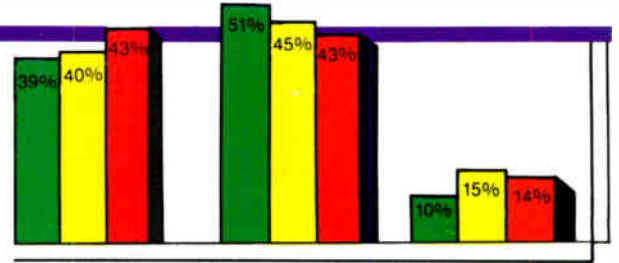


# SOUND & COMMUNICATIONS

Volume 34 Number 12

December 1988

## THE 1988 ECONOMIC REPORT



Supported by an economy whose strength continues to confound many analysts, manufacturers are more optimistic than usual in their forecasts for the coming year: they will be introducing more new product lines, and marketing those lines more aggressively than in previous years. These are among the conclusions drawn from our fourth annual review of the economy as it relates to the sound and communications industry. **36**



## AES CONVENTION HIGHLIGHTS

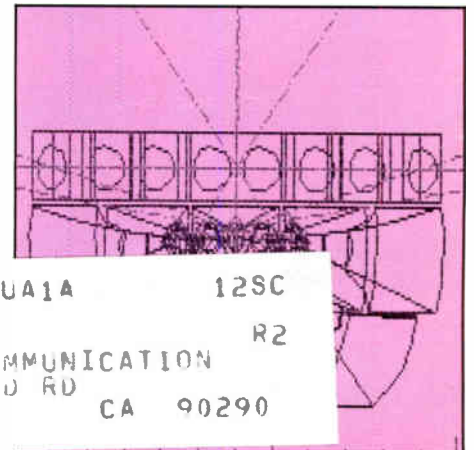
For those of you who were unable to attend the 85th AES convention held recently in Los Angeles (and for those of you who were there, and may have missed some items of interest), our special report in words and pictures reviews the convention highlights. **18**

## MARKET UPDATE: PORTABLE SOUND SYSTEMS

Schools, hospitals, hotels, churches — some of the largest markets for installed sound systems are also some of the largest markets for portable sound systems. Should contractors explore the opportunities offered by what is, for them, a relatively untapped but potentially profitable market? **40**

## CAD PROGRAMS: DESIGN SOFTWARE REVIEW

This month, a series of articles are available on CAD programs for system design. This review of the history of these programs



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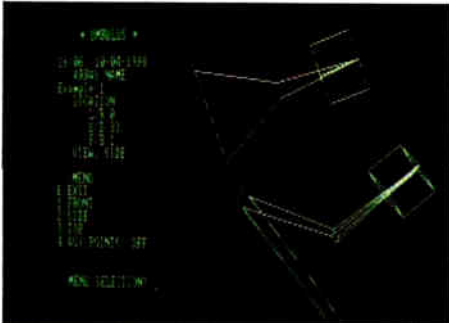
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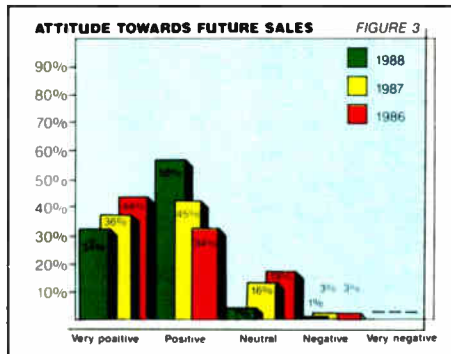
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# SOUND COMMUNICATIONS

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### Coming in January . . .

We continue our series reviewing programs for the computer-aided design of sound systems, take a look at loudspeaker design and development, and much more. Don't miss it !

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World Radio History

## MORE ON SPL

**K**udos to Gary Davis re: his recent article regarding, in essence, more ain't necessarily better when it comes to SPL ("The SPL War," Sound & Communications, October 1988). Copies of this article, with several lines underlined in red, should be required reading for all "sound persons," "house-owners," musicians and all assorted artists.

I, too, leave places because of unbearable levels — and when I introduce myself to someone that I think may wish to know something, I usually get the stare which means, "Yeah, yeah, Mister — get outa my face — I know what I'm doing!" Showing my age, I can report that in the old days, whether it be a small club room or a moderate size room, most musicians and singers wanted and needed sound to sound as if there was no sound! If any amplification was used, it was usually needed because of a room with various and sundry dead spots. Under a small balcony usually demanded a bit of assistance. Today, it appears that even in rooms that are acoustic disasters (naturally) — sound people exacerbate the problem of inherent distortion by pumping up the level and thus creating more problems.

Davis is correct re: where it's at is in the ear of the beholder, not the "maker" or the middle-person/sound person. The audience suffers when loudness triggers the stapedial reflex. This is a bilateral phenomenon that occurs when very loud sounds impinge on our ears and we have a "shock absorber" response. The acoustic reflex involves the contraction of the stapedius muscle which in turn reduces the rocking of our ossicles (middle ear bones). This can further distort the sound that we perceive and it tilts the curve of perception which further makes a fun concert into a non-fun

cacophonous disturbance.

The singers with their monitor speakers, as they demand more and more SPL are in jeopardy also. It's a natural reflex to want to hear ourselves. As sound is increased a singer's demand for increased sound is preceded by the singer getting louder (unknowingly) and louder. The increased force on the vocal folds (vocal cords) and the pharyngeal tissues (throat) can be devastating and can cause vocal modules, tearing and permanent hoarseness. Not a very good situation for a singer unless they wish only a two-year career.

TTS (Temporary Threshold Shift) happens to the audience as well and as we wander out to the street after a bombardment, the TTS is usually accompanied by tinnitus (ear ringing). Yes, it is true that we can apply for an unlisted ear, but we audience-persons come away unhappy and we shouldn't have to. We are also vulnerable in that the TTS can become a permanent threshold shift.

My last comment involves some interesting insight as to why sound gets louder and louder. It may be from bravado, egotism and ignorance alone. Some past research of mine, done years ago, seems to indicate that sound, hi-level sound, may produce a Temporal lobe high (that portion of the brain on the sides). The high produces physiological responses similar to drug ingestion. High pulse rate, breathing rate, perspiration and a general "spaced-out look and feeling."

Those of us that would hope for lower levels may be fighting a losing war!

**Mort Altshuler**  
Member,  
Sound & Communications  
Technical Council

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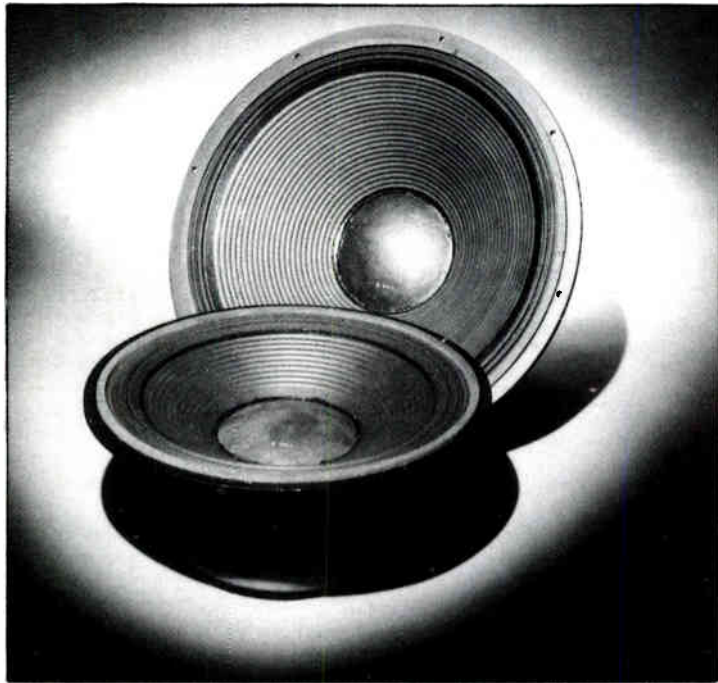


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# NEWSLETTER

## **EXCLUSIVE: SANDELL TO HEAD UNIVERSITY RAYMER**

At press time, it was learned by Sound & Communications that Bob Sandell has left Kurzweil to head up the newly acquired MARK IV company, University/Raymer. Sandell was formerly with Yamaha.

## **AKAI PROFESSIONAL NOT AFFECTED BY WITHDRAWAL OF AKAI CONSUMER**

Akai Consumer Electronics, audio/video distribution, will withdraw from the North American hi-fi/video industry. Akai Professional will not be affected by the withdrawal, according to Jerry R. Freed, president of International Music Company.

In a memo to Akai dealers, Freed warned dealers to ignore erroneous rumors that may be spread in the coming weeks. Jack Sugino, manager of Akai EMI, assured Freed personally that the marketing and distribution of Akai Professional products in North America will not be affected.

## **ELECTRO-VOICE EXPANDS RESEARCH AND DEVELOPMENT EFFORT**

Electro-Voice, Inc., in Buchanan, MI. has expanded its research and development effort with the construction of new engineering facilities. The three-story research and development center contains over 28,000 square feet of space and houses over 50 engineers, technical assistants and support staff.

The new facilities allow for the complete designing, testing and evaluating of prototypes, as well as offering conditions for fast Fourier and time-energy-frequency testing via a specifically designed listening room and anechoic chamber, according to Alan Watson, director of engineering at EV. Other departments include CAD, holography, and laser-based analysis.

## **ATLAS/SOUNDOLIER AP-SERIES LOUDSPEAKERS OBTAIN TRADEMARK REGISTRATION**

To protect the design and identity of its AP Series Reentrant Loudspeakers, Atlas/Soundolier was issued Trademark Registration Number 1,493,954 in the U.S. Patent and Trademark Office.

In a letter to offshore producers, the U.S. manufacturer advised that "by exact duplication of the distinctive design, infringers have recognized the value of Atlas/Soundolier products and laboriously duplicated every aspect of the equipment in order to confuse the trade and end users to believing they were purchasing a genuine Atlas/Soundolier loudspeaker."

Importers and distributors that advertise and market copies of the Atlas/Soundolier design within the United States will be required to discontinue selling the infringing products.

## **SYNERGETIC AUDIO CONCEPTS WORKSHOP ON GROUNDING, SHIELDING AND INSTALLATION**

Synergetic Audio Concepts (Syn-Aud-Con) will sponsor a workshop on grounding, shielding and installation on January 17-19, 1989 in Anaheim, CA. Allen Burdick, president of Benchmark Media Systems will be the workshop chairman. His staff will be John Lanphere of Altec Lansing and Ed Lethert of SECO in Minneapolis.

## **CASE LOGIC GOES TO UNITED KINGDOM**

Case Logic, Inc., manufacturer and U.S. marketer of soft-sided portable audio cases, has finalized an exclusive arrangement with British-based Path Group PLC for distribution of its products in the United Kingdom. This is the first time that Case Logic products have been available for general retail sale in Europe.

# NEWSLETTER

## **GENTNER REVENUE LOOKING GOOD FOR 1989**

Gentner Electronics Corporation has reported continued revenue growth and excellent earnings for the first quarter of fiscal year 1989. In its first quarter ending September 30, 1988, the corporation reported net revenue of \$1,021,504, up 50-percent over that of the comparable quarter last year, the company said. The company's financial statements indicated a net income of \$64,401, up 15-percent over that of the comparable quarter last year.

## **INTERSONICS GETS FOUR PATENTS IN ONE MONTH**

Intersonics, Inc. has been granted four basic-design patents in a single month by the U.S. Office of Patents and Trademarks. The new patents include two new types of transducers intended for the production of high intensity sound for use at both high and low frequencies. The other patents are related to the latest generation of acoustic levitation systems at Intersonics.

Intersonics, a relatively small firm, is the developer of the ServoDrive Loudspeaker (SDL) and a pioneer in the field of acoustic levitation being used for containerless manufacturing in outer space.

## **QSC POSTS RECORD YEAR AND CELEBRATES 21ST ANNIVERSARY**

QSC Audio Products closed its fiscal year 1987/88 with a record breaking 40-percent increase in sales over the previous year, the company reported. CEO Barry Andres credits the Series Two line of installed sound products for the tremendous boost in sales as well as expanded sales and marketing offices and engineering staff.

January 1989 will begin QSC's celebration of its 21st year in business. Greg McVeigh, QSC director of marketing, feels it is "keeping with our 'corporate culture' to honor our 21st birthday instead of our 20th." QSC was started in 1968 by Pat Quilter, vice president of engineering, with the production of a bass guitar amplifier for a friend.

## **RAULAND-BORG SUES TO PROTECT PROGRAMMABLE CLOCK PATENT RIGHTS**

Rauland-Borg Corporation has brought suit against Simplex Time Recorder Company, Inc. for infringing U.S. patent number 4,387,420. The patent is based on an invention included in Rauland-Borg's Model 2424 User-Programmable Clock.

Rauland-Borg alleges Simplex has included the patented invention in their models 6100 and 6400 Time Control Centers without the permission of Rauland-Borg. The lawsuit seeks an injunction of further sales of the infringing clocks and also an award of damages for past infringement.

The lawsuit was initiated after an impasse had been reached between Rauland-Borg and Simplex wherein Rauland-Borg offered to include Simplex in its ongoing licensing program for the patent.

## **ANIXTER RETIRES AT ANIXTER BROS.**

Alan B. Anixter is retiring from his role as the first and only Chairman of the Board of Anixter Bros. at the end of 1988. He is forming a new corporation, Alanburt, Inc., with offices in Northbrook, Illinois, as well as pursuing a series of different ventures.

Anixter feels comfortable about leaving because his corporate goal of reaching a billion dollars in sales will be attained this year, according to the company.

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- Active balanced inputs with looping XLR-type connectors provide greater than 70 dB common mode rejection — some of our competitors don't even spec this crucial parameter. Optional transformer-isolated inputs offer absolute isolation.
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## Developing A Marketing Attitude

By Monroe Porter

**M**arketing is one of the most popular buzz words of the 1980s. A sales rep recently remarked that marketing is sales with a college education. Of course, marketing is a little more complicated than this evaluation. But whatever the definition, it would be a positive step for the sound contracting industry to realize the need for selling or marketing their services in a more progressive manner. Many contractors still use the low price bid method of winning jobs and then wonder, in today's market, why they are having trouble keeping up with the competition. In this article we would like to review some of the advantages of selling value versus price and correctly marketing contracting services.

Seeing and seizing opportunities is one of the first steps in establishing a realistic marketing plan. Akio Morita, co-founder of Sony, tells a story about two shoe salesmen a company sent to Africa. After scouting the territory, the first salesman reports back to the head office, "No prospect of sales. Natives don't wear shoes." The second, more marketing conscious salesman, sends a rush telegram, "No one wears shoes here. Stop. We can dominate the market. Stop. Send all possible stock. Stop." Need we say more about seizing opportunity.

A change in attitude is another important step in the development of a successful marketing plan. In today's market, contractors and suppliers must take an aggressive posture rather than just waiting for the phone to ring or for the plans to become available for bids. The bidding process is somewhat like playing poker. With four players, a pair of 10's might be a good hand, but with 15 players, someone is likely to be dealt three deuces. As the number of players increases, even if the player

pany which should include at least wins it is likely that the job will not be profitable. Often the company winning the bid is simply the one who makes the biggest mistake in calculations and not necessarily the one most qualified for the job. When this low bidder goes broke there is always another to take his place. To avoid this scenario, contractors should either seek work before bids are opened to the whole community or try to be added to a select bid list.

Such opportunities are always available but finding them usually requires some rules to follow when prospecting for potential customers.

1. Be aware of trends in your market. Keep an eye open for industries experiencing a boom. Prosperous businesses usually are looking to renovate, upgrade or even expand their facilities. Do your homework. Identify the top companies in your area and make them aware of your services. If feasible, visit their decision makers and develop a one-on-one relationship. They may not have specific plans pending, but your visit may influence their choice for future projects. They may currently do most of their business with one or two contractors, but have some smaller jobs that can help you get your foot in the door. The Chamber of Commerce or other local organizations can provide information on prospects but you must do the leg work to turn that potential into jobs.

2. Establish relationships with professionals who are traditionally called in on the construction job in its initial phases. Planning commissioners, soil engineers, surveyors and financiers are excellent contacts with inside information.

3. Create a reference packet. This is an information source on your com-

pany which should include at least some of the following items: A list of past and present jobs and, if possible, include a picture or at least a brief description; a list of clients, be sure to include all information so prospective clients can easily call these references. Add any facts about your company that support your credibility; your record for meeting deadlines, or bringing jobs in under budget can be strong selling points. Remember purchasing agents or project managers have a lot to lose if they sign on with a contractor who cannot do the job. Your information package should make them feel comfortable about the quality of your work.

4. Be patient. A contractor once told me he had tried soliciting new business by visiting prospective clients. He did not gain any contracts as the result of his efforts, so he quickly gave up. Frequently it takes four or five sales calls to generate an order. Be patient and hang in there. Put yourself in the buyer's shoes; don't you purchase goods from sales people who service your account and are anxious to have your business? Keep calling — eventually you may call just when the company is in need of your services.

In summary, "marketing" really boils down to taking an aggressive rather than a passive approach to increasing your company's sales. Rather than waiting for opportunities to fall from the sky, go out and reel them in. Both your attitude and approach will affect the success of your marketing strategy. The old adage proves true when it comes to company sales, "you only get back what you are willing to invest."

---

*Monroe Porter is vice president and CEO of PROOF Management Consultants, Richmond, VA.*

# It's Not Just A Phase We're Going Through.

The tremendous success of the Tannoy PBM series of reference monitors is by no means coincidental. Since the introduction of the world renowned NFM-8 nearfield monitor, much time and effort has been spent on discerning the needs of the mixing engineer and the applied requirements of "playback monitors". The PBM Line exemplifies this commitment to excellence in reference studio monitoring. These compact loudspeakers sport robust poly cone mid-bass transducers utilizing efficient long-throw, high power voice coils. The low frequencies are carefully controlled by optimum tuned ports located on the rear of the loudspeakers. Hi frequencies

are provided by Hi Power ferro fluid cooled polyamide dome tweeters which extend H.F. bandwidth beyond 20KHZ. The driver accompaniment is knitted together by means of a precision hardwired crossover unit, utilizing robust low loss components, and heavy-duty input terminals which will accept standard 3/4" spaced banana plugs and the majority of high quality, specialist audio cables. Transducers and crossover assemblies are neatly housed in a stylish, high density, partial wrap cabinet,

specially designed to minimize unwanted cabinet resonance, and high frequency reflection. In summarizing, we have left the best feature of all for last "price versus performance."

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## Project From Hell: Part II

by Marc L. Beningson

**T**hose of you who read the first part of this column in last month's issue will remember my story about an aggravating project in which I was involved, the "Project From Hell." (A slight exaggeration, but a catchy title which hopefully made you read the column, and of course, a little marketing goes a long way, right?)

My intent was to demonstrate by personal example some common practices in the construction industry that lead to poor acoustic performance of rooms. These are practices to which the industry is accustomed, which we have to help evolve into something better, so that the general public gets more of what it wants — good facilities for communication, be it entertainment, performing arts, business, or worship.

Here are some guidelines, not one of which was followed in my "Project From Hell":

1. Room acoustic problems are the responsibility of the architect. There are plenty of resources available to the architect to assist him in the proper design of a room, not the least of which is the acoustical consultant. No sound reinforcement system can properly compensate for high background noise, parallel surfaces, lack of absorption, etc. (Let's for the moment not discuss electronic architecture systems which can to an extent alter the acoustics of a room.) Sound contractors are not all acoustic experts either and should not have to function as such. Getting the room right is the architect's responsibility.

2. Unless they have the necessary background and experience (and few do), electrical engineers should not design sound systems or issue vague specifications for such systems. (Of course, by this I mean those who per-

form the function of electrical specification in the construction industry, and not those who have degrees in electrical engineering, although sometimes the latter is also the case.) Sound systems are specialty systems, similar to other advanced low voltage systems such as computer networks and cable television or video distribution systems—for which EE's are often in the practice of specifying only conduit runs and power requirements. We should encourage this for sound systems as well.

3. For the most part, in my opinion and experience, design specifications are superior to performance and other vague types of specifications. I believe in designing as detailed a specification as possible, when possible. We are still discussing measurement of sound system performance among ourselves in the industry—I would hate to see a trial where a jury would have to decide whether a sound system met certain intelligibility requirements based on testimony of various "expert" witnesses. As such, if I know what will work in a given room, I should specify that directly, and design a complete system as I know it should be: that is the expertise that my client is paying for.

Note that there is an exception to rule three—a performance specification can work well when the consultant is involved through the entire process, including the selection of a reputable contractor. The consultant and the contractor then can sit down together and essentially negotiate the system. Bidding is generally not a part of this procedure. This concept works especially well for budget projects or large projects requiring extensive engineering, that cannot afford enough of a consultant's time. I know of one fellow consult-

ant who has been doing this successfully for many years, and I have at times attempted this as well.

4. Even if it is not required by specification, generate some documentation about the system in preparation for that time in the distant future when someone will need to know something important about the system. Certainly it will make you look more professional when you are called in years later to upgrade, modify, or fix a problem if you bring concise documentation with you. Incidentally, I have been called in to look at systems where the owner does not remember the sound contractor's name or has misplaced any relevant system documentation. If your business name and phone is permanently affixed to the main rack (either in clear view or even inside the back door), you will not be forgotten when the owner is thinking of making some changes. Artists and craftsmen sign their work, right? Generally, this is a good thing, although I recall some cases when the owner would prefer to forget the contractor's name. (And occasionally the consultant as well.)

5. Even on low budget jobs, proper installation techniques must be used. If you can't afford to do it correctly, you have charged too little. If you had to intentionally "lowball" to get the work (and you needed the work that badly), it's time to think about your business practices over the past few years. There are only a few valid reasons to do a job "at cost." Charge enough to do it right, and then do it right, or walk away. Save your reputation and save a consultant like me from the dangers of "Projects From Hell." ■

---

*Beningson is a consultant in acoustics and sound system design based in Norwalk, CT.*

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PROFITABLE  
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# Traffic Light

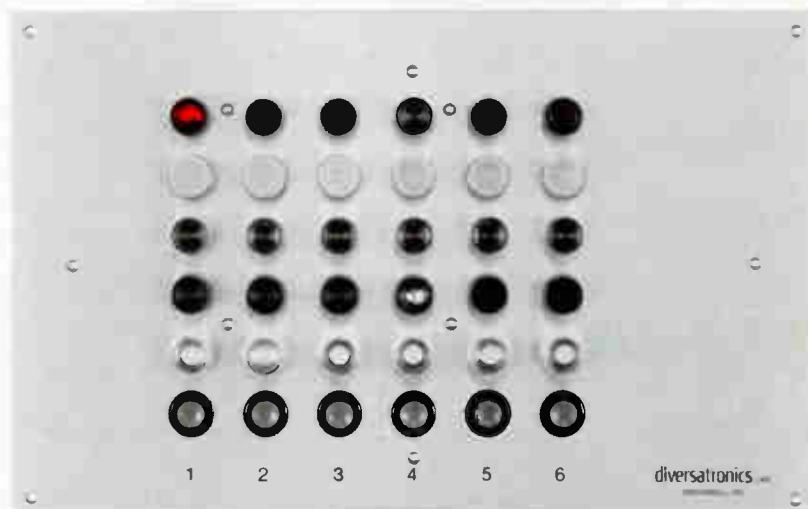
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Above: Master Panel



Left:  
Exam Room  
Panel



Right:  
Monitor Panel



## Ask Dr. Wokka

by Wilhelm Wokka, Phd, DAcDrD

### Dear Dr. Wokka,

I've been reading your articles for *Sound & Communications* with interest for the last ten months. I think we have a problem here. Look: I know this stuff is a big hoax and that some member of the *Testa Communications* staff is sitting somewhere having a great time playing Psycho-Science Editor. I don't take it seriously, but there are some trusting souls desperately trying to weed through the techo-noise who are actually reading this drivel and trying to use its "information" in their daily

---

**There are some trusting souls who are actually reading this drivel...**

---

lives as audio engineers.

Who are you really? I'm sure you don't have the guts to step forward and take responsibility for your actions. But let me tell you one thing; you're wasting the fertile minds of some good people out there. All this for a little "harmless" fun? Let's be serious.

Another thing. I've checked out your story on my own, as I live and work close to Philadelphia. I went to Penn's Landing to look for your silly Medical College of Musical Knowledge and it's not there. I called over a hundred leads on your background and no one even remotely knows you, only through these sham articles with your name on them. All I could find was an obscure

and defunct rock and roll band with a similar name. You're a fraud and a hoax! I dare you to disprove me. I dare this magazine to print this and am copying many famous audio persons on this letter. I've had enough of your damaging child's games. Show yourself and be counted, whoever you are.

**Clifford A. Henricksen**  
**Director of Engineering**  
**US Sound**  
**Lumberton, NJ**

### Dear Mr. Henricksen,

I can understand your anger in trying to assimilate the work I've published in this magazine. It's not an uncommon reaction from someone like yourself, trained in standard engineering practice. The reaction is similar to that from the colleagues of Freud or Darwin when their now-famous theories were first published or made available to the public. I've spent my entire professional life being called a quack by linear-thinking egghead know-it-all like yourself, so your letter doesn't phase me in the least little bit.

Can't find the Philadelphia Medical College of Musical Knowledge? How about pilgrims from all over the world who seek Gurus and Masters in the mountains of India and Tibet, looking for the Meaning of Life? These prophets don't have neon signs or Golden Arches outside their Temples. Do they want the world to walk in and turn their places of sacred knowledge into a Magic Kingdom? Let's be serious here. The news media would turn these places into zoos. The same is true for our Medical College. You want to find us? We're right here in Philadelphia,

but you have to want to find us, and you have to be open to new ideas.

If you start your search with the intention of uncovering a hoax, you'll never find us. This is sacred knowledge here, Mr. Henricksen. We know the secrets of the ancients. We are *Great Men of Audio Science*. If you want to walk with us, you must approach us with humility, not your typical American Football attitude. Those who "want to know" find us all the time and so can you, although not with your present attitude.

---

**You have to be open to new ideas. This is sacred knowledge...**

---

As far as your accusations of hoax, all I can say is that I don't think you're ready for this kind of knowledge. Have you read this column and even tried to apply its wisdom? Have you built a Sweet 1600? Have you overpowered the reverberant field? Have you given up speaker tapping and started making citizens arrests on those that do? Have you used equalizers properly? I'll bet you haven't given one iota of this priceless information a chance. As for me, I am the Doctor, no one else. An obscure rock band indeed!

In conclusion. I'm right and you're wrong. I'm smart and you're not. Don't mess with me.

**Next month: There will be a quiz.**



# Who would believe a microphone this flat...



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Condenser Cardioid

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ical noise. The electronics are audibly quieter as well – a tremendous advantage in typical boundary microphone applications. We also include a low-cut switch to help control acoustic room noise. The AT871 can be powered by an internal battery or from 9-52VDC phantom power.

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World Radio History

# 85th AES CONVENTION HIGHLIGHTS

BY JESSE KLAPHOLZ

*Editor's Note: For those of you who were unable to attend the 85th AES convention held recently in Los Angeles, we're pleased to present this review highlighting some of the technical papers presented and new products introduced.*

*We begin with a review of the technical sessions and new product technology, followed by a photographic "tour" of the exhibit floor.*

**T**his year's AES had a good showing of the next generation of product-based digital audio engineering—both in the technical papers, and at the exhibits. Rane did a tutorial paper on generic software for digital filter design. This shows that they are plunging into the hardware/software world of digital audio. An unexpected paper was presented by Barry Kulp of Zoran, a very-high-tech manufacturer of extremely powerful DSP chips used for video and radar. Kulp's paper was on digital EQ using FFT techniques, which are now becoming more economical and powerful on today's DSP chips. Symmetrix displayed a digital-audio workstation that uses the Macintosh II as its operator interface. Their product is based on modular DSP hardware with various signal manipulations being controlled in the Mac, but actually executing at real-time speeds in the DSP engine.

Also exhibiting were several manufacturers of digital audio chips including Motorola, dbx, and Crystal. Some embodiments of these were found at the Canetics booth in a portable AT-type/DSP-based FFT spectrum analyzer; at the Motorola booth, Spectrum showed a similar unit. Software and hardware are rapidly becoming the buzz at the AES; it seemed as though anywhere

you turned, someone was studying specs and inquiring about DMA (Direct Memory Access), DSP, MIPS (Millions of Instructions Per Second), and the like.

From Japan came a number of papers on loudspeakers. As always, they spend a tremendous amount of time on research, and their papers are generously populated with graphs and charts. Their data and results sometimes show up here on our shelves, and often their research adds to the data-base of transducer knowledge. The Japanese use of custom software on main-frame computers is the rule rather than the exception. Their research is always fascinating because of the detail and methods, while we often are troubled by the conclusions and reduction to practice. This is evidenced by the difficult time they have had in maintaining a presence in the pro loudspeaker market. On the other hand, their microphone technology certainly maintains a prominent position.

Among the more interesting papers was *The Adaptive Loudspeaker System* by Joji Kuriyama and Yasuyuki of Toa. In an oversimplified description, they use DSP to apodize or "pre-distort" the applied signal to a loudspeaker such that the resultant sound does not contain any unwanted frequency and phase aberrations. The system is embodied in software and hardware combination using algorithms to dynamically control the parameters of the DSPs. The approach is based on adaptive signal processing techniques, and the hardware used in the research consisted of two 16-bit A/Ds, 16-bit D/A, two Motorola 56200 DSPs, and a micro-processor (with its associated timing circuitry). The system is "self-learning" and can use the intended signal itself to adjust the parameters, such as speech and/or music.

*Spectral Contamination Measurement* by Deane Jensen and Gary Sokolich described a method whereby distortion is measured by multi-frequency excitation, "...which has the potential of displaying considerably more results than traditional single frequency or twin-tone excitation." They showed measurements with 110 dB dynamic range capabilities and applied it towards advanced input transformer and an early stage multi-stage filters, and the observation of phase effects on distortion.

Even though it was a Los Angeles convention, the papers did not seem as rife with product-hype presentations as in the past. This certainly may well represent a crossroads of technology transfer from related industries as we have discussed here recently.

On a more human side: it seems as though the more we talk



One of the many artifacts at the Jack Mullin Exhibit.



More than 12,000 attendees crowded the exhibit floor.

about the issue of speech intelligibility, the less we seem to be able to reduce the theories to a practicable level. While not at all minimizing Dave Klepper's comprehensive session, the tutorial overview of what each paper had to say did not cover the issue entirely. The papers presented by Peutz and Davis were a concise compilation of what we know about speech intelligibility from a statistical point of view. However, when we analyze complex multi-dimensional phenomena of a physiological nature in which we reduce our observations to a simple number, as in the general field of room acoustics, we must make a great deal of assumptions. In doing so, the assumptions made must clearly reflect a good group of decisions that can be applied similarly in practice and understood by other practitioners. Ken Jacobs of Bose presented their ongoing work in this area, looking at three algorithms concerning speech intelligibility.

Bose's study included three loudspeaker types: low-, mid-, and hi-Q. They used the ANSI phonetically-balanced word lists with a jury of screened listeners in ten different rooms at two different positions. The test results were then correlated with the "predictive" results from the three respective methods.

The first method was an adapted form of the STI method, whereby (as shown by Schroeder), an analytical impulse (unit impulse easily generated by computer) is fed into a "room model" and "measures" the STI. This is basically intended as an in-place measurement technique. But, Bose has apparently modeled the room parameters and impulse in software. If the assumptions made with the model are clear and valid this should prove to be a detailed model of the intelligibility in such room models. The second method was the S/N method of Lochner and Burger with the addition of a time weighting function. The third method was the Peutz %ALcons method. The Peutz equation is a simple relationship that when carefully applied has produced many highly intelligible sound systems. It is of interest, however, that Prohs has lately stated that the method we use to calculate Q yields too high a rating. The combined "errors" may therefore cancel each other out—in most experiences to the benefit of more "intelligibility headroom."

Nonetheless, Bose is making a case that the easily implemented (and perhaps not as intuitively understood as should be), Peutz method is not as accurate as the modelling/analysis STI method. While the two methods are clearly capable of producing good sound system designs, the modelling/analysis STI method needs a lot less brain-power

(continued on page 68)



AB International/DA 2148 distribution amplifier.



Allen & Heath/SABER mixing consoles.



AKG Acoustics/Implant mic.



Amber Electro Design/Test systems.

Photography by Jesse Klapholz.

# AES HIGHLIGHTS



Apogee Sound/Hanging hardware loudspeakers



ART/Multiverb digital processor.



Ashly Audio/Power amplifiers, signal processors.



Audio/Digital/RS-422 digital delay



Audio Logic/signal processors



Audio Precision/DSP-1 module.



Audio-Technica/AT4049, 4051, and 4053 mics.



BBE Sound/Sonic Maximizer in module form.



Beyerdynamic/MCE-86, M-58 mics.



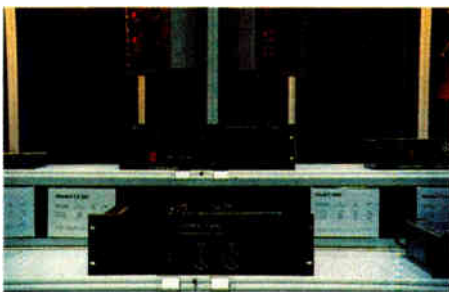
BGW Systems/750G power amplifier.



Bose Corporation/Sound System Software.



Bruel & Kjaer/Head and torso simulator.



**Crest Audio/Model CC301 power amplifier.**



**Bryston, Ltd./24 dB active crossover.**



**Crown/IQ System 2000 digital control system.**



**DDA/Q-Series console.**



**Canetics/PC-based analysis systems.**



**Crystal Semiconductor/A-D converters.**



**Denon America/Data reduction for CD systems.**



**Community Light & Sound/M4 coaxial.**



**dbx/563X hiss reducer.**



**Drawmer Distribution/E101 equalizer.**



**Connectronics/Modular patch bay systems.**



**EAW/KF850 Virtual Array concert loudspeakers.**

# AES HIGHLIGHTS



Fane Acoustics/Court Series, System 1000.



Klark-Teknik/DN726, DN775 digital delay units.



Gauss/High-performance drivers.



Harrison Info Technology/Signal processors.



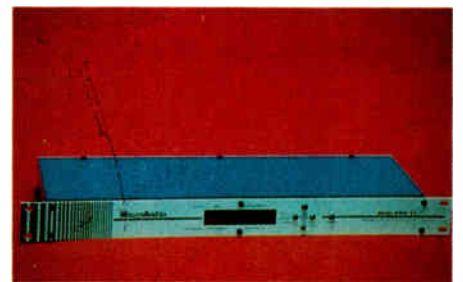
Klipsch/KP600 series loudspeakers.



Gentner Electronics/Pre-wired patch panels.



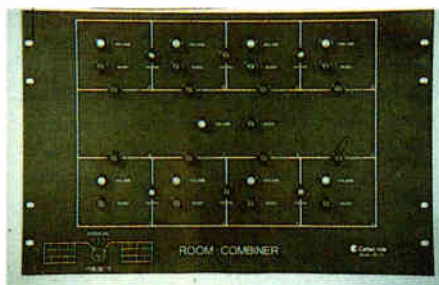
IED/Hotel Audio Management system.



MicroAudio/MIDI-controlled programmable eq.



Ghialmetti/Audio switching modules.



Ivie, A Mark IV Company/RC-12 room combiner.



Milab/D-37 dynamic cardioid microphone.



JBL Professional/Control series.



QSC/Model 1100 stereo headphone amp.



NADY Systems/650 VHF wireless system.



Reach Electronics/Paging systems.



Sennheiser/Eng 2003 wireless mic system.



Orban/787A programmable mic processor.



Renkus-Heinz/Smart, Dyna-Guard horn systems.



Shure Brothers/SM series, W15HT wireless mics



PAS/Coaxial loudspeakers, SM-1 studio monitors.



ROH/Metro-Audio control systems.



Soundcraftmen/Model 300X4 power amp.



Peavey Electronics/Mark VIII console.



Soundtracs PLC/MX32 console.



Telex /Single-channel wireless systems.



Spectrum/DSP56001 data analysis system.



360 Systems/Audio Matrix digital routing system.



Vega, a Mark IV Company/wireless systems.



Stewart Electronics/MM-4S Stereo mic mixer.



Turbosound/TDX series enclosures.



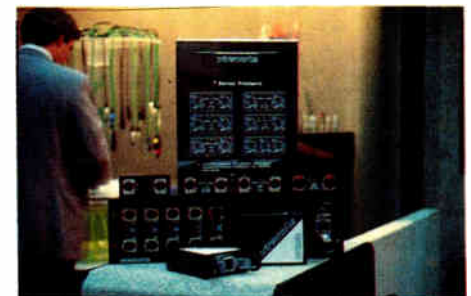
Whirtwind/Cables, patch bays, rack panels.



Symetrix/DSP audio workstation.



UREI/Model 7510A automatic mic mixer.



Wireworks/T-series of interface units.

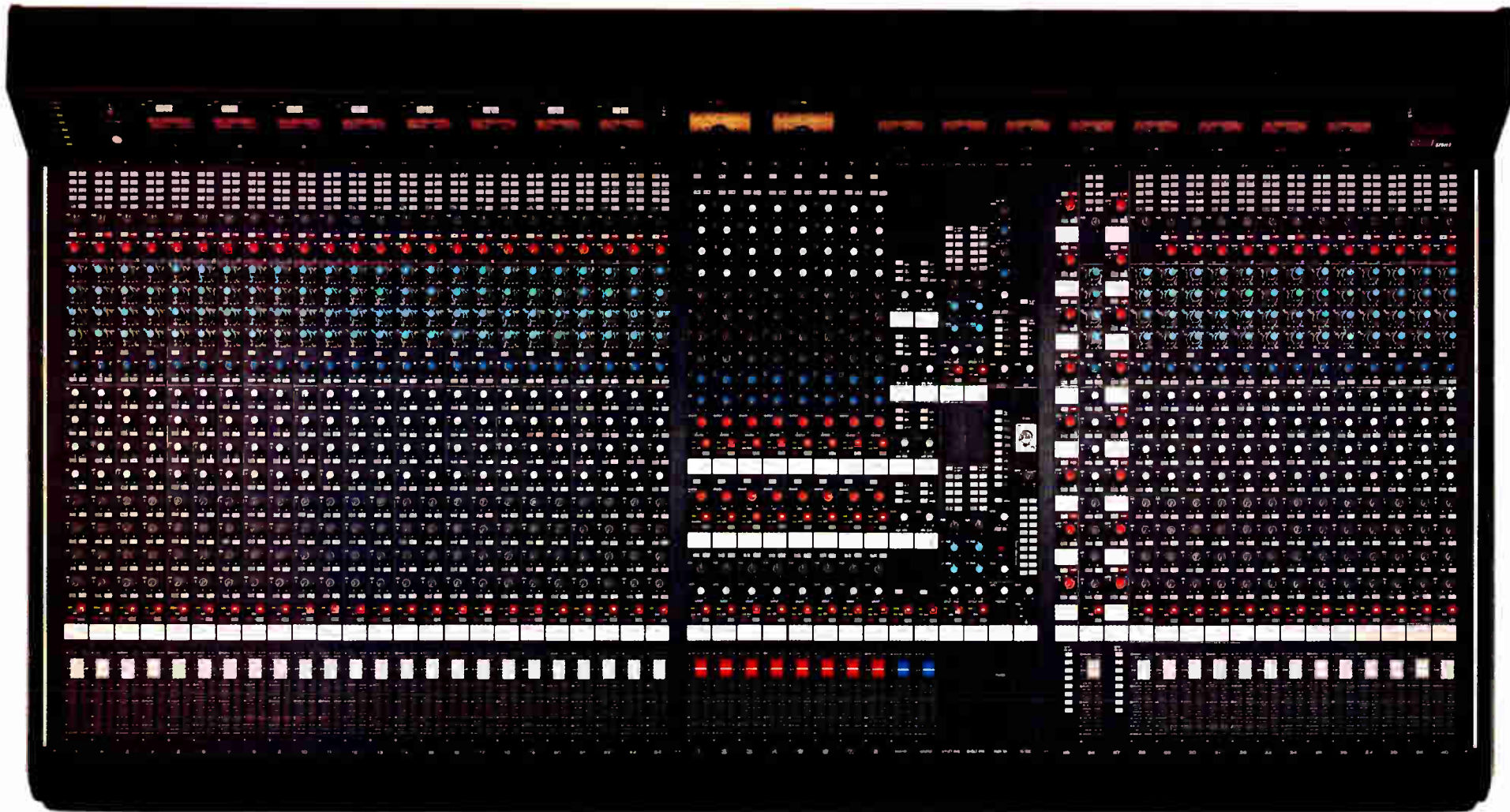


Syrinx/Digital control of analog signal routing.



Yamaha /Mixers, consoles, signal processors.





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**Panasonic**  
Industrial Company

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# COMPUTER PROGRAMS FOR SOUND SYSTEM DESIGN

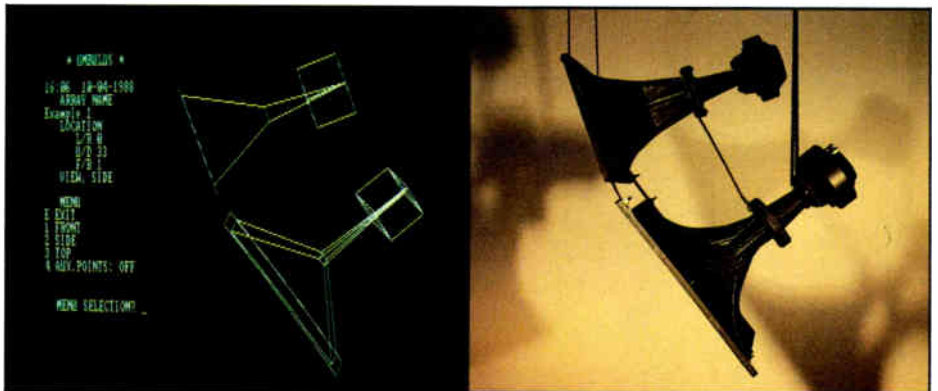
BY MIKE KLASCO

**C**omputer-aided design techniques for audio and acoustics have become an important part of the audio engineer's professional life. Most engineers that have not already invested the time to gain computer literacy will concede that this is something they will have to tackle shortly. This is the first in a series of articles intended to guide sound engineers and technicians through the various paths and options available in computer-aided design techniques.

While various articles on the features and applications of individual programs have appeared in print, most have been prepared by program publishers, not by critical and comparative reviewers. These articles tend to focus on the unique features and enhancements of each publisher's program, and tend to omit any mention of that program's drawbacks or lack of important functions. For example, some programs require excessive data entry time to model and/or modify a room, while others may lack the ability to model obstructions/shadowing, display maximum system gain before feedback, perform intelligibility estimates, or directly move or change the relative sound level of an entire cluster (in some programs, each speaker must be recalculated and moved separately).

Other parameters not generally discussed in these articles include the length of program learning time, poor documentation, bug-ridden and finicky programs that lose data and/or crash at minor keyboard errors, and the trade-off some program publishers have made: accepting excessive processing time (for some calculations) in order to avoid excessive program costs.

Actually, all this sounds much worse than the present state of affairs. I had originally planned to begin this series a year ago, but these problems were so serious and prevalent then that I decided to wait until the programs matured. I was afraid that my reviews would discourage rather than encourage potential users of these programs. However, in the last year all of the programs have made significant improvements in the areas of functionality, operational smoothness, and error-trapping capabilities. This series will review each program, and provide a comprehensive analysis of strengths and weaknesses, applications, computer equipment requirements, commitment in learning time, and other



*North Star Sound's loudspeaker array design program, Umbulus. A sideview of the array as designed (left), and the same view of the array itself.*

factors that sound contractors might find relevant when deciding to invest in computer-aided-design tools. This month we will look at how these computer tools evolved, briefly discuss currently available programs, and preview future topics that will be examined.

## EARLY TECHNIQUES

Sound system engineers have always used tools to visualize their designs. Conventional methods employ geometric tools, such as t-squares, protractors, drafting tables and the like.

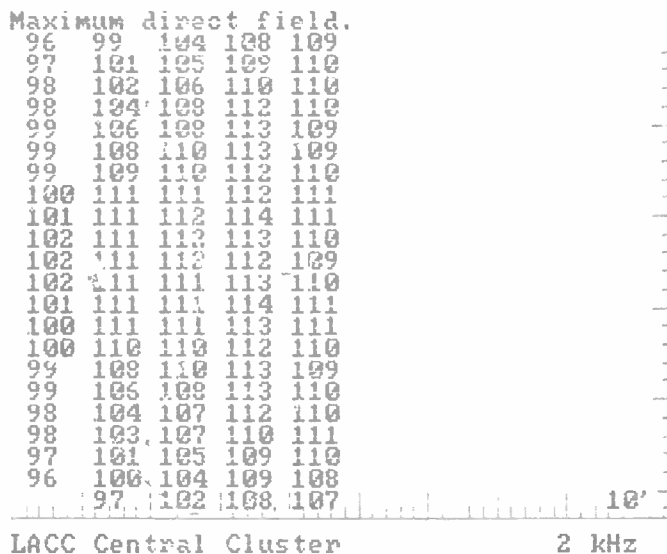
Acoustical mapping to determine the sound field coverage of a listening area is a derivation of architectural mapping. Ed Seeley presented an AES paper introducing acoustical mapping techniques in 1977. The following year Tom McCarthy of North Star Sound presented a paper on field use of this technique, adding further refinements. Graphically, acoustical mapping took the now familiar form of isobars, which were adopted by Altec in their data sheets around 1981 and were eventually included in most professional horn technical specifications.

Farrell Becker and others developed variations on the concept. Those two-dimensional transformations to paper or mylar attempted to minimize distortions as much as possible, but there is no such thing as a distortion-free flat map. The attempt to depict the spherical wave-front three-dimensional phenomena of sound from a horn resulted in distortions analogous to those of land masses depicted on maps rather than globes. This problem prompted another thinker, John Prohs of Ambassador College, to develop his three-dimensional spherical technique (also around 1981).

Manual (mechanical and optical) techniques were powerful visualization aides for array design as they efficiently displayed sound field seating-coverage uniformity, but other parameters such as maximum sound level, intelligibility, gain before feedback, and RT60 required time-consuming calculations, first by slide rule and later by calculator. Scientific calculators (such as the HP 41 "electronic slide rule") became the tool of choice for sound engineers in the late 1970s. Altec and Syn-Aud-Con developed, distributed, and promoted sound engineering programs for the HP 41 during this period. Programs were usually distributed on bar code (although magnetic strips were also used). Some engineers have resisted converting to the computer-aided approaches from the optical techniques because of the weaker intuitive feel and visualization of most computer-based software.

## THE TRANSITION TO PERSONAL COMPUTERS

Around 1980, the Apple II computer was becoming popular as an alternative to the scientific calculator. The computer was faster, had graphic capability (which could replace the need for the mechanical/optical visualization), used either tape cassette or floppy disk drives (which were much more efficient than bar codes or magnetic strips), and was not much more expensive than a full HP 41 with bar code reader and printer. Many of the Altec utilities were rewritten for the Apple II. The bar code programs were provided by Altec at no charge to anyone who was interested. The Apple II software was distributed through informal channels. The Altec Array program was the first commercial acoustical mapping program for clusters. On the Apple II it plotted isobars on a grid pattern, both to the monitor and to paper (if you had a printer). This was the infamous acoustical mapping program that did not compensate for the spherical to 2-D distortion and lead some trusting engineers to inadvertently specify some very uneven coverage designs. Aside from the spatial



*A printout of the maximum direct field as shown by JBL's CADP program.*

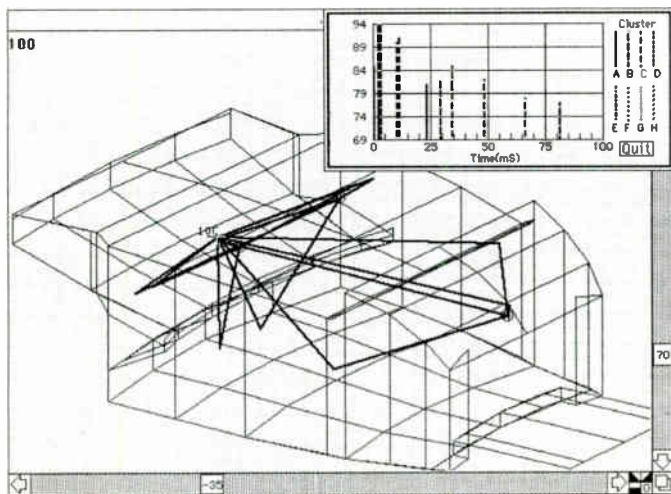
distortion problem, the Apple II program printed out too small to be usable (for my taste, anyway) and the isobar overlays supplied by Altec (and provided by JBL, EV, Community, and Bose in their technical data sheets and literature) was still required.

There were a number of very useful utilities for predicting RT 60, calculation of odd-shaped room surface area and volume, distributed speaker selection and spacing, selection of drivers and horns, crossover network design, and many other single-function programs.

John Prohs had attended one of the early Altec Array Program Workshops, immediately after which he began work on a practical 3-D spherical mapping technique. The objective at the time was to provide his department's engineers with a more accurate tool for sound system design. The initial program was authored with David Harris. Mapping on a sphere avoided the distortion problems associated with the two-dimensional methods. The isobars were hand-drawn on the sphere and this was projected onto the prints. Documentation of the optical approach required photography, the marked-up sphere itself, or hand sketching (time-consuming, not easily accurate, nor do the results always look professional).

Even with these limitations many engineers still felt that this approach was the best choice, so arrangements were made to allow Community Light and Sound to distribute "The Sphere Program" and equipment under the name "Cluster Computer." Shortly after acquiring distribution rights, Community encountered some fabrication problems and in 1985 ceased marketing the program.

Just as Seeley's and McCarthy's work was a major progression from the mechanical methods previously used, the Prohs system served as a significant bridge between the earlier, less



*The Modular design program from Bose, showing an example of the calculation of direct and reflected sound.*

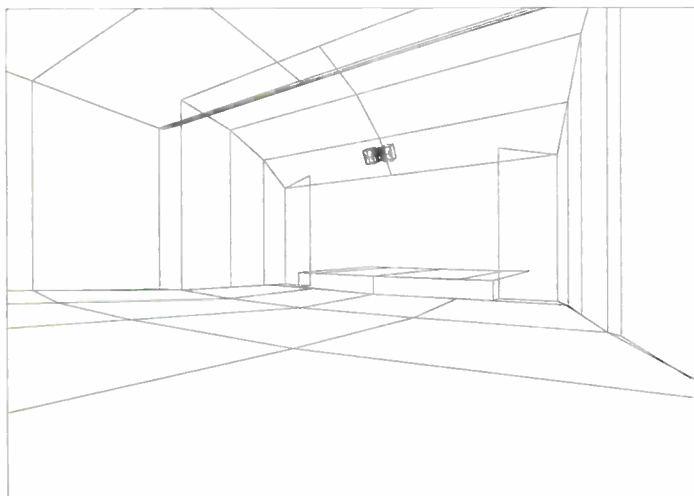
accurate two-dimensional mapping techniques and the highly reliable ones of today.

Tom McCarthy of North Star Sound, Minneapolis, MN, continued to develop his acoustical mapping techniques. His original program ran on the HP desktop computer. In reading over Tom McCarthy's 1978 AES paper, and other documentation, it is apparent that North Star had developed the first "commercial" program, and had originated some of the concepts and techniques used in most of the programs available today. As North Star is primarily a sound contracting firm, and the HP computer was popular in some scientific circles, but not commonly found in the field of audio or acoustics, the program was not widely used. The latest version of the program is now IBM compatible and can be completely implemented on the computer. As I have not yet had a chance to actually use this program, I am especially looking forward to reviewing it.

### COMPUTER-BASED INTEGRATED DESIGN

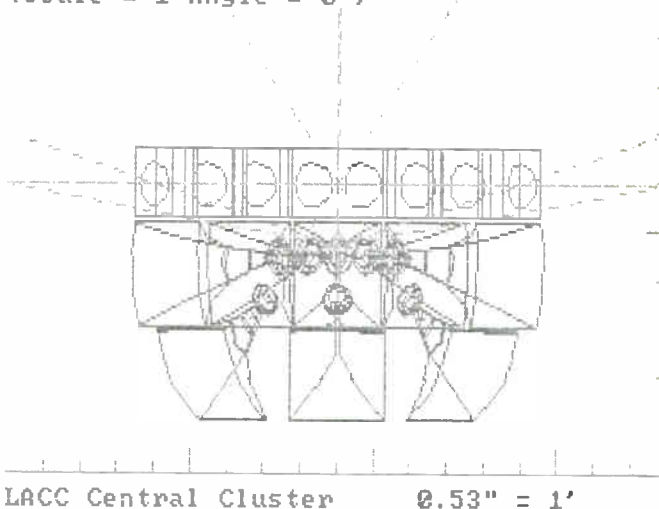
JBL created a great deal of excitement with the introduction of their Central Array Design Program (CADP) in late 1983. This program offered a self-contained approach that featured computer modeling of sound system performance including uniformity of coverage, maximum sound levels, direct to reverberant field, intelligibility, horn aiming points, and mechanical design. The program could draw different views of the cluster, and compile a report on the locations of the seating plane, speaker coordinates, center of gravity of the cluster, and various other parameters (including a utility for RT 60 predictions). All of these options were available from a main menu or sub-menus.

Except for the computer's monitor and printer, external devices (such as plastic spheres and overlays) were not needed. All data on drivers and horns were on floppy discs and completed jobs could be saved to floppy discs for future reference or editing.



*Virtually any perspective view of a system within a room is possible with the Bose Speaker CAD program.*

Cluster front view.  
(Scale = 1 Angle = 0 )



*JBL's CADP program: typical cluster front view.*

When the job was over, there was no tissue or tracing paper to save, and no plastic spheres to store. With the mechanical/3-D techniques, I found that as soon as you dumped the residue from the job, a new scoreboard (or some other obstruction or modification) would be installed, requiring a time-consuming redo of the original work. This phenomena has been linked to the same scientific law governing the rain that immediately follows the waxing of your car.

As with any ambitious, ground-breaking new project, CADP was at the center of numerous controversies regarding the accuracy of its intelligibility predictions, its tendency to crash, awkwardness in doing "what ifs" and moving whole arrays, non-standard directivity files, inability to model obstructions or shadowing, and very limited printer support. Although CADP will be reviewed in depth next month, I should mention that five years later the program is on release 2, error recovery is much improved, and the program is faster. The "polar sphere balloon" directivity file configuration pioneered by JBL is also used by Bose (in their Modeler program), EV, Altec, and Community, while Renkus-Heinz offers speaker library data disks for their products. As is typical with computer software, by the time the program is debugged and mature, it is also nearing obsolescence! While JBL has periodically given out program additions and updates to its users, the company is preparing to introduce an entirely new generation sound design program next year. CADP's position in its field is similar to Wordstar and Lotus 1-2-3. These were landmark programs in concept and comprehensiveness, and other program developers had the benefit of hindsight in their attempts to create alternative approaches. As CADP was the first integrated design program and is still actively licensed, we will start our reviews next month with the JBL program.

# Once upon a time

This was a movie  
soundtrack.

And this was  
an amplifier ↑

In their day, they were the state-of-the-art. The theater organ (or piano) provided all of the sonic textures required to completely involve an audience with the film on screen. The megaphone was reliable, but its limitations quickly became obvious. Its frequency response was rather limited, and its direct dependence on input level made it usable only by oral athletes. With man's undying need to to expand his ears' horizons, the film soundtrack came to replace live accompaniment. Sound reinforcement came to span everything from audio in the home, to rock and roll in the arena. As the quality of these mediums grew, the need to surpass the limitations of existing amplification became apparent.

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### VAMP

Altec's efforts to lead the industry with computer-aided-design in the early 1980s were temporarily impeded by financial problems. EV refined the Altec isobar/overlay technique in 1985 with their Very Accurate Mapping Program (VAMP). With VAMP the sound engineer was still at the drafting table with paper, pencil, and literally hundreds of overlays (25 per speaker). The program required an HP 41, although the calculator routines are also available on disc for the IBM computer.

The VAMP program gained limited acceptance with consultants and contractors who had been using the Altec isobars array techniques. The overall approach was similar, but VAMP offered more accurate results, especially in seating areas off-axis of the speakers.

VAMP eliminated the spatial distortions of Altec's mapping approach without the need of the optical technique's sphere. Although Isobars achieved an industry-standard status for a short period in the mid-1980s, the trend has been toward higher-resolution depictions. Bose and JBL do not supply isobars on their new products, but use the more comprehensive polar sphere technique. Actually, Bose never has supplied isobars, but

was among the first to supply overlays (the differences between these will be covered in the actual reviews).

University offers Easy-VAMP, a simplified variation of VAMP for smaller, less critical installations (such as paging speakers). Easy-VAMP may also have applications as a preliminary job-design/cost-estimating technique for VAMP users.

Looking back at the years 1983-1985, it might seem odd that programs requiring mechanical/optical devices and lacking data filing of jobs or speaker components to disk were still being introduced and developed after the JBL program was introduced. At the time, many sound installers and consultants were not ready to purchase (or even learn how to use) computers.

While CADP is accurate in its coverage analysis, it does not provide a strong intuitive feel in selecting the optimum horns. The program does not recognize obstructions, so jobs that have deep multi-tier seating or low ceilings between tiers may still require geometric or optical confirmation of coverage. Distributed sound systems are not supported and, until recently, very few other manufacturers prepared the directional data on their components for the JBL program. Additionally, the JBL program is made available only to authorized JBL dealers (and to some con-

*New from MacKenzie Laboratories, the leader in digital message repeaters*

# Random Access Digital Audio

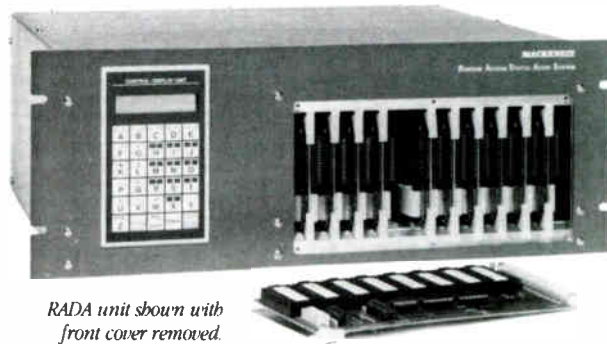
MacKenzie's Random Access Digital Audio (RADA) is an audio message repeater system with multiple-message capability. It is designed to serve as the voice playback section of alarm systems in applications such as:

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- Fire evacuation
- "Code Blue" messages
- Security warnings

Messages are digitized, stored in removable EPROM memory chips and controlled by the system's built-in microprocessors. The voice is entirely natural, just like a tape recording.

RADA provides the various levels of supervision required in life-safety systems, as well as continuous digital self-check and voice-check. Message prioritization and FIFO are standard features. Power interruptions won't affect the system's memory. The highly reliable, all-solid-state RADA system has *no moving parts*, so it requires *no maintenance*.

RADA is furnished in standard 19-inch equipment rack configuration. The basic unit provides up to 80 messages. Building-block expansion via sub-chassis



*RADA unit shown with front cover removed.*

provides capacities of more than 500 messages. Message lengths can be as short as 7.5 seconds or as long as 30 seconds. For more information about the versatile new RADA system, call MacKenzie Laboratories toll-free:

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Circle 206 on Reader Response Card

World Radio History

sultants), while some of the other programs were more freely distributed.

### THE PHD PROGRAM

Prohs and Harris continued to develop their program, and a version that accounted for obstructions, performed RT60, and other calculations was developed for the IBM compatibles and Crown TEF machine (but still required the plastic sphere). The first version also offered on-line help, indoor/outdoor modeling, %ALcons intelligibility predictions, and a comprehensive loud-speaker data base. It would eventually provide transformation to RASTI predictions as well.

Don Davis of Syn-Aud-Con considers PHD the program of choice, as it produces accurate results, is an intuitive aid in horn selection and aiming, is not from a speaker manufacturer (and so is available to everyone), provides a library of JBL, Altec, EV, Community and other drivers/horns, runs on the Crown TEF (and does a number of predictions that the TEF can directly test). About a year ago I received a pre-beta version of PHD that did not require the sphere, but instead used the graphics of the IBM computer.

At the time, I was considering doing this series of reviews, but the PHD program was in such an early state, both JBL and Bose were promising major revisions and editions to their programs, and Altec was promising immediate completion of their program [no official release date as yet] that I decided to wait. In any case, the new all-computer-based PHD program, introduced in May at the NSCA, is now being distributed by *Sound & Communication* magazine as part of the Richard Heyser Memorial scholarship fund (S&C June). The new PHD program is in color, an element they feel is critical to operation and visualization of the program without the sphere. As color is not supported by the TEF machine, only IBM compatible computers are supported. I will review this product after the CADP and the Bose Modeler Program.

Tom McCarthy of North Star has reintroduced his cluster design/room mapping programs for use with the IBM PC computer. The program is very practical, with many useful utilities for cluster design, hanging points, center of gravity and other handy features, although intelligibility, reverberation time, are not included in the program. When I review this program, I will use

*(continued on page 66)*

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# 1988 ECONOMIC REPORT

BY BILL INTEMANN

**M**anufacturers plan to introduce more new product lines in the coming year, and market those lines more aggressively than in previous years. And while more manufacturers than ever say that they are generally optimistic about sales in the coming year, the percentage of those who say they are *very* optimistic is down slightly, perhaps reflecting concern over an economy whose very strength is generating mixed signals for future performance.

These are among the conclusions drawn from our annual review of the state of the economy as it affects the sound and communications industry. As part of that review, we have once again commissioned a survey of manufacturers from each sector of the industry.

This year's survey was conducted by Survey Analysis, Inc., an independent market research firm. Confidentiality and integrity of data were guaranteed; all data was summarized and averaged, and only those results were reported to *Sound & Communications*.

## ECONOMIC STRENGTH

The economy continued its steady upward momentum through 1988, confounding most forecasters. The 1987 crash did not cause the economy to nose-dive, full employment and high plant utilization did not bring runaway inflation or spiralling interest rates, and instead of expanding, the trade deficit has been narrowing for months.

Much of this momentum is in manufacturing, where output, employment, and new orders continue to make solid gains. And

job growth has accelerated, with employment prospects remaining bright. The dollar is not expected to rise above current levels next year (except for brief fluctuations); if anything, it may go down a bit.

However, some forecasters believe that the economy's strength is generating inflation, and the Federal Reserve Board may act soon to hike interest rates to prevent "overheating." Residential building is one area that will suffer from higher interest rates, and new office building is expected to continue its four-year decline, dropping by another one or two percent during 1989.

Offsetting these declines is a predicted increase in industrial construction, which some analysts feel may climb as much as seven percent during 1989. A large amount of this new plant construction will consist of small factories built in industrial parks for light manufacturing and high-tech operations.

In addition to this new construction, US manufacturers are expected to upgrade and modernize their existing facilities — equipment grew old as manufacturers waited for the dollar to come down, but modernization is now under way.

## ECONOMIC IMPACT

The declining dollar will continue to have an impact on this country's ability to purchase goods manufactured abroad. The decline in new residential and office construction will certainly have an impact on the intercommunications and security markets, but that impact should be lessened somewhat by the predicted turnaround in industrial construction and increased emphasis on updating and modernizing existing facilities.

One of the main concerns of analysts and forecasters for the first half of the coming year is that the Federal Reserve, in acting to head off inflation by hiking interest rates, may trigger a recession. While many segments of this industry are resistant to recessionary pressures, others are not as secure, and all of us will need to watch first-quarter developments closely, and adjust our marketing plans accordingly.

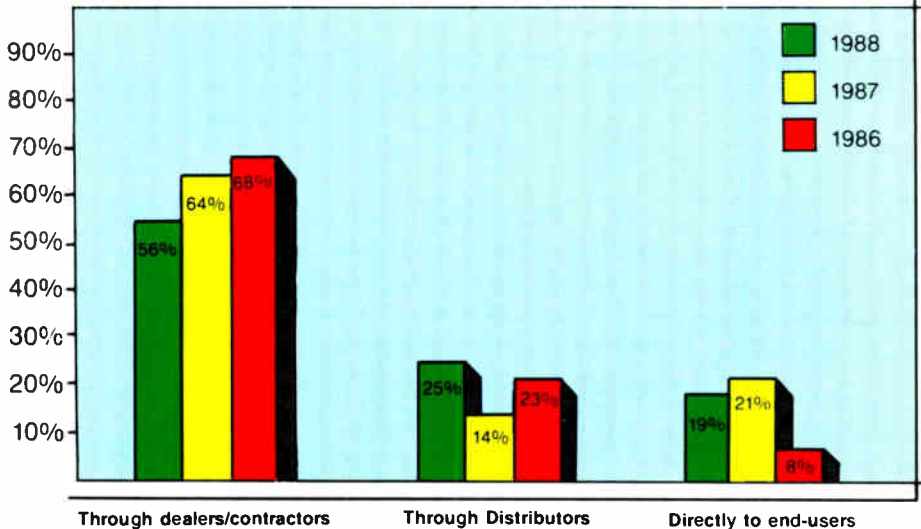
However, we should bear in mind that these concerns are generated by the *strength* of the economy going into the new year, and if the current growth rate slows to more manageable levels, and the dollar remains stable, and recession is successfully avoided, than this economic strength should provide a firm foundation for the

CATEGORY	ESTIMATED PERCENTAGE OF TOTAL MARKET	ESTIMATED MARKET SIZE
Audio	54	\$1,161,000,000.
Audio/Visual	7	150,500,000.
Back/Foreground	2	43,000,000.
Cabinets/Cases	6	129,000,000.
Headphones/Headsets	1	21,500,000.
Intercommunications	9	193,500,000.
Security	13	279,500,000.
Sound Masking	*	14,200,000.
Test Equipment	*	7,300,000.
Wire/Cable	7	150,500,000.

\*Less Than 1 Percent.

**DISTRIBUTION OF SALES**

FIGURE 1



going directly to end-users, as shown in Figure 1.

*Comments:* Sales through dealers/contractors continued to decline, down approximately 17 percent from their reported peak in 1986. However, in a reversal of previous trends, sales directly to end-users were down as well, declining nearly 10 percent from 1987, and sales through distributors have shown a dramatic increase, higher than any previously reported figure. The decline in sales directly to the end-user is most likely a reflection of the overall trend away from low-end selling reported by respondents this year. It may also be an indication that many of the new players who entered this market last year (and were selling directly to end-users) have won the confidence and support of distributors.

generally positive and aggressive stance this industry is taking in the coming year.

**1988 SALES/ESTIMATED MARKET SIZE**

Using a number of formal and informal trade studies, various proprietary sources, and the results of this year's survey, we estimate the total sound and communications market size to be \$2.15 billion.

Manufacturers were asked to indicate their company's approximate sales figures for 1988, for domestic US sales to contractors, dealers, and distributors only (no OEM or overseas sales figures were included). Using those figures, we have estimated the percentage of total market share for each of the various sectors comprising the sound and communications industry (see chart, page 36).

**DISTRIBUTION OF SALES**

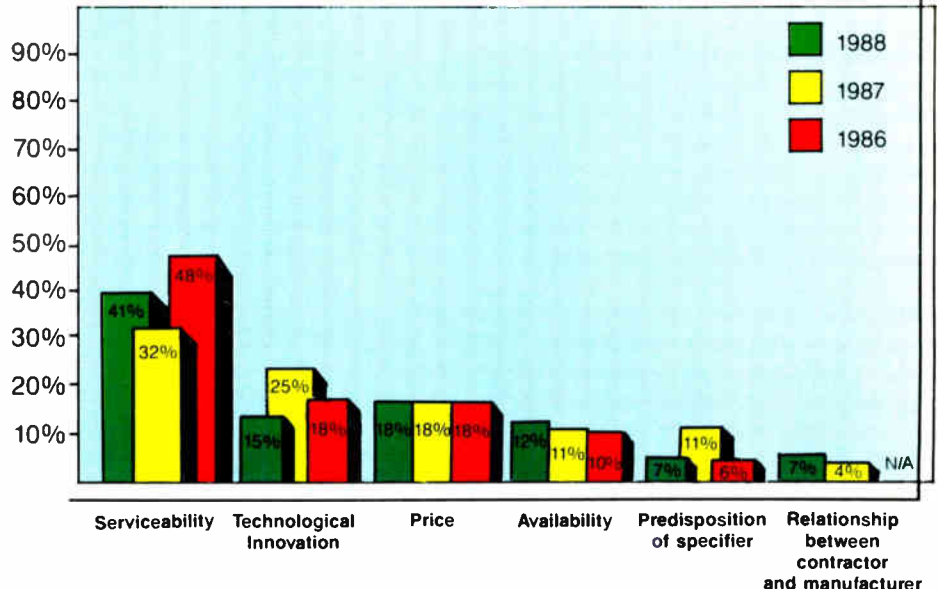
Respondents were asked to indicate the breakdown of their company's sales to dealers/contractors, distributors, and direct to end-users. According to the results, 56 percent of all sales were transacted through dealers/contractors, with 25 percent going to distributors and 19 percent

**PERCEIVED CUSTOMER CRITERIA FOR PRODUCT SELECTION**

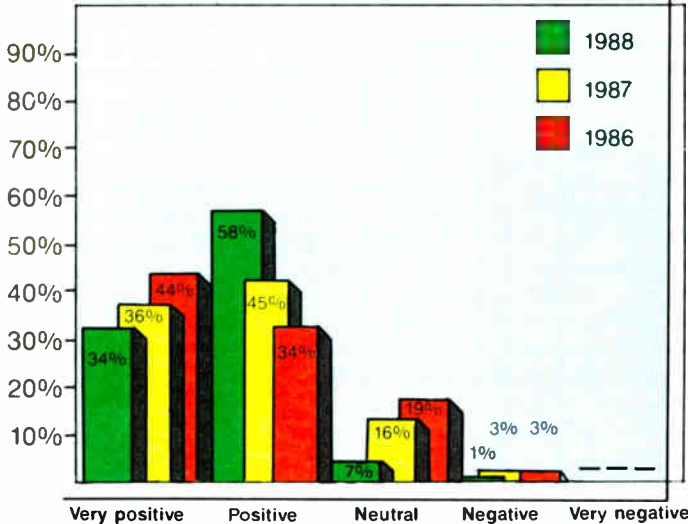
Respondents were asked to indicate which criteria they perceive to be most important to their customers. In all, they were asked to rank six criteria from 1 to 6, where 1 is most

**PERCEIVED CUSTOMER CRITERIA**

FIGURE 2



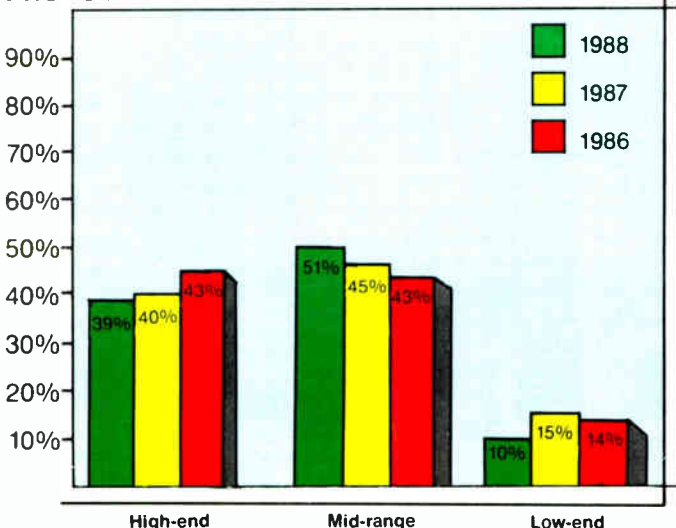
**ATTITUDE TOWARDS FUTURE SALES** FIGURE 3



important. The results: *Serviceability* was once again ranked by manufacturers as the most important factor influencing purchasing decisions, with *Price* and *Technological Innovations* ranked second and third, respectively, as can be seen in Figure 2.

*Comments:* Manufacturers have indicated for the fourth year in a row that they feel customers are more than twice as likely to be concerned with the reliability and ease-of-service offered by a particular unit than they are with how much that unit may cost. This tends to validate the idea that end-users are becoming increasingly more sophisticated about what constitutes quality and reliability in a given sound and communications product or system, and show an increasing willingness to invest in quality systems that offer long-term solutions. Losing some ground this year is the area of technological innovation, perhaps reflecting manufacturers' concern that customers may be waiting for the

**PRODUCT LINE EMPHASIS** FIGURE 5



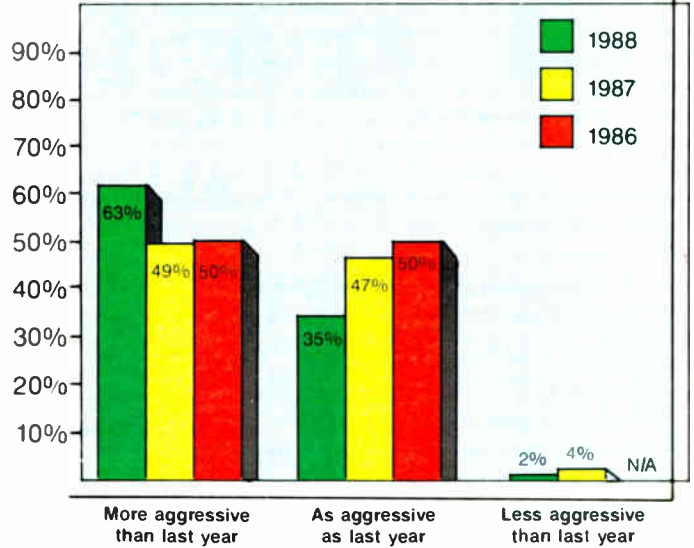
refinement of new technological applications, or waiting to see which of the new products introduced over the last ten years is going to stand the tests of time and hard practical use.

It is interesting to note that *Price*, which was ranked below technology in order of importance last year, is considered second in overall importance this year (and its percentage of overall importance has held steady for the last three years). Also of interest are the steady gains being made by *Availability* in percentage of overall importance: contractors are often in situations where they need a product quickly, and manufacturers may be growing more aware of that need.

**PERCEPTION OF FUTURE SALES**

Respondents were asked to indicate how positive or negative their outlooks were for sales in 1989. The outlook is positive indeed: 92 percent of all those surveyed indicated they feel optimistic about 1989, the highest percentage ever, with the lowest

**SELLING POSTURE IN COMING YEAR** FIGURE 4



percentage ever (around 1 percent) feeling negative about the coming year (see Figure 3).

*Comments:* Obviously, the economy's continued strong showing since the 1987 crash, and undeniable strength going into the new year, have left manufacturers feeling very optimistic as we approach the first quarter of 1989.

**SELLING POSTURE**

Here manufacturers were asked how aggressive their marketing plans are for 1989. Almost all surveyed — 98 percent — said their marketing plans for the coming year were as aggressive or more aggressive than last year. The number of companies planning to be very aggressive in the coming year is up almost 26 percent above last year's number, as illustrated in Figure 4.

*Comments:* Given the overall sense of optimism, the over-

whelmingly aggressive stance this industry is taking in 1989 reflects a desire to take advantage of strong and stable economic conditions for as long as they obtain, and a strong push is going to be central to many marketing programs in 1989. However, since 6 percent of our respondents indicated that they were neutral (or negative) in outlook for the coming year, some of this aggressive marketing is presumably the result of uneasiness over 1989's prospects for economic stability, and reflects a perceived need to maintain a strong presence in a fluctuating market.

**PRODUCT LINES**

Manufacturers were asked their opinion on market trends concerning product quality. In a marked departure from previous years, manufacturers indicated that the trend was away from low-end products, down 33 percent from last year. Continuing a slight but steady decline was the emphasis on the high-end of the prod-

uct line, at 39 percent down a bit from last year, but still a healthy percentage overall. Showing the most growth: the mid-range of product lines, gaining 13 percent over last year, and up nearly 19 percent from two years ago, as can be seen in Figure 5.

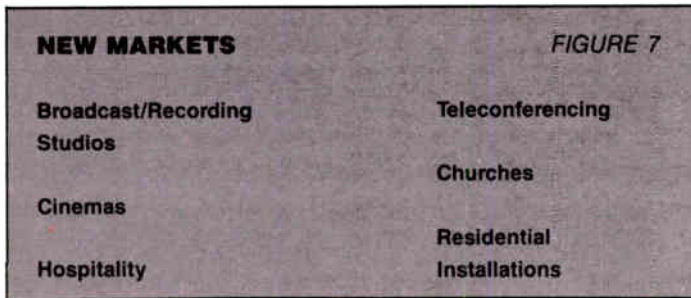
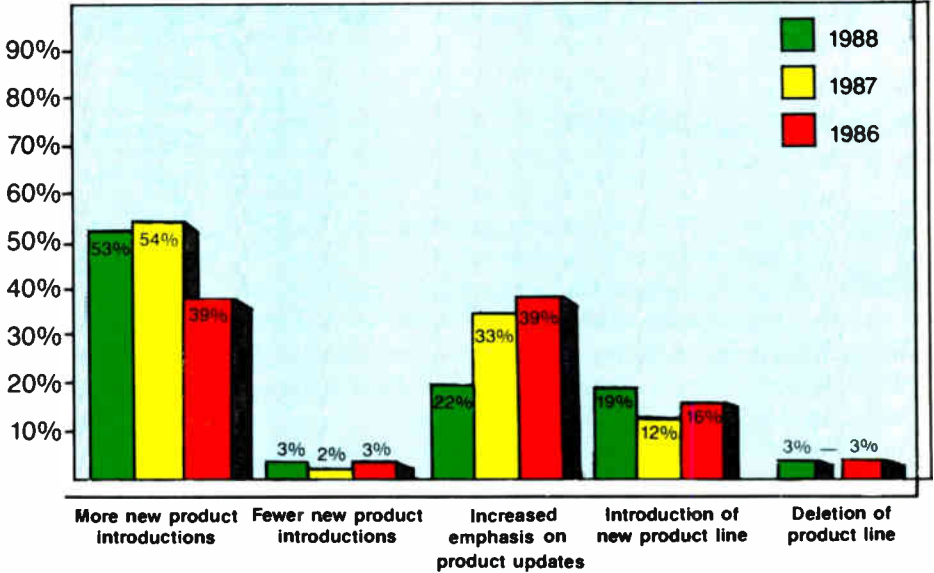
*Comments:* The continuing emphasis on the mid-range and high-end of product lines is consistent with the steady perception of the importance of product reliability over price. It would appear that a market-driven industry is responding to a demand for higher quality and greater durability in its products, and an increasing user awareness that less expensive models may not be a bargain in the long run.

listing that as their number one priority. 22 percent fewer manufacturers are listing product updates as a first priority, down 33 percent from last year (see Figure 6).

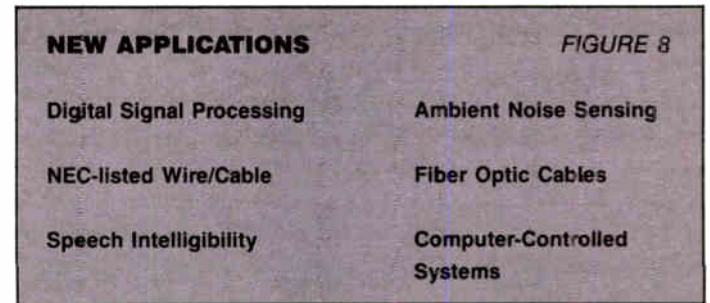
*Comments:* The number one 1989 product priority overall is the introduction of new products, a number one priority four years running. Consistent with this is an increase in the introduction of new product lines, up from last year's priorities. While still ranked second in overall priorities, product update is down significantly from last year, perhaps indicating the passage of a year of upgrading and greater market penetration for existing products. The time may have come for the incorporation of new technology into new products, and the cost of that technology may have come down during the last year to the point where cost-effective application is now possible.

**PRIORITIES IN COMING YEAR**

**FIGURE 6**



**FIGURE 7**



**FIGURE 8**

**PRODUCT PRIORITIES**

Manufacturers were also asked to comment on priorities for their 1989 product lines. Once again, as last year, the primary priority for manufacturers in the coming year is the introduction of new products, with about 53 percent (virtually the same as 1987) indicating this as their number one priority. And around 19 percent of respondents expect to introduce new product lines.

**NEW MARKETS AND APPLICATIONS FOR 1989**

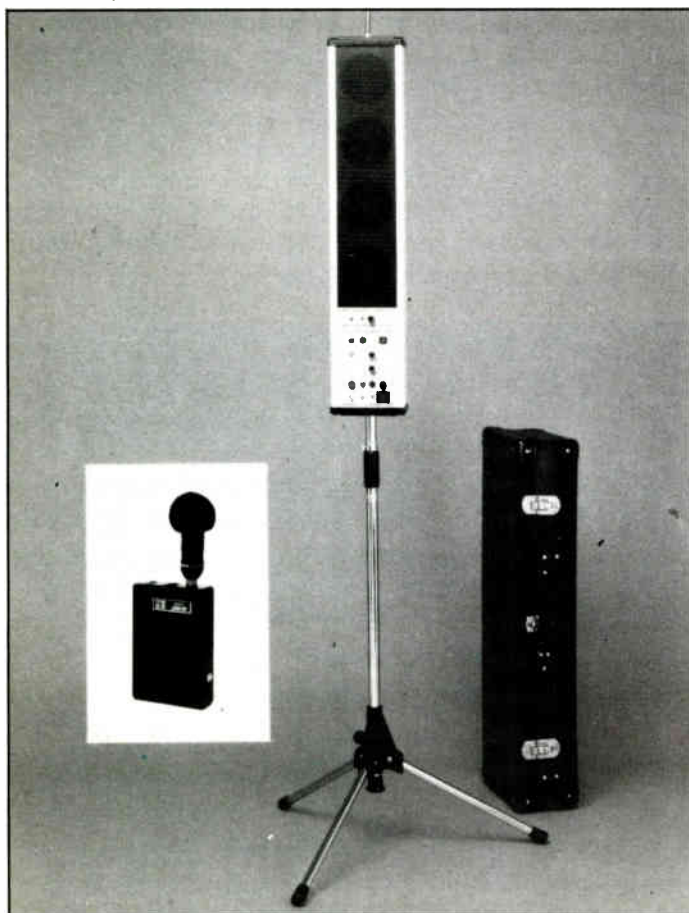
What new markets will manufacturers be addressing in 1989? What applications are they planning to address in 1989? Shown in figures 7 and 8 are some of the answers manufacturers gave to these questions. While the markets and applications listed may not be new to the industry, they may be new to a particular company, indicating the industry's desire to expand their product lines and broaden their market base, thus maintaining their competitiveness.

# PORTABLE SOUND SYSTEMS

BY BARRY MCKINNON

**C**ontractors who service churches, schools, field houses, hospitals, union halls, and hotels know that these can be very lucrative markets for installed sound systems. These same customers are also some of the largest users of portable sound systems, a market that can be quite profitable as well, especially as there is no installation required and therefore no labor to schedule.

Covering a wide spectrum of applications, from the familiar megaphone to sound reinforcement for music, portable sound systems offer the end-user the advantages of a sound system where no system has been installed, or where none could be installed. Our focus here is on systems for voice reinforcement and communication, the totally portable DC-powered system. These systems offer quick set-up and a minimum of required cabling (in fact, some feature wireless microphones, so there are no cables at all).



Paso's model CA-150/L portable lectern features wireless technology.

There are many potential customers to consider for these units: some you may already deal with (having installed permanent systems in their facilities), along with a large number of users you may not have considered. Portable systems can be offered as accessory items, and for some of your customers, you might even consider including portable systems as part of your system specifications. Many times they would not have considered how useful an item a portable system could be.

"It's unfortunate that more contractors don't consider the portable market. While they're in the school installing a system, these could be offered as an enhancement," said David Moore, sales manager at PASO Sound Products, Pelham, NY. That's a feeling shared by Jay Goldstein, marketing manager for Perma-Power Electronics, Inc., Chicago, IL: "We sell through contractors on a full system-supply basis, but they definitely lean towards wanting to hardwire. I think they're missing an opportunity."

Let's consider a few opportunities, from the most obvious to the more obscure. The most likely candidate is the hotel with a number of meeting and conference rooms, as Ron Evers, vice president of sales for Argos Sound, Genoa, IL, points out: "Hotels like the advantage of having AC/DC. They can take a system outdoors, they can take it to the poolside, or they can move it into a room where there is no reinforcement system." The need to make these decisions always seems to arise at the last minute, and the quick solution provided by a portable system can prevent panic calls to the local A/V company to get a system in time.

Schools, from elementary to university, require vocal amplification, often in unusual places. DC powered over-the-shoulder systems allow instructors to communicate on field trips, coaches on the playing field to instruct large groups of players, and student associations to stage large pep rallies. Bruce Jones, marketing manager of Lectrosonics, Inc., Rio Rancho, NM, points to this as an exercise in niche marketing: "We're very popular with directors of school marching bands." Portable lectern systems allow fast set-up of sound reinforcement in any classroom. Playback of video tapes or other audio tape sources through these systems may provide wider coverage and often much better fidelity than is possible with the built-in speakers of tape recorders and television sets. Jerry Sieler, president of Sieler Design Products, Gardena, CA, sees the school market as a large one: "The educational market is the largest for us. For example, we design a special unit just for the Los Angeles school system."

Churches are another large market. A fair amount of money is usually spent on the primary installed sound system, but there is always a need for auxiliary systems in the secondary meeting

rooms where Sunday school is held, or where prayer groups assemble. Portable systems can go anywhere church services are being held: "Suppose there's an assembly that moves outside on a nice day, or a funeral service is being held at graveside, you certainly won't have an installed sound system there," explained Jay Goldstein.

There are many other markets for these units, such as hospitals, police departments, pistol and rifle ranges, community associations, municipal governments, fire departments, civil defense, political candidates, sports organizations, corporate clients, industrial plants, museums...the list could go on for pages. The contractor that may consider the sale of this type of product should know that he faces stiff competition in the high-profile customer market. The large educational organizations will usually buy these products from Audio/Visual catalog and supply houses. As Bruce Jones puts it, niche marketing is the key: "We do most of our A/V sales through the big A/V companies with outside sales or catalog sales. We have a certain number of dealers in A/V and a very low turnover, we don't open many new dealers, and we always scrutinize new applications very closely. I would push the contractors more towards the niche market." Church supply companies offer these systems in their catalogs as well, so the contractor can't hope to compete head to head on tender sales of these portable systems, but direct sales can be quite healthy.

There are probably many contractors who are not familiar with the players in this marketplace, although many of these companies have been in this market for dozens of years. For the contractor who has always viewed portable systems as a backwater of the audio industry, a few surprises could be in store as we introduce several of these manufacturers. These companies take their products very seriously, and often the search for new technological applications (especially in the area of increased battery life) is as intense as at any R & D department, anywhere.

One of the relative newcomers to the portable is Anchor Audio, Inc., of Torrance, CA. They began by marketing a small powered-speaker system (at that time AC-powered). It caught on big with A/V departments and rental companies, and has led to the development of several

additional products. There are now two product lines: the small AC-powered systems (used in TV monitoring, A/V, and broadcast applications) and the portable AC/DC systems. Jon Pierson, national sales manager for Anchor, described the company's philosophy: "In an A/V department, there's always someone breathing down your neck to set up a system. We design our products so they're as close to 'turn it on and use it' as possible. We sit on the fence between pro audio and A/V, merging the two. A bit more high tech, more pro audio oriented...we have more power and more fidelity and we charge a bit more for that."

The Anchor line includes a broad range of products, from the five pound Mini-Vox (a 15-watt miniature unit resembling a plastic flashlight), to their table-top lectern (made of a lightweight plastic, it folds into a durable, easy to handle package). They also have a dual-speaker system that incorporates a woofer/tweeter combination and a small re-entrant horn. A switch in the unit allows a choice of music or high level voice reproduction. "People have a preconceived notion that battery-powered equipment doesn't sound good, is unreliable, and that batteries don't last. We're trying to change that view. It's been our mission to prove you *can* get decent performance from battery-powered equipment," said Pierson.



*Lectrosonics' entry in the wireless field — the Freedomike series.*

Argos Sound has been building their Voice-Director series since the early sixties. They offer several portable formats: the "Sound Lectern II" desktop lectern, the "Executive II" briefcase-size and "Speech Director II" suitcase-size systems, the "Sound Pak II" and "Voice Director II" outdoor sound columns, and the most recent introduction, the "Sound Rostrum II" full-size lectern. Ron Evers, vice president of sales, comments: "All of our systems are designed for optimum vocal reinforcement. Users like the idea of AC/DC, they can take the systems outdoors to sporting events and track meets where there is no sound." They market through A/V, church supply and office supply houses, and advertise in magazines that go to those marketplaces as well.

Battery life has been a major area of development for Argos: "With present-day electronics technology, equipment is designed so that when it's idling it draws minimal current. Battery life can be extended to 80 to 100 hours of intermittent use," said Evers.

A small Canadian company, KDM Electronics, Inc., Scarborough, Ontario, has been building a heavy duty suitcase-size model for the recreational market for five years. It has recently been discontinued and its replacement is due on the market in January: the "Portacall" is built into a high-impact aluminum case

and has four microphone inputs and two auxiliary inputs, all accessible from the front. "The new unit is simpler and less expensive, we got rid of the modular construction — but it's still built like a Sherman Tank," said company president Ron Bull. It has been built to withstand the punishment it gets in and around arenas, parks, and recreational complexes.

Lectrosonics offers a line of products that include full-height and desktop lecterns, lunchbox-size portable wireless sound systems, and rechargable battery-powered musical amplifiers. Several of the AC/DC sound systems incorporate their "Freedomike" wireless systems. The "Long-Ranger" is a high-level voice projection system for outdoor use. The wireless feature allows the operator to get well out of feedback range. The FM-AV4 is a very compact system also using the wireless technology. The line features the "Voice-Projector" lecterns: "Voice-Projector is almost a generic name in some markets," claims Bruce Jones. "We've been in the lectern market for 17 years. There are a lot of players in this market, and each one has their own niche. The lectern business has been pretty steady for a long time."

The company deals with a number of these niche markets: "A unique item makes it easy to find a specialty market." Police



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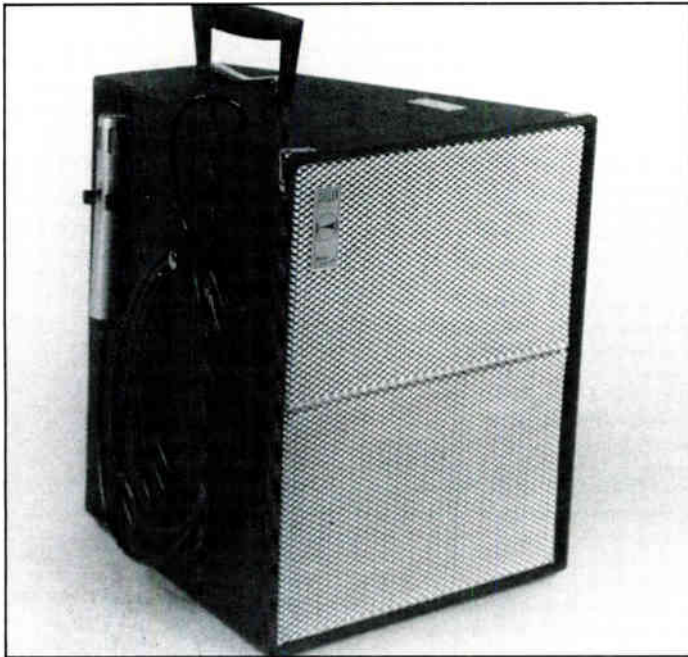
8

# HANDBOOK ON ESTIMATING

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*The Voice Director II from Argos.*

department firing ranges and marching band leaders are two examples of such markets. Lectrosonics supplies the corporate and educational markets as well as A/V. "Audio/visual is so broad, there's audio, video, and communications. The A/V companies

are doing contracting and the contractors are doing A/V," said Jones, describing the blurring of the lines between the big markets.

PASO Sound Products offers several sizes and styles of portable sound, from conventional megaphones to their wireless "Amplcolumn" system. Included are a number of lecterns in their "Lektron" series, as well as lunchbox-sized systems such as the "Audiovoice," and suitcase-sized systems such as the "Soundcaster." David Moore elaborates: "We have 28 portable systems, the portable lecterns, self-contained wide range systems, and over-the-shoulder systems that are big with schools and colleges, they're very important for training programs of all types." They also offer a range of DC-powered mobile communications amplifiers, the series 1000, that were used heavily during the elections. "Sales skyrocket every four years with the presidential elections," said Moore. In addition, a line of DC-backup, permanent installation amplifiers, the 4000 series, was introduced in 1987. Future portable sound equipment will benefit from the technology developed from the 4000 series.

Perma-Power Electronics has been building portable voice reinforcement equipment for 35 years. Jay Goldstein, marketing manager: "We were the pioneers in taking the tubes out of the

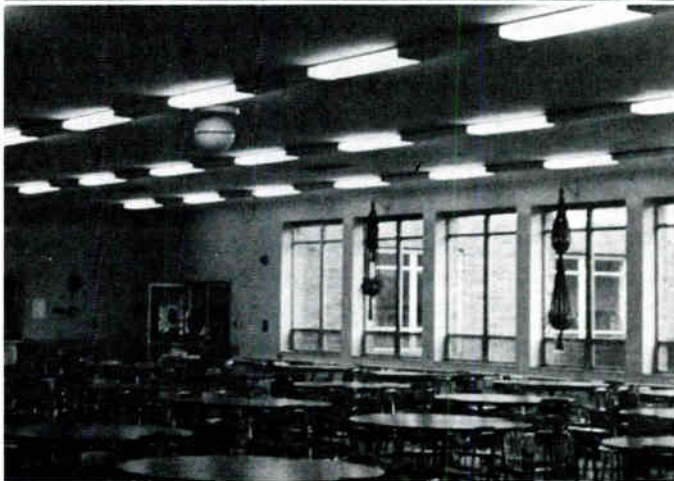
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Robert Satler, President of ARC Systems Corp., Chicago, IL, writes about a Soundsphere Loudspeaker installation at Mother McAuley High School in Chicago. He stated, "We used the Soundsphere Model #168 in the cafeteria. The school management could not believe that a single speaker with one 8" transducer could cover such a large room. Not only does it cover the room effectively, but it also sounds excellent without the use of any equalization."

"The other photo is of the school gymnasium. Here we used a single #2212-1 speaker. Again we found the coverage excellent."

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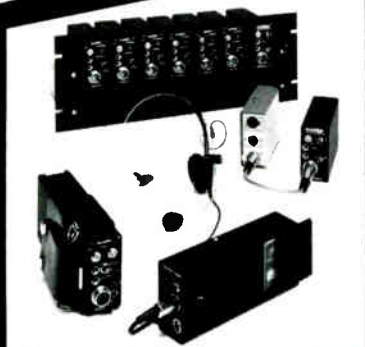
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**PORTABLE SYSTEMS**

amplifier and using transistors." They offer five systems, two luggage-size systems, one of which is the "Roving-Rostrum," which folds into its own lectern. Briefcase-size systems, car-top units, and a horn product known as "The Half-Mile Hailer" round out the line. The "Hailer" was in demand for the election campaign as well, with several politicians (including Senator Paul Simon) using them. The unit is also very popular with auctioneers and band leaders. "There's always a need to get voice communications across," said Goldstein. The "Hailer" is equipped with a separate microphone, allowing more flexibility of use than a megaphone would provide. Of course, the car-top units are in high demand in election years as well.

Another long time builder of portable systems is Sieler Design Products, a family operation, with all design done by Jerry Sieler. The company began in 1952, selling hi-fi speaker kits, and switched to electronic design and construction when the market became saturated with loudspeaker kits. "We took the original loudhailer or bullhorn and developed the small-package portable, a direct radiator in a small box. We solved the problems of feedback," said Sieler. He had presented a paper relating to the factors of communication being proportional to power and inversely proportional to distortion. It was these design tenets that produced the high-output, low-distortion products Sieler builds. The first set of patents on these pieces were sold to Lectrosonics, but since then Sieler has produced some new designs that extract very high output from battery-powered systems: "We pull one watt per volt out of these systems, the 24 volt supply will deliver 24 to 30 watts, and the 12 volt unit will deliver 13.5 to 14 watts," claims Sieler.

Every major politician from Eisenhower to Reagan have used Sieler's systems. The election year demands were high for the hand-held systems and the portable lecterns. "The educational market is the largest, but the politicians are the most powerful," said Sieler. Other users include A/V companies and the Border Patrol:

"We sell to some people whose lives depend on them being heard," Sieler added.

A relatively late arrival to the totally portable market is TOA Electronics, San Francisco, CA. While they have had AC-



*One of the portable lecterns from Argos — The Sound Rostrum II.*

powered portable equipment for years, they recently introduced the model WA-640 wireless portable. An AC/DC, 20-watt system with two non-diversity wireless microphones and a third hard-wired microphone input. They are available with and without a cassette deck built-in. According to Richard Krochmal, national sales manager, the new product seems popular: "We haven't done a press release on the unit because we sold the entire run before we took delivery. I guess you could say we're getting good acceptance." The full array of features in this unit is likely to point the way to the future of the portable system.

There are a number of unintentional  
*(continued on page 68)*

# When adequate is no longer good enough.

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World Radio History

# BRYN MAWR COLLEGE

BY JESSE KLAPHOLZ

**B**ryn Mawr College's sprawling campus, located in the suburbs of metropolitan Philadelphia, was built over a 50-year period around the turn of the century. The medieval architectural motif with its towering stone structures, flying buttresses, slate floors, and massive glass windows are where an electroacousticians' dreams take place — or is that nightmare? The 983 seat Goodhart Hall features these architecturally hard room surfaces, and low-pile seat cushions/seat-backs. When Richard Feld of TekCom Corporation, Philadelphia, PA, was first called out to visit the site, what he heard was a very live room in need of help.

Another contractor had already designed a system that used a delay position. This did not sit well with Richard, who knew from experience that a fairly high-Q cluster would need to be properly designed in order for him to be competitive. Subsequently, the author was called in to look at the prints and review the existing design. This new design was proposed to Bryn Mawr College, and installation of a single cluster location started soon after.

### ROOM HISTORY

Goodhart Hall, which was built in 1927, serves as the school's main auditorium. It originally included a pipe organ with two organ chambers. This accounts for the unusually large, expansive space. Measuring in at over 270,000 cubic feet, that allows for 275 cubic feet per seat — in comparison with the some 250 cubic feet per seat of Boston Symphony Hall. The stage itself is about 960 square feet, and adds about another 64,000 cubic feet of acoustically-coupled space. The stage-house has 24 line-sets used for scenery, cyc, scrim, black traveler, and three electric pipes for overhead theatrical lighting. The stage also has space for a full carpentry and scene shop, laundry, and plenty of storage



Using the dbx RTA-2 to set unity and crossover gains.

space.

The proscenium opening is 30 feet wide by 14 feet high. The stage extends three feet beyond the proscenium, with an orchestra pit below which can be covered extending the stage an extra six feet. Normally the front-row is 12 feet from the stage. The room may be reduced into a smaller, more intimate space by closing a curtain located 50 feet back at the approximate room center — reducing the seating capacity to about 540. Due to the symmetrical geometry of the room, the cubic volume per seat remains about the same. This curtain was donated to the school ten years ago by Katherine Hepburn (a Bryn Mawr alumnus).

### PRESENT USES

The auditorium is used for speeches, plays, and concerts. The emphasis on replacing the existing system was on improving the quality and level of speech intelligibility. The auditorium is often closed down to its half-size configuration, but may at times be used at its full capacity, which includes a balcony with stepped bench-style seating. The room is part of a theater arts program, and has a full dramatic theater stage crew of college students, although the overall sound system responsibility falls under the campus AV Department.

While the AV Department has an experienced and professionally qualified sound technician, Ralph DelGiudici, the system is often operated by the students. This means that the system must be extremely flexible, easily and quickly adaptable to changing programs, yet simple enough for a student to be quickly trained for each type of performance. Provisions must also be made to accommodate mixing when the auditorium is used in its full-seating arrangement, as well as with the curtain drawn at the mid-house point. Also, there are times when just one microphone is needed, and an operator in the house is not preferred. Therefore, there must be an easy means for controlling the system in any of these modes.

### SYSTEM DESIGN APPROACH

As was mentioned earlier, another design had already been submitted to the college. This design consisted of two-way loudspeaker systems using direct radiator low-frequency enclosures Crossed-over to two-inch driver/500 Hz Constant Directivity horns. One loudspeaker system was located at the front of the room and a second system was located at the mid-house position to cover the second half of the room, and the balcony. Because the room had a simple geometric layout — slightly-raked rectangular seating plane with the stage at one end — various loudspeaker coverage isobars could be easily projected onto a properly tilted floor plan using the Prohs cluster computer.

Using the Prohs analog real-time system allowed for quick

observations and comparisons of several horn combinations and individual horn orientations. Within minutes we were able to determine that the entire room could be covered from a single position with much greater control of overlapping areas and time delay artifacts. This was true from a time and frequency point of view. However, we must also consider the intelligibility of the system. To view this we may look at the simple relationship of direct-sound to reverberant-sound.

Classically, we use the reverberation characteristics of the room's physical makeup. This gives a room constant, that we use together with the directivity of the loudspeaker. Quickly one can see that if

a direct radiator low-frequency loudspeaker is used, the critical distance will be under 20 feet. When we have the furthest listener at 75 feet that means that he will not get to hear very much direct sound throughout the operating range of the low-frequency device. This range also happens to be where the room is more reverberant and where the main portion of the energy in speech lies. Thus, the fidelity is poor and the low-frequency range of speech — which in part serves as a carrier for speech information — ends up masking the speech information.

Because the room has a reverberation time of over two seconds in the low-end, we felt it was important to provide as much direct sound through the entire speech range to as many seats as possible. At first we considered the Community Light & Sound M-4 mid-range driver and horns. But because of their large size in relation to the room and their cost versus the available budget we could not seriously try them. Instead we opted for an older product available from Community: a 12-inch mid-range horn model M-80. Their directivity — while not the optimum — at least allowed us to include just over 75 percent of the seats within critical distance through the low-end of the speech range. The directivity available from high-frequency horns allowed us to maintain almost 100 percent of the seats within critical distance. By minimizing the excitation of low-frequency modes, a better direct-to-reverberant ratio is achieved.

Another important criteria is whether the system will be loud enough, i.e., with enough gain before feedback and with enough fidelity. The easier question to resolve is the power handling capability. We used very conservative power ratings in order to account for power compression. We also assumed a mutual coupling (+6 dB) of adjacent drivers since all driver mechanisms



*Goodheart Hall at Bryn Mawr College, PA.*

are physically aligned. We calculated — and later verified — a continuous output level of 117 dB SPL, from 80 Hz to the thermal limit of the JBL 2445 two-inch compression drivers.

The gain before feedback is also straightforward to calculate. In fact all of the calculations necessary for this type of design can easily be performed on a two-buck calculator, and the appropriate sound system design slide-rule calculators distributed by Syn-Aud-Con. Nonetheless, the cluster was calculated to be about the same distance from the furthest point down-stage as the front-edge of the balcony. This ended up giving us about 30 dB of acoustical gain through the entire speech range.

### **CENTRAL CLUSTER**

The central cluster consists of three 400 Hz CL&S constant-directivity horns: one each 90 x 40, 60 x 40, and 40 x 20. All three drivers are assembled vertically in an arc. Beside this vertical array are two M-80s, with 12-inch JBLs, one on either side of the high-frequency drivers. The mid-bass devices are aligned with the high-frequency array, such that at any listening point one is equidistant to both devices — well within a quarter-wavelength anyway. The low-frequencies were handled separately.

Often, sound reinforcement designs intended for both live speech and music do not properly reproduce low-frequencies. The speech and bass are frequently sent through the same equalization and loudspeakers. The cluster in this system does not include a low-frequency enclosure. This intentionally omits bass reproduction for speech-only applications by virtue of simply not plugging in the low-frequency cabinet. However when both music and speech are in the program, the bass cabinet is used.

# INSTALLATION PROFILE

Typically in this setup not as much acoustical gain is required.

However, there is a way (in situations that warrant) to route the speech to the cluster and the only inputs with bass energy in them to the bass cabinet. The Biamp console that was provided has two sub-groups and two effects sends. One of the effects sends can be used to send a signal through the spare channel of the Rane stereo crossover, and drive the bass cabinet unequalized. For pre-recorded music and direct connection to musical instruments, this can be workable with the three-band equalization on the mixer itself. The low-frequency enclosure is the PAS double-19-inch direct radiator. Ironically, it ended up in the original organ chamber in the corner of the room.

## SYSTEM SETUP

Bill Sapsis, co-owner of Sapsis Rigging Co., supervised the installation of the cluster. The cluster itself was custom fabricated

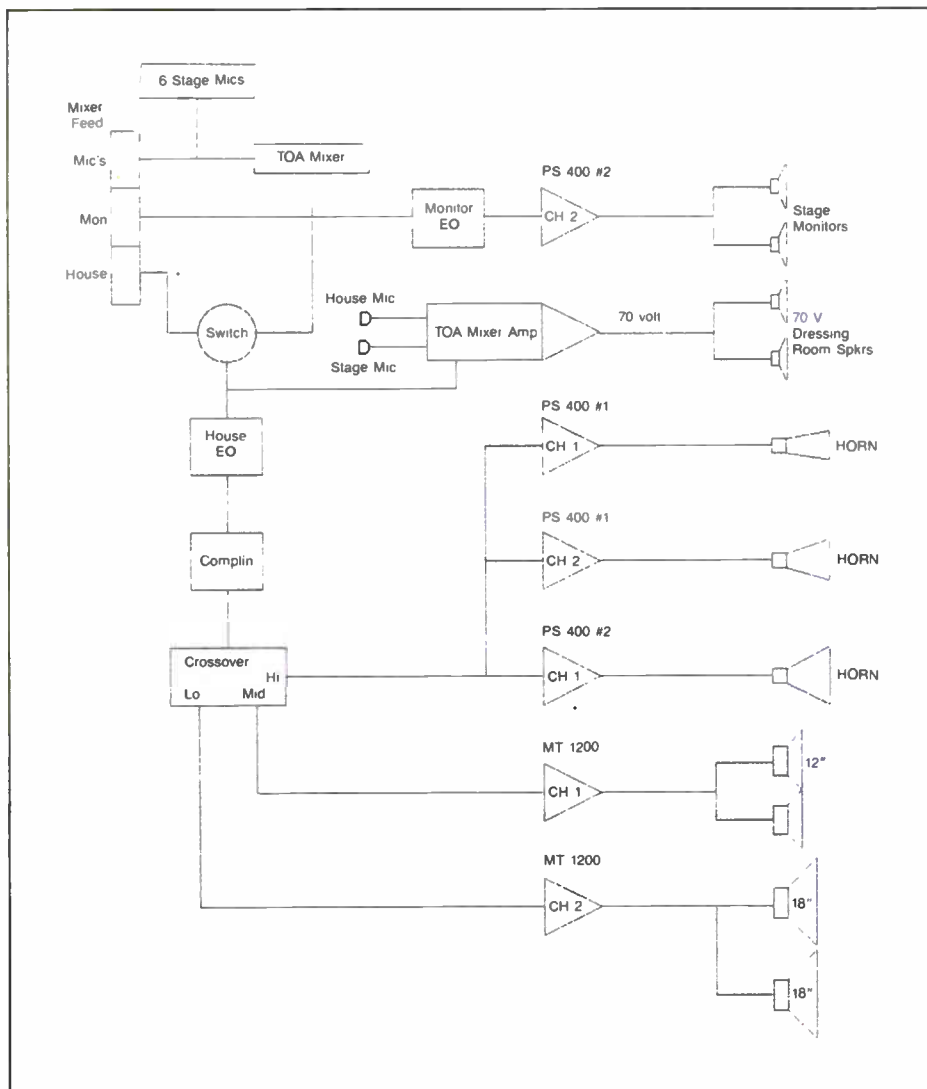
per the drawing specifications that included the design angles of each driver. Each horn was bolted at its front with 0.25- by 2.0-inch thick aluminum bar stock. The drivers are all attached with 1.0-inch square aluminum tubing. With pink noise playing, the entire array was hoisted into position so we could verify coverage from various positions in the room. While rather empirical in approach, it allowed the riggers to make adjustments in real-time (greatly simplifying the entire process).

In order to even further simplify — which translates to significant time-savings and controlled profits for the contractor — we used the dbx third-octave RTA-2. Using the pink noise generator and calibrated input we were quickly able to patch around each piece of gear in the rack, set all the gains to unity, and set the crossover gains. While listening at both the front and back of the house we were able to "jockey" the cluster up and down within

a few feet of the design height window and ensure that the coverage was smooth front to back. This only took several minutes of running around the room. The riggers quickly bolted the cluster in place and all of the mechanical adjustments were completed. This allowed us to raise the cluster while we were setting and verifying levels, set the cluster in its final mechanical position, and remove the acoustical shadowing part of the scaffolding in a matter of several hours.

We were now ready to balance the cluster electroacoustically. Using the dbx we set relative levels of the amplifiers to match the maximum output required by the college; about 100 dB mid-band. Having unity-gain through to the amplifier input maximizes the signal-to-noise ratio, something we still argue about with many sound system operators who insist on turning all the amplifiers up to "full-tilt boogie." Nonetheless, leveling the amplifier inputs takes only five minutes or so in small systems such as this. Provisions should be made to clearly indicate the input attenuation in the event amplifier replacement becomes necessary.

Once the rough loudness-compensated curve is set, the three high-frequency horn levels were matched. At this point, the fidelity and control of gross dominant feedback modes were equalized with one channel of the Yamaha third-octave equalizer. The dbx RTA-2 allowed us to use music as the "test signal" of the system, en-



Block diagram of system design.

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*The central cluster: three Community horns, two M-80s (with 12-inch JBLs).*

abling the system designer, contractor, and Ralph DelGiudici to comment subjectively on what we were hearing; and in real-time see an objective point of view. The dbx RTA-2 ended being

the second most important tool on the job next to the block-and-tackle used to hoist the cluster.

Because it can easily be used via its "electronic bank teller" type soft-keys, any contractor can feel confident of quick setups, along with easily repeatable and interpreted results. The gain settings were run-through rapidly with pink-noise, and with a few keystrokes the music is selected as a reference input from the console, and a microphone attached to another input of the RTA-2 allows the operator to "see" what the system is doing as he listens. Even while level and equalization adjustments are being made the room-reference function will update. This type of display is also very meaningful to many of the average clients we deal with.

#### **OBSERVATIONS**

Once the system was up and running, Ralph was glad he went to bat for TekCom, and justified the additional costs of a three-way single central system. The coverage was very even with smooth frequency response. Listening to classical, jazz, vocals, and rock music demonstrated the full-fidelity of the system. More

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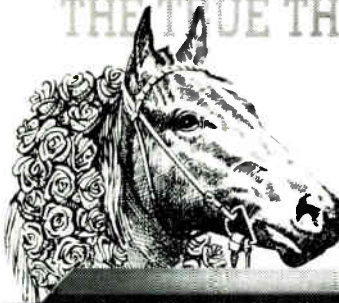
than adequate gain before feedback, and good speech intelligibility were achieved in the far corners of the room's lower level as well as most of the balcony (some of the seats are obscured by the curtain).

**Using the Prohs analog real-time system, we were able to determine that the entire room could be covered from a single position.**


Overall, the installation went very smoothly. After the first few events, the AV and theatrical departments were very happy with the many compliments they received on their "great new sound system."

*Klapholz is technical editor of this magazine.*

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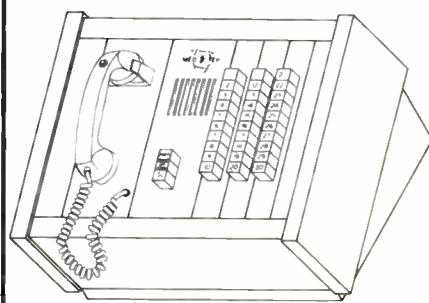
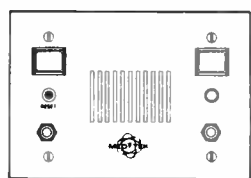

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## Contracting Closeup

### Dodge/Carroll Church Installation

Dodge/Carroll Electronics of Topeka, Kansas is working on a sound system installation in the Most Pure Heart of Mary Church in Topeka which is estimated for completion in early December. Charles Boner of Boner & Associates in Austin, Texas has designed the system. "It is a large cathedral reverberant room with a huge speaker enclosure — 15 feet by 10 feet," said Dean Dodge, president of Dodge/Carroll Electronics.

Altec Lansing has appointed Dodge/Carroll as their official contractor/distributor for the Topeka, Kansas trade area. Dodge/Carroll used Altec Lansing MR series horns with 299 drivers and Altec crossover, broad band equalizer, 1678C automatic mixers, and 9444A power amplifiers. Other equipment used in the church included White Instrument 3900 narrow band equalizer, JBL/Urei 7922 digital audio delay, Telex FMR2 wireless microphone, Shure SM99 microphone for the podium and Tascam 112 cassette deck.

### Selectro Especta Installs at the Aztec Stadium

Selectro Especta of Mexico City, Mexico has installed a new sound system in the Aztec Stadium in Mexico City in August 1988. The system included 12 Apogee Model 3X3 Electronically Coupled Concert Loudspeakers.

"The unusual thing about this job, was that the last two systems installed have virtually rotted out due to the poor air quality in Mexico City. Obviously, we wanted to avoid that happening again as well as improve the overall sound quality, so we took great care in our



*Most Pure Heart of Mary Church, Topeka, KS.*

speaker selection," said Jose Luis Olvera of Selectro Especta.

The Apogee model 3X3 speakers are specially coated and constructed for protection against pollutants, hung in a central cluster array over the playing field. The 3X3 incorporates a fluid-cooled titanium diaphragm driver assembly coupled to a large mouth controlled directionality mid range horn.

Low frequency reproduction is handled by two 15-inch cone drivers acoustically loaded by dual, separate CD horn sections, coupled at the mouth. A vented bass design allows for more efficient low frequency response and cone excursion control. An array of four one-inch throat horn/driver assemblies located towards the front of the mouth of the upper low frequency horn handle high frequency reproduction.

Also installed in the stadium was a Biamp 1224 mixing console, an Altec

Lansing equalizer, a Technics turntable, a dbx compact disc player and three Systems 55 HME wireless microphones. From the system installed in 1986, 37 model 3500 QSC amplifiers were saved and used in the new system.

### TSI Brings Sound to the Salvation Army

TSI, an audiovisual and sound system company based in Mineola, New York, has completed a sound system installation in the Salvation Army Auditorium in Suffern, New York, in November 1988.

The speech and program reinforcement system was installed in the auditorium and in a small divisible conference room in a building adjacent to the auditorium. The auditorium is a multipurpose room for meetings, awards, fund-raisers and theatrical performances. The carpeted room also

has markings for a basketball court allowing the auditorium to double as a gymnasium.

TSI used an Altec Lansing speaker cluster, consisting of a MR64A high frequency far-throw horn, a MR94A high frequency near-throw horn and a 515-8GHP/817A low frequency speaker suspended behind a fabric front on the top of the arch above the stage, according to Chris Maione, vice president of TSI. Also used on the installation were Crown amplifiers, one Urei equalizer, two JBL 4602 foldback-end monitor speakers on the floor and one JBL 4612 monitor speaker suspended overhead towards the rear of the stage, Wireworks patch panels multitailes and multiconnectors, Soundcraft 200SR mixing board, dbx 160X compressor/limiter, Altec 1631A electronic crossover, Urei 7922 signal delay, Winsted equipment console for the rear-house mix station and Tascam 112 cassette decks. ■

## People

### New President and VP at Telex

Jeffrey S. Wetherell has been appointed president and chief operating officer of Telex Communications, Inc. Wetherell transferred from another Telex subsidiary in January of 1987 to join Telex as executive vice president.



Jeffrey S. Wetherell

Wetherell previously had both domestic and international management assignments in Tokyo, Paris, Frankfurt, London, and Kinshasa, Zaire. His background includes sales and marketing, finance, strategic planning as well as operations management. His career includes 11 years with the Goodyear Tire and Rub-

ber Company and four years with Raytheon Corporation's Data Systems division which was acquired by the Telex Corporation in 1984.

Phillip A. Phelon has been appointed executive vice president of Telex. Reporting directly to Phelon will be all manufacturing plant managers, the director of quality assurance and the director of management information systems.



Phillip A. Phelon

Phelon joined Telex as production engineer in 1965. A year later he was named quality assurance manager. He then managed the company's Blue Earth, MN, plant from 1967 to 1983 when he was named vice president of manufacturing.

### Parker Promoted at Bogen

Thomas G. Parker has been promoted to the position of product manager, engineered sound, at Bogen Communications, Inc. He will be responsible for applications engineering, field training and customer support for the company's line of school and institutional sound products. Parker has served as an applications engineer for the past year, after joining Bogen's engineering department in 1987.

### Intensive Care Appoints Caraway Special Assistant

Intensive Care, the sales and marketing, artist relations and exhibition services organization, has appointed Steve Caraway as special assistant to the firm's owner Rick Rosen. Caraway comes to Intensive Care having served with several manufacturing firms, including TOA Electronics and Nady Systems and several of the industry's leading publishing companies, Testa Communications and GPI Publica-

tions. Most recently, Caraway held a position in the professional audio field with Caraway Audio in California.

### Anixter Appoints Dittman VP Contractor Sales

Anixter Bros., Inc. has appointed Bruce Dittman vice president of contractor sales. Dittman will concentrate on the continuation of Anixter's strong contractor sales program and the expansion of their international sales efforts. Formerly with Morrison-Knudsen, an engineering and construction company, Dittman has 13 years of international purchasing and operations experience.

### Osamu Tamura Named VP of Sony Pro Audio

Osamu Tamura has been named vice president of Sony Professional Audio Division. Operating out of the company's Teaneck, New Jersey office, Tamura will be responsible for the strategic growth and direction of the division and will coordinate sales, marketing and product development activities. Tamura has been with Sony for 20 years. Before accepting his present position, he was general manager in the audio division of Sony Broadcast Ltd., England.



Osamu Tamura

### Javelin Promotes Schaub

Javelin Electronics has promoted Roy F. Schaub, field sales manager, to the position of national sales manager, security products. Schaub has held positions with Singer/GPL CCTV Products, Scientific-Atlanta CATV Products, Bell & Howell and Audiotronics CCTV Products.



## Products

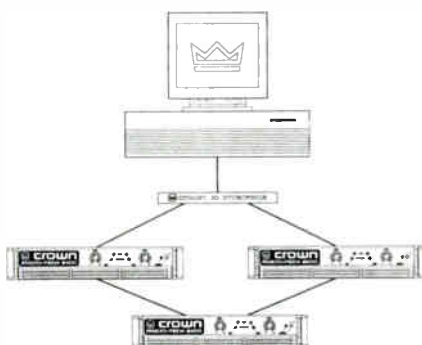
### Crown's IQ System for Macro-Tech Amps

Crown's IQ System provides independent and remote control of each channel of 1 to 2,000 Macro-Tech amplifiers, according to the company. The performance of each amplifier is digitally monitored with a Macintosh computer.

Features of the IQ system include: input attenuation level, audio signal at the amp input and output, inversion state of the audio signal, IOC signal, ODEP signal, and rail voltage (VCC) signal.

The IQ System is comprised of three parts: the P.I.P-IQ cards, the IQ inter-

face, and the IQ computer. The P.I.P-IQ cards plug into the P.I.P (Plug-In-Panel) connectors at the back of each



Macro-Tech amplifier. The P.I.P-IQ cards give the amplifiers the ability to interact with the IQ System. One card

is required per amplifier. The IQ interface interconnects the P.I.P-IQ cards to the IQ computer and acts as the go-between which translates the higher BAUD rate of the IQ System serial loop to that of the computer. Only one interface is used per system. The IQ computer can be any computer with a serial (RS232 or RS422) port.

### Akai S950 Sampler and S900 Hard Drive Interface Software

Akai Professional has introduced the S950 Digital Sampler, the designated successor to the S900 with the same features plus some new ones.

Akai has improved the sound quality by using improved analog to digital converters to yield a better dynamic

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in excess of 100 acoustical watts. Other features include:

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range. The sampling rate has been increased from 40 kHz to 44.1 kHz, yielding a useable audio bandwidth in excess of 17 kHz, according to the company. The S950 also has expandable memory that can be expanded up to 2.25 Megabytes.



Also new by Akai is operating software for their IB101A and IB101S hard drive interfaces. These interfaces allow the connection of either Atari or Supra hard disk drives (one at a time) to the Akai S900 digital sampler.

The IB101A V3.1 will now permit the system to utilize up to four Atari hard disks cascaded. The IB101S V3.2 allows the system to cascade up to eight Supra drives to the sampler.

**Tape-Athon Soundmarker 2000 Chime System**

Tape-Athon Corporation has introduced the Soundmarker 2000 dual cassette tower chimes/carillon system for church, school, or business.

The logic control is programmable in five minute interval with each cassette transport programed individually or together for 24 hour a day operation, seven days a week automatically with a manual operation mode also provided, the company said.

The system comes complete with built-in monitor speaker, power failures indicator, desk-top or rack mount, two



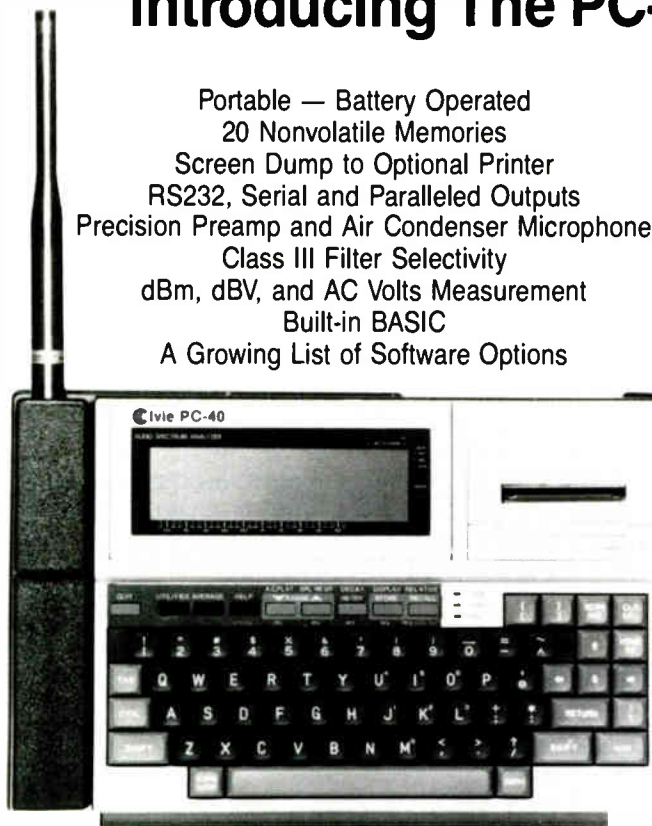
custom chimes tapes, and a five year limited warranty. Additional tapes are available from Tape-Athon's chimes music library.

**Renkus-Heinz Mid-High Frequency Point Sources**

Renkus-Heinz has models COAX60

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and COAX90 point sources. They provide accurate, uniform coverage at mid and high frequencies from a relatively small source, the company said. Mounting from h.f. horn and driver coaxially in the mouth of the mid-frequency horn, creates a powerful point source with pattern control from 250 Hz to 17 Hz, according to the company.

The co-ax package consists of the Renkus-Heinz SSD 5600 mid driver and an SSD 3301 high frequency driver mounted on Renkus-Heinz constant bandwidth horns. The COAX60 and COAX90 provide 60 and 90 degree coverage angles respectively.

**Robot Research Multivision Plus Processor**

Robot Research has introduced the Multivision Plus Processor, model MV50, the latest model in its Multivision series of digital video compressors, for surveillance or recording activities.

The MV50, an eight camera system, can be used as an accessory to a time-lapse VCR with features that include zoom capability, which allows selection of full screen "blow-up" of any quadrant during tape playback; the ability to "stamp" video images with location/time/date information; and a built-in alarm response triggering automatic

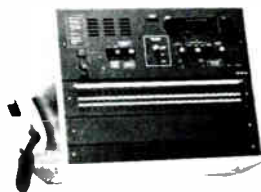
switching to the full screen format.

For surveillance applications, the MV50 features a real time refresh rate, video loss response, a built-in camera switcher with homing option, plus the Octaquad mode — three priority cameras remain in constant view while the remaining cameras (numbers four to eight) sequence into view within the fourth quadrant. Dwell time is variable through a built-in, user controlled program.

**BGW Fourth Generation 750 Power Amps**

BGW has introduced the fourth generation of the model 750 profes-

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sional power amplifier, the BGW 750F and BGW 750G. The 750 was introduced in 1969 as the power amplifiers for the movie Earthquake's sensurround subwoofers.

The 750F and 750G new features include IHF output power that has been boosted to 2000 watts, yielding an overall dynamic range of 113 dB; high performance active balanced inputs with over 70 dB of common mode rejection which are offered for the first time as standard equipment; switchable subsonic filters; input mode switching; and internal crossover card capability.

The two new BGW 750s differ only in their metering and display functions. The 750G includes a wide dynamic range LED level display, along with LED status indicators for heat sink and transformer over-temperature and for power supply failure. The 750F offers

LED modulation and true clip indicators.

#### Pirelli Produces Cable-In-Duct System

Pirelli Cable Corporation has produced Poly Duct, a cable-in-duct system that reduces the danger of damage to cables during handling, installation and service, according to the company.

Poly Duct incorporates a conduit loosely extruded over the conductor to provide a flexible pipe that is impact-resistant. It also provides protection against acids and other corrosive chemicals commonly found in soil, and substantially extends the useful life of the cable, the company said. In addition to providing protection, the duct system makes it possible to remove and replace the cable without excavating when properly installed. ■

those two bands to be recombined into a single output.

The DC24 can be set up to perform three basic tasks:

1. To provide two channels of compressor/limiter/expander for dynamic control of individual channels within a mixing environment, or for control of stereo feeds to a broadcast transmit point, a tape recorder, or a sound reinforcement speaker system.

2. To serve as a fourth-order Linkwitz-Riley electronic crossover that also includes compression and limiting to protect the speaker system.

3. To provide exceptionally flexible dynamic control over a single audio channel (by splitting the signal into two bands and recombining them after independently processing each band).

Each channel includes the following controls: Expander/Gate Threshold and Ratio, Compression Threshold and Ratio, Limit Threshold, Output Level, Channel (hard-wired) Bypass. Additional front panel controls include Power, Mode (Dual/Slave) and Crossover Frequency. The rear panel has the following features for each channel: an active, balanced, RFI-filtered XLR Input, an active, balanced 600-ohm XLR Output, a pair of unbalanced Side Chain Send/Receive phone jacks, and a Trim (-10 dBv/+4 dBu) slide switch. Additionally there is a Signal Ground Lift switch, a Crossover Engage push-button and an Outputs Combine/Separate slide switch.

The expander/gate function and compressor function normally sense the input signal (after the +4/-10 pre-amp trim switch). However, the side chain patch point enables the detector signal to be first routed through an external signal processor. If the unit is used for compression, external EQ will produce pre-emphasis (emphasize highs for de-essing) or a signal delay will create anything from zero overshoot to special effects. If the unit is

## A Closer Look

### Rane's DC24 Dynamic Controller

by Gary D. Davis

*Author's Note: This month marks a slight change in this column. In the past, we have printed an edited version of the manufacturer's press release on a product, followed by our comments to further illuminate the product. From this month forward, we are eliminating the press release altogether and providing our own description of the product. As has always been the case, we do not actually test the products described. Our comments are based on our analysis of descriptive literature (brochures, manuals, technical specs) and perhaps a conversation with the manufacturer. This column is intended to point out products that may be worthy of your closer look, which should certainly include a careful listening test*



and electronic evaluation to ensure suitability for your particular application.

**T**he DC24 is a well-thought-out package that combines several related signal processing functions. Each of its two channels includes an expander/gate, a compressor, and a limiter. The two channels may be utilized as completely independent processing chains. However, what makes the DC24 particularly interesting is the inclusion of a switch-selectable two-way electronic crossover that enables a single audio source to be split in half for separate processing. The outputs may then feed a biamplified speaker system, or... another switch enables





used as a gate, the side chain receive jack can be driven by signal from another signal (i.e., gating a snare drum channel with the bass drum to "tighten" the snares by silencing the channel when the bass drum is not sounding). The gating threshold is adjustable from -50 to +10 dBu, and the ratio from 1:1 to 20:1. The compressor threshold is adjustable from -50 to +20 dBu, and threshold from 1:1 to 10:1. Attack and release characteristics are program-dependent, ostensibly tailored to produce the least objectionable artifacts.

The limiter utilizes a single knob to adjust threshold; ratio is automatically adjusted based on the set threshold. The threshold range is -20 to +20

dBu. It would seem that at +20 dBu the maximum compression ratio would be applied because there is only 6 dB headroom above that (which is actually 2 dB better than most available units).

The crossover slope rate is fixed at 24 dB/octave. Its frequency is adjustable from 75 Hz to 7 kHz with a continuously variable pot (the knob has 41 detents for a degree of repeatability).

The Dual/Slave switch enables both channels' compressor/limiter control (sensing) circuitry to be activated by the channel 1 signal, which may be useful when the unit is used to process a stereo signal (although a combining circuit would be better, where the channel requiring the most gain reduction would control both channels' gain).

This switch does not affect the expander/gate circuitry, which remains independent (unless, of course, you use the side chain jacks to link the two channels' sensors).

Rane points out in their literature that the DC24 is well suited to broadcast applications, where a lot of compression is needed to "stand out" from the crowd as listeners scan the airwaves. The same key feature that makes the DC24 a broadcast contender also has a lot of appeal to anyone who needs high-quality dynamic control in a sound reinforcement or recording environment. Specifically, the ability to split a signal in half and process the two bands independently.

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# The AES Heyser Scholarship Fund



The Richard C. Heyser Scholarship Loan Fund has been set up to honor Dick Heyser, a highly gifted, loved and respected engineer, with a lasting memorial. The scholarship loan will financially assist promising graduate engineering students in the field who, otherwise, could not continue with their studies.

In March of 1987 Dick died, just a few months before he would have assumed the office of AES President. He not only was active in AES but he contributed greatly to the audio field through his Time Delay Spectrometry discoveries. He gave of himself on a personal level as well. Carolyn Davis, Co-Founder of Synergetic Audio Concepts, said of the fund, "Dick, himself, gave so much to all those with whom he came in contact, especially those just starting out; we feel Dick would have been pleased to know he is being remembered in this way."

In conjunction with this memorial, a major update of The PHD Program<sup>†</sup> will be dedicated to Dick Heyser and all the proceeds will go to the Richard C. Heyser Scholarship Loan Fund.

You may obtain a program for a donation of \$300.00 or more; prior owners may upgrade for a donation of \$50.00 or more. Make your check payable to the Richard C. Heyser Scholarship Loan Fund. Send to the Richard C. Heyser Scholarship Loan Fund, c/o *Sound and Communications*, 25 Willowdale Avenue, Port Washington, NY 11050.

† Trademark of Ambassador College.



attack/decay adjustment, no matter how elegant the compression and limiting circuitry, a compressor is going to produce pumping of noise and/or high frequency energy in the presence of strong low-frequency signals. A typical scenario would be the compression of a mixed program that contains a kettle drum and a string section. Every time the drummer pounds on the kettle, he ducks the strings (that is, the string level drops). Or pluck a bass guitar and listen to the upper harmonics of the lead guitar — they'll dip in level. However, if the signal is split in half, with the lows being compressed separately from the highs, these sorts of problems no longer occur (or at least they are far

less noticeable). What little noise pumping remains can probably be eliminated with the built-in noise gate.

The rear panel location for the Crossover in/out and Combine switches makes sense when the unit is used as a crossover. It is safer not to give an opportunity for someone to bump into the wrong switch, feed full-range material to the compression drivers, and instantly destroy a speaker system. Of course, we would have made the Combine output jack coincide with the low frequency output (just in case the above occurs), whereas Rane has designated the high frequency output as the Combine output (when the switch is set for combined rather

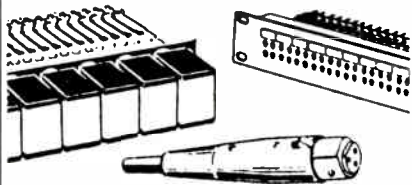
than separate outputs). Admittedly, the latter is a minor criticism.

Rane specifies overall frequency response to be 20 Hz to 20 kHz [PLUS MINUS] 1 dB, THD & noise at 0.1/(ref. +4 dBu/1 kHz), IMD at 0.1% (SMPTE, +4 dBu), and S/N ratio at 92dB (ref. +4 dBu, 20 kHz bandwidth). If it sounds anywhere near as good as it specs, this compact (1 3/4" x 19" rack mountable) unit deserves your *Closer Look*.

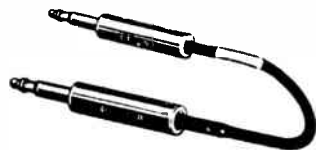
*Davis is president of Gary Davis and Associates, Topanga, CA, and has been a technical writer and audio consultant since 1974. Along with his associate, Ralph Jones, he authored the Yamaha Sound Reinforcement Handbook.*

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## Literature

### ERA Industry Calendar Available

The 1988/89 Electronics Industry Calendar is available from the Electronics Representatives Association (ERA). The 16-month, at-a-glance calendar includes dates, locations and

contact telephone numbers for more than 100 national and international electronics industry trade shows, meetings and conferences.

### Electro-Voice Broadcast/Production Microphone Catalog

Electro-Voice has issued a catalog

featuring its complete line of broadcast/production microphones. The catalog is available to station and facility technicians, engineers and management. "This is the first EV microphone catalog in over 20 years that is aimed specifically at the broadcast market," said Ivan C. Schwartz, EV broadcast/production marketing specialist. "There are selection and application sections as well as model information referenced by microphone type," Schwartz added.

### FSR Product Catalog

FSR, Inc., electronic control specialists, has published a short form, specification catalog on its entire product line. This 21 page booklet is available free from FSR in Cedar Grove, New Jersey.

### Bulletin for Panduit Pan-Mark Software for Printable Labels

A technical application data bulletin is available describing the Panduit Pan-Mark software program for producing computer printable labels and data plates. The Pan-Mark program

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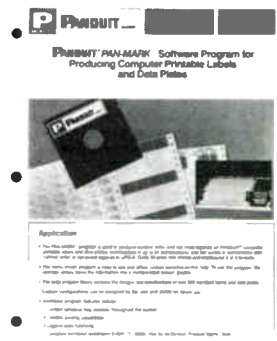
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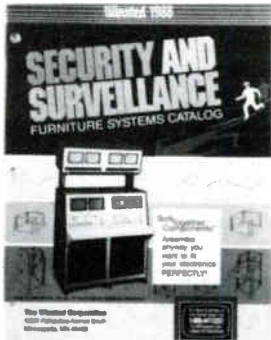


can produce number, letter and number/letter legends; UPC-A, Code 39 (also with check), and interleaved two or five bar codes; serializations in up to 24 combinations; and bar codes in combination with number, letter or serialized legends.



**Winsted Security and Surveillance Catalog**

The Winsted Corporation has published a new catalog featuring its full line of security and surveillance systems. Security and surveillance



support systems in the Winsted catalog are designed to accommodate most major brands of electronics, and the modular components can be configured to meet exacting requirements, according to the company. ■

**Video Expo San Francisco:** San Francisco, CA. Contact: Ellen Greenfield 914-328-9157. February 13-17.

**ISC South:** Orlando, FL. Contact: 312-299-9311. February 16-18.

**MARCH**

**National Association of Business & Educational Radio (NABER):** New Orleans, LA. Contact: 703-739-0300. March 15-17. ■

**Calendar**

**JANUARY**

**Consumer Electronics Show (CES):** Las Vegas, NV. Contact: 202-457-8700. January 7-10.

**Pacific Barber Telecommunications Council '89:** Honolulu, HI. Contact: Richard Barber 808-941-3789. January 15-18.

**NAMM Winter Market:** Anaheim, CA. Contact: NAMM 619-438-8001. January 20-22.

**FEBRUARY**

**INFOCOMM, sponsored by ICIA and AECT:** Dallas, TX. Contact: Kay Hynson 703-273-7200. February 2-4.

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## CAD PROGRAMS

(continued from page 34)

third party software for these functions (such as TPM's OPTORT60 for reverberation time, and AI for %ALcons).

In 1984, Tom Birkle (of the acoustical consulting firm of David I. Adams and Associates) wrote an article describing a sound system design program then under development. I was intrigued and contacted Tom to discuss his project, as I was consulting for a firm that was developing computer-based test equipment that I wanted to integrate with design software. The idea was to predict the results and then test the job using the same format. The test equipment had been developed for the Apple II and IBM computers, but Tom's program had just shifted from the IBM to the Apple Mac. At the time, the Mac seemed a very odd choice, but now its popularity is second only to the IBM standard. Bose sponsored the development of the program (now known as The Modeler), added and defined many aspects of the program, eventually hiring Tom Birkle full-time.

With great fanfare, the Modeler program made its debut in 1986, introducing many unusual features (along with extremely sophisticated room-modeling graphics). The Modeler is the first of Bose's Sound System Software series. Like the JBL CADP program, much controversy was created by this landmark product. While unique features were included, such as time arrival, other features were not: intelligibility prediction, gain before feedback (also missing on CADP and most other programs), and for all the fancy graphics, there was no way a cluster mechanical design could be created.

During the last year or so I have worked with versions 1.1, 1.2, and alpha 2 of the Modeler. In that time, the program has grown to include data libraries of EV, JBL, Renkus-Heinz co-ax and ceiling speakers (along with ray tracing), and room descriptions have become easier to enter (although this can still be time-consuming). An adjunct prototype program called Power View was developed to allow three-dimensional mechanical design of clusters and the transfer of data to and from Modeler. This program, the second in the Bose Sound System Software series, was just released as "SpeakerCAD": a third program is in development.

The formal release of Version 2.0 of The Modeler features direct/reflected ratios which may be interpreted for intelligibility predictions. Actual qualitative predictions ("excellent," "good," "fair," etc.) are not provided, but direct/reflected ratios are, with user-defined control of the cut-off time of mixing early reflections into the direct sound component of the ratio. Intelligibility prediction has been the most sensitive issue with the Bose program. Various papers have been given by Bose engineers challenging %ALcons, and until confirmation of intelligibility prediction techniques by direct comparison of simulation to actual test is completed, the Bose group has chosen to omit any of these algorithms from the program (as has North Star). As version 2.0 does provide direct/reflected ratios, the designer has the option of making his own determination from this data. The developers of Modeler suggest that direct/reflected ratios tend to bias the sound system engineer toward designs using highly directional speakers. (The areas of intelligibility prediction and speech comprehension will be explored in detail in subsequent reviews).

### ADAPTATIONS OF MAINFRAME PROGRAMS

Large acoustical engineering organizations have used mainframe computers for years, but such computers (and their programs) are not economically feasible for most sound contractors. There have been some adaptations of these programs for personal computers, although these have not always been happy arrangements. A few years ago my firm, Menlo Scientific, licensed a mainframe adaptation known as ONLP (Outdoor Noise Level Prediction) from Battelle Labs. The program was written for the Apple II computer, as the project was started before the IBM PC had hit the market. Initially conceived to predict noise transmission levels outdoors by generating sound intensity contour plots, it could also be applied to sound system, voice/warning, and civil defense designs. A number of sound sources at user-specified locations could be entered, along with sound levels and directivity at octave bands, and the contours would be plotted.

The program allowed user-defined resolution between contour levels, and user-defined dynamic range. The contours represented outdoor sound coverage (and amplitude) and direct sound levels indoors. No other computer program at the time

provided the intuitive visual feel (the JBL program provided levels in numbers rather than a graphic image). I used the program as an adjunct to CADP, when doing simulations for the 1988 summer Olympics and for the design of the very high intensity military sound system for the DMZ.

I spent much time preparing menus, rewriting the manual, getting the program debugged, and so on. Unfortunately, the program required about eight hours for each contour when many horns were being calculated. Without rewriting the program, there was no way to "stack up" all the desired contours for automatic calculation. If eight or nine contours were required, the computer would be on and tied up for days. In the case of the DMZ, the near-field levels approached 175 dB, levels behind the speaker array could not be more than about 85 dB, but levels miles away were required to reach more than 65 dB (the actual specifications are confidential, but of similar magnitude). In any case, a dozen contours are desirable if you want a window of five or six miles and a dynamic range of 110 dB!

I had attempted to try to model the project on CADP and PHD but these programs would not accept the dimensions. The project took over a week of computer time on ONLP. The Bose Modeler program has a sound intensity plotting utility, and most sound contractors complain about the 5 or 10 minutes it requires to plot a room. Ha! (When I was a kid, and when computers were young...) With the latest release of Modeler 2.0, an optional hardware co-processor is available that speeds up computations 25 times! With the introduction of programs more efficient than ONLP, I decided to drop the attempt to have the program rewritten for the IBM.

During 1985 and 1986 I prepared the computer simulations for the 1986 Asian Games and the 1988 Summer Olympics. The Seoul Olympic organizing committee was very much interested in the computer simulations done by Mashushita for the LA Olympic Games. The Mashushita program was developed from acoustics research done at a Japanese university. What is described here is from the information they had acquired and an AES preprint (Sato, K. "Application Of Acoustic Simulation To The Olympic Main Coliseum." October, 1984.) Directivity data from horns was developed with a spectrum analyzer from an automated turntable under computer

control. (A similar automated directivity measuring system is now in use at EV.) Ray tracing was plotted and echograms predicted for the main cluster at the LA stadium.

Although the Bose Modeler program now has ray tracing, the program used by Mashushita could also process music, superimposing the acoustics of the hall (or stadium) on the music. The results could then be subjectively listened to and objectively measured (for intelligibility, echoes, etc.).

Another mainframe program I encountered in the Orient was Hyfax from Fuji Sound. This program was developed from the same acoustics research as the Mashushita program. Fuji Sound is a design and construction company that builds recording studios, sound stages, concert halls and the like. Their internal design program features ray tracing, mechanical design modeling, echogram prediction, and more. Mark IV Industries has licensed this program for world-wide distribution by its EV and Altec divisions (except for Korea and Japan, where Fuji markets the software directly). Mark IV calls their program AcoustaCADD. Release 1.0 of Acousta-

CADD will have ray tracing, intelligibility prediction, ETC (energy/time/curve), uniformity of coverage and more. Later releases will also have 3-modeling for mechanical cluster design. Originally targeted for beta testing in fall of 1987, the program is about a year behind, and at this point there is no official release date. Two papers were presented on AcoustaCADD at last May's AES in Nashville, TN: one on the features of the program itself, the second on techniques to control or predict the time frame of software development.

That completes this overview of commercially available programs for sound system design (if I've missed any, please let me know: write me in care of this magazine). The individual program reviews will explore in detail such aspects as ease of learning and use, availability of speaker data libraries, speed of data entry, speed of computing, usefulness for sales presentations, comprehensiveness of predictions, interface with other programs such as word processing, desktop publishing block diagrams (flow charting), and computer-aided-drafting. Acoustic considerations will be discussed: ray tracing, reverberation, echoes, setting of time delays, recogniz-

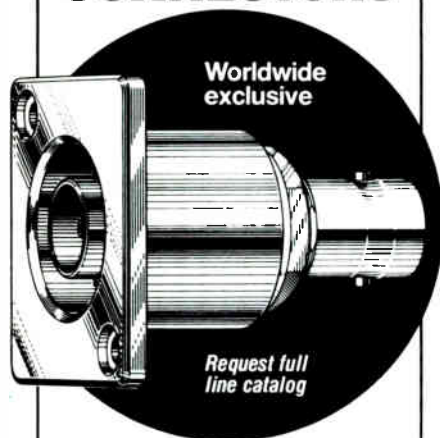
ing obstructions and shadowing, indoor and outdoor applications, central and distributed systems.

I will review JBL's CADP first, then the Bose Modeler, the PHD program, the North Star programs, and finally Altec's AcoustaCADD. With the exception of AcoustaCADD and North Star, I have used some version of these programs for at least a year. Supplementary programs for reverberation time, such as TPM's OPTORT60 and Acoustics II from Headware, articulation index utilities such as TPM's AI, printer utilities such as Pizazz (very handy for CADP), block diagram programs such as Patton and Patton's Flow Charting and MacDraw (for the Mac/Modeler), the Bose SpeakerCAD program and VDP's AutoCADD drawing library programs; AudCAD (audio), VidCAD (video) and TC+CAD (teleconference/multi-media) will all be reviewed

*Drafts of this article have been reviewed by Steve Romeo of JBL, Ken Jacob and Tom Birkle of Bose, John and Melisa Prohs of PHD Software, Jim McCarthy of North Star, and John Lanphere of Altec.*

*Klasco is president of Menlo Scientific, Berkeley, CA.*

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## AES HIGHLIGHTS

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and a lot more CPU power. With the increase in power/cost of computing, this technique is a promising one if implemented in an accurate manner. Until then, simpler computing methods using more complex intuition will be the generally accepted method and should provide many of us with the design criteria we need, at least for the present.

For the past ten years, David Meyer has been working at Purdue University on loudspeaker coverage and room acoustics on large computers. In the past, he developed directivity balloon software displays (and other leading-edge techniques). With the current trend towards very powerful personal computing surpassing the current minis, achieving animated real-time

## The papers were not as rife with product hype as in the past.

graphics with intense calculations is rapidly becoming a reality. Meyer is presently writing the animation program in C-language for an MS-DOS 386-based computer using a high-speed graphics card.

To conclude the session, David Marsh and Ashton Taylor presented a study of the sound systems and acoustics at the Houston Astrodome performed by Pelton Marsh Kinsella and Turner Collie and Braden. Using the TEF machine, they measured the %ALcons and RASTI performance of the existing system as used in the space. They also performed impulse measurements and reverberation analysis.

The presentation however, focused on the intelligibility aspects of the system and comparisons of the two methods. They concluded, basically, that the %ALcons seemed to track their subjective impressions more closely than that of the TEF RASTI in such a large acoustically difficult environment. Perhaps in large spaces it may be observed from their conclusions that RASTI, an abbreviated form of STI,

may not be adequate for complex environments. However, Wade Bray of Jaffe Acoustics had just recently completed a comprehensive study of the acoustics at the Astrodome and remarked that their measurements using the B&K RASTI unit more closely tracked the %ALcons numbers. Both Taylor and Bray agreed that more work must be done.

So, another AES has come and gone, with yet another session raising still more questions about the burning issue of speech intelligibility. Sound system design is evolving into an increasingly computer-oriented process, with different camps developing their own respective views. Nonetheless, when the smoke has finally settled, it will reside in a bunch of computer chips waiting to rise as the intelligibility phoenix. Most of us have had our share of first-release versions of software, whether it's 1.0, 1.2, or 3.0. But we all know that versions 1.0.2, 1.2.2, and 3.0.2 are the ones that really work.

Software that crashes a report is one thing, but software that gives erroneous answers does not sit well with the policy writers of errors and omissions insurance—they simply don't like software!

*Klapholz is technical editor of this magazine.*

## PORTABLE SYSTEMS

(continued from page 44)

players in this market as well: several musical instrument manufacturers offer AC/DC amplifiers. Peavey Electronics Director of Analog Products Jack Sondermeyer said, "I'm sure A/V people are using the equipment but it's not a market we've targeted directly." There are several products in the MI market that would be suitable for these applications.

The playing field and the players have been introduced. The decision to play or not to play is now in the hands of the contractors. Paso's David Moore said, "Our products are sold mostly through catalog suppliers. You'd think the contractors would be out banging on doors selling these easy-to-handle products. Contractors are mostly concerned with the big ticket sales, most don't take advantage of the opportunity while they're in their customer's door."

*McKinnon is an audio consultant and writer in Calgary, Canada.*



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## Economics of Acoustics

**W**hat seems to be most important to the electronics industry at large somehow manages to pass some of us by. Communicating information at the speed of light causing havoc on Wall street is the epitome of our success. We can send our intelligible signals around the world, and have messages conveyed instantly around the globe. But we can't even make the pastor be understood clearly in every church on every Sunday.

We still plod along with products based on technology from the talkie hey-days, and have exploited that knowledge to its exhausting end. Can we continue to rehash the thoughts of yesterday's great giants? Can this industry take upon itself to nurture and sustain research of its own? Where does today's culture lead our industry? Are we even asking ourselves these questions?

In January an old pillar in symbolism of our business will no longer exist — RCA — originally formed to straighten out the vacuum tube patent entanglements. At&T, Westinghouse, the American Fruit Co., and General Electric each owned a share in RCA. Now after two years of transition GE will be totally absorbing the RCA name, and dissolving its presence forever. The famous RCA building — home of Radio City Music Hall, Late Night with David Letterman, and Saturday Night Live — will be renamed the GE

Building. New York just won't be the same and all those cabbies will be more confused than ever.

Even more ironic is the sale of the rights to Nipper by GE to a French Co., that will capitalize on the Deco/Radio-Days appeal of old Nipper in front of the Victrola horn. The second giant is now breathing its final sighs before it is laid to rest. Not long ago, through Judge Green's infinite wisdom, the AT&T Co., was broken up destroying one of our greatest research facilities. The communications industry at large is a new one, one which the experts are still figuring out.

While we are analyzing the position of these crossroads, another year is coming to a close and it is time once again for my top ten list of predictions for the coming year. This year is special because of the Audio '88 predictions made by Drs. Olson, Martin, Boner, and Pierce, at the AES Convention in NY, 1964. Dr. Boner made 20 predictions that were published in last month's issue of Sound & Communications Magazine. [See AES Anecdotes.]

1) Dealers will continue to sell sound absorptive materials to home studios for room isolation.

2) Sound men will still insist that a room can be Equalized.

3) Loudspeaker measurements will become more confusing.

4) System designers will insist on fixing poor designs with eq and delay.

5) Systems will get 10 dB louder.

6) With the ever increasing proliferation of micros into our offices, the ubiquitous "mystery spec" will become even more mysterious.

7) Systems will still be designed that put as much incoherent energy into the reverberant field as in the direct field.

8) Microphones and loudspeaker systems will use less parts, cost less to produce, and will command a higher price tag.

9) Sound systems will use more signal processing, be more complex to design and install, be more costly, and will be noisier and less intelligible.

10) Sound systems will remain a deep dark mystery to many, catching us all off guard when a new line of self-contained high-intelligibility systems to be sold at Radio Shack is announced in the Wall Street Journal.

1989 promises to be a milestone in carving the history of tomorrow's magazine articles with GE, AT&T, IBM, and all the other two and three letter giants posing for mergers, huge acquisitions and takeovers. The paper shuffle of who owns who and what, happening at the speed of light, has the ability of leaving us behind in the dust, or sweeping us up for a wild ride on their coat tails.

Hang on for a wild and prosperous '89.

Jesse Klapholz  
Technical Editor

### Coming in January. . .

Join *Sound & Communications* as we continue our series reviewing CAD programs for sound system design. This time, we focus on JBL's Central Array Design Program.

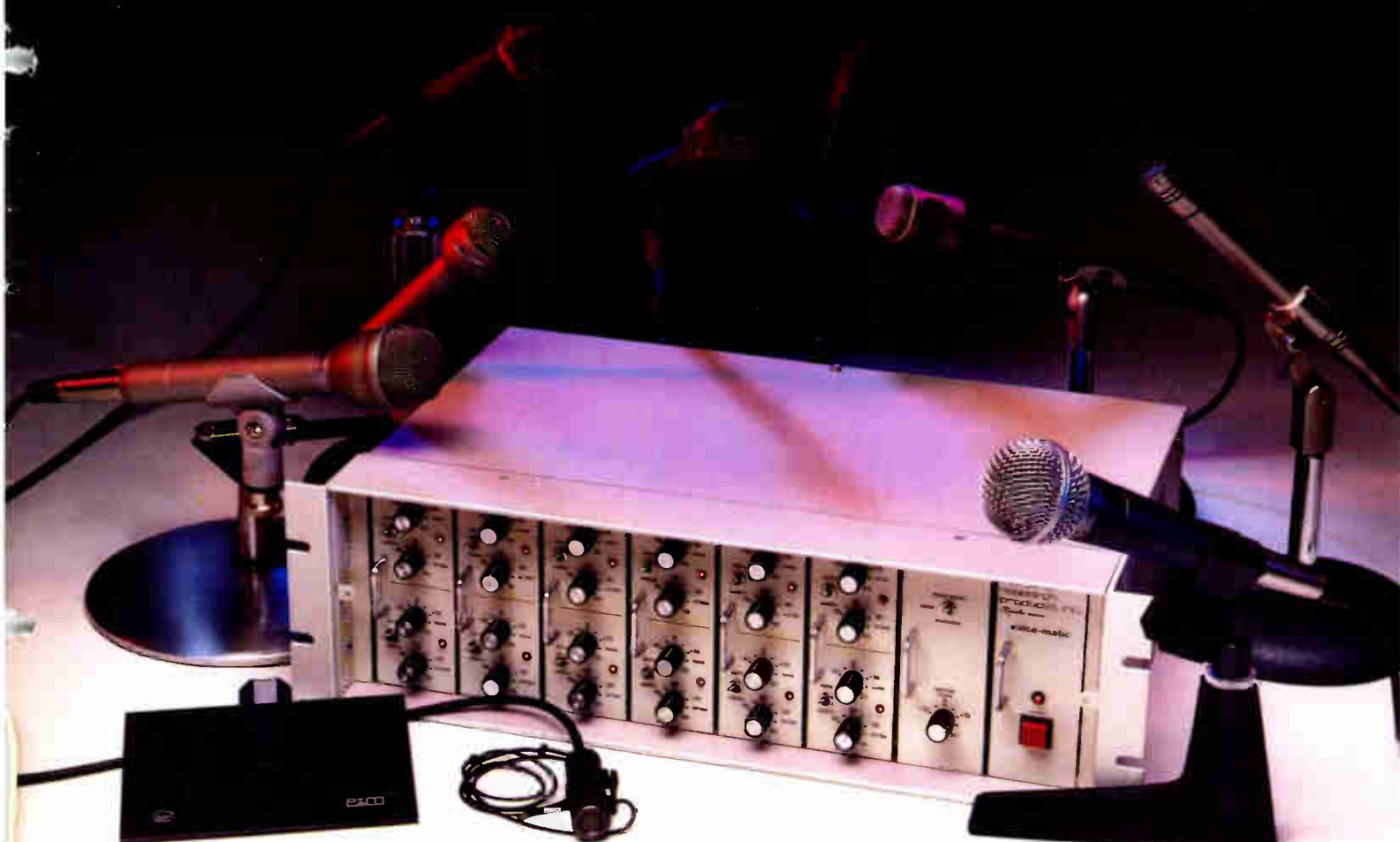
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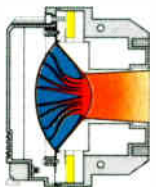
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