately, it was not possible to include every candidate's paper, and some interesting work could not be presented due to scheduling and other conflicts (on the part of the invited researchers). Related papers were also given in other sessions.

Perhaps most exciting for both acoustical consultants and sound contractors is that a number of these papers were on acoustical modeling techniques that are now available commercially.

During November and December, *SOUND & COMMUNICATIONS* reviewed the Bose Modeler program that boosts the intelligibility predictions techniques described by Ken Jacob in his AES paper. The EASE review, which we started last month and continue to explore, was the subject of Dr. Ahnert's paper, in particular his criteria for speeding the calculation of the image model of the room.

Simply put, the sound reflection paths are used to derive the intelligibility predictions from the impulse response of the room, and non-critical paths are not calculated.

In another session Sam Berkow gave a paper on the Hyperception software program and how he is able to use it to preview the acoustics of a space from the architectural drawings. The implications of Sam's paper were far reaching, as he described an auralizing technique in which a sound contractor could use a sound system design program (such as EASE) to prepare a room model, and then play music

I believe that most of these fellows that purchase SYSid will end up mastering the system after a few months and still have an appetite for more.

through the computer room model and listen to the room from any seat. Hyperception is a commercially available program and the subject of this review.

Hyperception's Workstation is an interactive Digital Signal Processing ("DSP") software package for audio analysis that runs on a number of data acquisition boards, such as Ariel's DSP-16, using an

IBM compatible as the host computer. The DSP-16 is the same board that is used by SYSid, the audio analysis system reviewed in the October and November issues of *SOUND & COMMUNICATIONS*. In many ways Hyperception Workstation complements rather than competes with SYSid. Hyperception is also developing the program for use with the IBM version of the TEF 20.

Hyperception Workstation is an overwhelming program for "power users." It offers the acoustical analysis capabilities that only the largest research organizations could afford just a few years ago. I ought to mention here that the program adds only \$1,000 to the cost of a SYSid system, although you might also consider additional optional enhancements to Ariel's DSP-16, which can bring the cost up another \$200. Even if Hyperception is rather a heavy duty program for sound contractor use, I believe that most of these fellows that purchase SYSid will end up mastering the system after a few months and still have an appetite for more. Hyperception Workstation will fix this problem.

So what might this wondrous tool for audio wizardry offer the consultant or the (superman) sound contractor? I will try to cover its many unusual attributes in this review, but because it is such an important and comprehensive program (especially for acousticians), we will continue to explore this program from the perspectives of various users in upcoming issues.

ANALYSIS TOOLS

The richness of the analysis capability can become overwhelming. It is such a powerful tool that you can become lost in your research and lose all track of time. Let me correct any impression that you will be wasting your time being mesmerized with the stunning graphics, as you will see elusive defects in the work you are scrutinizing, in painful detail. The time, frequency and amplitude domains can be viewed, not just in three dimensions, but in all four—including running (“animated”) waterfalls! Analysis is split into time domain (time vs. amplitude) and frequency domain (frequency vs. amplitude).

Time Domain Analysis Tools

Single or dual channel waveforms can be displayed, with graphics manipulation. Earlier versions of Hyperception only provided linear axis, not ideal for audio; now log axis options have been added to all displays. Operation of cursor, pan, zoom is the best that I have come across yet. Both event-capture “storage scope” operation with pre/post trigger functions and real-time scope operation are supported. Using the time domain options, you can pull up a data file of a previous test and

The time, frequency and amplitude domains can be viewed, not just in three dimensions, but in all four—including running waterfalls.

look at the waveform. You can continuously zoom in for more detail with a unique cursor. Although a mouse can be used, alternatively you move the cursor with the left or right arrow keys and adjust the size of the window you want to zoom in on with the up or down arrow keys. This approach works very well and is comfortable to use.

I used a 14" VGA monitor, but found myself constantly wishing for a larger screen. If you can afford it, a 16" or larger



PC-based workstation; note color spectrogram on monitor.

color high resolution monitor would be useful. Goldstar has recently introduced a 16" 1024 x 768 non-interlaced monitor (model 1650) with a “street price” much less than \$1,000, or there are the more established alternatives, the NEC 4D and Hitachi 1584, for a little more money.

Waveform editing includes playback of target window sections. Now what might this mean? The function to audibly play back a displayed section of the signal. Let's say you are looking at an ETC showing a strong reflection off a nearby surface. The ETC is a derivation of the impulse response of the room. If the energy does not decay properly, but has flutter echoes or other problems, the intelligibility and sound quality will be impaired. To aid in interpreting the visual ETC curve, you can “listen” to it! The ETC is of an impulse, and just as a hand-clap will excite a room, so will an impulse. The impulse you use should have enough low frequency energy to excite low frequency modes. You can “loop” the sound shown in the window and listen to it, using the outputs of the DSP-16 connected to an amplifier and speakers (or headphones). This function can be done any time, just by hitting the D key (“dump”).

Another possibility is to “auralize.” The term “auralizing” was coined by Dr.

Mendel Kleiner and was the focus of his AES paper, “Auralization: Experiments in Acoustical CADD.” While a number of papers have been presented on this theme, for now, Hyperception is the only PC-based commercially available approach to this technique.

Practical implementation would be to use as a source Denon's CD music recording made under semi-anechoic conditions,

Using the time domain options, you can pull up a data file of a previous test and look at the waveform. You can continuously zoom in for more detail.

played back by headphone. Hyperception uses the DSP-16 to continuously capture signals to your hard disk. The DSP-16 offers a stereo 50 kHz sampling rate through its 16 bit digital to analog converters, although the 64K memory option (\$200) is required in order to achieve the full 50 kHz rate. The effect of specific reflections can be heard superimposed over a test signal or music by superimposing the impulse response of the space onto the input

signal. This is accomplished by using the Convolve function found in Hyperception's menu.

If this sounds complicated, it is, but mostly for the computer, not the user. You can then edit out the reflection(s) from the impulse response and demonstrate the benefits of acoustical treatment (or moving or re-aiming the speaker).

I have seen and heard this process performed with the EASE sound system design program, using their EASEPOST post-processing module. The ETC was exported to Hyperception, and the segments from the Denon "anechoic" disk were processed and played back. It works, and this truly is a milestone in the simulation capabilities available to sound contractors.

Once the room's impulse response is available its sound characteristic can be listened to.

Typically this procedure will probably consist of generating two ETC curves, about 6 inches apart, and exporting them to Hyperception. Hyperception can accept and process dual channel signals. Both ETC curves will be superimposed on a stereo dry audio signal. The entire (convolution) process will be repeated using a binaural algorithm, and finally saved as a file. This file would then be able to be played back from the hard disk and listened to with headphones (connected to the DSP 16 outputs), thereby eliminating the double reverberation from the listening room.

In an upcoming issue we will explore Sam Berkow's auralizing work at Joiner-Rose using Hyperception. This capability is being studied by most of the sound system engineering software developers and may soon be an option for a number of programs that currently feature ray-tracing/image modeling techniques that al-

ready derive the room's impulse response in order to calculate RASTI intelligibility. Once the room's impulse response is available (even if the room is imaginary and exists only in the software's computer model), its sound characteristic can be listened to. Auralizing may soon be a capability of EASE, without the need for Hyperception, although a signal processor board is, of course, still required.

This is an intriguing tie-in between acoustic test gear and sound system design software. A related development, the TEF 20, is based on the Motorola 56000, and a version of Hyperception is being developed to work with the IBM compatible version of this analyzer.

Aside from the special application of auralizing, Hyperception is a high performance computing spectrum analyzer, and we will now look at these capabilities.

Frequency Domain Analysis

Frequency response measurements can be real-time (FFT size currently supported is 2048 points, 4098 non-real-time). Usable bandwidth is to 20,000 Hz with a signal to noise ratio of 67 dB (on the DSP 16). The maximum sampling rate is 50 kHz, which is adjustable downward. As the DSP-16's anti-aliasing filters are fixed at 25 kHz, if the signal has energy at half the sampling rate or higher, then frequency aliasing will contaminate your measurements. Sadly, all those great digital filters that can be synthesized within Hyperception must occur after the analog to digital conversion, *i.e.*, after the aliasing has occurred.

My solution to this problem is to use an external parametric filter built into my mic preamp. The Stewart Electronics MP-2 mic preamp combines the phantom power supply, preamp, and guard-band filter in one unit. The signal-to-noise ratio is limited to 67 dB when used with the DSP-16 board because of the way Hyperception performs the FFT with non-floating point processors. Alternatively, you can tell Hyperception to bypass the DSP-16 for this function and use the floating point math coprocessor (the '287/'387) on the

computer's motherboard. While the processing will be many times slower, the signal to noise ratio will be a bit better than 90 dB.

Using the digital scope function, waveforms can be captured and post-processed for their frequency response. Full triggering functions are available.

Aside from high resolution FFT frequency response, top-view color spectrograms (FTC frequency-time curves) can be viewed. This shows frequency on one scale and time on the other, with color showing sound intensity.

FTC/spectrograms were first developed for speech analysis (voice prints), but are powerful tools for revealing the character of anything from the signature of a piano

All those digital filters that can be synthesized within Hyperception must occur after the A/D conversion.

to a compression driver, a hall or a flyover by a Stealth bomber. Typically, the test object's impulse response (rise and settling time characteristics) are displayed. High Q resonances and ringing, echo density, harmonic structure or whatever can be visually discerned.

The 3-D (time-energy-frequency waterfall) spectrogram display includes dual trace, zoom, log axes, and accurate control of time spanned. Previously the MLSSA system 3-D time-energy-frequency had been the most usable tool I had come across (reviewed in the May, June, and July '90 issues of SOUND & COMMUNICATIONS), noticeably more so than the 3-D utilities in the present release of SYSid, but Hyperception's 2-D color spectrogram and 3-D waterfall are in a separate league as an analytical tool.

Everything, from scope operation, spectrograms, waterfalls, and so on, can be

(continued on page 64)

NEW EDITION OF 'HEARING'

By Neil Shaw

The sense that concerns all professionals involved in audio is the sense of hearing. In the second edition of *Hearing, An Introduction to Psychological and Physiological Acoustics*, Mr. Stanley A. Gelfand provides a complete survey of hearing science.

Mr. Gelfand is a professor in the Communications Arts and Sciences Department at Queens College, New York and the Ph.D. Program in Speech and Hearing Sciences at the City University of New York. This textbook unites in one volume an updated review of the anatomy, physiology, psychology and function of audition.

The contents of the book's 14 chapters progresses, in a logical and linear fashion, from the basic anatomy and physiology of the hearing organ to the psychoacoustics of and process of speech and music perception. The text also enables the reader to review the various relationships between the actual structure of the auditory system and the function of the system as a whole. The material is presented in a clear manner, while enumerating all the basic mathematical and physical concepts, that doesn't require a background in mathematics. The book is liberally illustrated with many diagrams, charts, photographs and tables that complement the written material.

The book is written so that readers, who may have widely differing backgrounds, may find a core of information of

sufficient depth and breadth for basic understanding.

The book begins with a review of physical concepts. The author reviews physical quantities, harmonic motion and sound, decibel notation, complex waves, standing waves and the concept of impedance. The fundamental concepts defined here are used throughout the rest of the book.

The next five chapters present an overview of the anatomical and physiological structures. There are chapters on the anatomy, conductive mechanisms, cochlear mechanisms and processes, the auditory nerve and auditory pathways. These chapters detail the actual "plumbing" of the mechano-acoustic path and the nerve pathways from the mechanical transformer to the signal processor, *i.e.*, the brain.

Mr. Gelfand then introduces, in the following three chapters, the basic psychological aspects of hearing. Psychoacoustic methods, theory of signal detection and auditory sensitivity each have their own chapter. These chapters explore the theories of sound perception and analysis by the brain.

In chapters 10 — 14, the material of importance to audio and audio systems is presented. The material presented in these chapters will help understand why some audio systems work right, and why others will never work. In addition, the perception of sound by humans is presented so that readers can provide systems that do not, as George Augsburger has said, provide imaginary solutions to non-existent problems. Masking is presented in chapter 10, with the material starting with monaural masking and progressing with frequency scaling, central masking, temporal masking and ending with poststimulatory fatigue.

Loudness is covered in the next chapter. The author reviews loudness level, loudness scaling, critical bands and loudness of complex sounds, temporal integration of

loudness and loudness adaption. Here, Mr. Gelfand describes the way in which humans perceive and interpret loudness and loudness level of various auditory stimuli.

Chapter 12 concerns itself with pitch. Pitch scales, pitch and intensity, beats, harmonics and combination tones, complex tones and periodicity pitch are reviewed.

Chapter 13 reviews the fundamentals and processes involved with binaural hearing. This chapter covers binaural summation, differential sensitivity, binaural fusion and beats, directional hearing, time-intensity trades, precedence effect, localization, reverberation and masking level differences.

The final chapter addresses speech perception. Topics addressed are the production and perception of speech sounds, the power of speech sounds, speech intelligibility and dichotic listening. Here, Mr. Gelfand reviews speech production and perception. He describes how the two are inherently interrelated, in that "we must be able to speak what we perceive, and we must have the ability to perceive the sounds that our speech mechanisms produce." He also points out that speech perception depends not only on the level of the speech, but also the material presented.

Each chapter is extensively referenced, over 1,300 references in all. The author provides a list of authors cited in addition to a subject index. The references run from nineteenth century work, such as Helmholtz's *On the Sensation of Tone*, to work done in the mid 1980s. Every important work and author is represented.

Hearing is a book that can easily find a place in the library of anyone who work involves hearing, especially professionals in audio. ■

Hearing, An Introduction to Psychological and Physiological Acoustics, Second Edition, Revised and Expanded, Stanley A. Gelfand, Marcel Dekker, Inc., New York and Basel 1990.

Neil A. Shaw is a Senior Associate with Paul S. Veneklasen and Associates.

THE USE OF PLUTONIUM 239 IN LOUDSPEAKER MAGNETS

By Wes Alderson

Major loudspeaker manufacturers have recently announced the use of Plutonium 239 as the magnetic material in raw drivers.

This element provides a number of extremely significant advantages over the old Alnico and Barium Ferrite magnets. One major advantage is the fact that Plutonium develops a much higher flux density in the gap between voice coil and magnet, thereby increasing efficiency.

SALESMEN WHO CARRY SAMPLES SUFFER AN 8.3-PERCENT LOSS OF TOTAL BRAIN NEURON COUNT PER DAY.

Other advantages include the following:

- Plutonium has a greater magnetic retention factor which is limited only by the half life of this unstable isotope (PU-239).
- The use of Plutonium magnets also enables sound contractors to take x-rays with a simple Kodak box camera when in close proximity of the magnet. Save on doctor bills . . . for awhile anyway.
- Loudspeakers employing these magnets are also much easier to locate in dark attics during installations.
- In long throw drivers, PU-239 makes the "throw" three miles.

Optional Accessories: Magnetic Monopoles. Available in 10 gram jars at \$38.40. May be poured in liquid form into the gap to restore flux density at that point in time when magnet loses strength due to half life. Free Electrons. Available in 16

gram cans. (No cost because they are "free.") Additional Neutrons. No charge. Gravitons. Out of stock; no longer available.

Unfortunately there are certain disadvantages in the use of Plutonium as a magnetic material. Salesmen who carry samples of this "radical" new device suffer an 8.3-percent loss of total brain neuron count per day. This begins to add up after a few weeks and undoubtedly accounts for certain behaviors we have noted in the territory. To examine the effects of brain neuron loss, we interviewed Sandy Clifford, who has carried samples of these devices

for seven months. When we reached him in his new residence, at Good Samaritan Hospital, he was unable to comment.

Probably the most dramatic drawback to the use of loudspeakers with Plutonium magnets is the fact that they must be shipped and stored in no greater than five units at a time. If six or more are placed in close proximity, they exceed critical mass and produce an uncontrolled fission reaction. We have lost several important accounts and consultants in this matter; therefore please use caution. For details on this exciting new product contact Wes Alderson at (213) 870-9286 or (602) 438-9763. ■

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HYPERCEPTION

(continued from page 61)

dual channel. One special application of dual-channel operation is sound intensity measurements. Steve Orfield and William Thornton have written on this topic numerous times in SOUND & COMMUNICATIONS, but now is the first time (with both SYSid and Hyperception) that a dual channel analyzer has been available for anywhere close to \$5,000.

The program can generate any test signal you can draw (or write the equation for).

SIGNAL GENERATION

On the signal generation side, the program can generate any test signal you can draw (or write the equation for). The waveform editor has a rubber band mode. The mouse is used to shape waveforms, including in the zoom mode. Also copy, overwrite, insert and delete functions are provided by editor cut-and-paste mode. Many stock waveforms are supplied with the program, including sine, chirp (swept sine), pulse, sawtooth, random-noise.

Many stock waveforms are supplied with the program, including sine, chirp, pulse, sawtooth, random-noise.

What it does not do . . .

Calibration of absolute sound pressure levels is awkward and not addressed in the documentation. The software is programmed to automatically set 0 level at the DSP-16's maximum input level. At present, Hyperception Workstation does not

support distortion analyses directly. You can generate sine wave, or two-tone test signals (IM) and observe the distortion components (using the cursor for accurate readout); it is just that Hyperception does not do this automatically, nor is there mention of any of this in the help screens or documentation. Reverberation and intelligibility prediction are also not addressed. In the instance of reverberation, you can generate an appropriate test signal and set up the digital filters within the program to derive the RT60 within octave bands, but again, this is not a directly supported option from the menus or application notes. For this type of work, SYSid is the more appropriate program.

HARDWARE REQUIREMENTS

Host Computer

IBM XT/AT 386/486 compatible, 640 K memory, graphics support for Hercules monochrome, EGA, VGA, super VGA (800x600), and 1024 x 768 resolution, coprocessor optional but highly recommended, hard disk drive and high density (1.2 meg.) floppy drive.

Over 200 printers are supported, including Laser Jet and color Paint Jet. 2-D spectrographs can be in color or grayscale. Printouts can be screen dumps or if you have EMS memory above DOS 640 K in your computer, the quality limited only by your printer's resolution. Pop-up menus allow you to set scale factors, resolution, copies, etc.

Data Acquisition Board

Most acoustical consultants and sound contractors will be interested in Hyperception Workstation as an adjunct to the SYSid acoustical analyses system, since Hyperception will run on the same Ariel DSP-16 data acquisition board. The Ariel DSP-16+ is a high performance plug-in board for IBM compatible computers. The DSP-16+ has dual-channel inputs and outputs, low distortion (.005%), low noise (about 90 dB) and 20 kHz+ bandwidth.

I have mentioned that the Stewart Elec-

tronics mic preamp is a good solution if you want to have an external anti-aliasing filter. If you will be doing mostly wide band measurements, then the most hassle-free solution is the Josephson Engineering C-550 electret condenser mic with the integral power supply and preamp in the mic body. The is a special version of the C-550 and a single cable simply connects directly to the DSP-16's input. The mic works, is

Calibration of absolute sound pressure levels is awkward.

super-linear, comes with a calibration curve, clamp, padded case and is less than \$600 including cables; a bargain.

To get more of the power of Hyperception, such as the full stimulus response capability, the program/data memory upgrade option Ariel offers for the DSP-16 is needed (64U-16 add \$200). Stimulus-response is when the analyzer sends out a test signal and synchronously captures and analyzes the response of the device under test. This is the concept behind TEF, MLSSA, and SYSid. Typically, most audio people will buy SYSid for \$3,000, which includes the DSP-16+ and then add Hyperception for \$1,000. If this is your plan, then the 64K memory enhancement (+\$200) should be included in the DSP-16+.

You can generate an appropriate test signal and set up the digital filters within the program to derive the RT60.

While SYSid only uses the DSP engine to create the test signals, while using the coprocessor chip in your computer to process the data, Hyperception takes full advantage of the TMS320 on the DSP 16 board. By using the DSP engine, realtime

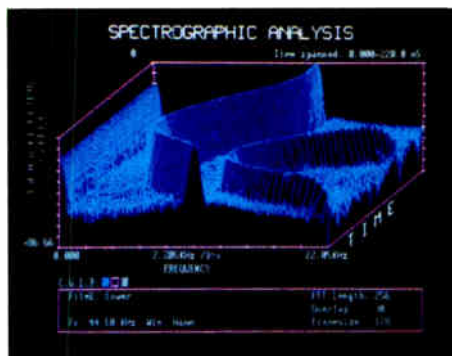
processing such as "live" FFT and scope functions are possible, as well as Hyperception's ultimate feat, a running 3-D waterfall display. A running waterfall, also known as waterfall mapping, is an animated 3-D frequency response curve during an event, such as the spectral decay of a room, or perhaps a speaker, responding to a test signal.

When traveling on the road, using a laptop that does not accommodate a DSP board, or maybe not even a coprocessor, Hyperception can be configured to work with these hardware limitations regardless. Both SYSid and Hyperception will work with Hercules and CGA graphics, usually one of which is supported in most low end laptops. Hyperception directly supports a large number of graphics boards and can be optimized to work tolerably well on most laptops, limited only by the typically marginal graphics quality of the screen. Coprocessor operation is automatically looked for by the software; if found then it is used, if not found, coprocessor operation is "emulated."

Hyperception directly supports a large number of graphics boards and can be optimized to work well on most laptops.

Emulation means the software fakes coprocessor operation in order to run the program, but the computation time is increased. The user, in the Utility menu, informs the program if a DSP board is installed. If you are not using a DSP board and a coprocessor, be sure you have patience, as the program slows down enormously!

If you require more than two channels, or want better than 16 bit dynamic range, or need faster processing capability, then super-processor boards, such as the Ariel ADC56000 can be used. One situation that benefits from a higher power board than the Ariel DSP-16 would be for auralizing,



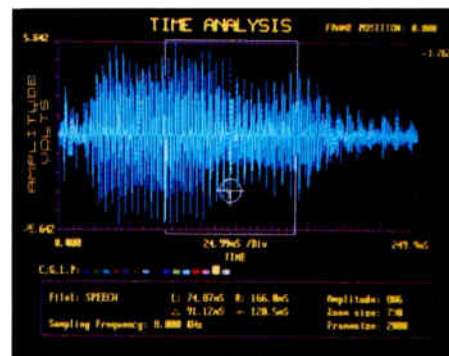
Three dimensional Time-Energy-Frequency plot of two sine waves changing in frequency over time.

the ability we have discussed that superimposes the simulated sound of a computer modeled room on an anechoic recording.

The DSP-16, when used with Hyperception, will allow direct to disk recording at 50 kHz sampling rates, in stereo. If the signal has a dynamic range equal to or beyond the DSP-16's capability (such as trying to process very wide dynamic range music from a DAT or CD), you will not have any headroom and must set your levels carefully. Hyperception informs you of impending overload and asks you if you want to rescale your levels. Obviously the 24 bit dynamic range of the Ariel ADC56000 signal processing board would be beneficial, but remember that SYSid will run only the DSP-16.

User Interface

Hyperception uses a mouse (or a cursor) with three menus, separated into Time Domain, Frequency Domain, and Utilities. About 30 functions are available within these three main menus. Although the user interface has been cleaned up quite a bit in release 2.0 and 2.02, getting proficient with Hyperception requires a little work. After all, you are in control of a real time scope, digital storage scope, real-time and event spectrum analyzer, and digital filter design system, as well as interface with the data acquisition board, all from the same main menu!

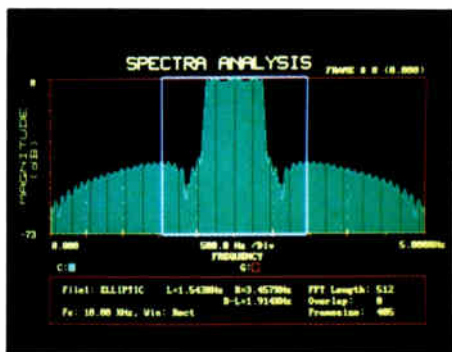


Oscillograph of speech signal.

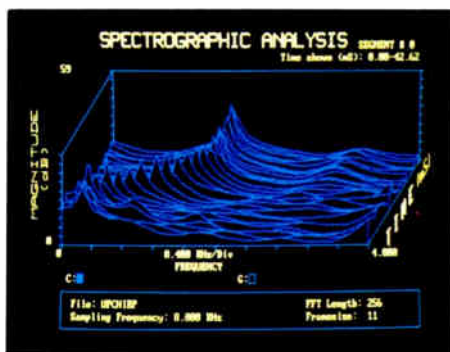
Is Hyperception too much for you? One way to find out painlessly is to get their (free!) demo disk, which offers much of the operation of the full program, but is limited to the demo files provided on the disk. (Incidentally, a demo disk is available for checking out the MLSSA and SYSid systems, which also have free or inexpensive demo disks.)

Is Hyperception too much for you? One way to find out is to get their (free!) demo disk.

Beyond the Hyperception demo disk, the next step for SYSid users would be to consider Hypersignal or Hypersignal Plus. These are programs that cannot generate test signals, nor acquire data. Using the SYSid, or Ariel's Scope or FFT programs you can export your data files into Hyperception, theoretically. Actually, when I tried to do this, I ran into some file compatibility problems. When this review went to press, Hyperception and Ariel were busy working the bugs out. Since these two companies are on more than speaking terms (both sell each other's products), this should be resolved shortly. When this file transfer works, I will mention it at the most appropriate op-



Magnitude response of elliptic bandpass filter. Note cursor is set to zoom in on band of interest.



Time-Energy-Frequency plot of swept sine wave.

portunity. I think this is more a problem of lack of documented procedures rather than incompatibility.

If you have the cash, I think the full Hyperception Workstation is the way to go for the most serious SYSid users. The sound contractor who simply wants to proof out the installation will find what he needs in SYSid. In fact, the next release

If you have the cash, I think the full Hyperception Workstation is the way to go.

of SYSid software (just being released as you read this) will have smoother general operation, a more complete RT60 module (featuring a multi-band, multi-color RT60 waterfall), and added %ALcons, STI and RASTI, and critical distance algorithms, along with a dozen more subtle enhancements!

If you need the capabilities of Hyperception Workstation, but you are not computer literate, or maybe you are a Microsoft Windows 3.0 fan, then you will want to know about Hypersignal-Windows. This program is just in the initial beta testing stage and features a totally graphical user-interface. Unlike Workstation, the Windows version keeps non-essential options out of view, unless they are pulled down. Potentially,

this will be an easier to learn program, with a faster learning curve. I will be playing with it soon and when Hypersignal-Windows is ready we will review it. JBL's CADP2 is also going to be a Windows 3.0 program, and these two might make a good sound system design and test combination. Remember that Windows 3.0 needs a fast computer with at least a few meg. of memory.

Documentation and Support

The Hyperception Workstation manual is 380 pages with extensive graphics and an index. The manual is comprehensive, but it lacks specific application notes for audio and acoustics and these are covered in a separate Reference Guide, which is well written and features numerous screen images. The main manual's organization is not ideal, with important information needed for understanding the program's operation appearing about midway between the covers. You will not get anywhere near the full potential of the program without becoming familiar with the contents of the two reference books. Hyperception's phone support is quite good.

Controlled Stimulus Response vs. Arbitrary Waveform Acquisition

Stimulus response operation is when a known test signal is generated by Hyper-

ception, and sent from the digital to analog converter on the DSP board to the outside world (to an amplifier and speaker). The sound system's (or whatever) response is then captured by a mic/preamp and input to the DSP board's analog to digital converter for analysis. The test signal is known and synchronized with the data acquisition process. Other stimulus response systems are the Techtron TEF, DRA MLSSA and the Ariel SYSid. Only recently has Hyperception added stimulus response to the system. Aside from stimulus response, the other class of analyzer is arbitrary waveform capture, such as the conventional FFT instrument which simply acquires whatever signal is present whenever it is turned on. Hyperception also completely supports this type of operation, and this is very useful for using CD test

Hypersignal-Windows is just in the initial beta testing stage and feature a totally graphical user-interface.

disks, analyzing the noise floor of rooms, machinery vibration analysis and so on. Using the trigger function or disabling averaging and cross correlation functions can enable some of the other stimulus response analyzers to operate somewhat as straight arbitrary waveform FFT analyzers.

ALTERNATIVES TO HYPERCEPTION

Digital signal processing software has been around for a long time, and one of the most established packages was ILS from Signal Technology Inc. I first came across ILS in college. At the time (20 years ago) it was for mini and mainframe computers and cost well over \$10,000, just for the software license. Data acquisition subsystems cost about the same, and the mini-computers were \$50,000+. More recently, ILS-PC was introduced, which

runs on IBM compatibles. Various data acquisition boards will work with the ILS system that are in the same price range as Ariel's DSP-16, while the ILS software is now about \$2,500. Since the ILS system is the most well known signal processing program in the scientific community, if not the audio/acoustic community, a brief comparison to Hyperception Workstation is in order. I had the opportunity to look over an evaluation copy of ILS-PC recently.

To be brief, ILS-PC is not a viable program for sound contractors or acousticians. It seems to have retained all the bad habits of the mini-computer days, such as poor error trapping, cryptic commands, endless function modules that do not want to talk to each other and more of the same. The bottom line is that ILS has not kept up with what is being offered elsewhere, for less money.

A few other signal processing packages do offer a bit more competition to Hyperception, but they do not run on the DSP-16. As SYSid is a very powerful and attractive program, but it only runs on Ariel's DSP-16, it does make this board and the other software programs that work with it of special interest to sound contractors. Other boards and signal processing software are being examined (some for the Mac II, others for IBM compatibles) and will be covered in future issues of SOUND & COMMUNICATIONS.

A few other signal processing packages offer competition to Hyperception, but they do not run on the DSP-16.

Hyperception introduced Hypersignal over five years ago, and has sold about 1,500 packages. Although it has not yet been embraced widely by the audio/acoustic community, Hyperception has recently targeted their development efforts in this direction.

One of the audio/acoustical users of this software is Sam Berkow of Joiner-Rose, and we will be covering his work soon. Another experimenter is Don Davis, and I am sure he will be writing about his experiences with this tool. During the past two years I have played with the program and watched it grow. The stimulus-response capacity has only been supported for the DSP 16 since last month, and the running waterfall and playback (auralizing) added just in time for Sam Berkow's paper at the 1990 LA AES. In fact, they only got around to adding log displays six months ago!

While TEF, SYSid and MLSSA are specifically targeted for audio system analysis, Hyperception complements their capabilities.

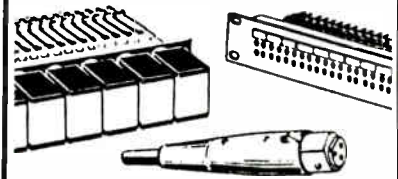
While TEF, SYSid and MLSSA are specifically targeted for audio system analysis, Hyperception has wider applications and complements their capabilities (file interchange is planned for EASE, SYSid and the TEF 20). When Hyperception is compared to other general purpose signal processing programs, it is the only developer I know of that is aware of and working toward creating this type of package specifically enhanced for acoustic and audio applications. For the acoustical consultant or sound contractor that has bought the Ariel SYSid and learned how to use it, and wants to do more, Hyperception is the ideal complement. ■

Hyperception, Inc. 9550 Skillman LB125, Dallas, TX 75243.
 Ariel Corporation, 433 River Road, Highland Park, NJ 08904.
 Stewart Electronics, 11460 Sunrise Gold Circle, Suite B, Rancho Cordova, CA 95742.
 Josephson Engineering, 3729 Corkerhill Way, San Jose, CA, 95121.

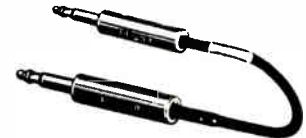
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Fourjay Installed

Music Systems Inc. of Bismark, North Dakota has announced the acceptance of its bid to upgrade the intercom and sound system for Dan's County Market in Dickinson, North Dakota. The market is a member of the Super Valu grocery chain popular in the Midwest. The installation will include 30 Fourjay Industries Model ST5-HF8W all-white music speakers. According to John Larsen of Music Systems, "In this type of open ceiling installation, the HF8 kettles have been very effective in providing clear paging while still allowing the music to be played with full frequency response."



Sony Video ID Storage and Access System

Badge Printer

Sony's UP-610 Video Sticker Printer has been used at two security shows to illustrate the ability of the system to produce instant black and white photo badges on adhesive backed video prints. Visitors to an installation pose for a video "snapshot" taken by the system's camera which is built into a compact unit that also houses a four-inch flat monitor. The snapshot can then be married electronically to the visitor's data file with an IBM PC compatible program, and printed out in the form of a peel-off temporary ID badge. The system's open architecture permits it to interface with existing databases.

University in New Zealand

The Pavilion of New Zealand has installed University Sound equipment in the cultural center and entertainment complex. Musicaster 100 compact loudspeaker systems are used in four outdoor areas of the facility. The system's enclosure is one-piece molded polyethylene, and all parts are weatherproof.

British Distribution

DRV Public Address Consultants has announced that it has been appointed the Rockustics distributor in the United Kingdom. DRV says the full line of Rockustics and Plantronics loudspeaker enclosures are to be stocked in the UK and are to be marketed in conjunction with the B.E.S.T. line.

ICA Exposition

The International Communications Association holds its annual exposition at the Anaheim Convention Center June 4 through 6, 1991. For the first time, the ICA Expo will feature a multi-vendor showcase demonstrating integrated business applications with related technical programming open to the industry at large. In the past, ICA technical programming has been open only to ICA members and guests.



Bose Acoustimass 5 Series II

New Acoustimass

Bose Corporation has introduced the Acoustimass 5 Series II Direct/Reflecting speaker system, for the residential market, providing enhanced bass, wider dynamic range, lower distortion and smoother extended frequency response than previous versions. The system consists of two arrays of stereo imaging speaker cubes (each cube about the size of an apple) and a typewriter-sized Acoustimass bass module. Four two-and-a-half inch wide-range drivers are mounted in the cube-shaped enclosures. Two cubes are connected to form each of the left and right channel speakers. The cubes can rotate nearly 360 degrees.

Colorado Center

Altec Lansing has announced that the Montrose Colorado Civic Center has installed an array of sound systems and components by Altec. Facilities using the equipment include a senior citizens center, an auditorium, meeting rooms and banquet facilities. Commercial Specialists of Grand Junction, Colorado, designed and installed the sound system in the new civic center. The 602-seat auditorium uses Altec A700s supplemented with MR11 Mantaray horns and 938-8A stage monitors. The meeting rooms and banquet facilities are equipped with Altec 1700 series mixer/amplifiers that are patch/combinable to accommodate different room configurations. The senior citizens center uses Altec 1700 series mixer/amplifiers and an overall paging music distribution system.



Craig Tordsen, Genesis

Restructured and Restaffed

Genesis Audio/Video in El Toro, California has restructured and restaffed its organization "to meet the increasing and changing demands of the audio/video equipment and systems marketplace." Bill Organ has been promoted to sales manager. Craig Tordsen has been named to direct the Commercial Projects Division specializing in conference, media and board room sales for commercial purposes. He will also assist in the residential and custom sales effort which has been expanded to include satellite dish system sales and installations.

New Tools

Echelon Corporation, founded by Mike Markkula, Jr., founder of Apple Computer, has introduced a "new class of control technology," a method of distributing intelligence and control across groups of products at a reported low cost. Support for the new technology platform was announced jointly by Motorola and Toshiba, which will produce the multiprocessor Neuron Chip for the new control network. Over 32,000 sense and control nodes are possible per system. Small networks can be placed inside individual products. Larger networks can create smart environments.

The system is based on a "local operating network" or LON. Nodes on the network have the ability to sense and monitor, count and tell time, manage switches and relays, and respond to conditions reported from other nodes. The LONs will be built from off-the-shelf interlocking parts. In addition, Echelon has announced the availability of LonBuilder, a developer's workbench.

Ambisonics in Nike Town

Soundings-ElectroTec, Inc. of Winslow, Washington has announced that it has supplied equipment for an Ambisonic production by Audisee, the sound design team in Seattle, for Nike Inc.'s recently opened Nike Town store in Portland. Nike Town incorporates sports, film, history and entertainment as well as product innovations, and is a prototype for similar retail stores to be built in other cities, reportedly including New York and Berlin. The Ambisonic Surround system includes sound effects recorded in the field using an AMS ST250 Ambisonic/Stereo mic. The Ambisonic Mastering System was also used.

Bose Training Seminar

Bose Professional Products held its World Sales Conference and Technical Training Seminar with 97 attendees from 28 countries. Four languages were simultaneously translated; French, German, Italian and Spanish. David Bell, manager of Bose Professional Products, moderated and hosted the event. A series of presentations by Bose personnel was presented over three days, with discussions including basic acoustic and physics, design of clusters and distributed sound systems, designing with software and sales strategies.

Audio Precision Cited

According to Audio Precision, the company has been cited by Prime Data, the test and measurement industry monitoring firm in San Jose, as the largest supplier of audio test equipment to the professional audio-broadcast-hi-fi market segment, which is the fastest growing market segment during the past five years.

Mark IV in Rio

Electro-Voice MT-4 concert speaker systems and Vega R-42A wireless microphone systems are playing a major part at Carnival in Brazil. Instalson is the Brazilian sound company providing audio for the Carnival parade along Avenida Marques De Sapucaí in Rio de Janeiro. Ronald Deakin of Instalson recommended the E-V system. Instalson is suspending high and low frequency cabinets in pairs along the parade route, using a delay system. More than 80 MT-4 cabinets are used. Vega R-42A wireless microphone systems have been used for the past three Carnival celebrations.

Fieldpiece Formed

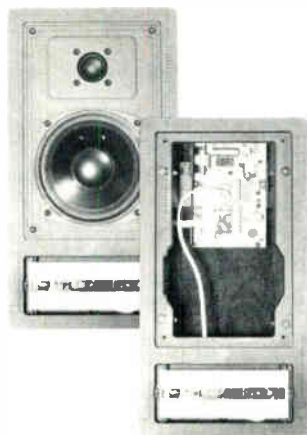
Fieldpiece Instruments has been formed to supply products designed for field service technicians and engineers in electronic, electrical, HVACR, and automotive markets. Initially the company will supply a line of heavy duty digital multimeters and integrated accessories. The company is headed by Rey Harju who has previously worked with Beckman, General Electric and ITT/Pomona Electronics. The company is located in Buena Park, California.



Ramsa WR-S840 monitor consoles.

Audio Tech Provides Awards Sound

Audio Tech of Sun Valley, California provided sound reinforcement services for the recent Billboard Awards show. According to Jim Showker, president of Audio Tech, the event was an acoustic challenge. "We had to create television quality sound in a huge building that is basically made of tin." Included in the system used were two Ramsa WR-S840 monitor consoles.



Bang & Olufsen IWS 2000 allows mounting of transceiver in the enclosure.

Residential Speakers

New in-wall speakers by Bang & Olufsen of America feature a one-piece flat grille of high-density ABS which eliminates the need for a trim ring. It is held in place by magnets. The grille's edges are tapered to cast no shadows. Two versions each feature a polycarbonate one-inch dome tweeter, multi-layer voice coil in a long-throw design, and 5.25 inch woofer. The model IWS 2000 allows mounting of the B & O Master Control Link transceiver and relay box, both of which are hidden from view. With a B & O remote control, this option allows any audio or video source in the system to be controlled from the room in which the speaker is located. The speakers will be available in June 1991.

CEDIA Meet Planned

The Custom Electronic Design & Installation Association is planning to hold its second annual Business Management and Trade Expo October 8 through 13, 1991 at San Francisco's Fairmont Hotel. The first Expo last October was held in Florida and included 25 seminars and exhibits of 40 manufacturers. CEDIA is the national trade association of companies which specialize in planning or installing electronic systems for the home. The association was founded in September 1989.

REP NEWS

Rep of the Year

Mike Green, principal of BTW Company, Aiea, Hawaii, has been named "Rep of the Year" by Sonance. Other awards presented by the company included "Most Inspirational Rep" to Dobbs-Stanford of Dallas, Texas; and "Most Improved Territory" to Market Share of Bellevue, Washington.



Sonance sales manager Dave Donald, in calypso gear for his performance at the Sonance rep breakfast, presents "Rep of the Year" plaque to Mike Green, BTW.

Firm Formed

S/R Marketing, Inc. has been formed by Walter Radner and Stephen Stone to represent sound and security products. The firm, located in Mount Liberty, Ohio,

covers Ohio, West Virginia, western Pennsylvania, and southern Michigan. Current lines, according to S/R include West Penn Wire, Sony Security Systems, Frazier Loudspeakers, Montgomery Technology, Dataline, and WSA.

Telecall Appoints Reps

Telecall America has announced several appointments of reps. Kodo Associates Inc. covers Minnesota, North and South Dakota, and western Wisconsin. Tel-Tronics covers Missouri, southern Illinois, Kansas, Iowa, and eastern Nebraska. Product Support Inc. covers Colorado, Utah, Wyoming, western Nebraska, eastern Montana and eastern Idaho.

U.S. Appointments

Audiomation Systems has appointed U.S. representatives for its Uptown moving fader console automation system. Leo's Audio & Music Technologies now covers northern California; Audio Interval Design covers southern California; Audio Techniques represents the metropolitan New York area; Anything Audio covers New England; and S.G. Audio covers the Midwest. Sound Associates represents the company nationally to the performing arts.

Hansen Named

Ronald G. Hansen has been named sales representative for Allied Film & Video throughout west central and northern Florida, as well as southern Alabama and Georgia. Hansen sells Allied's video duplication and fulfillment services, as well as motion picture film processing services.

FSR Rep

FSR, Inc. has appointed C.B. Electronic Marketing to represent its product line. The rep firm handles Wyoming, Colorado, Utah, Montana and parts of Idaho. Charles and Larry Bickford handle the line.

BBE Sound Appoints

BBE Sound Inc. has appointed Starin Marketing to represent the company in Minnesota, South Dakota, North Dakota, Wisconsin, north Illinois, Indiana and Kentucky. Starin Marketing includes Jon Bormann, Joe Stopka, Neal Weber and Jim Starin.

Additionally, BBE has appointed Studiotec for distribution, marketing and sales in Finland; Mack srl in Italy; Bon Studio Sound in Greece.

PRODUCTS

AKG's Mini-Mic; Sony Video Printer

Miniature Condenser

AKG Acoustics, Inc. of San Leandro, California has announced the C407 miniature condenser microphone. The features include an omnidirectional capsule and the housing is .3 inches in diameter. It comes with a detachable pin and clip, as well as a removable windscreen.

The C407 comes in two configurations: the C407 with the cable terminated by an XL-type connector containing a preamp/phantom power adaptor, and the C407/B with its cable terminated in a mini-plug for use with a wireless body pack or phantom power supply.

Circle 1 on Reader Response Card



The UP-610 b/w printer.

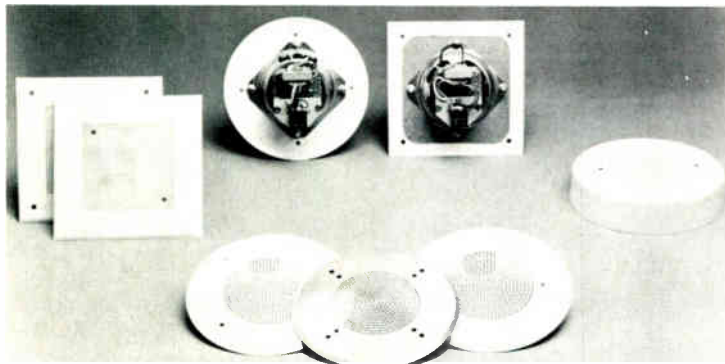
Video Printer

Sony Security Systems has introduced three video printers. The UP-910 b/w printer can produce print sizes up to 6 inches x 8 inches. The Printer produces 128 levels of gray and a maximum dot density of 750 x 508 pixels. It operates on EIA or CCIR b/w video standards with automatic selection.

Sony has also announced the UP-610 small format b/w printer which offers a print size of 2 1/8 inches x 3 1/2 inches. The unit produces peel-off, adhesive-backed prints.

In addition, Sony has introduced the UP-3000 color printer which produces 500-line resolution color prints.

Circle 3 on Reader Response Card



Speaker Assemblies

Atlas/Soundolier has introduced 4-inch diameter UL-listed loudspeakers for alarm signals and voice instructions. The "Fire Protective Signalling Speakers" can be used with compatible control equipment to provide voice communications, as well.

Power handling ratings of series UBT and UBT are 5 watts and 8 watts respectively. Frequency response range is 400Hz-4kHz, phenolic cone with an 8 ohm impedance. Speaker baffles are offered in white or brushed aluminum.

Circle 2 on Reader Response Card

Mics, Mics, Mics

Audio-Technica has introduced the High Energy ATM series of microphones with neodymium magnets. Included in the series are the ATM41HE and ATM61HE dynamic microphones, the ATM35 condenser microphone, the AT804 omnidirectional microphone and the AT8106 pop filter.

Circle 4 on Reader Response Card



Dual Channel Compressors

QMI has introduced Drawmer's DL241 Auto-Comp dual channel compressor/limiter. The Auto-Comp includes features and "sonic excellence" at a suggested list of \$699.

Features include: switchable, automatic program-dependant compression, soft-knee/ratio, zero crossover attack and LED displays.

Circle 5 on Reader Response Card

Dynamic Mic

Sennheiser has introduced the MD 422 dynamic microphone for road and studio applications. It is constructed entirely of metal and contains a hardened steel basket as well as a spring suspended microphone element.

Flat response is claimed. A five-step low frequency attenuator is also included.

Circle 7 on Reader Response Card



E-V Intros

Electro-Voice has introduced several products including the BK-42 series of stereo mixing consoles which are available in 8-, 12-, 16- and 24-channel configurations. Features include a humbucking ground design and servo-balanced outputs.

E-V has also introduced the 7600 stereo powered amplifier rated at 400 watts per channel at 8 ohms and 600 watts per channel at four ohms from 20Hz-20kHz at less than .1-percent distortion.

In addition, the DML-1152MC slant-monitor has been added to the DeltaMax line of electronically controlled speaker systems. The system features the 15 inch DL15X woofer and a DH1A high-frequency driver on a 'special' version of the HP64 horn.

Circle 6 on Reader Response Card

Sound Detector

The SDR sound detection relay from T-S-K Electronics uses existing intercom speakers as microphones to monitor any area for unusual disturbances. Two SDR Versions are available: The SDR-C is compatible with direct select intercoms and the SDR-D is designed for microprocessor-based intercom systems and school consoles.

Circle 8 on Reader Response Card



E-V's BK-42 series stereo mixing consoles.

Retirement System

Tel-tron has introduced the Microscan 2000 series systems designed for retirement center use. The Pre-engineered system supports emergency call, apartment smoke detection, daily resident check-in, voice communications, perimeter door monitoring, etc.

A microprocessor coordinates signal processing via "data gathering" cabinets. Duplex processing minimizes "home run" wiring.

Circle 9 on Reader Response Card



Crafty Consoles

Soundcraft has introduced the Spirit line of consoles. The two products in the line include the Spirit Live for sound reinforcement and the Spirit Studio for multitrack recording.

The Spirit Live is designed for a wide range of applications including small clubs, conference halls and churches.

The line incorporates Neutrik connectors, Alps faders and Soundcraft's equalizer and microphone preamp.

Circle 10 on Reader Response Card



The Soundcraft Spirit Studio for multitrack applications.

Video Quad

The JQ100 video quad system from Javelin is a realtime, high resolution video quad system for use with four separate cameras. Javelin's quad system allows for freeze framing of any of the four cameras for attention to a specific scene.

Circle 11 on Reader Response Card



Systems Interface

Audioaccess has introduced the SEI module (Source Equipment Interface). The SEI module enables Audioaccess' control systems to interface with any infrared controllable source equipment. Designed to memorize the infrared command codes of source equipment, the SEI was designed to provide a means of integrating Audioaccess control systems with source equipment without a hardware connection.

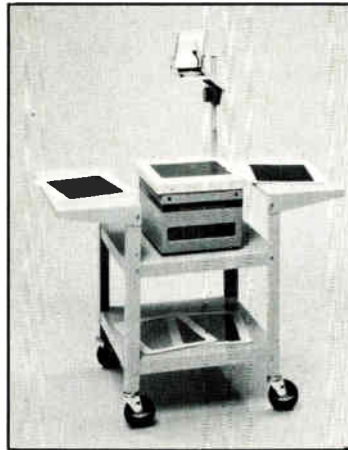
Circle 12 on Reader Response Card



Near Field Monitors

The Audix HRM-1s are two-way near field monitors that feature 6 1/2 inch polypropylene low-frequency drivers with rubber surround and dust cap.

Circle 13 on Reader Response Card



Overhead Projection Cart

Apollo Audio Visual has introduced an overhead projection cart designed so that presenters are able to sit or stand during a presentation. The adjustable top shelf has five positions between 21 and 29 inches.

Circle 14 on Reader Response Card

Paging Adaptor

Telecall has introduced as standard equipment the MP-TBZ talkback/zone paging adaptor for the Market-Page in-store paging intercom system. Replacing the MP-CU straight paging adaptor with the MP-TBZ will allow for zone paging and talkback.

The system allows a maximum of three zones, one MP-TBZ for each zone. The company states that no modification is necessary for this system.

Circle 15 on Reader Response Card

Mini-Dome Camera

Pulnix has added to its line of video and security products with the VCC-510 mini-dome camera, a monochrome CCD camera contained in a miniature ceiling mount dome. The camera measures 5.5 inches in diameter and is 3.5 inches deep. The dark red viewing window gives no clue as to the camera's direction. For very low profile installation, a flush mounting kit is available.

Circle 16 on Reader Response Card

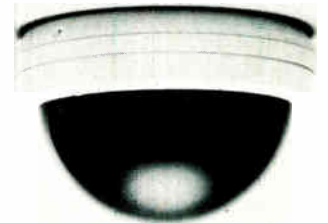


Table-Top Administration

The communications Systems Division of Dukane Corporation has announced the Compact 3200 series administrative communications system. Designed for use in educational, correctional and industrial facilities the 3200 is microprocessor controlled and allows for the inclusion of system options such as the telephone interface. Access is possible for up to 75 stations one at a time, in combination or all at once.

Circle 17 on Reader Response Card





Portable Sound System

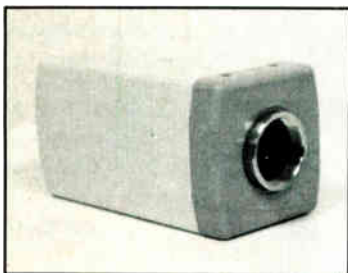
Anchor Audio has introduced the Voyager. The unit is a portable sound system for schools and municipalities which weighs 19 pounds. It has an auxiliary input for use with a tape recorder or instrument, and is battery powered for six to eight hours a charge.

Circle 18 on Reader Response Card

Hi-Fi Ceiling

The KSI 80-81CS system consists of one 8-inch low frequency driver with a polyolefin cone and a 20 ounce magnet. A 3/4-inch mylar dome tweeter and a 10-inch passive radiator are also included. The system is designed to be mounted in a 2 foot x 2 foot ceiling grid.

Circle 19 on Reader Response Card



Industrial CCD

Audio Video Supply has introduced a black and white CCD camera. The CV-110, designed for industrial applications, utilizes a 510 X 492 CCD in a 1/2-inch format. Resolution is 420 lines with a minimum required illumination of .02 lux.

Circle 20 on Reader Response Card

Low Light Camera

Elmo Mfg. Corp. has introduced a CCD camera with a low light capability of .08 lux and 500 lines of resolution. The black and white model SE-360 offers seven shutter speeds to 1/4000 second, Gen Lock and Line Lock and is available in three different power configurations.

Circle 21 on Reader Response Card



Bench DMM

B&K—Precision has introduced a three 1/2 digit bench DMM with a claimed .1 percent dc voltage accuracy, ac voltage response to 40 kHz and a .5 inch LED display. The model 2831A measures current to 20 amps, voltage to 1200 VDC or 1,000 VAC and resistance to 20 megaohms.

Circle 22 on Reader Response Card

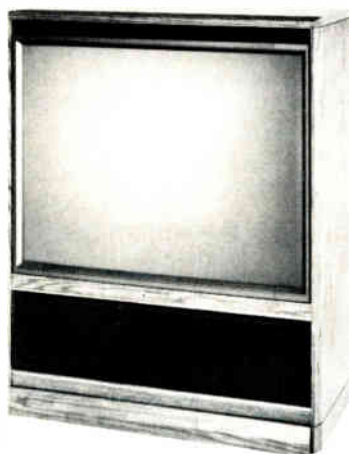


Control Panel

The Notifier System 5000 is a micro-processor-based fire alarm control panel which consists of a modular hardware design along with field-programmable zoning and operation.

Alarm initiating circuit modules provide multiple style 'B' or style 'D' Alarm Initiating Circuits. Alarm indicating circuit modules provide multiple style 'Y' or style 'Z' signaling zones.

Circle 23 on Reader Response Card



Video Monitor

The PT-4590VY 45-inch diagonal color projection monitor/receiver is being introduced by the Audio Video Systems Group of the Panasonic Communications & Systems Company.

The PT-4590VY includes three S-Video inputs and three stereo audio/video input/output jacks. Also included are three seven-inch optically-coupled lenses and three liquid-cooled picture tubes.

Circle 24 on Reader Response Card

Noise Gate

dbx has introduced the 363X half-rack noise gate. The 363X incorporates two independent or stereo strappable channels of gating. Each channel features separate Threshold, Hold, and Release Rate controls with Key Input, Key Engage, Key Monitor, Bypass and Stereo modes front panel selectable.

Circle 25 on Reader Response Card



Remote Control

The TeleCommand System 100 from JDS Technologies is a telephone-operated remote control system for control of up to 100 electrical devices by dialing touch-tone commands from a phone, on or off premises, or via the TeleCommand into an ac outlet and telephone jack.

Applications include lighting and appliance control, security systems, computer access protection, etc.

Circle 26 on Reader Response Card

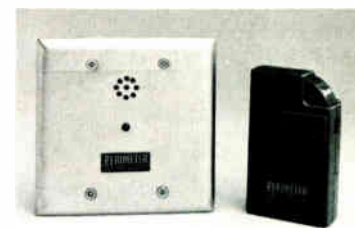


Personal Alarm System

Perimeter Products has introduced an updated version of its PAS-120 personal alarm system. The PA-RTS-01 personal alarm receiver/transmitter is designed to be integrated with any manufacturer's annunciator/control system.

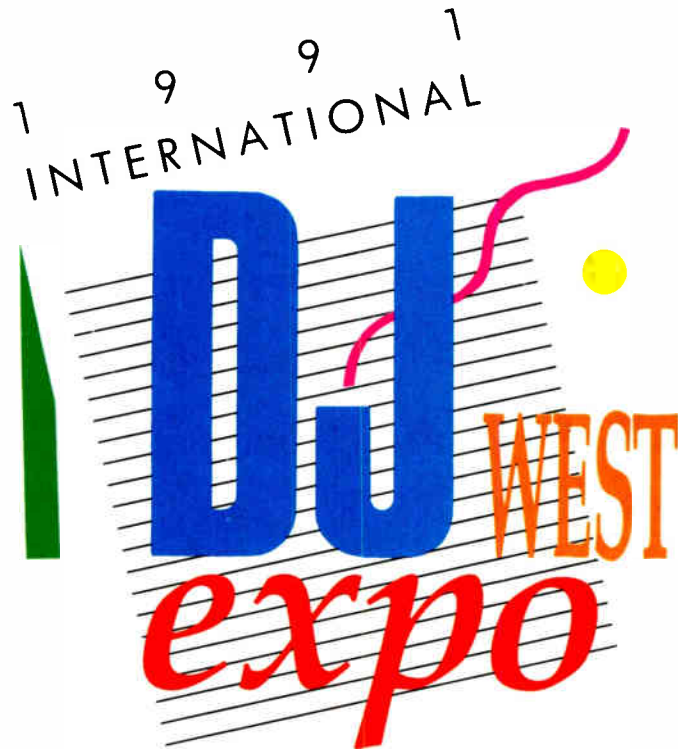
Individuals are equipped with a transmitter that sends a duress alarm signal to the receiving unit which then activates a relay. The receiver then identifies the location of the situation.

Circle 27 on Reader Response Card



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- Lighting Equipment Dealer/Distributor
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- Artist
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Please photocopy for your files or if you need additional forms.

LITERATURE

Ramko and Contact East Catalogs



Pro Audio

Ramko Research is offering its 1991 catalog for contractors and broadcasters. Eighty-nine items are available with more than 600 variations including Ramko's xL AS10 modular, integrated audio system. Other products include switchers, mixers, mic/line amps, interfacing amps, paging amps and preamps.

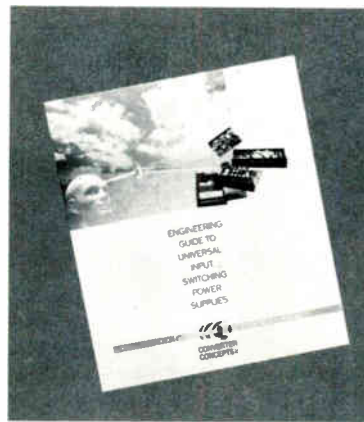
Circle 28 on Reader Response Card

Test Catalog

Contact East has introduced a full-color 164-page catalog which contains test instruments and tools for testing, repairing and assembling electronic equipment.

Aimed at engineers, managers, technicians and hobbyists the catalog contains products including oscilloscopes, power supplies, DMMs, soldering/desoldering systems, static protection products, ozone safe cleaners, magnifiers, inspection equipment, workbenches and lines of tool kits and cases.

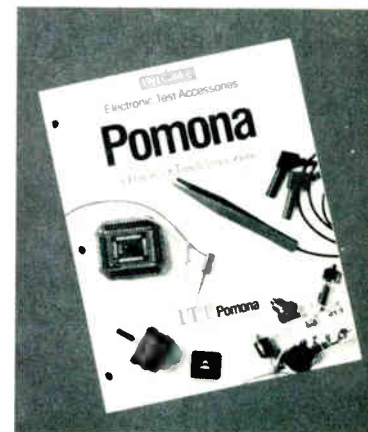
Circle 29 on Reader Response Card



Input Switching Power Supply

Converter Concepts has published a catalog featuring its line of universal input power supplies. Included are product information and specifications as well as tips on simplifying universal input switch power supply selection, product specs and ordering information.

Circle 30 on Reader Response Card



Test Accessories

Pomona Electronics has introduced a 140-page 1991 Catalog of Electronic Test Accessories. Products include a new 32-pin PLCC (.05 pin spacing) clip for Eprom devices and 100- and 132-pin QFP SMT test clips for Motorola 68020/68030 and Intel 80386SX microprocessors.

Circle 31 on Reader Response Card

Fiberoptic Cable

Pearson Technologies has announced its latest fiberoptic cable report, "How to Choose & Specify Fiber Optic Cables." The 35-page report is a guide for determining the optical, mechanical and environmental specifications for fiberoptic cables.

Circle 32 on Reader Response Card

CALENDAR

Upcoming Events

APRIL

Midlantic Electronics Show: King of Prussia, PA: Contact: (215) 828-2271. April 2-3.

ERA Annual Conference: Lisbon, Portugal: Contact: (312) 649-1333. April 4-11.

Facilities Security and Protection Expo and Conference: Chicago, IL: Contact: (708) 299-9311. April 9-11.

NAB (National Association of Broadcasters): Las Vegas, NV: Contact: (202) 429-5300. April 15-18.

DJ Expo West: Los Angeles, CA: (516) 767-2500. April 23-25.

Acoustical Society of America: Baltimore, MD: Contact: (212) 661-9404.

EDS: Las Vegas, NV: Contact: (312) 648-2300. April 30-May 2.

MAY

Video Expo: Los Angeles, CA: Contact: (914) 328-9157. May 14-16.

NSCA (National Sound & Communications Association): Cincinnati, OH: Contact: (800) 446-6722. May 20-22.

Comdex/Spring: Atlanta, GA: Contact: (617) 449-6600. May 20-23.

Fiberoptic Competency Certification Program: Sturbridge, MA: Contact: (508) 347-8192. May 20.

Semicon West: San Mateo, CA: Contact: (415) 964-5111. May 21-23.

Rep Expo: Milwaukee, WI: Contact: (708) 729-0100. May 22-23.

JUNE

Consumer Electronics Show: Chicago, IL: Contact: (202) 457-8700. June 1-4.

Expo Comm: Moscow, USSR: Contact: (301) 986-7800. June 5-10.

Nepcon East: Boston, MA: Contact: (708) 299-9311. June 11-13.

New Music Seminar: New York, NY: Contact: (212) 473-4343. June 13-18.

Test Engineering Conference: Atlanta, GA: Contact: (800) 223-7126. June 25-27.

JULY

Nomda/Southeast: New Orleans, LA: Contact: (800) 228-9772. July 17-20.

Communication Networks West: San Francisco, CA: Contact: (508) 879-6700. July 15-18.

Video Expo: Chicago, IL: Contact: (914) 328-9157. July 29-August 2.

AUGUST

NESDA/ISCET (Nat'l Electronics Sales & Service Dealers Assoc./Int'l Society of Certified Electronic Technicians): Reno, NV: Contact: (817) 921-9061. August 5-11.

Surface Mount: San Jose, CA: Contact: (800) 223-7126. August 27-29.

ISC East (International Security Conference): New York, NY: Contact: (708) 299-9311. August 28-30.

SEPTEMBER

Midcon: Rosemont, IL: Contact: (213) 772-2965. September 10-12.

Design Technical Conferences: Miami, FL: Contact: (212) 705-7740. September 22-25.

Video Expo: New York, NY: Contact: (914) 328-9157. September 23-27.

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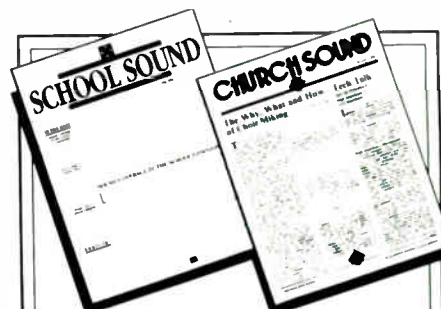
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PEOPLE

Multiplex Appointments; Stoner at Mitsubishi

Harju and David at Multiplex

Rey Harju has been appointed marketing manager of Multiplex Technology, Inc. In this position Harju's primary emphasis is on new product development and market penetration.

Harju has previously held positions with ITT/Pomona and Beckman.

In addition, John David has been named Product Specialist. David will be responsible for solving customers' technical and commercial problems, including working with customers to develop technical solutions and locating products needed within factory lead times.

CCTV Sales at Mitsubishi

Greg Stoner has been appointed to the position of national sales manager of the Closed Circuit Television department of Mitsubishi Electronics America, Inc. Stoner's principal responsibility is "to broaden Mitsubishi's market share focusing on security distributors."

Prior to Mitsubishi, Stoner held positions with NEC, Ikegami and RCA. He currently serves in the Army Reserve as a communications instructor.

Goldner at Altec

Steve Goldner has been named district sales manager of Altec Lansing for Territory -1: Arizona, California, Hawaii and Nevada.

Goldner is a liaison to the factory for Altec's sound contractors and represents Altec to acoustical consultants, architects and engineers.

Goldner has previous experience at Sony Corporation and at large distributors in the U.S.



Goldner

Communications at Dukane

The Communications Systems Division of Dukane Corporation has appointed Sam Boskovich, Michael Pecora and Martin

Boi to the Dukane Communications "Team."

Boskovich is Distributor Development Manager, and is responsible for distributor network development in addition to the supervision of training and marketing communications programs. Pecora, as Training Manager, is responsible for the all training programs for the division and the distributor network. Boi is the Project Engineer — National Accounts, and is responsible for establishing contact with the corrections industry.

Phonic Ear Managers

Phonic Ear Inc has appointed Greg Brown, Territory Manager for Tennessee, Virginia, North Carolina and South Carolina. Brown has sales responsibilities for the company's three product divisions.



Brown

Christine Labenski has assumed the position of Territory Manager for New Jersey, Maryland, Delaware, Washington, D.C. and parts of New York, Pennsylvania, Virginia and West Virginia.



Labenski

Anderson at AMX

AMX Corporation has announced the return of William V. Anderson. His responsibilities include providing support to

the national AMX sales rep network and coordinating its consultant liaison program.

He comes to AMX from an A/V consulting firm in Louisiana and has experience in A/V, theater and theatrical lighting education.

Alpha VP

Alpha Wire Corporation has appointed Linda Smith, Vice President of Sales. In this position, Smith is directing the overall sales activities of the corporation. She is responsible for national pricing, and supervising both the inside sales representatives and a field sales team consisting of 30 district managers and five regional managers.

Smith has been with Alpha since June 1981 and has held positions with Fisher—Brownell and Southwest Electronics.

InteCom CEO

Matra Communications has announced the appointment of George C. Platt as president and CEO of its U.S. subsidiary, InteCom Inc. Platt has served as president and CEO of Shared Resource Exchange, Inc., vice president of the Business Communications Group at ROLM Corporation and the general manager of field operations at Xerox Corporation.

Bonica at Panasonic

Panasonic Communications & Systems Company has announced the appointment of Steven Bonica as Vice President of its Audio Video Systems Group.

Bonica is responsible for all sales and marketing activities of the company's audio and video hardware and software products.

Bonica joined PCSC in October 1989 as Vice President, Audio and Video Planning. Prior to joining Panasonic, Bonica was Vice President, Engineering with NBC where he worked for 21 years.



Bonica

Johannessen Serves Customers

Steve Johannessen has been appointed director of customer support and artist relations for the digital products division of Kurzweil Music Systems and Young Chang acoustic pianos.



Johannessen

Johannessen is responsible for overseeing the user support services for Kurzweil customers. He also manages the artist relations program and interfaces with schools, government, the military and other institutions.

Perimeter Appointments

Perimeter Products has appointed Elizabeth Gerhold and Bob Williams.

Gerhold assumes the position of Marketing Specialist. She has a Bachelor of Science in Business/Marketing with a background in Marketing Communications.

Bob Williams is the Engineering and Operations Manager and has a defense engineering background. Williams has a BS degree in Mechanical Engineering from Penn State, as well as an MS in Electrical Engineering and an MBA from Santa Clara University.

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3. UHF sounds better.

A dangerous generalization perhaps, but it *does* have wider RF dynamic range. And because we're the first to use dbx† Noise Reduction in UHF, the resulting audio quality is even more impressive.

4. More frequencies are available.

Samson offers seven UHF frequencies that can be used simultaneously. If you're already running a lot of VHF on stage, you can place our UHF frequencies on top of these without any interference.

EIGHT THINGS YOU SHOULD KNOW ABOUT UHF

5. Samson UHF offers more microphone options.

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6. Samson UHF antennas set new standards.

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7. UHF is more expensive.

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8. Write for a free Samson UHF White Paper.

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*In case you were reading too fast, we wanted to remind you that this ad is about UHF, not VHF wireless. As long as you are reading our ad this closely, we thought we'd tell you who they are: Yukinaga Koike, Doug Bryant, Takao Horiuchi, Susumu Tamura. tdbx is a registered trademark of Carillon Industries.

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