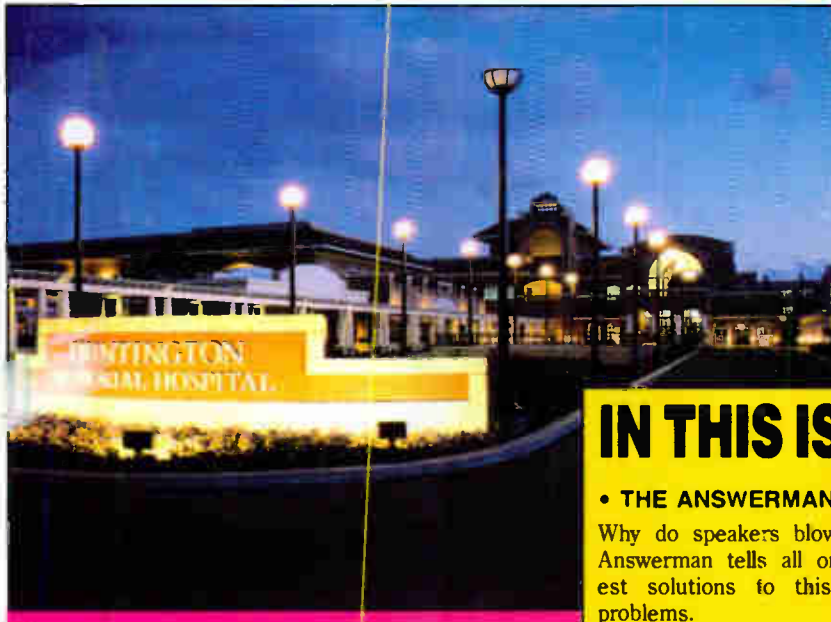


# SOUND & COMMUNICATIONS

Volume 38 Number 6

June 26, 1992



## THE HEALTH CARE MARKET

Business in health is relatively healthy — despite some hard considerations as to hospital competition, UL code, and the impact of the ADA. “Keep learning,” say those in the business. **28**

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#### • THE ANSWERMAN

Why do speakers blow out? The Answerman tells all on the newest solutions to this oldest of problems. **14**

#### • RACETRACK VIDEO

Video tells the story and interacts with the patrons at Arlington Racetrack where several hundred monitors and a Sony Jumbotron help make thoroughbred racing a livelier experience. **43**

#### • CONSULTANT'S SPOTLIGHT

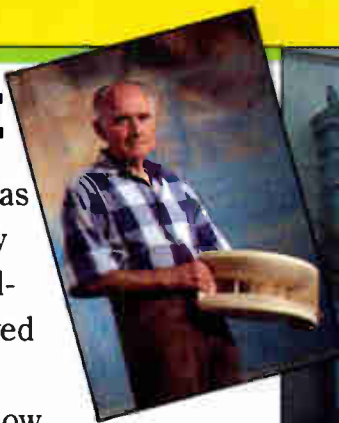
George L. Augspurger speaks with Sound & Communications about his designs, his computer program, and his business. Common-sense solutions and a good pair of ears are primary. **46**

## HEALTH CLUB SOUND

At the Waldorf-Astoria, customers are fussy. The interior designer and the decors' ambience made special demands on the sound and television systems for the Waldorf's Plus One health club. **36**

## THE NSCA SCENE

The NSCA Expo '92 didn't disappoint — as our reporter shows by surveying the show floor for the newest sound products. Loudspeakers proliferated, and electronics moved further into the digital age. Our reporter, Dan Sweeney, was on the floor for the show between the quake and the riot. A show that had its own fireworks. **20**



## LIBRARY SOUND?

It seems like a contradiction in terms, but sound is discreet — and discrete — in the quiet-zone library. Chicago's Washington Library has 12 different audio facilities, including a performance auditorium and sound booth, some multipurpose rooms, and a boardroom. **56**



2-input, 3-output multiway tap digital delay line with 16-bit Delta-Sigma A/D converter and a 48 kHz sample rate.

# Sound Simple? It is!

## Introducing the IDL™ 1000 Digital Delay Line Processor From Peavey

Don't let the technicalities scare you. This sophisticated piece of equipment is designed to eradicate the old nemesis of sound architects —

*time alignment of multi-speaker sound systems.*

The IDL™ 1000 digital delay processor from Peavey Architectural Acoustics will make the task simple and accurate. With over 1.3 seconds of delay (over .25 of a mile), the IDL 1000 can align multiple speaker systems in churches and auditoriums, to even the largest permanent installations such as arenas and stadiums. Within an array, individual drivers can be aligned in 20.8 microsecond increments. If needed, a second delay line can be formed that dynamically shares the delay memory by switching to stereo "B" and output 3.



A sliding security door is provided on the front panel to prevent tampering with input and output level controls.

distortion low as well as to maintain a full 20 kHz bandwidth. Both the inputs and outputs are electronically balanced and use XLR connectors. Transformers for the inputs and outputs are optional.

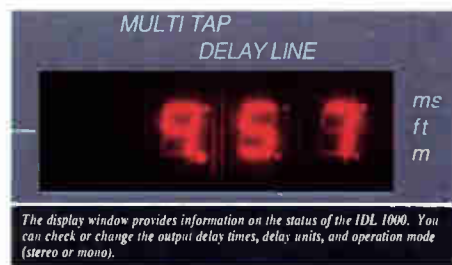
To further speed setting the delays, the display can be set in units of milliseconds, feet, or meters.

The IDL 1000 has a mute button for each output which can also be programmed to compare the current delay settings to a zero delay.

The IDL 1000 utilizes a 16-bit Delta-Sigma A/D converter and a 48 kHz sample rate to keep the noise and



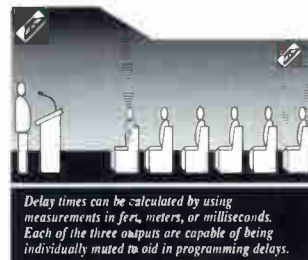
Two input and three output XLR connectors located on the back of the unit have corresponding level controls located behind the security panel in the front (transformers optional). An operation mode button sets the IDL 1000 to either stereo or mono operation. For extra protection against tampering, a lock switch is provided which makes the controls of the unit inoperative.



The display window provides information on the status of the IDL 1000. You can check or change the output delay times, delay units, and operation mode (stereo or mono).

Setting the IDL 1000 is a breeze with its 4-digit LED display and its variable rate increment and decrement buttons.

*The IDL 1000 — simply brilliant.*



Delay times can be calculated by using measurements in feet, meters, or milliseconds. Each of the three outputs are capable of being individually muted to aid in programming delays.



To receive a catalog showcasing Peavey Architectural Acoustics' full line of sound equipment, call or write: Peavey Electronics Corporation • 711 A Street • Meridian, MS 39302-2898 • (601)483-5365 / Telex: 504115

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# Serious High Frequency Protection?



We use this illustration to shed some light on a superior design and introduce the new Tannoy CPA5 (ICT)<sup>™</sup> loudspeaker - a small, contractor-specific loudspeaker from our new Contractor Series.

Designed and engineered with contractor requirements in mind, our new CPA5 offers controlled directivity and throw characteristics, uncommonly superior vocal articulation and strong vocal midrange presence from a loudspeaker promising failure-free operation from its HF unit. How? "Inductive Coupling Technology" (ICT)<sup>™</sup> makes it so.

Simply stated, the CPA5's five inch ICT transducer has no high frequency voice coil or HF windings. Instead, a one inch Duralumin HF passive radiator sits in the same gap with, and is inductively energized by, the electro magnetic high frequency energy, generated as a by-product of the LF unit. The ICT transducer's crossover free architecture ensures linear, smooth, symmetrical off-axis dispersion out to 22kHz and true point-source, phase coherent sound.

The CPA5's ICT design offers exceptional performance with outstanding dynamic range and 90dB 1W 1M sensitivity. AT LAST you can have a dynamic, full bandwidth background music system which even at the lowest of volumes, remains highly intelligible with shimmering presence. And yes - they also sound great loud.

The CPA5's 100 Watt power handling and 110 dB output, provides clean, non-fatiguing sound at exceedingly high volumes - free from mid-range compression, and with remarkable bass response for such a small enclosure (8 1/2" high X 6" wide X 5" deep).

Its modern, rugged, molded polypropylene cabinet (available in two colors) and shielded components are "environmentally friendly" and impervious to most weather conditions. Equipped with 70 Volt transformer fittings for multi unit installations, the CPA5 mounts both vertically or horizontally, offers two grill faces, and an adjustable, rotating badge.

While its affordable CUB-5 hardware meets all safety standards, the CPA5 also retrofits most existing mounting hardware available today.

We think you will find the Tannoy CPA5's exceptional performance a uniquely flexible, cost-effective and reliable alternative to what you've been settling for in foreground/background music systems. We have the required projection and presence you've been looking for, at all volumes, and you'll never blow our HF unit. We may not glow in the dark.... WE DON'T HAVE TO. If you value exceptional high performance and trouble free, safe sound, step up to the TANNYOY CPA5 (ICT)<sup>™</sup>.

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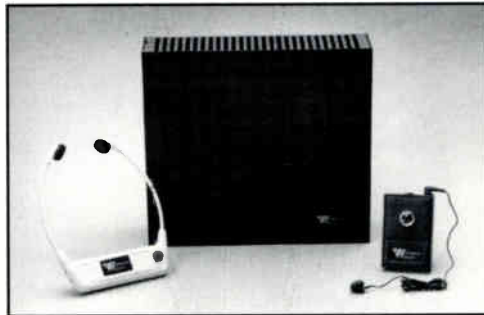
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## THE INS & OUTS

ROLLS has 3 new rack units the RA62HA headphone amplifier, RM81 and RM83 mixers. The RA62RH will power 6 pairs of headphones with six 1/4" headphone outputs, 1/4" stereo input on the front, right and left 1/4" inputs on the rear, and 6 bypass jacks. The front panel controls

include 6 VOLUME, and 1 PAN controls, MONO/STEREO and power switches. The RM81 is an 8 ch mike/line mixer with phantom power. The controls include 8 VOLUME, 8 TONE and MASTER VOLUME controls. The RM83 is a basic stereo mixer with all 1/4" ins and outs.

The controls are 8 VOLUME and MASTER VOLUME. There is a channel muting feature for remote muting of any or all channels. The RCA jacks can bridge several RM81s or RM83s together. All this at a cost of \$200, \$290, and \$290.



### RA62HA Features

- 6 Headphone outputs with level controls
- Up to one watt output per jack
- Stereo/Mono switch and Pan control
- DC to 30kHz response for accurate sound

### ROLLS RM81 MIXMAX Features

- Aux/Buss INS and pre-fade OUTs

- 8 XLR mike inputs and phantom power switches
- 8 1/4" jacks that can be jumpered to either line in or line outs
- Wide range tone controls on each channel

### ROLLS RM83 MIXMAX 2 Features

- 8 stereo inputs and RCA bridging jacks, stereo outputs

- Standard 19" X 1.75" EIA rack chassis
- 8 mute pins for remote muting of any or all channels



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Midvale, UT 84047  
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## What We Saw and Heard in Anaheim

This is the way it was: Exhibitors were up, attendance roughly even, at the 1992 Expo of the National Sound and Communications Association. The Anaheim Convention Center was host to 384 ex-



hibitors, and in a down year, most observers found an even attendance level to be a positive indication. As one rep told us, "We're actually taking orders, his voice full of surprise and positive vibes. And Jack Toerner, incoming president of NSCA, said at the annual general meeting, that a 20 to 25 percent growth is expected for NSCA.

High on everyone's list of talked-about events was QSC's decision to use Lone Wolf's MediaLink protocol in computer controlled products. QSC held a press conference at which it was announced that QSC and Rane were tying in with Lone Wolf's control design. The aim is for open architecture that QSC (and pre-

sumably Lone Wolf) hopes will be subscribed to by other manufacturers. QSC will include Lone Wolf technology in the whole EX line; delivery is expected in the fall. Configuration is expected to be a slot card with network node and hardware and software to interface with the amp. Optional systems and hardware may be on tap for applications for an entire sound system. Lone Wolf's "MediaLink" System is a multimedia communications protocol which Lone Wolf says can be facilitated with a "low cost" circuit board. Physical connection options include fiberoptic, PA-422, MIDI, coaxial cable, RS232, DMX, twisted pair, isolated twisted pair, radio frequency, and 110 volt carrier signal.

Discussions on control haven't ended however. Sources tell us that the Intelix method, which was licensed to Mark IV Audio last year, has been exciting interest.

And Crown, whose IQ system is proprietary, has announced new licensees. The IQ System 2000 computer control software has been licensed for use by T.C. Electronic and White Instruments. The agreement allows both companies



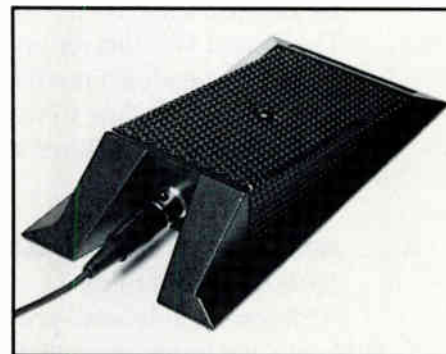
*TOA wireless mic systems.*

to also incorporate the new IQ DFOS, an artificial intelligence operating system due for introduction in 1993, into their products.

Other news coming out of the NSCA convention included the introduction of

whole new lines. University Sound's Unified Electronics line consists of an eight-channel mixer, a series of integrated mixer-amplifiers, and a variety of front panel accessory input modules. The MX-8 mixer, which is the heart of the line, doesn't require installation of input modules.

Frazier, not generally known for large speakers, showed its arrayable systems



*Peavey ASM-2.*

with the company's Cat technology. Each model is "virtually identical in physical size, time center geometry, and rigging configuration." The units can mount vertically or horizontally.

In CCTV, the one-third inch format gained ground with new adherents such as Javelin, which introduced a one-third inch model. Video displays made news, especially at Sharp where the company's nearly nine inch LCD was showing its capabilities. The two-inch-deep unit is a Thin Film Transistor Active Matrix Drive system and comes with a wall bracket.

Microphones were of course all over. TOA came on board with a wireless system in both diversity and non-diver-

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Our Technical Editor explains the reasons a contractor might want the latest in printer technology.

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SOUND  
&  
COMMUNICATIONS



# Introducing The Shure SM102. Now The Choice Is Black And White.

The new Shure Microflex™ SM102 makes the job of choosing a miniature condenser microphone an effortless one.

With its flexible, 6-inch gooseneck, the SM102 is easy to set up and aim. And its high sensitivity and smooth frequency response assure a clear and natural sound.

Compare directional characteristics. You'll find the SM102's cardioid polar pattern exceptionally uniform throughout its frequency range, which accounts for its outstanding background noise and feedback rejection. What's more, it has the lowest self-noise in its class, so you pick up distant voices down to a near-whisper

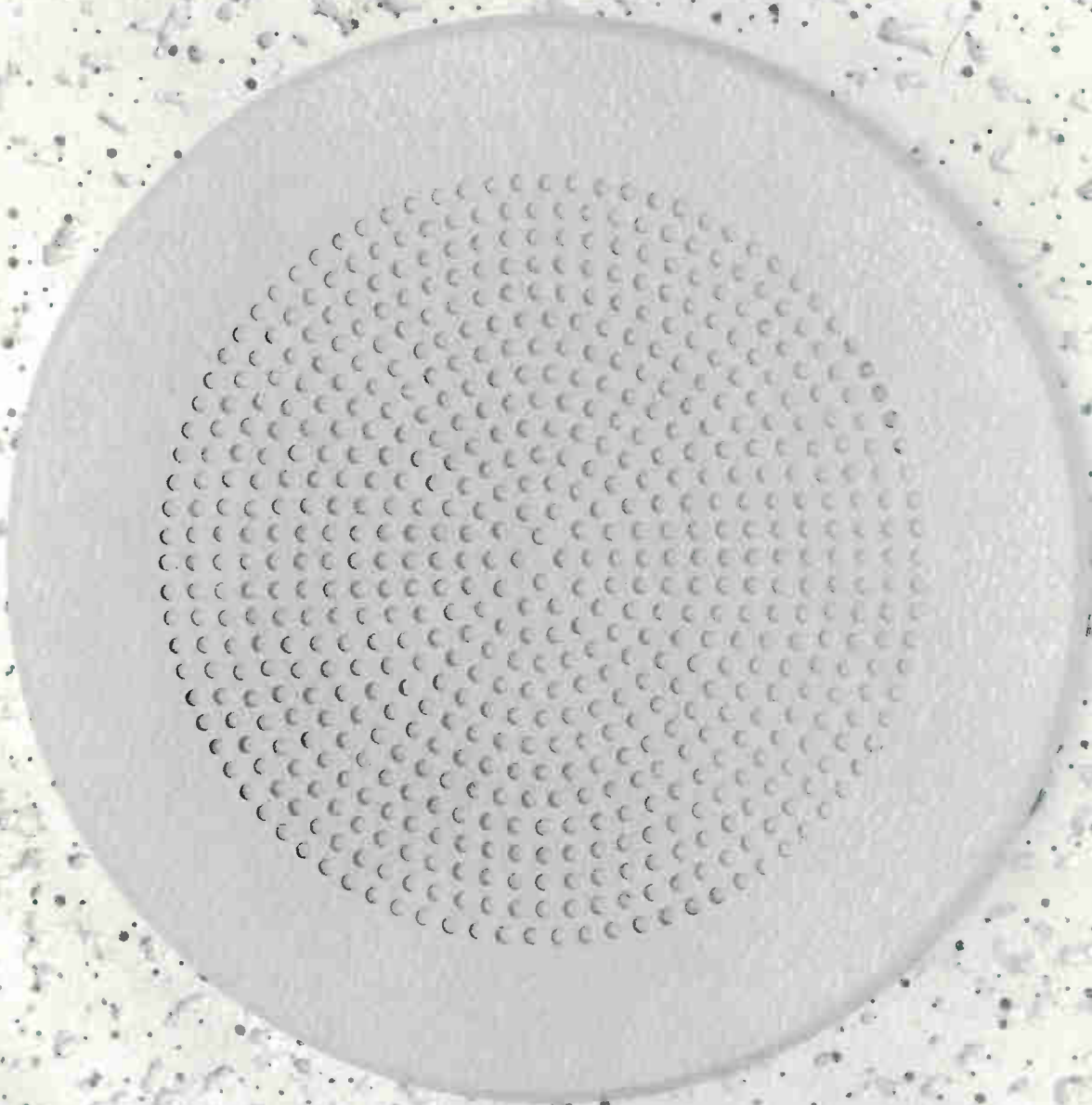
and assure the intelligibility of every word.

And with a choice of in-line or wall plate preamps, both with switchable gain, the SM102 gives you the unmatched flexibility to hang it any way, anywhere.

In fact, the toughest decision you need to make is black or white. Take your pick.

The SM102 is a proud member of the new Shure Microflex family of miniature condenser microphones. For more information on the **SHURE®** microflex™ SM102 or other Shure Microflex products, call 1-800-25-SHURE. The Sound of the Professionals ... Worldwide.

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# NEWSLETTER

## **MTX DJ MIXERS**

MTX Corporation has created the MTX Professional Products Group, responsible for the sales and marketing of MTX Professional Speaker Systems and Cases, MTX Soundcraftsmen Professional Power Amplifiers and DJ Mixers, and MTX Oaktron Professional Contractor audio products.

A line of DJ mixers is included under the MTX Soundcraftsmen brand. Designed by K. Ikezawa, who was previously connected with Numark, the line features mixers with sampling and memory storage. In addition, Bernie Howard Fryman has joined MTX from Numark as Director of Professional Products. Numark closed its doors in March.

## **QSC ENTERS COMPUTER CONTROL**

QSC Audio Products has selected the Lone Wolf MediaLink Network Protocol for the remote operation of EX Series power amplifiers, bringing QSC into the computer control market. Lone Wolf's MediaLink is an open system available to all manufacturers and is thus compatible with other systems via various network interfaces that include MIDI, PA-422, DMX and RS-232. QSC has chosen to support fiber optics as the preferred connection between amplifiers. Delivery of production units of the QSC amplifiers is expected in the fall.

## **JOHN PHELAN PROMOTED AT SHURE**

Shure Brothers has announced the promotion of John F. Phelan to the position of General Manager, International Marketing and Sales. Formerly Director of Technical Markets, Phelan has held several positions in his 15 years with Shure Brothers, including marketing manager, professional products; and manager, sales engineering.

## **SHAPIRO AT PANASONIC**

Alec Shapiro has been appointed general manager, marketing of Panasonic Broadcast & Television Systems Company. He was previously senior vice president with Ruder-Finn, and senior vice president of Geltzer & Company before that.

## **RAXXESS OPENS WESTERN OFFICE**

Raxxess Metalsmiths has opened a storage and distribution facility in southern California. In addition, the company has acquired additional assembly and warehouse space in Passaic, New Jersey. Doug Brown, sales manager, said, "Opening our Passaic facility effectively doubles the size of our operation." The company is headquartered in Paterson, New Jersey.

## **MOUGIS PROMPTED**

Andrew Mougis has been named senior vice president, sales and marketing for the Consumer and Professional Tape Divisions of Sony Recording Media of America. Mougis has been with Sony since 1977. He has served as regional sales manager for Sony Communications Products Company, and held various sales management positions for Sony's Professional Video Division.

## **NASHVILLE CONVENTION CENTER DROPS MUSIC**

The National Association of Exposition Managers has surveyed its members and found that "Exposition show managers are pulling the plug on music at their shows." NAEM executive director Steven Hacker said, "It's clear that the blanket music license agreement for conventions, meetings, and expositions simply is not working for many show managers." According to the NAEM, Nashville Convention Center has dropped the playing of music over its sound system, and other convention centers permit the use of music only if exhibitors agree to purchase a license from the appropriate music licensing organizations.

# NEWSLETTER

## **CORNING OFFERS NEW OPTICAL FIBER**

Corning Incorporated's Opto-Electronics Group is offering optical fiber with an outer cladding diameter of 125 plus or minus 1 micron as a standard for several of its single-mode fiber products. According to Corning, this 50 percent improvement in cladding diameter tolerances exceeds Bellcore's requirements for cladding diameter, and "is a significant step toward improving splicing efficiency."

## **TRACOMAN MOVES**

Tracom Inc. has moved to South Florida Industrial Park, 3015 Greene Street, Hollywood, Florida 33020. The new phone number is 305-927-3005. According to the company, the new office and warehouse is three times larger than the previous location and includes a fully equipped showroom.

## **COHERENT AND PHILIPS AGREE**

Coherent and T.R.T. (Philips Communications Systems) have announced an agreement under which T.R.T. has been awarded an international license for the manufacture of an echo canceller based on Coherent's signal processing and technology. Coherent will continue to develop, market and support its full product range on a global basis, in addition to the agreement with T.R.T. The new product was developed specifically for Philips, and will be marketed by Philips under the product code CEN 232.

## **INTERMEDIA SHOW NEXT APRIL**

The International Conference & Exposition on Multimedia and CD-ROM has changed its name to Intermedia. The show will next take place March 30 — April 1 in the San Jose Convention Center. Produced and managed by Reed Exhibition Companies, the show drew nearly 8,000 attendees and 120 exhibitors this year.

## **DIGITAL ACCESS ANNOUNCES VIDEO LEASING**

Digital Access Corporation has announced a private leasing facility that allows video conferencing users to lease the company's Fractional inverse multiplexer and Virtual Bridge products together with the customer's choice of a video codec in a single leasing package. The company has committed more than \$12 million for the leasing facility.

## **IBM, TI AND INTERMETRICS IN ALLIANCE**

IBM, Texas Instruments, and Intermetrics have announced an alliance to promote the Mwave subsystem, a digital signal processor technology for multimedia computing that will allow a single subsystem to handle the processing currently done by multiple add-in boards. TI and Intermetrics plan to introduce the first products later this year. TI will provide Mwave products to IBM.

## **NEW YORK CITY PROVIDING FIBEROPTIC CONNECTION**

The New York City Department of Telecommunications and Energy has announced an agreement with the Borough of Manhattan Community College that will provide the college a fiberoptic connection to satellite feeds in exchange for the city's use of BMCC Media Center facilities. The project represents the first use of the fiberoptic cable capacity made available by Metropolitan Fiber Systems under their franchise agreement.

## **SMCC AND GAIN TECHNOLOGY SIGN AGREEMENT**

Sun Microsystems Computer Corporation Worldwide Customer Support and Gain Technology, Inc. have signed a licensing agreement under which SMCC will develop and distribute interactive multimedia training software based on Gain's object-oriented hypermedia technology.



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◇Did we forget to mention we're giving away a free Duracell Alkaline battery with the purchase of a Concert Series II System? Offer expires October 1, 1992.

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# Premature Aging and Microphones

### INADVERTENT AGING

I have been aged considerably by the press of late. Recently the *Journal of the AES* credited me with the design of the RCA 77DX microphone which was done in the fifties, whereas I only did some redesign in the sixties. Now Don Davis, in the February *Sound & Communications*, states that Hans Dietze and I

### I THINK IT IS FITTING TO CREDIT DON WITH HAVING DESIGNED THE 604 PRIOR TO WW II!

worked on the RCA LC-1C "Olson" speaker and LS-11 cabinet right after WW II. Both Hans and myself were in elementary school at that time!

The LC-1 was an "A" in the fifties. I worked on it a little in the sixties to try to reduce burnout failures in the tweeter. It became the LC-1B after a few minor improvements. In the late sixties, Hans developed a high-temperature coil for the tweeter, making it an LC-1C. That model was well received and production lasted until the RCA Broadcast speaker works shutdown in the seventies. The LS-11A cabinet was a walnut finished version of Olson's beveled corner design for housing the LC-1, and was made in the late sixties.

As Don will recall, I primarily worked on microphones at RCA. I have continued this interest as microphone reviewer for *Audio*, and as resident mic expert for this mag. After my (rather lengthy) invited paper on microphones given at AES Anaheim in 1984, Don spoke to me

about the possibilities of presenting a similar talk at a Syn-Aud-Con seminar. That paper was updated and published as the microphone chapter in the 1988 McGraw-Hill *Handbook of Audio Engineering*.

Appropriate to these circumstances, and to the month of April [when this letter is being written], I think it is fitting to credit Don with having designed the 604 prior to WW II! Olson in *Acoustical Engineering* shows a reference to an article by J. B. Lansing in the *SMPE Journal* v.46, n.3, p. 212, 1946 for the 604. Don did not include in his article the famous RCA "Cubical" speaker, which was a three foot cube containing a high frequency horn-within-a-low-frequency-horn. This speaker was designed by Olson (according to A. J. May) and used at the 1939-48 World's Fair. I think that Volkmann described the sound at the fair in a later article in *JAES*.

From my articles in *Audio*, Don can learn that I have 604Cs in my listening room. I acquired these after my bad experiences with burned out LC-1A tweeters. In the late sixties, I did some mods to my 604s to smooth the ragged high frequency response so that they

### THESE SPEAKERS STILL SOUND VERY GOOD.

were as smooth as the LC-1s. (Dr. Olson was always proud that the LC-1 response was smoother than the 604). All it took was some "Ultralite" fiberglass and a glue gun, plus trimming some caps in the crossovers. The fiberglass was ap-

plied to the horn to prevent reflections off the LF cone. These speakers still sound very good, and just today my friend Jim Webb visited from the West Coast and was listening and looking at

### AS A REVIEWER OF MICROPHONES, I LOOK UPON A SPEAKER AS A TOOL TO COMPARE MICROPHONES.

my speakers. Jim has done sound for movies such as "Flashdance" and I was pleased that he liked my speakers. He mentioned that someone makes a custom crossover to smooth the 604, but of course this cannot cure the comb-filter effect of the cone reflections. I saved all of my data, hoping to write an article.

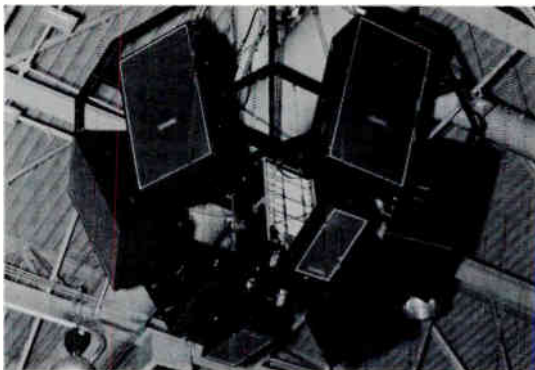
As a reviewer of microphones, I look upon a speaker as a tool to compare microphones. Thus, I try different mics for every test recording of a concert, but the speakers and listening room have not changed in nearly 25 years. I was very pleased to read Don's article because I find that a coaxial speaker gives the best sound in my smallish (14 x 25 ft.) studio. I do not like the sound of two- or three-way speakers in small rooms. I think that when the source dimension is not small compared to the listening distance, the image is blurred, and not accurate enough for microphone comparisons. Thus, I believe that it is a mistake to use the very tall contemporary hi-fi speakers in a small room.

Jon Sank  
Haddonfield, New Jersey

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Photo-Guy Boudia



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World Radio History

# Why Do Speakers Blow Out?

*This month the Answerman has lumped together many questions he has received – all of which boil down to the basic and generic – Why Do Speakers Blow Out?*

One of the biggest problems in commercial sound is that of speakers failing. Which constantly brings up the question “Why do speakers blow?”. Experienced audio people automatically respond that too much power was put into the speaker. Actually, this is not exactly what the problem is, and we need to take a closer look at the phenomena and discuss what new techniques are being used to combat this audio nemesis.

Speaker failure modes can be roughly grouped into categories: excursion limitations and thermal capacity. At lower frequencies, the coil and diaphragm (cone) may travel too far and can be mechanically damaged. In a woofer this commonly takes the form of a ripped cone, torn suspension parts, or deformed voice coil. In a compression driver, the diaphragm may shatter, or the suspension may tear. When the transducer (a fancy name for any type of speaker) is used in the middle and upper range of its response, excursion becomes less of a problem, while overheating becomes the more important issue. It is really overheating that burns out speakers, not how much power is applied to the driver.

So what new technologies are available to speaker manufacturers to improve power handling and prevent speaker failure, and what type of “defensive engineering” can the sound contractor contribute as part of the system design to further insure long term reliability?

### EXCURSION LIMITATIONS

For protecting bass speakers, the simplest approach is to use a filter to roll off the extreme low-end response. The best

place in the circuit path is before the power amplifier. Often, equalizers or even the power amplifier will have some low end cutoff designed in, but most likely this high-pass filter will start working just below 20 Hz, which is too low to protect most woofers. To complicate matters, the bass reflex enclosure benefits from more complicated protection circuitry. For example, if you have turned the duct to 40 Hz, then the woofer cone will have reasonable excursion requirements around 40 Hz, but cone excursion

## ANSWERMAN

will significantly increase above and below this frequency. If you tune the vent too low, then while you will load the speaker at the lowest frequencies, the vent will not provide any help where most of the program material is. If you tune the vent too high, then the deep bass will cause the woofer to bottom out on the low notes. As there is a lot more program material between 60 Hz to 90 Hz than there is at 40 Hz, you can potentially get a lot more sound out of your system if you can use a limiter that “knows” what the cone excursion vs. frequency limitations of your bass reflex enclosures are.

Variations of this approach have been taken into consideration in most of the signal processor speakers, such as those from Meyer, Apogee, Renkus-Heinz and others. A number of “universal” speaker signal processors also provide this capability for conventional speaker systems. One example of this was introduced by

Altec Lansing at the NSCA show in April. Some speaker processors, such as those featured in the E-V DeltaMax processors, use a clipping circuit to hard limit and prevent overexcursion so the coil does not hit the back plate of the magnetic system. This “bottoming” very quickly will deform the voice coil and ruin the speaker.

Not all solutions to bottoming are completely electronic. Yamaha’s YST processor speakers use a combination of mechanical techniques and servo-control to prevent bottoming. The voice coil overhang on the driver allows slightly longer excursion than is typical, but the clearance to the back plate is substantially larger, due to the unique design of the cast back plate. Prevention of extreme uncontrolled cone movement is handled by a combination of the servo-control amplifier interface and a multi-spider suspension.

With compression drivers, a combination of using a high enough crossover point and fast enough slope can be very effective in keeping out of trouble. The trend of 18 dB per octave slopes is shifting now to 24 dB per octave, and JBL, Yamaha, Rane, and Adamson now offer crossovers with 48 dB or more per octave slopes. A side benefit of these brick wall filters is the reduction of pattern control interaction anomalies between the woofer and the mid-range horn. Of course, do not attempt such fast slopes with high level (post power amp) passive crossovers or you will get a nasty response from your power amplifier. If you are using an electronic crossover, it is still a good idea to put a non-polar cap in series, between the compression driver and power amplifier. This will protect the driver from amplifier burps, such as turn on/off transients, dc offsets, hum and the like.



... but two new products from ATI have taken the audio world by storm! **LMS** and **LEAP** have revolutionized the way loudspeakers are designed and tested.

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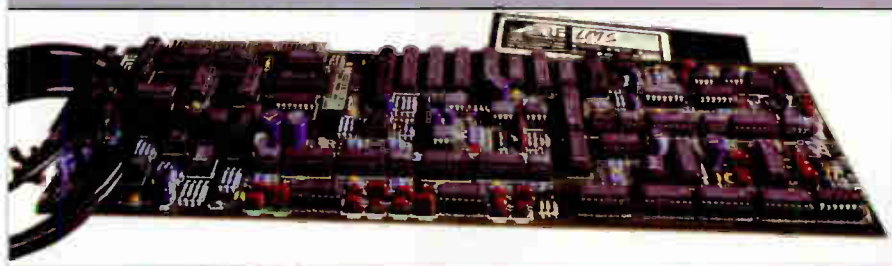
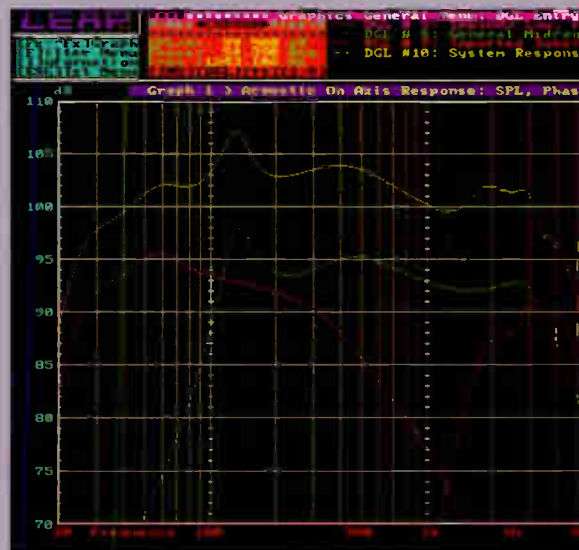
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World Radio History



Most of the signal processing speakers use a much higher crossover point than what was common for speaker systems using similar driver components designed in the 1970s and 1980s. E-V DeltaMax, Apogee, and Yamaha, for example, all have crossover points above 1000 Hz for systems that use a 15-inch

**EVERYTHING ELSE  
BEING EQUAL, THE  
LARGER THE  
DIAMETER OF THE  
VOICE COIL, THE  
GREATER THE  
THERMAL POWER  
HANDLING CAPACITY  
OF THE SPEAKER.**

woofer and a 3-inch diaphragm compression driver. This is an octave higher than the original Altec Lansing A7, for example. I must say that these products sound better and play louder because of this approach. Perhaps the hidden hero here is the improvements in cone paper formulations and woofer technology as much as the fast crossover slopes.

Still another technique is the dynamic shifting crossover point used in some processor speaker systems. In this approach, a relatively low crossover point is used at medium levels and progressively the transition point shifts upward as the excursion limitations of the compression driver are encountered.

**THERMAL LIMITATIONS**

Everyone has seen toasted voice coils pulled from some hapless woofer or compression driver that has been totally creamed. The voice coil consists of magnet wire which uses a copper, aluminum, or copper clad aluminum conductor of 28 gauge to 38 gauge wire. The wire insulation capacity can be as low as 105-degrees C to 220-degrees C. Each time the wire gauge goes up six sizes, the current capacity goes up four times,

so an increase of three sizes buys you double the current capacity.

Everything else being equal, the larger the diameter of the voice coil, the greater the thermal power handling capacity of the speaker. Of course, this is not always the case, and there are examples of 2.5-inch diameter voice coil woofers that can handle more power than 3-inch diameter voice coil woofers.

However, the voice coil does not function alone, but as part of a dynamic system. The voice coil assembly is attached to a cone (or domed diaphragm in a compression driver). The coil is wound on a former which is typically made of Kapton, Nomex, or aluminum (more on this later). The coil is centered in a magnetic circuit, which, if optimally designed, can effectively pull the heat off the coil.

A number of the signal processing speakers monitor the temperature conditions of the speaker, either by direct "sense" return wires back to the processor, or by "modeling" the amplifier's output. In either case, the processor will attempt to prevent dangerous power levels that create excessive heating of the voice coils.

Other efforts to engineer speakers to withstand excessive temperature levels have included using very heavy gauge voice coil wire and very high temperature wire insulations. But the best solutions are combinations of good efficiency and effective heat dissipation schemes.

The most important insight to be gained from this article is that it is not the power that you put into the speaker that burns it out, only the inability of the speaker to get rid of the heat byproduct. Woofers are only 5-percent efficient, at best, so 100 watts of audio input ends up as 5 acoustic watts (sound) and 95 watts of heat that must be dissipated.

To get the heat off the voice coil, various heat paths exist. The voice coil former can be thermally conductive. A case in point is an aluminum bobbin. Aluminum effectively pulls the heat off the coil and radiates it to the pole piece.

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Black anodized aluminum is a more effective radiator than natural aluminum. Aluminum bobbins are not everyone's favorite material, as the electrical conductivity results in eddy currents, which increase harmonic distortion and voice

## ALUMINUM BOBBINS ARE NOT EVERYONE'S FAVORITE MATERIAL.

coil inductance. The eddy currents also create a rocking force on the coil as it moves.

Kapton H, a high tech film material, is one of the most popular bobbin materials for high performance speakers. Kapton offers high strength even at intense temperatures, low weight, and none of the eddy current related problems of aluminum, but is not thermally conductive. DuPont, the manufacturer of Kapton, has recently introduced

Kapton MTB, specifically formulated for high performance speakers. Kapton MTB is thermally conductive and black, so heat is both pulled from the coil and radiated to the pole piece. Most speaker manufacturers using conventional Kapton will be upgrading to MTB this year.

Anyone who has worked on thermally insulating his or her home has learned that air is the best insulator. Unfortunately, the air gap between the voice coil and the top plate, and the air gap between the bobbin and the pole piece provide an almost insurmountable barrier for the heat that leaves the coil and bobbin. If the coil temperature is 350 degrees F, then the top plate is probably 150 degrees F. Most woofers have a vent down the pole piece, so the dust cup will pump air and transfer heat off the pole piece.

At the same time, air is also pushed

past the coil, pulling heat off. JBL's vented gap cooling system is a sophisticated and effective extension of this approach.

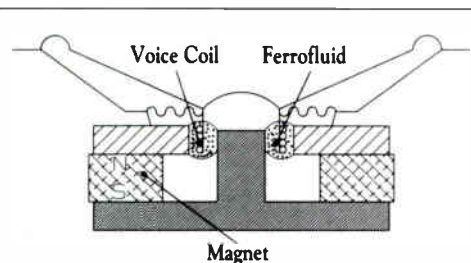
Intersonics developed a fan-cooling systems for their servo-controlled woofers a few years ago, and more recently

## THE MAGNETIC FLUID IS HELD IN THE GAP BY THE SPEAKER'S INTENSE MAGNETIC FIELD.

Bond has licensed the technology to cool their line of coaxial speakers.

A very effective and increasingly popular solution to the problem of the thermal resistance between the coil assembly and the magnetic system is to replace the air in the gap with a thermally conductive fluid. Ferrofluids, developed by NASA and licensed to Ferrofluidics Corporation, are magnetic fluids that are thermally conductive. The magnetic fluid is held in the gap by the speaker's intense magnetic field. The thermal resistance of ferrofluids is four times lower than the air it replaces. Ferrofluids have other benefits, such as a liquid bearing effect that keeps the coil centered, as well as being a lubricant, so coil rubs are less damaging to the wire insulation. While ferrofluids have been used in speakers for well over a decade, they have only become viable for pro audio applications in the last few years. For example, stable operation at elevated temperatures and woofer grade ferrofluids have only been commercialized during the last two years. Peak power handling of ferrofluid treated woofers typically increases by a factor of five (at frequencies above the excursion limited range). Apogee Sound was one of the first pro-sound speaker companies to use ferrofluids in subwoofers a few years ago. Since then, many autosound manufacturers have introduced ferrofluid-cooled woofers. Quite a few high power speaker manufacturers are now going through testing, and

# For hot voice coils, the cool solution.



Introducing the APG 900 Series — ferrofluids designed specifically to safely withstand 200 degree centigrade temperatures in speaker voice coils while maintaining long-term

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ferrofluid in woofers will be the norm in the next year. Speaker manufacturers that use ferrofluid may include the "Ferrosound" insignia in their advertising and on product data sheets.

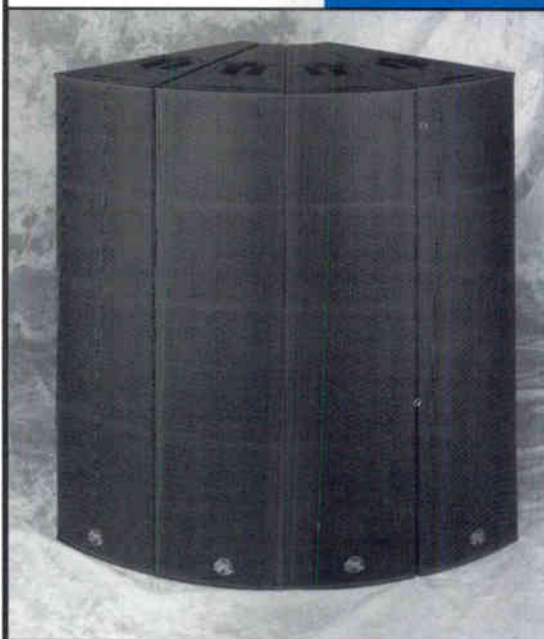
Improving the heat dissipation capabilities of loudspeakers has other important benefits, besides reducing coil burn-out. As a speaker coil heats up, its impedance rises. This results in the speaker drawing less current and the signal level dropping.

The operator responds by bringing up the level, and the speaker responds by increased power compression. This cycle continues until the speaker crashes and burns. Secondary, less catastrophic phenomena accompany power compression. If a passive crossover network is being used, then the speaker's impedance rise will also interact with the crossover point, with a shift of an octave not being unusual. Speakers undergoing power compression also have a drop in their top end response, so the sound quality, not just the level, is degraded. The thermal cycling greatly fatigues the glue joints and other materials, and the heating causes expansion of the coil and increased likelihood of the coil scraping the top plate of the magnetic system.

#### OTHER CONSIDERATIONS

Of course, even with excursion limitations and thermal power handling capacity being increased, other factors still limit how loud the sound system can be operated. If the woofer cone is not strong enough, then the cone cry and break up will cause the voice coil to go out of round and rub, as well as cause the sound quality to be awful. Similar considerations exist for compression driver diaphragms. Other factors compound compression driver limitations including air distortion in the phase plug and in the horn's throat.

One final limitation on how loud you can play the sound system is the consideration of the safety of the audience's hearing - but that is another topic for *The Answerman*. ■



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# INCIDENT IN ANAHEIM — THE 1992 NSCA CONVENTION

By Daniel Sweeney

**If you'd never been to the Anaheim Convention Center, Tannoy was eager to help you get your bearings. You could hear the new 10.1 speaker system they'd set up in front of the exhibit hall all the way out in the street.**

Soon after, 30 miles off and a world away, L.A. burned. And even now some of the more intrepid sound contractors are quietly making bids for reconstruction work.

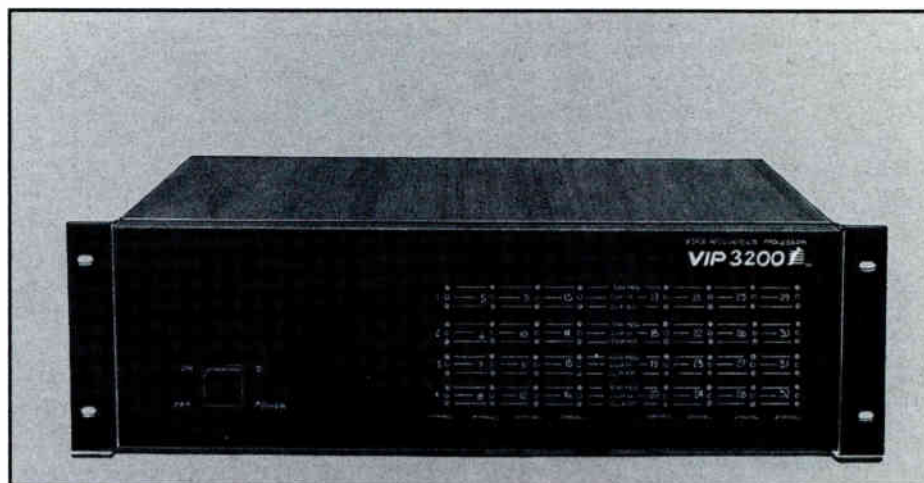
And here are some of the many new products from which they can choose.

## **UNCLASSIFIABLE, HIGHLY CONSPICUOUS**

Hughes Aircraft debuted a really striking new signal processor that certainly could have been put to excellent use in L.A.'s tumultuous core. The device is called the VIP 100 Voice Intelligibility Processor, and its function is to process speech to render it more intelligible in the presence of high ambient noise, and presumably also in unfavorable acoustical environments with high RT60s. Hughes representatives would discuss little of the processing taking place in the VIP 100 except to say that DSP is employed, and that the unit is not adaptive; that is, background noise is not

registered at all in the system. Demonstrations by Hughes did indicate good intelligibility in the presence of ambient noise at considerably higher RMS levels than the speech itself, so the new technology does appear promising. One may speculate that something is going on here akin to the harmonic emphasis provided by the Apex Aural Exciter, which itself has long been employed in the film industry to improve dialogue intelligibility in the presence of prominent sound effects in the mix.

tweeter which actually uses two voice coils for the tweeter — one massive and stationary which serves to dissipate the heat, and the other small and inductively coupled to the other which actually moves the driver in the magnetic gap (the aluminum dome of the driver actually forms the second voice coil). Tannoy also displayed some interesting flying hardware in the form of integral steel rods which also serve to latch the speaker cabinet together internally, and are said to provide absolutely secure installations. This new construction is used in the



*The Hughes model VIP-3200 eight- to 32-zone voice intelligibility processor.*

## **LOUDSPEAKERS**

Loudspeakers of one sort or another appeared to be the dominant product category at the show. Tannoy's dual concentric 10-inch drivers deployed in the parking lot were certainly among the more impressive offerings, achieving prodigious output levels and impressive clarity, albeit supplemented with an array of subwoofers. Tannoy was also showing a number of new models utilizing their patented inductively coupled

CPA 5 5-inch Contractor Series loudspeaker.

Altec Lansing showed a new line of coaxial speakers with five-sided cabinets designed primarily for houses of worship.

Anchor displayed a very compact, rack-mountable, two-way mini-monitor called the AN-1001X.

B.E.S.T., a purveyor of a line of highly unusual speakers employing proprietary planar drivers formed of contoured

*Daniel Sweeney is a freelance writer in Burbank, California.*

Styrofoam, introduced the ultimate wall speaker: the driver itself actually is the wall, and can be papered over for the ultimate in concealed systems. The company was displaying this speaker in a home theater setting where a wall incorporating the new driver was also serving as a screen for a front projection video system. The wall speaker was being used as a center channel dialogue speaker, and not having to overcome screen losses, it did not require special equalization in this application. The notion does seem to have possibilities.

Bose Corporation was showing its Free Space Business Music System which appears to be a professional version of the highly successful Room Mate consumer powered speakers. The system includes cube shaped, self-ampli-



*Wharfedale's Force 5 loudspeaker.*

fied main speakers with single full-range 2.24-inch drivers, and an Acoustimass bandpass subwoofer. These are basically background speakers designed for use in restaurants, stores, etc.

Celestion introduced the BX series of component woofers in 12-inch and 15-inch sizes. The cone is made of a com-

posite material, and the magnetic structure was designed with the aid of finite element computer analysis programs to maximize flux. Celestion also showed a new SR Series subwoofer and processor, and new slot and bullet tweeters.

Eclipse Research Corporation showed a line of very unusual dome shaped

## SOUNDSPHERE SPEAKERS KEEP NEWSDAY PRESSES ROLLING...

The Newsday corporate offices and printing plant are in a large building in Melville, N.Y. It contains the largest color offset operation in the country with ten printing presses. While they operate at the highest efficiency, the collation and inserting operations could not be stopped quickly when problems were encountered. The insert machines could not be turned off resulting in improperly collated newspapers.

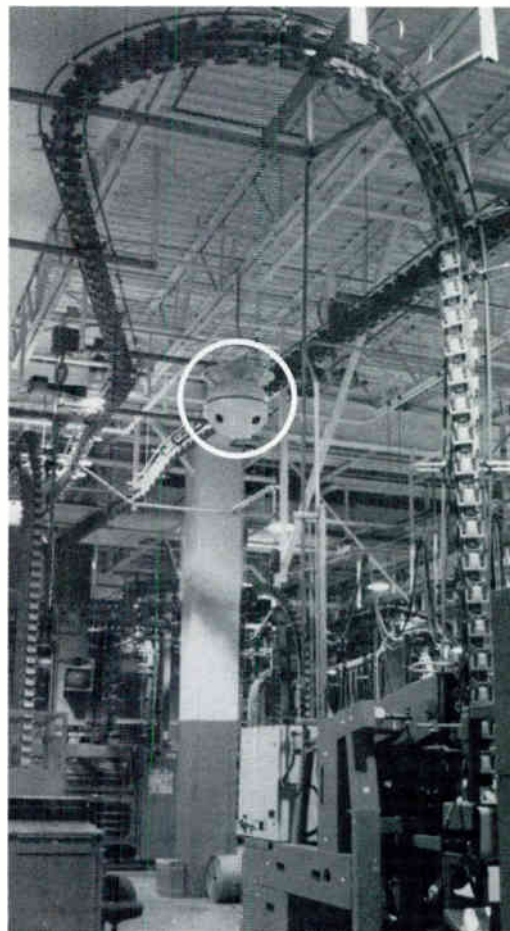
After trying flashing lights, buzzers and various horn speakers, a Soundsphere #2212-1 model was tested and five more were installed in the extremely noisy inserting operations room.

Patrick O'Hanlon, Production Maintenance Electrical General Foreman at the site states, "The area in question is a high density noise area and communication is difficult. When Bernie Lory of Craftsman Sound talked about Soundsphere speakers in airport terminals, I knew it was the system for us. The even distribution allowed us to maintain a volume level that would not be overbearing, to permit quick quality control adjustments in the insert area and to still be heard in remote corners of the room."

The installer, Bernie Lory has also put two Soundsphere #2212-2 speakers in the stacker area to improve the efficiency of that portion of the operation. He is planning to use more Soundsphere loudspeakers at this site to solve other operational problems.

*Write or call direct for further information.*

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omnipolar loudspeakers utilizing a coaxial driver array with a 12-inch paper cone and a 1-inch or 3/4-inch titanium tweeter. The coax is mounted on the bottom of the dome, and uniform dispersion is achieved by means of a radial wave guide formed by a disc attached to the base of the speaker.

A new tendency toward gigantism appears to be manifesting itself within the subwoofer category, and Excel is in the vanguard of the movement with its 27-inch Sub-27. Apparently intended as a special effects generator, the Sub-27 has a claimed output of 136 dB down to 20 Hz. Excel also showed the XLT-4 four-way arrayable concert speaker.

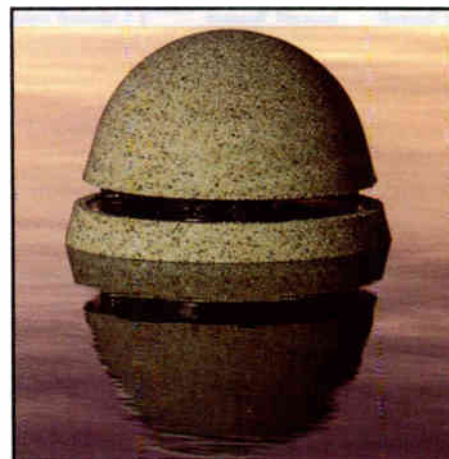
Fostex showed the SPA-11 and SPA-32 portable P.A. speakers.

Grund Audio Design showed the GT line of trapezoidal loudspeakers.

Infinity Systems, a company at one time associated strictly with consumer products, showed its entire line of wall speakers. The company anticipates greater involvement in residential pre-wired multi-room audio systems on the part of professional sound contractors, and is seeking to expand its installer base to include the latter.

Intersonics was supposed to be showing their new coneless servodrive subwoofer, but last minute technical problems delayed the introduction.

Klipsch and Associates introduced several new models of midrange/high frequency horns utilizing the tractrix profile Klipsch has been employing in



*Eclipse Research Corporation's OS omnidirectional, waterproof speaker.*

its consumer line for the last couple of years. Tractrix geometry, which is based on a variable flare rate, is said to yield lower distortion, by minimizing reflections; better phase behavior through the bandpass; and significant size reduction per a given bass cutoff point. The new models themselves, respectively the K-9040.5, K-6040.5, and K-4020.5, are of laminated construction, consisting of a balsa wood core covered with layers of fiberglass and resin. Klipsch claims improved performance over fiberglass alone in terms of structural resonances. Klipsch also showed a Lexan compression driver - apparently the world's first, and a near-field monitoring speaker, the KP-101, whose design represents a departure from standard Klipsch practice, combining as it does an acoustic suspension woofer with a 1-inch horn loaded compression driver.

In the audio curiosity department, Minneapolis Speaker Company (Misco) was displaying its new line of waterproof speakers intended for outdoor, marine, and prison installations (why prisons should be more troubled by moisture than other institutions is not explained, nor why prisoners themselves should be provided with the superior high fidelity claimed by the company for its products). The cones in these speakers are vinyl impregnated cloth and all metal work is specially plated.

OAP showed a number of compact, trapezoidal, flyable compact concert speakers.

Parasound displayed a 27-inch subwoofer with a cabinet roughly the size of a refrigerator.

P.A.S. announced a small environmentally resistant speaker system called the

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The L-1102 leveler/limiter from TOA.

PermTec P-100. All components including the cabinet are water resistant. The system, which includes integral flying points, uses two 5-inch woofers and a 1-inch phenolic horn tweeter. Also new were two component woofers, the HL-2580C fifteen incher, and the HL-2880C 18-inch driver.

Renkus-Heinz had several new offerings in its TSC Series. Of special interest is a new type of subwoofer combining a folded horn with a bandpass, and which is said to provide wider bandwidth than conventional bandpass designs along with some control of directivity.

Ross showed an extensive line of new product offerings in the categories of raw drivers and component horns.

SD Technologies launched a highly unusual ceiling speaker consisting of a four sided, low profile pyramidal housing with a coaxial driver set on each side of the pyramid for wide dispersion. The considerable back cavity formed by the pyramidal enclosure provides better loading in the bass than is usually the case with ceiling speaker systems.

Sennheiser showed several new broadcast headphones as well as its anti-noise technology which uses antiphase signals representing ambient noise to cancel out background noise at the listener's ears.

Soundtech showed four new models of main concert speakers dubbed the Titan Series.

Turbosound showed some additions to the Flashlight line of very high Q concert speakers.

Finally Wharfedale was showing the Force 5 wedge shaped sound reinforcement speaker with 8-inch cone and 2-inch horn.

Yamaha exhibited new YST subwoofers and stage monitors. The YST technology is a kind of active parameter synthesis involving a negative impedance at the output of the power amplifier. Benefits are reduced-box size per a

given 3 dB down point, and better cone damping than afforded by conventional ducted port alignments.

### SIGNAL PROCESSORS AND AMPLIFIERS

Adamson Acoustics showed its AX300/302 analog signal processing systems which are dedicated to the Adamson loudspeaker line. The processor provides frequency division, quasi-parametric equalization, and limiting. Filters are constructed out of integrated circuits rather than ladder architectures, and are said to provide steep skirts, exemplary phase behavior, and a degree of transparency not possible with conventional analog active filters. In addition Adamson Acoustics has announced a digital signal processor, but it was not ready at show time.

Audio Control introduced a professional version of its well known consumer subharmonic synthesizer for bass extension.

BGW showed the 750 and 350 series of amplifiers.

Brooke Siren (BSS) showed a very versatile electronic crossover, the FDS-318. The unit provides for four-way operation, overlapping crossover points, and horn equalization. Also from Brooke Siren is the VCS-926, combining a six band dual channel parametric with a spectrum analyzer complete with a 30 band RTA display. Fifty different settings can be stored in memory.

Carver displayed a new moderately priced high powered professional amp using a conventional power supply.


Cooper Sound showcased the CSPA-1 two channel battery powered microphone preamplifier with M/S matrix decoding and switchable filters and gain.

Crown showed the Com-Tech Series of 70-volt amplifiers with grounded bridge circuitry and computer controlled fans. P.I.P computer control interfaces are optional.

Furman introduced a subharmonic

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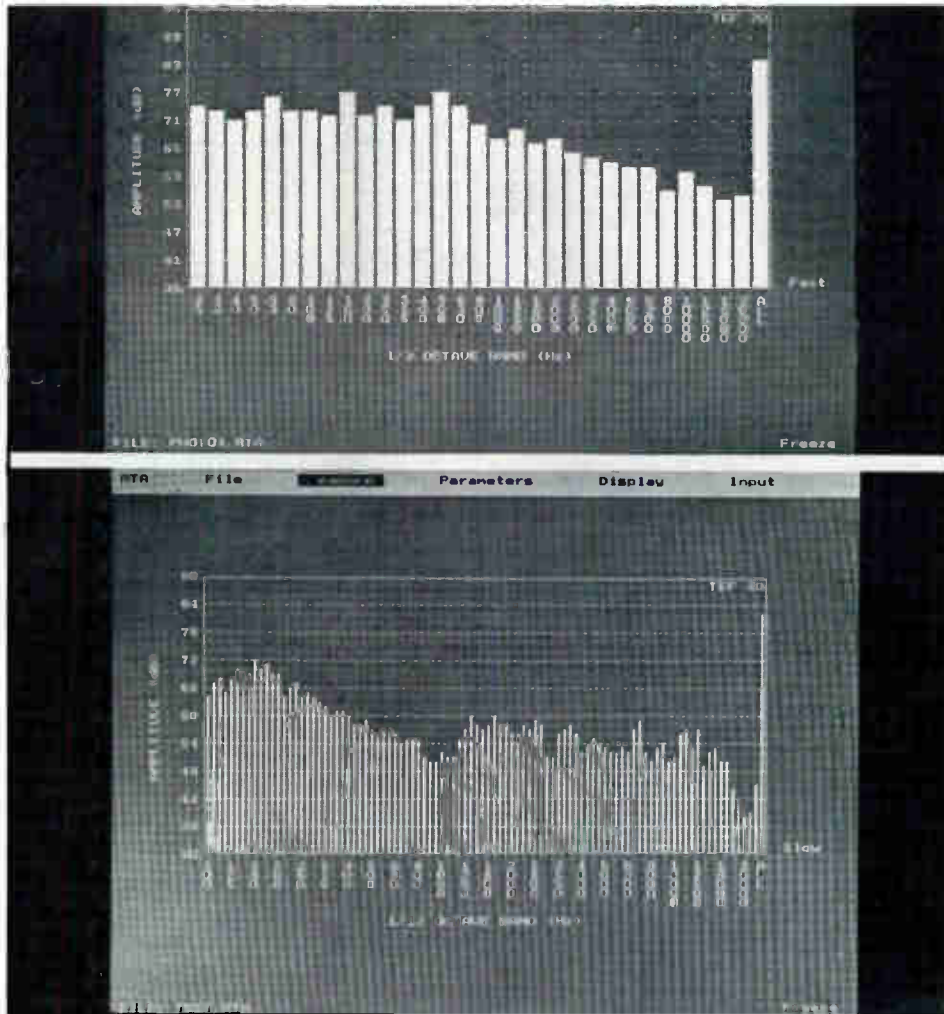


synthesizer.

Hafler showed its complete line of Series 9000 Trans-Nova amplifiers originally developed for the consumer market. Power ratings range from 65 to 250 watts per channel, and all amps in the line are fitted with both RCA and XLR connectors.

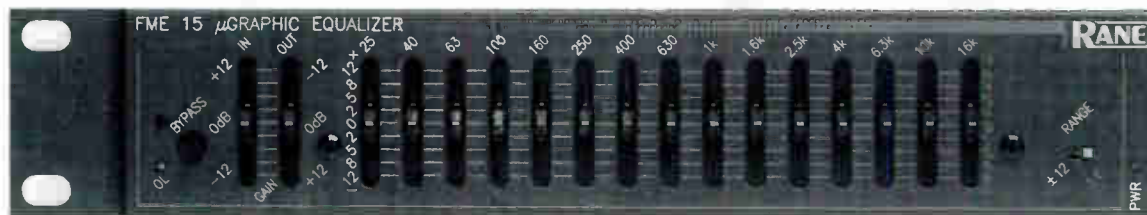
Ivie debuted a digitally controlled signal processor named the DCSP 700. The unit combines a distribution amp with a third octave equalizer, and will accept cards for electronic crossovers and horn equalizers. Apparently settings are controlled by microprocessors while the signal circuitry itself is analog.

Klark-Teknik showed a couple of interesting new pieces, the DN800 active crossover and the DN728 digital delay line. On the DN800 crossover, parameters are card selectable, and the user has a choice of Butterworth, Bessel, or



The Sound Lab RTA was one of Techron's introductions at this year's NSCA Expo.

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Linkwitz-Riley filter types and 12, 18, or 24 dB slopes. Eight channels are present on one chassis with filter overlap and phase compensation between bands provided. The DN728 uses 18 bit D/A converters with sampling rates of 200 kHz for superwide bandwidth and dynamic range. Delay times may be adjusted in 5 microsecond increments, and delay times may be displayed in either units of time or measures of distance. Settings are stored in nonvolatile memories and may be password protected.

Parasound, in addition to its enormous 27-inch subwoofer, showed a line of high current power amplifiers. Like the Hafler products, these were originally designed for consumer use, and only the flagship Parasound HCA-2200 uses professional standard XLR balanced inputs.

QSC's new line of moderately priced amps to be sold under the Sonetic Labs brand name have power ratings that range from 185 watts per channel to 650 watts.

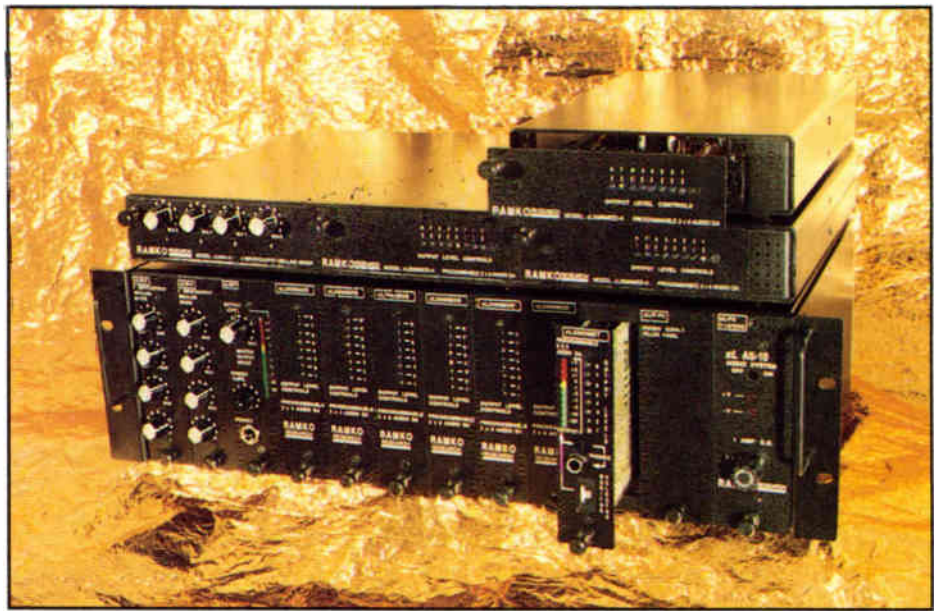
TOA is offering new digital converters for its very versatile SAORI digital processor. The new converters are said to offer wider dynamic range and lower noise. TOA also showed the L-1102 leveler/limiter which may be used either for loudspeaker protection or for preventing overload of digital processors. The L-1102 includes a noise gate with threshold adjustable from -40dB to -80dB.

White Instruments announced the DSP5000 digital audio signal processor. The unit has one input and four outputs and combines the functions of an electronic crossover, parametric equalizer, and digital delay.

Yamaha announced two new digital equalizers, the DEQ5 and the DEQ5E. Either unit can be used as a six-band parametric or a one-third-octave graphic.

### MIXERS AND SYSTEM CONTROLLERS

Amek/TAC introduced the TAC SR6000 mid-priced mixer for sound reinforcement. The unit includes a 10x8



*Ramko's System 2000 integrated audio system.*

output matrix and an auxiliary send system permitting up to 16 sends. Parametric equalization through the midrange is also standard. Also shown were the TAC B2 and Bullet compact consoles.

Biamp Systems exhibited the SCM7600 stereo club mixer. The system is specifically designed for disco applications, and includes turntable inputs and a light send output for driving lighting controllers. It also includes a dynamic range expansion circuit for the subwoofer output. Also new is the Integrity powered mixing console which incorporates three 150 watt power amplifiers. The Integrity is intended to provide a complete electronics package for portable audio applications.

C-Audio showed a software package for controlling multi-amp installations. The system, which works through Microsoft Windows, includes remote turn-on and turn-off, level setting, diagnostics, and monitoring of individual amps for peak levels and clipping.

Crown showed its MPX-6 "intelligent input multiplexer," so-called because it includes a microprocessor which can serve as an IQ interface. Basically the piece is a 6x2 stereo mixer designed to work with a PC host computer and a P.I.P. equipped amplifier. Typical applications would include airport paging systems, hotel conference rooms, houses of worship, and surveillance systems.

Dan Dugan Sound Design announced an automatic mixing controller for live sound applications requiring numbers

of active mikes. The mixer features a single ambience mike channel and a unique gain limiting function.

DOD showed the 1642 16 channel mic-line mixer designed for both live sound and recording applications. Gain circuits utilize new monolithic IC preamps.

Mackie Designs showed a number of new products. The CR-1604 is a 16 channel Mic/Line mixing system. Gain controls are concealable. The XLR10 is a microphone input expander for the CR-1604, featuring 10 discrete phantom-powered microphone preamps.

The Micro Series 1202 is a 12 channel, very compact, mic/line mixer. And the Mixer Mixer is a combiner which will accept the outputs of up to three mixers.

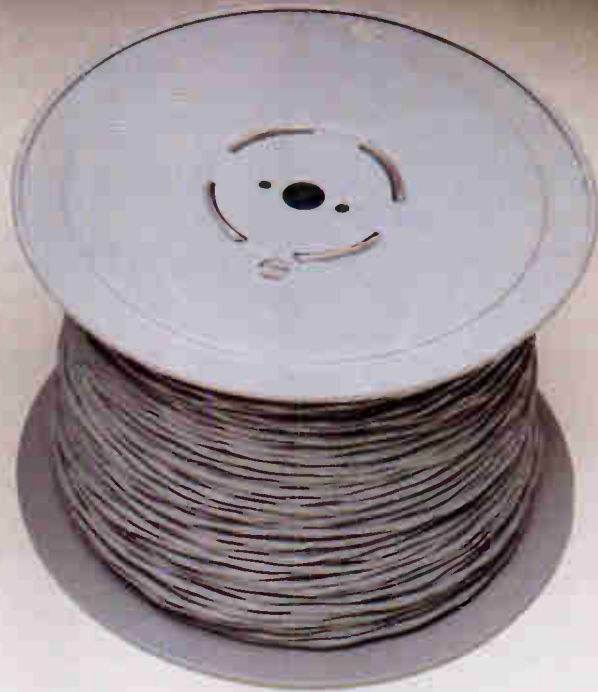
Meridian Communications showed the Distramix 8x8 matrix mixer. Weight is only 23 pounds, and the unit is readily expandable.

ProTech audio showed four new mixer/preamplifiers designed as plug-in printed circuit board modules for use in rackmount card frames. All models have one line output and will accept variously two to five microphone inputs. The company also showed a 6x1 audio mixer for small venues, especially houses of worship.

Ramko displayed the System 2000 Integrated Audio Systems offering options for distribution, mixing processing intercom, and room combining in a modular main frame assembly. Modules communicate with one another in-

*(Continued on page 67)*

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# The Health Care Market

## *Contractors and Consultants Claim Good Health in the Marketplace*

BY MARIA M. CONFORTI

**C**ontractors and consultants whose clients include hospitals, nursing homes, ambulatory clinics, and the like are reporting that business is healthy, thanks to the development of communications systems and of the marketplace itself.

"Total system communication - not only audio - through the computer, is where the industry is going," observes Harry Quanz, VP/operations at Aiphone Corp. The opinion is echoed by Sam Watkins, Executone's sales manager for the Orlando, Florida, area. Systems that allow flexible communication are in demand, Watkins says, and health-care institutions want "[t]he ability to change the parameters within the systems as far as where the calls go, [plus the ability] to find people efficiently and to get information to those people so they don't have to make trips up and down. They can save steps in delivering patient care, and save money for the facility."

"Nurse call systems are becoming more sophisticated in hospitals," notes Ed Lobnitz, Tilden, Lobnitz, and Cooper's chairman of the board and director of

the health-care division of the Orlando-based firm. For 13 years, his firm has consulted jointly with an architectural partner for Florida's Health and Rehabilitative Services' license division that regulates hospital construction. Additionally, TLC and the HRS cosponsor seminars for the hospital industry. "You have digital logic [integrated into nurse-call systems] so...you can prioritize cer-

### **Nurse call systems we used to put in were pretty stodgy.**

tain patients." Lobnitz also stresses the importance of flexibility in these systems. "Nurse call systems we used to put in were pretty stodgy; now with the digital [capability], you can program rooms, acuities, and priorities."

"I personally believe that computer-based systems are the way to go, but our marketplace here in Washington, D.C. and Baltimore has been more of the basic nuts-and-bolts stuff," says Michael Crider, VP/general manager of Comm-Tronics. Most of Comm-Tronics' recent jobs have either been renovations or installations at ambulatory clinics where

purchases are for "very basic sound and video signalling product," he reports.

Hospitals are increasing their use of duplex intercoms, says Michael Spencer, sales/health-care division of Douglas Roesch Communications. "In the Los Angeles area, a lot of the facilities have older systems that need to be replaced. It's a nice install, and allows us in many instances to re-use existing cabling."

There are frequent inquiries about systems that allow access to doctors at any location, says Nanci Brooks, VP at Telecall America. "[The doctor] has to have the ability to answer back" without touching the device, so if someone needs information on a bedridden patient, the doctor can communicate from, say, the operating room.

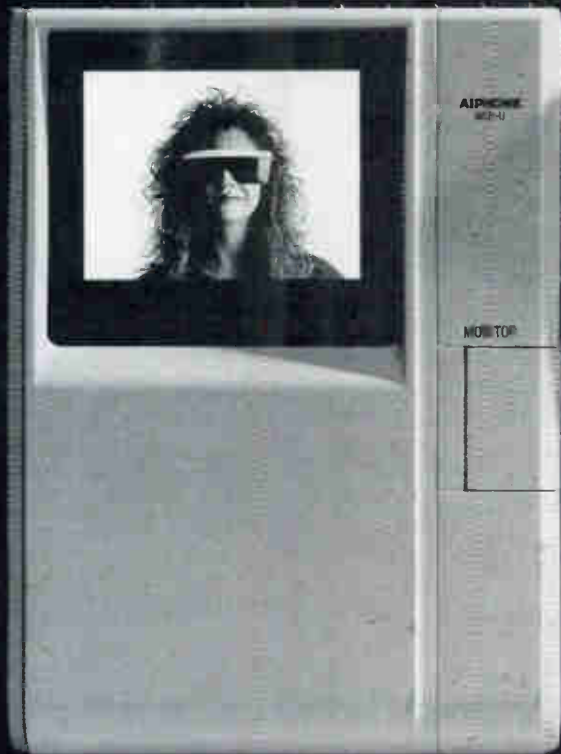
Several sources also reported a rising demand for security systems. Secured areas like hospital pharmacies may necessitate video entry or CCTV systems, while tracking devices are used to deter baby theft and to monitor Alzheimers patients.

Nurses "love" computerized call equipment, says Lobnitz. "It gives them so much better opportunity to serve the patient...They'll know exactly what to do when they go [to the patient]: they've

---

*Maria M. Conforti is a freelance writer in the New York area.*

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*Shriner's Children's Hospital in Tampa, Florida. Installation by Consulting Engineering Associates, Inc.*

already been primed" by the system's memory.

Sometimes, these complex systems elicit complaints from nursing staff, according to James F. Kill, president of Consulting Engineering Associates in



*Huntington Memorial Hospital, California Building, Pasadena, California. Installation by Douglas Roesch Communications, Inc.*

Clearwater, Florida. "It's too complicated for the average nurse: They're used to seeing flashing lights and buzzers... After a couple of years, they get used to it, but

that's an awful long payback period." On the other end of the spectrum, Lobnitz reports that nurses are accustomed to computerized systems after a one-week

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*Aiphone installation at the UCLA Medical Center.*

orientation followed by about a month's acclimation period.

Nevertheless, Kill notes that hospital and nursing home engineers "love" the systems because of their ease of maintenance. "They really want to be able to sit at their desk and monitor the whole [facility]," Kill says. "...Accordingly, it makes for a minimal amount of staff to run a building."

"Facilities are trying to optimize every caregiver on the floor," Watkins says. "Budget constraints and everything else



*Humana Hospital Northside in St. Petersburg, Florida.*

are such that you're trying to make these people more efficient...by giving them more bedside time. The more time the nurse or aide can spend with the patient, the quicker their recovery and the faster they're out and back home." A decrease in confusion and noise, furthermore, can make a patient more comfortable.

Watkins credits this consideration with the move toward locating staff with personal pagers rather than intercoms.

Opinions vary on the impact of the American Disability Act. "I think ADA will drive the cost up," says Spencer. "When we have to design something that's handicap-accessible, we have to

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# Health Club Sound

*New York's Posh Waldorf-Astoria Loses Weight  
by Gaining a Multi-Zone Fitness Center*

BY TOBY COHEN

**A**t Plus One Fitness Center in New York City, president Michael Motta points out that while the "training floor might be loud and lively, the massage area might be of a whole different mood. So we want to provide all those zones with different types of music."

When called on to design and install the deluxe sound and video system at the brand new Plus One Fitness Center at the Waldorf-Astoria Hotel in midtown Manhattan, New York City-based CD Street's co-owners Abe Tessler and Frank Jacobowitz enlisted the services of engineer-on-call Doron Glazer from the planning stages through the job's completion.

The job had initially been bid out by another firm that had designed a system that did not live up to the standards that Plus One was looking for. "They were looking for something a lot more elaborate, of a lot higher quality," says Glazer. "Apparently, the operators of the system were already familiar with CD Street because CD Street had done work for them at other locations. So they asked them to look over the original design, and CD Street asked me to speak with them. We discussed their needs and a week later, proposed a system We gave



*At the Waldorf-Astoria's Plus One Fitness Center patrons can watch what they want while exercising through eight Pivotelli-mounted Toshiba televisions.*

them a group of grids, and the operation of the system was approved. The equipment was then ordered, assembled, and installed."

According to Glazer, the people at Plus One had wanted the "highest possible quality of sound, but they also wanted flexibility - to be able to have different sources in different areas, with adjustable volumes." There was also the desire to have equipment above the stan-

dard industrial grade in the main part of the room."

Hired as an engineer/consultant, Glazer's job was to draw the schematic, make the system work, and help oversee the final installation. Also on hand were engineer/consultant Rob Orlinick, another independent (who often works with Glazer), as well as CD Street's chief installer, Patrick Carter.

Tessler, in his supervisory role, main-



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tains a smooth-running operation at CD Street, a custom installation company that stocks and sells audio equipment and CDs, as well as designs and installs audio and video systems. His main concerns are that the client is happy, the system sounds and looks good, and that the client knows how to operate it. He stresses the importance of making sure of what the client wants and giving it to them, without under- or over-designing the system, or going outside of budgetary boundaries.

Tessler adds that it was very important to Plus One that the system looked very, very good, as well as sounded good. "If you didn't want it to look great," he remarks, "you wouldn't hire a custom installer, you would do it yourself." In an environment of constant activity, ease-of-operation is also important, as well as

special attention paid to wet areas, special limitations and overall safety.

Glazer points out that industrial systems in health clubs "are much more than home stereos. They need to be

**The amplifiers and sources were all housed in one central equipment rack within a large walk-in closet.**

carefully designed and installed for trouble-free operation, and not thought of as less important than the plumbing or electrical systems. You need to decide how many different speaker zones

and sources will be used, how many speakers-per-zone will be installed and what volume levels are desired in each area."

The amplifiers and sources were all housed in one central (standard 19-inch) equipment rack within a large walk-in closet, described by Glazer as being "well-lit and well-ventilated - an ideal place to house such equipment." Approximately five feet tall, the rack was sub-divided into three sub-systems, referred to by Glazer as systems "A", "B", and "C".

System "A", the main system, had the highest quality equipment and the most sources. Covering both the main exercise area and the aerobics area, it includes eight Pivotelli-mounted Toshiba televisions, placed near the exercise machines, "so people could watch what-



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ever they want while exercising," says Glazer. "We had modified each of these televisions to accept headphone jacks." The audio sources for these rooms are a Sony CDPC900 CD changer and a Denon DRR-680 cassette machine. A Carver PCS-60 combination tuner/preamp is targeted to this zone. In addition, there are two Toshiba VCRs (wired to two

### **They wanted the rest of the room to play a little louder.**

modulators to receive two Waldorf-Astoria house network channels.

System "A" provides the main exercise room and aerobics area with the same capabilities but with separate power amps for independent volume control. The JBL SR6630 power amp (300 watts/channel) covers the main exercise room, which houses eight JBL Control 1 speakers, while the JBL SR6615 power amp (150 watts/channel) covers the aerobics area, which houses four JBL Control 1 speakers. "After the installation was completed," recalls Glazer, "they expressed interest in lowering the volume of just two of the speakers in the main room, which were situated directly over the front desk. They wanted the rest of the room to play a little louder. So, in order to do this without adding amplifiers, which would have been expensive, we added a volume control for these two speakers, which is mounted in the main sound rack."

Glazer points out that the JBL Control 1 speakers are "small, compact, and in our opinion, the crispest available. They're very clear and sound good at any volume level." The Control 1 speakers in System "A" were ceiling-mounted on JBL MTC-2+ swivel brackets. "JBL makes a number of brackets for these speakers," he continues. "These allow the greatest flexibility. They swivel in all directions, and afford a very high safety measure in that even if someone actually hit the speaker off the bracket, there's

a safety wire between the bracket and the speaker, so that the speaker would not fall down to the ground, but would hang."

Systems "B" and "C" were identical in their electronics, with "B" slated for the locker room areas and "C" for the

director's office and massage room, both located at the back of the facility. "B" and "C" each utilize a Bogen TP-100A tuner and a Denon DRR-680 cassette machine. A TOA A-903A combination mixer/amplifier (with two input modules added) was chosen for its 70-volt output. "Using



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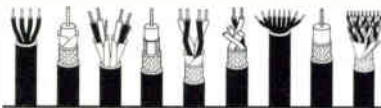
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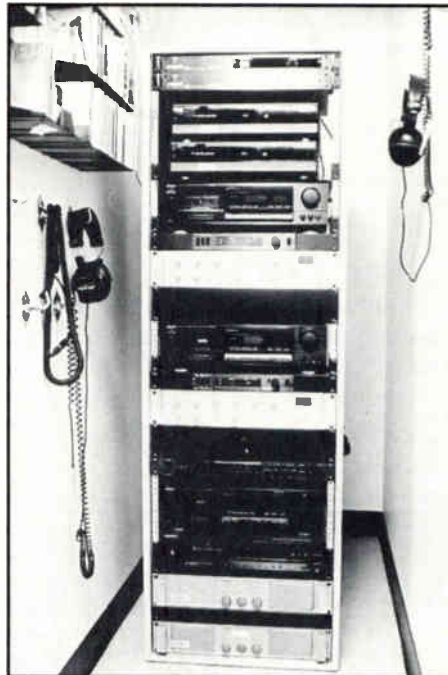
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40 Sound & Communications

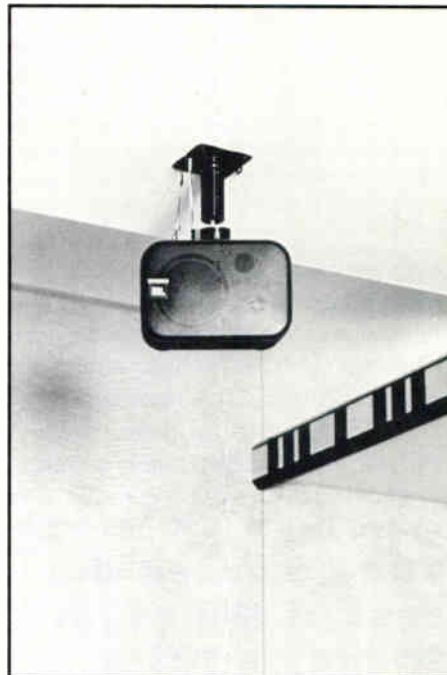


The amplifiers and sources are all housed in one central equipment rack within a large walk-in closet. The rack was sub-divided into three sub-systems, "A", "B", and "C".

the 70-volt speaker system," explains Glazer, "you can add speakers, as needed, until you reach the power limits of the amplifier." The speakers used in these rooms were the Soundolier G51-8s, which Glazer says are among "the industry standards for 70-volt standards." Each area is also equipped with Soundolier AT-35 volume controls, wired from the amplifier and out to the speakers. There is a total of seven speakers between systems "B" and "C": two in each locker room, one in the area between each locker room, and one in each of the back rooms (director's office and massage room). As far as PA capabilities are concerned, the possession of an already-integrated telephone/paging system gave the Plus One staff one less installation to have to consider.

In citing characteristics unique to sound installations in fitness centers, Glazer comments that very often, the appropriate parties "do not plan an area for the equipment. That makes service and operation more difficult. One thing that made this job go so well was that they did have a closet planned for this audio/video rack."

Tessler reflects that a fitness center "needs plenty of power and lots of speakers. If you don't have it in your budget, you wind up cutting some of the equip-



JBL Control 1 speakers are housed throughout the fitness area.

ment, and then it's not where it should be. I can put four speakers in four corners and blast you out of the room. But the main objective is not to do that, it's to have even sound throughout so that if you're standing next to the speaker, you don't go deaf because it's too loud. If it's designed properly, you can have it at lower volumes and still enjoy the music."

Glazer, who has worked as an independent contractor on several health club installations (including Starrett City Pool Club in Brooklyn, New York and Bay Bridge Health and Racquet Club in Bayside, Queens, New York), has found the very often, in the design of such facilities, not enough provision is left in the budget for the audio/video system. "They assume it's going to cost a certain amount of money but to accomplish what they need to, it's usually about double what they had anticipated. People should be made aware that quality systems cost more than they think. This," he's quick to add, "was not a problem with the Waldorf."

Glazer notes that because of careful planning in advance, there were no major problems encountered at the Waldorf-Astoria Plus One. "In relation to the floor plans," Motta recalls, "I think we knew where our zones were and which zones

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we needed to control. The only variable, it seemed, as we developed the floor plan, was the placement of the equipment. For example," he says, "Where's that one treadmill going to be? And where do we need appropriate jacks for power, sound and cable, because we connected it to the house television system?"

"We're talking of only about 3,000 square feet in the entire facility," continues Motta. "But there are several small rooms. I thought it was a tricky installation, he adds, "because we had to have, within a 400-square-foot area, an area before an aerobic dance floor, another small area where somebody might be on a bike, and right next door, an area where a massage would be going on. So you need good sound quality. You also need good isolation between the rooms

**"We had to have, within a 400-square-foot area, an area before an aerobic dance floor, another small area where somebody might be on a bike, and right next door, an area where a massage would be going on."**

and areas." Because the speakers are hung from the ceiling and the television monitors are connected by headphones, Motta doesn't think the flooring, insulation properties, or finishes were a consideration.

The final stage of the installation entailed explaining to the Plus One crew how to operate the system. Tessler describes the system as being "pretty much maintenance-free; high-powered and very tough. The only things you have to maintain on systems like that are a few of the sources, like the cassette decks and CD players. If there's a problem, we're usually there within 24 hours. We'll put another piece of equipment in its place while we're repairing it.

"We check it once in a while," he  
*(continued on page 61)*



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# Arlington International Racecourse

*Video Helps Arlington put Racing Guests First*

BY TODD ZIMMERMAN

**W**here can you take your family to enjoy a 25-screen videowall, dine at any one of six restaurants, and also enjoy a petting zoo, bands, clowns, jugglers, and international thoroughbred racing?

The answer is Arlington International Racecourse in Arlington Heights, Illinois, a northwest suburb of Chicago. The wide variety of additional entertainment alongside the already spectacular racing at Arlington is not accidental. "This is the kind of racecourse you're not afraid to come to even if you know little or nothing about racing," says Bob Carzoli, Arlington's Director of Television Operations. "Arlington has a unique commitment to broadening the appeal of international thoroughbred racing to a whole new generation, including families and business people."

## VIDEO AT THE STARTING GATE

Video plays a major role in helping Arlington's guests (the racecourse always refers to its customers as guests) feel at home. For instance, a grandstand exhibit called "The Starting Gate" uses video extensively — from a virtual wall of large screen monitors to individual interactive "touch screens" — to entertain and teach about thoroughbred rac-

---

*Todd Zimmerman heads up the Z Group, an advertising, design and production house in Chicago, Illinois.*

ing. Viewers can select topics ranging from how horses are trained and ridden to hints on handicapping and wagering simply by touching a screen.

Designer Jim Adler describes the exhibit as a place "where everyone can begin to become an insider. The more you know about horses and the track, the more comfortable it feels, and the more exciting and fun it will be."

## ONE GRANDSTAND — 750 MONITORS

Arlington's building reflects more than ever the racecourse's commitment to making its guests feel welcome, and to using audio-visual technology to help make that commitment a reality. The 700,000-square-foot grandstand includes 750 television monitors for viewing races. Over 400 of the monitors replace the old tote boards used in the infield to display racing odds and other wagering information.

The Zenith and Sony monitors are mounted with brackets supplied by Peerless Sales Company. "Peerless provides a special yoke style of bracket that saves on wall space, so we can place more monitors in one area," explains Carzoli. "The brackets are very solid, so they keep our investment in monitors secure. Plus they're good looking, and that fits in with our objective to have an attractive environment for our guests."

## A FULL BROADCAST FACILITY

The monitors and brackets are part of one of the most complete closed circuit television and editing studios in the sports world. "It's a full broadcast facility," says Carzoli. "We have all standard broadcast equipment, 18 channels and a Dubner graphics system. We also have a Jumbotron projection video display, a 19-foot wide by 39-foot high screen that can be viewed from anywhere in the stands. We use 10 cameras to monitor every race, and we're the first racecourse to use multiplex screens."

## MAKING DOWNTIME INTERESTING

This impressive array of a hardware supports a menu of innovative video programs aimed at entertaining guests between races and teaching them about the sport. "The 15 to 20 minutes between races is usually considered a bore," says Carzoli. "We want to make this 'downtime' interesting, and also attract and hold guests who may not be knowledgeable about thoroughbred racing."

A video program called "Just Ask Me" includes a two-minute video created from the 25 questions guests ask most frequently. Another five-minute piece is on Arlington's annual International Festival of Racing. Other programs highlight various jockeys, owners and trainers.



*The Arlington International Racecourse in Arlington Heights, Illinois.*



*Seven hundred fifty monitors for race viewing are contained in the grandstand.*

Customer Assistance Representatives stationed near the video monitors answer general questions and help guests read their racing forms.

"All of this is geared to helping make Arlington a place people feel comfortable about visiting," summarizes Carzoli. "Video is a mainstay of our overall concept of providing a family atmosphere and entertainment." Indeed, even with amenities such as six restaurants, a petting zoo and sweeping flower gardens, the biggest recent draw for guests at Arlington outside of the races themselves is the Jumbotron projection screen.

#### **A HISTORY OF GUEST FIRST**

This "guest first" orientation is not new to Arlington — it's been part of the racecourse's history from its inception in 1927. Curley Brown, the California-born racetrack builder who led the investor group that founded Arlington, envisioned the racecourse as not only a track but also as an equestrian center with golf courses, a tennis club and bridle paths.

Very soon after its opening, Arlington established a reputation for adopt-

ing the latest in technology to better serve its guests. For example, in 1933, Arlington made racing history by installing the first all-electric totalisator, a system that reduced time between races, and showed fans the volume of betting in the place and show pools as well as the amount wagered on each horse.

Chicago racing's first photo-finished camera, *The Eye in the Sky*, was installed in 1936. The high-speed motion picture camera all but eliminated decisions by placing judges. Other technical improvements followed, capped in 1967 by the installation of the largest closed-circuit color TV system in all of sports.

#### **TEST BY FIRE**

In 1985, Arlington's commitment to racing and its guests was put to the toughest test ever. Early in the morning of July 31, a small fire that began in the Post and Paddock Club spread through the clubhouse and to the grandstand, completely destroying the entire building.

With the Arlington Million only weeks away, crews worked around the clock to prepare the track and temporary bleachers so the race could be held

as planned, August 25. The race, later dubbed the "Miracle Million," and attended by more than 35,000, foreshadowed the successful rebuilding of Arlington. A 13-day International Festival of Racing was held in 1986, and a 91-day 1987 season was held even though the racecourse was without a permanent building. Groundbreaking for the new facility took place after the final race on Labor Day, 1987, and 19 months later the new grandstand was complete in time for the 1989 season.

#### **THE SPIRIT OF A RACETRACK**

In 1973, the entire Illinois racing industry, including Arlington, was suffering from falling attendance and wagering. In the midst of these difficulties, Arlington scored a major coup with the appearance of Secretariat, the 1973 Triple Crown Winner, at the Arlington Invitational. When Secretariat won the race by nine lengths, attendance zoomed at Arlington and all area tracks for the rest of the season. This special "Spirit of Secretariat" carried into a successful 1974 season and was a turning point in Arlington's history.

Now state-of-the-art video programs capture the spirit of a racetrack. This new spirit is one of promise that Arlington will successfully expand racing to a whole new generation of fans. "At Arlington," says Carzoli, "Video not only reflects our dreams for this facility, it's an integral part of making them happen." ■



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World Radio History

# PERCEPTION IN MOTION: AN INTERVIEW WITH GEORGE L. AUGSPURGER

By Wendy J. Duch

**Thomas Jefferson once noted that “it is neither wealth nor splendor, but tranquility and occupation which give happiness.” This observation, though written roughly two centuries ago, is an apt description of the life and work of George Augspurger.**

Those who have heard Augspurger speak publicly, or have had the pleasure of reading any of a number of his technical articles, appreciate the genuine sense of fun with which he demystifies loudspeaker and room acoustics. Even those unfamiliar with his subject matter walk away with some greater understanding of the information being conveyed.

As a practicing acoustician, Augspurger knows that nothing can replace a good pair of ears. He has found that most problems in applied acoustics have common-sense solutions, and that recording studio acoustics may be applied to home and commercial installations with surprisingly good results. He has also found acoustic anomalies which do defy common logic. It is his experi-

ence that computer-based measurement systems can be useful in helping acousticians find solutions to such problems.

In the following interview, Augspurger shares something of his experience with computers, and much more.

*Sound & Communications:* You seem to be known the best for designing recording studios and custom loudspeakers. Is that currently your main area of interest?

**My experience at JBL had given me a good grounding in loudspeaker systems design and introduced me to people in the recording industry.**

*Augspurger:* Not really...those are services which my company provides. My work for the music recording industry probably takes up 50 percent of my time, but I do a lot of architectural acoustics and sound system designs as well.

*Sound & Communications:* You mentioned “my company”...?

*Augspurger:* Perception Inc. was founded about 20 years ago by three of us who were interested in exploring room equalization techniques. It happened to be a good time for me to see if I could make a living as an independent

consultant. My experience at JBL had given me a good grounding in loudspeaker systems design and introduced me to people in the recording industry. So, almost from the start, Perception Inc. was involved with recording studio facilities. I also knew sound engineers at places like Hollywood Bowl and the Los Angeles Music Center, and through them got commissions for sound system design work.

*Sound & Communications:* Who were the other two founders? Are they still part of your consulting group?

*Augspurger:* Larry Phillips was originally very active in the company. He and I spent a week in Austin, Texas getting a cram course in equalization theory from Dr. Paul Boner. Larry later sold his stock to me and went on to a career in marketing. The other original founder was, believe it or not, Tom Hidley. Tom came up with the concept of building turnkey recording studios which, at the time, was a revolutionary idea. However, after having left JBL to do independent consulting, I didn't want to be a product supplier. So, I continued to operate Perception Inc. as a one-man consulting office while Tom established Westlake Audio as his own firm.

*Sound & Communications:* It must have been exciting to be tutored directly by Dr. Boner, as well as a great privilege.

*Augspurger:* It certainly was. He was a Texas gentleman of the old school as well as a brilliant acoustician. We set up a professional relationship with Boner Associates that continues to this day. Although the two companies are not tied

---

*Wendy J. Duch is a freelance writer living in Michigan.*

to each other in any way, Charles and Richard Boner have been willing to collaborate on projects or help me in any other way they could.

*Sound & Communications:* Were you involved in audio experimentations before your experience at JBL?

*Augspurger:* I had always been interested in science and especially in audio reproduction. High fidelity was hot stuff when I was going to college and I built a lot of my own gear from kits. My system included a two-track mono tape recorder – the manufacturer furnished the transport and a schematic of the record/play electronics. It taught me a valuable lesson about the validity of A-B listening tests.

I refined and tinkered with the equalization circuitry until the record/play

frequency was as flat as I could get it. I could make a tape recording of an LP, then play the LP and the tape simultaneously and do an A-B comparison. The only problem was that prolonged listening to tape playback would give you a

### **There aren't very many high-quality, high-powered loudspeakers available.**

headache. The machine was full of scrape flutter, IM distortion, bias oscillator leakage and who knows what. None of these were audible on an A-B comparison.

*Sound & Communications:* Getting

back to sound reproduction, I've heard that some celebrities have had you design proprietary monitor loudspeakers for their studios. What is it that sets your loudspeaker design apart from the rest?

*Augspurger:* First of all, there isn't any one design. I design custom monitor systems for clients who want that service. More than half of my studio design projects use standard, commercial monitor loudspeakers. There are three main reasons why a studio may want to go with a custom design: First, it is proprietary to that studio, even though it may be very similar to one I did for the studio down the street. Second, there aren't very many high-quality, high-powered loudspeakers available; some of the rap artists and rock producers will blow up Tannoy and UREIs in a matter of hours.

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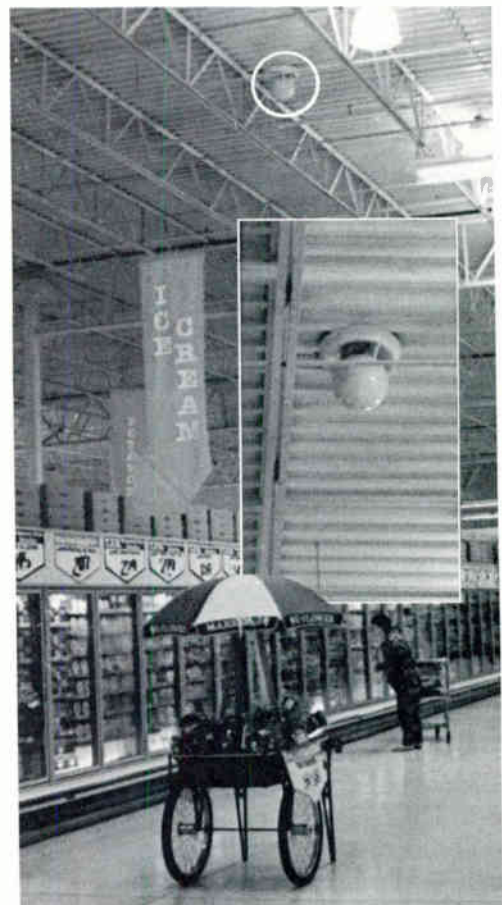
Scott Miller, Manager of Pro Sound at Muzak of Minneapolis, notes that the Cub Foods executives selected parchment-colored #110 Soundspheres to meld with the ceiling color and felt that the shape and color were highly compatible with the contemporary interior design esthetic.

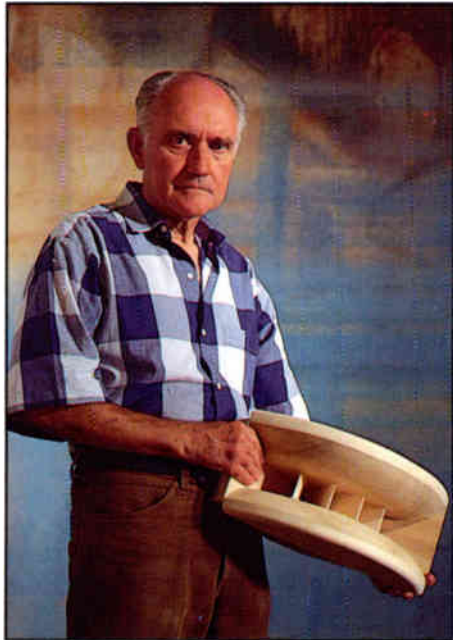
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A man and his horn. George L. Augspurger with the Perception high frequency horn.

Finally, components from different manufacturers can be combined if that is what the client wants.

*Sound & Communications:* That makes good sense. But when somebody says he wants to mix on “Augspurger monitors,” what does he mean?

*Augspurger:* Probably a two-way biamped system using TAD woofers, a TAD or JBL high-frequency driver, and a wooden high frequency horn that I designed.

*Sound & Communications:* Why did you design a new high frequency horn? And why did you decide to make it out of wood?

*Augspurger:* Because recording engineers dislike many commercial horns. I wanted to use a horn made of wood because it can be very solid and because musicians trust wood. I wanted a horn that did not rely on abrupt changes in shape for high-frequency dispersion. And I wanted something no bigger than necessary, but big enough to load the driver down to 800 Hz or so. I borrowed a design concept that has appeared com-

mercially from time to time. It is similar to a radial horn, but the side walls flare smoothly from throat to mouth—there is no abrupt discontinuity at the throat. High frequency dispersion is then accomplished with curved vanes. It is sort of a multi-flare radial exponential multi-cell.

**I wondered if the brain might not interpret this as an increase in spaciousness rather than tonal coloration.**

*Sound & Communications:* Yet it is my understanding that one of JBL’s technical notes was very negative about the idea of using throat vanes for high-frequency dispersion.

*Augspurger:* It’s true that throat vanes don’t do what common sense tells you they ought to do. You are changing a

single waveguide into an arc-shaped array of sound sources and they produce all sorts of interference effects. But the comb filtering from such an array changes drastically with a small change in listener location and I wondered if the brain might not interpret this as an increase in spaciousness rather than tonal coloration.

*Sound & Communications:* And does the design do what you want it to do?

*Augspurger:* For the most part, yes. The final configuration of the vanes was arrived at after TEF tests of half a dozen variants. The response curve is grassy, but the grass changes with horizontal angle. The envelope of the curve is very uniform from zero degrees to 45 degrees off-axis. More importantly, it seems to deliver the kind of sound my clients were looking for.

*Sound & Communications:* Have you found many recording studios who want to use the Perception horn?

*Augspurger:* There are more than two dozen commercial control rooms and mixdown rooms that have custom moni-

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tors with the new horn and so far no one has asked me to retrofit a different high frequency horn. On the other hand, I have designed monitor systems for clients who wanted to use a JBL horn or an Altec horn or an Emilar horn. Those designs have been well received also.

*Sound & Communications:* Is your woofer cabinet sealed or vented?

*Augspurger:* In the world of popular music, vented cabinets are preferred. When properly matched to a good woofer, a vented cabinet will deliver greater low frequency energy. Because the cabinet can't be completely stuffed - otherwise the vent doesn't do anything - it always has a little "chesty" coloration that the rock and rollers like. To a hi-fi purist of course, the coloration is distortion.

*Sound & Communications:* You say

**When properly matched to a good woofer, a vented cabinet will deliver greater low frequency energy**

"properly matched." How do you go about matching a cabinet to a given woofer?

*Augspurger:* Here is where the computer comes into the picture. In just a few minutes I can run through a whole series of cabinet volumes and vent resonance frequencies to find out how response, cone excursion, and maximum level are affected.

*Sound & Communications:* Whose box design program do you use?

*Augspurger:* My own [Augspurger's vented box construction program, VENTWRK]. The good commercial programs all seem to require a math coprocessor and at least two megabytes of memory, both of which are totally unnecessary. Also, I am aware of one commercial program that delivers wrong answers on basic stuff like impedance and cone excursion.

*Sound & Communications:* Even so, it seems like an awful lot of work just to "reinvent the wheel," as you are so fond of calling it.

*Augspurger:* Yes, but at the time I got my first computer there were no commercial speaker design programs available. Bart Locanthi wrote one of the seminal papers on analog circuit model-

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ing and I had used that to build actual breadboard circuits. I wanted to transfer the analog circuit model to a digital computer without asking Bart for help.

*Sound & Communications:* And did you succeed?

*Augsburger:* Almost. It took about six months to write my original Basic pro-

**The good commercial programs all seem to require a math coprocessor and at least two megabytes of memory, both of which are totally unnecessary.**

gram for the Apple II, and I was really proud of myself when it started to deliver believable results. However, when working on the cone excursion routine I had to ask Dr. Bruce Walker for some assistance with the formulas.

*Sound & Communications:* So your program is based directly on analog circuit analysis rather than Thiele-Small alignments?

**If you try to extrapolate directly from Thiele-Small alignments you won't get either one right.**

*Augsburger:* Yes, and it is a more versatile approach. The work of Thiele and Small is invaluable for understanding how vented boxes behave. The Thiele-Small alignments condense a lot of variables into charts that are easy to use, and Richard Small also developed

methods for predicting system losses and large-signal behavior. But a computer can directly analyze the analog circuits that were used as the basis for developing those charts.

*Sound & Communications:* What you are telling me is that once you have a routine to analyze electronic circuits, you can model offbeat loudspeaker sys-

tems as well as normal closed boxes and vented boxes, right?

*Augsburger:* Exactly. There are even some advantages when working with normal systems; predicting low frequency response of a large array, for example. My current program knows the difference between a stack of sixteen 40 Hz vented boxes and a 16-speaker

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June 1992 53



Take One Studios were designed by John Edwards, Architect and Perception Inc.

array tuned to 40 Hz. If you try to extrapolate directly from Thiele-Small alignments you won't get either one right.

**Sound & Communications:** I presume that your current program has outgrown the Apple II. Did you upgrade to a Macintosh?

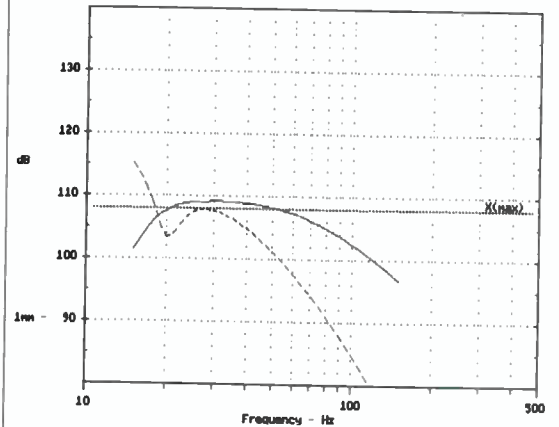
**Augspurger:** No. Based on recommendations from people like Don Keele, I was ready to buy a Mac, but then Bruce Walker reminded me that the Macintosh is the operating system. If you want to be able to play with assembly language routines or floating point formats, an IBM clone is easier for an amateur programmer to use. So, most of the programs I develop for my own use run on an AST Bravo. A number of them, like the loudspeaker analog program, have

also been adapted for the TEF machine.

One of the more approachable practitioners of loudspeaker and acoustical design, Augspurger recognizes the importance of human resources in the furtherance of audio research. For him, accessibility is more than just a design concept. Plain old-fashioned common sense augmented by cutting-edge technology are opening the doors of acoustical perception both for himself and audiences worldwide. Having started out with little more than a slide rule and a good pair of ears, the ears have become an industry standard. The slide rule of course, has long since been replaced by ever-more sophisticated toys.

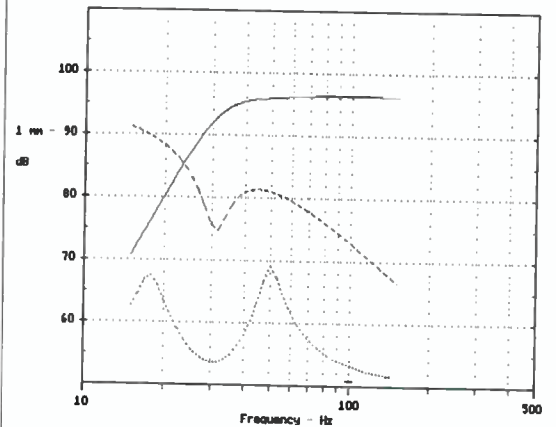
TAD 1603 woofer in 275 liter vented box with lowpass filter

Response and cone excursion at rated drive level



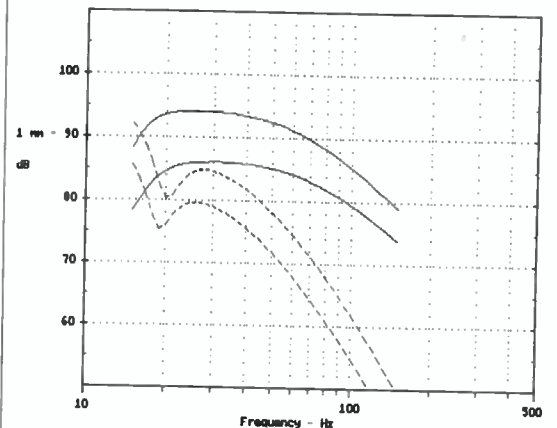
Two TAD 1603 woofers in 326 liter vented box

1w/1m response, cone excursion, and impedance



One subwoofer halfspace vs. four systems in corner

1w / 1m response and peak cone excursion



Computer printouts from Augspurger's VENTWRK program of a design project for Walt Disney Imagineering production facilities in Glendale, California.



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# 71 Miles of Book Shelves

## *Audio Systems Play A Major Part in Chicago's Washington Library*

BY KEITH CLARK

**T**he new Harold Washington Public Library in Chicago is easily one of the largest (if not the largest) facilities of its kind in the world.

Some quick statistics: The building occupies an entire block in the city's south Loop; it is 10 floors tall, all of which can be accessed by the public; each floor of the facility has 75,000 square feet; the building houses 71 miles of book shelves; there are 12 different audio installations throughout the facility.

It's this last point that will be addressed in this article, but even detailing each installation would be a cumbersome chore. Instead, we will highlight some of the larger, more notable installations housed within this truly world-class facility, which opened last October and cost in excess of \$150 million.

All of the audio equipment installations for the building, with the exception of the paging system, was installed by Ancha Electronics of Rolling Meadows, Illinois. The paging system was installed by Bridgewater Custom Sound of South Holland, Illinois. Project engineer for the installation was Jack McCallum of

Ancha. A variety of audio equipment was specified for the wide range of applications throughout the building, with the only constant being Crown Com-Tech amplifiers.

Work commenced on the audio system installations shortly before the building officially opened, with most equip-

### **A centerpiece of the facility is the performance auditorium, with seating for nearly 400 people.**

ment now installed and running. However, McCallum still reports to the library almost every day, making minor installations and adjustments.

#### **THE PERFORMANCE AUDITORIUM**

A centerpiece of the facility is the performance auditorium, with seating for nearly 400 people. The room is designed for versatility, handling everything from theater groups to film viewing to speeches. It has two boxes provided especially for television cameras.

The room is especially designed for

live performances, with all seats close to the stage and affording a good line of sight. The stage is about 60 feet wide, 25 feet high.

A sound booth containing the mixing console and other audio components is located immediately behind the last row of seating. This room is fronted by glass panels, which can be slid open if necessary. Because the room was designed to provide good acoustics, the audio system is not burdened by the need for a lot of help in the way of digital delays, etc.

"The house PA is a left/center/right system with an Intersonics subwoofer getting a signal feed from all channels," says McCallum. "The clusters are made up of Electro-Voice HP940 and HP640 horns with DH1A drivers, as well as the E-V TL606DX boxes for low frequencies, driven by the Crown Com-Techs. The E-V and Crown gear together is a nice combination, producing a smooth, pleasing sound."

The room is also set up for sound in surround, which can be a nice addition to some motion picture presentations. Several Vega R-42 wireless systems are also employed, with antennas mounted adjacent to the performance stage for maximum reception.

The room also employs a Sennheiser

---

*Keith Clark is Vice President, Public Relations for Jesse Walsh Communications in Buchanan, Michigan.*

Infra-Red System for the hearing impaired. McCallum pointed out that almost every room with audio equipment must employ hearing enhancement systems of some type because the library is a publicly-funded facility.

The house console, a Soundcraft 8000, is modified to work well in combination with the main house system. "The board has left/center/right pan control and masters, and as far as I know, it's one of the first boards of its kind, if not the first, to be used," McCallum says. The console is surrounded by three monitor speakers suspended above it.

A wide variety of electronics equipment is available, including a Lexicon LXP-1 and LXP-5, Alesis quad reverb for special effects, Rane GE-30 for equalization, and dbx 166 limiters. A small, 70-

volt system is also in place to distribute a live feed to dressing rooms and other rooms in the vicinity of the theater. The monitor system features a 24-channel mixing console with portable monitors

**Almost every room with audio equipment must employ hearing enhancement systems.**

that allow easy, flexible configuration throughout the stage area.

The audio system is also tied via 32 audio tie lines to a full video production facility. Some video tie lines are patched

into the audio system as well, for control of images projected by a Talaria M P projector on a Stewart screen, which can be lowered down to the stage. Patch boxes are located throughout the stage area.

The amplifier racks are housed in an upstairs area adjacent to backstage. Crown Com-Tech 400s are used to power the high frequencies of the surround, monitor and main channels, while Com-Tech 800s power the low frequencies. A Crown Macro-Tech powers the subwoofer. Also housed with the amplifiers are ADD delay systems for time-aligning the drivers.

"It's not a huge room, but they sure have a lot of capability for the size," McCallum says.

**THE MULTI-USES ROOM**

Also on a lower floor is a large room

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*The Atrium on the top floor of the library.*



*The sound room of the performance auditorium.*



that can be subdivided into two smaller rooms. The rooms are designed to be used for everything from business meetings to wedding parties, so the audio system has to provide a great deal of flexibility. The layout and design of the multi-uses room is also utilized in several meeting rooms on upper floors.

All of these rooms feature a nice selection of capabilities, including CD/tape, VCRs, Barco projection units, full close-captioned decoders, podiums with microphones, and patch bays conveniently located for additional miking capacity. Many of the podiums feature Crestron Crestnet touchscreens to allow a speaker control of A/V productions during presentations.

In the multi-uses room, speakers are flush-mounted into the ceiling, with an Audio Digital ADD-2 digital delay for speakers located in the back when the entire room is used. Electronics for the A/V system are housed in a storage closet attached to the room.

"The multi-purpose room, as well as the other meeting rooms, were specifi-

cally intended and designed to provide a lot of versatility to accommodate a wide variety of needs," McCallum says.

#### **ORIENTATION THEATRE**

The orientation theater is conveniently located in a main traffic area on the second floor of the library, and its name describes its intended use. Visitors are encouraged to stop into the room, where a tour of the entire facility (via video-

#### **Electronics for the A/V system are housed in a storage closet attached to the room.**

tape) is hosted by Chicago television personality Bill Kurtis.

"This was designed to be a 'hands-off' room, where Tom Hayes of Ancha has written an IBM-based computer program that automatically activates a VCR showing the taped presentation every 20 min-

utes or so," McCallum says. A laser disc version of the presentation will eventually replace the VCR version. "Unfortunately, the time accesses are really slow with the VCR system, so we're going to go with the laser disc to make access more instantaneous."

The computer not only controls the video, but also works with a Crestnet interface system to control other aspects of the theater, such as lighting, slide projectors, cassette player, etc. A podium is also available for live presentations, and it is equipped with a Crestnet touch-panel to allow the speaker control of system and room functions.

Video is projected on a screen at the front of the theater by a Barco projector, which is located behind the screen. In fact, the entire control system for both audio and video are located in a room immediately behind the screen.

#### **OTHER FEATURES**

A highlight is the winter garden room, or atrium, on the top floor. It is a glass-covered room actually two stories tall,

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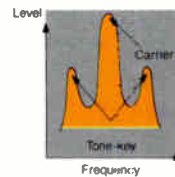
It wasn't long before the church needed a second mic. Instantly, their devoted contractor

appeared, sleek new mic in one hand, receiver module in the other. And in five minutes he was finished. But the praise was just beginning.

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settled into their pews when they raised their collective voices for two more mics. Miraculously, what was once just one receiver had multiplied and was now four in a single rack unit. A chorus was raised for the forward thinking contractor and the TOA wireless system.

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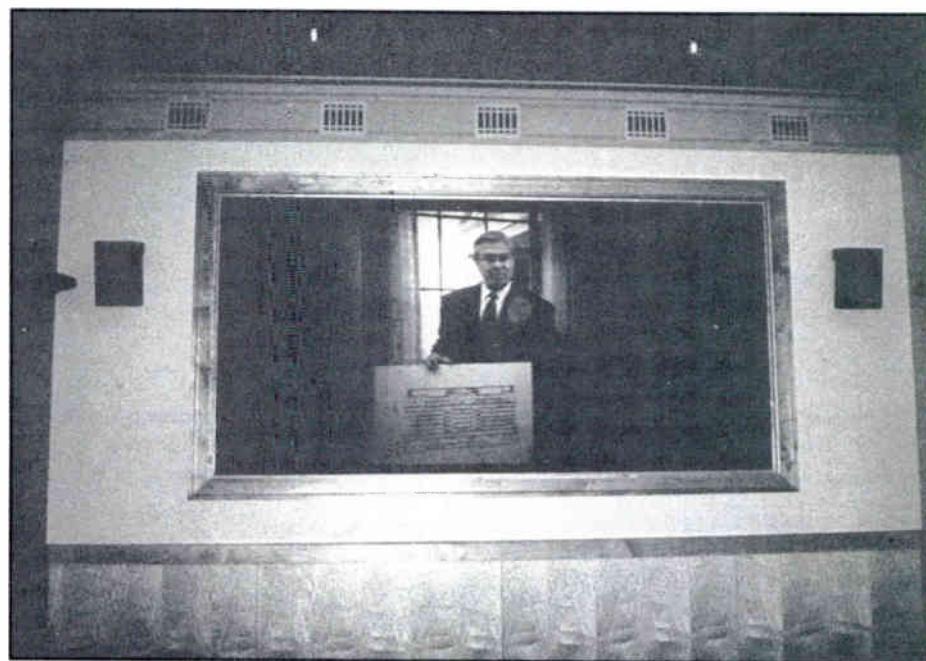
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*One of the  
multi-purpose  
rooms.*



*The orientation theater.*

that affords a view of the skyline. This room is used for receptions and other events, accommodating up to 650 people. Two portable audio systems can be rolled in via steel carts and set up in a matter of minutes. This system may be upgraded in the near future.

The library also features a language lab, where library patrons can listen to and view materials in dozens of different languages. Fourteen separate carrels offer a wide assortment of capabilities, with some offering audio, and others offering video capabilities as well. Each carrel has a headphone amplifier and Crestron control panel, allowing the patron control. In addition, a shortwave radio is linked to the system, allowing monitoring of foreign broadcasts.

The music listening room, not yet com-

plete, will have 35 individual carrels allowing patrons to listen to a huge assortment of music, either via CD, tape or vinyl albums, even 78 rpm albums. Plans for the future call for individual practice rooms with recording capabilities to be located adjacent to the music listening area.

The top floor also contains a boardroom with A/V facilities, including several microphones on the meeting table, providing full telecommunications capabilities.

Clearly, Chicago's Harold Washington Public Library is not your "average" library. Not only is it impressive from a sheer size standpoint, but through its employment of new technology, provides a look at the future of public facilities. ■

## HEALTH CLUB

(Continued from page 42)

explains, "making sure everything works. We change the headphones once in a while, because they constantly go on different people's heads. The sweat will corrode a headphone or make the padding wet. So, we rotate them."

Glazer advises that in "wet or humid areas, such as locker rooms, you definitely need industrial-grade components that will not corrode. Secondly, you need equipment that can run hour after hour, for continuous operation, without overheating." He adds: "Provisions should be made for quick troubleshooting and replacement of parts, as well as room for system expansion or modification."

With aesthetics playing a major role in making a fitness center more attractive to prospective, as well as current, members, audio components and peripherals are selected even more carefully to fit the decor and ambience while combining style with function. "There's always a look or style you're trying to achieve," says Motta, "especially in places like the Waldorf-Astoria. You can't throw something up that's unacceptable. They do have a certain art-deco type of look; but with audio/visual equipment, I challenge you to go out and find an 'art-deco-looking' monitor. So we just chose a black color - real flat black. We tried to stay high-tech," he continues, "even though it was an installation that had a wood finish to it. And they fit well. Even though you're in a real old, rustic, or wood-finish type of room," Motta concludes, "if you have a high-tech-looking monitor, it seems to blend in, for some reason."

Sacrifices are sometimes necessary. "Very often," says Glazer, "the audio/video engineer is at odds with the interior decorator - whereby, what sounds good does not look good, and what looks good does not sound good. We had to make some compromises, even at the Waldorf. CD Street and I would've liked to have added subwoofers to the system, but because of, primarily, the interior decorator and the way it would look, they were cut out." Glazer explains that while having them would have provided deep bass, in "retrospect, they hardly ever use the system to the capability that subwoofers would have added. It turns out that the Waldorf, because of its size and intimacy, they never turn up the

volume enough to take full advantage of the subs."

This fully illustrates the point that spanning the workout facility spectrum needs assessments and thus, sound and video requirements differ from facility to facility. "you can't compare Plus One to most

### In "wet or humid areas, such as locker rooms, you definitely need industrial-grade components that will not corrode."

fitness centers," remarks Tessler. "Their main concern is to train you one-on-one. To them, it's not that important to have that very loud, bassy area that most other clubs would need. In the Waldorf-Astoria Plus One Fitness' case, it's more important to have not just sound, but video capability as well - to let the client watch CNN News, for example, or whatever it may be."

Comments Motta: "The hardest part is keeping 25 different people, from 25 different states - maybe even countries - happy. That's why a sound system that would emanate from one source would never do for us. Some just want to be alone and work, aerobically, by themselves, and listen to music or watch television. Some might have a movie or videos that they want to watch. Some might want no sound at all. So, we tried to find a system that would meet all those needs under the circumstances. This is a very small space. We're not talking about a 20,000-foot or 40,000-foot health club."

Conditions also differ when you consider the type of structure housing the facility and its location. As the gym/health club/fitness center market continues to grow facilities, be they multi-purpose or specialized, will require a breed of equipment well-suited to environments never before considered for setup beyond the basic PA. This may require manufacturers to take a second look into product testing, materials and systems compatibility. ■

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# What's New in Printers?

## *Special Applications for Sound Contractors*

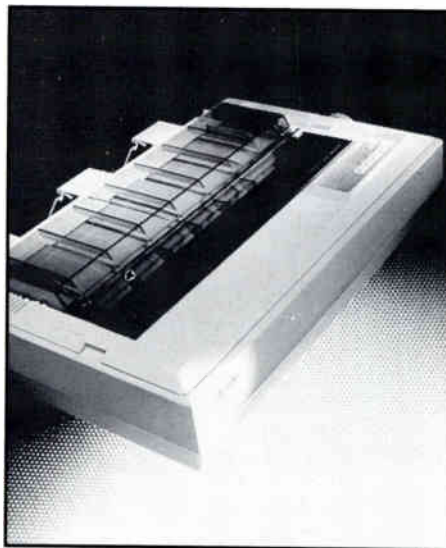
BY MIKE KLASCO

**S**o what is an article on printers for computers doing in *Sound & Communications* magazine? During the last year I have been noticing a number of unique printers that have special application for sound contractors. After taking a close look at these specialized products I thought that a round up of what has been developing would be of interest to our readers.

Aside from the conventional dot matrix and laser printers that are typically used with IBM compatibles and Macs, what else is going on? I found four categories that intrigued me: portable printers, color printers, printers that emulated XY plotters, and Mac/IBM compatible laser printers. The portable printers all list in the \$500 price range, while I will limit my discussion of color printers to \$3,000 and under. The C size XY printer/plotters are from under \$2,000 on up, and the Mac/IBM laser printers are under \$3,000. Unless I say otherwise, the prices given are list, so you might expect street prices of 10- to 25-percent off.

### PORTABLE PRINTERS

If you have not seen the latest crop of portable printers, you are in for a pleasant



*Fujitsu's DL 3600 PrinterPartner.*

surprise. I wish the speakers I design could be shrunk so much yet still perform so well! Aside from using these printers with your laptop computer, other uses are with portable test gear that has a printer interface (such as the Audio Control and Sound Technology analyzers) and computer based test gear such as the TEF 20, SYSid and MLSSA systems. One of the first attempts at a portable, battery operated printer was the Kodak Diconix. Originally priced in the \$400+ range a few years ago, the print quality was passable in this almost silent and compact ink jet technology printer. The Diconix is now

being liquidated by mail order houses because the latest crop from Citizen, Canon, and Seikosha has obsoleted this product.

### Citizen PN48

The Citizen PN48 has the best print-quality performance of the portable printers, with laser quality text, yet the list price is only \$550. The graphics quality is good, but not quite laser quality. The PN48 is battery powered and will print 25 pages on a charge. The non-impact printing technology is almost silent and works with most media, including regular paper and transparencies. The PN48 weighs less than two pounds. A "pro" version includes an ac adapter/recharger and soft carrying case.

### Seikosha LT-20

Designed to fit under your laptop computer, the Seikosha LT-20 is about 15 inches x 11 inches, but only two inches high. Unlike the other battery operated portables, the LT-20 is a dot matrix printer, and uses a 24 pin print head. One benefit of dot matrix over non-impact technologies is multiple forms printing—the LT-20 can pound through three-part forms. The ribbon cost of dot matrix printers is five to 10 times cheaper (per page) than inkjet. Another attractive feature is the Seikosha's 50 page paper tray that is built

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*Mike Klasco is the Technical Editor of Sound & Communications magazine.*





*B-size .GIF file printed on a JDL AutoPlotter XP with 180x180 resolution.*

into its case. If you have ever tried to use a portable printer under field conditions (or on a plane), you will immediately recognize what a smart idea this is. Dot matrix is a power intensive approach, but the LT-20 will get 100 pages per charge, four times that of the Citizen PN48. The LT-20's stamina comes with a weight penalty, as it is five pounds, much more than the Citizen's two pounds. Print quality is near letter quality, but not in the same league as the Citizen. And dot matrix is noisier than non-impact techniques, but the print speed is much faster. The LT-20 has a quiet (and slower) mode. The LT-20's integral paper tray, faster print speed and multi-part forms printing may be strong enough reasons to pick this flatbed printer over its competitors.

#### **Canon BJ-10e and Apple StyleWriter**

The Cannon BJ-10e uses non-impact technology, weighs a bit less than five pounds, and its list price, at \$500, is the same as the Seikosha. It is battery operated, and offers print quality close to the Citizen PN48. The printed pages do not want to get wet, as the special ink used to prevent clogging the Cannon's inkjet print mechanism is not smudge-proof when moist. While the portable printers mentioned here are for use with parallel interface equipment (such as IBM compatibles), the Apple StyleWriter printer will work with Apple Mac computers, including their laptop. The StyleWriter essentially uses a BJ-10e mechanism inside its stylish case. There are a couple of other portable printers being introduced

as you read this, so shop around before you buy.

#### **COLOR PRINTERS**

The first approach to getting a color printout was using a plotter. The early plotters had one pen, and drew all the lines of one color first, and then required the operator to change pens and the plotter would draw the next color, and so on. More advanced plotters have four, eight, 10 or more color pens and automatically change color pens. Still, they cannot do double duty printing text documents. Furthermore, none of the sound system design programs nor the computer based test gear (TEF, SYSid, MLSSA, etc.) will work with XY plotters. One alternative, color dot matrix printers, have been around for a while. Epson and others have offered relatively cheap color printers which use a four color ribbon. The color ribbon is controlled by the software to move up or down to the correct color to print the desired color dot. Why isn't everyone using these printers? The first generation color dot matrix printers were slow, with a full page of color graphics taking 10-20 minutes. The print head must make a separate pass for each color, so if four colors are used, four passes are required. If a color is selected that is not one of the four colors on the ribbon, then two passes are required to synthesize that compound color. Usually, these composite colors look terrible (maybe I should call them compost colors!), as the registration is poor and the inks are not pure so they do not mix well. The hardcopy generally is not presentable. Dense areas of

color saturate the paper, and the paper warps. If the paper does not warp because of ink saturation, then it will still look beat up because the print head rips up the paper fibers.

There are no real standards for color print codes, so a software print utility is needed. It is time consuming to set up the print utility to coordinate the colors you see on your screen with the colors you will get off your color printer.

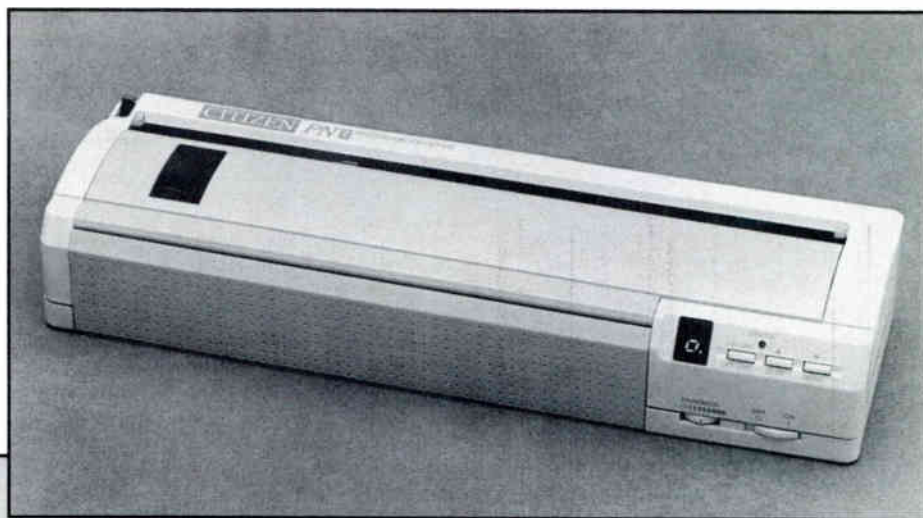
What about thermal inkjet/bubble technology? About five years ago the early Cannon 1080 color printer was priced competitively with the color dot matrix printers, which was in the \$500 range. I bought one, but found that the colors were really too washed out for any practical use. In the \$10,000 range there have been a few viable color printers, but so what!

In the last few years Hewlett Packard's PaintJet was introduced at less than \$1,500 and produced good quality color output, but only A size paper could be accommodated. The XL version has been developed which will work with B size drawings. This is a good solution for presentations of sound system design programs and computer based test equipment, both of which have the potential of impressive color graphics. The Mac version of the printer is called the PaintWriter XL and is a bit more expensive at \$3,000 list. A high resolution version of these printers is planned for later this year.

There are thermal inkjet and bubblejet color printers from Tektronix and others, but nothing in the \$3,000 price range. An alternative to these printers is the large

format color printer/plotter. There are a few of these that use dot matrix printing techniques which produce prints that are of satisfactory quality, and certainly far better than the color dot matrix printers of just a few years ago.

*Seikosha's LT-20, designed to fit under a laptop.*



*Citizen's PN48 notebook printer.*



### LARGE FORMAT PRINTER/PLOTTERS

Most sound contracting firms spend a good deal of time looking at large format prints, as well as preparing the prints themselves. C and D size prints require serious hardcopy equipment. Until recently this required a \$5,000+ XY plotter. Cheaper XY plotters in the \$2,000 range have been introduced that can handle C and D size plots, but these are typically single color and, of course, will not print documents. XY plotters require an operator to baby sit during operation, as pens are prone to run dry. Most plotters can only load paper for one print at a time.

A size prints are 8.5 inches x 11 inches, B size prints are 11 inches x 17 inches, C size prints are 17 inches x 22 inches, D size is 22 inches x 34 inches and E size 34 inches x 44 inches.

It would be nice if you could buy a letter quality, or near letter quality, printer that could also turn out an occasional color print from time to time. Since a dot matrix

printer is really a print head that slides over a greased bar, why not just extend the metal bar a little bit longer so B or C sized paper will fit? This is what AMT, DaVinci, and JDL have done. Essentially, these printers are specially enhanced wide carriage printers. In fact, all three firms started out with printers that handled B size and upgraded them to C size.

So what else is enhanced over garden variety wide carriage dot matrix printers? They all offer above average quality color, either include or have options for HPGL emulation (so they can accept and interpret plotter commands), are compatible or are directly supported by AutoCAD (ADI drivers), and have more sophisticated paper handling (for example, the JDL has an option of handling a large roll of paper ("roll feed") so it can churn out prints all night). The claimed resolutions are about the same or better than laser printers, but the dot size and print quality of these printers is clumsy compared to even a low end laser. But remember

these dot matrix printers offer C size and color, something you won't get from a laser in the near future.

### AMT

AMT's early problems with print speed due to computer interface have been resolved since their initial model 500, which was only B size. The Intelli-Plot 535, an improved version was upgraded to C size and is both quieter and faster. Recently, the Intelli-Plot Turbo has replaced these models.

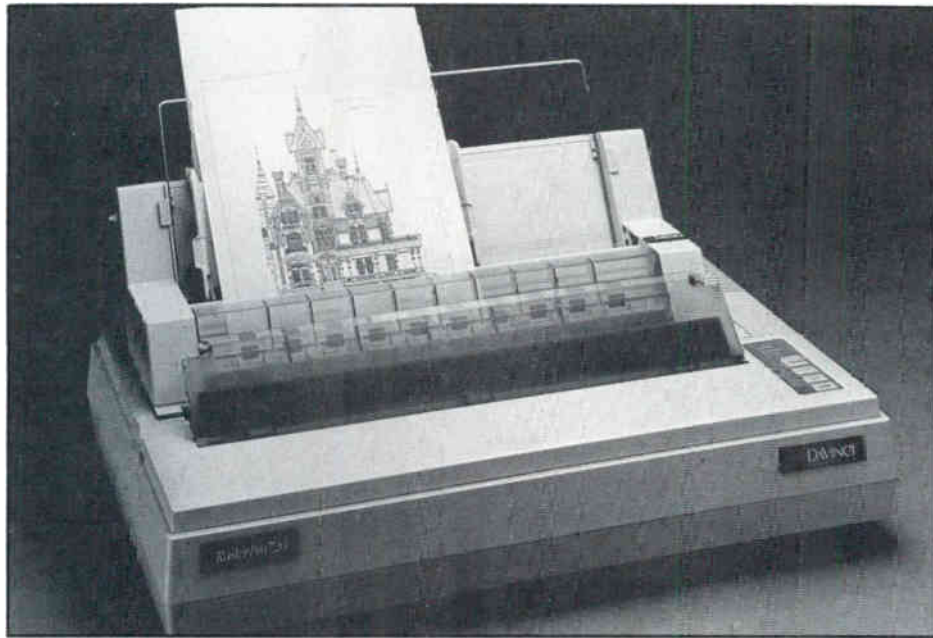
The AMT Intelli-Plot Turbo handles C size paper and will print in color. HPGL emulation is built-in. Cost is low at about \$2,000 yet the print samples I have seen looked quite good.

### DaVinci

DaVinci RasterPro 720 is ultra high resolution at 720 dots per inch (a laser printer is only 300). The DaVinci mechanism is actually a modified Fujitsu B size that has been widened for C sized prints, and it also boasts higher performance controller electronics for HPGL emulation and straighter line printing. Cost is about \$3,000 to \$3,500, depending on buffer memory. The more buffer memory you have in the printer, the less time it takes before your computer is freed up during printouts.

### JDL

JDL has a number of printer/plotters. JDL was the first to offer a printer/plotter, the 700 series, which was B size. This was stretched to C size in the 800 and 850. This year they have introduced an up-graded printer which they call the AutoPlotter (about \$3,800 list). Their flag-



The Da Vinci RasterPro 720.

ship is the ExpressPlotter which accepts D size paper. A variation of this printer is the OmniPlotter, a network printer. The Omni and Express plotters will work with Macs, IBM compatibles and Sun workstations.

#### WHAT ABOUT SOME CHEAPER SOLUTIONS?

##### Strips

The cheapest in-house solution to large format printing is to "strip" in the drawing. By using a print utility (such as Pizazz) the user can define segments of a drawing to be printed out on an A size printer. A dot matrix printer may only be able to pass paper 8.5-inches wide, but fan fold paper continues on forever. The strips of printout are glued to the C or D size paper stock and this montage is then taken to the local print shop for blueprinting. I know of a contractor that gets passable results with this approach, but this is definitely not the high road.

More workable is to get the largest size drawing on a B size printout (using a wide carriage dot matrix) and pasting this to the C or D size print and having this blue printed. This will not be adequate if you have a complex wiring drawing that really requires the entire 22-inch x 34-inch paper, but works well for having your speaker cluster drawing on the same size paper as the rest of the architect's prints.

##### B Size Printers

One especially interesting printer from Fujitsu is the DL 3600 PrinterPartner, a

\$950 list price color dot matrix wide carriage printer. It will accommodate paper up to 16.5-inches wide, which means you can print out B size prints (11 inches x 17 inches) using a portrait format, but you will come up short on C size (17 inches x 22 inches) by 1/2 inch because of the 16.5-inch carriage width (but you can still paste up a 16.5-inch x 11-inch print to C size stock and bring this to the blue print shop). The DL 3600 combines some of the capabilities of PostScript lasers, color printers, and near letter quality 24 pin print head, so this might just be the multi-purpose solution for a sound contractor on a budget.

##### Service Bureaus

A non-capital-intensive approach ("I have no money!") is to use service bureaus. Most big cities have these and they can be found in the phone book or by asking the local blue print shop. Using one of the standards specified by the service bureaus (such as AutoCAD DXF, or some other standard such as TIFF, etc.) you can modem or send them the file on disk. They will Fed Ex you the printout(s) at some price per square foot (maybe about \$5 - \$10 per foot).

##### Mac and IBM Compatible Printers

I have found that most Mac users also have IBM compatibles. A laser printer for the Mac should have an Appletalk interface and PostScript (or at least have an AppleTalk interface with a PostScript clone). I do not want to go into what

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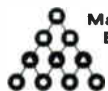
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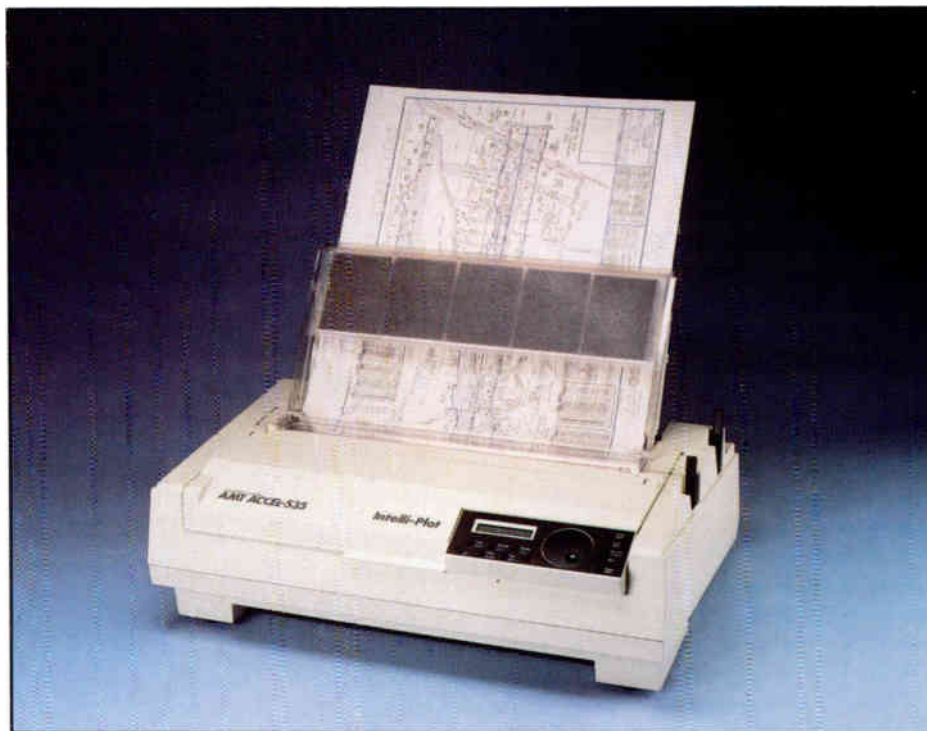
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*The AMT ACCEL-535 Intelli-Plot.*

PostScript is, (or what PostScript clones are, or what True Image is, etc.). But the bottom line is that if you want to be happy with your Mac laser printer you should have PostScript. Although there are quite a few PostScript printers on the market, you may also want to connect your printer to your IBM compatible. Although printers with AppleTalk interfaces typically have serial and parallel interfaces, this will still require changing some settings every time you switch back and forth between the IBM compatible and Mac computer, which is a pain!

So far, I know of only a few reasonably priced laser printers that do not require any changes when printing from both Mac and IBM computers. These are the QMS 410, the NEC 2 90 (usually just called the Silentwriter 90), and the OKI OL840. All list for less than \$2,700. The NEC can be had for less than \$2,000 from mail order firms. The reviews on these printers have been excellent and I have been using a NEC 90 for a few months and am very happy with it. The QMS 410 automatically switches out of the box, while the NEC requires an optional software program called AES (this stands for Automatic Emulation Software, not a certain sound engineering society!). The OKI also uses software switching. A fourth choice is the Microtek TrueLaser which uses TrueType, an involved PostScript

compatible clone. Like the QMS, the Microtek TrueLaser automatically switches between your IBM compatible and Mac computer.

By the way, if you are considering Hewlett Packard's laser printers for your Mac, don't, as H-P's printers are not directly compatible, requiring PostScript cartridge adaptors, interface adaptors, are wasteful of the printer's buffer memory and finally, operation is slow. Sharing your IBM compatible and Mac with the H-P requires complete power-down of the H-P each time you change back and forth.

#### **ADDITIONAL SOURCES OF INFO**

If the CAD related stuff is of interest to you, then you may want to get a subscription to MicroCAD News at \$35 ((512) 250-1700).

"PC Week" and "PC World" cover the IBM compatible market well, but you might want to scan the cover and table of contents to see if there are articles of interest rather than getting a subscription.

The large format printer manufacturers will send you actual print output samples (as well as literature and dealer lists): AMT, (805) 494-4221; DaVinci Graphics, (408) 737-8800; JDL, (805) 388-8709.

If articles like this one are of interest (or not of interest) please let us know. ■

*(Continued from page 26)*

ternally via DIP switch connections.

Shure Brothers' new FP410 is an automatic mixer accepting four microphone inputs plus providing linking capability for up to 25 mixers. It is designed for broadcast applications, theatrical stage miking, and video production.

Soundcraft brought several new mixing consoles to the show. The Delta SR four buss sound reinforcement console comes in 8, 16, 24, and 32 input versions. The Delta DLX offers a similar range of inputs and includes an active pan pot, a patented mike preamp, and a wide range of modular configurations. The Vienna Sound Reinforcement Console is an eight buss model of broad capabilities offering continuously variable stereo separation and phase enhanced wide stage stereo. The Vienna uses a VCA grouping system, and allows for linkage of buss and solo signals between slave and master consoles.

Also utilizing an eight buss configuration is the new Venue II which replaces the existing Venue model. An unlimited

number of input modules may be specified within 16, 24, 32, and 40 input frame sizes.

Yamaha's PM4000 is a flagship sound reinforcement mixer available with up to 48 inputs, four full-function stereo input modules, and 12 aux sends. The EQ section provides four bands of fully parametric equalization.

**TEST EQUIPMENT**

Meyer Sound made news with their new SIM System II for source independent room measurement. The new system includes the SIM-2201 Sound Analyzer, the SIM-2403 Interface Network and a selection of software options.

Techron showed the TEF System 20 which includes a number of PC based hardware packages and three new software offerings including a realtime analyzer for the PC.

**MISCELLANEOUS**

Pioneer had a number of new product entries in some fairly unusual categories. The company announced the CAC-

V3000 disc changer which holds up to 300 compact discs – surely a record of some sort. The company also showed a laserdisc autochanger, various laserdisc players and signal processors for karaoke use.

RPG showed a concrete version of their well known quadratic residue diffusor suitable for use in supporting walls, as well as the new Diffusorblox Helmholtz resonator bass absorber/diffusor.

Systems Development showed some three-dimensional diffusors of their own where diffusion is achieved by an array of projections rather than wells as in the RPG design.

Finally Valcom showed a highly versatile new six-zone paging control system.

All this represents a series of very fleeting impressions over a very hectic three day period. Obviously there were hundreds of new products on display in dozens of categories. There's really no substitute for attendance, and we hope you all can come next year. ■

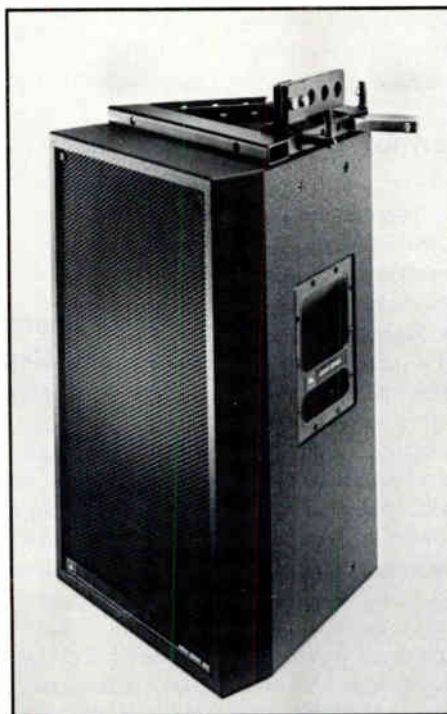
**LETTER FROM THE EDITOR**

*(Continued from page 5)*

sity models. The systems are VHF, rack-mountable, and outfitted with removable front panel covers which conceal two tuner ports that accept frequency specific tuner modules. TOA's proprietary double squelch circuitry is used. Peavey introduced several new models including the ASM-2 using boundary effect technology for inconspicuous use.

Clair Brothers established itself strongly as a sound contracting firm, developing a contractor network and independent reps. Clair showed the P-4 Piston Array Element, an arrayable, three-way full-range speaker system with an unusual appearance, since the front area is around 13 inches and the side walls taper back.

JBL showed the 4892, the first model in the company's Array Series line of concert loudspeaker systems. It's designed to work with the new JBLES52000



*JBL Array Series Model 2892.*

Digital Controller.

Why was NSCA termed a success by so many people? Tom Bensen of Metropolis Audio Marketing points to an industry in flux, the demise of the NAMM summer show, and the interest in new markets such as residential installations as the impetus for the successful NSCA show he just attended. "A lot of buying doesn't happen at that show. I usually write business after NSCA. But it has become the major forum for new product introductions. And I saw good serious traffic."

Best regards,

Judith Morrison  
Editor in Chief

## New Name for Klark-Teknik; New Firm for Crawford and Friend



Sam Spennacchio

### Pinnacle Audio Named

Klark-Teknik Electronics Inc. has changed its name to Pinnacle Audio. According to Sam Spennacchio, vice president, this change has been spurred by the addition of new lines such as Dynacord; the growth of existing brands currently distributed by the company including Klark-Teknik, DDA and Midas, and the company's goal to reach new market segments beyond professional audio and sound contracting. Pinnacle Audio is now the official arm of Mark IV Audio responsible for distributing and marketing all foreign product lines in the United States.



Photo by Donna Buie

Left to right: Erich M. Friend, David D. Crawford

### Consulting Group Formed

Erich M. Friend and David D. Crawford have formed a new theater consulting group, Crawford — Friend Consultants, Inc. in Fort Worth. The firm specializes in performing arts technology and facility planning. Fields of expertise include lighting, dimming, sound, rigging, drapery, and audio/visual systems. Other design elements addressed are seating plan and sightline studies, feasibility studies, room acoustics, and theater safety assessments.

### Matthias Little Dies

Matthias Little of Quam-Nichols died on May 11 at the age of 79. He joined the Quam-Nichols Company in 1931, rising over five decades to its presidency and chairmanship. He retired in 1983. The company is now headed by his son, William G. Little. Matt Little had a reputation for being well-organized, focused and unpretentious.

### Adamson Sales

Adamson has announced several sales. More product has been sold to Inversiones Intertek of Venezuela. LYD Systemer a/s of Norway has placed additional orders. Product has been shipped to J-Mar Electronics in Toronto for installation in the North York Performing Arts Centre, a new multimillion dollar facility.

In additional news from Adamson, new personnel appointments have been made: Andy Lam has been named Electrical Engineer. Paul Bauman has been named Chief Engineer, overseeing new product development, quality control, service, and the activities of the company's six electrical engineers.

### Recognition for Videowalls

The Minnesota Timberwolves were recognized at the Information Display and Entertainment Association Conference and Exposition in Orlando for Golden Matrix Awards for the Best Large Screen Presentation in North America and Best Interactive Game. The Timberwolves entry included a five minute videotape sampling of actual Timberwolves game footage, including animation, special effects and videowall programming. As Duffer Schultz, the Timberwolves' Manager of Audio Visual said, "We set this competition, and the award, as a goal. This was the first time that a basketball organization has won 'best overall' and the first time that a videowall has been honored. The creative effort was made possible by Electrosonic videowall controller hard-

ware and software, and by graphics from IVL Post, Minneapolis."

### Football Equipment

Electro-Voice has announced that two large football stadiums at major Texas universities have installed Electro-Voice MH6040 Manifold Technology horn/driver systems. The systems were installed at Floyd Casey Stadium at Baylor University in Waco, and Amon G. Carter Stadium at Texas Christian University in Fort Worth. At Baylor's Casey Stadium, with a capacity of 46,000, a total of 13 MH6040 systems were used in two main clusters located on the roof of an athletic building behind the north end zone seating. The entire Baylor system was specified by Charles Boner of Austin, and installed by Universal Time Equipment Company of Tyler, and Thomas Electronics of Fort Worth.

At Texas Christian's Carter Stadium, also with a capacity of 46,000, six MH6040 systems were installed, also atop a building located past one of the end zones. The system was specified by Erich Friend (at Langestien Friend Associates), with additional design work and installation done by Electro Acoustics of Forth Worth.

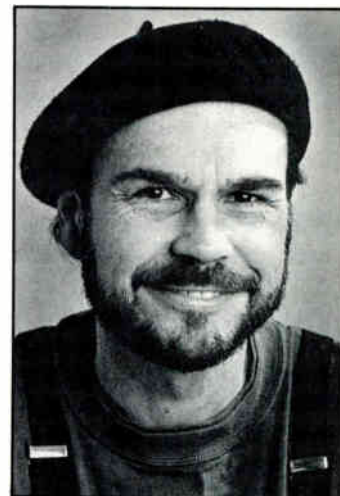
### Tannoy Speakers in San Juan Capistrano

Tannoy Sales and Marketing Director Bill Calma, and William J. Neison and Donald Grant, co-owners of db Music & Sound, have announced the installation of four Tannoy CPA 12 Contractor Series loudspeakers in San Juan Capistrano's Community Christian Church. The four speakers, powered by Rane MA-6 amplifiers, are being deployed in two clusters of two speakers each, to the left and right of the platform/pulpit. The clusters are suspended from laminated wooden beams attached to the building's ceiling/wall infrastructure.

### Computer Control in Kentucky

T.C. Electronics has announced the installation of a computer controlled audio equalizer system for the Whitney Hall of the Kentucky Center for the Arts in Louisville, Kentucky. The sound system design was by David Robb of Jaffe Acoustics, and the system equalizers and signal delay were provided by T.C. Systems East. The system consists of 14 model 1128x one-third octave equalizers, five model 1280 2-in 2-out signal delays and three model 1380 1-in, 3-out signal delays. All 22 single space T.C. Electronics products are housed in a common rack in the theater's main audio control booth and are controlled by an IBM compatible personal computer with VGA monitor. The Whitney Hall is a three-tier 2,400 seat multipurpose auditorium.

T.C. Electronic products have also been used in the Wang Center in Boston, and the Civic Arena Tuxtla Gutie Rrez in Mexico. Both were designed by Jaffe Acoustics.



Carl Malone

### CM Automation Formed

Carl Malone has formed CM Automation to manufacture and distribute high end professional audio products. The first product is the MX-816 Professional Mixing Automation System.



TAD studio monitors housed in more than 40 cubic feet of poured concrete.

### Concrete-Well Monitor for Studio

Technical Audio Devices (TAD), the division of Pioneer Electronics, has "developed a unique studio monitor that employs a non-traditional enclosure material to significantly reduce spurious resonance." More than 40 cubic feet of solid, poured concrete houses four trademarked TAD design methodologies engineered to deliver "maximum sound pressure levels with high quality near-field listenability." The custom TAD Studio Monitor system was designed and installed at Bad Animals/Seattle's Studio X, the newest studio at the six-room facility owned by Ann and Nancy Wilson of Heart, and long-time Seattle studio operator Steve Lawson. The four design methodologies used are: Opaxial, Apaxial, Afast (Acoustical-Filter Assisted Tuning) and CGR (Capacitive Gap Reduction).

### NASA Chooses Bose

NASA has chosen a specially designed Bose speaker to serve a key function in a new space shuttle communication system. Astronauts use the system to remain in touch with ground control, and with each other during spacewalk and satellite repair activities. The system combines two speakers and a microphone in a single housing. The speakers built into the unit are based on the Bose Acoustimass-5 Series II speaker system. Each spacecraft uses two speaker units, one on the flight deck, and one mid-deck. All existing NASA spacecraft are to be retrofitted with the Bose systems. And all future space shuttles will incorporate them.

### New Report Available

"Computer-Aided Classification of Sound Effects Taking into Account the Psychoacoustic Characteristics of Human Hearing" is the title of a report prepared by the staff of Head Acoustics GmbH. The report summarizes, in handbook style, calculations that may be used to "generate quantitative information about psychoacoustic parameters of sounds related to auditory sensations." The report is available from Sonic Perceptions, Inc., 28 Knight Street, Norwalk, CT 06851.

### Recording Program at Peabody Institute

Home of the only five-year degree program in recording arts and sciences in the U.S., the Peabody Institute of The Johns Hopkins University in Baltimore, MD recently took delivery of a TEF 20 acoustic analyzer for use in three of its courses. According to Alan Kefauver, the institute's director of recording arts and sciences, the DSP-powered TEF 20 has already proven to be a great teaching tool. "It's always helpful in any academic situation to be able to visually and demonstrably reinforce what you discuss in lectures," he believes. "And in an audio environment, the TEF 20 provides an excellent platform to do both."

Emphasizing a hands-on approach to learning, the three classes currently using the TEF 20 are in musical acoustics, advanced recording, and sound reinforcement. "In the musical acoustics class, the TEF 20 supplements the aural experience with a visual one," Kefauver explains.



### All Pro Sound Places First

All Pro Sound's entry in the Mini-Grand Prix of Pensacola placed first in the qualifying heat, the semi-final race and the pit crew competition. The All Pro Sound car was sponsored by Shure Brothers, Monster Cable, QSC Audio, TOA Electronics and Telex. The cars are one-third scale Indy 500 race cars. The race was held to benefit the Gulf Coast Children's Medical Foundation, the Pensacola Ronald McDonald House, and the One Day at a Time program.

All Pro Sound has plans to enter other benefit Mini-Grand Prix's in the southeast.

Chuck Walthall, head of All Pro Sound's Pro Division, and one of the drivers of the car, said, "The teams made up of auto mechanics and experienced race car drivers were saying, 'What do those audio guys know about race cars,' and here we ended up winning the pit crew competition."

"The goal of the class is to provide an overview of the dynamic acoustical forces which produce and affect music. With the TEF 20, students are able to actually look at reflective patterns, frequency response, and time response, and apply what these things mean in terms of musical fundamentals, overtones, and attack times. In simpler terms, if we're discussing how a clarinet works, the TEF 20 shows us exactly what a vibrating reed on the end of a tube does in an acoustical sense."

In Peabody's Advanced Recording 1 class, the TEF 20 is utilized during a section on architectural acoustics. The class is broken down into three groups. Then, each group is asked to make various measurements in three different halls where they also make recordings. Following TEF analysis, students report why each hall sounds like it does, and determine how different microphone placements can eliminate flutter

echoes and other acoustical problems.

Using other basic TEF 20 powers Peabody's sound reinforcement class covers topics such as loudspeaker placement, coverage patterns, and output capabilities.

Students completing the five-year program leave Peabody with a bachelor of music degree in recording arts and sciences. "Students in the program earn over 210 credits during their five years of enrollment," Kefauver adds. "Once they've completed their stay here, essentially they have gone through the same four years of education that a music major does, plus they have completed course work in electrical engineering and recording. I developed this type of educational format purposely because I felt that it was a lot easier to take an accomplished musician and teach them engineering than vice versa."

—Techron

## Videoconferencing in Big Business

Videoconferencing Systems Inc. has installed several room systems for clients including Arco, Lockheed, and NationsBank. Arco has 23 active videoconferencing sites worldwide. NationsBank upgraded eight of its existing systems during the first three months of 1992, replacing the components with VSI-manufactured equipment including audio switchers, video switchers, pan/tilt/zoom/focus and control panels.

## Music and Educational Satellite Network

AEI Music Network has signed an agreement with NHFA (National Home Furnishings Association) allowing members to contract for services on the Home Furnishings Music & Educational Network. Plans for the network include message service, in-store promotion, training sessions, and video transmission of new products from manufacturers.

## REP NEWS

### Symetrix Rep Awards

Symetrix, Inc. has named John Amstadter of JAMM Distributing its Rep of the Year. JAMM handles the Symetrix line for Illinois, Michigan, Minnesota, Kentucky, Wisconsin and Indiana.

Cambridge Marketing of Ohio was recognized by Symetrix for exceeding their sales quota. Cambridge was awarded the "Symetrix Quota Buster" award.

### Yocum Appointed

Yocum Marketing of Mesa, Arizona has been appointed to represent Frazier in Arizona, New Mexico and the west Texas panhandle area. Frazier is seeking a limited number of sound contractor/dealers in the region.

### Colosseum Names Reps

Having launched the Infinite Modular Power System, Colosseum Inc. has appointed the following representatives: Main Line Marketing for Florida; Reflex Marketing for New York, New Jersey, eastern Pennsylvania. J.W. Lehner Co. for Ohio, western Pennsylvania, and West Virginia.



## Video Display for Disney on Ice

The Disney on Ice tour has been using two large scale Electrosonic video display systems. Two Procube videowall systems, directed by Picbloc 3 video display controls and C-Through videowall software, are suspended above and to each side of the Disney on Ice set, which is positioned at one end of the performance arena. Each videowall is comprised of 16 Procube video display modules,

with each Procube having a 40-inch diagonal viewing area. The videowall assemblies are flown approximately 15 feet above the ice. A mix of live and pre-recorded images (using two laser disc players) follow and amplify the performers' numbers on the ice. The videowall's special effects are synchronized by C-Through using SMPTE time code.

## Gonsalves Replaces Tannoy

Tannoy has announced the appointment of ASC's Paul Gonsalves as Tannoy's sales representative for Ontario and Quebec. ASC (Acoustical Services of Canada) is an independent sales and marketing firm.

## Telecall Honors Reps

Telecall has honored the following reps: David H. Brothers Co, Rep of the Year; LMS Marketing, Most Inspirational Rep; J.R. Morgan, Largest Percent Increase; Kodo Associates, Best Customer Service; Pacific Marketing Group, Rookie of the Year; Charles B. Kurmuss of P.M. Desnoyers, Salesman of the Year.

## Warren Associates Appointed

IRP has appointed Warren Associates of Livermore, California its sales rep for northern California, northern Nevada, and Hawaii. IRP now has coverage in all 50 states, the four western provinces of Canada, and the Yukon. Eastern Canada including Ontario, Quebec, and the Maritimes will be serviced directly by IRP factory personnel.

## Pioneer — RGB Exhibit

Pioneer Communications of America Inc. and RGB Spectrum contributed to a joint presentation during the NAB show using RGB Spectrum's MediaWall system with a wall-sized array of Pioneer Projection Cubes. MediaWall accepts computer graphics, animation and scanned images through a direct digital connection to a Macintosh computer.



## CALENDAR

### Upcoming Events

#### JULY

**Satellite Dealers Association:** New Orleans, Louisiana. Contact: (317) 653)8262. July 8-11.

**CD-I Publishers Conference:** New York, New York. Contact: (914) 328-9157. July 22-24.

**Night Club and Bar:** New Orleans, Louisiana. Contact: (800) 247-3881. July 27-28.

#### AUGUST

**NESDA/ISCET (Nat'l Electronics Sales & Service Dealers Ass'n/Int'l Society of Certified Electronic Technicians):** Fort Worth, Texas. Contact: (817) 921-9061. August 3-9.

**Image World:** Los Angeles, California. Contact: (800) 800-KIPI. August 10-14.

**National Hardware Show:** Chicago, Illinois. Contact: (203) 964-0000. August 16- 19.

**International Security Conference (ISC) East:** New York, New York. Contact: (708) 390-2436. August 25-27.



## PEOPLE

### Pace Names Miller; American Appoints Day

#### Miller Heads Pace

Pace Systems — New Orleans has named Eric Miller to head up its contracting and sales division. Miller has been in the contracting business for more than 15 years.

His credits include The Aquarium of the Americas, The Audubon Zoo-CNG Learning Center, Cats Meow, and New Orleans City Limits.



Miller

#### Day is VP



Day

American Sound & Video Corporation has appointed Leslie Day to Vice President of Marketing and Sales. Day is managing marketing and sales activities for the corporation's production facilities in California, Georgia, New Jersey and Michigan and activities of the sales office in San Diego, California.

#### Carter at Maxon



Carter

Maxon Systems Inc. has named Jeanette Carter the company's Assistant Regional Sales Manager for the Western Territory. Carter, who joined Maxon in 1983, was previously Special Projects Manager for the company.

She is responsible for the Rocky Mountain Territory including Utah, Wyoming, Idaho, Montana, Colorado, Arizona and New Mexico.

#### Preformed Names VP



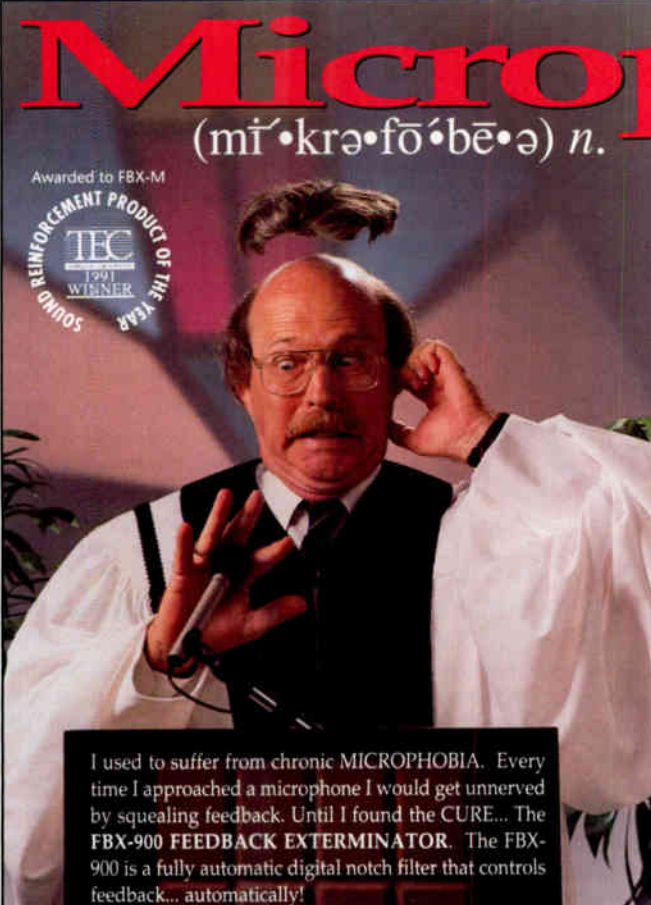
Ruhlman

Robert G. Ruhlman has been promoted to Executive Vice President of Preformed Line Products and has been elected to the company's Board of Directors.

Ruhlman is responsible for supervising the conversion to a new computer system and is chairman of the Project Review Board. He has been Vice President of Corporate Planning since 1989 and is retaining responsibility for the Corporate Planning Group while overseeing the Research and Engineering Department.


# Microphobia

(mī'krə·fō'bē·ə) n. The fear of feedback.



Awarded to FBX-M  
SOUND REINFORCEMENT PRODUCT OF THE YEAR  
TEC  
1991  
WINNER

I used to suffer from chronic MICROPHOBIA. Every time I approached a microphone I would get unnerved by squealing feedback. Until I found the CURE... The FBX-900 FEEDBACK EXTERMINATOR. The FBX-900 is a fully automatic digital notch filter that controls feedback... automatically!




## THE FBX-900 CURES FEEDBACK!

"Recently, we installed a sound system into the aerobics instruction area of a new health club facility. Normally, feedback occurs when a microphone moves in front of the speaker system, but here, we installed the FBX and it cured the feedback! Now the aerobics instructors can move freely around the entire room with their wireless."  
Dean Sims - Intelligo Inc, Winona, MN

"I have used the FBX on a number of different venues and I knew that it worked. I didn't know just how good it worked until I faced a three day conference with changing humidity, temperatures and over 50 open mics... WITH NO FEEDBACK!"  
Peter Archambault, PMA Industries, Johnson, RI

The FBX-900 Feedback Exterminator continuously monitors the sound program, detects resonating frequencies and places narrow 1/10 octave digital notch filters, automatically terminating feedback!

Call Sabine at 904/371-3829 for more information.



**Sabine**  
Musical Manufacturing Company, Inc.

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\*The names FBX-900 and FBX Feedback Exterminator are registered trademarks of Sabine Musical Mfg. Co., Inc.

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## PRODUCTS

### Speaker Introductions

By Steve Jacobs



#### Architectural Speakers

JBL Professional has introduced the Architectural Series line of loud-speaker systems. The line is designed to allow for custom design while maintaining the "convenience of off the shelf inventory."

There are 12 Non-Derivative systems that are trapezoidal with the sides tapered at 15-degree angles, and are engineered to accept one-inch or two-inch exit compression drivers coupled to one of the Flat-Front Bi-Radial horn models.

The nine standard Derivative systems are derived from existing SR and Concert Series systems. They can be ordered standard (STD) or as special (SP) models with user-desired options.

Circle 1 on Reader Response Card



#### Drive-Thru

Comcast Sound Communications has introduced the Comcast Series-1000 Drive Thru system for fast food operations, convenience stores, banks, gas stations and industrial sites.

The single-channel CDT-1000 and dual-channel CDT-1200 intercom systems include microprocessor controls, single-board construction, LSI circuitry and twin amplifiers for talk and listen functions.

Circle 2 on Reader Response Card

#### Ready to Fly

Yorkville Sound has introduced Aeroquip flying hardware options on Elite and Pulse enclosure models. Rated up 6,000 pounds each, the hardware is designated with the suffix 'F' and is implemented on Elite models MX-2000F, MX-401F and M-600F, and Pulse series models P-8WHTF/P-12WHTF.

Circle 3 on Reader Response Card



#### Manifold System

Electro-Voice has introduced the MTH-2/64, a mid-, high-frequency manifold speaker system with multiple drivers summed directly into 60-degree x 40-degree fiberglass horns in a trapezoidal enclosure.

The system reproduces mid-bass (160-1,600 Hz) with two DL10X 10-inch drivers manifolded into a square-mouth horn that is independent of the drivers. High frequencies, from 1,600- 20,000 Hz, are reproduced by two modified DH1A compression drivers that are manifolded and mounted on a modified HP64 60-degree x 40-degree constant-directivity horn.

Circle 4 on Reader Response Card

#### Speaker Systems

SoundTech Has introduced three series of speaker systems. The Universal Series consists of rectangular, all-purpose systems that feature either constant directivity horn tweeters or piezo horn tweeters. Two-way and three-way systems are available, as well five subwoofers.

The Bantam Series Trapezoids consist of eleven models constructed of marine plywood in two-way, three-way and subwoofer systems. The trapezoid enclosures are uniform in depth and width and are designed for clustering.

The Radial Trapezoid speaker systems are two-way systems with either a single 15-inch woofer or dual 15-inch woofers coupled to SoundTech's H30 radial horn and titanium compression.

Circle 5 on Reader Response Card



#### Boundary Mic

Peavey Electronics' Architectural Acoustics Division has introduced its ASM 2 microphone. The mic employs boundary effect technology to maintain phase coherency. It is designed for inconspicuous use on flat surfaces and functions as part of the sound boundary of a reflecting surface with a back electret unidirectional capsule.

Circle 6 on Reader Response Card

#### Variable Focal Length

Rainbow CCTV Lenses has introduced two variable focal length lenses. The lenses are designed for use on 1/2-inch and 1/3-inch format cameras. The focal length is 6-12 mm with an aperture of F/1.4. Each lens has manual focal length adjustment. Manual or Auto Iris is available.

Circle 7 on Reader Response Card



#### Multimedia Cart

Chief Manufacturing Inc. has introduced the Adapt-A-System LV series multimedia cart. The height-adjustable LV-401 (one tier) and LV-402 (two tier), with the roll and pitch adjustable LSS video projector shelf, is designed to accommodate video projectors in a one, two or three tier configuration. A variety of accessory shelves and post lengths are also available.

Circle 8 on Reader Response Card

#### Rigging Systems

The AMFS Series Modular Loud-speaker Rigging System from ATM is available for Community Professional Sound models NFB, RS JR, RS220, RS660 and the RS880. The system is also available for Electro-Voice models DML-1122 and DML-1152, and Martin Audio model CT2. In addition, a yoke bracket is available for the PAS model RS2.

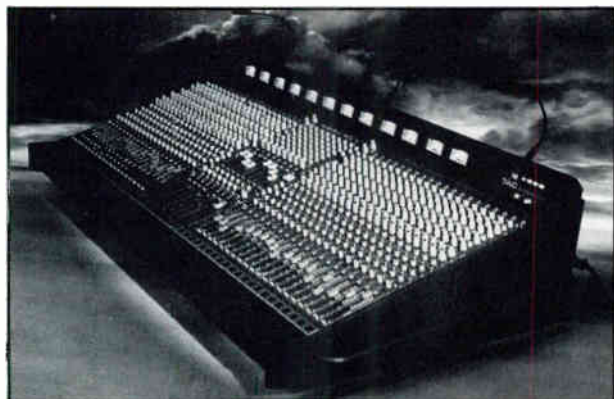
Circle 9 on Reader Response Card



### Power Distribution

ETA Lighting Systems has introduced the PD power distribution series that includes six rackmounted models designed to protect audio and electronic processing equipment from abnormalities occurring from incoming AC power as well as distributing the power from a controlled, central location.

Circle 10 on Reader Response Card



### "Mid-Priced" Console

AMEK Technology Group Plc has introduced the TAC SR6000 "mid-priced" console for sound reinforcement and live teleproduction. The console incorporates eight VCA/Mute Groups, eight audio groups, a 10x8 output matrix and an aux send system with up to 16 sends.

A 40-input chassis weighs 330 pounds and measures 66 inches in width.

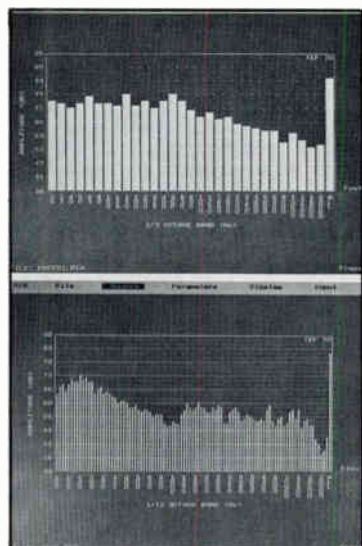
Circle 11 on Reader Response Card



### Door Answering

Clarity has introduced its Door Answer Control System that allows answering of a door from a remote location through the use of a telephone. The system interfaces with electronic key and PBX systems or a single-line telephone. The unit provides hands-free talkback from the door location and will allow the door to be unlocked when equipped with an electric strike plate.

Circle 12 on Reader Response Card



### TEF Software

Techron has announced its Sound Lab RTA software. Designed for Realtime Analysis with either the TEF 20 or TEF 20HI the software allows measurements at 1, 1/2, 1/3, 1/6 and 1/12 octave bands. Collected data can be viewed in 3, 6, or 12 dB-per-division increments. The data can be manipulated to obtain overlays, or it can be compared to a standard with the use of a difference mode.

Circle 13 on Reader Response Card



### Modular Mixing

The Interface series of modular mixing consoles has been made available by several Mark IV Audio companies. The consoles are being marketed by Mark IV companies Altec Lansing, DDA, Dynacord and Electro-Voice.

Interface consoles come in 8-, 16-, 24- and 32-channel mainframes. Various stereo master, group output and input modules are available.

Circle 14 on Reader Response Card

### Codes to Pagers

Smart Page from Trionics Corporation allows the Infinity 9610 programmable control panel to be programmed so that it can send codes directly to digital pagers. Matters requiring immediate action or general information can be transmitted to one person or an entire security or maintenance force.

Circle 15 on Reader Response Card

# Linkage.

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Circle 286 on Reader Response Card



The DOD Electronics RTA Series II RealTime Audio Analyzer.

### Rack Wear

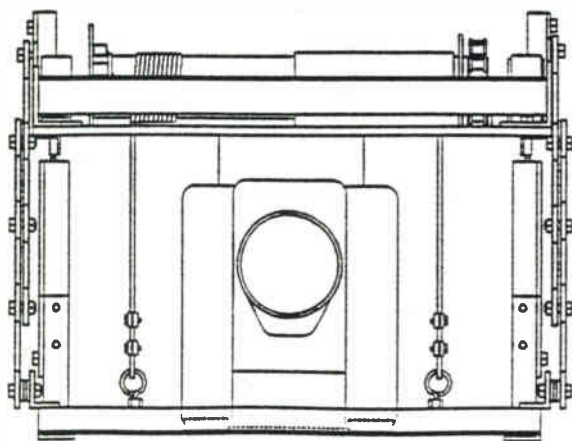
DOD Electronics has announced a line of rack products dubbed the Series II. The line consists of five equalizers, two crossovers, a quad noise gate, a stereo compressor/limiter and a realtime analyzer.

Circle 16 on Reader Response Card

### Projector Lift

SVS, Inc. has introduced its SVS-9 Projector Lift for LCD projectors and slide projectors. The recessed system provides floor-level access to ceiling-mounted projectors up to 11.5 feet and includes 5.5-foot drop distance from ceiling, one show position and a shelf for the projector.

Circle 17 on Reader Response Card



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Circle 283 on Reader Response Card



### Fiberoptic Intercom

Math Associates, Inc has announced the SecurCom FI-3000 solid state fiberoptic intercommunications system intended for use in embassies, airports, military bases, nuclear facilities, hospitals, correctional facilities and other similar environments.

The SecurCom FI-3000 series consists of various components to allow full duplex intercom systems, from two to 576 individually addressable and identifiable local stations, to be configured. Operation at local stations in hands-free while base stations may be used with push-to-talk microphones or combination microphone/headsets.

Circle 18 on Reader Response Card

### For a Limited Time...

Eventide has introduced its limited edition H3500 Dynamic Ultra-Harmonizer. Along with pitch-shifting and an added group of dynamic effects, the unit includes sampling, delays, flanges and choruses, reverbs, the Instant Phasor and sound effects.

The H3500's 18 digital processing algorithms include Mod Factory 1 and Mod Factory 2. The two algorithms are responsible for the unit's DFX dynamic effects, ranging from compression to ducked delays, beat-per-minute delay and loops, and touch-sensitive choruses and reverbs.

Circle 20 on Reader Response Card



### Configurable Delay Line

Klark-Teknik has announced the DN728, a dual input/six output user-configurable delay line. The unit is designed to synchronize sound paths in multiple signal distribution systems and multiway loudspeaker networks.

The DN728 is a one-rack unit featuring proprietary 64x oversampling converters and linear-phase DSP decimating filters, and is designed for theater and public address applications.

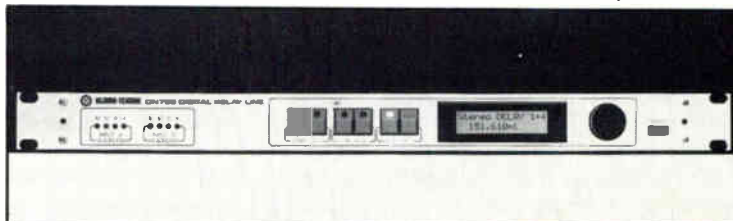
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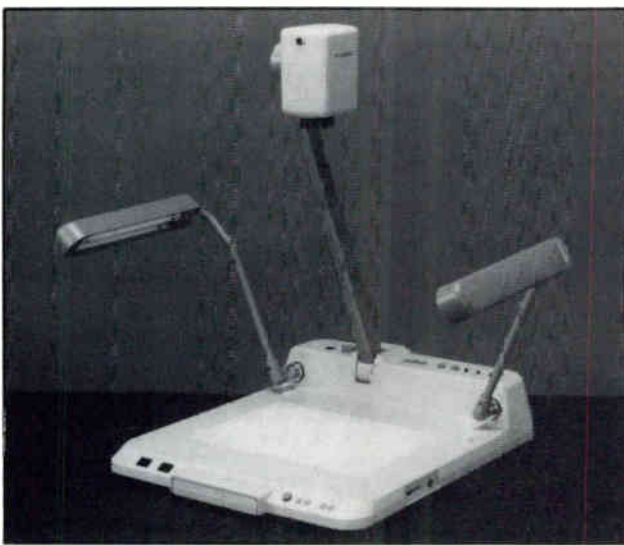
### Speaker/Amplifier System

Dynacord has introduced the P5 processor-controlled, four-way, active two-way stereo speaker/power amplifier system. The P5 is designed for long-throw capability and speech intelligibility.

The system consists of the 2215 controller amplifier, two PCS 15.3 trapezoidal mid-high frequency speaker cabinets and four PCS 18.1 subwoofers. The controller amplifier provides output power of 1800 watts

Circle 21 on Reader Response Card





### Visual Presenter

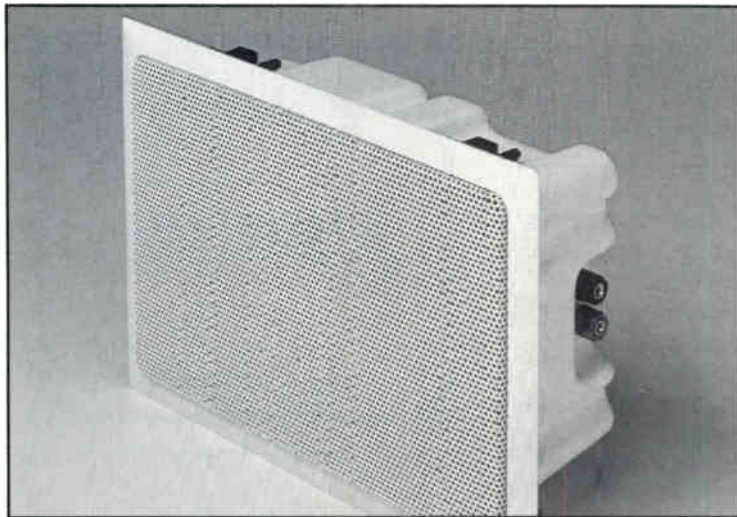
Elmo Mfg. Corp. has introduced its second generation EV-368 visual presenter. The model incorporates a high resolution 1/2-inch CCD chip which produces over 400 TV lines. The new model also features S-Video out and a number of front controls. The unit can project hard copy, 3D objects and transparencies on any video monitor.

Circle 22 on Reader Response Card

### Rack Slide Kit

The Winsted Corporation has introduced a rack slide kit to accommodate Sony's PVW-2800 and PVW-2600 Betacam VCRs. The model F8101 rack slide kit is designed to hold the VCR securely and allow for maintenance of equipment. The VCRs pull out on ball-bearing slides. Adjustable finger brackets allow rack mounting in slope or vertical racks.

Circle 24 on Reader Response Card



### In-Wall Ambiance

Cambridge SoundWorks has introduced In-Wall Ambiance. The version of the Ambiance speaker consists of the 6 1/2-inch long-throw woofer, 3/4-inch wide-dispersion dome tweeter, and crossover network of the original model in an integrated frame/enclosure that mounts into a wall.

In-Wall Ambiance's exposed front frame measures 8 1/4-inches wide by 11 3/4-inches high by 3/8-inch deep. The enclosure extends 3 3/4-inches into the wall.

Circle 23 on Reader Response Card

### Sound Level Meters

Scantek, Inc. has announced two sound level meters from Rion. The NL-14 is a Type 1 (precision with impulse) that weighs 21 ounces. The NL-04 has the same capabilities as the NL-14 except that it has Type 2 accuracy.

Features include optional, built-in and removeable octave- or octave/ third octave-filter sets, memory card and printer. The units can store up to 9000 data points, 100 spectra if either filter set is used and compute LEQ, LMAX and LN with selectable measurement times.

Circle 25 on Reader Response Card

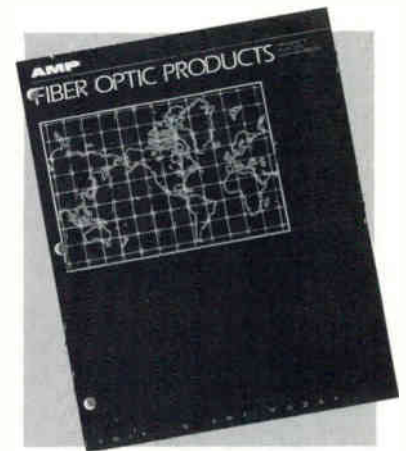
## LITERATURE

# Teleconferencing and Home Automation

### Teleconferencing 101

Acquiring the Competitive Edge in Teleconferencing has been introduced by Coherent Communications Systems Corporation. The guide is designed to answer questions about the practicality, applications and benefits of teleconferencing and is available at no cost.

Circle 26 on Reader Response Card



### Home Automation

Home Automation Laboratories has introduced its latest catalog of Home Automation products. Home automation, environmental controls, remote control, X-10 modules, computers, security systems, telephones and audio/video products are covered in the 52-page catalog.

Circle 27 on Reader Response Card

### Fiberoptic Products

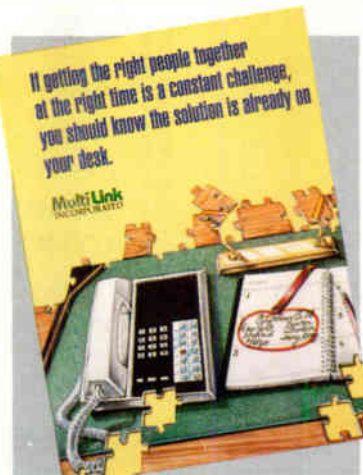
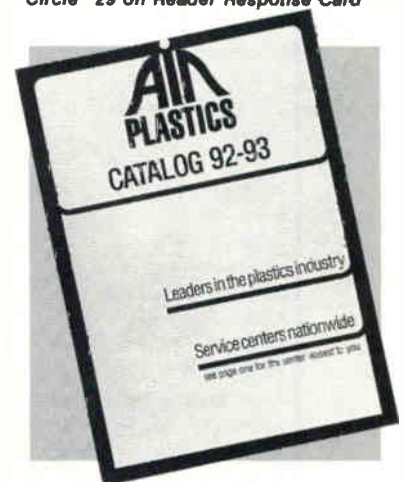
Catalog 82188 from AMP covers fiberoptic products available from AMP. Included are board-mount light-emitting diodes (LEDs) and PIN photo detectors, transmitters, receivers, transceivers, connectors, splices, cables, cable assemblies, distribution products, switches, couplers and multiplexers. The products are designed a number of applications. The catalog provides product information including product dimensions and performance characteristics.

Circle 29 on Reader Response Card

### Evaluating Teleconferencing

MultiLink, Inc. has made available a brochure to assist organizations in the evaluation of audio teleconferencing strategies. The brochure discusses audio conferencing applications and "success stories." It also outlines the different options available to organizations for implementing programs.

Circle 28 on Reader Response Card



### Plastics

Ain Plastics, Inc. has introduced the Ain Plastics 1992-1993 catalog. The 184-page format offers lines and new products.

Ain offers a number of plastics for delivery that are detailed in the catalog with available sizes, thicknesses, specifications and tolerances.

Circle 30 on Reader Response Card

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Use the Reader Service Card opposite page 30. Just circle the RS# of products that interest you. Detach, and Mail!

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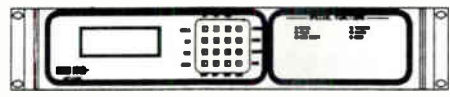
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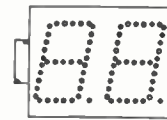
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# PRODUCT CHECK:

# THEATERS AND AUDITORIUMS

Products used most frequently in theater and auditorium installations . . .

## ... NOW IN PROGRESS

**PRODUCTS**

• Microphones  
• Signal Processors  
• Power Amplifiers  
• Speakers  
• House Mixers and Consoles  
• Monitors Mixers and Consoles  
• Speaker Rigging Equipment\*  
• Rack Equipment  
• Microphone Cable Systems (Snakes)  
• Intercom Systems

### FIRST PLACE

AUDIO-TECHNICA  
DOD ELECTRONICS  
CROWN  
JBL  
BIAMP  
YAMAHA  
SOUND MANUFACTURING  
ATLAS/SOUNDOOLIER  
PROCO  
AIPHONE

### SECOND PLACE

SHURE  
YAMAHA  
ALTEC LANSING  
ELECTRO-VOICE  
SOUNDCRAFT  
SOUNDCRAFT  
OMNIMOUNT  
LOWELL  
CONQUEST  
TELEX

### THIRD PLACE

ELECTRO-VOICE  
RANE  
TOA  
FRAZIER  
YAMAHA  
BIAMP  
FRAZIER  
JBL  
HORIZON  
DUKANE

\* Indicates tie

## ... IN LAST SIX MONTHS

**PRODUCTS**

• Microphones  
• Signal Processors  
• Power Amplifiers  
• Speakers  
• House Mixers and Consoles  
• Monitors Mixers and Consoles  
• Speaker Rigging Equipment\*  
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TELEX

### SECOND PLACE

AUDIO-TECHNICA  
JBL  
ALTEC LANSING  
TOA  
BIAMP  
SOUNDCRAFT  
OMNIMOUNT  
LOWELL  
CONQUEST  
AIPHONE

### THIRD PLACE

ELECTRO-VOICE  
DUKANE  
JBL  
ELECTRO-VOICE  
ELECTRO-VOICE  
BIAMP  
FRAZIER  
DUKANE  
HORIZON  
BOGEN

\* Indicates tie

## SURVEY METHODOLOGY

1. The sampling pool for the survey consists of sound and communications contractors from Sound & Communications' subscription list. Only contractors within the United States and Canada are called.
2. In a telephone survey, contractors/installers selected at random are asked to identify what brand they used for various products in installations completed in the past six months and those in progress. A different type of installation is highlighted each month.
3. On completion of the survey, results are tabulated and the product brands are ranked on a scale from one to three, with number one having the most votes. Separate rankings are made for installations occurring in the past six months and for those in progress.
4. An asterisk (\*) denotes a tie for that ranking.

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# BACKED BY POPULAR DEMAND.

After more than twenty years, UREI Compressor/Limiters remain the choice of audio professionals, having earned a reputation for excellence as hard working tools of the trade. It is difficult to find a recording or broadcast studio that does not own at least one UREI Compressor/Limiter. And engineers in the Sound Reinforcement and Installed Sound industries have long considered our products as vital links of any high quality audio equipment chain. With experience as our teacher, and modern technology as our guide, we are proud to offer three LA Series Compressor/Limiters, beginning with the LA-22.



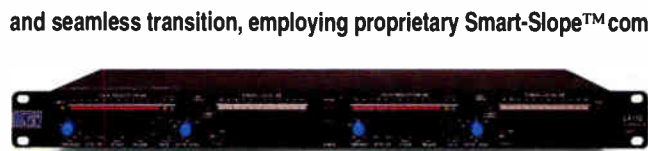
The LA-22, a dual channel unit, contains three Gain Reduction circuits, can be used as a Dynamic Expander, and is equipped with a Full Parametric Filter on each channel. Its unmatched versatility sets it apart as a truly unique multi-function tool. Designed with innovative "spectral agility," the user has the option to reduce or expand gain across the total audio bandwidth or at a chosen center frequency with variable "Q" of 1/6 octave to 2-1/2 octaves. With proper settings in the expansion mode, you can use the LA-22 to "lift" vocals in a live or studio mix or increase intelligibility in paging systems or radio broadcasts. Conversely, in the gain reduction mode, the compression can be frequency focused to control levels to prevent feedback, for De-essing, De-popping or to creatively "fatten" the sonic character of particular instruments and vocals. The parametric filter circuit, completely accessible via the rear panel barrier strip, can be accessed and routed to the Side Chain, thus making the LA-22 a frequency dependent gain reduction or expander system.



Full Parametric EQ Section.



As a pure Compressor/Limiter, the LA-22, along with the LA-10 single channel and LA-12 dual channel models, offers unparalleled performance



and seamless transition, employing proprietary Smart-Slope™ compression ratios. All three models feature transformer isolated output stages, optimized by a patented active circuit to assure the elimination of distortion and saturation frequently associated with transformers. Active Balanced Bridging

Inputs easily handle amplitudes in excess of +24 dB and both input and output connections can be achieved by your choice of XLR-type, 1/4 inch phone or Barrier Strip connectors. Exceptional signal integrity, low distortion and superb dynamic range is common to all models.

All three LA Series models are housed in a compact 1U rack space and are designed to deliver years of reliable service, in the studio or on the road. Whether your application is sound reinforcement, recording, broadcast or for permanent install, you'll find LA Series to be a trustworthy and hardworking addition to any system. From the people who set the standard, UREI.

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