Lab Test: The J.W. Davis PA-70 Pataxial Loudspeaker

SOUND & COMMUNICATIONS

FOR CONTRACTORS, SYSTEM MANAGERS AND SPECIFIERS

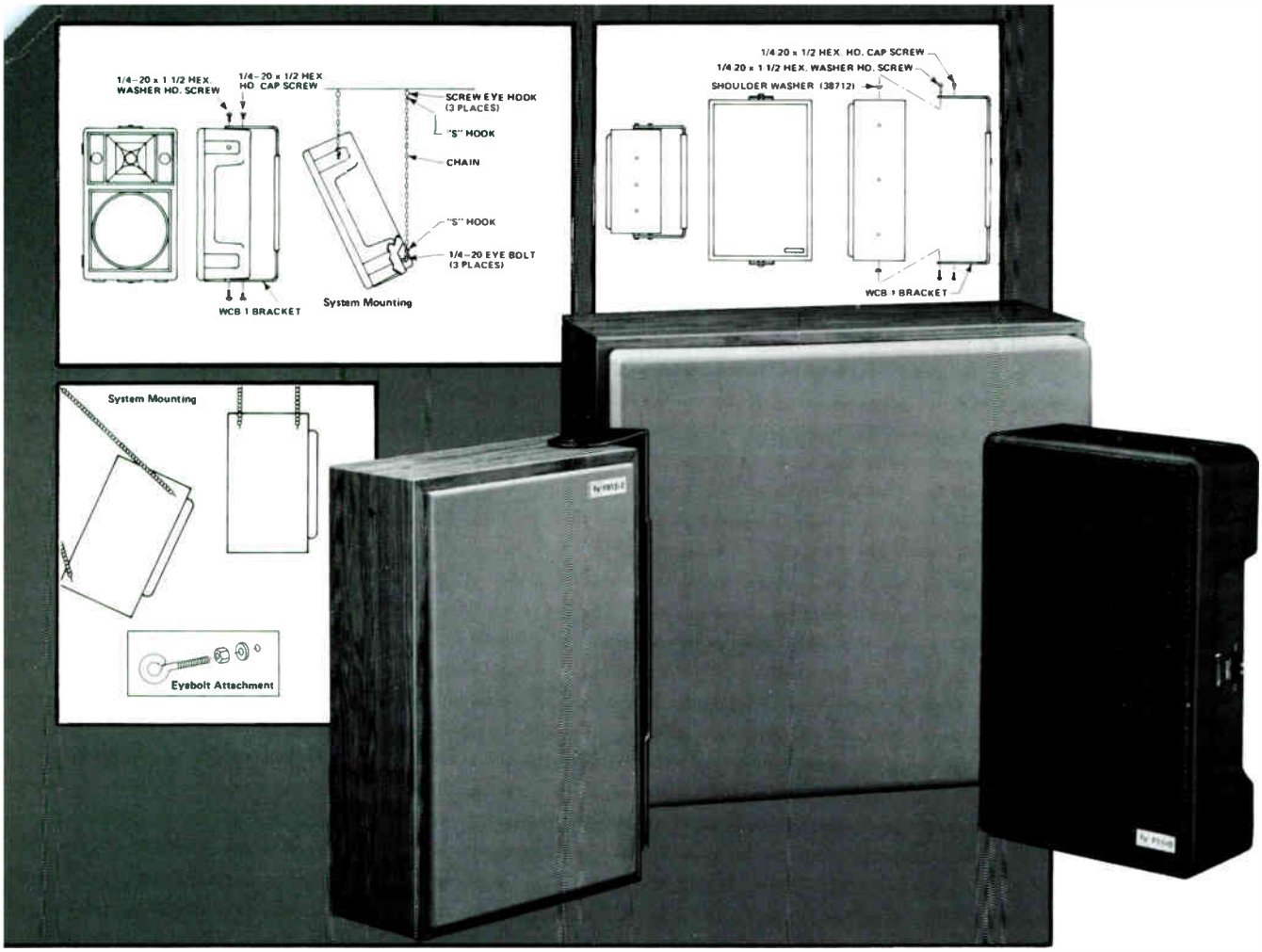
JULY 1986

UNDERSTANDING THE IN-HOUSE SOUND MAN

The Growth of Video Teleconferencing

Audio Level Controls

Installation Profile: Tropicana East



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The FR15-2, FR12-2 and PI100 speaker systems from Electro-Voice. Outstanding performers that install with ease and look as great as they listen. Let us tell you more. Contact Jim Long, Director of Marketing/Professional Sound Reinforcement, Electro-Voice, Inc., 600 Cecil St., Buchanan, Michigan 49107.

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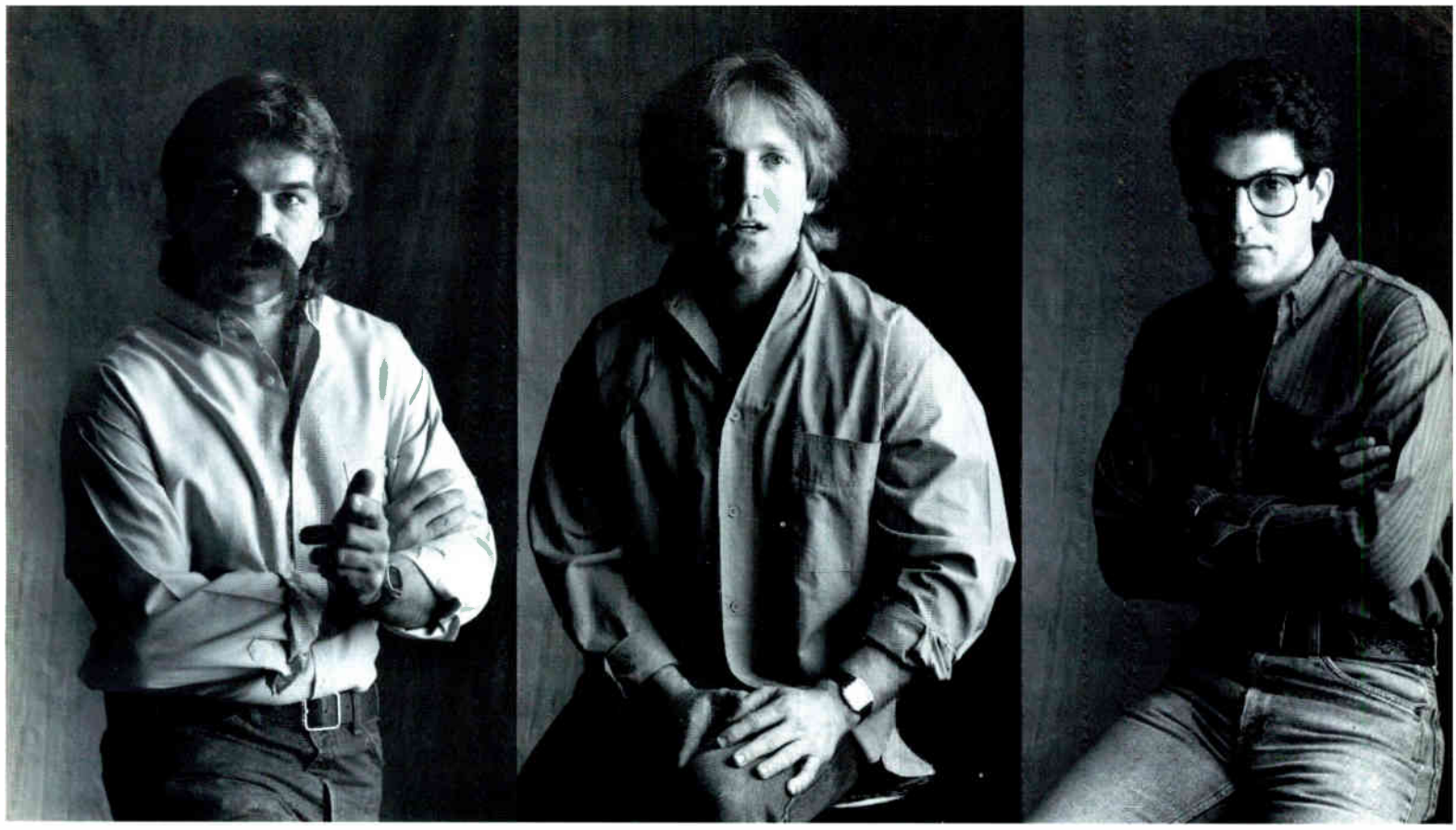

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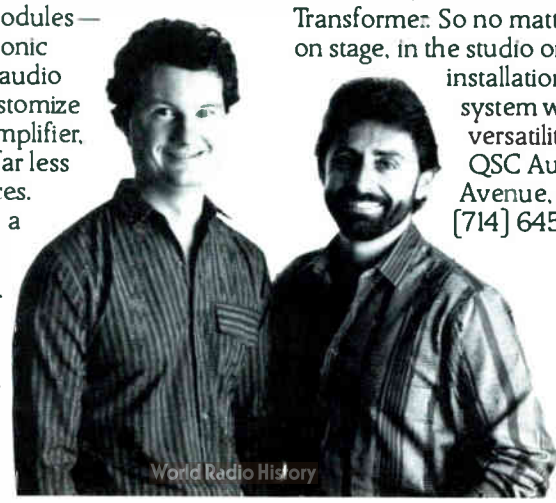
Three professionals whose careers depend on getting excellent sound—and though each has a different set of criteria, all agree on the benefits of QSC's Octal Accessories. QSC has pioneered the development of high power, low-profile amplifiers of unquestionable fidelity and reliability. And with the new Octal Accessories we've also pioneered versatility. QSC's unique Octal socket [which is standard on all Series One and Series Three amps] accommodates a whole line of passive and active Octal Input Modules—from input transformers to electronic crossovers and power limiters—audio accessories that enhance and customize the performance of each QSC amplifier, quickly and easily, and at a cost far less than buying rack-mounted devices. And when requirements change, a different QSC Octal module can meet that need. In this way QSC is making obsolescence a thing of the past. QSC Octal Products are space-savers too: each module attaches at the rear panel, out of the way without adding rack space. All Octal Accessories perform to the same high standards that distinguish QSC amplifiers, combining meticulous design considerations with real-world durability. Octal Modules include: XH-1 and XL-1 Crossovers, PL-1 Compressor/Limiter, UF-1 Universal Active Filter, T-1 Input Transformer, A-1 Octal Attenuator, and AT-1 Octal Attenuator with Input Transformer. So no matter where your sound matters—on stage, in the studio or in a custom designed installation, QSC provides your sound system with an invaluable lasting benefit: versatility. For more information contact: QSC Audio Products, 1926 Placentia Avenue, Costa Mesa, CA 92627 [714] 645 2540.

QSC Quality Service Commitment



Patrick Quilter
Vice President/Engineering.
QSC Audio.

Barry Andrews
President,
QSC Audio.

SOUND & COMMUNICATIONS

Volume 32 #7
July 1986

20

FEATURES

DEPARTMENTS

COLUMNS

ON THE COVER

Stephens Auditorium at the Iowa State Center is on the cover of this month's *Sound & Communications*. Jake Ewalt discusses his role as head of the audio department at the State Center in "Understanding the In-House Sound Man." See page 20.

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WHAT TO LOOK FOR WHEN YOU LISTEN TO A POWER AMPLIFIER.

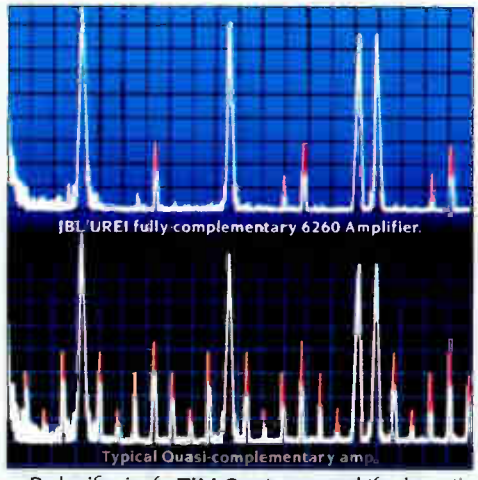
When it comes to evaluating amplified sound, seeing is believing.

In fact, when engineers judge the sound quality of an amplifier, they often rely on *two* precision instruments: the human ear, and the industry-standard Transient Intermodulation Distortion Test, because when measuring sound with T.I.M. what you see is what you get.

And what you see can be eye-opening. Amplifiers that seem to square off evenly spec. for spec., often perform very differently under the scrutiny of T.I.M. Pushed to their limits, many produce brittle, edgy or distorted sound especially during high frequency passages and sharp transients.

Many manufacturers deal with distortion by using massive amounts of feedback through a single overall feedback loop, placing greater demands on the amplifier and producing an inferior sound.

When we built our new JBL/UREI Amplifiers, we committed ourselves to designing the industry's purest-sounding amps that would not only score highest marks on the T.I.M. Test, but deliver the truest amplified sound ever heard.



Red spikes in the TIM *Spectrum reveal the dramatic differences in distortion output.*

Instead of sloppily force-feeding massive amounts of output signal back into input stages, and congesting it all into one circuit loop, we've established operating points at *each* gain stage. This allows signal purity to be maintained along the entire circuit. And permits optimized use of the type and amount of feedback for each individual gain stage.

In a simple analogy, the new JBL/UREI Amplifiers do each signal track right the first time, so that you don't have to fix it in the mix. The result is sound far cleaner than typical quasi-complementary and fully-complementary output stages only. And far more pleasing to the ear.

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The Influential Sound Man

by Nancy Peterson

Traditionally, when we think of sound system *design*, we think of the acoustical consultant and/or the audio consultant. When we think of sound system *installation*, we think of the sound and communications contractor. And when we think of sound system *operation and maintenance*, we think of the in-house sound man and/or mixer. As we all know, these roles are not always cut-and-dry. For example, it is not unusual for the contractor to also design a sound system for a small local church or a paging and PA system for the town's high school. But, when it comes to designing a sound system for a large facility—such as Indiana's Hoosier Dome, how much influence does the in-house sound man have on the design and specification? If you say little, you better think again. In many large facilities around the country, including Hoosier Dome, the in-house sound men play a major role in the design, specification, and installation of the systems installed in their facilities. And on some not-so-rare occasions, as we have learned, it is the in-house sound man who is the *designer* of the system itself. In this omnipotent position, the sound man will often have a say as to who installs the system (he might even have the *whole* say).

Recognizing the influence an in-house sound man may have on both installation and design of a system, *Sound & Communications* has taken a closer look at the role of this powerful position in this month's cover story "Understanding the In-House Sound Man" by technical editor Jesse Klapholz. Interviewing the sound men from two large facilities, Jesse investigates their roles as system operator, manager, system maintainer *and* even designer. At the Alberta Jubilee in Alberta, Canada, Barry McKinnon reports on the facility's sound system update which was designed *and* installed, with assistance from Gerr Electroacoustics, by Rick Parlee and Gerald Paglaro, the Jubilee's in-house sound men.

In addition, our Installation Profile this month is on a showroom sound system designed by Patrick Batzell, the in-house sound man at the Tropicana East Hotel & Casino in Atlantic City, NJ. The installation at the Tropicana is another example of the sound man's influence when it comes to design and installation. If you understand the sound man and his responsibilities, needs, and concerns, you are ready to meet those needs when they arise. To accomplish this, obviously, you must establish good strong lines of communication.

Proof Positive

"It's very important to work with the sound man during and after the installation," said Dick Bowman, director of sales and marketing for McKinney Associates, a sound contracting firm in Hayward, CA. "If you can find out early on what he (the sound man) wants and how he envisions using the system— it's a lot easier."

More important, according to Bowman, is that the sound man work closely with the consultant. "We've worked on jobs where the consultant designed a system with little or no input from the sound man. The system wasn't all what the sound man expected, which turns out to be even a bigger headache," Bowman said.

Part of the communications plan at McKinney Associates is an extensive follow-up program. "First of all, we warrant everything for one year. And during that year we keep in constant communications. About three months before the warranty is up, we offer the facility a service agreement. After the year, we still call the facility every 45 days or so. We do this partially because we find there is a large turnover in the audio department. Therefore, we have to keep in contact to let them know who to call to maintain the system."

Bowman believes—and we agree that good communications between the contractor and the in-house sound man is the ticket to sales and success!

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TURBOSOUND AND BSS MERGE IN ENGLAND; US DISTRIBUTION WILL REMAIN SAME

The Turbosound Holding Group, parent company of America's Turbosound Inc., has announced a merger with Brooke Siren Systems (BSS) in England. However, both companies are committed to retaining their successful U.S. distributors here and will not merge in this country, according to Daniel Abelson, vice president of Turbosound Inc., which distributes the loudspeaker enclosures in this country. BSS will continue to be distributed here by Klark Teknik, he said.

Abelson remarked, "Like the products, the two companies see nothing but a seamless crossover as the merger takes place. Turbosound manufactures high quality loudspeaker enclosures and BSS manufactures the best crossovers—it's a natural combination. Our engineers have been in communication for some time in England, and they share many values."

AMERICAN TRADING, PARENT COMPANY OF ATLAS & SOUNDOLIER, ACQUIRES JAVELIN

American Trading and Production Corporation, parent company of Atlas Sound and Soundolier, recently acquired Javelin Electronics, a California-based manufacturer of CCTV equipment. According to an Atlas spokesman, there are no plans for joint operations between either Javelin and Atlas or Javelin and Soundolier. According to American Trading, the Javelin management, including president Donald T. Heckel, will remain the same.

Charles Koblentz, American Trading senior vice president, said: "Javelin is an outstanding company with a dedicated and capable staff and a line of products which we are pleased to have as a part of American trading. We believe that Javelin has an excellent future and are confident that as a part of American Trading it will enter a new period of rapid development."

Javelin's line includes solid state cameras, special lenses, microscope attachments, and monitors.

MATSUSHITA ELECTRIC ESTABLISHES PANASONIC BROADCAST SYSTEMS

Matsushita Electric has established a new corporate branch, Panasonic Broadcast Systems Company, dedicated to the sales, service, and development of broadcast systems, including the new MII universal broadcast format. Kiyoshi Seki, president of Matsushita Electric, said: "We intend to respond to the highly specialized requirements of broadcasters by assembling a staff which is knowledgeable, sensitive to the service and training needs of the industry, and capable of developing quality products." According to Seki, the chief operating officer of the new company will be announced in the near future. Takashi "Tak" Urabe, Panasonic Industrial Company senior vice president, has assumed the position of vice president of the new Panasonic Broadcast Systems Company. With a staff of 60, the new company will include two divisions, one handling sales and marketing, the other handling service and engineering, including new product development.

NEC TELEPHONES MERGES INTO NEC AMERICA

NEC Telephones, a wholly-owned subsidiary of NEC America, has merged into the parent company, NEC America. As a result of the merger, NEC Telephones' functional responsibilities have been divided into two new divisions of NEC America—the Business Systems Sales Division and the Business Systems Division.

Gerard Meyer, formerly president of NEC Telephones, will serve as a senior vice president of NEC America and as the general manager of the Business Systems Sales Division, overseeing sales of PBX, key phone, and information management telecommunications gear, the same line sold by NEC Telephones.

William Gorey will head the Business Systems Division as vice president and general manager, with Rikio Sato as assistant vice president and assistant general manager. As head of the Business Systems Division, Gorey will be responsible for engineering and for providing technical support to the customer.

ICIA ANNOUNCES RESULTS OF DEALER PROFILE SURVEY

The International Communications Industries Association (ICIA) has announced the results of its 1986 Dealer Profile Survey. The results show that ICIA's dealer members sell and rent a variety of products, including audio-visual, video, photographic, satellite, and computer equipment. Many dealers also provide services and repairs. Of the dealers surveyed, 91 percent sell hardware, 43 percent sell software, and 78 percent rent equipment. Sixty percent of the hardware dealers said that half or more of their business consists of hardware sales. Audio-visual products are sold by 87 percent of the dealers. A further breakdown indicates that 73 percent sell video products, 72 percent sell audio products, 24 percent sell computers, 22 percent sell photographic equipment, 12 percent sell computer graphics products, and 9 percent sell satellite equipment. The breakdown of software sales shows that 85 percent of the dealers sell audio-visual software, 80 percent sell pre-recorded videotape or videodiscs, 62 percent sell blank videotape or videodiscs, 60 percent sell computer software, and 16 percent sell film. The results indicate that the rental business "has become slightly more popular among ICIA dealer members this year." More than half of the dealers report that they perform services such as consulting and production. ICIA dealer members sell primarily to the business and industry market (88 percent) and to the education market (81 percent).

Other markets served include government (62 percent), medical (56 percent), religious (53 percent), and consumer (40 percent). Other markets reported, but for which ICIA provided no statistics, are hotel/convention, association, broadcast, and theater.

JBL SPONSORS AUDIO ENGINEERING CONFERENCE & WORKSHOP

JBL Corporation held a three day seminar May 20-22, which was attended by over 300 contractors and consultants, that focused on the basics of sound system design and product applications. The seminar, which was held at the Marriott in Warner Springs, CA, covered several topics including grounding and powering techniques, rigging and installation of systems, speech intelligibility, sound system design using a PC, mixing consoles and their applications, and loudspeaker design and how it works. In addition, evening workshops were held which included topics such as speaker enclosure construction, the arraying and hanging of speaker systems, video projection, room acoustics, and acoustic/system measurement and analysis.

"This is not the first time JBL has ever held a seminar," said Ken Lopez, vice president of sales at JBL, "but this was probably the biggest and most extensive seminar we've ever held. The individual workshops were given by a variety of nationally-known consultants and I would say that nine out of 10 of the seminars were excellent. It was a very, very successful conference. We've already booked space for next year."

JBL also took this opportunity to introduce products to its line including a UREI digital delay, concert series products, and the company's first professional video projection unit.

ATTENDANCE PROMOTION FOR INTERCONNECT '86 OFFERS $3000 IN PRIZES

The United States Telecommunications Suppliers Association (USTSA) has developed a special promotion aimed at insuring good attendance at Interconnect '86, which will be held at the San Mateo Expo Center in San Mateo, CA, August 26-28, 1986. To implement the promotion, dubbed "Team Up To Win," free invitations to the show will be sent to all exhibitors, and the exhibitors will in turn send these invitations to their customers. When attendees pick up their badges in the registration area, the invitations will be validated and deposited in a prize drum from which a lucky attendee's name will be drawn daily. The lucky attendee wins $500 in cash and the salesperson who distributed the winning ticket wins $500 in cash.

LETTERS & OPINIONS

TROUBLE-FREE MICRO

Apparently your May issue further outlines the controversy on health care facility microprocessor systems, per Mr. H. Kelsey Page's letter. However, there are still several points that should be covered in defense of Ronald Rosen's initial editorial.

First, one must differentiate between full-service hospitals and health care facilities such as nursing homes, rest homes, and convalescent centers. Hospitals generally require much more sophistication in nurse call systems—features and functions that other less demanding health care centers simply do not require or cannot afford. They usually can meet their requirements by the use of a basic two-way intercom to each room, including bath, and an LED indication at the nurses station of the calling station. These systems are usually not microprocessor based because of cost.

However, if any significant features and functions are required, then a microprocessor system is the answer. On the market today are systems that have visual and audio capability, sufficient for most hospital needs.

But it is the cost and service statements I wish to address. Microprocessors tend to be more costly in installations with few stations—as the number of stations goes up, the cost per station goes down. And the wiring cost is an extremely important consideration. A fairly typical multiple station open-voice/telephone intercom may require some 30 wires, a multi-featured microprocessor system can be installed with one or two twisted pairs.

As for service—and this may sound too good to be true but it is—we find microprocessors to be the most trouble-free systems we have ever sold. Once checked out and installed properly, they are as fool proof as any user could wish. And they do the "simplest things" without problems in addition to the more complex functions!

We have many systems on our naval ships, for example, with an absolute trouble-free record over several years. I don't think referencing $554 toilet seats and $700 hammers is a valid reason to question the government's specifying microprocessor intercom systems. They do so because of reliability, multiple functions and features.

To conclude, microprocessor technology is the wave of the future in intercom and nurse call. Aiphone now has six separate systems, including a new one using each station as a self-contained microprocessor—no central exchange unit needed. As a result, the cost per station is dramatically lowered.

Aiphone is really quite unbiased on the subject of which system to use. But as the industry progresses, the customer demands more and more in the way of features and functions with less service. In fact our finding is that the ultimate user is more and more willing to pay more to insure less service. That being the case, microprocessors are and will be more and more the choice.

—Jim Morrison
National Sales Manager
Aiphone Corporation
Bellevue, WA

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Investigate Toa's new **HS Series**, the complete line of loudspeakers for clear, transparent vocal and music reinforcement. The HS Speakers combine with the 900 Series and the 500 Series Paging/Music Systems to provide reliable, quality sound.

These rugged, two-way and three-way loudspeaker systems can be painted to match any decor. They provide built-in mounting hardware for ceiling suspension, and input terminals for full-range or bi-amp operation.

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by S. Ann Earon
Telemanagement Resources Int'l, Inc.

Teleconferencing Systems

TRAINING THE CLIENT

With the advent of computers, products and services have become more sophisticated. Even though technology has allowed things to be come smaller and more efficient, users are often confused by this sophistication. Vendors are touting ease of operation and maintenance and are often overlooking the education of the user.

As a vendor, how often do you sell a product, deliver it to the customer, provide minimal training, and go on to your next sales?

Benefits

Training is being overlooked. The benefit of training is additional sales of a product or service. If users feel comfortable with a product, understand how to use it and, more importantly, understand how the product or service meets specific business needs, the vendor will benefit from increased usage and sales.

As an example, teleconferencing technology will be used to show how a four phase approach to training can improve usage and increase sales.

Teleconferencing, defined as two or more people communicating electronically from locations separated by distance or by distance and time, is a technology that has been growing as transmission and hardware have become more cost effective. A teleconferencing system can be comprised of a variety of components including audio, audiographic, video, and computer conferencing technology. The more complex the system the greater the need for training.

The time spent effectively training users about a product or service will be rewarded with satisfied customers, minimal vendor servicing, and increased sales. Make customer training an integral part of doing business.

Types of Training

To effectively meet customer's needs vendors should incorporate four types of training into their product or service offering: maintenance training, facilitator training, general user training, and applications training.

Each type of training serves a specific purpose in the education and satisfaction of the customer.

Maintenance Training

To avoid unnecessary service calls, often times made to solve minor problems, it is important to provide maintenance training to a designated person or persons within the customer's organization.

Maintenance training should be hands-on training to explain the important components of a product or system and to show the customer representative how to trouble-shoot a problem. To be successful, maintenance training should include written documentation along with the hands-on experience. It is important that any documentation accompanying the product be written in easy-to-understand terms. Too often vendors get caught up in their own terminology and forget to define, what may seem like simple, words to the customer.

Facilitator Training

With a teleconferencing facility it is often important to have an individual responsible for the day-to-day activities associated with a teleconferencing room. These may include room reservations, room operations, user training, usage tracking, and system evaluation. Other types of system installations, e.g. computer facilities, may also require a facilitator.

It is important for vendors to train facilitators. If these individuals are not properly trained, the success and ongoing usage of a product or system may be in jeopardy. Training should consist of hands-on experience and documentation. Documentation given to a facilitator may be passed along to other facilitators or users. it is important to make the documentation easy to read and follow so basic system operation can be quickly mastered.

General User Training

Any new product or system introduction requires some training for users, even if it is nothing more than general familiarization. Vendors who provide a user training session as an automatic component of their product package are offering a competitive advantage. Customers realize that new technology has an associated learning curve and that it takes time for users to feel comfortable with a new way of doing business. This holds true for everything from a new calculator to a new computer.

Vendors who offer classroom training to users have a better opportunity for ensuring successful usage of a product. Students can discuss their concerns and questions can be answered for everyone at one time.

Unfortunately, most vendors don't go far enough. Users are trained to push buttons and make products run, but rarely does anyone explain the value of operating the product in the first place. This leads to the last, and most overlooked, form of training...

Applications Training

Think of the many times you've been approached by a salesperson to buy a product—at supermarkets, car dealers, department stores. Often your response has been: "I don't need that!" Exactly, no one has shown you the value of the product—how it applies to your situation, how it meets your needs.

Application training is designed to show customers how a product or service can be applied to meet specific applications and needs. If vendors would look past the issue of selling a single product or service to the issue of properly training the cusomter, more satisfied customers and increased sales would exist.

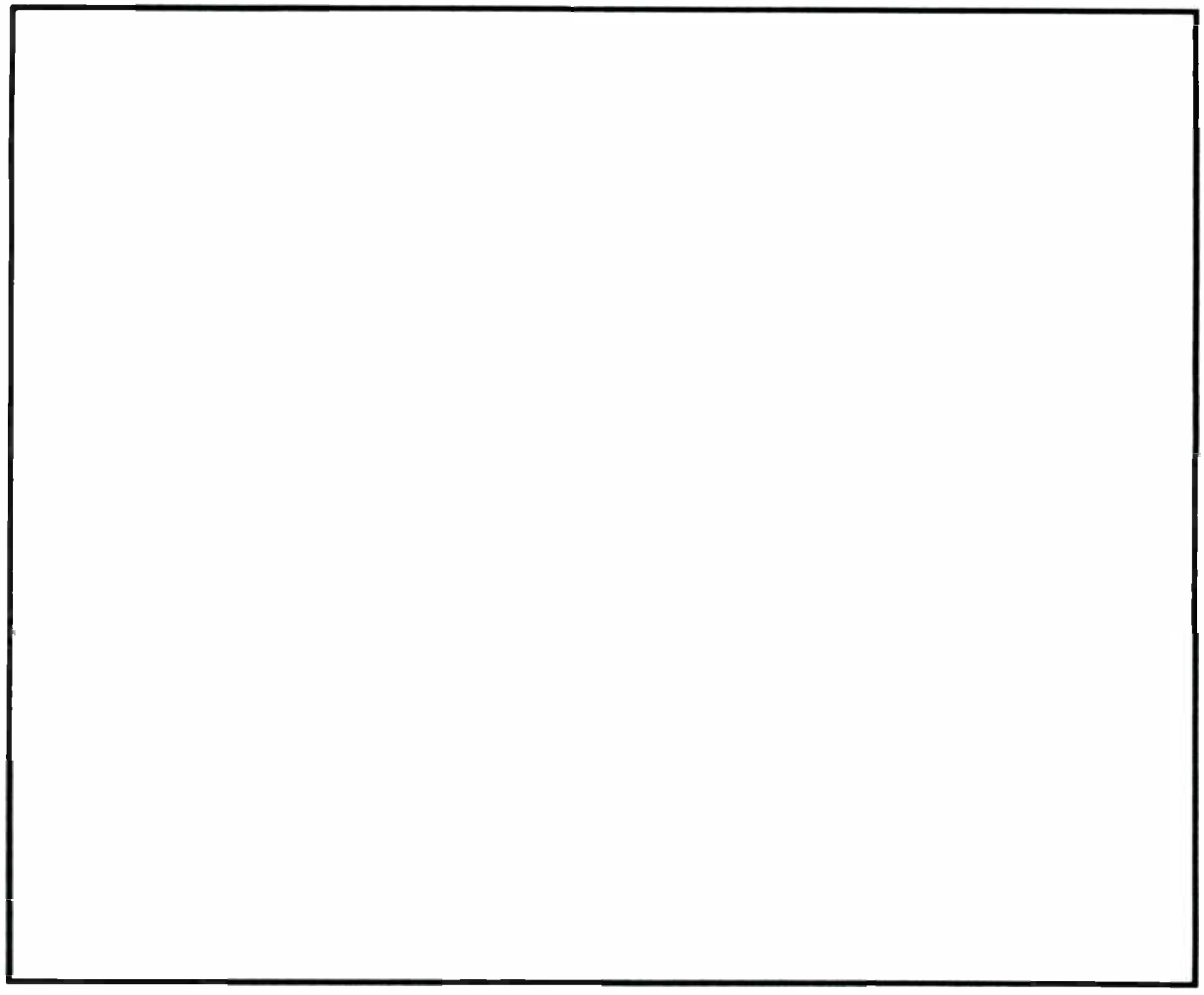
Effective applications training means the vendor must understand the customer's industry and needs (See June *Sound & Communications*, page 10, "Assessing Your Client's Needs"). A general applications training package should be developed and selected sections applied to customers within specific industries (e.g. identify the applications of the product for an engineer in a manufacturing company).

Methodology

To keep vendor costs low and minimize customization, vendors should develop a generic training package that will allow for minor customiza-

(continued on page 35)

PICTURED BELOW IS OUR IDEA OF THE APPROPRIATE SPEAKER INVENTORY FOR A COMMERCIAL SOUND CONTRACTOR



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From Potentiometers to Computers

AUDIO LEVEL CONTROLS

As most of you know, audio level controls are available in an ever increasing variety. Almost every day somebody comes out with a new device designed to make a particular application easier to install. Level controls are available from the standard potentiometer to today's large and highly sophisticated computer controlled systems.

This article will discuss the criteria required for proper level control, and the various pieces of equipment available to accomplish various tasks.

Electronically reproduced sound can be broken down into six basic functions: transducers—microphones and speakers, amplification, mixing, shaping, distribution, and storage. The most important parameter common to all six functions is proper level. Although good frequency response and distortion characteristics are important, they don't help much if the amplifier stages are being over or underdriven. If only one preamplifier stage goes into an overdriven state, the entire audio program suffers.

Proper level means the setting that has sufficient gain to do the job, and still allows a reasonable amount of headroom. With a minus 40 dB input signal, a preamplifier set to 20 dB of gain has 20 dB more headroom than the same preamplifier set to 40 dB of gain. While this setting may not be practical in some applications, it does demonstrate that no amplifier should be set for maximum gain. Remember, the goal is to get the program material through the entire audio system, without overdriving any amplifier stage.

A standard audio system flow chart, **(Figure 1)** with recommended levels marked in dB, is supplied as a reference to help in the design of a sound system.

The mathematical problems encountered in designing a sound system can quickly be seen by comparing several types of devices usually found in different parts of the system. Generally speaking, audio power amplifiers have a *useable* dynamic range of 20 dB. A 100-watt power amplifier will go from delivering 1 watt to delivering 100 watts, when the input signal is increased by 20 dB.

Input devices, such as microphones, have a *useable* dynamic range of approximately 50 dB. Tape machines and phonoraphs have a range over 40 dB, and compact disc players almost 90 dB.

It is easy to see how difficulties arise when laying out a sound system. When there is no full-time sound man riding gain on a system, the best way to make the input and output devices compatible is to compress or limit the program material. This is called "dynamic processing." This processing should be designed into every sound system, and should be done as close to the origination of the program material as possible.

Some installers have tried to adjust a system with almost all of the necessary gain in a single preamp or amplifier stage, with all of the subsequent stages running at low or zero gain settings. A perfect example of this would be a mixer with all the inputs turned up to full gain, and the outputs turned almost completely down. The input preamplifiers would be 20 dB closer to overload than is necessary. Also, although most equipment manufacturers have taken this into account when they design their equipment, operational amplifiers are more stable when some gain is allowed to remain on the amplifier.

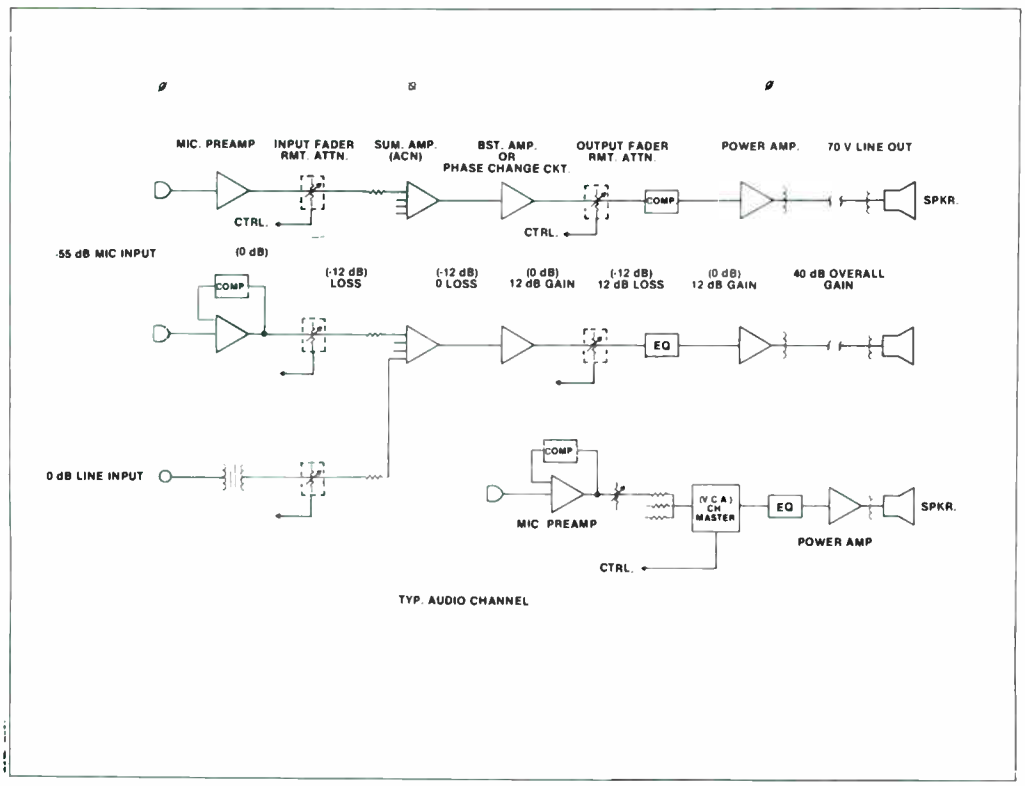

Figure 1

Compressor/Limiters

Compressors and limiters come in a wide variety of shapes, sizes, and combinations of features. The compressor portion of each unit will allow the output to increase at a slower rate than the input is increasing. Usually the ratio of input to output is 2:1. The limiter portion of these units will not allow the output to rise above a predetermined level, regardless of what is happening at the input.

The ideal unit will contain both of these features. This will allow the output to rise slower

by William Murphy
ProTech Audio Corporation

than the input, for a higher overall presence level, and still limit the output at the predetermined level, for protection of the following amplifier stages. By dynamically processing the signal at the input, you will have total control of the entire audio signal path.

Potentiometer

The potentiometer has been around since the beginning of the Electronics Age. It serves the purpose for which it was designed (voltage dividing) very well. Using today's nomenclature, the potentiometer is considered an analog device. It is dedicated to a particular circuit, and it is not practical to remove a pot from a circuit without drastically altering the circuit's operation. Also, ganging of pots for level control from multiple locations (lecture halls, AV presentation rooms, etc.) becomes difficult, and somewhat complex, circuit wise.

The main advantages of the potentiometer are the simplicity of installation in simple circuits, and the infinite variability of the gain. Design factors that must be considered when using pots are: the required power dissipation, the total resistance needed for proper impedance matching (Don't put a 600 ohm pot in front of a 10 K input.), and the resistance taper desired for smooth attenuation.

Remote Attenuators

Remote attenuators come in several different types: LDR units, LED/LDR units, and VCAs. The oldest remote attenuator is the LDR unit which works in conjunction with an incandescent light source. A potentiometer, located in a remote location, controls a low DC voltage to the incandescent light source which is shining on several light-dependent resistors that are aligned to create an "H" pad or a "T" pad. This type of device may be put into the audio program chain anywhere after the first microphone preamplifier, and before the power amplifier. The better devices are calibrated to maintain a constant 600-ohm impedance throughout the attenuation range (−3 dB to infinity), on both the input and output. If this type of device should lose power, it will still pass signal, but usually at a 12 dB lower level.

The proper alignment procedure would be to set the remote attenuator to provide 12 dB of attenuation, then set system overall gain to the desired level. This will allow the remote attenuator to both raise and lower the audio level, as different conditions are encountered. A stereo unit may be used to control a balanced line. The main advantage of this device is that the audio signal remains in the equipment rack. Also, the units are relatively low in cost, and may be added to an already existing system.

LED/LDR Remote Attenuators

LED/LDR units are light emitting diodes combined with light dependent resistors configured to form a "T" pad. The unit is all solid state, which implies that they will be more reliable than the LDR units using incandescent light sources. However, experience in the field would indicate that both types of units have about the same mean-time-between-failure. Both should work very well for many years. This type of device is usually found packaged as an add-on to already existing equipment. It is very popular with mixer manufacturers. The chief disadvantage of this packaging is that you must buy the unit from the manufacturer of the equipment already in the system. This has a tendency to increase prices and limit availability. The main advantage to using LED/LDR attenuators, is that they work very well, and again, will keep the audio in the equipment rack.

Voltage Controlled Amplifiers (VCAs)

By now, I am sure that most of you have read numerous articles describing the VCA and its many uses. The VCA is the most versatile of all remote level controls. It is not only

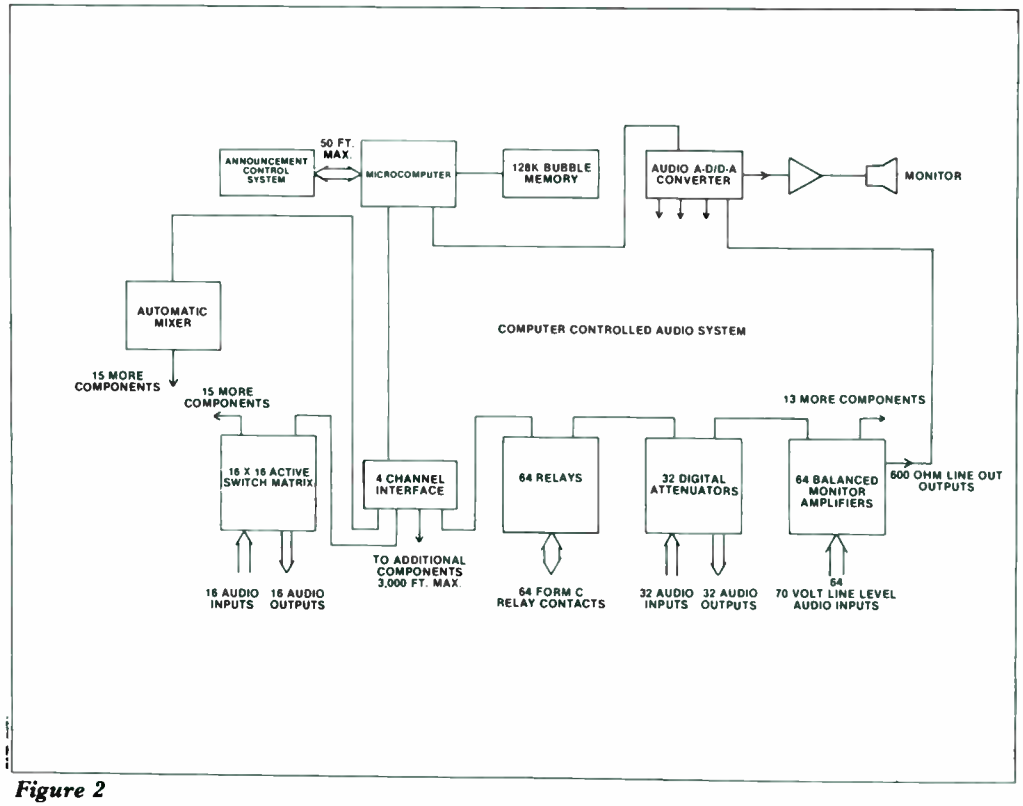

Figure 2

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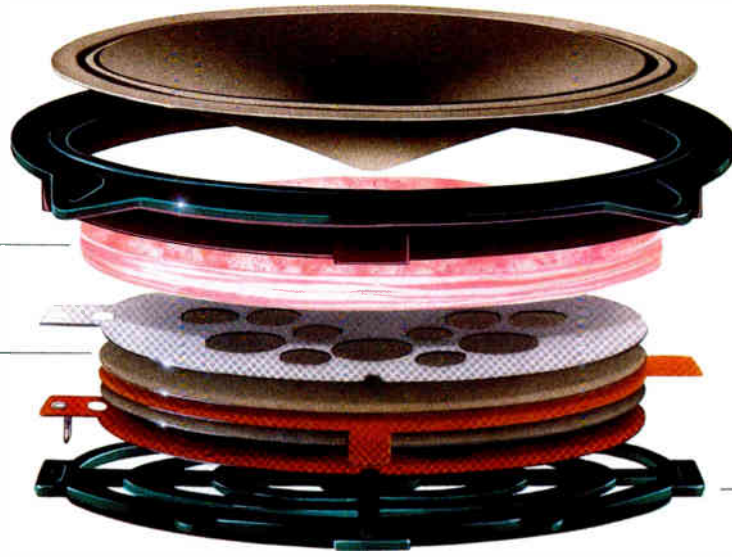

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possible to attenuate an audio signal with a VCA, but you can also add gain, which is a great benefit in many applications.

The available gain in the VCA can be used for applications like line amplifiers, making the unit serve a double purpose, and therefore making it very cost-effective. For the cost of a good line amplifier, you can purchase a VCA and achieve line amplification and remote control for the same price.

It is possible to group or gang many channels in an almost limitless variety, allowing easy configuration of complex control systems. The voltage controlled amplifier is used to create control circuitry in many of today's dynamic processors such as compressor/limiters, noise gates, and expanders. The VCA may be purchased in chip form, module form, preamp form, or complete channel ready form, with the price varying according to the completeness of the format.

Multiple position, pushbutton switches may be substituted for potentiometers when restriction of level selection is desired. By wiring selected resistive pads onto the pushbutton switches, only preselected gain settings may be achieved. This type of restriction has prevented call backs on installations where an overzealous catering manager has caused damage to a system by improper adjusting of power levels.

While the VCA is relatively easy to use audio wise, the power supply requirements are a bit more complex than are the LDR type attenuators. The VCA requires +5 volts for attenuation, −2 volts for gain, and ±15 to 18 volts for the operational amplifiers. Wiring all this together can be a bit burdensome.

A single pot may be used to control many VCA channels, providing they are referenced to the same power supply ground.

Automatic Level Controls

This type of device is designed to match the sound system level to the ambient noise conditions as they vary throughout the day.

A voltage, indicative of the present ambient noise level, is fed into the sensing ports of the ALC. The unit will then process this information and adjust the power amplifier output to the required level.

This particular unit incorporates a limiter on the announce channel, for an even tighter control of the sound system level.

Ramp Controlled Amplifier

The ramp controlled amplifier is a relatively new combination of amplifier, VCA, and ramp generator all in the same module. The overall gain of this module is set via the trimpot mounted on the printed circuit board. Then, a momentary double throw switch is mounted in a remote location. By pressing the switch, the gain position of the amplifier can be ramped up or down. This particular module may be ramped ±20 dB. The advantage of this type of circuit is that many switches may be mounted in various locations, and each can control the audio level since the switch action is momentary. This would be an ideal circuit for venues requiring level control from different locations such as lecture halls and boardrooms.

Computer Controlled

The advent of computer controlled audio in the early 1970s allowed many long production processes to be shortened and subsequent setup time to be brought to a minimum. Most of the original research and design work was done by manufacturers of recording studio equipment. This R&D effort was feasible for two main reasons: studios are always looking for something new and mix-down time is usually billed at half the rate of recording time. By freeing up the studio through less required time for mix-down, profits went up with the increased booking of recording time. These increased profits were available to help pay for the new equipment.

In the last five years, packaging technology has advanced to the point that almost anyone can now afford some kind of a computer. A simple computer with a $100 add-on board can be used to control audio channel on/off and level functions. These computers can easily be made to work in conjunction with voltage controlled amplifiers or ramp controlled amplifiers.

If a more complex or sophisticated system is required, these systems including software are now available from at least one manufacturer—Innovative Electronic Devices (IED) which specializes in the development and manufacturing of computer controlled systems.

(continued on page 48)

by Marc Beningson
Jaffe Acoustics

THE IMPORTANCE OF SHOP DRAWINGS

Shop drawings are a part of nearly every sound system specification package. Within 60 to 90 days after the award of a contract from an owner or general contractor, the sound and communications contractor is required to submit shop drawings. Sound system designers and acoustical consultants often have different expectations and requirements for this major submittal and many contractors try to submit as little paperwork as possible, so as to spend as little time and money up front as possible. Unfortunately, this has the effect of causing problems later in the project—problems which will cost someone (quite often the contractor) more money down the road.

Resistance to shop drawings usually takes the form of "the work will be completely to spec and, therefore, no shop drawings are required." Nothing could be further from the truth. Shop drawings serve as confirmation of workscope and, when approved, provide protection for the contractor as documentation of the work to be performed. Therefore, it is in the best interest of the contractor to make this important submittal as detailed and as accurate as possible.

The most significant single problem with any project is misinterpretation of workscope. The sound system designer prepares specification documents which are intended to describe completely the system design and the scope of work for the contractor. The contractor must make a number of important decisions in how the key aspects of the project will be executed. No specification is a perfect or complete recipe for the construction of a sound system and the contractor must engineer and coordinate the remaining details depending on the specification documents. The key functions of shop drawings are to indicate to the system designer, acoustical and other consultants, and other contractors, what work is intended to be performed, how that work will be performed, and what work is required from other trades in order to complete the project.

Shop drawings should demonstrate the contractor's understanding of the design intent. They should be a contractor's way of saying: "This is what I understand the system to be. This is my interpretation of the design specifications. This is the equipment I intend to provide, and this is the manner in which it will be mounted, wired, powered, or grounded. For the price I have submitted, this is exactly what I intend to do." Any discrepancies can then be resolved before the system is partially assembled.

Copies of original specification documents are not shop drawings and should be rejected. The contractor must draw up templates for stamping and engraving custom plates and panels, for example, and specification drawings are rarely detailed enough for this. The actual construction templates should be submitted to show exactly what is to be provided.

The shop drawing submittal should not be just drawings. Lists of equipment should be included—not only of the major equipment items, but also those items "not specified but required to provide a complete system." (Most contractors are undoubtedly familiar with this phrase.) Wiring conventions and color coding, connector pinouts, and termination schedules are all critical information which should be submitted. If the contractor engineers the entire project in detail while preparing the shop drawing submittal, there will be two unexpected bonuses. One is that these drawings can be used by shop and field technicians to maintain consistency throughout the execution of the project. The second is that if all goes according to plan, these shop drawings can be easily converted into as-built drawings. As-builts are usually required as part of the final system documentation for the owner, and, even if not required, good as-built drawings facilitate service of the system. A service contract over a number of years can be an additional source of income.

Shop drawings are most important to the contractor because they are a major project milestone in new construction. Frequently, full approval of the submittal is authorization for a major payment to the contractor. Providing good shop drawings reflects well on a contractor and his abilities—it is good engineering practice and it makes simply good business sense to submit the drawings correctly.

"This is what I understand the system to be; this is my interpretation of the design specifications. This is the equipment I intend to provide, and this is the manner in which it will be mounted, wired, powered, or grounded. For the price I have submitted, this is exactly what I intend to do."

(Top) Stephens Auditorium at Iowa State Center; (right) speaker cluster above score board at Hoosier Dome; (right, center) full view of Hoosier Dome; (far right) Mayor's Breakfast at Dome.

the ticket to sales and success

UNDERSTANDING THE IN-HOUSE SOUND MAN

by Jesse Klapholz

In the sound contractor's daily work, he must maintain solid and constructive relationships with a number of people. Consultants, electrical and general contractors, manufacturers' reps, and the manufacturer are among the obvious people. Also very important—yet often overlooked—is a facility's in-house sound man. Although many contractors do not realize it, the in-house sound man often plays as influential a part in the design and installation of a system as he does in its operation. Maintaining good communications with the sound man can be the contractor's ticket to sales and success.

Understanding the Sound Man's Role

The sound man has a ubiquitous position exemplified by his varied responsibilities and tasks. To better understand the sound man's role and responsibilities, let's look at how the personnel hierarchy is set up in most facilities.

Usually any hall or auditorium will have someone called the TD (technical director) who is responsible for all the technical aspects of the operation of the facility. It is the TD who will coordinate and serve as the liaison between the 'techs' and the management. Long term projects and budgeting are also usually administered by the TD. Directly under the TD are the head carpenter, the electrician (or lighting designer), and the sound man. While these are normally separate positions, smaller facilities often incorporate these responsibilities into fewer positions. Similarly, larger operations may expand the number of positions—but the responsibilities are the same.

The three department heads will coordinate their respective crews' work with the TD. Electricians will have to run wiring for the sound crew, carpenters will build equipment storage, the stage crew will help set up systems, etc. A good working relationship with the rest of the staff and the support of his crew enables the sound man to successfully do the job.

Designing the sound system

Before they are built, most facilities start with a concept which is brought to an architectural firm to turn into a finished design. Eventually, the acoustics become a consideration and a sound system will have to be designed.

When projects are built from the ground up a sound man is usually not involved. However, if the owners have a sound man on staff at another similar facility he will often be involved to some degree. The sound man's role can vary from only supplying input on what the facility will need from an operational standpoint, to actually being the consultant.

Many facilities that are built without input from the sound man who will eventually "fly the plane," inevitably need many last minute changes. Often in talking with the audio techs of a facility we have read about, for example, we learn that the Frasimadatil loudspeakers installed by Rambo Sound were never even used.

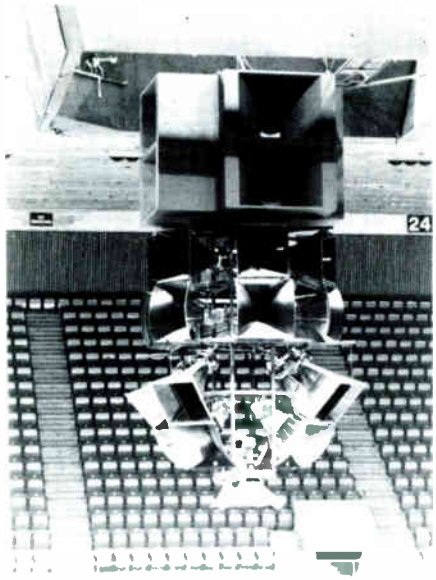
Specifications are the key ingredient to the design/installation recipe. Whether there are reams of paper and piles of plans, or simply a hand drawn sketch and a few words—it is still a specification. It is with this spec that the owner will make decisions regarding the acceptance and payment for a new sound system. The spec will become part of the contract between the contractor and the owner. The contract, based upon the spec, will supersede all previous agreements either written or oral.

Both in the preparation of the spec and its execution there is more than just the system specifier and the owner. The architect, engineer, electrical contractor, manufacturer, and the sound contractor are all key players.

Again in smaller venues all of these functions may be handled in-house. Nonetheless, all of the responsibilities and functions of these positions remain the same, whether they are served internally by one person or externally by a half-dozen firms.

In some of the worst situations, however, it is not a sound man or consultant, but a *friend* or *relative* of the owner that is hired as the sound design "expert." This happened recently when a major real estate developer decided to build a large hotel/entertainment complex. The "expert" brother-in-law specified two extremely underrated sound columns for a large theater. Needless to say, the system was totally inappropriate, and the contractor was left holding the bag. At that point the communications between the contractor and the new in-house sound man turned into a fiasco—the brother-in-law was nowhere to be found.

Even though the sound man is in the middle of the hierarchy, he undoubtedly comes to the top of things when the sound system mysteriously squeals in the middle of a program or performance.



The cluster at Hilton Coliseum.

Good Contractor/Sound Man Relations

An example in which good contractor/sound man relations prevailed is the Indiana Convention Center and Hoosier Dome.

The Convention Center opened in May of 1972 with three exhibit halls, 17 meeting rooms, and a 144 by 92 foot ballroom. Quentin Quinn came on board as the sound and special lighting supervisor in 1974. During the early years of operation the Indiana Convention Center had 25 meeting rooms, three exhibit halls, and a 2,000 person capacity ballroom. After it was decided that the facility was to have more exhibit space and the Hoosier Dome added, the first step taken was to hire a consultant.

Quinn became involved in the design phase in the very beginning with the provision that the audio-systems consultant would be ultimately responsible for every aspect of all of the audio systems from design concept through the final installation and checkout. Coffeen, Anderson, Fricke, & Associates was selected as the audio consultant and worked with Quinn during the entire design process which took over a year from initial design concept to the first set of plans and specs. It was important for the consultants to understand the needs of the client and to interface all new systems with the existing operation.

Many visits to the facility and talks with Quinn ensured that the installation would be a success—after all it was the operations people who would have to set up and operate the systems at each meeting, convention, and sports event. The addition included 17 meeting rooms, a ballroom, and the 61,000-seat Hoosier Dome. Clearly with a facility of this magnitude, the fine line between smooth operation and failure is one that is catastrophic if crossed over.

Once the specs and plans were approved, the bids went out and Ancha Electronics was selected as the audio contractor. Jack Cook, Ancha's project manager on the job site, worked closely with Quinn throughout the entire project on a daily basis. Developing a close relationship proved beneficial. Quinn became intimately familiar with every nut and bolt of the job and even knows where every wire is pulled. Being on the jobsite every day with the contractor reviewing progress, and therefore being able to iron out problems on the spot, is a result of the sound man/contractor relationship.

The opening event at the new Hoosier Dome was the Mayor's Breakfast, with 5,000 attendees on the stadium floor. Since then, the scope of events has included religious conventions, mud boggs and tractor pulls, midget car races, trade conventions, and the upcoming North American Christians with attendance expected at 60,000 on the opening day of a week-long conference. With all of these events—not to mention that the Hoosier Dome is the home of the Colts—the system setups are carefully planned in advance.

While all the requirements of each event are determined in advance, it is the facility's computer-controlled systems which allow for easy setups and changeovers. The computer systems, which utilize personal computers, interface with the sound system via customized software by IED. The IED system has eight basic setups which can be called up from disk, reconfigured for a particular event, and

modified for any special requirements of the event. The computer system saves a lot of man hours and economizes the audio operation.

The audio staff consists of three full-time audio technicians and one electronic technician, with additional part-timers as necessary. (Quinn has had up to 40 or 50 technicians working around the clock for those one-day turnovers of events.) Last year, the facility held just over 1,000 event-days or an average of three events per day. The relationship maintained by Quinn and Ancha Electronics, both during and after the installation has helped the smooth operation and maintenance of the audio equipment in the Convention Center and Hoosier Dome.

Example 2: Iowa State Center

The Iowa State Center, four buildings in the corner of Iowa State University's campus, includes a 2,700-seat theater, 400-seat theater, 400-seat auditorium, 15,000-seat arena, and a small convention center. Jake Ewalt heads the audio department at the Center. In addition to his duties in the Center, Ewalt is often asked about audio systems in other areas of the campus and also provides sound for outdoor events with a small portable system. Being a university facility means that student labor is used as much as possible with as many as 80 or 90 part-time students working in the facilities. Out of this group, Ewalt routinely uses three or four students. Together with his full-time staff assistant, Carl Bruggeman, they set up and operate the audio systems for most of the events.

Ewalt was working as one of these part-time students on the stage crew in 1971 when the original sound system was installed in the arena. Later, in 1981, he had the opportunity to design a new system for the same arena. Ewalt said, "Over the years, everything was getting louder, people wanted more sound for the acts, and we wanted a system that could work for our normal athletic events, which is the bulk of what happens over there, and still do some of our home-brew rock shows and charity dance marathons. The major criterion that was called for was the flexibility of a central cluster to handle pop acts and light rock."

The cluster's design allows it to be moved from the center of the arena to the end of the arena, where it is placed for concerts. American Audio in Madison, WI, supplied most of the equipment for the installation. American Audio worked with Ewalt in the design and layout of the cluster. The design rigging of the cluster itself was contracted out to a mechanical engineering firm. In this situation, Ewalt acted as the architect, engineer, consultant, and electrical contractor. This exemplified the smooth installation that results from a good sound man/contractor relationship.

Contractor/Operator Communications

Recently, I was called in by a local sound contractor to straighten out the problems at the installation they were doing in a large high school auditorium. After listening to all of the complaints about fuzz, bright this and that, and distant sound, it turned out that there were no problems at all with the contractor's design or with the installation. The problem was with the communications between the contractor and with those who were operating the system—the overzealous music teacher and his trigger-happy crew of students. A few brief lessons and pointers on sound system operation were all that were needed to get things running on the right track. In fact, the high school ordered more monitors, microphones, and several effects units from the same contractor—now everybody is happy!

(continued on page 27)

A few brief lessons and pointers on sound system operation were all that were needed to get things running on the right track.

JUBILEE UPDATE

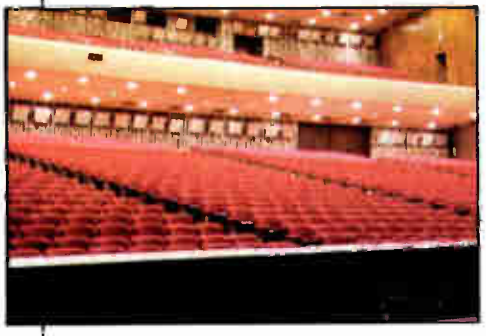
by Barry McKinnon

When the sound system on the Southern Alberta Jubilee Auditorium was originally installed in 1957, it was representative of large theater systems of that era. The original central cluster consisted of low frequency cabinets and multicell horns. And as was common of systems using multicell technology, comprises were made due to the inadequate frequency versus coverage of the horn. For years any shortcomings in the high frequency coverage at the Jubilee was something that had to be tolerated.

Toward the end of the 1970s, more than 20 years after the original sound system was installed, an evolutionary update program was embarked upon that was to result in a sound system which utilized equipment on the leading edge of hi-tech.

One of the major forces influencing the sound system update was the current audio department head, Rick Parlee. Joining the audio department in 1978, Parlee was an audio enthusiast who had little tolerance for less than optimum sound quality. By investigating as much theory as he could find and attending as many seminars and courses as he possibly could, Parlee soon realized that there was no good reason to tolerate poor sound, or even stop at good sound when it was possible to achieve superb sound.

By 1980 a program of updating and replacement of aged components including the power amplifiers, high frequency horns and drivers, low frequency systems, mixing consoles and microphones had begun. At each change, discernable improvements were being made, adequate for the management of the building to become enthused as well.



Also in 1980 another audio enthusiast/technician, Gerald Paglaro, joined the staff at the Jubilee and things began to rapidly take shape. After upgrading the cluster and associated equipment and obtaining more modern measurement and analysis equipment, Parlee and Paglaro found that even with all the changes they had tried, there were a few critical areas of performance that could not be improved on due to basic system design.

In 1983, they diverted their drive for "perfect" sound to their on stage monitor mix system. The rock & roll type monitors they had been able to buy were not satisfying the critical needs of operatic, classical, dramatic, and jazz performers. A budget was established for a monitor system "second to none" and a search for a better monitor speaker led them eventually to Gerr Electroacoustics and Meyer Sound Laboratories UM-1 monitor speakers. They were so impressed by the quality of UM-1's that they purchased eight of them to be used with the Midas monitor consule, Altec equalizers, amplifiers and the Meyer control electronics.

Once again the improvement was so substantial over the previous product that the building management people were suitably impressed and proceded to authorize a budget for a house system upgrade in the following budget year.

The system design was to be done in house by Parlee and Paglaro, with assistance from Gerr Electroacoustics and Meyer Sound. Applying as much of the technical inforamtion as they could lay their hands on, they produced a final design that was tendered early in 1984.

The system design called for a main cluster consisting of three of Meyer's MSL-3 speaker systems, three UPA-1 speakers, four 650-R2 subwoofers and the M3 and M1 control electronics, and two side fill systems that are destined to be hung from the side walls but for now are on movable dollies on

(Top) control room view of stage; (bottom) control room racks with Cetec Ivie and Meyer Sound equipment; (left) view of audience from stage.

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either side of the stage. These side fill systems each consist of two MSL-3 and two UPA-1 systems, and M3 and M1 control units. The side fill systems all use BGW 750 amplifiers and the main cluster uses Ashly FET 500 amplifiers. The house system is fed from a Neve 32x8 console, specially built to fit a narrow structural opening in the sound booth. A recent addition to the system is six Meyer CP-10 complimentary phase parametric equalizers.

Once the basic system components were in place, the job of fine tuning all of the related components to work optimally as a system began. Parlee said, "All of the engineering Meyer has done with his system drastically reduced the amount of engineering required to install it. All the usual hassles of hanging a cluster were eliminated with the preinstalled rigging points. The matching of efficiency and sensitivity of components reduced the time required to interface it with the rest of the system. It was easier and more efficient to install than an all-component system."

Parlee was unable to give an exact estimate of the time involved to install the equipment as much of the system was installed during "quiet days" between performances. According to Parlee, the biggest consumer of time was fine tuning other equipment to match the performance of the Meyer equipment.

When they first began to analyze the system after installation, discrepancies were found in levels in some segments of the response that could only be accounted for in variations in the power amplifiers. When measured with test instruments, it was discovered that some inconsistencies in the stepped attenuator-type volume controls of the amplifiers actually made it impossible to set levels the same on all amplifiers.

As a solution, 10 turn pots were installed in all the amplifiers, to allow proper setting of output voltage of the amps so that the Meyer processors could function as they are designed to. Other variations also cropped up which initiated a search for better quality input transformers that would allow optimum high frequency performance. After testing all the devices taht were readily available to them, Parlee and Paglaro contacted Jensen Transformers for advice. Rick said the Jensen people were "incredibly helpful," offering advice and providing them with JE-0900-9050 transformers optimized specifically for the input of the BGW 750 amplifiers.

Because of the attention given time alignment and phase linearity, Parlee and Paglaro have pursued more research into those areas and have become more conscious of sound system practices that optimize the phase characteristics of the entire sound system.

"Every change we make now is very audible. We were quite frankly shocked that phase coherency could make this big a difference in a sound reinforcement system, we had expected that any improvement in phase response of a sound system would be masked by problems in the room. What we have found, though, is a drastic improvement in the clarity of the system, a reduction in the amount of equalization needed, more gain before feedback, and a more neutral place to start from for artistic embellishment. Our studio background man, Hal Kay, has been amazed by how neutral a live sound system can be," said Parlee.

Parlee described the new performance of the system as a double-edged sword, on one hand being easier to operate and on the other being more demanding of the operator as it won't mask bad mixing.

With phase response of the system in mind, the next stop is to optimize the phase characteristics of the system input jack to speaker, actually right to the microphone. They tried Crown's PCC-160 phase coherent cardioid microphone and found smoother sound character and feedback rejection than they had with their conventional footlight pickup mics. The next target for cleaning up the phase response was the cable itself, ProLink cable by Monster Cable was chosen.

"We plan to acquire the Meyer SIMCAT analyzer," Parlee said. We want to make sure we aren't working in the dark on optimizing the phase response of the system.

More conventional aspects of high quality audio systems were also addressed: including separate power regulation for all audio equipment using an enormous power conditioner that feeds the control room and all rack locations.

With competition from the Calgary Centre for Performing Arts, the desire of the audio department and management of the Southern Alberta Jubilee Auditorium to have a facility that is "second to none" in audio quality remains strong.

SOUND MAN

(continued from page 23)

No contractor can afford to be blacklisted by a consultant or owner. We all hear stories from time to time about a contractor who allegedly did not fulfill his obligations to the owner. In many situations, the contractor was keeping his end of the bargain but the owner had failed to communicate to the consultant (or sound man) what he desired in the end product or his design objectives and criteria changed during the installation. But, if the owner fails to recognize whose responsibility it is to ensure that his requirements were properly translated into a spec, the contractor ends up with the short end of the stick.

The Bottom Line

Just as hearing is one sense that contributes to the overall perception of an event, seeing the picture is equally important. The design of all electrical, stage, and lighting systems must all be implemented as component parts of a single system—all working together. Furthermore, there must be coordinated efforts by the stage, light, and sound crews to create the desired effects. When it all comes together, the audience is truly captivated by the experience.

To quote Don and Carolyn Davis' book, *Sound System Engineering:* "Having worked out the distribution, and smoothing of the house curve, you are then left with the actual problems of the microphone response...There is also the irrational to consider—when the performer prefers a certain shape, size, color, trade name, or personal microphone." The Davises are pointing out that no matter how technically competent you may be, you have to be prepared to diplomatically deal with performers' irrationalities. The sound man's role is clearly three-fold; he is a business administrator, an artist, and a technician. It is the fine-tuning of these skills and their balance that will make a sound man successful.

The Growth of Video in... TELECO

by Sandy Kyrish
Pierce-Phelps

Plenty of people believe video teleconferencing is still science fiction, but plenty of companies know that their teleconferencing rooms have been saving their businesses time and money. Electronic meetings are becoming more frequent each year as improved technology drives down costs.

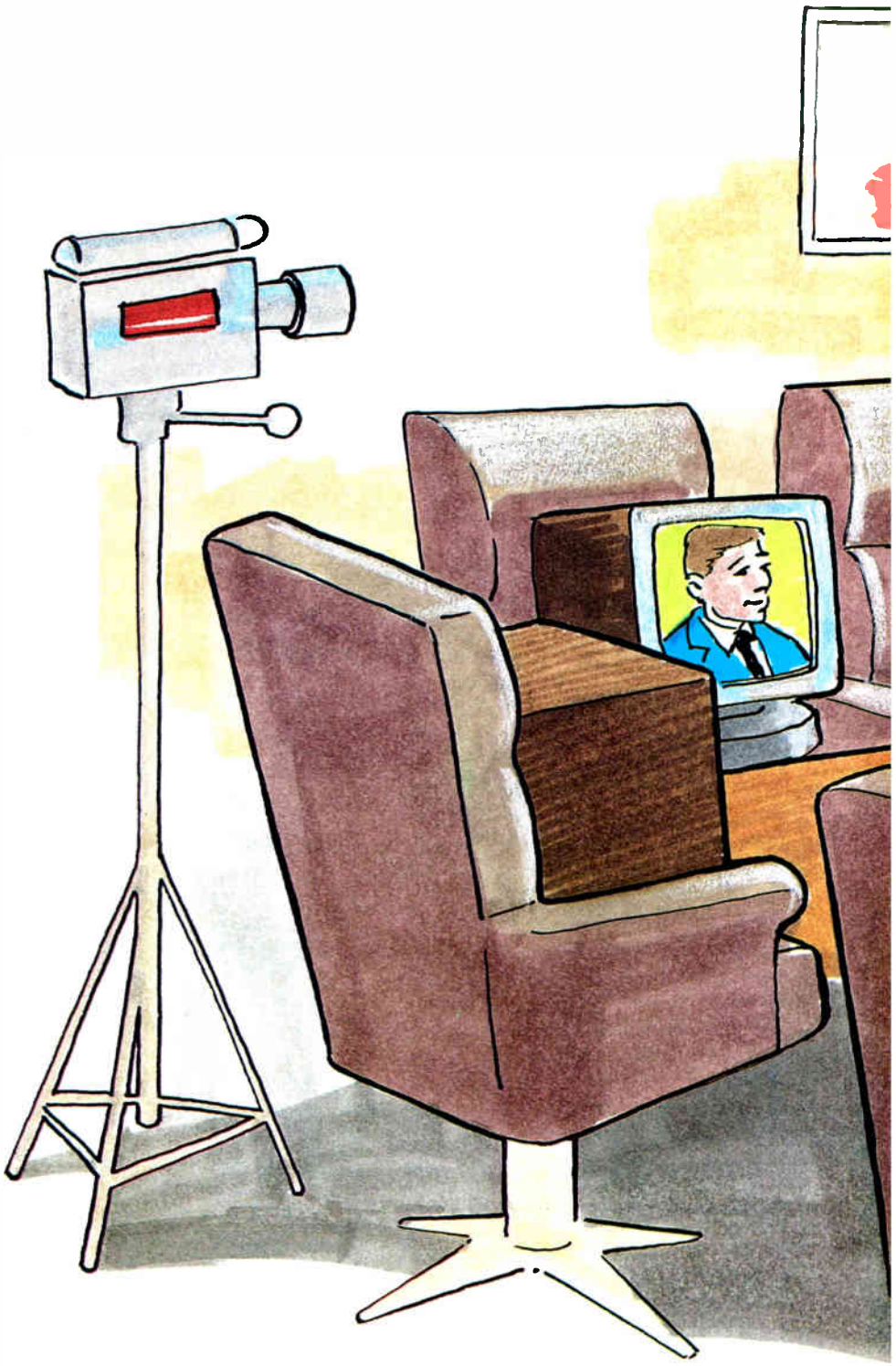
Video teleconferencing combines innovative transmission techniques with familiar audio and video equipment. This article describes some of the technologies used in teleconferencing. It explains the use of video compression to transmit pictures economically, and it describes the layout of a dedicated, custom-built teleconferencing room.

There are three basic types of teleconferencing: audio, audiographic, and video teleconferencing.

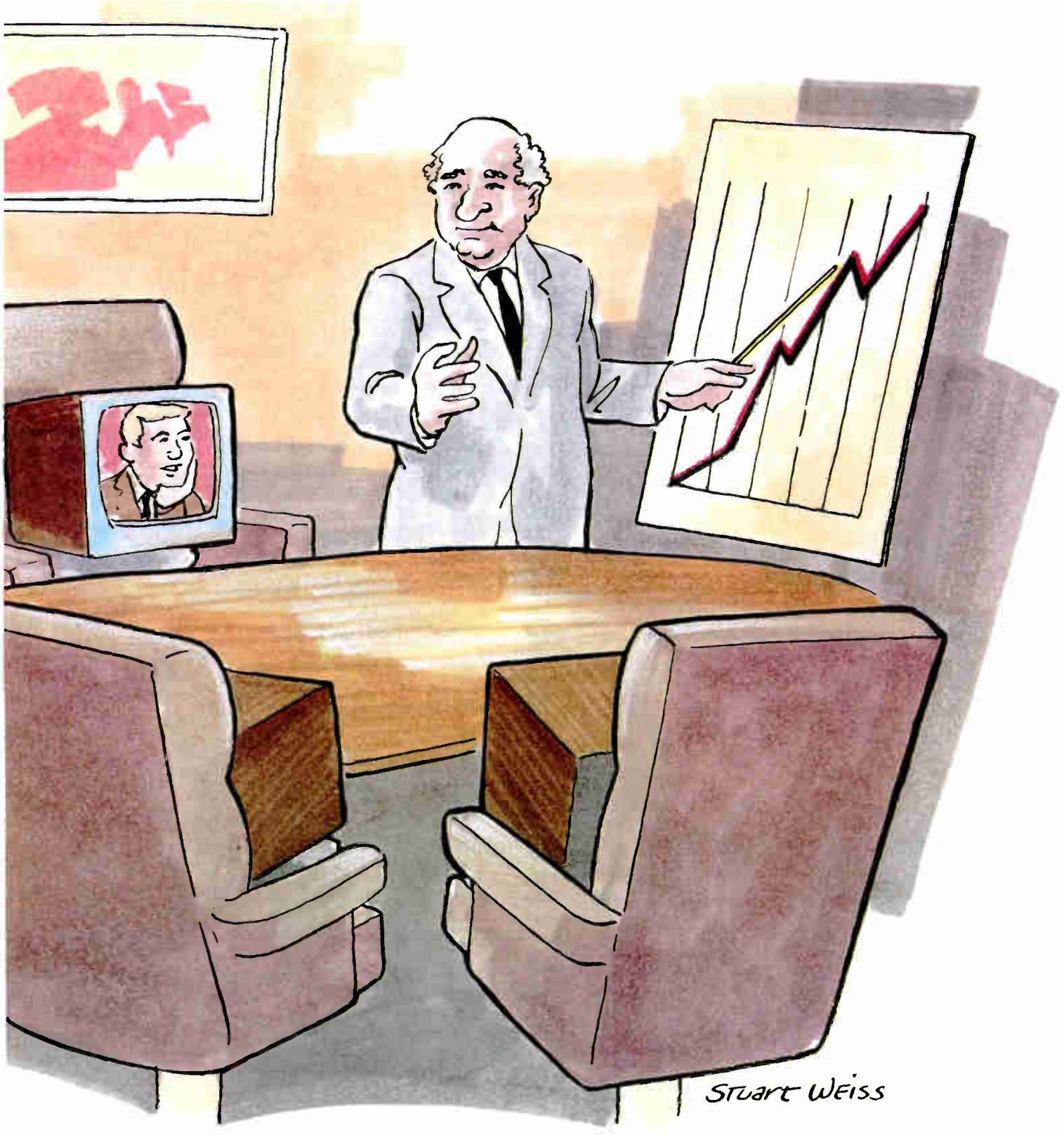
Audio teleconferencing is used when three or more people need to talk among two or more locations. An in-expensive and familiar application would be two groups gathered around their speakerphones. Speakerphones, however, introduce high noise levels and often give a hollow or distant sound to human voices.

Commercial audio teleconferencing equipment offers quieter, more realistic conferences at a correspondingly larger cost. These products incorporate higher quality microphones and speakers, but still use standard telephone lines for transmission. They are used by groups who teleconference frequently enough to justify the investment.

For larger meetings, an audio bridge is often used. Several companies provide audio bridging services. Persons participating in the conference dial the bridge telephone number, and an operator connects them to the conference. Signal and noise levels are monitored for each



ONFERENCING



caller on the bridge. These devices can effectively link more than 20 callers in one conference.

An audiographic teleconference is a voice conference supplemented with visual displays. A facsimile machine, for example, can be used during an audio conference to send drawings and documents between the two locations. Software can run simultaneously on personal computers at each site.

A common implementation of audiographic teleconferencing is called freeze-frame. Cameras can be arranged to show people or graphics (or both), but only still-frame images can be sent. The pictures, sent over a standard telephone line, can take 30 seconds to be transmitted. Many companies have used freeze-frame with success, because face-to-face visual contact is sometimes not as important as the ability to transmit and display drawings and charts.

In this article, however, the word "teleconferencing" refers to video teleconferencing.

Video Compression Techniques

Several companies use analog or digital microwave transmission to link teleconferencing rooms located in the same geographic area. However, many teleconferencing facilities link distant sites. Also, many companies using teleconferencing have more than two distant facilities. Satellite transmission is an appropriate

GLOSSARY

analog microwave transmission - a microwave link is a high frequency radio path between two short-distance sites. It can carry audio, data or video signals. Analog signals are represented by cycles per second and use specified amounts of bandwidth (i.e. 6 MHz for a full-broadcast analog signal).

audio teleconferencing - the practice of connecting three or more people at two or more sites by standard telephone lines.

audiographic teleconferencing - audio conferencing supplemented with graphics displays. A facsimile machine might be used in an audiographic teleconference, to transmit documents between sites.

digital compression techniques -methods used to substantially reduce the amount of picture information sent in a video signal. Digital compression devices analyze outgoing video signals and only transmit information about areas of the picture which change. This allows pictures to be transmitted more economically, but the video signal will be degraded.

digital microwave transmission - a microwave link is a high frequency radio path between two short-distance sites. It can carry audio, data or video signals. Digital signals are represented as bits per second and use specified speeds of transmission (i.e. 768 thousand kilobits per second).

half T-1 channel - a digital transmission path carrying data at the rate of 768 thousand bits per second. A good-quality compressed video picture can be transmitted at this rate.

interframe coding - a digital compression process which compares each outgoing video frame to its preceding frame. The video codec only transmits the picture information which is different from the previous frame. This coding is used when little motion is occurring on the screen.

intraframe coding - a digital compression process which does not compare frames to each other. This process is used when a lot of motion appears on the screen. All motion information is transmitted, but fine picture detail (clothing designs, etc.) may not be. As the motion decreases, interframe coding resumes and picture detail will be filled in.

modem - a device which converts a digital signal to an analog signal for transmission. The receiving modem then reconverts the analog signal to a digital signal. Modems are used to allow computers to transfer information over the telephone network.

pixel - a pixel is a picture element. A video screen is comprised of tens of thousands of pixels. Each pixel contains the brightness and color information which describes its tiny area of the screen.

T-1 channel - a digital transmission path carrying data at the rate of 1.544 million bits per second. A good-quality compressed video picture can be transmitted at this rate.

video codec - a device which accepts an analog video signal, then digitizes and compresses it. The receiving codec reconverts the compressed digital signal and displays it as a slightly degraded analog picture. Video codecs allow video signals to be transmitted at significantly lower cost than analog transmission.

video compression - see digital compression techniques.

video teleconferencing - the practice of connecting two or more people at two or more sites with video transmission. Cameras, microphones and monitors are used to transmit sound and images between sites. Teleconferencing rooms can be connected by analog or digital transmission lines.

technology for connecting remote sites in flexible configurations.

For teleconferencing applications, however, analog satellite transmission of video signals is normally cost prohibitive. A full-broadcast analog video signal uses six megahertz of bandwidth, requiring an entire satellite transponder. Affordable corporate teleconferencing would be impossible without digital compression techniques which can allow more than 40 video signals on one transponder.

The device used to digitize and compress an analog video signal is called a video codec, short for coder/decoder. A codec is the opposite of a modem (modulator/demodulator). A modem takes digital output from a computer, transforms it into an analog waveform for transmission on the telephone network, and re-digitizes the waveform at the remote end. A codec converts an analog video or audio signal into a bit stream for transmission, then reverts the signal to analog at the remote site.

As the codec digitizes the analog signal, it also compresses it. A television image is composed of thousands of picture elements (pixels) which describe the brightness and color composition of every area of the screen. Think of the pixels as a list, with every item on the list describing a tiny portion of the video screen. Imagine that every time a video frame is created (which is 30 times a second), the entire list is read and acted on. The length of that list is considered as an amount of data which must be handled.

Now assume that the pixel list is describing the video image of a man who is talking and sitting in front of a blue wall. As you read the list for each frame, some pixels change all the time as the man talks. The pixels describing the blue wall don't change at all. Obviously, it's wasteful to repeat the unchanged portions of the list, frame after frame. It would be a better idea to read only the items that have changed since the last list.

This analogy describes the interframe coding method of video compression. The codec delays the outgoing signal by milliseconds, to compare each outgoing frame to the one before. Although compression algorithms and methods vary between codec products, the result is that limited digitized picture data is sent for each frame, describing the changed areas of the screen. The receiving end processes this data and produces an analog output for display.

Interframe coding works well as long as motion in the frame is limited. If the man in front of the blue wall stood up just as someone else ran into the room, the pixel "list" would be full of new data needing to be read. A different technique, intraframe coding, is used in some codec products to handle active pictures.

In a busy picture, it may not be useful to compare rapidly changing frames with each other. The codec actively shifts to intraframe coding, which sacrifices picture resolution for the ability to handle increased motion. Picture information is sent for all areas of the screen, but some picture detail is lessened. If the person running in the room was wearing a small-plaid jacket, the codec would concentrate less on defining the jacket than handling the running motion. As activity settles down, the codec reverts to interframe coding and the plaid jacket becomes more noticeable.

A compressed video image (using either technique) is noticeably degraded but still very usable. If a person moves his or her hand very quickly, the hand movement will often appear to "streak" or to jerk on the screen. The quality of the monitor or projector displaying the image can dramatically affect the appearance of the signal.

Codec manufacturers have tailored their compression ratios to fit a compressed video signal onto the T-1 transmission standard (1.544 megabits per second). A T-1 channel is the equivalent of 24 digitized voice-grade lines. It is an attractively priced and commonly leased channel configuration for corporate voice and data traffic.

The original compressed pictures on T-1 circuits were not very good. However, compression technology has improved enough to allow quite acceptable picture transmission at both T-1 and half T-1 (768 kilobits per second). The accomplishment

(continued on page 42)

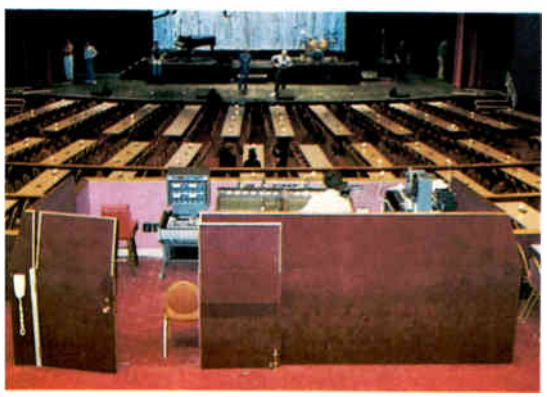
Installation Profile

Showroom Sound

TROPICANA EAST

by Patrick Baltzell

In 1981 the Ramada Corporation entered the Atlantic City gambling market with the world's most expensive hotel and casino complex—the Tropicana East. At a cost of $330,000,000 it exudes elegance, from the Italian marble lobbies and glass elevators overlooking a spectacular casino atrium and the Atlantic Ocean to the rooftop tennis courts and swimming pool. But before the facility was completed, the money ran out. Escalating cost overruns halted construction on the entire project, including the 1,800-seat showroom. Without a showroom, the ballroom became the designated showplace.



Yamaha 1516 mixing console.

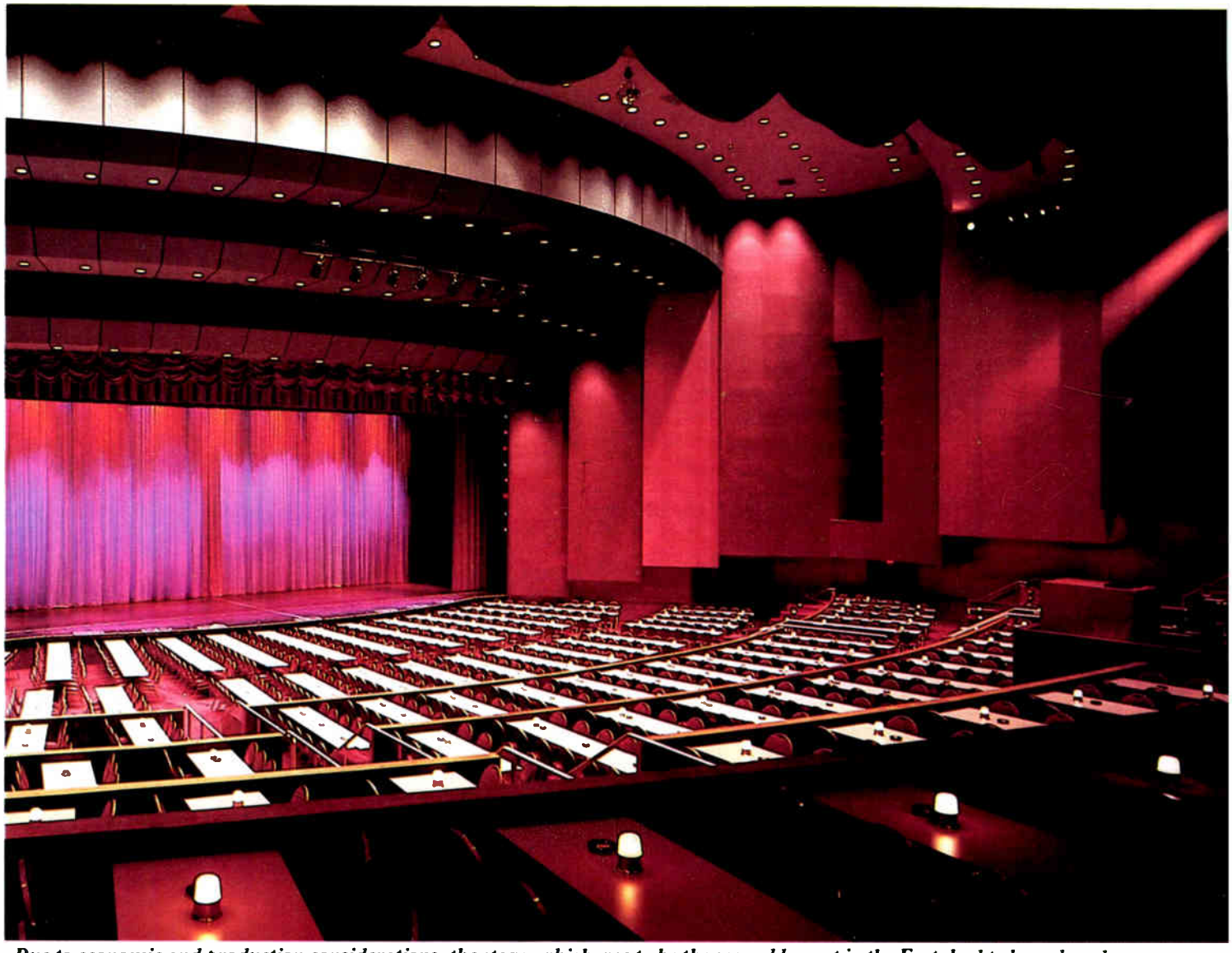
The ballroom, a more than adequate space for meetings and conventions, proved to be quite a challenge for high level entertainment. The sound was 60 overhead distributed ceiling speakers, supplemented by two three-way speaker stacks, and a myriad of digital delays to bring together these 66 sources. The "stage" was a series of 42-inch high platforms screwed together. The lighting department managed two F.O.H. positions with 300 instruments and shared a makeshift pipe grid with the stage draperies. The "dressing room" consisted of a table, a mirror, and a clothes rack behind a velour drape. Unfortunately, the performers had to walk through the audience to get to running water before the show started, which undermined the impact of the costumes. In much the same way, the lack of a contour curtain gave the audience an hour and a half to study the set before the show began.

After a series of production shows and musicals which weren't very successful, the Tropicana decided to produce headliner entertainment instead. This policy prompted some minor improvements such as moving the sound mixer's position into the ballroom. Previously it was located in a rack room adjacent to the back wall of the ballroom with a 3 x 3 foot window looking towards the stage. A one-quarter-second delay from the stage sound system combined with a three second midrange reverberation time resulted in some "interesting" performances, most unbeknown to the mixing engineer.

After three years of operation, construction was able to resume on the showroom. The original plans called for the second largest stage on the East Coast. (Radio City Music Hall in New York is the largest.) The proscenium opening was to be 90-feet across and 42-feet high with 5,500 square-feet of wing space and 95-feet to the grid. Economic considerations, along with an industry away from elaborate production shows, demanded that the stage dimensions be scaled down. The architectural firm Welton Becket Associates of New York and theater consultant George Thomas Howard Associates were hired to redesign the showroom. They reduced the proscenium opening to 68-feet across by 24-feet wide with a 30 percent reduction in wing space. Even reduced, this showroom is remarkable in this age of cost effective showrooms.

The center stage features a custom West German built 18-foot by 40-foot elevator and the upstage wall is a collapsible motorized bleacher assembly which seats 800 people for boxing events. Add the 68 line sets, three motorized traveller tracks and contour, and the possibilities are limitless.

The Kliegl lighting system is equally impressive. Designed by Tropicana Lighting Designer Joe Lazarus, it incorporates four F.O.H. positions, 1,300 instruments distributed among 1,800 individual dimmer circuits. At the heart of the system is a Kliegl



Due to economic and production considerations, the stage, which was to be the second largest in the East, had to be reduced.

Command Performance console. Four Colortron Colorare 2000 Zenon followspots complete the system. A special feature of the Tropicana Showroom is the General Electric ECONK BL-1 Energy Management System. Work light groups (fly bridge, grid, etc.) and electrical outlets throughout the theater home run to banks of modules containing over 1,800 relays. These modules are then programmed to one or more of 12 strategically located control panels. As an example, in the house audio booth there is a control panel with switches that have been assigned to electrical circuits in the orchestra loft. The sound engineer can then turn on and off music stand lights with one switch and amplifiers and band gear with another without leaving the console. The program allows for multiple control locations as well as master and submaster group relationships. Furthermore, any circuit can be reassigned later to accommodate future needs.

When construction resumed, as chief audio engineer, I began designing a sound system for the showroom. The theater size and seating arrangement suggested an engineered flown central cluster. Duncan McKenzie of George Thomas Howard Associates later expanded this to include right and left "effects" clusters. The concept of a midrange device spanning the fundamental voice range (200 Hz to 2 kHz) without a crossover point or transition from a cone driver to a compression driver became the starting point for selecting components. After extensive listening tests and FFT analysis of response and pattern control a Community Light & Sound M4 driver and PC 1500M series horns were selected. TAD 4001 two-inch compression drivers coupled with Community Light & Sound PC200 Series pattern control horns were chosen for high frequency coverage. Low frequency (below 325 Hz) represented a compromise. Sixteen of 20 Altec Lansing 817A double 15-inch ported horn-loaded cabinets in storage from the original purchase were dusted off, reinforced with three-quarter-inch particle board and two-inch angle iron then retrofitted with JBL 2225 J 15-inch drivers with appropriate port tuning adjustments. Likewise, the subwoofer system (20 Hz to 69 Hz) consisted of two Altec SS 1020 cabinets retrofitted and tuned for JBL 2235 H 18-inch drivers.

The electrical contract was awarded to Chadwick and Simon of Bensalem, PA, and the new audio contract was awarded to Pierce Phelps Audio Division of Philadelphia. Under the direction of project engineer, Ernie Zelling-

er, the 10 equipment racks and assorted audio panels and floor pockets were preassembled and wired to provide entirely solder-free field connections. All of the audio terminations by the union electricians were Telco crimp connectors, barrier strips, or ADC punch blocks. This approach eliminates cold solder joints in the field. The audio equipment rack room, located directly below the house mixing booth, is accessible by a trap door and ladder. This is advantageous during equipment checks and set ups. Troubleshooting is much easier when one is not working with remote amp racks up near the cluster.

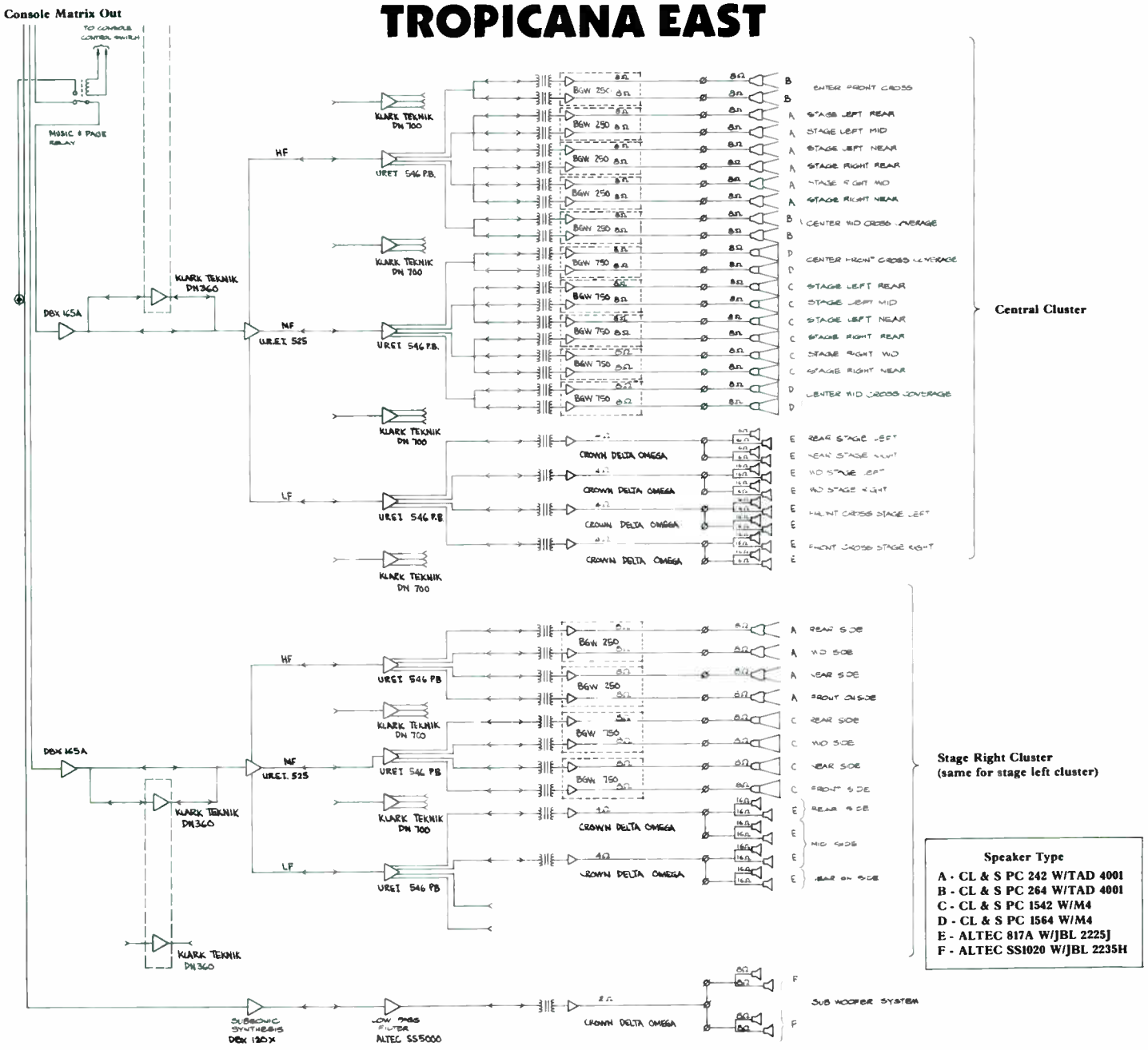
The problem of 175-foot speaker runs to the low frequency and subwoofer components was solved by using Crown Delta Omega 2000 power amplifiers with the Interface Velocity Control circuit. Using an oscilloscope at the speaker terminals each low frequency amplifier control circuit was adjusted for ideal square wave response with a 25 Hz input. This procedure effectively eliminates the effects of long speaker runs.

The IQS FFT analysis system and nine Klark-Teknik DN700 delay units were used to digitally time align each of the 19 high-frequency combinations to assure on-axis coherency. With 12 high/mid combinations in the center cluster alone there were certainly phase anomalies, but the on-axis response improvement was considerable and the overall subjective benefit was dramatic.

Equalization of the system was accomplished through the use of nine custom UREI parametric filter sets installed *after* the crossover. This alternative to the one third-octave approach provided several advantages. Equalizing individual driver response after the electronic crossover with custom parametric filter sets spanning only the bandwidth of that driver allows precise tailoring of the response at and *beyond* the crossover points. Adjustments affect only that driver. During the equalization process each filter was switched in circuit as needed reducing noise from unused filters.

The 68 stage microphone lines originate in a portable Wireworks stage distribution system and three apron floor pockets. In addition to

TROPICANA EAST



feeding the house console patch bays, these lines have two transformer-isolated splits. One set terminates in parallel amp multipin connectors in floor pockets side stage left and right for the portable stage monitor system. The second set is designed to terminate at the television company switch closet on the street for remote broadcast applications. (At the time of publication that phase was incomplete).

The six portable monitor racks can be connected to the floor pockets stage left or right and all microphone lines and house trunk lines appear as patch points. The monitor amplifier outputs are connected to an adjacent floor pocket where they feed a hard-wired understage distribution network. This enables monitor speakers to be plugged into the nearest floor pocket, eliminating long cables on the stage surface.

There are an additional 94 microphone lines throughout the theater and audience areas and 40 microphone lines and a two channel click track headset system in the orchestra loft. A tri-level "studio" is situated above the audience with a view of the stage used for ballets and production shows that require a clear stage. When the orchestra is in the loft a composite mix is sent to a permanent production foldback system consisting of six Community Light & Sound RS440 four-way speakers suspended from the light ladders stage left and right.

The intercommunications is a custom four channel RTS system. Channel A is an all access stage manager channel. Channels B, C, and D are dedicated to lighting, sound, and fly respectively. All portable user stations are two channel with an individual volume control enabling the user to listen to A and B, C, or D simultaneously.

The interior design of the showroom allowed for one-inch acoustical treatment of only the rear surfaces. The untreated nearly parallel side walls created midrange flutter echoes especially when stage sidefill levels were loud. The problem was documented by Mark Holden from Jaffe Acoustics of Norwalk, CT. The room measured an RT60 time of 1.8 seconds at 2 kHz rising to 2.1 seconds at 125 Hz. After spending over $12 million on the completion phase of the showroom, it took some persuasion to release the additional $150,000 to treat 10,000 square feet of wall surface (virtually floor to ceiling). Two-inch, seven-pound-per-cubic-foot-density wrapped acoustical panels custom manufactured by Sound Reduction Corporation were installed. The results delighted everyone. The FFT spectral decay plots in were useful in programming the house Yamaha REV 1 digital reverberator. With the knowledge of the existing room reverberation and early reflection patterns, the digital reverberator can be programmed to complement those for an even decay.

The Tropicana takes full advantage of the flexibility of its showroom, which is often in use seven days and seven nights a week. Headliners generally send sound and lighting requirements in advance. After the first engagement, settings and plots are recorded, making repeat engagements easier. In the case of production shows more research is required; I have had to attend rehearsals of shows in New York City so I could design the sound before they reached the Tropicana. Televised events such as boxing and wrestling involve long days of preparation. Camera and communication lines are pulled from the truck up three levels to ringside. Precise light levels are established. The audio mix for the house must be edited and isolated and then returned to the truck where it becomes just one of many sources used in the final product.

At the time he wrote the article, Patrick Baltzell was the in-house sound man at the Tropicana East.

SALES & MARKETING

(continued from page 12)

tion to meet any customer's needs. This training package could include descriptive brochures, a product manual, training tapes, handouts, and a number to call for assistance.

Training can be offered using a variety of media— videotapes, slides, computer diskettes, programmed text, and on-site instructor. Each vendor's training package should be developed around the vendor's product and its complexity.

The time spent effectively training users about a product or service will be rewarded with satisfied customers, minimal vendor servicing, and increased sales. Make customer training an integral part of doing business.

S. Ann Earon is president of Telemanagement Resources International and serves on the board of directors of the International Teleconferencing Association. Earon previously worked in several marketing positions with AT&T.

THE J.W. DAVIS PATAXIAL PA-70 LOUDSPEAKER

by Farrel M. Becker
AUDIO-ARTISTRY

The Pataxial PA-70 loudspeaker, manufactured by J.W. Davis and Co., is a smaller version of the Pataxial PA-150. Both are of a unique design: a high frequency horn coaxially mounted such that the high frequency driver is positioned directly in front of, and not quite touching, the dust cap of the woofer. This configuration, unlike most others, along with a phase-aligned crossover permits the Pataxial loudspeakers to maintatin their phase alignment as the listener moves off axis both vertically and horizontally.

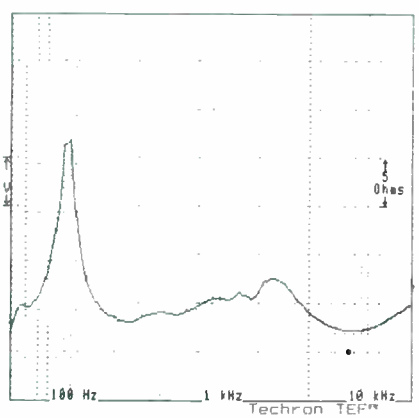
The Pataxial PA-70 consists of a 10-inch woofer in a tuned-vent enclosure with a short, conic low frequency horn. A one-inch dome type compression driver is coupled to a small sectoral horn which is mounted within the low-frequency horn. The individual drivers are fed via an internal high-level passive crossover.

The loudspeaker is rated for a continuous 700 watts (no mention is made in the specifications as to whether the power rating is for sine wave, pink noise, program, or whatever). Connections are made via a pair of color coded, spring loaded connectors. The data sheet says that these connectors are compatible with a dual banana plug. Indeed a dual banana plug can be inserted into them, but the resulting connection is not very secure. I suggest inserting the wires directly into the Pataxial's connectors.

The PA-70 measures 15.5-inches high, 23.25-inches wide, and 18 7/8-inches deep. A recessed handle is provided on one end of the enclosure and, according to the data sheet, provides "for easy portability."

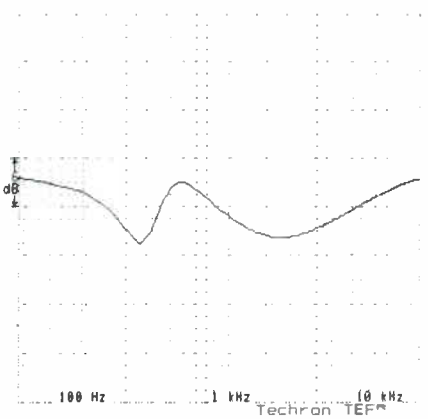
The magnitude of the loudspeaker's impedance is shown in **Figures 1**. The minimum impedance of 7.2 ohms occurs at 7,800 Hz. The impedance at the woofer's resonant frequency (98

Figure 1



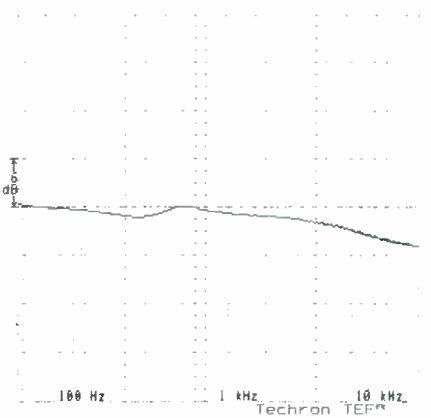
Magnitude of PA-70 impedance, 0-20 kHz, 7 Hz resolution.

Figure 2

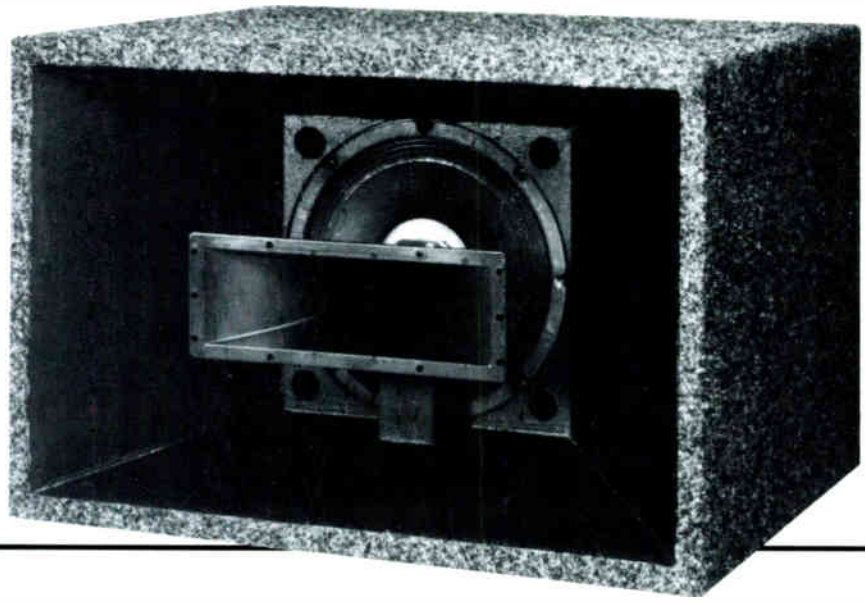


Amplitude response of DP-70 equalizer fed from 50 ohm source, 0-20 kHz, 10 Hz resolution.

Figure 3



Response error caused by feeding DP-70 equalizer from 600 ohm source, 0-20 kHz, 10 Hz resolution.



Hz) is 44.45 ohms.

A passive equalizer (J.W. Davis DP-70) is supplied with the PA-70 and is intended to be placed ahead of the system's power amplifier. **Figure 2** shows the equalizer's response. This equalizer was designed to see a source impedance (the actual output impedance of the device that is driving it) of 50 ohms or less. I have found that, generally, the output impedance of most active professional audio equipment is in the area of 125 to 150 ohms. A worse situation might be a passive equalizer set or attenuator feeding the DP-70 equalizer. The response error caused by feeding the DP-70 equalizer from a 600 ohm impedance is shown in **Figure 3.** The error is relatively small up to 13 kHz and increases to a loss of approximately 5 dB at 20 kHz. All acoustical measurements were made with the DP-70 equalizer ahead of the power amplifier and fed from a 50 ohm source.

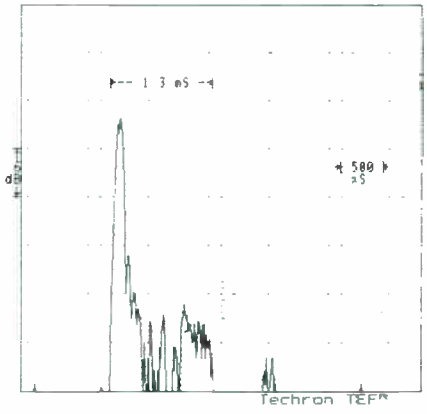
Figure 4 is an Energy Time Curve (ETC) taken on axis. The tall peak is the high frequency horn. The lower level energy that is spread to the right of the horn is from the woofer. Spreading of this kind is inherent in band-limited devices such as a woofer that is fed by a crossover. The high frequency horn is well aligned in time with the woofer.

The anechoic on axis frequency response is shown in **Figure 5**. The one-watt/four-foot sensitivity at 1 kHz is 100.6 dB. The EIA rating is 53.1 dB. **Figure 6** is a semi-nearfield measurement taken at the mouth of the cabinet. This is an estimate of the farfield response. The response shelves down approximately 6 dB below 900 Hz and rolls off below 55 Hz. The shelving can be handled with equalization.

The PA-70's phase response is shown in **Figure 7**. Notice the smooth transition at crossover and flat response beyond. This is the result of the phsycial placement of the drivers in combination with a well-designed crossover.

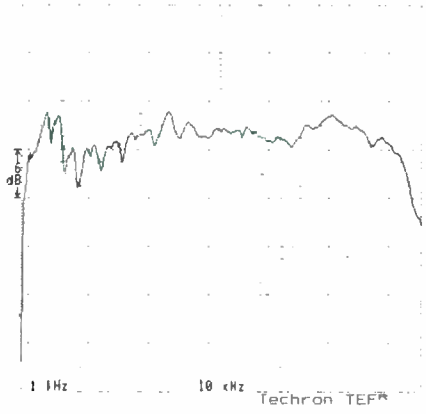
Figure 8 shows the loudspeaker's

Figure 4



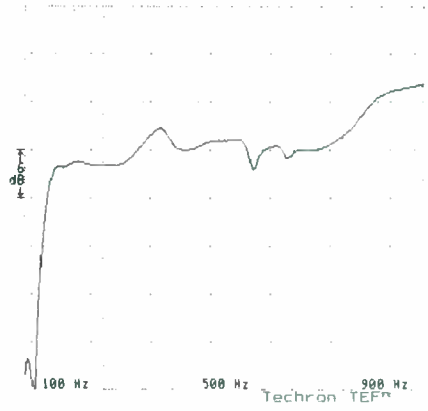
On axis ETC.

Figure 5



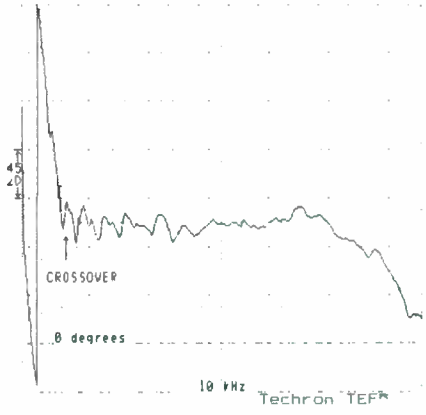
On axis frequency response, 0-20 kHz, 150 Hz resolution.

Figure 6



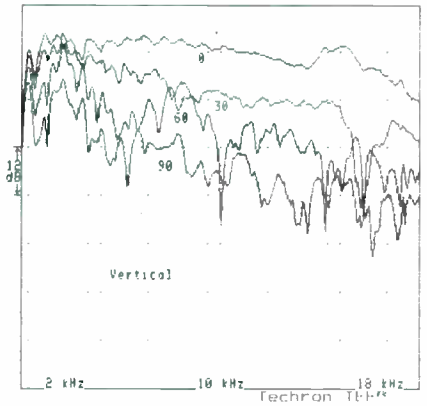
On axis frequency response semi-nearfield, 0-1 kHz, 35 Hz resolution.

Figure 7



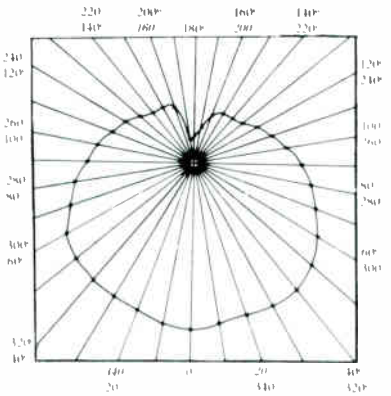
On axis phase response, 0-20 kHz, 150 Hz resolution.

Figure 8



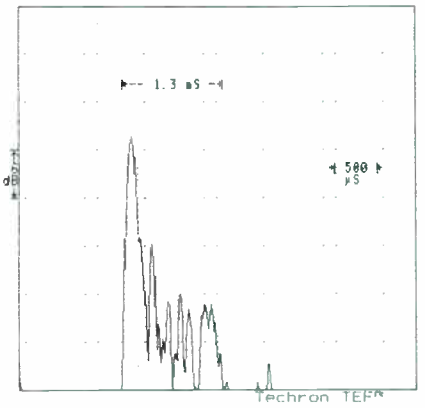
Frequency response 0, 30, 60, 90 degrees off axis vertically, 0-20 kHz, 150 Hz resolution.

Figure 9



2 kHz octave band vertical polar response, 10 degrees/data point, 5 dB/major division.

Figure 10



ETC 20 degrees off axis vertically.

frequency response (from top to bottom) on axis, off axis 30, 60, and 90 degrees vertically with no offset between curves. With the exception of approximately 1 kHz to 3.5 kHz, the PA-70 maintains its vertical pattern fairly well with only moderate narrowing at higher frequencies. The polar pattern widens substantially between 1 and 3.5 kHz resulting in a lower Q in the speech intelligibility range. **Figure 9** is the vertical polar pattern for the 2 kHz octave band. **Figure 10** shows an ETC taken 20 degrees off axis vertically.

Figure 11 shows the loudspeaker's frequency response (from top to bottom) on axis, off axis 30,60, and 90 degrees horizontally, again, with no offset between curves. Here also the PA-70 maintains its pattern fairly well with only moderate narrowing at high frequencies. The horizontal polar pattern also widens between 1 and 3.5 kHz, but not as severely as in the vertical plane. **Figure 12** is the horizontal polar pattern for the 2 kHz octave band. **Figure 13** shows an ETC taken 30 degrees off axis horizontally.

J.W. Davis quotes the 2 kHz vertical and horizontal beamwidths as 45 and 90 degrees respectively. These values are apparently for a single frequency. From **Figures 9** and **12** the vertical horizontal beamwidths for the 2 kHz ocatave band are 130 and 70 degrees respectively. The Q for the 2 kHz octave band is 6.75.

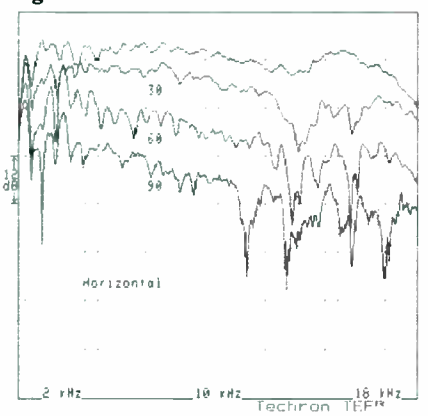
The position of the high frequency horn in relation to the woofer and the overall time width of the energy in both **Figures 10** and **13** are similar to the on axis ETC of **Figure 4**. This indicates how well the PA-70 maintains its alignment in time as the listener moves off axis. This highly desirable attribute is a result of the unique configuration of the Pataxial loudspeakers.

Conclusion

The Pataxial PA-70 has a very clear and distinct sound. When listening at close range, the sound seems to be coming from a single point rather than shifting from driver to driver with frequency. The clarity holds as the listener moves off axis due to the arrangement of the drivers. Speech intelligibility on the PA-70 is outstanding. Where its polar pattern will provide the needed coverage and its Q is appropriate, this loudspeaker will provde extremely intelligible sound.

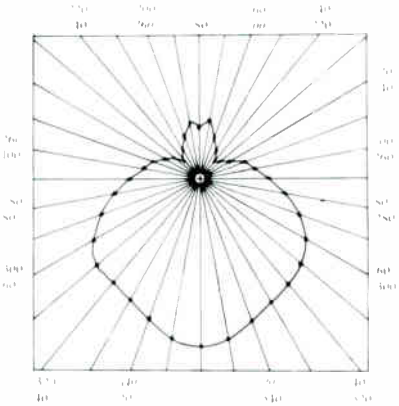
Farrel M. Becker, a consultant for Audio Artistry, specializes in live sound for the performing arts. Becker started working with TEF technology in 1979 and now teaches the fundamentals of TEF in Techron training program.

Figure 11



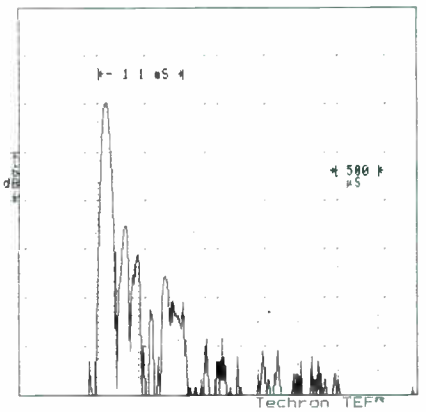
Frequency response 0, 30, 60, 90 degrees off axis horizontally, 0-20 kHz, 150 Hz resolution.

Figure 12



2 kHz octave band horizontal polar response, 10 degrees/data point, 5 dB/major division.

Figure 13



ETC 30 degrees off axis horizontally.

PRODUCTS IN REVIEW

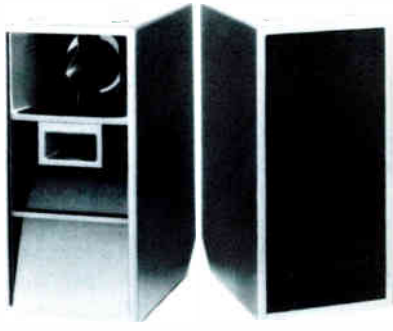
SENNHEISER DEBUTS INFOPORT WIRELESS SYSTEM

Sennheiser Electronic Corporation has introduced the Infoport™, a wireless tour guide system designed to provide corporations, manufacturing plants and museums with enhanced portable high-frequency cordless communication capabilities. The Infoport utilizes Sennheiser's SK 1010-7 100 mW single-channel narrowband transmitter and HDE 300-6 stethoscope headphone receiver.

The SK 1010-7 transmitter accommodates a variety of Sennheiser microphones, including the MKE 10 omnidirectional lavalier, the MKE 2010 omnidirectional microphone, and the MKE 4010 cardoid microphone.

The Infoport™ system is said to allow the individual guide distortion-free communication with listeners up to between 100 and 150 feet away. For shorter distances, the SK 1010-6 economical 10 mW transmitter is available. Both the SK 1010-7 and SK 1010-6 are otherwise identical. Each is powered by a single 9V alkaline battery. Typical operating periods for the SK 1010-7 and SK 1010-6 and six and 20 hours respectively.

Circle 50 on Reader Response Card



TURBOSOUND'S NEW REINFORCEMENT SPEAKER

Turbosound Inc. has introduced the TMS-2A sound reinforcement loudspeaker system. The TMS-2A is already in use in concert halls including the National Arts Center of Canada in Ottawa and other performing arts centers. It is similar to Turbosound's passive TMS-2 module, but the TMS-2A uses a "two-way active three way crossover" and utilizes the same high-efficiency 10-inch midrange driver as in the TMS-3 and TMS-4 loudspeaker systems. The TMS-2A's enclosure features angling and flying points.

The TMS-2A is designed for use in theaters, halls, clubs and general sound reinforcement applications. It is also effective as a disco system in conjunction with Turbosound's TSW-124 subwoofer. The biamped, three-way, full-range line array utilizes a proprietary 15-inch driver loaded into a patented TurboBass™ device, a proprietary 10-inch driver loaded into a patented TurboMid™ device, and a one-inch high-frequency driver loaded into a proprietary flare.

Circle 51 on Reader Response Card

FURMAN ANNOUNCES POWER CONDITIONER/LIGHT MODULE

Furman Sound has debuted its new power conditioner and light module. Similar to Furman's other power conditioner and light module, the PL-8, the new unit, named the PL-Plus, is designed to be mounted in the top space of a rack of electronic equipment and, like the PL-8, features eight switched AC outlets with spike and surge suppression for power distribution and two convenience light fixtures which telescope out of the front panel to illuminate the controls. In addition, the PL-Plus combines a Multi-stage Pi filter for RFI and a voltage monitor which continuously displays line voltage present.

Circle 52 on Reader Response Card

NEW AKG MIC WITH NOISE CANCELLING SYSTEM

AKG Acoustics has introduced the D-321, a microphone free of handling noise due to a newly patented exclusive noise cancelling system in which the microphone magnet is flexibly suspended so that the diaphragm and the magnet vibrate in phase. This cancels surface noise, according to AKG. For protection against stray magnetic fields, the D-321 features a hum compensation coil.

The D-321, according to AKG, will handle a compressive stress of up to 1,100 pounds. The mic features a die-cast zinc housing, male XLR connector, woven matte stainless steel front grille, internal high-impact protective basket, and low lustre enamel gray finish. Specs include 40 Hz to 20 kHz frequency range and 300-ohm impedance at 1,000 Hz.

Circle 53 on Reader Response Card

JBL INTRODUCES SEVERAL NEW PRODUCTS

JBL has introduced the 4646, a compact, low—frequency system with a 12-inch speaker. Designed for churches, restaurants, and other fixed installations, the 1.2-cubic-foot 4646 is said to be small enough to be inconspicuously mounted by a sound contractor as part of a cluster design.

The speaker, which features JBL's symmetrical field geometry design, has continuous pink noise power capacity of 350 watts per AES standard, according to JBL. Specs include 8-ohm impedance, 96 dB sensitivity at 1 watt/one meter, usable frequency response to 50 Hz, and axial response to 2,000 Hz, according to the manufacturer. The 4646 features a four-inch voice coil and black vinyl finish.

JBL has also introduced a new line of studio monitors, which the company said provide greater accuracy and tighter response tolerance, the 4406, 4408, 4410, and 4412.

Another new JBL product, the 6215 power amplifier, fits in a single rack space and will pump 35 watts into an eight-ohm load, according to JBL. The 6215 is designed for low-power applications, such as driving headphones or small speakers in a studio.

Circle 54 on Reader Response Card

PRODUCTS IN REVIEW

a closer look

by gary d. davis

TOA HS Speaker Systems with Constant Directivity Horns

TOA Electronics recently introduced its H-Series loudspeakers, featuring three different two-way and one three-way bass reflex sound reinforcement speakers. Designed for easy installation in medium-sized churches, schools, and assembly halls, these units have built-in ceiling mount hardware, and a finish which can be painted to blend with any decor. The factory finish is a pale beige lacquer, with a charcoal brown jersey removeable grille.

The loudspeakers have screw terminals for full-range or biamplified operation (except the HS-15). Adjustable level controls for the high frequency driver (and very high frequency driver on the three-way HS-315) are included for use in full-range mode. All models utilize a flush-mounted high frequency horn with 90-degree horizontal by 40-degree vertical coverage.

TOA said the HS Series is designed for use in conjunction with its modular 9000 Series of paging and music sound reinforcement systems. They are said to offer clear, transparent reinforcement for voice or music.

Comments: We often like to see more details than manufacturers typically provide in press releases. We requested TOA's spec sheets, and were surprised with what we found. Here we have four new models of loudspeakers, and TOA quietly omitted one of their most significant features: they all have constant directivity (CD) horns! The polar patterns shown on the spec sheet do indicate very close correspondence from 1 kHz through 8 kHz (in both planes). That should make it a lot easier for those of you who must carefully control sound coverage, especially with wider areas requiring multiple enclosures.

Three of the models, the HS-212, HS-215, and HS-315, employ true compression drivers, crossed over at 1 kHz, to power the CD horn. The HS-315 also uses a small, exponential diffraction-horn tweeter for frequencies over 8 kHz. All three of these models are rated at 120 watts of pink noise (band limited 50 Hz to 20 kHz), or 360 watts program power. The HS-212 has a 12-inch woofer, and the other two models 15-inch woofers. They are all rated at 100 dB/W/m sensitivity, and have relatively flat response to beyond 10 kHz, with useable response out to 20 kHz. They weigh 53, 60, and 77 pounds respectively. The high frequency level controls (and very high frequency control on the HS-315) are attenuators with a range of 0 to -10 dB; they only function with full-range connections.

The HS-15 differs from the other three H-Series speakers in that its CD horn is coupled to a piezo-electric high frequency driver. This is apparently an economy model; it has a 15-inch woofer and is rated at half the power capacity of the other models, it is 2 dB less sensitive and its top end begins rolling-off above 8 kHz, it weighs 35 pounds. And the HS-15 does not offer biamplification capability or high frequency level controls.

Typically, the power handling capacity of this type of loudspeaker, in full-range mode, is determined by the rating of the woofer. One thing which is obviously lacking in the specifications for these units is the power rating for the individual drivers so that, if operated in biamped mode, the appropriate size power amp can be selected for the high end.

Clearly, these loudspeakers are targeted for commercial use. With a low end that goes down to 50 Hz or so, and a high end which is useable well beyond 10 kHz, they all cover an adequate frequency range for high quality music reinforcement. The screw terminals provide a means for secure electrical connections which won't pull loose or develop high resistance, as can phone jacks and certain quick-connect schemes. The clean lines with paintable finish and built-in mounting hardware will facilitate installation. We did not see any distortion specifications, and, as with all loudspeakers, ultimately there is no substitute for a listening test, so it's up to you to take a closer look.

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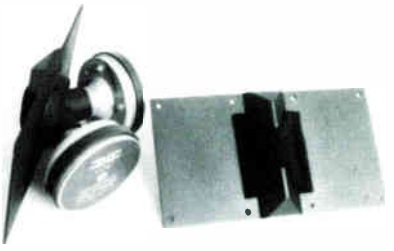


DCL Company "X-Vector" Wave Guide

DCL Company has developed a wave guide, a device utilized in lieu of a conventional horn to couple high frequency compression drivers to the environment. Known as X-Vector, the wave guide utilizes two screw-on one-inch throat drivers (standard 1-3/8 inch x 28 threaded mount) to provide very wide dispersion (140 degree horizontal by 60 degree vertical) over a range from 2 kHz through 22 kHz. (The recommended crossover frequency is 3 kHz.) The narrowing vertical pattern is said to compensate for the inherent roll-off of high frequencies at greater distances due to the differential attenuation of the air; that is, if the waveguide is aimed at the rear, the narrow vertical pattern will "throw" sound that way, and not spill too much into the near area.

The X-Vector is very compact, with a 6 x 11 inch integral baffle and a

(continued on page 49)

Q: Where can I find the right intercom for my school installation?

A: The annual Sound & Communications BLUE BOOK has all the answers. Whether it's school intercoms, power amplifiers, graphic equalizers, CCTV monitors, or background music receivers...you can find it all in the BLUE BOOK — the purchasing directory of manufacturers.

COMING IN AUGUST • *THE 1986 SOUND & COMMUNICATIONS BLUE BOOK*

TELECONFERENCING

(continued from page 31)

is impressive when one considers that an analog video signal equals approximately 1,500 analog voice grade lines, but T-1 and half T-1 use 24 and 12 voice-grade lines respectively.

As picture quality has improved, codec products have become smaller and less expensive. Although it may not sound like a sale, codec prices have fallen below $100,000. And while the codec used in a digital telephone is a single chip, a video codec is sometimes the size of a medium refrigerator. New video codecs look more like dormitory refrigerators.

Many codecs offer picture transmission rates ranging from 384 kilobits per second (kb/s) to 56 kb/s. Obviously, the lower transmission rates equal lower costs. However, picture quality is noticeably affected. Fifty-six kilobits per second will enable desktop teleconferencing (since 56 kb/s is the telephone company standard for a voice grade line), and picture resolution at this rate is constantly improving. But most corporate teleconferencing facilities now use the T-1 or half T-1 transmission rates.

The corporation building a teleconferencing facility normally owns the room but leases the satellite time from a common carrier or a private company. The T-1 (or half T-1) does not have to be permanently dedicated to teleconferencing. The corporation leasing the T-1 can use it at night, for example, to transmit data between locations.

Inside the Teleconferencing Room

The sophistication of a teleconferencing room is often determined by the amount of money and corporate support available for the project. Not all video meetings require elaborate facilities; modular roll-around cabinets can contain the basic equipment necessary for an ad hoc videoconference.

A dedicated meeting room usually resembles a cross between a traditional conference room and an audio-visual presentation room. Naturally, any videoconferencing facility will require certain basic equipment including one or more cameras, monitors, microphones and room loudspeakers. A graphics display area may require a stand-alone workstation or be incorporated onto the room conference table. Control of room functions is provided by one or more user control panels.

The conference table is normally designed to accommodate up to eight people. Better camera angles are possbile when the table is trapezoidal or arc-shaped. The table is placed several feet away from and facing a wall which contains rear-screen projectors or large video monitors.

Although large-screen projectors show more life-sized images, video monitors provide better resolution. Video projectors handle T-1 and half T-1 pictures quite well, but they cannot match the sharpness of video monitors. They also require frequent tweaking, which monitors do not. However, groups of people often look unrealistically small when displayed on a video monitor.

One or more video cameras are mounted above or below the display area. These cameras may be on motorized pan-tilt heads if controlled movement is required. Additional cameras may be used to cover a lectern or writing board area.

Users should not be concerned with setting camera shots during a business meeting. The table control panel normally offers pre-set camera shots which correspond to seating arrangements. Cameras can also be pre-set to cover the lectern area or writing board.

Graphics can be transmitted from a graphics console (workstation) or from the conference table. A graphics display camera can be mounted in the console, allowing display of documents, transparencies, objects or slides. Many companies choose to mount the graphics camera in the ceiling over the conference table, allowing more convenient display.

The teleconferencing room must not contain television studio lighting, since these lights would be distracting to room users. Modern industrial cameras (three-gun and one-gun) produce acceptable pictures under adequate fluorescent lighting. Unobtrusive specialty lights can be used to provide necessary fill lighting.

Microphones are placed on the conference table or hung from the ceiling. Directional or cardioid microphones are desirable to reduce feedback from the room loudspeaker. Audio-visual support equipment, including slide projectors and videocassette recorders, can be located in the room or placed in accessible closets.

The perceived complexity of a teleconferencing room depends on the functions available at the user control panel. Many companies limit their users' need to actively control room equipment, while other companies provide a full range of audio-visual presentation capabilities. These decisions may come from a knowledge of the company's unique culture, but they also may reflect the attitudes of the people involved in room design.

A room control panel should offer all the functions necessary to conduct the types of meetings held within the company. Engineers may require the capability to display large objects, while financial analysts may be more concerned with high-resolution document display. The goal must be to produce a control panel design which will not be intimidating to system users.

Sandy Kyrish, who has a master's in Communications Technology, is a video conference marketing representative for Pierce-Phelps' Video Systems Division.

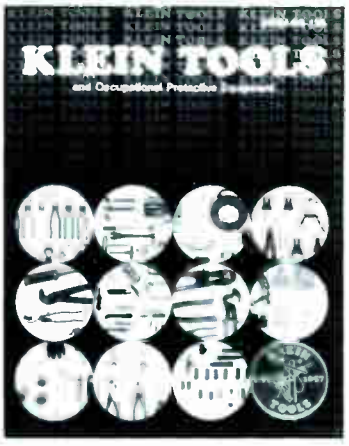
AD INDEX

DATAFILE *info.sources/new literature*

Marshall Publishes 1986 General Catalog

Marshall Electronics' 1986 General Catalog features the company's power cables, speaker cables, video-camera cables, patch bay connectors, panels, video switching consoles, RF amplifiers, and coaxial relays. Specifications and suggested applications are shown for most products in the catalog.

Circle 59 on Reader Response Card



Klein Tools Releases General Catalog

Klein Tools new general catalog (#129) covers the company's lines of hand tools and occupational protective equipment. The catalog includes a selection of pliers, wrenches, screwdrivers, bolt cutters, cable cutters, pocket knives, socket sets, hammers, tape measures, saws, drill bits, chisels, levels, gloves, tool boxes, padlocks, and tool pouches. In addition, the catalog covers a selection of specialized tools and equipment for the electrical, CATV, telephone, and electronics industries. The catalog features pictures, drawings, and specifications for all tools and equipment.

Circle 60 on Reader Response Card

Tool Catalog Now Available From Contact East

Contact East has released its new tool and instrument catalog, featuring 5,000 hard-to-find products for assembling, installing, testing, and repairing electronic equipment.

With full-size pages, color photos, and detailed descriptions, the catalog features precision hand tools, tool kits, test instruments, soldering supplies, and static control products.

Circle 61 on Reader Response Card

Electrovert Cable Harnessing Brochure Now Available

Electrovert has released its updated 12-page brochure covering the company's line of wire and cable harnessing and marking devices. The brochure provides complete and detailed information on applications, materials, specifications, properties, dimensions, and ordering data for each product.

Circle 62 on Reader Response Card

Speco Features Product Line In Its New Poster

Speco has released a 26 x 38-inch poster that features the company's entire commercial sound line, including speakers, speaker assemblies, wall baffles, and P.A. amplifiers.

Circle 63 on Reader Response Card

BOOK REVIEW

by Don Davis

Volumes of Acoustics

Cremer, Lothar and Helmut A. Muller, *Principles and Applications of Room Acoustics, Vol 1 & 2* (translated by Theodore J. Schultz), Applied Science Publishers: London and New York, $147.

These are expensive volumes, approximately $147, but they are worth every penny! Volume 1 covers geometrical acoustics, statistical room acoustics and psychological room acoustics, while Volume 2 covers wave-theoretical acoustics.

For those sound contractors who have wondered just what legitimate acoustic consultants have to know and be able to do, these volumes are a revelation. They also serve as a useful yardstick (or meter stick for those of you wed to the S.I.) that allows identification of the pretenders.

If you are truly interested in how we perceive sound and what environmental elements both indoors and outdoors do to that perception, you will be unable to lay these volumes down.

Well written, well translated, and well illustrated, this writer knows of no comparable collection available in the English language.

The potential reader should bear in mind that *this book is on acoustics;* sound systems receive only about four pages of attention. Despite this, the value of understanding the development and behavior of the complex sound fields that arise in real rooms from any source leads quickly to an understanding of other sources' interactions as well.

The remainder of this decade will see important improvements made in sound systems as they employ increased knowledge of the integration capabilities of the human hearing system.

The chapter on "The Fine Structure of Reverberation" is worth the price of both volumes. The works of Schroeder, Atal, Jordon, Kurer, Cremer, Reichardt, Thiele, Beranek, Kutruff, Meyer, and many, many others are reviewed and meaningfully summarized in these volumes from scattered publications in obscure acoustic journals.

This month's book review is by Don Davis a principal of Synergetic Audio Concepts in San Juan Capistrano, CA.

RESOUNDING LIBERTY

In addition to the structural renovations at Liberty Island, visitors to the Statue of Liberty will enjoy improved PA and life-safety systems. As part of the recent renovation of Miss Liberty and her museum, BRD Systems and Wade Electric, both of Queens, NY, have installed communications equipment.

At press time, BRD Systems, the company installing the life-safety systems at the Statue, reported that work was continuing in an effort to complete the installation by July 4th.

BRD Systems engineer Jim Davis said: "We're working right down to the wire. It's a hairy situation. A lot of the interior spaces have to be finished before we can test the equipment. We have a crew there all the time and we're hoping to complete the installation before the deadline."

Wade Electric is installing the PA systems in the Statue and museum. Cassettes playing over the loudspeakers in the Statue's elevators will give visitors instant history lessons. Appropriate cassettes will play for the up and down trips.

Paul Sheehan, Wade Electric project manager for the liberty Island installation, also reported that work was continuing in a race against the impending deadline.

Sheehan said: "We're waiting for the elevator installer to give us information on the elevators. The movement of the elevators, up or down, triggers the appropriate cassette. There's one tape for people going in and one tape for people leaving. We need the information on the timing of the elevators before we can finish the installation."

Several sound equipment manufacturers have the honor of having their products installed on Liberty Island. From Atlas Sound, the Statue will have 25 VTS loudspeakers and the museum will have 75 APF speakers. Soundolier baffles will cover the speakers. Dukane amplifiers will power the paging systems. Paso's RG Series cassette deck will keep the historical-information cassettes rolling. The life-safety system will include smoke detectors and a control panel from Mirtone, a Canadian company.

Achieving the...

HARD ROCK SOUND

Part of the requirements of the sound system that was installed at New York's Hard Rock Cafe earlier this year, was that it complemented the club's "rock-oriented" atmosphere, according to Isaac Tigrett, Hard Rock founder and owner. A visitor to the Hard Rock might find himself sitting at a 70-foot Stratocaster guitar bar or at a table across from Elvis Presley's tour jacket, Chubby Checker's boots, or Waylon Jenning's guitar.

"The sound system we needed (and eventually installed) had to match the quality and attention to detail that we have achieved for the club's ambience and food. It plays an important part in our success," Tigrett said.

The installation, which took about five months, faced several obstacles, including the physical problems created by the Cafe's balconies, multiple levels, and memorabilia-covered walls. The system had to be versatile enough to produce recorded and live music along with multi-track recording, radio broadcasting, and video production.

The system's designer, Howard Smith, of Smith, Fause & Associates, said: "We decided on an electro-acoustic solution to enhance articulation. We used a large number of small speakers to cover specific areas at very short throw distances. The approach reduced the amount of reverberant sound in proportion to direct sound. We aimed for a very high-presence sound characteristic, like what you might hear in an exceptional car stereo system."

Indeed, the Hard Rock installation uses a large number of small speakers:

(continued on page 48)

Installing the Ramsa speakers over the Stratocaster guitar-shaped bar.

American Fibertek Introduces Fiber Optic CCTV System

American Fibertek has introduced the SentryVision system, a light-modulation system that allows CCTV transmission over fiber optic cables. A transmission module, located on or near the camera, converts the electronic video signal to a modulated light signal that is transmitted over a fiber optic cable. A receiver module, located near the monitor, converts the optic signal back to an electronic signal.

Fiber optic cable transmission offers less interference and less signal loss over distance than coaxial cable.

American Fibertek provides all the tools, connectors and fiber optic cables needed for an installation of the system.

Circle 39 on Reader Response Card

New Locking Security Cabinets From Winsted

The Winsted Corporation has introduced two new locking security cabinets. Designed to provide security for video recorders, control units or other electronics, the cabinets feature hinged locking doors.

Both models feature 14-gauge steel bodies and 12-gauge steel doors. Rear access openings accommodate input, output, and power cables.

Cabinet 06035 features a pullout shelf for access to top-loading VCRs, a rack for equipment mounting, and an optional cooling fan. The cabinet measures 13 x 21 x 24 inches.

Cabinet 96033 includes a high-tensile steel mounting kit for installation on any work surface. The cabinet measures 9-1/8 x 24 x 19 inches.

Circle 40 on Reader Response Card

Industry West Introduces Multi-Unit Adaptor Box

Industry West Electronics has introduced the EJ-10 multi-input adaptor box, a device that allows connection of different sound sources to the mic input jacks of a house sound reinforcement system.

The EJ-10's inputs include unbalanced stereo phone, phone, miniphone, RCA phono, speaker-level one-quarter-inch phone plug, and telephone line modular jack. Outputs include a transformer-balanced 100-ohm adjustable mic level output on a three-foot cable with a male XLR plug and a telephone modular jack.

Controls include a volume control, a hum switch, and a telephone line seize switch.

Circle 41 on Reader Response Card

Atlas Sound Introduces Telephone Signalling Devices

Atlas Sound has introduced several products that use light or sound for auxiliary telephone signalling. The signallers are compatible with most key phone and PBX systems.

The TST, for 110 VAC operation, provides 10 to 14 flashes per 1.5 seconds and its light output peaks at 70,000 candlepower. The TST-12, for 24 VDC operation, provides one to three flashes per second.

The TC chime is said to provide a pleasant tone which will help to preserve the quiet of professional offices and health care facilities.

The TCST provides both an electronic chime and a 70,000 peak candlepower strobe and is suggested for use in lobbies, meeting rooms, warehouses, transportation docks, and factories.

The TRR, a multi-purpose telephone ring relay rated at three amps and operable from either 125 VAC or 28 VDC, provides one normally-open and one normally-closed contact.

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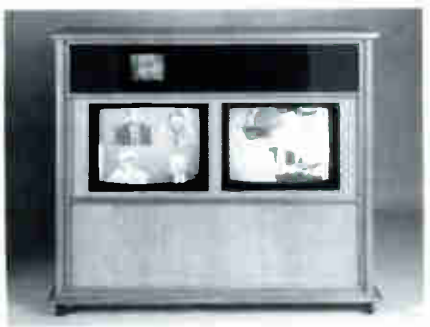

GEC's Videoconference Cabinet on Wheels Introduced

GEC Video Systems has introduced the Hannover Rollabout, a videoconference equipment cabinet on rollers. The Rollabout's natural wood finish will match any conference room decor, according to the manufacturer.

The unit houses the monitors, cameras, sound unit, codec and other videoconference equipment such as echo canceller, split screen unit etc., according to requirements.

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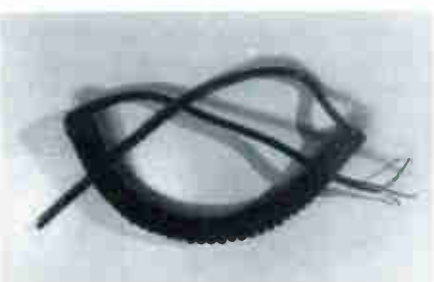

New Retractile Power Cords From Brim Electronics

Brim Electronics' new series of UL-approved retractile power cords feature full color-coding and are rated to 60 degrees celsius. The cords come in two, three, or four-conductor 18-gauge and 16-gauge soft bare copper configurations. These plastic-jacketed cords are said to be smaller and lighter—for a given voltage rating—than neoprene-jacketed cords.

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FACES AND PLACES

Aiphone Appoints Kohagen Director Marketing & Advertising

Stan Kohagen has joined Aiphone Corp. as director of marketing and advertising. Kohagen will coordinate national advertising, marketing, and trade shows for Aiphone.

Prior to joining Aiphone, Kohagen served as a marketing consultant in the Seattle area. Before that, he worked in several advertising agencies.

Sony Announces Meyer, Plushner, and Rosen Appointments

Sony Professional Audio Division has announced the appointments of Ken Meyer as western regional manager, Rick Plushner as western regional manager for digital audio, and Gary Rosen as eastern regional manager for digital audio.

Meyer, who will coordinate western sales and marketing of professional audio equipment, has worked for Sony since 1979, first as a sales representative in the consumer products division and then as northwestern regional sales manager for consumer audio products.

Plushner, a graduate of the Univcrsity of Miami, will head western sales and marketing for the entire line of Sony digital audio equipment. Plushner has worked for Sony's West Coast division since 1979.

Rosen, who has previously worked as an independent audio consultant and as a general manager for the House of Music recording studio in West Orange, NJ, will be responsible for eastern sales of Sony's digital audio line.

Harris Names Adams VP, Digital Telephone Systems Division

Harris Corporation has appointed William J. Adams as vice president and general manager of its Digital Telephone Systems Division. Adams joined Harris in 1984 as vice president and general manager of the Mobile Telephone Division. Prior to joining Harris, Adams worked with General Electric and Northern Telecom. Harris holds a bachelor's degree in mechanical engineering from Union College and a master's degree in business administration from Vanderbilt University.

ADA Appoints Houston Chief Engineer

ADA Signal Processors, Inc. has appointed Bill Houston as its chief engineer. A company spokesman said, "Houston has been instrumental in expanding ADA's research and development into new areas, including MIDI and digital signal processing."

Houston, who holds a degree in electrical engineering from the University of Kentucky, has experience in both analog and digital design. Before joining ADA, Houston served as senior design engineer for MCI/Sony.

BILL HOUSTON

WILLIAM B. COOLEY

NEC TelephonesNames Cooley PBX Product Manager

NEC Telephones, Inc. has appointed William B. Cooley as PBX product line manager. Cooley will develop sales and marketing documentation for the NEAX® 2400 IMS and Impulse digital PBX switches. He will also work on new product development and market research.

Before coming to NEC, Cooley worked at the Graybar Electric Company as a national telecommunications product specialist.

Altec Lansing Names Shepherd Manager, Design Engineering

Ed Rusch, vice president of engineering at Altec Lansing Corporation, announced the appointment of John Shepherd as manager, design engineering. In his new position, Shepherd will be in charge of the new product design laboratory, and oversee the product development and documentation of electronic and acoustic audio devices.

Shepherd has been in the sound equipment manufacturing business for 16 years, working in technical and engineering positions for Peavey Electronics Corp., MCI, and Accurate Sound Corp. He was educated at Hinds Junior College and Florida Atlantic University, and is a member of the Audio Engineering Society.

Paso Promotes O'Brien To Product Manager

Paso Sound Products has announced the appointment of Ken O'Brien as product manager. O'Brien will be responsibile for product development, enhancement, and documentation, as well as providing technical information and support to the sound field.

O'Brien, who studied engineering at the New Jersey Institute of Technology, has previously worked for Simplex as a regional representative and for Bogen as national sales engineer.

Muzak Names Mann Manager, Creative Services

Muzak President Tony Hirsh has announced the appointment of Carol Mann as manager, creative services.

Mann joined Muzak in December 1980, as administrative assistant to the president. She subsequently served as an associate systems analyst, supervisor of administration, and, most recently, creative services coordinator.

Before joining Muzak, Mann worked for a New York marketing firm, and was previously associated with a sales and marketing division of Inter-Continental Hotels.

Brouhard To Manage Marketing For Pirelli Fiber Optics

Pirelli Cable Corporation's Communications Division has named Jack Brouhard marketing manager. While overseeing advertising, public relations, and market research, Brouhard will design and implement strategies to support Pirelli's position as a supplier of fiber optic cables and assemblies.

Brouhard spent the last four years in the field of fiber optics, as a sales executive with Siecor Corporation and Corning Glass Works.

REP NEWS

Bill Bencsik (center) of Bencsik Associates, Inc. in Ocala, FL, was named TOA's 1985 Rep of the Year at the NSCA Expo in Las Vegas, NV. Sam Sakata (left), president of TOA, and Joe Green (right), TOA's national sales manager Commercial/Engineered Sound Group, presided over the awards ceremony. Bencsik Associates, which covers Florida and Puerto Rico, has represented TOA since 1982.

Jeron Electronic Systems, Inc. has presented awards for outstanding sales achievement in 1985 to **Mike Schlarman** of **M. Schlarman Associates** in Wanague, NJ, and to **Gerry Horne** of **RG Associates** of Stow, MA. **New West Agency** also received an award. The presentations were made at Jeron's national sales meeting which was held during the 1986 NSCA Contractor's Expo.

Thomas Dowell & Associates, a St. Louis, MO, rep firm, has received **Switchcraft, Inc.'s 21st Annual Hermes Award** for outstanding achievements in the marketing of Switchcraft electrical and electronic components.

Lineau Associates of Columbia, MD, will represent **Paso Sound Products, Inc.** in UTP 10, which includes Virginia, Washington, D.C., and Maryland. The firm, headed by **Red Vaughn**, will be responsible for Paso's Commercial sound, packaged sound, and Elvox Intercom product lines.

CALENDAR OF EVENTS DATE BOOK

DATE	EVENT/COMMENT	LOCATION	CONTACT
Aug 18-19	**Sound Engineering Seminar** Two-day seminar in audio and acoustics by Synergetic Audio Concepts.	Syracuse, NY	Syn-Aud-Con (714) 728-0245
Aug 21-24	**International Business Music Association** Meeting & Conference.	Traverse City, MI	IBMA (216) 833-4164
Aug 26-28	**International Security Conference** Sound, Signal & Security.	New York, NY	ISC (312) 299-9311
Aug 26-28	**Interconnect '86** Seminars & exhibits.	San Mateo, CA	USTSA (312) 782-8597
Sept 8-10	**NCC-Telecommunications Conference** Program & seminars.	Philadelphia, PA	AFIPS (800) 622-1986
Sept 29-30	**9th Kentuckiana Sound Seminar** Exhibits & seminars.	Indianapolis, IN	Andy Baker & Assoc. (317) 253-9667
Sept 30-Oct 1	**Chesapeake ERA Electronics Show** Exhibitors & seminars.	Greenbelt, MD	ERA (301) 235-1942
Oct 6-8	**U.S. Telecommunications Supplier's Association Conference.**	Seattle, WA	USTSA (202) 872-1200

HARD ROCK

(continued from page 44)

65 Ramsa WS-A10 speakers. Other equipment used in the installation includes Technics turntables, CD players, and reel-to-reel recorders, Mitsubishi multi-play cassette and CD players, Klark-Teknik DN 700 digital delays, White Instrument subharmonic filters, and Ramsa speakers, mixing boards, and amplifiers.

Robert Drake Acoustics, of New York City, installed the system. Bill Beatty of Studio Instrument Rentals, New York City, consulted on the installation.

According to Robert Drake of Robert Drake Acoustics, club owner Tigrett has ordered modifications to the installation in order to "provide greater acoustic presence." These modifications will include the installation of new subwoofers.

THEORY & APPLICATION

(continued from page 35)

the near future, I believe you will see the units with modems that allow the system to talk to a central computer back at the contractor's shop. This feature will allow the contractor to check every system he installs on a weekly basis. You will be able to turn on the computer monitoring system on your way out the door at night. So when you come in the next morning, you will have a complete report stating system status with faults traced to the exact piece of defective equipment. A service tech can then be dispatched with the exact replacement part needed to restore the system to full working capability. This service will be billable to your customers on a monthly basis, which should serve to drive up revenues substantially.

In closing, I would like to suggest that if you have a computer, become very familiar with its operation. If you don't have a computer, invest in one. It doesn't have to be expensive, a simple Commodore-type unit will teach you almost all you will need to know. And when you find something new, tell the manufacturers about it. Or, write a letter to a trade publication. The faster we all get used to computer controlled audio, the faster our industry will grow.

William Murphy is president of ProTech Audio Corp. This article is a condensed version of a technical seminar paper Murphy presented at the 1986 NSCA Contractor's Expo.

A CLOSER LOOK

(continued from page 40)

slightly raised mouth area. The mouth is protected by metal mesh and acoustic foam. (The foam also helps control distortion.) Overall depth with typical drivers mounted, is just six inches. The unit is made of aluminum and high density compounds, and no extra driver support is required. X-Vector can be mounted in an enclosure or free-standing, and is ideal for clustering suspended arrays.

The moderately priced X-Vector is currently being sold to OEMs and in larger quantities to contractors. However, DCL will accept orders for as few as four units.

Comments: We wondered what the difference was between a waveguide and a horn, so we contacted DCL owner Dan Longest. He told us that unlike a horn, the X-Vector does not match the impedance of the drivers to the acoustic environment (it has very little cross-sectional area at the mouth). It does, however, have a phasing plug (actually a ball-shaped item) which controls the mixing of acoustic output from the drivers. According to Longest, the sound exits the drivers in plane wave form, and about half of it goes "straight" out (which is actually angled to one side or the other due to the splay of the drivers), while the other half of the sound wraps around the phasing ball (due to diffraction) and fills the central area. Apparently this approach keeps phase distortion to less than 0.5 percent (percent by SPL).

Longest explained that the design was derived through extensive computer analysis, and that the frequency response and dispersion are more controlled by the waveguide than by the particular brand and model of driver. Generally, the response is flat from 2 kHz to 4 or 5 kHz, and then rises somewhat above that. The maximum SPL occurs in front of the baffle, where it is about 6 dB higher than the level coming from either driver (unlike the conventional horn, where maximum SPL develops in the throat). This causes the very highest frequencies to spread out along the baffle surface. Thus, HF output actually increases as one moves off axis from +/-70 degrees to about +/- 90 degrees (i.e., between a 140 degree and a 180 degree dispersion angle). This angle turns out to be too wide, and the acoustic foam grille actually serves to attenuate that off-axis build-up, making the overall horizontal dispersion more uniform. X-Vector may be somewhat less efficient than a horn, but it has wider dispersion...and with no more phase distortion (possibly less) than an acoustic lens would induce.

Apparently, after experimenting with single-driver waveguides, Longest found that his design approach worked best with two drivers. In fact, he recommends it primarily for high SPL systems, where it is said to yield relatively low distortion for its wide dispersion, wide frequency range, and high-level output. The X-Vector should work with any true compression driver with a suitable diameter and thread, but is not for use with piezo-electric drivers. The acid test with any piece of sound equipment is, of course, how good it sounds. It is not possible for us to evaluate the design based on spec sheets and conversation, although it seems like a workable concept that bears your closer look.

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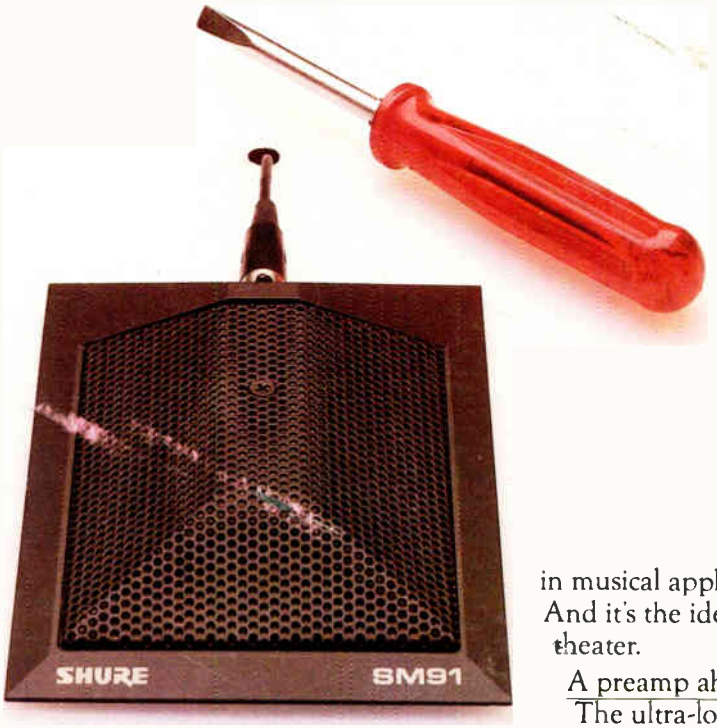

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