Lab Test: Soundsphere 168 Speaker

SOUND & COMMUNICATIONS

FOR CONTRACTORS, SYSTEM MANAGERS AND SPECIFIERS

JANUARY 1987

LOUDSPEAKER CLUSTER DESIGN

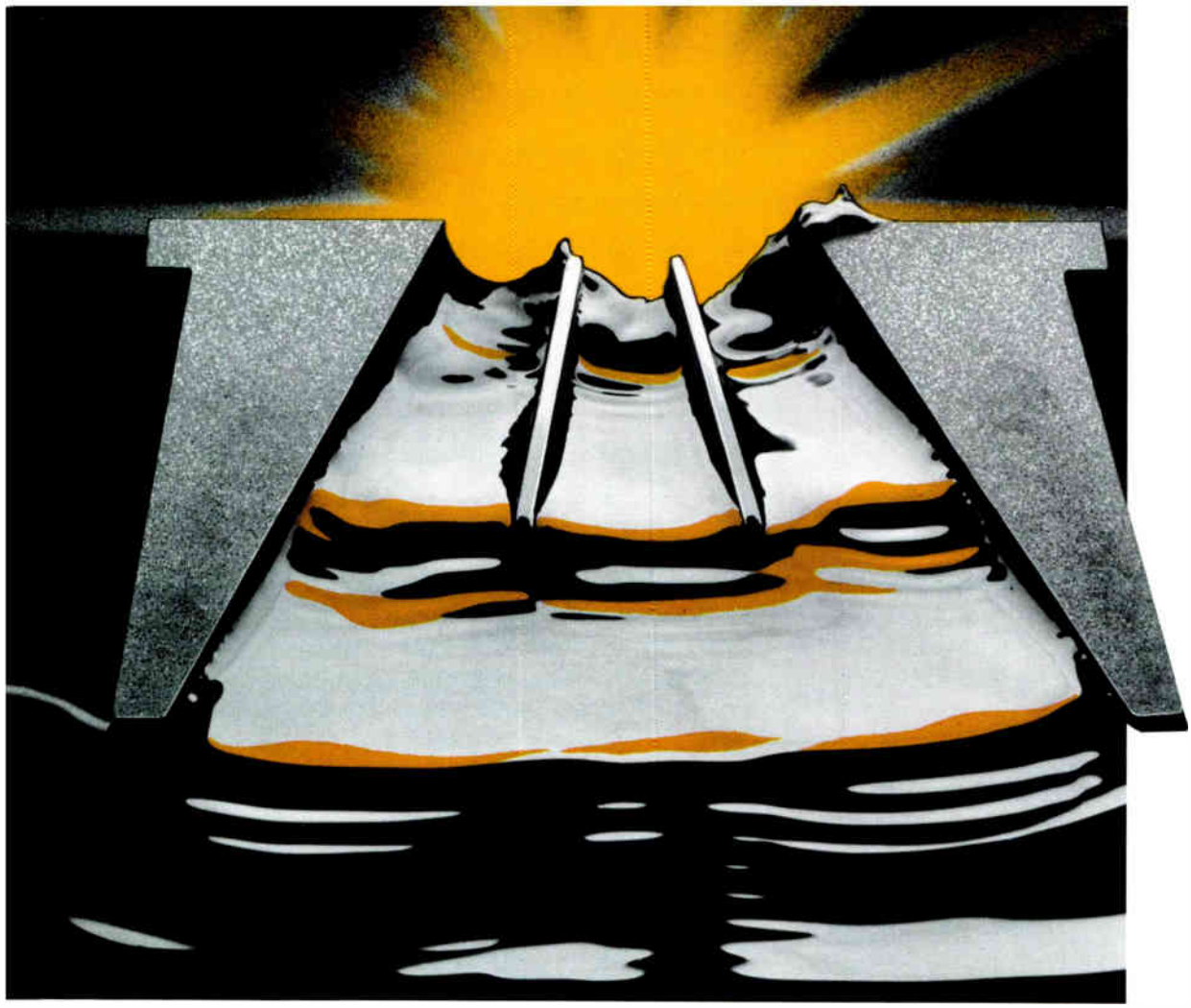
Grounding

Fire Alarm Systems

Decentralized Management

AES Conference Review

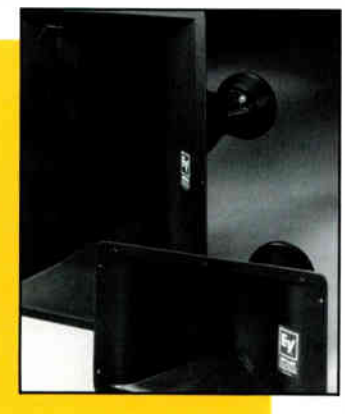
Computer Testing the Sound System for the '88 Olympics



NEW WAVE DESIGN

Blocking the Incoherent Wave

Cast into the throat of every **TransPlanar™ HP horn,** unique beamwidth control vanes represent a revolutionary advance in constant-directivity design. Until now, two-inch-throat designs were compromised by on-axis dropout. Intrigued with this curious problem, EV engineers applied principles of geometric optics to isolate the incoherent waveform responsible for this phenomenon. Instead of coursing down the horn in an organized fashion, this offending wave reflects off the walls of a two-inch throat, shadowing direct output and causing a loss in level. Ray analysis was used to predict this occurrence and determine the exact configuration of slotted waveguides which block the cancelling wave and eliminate on-axis dropout.



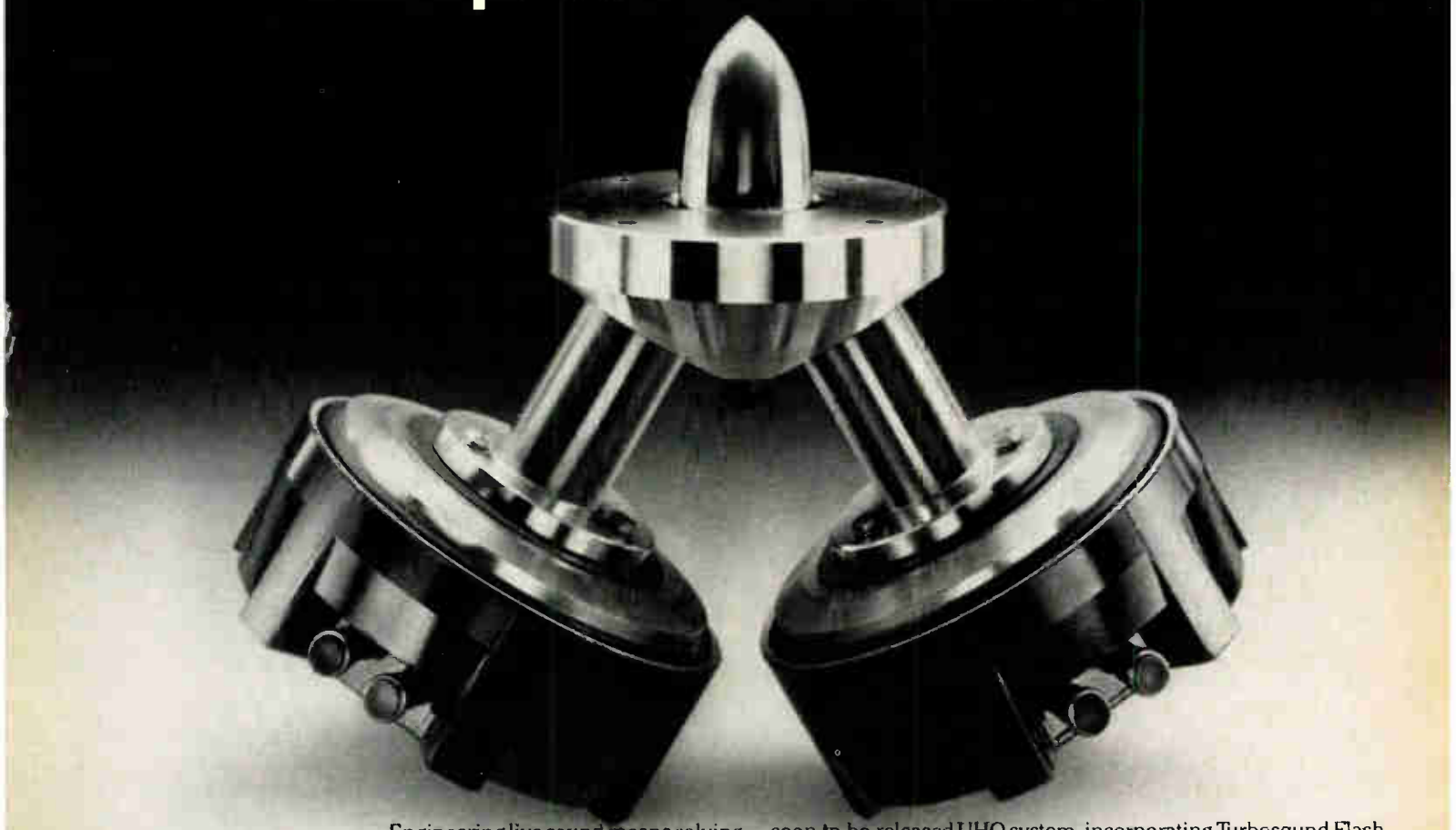
Acting together with an optimum diffraction slot, the beamwidth control vanes also eliminate both horizontal and vertical beaming in the very highest octave. Other two-inch-throat designs exhibit narrowing of the coverage angle above 10,000 Hz. But the HP horn maintains uniform dispersion to 20,000 Hz!

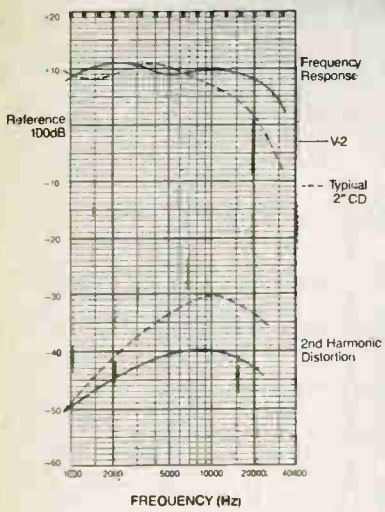
When Electro-Voice invented the constant-directivity horn in 1972, we really started something. Now we're making waves again . . . bringing you second-generation CD design with the most uniform beamwidth control in the industry. To learn more about HP horns or the high-performance DH1A and DH2 two-inch-exit drivers designed especially for them, contact Pro Sound Marketing at Electro-Voice, 600 Cecil St., Buchanan, MI 49107. **We'll be glad to tell you why when the competition beams, we just smile.**

Electro-Voice®
SOUND IN ACTION™

Circle 222 on Reader Response Card

We don't mind looking a bit ridiculous if it helps make live sound sublime.





Curves have been smoothed for purposes of comparison.

Engineering live sound means solving a multitude of "impossible" problems. Every audience — and every artist — expects great sound. Unfortunately, venues rarely cooperate with those expectations. Fortunately, Turbosound goes to any lengths to develop effective solutions to sound reinforcement problems — even when that entails a total re-examination of fundamental principles.

Our determined refusal to rehash the conventions of enclosure design has led us to develop several patented design principles. And to produce unusual-looking loading techniques like our unrivalled TurboMid™ and TurboBass™ devices. Our search for a solution to the dilemmas of HF projection and distortion has now produced the radically advanced V Series.

V Series combines aspects of manifold technology with Turbosound loading techniques to blend the outputs of multiple drivers gradually, minimizing phase cancellation. The first realization of the V Series principle is the V-2 shown here. Available initially for the T-3 flare in our world-travelling TMS-3 full-range enclosure, this central focussing device couples two custom-built 1" drivers. It extends the TMS-3's HF response to a true -3 dB at 20 KHz, reduces harmonic distortion dramatically and paves the way for the soon-to-be-released UHQ system, incorporating Turbosound Flashlight™ technology.

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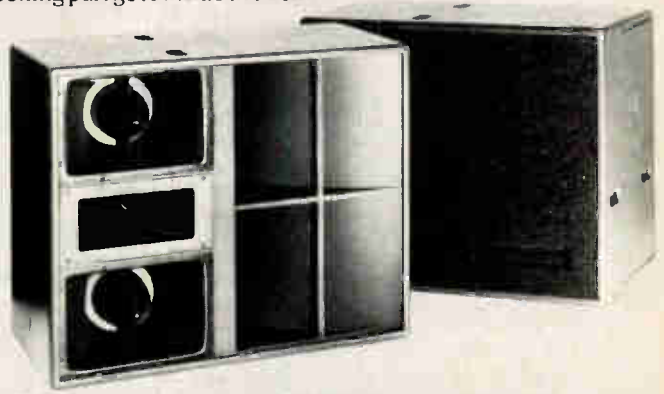
Finally, we'd like to point out one more important fact about this unique advance in professional audio performance — the ridiculous-looking part goes *inside* the box.



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*TurboMid™ and TurboBass™ devices are covered worldwide by Principle Patents, not simple design patents. Principle Patents covering V Series have been applied for. The concepts embodied in these designs are, therefore, entirely unique. See Turbosound literature for full information.

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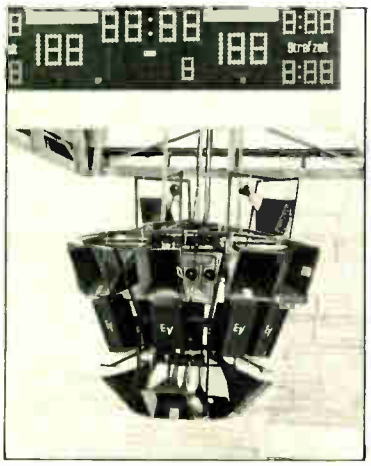

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FEATURES

DEPARTMENTS

ON THE COVER

This month *Sound & Communications* is featuring an article on loudspeaker cluster design. The cluster which appears on the cover is located in the Osaka Hall in Osaka, Japan. The horns in the cluster are from Altec Lansing. See story on page 16.

COLUMNS

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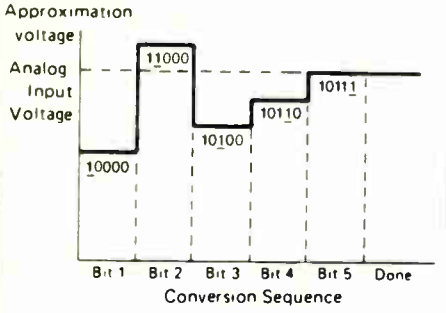
LETTERS & OPINIONS

SLIPPED DIGIT

In the October 1986 issue of *Sound & Communications* you published an article on the theory of analog-to-digital conversion systems. After careful review of this article I found some errors in the diagram (Figure 4B, page 48) showing conversion by using the successive approximation technique. According to the article (page 49) comparisons that evaluated lower than the input level would store a '0' in that binary bit and levels that compared above the input level would store a '1' in that binary bit. This is not the case in your diagram of Figure 4B. Bit 2 of the conversion sequence was shown at a higher level than the approximation, thus bit 2 should have a '0' stored in this position. Again, in bit 3 of this sequence the value compared lower than that of the input voltage. This should have caused a '1' to be stored in this position (bit 3). The resulting output in binary of the conversion sequence shown should result in a '10111' at the final step.

Harold Blakney
AVCOM
Washington, D.C.



(B) Conversion Sequence Showing Successive Approximation Voltages and Corresponding Digital Numbers

Figure 4 - Successive Approximation ADC and Output.

You're absolutely correct! We thank you for bringing this to our attention so that we can share this information with our readers.

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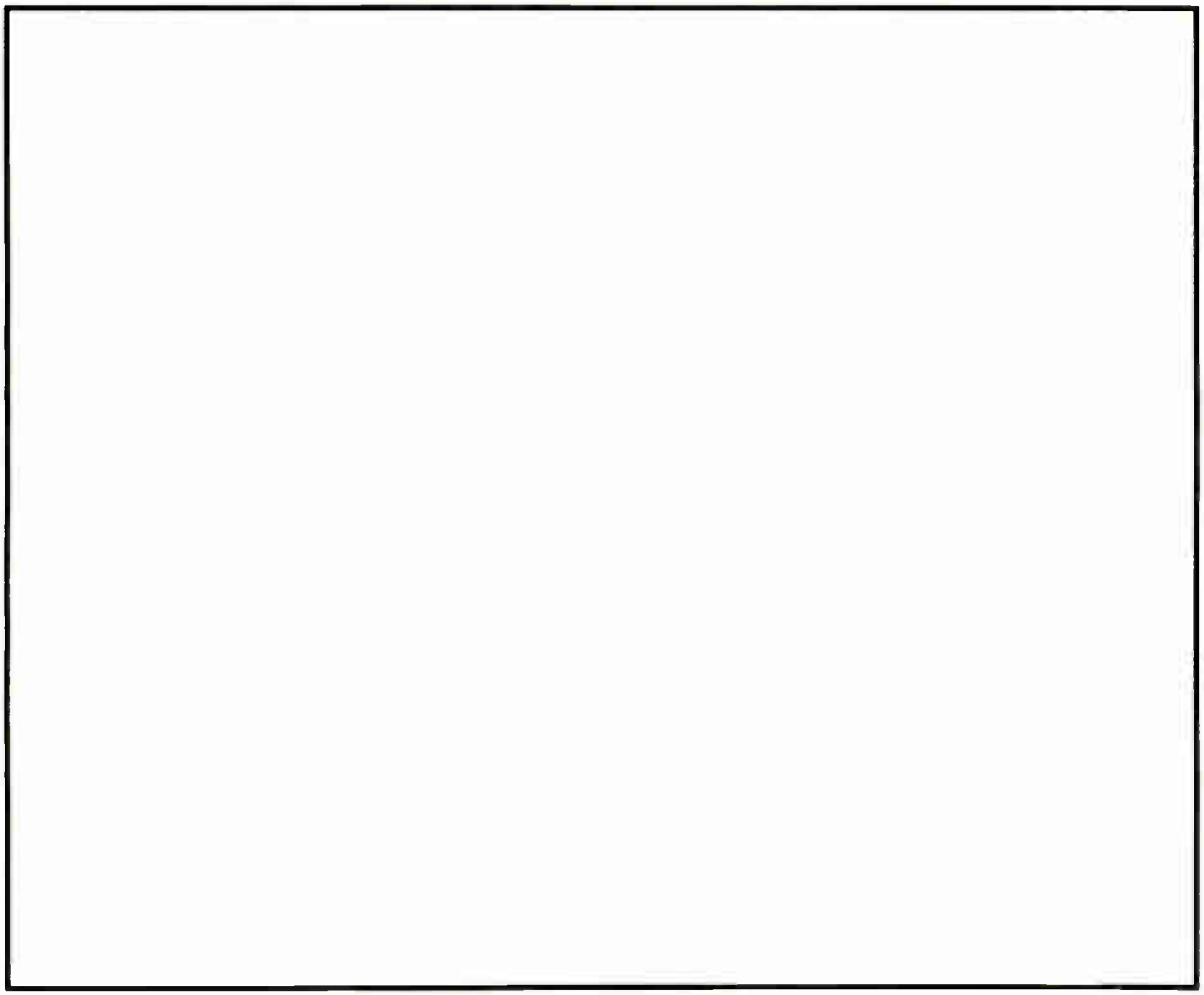

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MEMORY PROTECTION DEVICES ANNOUNCES INTENT TO ACQUIRE BOGEN

Memory Protection Devices, Inc. has signed a letter of intent to acquire the assets and liabilities of Bogen, a division of Lear Seigler, Inc., for an undisclosed amount, subject to completion of financing efforts, according to David Kassel, chairman of Memory Protection Devices. At press time, the closing was scheduled for December 30, 1986. "This change falls into the classification of a friendly takeover for us," said Carl C. Dorwaldt, vice president of marketing for Bogen. "Of the various groups that were interested in buying Bogen, Memory Protection Devices was the one we preferred." According to Kassel, although it's too early to announce any changes, there are plans to possibly apply some of Bogen's organizational systems, such as sales and distribution, to that of Memory Protection Devices, which manufactures and markets a line of proprietary battery connectors designed for use with high performance lithium coin and cylinder cells, and maintains a franchised Panasonic Battery Modification Center. In other news, it was announced by Lear Seigler Inc. and Forstmann Little & Co. that Lear Seigler and L Acquisition Corp., a corporation organized by Forstmann Little & Co., have entered into a definitive merger which provides for Lear Siegler to be acquired by L Acquisition for $92 in cash per share and $230 in cash per share of convertible prefered stock, for a total of approximately $2.1 billion, including refinancing of debt and other costs.

V BAND SYSTEMS INC. TO PURCHASE CP INTERNATIONAL

V Band Systems, Inc., a manufacturer of key telephone systems, has announced that it has agreed in principle to acquire CP International, Inc. and its U.S. and United Kingdom subsidiaries suppliers of video and digital switching systems to the financial service industry for approximately $8 million in cash plus an additional contingent amount based upon CP's financial results for the year following the acquisition. The purchase is expected to be completed before the end of 1986. Thomas E. Feil, chairman and CEO of V Band said, "The acquisition of CP International, Inc. will greatly enhance our product offering in the markets we now serve, and represents a strategic step toward becoming the world leader in voice and data terminal systems for instant access communications." Completion of the acquisition is subject to certain conditions including negotiation of a definitive agreement and approval by the board of directors of V Band and CP. CP International, Inc. along with its subsidiaries, C&P Technology, LTD. and C&P Associates, LTD., designs and manufactures advanced computerized trading systems for financial institutions.

AB INTERNATIONAL ELECTRONICS ACQUIRES PRODUCT ASSETS OF AB SYSTEMS

AB International Electronics Inc. has announced the acquisition of all product assets of AB Systems, Inc. AB Systems was originally founded in 1976 as AB Systems Design Inc. by Robert Bird and George Anderson and then acquired by Theta Industries in late 1983. AB International brings these two individuals together with Irwin Laskey, vice president of the corporation who is responsible for market development in addition to sales and marketing management. AB International and its principal stockholders—Anderson, Bird and Laskey—are dedicated to the concept of loyalty to dealers and customers and in keeping with this philosophy the company will endeavor to provide service continuity for past AB designs while simultaneously introducing new products. AB International's principle office, located in northern California, provides complete manufacturing support facilities. An additional office, located in southern California, provides full domestic and export sales and marketing. Regional sales are handled by the company's independent representatives and export distributors.

SENATE PASSES PROMPT PAY BILL, ICIA MEMBERS TO BENEFIT

The Senate has approved legislation to eliminate loopholes in rules which require federal agencies to pay interest penalties on overdue accounts owed to dealer, manufacturers and publishers. Passage of the bill was a goal of the International Communications Industries Association (ICIA), whose members report that 25 percent of all government bills are paid late and that the payments often do not include interest penalties.

Sponsored by Senator Paul Trible (R-VA), Senator Lowell Weicker (R-CT) and Senator Dale Bumpers (D-AR), the legislation was developed in response to hearings conducted in the past year by the Senate Small Business Committee. At the hearings, witnesses from the business community headed by ICIA staffer Kenton Pattie, outlined the major problems with implementation of the Prompt Payment Act of 1982. According to ICIA testimony, agencies have made substantial improvements in bill-paying practices since the passage of the 1982 Act but problems still exist. Complaints center around agencies' refusal to pay interest on overdue payments, routine use of the 15-day grace period to extend payment terms, and improper taking of early payment discounts. Also construction companies reported the failure of agencies to pay promptly on progress payments and retained amounts and the lack of provisions for prompt pay to subcontractors.

Pattie said ICIA members and other small firms will benefit from the new legislation's requirement that agencies be restricted from spending an indefinite period of time processing paperwork before beginning the start of the 30-day payment clock. To accomplish this, the bill establishes a new definition of "receipt" of invoice. Additionally, the grace period (giving the government 45 days to mail a check) is gradually eliminated and language has been added to prevent illegal taking of early payment discounts.

ITT ANNOUNCES DISTRIBUTION AGREEMENT FOR HITACHI'S DX SERIES

ITT Business Communications Corporation (ITT, BCC) and Hitachi America, Ltd. announced that they have entered an agreement for sales and service by select ITT BCC authorized distributors of Hitachi's DX Series of communications systems. The distribution, according to the two companies is a logical extension of a relationship that began in 1984 when ITT BCC began selling the Hitachi DX series PABX for hotel/motel applications. ITT emphasized that the DX series is supplementary to the system 3100 PABX. The DX Series addresses a larger line size, and more specifically, hotel/motel and hospital applications.

TELECONFERENCING MARKET EXPECTED TO GROW SUBSTANTIALLY BY 1990

According to a study by Frost & Sullivan entitled "The Teleconferencing Market in the U.S.," the market will see a 24 percent average annual growth in expenditures from $167 million in 1985 to $486 million in 1990. Of total five-year revenues of close to $1.6 billion, two-way videoconferencing is expected to account for 62 percent. One-way video for 24 percent, audiographic 11 percent, and audio teleconferencing three percent. A user survey conducted for the study concluded that the most popular current applications of teleconferencing are sales presentations, product demonstrations, technical assistance, training, and engineering conferencing. Two-way, full-motion videoconferencing has been the slowest to gain acceptance, but decreasing transmission costs, more efficient signal compression techniques and the emergence of lower cost and portable hardware are rapidly opening up the market.

CPC HAS STARTED NEGOTIATING SUBCARRIER AUTHORIZATIONS

CPC, a newly-formed subcarrier negotiations and subcarrier consultant firm, which opened early last year in San Diego, CA, is currently negotiating subcarrier authorizations for a number of companies and radio stations throughout the United States. CPC acts as broker and consultant in all phases of leasing and subcarrier consultancy matters utilizing consulting engineers geographically located in the U.S. and all levels of radio station management. Among the companies CPC represents are customers of SCA Data Systems, American Diversified Capital Corporation, Adams Communications, Chinese Radio Network Corporation, SCA/USA, Ltd., First Continental Communications Incorporated and Extended Search Paging International.

ERA OPENS MARKETING CONFERENCE TO MANUFACTURERS

The Electronics Representatives Association (ERA) has announced that its 1987 Management & Marketing Conference will be open to electronics industry manufacturers who sell their products through manufacturers' representatives. Manufacturers are invited to participate in two days of the conference program on April 21-22, 1987. The annual ERA conference is scheduled to be held April 20-25, at the Marriott Desert Springs Hotel and Resort, Palm Desert, CA. Manufacturer participation will focus on the relationships between representatives and their principals and include sessions devoted to professional standards of conduct, ethics, a key issues dialogue plus the most common mistakes that manufacturers and representatives make in dealing with each other. During the remainder of the conference, members will continue with the regular management and marketing sessions. Manufacturer registrations for the 1987 ERA conference are now being accepted on a first-come, first-serve basis. ERA executive vice president and CEO Raymond J. Hall reports that "To preserve the balance of dialogue in conference workshops, the number of manufacturer participants will be limited to a percentage of ERA member representatives in attendance. Details on program sessions and registration for the conference are available from the ERA national office at 20 E. Huron Street, Chicago, IL 60611; (312) 649-1333.

SURVEY FINDS CHANGES IN FM SUBCARRIER USAGE

The market for FM subcarrier in the top 30 U.S. markets has grown four percent from September, 1985 to September, 1986, according to a report released by Waters Information Services, Inc, who publishes the FM—SCA Census each Fall. Comparing the results of the 1985 survey with the 1986 survey, the following trends show the number of subcarriers in use increased from 352 to 366 or 3.98 percent; the most dramatic increase was in voice applications which increased from 69 to 80 subcarriers, a 15.94 percent rise; data transmission remained the leading applications, but the number of subcarriers in use actually decreased from 97 to 92; the number of subcarriers operating at a frequency of 92 kHz increased from 48 to 68, a 41.67 percent rise; the number of FM radio stations transmitting two or more SCAs nearly tripled, from 25 to 72. The FM-SCA census covers the activities of 536 FM radio stations in the 30 largest U.S. ADIs.

BENCHMARK ASSOCIATES AND DOWNTOWN DESIGN FORM NEW COMPANY

Benchmark Associates, a designer of recording studios, control rooms, and stages has joined with Downtown Design, a nationally-published architecture firm. The new company will specialize in designing and building complete facilities at levels of cost and quality control impossible in projects contracted conventionally, according to the company. "Most projects include reception areas, offices, and the customary support facilities for a studio," Vin Gizzi of Benchmark Associates said. "It's far more convenient and more efficient to have the job handled by one company rather than an architect, plus a studio designer, plus a contractor. We're one of the few firms in the country who can manage it all, from design through construction."

by Dick Bowman
Lloyd F. McKinney & Associates

DECENTRALIZED MANAGEMENT

Many small contracting companies today operate sufficiently under a single manager who is responsible for all aspects of the business from sales to ground maintenance. Yet, as a contracting company grows, a need for more managers with specialized abilities evolves. The transition from a centralized to a decentralized management system can often be difficult and confusing. Questions arise as to: Who is responsible to whom? Who should be involved in organizational planning—both long and short term? And what can be expected from each manager?

The following article is how one contracting firm, Lloyd F. McKinney & Associates of Hayward, CA, implemented a decentralized management program within their company.

* * *

There are three basic functions of our business:

(1) *Marketing*—Someone must sell, promote, and merchandise our capabilities of installation of communication and audio/visual systems. Otherwise put our capabilities together with the customer.

(2) *Operations*—Someone must buy, build, install, and service the items sold by Marketing.

(3) *Finance and Administration*—Someone must manage and control dollars, resources, systems, people, and data.

These are all the many and varied support functions that were needed by our company.

It is helpful to visualize these three elements as a three-legged stool. When all are healthy and functioning together, they form a sturdy, rigid figure—when any one of them is weak or fails, our business cannot survive for very long.

In our business planning sessions, we found it hard to discuss any one of the three without some mention of the other two. Our president and vice president has a working knowledge of all three, but has neither the time nor skill to master all three. We felt that if McKinney & Associates were going to optimize the business' growth potential, we should implement a decentralized management program.

First, the company was re-organized to include a director of sales and marketing, director of operations, and director of finance and administration with each director reporting to the president.

The director of sales and marketing not only has the responsibility for sales, advertising, and marketing, but also for engineering and drafting functions which we felt were sales support activities. The director of operations is responsible for the installation and service technicians, project management, material control, and building and grounds. The director of finance and administration has responsibility for secretarial support, data processing, accounting, and personnel.

The president, vice president, and the three directors have a two-day planning meeting each year to go over the current business plan, as well as the five-year plan. The same group meets every 90 days to review their part of the business plan. If changes are needed in the plan, they are discussed and implemented at this time.

At each meeting, the group reviews the objectives of the business, the marketing plan, organization of the company, funds flow and financial projections, and performs a market and product-line analysis. These meetings are held away from the office so that there is complete concentration on matters at hand.

At McKinney & Associates nothing happens until a sale is made; therefore, it is not surprising that the director of sales and marketing is the first to receive the most intense scrutiny. As a result, building an effective sales force is increasingly important. Of particular importance for our sales force is its focus on profitable areas such as particular market segments; products, and special markets. Building a strong and productive sales force we found to be dependent on four major areas: (1) quality of the salesperson, (2) quality of leadership, (3) sales training and (4) sales management fundamentals. We try to strike the proper balance between independent enterpreneurship and disciplining in managing the sales force.

The key to defining our sales mission is a marketing strategy which provides direction in such areas as products, markets, customers, orders, and activities. The sales' mission is stated as specifically as possible in order that the present sales force can grow and manage their specific market areas.

The next principle is to provide adequate guidance to sales and marketing, operations, and finance and administration that defines: key sales tasks, ensuring capable first level supervision/support, installing and effective information system, and controls.

It is the desire of our company to improve management performance by having full-time managers who: (1) train future managers how to manage properly, how to improve employee selection, and how to appraise employee performance; (2) provide feedback and control devices in a concise, usable form; (3) train future managers how to handle feedback and train employees on how to self-monitor their performance.

It is our management's feeling that you must always take that extra step, and should inspire others to do so.

Dick Bowman is the director of sales and marketing at McKinney & Associates.

GROUNDING

by Daniel Queen
Daniel Queen & Associates

Today computers aid the design of sound systems, yet one major mystery remains for the contractor—grounding. The ubiquitous ground loop waits to ensnare any system designer who forgets that a system is more than lines on a drawing.

Yet there are only two rules to follow: one has to do with the flow of current; the other the generation of voltage. Current flow is important when a system includes wiring paths called "ground loops" which act like open turns of a coil. Such loops act as the secondary of a transformer picking up any varying magnetic fields in their vicinity.

When the magnetic field is produced by a signal, a replica of the signal will flow in the ground loop. If the ground loop is located near the input channel that originally produced the signal, the result can be oscillation, signal cancellation, or a distortion of frequency response. If, instead, the loop is located in a different channel, the result will be crosstalk. When, on the other hand, the current is not signal but is noise, such as the 60 Hz hum from the power supply, the result will be an increase in the noise in the channel.

It is important to understand that the key, with respect to ground loops, is current. For a ground loop to be detrimental, it must allow current to be induced. Thus if the impedance of the loop is high, the current may be sufficiently low to be harmless.

When a loop, such as that in *Figure 1*, includes the high impedance input of an amplifier, it would be of relatively little consequence. However, were it to include a loaded low-impedance input, the problem would be substantial.

A well-designed transformer input usually provides high-impedance loading even for a low-impedance microphone over most frequencies, so no problem occurs, for example, in rejecting powerline hum. However, the same transformer may have a loading effect at very high frequencies; resulting in system oscillation, squelching, and response distortion.

Note that shielding does not cure ground loop pickup, since the pickup is magnetic. However, judicious use of shielded cables can prevent the inadvertant production of ground loops. By utilizing cables in bundles, the "single turn" of the loop is physically closed and thus will not pick up the inductive field. Paradoxically, it is helpful to allow cable bundles to twist askew, rather than to line them up neatly. As in the case of the twisted pair, such twists also tend to cancel inductive pickup.

Pickup from a ground loop need not be applied directly to an input to be a problem. Often a ground loop can be formed out of ground conductors themselves where they produce a current at a common ground path. Because the ground path has finite resistance, a voltage is produced across the resistance. If the resistance appears in an amplification path, as in *Figure 2*, the ground loop can create noise or oscillation problems.

Multiple loops can also cancel or add to the problem. It is easy to see how magic seems to be operating when one corrects a ground loop situation and finds the hum has increased because that ground loop was actually cancelling induced pickup from another loop nearby. If one understands the mechanism, one will recognize that another ground loop is present and must be corrected. Never will closing a loop increase noise of itself. It is always better to close the ground loops than rely on them as hum or oscillation cancelling mechanism—which will be unstable.

A second category of grounding problems is similar to the last example in that voltages are produced by currents in common ground conductors. For example, in *Figure 3*, loudspeaker current is flowing in a short portion of an equipment rack basing which causes a voltage to be applied to an input. Where the signal is in phase with the input, oscillation will occur. Where it is out of phase, signal cancellation will occur. Thus this problem can produce either oscillation or a distorting of the response of the system. This problem may also be produced by noise signals such as a 60-cycle induced buzz produced on a safety

(continued on page 27)

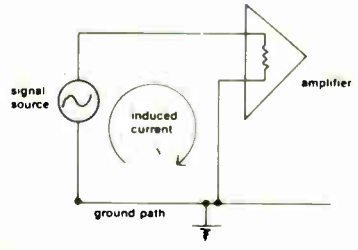

Figure 1

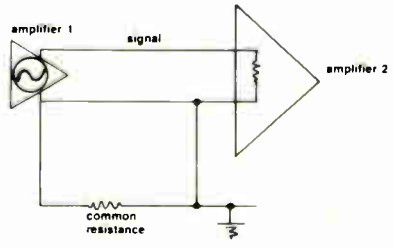

Figure 2

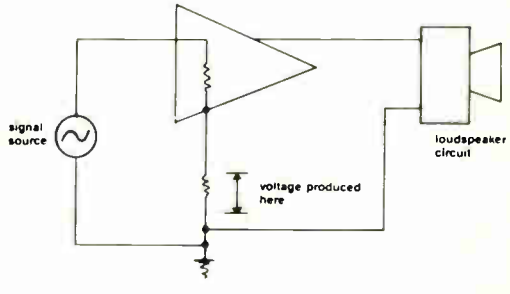

Figure 3

"When Cunard wanted sound fit for a queen, I specified Bose."

[illegible] design and install sound systems for their flagship Queen Elizabeth 2.

It's hard to imagine a more challenging place to install a sound system than the Queen Elizabeth 2. After all, she *is* the world's most renowned luxury liner, and people enjoying her hospitality naturally have great expectations. They expect to dine, play and relax on their cruise in style and comfort. *And almost everything on board the Queen, including the sound system, is important in cultivating the right atmosphere.*

But the QE 2's sound system has to do more than sound good. Should the need arise, it also has to be capable of providing passengers with vital safety information. It must meet the strict standards set by a number of organizations including Lloyds' Registry of London, the U.K. Dept. of Transport and the U.S. Coast Guard. It needs to be rugged enough to withstand environmental extremes, easy to install, and above all, it has to be reliable—because the nearest service may be an ocean away.

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CONSULTANT'S COMMENTS

The Early Stages After
AWARDING THE CONTRACT

by Marc L. Beningson
Jaffe Acoustics, Inc.

For the past several months, I have been discussing the consultant's role and responsibilities during the design of the building, before the sound contractor has been brought on board. Last month's topic was bidding, and what a consultant looks for in a contractor. Now let's assume that the sound contractor has submitted a successful bid, and has been awarded a contract for sound system installation. What happens next?

For the sound system design consultant, the time between award of contract and submittal of shop drawings can be one of the few less intensive portions of the project, however, for the contractor, it should be a very busy time. Presumably, all of the contractor's questions were answered during the bidding process, so that the contractor should fully understand the technical requirements of the specification. However, it is understood that there are some unasked questions which do not relate to pricing and, therefore, remain unanswered after the contract is awarded. The contractor's first order of business is to get those answers. When an owner hires a sound contractor directly, there are only two parties involved in all decisions. But in a large construction project, such as a new theater, there is a specific hierarchy of individuals and companies involved. The sound contractor works for the general contractor or construction manager (many sound systems are subcontracted through the electrical contractor, an unfavorable situation—more on this in another column) who in turn works for the owner. According to the correct procedures, the contractor must submit a request for information or RFI (sometimes referred to as a request for clarification or RFC) to get answers to simple questions. The RFI filters up through the general contractor to the architect, who distributes it to the design consultant as well as other members of the design team as appropriate. The designer's response must filter back via the same channels.

"Don't be penny wise and pound foolish" and "An ounce of prevention is worth a pound of cure" have a basis in truth, if only because old Murphy and his law await those who are insufficiently organized.

This process can be time consuming and frustrating, especially because the sound contractor and the design consultant are the only people who have any concept of the details of the sound system, and all the other individuals will just "rubberstamp" the submittal. In actuality, the process exists for one important reason—to protect the owner and ensure that he receives what he is paying for. Generally, I have found that a compromise solution is in order. The sound contractor is given permission to contact the design consultant directly by phone. Notes are kept by both to document the discussions. If, in the opinion of either, the implications of the decisions are important enough, an official RFI or response is issued to document the decision with the other parties. However, this simplification practice is generally frowned upon in government jobs, where it is most required, because review committees, state agencies, and other individuals must also review all submittals as the *owner*.

Once the contractor has a full understanding of the system, it is time to dig into the first major submittal required—shop drawings, which were the topic of a previous column ("The Importance of Shop Drawings," *Sound & Communications*, July 1986, p. 19). But first, some organizational steps will make the project simpler and hopefully more profitable for you. (It will also make the design consultant's job easier and more time efficient.)

The most important step is to designate a project manager, and make sure that he understands the specifications *thoroughly*. Let him look through the contract documents, general conditions, and project procedures. Attention corporate management: The project manager *must* have sufficient time to become completely acquainted with the workscope and procedures of the project. If you think his time is costly now, wait until he and four of your technicians are working overtime to correct an error that could have been foreseen.

The project manager should be in charge of engineering the system, getting shop drawings drafted, researching the specified equipment and compiling cutsheets. The project manager should be the contractor's sole representative to the general contractor and the design consultant to ensure consistency in all discussions and to avoid confusion. Once shop drawings are approved, all orders and acquisitions should be under the direction of this project manager. This is not to say that this person must do all the work himself, but it is critical that the project manager be given the resources to plan, order, schedule, and execute the project. If the contracting organization cannot make these resources available to the project manager, then it should not have bid the job in the first place. A company that fumbles in the early phases of a project is not likely to be able to complete the system installation as successfully (or profitably) as one that plans ahead.

Remember that the often overused cliches, "Don't be penny wise and pound foolish" and "An ounce of prevention is worth a pound of cure" have a basis in truth, if only because old Murphy and his law await those who are insufficiently organized.

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Circle 204 on Reader Response Card

A Tutorial On LOUDSPEAKER CLUSTER DESIGN

by Jesse Klapholz

Courtesy of Community Light & Sound

Community Light & Sound components were installed in the cluster at the Spectrum Auditorium in Philadelphia, PA.

The first large-scale sound systems built by Bell Labs and RCA were two-way systems consisting of a horn-loaded, low-frequency device and a horn-loaded compression driver for the high-frequencies. These systems are often called integrated systems. As the requirements of sound reinforcement systems grew, and their acceptance became more widespread, loudspeaker cluster designs emerged from the offices of audio/acoustic consultants and replaced integrated systems in many venues. Rather than rewriting the book on cluster design, a tutorial review of cluster design basics which can be used as a checklist will follow.

Design Criteria

For the sake of clarity and brevity, the acoustical considerations associated with the selection of a system type, i.e. cluster, distributed, etc., will be assumed for the choice of a cluster design. Also, it will be assumed that the system will be used for reinforcement of a live source. Discussed in an earlier article ("Distributed Sound Systems" *Sound & Communications*, April, 1986) was the basic need to answer the following questions: Is the system loud enough? Can everybody hear? Can everybody understand? Will the system feedback?

While these criteria may seem rather elementary at first, simplifying the many complex facets into a design-task consisting of four basic elements will prove itself in systems that work. We may categorize two basic elements by acoustic/geometrical and electro-acoustical. Of course, all of these criteria will directly relate to human perception, therefore, psycho-acoustics will be the bottom line. Reverberation, echos, NC-criteria, sight lines, source-to-listener distances, ratios between the closest listener and furthest listener, and cluster locations and size(s) should be identified and answered as a first step.

Excessive noise sources and disturbing echo problems should be corrected before the sound system is designed and installed. For example, if the HVAC designer has specified too noisy a system for the space, it should be made clear that it will impede on the *understanding* criterion. Similarly, if the reverberation is too excessive for the understanding of speech, modification of the acoustical characteristics of the space will be

necessary—a sound system will only exacerbate these conditions.

We will now have to make some assumptions and translate some psychoacoustic terms of acceptance into several objective numbers to ensure that everyone will hear and understand what they mean. No matter how we translate these subjective terms into objective scientific quantities, we must be clear on the premise that these are only representations. With this in mind, we assume that a given level in dB-SPL at each listener's ears will guarantee the designer of both good hearing and understanding of the source by the listener(s). We can then observe, or estimate, the level of the source and calculate the resultant level at each listening location for inverse-square-law, additional level due to reverberation, the ratio between the direct and reverberant sound, and the level above the background noise.

From these observations, we may estimate how much gain (amplification in dB) is needed for each listening area. Since noise, intelligibility, and gain are all frequency-dependent, it makes sense to observe all of these in octave bands at a minimum, while third-octave displays may be more useful. A table or room map of the range of needed gain values will show the increasing gain needed in relation to distance from the source, and will also show the point where reinforcement is even necessary. Often, no reinforcement is needed in up to the first one-third of the listener area in smaller rooms, halls, and auditoria.

Component Selection

Having established the needed gain, we have crossed over to the electro-acoustical considerations in our checklist of cluster design parameters. With the geometrical relationships between the source, microphone, cluster, nearest listener, and farthest listener, we may calculate the amount of gain that may be expected from the cluster. Now, questions of how much SPL, bandwidth, and fidelity will have to be answered. Since we have already scrutinized all of the possible applications and sources of the system and its environment, we should have all the facts at our fingertips to answer these questions. When we assign numbers to SPL and bandwidth, we are ultimately dictating the size, type, and cost of components to be used in the cluster.

Fidelity, however, is another matter altogether. How good the system sounds is both important to the understanding and intelligibility of the source, and is important to the owner as well. While the fidelity of a cluster may be categorized in broad terms, fine points of subjectivity may enter the picture. If this is the case, although measurements can be made to show differences, these audible fine points are often best left in the subjective domain—the human perception. Nonetheless, a broad category of fidelity should be chosen.

Now that we know how loud the system must be and the frequency response that's necessary to fulfill our requirements, the specifications of the cluster's individual components must be considered. Power handling, axial-sensitivity or efficiency, directivity, and coverage of the cluster's individual loudspeaker components are compared to the required levels in octave bands. The total power output of the device should be known, either by direct measurement or direct specification, and computed with the acoustical characteristics of the space to map a direct sound field SPL of the listener area.

One of the most common faults in system designs is right here—at the loudspeaker selection. Many designers will simply take the one-watt sensitivity and factor that figure to the maximum power capacity of the driver—not the case in the real world. This would assume that the loudspeaker is linear throughout its power operating range. Since most loudspeakers we use are under 10 percent efficient, we must realize that a major portion of the electrical energy applied is converted into heat. The non-linearities of loudspeakers are discussed in depth in a recent article by Mark R. Gander. ("Dynamic Linearity and Power Compression in Moving-Coil Loudspeakers," *JAES*, vol. 34, #9.)

Courtesy of JBL

The cluster at the PTL Club in Charlotte, NC, was designed by Boner and Associates and Ken Dickensheets.

Design

We are now ready to design the cluster. We know where the cluster will be, what components we will be using, and where the sources, microphones, and all the listeners will be located. The included horizontal and vertical coverage angles with respect to distance from the cluster are mapped first. This can be most easily done with a computer, especially if the room data can be efficiently entered into the program. If a computer is not used, then the Prohs Harris Cluster Computer[1], or the EV Vamp can be used with great success and real-time 'what if' scenarios.

Another CL&S cluster

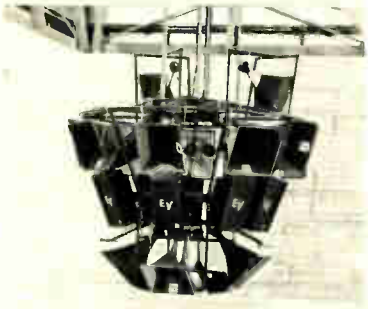
The scenario game is how we will finally determine what coverage horns, how many, and where they will be aimed. A simple technique consists of placing a horn at the cluster position and manipulating it about the space to ensure that it will cover a specific listener area within a "target window" of level variation. This process is repeated as necessary until the entire listener area is covered, and every listener location is within the direct field. In selecting a horn it should be noted that the Q, or measure of directivity, is integral in the relationship between the room

and the cluster deciding where the direct field will be (see Theory & Application, p. 12). Obviously, we must stay within the requirements of the total direct field SPL specified earlier.

Choosing the amount, Q, and direction of loudspeakers will all play an important role in the final amount of gain available in the system. Ideally it is important to place the microphones of a system within the reverberant field of the cluster. This will usually provide an additional 3 dB of gain to the system. Conversely, directional microphones will aid in providing additional gain, however, this is a more complex case which is beyond the scope of this article and is covered in more depth by Robert B. Schulein in "Microphone Considerations in Feedback—Prone Environments," *JAES*, vol. 24, #6.

Perhaps the most difficult aspect of cluster design is the practicalities of the implementation of the design. Size, weight, and physical placement of the loudspeakers in the cluster are often overlooked by many designers (or never considered at all), leaving it up to the installation crew. Over the years, manufacturers have improved their designs mechanically and have provided us with integral mounting provisions, size-coordinated devices, devices that "cluster" more compactly, not to mention horns that maintain their coverage in both the horizontal and vertical planes with respect to frequency increase (constant-directivity, constant-coverage, etc.). Simple scale models of horns and loudspeaker enclosures can easily be made from off-the-shelf materials available at art supply houses. These models allow the designer to quickly assemble a cluster—even take pictures of what the final design should look like.

Up to this time, some imaginary point in space has been designated as the cluster location. We must now make this point real, and so must the location of each device and their relation to each other in the cluster. This raises a question that is still argued among many designers—what is the center "point" for a horn? The idea is that we are ultimately striving to produce a somewhat coherent and symmetrical wavefront with the cluster design.



This Electro-Voice one-and-a-half ton central cluster was installed in the Bern Stadium in Switzerland.

Courtesy of Electro-Voice

We cannot mount all of the drivers in the same physical space. But, keep in mind that we are not designing studio monitors where the listening point will be within an arm's reach. In our applications the listeners will typically be some 20 to 25 feet from the cluster at a minimum. It is important, therefore, that the cluster components be close enough, with respect to frequency/wavelength such that the listener will hear a coherent signal. In practice that means any two devices that a listener will be hearing should be placed within a quarter-wavelength from each other.

While considerations of this coherence are in the time-domain, we are equally concerned with the aspects of coverage. It turns out that most devices, especially hi-Q ones, have centers that are physically different for their center points of coverage and time. This brings us back to the question we raised earlier about the center point. The real answer is the best possible compromise that the designer can implement as a system. Usually mechanical, space, and/or physical limitations will dictate to some degree the final arrangement, making the designers decision for him. An easy-reading tutuorial of time/acoustic-centers may be found in "Loudspeaker Phase Measurements—Transit Responses & Audible Quality," *Bruel & Kjaer Application Notes*, Henning Moller, P17-198.

Related to the bandwidth and fidelity of the cluster is what the cluster will be used for—music, speech, or both. In many venues both music and speech will need reinforcement, or there will be music playback with speech reinforcement. In either case, there are overlapping bandwidths and processing needs. Low-frequency information in music can extend to down to well below 40 Hz, while, energy in the human voice is seldom found below 125 Hz. At the other end of the spectrum, high-frequency information in music can extend above the limits of hearing, while little useful information in the human voice can be found in even the 6 kHz octave. Clearly, the voice needs reinforcement in a narrower bandpass than music.

The limited bandpass of speech is the obvious aspect, but needed gain is often overlooked. If the initial stages of design gathering were performed thoroughly, then we already know that the speech channels typically need more gain than the music channels. This leads us to the concept of two separate channels, or sub-systems, of signal processing of the system inputs.

Many systems have their fidelity ruined because equalization was introduced to bandlimit the cluster's frequency response to suppress feedback in speech inputs. In most installations today, the mixing console will easily accommodate these two channels either through left-right masters, or with the use of sub-group routing. The cluster can be designed and set up for wide-bandwidth and high-fidelity, while the speech-inputs can be processed and reproduced through the cluster as if the cluster was set up specifically for speech.

Signal Processing For The Cluster

Over the years much has been said about crossovers for multi-amplified loudspeaker systems. Lately, even newer systems have

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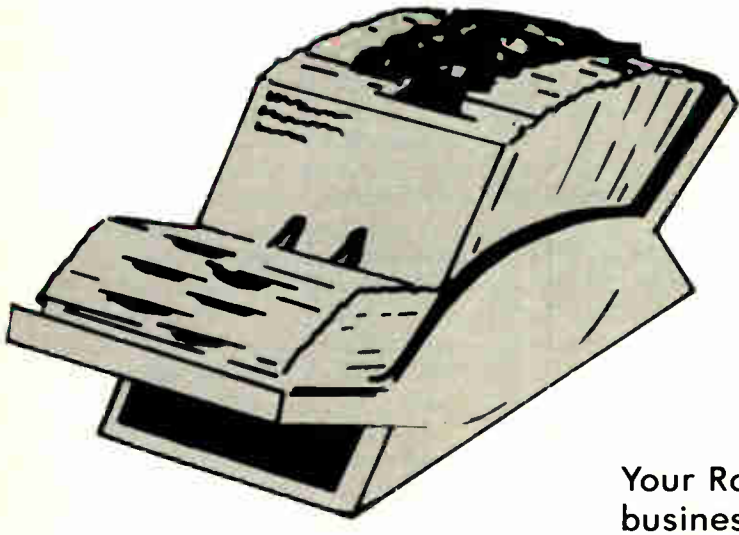

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been designed with many more on the way to yet take advantage of DSP (digital signal processing). However, no matter what form the actual circuit is executed in, the acoustical results will be the same. Different filter types and slopes will yield different combinations of the loudspeaker outputs[2].

Perhaps the most abused feature in electronic crossovers are limiters. Limiters, are becoming more common in electronic crossover systems and are included strictly for system protection. These should be used for absolute protection only. No sound mixer should depend on these for limiting the dynamic range of a vocalist, for example, under any circumstances.

The other two newer features finding their way into the current electronic crossover systems are alignment-delay and equalization. While some units have offered EQ for specific loudspeakers, more units are now offering basic compensation EQ for constant-coverage horns. Alignment delay to compensate for staggered arrival times of individual components of a cluster is certainly a utilitarian feature for a crossover or stand-alone signal processor. However, any good design should not depend on EQ or electronic alignment to correct for gross misalignments in the cluster. As much attention to alignment should be paid as is practical, only depending on electronic delay alignment for optimizing of the final output.

Equalizers

So much has been said about equalization that it is not clear as to what has been said. Nonetheless, a few words of wisdom on this topic. The golden EQ rule: as little as possible! Every aspect of the system should be in alignment before any EQ is attempted, i.e., the geometrical relationships of all sources, transducers, and listeners; and the signal's phase integrity (which includes polarity at all stages). Remember that feedback is a closed-phase-locked loop, and as such any manipulation of location and/or EQ will change the characteristics of this loop.

After the entire system is verified for proper installation and is aligned, both mechanically and electrically, equalization can be used. First any broad-band anomolies should be corrected. Octave, two-third-octave, one-third-octave, or parametric-type equalizers can be used for the broad-band equalization. The units selected should be based in part on what the person responsible for the actual tuning will feel comfortable with. The important factor to consider is that at this point only a general response curve of the early response of the loudspeaker cluster will be equalized.

We use the term "early-response" as opposed to anechoic found in most texts because the effects of any reflections (or shadowing) from adjacent devices and/or building surfaces and combinations of multiple devices will contribute to the overall direct-field response. We will perceive this as 'coherent' early-sound and the envelope of the total amplitude will be balanced spectrally.

As everybody already knows, the notches in frequency response caused by comb-filters cannot be retrieved by equalization. Further equalization should be provided for in the speech channels to band-limit the range and to further attenuate 'narrow' frequency-bands in the goal of stabilizing the tendancy of feedback. These equal-

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izers can be dedicated narrow-band units or parametric ones.

Flow Charts & Computer Programs

Flow charts have been presented by various systems designers and can be readily adopted for use by all. A flow chart can, however, limit the 'vision' of an otherwise creative thinker. A flow chart can be perhaps more appropriately thought of as a checklist. Any prioritized list of procedures, can be used to prepare a computer program to automate the process and help with the time-consuming math.

Many CAD programs for sound system design are readily available for several popular personal computers. We can also be assured that many more are on the way that will be capable of directly communicating with the standard CAD systems used in the architectural/engineering sectors.

For Further Reading

Sound System Design Reference Manual, JBL, 1982

Polar Responses of Electro-Voice HR6040 Horns in Selected Arrays in Pro-Sound, Facts No. 4, September 1976, Electro-Voice.

"Sound Reinforcement: An Anthology," *JAES*, Vols. 1 and 2.

Notes

[1] David H. Bryan, "Sound System Design: Prohs & Cons," *Sound & Communications*, October 1984, pp. 20-37.

[2] Jesse Klapholz, "Electronic Crossovers," *Sound & Communications*, November 1985, pp. 20-27.

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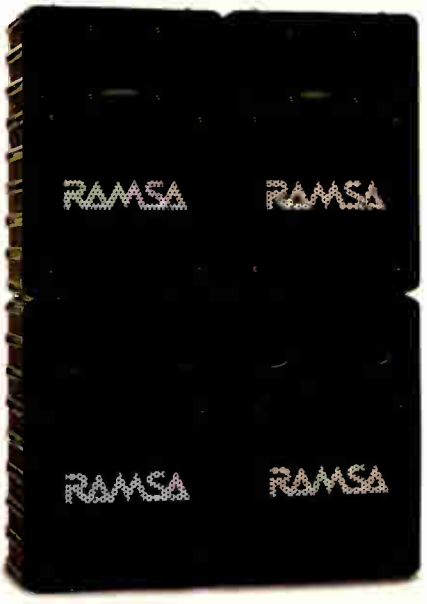

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COLOR IN CCTV

by RICHARD HOFMEISTER
Pulnix America Inc.

In virtually every television program or movie we now view, we expect full, vivid colors. Black and white subjects have been limited to surviving classic feature films and television shows, or as an occasional media for artistic effects. There is even a controversial movement under way to "colorize" old black and white films using computers so that these films will be commercially acceptable to new, young audiences. However, color is a relatively new approach in security surveillance. In fact, monochrome video remains dominant in most currently installed CCTV systems.

Although color technology has been available to the CCTV industry for a long time, significant cost differences between color and monochrome equipment has eliminated use of this equipment in all but a small percentage of installations. This cost differential has extended to maintenance and repair beyond the initial purchase of the color equipment. Color cameras using imaging tubes often require additional servicing to keep color hues balanced over time.

The recent widespread usage of solid state cameras (i.e. cameras featuring solid state silicon imagers as opposed to tubes) has revolutionized the CCTV industry. The new "chip" cameras are extremely small, lightweight, low power, and easy to install. More importantly, the solid state imagers are practically immune to burning, image lag or flaring, and physical shock. Chip cameras are dependable and will operate for many years with degraded image quality or need for maintenance. Solid state technology allows color CCTV cameras to be produced for a relatively low additional cost over a black and white model. This will become especially true over the coming year as new products are introduced. All color cameras are priced according to several different considerations. One consideration is the ability of the cameras to faithfully reproduce the

color hues of the scene being viewed. We have all experienced the distress that accompanies viewing a scene in which the colors are unrealistic and disturbing to our innate sense of proper hues for a given object or landscape. Higher quality cameras reproduce colors very accurately.

Another important consideration is resolution. This is measured in numbers of horizontal and vertical television lines. Good resolution is important in security as proper identification of an individual or event depends on the resolving quality of the image. You may see figures such as 510 x 492 associated with resolution for solid state cameras. This refers to the horizontal and vertical rows of individual picture elements (pixels) which make up the solid state imagers. These figures should not be confused with the TV lines of resolution, which refers to the subjective ability of a viewer to differentiate between decreasingly spaced pairs of lines on a test chart when reproduced on a TV screen. (Video monitors are also rated using this same method). Chip cameras are being produced with ever increasing pixel arrays as technology allows. Although chip cameras generally have lower TV line resolu-

Courtesy of Pulnix America

tion than tube cameras, the flat, precisely-produced imagers created very vivid, distortion free scenes that are more than adequate for most security applications, and are often not discernable from tube type imagers under the same conditions.

A final consideration in pricing a color camera is the type of performance the unit will deliver over a long period of time, and under various light conditions. Generally, the lower the light level requirement, the higher the cost. Tube cameras operating in low light levels require more sensitive imagers. These imagers in tube cameras can be quite costly. Solid state cameras using CCD (charge coupled device) imagers have good low light sensitivity as the inherent nature of the silicon imager.

It is important to note that color cameras are not generally recommended for viewing scenes having very poor lighting. Due to the filters used in front of camera imagers to produce the color hues, some light sensitivity is lost compared to when the same imager is used in a monochrome camera. Colors become somewhat muddied when the lighting is bad. Although some CCD cameras on the market retain excellent color rendition at lower light levels.

Once a good quality color camera has been selected, it is equally important to use a color monitor which meets or exceeds the color reproduction capability of the camera. It is best to use a monitor having at least 600 TV lines of resolution. Check the different monitors available for best color balancing and color hue adjustment. Although some of the latest model broadcast color monitors have an audio/visual provision for CCTV use, it is probably best to avoid monitors of this type. Color computer monitors are also not recommended for color CCTV systems.

Now that the technology makes the adoption of color systems a real practicality in terms of cost effectiveness and ease of implementation, it is important to appreciate the true advantages of color. Most significant is the added information which color provides to a viewer responsible for security surveillance. Subtle color hue changes may lead the operator to detect an intruder that might have gone unnoticed in the flat grays of a monochrome camera. Reaction speed is increased when quick identification is essential. For example, a guard spotting an individual in a crowd can instantly relay a specific color of clothing to assist a colleague to rapidly spot that person. Color is also important for increased accuracy when taped incidents are later used for prosecution. Lastly, it is less fatiguing to view color scenes for security personnel charged with scanning banks of video monitors for many hours.

To review, color can add much to the effectiveness of a good CCTV surveillance system. Recent advances in camera technology have resulted in a new generation of robust and high quality cameras that are closing the traditional cost gap between monochrome and color. While black and white remains more practical in very low light applications, color should be considered for many routine surveillance systems.

Richard Hofmeister is sales manager for the Video Products Division of Pulnix America. He is also co-author of *The Security Dictionary*.

THEORY & APPLICATION

(continued from page 12)

ground being applied to a point common with an input.

The cure for common ground problems is anything that is present that will reduce the magnitude of the voltage produced by the current. Often the current can not be eliminated and the resistance in the common conductors must be reduced. The best approach is to route the conductors differently. Thus when the loudspeaker connection in *Figure 3* is made to a point at the opposite side of the input ground, a voltage is induced in a path not including the input. If this is not possible, a solution would be to reduce the resistance in that path so that the voltage is not high enough to affect the input. This can be done with heavy busbar or generally larger conductors. However it is clear that some voltage will be produced no matter how large the conductors are made. So, it is better to improve the routing of such currents.

Grounding problems are the principle reason for the failure of an otherwise well-designed sound system to meet its specifications. They occur when undesirable electrical components are mechanically produced by the careless placement of parts and wiring. Avoidance of such problems requires recognition of the sound system as a physical, mechanical, three-dimensional device.

Daniel Queen has been the head of Daniel Queen and Associates, an acoustical consulting firm since its inception 20 years ago.

Ad Index

COMPUTER TESTING OF
The Sound System for

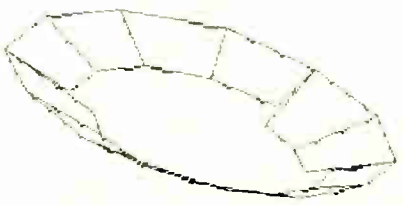
by Mike Klasco
Menlo Scientific

Seoul, Korea is the site of the 1988 Olympic Games and the country has been avidly preparing for the event.

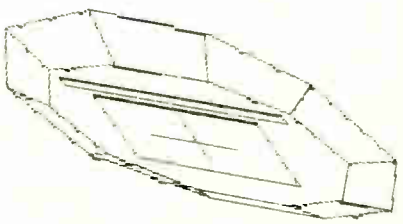
Since my consulting work brings me to South Korea every few months, and one of my clients, JE-IL Electronics, was designing and installing the sound systems for the Olympic facilities, I became involved with the project. We were to set up a computer-aided-engineering capability to prepare the computer simulations and to test the sound systems and acoustics of all the installations.

The project was to include the main stadium and the five arenas: fencing, tennis, gymnastics, cycling, and weightlifting. The simulation section was to include reverberation and predictions, maximum sound level, and sound intensity contour plots. The testing program included RT60; echograms (early reflection analysis); adjusting levels/horn re-aiming; setting electronic crossovers, equalizers, and time delays; and the other aspects of system set-up.

For the 1984 Olympic Games in Los Angeles, Mashushita performed computer simulations with specially prepared software and a mainframe computer. We were attempting to accomplish this project in Seoul with a audio-computer-workstation based on Apple II and IBM ST compatible personal computers. The workstations were identical to conventional Apple and IBM personal computers except



Seating for fencing, oblique view.

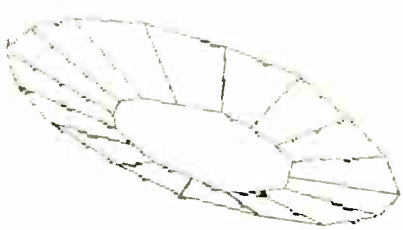


Seating for the Main Stadium, oblique view.

the '88 Olympics

Courtesy of the Korean National Tourist Corp.

'Top, Left) Interior view of the baseball stadium. (Top) The Olympic Main Stadium under construction in the Seoul Sport Complex (prior to 1984). (Top, Right) Interior view of the Main Stadium.



Seating for gymnastics, oblique view.

that they were built into rugged transportable cases and had audio/acoustic test instrument plug-in cards. The software used is commercially available.

After receiving the plans, the first step was to review each facility. Usually, sifting through architectural prints can take some time just to get familiar with the facility and to find which prints have the information you need. It becomes a lot harder when many of the notations are in Korean!

Almost every variation of facility/sound system layout was represented in this project. The main stadium is open with circular seating area, multiple levels, and a distributed sound system. The gymnastics and fencing arenas are single tier with circular seating and a stretched fabric roof and central speaker clusters. The rectangular-shaped tennis arena is open with single tier seating and a distributed system. The cycling arena is partially enclosed, with single tier seating, with a split main cluster and a secondary distributed system. The weightlifting arena is an enclosed rectangular structure with a main cluster.

Most of the drivers were designed and manufactured by Sammi Ltd.—Korea's largest and oldest speaker manufacturer. Although virtually unknown in the United States, Sammi is an O.E.M. for a number of the large U.S. loudspeaker companies.

The most commonly used component was a 10-inch cast frame woofer (with 103 dB sensitivity), a one-inch bolt-on compression driver, and a ring radiator bullet tweeter. Additional

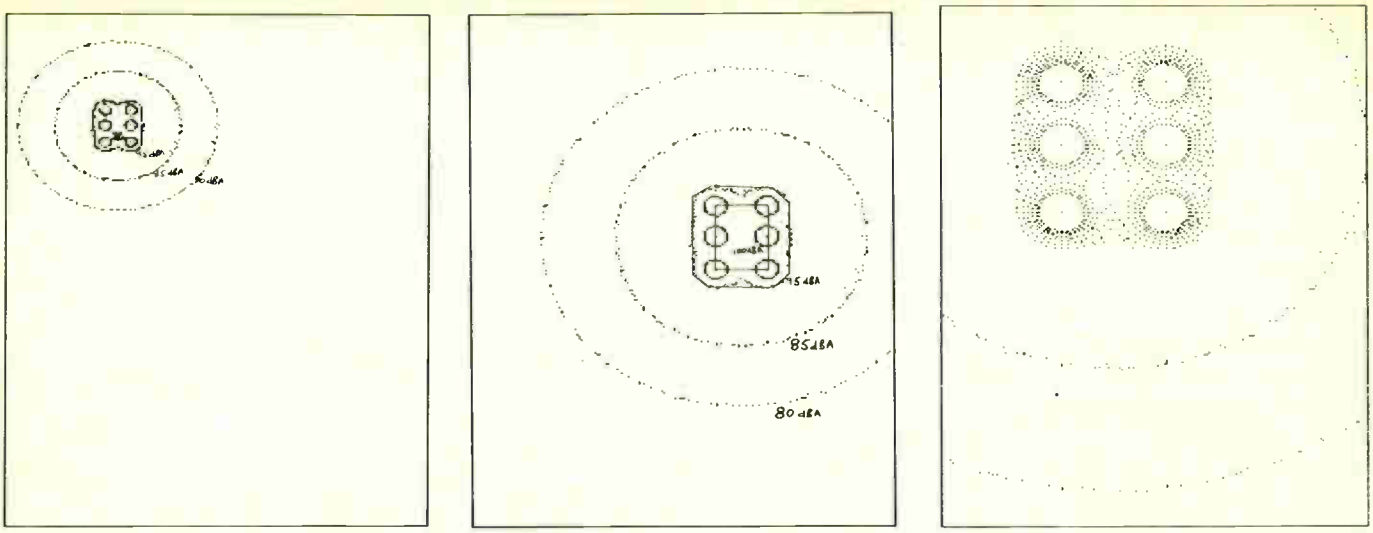


Fig. 1: **Using the Tennis arena as an example, an overview is provided by using a 2000′ x 1370′ window, much larger than the arena boundry. Each contour is labeled, and there are four contours; 80 dBA, 85 dBA, 95 dBA, and 100 dBA. The six circles with a center dot are the 100 dBA contours of each cluster. The dot is the location of each cluster.** *Fig. 2:* **We have zoomed in on the Tennis arena, and the playing field and seating areas have been sketched onto the plot.** *Fig. 3:* **The window has been zoomed again. Additional contours have been plotted, in 1 dB steps from 95 dBA to 100 dBA.**

components used were two-inch bolt-on JBL compression drivers. Horns were either constant directivity or multi-cell types, manufactured by JE-IL Electronics. Amplifiers, electronic crossovers, and consoles were also manufactured by JE-IL Electronics. The one-third octave equalizers were from UREI.

To develop the reverberation predictions for each space, I used Acoustics II, a software program from Headware which runs on the Apple II. This program asks for materials for each surface, square footage, etc., and has a material absorption coefficient file library which can easily be expanded. The results are given using the common reverb formulas and the program indicates the formula most likely to be accurate for each octave band.

Although intended for small to medium size spaces, the actual RT60s match closely between the simulations and actual tests. There are a number of programs for selection of horns, and coverage patterns, such as Altec's Isobars, EV's Vamp, and Prohs and the Harris Cluster Computer. As the design had already been completed and my job was to confirm and optimize the design, the ideal program appeared to be JBL's CADP. I had also looked into the new Bose Modeler program, but this was still under development at the time.

Entering the Acoustic Space and Sound System

The JBL CADP calls for the coordinates of the seating and speakers to be entered with the keyboard. This entails a grid be set up on the print and data entry which is unnecessarily time consuming. The speed of recreating the facility and sound system in the computer could be done more accurately and efficiently if a graphics tablet capability was built into the program.

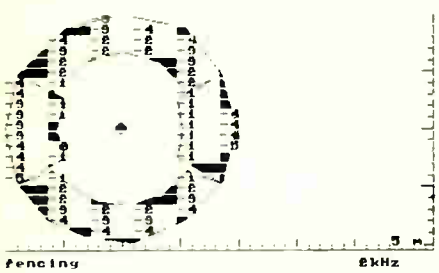
With the graphics tablet, the scale of the print would be entered into the program and the print would be placed over the tablet. The corners of the seating areas would be labeled and simply pointed to with a stylus. Data entry using this technique would require less than 10 percent of the time that locating, determining, and entering by keyboard the same coordinates and with a less chance of error.

Even more efficient would be if the program could *read* the AutoCAD files of architectural prints. AutoCAD is a very popular drafting program with architects. If the AutoCAD file print could be read by the program then simply using the AutoCAD file disk with special symbols for specific speakers, amplifiers, etc., and eliminate the need for any manual data entry. These comments apply not only to the JBL program, but to all the other audio system design programs.

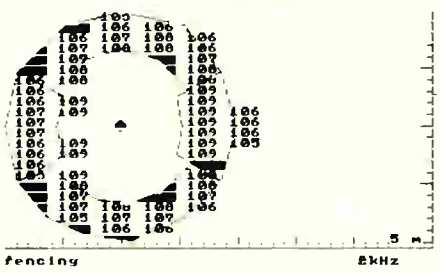
Aside from entering the coordinates, the rest is a lot of fun, such as changing or re-aiming horns, adjusting levels, and comparing results. Coverage, uniformity, maximum SPL, intelligibility, and direct/reflected ratios can be easily checked out. Once familiar with the program, the only other time consuming aspect is creating files for new drivers and horns. The data required by the program is somewhat more detailed than is provided by suppliers other than JBL and must be determined independently. Some of the print-outs are shown here.

Oblique Views

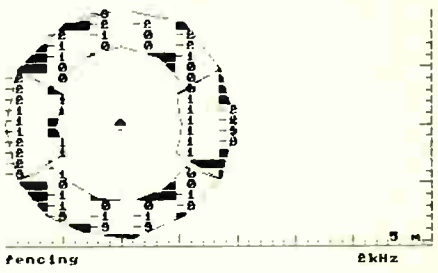
As you enter the seating areas ("seating planes") the user may check for gross errors of data entry by view-



Normalized direct field.



Maximum direct field.



Direct/reverb for R.

ing the three-dimensional representation. Although crude by CAD system standards, these images certainly impress clients. *(Figures 1, 2, 3).*

For low budget jobs that are symmetrical, partial simulations with only some fraction of the seating/sound system may be entered. The disadvantage is that the sound leakage of one set of speakers out of the desired coverage area can not be viewed, which is useful for both main cluster designs and distributed systems.

Although the graphics shown here are for entire arenas, single seating areas are normally selected for study and far more detail can be seen as the screen and data points shown for the entire facility are then zoomed into a single seating area.

Using the fencing area as an example, some of the simulations from the JBL program will perform are:

- sound uniformity—normalized direct field—0 is the point of highest intensity, ie., horn aiming point,
- direct/reverberant field—both entry and full conditions are shown, with R for entry and R' for a full crowd.

RT60 and CAD

The JBL program requires the RT60 at 2 kHz be entered (most of the JBL program is focused at 2 kHz for intelligibility prediction). CADP provides a utility for calculating the RT60 characteristic, but faster and easier is Acoustics II (which unfortunately runs on the Apple II, while CADP runs on the IBM). Alternatively is Studio A from Data Base Design, which runs on the IBM. This program will calculate the RT60, but, as Studio A is really intended for small rooms, not arenas. It also does not allow selection of reverb formulas, therefore you may find you have to get out your calculator. The Altec HP41 calculator programs are an alternative for estimating RT60 and versions of these programs can be found for the Apple II. While the JBL program provides comprehensive information, the graphics are not intuitively satisfying, ie., although the information is provided either in dB, "good," "okay," or "fair," there is not a graphic image of the results.

To provide the visual image of the sound distribution and maximum sound level I used ONLP which runs on Apple II compatibles.

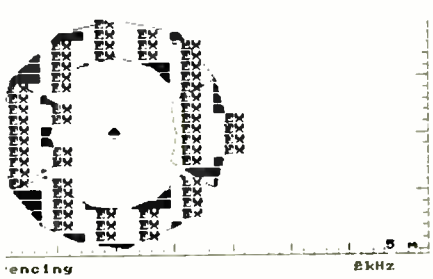
ONLP (Outdoor Noise Level Prediction)

ONLP was created by Battle Memorial Institute's Columbus Laboratories and my firm, Menlo Scientific, has further developed this program and is licensed to market it .

One of the utilities of the program graphs a sound intensity contour (Figure 1). The contour plot provides an instantly understandable display that is satisfying even to technically unsophisticated clients, yet is also powerful for the design engineer. The scale and coordinates are adjustable so the user can zoom in on critical areas. The scale of the viewing window may be a few square feet or a few square miles. (I have found both ends of this range useful at times, from modeling the sound field of a printer to design of 175 dB high intensity arrays for the DMZ which had to project over five miles to North Korean bunkers.) Note that barriers (walls) may be entered onto ONLP to show accurate attenuation of sound transmission beyond the arena.

Part II of this article will show test results of the measurements, information, and description of how the Sigma RS-4 was used for one-third octave, reverberation time, and time alignment calibrations, and the IQS 401 was used for echograms (early reflection analysis), and electronic crossover calibration.

Mike Klasco, president and founder of Menlo Scientific, recently completed work on the sound system for the 1988 Olympics in Seoul, Korea. Klasco, a member of the AES, is currently working toward a PhD in Signal Processing Time Compression.



st. intelligibility (R^1)

Designing Fire Alarm Systems

by Martin Needleman

Much confusion is common among contractors installing fire alarm systems. Issues concerning the jurisdiction of code, and what codes actually consist of, are some of the ground rules—simply learned—not understood by all. With an understanding of what the codes are, and how to ascertain the code information for your locality, the basics of fire alarm systems design will unfold easily.

What the designer/specifier should know first are the following: a) what the construction dollar budget is; b) what type of system the owner is looking for, i.e., in terms of sophistication; c) he should be comfortable with the NFPA and BOCA Codes, and d) he should be familiar with all available products so as to design and specify a system that the owner wants and can grow with. This also includes knowing the difference between a multiplexed system, a hard-wired system, and a hybrid system where each detector via a chip can become its own zone and are mutliplexed while the pull stations and bells are hard-wired. The designer/specifier should also know construction methods so that when he puts together a scope of work he will have the ability to intelligently communicate with the installing contractor (or, in case of an in-house design, his own installers) about how the system is to be installed, and how a system can be phased into an existing building.

It becomes extremely important that the designer/specifier be familiar with all the applicable codes and recognize that they state only the absolute minimum requirements. It is incumbent upon the designer to take the system design to the next step and make the systems parameters as described in the codes a cohesive, workable, and expandable system. The system should function for the life expectancy of the building.

When designing a system in an unfamiliar city or municipality, do not assume anything about the applicability of the national or state codes. Contact the Building Inspector's Department and/or the Fire Marshall at the local city or town hall, ask what codes are currently being followed, and obtain local codes for files. Surprisingly, some small towns write their own codes which may differ from, or amend, the NFPA and BOCA codes usually adopted by most cities.

NFPA is the National Fire Protection Association and it consists of approximately 250 standards. BOCA is the Building Officials and Code Administrators International, Inc. BOCA is commonly called the "Basic Building Code." The cities of Philadelphia and Lancaster, in Pennsylvania, as examples, have adopted the BOCA Code as their Building Codes. Caution: Philadelphia has adopted the 1981 version while Lancaster has adopted the 1978 version. The NFPA standards that are applicable to fire alarm design are listed in *Table 1.*

One point that may be overlooked in the review of these complex codes is the documentation. When laying out a system, the drawings will be similar to the layout of a sound system. Microphones, attenuators, receptacles, loudspeakers, etc., will be replaced by smoke detectors, flow switches, pull stations, etc. However, it is important to realize that for reasons of liability all drawings must have the seal of a PE (Professional Engineer) registered in the state where the work is being installed.

UL Listings

There is a difference between using Underwriters Laboratories Listed devices from several manufacturers and using an Underwriters Laboratories List System (ULC). For example, in a high-rise building, where an audio evacuation system is a code requirement, we may be specifying Brand-X fire alarm system, and because of good intelligibility and UL Life Safety Listing we want to use Brand-Y loudspeakers. We must first go to the local authority having jurisdiction (fire marshall or building inspector), and ask for their acceptance of the equipment proposed. Assuming that we have received acceptance, we must then obtain the same acceptance from the insurance carrier for the building who will usually go along with the local authority having jurisdiction. All equipment used must bear the UL listing, otherwise the insurance carrier has the right to deny payment if a fire occurs.

The System - One Example:

The building and system used in this example do in fact exist in Philadelphia, PA. But, for anonymity, generic terms will be used.

A 30 story office building was sold, and part of the condition-of-sale was that the seller would turn over a

building that was in compliance with all pervailing codes. The building had no smoke detection, although it had mechanical code-wheel manual pull-stations, and AC-operated series bells. The prevailing code requires smoke detection in common areas, i.e.: corridors, elevator lobbies, etc., and by reference to the NFPA standards, requires battery back-up for the bells. All wiring is required to be NFPA Class A, more on this later.

The problem is as stated, and there are several ways to go about solving it. Obviously the lowest capital investment in terms of initial equipment costs is to use a hard-wired electromechanical system. But, this is the most expensive method in terms of labor cost. As typically done in hard-wired systems, all devices are wired to a central panel. If the panel is located on the ground floor, and each floor requires 16 conductors, the conduit sizes required become unruly. In addition, expansion of the system is difficult at best and troubleshooting is next to impossible.

Another method is a multiplexed electronic system where though all devices are still connected to a central point it is called a Central Processing Unit (CPU) with a non-volatile memory. The devices in each zone are connected via a four-wire multiplexed communications loop. This is the way we decided to design the system. This decision also allowed the building to remain occupied, as the vertical wiring (wiring between floors) was kept to a minimum.

Since a multiplexed system uses electronic devices (transponders) or data gathering panels that have a high initial cost, we decided to specify a transponder for every third floor. So that one panel on the ground-floor would handle signals from the basement, the ground floor and the first floor. This way 90 percent of the wiring is horizontal above the ceiling of each floor. The vertical conduit runs consist of two three-quarter-inch conduits, each containing a communications loop of two wires.

With these decisions made, we were on our way—so we thought. The front-end of CPU in the case of this building was an existing building automation computer. The idea being that an environmental systems building control system in which software was to be added to accommodate the fire alarm system. This became a very expensive proposition in both software and hardware (remember the ULC requirements). It would have been less expensive for the owner to purchase a basic multiplexed fire alarm system that did not talk with the building automation computer. But, give the owner what he wants, and in this case the owner wanted to take advantage of their existing computer and was willing to pay additional costs.

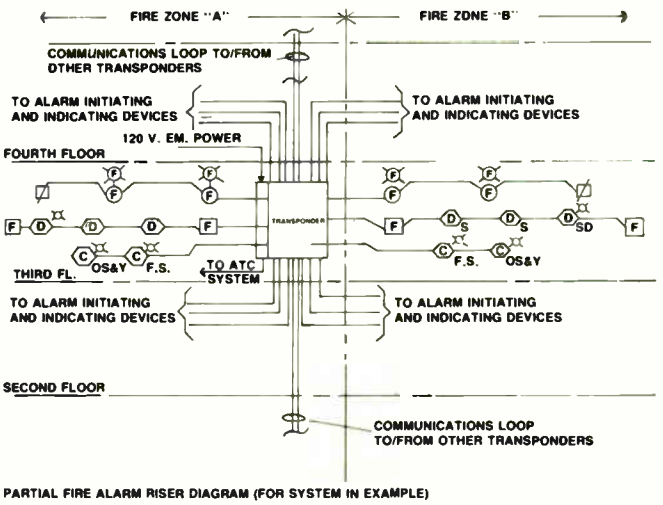
The next problem was that during the installation of the new fire alarm system, we could not allow an occupied building to be without an operating fire alarm system. As the existing equipment was not compatible with the new system being installed there were many locations that had two pull-stations and precautions had to be taken to ensure that a building occupant did not attempt to initiate an alarm from an unoperable pull-station. We instructed the installing contractor to post signs covering the devices that were new but not yet in operation. These signs stated simply, "Station Not Activated."

We were able to put in place all the new devices and wiring as well as all of the new electronics without turning off the existing fire alarm system. This also enables us to test the new system on a floor by floor basis. Also, when the new system was finally tied into the existing computer, we were able to test the entire new system without turning off the existing electromechanical system.

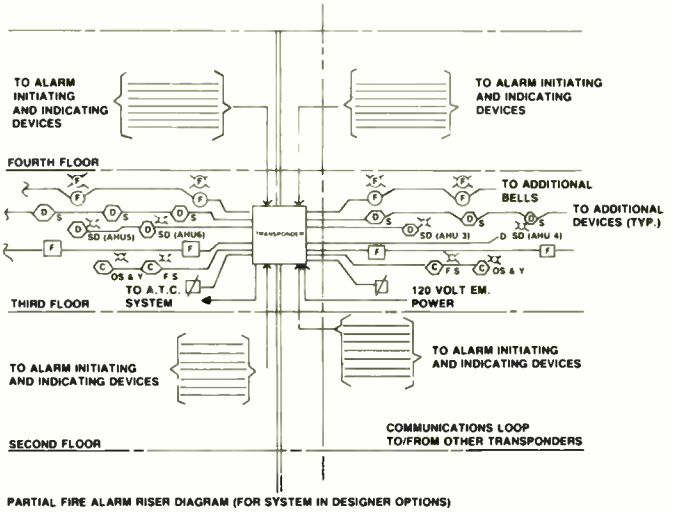
After the new system was activated, the existing system was disconnected and removed—which sounds easier than

Legend Fire Alarm System Devices

- (F) **Bell**
- (F) **Flashing "Fire" Light**
- [F] **Pull Station**
- (D) S **Area Smoke Detector**
- (D) SD **Duct Mounted Smoke Detector (AHO #) with Remote Indicating Light and Air Handling Unit Number**
- (C) FS **Sprinkler Flow with Remote Indicating Light**
- (C) OS & Y **Sprinkler Tamper Switch (open stem & yoke) with Remote Indicating Light**
- **Door Release (Magnetic).**



PARTIAL FIRE ALARM RISER DIAGRAM (FOR SYSTEM IN EXAMPLE)



PARTIAL FIRE ALARM RISER DIAGRAM (FOR SYSTEM IN DESIGNER OPTIONS)

it really was because of patching existing walls, etc.

The aspect of using a multiplexed system in a high-rise building enabled us to lock the fire tower doors, and upon actuation of the fire alarm system, or upon power failure, we were able to automatically unlock the doors, thereby, giving fire safety and security. Yes, the doors meet the code requirements because if the locks fail the doors unlock.

The Wiring and Power for the System

As stated earlier the wiring requirements were for an NFPA Class "A" system. This is an electrically supervised system, so that the occurrence of a break or a ground fault of the installation-wiring circuits which would prohibit the operation of the system, a distinctive trouble-signal will sound.

You may recall that the existing bells in our example system were AC-operated. Delving into the NFPA Standards we find that even when a facility has an emergency generator, its use as a power supply for fire alarm systems shall be permitted only where a specially-trained operator is on duty at all times. This turns out to be unlikely in most buildings of commercial or institutional occupancy. Hence, AC bells are not acceptable by NFPA Standards.

ZONE	INPUT						OUTPUT						
	MANUAL PULL STATION	AREA SMOKE DETECTOR	DUCT SMOKE DETECTOR	WATER FLOW SWITCH	TAMPER SWITCH		RING BELLS/ FLASHING LTS.	FAN SHUT DOWN	DOOR RELEASE	ELEVATOR RECALL	MUNICIPAL TRIP	INDICATION ON PRT & CRT	REMARKS
3A	X						X	X	X	X	X	X	SHUT DOWN AHU #3
3A		X					X	X	X	X	X	X	SHUT DOWN AHU #3
3A			X				X	X	X	X	X	X	SHUT DOWN AHU IN ALARM
3A				X			X	X	X	X	X	X	SHUT DOWN AHU #3
3A					X								INDICATE TROUBLE SIGNAL

Fire Doors, Smoke Doors, and Flow Switches/Tamper Switches

When a given floor is divided into more than one zone, then each zone must be separated from the adjacent one by a fire wall, which is a rating of the partition's ability to withstand combustion for a period of two hours. In office spaces, for example, openings in these walls will be necessary to connect the various areas. Each opening has to have its own protection by means of a door that will automatically close upon actuation of the fire alarm. These doors are typically held open with a magnetic device, so that when either adjacent zone's alarm is actuated, the power is cut to the magnetic holder and the door closes, maintaining the two-hour fire rating. When areas are divided into multi smoke-zones, barriers are established and doors are fitted with these magnetic devices. HVAC system will also require that the ductwork and plenum be zoned

TABLE 1: NFPA standards for fire alarm design.

a) NFPA-26, Supervision of Water Supply Valves.
b) NFPA-70, National Electric Code.
c) NFPA-71, Central Station Signaling Systems.
d) NFPA-72A, Local Protective Signaling Systems.
e) NFPA-72B, Auxiliary Protective Signaling Systems.
f) NFPA-72C, Remote Station Protective Signaling Systems.
g) NFPA-72D, Proprietary Protective Signaling Systems.
h) NFPA-72E, Automatic Fire Detectors.
i) NFPA-80, Fire Doors and Windows.
j) NFPA-90A, Air Conditioning Systems.
k) NFPA-101, Life Safety Code.
l) NFPA-204, Smoke and Heat Venting.

(For information on national codes)
National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

and shutoffs treated in the same manner.

Likewise, in sprinkler systems each zone has a sprinkler flow switch, which is basically a paddle-type switch. When water is flowing through a feed off of the sprinkler system's riser this switch will activate the fire alarm system. There is also a tamper switch which is electrically supervised so that if you want to do work you can turn off part of the sprinkler system. But, when you turn off part of the sprinkler system you must have an indication of some sort that you have done so, usually a trouble signal.

Designer Options

There are several ways to have a multiplex system function. The author, as the designer of a system, would prefer to allow the building owner the ability to know as much information as possible. For instance, if we say that a given floor by code definition is two fire-zones, then we know that we have two reporting areas.

We can now break this down further by indicating the type of device that put the zone (or area) into alarm; i.e., manual pull-stations, area smoke detectors, duct-mounted smoke detectors, and water-flow and tamper switches (which report as a trouble-signal). All of this information will be indicated by a hard-copy printer and at the CPU by either LED readout or on a video monitor. What all this means is that instructions to key personnel can be simplified and proper action taken, thereby, reducing some of the guesswork about the source and location of a fire for quicker response where time is a key element in fire fighting.

Riser Diagrams and I/O Summaries

As you view the typical fire alarm system riser diagrams you may want to think of the signals as inputs/outputs. Doing this will assist you in writing the specifications, i.e., Input/Output Summary Schedule (also known as I/O Summary). The use of an I/O Summary will allow easier pricing from the vendor(s) to the contractor, and will usually mean better pricing.

For example: the alarm initiating devices (manual pull stations, area smoke detectors, sprinkler flow switches, etc.) are input signals to the system. The alarm indicating and control devices (bells, flashing Fire Lights, door lock releases, etc.) are output signals from the system.

To take this thought one step further in our example system, if an area smoke detector on the third floor of fire-zone "A" was in an alarm condition the following would happen. The zone in alarm condition would indicate on the computer printer and the CRT, a signal would be sent to the local fire company, and the bells would ring throughout the entire protected premises in a coded manner indicative of the floor (zone) in alarm, the flashing lights would flash at about 120 flashs/minute, the fire tower doors would unlock, and any other control functions would be carried out.

Other control functions might include such things as elevator recall to the ground level, sending of a signal to the Automatic Temperature Control (ATC) system to effect fan shut-down or for exhaust fan start if there is an engineered removal system as well as other life safet systems.

AES Convention

This year's AES Convention was encouraging for most in attendance because it was staged as what one would observe as two separate events—the technical sessions and the exhibits. With the huge Los Angeles Convention Center set up as the headquarters for the manufacturers exhibits, there was no crowding at all while accommodating the record breaking 10,000-plus attendees. The site for the technical sessions was just a three-minute shuttle bus ride away at the L.A. Hilton Hotel.

New technology was not as widespread, in the technical sense of the word, as opposed to the aspect of product implementation. R&D is yielding products that we can use in our businesses, and these products are becoming more practical and economical. Digital audio is something familiar to us all, and many new products are entering the marketplace at increased cost to performance points.

Clearly, one of the innovators in digital technology is Lexicon Inc. (remember they introduced the first digital delay line over 15 years ago). This year, Lexicon was demonstrating the digital audio production system of the future—Opus. Opus uses random access technology to produce a fully digital audio production system including console, signal processing, editing, and archival storage, and playback.

Yamaha also showed the latest results of their ongoing R&D efforts in DSP (digital signal processing)—the DMP7 Digital Mixing Processor. The DMP7 is a fully digital 8 X 2 mixer which features a three-band parametric equalizer, panning, effects buss controls, and motorized faders on each input. The three effects busses provide up to 15 different digital effects each—ala the SPX-90. The output busses feature digital compression and externally controllable output levels. All mixing and settings may be memorized as "scenes." A digital-mix-buss is also included which, for example, would allow one to cascade up to four DMP7s creating a 32 X 2 mixer with 12 DSP multi-effects systems. The projected price for the DMP7 is under $3,900.

On the more traditional side of DSP was AKG's ADR-68K digital reverb and effects unit; ART's PRO-Verb, a $395-list multi-effects unit with 100 presets and MIDI; Audio Digital's first digital processors the ADD-2 and ADD-3 with two and three outputs respectively, designed for cluster/loudspeaker alignment/delay; JBL's new cluster/loudspeaker alignment/delay the 7922, which features linear-phase filters and an optimized gain control scheme; and Ibanez's SDR 1000 Stereo Digital Reverb, which incorporates a dual-DSP IC making it capable of true stereo or independent two-channel operation.

A new company to the audio business is DCS Audio Products, Inc. They debuted the DAP-1 Digital Audio Processor which implements some rather unique processing techniques. The DAP-1 uses an extremely high-speed processor that handles the four-channel digitized data in real-time. Besides the obvious recording studio and reinforcement applications, applications in R&D and academia will warrant the replacement of their time-consuming off-line processing with the DAP-1. The DAP-1 should prove to be a powerful device for electronic-architecture systems. This model, as well as a slave version, can be externally controlled via a computer.

Companies which showed new micro-computer controlled products included MicroAudio, IED, and Oxmoor. MicroAudio showed its 2800 RTA/EQ controller and EQ Pods. IED showed its new rack-mount 590X microcomputer system. Oxmoor showed its DEQ-29BC (boost/cut) and DEQ-29CO (cut-only) 29, one-third-octave-band equalizers. These single-space rack-mount units are knob-free and are designed to be set-and-forget with a Macintosh or MS-DOS PC which can program any of the 100 on-board non-volatile memories (eight curves on the cut-only version) in 0.5 dB steps through a +/− 12 dB range.

In support of analog designs was Dolby Labs with its Spectral Recording process which allows one to achieve equivalent or better digital audio performance using traditional analog signal transmission or recording systems. Orban introduced two new analog products the Model 787A Programmable Mic Processor and the Model 464A Co-Operator. The 787A includes a mic preamp, three-band

Review

by Jesse Klapholz

parametric EQ, compressor, de-esser, noise gate, compressor gate, and ducker all programmable with memory for storing up to 32 different set ups all-in-one unit. The Orban 464A is a dual-channel, dual-space unit that includes transparent level control, compression, "silence gate", and HF limiting.

Of worthy mention is a new unit from Elison of Paris, the YSMA 12. Resembling a 12-band EQ, the YSMA 12 is really a single-ended, non-encoding noise reduction unit that ingeniously operates in 12-bands of reduction with the threshold adjustable in each frequency band. Also for cleaning up noisy signals was Brooke Siren System's DPR-502 dual-channel noise-gate. The DPR-502 features two innovations: Auto Threshold and Auto Attack. The auto features along with the parametric Key Filter, Key Level Meter, and Key Listen make this device a good candidate for the demanding sound engineer.

In the loudspeaker arena EAW was showing a new carbon-fiber diaphragm, two-inch-exit driver; a one-inch-exit driver with 1 to 18 kHz response and 35-watt RMS power capacity; and an 18-inch-LF loudspeaker with a 400-watt continuous sine-wave rating. Ramsa demonstrated a new WS-A240 vented, direct-radiator, sub-woofer system. At just over two cubic feet, in a molded enclosure with interlocking ribs, this package should be easy to use in single or multiple setups yielding good mutual-coupling.

Two new loudspeaker companies to enter the sound contracting market were Martin Audio USA and Apogee Sound Inc. Both companies offer a wide range of integrated systems packages. Also, EV, Cerwin-Vega, and Turbosound displayed their new manifold technology loudspeaker systems. Finally, for the loudspeaker system designer, CNS Electronics introduced LEAP, one of the most comprehensive loudspeaker enclosure analysis programs written to run on a MS-DOS PC.

As anyone would expect at an AES show, the test equipment guys were out in full force. Ivie was showing a hand-held, one-third-octave RTA, that is built into a computer with a full qwerty-keyboard, printer, and calibrated microphone. A computer/one-third-octave RTA shown by dbx (which will be out this year) compares an input signal, the output of a console for example, to the output of a microphone, so the frequency response of a sound system may be measured using the program material itself. Also, Apogee Electronics debuted a computer-controlled one-third-octave RTA.

On the software side, Sound Technology was demonstrating a new program that automates the operation of its distortion/audio test sets, and presents new types of data. Audio Precision showed its new Wow & Flutter option, and multi-in/out switcher that automates the testing of consoles of tape decks. The Techron TEF 10/12 showed two new software releases, V-Box-Res for designing single or multiple LF-enclosures, and Polar for displaying the polar pattern of microphones or loudspeakers. IQS debuted the new 416-A multi-channel signal analyzer. The 416-A resides in a MS-DOS PC and is capable of up to 16 channels of simultaneous analysis. Using DSP software the unit was running frequency, phase, correlation, etc., and impulse responses in pseudo-real time.

With limited space available it is impossible to report as many new products as were shown in the microphone, wireless microphone, mixer, signal processor, amplifier, and loudspeaker categories. But in the months to come, many will run in *Sound & Communications*' Products In Review column.

It was necessary to walk between the two sites in the sunny California weather to attend several *private* demonstrations. The most impressive of these was the "Delta stereophone" sound reinforcement by AKG. Many were impressed by the high degree of intelligibility and naturalness of speech reinforcement produced by this system.

The technical sessions were well attended by listeners and lecturers alike. One point was made clear, people are still figuring out how to build a better mouse-trap in the areas of loudspeakers, crossover, analyzers, acoustical math....

As last year, audio tapes are available of all the sessions

(continued on page 49)

LAB TEST REPORT

SONIC SYSTEMS' MODEL 168 SOUNDSPHERE LOUDSPEAKER

by Farrel M. Becker
AUDIO-ARTISTRY

The Model 168 Soundsphere is one of several loudspeakers manufactured by Sonic Systems. The drivers in Soundspheres are in a spherical enclosure and radiate into a reflector. Some models use tweeters spaced around the sphere with a woofer radiating into the reflector.

The Model 168 uses a 15-inch ported spherical enclosure with an eight-inch coaxial driver that radiates directly into a 20-inch reflector. Its overall height is 19-inches. Both the enclosure and the reflector are made of fiberglass and are available in almost any color. The weight of the loudspeaker is 20 pounds.

The 168 carries a 75 watt power handling rating. A short length of clear-jacketed "zip" cord extends from the bottom of the reflector for connecting to the loudspeaker. No polarity indication is given. On the unit I tested, the dark colored conductor was positive.

Figure 1 shows the magnitude of impedance for the loudspeaker. The minimum impedance is 7.7 ohms and occurs at 8,370 Hz. The impedance at the loudspeaker's resonant frequency of 90 Hz is 46.7 ohms. The 27.8 ohm peak at 37.5 Hz is due to the port.

The term *on axis* does not have a lot of meaning with a loudspeaker such as this. Since Soundspheres are usually mounted on or hung from the ceiling with the reflector up, I used a position that would be directly below the loudspeaker for the on-axis measurements. This is the point directly opposite the reflector.

Figure 2 is the ETC (Energy Time Curve) for the on-axis position. The loudspeaker fills virtually the entire display and actually lasts for over 4 ms. This is most likely due to the complex way in which the sound interacts with both the inside and outside of the enclosure and the reflector. There is only a minimal amount of absorptive material glued to the inside of the enclosure.

The anechoic frequency response for this position is shown in **Figure 3**. The

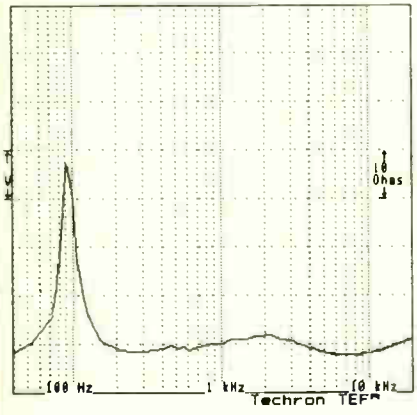


Figure 1 Magnitude of Soundsphere 168 impedance, 0-20 kHz, 7 Hz resolution.

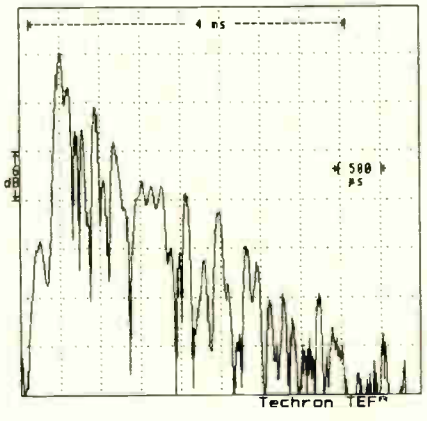


Figure 2 "On axis" ETC.

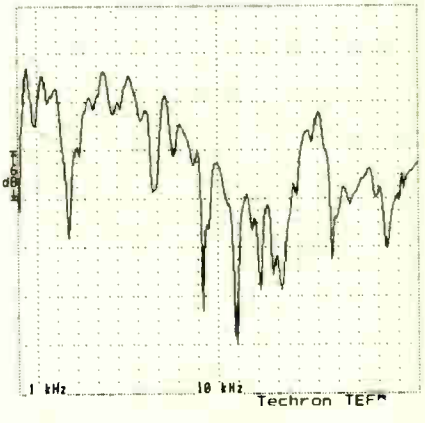
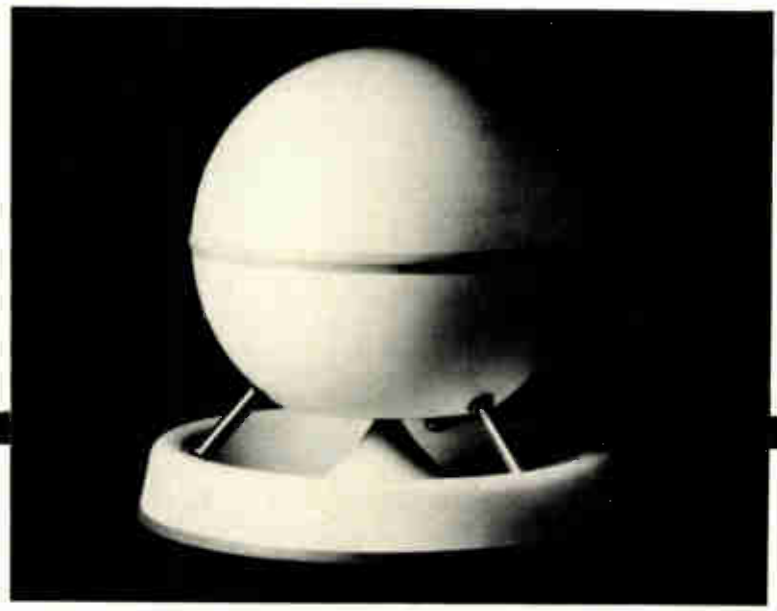


Figure 3 "On axis" frequency response, 0-20 kHz, 150 Hz resolution.



1 watt/four foot sensitivity at 1 kHz is 89.6 dB. The EIA rating is 42.1 dB. **Figure 4** is a low frequency semi-near field measurement made one inch from the top of the sphere (opposite the reflector). **Figure 5** shows the response of the port. The ragged response is, again, most likely due to the interaction with the sphere and reflector.

The raggedness of the frequency response made it impossible to show all of the phase response in one display of 360 degrees. In **Figure 6** the phase "wraps" around from bottom to top at four points marked 1 through 4. Cancellations in the frequency response occur at these points.

The Soundsphere is an attempt to create an omnidirectional loudspeaker. The spherical shape is reminiscent of the spherical spreading of the sound radiated by a point source. A truly omnidirectional loudspeaker would have the same frequency and time responses in all directions.

Figures 7 and 8 show the frequency response 30 and 60 degrees respectively from the on-axis position. **Figure 9** is the response taken at 90 degrees or in the "horizontal" plane of the sphere (i.e. at a right angle to a line from the center of the reflector to a point on the top of the sphere opposite the reflector).

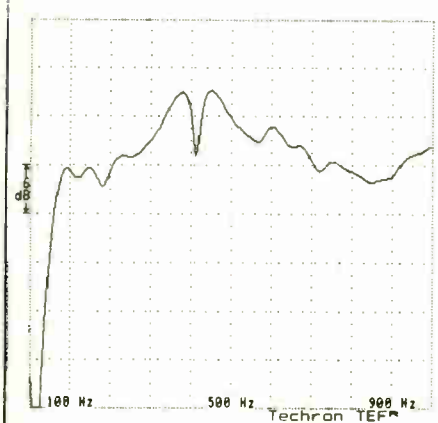


Figure 4 "On axis" near-field frequency response, 0-1 kHz, 35 Hz resolution.

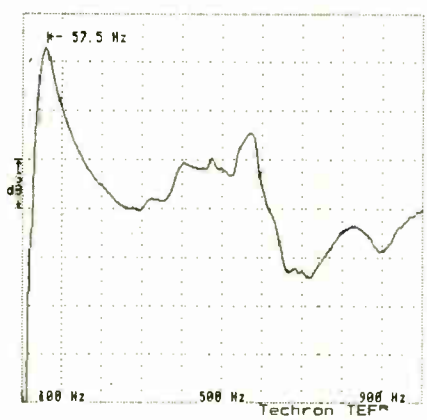


Figure 5 Frequency response of port, 0-20 kHz, 14 Hz resolution.

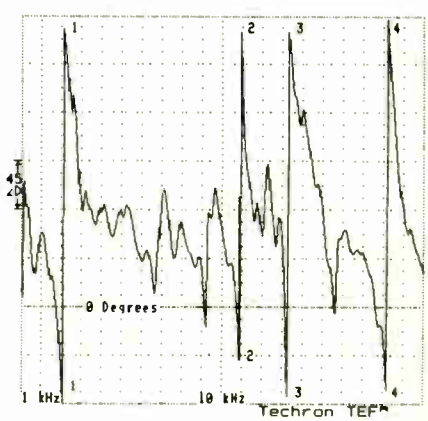


Figure 6 "On axis" phase response, 0-20 kHz, 150 Hz resolution.

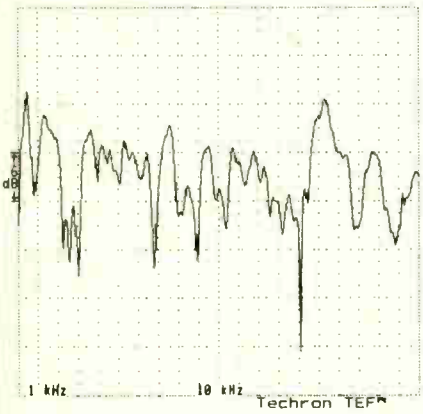


Figure 7 Frequency response 30 degrees "off axis," 0-20 kHz, 150 Hz resolution.

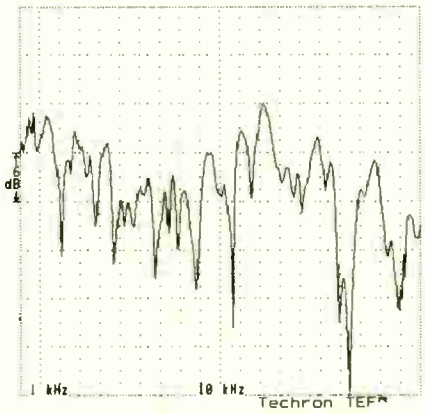


Figure 8 Frequency response 60 degrees "off axis," 0-20 kHz, 150 Hz resolution.

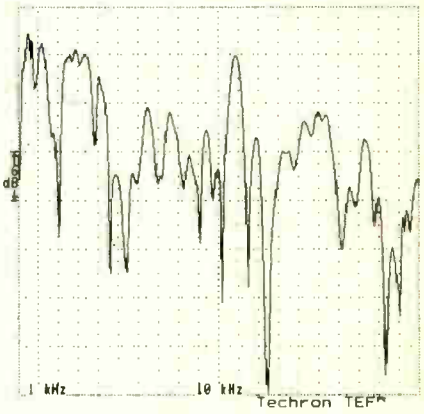


Figure 9 Frequency response in "horizontal plane," 0-20 kHz, 150 Hz resolution.

Referring to **Figure 3,** there are significant differences in response with angle around the sphere. **Figure 10** is an ETC taken in the horizontal plane. The majority of the energy now occurs within 2.5 ms, but there is still some output out to 3.9 ms.

The variation in frequency and time response with the angle (often called lobing) is not surprising considering the asymmetries involved. When the listening position is changed, the reflection and diffraction patterns around the sphere and reflector change.

Figure 11 is a composite vertical polar response showing the individual frequencies in the 2 kHz octave band in 50 Hz steps. It is clear that the response is changing dramatically with frequency. In order to get a more intelligible look at the Soundsphere's polar characteristics, **Figures 12, 13, and 14** show the vertical polar response for the 250 Hz, 2 kHz, and 8 kHz octave bands respectively. The loudspeaker is almost omnidirectional at low frequencies, but definitely not at higher frequencies.

The Soundsphere 168 is symmetrical in the horizontal plane. **Figure 15** shows the polar response for each of the octave bands between 250 Hz and 8 kHz overlaid on top of each other. The symmetry of the horizontal plane results in a perfect 360 degree polar. This occurs, however, *only* in the horizontal plane. The Q for the 2 kHz octave band is 1.59.

Probably the best place to use a loudspeaker of this type is in a fairly reverberant room where it can be mounted in such a position so that all of the listeners are well beyond critical

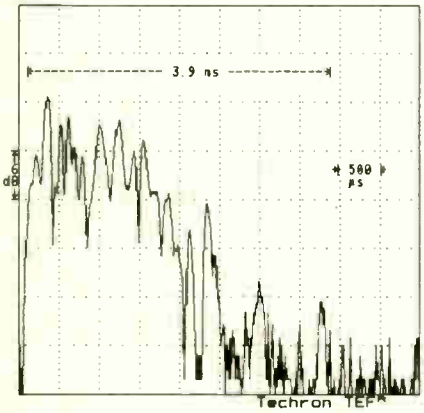


Figure 10 ETC in "horizontal plane."

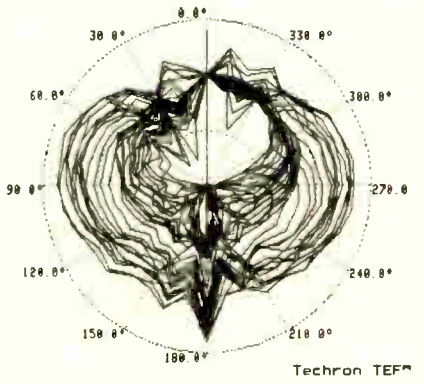


Figure 11 2 kHz octave band vertical polar response, composite of frequencies (50 Hz steps), 10 degrees/data point, 12 dB/division.

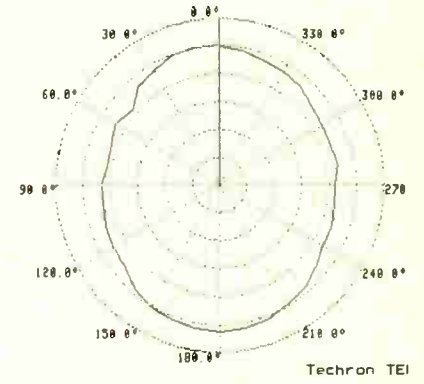


Figure 12 250 Hz octave band vertical polar response, 10 degrees/data point, 6 dB/division.

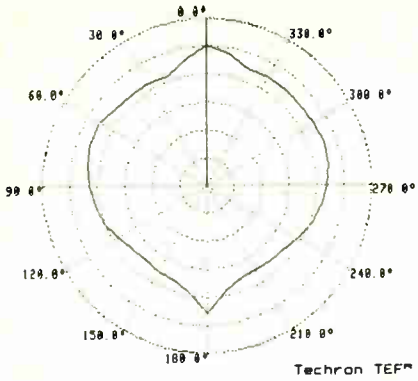


Figure 14 *8 kHz octave band vertical polar response, 10 degrees/data point, 6 dB/division.*

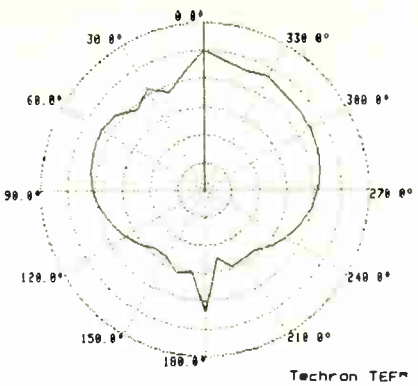


Figure 13 *2 kHz octave band vertical polar response, 10 degrees/data point, 6 dB/division.*

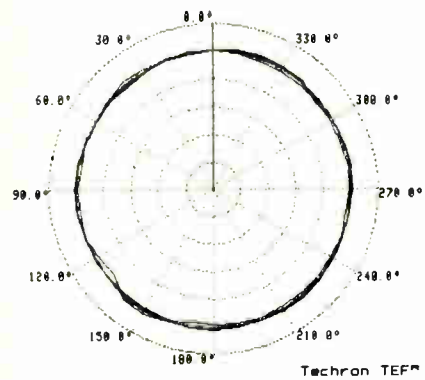


Figure 15 *Horizontal polar response, overlay of octave bands from 250 Hz to 8kHz, 10 degrees/data point, 6 dB/division.*

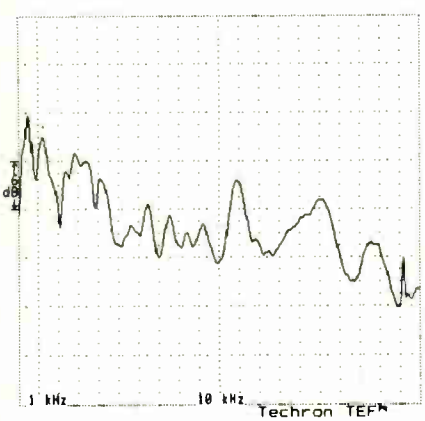


Figure 16 *Power response (average of horizontal and vertical polar responses), 0-20 kHz, 150 Hz resolution.*

Farrel M. Becker, a consultant for Audio Artistry, specializes in live sound for the performing arts. Becker started working with TEF technology in 1979 and now teaches the fundamentals of TEF in Techron training program. Becker is a member of AES, ASA, and USITT.

distance. The frequency response variations will be minimized since the listeners will primarily be hearing the reverberant field. Depending on the reverberation times involved, music should sound acceptable in these applications.

Figure 16 shows the power response of the Soundsphere 168 as derived from the 72 individual measurements that make up the horizontal and vertical polars. A little equalization should provide a relatively flat response in the reverberant field—which could also make the loudspeaker useful for reverb measurement applications.

PRODUCTS IN REVIEW

KLARK–TEKNIK'S JADE 1 LOUDSPEAKER SYSTEM

Klark-Teknik Electronics has announced the introduction of the JADE 1 Active Monitor Loudspeaker System. The JADE 1 is the result of an ongoing joint development project between Munro Associates and Klark-Teknik Acoustic Division.

The JADE 1 is designed as a near-field reference point monitor for quality assessment of digital material.

The incorporation of all support electronics, including amplifier and crossover, has enabled the design team to critically match the electrical and mechanical properties of each system. The result is an optimized phase linearity that allows precise judgement of the stereo imaging in the vertical, horizontal and depth domains, according to the company.

The JADE 1 is a self-contained monitor system requiring only line level audio and AC powering. The system is based on a compact two-way bass reflex design with an extra large port to reduce distortion. On board controls include driver protection, HF and LF compensation, and input level controls.

The JADE 1 has a suggested U.S. retail price of $2,500 per pair.

Circle 7 on Reader Response Card

CLEAR-COM'S DIGITAL INTERCOM BELTPACKS

Clear-Com has announced the Series 500 intercom beltpacks. These new beltpacks utilize a custom designed digital integrated circuit to control noiseless electronic switching on all audio and signaling circuits. The digital IC logic enables the special dual action, momentary or latching microphone pushbutton action. It also enables the "Remote Mic Kill" feature which allows open microphones to be remotely reset to "Off" from the master stations or other location.

Other features included in the Series 500 beltpacks are: recessed damage-protected control; compact size and shape; light weight; dynamic, carbon or electret microphone compatibility, mic On-Off LED indicator, microphone limiter/compressor; multi-segment, high intensity LED call

NEW TECHNOLOGY

What could you do with a micro-computer controlled equalizer that features over 120 user presets; an alphanumeric LCD display; complete MIDI ports and software control including 128 programs; complete control of all functions via an external computer; a composite video output for hooking up a monitor which would provide total viewing of the actual frequency response, slider positions, system status, and MIDI parameters; and the utility of controlling up to 15 "slave" equalizers?

While you're pondering that question, listen to this: ART has developed a two-third-octave controller/equalizer and slave/equalizer called the IEQ and SlaveEQ respectively. The new products include micro-computer, MIDI, and digital control over analog circuitry technologies in a compact/economical package. The IEQ features a new technology developed by ART called Smart Curve™. Smart Curve actually *looks* at the curve selected by the fader positions, and sets the gain of each filter until the actual frequency response is as close as the 0.5 dB steps-size will allow, thus minimizing filter interaction. The sonic advantages are that ringing is minimized, since the Q does not need to be arbitrarily set high.

Unlike other designs, the resolution of the fader positions of IEQ/SlaveEQ is +/– 16 dB in 64 0.5 dB steps. The circuitry used in these designs will yield a dynamic range greater than 100 dB and THD less than .009 percent, according to Mitch Milton, project engineer in charge of the development of the IEQ at ART. Both the IEQ and SlaveEQ are single rack-space units with active-balanced inputs.

The front-panel controls include a cluster of four buttons for up/down (used for increasing or decreasing boost/cut, preset number, program number, etc.) and left/right (for selecting frequency bands, alternate functions, etc.). To the left of these buttons is the LCD display. To the right are the function selection keys which include EQ, PRESET, SYSTEM, and MIDI. For example, when the EQ mode is selected, the right/left keys select the frequency band, and the up/down keys set the amount of boost/cut. After the parameters are set, the STORE button is used to write the EQ curve in any of the 128 battery back-up memories each with a corresponding number and a 16-character user defineable title. Similarly, any of the 128 presets may be read from memory with the RECALL button. To the right of these switches is the ACTIVE button (same as EQ in/out) and LED. While the LCD display shows only the current MODE and parameters, the VIDEO output displays all of the settings of all of the modes, the slider settings frequency response.

The ability to control multiple clusters and multi-zones in a large sound system with a single control-unit and have a bank of equalizers in a remote rack-room will be welcome in many systems. Security, the space saving advantage for sound booths, minimized wiring and installation, and reduced hardware costs are the obvious benefits of this technology. However, offering the enhancement capabilities of voicing sub-groups, for example, can easily be automated and the soundman's favorite EQ curves can be saved for future use, or stepped through during a performance. According to Mitch Milton, future products will take advantage of the computer communications protocol built into the IEQ so that one-third-octave or parametric equalizers could be controlled by the IEQ. With the widespread use and low-cost of MIDI, taking advantage of this communications system allows you to design extremely complex EQ networks which are sonicly sound, as well as simply and economically installed. The IEQ and SlaveEQ list for $595 and $350 respectively. ART also offers a 3.5-inch rack mount composite video monitor with multiple composite video inputs for $150.

Circle 9 on Reader Response Card

signal, one-quarter-watt audio output into 50 ohms; a surface mounting adapter that the beltpack clips into for semi-permanent mounting; a color-coded stripe for easy model type identification; easily replaceable belt clip; ergonomically designed operating controls for ease of operation; rugged case constructed of extruded aluminum and advanced HDS composite material.

Circle 11 on Reader Response Card

TURBOSOUND'S HIGH FREQUENCY DEVICES

Turbosound has introduced the V Series high-frequency device, which employs specially assembled one-inch compression drivers. The design of the V Series allows two drivers to share the same throat and horn without the phase cancellation problems normally encountered.

The V Series reproduces the upper octaves of the audio spectrum without the distortion normally associated with compression drivers. Turbosound engineers have eliminated the phase cancellation effects which interfered with the performance of previous designs of this general type. The solution takes the form of a central coupling device which allows sound waves produced by the two drivers to mix gradually. According to the company, this avoids phase cancellation and produces a clear, distortion free high frequency assembly with an extended response. The central coupling device is the subject of a Principle Patent application.

Circle 12 on Reader Response Card

NEW POWER AMPLIFIER INTRODUCED BY REVOX

The new Revox B242 power amplifier is designed to meet demanding professional sound applications while at the same time providing sonic performance to satisfy discriminating audiophiles, according to Studer Revox.

For professional applications demanding ample power reserves, the B242 provides 200 watt minimum RMS per channel with THD of less than 0.005 percent. A rear panel impedance matching switch and the same power output specifications apply to either 4 or 8 ohm loads. In bridged mono mode, the B242 can supply up to 400 watts. To protect both amp and speakers, the B242 has DC voltage control and electronic short-circuit protection.

The B242 provides both balanced XLR and unbalanced RCA inputs, and input sensitivities are separately adjustable for each channel.

Circle 13 on Reader Response Card

VECTA WIRELESS FEATURES CVX AUDIO—PROCESSING

The Vecta VS-1 wireless microphone system is a new product from Cetec Vega designed and priced for school, church, business, entertainment, and similar applications. It has a clear, crisp sound similar to that of a good wired mic, according to the company, but eliminates tripping over or tugging on tangled mic cables.

The Vecta wireless microphone system features the "CVX" audio-processing technique to provide a high signal-to-noise ratio and extra-quiet background over a wide dynamic range of input levels. System range is up to several hundred feet.

The VS-1 system includes an electret lavalier microphone (with windscreen and clip) wired into a miniature radio transmitter. At the other end of the system is the Vecta receiver, on the same radio frequency as the Vecta transmitter. The Vecta receiver plugs into the user's audio amplifier (or audio recording equipment).

Circle 45 on Reader Response Card

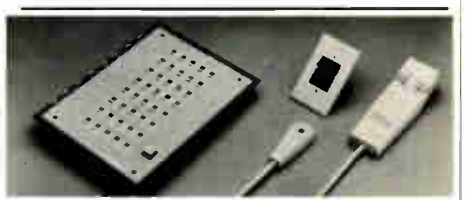
BBE INTRODUCES THE 402 "MAXIE" SONIC MAXIMIZER

BBE has introduced the BBE 402 "Maxie" sonic maximizer used in home-recording studios, smaller musical groups or small club sound systems.

According to BBE, the 402 "Maxie" sonic maximizer is a multi-band, program controlled signal processor which can add brightness and presence without introducing the underside stridency, which so often is characteristic of equalized sound, especially at peak levels. It increases voice intelligibility by eliminating frequency band masking when important sibilant and consonant elements are represented in the program signal. It is said to improve the overall sonic quality of the sound, regardless of speaker quality, according to BBE.

Weighing 5½ pounds, the BBE 402 "Maxie" is packaged in a 17-inch, rack-mounted chassis which occupies one standard EIA space and is a compact five-inches deep. Suggested retail price is $299.

Circle 46 on Reader Response Card



CONTEL EXECUTONE'S NURSE CALL SYSTEM

Contel Executone has introduced Statcom, a visual nurse call system.

The Statcom system provides instant patient-to-nurse communications with distinctive tone and visual call annunciation for both normal and emergency calls. High-luminosity, long-life LED indicators on the annunciator panel provide clear, visual indication of individual patient calls, according to the company.

The call status of up to 60 beds can be displayed at a single annunciator panel. The Statcom system is offered in four patient station configurations of 10, 20, 40, and 60.

Circle 47 on Reader Response Card

PRODUCTS IN REVIEW

a closer look

by gary d. davis

Symetrix 571 SPL Computer™ Maximizes Intelligibility

Symetrix has announced the 571 SPL Computer™, a microprocessor-driven automatic level controller that maximizes sound system intelligibility in response to changing environmental noise conditions. Typical applications include bus and train stations, airports, sports arenas, subway terminals, factories, places of worship, shopping malls, department stores, restaurants, and nightclubs. The SPL Computer can discriminate among environmental noise and background music and paging signals under any circumstances, according to the company. Calibration is a fast two-step process requiring no test gear. Nonvolatile memory stores calibration settings permanently.

In addition, the 571 includes a full-function stand-alone paging and music system controller, with a balanced mic level paging input, a balanced line level paging input (house feed), a background music input, and page-over capability (music ducking). To compensate for input level variations from different signal sources, the 571 includes software selectable AGC. Suggested retail is $799.

Comments: Signal processors that control sound system gain based on the ambient noise level are nothing new. I am aware that Altec Lansing and UREI have made such devices for years. This generic function is almost essential in paging environments like airport terminals, bus depots, and the like, and is useful in industrial or commercial paging systems. Basically, a noise-controlled amplifier enables the paging system to be louder than loud background noise, without being excessively loud during quieter periods of activity. The trick has always been how to differentiate the actual ambient noise from the sound being injected into that environment by the paging system itself. Previous methods relied heavily upon proper placement of the sensing microphone(s) for the background noise level detection circuitry, with some possibility of using phase (polarity reversal and/or time offset) to help cancel the return of paging sound into the sensing mic and differentiate the true background noise level.

According to Dane Butcher of Symetrix, what they have done differently is to use digital side-chain processing and computer logic to assist in that differentiation of noise versus signal, as well as to set the minimum and maximum paging levels. The 571 setup procedure calls for adjusting the quietest and the loudest levels you'll ever want from the system, which are entered in memory. The system also memorizes a profile of the environment's response to the paging system, obtained during a quiet period (like 4 a.m. in an airport or mid-day in a nightclub) as obtained from one or two sensing mics. Logic compares this memorized data to the acoustic environment under typical, noisier conditions. The logic is able to sort out (more or less) how much of the sound is contributed by the paging system, and therefore can determine the true ambient noise level in order to scale the paging output level accordingly.

(continued on page 49)

S&C's Job Report

Format
STATE
city: Name of Job, $ Total of Construction, Phase of Project. Contact: Name, Company, City, State; Telephone Number.

TOTAL CONSTRUCTION
1—up to $1 million
2—$1 million to $9 million
3—$9 million to $17 million
4—$17 million to $25 million
5—$25 million and up
NA—Not Available

PHASE OF PROJECT
A—Planning = Consultant is designing system
B—Pre-Bid = Final plans near completion
C—Bidding = Bid date set
D—Starting = Electrical Contractor/ General Contractor/ Owner buying now

The following jobs are in various phases leading up to bid. If you are interested in any of the projects, please contact only the names printed below.

CALIFORNIA

Bakersfield: Bakersfield Christian Life Center, 3, D. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc. Santa Monica, CA; (213) 450-1733.

Beverly Hills: Ma Maison Hotel, 4,B. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc. Santa Monica, CA; (213) 450-1733.

Cerritos: Performing Arts Center, 4,A. Contact: Robert Long, Theatre Projects, New York, NY; (212) 873-7211

El Segunda: Aerospace Building A-8, 5,C. Contact Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

Escondido: Escondido City Hall, 3,C. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

Los Angeles: Western Airlines Terminal, 5,A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

Ojai: Ojai Valley Inn, 5,A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates Inc., Santa Monica, CA; (213) 450-1733.

Pasadena: Lake Avenue Congregational Church, 4,A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

Sacramento: Mercy Hospital, 2,B Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc. Santa Monica, CA; (213) 450-1733.

San Jose: Fairmont Hotel, 5,D. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

CONNECTICUT

Hartford: Connecticut State Capitol Hall of the House of Representatives, NA, C. Contact: Mark Beningson, Jaffe Acoustics Inc., Norwalk, CT; (203) 838-4167.

FLORIDA

Naples: Naples Performing Arts Center, 4,A. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates, Inc., New York, NY; (212) 420-8787.

St Peterburg: Bayfront Center Auditorium Renovations, 3,B. Contact: Robert Long, Theatre Projects, New York, NY; (212) 873-7211.

ILLINOIS

Highland Park: Ravinia Young Artists Insititute, 2,C. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

KENTUCKY

Alexandria: Campbell County H.S. Gymnasium, 1,A. Contact: Richard J. Lemker & Associates, Covington, KY; (606) 261-9529.

Covington: Holmes High School Auditorium, 1,A. Contact: Richard J. Lemker, Lemker & Associates, Covington, KY; (606) 261-9529.

MISSOURI

Mokane, Callaway County: South Callaway R-2 School District, NA, C. Contact: J. T. Weissenburgger, Engineering Dynamics International, St. Louis, MO; (314) 991-1800.

NEBRASKA

Lincoln: Lied Center for the Performing Arts, 4,D. Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

NEW YORK

Jamestown: Palace Theater, 2,B. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates, Inc., New York, NY; (212) 421-8787.

New York: John Jay College for Criminal Justice, 5,B. Contact:Robert Benson, Knudson-Benson Associates Inc., Mercer Island, WA; (206) 232-2273.

New York: Metropolitan Opera, NY Philharmonic Summer Parks Concerts, NA,A. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

OKLAHOMA

Oklahoma City: Remington Park, 5,A. Contact: Neil Johnson, Ewing Cole Cherry Parsky, Philadelphia, PA; (215) 923-2636.

OHIO

Cleveland: Palace Theatre-Playhouse Square, 2,B. Contact: Mark Beningson, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

Columbus: Ohio State Office Technology Tower (Office) NA, C. Contact: Marc Beningson, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

Columbus: Ohio State Office Tower (Theaters), 5,C. Contact: Chuck McGregor, Jaffe Acoustics Inc., Norwalk CT; (203) 838-4167.

Columbus: Ohio State University Wexner Center for the Visual Arts, 5,D. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

PENNSYLVANIA

Easton: State Theatre Renovations, NA,B. Contact Robert Long, Theatre Projects, New York, NY; (212) 873-7211.

SOUTH CAROLINA

Columbia: University of South Carolina, Kogor Center for the Arts, 3,B. Contact: Chuck McGregor, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

WASHINGTON, D.C.

Washington, DC: National Council of Catholic Bishops Conference Center, 2,C. Contact: Marc Beningson, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

NEW BRUNSWICK, CANADA

St. John: Bicapital Theater Project, 2,A. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates Inc., New York, NY; (212) 420-8787.

To have your jobs listed in S&C's Job Report, send your information to:
S&C's Job Report
220 Westbury Ave.
Carle Place, NY 11514

FACES AND PLACES

Electro-Voice Names Long Director of Marketing

Jim Long has been appointed director of marketing for Electro-Voice, Inc., it was announced by vice president of marketing Paul McGuire.

Long, previously marketing services manager for pro sound reinforcement, is responsible for tactical marketing efforts in EV's music, professional, pro sound reinforcement and commercial business sectors.

Long joined Electro-Voice in July of 1966 as an electrical engineer. Since that time he has held a variety of engineering and marketing positions, including strategic planning and product development functions. He is a graduate of Purdue University with a degree in electrical engineering and received his MBA from Northwestern University.

Imura Named President & CEO Of Matsushita Electric of America

Matsushita Electric Corporation of America (MECA) has announced the appointment of Akiya Imura as president and chief executive officer of the corporation, succeeding Kiyoshi Seki. Seki will return to Japan as president of Matsushita Electric Trading Co., Ltd. (MET), a major subsidiary of Matsushita Electric Industrial Co., Ltd. (MEI).

Imura is currently a director member of the board of Matsushita Electric Trading Co., Ltd., a position he has held since December 1982. He is responsible for the Corporate Planning Division, the Service Division and the Publicity Division of MET.

Imura joined MET in 1957. In 1972 he was assigned to the United Kingdom, and in 1981 he was appointed president of Panasonic U.K., Ltd. During his 12 years of service in the United Kingdom, he established the operation and developed it into one of the leading electronics companies in Great Britain marketing a wide range of Panasonic and Technics products.

Matsushita Electric Corp. of America is known throughout the U.S. and Canada for its Panasonic, Technics, and Quasar brand names.

AKIYA IMURA

REP NEWS

Paso Sound Products has announced that the **De Witt Austin Company** has assumed representation of Paso Sound Products and Elvox Intercom Systems for western Tennessee and Mississippi. De Witt Austin Company presently represents Paso within North Carolina, South Carolina, eastern Tennessee, Alabama and Georgia. This additional territory will be serviced by Ray Austin from the Marietta office.

Community Light & Sound, Inc. has announced that the Denver-based sales group of **Pearson & Pearson** will represent the company's interests in Colorado, Utah, Wyoming, New Mexico, southern Idaho, the Nebraska panhandle, and El Paso, Texas. Managed by **Don** and **John Pearson**, the firm will target their marketing efforts toward both MI and commercial pro audio sales.

MARION ANTONIO

Altec Lansing Names Antonio Materials Manager

Marion (Tony) Antonio has been appointed materials manager of Altec Lansing by Dave Merrey, president of the company. Antonio's responsibilities include purchasing, production control, stockroom, shipping, quality control and customer service.

Before joining Altec Lansing, Antonio worked for Gulton-Luminator from 1981-85, and Gulton-Femco Div. from 1977-81. Prior to that he worked six years for General Electric and four years for Hubbell. Antonio was educated at Georgia Tech, from which he holds a B.S. in Industrial Engineering.

Apogee Sound Announces Newly Appointed Officers

Apogee Sound has announced the appointments of Jim Sides to the position of production manager and Joe Manning to the position of vice president of sales.

Sides will be responsible for the production of all Apogee audio products as well as participating in Apogee's printed circuit designs for signal processors. In the past, Sides worked with McCune Sound and Audio/Visual Headquarters in the Los Angeles area.

Manning will be working at the newly formed southern California branch of Apogee Sound Inc. Formerly regional manager for the California operations of Hoover Audio/Visual, Manning previously worked at McCune Sound as regional manager for the San Diego area for 12 years. Manning will be responsible for coordinating sales activity on a worldwide basis for Apogee products.

SCA Data Systems Appoints Holub

SCA Data Systems has announced the appointment of Frederic Holub as national field service engineer.

Holub will be responsible for any broadcast station interference and working with the dealer network in receiver installation and service.

Bell Named Manager of Bose Professional Products

Bose Corporation has appointed David H. Bell to the position of manager, professional products. He reports to John Geheran, vice president of sales and marketing.

Bell has been with Bose Corporation for more than five years, as general manager of the company's subsidiary in Australia, and, previously, as national sales manager there. Before that, he was national sales manager for W.C. Wedderspoon, an Australian distributor of Bose consumer and professional products.

Bell spent 10 years as a professional jazz and rock musician in Australia. He has also worked as a sound engineer in live production and theatrical presentations.

SUPPLIES•SERVICES•SUPPORT

New Altec Lansing Catalog Covers Complete Product Line

Altec Lansing has announced a new catalog featuring its complete audio product line. The catalog, consisting of 10 brochures and a folder-sized wallet, covers microphones, mixers, signal processing equipment, amplifiers, and loudspeakers manufactured by Altec Lansing.

The catalog has color photographs of each Altec product, complete tables of performance specifications, and applications guides for most product categories.

For a nominal fee of $2, individual copies of the new catalog are available from the company.

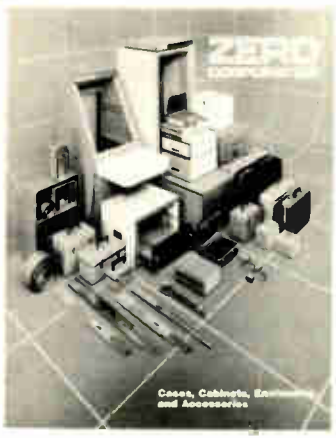
Circle 1 on Reader Response Card

New Overhead Microphone Mount Available From Crown

Crown International has introduced a new microphone mount, the GLM™-OHM. It is a boom stand mount for overhead miking of a drum set or other source with a Crown GLM microphone. The inconspicuous mount adjusts easily and securely positions the microphone.

The GLM-OHM Overhead Mount screws onto a standard microphone stand with a five-eighths-inch 27 thread. Boom length is 60 inches; boom diameter is one-quarter-inches.

Circle 2 on Reader Response Card



New Zero Catalog is Case & Cabinet Sourcebook

Zero Corporation has just released its 290-page 1987 full line standard product catalog.

The catalog includes the company's line of deep drawn aluminum boxes and covers, carrying cases, instrument enclosures, military cases and cabinets, card files, chassis slides and accessories, commercial and industrial electronic cabinets, and consoles, blowers and cooling systems, rotationally-molded transit cases, thermoformed plastics, and more.

The catalog highlights design ideas and engineering data, includes color charts, and offers complete mechanical and military specifications for simple part number ordering.

Many of the products listed in this new reference guide are available for five day delivery ARO. The company also offers engineering support, applications assistance, and technical design assistance for full custom or highly modified product requirements.

Circle 3 on Reader Response Card

Panduit Introduces Line of Stainless Steel Wall Plates

A new line of stainless steel, single gang wall plates has been introduced by Panduit Corp. The wall plates are part of a complete line of Panduit® surface raceway accessories for Telco, CATV, and office wiring.

The type WPS wall plates are made from durable, rust resistant 430 stainless steel with an attractive, brushed finish. They are available in a wide variety of configurations to meet coax, twinax and "D"-sub wiring requirements and are designed for the use with the JB3510 junction box. The WPS-9 and WPS-10 wall plates are pre-wired with modular telephone jacks (single and double). Each wall plate is individually packaged with an inner bag of mounting screws.

The full line of surface raceway accessories and Panduit® wiring products is available nationwide from Panduit stocking distributors.

Circle 4 on Reader Response Card

Brochures Describe Marconi White Noise Test Sets

Marconi Instruments has issued two brochures describing its line of White Noise Test Sets.

The Model 2090B, detailed in an eight page brochure, measures noise and intermodulation on wide-band multichannel telecommunications systems. The brochure gives details, block diagrams, and full specifications.

The Model 2090C Automatic White Noise Test Set, described in a 12-page brochure, provides automatic measurement capability for f.d.m. baseband noise loading tests, specifically n.p.r., signal to noise ratio, and channel power weighted and unweighted. Features described include digital readouts; analog and b.c.d. outputs for recording; semi-automatic control of generator from receiver; GPB operation for automatic measurement sequences. Additional applications are for checking noise performance of VCR's and A to D converters.

Circle 5 on Reader Response Card

Viking's Paging/Loud Ringing Systems Brochure for Upgrades

A new four page brochure describing the complete family of paging and loud ringing products is available from Viking Electronic. The systems are designed to add features to electronic key, 1A2, non-KSU and single line systems. According to the company, these systems will allow the user to upgrade an existing installation or enhance new ones.

Circle 6 on Reader Response Card

CONTRACTING CLOSE-UP

Success at ESSC Regionals Brings New Plans and More Shows for '87

The word from Chicago is that the ESSC Regionals held in Secaucus, NJ, and Baltimore, MD, early last December were *very* successful. So successful that the exhibitors have decided to hold six shows in 1987—double the number of shows last year. The '87 shows will be scheduled in "pairs"—that is in two cities within the same region of the country, but in different markets, a day or two apart. The shows will again be scheduled in the fall and reports from the NSCA, one of the two sponsoring associations, indicate that they will be in cities across the country.

Other new plans for 1987 include changing the times that the exhibit floor is open to noon until 9 p.m. and serving sandwiches and coffee on the floor for dinner with the intention of attracting the people who are too busy during the day to stop by. On the second day the show will be open from 10 a.m. to 4 p.m.

Also new to the regional shows is a height requirement for those booths in the center of the floor. According to Bud Rebedeau, executive secretary for the NSCA, center booths can only be 54 inches from the floor and booths along the wall will be permitted to remain as high as eight feet. (This regulation is currently in effect at the national show.) "This opens the floor and makes it an easier show to look at. It also makes the show friendlier," Rebedeau added.

Educational seminars will continue to be offered at the regional shows. Although a complete listing of seminars for 1987 is not yet available, it has been reported that fiber optics will again be a seminar topic at the fall shows.

The ESSC Regional Shows are sponsored by the National Sound and Communications Association and the Electronic Representatives Association. For more information, call 312-593-8360.

PLEASE SEND all your contracting company's news to:
Contracting Close-up
Sound & Communications
220 Westbury Ave.
Carle Place, NY 11514

CALENDAR OF EVENTS

DATEBOOK

DATE	EVENT/COMMENT	LOCATION	CONTACT
February 9-11	**Solid State Electronics for Non-Electrical Engineers.** Course for technical professionals.	Houston, TX	The Center (201) 238-1600
February 18-20	**Satellite Communications Engineering Principles Course.**	Washington, DC	George Washington University (202) 994-6106
February 23-24	**"Today's Telecommunications, What It's All About."** User-oriented seminar.	New York, NY	J.H. Morgan Consultants (201) 766-0969
February 26-28	**Commtex International '87** Products, seminars, training.	Atlanta, GA	Bobbie Hunt (703) 273-7200
March 2-6	**Integrated Telecommunications Systems Course.**	Washington, DC	George Washington University (202) 994-6106

A CLOSER LOOK

(continued from page 43)

The digital logic allows for some special, software-controlled options, as well: things like very long averaging times, or very short response times (so the system can, for example, ramp up the paging level in the presence of an arriving train or aircraft, yet not "pump" in a nightclub paging application). In a large industrial shop, where different pieces of machinery are periodically turned on and off during the day, multi-minute response times will prevent the paging levels from pumping. If the shop shuts down for a break or at the end of a shift, the paging system should be able to change levels immediately so as not to "blast" eardrums, especially when the hearing protectors have just been removed (everyone follows OSHA rules, right?). Symetrix is building in software options (via DIP switches on the front panel) to deal with this special case so that slow gain increase, fast gain decrease characteristics can be obtained...or vice-versa for other situations.

There is a barrier strip for line-level background music input/output signals at full 20 kHz bandwidth (remember, the unit allows for manual or automatic ducking of background music by the page mic). The barrier strip also accepts a line level paging mic input. In case you want to plug a paging mic directly into the 571, an XLR with 50 dB gain and fairly wide range voice response is provided. Two additional XLRs are provided for the background noise sensing mics. All inputs and outputs are electronically balanced, with output transformers available optionally. Output level is +24 dBm. A noise spec was not available, but they are using the Allison EGC 101 VCA, which is a fairly quiet amplifier. The folks at Symetrix appear to have done their homework on this unit. Though as you know I don't test items for this column, I feel the 571 deserves your *closer look.*

Circle 10 on Reader Response Card

Correction

I owe BGW and our readers an apology. In a previous issue I took a closer look at their SPA-1 and SPA-3 signal processing power amplifiers, and commented that since 10 uS is about one inch, their 50 and 100 microsecond delay increments provided five- or 10-inch physical offset correction. OOPS. My calculator hand slipped, and of course we know 10 uS corresponds to 0.135 inches in standard, sea-level conditions (about one-eighth inch), so the BGW equipment provides more like five-eighths inch and 1¼-inch offset, which is certainly reasonable for the intended application.

AES REVIEW

(continued from page 37)

and workshops from: Mobiltape Company, Inc., 1741 Gardenia Ave., Glendale, CA 91204; (818) 244-8122. While the sessions are almost entirely available in preprint-form from the AES, the workshops are only available archivally in cassette form. The workshops had some enlightening moments in the measurement session in particular. At $79.95 plus $3 shipping and handling, the sound reinforcement related workshops can be highly informative to those who could not attend every breakfast, booth, demo, lunch, meeting, session, workshop, and dinner.

CLASSIFIEDS

Franklin TIME SYSTEMS

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Three 7ft Racks—four Tape-Athon 702-10P Tape Decks, Two 6ft Racks —Tape-Athon 702-10P Tape Decks, Tape-Athon Transports Tape Decks, MTH-10 Tape Decks, and 10-inch Reels. For information & prices call Musi-Matic, Inc. (219) 485-1470.

BUSINESS FOR SALE

Sound and Communications business for sale in the metropolitan Toronto, Ontario area. Have major lines. Good contacts. Over 20 years in business. Good opportunity for young dynamic persons. Interested parties only. Reply to: Attn: J.P. P.O. Box #159, Carle Place, NY 11514

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HELP WANTED

Artec Consultants Inc, a theater planning and acoustic consulting group based in Manhattan, is seeking a person with at least 3 years experience in the design and specification of fixed installation sound reinforcement systems and related electronic systems. We are particularly interested in someone with experience in loudspeaker cluster design for auditorium seating from 400 to 3,400. Please reply to: Anne Louise R. Bottomley, Artec Consultants Inc, 245 Seventh Ave., 8th Floor, NY 10001.

HELP WANTED

SALES/MARKETING MANAGER

Having become a leading supplier of amplifiers to many national touring sound companies, our reputation for building extremely reliable and sonically superior amplifiers is growing rapidly. Recognizing the needs of sound contractors, Crest Audio is shortly introducing a range of stereo, mono and constant voltage amplifiers, designed and built with the same philosophies as our touring sound company models.

We view the contractor market as a serious growth opportunity for Crest Audio, and with this in mind, we are creating a separate division for which we need an experienced individual to manage all phases of the Marketing and Sales.

If you have extensive knowledge of the contractor market, good understanding of amplifiers and systems, and have a successful sales and marketing background, Crest Audio can offer you a career opportunity with excellent potential. We're seeking a hard-working individual who has the ability and dedication to build Crest Audio into as strong a position in the contractor market as we now enjoy in the sound company market.

If you are the professional we need, send your resume in strictest confidence to John V. Lee, President, Crest Audio, 150 Florence Ave., Hawthorne, NJ 07506.

CREST AUDIO

THE PROS SAY A FEW WORDS ABOUT THE MANY COMPONENTS OF JBL.

High-quality components teamed up with results-oriented engineering. That's how JBL Professional helps the pros achieve superior sound for specific applications. Here's what JBL means to five leading professionals— all with vastly different requirements:

"JBL products are very reliable and efficient, and that's why we've used them for 16 years here at Abbey Road Studios. We have JBL equipment in many locations throughout the studios, and these products give us the sound uniformity we really need. We can count on JBL for professional, solid, great-sounding products."
Ken Townsend, General Manager
Abbey Road Studios, London, England

"In the concert sound business, we don't get any second chances. If the sound system doesn't perform, the audience can't come back next week when we've got it right. That's why we chose JBL. JBL products offer professional dependability and great sound—and that's how we define quality in our business. JBL really cares about making their products the best."
Roy Clair
Clair Brothers Audio

"You can't create a truly outstanding soundtrack without being able to hear everything accurately. That's why JBL's clarity was the first thing that impressed me. And with JBL, I can rest assured that our soundtrack will sound just as good in the theaters as it does in the studio."
John Bonner, Chief Engineer
Goldwyn Sound Department
Warner Hollywood Studios

"We first installed JBL equipment when we were selected as the boxing venue for the 1984 Olympics. Our P.A. system brings great consistency and clarity to all our sporting events, including wrestling, motor sports, track meets, and basketball. JBL components deliver outstanding sound regardless of your seating location or the size of the crowd."
Glenn Mon, Acting Director
Los Angeles Sports Arena

"We chose JBL equipment because of its great reliability and transparency. All the worshippers in our 7,000-seat sanctuary must be able to hear equally well. JBL horns accomplish this without coloration. The sound is very clear and natural no matter where you're sitting."
David Taylor, Director of Media
First Southern Baptist Church
Del City, Oklahoma

At JBL Professional, we believe that components should match your application, not the other way around. To hear more about what sound professionals see in us, contact your JBL Professional dealer.

JBL Professional
8500 Balboa Boulevard
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Introducing the only wireless that captures all a Shure mic can give. The new Shure Wireless System.

Never before has a wireless system so precisely matched advanced microphone technology with precision RF electronics. The result is superb sound quality and performance you might expect only from a conventional cabled microphone.

Most systems start with someone else's microphone.
No wireless system can give you more sound quality than the microphone itself can deliver. That's why each new Shure Wireless features a genuine Shure microphone for more accurate sound reproduction. Plus the reliability and durability you've come to expect from Shure.

Designed to overcome major problems found in other wireless systems.
The Shure system features our exclusive Diversiphase™ dual-antenna system designed to eliminate dropout and provide the strongest signal possible at all times. Unlike other systems, Diversiphase corrects reflected or direct (multipath) signals that are out of phase, so they won't cancel each other...and adds them. Result: more antenna gain.

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