

Installation Profile: The S.S. Admiral

SOUND & COMMUNICATIONS

FOR CONTRACTORS, SYSTEM MANAGERS AND SPECIFIERS

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Headphones & Headsets

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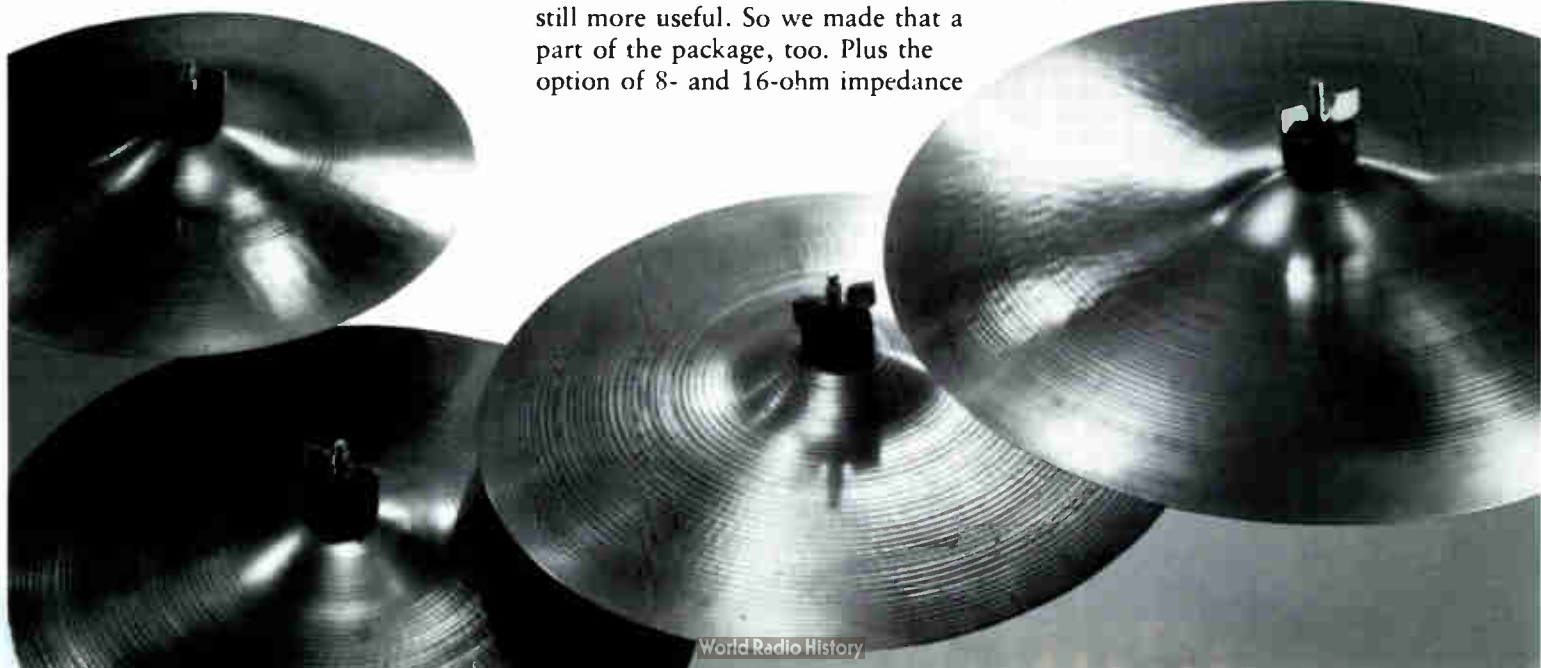
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Our Ongoing Commitment

In June, *Sound & Communications* introduced an innovative addition to our magazine entitled, **the Contractor's Guide to Mixers**—a special pull-out section of mixers and consoles. Due to the overwhelming response to this section by the sound contracting industry, we are happy to announce that we are continuing our ongoing commitment to the industry by bringing you another.

This September issue of *Sound & Communications* includes **The Contractor's Guide to Alarm & Security**. Judging from the huge response by the alarm and security community, it is evident that this market is growing quickly and is becoming more diversified and sophisticated. Many of the companies listed offer a variety of equipment so that the sound contractor can choose the best system for his particular needs.

In this comprehensive special pull-out section, the sound contractor will find the companies and their equipment under the following categories: **AUDIO/ALARM, VIDEO, INTERCOMS, and/or SECURITY SIGNALING DEVICES**. We've also added an alphabetical directory of companies at the end of the section for your convenience. In future issues, we will continue our ongoing commitment by presenting sections on other equipment of vital importance to the sound contracting industry.

Almost 20 audio manufacturers recently stood by *their* commitment by donating their time, effort and equipment for 314 venues during the nine-day, 1987 Special Olympics last month. Held at the University of Notre Dame in South Bend, Indiana, Crown International, a principle sponsor, and other manufacturers, worked round-the-clock to make the event a huge success.

Every day I saw a sense of team effort and pride in the air while people set up sound reinforcement systems so that the 4,500 special athletes and observers could hear the best possible sound. Crown's Bill Raventos, who helped solicit over \$700,000 worth of equipment from the audio companies, and Tom Durell, who has coordinated sound systems for such events as last year's Liberty Weekend, worked together in coordinating the sound reinforcement for the Special Olympics. Bill said he didn't realize the scope of the project until it was over. In an upcoming installation profile in *Sound & Communications*, Tom will discuss the enormous amount of work that went into the event.

It was amazing how so many people pitched in and made it all happen. People ran to the rescue. In one instance, it was discovered that a venue was overlooked—the auditorium where a dance was to be held for the athletes. In one hour, volunteers pooled together and set up the sound equipment just in time for the dance to begin. That was dedication.

Sound & Communications is dedicated to the sound contracting market and we're here to help out, pitch in and be your funnel for information in the industry. Call us, we're here to listen.



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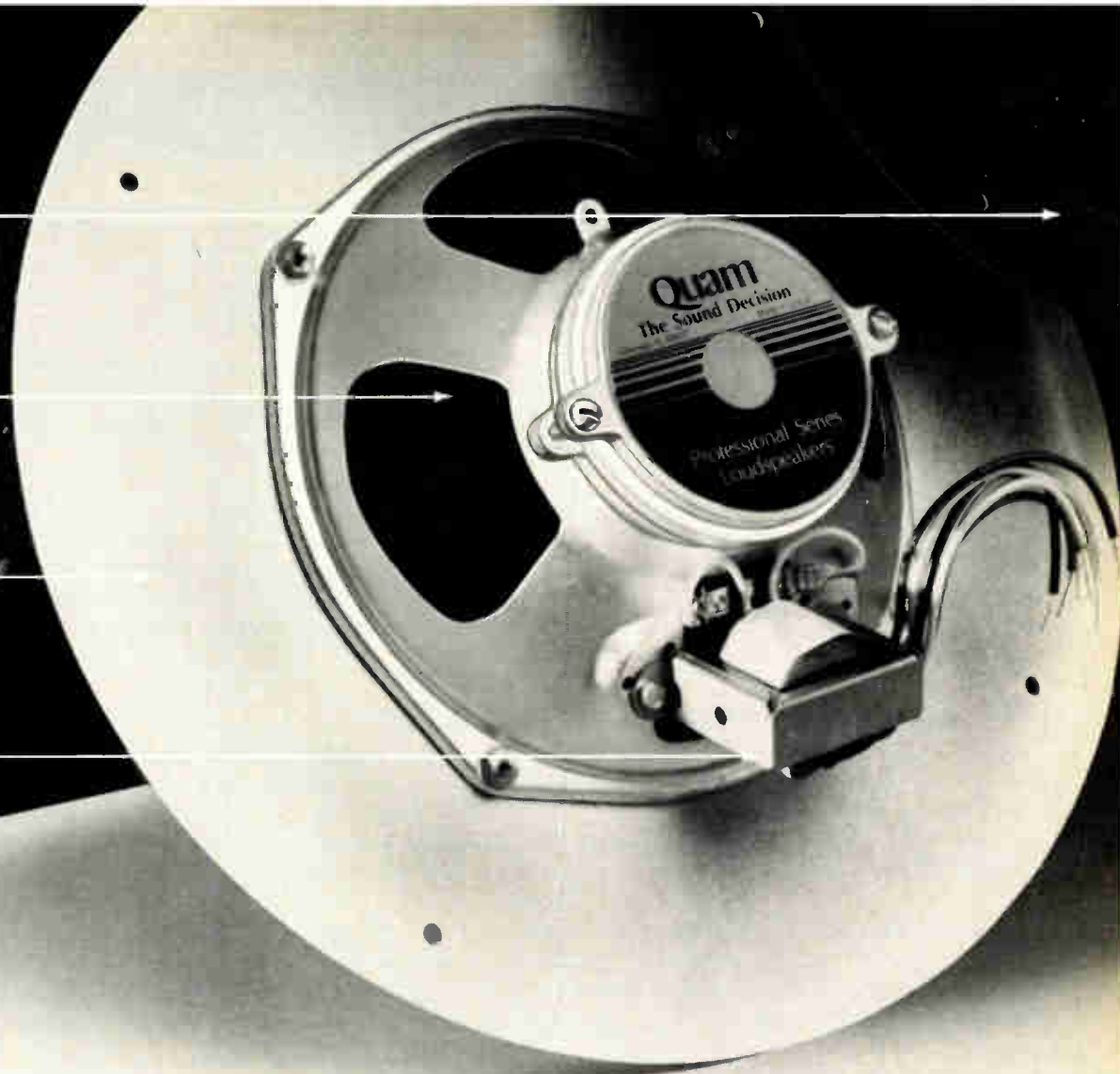
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MUZAK PURCHASES MUSI-CALL AND ATLAS MUSIC

Muzak has announced the purchase of Musi-call and Atlas Music Co., both of Chicago, Illinois. "This acquisition broadens our customer base, adds experienced and well-qualified personnel, improves our overall efficiency, and generally strengthens our business in Chicago," said Mark Torrance, Muzak president. In addition, Dan Hart, manager of Musi-call and Atlas Music for more than seven years, has been appointed general manager of the combined operations.

In a related issue, Muzak and HM Electronics have announced a private label agreement for Muzak to distribute and sell the new HME System 100 wireless drive-thru line under the Muzak Engineered Sound brand name. According to Pat Miller, Muzak purchasing administrator, "This agreement allows us to become a more complete supplier in the fast-food industry with regard to background music and communications systems."

DOUG DICKEY, KEY FIGURE IN PRO-AUDIO, DIES

Douglas Finch Dickey, a key figure in the professional audio industry and senior executive at Solid State Logic (SSL), died on August 8 at the age of 35, following a long illness. For over 10 years, Doug played a major role in SSL's development and success, first as head of SSL's professional audio team in the USA and, subsequently, he became increasingly involved in product specifications and design.

He was part of the team responsible for the SSL Stereo Video System, which has become a major influence in the production of audio for stereo television. More recently he helped guide SSL's move into the motion picture industry, and was involved in panel design and software interfaces for SSL's first digital system.

IBMA CONVENTION TO BE HELD IN CALIFORNIA

The International Business Music Association's Annual Convention will be held from October 14-17 at the Marriott Rancho Las Palmas Resort in Rancho Mirage, CA. The convention's theme "Problem Solving for the '80's" will be explored in seminars that deal with topics like hiring and firing, collections, keeping a positive attitude in sales and business, and problem solving for management. Registration fee at the hotel will be \$150 per person and \$25 for spouse or guest. For more information contact the IBMA at (312) 685-7850.

AES' 83rd CONVENTION TO TAKE PLACE IN NEW YORK CITY

The 83rd Audio Engineering Society Convention will take place from October 16-19 in New York at the New York Hilton and New York Sheraton Centre. The theme of this year's convention will be "Audio & Video: Analog Present, Digital Future." Among the seminars offered are "Sound Reinforcement," "Disc Based Audio Editing," "Transformers and Audio," "Visual Audio Monitoring and Metering," and "User Interface for Electronic Music." For more information contact AES at (212) 661-8528.

A GROUP OF "WHO'S WHO" OF PRO AUDIO PITCH IN AT FEST

A group of well-known pro audio manufacturers assembled the sound system used for the Association for Multi-Image Festival held August 24 at the Marriott Hotel, Lake Buena Vista, Florida. The Association of Multi-Image (AMI) is a non-profit organization devoted to the promotion of computer-controlled slide shows. Since

1979, AMI has sponsored the festival, in which hundreds of entries are screened and judged and prizes awarded.

Among the participating manufacturers donating equipment to this year's festival were Otari, QSC Audio Products Inc., Pro Co Sound Co., Star Case Co., Community Light & Sound Inc., Aphex Systems Ltd., Electro-Voice Inc., Audio-Technica U.S. Inc., Studer-Revox, Audio-Digital, dbx, Technical Projects, and Clear-Com. Past contributors include Crown International and MCI/Intertek. Former QSC marketing director Greg Hockman, was audio supervisor for this year's festival.

AUDIO-TECHNICA STARTS UP HEARING PRODUCTS DIVISION

By early October, production will begin on Audio-Technica's new line of personal hearing instruments at its plant in Stow, Ohio. According to a company spokesperson, "Our new products are part of a growing and important market segment and the products relate to the business we're already in — transducers." He added that the direction of the company will not change. "We're adding a division to become more diversified and to use our resources in a different way. Audio-Technica is and will remain involved in the MI and pro music industries," he added. Key personnel for the Audio-Technica Hearing Products Division could not be confirmed at press time.

AUDIO L.A. IS THE NEWEST AUDIO SUPPLIER ON THE BLOCK

Audio L.A., a professional audio equipment supplier specializing in systems design, installation, service and sales with video and MIDI expertise, was recently formed. As a professional sales company, Audio L.A. will cater to high-end audio/video and MIDI markets including recording studios, broadcast companies, record companies, producers, musicians, education, government and military institutions. The new supplier is affiliated with West L.A. Music.

ALTEC LANSING HOSTS A DELEGATION FROM CHINA

Altec Lansing hosted a delegation from the People's Republic of China recently at the Altec plant in Oklahoma City. The delegation was comprised of six individuals representing the governmental agency which manages and regulates the hotel industry in China, as well as the governmental agency that regulates importation of all acoustic and electronic products into China. The Beijing International Hotel is the first of several luxury hotels sponsored and financed by the Chinese government. About \$100,000 worth of Altec Lansing products will be installed in the Beijing Hotel.

In a related issue, Altec announced a free freight policy for all individual orders of \$2,500 or more at the 1987 Altec Lansing Summer Clinics. Also announced at the clinic was a new three-year warranty on all electronics products and a new five-year warranty on all acoustic products.

AGFA-GEVAERT, PHILIPS AND DU PONT IN JOINT VENTURE

Agfa-Gevaert, a subsidiary of Bayer AG, West Germany has agreed to form a joint venture with Philips N.V. of the Netherlands and Du Pont Co. of the U.S. for the manufacture and marketing of audio, video and data magnetic tape, effective January 1, 1988. The joint venture is designed to combat the strong inroads made by the competition, especially products of magnetic tape from the Far East, which has resulted in a decrease of 60 percent in prices of blank video cassettes over the past five years.

by Jesse Klapholz

To Bid or Not To Bid . . .

At least once every several turns of the moon, bids mysteriously appear that require more than one cup of brew to inventory. These bids usually come in large packages with reams of specs and piles of drawings. The bid documents, if they are included, require us to familiarize ourselves with a client's venue and use, and the designer's interpretation thereof, all within one day. Final bid with additive alternatives, line deducts, and extended warranty plans are due in one week, of course.

"This specification describes the function, performance and equipment required to provide low equalized professional sound electro-acoustic sound systems for the . . ." It's time to reach

for the aspirin when the spec continues with, "The system shall be of the latest all plug-in type transistor design. It shall be able to operate simultaneously without period of warm-up. The equipment specified herein shall be factory tested and results of these tests shall be delivered to the owner at time of delivery of equipment."

When an architect or consultant specifies a system to be bid upon that clearly is not a complete design and has many flaws, you may be the wiser for declining. Many specs include a clause that say the bidder is responsible for omissions and errors in the design, and to verify actual conditions. But, if the specifier has not completed the design, and not given the owner all of

the features to satisfy his requirements, you'll be left holding the bag. There is in fact a clear distinction between a "preliminary" design and a final version. It is a shame to see the abuse of word processing technology to the point where it damages the credibility of the high-quality work produced by many specifying groups who use it effectively.

It is your obligation to the owner as a professional to decline these types of bids as specified. Bidding on such a project only condones the inexcusable sham presented by unscrupulous hucksters. The decision then becomes yours if you are willing to complete, or even redo, the design. The client

(continued on page 59)

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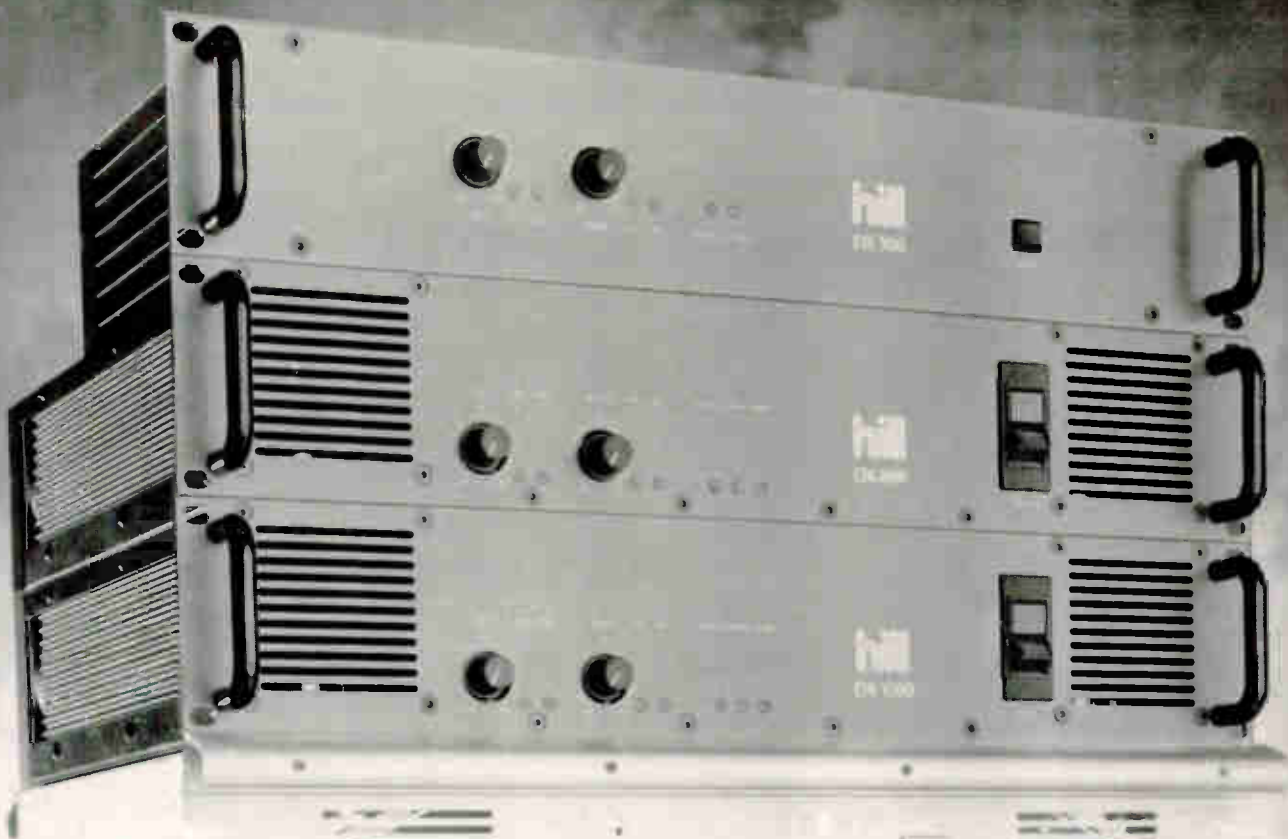
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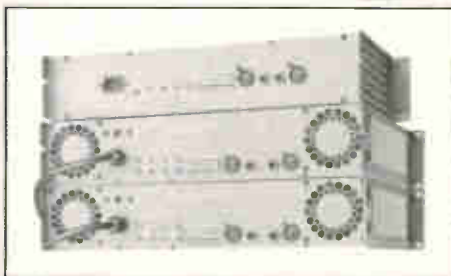


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DX800 output power: 250 watts into 8 Ω , 400 watts into 4 Ω (per channel, both channels driven, 20Hz - 20kHz, -0.5dB), 800 watts into 8 Ω (bridged mono), 800 watts into 4 Ω , 900 watts into 2 Ω (burst power*) distortion (250mW to rated power at 8 Ω): IMD SMPTE: < 0.01%. THD (1kHz): < 0.01%. THD (20Hz-20kHz DIN): < 0.02% size: 2 rack spaces, 13" behind front panel weight: 13Kgs, 29 lbs. cooling: 1 servo controlled DC fan.

DX1500 output power: 300 watts into 8 Ω , 500 watts into 4 Ω , 750 watts into 2 Ω (per channel, both channels driven, 20Hz - 20kHz, -0.5dB), 1000 watts into 8 Ω , 1500 watts into 4 Ω (bridged mono) 1500 watts into 2 Ω , 1600 watts into 1 Ω (burst power*) distortion (250mW to rated power at 8 Ω): IMD SMPTE: < 0.01%. THD (1kHz): < 0.01%. THD (20Hz-20kHz DIN): < 0.02% size: 2 rack spaces, 13" behind front panel weight: 15Kgs, 34 lbs. cooling: 2 servo controlled DC fans.

*Burst power is a 1kHz tone for 10ms every 100ms, single channel (an indication of the amplifiers ability to handle music transients and tolerate deviations in nominal speaker impedance)

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by Marc L. Benington
Jaffe Acoustics, Inc.

Construction Specifications

Over the past several months, this column has discussed a number of ways of structuring the sound system contract to ensure the successful installation of the system. By placing the sound contract in different sections of the construction specifications, the sound contractor is given more control over various aspects of the installation. With this control, however,

“By placing the sound contract in different sections of the construction specifications, the sound contractor is given more control over various aspects of the installation.”

comes more coordination and more responsibility for the sound contractor. For the most part, a better installation is assured when all of the sound system details are in the control of a qualified installer, thus the disadvantages are minimal.

Of course, the structure of the sound system contract is generally not something that the sound contractor has control over. It is something that

the sound system designer determines through coordination with the architect. However, on many occasions, a sound contractor may be called upon to design a system for a client, without a commitment to install the system as well. Essentially, the contractor in this case is acting as a consultant and has the obligation to provide the best design to the owner. Therefore, the contractor is in a position to influence how the design is issued in a contract, and the options that have been discussed — sections 11, 16, 17 and other arrangements — should be evaluated.

All of this discussion assumes, of course, that contractors are bidding on a design specification provided by a design consultant. While this is the manner in which the largest projects are awarded, it is undoubtedly not the manner in which the majority of projects are awarded. Let's look at some of these other methods and types of contracts.

Most specifications are design specifications, that is, the equipment required is listed and the configuration of the equipment is demonstrated. Assembly methods and installation details may also be established, of course, some design specifications are clearer and more detailed than others. Because design specifications leave less room for interpretation, all bidders for the most part are proposing to provide the same system, and therefore bidding should be fair and competitive.

A performance specification, on the other hand, does

not include a particular design or selection of equipment. Instead, it lists desired performance criteria, such as sound pressure level over a given seating area, frequency response, speech articulation index and other parameters. Each bidder can put together a system based on his interpretation of the requested performance criteria. Obviously, the system designs can vary considerably in quality, ease of use, durability, ability to meet the owner's expectations, and especially cost, while still meeting the specified performance criteria.

Essentially, a performance specification provides standard design criteria to a variety of designers, each of who has a different background and opinion in system integration, as well as a commitment as a dealer to sell certain equipment. Thus, even more so than for a design specification, the lowest bid is not always the best bid. When an owner issues a performance specification, he must evaluate closely each proposal for conformance with his objectives, rather than waiting until the installation is complete. If the owner has insufficient knowledge to do this, then his best course should have been to hire an independent consultant to prepare a design specification based on his performance criteria.

Of course, a consultant could also prepare a performance specification, but this is rare. In more cases, consultants have very specific concepts of how design solutions should be executed, and their specifications will show

“Because design specifications leave less room for interpretation, all bidders for the most part are proposing to provide the same system...”

these designs in a manner that will ensure that the execution is in accordance with their concepts. The design

“Most specifications are design specifications... the equipment required is listed and the configuration of the equipment is demonstrated.”

specifications can accomplish this, a performance specification cannot.

Who would believe a microphone this flat...



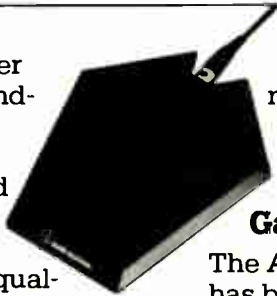
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What Brand of Ears Do You Wear?

How to evaluate the myriad of choices in headphones and headsets

or

Can we really compare headphone performance at all?

by Jesse Klapholz

We all take headphones for granted because they have been around since the beginning of time—electro-acoustical-time that is. The development of telephone apparatus saw various configurations of 'receivers' including moving armature, electromagnetic, moving coil, crystal, and electrostatic. Earphones, or, phones—the early reference to these devices—were generally defined as, "two flat telephone receivers held on the head by a spring."

While there were several attempts at producing dynamic loudspeakers in the 1800s, it took the invention of the vacuum tube and amplifier to make dynamic loudspeakers and headphones practical. Most headphones found in professional applications today are of the dynamic type. But there is a bit more to this story than just "two little speakers and a spring."

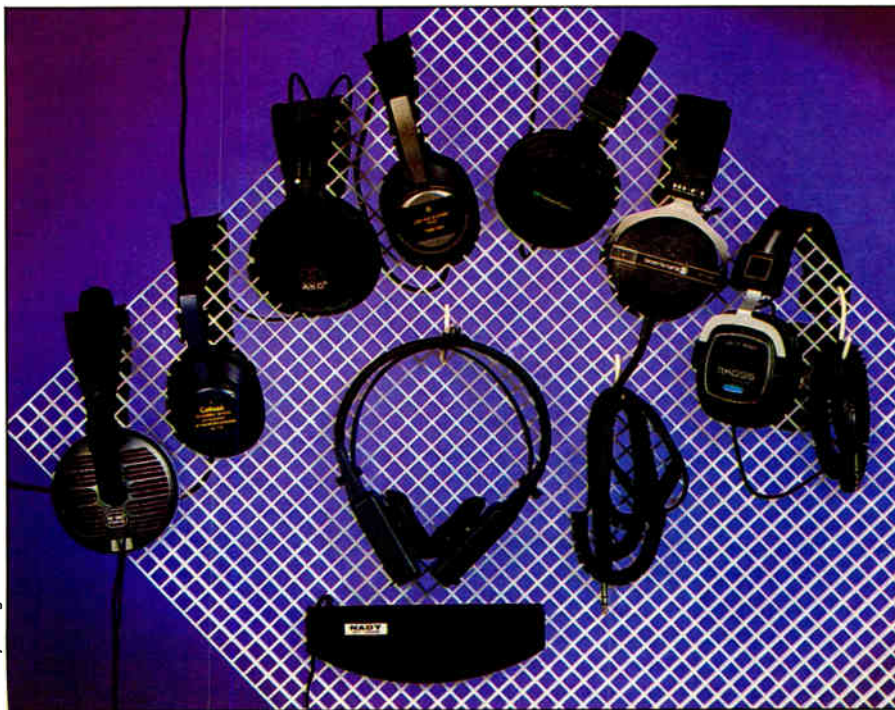
Photo by Doug Hanewinkel

BACKGROUND

Work in the U. S. continued intensely throughout the early 1900s in conjunction with the development of sound sources for intelligibility testing, mostly at Bell Labs. Western Electric's ERPI 705s exemplify the most popular electromagnetic headphones seen in many pictures and articles during the

early days of radio and cinema. Electromagnetic types basically use a metal diaphragm set in a reciprocating motion by the attracting/repelling magnetic forces produced by audio signals flowing through a field coil. As one can imagine, these types had severe frequency response problems due to the resonant nature of the magnetic metal diaphragms and stiff assemblies.

In 1911, Edward S. Pridham and P.L. Jensen developed a moving coil telephone receiver that later became the first commercially-available Magnavox loudspeaker. Bell Labs' efforts culminated in their introduction of the Western Electric 555 loudspeaker in 1926. A little known fact is that through these developmental efforts Bell Labs had produced a dynamic headphone with smooth frequency response to 4,000 Hz—more than adequate for their re-



Stereo headphones for monitoring include: (top row L-R) Sennheiser's HD40-13, Calrad's 15-115, AKG's K 240DF, Tascam's THP-400, Technical Projects' DMH 205, Beyer Dynamic's DT220, Koss' Pro 14X Plus; and (center) Nady's IRT-200 XM with IRH-210X.

search purposes at that time. These were primarily used for telephonic intelligibility research, and as such were called "moving-coil telephone receivers."

Clearly, there was a need for a good-sounding headphone that could be used for signal monitoring purposes. In 1933, RCA—not to be outdone by Western Electric—introduced the "Ribbon Telephone Receiver." Harry Olson (most famous for his ribbon mics) first introduced us to his now extinct term "High-Quality" when describing audio gear with the introduction of the MI-3453 headphones. Over a period of time these proved to be unsuccessful—output was limited and acoustical correction was required through back chambers. A need for wider frequency response and output was needed.

According to the British, it was G.A. Briggs at Wharfedale who first commercially introduced the moving coil headphone in 1937, called the Voluphone. This unit was intended for use by deaf people so they could, "...listen to radio without having the volume level from the main loudspeaker too high for the comfort of others in the room, or next door; also two people could listen to different programs in the same room, but this involved another [radio] set." Needless to say, the unit was dropped from the marketplace in two years.

More significant is this year's 50th Anniversary of the Beyer Dynamic DT 48, the first commercially successful high-quality dynamic headphone. Eugen Beyer founded Eugen Beyer Elektronische Fabrik in 1924 in Berlin, primarily manufacturing dynamic loudspeakers used in theatres. Unsatisfied with the quality of headphones available, Beyer decided to employ the loudspeaker technology he was using for a new headphone design. Originally designated a "Dynamic Measuring Telephone," Beyer's DT 48 dynamic transducer system used a permanent magnet, aluminum diaphragm, and moving coil.

The DT48's frequency response (30-16,000 Hz) made it successful as an audiometric reference headphone. During the next several years, the DT 48 became a successful broadcast headphone as well. Except for various cosmetic changes in the headband, ear cushions and cord, the DT 48 has remained unchanged for the last 50 years. In 1950, Beyer added a stereo plug to the DT 48 making it the first commercially available dynamic stereo headphone set. Today, the DT 48 is still widely used in broadcast, and as a monitor headphone for on-location recording for video and film.

Headphones were popularized in con-



Beyer Dynamic's DT48 headphones are 50 years old this year.

sumer circles in this country by John Koss with his introduction of a dynamic stereophone in 1958—coining the term "stereophone." The first Koss designs were inspired and empirically based on a popular hi-fi speaker that used a number of small elements. Koss and Martin Lange built a prototype from an old army headset using the ear-cushions and band, some cardboard, and two of the hi-fi speakers. Many manufacturers including Permoflux, Sharpe, Electro-Voice, Telephonics, and Roanwell realized the market niche Koss had established and the marketplace quickly had abundant supplies available in many choices of design, feel, and fidelity. At this time the Sharpe



A typical example of contemporary headphones are Fostex's T-20 RP Technology headphones.

Headphones became the "headphones of choice" because they were the first 8/16Ω models, and they used soft or liquid cushions.

NEED FOR STANDARDS

With manufacturers designing and producing products from such a diversity of backgrounds, headphones were far from compatible—what an electronics manufacturer said was the 'right' channel did not necessarily agree with "X" manufacturer's headphones. These considerations and acoustical performance specifications were the subject of long debate of technical committees drawing up standards. In fact, the acoustical performance of headphones for audio use really has no universally agreed-upon standard.

For years the prevailing standard for measuring frequency response USAS 224.9-1949, was, "...useful in comparing the quality of identical earphones below approximately 5,000 cycles per second." Obviously, the 1949 standards were obsolesced by hi-fi and stereo audio quality. The EIA (Electronic Industries Association) adopted a standard for the "Polarization of Stereophonic Headphones with 3-Contact Plugs" in 1966, as standard RS-331. The IHF (Institute of High Fidelity) formed a "Headphone Sub-Committee" and drafted a standard for the electrical connections of headphones in 1972. The committee's objective was, "To standardize a coupler and measuring systems for pressure and velocity headphones of the circumaural and supra-aural types to record what the real ear hears in wide-range music." Subsequently, the committee did draft some standards but never really caught on and the IHF was absorbed into the EIA anyway.

The NBS (National Bureau of Standards) in Washington, D.C., conducts research in and maintains calibrated references for many facets of measurable quantities encountered in the physical sciences and its allied arts. NBS has the responsibility of maintaining reference standards for the calibration of headphones for audiometric purposes. However, through the 60s—the evolutionary period of headphones—the NBS grouped telephone receivers, intercom headsets, and headphones for stereophonic listening as "Communications Earphones." Furthermore, the NBS regarded the, *American Standard Method for the Coupler Calibration of Earphones No. Z24.9-1949*, as a satisfactory base-line in the testing and evaluation of these units.

The complexities grew from here as the various committees could not (and still have not) agree upon a universally acceptable method of measuring the performance of headphones. Therefore, several

(continued on page 59)

An Historical Profile

The Telecommunications Headset

by Don Wilson

Like most types of electronic equipment in widespread use today, the telephone headset is a product of the technology of the 20th century. Its evolution has been punctuated by several major breakthroughs along the way, but clear parallels remain between state-of-the-art headsets of today and the earliest models, which date back nearly 100 years.

The earliest ancestor of the headset was first developed around 1890, not long after the invention of the telephone itself. When the first branch exchanges came into being, there was need for freeing up the hands of the local branch exchange operators so that they could connect the interconnect cables that made the connection between the parties.

The apparatus wasn't really a headset at this point, but simply a mouthpiece microphone suspended from the wall in front of the operator, while the receiver was hand-held by the user. This style, with many variations, persisted for about 40 years.



A pilot uses Plantronics' MS50 headset in the 1960's.

The next development, again not a "true" headset, consisted of a receiver attached to a wire framework which fitted over the user's head. The microphone was attached to a triangular metal breastplate that rested on the user's chest, suspended by a harness.

It was a step toward hands-free communication, but ergonomics and comfort were clearly not a priority — operators developed concave, triangular depressions in their chests by the end of a shift. This operator's set lasted only about 20 years.

FIRST 'HEADSET'

After World War II, Western Electric introduced the now-classic WE52, the first operator set that could be termed a "headset" and with obvious links with the units of today — and the WE52 still sees use in some areas of the world today.

While continuing to use a single receiver earpiece attached to a wire frame, the WE52 incorporated a microphone into the assembly — suspending it from a wire boom that curved



Telecommunications Headsets include: (top row, L-R) Plantronics' Supra MH0525, Plantronics Spirit SP02, Audio Sears' 1400 PL, Audicom's Symmetry, AKG's Q15; (bottom row) ACS' Microset SM732-0420, Unex's Ventel V-S-NC-QD, Plantronics Liteset, Television Equipment Association's Secrette, ACS' Ultralight SW732-0111.



Headsets for intercoms and sound reinforcement are: (top row, L-R) Technical Projects' SMH210/U, Shure's SM-15-CN, Clear Com's CC75B, Cambridge Communication's FJ, Nady's PRC-3XDE; (second row) Ph Electronics' CHR-1198, David Clark's H3330, Clear Com's CC-240B, Numark's HM6000A, Beyer Dynamic's DT108; (third row) RTS' LH268, Television Equipment Association's Slingard, Audio Technica's ATM73, Television Equipment Association's Astrolite, Setcom's 5-TVI; (fourth row) Heil's HCS with MB-10 earphones and RTS' LH267.

down from the earpiece to the user's mouth. Designed with a carbon microphone, the WE52, and closely related variations, became the "work-horse" headset of the 50's and 60's in the USA. It did suffer from variations in output sensitivity because of "packing" of the carbon granules in the microphone.

With the advent of the transistor in the 50's and 60's, it was now possible

to develop a replacement for the carbon transmitter. At Plantronics, which was founded by two pilots in 1961, the MS50 headset was developed for airline pilots. It was a logical next step to adapt this headset for the telecommunications market.

Designed to be clipped to eyeglasses or worn with a spring-metal headband, the MS50 was lighter and more comfor-

table than the WE52. It also offered a key new feature: the voice-tube microphone. By incorporating a miniature sound-pipe from the user's mouth to the microphone located remotely in the capsule, the MS50 eliminated the WE52's heavy microphone and boom.

The voice tube offered another advantage — the microphone transducer was safely tucked away in the capsule where

TESTING OF THE TELECOMMUNICATIONS HEADSET

Artificial Mouths and Ears

by Don Wilson

Testing of headsets requires the help of artificial ears and artificial mouths. This is because of the variability of human ears and mouths and the need for a large quantity of human subjects to determine subjectively and within acceptable error the characteristics of a headset device.

Artificial ears consist of a stable standard-microphone and cavity volume depending on the coupler system used by the headset device. Some artificial ears have several cavities, connected by acoustic resistance elements to give the artificial ear the desired impedance and frequency response. The following are the basic types of coupler systems:

1. Supra-aural (on-ear, like a telephone receiver)
2. Circum-aural (encloses the outer ear in the cup)
3. Ear-tip or ear-insert (sound coupled to the ear canal entrance)
4. Intra-concha (essentially filling the concha cavity but not entering the ear canal itself)

The International Electrotechnical Commission (IEC) has been the Standards Organization developing standards for artificial ears for many years. The commission works via committees representing the nations of the world.

The type 1 Supra-aural artificial ear has been standardized for receiver testing to the IEC-318 (1970); "An IEC artificial ear, of the wide band type, for the calibration of earphones used in audiometry." This type has been standardized for telephone receiver testing in the telecommunications industry, for example.

The type 2 Circum-aural artificial

ear is presently defined only by a preliminary standard from IEC (IEC SC-29C-1985). There are problems with releasing this preliminary standard as a general circum-aural artificial ear and thus there is not general acceptance of the preliminary standard by the member countries.

The type 3 Ear Insert artificial ear is generally accepted as the IEC-711 (1980); "Occluded-ear Simulator for the Measurement of Earphones Coupled to the Ear by Ear Inserts." The artificial ear has been adopted by the Consultative Committee International Telegraph and Telephone (CCITT) Study Group XII in P. 51 of Volume V publication for telecommunications applications.

The type 4 Intra-Concha artificial ear at this time has no recommended standard. In some cases where there is no specific "fit" required between the receiver system and the ear canal of the artificial ear, a Head and Torso Simulator (such as the Knowles Electronics KEMAR Manikin) will give satisfactory results. It is understood that Bruel & Kjaer of Denmark is bringing out a similar manikin in 1988 called HATS.

Any acoustic leakage in an artificial ear will cause errors in the frequency response and output. In general, a small acoustic leak will cause large loss of low frequencies, and sometimes an increase in the output at frequencies above about 1200 Hz. The proper testing of a receiver takes into account the acoustic leakage that occurs on the typical human ear, either by having the leakage during testing, or testing it without leakage, and adjusting the data for typical leakage.

To excite the microphone of head-

sets for testing, an artificial mouth is required. Artificial mouths have been around for decades and there are industry procedures for using them to test telephone instruments (for example IEEE Std 269-1983). However, the standards that define the off-axis sound field characteristics of an artificial mouth so that they approximate the sound field around a model head are just now in development and probably will not be issued for many years yet.

Artificial mouths sufficient to test typical telephone transmitters are available as a commercial product from Bruel & Kjaer Company. A newly designed artificial mouth exhibits much improved correlation to human head sound distribution.

There are basically three types of headset microphones:

1. Pressure type
2. Pressure gradient type, commonly called "noise-cancelling" microphones. (Also "proximity" microphones)
3. Cardioid directional type

By far the most common type of headset microphone (1 above) is the pressure type in which the output falls off approximately with the distance. This type presents no particular test problems.

Of the (2) type above, the proximity microphone has an output which falls off approximately as the square of the distance, and responds to the pressure gradient of the sound field. It must be accurately positioned in the sound field or gross errors will result.

Of the (3) type above, the cardioid microphone is similar to the proximity microphone in its critical positioning to obtain correct results.

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the tiny wires were not subject to wear-and-tear of the constant usage. The voice tube offered still another advantage — being made of plastic, it was a natural insulator. No longer would users experience static electricity shock discharges between a boom mounted microphone and their lips.

With the advent of linear microphones, replacing the carbon transmitters, a new problem emerged for the typical headset user — that of background noise pick-up. The carbon transmitter, by virtue of its inefficiency at low sound levels, yielded a measure of background-noise suppression which was lost when going to the linear microphones. To solve this problem, a feature called “switch-gain” was incorporated in the headset amplifier which increased the amplifier gain when the user was talking, and reduced the amplifier gain when the user was not talking. This feature effectively solved the problem and did it better than the carbon transmitter it replaced.

NEW DEVELOPMENTS

As time passed, more headset suppliers entered the marketplace. Advances in transistors, integrated circuitry, infrared technology, and the advent of the electret microphone led to the development of products such as electronic telephones, infrared speakerphones, and headsets designed for a variety of niche markets. The users, such as computer terminal operators, cable splicers, air-traffic controllers and business professionals, all shared one common need: a headset product that would provide clear, comfortable, hands-free communications.

One development was in the area of acoustic safety and perception of acoustic safety. From 1978 to 1981, a monolithic receiver amplifier integrated circuit was designed by Plantronics, which, in addition to amplification, linearly limited the maximum acoustic sound pressure to the user's ear. This I-C, operating only from power available from the telephone line, was trademarked “SoundGuard.” Although the earlier headsets were safe to the user's hearing, the SoundGuard circuitry increased the user's *perception* of hearing safety by a six-fold factor. (From an in-depth field questionnaire study.)

In 1984, the deregulation of the AT&T system effected major changes, both in telephone product technology and the distribution of those products to the consumer marketplace. New customer markets emerged, such as the

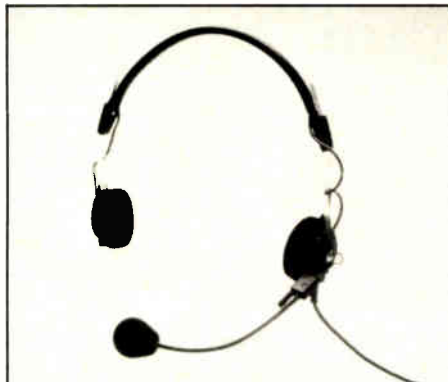
small business and home office sectors, requiring specialized quality products at lower prices.

Almost overnight, suppliers who depended on AT&T for all phases of product procurement and distribution were forced to confront a free market on their own.

One of the common ways to obtain a hands-free system for an individual telephone user is to mate a headset with a telephone instrument. The functions of dialing, ringing, and hybrid (four-wire to two-wire network) are obtained from the telephone set, and the voice pickup and received sound output are obtained from the headset.

The proliferation of different types of telephone instruments brought about by the deregulation of the AT&T systems has made designing this type of headset an engineer's nightmare! One telephone instrument manufacturer had three different engineering departments resulting in three different interface specifications for interconnecting a headset to his telephone instrument.

At Plantronics, the latest innovation in the headset arena is called the “LiteSet” and is somewhat similar to



Two examples of headsets for intercoms and sound reinforcement applications are (top) Telex's monaural PH-24, and Telex's binaural PH-91/PH-92.

the small earpiece worn by Lieutenant Uhura on the “Star Trek” television series. LiteSet is a miniature microphone/receiver capsule weighing less than one-half ounce that mounts to the user's outerear cavity (the concha) with a small “button” that eliminates headbands or eyeglass clips. Thus, LiteSet provides the same hands-free benefits of a headset without the “look” and feel of one.

The LiteSet headset has been mated with a cord-free radio system which allows the user mobility within a typical office environment. A dial pad that clips to a belt or fits in a shirt pocket is attached by a light-weight cable to the LiteSet capsule. If the user is away from his or her office but within the radius of the base-station, and he receives a call, a tone will sound and he may take the call at that location. He may also place a call at the remote location.

LOOKING INTO THE FUTURE

Where is headset technology going in the years to come? The fact that the best signal-to-noise ratio in voice pickup occurs when the microphone is kept in close proximity to the user's mouth will make one way of headset designs which move the microphone to remote locations. So called noise-cancelling microphones (I like the term “proximity” microphones) are difficult to position on the average user so that they do not become “voice-cancelling” microphones. These facts suggest that in all but the noisiest of locations, the common pressure microphone will prevail. The weight of the capsules supported by the user's ear are in the region of less than ½ ounce — low enough that smaller, lighter, capsules do not accomplish much except to increase the manufacturing costs. Just about all of the ways to couple sound from a headset into the human ear have shown up in headset designs, so there should not be any surprises here.

Who can foretell what the 1990s will bring? We will just have to wait and see!

Don Wilson is a senior engineer at Plantronics, Inc. who has 24 years of engineering experience concerning headsets and telecommunications equipment. He is a member of CCITT (Consultative Committee International Telegraph and Telephone) Study Group XII—a standards group on international telecommunications. He also is a CCITT special reporter on headsets. Wilson is a member of IEEE and holds nine patents on acoustic and electronic apparatus.

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On the drive-thru line outside, the Technical Projects SMH 210 headset is used by an order taker.

Drive-thru Intercoms

by Glenn Mullis

The top 50 fast food restaurant chains operate over 67,000 stores, and have sales in excess of \$50 billion a year. Small independents probably do 25 percent of that. Impressive as these numbers are, the more significant data for sound contractors is that close to 50 percent of those sales are conducted at the drive-thru window, and there may be another 10-13 percent of carry-out customers cluttering up the inside of the restaurant because the drive-thru is moving too slowly.

While the restaurant owner can easily spend \$100,000 on the dining room portion of the restaurant, and tens of thousands more every year on staff to clean tables, mop floors, and maintain washrooms, traditionally the expense for serving the drive-thru customer has been confined to an inductive loop to identify the presence of a customer at the menu board, and the menu board itself, with a poor sounding simplex "squawk-box" arrangement for communicating.

Clearly, shifting an existing customer from the high-cost dining room to the low-cost drive-thru would be financially advantageous for the restaurant owner. Encouraging customers to make this shift will remain difficult until drive-thru ser-

Glenn Mullis is president of Technical Projects and a member of NSCA. He is a graduate of the University of Western Ontario.

vice truly deserves to be called *fast* food. Two of the obstacles to faster service—getting the order and handling the money—can be readily and economically diminished. It is the poor quality of the communications system, made worse by the kitchen noise it picks up, which continues to cause delays. If, as a bonus, we can eliminate the racket from the drive-thru from being heard inside the restaurant, we can improve that environment for both worker and customer.

A Mature Market

Fast food restaurants are experiencing a mature market. Growth is limited and competition is fierce. Not only are the traditional competitors fighting it out for market share, but convenience stores, and even supermarkets, are successfully pursuing the same customer. Since differentiation of the foods served is limited and has already been emphasized (Burgers v.s. Chicken, Fried v.s. Broiled, etc.) the competitive arena has shifted to service, and the one area in which service can be substantially improved is at the drive-thru. Not only is more efficient drive-thru service a feature that can be advertised, but it can also influence spur of the moment decisions. Most fast food operations are located in clusters. For a potential customer with no brand loyalty, the choice of the fastest moving drive-thru seldom involves travel of more than a block or two.

A More Efficient Drive-Thru

As proven by the number of drive-thru-only chains which are springing up, the profitability of a more efficient drive-thru is substantial. Assuming that every car going through a drive-thru has only one occupant, and that the average bill is \$3.40, one extra car per minute results in added business of \$3.40 per minute. If the food cost is approximately 31 percent, the added gross profit becomes \$2.35 per minute. If the restaurant has 90 minutes per day, six days per week, during which there are enough customers in line to utilize this increase in efficiency, the added gross profits multiply out to \$65,988 per year.

Reaching the goal of increasing efficiency by one-customer-per-minute is being done but, it may require a greater investment than many operators are willing to make. However, there are steps along the way to full efficiency while on a budget.

Step One in improving communications is to replace the order taker's intercom microphone/speaker with a headset. Just the resulting reduction in kitchen noise, both in the system and in the order taker's ears, is a major improvement. Improving the quality of the menu-board speaker and the electronics, and some judicious equalization can result in vastly improved communications, and a much better chance of getting the order right, the first time. However, if the food





preparers have traditionally "listened in" to the order takers' intercom speaker as a means of anticipating incoming orders, some provision must be made to avoid losing that advantage. Headsets for the preparers may be necessary, or speakers in the cooking/packaging area.

Step Two can only be implemented in a "Window 1 - Window 2" situation, where the Window 1 operator cashier has a headset and listens to the order being taken, and prepares to collect the money before passing the customer along to Window 2 to pick up the purchase. Collecting the money, and making change, takes longer than either receiving the order or handing over the purchase, making this efficiency more important than one would imagine.

Step Three is to replace the menu board with an outside order taker, during peak periods. Equipped with a head-

set, this person walks down the line of cars and takes orders, simultaneously relaying them to the inside order taker. The tendency of the customer to linger over menu choices is eliminated, and questions regarding condiments or preparation are quickly resolved. The inside order taker then relays the check amount back to the outside person who informs the customer, and encourages them to get their money ready, and to approach the cashier prepared to pay. Some go so far as to position another outside person, an expeditor, who is part of the headset system and who collects and makes change at the car window. In addition to the speed-up generated by this system, the purchase commitment has been made earlier, reducing the numbers of those who might, anticipating a long wait, drive off.

Step four, while the most costly, poten-

tially contributes the most to efficiency. It consists of making both the inside and outside order takers wireless. For the outside order taker, the advantages of not getting tangled up in yards of cable is obvious. On the inside, the order taker is now free to move about. If the system is set up so that the inside order taker can also directly access the menu board during off-peak periods (when there is no outside order taker) that person is free to also serve customers inside, prepare food, or perform any other task. The coup-de-grace is to provide the shift supervisor with a wireless (perhaps listen-only) headset, in order to audit the order handling process.

RF Devices

Involving RF devices in the system will introduce all the problems which contractors have learned to know and love





At another drive-thru, the HME COM100 headset (part of the wireless System 100) is used by customer service employee inside.

with regard to wireless microphones, headsets, etc. The environment of a fast food restaurant is unbelievably hostile to low power RF communications. The line-up of running automobiles, which the outside order taker's communicator must overcome, is not much better. Providing a system which works well is fur-

ther complicated by legitimate concerns at the FCC over the proliferation of these systems, and their desire to keep the power levels low.

Several systems are being marketed, most of which are not full duplex, and very few of which work reasonably well. Particularly when being used in the inside order taker-to-outside order taker communications mode, a press-to-talk button seems stone-aged. No doubt there will be ongoing attempts to come up with duplex wireless communications, which can operate in this environment at a cost that this market is prepared to accept.

Fast food operators, who work daily with narrow margins, are cost-conscious as a group. It would appear that the price point for a three-communicator wireless add-on to an existing hard wired menu board system has to be around \$2,000-\$2,500 to ensure volume. If quality is to be maintained, this won't be an easy price point to reach.

Aside from the RF devices, a quality drive-thru communications system should hardly be considered a "triumph of modern technology." The systems are, technically, relatively simple, and several manufacturers turn out quite competent kits. Now that aggressive fast food operators have acknowledged the need for bet-



Talk-A-Phone's TAP-HS-1 headset is an example of a system that provides totally hands free, two-way conversation between order taker and customer.

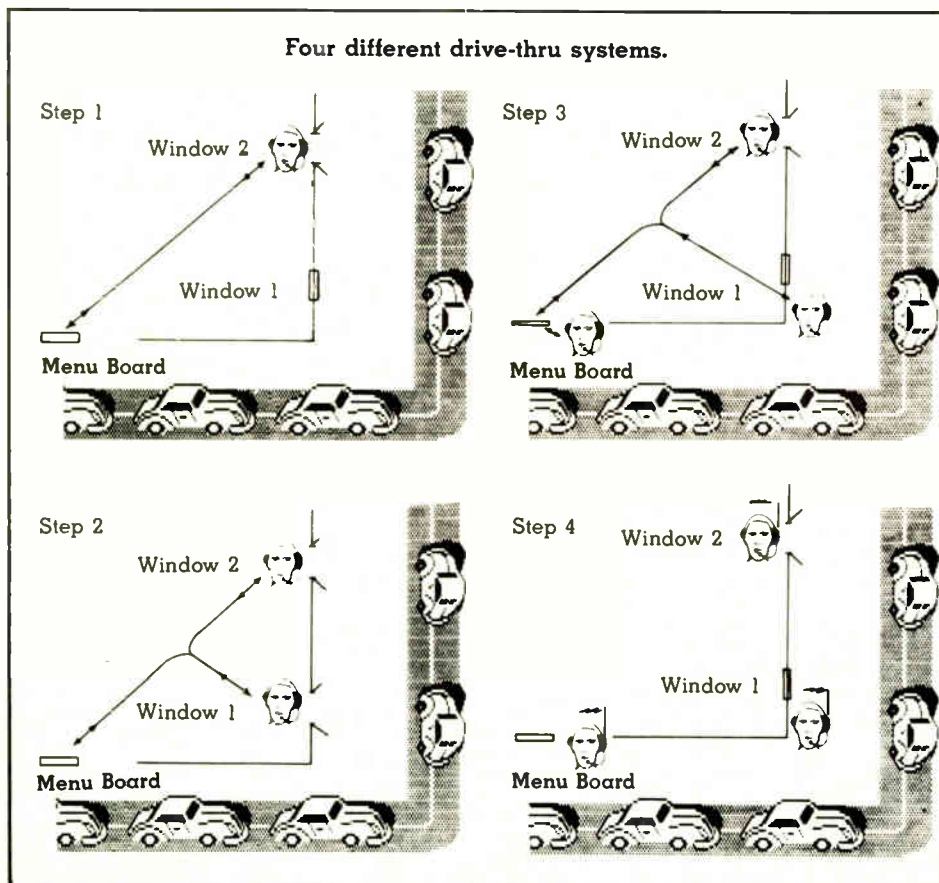
ter systems, the challenge for the contractor is to provide installations which will raise the levels of intelligibility and still withstand day-in, day-out rough usage.

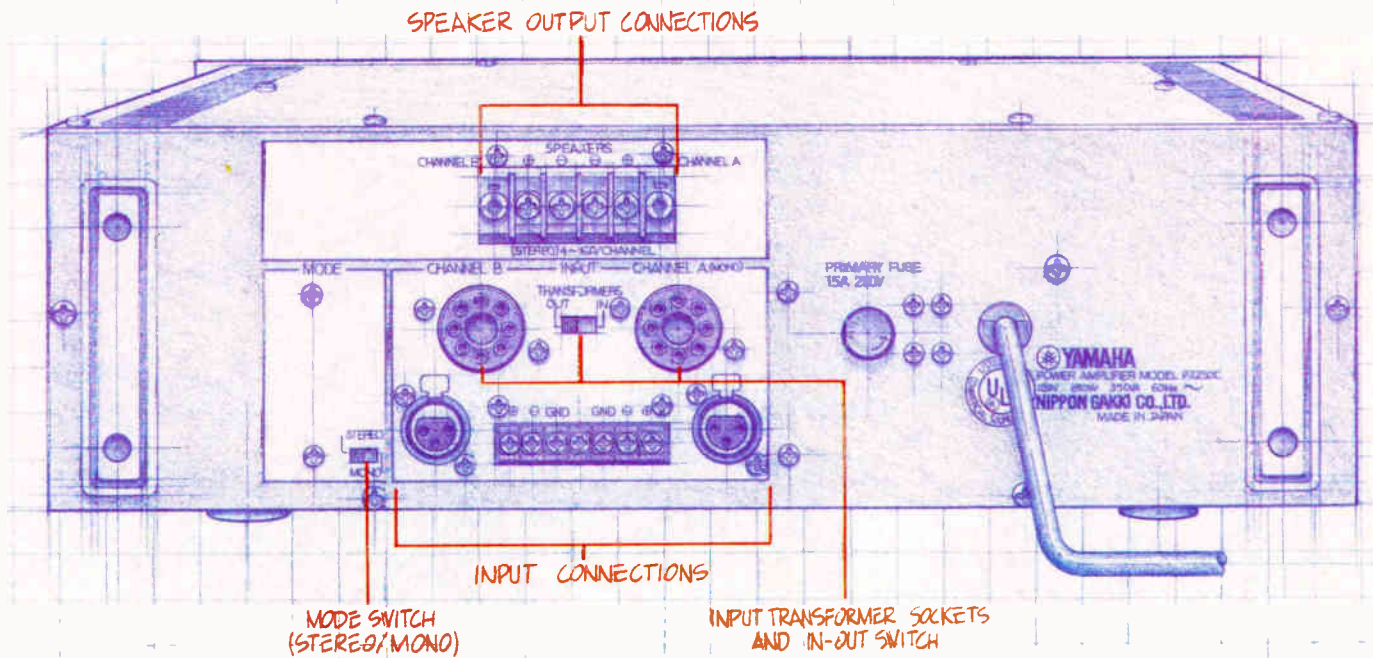
Caution Is Essential

It is possible for the local contractor to get into this \$2-400 million market, but caution is essential. Depending upon the chain, franchisees may be restricted to equipment approved by the corporation. This is certainly true of corporately operated units, although even here there seems to be some laxity when it comes to modifying existing systems for incorporation of headsets. Because of this, some manufacturers are selling drive-thru communications systems directly, and then turning the maintenance agreements over to local contractors.

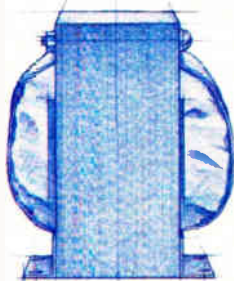
In this rough usage environment, the contractor wants to satisfy himself that the systems he has agreed to service, if at a fixed price, are going to stand up to the inevitable abuse. Switches and connectors must be able to withstand constant yanking and tugging. Some headsets which are perfectly acceptable in any other application have about a two week life-span in the fast food market. Where the opportunity for sell-through of wireless systems or add-ons exist, the contractor should thoroughly test the system in a number of fast food environments before assuming the responsibility for its performance.

The competitive pressure on fast food operators to provide better and better drive-thru service can only increase, driving a wedge into the "lowest bidder" concept and increasing the potential for competent contractors to sell, install and maintain better and better systems.





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The Eleventh Commandment



HART II

Any sound engineer or contractor who has worked with a religious facility — no matter what denomination — soon comes to the realization that the final authority over any project comes from a committee whose expertise has little to do with sound. And one thing every committee will tell you is that, of course, they want the sound to be perfect. . . they just don't want to see microphones everywhere; sometimes, they don't want to see them at all! (Frequently, this also applies to loudspeakers, but this is another subject altogether.)

With respect to the minister, this problem is easily solved with body-mounted microphones — frequently used in a wireless (RF) system — as they provide both good pickup and mobility.

With the growing need to record or reinforce the larger scale musical performances, which are now frequently part of the service, the sound engineer must be able to call upon an expanding knowledge of a variety of microphone techniques. Solutions range from simple to complex, and require different equipment and procedures for each particular situation.

The first determination which must be made is the nature of the sound treatment required: i.e. basic reinforcement; recording, and if so, is it to be stereo or mono; broadcast — radio or television — stereo or mono; or a combination of the above. If reinforcement is required, the problems of articulation and feedback must be considered. If stereo recording and/or broadcast are involved, the stereo perspective (imaging) and stereo/monaural compatibility must also be given careful attention. Depending on the type of performance involved, an active "live" mix may also be necessary; separate mixes may even be necessary if reinforcement and recording or broadcast are being done simultaneously. And, of course, the microphones and related equipment frequently must be "invisible" to (the camera or) the congregation!

In this article, I will present some basic information about several of the primary microphone techniques which may be employed. I must state at the outset, however, that "invisible" microphones do not yet exist; the only thing we can do currently is to make their presence as unobtrusive as possible.

General Considerations

Articulation and feedback problems are generally addressed by the implementation of directional microphones, since these tend to minimize pickup of sound

from unwanted directions. Further improvement can be achieved by reducing the distance between the microphone and performer(s). From this, one could conclude that close placement of multiple microphones is the answer, and sometimes this is indeed the best procedure. More often, however, "minimalist" techniques will produce a better sonic result, with the added benefit of reduced clutter, complexity, and cost. By "minimalist" techniques, I refer to the primary two and three microphone pickup systems.

The most important criterion with these techniques is that the microphones of any stereo configuration be fairly closely matched with respect to frequency and polar response; this will insure that the stereo pickup does not "favor" one microphone over the other due to frequency response or placement. Careful selection therefore is critical: listen to the microphones; note any differences and try to minimize them. (Cost and brand-name can be an indication here, as better microphones are generally kept to tighter tolerance. This is not an absolute guarantee, however, as some inexpensive microphones can be quite good. Even so, manufacturing problems can slip by, so a careful test in the shop may prevent a problem before it arises on the job site.)

Coincident Techniques

The first approach to two microphone techniques falls into the basic category of coincident or "intensity stereo" configurations. (The term "intensity stereo" refers to the fact that the stereo imaging results solely from differences in the intensity of the sound at the two microphones.) This approach employs two directional microphones, aligned vertically on a common axis, and set at some angle with respect to each other. [Fig. 1]

Most commonly, this technique is accomplished with cardioid microphones, set at an included angle of between 90 and 120 degrees. [Fig. 2] This provides good articulation with solid stereo imaging and a high degree of monaural

compatibility. By using hypercardioid [Fig. 3] polar patterns, you can gain even greater critical distance between the microphones and the performers. This technique works particularly well with choral groups and small instrumental ensembles.

"Crossed figure-of-eight" (bidirectional) microphones provide another technique commonly used for recording. Due to the fact that the pickup to the rear of the pair is equal to the front, however, this technique does not work well when sound reinforcement is also involved. [Fig. 4]

Placement

Where to put the microphones is always of major concern. Primary mic-ing techniques insure that the balance within the ensemble should be captured without modification by the pickup. With the coincident techniques discussed above, it is best to start with the microphone pair placed "downstage" (i.e. toward the audience) from the performers, at a height slightly above the highest performer. The angle between the microphones should be wide enough that their polar patterns encompass the entire ensemble, but not so wide that extraneous sounds or reverberation are also included in the pickup. (For example, with a choral ensemble, the microphones should be perhaps eight to twelve feet downstage of the front row, at an elevation just above eye level of the top row, and angled to aim just inside the extremes of the group.) This, of course, is just an initial guideline; the actual position will vary with every situation, since the size and type of each ensemble, the acoustics of the performing space, and the general requisites of the sound desired all play an important role in final microphone placement.

In the end, the polar patterns of the microphones, the angle between them, the distance and height from them to the performers, are all factors which can only be determined by the sound they produce. The essence of good microphone

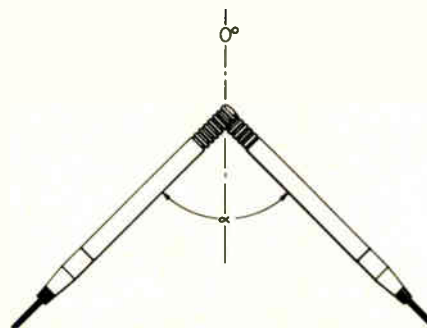


Fig. 1. Coincident XY microphone pair.

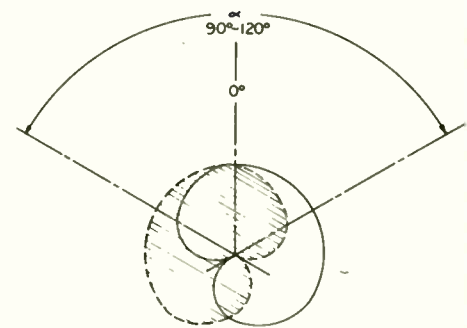


Fig. 2. XY cardioid pair.

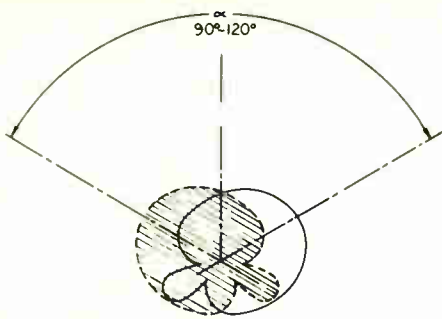


Fig. 3. XY Hypercardioid pair.

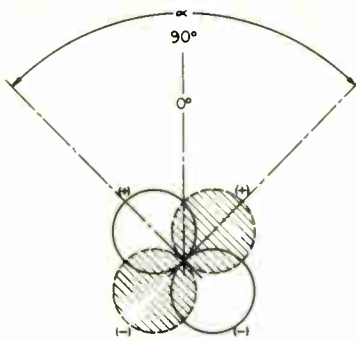


Fig. 4. XY crossed figure of eights (Blumlein).

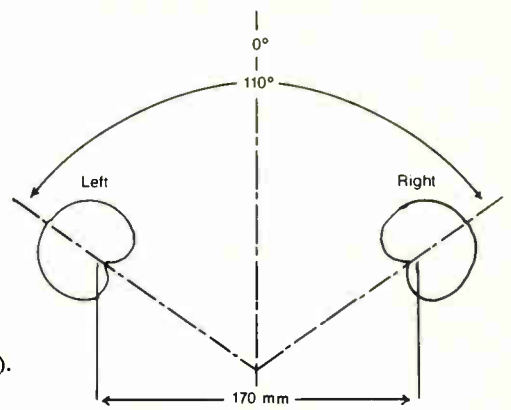


Fig. 5. O.R.T.F. configuration

selection and placement is to listen and learn.

Near-Coincident Techniques

If a more "open" or "spacious" sonic

perspective is desired, the angle between the two microphones may be widened, and the distance spread slightly; the pair is now considered to be near-coincident. The use of cardioid or hypercardioid

microphones again provide reasonably good gain before feedback, although not quite as high as with coincident techniques. The most common near-coincident configuration was developed by the French Radio and Television, and is known by the initials O.R.T.F. [Fig. 5] In practice, the specific angle and spacing of the two microphones need not be as precise as shown. This technique is also relatively simple and inexpensive to implement, and in fact, if placed anywhere near the "right" spot, will always produce a pleasant result. (Thus, I often refer to near-coincident pickup as the C.Y.A. technique.)

As with coincident techniques, the same placement criteria applies. Keep in mind, however, that suspending any near-coincident pair of microphones is not simple.

Ron Streicher began working at Pacific Audio-Visual Enterprises in 1972, where he serves as an independent audio consultant and recording engineer.

References and Recommended Readings

Recording Techniques, by Ron Streicher, MIX Magazine, Vol. 9, No. 8, pp. 50 ff, 1985 August

Stereophonic Techniques, an anthology published by the Audio Engineering Society, New York, NY, 1986

The Microphone Handbook by John Eargle, Elar Publishing, New York, NY, 1982

Figure references are as follows

Fig. 1: JAES article fig. 1

Fig. 2: JAES article fig. 2

Fig. 3: JAES article fig. 3

Fig. 4: JAES article fig. 4

Fig. 5: JAES article fig. 7

Next month: Visual considerations, spaced microphone techniques, pressure boundary microphones, and accent microphones.



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 medical alarm systems
 voice evacuation systems
 megaphones

COMPANY:

COMPANY:	apartment/residential alarms	industrial alarms	institutional alarms	burglar alarms	fire alarms	voice alarm systems	driver horns	outdoor warning systems	audio surveillance systems	re-entrant loudspeakers	security speakers	transistorized amplifiers	door entry systems	medical alarm systems	voice evacuation systems	megaphones
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INTERCOMS

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multi-station intercoms

intercom wire

COMPANY:	apartment/residential intercoms	micro-computer	in/out registers	apartment/residential video intercoms	apartment stations	lobby panels	telephone entry control systems	wireless intercoms	industrial intercoms	multi-station intercoms	intercom wire
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Altronic Co. Ltd.	•			•	•	•	•				
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GBC CCTV				•							
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Speco											
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TOA Electronics		•									
Valcom	•	•					•				
Visacom Corp.											
Whelen Engineering Co.											

VIDEO

B & W CCTV cameras
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 door monitors
 pan & tilt scanners
 video signal equipment
 video tape recorders
 time lapse recorders
 remote control equipment
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 switchers
 dummy cameras
 video entry control systems
 housings
 modulators
 video wire
 camera mounts
 video motion detectors
 RF cameras
 fiber cable
 lenses

COMPANY:

COMPANY:	B & W CCTV cameras	color CCTV cameras	fiber optic transmission systems	video monitors	door monitors	pan & tilt scanners	video signal equipment	video tape recorders	time lapse recorders	remote control equipment	hidden surveillance cameras	switchers	dummy cameras	video entry control systems	housings	modulators	video wire	camera mounts	video motion detectors	RF cameras	fiber cable	lenses
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Aiphone Intercom Systems			•	•									•									
Altronic Co. Ltd.	•		•	•									•									•
American FiberTeck, Inc.		•			•																	
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Atlas/Soundlier														•				•				
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De-Tech										•												
Elbex America	•	•		•	•	•	•		•		•	•	•									•
EMI, Inc.					•									•				•				
E.R.L. Electronic Products, Inc.														•								
GBC CCTV	•		•	•	•	•	•	•	•		•	•	•	•					•			•
Hedco			•			•					•											
Javelin Electronics	•	•		•		•	•	•	•		•			•	•							•
Jensen Video Sonics	•	•	•	•	•	•	•	•	•		•	•	•	•								•
Jeron Electronic Systems, Inc.														•								
JVC Co. of America	•	•		•			•	•														
Lefebure	•	•	•	•		•	•	•	•		•	•		•								•
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Siedle Intercom	•			•	•		•		•					•	•							
Surveillance Video Systems	•				•								•									
Tektone Mfg.				•										•								
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VCS, Inc.	•		•						•				•									
Visual Comm. Specialists									•									•				
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VIDEO

SECURITY SIGNALING DEVICES

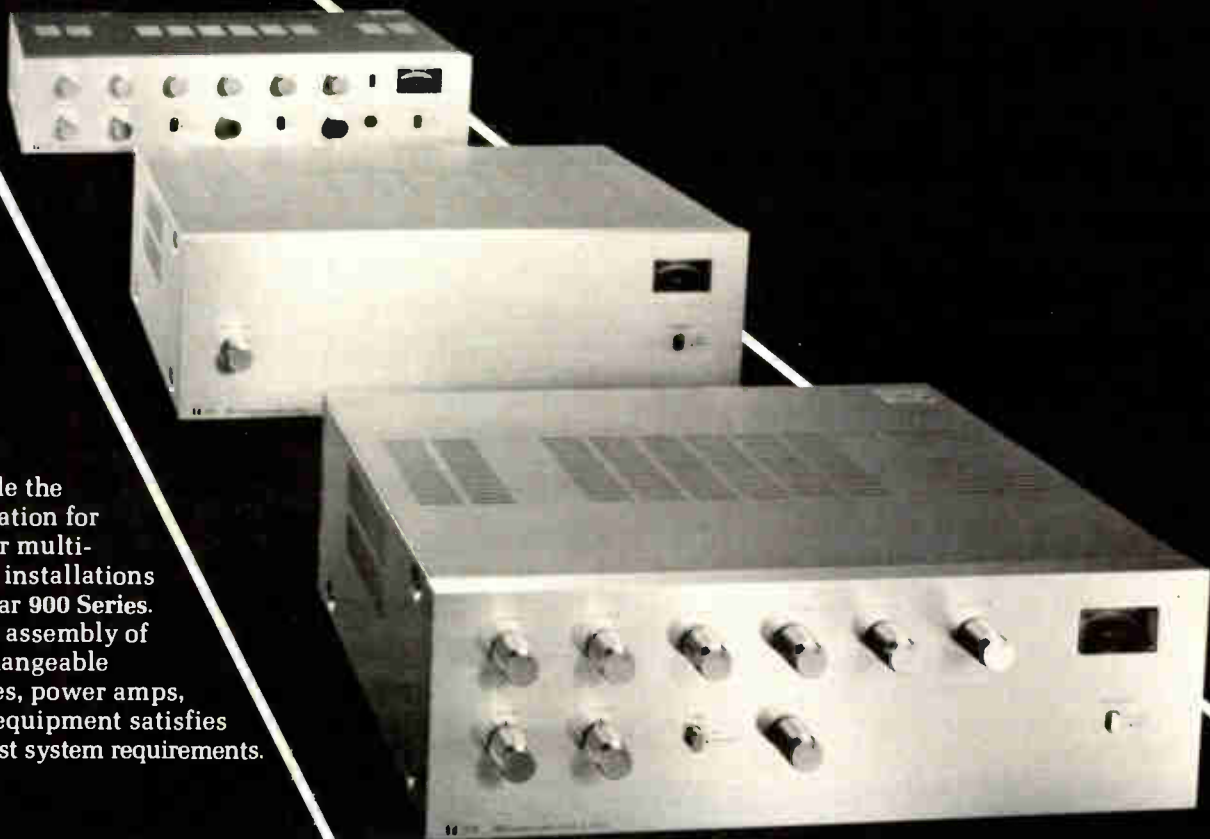
COMPANY:	digital/radio message repeaters	sirens	self-contained sirens	vehicle sirens	delay timers	test timers	RF telemetry systems	intrusion annunciators	access control devices	security wire	bells	horns	locks
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The S.S. Admiral

by Will Parry

The famous steam-powered excursion boat the S.S. Admiral is docked in St. Louis at the foot of Washington Avenue and around the bend from the St. Louis Arch. When christened the Admiral in 1940, it was the world's largest inland riverboat and the first inland passenger steamer to be completely air conditioned. Some 378 feet in length, 95 feet across the beam and 65 feet high, it weighed 2,240 tons and had six levels: a main deck, ballroom deck,

Will Parry, who is a member of the *Sound & Communications* technical council, is general manager of the installation division of Maryland Sound Industries. Prior to joining the company nine years ago, he was a partner in All-American Sound. He is a member of the Audio Engineering Society. Parry earned his BA in economics from Utica College of Syracuse University in New York.

mezzanine deck, promenade deck, terrace garden and top or "Lido" deck, which was famous for nighttime cruises.

From 1940 to 1979 it carried families, friends and lovers up and down the Mississippi River. Many of the people who fell in love on the Admiral now have children who frequent the Admiral's shows and shops and who dance in the Grand Ballroom. The S.S. Admiral is an institution in St. Louis.

How do you renovate a 160,000 square-foot river boat as an authentic looking high-tech entertainment facility? The owners (S.S. Admiral Partners) chose Landmark Entertainment Group of Hollywood, California, to accomplish this. Landmark was responsible for the project's concept, interior and exterior look; for coordination with the architectural firm of Hellmuth, Obata and Kassabaum; and for implementation of the technical systems. That's where Maryland Sound Industries (MSI) came in.

MSI was hired to design, fabricate and install the entertainment audio systems. These systems are in three areas: The Grand Ballroom, Lindy's Cabaret, and the Birdland Theatre. Each area necessitated a different functional approach. Sound quality, flexibility and reliability were the cornerstones of the design philosophy — all with an eagle eye on budget dollars. This was to be a technologically advanced complex, but the sound system budget could not sink the ship.

THE GRAND BALLROOM

The Grand Ballroom is on B deck. Afternoon shows seat 800 people for a musical review of music from the 40's to the 80's. At night the Admiral's all-star orchestra backs up a four vocalist "Manhattan Transfer style" quartet for dancing. Therefore, the Grand Ballroom system was designed to support live, live-to-tape and pre-recorded stage shows. The Ballroom is a rectangle with the stage in the center of the long wall. To exaggerate the stage placement, two proscenium soffits extend out from the stage and arc another 30 feet. This makes the distance

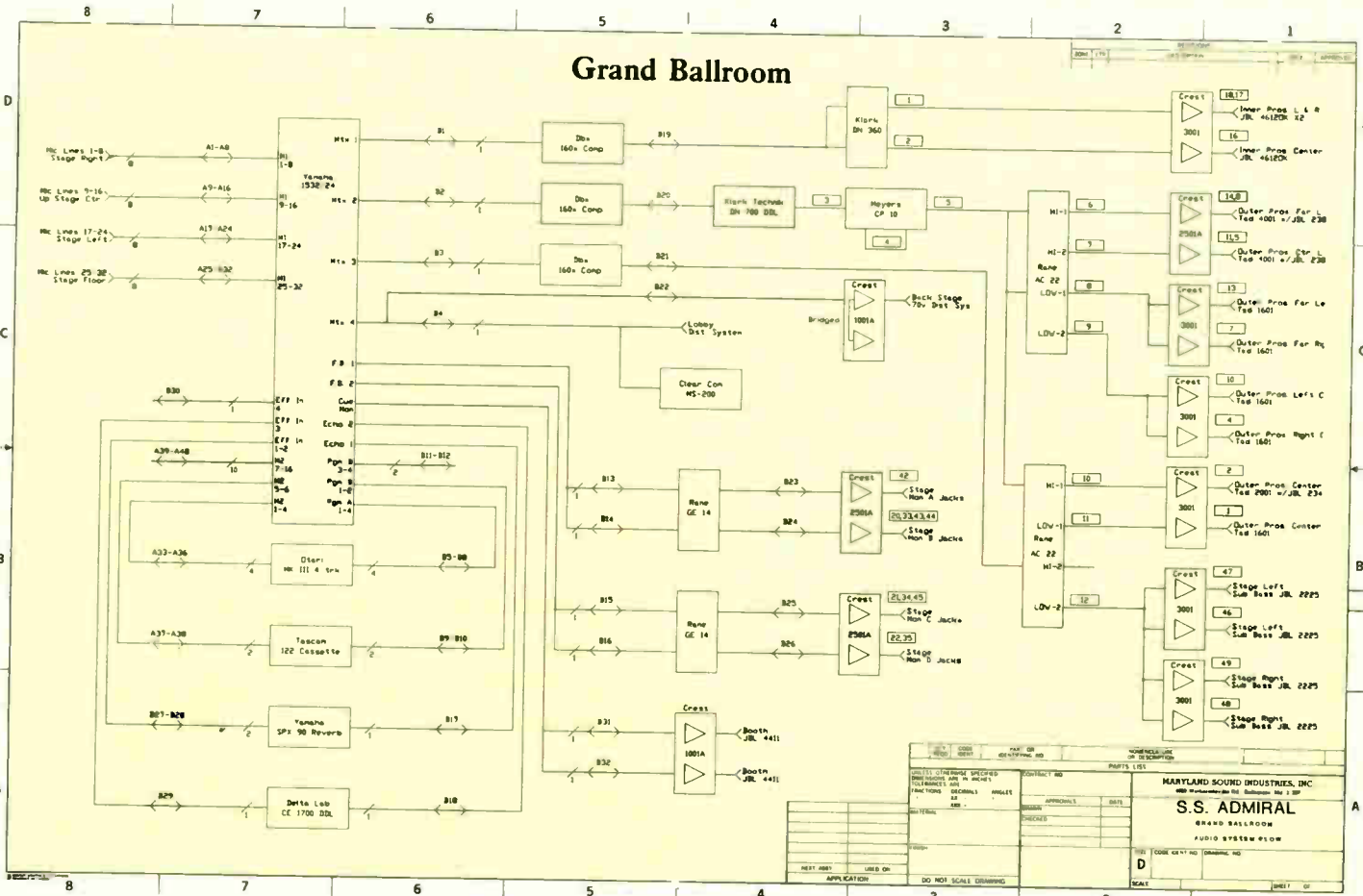


The Grand Ballroom sound system, which supports live, live-to-tape and pre-recorded stage shows, consists of a Yamaha 1532/24 console, Otari MK III four track, Tascam 122 cassette, Yamaha SPX 90 reverb and CE Delta Lab 1700 DDL.

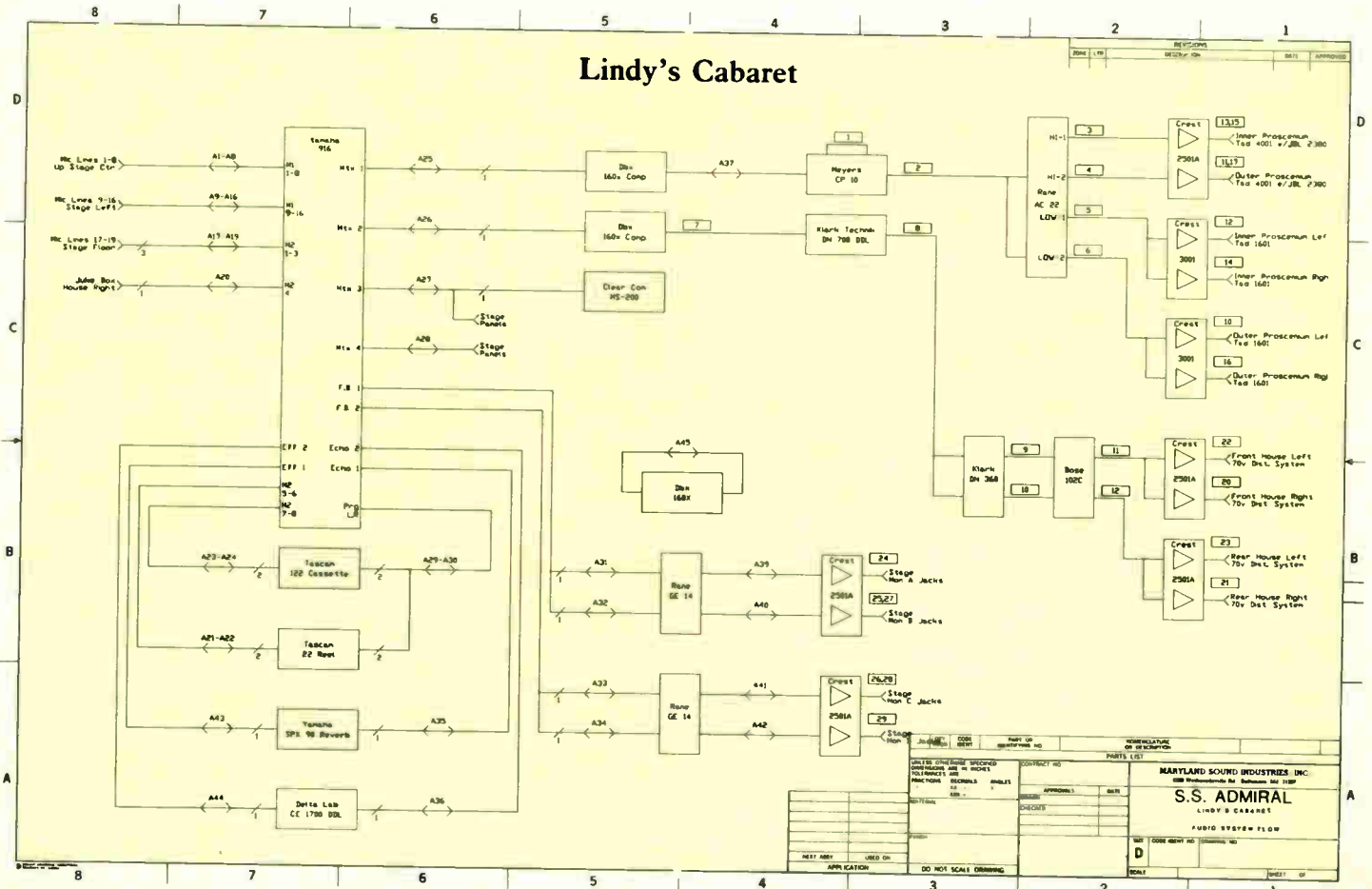
The Grand Ballroom seats 800 people for a musical review of music from the 40's to the 80's.



Grand Ballroom



Lindy's Cabaret





Lindy's Cabaret equipment set-up is similar to the Ballroom's. It includes a Yamaha 916 console, Tascam 122 cassette, Tascam 22 reel, Yamaha SPX 90 reverb, and Delta Lab CE 1700 DDL.



Live presentations are held nightly in Lindy's Cabaret, a two-story cabaret at the stern of the Admiral.

from the outer soffit's center speaker to the sound booth less than 20 feet!

To compensate for this there are two rings of speakers and floor-mounted sub-bass cabinets. The inner ring is on a separate feed and provides coverage for the area under the proscenium soffit. The outer ring is comprised of the five custom enclosures. The four outer boxes utilize 90x40 horns while the center box uses a 100x100 horn. The same 15-inch bass speakers and high frequency drivers are used throughout. The outer ring speakers are bi-amplified and use a crossover with adjustable time delay for the low frequency drivers. The enclosures were specifically designed to complement the drivers and fit within the outer proscenium soffit.

As a separate system, two custom 2x15 inch enclosures are mounted under the stage, far left and right. A low pass filter is provided in line with the send and is adjustable for frequency. These speakers act as a sub-bass reinforcement system. Since their send is independent, only material with low frequency material need be sent to this system.

Four delay speakers (full range enclosures) were included in the original proposal. They were located in custom Sonex-lined pockets in the ceiling. The intention was to allow additional gain and high frequency coverage in the farthest extremities of the Ballroom. Due to budget and construction considerations, however, these were deleted before final installation.

All amplifiers, crossovers, and equalizers are located backstage left. The cabinets have machined front doors to maintain security while allowing proper ventilation. All power for the audio systems

originated from the same clean power transformers; isolated neutrals and ground are used exclusively.

The audio and lighting booth is located directly across from and at eye level with the outer proscenium speaker on the second floor. The center speaker is controllable in level independently from the other flown speakers at the amplifier rack. The house console is a 32x4x4 console with 24 channels installed. The matrix outputs provide direct access to the inner, outer and sub-bass speaker systems. The room equalization is set and locked at the main equipment cabinet. Four channels of patchable two-third octave equalization are available in the house effects rack if equalization, other than channel equalization, is needed.

Three microphone stage input panels are provided stage right, upstage center, and stage left. Stage floor pockets are provided downstage center, left and right. All microphone lines are normaled throughout the patch bay. All line level interconnects are patch bay accessible. This includes one four track tape recorder, one cassette deck, one digital reverb, one digital effects device, four channels of two-third-octave equalization, three limiters and the booth monitor power amplifier. Not shown on the Grand Ballroom flow chart is an MSI spares in/out patch panel. This panel connects directly to the bay. XLR male and TRS connectors are called outs, XLR female and TRS connectors are called inputs. With this panel any portable device may be interconnected by simply using the patch bay.

Microphone selection includes a wide variety of professional wired and wireless microphones. As can be seen by the ac-

companying equipment list, microphones can be tailored to support many types of live presentations.

There are two wireless systems, one for the Grand Ballroom and one for Lindy's Cabaret. The wireless system uses Sony frequency synthesized technology. This allows a great deal of flexibility in combining the two systems into one larger system as needed.

LINDY'S CABARET

Lindy's Cabaret is a two story cabaret at the stern of the Admiral. A wrap-around balcony shadows much of the first floor and sound/lighting booth. Live presentations are held nightly and are themed to complement the art deco interior.

Equipment selection in this space was followed from the Grand Ballroom to provide continuity of sound, quality and interchangeability of parts. The main speakers are comprised of four custom enclosures with 100x100 horns/drivers and 15-inch low frequency drivers. These are located in the false soffit directly above the front lip of the split stage.

Under-balcony coverage is via high quality 4-inch speakers separated into two time zones — those nearest the stage left and right, and the speakers farthest from the stage. Separate compressor limiting and delay is provided for each speaker group.

The house console is a 16x2x2 console. A full patch bay is provided for all microphone and line level sources. The system operates without any patches in normal mode. In this booth, the same effects package and tape recorder package is provided as in the Grand Ballroom. (See the accompanying "Lindy's Cabaret" floor diagram.)

To match the decor, the vocal microphones were specifically selected. The original intention was to take some 1940's

(continued on page 57)

PRODUCTS IN REVIEW



Shure's New Condenser Microphones

Shure Brothers Inc. has announced the introduction of two condenser microphones: the Shure 849-LC and 869-LC.

The 849-LC and 869-LC are the first hand-held condenser entries in Shure's General Microphone Line. The 869-LC is a ball-type microphone designed for vocal applications, while the 849-LC is suited for instrument

miking and recording. Both models are intended for use in general sound reinforcement and musical applications.

Both models feature wide-range frequency responses that are tailored for their intended applications. The 849-LC's response has no upper midrange presence rise at 5 kHz and an electronically generated low-end rolloff. The uniform cardioid polar patterns of both models provide maximum rejection and minimum coloration of off-axis sounds.

Other features of the 849-LC and 869-LC include a recessed on-off switch, heavy-duty shock mounting, and protection against outside RF interference. Both models may be powered by standard phantom power sources or by a 1.5 volt AA battery. The 869-LC also incorporates a built-in spherical wind and pop filter.

User net price for both the 849-LC and 869-LC is \$168.

Circle 52 on Reader Response Card

Gold Line's Dividing Systems

Gold Line has introduced two new Loft single rack space frequency dividing systems with built-in limiters. Model 603MP is a mono three-way and the model 602SP is a stereo two-way.

Both units feature limiters placed in the optimum filter path and preset to different attack/release times to protect against frequency shift and distortion. These continuously adjustable cross-over networks employ 24 dB/octave "Linkworth-Riley" filters, low noise high slew rate circuitry, and LED output indicators. Power turn-on/turn-off transient suppression is provided to protect speakers and drivers when power is accidentally disconnected.

Both models are available with either knobs or recessed controls. Contractor "C" series units are provided with security plates at no extra charge.

Circle 53 on Reader Response Card

A · E · S · T · H · E · T · I · C · S

The new CSV Series speaker systems by Community complements the decor of the most discriminating contemporary commercial environment. CSV sound systems and floor monitors' built-in dynamic protection circuitry assures high reliability. Our simplified brackets guarantee ease of installation and offer the system designer a wide choice of mounting options. Also available are visually identical, specification-equivalent, optimally vented low frequency enclosures.



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IF YOUR PROJECTOR ISN'T THIS FLEXIBLE NOW, IT NEVER WILL BE.

JBL's new Model 6810 Video Projector offers off-the-shelf flexibility the others can't touch.



The Model 6810's 40-function remote control puts sophisticated command in the palm of your hand.

An input panel that's worthy of a blue ribbon panel.

It's just one of the many reasons why JBL's new Model 6810 Video Projector is your most complete choice for a wide range of professional applications.

Unlike most other projectors, the Model 6810 is *born* brilliant. We knew you needed plenty of inputs, so we gave you six: enough RF inputs to accommodate antenna, cable, and satellite dish simultaneously. Plus plenty of inputs to handle your VCR, videodisc player, or computer. (Many competitive models give you just one or two inputs.)

Because your professional needs can change quickly, the Model 6810 offers impressive off-the-shelf flexibility. You can choose from floor or ceiling mounting, front or rear projection. And the picture size goes

from five to fifteen feet diagonally on virtually any type of screen surface, flat or curved.

But flexibility wouldn't mean much without a sharp, superior picture. The Model 6810 gives you an extra crisp picture because it has the widest video amplifier bandwidth of any projector on the market.



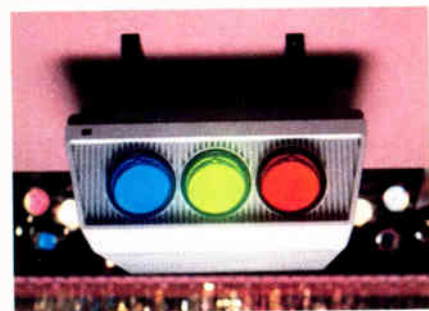
JBL's Model 6810 fits right into your environment, offering a choice of front or rear projection (5 to 15 feet diagonally) on all types of screens.

And just take a look at some of these Model 6810 exclusives:

...the only video projector with a built-in 178-channel tuner and stereo decoder for Zenith/dbx* stereo and Second Audio Program broadcast signals.

...the only video projector with a wireless 40-function remote control.

* Zenith is a registered trademark of Zenith Electronics Corporation
dbx is a registered trademark of BSR North America Ltd



If floor space is at a premium, the Model 6810 can be ceiling mounted quickly and easily.

...the only video projector that supports onscreen graphics and lets you superimpose text.

...the only video projector that accommodates a variety of personal computers with just a flick of a switch (from analog to TTL). Many competitive models don't allow for TTL input, something that's absolutely necessary to connect an IBM PC.

JBL Professional, an audio legend for more than four decades, now offers a remarkably complete vision of what video projection is all about. To learn more about the Model 6810's professional performance and flexibility, contact your authorized JBL Dealer today.

JBL Professional
8500 Balboa Boulevard
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JBL PROFESSIONAL
VIDEO
PRODUCTS



AEI Introduces ProPac 4

The ProPac 4 commercial cassette system is an industrial duty cassette player, featuring an all-direct-drive transport mechanism.

ProPac 4 has a four-track, auto-reverse, continuous play format, offering four hours of uninterrupted music. Special heads, chrome tape, broadcast quality cassettes, and duplication techniques using Dolby HXPro provide a full fidelity sound.

The system has a built-in power

amplifier with direct and 70 volt output, Dynamic Noise Reduction, bass and treble controls, quick-reverse and remote speaker systems.

Circle 54 on Reader Response Card



Documotor Duo Provides Record of Events

Javelin Electronics has introduced a closed circuit TV system that provides a permanent record of events plus near-photographic quality hard copy photos in color or black and white.

The time-lapse video recorder

(model XL 1400) captures everything a CCTV system picks up. Connected to a single camera or a multi-camera set-up, it can provide up to 10 full days of around-the-clock recording—using a standard VHS video cassette. A special alarm mode switches to normal recorder speed (up to 60 images per second) for the duration of the alarm. Visual search of a cassette can be accomplished in forward or reverse mode at over 200 frames per second, and every image includes a complete readout of time, date, power failure warning, and alarm count.

The video printer (model JP2500) can be connected to any standard camera, switcher or video recorder, and generates a 4- by 5-inch (six lines/mm) print in approximately 60 seconds in color or black and white. Time and date can be superimposed in each print. The video printer can also be used for personnel ID records, documenting intrusion, and identifying persons, vehicles or objects. It is capable of providing color photographs to law enforcement personnel almost before they arrive at the scene of a crime.

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HOW BRIGHT IS YOUR PRESENT STROBE?

FARADAY'S NEW STROBE AVERAGES 3.0 CANDELA PER U.L. STANDARD 1638



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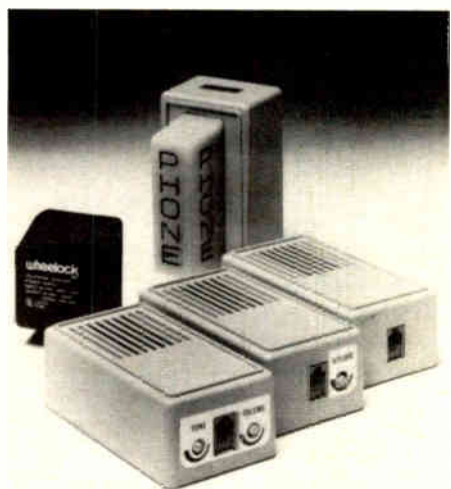
THE ONE SOURCE FOR YOUR SIGNALING NEEDS.

Sonic Research Associates Introduces the SRA-573

Sonic Research Associates introduces the SRA-573 Tri-Ambient Synthesis Stereo Soundfield Processor™. The device preserves stereo imaging integrity throughout large areas of rooms. The patented psychoacoustic technology specifies a four point T-pattern loudspeaker arrangement for use with the stereo input, multi-channel output signal processor.

An image control allows fine tuning of the stereo image coherence. A full range monophonic output is provided for subwoofers or distribution amplifiers. The power supply is internally switchable for international operation. The output stages are electronically balanced, XLR-type connectors, and feature push-pull operation capable of driving +24 dB into a 10 Kohm load. The device is 1¾-inch high by 19-inches wide x 12 inches deep, and is rack mountable with the detachable three conductor power cord.

Circle 56 on Reader Response Card



Telephone Extension Alerts from Wheelock

Four types of telephone extension alerts, each with a different signal, have been introduced by Wheelock, Inc. The line offers a choice of horn,

warble, chime or incandescent lamp signals. A 24 VDC power supply is available. Trade prices for these alerts, complete with the power supply where required, range from \$23 to \$35.

The three types of audible alerts in this line are: Horn: Model HR-AT5-W, which has a 90 dBA output and operates on 18-30 VDC; Warbles: Model WR-AT1-W, which has a 90 dBA output and operates on 50-130 VAC, 20-30 Hz and Model WR-AT5-W, 90 dBA output, 20-30 VDC; and Chimes: Model CH-AT1-W, which has an 80 dBA output and operates on 50-130 VAC, 20-30 Hz; Model CH-AT2-W, 80 dBA output, 18-14 volts, AC or DC; and model CH-AT3-W, 80 dBA output, 8-12 VAC or 9-15 VDC.

The visual alert is model VL-AT5-W, with dual incandescent lamps. It operates on 24 VDC. The Wheelock power supply, Model EPS-2401, provides filtered 24 VDC at up to 100 mA of current.

Circle 57 on Reader Response Card

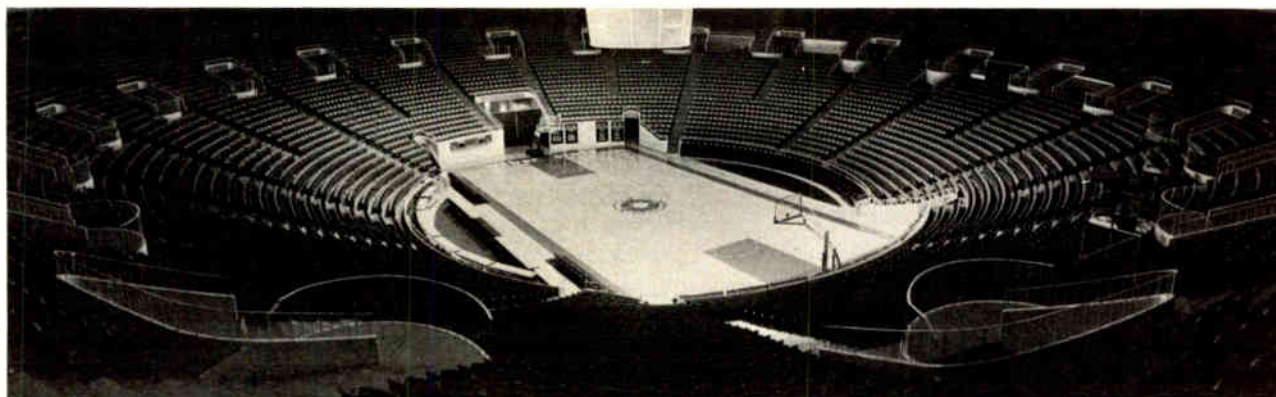
Altec Announces Anniversary Series

Altec Lansing Corp. has announced a new power amplifier, the model 9444A Anniversary Series.

The 9444A is a dual-channel model with each channel delivering 300 watts of continuous average power into 4 ohms or 200 watts into 8 ohms, and in bridge mode, the 9444A can deliver more than 600 watts at typically .025 percent distortion. Also each channel is independently protected against temperature extremes, excessive output voltage and phase shift, radio frequency interference, and short-circuited loads.

Accessory sockets for each channel accommodate plug-in electronic modules. The level controls are rear-mounted to avoid "accidental" changes. True output balancing transformers (models 15524A and 15525A) for 300 watt and 600 watt applications are available along with a new 300 watt autotransformer (model 15567A).

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GOOD FOR THE LONG HALL.

You can search every auditorium in the world and not find sound equipment with more innovation and flexibility for less money, than Audio Logic.

Our R2D3 Digital Speaker/Room Delay Unit is one example. It's designed with three independent outputs, each capable of 0 to 327 milliseconds of time delay, with minimum increment of 20 microseconds.

The R2D3 expands easily to 1.307 of delay



R2D3 Digital Speaker/Room Delay Unit. Price: \$799.95

time at a full 20 Hz to 20 kHz bandwidth, ± 0.5 dB. Setup is so quick and accurate, all you do is input the distance value

and it calculates the rest.

Check out Audio Logic's complete line of quality sound contractor products. You'll find we've got more to offer than a triple bill at the Garden.

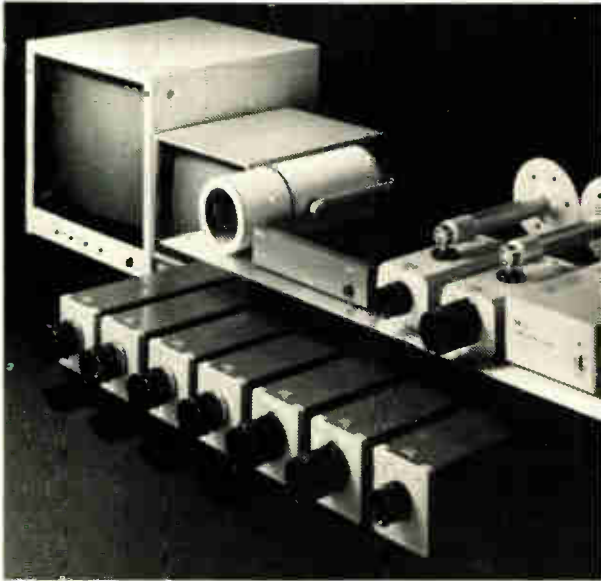
© 1987 DOD Electronics Corporation. Manufactured in U.S.A. For specifications, contact Audio Logic, 5639 So. Riley Lane, Salt Lake City, Utah 84107 (801) 268-8400.

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Advanced Toa technology, and a system approach to video observation equipment are your guarantee of optimally effective remote surveillance. The Toa - Security Group equipment comes in a full line-up that covers every need and situation. We offer versatile, sophisticated, and reliable video cameras; monitors; switching, distributing, and remote control units; as well as a complete selection of support accessories. Toa - Security Group video systems have all you need for video observation with the best that technology can offer.

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Valley International's New Addition to the 800 Series

The Commander is Valley's latest addition to its 800 series modular audio signal processing line. Proprietary Symmetrical Release Coupling Circuitry allows the Commander to compress the audio signal for dynamic range control with freedom from noise level recovery due to the unit's interactive expander.

Linear Integration Detection allows the unit's detector to emulate the response of the human ear in order to maintain correct musical relationships in the processed material. To ensure accurate processing of the entire audio spectrum Peak Reversion Correction circuitry compensates for discrimination against low frequencies to eliminate "pumping" and breathing."

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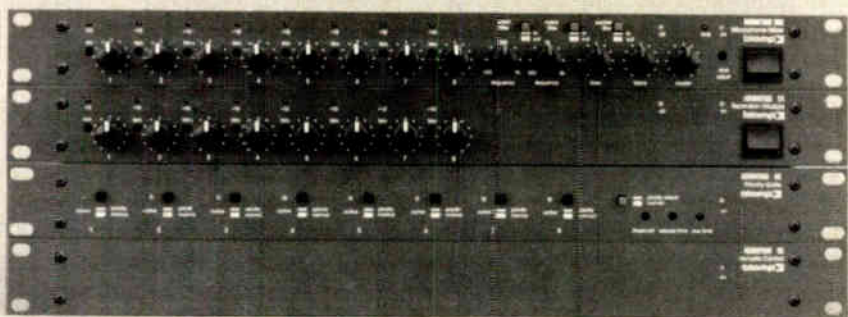
Invisible Supports for the Pro Sound Contractor

Invisible has introduced a product to support very large audio and lighting mixer consoles. The new Super Tee Brackets attach to any of the Invisible's 24-inch KB stands, providing durable, height adjustable support for concert mixing, or the support of any other large "Table Top" types of equipment. A pair of KB Stands outfitted with Super Tee Brackets will provide a method of support available for commonly used consoles. A Super Tee Bracketed Invisible Stand will set up or knock down in seconds and will travel in the KB bag.

Circle 79 on Reader Response Card

a closer look

by gary d. davis



Biamp's Automatic Mixer System

Biamp Systems has introduced a flexible mixer system consisting of four separate single rack-space modules which can be combined in a range of configurations.

The basic unit, the Advantage One, is an eight-channel mixer. Each input channel includes a pad switch, trim and level controls, standard 12 volt phantom power with jumper strap (48 volt phantom power is optional), XLR connector and quarter-inch phone patch jack. Input transformers are available. The output controls consist of two sweepable notch filters, a rumble filter, built-in adjustable limiter, bass and treble controls.

The Advantage EX is an eight-channel autogate with a priority switch for each gate. The addition of the AG module converts the Advantage One into a fully automatic mixer with priority options. The Adaptive Threshold Sensing (ATS) continuously updates the gate threshold level to accommodate for changing ambient noise levels. The output level is automatically adjusted by the number of open microphones.

Comments: There are a number of automatic mic mixers on the market, so we were curious to see what Biamp had done to distinguish its product. We spoke with Mike Simms at Biamp to gather some additional technical details.

The method by which the Advantage One adjusts the gain of each channel was carefully devised to avoid the random opening of mics at low am-

bient noise levels that occurs with certain other automatic mic mixers, yet to avoid "opening" adjacent mics when a person speaks loudly. The threshold that "decides" whether or not a channel should be brought into the mix is actually determined by two factors.

First, there is an adjustable, fixed threshold which primarily sets a minimum level for opening a mic. This operates primarily at very low ambient noise levels. Then there is an automatically generated additional threshold at all open mics (analog DC rectification and summation of the peak signal values). This fast attack/slow release threshold control signal is added to the fixed threshold control signal, and it can significantly raise the threshold to adjacent, not-yet-open mics. The overall logic is designed to reduce the system output level 3 dB each time the number of open mics is doubled, thus assuring stability (it keeps the overall gain below the feedback point when all eight mics — or more — are active if it started out stable with one mic active).

The modularity of the system, with add-on eight-channel expanders and priority modules, enables the installation to be as simple or complex as necessary. While the ability to give any of the eight mics priority over other channels requires the use of the Advantage AG module, there is a more limited priority function built into the Advantage One itself; internal jumpers on channels one through seven permit them to be set so that any signal present above a fixed threshold will auto-

matically mute channel eight by 10 dB. This feature can be used, for example, to "duck" background music when paging is required; the fixed threshold of this built-in priority function is somewhat adjustable to the extent that an input's gain can be trimmed differently, and the overall level can then be readjusted as required.

The Advantage AG works somewhat differently in that each channel has a switchable priority feature that mutes all other non-priority channels by a fixed 30 dB when the "prioritized" input is in use. The unit works with the signal taken from an unbalanced T/R/S phone jack patch point in the Advantage One, and thus it could really be used with any mixer that has a similar patch point; however, when used with the Advantage One, this unit also provides a control signal to adjust the overall gain for the number of open mics.

The Advantage One is rated at 0.07 percent THD, and its frequency response is conservatively rated at 20 Hz to 20 kHz ± 3 dB (Mike Simms says it is typically +0, -0.5 dB). The Advantage AG is rated 0.05 percent THD, and is said to be flat from 20 Hz to 20 kHz. The Advantage One's equivalent input noise is -126 dBm with a 150 ohm source. Unweighted output hum and noise (20 kHz bandwidth) with one input preamp at 40 dB gain, and all other controls at unit is -75 dBm; with all controls at zero, output noise is -85 dBm. Maximum output level is about +14.5 dBm (the unit has 12 volt rails). This should be plenty quiet for meeting rooms, conferences, small clubs, and so forth. And while +14 or +15 dBm output level may not be sufficient to drive a large bank of electronic crossovers and/or power amps, it is more than enough for one or two amps.

If you're shopping for an automatic mic mixer in the eight to 32 input range, we think Biamp's Advantage system deserves your *Closer Look*.

Circle 59 on Reader Response Card

by Jesse Klapholz

Buildings for Music — from Past to Present

Forsyth, Michael, *Buildings for Music, the Architect, the Musician, and the Listener from the Seventeenth Century to the Present Day*, Cambridge: The MIT Press, 1985, 372pp., \$35.00 (hardbound).

Upon first browsing through this book, one might get the wrong impression from the profusely illustrated content. However, reading the text reveals a world of information, stories and facts. Each chapter is accompanied by detailed notes referenced at the end of the book. A bibliography of 17 general topical sources used for the research in the book is also included. *Buildings for Music's* nine chapters comprehensively leads the reader from the beginnings in the small 17th century English pub music rooms, to the multi-dimensional/multisensorial venues of the future.

The preface sets the stage with oil painting reproductions of various his-

torically significant concert halls of Europe, and wets your appetite with several international examples of modern spaces. "Theme and Variations," the first chapter, forms the premise for the subject of rooms of musical performance. Quoting from Sabine and Bagenal, the author places perspective on various types of acoustics, how they

relate with different countries, cultures, and how they evolved to the spaces we have today. In the 18th century, during the development of classical music, small music rooms were dominant. An entire chapter is devoted to this era covering it in remarkable detail. Many immortal composers became popular during this period as did the halls they performed in. Unfortunately, as Michael Forsyth brings to light, the average life span of these buildings was only 18 years because fires were common and building codes did not exist yet.

While the early chapters serve as more musical history than architectural, it is the third chapter, "The Development of the Opera House," where the emphasis of construction and science begins. As with the earlier chapters, entertaining detail is given to the background of many now famous halls that we base much of our science upon. The evolution, both musical and scientific, are given in tandem with plan- and elevation-views of many halls. As an aside, ancient acoustical myths are imparted to the reader as are acoustical truths.

"Music on the Grand Scale," is chapter four and ties together the church, music room and opera house presenting the reader with the concert hall as we know it today. These early halls set the stage for what was later to be called the 'shoebox hall.' During this period, however, one man was most notorious to the music scene—Wagner. An entire chapter is devoted to this man's unique contributions to opera house design. Wagner was both an architect and composer, best known in this sense for his 'Ring' operas where the hall was specifically designed for these performances. Chapter five goes into detail on the background of these events both musically and architecturally.

A second generation of concert-going public created a demand for more and larger concert halls. The symphony hall became an institution during this period (the mid-18th cen-

ture). Chapter six includes many details and interesting stories in the evolution of today's 'sacred' concert halls. Included of course, are three eternally 'perfect' halls, Grosser Musikverinssaal, Vienna; Neues Gewandhaus, Leipzig; and Concertgebouw, Amsterdam.

While these halls were built mostly from an empirical approach, the late 1800s saw the rise of real scientific study in room acoustics. Chapter seven, "Science and the Auditorium," relates the events that led greats like Adler, Upham, Henry, and Sabine, to the beginnings of a real scientific understanding of room acoustics. In proportion to the rest of the book, some 10 pages of text in this chapter are somewhat disappointing to the more technically biased reader. However, there are some interesting details and important historical research presented. For example, at the age of 24, world famous architect Louis Sullivan became Adler's partner. Together they designed several historically important halls.

The early 1900s saw the birth of the outdoor music pavilion, electroacoustics, and a new genre of acousticians like Watson, Knudsen, Bagenal, and Wood. These topics are covered in their importance to the musical community in chapter eight, "The Hi-Fi Concert Hall." Some acousticians' names are not mentioned, while the architect is. Likewise, some acousticians' work is not mentioned.

The final chapter, "Toward the Future: A new Context for Music," would more suitably be entitled as an epilogue. While these chapters are not the definitive 'book' on electroacoustics and concert halls, they certainly bring the disciplines of architecture, music and science together in their proper perspective in an unprecedented manner. This reviewer found *Buildings for Music* both highly informative and entertaining. As it is readable by architect, musician and sound man alike, it can suitably serve as liaison between any of these groups.

"Buildings for Music ... leads the reader from the beginnings in the small 17th century English pub music rooms, to the multi-dimensional/multisensorial venues of the future."

torically significant concert halls of Europe, and wets your appetite with several international examples of modern spaces. "Theme and Variations," the first chapter, forms the premise for the subject of rooms of musical performance. Quoting from Sabine and Bagenal, the author places perspective on various types of acoustics, how they



Catalog of Technical Supplies for Electronics

General Catalog, free from Contact East, contains 108 pages of products for engineers, technicians, and hobbyists working with electronic and electrical equipment. Over 140 new products are introduced in this edition. Also features, as part of Contact East's lines are test instruments, precision hand tools, soldering supplies, the latest in static protection, and Contact East's line tool kits. All products are described in detail with specifications, full-color photos, prices and come with the company's guarantee.

Circle 60 on Reader Response Card



HHSmith Publishes New Catalog

Information on electronic hardware, connectors and test accessories has been published in bound directory format and is available from Dialight

Corporation's HHSmith product group.

Consisting of 132 pages of specifications, diagrams, photographs, products descriptions, application information and instructional material, this directory of hardware and accessories covers a range of products including binding posts, phone plugs, jacks, standoffs, connectors, patch cords, strain relief tools, spacers, etc.

Circle 61 on Reader Response Card

Product Catalog From Triad-Utrad Available

The 1987-1988 product catalog from Triad-Utrad is now available. The catalog features specifications and illustrations of all Triad products including audio, power, P.C. mounted, pulse, interstage and input transformers and voltage regulators, filter reactors and toroidal inductors.

Circle 62 on Reader Response Card



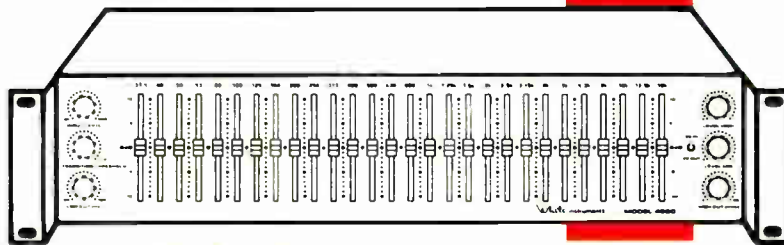
Raychem Describes Uses of PolySwitch Devices

Five new applications notes from Raychem Corp. describes uses for the company's PolySwitch® PTC (positive temperature coefficient) circuit protection devices.

The literature covers use of the devices in telecommunication networks, subscriber line interface circuits, PBX and key telephone systems, loudspeakers and batteries. Also available is a companion piece, a general guide to circuit design with PolySwitch devices.

The four-to-six page application notes describe how PolySwitch PTCs

We've Gone in Another Direction . . .



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. . . our first Graphic Equalizer featuring *Linear Controls* with the best signal to noise and highest filter precision of any R-C Active Graphic we've tested!

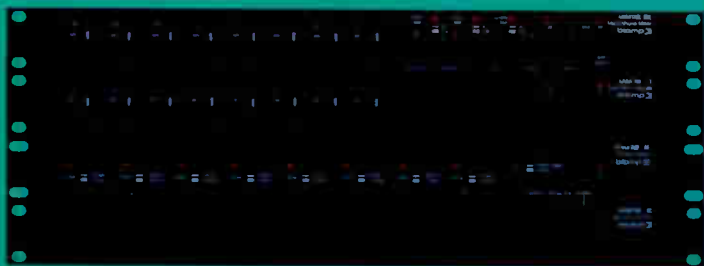


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WHETHER YOU NEED A SMALL ADVANTAGE...



OR A LARGE ONE...



THE BIAMP ADVANTAGE SYSTEM™ WILL HANDLE YOUR JOB

It's an 8-channel microphone mixer... or a fully automatic priority mixer with remote controls... up to 32 channels... or almost anything in between.

The Biamp ADVANTAGE System gives you superior solutions to an incredible range of audio system installation problems.

With a discrete front end for exceptional sonic performance, outstanding flexibility and the proven, rock-solid Biamp reliability. The ADVANTAGE can be *your* advantage in a competitive world.

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Circle 218 on Reader Response Card

can be used to protect against excess current, voltage, and/or temperatures in each application area. They provide technical information, including charts graphs, and circuit diagrams.

Circle 63 on Reader Response Card

Design Guide Product Catalog from TRW

An updated 604 page design guide/product catalog providing specification and ordering information for the entire line of TRW connector products is now available from the TRW Connector Division.

The TRW Worldwide Connector Design Guide/Catalog, No. C-100A contains a 16-page Connector Selection Guide. Basic data including grid densities, tail configurations, and application advantages and disadvantages in a chart format is included for all TRW standard connector types.

The chart is color-coded to help in simplifying the selection process and the connectors are arranged by application. Application categories include: PC board-to-PC board, PC board-to-flex circuit, PC board-to-discrete cable, PC board-to-component and cable-to-cable.

The product section of the design guide/catalog provides specifications and ordering information supported by charts, illustrations, and photos for all standard TRW connector types. Complete performance and dimensional information is also presented for these connectors.

Circle 64 on Reader Response Card

Mini-Catalog Describes For-A Corp.'s Products

For-A Corporation of America has announced publication of a new mini-catalog on its line of professional broadcast products.

The Broadcast Products Catalog includes photographs and description of For-A Video production switchers, signal processors, including NTSC and Component Color Correctors, and Time Base Correctors and frame synchronizers used in professional broadcast applications. Block diagrams of typical component and composite/NTSC productions systems illustrate the integration of For-A equipment into professional broadcast systems.

Circle 65 on Reader Response Card



USD Offers New Short Form Catalog

Underwriters Safety Device offers a Short Form Electronic Standard Products Catalog which includes illustrations and complete specifications on the USD line of circuit protection devices, input/output connectors, AC power receptacles and double row terminal blocks.

USD products featured in the catalog include Manual Reset Circuit Protectors with ratings of 8, 10, 15, 20, 25, 30, 35, and 40 amps; AC power Receptacles in flange mount and snap-in mount configurations; and four styles of printed circuit board Input/Output Connectors in both one- and two configurations with .375 inch and five millimeter centers. Three types of USD double row Terminal Blocks rated at 300 V, 20 amps; 600V, 20 amps; and 600V, 30 amps are also fully described.

Circle 80 on Reader Response Card

abc TeleTraining Inc. Offers New Publication

Basic, understandable information most sought by new people entering the field of telecommunications is now available in a single publication, entitled "Anatomy of Telecommunications", which puts the multiple parts of the telephone industry into perspective.

The author, Tom Smith, has presented much the same type of information to hundreds of students who have attended the abc TeleTraining workshop, "Fundamentals of Telecommunications," which he's taught for the past six years.

The book was produced by abc TeleTraining in its new, self-paced

study format with built-in study guides, making it adaptable for either individual self-study or classroom situations. Each chapter includes outlines, objectives, preview and review questions, and term definitions.

Developed to remove much of the mystery from telecommunications for newcomers, the book draws the "big picture" of the industry in a readable, jargon-free style, which will enable anyone to understand the telecommunications business, including the recent changes, according to the company.

Circle 81 on Reader Response Card

Brochure Describes North Hills Capabilities

North Hills Electronics, Inc. has announced the availability of a new multi-page brochure describing its facilities and capabilities in microwave and wideband component design and manufacture.

The full color brochure details the technology and resources employed by the company as well as providing examples of recent product design and developments. North Hills production capabilities include a wide selection of standard products

Circle 82 on Reader Response Card

McCAULEY

... Pure Performance



The quality of McCauley loudspeaker systems goes far beyond cabinetry and exterior decor. Inside every McCauley system is what our company is all about, the driving force behind every system—its components. Not just a collection of pieces and parts that you find in so many other companies' boxes, but a precisely matched set of transducers that have been designed, engineered, and manufactured at McCauley and by McCauley to deliver a signature of pure professional performance to the term "State of the Art."



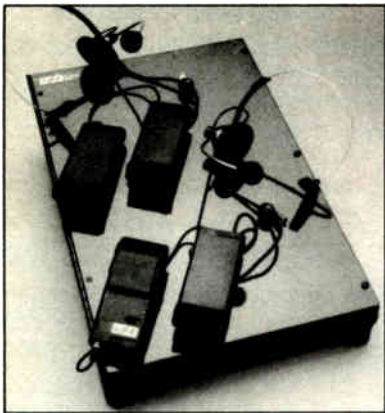
To experience McCauley speaker enough for some; claim puts you in a performance." Tame the Series 800 system at an authorized McCauley dealer. Call or write the factory for detailed product specifications.

the sheer power of a system is reward but to lay your world of "Pure Performance."

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Circle 244 on Reader Response Card

Elenex Introduces FREEDOM™ The New Wireless System



The FREEDOM™ Wireless Drive-Thru Communications System. The latest in professional wireless communications. FREEDOM™ provides:

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- Digitally Coded Radio Transmission
- Modular Battery Pack
- Wall Mounted Storage Rack
- Simple Installation
- Excellent Selling Margins for Dealers

Call us for a free catalog on FREEDOM™ and our other products:

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7392 Trade St.

San Diego, CA 92121

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NEW YORK

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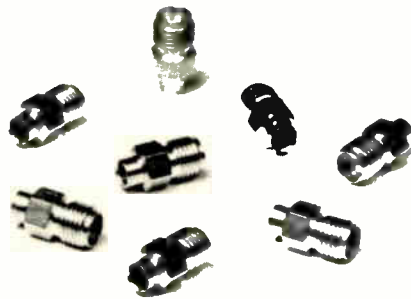
No. Cohocton, NY 14868

(716) 534-5280

LNEX
ELENEX, INC.

Circle 228 on Reader Response Card

SUPPLIES • SERVICES



Micro-Coax Offers Female Connectors

Micro-Coax™ Components, Inc. has announced the availability of stainless steel SMA female connectors for semi-rigid cable. Now available are SMA female connectors for 0.0856 inch (2.20mm) diameter cable and 0.141 inch (3.58mm) diameter cable.

Micro-Coax Components' connectors meet MiL-C-39012 specifications and are rated up 125 C.

Circle 66 on Reader Response Card

Mogami's Superflexible Bantam Patch Cords

Mogami Product Division, Marshall Electronics, Inc. has introduced a new series of Superflexible Bantam Patch Cords for studio engineers and other broadcast professionals.

The Tiny-Tel (.173 inch) Bantam Patch Cords feature Mogami's new Quad-Balanced Wiring, which was developed by factory engineers working directly in major studio complexes with broadcast professionals using the newest recording equipment.

Mogami Bantam Patch Cords use a specially annealed high conductivity Oxygen-Free-Copper which delivers definition, detail and transparency in the quad-balanced configuration. Each has a nickel-plated tip/ring/sleeve connector which is designed to resist corrosion and eliminate polishing for service life. Included with each interconnect are a set of interchangeable color rings for patch cord identification. Optional gold-plated connectors are available.

Circle 67 on Reader Response Card

SUPPLIER OF INTERCOMS AND ELECTRONIC WIRES

Call toll free
1-800-247-9099

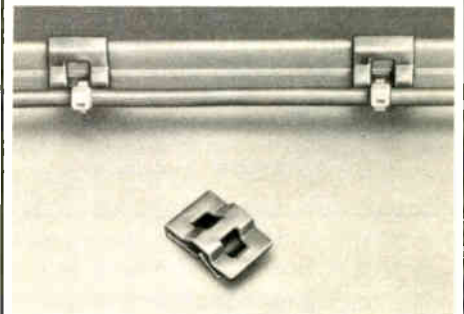


TAPPAN WIRE

• **CABLE, INC.**

256 OAK TREE ROAD,
TAPPAN, NY 10983

Circle 234 on Reader Response Card



Panduit's Clip-on Mount for Cable Ties

A new clip-on mount for use with cable ties on panel edges has been introduced by Panduit Corp., Electrical Group.

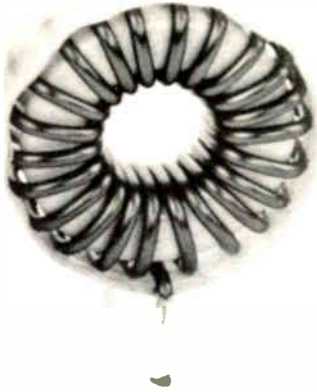
Made from zinc-plated steel, the new mount is designed to retain wire bundles, a cable or tubing along the edges of panels. The low profile mount is used with miniature, intermediate or standard cross-section cable ties up to .19 inches wide and can be used with panel thicknesses from .03 to .125 inches. It is attached

Sound & Communications

edge, eliminating the need for any drilling and fasteners.

Cable ties can be inserted in one of four directions to permit parallel or perpendicular bundle retention.

Circle 68 on Reader Response Card



Toltec's Toroidal Swing Inductors

Toltec Industries, Inc. has introduced the T1500 Series of toroidal

swing inductors, each of which features the ability to shift inductance by a ratio of more than 10-to-1.

This shifting ability enables T1500 Series toroids to present high impedance at low currents and low impedance at high currents.

Toltec offers 21 toroidal swing inductors, ranging in no-load inductances from 316 microhenries to 10.3 millihenries. Seven maximum current ratings are available from three to 25 amps.

Circle 69 on Reader Response Card

Set It Right with Set-It-To-Here

Adjust the control on both commercial and residential systems and identify the settings with Set-It-To-Here markers.

Using markers of different colors are beneficial when various combinations of settings are required, such as for evening and day use, and for night club, etc., entertainers who each perform at alternating times or on different days of the week. Now the con-

trols on the sound system can be positioned to the arrows and other markers of the performer's designated color. Properly applied markers will remain adhered to the panel until removed with a fingernail or other non-sharp object.

One package that sells for \$6.49 contains a vinyl sheet consisting of a number of different self-adhesive markers.

Circle 70 on Reader Response Card



Eraser's New Brush Really Cleans Up

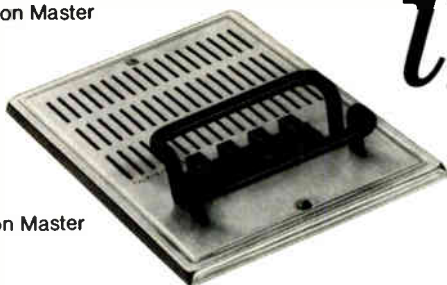
The Eraser Company Inc. has announced the availability of the new Model ABR6C, abraser cleaning and

Automatic **hands-free** communication between Menu Board and Window Order Taker

TALK-A-PHONE
Fast food drive-up intercoms



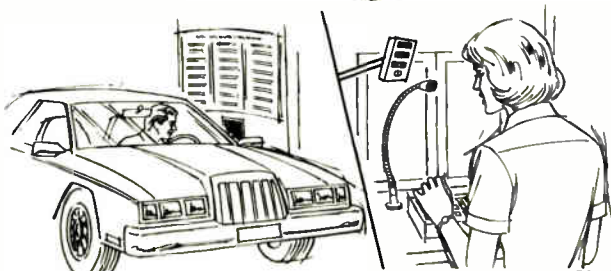
TAP-1R Single Station Master



TAP-4R Four-Station Master

Rugged and dependable with exceptional intelligibility

Neither Master nor Sub uses controls with TALK-A-PHONE Fast Food Drive-up Intercoms. Background noises are suppressed to provide exceptional intelligibility even in noisy locations. Talk-A-Phone Intercoms can be used with customer's new or existing vehicle detector.



TALK-A-PHONE CO.
5013 NORTH KEDZIE AVE. • CHICAGO, IL 60625
DEPT.

Circle 222 on Reader Response Card

burnishing brush, made of coarse grade fiberglass and used for a variety of cleaning and burnishing operation in the electrical and electronic industries.

The ABR6C is covered with a plastic sleeve. A gentle brushing action will burnish or clean a variety of surfaces, metallic or non-metallic. The model ABR6C will not contaminate or alter the electrical properties of the

surface cleaned.

The Abraser is made for cleaning small areas, as it is 1/4-inch OD and 7/8-inches long. It is a tool for deburring metal or plastic parts, cleaning motor commutators, removing rust and corrosion, or cleaning electrical contacts. It is also a tool that can be used for repair, rework, or final touch-up jobs.

Circle 71 on Reader Response Card

McKenzie Crossovers and Dividing Networks

McKenzie Acoustics has developed its own range of loudspeaker crossover units and filters.

The CX25 crossover is designed to improve performance and protection in a three-way system at frequencies of 800 Hz and 5 kHz. McKenzie Acoustic's CX35 crossover operates in similar fashion at 2 kHz and 5 kHz.

A typical use for McKenzie's CX5 passive filter within a two-way loudspeaker system provides tweeter protection at 5 kHz.

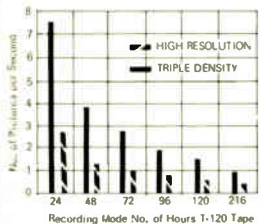
Circle 72 on Reader Response Card

CREST TA-104TL STATE OF THE ART TRIPLE DENSITY™ RECORDER

- Wireless Remote Control
- HQ - High Quality Operation
- High Resolution/Triple Density Selectable
- On-Screen Prompt Driven Menu
- Multiple Timer/Speed Setting
- Flicker and Noise Free Search
- 12 Selectable Speed Settings



COMPARISON NUMBER OF PICTURES PER SECOND
TA-104TL High Resolution vs Triple Density Mode



The TA-104TL is the only High Resolution/Triple Density selectable recorder in the industry today. Triple Density recording provides three times as many pictures in the same time period as conventional recorders. This means less time between shots and a better opportunity to catch the image you need.

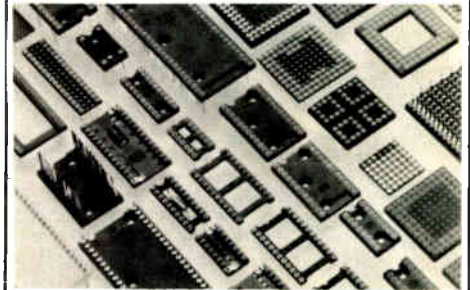
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FAX (213) 731-1417

Circle 225 on Reader Response Card



New Sockets and Adaptors from Samtec

Samtec low insertion force pin grid array sockets are available in over 150 standard pin grid array patterns from eight by eight arrays to 20 by 20 arrays to match most common semiconductor part numbers and matching Samtec connectors. Both solid body and ventilated open body designs are available.

The Samtec line of DIP sockets and adaptors now includes new low profile and standard profile high temperature polyester body designs. The new sockets and plugs are suitable for most vapor phase and infrared soldering processes.

These connectors are available with a selection of low insertion force lead sockets and terminals with surface mount, low profile, solder and wire-wrap terminations. Lead sockets and terminals include surface mountable designs and super low profile lead sockets less than .100 inch above the board.

Prices start at 20¢ at the 1,000 piece level and most are available from stock.

Circle 73 on Reader Response Card

PRO POWER SERIES.. PROFESSIONAL PA and BACKGROUND MUSIC AMPLIFIERS



PRO-20T



PRO-40T



PRO-50



PRO-120



PRO-T

- Professional, rugged P.A./ Background music systems
- Built-in custom features
- Balanced or unbalanced, high or low impedance microphone inputs. No matching transformers required.
- ALL CANNON lock-in microphone connectors
- TRUE RMS Power ratings
- Efficient integrated circuit construction. Lowest noise microphone preamps in any P.A. line
- Rack Mount construction
- Overload Protection built in
- Equalizer Input feature in all models except PRO-20T
- Up to FOUR Microphone inputs
- PRIORITY PAGING Feature
- AM-FM Tuner accessory unit (Model PRO-T)
- Background Music AM-FM Tuner built-in (Models PRO-20T, PRO-40T)
- Phone-type jacks for speaker connections
- Traditional Fanon Quality construction and advanced engineering
- Full Fidelity—Factual, guaranteed specifications
- Custom Styling
- "Soft Gold" Anodized front panels
- Four step-up Power Ratings: 20 watts, 40 watts, 50 watts and 120 watts.
- More Watts per dollar

DATE	EVENT/COMMENT	LOCATION	CONTACT
September 16-17	Fourth Annual Electronics and Commercial Sound Show.	Charolette, NC	Rohr, Wagner, Roberts (803) 324-5111
September 21	"Seminar for a Sound Education." Audio seminars sponsored by Secom Systems.	Atlanta, GA	Secom Systems (404) 455-0672
September 27-29	"MCA '87: MMDS+ITFS+OFS= The Future Medium for Entertainment and Education" Microwave Communications Association's convention.	Washington, D.C.	Microwave Communications Association (202) 659-4417
September 28-29	NSCA Regional Conference.	Detroit, MI	NSCA (312) 593-8360
October 1-2	NSCA Regional Conference.	Pittsburgh, PA	NSCA (312) 593-8360
October 15-18	International Business Music Association Convention.	Palm Springs, CA	IBMA (216) 833-4164
October 16-19	Audio Engineering Society Convention.	New York, NY	AES (212) 661-8528
October 29-30	International Planned Music Association Annual Convention.	New Orleans, LA	David Payne (805) 965-5268
October 31- November 4	SMPTE.	Los Angeles, CA	SMPTE (914) 761-1100
November 9-10	NSCA Regional Conference.	St. Louis, MO	NSCA (312) 593-8360
November 12-13	NSCA Regional Conference.	Chicago, IL	NSCA (312) 593-8360
November 29- December 1	L.A. Sound and Video Show.	Los Angeles, CA	Westech Marketing (213) 870-9286
November 30- December 1	NSCA Regional Conference.	Los Angeles, CA	NSCA (312) 593-8360
December 2-4	Unicom '87. Exhibition sponsored by NATA.	Dallas, TX	Karen Palermo (202) 296-9800
December 3-4	NSCA Regional Conference.	San Jose, CA	NSCA (312) 593-8360
January 7-10	CES.	Las Vegas, NV	CES (202) 457-8700
January 15-17	NAMM.	Anaheim, CA	NAMM (619) 438-8001

FACES AND PLACES

Personnel Changes at QSC Audio

Several personnel changes have taken place at QSC Audio. Greg Hockman has left the company to pursue other interests. Greg McVeigh has taken his place. The company has retained the services of Erika Lopez, and Audient Marketing. Ms. Lopez has worked for Soundcraft and JBL. In addition to public relations Ms. Lopez will negotiate ad placement for the company. Pete Kalmen will be the new national sales manager.



**JOHN
McNAMARA**

McNamara Named Sales/Marketing Director

John McNamara has been named director of sales and marketing for Dialight Corp.

McNamara has been with Dialight for 24 years. He was most recently eastern region sales manager, a post he held since the merger of Dialight Kulka and HHSmith product lines both domestically and internationally.

Prior to the merger, McNamara held a variety of positions with Dialight in engineering, manufacturing, inside sales, field sales and sales management, including Mid-America Regional manager.

A graduate of Edison State College in New Jersey, McNamara has a B.B.A. degree in management.

Telex Communications Reorganizes Engineering

Telex Communications, Inc. (TCI) has reorganized its engineering department. TCI chairman Ansel Kleiman says the reorganization "is in keeping with the corporate focus on the integration of voice and data communications technologies." Effective with the reorganization in September, Dean Flygstad, v.p. engineering, has been promoted to senior vice president

for science and technology, a new position. He will be succeeded by Joseph Weinbarger who has been named to v.p. engineering. Weinbarger will transfer to the TCI headquarters in Minneapolis from Raleigh, NC, where he was director of advanced development at Telex Computer Products.



**JOHN
STIERNBERG**

Stiernberg Becomes Sales Manager for dbx

John E. Stiernberg has been appointed national sales manager for dbx professional products. Stiernberg had been product division national sales manager for Bose Corp. since 1981.

A veteran of almost 15 years in the industry, Stiernberg has been involved with every facet of the music business—composer, record producer, manager of professional groups, music retail manager, and manufacturers' representative.

Soon after his graduation from Ripon College in Ripon, WI in 1973 with a BA in music and anthropology, he joined Morgan Brothers Music in Oshkosh, WI, where he managed the retail store, handled the music lesson program and booked talent until he joined Bose Corp. in 1981.

Stiernberg is a member of the National Academy of Recording Arts and Sciences (voting member), National Association of Music Merchants, American Federation of Musicians, International Business Music Association, National Sound and Communications Association, and the International Planned Music Association.

REP NEWS

The data communications product line of **Mitel Datacom Inc.** will be represented throughout the United States by 12 manufacturers' representative firms, the company announced. The 12 firms will sell a full line of CCITT compatible modems, including the DM 4962X, the first functional V.32 modem, multiplexers, data over voice equipment and line drivers. The data communications products, manufactured by **British Telecom Datacomms**, are sold and supported in the U.S. and Canada by Mitel Datacom as part of a marketing agreement between the two companies announced in March, 1987. The rep firms are: **Colins-Co, Inc.**, Orlando, FL; **CSI Systems, Inc.**, Lexington, MA; **Data Express**, Anaheim, CA; **DataAids, Inc.**, The Woodlands, TX; **DataNet**, Englewood, NJ; **RG Engineering**, Rochester, NY; **Rush-Drake Electronics**, Lake Oswego, OR; **SEA, Inc.**, Carmel, IN; **Stone & Associates**, Hazelwood, MO; **Technical Sales Associates**, Rockville, MO; and **WKM Associates**, Pittsburgh, PA.

Broadening its sales coverage to provide increased customer service, **IMC Components** has retained **Michigan Romax Sales, Inc.** of Warren, MI. Acting as an independent manufacturer's representative. Michigan Romax Sales will provide sales representative for **IMC Components** and its fan line in Michigan. Founded in 1981 by Roger Brady, president, Michigan Romax Sales specializes in providing electro-mechanical products to OEMs in the electronics, automotive, industrial, and military industries. Also, IMC has retained **Birde Marketing Inc.** of Markham, Ontario. The company will provide sales representation for **IMC** and its fans line throughout the Canadian regions of North America. Birde Marketing maintains field sales offices in Montreal, Quebec, and Ottawa, Ontario. The headquarters is in Markham, Ontario.

Williams Sound Corp. has appointed **Warren Associates** of Santa Clara, CA, as their new representative for Northern California and Northern Nevada.

S & C's Job Report

Format

STATE

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

TOTAL CONSTRUCTION

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

PHASE OF PROJECT

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

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

ALASKA

Fairbanks: Fairbanks Activity Center, NA, B. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

CALIFORNIA

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

Concord: Automatic Data Processing, 1,D. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

Los Angeles: Ketchum Communications, 1,D. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

Los Angeles: Simon Wisenthal Center, 3, A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

Menlo Park: Raychem Corp, 1,A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

Milpitas: Sun Microsystems, 1, A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

Modesto: Trinity Presbyterian Church, 1,D. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

Oakland: East Bay Municipal Utility

District, 1,A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

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

Palo Alto: Kleiner, Perkins, Caufield, Buyer, 1,C. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

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

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

San Diego: UCSD Graduate School of International Relations, 1,A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

San Francisco: First Interstate Bank of California, 1,C. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

San Francisco: Kleiner, Perkins, Caufield, Buyer, 1,A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

San Francisco: St. Mary's Cathedral, NA, D. Contact: Marc L. Beningson, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.

San Francisco: Portman Hotel, 1,D. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

San Jose: Ford Aerospace, 1,A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

San Jose: McDonnell-Douglas, 1,B. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7620.

San Jose: San Jose State University Recreation and Events Center, NA, D. Contact: Edward McCue, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

San Jose: St. Joseph's Cathedral Center, 1,B. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.

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

CONNECTICUT

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

FLORIDA

Miami: Bayfront Park, 2,C. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

Naples: Naples Performing Arts Center,

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

ILLINOIS

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

KENTUCKY

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

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

MASSACHUSETTS

Boston: Hayden Hall, Boston University, 2,B. Contact: Chuck McGregor, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.

MINNESOTA

Minneapolis: Minneapolis Armory, NA, A. Contact: Steve Orfield, Orfield Associates, Minneapolis, MN; (612) 727-2557.

MISSOURI

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

NEW YORK

Astoria: American Museum of Moving Images, NA,B. Contact: Wade Bray, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.

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

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

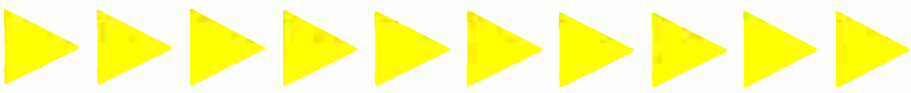
New York: JP Morgan Bank Trust Committee Room, NA,D. Contact Marc L. Beningson, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

New York: Metropolitan Opera, NY Philharmonic Summer Parks Concerts, 3,A. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

OHIO

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

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



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Columbus: Ohio State Office Tower (Theaters), 5,C. Contact: Chuck McGregor, Jaffe Acoustics Inc., Norwalk CT; (203) 838-4167.
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Kettering: Lincoln Park Amphitheatre, NA,A, Contact: Chuck McGregor, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.
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Dallas: Texas Instruments, Center III Mini Theater, NA, B. Contact: Dave Marsh, PMI Acoustics, Inc., Dallas, TX; (214) 960-7666.
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Washington, DC: National Council of Catholic Bishops Conference Center, 2,D. Contact: Marc L. Beningson, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.
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Halifax: A/V system for City Council Chamber of Halifax, NA,C. Contact: Peter Terroux, Halifax, N.S.; (902) 429-4616.
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S.S. ADMIRAL
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 microphones and replace the transducer with a new device. However, AKG was kind enough to bring onto the market at the perfect time the correct microphone for this application, the AKG D112. It looks great and functions in accordance with our design.

THE BIRDLAND THEATRE
 The 350 seat theatre is located on "A" deck of the boat and features an 18 minute show, presenting music of the Mississippi river boat days, performed by a cast of over 12 animated characters. The audio system is designed to support the multi-channel show tape, produced by Landmark Entertainment Group. In addition to the left and right stereo and surrounding music tracks, additional tracks and speakers are provided for point-source character dialog on the set.

Equalization, limiting and time delay are all incorporated on the tape itself, while the actual show levels and track switching are controlled by a custom VCA level controller and switch matrix developed by Marshall Long Acoustics. All elements of the show, including animation, lighting and the audio control are synchronized to a SMPTE time code track, using a show control system designed and installed by Triad Productions, Inc.

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CONTRACTING CLOSE-UP

Contractors Win Audio-Technica Contest

Two contracting firms won prizes for submitting examples of UniPoint microphone installations in the "Show Us Your Unipoints!" contests.

AV Associates, Storra, CT, won a Silver Eagle professional tool kit for a church installation using the AT853W

choir microphone. The white AT853Ws are hung above the church choir and complement the all-white interior of the sanctuary.

Sound Com Corporation, Berea, OH, also won a Silver Eagle tool kit for a church installation, also using the

AT853. In this installation, the AT853 is used to amplify the organist/soloist, who also directs the choir. The AT853 gives the organist enough room to conduct the choir from the organ console, while still providing enough coverage for vocal solos.

Commemorative plaques were also sent to the winning contractors, while runners-up were awarded custom Audio-Technica jackets.

Contractors Install Turbosound in a Variety of Places

Turbosound recently installed several new sound systems in an array of markets.

According to Dan Abelson, vice president of marketing, the company continues to grow in the sound reinforcement, touring area, and has been stepping up its business in the sound installation market. "Since we introduced the TSE installation series three years ago, we have increased our business in church reinforcement and theatre and concert hall reinforcement."

The Apollo Theatre in Harlem, New York recently was supplied with a whole new sound reinforcement system thanks to Turbosound. As part of a comprehensive refurbishment of the 1914 building, which will transform the theatre into an audio/video/television center for live performance and broadcast, the Apollo needed a high-quality sound reinforcement system. After a year of testing different systems, the Apollo management picked a system of 16 Turbosound TMS-4 enclosures.

New Jersey's Thunder and Lighting was responsible for the installation.

In another part of the world, Turbosound's Agent for Israel, Barkai Ltd, was recently chosen to provide sound reinforcement equipment for the Hapoel Games, Israel's premier sporting event. The Games are recognized as an important Olympic qualifier.

The system was of "Olympian" proportions, no less than 40 TSE-111's, 30 TSE-118's, 26 TMS-2's, six TSE-260's, 12 TMS-4's, four TMW-215's and eight

TMW-212's were used. The enclosures were arranged in two main stacks and placed at regular intervals around the entire track.

In another area, Crystal-Taylor Systems, Turbosound's exclusive Philadelphia dealer, supplied Peirce-Phelps with a TMS-3 system for sales to the city of Philadelphia. The system will be permanently installed in the Robin Hood Dell East amphitheatre, a 10,000 seat outdoor venue.

The speaker system consists of 20 TMS-3 cabinets flown from the roof of the facility on Turbosound FB-312 flying bars. Eight TMS-4 full-range cabinets are used for front fill, with four TWS-124 subbass cabinets rounding out the system.

Crystal-Taylor Systems assembled and wired the racks, the signal distribution system and the AC distribution as well as the loudspeaker system. The complete package includes a 40-input Yamaha PM-3000 house console, a 32-input TAC monitor console, Crown Microtech amplification, Brooke Siren FDS-360 Crossovers, and Klark-Teknik DN 360 graphic equalizers.

Lastly, K Squared Associates of Plymouth, Michigan, has been awarded the contract for a new sound system in the first Assembly of God Church in Winston-Salem, NC. The system consists of seven TMS-2 and seven TMS-1 as a central point-source array, two TMS-2 full-range cabinets provide fill for the choir along with four TMW-215 low profile floor monitors.

Altec Lansing Goes for a Swim

Industrial Communications Company, a Florida-based sound contractor, installed an Altec Lansing sound system for the Mission Bay Aquatic Training Center, Boca Raton, FL.

A two-way sound system is located on the top portion of the scoreboard and is comprised of four 817A low frequency horns, with two 515-B 8GHP bass drivers each. The high-frequency section is comprised of four Mantaray® Constant Directivity horns with 291 high-frequency drivers. The system is driven by two Altec Lansing 2200A Incremental Power® System Mainframes with 2275 75 watt amplifier cards and 2276 150 watt amplifiers for a total of 800 watts. The power amplifiers are located inside the scoreboard. In the announcer's booth is an Altec Lansing 1692 mixer and 1653 1/3-octave equalizer.

Audio West Installs Apogee

Glen Hatch of Audio West has installed 15 Apogee AE-1 speakers in the Angeles Temple in Los Angeles, CA. The AE-15's are being used as balcony fill for the two balconies in the large, domed structure. Eight AE-1's are mounted to the wall on yokes, and seven AE-1's are mounted on poles using the integral yokes at attachment points. The speaker system is powered by two Crown Micro Tech MT1200LX amplifiers. A Klark Teknik DN716 delay was used to time align the balcony system with the original.

WHAT BRAND

(continued from page 16)

standards have evolved and are still used in the meantime. Obviously, this makes it a difficult procedure for any one to know what the baseline is—let alone compare frequency response of different headphones.

ACKNOWLEDGEMENTS

The author wishes to thank: Jon Sank for his guidance in the preparation of the manuscript; Hans Dietze for obscure info; Daniel Queen for perspective; and Paul Murphy for the DT-48 History.

Next month, in our Tech Notes, we will include a review of the basics of how the outer ear and pinna react with a sound field and with headphones; and a review of real-ear measurements with miniature probe microphones, and the various couplers used as calibrated test fixtures.

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TECH. SPEAKING

(continued from page 10)

must be presented with all of the facts so that he may properly assess what his consultant has done and not done. If he feels it is the typical case of "sour grapes" he may not listen at all. But sour grapes do make champagne, and

a well-written letter often moves one's foot from mouth through the door.

Options available to the owner are going back to the consultant and asking him to complete or redo the spec, or even ask you to recommend what type of systems approach to take. This tact has been successful for many situations.

Surely loudspeaker specs will prevail that read: "Frequency response shall be flat within the limits of ± 5 dB from 20 Hz to 20 kHz. Efficiency shall be such that an electrical signal of one watt shall produce a mean sound level of 116 dB at one meter distance. Dispersion shall be 360° at all frequencies. Power handling capacity shall be 350 watts continuous music and speech. Impedance shall be 8Ω at all frequencies and shall be non-inductive and non-reactive. The loudspeaker shall carry a lifetime warranty." Where can I buy one of these?

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Looking back at **SOUND & COMMUNICATIONS**

30 Years Ago

In the September, 1957 issue of *Sound & Communications*

According to "Late Lines," one of the newer markets for background music was construction companies using music to entertain sidewalk superintendents viewing operations through peep-holes. Wonder if 42nd Street picked up on the idea?

"People and Companies Making News" reported on a closed-circuit television registration system that was working at the Jack Tar Orange House in Orange, TX, to speed-up and simplify guest registration. The tele-visual hook-up enabled guests to register and to pay their bills directly from the motor entrance. The system used three RCA "TV Eye" CCTV chains. One was a camera installed at the hotel's main registration desk in the lobby to project a picture of the room clerk to a TV receiver mounted over

the outside TV registration desk. A second camera was focused on the outdoor desk to transmit a picture of the guest to the room clerk. A third scanned the driveway, enabling the room clerk to view on a second receiver the make, model and license plate of the guest. Also included was a two-way intercom system and a pneumatic tube for exchange of registrants cards, room keys, bills and payments

20 Years Ago

In the September, 1967 issue of *Sound & Communications*

One of the new products introduced was the "weathercaster," a time weather channel originator, that may have been used in CATV systems and for hotels, motels, schools and TV stations. The unit comprised a fixed vidicon camera focused on a rotating mirror which picked up eight viewing

positions; a clock, barometer, thermometer, wind direction indicator, rainfall indicator, wind velocity indicator, relative humidity indicator and rotating sign holder. The six sided sign holder was used to display news announcements, advertising or public service messages.

Telex Corp. opened a 50,000 square foot manufacturing plant in Blue Earth, MN.

15 Years Ago

In the September, 1972 issue of *Sound & Communications*

In "Late Lines," *Sound & Communications* called for the organization of a trade association saying, "Trade association for the private telecommunications and sound system contractor is one idea whose time has come."

"Face-to-Face-Phones" (no author given) gave a description of a picture telephone system "that provided a sharper image than the standard black and white home television..." It was developed by L.M. Ericsson Telephone Co. of Sweden. One of the uses for the system was for internal visual communication in large corporations or institutions..." So now you can not only hear how angry your boss is you can see him turn funny colors too.

10 Years Ago

In the September, 1977 issue of *Sound & Communications*

"Sounding Off at New Port" detailed the sound system that was used during the 1977 Newport Jazz festival. The system was installed by Capron Lighting of Needham, MA. Among the equipment used to test the systems was an Electro-Voice RE-2 microphone and a White Model 150 hand-held spectrum analyzer.

In "Sound Sells with Spirit," Arch Hope detailed the point of purchase electronic selling program to stimulate in-store sales used by Foremost Liquor Store in Chicago. Six color TV sets were located around the store and played a repeating 25 minute videotape of beer, liquor and wine ads. And the clothing stores today act like they thought of it first.

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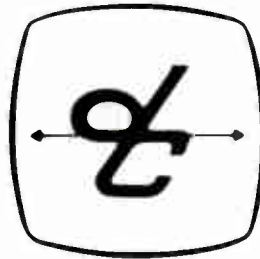
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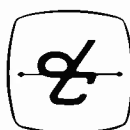
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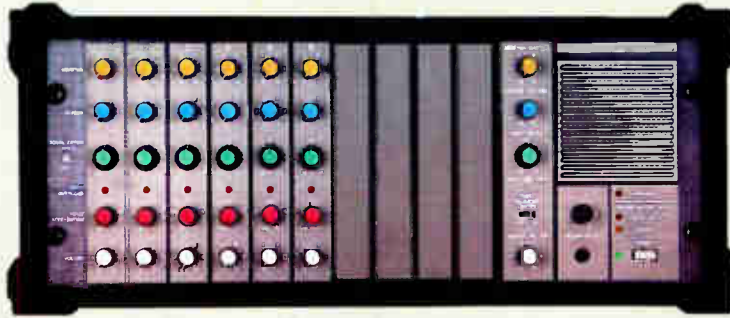
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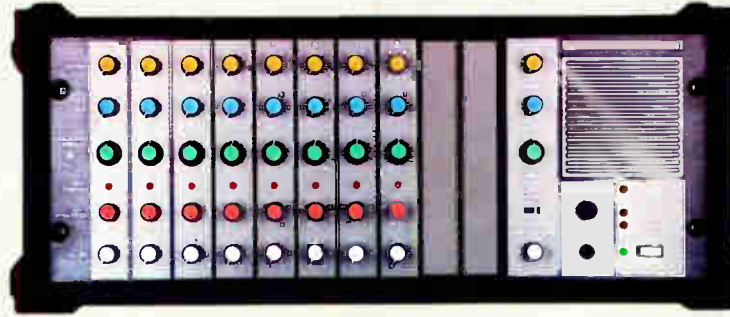
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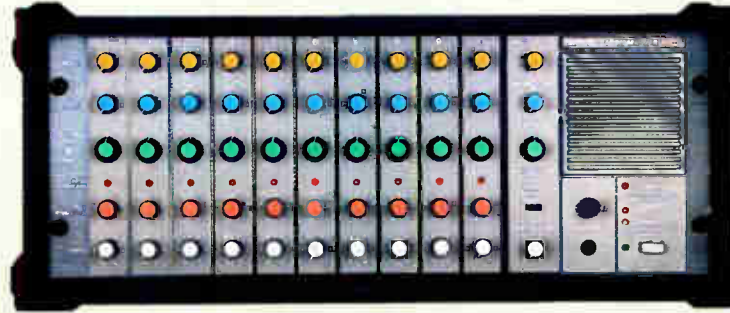
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