

OUTDOOR AMPHITHEATER SOUND

SOUND & COMMUNICATIONS

FOR CONTRACTORS, SYSTEM MANAGERS AND SPECIFIERS

DECEMBER 1986

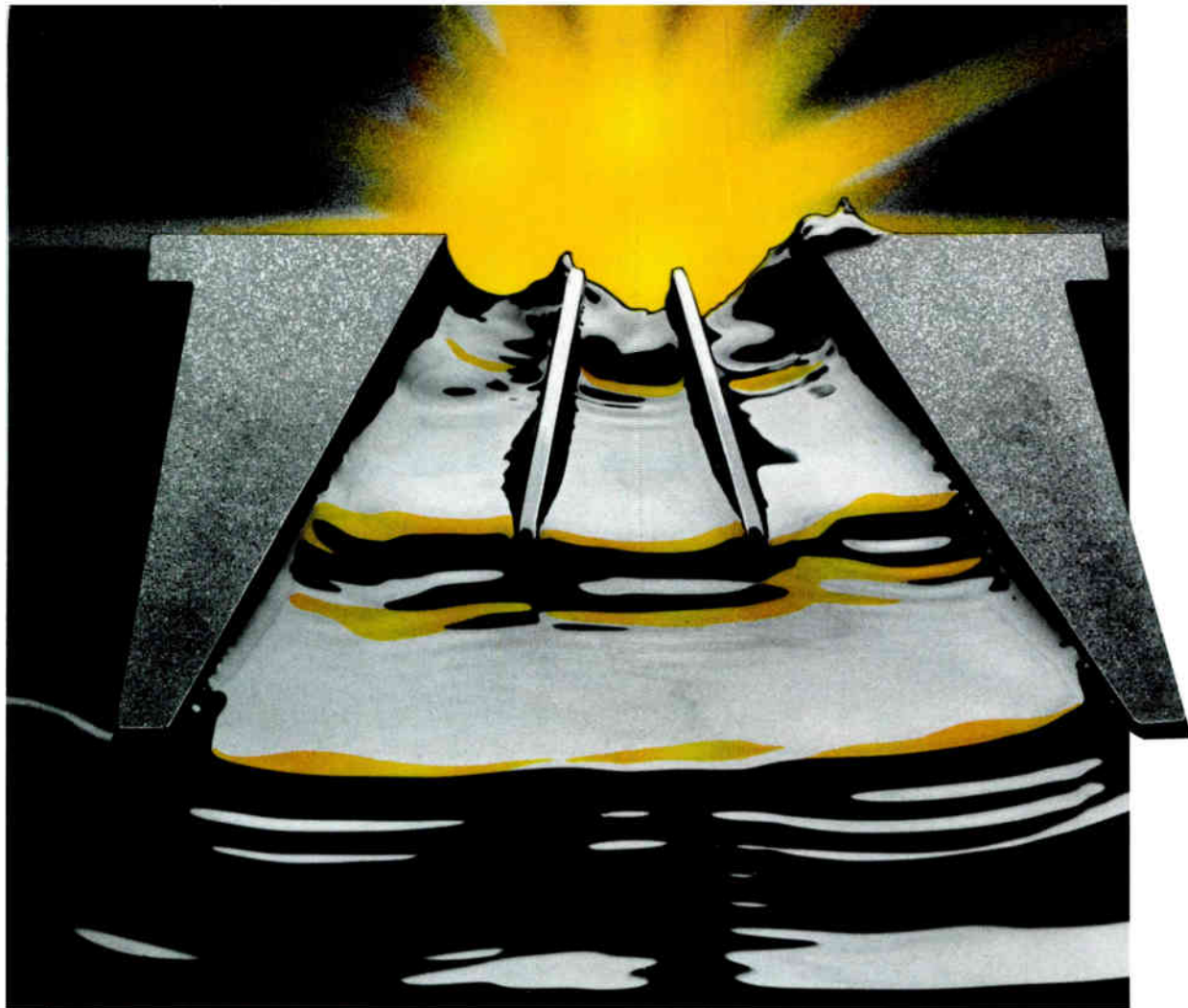
**1986
INDUSTRY
REPORT**

**1986
ECONOMIC SURVEY
FOR
SOUND & COMMUNICATIONS
MAGAZINE**

**DIGITAL
SIGNAL
PROCESSING**

**PROOF OF
PERFORMANCE**


HARRY HELLER RESEARCH CORP.



NEW WAVE DESIGN

Blocking the Incoherent Wave

Cast into the throat of every **TransPlanar™ HP horn**, unique beamwidth control vanes represent a revolutionary advance in constant-directivity design. Until now, two-inch-throat designs were compromised by on-axis dropout. Intrigued with this curious problem, EV engineers applied principles of geometric optics to isolate the incoherent waveform responsible for this phenomenon. Instead of coursing down the horn in an organized fashion, this offending wave reflects off the walls of a two-inch throat, shadowing direct output and causing a loss in level. Ray analysis was used to predict this occurrence and determine the exact configuration of slotted waveguides which block the cancelling wave and eliminate on-axis dropout.

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Live Sound Engineer



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Danny Watson
Promise Productions
Producer/Keyboardist

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Miles Kapper
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AV Staging Specialist

Three professionals whose careers depend on getting excellent sound — and though each has a different set of criteria, all agree on the benefits of QSC's Octal Accessories. QSC has pioneered the development of high power, low-profile amplifiers of unquestionable fidelity and reliability. And with the new Octal Accessories we've also pioneered versatility. QSC's unique Octal socket [which is standard on all Series One and Series Three amps] accommodates a whole line of passive and active Octal Input Modules — from input transformers to electronic crossovers and power limiters — audio accessories that enhance and customize the performance of each QSC amplifier, quickly and easily, and at a cost far less than buying rack-mounted devices. And when requirements change, a different QSC Octal module can meet that need. In this way QSC is making obsolescence a thing of

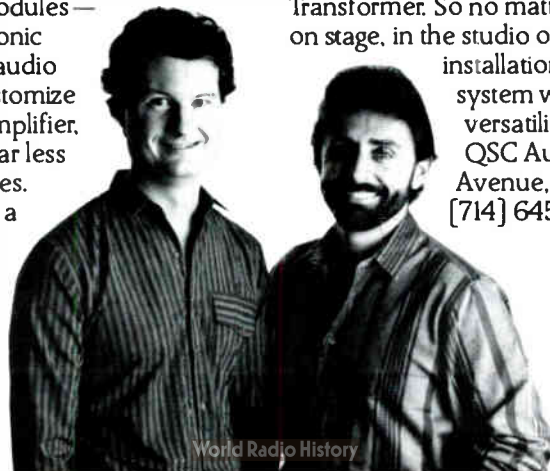


the past. QSC Octal Products are space-savers too: each module attaches at the rear panel, out of the way without adding rack space. All Octal Accessories perform to the same high standards that distinguish QSC amplifiers, combining meticulous design considerations with real-world durability. Octal Modules include: XH-1 and XL-1 Crossovers, PL-1 Compressor/Limiter, UF-1 Universal Active Filter, T-1 Input Transformer, A-1 Octal Attenuator, and AT-1 Octal Attenuator with Input Transformer. So no matter where your sound matters — on stage, in the studio or in a custom designed

installation, QSC provides your sound system with an invaluable lasting benefit: versatility. For more information contact: QSC Audio Products, 1926 Placentia Avenue, Costa Mesa, CA 92627 [714] 645 2540.

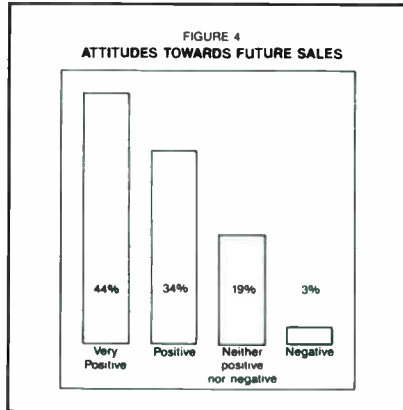


Quality Service Commitment.



Patrick Quilter
Vice President/Engineering,
QSC Audio.

Barry Andrews
President,
QSC Audio.



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24 1986 ECONOMIC REPORT

From the annual survey of manufacturer's sales, *Sound & Communications* reports on what kind of year it has been for the sound and communications industry as whole and how each individual segment did in 1986.

30 INSTALLATION PROFILE: AN OUTDOOR SOUND SYSTEM RENOVATION by Greg Robertson

Audio Associates recently renovated the outdoor sound system for a 4,400-seat amphitheater which was backed by a solid brick wall with a multilevel hillside stage that covers almost an entire city block.

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ON THE COVER

This year *Sound & Communications* went to the research firm of Harry Heller & Associates in Port Washington, NY, to conduct its annual economic survey. Results from the survey are passed on to you in *Sound & Communications'* 10th Annual Economic Report on page 24.

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Our new SOUNDGUARD™ audio surveillance monitor watches out for you.

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Our new automatic mixer watches your microphones for you...and

Our new school & power intercoms make communications easier for you.



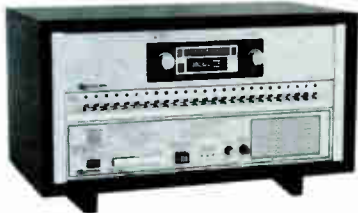
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The One To Watch!

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Performance impressive enough
to change a sound pro's old habits.

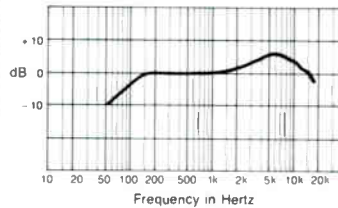
SURPRISING!

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

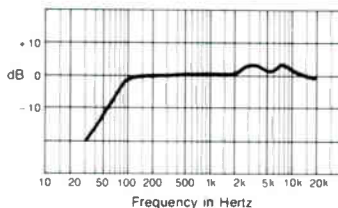
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on TD13 dynamic enhances vocals



Wide flat, studio quality
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TELEX

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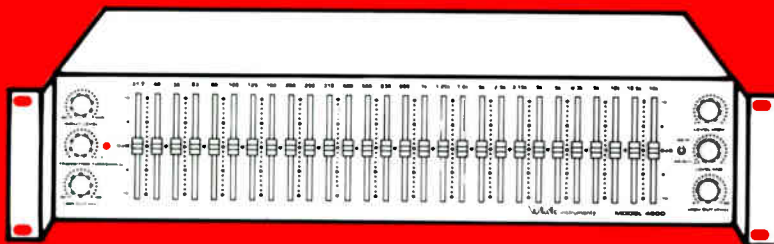
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If you take us apart, you'll take us on.

When we decided to expand the Quam line to include ceiling baffles, backbox enclosures and assemblies, we wanted to do more than just complement our loudspeaker offerings. We wanted to give the contractor another choice. Judging from the growing list of contractors who have switched to Quam, we did just that, with an unbeatable combination of quality, price and service.

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example. From the heavier gauge metal to the more durable epoxy finish, Quam baffles are made in our own plant to look, install and perform better. The same is true of the entire Quam line, from enclosures to transformers to 8" speakers.

You don't pay a premium for this higher quality, because as always, Quam's prices are very competitive. Nor do you pay the hidden cost of maintaining inventory. All catalogued

items, including assemblies, are ready to ship on receipt of order from our 70,000-piece warehouse stock. You buy Quam only as you need the parts.

Take us apart. Then take the competition apart. You'll see that Quam is your best choice. Call or write for your free Quam commercial sound products catalog, and take us on. It's the sound decision.

Quam: The Sound Decision



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EDCOR PURCHASES DELTA MAGNETICS

Edcor has announced the purchase of Delta Magnetics, a transformer manufacturer. Edcor will now market audio and power transformers to sound contractors, while Delta Magnetics will continue to market transformers to OEM users. The Edcor line will consist of a standard series of "off-the-shelf" audio as well as custom-designed transformers. Existing Edcor representatives will direct regional sales efforts. Edcor and Delta Magnetics have reported to have developed a CAD-CAM program to assure high quality low price transformers. All quoting and design is computerized for fast customer response.

CREST ELECTRONICS PURCHASED BY PRIVATE INVESTOR GROUP

A group of investors, led by a Minneapolis investment banking firm, has purchased Crest Electronics of Dassel, MN. Investors include the principals of Hunter, Keith, Marshall & Co., Inc., specialists in the private placement of fixed income securities. James H. Holm an independent investor and former executive with General Mills, Inc. will serve as Crest president and chief executive officer. Crest supplies a diversified product line including nurse call systems, staff registers, patient security systems and other electronic devices to hospitals, nursing homes, and senior citizens' residences.

SIECOR CORPORATION TO OPEN TOKYO OFFICE

Dr. Charles B. Wakeman, president of Siecor, has announced the opening of an office in Tokyo for Siecor's Asian operations. David D. Baskerville, vice president-Asia, who has lived and worked in Japan for 14 years, will head the office in Tokyo, which will open with a staff of five. Wakeman indicated that the Japan market will be at first the focal point of the new office's marketing efforts. "We are most pleased that Japan is beginning to open the telecommunications market to overseas suppliers," he said. "This fiber optic market is expected to grow substantially in the years to come. Siecor is committed for the long term to supplying, in an orderly manner, quality, price-competitive telecommunication products to Japanese customers."

U.S. TELECOMMUNICATIONS SURVEY FINDS PROBLEMS FROM DIVESTITURE

U.S. Telecommunications Suppliers Association (USTSA) recently conducted a survey to see how its members felt about how divestiture is working and how it has affected their competitive opportunities. The nine-question survey, which received response from 25 percent of the manufacturers and suppliers belonging to the association, found that while competition for business from Bell Operating Companies (BOCs) is stronger than ever, the benefits of that competition are not necessarily seen in increased sales to the BOCs. About half of the respondents indicated they had been doing business with the BOCs prior to divestiture. Of those, 38 percent said they are doing more business today, 33 percent are doing less and 28 percent are doing about the same. Asked if the BOCs favor AT&T as a supplier, only 44 percent answered yes. However, most indicated Bell-core has not been an asset to the industry. The members were asked to rate the regional holding companies for their willingness to buy solely on the basis of price and quality. The results showed that Pacific Telesis was the best and Southwestern Bell was the worst. The general result of the survey was that the BOCs are not perceived in a positive light by their supplier community, and barriers to sales are still thought to be significant.

INTERSONICS, INC. MOVES TO NEW FACILITIES DUE TO INCREASED SALES

Strong sales during the last two years at Intersonics have resulted in the company moving to expanded operating facilities. Relocating within the same northern Chicago area suburb, Intersonics now has an additional 13,000 square feet, allowing for an increased production area, a large demo facility, and a test room for their servo-drive subwoofers. Improved laboratory facilities for other high-tech activities, together with

additional office and conference space provide for Intersonics continued growth, according to Charles A. Rey, president. "Our sales in 1985 tripled over the previous year, and we are projecting a 100 percent sales increase again in 1986," said Rey. "Our previous location was oriented toward scientific research and project development. The SDL subwoofer growth necessitated a move to ensure continued customer satisfaction, and we anticipate an end to delivery delays by this fall." The company plans to add personnel and future plans include expansion of their woodworking facility, assembly-line production layouts, and an in-house spray booth.

WILLIAMS SOUND EXTENDS WARRANTY EFFECTIVE SEPTEMBER 1, 1986

Williams Sound Corp. has announced that the company has extended the warranty on all commercial sound equipment from two to three years, effective September 1, 1986. The warranty covers parts and labor on the Personal PA/FM Broadcasting System, Tour Guide System and Williams Wireless Microphone System. The increase is due to the small amount of equipment returned for repair work and in part to Williams continued effort to provide complete customer satisfaction, according to the company.

LAN-TEL SURVEY REVEALS CONSUMER PHONE PREFERENCES

Lan-Tel Inc. of Marlborough, MA, recently conducted a survey that determined what consumers wanted in a telephone. According to the survey, they wanted a compact phone that wouldn't take up a lot of desktop space. The same phone should have extra large buttons that are spaced widely apart. Phones should offer the latest features and services, yet look exactly like the standard push-button phone. The color of the phone didn't matter, as long as it goes with the office decor. "According to this survey, designing a phone everyone will like is a very big challenge," remarked Joy Mullett, director of marketing for Lan-Tel. "How do you keep a phone compact while increasing the size of the push-buttons? That dilemma should keep telephone designers busy for quite a while." The market research survey was performed as part of Lan-Tel's marketing efforts for its new integrated and multinodal voice/data business communications system.

APOGEE SOUND DOUBLES SIZE OF PRODUCTION FACILITY, OPENS NEW OFFICE

Ken Deloria, president of Apogee Sound, Inc. has announced the expansion of the northern California production facility in Petaluma. "Due to nearly exponential growth in 1986, the expansion was necessary to continue our ability to meet tight delivery schedules," he said. All mid- and high-frequency horns will now be manufactured in the new plant at Cypress Business Park in Sonoma County, CA. Construction is scheduled to begin in January on an anechoic test chamber in the new facility. Deloria has also announced the establishment of the southern California sales branch headed by newly-appointed vice president of sales, Joe Manning.

ALTEC LANSING EQUIPMENT USED ON QUEEN'S TRIP TO CHINA

Queen Elizabeth, who was the first reigning British monarch to visit China, used Altec Lansing sound reinforcement equipment that was supplied by Fee Lun Radio Service in Hong Kong. Gary Rilling, vice president of marketing, sees the trip as significant because it shows that "Mainland China is coming into the 20th century and the people are becoming more relaxed. With royalty visiting the country, it's nice to see that American audio products were used throughout her trip."

CERWIN-VEGA MOVES TO EASY STREET (LITERALLY)

Cerwin-Vega, Inc. has announced that the company is moving to 555 East Easy Street in Simi Valley, CA 93605. The firm is expected to be completely moved into their new business address by November 1. The new facility will house all administrative offices and manufacturing functions in one 110,000-square-foot building.

LETTERS & OPINIONS

SOFTWARE SEARCH

I was very interested in the Computer Aided Speaker Design Program you had reviewed in the August issue of *Sound & Communications* magazine, and was wondering if you could advise me where this program could be obtained and at what cost.

Yours truly,
Robert W. Brown
Manager, Communication Systems
Len Finkler & Co.
Ontario, Canada

The article you are referring to was "A Software Review: Computer Aided Speaker Design," by Jesse Klapholz, Sound & Communications, August 1986, pp. 18 and 20. The software which was reviewed in the article was from Scientific Design Software, P.O. Box 3890, Northridge, CA 91323; (818) 718-1201. The cost for the software for an IBM computer is \$149.95 and for an Apple II is \$99.95

CHURCH SOUNDSPHERES

I am writing to request your assistance in a matter serious to Sonic Systems, Inc. Recently I received a phone call from a man who stated that he had been in Montreal and that Soundsphere loudspeakers were not at Notre Dame. I told him that I would check this out and asked for his phone number. He gave me a phony telephone number, starting with a non-existent area code.

I wish you to publish the following:

I wonder about the actual motivation of a person like you, spreading a rumor about Soundspheres not being in place and used at Notre Dame Basilica in Montreal. After receiving word from Soundsphere Rep Chuck Olson that he was told the same information, I became very concerned.

I requested that my Montreal rep, Aurele Desjardins, visit Notre Dame Basilica to give me a phone and written report. As of October 29, 1986, Aurele telexed that "everything is the same as that previously installed." Also, he stated "there has never been

at any time any talk about replacing or modifying the speakers and everyone is happy with the system. I presume that whoever is telling that the speakers are to be removed does not realize that these are the only speakers that can *disappear* in the fantastic decor of the church."

It could be that you are passing around incorrect comments about the Notre Dame Basilica installation or that you made another error. That is, that you were in Notre Dame Cathedral in Montreal. You see, one place is called a Basilica and the other a Cathedral. They are similar in size and even Montrealers occasionally confuse the two. I would like to believe that you were in the wrong church and will adjust any future statements you make about Soundspheres at Notre Dame Basilica in Montreal.

Cordially yours,
John J. Karamon
V.P. Marketing
Sonic Systems
Stamford, CT

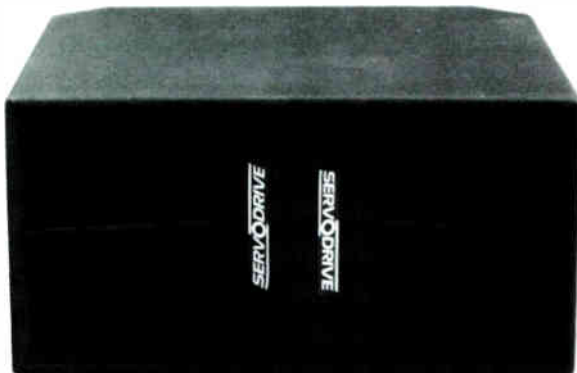
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- ★ Longer Warranty Period
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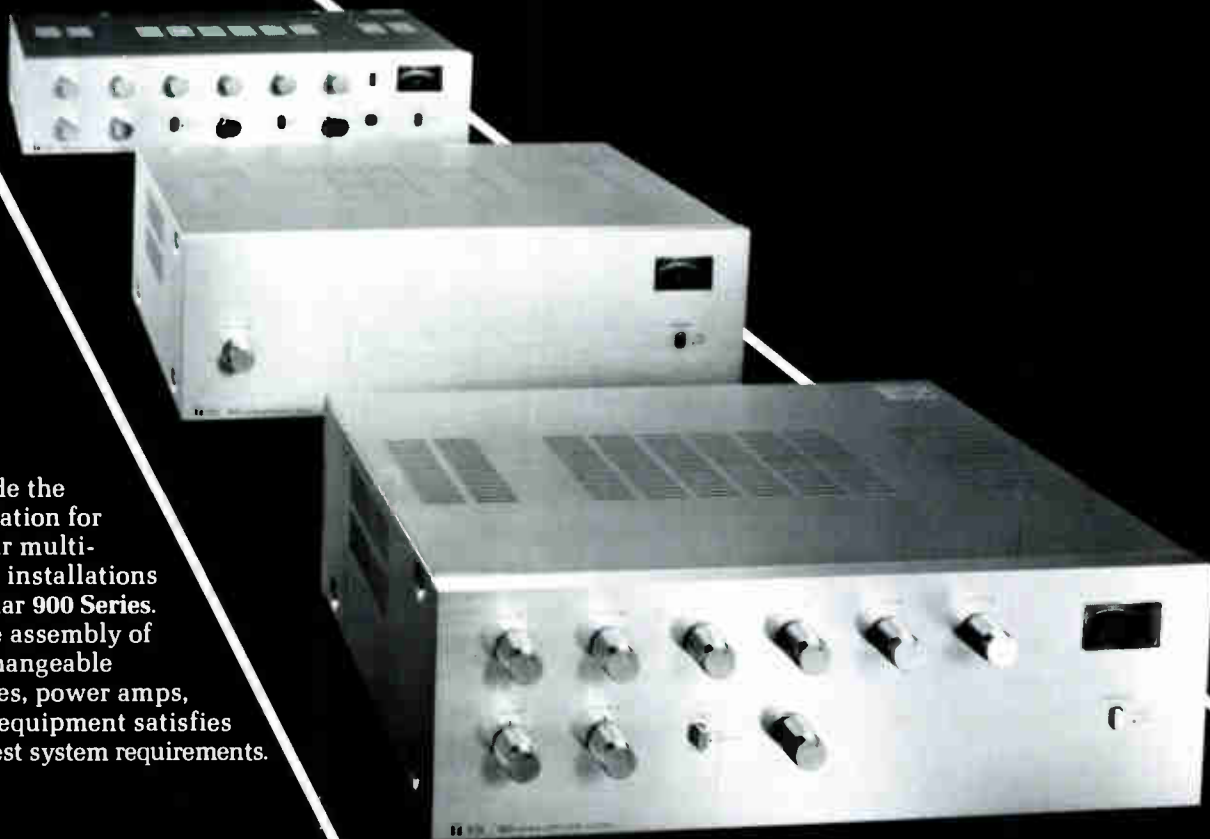
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by William Thornton, Ph.D., P.E.
Thornton Acoustics & Noise

THE MASTER EQUATION

In architectural acoustics, confusion often exists about the effects of the direct and reverberant fields. This article, which is the third in a series, deals with sound pressure and power levels. Power, distance, and room effects are shown to be related in a cohesive fashion so that sound pressure level can be predicted at various locations in the room.

Master Equation

For room acoustics, Equation (1) describes the sound pressure level as a function of sound power level, distance, directivity, room size, and absorption. This Master Equation is:

$$(1) L_p = L_w + 10 \text{ LOG} \left[\frac{Q}{4\pi r^2} + \frac{4}{S\alpha} \right] + 10.3$$

- L_p = S.P.L.
- L_w = S.Power Level
- Q = Directivity factor
- S = Room area in sq.ft.
- α = Average room absorption coef.

Sound pressure level is frequency dependent because of directivity and absorption. It is normally computed for narrow, one third-octave or one-octave bands. Overall levels, such as the A weighted sound level, can only be computed in very special cases where the absorption and directivity are constants for all frequencies of interest.

Direct Field

The Master Equation contains two important terms. The first term (within the log expression) de-

scribes the direct field effect. The numerator has directivity information which accounts for the radiation characteristics of the source. Sources such as loudspeakers typically have a large Q along the primary axis.

The denominator has distance information and it describes the spherical spreading of the wave front. A derivation of this equation would show that this term is really the spherical spreading of a wave front generated by a monopole source, i.e. one which radiates sound in all directions. The denominator is the area of a sphere. As the distance increases, the sound pressure decreases. Why? Because area increases are offset by decreases in pressure at the same rate. For an outdoor source, the sound pressure level would decay at a rate of 6 dB for each doubling of distance.

Reverberant Field

The second term (within the log expression) accounts for room effects. The room causes sound buildup which is a function of room size and absorption. At large distances from the source, the effects of the direct field diminish and the reverberant field dominates. Why does this occur? Sound bounces around randomly throughout the room but at any given point in the room and reverberant field, these random wave fronts add together to produce a uniform sound field at all of these locations in the room. The sound pressure level is fairly constant at all of these points, as measured with a

sound level meter. It is important to realize that constant sound pressure levels will only occur when filter bandwidths encompass many room modes, i.e., the modal density is high. Typically, at least 10 or more room modes should be excited within the passband of the meter's filter. If very narrow bands were used, e.g. 1 or 0.1 Hz, standing wave effects would be observed.

This equation also assumes the sound source is broad band in nature, i.e., pure tones do not dominate the sound spectrum. If pure tones exist, e.g. they are 10 dB or more above the spectrum level, then strong standing wave effects will be observed and this equation is not valid.

The area, S , which is the interior surface area of the room, indirectly accounts for volume. Alpha, the space-average absorption coefficient, accounts for room absorption. The reverberant field term of the equation is accurate for empty rooms which are acoustically hard

and which have a diffuse field. With appreciable absorption, the reverberant field term will lead to errors.

Sound Pressure Level Trends

Recall from the previous articles on sound power, that the L_w is constant for a source under steady state conditions. If we plot a series of curves as a function of distance and room characteristics, the curves shown in Figure 1 are obtained.

$L_p(r,f)$ minus $L_w(f)$ is plotted on the Y axis versus distance on the X axis. The curve parameters are the product of room absorption and surface area. These curves demonstrate that the direct field dominates for large rooms and extends into the room for large volumes. Similarly, if substantial absorption exists, the direct field extends far into the room. This equation shows the correct trend for hard rooms, but it is less reliable when substantial absorption occurs. For non-

TABLE I: CRITICAL DISTANCES

Q	Length	Width	Height	Area	Alpha	Rc
1.0	100	75	25	23750	.05	5
10.0	100	75	25	23750	.05	15
0.1	100	75	25	23750	.05	2
1.0	100	75	25	23750	.50	15
10.0	100	75	25	23750	.50	49
0.1	100	75	25	23750	.50	5
1.0	300	150	75	157500	.05	13
10.0	300	150	75	157500	.05	40
0.1	300	150	75	157500	.05	4
1.0	300	150	75	157500	.50	40
10.0	300	150	75	157500	.50	125
0.1	300	150	75	157500	.50	13
1.0	50	25	10	4000	.05	2
10.0	50	25	10	4000	.05	6
0.1	50	25	10	4000	.05	1
1.0	50	25	10	4000	.50	6
10.0	50	25	10	4000	.50	20
0.1	50	25	10	4000	.50	2

ideal rooms, the reverberant part of the curve will slope off gradually rather than having a flat slope as shown in *Figure 1*. If barriers and other obstacles exist in the room, the trends may not be correct at all. This equation should be used as a conceptual model when the conditions depart from this ideal behavior.

Critical Distance

The break point between the direct and reverberant field is important. For example, if the levels of a loudspeaker are being checked, it should be done in the direct field, not the reverberant field. The transition between the direct and reverberant fields occurs in the region of the curved portion of the curves as portrayed in *Figure 1*.

This point is determined by equating the two terms and solving for the critical distance as shown in *Equation (2)*.

$$R_c = (QSa/16\pi)^{1/2}$$

where:

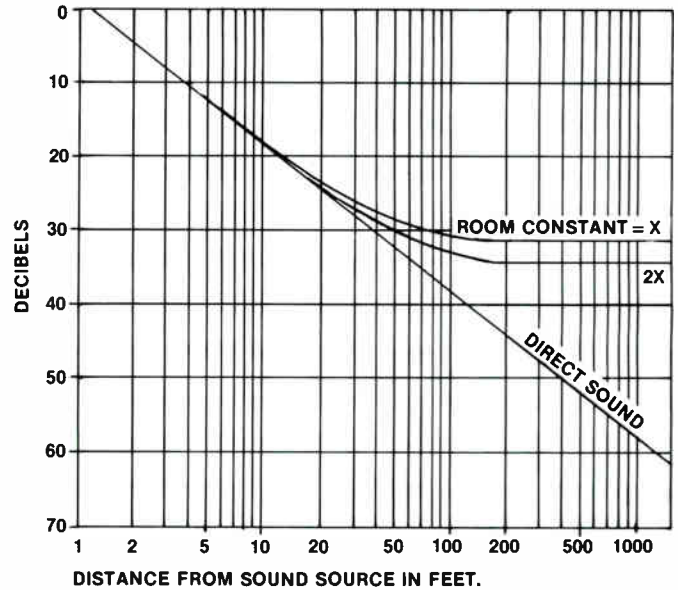
R_c = critical distance in feet.

This distance is important in practice. For example, if the characteristics of a speaker were being checked with a sound level meter, the measurements must be made within the bounds of the direct field. If the characteristics of the room are being checked with a standard sound source, then measurements should be made in the reverberant field. Table I provides tabular data on the critical distance for various rooms sizes and absorption.

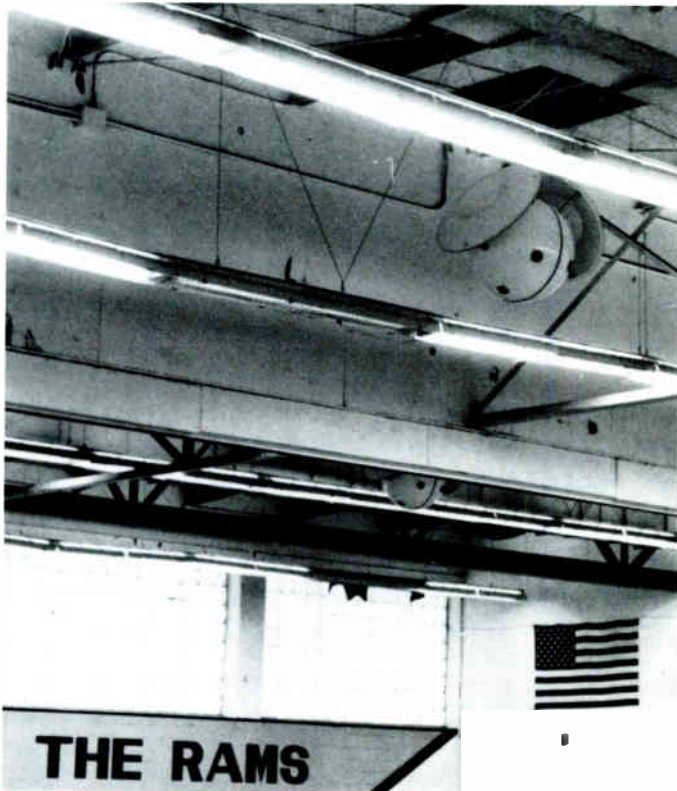
These examples show that the direct field does vary. For example, a large room

with 50 percent absorption and a Q of 10 will have a
(continued on page 49)

Fig. 1: Decibel changes with distance from source.



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After the installation at Taylor Center High School Gym of a new sound system with two #2715 Soundsphere speakers and various electronics, Dave Hill, of Comcast in Warren, MI, received the comment, which speaks for itself "Great full sound!" Robert Haarala, Principal has told Tina Merwin, President of the Class of '85 that the system, partially paid for by the class, is "fantastic."

Dave Hill also comments, "Recently, I received a call from another high school sports booster club asking Comcast to visit their school and tell them how their gym could be made to sound as good as the one at Taylor Center." Dave continues, "It's always a pleasure to receive compliments, but better yet to get referrals from customers."

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DIGITAL SIGNAL PROCESSING

In "Digital Audio Basics: Analog-Digital Conversion" *Sound & Communications*, October 1986, we outlined the process of converting audio signals between the "real world" analog and digital domains. Once an audio signal is translated into a series of digital numbers, we can use all the power and techniques of computer processing to perform virtually limitless manipulations on it.

There's a hitch, though: computation takes time, and in order to process audio signals and deliver the results in a perceptually immediate manner (that is, in real time), we are limited by the number and complexity of manipulations that can be performed in time between each numerical sample of audio information. This is as short as 1/44,000 second for high quality audio sampling at 44 kHz!

Digital audio processing doesn't have to be performed in real time. But most systems don't have enough memory or disk storage to keep the result of non-real-time processed audio, and most applications simply can't tolerate any perceptible time delay in signal processing. For useful real time systems, we are limited by the speed and accuracy of digital hardware components at the present state of the art.

The newest hardware places us on the verge of many exciting possibilities, but we can still look forward to many hardware advances before we exhaust even a

fraction of the theoretical possibilities available right now.

Storage Based Processing

The simplest form of digital processing is just storage and retrieval of the digital audio signal or digital delay. Digital delay was first implemented by loading the signal samples into a *shift register*, and clocking the samples through from beginning to end. The delay time depended on the clock rate and the number of stages in the delay line. Since the sample rate must be kept high to avoid signal bandwidth degradation and the shift register is an essentially non-programmable hardware device, the versatility of these devices was quite limited.

A more elegant approach to digital storage and retrieval systems is the memory-based approach. The signal samples are loaded into the memory of a computer or digital processor, and a bookkeeping or pointer system keeps track of what sample is where, when to output a stored sample, and replace an obsolete sample with a new one. This system is more versatile and is easily programmable with respect to delay length, multiple taps, etc.

Memory-based digital processing is currently the most widely used type, and is responsible for digital delay, reverb, and pitch-shifting systems in use today.

Limitations

The limitation of memory-based processing using standard memory and microprocessor components is defined by the number and the complexity of operations that must be performed on the digital signal samples in the approximately 20 microseconds between the samples. Most microprocessors can implement a few storage, addition, or subtraction operations in this amount of time, but little else. Multiplication operations in conventional microprocessor systems take so long as to be virtually unusable in real-time audio processing.

The 16-bit data path of conventional microprocessor architectures is also a limitation for many types of digital processing. You might think that the 96 dB theoretical dynamic range of a 16-bit channel would be sufficient for the most demanding audio processes, and that's true as far as the outside world is concerned. For sophisticated digital processes involving the multiplication and accumulation of many samples by very precise digital coefficients, 16 bits unfortunately falls short.

So these two limitations—computation speed (especially multiplication) and word length (16 bits)—of ordinary processors create the need for a more advanced processing element to handle real-time, high quality digital audio processes.

Delay and Feedback

An interesting aspect of

digital processing is that it is principally composed of two basic components: delay and feedback.

You probably have heard a digital delay device set up as a multiple echo, where the delay time between the original signal and the delayed signal is easily perceptible and the successive delayed signals are attenuated so that they gradually fade out. If the delay time is made smaller, you hear the sound of a tin can reverb. Even smaller, and you can't hear it as a delay any longer, but as a comb filter (better known as a Flanger if you sweep the delay time back and forth).

Now try to imagine the delay time being only the time length between audio samples into the processor. Okay, maybe it's a little too much like one hand clapping, but it's also the simplest way to understand the fundamental principle of digital filtering: a combination of unit delays of one sample period and feedback (or feed-forward) of a portion of the delayed signal to create an arbitrary frequency and phase response.

Multiplier Based Processing: The Digital Multiplier

Digital multipliers are special purpose chips that perform a multiplication operation on two digital numbers in approximately one-tenth of a microsecond. That same operation done with an 8086 16-bit microprocessor would take about seven microseconds, so the multiplier is about 70 times

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OUTBOARD GOES INBOARD. Each PM-175 and PM-350 has an internal circuit card bay which accepts Carver's new plug-in signal process-

ing modules. Soon to be available is an electronic, program-able 2-way stereo crossover, with 24 dB per octave Linkwitz-Reilly phase -aligned circuitry, a built-in adjustable high-end limiter and balanced outputs. And more modules will be available in the near future to further help you streamline your system.

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SPECIFICATIONS: CARVER PM-350 Power: 8 ohms, 350 w/channel 20-20kHz both channels driven with no more than 0.5% THD. 4 ohms, 450 w/channel 20-20kHz both channels driven with no more than 0.5% THD. 2 ohms 450 w/channel 20-20kHz both channels driven with no more than 0.5% THD. Bridging: 900 watts into 8 ohms; 750 watts into 16 ohms. THD-less than 0.5% at any power level from 20 mW to clipping. IM Distortion less than 0.1% SMPTE. Frequency Bandwidth: 5Hz-80kHz. Gain: 31 dB. Input Sensitivity: 1.5 V rms. Damping: 200 at 1kHz. Slew rate: 25V/micro second. Noise: Better than 115 dB below 350 watts. A-weighted. Inputs: Balanced to ground, XLR or TRS phone jacks. Input Impedance: 15k ohm each leg. Compatible with 25V and 70V systems. 19"Wx3.5"Hx11.56"D



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The function of the multiplier in digital signal processing is pivotal. All digital filtering processes are totally dependent on multiplication and accumulation of many signal samples for each output to the analog world. Digital reverb and multiple-feedback delay processors are greatly enhanced by the ability to feed back accurately attenuated output samples to appropriate summing nodes for increasingly realistic effects.

Multiplier and multiplier-accumulator chips have existed for at least seven years, and are used extensively in digital audio processing. Multipliers with 16 and 32 bit data paths are common.

Need for Special DSP Chips

Multiplier and multiplier-accumulator chips, though

essential for real-time digital audio processing, are still not sufficient to provide optimum economical digital audio processing systems. A combination of a 16-bit microprocessor and a multiplier-accumulator is in one sense a case of overkill and in another sense inadequate to the needs of digital signal processing. It's overkill in the sense that the microprocessor is only performing a very small fraction of its large repertoire of functions to implement the repetitive DSP computations. But more important, it's inadequate because it lacks the word length (32 bits is optimum) to deal with the results of multiplying 16-bit signal samples by numerous accurate coefficients to produce clean 16-bit audio output.

The only practical solution for constructing real-time digital audio processors had been to use

discrete components such as fast "bit-slice" computation elements in conjunction with digital multiplier-accumulators, resulting in a complex and expensive product. Clearly, a special kind of processor is needed to deal with real-time digital audio processing.

The New DSP Technology: The Processor

The DSP chips will do for digital signal processing what microprocessor chips did for other forms of computing: reduce the complexity and cost of products to achieve mass market status.

Specialized digital signal processing chips are still in their infancy as products. Their distinguishing feature is the integration of a fast multiplier, a 32-bit arithmetic computation section, and arithmetic processing appropriate to the repetitive but computation-intensive function of real-time signal

processing. To speed processing, separate data busses are used for program and signal data. Currently available parts will process from six to 10 million instructions per second with multiplication in a single instruction cycle.

Texas Instruments was first in the field with its TMS32010 Series. Now other companies (Motorola, NEC, Hitachi, and Fujitsu) are in the market with similar devices. Though a standard DSP chip has not emerged, the chips share common architectural principles.

Future Products and Applications

The impact of DSP chips in audio will be to reduce the cost of presently available functions (digital delay, reverb, pitch shifting, time compression/expansion) and to allow the implementation.

(continued on page 49)

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by Marc. L. Beningson
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QUALIFYING FOR A BID

It is common knowledge that bidding is a process designed to promote competition. Generally, the bidder with the lowest price wins the project, a situation that satisfies only the person who writes the check and then only in the short run. There are bid evaluation schemes which assign weighted scores to the technical merit of a proposal, experience and reputation of a contractor, the proposed date of completion and other factors, but usually the most weight is still assigned to cost.

The weakness of the low bid scenario is perhaps best summarized by the late Virgil "Gus" Grissom, one of the original seven NASA as-

"Imagine sitting on top of a giant candle made of parts made by different manufacturers—with each one the lowest bidder."

—Guss Grissom

tronauts. He said, "Imagine sitting on top of a giant candle made of parts made by different manufacturers—with each one the lowest bidder."

In order to encourage good competition among equally qualified contractors, many consultants include in their specifications a pre-qualification clause. This requires a contractor to submit a set of forms that determine if a contractor is qualified to participate in

the bidding process for a given project. A number of consultants include a list of pre-qualified contractors in the specification, often eliminating the ability for a non-listed contractor to participate in bidding.

If pre-qualification becomes more widespread and even if it does not (many government projects prohibit such limitations on participation), it is in the best interests of contractors to impress consultants with their qualifications. If you have been wondering how to better convince a consultant that your contracting firm deserves a shot at his next specification, the following are a few items that might influence him.

(1) *Send an impressive brochure and cover letter.* First impressions are important, and frequently these materials are the consultant's first introduction to a contractor. While a brochure is often targeted towards customers, the cover letter should be geared to the consultant. A personal letter addressed to the sound system design consultant rather than the principal or "Dear Consultant" is a nice touch.

(2) *References and reputations are a significant barometer by which to judge a contractor.* A list of satisfied owners and users of installed systems is most impressive. It is also interesting to note what reputation a contractor has among his fellow contractors. Is he known for high quality work at a competitive price, or does he "low ball" mere-

ly to stay in business just one more year?

(3) *A list of completed projects and all work in progress, along with their approximate dollar value, the date of completion (or expected date of completion), and a brief description of the project is important.* A consultant can learn a number of things about a contractor from this list. It shows the experience of the contractor, and his current work load. It shows the magnitude of the projects the contractor has worked on, and whether or not there has been growth in the size of projects undertaken. Most importantly, the project list shows the type of projects in which the contractor has been involved. For example, when bidding on a \$500,000 theater sound system project, several contractors may list projects of similar dollar amounts. In my evaluation however, there is certainly a large magnitude of difference between the technical and managerial competence to successfully install a \$500,000 theater sound system, recording studio, or audio-visual system and the ability to install a background music, paging, intercom or sound masking system of similar cost.

(4) *The resumes of the key technical personnel, the people with whom the consultant will actually be working, tell an important story about a contracting organization.* I like to see a blend of collegiate and self-educated types, along with a good balance of the mature and ex-

perienced with enthusiastic young people. The range of their experience in engineering, design, installation, and operation of sound systems is essential. Active participation or interest in music or other performing arts groups adds a good perspective to sound work. Published papers, magazine articles, and participation in AES, NSCA, IEEE or other professional organizations is also impressive. Are there a number of qualified project engineers? Or does the entire operation depend on the expertise of a single individual who might leave in the middle of a project?

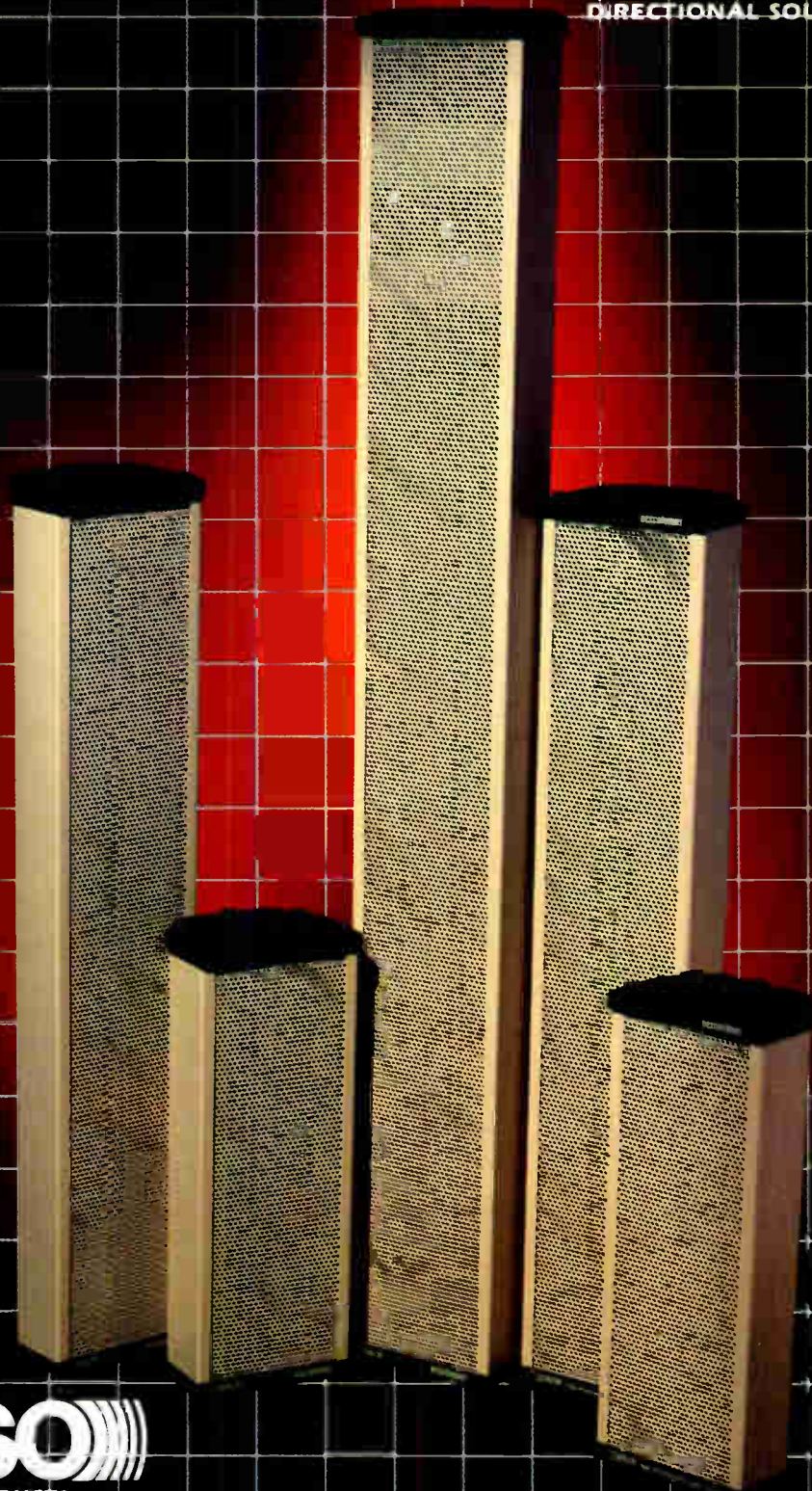
(5) *Attitude and personality of the organization's representative can also affect a consultant's opinion of a contractor.* After all, they must maintain a good working relationship during a construction period which may last six months to four years. Will the contractor be cooperative with the general contractor and other trades, or will he isolate himself from the rest of the project? Will sound system requirements for the work scopes of other trades be adequately coordinated? Will change orders, clarifications and inspections be simple or difficult? Can we work together for the benefit of the owner and user groups to successfully complete a high quality system we can both take pride in?

(6) *The type of business run by the contractor is important in evaluating his suitability for a particular project.* Is it a
(continued on page 49)

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PROOF OF PERFORMANCE

by Jesse Klapholz

Any good sound system specification will include a proof of performance section—this is the *only* way the system designer can ensure that the system will perform to his design criteria. Proof of performance testing is also a selling point. If a contractor shows the customer that he will test the system under a rigorous set of specifications, then the customer will feel confident about the system's performance.

The quality control of a job will be determined, for the most part, by the testing done as specified in a proof of performance procedure. These procedures share many similarities among various consultants' specs. For the purposes of demonstrating the utility of these tests and their specifications, this discussion will be limited to the proofing of typical sound systems, as related to the directly assessable attributes. Measurements used in acoustical surveys, noise surveys, reverberation analysis, equalization, intelligibil-

ity, etc., will not be included here.

Specifications

If the system was designed by a consultant, a specification must be followed. However, when a contractor is selling his own design/install system, a specification can be one of the best selling tools. In the specification the contractor states what he intends to supply and makes a commitment to that effect. In writing his own specification, the contractor should include clauses specifying the competence of the technicians, the test equipment to be used, who will pay for what, when the tests will be performed, the documentation to be generated, the scope of the tests, and the test procedures. These provisions are the same as those found in most consultants' specifications.

The person(s) involved with the final adjustments of the system should be familiar with the project, so that time is not wasted on learning all the ins and outs. This means that the technician should also be technically competent so that he understands what the system designer has set out to accomplish. Furthermore, the technician should be capable of operating the system(s), troubleshooting, and setting up and operating all of the test equipment listed in the specification. The qualifications of this technician should be spelled out clearly in the spec. Again, this shows the customer that the contractor will have a qualified technician execute a number of procedures and tests on the system(s) demonstrating that the installation is complete and done to an exact standard.

The next part of the specification is

simple—the test equipment list. For the most part this will entail an inventory list of the test equipment necessary to adjust and verify the performance of all relevant system components and the system(s) as a whole. Included in this inventory should be a statement of the type of equipment used; kits, home-built, and other non-professional test equipment is unacceptable under this specification.

At this point it should be established as to who will do the testing; what equipment they will use; who is responsible for how much of the technician's time and when he may perform the tests; who will provide support labor and/or equipment; what type of documentation will be generated; and how will it ultimately be presented to the owner. The proof of performance specification is now ready to describe the actual testing procedures. Often, the actual checkout will be done in two steps: a) the verification of system completion and minor adjustments and b) the final adjustments and demonstration/instruction.

The two-step procedure is always done when a consultant is involved—he would like to be sure that when he travels to the job-site that everything is ready for him. It is similarly advisable for the contractor to follow the same two-step approach when no consultant is involved. Last minute bugs can be worked out, for example, that can save a lot of time and embarrassment. Recently, my services were engaged to proof a contractor's sound masking installation and a design flaw was uncovered—more

“The ‘teeth’ of a specification are in the acceptance testing procedure.”

—David H. Kaye and David L. Klepper, “Sound System Specifications” *Journal of the Audio Engineering Society*, April 1962.



Stu Weiss

70-volt taps had been specified than available amplifier power. Because this spec was a two-step type, we were able to rectify the situation by adding additional power. This is not the proper time to uncover design flaws. In this case the additional power amplifier costs became the responsibility of the contractor—it was a lot cheaper to add

the additional amplifier, than to re-tap some 720 loudspeakers.

Barring any other unusual circumstances, such as in the previous example, the first task of the testing is a thorough visual inspection of the installation and all its component parts to ensure that all of the work was performed in compliance with the speci-

fications. This is normally followed by a check of the AC power system and routing and the grounding system. *Table 1* is a set of typical specifications for the first part of the sound system checkout. The specification guides the technician step-by-step in a methodical and procedural manner, documenting results along the way that will show

the designer and owner that the installation performs as specified. Similarly, the results of *Table 2* and *3's* tests and adjustments shows the owner and designer that the sound system will perform electroacoustically.

At this point all of the documentation can be prepared for final inclusion in an *Owner's Manual*. If a contractor is willing to take all of the steps in such a proof of performance specification, and incorporate their costs into the bid proposal, he will surely show his confidence that the system will work—to further guarantee this, he also includes in the contract clauses as powerful and meaningful as a system warranty. Furthermore, when a proof of performance specification is written along the guidelines presented here, anyone contesting the work will have to go through more than just saying there are some problems—they will have to do a lot of measuring and documenting to refute the validity of your report.

Sound systems and technicians' tasks have both been evolving from the vacuum tube complexities (simplicities?) of the 1940s to today's digital technologies. We must be fully capable of handling today's computerized systems and prepare ourselves for tomorrow.

“Some day, perhaps, we shall have sound systems that need no maintenance. Designers continually strive to produce equipment of this kind, and comparison of modern sound systems with those manufactured in the early days of sound motion pictures will show that this ideal is being approached more and more closely.”

—R.T. Van Niman, chief sound engineer, Motiograph Inc. “Sound System Maintenance,” *Soundtrack Magazine*, 1944.

Table 1. Specifications for the initial checkout of a sound system.

Prior to undertaking the equalization of the sound system, perform the following inspections and adjustments, and submit to the engineer the written results of each inspection for inclusion in the permanent records of the sound system.

- a. Measure and record the impedance of each active device operating as a source to any passive device or series of passive devices. Record the DC resistance of any build out resistors used.
- b. Measure and record the input impedance of any active device used to terminate passive devices and record the total impedance of all such devices. Record the DC resistance of any terminating resistor used.
- c. Measure the absolute polarity of all devices, including all loudspeakers in the signal path, correct and record any reversals.
- d. Adjust the gain of all devices in the signal path for optimum S/N ratio and maximum crest factor.
- e. Measure and record the impedance of each loudspeaker line before connecting it to the output of its respective amplifier.
- f. Measure and record the total hum plus noise at each amplifier output.
 - 1) Adjust gain controls for optimum S/N ratio and full amplifier output with -60 dBm level at a microphone input.
 - 2) Without changing gain, measure total hum plus noise at each output of a signal path from every input. Level shall be at least 85 dB below specified output power of respective amplifier over a bandwidth of 20 to 20,000 Hz.
- g. Measure and record the system's electrical frequency response for each input channel through power amplifier. The response shall be flat +/- 1.5 dB from 20 to 16,000 Hz.
- h. Using an oscilloscope, 5 MHz minimum bandwidth, and loudspeaker/headphone monitoring, check all outputs for oscillations and RF pickup/interference, both with no signal input and with music input.
- i. Measure and record the THD (total harmonic distortion) of each input through amplifier output as follows.
 - 1) Adjust gain controls as per hum and noise tests and terminate amplifier outputs with appropriate dummy loads.
 - 2) Measure THD at 100 Hz, 1 kHz, and 10 kHz. at 1%, 10%, and full output power.
 - 3) THD shall measure less than 1%.
- j. Verify that music, reproduced at the full output specified, and a swept sine wave through the system's specified bandwidth 6 dB below rated output, do not cause noise, rattles, or other extraneous sounds from any loudspeaker.
- k. Measure and record the acoustic distribution of the loudspeakers in the sound system throughout the entire seating area. Record the location of all positions in the seating area where any one-third-octave band, deviates more than +/-3 dB from the desired house curve.

Table 2. A typical specification for the initial checkout and adjustment of the reinforcement section of a sound system.

The following procedures shall be followed in establishing the house curve.

- a. Measure and record the acoustic gain of the system for each microphone position and combinations of 1, 2, 4, etc., open microphones each set at the same gain.
- b. Using the measurement system's test signal, place a calibrated measuring microphone in the seating area at twice the critical distance. The acoustic amplitude response shall be recorded.
- c. Any and all dedicated equalizer circuits shall be adjusted as indicated by the respective manufacturers.
- d. The individual loudspeaker components' *relative* level shall be adjusted to achieve as close as possible a flat frequency response curve. This rough house curve shall be measured and recorded.
- e. The house equalizer shall be adjusted to bring the observed acoustic amplitude response within +/-3 dB uniformity (or better, if possible) and to conform to the predetermined high-frequency rolloff dictated by the combination effect of humidity, air absorption, and the random incidence of the measuring microphone. The equalized house curve shall be measured and recorded.

(continued on page 40)



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1986 Annual Economic Survey and Report

For this year's Economic Report, *Sound & Communications* developed an exclusive three-part thrust. First: We undertook, for the first time in this industry's history, an independent study by a respected market research firm, Harry Heller & Associates of Port Washington, NY.

Second: We conducted an in-depth interview with respected individuals on the state of the economy as it relates to the sound and communications industry.

Third: We coalesced a number of trade source studies—both formal and informal, proprietary and not—acquired confidentially in order to enhance and give background to the findings of our first two studies.

While individual companies did not necessarily see growth in 1986, all signs seem to point to the ironic fact this slow particular growth reflects a general growth. As other industries have flattened or softened, more interest has moved to what is seen as a chance for profits. In other words, there are more players in this market. So many that it may dilute the growth. Is there a shake-out coming? No one seems to think so. But there is an apparent trend toward mergers and acquisitions within the industry. The key to many smaller manufacturers' survival may be to be bought out by another company.

At year end, the economy is a question mark. The new

tax law is still the great unknown, as far as the hidden effects that it may create. If new construction is affected, the number of new jobs will decelerate.

With, however, advances in technology and creative marketing, the general consensus is the market is expanding amid a sense of stability.

Heller Research Corporation, who conducted this year's survey, is a full-service, independent market research company serving the market research community since 1972. It is highly respected and draws its clients from all over the United States. Its president, Harry Heller, is well-known in the field, recently completing a one-year tenure as president of the New York American Marketing Association. The Heller client list includes 40 of the Fortune 500 companies, 20 of the top 25 advertising agencies, and 25 of the top 100 national advertisers.

The current study was supervised by Dr. Arnold Diamond, vice president and research group head at Heller Research. He holds a Ph.D. in psychology.

SALES VOLUME

The numbers reported in this part of the survey reflect the product sales to the contractor/dealer segment of the industry in a particular product category. The first two columns in Figure 1 show the average sales per company

FIGURE 1

	AVERAGE SALES 1985	AVERAGE SALES 1986	ESTIMATED MARKET Size 1985	ESTIMATED MARKET Size 1986
AUDIO PRODUCTS	\$5,570,200	\$6,071,320	\$930,223,400	\$1,044,267,040
TELEPHONE PRODUCTS	\$2,293,700	\$1,674,401	\$119,272,400	\$66,976,040
WIRELESS COMMUNICATIONS	\$992,000	\$1,253,607	\$11,904,000	\$15,043,284
ENGINEERED INTERCOMS	\$2,944,370	\$3,297,644	\$117,774,800	\$128,608,116
SUBSCRIPTION SERVICES	\$370,000	\$518,000	\$14,430,000	\$22,792,000
SECURITY SYSTEMS	\$1,155,000	\$1,582,300	\$92,400,000	\$169,306,100

FIGURE 2
PERCENTAGE OF SALES
TRANSACTIONED THROUGH OUTLETS

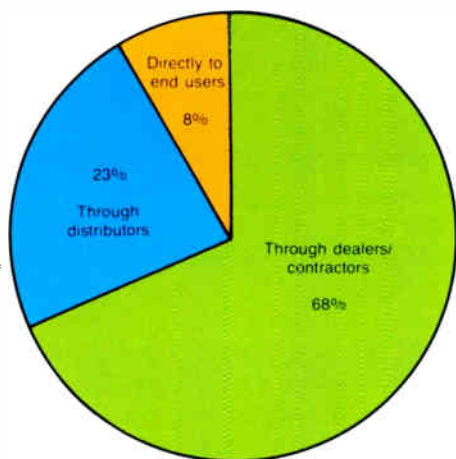


FIGURE 3
PERCEIVED CUSTOMER CRITERIA
FOR SELECTING COMPANY'S PRODUCTS

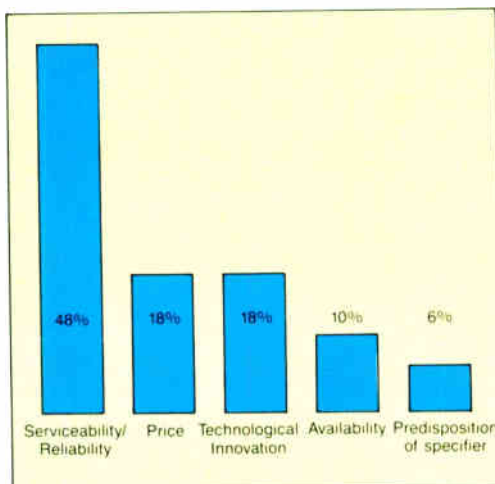
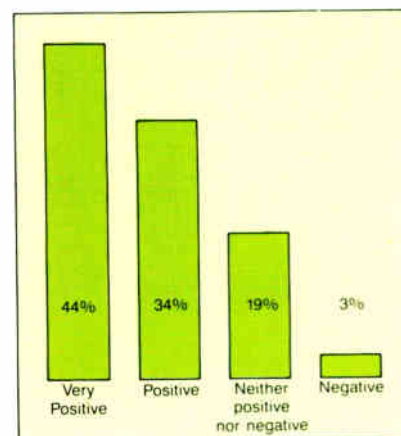


FIGURE 4
ATTITUDES TOWARDS FUTURE SALES



Researched by Harry Heller Research Corp.

in each product category. The last two columns are an estimation of total industry sales in a given category. It is important to remember that all sales figures reflect *only* sales made by manufacturers to contractors and dealers.

It was a good year for almost all the categories concerned, with the notable exception of telephone products which showed a significant drop in sales to contractors and dealers. On the whole, the entire sound and communications industry was up by an average of 11 percent, with the largest sales increases coming from the security and subscription services segments.

Comments: When deregulation entered the picture a few years ago, many thought that telephone installation would be the growth market for contractors and dealers. But with evolution of a few large companies doing the bulk of the business, sales of telephone products to the contractors never realized that expected growth. What is becoming the major growth market for sound and communication contractors is security products and installations. Since almost one out of every two contractors is now selling and installing security and alarm systems (see "Today's Contracting Business," *Sound & Communications*, May 1986), it is not surprising that sales in that area have soared. Subscription services—the business music industry—also show a healthy increase in 1986. One reason for this is the trend toward video foreground music systems in department stores and night clubs.

Figure 1 also shows the percent increase in average sales per company from 1985 to 1986 was *less* than the increase for overall market size. Particularly in the audio and security markets, this can be attributed to the fact that there were more companies participating in sales to the fixed installation market in 1986 than in previous years. As a result, many companies this year have found the industry's growth did not parallel their own growth.

DISTRIBUTION OF SALES

Respondents were asked to indicate the breakdown of their company's sales to contractor/dealers,

distributors, and end users. According to the results, about two-thirds of sales were transacted to dealer/contractors, and about one-quarter to distributors. The remaining one in ten sales were made to the end user. (See Figure 2)

Comments: Sales to dealers and contractors has been a burgeoning trend within the industry for the past few years. One theory suggests that new attention has been placed by manufacturers on the contracting sector of the industry due to troubled waters in other sectors of the audio industry. While another theory maintains that growth in sound and communications contracting is due to a much larger and older trend—that being that the influence and influx of quality sound in consumer audio has produced a demand for better sound in professional and industrial applications.

PERCEIVED CUSTOMER CRITERIA FOR PRODUCT SELECTION

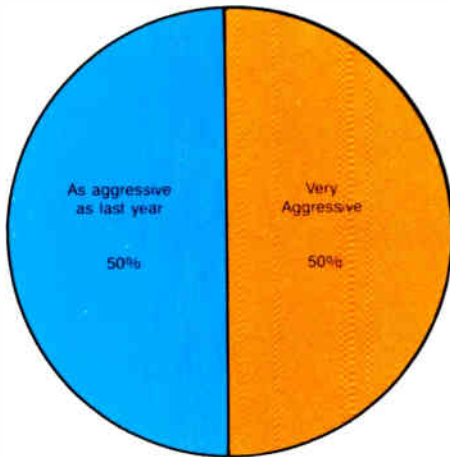
Respondents were asked to indicate which criteria are most important to their customers. They did this by ranking five criteria from "1" to "5" where "1" is the most important.

The results show that *Serviceability* was the most important criterion, being considered most important by half of the respondents. *Price* and *Technological Innovations* were ranked next in importance by respondents, being important to one of the five customers. (Figure 3)

Comments: This is the second year in a row that *Serviceability* has ranked first (by a wide margin) among the criteria for selecting a product. The rationale for this response is, again, attributed to the idea that end users are demanding more quality sound systems—and not in just the sound the systems produce, but also in the long term use that they can expect from the system. In short, many are looking at the sound and communications systems they are investing in as a long term solution regardless of price, availability, etc.

What is interesting to note is that in comparison to the responses in 1985, manufacturers are recognizing techno-

FIGURE 5
EXPECTED STRATEGY
TOWARDS 1987 SALES



Researched by Harry Heller Research Corp.

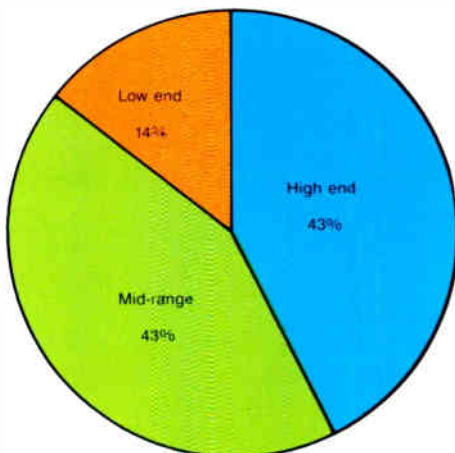
logical innovations as a more important factor as a customer's selection criteria. This year it was ranked second, along with price, according to respondents. This could possibly be attributed to the impression of many that technological innovations equates to, or at least implies, quality.

PERCEPTION OF FUTURE SALES

Respondents were asked how negative or positive they feel towards sales in 1987. Based on the responses, the future looks bright. Over three-fourths of the companies that responded are either positive or very positive with almost half saying "very positive." Almost no negative attitudes emerged, although one out of five respondents were neither positive nor negative. (Figure 4)

Comments: Even with the migration of many new manufacturers into the industry, many companies are optimistic about their own sales projections. This could be because the majority of manufacturers, for the most part, don't feel that the industry is saturated and there is still room for, and expectation, of growth.

FIGURE 6
AREAS PRODUCT LINES
APPEAR TO BE LEANING TOWARDS



Researched by Harry Heller Research Corp.

SELLING POSTURE

Here companies were asked how aggressive they planned to be in 1987. Given the optimistic attitude from the preceding question, most everyone said that they will be very aggressive. Just as many said that they would be as aggressive as last year. No one said that they would put less emphasis on products for this industry than they did last year. (Figure 5)

Comments: This response could be the result of several things. First, the manufacturers which have adjusted their concentration to the contracting sector are looking at this as their bread and butter for the next few years or more. Therefore they had better be aggressive. Second, those who are totally new to the sound and communications industry, i.e. manufacturers of fiber optics and related products, are looking to make a major thrust into the industry. And finally, those who are long time members are looking at a whole new herd of competitors—they must be aggressive, so not to get trampled by the hungry newcomers.

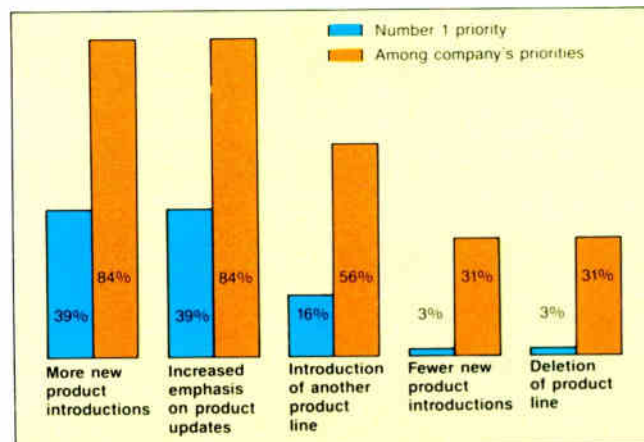
PRODUCT LINES

We asked manufacturers about their plans for their product lines in 1987. We wanted to know what was their opinion about the trend in the market toward a quality of product. The response was a pretty even split between those who feel the market is moving toward the high end of products and those who said they feel it is leaning toward the mid-range products. A little more than one in ten said they felt the direction is toward the low end. (Figure 6)

Comments: This response reflects directly on the question of buying criteria. Manufacturers perceive the industry as wanting a more reliable, quality product—therefore the trend would be toward high end and mid-range products, as opposed to less expensive, less reliable models.

This also shows that this industry is becoming more market driven, by responding to what is their perception of what the market wants.

FIGURE 7
1987 PRIORITIES



PRODUCT PRIORITIES

Companies were also asked about their priorities for their 1987 product lines. They were asked to indicate which ones they planned to do and to rank them in order of priority.

Manufacturers indicate two major priorities: more new product introductions and an increased emphasis of product updates. Each is the highest priority for four in ten companies and almost nine in ten companies plan to do each at some level.

Comments: What is interesting about this category is comparing this year's results with 1985's. In 1985, most companies reported that their plans were to introduce more new products. In 1986, the number of companies that plan to introduce new products is the same as those which plan on product updates. For the most part, it takes less money to update an existing product than invest in the development of a new one. Therefore, companies can stay aggressive and compete by offering something new, while, at the same time, doing it at a lower cost.

APPLICATIONS FOR '87

We also asked manufacturers what new applications their companies will be addressing in 1987. Although new to a particular company, many of the applications indicated are not new to the industry. What this may be a sign of is that many companies are trying to

become more full line manufacturers by offering contractors everything that they need for a *total* sound and communications installation. (See Figure 8)

New Applications Companies

Will Address in 1987

Integrated systems
 Computer security access
 Product niches
 Professional/Industrial video broadcast
 Audio/visual
 Security market
 Wireless IFB & ENG
 Sound and telephone for residential market
 Power applications
 Organ theater markets
 HIS
 Engineered sound
 Fiber optics
 Industrial grade intercom systems

Researched by Harry Heller Research Corp.

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From the Manufacturers' Viewpoint

Since our perception of what is going on in the sound and communications industry is only one point of view of the direction in which the industry is headed, we revealed our findings to some of the major participants in the industry and asked them what they thought it all meant.

It remains prevalent that more and more sales are being made through the contractor/dealer and not to other outlets such as distributors and end users. None of the manufacturers we talked to were surprised to hear this.

"Distributors in the main are not equipped to service end users. Therefore, they become virtually disqualified as an effective channel of distribution for products that either need to be demonstrated to be sold or installed," according to John Stiernberg, sales manager at Bose Corporation. "End users are disqualified in part for the same reason that distributors are disqualified—in that an end user typically needs installation, system design, and other types of service and expertise to complete the job. So, they're really not in the position to take care of themselves and that is where the contractor and dealer come in."

F. Davis Merrey, president of Altec Lansing, agreed. "I think that there is all kinds of potential problems selling directly to a church, for example. I'm sure it's been done. But I think the problem is the lack of technical training and expertise on the part of the end user to properly install, maintain and operate the equipment. That's really the sound contractor's expertise."

Merrey added that selling to a distributor isn't feasible either because the number of sound contractors is not large enough to warrant it.

When we asked manufacturers why they thought serviceability remained as the leading criterion for product selection by a contractor, the responses we received ranged from support and agreement to disbelief.

"When a contractor installs a product, often times, it's not in a place that is easy to get to. And no one wants to be in a large hall and his sound systems give out. I think that it's tantamount to an architect having one floor in his hotel collapse," said Phil Betette, president of Applied Research & Technology. "So, I think serviceability speaks to the quality of the product. Then once anything does go wrong, it can be fixed easily and quickly."

Stiernberg said that serviceability as the number one choice is "a manifestation of a sweeping cultural change that is affecting not only our industry, but others as well. That change is an emphasis on quality and on longer term investment. The end user is looking further into the future and requiring a longer term solution to whatever problem they have. So rather than the proverbial 'quick fix' the customer is thinking, 'I want to get this taken care of once and for all. So, I better be willing to be patient and invest in the quality that is going to achieve that objective.'"

But not all manufacturers agree. Robert Pabst, president of Electro-Voice, said that he didn't share that opinion at all and that the *relationship* between the contractor and the manufacturer was more important than any of the criteria given. He added that the selectivity of distribution and the support systems offered by the manufacturer are both integral parts of that contractor-manufacturer relationship.

In addition, Pabst said that he suspects most manufacturers were supplying serviceability and reliability on the same or

comparable levels, therefore eliminating it as a criterion.

According to the manufacturers which responded to the survey, their outlook for sales in 1987 is positive. Again the manufacturers we talked to presented controversial views as to the reason for the response.

For those who agree that the outlook for future sales is positive, the predominant reason attributed to this is the fact that most people now have better sound in their homes and cars, therefore they come to expect better sound in the other areas of their lives, such as office, church, community arts center, and so on.

"This is probably why technological advances rated second in the previous question—because people are more technologically aware that they can have good quality sound without having P.H.D.s," said Betette. These advances have made products both good and user friendly."

Stiernberg also agrees that the outlook is a positive one and said the reason for his opinion is two-fold. First, the end user is more educated and focused at a longer term use, and they're willing to demand and pay for better quality. Second, Stiernberg said, was that the emphasis on sound was coming to the surface—sound reinforcement or sound reproduction is underdeveloped. There is still a very big growth potential for it because it is coming into focus from the end user's point of view.

On the flip side, some manufacturers don't think the future is as bright as it's being made to appear. According to Merrey it is wishful thinking on the part of many of the manufacturers. "I think that most people would think that there would be some growth, but it would be pretty limited growth because this industry follows the economy quite closely and I think the economic outlook over the next couple of years is not all that good."

Merrey also sees the trend of other manufacturers focusing new attention on fixed installations as seeping into the product plans of many companies, therefore resulting in a trend toward updates. "The same people who are now entering the fixed installation segment are modifying their products to make them applicable to the sound contractor market. In addition, it's also a little bit of a stalling factor involved in the product development because people are waiting to see what's going to happen with digital. It's kind of a state-of-the-art pause, if you will, in new product development. So, people are deciding they might be putting their money into product changes as opposed to new lines."

Herb Jaffe, consultant for marketing for Atlas Sound and Soundolier, said in his opinion the trend toward updates is due to the fact that it is a mature industry. "I think we are all, to an extent, updating in that we are all seeking something that is nothing major technologically. So we are updating—getting better quality, less distortion, etc.—but functionally we are in a mature industry."

According to Stiernberg, the reason for the lean toward updates is because the market is saturated with product and manufacturer options. "In other words, for every problem there are a dozen solutions or at least more solutions than are necessary," Stiernberg said. "Technology has advanced in the past ten years significantly, but we're in a bit of a plateau. Not in a negative sense, but rather an objective sense. We probably need a few years of refinement rather than addition. So I see it as healthy."



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Outdoor Sound System Renovation

by Greg Robertson
Audio Associates, Inc.

Many fixed installation audio systems have been called unique, yet few have encountered complexities that Audio Associates, Inc. of Oklahoma City, OK, did when they were selected to re-engineer the Gerald L.K. Smith Amphitheater in Everta Springs, AK. The 4,400-seat outdoor amphitheater is backed by a solid rock wall with a multilevel hillside stage which covers almost an entire city block. The natural scenery and stage set is designed to represent the streets of Jerusalem. The amphitheater offers even another special feature—a spectacular view of the Ozarks. Also in direct view, to the northwest, is the Christ of the Ozarks statue. This concrete and steel figure stands over 65 feet at the top of a peak. Two limousines can be suspended under its out-reached arms. Audio Associates, Inc., a full service audio engineering and consulting company, was asked to solve the audio problems of the largest on-going live outdoor drama in the United States—The Great Passion Play. The production, staged by the Elna M. Smith Foundation, draws over 270,000 spectators annually.

The Great Passion Play is staged six months each year—from the last Friday in April through the last Saturday in October. The play depicts the biblical events leading up to the crucifixion and resurrection of Jesus Christ. The cast includes over 200 local actors, yet all audio, dialogue, and music is reproduced from multi-channel recorded tape. The original three-channel system, of mostly Altec Lansing components, had been expanded to eight main channels. Unfortunately the previous expansion and modifications to

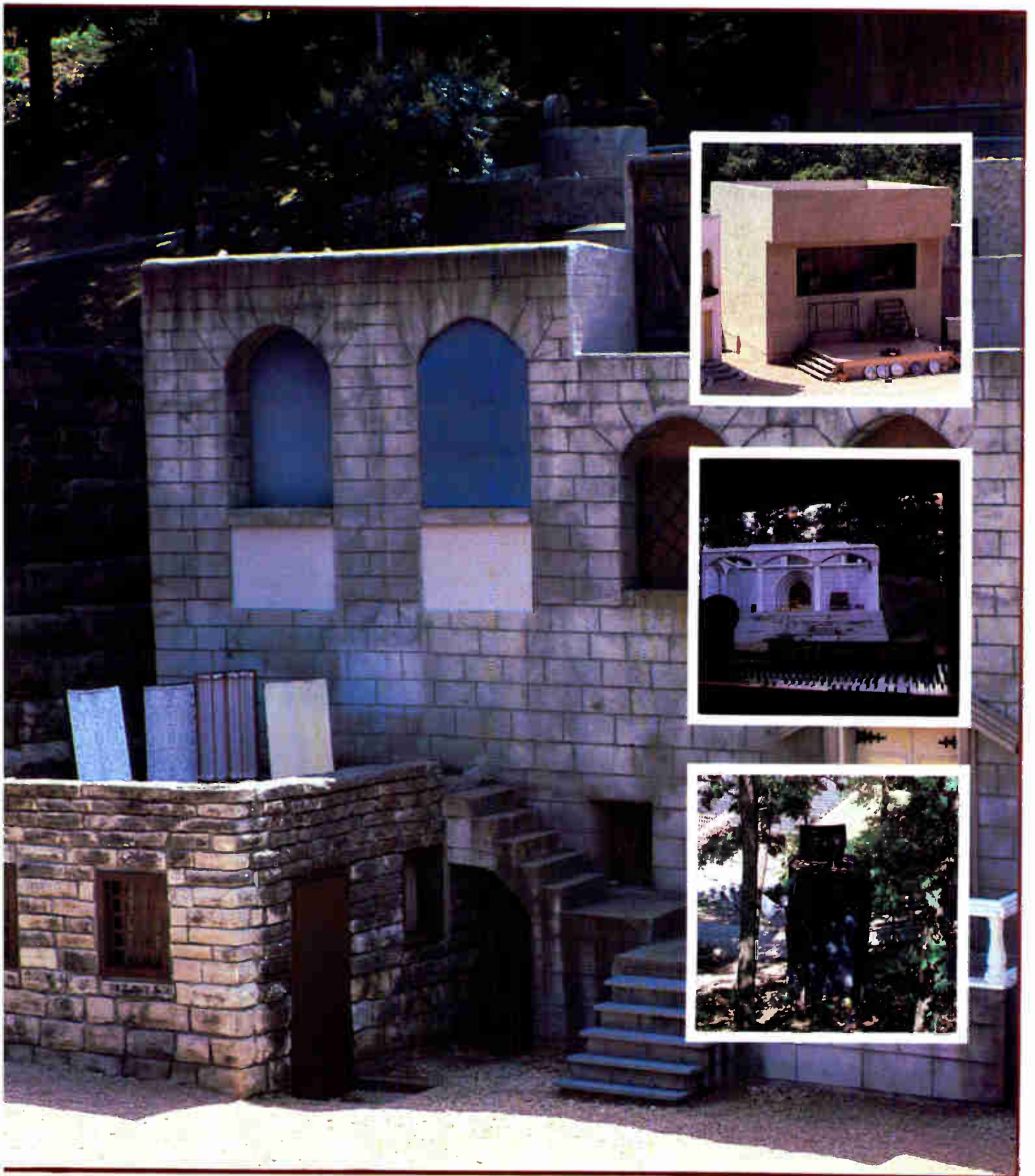
the system significantly reduced the overall sound quality. The job of Audio Associates was to re-engineer the system for increased performance using as much of the existing equipment as possible.

The dialogue sound tracks were pre-recorded in live segments on the set. The recordings were made on twin 24-track machines in a mobile recording unit. The entire score was written by Phil Perkins and recorded by the London Philharmonic Orchestra with Phil Perkins conducting. The score was recorded in London at Columbia Studios. The tracks were then assembled by Bill Cobb in California. Last year, the play was produced on video tape and is available from the foundation.

Two 3M 16-channel recorders are located in the control room. The tracks consist of eight main program channels; two cue channels and one time code sync track. The sync track feeds time code data to the Colortran Dimension-Five lighting control unit. The entire lighting system is programmed for automatic control. One microphone in the control room is used for pre-show announcements. Two engineers operate and maintain the lighting and sound system. The multitrack decks, console, and lighting controls are in a specially constructed control room directly below the audience, with a view of the stage.

Both 16-track decks feed a 24 channel console. The console is an Allen and Heath Brenell 24X8 Series III. This gives the technicians total control of the audio as well as the ability to cross feed channels for special effects. Eight main channel speaker systems are cleverly concealed throughout the





The stage and scenery was designed to resemble the streets of Jerusalem. So not to interfere with the set, Audio Associates camouflaged the speakers which were strategically placed around the outdoor theater. (top, right) Another view of the stage which runs almost an entire city block; (center, right) view from the mixing console (bottom, right); a concealed loudspeaker cluster.

set. These locations provide point source sound from each main stage area. The areas include: The Garden of Gethsemane; Herod's House; Pilate's Court; the Temple; The Last Supper; The Upper Room; the Palace (Sanhedrin); Mount Calvary; and The New Marketplace. Exact timed music tracks allow transition for actors to move from set to set. Many sound effects as well as the music are very effectively used and panned between the eight speaker locations.

Listeners were being subjected to tremendous echo problems from the rock wall behind them and there was distortion throughout the system caused by the use of under-powered consumer amplifiers. These problems were further compounded by incorrectly phased loudspeakers and many long, unbalanced high impedance lines connected to the low impedance equipment. To solve these problems, Altec Lansing Model 1270B power amplifiers were installed. Also, four Altec Lansing Model 210A speaker cabinets with twin 515s were removed from storage and re-installed. In addition, Mantaray[®] constant directivity high frequency horns with Altec Lansing 291-16K high frequency drivers



The Great Passion Play, which is held annually at the amphitheater, is the longest on-going live drama in the U.S. and draws over 270,000 spectators each year.

were used to enhance the systems performance. The system had never been properly balanced, so we added eight Altec Lansing Model 1653A one-third-octave equalizers to the system and balanced it at many separate listener locations to assure the best quality of

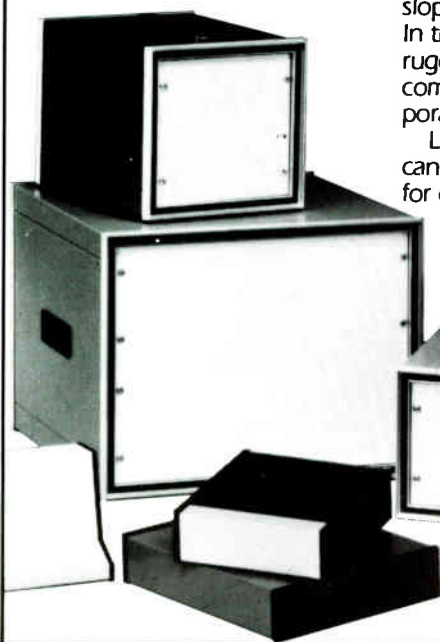
sound throughout the audience. This was critical, because some of the speakers were as far as 600 feet from the audience. After rewiring, correctly aiming and phasing all the horns, the system was tested. According to Chuck Robertson, the general manager and producer of the company, "The sound is outstanding. It is the best we've ever had and we're very pleased."

Audio Associates, Inc. will begin a second phase of this project before the 1987 season. This work will include the installation of additional Altec Lansing 210 low frequency cabinets to give further depth to the system. Additional Altec Lansing Mantaray[®] horns and drivers will also be installed.

By using most of the existing equipment, and matching components for a total system concept, the Passion Play achieved a new, higher level of sound quality. A special thanks is due Pat Transue, Floyd Clark, and Jerry George for their assistance during the installation.

Greg Robertson founded Audio Associates Inc. in 1969 while he was working at NBC affiliate WKY-TV-KTVY. Audio Associates has worked on 18 presidential and vice presidential visits. Robertson is a member of AES, USITT, and SBE.

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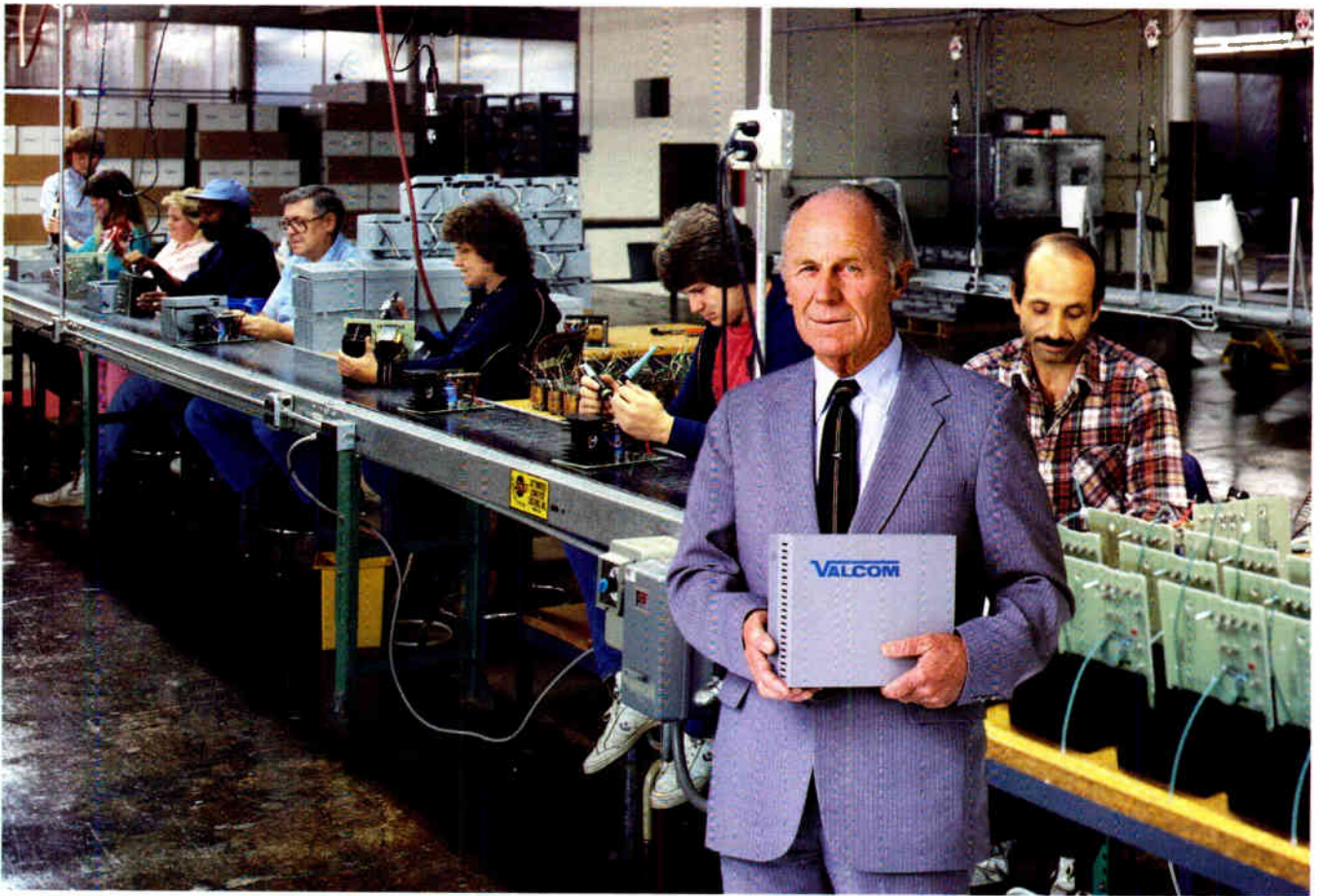
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PRODUCTS IN REVIEW

RANE'S INTERPOLATING CONSTANT-Q GRAPHIC EQ

The Rane Corporation has announced the development and availability of a new GE 30 Interpolating Constant-Q Graphic Equalizer, a full one-third-octave equalizer, which features accurate bandpass control of frequencies "on and in between" the standard ISO points.



According to Rane, the capability of the new GE 30 was made possible through the development of special computer-optimized filters and dual alternating summing amplifiers. The result is a well-defined, "interpolated" bandpass response between any two ISO frequencies without altering the equalizers performance, the company said.

Simple level adjustments of any two adjacent control sliders allows precise alignment of the filter center frequency with that of a feedback or absorption node. The end result is greater control over sound system performance with minimum adverse effects on overall sonic quality.

Circle 1 on Reader Response Card

WILLIAMS SOUND'S NEW FOUR-CHANNEL RECEIVER

Williams Sound Corp. has an-



nounced the availability of a new four-channel personal receiver. The PPA R7-4 Receiver is designed for

multichannel applications such as movie theaters, guided tours, and simultaneous language interpretation. The PPA R7-4 can be used with the Williams Sound Personal PA/FM Broadcasting System, Tour Guide System, and Personal FM System.

The new Receiver features a four-position rotary knob for easy selection of any of the four pretuned channels.

Circle 2 on Reader Response Card

3M'S UNIDIRECTIONAL MICS FOR INDUSTRIAL USE

3M has introduced a new line of unidirectional microphones designed for heavy-duty industrial use.

The mics have a die-cast metal body, grip-to-talk bar, sealed micro-switches, and dual shock-mounted mic element for long life.

The mics also have an internally lubricated 19-inch gooseneck with electro-plated surfaces to reduce unwanted noise.

The flex mics come in three switching modes—normally open, normally closed, and switchless (live). The switches also have contacts for or music mute or relay control.

A multi-purpose mic with off/on switch, 15-foot cable, and mic holder is also available.

Suggested end-user list price for the switched flex mic is \$78.90 and for the multi-purpose mic is \$73.90. Volume discounts are available.

Circle 3 on Reader Response Card

DUKANE PRINTER FOR NURSE CALL SYSTEM

The Communications System Division of Dukane Corporation has announced a new desk-top dot matrix printer designed for use with the Dukane System 2070 Nurse Call System.

Dukane's new printer, Model 9A2055, provides a permanent chronological record of events occurring within the microprocessor-controlled communications system. Items recorded include: calls placed to the master station from room and remote stations; calls answered; calls cancelled and calls placed on reminder status.

Capable of printing the time (hours, minutes, and seconds), date (month, day, and year), patient room or remote

station number, priority level (emergency vs. normal) and type of transaction (originate, cancel, or reminder call), Dukane's new printer/nurse call system assists facility staff members with time and risk management. Supplying continuous hard copy records of time elapsed between call origination and cancellation, the system can be used as an important source of reference.

The compact new Model 9A2055 printer accommodates single sheet or roll, plain, or sprocket type paper and includes a built-in, self-test program for verifying printer operation.

Dukane's System 2070, a multiplex communications system modular in design, is capable of providing up to 3,072 hospital beds with two-way communications, public address, staff location, and staff emergency functions.



The user programmable system, designed for low cost installation and expansion, features automatic secrecy, independent or combined area operation, zone recapture, system monitor, and easy interface with a Motorola or Ericsson pocket paging system.

The 2070's new supervised code blue display station has an LED annunciator panel that notifies personnel of a code blue or stat call and flashes if the system is not functioning properly.

Circle 4 on Reader Response Card

DAVID CLARK'S HEADSET WITH THROAT MIC

A new, noise-attenuating communication headset with an electret throat microphone has been developed by the David Clark Company, Inc. The Model H3140 headset was specially designed to be used under a safety hat or fire helmet and with all breathing masks. The throat mike is secured in place with a soft, washable velcro strap.

(continued on page 36)

PRODUCTS IN REVIEW

a closer look

by gary d. davis



Meyer Sound 500 Series Loudspeaker System

Meyer Sound has added a new model to its line of professional recording and sound reinforcement products. The Meyer Sound 500 Series Loudspeaker System consists of a pair of full-frequency 500 Series Loudspeakers in combination with the 500 stereo integrated amplifier. The loudspeakers utilize a 15-inch low frequency driver in conjunction with a high-frequency driver mounted on a modified radial horn. Each speaker measures 20 inches wide x 32 inches high x 14 inches deep and has a shipping weight of 110 pounds. The special amplifier consists of a professional-quality 600 watt/channel power stage, control electronics, and sophisticated driver-protection circuitry, all integrated in a single 19 inch wide x 5 1/4 inch high rack-mountable package.

The amplifier has a complementary FET output stage, bipolar drive stage, and a fully regulated power supply which will operate from 100 to 130 VAC or 200 to 260 VAC (field selectable). The amp includes circuits which continuously monitor the actual power delivered to the loudspeakers. Self-protection circuits optimize the performance (and reliability), which is particularly useful should the system be consistently overdriven.

In addition to driving the 500 Series Loudspeakers, the 500 Stereo Integrated Amplifier is capable of powering a complementary pair of Meyer

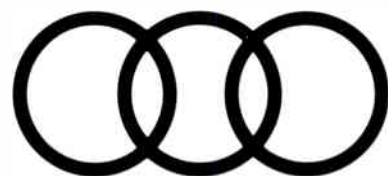
501 Subwoofers. The amp will accept balanced or unbalanced inputs. Rear panel variable high and low frequency controls are provided.

The 500 Loudspeakers and 501 Subwoofers have recessed hand grips as well as internally mounted rigging blocks to facilitate permanent installation. The acoustically-transparent, protective, fiberglass-mesh grilles are removable. The cabinets have a paintable, factory-applied, flat back textured finish. Foam-lined ATA-style shipping containers are available, and are recommended for transporting the system after its initial shipment from the factory.

Comments: John Meyer has been turning out innovative, high quality audio products (primarily loud-

speakers and related products) for over a decade. He has acquired quite a following among recording studio and sound reinforcement folks; the recording folks have been impressed with the low distortion, while the reinforcement people have been awed by the sheer level and bandwidth Meyer has been able to extract from relatively compact enclosures. The press release did not contain information on the sensitivity, distortion, or bandwidth of the overall system, nor on the directional characteristics. So I contacted Meyer Sound Labs for details.

The amplifier has balanced XLR inputs (10 kohm balanced or 5 kohm unbalanced). It uses AXR type output connectors. The amp is rated at 1,200 watts total average sine wave power
(continued on page 49)



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international

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Circle 229 on Reader Response Card

(continued from page 34)

The combination of the H3140 headset and V3412 VOX (voice operated transmission) belt station provides hands-free operation.

This durable, high impedance headset can be used with all intercom systems produced by the David Clark Company.

Circle 5 on Reader Response Card



ROSS'S CN3201 3-WAY/5-WAY ELECTRONIC CROSSOVER

IMC Ross has introduced the CN 3201 Electronic Crossover which features two separate three-way channels for stereo triamping and, by patching the two channels together, allows use as a five-way mono electronic crossover. Each channel has separate low, high, and mid output jacks with phase inverters and a level control for each section. Low/mid allows for any crossover point between 100 Hz and 800 Hz cycles and hi/mid provides for any crossover point between 800 Hz to 10 kHz. Signal-to-noise ratio is -95 dB with a total harmonic distortion of .005 percent.

The CN 3201 Electronic Crossover features a 12 dB per octave slope and can be used as a five-way mono system (with separate level controls for dual bass power amps) or as a three-way, stereo crossover. The CN 3201 Electronic Crossover retails for \$399.95.

Circle 6 on Reader Response Card

TRIGON'S TELEPHONE ENTRY SYSTEM WITH VOICE FIDELITY

The Model 301 is the latest in the Trigon line of telephone entry equipment. With hands-free circuitry, the Model 301 provides voice fidelity normally found only in handset units. A visitor's voice is easily identifiable and the advanced circuitry provides uninterrupted conversation between calling and answering parties as with normal full duplex telephones, according to Trigon.

Designed to reduce ambient noise, the Model 301 has features such as crystal tone decoding, EEPROM memory, programmable directory code length (random), pulse or tone dialing, programmable call timer, and remote programming.

The Trigon 301 is encased in stainless steel and is equipped with an incandescent display for easy readability in direct sunlight. The postal switch is a standard feature on the Model 301 and the keypad is a stainless steel, sealed unit.

Being equipped with crystal tone decoding and unique hardware features, the Model 301 will accept tone, short tone, and dial pulse signals from tenant phones.

The Model 301 is available with memory sizes up to 800 12-digit numbers, with accompanying direct entry codes as a standard feature.

Circle 7 on Reader Response Card

JBL/UREI IMPROVES DIGITAL AUDIO DELAY

The new JBL/UREI 7922 Digital Audio Delay helps achieve superior performance and sonic quality by offering high-resolution precision while remaining far more transparent than most digital delay devices, JBL reported.

The 7922 features two independently adjustable outputs that simplify the most difficult tasks associated with audio delay: eliminating echoes and aligning the acoustic centers of separate drivers within a single loudspeaker array.

In high-resolution mode, the 7922 lets sound professionals control the audio delay in highly precise, 10 microsecond steps—equivalent to about one-eighth-inch resolution—with maximum delays of 327 milliseconds (more than 350 feet).

JBL said the 7922 offers greater transparency than competitive digital delays because of its linear phase anti-aliasing filters. These filters are designed to create no more than + or -5 degrees of phase shift in the audio passband from 20 Hz to 20 kHz, thus safeguarding audio quality and superior imaging.

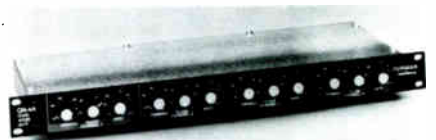
Protected by a 19-inch rack mountable package, the 7922 Audio Delay is available immediately for worldwide delivery.

Circle 8 on Reader Response Card

FURMAN SOUND UPDATES QUAD NOISE GATE

Furman Sound has announced its newest product, the QN-4A Quad

Noise Gate. The QN-4A, an updated version of the QN-4, features three wide range controls on each channel: a threshold control (adjustable from -80 to +20 dBv), release rate control (adjustable from .005 seconds to five seconds), and a depth control which allows the user to adjust the action of the gate, from gentle level reduction to total off.



The QN-4A uses pulse width modulation to achieve its gain reduction which results in extremely low distortion specification, three or four times lower than products which use VCAs. The unit features front panel calibrations (in dBc) for accurate adjustments and a ground lift switch to eliminate ground loops. Hysteresis circuitry in the level detection circuit virtually eliminates fluttering during the tail end of a decay.

The QN-4A is easy to adjust, according to the company. First the threshold is set so that a typical signal, when present, will turn on the channel, and when absent, the residual noise will be insufficient to turn it on. The fade time and the depth control are then set depending upon the nature of the program material and the application. When a tight sound is desired, the fade time would be set for fast decay, and the depth also set for maximum or near maximum. This type of setting can also be used to clean up a muddy sound by stripping it of excessive reverberation. However, sometimes this is too pronounced of an effect and too noticeable. In this case, the fade time can be set for a longer, more gradual decay so that natural reverb is preserved and the listener does not even perceive it working.

Circle 9 on Reader Response Card

VIKING ELECTRONICS INC. INTRODUCES SYSTEMS 309

Viking Electronics has debuted the Systems 309, an American-made, four-wire electronic key telephone system designed for the small to medium size business.

The basic three line by nine phone



system comes complete with built-in intercom with one-way call announce, paging amplifier, selectable ring, 10-number speed dialing, music on

hold, on hook dialing, and more. The system can be expanded to seven lines by 15 phones without replacing the system's existing telephones.

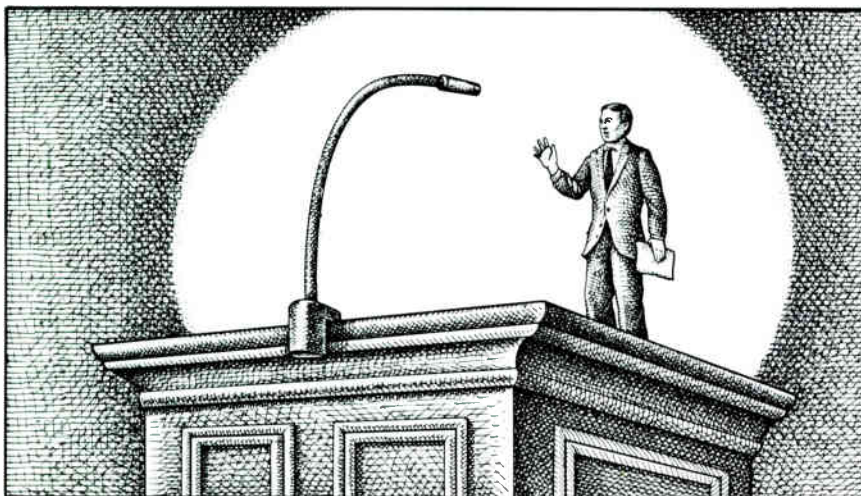


Viking's System 309 offers telephones in three configurations: the standard phone, suggested list price \$179, a phone with integrated busy lamp field, suggested list price \$249, and a third phone incorporating auxiliary jacks for use with modems, speakerphones or dialers.

The suggested list price for the 3x9 Key Service Unit (KSU) is \$595.

Full in-factory and field service is available for the System 309 and includes a quality "K" type handset with a carbon mike for excellent quality voice transmission.

Circle 10 on Reader Response Card



Announcing the end of miniature mics that miniaturize sound.

The Shure SM98 is now available with gooseneck mount.

Building a small condenser lectern microphone isn't difficult. The challenge is building one that delivers low distortion, wide frequency response and the warmth and clarity of larger condenser mics.

The Shure SM98 does just that.

The secret is an innovative design that integrates the cartridge capsule with the outer case. It provides more uniform polar response for better isolation and smoother frequency response. The result—more natural sound.

The great sound of the SM98 is now available with a superior 18" gooseneck adapter, the new

A98-G18, that makes it ideal for use on lecterns and pulpits. To keep it looking better, longer (even after repeated adjustments), we've put the support tubing inside. The SM98 also includes a plug-in cable to speed setup, eliminate wiring and make it easy to detach the mic. An optional A98PF pop filter and mic locking collar are also available.

Nobody else builds a miniature condenser mic that sounds as good as the SM98. Or a gooseneck that works as well. But then, nobody has a reputation like ours to live up to.

For more information, write or call Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60202-3696 (312) 866-2553. G.S.A. approved.

SHURE

Breaking Sound Barriers for over 60 years



AMPLIFIER RESEARCH'S 25-WATT AMPLIFIER

Designed to perform a wide variety of rf test-lab tasks, the Model 25A100 is a new solid-state benchtop amplifier introduced by Amplifier Research. The 25A100 delivers 25 watts minimum saturated output power throughout the four-decade frequency band of 10 kHz to 100 MHz, and 20 watts linear power measured at less than 1 dB gain compression at the same bandwidth. Only one milliwatt of rf input signal is needed for rated output.

Full bandwidth is instantly available—no need for tuning or band-switching according to the company; a major benefit in sweep testing. Of equal importance is the amplifier's 100 percent tolerance to gross load mismatch. It can operate without damage, oscillation, or shutdown even with shorted or open output terminals, or under any other source/load impedance-mismatch condition.

Occupying 14½ x 6½ x 8 inch of benchtop space, and weighing 21 pounds (9.5 kilograms), this amplifier is available in a range of 50/60 Hz line voltages from 100 to 240 volts.

U.S. price of the Model 25A100 rf amplifier is \$2,000.

Circle 11 on Reader Response Card

Circle 215 on Reader Response Card



OUTTASIGHT!

Until today, your choice of hemi-cardioid boundary microphones was limited. You could either choose thin sound to get articulation, or mid-range sound without the extended highs and lows needed for demanding sound reinforcement.

Full Range Performance

Introducing the full-range AT871 UniPlate Condenser Cardioid Microphone. The AT871 is designed to mix right in with other microphones, yet provide remarkable reach with

excellent presence. It features the response curve and polar pattern needed to provide higher gain-before-feedback than you thought possible.

Acoustically, Electronically Quieter

The AT871 is heavier than the rest, to stay where it's put, while better damping out floor or table vibrations. Its electronics are audibly quieter, and a low-cut switch helps control room noise. The AT871 can be powered from its own battery

or 9-52VDC phantom power.

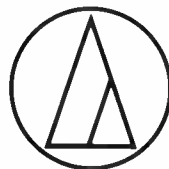
Field-proven

The new AT871 has already proven itself in demanding field tests. For stage sound reinforcement. For teleconferencing and boardroom sound. In TV news desk applications. Wherever great sound must disappear from view.

Test the AT871 against any or all of the rest. And against your most critical sound problems. For sound that's out of sight, trust Audio-Technica.



**Model 871 UniPlate
Condenser Cardioid Microphone**



audio-technica®

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Circle 209 on Reader Response Card

KING OF CLUBS



Go downtown and look around. The fancy pants dance where the music is cool. And the smoothest, easiest way to perfect a club's sound is Rane's innovative MP 24.

We've loaded this new Stereo Program Mixing Console to the gills with features. You're looking at more flexibility and performance in this one unit than in any other mixer/preamp made. Furthermore, it's got the highest level of signal quality: noise and distortion are virtually eliminated. And it's priced at \$995

Here's a partial rundown of why the MP 24 just made the competition obsolete. Nine stereo inputs (three phono and six line)

are accessed through four stereo mixing buses, each with its own 4-position selector switch and Alps studio grade 60mm slider. Crossfade is completely assignable via another 60mm slider and two selector switches. Then there's

separate mic and program EQ, mic and program loops, master balanced outputs, zone and booth outputs, light trigger output, cue system... whew! And that's not the half of it.

Those in the know are already saying our MP 24 will be the industry standard. But why be modest? We think it'll be the king. Rane Corporation, 6510 216th Southwest, Mountlake Terrace, WA 98043. 206/774-7309.



Circle 207 on Reader Response Card

World Radio History



BLONDER-TONGUE'S VHF CHANNEL PROCESSOR

Blonder-Tongue Laboratories, Inc. has announced the availability of its MSCA two volt, VHF channel processor for amplifying and stabilizing the level of a single VHF channel in MATV and SMATV headend systems. According to the company, a stable, quality signal free of distortion and intermodulation products is assured by the combination of a low-noise, high gain amplifier with exceptional output capability and a wide AGC window. An aural trap adjustment located on the front panel is said to provide up to 10 dB of sound attenuation at the input to reduce distortion, without affecting color quality.

The MSCA is designed for standard rack or cabinet mounting. An 18-inch line cord and a convenience AC outlet permit easy connections between units.

Circle 12 on Reader Response Card

AMPLIFIER RESEARCH'S RF PULSE AMPLIFIER

Amplifier Research has introduced a new, very compact high-power rf amplifier developed especially for NMR and other applications that demand rapid blanking capability and instantly available bandwidth over the 2-150 MHz frequency band.

The new Model 1000LP amplifier delivers 1,000 watts of linear pulse power on an up to 10 percent duty cycle with a maximum eight-millisecond pulse. The fast blanking feature effectively shuts down rf power to permit sampling of NMR signals.

In addition to pulse operation, the Model 1000LP has a front-panel cw pushbutton selector which may be used for continuous-wave applications at power levels to 200 watts.

Latest advances in power-amplifier design have been used to advantage in the 1000LP, in which all solid-state, low-power stages are coupled to a vacuum tube final power stage. This final output stage operates in gated mode for maximum efficiency, reduced noise, and optimum pulse duty cycle.

Pulse operation requires only a TTL gate pulse synchronized with the rf input signal. Gating can be provided by the AR Model 999 preamplifier, and



the rf signal (1 milliwatt maximum for full rated output power) is available from any frequency generator or synthesizer within the 2-150 MHz bandwidth of the amplifier.

The Model 1000LP is totally tolerant to load mismatch: It will not shut down or go into oscillation under any magnitude or phase of source/load impedance mismatch, even in the event of shorted or open output terminals, according to the company.

Circle 13 on Reader Response Card

MOVING?

Please attach your Sound & Communications mailing label or print your address exactly as it appears on the label.

Also please enclose a letterhead with your company's new address.

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Sound & Communications
220 Westbury Avenue
Carle Place, NY 11514

PROOF OF PERFORMANCE

(continued from page 22)

Table 3. A typical specification for the procedures for the control of dominant feedback frequencies.

- a. The sound system gain shall be adjusted until it reaches regeneration. Determine the frequency of regeneration, and adjust the appropriate filter until the observed regeneration ceases. This procedure shall be continued until the specified potential acoustic gain is achieved. At the conclusion of the tuning for feedback frequencies, the electrical amplitude response of the equalizers shall be recorded.
- b. Suppress the tendency of the sound system microphone to become unstable when approached by a talker. Identify the frequencies affected by the approach of a person, and provide enough attenuation to ensure stability. Records shall be made of additional attenuation provided.
- c. Measure and record the acoustic gain of the system at the octave bands of 500 Hz, 1 kHz, and 2 kHz.

Table 4. A typical specification showing what should be included in the owner's operating manual:

- a. List of personnel and certified test equipment used.
- b. The recorded inspection results of Table 1.
- c. The recorded equalization results of Table's 2 and 3.
- d. The variation of acoustic distribution throughout the seating area above and below a reference level at each one-third-octave center frequency from 500 Hz to 5,000 Hz.
- e. All calibrated settings of each filter used.



Point Source Monitors for Point Blank Truth.



When it comes to sound, some people get a little funny about the point blank truth, in that they don't want to hear it.

They've come to expect that low end bump around 200 Hz because it makes the kick drum punchier, or they like the phase irregularities of the typical tweeter because the highs are all tst-tst.

At Fostex, we believe that truth is stronger than fiction. That's why we made the RM-Series. Point Source. Phase Coherent. Near Field.

They are reference monitors. They tell you exactly what you have and let you hear precisely what you're doing. Period. With neither apologies nor pamperings. Just the point blank truth.

What's more, when you mix with RM-765s or 780s, tape playback remains relatively the same from studio mains, to home stereo to car.

How many times have you heard just the right sound on a mix, only to find a completely different sound when you hear the tape on other monitors?

When you work with sound, you need a truthful reference. One that lets you hear the misses as well as the hits.

We encourage you to audition these Fostex reference monitors with a known source. Because we're confident that you'll know the truth when you hear it.

Point Blank.



RM-765/780

Fostex

Pro Sound Division
15431 Blackburn Ave.
Norwalk, CA 90650
(213) 921-1112

APPLYING FOR GOVERNMENT CONTRACTS:



A Starter Kit of Forms
with Instructions
for Small Businesses
and Entrepreneurs.

Sonalysts Kit Tells How to Get Government Contracts

A new kit filled with instructions on how to apply and qualify for contracts totalling over \$33 billion dollars with the U.S. Government is now available from Sonalysts, Inc. "Applying for Government Contracts - A Starter Kit of Forms with Instructions for Small Businesses and Entrepreneurs" is a guide designed to assist minority-owned companies, entrepreneurs, small and large businesses in seeking government projects.

The new guide offers time and money savings to users by compiling a comprehensive selection of key documents in one easy reference guide. Each kit contains over 50 separate forms and instructions on why, when, and where to submit the appropriate paperwork. The guide is divided into sections taking readers through the various steps for doing business with the federal government including: being added to the qualified bidders list, preparing proposals, contract administrations, security clearances, billing and more.

The booklet also provides information on where users can obtain additional information or assistance in applying and qualifying for government contracts. The starter kit is available for \$49.95.

Circle 15 on Reader Response Card

Quick Guide to Techron® Products Now Available

The features and advantages of Techron Power/Supplies and Accessories have been published in a short, easy-to-read catalog.

The *Short Form Catalog* presents the entire range of Techron Power Sup-

plies/Amplifiers. All Techron amps develop maximum power with 2- to 4-ohm loads; they are also capable of driving other load impedance and can handle any load from pure reactive to pure capacitive. Techron offers power ratings up to 4 KVA, and 110, 120, 200, 220, or 240 VAC operation.

Featured in the catalog are the Series 5500 dual/single-channel amps. These include an AB+B output circuit for improved reliability and high linearity of the output signal, and the IOC™ distortion indicator which reports variance from input or output wave form.

Circle 16 on Reader Response Card

Expanded Industry Calendar Available from ERA

Publication of an expanded Electronics Industry Calendar for 1986-87 has been announced by the Electronics Representatives Association (ERA). The newest edition of the compact calendar covers 16 months from September 1986 through December 1987. Major events for all segments of the electronics industry are listed in the calendar by date, with locations and contact telephone numbers included.

ERA publishes the Electronics Industry Calendar as a service to the industry and distributes copies free.

Circle 17 on Reader Response Card

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FACES AND PLACES

JBL Pro Names Martinez Market Manager

Hector Martinez has been named to the new position of market manager at JBL Professional. In the position, he will interface with JBL dealers and sales reps and provide their input as new products are developed.

Martinez's background includes five years with JBL from 1972-77 as a technical services coordinator. He also has worked in the greater Los Angeles area for a retailer of audio and video products and most recently as a manufacturer's rep of commercial sound and lighting equipment.



**HECTOR
MARTINEZ**



**MICHAEL
SCALA, JR.**

Simpson Appoints Scala Director of Marketing

Michael Scala, Jr. has been named director of marketing of Simpson Electric Company.

In his new position, he will be responsible for the sales and marketing of Simpson's various product lines to the government, original equipment manufacturers, and distributors, both domestic and foreign.

Prior to joining Simpson, Scala served as national sales manager of Triplett Corporation and director of marketing of the B&K Precision Instruments Product Group.

Gauss Promotes Williams And Fleischmann

Cetec Gauss has announced the promotion of Jim Williams to vice president and general manager; and Jacques Fleischmann to the position of national sales manager.

Williams, who joined Cetec Gauss eight years ago, had been executive vice president and assistant general manager.

Before joining Cetec Gauss, Wil-

liams had been manager of quality assurance at RCA Records in Indianapolis.

Jacques Fleischmann has also been appointed national sales manager for Cetec Gauss. In this position, he will direct the company's factory representatives in the U.S. and Canada for the sale of the company's line of loudspeakers. Fleischmann has been with Gauss for the past nine years as sales manager of the company's duplicator products. He has over 20 years experience in the professional audio business. Prior to joining Gauss, he worked for ElectroSound and Reeves Video Service in New York.

V Band Appoints Simels Director of Sales

V Band Systems, Inc. has announced the appointment of Rich Simels as director of sales.

Simels, who has been with V Band for a year as national accounts manager, will be responsible for all

sales activities within the North American region.

Prior to the V Band appointment, Simels was employed by Honeywell Communication Services, where he held the positions of sales manager and branch manager.

Hurley Joins Anixter As Product Sales Manager

John Hurley has joined Anixter Bros., Inc. as transmission product sales manager, it was announced by John Pryma, vice president of Anixter's Transmission Product Sales Group. Hurley comes to Anixter from American Telephone & Telegraph (AT&T) as an account executive.

In his new position with Anixter, he will be responsible for promoting the sale of D-4, a fourth generation digital channel bank manufactured by AT&T Technology. The D-4 allows 24 voice and/or data channels to be transmitted over one T-1 line, allowing corporate America customers to substantially reduce their phone bills.

REP NEWS

Jeron Electronic Systems, Inc. has appointed the following firms to represent its product line: **Pacific West Marketing** of Honolulu, HI, for Hawaii and all U.S. possessions in the Pacific; **Techno Associates** of Dallas, TX, to cover Texas, Oklahoma, Arkansas, and Louisiana; **Jim Church Marketing** of Bloomington, IN, to cover Indiana; **Burcaw Company & Associates** of Warren, MI, will cover the state of Michigan.

R.M. Associates, LTD., a manufacturers representative headquartered in Kansas City, has announced they are changing their name to **Eakins/Bernstein & Associates**. Company President **Michael Eakins** said there are no changes in personnel or ownership, only in name. The change is being made to eliminate confusion with other firms with similar names and to be more identifiable in the industry. The company represents JBL, Soundcraft, Shure Brothers, Akai, Carver, and Canare Cable.

Lowell Manufacturing Company has recently appointed two new manu-

facturing rep firms to sell its product line. **Peregrine Southwest Reps** of Houston and Dallas, TX, will cover Texas, Oklahoma, Arkansas, and Louisiana; and **Design Factors** of Hacienda Heights, CA, will cover southern California and southern Nevada.

Paso Sound Products has announced the appointment of **Weller Electronic Sales, Inc.** of Columbus, OH, as the company's new sales representative in U.T.P. Territories 11, 12, 13 including Ohio, western Pennsylvania, and West Virginia. Weller Sales headed by Ralph Wright, has been involved in the commercial sound market for over 20 years.

Astatic has appointed two new manufacturers' representatives: **The Sunrise Sales Company** of Romeoville, IL, will cover Indiana and Kentucky in addition to the northern Illinois/southeastern Wisconsin territory they have covered for Astatic since 1978; and **Bi-State Marketers** of Ridgely, NJ, will cover the New York Metropolitan area and northern New Jersey.

NSCA ELECTRONIC CONTRACTORS EXPO : WORKSHOPS EXHIBITS ... AND MORE '87

APRIL 6th, 7th, 8th, 1987
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"Here's the only expo worth closing up shop for!

—Harold George
NSCA
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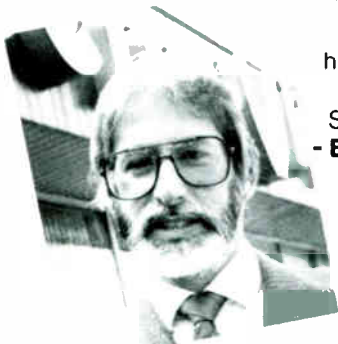
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—Mel Wierenga
VP and
Expo Chairman



"This is the year we're highlighting VIDEO SECURITY!

—Barry Levine
Expo
Committee



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501 WEST ALGONQUIN ROAD
ARLINGTON HEIGHTS, ILLINOIS 60005

Circle 227 on Reader Response Card

CONTRACTING CLOSE-UP

AV AT PA BELL

McKinney and Associates recently completed a two year, \$4 million project on the Pacific Bell Administration headquarters in San Ramon, CA. The company did all the audio/video work and installed a Bass Band Video and Audio System which permits a program to be set up in one room and transmitted to other rooms. McKinney and Associates also installed sound masking equipment and a Clear Com intercom system.

According to Dick Bowman, sales and marketing director, "What was unique about this project was the sheer size of the facility. It holds up to 7,000 people, stands four-stories high, and takes up eight city blocks in both

directions."

The building, which is shaped like a cross, has a center core where there are large classrooms, a reception lobby, and the network operating center. The building also has a 180 seat multipurpose facility, 51 conference rooms, and 10 executive conference rooms.

The project was built on the fast track system—that is as the building was undergoing construction, the sound system was designed at the same time. Bowman said, "This is a different way of doing installations; you don't have the luxury of time." But Bowman added by working under this method, they were able to save Pacific Bell money.

System Rules in ROCK'S SUPREME COURT

Tesseract, Inc. of Dallas, TX, is near to completing the sound system installation for the newest Hard Rock Cafe in Dallas.

Dubbed the "Supreme Court of Rock 'n' Roll," the Dallas Hard Rock is located in a century old federal court building. The two story building has four bars, an outside deck with a balustrade of 253 Les Paul Guitars, a working solid brass oil rig which operates when the restaurant is open, and an outdoor elevator which goes up to a private bar called The Cheese Club.

According to John Maus, president of Tesseract, there have been few problems with the installation of the the sound system because the layout is similar to the Hard Rock Cafe in New York.

A main feature of the system is the voltage control amplifiers which preset how high or low the volume can go. "This prevents people from doing things that they shouldn't—like blowing the speakers," Maus explained.

The master adjustment control, located in the front desk area, is key-operated so that unauthorized personnel can't get to the system. "Everyone thinks they can adjust the sound system better than anyone else," Maus

said, "this master control will cut out a lot of the equipment failures."

Among the other equipment installed were Ramsa loudspeakers, amplifiers, mixers, and crossovers, RTS Systems buffer amplifier, a TW Series intercom, a URIE amplifier, JBL 18-inch woofers, and dbx limiters.

SEARS' SOUND

Ancha Electronics has been very busy according to president Bob Ancha. The company has recently finished installing audio/video equipment for Sears/Roebuck in Chicago.

Ancha installed an audio/video training room on the 41st floor of the Sears/Roebuck building. The installation featured a special mechanism to bring the video projector down from the ceiling when it's being used.

Among the equipment installed were 18 Kodak slide projectors, AVL Genesis computer, a Yamaha console for program channelling, a Sony video projector as well as some video equipment from Sears.

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.

CALIFORNIA

Bakersfield: Bakersfield Christian Life Center, 3, D. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc. Santa Monica, CA; (213) 450-1733.

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

Cerritos: Performing Arts Center, 4, A. Contact: Robert Long, Theatre Projects, New York, NY; (212) 873-7211.

El Segunda: Aerospace Building A-8, 5, B. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

Escondido: Escondido City Hall, 3, A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

Los Angeles: Western Airlines Terminal, 5, A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

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

Pasadena: Lake Avenue Congrega-

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

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

CONNECTICUT

Hartford: Connecticut Legislative Office Building, 5, C. Contact: Marc Beningson, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

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

FLORIDA

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

St. Petersburg: Bayfront Center Auditorium Renovations, 3, B. Contact: Robert Long, Theatre Projects, New York, NY; (212) 873-7211.

ILLINOIS

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

KENTUCKY

Lexington: Remington Park, 5, A. No consultant named. Contact: Neil Johnson, Ewing Cole Cherry Parsky, Philadelphia, PA; (215) 923-2636.

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.

NEBRASKA

Lincoln: Lied Center for the Performing Arts, 4, C. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

NEW YORK

Jamestown: Palace Theater, 2, B. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates, Inc., New York, NY; (212) 420-8787.

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

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

OHIO

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

Columbus: Ohio State Office Technology Tower (Office) NA., C. Contact: Marc Beningson, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

Columbus: Ohio State Office Tower (Theaters), 5, C. Contact: Chuck McGregor, Jaffe Acoustics Inc., Norwalk CT; (203) 838-4167.

Columbus: Ohio State University Wexner Center for the Visual Arts, 5, D. Contact: Chuck McGregor, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

PENNSYLVANIA

Easton: State Theatre Renovations, NA, B. Contact Robert Long, Theatre Projects, New York, NY; (212) 873-7211.

SOUTH CAROLINA

Columbia: University of South Carolina, Kogor Center for the Arts, 3, B. Contact: Chuck McGregor, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

WASHINGTON, D.C.

Washington DC.: National Council of Catholic Bishops Conference Center, 2, C. Contact: Marc Beningson, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

NEW BRUNSWICK, CANADA

St. John: Bicapital Theater Project, 2, A. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates Inc., New York, NY; (212) 420-8787.

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Looking back at SOUND & COMMUNICATIONS

10 Years Ago . . .

The first formal economic issue was introduced. It was entitled "76-An Economic Roundup." Excerpts from the editorial that month included the following:

- The dynamics of the marketplace played hob with more equipment suppliers this year than any former year: failures, mergers, and a saturated audience for customer-owned telephone systems ruled the year."
- Processing audio products—the compressor/limiters, the graphic analyzers, the notched filters, all of the signal processing equipment that saw an ever-widening acceptance and use—made a heavy dollar contribution.
- And probably among the most influential on the industry that year was the Saturday night fever which plagued the country with outbreaks

of discos in almost every city. "Discotheques that sprung up like mushrooms after a rainstorm. . . No one can get a handle on this end of the sound market. But suffice it to say that it has already registered several millions in product sales."

The Harmonizer from Eventide Clockworks was also introduced that month. It was called "a versatile digital delay line that may be used for equalization in sound reinforcement applications.

20 Years Ago . . .

The six products/services which "led the charge up the sales curve" in 1966 were

- automatic telephone systems,
- closed circuit television,
- one-way radio programming services,
- two-way mobile radio equipment,

- telephone answering devices,
- background music services.

It was reported that government spending in all business areas was expected to be maintained. "There's no slowing in the Viet Nam commitment; there'll be no drying up of armament and electronic equipment spending. And all business is local, so your industry will prosper."

"Don't shoot the operator. . . Do it the Modernphone way" said another ad from the Modern Telephone Corp. of New York. The Modernphone boasted: "at a flick of a finger you can talk to anyone on your staff—and they can talk to each other, *without* having to go thru a switchboard."

30 Years Ago . . .

The new interest in FM broadcasting, created by multiplexing authorization, brought on the need for a new monitor and relay crystal-controlled receiver for the FM broadcast band, 88 to 108 mc. The receiver, which was manufactured by Browning Laboratories in Worcester, MA, was expected to find widespread use also in relay work with so many stations joining high fidelity network operations.

Television star Ed Sullivan gave a new electronic carillon made by Stromberg-Carlson to Georgetown University. The carillon, named the "Flemish Master," was originally used in 1956 on Easter Sunday on Sullivan's television show in accompaniment of the Georgetown University Glee Club. Before the show the instrument was presented to Sullivan by Robert C. Tait, president of Stromberg-Carlson.

Blonder Tongue Labs, Inc. advertised its new Observer Camera, Model TVC-1, and receiver for closed circuit applications. The system sold for "as little as" \$1,995.

A subscription to *Sound Merchandising* (now *Sound & Communications*) was \$2 a year.

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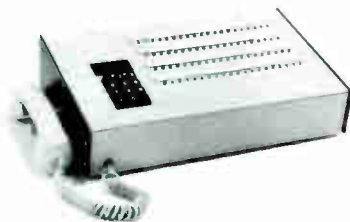
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Circle 218 on Reader Response Card

Winsted Introduces An Economy Equipment Cabinet

A new economy model cabinet for rack-mounted electronics equipment has been introduced by The Winstead Corporation. Designed with removable side panels for easy installation and servicing of electronics, the Model V8405 vertical rack cabinet offers a full 70 inches of rack space, with strict EIA 19-inch width.



The cabinet features an open bottom for ventilation to keep electronics cool. It is available with optional cooling fans, electrical outlet strip, stationary and pull-out shelves, and blank panels. Useful for video and security electronic equipment, the cabinet is ruggedly constructed of extra heavy gauge steel panels over steel channel frames, and is designed with grey and beige baked enamel finish.

Circle 18 on Reader Response Card

Canare Debuts Line of Audio/Video Cable

Canare has introduced a new line of professional audio/video cable products at the Los Angeles AES show. Among products in the line is the MR202-AT Series which is a 25 awg, multichannel microphone cable with a two conductor individually insulated twisted pairs and aluminum tape shield and captive drain wire. Channels are color-coded for ease of identification. It has easy strip conductors for

termination efficiency. The MR202-AT is available in two to 24 channels and for digital data transmission.

The D202 Series is a 25 awg, multi-channel data cable. It has a two conductor, braided shield, and is flexible and color coded. It's also available in four >32 channels and for digital data transmission.

The VAC-FB cables are pre-assembled BNC > BNC Cables. They utilize Canare LV-61S(RG-59/BU) 75 ohm cable and Kings crimp connectors. They are available in eight colors with a matching friction lock boot. They come pre-packaged in lengths from three to 25 feet and are ultra-flexible for patchbay and other video interfacing situations.

The 4S6 and 4S11 Cables are 20/14 awg quad-conductor speaker cables which are flexible and have an excellent frequency response and very low loss. They maintain shape and strength due to a cotton filler. They are made for demanding amplifier/speaker hook ups.

Circle 19 on Reader Response Card

Brand-Rex Introduces Standard Electronic Cables

The Brand-Rex Cable Systems Division of BRIntec Corporation has announced the availability of standard metallic and fiber optic electronic cables.

The new Brand-Rex® offering of electronic cable includes multiconductor cables, multipair cables, coaxial and twinaxial cables, LAN cables, plenum cables, fiber optic cables, and specialty computer cables. More than 12,000 part numbers are available.

Circle 20 on Reader Response Card

The Sound Enhancer Eliminates Vibration

Speco has announced the addition to its product line of the GSE-8P or The Sound Enhancer. A ceiling mount for any eight-inch speaker, fits completely recessed into the ceiling and acts as a sound chamber. According to Speco, the GSE-8P is engineered for vibration-free performance. It is manufactured of a fire retardant ABS plastic. The GSE-8P requires less than six-inches of clearance space in the ceiling.

Circle 21 on Reader Response Card



Modular Patch Panels from Support Systems, International

A new line of modular patch panels for data and telecommunications installations has been introduced by Support Systems, International. The patch panels provide a centralized hub between a computer, controller or PBX, and any other equipment hooked up to it. Like an old telephone operator's switchboard, the patch panels allow you to switch access around.

Modular patch panels can be used on any type of system and are expandable. When the system grows, when people move their offices, and when need for access shifts around (i.e. order taking during Christmas or accounting during tax time, etc.) modular patching gives you the needed flexibility.

The panels come in three standard 24 port models: four wire, six position; six wire, six position; and with eight wire, eight position U.S.-made connectors on the front. The rear has 50 position telco type connectors.

Circle 22 on Reader Response Card

Viking Electronics LT-600 Problem Finder

The Viking Corporation has introduced the LT-600 which allows users to determine whether an equipment or Telco problem exists prior to dispatching a repairman. In addition, the user can positively demonstrate the problem to the Telco technician eliminating any question about whose problem it is as well as erroneous billings.

The LT-600 is installed between the Telco demarc and the customer owned equipment.

The LT-600 addresses all major Telco problems including no dial tone, no line, noisy line (static, hum), won't break dial tone even Telco reterminating the wrong line, (50/50 chance of reversing the polarity), and cross talk.

Circle 23 on Reader Response Card

DATE BOOK

CALENDAR OF EVENTS

DATE	EVENT/COMMENT	LOCATION	CONTACT
January 7-9	Fiber Optics Workshop and Laboratory.	Lake Buena Vista, FL	University of Central Florida (305) 275-2123
January 8-11	Winter Consumer Electronics Show.	Las Vegas, NV	CES (202) 457-8700
January 16-18	National Association of Music Merchants.	Anaheim, CA	NAMM (619) 438-8001
January 21-23	Solid State Electronics for Non-Electrical Engineers. Course presented by The Center for Professional Advancement.	E. Brunswick, NJ	The Center (201) 238-1600
January 27-28	Digital PABX—What It's All About. Seminar.	New York, NY	J.H. Morgan Consultants (201) 766-0969

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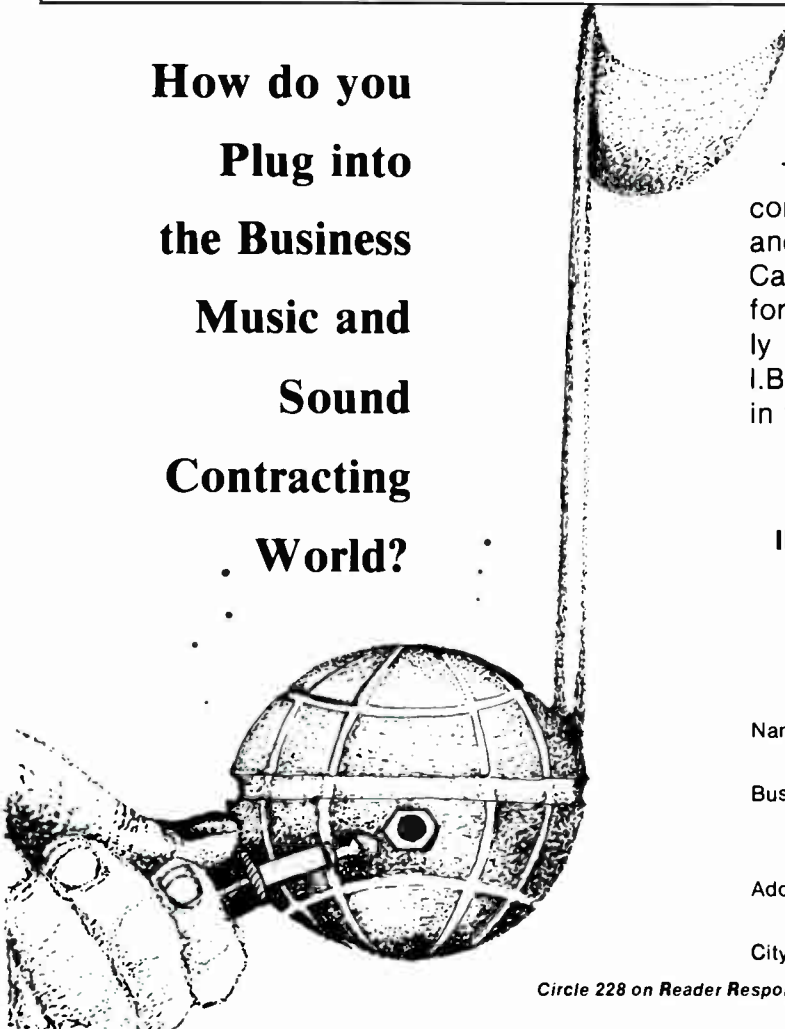
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Circle 228 on Reader Response Card



A CLOSER LOOK

(continued from page 41)

(72 V, 18 A peak per channel), at less than 0.1 percent THD, and draws up to 1,600 watts from a 50 or 60 Hz AC power source. Dynamic range is said to be over 100 dB. The 500 speakers are rated at 100 dB sensitivity at one meter with 1 volt RMS pink noise input; since I don't know the impedance, it's difficult to compare this to other sensitivity specs. Each 500 speaker is rated at 130 dB SPL peak, 110 dB SPL maximum continuous sine wave from 100 Hz to 16 kHz. The crossover has a 12 dB/octave high pass and 6 dB/octave low pass, with an effective acoustic crossover point of 1 kHz. Nominal dispersion for the horn is 40 degrees vertical by 90 degrees horizontal. Frequency range for the 500 is 30 Hz to 16 kHz (half space), with a free field response of 40 Hz to 16 kHz +/-3 dB. Obviously, adding the 501 subwoofer will extend the bottom end response.

Since this is a complete "matched" system, and since I have heard what Meyers can do with similar systems, I would expect the overall performance to be sonically excellent. Clearly, with that much power, and Meyer's specialized protective control circuitry, even the relatively compact boxes will be able to generate a high average SPLs. This system should be adequate for full-range musical sound reinforcement in small clubs, meeting rooms, small to medium size theaters, and so forth, and its portability makes it a candidate for touring/rental systems. For these reasons, I think the Meyers 500 system deserves your *closer look*.

Gary Davis owns Gary Davis and Associates, a firm which has produced instruction manuals, catalogs, advertisements, and newsletters for the audio field over the last 12 years. Davis has worked as an electronics technician, is a member of the AES and author of the CAMEO dictionary.

Circle 14 on Reader Response Card

THEORY & APPLICATION

(continued from page 13)

direct field which extends for 125 feet. On the other hand, the direct field of a small room with 5 percent absorption and a Q of 0.1 will only extend to one foot. The examples in this table should be studied very carefully to develop a

feel for the effects of room size and absorption.

Comments

The Master Equation must be understood by those working with room acoustics. A good grasp of it will eliminate confusion which sometimes occurs when designing speaker systems and related problems.

Editor's Note: The articles referred to in this column are "Sound Intensity and Power," Sound & Communications, June 1986, p. 14; and "Sound Power Levels," Sound & Communications, September 1986, p. 14. Both articles were by William R. Thornton, Ph.D., P.E.

Bill Thornton, president of Thornton Acoustics and Noise, holds a B.S.M.E. and an M.B.A. from the University of Pittsburgh and an M.S.M.E. and a Ph.D. in Mechanical Engineering from Purdue University.

COMPUTERS

(continued from page 16)

of many processes which have so far been commercially infeasible. Products such as digital filters, equalizers, nonlinear signal processors, digital mixing boards and inventive new processes will undoubtedly be implemented with this technology.

Michael Beigel, who has been a consultant since 1978, specializes in electronic product development and holds numerous patents in musical products and related fields. He is a member of the AES and the ASA.

CONSULTANTS

(continued from page 18)

small family business with owners that will give extra care to the project? Is it a dedicated local company or part of a high profile national group? Is it a division of a larger corporate entity with a high bonding capability and financial resources to sustain any losses due to errors in estimating? Will the organization be around in several years to provide maintenance, service, and field support? One type of contractor may be more appropriate for a particular project than another.

(7) *The contractor's shop is often a good indication of the quality of his work.* The level of organization of parts and inventory, and the layout of the shop

can tell more about a contractor than anything else. A sloppy or poorly equipped (or non-existent) test bench probably indicates a lack of commitment to quality control. Observing work in progress in the shop provides a good insight into the probable outcome of a project in the field.

(8) *Does the contractor read and understand a specification?* I am often surprised at the number of people who show up at a prebid conference unprepared. This is a contractor's prime opportunity to meet and impress the system designer. A contractor who shows up at the prebid with a list of technical questions regarding workscope or system details that pertain to the cost of the system is impressive. A contractor who calls the day before bids are due with questions that are clearly answered in the specification is not impressive. A contractor who has not researched the details of the specification cannot possibly submit an intelligent bid.

(9) *There is nothing that speaks better for a contractor than a successfully completed execution of one of the consultant's own specifications.* Once a contractor is familiar with the requirements of a Jaffe Acoustics, Inc. specification, performing a second successful installation is that much easier.

Marc Beningson is a senior electro-acoustic consultant with Jaffe Acoustics. Beningson, a member of the AES, came to Jaffe Acoustics shortly after receiving a B.S. in Mechanical Engineering from the Rensselaer Polytechnic Institute.



APRIL '87

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