SOUND & COMMUNICATIONS

Volume 37 Number 7 July 25, 1991

THE SIXTH ANNUAL CONTRACTORS SURVEY

We sent out the surveys and you, the contractors, have spoken. Contractors are no more immune to the recession than anybody else and many of you are having to make do with less while having to find new markets and come up with new strategies to stay competitive. And you're doing it. How and why and more — in our annual survey of perceptions and realities in the market. **37**

1991 CONTRACTORS SURVEY

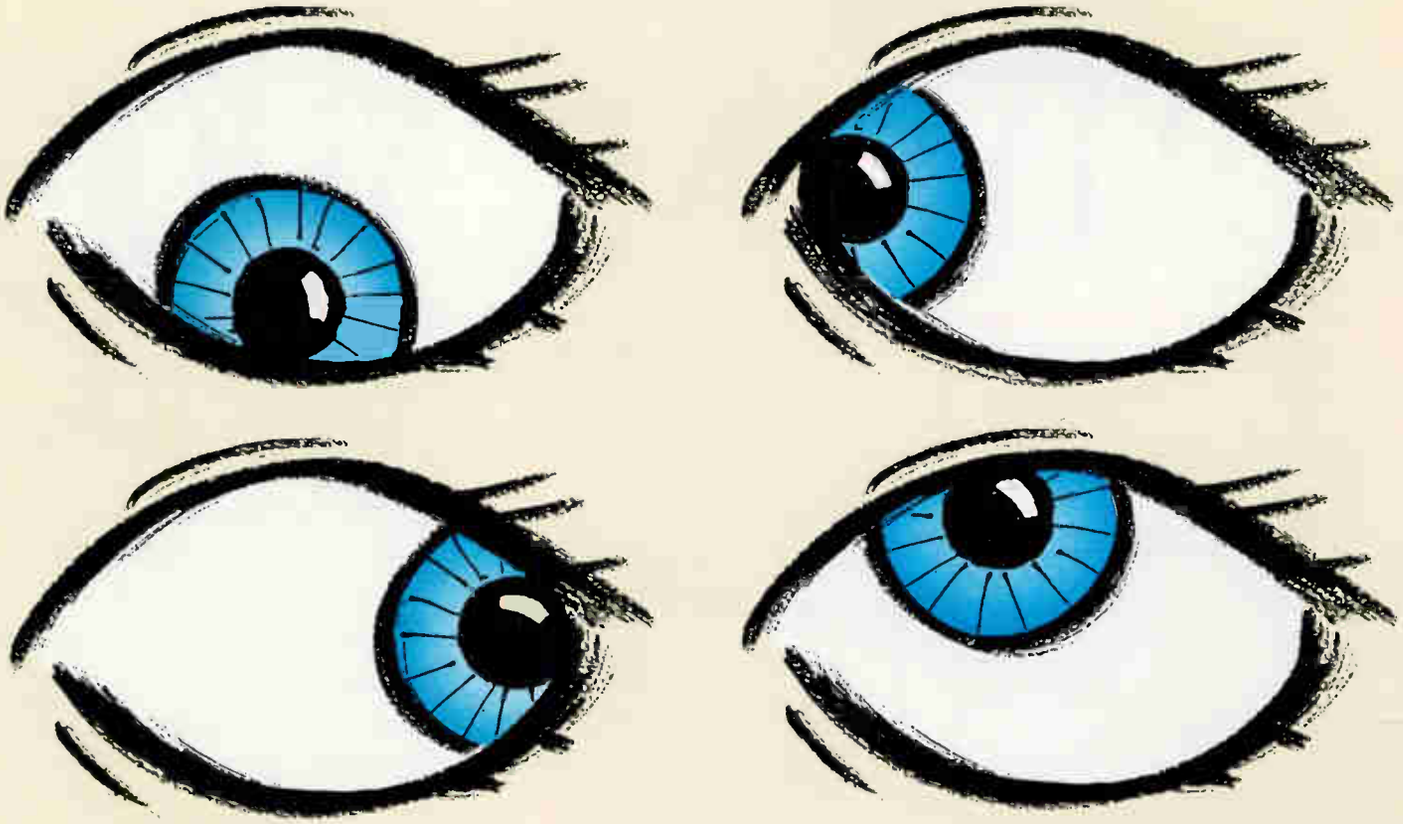
IN THIS ISSUE

WILLOW CREEK CHURCH — AN ONGOING PROJECT

Good relationships don't end with a project. Ancha Electronics and Willow Creek Church built a rapport that continues through upgrades, renovations and plans for the future. **54**

SOUND AT A SYRACUSE MALL

Even the carousel at the Carousel Mall has a sound system. The mall as a theme park reached fruition with the efforts of the mutual admiration society made up of AVL, Sound Engineering and Clair Brothers. Sensible sound designing was necessary for the entry ways, the tree-filled food court, banquet rooms and other mini-venues in this multi-zone, carefully designed mall. **30**



Now you've seen everything.

Aiphone introduces the world's first multi-directional video entry system. The Video Sentry PanTilt.

Scans five times more viewing area than typical fixed systems. Without the distortion of extreme wide-angle cameras.

Aiphone does it again! Now with fingertip control, you can easily scan the entire entry space—left, right, up, down, all-around. So no one can hide in the shadows. And no one is too small, or too tall, to be greeted by the new Video Sentry PanTilt.

Everything off two wires.

PanTilt directional commands, picture, sound—all on two wires. It's ingenious. And with only two wires, installation's a snap.

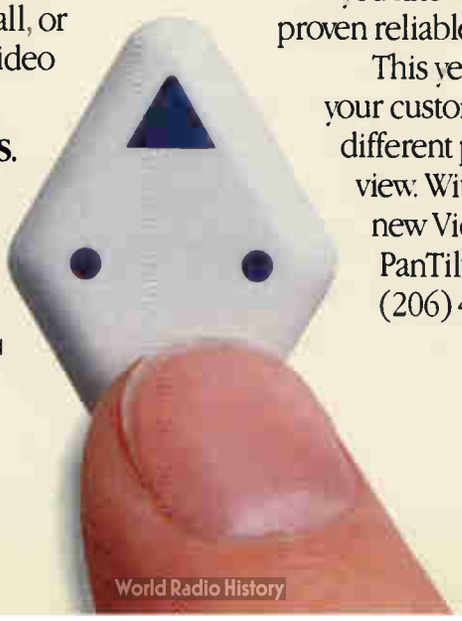
Multi-directional door camera

The quality that is Aiphone

The Video Sentry PanTilt is made by Aiphone. So even with all its innovative technology, you know it's been proven reliable.

This year, give your customers a different point of view. With the new Video Sentry PanTilt. From Aiphone. Call us at (206) 455-0510.

Inside monitor features backlight and PanTilt control buttons



Multi-directional control pad

AIPHONE®

Communication systems for business, home & industry.

Sight • Sound • Security

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Is There A Point When Out Of Control Becomes Complete Control?

Yes. The Moment You Plug In The New CEX-4L™

From Peavey Architectural Acoustics®

When we say complete control, we mean it. The CEX-4L from Peavey Architectural Acoustics is a totally programmable, all digital audio processor that redefines the role of a multi-way sound system controller. The CEX-4L provides ultimate control of even the most difficult rooms, with surprising options you never thought available in a crossover at this price — or any price, for that matter. The versatility of the CEX-4L will amaze the most discriminating sound engineer. For example, the CEX-4L may be configured as a crossover — four-way, two-way stereo, three-way with a fourth full range (or band limited) delayed output — or it can become a one or two input multi-tap delay. In either application, each of the four outputs can be delayed, equalized, peak limited, and /or bandwidth limited with a choice of six filter selections, including eighth order Linkwitz-Riley filters with 48 dB per octave slopes. An adjustable horn EQ, a one band parametric EQ, or low and high frequency shelving filters can be selected for each output. Precise peak limiters provide driver protection while maintaining musicality to system performance. The selective "linking" feature allows the limiters to track, preserving the spectral balance. Set-up and functionality come quickly and intuitively. The control panel is simple and straightforward with labeled buttons for the various features and a 20 x 2 backlit LCD display. A "data entry wheel" has been included for rapid system calibration, plus a built-in security lock, selective polarity reversal, and muting on each of the four outputs. The totally software-based CEX-4L also allows for essentially effortless field upgradeability, meaning that the CEX-4L will never become obsolete. Yet, we saved the very best for last...audio integrity comparable to high performance DAT recorders. The new CEX-4L all digital audio processor from Peavey Architectural Acoustics. The technology is here. The time is now. Experience the feeling of control...COMPLETE control!

PEAVEY®
ARCHITECTURAL ACOUSTICS®

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FEATURES

DEPARTMENTS

SOUND COMMUNICATIONS

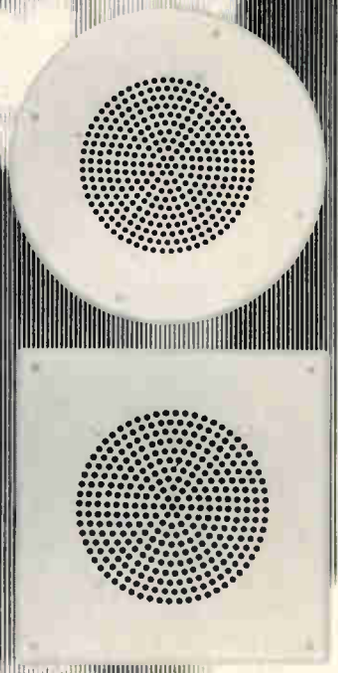
NEW QUAM BAFFLES BAFFLE VANDALS

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.

STEEL ON STEEL DESIGN PROTECTS LOUDSPEAKER INSTALLATIONS



Quam The Sound Decision Since 1930

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A digitally controlled sound s
the largest airport or the

Crown introduces digital system control that's affordable for even small installations.

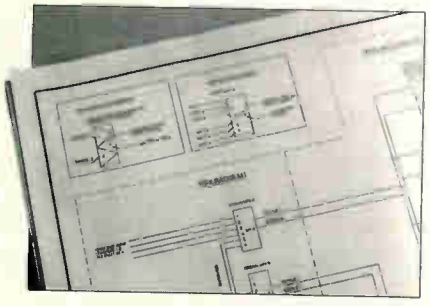
Installed sound is moving to digital control. But if you're like most contractors, the huge cost and steep learning curves of existing systems have made you think twice about specing digital sound control.

Crown changes all that with the introduction of the IQ System's MPX-6,™ SMX-6™ and IQ COM-Q components. Now, the same IQ System® with the capability to handle airports, stadiums and convention centers also makes economic sense in bringing digital control to churches and boardrooms. With its intuitive operation, no other system is as easy to use as the IQ System.

IQ SYSTEM 2000

A different approach to digitally controlled sound.

The IQ System is unlike existing digital systems which are expensive, difficult to learn and susceptible to total system failure. Designed around highly sophisticated yet relatively inexpensive components, the IQ System is easy to use and highly reliable. IQ components are designed to keep the system operating even if a host computer should fail.



The IQ System gives you the flexibility to design systems that match the exact needs of an installation—no matter how large or small.

Entry-level IQ System: MS/PC-DOS-compatible computer, Crown Com-Tech 200, MPX-6, loudspeaker and microphones. Approximate retail price of this system is $3,700. Prices may vary depending on specific components and configuration.

Because of its outstanding flexibility, the IQ System may be tailored exactly to installation needs, while leaving further expansion possibilities wide open.

As additional components are introduced in the near future, you'll discover there's no more flexible or cost-efficient system than Crown IQ.

MPX-6. Expanding signal routing and control capabilities.

The MPX-6 is one of two IQ System multiplexers which make sophisticated control and routing of signals easy and affordable. Digitally controlled by a host computer or IQ COM-Q tape controller, an MPX-6 can route and switch six mic/line inputs, two summed outputs and two independent bussing outputs. Any level of any input can be routed to any output with a controllable range of 120 dB in 1/2 dB increments. This ability to route both incoming and outgoing signals provides unsurpassed system flexibility. But that's not all.

Multiple MPX-6 units can be combined to create 6x4, 12x2, 24x8, etc., mixing capabilities. In fact, you can control up to 24,000 inputs with just one IQ System!

The MPX-6 may also be used remotely in distributed intelligent control systems to reduce long microphone line runs.

With the addition of the MPX-6, the ability to route signals in complex routines is not only possible, but easy.

SMX-6. Sensing multiplexer.

The SMX-6 builds upon the MPX-6 with additional sensing and configuration capabilities. It contains six mic/line inputs and four outputs like the MPX-6, but adds the capability of monitoring the pre-attenuated levels coming into the inputs.

Unlike other devices such as automatic mic mixers, control and configuration of the SMX-6 are achieved with downloadable software. These downloadable instructions, called Algo™ Packs, allow the contractor to program specific capabilities into the processor of the "intelligent" SMX-6. Automatic mic mixing, video-follow-audio switching and impedance and equipment checking are just a few of the many possibilities. It may also be combined with the MPX-6 for in-

The Crown MPX-6 multiplexer and SMX-6 sensing muliplexer provide unsurpassed mixing and routing/switching capabilities.

ystem so versatile, it can handle smallest church budget.

IQ System software is available for both MS/PC-DOS-compatible and Apple Macintosh systems. Designed to be user-friendly and intuitive, the system eliminates the need for the extensive training required by other systems. The basic IQ software is available without charge with any IQ component.

creased mixing and routing capabilities at a reasonable cost.

PA-422 compatible.

Both IQ System multiplexers provide an option for being driven directly by any computer with RS422 or RS232 communication. An additional multiplexer option provides compatibility with the PA-422 standard and allows multiple PA-422 devices to be independently driven from each multiplexer. This permits control of compatible digital delay units, parametrics, third-octave equalizers and more.

No-Fee IQ System software.

Unlike other systems, the basic IQ System software is provided without charge with any IQ component. Software is available for both MS/PC-DOS-compatible and Apple® Macintosh® computers. Because of the many possible applications for these components, command codes and protocols are included so specific routines may be programmed by the contractor or system user.

IQ COM-Q. Complex system control made simple.

The IQ COM-Q component makes system configuration as simple as playing a cassette tape. Designed to digitally record the commands from an IQ host computer onto almost any tape medium (cassette, open reel, DAT), the COM-Q permits the system to be configured by simply playing back the appropriately recorded tape for a desired system change. This not only allows for quick and simple changes, it permits those without extensive training to control the system. Contractors can pre-program configurations in-house for an installation which then requires only an IQ COM-Q and interface-capable component to run the system. With multitrack recording, the COM-Q can initiate complex audio and system commands useful in applications such as theater productions and crowd movement at theme parks.

The IQ COM-Q makes sound system configuration as simple as playing back a cassette tape.

Installation ideas.

The design flexibility and sophistication of the IQ System may make you rethink how you design installations. Here are just a few of the many possible applications.

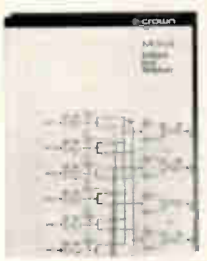
Small Conference Center

The IQ System multiplexers can decentralize audio system installations, reducing wire and associated costs, without decentralizing control. For example, one multiplexer and one Com-Tech® can be used to control the signal routing for two banquet rooms.

Surveillance/Security

The IQ System can be used to create a surveillance system in high-security areas. With strategically placed microphones and Crown multiplexers, audio or video-follow-audio monitoring is easily achieved.

For more information on the IQ System and system components, see your Crown representative or call toll-free: 1-800-535-6289.



Free literature on the IQ System and IQ components, including data sheets and application guide are available from Crown or your Crown representative.

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LETTER FROM THE EDITOR

Surveying the Sound Contracting Market; Thanks for the Input

For the sixth consecutive year, Sound & Communications magazine presents its Survey of the Sound Contracting Business, a compilation of statistics and comments from its readers on the state of their businesses, and their thoughts in general. This survey, conducted in late spring each year, works in tandem with the Sound & Communications economic survey of manufacturers published each December. And although the results are necessarily different, the tenor of the responses correlate to some extent.

Sound contractors remain positive about their business, although times are tougher and they're concentrating on basics more. As one contractor told us, "Thank God for the churches," since that is the root of his business, and churches are maintaining a level of new construction for him. Other contractors are focusing on other aspects of the business with mixed results. More companies are entering the residential and teleconferencing fields. Fewer companies are getting the bulk of their revenues from more traditional sources. And contractors are voicing their frustrations, with comments relating to the need for quality products, protected distribution, and clear product training. Manufacturers similarly offered complaints about contractors in our last Economic Survey. We publish these comments as a public service. Let's hope that these sometimes adversarial groups listen to each other and work toward better business for all.

You can read the full analysis of our Contractors Survey in this issue. We thank all of our readers who responded, and hope the survey is of use in planning for the future.

Before the summer doldrums set in, you should know something about the happenings at the summer Consumer Electronics Show where the home theater companies were on the main floor, home high end hi-fi companies had lodgings at the Conrad Hilton, and despite a feeling of pre-summer industry doldrums, attendance was up from last year, according to the folks at CES. There were enough products to keep anyone attending busy. Multiroom systems received new adherents as a/d/s made its first full showing of its system. Sony exhibited its SIRC II remote communication system with, however, no plans for delivery. This could conceivably operate in the commercial environment as well. Mitsubishi showed new large screen televisions designed for easy flush mount installation. Yamaha showed its new multiroom system. Sennheiser exhibited its decoder for hearing assistance designed for use with the newly legally mandated closed captioning device of the National Closed Captioning Institute. Niles showed its software based custom designed Media Access system, first exhibited at the NSCA convention. Panasonic, in a major exhibit celebrating its move to Hollywood and its sponsorship of the Olympics, also showed its audio-video mixer. Pioneer introduced a CD — LD changer, which could presumably make it into the karaoke field. And karaoke appeared in various formats — CD-Interactive, CD-Rom, CDTV. And so on and so on. We're saving details on these and more products and trends for an upcoming issue that will focus on residential work. So keep reading us.

Regards,

Judith Morrison
Editor in Chief

SOUND COMMUNICATIONS

Publisher/Editorial Director
Vincent P. Testa
Editor-in-Chief
Judith Morrison
Technical Editor
Mike Klasco
Associate Editor
Steve Jacobs
Research Assistant
Jennifer Sinclair
Contributors
Brad Leigh Benjamin, Ray Dolby, Daniel Kumin, T.G. McCarthy, Daniel Sweeney
Technical Council
Dr. Mort Altshuler
Professor Audiology, Hahneman University, Chief of Audiology, V.A. Hospital, Phila, PA
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Advertising Manager
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Classified Ad Manager
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Traffic Manager
Ron Perone

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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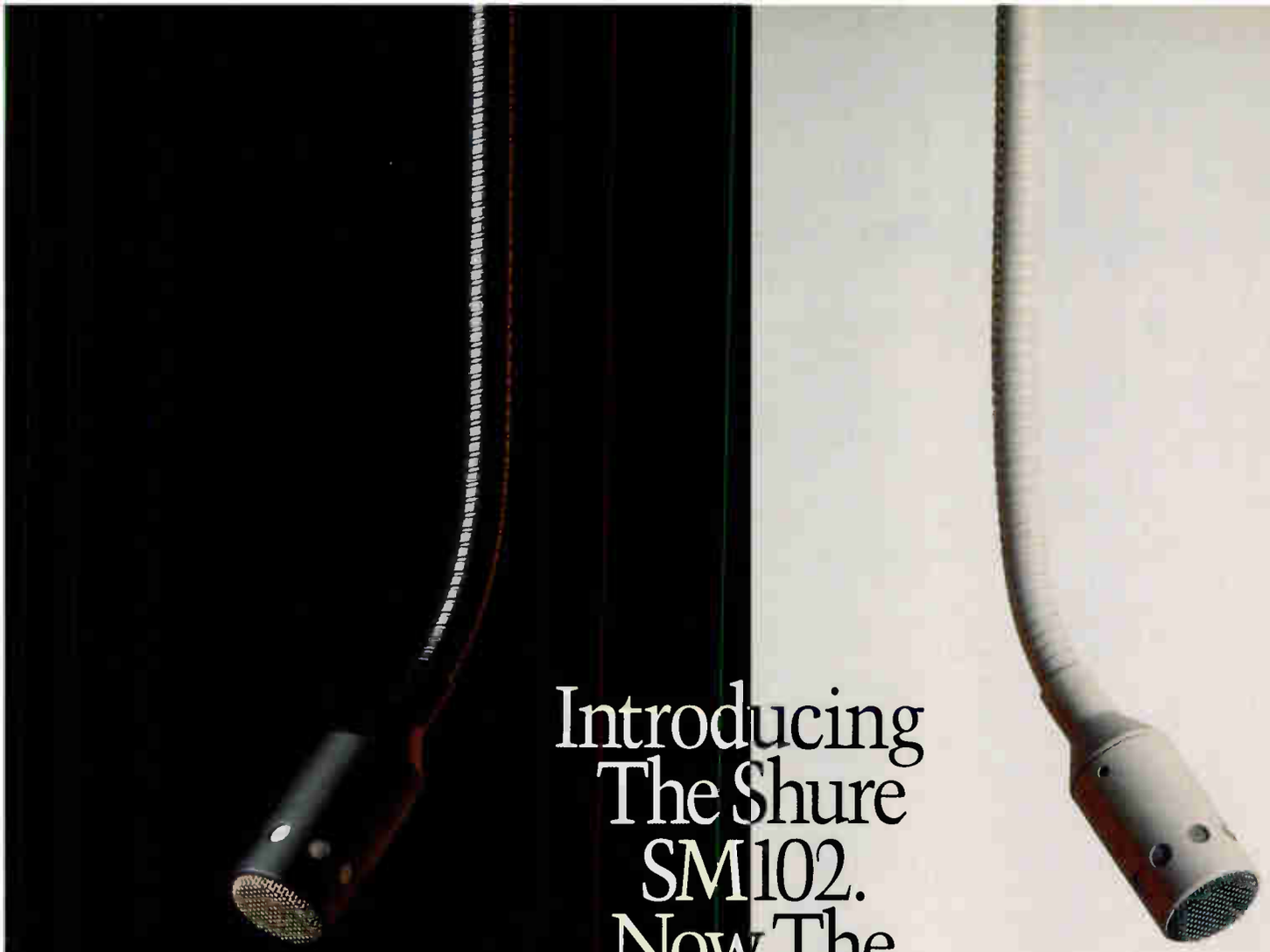

Introducing The Shure SM102. Now The Choice Is Black And White.

The new Shure Microflex™ SM102 makes the job of choosing a miniature condenser microphone an effortless one.

With its flexible, 6-inch gooseneck, the SM102 is easy to set up and aim. And its high sensitivity and smooth frequency response assure a clear and natural sound.

Compare directional characteristics. You'll find the SM102's cardioid polar pattern exceptionally uniform throughout its frequency range, which accounts for its outstanding background noise and feedback rejection. What's more, it has the lowest self-noise in its class, so you pick up distant voices down to a near-whisper and assure the intelligibility of every word.

And with a choice of in-line or wall plate preamps, both with switchable gain, the SM102 gives you the unmatched flexibility to hang it any way, anywhere.

In fact, the toughest decision you need to make is black or white. Take your pick.

The SM102 is a proud member of the new Shure Microflex family of miniature condenser microphones. For more information on the SM102 or other Shure Microflex products, call 1-800-25-SHURE. The Sound of the Professionals ... Worldwide.

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When it comes to buying and installing low-voltage electronic cable, don't trust an unknown. Rely on West Penn Wire for the quality your installation deserves.

For over 20 years, we have risen above the fray of generic producers by manufacturing only the finest in cable products. Products like CL2, FPL, CM, plenum and non-plenum cables that meet and exceed the new NEC Codes. Products you can rely on for years.

And there's no mystery about our customer service. We like to feel it's the best in the industry. We're proud of our record for prompt, efficient, personal handling of all your needs...from order entry to delivery. Our reputation is built on our ability to help customers meet individual product requirements.

West Penn offers a complete selection of low voltage electronic cable. All backed by the dependable quality, service, competitive pricing and engineering assistance you've come to expect from West Penn Wire.

Don't take a chance on an unknown. It could leave you shorted in the long run. Call us on **800-245-4964** (in PA, 800-222-8883). P.O. Box 762, 2833 West Chestnut St., Washington, PA 15301.

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NEWSLETTER

BT NORTH AMERICA — PEIRCE-PHELPS AGREEMENT

British Telecom has entered the U.S. videoconferencing market and has signed an agreement with Peirce-Phelps, Inc. to provide nationwide systems maintenance and integration of BT's portfolio of videoconferencing products which the company launched in the U.S. as of June 25. Under the terms of the agreement, Peirce-Phelps will integrate BT's videocodec products with cabinetry and other related video and audio equipment to produce BT's "rollabout" products. Additionally, Peirce-Phelps will provide BT customers with installation, consultation, and 24-hour service on a nationwide basis. Peirce-Phelps has built over 400 full-motion videoconferencing facilities, employs over 300 employees and has sales of over $140 million. BT's North American subsidiary, BT North America, under which the U.S. videoconferencing products will operate, has a staff of over 3,000 worldwide and employs over 1,600 personnel in the United States.

Initially, BT North America will sell two videocodec products — the VC 2100 and VC 2200. The VC 2100 offers videoconferencing capabilities from 56 kbps up to 2 Mbps and provides virtual broadcast quality pictures, according to the company. The VC 2200 is designed for worldwide dial-up videoconferencing up to 112/128 kbps. Both products, priced at $44,000 and $42,000, comply with the CCITT H.261 international standard for videoconferencing.

TAD U.S. PRODUCTION

The Technical Audio Devices (TAD) division of Pioneer Electronics (USA) Inc. has introduced the first TAD product manufactured in the United States. The TD-4002 high frequency compression driver is produced at the new TAD manufacturing facility in Long Beach, California. According to the company, the inauguration of U.S. manufacturing allows TAD to develop products parallel with Pioneer's engineering team in Japan, provide improved response time for large orders, and allow custom manufacturing for unique customer needs.

Leon Sievers, senior product planner for TAD, said, "Besides representing a major step forward in driver design, we feel that the opening of our Long Beach production facility represents our renewed commitment to professional products and future product development."

MORE KARAOKE

Sony has introduced a karaoke CD player with vocal reduction circuitry, providing the accessibility of karaoke without special software. Sony's CDP-K1 searches for the mono recorded midrange frequencies and applies phase cancellation techniques to eliminate singing and spoken words. The unit also provides inputs and mixing capabilities for two microphones.

PRODUCT LIABILITY

According to the International Communications Industries Association, 30 senators have introduced legislation to streamline product liability claims, in an effort to reduce insurance costs to businesses. Known as the Product Liability Fairness Act, the legislation seeks to expedite claims and provide an alternative dispute resolution process. The bill is supported by The Product Liability Alliance, of which ICIA is a founding member.

LINKING MARK IV

Mark IV Audio has begun implementing a computer network system between each of its companies as well as branch facilities. The first step has been to link all of the U.S. facilities to the corporate computers of Altec Lansing in Oklahoma City and Electro-Voice, in Buchanan, Michigan, via modem and dedicated telephone lines.

ANTHONY RETIRES

John (Jack) B. Anthony has retired June 28, 1991 after more than 30 years as a rep in the New York City area. His firm continues to be known as the John B. Anthony Co. and will be run by Mike Oltz and Julie Steinberg with Anthony consulting on a part-time basis.

NEWSLETTER

ACOUSTICAL AWARDS

The National Council of Acoustical Consultants selected the Evangeline Atwood Concert Hall in Anchorage, Alaska submitted by Jaffe Acoustics Inc. for overall honors at the 1991 consulting projects poster exhibit. Other winners were: Jackie Gleason Center for the Performing Arts in Miami Beach, Florida, Jaffe Acoustics Inc. consulting (in the category of auditoria and listening spaces); Andover Town Hall Restoration in Andover, Massachusetts, Cavanaugh Tocci Associates Inc. consulting (civic, educational and commercial buildings); Ingersoll Farm Highway Noise Impact Studies in Borne, Massachusetts, Cavanaugh Tocci Associates Inc. consulting (industrial and civil works projects, environmental impact studies); St. Joseph Cathedral Renovation in San Jose, California, Paoletti Associates Inc. consulting (general electroacoustics projects and applications); Des Moines Library in Des Moines, Washington, JGL Acoustics Inc., consulting (general noise and vibration control projects and applications); and the Acoustical Model Study at Southern Missouri State University in Springfield, Missouri, Paoletti Associates, Inc. consulting (general research studies and publications).

EIA PROMOTIONS

The Electronic Industries Association/Consumer Electronics Group has announced the following promotions: Sam Lippman, Staff Vice President of Exhibits and Operations for CES; John W. Walther, Jr., Staff Vice President of Administration and Finance; George A. Hanover, Staff Vice President, Engineering; Cynthia Saraniti Upson, Staff Vice President of Communications; David E. Poisson, Vice President of Government and Legal Affairs; and Cheryl J. Hollins, Staff Vice President, Member and Industry Relations.

GRASS VALLEY AND BASYS COMBINE ON AUTOMATION EFFORT

Grass Valley Group and BASYS have announced a joint effort aimed at "making full automation cost-effective". The relationship is targeted at projects such as using computer control of routing switchers, production and master control switchers, and program storage devices. The joint venture will allow the customer to deal with a single contact from concept through execution and maintenance of the system.

CONSULTANT DIRECTORY

The National Council of Acoustical Consultants has announced the availability of its directory of members. The directory of the 100 member firms includes a "matrix" of specialties and outlines the selection of an acoustical consultant.

HAWAII MIXERS

Biamp mixers have been installed in the Forum, a multipurpose exhibition, entertainment, and meeting facility in Honolulu, Hawaii. The Forum, which has a capacity of 250, contains 6,800 square feet of space, a 16-foot high ceiling, and a 28-by-16 foot proscenium stage with theatrical lighting. Audissey Sound, of Honolulu, installed the sound system which featured a Biamp PM602 mixer for multimedia presentations and a Biamp Rackmix II for live sound reinforcement.

THE ENVELOPE, PLEASE

A/V Marketing, of suburban Indianapolis, has received the 1990 Ramsa "Rep of the Year" award. A/V Marketing was founded in 1981 and covers territories in Kentucky and Indiana.

SUMMER STATS

"Business was better than usual at the Summer CES," said Gary J. Shapiro, Vice-President of the Electronic Industries Association's Consumer Electronic Group (EIA/CEG). 55,629 attended the show, including 21,876 buyers representing 86 of the nations top 100 retailers.

Statistics released at the show say that shipments of 27-inch and larger direct-view TVs already have increased 16 percent over 1990, projection TV shipments are up 14 percent over the same period last year, cellular phone sales are up 24 percent over 1990, and multi-play home CD changers are up 19 percent over last year's figures for the same period. For the first time since 1983, the industry is back into positive trade figures to top some $450 million for the first quarter of 1991.

WE'RE INTRODUCING OUR IN STORE PAGING SYSTEM ONE MARKET AT A TIME.

For your customers who need a flexible and reliable in-store paging intercom system, Market Page™ can definitely cut the mustard.

Designed specifically for supermarkets, department stores, car dealers, nurseries, warehouses and manufacturing plants, Market Page offers twice the capacity of the competition.

It can accommodate up to sixty stations and offers four separate intercom channels plus paging. Should you need less than four channels, simply reduce the wiring by one wire per channel.

Market Page also features zone paging and talkback. And it's stylish design looks great on a desk or wall mounted.

For more information on Market Page, please call us toll-free at 1-800-752-2860.

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The Answerman Debuts with Answers to All Questions

This month Sound & Communications inaugurates a new department — "The Answerman." Answerman consists of a group of experts including Mike Klasco, our technical editor.

The reason for this new department? We'll tell it to you straight. We get letters — letters asking us questions on services, technical configurations of equipment and just about anything else our clever readership can dream up. And, in truth, we have the resources to find, the answers.

We're determined to team up the questioner with the right Answerman. There is omniscience in numbers.

So send us your questions, your problems, your technial concerns. We'll find the answers. Send your questions to Answerman, Sound & Communications, 25 Willowdale Avenue, Port Washington, New York 11050. Or fax to 516-767-9335.

Here are our questions and answers for this month. *Editor*

Dear Answerman,

I read with great interest in the Sound & Communications an article concerning background music on CDs for commercial use offering license fee paid CD libraries.

I would greatly appreciate it if you would forward to me the name of the companies that offer this.

Samuel J. Blengs
President
Casco Backgroud Sound, Inc.
Charlestown, MA

Dear Sam,

Background music has been distributed by phone line, satellite, tape cartridges and cassettes. Quality and consistency of both the source material as well as the playback equipment has not been as good as most of us would hope for (I am being a gentleman here). CDs offer the potential of high quality, robust and long life medium. Denon offers a proprietary format extended play mono CD system, but their system has not gained acceptance in the U.S. Perhaps the playing time/bandwidth tradeoffs of this package are too extreme. With the proliferation of inexpensive and reliable CD changers with 5, 6, and even 10 disks for less than $300 retail, this would seem to be background music heaven. Numark even has a dual transport model (CD6020) which will automatically match the beat and then do a transition between disks. For commercial installations the most exciting system is the 100 CD package provided by Gefen Systems. Consisting of the NSM CD2100 CD changer (or Sony's CDK-006 60 CD changer), various optional computer interfaces including MS-Dos and Mac versions, Gefen's SoundTouch software, this would appear to be a total solution.

But I am afraid I have some bad news. On closer inspection, while there are dozens of sources for legal commercial CDs, these are intended for background music for production work, industrial films, etc. While some of this music will be appropriate for background music, many of the vendors either will not sell the program material for this purpose, or charge double the already stiff fees.

ALL RECORDS, TAPES, CDs, ETC. ARE SOLD TO CONSUMERS ONLY FOR NON-COMMERCIAL USE.

While Sam is in the background music business, for other readers who are not, it may have occurred to them that it would be easy to simply provide the hardware such as a CD changer and a compressor to restrict excessive dynamics. They should be aware that all records, tapes, CDs, etc. are sold to consumers only for non-commercial use. Even discos and radio stations are legally required to pay a "play" fee. Does ASCAP and BMI really check up on what sort of background music is played in bars, boutiques, hotels? Is there really a background music spy network? Yes, I know this for sure, as Pamela Michael (one of our writers) has worked for years for one of these organizations. Anyway that is at least her excuse for going to bars and shopping. Play fees are a gray area, and is the focus of an upcoming article from Pam.

Still another potential solution to the program material problem is for the background/foreground music vendors to transfer their existing music libraries from tape to CD. In the past this was prohibitive as quantities and cost were high. The CD mastering business has gotten competitive, and quantities as small as 500 piece runs at less than $15 a disk are the norm. For even smaller runs the recordable CD systems from Kenwood and Denon (and now Yamaha) can be used (these are the only recordable CD hardware than can produce CDs that are useable on conventional CD players).

In any case, here is a short list of license-fee-paid producers of CDs, provided for you to sift through for potential program material for background/foreground music. A more extensive list is provided in the Blue Book directory (the Sound & Communications August directory issue). We would like to hear from any readers that have any thought and insights into this situation.

FirstCom/Music House
13747 Montfort –220
Dallas, Texas 75240
800-858-8880

DeWolfe Music Library
25 West 45th Street
New York, NY 10036
212-382-0220

Creative Support Services
1950 Riverside Dr.
Los Angeles CA 90039
213-666-7968

Manhattan Production Music
P.O. Box 1268
Radio City Station
New York, NY 10101
212-333-5766

Audio Action
4444 Lakeside Drive
Suite 340
Burbank, CA 91505
818-845-8020

CD Changer Package Gefen Systems
6261 Variel Ave., Suite C
Woodland Hills, CA 91367
1-800-545-6900

Denon America, Inc.
Broadcast Products Div.
222 New Road
Parsippany, NJ 07054
201-808-1608

Dear Answerman,

I have been reading your articles on Computer Aided Design programs with great interest, but through no fault of your own I must admit to still being confused as to which program would best fit our company's needs.

We are a small contracting company whose business has developed over the years as an outgrowth of our MI store. We have been focusing more on the contracting side of our business for about three years now. Our primary customer base is small to medium sized churches, offices, restaurants and some manufacturing facilities. Of late we have been more involved with larger type facilities and feel that it is now time to seriously consider a CAD program.

Because of our extensive MI background we use Peavey (MI and Architectural Acoustics lines) equipment. My question is: which CAD program would best meet our needs, i.e., small to medium churches, 500 to 1500 seat auditoriums, etc.; Peavey sound cabinets, central arrays and distribution systems? Also, we have available both IBM compatible and Mac computers.

Thank you for your help with this question and for the very fine articles in Sound & Communications. Keep writing, I promise to try and keep up!

Robert H. McMillan
Field Sales and Installations
Mac's Musical Madness
Hudson, NC

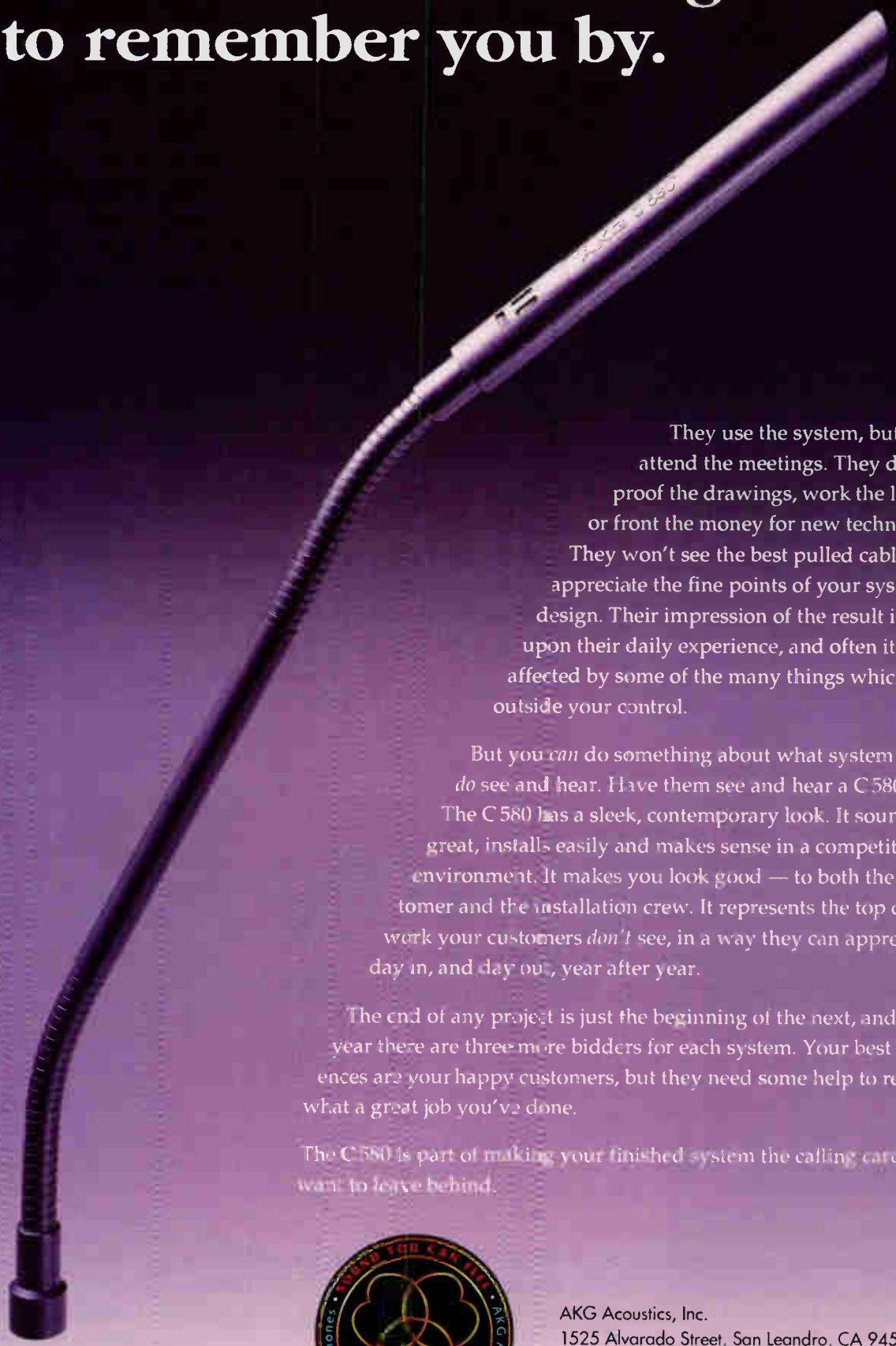
Dear Robert,

You're in luck. While Peavey does not have a CAD program, the company has decided to support the EASE program from Renkus Heinz. Data on many Peavey products will now be included within EASE. Renkus Heinz has taken the unusual position of selling EASE purely as a product, rather than as an extension of their corporate image or marketing program. If you can come up with $1500, then you can have the program. Sound system software programs such as EASE, PHD and Umbulus have an open data base, and data on Peavey or other components can be entered by the user. Contact Peavey Customer Service and ask for Sound System Design Data.

The PHD program was reviewed in the September and October 1989 issues of SOUND & COMMUNICATIONS and ought to be adequate for any of the jobs you are doing. PHD is available from the Richard Heyser fund for a donation of $300. The PHD program is not affiliated

(continued on page 65)

Leave them something to remember you by.



They use the system, but didn't attend the meetings. They didn't proof the drawings, work the late hours or front the money for new technology. They won't see the best pulled cable or appreciate the fine points of your system design. Their impression of the result is based upon their daily experience, and often it's affected by some of the many things which were outside your control.

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The Low Q Alternative

Low Directivity and Omnidirectional Loudspeakers for Sound Reinforcement

BY DANIEL SWEENEY

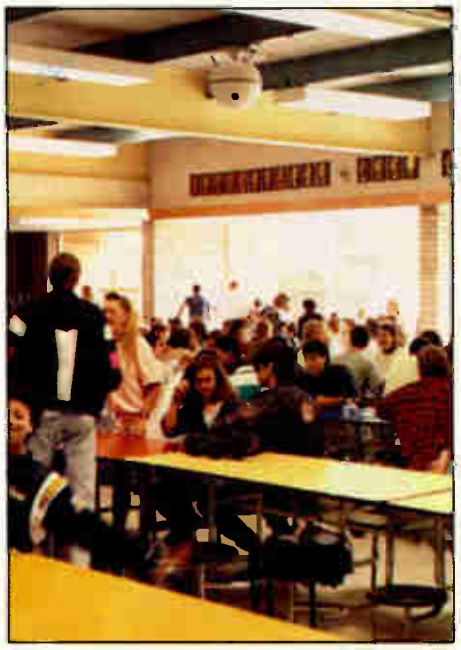
Professional audio installation practices have developed around high Q, low directivity loudspeakers. Before loudspeakers even existed, high Q horns had established themselves in domestic phono playback in products such as the Victrola, and by 1925, when loudspeakers were first introduced commercially, acoustical engineers had formalized a large body of design principles for constructing horns.

This design expertise was carried over into the areas of public address and sound reinforcement, and was built upon by successive generations of sound engineers employed by such firms as Western Electric, and RCA. Today the sound contractor can select from a vast arsenal of high Q designs to meet virtually any application need.

Unquestionably, high directivity speakers can be made to work almost anywhere, but at least in some applications, low directivity options are available—options which may yield subjectively more pleasing results, and which may be considerably more cost effective. Thus an understanding of the operation and deployment of low Q loudspeakers can be extremely useful.

HIGH Q CONVENTIONS

By earlier definitions, the term Q was applied to the sharpness of resonance in either electrical or mechanical filter systems, but in recent years the concept of Q has been broadened such as to permit application to loudspeaker coverage patterns. Q, as the term relates to loudspeaker coverage, is conventionally defined to represent the directivity of the loudspeaker along its major axis of output. Strictly speaking, however, Q measurements may be developed for any axis. Even in terms of a broader definition, discussions of Q are generally limited to a relatively small set of planes extending over only a few degrees of vertical arc.



Soundsphere speakers in use at the Homewood-Flossmoor Cafetorium.

In some applications, low directivity options are available.

Now the majority of loudspeakers will exhibit different degrees of directivity within each plane, and at different frequencies within each plane, and so reference to single numbers in describing loudspeaker Q provides a very incomplete picture of loudspeaker performance. With the currrent generation of constant directivity horns one assumes fairly constant Q in the horizontal plane and vertical plane with the pattern slightly widening out at the bottom of the bandwidth and narrowing at the top end.

Below 500 Hz most professional loudspeakers systems have low directivity, and rapidly become essentially omnidirectional. Five hundred cycles is the typical low frequency limit for professional horns, and relatively few professional speakers extend horn loading to the bass. The handful of large bass horns from such manufacturers as EAW, Klipsch, Peavey, Cerwin-

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207	221	235	252	269	286
208	222	236	253	270	287
209	223	237	254	271	288
210	224	238	255	272	289
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☐ A Final approval/Buyer
☐ B Recommend/Specifier
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☐ 1 Have salesman call
☐ 2 Need within 3-6 months
☐ 3 Future projects

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☐ A 1-3 ☐ B 4-10 ☐ C 11-25 ☐ D 26-100
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6	20	34	51	68	85
7	21	35	52	69	86
8	22	36	53	70	87
9	23	37	54	71	88
10	24	38	55	72	89
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Vega, and Intersonics maintain some directional characteristics down to as low as 50 Hz.

Below 500 Hz most professional loudspeakers systems have low directivity.

A Q of 1 represents a completely omnidirectional output. A Q of 10 characterizes the opposite extreme of directivity in a loudspeaker, while a Q of 5 or 6 is considered moderate.

Historically high Q loudspeakers have always tended to be favored in our industry, and the desired directivity has generally been accomplished through horn loading. This tendency is no accident, and there is little question that in the thirties and early forties at the dawn of the pro sound industry, the high Q horn was the only really feasible transducer technology available for sound reinforcement. At the

High Q loudspeakers have always tended to be favored in our industry.

time, high power amplification was experimental at best, and the limited electrical output from commercially available amplifiers had to be converted into acoustical watts with maximum efficiency. And, as much as possible, sound had to be directed at the audience and absorbed by their bodies and adjacent furniture. Dispersing acoustical power into the unoccupied portions of the listening space was wasteful, and in many cases worse than wasteful because the wall reflections might diminish speech intelligibility. The horn recommended itself from the first for all of these reasons.

From the late nineteen forties onward, electrical efficiency has been a less significant factor in determining transducer technology, but the speech intelligibility issue has remained. The strength and duration of the reverberant field is known to be of key importance in determining the intelligibility of speech heard through a public address system. If the reverberation time of a room is over 1.5 seconds, speech intelligibility begins to be degraded, and thus if most of the loudspeaker output can be tightly focused on the audience, relatively little acoustical power will be contributed to the reverberant field. Then too, sound absorptive treatments can be more effectively deployed since they need only cover surfaces within the footprint of the loudspeakers and the area of first reflections.

During the past several decades of the industry's development, a comprehensive rationale has developed around the use of high Q horns. Such horns, it is said, will

allow for better speech intelligibility within highly reverberant spaces, and they will reduce interference effects between adjacent loudspeakers to a minimum since the overlap between speakers can be made very small. And if horn loading is used for the woofer, the speaker may be aimed so as to avoid exciting room modes as well.

That's the rationale, and it's almost certainly valid as far as it goes.

But there is an alternative approach.

EMERGING ALTERNATIVE

Fairly low Q, single element direct radiator speakers (we are talking about the lowly four-inch and eight-inch cone speaker here) have long been used in flush mount ceiling installations for paging or intercom — in other words, in rather undemanding applications requiring low cost distributed systems. More recently, defying conventional wisdom, low Q speakers have been successfully employed in such unlikely settings as night club PAs, sports arenas, even high volume sound reinforcement applications.

Today four companies currently devote significant efforts to marketing high output, low Q professional loudspeakers:

The makers of low Q speakers adhere to somewhat diverse design philosophies.

Bose Corporation, Sonic Systems, B.E.S.T., and Wolcott Audio. Significantly, three of these companies had their initial concentration in the home high fidelity market where low directivity designs tend to be preferred.

The makers of low Q speakers adhere to somewhat diverse design philosophies, and do not represent a community of engineering practice as could be said be the case with the leading horn manufacturers. But all make similar claims for their products: more natural sound quality than achievable with high Q horns, fewer units required for adequate coverage, and — most controversial — better intelligibility in reverberant spaces.

LOW Q TRANSDUCER TECHNOLOGY

All four companies have faced significant design obstacles in developing low Q professional products. Most significantly, low directivity is associated with low efficiency in converting electrical energy into acoustical output, and this means that more drivers will be required to achieve the same power response delivered by high Q, horn loaded systems, which in turn will result in more costly and more complex installations. And if low directivity direct radiator speakers are to be used in clusters where efficiency will be maximized through mutual coupling, then low directivity characteristics will be lost through cancellation effects. In short, conventional low Q direct radiator technology, such as is used in most consumer loudspeakers, does not appear very promising for demanding professional applications.

The most straightforward approach to producing a low Q speaker of reasonable efficiency and wide bandwidth that would be useful in professional applications is the 360 degree radial horn. This design is currently embodied in a speaker named the Omnisphere marketed by a small Southern California firm called Wolcott Audio, and coincidentally in a speaker called the WS 2800 made for Whelan Engineering by Community Light and Sound. The latter was designed for high intensity outdoor voice warning systems, and is not ordinarily sold to sound contractors, though according to Bruce Howze of Community, these radial horns are occasionally used in indoor paging systems in large enclosed areas.

A 360 degree radial horn has a mouth with no sides. As the name implies, the mouth extends for 360 degrees in the

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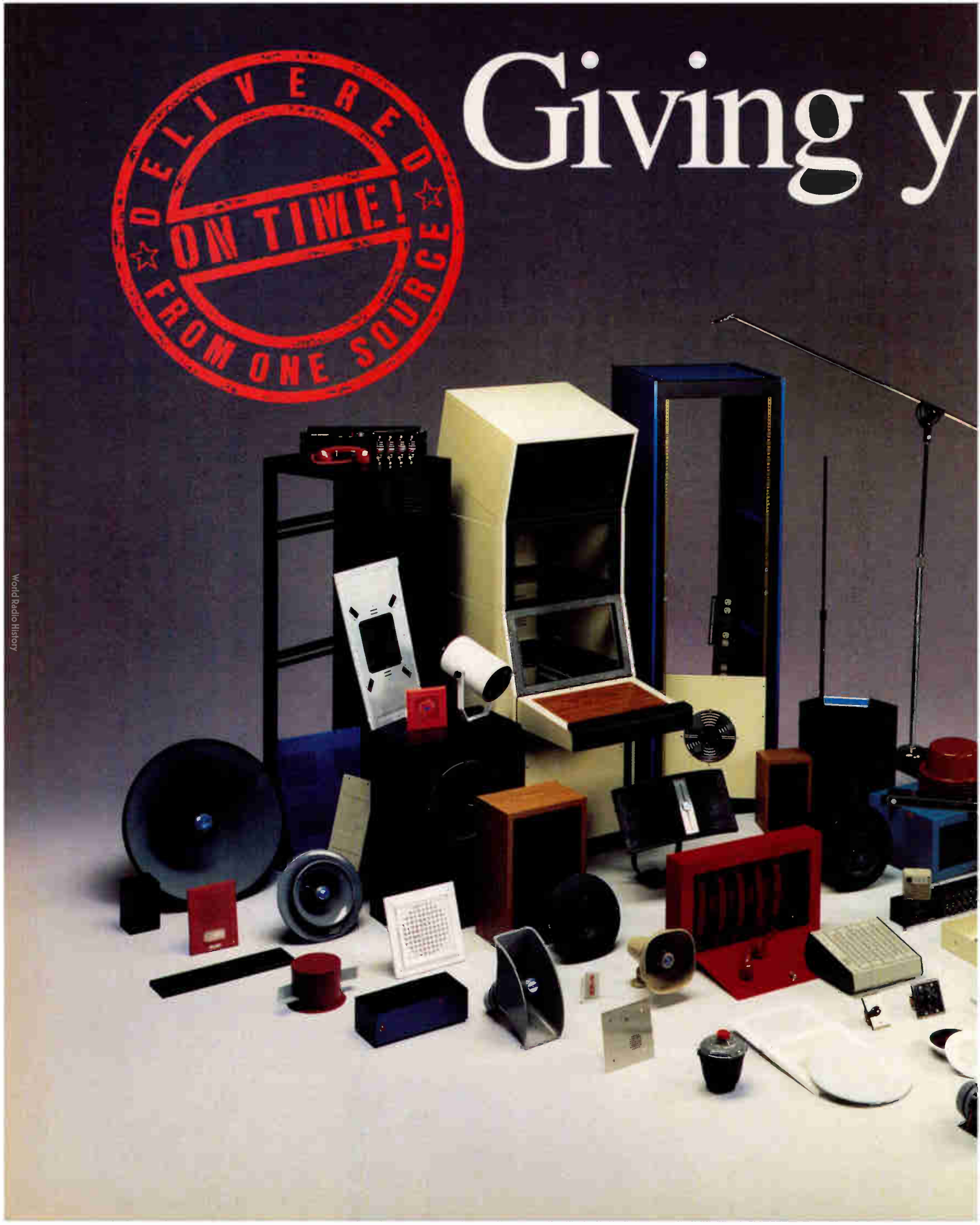

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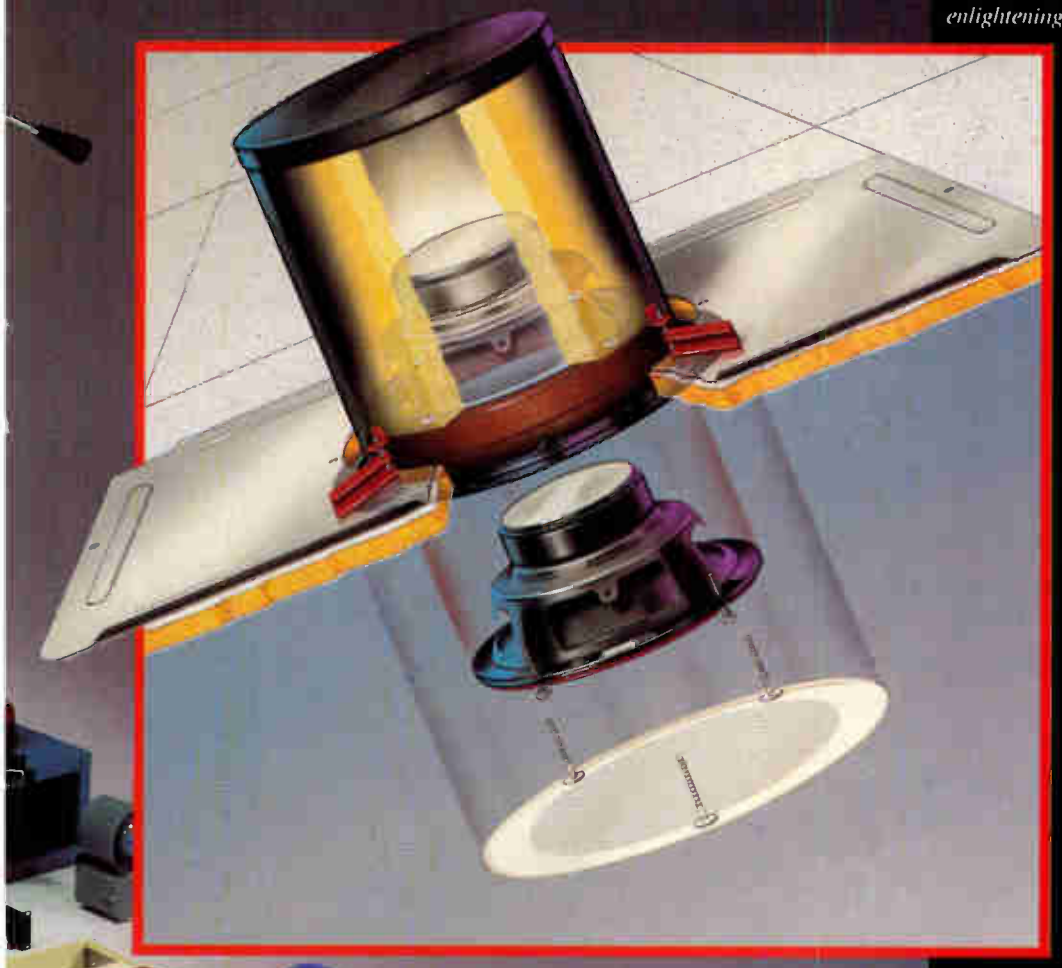

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horizontal plane, and the horn itself is formed by placing two more or less hemispherical domes in close proximity, with the driver resting upon the apex of one of the domes. Because the horn structure is open, extremely high throat pressures cannot develop, and the gain of the

A 360 degree radial horn has a mouth with no sides.

horn is always low in practical embodiments. Still, the design does confer a considerable efficiency advantage over a direct radiator tweeter.

Such horns are mentioned in AES papers delivered by Bert Berlant and later by Daniel Queen, and Queen himself developed a consumer loudspeaker based on the concept, but Henry Wolcott appears to have been the first to aim a design

B.E.S.T.'s CT72 transducer at Flakey Jakes in Anaheim, California.

at the professional market. His speakers employ the horn down to about 1800 Hz, and then cross over to an arrangement of 6½" woofers, one per panel of a four-sided cabinet. Essentially omnidirectional coverage extends from above 16 kHz down to a corner frequency of 40 Hz. On the other hand, the now discontinued Queen system crossed over at 800 Hz to a single woofer, while the Community horn is a single element system with response down to 200 Hz.

A totally different approach to omnidirectionality is seen in the B.E.S.T. line of planar loudspeakers. B.E.S.T. markets a line of speakers of very unconventional design. Originally developed for musical instrument applications, B.E.S.T. speakers were sold with some success in the consumer market before the company concentrated its efforts on the pro field from the mid-eighties onward. The basic design has remained unchanged from the sixties when it was perfected by Jose Bertagni, the company founder.

B.E.S.T. speakers are direct radiators originally designed to be used in free air without an enclosure, though several current versions have since been configured for ceiling mounting. Instead of a cone, a large, intricately shaped sheet of Styrofoam plastic is used for a diaphragm. The sheet is of varying thickness, and is loaded with plastic spheres. The sheet is driven by from one to six (depending on model) linear motors using fairly conventional loudspeaker voice coils that communicate with the diaphragm through elastomer discs which the manufacturer terms "hammers." B.E.S.T. motors all utilize ferrofluid for increased power handling.

The diaphragm functions in a controlled breakup mode over its entire operating range with the radiating area progressively narrowing with increasing frequency. High frequencies radiate out from the vicinities of the voice coils toward the edges of the diaphragm, and are progressively damped en route. The beads impregnated in the diaphragm tend to decouple at the highest frequencies, creating a multitude of supertweeters. The basic design approach is somewhat reminiscent of the Walsh Driver, which is used in consumer products by Ohm Acoustics, and the more recent Aria consumer loudspeaker which also employs a large flat diaphragm driven by a voice coil. About 20 years ago B.E.S. speakers were originally marketed by Fisher as a wall-hanging speaker, while another firm, ERA, offered a very inexpensive Styrofoam flat diaphragm transducer for wall or ceiling mount applications. Perhaps some of our readers will also remember Yamaha's ear-shaped

Styrofoam speakers.

The B.E.S.T. drivers approach the ideal of a true omnidirectional point source. Directivity is claimed to be extremely low in both the vertical and horizontal dimensions, though in the ceiling mount models, a hemispherical rather than a spherical soundfield is projected.

Mark Engebretson of Summit Labs tested two B.E.S.T. models for axial directivity, the CT12E and the CT72D. Both speakers are designed for flush mounting in walls or ceilings. Engebretson computed a total of five intermediate angles in 15 degree steps in addition to the horizontal and vertical polars for spherical average Q over a frequency range of 200 Hz to 20 kHz. The CT12E hovered around a Q of 4 over the entire bandwidth, while the CT72D varied from 4 to less than 1. No freestanding models were measured, but if B.E.S.T. specifications are correct, they are probably the only approximately omnidirectional speakers which have ever found commercial application. Incidentally, the Engebretson report is available in bound form from B.E.S.T.

A somewhat related approach is exemplified by the Soundsphere line of professional loudspeakers developed by Sonic Systems of Stamford, Connecticut. Like the Wolcott Omnisphere, the Soundsphere is an indirect radiator, but it isn't a horn as such.

The diffusor is close enough to the drivers to exert a slot loading effect.

The driver or drivers fire downward onto a broad shallow cone shaped diffusor with concave curves. The diffusor is close enough to the drivers to exert a slot loading effect, and coincidentally to set up complex diffraction effects. Directivity data and application information on the Soundsphere are available in the Bose Modeler CAD program available from Bose Corporation.

According to Dan Graveraux, a consultant for the company and president of Sound Engineering, an acoustical engineering firm, the design was developed intuitively. Soundspheres have gone through several iterations, but current models generally exhibit a Q of 2 in the voice region with a gradual narrowing of focus at frequencies above 3 khz. Minimum Q for most Soundspheres is 4. So essentially the Soundsphere is a low Q, but not an omnidirectional device.

According to Dan Queen, also a consultant with Sonic Systems, and head of

Daniel Queen and Associates as well as a member of the Technical Council and Standards Committee of the AES, the Soundsphere can be said to have random directivity in that the output exhibits a multitude of lobes in all directions, and narrow spikes in any direction. In the far field, within a reasonably reverberant environment, coverage is uniform and frequency response is smooth.

The Bose approach to low directivity speaker design is significantly different from all of the above. First of all, Bose professional speakers are not omnidirectional, but are instead designed to achieve a Q response in the 5 to 6 region. Bose professional speakers are not designed to radiate equal energy to the rear, but do radiate considerable energy to the sides. Bose

The total array may be regarded as a single radiator whose effective diameter decreases with frequency.

speakers are specifically intended to develop a pattern of early reflections, which research by Bose and others indicates will tend to increase speech intelligibility. Late reflections comprising the diffuse field have precisely the opposite effect.

Bose wide range speakers are all direct radiators, and are designed to exhibit high efficiency, high power handling and medium Q across a wide frequency spectrum. In practical terms this necessitates an array of drivers, and Bose gets around the natural tendency of arrays to beam by contouring system response by progressively attenuating the output of the outer drivers in the array with increasing frequency. The total array may be regarded as a single radiator whose effective diameter decreases with frequency, exhibiting an electrical analog to controlled cone breakup.

Next issue: System design considerations and application specifics in the use of low Q professional loudspeakers. ■

Sound at the Carousel Mall

Good Planning, Good Specs and Careful Work Mean a Mall and not a Merry-Go-Round

BY DANIEL KUMIN

Syracuse, New York's Carousel Mall is unequivocally a mall for the 21st century. Carousel is big: approaching two million square feet. Carousel is busy: More than 180 stores, including such anchors as Bonwit Teller, JC Penney, and Lechmere, fill its roughly cruciform, seven-level layout. But perhaps most significantly, Carousel goes well beyond a simple shopping arcade, thanks to the conception of developer/owner the Pyramid Company of Onondaga, NY. The mall is equally an entertainment space complete with themes, sound and video spectacle, and a panoramic observation-level banquet facility of four large configurable rooms — equipped with interactive audio and video systems — capable of accommodating as many as 2,000 people for functions contracted much as at a first-rank hotel.

Oh — and the Carousel Mall does include a carousel. Pyramid rescued a working, classic example from the Roseland amusement park in Canandaigua, New York, and painstakingly refurbished it at substantial expense. Complete with its original, restored steam calliope (and a modern sound system to boot) it now takes center-stage in the upstate mall, lending a central theme to its new home.

Providing sound for this elaborate multi-purpose edifice was the warrant of Seth Waltz, president of AVL Technologies, Rochester, New York, the design and consulting firm working in pro audio, lighting and video. AVL was hired by Pyramid in February 1990, shortly after Carousel broke ground in late 1989, and worked for some six months before specing out the job. (AVL did not have an opportunity to perform architectural acoustical consulting.) The last, punch-list visit of the eventual audio team occurred in December, eleven short months later.

Waltz' firm set out on paper a sound system capable of distributing top-quality background music and unusually intelligible message paging throughout the mall's commercial spaces. AVL also designed sound for the interconnected, highly automated, user-friendly audio/video systems to be installed in the mall's observation-level banquet spaces. (Video contracting was performed by another firm, UniVision, of Syracuse.)

In the latter design stages, Waltz collaborated with Dave Callahan of Syracuse's Sound Engineering. Callahan was brought in by developer Pyramid to function as its in-house consultant and on-site supervisor. Waltz and Callahan's first priority in finalizing the substantial distributed system for the marble-glass-and-steel mall was to achieve a degree of speech intelligibility and even coverage not always found in such dynamic, difficult public spaces. In designer Waltz' view, the choice of loudspeakers and their placement constraints were paramount considerations: AVL made extensive use of Bose Corporation's Pro Modeler acoustical design software to calculate coverage overlap and reverb data, and — as Waltz pointed out — to make the proposal's implications quickly and graphically clear to the clients.

Completed plan in hand, AVL put the job out to bid around mid-summer. Invitees included a handful of sound contractors of a stature commensurate with the project's considerable scale. In spite of its relative newness to the non-peripatetic contract-sound field, renowned touring-sound house Clair Brothers Audio Systems of Lititz, PA was a natural bidder, and ultimately became the final team member.

Implementing the Carousel project presented myriad challenges to Waltz, Callahan, and Clair Brothers. At the design stage, top-priority was given to coverage and intelligibility — no mean feat in the multi-level, largely open-space Carousel Mall. Waltz designed for about 50 percent less than full center-to-center coverage in the main mall areas, a factor permitted by the casual nature of the space and pretty much dictated by budget constraints. The resulting layout uses more than 550 sep-

Daniel Kumin writes about professional and consumer audio, visual and musical topics for a number of publications.

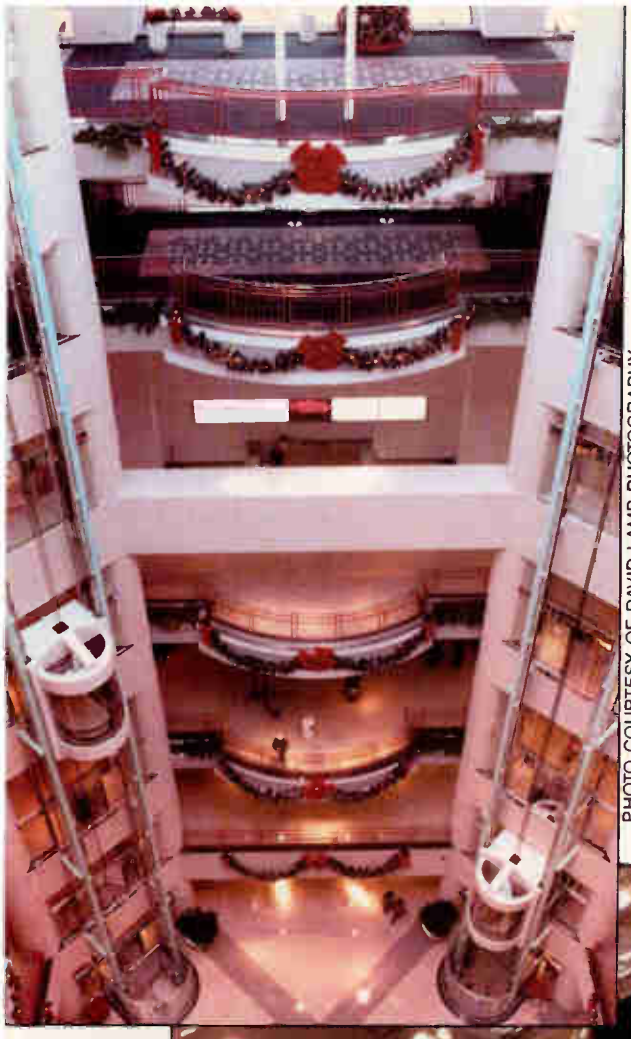


PHOTO COURTESY OF DAVID LAMB PHOTOGRAPHY

Syracuse's Carousel Mall is almost two million square feet.

cabinets play into the four grander of Carousel's six "theme" entryways, where speaker visibility (and a somewhat higher performance level) were specifically desired. (Outdoor Boses handle the other two entrances.) Filling out the transducer complement are a number of Rockustics speakers. These items, which disguise themselves as small boulders, were deployed to fill in the "Food Court" eating zones. According to Waltz, the Rockustics idea arrived while work was in progress, as he witnessed the arboreal contractor trucking in quantities of palm trees for the courts — huge, open expanses largely

PHOTO COURTESY OF DAVID LAMB PHOTOGRAPHY

Entrance to the Carousel Skydeck.

arate loudspeaker installations all together.

Ceiling-mounted Bose 102s (about 500 altogether) provide the bulk of the coverage in the mall's commercial spaces. In several sections of Carousel's "transverse courts" wider dispersion was called for. Here, a total of 45 Canton In-Wall 9s — two-way, flush-mounted "home hi-fi" loudspeakers were innovatively selected and installed in soffits. Sixteen TOA F-300 devoid of any practicable locations for conventional speakers.

Power in the Carousel Mall design is generated by Crest: A cluster of 16 CV-601 power amps (600 watts-per-channel times two/70 volts) generate something approaching 20 kilowatts of audio signal power in the mall itself. (This is perhaps an order of magnitude of more juice than may often be seen in such a system. The

Restaurant at the Carousel Mall.

Carousel audio team feels this has much to do with the installation's excellent final sound and intelligibility.) All of the commercial spaces are serviced by 70-volt distribution. The background-music sources include an Onkyo CD changer (appropriately enough a top-loading "carousel" design), as well as a direct-broadcast satellite downlink.

The mall system was designed to operate as 11 distinct zones, fully open to custom programming by zone. Eleven TOA M-900 mixers, each configured for four channels with U11S line/mute input and T01S output modules, and twenty Rane ME-30 equalizers service the front ends. Benchmark Media Systems DA-101 line-level distribution (transformerless output) modules were employed; voice-processing for paging is via Symetrix 528s.

The Pyramid Company of Onandaga, New York designed the mall.

A Mackenzie DigiMac hard disk-based, computer-controlled digital messaging system rounds out the program sources. Seven DigiMacs are deployed to provide a different message for each of the mall's public entrances: Each entry is thematically differentiated by an individual antique carousel horse. The welcoming messages

are accompanied by CD-sourced music (once more from Onkyo changers), and each provides a brief history of its particular wooden pony. The DigiMac systems can be reprogrammed on-site by microphone, but were designed to be easily transportable for more polished program loading in a recording studio.

Finally, the Carousel Mall's actual carousel was not neglected: It was retrofit with a free-standing sound system, built into the calliope's pipe cluster, to serve as backup/auxiliary for the roundabout's classic steam organ. It incorporates another Onkyo CD changer, a TOA M-900 mixer, a Crest amp, and Electro-Voice PI-100s installed in four separate chambers distributed among the pipes.

AVL's performance goals for the commercial mall spaces were ambitious, but

Clair, AVL and Dave Callahan combined to produce the sound system.

straightforward enough: 80 Hz to 4 kHz within a ±2 dB window, tuned for 6 dB/octave of rolloff below, and 3 dB/octave above these initial limits. Consistent level capability of 90 dB on-axis (standing ear-height) from 200 Hz to 2 kHz — also within 2 dB — was another benchmark; the background music system was initially set up to provide average levels of 76 dB, measured similarly.

Of course, in public spaces such as Carousel, the paging function is of equal importance to BGM. The mall's sound design incorporates fully automated All-Call paging (automated Fire Paging and alarm were not part of the audio job, but their overrides are fully integrated) via a hard-wired mic in the Security Office area. However, local paging panels, with zone-muting capabilities, are distributed throughout the complex, so that special events incorporating live music announcement can take place with great flexibility (an Electro-Voice portable sound system

began working noon to 10 PM, or even 10 PM to 8 AM, gleaning hours of confusion-free time. The Clair people collaborated with AVL and Dave Callahan to solve the kinds of unforeseeable design problems bound to crop up in so large a project: Pelland recalled one in particular that involved siting a long antenna for a wireless mic system broadcasting to a receiver 2,000 feet away, while eliminating potential RFI problems throughout the mall.

Pelland allowed that the Carousel Mall was the largest 70-volt system Clair has yet dealt with, and that many walk-throughs were ultimately needed to balance it up to meet the design's standards. Completing and testing the system — a series of checks for level and frequency-response — was a bit of a crunch as opening day loomed. "Boomer" Bang put it more graphically, describing the site as "jackhammers going from sun-up to sunset." But the job was wrapped on time, and there have been next to no bugs. Subsequent maintenance for Clair has consisted of a couple visits to train new personnel on the observation-level banquet-room systems.

Clair Brothers, AVL, and Sound Engineering ended up as something of a mutual admiration society. Pelland was full of praise for the design team, in particular pointing out the virtues of working on a project of Carousel's magnitude with a design/consulting team as flexible and fast-reacting as AVL and Sound Engineering proved to be. Regrets from within the audio camp were few. However, all parties mourned the loss of an automatic gain-control system originally conceived for the main mall's BGM and paging functions, which fell victim to ultimate budget constraints. According to Waltz, the potential remains for an easy retrofit.

For his part, Sound Engineering's Dave Callahan summed up the Carousel experience like this: "It was a fairly big venture for my company. While it's a little hard to think of Clair as a fresh face, permanent installations were a bit new for them. But the quality of their work and their expertise were the same as they bring on the road — they did a great job. The Clair crew got along really well with all the other trades — I can't say how critical and sometimes difficult that is. Everyone on the job always loved the Clair Brothers people.

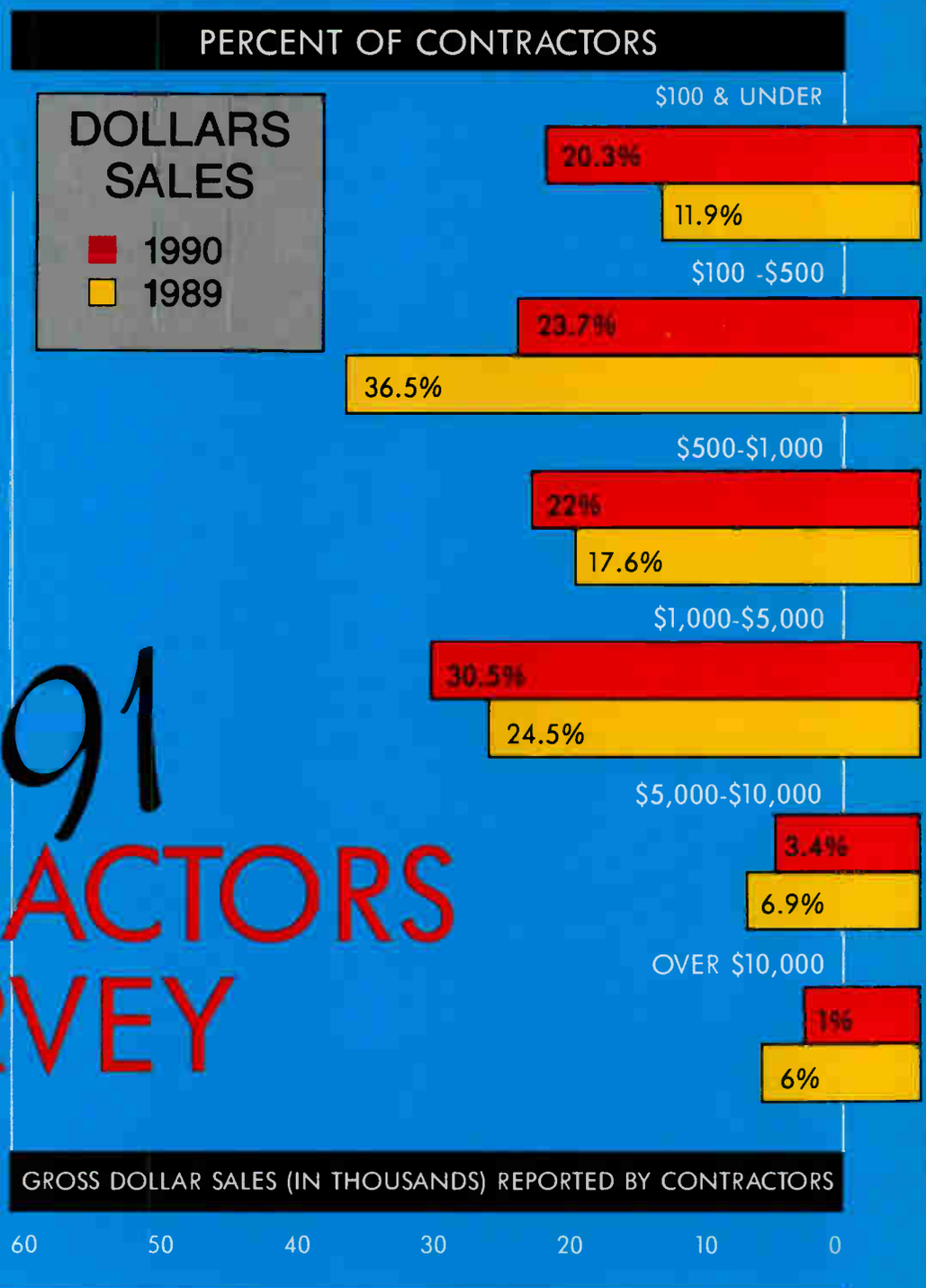
"The design Seth (Waltz and AVL) came up with was pretty amazing. The system worked out really well, and with Clair Brothers, so did the project itself. It's jobs like this that separate the men from the boys." ■

SOUND & COMMUNICATIONS

1991 CONTRACTORS SURVEY

ATTITUDES

	PERCENTAGE
VERY POSITIVE	40.7
POSITIVE	39.0
NEUTRAL	10.2
NEGATIVE	5.1



The Sixth Annual

Survey of the Sound & Communications Contracting Business

By Judith Morrison

(Research assistance by Liz Krumenacker.)

More people are making less money. Fewer people are making more money. Total dollar sales are down; and companies are making do with fewer employees. The sound contracting business is thus no anomaly. What's happening in the rest of the economy is no secret to this industry.

All this doesn't lessen positive expectations on the part of sound contractors, who are being more inventive and moving into new market segments to hold their own and grow within the constraints of the times.

Sound & Communications magazine's Sixth Annual Survey of the Contracting Business elicited these and other implications important to understanding what's going on. The four-page survey was mailed in May of 1991 to a sampling of Sound & Communications contractor/readers. Results were gathered in June, and were tabulated by an independent market research firm, Survey Analysis. For this year's survey, we added a few questions, finessed some others, and gave additional space for write-in comments. As we all know, Sound & Communications readers are a vociferous bunch, and the write-in answers made for interesting reading, and interesting analyses.

The average total dollar sales for contracting firms is down for 1990. The average for 1990 came in at $1,269,000, down from last year's 1989 figure of $1,473,000. Within that total, the numbers allude to trends, but with no clearcut avenue. For instance, more companies (20.3 percent, up from 11.9 percent last year) are reporting the low end of sales (under $100,000). (This is, however, closer to the previous year's response of 18 percent.) Only 3.4 percent are reporting sales of over five million dollars (down from 7.5 percent last year and 8 percent the previous year). Yet nearly a third are falling within the $1,000,000 — $4,999,999 range this year, compared with only a quarter last year and the year before. Similarly, the percent of companies reporting sales of between $500,000 and $999,999 has risen to 22 percent from last year's 17.6 percent and the previous year's 13 percent. To summarize, fewer companies are reporting sales of over $5,000,000. More companies are reporting total sales of under $100,000. There is a trend downward between $100,000 and $400,000; and a trend upward between $500,000 and $4,999,999. When it's figured with broader classifications, the results indicate that more companies this year have sales below $499,000 (44 percent this year). More companies have sales between $500,000 and $999,000 (22 percent). And the same percentage has sales over $1,000,000 (34 percent).

Last year 48.4 percent of respondents reported sales under $5,000,000. This year 44 percent reported in that range. In 1988, the figure was 56 percent. This shows a clear trend toward larger dollar sales. But the small companies may be getting smaller; and there are clearly fewer companies getting much much bigger (over $10,000,000).

The average number of employees for sound contracting companies is 14.8, with nearly 40 percent of companies employing between four and 10 people. As one would expect, bigger companies had more employees. However, there's a big jump between companies reporting sales of $500,000 to $999,999 (average number of employees: 7.8) and those reporting sales of $1,000,000 and $4,999,999 (average number of employees: 30.7).

At any rate the overall average number of employees is down this year from last year's 16.2.

What services do these companies provide? For some reason, fewer companies are reporting involvement in repair and maintenance (86.4 percent versus last year's 93.1 percent). Our survey didn't encompass reasons for provision of services, so we can offer no analysis of this change. Fewer companies reported equipment

Markets to Expand Into

- Rentals/Sales Retail
- Hospitals (Nurse Call)
- Residential
- Church Sound
- Videoconferencing
- Corrections
- Security
- Acoustical Treatments
- Music Rentals
- Fiber Optics
- Fire Alarm
- Rock (sound installations)

Most Important Markets For 1990

- Commercial Sound Reinforcement
- CCTV
- Entertainment Sound System
- Nurse Call
- Non-Security Video System
- Sound Service
- Business Music System Hardware
- Pro Sound Equipment
- Factory Paging

Judith Morrison is the Editor in Chief of Sound & Communications magazine.

sales (91.5 percent versus 95.6 percent last year). But those providing system design and system installation remained constant. However nearly 12 percent reported provision of "other" services (down from 15.7 percent last year, and with more companies in the east reporting "other"). Again, we have to admit a limitation to the survey since we didn't specifically ask for an itemization of "other." Companies answering another question, however, which was "What other businesses, if any, are you in?" volunteered businesses ranging from tree farming to broadcast.

Virtually all of the larger companies provided repair and maintenance service and equipment sales, with the midrange being the largest provider of "other services."

How large — in dollars — are the jobs currently being done? How do they compare to past years? Perhaps surprisingly the average dollar value of systems has gone up — from $15,800 last year to $21,400 in 1990. Similarly, the 'largest size system installed in 1990' rose from 1989 — from $96,000 to $170,400. Predictably, larger companies reported larger size jobs. The northwest reported the largest largest-size system (a mean of $496,600), but came in just slightly higher than the mean on "average size of system" — at $27,000. The smallest companies reported an average size of $9,500 versus last year's $6,700. And that change carried throughout the size of the companies. It seems that the jobs are getting larger, or at least are costing more. But the change in total sales figures for respondents seems to indicate that there are simply fewer jobs around.

The time taken for these jobs has gotten longer. This year's survey showed a typical time from order to finished system as 3.3 months. Last year the typical time was 2.6 months. The year before it was 2.5 months. For the past six years, that figure has hovered around the three month window, but this year it comes in on the far side. That could correlate with the higher cost of the average job. Are installations becoming more complex, more costly, and more scarce? The results seem to bolster this view.

What equipment is going into these installations? For the sixth consecutive year, TOA has come in as the top selling line reported by sound contractors.

Each year for all six years of the Sound & Communications Contractors Survey, we have asked questions concerning manufacturer relationships: the top selling lines, best relationships, most reliable brands, best values. Last year we began asking the brands contractors are least likely to use. TOA's status in the marketplace is beyond dispute. It is the only company to consistently and positively show up every year, and it has always run in first place. After that, there has been some jockeying for position from year to year. This year's placement for top-selling line, after TOA, is Atlas/Soundolier, JBL, and Electro-Voice, all too close statistically to rank separately. After that, Bogen, Altec Lansing, Rauland - Borg, and Shure placed high as top sellers. Other companies garnering favor as top sellers included Dukane, QSC, Peavey, Crown, West Penn, and Audio-Technica.

Last year, we noted that it was impossible to quantify the responses that mentioned companies of the Mark IV Audio Group. We received answers ranging from Mark IV to E-V—Mark IV to Altec Lansing—Mark IV. This year, there was no confusion. It seems that over the past year, Mark IV has done its job in defining

More Time Should Be Spent With . . .

	PERCENTAGE 1990	1991
Architect	27.7	22.0
General contractor	4.4	1.7
End user	20.8	25.4
Electrical contractor	5.7	5.1

Average Projected Percent of Sales

	PERCENT RESPONDING 1990	1991
SOUND REINFORCEMENT		
Commercial sound reinforcement (installed)	28.4	28.9
Commercial sound reinforcement (portable)	2.1	1.5
Entertainment sound reinforcement (installed)	6.0	3.2
Entertainment sound reinforcement (portable)	3.4	1.1
Sound service (rental & operation)	4.7	3.5
Pro sound equipment	4.0	3.5
MI/musical instrument	0.9	—
INTERCOM (Non-telephone)		
Office-to-office	1.5	1.2
Nurse call	4.1	5.7
Other Hospital/health care intercom	0.6	1.8
Factory paging/talk back	1.8	1.6
Other wired intercom	4.4	3.0
BUSINESS MUSIC		
System hardware sales/installation	3.7	1.5
Sales of tape/cartridge	0.5	0.3
SCA/Satellite	2.7	5.8
Music library rental/programming	1.5	0.4
INTERCONNECT		
Keyphone sales/installation	4.0	3.2
PBX sales/installation	0.9	1.5
Hybrid sales/installation	1.5	2.5
Support & peripheral equipment	0.7	1.2
OTHER		
Video systems (non-security)	4.5	6.2
CCTV	3.0	9.0
Alarm/security/life safety	6.3	6.6
Sound masking	0.7	1.5
Teleconferencing	0.7	2.4
Residential systems	2.5	6.2

Actions Manufacturers Should Take

"Certain distributors sell to anyone who sends them a check . . ."

"Limit sales to qualified dealers — no trunk slammers."

"Send engineering and marketing people into the fields to find out about real life in the market place."

"Remember that my end-user is not an engineer — make equipment more user-friendly."

"Make high-end lines of equipment more available to medium-sized companies."

"Consult with contractors more."

"Understand the needs of an honest contractors business."

"Train their reps (or sales force) to be more knowledgeable on their products and the market they address."

"Improve standardization."

"Make equipment available for demonstration before final purchase by client."

Most Important Markets Projected

	PERCENT RESPONDING 1990	1991
SOUND REINFORCEMENT		
Commercial sound reinforcement (installed)	47.8	52.5
Commercial sound reinforcement (portable)	7.5	5.1
Entertainment sound reinforcement (installed)	17.0	10.2
Entertainment sound reinforcement (portable)	6.9	3.4
Sound service (rental & operation)	10.7	16.9
Pro sound equipment	12.6	11.9
MI/musical instrument	1.3	—
LOCAL WIRE INTERCOM (Non-telephone)		
Office-to-office	9.4	8.5
Nurse call	13.8	13.6
Other Hospital/health care intercom	6.9	5.1
Factory paging/talk back	10.1	8.5
Other wired intercom	13.8	5.1
BUSINESS MUSIC		
System hardware sales/installation	9.4	10.2
Sales of tape/cartridge	3.8	3.4
SCA/Satellite	6.3	6.8
Music library rental/programming	5.7	1.7
INTERCONNECT		
Keyphone sales/installation	8.2	6.8
Support & peripheral equipment	3.8	5.1
OTHER		
Video systems (non-security)	14.5	15.3
CCTV	11.3	16.9
Alarm/security/life safety	11.9	8.5
Sound masking	6.3	10.2
Teleconferencing	2.5	8.5
Residential systems	5.7	8.5

the components of its audio group. We received no "Mark IV" responses; survey returns mentioned only the component companies. Thus, Electro-Voice and Altec Lansing, both Mark IV Audio companies, came in independently in the top selling category.

It's always interesting to correlate the top sellers with the other characteristics we specify: best relationship, most reliable, best value. This year's best relationship winners are TOA (first place again), then Atlas/Soundolier, followed by JBL and West Penn. After that, QSC, Altec Lansing, Rauland Borg, Shure, Crown, Rane, Peavey and Bogen placed high.

It's important to remember that all the manufacturer related questions were open-ended. Our survey as written contained no prejudices. Respondents were free to fill in whomever they pleased with no suggestions. It seems to us that manufacturers placing in the "best relationship" category have, either at the management or rep levels, some people doing something special that would cause contractors to specifically name them in their answers.

Of the brands found most reliable: TOA took first place, followed by Electro-Voice and JBL. Shure, Rane, Atlas/Soundolier, QSC, West Penn, Bogen, Crown, Rauland-Borg, and Altec Lansing also placed.

Of the best values: TOA was first, followed by Electro-Voice and then Atlas/Soundolier and West Penn. After that, companies mentioned most often included Shure, Crown, Peavey, and Biamp.

What are the brands *least* likely to be used? This is always a dicey classification, since many factors can go into a negative rating: rep relationships, franchise requirements, market positioning.

Some of the reasons given for naming a company bear noting: "high price"; "unreliable"; "They don't give a damn"; "Everyone sells it"; "Difficulty to pro-

The most important criteria for getting most jobs

	PERCENT RESPONDING
Low bid	11.9
Fair price	16.9
Service & maintenance availability	20.3
Installation availability	6.8
My company's presentation	23.7
Equipment carried	1.7

Total Dollar Sales for 1990 (Compared To Last Years' Response)	PERCENTAGE		
	1988	1989	1990
Under 100,000	18	11.9	20.3
100,000-499,999	38	36.5	23.7
500,000-999,999	13	17.6	22.0
1 Mil.-4,999,999	23	24.5	30.5
Over 5 Million	8	7.5	3.4

cure''; ''unpredictable results''; ''overly complex system.''

Of those brands that are favorably regarded in the marketplace, one of the most critical factors is the manufacturers' rep. You'll note the relative correlation between ''top selling'' lines and ''best relationship.'' While everyone loves the thing he makes money at, the fact remains that the manufacturers' rep is often responsible for that relationship. For the second consecutive year, we've asked our readers to name the manufacturers' rep/distributors with whom they have the best relationship. This was a write-in question with no suggestions offered, and we think all the reps mentioned deserve commendation. The companies mentioned most often were North Supply, Vector Corp. and Chuck Olson. After that, because of the wide universe and the closeness of the votes we've determined to list the reps in alphabetical order, and you'll find that list elsewhere in this report.

We asked our readers which organizations they belong to, and which conventions they attend. The tough economy seems to be encouraging contractors to network and join for a common business effort. At all levels there's been growth. Reported membership in AES is up from 22 percent last year to almost 24 percent this year. Membership in ICIA moved up a percentage point from 6 percent to nearly 7 percent. And membership in the National Sound & Communications Association has risen from 55.3 percent of our respondents last year to 57.6 percent this year. As might be expected, respondents from larger companies are more apt to belong to NSCA than smaller companies.

Concerning convention attendance, almost all industry-related conventions gleaned a larger percentage of our readers' attendance (only NAB remained relatively constant at just under 7 percent). Nearly 60 percent of our respondents attend the NSCA convention (up from 55 percent last year). A quarter of them attend the Audio Engineering Society convention. Eight-point-five percent attend ISC, 8.5 percent attend NAMM, and 3.4 percent even attend SMPTE. But the convention that registers the most growth in our survey is Infocomm, increasing from a reported attendance last year of 7.5 percent to 22 percent this year. That doesn't completely surprise us, since Infocomm has increasingly become a venue of multi-media equipment being used in boardrooms and high end residential work.

Even new conventions are garnering support. DJ Expo, the convention for the club market, which had its first convention less than a year ago, has attracted almost two percent of our respondents.

What segments of the market are the most important, and how does that compare to past years?

Just under 80 percent of our respondents received at least 1 percent of their 1990 gross sales from the commercial sound reinforcement (installed) category. That's the largest percentage for any market segment we listed. However, that number is down from last year's whopping 85.5 percent. Similarly, all categories of ''sound reinforcement'' showed a decrease, with ''pro sound equipment'' falling from 40.9 percent of respondents to 27.1 percent.

All categories under non-telephone intercom fell, with the notable exception of ''nurse call,'' which increased 10 percentage points from 23.9 percent to 33.9 percent. Similarly high increases occurred in CCTV (from 39 to 49.2 percent) and non-security video systems (32.7 percent to 37.3 percent).

Markets with 1 percent of Sales	PERCENT RESPONDING	
	1989	1990
SOUND REINFORCEMENT		
Commercial sound reinforcement (installed)	85.5	79.7
Commercial sound reinforcement (portable)	26.4	20.3
Entertainment sound reinforcement (installed)	37.1	27.1
Entertainment sound reinforcement (portable)	20.1	8.5
Sound service (rental & operation)	36.5	33.9
Pro sound equipment	40.9	27.1
MI/musical instrument	1.9	1.7
LOCAL WIRE INTERCOM (Non-telephone)		
Office-to-office	31.4	27.1
Nurse call	23.9	33.4
Other Hospital/health care intercom	21.4	20.3
Factory paging/talk back	49.1	40.7
Other wired intercom	34.6	20.3
BUSINESS MUSIC		
System hardware sales/installation	27.7	28.8
Sales of tape/cartridge	8.8	11.9
SCA/Satellite	11.3	13.6
Music library rental/programming	11.3	5.1
INTERCONNECT		
Keyphone sales/installation	18.9	20.3
PBX sales/installation	8.8	11.9
Hybrid sales/installation	9.4	5.1
Support & peripheral equipment	11.3	15.3
OTHER		
Video systems (non-security)	32.7	37.3
CCTV	39.0	49.0
Alarm/security/life safety	19.5	25.4
Sound masking	22.0	20.3
Teleconferencing	10.7	22.0
Residential systems	13.8	27.1

Large increases were shown for "teleconferencing" (from 10.7 percent to 22 percent), and "residential systems," (from 13.8 percent to 27.1 percent). This increase is consistent with the increase in attendance at the Infocomm show, and in anecdotal information collected by Sound & Communications magazine regularly in speaking with its readers. And last year's survey elicited, under our "most neglected markets" question, high response for residential systems, teleconferencing, CCTV, and non-security video.

Our readers are apparently making strides in their market plans.

What were the most important markets in 1990? Commercial sound reinforcement (installed) was rated as a most important market by 61 percent of the respondents. (Only 48 percent had predicted this last year; but our readers pay attention to reality — 52.5 percent project this as an important market for 1991). Nurse call is up to 22 percent reporting it as an important market, from 13.8 percent last year. Factory paging is down. Market segments showing *actual* growth as "most important markets" and *predicted* growth are non-security video systems, CCTV, teleconferencing and residential systems.

When it comes to average percent of sales, however, commercial sound reinforcement (installed) weighed in with only 30 percent of 1990's sales figures, although this was up from 1989's 24.8 percent. Other segments showing increases were nurse call, SCA/Satellite, non-security video systems, CCTV (6.8 percent from 2.8 percent), teleconferencing and residential systems (5.5 percent from 1.7 percent last year.

Losses were taken in all sound reinforcement categories except MI/musical instruments. However, MI received miniscule votes as an important market to our respondents.

Projections for 1991 tend to follow the reality of 1990 (the same pattern could be seen for last years projections). Projections for teleconferencing, residential systems, CCTV, non-security video systems are all up, following similar increases in 1990's percent of sales.

Over half of our respondents currently do "most of their work" on "worship houses." Over 40 percent concentrate on schools, and 44.1 percent on offices and factories. A third of our respondents focus on auditoriums and concert halls, with almost as many concentrating on clubs and restaurants. A full fifth of the contractors concentrate on boardrooms. This is the first year that we've asked this question, so no comparisons can be made to past surveys. Many of our respondents checked off more than one major concentration, so the total adds up to more than 100 percent.

Smaller companies tend to do more church work; larger companies do far more work on schools, boardrooms and auditoriums. And large companies (over $5,000,000) do virtually no work in clubs and restaurants; that type of installation is handled mainly by mid-sized companies. Small companies (under $500,000) do very little work in hospitals and only 22.5 percent of companies under $1,000,000 focus on that kind of work. Church work concentration is most prevalent in the north central and northeast. School work is most prevalent in the south central and north central regions. And as one would expect, office work is concentrated on by less than a third of our northeastern respondents, and over half of those in the southeast and southwest.

How do contractors get their jobs, and why do they think they get them? We asked, "What are the most important criteria for your getting most of your jobs?" A hefty 44 percent rated "my company's presentation" as the most important or second most important factor in actually getting work. This factor was more critical for the central region, and least critical in the northeast. The second most important factor was service and maintenance availability, which was considered most important by a fifth of the respondents. But note that only 86.4 percent rated service and maintenance as factors in their business on an earlier question.

Fair price was considered most important by nearly 17 percent, and "low bid" by 12 percent. Low bid was far more important to larger companies than to smaller, and to companies in the south

THE BEST REPS

Manufacturers' rep/distributors having the best relationship with contractors.

North Supply	Teniko	C.M. Sales
Vector Corporation	Graybar	Peter Schmitt
Chuck Olson	Bencsik Associates	David Brothers
Western Audio	Warren Associates	Roger Ponto & Associates

Other companies receiving a sizeable number of votes (in alphabetical order):

ADI	Jones Audio Sales	Qualitone
Advantage	J.V. Belusko	Radon
Almo	Kodo & Associates	Rancilio & Associates
AMA	Kingston	RCK Sales
Aywest	Martin Audio	Richardson Sales
Avcom	Marketshare	Ron Cole
DAS	Meyer Marketing	Ross Radio
Dobbs Stanford	Northmar	RPM
Eakins Bernstein	NTD	RT Marketing
Excellence Marketing	Palnor	Shalco
Full Compass	Pat Norman	S.Y. Schoonmaker
Greg Dzubay	Peregrine	T.K. Group
Henry Phillips	Professional Audio	WesTech
Hudson Marketing	Pro Tech	Yore Company
Innovative Audio	Pusecker Sales	Ziskind
JAMM Distribution		

Venues of Concentration

	PERCENTAGE
Worship houses	50.8
Schools	40.7
Boardrooms	20.3
Auditoriums/concert halls	33.9
Offices/factories	44.1
Hospitals	20.3
Clubs/restaurants	30.5

central region. Equipment carried was considered most important by only 1.7 percent of the respondents overall — but a third of the international respondents considered this most important.

This question obviously asked the contractors how they get the job; it didn't ask the end user. So it's a judgment call as to how much ego went into the answer "company presentation." Any successful businessman wants to believe it was his company's capabilities that acquired a project, and not the mundane subject of low bid.

Most business people use personal computers in their business. What kinds do our readers use? The vast majority use IBM and compatible machines, with those using Apple Macintosh usually owning both types. We didn't ask questions on CAD or sound system design, so unfortunately we have no answers on what computers are being used for that type of work, if any. For strictly business operations, IBM compatibles came in as clear leaders.

What is this business called? Once again, we asked contractors how they define their firms. And once again, we received a much varied response. This was an open ended question, and the responses were as various as last years, ranging from sound and communications contractor to "electronic systems sales, service, design installation," to "small, innovative professional firm." This industry seems to be as disperse and as changing as the people in it; what keeps it going is the diversity. And that shows up in the definitions offered.

Projected Importance to Sales For 1991

- Commercial Sound Reinforcement
- CCTV
- Sound Service
- Non-Security Video System
- Nurse Call
- Entertainment Sound Systems
- Pro Sound Equipment
- Sound Masking
- Background Music System Hardware

How does the contractor spend his day? Nearly 50 percent of the interfacing time is spent with the end user. After that, the numbers fall off sharply to 12 percent with the electrical contractor, 8 percent with a general contractor, and 8 percent with the architect. Three percent of the time is spent with the interior designer. These numbers remained fairly steady across geographical regions and size of the contracting company. And they were relatively consistent with last year's figures.

Most Reliable Brands

- TOA
- E-V
- JBL
- Rane
- Atlas/Soundolier
- Shure
- QSC
- West Penn Wire

Interestingly, more contractors would like to spend more time with the end user, more than with any other category. Over a quarter of a respondents would like to spend more time with the end user. Less than 2 percent would like to spend less. Nearly 14 percent would like to spend less time with the electrical contractor. And 22 percent would like to spend more time with the architect.

How successful is the attainment of these goals? Not very; the actual time spent this year is relatively stable to last year's time spent. But practically across the board, less time is being spent interfacing with others in general.

What's the general attitude of the sound and communications industry?

This is a pretty upbeat business. Nearly 80 percent of the respondents said they

Average Percent of Sales

	PERCENT RESPONDING 1989	1990
SOUND REINFORCEMENT		
Commercial sound reinforcement (installed)	24.8	29.8
Commercial sound reinforcement (portable)	2.3	1.4
Entertainment sound reinforcement (installed)	6.5	2.2
Entertainment sound reinforcement (portable)	2.5	2.0
Sound service (rental & operation)	5.5	4.3
Pro sound equipment	4.8	3.7
MI/musical instrument	0.9	2.5
INTERCOM (Non-telephone)		
Office-to-office	1.0	1.1
Nurse call	4.0	5.6
Other Hospital/health care intercom	1.0	1.4
Factory paging/talk back	2.5	2.4
Other wired intercom	3.7	1.3
BUSINESS MUSIC		
System hardware sales/installation	3.6	2.1
Sales of tape/cartridge	0.7	0.2
SCA/Satellite	1.6	5.4
Music library rental/programming	1.0	0.3
INTERCONNECT		
Keyphone sales/installation	4.4	5.0
PBX sales/installation	1.0	1.5
Hybrid sales/installation	1.4	2.2
Support & peripheral equipment	1.5	0.8
OTHER		
Video systems (non-security)	3.3	5.2
CCTV	2.8	6.8
Alarm/security/life safety	6.1	6.2
Sound masking	0.8	1.2
Teleconferencing	0.6	2.2
Residential systems	1.7	5.5

Installed System Jobs (Dollars In Thousands)		
	1990	1991
Average size of systems	15.8	21.4
Largest size of systems	96.0	170.4
Typical time from order to finished system (months)	2.6	3.3

felt positive or very positive towards business as a whole. Only 5 percent felt negatively, while practically no one felt very negative. This matches up pretty consistently with the results of the Sound & Communications Economic Survey of manufacturers done each January.

As far as product direction: More people expect the direction of the industry to fall in the high end or midrange. Only 3.4 percent see the direction going towards the low end. Nearly 50 percent see it in the middle. And nearly 40 percent see it in the high end.

And what can manufacturers do to help sound contractors? This year we added a question: "What one action could manufacturers take to help your business?" As you would expect, the answers were highly individual. But communication tended to lead the pack of suggestions. Some examples: "Consult with contractors more,"

Top Selling Lines

- TOA
- Atlas/Soundolier
- JBL
- E-V
- Shure
- Altec Lansing
- Bogen
- Rauland-Borg

"product training," "better technical information," " more detail in catalog," "send engineering and marketing people into the field so as to find out about real life. . . ." The economy is obviously on contractors' minds, and some of our respondents alluded to harder times in their suggestions: "Provide more credit/demo gear"; "lower prices"; "quit cutting deals with the big guys," "provide extended terms," "due to longer lead times, we need to know about models changes ASAP," "creative financing terms such as Peavey has done with the Architectural Acoustics line."

Many contractors are crying for more demonstration facilities and products, for limited distribution, for standardization. And efficiency counts: "Notify us when it's a B.O. ASAP, not three weeks later when we call because no shipment yet."

And a subject that has become more of a problem in the past year: "Help keep state laws from dictating licensed electrician required to work on low voltage systems."

We're pleased to provide this forum for contractors' suggestions to manufacturers. But we also asked for general comments from our respondents. They were free to write whatever they pleased. As one would expect, contractors used this space to voice their favorite complaints: "Too many unlicensed consultants." "I'm tired of paying for the manufacturer's mistakes." 'The desire by too many is to make as much money as quickly as possible." "We need standards for specifications of equipment." "All but a few manufacturers are confused about what contractors do."

But a general aura of positivism fits with the statistical indications. As one contractor said: "In spite of ups and downs, I still like the business we are in and get a little smarter each day."

The annual Sound & Communications survey of the contracting business makes us a little smarter too — here at this magazine, and, we hope, to you in the field.

Most Important Markets	PERCENT RESPONDING 1989	1990
SOUND REINFORCEMENT		
Commercial sound reinforcement (installed)	60.4	61.0
Commercial sound reinforcement (portable)	12.6	10.2
Entertainment sound reinforcement (installed)	21.4	15.3
Entertainment sound reinforcement (portable)	10.7	5.1
Sound service (rental & operation)	16.4	22.0
Pro sound equipment	23.9	11.0
MI/musical instrument	1.3	1.7
LOCAL WIRE INTERCOM (Non-telephone)		
Office-to-office	14.5	13.6
Nurse call	13.8	22.0
Other Hospital/health care intercom	10.7	10.2
Factory paging/talk back	22.6	18.6
Other wired intercom	17.0	10.2
BUSINESS MUSIC		
System hardware sales/installation	13.8	20.3
Sales of tape/cartridge	5.7	5.1
SCA/Satellite	6.9	10.2
Music library rental/programming	8.2	1.7
INTERCONNECT		
Keyphone sales/installation	12.6	10.2
PBX sales/installation	5.0	3.4
Hybrid sales/installation	5.0	1.7
Support & peripheral equipment	5.0	5.1
OTHER		
Video systems (non-security)	14.5	22.0
CCTV	21.4	27.1
Alarm/security/life safety	10.7	11.9
Sound masking	7.5	11.9
Teleconferencing	3.1	10.2
Residential systems	5.7	13.6

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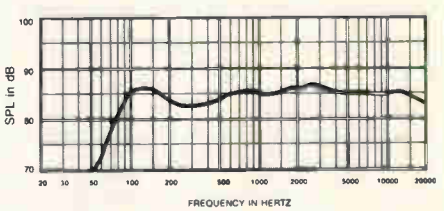

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Beyond the Thunder Dome

The Acoustical Rescue of a Venue from Hell

BY DANIEL SWEENEY

The New Bremen American Legion had a problem on their hands. They'd purchased an auditorium with a view to hosting dances and musical events, and the acoustics of that hall were so dreadful they couldn't pay people to attend. Speech intelligibility was terrible, and musical reproduction was worse. High volume sound reinforcement set off uncontrollable bass resonances that fed back through stage mics, while high frequencies were almost totally lost. A complex pattern of focused reflections caused the reverberant sound to exceed the level of direct sound at the stage by 10 dB at 100 Hz.

New Bremen is a little town in Ohio about a hundred miles north of Dayton. It is not a town with a lot of entertainment resources, and virtually any venue providing musical entertainment stands a good chance of drawing widely from the surrounding area. But the hall's original owner went bankrupt trying to operate a restaurant-night club in the building's unpromising interior environment after a futile attempt to correct the acoustics with absorptive treatments to the wall and ceiling. The Legion bought the place on the cheap with the hope they could somehow control the reverberation sufficiently to achieve acceptable acoustics, and by the terms of the sales contract, final sale was conditional upon the rectification of the hall's acoustics.

The American Legion soon found that it had a considerable task on its hands.

The Legion contacted several local sound contractors for proposals, but none of them were even prepared to bid. The consensus among the professionals was that the hall was irredeemable.

Finally the Dayton-based sound contracting firm Panacom agreed to have a go at the structure. Acoustical engineer John Murray, now employed at Electro-Voice, was assigned to the project. He in turn contacted Acoustics Sciences Corporation, the manufacturer of Tube Traps and other room damping devices and acoustical treatments. Thus began a most difficult renovation.

BEFORE

"It was a concert hall from hell," recalls John Murray. "It had the worst acoustics of any structure I ever encountered. The focused reflections were the worst aspect of it. You'd get reverberation that was a good 10 dB louder than the direct sound a couple of seconds after the direct sound had arrived."

The basic structure of the New Bremen Legion Hall is a concrete dome. The dome consists of a four inch thick shell of concrete which was literally sprayed over a huge inflated plastic form. The dome is not circular; rather it resembles one half of an egg shell. The structure measures 120 feet in length, and is 100 feet at its widest point. Maximum height is 35 feet. An interior concrete block wall divides the structure at the point of greatest height. The smaller segment of the dome is used as a club house, while the larger segment was designated a concert/dance space.

A half dome of this sort has inherently poor acoustics for speech and music reproduction. The gently curving interior ceiling surface functions as a wave guide, channeling reflected sound against the back wall where it is reflected back, redirected, and reflected back again through many, many wave cycles. In this case the situation was made worse by the fact that the stage was located opposite the partition wall, at the narrowest part of the structure where the reflections converged. The RT_{60} (time required for reverberant sound to decay 60 dB) of the New Bremen Legion Hall was nearly five seconds at 60 Hz. Bass boom was simply overwhelming, and overhang in the lower midrange was sufficiently long to garble speech intelligibility badly.

As indicated earlier, the previous owner had attempted an acoustic fix, and the treatment he employed actually made the hall problems more severe. He covered the partition wall with tectum, and sprayed almost the entire ceiling of the dome with 1" acoustic cellulose. These treatments brought the RT_{60} down to less than a second for frequencies above 1 kHz, but did nothing to tame the uncontrolled bass and

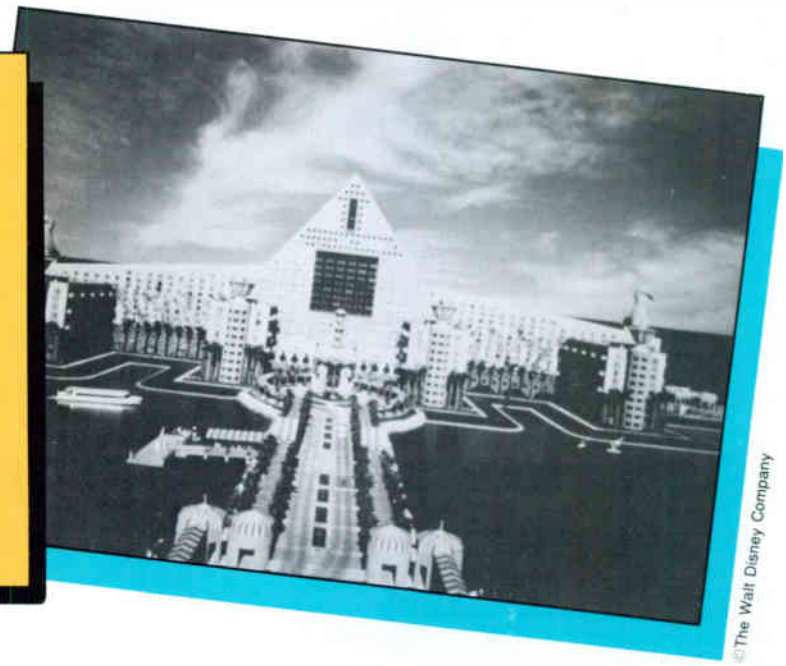
1991 INT'L DJ EXPO *Goes to Florida!*

In hitting both coasts, The **International DJ Expo** has defined itself as the premier DJ confab in North America. With successful shows in Atlantic City, in October, 1990, and Los Angeles, in April 1991, the **International DJ Expo** has enlivened the DJ market, given new respect to the nightclub business and afforded the dance music community a biannual event.

While DJs are the primary focus — indeed, every major player in the DJ market exhibits and attends the Expo — club hardware, including sound reinforcement and lighting equipment, is also displayed in the exhibit hall and discussed at the various seminar panels. Club installers and designers — as well as the DJs and those in the music business — have discovered the Expo as a means for making valuable contacts. Surely, the **1991 International DJ Expo** will be no different.

The Expo, slated for **October 14, 15, 16, 1991,** at the WALT DISNEY WORLD DOLPHIN in Lake Buena Vista, Florida, offers all that and more. All of The Walt Disney Company's attractions — including the WALT DISNEY WORLD® Resort, the Disney-MGM Studios Theme Park and the Pleasure Island multi-club facility — will be within easy access to expo attendees. Attendees are also encouraged to visit nearby Orlando, with its variety of theme parks and other attractions, and see why it's quickly becoming the business and leisure capital of the Sun Belt.

1991 INTERNATIONAL DJ expo



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1991 INTERNATIONAL

DJ expo

October 14, 15, 16, 1991
Walt Disney World Dolphin
Lake Buena Vista, Florida

A&M's Manny Lehman with Herb Alpert and Jellybean Benitez during the DJ Expo's "Artist Development" seminar.

Ultra Naté belts it out during a DJ Expo showcase.

A DJ spins at the Gemini booth on the expo's exhibit floor.

Taking advantage of the DJ Expo's networking opportunities, two attendees mingle.

Photos by Mark Ragonese

Activity surrounding the Tascam booth.

Expo Raves!

"I met a lot of key DJs, remixers and so on that I've never met before."
— Dave Costanza, ***Epic Records***

"Once again the International DJ Expo proved that DJs are a legitimate industry, and that DJs know their music, and know real business."
— Jeff Greene, ***Party Time DJs***

"The 'buzz' was very, very intense . . . DJs with great awareness and experience came by to see the show. Some of these guys had vinyl cuts of their own with them . . . Topics were addressed by panels of professional guys who really know their stuff. There was clearly a lot of crowd involvement, too. I don't think the knowledge could have been gained anywhere else in the world."
— Peter Cutchey, ***Peavey Electronics***

"I saw DJs walk in as novices and walk out as pros."
— Sheldon Starke, ***entertainment lawyer.***

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Each night of the Expo will see up-and-coming dance artists perform at some of the area's top nightclubs. In its brief history, the Expo has become a vehicle to showcase and launch fresh new talent. For example, the Expo has presented acts such as C+C Music Factory, Deskee and 2 in a Room as part of its evening talent lineup. Don't miss your free club admission, which comes with every full expo pass.

• Exhibits

Over 20,000 square feet of exhibit space will house DJ- and club-related displays from top manufacturers in the industry. Over 100 exhibit booths from major companies — including Numark Electronics, High End Systems, JBL, Technics, Gemini, Martin, American DJ, and more — will be showing the latest in DJ equipment. This year's show promises to be the largest exhibition for DJ gear ever assembled under one roof.

• Spinoffs and Awards Night

This year's International DJ Expo will feature DJ spinoffs, where the most talented jocks battle it out for the DJ Expo title. In addition, attendees will be invited to the first annual DJ Times Awards on October 16. Awards will be given in such categories as: Best Club DJ, Best Mobile DJ, Best 12-inch Single, Best Album and Most Innovative DJ Product.

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- Record Pools/Record Labels
- Nightclub Audio Installation
- The DJ and Club Manager
- and many more

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We are pleased to offer a special hotel discount rate of $130.00 per night (single/double) EXCLUSIVELY for DJ EXPO attendees, available from Friday, October 11 through Saturday, October 19.
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- ☐ g. Club Owner/Manager
- ☐ h. Architect/Designer
- ☐ i. Audio Equipment Dealer/Distributor
- ☐ j. Lighting Equipment Dealer/Distributor
- ☐ k. Record, Tape, CD Retailer/Distributor
- ☐ l. Record Company
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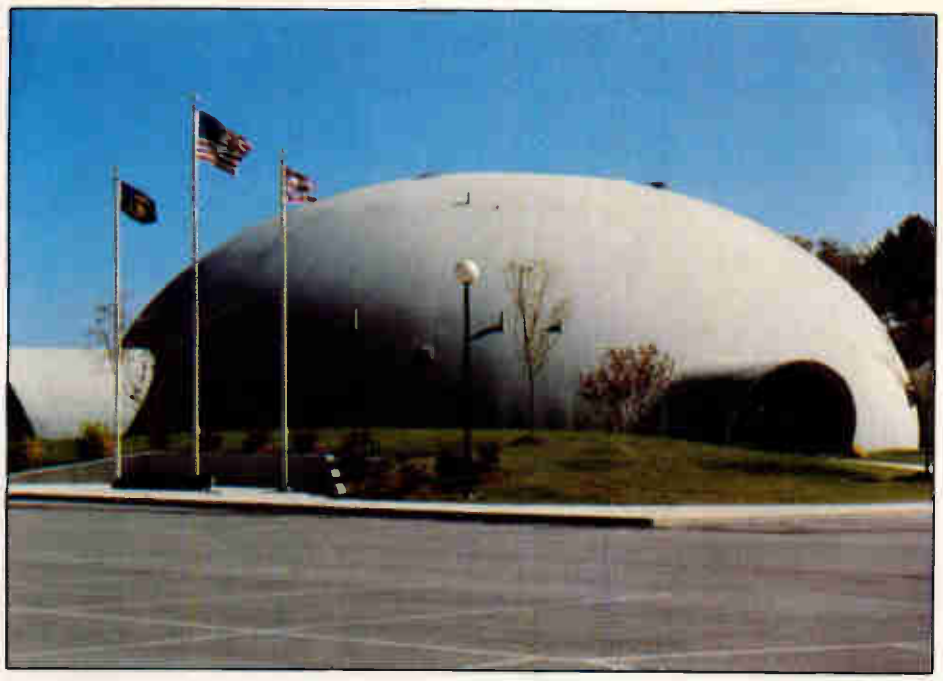


The New Bremen Legion Hall in Ohio.

ASC Tube Traps in use at the hall.

lower midrange, and indeed made them seem even more resonant. By the time Panacom and ASC were brought in, the building was at its acoustical nadir.

Murray intuited correctly that two steps had to be taken to achieve acceptable acoustics in the room. First, the bass and lower midrange had to be severely damped, and second, the room had to be livened in regions above 1 kHz.

"The Legion went along with the idea of controlling the bass," recalls Murray. "That was obvious to anybody, but they didn't like the idea of livening the highs. That took some convincing."

For bass control Murray turned immediately to Acoustic Sciences Corporation. "I'd worked with them before, and they made the only commercial product that seemed suitable."

Murray had access to TEF equipment and he made a series of measurements of the building with swept sine wave signals. He measured an RT_{60} of 4.41 seconds for a 60 Hz tone. An octave up, decay time was nearly as long, and it was still above 2 seconds at 500 Hz. Murray sent the information to ASC.

ANOTHER LOOK

Art Noxon, President of ASC, was confident that the structure could be salvaged, but the total budget of $15,000 presented a real challenge. Noxon realized almost immediately that several hundred running feet of acoustical treatment would be required simply to attenuate the bass, and in terms of his company's pricing structure that quantity posed a problem.

ASC's basic product is the Tube Trap TM. The Tube Trap may be described as a damped resonator consisting of a wire mesh supporting frame wrapped with layers of compressed fiberglass, and surrounding a hollow interior. The Tube Trap, which comes in a variety of different sizes and configurations, has been designed to be reflective to mid and high frequencies, but absorptive of low frequencies. It tends to be most effective when placed at room corners where acoustic pressures are high. The constrained fiberglass layers then face high pressure nodes, which push air past the fiberglass and into the low pressure interior of the trap. Disposed in this manner, the individual strands of fiberglass are exposed to maximal sheer forces, and thus dissipate low frequency acoustical energy as heat much more effectively than simple wall panels of packed fiberglass.

After the "fix," improvement in RT60 was dramatic.

ASC is both a pro sound and a consumer audio company, but its primary market is recording studios. The company has been relatively inactive in sound contracting and in supplying concert hall architects, so the Bremen Hall project was a bit outside the company's normal activities. Nevertheless, Noxon was convinced he could set the hall to rights within the budget. "I knew it was going to take some improvising though," says Noxon. "We didn't really have a ready-made product to suit this application."

Noxon generally likes to measure a room

using Techron equipment manned by ASC personnel, but in this case he was satisfied with the reliability of Murray's measurements and accepted them at face value. Techron testing was supplemented with the construction of a scale model at ASC's Eugene, Oregon headquarters. Noxon made the model by stretching metalized mylar on a wooden framework, and then reflected a penlight beam off the mylar surface and used the pattern of light reflections to predict how sound waves would behave in enclosed space of the same form. The model is admittedly rough, but Noxon has found such mockups to be generally reliable instruments for determining the gross low frequency characteristics of an acoustic space.

THE FIX

Noxon quickly determined the general characteristics of the hall, and realized, as had Murray, that not only would the bass have to be tamed, but that high frequencies should be livened. The job would have been easier if the tectum and cellulose had never been applied, but since it was impractical to remove all of the treatment, Noxon had to find some other way to make the room more reflective. Altogether, what was needed was a complex arrangement of reflective and absorptive surfaces which would not entail high construction or materials costs.

ASC had no standard product that would address all of the hall's problems, so Noxon had to fabricate some one-off devices for the job.

For bass absorption Noxon settled on a modification of an existing product, the company's 16" Half Round. This is essentially a fabric covered half cylinder designed to lie flush against side walls. For this application Noxon left the fabric off on the flat side to reduce costs, and specified that the half cylinders be directly bonded to the tectum on the partition wall. The Half Rounds were stacked one on top of the other from a few feet above floor level all the way to the ceiling, and a total distance of two and half feet separated each vertical stack. In this space sheets of corrugated fiberglass were placed, again glued directly to the tectum. The fiberglass sheets, which are basically a ceiling material, had flat-topped corrugations which made for a good glue bond, and which also tended to cause the panels to resonate strongly in the upper midrange, livening up the room in that critical frequency range. On the other hand, high frequencies were reflected with no sym-

(continued on page 65)

RAY DOLBY SPEAKS ON ENGINEERING, BROADCASTING AND ERGONOMICS

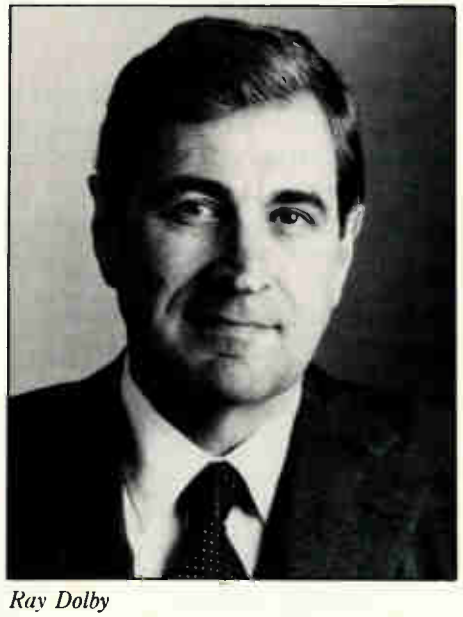
By Ray Dolby

Sometime after I chose the title for these remarks — "Broadcasting and Ergonomics" — I looked in Webster's and was surprised to find no entry for the word *ergonomics*. I was even more puzzled when I looked in the Oxford dictionary. Had I been imagining the word all these years?

Happily, our company librarian soon put me at ease; the word does exist, as all of us engineers know. In the context here, I simply mean ergonomics to be the relationship between broadcasting technology and the human reality of the listener or viewer.

As all of the engineers, designers and inventors in this room know, it is all too easy to become so fascinated by technical fireworks that we may sometimes overlook what the consumer really wants or needs. Or, on the other hand, we may provide more than what the customer is capable of perceiving or utilizing.

I think and worry about these things a lot when it comes to my own business. For example, how good a signal-to-noise ratio



Ray Dolby

is really required? If I wear my engineer's hat, I can make it so good that human beings can no longer hear any noise whatsoever. That is, I will have created an ergonomic mismatch between the technology and human perceptual capabilities. But if in my engineering zeal I have made the system and its hardware and software so good that no one can afford to buy it, what have I gained?

On the other hand, in my concern for a particular type of performance or specification, I may also overlook some attribute the consumer craves. In the beginning the customer may not be able to articulate this requirement. After all, he may still be a bit confused about it all. In due course, with experience, he will let us know.

In other instances the neglected requirement may be clear. Let me tell you this little story. When I was a young engineer I had the good luck to be a member of the Ampex video tape recorder development team. For the VTR introduction in April 1956, Ampex management had decided that there would be two simultaneous presentations. One was to be at the Chicago NARTB convention — that's what the NAB was called in those days. There would also be a press conference at Ampex in Redwood City, California — in the unmarked VTR development building, secret up to that point, off to the side of the main Ampex building.

The VTR team was split up for this exercise, and I was placed in charge of the technical aspects of the California presentation. We had only two working machines — the one in Chicago and the one in Redwood City. There were no backups. I operated the California machine, and also took the technical questions. One journalist asked, "How long will it be before we can have one of these at home, no larger than a suitcase?" I was flabbergasted, astonished and irked by this. Here, behind me was a large console and two racks of electronics, representing blood, sweat and tears. I was so proud of this, and so were a lot of others. The thrill still hadn't worn off that we were actually getting decent pictures from tape. I turned to the equipment, gesturing, and exclaimed, with all the authority of my twenty-three years, "Look at this. I don't think what you have asked for will happen in less than twenty years!"

Of course, I was guessing, but as things turned out I ended up not too far off the mark, with the first practical home video recorders appearing in the mid-seventies.

This article is a transcript of a speech made by Ray Dolby at the Engineering Luncheon during the convention of the National Association of Bradcasters in April 1991. Mr. Dolby of course is the world-famous head of Dolby Labs and we think his remarks are pertinent to all engineering professionals.

But that's beside the point. The potential customer — the journalist — back in 1956 had the point. In effect he was saying, "This is all very nice, but it's too big." He was right. This was a humbling experience for me, and the lesson has stayed. Brilliant engineering achievements and fantastic specifications mean nothing to the consumer unless he can perceive something useful and convenient, with lots of advantages and negligible disadvantages.

There are many examples of this principle in operation all around us. For instance, about a month ago my 16 year old son expressed dissatisfaction with the cassette decks we had around the house. So I went with him to a stereo shop where he zeroed in on the feature that he really wanted, namely music search, which allows you to skip along automatically from selection to selection and find the piece that you want. I said, "What about the frequency response, the signal-to-noise ratio?" A shrug of the shoulders. Well, there is no doubt about it. The engineering characteristics and specs were just being taken for granted, and assumed second place to the ergonomic feature uppermost in my boy's mind. He wanted to find the music that he wanted, easily and conveniently.

My 13 year old son sprang a similar one on me. I had bought him a little CD player for Christmas. This he installed in his music setup on the other side of the room from his bed. After some days, mutterings of discontent issued forth, and it turned out that the player could not be called complete until I went out and got a remote control adaptor. Remote control. I am sure the CD engineers must be as humbled as I was regarding the cassette deck.

Of course, I find myself operating in the same way. I recently bought a car after doing some test drives and comparisons. In the end I selected the smoothest and quietest car, which may not be too surprising. But what clinched the deal for me was that the letters on the knobs and buttons were large, with white on black — nice and bold. I could read the buttons! One of the competitors had used very artistic, teeny, tiny letters. The other competitor used red lettering on black, also very artistic. Now tell me, have you ever tried to read red letters on black — at night?! We're talking about practical user ergonomics here.

Have you ever wished for a pause control on your VCR, or on your TV set for that matter? I mean simply something that shuts off the sound and the picture, that's all — nothing comes out of the speakers and nothing is on the screen. Now if you press your VCR stop button in the middle of a video what do you get? The video stops and a raucous sitcom or game show comes on! If you press the so-called pause button you get a frozen picture — which

also doesn't exactly continue the mood of the video — and then after a couple of minutes you get the sitcom anyway. Of course, this happens because the VCR doesn't want you to grind up the tape. Nonetheless, I think the designers have to work on this, in order to satisfy the real wishes of the user.

I suppose what this all boils down to is the issue of control. One reason many people like recordings, whether audio or video, is that, more or less, they are in control. One aspect of this is getting information. What is the music we are hearing? Who's the artist, and what's the name of the album? With a recording it is easy to know. With broadcasting it is much more problematic.

There is a classical radio station in San Francisco, KDFC, that goes a long way towards filling this requirement without technology and without being too wordy. The name of the piece, the composer, and the date of composition are reliably given at the beginning and end of each selection. In this way the minimal condition for the preservation of the listener's sanity is provided. What does the average radio station give us, especially with pop and rock music? There is no announcement about the music, and certainly not after the track is finished. Often I have listened and thought, "I like that music. I'd like to get that album." And what happens when the track is finished? Straight into the next peice, or a commercial! I have lost my chance to become pop and rock literate.

Now wouldn't it be nice if I could just look at a display, a little window on the receiver, while the music is on, and it would tell me everything. I dare say that if a facility like this were offered now or on any future radio broadcasting system it would be appreciated much more than any marginal reductions of distortion, improvements in signal-to-noise ratio and the like.

I would make an exception along these lines, and that is FM multipath distortion and noise. In my home town of San Francisco multipath is severe, to the point of being a genuine ergonomic problem; the ears rebel. Apparently, with conventional FM it is just is not feasible to get rid of the problem; even diversity reception is not enough when you have hills and dales. So an entirely new, incompatible standard evidently is required. New digital schemes are being considered for this. My opinion is that if the multipath problem alone is solved this would justify a change.

If you will allow me a little commercial break, we at Dolby Labs have an audio coding scheme, called AC-2, that can be

applied towards a solution — and incidentally not only for radio but for television too. Once there has been a study of the various proposals, I'm sure we will have a digital radio system that will gladden the hearts of my fellow multipath plagued San Franciscans.

On the television front, the jury is still out on whether a new incompatible standard will be required or not. What proportion of the viewers would be served by a new HDTV system? I don't mean under lab conditions, but under the real conditions of the home, in which it is not always possible to use large screens or optimal lighting. For example, I had to do some ergonomic matching to find a TV set that was *small* enough to satisfy my wife for her kitchen. She would not hear of a screen larger than about 10 inches. Think about that in relation to talk of a thousand plus lines.

People like Faroudja Labs have shown that it is possible to squeeze a lot more performance out of the NTSC system in the instances where viewing conditions make this worth while. If improvements such as digital sound and clever video processing, together with line doubling and progressive scan, can satisfy most of the people most of the time, how much of a market will remain for HDTV? This worries me. Is HDTV perhaps an ergonomic mismatch, a bit like offering 70 mm film for home movies? Personally, I would love to have HDTV. But is there enough of a market out there to make it practically and economically viable? It will be the Rolls Royce of television to be sure. But let us not foget that there will always be a demand mostly for Chevrolets.

It is non-ideal that sometimes we as engineers have to be brought back to the world and reminded of the fact that we are designing and providing for real people, with their own agendas and desires, not to mention pocketbooks. These customers also have human perceptual limitations and, lest we forget, most of the time they have less than ideal conditions for enjoying what we provide.

Nonetheless, in conclusion, I think it is wonderful that we as engineers are always in pursuit of the best, the finest, the latest. If we didn't have this instinct and didn't enjoy doing this kind of thing we wouldn't be engineers.

With these caveats, let me wish us all a happy time in devising and introducing new broadcasting systems. ■

Ancha Electronics and Willow Creek Church

Relationships Make Good Business and Profit Both Sides

BY BRAD LEIGH BENJAMIN

What constitutes a good relationship? A good partnership? A good marriage? One might say one in which the association is mutually beneficial to both parties over the long haul. Contractors take note. You don't always have to go looking for new clients when opportunities may exist in your own backyard, *i.e.* previous clients whom you've serviced exceptionally well and whose venues or businesses are growing, effecting requisite demands for additional sound reinforcement/media systems. Little airports grow up to be big airports with larger terminals. Businesses franchise and multiply like rabbits at a Club Med. If you've done an outstanding job, odds are you'll be asked back again. Yes — you can grow with your clients.

An excellent example of this phenomenon can be illustrated by the fruitful and ongoing business relationship between Willow Creek Community Church of South Barrington, Illinois, and Chicago's Ancha Electronics, Inc. Over the course of their ten year association, Willow Creek has grown into a house of worship like no other — a magnificent, multimedia sanctuary rivaling some of the most exotic venues in the U.S.

Since the earliest days of worship in America, music and song have inspired the masses. From the bold and "heretic" intervals openly intoned by insurgent colonists to the emotional cadence of gospel in the rural South, the infusion of music and popular culture into theological practice has impassioned worshippers for generations. Willow Creek represents the evolution of that infusion to its ultimate degree — a sanctuary where services are accompanied by full orchestras, state-of-the-art MIDI keyboards, and even rock bands bathed in multicolored lights, effects and visual media on par with a Pink Floyd concert date. Ancha Electronics has contributed greatly to the genesis of this facility.

Willow Creek is a sanctuary where services are accompanied by full orchestras, MIDI keyboards and rock bands.

ANCHA ELECTRONICS

Ancha Electronics, of course, is one of the largest audiovisual contractors in the U.S. with offices outside Chicago, Tampa, and Atlanta. In business for 30 years, Ancha is a high-tech, multistation CAD facility specializing in precise design and installation of custom multimedia and sound reinforcement systems. Ancha's engineering department manufactures specialized cards and custom electronics which are often specified into outside consultants' design projects. These products include summing cards, audio distribution cards, and slide projector control cards, to name a few.

"A lot of jobs require custom electronics and things just aren't made cost effective enough, so we've chosen to make them ourselves," comments Senior Sales Engineer Patrick J. McAllister.

Ancha Electronics' credits include United Airlines' "Terminal For Tomorrow" at Chicago O'Hare, Joe Robbie Stadium, and the Hoosier Dome — an installation utilizing a series of multi-speaker clusters routed through an IED computerized switching network that automatically adjusts volume and staggers delay between clusters depending on the type of event in progress and the location of the sound source. Custom Ancha electronics enable an operator to reconfigure the entire system on a PC by simply clicking on a designated preset such as "rock concert" or "football game."

WILLOW CREEK MAIN SANCTUARY

Almost ten years ago, the Main Sanctuary at Willow Creek was the recipient of a successful design/install by Ancha Electronics. It encompasses a wide range of media. The chancel/stage area itself is 80 feet in width by 40 feet in depth. It's often used for music and theatrical events. Multi-channel snakes run from several locations on and around the stage to a 40-channel Yamaha PM3000 console located in the control booth at the rear of the Sanctuary. All snakes are configured for mic inputs. Direct boxes are used for line level sources. For larger productions, dual PM 3000s are used in tandem. The control booth is outfitted with Otari MX5050 four-track recorders, DAT technology and a host of signal processing gear including Yamaha reverbs and delays.

View of the control booth in the sanctuary.

The sanctuary equipment rack.

"The church is architecturally beautiful and very large. It seats 4,550 people."

Video shoots are also produced from the control booth.

The Sanctuary is set up for three camera video shoots using Sony M7 cameras, one of which is set up on a Vicon automated remote pan/tilt system. The booth is equipped with a Grass Valley Component Switcher routing video signals to 12 Sony VPH big screen video projection units in the Sanctuary and five 25-inch monitors throughout the building. The stage is equipped with a Strand lighting system consisting of 400 fixtures across three racks of dimmers and an ETC Expression controller.

"The church is architecturally beautiful and very large," says Pat McAllister. "It seats 4,550 people. A lot of the problems we encountered were from the facility being so wide and deep." He continues, "The objective of a good sound reinforcement system for speech is to make the sound appear as if it's coming from a single point and that it's actually coming from the speaker's mouth. There are three main clusters that cover the Main Sanctuary. That's the first point of reference where the sound comes out. Those three clusters are approximately 28 feet apart which made it quite difficult to create a single point source effect. We used a lot of very intricate design parameters to achieve that objective."

The Yamaha MC1604 console in the chapel (top) and the chapel cluster (right).

The speakers, consisting entirely of JBL components, were suspended at various angles from the ceiling approximately 25 feet above the floor. A total of 25 speakers spread across 18 staggered locations were employed to reach 14,000 people per weekend, and over 60,000 during Easter week.

"We run half a dozen to a dozen wireless mics every week," says Willow Creek Technical Director, Marty O'Connor. "At our fifteenth anniversary extravaganza we utilized 34 wireless mics for singers and drama for seven days."

"We utilized 34 wireless mics for singers and drama."

"Microphones are crucial to the integrity of the overall sound," adds McAllister. "We used Audio-Technica AT853 cardioid condensers to completely mic the chancel/stage area. They have great range and fidelity. They're pencil thin and they suspend from the ceiling really nicely. You can aim them easily, but more than that, their response is very smooth. Whereas a lot of mics at a distance are thin sounding, the AT853 is very full sounding and it allows you a lot of gain-before-feedback. We use it for choirs, overhead miking, and theatrical applications for stage."

A total of 25 speakers spread across 18 locations were used.

"On the pulpit area, as we do in a lot of churches, we used the Audio-Technica AT837QML Quickmount which is a miniature cardioid condenser gooseneck microphone," continues McAllister. "A lot of orators in church facilities don't have great mic technique. With the AT837, be it on a boardroom conference table, or a pulpit, they don't have to stand one to two inches from the mic to sound good. They can be further away and the mic still has great response — a real full sound."

"We've also got them using Audio-Technica ATW1031 wireless body packs with AT803 lapel mics," adds McAllister, "as well as ATW-T32 wireless handhelds." All Sanctuary mics are routed to a an Ivie 5001 modular gate/mixing system to eliminate several open mic channels at once.

The power for the entire system is stored in its own room in custom Ancha racks. Ancha has designed a circuit that is capable of sensing output and input voltage across every piece of gear in the signal path. The diagnostic electronics check for speaker and component failure, processing gear failure, etc. Any voltage anomalies set off a remote alarm and LED light notifying Ancha technicians of a problem.

The power for the entire system is stored in its own room in Ancha racks.

"Bob Ancha designed us a great system which we've been able to add to and expand on," says Marty O'Connor. "It was the foundation for a great relationship."

THE CHAPEL

"Approximately two years ago we built a 500 seat chapel," continues O'Connor. "Bob Ancha and his team came in and outfitted the room with [Eastern Acoustic Works] KF600s, Crown amps, and a Yamaha MC1604 console. The amps stored were almost 300 feet away from the console so they designed a remote power switch." He adds, "What's unique about the system is that for musical applications, the stereo configuration is not left to right, but front to back. We have three KF600s hanging from a center focal point over the stage. In the back of the room are two KF600s and two 18-inch subwoofers.

"The stereo configuration is not left to right but front to back."

There are also two 18-inch subs buried in the concrete floor underneath the stage. We've got a Kurzweil 250 RMX which we use for organ and orchestral sounds. The front to back stereo configuration creates this antiphonal type of sound. We pan the organ up front and the horns, flutes, strings and other woodwinds to the rear. You get an incredible swelling of sound in the room which was kept somewhat "live" for our applications. It's got a relatively high RT60 and natural reverberance that's great for choir and organ sounds. It's powerful and impressive with a heavy

(continued on page 66)

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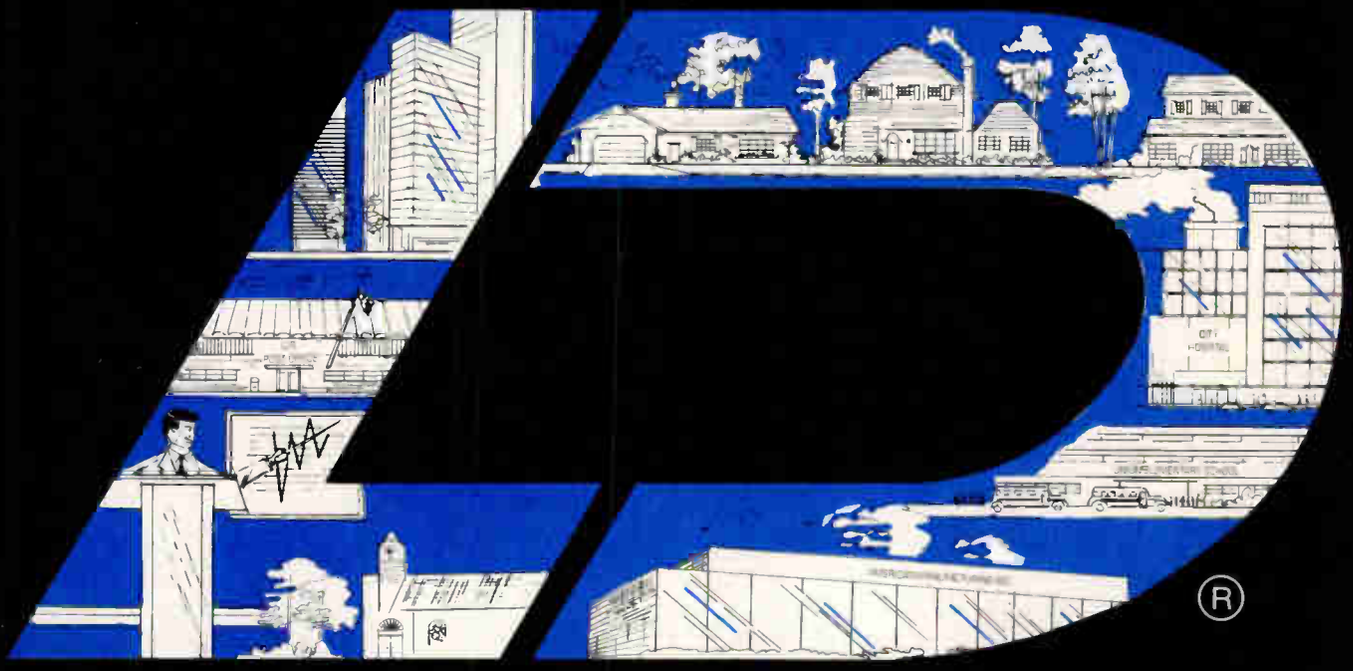

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The Flavor of the NSCA Expo '91

Communications, Networking and Product for the Sound and Communications Industry

BY TOM McCARTHY

As a working Sound Contractor, I look forward to the NSCA Conventions more than to the other audio trade shows because I've found that NSCA is the one that communicates best within my field.

This year's meeting was headquartered in the Cincinnati Convention Center and ran from May 18th to the 22nd. The first two days were given over to expanded educational programs, with the official Contractors' Conference & Expo starting on May 20th.

One thing that sets NSCA conventions apart from the other audio trade shows is the lack of a "Welcome-to-the-wonderful-hocus-pocus-world-of-pro-sound" attitude at NSCA. That's probably because sound contractors tend to concentrate on long term practicality rather than flash-in-the-pan hype. They have a pretty good idea of what can and can't be done, and are looking for real advances rather than slick sales pitches.

Practicality and reliability are crucial in sound contracting because the systems are often vital, but are operated incidental to, rather than being central to, what their owners do. As a result, the people operating the systems may not have a particular talent or interest in either the technology or the art of using it; but it has to work anyway. To successfully operate in this environment of benign neglect requires solid robust practical designs thoroughly thought through and stripped of fantasy or wishful thinking. I think that's why the flavor of NSCA is different from other audio industry trade shows.

Writer Tom McCarthy at the ATM booth.

As I walk onto the more than three acre exhibition floor I'm impressed by the large number of booths. It looks like the room is packed to the fire code limits. It's interesting to note that all the booths seem to be the same size. Apparently exhibitors are not allowed to rent several contiguous spaces and use the area to build the kind of palatial super booths I've seen at other shows. I take this as an indication of a serious business convention because it has the effect of making it easier for me to circulate around the floor and not miss anything. No doubt it also has the effect of putting everyone, large manufacturer and small, on a level playing field. I can evaluate products without being overloaded by the effects of bigger-than-life promotional budgets. My second impression is that judging from the number of people filling the aisles, every sound contractor in the industry must have sent a representative.

As I take a quick orientating cruise up and down the aisles, there is no doubt that this is a sound contracting show. The backbone suppliers to the industry are all here. There is a mix of old established companies and new, and the exhibitors are showing everything from classic nuts and bolts type products to innovative "sign of the times" hardware. My main interest is in sound reinforcement, but security, nurse call, exhibition lighting, video, conference, intercom, fiberoptic, background music, projection, paging, central clock and test equipment contingencies are well represented too.

T. G. McCarthy heads up North Star Sound in Minneapolis, Minnesota.

With this many exhibitors, there are some me-too copies of other peoples products in evidence. It's my feeling that copycatters contribute little, so I try to bypass them and favor the real innovators.

One of the main reasons I go to an industrial show is for the chance to talk to the people, and NSCA is particularly good for that. I think that because the majority of the people here have actually been on the front line, most of them for many years, there is less of a perceived need to instantly establish ones credentials and make impressions than seems to be the case at other shows. Here we may feel we can be more open about expressing our own thoughts rather than simply parroting what we think the other guy expects to hear. At any rate I find conversations here more interesting than at other trade shows. And the war stories are great; worth the price of admission by themselves.

Here are some of the suppliers I talked to: One long time sound contractor is Vic Hall, retired from Communications Co., San Diego (though he doesn't look very retired as I talk to him in his booth). I ask about a portable reverberation time meter, the RT60, which he built and was selling back when most of us were describing rooms as either live or dead and wouldn't have known what to do with a specific reverberation value if we had it. He tells me, "I built it because I needed it, then once I had it there was no reason not to sell it to others." He is continuing to sell things that he needed, like room combiners for hotel ballrooms, a message light system, and others. He also has a new version of the RT60. Vic points out that his products are useful but that they have a limited market. For example, he tells me that if he sold every room combiner that got sold it would provide a nice return, but when additional suppliers start producing a like item, the market gets too diluted and none of the suppliers can realize a good return on investment.

I look forward to the NSCA Conventions more than to the other audio trade shows.

Dan Dugan, of Dan Dugan Sound Design in San Francisco, is another entrepreneur who has a booth here. Dan designed the first working automatic microphone mixer and is apparently one of the few people to successfully license

an independent design to an old line industry manufacturer. Now he's developing and marketing related equipment under his own name.

Uptown Technology, Fort Atkinson, Wisconsin, manufactures passive MIDI controlled audio switchers and several versions of distribution amplifiers. The company is known by its customers as a source of problem solving circuitry. Dave Hill tells me that their product ideas come from working with musical groups and finding solutions to their needs for low noise, low distortion signal routing. It would seem that some of those products have commercial sound applications too.

Sound contractors tend to concentrate on long term practicality rather than flash-in-the-pan hype.

OAP is showing a new Audio Engineered loudspeaker series, designed by Dr. Patronis, which apparently harnesses a synergetic mechanical relationship between the high frequency and low frequency transducers. I heard it and it sounds good. You may know OAP as the company that responded to sound contractors' needs for a packaged, flyable two-way loudspeaker system with adjustable high frequency horns. That unit, the C-1, has been well accepted by contractors.

Community is now publishing isobars for its horns. I remember Community then Community Light & Sound as one of the first companies to publish detailed measurement data on their devices. In fact I purchased a binder full of horn data from them back in 1977. It included test data, a description of how the tests were made, and measurements of other manufacturers' products for comparison.

Clair Bros. is putting what they learned in their pioneering touring concert work to use in their entry into commercial sound, showing a system of loudspeakers and amplifier racks that look and work a lot like their touring cousins. According to Barry Clair, the quality is there but they don't have extra ruggedizing features that are needed to stand up to heavy over-the-road abuse.

One thing that concerns us all is the safety aspects of flying loudspeaker systems. A possible source of answers to rigging problems is the loudspeaker flying hardware system by the ATM group of Carson, California. Not all loudspeaker aiming angles can be accommodated, but ATM's modular system, which is based on a collection of off the shelf fittings, will hang several manufacturers' loudspeakers in a wide range of configurations. Kerry Bullis tells me that each design is signed off by a licensed structural engineer, and is accompanied by certification to that effect. That should lighten the burden on more than a few sound contractors.

Gold Ribbon Sound of Iowa City, Iowa, has a novel idea. An amplifier and loudspeaker system housed in portable acoustical partition panels—the kind used to define workspaces in open plan offices. A combination of these sound system panels

Every sound contractor in the industry must have sent a representative.

along with blank panels, chalk board panels, projection screen panels, etc. can form an acoustically and visually isolated portable or semi-permanent meeting space.

In addition to booths on the main display floor, dozens of manufacturers have private demo rooms too. Most of the manufacturers whose rooms I visit seem to be making an effort, but sound pressure levels in some loudspeaker auditioning rooms cause me to put the hearing protectors in. I've never heard a loudspeaker yet that I couldn't evaluate at a non-hearing damaging level, and the only reasons I can imagine for full throttle operation are either to prove that the loudspeaker can

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- ☐ 3 Contractor—Fire/Alarm/Safety
- ☐ 4 Electrical Contractor
- ☐ 5 Pro Audio/Studio/Reinforcement
- ☐ 6 Architect/Designer
- ☐ 7 Engineering/Acoustical Consulting
- ☐ 8 Maintenance/Service
- ☐ 9 Dealer/Distributor/Rep
- ☐ M Manufacturer
- ☐ O Other _____

(4) Your purchasing authority:
- ☐ A Final approval/Buyer
- ☐ B Recommend/Specifier
- ☐ C No Direct Authority/User

(5) Number of employees at your company:
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- ☐ 26-100 ☐ Over 100

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- ☐ 6 Architect/Designer
- ☐ 7 Engineering/Acoustical Consulting
- ☐ 8 Maintenance/Service
- ☐ 9 Dealer/Distributor/Rep
- ☐ M Manufacturer
- ☐ O Other _____

(4) Your purchasing authority:
- ☐ A Final approval/Buyer
- ☐ B Recommend/Specifier
- ☐ C No Direct Authority/User

(5) Number of employees at your company:
- ☐ 1-3 ☐ 4-10 ☐ 11-25
- ☐ 26-100 ☐ Over 100

7/91

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take power without disintegrating or to attempt to mask flaws by brute force. The first may be legitimate, but it seems that a responsible demonstrator would pass out hearing protectors beforehand. Maybe they do and I just don't see them. I normally leave the room when spls get too high.

In talking to attendees, I find that the state of the economy is reflected in a mood of cautious optimism. No one seems to be overtly pushing the panic button, but there is a definite circling of the wagons. Some contractors are responding by branching into new but related areas. Others are pulling back from areas they previously branched into to concentrate on areas of their expertise. Still others appear to be steering a steady course but with more administrative controls. And yet others steady course, but are beefing up technical facilities.

Sound pressure levels in some loudspeaker auditioning rooms cause me to put the hearing protectors in.

The education program at NSCA is right in step with the times. There are courses offering aid in carrying out any of the above strategies or even one I didn't hear talked about on the floor: Selling the business. In balancing the opinions that parts of the educational program are too heavy against those that parts are too light, it would seem that the program is right on target.

Speaking of programs, I had a chance to see the EASE computer program which Renkus-Heinz is marketing. It's called an Electro-Acoustic Simulator for Engineers, but it's functionally equivalent to the sound system design programs that JBL, Bose, John Prohs and Altec Lansing are marketing. One of the things that impresses me about EASE is that it seems to have been put together using the systems analysis-documentation- programming-debugging approach that I learned in college, and which is used in producing serious programs in other fields. There are faster ways to get programs out, and the programs often work, but they tend to resemble a binary version of a ramble shack; with a feature added here, another added there, etc. EASE has graphics that are as good as or better than the sound system design programs and it has more features. Of particular interest is its open data base. That means you as a user are not limited to using only those horns the program's marketer says you can use; you can add your own horns from any manufacturer you like. Some say there is a problem in that because a user might diddle the data to make devices he's selling look better than those of his competition. EASE has shown us how to get around that. They print a question mark on the screen if non-factory entered data is being used. Having seen that technique, other program marketers may open their data bases too. In fact John Lanphere announced during one of the EASE presentations that a future release of AcoustaCADD will include the feature.

I haven't done an item by item comparison, but it seems to me that EASE can duplicate every feature of the sound system design programs and can do a few extra things too. It can transfer files into and out of AutoCAD; calculate intelligibility in terms of % ALcons, RASTI, or the European C; and can operate at a "quick and dirty" level or do in-depth scientific analysis. From what I saw of it, it doesn't seem any harder, and may even be easier, to learn to use than the sound system design programs are. It looks like there will be a lot of furled brows and midnight oil burned as EASE features are reverse engineered into sound system design programs.

This years NSCA Exhibition was certainly up to my expectations. Here's looking forward to next year. ■

IMPORTANT!!

1991 INTERNATIONAL DJ expo

We are pleased to offer a special hotel discount rate of $130.00 per night (single/double) EXCLUSIVELY for DJ EXPO attendees, available from Friday, October 11 through Saturday, October 19.
You MUST identify yourself as affiliated with the INTERNATIONAL DJ EXPO in order to qualify for this special discount room rate.
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- ☐ Club Owner/Manager
- ☐ Architect/Designer
- ☐ Audio Equipment Dealer/ Distributor
- ☐ Lighting Equipment Dealer/ Distributor
- ☐ Record Tape, CD Retailer/ Distributor
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ANSWERMAN

(continued from page 26)

with any manufacturer. Umbulus is available for $730 from Northstar Sound, a sound contracting firm. (Umbulus was reviewed in the June and July 1989 issues of SOUND & COMMUNICATIONS.)

Sound system design software such as JBL's CADP and Bose Modeler are part of those companies' marketing strategies, and distribution (aside from consultants) is generally limited to their dealers. Another audio manufacturer/software developer, Mark IV/Altec, E-V, etc.), allows non-dealers to license their program, but AcoustaCADD only includes data on their own products and does not allow new products to be entered into the database.

All of the above programs run on IBM compatibles except for the Bose Modeler which runs on the Apple Macintosh.

Perhaps you do not want to spend $1500 for EASE nor spend the time entering isobar data into the PHD or Umbulus programs for each speaker you consider using. One solution to this problem is Bob Thurmond's overlay mapping technique reviewed in the November 1989 issue of SOUND & COMMUNICATIONS. This approach uses generic overlays, i.e., 90 × 60, 60 × 40, etc. Overlays are provided for both horizontal and vertical. This is a quick and straightforward approach, does not require data entry, nor even a computer, yet provides meaningful results. In fact, as an intuitive design aid, the visualization provided by this approach easily matches most of the computer programs, yet the overlay pack only costs $10 and a self addressed envelope! The hair in the ointment is that jobs that require sharply angled speakers are awkward to model with this approach. Also, specific idiosyncrasies of particular horns are ignored. While quantitative data (that is, intelligibility, maximum sound level, etc.) is not directly provided, this data can be derived by use of a calculator.

The relevant addresses are: EASE c/o Renkus Heinz, Inc. 17191 Armstrong Ave. Irvine, CA 92714; PHD c/o Richard Heyser Scholarship Fund, 10415 Fairgrove Ave., Tujunga, CA 91042; Umbulus c/o North Star Sound, 1406 First Ave. South, Minneapolis, Minnesota 55403; G.R. Thurmond and Associates, 1509 Brushy View Cove, Austin, TX 78754. Also check the Blue Book August issue of Sound & Communications for further info. ■

THUNDER DOME

(continued from page 49)

pathetic resonance. The panels provided limited attenuation in the lower frequencies, though most of the bass absorption was accomplished by the Half Rounds.

In total, 410 running feet of Traps were employed in the job. Total cost of the material supplied by ASC was $9,000. The total bill presented to the American Legion by Panacom was roughly $15,000. No sound reinforcement equipment was provided.

THE RESULTS

The New Bremen hall was subsequently remeasured by John Murray with Techron equipment, and improvement in RT_{60} terms was dramatic. The RT_{60} for 63 Hz was down to 2.92 seconds and an octave up the time was 2.64 seconds. Measurements were not made for frequencies past 500 Hz, but the hall was subjectively much livelier. In fact subjective impressions of hall acoustics were uniformly positive after Panacom had finished its work, and the Legion began to book acts and stage events on a profitable basis. ■

(continued from page 56)

low end response that really shakes the room. We were extremely happy with what Ancha did. They also completed a social hall directly below the chapel."

ON THE HORIZON

Willow Creek Community Church is in the throes of a 210,000 square foot expansion which must be tied into their present 150,000 square foot facility. Based on his successful track record at Willow Creek, Bob Ancha has already done some preliminary work to implement the audiovisual concepts designed by Craig Janssen of the Joiner-Rose Group from Dallas, TX. The expansion will feature a Gymnatorium — three full size NBA basketball courts adjacent to a full fly, fully rigged, retractable proscenium thrust stage. The system will be largely used by the high school ministry and require at least 115 dB spl and a giant bottom end. Each individual, enclosable basketball court will also have its own sound system. All systems will be controlled from the Gymnatorium control booth which will also receive an audiovisual feed via fiber optics from the Main Sanctuary.

Willow Creek is in the throes of a 210,000 square foot expansion.

Also featured in the expansion will be a new multimedia conference room, a "black box" room, a ministry center, and two large conference areas segmentable into four rooms each.

"The new expansion will have all the latest equipment and technology incorporated."

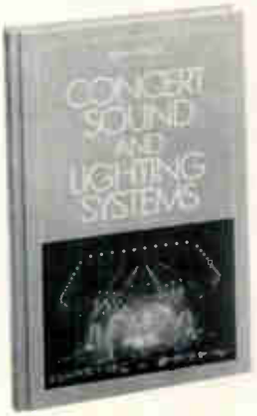
"The new expansion will have all the latest equipment and technology incorporated on the most recent updated CAD software," says Pat McAllister. "Equipment similar to the [Peavey] Architectural Acoustics CE28 computerized EQ which adjusts the speaker clusters to the room's acoustic environment will keep the system smooth in frequency response." He adds, "We will also continue to use Audio-Technica's ATM series microphones because there's nothing more innovative or ahead of their time. Several of the ATM mics may have been designed years ago, but they're still the best around."

"Bob Ancha is the only one who has done any work in this building to date," adds Marty O'Connor. "He likes working with us and we like working with him very much. He's done a great job for the last 10 years. Bob is very well respected for his system designs and he's done an unbelievable job of developing a team of acousticians, designers, and installers. His installers are meticulous. They do it better than you think you would do it yourself, which to me is one of the highest compliments we could pay those guys. Bob's attention to detail is second to none and the support staff, secretaries, and receptionists all honor his philosophy of excellence. He upholds the same standards we do and because of that it's been a profitable relation ship for both of us. There's really no end in sight." ■

"CONCERT SOUND AND LIGHTING SYSTEMS" — A PLACE TO START

By Mike Klasco

"Concert Sound and Lighting Systems" is a book intended to introduce newcomers to the nuts and bolts of operating these systems. For a sound contractor, the way things are handled in the world of concert sound can seem a little strange. Written by John Vasey, the book can be a useful "hands on" guide to why roadies do the things they do.



The book is certainly not a definitive work, but it can provide enough of a background so the reader can better understand more technical books on the subject as well as learn on the job. The 178-page book has a glossary, is indexed, and technical appendixes are included on cable wiring and production checklists.

The publisher, Focal Press (80 Montvale Avenue, Stoneham MA 02180), is a small publisher based in London and Boston which has introduced many audio books in the last few years, most written by European authors.

The book's back cover states that John Vasey, the author, is an operations manager for a touring sound company and has worked in this field for over 15 years. His practical knowledge is apparent, but the type and number of technical errors, omissions, questionable generalizations are unsettling, and they can be found throughout the book. I am not going to begin to list all of these here, but woofers do not typically have a response from 0-63 Hz, all 1/3-octave analyzers do not have 26 bands, the inverse square law is not just "an equation relating the intensity of light to the distance of the object." There are omissions in the cable wiring section such as lack of mention of the likelihood of finding inconsistent 3 pin XLR pin wiring designations, and so on. Reading "Concert Sound and Lighting Systems" reminds me of the feeling I get when I read *Consumer Reports*. How can I trust Vasey on the topics I am not familiar with, when I see the errors and omissions in the topics I know well? Still, the book has a great deal of useful information that you will not come across elsewhere all in the same place.

The opening section on power covers numerous topics that sound contractors are usually not comfortable with. Some of these are 3 phase power, power distribution systems, laying power cables, ground loops, as well as power for lighting systems. In permanent installations much of this is taken care of by licensed electrical contractors, although touring companies in the U.S. certainly do get involved in power. As the book is European in origin, but intended for worldwide distribution, I would have expended more stress on the need to follow the electrical codes of the country you are in, and the fact that wiring codes vary widely.

The section on sound systems covers all the components including speakers, amplifiers, signal processing, consoles, mics and so on. A separate chapter covers procedures for preparation, setup, show time, and loadout. Vasey obviously knows his stuff, although his consistent generalization of specific (and somewhat unique) products as generic detracts from the explanations. In this book, raw drivers are JBL, speaker systems are Turbosound, equalizers are Klark-Teknik, not just in the photos, but in the descriptions. In one case — contact pickups — the entire product category is called by one product's brand name (C-ducer).

The lighting section covers the various fixtures, trusses and grids, control consoles, as well as theatrical accoutrements such as smoke machines, pyrotechnics (explosive effects) and drapes. I found this section informative and it gave me a much better understanding about the lighting equipment that I set over, under and around during an event.

I recommend this book, in spite of all my remarks about its many little errors and omissions. This edition needs a good going over by a technical editor, but there are very few alternatives to this book. Bob Heil, the founder of Heil Sound, had such a book about 10 years ago, but Bob, his company and book all seem to have disappeared. If you are looking for a overview on what concert sound is about, "Concert Sound and Lighting" is a good place to start. ■

Mike Klasco is the Technical Editor of Sound & Communications.

Gand Custom Division; Audio-Technica to Canada

Audio-Technica in Canada

Jon R. Kelly, president of Audio-Technica U.S. Inc., has announced that Audio-Technica U.S. is distributing all of its professional audio products throughout Canada. "All in-house operations are set up and ready to go." commented Vice President of Marketing Ken Reichel.

IED in Cobo Hall

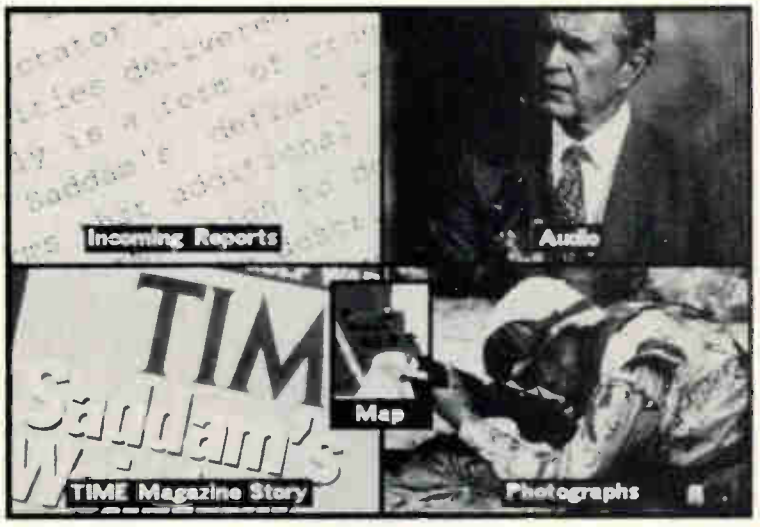
The computer controlled sound equipment of Innovative Electronic Designs of Louisville, Kentucky was chosen for Detroit's Cobo Hall Convention Center sound system. Ian Wolf of Acoustical Designs Services, Inc., in Mission, Kansas, was the consultant for Turner Construction, the construction management company. The system integrates the I.E.D. 500 ACS announcement control system with the I.E.D. series 2000 UDAPS. The UDAPS gives Cobo Hall the ability to operate four stages simultaneously, with each reproducing its own delayed signal at the same time on any one speaker. Installation contractor was Multi Communications, Inc. of Livonia, Michigan.

Racom Enters Industry

Racom has entered the sound and communications industry with a line of digital voice announcers and related products including feedback eliminators (record-then-play) and multi-line paging connectors. Racom can be reached at (800) 722-6664.

Audio Design Services Serving Restaurants

Audio Design Services, Inc. of Tarzana, California, has contracted sound systems for three new restaurants in California. Currently under construction in Santa Monica is Restaurant Bikini from chef/author John Sedlar. The Depot will be an American urban grill concept located in a historical train depot built in 1912. And the Drago Cucina will be located in Santa Monica. Distributed sound and music systems at all three restaurants will feature Bose 102 series speakers.



New Media

CD-Rom software has increased, with the addition of a venture between Time Magazine and Warner New Media, which has published "Desert Storm" on CD-Rom. The disc contains the equivalent of over 6,000 pages of information. Individual stories, reports, pictures and audio are indexed chronologically and by subject matter.

Scantek Moves

Scantek has more than doubled its space in its relocation to 916 Gist Avenue, Silver Spring, Maryland.

Acoustical Standards

A new integrated series of Open Office Acoustical Standards has been announced by the American Society for Testing and Materials. The standards allow the direct specification of open office acoustical performance for components, such as ceiling assemblies, furniture barriers, and wall panels; as well as for the overall acoustical performance of the environment. The standards were unveiled as part of a two-day ASTM training course on "Acoustic & Noise Control Standards for Architectural and Industrial Applications." The course included a tour of Armstrong World Industries' acoustic test laboratories. The training session will be repeated on November 4 and 5, 1991 at the St. Petersburg Hilton, with laboratory demonstrations at Jim Walters Research in Tampa.

Solid State Logic Commended

At the culmination of a three-year "Opportunity Japan Campaign," Solid State Logic received a special commendation awards for outstanding sales success in Japan. "Opportunity Japan" is supported by the British Department of Trade and Industry and the British Overseas Trade Board to encourage British exports to Japan. There are now over 150 SSL consoles installed in Japan.

Gand Custom Installations Division Formed

Gand Music and Sound of Northfield, Illinois, has opened Gand Custom Installations. Hank Horton, of Gand's retail Pro Audio department, has been promoted to head the new division. President Gary Gand said, "We have been active in the sales, rental and installation of sound systems since 1971. We believe the time is right for expansion, and have started a new division to focus on an area that we already have had great success in." Recent Gand installations (using Bose products) include: Carthage College Chapel, Kenosha Wisconsin; United Conveyer Corporation, Waukegan, Illinois; Northshore Unitarian Church, Bannockburn, Illinois; and Community Christian Church, Lincolnshire Illinois.

Gentner Reports Earnings Increase

Gentner Electronics Corporation s reported a net income of $87,901 or three cents per share for the third quarter ended March 31, 1991. This compares to last year's net loss of $241,034 or eight cents a share for the same period. Third quarter revenues of $1.4 million are down six percent when compared to last year's revenues of $1.5 million.

Solid State Logic Master Studio System.

Gary and Joan Gand, Hank Horton, and the Yellowjackets celebrate new division.

Intergalactic Meet

The tongue-in-cheek FGS Intergalactic Cartel and Holding Company headed by well-known industry members Dennis Fink, Mark Gander and Neil Shaw, once again held its annual guest mix at the Topanga Days Country Fair. Since no one can describe the activities of FGS better than they can, we've decided to reprint their press release:

Famous sound mixers and audio types from around the world gathered again this Memorial Day weekend at the Topanga Days Country Fair in Topanga Canyon, in the mountains above Malibu outside Los Angeles. The attraction, as always, was a chance to be a Guest Mixer for FGS Intergalactic Cartel and Holding Company's annual live sound mixing extravaganza for the bands appearing at the Oak Tree Bowl at the Topanga Community House.

Most of the major international tour sound companies were represented: from Audio Analysts, Michael Renault and his wife; Spy Matthews from Delicate Productions; from Electrotec Productions, Mick Whelen and family; Mike Stahl and Tony Gould from Maryland Sound Industries; Dirk Schubert and family from Schubert Systems Group; and Don Pearson of Ultrasound and family flew down for the weekend from San Francisco.

Audio industry types seen mixing and enjoying the festivities included Sue Jones from AMEK, Greg McLagen of University Sound, Erika Lopez of Audient Marketing, technical writers and consultants Gary Davis and Garry Margolis, guitar amp guru Paul Rivera, and all four JBL Professional Vice-Presidents: Ken Lopez, Lance Korthals, Jim Spiegelberg, and Mark Gander, the "G" of FGS.

Other audio luminaries in attendance included Stan Miller, long time personal sound mixer to Neil Diamond, who repeated his yearly mix of the bands cover version of Diamonds' "Cherry Baby"; Dr. Marshall Buck, President of the Audio Engineering Society; John Eargle, past AES President, recording engineer, noted author and consultant; Phillip Storey, original co-founder of JANDS Concert Productions, Australia; and Scott Page, ace studio and tour saxophonist and studio innovator.

Joel and Kathy Silverman of Lexicon, repeat fly-in attendees, again contributed their efforts to the Delay Tower Committee (the delay towers each consisted of two milk crates, stylishly decorated with FGS logos and appropriate warnings concerning possible shock hazard and proper grounding). Joel and Kathy also assisted Robin Winter, one of the first women live sound mixers and another long time FGS supporter, with the sale of FGS T-shirts, a new addition this year.

Other innovations this year included a stereo central cluster hung by a chain motor from the bandstand roof, courtesy of Stan Miller. The main reinforcement system, primarily memo loaned from JBL

Professional, was driven by prototypes of JBL's new digital system controller. A video monitor-player in the mixing booth, courtesy of Ramsa/Panasonic, continuously showed David Scheirman's "Live Sound" video tape to prep the guest mixers for their upcoming task. Other industry equipment contributions included effects from Lexicon, distribution amps from Aphex, a Soundcraft console, and a new prototype stereo limiter and a digital delay from JBL.

FGS principal organizers are Dennis Fink, President of Mathematical Systems Design Inc., a digital electronics consulting firm; Mark Gander, Vice-President of Marketing for JBL Professional; and Neil Shaw, senior associate with Paul S. Veneklasen and Associates, consultants in acoustics. All three are long-time residents of Topanga Canyon, and this is the sixth year that they have volunteered their time to organize and assemble a sound system for the annual non-profit Topanga Community Club fund raiser.

Left to right: Dennis Fink, Mark Gander, Neil Shaw of FGS Intergalactic Cartel and Holding Company control the mix while wearing their traditional FGS ceremonial garb.

has an "exceptionally dedicated labor force." Neutrik hXas also announced that the company has intensified the automation of its production assembly and doubled the capacity for its Speakon loudspeaker and amplifier connectors.

Neutrik has increased capacity for Speakon product.

Sound for Hockey

Outline, the Italian manufacture, supplied a 15 kW sound system to the Cavalese's Ice Stadium for the Hockey on Ice World Championship. The sound system was designed by Audio Reinforcement Concepts of Milan, and was built using Outline's Topfly long throw loudspeaker. Kdb—Trento was the sound contractor; Screenline srl was the rigging supplier. Eight Topfly units were arranged in a central cluster configuration.

Office Opened

HAVE, Inc. (Hudson Audio Video Enterprises) has opened a southern regional sales office at 1313 Lincoya Bay Drive in Nashville. Agatha Brown, who has been with the company for five years in the Hudson, New York headquarters, heads up the new office. Have, Inc. is a national distributor of tape and cable, connectors and accessories. Its duplication division provides custom service. Corporate headquarters are in Hudson, New York.

U.S. Capitol Makes Purchase

The U.S. Capitol Building in Washington, D.C. is being equipped with seven new Oval Window Audio Satellite Induction Loop Assistive Listening Systems. The systems will be installed to provide hearing assistance to members of the U.S. Senate and House of Representatives, as well as to the public. Rooms to be equipped include the House Committee on Science and Technology, Senate Veteran Affairs Committee, Senate Appropriations Committee and Senate Rules Committee.

B.E.S.T. Announcement

A premature announcement was made by B.E.S.T. in declaring DRV in England and ELAB in Italy as exclusive distributors of the B.E.S.T. product line. B.E.S.T. hopes to officially confirm these two companies as distributors in the near future, but is unable to at this time.

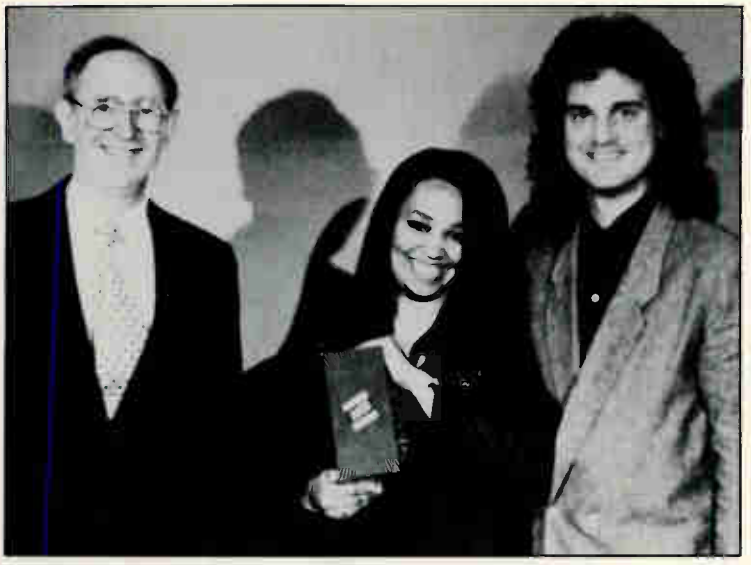
ICIA Scholarship

A Texas audio-visual group has presented a check for $9,300 to the International Communications Industries Association to fund a perpetual scholarship for current and future ICIA members in the state. The Texas Audio Visual Dealers Association in Waco called for ICIA to administer the fund. The objective is to "enhance the quality of the industry and professionalism of ICIA members in Texas." The scholarship was announced by former ICIA board chairman Edward Goodman, Jr., of AVW Audio-Visual, Inc. in Dallas.

Neutrik Factory

Neutrik has opened a new factory on the Isle of Wight, under the management of Paul Smith. Thirty-two people are working in the new production center for audio instruments and connectors. According to the company, "it has become more and more difficult to find qualified people" in Liechtenstein, whereas the Isle of Wight

PEOPLE



Shure's Dan Levine with Tracee Lewis, 1991 Outstanding Advanced Vocal Student, and Jerome Stocco, director of MI's Vocal Institute.

Shure Brothers Awards

Shure Brothers participated in the 1991 Musician's Institute Graduation ceremonies at the Wiltern Theatre in Hollywood. Three Shure Beta 58 microphones were presented to the winners of the Outstanding Student, Advanced Outstanding Student, and Human Relations Awards for MI's Vocal Institute. The participation marked the beginning of the company's commitment to support the Institute with product and training. Al Hershner, Shure's director of sales, said, "We know that Musician's Institute is a launching pad for some of the country's most promising talent, and we feel that a close relationship will provide these future working musicians with a knowledge of . . . our products. . . ." Daniel Levine, Shure's west coast products consultant, was on hand to present the awards.

Ferrofluidics Corporation Gets Crystal Order

Ferrofluidics Corporation has received a purchase order valued at $3,690,000 for multiple units of its fully automated silicon crystal growing system. Dr. Ronald Moskowitz, chief executive officer, said, "As a result of the proprietary nature of the order, the company is unable to name its customer or provide further details of the contract. . . . These systems also incorporate new proprietary technologies including laser melt sensing and a continuous feed mechanism."

REP NEWS

Taub Sales Reps Gauss

Gauss Loudspeakers has appointed Taub Sales of Silver Spring, Maryland as its exclusive representative in the mid-Atlantic region for its line of professional loudspeakers. Morton Taub has been an independent audio manufacturer's representative since 1968. He is joined by his son, Steven, in directing Gauss marketing activities. Paul Hugo, sales and marketing director for Gauss, said, "The appointment of Taub Sales strengthens the Gauss commitment in a very important market."

Telecall Names Reps

Telecall America has appointed the following representatives: LMS Marketing for Michigan; Leslie's for northern Illinois and eastern Wisconsin; Pacific Marketing for northern California and northern Nevada; Loppnow & Associates for the Pacific Northwest.

Telecall America has also announced its Rep of the Year: David H. Brothers Co., Inc. (mid-Atlantic). Outstanding Achievement Awards went to LMS Marketing (Ohio Valley) and Pacific Group (southern California, Nevada and Hawaii). Chuck Strejnowski, salesman for LMS Marketing, received an award for Outstanding Pioneering Saleswork.

BBE Sound Appoints

BBE Sound has appointed Robert Louis Associates and First Choice Marketing as reps for its product line. Bob Louis of Robert Louis Associates will handle the line in Ohio, western Pennsylvania and West Virginia. Tony Tudisco of First Choice Marketing handles Alaska, Washington, Oregon and Idaho.

(continued on page 75)

Toshiba Names Ohashi; Davies at Ampex

President of Toshiba

Hitoshi "Henry" Ohashi has been named President of Toshiba America Consumer Products, Inc. Ohashi replaces Kenichiro "Ken" Hiyama, who has served as TACP President since 1987.

Ohashi's 30-year Toshiba career has included positions as Executive Vice President of Semp Toshiba S.A, Toshiba's Brazilian subsidiary; Senior Manager, International Operations-Consumer Products for Europe; and Senior Manager for IOCP operations in North and South America.

Ampex Appoints Davies

Ampex Recording Media Corporation announced the appointment of David H. Davies as Vice President, Development Engineering. Davies reports to Thomas J. Wheeler, President and is responsible for product and process development programs.

Davies has been with 3M company where he held a number of executive positions in R&D and general management. In addition, he was a co-founder, Vice President and Board member of Kylex Inc.

Gibson Joins DSX

Edward (Rusty) Gibson has joined DSX Access Systems. Gibson's responsibilities are as the DSX Technical Support contact within DSX Access Systems. Previously, Gibson was the Technical Support contact for Radionics.

Everett to Duplication Division

Vaughn Communications, Inc. has announced the transfer of Ric Everett to the Duplication Service division as Regional Manager in the Tampa branch.

Everett is responsible for the development of new and existing duplication accounts in the Florida gulf coast region. He had previously been responsible for the development of rental operations in Tampa.

(continued on page 75)

CALENDAR

Upcoming Events

AUGUST

Advanced Acoustic Measurements Workshop: Norman, IN: Contact: (812) 995-8212. August 5-7.

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.

Syn-Aud-Con Seminar: Norman, IN: Contact: (812) 995-8212. September 19-21.

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

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

OCTOBER

Audio Engineering Society 91st Convention: New York, NY: Contact: (212) 661-8528. October 4-8.

Syn-Aud-Con Seminar: Norman, IN: Contact: (812) 995-8212. October 17-19.

NOVEMBER

CyberArts International: Pasadena, CA: Contact: (408) 446-1105. November 14-17.

Teleconferencing by Shure; Multi-Unit Security from Aiphone

The GR3000 Graphics Tablet.

Audiographic Teleconferencing

Shure Teleconferencing Systems has made available its GR3000 interactive audiographic teleconferencing system, a multimedia device designed to share audio information and computer graphics via telephone lines or high speed digital transmission.

The unit allows users to share and manipulate images in real time and make notations that appear on PC screens in other locations.

Circle 1 on Reader Response Card

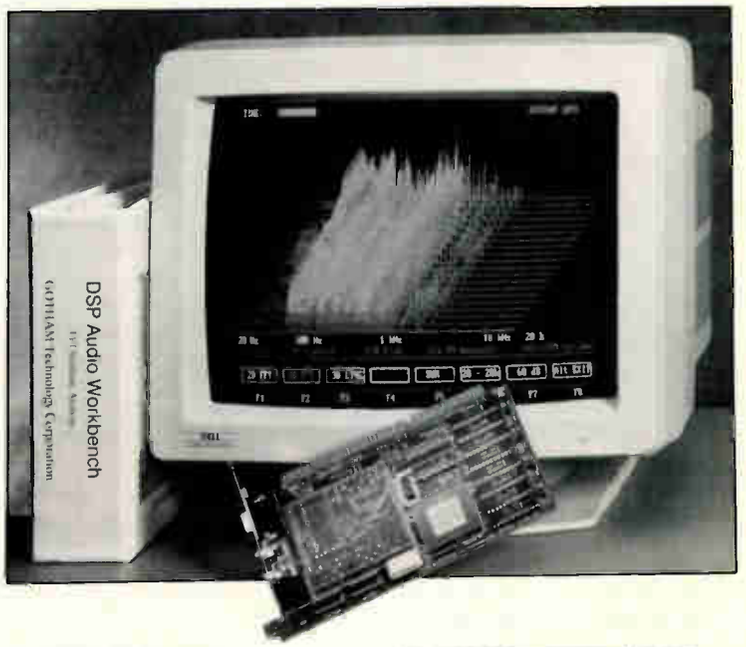
FFT Module

Gotham Technology Corporation has introduced a DSP Workbench realtime FFT analyzer. The FFT software module allows for viewing of events in the audio spectrum in realtime. The VGA compatible graphics display plots frequency, amplitude and time in two and three dimensions.

FFT data can be captured for replay and analysis. A peak hold memory references stored data to elapsed time or SMPTE timecode.

The DSP Workbench is designed for use on an IBM PC/AT running at 20 MHz or faster with color monitor and VGA graphics card.

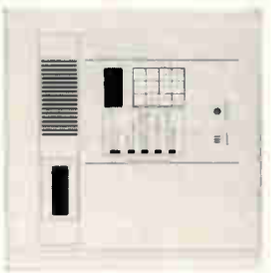
Circle 2 on Reader Response Card



Multi-Unit Security

Aiphone Corp. has introduced its VX multi-unit entrance security systems to the U.S. multi-housing market. The VX systems are custom-designed intercommunications and video systems engineered for multi-housing residential buildings with as many as 240 units. The systems enable residents to screen visitors by sight and sound before allowing access to key areas.

Circle 3 on Reader Response Card



The VX system's entrance station.

UHF Transmitters

Vega is introducing its T-680 series of UHF handheld transmitters, designed for use with the company's 600 series of wireless systems. The units deliver 150 mW of RF output power which gives it a range of up to 1,700 feet.

The transmitters use Vega's internal dipole antenna and feature Dynex III audio processing. The system has a signal- to-noise ratio of 108 dB.

Circle 4 on Reader Response Card

Tape/Audio Interface

The TAI, tape/audio interface module from FSR accepts the stereo audio from sources including tape decks and CD players, and raises the level +4dBm.

The outputs are balanced 600 ohm transformer-coupled, the input connectors are RCA-type and outputs are terminal strips. The unit can be field configured to mix right and left channels if a single mono out is required.

Circle 5 on Reader Response Card

Facilities Test Unit

Wiltron Company has introduced a digital facilities test unit, model 9968, for 3 x 1 and 1 x 1 digital cross-connect systems. Wiltron's DFTU is able to run up to 14 simultaneous test sessions on DS1 circuits from two 3 x 1 or 1 x 1 DCSs.

The DFTU can be used to conduct acceptance testing, fault sectionalization and repair verification on DS1 circuits and T1 services.

Circle 6 on Reader Response Card

Microprocessor-Controlled Intercom

The Communications Systems Division of Dukane Corporation has announced the MCS250 and the MCS250T administrative communications systems. The units are expandable microprocessor-controlled intercommunication systems which offer school, university, institutional or correctional facility administrators open voice communication between administrative and remote stations throughout the facility.

Voice intercom, All Page, group page, emergency All-Call and janitorial alerts are some of the functions of the units.

Circle 7 on Reader Response Card

Paging and FM

Yorkville Sound has introduced the IS-340 paging system with FM tuner. Features include paging mic/line input with auto priority control, two aux inputs and 35 watt amp which can operate into 1 ohm. The 19-inch, rackmountable IS-340 is designed for restaurants, clubs, offices, stores and medical facilities.

Switchable priority paging circuits drop the music down 16 dB when the paging input is active. Loudness controls on the FM and line inputs equalize the music by boosting the bass and treble at low to moderate levels while leaving the paging input flat.

Circle 8 on Reader Response Card

Worldwide VCR

The AG-2600E multisystem VCR has been introduced by the Audio Video Systems Group of Panasonic Communications & Systems Company.

The unit is compatible with the world's major television systems including PAL, SECAM, MESECAM and PAL-M broadcasting systems, as well as the American NTSC system.

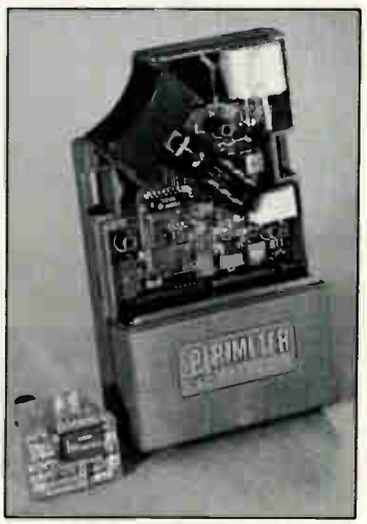
Circle 9 on Reader Response Card

Residential Speakers

Cerwin-Vega has introduced the DX series of residential loudspeakers. The series consists of the DX-9 15-inch three-way loudspeaker; the DX-7 12-inch three-way; the DX-3 10-inch three-way and the DX-1 eight-inch two-way.

The models feature powdered iron core inductors, ferrofluid in tweeter voice coil gaps and tighter gap tolerances. The tweeters have self-resetting protection circuitry.

Circle 10 on Reader Response Card



Personal Alarm

Perimeter Products has introduced the SMD (Surface Mount Device) version of the Perimeter Products Personal Alarm System. An audible low battery alarm, a man-down feature and a modulation technique to reduce the nuisance alarm rate have been included.

The PAS transmits a continuous ultrasonic signal when it is on. The receiver can turn on microphones and CCTV cameras in the alarm area, providing the control center immediate audio and visual input.

Circle 11 on Reader Response Card

Webbed Sleeving

An expandable polyester webbed sleeving with velcro-type enclosure designed to bundle loose wiring and/or other objects into assemblies is available from Alpha Wire Corporation. The "ZIP-GRP" is made for protecting cable assemblies, harnesses, flat cable and other wiring while resisting most oils, chemicals and cuts and abrasions.

Circle 12 on Reader Response Card

CCD SVHS Color System

Elmo Mfg. Corp has added a ½-inch remote head, CCD micro SVHS color video camera system, model CN401, to its line of miniature CCD cameras. The unit's camera head and control unit can be separated up to 100 feet by a cable. The camera accepts most 'C' mount lenses.

Circle 13 on Reader Response Card

LITERATURE

Color Billboard

Video Data Systems has introduced the model 830CB message display for CATV, education, hotel/motel and industry. With an 8K battery backed-up memory, it provides a full-screen display (eight text rows). It includes such features as character by character by character color backgrounds available in eight colors, font and border selection, queue format flexibility and a realtime clock and calendar line with battery back-up.

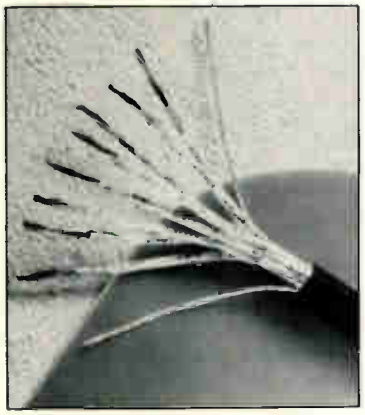
Circle 14 on Reader Response Card

Audio Snakes

The Belden Division of Cooper Industries offers 12 multi-pair snake cables. The 24 AWG snakes are a smaller size than the 22 AWG cable but support audio over the same distances. The new cables. Belden -1508A-1519A are available in pair configurations of 1, 2, 4, 6, 8, 12, 16, 20, 24, 26, 32 and 52.

The cables are constructed with 24 AWG, 7-strand conductors insulated with polyethylene for low capacitance.

Circle 15 on Reader Response Card



Projector Housing

Electrical Design & Development has introduced the Video Televator, a video projector housing which raises, lowers and automatically turns on a projector. Installed above the ceiling, it conceals a video projector when not in use. It is activated by a handheld remote control or a wall switch. Additional contacts can be used to automatically close drape, selectively dim up to 1200 watt incandescent lights and activate an audio system.

Circle 16 on Reader Response Card

Vidicon Replacement

CCTV Corporation has introduced the "GBC" CCD-300 micro-miniature solid state CCD camera. The CCD-300 is designed as a vidicon camera replacement. The camera utilizes a micro-electronic shutter that allows the sensor to compensate for light changes.

C- and CS-type lenses can be used on the CCD-300, which also features in excess of 350 lines of resolution.

Circle 17 on Reader Response Card

Woofer Line

Peavey Architectural Acoustics is now offering the A/A Series of woofers. The speakers feature the combination of a Kevlar impregnated cone and a magnet structure. The Kevlar cone is structurally stiff and the magnet structure has been engineered with a geometry pole piece.

The series comes in three models. The A/A-1218 is a 12-inch woofer; the A/A-1558 features usable frequency response into the midrange; the A/A-1818 offers extended bass response and is designed for discos and special effects situations.

Circle 18 on Reader Response Card

Vibration Analyzer

Scantek, Inc. has announced the Rion VA-10 vibration analyzer for field measurement and evaluation of rotating machinery for machine health monitoring. The VA-10 measures acceleration with a pencil-sized probe. Measurement modes include acceleration, velocity and displacement.

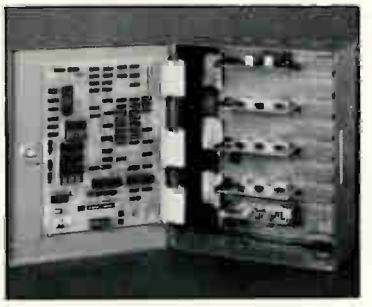
Circle 19 on Reader Response Card

Controlling Access

Galaxy Control Systems has announced the model 270 access control system. The model 270 employs the surge protection and modular design features of the Galaxy 260 controller.

The 270 supports 10,000 cared users, 256 access levels and has an 11,000-event activity buffer while supporting multiple-reader technologies. Combination card and PIN number entry, forced entry alarms and two password levels are featured.

Circle 20 on Reader Response Card

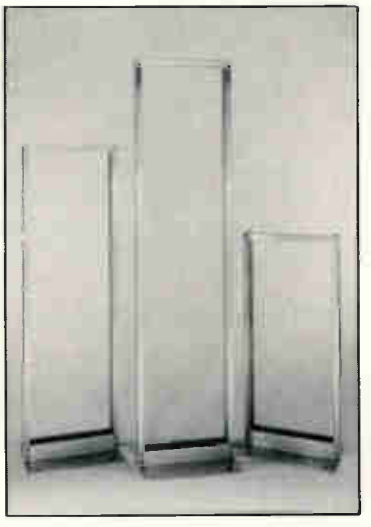


Modular Frame

Precision Fabrication Technologies has introduced its Modular Networking Frame. This all-aluminum relay rack is available in 19- and 24-inch rackmount widths with overall heights of 47, 66, 75 and 84 inches.

Other features include aluminum extrusion construction, EIA universal hole spacing and designing for multi-bay configurations.

Circle 21 on Reader Response Card



Apollo and Trilite Catalogs

Presentation Products

Apollo Audio Visual has updated its four-color, full-line catalog with four more pages of products for professional presentations. New products in the 36-page catalog include easles, OHPs for LCDs, wooden overheads and lenses for slide projectors.

Circle 22 on Reader Response Card

Lightweight Frame System

Trilite has released its designLine brochure for its lightweight aluminum modular frame system designed for its load bearing capabilities and inherent strength.

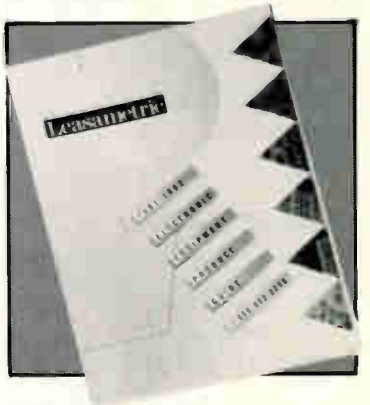
Circle 23 on Reader Response Card

Electronic Equipment Guide

The 1991/92 Electronic Equipment Product Guide has been released by Leaseametric. This guide contains more than 200 pages of illustrated information on the line of test equipment and workstations the company offers for rental or lease.

The guide is designed to be a reference tool for those who rent or lease equipment, and contains a manufacturer's index and product specifications.

Circle 24 on Reader Response Card



Wiring Systems

Anixter Bros, Inc. has published its third edition of the Wiring Systems Product Catalog. This 25-section, 1,582-page catalog has been updated to reflect changes in the marketplace according to the company.

Changes in this year's catalog include an added test equipment section, a combined power protection and customer premises section and revisions in ten other sections.

Circle 25 on Reader Response Card

(continued on page 75)

NEWS

(continued from page 71)

RTS and Olympics

Telex Communication has been contracted by CBS, Inc. to supply intercom communications systems for its coverage of the 1992 Olympic Winter Games in Albertville, France. CBS will purchase a CS9700 intelligent processor-controlled communications system for its main broadcast facility, as well as three smaller CS9500 systems for use at individual venues. In addition, the NBC Television Network has contracted with Telex to supply a CS9700 intelligent processor-controlled communications system for its broadcast center at the 1992 Barcelona Summer Olympic Games. The 300 x 350 processor-controlled intercom system will be installed in a facility being built in Barcelona, and will provide communications within the broadcast facility, as well as integrating venue communications with the central broadcast center.

Horizon Expands

Horizon Manufacturing, Inc. has expanded to new facilities at 230 N. Spring Street in Cape Girardeau, Missouri. Horizon, which was formed in June, 1990, has been operating out of a 14,000 square foot facility, and now has 30,000 square feet. According to Ernie Eudy, Horizon VP/CEO, "Our production department has grown over 300 percent in the last ten months." The company is a supplier of audio cables and accessories.

Drake Assumes Rights

In a new venture, Philip Drake Electronics Ltd of Great Britain has assumed the exclusive worldwide marketing rights for ADT's FC-1 Digital Audio Format Processor. The FC-1 is designed to convert between AES/EBU, SPDIF and SDIF-2 formats. It provides two-channel mixing and signal processing facilities. Barry Spencer, sales and marketing manager, said, "We felt that the FC-1 was an ideal product to complement our range of digital audio converters, amplifiers and switchers. Digital audio continues to pose equipment interfacing problems and further products are already in the pipeline."

Celestion Record Sales

Celestion Industries plc has announced "excellent results" for the year ending December 31, 1990. Peter Wellikoff, president of the American-based Celestion Industries, Inc. said that the U.S. subsidiary achieved record sales and profits. Wellikoff added, "While 1990 was our most successful performance in the U.S. to date, our forecast for 1991 is for another record year." The parent company has recorded an operating profit before interest of $3.13 million, an increase of 170 percent, while sales increased by 13.4 percent. The Celestion Loudspeakers Division reported operating profits up 22 percent. Sales of Professional Products increased 23 percent, out of which Celestion's Sound Reinforcement business increased 35 percent over the previous year.

PEOPLE

(continued from page 71)

Sales at Digital F/X

Digital F/X, Inc has announced the promotion of Sheila Ross to national sales manager for the Composium family of integrated digital production systems. Formerly western regional sales manager, Ross is overseeing United States and Canadian sales for the Composium line.

Ross

Marketing at Dytel

Dytel Corporation has added James Walker as Vice President, Marketing. Walker joins Dytel from Mitel Systems Integrators where he was Vice President of Sales.

Walker has 19 years of experience in the telecommunications industry, and has spent 10 years with Fujitsu and six years with United Telecommunications, Inc.

Manager is Slick

Technics Musical Instruments Division has announced the appointment of Daniel J. Slick to the position of Regional Manager, Eastern Group. In this role, he will oversee sales and marketing of Technics' line of digital pianos, digital pianos, digital ensembles, organs and keyboards for the northeast and mid-atlantic states, including parts of Ohio.

LITERATURE

(continued from page 74)

More Fiber Optics

abc TeleTraining has added "Fiber Optic Cable — A LightGuide," by James J. Refi. This guide to fiberoptic cable explains the technical aspects of the subject from a basic engineering view. The 16-chapter 208-page book includes information on optical loss, bandwidth, properties, inside and outside cable, installation, fiber joining, slices and connectors, field testing and maintenance.

Circle 26 on Reader Response Card

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FREE INFORMATION

Use the Reader Service Card opposite page 18. Just circle the RS# of products that interest you. Detach, and Mail!

HELP WANTED

GENERAL SALES MANAGER

For excellent territory in S.E. United States. Must have experience in sound, drive thru and background music selling. This position provides an opportunity for earnings of 50K to 80K based on production of market. Full benefits.

Send Resume:

Sound & Communications
Dept. 71
25 Willowdale Avenue
Port Washington, NY 11050

Service Technician

Thompson Engineering Company is accepting applications for the position of Service Technician. Candidates must possess the following knowledge, experience, skills and abilities:

- Factory training, extensive experience and skills in the installation and service of Rauland institutional communications products
- A thorough general knowledge of electronic key telephone systems, television systems, sound systems, security systems and fire alarm systems
- A proven ability to provide exceptional customer service and satisfaction to a wide variety of customer types and personalities

Please send complete resume, documentation, references and salary history to:

Gregor E. Eberhardt, General Manager
Thompson Engineering Company
3651 Oakley Ave.
Riverside, CA 92501

SITUATION WANTED

POSITION WANTED

A sales marketing professional seeks a position with a manufacturer or major distributor. Can demonstrate expertise with engineered systems IE Sound, MATV, CATV, FA, NC, and Educational, Health Care, Institutional and Commercial/Industrial Markets'. Will provide a detailed resume and good references. Northeast, (N.Y.C. metro) or: Southeast, (So./Cent. Florida) preferred.

Respond:

P.O. Box 482
New Hyde Park, NY. 11040

Manufacturer's Rep & Dealers Wanted

RACOM PRODUCTS INC. is seeking Manufacturer's Reps and Dealers for our line of Digital Voice Announcers, Feedback Eliminators, Multi-line Paging Concentrator and other related digital voice storage/announcers line.

Call 1-800-722-6664 or Fax: 216-351-0392 for details

EQUIPMENT FOR SALE

FOR SALE: SEALED BIDS WILL BE ACCEPTED FOR AUDIO EQUIPMENT RECENTLY REMOVED FROM THE INDIANA HOOSIER DOME.

Equipment was installed in 1984 and removed in 1990 for the purpose of upgrading the sound system. All equipment is in good to excellent condition. Clusters were flown and never on the road. All compression drivers were recently tested and met impedence specifications, before disassembly. All voice coils are currently manufactured by ElectroVoice. Primary signals were mostly voice and some music. System is available as a complete package or will consider some breakout into smaller packages. Minimum breakout considered would be four bass cabinets and twelve horns per package.

Qty of (72) ElectroVoice large format "HR" Series Horns 6040A w/DH1012A Drivers,
(26) #TL-606D Low Frequency Speaker Bass Cabinets,
(7) HR4020A High Frequency Horns with DH1012A Drivers,
(25) ElectroVoice AT-100 Auto Transformers, and
(59) Crown UMX-200 Transformers.

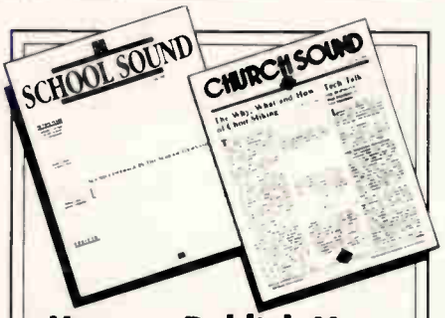
Drivers are rated at 40 watts, long term average power with a 10db crest factor (over sixty watts with a more typical crest factor of six db). Bass cabinets are rated at 800 watts and include dual 15 inch drivers.

All equipment is to be sold and picked up as is.

Bids are due by August 15, 1991. Please contact Bill Sampson 317-262-3401 should you have a question.

Send Bids To: **Attn of William G. Sampson**
Indiana Convention Center & Hoosier Dome
100 S. Capitol Avenue, Indianapolis, IN 46225

MARKETPLACE



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Circle 230 on Reader Response Card

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Circle 224 on Reader Response Card

PRODUCT CHECK: RETAIL

Products used most frequently in retail installations . . .

. . . NOW IN PROGRESS

PRODUCTS	FIRST PLACE	SECOND PLACE	THIRD PLACE
Speakers	ATLAS/SOUNDOLIER	QUAM	BOSE
Power Amps	TOA	ALTEC LANSING	QSC/3M*
Audio Tape	3M	TECHNICS/AEI*	TEAC/JVC/CARVER*
● Cameras	● BURLE	● PANASONIC	● VICON
Monitors	PANASONIC	BURLE	RCA
Mics	SHURE	ASTATIC	AUDIO-TECHNICA/TELEX*
Mixer	TOA	BIAMP	E-V/ALTEC LANSING/PEAVEY*
Signal Processors	TOA	A.R.T.	FURMAN

* indicates tie

. . . IN LAST SIX MONTHS

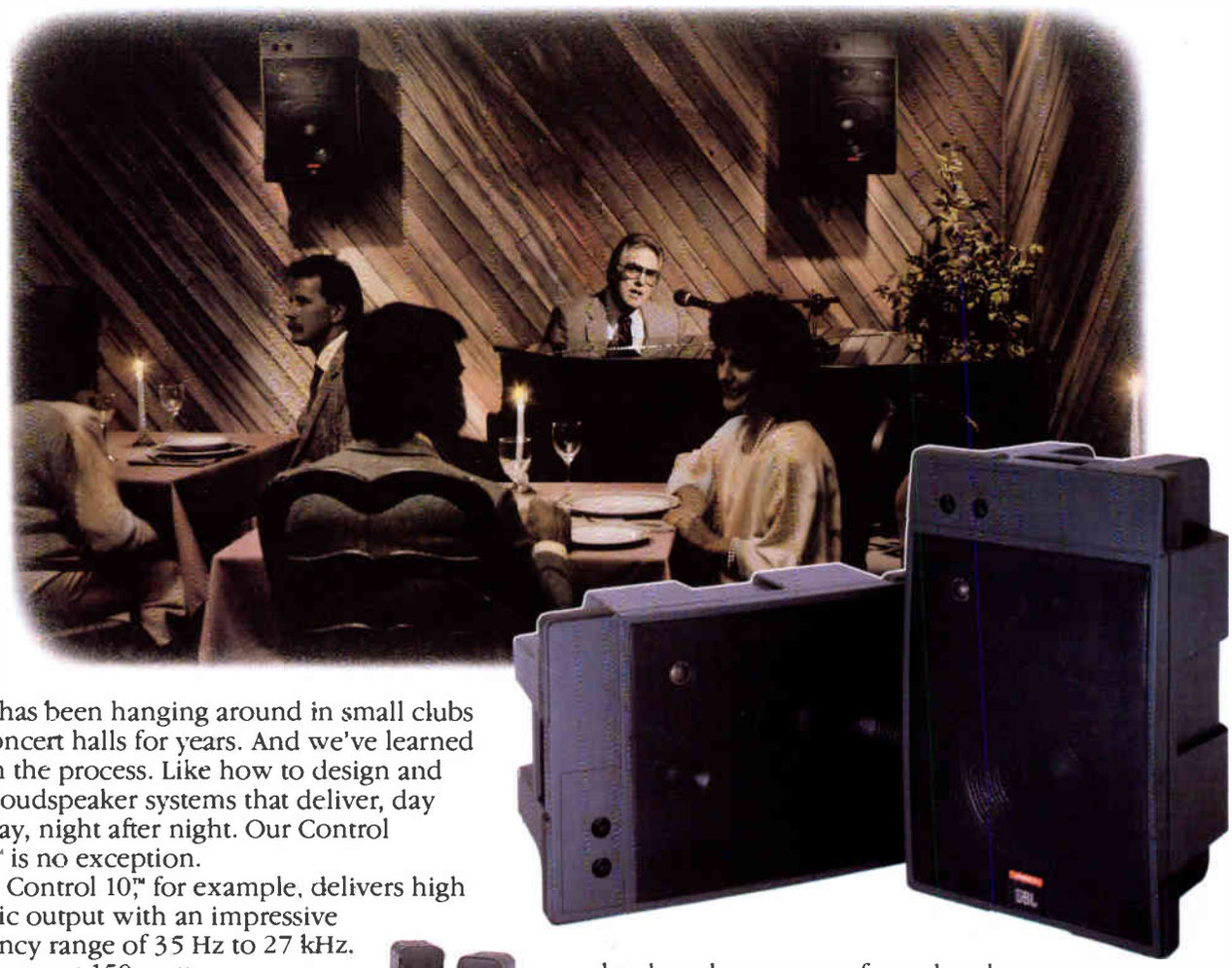
PRODUCTS	FIRST PLACE	SECOND PLACE	THIRD PLACE
Speakers	ATLAS/SOUNDOLIER	QUAM	JBL
Power Amps	TOA	ALTEC LANSING	QSC/CROWN/UNIVERSITY*
Audio Tape Players	TECHNICS	3M	JVC
● Cameras	● BURLE	● PANASONIC	● JAVELIN
Monitors	PANASONIC	BURLE	RCA
Mics	SHURE	AUDIO-TECHNICA	TELEX
Mixers	TOA	BIAMP	E-V
Signal Processors	TOA	FURMAN	RANE/DOD/ART*

* indicates tie

SURVEY METHODOLOGY

1. The sampling pool for the survey consists of sound and communications contractors from Sound & Communications' subscription list. Only contractors within the United States and Canada are called.
2. In a telephone survey, contractors/installers selected at random are asked to identify what brand they used for various products in installations completed in the past six months and those in progress. A different type of installation is highlighted each month.
3. On completion of the survey, results are tabulated and the product brands are ranked on a scale from one to three, with number one having the most votes. Separate rankings are made for installations occurring in the past six months and for those in progress.
4. An asterisk (*) denotes a tie for that ranking.

From Night Spots, To Tight Spots.



JBL has been hanging around in small clubs and concert halls for years. And we've learned a lot in the process. Like how to design and build loudspeaker systems that deliver, day after day, night after night. Our Control Series™ is no exception.

The Control 10,™ for example, delivers high acoustic output with an impressive frequency range of 35 Hz to 27 kHz. This compact 150 watt three-way system is equally at home in restaurants and clubs or corporate boardrooms and other presentation environments. And its fully shielded enclosure will let you safely locate the system adjacent to video monitors without effecting CRT performance.

Control Series. Compact high performance loudspeaker systems designed to meet a broad range of fixed and mobile applications.

Quick and Easy Installation

With a wide range of mounting hardware available, you'll be hard pressed to find an application too tough for the Control 10. In fact, all Control Series loudspeaker systems, from the ultra-compact Control 1™ and Control 5™ to the powerful Control 12SR,™ are designed to work perfectly with a wide variety of mounting hardware.

Whether your application calls for ceiling or wall mounting, rack mount or even mic stand and tripod mount, the Control Series will solve your installation needs quickly and easily while giving you the sonic performance your application demands.

Next time you find yourself in a tight spot, remember Control Series then call your JBL representative. We'll send you complete product information and specifications.

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JBL Professional
8500 Balboa Boulevard, Northridge, CA 91329 USA

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