

SOUND & COMMUNICATIONS

Volume 34 Number 11

November 1988



AUDIO-ENHANCED ENVIRONMENTS

Along with theme park designers, museum directors and zoo curators are responding to the increasing demand for more realistic recreations of natural environments. As a result of the public's growing level of sophistication and awareness of what constitutes high quality audio, designers are discovering the value of audio enhancement. Here's a look at the ways in which modern audio technology is enriching several of these environments. **28**

SIGNAL PROCESSING

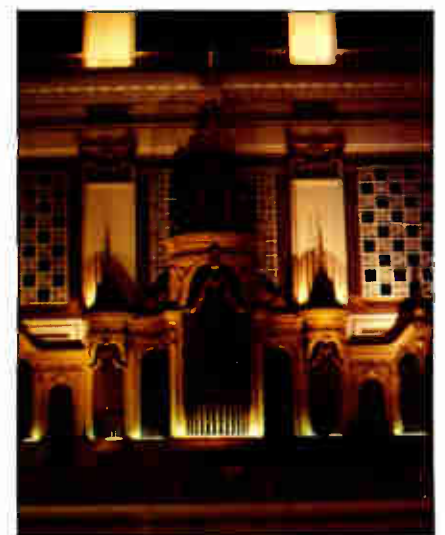
When the audio signal is altered in a non-linear fashion, whether for mild enhancement or for extreme special effects, we are using signal processing. In the second part of our primer on signal processing, we cover compressors, limiters, noise gates, and expanders—from basic design to applications. **34**

DUELING KEYBOARDS

When the Kurzweil 250 digital keyboard took on the Great Organ at John Wanamaker's, the real challenge lay in designing its loudspeaker system. What was the result? **24**

ATLANTIC CITY BACKGROUND

The sound systems in the showrooms and lounges of Atlantic City may be impressive, but they're not the whole story when it comes to the aural environment of a major casino hotel. From the moment guests arrive at one of these facilities, they are cradled in an atmosphere of sounds tailored to suit an astonishing variety of mood and ambience. Background systems are the focus of this third installment in our series on the casinos of Atlantic City. **40**



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MA/MR Series mixer/amps put style in sound reinforcement. The MA/MR Series mixer/amps look right in any setting. Clean lines and a modern black finish add to their attractive, professional appearance.

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A helpful, easy-to-understand owner's manual provides clear instructions on installation, operation, and service. In the unlikely event of a problem, a bottom panel can be removed for access to the main circuit board. Day after day, year after year, you can rely on the refined MA/MR Series to deliver the performance you need.

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The PHMS-1 Personal Headphone Monitor System is a modular monitor/mixing network that can grow according to your needs. Its two basic components, the PHMAS Master Module and the PHSAT Satellite module, give you everything you need for almost any application.

12 clean watts per channel allow the

PHMAS to power up to 32 sets of headphones, while its 4 inputs, complete with volume and pan controls provide you with total flexibility.

The PHSAT Satellite Module has 2 channels, each with 2 headphone outputs; separate L&R volume controls and stereo/mono switches for unequalled control.

If you need extra inputs, the PHEX-8 gives you 8 more, bringing the total to 12. It interfaces directly to the PHMAS via a special jack which provides power and audio signals for the PHEX-8.

The basic system is comprised of one PHMAS and one PHSAT, however all components are available separately.

P40-2 40 WATT STEREO POWER AMPLIFIER



Our P40-2, is a 2-channel, 40 watt per-channel power amplifier designed for situations that don't require its high-powered relatives. Low noise, a conservative power rating, and it's one-

space rack size make the P40-2 one of the handiest power amplifiers on the market and one of the most useful audio tools you'll own.

MIX-5 5 CHANNEL MIXER



The MIX-5 is U.S. Audio's single-space rack mountable five channel monophonic mixer. Four balanced low microphone or four high impedance/line level inputs and one summed stereo auxiliary input, plus a ten-segment LED level indicator combine to make the MIX-5 a welcome addition to anyone's "audio toolbox".

Brand New From...

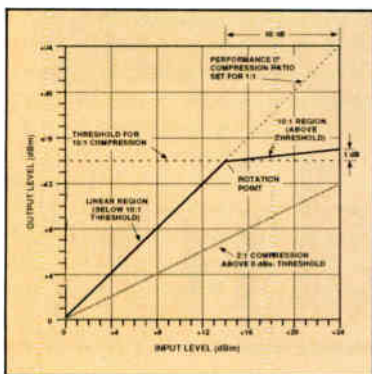


PRODUCTS

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By Jesse Klapholz

The microchip took on the mighty pipe organ, with surprising results.

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By Gary Davis and Ralph Jones

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SOUND COMMUNICATIONS

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Coming in December . . .

Our annual Economic Report. A review of the year's economic activity as it relates to this industry, with a forecast of economic trends to come. Don't miss it!



SUPERIOR PERFORMANCE ANYWHERE, ANYPLACE, EVERY TIME.

No matter how much you spend on a wireless system without selectable channels in the receiver and transmitter, you'll always be vulnerable to potentially damaging interference.

That's why the Samson Broadcast STD wireless system offers ten selectable channels in *both*. Simply dial up the ideal channel in the receiver, then select the identical channel in the transmitter

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But the real benefit of Broadcast STD truly becomes apparent once

you hear the system. Samson's sophisticated "new generation" RF circuitry with dbx* noise reduction provides more dynamic headroom and the purest, most transparent audio quality available in wireless today.

The Broadcast STD Series combines these leading edge features so you know you're getting matchless performance. Anywhere, anyplace and every time.

Broadcast STD Series available in Hand-Held, Lavalier & Instrument Systems.

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The Music & Sound Retailer
Home Entertainment

Circle 217 on Reader Response Card

MAJOR ANNOUNCEMENT

How you can become an AEI Music DBS Distributor - Now!

AEI Music Network Inc., America's leading foreground music company, announces the acquisition of Seeburg Music Satellite Network from Capitol Broadcasting Company. This acquisition is transforming the business music industry and opens tremendous opportunities for you.

AEI Goes "DBS"

Now, AEI is entering the market for "DBS" (direct broadcast by satellite) music. This revolutionary system, developed by Seeburg, allows reception of music, data and other signals direct from satellite . . . to a dish only 29" across!

tion of more than a thousand DBS packages. As a distributor, you can share in the fruits of this success through installation, service and a unique rebate program. But only if you become an AEI Preferred Distributor.

Profit Opportunities

AEI already has more than sixty DBS distributors in place. We now need strong representation in selected additional markets across America. Great profit opportunities exist for enterprising businesses, which want to be at the very forefront of the DBS revolution.

Music, Marketing and More. . .

AEI Music Network Inc. is well known for its outstanding marketing strategies, leadership in music programming, strength in national accounts and in the depth of its dealer network.

Our national accounts team has already signed contracts for the installa-

MUSIC THAT MEANS BUSINESS™

Here's why AEI is America's leading high quality business music company:

- Founded in 1971
- Now serves over 51,000 customers
- \$1,000,000 marketing program scheduled for 1989
- An audience of 20 million every day
- Employs 225 people
- 320 dealers/distributors nationwide
- Satellite transmission via GE Americom's K2 Ku-band satellite
- Spectra music package provides four sensational music formats
- Full 15 kHz frequency response
- National account customers include: The Gap, The Limited, Bennigans, TGI Friday's, Banana Republic, Casual Corner, Neiman Marcus . . . and *many* more!

Act Now!

There are a limited number of open markets. If you are interested in this once-in-a-generation opportunity, call Denny Thompson at 800/831-8001 today, for your distributor information package.



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206/329-1400

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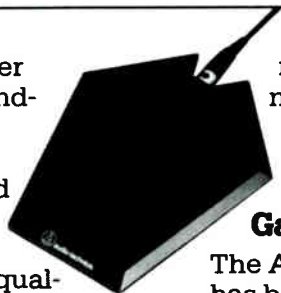
Who would believe a microphone this flat...



Model AT871 UniPlate™
Condenser Cardioid

could have a curve to match!

If you've tried other hemicardioid boundary microphones, you may have been disappointed in the sound... thin, peaky, and requiring lots of equalization. If so, it's time to listen to ours: the new AT871 UniPlate Condenser Cardioid.



response so vital to natural sound reinforcement.

Outstanding Gain-Before-Feedback

The AT871 UniPlate Cardioid has both the polar pattern and response curve to provide higher gain-before-feedback than you may have thought possible. But better gain-before-feedback and a great sounding element are only a part of the story.

Less Noise Two Ways

By using a very low-mass diaphragm and a case heavier than the others, we sharply reduced sensitivity to mechan-

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

Effective Problem Solver

The AT871 is solving problems in stage sound reinforcement, church sound, teleconferencing, boardroom applications... even TV and film locations. Wherever great sound is needed...unobtrusively. We urge you to test the AT871 side-by-side with any of the rest. Choose your most critical sound problems. The difference you hear will prove our point.

UniPoint Technology at Work

Our experience pioneering UniPoint miniature condensers permitted us to take a new approach to boundary microphone design. We optimized the basic UniPoint cardioid element for boundary use, creating remarkable reach and presence, yet retaining extended high and low-frequency



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NEWSLETTER

GROWING MARKET FOR ALTERNATE POWER SOURCES

A recent report from Frost & Sullivan predicts a rapidly expanding market for uninterruptible power supply systems. The market research firm reports that the market should grow from around \$625 million this year to \$1.19 billion by 1993. The report goes on to say that static on-line systems will dominate, reaching 75 percent of the market through 1993, with standby systems expected to grow at a faster rate, reaching 16 percent of the overall market by 1993.

MEETING SET FOR NSCA PRODUCT SAFETY GROUP

The Product Safety Group of the National Sound & Communications Association (NSCA) has scheduled a meeting for December 7, 1988, at the Embassy Suites O'Hare Hotel, Rosemont, IL. Topics expected to be discussed include: identification of technical issues, appointment of members to the Industry Advisory Conference to Underwriters Laboratories, and progress reports from the committee on power levels and the committee working on developing generic guidelines.

AMERICAN DYNAMICS DISCONTINUES PRIVATE-LABEL PRODUCTION

Effective November 15, American Dynamics (a manufacturer of CCTV equipment for surveillance and security applications) discontinued its program of marketing a portion of its output of CCTV products to OEM's under private label. The company will concentrate its efforts on marketing to distributors and dealers for resale to the end-user. Victor C. Houk, American Dynamics vice president of sales and marketing, said: "With this basic change in corporate policy, we will be better able to support our growing network of CCTV dealers and distributors, providing off-the-shelf delivery of much of our product line."

KLIPSCH ANNOUNCES NEW MOVES

Klipsch & Associates, the well known Arkansas manufacturer, has introduced a new professional loudspeaker line, the KP series, and has segmented and reorganized the sales representation for its professional loudspeaker products. New reps appointed include: New England Technical Associates, Audio Associates Corporation, J.B. Parent Company, Michael Chaffee Enterprises, Starin Marketing, AIM Marketing Group, Reep Professional Marketing, and Northmar.

BIAMP SYSTEMS PURCHASED

Biamp Systems, along with Northwest Audio Systems, Inc., has been acquired by International Music Company (IMC). Biamp will be a wholly owned subsidiary, and will continue to be responsible for research, design and manufacturing in its facility in Portland, Oregon. Sales reps for Biamp reportedly now have access to Ross and Akai products.

AUDIO-TECHNICA ON PODIUM

The podium currently being shipped to the Smithsonian is from the Republican National Convention, and Audio-Technica tells us it's proud to have a TriPoint microphone on board the podium as it appeared at the convention.

DIGITAL EFFECTS PROCESSOR INTRO

Yamaha has introduced a digital multi-effects processor with 16 bit quantization and a sampling frequency of 44.1 kHz which can directly accept digital audio input. The model SPX1000 carries a suggested retail price of \$1,795.

FIRST ANNIVERSARY

Yamaha Communication Center, the New York facility which Yamaha created as a showroom and research and development center in the heart of the music center, celebrated its first anniversary this month with a concert and reception in Manhattan. Nearly 300 guests were expected.

ALTEC CONFERENCE

Altec Lansing Corporation has pronounced its October technical conference a success. The conference in

NEWSLETTER

Montreal was attended by over 150 industry professionals and included two days of intensive sound engineering discussions.

FORMAL PURCHASE OF SEEBURG

AEI Music Network Inc. has officially acquired Seeburg Music Satellite Network and Capitol Background Music from Capitol Broadcasting Company. The acquisition was formally announced by AEI's chairman and ceo, Michael J. Malone at the IBMA convention in Fort Lauderdale. According to the company, the acquisition combines the nation's largest supplier of on-premise original artist music programs with the country's leading supplier of satellite directly distributed music services. AEI currently claims 50,000 clients in the U.S. and Canada.

RAULAND-BORG SUIT

Rauland-Borg Corporation has brought suit against Simplex Time Recorder Company for patent infringement. The patent in question is, according to Rauland-Borg, based on an invention included in Rauland-Borg's Model 2424 User-Programmable Clock. The lawsuit seeks an injunction of further sales of the "infringing clocks" and an award of damages.

GRAY MARKET BATTLE CONTINUES IN COURTS

In its continuing battle against gray market goods, Yamaha Electronics Corporation, USA, has announced that it intends to continue its legal action against ABC International Traders, Inc., Los Angeles, by appealing a summary judgment recently granted to the retailer. Don Palmquist, president of Yamaha Electronics, said that Yamaha is prepared to appeal this case to the United States Supreme Court, if necessary.

"PROMPT PAY BILL PASSED"

Federal legislation has been signed to increase the rate of payment by the federal government to suppliers. The "Prompt Pay Bill" is now Public Law 100-496, and The International Communications Industries Association, which spearheaded lobbying for the law, claims the law will save industry \$87 million in 1989.

ERA EXPANDS

The Electronics Representatives Association has launched an associate member program for manufacturers who sell through representatives. The goal of the program is "to provide manufacturers with market-specific assistance . . . to sell their products more efficiently." The ERA currently has 2,000 member firms selling more than \$40 billion annually for over 8,000 manufacturers.

CLOSED CIRCUIT TV CONTRACT AWARDED FOR URBAN TRANSIT

Cohu, Inc. of San Diego has been awarded the subcontract to build and install the closed-circuit television system for the Southern California Rapid Transit District's Metro Rail Project. The initial subcontract from Bechtel Civil totals over \$1.4 million, and covers system engineering, documentation, fabrication, installation and testing of the CCTV system and ancillary hardware. Cohu is one of six subcontractors working on the Metro Rail Communications contract.

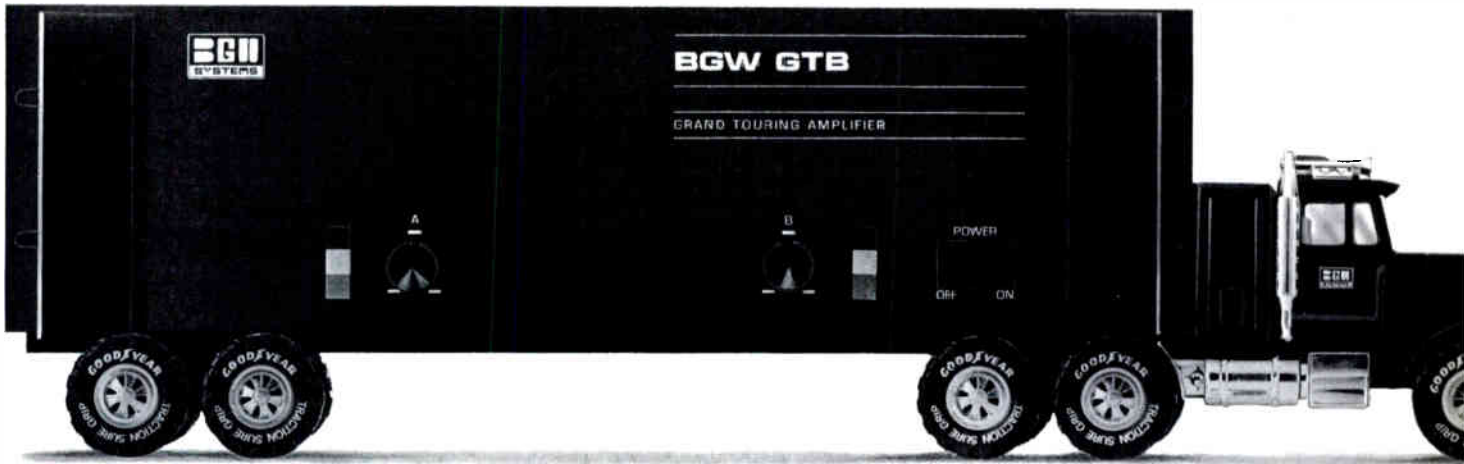
PATENT INFRINGEMENT CLAIMED BY PANDUIT

Panduit Corp. has announced that it has filed suit charging Catamount Manufacturing Incorporated with infringement of two of Panduit's cable tie patents. The complaint seeks damages and an injunction.

REPORT SAYS HOME SECURITY MARKET IN ITS INFANCY

Frost and Sullivan has issued a report on the home entertainment and information equipment market which asserts that the home security and monitoring devices market is "still in its earliest phases." The report predicts that sales of these "simple low-cost devices will take off around 1990," growing from 750,000 in 1987 to 2 million annually in 1992.

No One Takes The Rigors Of The Road As Seriously As BGW.



It's true. Next to BGW Grand Touring Amplifiers, other so-called touring amps are just "tourists." Our Grand Touring Amps deliver the power, performance and features you need on the road. And they're built to keep on doing the job under conditions that send other amps packing.

Take our new heavy-duty model **GTB**. You won't find this combination of road-ready features in a Crown Macro-Tech, a QSC Series III, or ANY other power amp (except our own flagship model **GTA**).

- One-piece welded steel chassis withstands rough rides and load-outs.
- Forced-air cooled, massive extruded aluminum heat sinks provide continuous operation in hot, crowded racks.
- Two ohm capability allows BGW amps to drive more speakers with fewer amps — saving money and rack space.
- Magnetic circuit breaker/front panel power switch affords instant overload protection. (You have to pull a Crown out of the rack to change a 20¢ fuse!)
- DC Crowbar speaker protection — a BGW first since 1971 — provides positive protection for expensive speakers, without relays.
- Modular construction means fast, easy field service.
- 100% discrete circuitry (no IC's) with low feedback delivers superb sonic performance.

- Active balanced inputs with looping XLR-type connectors provide greater than 70 dB common mode rejection — some of our competitors don't even spec this crucial parameter. Optional transformer-isolated inputs offer absolute isolation.
- Switchable subsonic filters protect low frequency drivers from excursion limit damage.
- Crossover capability — two BGW cross-over cards can be mounted in our touring amps, safe from abuse.
- Large LED indicators maintain readability across the stage.

A touring amp with all these essentials, plus legendary BGW reliability and sonic integrity, will make our competition nervous — especially since the **GTB** costs no more than their "comparable" amps. Too bad for them. But peace of mind for you, when you go with BGW Grand Touring Amplifiers.

You know a professional tour is no place for "tourists." (And neither is a fixed-location amp rack, right?) So call BGW Systems toll free at **1-800-468-AMPS** (in USA and Canada) to arrange a demo of our new "workhorse" model **GTB** or the "2.4 Horsepower" model **GTA**.



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ENGINEERED TO BE THE BEST

Increasing Market Share Through Networking

by Al Benoy

Independent dealers of communications equipment are finding, as their industry matures, that manufacturers are learning from one another's successes, and that equipment is becoming increasingly standardized. This trend has brought with it a degree of product compatibility which makes everyone's work easier. But, at the same time, largely similar products have put the consumer in a position to compare prices intelligently. Given brands of equal repute, price has become the most influential factor in their buying choices.

One major area of opportunity remains available to the independent dealer who wishes to differentiate himself in the marketplace: value-added service. The concept is old, but consumers are no less pleased when they find it today. Marketing a service relationship, however, requires that consumers understand and truly appreciate the distinction between apparent low up-front cost for a communications system and actual low cost for such a system over time. Independent dealers who offer value-added service to their customers know that those who understand this distinction usually opt to pay a competitive price. How then, does one market a long-term service relationship to a broader audience in today's hyper-competitive market?

There is much to be learned from an examination of other industries in which independents thrive. Competing successfully as a service-oriented organization in such markets often

means cooperation on some level. One example might be an independent dealer of sound systems networking with building contractors, who are in a position to know of projects which will require sound systems. Good relationships with such individuals who are in a position to make recommendations are extremely useful when one is marketing value-added service, as their word carries the credibility of a relationship of trust already established. Reciprocity is an important feature of such networking, as it makes the relationship worthwhile for both parties.

Other independent dealers focus on cooperation with related industries in ways that create win-win relationships that establish good rapport with potential prospects. For example, a local phone company might work with a dealer of FAX machines to provide special kinds of installations which are less costly for both the FAX dealer and his customer. In such cases, the phone company generates service calls, as well as establishing new prospect relationships, whenever they help install a FAX machine. The potential for such complementary relationships exist in virtually any business.

In some cases, independents in a particular industry have formed marketing cooperatives which have achieved successes perhaps greater than they could initially have imagined.

Consider the floral industry. Under the nationwide FTD marketing umbrella, thousands of independent florists have built a collective image. This image provides an easily recognized identity, which enables each of them to enter into customer relation-

ships without first having to establish trust. Until proven otherwise, there is seldom a question that they will provide quality service and nationwide delivery.

Consider, too, the property/casualty insurance industry. Its independent agents—who might otherwise be perceived as too small to handle the task of insuring valuable assets—are provided with the credibility of a huge corporation's umbrella. One major insurance company has actually adopted the umbrella as its logo!

Other examples of cooperation between independents abound. Most common are clearing-house 800-numbers. In these cases, a group of providers of a particular service come together and advertise a toll-free phone number where a customer can find one of them. By implication, "one of them" is a better choice than a random choice from the yellow pages.

The purpose of a marketing cooperative is widespread recognition of its members for meeting certain standards which exceed the industry standard. By virtue of wearing its nationally recognized and widely shared seal-of-approval, participants immediately possess visibility and credibility.

Now, when a number of independents pool advertising budgets, they can also communicate with prospects via radio and other media. Independently, they could never afford such coverage. Yet, advertising dollars which once competed can indeed work together, and without the "fog" which their competing advertising claims once generated.

A cooperative-wide seal of approval has a complementary impact. It can

Benoy is president and CEO of Phoneserve, a marketing and advertising company in Visalia, CA.

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

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

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

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

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appear alongside individual company logos on trucks, storefronts, and stationery. The symbol itself eventually gains city-wide or even nationwide exposure. In turn, its exposure provides respectability to all those who display it.

An independent dealer may spend years building a business, a few months acquiring a particular client, so results are expected as a reward for hard work. But when the phone rings, a technician visits, or a piece of equipment breaks down, his business is on the line again. Every time.

Consistency is the key. While he cannot have the same person answering the phone all the time, his employees can always answer it in the

same way. Likewise, the technician may change, but consistent levels of service and of courtesy can be institutionalized.

As the communications giants grow larger, more opportunities arise for independent dealers—if positioned properly—to promote the virtues of dealing with a local, service-oriented independent. Simple problems can become a nightmare when dealing with a large corporate bureaucracy, thus strengthening the case for independent service. Special relationships with independents in other industries can boost the pool of prospects with whom one can establish relationships without starting “cold.” And the more dramatic

step of implementing a marketing cooperative brings the unbeatable combination of national positioning and local service to cooperative members and to consumers.

In fact, the frustrating edge of large competitors who buy in quantity and slash prices can only be overcome through a corresponding largeness of effort in the service arena. Given the whole story, many consumers would opt for a long-term service relationship with a reputable dealer. But how will they ever know they have that option? Marketing cooperatives provide both the capacity for such independents to get the word out, and the credibility that needs to underlie their claims. ■

DIGITAL VOICE ANNOUNCEMENT SYSTEM



Model 50



Model 150

If your requirements call for:

- Solid state reliability with no maintenance
- Single or random access multmessage capabilities
- Single play, timed repeat or continuous play modes
- Radio broadcast audio quality
- Messages up to 4 minutes in length
- Messages you can record yourself
- The ability to change messages in seconds
- A unit that is ACD compatible
- A unit that comes equipped with an I/O port
- Compatible with auto dial equipment
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World Radio History

Project From Hell

by Marc L. Beningson

Every once in a while you get one—a project from hell. One that is so much trouble that it promotes gastric distress and receding hairlines. The one I'm going to describe is not quite that bad, but it was frustrating enough to make me wonder about the state of our industry. I envision four or five contractors out there reading this saying, "Oh no, he's going to talk about that project we did for him!" Relax, guys, it's not that one (although maybe in an upcoming column). This was a small project in my hometown for an organization of which I am a member—the worst kind of project because there is no limit on the number of unbillable hours you will invest in the project—but I solved that dilemma by donating my services.

The project in question was the Synagogue in my hometown, where my family has been a member for almost sixty years. Since the current building was constructed in 1973, I have been listening to a fairly poor-performing sound system, and since I became actively involved in "the industry" I have had many conversations with other members about how to improve it. Finally, I was approached by the Board to do something about it. I began to look into the existing system closely, and here the descent into hell began.

Now I should point out that the problems with this project had nothing to do with personalities or contractors or even the equipment itself—the problem that bothered me was that the system was designed and installed in a manner that represents everything that I feel the process should not be. There was no sound or acoustical consult-

ant—and it shows. The room and the sound system had problems that showed a lack of understanding of how the room would work.

The acoustical problems in the room are impossible to solve—that is, difficult to solve without throwing outrageous sums of money at them—things like expansive window walls, focusing hard rear walls, a coffered ceiling allegedly treated with "acoustic" tiles, and a major mechanical room located directly adjacent to both the sanctuary and the social hall. These are basic architectural errors easily solved in the planning stages, but virtually impossible to deal with in an existing structure. The frustration begins.

The sound system as installed in its basic form was not too bad. It was obviously installed by someone who knew something about audio. The basic system is a pair of Dukane mixers and amps feeding some inexpensive eight inch (non-coaxial) ceiling mounted speakers on a 70V line in the sanctuary, with four column speakers in the adjoining social hall. Simple and reasonable. The quantity of speakers, however, was insufficient in my opinion and the layout questionable. Two speakers are located very close to the microphone positions used by the Rabbi and Cantor about 95% of the time. Microphone jack positions are impractical and show that there was little understanding of how the service works. I offer no sympathy to whoever made these decisions because the layout of the bimah (stage) in Conservative Synagogues is almost a standard—and certainly this congregation has made no major changes in the structure of its services in my lifetime.

The result is that during the High Holiday Services—when the entire congregation is present—the room is

plagued by microphone wires running exposed in areas where there is heavy traffic. Meanwhile there are microphone jacks that are never used because they are in inaccessible locations. Of course, the conduits of minimal size and the backboxes are imbedded in a poured concrete slab, so expansion is not an inexpensive proposition.

It was in researching the conduit runs that I began to get angry. The fact that I couldn't even find the construction set of drawings for some time was not the fault of anyone involved with the building's design. What I finally found on the drawings, though, is representative of what I believe has been typical in our industry in the past. It has begun to change, and it must continue to change.

Interestingly, the system described on the electrical engineer's drawing had absolutely nothing in common with the system that was installed. The designed system had frontally mounted column speakers in place of the ceiling speakers. Although the design drawings were not clear about the exact location of these column speakers, I cannot envision a place where the specified speakers could possibly have been effective. Thus, in a way, this "substitution" was a good thing, but the fact is that there is not one shred of documentation available that discusses the change. There are no shop drawings or any other drawings or descriptions of the system as installed, and although the system function is fairly obvious, how the low level wiring gets from the rack to the bimah is a mystery that will remain buried beneath four feet of concrete.

At this point I suppose it would seem like I am just complaining if I mention the 200-amp power distribution panel

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



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that all the sound wiring passes within two feet of. The pull box and conduits in which microphone, line, and microphone level wires are freely mixed was not a big surprise when we found it, and neither was the exceptionally small gauge for its length wire which we could not economically replace without any documentation of conduit runs.

What I did find that was particularly disturbing was the use of standard light switches in 2-gang electric boxes screwed to the side of a mixer to provide speaker switching capability. Another engineering masterpiece was the XLR to phono jack adaptor that permitted a microphone to be fed into a mixer bridging input—no wonder none of the input controls had any effect!

And the list goes on, but you get the idea. Some may accuse me of demanding “big time” results in a small project, and perhaps I am guilty of that. I have this strange idea that a user should not have to get into an overly technical discussion of things he generally does not understand in order to get what he needs. It seems to me that a user should get a technical solution that meets his operational requirements, and it is up to the design professional to assess these needs and come up with an appropriate solution, regardless of whether that design professional is an acoustical consultant, sound system designer, electrical engineer, or sound contractor.

I believe that it is also possible to ex-

plain to an owner, or to an architect, that there is a minimal cost involved in obtaining the minimal level of performance required, below which it may be better to do nothing. (In fact, in this synagogue, proper acoustic design might have eliminated the need for any sound system for many functions.) Below this minimal point, we may be dealing with semi-professional and even home hi-fi equipment, inadequate designs, and performance below the owner's expectations.

Personally, I would rather get a small fee for designing a small system than a large fee for redesigning a system that frustrates the owner and myself. Why? It's easier and more profitable in the long run. ■



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Theater Acoustics

by Rob McManus

In the creation of a theater, the old saying is true: “the sum of the parts makes up the whole.” While several of the parts contributing to a theater’s success may be more important than others, all are necessary.

Acoustics is one aspect that is most important in the successful design of a theater. Acoustics is to a theater as music is to sounds. A successful musician knows that the difference between simply playing notes and making music is all in the way those notes are played—interpretation, expression, dynamics, phrasing, style—all are parts of an equation that transforms the mere playing of notes into a moving musical performance. Similarly, a successful acoustician knows that to turn a barren performance space into a living theater, he must draw upon the various tools and resources at his command to create conditions that will transform and enhance the mere perception of sounds, creating an emotionally rewarding experience for the audience.

Some may argue that an acoustical consultant is not needed to achieve an acoustically successful theater, that there are others involved in the design process who can carry out their specific tasks and oversee acoustical matters as well. True, architects know about acoustic properties. And it is true that sound contractors are quite capable of designing sound systems (as has been proven through design-build projects).

On the other hand, the acoustical consultant not only has a thorough knowledge of acoustical properties, but knows how to manipulate these properties for the desired results. The acous-

tical consultant is an independent agent, approaching each project objectively. The client hiring the acoustical consultant has a vision of what the end result will be. The job of the acoustical consultant is to advise the client on how best to make that vision a reality. Answers to a client’s questions, solutions to a client’s problems—these are the “products” the acoustical consultant is selling. The client expects the best advice, and the acoustical consultant is responsible for the results when that advice is taken. This situation requires the acoustical consultant to be objective in his recommendations.

The acoustical consultant’s role in the evolution of a theater begins with a lead or potential project. Members of the architectural acoustics team and electroacoustics team work together to create a proposal. The proposal outlines the consultant’s intended coverage of services, or scope of work, and compensation for services.

Negotiations between the client and consultant involve fees, agreements, and conditions of the proposal. After the client authorizes the proposal, the consultant may begin the schematic design phase. During this period, program requirements are determined and balanced with budget considerations. The schematic design in terms of architectural acoustics deals with measurement of environmental noise, critical space proximity to internal noise sources, room volume and geometry recommendations, preliminary interior materials, and noise barrier/HVAC system necessities.

During the design development phase, information gathered from the schematic design phase is used to provide specific solutions and recommendations for sound isolation, HVAC, and

room acoustics. Among the solutions and recommendations for sound isolation are material types, doors and windows, and methods of eliminating or reducing noise from mechanical equipment. Air velocity and air noise attenuation are the critical subjects in designing quiet HVAC systems. For the design of desired room acoustics, reverberation times are calculated using room volume (in cubic feet), total surface area of the room (in square feet) and the relative absorption of the room (in sabines). The absorption of the room is the greatest variable in the calculation. Some of the factors involved in accounting for absorption are: the type of seating in the room (hard seats or cushioned), the number of persons in the room (full occupancy, half occupancy or empty) and the room interior materials (carpet, wall covering, etc.). From the resultant reverberation times, recommendations are made for absorptive materials and interior shapes of the room.

Other design development considerations include the orchestra pit, audience seating, acoustic shell, and auxiliary room acoustics (rehearsal rooms, sound control rooms, lobbies, dressing rooms, and corridors are all considered auxiliary rooms). Sound system design development also involves solutions and recommendations using information from the schematic design phase. Electrical requirements for the sound system are designed and coordinated with the electrical engineer. Sound system equipment is located on drawings for review with the architect and other members of the design team. Detailed drawings are made that convey information for speaker arrays, control room layout, and mounting procedures, etc.

A one-line diagram is drawn, show-

McManus is an audio consultant with Jaffe Acoustics, Norwalk, CT.

ng the entire system schematic. A schedule of terminations is developed, including all audio equipment or terminations, their mounting, enclosure and wiring requirements, and routing. An equipment list and budget estimate are generated for the sound system.

The last phase in this design process is the production of working drawings. Working drawings are detailed and updated versions of drawings and recommendations from the design development. It should be noted that throughout the design process (but primarily in the design development and working drawing phases) coordination between the acoustical con-

sultant and other project design members is crucial. All members of the design team are constantly refining and modifying their own part of the whole theater in an effort to integrate their systems with others.

It is at this point that contractors bid on the project in the hope of becoming members of the project's construction. The contractors who win the bid will construct the theater based on the work of the design team, and must schedule and coordinate with each other in a similar way to insure that the theater is built to the design specifications. Timing is a key factor, and care must be taken in scheduling the vari-

ous phases of construction. Certain contractors can perform their individual tasks simultaneously, and others perform work that can overlap, but there are some contractors who cannot begin their work until others have started or finished theirs.

Throughout construction, the acoustical consultant will make site visits to verify that the design and, more importantly, the client's vision are becoming reality. During the opening of the theater, the acoustical consultant performs verification tests, and will periodically conduct check-ups to see that the client's vision remains real.

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DUELING KEYBOARDS

BY JESSE KLAPHOLZ

Music is an intrinsic part of our lives, and an extension of our very being for most of us in this business. Whenever we have an opportunity to be involved with something musical, it is either so close to “home” that it brings us great joy, or is so “opposed” to our musical tastes that we find the project revolting. Music does have that effect on us. Music can be soothing or it can raise your blood pressure. But one of the greatest combinations to-date of sheer power and ethereal beauty is the pipe organ, whose origins date back to the ancient Egyptians and Mesopotamians.

Anytime music is mentioned today electroacoustics are inevitably—or rather fortunately—involved. To many of us music serves as background, foreground, or event. In religion it has become a very important part of the service. In business it has become an integral part of the daily operation of any public space. Back in 1876, Rodman Wanamaker, founder of Philadelphia’s John Wanamaker department store, had a vision: music should be a part of daily lives and work. To make that vision a reality, Wanamaker ordered the finest organ in the world to be installed in his store’s eight-story Grand Court.

The display of the Great Organ at Wanamakers is the world’s most dramatic example of foreground music in a retail store. The organ has served many years to attract shoppers and add a great sense of dignity to the store. The organ’s prime purpose in life is to give support to the image of John Wanamaker. Since its inaugural concert in 1911 it has been played every business day at noon, and during the Christmas season a special concert is given every day on the hour. Inarguably it has been heard by

more people than any other organ in existence.

“WHAT MAKES MUSIC”

This past August, a special concert was given as a part of the opening of a two year, seven-city tour of the exhibit, “What Makes Music.” The exhibit covers the basic technical aspects of sound, music, and acoustics. Simple percussion and wind instruments are demonstrated in such a fashion as to clearly show how they produce their individual characteristic sounds. The technology of digitally making music today is demonstrated using a Kurzweil 250 system. Philadelphia was the kick-off city of this nation-wide tour and the Franklin Institute, along with one of the program’s supporters, Kurzweil Music Systems, decided it would be fitting in Philadelphian tradition to bring part of the event to Wanamaker’s.

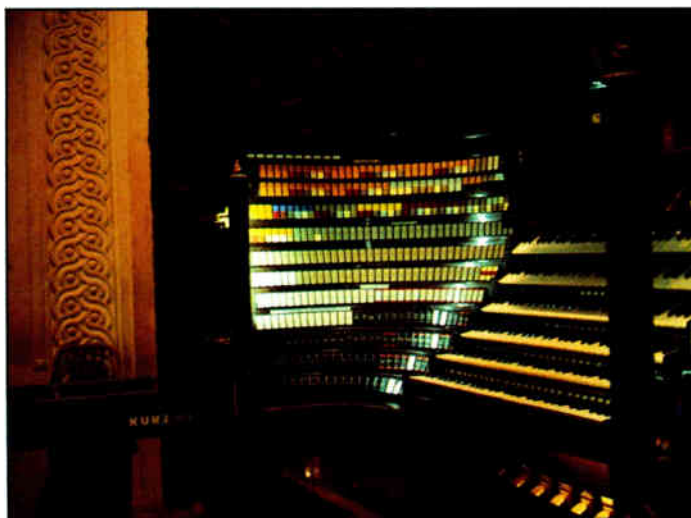
THE GREAT ORGAN

As was mentioned earlier, the Great Organ at Wanamaker’s is known as the world’s largest instrument. As originally installed in 1911 it had 10,059 pipes, designed by George Audsley and built by the Los Angeles Art Organ Company. By 1914, 8,000 pipes were added; by 1930 there were 30,067 pipes. Eleven of the pipes are 32 feet long, and 40 of them are 16 feet long! In addition to the pipes there are tower chimes, the largest of which is 12 feet long, five inches in diameter, and weighs 600 pounds. It is rung by the impact of a pneumatically driven 18 pound hammer with a driving pressure of 72 pounds. The console weighs in at two and a half tons, has six manuals with 451 stops and 964 controls, and there are 42 accessories for the feet. All of the sound produced by the organ comes from a single energy source—a 175 horsepower air compressor. Considering that resonating pipes are rather efficient at their tuned frequency, that is a lot of power (especially in a reverberant space). Some power is used by the shutters, which look like oversized venetian blinds, that control the sound level of some of the banks of pipes.

THE KURZWEIL

Weighing in at a mere 120 pounds of metal, silicon, and 88 wooden keys, the Kurzweil’s some 62 switches and sliders control the play-back of digitized samples in its memory. One would easily use the term synthesizer, but Kurzweil calls their unit a “keyboard instrument.” In all sampler systems the amount of memory quickly becomes an issue, and each system uses some sort of memory reduction. The Kurzweil uses proprietary data compression techniques. Also, each note is not sampled individually: there may be only one or so samples per octave, depending on the character of the instrument and how well it lends itself to being time-warped. The sample is either sped up or

Photography by Jesse Klapholz.



David and Goliath: the Kurzweil 250 (left) and the Great Organ.

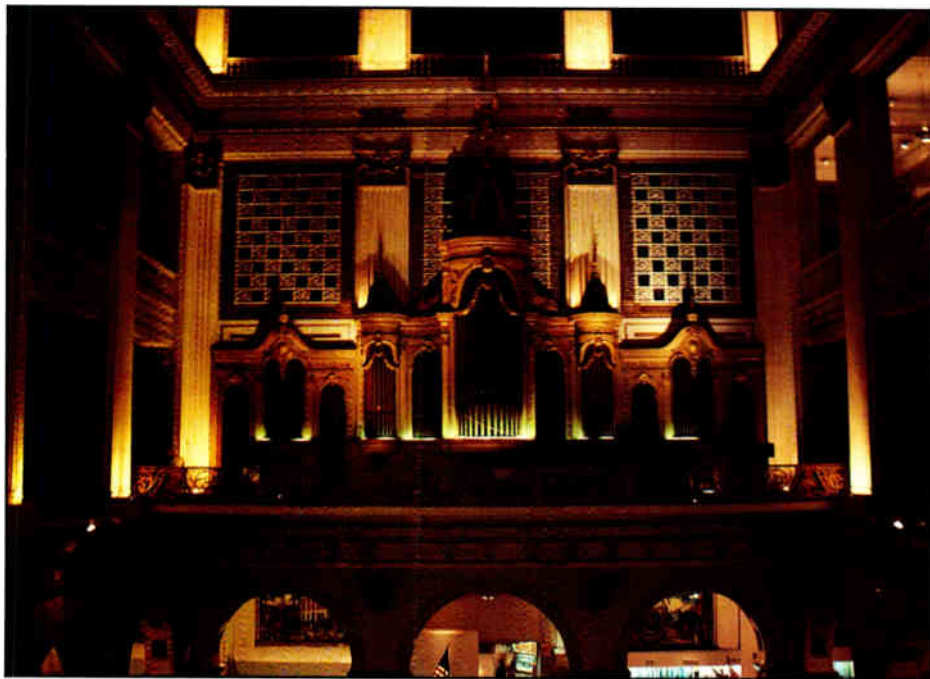
slowed down during play-back to render different musical pitches.

The instrument has 12 discrete outputs available, a stereo mix, a computer interface, and of course the MIDI port which allows for simple interconnection to many signal processors, sequencers and switchers, and other instruments. There are almost an infinite number of possibilities through pre- and interactive-program MIDI events. Kurzweil is known within the music business for its very large library of high-quality sounds, which includes choirs, just about every orchestral instrument imaginable, organs, electronic sounds, electric sounds, and sound effects. The multitude of sounds can easily challenge even the Great Organ at Wanamaker's. The real duel really lands at our feet then—the loudspeaker system.

THE SOUND SYSTEM

When the event was scheduled, the Philadelphia Kurzweil dealer, TekCom, Corp., was called upon to provide a sound system for the Kurzweil keyboard. TekCom is in the business of providing complete turn-key packages for recording and production studios, and engineered commercial sound systems. The author is occasionally called upon by Richard Feld at TekCom to assist in the design of difficult or unique situations. Anyone that has experienced a pipe organ in any kind of large space quickly realizes that there are hundreds of sources spread out over a very large space—often along more than one wall. This accounts for the “ethereal” character and effect of a pipe organ sound. Secondly the sound energy that a pipe organ is capable of is tremendous, after all, it is converting an air stream from a large air compressor. To have a small keyboard in the same environment with any organ—let alone the world's largest—presents some rather provocative dinner conversation.

Ultimately the loudspeakers used in any synthesizer system become the “pipes” or voice of the instrument and the amplifiers become the “air compressor.” The power is derived from the electrical source in both cases. Most loudspeakers in use these days that might be a candidate for this type of application have no more than five different sizes of loudspeakers. The size of the source really will determine the degree of directionality the loudspeaker will have. Even in a horn type system the size of the horn mouth will determine the proportional low-frequency

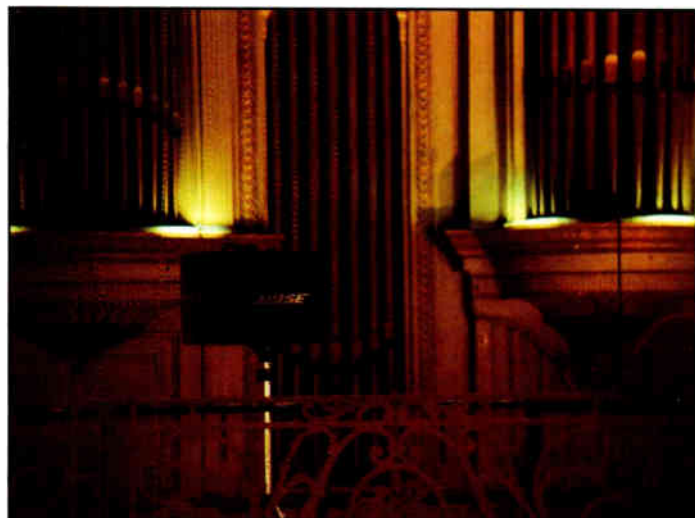


“World’s Largest Instrument”: the Great Organ at John Wanamaker’s.

point at which the horns directional characteristics will deteriorate.

In an organ, on the other hand, there is a different size pipe for each note and each type of sound. Therefore the directional characteristics have been predetermined by the physical size and shape of the pipes when the organ was designed—much more complex than one could envision of a loudspeaker.

The number of loudspeakers and their placement then become the design elements in voicing the synthesizer to a given environment. Unfortunately, from a power point of view, one cannot



Bose Acoustimass Pro's were used as the main speakers.

simply pump more electricity into the loudspeaker's "compressor/air tank." Thus the elements of size, frequency range, directional characteristics, total acoustic power output, and fidelity must be considered.



Sub-woofers: the Bose Acoustic Wave Cannons.

The first visit to meet with the Wanamaker people revealed that our job was going to be tougher than originally anticipated. The setup approached a para-military operation in that it had to be done strictly after store hours, quickly, cleanly, and very temporarily. Therefore, portability, and compactness were the primary considerations. The Bose Acoustimass Pro units were used as the main speakers, and two Acoustic Wave Cannons were used as the sub-woofer system.

Each Acoustimass Pro unit consists of a double-tuned 12-inch woofer and six wide-band transducer, all driven by a self-contained light-weight switching amplifier. The unit only requires ac power and a line-level signal. The sub-woofers were driven by a single Crown Micro-Tech 1200. Auxiliary loudspeakers were placed on a second balcony they were the EAW FR-120s, driven by a second Micro-Tech. All of the equipment fit in a van and was delivered in the same manner as racks of clothes are received at the store. The set-up was simple and only a few lines were necessary.

Prior to the performance, one rehearsal was run in which the personnel of Wanamaker's, the Franklin Institute, Kurzweil, and

(continued on page 67)

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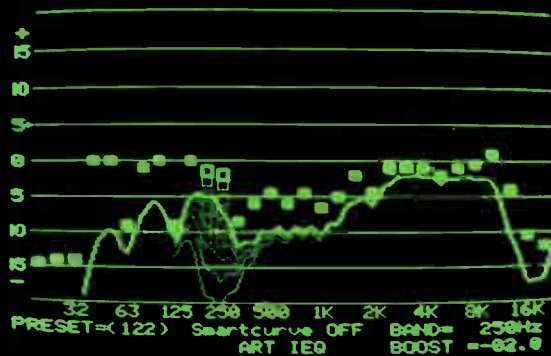
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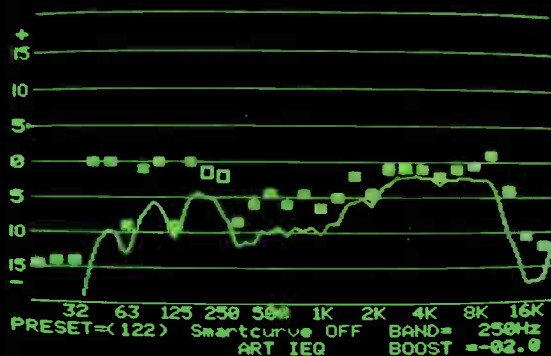
1 See the Sound

This is a video output of the IEQ as the unit is being adjusted. The sliders can be moved \pm 15dB in 1/2dB steps to get the exact response you need. With the simple push of a button, complex equalization can be done in seconds with incredible accuracy.



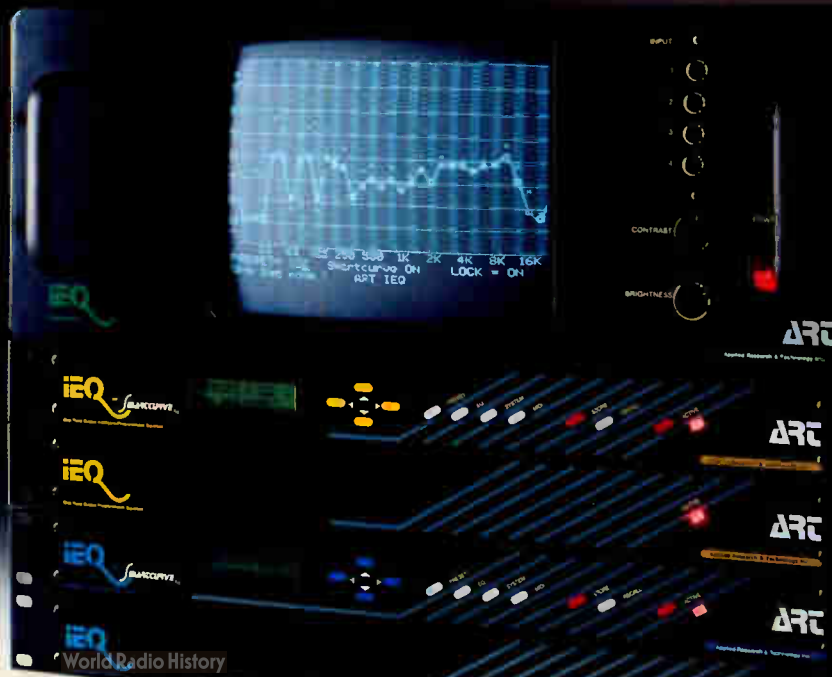
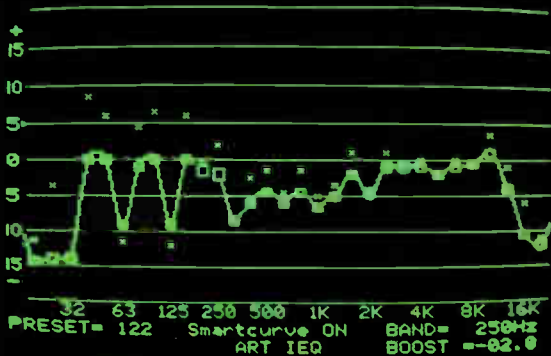
2 Hear the Sound

The power of the IEQ readily becomes apparent as the video display plots the frequency response due to the slider settings. The IEQ offers high quality constant "Q" equalization. The video graphic display shows the correlation between the sliders and the frequency response.



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AUDIO-ENHANCED ENVIRONMENTS

BY MALCOLM HOWARD

There are still some places on this planet so far removed from our normal experience they defy description. Consider a dense Thailand rain forest, its cavernous jungle chambers crowded with calling birds and howling monkeys. Or a pitch-black cave on the island of Jamaica, home to 20,000 bats who drop from their roosts and burst from the cave mouth in one immense black cloud. Now imagine the difficulty facing those whose task it is to design faithful recreations of exotic environments such as these.

Often, it is the museum curator or zoo director who must attempt to convey to us city-dwellers a sense of the environmental reality of the un-paved portion of the world. Since the 1940s, if not before, curators and directors have done their best to recreate authentic natural settings. But these days, more attention is being paid to the acoustical nature of these exhibits, as designers attempt to bring more drama and accuracy to their portrayals of the wild kingdom. As a result, there has been an increase of prestigious work for sound contractors in this still small but growing market. This article will take a look at how audio is being used to enhance several natural environment exhibits.

JUNGLE WORLD

Since the 1940s, New York's Bronx Zoo has been an innovator in bringing animals out of their cages and into natural habitat panoramas. The zoo's Jungle World exhibit is a huge greenhouse of sorts, enclosing five distinct types of rain forest environments, inhabited by small clawed otters, black leopards, silver leaf monkeys, and white-cheeked gibbons, among others.

"In the 1970s, zoos began to be viewed as a theatrical and emotional experience," said Thomas Veltre, director of audio/visual material for the Bronx Zoo. Veltre and the zoo's management realized early on the need to make Jungle World entirely convincing as a theatrical experience. But on another level, the Bronx Zoo views Jungle World as an educational experience, as a way of informing the general public about the destruction of the world's rain forests. When leaving the jungle's humid sanctum, visitors are confronted by two large LED displays: one that counts down the steadily decreasing acreage of rain forest, and another that tallies the steadily increasing number of human beings on this planet. The more convincing the visitor's encounter with this fertile, exotic environment, the more compelling the realization that it is disappearing at an alarming rate.

When the Bronx Zoo was finalizing its plans for Jungle World, Veltre was asked to propose a sound system for the new exhibit.

The request came from the zoo's director, William Conway. Veltre, who at the time was audio visual specialist for the New York Zoological Society, agreed to take on the project.

First, he broke the project down into two parts: a multi-channel field recording that would capture the feeling of depth and distance under the trees, and the installation of a multi-channel playback system that would distribute the sound realistically within the exhibit.

Accompanied by a guide (who also served as interpreter), a biological expert associated with the zoological society, and an audio specialist [Bill Fontana], Veltre travelled to Thailand's Khao Yai National Park, northeast of Bangkok.

Using an eight-channel mixer and a half-inch eight-track Otari reel-to-reel, Veltre strung from six to eight Electro-Voice 635As across a hillside in a long line. The length of that line of mics was never less than 300 meters long, so the delay of sound from one end of the chain to the other would be authentic. He boosted the signal with battery operated pre-amps that sent the signal on balanced lines back to the Land Rover. Because the crew was miles from an electrical outlet, they used a 100A/hour car battery, which they connected to a transformer. The pre-amps were run continuously on two nine-volt transistor batteries.

Back in his San Francisco studio, Fontana edited the stereo and eight-channel recordings, separating to some degree insect sounds from other animal sounds. Then it was on to New York, where Veltre set about installing speakers within the rocks, artificial trees, and shrubs of the exhibit.

Veltre chose Polyplaner speakers made by ERA of Moonachie, NJ. The polyplaner is a five-inch, styrofoam speaker chosen for its ability to fill the large rooms with sound, withstand the constant heat and 90-percent humidity, and its affordability for the non-profit group. The speakers were more than adequate for the high-frequency sounds of insects. Bose 101's were used for the more demanding sounds of the birds and monkeys in the larger areas.

Speaker placement was a tricky and demanding task: for maximum authenticity, the animal sounds had to be perceived as emanating from the animals's precise location. For example, to play back the sound of fiddler crabs popping in and out of their lairs involved placing speakers directly below the exhibit's walkway, where the crabs would hide. In such cases, Veltre had to design speaker housings strong enough to withstand the powerful hands of otters and monkeys. An intern came up with a design that uses a five-inch Polyplaner cemented to the end of a two-foot long plastic PVC drain pipe, which was then covered with a heavy gauge galvanized mesh.

Howard is managing editor of The Music & Sound Retailer.

The system is controlled from an audio-visual room hidden—along with a Jungle Lab study room—behind a large rock showcase in the main rain forest area. Veltre used a MacKenzie Model 400 message repeater, which has four 4-track playback channels (for a total of 16 tracks).

On each channel is a distinct animal sound, from the largest mammals to the smallest insects. These channels are routed through one of four Tascam PE-40 parametric equalizers and one of three Rane 6-channel MA-6 power amplifiers.

ROYAL MUSEUM OF ONTARIO

At the Royal Museum of Ontario, curator Paul Martinovich set out to create a huge simulation of an actual bat cave that exists on the caribbean island of Jamaica. “There are several messages behind the bat cave, but the main one is attitudinal,” said Martinovich. “Bats have sort of gotten bad press, and people are generally afraid of them. We want to change the way people look at bats.”

Martinovich knew it would take more than the usual display case of stuffed bats to get this message across. “To do this convincingly, the structure and quality had to be very good,” he said. So the museum set about fabricating the most realistic environmental encounter possible, and that included providing an authentic aural experience. “That’s why we opted for computer-controlled compact discs,” he added.

The Royal Museum had worked with a small sound-contracting company, Syscomp Electronic Design, owned by Peter Hiscocks, for several exhibits in the past. Hiscocks (who is also working on the sound for a bird call exhibit using CD mastered discs) came up with a proposal for a computer-controlled soundtrack to a group’s tour of the exhibit.

As visitors descend into the cave, they are greeted on one channel by the sound of the jungle, while on another channel begins the narration that will guide them on their cave journey. This journey will take them from the mouth of the cave (where the ultra-sonic chirps made by the bats as they navigate their way through the pitch-black are slowed down to the audible range and played back as the narrator explains the workings of this natural “sonar”), past the roosting section (where there is a general pandemonium of loud bat sounds), past the sound of a waterfall (where the narator explains water’s role in cave formation), and then to a section that explains more about types of bats and their distinct features.

Then it’s on to what is by all accounts an incredibly realistic recreation of one of the world’s most intriguing and eerily beautiful natural wonders. Funny thing about bats, but when they decide



Time machine: the “Evolator” at New Mexico’s Natural History Museum.

it’s time to leave the cave, the whole family tends to go out at once. Thousands of flapping bats suddenly leave their roosts at certain specific times of the day, said Martinovich. The experience of seeing and hearing an immense black cloud of flying mammals, wings flapping loudly overhead as they crowd towards the cave mouth, is nothing short of awesome. The recreation of this has become as much a hit with museum-goers as was the actual experience by museum staffers who studied the cave.

The effect was captured using fairly basic (but up-to-date) lighting technology and some good old-fashioned ingenuity. Two sets of 12 synchronized strobe lights timed by MIDI-controlled light chasers, were set up in a row behind the stuffed bats that hang from the cave ceiling. As the strobes fire systematically down the line, they shoot bat-shadows against the wall of the cave. The narrator’s voice is slowly drowned out as the sound of the

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World Radio History

swarming bats (recorded at the Jamaican cave) grows louder and louder.

Writing all the software for the tour program himself in a Basic multi-tasking operating program, Hiscocks used a Commodore 64 to communicate with eight Sony CPD 302 CD players. The CD players are connected (via their remote control inputs) to a microprocessor-based CD controller, designed by Hiscocks himself.

Because the computer is capable of multi-tasking, it can begin a second tour while the first tour is already in progress, Hiscocks said. The computer senses "switch closures" and then opens and closes 40 relays that control the cave equipment. Eight of the 40 relays trigger CD players, while 24 are reserved for triggering the light dimmers that control the cave lamps; the remainder are used for miscellaneous functions, such as resetting the entrance timer or triggering the strobe lights in the exodus section.

The entire program, which consists of eight different samples for the eight different parts of the cave, is contained on one compact disc. Seven of the samples have narration on one track with sound effects on the other. The remaining sample consists of dripping water on the left channel and jungle sounds on the right for the entrance of the cave.

The players are hard-wired into eight 2-channel power amplifiers that take the stereo signal to 14 loudspeakers, half of which play the narrative while the other half are placed within the diorama, repeating bat noises and dripping water.

Total cost to the Royal Museum: \$45,000. That expenditure is offset, said Hiscocks, by the fact that there is virtually no maintenance required by the museum's staff, and the only mixing involved is adjusting the pots on either channel of the power amps. CD's were chosen because the life expectancy of a cartridge is substantially less and the fidelity begins to deteriorate after the first week. Random access is appealing because there's only one disc being accessed, adds Hiscocks.

"My background is in the theater, so my view is that we're simply making the Museum more exciting and theatrical," said Hiscocks, who worked on the exhibit over three years. And it was this theatrical experience that told Hiscocks that if people left the exhibit marvelling about the incredible lighting and sound effects, he would have failed: "In the theater, if the audience leaves the play saying 'What great sound,' then the sound didn't do its job," said Hiscocks. "They should be saying, 'What a great play.'"

Ironically, Hiscocks sees the entertainment-based theme parks aiming to become more authoritative as museums are aiming to become more entertaining. Hiscock may be right as many companies with theme park experience vie for this market.

NEW MEXICO'S MUSEUM OF NATURAL HISTORY

Art & Technology, a California firm made up of several former Disney special effects executives, recently completed an exhibit

for the New Mexico Museum of Natural History in Albuquerque. It's a journey back in time some 80 million years, when New Mexico was the floor of a vast but shallow inland ocean. The concept: directly relating the reality of a prehistoric time period to the visitors by taking them to that period.

Unlike Syscomps and Veltre, Art & Technology ultimately constructed the entire exhibit, sound being only one part of that process. The firm also fabricated an underwater sea-scape and shoreline along with many other aspects of the exhibit.

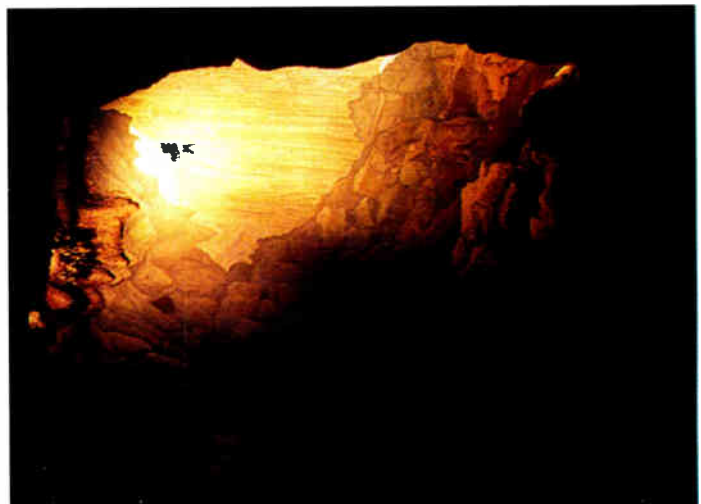
There are three main aspects to the museum's exhibit: the sea shore, the volcano, and something called an "evolator."

For augmenting the visual phenomenon of a synthetic inland sea, Art & Technology used 360 Systems Permanent Playback units, upgraded to 15 Hz for the high-band sounds of sea gulls and waves, according to Greg Stevens, who heads the company's audio installations.

For the sea shore, the company used two sets of speakers for each channel and placed them about ten feet apart in the ocean diorama. The two channels were fed sounds from two cards of the 360 Systems Quadfile.

The system plays back a stereo signal to a dbx 1531P Graphic EQ, added mainly because the company did not know the acoustics of the unfinished room until well after the sounds were burned onto the playback unit's RAM chips. The equalized stereo signal inputs into a QSC 1200 stereo power amp, which in turn feeds the two Ramsa WS A80 two-way speakers, which were separated by only about ten feet.

Between the Cretaceous and Tertiary halls is the 'Evolator,' an elevator through time that transports visitors all the way back to 75 million B.C. It's really all an illusion, conjured craftily with a merger of video and audio information. Although the "time travelers" inside seem to see and feel the machine moving up and down, the Evolator never actually moves. The only real movement is from the rock wall behind a window, which is scrolled



The bat cave at Ontario's Royal Museum.



Equipment rack at Royal Museum's bat cave.

up and down. As the Evolator "takes off," video projectors depict either the pilot, or a computerized cohort named Elsie (short for Electronic Logic Synthesis Intelligent Entity), guiding the craft until you find yourself under the seam, 37 million years ago.

You stay just long enough for the Evolator to suffer an accidental whack from the tail of a Mosasaurus, a prehistoric sea crea-

ture. The drama is seen through video screens while the Evolator is mechanically shaken in synch with the video image.

At another rest stop, you stay just long enough at a gorgeous prehistoric ocean beach for the pilot to get out of the Evolator, praising the beauty of the prehistoric beach, and telling Elsie to direct the camera toward a pair of nesting Parasaurolophuses. (Parasaurolophi?) This effect is simulated by the artificial clanging of a supposed porthole and the sound of footsteps on top of the craft, followed by a shot of the pilot outside on the beach (footage shot by Jodi Van Meter, the firm's video and photography director, and her team). The beach footage was actually shot in Palm Beach, FL, the only ocean environment the team could find in the States where palms actually grow on the beach (supposedly what New Mexico was once like), Van Meter said.

There are six channels of audio inside the Evolator: one for the video-taped character of the pilot, one for the R2-D2 like character Elsie, two front sound-effects channels, and two rear sound-effects channels. The sound effects were all created or sampled by Russel Brauer with a computer and synthesizer, Stevens said. While those sounds were driven by RAM cards, the video images are stored on laser disc. The audio is supplied

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by four Ramsa A-80's and one Ramsa WS-A240 sub-woofer for the low frequency rumble of time travel through solid rock. The sound in this exhibit is also controlled by a 360 Systems Quadfile.

In the "volcano," the firm again used a 360 Systems Permanent Playback unit modified to 15 kHz. The air is scented with the smell of a volcano and the floor is clear acrylic that shows what appears to be moving lava underneath.

A QSC 1200 power amp juices two 15-inch Pyle drivers, which are mounted into the phony rock wall for low-frequency sounds (such as lava flow and earth rumblings). Another separate Permanent Playback unit runs a loop of water droplets and the hissing of steam, which is reproduced by two OWI 202's with plastic drivers. Stevens chose the OWI plastic drivers because they had to be positioned next to the supposed subterranean source—steam jets that spew and hiss like the thermodynamics of a volcano's belly.

NATURAL HAZARDS

When a natural environment is duplicated, many of the hazardous conditions associated with those environments are duplicated as well—extremes of heat and humidity, and the curiosity of

resident wildlife can all wreak havoc on sensitive electronic equipment.

Many speakers at the Natural History museum in New Mexico are directly in line with fog-generating machines inside the volcano, or are affected by the moist forest of the Cretaceous Hall. Most of the controlling equipment is in a centralized room with its own air conditioner, which essentially acts as a dehumidifier. Greg Stevens has chosen to use OWI's near the steaming crevices of the volcano, and says they have served him well.

In the pseudo-outdoor environment of Jungle World, Thomas Veltre has had some problems with the meddlesome small-clawed otters, which (he believes) dug up a power line that fed several of the Bose speakers in the room. Replacing the line, which was housed by plastic PVC piping, will mean digging up the entire length of the line to find the break, and then re-running the cable with a stronger housing. And Veltre recently made a startling discovery: cockroaches seemed to love the cone material in the exhibit's Bose speakers. He said the company provided new speakers that were coated with a substance that appears to be repelling the insects (so far).

(continued on page 67)

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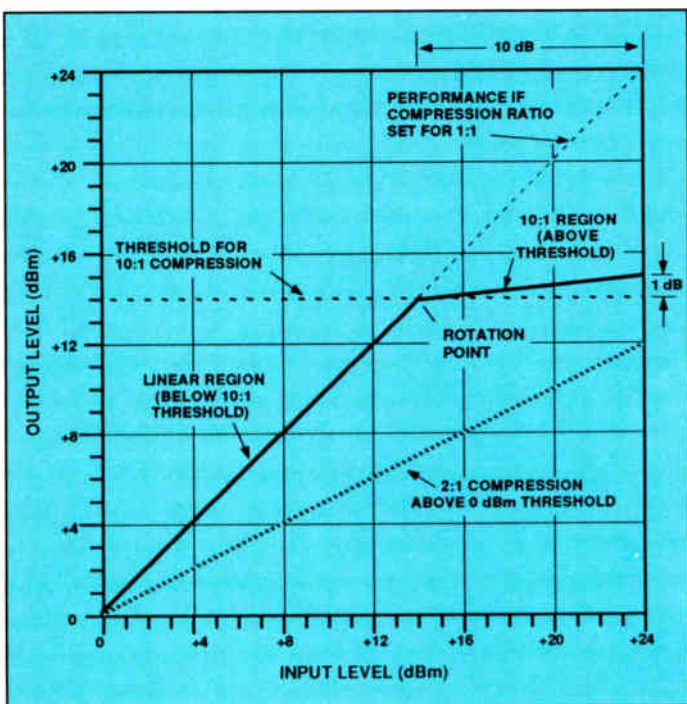
AUDIO SIGNAL PROCESSING: PART II

BY GARY DAVIS & RALPH JONES

COMPRESSORS AND LIMITERS

Compressors and limiters are signal processors that reduce the dynamic range of the signal. The limiter is designed to prevent signals from exceeding a given (usually adjustable) threshold level. Sometimes the limiter is a “brick wall,” preventing any further rise in input level from resulting in any rise in output level above the set threshold; sometimes the effect is to allow only a small (non-linear) rise in output level for further increases in input level above the set threshold. This action, because it eliminates the peaks in signal level in a program, is known as “leveling,” and some limiters are also known as “audio leveling amplifiers.”

The ratio of the change in output level (in dB) to the change in input level is known as the “compression ratio.” Generally, a limiter will have a compression ratio of from 8:1 to 20:1 or even higher. If a unit is set to 8:1 compression, for example, then an increase in input level of 8 dB (assuming the input is above the set threshold value) will result in a 1 dB increase in the output level. A few units offer infinite compression, whereby no amount of increase in input level (above threshold) will cause an increase in output level. Because the transfer characteristic (the slope of the plot of change in output to input level) changes at the



5-25: Compression and limiting characteristics.

threshold, the threshold is also known as the “rotation point.”

Limiters are generally used to process only the program peaks, which is why they are also known as peak limiters. In broadcast, such units prevent overmodulation of the transmitted signal. In sound reinforcement, they can be used to protect loudspeakers from mechanical destruction in the event of a dropped microphone (by limiting the peak level that will be fed to the amps and speakers). In record cutting, they prevent excess cutting stylus excursion, which would otherwise cause “kissing” of adjacent grooves and subsequent skipping when the pressed record is played back.

If the threshold is reduced so that most, or all, of the program is subject to compression, then the device will function as a compressor. Compressors generally use lower compression ratios than limiters; typically 1.5:1 to 4:1. Compression has a number of uses. In tape recording, broadcast or sound reinforcement, compression is sometimes used to “squeeze” the dynamic range of a program to suit the storage or reproduction medium. That is, if the noise floor to saturation point of the tape represent a 50 dB dynamic range, and the live program has a 100 dB dynamic range (noise floor to peak level), then 2:1 compression will enable that program to “fit” on the tape. In any situation where the ambient noise level is high, yet the maximum sound level which can be reproduced is limited (i.e., industrial or commercial paging systems), compression can be used to “squeeze” the program into a very small dynamic range, and that range can be reproduced just below the maximum output capability of the sound system.

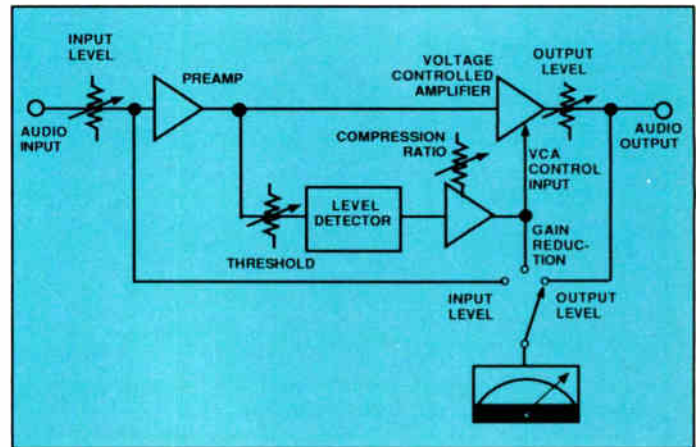
Take the paging system in a stadium, for example. Let’s say the ambient noise level during an event regularly exceeds 95 dB SPL (during cheers, applause, etc.), yet the maximum sound level the reinforcement system can deliver to the middle of the audience is 110 dB SPL (15 dB of effective dynamic range). At the same time, the trained announcer’s speaking voice may have a dynamic range of 30 dB (untrained voices may vary by more). By applying 2:1 compression to the voice, the entire program is “squeezed” down to 15 dB, which is then capable of being reproduced by the sound system at levels which the audience can hear. (This is a somewhat oversimplified explanation, since a coherent program such as voice can often be discerned below the level of random noise.)

Because the circuitry is almost identical, the real distinction between a compressor and a limiter is how the device is used. In fact, many such devices are designed to perform both functions; they have a wide range of adjustable threshold and compression ratio values (and sometimes attack/ decay character-

istics), and are therefore known as "compressor/limiters."

HOW COMPRESSORS/LIMITERS WORK

There is generally a voltage controlled amplifier (VCA) whose gain can be varied by an applied voltage. A detector (or side-chain) circuit is provided which contains the threshold and any attack/decay time adjustments, and which samples the input signal to create a control signal. The control signal is then applied to the VCA. There are typically input and output level controls as well, and there may be a meter circuit which can be switched to indicate the input level, output level and/or the amount of gain reduction at any instant.



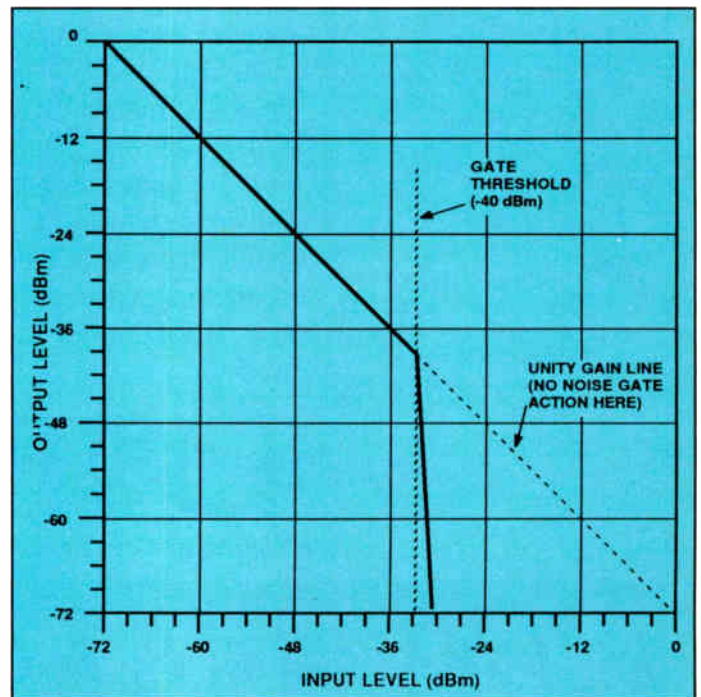
5-26: Block diagram of a compressor/limiter.

Actually, one of the major factors which distinguishes one compressor/limiter from another is the method by which it detects the input signal level. Some units, particularly limiters for broadcast or record cutting, operate based on the instantaneous peak input signal level. Other units operate based on the average signal level. Still others detect the RMS (root mean square) signal level. What is the difference? Peak level detection, particularly with a high compression ratio, can be used to absolutely prevent any output signal from exceeding a set value for even a fraction of a second. However, it will also "duck" the output level in the presence of a momentary peak which, in some cases, is more of a problem than preventing the peak from reaching the output. Averaging and RMS detection may allow a fraction of a cycle to several cycles of higher-level audio to get through before the compression "clamps down" the level. This will, in some cases, result in a more natural sound, particularly when the threshold is set to apply moderate compression to a large percentage (or all) of the program.

Averaging the signal level is done by a relatively simple circuit. However, the numeric average of the signal voltage does not happen to correspond as closely to the way our ears perceive relative loudness as does RMS detection. RMS detection, however, can be trickier to achieve. With a pure sine wave signal, the RMS value of the signal is 1.414 times the peak level, but with a complex audio signal, the RMS value is not as easily derived. Fortunately, there are some clever engineers around who realized that light output of a lamp or an LED excited by an AC signal corresponds to the RMS value of that signal. Therefore, a light source (an LED) which is excited by the sampled input signal may be used, in turn, to excite a light dependent resistor (LDR), which modulates the control voltage for the VCA. There are other, even more complex RMS detectors in use which do not rely on LED/LDR technology.

The speed at which the gain is reduced in response to an in-

crease in input signal level is defined either as the attack time (in milliseconds) or the attack rate (in dB per second); the term will depend on the nature of the circuitry and how the manufacturer treats this parameter. Similarly, the speed at which the gain is restored to the original value after the input stimulus is removed is known as the release time or release rate.



5-27: The action of a noise gate.

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The detector, or side-chain, circuit on some compressor/limiters is brought to a pair of input/output connectors. This permits signal processors to be used in the side chain. If, for instance, you want more compression in response to high frequency signals, you can insert an equalizer in the chain with the high frequencies boosted. This setup is often used for "de-essing," whereby vocal sibilance is removed by differential compression. If low frequency EQ cut is used, the compressor will allow drum sounds to get through more-or-less unaltered, yet may "clamp down" on a relatively less powerful (but more threatening to tweeters) high synthesizer note. If a brief signal delay is inserted in the main signal path, and the side chain input is fed from a point ahead of the delay, a zero attack time can be achieved—or even an unusual "pre-compression" effect whereby the compression is heard before the signal which causes it (this resembles the sound of a tape recording played backwards).

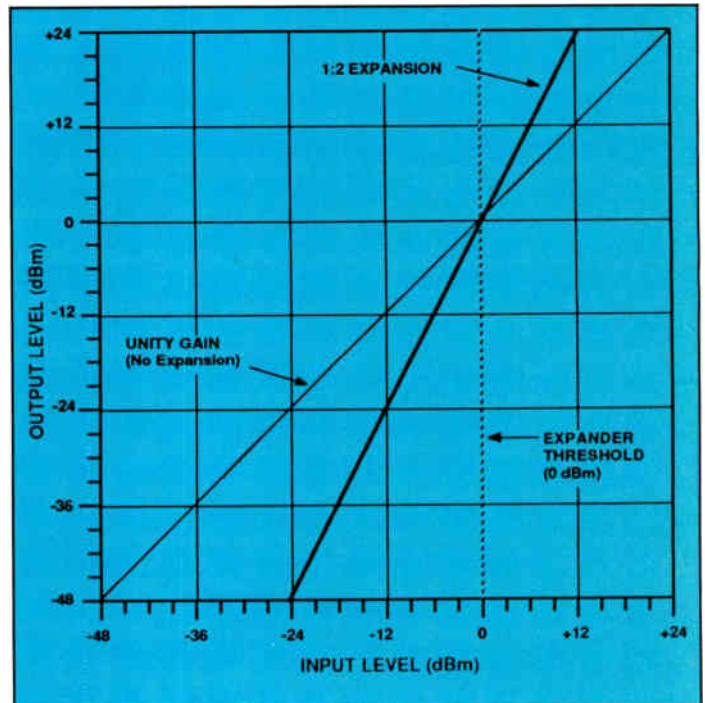
SETUP ADJUSTMENTS

There is no one attack or release value which is optimum for all situations. Too rapid an attack can cause unnatural program level fluctuations, and can cause considerable distortion of low frequency signals as the compressor tries to "ride the waveform." Too slow an attack will allow the output to exceed whatever level has been chosen as the desired maximum before the compressor/limiter acts. Too fast a release will result in "pumping" or "breathing" as the gain changes rapidly, and too slow a release will cause quieter portions of the program to be "lost" while the gain is still reduced in response to the no-longer loud input stimulus. For these reasons, manufacturers either provide for attack/release time values that automatically change in response to the input signal, or for manually adjustable attack and release times (or rates). While some people insist on manual adjustments, misadjustment can cause major problems in the sound. Some models have both automatic and manual modes. If you decide to manually adjust these parameters, follow the suggestions provided by the manufacturer of the device. In the absence of that, here are a few hints:

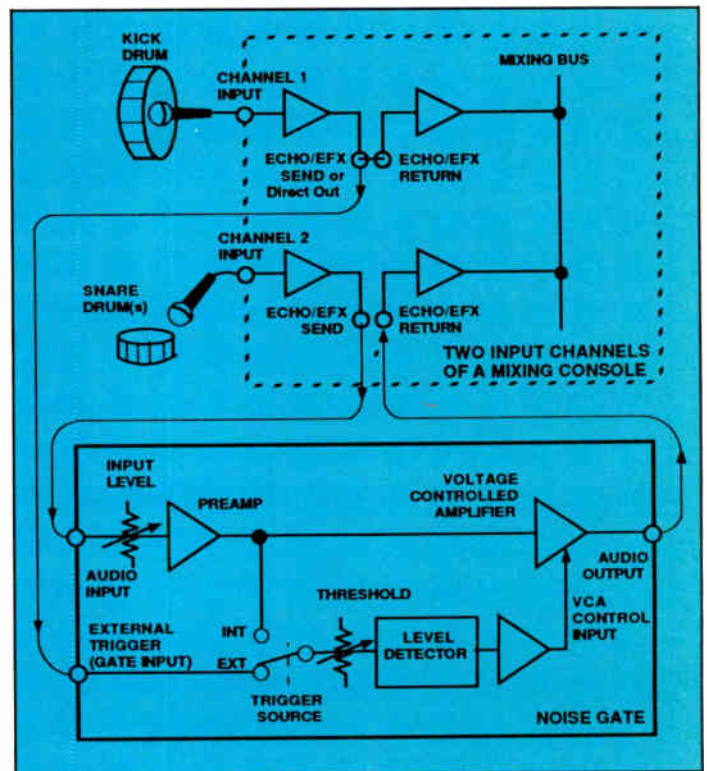
With a given input signal, adjust the input level control (if any) so the input is well above the noise floor, but does not clip the input stage. Then set the threshold to whatever rotation point, and set the compression to whatever ratio may be appropriate for the situation. For speaker protection, as an example, the threshold should be set to a point that will prevent the power amplifiers from delivering whatever power level is established as the mechanical limit for the speakers.

Suppose a loudspeaker is rated at 100 watts continuous and 200 watts peak, and the power amplifier is rated at 200 watts output to that speaker's rated load impedance (given a +4 dBu input). Let's also suppose that the power amp's input attenuator is turned down 10 dB. (For simplicity, we'll assume that the compressor's input and output level controls are adjusted for unity gain through the device when there is no compression.) In this

case, a +14 dBu signal applied to the amp will cause it to deliver 200 watts to the speakers. The threshold and compression ratio



5-28: The action of an expander.



5-29: Using a noise gate to "tighten" a snare drum.

of the compressor/limiter must therefore be set to avoid exceeding +14 dBu. If you want to preserve as much as possible of the natural program dynamics, you set the threshold to +10 dBu. Our criteria require that any input signal, no matter how loud, should not cause the output to increase more than 4 dB beyond that value. We may assume that, due to the capabilities of the

equipment feeding the compressor/limiter, no input signal will exceed +26 dBu. We subtract +10 from +26 and see that a 16 dB dynamic range must be compressed to 4 dB, and simple math shows us that a 4:1 compression ratio will do the job. Had we set the threshold at +13 dBu, we would have had to restrict the remaining 13 dB of possible input signal increase to a mere 1

dB of output signal increase (a 13:1 compression ratio). This would be okay, but very high compression ratios sound less natural since the effect comes in "all at once." Still, this is okay if you plan to watch the input levels carefully to avoid the above-threshold region and the limiting is really just "brick wall" protection.

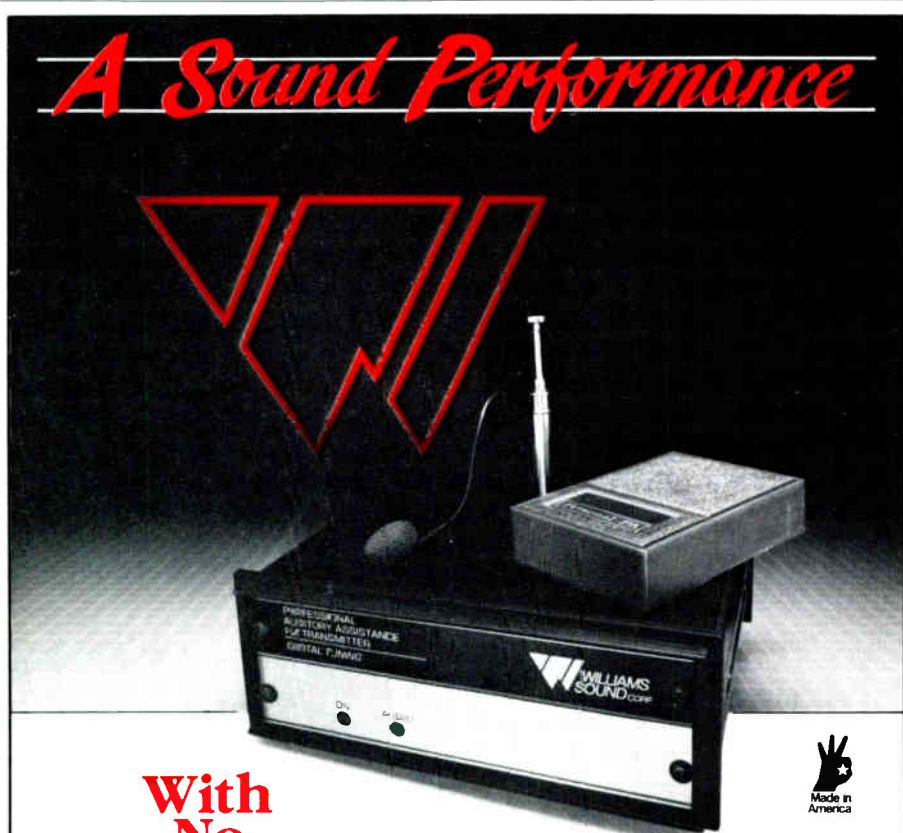
With typical program material applied, listen to the output (and evaluate it with a meter or oscilloscope) as you adjust the attack. If you're using the system for limiting to protect loudspeakers, prevent over-cutting, etc., use the fastest time or rate you can without audible distortion. If you're using the system for compression (to level vocals or to increase the sustain of an electric guitar), use the slowest attack you can, consistent with reasonable output level control; by providing greater apparent dynamic range, this avoids ruining the "punch."

Set the decay time slow enough so that you don't hear excessive "pumping" or "breathing," yet fast enough so that the program is not "ducked" unnecessarily after a loud passage.

NOISE GATES AND EXPANDERS

A noise gate is a signal processor that turns off, or significantly attenuates, the audio signal passing through it when the signal level falls below a user-adjustable threshold, as illustrated by figure 5-27. The idea is that the "desired program" will pass through unaltered, but low-level hiss and noise (or leakage from other sound sources) will not be heard when the primary program is not present (presumably when the level is below the set threshold).

Those noise gates which literally "shut off" the signal flow when the program is below the threshold level will tend to have an audible effect as they cut in and out. The sudden change in background noise



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level may be disturbing. This is why some noise gates are designed merely to reduce the signal level by a finite amount (to lower the gain) when the level falls below the threshold; the effect is to reduce noise, but not to have a drastic, sudden change. To further avoid the audible modulation of background noise, these units may have automatic or adjustable time constants whereby after the level drops below the threshold, it takes so many milliseconds for the gain to be reduced.

The circuit which reduces the gain is an expander, although it is not known as such in this case. What is happening is that the noise floor of the program is being reduced, and hence the dynamic range of the program is being expanded.

When the expansion circuit works only below a set threshold, we call the device a noise gate. However, there are signal processors which expand the entire program. In this case, the threshold is set to be any convenient "zero" point, typically at the nominal program level. Any signals which fall below that threshold are expanded downward in level so they become even quieter than they already are, and signals above the threshold are expanded upward in level. The net result is a program with greater dynamic range. In this case, the device is called an expander. (See figure 5-28.)

NOISE GATE APPLICATIONS

Noise gates are useful for automatically muting temporarily unused mics in a recording or sound reinforcement system. As you know, the number of "open" mics will reduce the available gain before feedback in a reinforcement system, and will generally add to the background noise in a recording. Particularly in complex, multi-channel setups, the use of a noise gate can improve the sound without increasing the workload for the mixing engineer. Using a noise gate on the overall mixed program is of little value; it is difficult to find truly "silent" passages in a mixed program, so the gate might be cutting out quieter portions of desired audio signal. In order to be effective, with minimum audible side effects, each subgroup, or perhaps nearly each input to the mixing console, should be processed by its own noise gate. A noise gate

is useful, too, in reducing the effects of crosstalk onto other circuits within a console. Naturally, one noise gate per channel can be very costly, and there are some input sources that just don't need a gate (i.e., a quiet, direct-input digital electronic keyboard), so these factors must be evaluated in setting up a system.

(continued on page 48)

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World Radio History

A LOOK AT “BACK OF THE HOUSE” SYSTEMS

BY DAVID STAROBIN

Music: we wake up to it, exercise to it, relax by it, fall asleep to it. It's in the background while we shop, eat, and work. Music plays from our car systems while we drive and our personal systems as we walk down the street. Installers, designers, and manufacturers of background and foreground music systems will all attest to the pervasiveness of music in our everyday lives.

Here in the casinos of Atlantic City music is everywhere—

and I mean everywhere! Let's follow the soundman at a typical casino as the lounge band finishes a set. As the applause fades, the soundman turns up the house music (fed from a four-hour repeating foreground music machine) and makes his way to the employee cafeteria during the break between sets. Exiting the lounge, he can hear the “moderate rock” tape playing on the casino floor, interrupted occasionally by the house paging system. He crosses the hotel lobby to the strains of another music system.

Uninterrupted, the music continues during the elevator ride and down the wide hallway between the meeting rooms. He could, if he wanted to, open up the amplifier and bring up the music in any or all of the meeting rooms and ballrooms. Leaving the public areas of the building, through the “Employees Only” door and up the stairway to the employee cafeteria, the music accompanies him. In the cafeteria, the music plays constantly and unobtrusively.

It takes a lot of time and energy to make this aural environment appear effortless. Here's a behind-the-scenes look at how some of the casinos of Atlantic City approach this complex challenge.

THE SANDS HOTEL AND CASINO

Let's take a look at what drives the back of the house systems at the Sands. There is a small, crowded tech room on the mezzanine level. Along with component storage, a video dubbing station, and a repair bench, there is one wall completely lined with electronic equipment racks. Here is where cable TV is decoded and distributed—feeding meeting rooms, executive offices, the stage and dressing rooms, etc. Prime channels are sent to the suites and lounges.

The Sands recently switched their in-house music system over to Muzak. Lead Technician Jim Black made the decision because, as he says, “Muzak is programmed for us. They have a truly psychological approach to the selection and variation of their formatting, and the music changes as the day goes on. This frees my crew of the tedious task of rotating tapes



From boardwalk to casino: Atlantic City's “people-mover.”

and maintaining decks.” Most of the other houses, as we shall see, make use of repeating tape decks of one sort or another.

The Muzak signal is transmitted via microwave across two states to a tower in Atlantic City. The Sands receives it via a TELCO line from across town. The back-of-house racks use TOA 900 Series Amplifiers, model A-903A, to distribute the music to the various 70-volt speaker systems throughout the facility. The amps also insert paging from the hotel operators, and afford the ability to balance music and paging throughout the house. A Yesco deck can be inserted at the flick of a switch as backup should a problem develop with the Muzak feed.

The old Sands system, using Yesco Foreground Music Model 800 decks, is still used for various in-house functions. Often a party or meeting will require specific background music: an art showing may request light classical; a party with a carnival theme may request circus music. These special requests are fulfilled by patching a Yesco into the overhead system of the function area and inserting one of Yesco’s custom tapes. These machines also serve the gourmet dining rooms—Rossi’s Buffet plays light Italian compositions, while the Brighton Steak House offers moderate instrumentals (although on weekends a live pianist entertains at a Yamaha concert grand). Players Lounge has its own Yesco deck and plays up-tempo contemporary, “city beat,” or country and western between sets, depending on the current act.

Black points out the importance of maintenance on these decks. Some of them are running twenty-four hours a day, seven days a week. The crew uses a special lubricated cleaning solution to insure clean heads and minimal wear.

BALLY’S GRAND

The most innovative background music system I’ve seen in Atlantic City is at Bally’s Grand (formerly the Golden Nugget). Michael Chelakis took time to walk me through the system and explain its evolution to me. Steve Wynn, the original owner of the Golden Nugget, was so impressed with what the Disney organization had done in Florida that he had Paul Magill Associates, the original designer, install Scully Model 270 1/4-track stereo tape decks for house music. Disney was contracted to make custom tapes for the casino. This proved to be too expensive after a few years, and now the crew makes their own in-house tapes from an extensive collection of compact discs. Of course, applicable licensing fees are paid (to BMI, ASCAP, et al).

The Scullys were upgraded with Saki glass heads and, claims Chelakis, are flat from 20 to 20k. Being an audio person, I immediately noticed the quality of the background music, as would most readers of this magazine. But I can’t help but feel that the average person walking into Bally’s Grand would notice the difference, too, even if somewhat unconsciously. The house music



The “Skywalk” at Tropworld.

is distributed through Altec 1590C amplifiers and is zoned to be very flexible. As Chelakis points out, although the entire system is eight years old, it was designed with enough flexibility to enable the crew to accommodate different needs as they arose throughout the years. Any public space is patchable. Deck One provides the casino with upbeat music, while the second floor deck plays subtle easy pop. The Chinese, Italian, and Classical French gourmet dining rooms each have a dedicated track from other Scully decks, that providing appropriate background music for the clientele at the different restaurants. For special events and parties in the ballroom, the crew can create custom music from its extensive collection of CD’s.

To appreciate the high level of quality that Bally’s Grand maintains, let’s look at another music system there. Yet another Scully deck provides elevator passengers with background music. Here’s the difference: early in the day, when a hotel guest leaves his room and enters the elevator, he is treated to upbeat music on the ride down to the main floor. At the same time, the closing door triggers a cart machine announcing the current stars appearing at the showroom and lounges. At the end of the day, on the ride back up to his room, the music cross-fades to track two of the Scully, a slower, more relaxing selection of music (minus the cart announcements). It’s a sophisticated system, and it works.

The ballroom system at Bally’s Grand is also very flexible. Altec 1592B Mixer Amps (over 12 units) and Altec 1594B amplifiers, plus a matrix system, allow for easy patching of 12 combinations in 14 rooms. Again, the original design of the system was “so flexible that no alterations or additions were ever needed,” says Chelakis. Michael also feels that 24-hour a day level monitoring by the tech crew is more consistent than the automatic level adjusting units that other houses use.

Another music-related duty of the tech crew at Bally’s Grand is the maintenance of the stereo systems in the hotel rooms.

You won't find a clock-radio bolted to the nightstand here, but rather a full-blown component stereo system—each one of 800 rooms features a pair of Boston Acoustic and Morell speakers, a Pioneer receiver, and an Akai cassette deck. Above the fifteenth floor, the 325 “custom” suites each feature a component system that rivals most audiophile's home stereos.



Equipment rack at the Sands.

CAESAR'S

Caesar's, the second casino to go up in Atlantic City during the late seventies, gives us a different look at the evolution of back-of-house music systems. Barry Pincus, the Lead Tech for eight years, inherited something quite different than his counterpart at Bally's Grand. To put it simply, as Pincus told me, “The original system has been replaced.” Both he and Gary Straub, both with extensive broadcast backgrounds, re-wired the entire system. The original layout scattered control equipment throughout the house; it's all been consolidated now in one location.

Pincus complains that “the system installer doesn't consult with the end user.” (This has been an all-to-common complaint

I've heard while researching this series of articles.) Now Pincus has complete cooperation with management, and he's gained their trust and support because of the job he and his crew have done to rectify a system that was botched from the start.

The original installation and maintenance was done by Bell Telephone. With Ma Bell's' diversification, they lost the system and New Jersey Communications, now Verex, took it over. That original installation was full of interconnecting problems, according to Pincus. Finally, the in-house crew stepped in and replaced everything. The job was done with a \$50,000 budget from management and completed in two weeks.

Pincus points out the rather obvious reasons for taking over the system and maintaining it with his in-house staff: “First, it's cheaper! Second, the crew is more familiar with the requirements of the system than an outsider, so our design is much more flexible. Finally, there is no need to wait for repairs. We know the system because we built the system from the bottom up.” Pincus recalls it sometimes took days for outside repair personnel to fix a problem with the old system: when the house audio is tied into life-safety systems, as required of all casinos here, a malfunction could be life-threatening in case of an emergency. (Incidentally, the life-safety systems are designed to mute all audio throughout the house and turn control over to the Command Center. Stiff fines await those houses that are not in compliance with this important regulation.)

House music at Caesar's is provided by Rowe CPC 180 Time Master four-hour tape machines. Each of the ten units can hold six carts and play them randomly. The music, plus paging, goes through LPB DAI-16 distribution amps. Every source goes through its own Altec 1812B compressor to keep things clean and manageable. A 3M message repeater (I've seen this unit at most houses in town) adds pre-recorded announcements to in-coming callers music-on-hold. The tech crew also has jurisdiction over all of the telephone service in the facility.

Caesar's also has two six-line telephone answering machines. At the end of the work day, various offices and telephone lines are switched over to these machines which contain digitized voice announcements informing the caller of, for instance, the hours that the box office is open. Gary Straub programs these machines and his broadcasting background has earned him the title of “The Voice of Caesars.” At the head of the house-music system is a mixer. With it, the crew can insert anything anywhere. They can even plug in a mic and make an announcement throughout the entire building, if necessary. The meeting rooms are served by a 16 x 16 matrix and Altec 9440 amplifiers (which Pincus plans to replace with Bogen units). For major ballroom functions, the crew can bring in different audio and reinforcement components, including multi-channel consoles and complete four-way systems.

TROPWORLD

The Tropicana's recent expansion and change of name to Tropworld accounts for the existence of two separate systems. The



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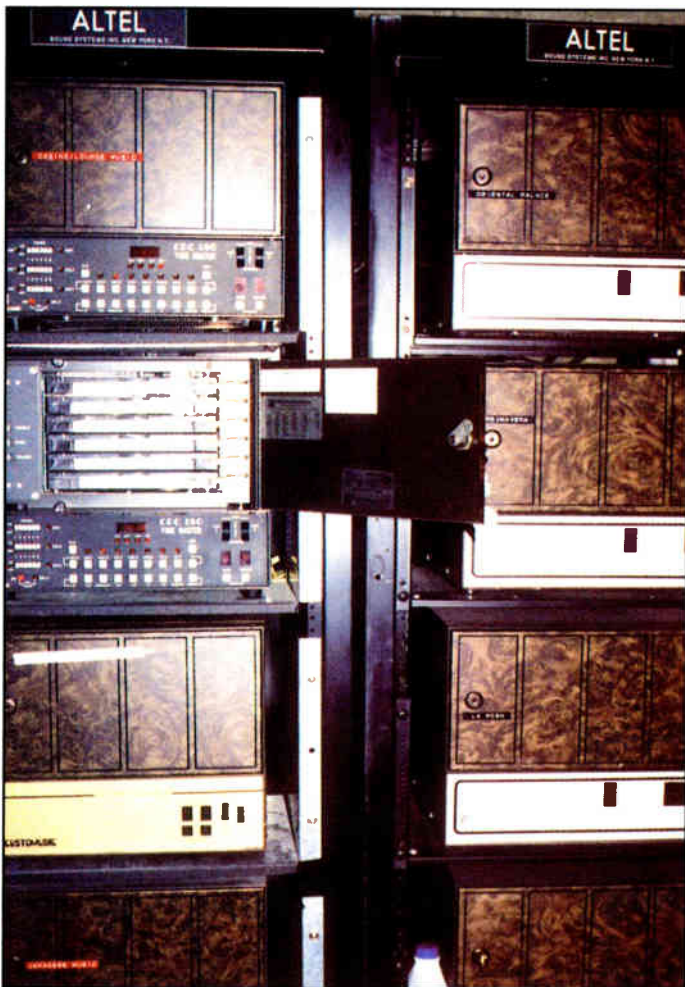
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Tropicana uses 3M Model 2083 tape machines which utilize the same type of continuous loop four-hour music carts as the Yesco. These replaced the more cumbersome 3M Cantata machines. The crew rotates tapes every four hours, beginning with quiet music in the morning, progressing through more up-tempo selec-



House music racks at Caesar's.

tions by afternoon and into early evening, and toning back down by late evening. And as the day goes on, the gains are raised as well to compensate for the heavier traffic (and noise levels). The music on the casino floor is controlled by Altec NOALA units. These compensate for varying noise levels by expanding the music signal so it can always be heard above the din of the casino gaming area. Other houses utilize similar units, such as the UREI ANCA (Ambient Noise Controlled Amplifier) or the Symetrix Model 571 SPL Computer.

The Royal Swan Ballroom has a rather extensive sound system. Amplification is provided by BGW 320B and BGW 620 units. Supporting the system are Altec-Lansing Equalizers and Lexicon Delta-T Model 122 digital delays. The Ballroom Status Configura-

tion Panel allows the distribution of sound to be changed as different sections of the ballroom are walled off according to the particular function or functions on hand. The Kliegl lighting console can follow the same configurations. Altec 1592B Mixer Amplifiers, Shure SE 30 gated Compressor/Mixers, a Revox B77 MkII stereo tape deck and 3M Cantata Continuous Music Player fill out the system. Behind the racks are the banks of relays that comprise the life-safety system.

Nick Oliva, former lead tech and now technical services manager, took me to see the new system. Oliva was responsible for requesting and selecting the system, and Pierce-Phelps did the installation. The tech crew, under Chip Alton, the lead tech, has complete control. The set-up is impressive, and represents state-of-the-arts electronics. At the heart of the system is the Creston Computerized Matrix System, which does away with the need for conventional patch bays. Background music source and level are routed to any combination of eleven zones (via push-buttons). Paging is enabled or disabled here as well. Cetec Ivie 5000 amplifiers power the meeting rooms, and the wall modules in the meeting rooms are actually VCAs which control these amps. Crown PS-400 and PS-200 amplifiers serve the public areas, health club, lounges, elevators, etc. Paging is a completely separate system to avoid cross-talk. It is combined with the music signals on the computer matrix. A total of 22 Symetrix Model 571 SPL Computers control levels for page over music, and a DBX 160x compressor is in-line with every source (page, music, etc.). A MicroAudio 2800 analyzer is available for insertion anywhere in the system. This computerized equalizer can be used to set a curve anywhere in the system through its slave units located throughout the racks.

HARRAH'S MARINA HOTEL AND CASINO

Joe Marchione says the system at Harrah's was "85 percent correct" when he got there. He has had difficulty in expanding due to the original layout of the system. He points out that expansions should be installed "internally," not by making the system "wider." That is, the center rack, the "brains" of the original system, should already be packed. When add-ons must go to outer racks, the system integrity is compromised (and things get confusing). Harrah's, like any other casino, is always adding new areas, changing bars, dividing rooms, etc. He says, with a chuckle, that you "have to be devious in your original layout. You have to plan incrementally: if you need two, make four."

Marchione feels very strongly that the lead tech should be an integral part of the construction process; too often the construction team doesn't include the lead tech in planning the layout. It's all done by management and the construction department. Marchione has had to beg electricians and construction personnel for ceiling plans and floor plans. He wants to be included in the construction department's discussion team: "I don't care if I'm on the bottom of the list," says Marchione, "just put me on the list!"

Another problem with some construction crews is that they will rip stuff out with no regard for what is there: speakers get cut, amplifier leads shorted, there is hum because of interconnecting problems, and speakers disappear! If the tech is not included, the construction crew is likely to install speakers anywhere.

The house music system is flexible, with close to a dozen EV-1 mic/line mixers fed by Yesco Model 800 Foreground Music decks and 3M Model 2083 Audio Decks. A trio of 3M Model 456 Message Repeaters handle the various in-house announcements. Each area is zoned with its own mixer, amp, and patch point.

Listening to the various systems at Harrah's, one becomes aware of the importance Marchione places on audio ambience. The subliminal effect is extremely important, he believes. Whether arriving by bus or limo, one is immediately greeted by pleasant music. Even the two Bose outdoor speakers over the main hotel entrance are strategically placed so you are literally drawn into the building by the music.

Harrah's has a skywalk connecting the self-park garage to the main casino. Many buildings in town have a similar second or third story glass-enclosed skywalk through which thousands walk

daily. At one such skywalk, the sound system consists of a single speaker at one end. At another, Bose units are pointing directly toward the crowd every ten feet. Marchione, however, took advantage of the curved glass roof of Harrah's skywalk and fired

(continued on page 67)



Behind the scenes at Harrah's.

Heaven's Gate

ASHLY



In the past, noise gates were only thought of as a way of getting rid of unwanted background material. As time went on people found that they could use these tools more creatively to shape their overall sound. Something more was needed to transform a mere signal processing device into a truly flexible instrument of innovation. Ashly set out to deliver just such an instrument.

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SOUND IMPROVEMENT AT TEMPLE SINAI

BY SCOTT REIDINGER & FARRELL BECKER

At Washington, DC's Temple Sinai, a recent renovation of the 80 x 100-foot sanctuary's sound system has delivered the level of intelligibility that the congregation has sought during the building's 30-year life.

The Temple's new mixer automatically attenuates microphone channels that do not have active inputs while a signal-leveling module in the mixer maintains a uniform output. Three transversal equalizers adjust the sound for best overall response in three different areas: the sanctuary, with its 20-foot ceiling; the sanctuary's entrance foyer, with its 12-foot ceiling; and the adjoining 80 x 50-foot social hall, which the Temple uses for overflow seating during the High Holidays. New speakers, chosen for the room, evenly provide the seating area with the ratio of direct to reverberant sound necessary for good speech intelligibility.

Before the renovation, the room had dead spots, particularly in the high frequencies. At the upper front wall of the sanctuary were multi-cell horns, with most of the cells closed off. The resulting disruption of the horns' directional characteristics (with all cells open, the horns provided excessively wide coverage) effectively reduced the Q of the horns and drastically reduced speech intelligibility.

Yet the existing system was only the latest of several attempts to improve the sound. The original distributed speakers in the ceiling had been disconnected years ago. Among the subsequent pieces of equipment, the two previous audio signal delays were

still in place: a tape-loop delay, and its predecessor—a tube-type acoustical delay about a hundred feet long.

Rather than patch up the old sound system, the Temple's trustees decided to go for a new one, professionally tailored to the characteristics of the space. They received several different proposals. To help them decide, they called in Farrel M. Becker, an acoustical consultant. He recommended Cardinal Systems' basic proposal, and revised the sanctuary speaker selection. After Cardinal installed the system, Becker equalized it. Installation and equalization were accomplished in time for the High Holidays, 1987.

The system's input is through Audio-Technica electret microphones at the Rabbi's podium, the Cantor's podium, the Ark, at a soloist's position, and through two elevated mics at the choir. There is a jack for an additional mic at the rear of the sanctuary.

The microphones feed an eight-channel Industrial Research Products, Inc. (IRP) DE-4013 Voice-Matic Automatic Microphone Mixer. As the service shifts from the Rabbi to the Cantor to the choir, the mixer automatically attenuates mics that do not have active inputs. The Rabbi's mic is always partly open to admit a constant background sound, for more consistent sound in the hearing-assistance system and in the tape recordings for shut-ins.

The automatic mixer provides the maximum gain before feedback, while automatically adjusting its master gain to compensate for the number of microphones that are open at any given

time. This is essential in carrying the input of a soft voice, say, the voice of a child, participating in the service. However, the mixer also accommodates a strong-voiced adult speaker. An IRP DE-206 Level-Matic master module in the mixer senses the volume variations between soft and loud voices and the distance variations between talkers and mics. It automatically adjusts the master gain to maintain a uniform output, so that stronger voices don't overpower weaker voices.

The signal to the main speakers goes through an IRP DG-4021 TEQ Transversal Equalizer to an Electro-Voice crossover, whose outputs go to two IRP DH-4020, dual-channel, 100-watt/channel power amplifiers. Low frequencies from the crossover go to a DH-4020, which is bridged to provide a 300-watt output. High fre-



Temple Sinai after installation of main speakers.

quencies go to the A channel of a second IRP DH-4020 amplifier. The amps feed Electro-Voice speakers: a high-frequency 90-degree (horizontal dispersion) by 40-degree (vertical dispersion) horn; and two 12-inch low-frequency speakers, stacked vertically to disperse the sound in a 52-degree vertical pattern. These speakers are just below the ceiling at the center of the sanctuary's front wall.

The second feed from the DE-4013 mixer goes through a digital audio signal delay (an existing IRP DC-4011A) and then splits into two paths. One is through a second DG-4021 TEQ transversal equalizer and the B channel of the second IRP DH-4020 power amp to five new Soundolier ceiling speakers—8-inch coaxial units—at the sanctuary's entrance area.

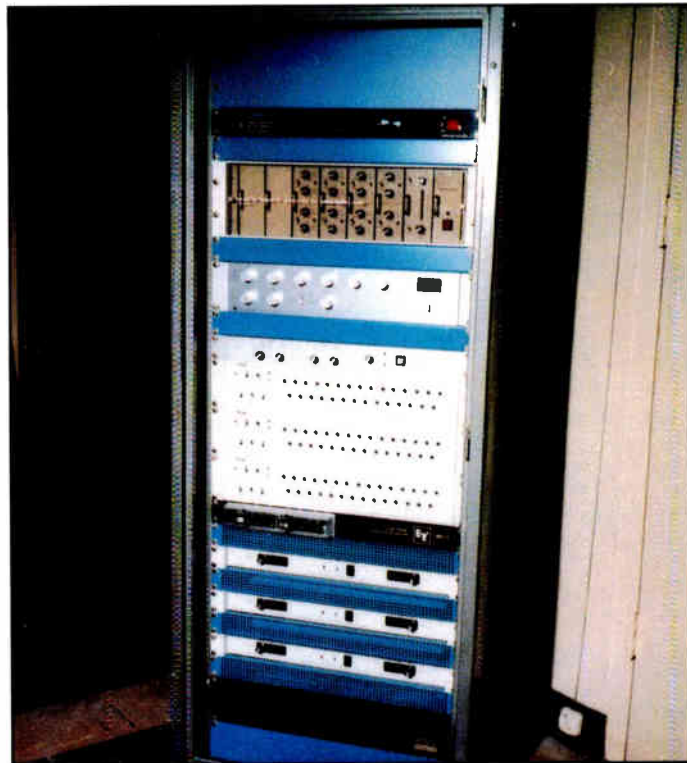
The other path is through a third DG-4021 equalizer and a third DH-4020 amp, bridged through an IRP DH-100 70-volt transformer to two speakers at the rear of the Sanctuary, providing sound to the social hall. These are existing units, Altec multi-cells, each flanked by a pair of Altec 15-inch woofers. We added fiberglass in front of the horns to shade off the parts that were radiating sound unto the adjacent walls. This improved the intelligibility in the social hall.

The microphone mixer was equipped with additional, buffered outputs, which feed a TOA 30-watt mixer amplifier, which, in turn, feeds the choir monitor speaker. The choir mics are about five feet in front of the singers and about three feet above their heads, for an even pickup of all of the voices. An auxiliary mixer output bypasses the equalizers and feeds the radio transmitter of a Williams hearing-assistance system, as well as a tape recorder.

The IRP equalizer has 29 frequency-band controls on one-third-octave centers. Using these controls, we equalized each area individually, with no other speakers operating. Then we operated all three together and matched levels as we went, so that we would have the same volume in all areas. We touched up the equalization to compensate for interaction between areas and fine-tuned it with everything operating simultaneously.

The equalizer we specified was equipped with screwdriver-adjustable controls. IRP makes an identical equalizer with rotary knobs, and another with slide controls; during a tune-up, slides and knobs are easier to use than a screwdriver. However, the screwdriver-adjustable unit discourages people from changing the settings and incurring the expense of callbacks.

Similarly, we wanted to minimize the client's responsibility for maintenance. The IRP power amplifiers have no cooling fans (which require air filters). Clogged filters can damage amplifiers and require additional callbacks. The people at Temple Sinai



The equipment rack at Temple Sinai.

prefer low-maintenance sound.

And they like the sound of their new system.

Reidinger is affiliated with Cardinal Systems Corporation, Silver Spring, MD. Becker is an acoustical consultant with Audio Artistry, Kensington, MD.

TEMPLE SINAI INSTALLATION COMPONENTS

- IRP DE-4013 Voice-Matic microphone mixer
- IRP DE-206 Level-Matic Master module
- IRP DH-4020 100-watt power amplifiers
- IRP DG-4021 TEQ transversal equalizers
- IRP DC-4011 audio signal delay
- Williams PPAT-3 transmitter (for hearing assistance system)
- Furman PL-Plus power conditioner and light module
- TOA A903A 30-watt mixer-amplifier
- Audio-Technica 857 speakers' mics; 855 soloist's mic; 853 choir mics
- Electro-Voice XEQ-2 crossover with EQR 1250 crossover network
- Electro-Voice TL806DX low frequency speaker
- Electro-Voice HP-940 high-frequency speaker with a DH-1A driver
- Soundolier C803 coaxial speakers
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SIGNAL PROCESSING

(continued from page 39)

Noise gates can do more than simply quieting a noisy guitar, keyboard or vocal mic input when the instrument or singer is momentarily silent. They can actually "tighten up" a performance. Take the drummer as an example. It may be that the snare "overshoots" or resonates a bit too much, or that it is simply played a bit off-time with respect to the kick drum. In this case, the kick drum can be used to "synchronize" the snare. (See figure 5-29.)

Nearly all units have a separate "trigger" or "gate" input, which is normally wired (internally) to derive signal from the main audio input to the gate unless a switch (or switched jack) causes the trigger signal to be derived externally. With the kick drum connected to the trigger input of the snare drum's noise gate, the downward expansion threshold is no longer triggered by the audio signal flowing through the gate's main program path, but by the kick drum. The trigger signal can be tapped from a direct output on the console's kick drum input strip. When the kick drum is played, its level "opens up" the noise gate on the channel which processes the snare, and when the kick sound abates, the snare input is shut off automatically so that the snare is forced into synchronization with the kick.

EXPANDER APPLICATIONS

Expanders are a component in most tape noise reduction systems. They do the "decoding" of the encoded (compressed) audio tape, simultaneously restoring the original dynamic range of the program and "pushing down" any added tape hiss or noise below the inherent program noise floor.

Expanders are also available as separately packaged signal processors. Consider the playback of an ordinary tape recording or record, or reception of a radio broadcast, any of which may have been compressed somewhat for better storage or transmission. This compression reduces the dynamic range, which can take out some of the "punch" in the program and can make the program less exciting or less natural sounding. In this case, the expander can restore some of the "lost" dynamic range. Unless severe compression was used, however, expansion ratios should be restricted to no higher than 1:1.4 if a natural sound is to be preserved. The problem with using too much expansion is that, unless it is the exact inverse of the compression applied to the program, it will cause unnatural surges in level. Expansion will work best with a program which already has a reasonably wide dynamic range. If you take a severely compressed radio broadcast, for instance, with 6 dB dynamic range (yes, they do exist), even a high 1:2 expansion ratio will still give you a mere 6 dB increase (to 12 dB dynamic range—not very impressive). However, process a modest 50 dB dynamic range program with 1:1.4 expansion, and the resulting 20 dB increase (to 70 dB dynamic range) may exceed the capability of many sound systems!

Expansion can restore (or create) the missing "punch" of a complete program mix or an individual signal in that mix. Depending on where the threshold is set, and how the unit is adjusted, the expander can also serve as a sort of single-ended noise reduction process to quiet down a recording, broadcast or instrument signal which has too much hiss. ■

The editors would like to thank Gary Davis and Ralph Jones for permission to use material from the Yamaha Sound Reinforcement Handbook.

VIDEO ACCESS CONTROL

BY JIM MORRISON

Video-based access control systems are becoming an increasingly popular means of providing security at the entrances to urban apartment and condominium complexes. Not only do the systems protect residents, but they also convey the upscale image desired by owners and developers alike.

Many sound and security contractors have been answering this demand for the installation of video security systems in multi-family dwellings and have proven there's a large market out there. Contractors new to this market may benefit from the knowledge gained by those who've gone before them—a knowledge of possible problems, requirements, and wiring demands to be faced when installing a video entry system in either a new or an existing building.

NIC Inc., a security firm in Seattle, WA, recently installed a video entry access control system in a 16-unit condominium complex in Seattle's cosmopolitan Capitol Hill neighborhood. Vern Nichols, owner of NIC, answered the developer's request for a security system that was dependable, yet wouldn't detract from the building's aesthetics. (In this case, the system chosen was an Aiphone VB.) Installation of the 17-station system, (one entrance station and 16 inside stations) was surprisingly simple.

VIDEO SYSTEM WIRING

The entire system is powered by a single, DC 24-volt power supply. From the base entrance station, Nichols ran 128 conductors to the 16 units (four units per four floors). Each condominium required six wires—one positive, one negative, one for the call signal, one for the voice path, one for the door release and another positive for the video. The additional positive wire for video is needed because it takes a different voltage than the positive for the audio. (The audio is always on, while the video is on only when a caller presses the button.) Two spares were also run to each unit (in case some wires needed replacement).

The video capabilities of the system are carried from the master station to each unit by a coaxial cable. Nichols used 5C-2V coaxial cable with 75 ohm impedance and copper conductors (not copper-weld). The cable is distributed separately to each of the floors through four video output terminals on a VD-4 video wiring adaptor. An impedance-matching switch must be set at 75 ohm at the farthest station on each terminal and at HIGH on the other stations. In addition, the shorting connector should be left attached to the farthest unit and removed from the other units.

Nichols found that running the cable for each floor through a separate terminal meant problems could be more easily located. If a problem does occur and a unit goes defective,

Nichols explains, the defect is isolated and will effect only that one floor and not the entire building.

All of the units in the building were also wired for a second inside station. That meant simply running the six wires and the coaxial cable from the first station to the second.



The Hermitage: Renovations offer opportunities for system upgrade.

A CLEAR PICTURE

The most crucial part of the installation, Nichols discovered, was the proper installation of the entrance station. "At this point, the installer really has to take the initiative and tell the developer what will work and what won't work," Nichols says. "The builder may want the entrance station to be located where it may look the best, but if it's not the best spot for picture intelligibility, the installer has to work to convince the developer of the importance of a better location." Since tenants are primarily concerned with the quality of the picture on their own monitor, and not with the aesthetic positioning of the entrance station, they would be dissatisfied if the station was installed improperly and the picture was unclear.

The entrance station should be installed at a height that puts the center of the camera at about 55 inches (about four inches below the average height of callers). That height will help provide a good picture of anyone 4 feet tall to 6 feet 4 inches tall, according to Nichols. Though the entrance station should be placed at exactly the calculated height, it can also be installed a little higher or lower. The vertical picture angle of the camera lens need only be adjusted one inch up or one inch down accordingly.

Nichols advises installers to be aware of strong light sources in the entrance area. If the sun or a strong light is behind the caller, the person's face will appear dark on the inside monitors. An illuminating lamp can brighten the face, but the problem is more easily resolved if the entrance station does not face a strong light.

In this case, Nichols also wired the complex for a second,

VIDEO ACCESS CONTROL

audio-only station at a second building entrance. Tenants can identify callers at that station by voice. Unlike the main entrance station, however, the second station does not have an electric door release so tenants must either physically open the door or instruct the caller to go to the main entrance.

Although the installation of a video intercom system can be relatively easy, Nichols warns there are some concerns to be aware of. First, Nichols cautions against running the wires too close to AC wires.

If an intercom system's wires are run through the same holes in the studs or are not insulated from the AC wires, crackling can occur in the sound transmission and decrease the sound quality.

After the wiring is complete, it should be checked regularly until construction is completed. Nichols' biggest problem has been the unintentional destruction of wires by builders. "Dry wallers can put a nail through a wire, and plumbers can burn a wire while soldering and not even know it," he says. "So we check the wires every few days to make sure everything is still working. Then, if a wire is ruined, we know who's responsible and we don't lose the repair costs."

A typical wiring scheme is shown in figure 1. In the diagram, MV-VBU refers to the video

monitor unit while VB-1D refers to the audio, or intercom, unit. In this case, the VD-4 video wiring adaptor distributes the video cable to the first four floors of the building through its four output terminals, one going to each floor. Not shown are two additional VD-4's which distribute video cable to the remaining floors, the majority of the apartment units, a second entrance station, and power supply boxes for the VD-4's and second entrance station.

VIDEO SECURITY AT THE HERMITAGE

Similar obstacles were faced by Joe Padula Jr., the president of A.F.Y. Security Distributors in New Jersey, who oversaw the installation of a VB intercom system in The Hermitage, an older, 64-unit 11-floor facility in the Tudor City Village neighborhood of New York, NY. Like Nichols, Padula coped with the problem of damaged wires by stringing extras and by regularly checking the system.

The installation, done during a remodeling of The Hermitage, was similar to Nichols' work, but on a much larger scale. Five times the number of conductors leaving the base station, for example, and five power supply boxes were needed (instead of one) to power the main entry units. And because of the large

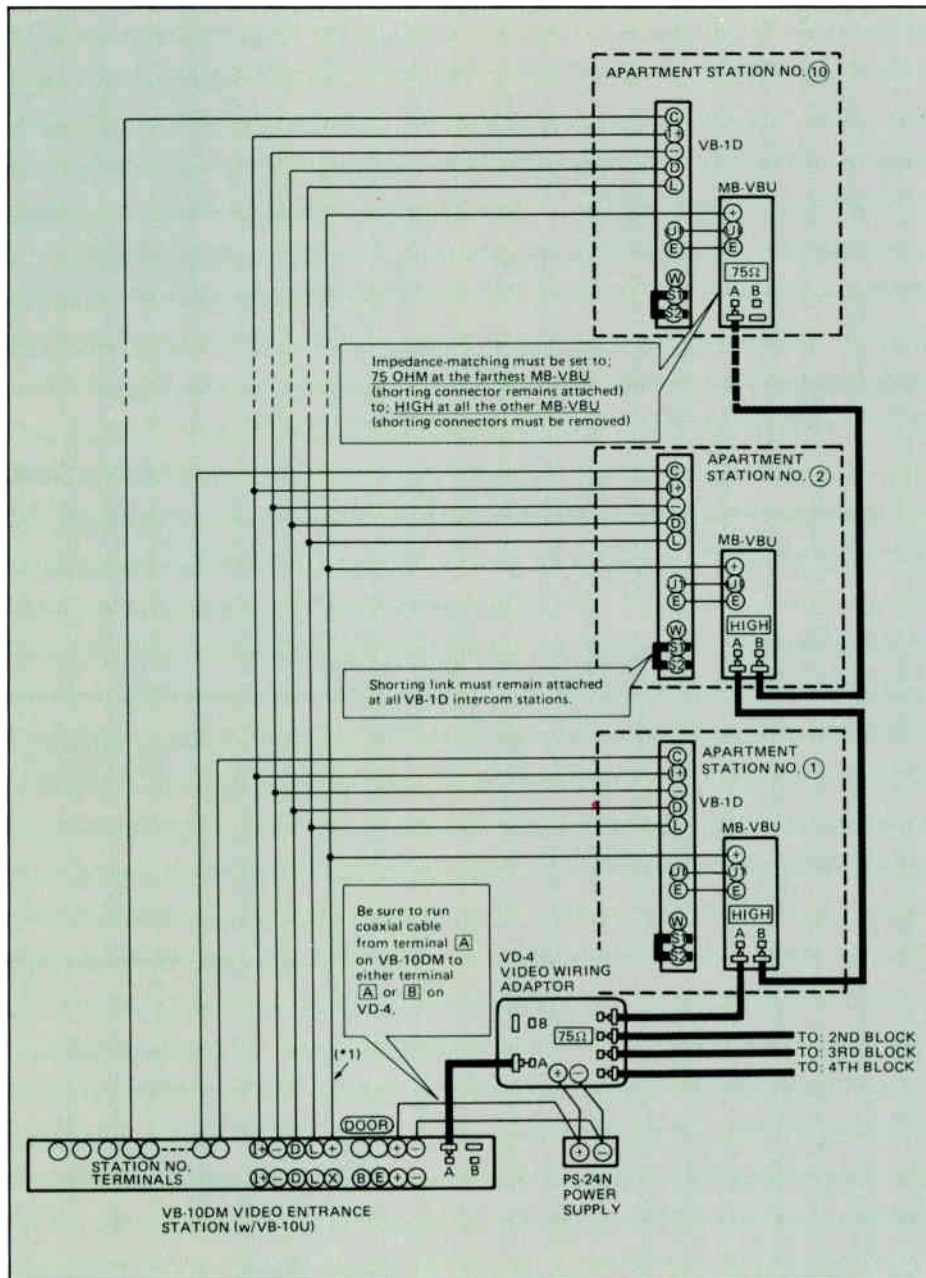
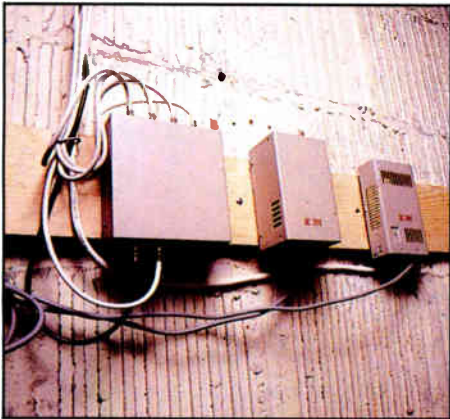


Figure 1. Key to this typical wiring scheme: +, - (power supply); I (intercom); D (communications); L (door release); B, E (lamp control); X, E (occupied light).

VIDEO ACCESS CONTROL



Power supply boxes at The Hermitage.

number of apartment units, additional video wiring adaptors were required.

While Nichols used a single VD-4 adaptor in the Seattle installation, Padula used three for The Hermitage. The first distributes the video cable to the first four floors, with one output terminal directed to each floor. The second serves floors five through eight and the last one directs the cable to the ninth and tenth floors, as well as to the penthouse.

A separate DC, 24-volt power supply



Apartment unit with door release.

box was added for each adaptor. To keep the wiring accessible, both the adaptors and the power boxes were located in the garbage chute areas of the basement, fifth, and ninth floor levels.

The size of the building also warranted a second fully capable entrance station, which meant further electrical coordina-

(continued on page 68)



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Contracting Closeup

Coffeen, Anderson, Fricke & Associates Design Systems

Coffeen Anderson Fricke & Associates of Lenexa, KS, have just completed two projects: the Offutt Air Force Base near Omaha, NB, and the Charlotte Coliseum in Charlotte, NC. The company works with an architect to design room acoustics and electro-acoustic systems/sound systems.

Coffeen, Anderson, Fricke & Associates worked with Electronic Sound Company, contractors in Omaha, NB, for the installation at Offut Air Force Base. The installation of audio and video equipment took place inside the Strategic Planning Center for FAC command and was completed in mid-October.

Innovative Electronic Designs, Inc. (IED) model 5000 audio processing system and the 4000 series automatic mixing system supplied a system with 72 microphone inputs. The microprocessor provides continuous interface of the main bus, auxiliary bus, priority bus, and the NOM digital attenuator bus of the automatic mixing system.

Also included in the installation were four Barco video projectors, a variety of slide projectors, Electro-Voice sound effects speakers and eight-inch coaxial speech reinforcement speakers.

Coffeen, Anderson, Fricke & Associates worked with Long Communications of Winston-Salem, NC, to install a computer-controlled sound reinforcement system using IED's equipment and software in the Charlotte Coliseum.

In the Charlotte Coliseum, IED supplied their model 500 audio control system with a 590 microcomputer that uses graphic computer screens. The microcomputer custom software allows the system user to switch event

screens that control two main speaker clusters, six extended clusters, 16 satellite clusters, 16 under-balcony speaker arrays, 16 upper deck speaker arrays, and eight concourse speaker arrays while maintaining proper time delay and gain structure for various stage locations. In addition, the IED 596 monitor system allows testing and monitoring of the system's line level signals and speaker lines. IED also supplied the software control for the system's paging and background music for meeting rooms and service area.

Comcast Sound and Altec Lansing Bring Sound to Illinois Colleges

Comcast Sound Communications, Inc., Peoria, IL, replaced an existing 30-year old Altec Lansing distributed sound system at Western Hall, Western Illinois University's multi-purpose facility with a system comprised of one main cluster and 25 satellite clusters. The installation was completed in August 1988.

The new system includes nine Altec Lansing model 9444A power amplifiers, 30 299-8A compression drivers, 10 MR11564 and 20 MR11595 constant directivity horns, one 8558A equalizer, three 1631 crossovers, one 1593C amplifiers, one 1699 mixer, and 26 8127 bass loudspeaker systems.

Comcast Sound Communications currently is working on the Redbird Basketball Arena at Illinois State University. Altec Lansing as well as Electro-Voice equipment will be used. Completion of the installation is expected to be mid-December.

Sound Distributors Install in New San Antonio Marriott

Sound Distributors, Inc. installed a

complete sound package in the new San Antonio Marriott Rivercenter in Texas. The sound package included the ballroom, which is a full one acre and can be divided into 14 sections, the conference rooms and the music and page system for the general public area, according to Jim Dillon, general manager at Sound Distributors. A teleconferencing-cable network also was set up for the ballroom and conference rooms Dillon added. The system was designed by Jeff Loether, audio/visual engineer for the Marriott Corporation.

The sound package included Altec-Lansing 920-8A ceiling loudspeakers and 15708 transformers, Altec Lansing 2280A's, 2271's, 2273's, 1674C's, and 1678C's, plus Urei 533 equalizers and Urei 535 equalizers, DBX 160X compressor/limiters, JBL 8110 loudspeakers, FSR audio mixing, RCI patch panels, and Toa equipment for the public paging system.

The installation was completed in October 1988.

Comcast Sound Theater Installations

Comcast Sound Communications, Indianapolis, IN, has installed sound systems in The Performing Arts Center in Fort Wayne, IN, and in The Battle of Tippecanoe Drama Theater in Battleground, IN.

The installation in The Performing Arts Center included building a sound booth in the rear of the seating area and a complete conduit system including microphone line level, speaker level and technical AC power, according to Bill Kolts, sales engineer at Comcast. A right, left, and center speaker cluster system, a four-channel effects/monitor system and a FM-hearing impaired system also was included in the installation Kolts added. The job was completed in late September, with



minor details currently being finished at press time.

The equipment used in the job included a 24-channel Soundcraft 500 console, JBL 6290 amplifiers, Rane AC22 crossovers, RTS distribution amplifiers, DBX 166 compressor/limiters, JBL 5549 equalizers, Urei 562 notch filters, JBL 4602B stage monitors and JBL 4408 program monitor speakers. The clusters included JBL 4648 woofers and Electro Voice HP940 and HP1240 horns with Electro-Voice DH1A drivers.

Comcast used a 16-channel surround system run off of an Amega computer controlled Richmond Command Q console for its installation at The Battle of Tippecanoe Drama Theater. The goal of the system is to accurately recreate a battle with the speakers surrounding the audience in the outdoor theater, according to Kolts.

The equipment used by Comcast included ten JBL 4699B speakers, three JBL 4698B speakers, 13 JBL 6260 amplifiers, two Toa P912 amplifiers, one Tascam 480B taperecorder, two Revox PR99 taperecorders, one Electro Voice 8108 mixer and three Soundcraft ATS 360 speakers.

Kolts estimates the sound system will be completed by the end of November.

Audio Experts Go On Campus and to Historical Theater

Audio Experts, Kokomo, IN, have made recent installations at the Morris Civic Auditorium in South Bend, IN, and at the University of Notre Dame.

The company, acting as a consultant, designed a new audio system at the Morris Civic Auditorium, a 1920's theater listed on the National Register of Historic Places, according to Phil Mitchell, Audio Experts president. The theater had purchased a Crown amplifier and a Klark-Teknik mixing con-

sole last year from Special Olympics. Working with these, Audio Experts installed a completely new speaker system, Mitchell said.

Audio Experts installed JBL Concert Series speakers—two 4852s, two 4862s, and two 4866s. JBL SLT-1 speakers were used for the dressing rooms. For the area shaded from the cluster under the balcony, the company installed two Apogee AE-2 under balcony speakers and one A-2 speaker processor. For signalling, Audio Experts used Ashly CL 50 compressor/limiter, Ashly GQ 231 dual 1/3 octave equalizer, Ashly XR22/12 crossover and Crown macrotech 600 power amplifier. The installation was completed in the beginning of October.

Audio Experts have installed most of the sound systems at the University of Notre Dame in the past two years according to Mitchell. Recently, the company installed systems at the Stepan Center, the Notre Dame Stadium and a portable system for use by the Student Activities office.

The Stepan Center, which was visited by President-Elect George Bush before the election, is a domed building which houses concerts and various programs throughout the year including an annual jazz festival. "It is terrible acoustically, and our goal was to overcome the acoustics as much as possible and it worked out well," Mitchell said about the Center. Audio Experts replaced the old system.

The equipment installed at the

Stepan Center included: five JBL 2360A 90 by 40 high frequency horns, five JBL 2445J compression drivers, four JBL 4646 12-inch low frequency speakers, two crown DC 300A amplifiers, one JBL 7922 signal delay, one Ashly XR22/12 crossover, one Ashly GQ 131 1/3 octave equalizer, one Bi-amp Advantage 1 mixer, one Ashly CL 50 compressor/limiter and one Nakamichi MR2 cassette deck. The job was finished in early September.

The Notre Dame Stadium installation involved placing speakers throughout the concourse and at the 90 entrances. The system is used for repeat messages regarding safety and stadium rules with paging capability break in with live microphone.

Audio Experts installed 32 Atlas/Soundolier AP30T speakers, MacKenzie digimac digital message repeater, Rane ME15 2/3 octave dual equalizer, Toa M900A mixer, Shure 450 paging mic, and Crown DC 300A power amplifier. The Notre Dame Stadium installation was finished in early September.

Audio Experts set up a portable system for the Student Activities office for use at concerts and other on-campus activities and functions. The \$40,000-\$50,000 system contains a Soundcraft 200B 24-channel mixing console, Crown microtech amplifiers, Ashly signal processing, Worldwide multipin snake system, Star cases, Community Light & Sound speakers and Crown, Shure, and AKG microphones.

People

Anixter Names VP of University Sales and VP of Training and Development

Anixter Bros., Inc. has named Dave Stanley vice president of university sales, a newly created position. Stanley has been with Anixter for 15 years and

most recently had been midwest regional sales vice president.

Bill Millholland has been appointed vice president of training and development for Anixter. Millholland, previously the vice president of contractor sales, will be responsible for the design and



implementation of Anixter's training program to its worldwide sales and operations force of 3100 employees in 125 locations.

Appointments at Shure

Shure Brothers Inc., has appointed Lottie Morgan vice president, sales.

She will be responsible for the supervision of all domestic distributor sales of Shure products. Morgan has been with Shure since 1962. She has held a number of sales management positions, including her



Lottie Morgan

most recent post as national accounts manager.

Alan G. Hershner has been appointed director of sales, domestic distributor products at Shure. He will supervise the activities of all Shure domestic sales representatives. Hershner's previous position at Shure was western regional sales manager. He joined Shure in 1984.

Gentner Has New Appointments and Additions

Gentner Electronics Corporation has restructured and added to its Research & Development department.

Jim Pino has been appointed director of research and development. He will manage all R&D operations. Pino

has 29 years experience in the electronics industry and has been manager of ADT, a circuit board design division of Gentner.

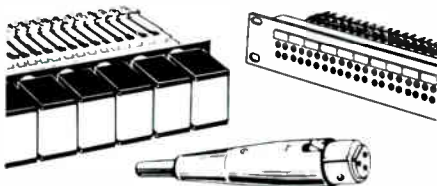
Bill Gillman maintains the position of vice president of engineering within R&D. Gentner has appointed Craig Boswell as product development coordinator, and Jim Wright as CAD services coordinator.

Dan McGuire and Tracy Bathurst have been hired as new engineers for software and hardware engineering in R&D. R&D will also be hiring a new CAD system operator.

Bill Traue has been added to the customer support team at Gentner. Traue has 15 years experience in radio broadcast engineering. He has been a

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chief engineer for six radio stations and has supervised the construction of three new broadcast facilities.

Bard Promoted at Burle



Michael Bard

Burle Industries, Inc., formerly RCA New Products Division, has promoted Michael Bard to technical applications specialist. Bard will be responsible for technical support for Burle equipment.

Bard joined RCA/Burle in 1979 and has held various positions at the company including, most recently, camera repair technician at Burle.

QSC Appointments

QSC Audio Products has two new appointments at their Costa Mesa, CA headquarters. Tom Day has been promoted to service manager, and Neil Pedinoff has joined QSC as a senior engineer.

Day has been with QSC for over five years and most recently held the position of manufacturing engineering manager. Pedinoff joins QSC after three years at UREI as a project engineer.

IED Appoints White to Sales Force

Innovative Electronic Designs, Inc. (IED) has added Jeffrey N. White as sales applications engineer. Before joining IED, White had been a sales representative for Charlie Winkler & Associates. He has also held positions as assistant national sales manager for professional products at Audio-Technica, and in loudspeaker systems,



Jeffrey N. White

engineering and marketing, at Electro-Voice. White is a holder of two patents in sound products design.

Grossberndt Named Stentofon President

Stentofon Communications, Inc. has named Donald K. Grossberndt president. He succeeds Ken Jensen, who will continue with the company as executive vice president. In his new position, Jensen will assist with Grossberndt's transition to president, as well as being responsible for key accounts and new market development.



Donald K. Grossberndt

Grossberndt comes to Stentofon from Contel-IPC. He had been with the firm for four years, first as vice president of sales and later as vice president of sales administration. He has been in the telecommunications industry for 21 years.

DOD Appoints Banks VP of Marketing

DOD Electronic Corporation has appointed Larry Banks to the position of vice president of marketing. Banks comes to DOD from a large music store chain in which he was a partner and the general manager. He has held

Products

Grommes-Precision Announces a New Line

Grommes-Precision has introduced the PR-30 FM-AM background music and paging receiver, a tuner-amplifier with a microphone and telephone. With the PR-30, paging can override or mute the music. The microphone and telephone line inputs are balanced low

impedance without transformers. The sensitive FM-AM tuner uses internal or external antenna and features a LED Tuning Indicator. The PR-30 delivers 30 watts RMS power with 0.25 percent distortion or less to four ohm, 25 or 70 volt speakers.

Agfa-Gevaert Promotes Tibensky

The magnetic tape division of Agfa-Gevaert, Inc. has promoted Joseph E. Tibensky to the position of national marketing manager for audio products. He will be responsible for the marketing of the division's line of audio products in the U.S. Tibensky has been with Agfa-Gevaert for five years, previously as the division's audio products manager.



Joseph E. Tibensky

Trevor Cash International Established

Trevor Cash International, a marketing consultancy, has been set up by Trevor Cash. Cash recently was the sales director of Trace Elliot, where he had been for three years. The marketing consultancy's first major client is the DOD signal processor manufacturer and its three product lines, DOD, Digitech and Audio Logic.

Also from Grommes, two new amplifier models: the GT60B and the



GT125B are six-channel (four mic, two aux, or six aux) mixer power amplifiers. Microphones have built-in low impedance balance line transformers and provision for telepage without any other accessory. It has automatic voice activated or manual muting.

Half-Rack Series From Symetrix

Symetrix has introduced the SX200 Series, a new group of products in the "half rack" size. A two-unit full-rack mounting pan is available, allowing two totally different functions to be mounted within a single rack space. The SX201 Parametric EQ/Preamp, features a +15 dB boost and -30 dB



notch filter capability, with unbalanced preamp input, balanced/unbalanced line level input, and balanced line driver output.

The SX202 Dual Microphone Preamplifier features two ultra clean microphone preamplifiers with variable gain, 15 dB pad, +48 volt phantom powering, left, right, and left + right outputs. The SX204 Headphone Amplifier is a one-in four-out amplifier utilizing proprietary high voltage converter technology to drive high impedance headphones like a big power amp, while providing more than ample power for low impedance phones.

Nel-Tech's Personalized Radio Marketing

Nel-Tech Labs Model DXV2000 for radio broadcasting is a user recordable, solid state, natural voice system. The DXV2000 allows the user to record



personalized promotional messages to be broadcast over unused FM channels in their local area.

Message lengths may vary from 30 to 240 seconds, and the typical broadcast range is from 500 to 700 feet.

Concept Communication Introduces Boards

Concept Communication has introduced a pair of expansion boards for the IBM PC and compatibles that provides full-motion videoconferencing capability. The boards, together called Image 30, combine with standard video cameras and monitors to create a videoconferencing system around a PC. Transmitting at user-selected bandwidths of 56 Kbs to 384 Kbs, Image 30 transmits full motion at 30 frames per second. It also allows a user to transmit, display, and store full-color high-resolution graphics, exchange PC files disk-to-disk, and access other programs during a conference. A user only needs to connect one or two video cameras, a video monitor, and a digital transmission line to the boards' outlets. Image 30 also supports other peripherals such as VCRs and video printers, as well as equipment that links up additional cameras and monitors.

Bogen Expands Its Line

Bogen Communications, Inc. has announced a night ringer module and a new series of telephone paging amplifiers with built-in night ringer. Model NR100 night ringer and TPU-A series amplifiers provide an electronic ring signal through paging system speakers to alert security or other after-hours personnel to incoming telephone calls. They are designed to eliminate

the need for separate night bells.

The NR-100 module connects to the auxiliary input of an amplifier to convert a paging system for night bell service. It provides an input for a background music source and precedence for the tone signal over the music, which is automatically muted.

Night ringer circuitry is also offered in four amplifiers, models TPU-15A (15 watts), TPU-35A (35 watts), TPU-60A



(60 watts), TPU-100A (100 watts). These amplifiers provide inputs for a 600-ohm balance telephone line, a background music source, and a balance low-impedance microphone (except TPU-15A). They feature voice-activated circuitry which automatically mutes or fades music during paging and automatic output leveling to com-



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pensate for the different voice levels of individuals using the system.

The cabled pairs are wrapped with a polyester film and jacketed with PVC. The inner jacket is wrapped with a polyester aluminum foil shield with a 24 AWG stranded tinned drain wire which allows easy termination of the cable shield. The outer jacket is flame retardant PVC.

Ambient Analysis System and Hotel Audio Management from IED.

Innovative Electronic Design, Inc., has introduced the Model 540 Ambient Analysis System. The system has the ability to vary sound system level in real time response to changing background noise such as crowd roar and jet noise.



The 540 has special sensors that allow it to work with any sound system, small

or large, one zone to multi-zone.

And IED has developed a new microcomputer-based audio management system for hotel ballroom and meeting rooms (up to 16 rooms may be accommodated). The system monitors and controls all functions for the changing audio requirements created by the constant rearrangement of moveable room partitions to accommodate different size events.

The system automatically preprograms scheduled events of the sound system by simple menu-guided data entry at the time the meeting space is rented. The system features the 400 series automatic mixer which eliminates the need for an on-site sound system technician.

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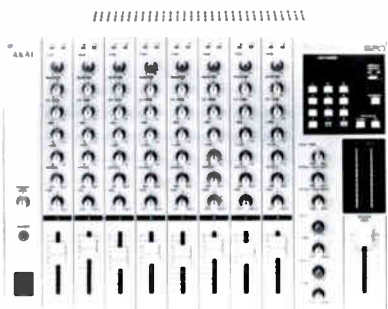
one of the leaders in the fields of acoustical consulting and sound system design is seeking experienced sound system designers. Qualified applicants will have previous design, or engineering & installation experience with large, high quality sound reinforcement systems.

The position is a senior level designer post. As Jaffe promotes from within, the successful candidate may have the opportunity to direct the sound system department at Jaffe.

Candidates with excellent design skills, some marketing background and strong organizational abilities will draw top consideration. Good salary and benefits. Write to:

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Jaffe Acoustics, Inc.
114A Washington Street
Norwalk, Connecticut 06854
(203) 838-4167

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Akai Introduces MIDI Volume Control and Demo Pack

Akai Professional recently introduced real-time level attenuation for audio signals via MIDI control as a new feature to the Akai MPX820 programmable eight-channel mixer. The mixer will now send and receive MIDI Con-

troller #7 which allows for automation of mixer levels. MIDI channel 1 is assigned to the Master, channels 2-9 to input channels 1-8, and channels 10 and 11 to the Aux 1 and 2 levels. With the volume control, users can record fader moves to MIDI sequencers or adjust mixer levels from master keyboards equipped with assignable controllers. The MPX820 now includes the new ROMs. Older units can have the update installed, free of charge, at an authorized Akai service center.

Also new to the Akai line is an accessory pack for keyboardists. The pack includes the ME30PII Programmable Patch Bay, the ME25S Programmable Note Separator, the PEQ6 Programmable Equalizer, and the MB76

Programmable Mix Bay. This pre-packaged MIDI effects demo pack is being offered to Akai dealers to show the flexibility of these rack-mount effects when used together as a system. All four devices accept MIDI program change commands or a footswitch that can be used to advance the banks. The bank data can be loaded and saved via MIDI using System Exclusive messages.

ICS, Inc., Introduces Uninterruptible Power

The ICS Electro-Pac Model "E" UPS helps to solve power problems for sensitive and critical equipment such as computers and instrumentation. In the event of a total loss of incoming



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TekTone's newly-designed video monitor (VM-103) features a low-profile, streamlined look, with outstanding video resolution and superior sound quality. Coordinates with the (VM-320A) Multi-family Entrance Panel (shown), or the Single-family Residential Panel (VM-600A).

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power, such as blackouts, brownouts, etc., the system transfers to the battery back-up instantaneously. The UPS features stable output, high overload capabilities and a full range of alarms. Batteries are provided for length of time required by application.

ICS, Electro-Pac Division is also introducing the Lifeline Uninterruptible AC power supply designed for the microcomputer market at an affordable price. In case of power failure a maintenance-free internal battery is designed to handle the full power of the system for 5 or 10 minutes. An external battery may be used to extend operation for one hour or longer if required. Lifeline plugs into a normal 120 VAC, 600 VA, 1000 VA.

Audix Introduces Studio Monitors

Digital Designs, a newly formed division of Audix Corporation, has introduced a series of near-field studio monitors. One of these, the Model LS-161, is a two-way acoustic suspension loudspeaker system featuring a 6½-inch polypropylene woofer and a one-inch, phase corrected ferrofluid cooled polymer dome tweeter.

The woofer features a textured semi-hyperbolic cone, a ventilated nomex voice coil former, four-layer high temp wire and a closed cell polyurethane foam surround with precise edge termination properties. The tweeter, due to its ultra-light moving mass and liquid cooling, provides transient response and dampens the fundamental reso-

nance, thus simplifying crossover termination. The tweeter and woofer are time corrected and produce a point source for superior image localization.

Other models include the LS6, a slightly smaller version of the LS-161 (without the two-position switch), and the LS-261, consisting of two 6.50-inch woofers and a tweeter.

Concept Communication Introduces Boards

Concept Communication has introduced a pair of expansion boards for the IBM PC and compatibles that provides full-motion videoconferencing capability. The boards, together called Image 30, combine with standard video cameras and monitors to create a

The One And Only

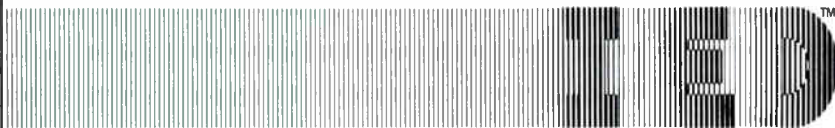


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videoconferencing system around a PC. Transmitting at user-selected bandwidths of 56 Kbs to 384 Kbs, Image 30 transmits full motion at 30 frames per second. It also allows a user to transmit, display, and store full-color high-resolution graphics, exchange PC files disk-to-disk, and access other programs during a con-

ference. A user only needs to connect one or two video cameras, a video monitor, and a digital transmission line to the boards' outlets. Image 30 also supports other peripherals such as VCRs and video printers, as well as equipment that links up additional cameras and monitors.

side consultants and handle outsiders' ideas. It is written in concise, non-legal language, and organized specifically for R & D activities, and applies if you have a patent attorney or not.

Literature

Protection from Penn

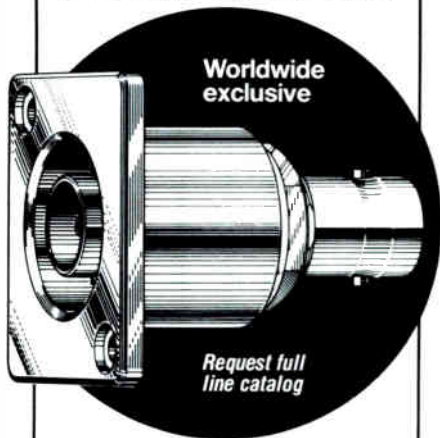
Penn Institute Inc., new guide Protecting Engineering Ideas & Inventions is a 223-page legal guide written especially for engineers, scientists and managers who must know how to

legally protect a company's engineering work. The guide covers every legal issue of importance in engineering, including patents, copyrights, trademarks, trade secrets, and secrecy agreements; and how to work with out-

Directory of Software Preview Centers from ICIA

The Educational Computing Council of the International Communications Industries Association (ICIA) has recently published the third edition of its Directory of Software Preview Centers. The revised and expanded directory will help producers and publishers of educational computer software to quickly identify preview centers that will meet their needs. The directory helps producers to target preview centers

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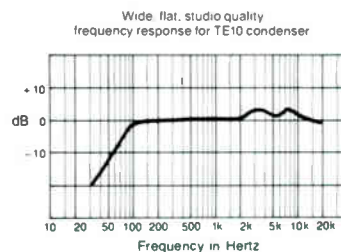
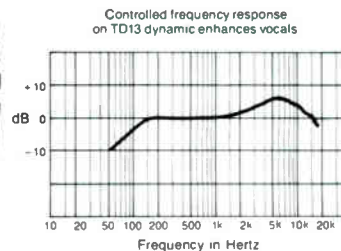
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SURPRISING!

Telex TE10 and TD13 sound reinforcement mics are making believers out of sound pros who have been automatically specifying the same microphone for years. These new low mass design condensers (TE10) and high output dynamics (TD13) are meeting the demands of even the toughest pros while at the same time providing unexpected savings. Surprise yourself. For detailed information write Telex Communications, Inc..

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which can display their software most effectively and buyers can use the directory for preview centers that display software in their curriculum areas.

Nemal's Revised Guide

Nemal Electronics International has published a new and revised edition of its Cable and Connector selection Guide covering a wide range of electronic cable, connectors, tooling, and cable assemblies. The 40-page guide offers technical specifications on more than 1000 military and commercial products including attenuation, power, VSWR and temperature ratings.

Corning's Strength Test

According to an article in Telephony

magazine, titled "How Much Stress Can Fiber Take?," breakthroughs in understanding fiber's physical properties are opening up opportunities for designers to capitalize on fiber's strength and fatigue resistance. The article also describes experiments that are helping researchers understand fiber's potential to withstand stress in cables.

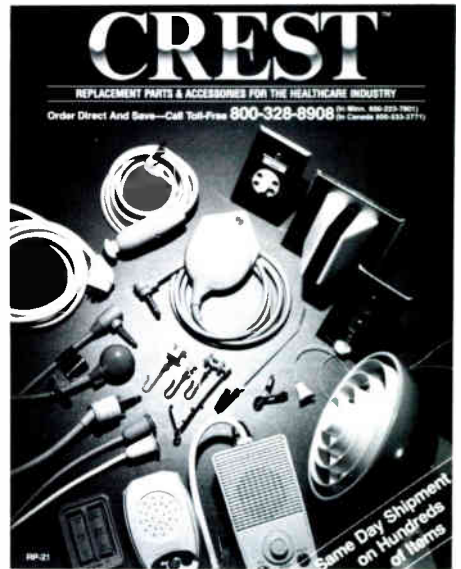
Utility Identification Products Catalog from Ametek

The Carsonite Division of Ametek, Inc. has just published a new 12 page, full color catalog on their entire line of Carsonite flexible signing products for protection of buried utilities. The catalog covers marking devices for use in

the telecommunications, gas and oil pipeline, water/sewage and power industries, or anywhere underground facilities are used.

Healthcare Communications Catalog From Crest

Crest Electronics has published a new catalog for the healthcare industry, detailing complete calling and signalling systems, with over 1600 replacement parts and components.



Products include pillow speakers, bed controls and motors, patient and room accessories, maintenance and safety products, security, fire alarm and signalling devices, and more. The 168-page catalog offers a free planning service for nurse call systems, and is 3-hole punched for easy filing and ready reference.

Catalog Supplement From Contact East

A new supplement from Contact East features a wide selection of top brand-name test and measurement instruments. Included are DMM's, oscilloscopes, breakout boxes, EPROM programmers, hand tools and tool kits,

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ICIA Offers Seminar Series

The International Communications Industries Association (ICIA) is having hands-on training seminars for professional media users. The "Information and Communications Technology Conference" is designed to help educators, business communications specialist, corporate trainers, meeting planners and other learn the applications of various presentation products. The seminars are presented in conjunction with ICIA's annual trade show INFOCOMM International in Dallas, TX from January 31 through February 4, 1989.

Fiber-Optic Installation Challenges US Sprint

An article published in Telephony magazine showed the details and problems of US Sprints construction of their nationwide fiber-optic network through California's Feather River Canyon. The 75-mile route through the narrow, rocky canyon included many tunnels, bridges, twists and turns that re-

quired creative solutions to tricky construction problems.

Marconi's Midata 510 Brochure

Marconi Instruments Inc. has released a ten page, four color brochure on the new MIDATA 510. The brochure describes the different units of the MIDATA 510 main console including the color monitor, Winchester disk, printer, keyboard and mainframe.

Data Sheet from Delta

A new two-page data sheet describing a one-step SMA plug that replaces double crimp semirigid cable connectors and meets all MIL-C-39012 requirements is being offered by Delta Electronics. The data sheet describes

the plug which features a self-contained female center contact that accepts the center conductor of the cable without soldering. Graphs displaying VSWR's and complete technical information, part numbers, and cable assembly instructions are provided.

Daburn's New Catalog

Daburn Electronics & Cable Corp, has just introduced it's new product catalog. The catalog has new charts and tables to aid the user of its updated and expanded product line of: wire, cable, shrinkable tubing, sleeving, lacing cord and tape-fastening devices, plugs and jacks, porcelain insulators and retractile cords.

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Calendar

NOVEMBER

Lighting Dimensions International '88:

Dallas, TX. Contact: Patricia MacKay, 212-677-5997. November 18-20.

Unicom 2 Expo and Conference:

Dallas, TX. Contact: Kay Hynson, 703-273-7200. November 29 - December 1.

DECEMBER

SPARS Luncheon:

New York, NY. Contact: 212-764-5980. December 1.

Video Expo Orlando:

Orlando, FL. Contact: 914-328-9157. December 12-16.

JANUARY

Pacific Barber Telecommunications Council '89:

Honolulu, HI. Contact: Richard Barber, 808-941-3789. January 15-18.

NAMM Winter Market:

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

FEBRUARY

INFOCOMM, sponsored by ICIA and AECT:

Dallas, TX. Contact: Kay Hynson, 703-273-7200. February 2-4.

Video Expo San Francisco:

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

ISC South:

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

MARCH

30th ERA Management and Marketing Conference:

Maui, HI. Contact: 312-649-1333. March 12-18.

Communications Expo '89:

Las Vegas, NV. Contact: 303-220-0600. March 29-31.

APRIL

National Relay Conference:

Stillwater, OK. Contact: 219-264-9421. April 17-19.

ISC Conference:

Anaheim, CA. Contact: 312-299-9311. April 25-27.

NAB:

Las Vegas, NV. Contact: 202-429-5300. April 29 - May 2.



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R-431 Graphic Equalizer (top) R-830 Graphic Equalizer (bottom)

KEYBOARD DUEL

(continued from page 26)

members of the press were able to audition the Kurzweil/electroacoustics system. There was clearly no contest in terms of sheer power, and spaciousness. But what could be installed in a matter of hours, as compared to what took years to install, was a demonstration of what can be accomplished with electroacoustic equipment available today. In a permanent situa-

“Most people couldn't tell which instrument was playing which sounds most of the time.”

tion, a greater number of sub-woofer systems could be installed, more loudspeaker channels could be distributed all around the space, and switching provisions could be accomplished with readily available MIDI sequencers and switchers. All of this, expensive and profitable as it may sound, is a far cry cheaper than the original \$2 million price tag of the 1911 Great Organ.

THE ROOM

The environment in which all of this took place lends itself to some practical and topical discussion. First of all the acoustical characteristics of a room ideally suited for organ music physically yields a rather large space with high walls that are fairly hard—rather the opposite of what one would like to see when dealing with speech intelligibility. Clearly there are diametrically opposing criteria for organ and speech, and to have both of them co-exist is the bane of any soundman. That is unless he can convince the organist that he can play a MIDI instrument with a mere 88-keys, a sundry of signal processing, and serial connection to a myriad of instruments and voices—sounds he himself can create even spontaneously. This new generation instrument can be convincingly powerful and subtle with the ethereal qualities and spaciousness of a multitude of pipes.

There is no question about it from a technical point of view, inasmuch as the electroacoustics are concerned. The main effects that can be achieved with a pipe organ can be duplicated by the an appropriately designed and tuned sound system, given enough channels, and loudspeaker devices properly selected for quality, power output, and directional character. The space can be designed with proper acoustics for good speech intelligibility, and the acoustics of a great organ hall can be effectively simulated with high-quality electroacoustic reverberation systems. Ironically, most people today listen to orchestral music that has been recorded somewhat on the dry side, and reverberation has been added with a high-quality digital reverberation unit.

The 45-minute concert (which was called “Tradition and Technology: A Performance Where Everybody Wins,” featured works by Schumann, Handel, original pieces by Keith Chapman the Wanamaker organist, and John Shykun, a member of the Kurzweil 250 development team. The concert ended with a medley of block-buster movie themes played on the 250. Opinions of what everybody heard while in the same room with roughly the same vantage points ran the gamut from sincere to ridiculous to enraged. Some remarked how surprised they were that the organ could sound like people singing. One man commented on how the organ was not a mono source it is “a creation with 30,000 points of sound, something that is bigger than life.” Most people’s reactions were however surprisingly profound—they couldn’t tell which instrument was playing which sounds most of the time.

But if anybody wanted to hear what the Philadelphia orchestra might sound like in the year 2000, they heard it at John Wanamaker’s store August 10th, 1988, at the Dueling Keyboards Recital. Acoustics, culture, and economics will have the final say. ■

Klapholz is technical editor of this magazine.

AUDIO ENHANCEMENT

(continued from page 33)

From the jungles of darkest Africa, to the bat-caves of Jamaica, to the distant geologic past, we have learned how to duplicate environments whose very ex-

istence was unknown to the general population a relatively short time ago. And enhancing these environments with state-of-the-art audio techniques has become a primary ingredient in the assembling of these remarkably authentic experiences.

ATLANTIC CITY CASINOS

(continued from page 45)

his Bose speakers right into the apex. The result is an incredibly pleasing effect—a sort of “surround-sound” created by natural reverberation. Again, you’re immediately swept up by the music. Other casinos in town use the same components, but not all of them benefit from the kind of attention to detail Joe Marchione brings to Harrah’s.

DAILY EVENTS

All around town the in-house tech crews are often responsible for areas of audio other than background music. Every ballroom and meeting room is used for anything from small business meetings to extravagant wedding parties. The daily events log could call for anything from a simple podium microphone and background music, all the way to a complete sound system for an entire orchestra with elaborate banquet lighting.

Other systems fall under the crew’s responsibility as well. At the Sands, the tech crew is responsible for maintaining the Hollywood Universal Studio Tour exhibit, complete with the 24-foot mechanical shark from the movie Jaws. Under the shark is an Atari Mega ST computer used to run a program called ADAP Soundtrack. This is a 16-bit digital-to-analog audio processing system that stores the famous soundtrack portion of the movie. It is triggered every five minutes: the music builds to its frenzied crescendo, the shark comes to life, snapping its jaws and thrashing its tail. Very scary—only the tech crew knows that it’s all done with bytes and hydraulics!

The crew is also responsible for the Sportscaster receiving dish on the roof of the building. This unit receives a satellite signal that sends current sports scores and stories across a moving-character display in the Plaza Club, the plush lounge for high-rollers, located on the top floor.

The most technologically current installation I have seen is at the Sands. Because this casino, and the Claridge next door, are located one block in from the

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Ashly Audio (716) 544-5191	45	227
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IED (502) 267-7436	62	236
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Tannoy (519) 745-1158	13	213
Telex Communications (800) 328-3771	63	235
Tektone (305) 844-2383	61	221
TOA Electronics (800) 843-4753	21	210
University Sound/ Electro-Voice (616) 695-6031	CII	201
White Instrument (512) 892-0752	57	232
Williams Sound (800) 328-6190	32	225
Yamaha Pro Audio (714) 522-9011	17	208

boardwalk, the two casinos jointly built a "people-mover" to give people a free ride in from the boardwalk. It is a raised, fully enclosed corridor that whisks people along on a moving belt. On their way, they are treated to pictures, music, and an accompanying narration detailing the history and evolution of Atlantic City.

The \$180,000 audio system was spec'd and installed by Pierce-Phelps, and includes the 360 Systems Permanent Playback modules. There are two units of 16 zones each. As the rider moves along the block-long "people mover," he passes through a total of 32 zones, each designed to have its own narration to accompany the particular picture he passes. Seventeen Bose System Controllers (two zones each, plus a monitor and backup channel) take signals from QSC Model 1200 Stereo Amplifiers. The 32 zones are fed from the 360 Systems Permanent Playback Quadfile, a solid state message reproducer. Each of the 32 channels is stored digitally and triggered through its amp to the appropriate speaker along the "people mover."

The system, similar to those designed by Disney, is conceptually a good one. However, it would be more effective if the overhead speakers selected had a more directional characteristic to them. After the system was fired up, it was found that as one proceeded through the closely-spaced zones, the preceding and upcoming zones were overpowering the intelligibility of the current zone. In other words, the rider was bombarded with at least three different announcements at any given location along the ride.

So at present, all zones are combined and the rider hears the entire narration, though not necessarily coordinated to the pictures. This could have been done with a single 70-volt system at a savings of around \$177,500! But this is only a temporary solution: once all the bugs have been worked out, and the system is finally running as planned, it should be a striking and novel effect enjoyed by all. (Again, the tech crew was not included in the planning stages of this endeavor. If they were, it's possible that some of these glitches could have been foreseen and avoided.)

Before we end this behind-the-scenes look at the back-of-the-house audio systems here, I did want to mention that there is an incredible system currently being installed as part of Trump Castle's new expansion. We spoke to Steve Gietka about some of the advanced components that are

a part of this project. At the heart is the IED (Innovative Electronic Design) Computer. This allows storage and instant recall and re-setting of mic position, delay times, selection of mic jacks, enable/disable house music, etc. A particular set up can be contoured to meet the specific requirements of a function and recalled with full automation at a later date. As of this writing, the system is being installed. When complete, it will be the most advanced of its kind in Atlantic City. We'll have more on that in a future article. ■

Starobin is an audio consultant based in Atlantic City, NJ.

VIDEO ACCESS CONTROL

(continued from page 51)

tion. The second entrance station required its own separate DC, 24-volt power supply. And the various functions of the entrance stations had to be integrated by connecting the cable and conductors from the first station to the second. (It was not necessary to run cable from the second station to all of the inside stations.)

Other modifications were made as well. The directory panel on each station was expanded to accommodate 64 directory cards. And a light was needed to illuminate every 20 cards. Each of the lights uses a separate DC, 12-volt power supply box. Both entrance stations also include electric door releases, which required separate AC transformers.

Since the complex had two fully functional entrance stations, the developer wanted his tenants to be able to distinguish which station was calling. So Padula modified the call tone from one of the entrance stations. The stations are pre-set in the factory for transmitting a four-stroke chime tone, but Padula changed the second station to a two-stroke chime tone by relocating one of the shorting connectors on the unit's chassis. With the different chime tones, any apartment resident can determine which entrance is calling.

Like Nichols, Padula has found that the installation of a video system—even in a large complex such as The Hermitage—is not complicated, and he encourages other sound and security contractors to explore this new market for apartment and condominium video security. ■

Morrison is national sales manager for the Aiphone Corporation, Bellevue, WA.

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The John T. Mullin Collection

It is not very often that any of us are afforded the opportunity to see the entire history and development of our industry revealed before us—let alone in one room. At the most recent Audio Engineering Society Convention in Los Angeles this opportunity was made available to those fortunate souls that took the time to walk through “The John T. Mullin Collection: The History of Sound Recording,” at the Los Angeles Room of the L.A. Hilton. Jack Mullin, for those who don’t know him, brought over the first magnetic tape recorder taken from the Germans at the end of WWII. His legendary collection runs the gamut from early mechanical record players to the early days of magnetic recording, with perhaps the single most comprehensive professional broadcast microphone collection. All of this equipment (along with many hi-fi, cinema, and various other treasures) comes with fascinating personal stories from the master himself—Jack Mullin.

Walking into the Los Angeles Room was a shock to everyone there. Inevitably the first word (after some gasping) was, “WOW!” This collection is a treasure that we are all so fortunate to have Mr. Mullin share with us in the

way that he has. On Friday afternoon of the convention he made a three-hour presentation to a hushed and astounded audience. The A.E.S. captured this on video tape for posterity.

Posterity. Is this living history simply a monument that will live in infamy of the 85th A.E.S. Convention? Clearly if measured alone by the number of snapshots taken during these four days, there is a great interest in this history. Jack Mullin’s personal collection and physical inventory of hardware is of incredible value by any measure. But when combined with the professional recollections of Mr. Mullin’s career, this collection is not a collection—it is the very essence and foundation of the Audio Engineering Society.

The A.E.S. was originally formed by a group of engineers that were involved with various manufacturing and recording businesses. Their common interest was the development of hardware and its use for the recording and playback of music. Through the years the core of the society has always been the recording and playback of music. Of course, when this is done a sound system is involved, and when a number of people are assembled one

hopes a professional is involved. To our group of audio professionals the Jack Mullin legacy is one that ties together all of the factions of our profession. These factions, at times in conflict with each other, all share in the history and foundation presented no better than by the Mullin legacy.

Until now, Mr. Mullin has preserved this entire collection at his own expense and energy. While he has had support from others, the future of his legacy is undecided at the present. The documentation alone of Mr. Mullin’s legacy has not been decided. The history for us, and for future generations of audio professionals, is not even remotely available. For this legacy to flounder would be an unforgivable event for any of us to “innocently” stand by and watch. Every one of us should show our concern, even if that only means being interested in seeing this display at future conventions, or at a museum in New York, for example, and telling everyone you know about it. If anyone is interested in staying in touch with the core of our professional society, please contact me at our editorial offices.

*Jesse Klapholz
Technical Editor*

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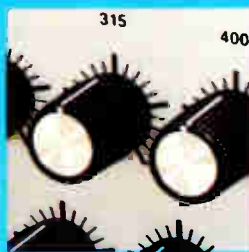


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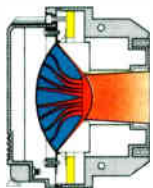
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