SOUND & COMMUNICATIONS
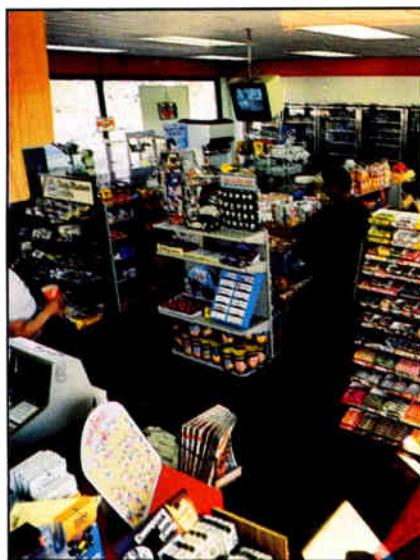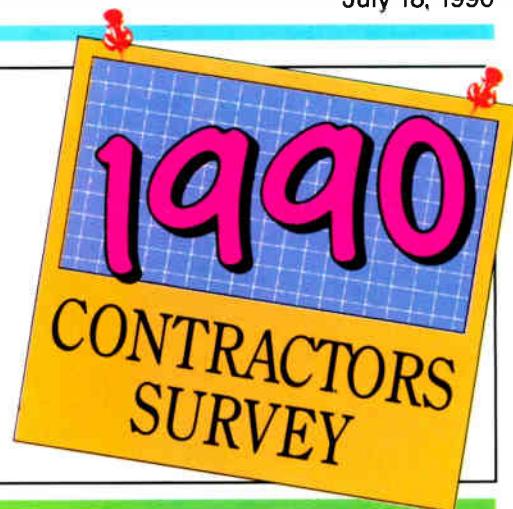
THE FIFTH ANNUAL SURVEY OF SOUND AND COMMUNICATIONS CONTRACTORS

For the fifth straight year, we survey our readers on how they're doing, what they're doing, and what they have to say about their business. The responses elicited some surprises and some optimism for the future. **37**

1990 CONTRACTORS SURVEY

SECURITY

CONVENIENCE STORES
With over 80,000 convenience stores in the U.S., the market is important. New techniques and considerations improve the opportunities for CCTV sales and installations. **32**

HOSPITAL SECURITY
Lenox Hill Hospital needed better protection for its staff, patients and visitors. It installed a computerized security system that allows a guard total communication for instant assistance. **30**

ACCESS CONTROL
Every business needs to control access. The kind of access system depends on the business — and the installer. Cards, codes, keys and biometrics: Security systems are sophisticated money makers. **26**

TESTING & MEASUREMENT

Field Report: Electronic rangefinders seem like great new gadgets. But how useful are they? And which ones are best? Sound & Communications field tests the new generation of measurement tools, for a variety of purposes. **46**

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AMPS, PART 2
This month's installment in our series covers higher output in smaller spaces. We survey the market and trends. **53**

CES
While the Consumer Electronics Show isn't on the must-see list of sound contractors, new products at the summer show had implications for the market. **22**

INSTALLATIONS

- **DITKA'S**
Now they are three. The Chicago nightclub Ditka's opens its third location, Ditka's Northwest, near O'Hare.

- **UNIVERSITY OF CINCINNATI**
American Sound designed a sound system for a multipurpose center when the University basketball program outgrew its former home. The system included the arena, corridors, boxes, rooms — and emergency paging. **71**

This wireless system puts an end to customer handholding

Reliability.

Isn't that what you look for first in a wireless system? After all, you don't want the system coming back to haunt you once it's delivered.

Vega Ranger systems are available in both true-diversity and non-diversity configurations, and offer a number of design characteristics that insure ease of operation even for the inexperienced user.

Our R-98 true-diversity receiver is superior to phase- and antenna-diversity systems. A true-diversity design employs two receivers, allowing the strongest signal to be picked up, thereby eliminating dropouts and the audible switching noise sometimes associated with phase-diversity designs.

Vega Ranger systems also employ exclusive CVX™ audio processing, which provides lower distortion, a higher signal-to-noise ratio and wider dynamic range than any competitive system on the market.

Vega Ranger receivers utilize MOSFET RF amplifiers and multipole RF and IF filtering networks that assure high sensitivity, as well as full rejection of off-channel signals for virtually interference-free operation. The T-93 bodypack is available with a variety of condenser lavaliers and includes a silent mic on/off switch.

The T-99A, our latest handheld, features a new lightweight, professionally contoured shape which eases handling fatigue. It's also equipped with the industry-renowned N/D757A dynamic microphone element from Electro-Voice, while the T-95 features the BK-1 electret condenser element.

Finally, there's the Vega name itself — one synonymous with professional-quality wireless systems the world over. Reliability. Dependability. Performance.

That's Ranger from Vega.

For additional information and literature, give John Murray a call at 616/695-6831. For technical assistance, please contact James Stoffo at 1-800-877-1771.

||| Vega
a **MARK IV** company

World Radio History

The video entry system for those who live in more than one room.

Any CCD or MOS CCTV camera can be connected in addition to Telecall's two camera door stations.

An electric door release button lets the home owner open the correct door from any monitor station.

Homeowners can view the door area even when no one is calling with any of the Telecall room monitors or their regular T.V. set.

Monitors and door stations require only 2 wires to carry A.V. signals for easy installation.

The TD-CU video control unit allows the home owner to interface multiple room monitors and door stations for unique and diversified coverage.

The infrared MOS camera can transmit from your door in almost total darkness. It requires just one lux of light.

Telecall's Security Systems are backed by their 40 years of leadership in intercom technology.

The multi-door multi-monitor system

LETTERS

NOT ALONE

We were delighted with the Installation Profile on Avery Fisher Hall in the March 19th issue. However, a reader may get the impression that I was responsible for the acoustics of the hall. In fact our responsibilities were for the sound system only. The acoustical consultant for room acoustics, sound isolation, and noise and vibration control, was Dr. Cyril M. Harris of Columbia University. Other projects for which Dr. Harris was the consultant include the Kennedy Center in Washington, D.C., Symphony Hall in Salt Lake City, Orchestra Hall in Minneapolis, and Powell Hall in St. Louis.

David L. Klepper
KMK Associates, Ltd.
White Plains, NY

CLOSE CALL

I have the May 16, 1990 issue of Sound & Communications and hasten to make a small correction in your Letter from the Editor.

True, the first advertiser in Sound Merchandising (Later on, we dropped the "Merchandising" in favor of "Communications.") was Atlas Sound.

However, it was Robert Reinhart, then the President of Atlas Sound, who placed the first advertising with us. Herb Jaffe, in those early days, was with Dukane. Mr. Jaffe has been a solid supporter of Sound & Communications over the years, and a friend of long standing.

Jerry Brookman
Sound Publishing Company, Inc.
Great Neck, NY

COPYRIGHT

The May 16, 1990 issue of Sound & Communications contained an article by Dr. Kathleen J. Hansell entitled "The Growing Market," in which four figures were used. The figures should have included a copyright designation for 1990 belonging to KJH Communications.

ELECTRICAL INSTALLING

In reading your 3/19/90 installation profile in the Winter Garden House in New York, I could not believe you published the quote on page 56 which promotes the idea of electrical contractors installing Sound Systems.

Someone should inform Ms. Blatt about the daily struggle to limit the sound and communications work performed by electrical contractors as side work.

If you're going to profile something like this, I suggest you are thorough and note that electrical contractors never have proper test equipment, reserve inventory, emergency sound service and do little to nothing to support our industry.

Tom Court
Sound Incorporated Communication
Engineers, Naperville, IL

We just report the facts. And sound contractors need to know that they may be losing jobs to electrical contractors — competent or not.

— Editor.

CLARIFICATION

In an article on the sound system for the New York nightclub Red Zone (January 19, 1990), it may not have been clear that the subject under discussion was an alteration to the original installation designed and installed by Lewis Feldman Audio (see *Sound & Communications*, February, 1989). Part of the original installation appeared in a photograph accompanying the latest article, and included face plates saying Lewis Feldman Audio. The article was in no way intended to criticize the original installation. *Sound & Communications* regrets any possibility that any reader may have inferred that, and any embarrassment caused Lewis Feldman Audio or Mike Conacchio of Sound Environments who currently maintains the sound system and whose name was omitted from the recent article.

CALENDAR
Upcoming Events

AUGUST

International Computers in Engineering Conference and Exposition: Boston, MA. Contact: (212) 705-7740. August 5-9.

NESDA/ISCET (Nat'l Electronics Sales & Service Dealers Ass'n/Int'l Society of Certified Electronics Technicians): Tucson, AZ. Contact: (817) 921-9061. August 6-12.

Advanced Vibration Analysis Seminar: Knoxville, TN. Contact: (615) 675-2110. August 20-24.

ISC East (Int'l Security Conf.): New York, NY. Contact: (312) 299-9311. August 28-30.

Surface Mount '90: Boston, MA. Contact: (800) 223-7126. August 28-30.

SEPTEMBER

Light & Sound Show: London, England. Contact: (081) 994-9880. Sept. 9-12.

ASIS (American Society for Industrial Security): Contact: (703) 522-5800. Sept. 10-13.

Video Expo: New York, NY. Contact: (914) 328-9157. Sept. 10-14.

MIDCON: Dallas, TX. Contact: (818) 967-9411. Sept. 11-13.

ASME Design Technical Conferences: Chicago, IL. Contact: (212) 705-7740. Sept. 16-19.
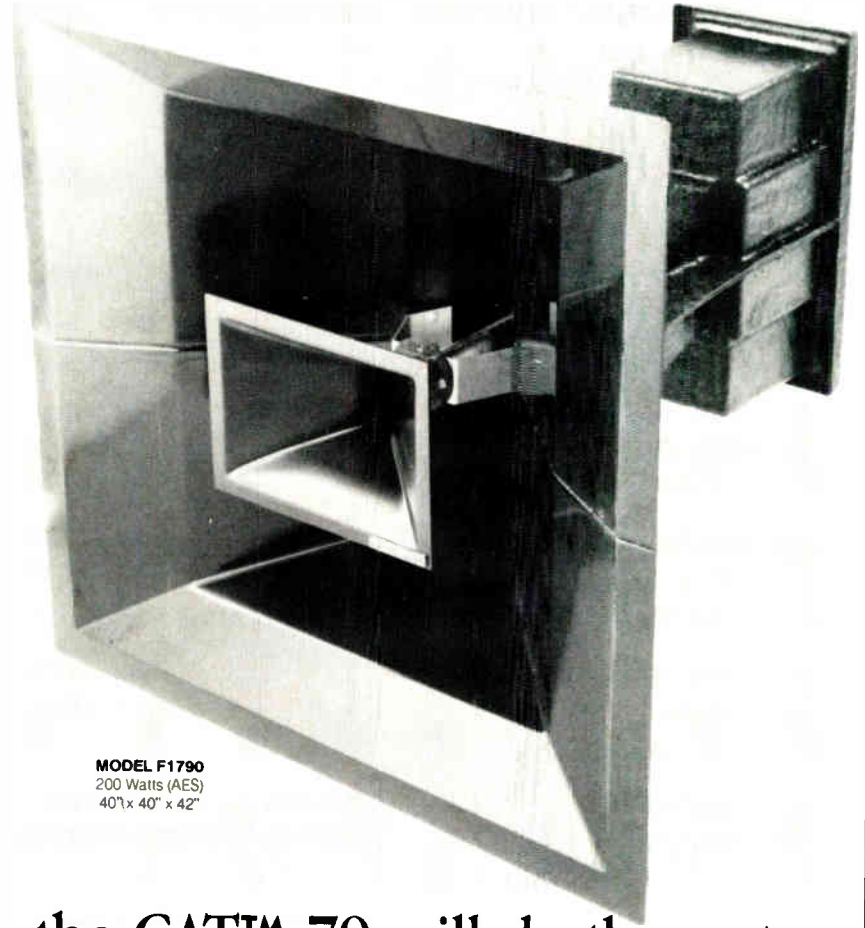
89TH Audio Engineering Society Convention: Los Angeles, CA. Contact: (818) 986-4643. Sept. 21-25.

Telecommunications Association: San Diego, CA. Contact: (818) 967-9411. Sept. 25-27.

OCTOBER

1990 International DJ Expo: Atlantic City, NJ. Contact: (516) 767-2500. Oct. 23-25.

BACKBOX:
Choice of seven.

SPEAKER:
Choice of eleven.

BAFFLE:
Choice of nine.

TRANSFORMER:
Choice of five.

With 3450 standard assemblies, Quam gives you custom-designed flexibility with off-the-shelf delivery.

When we say Quam offers a broad line of 8" assemblies, we don't mean a few speakers with a lot of baffles. We mean 11 different speakers, with nine baffles, to suit virtually any application. Add any of seven backboxes and five transformers (and more of each coming), and you have more than 3450 combinations to choose from.

You specify it the way you want, and you receive it when you want. All the components are in inventory...70,000 pieces! You order and we assemble and ship within 24 hours. No waiting.

Our broad commercial sound accessories line is a change from the days when Quam concentrated exclusively on speakers. And we'll continue to change, adding innovative, high-quality products that help make you more profitable.

What will never change is our tradition of quality and service.

Make Quam your Sound Decision. Call or write now for your free Commercial Sound Products catalog, and we'll add you to our mailing list for catalog updates and product announcements as they occur.

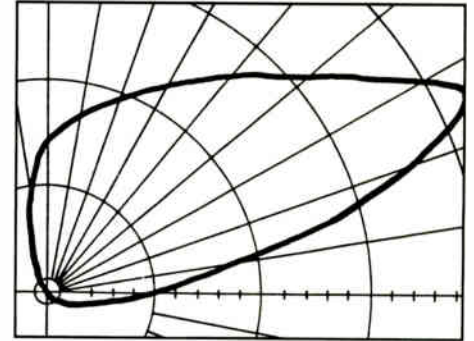## Quam: The Sound Decision

QUAM-NICHOLS COMPANY • 234 E. Marquette Road • Chicago, Illinois 60637 • (312) 488-5800

Circle 207 on Reader Response Card

World Radio History

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NEWSLETTER

NEW PRESIDENT OF ELECTRO-VOICE

Paul McGuire has been named president of Electro-Voice, succeeding Robert Pabst, who continues as president of Mark IV Audio and remains based at EV's Buchanan headquarters. Last year, McGuire was named executive vice president of EV. His promotion, according to the company, "allows Pabst to concentrate on the future business development of the Mark IV Audio group," which includes Electro-Voice, Altec Lansing, Vega, University Sound, Gauss, Electro Sound and Dynacord. Pabst commented that McGuire's "market driven philosophy has been the major factor in EV's exceptional growth and success of the past several years."

THX FOR THE HOME

The Lucasfilm THX theatrical system has been licensed and introduced for the home. Licensees include Matsushita, Lexicon and Snell Acoustics. The Technics division of Matsushita showed prototypes of a THX system at a demonstration at the CES show in June. A total system including controller and speakers can range between $12,000 and $20,000. The THX system includes Dolby decoding and is an enhancement that gives high quality reproduction, rather than a system that is inserted at the recording stage.

IBMA CONVENTION PLANNED

The 20th annual convention of the International Business Music Association is planned for September 15 — 18 at the Marriott Harbor Beach Resort in Fort Lauderdale, Florida. Seminars include sessions on "Training Salespeople," "Selling Business Music," "Direct Mail," and "Cancellation and Customer Relations."

DJ EXPO

Testa Communications has announced the presentation of DJ Expo, to be held at Resorts International in Atlantic City October 23 through 25. 1990. The show, targeted towards buyers of club equipment and DJs, will feature over 50 exhibitors and will be a forum for seminars, presentations by leading dance music performers, and contests.

TANDBERG DISTRIBUTION

Tandberg is again being distributed in the United States. Eurosound has picked up the United States distribution to add to its current line which includes Ariston and other high end hi-fi equipment.

SONY VIDEOCONFERENCING

The Video Conferencing and Satellite Systems Division of Sony Corporation, and Compression Labs, Incorporated have announced a strategic marketing agreement to service the video-conferencing market in the United States. Under the terms of the agreement, CLI will supply video codecs to Sony for product integration and resale.. The two companies also expect to collaborate on selected international videoconferencing projects. Sony in Japan and CLI already have an existing relationship in the far east. CLI claims to be the largest video codec supplier in the world with revenues of $29.2 million in 1989. Sony believes its entry into videoconferencing will accelerate the market's adoption. According to T.C. Browne of Sony, "With our new videoconference system controller and peripheral components, the CLI codecs add a broad level of functionality to Sony's videoconferencing systems..

NEW ENGLAND DIGITAL LEAVES HARMAN

New England Digital Corporation has formed a joint venture distribution company based in Munich with Mr. Rolf Chrostec, in order to establish a mainland based European operations center. The companies products had been distributed by Harman Germany's Professional Products Division. According to an announcement by New England Digital, Klaus Schulz-Hanssen, president of Harman Germany, said, "We have decided to concentrate our resources on our growing high end pro audio product lines, JBL and Soundcraft."

NEWSLETTER

SYN-AUD-CON INTELLIGIBILITY WORKSHOP

Synergetic Audio Concepts (Syn-Aud-Con) has announced new dates for its Intelligibility Workshop II — October 7 through 9, 1990 at Indiana University. It was rescheduled in order to use the new Techron TEF 20. Staff for the workshop is Dr. Larry Humes of Indiana University and Peter Mapp, the British acoustical consultant.

RISER-BOND EXPANDS

Riser-Bond Instruments has announced a company expansion and construction of an additional facility in Lincoln, Nebraska. The new 14,000 square foot facility is expected to be completed by August, 1990.

RUSS BERGER DESIGN GROUP

The Russ Berger Design Group has been formed in Dallas, Texas. Berger, previously vice president of the Joiner-Rose Group, is specializing in acoustics and recording and broadcast studio design. Joining Berger in the venture are Richard Schrag, Randy Dratzer and Elizabeth Everett. Russ Berger Design Group and The Joiner-Rose Group plan to collaborate on future projects.

NEW SERIES FROM RANE

Rane Corporation has announced the first of a series of audio processors designed and distributed exclusively for commercial applications, featuring both three-pin and barrier strip input and output connectors. The series will be launched in early fall.

DAT FOR THE HOME

Several Japanese companies have announced delivery dates for consumer DAT products, with Sony announcing the first — immediate shipment of two models, one at $900 and one at $950. All the announced machines include the SCMS copy code chip developed by Philips. European companies including Philips are awaiting final legislation on the copy code issue. The Stellavox DAT was ordered by several retailers during CES for consumer distribution; Stellavox personnel say that consumer versions will include the SCMS chip (absent from all professional players).

CEDIA MEET

CEDIA, the residential custom installers association, met during CES, and announced new members including Dolby and Lucasfilm. A trade show is planned for September.

PLASA SHOW

Light & Sound Show 90, the PLASA forum for the entertainment equipment industry, in England is planned for September 9 through 13 in London. Cliff Richard will open the show.

JOHNSON APPOINTED

Illbruck, Inc. has appointed Eric W. Johnson national sales manager of Sonex Acoustical Products for pro audio markets, a new position. Johnson supervises and coordinates all sales and service functions and is responsible for the administration and expansion of the Sonex dealer network.

PROMPT PAYMENT WIN

Jack Culp, President of the Inernational Communications Industries Associations, has supported an order by the federal Office of Management and Budget which stops a Defense Logistic Agency plan to extend the payment period on bills it owes to private contractors. Under DLA's plan, the agency gave itself 15 working days to receive goods shipped by private sector contractors, rather than the seven calendar days mandated by the Prompt Payment Law. The policy was investigated at the request of Congressman John Conyers.

SOME BREAKTHROUGHS ARE

Super TD. Take a look. See what most professional VHF systems will look like in the years to come.

Why? Because others will try to match Super TD's breakthrough wireless performance by focusing on the obvious things.

Like its optional Active FM antennas, another Samson first in wireless that increases effective transmission range by 25%.

MORE OBVIOUS THAN OTHERS.

But the real reasons why Super TD consistently outperforms everything in sight is the technology you *can't* see.

Look inside the receiver. Examine our new cavity-tuned design. It delivers twice the sensitivity and four times the dynamic headroom as the current industry leader — the Samson Concert TD system.

Notice Super TD's professional *dbx Noise Reduction. It's responsible for the exceptional sound quality that matches the best reception in wireless.

Consider the *system*. Super TD's powerful hand held transmitter features an unmatched selection of popular mic elements. The sleek, dynamic TX-3 Eurostyle belt pack sets its own performance standards for the future.

Super TD. No matter how you look at it, it still adds up to the very best in VHF wireless.

SAMSON ®

WE ARE THE WIRELESS FUTURE ®

KEY
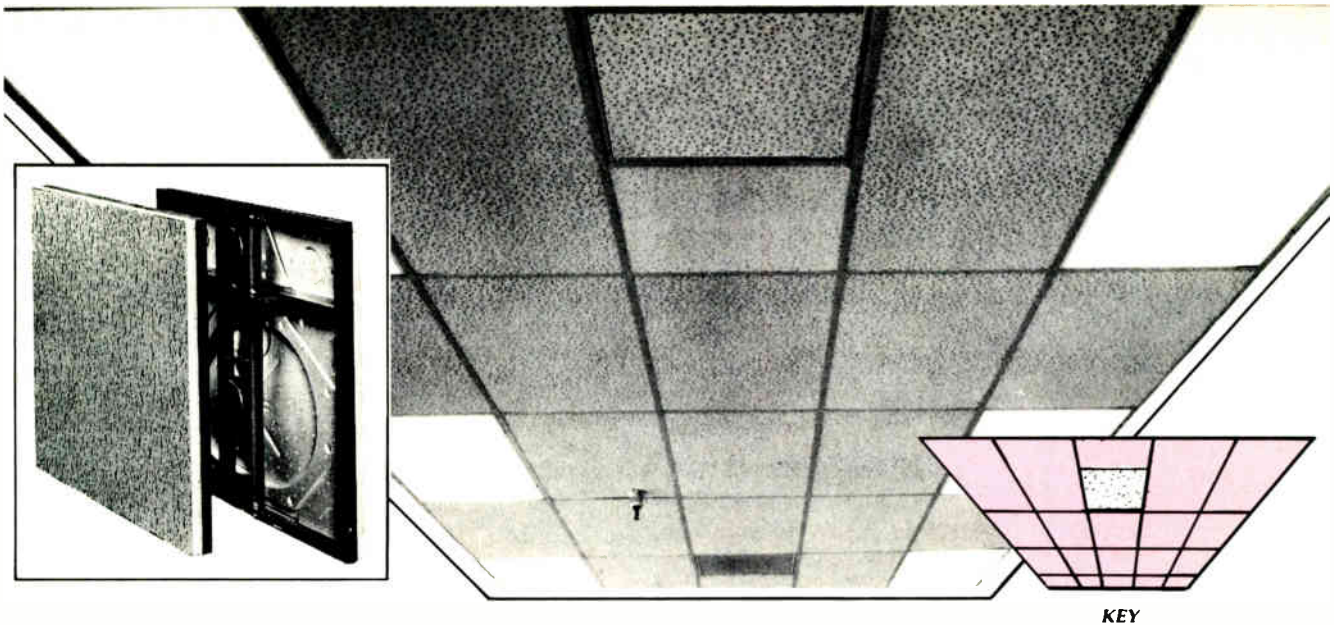
Transducers That are Heard But Not Seen
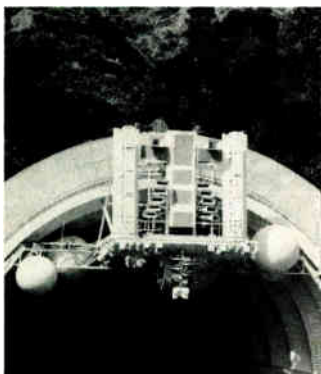
B.E.S.T.:
THE SOUND AT THE HOLLWOOD BOWL

B.E.S.T. technology has proven itself in a wide variety of applications. Our outdoor transducers are working in installations around the world. To establish a long term proof of performance, we installed 128 of them to provide sound augmentation for the Hollywood Bowl. After nearly eight years of temperature and humidity extremes, we're pleased to report original performance is "unchanged" as they continue to delight demanding audiences.

The End of Expensive Cosmetic Coverups

With conventional cone speakers, and their unsightly perforated grilles, a room must sometimes be designed in advance to hide or disguise the speaker. Now, it is no longer necessary to deal with the conflict that exists between what a customer wants and what technology can provide him. B.E.S.T transducers offer top quality sound and *invisibility*.

Where Can You Use Them?

Applications include: airports, theme parks, theaters, churches, industrial facilities, schools, convention centers, nightclubs, hotels, office buildings, retail stores, conference rooms, retail malls, restaurants and indoor/outdoor stadiums.

How We Do It

B.E.S.T. has solved the problem where it should be solved — right at the source: the transducer itself.

First: B.E.S.T. transducers are perfectly flat. The thin lightweight design is engineered to drop easily into a T-bar grid ceiling.

Second: By using a special image transfer process, we can imprint each CT72 with a perfect replica of virtually any acoustical ceiling tile pattern, (the four most popular patterns are always in stock. Others are available upon request).

Result: A distributed sound system that preserves a seamless, unbroken ceiling with a perfect visual match.

How to Save Money — While Improving Your Sound

Invisibility is only part of the story. The revolutionary B.E.S.T. flat diaphragm technology means omnidirectivity — perfectly dispersed sound over a full 180-degree arc at all specified frequencies. The result: much smoother coverage using far fewer transducers. (In most installations, one B.E.S.T. CT72 will replace three to six conventional speakers.)

If our guaranteed layout program is used and the customer's specified coverage is not achieved, **BEST WILL PROVIDE FREE TRANSDUCERS** to meet that coverage.

B.E.S.T.

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Sound & Communications Initiates Software Dialog

OLD NEWS

A year and a half ago, during an informal conversation with someone I've known for a long time — Dave Merrey of Altec Lansing — it became apparent to me that manufacturers were spending a bundle in time and dollars to develop programs for speaker design — and that they were well aware of the waste in separate endeavors being pursued throughout the industry, and the dollar value of r&d. There's no news to that.

Over a year ago, in fact, our television show, NSCA-TV News, presented the various software developers and asked them about compatability. There were no clearly compatible responses. There's no news to that.

MAKING NEWS

Concurrently, Mike Klasco, who was then, as he is now, writing (for *Sound & Communications*) the only *independent* hands-on reviews of speaker design software, became concerned as an acoustical designer of the constraints put on him by the separate and non-compatible software programs — in cost and in convenience. Mike was practically the only person in the business who could see the overview, since he had been studying in depth and at the terminal all of the programs — before they even came on the market.

Of course, we had attended Infocomm, and had been to the Infocomm Shoot-Out, a comparison shopping expedition of data screens and giant video monitors. While the Infocomm Shoot-Out is extremely valuable to an investigator of existing hardware and applications, its format didn't address, we felt, the problems we saw in the many roads being constructed toward full-fledged CAD speaker design.

During the course of the last year, Mike became technical editor of this magazine. We began talking seriously of the problems we had casually discussed. We looked at the results of the Sound & Communications Annual Survey of Sound Contractors. We pooled information we had gathered in talking to software developers, industry leaders, consultants and contractors. And we knew there was a problem that was industry wide. As an acoustical consultant, Mike was daily dealing with issues of incompatibility. These are the problems of the computer age.

SOLUTIONS

But they can be alleviated. There were many solutions that came to Mike and me. We could run a school. We could run demonstrations. A school seemed premature. A demonstration seemed ridiculous, since all the software developers exhibit, or can exhibit, at the NSCA convention. And we saw no real reason for contractors to take time out of their visit to the convention to attend *and pay for* a demonstration of various software programs that they could see on the floor. The likes of John Lanphere and Mark Christensen were extremely articulate and available at their booths.

NEW NEWS

What *is* news is that in April *Sound & Communications* called a meeting in Las Vegas for all software developers, whoever wanted or could come. They came, and — most importantly — talked. A dialog was begun. And will be continued. Because this magazine has no ax to grind. We didn't carry rate cards to the meeting; our editorial people don't sell advertising; and we even picked up the tab for breakfast.

NEWS CREDO

We haven't publicized the meeting as a Sound & Communications extravaganza. Because we're not into grandstanding. We're happy to see that others are following our lead. CAD standards and compatibility are being talked up as a new issue. Well, it's not a new issue. The manufacturers and the users are hip and have been concerned for a long time. We're glad to see that the rest of the world is paying attention now.

We genuinely care about all of our readers who are using Autocad (a very sizable proportion) who can't use it with the current configurations of speaker design software. We genuinely care about the purely scientific and applications-oriented elegance of programs coming on line. We truly care about the waste of resources in duplicating efforts.

Mike Klasco, along with our readers, practices in the field. But Mike is also an engineer and an educator. He talks for himself on the subject of standardization of CAD speaker design software elsewhere in this issue.

And as for this issue of *Sound & Communications:* For the fifth consecutive year we have polled a random selection of 2,000 sound contractors to elicit information on what their business is all about, and what their opinions are of their business. It's part of our philosophy of being a service oriented magazine with a separation of editorial and advertising concerns.

Sound & Communications is dedicated to providing a forum for the exchange of information. We try to do this in reviews, in installations, and in following — and sometimes leading — our readers' interests. As for the future: you can expect to see more in-depth articles on changes in technology and marketing.

And you can expect to see a bit more on residential systems, since our readers have expressed interest in them, and since the editorial and publishing staffs of this magazine virtually created the format by which stories on residential high end systems are published. By virtue of other endeavors of Testa Communications, this staff is unusually well versed in what goes on in other aspects of the industry. In addition to magazines in the audio and video fields, Testa Communications' convention television programs now take in seven conventions per year — with more to come soon. We try to provide our readers with what they want to know. So let *us* know what you see that you like and don't.

Best regards,

Judith Morrison

Audio Software Compatibility:
There Is a Light at the End of the Tunnel

By Mike Klasco

Early one morning during the NSCA a group of about 25 could be seen talking rather animatedly over breakfast. Some were from the engineering staffs of audio equipment manufacturers, a couple were sound contractors, while others were acoustical consultants. What they all had in common was that they developed software for audio applications.

The meeting's purpose was to initiate dialog between software developers and perhaps even explore the possibility of an audio engineering software standards group (and perhaps set it up as a working committee in the AES or NSCA).

The meeting was well attended by the big guns (John and Melissa Prohs (PHD), John Lanphere (AcoustaCADD), Tom Birkle (Modeler), Dr. Black (VDP—Video Design Pro), and others from these groups. The meeting was also well attended by smaller developers such as Bruce Elliot (who updated CADP and is marketing it independently, with JBL's blessing); several people from Bruce Warden's organization who are developing CASE, a high power acoustical/sound system design program; Bill Gelow was there from Renkus-Heinz as they are contemplating marketing a full scale acoustical/sound system design program from Eastern Germany (no, this is not a joke, I have been playing with the program, and it has the potential to be a top contender); Tom McCarthy, of Umbulus fame (the first sound system design computer program, and the inventor of isobars) and others.

Specific topics discussed were sound system software standards and file interchange between programs.

The hot topic was standardizing the measurement resolution of directional files allowing speaker/horn library interchange, or perhaps a third party file conversion program. A related issue is closed databases where there is no utility module for entering or updating the speaker/horn library. Anyone working with databases, spreadsheets or even word processing programs has probably needed to use a file conversion utility to import a co-workers' file or even just transfer your own work from your laptop to your desktop computer.

Unfortunately, these conversion utilities do not exist for directional files between sound system design programs. Even better than file translation/interpolation programs would be file standardization.

Before the meeting I spoke to a few of the acoustical test equipment manufacturers about automated polar measurements. Only a few manufacturers can afford to build the custom measuring equipment to acquire high resolution directional data on speakers, one-box systems, and arrays for entry into CAD programs. Presently, it is an almost impossible task for smaller manufacturers, consultants, or contractors to measure and prepare the data for many of the new programs. If the actual array could be measured and entered into the design program library, the CAD program's predictions would be of much greater accuracy than simply using individual horn directional data. An automated turntable to rotate the speaker is needed, but an inexpensive ($600) unit has recently been introduced. Aside from this piece of hardware, software drivers would be needed to continuously acquire response at various rotations. The general response from the test equipment manufacturers was that they would add this capability, but only if a single standard was agreed upon.

This issue of directional file compatibility was discussed at the meeting, and a general agreement was made that further discussion would be valuable, and future releases of software might move toward some standard that might be worked out in the future.

Another issue explored was the partial standardization of the file structure of the room model coordinates and surface materials. If the time to enter the model can be reduced, then sound system design programs will be perceived as more useful. Keyboard or mouse entry of coordinates would only be required if an architectural CAD drawing on disk was not available. AutoCAD is the defacto standard with architects, and an increasing number of jobs are available to contractors as AutoCAD (DIF.) files. Using AutoCAD as common ground, architectural drawing files could be specially annotated so the room coordinates and surface materials are directly imported into sound system design programs, eliminating both errors and time wasted by redundantly entering the room co-ordinates. Presently, there are a number of obstacles to importing AutoCAD drawings; for example, most drawings are in 2D, and the 3D drawings are wireframe rather than surface planes. AutoCAD 11, which will be released this fall, will feature the AutoCAD Development System, which may present a bridge between architectural drawings and acoustical room models. Before the meeting I discussed this with *(continued on page 78)*

■

Distortion in Wire —
The Emperor's New Clothes

By Alex Rosner

The following article was prompted by a Guest Column in our March 1990 issue, written by Barry Thornton. — Editor

O ver the years, representatives of companies making various cables claiming to be superior to ordinary good quality cables have called on me. Their sales pitch has been: The customers want it; sell it; you'll make money; we'll make money; everybody will be happy; it's not a bad cable. At no time did any of them ever demonstrate his product's superiority. Never. They left samples but did not call back to inquire as to our test results. They knew the results. The demand pressure is so high that some consumer loudspeaker manufacturers wire the internal drivers with esoteric cable not because it will improve the sound but because they're tired of having to defend their position to inquiring speaker owners.

Not content with their success in the consumer market, esoteric cable manufacturers are now trying to persuade professional sound contractors that we're missing out by not using these cables.

Whether or not this persuasion succeeds is up to us, and silence on the part of those who know better is not part of the solution. The attempt at persuasion is based, as I see it, on distortion of the truth, and of greed.

Since time began, various enterprises, using devices applicable to the time and the place, have duped the public under the guise of improving things. We idealistic American audiophiles, it seems, are particularly prone to self-delusion, especial-

Alex Rosner is the founder and president of Rosner Custom Sound, Inc.

> "Esoteric cable manufacturers are trying to persuade sound contractors that we're missing out by not using these cables."

ly when the power of suggestion is present. Evidently, when it comes to making things better, first we send eternal vigilance out to lunch. We then get taken. When we find out, we blame others and sue. Someone gets a black eye, and often Uncle Sam pays off the losses when companies go under.

Originally, I was going to write a technical article on this subject, until I realized that it's been done already many times and hasn't done much good. When people really want to believe something, no quantity of facts will change their minds. Besides, the burden of proof is on those who want us to spend money on their products.

In 1978 I corresponded with Paul Klipsch on this subject, after we independently evaluated several of the then available speaker cables and came away with the same result: No audible differences. Do

> "Electrons do not flow better through pretty wire; in the audio range at least, skin effects and other special electron flow processes have no effect on the sound."

you think much has changed since then? The whole idea that there's more going on than meets the eye is flawed. Electrons do not flow better through pretty wire; in the audio range at least, skin effects and other special electron flow processes have no effect on the sound. To say that they do is nonsense. You might want to conduct the test yourself because it's easy. A reader of Audio Magazine recently put such a test procedure into plain English: "The test must be double-blind to eliminate suggestion and this can be done without switches which some people claim have audible effects; just have a disinterested person do the hooking up of the different cables. Have two or three people listening in a relaxed atmosphere. A larger group might increase tension. Toss a coin about 30 times to generate a suggested sequence and to see how some truly random result would look, for comparison to later test results. Only the disinterested person who is changing the wiring hook up knows which cable is which, until after the test. Thus, there can be no self-delusion. It's remarkable how "audible" phenomena often vanish dramatically when the double blind test is invoked." It should be added that as a further precaution see to it that the disinterested person not be seen or hear by the listeners.

This is not to say that all cables, regardless of thickness or physical construction are equally good and need no concern from us during design and installation of sound systems. With regard to thickness of conductors, a suitably large gauge of cable must be used between amplifier and speaker so that its resistance represents no more than five percent of the loudspeaker's lowest impedance.

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McIntosh Laboratory offers the following clearly understandable table in its owner's manual for amplifiers:

FOR 4 OHM LOADS		FOR 8 OHM LOADS		WIRE GAUGE
Feet	Meters	Feet	Meters	
15	4.6	30	9.1	18
25	7.6	50	15.2	16
40	12.2	80	24.4	14
60	18.3	120	36.6	12
100	30.48	200	60.0	10

If the cable runs in walls, ceilings on under floors, it's a good idea if the individually insulated conductors have an outer covering for protection against penetration from surrounding objects. Some local electrical codes specify outer jacket materials, such as Teflon, for example, which behaves chemically different in fires. Teflon-coated cables are also more slippery and stiffer to handle, in general. But these are physical considerations not related to the cable's effect on the signal.

With respect to minimizing effects of electromagnetic interference at radio and power line frequencies, twisting the speaker wire helps. Very low voltage cables in the micro to millivolt range require shielding and there are various shielding methods in use by legitimate cable manufacturers. The longer the cable runs the more it is subject to outside interference, requiring superior shielding.

If you would like to see an in-depth technical discussion on this subject, read the article "Cables and the Amp/Speaker Interface" by R.A. Greiner in August 1989 issue of Audio. This is an adaptation of his technical paper presented to the Audio Engineering Society in 1979, later published in the Journal of that Society (Vol. 28, No. 5 May 1980).

During a Consumer Electronics Show in Chicago, many years ago, I was sure I heard an improvement in sound as the result of a cleverly biased turntable platter mat demonstration. We did it over and over again to be sure. After taking the mat home and evaluating it under proper conditions, the difference disappeared.

The laws of physics which govern the conduction of electricity in cables are known to those who take the time and trouble to learn them, and they haven't changed lately. Is it possible that we can send men to the moon but don't know how electricity flows through wire? By selling snake oil we contribute to the mistrust, which hurts the entire audio industry. One reason for this is the bad practice by magazines and ads of showing a graph with means absolutely nothing, just to look scientific. It reminds me of the TV ads for pain relievers which use graphs and beeps to appear technical.

When it comes to improving sound systems there is no stopping people who want to believe that if they spend $5,000 to rewire a complete system they'll get an improvement in sound. Some want to be part of an elite group. Some are audio addicts who must constantly buy new equipment whether it actually improves things or not. If I spent $1,000 on audio cables, I might hear a difference too. After spending hours washing and waxing my car I'm sure it drives better. Psychologists call this phenomenon cognitive dissonance. Let's face it, the products in question are seductively beautiful. They must do something! Once disbelief is suspended, out the window goes critical evaluation. Then, technical articles, like bad press actually benefit the perpetrator, as long as his

Summer CES; A New Hunting Ground

By Ed Foster

In the past, Consumer Electronics Shows haven't been prime hunting grounds for sound contractors. Sure, you'd find a few test equipment manufacturers peddling their wares, but you'd get much better coverage in this area at a different venue. And, the audio part of the CES has tended to straddle the extremes — boom boxes and ''tweak'' esoterica — with a foot in the middle ground of mid-fi products. Traditionally, there has been relatively little in the professional category; these are, after all, consumer electronics shows. But, now that multi-room, remote controllable, audio/video systems are taking hold, home A/V installations are becoming an increasingly attractive area for the professional sound contractor, and home A/V has taken hold of the CES with a passion.

One of the earliest non-custom-designed true multi-room/multi-media remote control systems was Simul*Source.

The Sonance 260x3 Amplifier.

Simul*Source was developed by Soundstream Technologies, a Folsom, California based manufacturer of home and car audio gear that, for one reason or another was not at this summer's CES. As the name implies, Simul*Source permits the user to choose to listen to different audio sources in different rooms of the home. All sources emanate from a single central location and any source can be directed to one or more listening zones at will. Simul*Source handles video as well as audio signals and

carries both on low-level shielded pairs. Stereo amplifiers in each zone drive the local speakers, interface the local infrared pickup (or wall-mount keypad) with the central unit, handle the video interfacing and provide an input for a local audio source if desired. Each remote amplifier can drive multiple loudspeakers that can be switched on and off by a remote-actuated relay. One of the nicest features of the Simul*Source system is its ability to access non-Soundstream equipment from any room in the home via its programmable remote control. Infrared signals picked up by the local eye are sent back to the central location and ''retransmitted'' by an infrared repeater that floods the area and thereby accesses whatever infrared remote controllable equipment is present.

Soundstream was early to bat but now faces increasing competition. Many of the Japanese behemoths have developed multi-room remote-control systems albeit few are as flexible in application as Simul*Source. Until now, this niche has remained the province of American companies such as Audio Design Associates, MKO Electronic Systems and Miami-based Niles Audio Corporation.

The Niles system shown at the show takes a modular approach and can be expanded to the extent necessary to cover the application. One SR-6 Source Rack ac-
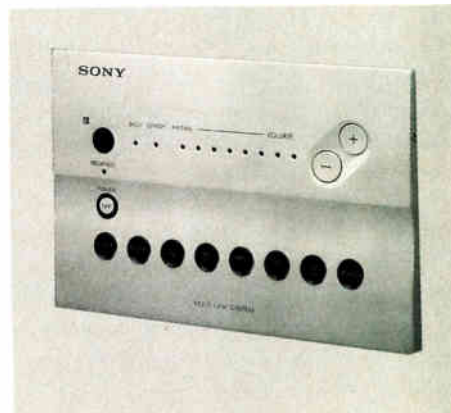
Sony's Digital Master Control Center.

cepts up to three AS-2 Source Cards and six RC-1 Room Cards. As many as ten SR-6s can be cascaded to support a 60-room system. Each Source Card handles a pair of stereo inputs so a fully equipped Source Rack accommodates six sources. The rack also has six outputs that drive auxiliary IRC-1 IR Flashers that are to be placed near the equipment to be controlled. If the source gear is not IR controllable, Niles has a six-slot CR-6 Control Rack in which FC-1 Function Control cards are mounted to interface with the source equipment.

Each room card can select among the six audio sources and provides independent adjustment of volume, balance and tone — via keypads or the HC-6 Hand Held IR Controller — from the remote location. The RC-1s also have external processor loops in which a graphic equalizer or some other ancillary component can be connected. What the system does not provide is video switching although Niles does produce a one-in/six-out video distribution amplifier that can be used to drive multiple monitors from a single source.

Although Analog and Digital Systems, Inc. (a/d/s/) didn't exhibit at CES, the company introduced new products off-site

— the SC6 Architectural Audio Preamp, the PH6 Architectural Audio Amplifier, and the CX2 Electronic Crossover. The SC6 preamplifier handles eight stereo program sources and can route their signals to as many as six individual zones in the home. Microprocessor control permits the user to choose any program source and adjust volume, balance, bass, treble and loudness by means of a handheld or wall-mounted remote control. The bass and treble settings are stored in the SC6 memory and recalled as needed. The system also includes an RS-232 input so it can be controlled by a home computer.

The a/d/s/ PH6 is claimed to be "the first high output, high current multichannel amplifier built to true audiophile standards." It can be used in 6-, 5-, 4- or 3-channel modes. Each channel can drive up to four 4-ohm speakers (a total of 24 speakers in all) and the amp is rated at 100
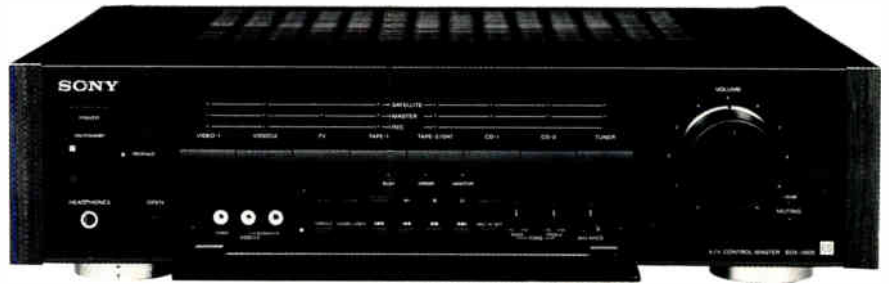
The Sony SOX-2005 A/V Control Master.

watts/channel, six channels driven, into 4-ohm loads. Unlike the Soundstream and Niles designs, a/d/s/ routes speaker-level rather than line-level drive throughout the home.

The a/d/s/ CX2 is a two-way electronic crossover that employs a 4th-order Linkwitz-Riley topology with plug-in modules that set the crossover point for specific a/d/s/ speaker combinations. A constant bass circuit, built into the crossover, permits user adjustment of level in the band below 85 Hz even without

biamplification. a/d/s/ also introduced the 750iL In-Wall Loudspeaker System claimed to be "the first architectural loudspeaker suitable for serious listening." The 750iL is a three-way infinite baffle system that incorporates the same unison technology as the company's CM series speakers. Because the plane of the speaker's baffle is virtually coincident with the wall, a/d/s/ claims that the 750iL is less subject to rear reflection than a freestanding speaker. Driver complement includes a 1-inch copolymer dome tweeter, a

1½-inch dome midrange and a 7-inch long-excursion copolymer woofer.

In-wall speakers were all over, with upgrades from a number of manufacturers including Boston Acoustics' new 305/325 and 380 Designer Series. While most in-wall speakers are designed to be mounted directly to the sheetrock, that practice leaves the rear cavity undefined; there's no telling what air leakage will occur behind the studs. Wallspeaker Technologies of Novato, California solves that problem by premounting the drivers in a shallow baffle that fits between the studs.

Known for its in-wall speakers, Sonance introduced two power amplifiers at the Summer CES, that are designed to solve custom installation problems. The Sonamp 260 and Sonamp 260x3 are high current 60 watt per channel amplifiers that are
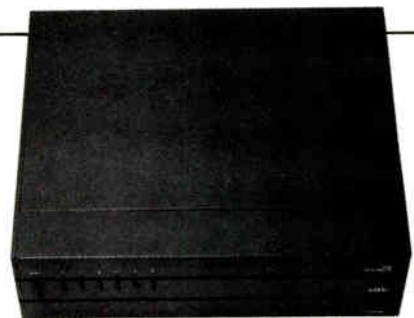
The a/d/s/ PH6 Power Amplifier.

designed to remain stable with low impedance loads that occur in distributed audio systems. Both models incorporate an automatic on/off function which is program source activated. The normal state of the amp is in a standby mode, if it senses an input signal, it immediately goes to a full-on condition, so as to accomodate remote controlled equipment. In addition, the 260x3 has outputs for three pairs of speakers.

In a sense, I've saved the most exciting innovation for last: Sony's new Digital Signal Transfer system. The Digital Signal Transfer System is a multi-room, multi-source transmission system that uses a single RG-59 75-ohm coax to distribute multi-channel audio (and one video signal) throughout the home. The system consists of a Digital Master Control Center and as many remote Satellite Decoder/Amplifiers as there are zones. Up to eight stereo channels are converted into 16-bit digital audio data (if they are not already digitized) by a High Density Linear Converter in the Master Control Center. The digital signals are then compressed by a proprietary Sony chip (CXD-2520S) before being multiplexed onto the cable. Any one of three video signals can be selected and placed on a built-in 428-MHz RF carrier for transmission to the remote zones. At each remote area, Satellite Decoder/Amplifiers choose and control the desired program either from a built-in keypad or from an infrared sensor that works in conjunction with the system's Intelligent Remote Commander. Each Satellite Decoder/Amplifier includes a 40-watt/channel stereo amplifier for powering the speakers. According to Sony, more than 50-percent of U.S. homes are already wired for cable so their system can be installed without snaking extra wire. Now, that's a step in the right direction! ∎

World Radio History

ACCESS CONTROL: SELECTING THE RIGHT TECHNOLOGY

BY JOHN SANGER

Almost every business needs to control access. Control may be as simple as restricting access to a single storage room in a retail store or as sophisticated as a system for tracking hundreds of employees throughout a sprawling multi-building industrial complex.

Regardless of the size and type of business, you start planning each system at the same point: determining your customer's needs. You also have a single goal in mind: giving him more control of his facility.

Most access control systems fall into one of three groups: stand-alone, on-line, or distributed.

Stand alone systems, self-contained devices usually incorporating a digital keyboard or card reader, contain all the necessary electronic circuitry to grant or deny access.

On-line systems typically handle large numbers of doors and users, directly connecting each entry-point device, such as a card reader or biometric sensor, to a central computer, which provides system "intelligence."

Distributed systems interface one or more readers or sensors to individual controllers, which are wired to a central processing unit or computer. In these systems, the controllers make most of the access and denial decisions.

An access control system's equipment options range from simple keys and locks to sophisticated systems based on biometrics. Both ends of the spectrum have advantages and disadvantages. For example, standard locks may not provide adequate security and control, and large-scale multi-door systems aren't always practical or affordable. Most of your access control jobs probably fall somewhere between the two extremes.

Stand alone single-door systems give customers control without the expense of a full-blown access control system. "The system's initial cost will be greater than for locks and keys, but long-term costs may be lower," according to Lee Graham, product manager for Detex Corp. In a card or keypad-based system your customer probably can change codes and access levels himself.

A simple keypad system consists of a standard numeric keypad, a controller, a transformer and an electric or electromagnetic lock on a door. Features vary on these systems.

Some systems allow only a single code which, like a key, is issued to employees requiring access. Other systems include multiple codes, so each employee is assigned a unique personal
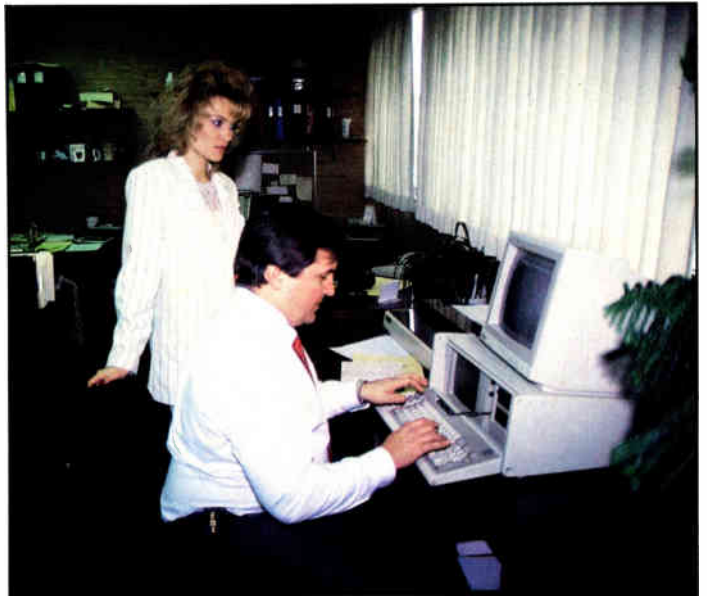
Computers run most multi-door and multi-building access control systems. You'll have to initially configure the system and train your customer's personnel on its operation.

Some card-access technologies can be incorporated into small key-like devices that can be carried in pockets and purses.

Simple pushbuttons can be used for egress from secure areas if your customer doesn't need to know who left the area.

identification number (PIN).

A drawback to a few single-door systems is that they can be defeated by propping the door open after an authorized user enters. Select a system with a door-ajar alarm, or install an electromechanical or electromagnetic door lock which offers this feature.

Also consider systems that are programmable to control access by time and day. The crew working the graveyard shift would only be granted access between 11:30 PM and 8:30 AM, Monday thru Friday, for example.

Cards are the most common component in standalone and multi- door access control systems. All you have to do to gain entry is insert your card in, slide it through or place it near a card reader. If the card is valid for the time and place you're trying to enter, the system grants access.

Your customer might want a permanent printed record of all events that have occurred, including the date, time, access point and cardholder's identification. If so, be sure the system you select can be connected to a printer. Many systems provide historical records of all accesses granted as well as those denied. Some generate audit trails, so an individual cardholder's movements can be tracked.

Joseph Costa, president of Security Control Systems Inc., believes even dealers just entering the access control market can tackle moderate-size jobs from the outset. "A new dealer could handle an installation requiring 30 card readers. He'd have to work closely with the equipment manufacturer, however," Costa said.

Security Control Systems, like many other access control equipment manufacturers, provides extensive training programs for its dealers.

"We'll provide on-sight supervision and actually do the final hook-up and testing," Costa said, referring to a dealer installing his first large job.

Whether it's a standalone, multi-door or multi-building card-based system, you should select the type of reader based on its intended use. For example, it takes more time to use an insertion-type reader than a slide through, or swipe, model.

In most cases, the additional time won't matter. It might matter if 100 employees arrive for work at a single entry point within a half-hour period each morning, however. In that case, seconds could be critical in getting the people into the building and to their workstations without having to stand in line.

Proximity readers allow speedy entry because cards only have to be placed on or near readers. Some hands-free access control systems can sense cards up to several feet away, allowing users to open doors without inserting, swiping or passing cards near readers.

Security can be compromised if cards are lost or stolen, or codes are shared. Cards and codes can be changed quickly, however.

Systems requiring both cards and codes offer more security

and reduce the risk of compromise. If greater security is required, biometric sensing devices can be installed.

Because human beings are unique, certain characteristics can be measured electronically and converted into an information stream that a computer understands.

When a person seeks access through a biometric access control device, his current biometric characteristic is measured against an electronic template comprised of samples taken when he enrolled in the system. If the comparison is within prescribed tolerances, he is granted access. If not, access is denied.

Current biometric sensors used in access control systems can identify you by your: fingerprints, hand geometry, retinal pattern, voice, and signature.

Whatever sensors and systems you select, you should be well versed in how they operate and how they're installed before walking out the door and heading for the job. "Up-front education is the most important thing a new dealer can do for himself, regardless of whose equipment he's using," Costa said.

Learning a product's characteristics goes beyond the classroom. "Set the system up on your workbench and run it. Get familiar with it," says Jerry Baker, president of Micro-State Electronics.
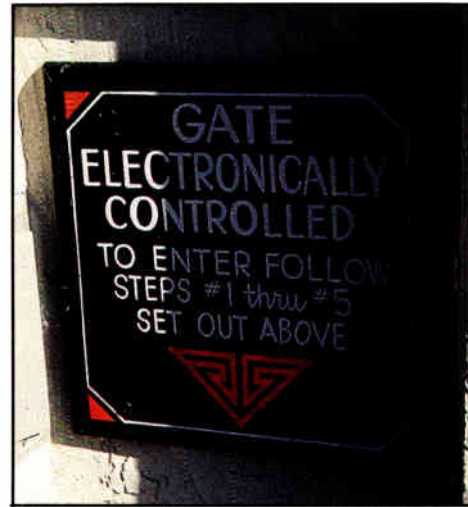
Wide-ranging applications for controlling entry and egress exist and not all of them are in or on buildings. Gate control at a mini-storage warehouse is one of many outdoor applications.

Most equipment manufacturers gladly offer telephone support—especially for new dealers. "All [a dealer] has to do is call us. When the equipment is on the bench, we can answer questions, explain features and talk him through most problems that arise," Baker says.

Costa recommends taking hands-on training a step further. "A new dealer should buy a small system to use for demonstration purposes. The most successful dealers I've ever worked with were the ones who made that type of financial commitment. The system could provide a demo for prospects as well as controlling his own building," he said.

Having a system in your own building means you become familiar with it because you use it daily. When you are trying to sell a system, bring the prospect to your building so he sees that you use it yourself.

"Give the prospect a demo that's not really a demo. The system is hooked up to your building so he gets to see an active system. He can see how the system operates in a real installation. You can run real reports. He can see that it's not just a canned demonstration program," Costa said.

Baker cautions against just doing an occasional job. Commitment to the products you select and a marketing plan are key ingredients in the formula you access.

"You have to remember that if anything goes wrong with the equipment, it must be fixed immediately. If everybody [in your customer's facility] comes and goes with a card, then a component failure could create some major problems," he says.

Part of the commitment is in spare parts, so repair or replacement of defective units can be effected quickly. Some manufacturers, such as Micro-State Electronics, encourage dealers to keep spare parts on hand by offering large discounts as an incentive.

If you are wondering where to find prospects for access control systems, you don't have to look beyond your current commercial customer list to start. You're good at what you do now, so you have built-in credibility when you call to determine needs for controlling access to a customer's facility.

PHOTO COURTESY OF DETEX CORP.

Some systems let you select cards or codes — or use both to increase security.

PHOTO COURTESY OF INTERNATIONAL ELECTRONICS INC.

Code-operated keypads are easy to use and many systems allow individual PINs.

As a profit center, access control can add significantly to your company's bottom line. ''On a small single-door system, dealers might have about $300 in materials and time invested. They can charge $500 for it. It's a price most businesses won't balk at.'' says Neil Licht, national sales manager for International Electronics Inc.

Large systems can run into tens and sometimes hundreds of thousands of dollars. ''Because there is such a large potential market for access control systems, dealers can get into it without getting into bidding wars,'' he says.

A product's price tag is not necessarily what it costs you. ''Think about its real cost—which includes time spent installing and servicing. Look beyond price and evaluate quality and performance issues,'' Licht advised.

Importantly, when marketing access control systems, don't get boxed in by thinking they only open doors. They can do much more.

For example, if you are a member of the Hard Rock Cafe's private club in Dallas, then you know that you gain access with an encoded membership card. When you arrive at the club and insert your card in the reader in the first-floor elevator lobby, the elevator is summoned automatically to take you to the club's floor. When you step out of the elevator, the bartender already knows you are there and your favorite drink is displayed on the CRT located at the bar.

Maybe you store business or personal items in a mini-storage warehouse. Many of these facilities use access control systems. You insert your card when you arrive and the gate opens. And, if the individual storage units are equipped with door alarms, your unit's sensor automatically is shunted.

IN THE CARDS

At first glance, cards for access control systems may appear alike. They're not. Many operate on vastly different technologies, including: magnetic stripe, magnetic core or dots, watermark magnetic, bar code, proximity, capacitance, optical, Wiegand wire, and Hollerith.

Magnetized material on one side of a magnetic stripe card holds the data that identifies it. Similarly, specific patterns of very small polarized magnetized spots on a barium ferrite core contain the readable data on magnetic core or dot cards.

Watermark cards also use magnetic stripes—but they're divided into electronically identifiable zones of varying widths.

Bar codes also can be read by specialized sensors.

Passive circuits that create specific frequencies when placed near specialized sensors give proximity cards their identities. These cards don't have to be inserted into or swiped through readers and often can be ''read'' while inside a purse or wallet.

Sensors scan capacitance cards, which contain unique combinations of capacitor plates to create code patterns, when they're inserted in card readers.

The relative passage of infrared light through rows of transparent spots give Dotical cards specific signatures.

Wiegand wire cards use embedded magnetized wire pieces to establish code patterns.

Hollerith cards, into which tiny holes are punched, can be read by a light source and sensor, or contact brushes.

Some tandem-technology cards combine two technologies on a single card so a single card to be used in different types of card readers within a facility. In some cases, with a barium ferrite insertion and proximity card combination, you can add the newer proximity card readers without replacing the existing insertion-type readers for the magnetic cards.

A PRIVATE, MULTI-TASKING SECURITY SYSTEM

BY SUSAN KONIG

In response to a rash of highly-publicized rapes and murders which plagued several New York City hospitals last year, officials at Lenox Hill Hospital—one of the city's largest and most elite private health care facilities—have purchased a complete security system which gives security personnel instant information on the precise location of any hospital emergency. Designed and installed by Audio Response Technologies, Inc. (ART) of Garden City, NY, the PC-based, multi-tasking "E911" system allows anyone in the eight-building complex to summon security simply by picking up a telephone. And if the Lenox Hill response is any indication of what's to come, this competitively-priced, multi-purpose security system has rendered its more conventional predecessor—like the panic-button system—welcomingly obsolete!

The "E911" made its official debut late last year, when Lenox Hill administrators contacted ART president Kenneth McCadden, requesting that "panic-type" buttons be installed throughout their 800-bed facility. McCadden maintained that such a system was simply not sophisticated enough for a complex as large as Lenox Hill. "Not only would installing enough buttons to service the entire institution have been a never-ending process," he explains, "but locating the pending emergency once an anonymous button was pushed would have been a time-consuming proposition at best." Administrators decided that the newly-developed "E911" system—available at a comparable cost—was a far more feasible option, because it would take the hospital's 2700 telephones and essentially turn them into panic buttons, whose precise location could be ascertained in seconds!

```
                        10 10  1:1689
ORIGINATING 2345      BLGD # 6
NEAREST    2456       ADDRESS 15W23
CALL POLICE Y 3356767 FLOOR # 15
CALL FIRE Y 4356767   ROOM PATHOLOGY
                      ELEVATOR # 5 WEST
NAME                  STAIRWELL # 53 56
                      EXITS W23 W24
SPECIAL INSTRUCTIONS:
```
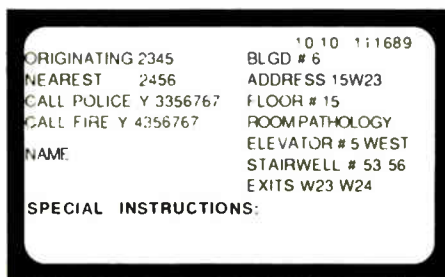
This is a sample screen. Entries can be placed in any order.

Designed to service any type of institution—public or private, the ART "E911" essentially duplicates a new public 911 service of the same name (currently available in most major U.S. cities), which allows a caller to summon police merely by dialing "E911." Once the number is dialed, police receive a computer printout of the caller's telephone number, and a subsequent readout of the corresponding address, regardless of whether voice contact is made. In other words, the caller needn't stay on the line.

In much the same fashion, the McCadden system links the hospital's GTE 4600 PBX to a customized ART microcomputer base, located in the security office, so that anyone with access to a Lenox Hill telephone can summon security simply by dialing '1-2-3'. The system displays the originating telephone number, plus a database file for each and every telephone. In other words, security knows exactly where the telephone is located, the nearest telephone location, the building, floor, room number, nearest elevator, etc. The system is not voice-activated, so again, the caller needn't stay on the line. McCadden stresses that the system has applications for a variety of institutions; "It could even be used on the community level to link residents and small businesses to the police."

What is probably first apparent to the perspective client is how conveniently unobtrusive this system is. It consists of only a desk-top ART 386, 33 MHz computer and terminal, whose installation requires little more than plugging in the components. Essentially, the system takes the hospital's previously-existing PBX and activates its A.N.I (automatic number identification) capacity with customized software, thereby transforming it into a highly-sophisticated data transport system. "It becomes a virtual 'collection agency' for vocal and computerized data," McCadden explains. "The computer, in effect, says 'Send me touch tone signals' — these being the emergency code '1-2-3'. It then translates those signals into the originating telephone number, and automatically retrieves the file associated with those digits. The file indicates precisely where the call came from—the building number, room number—any information desired and previously entered into the database."

Once an emergency call comes in, the system allows the attending security officer to dial the police or fire departments merely by striking a designated key on the computer. Again, voice contact is not necessary. Responding officials receive a printout of the exact location from whence the call originated. The officer can also conference the call among himself, the caller and the police, if necessary.

Designed to service a myriad of potential emergency situations ("We sought to cover every conceivable scenario," McCadden says), the system can operate unattended. Each E911 call is stored and printed out, so that, should the attending guard have to leave his monitor for any reason, he will, upon return, receive both an on-screen and printed record of any
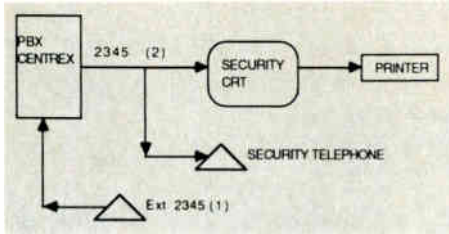
Flowchart for Audio Response Technologies' "E911" system.

calls made in his absence. The computer also prints out reports of emergency occurrences for permanent record.

The system has mass announcement capability, designed to service the large-scale emergency. This feature basically allows a voice message to be delivered to up to 50 parties at once. In the event of a major disaster, for example, the attending officer can record a message indicating what has happened, and have it instantly relayed over the phone to key personnel (whose telephone numbers have been previously entered into the database), regardless of their whereabouts. This is made possible by a custom database capable of coordinating several lists of information at once. McCadden explains: "A first list might contain inter-hospital phone numbers, for example, with a second 'back-up' list of respective home numbers so that, if an individual doesn't answer his office phone, the computer retrieves the back-up list and automatically dials his home." To receive the message, the individual must punch in an identification code on his telephone; this ensures, for instance, that if he is at home, his seven-year-old son doesn't receive the message instead. If a phone call isn't answered, or an I.D. number not punched in, the system then summons the individual via beeper.

Guard tour tracking is yet another of the system's capabilities. "A guard can confirm he is where he should be merely by punching a code in at any telephone," McCadden explains. "The central monitor will display his exact locale." It can also perform access control/alarm monitoring, when special alarms are attached to select hospital doors. These alarms are linked to the computer base, so that, if a door is opened or closed when or where it shouldn't be, the computer will indicate the precise location of the unwarranted "relay" action.

McCadden stresses that this menu-driven system requires minimal computer literacy, and can be tailored to meet specific security needs. It is also multi-tasking, so that, should a guard wish to modify a file, for example, he can do so knowing that, in the event of an emergency, the screen will automatically switch back into the emergency mode.

The consensus among Lenox Hill officials is that the E911 is ideally suited for their security needs. "This system allows us to know exactly when and where there is an emergency; that would have been close to impossible just a few years ago," says security director Eugene W. Flynn. "It's very time and cost-effective, and its operation doesn't require much training."

He stresses that the customization capabilities have proven extremely useful: "We've added an annunciator to the system which produces a very distinct sound so that, when an emergency call comes in, it's sure to be heard amidst the noise of the security office. We've also programmed it to display the fastest route to an emergency site, via both stairs and elevator."

While he is quite pleased with the overall system, Flynn says his only concern lies in the potential for users to abuse it. "A system like this, which makes summoning help very simple, has a built-in potential for abuse; that is—summoning security in non-emergency situations. The public E911 system is prone to the same problem. I'm not saying abuse is inevitable; however it is certainly a possibility. Therefore, we will limit its accessibility to staff members, rather than patients, and administer regular announcements regarding the importance of not abusing the system. ∎

CONVENIENCE STORES: A GROWTH MARKET FOR CCTV

BY TOM PAPPAGEORGE

Convenience stores, while being convenient for local residents, present a prime target for the would-be robber or shoplifter. They also represent a dynamic market for closed-circuit television security systems with timelapse recorders.

There are more than 80,000 convenience stores in the United States. Each has an electronic security need identical to those of a larger department store or shopping mall. The only difference is that installation is on a smaller scale—most convenience store video security systems can be installed in one day and sell in the $6,000 to $10,000 dollar range.

Because convenience stores survive on high traffic and quick sales; shop lifting, robbery and employee theft are key areas of concern for store management. Thus, video security systems are of great interest to convenience store owners and managers alike. And, because the systems offer a deterrent factor not found in less visible security measures, return on investment is realized quickly—typically a noticeable decline in shoplifting, robbery and employee theft can be seen during the first month after a video security system is installed.

The need to ensure the safety of employees and patrons also increases the need for video security systems. This is reflected in a number of new laws that are being considered and passed which require convenience store owners to install a video security system. The first state to require a video security system is Florida. It is anticipated that as the incident of violent crime increases, many other states will follow suit.

Tom Pappageorge is Director of Marketing and Sales for Gyyr.

Flowchart for a typical convenience store CCTV system with timelapse recorder.

The reason for mandating video security systems is clear. The police need a witness to the crime. Many times the store clerk is dead or unconscious, leaving no clue for the police. This is where the video recording system comes in. Following a robbery, the police take custody of the video tape and can quickly make a copy of the robber's image for use in all all-points bulletin. In addition, if there is a video system installed, the probability of a robbery goes down, simply because the robber will go to an easier target.

The second largest concern for a convenience store owner is employee theft. It is estimated that more than 60-percent of convenience store losses are linked directly to dishonest employees, and the easiest area for employee theft is the cash register. It is here the employee can steal from his employer and have a good chance of getting away with it. Under-ringing, "sweethearting" and working with an open cash register drawer are common ways for an employee to steal.

Until recently the most common way to watch the cash register area was to use two CCTV cameras. One would watch the general area around the register, and the other camera would have a telephoto lens to watch the cash register display.

This dual-camera method was adequate until the introduction of LED displays, which were difficult for the cameras to "read." However, since the newer cash registers have an RS-232 port (older units

A photographic diagram of what is displayed on a display monitor when a quad is in use.

may be retrofitted with one) a direct connection between the video recording system and the cash register can be made. (In addition to RS-232 ports, some older cash registers can have an extra board installed inside the cash register that will do the same thing an RS-232 data port does. Caution should be exercised when using this type of interface, as they sometimes are not made by the cash register manufacturer and may void the register's warranty.) Now, when a store employee rings up an item, the same information that prints on the customer receipt is recorded on the video recorder. This makes it impossible for the store clerk to "sweetheart" the till without the incident being recorded.

The third crime-related problem a convenience store owner has to deal with is shoplifting. The best way to combat this age-old problem is to make it unlikely for the shoplifter to succeed. The video security system does this job very nicely by "looking" at all areas of the store. It is a good idea to have a monitor on the store floor. By placing a large video monitor (15-inch or 19-inch) where customers can see themselves, the deterrent factor in preventing hold-ups and shoplifting is greatly improved. It is also a constant reminder to the store employee that he is being watched.

When a display monitor is installed on the sales floor, the would-be shoplifter can easily see the total-store coverage of the video security system. This is why digital processors have become so popular for use in convenience stores.

Digital processors, or "quads," have the ability of taking four images simultaneously on one video monitor. Quads enable the store owner to record all four cameras in his store without losing any video information—a vast improvement over the old way of using video switchers.

With a video switcher, many seconds go by before a camera is revisited. With a digital quad there is no lost information due to sequencing time. The typical convenience store video system will begin with four CCTV cameras. The cameras are usually positioned to watch the entry area,

the cash register, the back aisles and an overview of the store.

Audio recording is now playing a larger roll with the video security system. Until recently, 24 hours was the maximum time a timelapse recorder could record audio. Now there is a timelapse recorder that can record audio up to 240 hours. The audio sounds are "real time," and the video looks like timelapse.

The actual video security system recording equipment will consist of a timelapse recorder, digital quad processor, a 9- or 12-inch monitor and possibly an audio recorder. (The monitor is used by the store owner to watch the store when he is present, and to review the video tapes when he returns the next day, or after a weekend.) This recording equipment is typically installed in the manager's office. This is usually the most secure area in the store, and it is unlikely a store clerk will have access to the manager's office when the owner or manager is away. For added security, the timelapse recorder and the digital quad processor can be installed in a lock box. A lock box is nothing more than a large steel enclosure with a fan on the back and a lock on the front, but it is a critical component when dealing with potentially dishonest employees. A lock box ensures that the video recorder and quad will not be tampered with even

if an employee has access to the manager's office.

When configuring the system, some rules of thumb apply. Your camera choice is very important. Your recording will only be as good as the image being sent to the recording equipment. Until recent years tube cameras were used exclusively in the CCTV security system. Tube cameras, however, had inherent drawbacks. They needed to be adjusted to ensure a quality picture. In addition, the tubes needed to be replaced every 12 to 18 months. Now the CCTV industry has moved almost exclusively to chip cameras. These cameras, while costing a little more up front, do not have any of the maintenance requirements of a tube camera. And the picture quality will be just as good 12 months after the installation as it was the first day you installed the video security system.

When selecting the timelapse recorder, beware of low-resolution units. A timelapse recorder is a must if the video security system is to be effective for the store owner, and choosing high quality equipment is especially critical when installing into the convenience store market. The purpose of the recorder is to store the images of a crime. If the timelapse recorder is low-resolution or low-quality, it may not fulfill your customer's needs.

WHICH SPOOL WOULD YOU BUY?
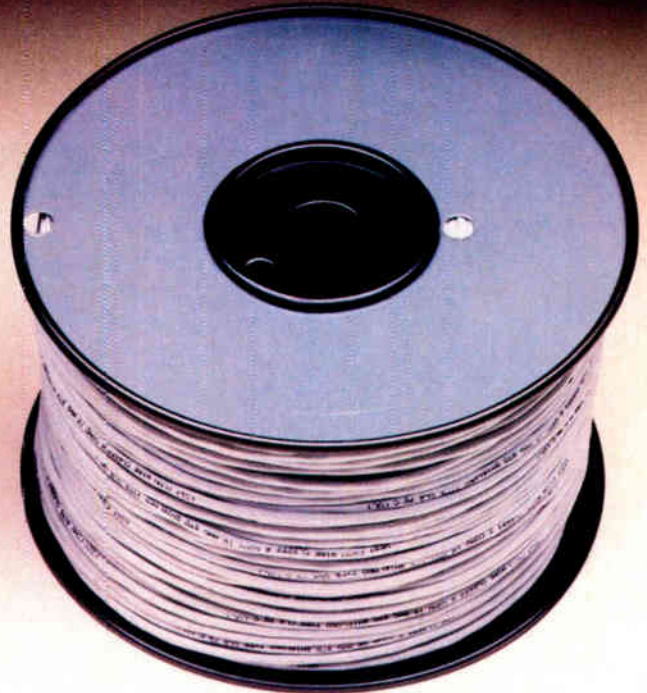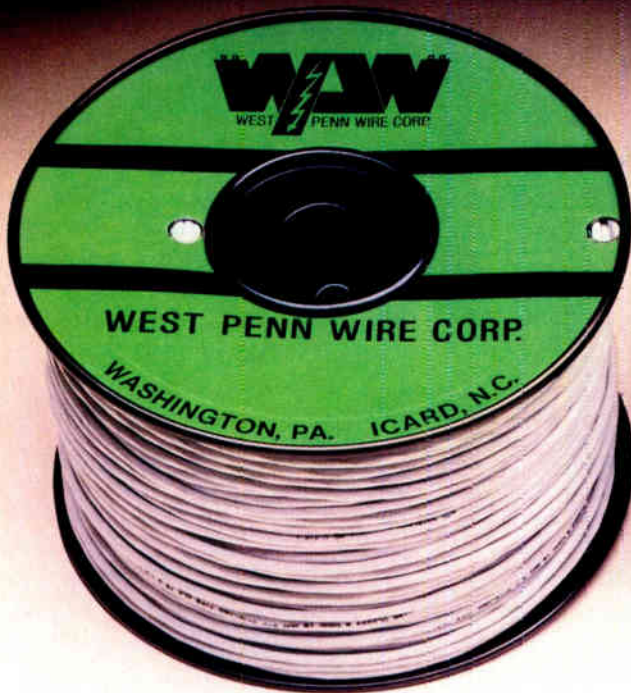
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You will find that the store owner becomes very dependent on the video security system, and if something is not working properly, the store owner will want it repaired immediately. Therefore, be prepared to respond to your convenience store owner's needs in 24 hours or less. And when configuring the system, keep quality and maintainability in mind. ∎

FLORIDA BILL REQUIRES CCTV SECURITY SYSTEMS

Following a rash of convenience store robbery-related killings, officials in Hillsborough County, Florida drafted a bill requiring strict regulation of convenience store security measurements. The law, which went into effect on April 15 of this year, requires convenience store owners to adhere to a number of regulations which span the gamut of retail crime prevention. Among the requirements is the installation and maintenance of a camera-based security system. The fine for not complying with the regulations stated within the ordinance is a maximum fine of $500 or imprisonment not to exceed 60 days, or a combination of fine and imprisonment.

The law defines a convenience store as a business that derives 50 percent or more of its gross income from the sale of goods, merchandise, gasoline for motor vehicles, or other articles of value in their original containers; offers a limited quantity and variety of food, household and sundry items; and does not sell or have for sale prescription drug items. The bill does not apply to truck stops with multiple employees working at all times.

According to Steve Walsh of Florida Electronic Repco, the passing of this law has made a dramatic impact on the sale of security systems with time-lapse recorders and chip cameras, as well as lock boxes and text inserters. "Prior to [the passing of the law] we would have anywhere between five and ten orders for video security systems per month," says Walsh. " Now, we are up to 30 per month. And, one dealer we do business with is in the process of quoting 200 systems — it's like the dealers have found a gold mine in the convenience store market."

World Radio History

SOUND & COMMUNICATIONS

DOLLAR SALES 1989

(Gross Dollar Sales Reported by Contractors (in thousands)

PERCENT OF CON- TRACTORS

	36.5%		24.5%		
11.9%		17.6%		6.9%	.6%
$100 & Under	$100 – $500	$500 – $1,000	$1,000 – $5,000	$5,000 – $10,000	Over $10,000
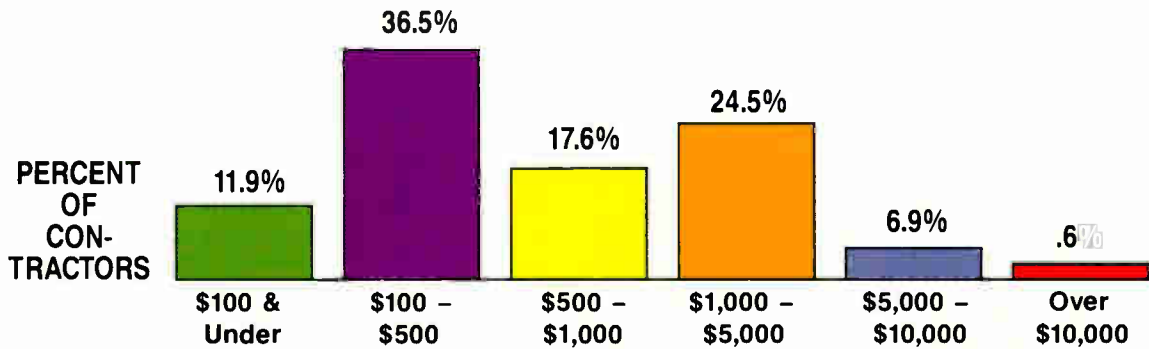
Most Important Markets for 1989 in order of importance

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

Projected Importance to Sales for 1990 (in order of importance)

Commercial Sound Reinforcement
Entertainment Sound Reinforcement
Alarm/Security/Life Safety
Non-Security Video
Keyphone Sales/installation

1990

CONTRACTORS SURVEY

Total Dollar Sales for 1989 Compared to Last Year's Response

	Last Year's Response (%)	This Year's Response (%)
Under 1,000,000	18	11.9
100,000-499,999	38	36.5
500,000-999,999	13	17.6
1 Mil.-4,999,999	23	24.5
Over 5 Million	8	7.5

Total Number of Employees

	Percent Responding
1 - 3	25.8
4 - 10	38.4
11 - 25	21.4
26 - 99	13.2
Over 200	0.6
Mean	16.2

Services Company Provides

	Percent Responding
Equipment Sales	95.6
System design	91.2
System installation	97.5
Repair & maintenance	93.1

Installed System Jobs

	Percentage
Average size of systems in 1989	15.8
Largest size of systems in 1989	96.0
Typical time from order to finished system (months)	2.6

Top Selling Lines

TOA	Altec Lansing
E-V	Atlas/Soundolier
Dukane	JBL
Bogen	Rauland, Shure (Tie)

THE FIFTH CONTRACTORS

BY JUDITH MORRISON

(Research assistance by Steve Jacobs; editorial assistant Hal Bienstock; statistical analysis by Survey Analysis, Inc.)

Well, we knew you weren't a namby pamby bunch, and once again you've proved it. In an informal way, the sound and communications professionals know who they are. They're secure in what they know and how they do what they do. But what exactly do they do — in a quantitative statement?

For the fifth year, Sound & Communications presents its annual survey of the electronic systems installers. We sent questionnaires to a random selection of sound contractors who responded well — but in their usual idiosyncratic way, choosing the questions they chose to answer and adding their own commentaries. An independent statistical service wrestled with the sometimes non-statistical answers, and correlated the results for us. And this is some of what we found.

Sometimes there are no surprises. As anyone who has attended an NSCA convention can tell, this is a business of small businessmen.

Well over a third of respondents place their businesses for 1989 in the annual sales bracket of $100,000 to $499,000. However, another third had sales of over a million dollars — with a quarter of survey respondents reporting sales in the one million dollar to five million dollar range. Seven and a half percent reported sales of over five million dollars, but only six-tenths of a percent reported sales above 10 million dollars. This worked out to an average dollar value of $1,473,000.

These numbers were consistently above last year's survey numbers in the middle range, with the "under $500,000" classification dropping 7.5 percentage points, and those points being picked up mostly in the middle range of $500,000 to a million dollars, with a slight rise in the one million dollar to five million dollar category. (A little under two percent of respondents didn't answer this question.) But since these are dollar values, the basis for the increase may simply lie in inflationary pressures and not have lead to any increase in profits for the aggregate of sound contractors.

Nearly thirty-eight and a half percent have between four and ten employees. Well over a quarter have only between one and three. However, a hefty 14 percent have over 25 employees. As one would expect, the companies with the highest dollar sales have the highest number of employees.

> "The age of CAD design is here. If you don't get on board today you might not have a tomorrow to worry about."

The 25.8 percent of respondents reporting one to three employees include 68 percent of the "under $100,000" in 1989 sales reported. Over 66 percent of the people reporting over $5,000,000 in 1989 sales have between 26 and 99 employees.

Our question in the survey was a closed end one, and almost everyone answered that he does almost everything: Sales — 95.6 percent of respondents; system design — 91.2 percent; installation — 97.5 percent; repair and maintenance — 93.1 percent.

A large percentage (15.7 percent) filled in "other" for this question also, but didn't amplify. Next year's survey will be changed to try to elicit more information on that 16 percent and exactly what they do.

The average size of systems installed in 1989 was a little under $16,000, with the average of the "largest system installed" reported as $96,000. As one would expect, smaller companies reported smaller average sales — with "under $100,000" respondents having an average system of

ANNUAL SURVEY

"We find in smaller jobs we are competing with M.I. dealers. In some cases we are called in, after, to straighten system out."

$6,700, "$1,000,000 — $4,999,999" respondents having an average of $263,000. Companies over $5,000,000 had an average of $373,000.

We also asked our surveyees what their largest installed system was in dollar value for 1989. As for these largest size systems — the "over $5,000,000" companies computed to a mean of $333,500 and the "under $100,000" companies showed a largest system size average of $9,800.

For some reason, companies in the northwest reported a larger average size than other regions — $29,500 for the northwest versus a fairly consistent spread between $14,000 and $16,000 for the rest of the regions, although the mountain region came in with a low of $6,200 for an average. That region made up the difference, however, in the "largest system installed" category — with an average of $156,500. Only the northwest came in higher ($195,400), along with "Out of U.S." at $221,700. ("Out of U.S." was, however, in the midrange for average size system — $15,700.)

The typical time from order to finished system has consistently run around three months for the five years we have been doing this survey, with last year's figure coming in at 2.5 months.

This year, the typical time from order to finished system was 2.6 months. Larger companies reported longer time frames ("Over $5,000,000" companies reported an average of 6.1 months.) Smaller companies reported shorter time frames (1.4 months for "under $100,000"). The mountain states companies took longer — 5.3 months on average, although their average sized system was smaller and their

THE BEST REPS

Who are the manufacturers' representatives and distributors who showed up as having the best relationship with contractors? (Remember, this was an open ended write-in question, requiring some time and thought from generally busy respondents, so the names showing up on this list have, we think, added value in that they were elicited rather than checked off.) The winners are:

JAMM Distribution	Audio Marketing	Robert Christopher Sales
Burt Ziskind and Associates	Taub Sales	Millar Electronics
Peregrine Reps	AMA (Bruce Hagan)	Henry Phillips Company
Dick Pass & Associates	Howard Smith	Randy Tericki
Secom	L-C	Schoonmacher Sales
Sigmet	Shalco	Shamrock
Bencsik Associated	Palmieri Assoc.	Conneen Inc.
Rancilio	Burtek	SRT Marketing
Jones Audio Sales	Graybar	Brooke Distributors
World Wide (Bob Gale)	Northland	Go Video
Dobbs Stanford	Meyer Marketing	Volutone
Monfort Electronics	Dawson	A/V Marketing
Silver Peak	Greg Drubay	Metropolis Audio
S.F. Marketing	Hudson Marketing	Pusecker Sales
Gregg Wilson	Metropolis	Paul Robinson
Steffy Marketing	Creative Audio Marketing	Jim Presley
John Humble & Assoc.	Charles Muse	RW Sales
C. L. Pugh	Graham/Davis	Marcom
CB Electronics	Wilson Audio	Midwest
Western Audio	Aywest, Inc.	Alan Hyatt
ASR Enterprises	Radon	Derek Allen
Sunrise Sales	Ken Simons/Excellence	AST
Lowery (Charles Samuel)	Marketing	Hot House Productions
Wally Wilson	Derek Allen & Associates	Communications
White Radio, Ltd.	Tom Parnell/New Horizons	Components
Burcaw	Avcom	HHP
B.C. Electronics	MJM Marketing	Vince Throckmorton
Jim Piper & Associates	Weller	Linda Wick
Vector	Frank Halter	Triad Marketing
North Supply	Ed Nuhring	The Music People
Jim Umstead	Forti	Paco Electronics
Brian Trankle & Associates	Power & Telephone Supply	Sound Sales
Audio Resources	Ouzinoff & Assoc.	Daniels Ent
Sound Marketing	Ron Tunks	W-3 Marketing
CM Sales	Roger Ponto & Assoc.	Bassett Sales
Starin Marketing	North Coast	AC Simmonds
Thorvin	Monte Lamb	Kodo Kawamura/
John B. Anthony	Leslie's	Kodo Assoc.
Pro Tech Marketing	RJ Marketing	Fred Yore/Yore Co.
Dave Dartko	Bernstein	Stereo Marketing
R-P Sales	Brian Scott	Warren Associates

Once again, remember there was a high correlation between top lines being sold and best relationship with the rep. Manufacturers take note; reps can use this for ammunition.

Sales Representatives need to understand the key elements of their position. Namely: Keep contractors informed about new products; supply adequate quantity of sales literature; provide strong support when things go wrong. Not much to this.

Most Reliable Brands

TOA	Shure
E-V	QSC
JBL	Rauland
Atlas/Soundolier (Tie)	Bogen
Altec Lansing	Aiphone
Dukane	Peavey
Crown	

"Keeping up with the commercial sound industry gives me a significant advantage in solving problems in residential sound systems."

"largest sized system" was not as large as the northwest (which took 3.3 months for a job) or the "Out of U.S." region (3.5 months).

How many brands or lines of equipment does the contractor sell? Answers ranged from "unlimited" to "5," with an average of 30. But authorization doesn't mean liking.

What are the contractors' favorite lines? Once again, for the fifth consecutive year, TOA came in first as the top line the contractor is selling. But Electro-Voice was close behind. Here we must stop to talk of some confusion in the market, one Mark IV Audio must be aware of. On our write-in, completely open ended questions asking about manufacturers and brands, we got the most varied answers regarding Mark IV. Answers ranged from simply "Mark IV," to "Mark IV — Altec, University," to "Altec — Gauss." Obviously, contractors are associating all the Mark IV companies, but are not quite clear on what Mark IV is. We chose to keep these questions open-ended in order to prevent any bias being inserted from the nomenclature of a company or the placement on a list and to allow space for some surprises. Clearly, that has worked to the detriment of the Mark IV companies which, had we provided a check-off list, would have been listed separately. In quantifying our data, we used individual companies where they were mentioned, and had to keep the "Mark IV" entries as separate classifications, since it was unclear which Mark IV the respondent was talking about. If all Mark IV entries are added up, the result puts Mark IV into first place in "top lines you are selling."

To return to the original statement: The top three lines contractors tell us they are selling are TOA, Electro-Voice, and Dukane. After that, the next most popular are Bogen, Altec Lansing, Atlas/Soundolier and JBL. This shows some change from last year, with the addition of Dukane, and the demotion of Shure to ninth place from fifth.

We computed the answers to this question in two ways, as an aggregate (with the results as above), and as a separate quantification of the number of times a company was listed as number one, number two and number three by individuals. The second method elicited these results: Electro-Voice was mentioned most often as number one in "top three lines you are selling," with TOA and Dukane close behind. The number two position for this question came in with TOA first, Altec Lansing second, and Electro-Voice third. The third position was occupied first by Atlas/Soundolier, with TOA and Shure tied for second place, and University and JBL tied for third.

Our next question asked which manufacturers the respondent has the best relation with, and once again there was some correlation, with the rankings being: TOA, Electro-Voice, JBL, Atlas/Soundolier, Dukane, Altec Lansing, and West Penn.

This year, however, we added a question. We asked which manufacturers reps or distributors contractors felt they had the best relationship with. And here, as one might expect, there was a clear correlation. TOA again came in first, Electro-Voice second, Atlas/Soundolier third, with Telex and West Penn following. The next slot was occupied by JBL/Soundcraft/Seck —

"I would like to see our products installed by us and bid directly to the general (contractor) instead of going through the electrical (contractor)."

again a lumping together of conglomerate components, similar to what we see more frequently in the Mark IV listings.

The brands found most reliable didn't necessarily correlate with the top lines, or the best value as contractors perceived them. The three most reliable were TOA, Electro- Voice and JBL, with Atlas/Soundolier, Altec Lansing and Dukane following closely.

As for the brands contractors say they are least likely to use, we've decided not to list them in public, for several reasons. First of all, the company that came in absolutely, positively last (or first if you choose to see it that way) as the brand

least likely to be used has recently undergone changes in its marketing director. We are inferring, correctly or not, that the company is well aware of its problems in the market and is making a serious attempt to correct it. Secondly, since we asked why contractors are not likely to use these brands, the reasons given very frequently had to do with rep relationships and with price considerations, and not always with quality or general relationships with the supplier.

A large and respected speaker manufacturer appeared frequently on the least likely list. The reasons given included: "Arrogant," "Hard to deal with," "Unfriendly personnel," and "Availability."

Frequently, the lines least likely to be used by some are most likely to be used by others. We'll allow here for some sour grapes in business disagreements. And in order to be fair, we've decided not to list the least likely ratings. Manufacturers should take note however. Contractors are not likely to use lines because of these reasons (all of these are exact quotes): quality has slipped; bad sound quality; garbage; minimum annual sales requirments — too high; poor customer service; bad network dealership structure; poor factory support; does not support contractors ; no innovative products; national sales manager is an [expletive deleted]; bad design; poor rep; cheap equipment; all talk, no action; rep is a lying rat bastard; management is hard to deal with; too expensive; unreliable; no protection from price gouging; bad sound quality; and [we have to report] "anti-Japanese sentiment."

Sound and communications contractors aren't necessarily joiners. They don't belong to a whole lot of organizations. But as one would expect, 55.3 percent actually belong to the National Sound and Communications Association. Twenty-two percent are members of the Audio Engineering Society. The numbers fall off drastically after that, with the next highest number being the six percent belonging to the ICIA.

Over half the respondents attend NSCA conventions. Seventeen percent attend AES conventions; seven and a half percent attend Infocomm (a higher percentage than belongs to ICIA); with the same percentage going to NAAM conventions.

Most Important Markets in 1989

	Percent Responding		Percent Responding
SOUND REINFORCEMENT		**BUSINESS MUSIC**	
Commercial sound reinforcement (installed)	60.4	System hardware sales/ installation	13.8
Commercial sound reinforcement (portable)	12.6	Sales of tape/cartridge	5.7
Entertainment sound reinforcement (installed)	21.4	SCA/Satellite	6.9
		Music library rental/programming	8.2
Entertainment sound reinforcement (portable)	10.7	**INTERCONNECT**	
Sound service (rental & operation)	16.4	Keyphone sales/installation	12.6
Pro sound equipment	23.9	PBX sales/installation	5.0
MI/musical instruments	1.3	Hybrid sales/installation	5.0
		Centrex sales	1.3
LOCAL WIRED INTERCOM		Support & peripheral equipment	5.0
(Non-telephone)			
Office-to-office	14.5	**OTHER**	
Nurse call	13.8	Video systems (non-security)	14.5
Other Hospital/health care		CCTV	21.4
intercom	10.7	Alarm/security/life safety	10.7
Factory paging/talk back	22.6	Sound masking	7.5
Other wired intercom	17.0	Teleconferencing	3.1
		Residential systems	5.7

"We need more good quality American made equipment that is competitively priced."

"Keep sound system installation and wiring out of hands of electrical contractor."

"After 18 years in this business I still find that most sound contractors still do not sell their products and service with profit in mind. They are satisfied with a small markup on equipment and a weekly paycheck for effort."

Most Important Markets in 1990

	Percent Responding		Percent Responding
SOUND REINFORCEMENT		Factory paging/talk back	10.1
Commercial sound reinforcement (installed)	47.8	Other wired intercom	13.8
		System hardware sales/ installation	9.4
Commercial sound reinforcement (portable)	7.5	Sales of tape/cartridge	3.8
Entertainment sound		SCA/Satellite	6.3
reinforcement (installed)	17.0	Music library rental/programming	5.7
Entertainment sound		Keyphone sales/installation	8.2
reinforcement (portable)	6.9	PBX sales/installation	3.1
Sound service (rental & operation)	10.7	Hybrid sales/installation	5.0
Pro sound equipment	12.6	Centrex sales	2.5
MI/musical instruments	1.3	Support & peripheral equipment	3.8
		Video systems (non-security)	14.5
LOCAL WIRED INTERCOM		CCTV	11.3
(Non-telephone)		Alarm/security/life safety	11.9
Office-to-office	9.4	Sound masking	6.3
Nurse call	13.8	Teleconferencing	2.5
Other Hospital/health care		Residential systems	5.7
intercom	6.9		

And now for the money part:

What were the biggest market segments for contractors in 1989 and projected for 1990?

Eighty five percent of respondents reported installed sound reinforcement as a source of sales, but only 60.4 percent checked this off as one of their most important markets in 1989. Nearly 50 percent checked factory paging/talkback as a source of sales, but 22.6 percent considered it an important market. Smaller companies were less likely to be in factory paging (26.3 percent for the ''under $100,000'' category versus 66.7 percent for the ''$5,000,000 plus'' category). The same differences were seen for CCTV and video systems (10.5 percent in both categories for the ''under $100,000'' and 41.7 percent from the larger companies for video systems, along with a whopping 75 percent of ''over $5,000,000'' for CCTV).

Overall, 39 percent of the respondents get business from the CCTV sector, 33 percent from ''non-security'' video systems. Here 21.4 percent considered CCTV

> "The ability to package a sound system bid with fire alarm, clocks, security, energy management, etc. is a very big plus and seems to be the trend for commercial markets."

an important market in 1989, and 14.5 percent thought of video systems as important. Nearly a third are active in office-to-office intercom, 23.9 percent in nurse call, 21.4 percent in other hospital intercoms.

Other rankings of interest: 27.7 percent listed business music system hardware, 37.1 percent listed installed entertainment sound reinforcement; 40.9 percent listed pro sound equipment (which may be a catchall category), 18.9 percent listed keyphone sales, 19.5 percent alarm-security-life safety, 22 percent sound masking. (These last two again correlated with smaller companies having less involvement than larger companies.) Nearly 14 percent are involved in residential systems, with smaller companies having more involvement. However, far more larger companies considered residential systems an ''important'' market in 1989, although the percentage of sales for this

classification was negligible for the larger companies. This may speak of expectations for the future, rather than the reality of today.

As for 1990: installed commercial sound reinforcement suffers a drop to 47.8 percent who claim it's an important market (from 60.4 percent for 1989). Across the board, projected involvement in all classifications went down for 1990. Where is the excess business going to go? We can't answer that — and apparently neither can our respondents: A third of them chose not to answer the ''markets for 1990'' question.

Projected sales percentages remained steady, however, with no losses expected in particular segments. Residential systems sales percentages are, however, expected to rise.

Once again we asked our respondents what areas they feel are most neglected by contractors. Sound masking, residential systems, interconnect, teleconferencing, alarm and security, and CCTV led the list of segments contractors feel are neglected.

This compares with last year in that Sound Masking, Alarm and Security, and Teleconferencing remain high on the list of most neglected markets. (Sound Masking is number one for the second year in a row.) However, none of these areas came in larger than last year, so one would infer that even though respondents feel these markets are neglected, not a whole lot of people are doing anything about it. Does this have anything to do with getting a line? The difficulty of moving into a whole new area? Our survey didn't ask those questions. And we can only use conjecture.

Despite the low percentage value expected in market segments, our readers would like to expand into them. The highest responses to ''Would like to expand into . . .'' came from these segments: Business music, 24 percent; residential, 22 percent; intercom — residential and commercial, 21 percent; commercial sound, 22 percent, ''pro sound,'' 17 percent; interconnect, 16 percent. It seems to us that the market is in flux, with commercial sound specialists wanting to expand into pro sound and vice versa. This flux is clearly shown in the answers to our question regarding the actual name of this

business (more on that later).

With all the talk of computerized sound design systems, we were curious as to how our survey respondents do business.

"The Sound & Communications industry should offer more seminars for the sound contractor to become more familiar with their products."

What kind of computer do they use, what kind of business software do they use, what kind of design software do they use? We kept this question open ended, since we didn't want to offer any prompts and wanted to get the respondents' own wordings. Surprisingly to us, the most frequent answers by far were IBM and IBM compatibles, with Apple and Macintosh runing a distant second. Some of our repondents even use Wangs, AT&T — and one DEC. We even found one Kaypro on the list. When it comes to business, contractors overwhelmingly chose Lotus 1-2-3 as their top business software by an almost four-to-one margin over a number of other software packages including Peachtree, Word-Perfect, Word Star, Microsoft, and Macwrite. However, in the area of design software, the winner wasn't quite so clear cut. Several contenders finished second to AutoCAD, the winner by a slim margin. The second place, four-way tie consisted of PHD, AcoustaCADD, Bose Modeler and JBL CADP, followed by "None." Some contractors have designed their own programs or had custom programs designed for them, while some contractors aren't yet sold as to the value of design software. As one of our respondents stated: "To date CAD programs are pretend and brand oriented."

As far as test equipment, what are the three most important pieces to the sound contractor; who are the most important manufacturers of test equipment? Our questions didn't break down manufacturer from type of equipment; and since this also was an open ended question, the answers were inconsistent. However, some order was evident in the answers: The Ivie IE 30 Real Time Analyzer was a clear favorite among contractors with the Fluke 77 DVM Multimeter coming in second followed

Average Percent of Sales in 1989

	Percentage		Percentage
Commercial sound reinforcement (installed)	24.8	System hardware sales/ installation	3.6
Commercial sound reinforcement (portable)	2.3	Sales of tape/cartridge	0.7
Entertainment sound reinforcement (installed)	6.5	SCA/Satellite	1.6
		Music library rental/ programming	1.0
Entertainment sound reinforcement (portable)	2.5	Keyphone sales/installation	4.4
Sound service (rental & operation)	5.5	PBX sales/installation	1.0
Pro sound equipment	4.8	Hybrid sales/installation	1.4
MI/musical instruments	0.9	Centrex sales	0.1
Office-to-office	1.0	Support & peripheral equipment	1.5
Nurse call	4.0	Video systems (non-security)	3.3
Other Hospital/health care		CCTV	2.8
intercom	1.0	Alarm/security/life safety	6.1
Factory paging/talk back	2.5	Sound masking	0.8
Other wired intercom	3.7	Teleconferencing	0.6
		Residential systems	1.7

"The death of this business will come as a result of people willing to work for nothing in the name of being competitive. Competition is fine as long a the "winner" is able to make fair dollar."

"Unlicensed and incompetent contractors are encouraged b unscrupulous reps and manufacturers. These people cause a destabilizing effect on our industry by doing substandard work."

"I'm proud to be part of this industry but I feel manufacturers slight some of the smaller contractors. Too often an out-of-state firm will take a good job, leave and never be heard from again as the customer is left in the cold because local dealers were not used in the initial install and do not feel obligated to provide serv"

"I think the major manufacturer are all a bunch of equipment whores!"

Average Projected Percent of Sales in 1990

	Percentage		Percentage
Commercial sound reinforcement (installed)	28.4	System hardware sales/ installation	3.7
Commercial sound reinforcement (portable)	2.1	Sales of tape/cartridge	0.5
Entertainment sound reinforcement (installed)	6.0	SCA/Satellite	2.7
		Music library rental/ programming	1.5
Entertainment sound reinforcement (portable)	3.4	Keyphone sales/installation	4.0
Sound service (rental & operation)	4.7	PBX sales/installation	0.9
Pro sound equipment	4.0	Hybrid sales/installation	1.5
MI/musical instruments	0.9	Centrex sales	0.2
Office-to-office	1.5	Support & peripheral equipment	0.7
Nurse call	4.1	Video systems (non-security)	4.5
Other Hospital/health care		CCTV	3.0
intercom	0.6	Alarm/security/life safety	6.3
Factory paging/talk back	1.8	Sound masking	0.7
Other wired intercom	4.4	Teleconferencing	0.7
		Residential systems	2.5

closely by the TEF System (10, 12, and 12+) and TOA's Impedance Meter. Other manufacturers mentioned as having the most important test equipment included Bruel & Kjaer, Tektronics, Gold Line, and Sencore. "My ears" even managed to garner a couple of votes.

With whom does the contractor interface the most on a job? We gave choices: architect, general contractor; end user; interior designer; electrical contractor; other. And we asked what percent of the contractor's time was spent interfacing with these. The all time time-eater is the end user (50 percent of the time spent), with the electrical contractor a far second (14 percent). As would be expected, larger companies spent less time with the end user (35 percent) and more time with the architect. The least time was spent with the interior designer.

But watch this: Who should the contractor spend more time with? More respondents answered the "architect" than any other. Who should the contractor spend less time with? The favored response was the electrical contractor. We did not correlate the size of the business of the respondent with the answers to the question. It might be interesting to do that next year. Does anyone want to spend more time with the end user? As a mat-

ter of fact, yes. Fully 20.8 percent of respondents said they should spend more time with the end user.

And for our favorite question: What is this business called? We asked our survey recipients, "How do you define your business?" The responses varied even more than we had expected, with some correlation showing in: "custom system design"; "engineered audio systems"; "sound and communications contractor." Other entries, though, included: "low voltage electronic systems contractor"; "background music, commercial sound and video"; "electronic systems contractor."

And what other businesses are these respondents in? Answers ranged from obvious, related businesses or "none," to totally unrelated separate business ventures. Included among the slew of different answers were: manufacturing custom cabinets; audio, video, and floppy disc manufacturer; broadcast consulting engineer; audio visual rental; signage — electrical installation; audio/video production; recording studio; retail music store; lighting sales; consulting in noise control; industrial video; home entertainment; satellite TV — domestic and commercial; real estate, construction; farming and distribution; and custom engraving.

At the end of our survey, we asked our respondents to make any comments about the sound and communications industry that they chose. We promised anonymity, although names and companies were filled in. Some of the most serious (and frivolous) comments are elsewhere in these pages.

So what have we learned? The sound and communications industry is strong, viable, independent. Sound contractors have positive expectations for the future. They are actively planning changes for the next year. They have definite ideas on what lines they want to use and why; their reasons for using particular products are sensible business considerations — reliable product, good customer service, good price. They want to spend their time interfacing with the movers and shakers of a particular job. And they define themselves in myriad and individual ways. As one respondent answered in defining his business — "It's stressful, great, fulfilling." ■

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FIELD EVALUATION OF RANGE FINDERS

BY T.G. McCARTHY

As a sound contractor, I often have a need to measure large rooms and I must often work alone. Depending on why I'm making the measurements, I use techniques involving everything from pacing to measuring wheels to tape measures to full-fledged rod and transit surveys. All the methods work, trading speed for accuracy and accuracy for speed. The name of the game is to pick the method that is appropriate to the application; to guess wrong results in wasted time.

The electronic range finder, properly used, presents an opportunity to gather data faster without suffering a proportional loss in accuracy. The trick is to be sure you're measuring what you think you're measuring. In a room with large flat unobstructed walls, that's no problem. In a room full of ornate carvings, niches, pillars, and angled or curved surfaces it can be a problem. Because the distance that is displayed is based on the travel time of an acoustic impulse, we need to be sure that the path the impulse takes represents the measurement we want to make. Here's what I found using range finders in the field:

For this evaluation, I have four range finders from three manufacturers: Calculated Industries Dimension Master Plus, Seiko Instruments HC-1000, Sonin 60, and Sonin 250. Carefully using all four units in the field, I find they are all in close agreement with each other — and with a steel tape measure. Stated accuracy is typically 0.5 percent. My measurements were within 2 inches in 100 feet, 0.2 percent. Therefore, I can say these range finders are better than pacing and are close to the accuracy obtainable with a tape measure. However, there is some aiming uncertainty

Sextant with master range finder unit in place.

Combination square head rigged to measure distance.

with the Sonin 60 and with the Seiko. I can't see where the beam is going, so I can't be certain I'm hitting the spot that I want to measure to.

The Dimension Master Plus has an answer to that. It is equipped with an aiming spotlight which greatly increases confidence that I am hitting my target. It also has a three element transducer array which narrows the acoustic beam, reducing the chances of foreign returns.

The Sonin 250 offers a different solution to the aiming/foreign return problem. It uses a transponder — a device that emits the acoustical measurement signal when triggered by my master unit. I place the transponder on the point I'm measuring from, then I take the master unit to the point I'm measuring to. When I push the "measure" button, my unit starts timing and triggers the transponder which in turn

fires an acoustic pulse at me. There is no ambiguity here; the measurement pulse can only come from the transponder. If I don't have any blockage between it and me, then I will time the direct line pulse and the measurement will be correct. The disadvantage, of course, is that the transponder represents one end of my "tape," and must be in the correct position for each measurement. Perhaps I could place a real tape in about the same amount of time that I can place the transponder. Maybe I'm not saving much time after all.

At any rate, I now have another way to make the measurements that I already have several ways of making. My real problem is not floor plans; it's heights, ceiling heights in particular. Many of the rooms I work in have peaked, arched, contoured, or broken ceilings. There is often

Determining the height

elaborate beam work, light fixtures and circulating fans. The ceilings can be covered with acoustical absorption and there's often a significant temperature gradient between ceiling and floor. None of these things are conducive to accurate measurements with ultrasonic acoustical pulses and none of the units gave consistently good results here (of course we can't even try the Sonin 250 in this application because we can't place the transponder).

However, a simple solution using the unique capability of the Sonin 250 suggested itself. The solution is to simply place the transponder directly under the feature whose height I want to measure. Then, holding the master unit aimed at the transponder and sighting at a 45 degree angle to the target feature, I move back and forth to line the target feature up in my sight. At that time the horizontal distance from me to the transponder is the same as the vertical distance from the feature to the height of my eye. I hit the measure button and read that distance out on my master unit. Adding the height of my eye above the floor gives me the height of the target feature above the floor. (Figure 1 is a sketch showing how the geometry works.)
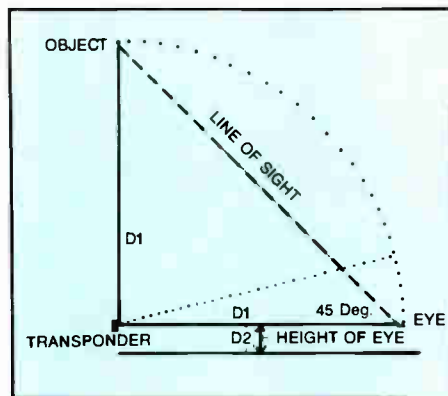

Fig. 1 Diagram of geometry.

The material to fashion a 45 degree sighting instrument can be purchased in the most rudimentarily stocked hardware store for under $20. The head from an inexpensive combination square and a rubber band will do the trick. (See photo.)

If I want to be more high-tech about it, a cheap plastic sextant offers two advantages: I can use the instrument looking horizontally rather than craning my neck back (the mirror does the craning), and I can use any angle within reason (if I don't use 45 degrees, I will need to calculate the height from the target to my eye by: Height above Eye = Measured Distance times the arc tangent of the sextant angle).

A sextant that costs under $20 is available at just about any yachting supply store. It's not the last word in geodetic survey instruments, but I've personally

Transponder in place.

used this sextant for blue water celestial navigation and can attest that it works. It will take a little getting used to though, especially if the upper regions of the room you are working in are dark and indistinct.

If I'm really a glutton for high-tech, I can affix two range finders to my sighting instrument: One to read the transponder distance, the other, a non-transponder type, to measure eye to floor distance. I

add the two readings to get feature height. These jerry rigs get the job done, but they look a little tacky. Perhaps I should ask our shop to make up a holder with a little more class.

Of the four instruments I tried, the two I like best are the Sonin 250 and the Calculated Industries Dimension Master Plus. I like both of these because they offer assurances that I'm measuring what

I think I'm measuring. In addition to its measuring capabilities, the Dimension Master Plus has a built in four function calculator, automatically figures area and volume and does inches/feet/yards/meters conversions (as does the Seiko HC-1000). But this capability is not too important to me because I like the satisfaction of punching through those things on my trusty HP 11C. Of the two favorite range finders, the one I would use most, because it facilitates difficult height measurements, is the Sonin 250.

In addition to measuring inaccessible heights, the Sonin 250 is a very useful aid for modeling rooms into Umbulus, our

> "The name of the game is to pick the method that is appropriate to the application."

loudspeaker array design program. By setting the transponder over my room reference point, I can gather horizontal coordinate data as fast as I can walk and write. First I list the room features that I want to map on my data form. Then I simply walk along the co-ordinate axis until I'm even with a feature, hit my measure button, write the value down, and move on to the next feature. When I'm finished with one axis, I do the other in the same manner.

The acoustic range finder is not a replacement for my other measuring tools, but it is a welcome addition. With it I can often achieve greater accuracy over other methods in a given amount of time, and it will let me make some measurements that would be heretofore impractical. As I use the instrument and gain confidence in it, I'm sure more applications will suggest themselves. ∎

Testing of Reflection and Absorption, Part Two

By Steven J. Orfield

While acoustics professionals understand a reasonable number of the applications of reflection and absorption, far fewer understand the test method used to derive most of the currently used data in specifying acoustically reflective or absorbent materials. In the May 16 issue of *Sound & Communications,* the four alternative methods of considering boundary surface acoustical effects in rooms were discussed:

- Geometric Reflection
- Diffuse Reflection
- Absorption
- Diffraction

Interestingly, the standard ASTM test for sound absorption is considered by most practitioners to be the only relevant and useable information with regard to reflection or absorption of specific products. This test, the Noise Reduction Coefficient (NRC) test method (ASTM C-423-89) is part of the ASTM Volume 04.06 standards on environmental acoustical testing. (The relevant European test is ISO 354-85 (E), "Acoustics — Measurement of sound absorption in a reverberation room", and this is found in the ISO Standards Handbook 4.) This test is commonly referred to as a "random incidence" absorption test.

THE ASTM TEST

The so-called random incidence sound absorption test is performed in a reverberation chamber (an extreme "live" room). Typically, the room must be a certain size in order to meet the requirements for establishing a sufficiently diffuse room for the lowest frequency of interest (In this case, 125 Hz). A sample of the material under test is placed in this room in accordance with a number of "mountings" or

typical use positions, so that the test will resemble that use condition. Details of mounting positions are contained in ASTM E-795-83, "Standard Practices for Mounting Specimens During Sound Absorption Tests."

Drapery, for example, is generally tested in a "G" or hanging mounting, reflecting the fact that an air space is behind the typical drapery or blind.

CANDLEPOWER DISTRIBUTION –
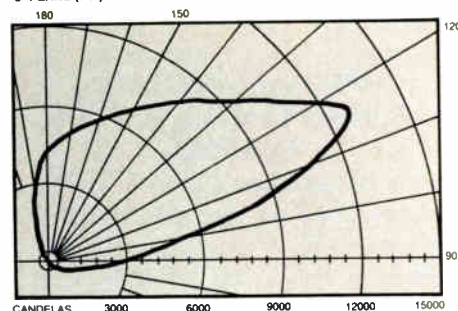0° PLANE (Perpendicular to Reflector)

Figure One: Luminaire Photometric Diagram

The laboratory has previously performed testing of the reverberation room to determine its reverberation time in each of the relevant test frequencies (Octave frequencies, 125 Hz — 4000 Hz). By use of the Sabine equation $(A = .9210 \, Vd/c)$ the number of sabines of absorption in each relevant frequency is then computed. The variables in this equation are:

- A — Sound Absorption (sabines)
- V — Volume of Reverberation Room
- c — Speed of Sound in Air
- d — rate of decay

Next, the acoustical sample is installed in accordance with the appropriate mounting requirement, and reverberation tests are again performed with the sample in

place in the chamber. Again, the sabine absorption in each frequency is computed, along with the percentage of absorption in each frequency. Finally, an average figure of merit, the NRC (Noise Reduction Coefficient) is calculated by using 250 Hz — 2000 Hz data and rounding off the absorption coefficients to the nearest multiple of .05.

This information and the total acoustical test report is then used by the acoustical consultant in calculating the effect of these tested materials on changes in performance of a room under consideration. The consultant generally will use a three axis or "Fitzroy" equation in order to reduce the calculational error effects of uneven placement of absorption in a space.

PREDICTION PROBLEMS

While this information is quite useful, it has a number of moderate to severe limitations. First, the currently used reverberation equations are somewhat imprecise. Secondly, reflection values of material are often considered as the simple inverse of absorption values, whereas reflection (and absorption) can strongly depend on the sample size. Thus, a small piece of the tested material may perform quite differently than a large piece of the same material. Finally, it is clear that absorption and reflection are typically physical problems which need to be characterized in terms of angle of incidence and angle of reflection to more accurately describe their typical performance. This has been known for some time, and the newer Schroeder mathematics has brought this out more clearly via the Quadratic Residue Diffuser.

Even in the 1930s, there was clear in-

terest and testing in an attempt to consider angular absorption. One example developed by Kuhl and Meyer is noted in Cremer and Muller's book, *Principals and Applications of Room Acoustics*.

This test approach was later used by the GSA to evaluate open plan offices and is used in ASTM E-1111 for tests of ceiling systems in open plan offices.

ANGULAR ABSORPTION — PARADIGM AND APPLICATION

One of the benefits of the study of physical phenomena is the cross-application of concepts between the relevant fields. For example, the MTF (Modulation Transfer Function), which has been central to intelligibility theory via the STI and RASTI standards, came from the use of this concept in optics years before. In a parallel application field, angular distribution or angular zonal "power" is a standardized metric supported by the lighting research and design community and its standards body, the IES (Illuminating Engineering Society). While lighting study and measurement was first interested in measuring light at the "receiver" position, it is now very interested in characterizing that same lighting via its angular source distribution. A typical luminaire (light fixture) photometric diagram is shown in figure 1.

This type of test is generally performed axially every 5 degrees both on the axis of the fixture and across the axis of the fixture. The results are used in simple and complex calculations based on the "zonal" performance of a luminaire. Since the relevant wavelengths in the lighting field are so small, light acts essentially as a straight line phenomenon for ray diagram purposes. Unfortunately, acoustical power tends to be found at much larger wavelengths and, therefore, exhibits the need for a more complex analysis in this analogy. While there are no standards for angular testing of acoustical materials, some de facto approaches are beginning to emerge and will, no doubt, be standardized over the next few years. The field of angular distribution testing of audio components certainly offers some direction.
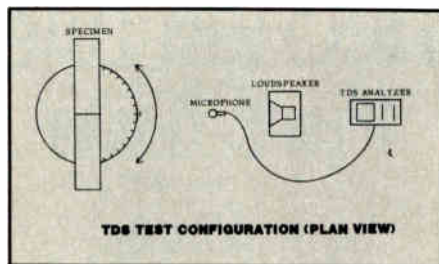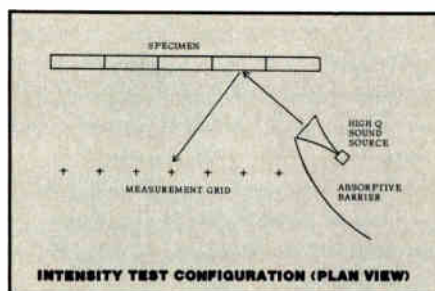

Figure Two: TDS Test Configuration One

Figure Three: Intensity Test Configuration Two

SPECIFIC ANGULAR ABSORPTION/REFLECTION TESTING

Prior to the assembly of this article, a major manufacturer of acoustical reflectors and absorbers, Wenger Corporation of Minnesota, approached Orfield Associates to test and evaluate their new quadratic residue diffuser panels, which were under development at the time. This request paired nicely with a broad interest which we had in the process and accuracy of measurement in this field, and thus, the specific testing examples are based on:
- Wenger quadratic residue diffusers
- Wenger reflective backs (diffusers)
- Reflective plaster wall
- 1½-inch acoustical fiberglass panels

In order to perform accurate testing of angular absorption and reflection, it is necessary to select a method which will, in some way be able to do one of the following:
- Attenuate most reflections.
- Isolate individual reflections.
- Determine the direction of sound flow.

The first method to consider would be

the use of an anechoic chamber. While this would be beneficial, there are few available of sufficient size for testing large samples. Another method would be scale modelling results anechoically, and this is also a somewhat obscure capability. More in the mainstream of acoustical testing are two methods which offer promise, one currently in use and another which, I suspect, will be emerging with some influence over the next few years. These two methods are Time Delay Spectrometry (TDS) and Sound Intensity (SI) testing. They are embodied in two types of analyzers currently on the market, the TEF system for TDS testing (Models 10, 12, 12+ and 20), which are all narrow band analyzers, and the Dual Channel Intensity Analyzer, such as the Bruel and Kjaer 2133, which is a digital fractional octave analyzer (1/1, 1/3, 1/12 & 1/24th octave). (See Sound & Communications, July & September 1989 — "Measuring Sound Intensity.") The TDS analyzer has the capability to provide a time "windowed" signal which can, within certain limits, separate source and reflected sound paths for individual analysis, based on a signal and an offset tracking filter, which can limit the time duration and delay for acceptance of a measurement. Thus, a test sample can be set up, a sound source can be oriented toward the sample, and the analyzer can be set to only select the reflected sound from the test sample.

This test method is typically referred to under the general heading of "impulsive testing," as an exact initial signal (impulse) is generated by the analyzer and is followed and analyzed for its change by the same analyzer. (This is also often referred to as a "2-port" measurement, as the source sound is generated by the analyzer and the received sound is analyzed based on this captive "source.")

Sound intensity measurement, on the other hand, is typically considered as a method which is used for "steady-state" sound measurement. Much like the audio engineers' historic use of the pink noise generator and the real time analyzer, intensity measurement is not based on time
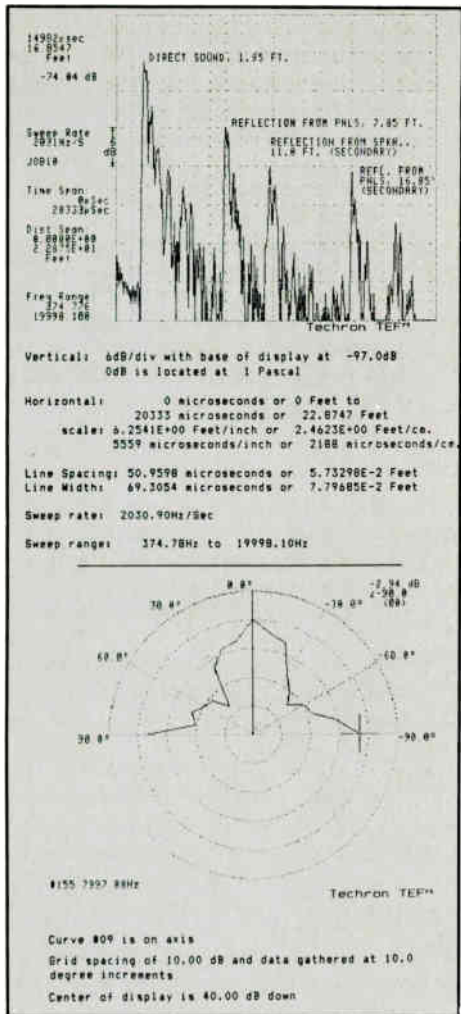
Figure Four: TDS Test Results

windowing but, rather, is based on the
ability of the dual microphone probe and
the intensity system to determine the
directional flow of sound. Thus, sound in-
tensity as a steady state sound field is the
instantaneous value of the directional flow
of sound (a vector quantity). By selecting
the orientation of the probe and by
measuring a set grid (map) of a sound
field, the vector quantity of sound power
can be measured, along with the local
sound pressure level at each measurement
point. If this method is used to broadly
characterize a sound field (measure at
many points and on many axes), it is
potentially very valuable in providing a
broad characterization of the "sound
power" absorbed by or reflected from the
object under test. (An example of a use
would be the characterization of a reflec-
tor system before and after mounting in a
performance hall.)

ACOUSTICAL TEST PROCEDURES

In the case of TDS testing, one con-
figuration was selected as noted in figure 2.

In this configuration, the test specimen
was mounted on a turntable, and the TDS
testing was performed with a TEF 12+,
and a stationary B & K microphone and
power supply. The sound source, which
was also stationary, was a B & K 4224
Sound Source fed by the TDS signal.

In the case of the sound intensity
testing, another configuration was used.
configuration two.

It is clear from these plots that the
reflector and the two diffusers are per-
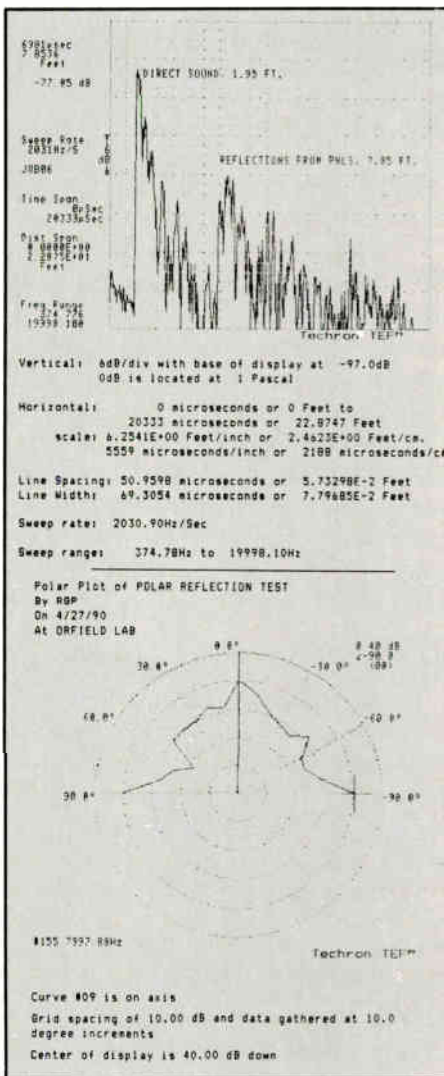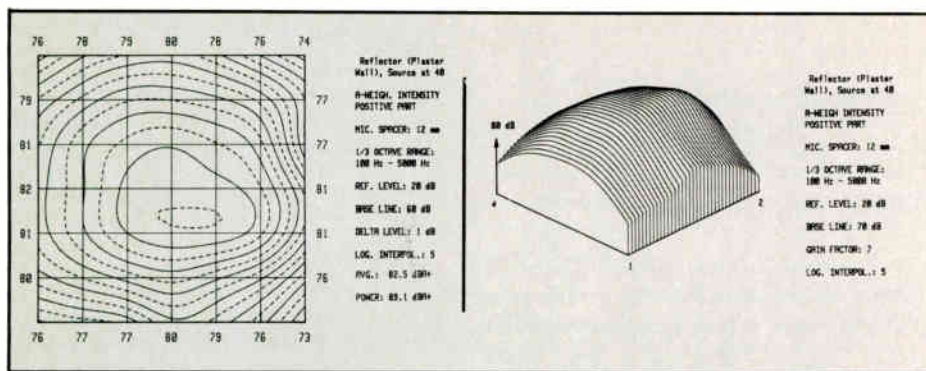

Figure Five: TDS Test Results

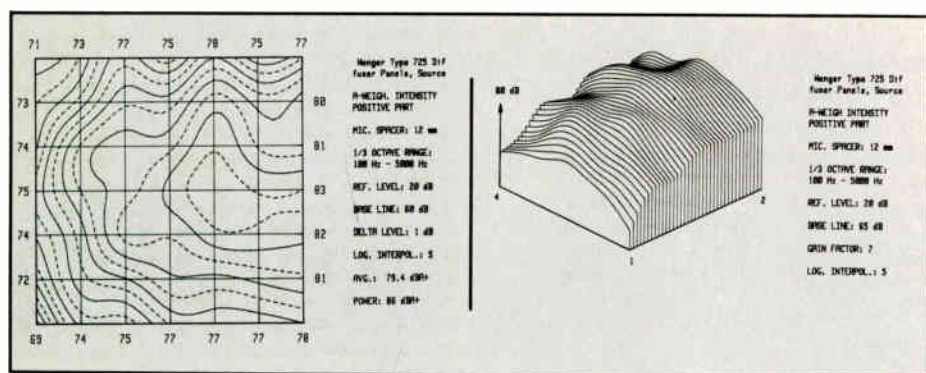*Figure Six: Nine Reflector Intensity Test Result*

Figure Seven: Wenger Diffuser Intensity Test Result

A larger array of test samples was placed against a wall, the sound source was oriented at 40 degrees toward the sample, and the intensity probe was moved through a plane in front of the sample. Reflection, absorption, and diffusion were tested under similar conditions. The loudspeaker was now an approximate 20 x 20 horn, and the noise source was a pink noise generator. Point by point intensity and pressure measurements were taken of the three sample types. This intensity test, unlike the TDS test, has not been performed before, as far as we can document. As a result, it is considered to be a more theoretical test. In the long run, due to the accuracy of the testing system, it may well be more accurate in determining results, especially in terms of power, than the TDS system.

RESULTS — TDS

The results shown are for a flat reflector and a Wenger 725 panel. In each case, we have taken an ETC (Energy Time Curve) and we have plotted a polar distribution pattern from about 500 Hz to 8000 Hz. These are noted below in Figures 4 and 5.

It is clear from these plots that the reflector and the two diffusers are performing characteristically for a typical quadratic residue diffuser.

It is also interesting that at certain frequencies, the diffuser panels tend to become more radical in their performance, suggesting the probability of resonant modes.

RESULTS — SOUND INTENSITY

The results shown are for a flat reflector, a Wenger 725 diffuser and an acoustical wall panel (1/-inch fiberglass). In Figures 6 and 7, the results of each sample are shown respectively via three A-weighted intensity plots:

- A number map.
- A contour plot.
- A 3-D map.

It is clear that the results can be seen in terms of:

- The power of the 3 test samples.
- The positional variation of the diffuser.

- The smoothness of the reflector and absorber response versus that of the diffuser.

RESULTS

This article represents only a very small part of the information available from this testing. Extensive additional TDS plots can be generated, and frequency based (i.e. 1/3 octave) grids can be superimposed. Also, waterfall TDS maps can be used to show the smoothness (or lack thereof) of the response of any specific material. In the case of sound intensity, we have only plotted A-weighted averages of our data. Additionally, this data can be plotted in 1/3 octaves (or higher resolution, if desired).

This article has attempted to demonstrate the validity of an interest in this field and two potential methods for the investigation of angular performance of test samples. Much additional research is needed, and Orfield Associates is undertaking some of that research at this time. We hope to hear from others and to discuss this problem and the many potential test methods with other interested measurement practitioners. Finally, we would like to thank Wenger Corporation for supporting and encouraging this work and for allowing us to use performance tests of their products in describing the process and performance of absorbers and reflectors. ■

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POWER AMP SURVEY — Part 2 HIGHER POWER, SMALLER SIZE

BY MIKE KLASCO and PAMELA MICHAEL

In our continuing survey of the direction and development of the power amplifier market, the designers, contractors and end users we talked to clearly identified a trend toward higher output in less rack space. Although, as Crest Audio's Marketing Director Bill Raventos avers, ''Sound contractors will always find bread and butter in low cost, lower power amps,'' the demand for higher output power amplifiers necessitated by today's wide dynamic range speaker systems has

pushed amp design engineers to explore new limits. Quite a few manufacturers are meeting sound contractors' needs with amplifiers that offer greatly increased output capacities — up to an astonishing 10,000 watts in the Crown Macro-Tech. And this megapower is often delivered by packages that are smaller, lighter and shorter due to more sophisticated power supplies, output transistor topology, and heat sink package technology.

In the 1960s, the monster power ampli-

fiers of the day were the Dynaco, McIntosh, Marantz, Altec Lansing and RCA monaural units — 60–75 watts — delivering just about as much power as one could hope to get out of tube technology. These amps were eclipsed in short order by the stereo solid state CM Labs, Lafayette and Mattes power amps with an unheard of 100 watts per channel. These early high power transistor power amps were fatally flawed, however, with serious problems with stability, reliability, and sound quality. At

The Soundcraftsmen 2/3/4/ channel MOSFET power amplifier.

higher impedance loads (toward 16 ohms) secondary breakdown of the output stages would develop over time. At lower impedance loads too much current would be drawn and the amps would overheat, and eventually thermal runaway would set in. When they were not failing, the IM and crossover (notch) distortion, especially at lower output levels, degraded the sound quality. So much for 100 watts per channel.

Today, Dynaco, CM Labs and Mattes are all out of business (although the name *Dynaco* has been picked up by a new company). On the other hand, another transistor amplifier from the same era, JBL's SE400, is still considered one of the finest sounding amplifiers ever made. Many amplifier designers look back on it as a model for the bigger amps of today. Another classic design, and the next generation of big amplifiers, was the Crown DC300, whose high power and low distortion shocked the industry. Many of these amplifiers are still doing duty in both hi-fi systems and in commercial installations. In the early 1970s the amplifier world was again shocked by a new company, Phase Linear. Bob Carver, with his 700 watt amplifier, pioneered the concept of high voltage transistor circuit design. By using transistors originally intended for video amplifiers, he was able to reduce the size of the power transformer (less turns ratio), thereby reducing the entire amplifier's weight and size. Not too many gain stages were used, and only a limited amount of negative feedback was used, so overload was graceful.

Another benefit was that the high voltage also resulted in enormous peak power, a design factor that most amplifier engineers were oblivious to, at the time. Eventually, dynamic headroom became a common performance spec. Bob Carver's Phase Linear has passed through various corporate hands and has long been out of

the pro audio field. Bob's creative energies are now spent at Carver, where high peak power, light weight and compactness are still the main themes.

Unfortunately, reliability of the high power amplifiers in the 1970s was not close to what the tube amplifiers achieved in the earlier decades. While changing the tubes every year was a pain, the newer transistor units managed to blow, from time to time, from input to output. If this wasn't enough, the speakers were usually fried from the DC on the speaker's voice coil. BGW got its start from pioneering rugged designs that were both physically and electronically reliable, as well as graceful and gentle when they did fail. Other power amplifier companies saw BGW's early success in discos and movie theaters (Universal Pictures' movie "Earthquake" put BGW on the map) and high performance with robustness soon became a common claim for amplifiers in commercial sound. BGW's current models, the GTA (Grand Touring Amp) and GTB are still known for recording studio quality with touring ruggedness.

Power amplifiers have their own set of inherent problems. Among these problems is the fact that transistors do not like working at the high temperatures during operation at elevated output. High operating temperatures often result in changes in the response and distortion performance figures. Protective measures must be taken to ensure reliability at these high operating levels. One trade-off is how far to bias into class B for cooler operation, versus heavier bias currents for class A operation for less notch distortion. At least in the not so distant past, a number of firms shipped amplifiers with the bias more toward class A and the service department would rebias the amps that came back for repair toward class B. Happily, many of the newer amp models are able to provide a balanced design with protection for a wide variety of circuit conditions, such as stable thermal operation, shorted loads, mismatched loads, or an open (no load) circuit.

Until the mid 1970s, most amplifiers were class AB with bipolar transistors. BGW and others briefly tried heavy duty single diffused (bipolar) transistors, but triple diffused (bipolar) became the standard as a good balance of speed, reliability, cost, and availability was achieved. Yamaha (consumer) introduced the first MOSFET power amps in 1976. By 1980 a few pro-sound MOSFET amplifiers were introduced by others, but Yamaha did not pursue this path for its professional products. A number of British amplifier manufacturers have adopted MOSFET output stages, and in the U.S. MOSFETs are used by Hafler, Soundcraftsmen, Ashly, and others. A number of designs use MOSFETs for the drive stage, such as Yorkville's AudioPro series. MOSFETs are
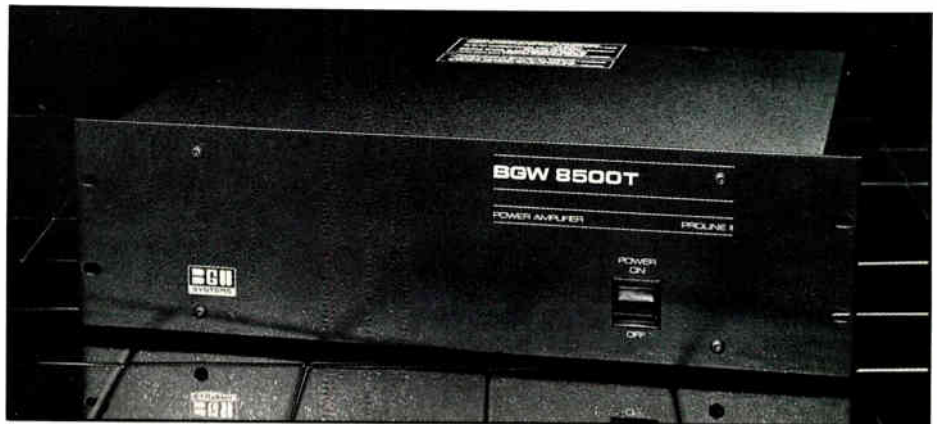
From the T Series, BGW's 8500T.

CIRCUIT BORED?
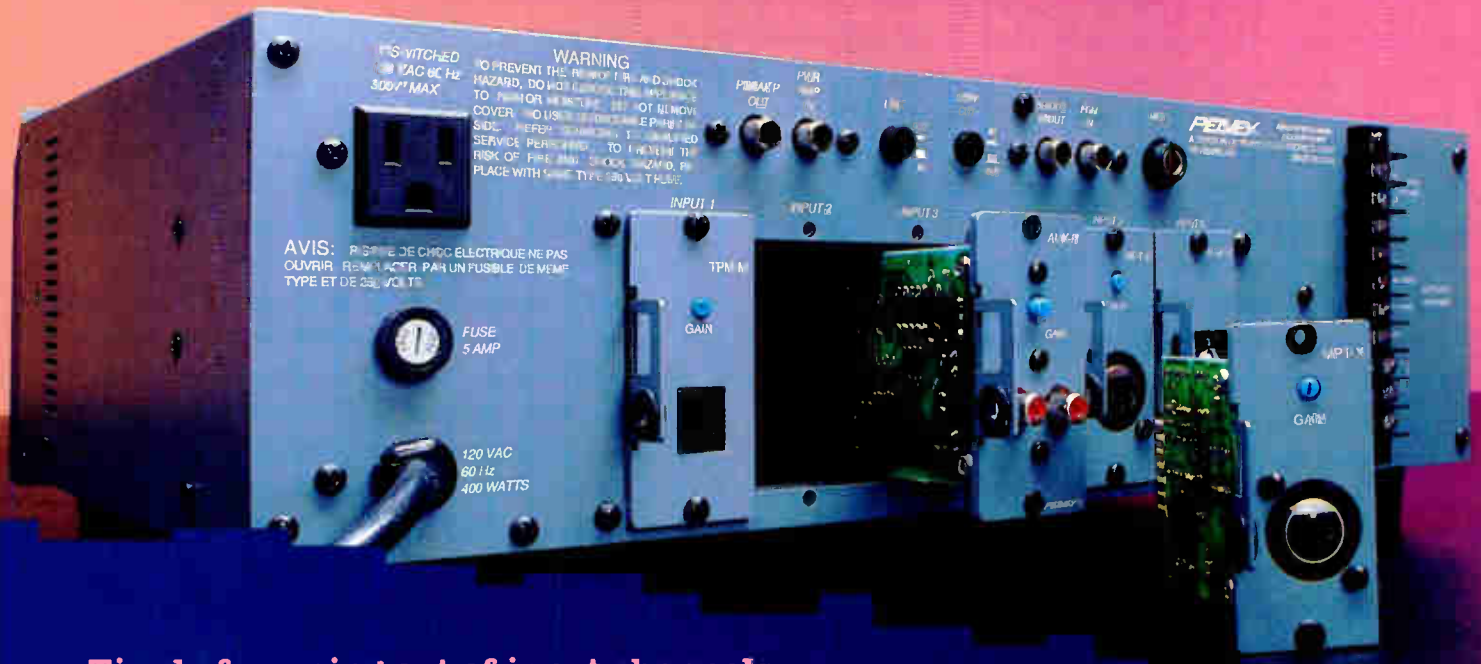
Tired of running out of input channels when you need "just one more"? Fed up with having to remember to buy that "auxilliary" music input module for every installation? What about the extra cost that comes out of your profit when rack mounting hardware is needed?

If you're just plain bored with having to purchase new equipment every time you modify your system, we have solutions that satisfy your space requirements as well as your budget. The Peavey Architectural Acoustics™ MA™ Series is designed with convenient need-oriented features that other suppliers tend to ignore. Like... A dedicated Program Input which gives you a ready-to-go channel for music sources WITHOUT THE NEED FOR A MODULE, providing that all-important 7th input instead of just 6 "module-only" choices. Standard-equipment rack hardware is packed right in with every rack-mountable item in the Peavey A. A. product line. On board level-sensing muting, Mic Preamp and Telephone Paging modules with mute-triggering capabilities, and attractive security covers as "standard" equipment are just a few of the advantages of the Peavey Architectural Acoustics MA Series equipment. So when "Circuit Boredom" sets in, give yourself a break—A break from equipment obsolescence. Choose the Peavey Architectural Acoustics MA Series and get excited for a change.

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Crest Audio's CC301 Professional Power Amplifer.

appealing as they do not have secondary breakdown problems nor thermal runaway.

Thermal runaway is caused (in bipolar designs) when the transistors get hot, resulting in their drawing more current (as their electrical resistance drops when they get hot), and this cycle continues until they fail. Actually, the proper selection of emitter resistors in the output stage of bipolar power amps effectively controls this problem. With MOSFETs, the resistance increases when they heat up, so thermal stability is inherent. And MOSFETs have higher "on" resistance than bipolars, so thermal cycling and other semiconductor package failure problems are more likely. In any case, a company's reputation for good engineering is a far more important indicator of potential product reliability than what type of output transistor they use.

According to the product managers and designers we interviewed, the initial impetus for smaller, more powerful amps came mostly from the sound touring companies. Portability is an unavoidable consideration when you're hauling and installing equipment time and time again. Technicians want amps that are lightweight, small, and rugged. They also need a lot of power to drive the huge arena speaker arrays that many concert installations require. The cost effectiveness of higher power amps, too, is a compelling factor in their increased usage. With rack space at a premium, the benefits of using two 300W amps or one 600W amp rather than six 100W amps is obvious. Additionally, fitting fewer power amps into a rack reduces external wiring, makes maintenance and installation easier, and lessens the chance

of interference and RF pick up. Many touring companies and permanent installation contractors opt to save money and rack space by powering more speakers with fewer amps. And freeing up rack space leaves room for signal processing equipment, EQ, and other niceties.

Of course, size reduction is always a delicate trade off between signal-to-noise ratio, speed and robustness for the designer. Many engineering problems have been successfully tackled in the last few years though, and high output equipment is increasingly reliable.

More power by itself is not always enough. The equipment must be able to deliver long term, continuous power — a standard not all amplifiers can meet, currently. "What one manufacturer calls a watt, another looks at and laughs," says Brian Wachner, BGW president. When bench tested, some so-called high power amps can deliver only transient power, delivering their rated power for but a millisecond. Amplifiers that fall into this category are usually some variation of Class G, originally introduced by Hitachi in 1977. Actually, a very similar approach was independently developed by Soundcraftsmen, which they called Class H at the time. Class G is a circuit technique to attain high headroom (avoid clipping) without building an enormous power supply or heat sink. The concept is that high power is only needed for very short periods (milliseconds) to avoid clipping on full range signals. Hitachi's approach was to use a dual voltage power supply and a secondary output stage. When the amplifier would approach clipping, the high voltage power supply would be brought into the action,

along with the supplementary output stage. When not being used, the additional components did not draw power or generate heat, cheapening the cost of heat sinks compared to conventional approaches, yet having higher peak power.

Carver was another early entry into the high power amp arena. Their "magnetic field power supply" amplifiers deliver extremely high peak power for their size and weight, especially in the mid and high frequencies. These are variants of class G. Some early models used a power supply that was known for chopping up the power lines. This approach occasionally interfered with other components of the system that were poorly regulated. Carver has since improved the situation on the few models in their product line that still use this configuration. Carver's PM Series is very popular with touring sound companies. One of Carver's new amplifiers is only a single rack space high, yet puts out more power than the big tube monsters of the late 1960s. While Carver's first consumer versions of his amplifiers were cube shaped, in the pro models only rack configurations are offered, and no half rack models have appeared yet.

The only half rack amplifiers that comes to mind are the Stewart products introduced at the winter NAMM show, but these are all low and medium power.

Crest was one of the first companies to offer a short rack height in a reliable, high output power amplifier. Their initial offering really was just a change in form factor, as the depth was too deep for most racks! That model has been gone for years, and the Crest 6001, 7001, and 8001 have been real favorites with touring companies for the past few years. All of these are of the class G type. Their newest model, the CV 301 is convection cooled and provides 300 watts into a 70 or 100 volt line, as well as a conventional 4 ohm speaker load. It was designed specifically to drive constant voltage distributed speaker systems. The CC301 model, by contrast, was designed for theater sound and other fixed installation applications.

About 1980, Crown introduced a breakthrough in power amp circuit design which

has served as a model for many of the high output compact amps manufactured today. Crown's grounded output in its PSA-2 offered a more reliable approach as well as more efficient use of output transistors. In 1985 Crown's Macro-Tech Series was introduced which featured high output in a relatively small, unique package, with an original approach to heat exchange — a large surface area rather than a large heat sink or a lot of aluminum. Their use of advanced technology output transistor topology; grounded bridged, allows them to use medium voltage transistors with high output and good reliability. Incidentally, this type of design technique is now the basis of most high power auto sound amplifiers.

Newest in the Crown power amp line is the Com-Tech Series which utilizes direct coupling output, eliminating the need for output transformers. Product Line Manager Verne Searer contends that trans-

The Carver PM-1200 magnetic series power amplifier.

formers are a holdover from the sixties when everyone had tube amps. "Contractors are still using transformers because they think it gives them better isolation," he says, "but most transformers aren't isolation transformers, they're autoformers, mostly. If they are getting isolation, it's probably minimal because in order to get good frequency response, some isolation characteristics must be sacrificed." In general, users get better signal and lower distortion without transformers, he says.

Crown's unique direct output to 70 volt

distribution (they also offer a 140 volt distribution) is useful in situations where you have a long run between amp and speaker — higher voltage means less line loss, more goes into speaker than into the wire.

MOSFET technology is employed in Soundcraftsmen's new model 300X4, introduced at the AES convention in Los Angeles. The 300X4 is a multichannel design, allowing the user to select either 2, 3 or 4 channel operation. It delivers 600 watts per channel at 8 ohms. Biamping monitors provide 210 watts per channel at

World Radio History

The JBL/Urei series of power amps include the ES150, ES300, ES600, ES900, and ES1200.

8 ohms, whereas triamping (using two 300X4s in the 3 channel mode) provides 600 watts per channel for woofers, 210 watts per channel for midrange and 210 watts per channel for the high frequency drivers. Manufacturing amplifiers for about 15 years, Soundcraftsmen has become more widely accepted by commercial sound contractors in the last few years.

Brian Wachner's BGW takes a more conservative approach to engineering in regard to compacting than some manufacturers. Their signal processing model SPA3 — three 200 watt at 8 ohms channels in one chassis of low height, with clever packaging and a lot of heat sink — combines several different functions in one box. The designers were able to get some of the power supply size down by using torroidal transformers, which also have a very low hum field. SPA3s are installed in the Universal and 20th Century Fox Studios screening rooms and in the arena system of the world's largest hotel, the just completed Excalibur Hotel in Las Vegas.

The Furman SP-20 is a compact half-rack 20 watt per channel stereo power amlifier.

The very new T Series has taken BGW's sound contractor series amps and made them available with various optional features — input transformers; auto transformers; stepped attenuators and crossover cards. Newest in the T Series is the 6500T Proline II Power Amp, two rack spaces high, a dual channel amplifier with a bridging switch for high power single channel operation.

Greg McVeigh, QSC's Director of Marketing, admits that QSC fought the move toward higher wattage amps at first. But with so many speakers being designed for higher power systems, the trend was clearly for more power. The QSC series III combined a ground referenced output stage (not dissimilar to Crown) along with Class G for enhanced peak power. More recently, QSC introduced its MX 400 (750 watts per channel at 8 ohms, 1125 at 4 ohms and 1500 watts at 2 ohms). The three rack-space MX 4000 incorporates new circuit designs that include a built-in limiter. The MX 400 features "open architecture" which allows for interface with control systems as they develop, and also with a second generation of signal processing devices that QSC is currently working on. QSC's Vice President of Engineering, Patrick Quilter says, "My goal was to improve this amplifier's efficiency so that the extra power can be obtained without requiring non-standard AC outlets."

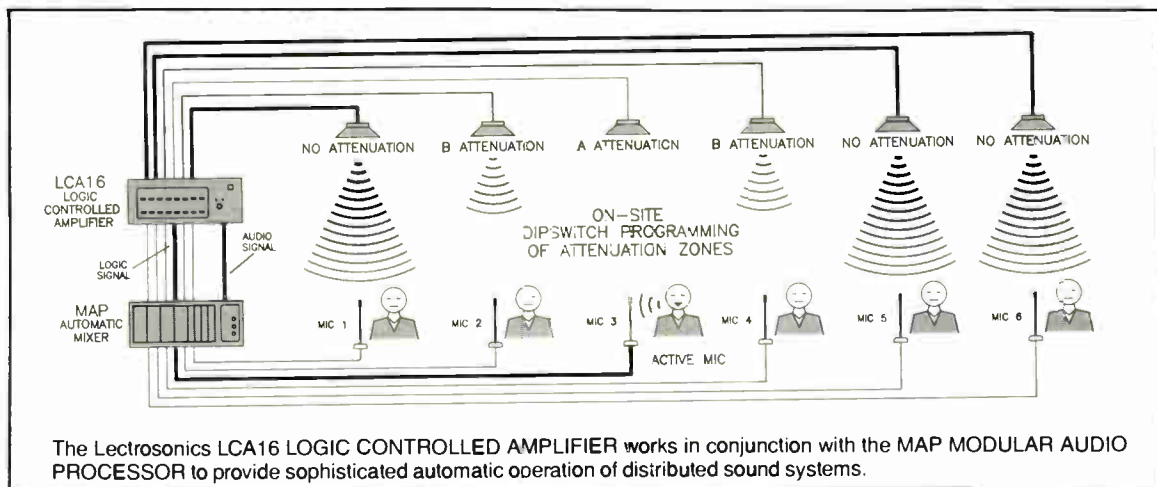JBL's two rack space "Ice Box" amplifier pioneered the use of the switching power supply in commercial power amplifiers over a decade ago. Today, most JBL/Urei power amps fit into two rack spaces, with the exception of the new ES 200, which fits into three rack spaces. The ES Series was designed specifically for sound contracting and touring, and offers output ranges from 75 watts/channel for the ES150 (into 4 ohms) to 600 watts/channel (also into 4 ohms) for the ES 1200. These exceptionally light amplifiers, 39 pounds for the ES 1200, for instance, are designed with circuit breakers rather than fuses and feature forced air cooling that linearly tracks the heat and alters fan speed accordingly. The SR Series is a "stripped

down" version of the ES Series, offering an output range from 150 watts/channel to 500 watts/channel at 4 ohms.

Yorkville, a Canadian manufacturer that has been strong in the MI market for years, has been moving into commercial sound with some innovative products lately. Their 3000 puts out 475 watts per channel into 8 ohms and 1500 watts bridged mono, in 2 rack spaces. The 3000 claims the efficiency of switching power supplies, but with the freedom of noise and distortion of conventional power supplies. An "energy management system" regulates line current for maximum output from ordinary 15 amp lines (this is probably a type of power correction factor circuit) The output stage is MOSFET.

Yamaha was one of the first Japanese pro audio companies to enter the power amplifier market in the U.S. in the 1970s. The P2200 was popular both in commercial sound and recording studios. While Yamaha consumer audio innovated with introducing the first MOSFET amplifiers for hi-fi, the pro audio engineers developed the 5002M, one of the earliest amplifiers commercially to use ground referenced class G output topology. In the late 1980's Yamaha's 2500 innovated with a switching supply for high output in a light package. At the NSCA show, Yamaha introduced two new amplifiers for PA and sound reinforcement: the P2700 (175 W per channel) and the P2350 (350 W per channel), both with three rack space heights. Yamaha's existing commercial power amps, which include output transformers, such as the P2150C, P2250C, and P2075C) remain in the line.

Class D, "digital," or switching amplifier prototypes have been shown by various manufacturers for over a decade. Infinity actually sold a few in the early 1980s, and Sony and other Japanese hi-fi firms have

shown consumer models over the years. In general, these designs use MOSFET power transistors originally developed for switching power supplies. In pro audio, Peavey's DECA series is just about the only class D full range design in production. Power Solutions briefly manufactured a 2000 watt class D amplifier intended for powering bass speakers. The Power Solutions amplifier was rugged and reliable, but the lack of power transformer isolation and other considerations (no FCC acceptance), as well as being too far ahead of its time, played their part in putting the company out of business. Bose did some of the early development work on Class D for sonar systems, and now has developed that experience for use in the bass amplifier built into the Acoustimass Professional Speaker System. A few British firms have tried manufacturing class D amplifiers, but these have not been marketed in the U.S.

> "Early high power transistor power amps were flawed."

The trend in amplifiers toward higher output in more compact size has been made possible by advances in power supplies such as the switching type, or the more conventional, by high performance torroidal, and/or by multi-voltage schemes such as class G. New power transistors (MOSFETS) and improved circuit schemes, again such as class G and grounded bridge type, are significant factors. More sophisticated packaging, using heat exchanges and fans has also enabled more compact and lightweight high output products.

Class D, or switching amplifiers, have come and gone, although expect their return with a vengeance as the speed and power of MOSFET power supply transistors continue to improve.

We will conclude our amplifier series with a close look at the trends of mainframes with plug-in amplifiers, multichannel amplifiers (more than two channels in the same chassis), and signal processing amplifiers. ■

World Radio History

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☐ B Engineering/Technical Mgt
☐ C Sales/Marketing
☐ D In-House Maintenance/Service
☐ E Field Installation/Maintenance
☐ F Consultant
☐ G Advertising/Promotion
☐ H Other_____

2 Primary business of company (only one):
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☐ 2 Contractor—Interconnect/Intercom
☐ 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
☐ 0 Other _____

3 Your purchasing authority:
☐ A Final Approval/Buyer
☐ B Recommend/Specifier
☐ C No Direct Authority/User

4 Intensity of your product need:
☐ 1 Have salesman call
☐ 2 Need within 3-6 months
☐ 3 Future projects

5 Number of employees at your company:
☐ A 1-3 ☐ B 4-10 ☐ C 11-25 ☐ D 26-100
☐ E over 100

NEW PRODUCTS: (Please Circle)

			43	60	77
			44	61	78
			45	62	79
1	15	29	46	63	80
2	16	30	47	64	81
3	17	31	48	65	82
4	18	32	49	66	83
5	19	33	50	67	84
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
11	25	39	56	73	90
12	26	40	57	74	91
13	27	41	58	75	92
14	28	42	59	76	93

ADVERTISING PRODUCTS: (Please Circle)

			243	260	277
			244	261	278
			245	262	279
201	215	229	246	263	280
202	216	230	247	264	281
203	217	231	248	265	282
204	218	232	249	266	283
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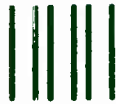
FAST ACTION CARD

U P D A T E

People

Sonance Names Leja; Delaney at Bogen

Sales Trainer at Sonance

Sonance has created the position of National Sales Trainer/Director of Market Research and named Kevin St. John Leja to the post. Leja's responsibilities include product training of internal staff, reps, dealer sales personnel and installers. He is also developing installation guides, white papers and other training materials.

John Leja

In the area of market research, Leja is charged with keeping abreast of market trends, analysis of competition and other market factors relating to product development.

Leja most recently held the position of Sales & Marketing Manager for Entertainment Designs, a Minneapolis custom installer. Prior to Entertainment Designs, Leja was a manufacturer's rep with Elliott Sales Company, Olathe, KA.

VP at Bogen

William J. Delaney has been appointed vice president, sales and marketing, for Bogen Communications, Inc. Delaney will be responsible for all Bogen product lines, including communications and sound equipment, and battery holders.

Delaney was most recently president of

Delaney

W. J. Delaney Associates, consultants, and served previously as general manager of the audio-video division of Casio, Inc. Earlier he held positions with Samsung Electronics America, Nikon, Sharp Electronics, and Pyr-A-Larm.

Meyer's New Marketing Manager

Meyer Sound Laboratories, Inc. has announced that Ralph Jones has rejoined the company in the position of Marketing Manager. Jones recently completed a six-year stint in the Los Angeles area as an independent consultant to several professional audio manufacturers. As an author he has published articles in audio trade journals and is co-author of the Yamaha Sound Reinforcement Handbook.

In his new position Jones responsibilities include documentation management and production, advertising and promotion management, and development of long-range marketing and customer support strategies.

Sales and Support Staff

Washington Professional Systems, a distributor of professional audio, video, and contract sound systems, has appointed three new sales assistants. Paul Freeman is responsible for development and expansion in the market for church, educational and hotel installed systems. Stephen Sadler, formerly senior engineer at Sony Professional Pro-Audio, will serve as a consulting engineer for all MCI and Sony products. In addition, Geren Mortenson is handling video sales for WPS.

Sales Additions at Bose

Bose Professional Products has announced three additions to its "team." Bruce Hurst joins Bose as the Eastern Regional Sales Manage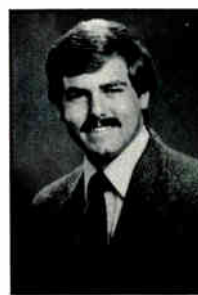r. He comes to Bose from Sequoia Sound and Lighting, a sound contracting company in St. Petersburg, FL, which he owned. Tim Landwehr is the Western Regional Sales Manager. For the past ten years Landwehr was employed by Rancillo Associates, where he was responsible for servicing Bose accounts in his territory. Phil Nelson is a factory sales representative for the Texas, Oklahoma, Arkansas and Louisiana territory. Nelson has been the primary design/sales engineer for McClelland Sound, Inc. in Wichita.

Terk Names Iaconis

Terk Technologies has named Francis J. Iaconis, National Sales Manager. Iaconis, who held a similar position with Conneaut Technologies, Inc., manufacturers of professional audio, will be responsible for the sales of Terk's line of FM antennas, as well as participating in the sales launch of the new wireless Leapfrog custom installation system taking place this spring.

Sales and Distribution at E-V

Todd Rockwell has been named sales and distribution manager for the Electro-Voice Pro Sound Market and Mark IV Cinema. In addition, Rockwell will continue to serve as marketing manager for Mark IV Cinema. Previously, he was a marketing specialist for E-V Pro Sound and Mark IV Cinema.

Todd Rockwell

Rockwell holds a B.S. degree in electrical engineering from Michigan Technological University in Houghton, MI.

News from around the industry

Morita Keynotes Consumer Electronics Show; Fenway Park Gets New Concourse

New Sound Systems

Acentech Incorporated is working on a sound system upgrade to "improve speech intelligibility and audio quality" at the Hoosier Dome Stadium in Indianapolis. According to Acentech, the central loudspeaker array and 23 smaller satellite arrays will be replaced. Most of the existing electronics will remain, but a new sound system control computer and updated control software will be provided. A crowd noise sensing system will automatically adjust the system output level to compensate for varying levels of crown noise.

Acentech also announced that it is designing a proposed concourse sound system for Fenway Park. Last year, the company designed the sound systems for Fenway Park's new private club and renovated press facilities. The system provides pickup and indoor distribution of exterior sounds (such as the audience cheering) to heighten excitement and give indoor club attendees a sense of being part of the action. Delay equipment prevents echoes of the game announcer. Broadcast media were provided with a distribution system of sound effects and other signal pickups for optional incorporation into their feed. Press facilities have special announcement and statistics distribution systems. In 1988, Acentech designed the central loudspeaker cluster .

Phonic Ear President's Club members (left to right) Dean Ogle, Janice Cockburn, Jim Mulford, Scott Posner, Harry Bragg.

President's Club

Phonic Ear plans to build a new facility to replace its existing premises by mid 1991. The announcement was made during the company's President's Club meeting for the company's highest performing sales/territory managers and their spouses.

Summer CES Shows Industry Luminaries

Akio Morita, founder and chairman of the board of Sony, was the keynote speaker and ribbon cutter of the Consumer Electronics Show in Chicago in June. Morita's speech emphasized, as one would expect, the need for cooperation between hardware and software makers. He learned his lesson he said during the brief active life of the Betamax.

Although no official figures were available at press time, attendance seemed to be down at the show, according to knowledgeable sources including the Chicago taxi drivers. Product categories generating the most interest included in-wall speakers and other "home theater" products.

Akio Morita of Sony opens the Summer Consumer Electronics Show, flanked by industry luminaries including Bill Little of Quam-Nichols.

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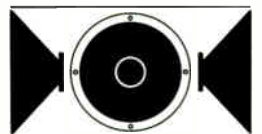
Products

Aiphone Intros Modular System; New Horn from Altec
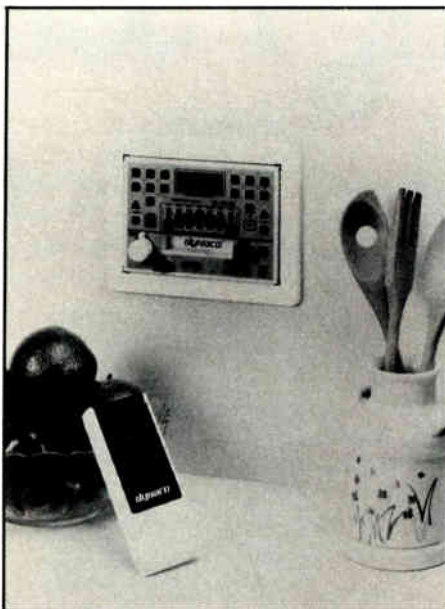
Modular System Combination

Aiphone Corp. has introduced the Master Sentry, a modular system in which video, radio and intercom units are combined to meet home or office specifications.

The system is controlled from the LEF-B intercom station, from which the user can control up to 10 other intercom stations. Each LEF-B unit includes a privacy button, and an All-Call button for voice announcements to other indoor units.

The BGR-10A radio unit features 12 pre-set buttons for easy access to stations. It has an integrated amplifier for music and All-Call announcements. The unit is also wired to accept auxiliary music sources.

Completing the system is the MFH-UB video monitor unit. Its outside door station contains a Charged Coupler Device infrared camera providing images to a four-inch flat LCD monitor screen inside.

Circle 1 on Reader Response Card

Wide-Dispersion Enclosures

Turbosound professional audio products has announced the TXD Series of wide-dispersion loudspeaker enclosures.

The TXD Series includes the TXD-520, TXD-530, and TXD-580. The TXD-520 is designed for filling areas that cannot be directly reached by the main loudspeaker system. The TXD-530 is designed for under balcony theatrical applications. The TXD-580 is a biamped, three-way system that provides 650 WRMS and is designed for bands and small touring applications.

Circle 2 on Reader Response Card

In-Wall AM/FM Receiver

Dynaco has introduced its Model 595 in-wall AM/FM stereo receiver which comes with a multi-room wireless remote and two hardwired remote sensors. It includes 30 watts of amplification per channel, a built-in auto-reverse cassette deck and 7-band graphic equalizer.

Other features include a built-in infrared sensor, 3-channel weatherband, DNR noise reduction, 12 pre-sets, a built-in headset jack and Compact Disc and audio power jacks.

Circle 3 on Reader Response Card

Turbosound TXD-520 (left), TXD-580 (center), and TXD-530.

Horn for Correction and Coverage

Altec Lansing has announced the VIR, Vari Intense Horn. The VIR horn is designed to provide both coverage in rectangular spaces and inverse square law intensity correction.

Features include: throat geometry that varies the acoustic intensity over the vertical pattern; a narrower horizontal angle in the rear of the seating area while maintaining wide coverage at the front; and a "Mantaray" style horn bell that provides an edge to the floor plan isobar. The horns also have low profiles to allow for mounting close to the ceiling.

Circle 4 on Reader Response Card

Video Patch Bays

Canare has introduced the VWJ2-W and VWJ2-S 75 ohm Dual Video Jacks. Available in normalled or straight thru, self-terminating modules, in 20 and 24 position Western Electric (.090) panel configurations.

Wideband performance to 600 MHz with less than 1.1 VSWR is designed for Computer Graphics, RGB, HDTV, Digital VTRs and other broadcast applications.

*Circle 5 on Reader Response Card*

MLSSA, Part 3

BY MIKE KLASCO

Part 3 of our look at DRA's MLSSA system continues where part 2 left off, examining speaker design, MLSSA 6.0 enhancements, microphone calibration and other aspects of this system.

USING THE MLSSA SYSTEM FOR SPEAKER DESIGN

Many sound contractors "roll their own" speakers. The reasons are many, from not wanting to sell the same models as their nearby competitors, the cost of shipping speaker enclosures across country, the need to satisfy a creative urge (speaker design can be satisfying and fun), or ego ("I can do a better job than the manufacturers"). In any case, a big chunk of the commercial sound systems that are installed use contractor-designed enclosures. To aid the design of these speaker systems, a number of software programs have been developed and are very popular among speaker engineers. A few of the most used programs are Scientific Design Software's CASD, for box design, and CACD for modeling crossovers and sophisticated box engineering. Another popular and powerful program is CMS Electronic's Leap. The CACD program can now use the MLSSA system to acquire the speaker's characteristics rather than tediously entering many data points from the response curve by keyboard data entry.

LEAP 4.0 requires sensitivity data which MLSSA provides with release 6.0, of which I received a pre-release copy just a few days before this review's deadline. Formal release of 6.0 is scheduled for late May.

The term "Thiele/Small parameters" will be familiar to any contractor who has considered making his own boxes. These raw speaker parameters are the data you need to predict what will happen if you put a particular speaker in a particular box. "What ifs" come much earlier if you know these data and have one of the speaker
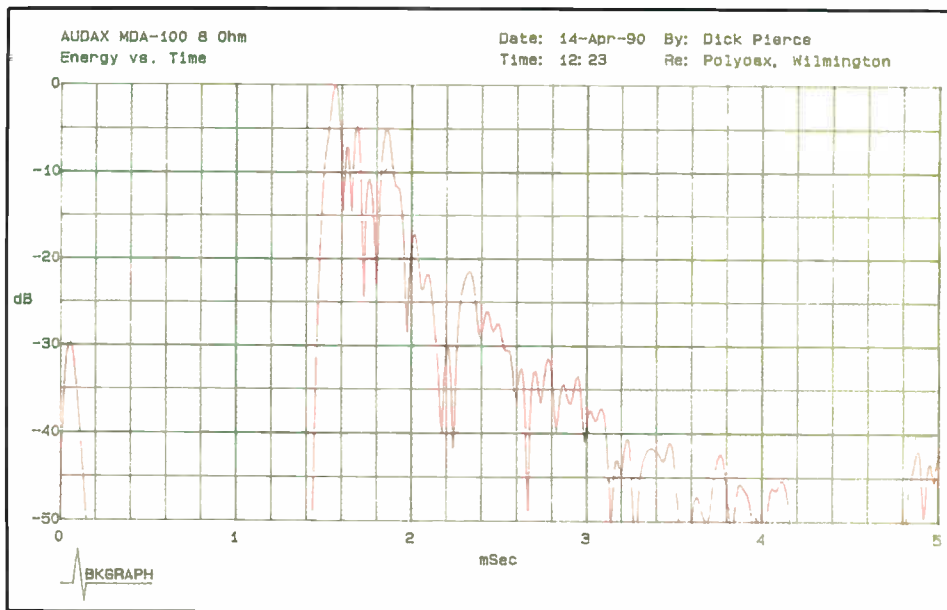
Energy vs. Time.

design simulation programs. Response curves, power handling versus frequency, maximum SPL, impedance curves, and selection of optimum speakers and box sizes can all be determined before you build your first prototype. These programs are reasonably accurate, by the way. But you need to know the Thiele/Small parameters, and not all manufactures supply them, or you may not trust the data they supply. Measuring these parameters can be intimidating at first. After you have gone through the procedure a few times, it is not so bad. Actually, all that is involved is measuring the speaker's impedance in free air, and then remeasuring its impedance in a box of a particular size (or adding a known mass to the speaker's cone instead of using the box), and then comparing the two measurements in a few equations. Audio Precision introduced an automated feature for their System One a while ago, and now a third party program, known as SPI (Speaker Parameter Interface) has been introduced for the MLSSA system. The program was developed by

Harmonic Designs of West Germany, a distributor of the MLSSA system, and is offered directly by DRA Labs in the U.S.

Vance Dickason, the editor of Voice Coil, the speaker designer's newsletter, compared the measurements of his manual setup, the Audio Precision One test system and the MLSSA/SPI measuring arrangement and found that the data were essentially accurate on all three, with the Audio Precision being slightly faster than the MLSSA system.

Speaker Parameter Interface 1.1 is available directly from DRA Labs at $90 and is recommended to anyone who intends to design speaker systems.

GRAPHIC HARDCOPY

The MLSSA software has a built-in print utility that supports Epson, OKIdata, and HP Laserjet printers. No support for color, wide carriage printers, or plotters is provided. Typically, for hard copy printouts for most engineering programs the best results are with a print utility. Although there must be a dozen print utilities

available, Pizazz Plus from Application Techniques (Pepperrell, MS) is the most commonly recommended by software developers as being easy to use, bug free, and flexible. I first tried Pizazz a few years ago as Scientific Design Software began to sell the program as an adjunct for their speaker design software programs. JBL also suggests the program to users of their CADP program, and more recently I have started looking over Hypas Software's acoustical analysis programs, which also recommend Pizazz. I have just received a copy of Pizazz + Plus which offers support for EGA, VGA, and even higher resolution screen dumps. Print utilities, such as Pizazz, work by sending the screen image to the printer. Many programs provide color graphics only to the screen, but not for the printer (like the MLSSA system). With a print utility you can get color, or change screen colors for different printer colors (if your printer supports color), or obtain a wide carriage printout, all by using the options in Pizazz. When you want a printout, you press the Prtscrn key and Pizazz takes over and provides a menu of many options. Once you have selected what you want, then you may print. Pizazz is able to get the best performance out of your printer. In fact the only way I can get my Canon BJ-80A ink jet color printer to work is with Pizazz, as the printer is never directly supported by any software. Since the screen dump programs rely on the screen resolution for the quality of their printouts, if you have VGA graphics you will get better quality than EGA graphics. Higher quality than VGA, such as superVGA 800 x 600 and 1076 x 700 are also supported.

BKGRAPH

If you have used B & K chart recorders for hard copy from B & K test gear for the last 20 years, you may want to keep with the style and format of printouts you are used to seeing. In this case, Pizazz won't help you, but BKGRAPH will. Richard Pierce has developed a utility program that works with the MLSSA system (and will probably be available for the Ariel and TEF systems) that can generate pre-
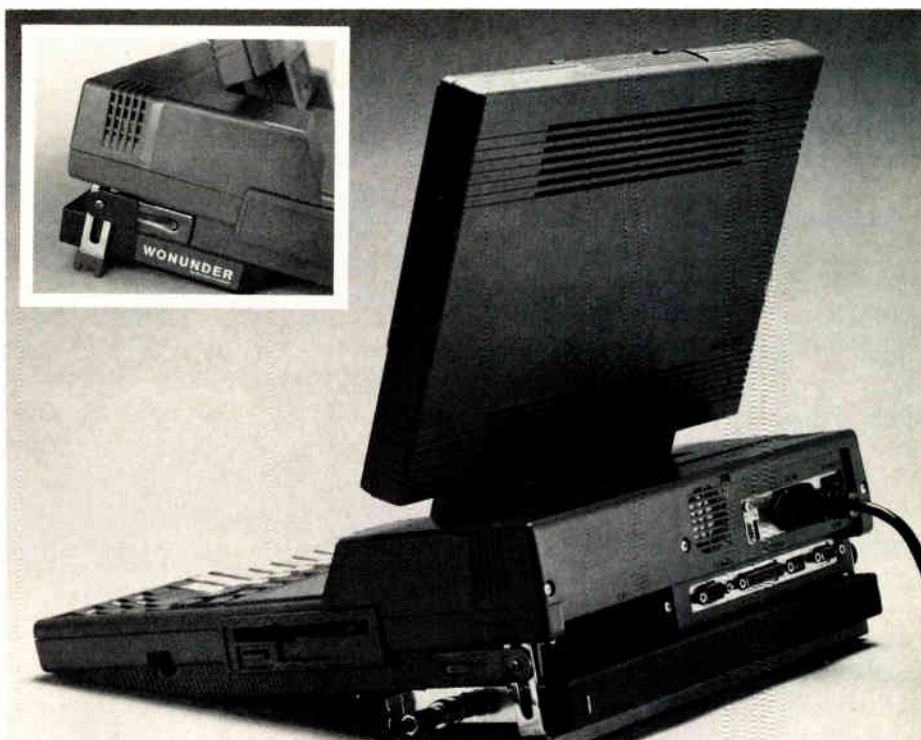
The Toshiba T3100, which will hold the MLSSA or Ariel board.

sentation quality plots on pen plotters and laser printers. The resulting plots match those generated by B & K equipment.

BKGRAPH allows selection of different vertical and horizontal scale types and widths, multiple curves per plot (overlays), selection of grid style, annotation and time stamping, and many other features as well. The system can plot log or linear amplitude vs. frequency, phase vs. frequency, or amplitude vs. time (such as impulse response, group delay, or energy-time curves).
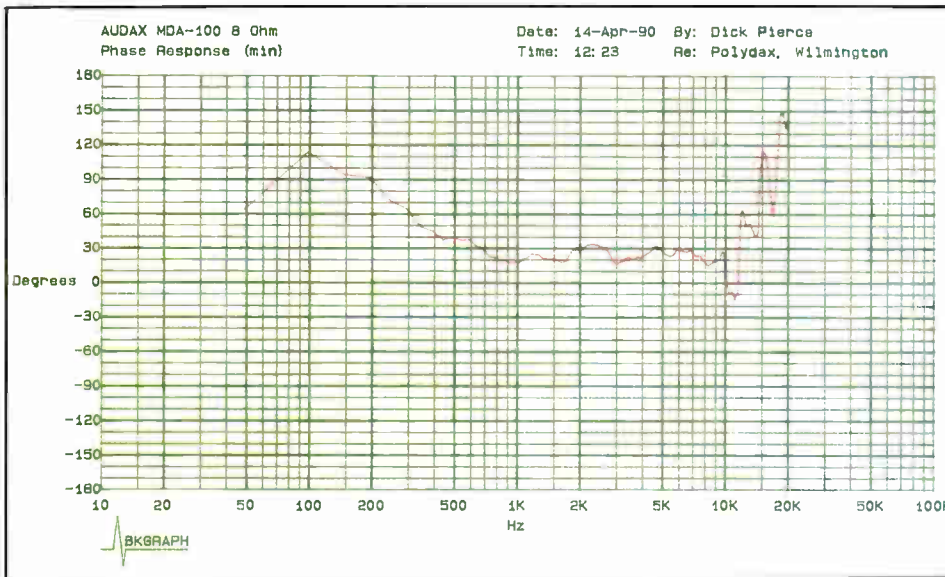
RELEASE 6.0 ENHANCEMENTS
Installation

In Part One of this review, I mentioned that installation of the MLSSA software required editing of files, which is not as convenient as having a set-up utility from within the program. 6.0 now has an automatic installation program which makes installation and initial configuration or re- configuration fast and easy. Updating older versions of MLSSA software also is automatic. The need to tell the MLSSA software the serial numbers of the filters on the hardware board for calibration is now done at the factory. Even the editing of the auto.exec file is optionally automatic. The new installation utility is excellent and makes setup painless and foolproof.

MICROPHONE CALIBRATION, TRANSDUCER SENSITIVITY, AND ABSOLUTE SPL MEASUREMENTS
Microphone Calibration

A weak point in the computer-based test equipment that I have used is the lack of microphone calibration (or very awkward and questionable procedures). MLSSA has suffered from this, and I have used a calibrated sound pressure level meter as a front end (which serves both as a SPL calibrator and mic preamp). In checking around, I have found that apparently this has been a common solution. One good source for inexpensive but reasonably accurate field use mics and sound pressure level meters is Larson Davis (more on this next month). Version 6.0 enters and stores calibration data on up to 10 microphone/preamp combinations. Alternatively, some of the settings can simply be different gain calibration conditions in order to obtain the best dynamic range from the mic/preamp combination. Microphone data are used to calculate absolute SPL and are automatically stored in data files. The Transfer Header now displays mic data so you know what mic was used to make a particular measurement. Although most field measurements do not require use of a mic calibrator (essentially an enclosure for the mic

AUDAX MDA-100 8 Ohm
Phase Response (min)
Date: 14-Apr-90 By: Dick Pierce
Time: 12:23 Re: Polydax, Wilmington

Phase Response.

with a calibrated sound source inside), MLSSA also now supports use of these devices for lab and other critical applications.

Loudspeaker Sensitivity

MLSSA 6.0 measures speaker sensitivity in dB-SPL per watt of input power. The nominal impedance of the speaker is specified, the mic is located at 1 meter, and the sensitivity is measured. This was the missing link for using the MLSSA system with LEAP speaker design software. I do raw speaker design and found it disturbing to have the capability to measure sensitivity missing. This has now been resolved.

Absolute SPL measurements

Sound and Noise levels are now able to be measured in dB-SPL in IEC standard octave bands. If you do noise surveys or want to measure maximum sound pressure levels in your installations, the lack of this capability in 5.26 would have been a problem. 6.0 also has A, B, and C weighing as well as wideband unweighted (flat) dB-SPL.

Energy-Time Curve

MLSSA 5.26 only provided wideband ETC displays, which were uncomfortable or at least subtly unfamiliar to users of TEF systems. 6.0 provides both unfiltered (wideband) and filtered (narrow-band) ETCs, plus a choice of window functions for ETC calculations. Reverb/direct ratios

can be displayed for any ETC, which will also be useful for proof-of-performance comparisons with sound system design programs.

Distortion

Digital signal analyzers are not the best way to measure distortion of analog electronics such as amplifiers, mixers, preamps or electronic crossovers. Analog or hybrid instrumentation manufactured by Audio Precision, Sound Technology, Amber, Neutrik, Hewlett-Packard and others are specifically designed for this purpose.

The MLSSA is effective for measuring distortion in loudspeakers. Release 5.26 could be used with an external signal generator and distortion products from a pure tone can be seen and second harmonic distortion measurements are calculated by the system. When testing speakers, near-field techniques or an anechoic chamber are required, as extraneous noise will confound the measure-

ments. A relatively inexpensive yet flexible signal/function generator is just being introduced by Audio Control Industries (who are known for their portable one-third octave analyzer). Alternatively, an endless number of tests can be performed with the MLSSA and the Prosonus SRD test CD. Next month we will compare a number of test CDs for use with the MLSSA system.

Spectral Contamination (Intermodulation Distortion vs. frequency)

Release 6.0 greatly expands the distortion capabilities of the MLSSA system. Intermodulation distortion vs. frequency from near-field or anechoic measurements using the system's internal pseudo-random noise generator will be supported. This IM distortion test is similar to the late Dean Jensen's spectral purity/contamination test scheme. It is much more comprehensive than either harmonic or conventional 2-tone intermodulation tests because the MLS (pseudo-random noise) excites the system with thousands of pure tones which can all interact. Use this test to compare compression drivers only if you have a strong stomach (a little of this next month). This test is also very effective for voice coil buzz and rub testing.

USING MLSSA SOFTWARE WITHOUT THE HARDWARE

The MLSSA system uses its hardware (circuit board) only during data acquisition, that is, when the actual measurement is taken. Post processing operations, such as determining frequency or phase response, distortion, RT60, RASTI, etc. are performed by your computer. A significant hidden benefit of post processing by the computer CPU/coprocessor, rather than by a dedicated digital signal processor (DSP) chip within the analyzer, is that the full signal processing capabilities of MLSSA are available whether the hardware is in your computer or not.

DRA Labs offers a full working demo disk (the full program, less the hardware) for $25. Once the raw signals have been acquired by the MLSSA hardware, anyone can proceed to analyze the data on their own computer using either a copy of the
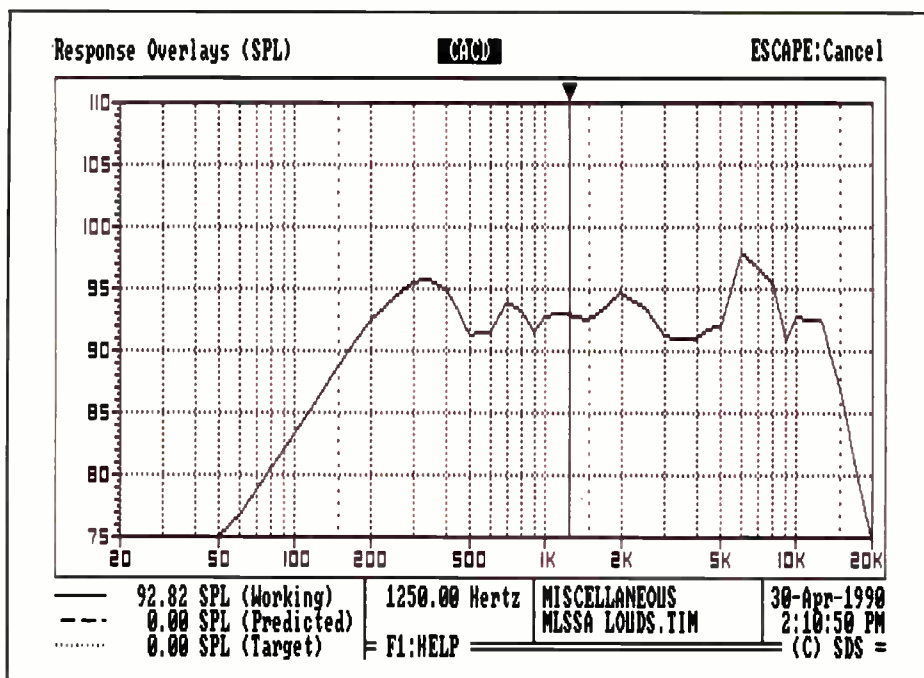
Response curve of a driver imported from a MLSSA driver file.

program or the demo disk. A few of the many situations where this would be applicable is when a consultant performs preliminary testing and provides the client's engineering staff with the "demo" program with the raw data files, or when junior engineers or technicians can use the MLSSA system out in the field and modem the raw data back to more experienced personal for analysis (again, without needing a second analyzer), or even remote control of the analyzer using a utility program such as Carbon Copy, where all operations are initiated at a remotely located computer using the program and automatically mimicked by the analyzer at another location (just turn on the analyzer and stand back).

Another possible use of the demo disk is as a demo disk (*am I smart or not!*). For $25 you can judge for yourself if this system is for you, as well as determine if your existing hardware is fast enough to suit your purposes. The minimum hardware requirements have already been discussed in detail, but remember use the demo disk, you will need a 1.2 meg floppy, a coprocessor, and CGA, EGA, or VGA graphics. Incidentally, if you have only a (Hercules compatible) monochrome then you would need to buy a EGA or VGA autoswitch graphics card which is capable of driving your existing monitor. I have seen autoswitch EGA graphics cards sell-

ing for less than $100. Recently I tried this combination using the MLSSA in a "transportable" computer (a backache with a handle). The monitor was a 9-inch amber CRT and the graphics card was an autoswitch VGA, with the MLSSA software set for gray scale VGA. The screen image was excellent.

POLARS WITH THE MLSSA

MLSSA does not yet directly support polar measurements. However, Marshall Buck has recently introduced an automatic measurement turntable ($600) which interfaces with the MLSSA system. Using the overlay command, angular measurements can be superimposed to characterize polar response. This is not as clear as the TEF 3-D or top view polars, isobars, or directivity balloons (such as used in Bose Modeler). Further software development is needed here and this function will be revisited in the fall in an article on measuring polar response of speakers and arrays.

QUALITY CONTROL TESTING WITH THE MLSSA

Speaker manufacturers, or even sound contractors or touring sound companies will find that the MLSSA can be set up as an easy to use QC system. The de facto standard for speaker production line QC

SOUND FROM THE MIDWEST
MODULAR SOUND QUARTERBACKS DITKA'S NORTHWEST

Winning or losing, Chicago Bears head coach Mike Ditka has always been able to make himself heard above the crowd. So, when it comes to his restaurant, why should it be any different?

The popular and sometimes controversial Ditka and his group recently opened up their third restaurant in the Chicago area bearing his name. And because being heard above the crowd (the A/V system) plays such an important role in the success of the Ditka's formula, the management group relied upon proven performance.

Modular Sound Systems of Barrington, Illinois designed and installed the audio systems in the first two Ditka's restaurants. So Modular was called upon once again to work its magic for the newest restaurant in the Ditka's fleet.

The original Ditka's Restaurant and City Lights on West Ontario Street continues to be the city's most popular downtown night spot. Another Ditka's Restaurant is located in Merrillville, Indiana, just southeast of Chicago.

The newest addition to the group is Ditka's Northwest, located on the far northwest side of Chicago, very near O'Hare International Airport. Whether commuting to and from downtown Chicago on the John F. Kennedy Expressway or traveling to or from O'Hare, one can't miss the huge vertical sign near the intersection of the Kennedy Expressway and Cumberland Avenue.

And like his first two restaurants, the personal stamp of the irrepressible coach is everywhere, from caricatures of his famous mug to trophies and plaques spread throughout the premises, to the special entree of the house highlighted on the menu, his personal favorite: Ditka Pork Chops.

A series of Zenith 20-inch monitors were installed around the room.

"A major part of our appeal is our sports atmosphere," said Andy Konstantaras, general manager of Ditka's Northwest. "So the audio/video system is absolutely vital to our operation.

And the audio system is the most underrated part of all because it needs to do so many things," he said.

The 10,000 square foot restaurant is really two different rooms: a restaurant and an all-purpose room which will be used primarily as a sports bar.

"The sound system has to operate at many different levels," Konstantaras said. "It has to produce when the restaurant and bar are filled to capacity, and it has to be clear and crisp when you have an empty room and the sound could bounce all over the place.

'Then in our sports bar [still under construction], you want to be able to hear a lot of bass for dancing."

Konstantaras is also pleased with the fact that he was consulted in the design of the system.

"It's designed in zones so the sound is soft, background sound over the maitre d's station and in the dining room, but loud enough in the bar to cut through the chatter, even though the two rooms are adjacent and only separated by dividers," he said.

The zoning is accomplished with the use of 24 B.E.S.T. CT-72D loudspeaker units recessed in the ceiling. Each of the units contains two drive units projecting through a 24-inch by 24-inch radiating surface or diaphragm.

"The surface of the speaker units looks identical to the ceiling panel it replaces," said Henry Heine, director of engineering for Modular Sound System, who designed the system. "The speaker units thus make the system extremely effective and totally invisible at the same time."

The speakers are on two circuits that

can carry the audio to each separate zone at whatever level is deemed desirable for the zone receiving the audio.

Some 20 Zenith color television monitors are scattered throughout the restaurant in tandem with the audio system, some in clusters so they can be split to show separate programming.

Regardless of the hour of the day or night, patrons had better be sports fans, and preferably Chicago sports and Bears fans, because virtually every minute the restaurant is open some sports event is being shown on the monitors, either via video tape or live.

"During football season, nearly every monitor is on the Bears game," Konstantaras said. "During the winter, we'll show different events on different monitors. It could be live games of the Bulls, the Black Hawks or DePaul University, or a taped event."

The programming for the system comes from a variety of sources. They include the local television cable system, a satellite dish, pre-produced programming played on two professional quality VHS videotape players, an audio cassette deck, a CD player, an AM-FM tuner, and live microphones in the restaurant and sports bar.

Modular is also involved in the design and installation of a sound system in the new room being constructed in Ditka's Northwest: the sports bar.

"The system in the sports bar will be similar to the one on the restaurant side," Heine said. "But in addition to the inventory of equipment that the restaurant has, the sports bar will have — in addition — turntables, two eight-foot-square large screen video projectors, a series of 20-inch color monitors around the room and a series of high-powered Bag End TA-12 loudspeakers on the dance floor."

How does Modular Sound's system work for Ditka's Northwest?

"It's been perfect from the minute we opened the front door," Konstantaras said.

AN EVENING AT A THEATER IN ROUND

As you stand in the foyer of the auditorium in the Marriott Lincolnshire Theater in Lincolnshire, Illinois the lights softly blink urging you to take your seat. After entering the auditorium, the first thing you notice are people entering the room exactly opposite you. "This auditorium is in the round" you say to yourself as you locate your plushly padded seat. Sitting in row E, seat 16, the excitement and anticipation of a live performance builds as you look around the room. To your left, you notice a large enclosed structure set up against one of the walls with orchestral musicians seated behind planes of glass. Looking more closely at the orchestra "pit" you notice a very small, long, thin, low profile loudspeaker placed to the extreme left and right of the large enclosure. As the lights begin to fade, soft sounds of violins and other orchestral instruments begin to fill the room. A few minutes into the orchestra's fanfare you realize the music is being heard through the sound system, and not "live." A powerful voice commands your attention from above and in front of you as you experience the opening of the musical "Chess."
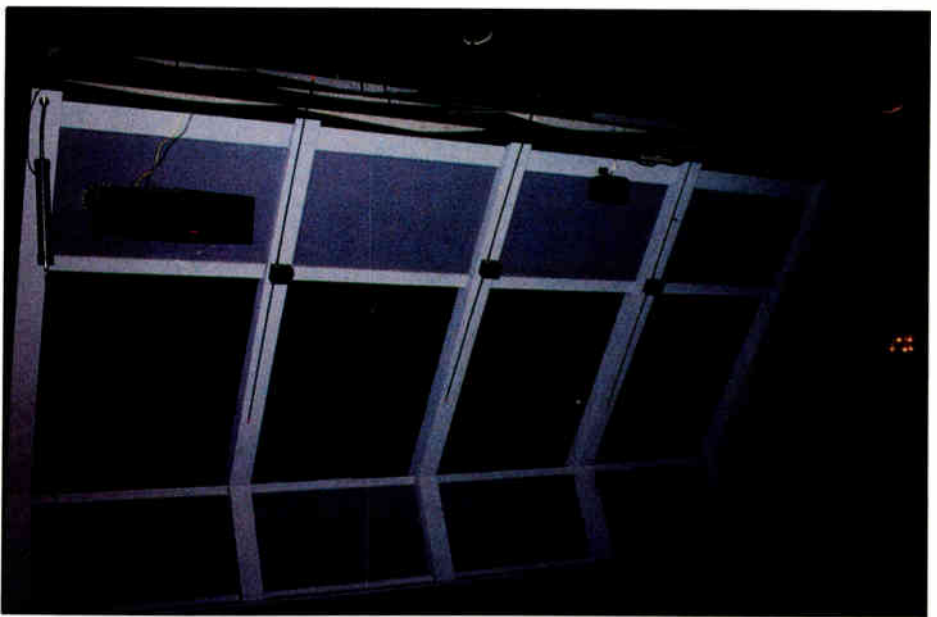
The sound booth at the Lincolnshire Marriott.

The Marriott Lincolnshire theater stages only musicals throughout the year. There are a variety of musical children's shows during the day, with Wednesday through Sunday evenings reserved for some of the finest Broadway-style musicals to hit the stage. The Lincolnshire produces only five major shows a year but has no down time during a twelve month, 52 week period. When a current show leaves the theater on Sunday night, the incoming show is loaded in and ready to open the following Wednesday! "The sound system at the Lincolnshire stays "on" and operable 12 to 15 hours a day," says sound designer and system engineer

Randy Allen Johns. "Reliability was a major concern when we started to look at speaker systems," said Johns. "Clarity and no distortion were the other deciding factors that went into selecting Apogee speakers."

The Marriott Lincolnshire Theater itself is approximately 90 feet square with a ceiling height of 20 feet in the center of the room above the stage and seats about 850 people. Starting at the center of the room, the ceiling slopes downward so that the ceiling height at the back of the seating sections is about 12 feet. (Four seating sections comprise the "in the round" interior of the theater, all facing the center of the room.)

With 28,000 season ticket subscribers, The Marriott Lincolnshire enjoys one of the highest committed audiences in the nation. "People are very comfortable at the Marriott Lincolnshire," says Johns. "We do everything within our power to help the patrons of the theater enjoy the show."

Installed by Opus Equipment and Sales, Gurnee, Illinois, are ten AE-5s, three AE-2s and one AE-12 speaker system. Six AE-5s are mounted in central cluster "pairs" down the centerline of three seating sections. The fourth seating section is the one that contains the orchestra enclosure. This seating section uses two AE-5s mounted on each corner of the lighting grid to provide sound coverage. Since the orchestra enclosure takes up about one third of the seats in

the center of the fourth section, acoustic "shading" effects of the enclosures sides dictated the use of more speakers for coverage.

There are two additional AE-5s located against the back wall on either side of the orchestra enclosure to provide reinforcement of the orchestra to patrons seated directly to the sides. One AR-12 subwoofer system is used to provide very low frequency reinforcement for the orchestra and supplies all very low frequency information for sound effects. Apogee A-2, A-5, and A-12 PV (Permanent Version) processors are used for time domain alignment, fixed corrective equalization

> "The sound system at the Lincolnshire stays "on" and operable 12 to 15 hours a day."

points and the Apogee PAR (Positive Amplifier Return) driver protection system for all system components. Apogee yoke assemblies and hanging brackets were used throughout the installation to suspend all loudspeaker systems.

Equalization of the sound system was performed by Ken DeLoria, President of Apogee Sound, using CORREQT™, an acronym for: "Computer Optimized Room Resonance Equalization Technique." This equalization technique involves the use of very narrowband frequency measurement

instruments. Once the narrowband resonance frequencies are identified, high precision narrowband equalizers are used to attenuate excessive acoustic energy at those frequencies, which in effect "tunes out" room resonance.

The house console has been upgraded to a Ramsa WR-S852 mixing console providing 52 inputs to accommodate the intricate productions and facilitate the use of many sound effects with dedicated channels. Johns points out that the console's variable high-pass filter "allows me to tailor the amount of low end cut to the voice of the actor. I'm able to adjust it to get maximum gain before feedback — especially on the low end — without adversely affecting the quality of the actors' voices."

In addition, Ramsa 9440 and 9220 power amps are used to power the Apogee speaker system, with Klark-Teknik equalizers being used for house equalization. A Lexicon LXP-1 with MIDI control is used for reverb, ambience and delay effects in addition to a Korg DDL. Comtek wireless systems with Shure lavaliers, AKG, E-V, and Crown PZM microphones complete the list of input transducers.

As you leave the theater you hear others remark about how good the orchestra sounded during the nights and your thoughts return to the small, compact speakers that are the orchestra. A quality sound system with a good engineer have allowed you to enjoy a great performance.

CINCINNATI BASKETBALL ARENA

The University of Cincinnati basketball program outgrew its home, the Armory Field House, several years ago. For a short time they used the city of Cincinnati's Riverfront Coliseum. This became tiresome since it was a substantial distance from campus, and revived the interest for an on campus multi-purpose arena. November of 1989 marked

the unveiling of the Merle Shoemaker Multi-Purpose Center.

The center lives up to its name by being everything from offices to racquetball courts to a full scale arena. With this broad spectrum of use, the communications systems obviously needed to be flexible and thoroughly designed and conceived.

In the arena and adjacent corridors,

boxes, and rooms, the system allows whatever is happening in the arena to broadcast into any of the adjacent areas. It also permits several of the corridors or concourse areas to operate independently with local microphone inlets and volume controls. The private boxes, such as the President's suite, have the ability to select the main event or one of two AM/FM

tuners. These may be tuned for background music or to receive an event of interest to the people in attendance.

The arena system is composed of eleven speaker clusters. All are selectable at the equipment rack, providing the flexibility of turning off upper deck clusters when attendance doesn't require them. There are six upper deck clusters, four floor clusters, and one convocation cluster. The system allows for nine optional delay combinations; these are chosen via a relay network according to what cluster(s) are to be selected as primary for the event. The individual boxes with ceiling speakers are even included in the overall delay scheme. Throughout the building there are over 200 Dukane 5A403 coaxial 8-inch ceiling speakers. These are all driven by a 70 volt amplifier. The clusters are composed of Electro-Voice HP series frequency horns combined with DH1A drivers. The lower frequencies are handled by JBL 4550 horn loaded cabinets containing E-V DL15X drivers.

Most of the electronics are Ivie modular components. Housed in (9) 5001/5101 mainframes are (7) 5506 6 x 2 mixers, (1) 5505 6 x 1 mixer, (3) 5301 1 octave equalizers, (2) 5702 compressor limiters, (16) 5807A 70v power amplifiers, (29) 5805 8 ohm amplifiers with (11) 5806 slave devices, incorporated into (6) E-V 2710 3rd octave equalizers, and (3) IRP 4015 digital delays.

All of the inputs appear on ADC patch bays to allow normalled through inputs for typical applications or patched to accommodate almost anything that can be

The arena system is composed of eleven speaker clusters which are selectable at the equipment rack.

dreamed up. Through the patch bay you can select up to twelve patch points and send them to a ProCo snake with helix connector. Via the snake we feed an E-V 8212, 12 channel mixing console which in turn sends its outputs back to the system.

A major consideration due to the size of the entire facility is the ability to make emergency announcements. In two locations there are key activated page inlets that override all programming in the system, should emergency evacuation become necessary.

In the adjoining Campus Sports Center, there were three separate systems installed. The first was a paging timer system in the racquetball courts and surrounding corridors. There are (32) JBL 8140-HT ceiling speakers distributed throughout the racquetball area, which allow paging as well as automated signaling for the end of the racquetball sessions.

There were two music systems installed in the weight room and locker room areas. Each system allows the user to select either a Crown PFM-3 tuner or Technics RST-330 tape deck as its source for music. The weight room has (11) B.E.S.T. speakers and the flexibility of sources allows the user to create any atmosphere he wants whether it be hard pounding rock and roll in the weight room or inspirational music in the locker rooms.

The Shoemaker Center is truly multi-purpose, and so are its communication systems. We at American Sound & Electronics are proud to provide these systems to the university and their patrons. ■

—Tim Engelhardt

Tim Engelhardt is a Communications Consultant for American Sound and Electronics, Inc.

GUEST COLUMN

name is spelled right.

To fight myth with myth let's recall a relevant fairy tale, which, like the truth, is familiar to us all. In Hans Christian Andersen's tale, "The Emperor's New Clothes," the Emperor loves clothes so much that he engages the services of a couple of weavers who turn out to be rob-

bers. They promise to make him the most magnificent clothes imaginable. They tell him that the clothes woven from the magic cloth could not be seen by anyone who was unfit for the office he held or who was very stupid. The beautiful clothes could only be seen by those who were fit for the offices they held or who were very clever. The emperor's faithful old Minister, and others in his court would not admit that they could not see the non-existing clothes and neither could the Emperor. It finally took

a little child to speak the truth by saying "But the Emperor has nothing on at all!!"

So don't believe magazines. Don't believe manufacturers. Don't believe dealers. Don't believe me. Find out for yourselves and then, like the little child, speak out. If we remain silent on this issue, for whatever reason, we're contributing to the delusion and we're as bad as the robber weavers. This industry is our livelihood and our joy. Let's keep it truthful. ■

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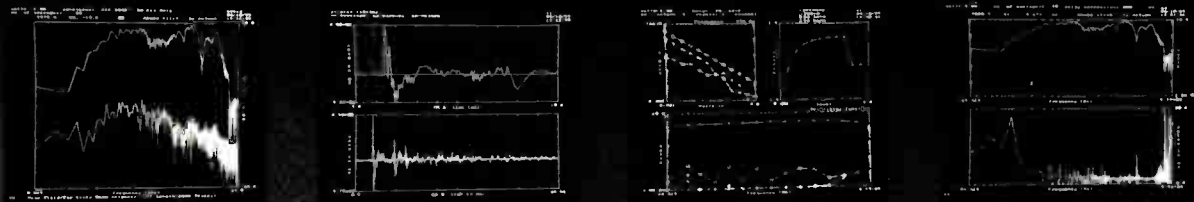
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SYSTEM RESPONSE

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SOFTWARE REVIEW

is the Ortofon P4000 which is very fast and comprehensive, as well as offering go/no go indication. B&K also offers very powerful hardware instrumentation/software QC test packages. Both the Ortofon and B&K are also many times more expensive than the total cost of a MLSSA system, even if you go for a fully loaded '386 or even a '486 system. In QC applications, the MLSSA system would be appropriate for incoming inspection of raw drivers to final testing of completed speaker systems. Impulse and frequency response, impedance, and other tests can all be performed and printed out with a single touch of a button through the use of the MLSSA's macro utility.

This is MLSSA's keystroke macro processor. Macros are "recordings" of keystrokes of a series of MLSSA commands. During QC, the macro is played back in order to automatically repeat the sequence of the commands.

Simple macros can be created to automate and speed up the steps needed to perform various measurements. The macro function can be included in the autoexec file so that whenever the computer is turned on, the "one button" test procedures are automatically set up and waiting to be triggered. On-screen instructions for the QC operator (such as "connect next speaker") can also be easily programmed into the QC test sequence.

CONCLUSIONS

Our review of MLSSA has shown it to be a comprehensive, yet comfortable to use instrument. The price/performance value is outstanding and especially judging MLSSA on release 6.0 software, it is a superior system regardless of cost considerations. I recommend this product to consultants, sound contractors, and other audio engineers for analysis of sound systems, acoustical phenomena, and speaker measurements. ∎

BUY · SELL · TRADE

MARKETPLACE

HELP WANTED

EQUIPMENT FOR SALE

Dr. Black of Video Design Pro (VDP), and he managed to get AutoCAD's interest. At the meeting a representative from Auto-CAD was present and actually made a number of commitments to support file interchange compatibility between AutoCAD and audio CAD design programs.

Joel Lewitz (principle of Lewitz and Associates) was elected as committee chairman.

Conclusions (prepared by Dr. Black of VDP, the secretary of the meeting, from his notes) —Standards are good, both for individual companies and for the industry as a whole — Agree to agree — it may be a long process, but everyone is committed to coming to an agreement at some point in the future.

• Seek NSCA sanction or backing of this committee to lend authority to the standards.

• AutoCAD is the defacto CAD standard and is the logical choice for providing a common denominator among software.

Additionally, VDP has offered to develop a generalized interface to AutoCAD at its own expense.

Finally, we briefly discussed what might be done in the future to give consultants and contractors a "hands-on" feel for the different programs, and improve the effectiveness of our efforts on educating the industry members on the benefits of these tools. I mentioned that the usefulness of the programs that I have been reviewing has dramatically improved from one release to the next. In general, pre-1990 releases of programs provided real benefits to users, but were plagued by some combination of lack of important functions, awkwardness of operation, etc. Even though the market size for these programs was potentially a few thousand copies, I believe none of the programs have sold a thousand copies, and most programs not even half of that. Considering that a few years ago most sound contractors could not operate personal computers, and did not even own one, combined with the idiosyncrasies of the programs, the lack of sales and the hobbyist nature of these software projects was understandable. Initial contact with the early efforts caused many potential users to turn away from audio engineering software. But in the last year or two, these programs have grown up and the audio field has become computer literate. The new release of Bose Modeler 3.1, the next release of Mark IV's AcoustaCADD, JBL's CADP II, and a number of new contenders, all seem to have reached a level of maturity and functionality that would warrant all sound contractors and acoustical consultants to have at least one program. This is not the case, and a joint effort by all the software developers and the NSCA would be needed to effectively get more contractors and acoustical consultants to get hands-on experience with the new generation of programs. The NSCA has been cooperative with promoting computer-aided-design at the past shows and will no doubt continue to be responsive to future requests. The software community now has a vehicle for progress and cooperation and it will be up to them to see where they go with it. ∎

ACCESS CONTROL

This type of system lets the warehouse owner or manager track who comes and goes—and when. It also lets him automatically lock out anyone who hasn't paid his bill.

One system, installed in an office building, helps get a customer's day off to a good start. When he inserts his card in the reader to gain access to the main lobby, the system automatically turns on the coffee pot in his 27th floor office.

Another system lets a secretary shared by several sales representatives know who's in and out of the office. As soon as a rep arrives in the office and inserts his card in the reader, an LED lights up on a display panel by the secretary's desk. When he leaves, and uses his card to check out, the LED goes out.

There's only one limit to what you can do to make your customers's life easier with an access control system: your imagination.

FOR MORE INFORMATION....

For books, such as "Access Control and Personal Identification Systems," "Electronic Locking Devices," "Total Facility Control" and many others, request a catalog from Butterworth Publishers, 80 Montvale Ave., Stoneham, MA 02180; (617) 438-8464.

An extensive study, looking at where the access control industry has been and where it's going, is available from J.P. Freemand & Co., Box 431, Newtown, CT 06470; 426-0023. ∎

STRIKING OUT

Regardless of the type of access control system you install, there must be a device to release a door for people to enter or leave, and hold it securely closed and latched at other times. While various devices exist, the most common is the electric strike. The type you select and install depends on the job you want it to do.

On the one hand, intermittent-duty strikes are designed to operate for short periods of time. They unlatch when power is applied and vice versa. They're known as fail-secure strikes because they hold doors latched (secure) when power fails.

On the other hand, continuous-duty strikes fall safe. That is, they automatically unlatch when power fails. Unlike intermittent-duty counterparts, these devices are designed to withstand continuously applied power to hold doors secure.

Most intermittent-duty strikes require AC power and usually emit buzzing sounds when energized. The noise is helpful because it signals the person seeking entry that the door can be opened. The buzz may be bothersome to people who work near frequently used doors, however. For peace and quite, select a DC-powered continous-duty unit.

Electromagnetic looks rely on magnetic force instead of mechanical components to hold doors closed against thousands of pounds of pressure. They, too, are available in models to fail safe or secure, as needed.

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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