SOUND & COMMUNICATIONS

Volume 36 Number 1 January 19, 1990

VERIFYING PERFORMANCE

It's fine to design a system that sounds fine to you — and to the client. But without formal verification of that performance, anomolies could exist that elude everyone at an early stage when modifications are possible. Steven Orfield discusses the performance verification procedures he uses at the St. Cloud Civic Center in Minneapolis. **12**

AcoustaCADD ARRIVES

It's finally here. AcoustaCADD from Mark IV Audio has been long awaited and long talked about. Mike Klasco worked with the program and offers a detailed review of its special features and accomplishments. **54**

Symposium on Speakers

A televised symposium at the AES convention brought together loudspeaker designers and users to discuss the advent of signal processed loudspeakers. There were some vital disagreements, although generally civilized behavior. And we present herein an edited transcript of what we deem was an important discussion of an important movement in this industry. **42**

TRENDS IN LOUDSPEAKER DESIGN

Loudspeakers come in myriad formats. There are several evident trends in speaker design currently, some compatible and some opposed to each other. In this issue we explore some of the more evident design philosophies coming from several speaker manufacturers — and being used by various sound installers. **33**

Boardroom Options

What are the current perceptions of boardroom/conference room design? What's on the client's mind? What are the designers thinking? How is it all coming together? Bill Sweeney interviewed a cross-section of the industry active in boardroom design. His report is herein. **23**

BOARDROOM RE-DO

An ad agency needed their conference rooms redone. Vitek Inc., was the installer; an easy-to-use and easy-to-understand complex of equipment was necessary — with good looks and hidden electronics. The result made the client happy. And that of course made the installer smile. **26**

You can't build a better mousetrap unless you know your mice.

For years, those of you who wished to enjoy the many benefits of processed speaker systems had to endure one major drawback: loss of sound quality when the system switched into the protect mode.

The new DeltaMax™ electronically controlled loudspeaker systems put an end to such frustration.

We built our knowledge of loudspeakers . . . and their destruct modes . . . into a controller which addresses overexcursion, voice-coil overheating, and amplifier clipping without altering frequency response—the system's incredible clarity remains unchanged.

In addition, front-panel LED's indicate these problems clearly and distinctly. From that point, it's your option to either make a change in the mix yourself or allow the controller to compensate automatically.

We also rigged these systems for flight—with optional three-point harnesses equipped with steel-reinforced pan-fitting hardware, perfect for safely arraying speakers in multi-cabinet clusters.

DeltaMax is brought to you by the same company that invented a variety of better mousetraps for the audio world, including constant-directivity horns and the world's first neodymium compression driver, the N/DYM® 1.

Give us a call today for more information and engineering data sheets.

Circle 206 on Reader Response Card

Electro-Voice®
a MARK IV company
600 Cecil Street
Buchanan, MI 49107
Phone: 616-695-6831

In Canada: Mark IV Audio Canada, Inc.
345 Herbert Street
Gananoque, Ontario K7G2V1

The Man With The Horn

The man was Myron Fulkerson. He started Fourjay Industries back in 1956. From the beginning, Myron's policy was to provide high quality labor saving American made products and to have them *In Stock for Immediate Shipment.*

Today, "the man with the horn" is Fourjay Industries itself. But the policies are still the same including *In Stock/Immediate Shipment.*

Of course, today, *In Stock* means much more than it did years ago. It means a big selection of horns, speakers, mounting rings, baffles and everything else for quality paging, marine hailing and even backyard hi-fi. Yet all of it is still *Fourjay Quality–American Made.*

Immediate Shipment means more, too, because installation delays (actual or anticipated) are more costly than ever.

So, when you're making a sound decision, remember the man with the horn and Fourjay, the company that's been doing it right since 1956.

FOURJAY INDUSTRIES, INC.

3400 STOP EIGHT ROAD • P.O. BOX 14617
DAYTON, OH 45413-0617
TELEPHONE (513) 890-6444 • FAX (513) 890-1692

Fourjay Quality — American Made

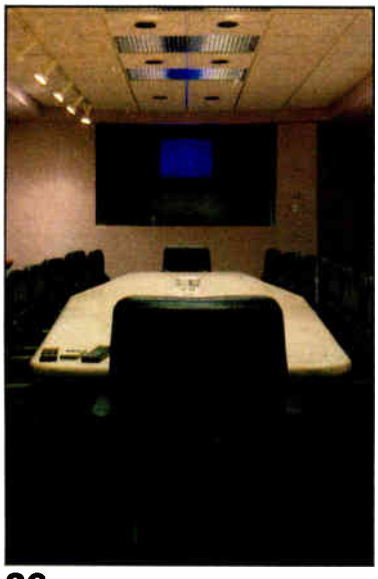
Circle 211 on Reader Response Card

CONTENTS

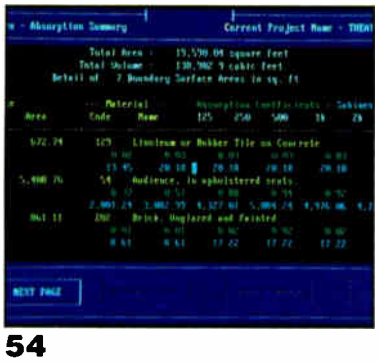
Volume 36 Number 1 January 19, 1990

FEATURES

12



26



54

COLUMNS

DEPARTMENTS

 Sound & Communications (U.S. P.S. 943-140) is published monthly by Sound & Communications Publications, Inc., 25 Willowdale Avenue, Port Washington, N.Y. 11050. 516-767-2500. President, Vincent P. Testa. Subscription rates: U.S.—1 year $15.00, 3 years $37.50. All other countries—1 year $25.00, 3 years $67.50. Subscriptions outside of U.S. must be paid in American currency. Second-class postage paid at Port Washington, NY and at additional mailing office. POSTMASTER: Send address changes to Sound & Communications, 25 Willowdale Avenue, Port Washington, NY 11050.

SOUND & COMMUNICATIONS

THE POWER OF SIX.

The MA 6 Flexible Six-Channel Amplifier.

We know what you're probably thinking. Why six channels?

Think about this for a minute. If almost every sound system out there uses more than two amplifier channels, wouldn't it make sense to put a bunch of channels in one box and save space, weight and cost?

We thought so. That's why we invented the MA 6.

Dollar-per-watt-per-pound-per-rack-space it's a killer. This one amp can drive an entire stereo 100/300 watt bi-amp speaker system. It can drive six passive monitor wedges with separate programs. Or two tri-amped side-fills. Or six separate background music zones. No matter how your sound system requirements change, the flexible MA 6 is an investment that never becomes obsolete.

If less weight, less space, less cost and greater flexibility sound good to you, then go with the power of six. The MA 6: 900 watts of innovation from Rane.

RANE

10802-47th Ave. W.,
Everett, WA 98204.
(206) 355-6000.

Circle 207 on Reader Response Card

AKG's C747. Small Size. Big Sound.

AKG's new C747 "pencil-type" condenser microphone sounds a lot bigger than it looks. In fact, its unique miniaturized transducer design and acoustically-tuned interference tube give the C747 sensitivity and uniform frequency response superior to mics many times its size. You'll like that on stage, TV, above a church choir or on a podium, where you need to capture performances without obscuring them. And you'll like it in the studio, where the C747 will go places other mics are just too big to follow. Clear lows, shimmering highs, tight pick-up pattern and mounting accessories that provide total convenience in any recording or sound reinforcement situation — with the C747 you get everything you need. Small size. Big sound.

AKG acoustics

Focusing on new technology.
77 Selleck St. Stamford, CT 06902
(203) 348-2121

SOUND & COMMUNICATIONS

Publisher/Editorial Director
Vincent P. Testa

Editor-in-Chief
Judith Morrison

Technical Editor
Mike Klasco

Assistant Editor
Steve Jacobs

Contributors
Jesse Nash, Steven J. Orfield, Janet Starcher, Larry Starcher, Bill Sweeney, Tom Yesewich

Technical Council
Dr. Mort Altshuler
Professor Audiology, Hahneman University, Chief of Audiology, V.A. Hospital, Phila, PA
Mike Biegel
EPD Technology Corporation
C. Leroy James
Rees Associates, Inc.
Richard N. Jamieson
Jamieson and Associates, Inc,
Russell Johnson
Artec Consultants, Inc.
Richard Negus
Purcell Noppe Associates, Inc.
William Parry
Maryland Sound Industries, Inc.
Daniel Queen
Daniel Queen Associates
Jon Sank
Cross Country Consultants
William R. Thornton
Phd, PE

Staff Artists
Steven E. Ingram
Germaine Egan Cassidy
Ellen Bader
Mike Lombardo
Greg Stattel

Typesetting
Leo Ancona
Helen Schmitz

Circulation Director
Robert Evans

Classified Ad Manager
Rich Kobel

Advertising Director
Nancy Davis

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

BPA

TESTA COMMUNICATIONS

Sound & Communications • DJ Times • Post
Sound & Communications Blue Book
The Music & Sound Retailer • The Retailer Red Book
The Music & Sound Buyer's Guide
CES-TV News • NAB-TV News • NAMM-TV News
NSCA-TV News • CROSSTALK/AES-TV News

LETTER FROM THE EDITOR

This is the month of Anaheim. Two trade shows of some interest to this industry are slated for the Anaheim convention center within a few weeks of each other. NAMM, of course, will be held January 19 — 21, and Infocomm rolls into town on February 1 (through the third).

The National Association of Music Merchants, sponsors of the semi-annual NAMM show, has seen, in the last few years, great hullabaloo and discussions and editorials, concerning a perceived decrease in attendance and importance of the summer NAMM show, and an increasing importance placed on the winter show. As with most trade shows held semi-annually, each convention takes on its own character. (Even at the mammoth Consumer Electronics Show, the winter show is shaping up as a place to introduce car audio products — and at least one pro

manufacturer has expressed new interest in joining the contingent of manufacturers there.) This winter NAMM is a proven show of new product introductions, sales meetings, and networking. While most of the products introduced are, of course, M.I. oriented, there is enough of a pro sound contingent, and a crossover of manufacturers to warrant a visit by many SOUND & COMMUNICATIONS readers.

Also opting for Anaheim this year is the Infocomm show, put on by the International Communications Industries Association. Originally thought of as purely an audio-visual show, Infocomm has broadened and widened its range, with exhibitors including video manufacturers — and a sizable group of professional sound companies. Over 10,000 attendees are expected at Infocomm; and seminars held for these attendees include: "Audio Systems for Conference Room," "Wireless Microphones," and "Basic Design for Communications Facilities."

The audio visual market has of course suffered a sea change in the past few years. The boardroom/conference room has become a multiple-use, multimedia arrangement, and manufacturers and installers have to keep up with the times while being prepared for economies and increasingly technical designs. The boardroom is rarely an audio-only facility; and it often requires intimate contact with the client.

This month, SOUND & COMMUNICATIONS features two stories on boardrooms, as a special focus. We will be following up on this subject throughout the year.

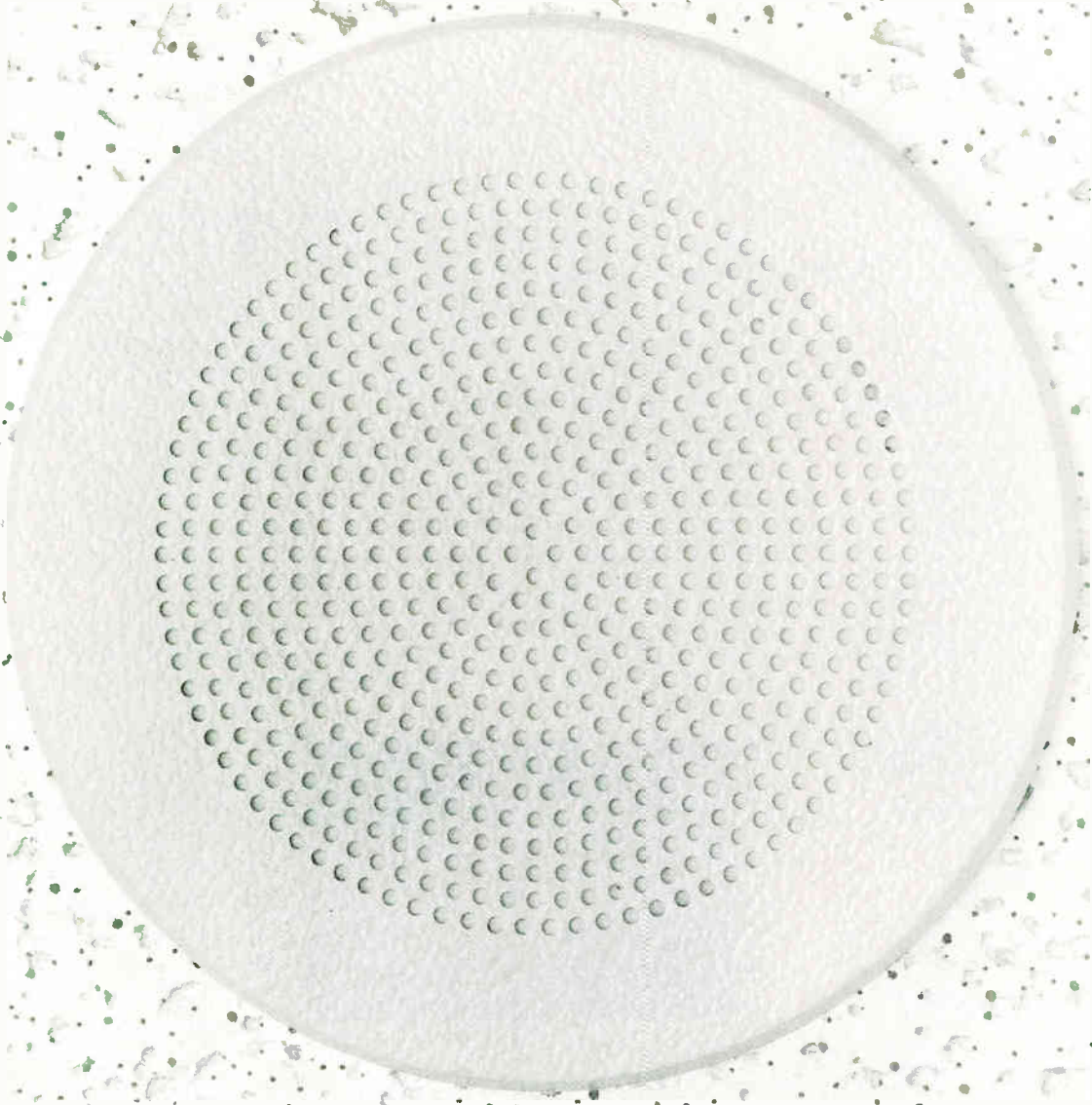
Of course, there's no sound without loudspeakers. And in this issue, we've collected a fund of articles dealing with loudspeaker design and the issues facing the industry concerning those designs. Whether it's new technology in manufacturing, or new software for designing rooms — or loudspeakers, there's an increasing need to know.

As always, we're interested in your response to our stories: good, bad or indifferent. Call, write, fax, whatever. We like to hear from you. SOUND & COMMUNICATIONS magazine, after all, is dedicated to being the intra-industry communicator.

Sincerely,

Judith Morrison
Editor-in-Chief

The Benefit is Easy to See—the Ceiling Baffle is Not!



You asked for baffles that would be as unobtrusive as possible on the ceiling. Quam listened . . . and responded with a complete new baffle concept, with:

- **A third less surface area than conventional 8" speaker baffles**
- **No visible hardware**
- **Made from steel textured to match popular contemporary ceiling tiles**
- **Quick and easy installation**

A complete assembly. . . a complete solution . . . a complete demonstration of the Quam philosophy: **We hear you!**

Quam has earned its position as preferred supplier to commercial sound contractors through responsiveness in product design *and* in service. A broad line to meet your needs. Inventory on *our* shelves, so you don't need it on yours . . . incoming WATS for quick efficient order-processing.

Call today for your free copy of the Quam Commercial Sound Catalog and Tech Spec 33 on the new BR8-10WS unobtrusive baffles.

Quam

The Sound Decision since 1930

Circle 202 on Reader Response Card

Quam-Nichols Company · 234 E. Marquette Road · Chicago, Illinois 60637 · Phone: (312) 488-5800 · Fax: (312) 488-6944

NEWSLETTER

BACKGROUND CD

A new background music company — Silk Music, out of Williamsville, New York — should be off the ground by the time you read this. The company is offering leases on specially adapted CD machines in concert with originally written and produced music on compact disc — with 70 minutes on each channel, ten discs to a changer.

SPECIAL OLYMPICS

Word comes from Crown that the Special Olympics is once again seeking help in providing sound reinforcement for the sporting and entertainment events during the International Summer Special Olympics slated for July 19—27, 1991 in Minneapolis. The 1991 games are expected to attract over 6,000 special athletes and 2,500 coaches from 90 countries. Crown requests that companies able to donate time, equipment or cash contact audio organizers Beryl Moore, Joe Wisler or Gil Nichols at Crown International.

SYN-AUD-CON ON INTELLIGIBILITY

The Synergetic Audio Concepts (Syn-Aud-Con) Intelligibility Workshop II will be conducted under the supervision of Dr. Larry Humes of Indiana University in Bloomington, Indiana on May 24 through May 26, 1990. The workshop will deal with the measurement of speech intelligibility and its uses in planning sound reinforcement systems. Syn-Aud-Con tells us that special emphasis will be made on understanding the role of the pinna and ear canal in intelligibility. In-the-Ear recordings will be made in the pressure zone of the eardrum of participants of the workshop. DAT recordings will be made of 5, 10, 15, 20 and 25 percent articulation loss of consonants.

PRODUCTION FORUM

The Broadcast Professionals Forum on the CompuServe Information Service has opened a section for Performing Arts Technicians. The section is called "Technical Theatre," and is open to all interested persons with a subscription to CompuServe. Topics covered, according to the company, include lighting, audio/sound/Midi, computer hardware equipment and software.

TECHNICS IN CONCERT

The New York Symphonic Ensemble concert in November at Lincoln Center in New York was the third and final concert in a series sponsored by Technics and featured Bach's "Concerto for Four Harpsichords" played on four Technics digitally sampled keyboards. The concert hall used Technics SST-1 Twin Load Horn speakers along with SST-25 Hz subwoofers. The speakers were powered by Technics SU-V90D digital integrated amplifiers.

FRAZIER EXPORT GAINS

Frazier, in announcing record export gains for 1989 (to 18.7 percent of sales), said the company plans to realize export trade at nearly 25 percent of their total for 1990.

ASSISTIVE DEVICES

The Assistive Devices Division of the Electronic Industries Association has been incorporated into the EIA's Consumer Electronics Group. The Division's membership consists of manufacturers who produce electronic hardware and/or software which provides assistance to the handicapped and special-needs groups. Member companies include Phonic Ear, Talktronics, Williams Sound, Tandy, Polk Audio, AT&T and others.

NEWSLETTER

ENSONIQ SOUND SELECTOR

Ensoniq Corp. has developed the Sound Selector, a "high resolution listening instrument." Housed in the case of a conventional hearing aid, the Sound Selector uses a custom microchip to detect, respond and compensate for an individual's hearing loss across 13 bands of sound in steps as small as 1 dB.

AUDIO-VISUAL POPULATION

One out of every 545 Americans is a member of the audio-visual industry, according to Hope Reports, which places the total U.S. AV industry at 440,000 people. The new edition of Hope Reports Media Market Trends identifies nearly 1.5 million organizations as using some form of AV media.

UNDISTORTED FIBEROPTIC

Bellcore Research, in collaboration with Pirelli, has transmitted, "virtually undistorted," 11 billion bits per second of data through a 260 kilometer length of Corning optical fiber without the use of electronic repeaters.

AGREEMENT REACHED

An agreement among Motorola Inc., Tandy Corp., and Nokia Corp. has settled Motorola's cellular telephone patent suits. There were no admissions of liability on any side, but "to facilitate an amicable resolution," Tandy and Nokia have agreed to a license under certain Motorola patents and to settle with Motorola on its other claims.

PORTLAND INSTRUMENT CORPORATION ACQUIRES ROH

The ROH division of Anchor Audio, Inc., located in Torrance, California, has been acquired by Portland Instrument Corporation of Glendale, California. ROH is responsible for the production of broadcast intercom systems, distribution amplifiers, line monitors and audio switching equipment.

Ron Fuller, President of Portland Instrument Corporation, stated that "the acquisition is a major part of Portland's program to broaden its interests in communications, broadcasting and teleconferencing." The new ARMS-7000 programmable Audio Mixing Switcher, which ROH designed for use in ballroom and conference room configuration systems, is representative of its paging, security, and audio switching devices.

Portland plans to add new products to the ROH line as well as initiate product enhancements to their line of products that ROH has been responsible for, in the broadcast intercommunica—tions industry.

EASTERN TELELOGIC CORP. RUNS FIBER-OPTIC CABLE ACROSS BRIDGE

Braving below-zero wind chill factors, workers for Eastern TeleLogic Corporation (ETC) started construction on a project to run a fiber optic cable across the Benjamin Franklin Bridge, from Philadelphia to South New Jersey, December 18th.

The project has been two years in the making, following Eastern TeleLogic engineering studies to determine the path the cable will take across the bridge and through the adjoining subway systems.

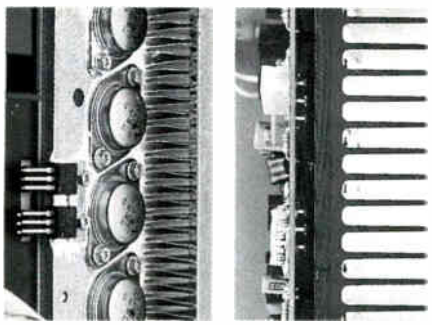
The new link is scheduled to be completed by February 1990, adding Camden and South Jersey to ETC's 108-mile advanced digital fiber optic network that stretches from Malvern and Willow Grove.

Warning: To Avoid Risk Of Shock,

Ignore This Amp-To-Amp Confrontation.

Let's be frank. We're out to change your idea of what—and who—makes a professional power amplifier. So if you just bought a Crown MacroTech, turn the page — this comparison won't be a polite one. But it will stick to the facts.

A look inside these two amps will give you a better idea of why BGW amps like the GTB Grand Touring Amplifier are built like no others in the world. And raise some questions about Crown MacroTechs.



Left: *The MacroTech uses mostly air to dissipate heat, not metal. The closely spaced fins are vulnerable to airborne dust and dirt.*

Right: *BGW uses ten pounds of aluminum to absorb thermal transients, extending power transistor life.*

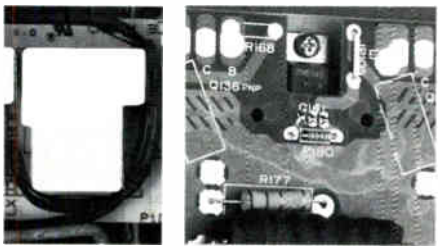
TAKING THE HEAT

If the MacroTech heat exchanger reminds you of an air conditioner, you've grasped its design. This approach works, at least until dust and dirt clog the fins. But as soon as the air flow slows or stops, temperature rises. Soon after that, the Crown shuts off — it could even fail.

The GTB uses massive extruded aluminum heat sinks with widely spaced fins. The mass of metal absorbs thermal transients without straining the fan. And without quick changes in transistor temperature. That's important: Transient musical loads put the worst kind of stress on power transistors. The effects of thermal cycling fatigue may not show up until after the warranty, but they can destroy lesser amps. Meanwhile, BGWs keep right on delivering clean, reliable power.

REAL SPEAKER PROTECTION

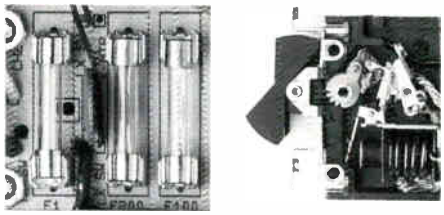
Most amps today are direct coupled, so a blown output transistor (the most common failure) connects the power supply directly to the speakers. Earlier MacroTechs had no protection against DC. Now Crown has learned their lesson — or have they? The sensing circuit and relay they now use shuts off the power transformer, but allows the filter capacitors to discharge stored DC energy directly into your drivers — risking real damage.



Left: *Crown uses a slow-acting, less reliable relay. It can allow the filter capacitors to discharge stored energy directly into your drivers.*

Right: *BGW's modular power output section protects your speakers against DC damage with an instantaneous Thyristor Crow Bar. And the module is easily replaced in the unlikely event of failure.*

BGW pioneered DC speaker protection in 1971. We stopped using relays years ago, when they no longer met our reliability standards for BGW amps. The GTB, like all BGWs over 200 Watts, uses solid-state Thyristor Crow Bars to keep DC from ever reaching your valuable speaker cones or compression drivers.



Left: *Time is money, and with Crown's MacroTech you can lose plenty of both: You have to pull it out of the rack every time a fuse blows.*

Right: *The GTB's power switch is also a rocker-actuated magnetic circuit breaker. You can reset it in a second if power lines hiccup.*

MAKE YOUR OWN COMPARISON

Before you buy or spec your next power amp, call us at **800-468-AMPS** (213-973-8090 in CA). We'll send you tech info on BGW amps and the name of your nearest dealer: He can arrange a demo of any BGW model against any amp you choose. Then you'll be able to appreciate the advantages of BGW engineering with your ears, as well as your eyes.

BGW SYSTEMS

13130 Yukon Avenue, P.O. Box 5042
Hawthorne, CA 90251-5042
Tel 213-973-8090 • Fax 213-676-6713

Circle 208 on Reader Response Card

PERFORMANCE VERIFICATION AT THE ST. CLOUD CIVIC CENTER

BY STEVEN J. ORFIELD

INTRODUCTION

In the design of a large facility with many A-V needs, there is great energy expended in the design and documentation process; as the bids are received and considered, there is again a considerable effort spent in evaluating each bid in terms of compliance, bidder quality and system or solution quality. The evaluation of the *final result* provided by the successful A-V contractor or general contractor.

This article deals with the problem of minimum appropriate verification of system and facility performance. In discussing verification, a project which has recently been completed, the St. Cloud Civic Center in St. Cloud, Minnesota, can be used as an illustration.

ST. CLOUD CIVIC CENTER

The City of St. Cloud is a medium size (100,000) city 60 miles north of Minneapolis; in the past five years, the city has become increasingly progressive in encouraging business development, and three years ago decided to build a new 100,000 square foot Civic Center for conventions, meetings, entertainment and athletic competitions. The City Council

was very concerned about the competitive position of this center vis-a-vis other regional centers. As a result, the City Council decided to take a direct interest in some areas of facility performance and

therefore to retain some consultants responding directly to the owner, including the acoustical and audio-visual consultant.

Orfield Associates was retained to perform these services and to verify, by testing, the results.

The courage and perseverence of the City of St. Cloud officials paid off in an unusually high-performance facility, and thus provides and interesting example of both the benefits of verification and of the problems inherent in not considering acoustics and sound system design in terms of specific performance.

ARCHITECTURAL ACOUSTICS

If an A-V design and specification has been executed appropriately, the first issue with which the system designer needs to be concerned is the basic building or room performance. In the calculation of sound systems design, the system designer should have assumed certain specified values for reverberation time and for background noise from the HVAC (heating and cooling) systems. Since the acoustical consultant, the architect or the engineering team were responsible for these issues, the designer must be concerned with failure of the facility to meet target values. If the audio and acoustical consultant are the same firm, this potential for architectural failure is reduced.

Specifically, if the reverberation time of the room is too long, the intelligibility may be reduced due to time-based distortion; if the HVAC system is too loud, the same consequence will result due to the reduced signal-to-noise ratio. As is often the case, the A-V designer or vendor may be held responsible for failure in performance due to the architectural acoustic failure in the basic design. To respond to these issues, the facility should be tested, prior to activation of the A-V system, for reverberation time and for NC (Noise Criteria) values to determine if the basic acoustical specification have been met.

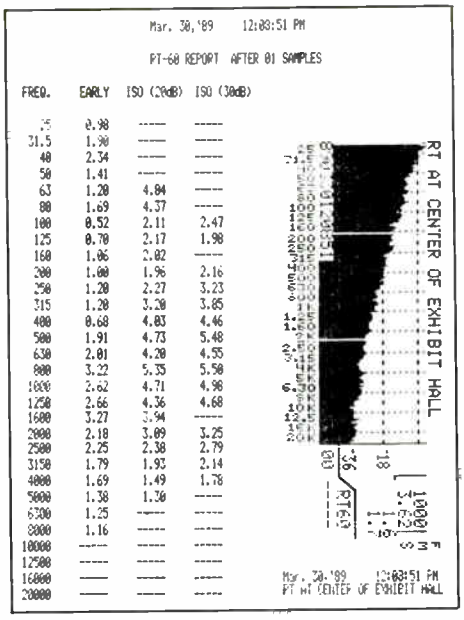


Figure 2. Ivie 40 PC Printout

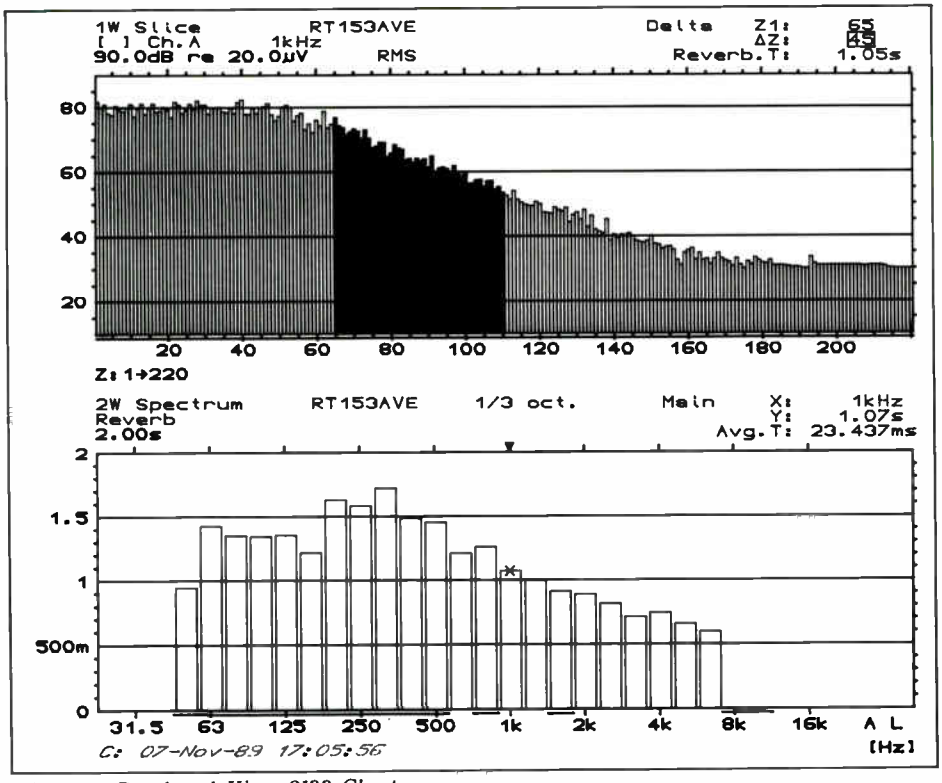


Figure 1. Bruel and Kjaer 2133 Chart

SPECIFIC REVERBERATION AND NC TESTS

Reverberation time can be tested via the use of a sophisticated dedicated reverberation testing system, via the of a digital signal analyzer or via simpler reverberation meter; it can also be evaluated by the ear using a hand clap or blank pistol shot. Some automated systems with this capability are:

AUTOMATED REVERBERATION TEST SYSTEMS

- CEL 160-196 Architectural test system
- Bruel & Kjaer 2031 sound level meter and software
- Ivie PC40 Real time analyzer
- TEF 12 Time delay spectrometry analyzer
- Ivie 30A-17A Real time analyzer/ microprocessor
- Norwegian Electronics 830 real time analyzer

An example of systems used for this evaluation based on full-scale digital signal processing are the Techron TED 12 analyzer and the Bruel and Kjaer 2133 Dual Channel real time analyzer. (Another more traditional method of providing this analysis is via the use of a sound level meter and a chart recorder.)

In the case of the St. Cloud Civic Center, the largest room is used as a reference, and this is the Haws Center, an athletic and performance area encompassing three basketball courts. The calculated reverberation time in this room, with acoustical ceiling treatment and acoustical wall panels was 2.0 seconds in the mid-frequency band, and the actual tested reverberation time in the completed facility is noted in Figure 5.

In terms of evaluating the NC value of the HVAC system, any measurement system which can accurately evaluate sound levels below 30 dBA will suffice in performing this test, as long as octave values can be attained on the system. The test equipment suppliers noted can all

(continued on page 69)

MEET THE NEW PLAYER...

TEK-MICRO CARE SERIES NC300 NURSE CALL

A MICROPROCESSOR-BASED AUDIO-VISUAL NURSE CALL SYSTEM
FOR NURSING HOME, HOSPITAL AND HEALTH CARE RELATED FACILITIES.

#1069 Listed

TekTone®
Sound & Signal Mfg., Inc.
1331 S. Killian Drive, Lake Park, FL 33403
Phone: (407)844-2383 Fax: (407)845-1587

27 Industrial Park Drive, Franklin, NC 28734
Phone: (704)524-9967 Fax: (704)524-9968

Circle 214 on Reader Response Card

1989 World Whitewater Championships Sound In A Savage Environment

By Janet Starcher and Larry Starcher
Sound Rental Service, Inc.

"Your company has been chosen to be the 'public announcing system' at the Savage River Site."

After more than two years, that one sentence in a letter from Charlie Teets, Technical Director, Whitewater Championships, Inc., meant that all the letters, phone calls and on-site meetings had finally paid off. Sound Rental Service, Inc., of Parkersburg, West Virginia, would provide sound equipment and services for the first World Whitewater Championships to be held in the United States. The setting was the scenic Savage River in Western Maryland.

For more than 20 years we have furnished "field sound" for fairs, festivals, regattas, etc., in addition to our "concert sound" systems for major entertainers and commercial installations. Therefore, we felt our experience and versatility qualified us to pursue such an event with confidence.

Engineer Bob Dewey and Todd Martin at house mix position. Because of low level seating, no mix booth could be erected.

A few of the horns to be mounted along the Savage River prior to competition.

Originally, we sought only the contract for the river events. What started as a very large paging system covering more than a mile of the Savage River quickly grew to include the Opening Ceremonies, an International Food Festival and other activities.

The opening ceremonies were held at the Frostburg State University Stadium on June 15 and featured several narrators and translators, both on the field and in the press box, prerecorded music, as well as a 300-voice choir. Chief Engineer Larry Starcher went into the opening ceremonies with an extremely positive attitude because of the immense organizational prowess of the Special Events Committee.

We had been told weeks in advance that because of the outdoor location and a ceremony which included the parade of athletes from 25 countries, along with a performance by the Marine Drum and Bugle Corps, a decision would be made by 9 a.m. that morning regarding any possible move to an alternate indoor location in case of inclement weather. The stadium system was set up and tested on the 14th, so no problems would be encountered if a move was necessary.

The rain had started before the sound crew arrived that morning, and despite unfavorable reports from the State Weather Bureau, the decision was postponed until noon, with ceremonies scheduled to commence at 5 p.m. At noon it was agreed that the "final" decision would be made at 4 p.m. Following a 3 p.m. choir rehearsal

The only speakers not mounted in trees. Note high gain repeater on top of bridge.

in the rain, Larry had no doubt the ceremonies would be moved indoors. At the 4 p.m. meeting he was released of responsibility for providing sound at the indoor location due to lack of sufficient time to move the system. A small system was provided at the indoor location by a local contractor.

The stadium system included coverage of the main bleacher seating area, seating areas on the opposite side of the field, and bleachers in both end zones for athlete seating. The console used was a DDA "D" Series, 40-input with matrix output, which drove the main system; rear and zone fills; choir monitors; and feeds to NBC and other news media. The cabinets were a two-box system designed by Larry, loaded with Fostex components

and powered by BGW amplifiers totaling approximately 12,000 watts. Due to consideration of sight lines and the performance of the Marine Drum and Bugle Corps, all cabinets had to be displayed, rather than stacked, and no cabling could be on the field. Needless to say, the opening ceremonies went on as scheduled, despite the intermittent rain.

Immediately following the ceremonies, the some 5,000 spectators and athletes were to dine on International cuisine while listening to the latest contemporary country music performed by "11/70," the Jamboree USA Staff Band, from Wheeling, West Virginia. This system had also been set up and tested the day before, but due to the rain and the lack of stage cover, final stage preparations and band setup could not be completed. After several attempts to contact committee members, we realized that the decision on where to move the food fest had been forgotten in the confusion surrounding the opening ceremonies. When committee members arrived and found no entertainment in progress, a hasty decision was made to move the band into the cafeteria directly behind the original stage area (much to the dismay of several cafeteria workers). To quicken the move, the original horn-loaded tri-amped mains were left covered outside, while a set of three-way sidefill cabinets became the new mains in the smaller location. Components for this system included Soundcraft 24-channel house and monitor consoles with six independent monitor mixes, powered by BGW amplifiers.

Near the end of the final set of "11/70," Larry learned that the crew working on the loadout of the stadium system had been working for more than two hours in almost total darkness. Apparently stadium and security personnel, in their haste to attend the festivities, had failed to leave the press box unlocked, where controls for stadium lighting and the sound system power tap were located.

By the time the indoor and outdoor food fest systems were loaded, the truck moved, and the stadium system loadout completed, it was 4 a.m. The schedule called for personnel at the Savage River race site at 8 a.m.

Several members of the Sound Rental Service crew had previously

(continued on page 22)

1200 WATTS, FOUR INDEPENDENT CHANNELS, FLEXIBLE, 2/3/4 CHANNEL SELECTABLE...

Four independent channels for multi-speaker and/or multi-zone systems or bi-amping...Switch to the *two-channel mode* for high power-600 watts per channel @ 8 ohms per channel...or to drive two 70-volt distributed line systems.

Three channel mode is ideal for systems with a subwoofer, or where tri-amping is desired.

The 300X4 has two completely independent power supplies and power transformers. It is completely protected against short circuits, open circuits and input overloads. Thermal protection is provided by Multi-Sensor Phase Control Regulation as well as two multi-speed cooling fans, and Automatic Resetting Thermal Sensors.

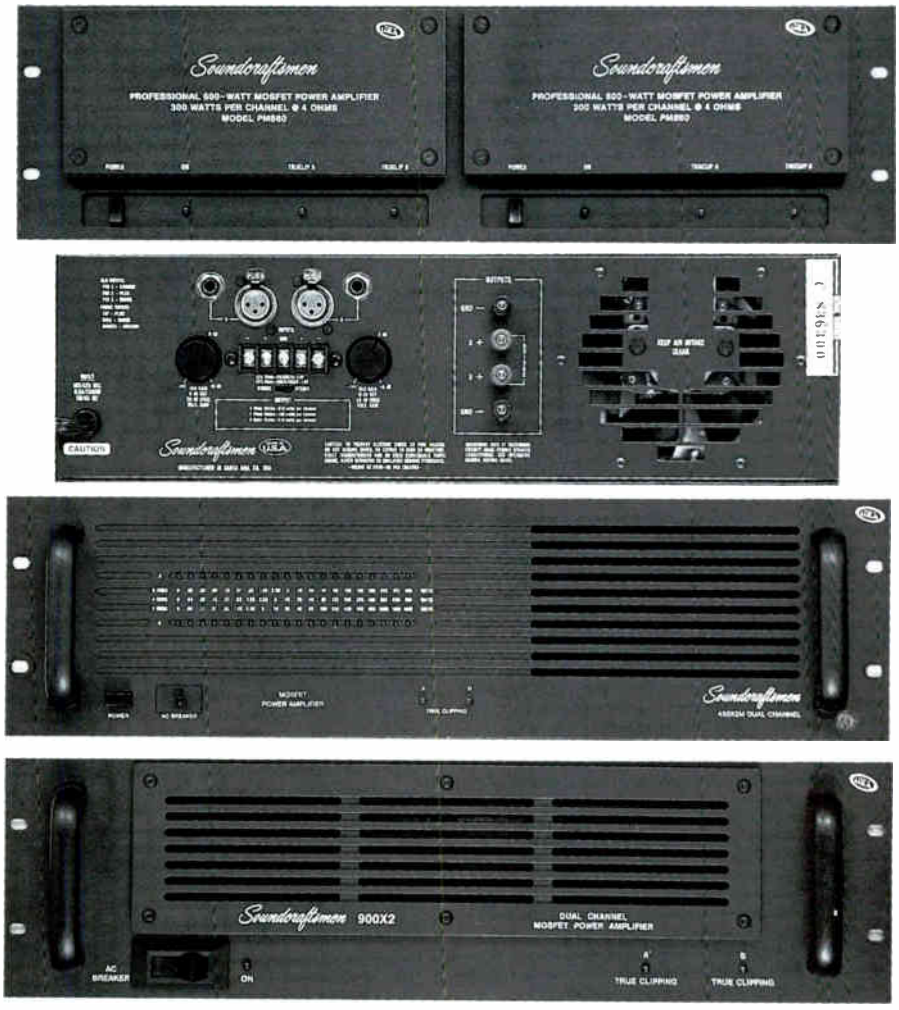
The front panel features extremely accurate clipping indicators for each of the four channels, as well as six Mode indicators for two, three or four channel operations.

Circle 220 on Reader Response Card

Circle Reader Service Card # for 200-watt Amplifier Comparison Chart and 1989 Buyer's Guide to Professional Products, with Specs and Prices.

Our **Sound Contractor Program** includes:...all models in inventory for next-day-shipment to you...maximum discount on small orders ...and Engineering Answers as close as your telephone!...

...our **20 years experience** building high-powered Professional amplifiers right here in Santa Ana, Cal., assures you of Reliability and Direct Factory backup!



PROFESSIONAL PRODUCTS by Soundcraftsmen MADE IN U.S.A.

• 2200 SO. RITCHEY, SANTA ANA, CA 92705 • TELEPHONE: 714-556-6191 • FAX: 714-662-0750 •

(continued from page 18)

spent June 6, 7, and 8 installing more than 8,000 feet of West Penn #293 shielded speaker cable (necessary due to use of high-gain UHF repeaters by various federal, state and local agencies), 1,700 feet of Belden 8451 2-conductor shielded cable for headset communications, and the 68 Atlas DR32 21-inch weatherproof horns, at the Savage River site. All speaker brackets and cable tie-points were located in trees situated on the river bank, virtually inaccessible by vehicle, so that all tools and supplies had to be carried to the work areas. Seventy-volt power for the system was provided by two TOA A-912 amplifiers feeding the up-river and down-river lines, and an additional Bogen C-100 amplifier feeding parking lots and auxiliary areas.

The main announcement system at the river site included two Telex FMR-2 Diversity wireless systems for the race commentators, hand-held microphones for the translators, and a tape deck for playback of music, recorded interviews and sponsorships. All inputs were fed into an 8-channel Electro-Voice Catalina mixer.

The river events took place on two consecutive weekends, the first being the Wildwater Championships (June 16-18), in which the athletes competed in the 4.5-mile down-river sprint against the clock. The second weekend (June 23-25) comprised the quarter-mile slalom competition, where racers navigated 25 gates suspended over a river whose normal flow rate of 150 cubic feet per minute had been raised to 1,100 cubic feet per minute, subsequently raising the ambient noise level from 67 dB to 82 dB.

Provided for the racing were two announcers' stands, one designated "Main announcer's stand," located at the beginning of the slalom course, the second the "play-by-play," located at the end of the slalom course. (The slalom course being a mid-section of the wildwater course). On the first weekend, no provisions for electric had been installed at the play-by-play booth; therefore, the Telex wireless systems were used at the distance of 1,500 feet from the antennas, greatly exceeding manufacturer's specifications. Originally, our information placed the play-by-play booth a few hundred feet from the announcer's stand. It was not until the system was being put in place that actual distance was known. We finally mounted the wireless antennas on 10-foot pieces of plastic conduit and located them on the stands of a wooden suspension bridge. The receivers were perched precariously on 10" x 10" cross-members under the bridge. We were extremely impressed with the performance of these units in such adverse conditions.

A Telex Audiocom system was provided between the two announcers' booths for intercommunications and cueing of recorded material. All race results were translated in three languages.

For the racing on the second weekend, electric was made available at the play-by-play booth due to the need for a computer terminal for monitoring of racers' positions and results. Because of this last-minute change, wireless receivers were moved to the play-by-play booth and fed into a Bogen C-100 amplifier to drive a 70-volt line 1,700 feed back to the main announcer's stand, where it was transformed to a line-level input by a makeshift resistor network assembled on a piece of cardboard with a hot-glue gun (improvisational handiwork).

Other systems at the Savage River site included a small paging system at the wildwater takeout area and a system at the press area, which included Bose 802 loudspeakers, a TOA A512 amplifier and BGW 2242 distribution amplifier providing eight direct feeds for broadcast media.

At the end of each competition day an additional system was installed at the awards area, using a TOA RXA-212 console feeding a Bogen C-100 amp and five Atlas DR-32 21-inch horns. This system provided an announcement microphone and three translator microphones, as well as a cassette deck for playing appropriate national anthems.

As the final day of racing drew to a close, the entire crew breathed a heavy sigh of relief at the end of a long and arduous three-week period which had gone almost flawlessly. The only obstacle remaining was the task of removing all installed cable, speakers and appurtenant equipment. Under ideal circumstances this project would be left for the next working day, after a well-deserved evening of rest and "relaxation." Instead, all equipment had to be removed in the remaining 2½ hours of daylight (there were no lights at the site except in administrative areas), and equipment and personnel transported to Marion, Ohio, some eight hours away, and equipment re-installed for the opening of a county fair within 48 hours. Oh, well, that's life on the road.

P.S. I would like to take this opportunity to personally commend the members of our staff, and especially Tedd Wilson, Bob Dewey and Todd Martin for making our first world event such a tremendous success. Thanks, guys! ■

CALENDAR

Upcoming Events

FEBRUARY

INFOCOMM: Anaheim, CA. Contact: (703) 273-7200. February 1-3.

ISC South (International Security Conference): Orlando, FL. Contact: (312) 299-9311. February 15-17.

Video Expo: San Francisco, CA. Contact: (914) 328-9093. February 19-23.

SOUND 90 Exhibition: Burnham Slough, England. Contact: 0628 665882. February 20-21.

ERA National Winter Weekend Conference: San Jose, CA. Contact: (312) 649-1333. February 23-25.

National Design Engineering Show: Chicago, IL. Contact: (203) 964-8287. February 26-March 1.

Fiberoptic Splicing and Termination Workshop (FC2): Sturbridge, MA. Contact: (508) 347-7133. February 26-March 2.

E I West (Electronic Imaging): Pasadena, CA. Contact: (800) 223-7126. February 27-March 1.

BOARDROOMS: MULTI-USE AND MULTI-MEDIA

BY BILL SWEENEY

Boardrooms or bored rooms? Bringing business conference centers up to date in every aspect of technology has become a burgeoning industry. The once smoked-filled room has expanded into a meeting place of audio, video and computerized information. However, the main concern of consultants in the field often comes down to a dual bottom line: accessibility and intelligibility.

"What's most interesting is what's going on with audio," says Steve Emspake of Shen Milson & Wilke. "You have to realize that, in large part, we're dealing with people into their sixties. Hearing loss gets to be a problem at that age. And they don't want anything too complicated. They haven't grown up with the technologies like the younger generation."

"Say, you have a huge old table and the architect says, 'You can't cut my table, it's too valuable.' What we do is run voice activated microphones and speakers into the ceiling. We get a complete voice lift, but filter out rustling paper and, because they sometimes they like to have a breakfast meeting, we have to cancel out the silverware."

Once the microphones and speakers are in place, says Emspake, the system is ready for interfacing as a duplex teleconferencing system. Yet the key for Emspake is keeping the control factor simple.

"We go with a small, wireless control with perhaps a more flushed out control panel. But if you get into all different kinds of commands you can scare the hell out of these people. They are gun-shy of technology. They may have an AV person on staff and they may not. What 'Mr. Smith' wants is a start-and-stop and that's about it."

A full video conferencing room is another matter, says Empsake. "Video conference rooms are not boardrooms. You just can't do it that way. The lights, background, carpets all have to be different. It's like the difference between a stage and a studio. What you're doing is creating a mini television studio and that can run from $80,000 into a few hundred thousand dollars."

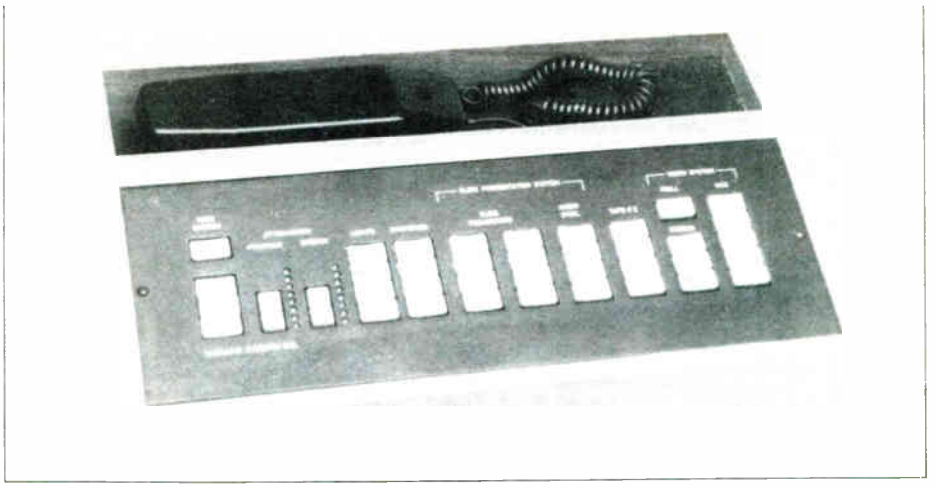
> "The once smoke-filled room has expanded into a meeting place of information."

Shen Milson and Wilke has recently installed these mini-studios for a variety of companies. "There's a multi-national company that recently upset a lot of people by moving out of Manhattan and going to Fairfax, Va. We did a full video conference room so they can keep in touch between the two facilities during the move 24 hours a day.

"A division of the Times Mirror Corp. needed a link between their Long Island and Manhattan offices. With them, instead of maybe four to six people at the conference, you might have 20. That brings up special camera requirements. That one is going on line in six to nine months."

At Marriot hotels, board and conference room flexibility is a key, says Jeff Loether, who's in charge of sound for the chain.

"We don't have the luxury of 'hot rooms,' " says Loether. "We have to be multi-purpose and reconfigurable because we rent the rooms for a variety of purposes. We hide the speakers in the ceil-



The FSR DL-64 system: sample lectern parcel, walnut finish, light oak finish with intercom.

ings because we can't have clusters hanging all around. We'll have mic jacks built in but things like movie and video screens have to be portable."

"For control, when we need high power in a room with a good amount of reverb we use the FSR 132 and we expect to go to the dual channel 302. For a smaller room with a lower ceiling we'll go to the FSR 112." FSR has just announced its IRC-1000 digital boardroom system to be offered in the spring of 1990.

"Board and conference room flexibility is a key... We don't have the luxury of 'hot rooms.'"

Loether adds that Marriott had been expanding its satellite teleconferencing centers but its growth has slowed somewhat recently. "Orgination of teleconferencing is extremely critical," he says, "You can't just roll in a camera."

Terry Klingaman of Peirce-Phelps sees teleconferencing as a very strong field and recently did a series of video rooms for Mobil. They also installed full media rooms for AT&T in Chicago, as designed by Dave Burnor, with 35-mm and video capabilities. "We try to make it a lot more automated and user friendly. We find we maintain flexibility best when our application is behind the scenes. The customer can cue a variety of functions from the lectern. We use Crestron, AMX and York. We find we can work up a control panel that eliminates a lot buttons and slides. The speaker can have everything he needs in a hand-held control."

A recent innovation is the touchpanel control, says Charlie Danelutt, also of Peirce-Phelps. "You can create your own buttons to control all audio and video functions. You simply draw on the screen with your fingers to design your system. You don't have to know computer language. It enables you to be very compact." Again, Danelutt points to Crestron, AMX and York as those active in the touchpanel area.

At the AT&T conference rooms, says Klingaman, the whole system is automated. "It allows for someone back in the control room to run through, say, eight different scenes. They simply go from one preset to another. You go from lights up, audio on automatically. And it will switch from playback sound to voice activation sound, so there's no lapse."

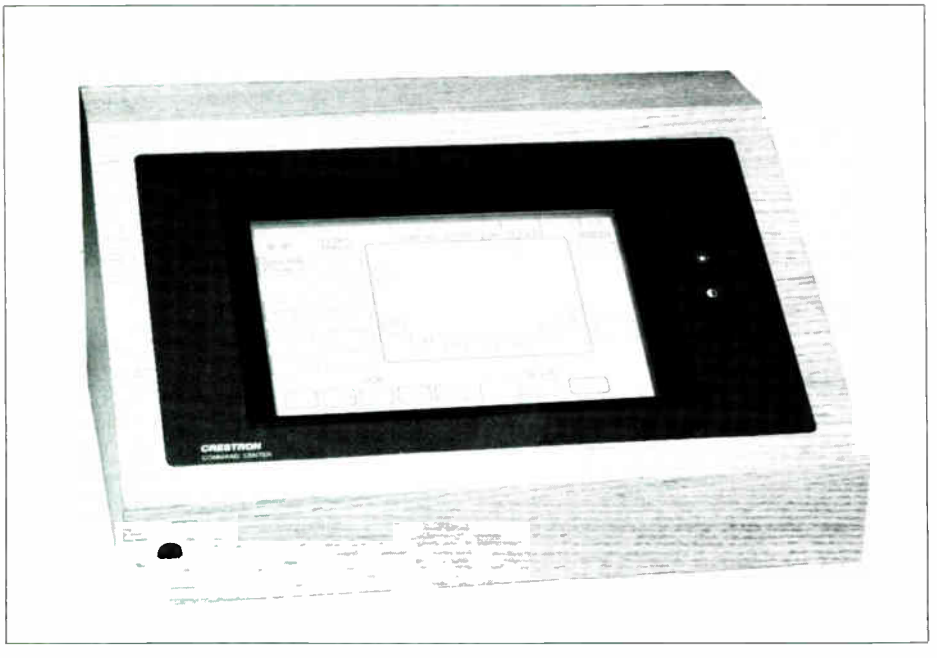
Mike LeBoss of Joiner Rose agrees that the audio aspect is the most persuasive in boardroom design. "You might have a teleconference and, if the video goes down, you can still carry on. If you lose the audio the conference is over."

Getting heard is the main feature of Joiner-Rose's "smart table system." "It's designed by Irving Wood, who's a senior designer here," says LeBoss. "Picture a room 35 feet high and maybe a quarter the size of a football field. The room is so large the people can't hear each other. What the table does is place a microphone and speaker near each person, but the system is 'intelligent.' It knows that someone speaking to the person next to him does not need the amplification of someone across the room. It makes dynamic adjustments instantaneously as people talk and it can plug into the phonelines. Equitable and Mony use them."

Talk is not cheap in this instance. The cost of the smart table, says LeBoss, can run from 30 to 60 thousand dollars as the middle ground, says LeBoss. "But that's just the electronics, you have to add the cost of the table itself, installation, add-ons."

What were once featured additions to the well equipped boardroom have become necessities, says LeBoss. As slide projectors gave way to VCRs and monitors, today's visual preference is projection video that can interface with computers.

"Projection video has become de rigueur in every facility. And much of the



Crestron's CTP-2000 wireless command center.

time they are hooked up to computers. You still see some slide trays, but now you're just as likely to see people carrying disks. They want a graphic presentation system that can display a Lotus type spreadsheet. And any image can be scanned by a camera and stored in a system like Kodak video slides."

"We try to make it a lot more automated and user friendly."

Projection video, says LeBoss, can have the effect of turning the boardroom into a giant computer terminal. "It used to be that if they wanted to show a graph, they would wheel in a monitor and everybody would gather around. Now they can interface the projector with a variety of computers, say Macintosh or Digital Equipment Corp., and use analytical software and show statistical anaylsis.

"For Quotron, we installed what was, in effect, a marketing theater showing the latest Dow stock platforms. We made sure everything built into the room could interface with the video projector."

Compatability is important even when handling the smaller projects, says LeBoss. "We always keep in mind when designing rooms that, in the future, we can add on. Even if it's just a little portable computer, the infrastructure is there."

With an eye towards the future, LeBoss sees laser projectors as device coming online. "They would project a much shaper image than we can offer now. And flat panel televsion is in the works, so we can get rid of all those tubes."

As for sound, LeBoss notes the home video revolution has made a sonic wave in the once staid boardroom. "As people are hearing these things at home, they want them in the room. Not just stereo; they're asking for a surround sound, more realistic environment effect. But we're not going overboard, yet. We're not showing Star Trek VI." ■

INTER-CONNECTED CONFERENCE ROOM SUITE HELPS MICHIGAN AD AGENCY COMMUNICATE

A fast-growing marketing communications firm needs conference rooms whose audio/video systems will perform many tasks, including impressing visiting advertising clients. But if the set up is too complicated to be operated by non-technical staffers, it may not do anybody any good.

Stone, August, Baker Communications Companies in Troy, Michigan (a Detroit suburb) opted for a video and sound systems retrofit by Vitex, a custom installer based in Walled Lake. The sound and video plan Vitex came up with for the firm impresses visitors, and meets a multitude of Stone, August, Baker's audio/video needs. But it was set up to be easy for the least technically oriented staff member to operate without leaving the conference table.

Conference room of Stone, August, Baker has an A/V room behind the black glass at the end of the room.

The 60-person agency, one of whose major clients is Lionel Trains, actually has four different conference rooms. Each has a different purpose, and a different audio/video system designed and installed by Vitex.

Main conference room of S,A,B.

The main conference room, 37 feet by 19 feet, is used by all of the account groups for major presentations. It was designed by Vitex so that the electronics are discreetly hidden away. The heart of the system is made up of Niles Audio infrared controls, which make it possible to operate equipment that's isn't in the same room.

A remarkably small quantity of the electronic equipment installed in the conference room is visible. As a client glances through the room from the 12-person conference table, he or she sees two fabric-covered panelled walls which have black laminate panels that are easily lowered to display presentations. The third wall houses art work and a movie screen, which can be lowered as needed.

The integrated Audio/Video equipment room for Stone, August, Baker.

The only device clearly visible in the main conference room is a Niles Audio IRR-1 receiver on the table.

If a client looks closely, he or she may notice the five Boston Acoustics 360 speakers and the M&K VX-4 subwoofer set into the fourth wall. Only a really sharp-eyed client can spot, under the 35-inch wall-hung Mitsubishi TV, a black glass panel. But that is the command center for audio and video in Stone, August, Baker's conference rooms.

Behind the black glass panel is a room about 18 feet long and 8 feet wide, which contains all the equipment, including a Luxman F-105 surround sound decoder.

According to Vitex's installation manager for the job, Ray Pickrell, the idea of surround sound took a little bit of selling to the Stone-August-Baker management. But it has made a substantial difference in such a large room. "It gave them the ultimate sound to enhance the visual presentations," he says.

The firm already owned some equipment when Vitex drew up its plan, and the installer integrated a customer-owned stereo component system with the new equipment. In addition, a slide projector, ½-inch and ¾-inch video cassette players, a reel-to-reel tape deck and an audio cassette player are in use. Interconnect incompatibilities between older and newer equipment were resolved by using Niles

SJ series connector plates: five-way posts which take banana plugs or which accept spade lugs, pins, or plain wire.

Before a presentation, the equipment in the media room is set up. Then whoever is doing the presentation can operate it with the Niles IRW-1 infrared receivers in the wall towards the front of the conference room. Niles' IRW-wall-mounted flashers are located on the wall next to the light switch where, Ray Pickrell says, nobody notices them.

But the video signal from the main conference room can also go to the other conference rooms, thanks to an A/B switching system in the media room and a coaxial cable.

"They were dragging equipment from room to room," says Pickrell, "and that didn't make sense to us. It gets very complicated; it can be very disruptive; and it can make a sophisticated operation look tacky."

The next largest room is a 20 foot by 14 foot creative conference room. Into it, Vitex also put surround sound, using the customer's already existing speakers, augmented by two Boston Acoustics 705's. The creative conference room is used to screen newly-produced commercials and news interviews, and to review video and audio tape submissions from producers and actors. It uses much of the same equipment as the main conference room and has its own screen, plus ¾-inch and ½-inch VCRs.

"Having the separate media room and the A/B system makes it possible to use the same equipment to send signals to several rooms without having to bother someone in the main conference room," Pickrell notes.

Meetings between Stone, August, Baker executives and salespersons representing magazines, TV and radio stations usually take place in the media conference room. With an outside wall whose windows overlook a wooded area, and a glass wall that looks out on the hallway, the environment is very pleasant. This room offers visitors access to a range of audio and video equipment.

The fourth, and smallest, executive conference room, 16 feet by 12 feet, is where small groups meet to talk or share ideas. Its windows overlooking the forest area help people think; and the audio cassette player and ½-inch VCR with wall-mounted monitor, as well as the wall-hung marker board, help them to be creative.

The Stone, August, Baker conference room complex was worked on during the fall of 1988 and was completed at the beginning of 1989.

"Vitex was extremely helpful," says Fred Hooper, Vice President-Creative Director of the company. "One of the hardest tasks we gave them was to make it easy for 'non-techie' people to use the systems in all the rooms. They came up with a way to use just one device to control the whole system.

"But they gave us a lot of advice before anyone lifted a tool, and we got just what we wanted: a conference room complex that looks and sounds great, that impresses our clients, and that we'll be glad to work in." ■

Red Zone: Hot Club's Sound and Lighting — An Ongoing Installation

By Jesse Nash

Currently, the most popular clubs that make up the New York party scene include the Palladium, China Club, Limelight, the Cat Club, Heartbreak, The Tunnel, and The World. Now, Red Zone is the nighttime sensation garnering a lot of attention. Located on West 54th Street between 9th and 10th Avenues, Red Zone is the "in" club to be seen at...if you care about such things.

A former ABC-TV studio, once the home of the daytime soap opera, *Ryan's Hope*, Red Zone is the brainchild of Viviane and Maurice Brahms. A city block long, the 20,000-square foot space can be a regular dance club, a concert room, a function room for major corporate events, a comedy club and/or anything else that the imagination can conjure up.

Red Zone opened a year ago. The main are is a 10,000-square foot dance floor. There is a 4,000-square foot V.I.P. room called The Screening Room and a V.I.V.I.P. (very important very important persons) platform overlooking the dance floor. There are three bars and a stage with two vast doors which open up to 54th street. And Red Zone claims that it has one of the best sound and lighting systems of any club in the United States.

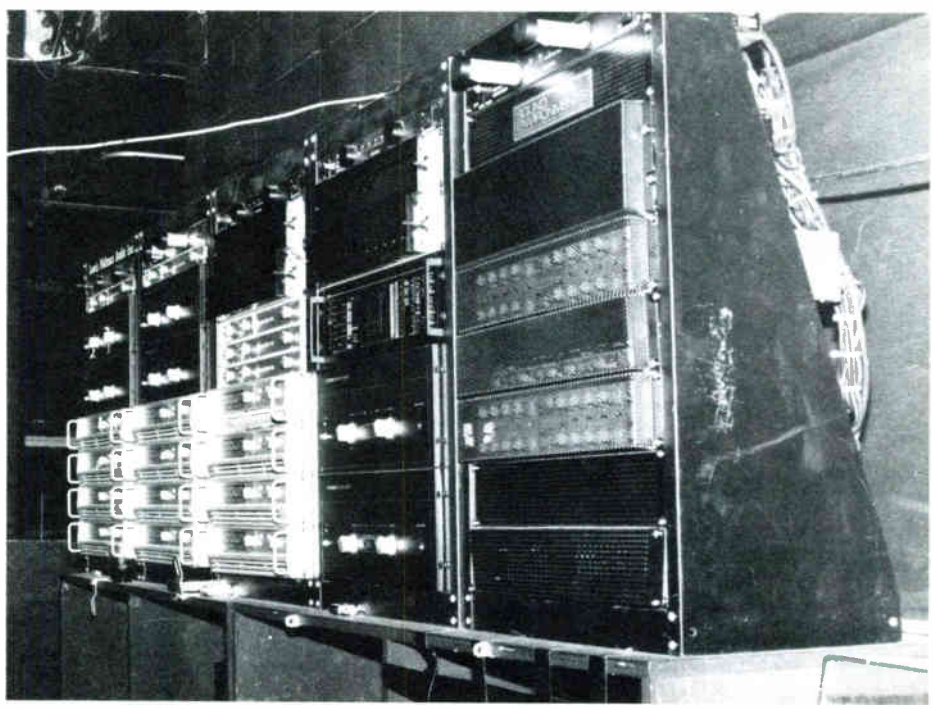
"People were saying that big clubs were out," comments Maurice Brahms. "Well, everything that's old becomes new again if you wait long enough."

Seth Langer and the Nightwing Group assume double duties, as they maintain both the sound and lighting systems. "Just as lights are an important contribution to a club's success, so is its sound system," says Langer.

Langer notes that there is still "further tuning on the room" that is necessary to improve the "quality" of the sound in the main area. "We've had some complaints from some of the residents of the surrounding neighborhood," says Langer. "And, so, we're planning on putting up a sound deadening wall. We hope that this will serve as the final cure to isolate the actual wall that's part of the adjacent building where most of the complaints have been coming from of late. The sound deadening wall will be a separate wall that's not coupled to it. Hopefully, that will be enough to deaden much of the sound waves that are going through it to the adjacent apartment complex."

Langer notes, however, that the planned deadening wall will cost between $30,000 and $40,000, and is looking at the possibility of another option to solve this problem. A redesign of the existing sound system into a unique near-field design by one of the best known acoustic consultants is also being looked at as a more cost-efficient method of dealing with this problem.

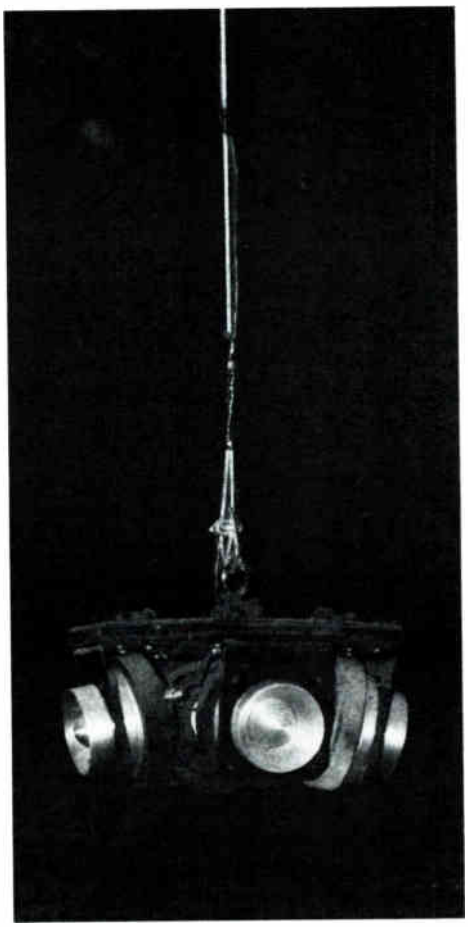
The setup of the sound system in Red Zone includes a series of Crown Macrotech 2400s PS 400s and D75s, with amps on the floor all in the main room.



The V.I.P. section contains Crown Macrotech 1200s.

Red Zone's DJ, Dave Morales, has "a really good ear," says Langer. "Dave is responsible for all decibel levels. Right now we have problem because the sound pressure level and sound field on the dance floor is in the center of it. That makes it difficult for the DJs to hear. So we've put a pair of monitors in the booth to allow the DJs to know what the sound is feeling like on the dance floor. We've also got a full set of compression limiters so that none of the DJs can turn up the sound beyond a certain level. At a certain level the sound just comes down. I don't know if the DJs can hear it or not, but the compression limiters do bring the sound down at a certain volume point. But then again, if there are a thousand people dancing in the main room, you've got to get some serious sound coming out in order for people to hear it."

Langer adds that the sound system was not designed to give people the opportunity to talk "outside" of the dance floor. "That whole (main) room is the dance floor," he says. "The sound system was designed to give you an even feel all over



the entire space. And this is a huge space: a long rectangular box. Now, because of the problems we've had with the adjacent apartment complex, we've had to narrow the sound field and bring it more toward the center of the room. And that now becomes one of the modifications that we have to make on it."

Langer says that there were no "unique considerations" to make when initially assuming work on the sound system other than maintaining "a high sound pressure level and a strong bass punch" that people can really feel on the floor. "That's the type of sound that the system was made for—so you can dance."

Langer admits that some "borrowing" has been applied to the Red Zone which he has used in his experience with other clubs. "We've used some sub-bass cabinets and 18-inch folded horns, which give you a lot of sound pressure, and which we use all the time in many clubs. It gives you a lot of output for the amount of power that you put in. The hung array JBL tweeters give you nice crisp highs which the DJs can use as an effect."

Langer adds that Red Zone accommodates live shows, and so "additional live

equipment" has been added to the "working stock" rather than renting from an outside company. "We have microphone stands, patch bays, etc.," comments Langer. "Live performances work out quite well. We have a small stage monitor system. Bigger acts are supplemented by whatever rental equipment comes in. There are mic patches that turn back to the DJ booth. There's also a 24-channel Soundcraft board there. And we have no problem if the act brings in its own sound people. We have them bring a separate mixing board which we have them mix into the house system. Usually, there's an additional sound booth which we'll set up in front of the DJ booth."

> "A city block long, the 20,000-square foot space can be a regular dance club, a concert room, or anything else that the imagination can conjure up."

Red Zone Equipment List

LIGHTING
- 1 Nova Systems Inc. Dimmer Board
- 2 Arion Pro Sixteen Projector Programmers
- 2 Diversitronics PS-4M-50 Strobe Controllers
- 1 Tolcon Scene Strobe Controller
- 1 Tolcon 648 Chase Controller
- 1 Tolcon 601 Single Channel Controller
- 1 Nightwing Custom Hoist Controller
- 1 Nightwing Custom Screen Controller
- 1 Nightwing Custom Switch Panel
- 1 Pulsar Touch Panel
- 1 Tracer Strobe Controller
- 1 Laser Systems North America Cyclops Controller
- 2 Rosco 1500 Fog Machines
- 8 Diversitronics 50S-2 Superstrobes
- 4 Diversitronics Par-64 Strobe Cannons
- 28 6-foot Tracer Strobe Tubes
- 4 Nightwing Custom Trusses
- 4 Nightwing Custom 20-inch Shafted Mirror Balls
- 4 Nightwing 4-Shaft Oscillators
- 8 Half-ton Duff-Norton Chain Hoists
- 16 Stagebright Lighting Par-64 ACLs
- 16 Stagebright Lighting Par-46 ACLs
- 64 Stagebright Lighting Par-46 Pin Spots
- 64 Stagebright Lighting Par-46 12-Volt Fixtures
- 32 Stagebright Lighting 14-inch Scoop Lights
- 32 Stagebright Lighting 6-inch Zoom Ellipsoidals
- 32 Stagebright Lighting Par-64 1k Fixtures
- 16 Laser Systems North America MK II Gyrolights

SOUND (Main Room)
- 12 Crown Macro-Tech 2400 Amplifiers
- 2 Crown PS-400 Amplifiers
- 4 Crown PS-200 Amplifiers
- 5 Crown D-75 Amplifiers
- 2 Urei 539 Equalizers
- 2 Urei 525 Crossovers
- 1 Urei 1620 Mixer
- 1 RG Expander
- 1 Custom three-way Bandpass Filter
- 1 Nakamichi MR-2 Cassette Deck
- 1 Otari MX-5050 Reel-to-Reel Tape Deck
- 3 Technics 1200 MK II Turntables
- 1 Soundcraft 200B Mixing Board
- 16 Emerald Sub-Bass Cabinets
- 8 Quad Bass-Mid-High Cabinets
- 6 "Z" Tweeter Arrays

SOUND (Upstairs)
- 6 Crown Macro-Tech 1200 Amplifiers
- 1 Crown PS-400 Amplifier
- 1 Crown PS-200 Amplifier
- 1 Crown D-75 Amplifier
- 2 Urei 539 Equalizers
- 1 Urei 525 Crossover
- 1 Crown PSL-2 Preamp
- 1 Urei 1620 Mixer
- 2 RG Expanders
- 1 Custom 3-way Bandpass Filter
- 1 Nakamichi MR-2 Cassette Deck
- 2 Technics 1200 MK II Turntables
- 1 Multiple CD Player
- 1 Multiple Cassette Player
- 2 Emerald Sub-Bass Cabinets
- 4 Dual Bass-Mid-High Cabinets
- 20 JBL Control 5 Speakers

VIDEO
- 18 Kodak Ektagraphic Slide Projectors
- 8 15-feet-wide Motorized Screens

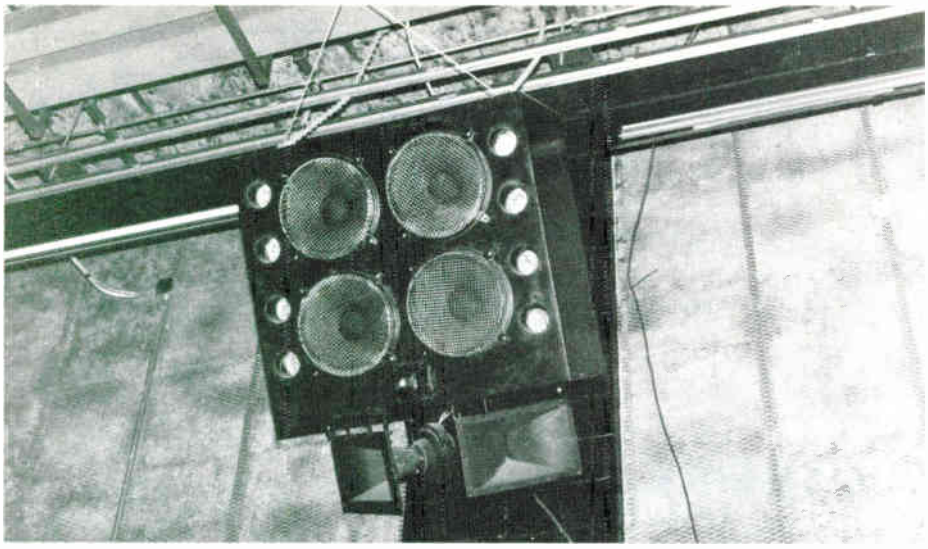
Red Zone has one of the best club lighting systems in the country. "The real triumph here is the lighting," says Brahms, who got Seth Langer to design the lighting after the previous designer threw his hands up and said, "It's too big a job for me!"

Brahms says he knew Langer wouldn't back down to the challenge. "[Seth] had designed the lighting in several other big clubs for me," he says. "He had done Infinity, Bond's, New York, New York and the Underground for me in the past, so I knew that Seth was the right person for the Red Zone."

About $200,000 was spent on Red Zone's lighting system — a figure Brahms considers "standard" in today's club scene. In addition — because the space was originally a television studio — Brahms "inherited" 100 dimmer packs which he estimates are worth $1,200 each.

In Brahms' experience, money well spent on lighting will improve a club's chances for success. "A club's success is based directly on the efficiency of its lighting system and design," Brahms says. "It's as important — if not more important — than the music itself. I've seen clubs with a really hot party going on, and the party never reaches a crescendo because the lights just stay dull."

When he boasts about his favorite lighting feature in the club, Brahms sounds like a proud father: "The Gyro lights are the best! They can do so many different things. They're so versatile in that they can do everything from be a spotlight for a fashion show to spinning and turning at different angles for those who just love a good light show when they dance. They have different intensities and different colors, too. They are truly special."



Langer, with a designer's eye, adds: "We've got 16 Gyros in the ceiling on four moving trusses which come down to 9 feet above the dance floor. There are four [Gyro] units on each truss. The units are unique in that they give us 360-degree movement and we can point them anywhere in the room. The Gyro lights have their own dedicated controller. It's a unit that's touch-sensitive and has a large memory capability that's specific to the product."

Kat Joy and David Wolf run the lights — a job Brahms takes very seriously. "It's very difficult finding people who understand the sophistication of the electronics and that also have the feeling, the soul, to play the music."

In addition to the lighting, the club's main floor features eight video screens which, Brahms says, enable him to cater to corporate functions and add dimension to the space. "The screens allow me to change the environment at any time," he explains.

> "The video screens helped Langer realize his concept of the room as an entertainment surface."

Langer says that the video screens — installed by TSI of Mineola, New York — helped him realize his concept of the room as an "entertainment surface." He explains: "As an entertainment surface, we project and display the walls as a lighting effect. We can create just about any environment we choose for any organization that has an interest in using the room. Eight motorized screens drop down in the room; and the garage door, which is behind the bar, is also used as a projection surface. There is a total of 18 slide projectors being used on them."

The video and, in particular, the lighting have given Red Zone the theatrical feel that the club's name lends itself to, according to Brahms. "The 'Red Zone' is a theatrical [term] which means that the show is going on," he says. "And that's the theme we hope will keep the club interesting and exciting to all who should happen to pay us a visit. I think that most people will agree that that is the special quality about the club." ■

TRENDS IN LOUDSPEAKER DESIGN

BY MIKE KLASCO

Loudspeakers are sexy — and are also the weak sister of the audio chain. Each year, more effort goes into development of speakers than into any other element — whether because of the mysterious appeal of speaker design or because transducers produce an order of magnitude more distortion than other components.

The development labs are abuzz — and current trends demand an understanding for future installations.

Many new developments and trends continue on all fronts, from magnetic driver systems to complete signal processing speaker systems. I have picked out some of these trends to talk about and also provided a little background.

PACKAGED MODULAR SYSTEMS

The requirements of the touring sound companies, performing arts centers and other large venues have encouraged the development of packaged speaker systems of modular design. About 10 years ago, EAW developed a modular horn loaded series for tour and fixed installations. Turbosound and Meyer Sound soon introduced similar products, with the Meyer product including matched signal processing. Altec Lansing worked with Stanal Sound and developed the Stanley Screamers. About four years ago, Electro-Voice introduced its manifold building block systems, and more recently has developed scaled down versions of the bass bin using two woofers instead of four. At the October AES Convention, Adamson Acoustic Design introduced an innovative two box concert system featuring a double woofer manifold-type bass enclosure, and a second enclosure with a cone mid-horn and compression driver treble horn.

> "The requirements of large venues have encouraged the development of packaged speaker systems of modular design."

ONE BOX SYSTEMS

The one box system had great appeal as set up and installation was greatly simplified. Like the package systems, these boxes were available with road worthy construction and flying rigging. Most designs used trapezoidal enclosures so tightly packed clusters could be constructed to reduce lobbing effects. Accessories such as dollies to hanging hardware were also available. Touring companies that did not have their own wood shop, or that found they could not afford their wood working facilities embraced these products.

> "The one box system had great appeal as set up and installation was greatly simplified."

EAW's 850 concert speakers were an early example of one box high output speakers for touring use.

JBL's Concert series was developed with the help of Stanal Sound and are essentially three-way one box systems. They were introduced about three years ago.

Turbosound introduced, at the last NSCA convention, a full line of one box speaker systems featuring direct radiating cone mid-range speakers for medium to short throw applications such as night clubs and discos.

Community has developed a full series of inexpensive but innovative and unusually high output one box systems for the musical instrument, night club and disco markets.

SIGNAL PROCESSING SYSTEMS

The first popular one box system with signal processing was the Bose 800, essentially a direct radiating version of its consumer product, the Bose 901 (which was first marketed in 1968!). The signal processor was an equalizer that was preset for the speaker's characteristics, but also cut the extreme bass to prevent over excursion of the drivers. Another product that introduced the concept of protective signal processing was developed by KLH in the 1970's and used a "black box" to model driver excursion and voice coil overheating of small bookshelf speakers.

"With the listening audience getting spoiled on CDs, the demand for louder and deeper bass is increasing the use of subwoofers."

The speakers were highly equalized in the bass, but the EQ was pulled down as the levels increased. The product had some commercial success, but KLH corporate management was, at the time, busier selling companies rather than products.

McCune Sound built compact high output signal processing speakers for their own use. Later, when John Meyer left McCune and started Meyer Sound, he established a product line of signal processing one box speakers. The signal processors provided extensive preconditioning, including limiting with each band, electronic crossover and equalization. Another McCune engineer, Ken DeLoria, went on to start Apogee Sound, which also manufactures a line of signal processing one box speakers. A separate sense wire is used with the Apogee speakers, which returns to the processor. EQ, electronic crossover, time alignment, and protection from over excursion and thermal overload are provided by the processor. Although generally expensive, Apogee has recently introduced the AE-4, which is its first mid-priced product. Renkus-Heinz was also an early player in the field of signal processing speakers, not just for compact systems, but also for concert sized modular systems. The "Smart" processors provide the full range of functions, from limiting to EQ, to protection. PAS offers its TOC processor for both its concert systems and coaxial monitors. The TOC is mainly an electronic crossover with Time Offset Correction.

Electro-Voice's Delta-Max system consists of two-way trapezoidal boxes and signal processors. The smaller model uses a 12-inch woofer and, interestingly, has a 1.4-inch throat instead of a 2-inch throat to maintain high frequency dispersion without using E-V "waveguide" vanes in the horn throat technique.

EAW has devised the KF600 compact one box design which features a woofer that is loaded both on the front and rear with separate chambers that exit to the front of the enclosure. The KF600 is matched to a signal processor which provides the usual equalization, electronic crossover and protection functions. The KF600 also features EAW's "Virtual Array Technology", which means that the pattern of the speaker matches the trapezoidal angles of the cabinet.

The next step is to match the amplifier's characteristics directly to the speakers, and Meyer and Yamaha are hard at work developing the next generation of products that accomplish this.

"Enclosures will continue to get smaller, which will require increased signal processing to maintain flat response."

SUBWOOFERS

With the listening audience getting spoiled on CDs, the demand for louder and deeper bass is increasing the use of subwoofers. Thiel-Small parameters greatly increased the predictability of direct radiating bass reflex enclosures for bass applications, especially above 50 Hz. A recent trend is toward enclosures that are specifically designed for bandpass use, typically with little output above 120 Hz. These "bandpass" designs use chambers on both sides of the woofer cone. Although this concept was first patented in the 1930's, Jensen popularized it for audiophiles in the 1960's. The Bose Tandem Tuned design reintroduced this technique in the early 1980's, with two woofers and front and rear chambers. Bose later introduced the "Cannon," at the 1987 NSCA, which used (approximately) a 3-foot and 9-foot section of PVC pipe with a 12-inch woofer in between. KEF also brought out a compound enclosure for consumer applications, as have Acoustic Research and Boston Acoustics. Even Sharp, Panasonic, and Sanyo have ghetto blasters using multi-tuned chambers!! Back on the commercial front, E-V, EAW and Adamson have "manifold" style configurations. Peavey and EAW (in its KF600) are using front and rear chamber loading.

Aside from acoustical techniques, signal processing is also being applied to subwoofers for protection, EQ and electronic crossover functions by E-V, Meyer, Apogee and others.

COMPONENT HORNS

Constant Directivity horns have become a de facto commercial standard, although dissent is being heard on the compromises and transient response and, in some cases, poor loading of the drivers. Adamson Acoustics introduced its concert system which uses mid and treble waveguide horns based on Dr. Earl Geddes techniques. This is the first successful implementation of Geddes' work, but other manufacturers are experimenting with this approach. Unlike previous constant directivity techniques, the use of vanes or diffraction slits or other sharp discontinuities are not used in the throat, and reduced coloration and improved transition response is claimed.

(continued on page 36)

TOA'S SPEAKER SYSTEMS

CLIMB UP TO TOA

Climb up to a Toa speaker for every conceivable application. From a compact SM Series personal monitor to a thundering SE system with an 18-inch woofer. All incorporating Toa's latest breakthroughs in high power, smooth dispersion speaker technology.

Scale new heights with Toa's SL and SD Series of reinforcement speakers and stage monitors. To keep them—and you—looking exceptional on the road, they now feature a rugged covering and lower profile. And the constant directivity horn gives you ultra-smooth, total sound coverage.

Style, quality and price make them the ideal choice when you want clear, commanding sound in a compact enclosure.

Rise above lackluster sound with Toa's premier high-performance 380SE and 480SE systems. Specifically designed for critical applications, the powerful SE Series units are equally at home in sound reinforcement as in making your keyboards 'synthable.'

Reach a new level of sonic accuracy with the ME Series of shielded near-field studio monitors. To reinforce ultra-low frequencies with outstanding realism, rise to the occasion with Toa's power-packed subwoofer systems.

Whatever your needs, there is a Toa speaker system that's perfect for you. You can't show 'em how good you really are unless your speaker sound is 'rock solid.' Climb up to Toa. Call us today.

Toa Electronics, Inc.,
601 Gateway Blvd., South San Francisco, California 94080.
Telephone 415/588-2538 or 800/843-4750, in California 800/632-2157. FAX 415/588-3349.

TOA

Circle 218 on Reader Response Card

CO-AXIAL HORNS

Renkus-Heinz, Community and Emilar have introduced co-axial horn systems. Low mid-range from about 300 Hz on up is handled by the very large format compression drivers these firms manufacture. Mouth size is almost 3-foot by 3-foot. Upper midrange/high frequencies are covered by conventionally sized compression driver/horns mounted coaxially to the larger horn's mouth.

Although the smaller driver/horn is coaxially mounted, it is not in time alignment with the bigger driver and a delay line is used to line the elements up into a point source. The Renkus-Heinz coax can be used with the "Smart" series signal processors for equalization, crossover, and delay alignment. Applications include high output voice or with a woofer array module, and high output music.

One might expect the obstruction of one horn in the mouth of the other to create serious reflections and polar discontinuities, but the 3-D polar plots this writer has seen from Renkus-Heinz look respectable.

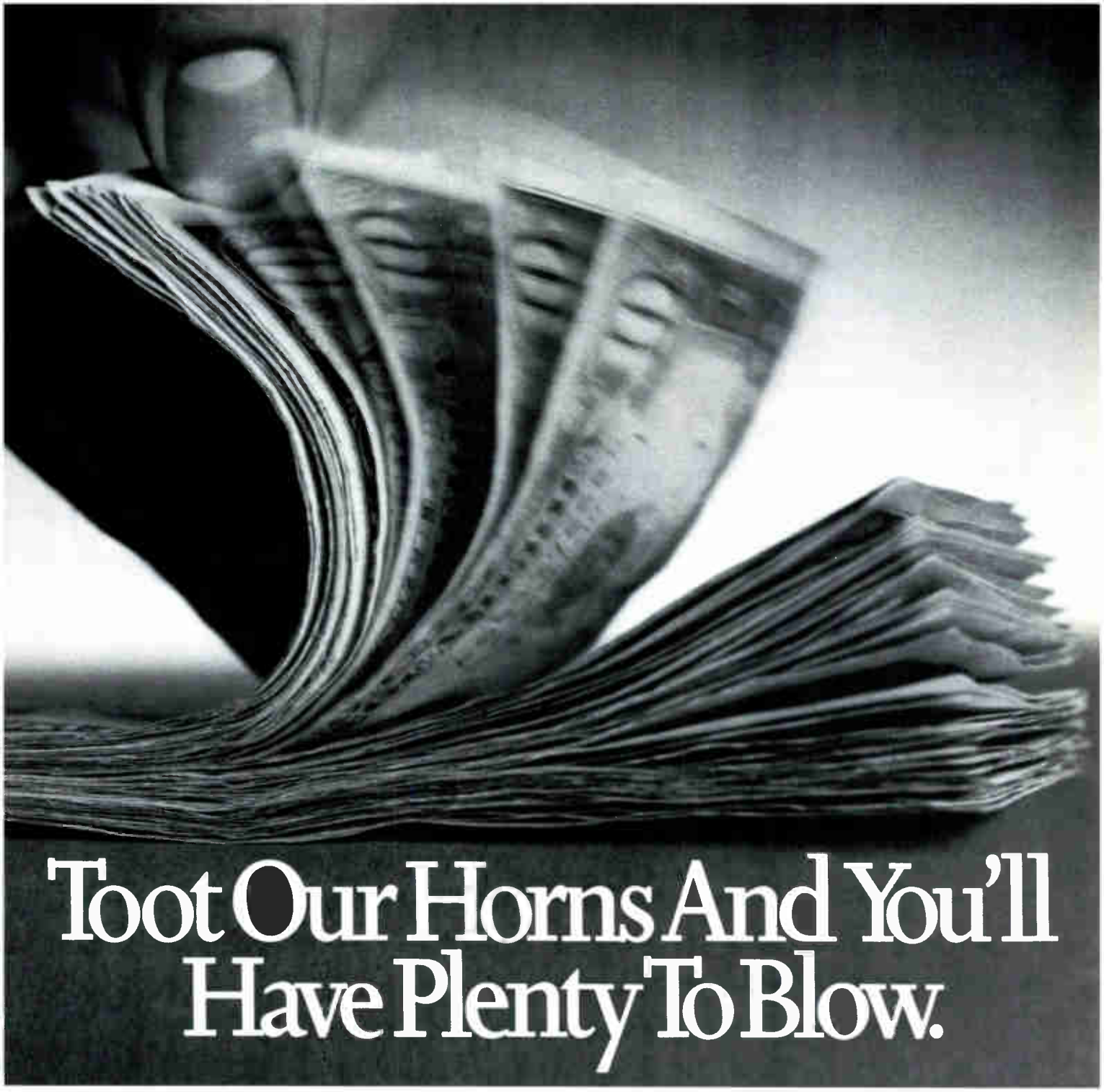
Frazier has expanded its CAT (Co-Axial Time-Aligned) series product line. These consist of horn loaded cone speakers with a compression driver/horn mounted coaxially. Some of the models have the cone horn flare constructed of acoustical foam, which minimizes inter-horn reflections and is reminiscent of the Acoustic Research "Magic" speaker and the Pat-axial system distributed by J.W. Davis.

"Constant Directivity horns have become a de facto commercial standard."

WOOFERS AND COMPRESSION DRIVERS

A few years ago Electro-Voice introduced a series of very high output woofers. Although some models had some problems and were discontinued, the EVX 180/150 has been used successfully by sound contractors and touring sound companies, and variations of these woofers have worked out well in the Manifold series. Unique features include carbon fiber paper cones which have high stiffness and light weight, large 4-inch diameter voice coils and double spider suspensions.

JBL has also been working on woofers. Using computer simulations of magnetic systems, JBL was able to reduce the magnetic system weight and size on their woofers without losing acoustic performance, and without resorting to esoteric magnetic materials. The problem with reducing the magnetic system mass is that



Toot Our Horns And You'll Have Plenty To Blow.

When you tell your customers about the quality and features that Gemco horns offer, get ready to make a sell. They'll be impressed by its rugged good looks and watertight construction. And you'll appreciate the fact that Gemco horns are shipped completely assembled, including a three-way adjustable, cast aluminum mounting bracket.

Plus, many of our horns feature special screw-type terminal connections that eliminate the need for soldering or splicing, making installation fast and easy.

So don't blow it. Recommend Gemco horns for all your customers' voice paging applications, and you'll have plenty to blow. For more information or a catalog, ask your electronics distributor or contact GEMCO today.

GEMCO

GEMCO Electronics, Inc. P.O. Box 993 Gallatin, TN 37066 (615)452-5960

Circle 216 on Reader Response Card

the heat sinking benefits are reduced. To counteract this effect, a new "direct coil venting" technique was developed which uses three vent holes directly behind the voice coil.

At the AES Convention last October, a paper was presented by Velodyne on servo-controlled woofers using accelerometers. Velodyne subwoofers are successful and highly regarded in the consumer market and perhaps they will be entering the pro market in the future.

COMPRESSION DRIVERS

Compression drivers are truly the weak link in the audio chain, and a good deal of activity is going on recently.

Electro-Voice introduced a variation of the DH1A compression driver using neodymium very high energy material about a year ago. Weight of the driver dropped about two-thirds to about seven pounds without any loss of performance, and actually with a 1 dB gain in high end response.

E-V, like JBL, continues to feature titanium diaphragms for their improved strength and reliability over aluminum. At the AES Convention, E-V introduced scaled down manifold technology using two drivers in addition to the four driver manifolds.

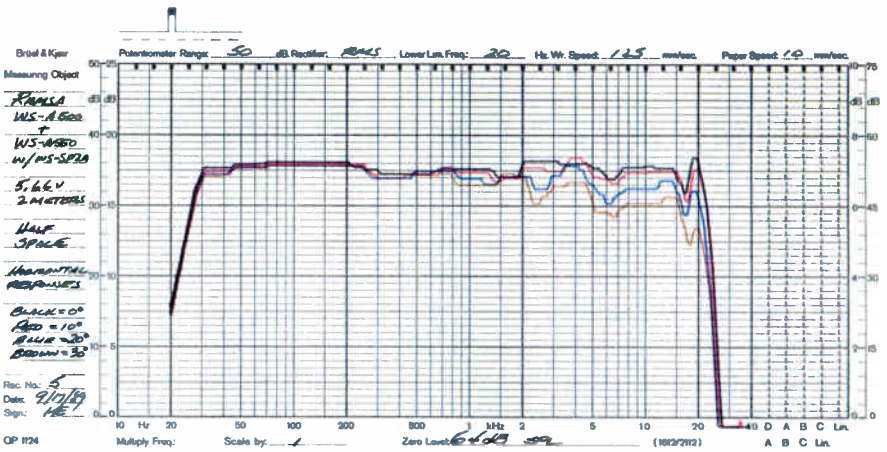
JBL has introduced the 2450 neodymium compression driver, which features an advanced phase plug and an embossed titanium diaphragm which minimizes diaphragm break up. Another neodymium driver has also been introduced in the 1-inch exit format.

McCauley, a small Washington based speaker manufacturer, has also introduced a large format 4-inch coil/diaphragm, 2-inch exit compression driver with a titanium diaphragm.

Radian, a compression driver manufacturer which only started about a year ago, has introduced a 3-inch coil/dome, 2-inch exit driver.

WHAT'S NEXT?

Enclosures will continue to get smaller, which will require increased signal processing to maintain flat response. Enclosures will also get lighter thanks to honeycomb materials for wall construction and new high energy magnetic materials. Coax horn designs will have reduced interference effects from the concentric horn due to smaller magnetic systems made of neodymium. Compression drivers will sound cleaner, as new refinements in materials, treatments and fabrication and analysis techniques reduce diaphragm resonances and break-up modes. Horns will also "clean up their act," as designers learn how to achieve constant directivity without messing up smooth frequency response, driver loading and transient response. Speakers will play louder yet sound cleaner and burn out less as signal processors get smarter and are able to offer more fail safe system protection. Hanging hardware will be designed to locate speakers to minimize lobbing and interference and cavity effects between elements. Overall, the trend will be for greater operational convenience, increased reliability, and closer to "hi-fi" studio monitor quality at louder levels in lighter and smaller sized systems. ■



If you think this looks good, wait until you hear it.

We could go the traditional way and tell you a load of "spec". But, to really appreciate the new Ramsa 500 Series Speaker System you have to *hear* it. To find out where you can hear it, call 714/373-7278, or write to Ramsa, 6550 Katella Avenue, Cypress, CA 90630.

Circle 15 on Reader Response Card

One-Box Design

With numerous manufacturers offering top quality one-box speaker systems, you might wonder why so many sound contractors still "roll their own" designs. The reasons include a combination of economic, marketing and technical factors.

Shipping big heavy speaker boxes from the factory to the dealer can cost almost as much as the box itself, especially if you are in a rush or are located at the other end of the country. Using name brand speaker components in your own enclosure provides price protection against musical instrument retail shops selling pro-sound gear. Yet products by JBL, E-V, Altec Lansing, and others give the contractor's product credibility. Another factor is that many sound contractors have their own wood shop, or a strong relationship with one.

Legitimate technical reasons exist for using raw components instead of ready built one-box systems. A well engineered cluster will use the optimum coverage pattern horn, precisely aimed and time aligned, with the lips of the horn mouths (and center-to-center spacing of the direct radiating speakers) more closely located than might be possible with ready made one-box designs.

Interestingly, some fine commercially marketed speaker system products have evolved from affiliations with sound rental shops. McCune Audio-Visual was the incubator for both John Meyer (Meyer Laboratories) and Ken DeLoria (Apogee). EAW, one of the originators of the one-box product category, developed their product in association with a touring sound company. Altec's old Stanley Screamers and JBL's new concert series came about from a working relationship with Stanal Sound. E-V has used DB Sound to help evolve and refine their Manifold concert sound products.

For whatever reasons, many sound contractors/pro audio people wear speaker designer hats from time to time and for these occasions computer-aided speaker design programs will come in handy. There are a wide variety of programs for vented (and sealed) bass enclosure design, matching the internal volume, vent tuning and woofer Theil-Small parameters to the target frequency response and cone excursion requirements.

If speaker system design is an important part of your work, or if it is your hobby, you will enjoy reading Speaker Builder magazine and the Voice Coil newsletter. Speaker Builder is primarily for hi-fi hobbyists, while Voice Coil is targeted for speaker designers in the trade. Both are published by Dell. The editor of Voice Coil is Vance Dickason. Vance also wrote the Speaker Cookbook, a popular and practical speaker system design text. He also has been reviewing speaker design software in Voice Coil. Bob White does speaker software reviews for Speaker Builder. Both are experienced speaker engineers. Ed Dell, the publisher, has been kind enough to let us reprint some of the reviews here: (A subscription to Speaker Builder is $15 and Voice Coil is $50. You can reach them at (603) 924-9464)

Computer-Aided Speaker Design, V1.3.2 by Scientific Design Software, P.O. Box 3890, Northridge, CA 91323. Includes two 5-inch disks and 80-page manual (3-ring binder). Suggested list price $200. Reviewed by Bob White.

New loudspeaker design software always interests me. In the old days all I had was my HP calculator and plenty of leisure time to experiment. The days of the calculator and spare time have fallen by the wayside in favor of computers and children. Over the last 19 years of speaker building, I have collected nearly all the equations I can use. I now have trouble finding the equations when I need them.

The software package presented by Scientific Design Software's Ted Telesky is the best collection of loudspeaker design technique I have seen. It seems to be based on work by Dr. Richard Small, Dr. Neville Thiele and the interpretive works of Don Keele. Design solutions that took a calculator and many hours now can be done in no time. You get a display of all the parameters and a full graphics representation. The package comes with two diskettes and a manual, to explain the various parts of the program.

REVIEW

The software is entirely menu-driven and comes with a program to configure itself in your hard drive. The main menu consists of six sections:

1. Sealed/Vented system design
2. Crossover design
3. Utilities
4. Driver file maintenance
5. Graph file maintenance
6. Other activities

Section one, system design, includes the two choices which constitute the main thrust of this package. Both are excellent in their presentation and execution. I have one minor complaint though. I think the maximum sound pressure of the design should be displayed in the same manner as the small signal response and the maximum input power. I have spoken to the author of the program and he assures me it can be revised.

Section two has several features included with the calculation of cross-

over components. All of the crossover rolloff choices are Butterworth and have a handy feature of component recalculation in the event of an unobtainable component. Also, the crossover design section offers two ways to compensate for the driver inductance, depending on the data. You can either input the driver inductance directly or get the program to calculate it for you by entering some magnitude values from the impedance curve. Either way, a network is calculated to equalize the inductance of the driver.

This section has an additional surprise. It has a menu choice for designing a circuit for removing the resonance of any infinite baffle driver. This is most helpful when crossover points are too close to the fundamental resonance of the tweeters. The L-pad attenuator design, which calculates the required resistors for a user input dB loss, is also useful.

The third section presents nine design utilities. The ones I find most useful are: V from moving mass, reference efficiency from T/S parameters, and Fb from vent diameter and volume of box.

In section four, Driver File Maintenance, this software package justifies its high price. It has an entire, built-in data base. You can enter specifics for any speaker manufacturer, as well as any model from a manufacturer. The version I reviewed includes data from 41 manufacturers with 722 models and all the parameters the sealed/vented design section needs to design a system. The program can search by parameter and by enclosure/F3. It also has complete house-keeping capabilities for making a new driver data disk, reading free disk space, and so on.

Section five contains a group of file utilities for displaying, listing, and deleting graphs saved under section one. There are also provisions for creating a new graph data disk and displaying the amount of free disk space.

The final section contains updated information and two helpful utilities for making extra data disks, and configuring screen colors.

CONCLUSION

Scientific Design Software is commended for producing such an attractive package. Although it is really aimed at the commercial designer who can't waste time searching for that right combination, the home hobbyist should find it very useful.

Although higher priced, this is a beautiful piece of programming expertise with many useful, time-saving features. It is presently menu driven with a window driven version in the works. I look for more software from SDS in the future.

SIGNAL PROCESSED LOUDSPEAKERS: A SYMPOSIUM

Testa Communications, publisher of Sound & Communications *Magazine, also produces Crosstalk at the AES, televised symposia on subjects of interest to AES attendees.*

The discussions held at the 87th AES in October were, we feel, of special interest to Sound & Communications *readers. The following is an edited transcript of a discussion on Signal Processed Loudspeakers. The moderator was Vincent P. Testa, president of Testa Communications. The participants included: Ken DeLoria, founder and director of Engineering at Apogee Sound; Cliff Henricksen who is director of engineering for US Sound in Philadelphia; Ken Forsythe, cofounder and director of engineering for Eastern Acoustic Works; and Mark Engebretson who's the principal consultant for Electroacoustic Technology.*

TESTA: I guess the buzz word, for the lack of a better way of saying it, in speaker design, currently, is signal processed loudspeakers. Would somebody please field the definition of a processed loudspeaker.

DeLORIA: I think the definition of a processor loudspeaker is specific to the different manufacturers who are creating them. The term has come to be recognized as a box or enclosure, if you will, that has an electronic device associated with it. Unfortunately, the definition sounds an awful lot like a Cuisinart. It sounds like you're doing something horrible to the signal. In fact what we're doing at Apogee is trying to improve the overall performance of the system; not trying to compensate for inferior drivers or trying to pull any tricks — black magic — or any of the things that have been said at one time or another. We're legitimately trying to make the best possible product that we can. And, traditionally, loudspeakers have all had — multi way-off speakers I should say — some form of processor or signal conditioner, whether it's a crossover, passive in the box or active and user adjustable, or active and fixed. In addition, equalizers are a tool of the trade that we've all come to respect and have found to be quite valuable. Combining these into a single package is what my definition of a processor is. It's associated with the processor-based loudspeaker.

TESTA: Ken, another company of course who's doing that is yours. Can you add anything to that?

FORSYTHE: I'd have to fundamentally agree. Our standpoint is that the processor gives control to the designer on certain parameters of the system that the end user might not be able to set precisely as can be done in a laboratory and under careful evaluation conditions. It also gives some tools that might not be readily available to the end user. Again, it is set under controlled conditions to optimize the performance of the loudspeaker.

TESTA: Does it really in fact improve the sound of the system, the performance of the system? Cliff?

HENRICKSEN: Well, are you looking for a company philosophy sir, or an opinion? I agree with Ken and Ken that these loudspeakers are dynamic — the current vogue. What processing means is the dynamic changing of the signal, with the goal being to make the speaker sound better. My personal opinion and the position we've been working with on our systems is that processing should just be sort of a safety valve. Basically, we don't believe in processing within the normal range.

TESTA: So you're saying it's a safety valve in order to protect the speaker against any misuse.

HENRICKSEN: Misuse, mistakes.

TESTA: Ken just said that's a misconception.

DeLORIA: Yes, I'm saying that not all processors are created equal. Obviously, there are different philosophies from one company to the other. Some of the processors out there in the marketplace do seem to intentionally change response with power levels and not just at the upper stage where you're about to reach thermal breakdown or excursion limitation. The processors that my company builds do not do that. We specifically stay away from that. We do very much what Cliff just outlined in putting the final safety valve just before thermal runaway or thermal breakdown of a driver, or excursion limitation of the driver. So, it isn't a dynamic change — as you increase the program level you get some change in response. But, at that last point, where if you were to continue increasing it, you'd probably experience driver failure anyway. At that point, we feel the tradeoff is one that's benefit is to protect the drivers.

FORSYTHE: I'd like to stress the point in basic agreement with Ken that it's a tool available to the designer that requires the rest of the system to be as good

Music made Beautiful

Sonance makes music more beautiful with "Architectural Audio." Custom in-wall stereo speakers and controls that blend unobtrusively into your home's most discriminating decor.

All Sonance speakers and controls can be painted or cloth covered to aesthetically match any room's delicate design. Precision flush mounting insures excellent high fidelity response and consistent decorative perfection.

To experience "Architectural Audio" we invite you to call your local Custom Audio/Video Specialist.

SONANCE

A DIVISION OF DANA INNOVATIONS

[redacted] CALLE PERFECTO, SAN JUAN CAPISTRANO
CALIFORNIA 92675 (714) 661-7558
Outside CA (800) 582-7777 FAX (714) 240-4995

[redacted]

Sonance Products include Five variations of Speakers, One Passive & One Active Subwoofer, a Speaker Distribution System and Five different Volume Controls & A/B Selectors. (All Built-in Products fit in "2×4" wall)

Circle 209 on Reader Response Card

as possible. It's not a means of taking inadequate components and getting good/great results from them. And the less you have to do to perform the job you're after the better off you'll be. The less dynamic change the better the end result is going to be.

ENGEBRETSON: I want to explore, a little bit, what the fundamental purpose is of signal processing. We've talked about protecting the loudspeaker by using some form of limiting, and to me that's a little confusing because, generally speaking, when you apply a limiter to a device you do in fact limit the dynamic range rather than expand it. As such, you bring it closer to thermal limits rather than further away.

"Unfortunately, the definition sounds like a Cuisinart."

HENRICKSEN: And that's a distortion too.

ENGEBRETSON: And, of course it's a distortion. You're getting into a nonlinear system at that point and the question is where does the protection cutoff and the actual changing of the sound begin. I mean, where are these fine points defined?

TESTA: And, is the adjustment to compensate for the inadequacy of the speaker itself, anyway? Isn't that also another agenda added to the agenda? Well, I think not just thermal overload but also to disguise the inadequacy in the speaker itself.

ENGEBRETSON: I wouldn't say it was to disguise inadequacy, necessarily, but there is the factor certainly in the compact systems — the very small systems. In order to make these things play loudly, it's a given that you have to use high efficiency transducers. You can't get by with low efficiency devices because there isn't enough power available to throw at them. So you wind up using equalization to compensate for the roll off you're going to experience with the high efficiency woofer in a small box. You can't do it any other way. And then you have to remove the equalization at high levels in order for that system to survive. And to a certain extent the smaller systems in particular are really chasing their own tails, so to speak, because in order to operate at high levels they need the limiting to get rid of the equalization that makes it sound good.

TESTA: Ken, you've said that the ears are part of the process and suggested that crossovers should be set by them.

FORSYTHE: I think the ear can be an excellent test instrument on its own. It has to be part of the process. After all we listen to these loudspeakers, and the instrumentation we use to measure them are somewhat limited. Perhaps, we are not even always sure what we're measuring with them. The end result is what we hear. A form of distortion may be introduced; there are a number of considerations that may go into setting an optimum crossover point. I think once that's been arrived at, often times the setting is so precise that it needs to be controlled in the final environment, to an extent, more precisely than a knob in the front of a conventional crossover would allow.

"The processor gives control to the designer."

HENRICKSEN: My opinion is that anyone who designs a system creates a statement about music. And, if you listen to the speakers that all of us design, all next to each other, they all sound radically different, really different from one another. What we present really is an opinion of how music sounds, and it's our vision of music. Ultimately, my feeling is that we're all artists and that my executive brain is artistic because I'll end up making the thing sound the way I think music should sound.

TESTA: The question always comes up with processed speakers: are you taking away the creativity? Is it fighting the purpose of the engineer, of the mixer? You feel fairly strongly that it doesn't limit his creativity.

"Equalizers are tools of the trade that we've all come to respect."

DeLORIA: Yes, I do feel strongly about that. Again getting back to the philosophy of a specific processor: The processor's intent is to divide the frequencies. I think we pretty much all agree on that. In large speaker systems, none that I know of reproduce the full audible range out of a single driver. If you're dividing frequencies and you're adding equalization that task's specifically meant to flatten out the response or to produce a usable response that you feel works. That integrates the speaker properly into the typical environments that it's used in, which may deviate slightly from flat. You're not taking anything away, because you still can use equalization. You still will use equalization under almost all normal conditions these days. There'll be a mixing console, a single source that has some kind of control over it, usually pretty elaborate the way things are shaping up. Somebody will have the ability to change the EQ just as he does with, let's say, a conventional crossover that doesn't include any fixed EQ or limiters. The typical conventional electronic crossover usually is user adjustable and often times operators will use the drive levels or the crossover point as a form of equalization. I don't believe that that's the most appropriate place to equalize. Those are settings that are very precise, as Ken mentioned, and should be done in a laboratory environment or at least a controlled environment where one can see what the impact of those changes are. Not only on-axis, as you would experience in setting up a speaker and listening to it, but all the way around it: polar response, phase response. You can't always do that, to my way of thinking, just by listening to where your program source may be suspect. You don't know exactly

Apogee Sound is proud to have been the speaker system of choice for
The 1989 Academy Awards, The 1989 Grammy Awards,
The 1989 American Music Awards, The 1989 People's Choice Awards,
The 1989 Country Music Awards, The 1989 Golden Globe Awards,
1989 Awards for Cable Excellence and The 1989 Soul Train Awards.

APOGEE
SOUND INC.

1150 Industrial Avenue Suite C, Petaluma, CA 94952 (707) 778-8887

Circle 219 on Reader Response Card

what it does. All you know is what it did on another speaker that you like. The combination of instrumentation, which is a powerful tool and getting better as years go by, and listening — you cannot have one without the other, because the end product is a device that we listen to — are required to create the best possible response out of multi-way systems.

TESTA: If this is such a cure-all, why isn't everybody using it? Exactly what are some of the obstacles involved in these processed speakers, and why is there resistance in the marketplace?

FORSYTHE: I'd just want to make the point that I think a controlled speaker, a speaker where there's a processor associated, where a lot of the parameters that go into setting the final sound of the speaker have been set by the designer, can actually enhance the artistic ability of the sound engineer, the artist, whoever's using it, by eliminating a lot of the variables in order to create the sound the artist is after. The speaker then becomes more of a transducer that reflects changes and equalization at the specific input or microphone.

"Processing should be a safety valve."

ENGEBRETSON: That's providing it doesn't introduce variables of its own.

FORSYTHE: I'll agree with that. And I think that's an important consideration, and these "processed speakers" that are covering a fairly wide gamut in the marketplace. And that's why I think that the amount of "processing" involved should be as little as required to do the job the engineer's after.

HENRICKSEN: I don't think there's ever been a speaker in the history of mankind that hasn't introduced its own signature. I think they all speak with different voices and those are the voices of their creators.

ENGEBRETSON: From a philosophical point of view, I understand where you're coming from. However, I believe that the loudspeaker also has a role in reproducing a relatively faithful acoustic signature of the electrical signal that constitutes it's input. And to that end, I can't completely accept the *let's do it all by ear* philosophy.

HENRICKSEN: I'm saying all these speakers sound different.

ENGEBRETSON: Well, they do, but yet, you're also going to find that there are remarkable similarities when speakers start getting very accurate.

HENRICKSEN: Oh, I agree with that.

"Not all processors are created equal."

ENGEBRETSON: And this includes many, many products of different manufacturers. When they get close to being right they all sound very similar.

HENRICKSEN: Do you think there are a lot of speakers like that?

ENGEBRETSON: Yes.

FORSYTHE: I would say that the speakers available in the marketplace today are a significant improvement over what was in the marketplace 10 years ago. And they probably all sound much more similar to each other than they did 10 years ago.

DeLORIA: I agree with you, Mark. We're often engaged in doing comparisons with other products that potential customers want, and they are getting much more similar. The differences are not as great.

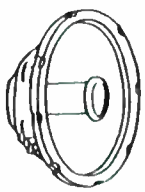
sound power

AP 15 (T)
AP 30 (T)

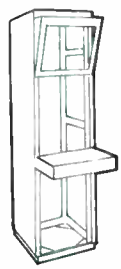
Commercial Sound Loudspeakers

Loudspeaker Baffles and Enclosures

Voice/Tone Loudspeakers



Professional Sound Loudspeakers



Cabinets, Racks and Consoles

Mic·ophone and Equipment Stands

FOR PAGING, INTERCOM, PROTECTIVE COMMUNICATIONS OR ELECTRONIC SIGNALLING

. . . is the maximum audio efficiency and high intelligibility attained by task-oriented loudspeakers with compression drivers.

. . . is the U.S. trademark design of the AP-Series, universally recognized as the symbol of Atlas / Soundolier craftsmanship.

. . . is the ability of buying cost effective products from a "Quick Shipper" inventory that assures order processing in less than forty-eight hours A.R.O.

. . . is the practical experience and sales-service support dedicated to provide customer satisfaction whenever you contact . . .

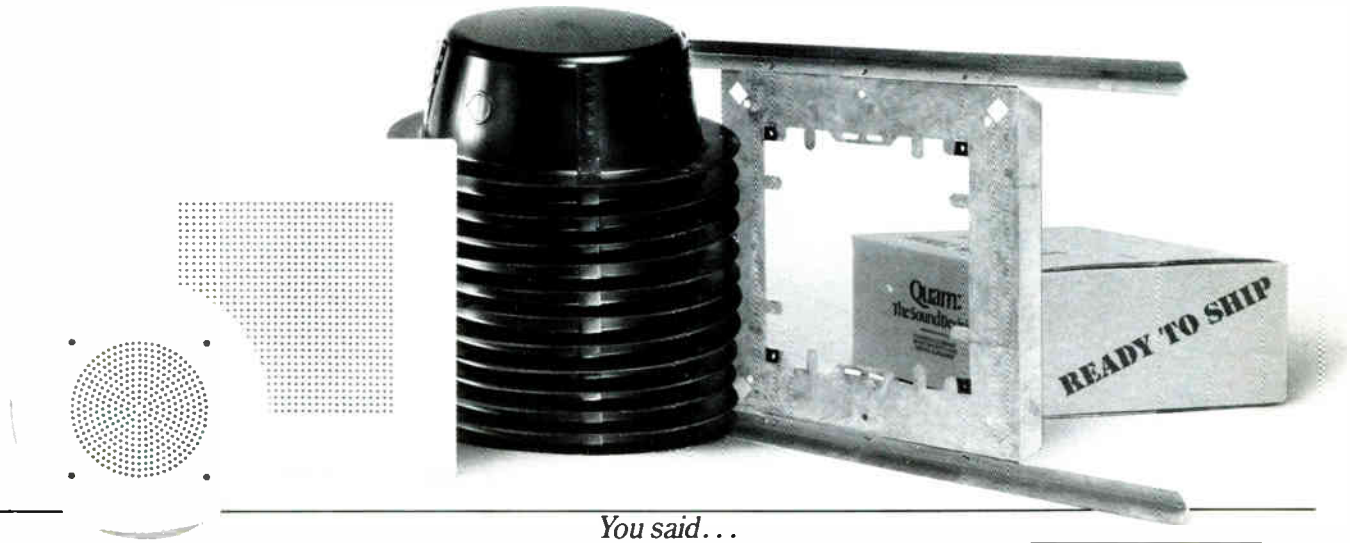
ATLAS / SOUNDOLIER

DIVISION OF AMERICAN TRADING AND PRODUCTION CORPORATION
1859 INTERTECH DRIVE / FENTON, MISSOURI 63026 U.S.A.
TEL: (314) 349-3110 / TELEX: 910-760-1650 / FAX: (314) 349-1251

Circle 212 on Reader Response Card

THE FACT IS, WE'RE LISTENERS.

Speakers started our business more than 50 years ago. Listening keeps us prospering today. Developing products and services you need. Continually introducing improved techniques. Providing you with the tools to be a leader in your market.



You said...

"GIVE ME BAFFLES THAT REALLY LAST."

Quam's do. The tile-matching, white powdered-epoxy finish of our full-range series of 8" and 4" baffles provides durability far superior to enamel or lacquer. They stand up to handling during shipping and installation, and maintain their fresh look.

"BACKBOXES TAKE UP TOO MUCH SPACE."

Not Quam ERD-8 backboxes. The unique, drawn design of these lightweight backbox enclosures means they nest for storage and transit – taking up one-fifth the space of traditional high-hats. More important to your customer, the one-piece, leak-proof construction of the ERD-8 backboxes results in problem-free air pletum installations with better audio response.

"MOUNTING ASSEMBLIES ON CEILING TILES TAKES TOO MUCH TIME."

The design of the Quam SSB-2 Speaker Support Bridge saves you substantial time. It eliminates the need to cut a close-tolerance round hole in the ceiling tile. Locking tabs on the bridge's center plate prevent movement during installation. And the SSB-2 accepts most of the industry's popular round or square baffles, with or without backboxes.

"I NEED IT, WHEN I NEED IT."

Quam's toll-free order line and factory inventory of over 100,000 products means you get exactly the products you want – even complete sound masking assemblies – shipped within 24 hours of receipt of your order.

So while speakers started it all, listening keeps us – and you – prospering. And we'll continue to listen – and respond to what we hear – while we refine and enhance our current products and create new ones to meet your evolving needs.

Quam: The Sound Decision Since 1930

Quam-Nichols Company • 234 East Marquette Road • Chicago, Illinois 60637 • (312) 488-5800

Circle 203 on Reader Response Card

ENGEBRETSON: But I don't build any loudspeakers. I guess I've been sitting on the outside of this. You three gentlemen have been discussing signal processing from your own individual points of view and obviously none of you have any fault to find with your own points of view. I think that's just human nature. But from the standpoint of the user, there is, I think, a great deal to be said for providing as little electronic intervention as possible and being able to have a system that is linear both in terms of its frequency/amplitude characteristics and its dynamic characteristics. So, that it will give you a reasonably faithful replication of the electrical signal that is sent to it. And if you use too much dynamic manipulation — and some products do use too much dynamic manipulation (I think we all know this) — you change the sound of that loudspeaker considerably from soft levels to high levels. It changes character completely.

"Are you taking away the creativity? Are you fighting the purpose of the engineer?"

TESTA: What happens to the character? Can you describe to me exactly what happens at a maximum level? At an increased level, what would happen that wouldn't happen with a traditional speaker left alone to the mixer's own ears and eyes and fingers?

HENRICKSEN: The traditional speaker left alone is going to complain.

TESTA: And throw it back into overload problems so that we're still back to the concept that processing is included to avoid overload.

ENGEBRETSON: Well, not necessarily. There is such a thing as driving your automobile at 60 or 70 miles an hour. You don't have to have your foot to the throttle all the time. And the same thing is true with operating loudspeakers. There's no reason why they have to be operated some place into the threshold of self-destruction. They can be operated more sensibly, more reasonably without necessarily having to protect them from the caprice of the user.

TESTA: What are the negatives that creep in at maximum levels, at increased levels of processed speakers?

ENGEBRETSON: Well, certainly every loudspeaker has limitations. Obviously, as you begin to approach the thermal limits of a loudspeaker, you can encounter severe power compression, and it's much much worse than most manufacturers would have you believe. We hear about numbers of one and two dB of power compression, and in today's power ratings

it's typically closer to five. And you know this!

HENRICKSEN: But you can just get out there and listen to it too.

ENGEBRETSON: Well, yes you can get out there and listen to it, I suppose.

HENRICKSEN: You know what it sounds like.

ENGEBRETSON: Yes. Yes. You do. And you can move away from that as an operator very quickly without having to use an external signal processing device.

"The ear can be an excellent test instrument."

HENRICKSEN: And you can design your speakers with good heat transfer with a lot of horsepower behind them and with a lot of the usual engineering tools that loudspeaker designers have available.

ENGEBRETSON: I think the question you were asking though is, what do these things actually sound like? If the loudspeaker is using a great deal of power response equalization, for example, when you start getting up to very high signal levels, the effects of that power response equalization go away. Those are the first signals that cross the threshold of limiting. And it's the first thing that begins to disappear. One particular loudspeaker has a tendency to sound very, very thin and very strident when displayed at high levels, but is nice and rich and full and pleasant at moderate to low listening levels.

"There is certainly a political ramification..."

TESTA: I'd like to ask again if these processed speakers are the wave of the future? Why isn't everybody using them? And when they are being used what is the best application and what are some of their limitations?

DeLORIA: I think they are being used a lot more, certainly, than they have been in the past. They've only been on the marketplace for a limited period of time. Now that there are multiple manufacturers creating them, people who are in the market for loudspeakers have more to choose from. I think the reason they haven't penetrated some areas of the industry, particularly in large scale rock and roll, is that there is certainly exists a political ramification. The large touring companies have what they feel is a proprietary or very specialized approach. They're successful with it. Their clients keep coming back for more. The last thing in the world they need to do is to change it, particularly when they have warehouses full of these devices that they build.

FORSYTHE: That's not political, that's just marketing.

DeLORIA: Marketing and politics. Because if they buy an off-the-shelf speaker from Apogee, EAW, or whoever their competitors can go to the client and say, "I can offer you the same speaker," whereas in the case of some of the big names...

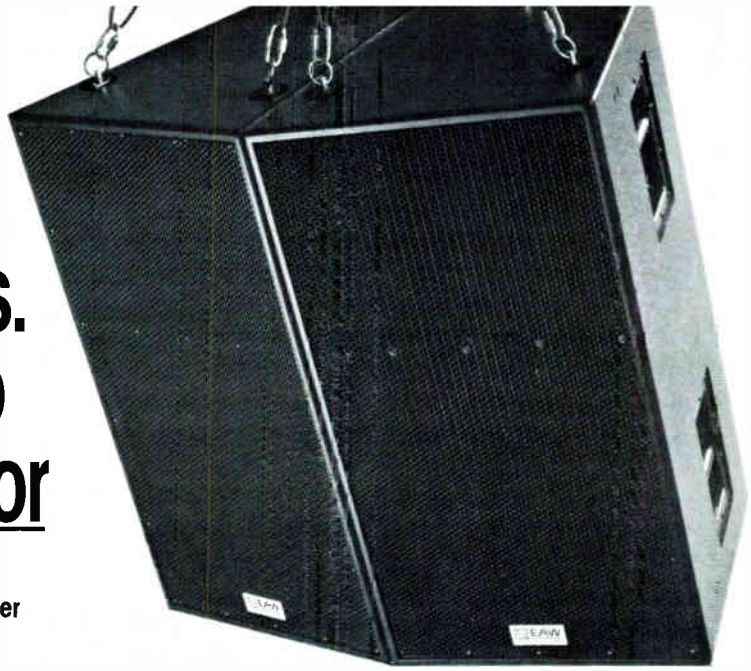
ENGEBRETSON: They'll lose the magic.

"A great deal can be said for providing as little electronic intervention as possible."

HENRICKSEN: I think as the industry gets better, as mixers get better, as we educate and train the people who operate this stuff better, and as we design better speakers, processing will be used strictly as a safety valve, as one would put a safety valve on a large powerful machine; and the future of good sound is both operator training and better loudspeaker design.

"No one can repeal the laws of physics. The challenge is to make them work for you."

KENTON FORSYTHE
Director of Engineering; Co-Founder



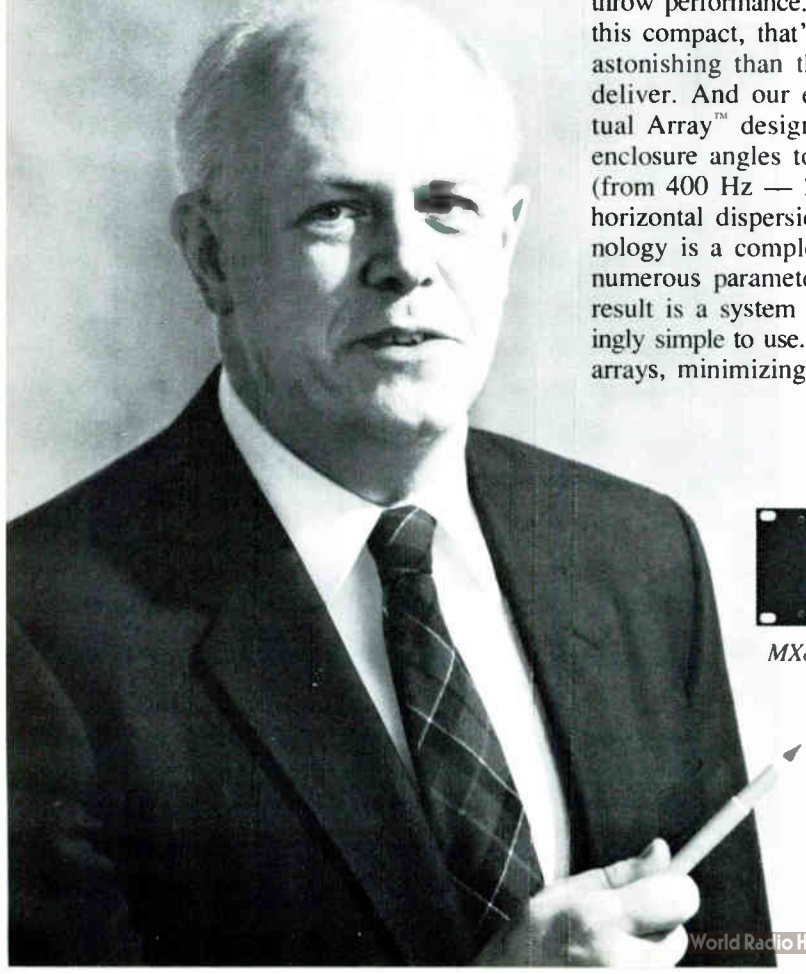
Case in point: The KF600, EAW's newest system for performance applications. It measures just 33" high and 19 3/4" on a side. Yet KF600s produce 130 dB, averaged from 65 Hz — 20 kHz.

A principal factor behind that small miracle is our unique Transverse Geometry™ low frequency subsection. In this ingenious example of physics at work, the woofer faces *sideways*. Yet its entire output is frontally focused. The design uses dual chambers (one tuned, the other acoustically open) to accomplish this acoustic rotation while maintaining high woofer efficiency.

At 15 feet, KF600s sound impressive. At 150 feet, they're simply amazing. A 60° horizontal coverage pattern delivers true long throw performance. From speakers this compact, that's even more astonishing than the SPLs they deliver. And our exclusive Virtual Array™ design matches the enclosure angles to that constant (from 400 Hz — 20 kHz) 60° horizontal dispersion. VA™ technology is a complex balance of numerous parameters. But the result is a system that's amazingly simple to use. With KF600 arrays, minimizing interference and eliminating lobing or hot spots is virtually automatic.

We're known for innovative enclosures, but we also know the value of electronics. So we've developed KF600 modules for our MX800 Closely Coupled Electronic Processor™. The MX800 provides four-way asymmetrical crossovers, time/phase compensation, individual driver protection and high frequency power response equalization, along with LF excursion control and equalization. All functions are precisely adjusted — through TEF™ analysis and real world testing — for optimum effectiveness.

If you have an application that demands unlimited sonic performance while providing limited space and setup time, audition KF600s. You may have a little trouble believing your own ears — most people do. But what you'll hear is real: No magic, just the laws of physics, artfully applied.



MX800 CCEProcessor — an integral part of the KF600 system.

EAW
EASTERN ACOUSTIC WORKS

One Main Street, Whitinsville, MA 01588
(508) 234-6158 • (800) 992-5013 • Fax (508) 234-8251

Circle 217 on Reader Response Card

FORSYTHE: I think that the direction of these controlled processor systems is certainly one that is going to continue in the industry. They offer a lot of advantages to the user, and there are going to be more systems using that. I think we need to remember that it's only addressing one aspect of loudspeaker performance. You might consider how the speaker is working by itself. I think it's just as important to determine how they work in multiples when you're trying to create an array of coverage in a large area, and to have the most effective point source of sound and the least phase interference among the different components of the array. It's difficult to address that with the electronics now and it really needs to be addressed in the fundamental design of the speaker system.

"There's never been a speaker in the history of mankind that hasn't introduced its own signature."

ENGEBRETSON: Obviously, signal processing is going to be with us in one form or another for loudspeaker control. It's necessary. I think that as more and more people get involved in designing electronically controlled systems, there will be some new and additional thoughts on the subject. And I think that as with any other signal processing, that which process least usually processes best. Maybe I would prefer to see things available to the operator rather than having control removed from the operator, but frequency dividing systems, of course, always have to be loudspeaker specific, and that's certainly not a variable equalizer that folks should be manipulating. I believe that signal processing should be a black box with no knobs. ■

MARK IV'S AcoustaCADD

BY MIKE KLASCO

AcoustaCADD™ has finally arrived! Altec Lansing first teased their dealers with previews of this program three years ago, but ever more ambitious aspirations for this software kept pushing back the initial product release until the tail end of 1989. The program was in beta (prototype) testing from September 1988 to September 1989, and a number of people questioned whether the project would ever come to fruition or if the program would be too little, too late. Well, as this is going to be a long review, with the conclusion at least a month away, if you can't wait (or do not care that much), the bottom line is that the project was successful and was very much worth the efforts.

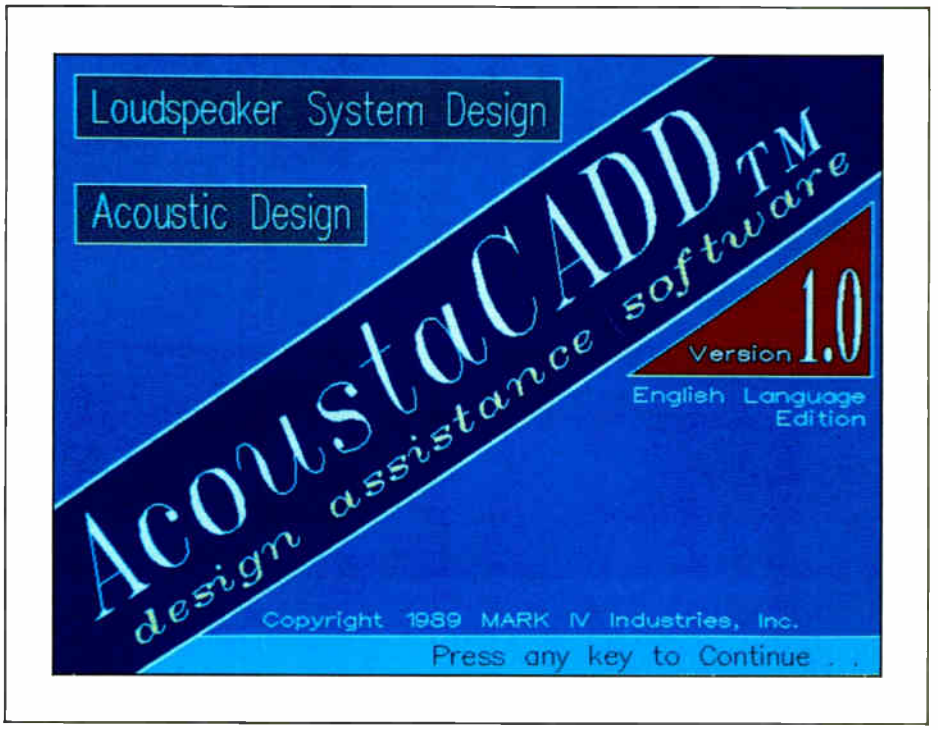
I have been reviewing sound system engineering programs for a year now and have just about exhausted all the programs that have already been commercially released. AcoustaCADD is actually the first new sound system engineering program in years, JBL's CADP, the Bose Modeler, the PHD Sphere Program, and Umbulus all having been initially released before 1986. AcoustaCADD is also the first of a new generation of sound system engineering programs that run on IBM compatible computers which boast high resolution graphics, and a mouse user interface, along with 3-D room modeling with ray tracing and other sophisticated acoustical modeling capabilities. AcoustaCADD will soon have the company of other soon-to-be-released software from NexoCAAD (from Nexo of France), JBL's CADP II, and CASE from Source Phoenix. Of course, Bose Modeler 3.0 already offers similar features on the Macintosh computer.

AcoustaCADD started life as a research project by Dr. Sho Kimura of the Acoustic Simulation Laboratory at Nihon University in Japan. Various of his protegees continued development at different organizations, and numerous papers have been given over the years, but few in English. One paper that described this work was given at the 1984 AES Convention by Matsushita engineers on the computer simulations for the Los Angeles Olympics. Matsushita's program had intriguing capabilities, including ray tracing, automated directivity measurements, and the ability to impose the predicted sound character of the room onto recordings in order to hear how the sound system would sound in the facility even before it was installed. A mainframe computer was required for these feats, and the software was not for sale.

One student, Mr. Akira Mochimaru joined Fuji Sound in Tokyo, Japan. Fuji Sound is a sound system and acoustical design contracting firm that specializes in halls and recording studios. The sound system design program developed by Mr. Mochimaru used the NEC BASIC88 programming language, which is not compatible with MS-DOS computers.

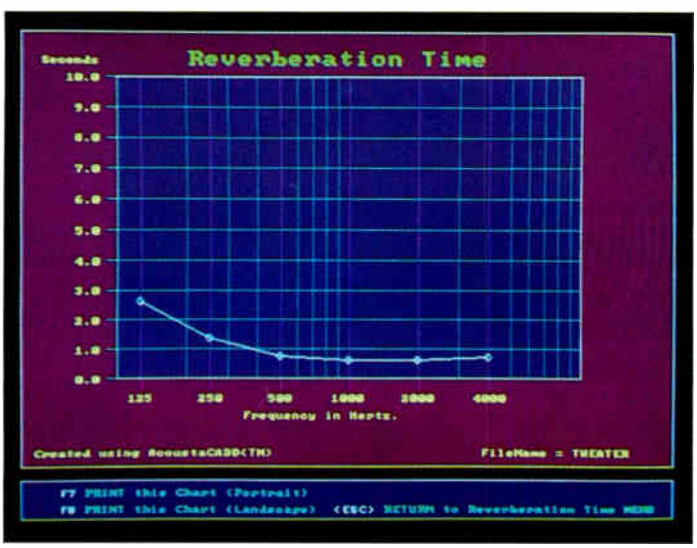
In 1986, I encountered a presentation of the program in Korea (while I was consulting on the computer simulations and design for the sound systems for the Asian Games), but the representatives for Fuji Sound made it clear that this was strictly an in-house program and not for sale.

About this time Altec Lansing was getting back on its feet (as it had been acquired by Mark IV) and the decision was made for the company to get back into sound system engineering software. Negotiations began with Fuji Sound to "port" their program over to MS-DOS IBM compatible computers. John Lanphere of Altec Lansing would coordinate the effort and define the program's overall organization. The final product would be distributed by both Altec Lansing and Electro-Voice. What started out as a translation of the original mainframe program into a personal computer program evolved into a much

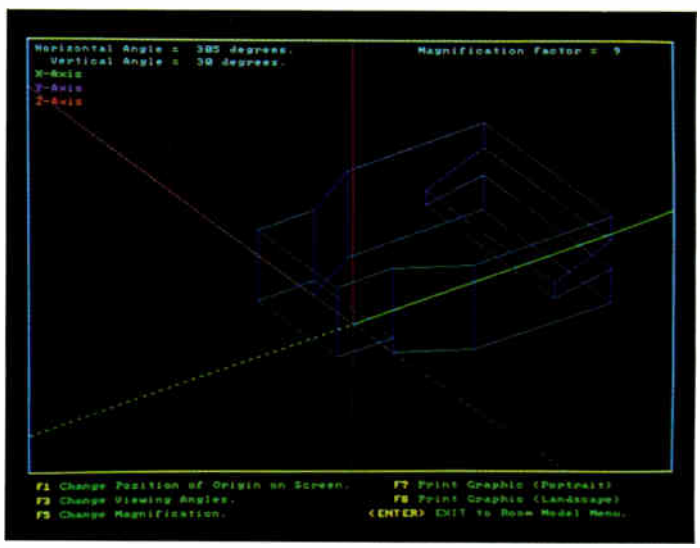


AcoustaCADD sign-on logo

more comprehensive development, and projected release dates slipped from the summer of 1987 to the actual release of version 1.0 in November of 1989! Even now, AcoustaCADD Release 1.0 represents the "launch" product, not the full featured embodiment that will unfold as the program continues to mature. Various features and capabilities under consideration for development, but not included in AcoustaCADD Release 1.0 are STI and RASTI intelligibility predictions, a predrawn speaker library to aid cluster drawing with computer-aided-drafting programs, and directivity balloons with phase information. Aside from allowing accurate prediction of cluster interference effects, phase/directivity balloons can provide an insight into a horn's standing wave problems which show up as phase perturbations (and impedance irregularities). Another feature, ray tracing, has been included in the first release without, however, the capability of shadowing obstructions such as pillars or balconies.



Reverberation Times Graph



Auditorium Model

HARDWARE REQUIREMENTS

We have printed, in this magazine, a general examination of high performance IBM compatible hardware needed for programs like AcoustaCADD. Advanced microprocessor computers, high resolution color graphics, and fast hard disks and optical drives are some of that hardware. More specific equipment recommendations can be made.

AcoustaCADD will run on any IBM (MS-DOS compatible) having 640 K of memory, using a hard disk and a single 360 K floppy drive. For purposes of attaining good program speed, you will want an AT class ('286 or '386 cpu) machine. As the software often must load different modules from the hard disk, a fast 20 megabyte hard disk drive is recommended, of which the program and related data files will need 5 meg. Either an EGA 640 horizontal x 350 vertical or a VGA 640 horizontal x 480 vertical high resolution color graphics board and monitor are required, and resolution can be easily configured from within the program. Support for 25 different brands of EGA and VGA graphics boards are supplied, including "generic" EGA and VGA types. CGA and Hercules graphics boards systems are not supported, as high resolution color graphics were considered necessary for the operation of the program. Printer support is also unusually comprehensive and includes the typical Epson compatible standards, laser printers, narrow and wide carriage 9 and 24 pin printers, and even color thermal and ink jet printers. You can even select whether the graphics are printed out *landscape* or *portrait* (long axis horizontal or vertical). An idiosyncrasy of the program insists that you must select a printer when you configure the program, even if you do not have a printer connected (for instance, if you are traveling and using a laptop computer). A number of mice pointing devices are supported, or you may use the cursors instead. The wide device capability comes from using the Halo graphics development system licensed from Media Cybernetics and allows the program to continue to take advantage of new peripherals soon after they are introduced. The program requires use of a math coprocessor chip and this component is especially important as it speeds up computationally intensive functions such as ray tracing as much as ten times. The coprocessor plugs into a socket on the computer's motherboard.

The minimum configuration, for the user with time but little money, would be an IBM XT class system with 20 meg hard disk, 640 K memory, 8087 coprocessor, a single 360 K floppy drive, color EGA monitor and graphics card, mouse and Epson compatible printer. Careful shopping should bring this system in for about $1,500, or about $1,300 with VGA card and gray scale monitor. While it is possible to use a VGA compatible gray scale monitor, the color highlighting technique used in the menuing system causes the selection function to disappear! Some laptop or portable computers with monochrome screens provide shading adjustment utility software that gives acceptable rendering of VGA or EGA color images.

A no frills IBM AT class configuration with 20 meg hard disk, 640 K memory, 80287 coprocessor, single 360 K floppy, color EGA monitor and graphics card, mouse, and Epson compatible printer can

be bought for about $2,000—$3,500.

A high-speed AT class configuration with a 65 meg high speed drive, 640 K memory, fast 80287 coprocessor, high density floppy drive and 360 K floppy drive, color VGA high resolution graphics, mouse, 24 pin near letter quality printer and HP Paintjet color printer package will be about $5,000—$8,000.

An "engineering workstation" with the more powerful '386 CPU, 65 meg high speed drive with high performance hard disk controller card, mouse, 80387 coprocessor, super VGA 800 x 600 resolution color graphics and matching multisync monitor, laser printer and HP Paintjet color printer package will cost about $10,000—$14,000.

Factors such as service, installation, dealer markup, clock speed, quality of construction, and endless other factors make these prices only "guessimates."

It is easy to spend another $2,000—$10,000 on a large format color, plotter extra memory, a trackball instead of a mouse, large size 19-inch + high resolution color monitors, and so on.

SOFTWARE LICENSING FEES AND REQUIREMENTS

AcoustaCADD is not copy protected. Unlike the software developed by some of the other speaker manufacturers, AcoustaCADD is not restricted to authorized dealers, but is available to everyone who has the purchase price! The initial licensing fee is $925, and the yearly update and support fee is $100. The user is allowed to make copies only for one site location, and license additional copies for other sites at $100 each. Major expansions of the program in the future may require additional licensing fees, but these will be optional. This seems to me a very reasonable approach to distributing the program.

USER INTERFACE

AcoustaCADD is menu driven, with a main menu and submenus. To select the function desired on the menu, you may point and click with the mouse, use the cursor, or use the item letter or number from the keyboard. Data entry is by keyboard or by mouse. Operation of the program is fairly intuitive, although no "help" key is available. Options of what you should do next, with generally clear instructions, are on the screen most of the time. Use of the special function keys has been taken advantage of. While this is common in most MS-DOS software, it has not been used in sound system engineering software previously. Error trapping would be considered very good even if this were a mature program. Considering this is the "launch" version, the program's ability to keep the user out of trouble is excellent. Whenever you screw up, you usually can get out of trouble without messing up your work by hitting ESC key and ending up at the previous menu, work intact. Some mistakes result in the program making rude noises at you (intentional on the part of the program developer) followed by a screen prompt on how to get out of the mess you made for yourself.

The AcoustaCADD program developers have opted for hierarchical menus (main and submenu) using several BASIC Toolkits including Quick Pak Pro and Quick Windows Advanced. The device-independent graphics have been implemented using the Halo Graphics Development System. An alternative approach is to use Windows, a semi-standard user interface which is being heavily promoted by Microsoft, developers of the MS-DOS operating system the IBM compatible uses. Both JBL and Nexo (NexoCAAD will be reviewed in the very near future) have adopted Microsoft Windows, along with a number of spreadsheets, word processing, and desktop publishing programs. Windows provides a standard interface, pull down menus, and export of data into other Windows programs. It also is infamous for requiring an extremely powerful computer to achieve acceptable speed, as well as being memory hungry (programs require extra memory when they are adapted to Windows). Window application developers counter that Halo and other non-windows program's "shells" and graphics development tools are obsolete and do not offer the advantages of Macintosh style operation on MS-DOS computers. This controversy is raging throughout the software industry and looks to continue for some time.

DOCUMENTATION AND SUPPORT

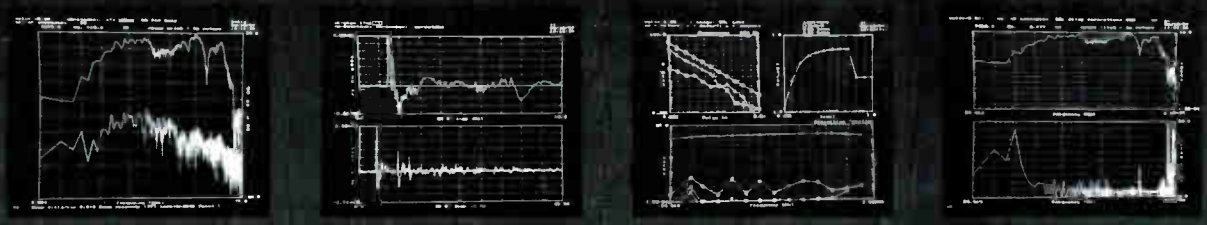
The program size is larger than any of the previously released sound system engineering packages, and consists of 12 (!) floppy 5¼-inch 360 K disks. The installation and arrangement of the software is on the order of other high power software programs such as Ventura, a desktop publishing program and AutoCAD a mechanical drafting program. There is an installation disk along with, five program disks, a sample projects disk (great!), drivers disk (not speakers, but devices such as printers, graphics cards, etc.) and a utilities disk. The sample projects disk contains a stadium, an arena, a church and some other jobs. Five additional disks are the direction data file libraries for E-V, Altec Lansing, and University components (at the time of this writing, the data for the University products were not yet released).

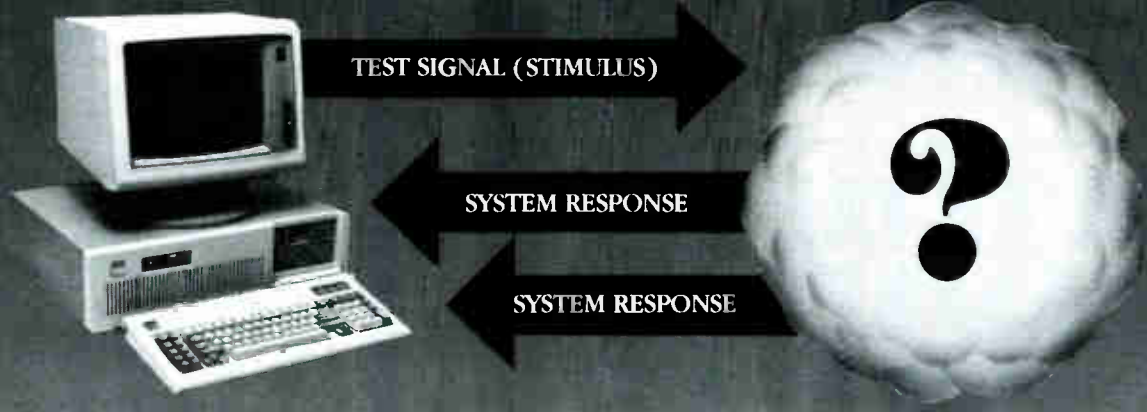
Creating new directional data files by the user or by other manufacturers is not directly supported by the program which is also the position adopted by Bose in Modeler 3.0. I have mixed feelings about this (and will discuss this issue next month).

Two manuals are provided, one for acoustic design, and the other for loudspeaker (sound system) design. Two pads of data entry worksheets are also included. Even though many sections of the manuals have not been finished, the present documentation is still comprehensive and includes detailed instructions on getting started, planning your work sessions, aiming the speakers, and running the performance simulations.

One area that could be expanded and clarified is in installation procedures. Installation of AcoustaCADD onto your hard

Turn Your PC Into A Complete Acoustics Lab





Ariel's new SYSid™ hardware/software, developed in conjunction with AT&T Bell Labs and proven over years of their use, turns any MS-DOS PC into a powerful acoustics test instrument.

With unprecedented accuracy and speed it characterizes response to 25 kHz for transducers, filters, ADCs, servos, structures or even concert halls.

SYSid is economical because it replaces several costly instruments, yet computes and displays any function in seconds.

- *Impulse and time domain response*
- *Complex transfer function and impedance*
- *Narrowband or 1/3-octave spectra*
- *Harmonic and intermodulation distortion*
- *Noise floor measurements*
- *Time history waterfall displays*

The SYSid system insures consistently precise measurements by using dual 16-bit converters, double precision averaging and floating point signal analysis, all matched to its digitally generated chirp or CW stimulus.

Ariel_

Call To Receive A Free Demo Disk:

1-201-249-2900

Ariel Corporation, 433 River Road, Highland Park, NJ 08904
FAX: 201-249-2123 / DSP BBS: 201-249-2124 / Telex: 4997279 ARIEL

SYSid requires an IBM compatible PC with floating point coprocessor and graphics capability.
IBM is a registered trademark of International Business Machines Inc.

Circle 213 on Reader Response Card

disk requires a good working knowledge of MS-DOS, the disk operating system. To prepare your computer to accept the program, you must check and possibly modify your boot configuration files. Most casual users of IBM compatibles are not familiar with file editing procedures. The installation procedures were already revised from the manual in my early release copy, but a little more work on this is in order and would smooth the user's first impressions of the program.

A quarterly newsletter, AcoustaFACTS, is promised as a source of new information and announcements on the program. Several seminars on the program have already been given, and more are planned. There will be no charge to licensed users for either the newsletter or seminars.

A special hotline phone number and a FAX number are provided for hardware and software support. The manual stresses that help is for operation of the program, not in designing sound systems or room acoustics.

PROGRAM FLOW

AcoustaCADD is separated into four modules: project management, room modeling, acoustical analysis and sound system design. We begin by reviewing the first three modules.

Project Management

The Project Management "house keeping" module maintains project files (jobs) for editing, review or hardcopy printout; and allows naming of new jobs, or renaming or splitting of existing projects at any time during or after completion of the job. Sets of data files for each project are maintained in a master directory on the hard disk. Copies of the original files are not altered unless the program operator decides to update them. If your revised simulations are useful, you might update the job file with the improved design, but if your efforts were not fruitful, you could "toss" the results without altering the original data.

Room Modeling

The room mapping of seating areas in sound system design programs has evolved in AcoustaCADD into sophisticated acoustical room modeling techniques. The boundary surfaces in the room are defined, although for spaces in which you do not expect acoustical problems, the user has the option of modeling only the floor and seating areas. This is a desirable capability, as room modeling can be time consuming, and unnecessary detail can be inefficient. Although some functions exploit the use of the mouse, defining the boundary surfaces requires data entry through the keyboard. Using the keyboard (in this instance) is more time consuming and more prone to errors than using the mouse. Adding to or editing to boundary surface information can be done with the mouse or the keyboard.

> "AcoustaCADD is separated into four modules: project management, room modeling, acoustical analysis, and sound system design."

The model can be displayed over a wide range of scales so you can zoom in or out, rotate, and view with any vertical viewing position from elevation to floor plan. These manipulations also are by keyboard entry; this is less intuitive and not as accessible as using the mouse to control the screen image. To manipulate the size, wire frame model location or viewing angle various special function keys are hit (F1—change position of Origin, F3—change viewing angle, F5—change magnification), each of which brings onto the screen, a command menu. For example, hitting F1 brings up

the initial prompt of MOVE ORIGIN LEFT OR RIGHT by using the cursor keys, followed by the prompt of MOVE ORIGIN UP OR DOWN by using the cursor keys. Rotating the wire frame model is more involved, with F1 for resetting to 0 degree position, F2 for 90 degrees, F3 for 180 degrees and F4 for 360 degrees. Views between these angles can be accessed by using the cursors, which jump in 5 degree increments, or the + or – keys for 1 degree increments. While these procedures sound a little awkward, especially when compared to the mouse and scroll bars used in Windows or on the Macintosh, they are really not a problem after you get familiar with them.

The zoom function is called "magnify." As the scale on the screen is not marked off in feet or meters, this information is not intuitive and an architectural scale would be a big improvement, especially if the scaling could be kept accurate to the printouts. To change the scale, the special function keys are used again, and the range is 0.5 to 30.

The room model used within AcoustaCADD is a "numeric model" rather than a "graphic model," as used in most other sound system engineering programs. The program developers claim that extracting numeric data from a computer "graphic" is potentially erroneous and position-sensitive (the view you choose will affect the accuracy of your results). The downside to the higher accuracy of using a numeric modeling approach is that it is computationally more intensive, which is one of the reasons the operator cannot manipulate the 3-D Wireframe model's position or the speaker's aiming angle in real time (or locate coordinates with the mouse) as is possible in graphic model programs such as the Bose Modeler. This topic warrants a more detailed discussion, and in a future CAD Topics we will discuss this point with the sound system software developers themselves.

Creating The Acoustical Model Of The Space

To start a new job the user starts off in the main menu and selects SELECT/EDIT 3-D DESIGN MODEL (this is the project management function). The submenu for this module appears after it has been retrieved from the hard disk.

Before you start your work session with AcoustaCADD, you should have dimensioned drawings including floor plan, reflected ceiling plans and sections (if possible), and elevation views. Sketching paper is also recommended by the manual,

and I would suggest you don't throw away your drafting table just yet. The sketches should be kept in the project file for future reference to aid in identifying which boundary surfaces relate to room model boundary surfaces, as well as other project information. You will also need to know the room's reverberation characteristic versus frequency (or at least 2 kHz), or if the room is to be modified. If the room does not yet exist, then you need to know the surface materials for each boundary. Modeling an entire room can be tedious and more work than some projects warrant. (This has also been a common complaint with another program that provides sophisticated room modeling capabilities).

Actually AcoustaCADD provides the option of just modeling the floor, which would be adequate if you are confident that the room is acoustically well behaved. This short cut will simplify and speed the room modeling and is an especially useful and appropriate technique for doing a quick cost estimate. Perhaps the manual should emphasize this option.

The manual does suggest that you should also be familiar with all the products you intend to use in the design, and even try to find out what your client desires in performance, function, appearance and so on. Although the manual states that the program will help a good designer do good jobs faster, and a poor designer do poor jobs faster, I suspect that AcoustaCADD, with all the guidelines and common sense advice contained in the manual, would have a beneficial effect on the work of a marginal designer, especially if he bothered to look over the manual.

Once you have started the program the first choice on the menu, CREATE DATA FILES FOR NEW PROJECT, is selected. After the job is named, you return to the ACCESS MENU. From the ACCESS MENU you select the CREATE/EDIT 3-D DESIGN module. The hard disk then loads this module, and the submenu appears.

If all this menu jumping sounds awkward, it is and a little reminiscent of JBL's CADP I. On the other hand, a windows approach would require moving the mouse around the tabletop and waiting for the computer. Only if you have a real screamer (very high speed powerhouse computer) would a Windows interface be faster overall, weighting both computer and operator manipulation time factors.

ADD/EDIT — BOUNDARY SURFACE DATA is then selected, and the position and attitude (orientation) of the plane and to the adjacent surfaces defined. Planes

are defined as two axes planes, one-axis planes and wild card planes. This approach eliminates defining the corner coordinates as required by most room mapping techniques and is similar to the Bose Modeler in this aspect. The model may be modified by changing surface and plane definitions rather than changing many set of coordinates. This allows you to stretch or shrink room dimensions without redefining the planes. The data may be entered using either feet or meters, although the default is selected when you initially configure the program, but can be switched at any time. The ability to switch at a later point is useful if you are more comfortable (and less error prone) with one measurement standard, while the architect, consultant, or installer desires another measurement system. Generally this is only a consideration in international work. Once the data are entered into a table of plane definitions and a table of boundary surface definitions, the computer calculates the coordinates of all the corners. The area of each boundary surface and the total interior volume of the model is also calculated. This is the first sound system design program to do this automatically and is a real time savings feature.

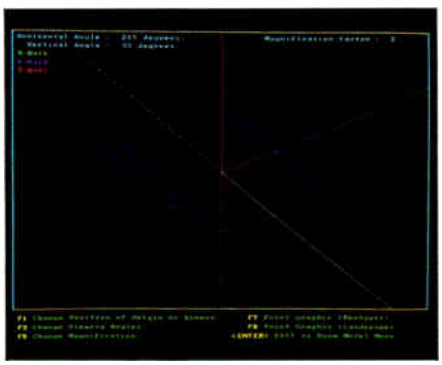
You also specify if the room model is an indoor (enclosed) facility, or outdoor, or a partial model, such as when you are not worried about acoustical problems. Mapping coordinates use X as the length of the room from front to back, with Z as the vertical height. A right-hand coordinate system, the same as AutoCAD Release 10, is used, X and Y are the horizontal axes and Z is the vertical axis. The origin may be placed at any point in the model convenient to the user. The center of an arena floor or the talking position on the stage of an auditorium might be typical origin locations. A datum point specified by the architect might also be used. There is, unfortunately, no standardization among sound system designers or architects. Some confusion might result if the user switches from one program to another from time to time, such as using one program for one brand of speakers and another program for another brand of speakers (such as Modeler for Bose installations and AcoustaCADD with Altec Lansing, Electro-Voice or University Sound).

The maximum distance along any axis is 820 feet, so you must start out with a negative coordinate if you need a larger dimension (which is awkward) with a maximum dimension of 1,640 feet. This should be adequate for a large stadium, but might not be adequate for modeling a large amphitheater with lawn seating, an entire theme park or factory paging system, or many siren/voice warning systems within a single simulation. A diagnostic routine can be selected from the submenu and aids in troubleshooting errors in the model by displaying the wire frame with a selected surface outlined and highlighted

(a change of color), along with the user-entered surface and plane definitions. This is a helpful feature, especially for creating complex models, and ought to be a part of all 3-D modeling programs.

Aside from defining the boundary surface planes, the room model menu also includes (optionally) specifying the boundary plane surface material. Unlike the latest release of Bose Modeler, this is a separate operation and therefore results in a substantial increase in both operator effort and possible data entry errors. On the other hand, like the PHD program, you may skip defining each boundary surface material and just enter the average absorption coefficient for each frequency band.

Up to 500 planes or sides may be entered, with each surface having as many as 76 corners, and this defines the current state-of-the-art, although NexoCAAD will have similar capabilities. As each plane is entered, its relationship to already entered planes is defined: none, X-axis symmetry, and parallel. As with all the other sound system engineering programs, curved surfaces cannot be modeled and instead are approximated as a number of planes.



Football Field Model

Architectural Acoustics

The acoustic design and analysis module includes prediction of octave band reverberation and ray tracing.

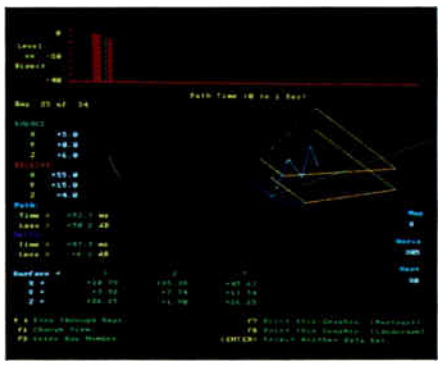
Octave band reverberation time may be entered in a number of ways, either by various calculations from within the program, or from actual measurements.

If the facility already exists and the acoustical characteristics are not going to be changed, then actual RT 60 measurements should be used six octave bands are used for reverberation analysis. I also like to use predictive techniques as a "reality check," as there are many possibilities for error in RT60 measurements. The directionality of the exciting sound source, the ambient noise of the space, flutter echoes, and other factors can all influence your data.

Of course predictive measurements can also be ambiguous and there are a number of different formulas used, some more appropriate than others, depending on circumstances. AcoustaCADD only provides the Sabine equation. This technique assumes that the absorption is relatively evenly distributed throughout the facility, and the space is adequately large. Norris-Erying and Fritzroy techniques are not supported, although this module will probably be expanded in later releases. The Fritzroy technique requires a separate data base of absorption characteristics and is not compatible with conventional Sabine absorption coefficient files. One of the other sound system engineering program developers has found significant errors in the conversion techniques of using Sabine data base coefficients with the Fritzroy formula.

If you are familiar with acoustical properties of materials and have looked over the room or detailed plans of the space, you can enter the average absorption coefficient for each octave band and immediately see a plot of the room's RT 60. From start to finish this process took me about one minute and was very helpful for "what if" acoustical treatment modifications and estimating room RT 60.

A data base of absorption coefficients is included with the program and is easily accessible. The files are intelligently organized as to materials likely to be used for the floor (code 100—199), the walls (code 200—399), the ceiling (code 400—599), or special constructions (code 0—99). The library is enormous and is by far the largest and most complete of any reverberation software utility commercially available. New files may also be created and added to the library. Not only is the library comprehensive and well organized, but detailed information is maintained in the data base as to what standard the data were obtained, including even the spacing from the wall (which can have a dramatic effect on the low frequency absorption coefficients) as well as the reference source for these data.



Retracing 1 Ray Shown

Ray Tracing

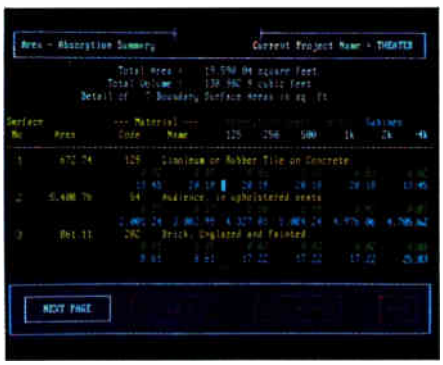
Ray tracing in AcoustaCADD is of the statistical type and is actually an image model, (the same is true for the Bose Modeler). The image model shows only the valid paths which have been calculated from reception points on the surface of interest through "virtual images," whereas with ray tracing many rays are simultaneously emitted from the sound source which may find their way to reception points on the surface of interest within the prescribed number of reflections. Ray tracing is computationally at the practical limit of personal computers, but image modeling is less intensive yet still useful. One MS-DOS program that is actually a true ray tracing program is DBray. (We will explore this program and others in detail in an upcoming issue.)

Aside from looking pretty and impressing others, ray tracing has potential uses that include prediction of flutter echoes, predicting STI and RASTI, and eventually the imposing of the room's characteristics onto an anechoic recording to aurally preview the acoustics of space (with a suitable digital to analog converter).

At the moment none of these capabilities is available from any of the commercially available programs, although flutter echo prediction is claimed for the NexoCAAD software, which is being released shortly.

The user defines location of the source (speaker) and receiver (listener) locations. The locations must be defined by entering coordinates with the keyboard, rather than pointing with the mouse, which would have been more efficient. This is due to the numeric rather than graphic model used by the program (which the developer claim is intrinsically more accurate). Up to five reflections may be calculated, but usually three is the maximum practical amount due to limitations of computer processing time. Ray tracing/image modeling calculations are computationally the most intensive task required in sound system engineering programs. A simulation using many speakers, a complex room, and more than a few reflections can take hours on an XT class machine. On-screen counters are provided. Although this lets you know that the computer and software are functioning okay, the counter function actually increases the processing time slightly. Some of the simpler models I tried took only a minute to calculate the ray tracing for the first two reflections.

After processing, a set of rays may be displayed along with a 3-D view of the room model. All rays may be displayed together or any one ray may be displayed along with all the information related to its transmission path. You may step forward or back through each ray by using the cursors, which is very useful as the composite ray trace is usually too "busy" to decipher what is going on. Aside from the "ray trace," a good deal of data is provided; source and receiving locations; the number of reflections taken by the ray; path length in milliseconds; the difference in path length to the direct sound path; the path loss dB; the index numbers of the reflecting boundary surfaces; and the coordinates of each point of reflection on each surface. Predicted ray path loss relative to the direct path is displayed versus time in a "pseudo ETC" format. The manual stresses that this graph is only a similar idea to an ETC which is an actual measurement.



Absorption Summary

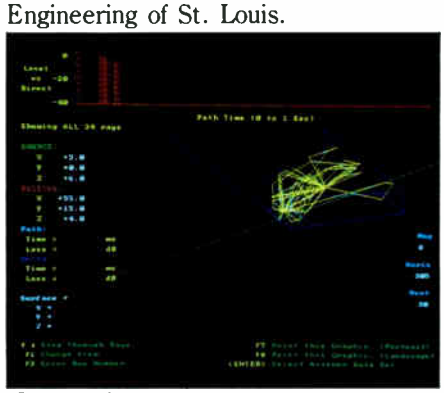
While this simulation is very computationally intensive as far as what can be done on personal computers, it still represents a very preliminary step forward in light of acoustical phenomena in real spaces. Much more sophisticated models will be needed before the "pseudo ETC" generated in these simulations will be close predictions of the ETC measured in the room. I look forward to comparing the ETC from an actual installation versus the synthesized curve by the room modeling software, for the same space, source(s) and receiver(s).

An interesting paper was given at the October 1989 AES convention ("A Theoretical Model Study of the Reflected Energy in a Worship Space" by Michael Garrison) in which the author modified the Bose Modeler program image model module to account for diffraction effects, not just absorption effects. This capability is not available in either Bose Modeler, AcoustaCADD or NexoCAAD (at least not yet).

I would anticipate that future releases of CAD software might have not only speaker directivity files, and material absorption coefficient files, but also diffraction files. These diffraction files could include typical boundary materials (from Venetian blinds to cylindrical pillars) as well as specific diffraction and/or absorption devices such as the ASC Tube Trap, the RPG diffraction gratings, or whatever.

The Techron 12 and the DRA MLSSA test instruments both derive the STI and RASTI intelligibility scores from the ETC of an impulse. The "pseudo ETC" synthesized by AcoustaCADD is not appropriate for this, and perhaps nobody understands this better than the program developers. Mr. Mochimaru of Fuji Sound returned to Nihon University and did his doctoral research on speech intelligibility prediction. Now Dr. Mochimaru has joined the AcoustaCADD development staff at Altec Lansing full time to dedicate his efforts to the program's future development.

Another area that might be of interest is the expansion of the simulations beyond the room model (this is not performed by AcoustaCADD). What this means is that the sound levels of any (or all) of the speakers could be determined for areas outside the boundary of the room. The use for this would be for noise leakage/noise control data, which often are a part of the acoustic analysis of a commercial facility. The STC (Standard Transmission Coefficient) of the wall constructions would have to be known or determined by the program. One utility that predicts wall construction attenuation is TL/STC, available from TPM Software. Programs that predict noise attenuation from barriers are END, distributed by Scantek of Rockville, Maryland; and SYSNOISE, distributed by Dynamic Engineering of St. Louis.



Ray Tracing — All Rays Shown

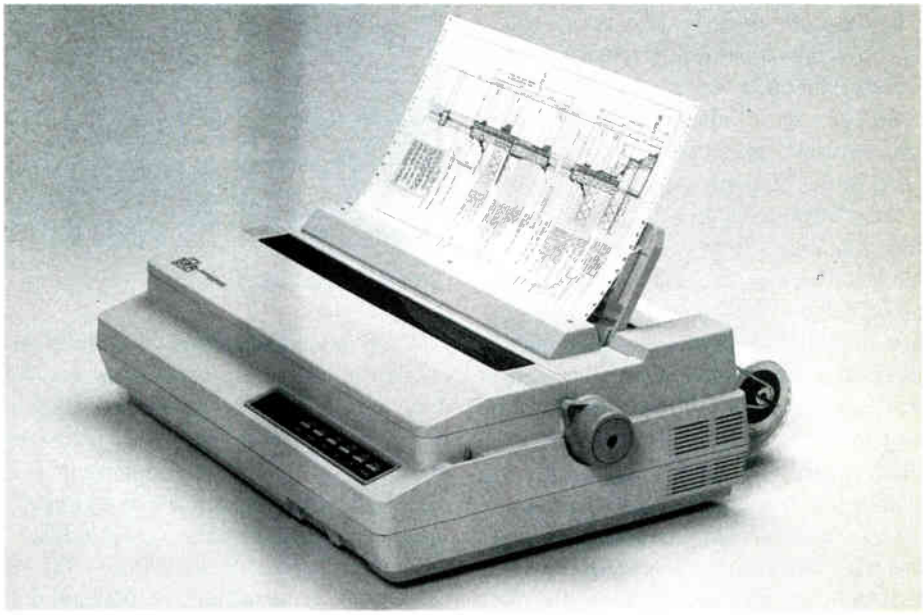
Next month we will continue to explore AcoustaCADD and proceed to evaluate its unique and controversial Iso-Beam speaker selection. ■

HARDWARE AND CAD SYSTEMS: Part II

BY MIKE KLASCO

There are few things worse than spending a bundle on a software package, only to find that your computer won't accommodate the program, or will accommodate it only with difficulty. As software becomes more complex, more elegant — and more useful — our hardware has to be up to the effort required.

We continue our discussion — begun last month — of hardware requirements.



The JDL Auto Plotter (Model 850 GL+)

FLOPPY DRIVES

The original IBM PC used a 5¼-inch 360K floppy drive. This is one of the few original components that is still with us. The AT computer introduced the high density 5¼-inch 1.2 meg floppy, but early problems of compatibility between the higher density drive's ability to record on the lower density media ("floppies") resulted in a 360K floppy being included in all systems. Almost all software is still distributed on 360K media.

The IBM series PS/2 has introduced two new capacity standards in the 3.5-inch format: 700K and 1.4K meg.

Although the 3.5-inch media are still called floppies, actually they have a hard plastic outer shell. The PS/2 series has not been successful in engineering, or most other fields, and the 3.5-inch drives have only been adopted outside of the IBM's own PS/2 series in laptop computers. If you are buying a laptop, then you will certainly want your desktop unit to exchange disks with your portable.

OTHER PERIPHERALS

AcoustaCADD also suggests that you use two floppy drives, a mouse, and a plotter and fast printer. Perhaps you will want to combine the function of the plotter with one of the new 24-pin "c" size color dot matrix printers such as the JDL 850 or the Accell 500 from ACT, both under $2,000. If this is still too expensive, HP has the Paint Jet color ink jet printer for about $1,500. AcoustaCADD can be configured to send data reports to one printer and graphics to the color printer.

Aside from a hard disk and the usual other high performance peripherals, JBL's CADP II has opted for a RAM memory intensive approach. Instead of main and submenus (such as previously used in CADP I), Microsoft Windows (with pull down menus, and a Mac-like user interface) was selected for CADP II. Aside from 640K of memory "under DOS," another 2 meg of memory is needed for efficient operation. This approach will be discussed in more detail in our review of CADP II.

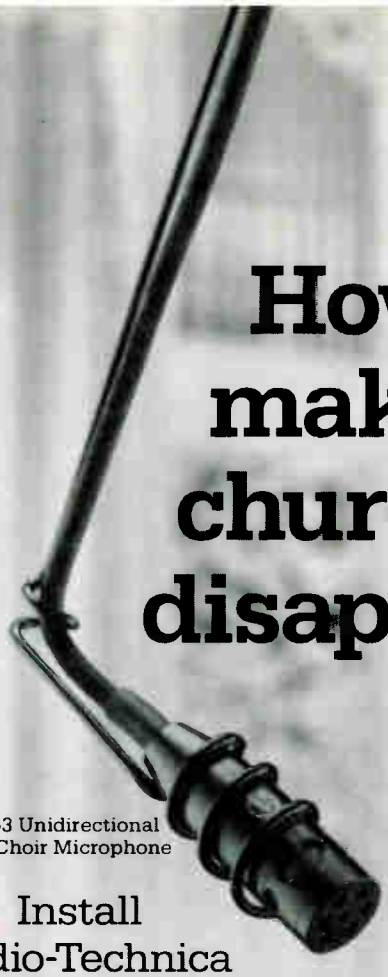
NexoCAAD also uses Microsoft Windows user interface, although only 640K memory is required, but with Windows, more is better! A hard disk and a mouse are also needed.

SPEED, CPU, COPROCESSOR AND OTHER FACTORS

All the software developers insist that a 286 or a 386 machine with a math coprocessor chip is the only way to get good speed from these computationally intensive programs.

The first IBM personal computers (PC and XT) used the Intel 8088 CPU or microprocessor. This was 16-bit internally, but only 8-bit externally, as memory chips, plug-in slots, etc. were much cheaper for 8 bits in the early 1980's. IBM later introduced the AT system which used the Intel 80286, which is both 16-bit internally and externally, although both 8- and 16-bit buss slots were provided for plug-in cards, to control monitors, hard disks, etc. In the last two years 80386 computers have been introduced, which are 32-bit internal/external CPU's, and have 8-, 16-,

How to make your best church sound systems disappear from sight!



Actual Size
Model AT853 Unidirectional
Condenser Choir Microphone

Install Audio-Technica UniPoint® miniature studio-quality microphones

Every congregation deserves the best possible sound, whether at the service or listening to broadcasts or tape. Now you can install superior sound without bulky microphones and awkward microphone stands that intrude on the services.

New Directional Choir Microphone

Audio-Technica engineers have broken new ground with our UniPoint design that delivers studio-quality sound from tiny, inconspicuous *directional* microphones. Our new choir microphone is so small and light that it can be suspended by its own slim cable, making it virtually invisible. Yet it offers controlled pickup of only the choir, sharply reducing room noise and reverberation.

Directional models for altar, lectern, pulpit, plus lavaliers

Four other UniPoint models for use at the lectern or pulpit offer the same clarity, full range, and directional pickup control. Our comprehensive approach to church sound also includes a surface-mounted directional microphone that lies flat on altar, table, or floor. We round out the selection with directional lavalier microphones that solve acoustic problems other lavaliers can't handle. The entire line provides full freedom of movement to the participants, yet the microphone is almost unseen.

Model AT871
UniPlate Boundary Cardioid

Model AT857AM
Podium Cardioid

Better sound is now smaller, lighter, less visible

Whether your customer's sound system is solely for sound reinforcement, or is also used for radio/TV or tape recording of the service, UniPoint microphones improve the sound quality while remaining almost invisible.

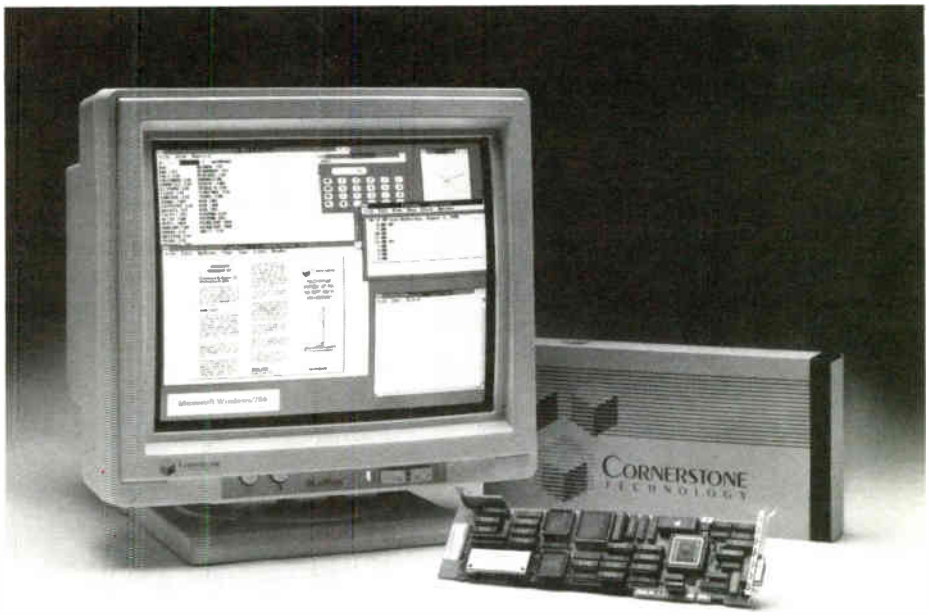
Our experts are ready to help

If you ever need help with specific installations – whether large or small – our Audio-Technica church sound experts are ready with answers to your most difficult problems. To watch your toughest church sound installation problems disappear, call or write us today.

audio-technica

1221 Commerce Drive, Stow, OH 44224
(216) 686-2600

Circle 205 on Reader Response Card



The Cornerstone DualPage™ 19" grayscale monitor and board subsystem for IBM PS/2 Models 50, 60, 70, 80 and equivalent systems. Provides display of two full pages at 1600 x 1280 resolution, with up to 16 shades of gray.

and 32-bit slots. Intel has also introduced the 80386sx, which is 32-bit internal, but 16-bit external, and therefore is cheaper. Recently, the 486 has been announced, which is even more powerful than the 386.

Another parameter that you will see in CPU specifications is clock speed. 8088 CPU speeds vary from 4.77 meg to rarely above 12 meg. 286 CPU speeds vary from 6 meg to 25 meg. 386 CPU speeds vary to 33 meg.

Generally speaking, the later the CPU and the higher the clock speed, the faster the computer will perform its work (measured in millions of instructions per second — "MIPS").

Instructions per second can also be speeded up from 2 to 10 times by adding a math coprocessor (sometimes called a floating point processor). This is a second CPU that is designed to take over the floating point calculations from the main CPU. The coprocessor is an IC chip that plugs into a socket on the motherboard near the CPU. Cost of the slower and simpler 8087 coprocessor for the 8088 is about $100. while the 80287 coprocessors for the 286 CPU range in price from $200 to $350. 80387 coprocessors for the 386 machines have been dropping in cost, but are still about $500, depending on speed. The new 486 CPU actually has the coprocessor built in. The earlier sound system design programs did not take advantage of math coprocessors, but the new programs either will not operate at all, or will simply be too slow to be usable without a coprocessor.

WHAT ABOUT THE MAC?

The Macintosh has gone through a similar upgrading in video resolution and color, hard disk options, CPU power and speed, and coprocessor options. Apple has also just introduced a laptop, portable Mac. We will cover the Mac in detail when we review the latest release of the Bose Modeler program this spring. Audio engineers who are committed Mac users are beginning to have a choice in programs from those by Bose (Modeler, Speaker-CAD, Rackmaker), and from Carvin's AudioCAD speaker enclosure design program and, eventually, JBL's CADP II Mac version toward the end of 1990.

(continued from page 14)

supply equipment for this purpose. The Octave values noted should be marked on a standard NC chart, and this information can then be compared with the specification on the design team.

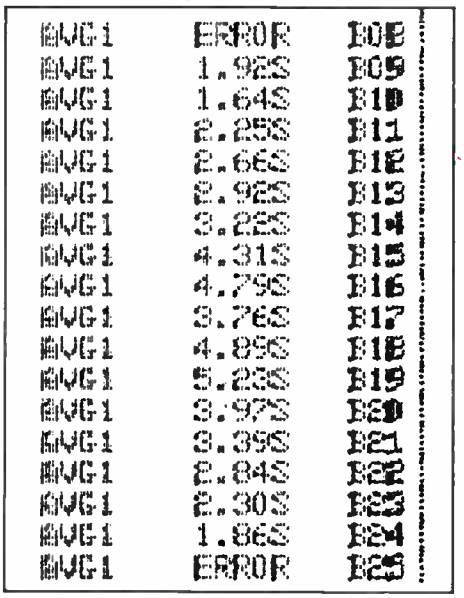


Figure 3. CEL Reverberation Printout

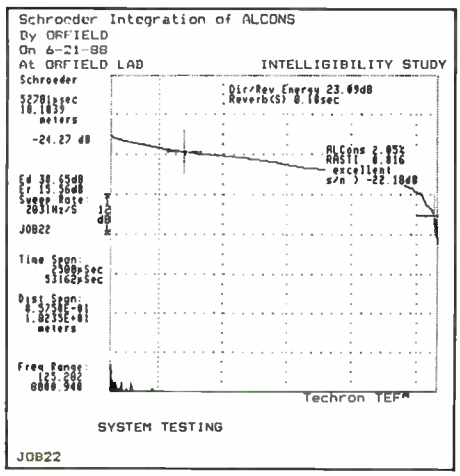


Figure 4. TEF 12 Reverberation ETC Graph

If either of the values noted in this testing are significantly higher than those specified, the design team and owner should be notified of this potential problem. Since intelligibility is inversely proportional to both NC value and to reverberation time, serious problems could be the result of failures in these measurements.

In the case of the St. Cloud Civic Center, the NC values in Figure 8 illustrate the values specified in the Stockinger Suite, one of the large meeting rooms (NC-30).

The actual initial performance of the space is noted and meets an NC-35 criteria in Figure 9.

Figure 8.

Frequency:	63	125	250	500	1000	2000	4000	8000
Specified NC:	57	48	51	35	31	29	28	27

Figure 9.

Frequency:	63	125	250	500	1000	2000	4000	8000
Measured NC:	60	52	43	35	31	25	14	12

Since the criteria was not met upon initial testing and the HVAC system silencing was suspect, this was inspected, and corrective orders were given to meet the specified standard.

Figure 5.

Frequency:	125	250	500	1000	2000	4000	8000
Measured RT/60:	2.0	1.6	1.6	1.9	1.8	1.1	1.0

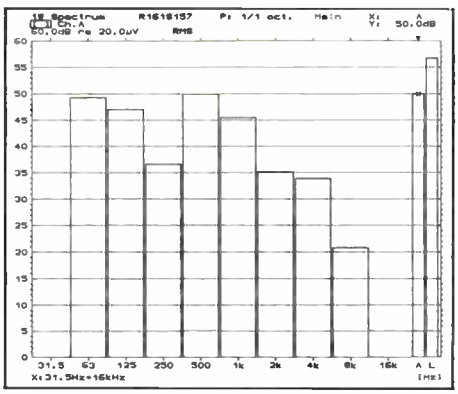


Figure 6. Octave Measurement — B&K 2133

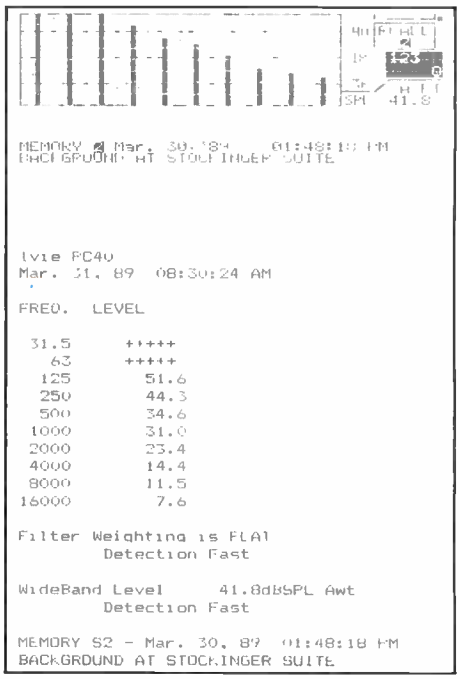


Figure 7. NC Chart with dB Values

Further testing provides a more refined view of the average performance of the facility, and among the testing performed at the St. Cloud Civic Center to verify specific and average performance were these tests:

- FSTC — Field Sound Transmission Class (Test of major wall types)
- FSTC — Field Sound Transmission Class (Tests of all sound rated doors)
- NC — Tests of representative non-reinforced rooms (rooms without sound systems)
- NC — Tests of lighting system noise
- RT — Tests of representative non-reinforced rooms

At the Civic Center, STC testing was particularly important because the layout of the Center allowed for concurrent basketball tournaments and large meetings separated only by a corridor. It is interesting to note that while the sound doors specified at the St. Cloud Civic Center (Industrial Acoustics doors) were very high in quality, the initial STC testing demonstrated that they were not adjusted properly, and significant leaks were thus present at the floor gaskets, and easily remedied problem.

VERIFICATION OF SOUND SYSTEM PERFORMANCE

In the evaluation of the sound system, itself, there are an unlimited series of field tests which might be performed; the most important of these are performed to establish minimum performance compliance and to adjust the systems for optimal performance.

Recommended tests are included in Figure 13.

There is another series of adjustments which involve the actual tuning and final adjustment of the system. These are not verification tests, but their inappropriate adjustment will often cause failures during verification tests. In our practice, we ask the audio contractor to make initial adjustments, but we prefer to perform final adjustments ourselves, since most audio contractors have a limited amount of test equipment.

These intermediate setup adjustments include those indicated in Figure 14.

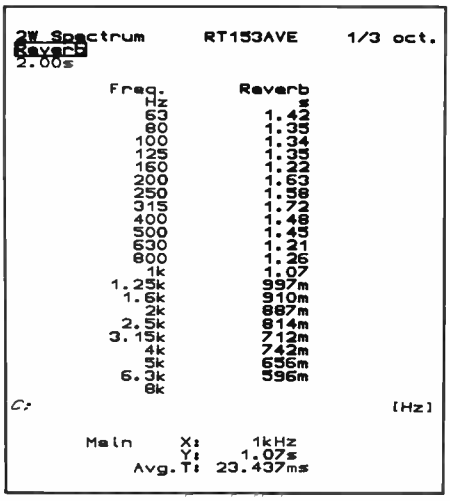


Figure 10. Reverberation Time — B & K 2133

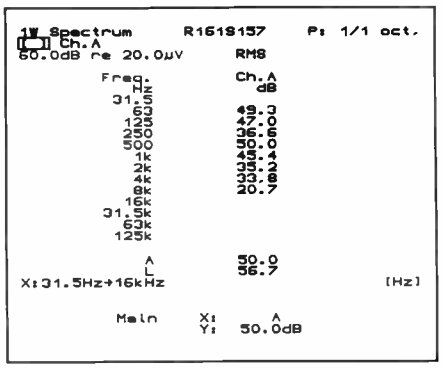


Figure 11. Noise Criteria — B & K 2133

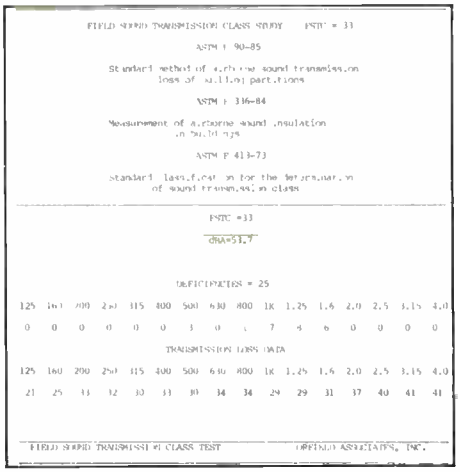


Figure 12. FSTC Results — Sound Doors — Orfield STC Program

Figure 13.		
Preliminary Evaluation	**Formal Test**	**Instrument**
Levels of speech intelligibility	RASTI/STI	RASTI/TEF
Frequency response of the system	EQ/EFC	RTA/TEF
Time delays and echoes present	ETC/ Time Base	TREF/RTA*
Odd sounds present	Sine Sweep	Sine Gen.

(*Ex. B & K 2133 with Multispectrum Capability or Ivie PC40 in RT60 Mode)

Figure 14.	
Preliminary Evaluation	**Instrument**
Cluster component balance	Sound Level Meter/RTA/TEF
Cluster Coverage	Sound Level Meter/TRA/TEF
EQ adjustment	Real Time Analyzer/TEF
Crossover adjustment	Real Time Analyzer/TEF
Time delay adjustment	RTA*/TEF
Operating level adjustment	Sound Level Meter/RTA
Automated microphone sensitivity	Real Time Analyzer

(The specifics of set-up testing will be part of a future article.)

SUMMARY

As with all professional consulting and design, the results of the process are often determined by the care and control over the process which is exerted by the consultant. In the audio design and acoustical consulting fields, there are generally few firms who practice formal verification. (Many say that they would like to but that the client won't fund the process.) Additionally, there are many consultants who design audio systems and place the total responsibility on the audio contractor to achieve high quality performance, failing to take responsibility for the quality of their own consulting work.

Unfortunately, without formal verification, the performance of both the occupied space and the audio system is often far below what the client paid for. This is usually due to common problems caused by either failure to follow the specification or failure to check out and tune the space or system. It is interesting to note that on projects where consultant testing is included as part of the specification, the initial performance results are often far better, due to the greater care expended on the project. ■

This publication gives you good reading, good writing

and good arithmetic.

We present the information in our articles clearly, accurately and objectively. That's good writing. Which means good reading.

We present the information in our circulation statement clearly, accurately and objectively. That's good arithmetic.

BPA (Business Publications Audit of Circulation, Inc.) helps us provide precise and reliable information to both advertisers and readers.

An independent, not-for-profit organization. BPA audits our circulation list once a year to make sure it's correct and up to date. The audit makes sure you are who we say you are.

This information enables our advertisers to determine if they are reaching the right people in the right place with the right message.

The audit also benefits you. Because the more a publication and its advertisers know about you, the better they can provide you with articles and advertisements that meet your information needs.

BPA. For readers it stands for meaningful information. For advertisers it stands for meaningful readers. Business Publications Audit of Circulation, Inc.
360 Park Ave. So., New York, NY 10010.

MEDIA
INTELLIGENCE
BPA

U P D A T E

News from around the Industry

Feldman Audio Installs; GandTech '89

New York Installations

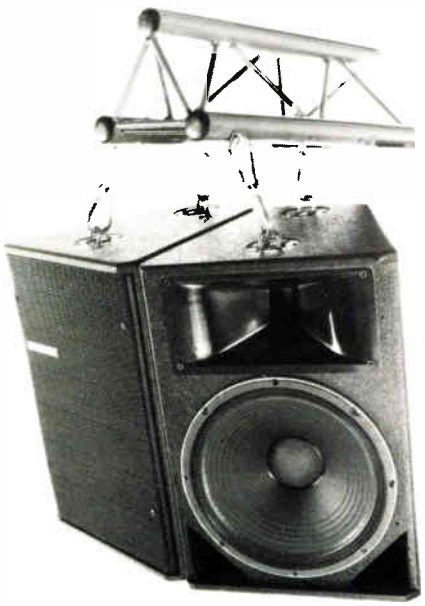
Lewis Feldman Audio has recently done several installations in New York, including: the Saint/Old Filmore East Concert Hall; Lucky Strike Restaurant; and a fund raising event for AIDS research at the Old U.S. Customs House. JBL Professional equipment was prominently used.

McClelland Sound

McClelland Sound was the contractor for an installation at The Palace Theater in Wichita, Kansas which uses a number of JBL systems and components. The theater consists of six Dolby surround houses and two large THX houses. JBL 8330 surround/foreground music systems were used in the smaller theaters and in the lobby in a stereo configuration for background music. The complete installation included six 4670B direct radiator systems, six 4675A-8LF direct radiator systems, and 55 8330 surround/foreground music systems.

Macpherson at ABC

An eight-cabinet array of Macpherson M2 trapezoid two-way loudspeakers was recently installed in ABC's Studio 1 in New York, home to the Prime Time Live show. The system was installed by Crystal Taylor Systems, Inc. of Bensalem, Pennsylvania. The speakers are used for the sound stage. A wireless microphone system is used in the studio, and individual speakers can be muted. The M2 system is a trapezoid shaped two way loudspeaker featuring extended bass response of a heavy duty 15-inch low frequency driver along with a one inch compression driver and 90 x 50 constant coverage horn.



Crown Honors Christiansen

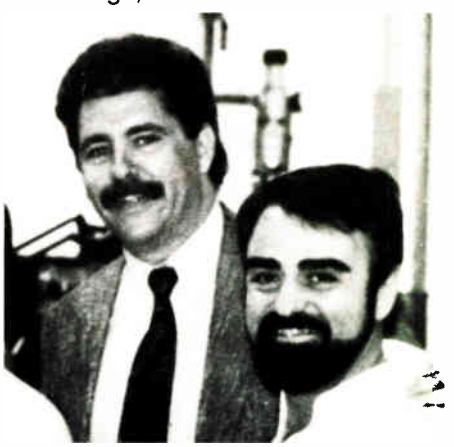
In recognition of 35 years of service to Crown's international sales and export efforts, Crown International hosted a special banquet in honor of Niles Christiansen at Crown's corporate headquarters in Elkhart, Indiana. Crown and Christiansen began their association in 1954. For the last 10 years, Christiansen has handled Crown products exclusively. Earlier this year, Crown purchased the assets of Christiansen's business and announced that he was being retained as a consultant to their new in-house export arm, Amcron.

Martin Audio New Line

Martin Audio Video Corporation has been selected by WaveFrame Corporation to represent its product line in the New York area. Martin Audio Video is a wholly owned subsidiary of Video Services Corporation.

Re-Cone Class

JBL recently held a speaker re-cone class for members of the Hermes Music technical department. The classes come as a result of JBL Professional's move into the new Customer Service complex on the Harman International Business Campus in Northridge, California.



Left to right: Ken Lopez, v.p. sales, JBL Professional, Alberto Kreimerman, president, Hermes Music.

HDTV in Zoo Exhibit

The St. Louis Zoo's Living World Educational Center, a two story structure that includes classrooms, lecture halls, an auditorium and library, also in-

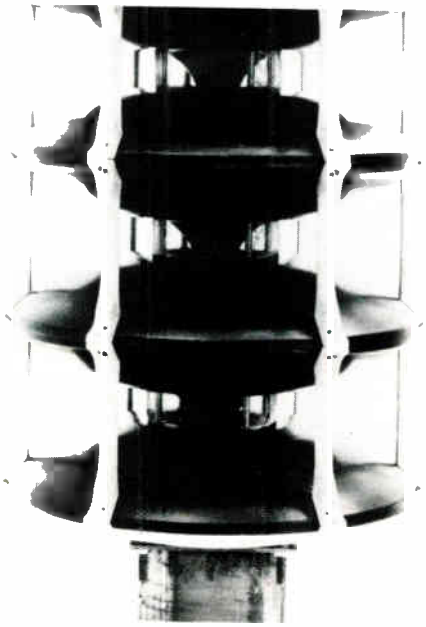
cludes displays featuring Sony video equipment. For instance, a simulated Ozark Mountain stream has a Sony camera placed in the stream and outfitted with viewer controls allowing visitors to witness underwater life. In other areas of the Animal Hall, two cameras, with different filters, simulate the view of the world from animals' points of view.

A Sony HDTV disc player is part of an equipment package that enables visitors to "orbit the earth." A compilation of animated satellite photographs of the earth were edited together to show visitors what the earth looks like from space. Sony believes this is one of the first public uses of high definition video in an exhibit. The architectural firm of Hellmuth, Obata and Kassabaum designed the exhibit.

St. Louis Zoo exhibit features Sony high definition video disc player.

Community in Denmark

As a supplier of custom fabricated horns and drivers to the Whelen Engineering Company, Community Light & Sound has become part of a contract for more than 1,200 electronic outdoor warning systems which will be built for Denmark. The contract, which Community says is the largest of its kind ever signed, was formalized before the Danish Parliament. Plans are to use the warning systems for all natural and manmade emergencies. At the heart of the project is Whelen's WPS-2700 Series high power voice and siren system. The Community components, designed by company president Bruce Howze, include a 400 watt high power 1.4-inch compression driver and a custom horn which features circular cell construction to eliminate gaps or loading in the coverage area. The completed installation is slated for September 1993.



Mtel Increase

Mobile Telecommunication Technologies Corp. (Mtel) has reported a 63 percent increase in third quarter revenues of 1989. The company is the parent corporation of SkyTel, formerly National Satellite Paging, and has recently offered 3,450,000 shares of common stock.

Sound Provided

Zeo Brothers Productions, the concert audio company in Hatboro, Pennsylvania, was responsible for providing sound reinforcement to the Keswick Theater for the Joe Strummer Band. The sound system consisted of the company's MSE 3 and MSE 218 Sub, and was powered by Crest Audio 8001s, 7001s, and PL 400s, with the Ramsa WR-S 852 52 input console in the house and the TAC Scorpion 40 x 12 monitor console.

Gand Music Expo

Attendance for Gand Musictech '89 reached approximately 2,500 people. The two day event, now in its fifth consecutive year, is put on by Gand Music & Sound in Northfield, Illinois, as a consumer oriented music show. A variety of seminars were offered, and guest appearances were made by Stanley Jordan, Tom Coster, and Terry Fryer.

Davis Adds Telecall

J.W. Davis & Company has added Telecall to its "family of products." "This outstanding intercom equipment, together with the broad Aiphone line, will provide you with even greater opportunities to select just the right equipment for a specific application." says Jack W. Tucker, vice president sales. Telecall is manufactured by Nippon Interphone. Telecall America is managed by Hiko Shinoda.

Left to right: Terry Fryer, Tom Coster, Korg senior v.p. Kim Holland, Garry Gand, Joan Gand, Korg executive v.p. Mike Kovens, Korg U.S.A. president Seiki Katoh, Korg sales team member Ken Zemenak.

Products

Frazier CAT; OAP Subwoofer

CAT 66 Available

Frazier has announced the immediate availability of a medium throw 60 degree x 40 degree dual horn high power handling system — the CAT 66. The system is the latest addition to a family of source aligned loudspeaker systems featuring the Coincident Aligned Transducer principle that Frazier says is the backbone of its design program started in 1986.

The Frazier CAT 66 consists of two heavy duty 12 inch woofers angled inward in a constant directivity type bass horn and a Frazier 60 x 40 high frequency horn with a high output one inch compression driver mounted in the center of the bass horn.

Circle 1 on Reader Response Card

Twin Reflex Subwoofer

OAP Audio Products' Model TR218 Twin Reflex Subwoofer is designed for portable or fixed applications, and combines high output and power handling in a compact format, says the company. Two identical bass reflex chambers are combined within a single enclosure; the drivers can be operated independently, with each other, or singly with the appropriate input panel. The unit weighs 170 pounds.

Circle 2 on Reader Response Card

Text Inserter

Gyyr's new 5132 Text Inserter allows digital text from electronic cash registers, automatic teller machines and other digital devices to be recorded onto a videotape along with images received from video cameras. During playback, the data are displayed with the video. The Text Inserter can be interfaced with a Gyyr time lapse video recorder and, for instance, an electronic cash register, allowing the videotape to show the merchandise that was purchased. The Text Inserter operates with standard RS-232 connectors, cables and electrical signal levels.

Circle 3 on Reader Response Card

Color Monitor

Javelin Electronics has introduced a nine-inch color monitor designed specifically for use in surveillance and industrial cctv applications. The model features an "attractive cosmetic design" that includes external power on/off switch and LED, along with recessed front controls that are protected by a push-to-open flipdown control door.

The back of the monitor provides for BNC video input and loopthrough with switchable 75 Ohm termination. The CVM9 produces resolution in excess of 320 TVL horizontally and 350 TVL vertically. The unit can be double rack-mounted in standard 19-inch racks "without the crosstalk evident in many other color monitor models."

Circle 4 on Reader Response Card

SOUND & COMMUNICATIONS

ADVERTISER INDEX

Company	Page	RS #
AKG Acoustics (203) 348-2121	6	—
AMC Sales (213) 869-8519	73	276
Apogee Sound (707) 778-8887	45	219
Ariel Corp. (201) 249-2900	57	213
Ashly Audio (716) 544-5191	17	239
Atlas/Soundolier (314) 349-3110	47	212
Audio Logic (801) 268-8400	59	245
Audio Systems AUDSCO (800) 852-6522	68	274
Audio-Technica (216) 686-2600	67	20
BGW Systems (213) 973-8090	11	208
Cal Switch (800) CAL-SWCH	73	277
Community Light & Sound (215) 876-3400	49	238
Crestron Electronics (201) 894-0660	27	251
CT-Audio (800) CT AUDIO	68	275
Eastern Acoustic Works (508) 234-6158	51	217
Electro-Voice (616) 695-6831	CII	206
Fisher Berkeley (415) 655-9696	63	244
Fourjay Industries (513) 890-6444	3	211
Frazier (800) 643-8747	53	228
FSR Inc. (201) 239-0988	23	256
Gemco (615) 452-5960	37	216
Innovative Electronic Designs — IED (502) 267-7436	75	258
Javelin Electronics (213) 327-7440	CVRIII	210
JBL Professional (818) 893-8411	CIV	201
Lectrosonics (800) 821-1121	25	229
MacPherson Loudspeakers (517) 321-0700	46	255
Mfs. Representatives Educ. Rsch. Fndn. (312) 208-1466	50	—
McCauley Sound (206) 848-0363	38	250
Menlo Scientific (415) 528-1277	74	249
Music Supply (214) 946-8450	77	282
NSCA Expo '90 (708) 598-7070	52	—
OAP Audio Products (404) 945-1028	32	243
Opamp Labs (213) 934-3566	76	281
Panasonic/Ramsa (714) 373-7277	39	215
Portland Instrument (818) 500-0137	77	283
Quam-Nichols (312) 488-5800	8, 48	202, 203
Radian Audio engineering (714) 961-1213	41	242
Ramsa *(See Panasonic)*		
Rane Corporation (206) 774-7309	5	207
Samson Technologies (516) 932-3810	28	248
Seam Tech (415) 861-6011	76	280
Sonance (714) 661-7558	43	209
Sonic Systems (203) 356-1136	18, 30	240, 241
Soundcraftsmen (714) 556-6191	21	220
SoundScape (407) 876-6864	36	264
Stentofon (816) 231-7200	58	254
Tektone Sound & Signal (407) 844-2383	15	214
TOA Electronics (800) 843-4753	35	218
Yamaha Pro Audio (714) 522-9011	12-13	246

Readers... Contact the Manufacturers

Most suppliers are happy to provide additional information on products that interest you.

Use the Reader Service card opposite page 19, or just call the company. And when you call, say you saw it in *Sound & Communications*.

MARKETPLACE

Circle 282 on Reader Response Card

Circle 283 on Reader Response Card

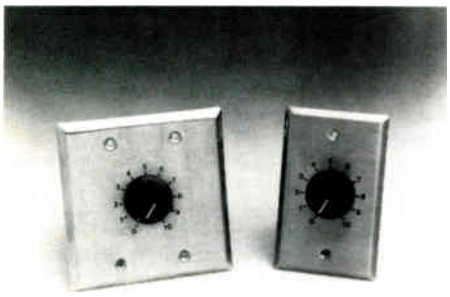
HELP WANTED

BUSINESS OPPORTUNITY

LINES OFFERED

Transformers Available

Monaural and stereo attenuators/ auto transformers for commercial, professional and residential sound systems are now available from Atlas/Soundolier. Ten steps with an attenuation rate of 3 dB per position plus positive "off" are provided and all switching contacts are silver plated. The complete assemblies are furnished on one and two gang steel plates.



Four Quadrants

The Burle TC8274 VidQuad is a four quadrant multiplexer that digitally captures the full video from four sources which may be unsynchronized. It then reduces these images to quarter screen size and combines them to provide a real time video output for display of the four inputs in four quadrants on a single monitor.

Floor Monitor

ProSystems has introduced the FP 121M floor monitor featuring ProSystems' Fibrelite construction which the company says makes the FP Series 20 percent lighter than comparable plywood speaker enclosures. The monitor is covered with gray carpet type material. The FP 121M is a two way system featuring full high pass and low pass crossovers, 12 dB per octave, passive. A jack panel on the side provides a full range input as well as biamp outputs.

People

Singer at Samson: Campbell at Ramsa

Soundtracs Sales

Samson Technologies Corp. has appointed Joel Singer product sales manager for the complete line of Soundtracs mixing consoles. In announcing the appointment, Scott Goodman, vice president of sales and marketing, stated, "Joel's experience in recording and live sound, along with his background in electronics and retail management, makes him the diverse type of individual we were looking for."

Promotion at Ramsa

Carla Campbell has been promoted to Eastern Regional Sales Manager of Panasonic/Ramsa Professional Audio. Campbell has been with Panasonic/ Ramsa for three years, most recently as manager of the telemarketing sales department. Previously she was with JBL for 10 years. Steve Woolley, national sales and marketing manager for Panasonic/Ramsa, said of the appointment, "I think Carla's years of experience combined with her personality, tenacity and loyalty make her the ideal person in this key sales region."

OUR NEW PAN/TILT LEAVES THE COMPETITION ALL WET.

When Javelin first set out to build the world's best pan/tilt system, we took a close look at the competition.

And made a fascinating discovery: other manufacturers' units which claim to be weatherproof really aren't. Particularly when hung in an inverted position, they can collect moisture—moisture that quickly leads to corrosion and failure.

Our new OMNI-Trak™ pan/tilt solves the problem with an exclusive sealing system that locks out dirt and moisture. And locks in reliability. Guaranteed.* So it keeps working even in the roughest weather.

Simple To Install.

But that's not all. OMNI-Trak™ also offers an optional built-in Accessory Control Unit. You get simpler, neater wiring (no outboard boxes), greater reliability and a savings of up to $900 per camera position. OMNI-Trak's™ mounting hole pattern makes it a simple "bolt-in" replacement for other models.

Easy To Afford.

Perhaps most impressive, OMNI-Trak™ gives you all this for a price that's actually less than its closest competitors. OMNI-Trak.™ Made in the U.S.A. exclusively by Javelin.

Remember, no matter how wet things get, it won't leave you high and dry.

JAVELIN ELECTRONICS
Division of American Trading and Production Corp.
19831 Magellan Drive, Torrance, CA
90502-1188 (213) 327-7440
(800) 421-2716 USA
(800) 528-9200 CA
Telex: 194860
JAVELIN TRNC

OMNI-Trak™ platform mates perfectly with Javelin's new all-weather, high-impact polymer camera housings.

*Contact Javelin for complete limited warranty details.

OMNI-Trak™ is a trademark of Javelin Electronics

© 1990 Javelin Electronics

TODAY'S JAVELIN

Circle 210 on Reader Response Card

Power. Play.

Loudspeaker design: To achieve high power handling capability, sensitivity suffered. You could get more power, but you had to accept less play.

Another Advance From JBL.
Ever since Jim Lansing flattened voice coil wire in the early thirties, JBL has continually edged loudspeaker design closer and closer to perfection. The introduction of our new 2200 Series models marks another JBL advance in transducer technology.

Vented Gap Cooling.™
As a voice coil's temperature rises, so does its impedance, causing power compression. Every dB of power compression translates into one less dB of output.

To reduce power compression and gain overall sensitivity, JBL created vents from the voice coil, through the magnet structure, to the rear of the loudspeaker. As the cone travels, heat is dispersed and cool air returned to the voice coil. The result, a true 600 watt loudspeaker with high sensitivity. You get twice the power handling plus greater output.

New SFG™ Magnet Structure.
Through computer modeling and simulation, the 2200 Series SFG magnet structure achieves optimum flux density and significantly lower distortion while realizing up to 20% weight reduction.

We Heard You Loud And Clear.
Whether you're looking for a mega-watt touring loudspeaker, or for a low distortion critical listening device, JBL has the model for you. All with the new SFG magnet structure with Vented Gap Cooling. The new 2200 Series models give you the best of both worlds. Power, and play.

JBL

JBL Professional
8500 Balboa Boulevard, Northridge, CA 91329 USA
A Harman International Company

Circle 201 on Reader Response Card