

# SOUND COMMUNICATIONS

Volume 36 Number 10

October 17, 1990



## Multi-Room Residential Systems

The competition is on as custom home installations gets more multi-room manufactured product using different techniques. Contractors need to be aware of the many opportunities available to them in an area that they have yet to make major inroads. A primer on the various options available. What's available? How does it work? What can it do? **26**

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- **Preview of EASE**

Don Davis previews EASE, the newly available program by Dr. Wolfgang Ahnert, and talks of the man himself. **68**

- **Theory & Applications**

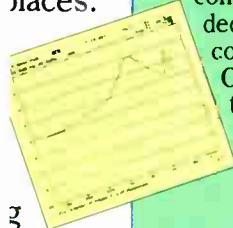
What is the minimum cost and component makeup of a dedicated portable recording system? Steve Orfield tests the system and expands on promise for the future. **18**

- **Test CDs**

The compact disc can act as the signal generator for testing and measurement, cutting the umbilical cord and effecting accuracy. What test discs are on the market and how useful are they. **59**

## RT

are in places.



designs of more — and more flexible. **47**

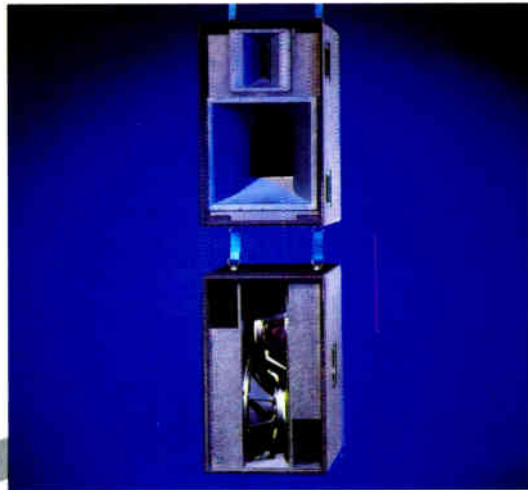
## Rosen Residential

Leona Helmsley's quarter million dollar residential installation is only part of the business of Audio Sound Productions. Mixing residential and commercial work, the company is currently installing the systems for the Barney's chain of upscale stores. **36**



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# MT-2



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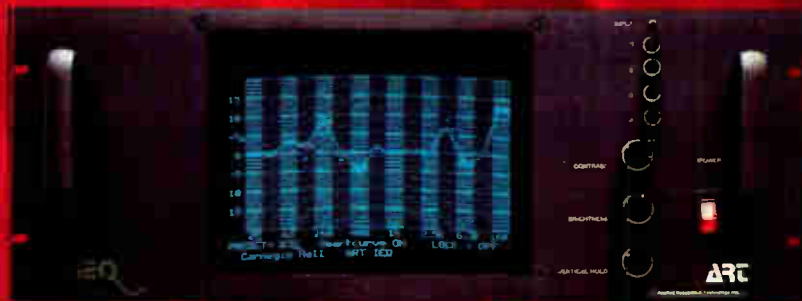
The MTH-2/94 features two DL10X cone drivers manifolded into a 90° × 40° fiberglass horn for mids and two modified DH1A drivers for highs, also manifolded into a 90° × 40° horn. Both horns may be rotated to accommodate vertical or horizontal box orientation. The low-frequency box, the MTL-2, is a manifolded design with two DL18mt drivers.

The systems may be flown with Aeroquip L-track flying hardware or stacked in a conventional manner. Don't be misled by its compact size: no other competitive system can deliver more muscle per pound than the MT-2.

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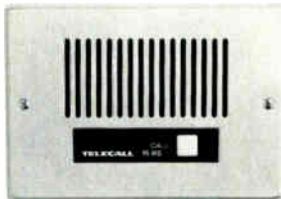
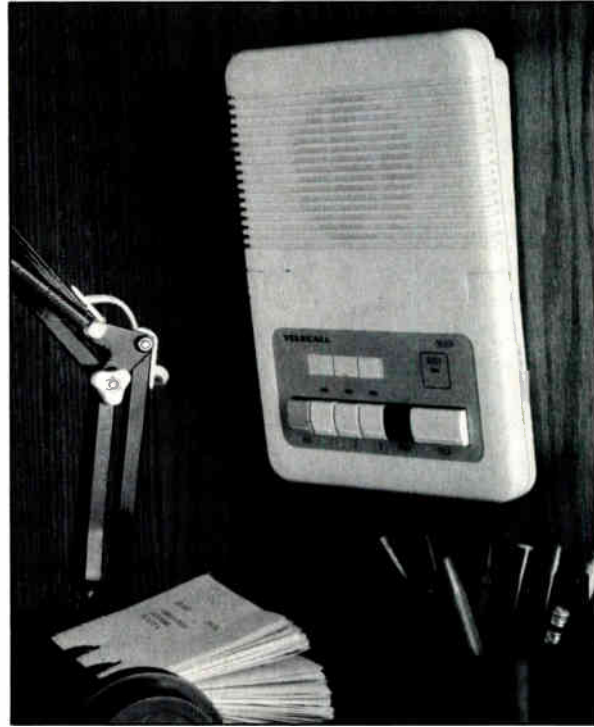
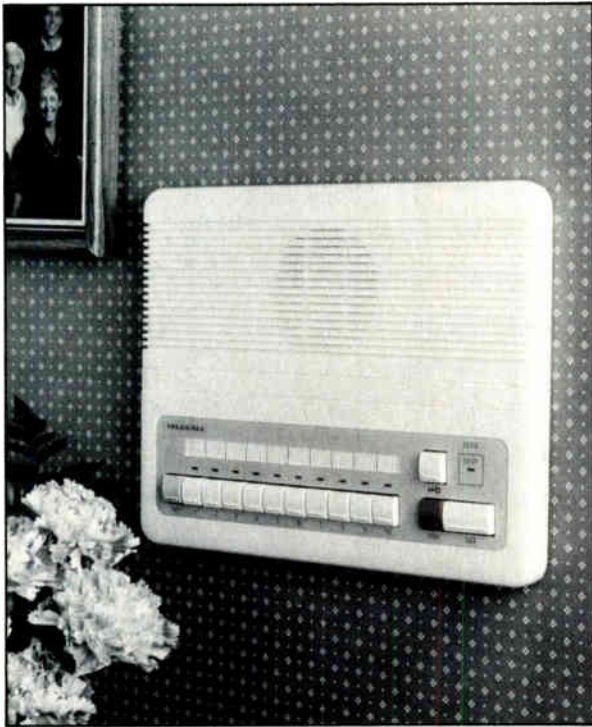
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## LETTERS

### Measurements, Wire and 70V

**Our July issue elicited a hefty response to Alex Rosner's guest editorial condemning esoteric cable. Most of the callers and writers agreed with Alex.**

—Editor

#### NOT FEW, TWO!

I appreciate Sound & Communication's recent positive review of the MLSSA Acoustical Measurement System. While Mike Klasco generally did a good job covering the product, the article does contain some minor errors of fact.

Part 2 implies that there are few available MLSSA compatible portable computers. In fact, there are two such portables both made by Toshiba. The Toshiba T3200sx is a 386sx machine with 40 MB hard disk and monochrome VGA graphics. Available from discount computer outlets for around \$4,000, it has the required full-length expansion slot and socket for a 387sx math coprocessor. Another alternative is the Toshiba T5200. This portable is a full 386 machine but is somewhat more costly than the T3200SX. Both of these portables have been tested running MLSSA and are both recommended by DRA Laboratories for portable measurements using MLSSA.

The other error relates to the use of the MLSSA demo disk. The demo disk is intended for demonstration purposes only and will not load data files other than those included on the demo disk. What the article (part 3) should have stated is that the standard MLSSA software is not copy protected and can therefore be installed on more than one computer. Using a portable computer containing both the MLSSA board and software, for instance, the user can perform field measurements to be analyzed later on a more powerful desktop machine with a full color VGA display running the MLSSA software but without the board installed.

**Doug Rife**  
President  
DRA Laboratories  
Sterling, VA

#### DEBUNKED DELUSIONS

Huzzahs and kudos to Alex Rosner for his Guest Column, "Distortion in Wire — The Emperor's New Clothes," in the July 1990 issue. It is wonderful to see the call for a logical examination of the validity of the claims made by the marketers of the fancy audio cables without resorting to the theories of propagation of electromagnetic waves, because I have certainly tried the latter with certain audio enthusiasts with only limited success.

I agree totally with Alex that, we who are representatives of this industry, must make every effort to debunk delusions and marketing hype, otherwise, the eventual loss of credibility will adversely affect us all.

**Robert Lin**  
President  
Comco Systems, Inc.  
Brooklyn, NY

#### NEWER-BETTER-CHEAPER?

I really enjoyed the Guest Column in your July issue. Mr. Rosner makes the point that representatives from manufacturing companies work very hard convincing buyers that their products are newer-better-cheaper. That's the way the game is played. A prime example of Mr. Rosner's point is in another part of the July issue. In "Amp Trends, Part 2," a manufacturer's representative talks about direct-coupled 70V power amplifiers and how they completely eliminate the need for output transformers.

Direct-coupled 70V power amplifiers are not new or "unique." America's largest amusement park has been using a modular direct-coupled 70V amplifier system for ten years. Altec Lansing has offered direct-coupled 70V power amps since 1976 and offers four direct-coupled 70V power amplifiers today:

• The 2280A Incremental Power System is a ground referenced or ground lifted direct-coupled 70V power amplifier. Eight 78W, 70V amps, that can be paralleled, in a four rack space package.

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# What sound does a loudspeaker make when it's on backorder?



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But you may hear loud noise from customers  
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At Quam, we don't like backorders any more than you do... in fact, we won't tolerate them! To give you total protection from backorders, we keep 60,000 speakers in stock at the factory, so we can always ship, within 24 hours of your order, any standard item, including line matching transformers and ceiling grills or speaker/transformer/baffle assemblies. So when you deal with Quam, your work schedule won't be delayed because the

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- The 2200A Incremental Power System is eight 75W amps in a four rack space package. It can be configured as four 150W, two 300W, or one 600W true balanced direct-coupled 70V power amplifier.

- The 2204A four channel power amp can be configured as two 150W or one 300W true balanced direct-coupled 70V power amplifier.

- The 9444A Anniversary Series amp when bridged becomes a 600W true balanced direct-coupled 70V power amplifier.

'Amp Trends, Part 2'' quotes just one individual and clearly he is coming from a newer-better-cheaper marketing position. How can "...users get better signal and lower distortion without transformers..."

when the direct-coupled 70V power amplifier must drive a step-down line transformer before it can drive a loudspeaker? 70V output transformers are not;

- mostly "autoformers."
- "holdovers from tube amps."
- poor performers.

Critics will often claim unacceptable THD, frequency response, phase response, or insertion loss with transformers. Tests prove quite the contrary: good 70V transformers (like the 15,000 series from Altec) will convert your standard power amplifier to a 70V amp and offer < 0.1 percent worst case THD (@50Hz), better frequency response than almost any loudspeaker that will be connected to them (35 Hz to 15 kHz  $\pm$ 1 dB, < 15

degrees of phase shift at 15 kHz, and < 0.5 dB insertion loss (that's 25W from a 300W amp). Most 70V packaged distribution power amplifiers (Altec, Dukane, Rauland, TOA, etc.) will have an output transformer built into the chassis. These transformers are commercial grade and generally offer frequency response from 50 Hz to 15 kHz, about 1 dB of insertion loss, and < 1 percent THD. So what's left to complain about? Does a transformer offer true isolation between the amplifier and the load? Yes!

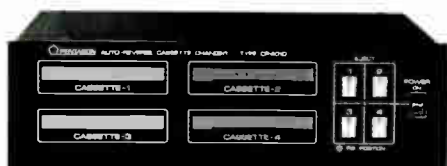
The signal introduced on the primary winding is reproduced on the secondary winding without sharing "common." This is the definition of output isolation and one of the main advantages over a direct-coupled 70V power amplifier. Most direct-coupled 70V power amplifiers fall into one of three categories: true balanced, ground referenced, or pseudo balanced (ground lifted). The true balanced 70V power amp has both legs "hot." If either leg accidentally contacts ground, the amplifier output is driving into a short, protection circuits kick in, the output will drop 6 dB, and complete failure is entirely possible. The ground referenced 70V amp and the ground lifted amp are susceptible to grounding problems. All three types can benefit from the isolation output transformer and many sound system designers will insist on them.

Should output transformers always be used? Not necessarily. Many times a direct-coupled 70V power amp will suffice. However, when ground problems are anticipated, when the loudspeaker lines were not installed by your company, when the loudspeaker lines are very long, when they are vulnerable to tampering, when the sound system is in a high RF environment, or if the system absolutely cannot go down, seriously consider using a quality output transformer for true isolation.

Gary R. Jones  
 Technical Services Manager  
 Altec Lansing Corporation  
 Oklahoma City, OK

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- DIN and RCA line out connectors
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- Switchable 110/220 VAC, 50/60 Hz power supply
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### ADDITIONAL SPECIFICATIONS:

- Head Configuration Four track in line head
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- Line Output 500 mill volt
- Signal to Noise Ratio Better than 45db
- Wow & Flutter Less than 0.02% WRMS
- Front Panel Power ON/OFF switch
- Back Panel Lighted cassette eject buttons
- Color Line voltage select switch
- Power Consumption Auto Gain level control
- Speed Regulation Black cabinet with black front panel with white silk screen lettering, including Pentagon logo
- Accessories 28.8 VA



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# SOME BREAKTHROUGHS ARE MORE OBVIOUS THAN OTHERS.



Super TD. At the risk of sounding immodest, we think many professional VHF systems will look like this in the years to come.

Of course, others will be quick to pick up on Super TD's optional Active FM antennas that do increase effective transmission range by 25%.

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Super TD's solid hand-held transmitter features a vast selection of popular mic elements. The sleek TX-3 Eurodesign belt pack also sets new performance standards.

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World Radio History

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# NEWSLETTER

## **HARD DISK AND DAT**

Otari has introduced the DDR-10 digital recorder and editor based on the Digidesign Sound Designer software. Otari has also entered the DAT ranks, with a model that incorporates time code. The Otari R-DAT is planned for summer of '91 release. The price is targeted at less than \$6,000.

## **CO-MARKETING AGREEMENT**

Kaba R&D and Studer Editech have announced a co-marketing agreement whereby Kaba will sell the Dyaxis 2 + 2 digital editing system as a four-track tapeless master unit with the Kaba four-track realtime cassette duplicating system.

## **ADAPTIVE DIGITAL FILTERING**

Cambridge Signal Technologies has introduced an "Acoustic Environment Correction product" incorporating an adaptive digital filtering technique. The AES 1000 is designed to resolve the problem of frequency response errors introduced by room reflections. According to the company the adaptive digital filter concept originated in the early '80s at Teledyne-Acoustic Research.

## **SIEMENS BUYS AMS**

Siemens Austria and AMS Industries have announced the terms of a recommended cash offer for AMS by Siemens. AMS is engaged in the design, manufacture and sale of professional sound processing systems based on digital electronic techniques. Leslie Stevens, chairman of AMS, said, "Joining the Siemens Group will bring benefits of synergy to both parties." Siemens is also the parent company of Neve.

## **AUDIO PRECISION PORTABLE**

Audio Precision has introduced the first product in a new line. The Portable One is a portable test set housed in a "ruggedized" enclosure.

## **NEW TAPE**

The 3M Company has introduced an analog audio mastering tape that records at operating level plus-nine, according to the company, with signal to noise ratio of 79.5.

## **CLIFF ELECTRONICS IN U.S.**

Cliff Electronic Components Ltd. of London has announced the availability of their audio product line in the United States through their newly established north American sales office in Houston. The North American operation offers a line of jack sockets, connectors, cabinet hardware and other audio products. Robert Tupper has been named president of Cliff Electronics overseeing North American Operations.

## **TEKTONE JOINS NEMA**

TekTone Sound & Signal Manufacturing has been accepted as a member of The National Electrical Manufacturer Association. TekTone participates as a member in the Hospital Communications Group under the auspices of the Signaling, Protection and Communications Section.

## **AUDIOVISUAL BUYS AVC DIVISION**

Audiovisual, Inc. has purchased Video Midwest/AVC Systems, a division of Minneapolis based Vaughn Communications Group. Audiovisual, Inc. is a communications equipment dealer with offices in Omaha, Des Moines and Bismarck. The newly acquired division is expected to continue to operate under the current name until the move to a new facility is completed. Vaughn Communications continues ownership of its remaining divisions in the communications industry.

# Designed For Today, Tomorrow And Yesterday.

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WV-BL200 Shown  
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**W**hether you're upgrading a security system or starting one from scratch, there's one line of CCD Cameras designed to meet all your needs today, tomorrow and yesterday. The WV-BL200 and

WV-CL300 Series CCD Cameras from Panasonic®

Because the Panasonic WV-BL200 and WV-CL300 Series CCD Cameras represent a technological breakthrough that can amount to big savings for you. While delivering high performance and maximum versatility.

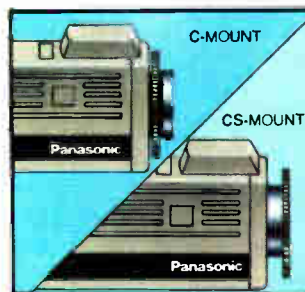
Take their optical versatility for example. With eleven high-quality, low cost CS-mount lenses, you can select just the right one for your specific application. From wide angle to super-wide to telephoto. From manual to ALC (Automatic Light Compensation).

The WV-BL200 and WV-CL300 Series CCD Cameras also feature a new lens mount configuration that accepts both C-mount lenses and our line of CS-mount lenses. Including DC and video controlled ALC lenses. So you can use both the lenses you may already own or our CS-mount lenses.

But that's not all that makes these cameras special. They tolerate extreme temperature variances (+144°F to -22°F) virtually

eliminating the need for costly cooling and heating systems (WV-BL200 Series). All with the exceptional performance of 1/2 inch CCD chips.

The WV-BL200 and WV-CL300 Series CCD Cameras. They'll perform for you today. Grow with you tomorrow. And allow you to utilize equipment you purchased yesterday. And they're only from Panasonic.



Find out more about Panasonic's CCD Cameras. For more information and your local dealer, call your nearest regional office.  
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Southeast: (404) 717-6835, Southwest:  
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**Panasonic**  
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# HOW TO MAKE HEADLINES PROMOTING YOUR BUSINESS

By David Lander

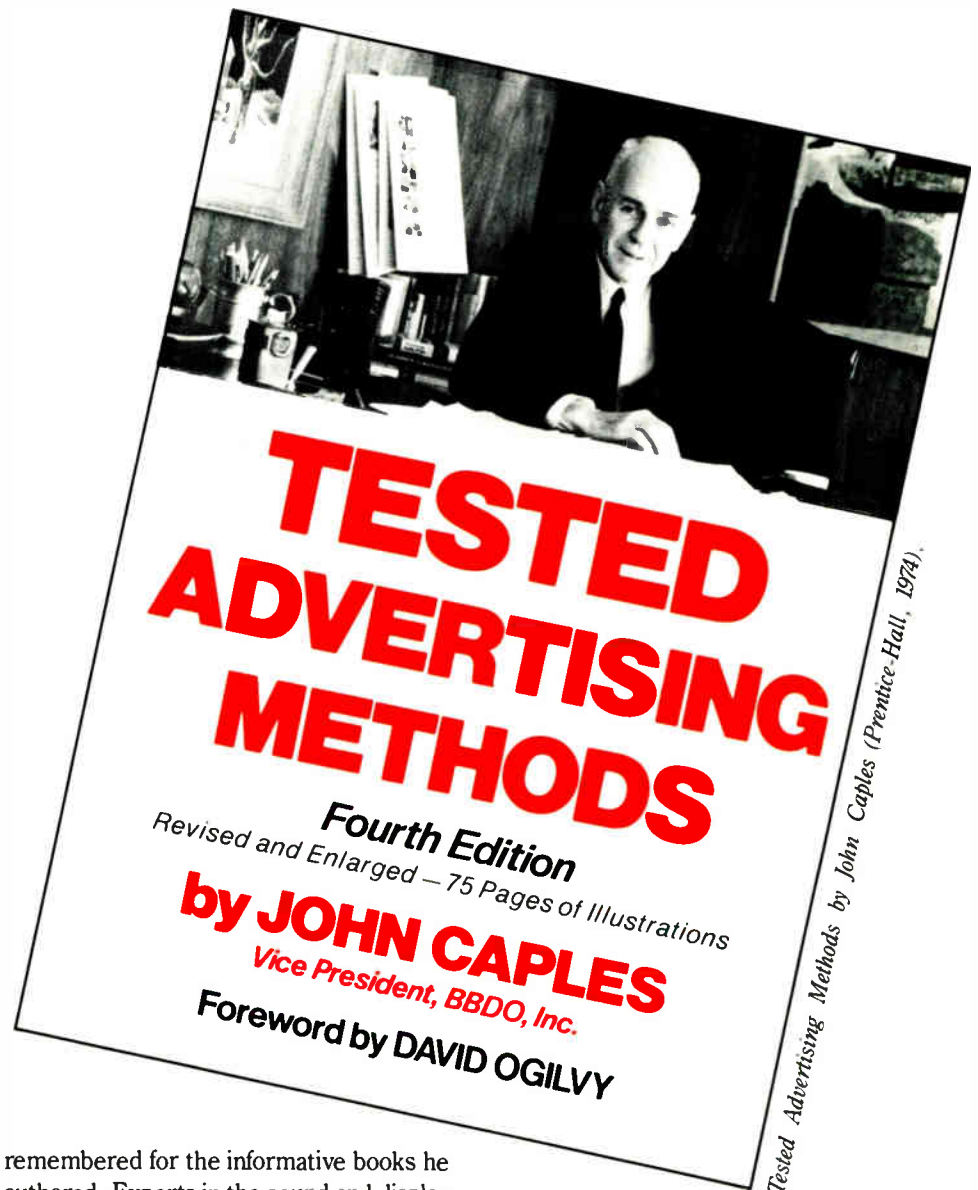
**Manufacturers do it, retailers do it; these days even such normally staid professionals as lawyers are doing it. In today's business climate, promotion is more important than ever for businessmen.**

Like other purveyors of goods and services, sound and communications specialists ought to be promoting their businesses on a week-to-week, month-to-month basis. And no matter what format they choose to employ — a glossy brochure, fliers, letters or even telemarketing — they should be aware of the importance of headlines.

No one understands the role of headlines better than direct mail copywriters. Shrewd mail order pros test their offers by running parallel ads using the same copy but different banner lines. Since an ad with a good headline will substantially outpull one that leads off with a weak promise, veterans of this particular advertising segment tend to know just what works and what doesn't.

The dean of mail order copywriters, John Caples, died just a few months ago at age 90. In terms of exposure, Caples was to his art what Frank Sinatra is to the popular song. Virtually everyone over a certain age is familiar with his work. Take, for example, the ad that Caples penned for a correspondence course in piano playing way back in the 1920s. It began with the headline, "They laughed when I sat down at the piano," and it ran for decades.

A longtime executive with the major ad agency, BBD & O, Caples will also be



remembered for the informative books he authored. Experts in the sound and display industry who write their own copy, as well as those charged with guiding outside writers and judging their submissions, are sure to benefit from his knowledge and common sense. No one will find the books difficult since John Caples focused on the very fundamentals of copywriting.

Every ad starts with a headline, of course. As Caples pointed out in a book called "How to Make Your Advertising Make Money," so do related promotional formats. "All messages have headlines," the veteran copywriter commented. "In radio, it's the first few words. In a letter,

it's the first paragraph. Even a telephone call has a headline."

"A headline is the label on the package, the sign on the door, the frosting on the cake," Caples advised. "It is the deciding factor regarding whether the reader will open the package or enter the door or eat the cake."

"If you have a good headline, you have a good ad," he emphasized. "If you have a poor headline, you are licked before you start. Your copy will not be read."

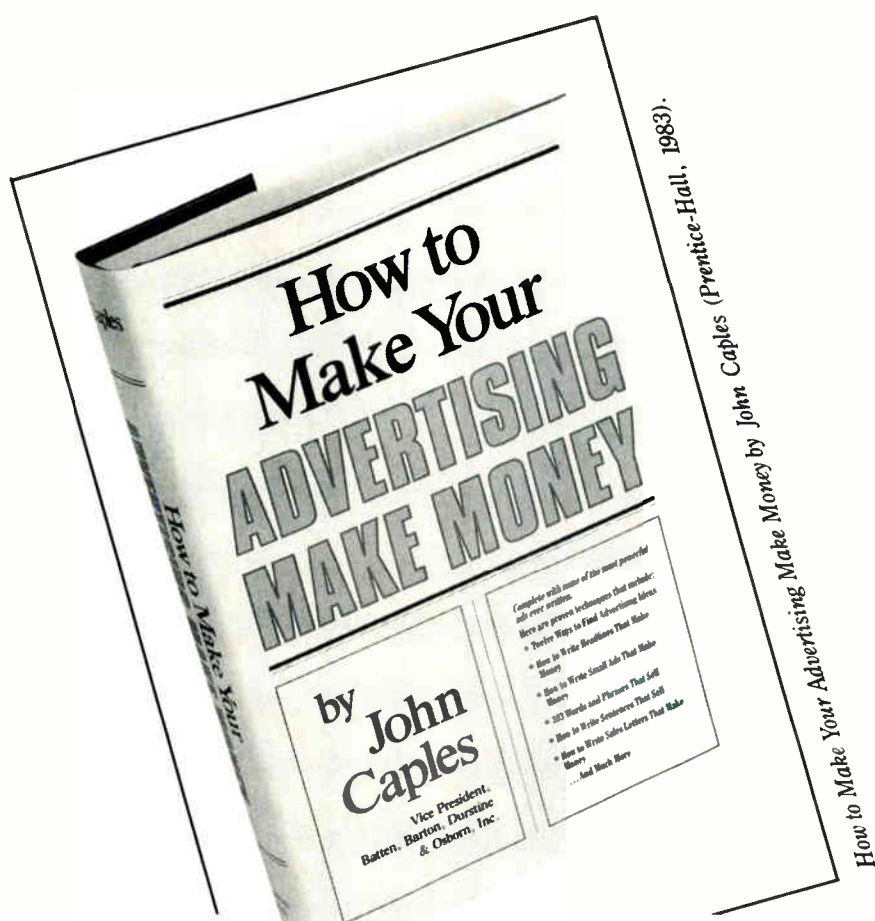
At its most basic, a headline is nothing more than a promise, an offer to potential customers. The more concise and compelling the offer, the better. In the above-mentioned book, in a chapter entitled "How to Write Headlines That Make Money" (more about "How to" offers later), Caples recalled walking by a bank window and seeing a poster with the headline, "Be \$2,278 Richer."

## A HEADLINE IS NOTHING MORE THAN A PROMISE, AN OFFER TO POTENTIAL CUSTOMERS.

"The copy told how a \$10,000 deposit would produce \$2,278 in interest in a short time," he wrote. "How much more effective this headline is than the familiar repetition of interest figures that banks have been featuring for years. These three words instantly dramatize the reward you get for saving."

In the same chapter, Caples presented a quiz that can prove extremely useful for those who write copy or guide and judge others who do it for them. Exhibiting 20 pairs of headlines that were followed by similar copy when run in print media, Caples challenged his readers to pick the headline in each pair that pulled best.

Here is one of those 20 pairs: "Announcing an important revision of the Bible" vs. "Most important Bible news in 340 years." These promises headed up mail order advertisements offering the Revised Standard Version of the Bible. One sold 71 percent more Bibles than the other.



The second headline is the successful one. The achievement it proclaims sounds more important than the revision announced by the other, according to Caples, who noted that the offer "carries conviction and implies news of great consequence." Part of the reason for this is the use of a very specific time period, 340 years. Good writers employ specifics — sharply-etched words and images — rather than working in terms that are less concrete and more difficult to see or feel.

Sound contractors can easily borrow from this impressive headline in letters or fliers that offer new products by leading off with an equivalent message. *Here's the most important innovation in sound reinforcement in two decades, for example. Or: This is the biggest news in industrial security since the invention of the lock and key.*

Ads and letters, brochures and fliers, phone calls, even in-person sales calls, consist primarily of words. In a fascinating study of the language of headlines, Caples once underlined every important word in a published list of 100 headlines that had actually run and had proven persuasive ("the," "this," "these," "an" and other such words were omitted). The four substantial words that recurred most frequently were "you," "your," "how" and "new."

"Every copywriter should remember the value of hammering away at you, you, you, both in headlines and in copy," Caples

counseled. Though times change, he further stated, people do not; human nature will insure that they continue to respond to words like "new."

Headlines that begin with the word "how" or the phrase "how to" are perennially effective, Caples was quick to add. In fact, the advertising great began 10 of the 17 chapter headings in "How To Write Headlines That Make Money" along with the book's title and its preface — with "How" or "How to."

"People want to know how to solve problems, how to get ahead . . . how to win friends and how to end money worries," John Caples explained. In promoting their businesses, sound and communications specialists would do well to keep in mind that customers ranging from security-conscious businessmen to music-loving homeowners can help achieve these very goals by finding just the right firm to specify and install their equipment. ■

### BOOKS BY JOHN CAPLES

**Making Ads Pay** (1957), a Dover paperback.  
**Tested Advertising Methods** (4th edition, 1974), available from Prentice-Hall in hardbound or paper.

**How To Make Your Advertising Make Money** (1983), also from Prentice-Hall in hardbound or paperback editions.

**Advertising Ideas: A Practical Guide To Methods That Make Advertisements Work** (1986). In hardbound from Garland.

# TESTING AND MEASUREMENT

## A MEASUREMENT IS WORTH A THOUSAND WORDS

By Don & Carolyn Davis

**We were recently asked to assist in evaluating a sound system in difficulty at a new high school auditorium.**

We were told upon arrival at the auditorium that the stage was suffering from a severe echo in the house. We were also told that some participants were made "nauseous" by the blurred reflections. When questioned, the users said that it seemed to come from the curved upper rear wall above the balcony. When asked if stage monitors helped mask the reflections, they said yes, but the staff members that had complained had not used monitors. Listening to the hall from the talker's location on the stage seemed to confirm what had been said.

At this point we brought in a TEF 12 analyzer from the car and measurements were made. The output of the TEF 12 was fed to a microphone input on the stage via a Shure A15LA which takes 600Ω unbalanced at line level to 150Ω balanced at mic level. The measuring microphone (a GenRad 1/2-inch electret) was placed at the talker's position near the front of the stage area.

The loudspeaker array was just above the test microphone and sound from it arrived first 21.8 feet from the reference point, 0, quickly followed by a floor reflection, 32.4 feet. (Figure 1 shows the ETC that resulted.)

Out in the center of the ETC was the mass of early room reflections that were too high in level and too late in time, 138.6-feet to 180-feet. Use of a 100 foot tape measure revealed the balcony face and the lower rear wall under the balcony. (Remember, these distances are double distances: from the loudspeaker to the

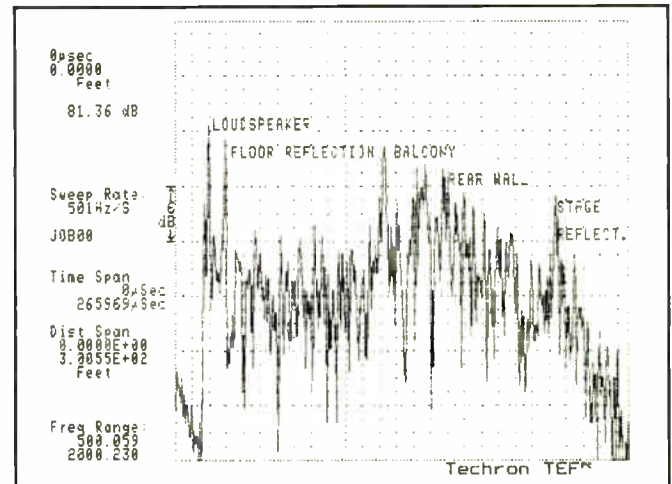


Figure 1: View of the problem as seen on an energy time curve (etc.) Horizontal scale 0 to 266 msec.

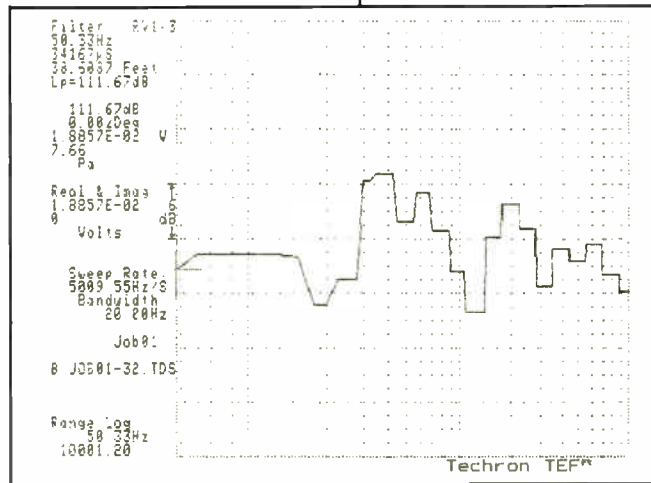


Figure 2: One-third-octave view of response. This correlates best with listener perception.

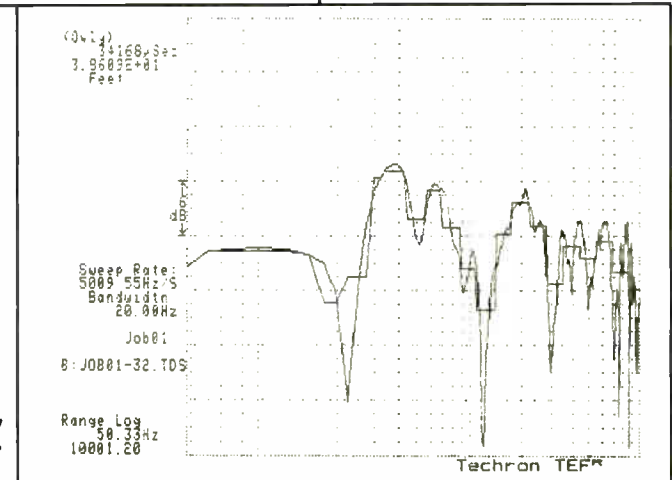


Figure 3: One-third-octave display overlaid with a measurement made with a 70 Hz CBF.

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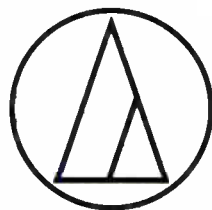
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surface and then, via reflection, back to the measuring microphone.) The 253.1-foot reflection was determined to be the loudspeaker to rear wall to rear wall of the stage area to the measuring microphone. Drawing the curtains completely eliminated this echo.

## PARTICIPANTS WERE MADE "NAUSEOUS" BY BLURRED REFLECTIONS.

Careful listening with cupped ears to speech revealed that it was indeed the lower rear wall. As the listeners raised their heads, the sound would then jump directionally from the rear wall to the array overhead. Sonex was used to block, one by one, every reflection to the microphone, confirming in each case where the reflection was from. We often say that Sonex and our ears are our most valuable measuring tool, and they are, but in this case the reflections were so complex that it wasn't until we saw the measurement that we were able to use our ears to localize the problem.

Witnesses were impressed with the precision of measurement and the ability to confirm the data through simple physical test.

### A SOUND SYSTEM PROBLEM

Since the sound contractor was at hand and about to equalize the system, I asked them if they'd like a frequency response of the system. They agreed (Figures 2 through 5 show what was present.) They had planned to "lift" the dips in the response with a boost filter, but the linear frequency scale response showed that the cause was a comb filter which is not equalizable. They were in need of synchronization with microsecond signal delay, not equalization.

It is important to note that this job had an excellent acoustical consultant and a first rate sound contractor. The architect had fought both of them into these problems.

How many of your jobs could I walk in on and find similar compromises? ■

Figure 4: Logarithmic scale view of the 70 Hz resolution measurement.

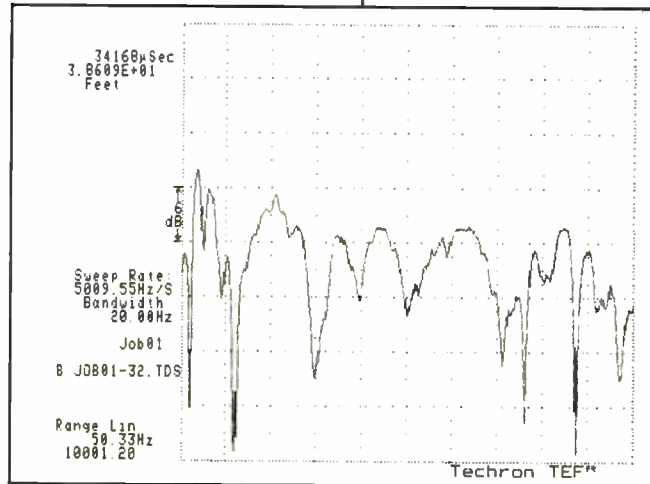
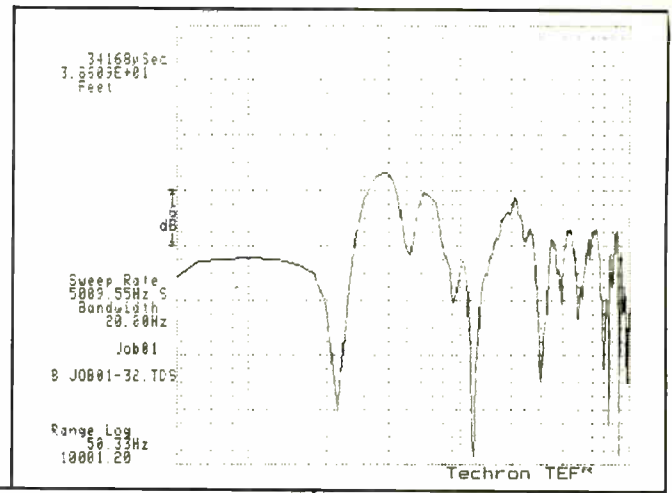
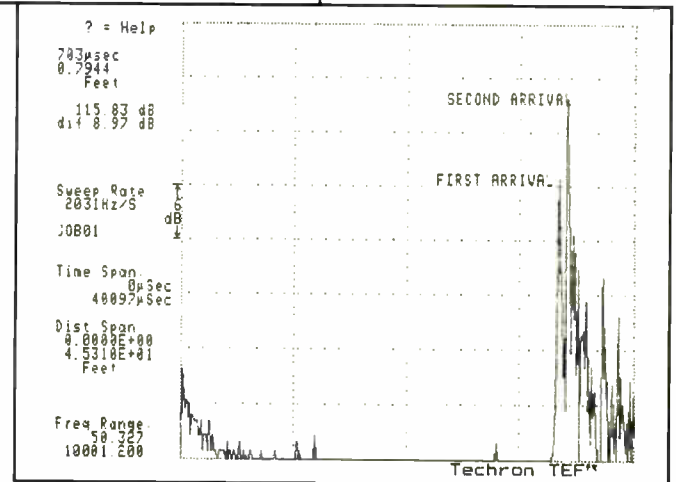


Figure 5: The identical measurement on a linear rather than a logarithmic frequency scale revealing that the dips and peaks are indeed due to missynchronization, and therefore, not equalizable.

Figure 6: The present missynchronization between units on one side of array. It is 703 microseconds or 0.7944 feet or 9.5 inches.



### ETC DISTANCES

Description	Distance	Label on ETC
From array to test mic.	21.8'	Loudspeaker
From array to floor to test mic.	32.4'	Floor Reflection
From array to balcony front to test mic.	138.6'	Balcony Reflection
From array to rear wall to test mic.	180.6'	Rear Wall Reflection
Balcony front to rear wall returns referenced to balcony arrival.	42'	
From array to rear wall to rear of stage to test mic.	253.1'	Stage Reflection



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# BINAURAL AUDIO PART TWO: INITIAL SYSTEM DEVELOPMENT

By Steven J. Orfield

**As was noted last month, there are many approaches to binaural recording, and some relatively inexpensive techniques, such as use of ear-mounted microphones and “binaural” mic systems without a torso.**

This study was intended to consider the “high end” of the market for professional recording and to determine the minimum cost and component makeup of a dedicated portable system. For this reason, Orfield Associates approached a number of high end manufacturers to sponsor this study, and these were Bruel and Kjaer, TEAC and Yamaha. Our principal goal was to assemble a true binaural system in a budget range of \$35,000 which would provide significant binaural professional recording potential.

### BINAURAL RECORDING COMPONENTS

The binaural system which we developed was based on the component types shown in figure 1.

In addition, we used an extensive set of test equipment (noted in Part One of this article) to test and document the results of this system. The specific components used in our testing are shown in Figure 2.

There was a specific rationale for the selection of many of these exact products. In the case of the torso, B&K manufactures the only “set” of torsos available



*B&K HATS Torsos*

### Figure 1. Binaural Component System

- Binaural recording torso
- Microphone preamplifiers
- R-DAT recorder
- Mixer
- Equalizers
- Loudspeakers
- A-D, D-A converters
- Amplifiers
- Headphones

worldwide (B&K refers to them as Head and Torso Simulators — “HATS”), an instrumentation torso and a recording torso. Thus, it is possible with high precision

to compare the recording torso results with directly calibrated measured results. In the case of the TEAC R-DAT recorder, there was clear concern regarding the recorder’s phase match. Prior testing [*Sound & Communications*, June 1989] had confirmed an extremely tight phase match on the TEAC system. (As will be shown later, some portable recorders have a far greater phase mismatch between channels.

Finally, with regard to other required equipment, there was a need for mixers, digital programmable equalization, amplification, converters and monitor loudspeakers. Yamaha has been a leader in the development of DSP and programmable

**Figure 2.  
Specific Binaural Components**

Bruel and Kjaer 5930 HATS  
Microphone Preamplifiers  
Neumann BS 48i-2 Power Supply  
TEAC RD-101T R-DAT Recorder  
Yamaha DMP-7D Mixer-EQ  
Yamaha P-2075 Amplifier  
Yamaha AD-808 A-D Converter  
Yamaha DA-202 D-A Converter  
Yamaha NS-10MC Loudspeakers  
Yamaha MS60S Loudspeakers  
STAX SRM-1/MK-2 Headphone  
Amplifier  
STAX SRM-TI Headphone Amplifier  
STAX SR Lambda Pro Headphones  
STAX SR Lambda Signature  
Headphones

components. In addition, their monitor loudspeaker systems are quite high in quality. Therefore, they provide a broad resource for the component portion of this project.

**INDIVIDUAL COMPONENT TESTING**

The first component evaluated was the B&K 5930 recording torso, and this was evaluated via use of the B&K 4128 instrumentation torso. The first of these units has studio microphones mounted at the entry to the ear canal; the second has a complete artificial ear device built into each ear position and is supplied with anechoically generated (free field) ear correction curves.

The free field frontal response of the instrumentation torso is noted below, along with the nominal free field response of the recording torso. It can be seen in Figures 3 and 4 that the responses are quite similar. Figure 5 gives the diffuse field, or incidence averaged, response for the instrumentation torso.

In order to compare the 5930 torso with conventional recording, we have removed the microphones and plotted two additional responses, a frontal incidence and a 90 degree incidence microphone response. (These responses are semi-anechoically tested.) This demonstrates the shift in response is due to the torso, the pinnae and the microphone orientation.

The recording torso (5930) is attached to the TEAC RD 1017 via a dual microphone power supply and a preamplifier. There is no equalization between the torso and the recorder.

On playback, there are two possible receiver configurations, either via loudspeakers or via headphones. It is common to equalize the recorded sound for flat listener response (diffuse field) based on the specific headset or loudspeaker used. Equalization curves were programmed into the Yamaha DMP-7D for use, respectively, with the STAX SR Lambda Signature

headset and the Yamaha NS-10MC loudspeakers.

In addition to the problems of equalization, loudspeaker playback reduces the binaural cues substantially, unless a playback binaural processor, for cancellation of cross channel effects, is employed.

The R-DAT recorder employed is particularly important, due to the need to cap-

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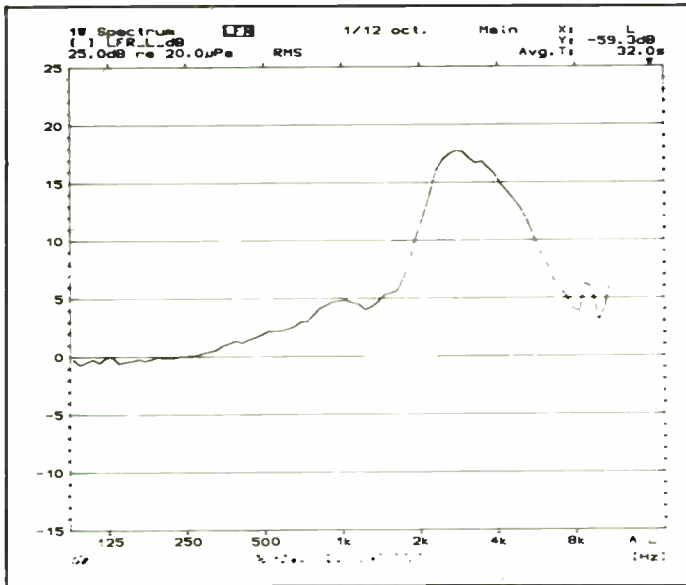


Figure 3: B&K 4128 Instrumentation HATS Response.

ture phase response differences at each "ear" position. While it has been assumed that binaural recordings can be successfully accomplished via the use of R-DAT recorders, there has been little information in the popular or professional press regarding the phase match requirements of the recording process or the phase match performance of individual R-DAT

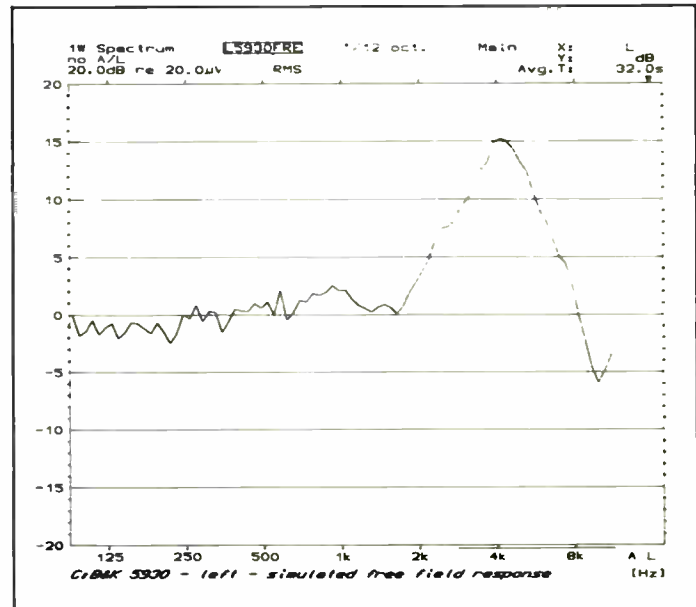
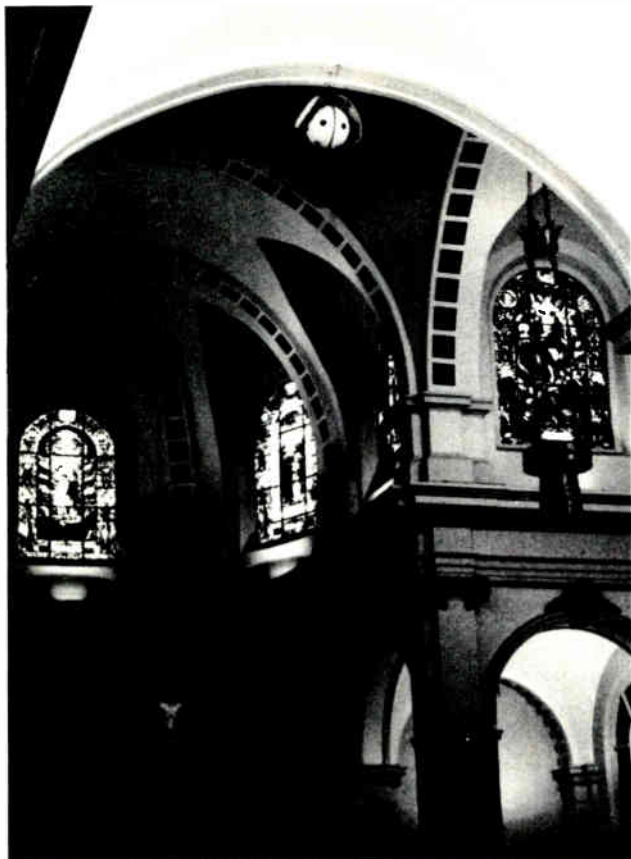


Figure 4: B&K 5930 Recording HATS' Response.

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Built just after the turn of the century, St. Mary's Church in Monroe, Michigan recently completed an extensive repair and rebuilding program. Fr. Brian Chabala, pastor of St. Mary's, was faced with a completely obsolete sound system since the new facility incorporated a vaulted ceiling. People complained constantly, and various sound adjustments did not make any difference. Echo was a large problem, especially with the people who were seated in the rear portion of the church building.

The sound problem was eliminated totally after the installation of one Soundsphere #2212-2 upon completion of the renovation project. Fr. Chabala stated, "I would recommend the Soundsphere system to anyone having sound problems. I can't speak highly enough about it...in fact since its installation there has not been a single complaint about hearing, even when some of the softest readers serve as Lector at Liturgy."

Last July, former Miss America Kay Lani Rafko was married at St. Mary's before an overflow crowd in the refurbished church. The sound operated perfectly and the Soundsphere helped contribute to the beauty of the occasion.

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recorders.

It is somewhat coincidental that the subject of recorder phase match was part of our initial work, and this coincidence relates to our earlier interest in determining phase match of R-DAT recorders for use in sound intensity testing. In an earlier collaboration with B & K and TEAC [*Sound & Communications* June 1989; *TEAC* newsletter, Spring 1989], Orfield Associates studied the phase match of the RD-100T and determined that it was close enough in tolerance to meet the needed .05 degree phase match for direct intensity data recording without postprocessing corrections. The specifications published by TEAC were far exceeded by actual measurements, and at the time, it was assumed that other R-DAT recorders would perform similarly. In fact, we have now tested other recorders typical of those in field use, and the phase mismatch is far

larger in some cases.

There has not, as yet, been a clear determination of the critical phase match necessary in order to provide the highest levels of directional cue, but it is reasonable to assume that the larger phase mismatches measured will degrade the recording perceptibly.

Two final criteria for selection of R-DAT

recorders are the signal-to-noise ratio and the frequency response. We have taken the same two recorders noted above and plotted both of these figures to show differences. (Keep in mind that the TEAC instrumentation recorder is designed for testing documentation and is appropriately three times the cost of the portable R-DAT recorder.

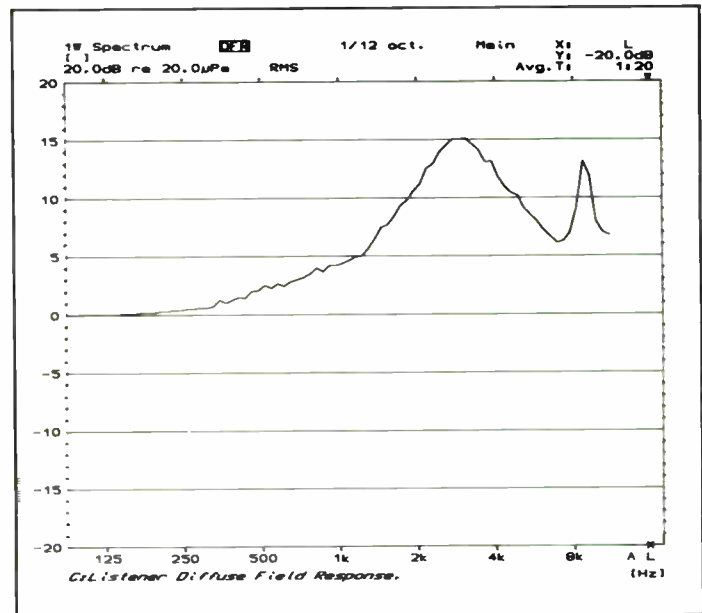


Figure 5: B&K 4128 HATS Diffuse Field Response.



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**Figure 6.**  
**Yamaha DMP-7D EQ Capabilities**

Three-band parametric equalizer:  
low: 32 — 800 Hz (29 pos.)  
mid: 250 — 8.0 KHz (31 pos.)  
high: 1.0K — 18.0 KHz (26 pos.)

The equalization used in the system development was based on the capabilities of the Yamaha DMP-7D Mixer-Processor, although Yamaha also has available a separate digital EQ which would give a more precise equalization. Since the DMP-7D is an 8 channel in — two channel out, this would provide the user with the additional capabilities of secondary feeds for mixing with the binaural channels. (We normally recommend two-channel recording). It would also provide a general purpose digital mixer for use in more standard format recording situations.

The specific equalization capabilities of the Yamaha mixer and the separate DEQ7 digital EQ are noted in Figures 6 and 7.

Next, the selection of the output devices was made based on frequency response, sound quality, additional uses and current conventions. With regard to the loudspeaker, the Yamaha NS-10 MC (Yamaha's

**Figure 7.**  
**Yamaha DEQ7 EQ Capabilities**

$\frac{1}{2}$ -octave (stereo)  
 $\frac{2}{3}$ -octave (stereo)  
 $\frac{1}{2}$ -octave (stereo)  
 $\frac{1}{3}$ -octave (mono)  
4-band parametric (stereo)  
6-band notch filter (stereo)

best known monitor) was selected.

Another Yamaha product was also tested, the MS60S powered loudspeaker.

Finally, the headset for initial testing was selected by reputation and by listening tests, and this was the STAX SR Lambda. Two versions (Signature and Professional) were tested with both solid-state and tube amplifiers. (Amplifier differences on these tests have not proved significant to date.)

Since this headset is known to be one of the most expensive systems (about \$1,200), it was also compared with some less expensive systems which we had on hand.

**CONCLUSIONS**

At this point, the recording system explained above has been assembled and used for a variety of recording experiments. Over the next few months, Orfield Associates, in cooperation with B & K, TEAC and Yamaha, will be considering some of the specific claims for binaural accuracy along with developing further views on appropriate uses and procedures for binaural recording (perhaps a later article will focus on binaural recording technique). This system is, as far as can be determined, the first manufacturer-supported, "off-the-shelf" system made up of available, multi-use components. ■

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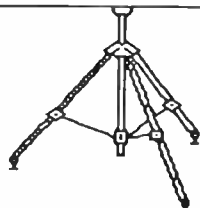
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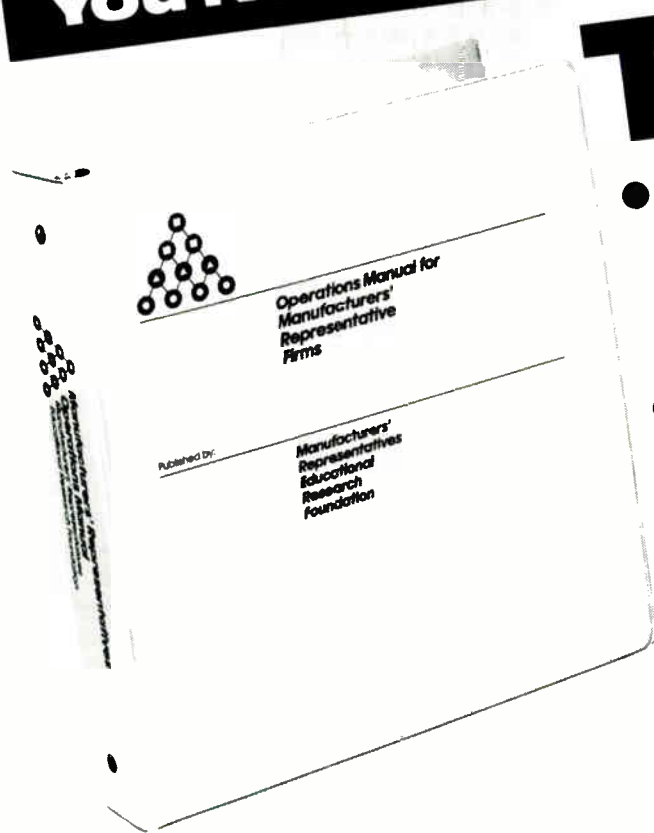
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# Multi-Room Systems

## *Multiple Formats for Making the Home a Media Haven*

BY ED FOSTER

**A**round the country, the move is on — towards custom audio/video systems in the home. It's an area which sound contractors are eminently well qualified to enter but in which few have taken the leap, at least not in the sense in which I am using the term. In the July 18 issue of *Sound & Communications*, I reported on what was new in this area at the 1990 Summer Consumer Electronics Show. Now, I'd like to get down to basics.

In its most rudimentary form, custom sound installation may mean little more than distributing speaker-level signals to multiple drivers scattered around the home — with or without "autoformer" or L- or T-pad volume control in each room. Fine for background music, but today's audiophiles demand much more — video as well as audio distribution, and the ability to select different program sources in different rooms, independently and simultaneously. All this is possible with today's equipment, but it does require an entirely different type of installation from running some speaker cables around the house.

Even from a sheerly technical standpoint, rudimentary installations have little to recommend them besides their simplicity. Routing speaker-level audio over appreciable distances destroys the amplifier's ability to "damp" the loudspeaker simply because of the wire resistance. L- or T-pad volume controls at the dropoff points only make matters worse. Cable resistance also can cause substantial power loss when driving low-impedance speakers. The professional way of over-

coming losses — running a "constant-voltage" line with tapped transformers at each speaker to match volume — is anathema to the dedicated audiophile. Transformers limit bandwidth, introduce distortion and degrade the damping factor. They may be fine in a stadium where intelligibility is the only requirement but, in audiophile circles, transformers have gone the way of the dodo bird.

**Even from a sheerly technical standpoint, rudimentary installations have little to recommend them besides their simplicity.**

As soon as we speak of providing independent program selection in different areas of the home, the logic of using line-level distribution and remote power amplifiers (or self-powered loudspeakers) at each remote location seems inescapable. At least it does to this observer although, apparently, not everyone agrees. The a/d/s/ PH6 amplifier mentioned in the July 18 article is a 6-, 5-, 4- or 3-channel amplifier obviously designed for placement in a centralized location with distribution occurring at speaker level. Self-powered loudspeakers offer advantages of their own

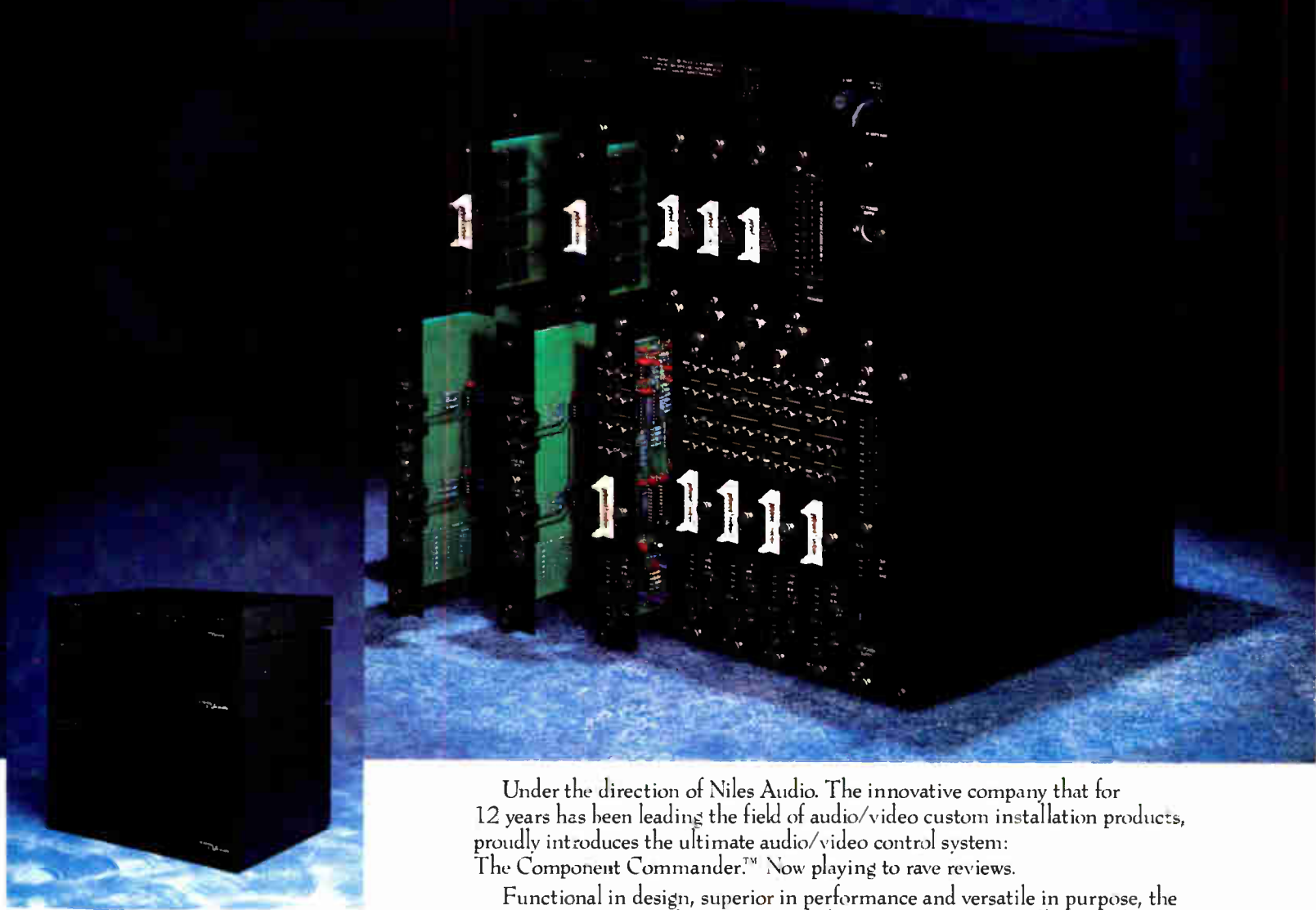
(albeit not without the negative of having to shell out for an amplifier for each speaker). With a dedicated amplifier/speaker package, anomalies in loudspeaker response can be electronically corrected in the amplifier, an approach taken by Bose in its new "Lifestyle Music System."

Distribution at line level eliminates the power loss and inferior speaker damping inherent in speaker-level distribution. It also enables more elegant means of volume and tone control in each zone via digitally controlled electronic attenuators and tone-control circuitry. Line-level distribution is not problem-free — noise pickup probably being the primary consideration, crosstalk between different sources carried in the same cable being another. Both problems can be controlled by using balanced wiring between the source and the remote zone with a differential input in the remote amplifier, an approach adopted by Soundstream Technologies in its Simul\*Source system.

A radically different solution to the distribution network has been developed by Sony, a company with the technological resources to "create" its own solutions to problems. In the Sony Digital Signal Transfer System, up to eight stereo channels are "digitized" into 16-bit PCM data streams that are subsequently 'compressed' by a Sony custom chip (the CXD-2520S) and multiplexed onto an RG-59 75-ohm coax. Any of the eight audio sources can be selected at any zone, decoded and amplified by Sony's 40-watt



# COMMAND PERFORMANCE



Under the direction of Niles Audio. The innovative company that for 12 years has been leading the field of audio/video custom installation products, proudly introduces the ultimate audio/video control system: The Component Commander.™ Now playing to rave reviews.

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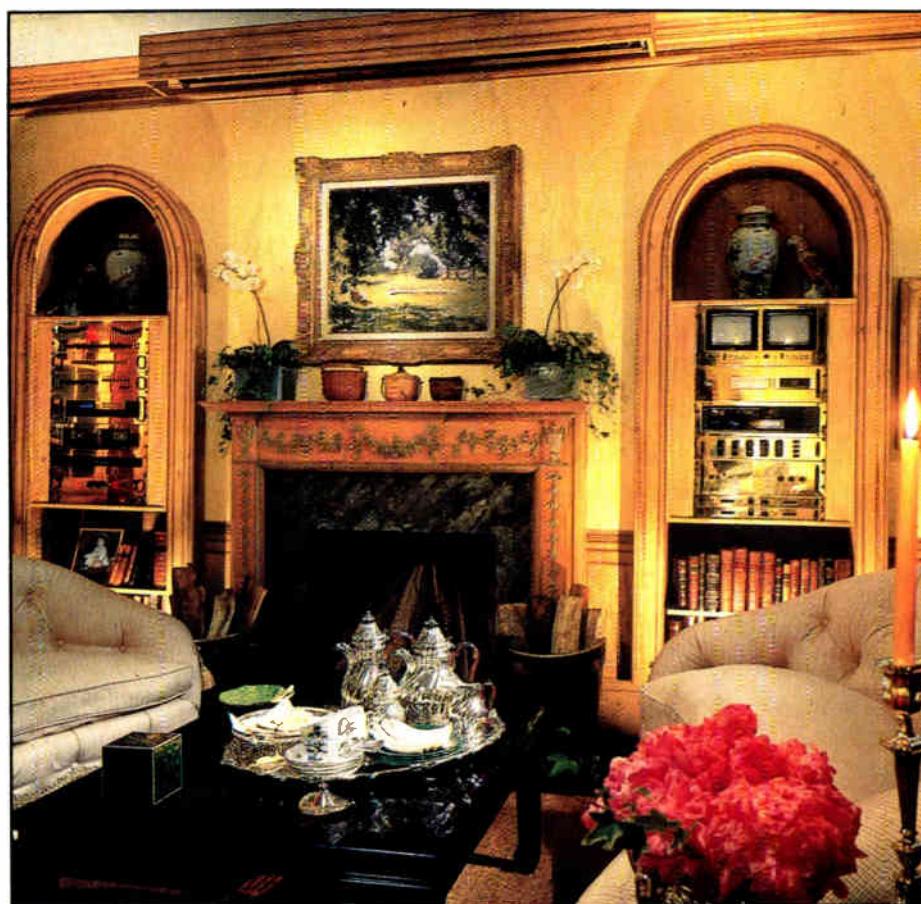
Satellite Decoder/Amplifier. In theory, the coax used by the Sony system can be the same as used by the cable-TV distribution network in the home [but see Bob Angus' article in this issue of *Sound & Communications*].

Many of today's upscale consumers want video as well as audio program distribution; there are several ways in which this can be accomplished. Because of the high frequencies involved, video distribution is not that simple a task. Be forewarned that some audio/video distribution systems have limited or non-existent video distribution. Some are able to access a local video source (such as a VCR) via a 'programmable' remote, route the video to a local monitor and, perhaps, the audio program from that source to the local speakers. Others are designed to distribute a video source throughout the home, but not with simultaneous and independent selection of audio and video programs in different rooms. There are also professional and consumer dedicated video-distribution systems that are not integrated with audio and are not within the scope of this article.

Three systems that do take on the "full" job come from Audio Design Associates (arguably the granddaddy of custom-installation manufacturers), from Sony and from Soundstream. When the ADA Omega system is outfitted with a VSU-8 Video Switching Unit, the user can choose to view and listen to any of eight audio/video sources in any zone. The video is carried separately from the audio on its own 75-ohm line in NTSC-composite format. The Sony system permits the user to choose one of three video sources at any remote zone while other zones are listening to music or watching the same video. The desired video source is conveyed on a 428-MHz (UHF) carrier on the same cable that distributes the audio. This means that the Sony system must be used with a TV "receiver" (rather than a video monitor) and undergoes a modulation/demodulation step on its way to the viewer. With Soundstream's Simul\*Source system, NTSC-composite video is distributed over a separate pair of wires within the main distribution cable and the



*The Bose Lifestyle Music System dedicated amplifier/speaker package allows anomalies in loudspeaker response to be electronically corrected in the amplifier.*



*An ADA System 88 is incorporated in this audio/video system in a room designed by Katherine Stevens. All components have brass face plates. The screen drops down from the ceiling when the projection television is turned on.*

PHOTO BY PHILLIP ENNIS



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added steps of modulation and demodulation (and the potential degradation in quality that that involves) are avoided.

Just as there is more than one way to distribute audio and video, so there is more than one way to "access" program sources from remote locations. By far the most popular approach uses the ubiquitous

"infrared programmable remote." Sensing "eyes" are placed in each room and wired back to the central location. Frequently, keypads are installed in each room in addition to (or instead of) the infrared pickups so that, if the user forgets the remote control (or simply finds it too confusing to use), he or she can access the system

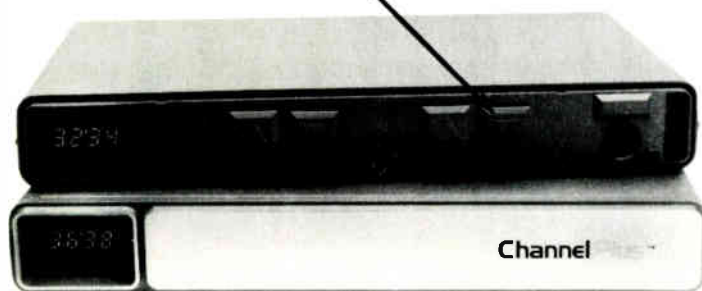
from the keypad.

Infrared remote controls are basically "line-of-sight" transmitters; you have to point them at the eye to get them to work reliably. For its Lifestyle Music System, Bose developed an RF remote control that works through walls. To avoid interaction with neighboring Bose Lifestyle Music

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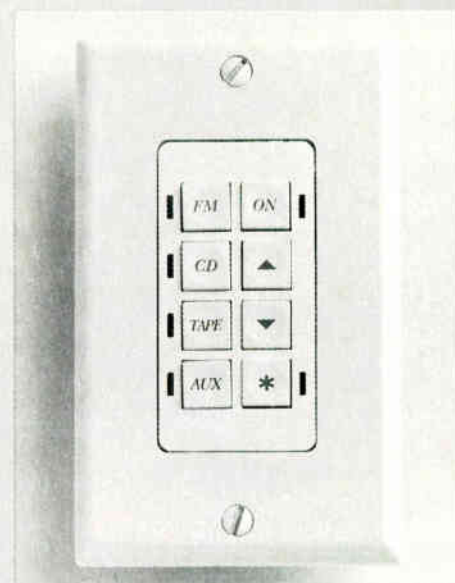


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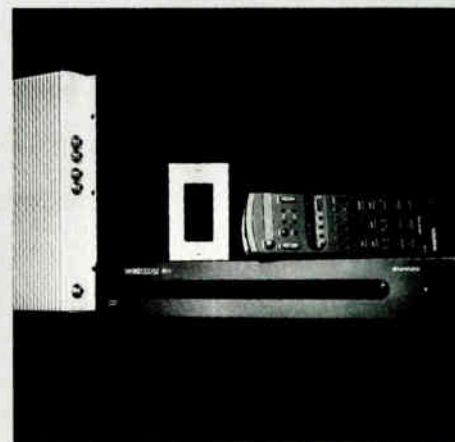
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## The Many



*A keypad for the Audioaccess multi-room system.*



*The basic Simul\*Source system permits control of up to eight A/V components from five independent listening zones.*

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World Radio History

Systems, the remote control and music center are fitted with house code switches similar to those found on garage door openers. The control logic is arranged to prevent a user in one zone from accidentally interfering with a listener in another zone. Control of the contested source is given to the user who selected it first —

Bose's version of "first-come, first served."

Custom systems differ widely in expandability and the ease with which they can be adapted to work with "foreign" components. Audio Design Associates and Miami-based Niles Audio Corporation adopt modular approaches which makes the

ADA System 808 and the Niles SR-6 Source Rack exceptionally expandable. By adding AS-2 Source Cards, RC-1 Room Cards and daisy-chaining SR-6s, the Niles system can be augmented to handle a 6-source/60-room audio-distribution system.

Being rack-mounted basic hardware, the ADA and Niles systems are not exactly

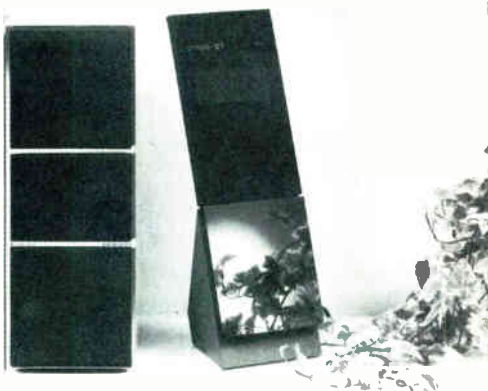
## Guises of Multi-Room Systems



*Pioneer's VSX-D1S A/V receiver is multi-room ready for simultaneous playback from two sources.*



*The Sony M200EX multi-room A/V center.*



*Bang & Olufsen's Beolink 7000 A/V System Controller.*



*The Niles Audio Component Commander allows users to select and control up to 60 rooms.*

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“museum pieces.” One that is and yet supports a high level of expandability is Soundstream’s Simul\*Source. The basic SN\*1 Simul\*Source system permits control of up to 8 audio/video components from as many as five independent listening zones each of which can encompass four rooms. Each SNX\*1 Simul\*Source Network Expander that is daisy-chained into the system adds an additional five independent control zones of up to four rooms each.

The descriptions just given demonstrate the difference between “sources,” “rooms,” and “zones” in a multiple-selection system. The number of “sources” the system is designed to handle indicates the number of different programs that the system has available to choose among. The number of “zones” indicates the number of different areas in

the home that can independently access any one of those sources. Each “zone” may include more than one “room” in which the user may be able to switch sound on and off (and perhaps control volume) but not select a different source from that available in other rooms of the “zone.” Thus, a master bedroom, dressing area and bath may be three “rooms” within the same “zone,” each presenting the same program source, (possibly) with independent control of volume and speaker activation.

### Each “zone” may include more than one “room.”

Finally, we come to the matter of compatibility with “foreign” sources. Some systems are designed to be used only with components of the same manufacture. Nice for the manufacturer; not so nice for the customer who may want components not available from that source. Fortunately, one need not design a system with that constraint. A number of vendors (including Audioaccess, Niles Audio and Soundstream) offer infrared “flashers” or “repeaters” that relay infrared commands to “foreign” components. All that’s needed is a programmable remote capable of “learning” the foreign codes and any infrared-controllable piece of equipment can be included in the system and accessed via the repeater.

What’s to come in custom installation? Judging by the activity in this area, I think we’ve just begun to scratch the surface. The Electronic Industries Association has developed a new “CEBus” concept over which practically any electrically operated home device — from dishwasher to TV — can be remotely activated from within or without the home. I’ve also seen several Japanese versions of “the home of the future.” Whether there will ever be a universal standard, it’s too early to tell. But one thing is certain. Home automation and remote control of electronic equipment will be more in demand as each year progresses. Time to get on the bandwagon. ■

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*The Bang & Olufsen Beosystem 6500 features system control from a remote master control panel.*



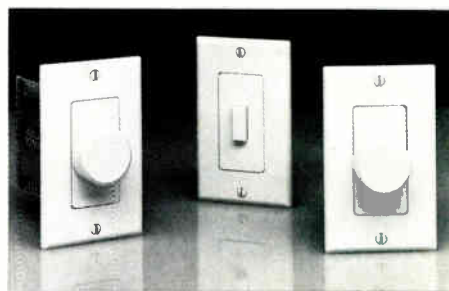
*Audioaccess' PX-6 multi-room remote controller.*



*The Sonance SDS4 line of switchers.*



*The Revox B210 table-top remote control.*



*The Sonance in-wall volume controls and speaker switcher.*

# Whose Wiring Is It, Anyway?

## *Cable-Company-Installed Wiring*

BY ROBERT ANGUS

**W**hen the cable company puts coaxial wiring in your house, it's yours, right? Sony Corporation operated on that premise when it introduced a digital audiovisual signal distribution system earlier this year only to find out that in 44 states, the wiring belongs to the cable company and it is illegal for consumers to hook anything up to it. Sony thus learned what many videophiles and homeowners had already discovered: that free cable-company-installed wiring is no bargain and that laws passed in the 1960s and 1970s to protect the cable industry may be holding back technology in the 1990s.

When television sets began popping up in bedrooms, kitchens and rec rooms 30 years ago, cable companies realized that there was money to be made from second- and third-set hookups. Savvy consumers realized that instead of paying \$4.95 per month forever for each additional hookup, they could do the job themselves and save. To stave off that possibility, the cable operators offered free in-home wiring — not only to existing homeowners along their lines, but to owners of apartment buildings and builders of new developments. Until the videocassette recorder came along, nobody complained, because there wasn't much else you could do with those wires beyond relaying cable signals.

Sure, a few irate customers cancelled cable service only to find company crews at their doors ready to rip out the wiring. In some cases, the cable company charged for the removal (even though it had installed the coax free); in others it left damaged or scarred walls and baseboards in its wake.

By the late 1970s, however, there were other signals begging to travel through those cables. The first satellite dishes had begun to appear. VCRs, while not yet commonplace, were providing entertainment for viewers who wanted to watch programs originating from the recorder in the living room on their bedroom TV sets. Fast forward to the '90s and the coming of sophisticated home automation systems. Earlier this year, Sony introduced DST, a digital audio and video signal transmission system that it said could use coaxial wiring such as that installed by cable companies. The catch is that 44 states have laws restricting the use of cable-company wiring for any purpose by homeowners.

Another reason most cable companies frown on this idea is that the Federal Communications Commission holds them responsible for leakage of radio-frequency signals that can interfere with licensed radio transmission including air traffic control signals. Cable operators say that a single defective F connector can bring down a substantial fine — not on the con-

sumer who may have installed it illegally, but on the cable company. The FCC raised fines sharply in July and has begun checking signal leakage in cable systems located near busy airports.

Sean Walsh heads Hometron, a company that installs very sophisticated home automation systems in some of the most expensive new homes being built in the Washington, D.C. area. "The problem I have is that I charge a lot of money for installing a system that includes not only audio and video signal distribution throughout the home, but also home security, climate control and telecommunications. On more than one occasion, I've bid a job where the cable operator comes in and offers to wire the entire development for cable absolutely free. Those builders who take the offer discover that the free wiring can be used for only one purpose — the distribution of cable signals in the home. They cannot use it for climate control or security or anything else, and I can't connect anything to it.

"Conversely, if the builder says 'thanks but no thanks,' the cable company can refuse to hook up his development. These days, it's very difficult to sell a house in an up-scale neighborhood where cable is generally available without being able to offer it."

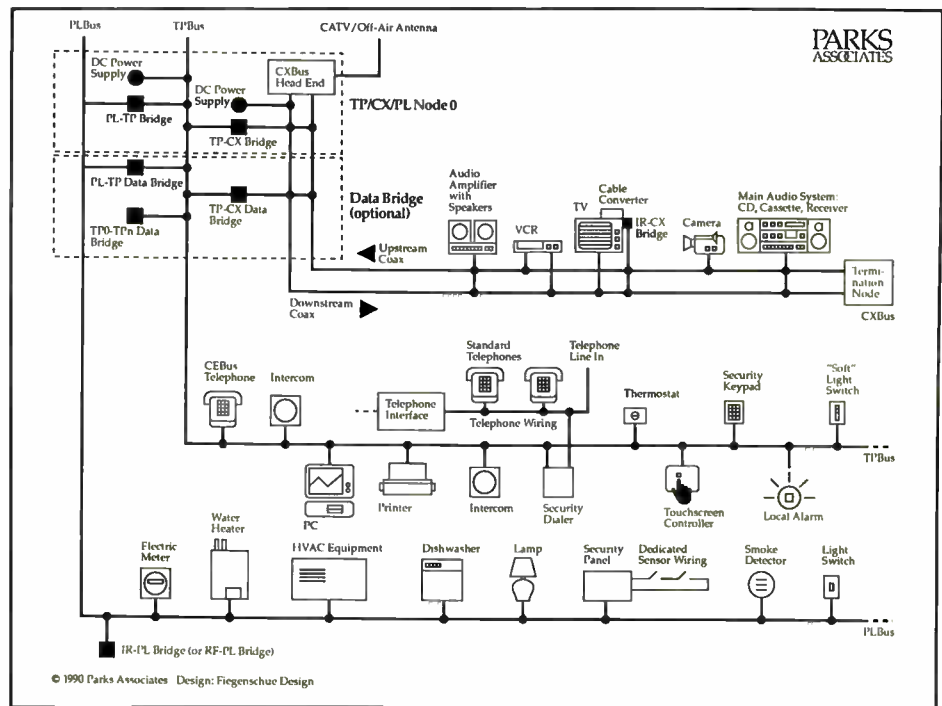
TeleCommunications Inc., the nation's

largest operator of local cable systems, has encouraged its local operations to provide cable service to schools for free including outlets in each classroom, an offer many hard-strapped school districts find too tempting to resist. Recently, Haystack Cablevision, TCI's local company in Canaan, Connecticut, offered to wire the local elementary school, which has its own satellite antenna. When the school board discovered that it couldn't use Haystack's wiring to distribute satellite signals, the board voted to use tax dollars to do the job instead.

Actually, a debate is raging within the cable industry over the whole question. While the National Cable Television Association has no figures on how much revenue the cable industry derives from second-set hookups, the trade paper *Multichannel News* recently estimated that 69 percent of cable customers do pay for service to a second set and Michael Dorfsman, executive director of the Connecticut Cable Television Association recently told a state legislative committee that second-set charges amounted to about 20 percent of total revenue in his state. If deprived of the charge, he added, the cost of service to all customers would go up substantially.

If Dorfsman's 20 percent figure is extended to total cable revenue, in excess of 898 billion per year, it's easy to see why most cable operators are fighting such new technologies as CEBus, Smart House and Sony's DST. On the other hand, a growing number of videophiles are perfectly well aware of the new wireless retransmitters that bypass the entire problem by rebroadcasting the RF output of a VCR, satellite receiver or whatever to receivers throughout the house; or install their own hardwired Rabbit, Video Link or Channel Plus distribution systems for a one-time charge of \$200 or less. In a typical multiset home, each drop from company-installed cable is worth \$57 per year to the operator.

During hearings on the Cable Television Consumer Protection and Competition Act of 1990, the House of Representatives Commerce Committee heard horror stories about cable companies that had ripped out company-installed wiring when



*CEBus: A typical configuration.*

customers discontinued service, leaving scars on walls and baseboards. In at least one case, a homeowner was charged for removal of cable he hadn't paid for. When wireless cable operators tried to buy the cable company wiring in an apartment complex in Florida after the building owner had quit cable in disgust, they were told that the operator wanted his wire back and they'd have to install their own.

**“It’s very difficult to sell a house in an upscale neighborhood where cable is generally available without being able to offer it.”**

So Congress set out to act. An amendment by Reps. Edward Markey (D.-Mass.) and Matthew Rinaldo (R.-NJ) called on the FCC to set up rules and regulations regarding the disposition of cable-installed cabling inside the home when a customer discontinues service. An alternate amendment would go even further. It would require the cable company to offer the customer the opportunity to purchase the cable at a reasonable price or, in the event he failed to exercise this option, to remove it, returning the cosmetics of the wall or

baseboard to their original condition. The trouble with both amendments from the consumer's point of view, says Lauritz Helland, a Lynnwood, Washington attorney specializing in communications law, is that they acknowledge cable company ownership of wiring within your home, a situation that's different from other wiring in the home. "The wiring that carries electricity from your meter to your TV set or bedside lamp is yours. It's your responsibility to maintain it. The wiring that connects your telephone to the junction box on the side of your house also is yours, even though the phone company may have installed it years ago. But cable wiring is different. Congress has now confirmed it."

The cable industry is not unaware of the controversy and the tidal wave of technology that threatens to wash over it. TCI, for example, has come up with a concept it calls Starport — a box on the side of the house that represents the subscriber's cable terminal. Like the telephone company box, it marks the point at which the subscriber assumes ownership and maintenance responsibility for his own domestic wiring. However, it's a lot more sophisticated than the telephone company box: it knows which pay services the subscriber is entitled to and passes only those signals. TCI argues that this approach not only decriminalizes the subscriber who wants to construct and maintain his own wiring, but eliminates a

*(continued on page 67)*



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# Mixing Residential and Commercial

*From Leona Helmsley to  
High Class Clothing Stores*

BY ELLIOT LUBER

**P**ublicity works in strange ways. When we got word several years ago of the super media system being installed in a home in Connecticut, we couldn't get the story. The client was close-mouthed and security conscious and absolutely refused any publicity. By the time the system was installed, however, the existence of this system was plastered throughout the New York Times. The installation — in the Greenwich Connecticut home of Leona Helmsley — became an issue in her legal woes. But the job was an accomplishment for Audio Sound Productions, the Long Island based installer.

Currently installing the sound systems for the Barney's upscale chain that is now expanding, Audio Sound has combined residential and commercial work along with touring and recording work. It's an all-around sound company with some special ideas. Elliot Luber interviewed Dave Rosen of Audio Sound Productions.

—Editor

David Rosen, president of Audio Sound Productions Inc. not only grew up with the



*An example of Rosen's speaker used in the ceiling of a residential installation.*

sound business, he has been and is today involved in literally every facet of it. His low-key, down-to-earth approach has kept him out of the limelight despite high-profile

clients.

For example, Rosen and company quietly:

Installed the sound system for rock group Led Zeppelin's green (and inconspicuous) touring van in 1975; installed the sound system at numerous Manhattan discotheques including Xenon and Studio 54's second location in St. Thomas, the Virgin Islands; installed the now-famous quarter-million-dollar, 20-zone sound system in Leona Helmsley's Greenwich, CT estate. (This system was alleged, during her recent tax evasion trial, to have been financed with company assets); recorded most of Long Island's classic live radio concerts for WLIR, WDRE and WBAB, yet never took public credits.

Audio Sound Productions is Rosen's own company, but obviously he has other deep roots in Long Island's pro audio community. He and his former partner, the late Sid Zimet, built Zimet Audio into a model entrepreneurial sound company, first in the area to go after many of the industry's major waves, from concert sound to disco, from home installation to commercial in-



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stallation, from pro audio to semi-pro audio, from service to cone repair, from sound system rental to remote recording.

Later, along with Michael Tapes, they founded Sound Workshop Professional Audio Products Inc. (which was sold last year after practically inventing the middle-market studio which lead to countless facility and mobile installations). Rosen and Zimet split their partnership several years ago, with Rosen founding Audio Sound Productions and Zimet founding Audioforce, a New York rental firm. Zimet, a pilot, was killed two years ago when his small plane crashed en route to Nashville.

Today, Audio Sound Productions is heavily involved with both installation and service. Among its recent projects has been installation of a custom sound system in Barney's New York men's clothing stores, nationwide.

The system, according to Rosen, uses the company's own design for ceiling speakers and also features metal Soundolier cabinets filled with Grommes-Precision Electronics amplifiers and custom switchers to select three input sources: a 10-disc Yamaha CD player, an Onkyo dual-reverse cassette deck and a Grommes-Precision Electronics tuner. The cabinet also houses an ART I-EQ, a monitor and a drawer for tape and disc storage. The A.R.T. is preset by Rosen. He uses an Ivie spectrum analyzer.

Stores completed to date include two in New York, an uptown store for lady's apparel and a downtown store for men in the financial district. Other locations installed include: Cherry Hill and Short Hills, NJ; Boston, MA; Westport, CT; Washington, DC; Seattle, WA; Costa Mesa, CA; Dallas and Houston, TX; Cleveland, OH; others will follow according to Rosen.

As many as three systems may be produced for each store — for the beauty parlor, the restaurant, and the retail floor. Rosen works directly with the architect, receiving plans and negotiating over ceiling speaker locations which must coexist with Barney's lighting design. Rosen got the national job, because, he says, the client wanted consistency. And, no doubt, was pleased with performance.

On the custom audiophile level, Audio

Sound Productions is also completing a major media room with Dolby Surround for a repeat customer who lives in a Long Island condominium complex. Rosen said this project will include a Dolby logic system decoder with a Pioneer audio system, Allison speakers, an AudioPro subwoofer, and Gretag Image Systems high power/high resolution projection display system. Pioneer is a favored brand choice for him



*A Gretag projector is mounted on the ceiling of the personnel department at Fortunoff's in Westbury, NY.*



*Ceiling speaker mounted at Barney's New York in Seattle, WA.*



*David Rosen at his lab in Long Island, NY.*

because of the consistency of cosmetics, obviously an important consideration in residential work.

Rosen explains that his price tags start at about \$12,000 for a custom system and increases from that point dramatically with the complexity of the system's requirements. He has an in-house woodworking shop to tailor the system to the existing interior.

"Custom installations for the home require a much higher level of both work and workmanship," says Rosen, "When you do a commercial installation, you generally have to let the electricians cut all the holes and pull all of the cables, but when it's in someone's home you really have to cut your own holes and then fix them. You need to be extra careful and you have to design it to fit the environment, and it takes that extra level of service to please the homeowner. New construction can be easier," he says.

One of his fastest growing business segments, however, is something alien to the consumer market, speaker repair. "When you pay \$200 for a speaker, repairing it for \$200-300 doesn't make sense," says Rosen, "but when you pay \$2,000 for it the price is right, particularly when we use good parts to make it sound like it did when new."

He now does authorized cone repairs for JBL, Electro-Voice, Gauss, Altec Lansing, Urei, Cerwin Vega, Yamaha, PAS, Fostex and TOA. Rosen reports his cone service business has nearly doubled over the past year.

This speaker repair technique, originally developed for his personal stereo at home, led to speaker customization. A combination of JBL and Electro-Voice pieces coming through led to more experimentation.

His best known systems, however, gained notoriety not through SPLs but through court proceedings, now expected to continue through an appeals process. Leona Helmsley hired Rosen's company to install sound systems at both her Greenwich estate and her duplex penthouse atop New York's Park Lane Hotel. Rosen estimated the Greenwich system alone cost approximately \$250,000.

"The system is magnificent," Rosen boasts. It consists largely of equipment by Audio Design Associates. The 20-zone system, according to Rosen, includes five zones to cover the gazebo, pool area, barbecue area, fountain and tennis courts with another five zones for the new pool area (indoors), that includes ASP's ceiling speakers, the breakfast room, a dance area and two more for upstairs and downstairs.

A wireless infrared remote control allows total program control of the audio system from any area it services. Audio sources include two tuners and a multi-changer cassette deck. Gauss 3288 coaxial studio monitors are used as loudspeakers in the dance area.

Rosen said a number of factors have come together to focus his efforts in the high end of the market. "It costs you too

much to do business today if you don't have that margin in front of you. If you're paying a technician to open something on the bench, it had better cost less to fix than to buy a new one, so you have to fix things of value," he says, adding that he has steered away from box sales to avoid competing with discounters.

Economics also keeps him away from smaller club installations, though his client list still reads like the entertainment page of the Long Island newspaper. "The biggest pitfall with clubs is getting paid," he says. "You try to get as much as you can up front and hope all goes well for the balance. Other than that, you stick to the bigger clubs that aren't trying to open the place with your money."

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# Teleconferencing Advice

## *How To Educate Your Client About The Basics*

BY BILL RUHNKE

“**T**eleconferencing” has come to mean many different things. To advise a client on teleconferencing requires a knowledge of a variety of technologies, applications, and equipment; and the ability to explain it all. For basic audio teleconferencing the client can be educated in the following way:

The simplest form of teleconferencing is audio teleconferencing over voice-grade dial-up phone lines. Most audio teleconferencing equipment will connect to an analog phone line. Just as a fax machine requires a direct line, teleconferencing equipment, likewise, needs a direct line, bypassing any fancy phone system that may send digital codes to smart phones. This voice-grade phone line is sometimes called “POTS,” an acronym for Plain Old Telephone Service.

POTS is really fairly sophisticated, because it sends fulltime two-way audio, over a single pair of wires. This two-way mode is called “full duplex.” When it gets to your phone, it is split between “send” (the microphone) and “receive” (the ear piece). This is accomplished by a “hybrid.” The hybrid is basically a transformer with the primary coil driven by the microphone, and two secondary windings, which are wound in opposite directions. One secondary puts the “send” audio into the phone line; the other is inverted in polarity and is used to cancel the “send” audio out of the feed to the ear piece.

---

*Bill Ruhnke is a designer of teleconferencing systems at TSI, Mineola, NY.*

Capacitance and inductance on the phone line makes it difficult for the inverted signal to exactly match and “null” the “send” audio which is on the phone line, so hybrids usually can be “tuned,” adding capacitance and inductance to match the phone line.

Most phone company transmissions between central offices are digital, which allows a call to be sent in bursts, intermixed with dozens of other calls on the same line. Digital transmission is one-way, not duplex. The phone company likewise uses a hybrid to split the subscriber’s line into send and receive. The subscriber’s POTS is provided by the phone company’s BORSCHT, an acronym for Battery, Over-voltage protection, Ringing, Supervision (which is determining when you’ve lifted the handset and dialed), Codec for analog-digital-analog conversion, Hybrid, and Testing.

The common speakerphone is the crudest form of teleconferencing. While the phone has a hybrid to split “send” and “receive,” in a speakerphone the microphone is too close to the speaker to allow both to operate at the same time. A microphone gate is used to mute the speaker. This is called “half duplex,” and provides what is essentially one way at a time on a two-way line.

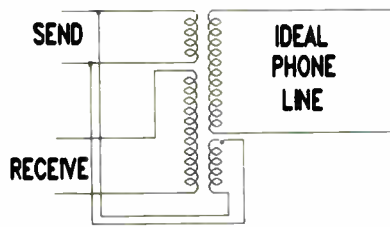
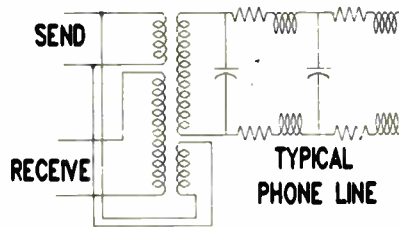
Natural conversation usually involves interrupting and interjecting. Half duplex does not allow for natural conversation. Also, the speakers and microphones used in most speakerphones leave a lot to be desired.

Improved speakerphones and portable suitcase systems use fast switching half duplex, or a system called modified half duplex. Modified half duplex does not completely mute the receive audio when sending. Other improvements include higher quality microphones and interrupt priority, which gives the listening party the power to switch the signal flow in his favor when he begins to talk. Some of these systems are still subject to annoying clipping of syllables as conversation switches from receive to send.

Full duplex conversation can only be achieved when the speakers are some distance from the microphones. The best audio teleconference systems are those that are integrated with a high quality room reinforcement system, which is properly designed to provide some isolation between the speakers and the open microphones. Automatic mic mixers and minus speaker zones are just two tools available to the sound contractor to minimize leakage of the speakers back into the microphones.

If the microphones are only feeding the phone line (through a hybrid), and are not providing speech reinforcement within the room, then feedback is not likely. Instead, leakage from the speakers will appear as echo to the other party, and may go totally unnoticed in the room in which the leakage occurs.

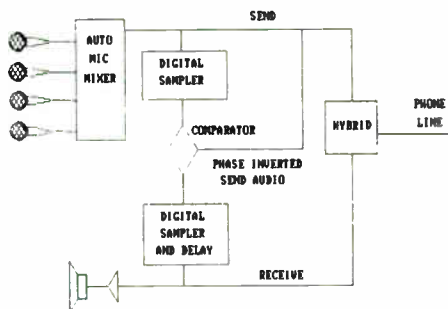
Unfortunately, most hybrids do not exactly null the line, and they allow some “send” audio to show up as “receive” audio. This is referred to as “side tone.”



Basic 4-wire to 2-wire hybrids.

Some side tone may be allowable, and can serve as speech reinforcement; however, that side tone will suffer from the extremely limited frequency response of the phone line. It is best to eliminate side tone where possible, and provide a separate microphone mix for any required reinforcement.

A digital hybrid automatically adjusts its null for optimum isolation between "send" and "receive." In addition, it can sample the frequency response of the phone line and provide equalization to compensate for peaks and valleys. The phone line is designed to pass 300 Hz to 3400 Hz, but most have very uneven frequency response.



Logical Signal Flow in Acoustic Echo Canceller.

Older audio teleconference systems may employ acoustic echo cancelers and electronic echo cancelers. Electronic echo is caused by a poorly tuned hybrid at the distant site's telephone company office. Your voice goes all the way out to the distant site and all the way back to you. This has not been a problem in recent months in most major metropolitan areas, because major phone company central offices have been equipped with high quality hybrids.

Acoustic echo is leakage from speakers into open microphones. An acoustic echo canceler samples the "receive" signal, inverts it, and uses it to null the speaker sound when it reenters the microphones.

When using standard phone lines for audio conferencing, often multiple sites need to be interconnected. Many office phone systems allow several lines to be

tied together, but audio quality usually suffers, particularly from one distant site to another distant site. A solution is a phone "bridge." The bridge ties multiple lines together like a party line, and provides signal conditioning to insure clear sound to all callers. Typical conditioning provided by a bridge includes equalization, noise gating to reduce the volume from callers who are not speaking, and automatic level control.

Several companies have bridges with up to 40 phone lines, and they provide conferencing services in two ways. All the conference participants can be instructed to call into the service at an appointed time. This is called "meet me" conferencing. Another way is to have one caller initiate a conference call and the service operator will call other participants and add them to the conference.

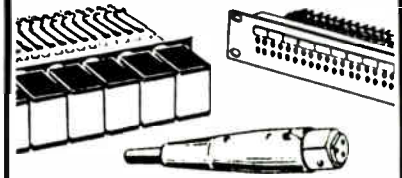
Voice grade phone lines cannot accommodate transmission of digital information at a high rate. Most data transmissions over voice grade lines occur at 1200 Baud (digital bits per second), 2400 Baud, or 9600 Baud. Standard fax machines (group III) operate at 9600 Baud. This rate is not adequate for video. "Slow scan" or "freeze frame" video can be sent at 9600 Baud. It can take from 10 seconds to 10 minutes to receive a slow scan picture, depending upon the resolution used. A single color video image requires approximately one megabyte of data. Black and white, or low resolution images require much less data.

Some slow scan devices allow for conversation on the same phone line at the same time a picture is being sent. Of course picture transmission slows greatly. Since the pictures are transmitted digitally, a variety of compression algorithms can be used. A compression algorithm is a mathematical formula that defines portions of the transmission. These formulae are sent in place of the data itself, saving space. ■

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# Gold Ribbon Sound Cinema

*A Sound Company That Creates Corporate Presentations in Movie Premiere Style*

BY DANIEL SWEENEY

**O**ur clients notice one thing immediately," relates Tom Simon, president of Gold Ribbon Sound Cinema. "People don't sleep through presentations anymore." Indeed sleep would be difficult in the environment created by Gold Ribbon for its corporate clients. Gold Ribbon specializes in audio/video installations in corporate boardrooms, and such installations typically use a minimum of 800 watts per system along with surround sound reproduction of corporate videos. Sony 1040Q computer grade front projectors are used in such systems as a matter of course. The style of the presentation has more in keeping with a movie premiere than a typical installation video, and that's precisely what Gold Ribbons wants. "Why give a presentation at all if it lacks impact?" says Simon.

## BEGINNINGS

Gold Ribbon Sound Cinema (quite a mouthful) had its earliest beginnings in an MIT laboratory back in 1975. Steve Spencer, now a sales executive with the company, and then a student in acoustics and erstwhile employee of Bose and Advent, decided to undertake an engineering project involving an unusual loudspeaker technology — this in fulfillment of a course requirement. Spencer

already had several years of professional experience in sound reinforcement and recording behind him, but he'd never designed a driver from scratch, and he was intrigued by the possibilities of a little known class of speakers known as ribbons or planar dynamics which were just then appearing as commercial products. Spencer became especially interested in a design out of Northern Ireland called the Strathearn, and he set about improving it and applying for patents on his innovations.

Ten years later he was still at it, and finally ready to take his device to market.

In the meantime Spencer, in the company of his brother David, had continued to support himself in sound reinforcement and recording (clients included the Beach Boys and Chuck Mangione), and had opened one of the first high end autosound installation facilities in the Midwest, a retail store known as Spencer Sound which is still in business, in Coralville, Iowa. But the ribbon remained an obsession — an obsession that ultimately consumed over \$1 million of investment capital and uncounted thousands of engineering man-hours, and indirectly led to the formation of Gold Ribbon Sound Cinema.

In late '85 Spencer's ribbon was perfected — as much as any device of that sort can be. The resulting product, dubbed

the Gold, was a massive panel made of aircraft alloys and huge stacks of ceramic magnets, and in between the magnet poles, a microthin kapton diaphragm vapor deposited with pure elemental gold. The device resembled a gigantic Neumann microphone capsule, and presented an unforgettable appearance. Many found the sound unforgettable as well, but at \$800 apiece, the panels sold slowly, and since the panel required integration into an elaborate cabinet with a line array of woofers, acceptance was necessarily limited to small market hardcore hobbyists and custom installers. The ribbon achieved its engineering goals, but as a commercial product it was and remained a specialty item of limited appeal.

## INCORPORATION AND CRISIS

By 1985 Spencer had acquired his own manufacturing facilities and launched a venture capital backed company called Gold Ribbon Concepts to make and market his innovative speakers. Gold Ribbon's board of directors brought in Denis Spencer (no relation), a professional manager, to oversee day to day operations while Steve Spencer took charge of engineering and sales. Later Alan Hulsebus, a mechanical engineer initially employed by Spencer Sound, took over



# Cedar Rapids Chamber of Commerce

BY DANIEL SWEENEY

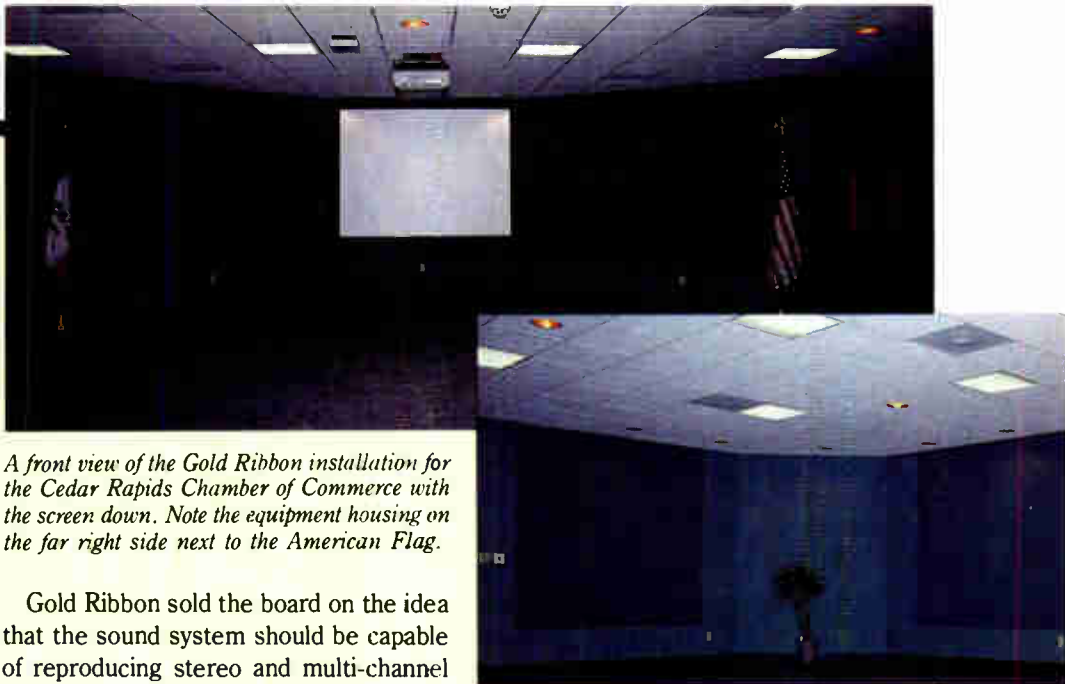
The Cedar Rapids Chamber of Commerce was one of Gold Ribbon's first big installs using their newly developed SoundWalls, and it says as much about the company's sales techniques as about their philosophy of audio system engineering.

Gold Ribbon had always striven to maintain a high profile locally by performing installations in the area and cultivating ties with the local university, and over the years the company had built up a reputation both for technical innovation and wide ranging expertise in audio electronics. A number of influential businessmen had been sold Gold Ribbon domestic systems, among them Don Hattery, a principal in Schive-Hattery Engineers and Architects, Inc., a prominent local design firm. Hattery sat on the board of the Cedar Rapids Chamber of Commerce, and he managed to persuade the members to hire his firm to renovate the board room. Hattery, of course, was favorably disposed toward Gold Ribbons and agreed to help pitch the SoundWalls as a component in his renovations.

The Board was persuaded that a new A/V system was in order, but the project had to go out to bid, and Gold Ribbon faced several competitors, among them, Pratt Audio Video, a firm with far more experience, and known nation wide.

Nevertheless, Gold Ribbon had one significant edge in installation. Whereas competing firms could only spec out systems and showcase whatever installations happened to be in the area, Gold Ribbon was local and had optimally set-up demonstration facilities within calling distance. The demonstration was the clincher, and Gold Ribbon won the bid.

The board room, even after extensive renovation, proved a real challenge. The room is cavernous, 10 sided, and wider than it is long — about as irregular a shape as one is likely to find. On the plus side, the room does not support standing waves, but on the other hand, unorthodox strategies were called for in positioning speakers.




*A front view of the Gold Ribbon installation for the Cedar Rapids Chamber of Commerce with the screen down. Note the equipment housing on the far right side next to the American Flag.*

Gold Ribbon sold the board on the idea that the sound system should be capable of reproducing stereo and multi-channel sound, and eventually hit upon a speaker arrangement that provided uniform coverage as well as good stereo across a wide range of listening positions.

The projection screen, a Stewart VM-120A12B with black expanded backdrop, was placed along the narrow front wall behind the speaker's rostrum, while the two stereo SoundWalls were positioned at ends of the short diagonal walls flanking the front walls. The SoundWalls crossfire at an angle of roughly 45 degrees, and since polar coverage is less than 3 dB down at 40 degrees from 30 Hz to 10 kHz, almost everyone in the audience is treated to strongly defined stereo. The rest of the diagonal wall surfaces are covered with acoustic panels to inhibit the buildup of corner resonances.

Sidewalls get a pair of SoundWalls in the middle, and a pair of acoustic panels flanking the speakers. The long back wall gets a single pair of SoundWalls and a single pair of acoustical panels in the corners. Altogether eight SoundWalls and ten acoustical panels are used. Signal sources consist of a Panasonic S-VHS videocassette recorder and a Pioneer CLD-3070 laserdisc player with Y/C video outputs. A Sony 1042Q front projection video monitor reproduces video as well as computer graphics. A Proton surround sound decoder is used to distribute the audio output among the eight speakers. This unit is capable of reproducing Dolby surround encoded tracks at high separation and is also capable of synthesizing surround effects from monophonic and stereophonic sources. The unit supports up to six speaker outputs which was why it was chosen for this application (parallel feeds were taken from the left and right side channel outputs).



*A rear stage right view of the rear speakers and side speakers of the Gold Ribbon Installation for the Cedar Rapids Chamber of Commerce.*

Also included in the system is a VM-120A12B Stewart screen, a Shure LS23/58 microphone, and a Shure M267 mixer.

Total equipment cost for the job was approximately 30K. Actual equipment sales were handled by Trade Show Audio-Video Services, Gold Ribbon's local distributor. Gold Ribbon worked closely with the architectural firm during the course of the installation—a necessity because the room's ceiling was raised, considerably affecting the room's acoustics.

The finished installation is semi-concealed. Both the SoundWalls and the acoustical damping panels are covered in fabric that has been color matched to drapes and carpeting, and the panels themselves are flush-mounted to the walls. Control electronics are mounted in an unobtrusive cabinet located along a short wall at the front of the room to the right of the recessed area containing the rostrum and the pull-down screen.

The Cedar Rapids Chamber of Commerce installation figures prominently in Gold Ribbon's portfolio, but it is somewhat atypical due to the relatively large number of speakers and damping panels required, and the use of Dolby stereo logic decoder rather than the Ambisonics equipment the firm uses today. "At the time we constructed the system, we were still experimenting with Ambisonics," explains Steve Spencer, now Sales Engineer for the company. "The Proton unit worked very well in this application, and its only real limitation was its use of RCA rather than balanced outputs." ■

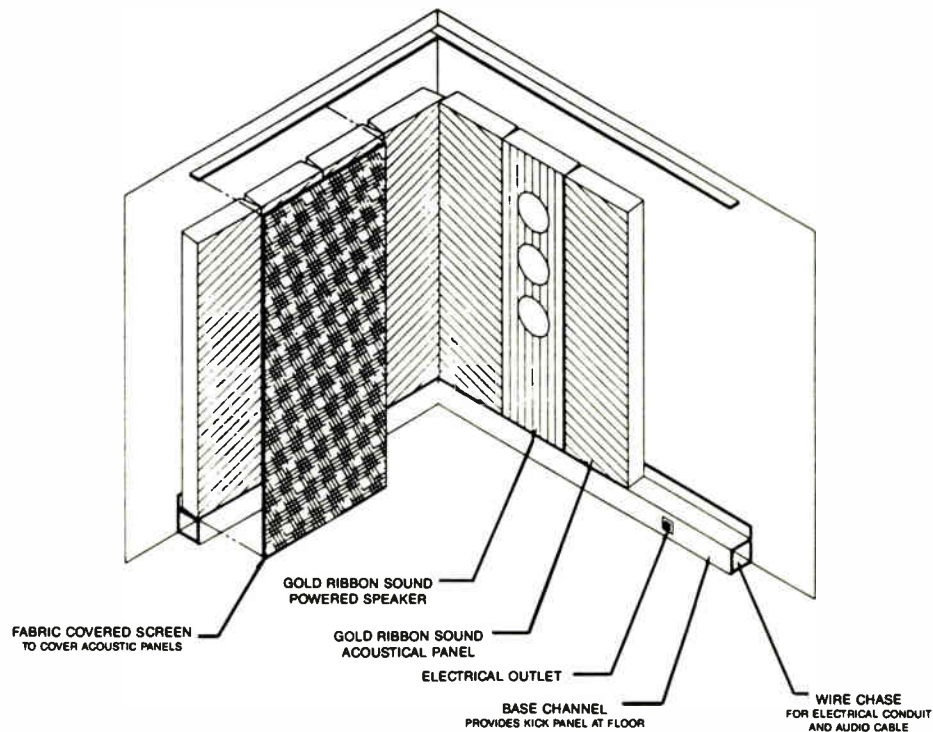
most of the design work.

Over the next two years, the new company managed to sell many hundreds of ribbon panels, and also made some limited production runs of assembled systems aimed at the esoteric home market. But the production cost of the latter proved too high to permit a profitable business, and most of Gold Ribbon's sales were within the home construction market.

Realizing the limitations of cultivating a consumer market based on an \$800 driver, the Gold Ribbon principals sought to find a niche in the emerging home custom installation market, and later in public address applications in settings such as hotels, churches, and concert halls. But the low efficiency and narrow dispersion of the ribbon limited its use in such applications, and reluctantly company management faced the fact that their baby was simply not suitable for sound reinforcement, and far too costly even if it had been. A manufacturing crisis settled the issue absolutely. Gold Ribbons' vapor deposition facilities became inoperable for almost a year which meant that no new ribbons could be manufactured during that time. Suddenly the company had no product to sell.

### CHANGE OF DIRECTION

In the meantime Gold Ribbon Concepts pursued new financing and managed to acquire additional financial backers. The new board of directors brought in Tom Simon, the current president, who formulated a new direction for the company both in R & D and in marketing. Simon decided that the public address market was fundamentally right for the company, and envisioned a specialized niche encompassing board room and lecture hall installations as well as temporary trade show setups. Instead of the high efficiency horn and reflex systems generally used in public address, the company would offer speaker systems which more closely approximated the sound quality of domestic high fidelity while retaining the closely controlled directivity essential in public address applications. Simon had reviewed the previous experience of the company in attempting



to sell ribbon drivers in the professional market, and decided to use the ribbon as a reference in designing the new speaker system. "Everyone who ever heard the ribbons was impressed, but not many wanted to pay for the Rowland Research amps needed to reach the ribbon's potential. We decided to try to emulate that sound using more conventional drivers."

Simon also elected to keep the Gold Ribbon references in the company name. "We have a loyal following of ribbon owners, and we still make ribbons on a limited basis," explains Simon. "We wanted to assure our previous customers that we still supported the product, and we think the association with the ribbon is valuable. There are still a lot of people who happen to think it's the world's most accurate loudspeaker."

Simon had confidence in Alan Hulsebus's engineering abilities and directed him to design the speakers which would replace the ribbon for professional applications. What the company eventually came up with to emulate the Gold was a modular speaker system called a SoundWall. Each SoundWall utilizes a coaxial pair of speakers — one 12-inch woofer and a horn-loaded, 1-inch dome — and a pair of 12-inch passive radiators. The drivers are mounted in a tall narrow panel measuring 92 by 24 by 7 inches. The base of the panel contains a 200-watt monophonic amplifier to power the drivers, and a channel for concealing cable connections. Each sound wall weighs approximately 65 pounds. The company claims a peak output of 115 dB at one meter.

In order to contact the acoustical environment where the speakers are used, the company also developed a sound absorbent acoustic panel of the same dimensions but half the weight. Normally each SoundWall speaker is flanked by two acoustic panels, but the panels are not attached to the speakers, and may be used independently to damp room resonance.

Gold Ribbons also makes graphic panels with interior fluorescent lights for illuminating color transparencies.

SoundWalls and accessory acoustic panels are highly portable, and Simon claims that the company can set up most rooms for a demonstration in as little as 30 minutes. The panels take up negligible floor space and are covered in designer fabrics, which make them considerably less intrusive than traditional bulky high efficiency public address speakers.

But what makes the Gold Ribbons system truly distinctive is the Ambisonics decoder which the company recommends for multi-speaker installations.

Ambisonics, for those whose memories of the quad era have grown mercifully dim, is a multi-channel format (not strictly four channel) which surfaced in the late seventies when the quad formats were expiring, and has lingered on, principally in Great Britain, up to the present day. Steve Spencer, who had considerable experience with Dolby surround sound in custom home installations, heard Ambisonics demonstrated in 1989 and felt that the system produced more convincing spatial effects than other multi-channel formats,

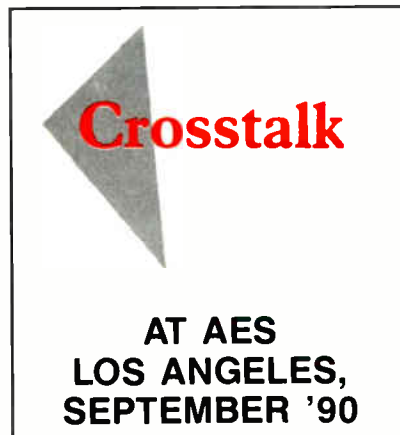
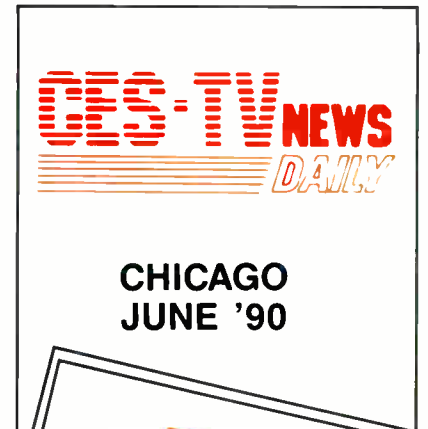
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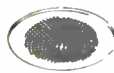
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# Rack Report

## *New Looks, New Uses*

BY RICHARD J. GRULA

Imagine two cars, both of which can take you from Point A to Point B. One is a boxy, all-gray affair with lumpy seats, minimum power and nothing in the dash except a speedometer and a gas gauge. A total utility vehicle. The other is an ultra-sharp, custom-colored job with hand-tooled leather interior, every accessory imaginable and a monster-engine purring under the hood. The ultimate driving machine.

Which key do you want?

In many ways, this is the question facing purchasers of rack enclosures. They can opt for the traditional — dull gray assemblies with little more than two strips of metal 19 inches apart — or they can step into the world of stylish custom racks designed to their specs and loaded with all required accessories. As cost differences between the custom and standard get smaller and smaller, the choice becomes less and less difficult.

### THE CHANGING RACK SCENE

“The custom rack market now outnumbers the standard rack market 4 to 1,” estimates Bill DeRoche, national sales manager of Bud Industries, Inc. Ten years ago, the numbers were reversed because custom racks were expensive, one-of-a-kind items. As DeRoche points out, “Back then, there might be 25 or 30 metal fabricators in any given city and they would act as small job shops, making two or five or 10 cabinets for a customer.”

Reasons for the custom rack explosion are twofold — demand and availability, both of which have increased. On one hand, more racks are located in more visually sensitive areas — boardrooms, conference facilities, high-exposure performance

venues and the like. End users in such locations demand cosmetically handsome enclosures with custom finishes, edge trims and even corporate logos to suit the given environment.

On the other hand, as manufacturers increase product lines of racks, accessories and finishes, the availability of custom racks make them easier to create and more affordable. Now, it's more a matter of finding the proper suppliers for what you

### **You don't want 75 screws sticking out each side.**

want and assembling their pieces into the system you need. You don't have to start from scratch every time. As Bob Reim, president of Acromedia, explains, “We hate to reinvent the wheel. If you're going to do fancy things, racks are like giant erector sets. The pieces are modular in nature. They all just have to be bolted up and when done properly, they look great.”

### COSMETICS AND ACCESSORIES

“You're seeing a division between the visible and invisible,” explains Herb Jaffe, vice president for marketing at Atlas/Soundolier. “Certain rack locations are purely utilitarian. Others have a visual exposure, and with that comes styling, finish and user ergonomics. But even with the utility racks, you don't want 75 screws sticking out each side — you want clean lines, some color and finish.”

Cosmetic and functional accessories are now common on most racks. When heat-producing equipment is installed, fans —

top-mount, bottom-mount, rear mount and single-rack space horizontal fans and others — are the rule. Front doors, be they security gates/cages or smoked plexiglas panels, are very popular, as are accessory drawers, dummy front panels and vents with black anodized aluminum finish that blends in with equipment. The actual racks also come in an array of configurations to handle different-sized equipment, including adjustable rear racks to support heavy gear and moveable front racks to accommodate 19-inch and 24-inch wide items.

“We're seeing a lot more angled mountings for video monitors and things of that nature,” says Atlas/Soundolier's Herb Jaffe. “Very tall racks with sitting positions and video monitors mounted in wedges pointing down to the floor, way above what used to be the standard top. Like in FAA control towers. That's a new trend. It's also in recording studios, because engineers don't want the visual monitor to their side. They want to be able to focus on what's in front of them and just raise their eyes to see the monitor.”

Jaffe also cites the popularity of cosmetic edge trims, meters and illuminated front panels “anywhere where equipment is in audience view. Not just Vegas showrooms, but also in much smaller venues where the control area is within the audience area.”

“We're matching colors constantly,” reports Ed Cunningham, administrative and technical sales manager of Bud Industries, Inc. “Lots of whites, reds and blues, IBM Blue two-tone racks. We also silk-screen a lot of corporate logos onto racks.”

Even the lowly rack shelf has gotten a cosmetic facelift, thanks to Middle Atlan-

tic Industries. Making use of their extensive machining facilities, Middle Atlantic's Custom Rack Shelf combines a rack shelf with a black anodized aluminum front panel custom cut to contractor's spec that fits precisely around the face of non-rack-mount equipment.

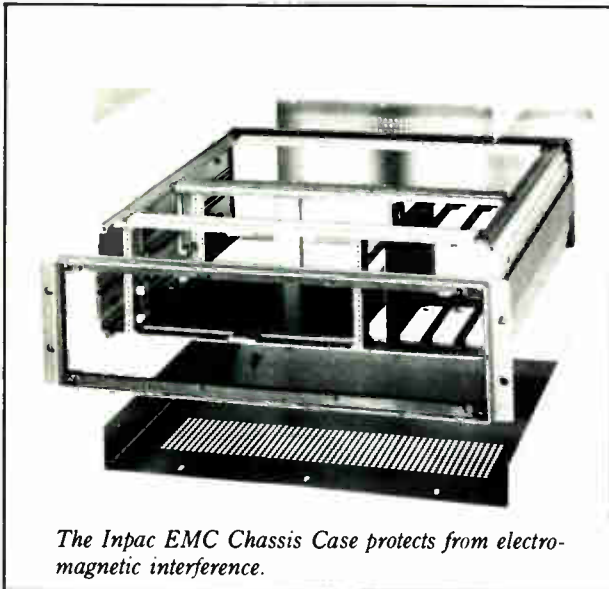
'A typical contractor could rig something like this into place,' says Bob

Schluter, owner of Middle Atlantic Products. 'But if somebody's got to sit there with a jigsaw and a file trying to cut this out, it's not going to look as nice as what we can do on our machinery. Our shelf is going to come out perfect and it'll cost about half what it would cost a contractor to do it himself.'

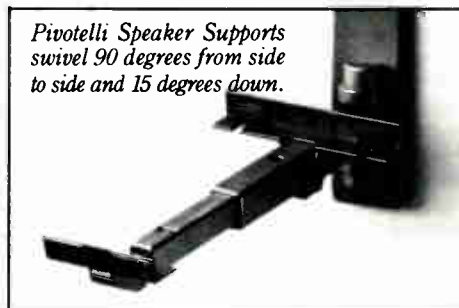
Schluter claims the shelf can also save

money on the job. 'Let's say you had a choice between using a rack-mount cassette deck that costs \$450 and a consumer deck that gives the same performance for \$150. A contractor can go with the non-rack mount consumer deck and our shelf and probably save 40 percent on the entire price. Plus, if there's a field service problem, they can go in with another

## Racks, Panels, Enclosures: The Options Proliferate



*The Inpac EMC Chassis Case protects from electromagnetic interference.*



*Pivotelli Speaker Supports swivel 90 degrees from side to side and 15 degrees down.*



*Middle Atlantic Products' custom RSH-4A is designed for attractive appearance.*



*The Omnimount System allows CCTV cameras to be mounted.*



*The Atlas/Soundolier Series IV enclosure system for various applications.*

consumer deck and switch it on the job-site, rather than yank out the rack deck and worry about replacing it.

### NEW STANDARDS

Several contractors have designed new *standard* rack enclosures which automatically incorporate certain popular features. The Acromedia rack, which Bob Reim estimates is used for 85 percent of all Acromedia jobs, is one such unit. This six-foot high enclosure has all-welded construction, a slightly deeper frame, a sub-

### We're seeing a lot more angled mountings for video monitors.

rail assembly in the rear of the rack to support heavy components, to hang cable bundles and other functions, internal service light, multiple wire-strip molds and a power system whose features depend on the requirements of the rack.

In addition, all the faceplate designations are engraved nameplates or engraved directly onto the component. And every rack that gets an Acromedia nameplate also gets a rack designation number. Any service person can use this designation number to identify the rack.

"We document all our jobs very highly and keep that information," says Reim. "If

### We can go to our library, pull out that vellum, print a sheet and send it to him.

somebody calls up three years later and says, 'I'm at So & So job in front of rack 32, what the hell do I have here?' We can go to our library, pull out that vellum, print a sheet and send it to him."

Because Acromedia engineers are so familiar with the Acromedia rack, it takes less time to construct systems with it. Reim uses this fact to sell Acromedia racks when other manufacturer's components

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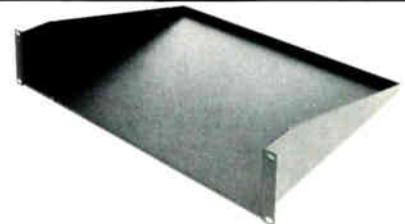


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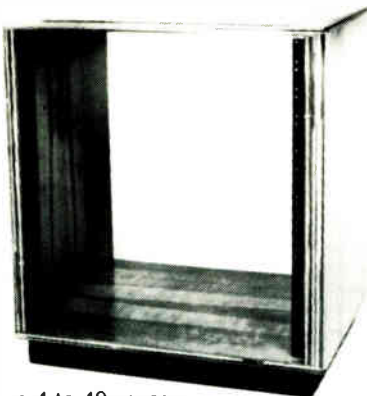
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are specified. Says Reim, "I go to the consultant and say, 'I'd like to offer the Acromedia for the following reasons. Within that timeframe, our rack costs a little more than what was specified, but we'll offset that cost because of the efficiency in building it. We can build with our rack faster and better than with other systems. It'll cost \$75 more to use our racks, but we'll save that \$75 in labor, so it's a wash.' Most of the times, our clients go along with it."

**Though the defense industry, with its need to keep foreign agents from listening to computers, was the first client to require this level of shielding, it was soon requested by private industry as well.**

Even rack construction methods and materials are being upgraded. Elkay Industries has just introduced a line of racks which use square tubular steel, rather than formed steel. The process is less complicated than what's required with formed steel and results in a less expensive enclosure which leaves a smaller footprint — 21-inches wide as opposed to 22 inches or 23 inches.

Since the Elkay enclosures are modular with removable tops and sides, they can be grouped together in bays using only two side panels, which can easily have a contrasting finish to the frame.

Says Elkay Industries president Paul Grote, "We can provide the contractor with the mechanical things he'd like to have and some extremely nice esthetics all in a price range that a guy usually pays for a meat and potatoes type of cabinet."

## ADVANCED RACKS

As computers and high tech gear go on the floors of many factories, Hoffman Industries has created the dust-proof water-resistant Design Enclosure Line, rated NEMA 12. These modular enclosures have capabilities for both 19-inch and 24-inch equipment, built-in accessory drawers, removeable sides and doors and fully adjustable racks. Plus, every opening is gasketed and sealed to protect components from dust, oil, atomized water and whatever else might be sloshing around the site. For cooling, Hoffman has a line of small air conditioners which bolt right on the side of the rack. They too are sealed, which maintains the NEMA 12 integrity.

Willing to take on anything from earthquakes to the most severe EMI/RFI interference, the Equipto Electronics Corporation is pushing rack capabilities to the farthest edge. Their standard heavy-duty rack meets MIL-STT810D tests for shock and vibrations which, as Kent Jarnig, company director of sales and marketing explains, means "you can bolt one of our racks into the back of a truck and drive around for 20 years" without damage to the rack.

For EMI/RFI protection, Equipto Electronics can upgrade their heavy duty rack to the Tempest Level. Though the defense industry, with its need to keep foreign agents from listening to computers, was the first client to require this level of shielding, it was soon requested by private industry as well.

"The next phase was computers on factory floors," says Jarnig. "Every time you fired the arc welder, you fried your computer. We have one customer who's an elevator company. Every time the elevator went by, the electromagnetic impulses were frying all the PCs up and down the building, floor by floor. It was like a broadcasting antenna."

Though less demanding EMI/RFI protection often uses a reflective paint sprayed inside the rack, Equipto Electronics seals every opening in their units with a mesh of beryllium copper and silver-coated com-



pression gaskets.

Hoffman's most recent innovation is a seismic hardening kit which can be retrofitted onto their racks. "The primary problem with racks in a quake is they fall over," says Jarnig. "But the second problem is that they break apart. If you've got telephone communications in there and it breaks, you snap all your cables and lose your contacts. Chop off 50,000 wires and it takes a while to get them back together."

With Equipto's seismic hardening kit,

**Put it through a Level 10 or whatever end-of-the-world thing and it'll still stand.**

Jarnig says, "We beef up the base and the frame work connects with additional, heavier bolts. We put in some triangular pieces of metal in the corner so the welds won't break and then we add an L channel in the front and rear so the rack can be bolted to the floor."

"We originally figured our heavy duty rack could pass the seismic test without hardening," continues Jarnig. "Until we went to test and actually sheared the rack off its base. The seismic test is only 30 seconds, but it's violent. It's on a moving platform and it slams left right left right like you'd run into in an earthquake. With the various parts we've added, it allows our heavy duty cabinets to withstand that kind of shock. Right now, you could bolt on to a fault line and put it through a Level 10 or whatever end-of-the-world thing and it'll still stand."

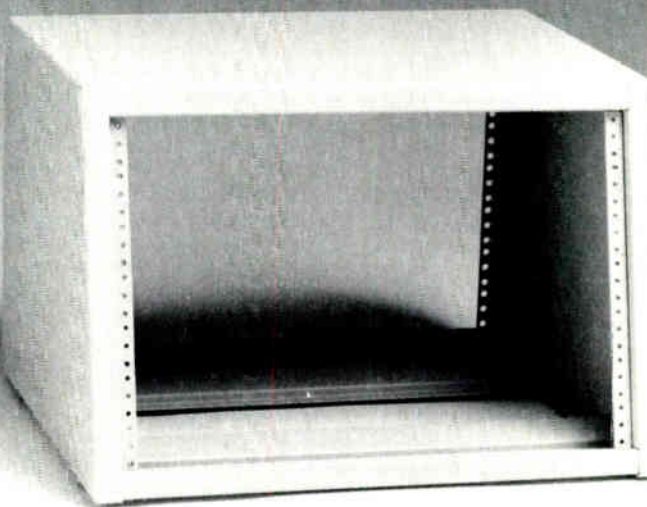
With the recent San Fran quake still fresh in people's mind, it's not surprising to hear Jarnig say of seismic-tested racks, "We see it as a critical, up and coming area. Anyone who has computers, communications or test equipment in a seismic area has to find a way to bolt these things down and withstand the shock or make the decision that if they lose it, it doesn't matter." ■



*Equipto Electronics Corporation products in use at NASA.*

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# Installation Profiles:

## *Equestrian Center's Sound & Intercom System*

BY RALPH NANTAIS

**W**hile the staff at Huntington Central Park Equestrian Center may not be able to talk to the animals, a new intercom system is helping them communicate better with each other.

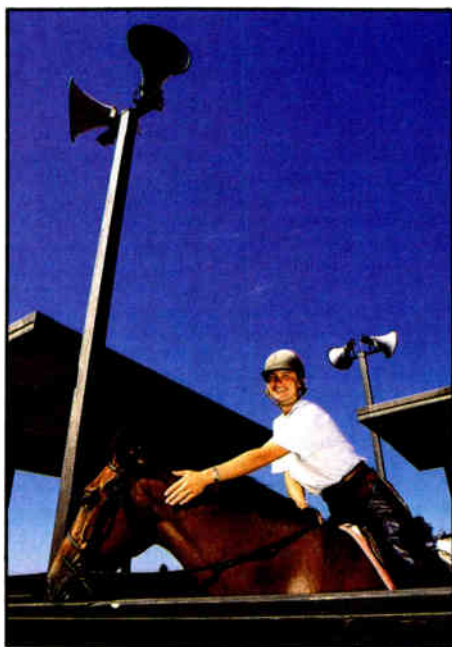
If you think a stable is not the best place to look for a communications system, think again. Huntington Central Park, in Huntington Beach, California, is a 25-acre facility that is rented to horse show managers about six times a year. Its three separate public address and intercom systems are put to several uses, from announcing to instructing.

During the hectic last few minutes before a show begins, the manager relies on that system to make sure everything comes off smoothly. He may need to call the front office for information on last minute entrants. And he must page the warm-up areas to alert participants of their order in the show.

At show time, announcers use three separate systems in the arenas to introduce the riders and their noble animals to the audience and judges.

Huntington Central Park's requirements for a sound and communications system presented some unusual challenges. The existing system consisted of small, portable loudspeakers and microphones. It was unable to deliver the sound quality desired by show managers, and did not permit two-way communication between the arenas, warm-up areas and offices.

To meet the high quality standards of first-class horse shows, the new system

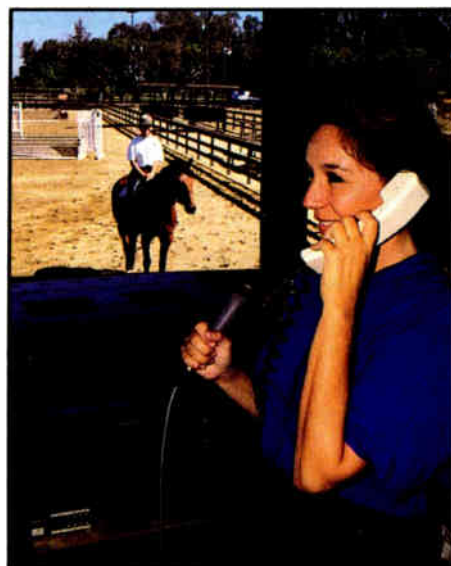


*Horses and riders await the call to perform from staging areas outside the arenas.*

had to provide high volume and superior sound "clarity." But it had to do it with a minimum number of loudspeakers in order to preserve the aesthetics of the center.

The constant heat and dust, especially in outdoor areas, brought up other special considerations. Dust could get into the controls and cause them to work improperly. And, if left out in the heat and dust too long, the internal components may also begin to malfunction.

Because of these considerations, all equipment would have to be ruggedly constructed and removable. The staff at



*Mary Harris, curator of the Huntington Central Park Equestrian Center, the Aiphone paging and intercom system as she call for confirmation of the next show participant prior to announcement.*

Huntington Central Park wanted to be able to cover and store the equipment indoors to protect it from the elements and vandalism, so portability was a must.

The Park hosts only about six shows a year, which presented another challenge. With each manager using the system very infrequently, the center needed an easy operating system that required little training.

Huntington Central Park was referred to NEI Communications by Computronix, a local computer company that specializes in military specification products. NEI recommended Aiphone's YAZ-90-3 inter-

com paging system, combined with customized Atlas AP-30T horns and public address amplifiers by Computronix. The YAZ system; it was felt, dollar-for-dollar, had the most features.

The intercom required minimum wiring — just four pairs looped from station to station — and wiring was installed underground.

The telephone-type system works for both two-way and one-way communication. The phones have three private communication channels, which allow show managers to talk to each other or the office, as needed. The electret-type transmitters, which provide full bandwidth, provided for paging.

Arranging the loudspeakers required a little more creativity. The three show arenas vary in size, up to 110 feet by 260 feet. In order for the sound to reach riders from 125 feet, and be directional enough to not overlap between arenas, a long throw horn was required. NEI installed two Atlas DR-42 horns with PT-60 drivers in the center on an 18-foot steel post.

HUNTINGTON CENTRAL PARK EQUESTRIAN CENTER		
Equipment List		
Quantity	Description	Size
12	steel poles	20'x4'x4''
620'	aluminum conduit	1''
4	pull boxes	12''x12''x4''
10	bell boxes with cover and gaskets	4'x4'x3''
4	Soundolier 600-12 cabinets	
1	Aiphone PS-24n power supply	
1	Aiphone YAW-RA zone paging amplifier	
4	Aiphone YAZ-90 intercom phones	
4	Amphenol 8 pin receptacles	
4	Amphenol 8 pin plugs	
4	Neutrik N3F microphone receptacles	
1	Astatic 983 uni-directional microphones	
3	Computronix ST-200T amplifier	
4	Computronix ST-125 amplifiers	
2	Computronix PR-2 preamplifiers	
3	Atlas APR 30T horns	
8	Atlas AP-15T horns	21''
12	Atlas DR-42 horns	
3	Atlas PT-60T drivers	
4	NEI speaker platforms	
300'	Atlas BIA-100 horns	
2,000'	West Penn #3653 intercom cable	
	General Cable 14-2 UF wire	

Posts also were set on the outside of the arena's perimeter fence. This arrangement not only met sound requirements, but also would not endanger riders performing in the arena.

The announcers' booths are approximately 125 feet from the loudspeaker system. The distance caused a two-second time delay which can be very disorienting to an announcer, who hears his amplified voice two seconds later than his actual voice. To correct this problem, a small monitor speaker was installed in each booth directly behind the announcer's microphone. Now the person speaking could hear his amplified voice immediately.

The hunt course, a large area used for jumping, also required a loudspeaker. Since the area is twice as long as it is wide, Atlas BIA-100 wide angle horns with PD-60 drivers provided very complete coverage and clarity, despite the outdoor acoustics.

The complete system meets the special communications needs of a large equestrian center. Managers communicate pre-show preparations and changes efficiently. Spectators and show judges hear the announcements and introductions of horses and riders without distortion. And all this is done without disturbing the atmosphere of rural gentility.

## Audio For Military Colors

BY DANIEL LECKIE

If you have ever been on a military base at 8 AM or 5 PM, you've taken part in the traditional military ceremony — Colors — the formal raising or lowering of the United States Flag to the sound of the National Anthem while everyone outdoors makes an appropriate salute.

Throughout the major traffic areas of the base, when the call to colors sounds, people outside stop walking, stop their cars, stop whatever they are doing, face the flag and salute.

How do they know when to do this? An outdoor sound system tells you. These systems are used mainly for bugle calls — Reveille, mess call, Colors, Taps, etc. These calls are used to help maintain military tradition, schedules, and discipline. Colors, for example, must be observed appropriately by everyone on the

base who is outdoors and within earshot of the bugle call.

The area of Naval Air Station Atlanta that is covered by the public address system is a rectangle about 100 yards wide and one mile long. Within this area, military and civilian personnel can hear the bugle calls because of the efforts of Petty Officer Earl Mabe and the men who work with him. Electronics Technician First Class (E6) Mabe was trained in electronics technology by the Navy and has 14 years of maintenance experience in a variety of electronics systems. He was transferred to NAS Atlanta, Marietta, Georgia a little over a year ago. He determined that an update and upgrade of the PA system was in order, particularly for the horns and cable, which were severely weathered.

Petty Officer Mabe did a little research

to determine precise needs and availability of replacements. He chose a Grommes-Precision model G252B 250 watt biamp for the output power amplifier. This would nicely match the Grommes-Precision



Training building speaker. Some of the cables shown are for the PA system.

model G5TA mixer he already had. For the horns he chose Atlas model DR42 round, fiberglass bells with Atlas model PD5VT 40 watt drivers. He used 70.7 volt transformers at each horn to control tapped power and match the load to the output of the amplifier.

The old horns had been mounted on building roofs along the main street of the base, Halsey Street. Petty Officer Mabe and his crew of reservists used these brackets to mount the new horns. He ran a double run of Belden 8760 shielded cable along the street, using the same cable support points as had been used for the previous cable. He ran one of the cables to the four horns on the left side of the side of the street and the other cable to the four horns on the right side of the street. He connected the cables to the amp in a left/right biamp configuration of 125 watts per channel.

His extensive sea duty experience

taught him to take special care to protect against corrosion. Therefore, he completely covered each connection with RTV sealant. This included connections made at junctions along the line. In addition, each line junction was wrapped in tape (Scotch 33) and placed inside a double gang electrical box which was also sealed with RTV. These cable runs required about 2,500 feet of cable.

Since these bugle calls are used seven days a week, the audio signal comes from a small cassette player in the base duty office. The main system is always on, and the duty petty officer of the watch plays the appropriate tape at the appropriate time. This signal is fed along telephone lines from the administration building to the main hangar where the mixer and amplifier are installed. There it is fed through a matching transformer into the mixer. The volume level is set at the mixer and cannot be changed at the duty office.

Of course, the system could be used for announcements or emergency instructions, if necessary.

Petty Officer Mabe purchased some of this equipment through the Navy stock system and the rest on open purchase from a local civilian supplier.

The equipment was installed, and is maintained, by Petty Officer Mabe and his reserve crew of six. They have the tools, the test equipment and the service information in their shop.

In the future, new lines will be extended to facilities now under construction. No additional amplifier will have to be purchased as there is ample capacity in the present amplifier for the additional load requirements.

As base PA systems go, there are many that are larger, but none more conscientiously maintained than that of NAS Atlanta.

## *New Michigan State Arena*

BY KEITH CLARK

**B**uilt at a cost of more than \$40 million, the recently opened Jack Breslin Student Events Center on the campus of Michigan State University in East Lansing, Michigan, is a multi-purpose facility playing host to numerous events, including basketball games, concerts and conventions. While boasting a seating capacity of 15,100, the main arena offers unobstructed views from every seat, with the farthest upper-deck seat being only 127 feet from the edge of the main floor.

With four 1,000-square-foot meeting rooms, an auxiliary gymnasium and administrative offices, the Breslin Center facility totals 263,000 square feet. The main arena has three levels, with the ceiling 100 feet above the floor.

The audio system was installed by Sound



*Keith Clark is Public Relations Director for Electro-Voice in Buchanan, MI.*

*The Breslin Center's audio system was installed by Sound Engineering and speced by Coffeen Fricke and Associates, Inc.*

Engineering, Livonia, Michigan, and specified by Coffeen Fricke and Associates, Inc., Lenexa, Kansas.

In the main arena, the combination of the effectively designed audio system as well as architectural considerations provides acoustics of a much smaller room. For example, acoustic pads covering the entire ceiling help keep reverb time to 1.5 seconds.

Electro-Voice speakers are used throughout the arena and meeting rooms. The entire system is designed to be patched, to allow greater flexibility. The ADC custom patch bays are located in the sound booth for the system. The booth, located on the mezzanine level, can be stored at the push of a button. It is built on an electronically controlled track, allowing it to be moved beneath the seating area, where an aluminum door closes in front of it, protecting the unit when it's not in use.

The main mixing console for the system, located in the booth, is a Yamaha PM 1800-32 unit, with digital delay controlled by a program from Innovative Electronic Design (IED) of Louisville, Kentucky. The delay system can be altered depending on the event and desired effects.

Twenty racks of electronic components are required for the main system, with an additional four racks for the meeting room systems. The racks are on a motor start relay system to prevent current overload. Racks for the main system are located in a storage room on the floor level of the arena; racks for the meeting rooms are positioned in easily accessible areas.

The central speaker cluster in the main arena is made up of eight Electro-Voice HP6040 and 10 HP9040 horns, powered by E-V DH1A drivers, for the high end. Low frequency support is provided by eight TL606DX cabinets, which include the 15-inch woofers each.

The cluster is located on a track which allows it to be moved, via a customized control unit located in the sound booth, toward either end of the arena, as well as toward one side. It can also be set to two different operating heights. The cluster's mobility allows versatility in configurations for various events.

Twenty-six satellite speaker clusters, suspended throughout the arena from the ceiling, are each made up of three E-V HP940 horns powered by DH1A drivers, with the low frequency supplied by E-V TL606AX cabinets, containing a 15-inch woofer. Both the components in the central and satellite speaker clusters are painted a custom gray color in accordance with architectural specifications.

Additional audio support in the main arena comes from Electro-Voice PRO-8AT30 speakers, installed in the floor of the upper balcony section, providing sound reinforcement to the mezzanine seating and walkways. The speakers are imbedded every seven feet, completely around the outer rim of the mezzanine level.

In the enclosed concourse surrounding the arena, E-V Musicaster 100 speakers are mounted above a ledge at intervals of sixteen feet. They are tilted at a downward angle.

The meeting rooms, which have several microphone and input jacks, feature E-V PRO-8AT30 speakers mounted in the ceiling every seven feet, for uniform acoustic coverage. The press room of the facility also features a similar audio setup, and both rooms are operated through an automatic mixer.

Microphone and input jacks are in abundance in locked boxes, located throughout the lower level behind the seating areas. They are accessible via cables which can be run through holes drilled directly above the boxes. The holes, big enough to accommodate several snakes, are covered by metal screw-on lids when not in use. This feature adds to the system's versatility, with the mic and input jacks located within a reasonable distance for any kind of event and configuration imaginable.

A small, portable system is also available to be set up for events not requiring a great deal of sound reinforcement. The

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## EQUIPMENT LIST FOR BRESLIN CENTER

Quantity	Manufacturer	Model #	Quantity	Manufacturer	Model #	Quantity	Manufacturer	Model
1	Aarmor	A-1 42' Case	26	Electro-Voice	TL606AX satellites	2	Telex	WLM-50
3	Aarmor	Mic Briefcase	8	Electro-Voice	TL606DX central	2	Telex	WT-50
3	Acoplan	20VDC-5amp-provide VTD15-450 per spec.	12	Hubbell	TL2-FP	1	Telex	XLR/TA4F Adapter
6	ADC	4-26790-0210	8	Hubbell	TL2-MP	1	TOA	SM25A
15	ADC	PJ-238	1	IED	4000+also provide 4450 extender cord	8	TRW	UTC-012
15	ADC	PJ-339	5	IED	4174-8C	2	TRW	UTC-A10
40	ADC	PJ-366	5	IED	4422C	1	White	4100A
51	ADC	PJ-82	5	IED	4532-12	15	White	4390
10	ADC	PJ-83	2	IED	4452C-7761-00	15	White	4391
1	ADC	QB-1	8	IED	4530	15	White	4400
1	Aiphone	QX-1200	1	IED	4530	2	White	4433
1	Aiphone	RMK-1200	1	IED	5000	2	White	4434
6	Alco	C23(red)	4	IED	5032-12	1	White	Knob Insert (Blue)
6	Alco	G13KC	1	IED	5088C1	1	White	Knob Insert (Red)
6	Alco	MPA-106F	12	IED	5104	12	Wireworks	'D' series connectors
6	Alco	MTF	6	IED	516	3	Wireworks	Loop Adapters
10	Alco	MTF	1	IED	516M	3	Wireworks	MBDX-19-2
1	Allen Bradley	JA1N200P102AA (1K)	10	IED	5201 S	3	Wireworks	MK19-100-1
10	Allen Bradley	JA1N200P103AA (10A)	8	IED	5202	3	Wireworks	MK19-25-1
6	Atlas	AD-12B	1	IED	5252	1	Wireworks	TE-3 32 Yamaha IT-1800
7	Atlas	AD-15B	1	IED	532	1	Yamaha	M406
2	Atlas	AD-4B	2	IED	5401	2	Yamaha	M512
6	Atlas	AD-5B	3	IED	5728	1	Yamaha	PM1800-32
4	Atlas	AD-6B	2	IED	5752	78	Soundolier	M-4806 as modified
6	Atlas	AD-8B	1	IED	5761	24	Soundolier	RWL-1
10	Atlas	DS-7	1	IED	590D	26	Soundolier	S19-1
2	Atlas	GN-13	4	IED	596	1	Soundolier	S19-10
2	Atlas	GN-19	1	IED	Software Manual	1	Soundolier	S19-14
9	Atlas	GN-6	1	IED	1E20B	1	Soundolier	S19-17
4	Atlas	M8-12C Tube	1	IVIE	1E65	102	Soundolier	S19-7
4	Atlas	M8-25	1	IVIE	1E65	29	Soundolier	SVP19-3
13	Audio Digital	ADD-3	27	Jensen	JE11-DCMF	3	Soundolier	SH19-7
96	Audio Technica	AT8314-25	27	Jensen	JE11P-1	11	Soundolier	HX-21B
40	Audio Technica	AT8314-50	1	Lemo	Connector	64	Soundolier	2 Gang S.S. Plate
1	Beyer	DT100.07WK	12	Littlelite	L3/18	1	Soundolier	1 Gang S.S. Plate
20	Beyer	SCH211/2	10	Lowell	10LC2	10	Soundolier	4 Gang S.S. Plate
20	Beyer	ST201A/2	1	Lowell	35LC2	1	Steelcase	Cabinet
20	Beyer	ST220	1	Lowell	35LC2-RM	2	Switchcraft	05AK25
2	Blonder-Tongue	MDX-75F	12	Mallory	Duracell	2	Switchcraft	05AK84+ .206
1	Blonder-Tongue	YFM-2	2	Pamona	4408	2	Switchcraft	05AK84+A3F
40	Bussman	Fuses	24	Pamotor	4800X	2	Switchcraft	25AF25
18	Chicago Miniature	CML10380	1	Perma Power	AC strip	2	Switchcraft	25FF25
18	Chicago Miniature	6330 LED	11	Potter Brumfield	R10LEI-X4-V700	4	Switchcraft	290
1	Cinch-Jones	P312CCT Conn.	2	Potter Brumfield	KAP-14DY-24VDC	2	Switchcraft	330F1P1
1	Cinch-Jones	P312DB Conn.	13	Potter Brumfield	Relay Sockets	2	Switchcraft	345AP1
14	Crown	FFX-2 w/transformers	10	Pro Co	S14-25T with Hubbell connectors	2	Switchcraft	349AP1
4	Custom	17.5"x17.5"x3/16" plate	10	Pro Co	S14-50T with Hubbell connectors	2	Switchcraft	361AP1
12	Custom	Standoff	10	QSC	1200	2	Switchcraft	386AP1
1	Custom	50' am leg	70	QSC	1400	2	Switchcraft	387AP1
1	Custom	Center Cluster Frame	17	QSC	AT-1	2	Switchcraft	389P1
2	Custom	M512 cover	174	QSC	OT-300	2	Switchcraft	390P1
1	Custom	PM-1800 cover	173	QSC	209-7R-1800	2	Switchcraft	40DF05
1	Custom	Sound Booth	4	Scotch	A15AS	19	Switchcraft	40DF25
26	Custom	2x4x8 with pegs	4	Shure	M64A	150	Switchcraft	41212
1	Custom	Sub-cluster Frames	4	Shure	SM-10A	150	Switchcraft	A3F
6	Symetrix	501	1	Shure	PS-FL7-11	178	Switchcraft	A3M
48	Dukane	3A230	1	Sony	VL-45G	112	Switchcraft	D3M
53	Dukane	3A100	1	Sony	ND-145G	62	Switchcraft	D3F
50	Electro-Voice	313A	1	Sony	CDP-750	1	Switchcraft	NL-112B HI-D
20	Electro-Voice	70383	1	Soundolier	164-8	4	TDK	SA-60
132	Electro-Voice	AT-100	1	Soundolier	500-77	1	Teac	V-770
90	Electro-Voice	DH-1A	179	Soundolier	540-77	1	Teac	X-2000
1	Electro-Voice	DH-1A diaphragm	24	Soundolier	61-BW	1	Telex	BC-1 Charger
4	Electro-Voice	DQ-56	3	Soundolier	A19-3	4	Telex	FMR-50
4	Electro-Voice	FM1202	71	Soundolier	A19-5	2	Telex	HS-6A
18	Electro-Voice	HMK-3-mount kits	4	Soundolier	ACS-1	12	Telex	ICX1/LS
8	Electro-Voice	HP-6040 main cluster	1	Soundolier	AT-75	1	Telex	IC-4M
10	Electro-Voice	9040 main cluster	48	Soundolier	BBG-5077	2	Telex	IC-4R
72	Electro-Voice	HP-940-Satellites	8	Soundolier	C803	2	Telex	IC-SF/LS-label channels "A" & "B" instead of 1 & 2
36	Electro-Voice	Musicastrer 100	24	Soundolier	C803T87	3	Telex	IC-SR
243	Electro-Voice	PRO-8AT30	4	Soundolier	HT167	4	Telex	PH-1
40	Electro-Voice	RE-11	81	Soundolier	M-2082	10	Telex	PH-2
4	Electro-Voice	SH1512	4	Soundolier	M-2233	2	Telex	PS-2L
84	Electro-Voice	STR-tweeter protector	4	Soundolier	M-2233	5	Telex	RM-12
36	Electro-Voice	TK-60 transformers for musicaster 100	54	Telex	WHM-500 rechargables	2	Telex	WHM-500

portable system includes E-V FM-1202ER monitor systems and SH-1512ER speaker systems, as well as a Yamaha board. They are stored in the same area as the main rack system, and can easily be carted to

the main floor when needed. Additionally, more than 40 E-V RE11 microphones are available for use with the system.

Reaction to the system has been extremely positive, according to the Chuck

Oslanci of Sound Engineering. "This venue needed a lot of variety, and this system has certainly provided it," he says. "From day one, the reaction to the sound system has been extremely positive." ■

# WILL THERE BE A TEST CD IN YOUR TOOL BOX?

By Mike Klasco

**We've touched upon the use of CD test discs as signal generators. Test CDs can extend the functionality of acoustical analysis systems in a number of ways.**

Potentially the most useful aspect is to eliminate the umbilical cord between the analyzer and the sound system. After all, what is the use of paying a premium for a battery operated portable computer (instead of a desktop) in order to move freely around the seating areas of a job, if the signal generator in your portable analyzer still has to remain connected to the sound system? With a CD signal source generating the test signals you have "cut the cord."

### TEST RECORDS

Pre-recorded test signals have been around for a long time. CBS Labs, B&K, JVC, Shure and others offered test records for decades. Although most test records were intended to evaluate the characteristics of phono cartridges and turntables, the B&K QR 2011 and the CBS CTC-330 and CTC-340 were for testing the entire sound system. Unfortunately, phono cartridge response characteristics are not all that linear; their transient response is marginal as a reference source, not to mention the unpredictable factor of record wear.

Test records simply lacked the integrity needed to replace the hardware test signal generator, and their use was limited to testing cartridges and turntables.

### TEST TAPES

Test tapes have long been available from Agfa (now part of BASF), Ampex, BASF, MRL, Studer-Revox, STL, Webber, and others.

Open reel test tapes offered a greater degree of precision than test records, assuming the playback deck was recently aligned. But open reel machines are bulky, and more costly than the obvious alternative of a signal generator.

Cassette test tapes, while convenient, suffer from the inherent weakness of the cassette format. This includes funky low-end response due to head dimension/wavelength limitations of the medium, top-end rolloff due to wear, EQ and bias miscalibrations, head misalignment, etc. Cassette test tapes as a signal source for sound system testing was not a viable solution.

### SIGNAL GENERATORS

Normally, a signal generator is used as a source for test signals. For field use, inexpensive sine wave generators are available for less than \$100. One such device is available from Fordham Electronics and a quicky review of this and similar devices is planned for an upcoming issue. Function generators for about \$150 to \$250 with sweep capabilities are available from mail order houses such as Mouser Electronics, Anasco, MCM, Transcat and others, although the signal purity is only fair (harmonic distortion is commonly over 1% on these devices). A popular low distortion (less than .3%) multi-function signal generator is the Loftech TS-1 manufactured and distributed by Gold Line. Aside from its sine wave oscillator capabilities, it is also a frequen-

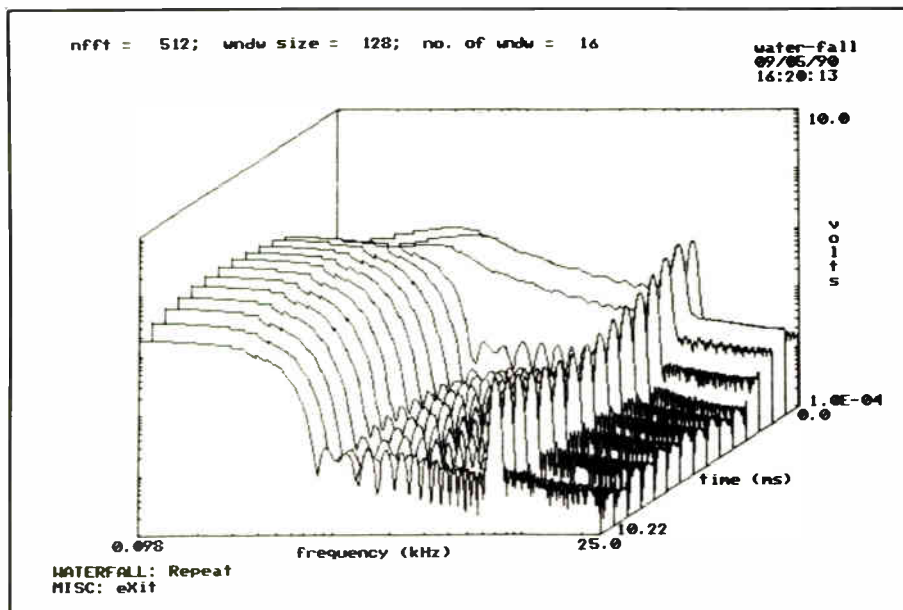
cy counter and dB/AC voltmeter for \$350.

For lab use I use a Wavetek function generator, which is a more sophisticated instrument than a sine wave generator. Lab grade function generators typically offer square waves, sine waves (distortion much less than .1%), sawtooths, and sometimes tone bursts. Triggering, adjustable sweep times, and other capabilities are common. In the case of the Wavetek, it is portable enough to take to the job, but cost, like most of its competition, is over \$1,000. And for white or pink noise, you will still need a separate noise generator.

Speaking of noise generators, one inexpensive source is Numark. I have used a Numark PX 2626 for the past few years and I have to admit that it generates noise of essentially the same spectrum and density of my GR (General Radio), which cost many times as much! Other sources for noise generators are Gold Line, which has the PN2 for \$90 and the more sophisticated PN3 (\$130) which has a timer (handy for reverb measurements). Ivie offers a very convenient miniature noise generator typically used with its handheld octave and 1/3 octave analyzers.

### TEST CDs

Test CDs have been around since the compact disc first appeared about seven years ago. The initial offerings were essentially for testing and engineering CD players. Calibrated defects to measure error correction and error concealment, low level linearity of D/A converters and other tests intended for CD player evaluation were the main focus. Nevertheless, some discs had applications beyond just testing CD players. CBS/Sony, Philips, Sony and Technics produce test CDs, although they



3D plot of two tone intermodulation distortion.

Sine wave signal.

are not so easily available. Denon and the French Pierre Verany test discs can be found in record stores, and the best of the bunch, the Prosonus SRD is available from Audio Control Industrial (the analyzer people) or direct from Prosonus.

Aside from expanding the capabilities of sophisticated spectrum analyzers (such as the Techron TEF, DRA MLSSA, Ariel SYSid), test CDs can be useful even if you do not have test instruments or have just rudimentary equipment. Test CDs with filtered  $\frac{1}{3}$  octave bands of noise can be used to measure system response with only a handheld SPL meter. This is very convenient in making uniformity of coverage measurements in seating areas.

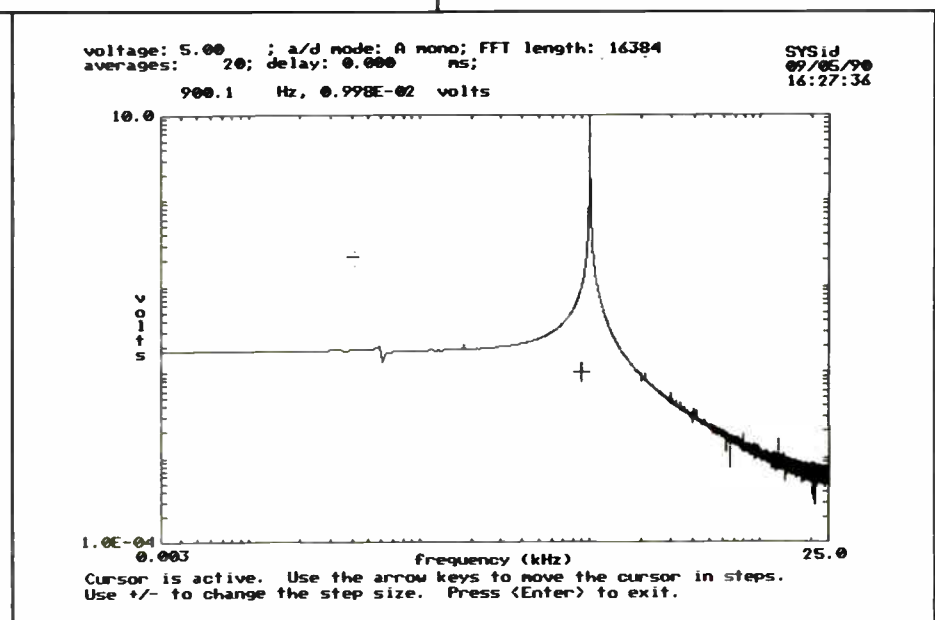
For this survey we took a look at some of the test CDs that are available.

### Prosonus SRD

SRD, "Studio Reference Disc," is a 62 track disc which was originally intended for studio use, although its application to testing commercial sound systems is by far the best of the lot. Aside from sine wave test tones, special TEF sweeps, impulse clicks, stereo imaging, and music clarity tests are included. Acoustic Science's MATT Music Articulation test is on the disc [see Art Noxon's article in the April 1990 issue of *Sound & Communications*] and LEDR, the Listening Environment Diagnostic Recording for spatial imaging is also included. The SRD has 62 bands of tests for over an hour of indexed test signals.

### Denon

Denon Columbia 38C39-7147 and the 33C39-7441 "Digital Audio Check CD"



have been around for a few years, and available in some record stores. The liner notes stress the low distortion of the digitally generated test signals on the CD. The 38C39-7147 contains frequency sweeps, test tones, IM, square waves, tone bursts, impulses, white and pink  $\frac{1}{3}$  octave bands and more. 33C39-7441 includes sweeps, wide band white noise, and music tracks. If you can find it, 38C39-7147 is a handy test disc.

### Bruel & Kjaer

Bruel & Kjaer recently introduced a test disc consisting of 23 tracks, of which 17 are extremely well recorded selections of music. By some coincidence, all the musical tracks were recorded with the B&K series 4000 Professional microphones! Joking aside, the intended purpose of this CD is to demonstrate the excellent qualities of these mics, but it will also help you to use your ears to judge

your installation work. An interesting aspect of the B&K disc is its usefulness for field use measuring of  $\frac{1}{3}$  octave response with only a sound pressure level meter. One track is a 1 kHz band of pink noise on the left channel, which is used to provide a reference level setting for the following test track. The following track is  $\frac{1}{3}$  octave bands of pink noise, from 20 Hz to 16 kHz, individually indexed. This allows a particular band to be repeated by your CD player, if you so desire. The combination of the series of pink noise bands on track 20 and a sound level meter can be used to measure the frequency response of a sound system. For example, when checking for uniformity of coverage of a seating area, only a handheld SPL meter and a pad of paper (to record the measurements) would be required.

As the bands of filtered pink noise must be played back serially, this process can be a bit tedious, but if you can't afford a



*3-D plot of stationary  
tone (sine wave).*

real time  $\frac{1}{3}$  octave analyzer with printout capability (such as offered by Audio Control, Gold Line, B&K, Ivie, and others), this is the poorboy's solution. Also note that high ambient noise will reduce the accuracy of pre-filtered noise and an SPL meter, as the out-of-band energy does not get filtered out as with real  $\frac{1}{3}$  octave analyzers. Another function of the pink noise bands, when used with a chart recorder, digital storage scope, or time/frequency/energy analyzer, can be as the signal generator for reverberation time measurements. Note that a number of the other test CDs in this survey also have  $\frac{1}{3}$  octave noise.

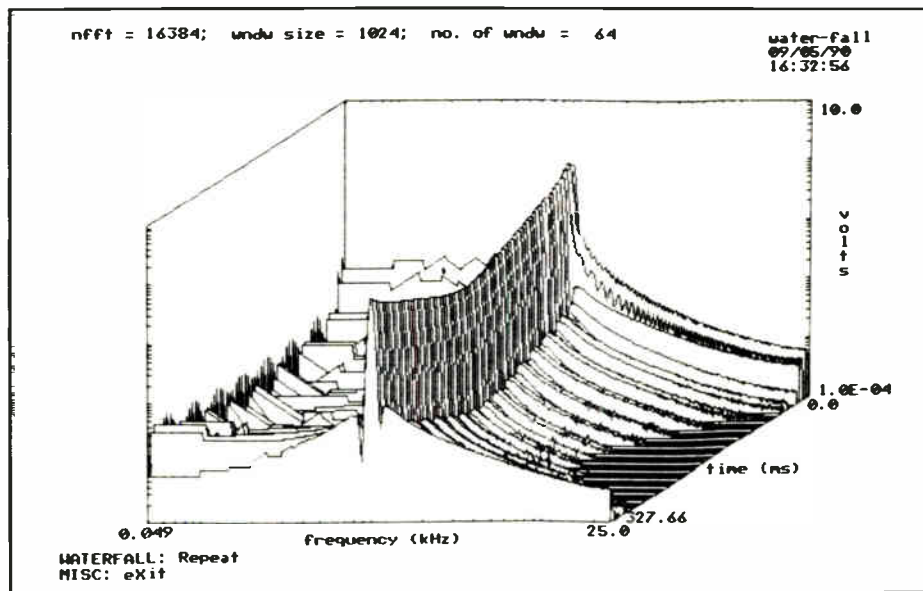
#### **NAB Broadcast & Audio System Test CD**

The NAB Test CD mostly has test signals for use by broadcast engineers including phase shift, tone bursts for checking meter ballistics, as well as a number of tracks of test tones, but to some extent a number of tests would be useful for adjustment of limiters and overall sound system setup.

#### **Pierre Verany**

Produced in conjunction with the French magazine Diapason, the Pierre Verany PV.784031 (Harmonia Mundi) gets down to business after 13 bands of steam trains, Indian Harps, Romantic Organ, etc. Tests include white noise.

The Pierre Verany PV.788031/788032 Digital Test is an excellent double CD distributed by Harmonia Mundi, which is best known here for importing European classical music labels into the U.S. As they sell to many record chains, you would be likely to find this disc in the "special effects" section of a big store, perhaps next to an album of thunder or a live recording of sleepy squirrels. In any case, aside from a number of music selections and CD tracking tests, there are various harmonic and IM distortion tests. These would be especially useful for high resolution analyzers, especially the MLSSA system which requires an external signal generator viewing IM and harmonic distortion measurements.



#### **SOME "HANDS-ON" USE**

I tried a number of test CDs while I was testing the MLSSA system. I use a wide range of CD players, including a three-year-old Sony Discman, two garden variety home unit players which used single D/A converters, and an up-scale dual D/A converter, oversampling player that claimed excellent linearity at low levels. IM and harmonic distortion could be clearly seen, both in the FFT and 3-D FFT modes. One of the cheap home players clearly had a modulation problem when its servo-system attempted to track an off-center CD. This could be seen in the 3-D mode as mid-bass noise that had the same repetition rate as an audible noise coming from the player. My guess is this was due to noise from the servo system that got into the audio output opamp through RF or the grounding system. Maybe the optical isolation boosted by the up-scale players isn't hype after all.

Another surprise was that the second harmonic distortion was typically only 40 dB down on the portable, about 50 dB down on the home players and 60 dB down on the high end player. Actually, these results were with the Prosonus and Pierre Verany discs. I got worse results with a test CD that I decided to leave out of this survey. I had expected better results, so I connected my Wavetek 185 directly to the MLSSA. This time I got about 70 dB down measurements. I discussed these results with Doug Rife, the developer of the MLSSA system. He also had tried these measurements with the SRD disc and got comparable results, 60 dB on a high-end CD player (about two years old) and 70 dB with a signal generator. Doug felt that these numbers are to be expected for a 12 bit digital spectrum analyzer, as well as

the possibility of noise and aliasing between the CD player, computer, and analyzer. And this type of performance is more than adequate for checking out a sound system or speaker system (I know a few speaker engineers who might consider selling their souls for a compression driver that measured distortion 70 dB or even 60 dB down, even at 1 watt level!). Conversely, a test CD does not look like the way to go for checking out preamps or power amps.

#### **CONCLUSION**

The Prosonus SRD disc, the Denon and the Pierre Verany Digital Test discs are the most useful for sound system engineering as well as the most commonly available. Among these discs are just about all the test signals available on CD. Nevertheless, there is quite a bit more that could be done with this format. For example, for convenient operation, the Techron TEF, Ariel SYSid and the DRA MLSSA would require a trigger signal. Also, the CD test signal needs to be identical to the test signal the analyzer generates. If the timing is "warped" from "wow and flutter" from the CD, then the accuracy of the system will be compromised (yes, CDs do have a type of time base fluctuation due to crystal inaccuracy). Signal averaging, which normally enhances accuracy, further increases the problems of maintaining timing sync. Some measurements, such as harmonic and IM, do not depend on the signal generator in the MLSSA system and are not affected by this factor. If the time base error for the popular high resolution analyzers are within acceptable limits then perhaps you will see a Sound & Communications test CD eventually. Stay tuned. ■

# Ariel's SYSid Part 1

## *A High Resolution Analyzer for System Identification*

BY MIKE KLASCO

**T**his is the first part of our review of the Ariel SYSid System and the second in our series of in-depth analyses of test instrumentation for sound system and acoustical measurement. SYSid means system identification: to characterize or measure a system. Like DRA Lab's MLSSA (previously reviewed), the Ariel SYSid is a package consisting of software and a circuit board that plugs into an IBM compatible computer. The intended users are the same that might consider the Techron TEF and DRA Lab's MLSSA.

Perhaps I have not voiced my opinion on this enough, but I strongly believe that these instruments are not only appropriate for acoustical consultants, but are the type of equipment that a competent sound contractor should have. High resolution analyzers require both an investment in learning their operation as well as a reasonable knowledge of audio phenomena beyond that of plain vanilla 1/3 octave analyzers. The proper calibration of time delays, cluster alignment, reverberation time measurement, setting of parametric equalizers and electronic crossovers require the use of these instruments. Additionally, distortion, noise floor (SNR), transient (impulse) response, impedance, and other characteristics can be deter-

mined. Just a few years ago the starting price of equipment with these capabilities was over \$10,000, but the MLSSA and SYSid can be fully operational for less than \$5000. If you already have a precision mic, a preamp and an IBM compatible, full operation will cost a bit above \$3000.

The other expense is the investment in time for increasing the depth of your understanding of audio and acoustics. Both the operation and "user interface" of these new analyzers are straight forward enough so that useable measurements can be made within a week, although expect to be learning new tricks from these high powered tools for a long time.

SYSid was developed at Bell Labs in the late 1970s as a test system for evaluating microphones and other transducers for audiology research. Originally, it required a "high power" minicomputer, although the typical IBM compatible 386 class computer many sound contractors use today would give the, originally used, Data General Eclipse a run for the money. Apparently Bell Labs also thought so, and in the late 1980s reworked the program to run on IBM compatibles. For hardware (to connect the computer to the real world), Bell Labs selected the DSP-16 data acquisition board from Ariel.

Ariel is a small, but capable company

that specializes in data acquisition/digital signal processing plug-in boards. Their audio products range from "digital microphones" for direct connection to the NEXT computer, to hard disk recording systems for post production and recording studios. The founders of Ariel were also among the founders of Eventide, another pro audio company known for leading edge engineering. Over a decade ago, Eventide designed and marketed one of the first computer-based 1/3 octave analyzers, (which also offered 3D plots and reverberation measurement). I bought one at the time and it is still working, now doing QC duty at the end of the production line of a small hi-fi speaker manufacturer. The Ariel DSP-16 board, was introduced in 1986 and used for various products including a real-time FFT analyzer, digital storage scope and a hard disk recorder. The board is supported by Hyperception for their signal processing software and by Momentum Data Systems for their digital filter design program, both of which will be discussed in the third installment of this review.

At some point Ariel noticed that quite a number of DSP-16 boards were being swallowed up by Bell Labs and on further inquiry discovered the use of their product with the Bell Labs SYSid software. In 1988

Ariel licensed the rights to market the SYSid program with the DSP-16. Anytime software is developed for in-house use, it will have rough edges. SYSid was no exception. The first release of the package was at the end of 1988, and it lacked many important features required for field use. For example, release 1.0 could not "truncate" reflections, which means you could not discard wall reflections and look only at the speaker's response separate from the room. Reverb time measurements were not supported. And the "user interface," *i.e.* general operation, was cumbersome. In 1989 release 2.0 brought the truncation capability and a radical cleanup of the user interface which resulted in reasonably straight forward single keystroke operation.

For this review I am using release 3.0, which now includes reverb time measurements, further refinements in operation, clearly labeled graphs, and numerous other improvements that were seriously needed. Earlier versions supported short and medium length FFT analysis to 4096 points resolution. Without getting too theoretical, this limited either the bandwidth or time duration of the signal within any one measurement. That is, either you could not get the low end response when using high sample rates (wide bandwidth) or you gave up on extended top end response when measuring low end response. In release 3.0 the maximum FFT size has been extended to 16384 in single channel operation and half that in stereo. This allows high resolution wide bandwidth response measurements. Still another factor in FFT size is that for SYSid (or any other analyzer) to work correctly, then the stimulus length must be greater than the impulse response of the system being tested. Originally conceived of for transducer testing, the shorter FFT-stimulus periods were not adequately long enough for reverberation time testing. The present version will deal with most large rooms, and if the bandwidth is brought down to 8 kHz (the highest frequency normally used for RT60) then even problem spaces can be dealt with. The DSP-16 hardware can accommodate up to 64K FFT sizes, but is not yet supported by

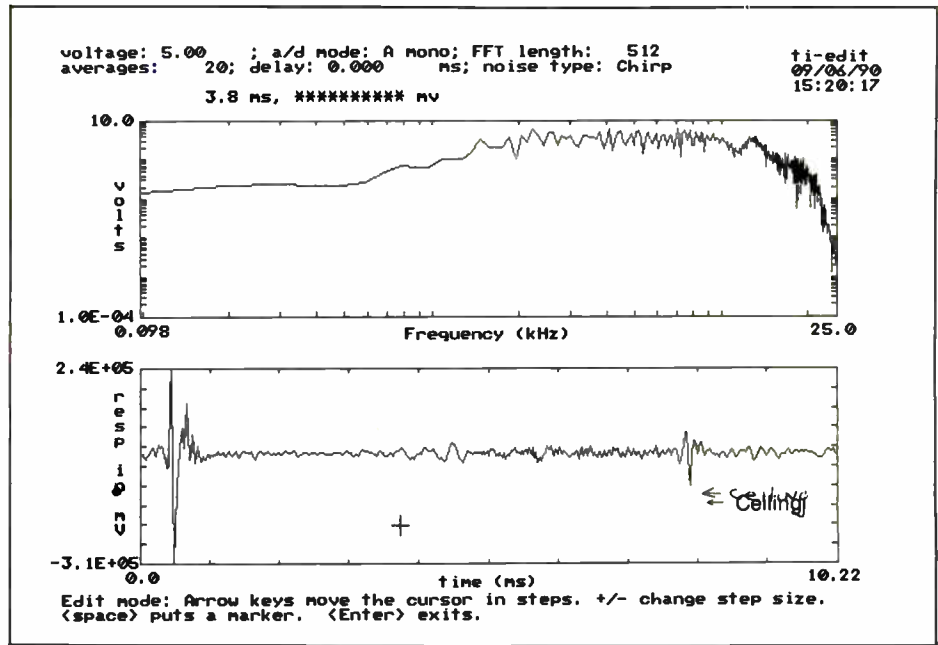


Figure 1: Upper curve shows frequency response of small horn/driver including room reflections. Lower curve shows impulse response of the horn/driver.

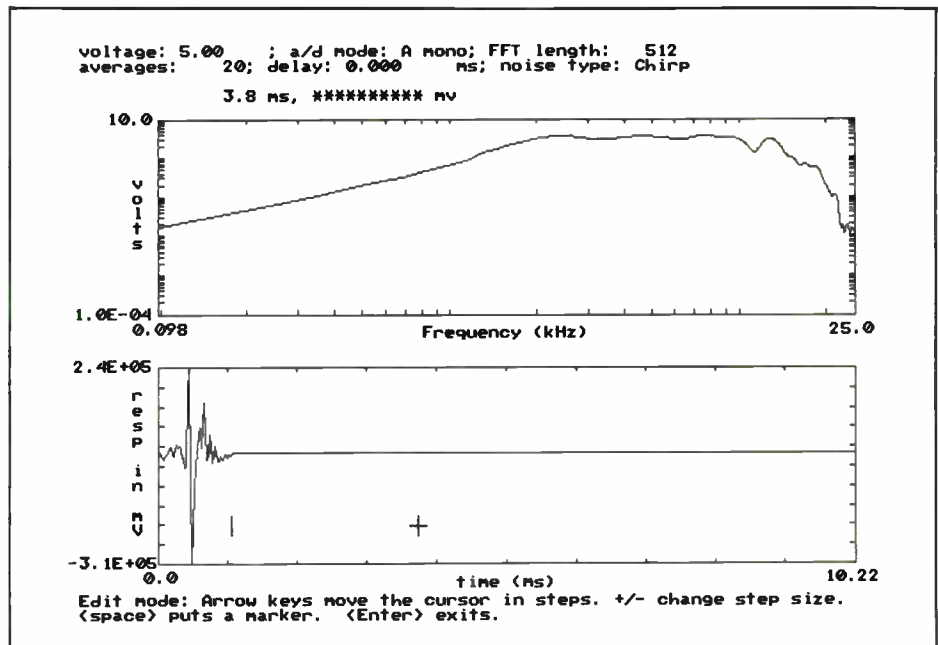


Figure 2: Upper and lower curves identical to figure 1 except that room reflections are edited out to create "digital anechoic chamber."

SYSid.

If you had previously tried Ariel's demo disk for SYSid and rejected the product, it is time to take another look. SYSid can now perform high resolution frequency response (as well as 1/3 octave measurements), phase and group delay, impedance, 3D waterfall plots, reverberation time, IM and harmonic distortion and noise floor measurements. A few significant features are "in the works" but have yet to be included; intelligibility (AL%cons

or RASTI), autoranging level adjustment, triggering, and straight forward SPL mic calibration.

For those of you who want the "executive summary" upfront, the Ariel SYSid is a powerful and effective system that I recommend. For me, it is a bit of a toss-up between the MLSSA and SYSid. While SYSid offers a higher grade of hardware engineering with a lower noise floor and more comprehensive distortion measurement capabilities than the MLSSA

system, the SYSid, at least in its present software release, is not as elegant in operation. With these two excellent choices (and the strong likelihood of a third choice from Techron with the TEF 20), sound contractors should not consider this a dilemma, but good fortune!

### SYSid THEORY OF OPERATION

When Crown introduced their TEF system, the time delay spectrum concepts had already been presented by Dr. Heyser and later by B&K in numerous AES papers. The MLSSA system also had undergone extensive peer review when its theoretical underpinnings were more recently presented at the AES. However, when it came to SYSid, confusion reigned. Oddly enough, the only technical paper relating to the Ariel DSP-16 given at the AES relating to audio measurements was on a TDS (TEF-like) system, but not SYSid.

Exactly how SYSid works and is similar or different is not really clearly determined or detailed in Ariel's literature. Still, I doubt if any of us would consider that Bell Labs would peddle a bogus acoustical system on the audio community (as they gave us most of the foundation of what we have now).

The SYSid manual does provide a description of the system. I also discussed the approach with both Jont Allen of Bell Labs and Tony Agnello of Ariel.

Basically, the approach is a simple one, but with a few very astute embellishments. The test system generates a swept sine wave also known as a "chirp." Actually, when you hear the test signal, it sounds almost buzzy and not at all like a swept sine wave. This is because the sweeping time is extremely fast and the chirp is repeated some number of times in quick succession. The repetition of the test signal is done so that the results can be averaged by the computer. Averaging causes the signal to add, while extraneous noise does not add. For each doubling of the number of averages you get a 3 dB increase in signal-to-noise ratio. Next an FFT is performed on the accumulated data and divided by the FFT of the stimulus (test signal) to correct for the stimulus

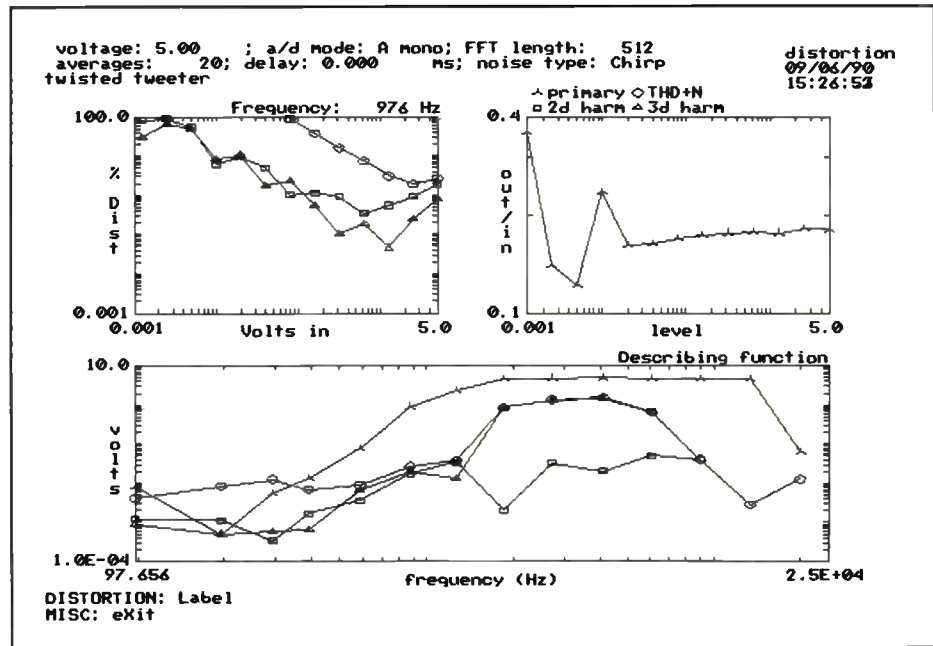


Figure 3: Distortion of tweeter with some problems!

phase. For a broadband stimulus, the result is the system transfer function (frequency response). The operator then can command SYSid to further process the acquired data to determine the phase and group delay, distortion, impulse response, etc.

The deeper you look into this system, the more you will respect the integrity of its precepts. This review is not on the detailed theoretical aspects of SYSid, but on its operational functionality. Nevertheless, some points should be mentioned, such as the fact that the chirp is a low crest factor test signal. This means that the amount of energy delivered to the system per unit time is high, which enhances the signal-to-noise ratio without risking overloading the system under test. In comparison, the TEF also uses a swept sine wave, while the MLSSA uses pseudo-random noise, known as MLS. With release 3.0 Ariel also offers an MLS test stimulus, as well as (operator-selected fixed frequency) sine waves and two-tone sine waves (to facilitate harmonic and IM measurements).

In a number of technical papers over the last few decades, researchers have reported that the resonances of electro-acoustic devices not only have a settling time (some resonances take much longer to settle than others), but also these resonances take some time to build up to their steady-state response. This certainly applies to speakers and rooms. To avoid averaging the first few premature reactions

of the system under test, SYSid does not use the first two responses. The only other test system to accommodate this refinement that I am aware of is the B&K TDS system.

The SYSid software requires the Ariel DSP-16 data acquisition board (otherwise where else would you find an input for audio on a computer?). Many audio engineers are leery of using computers for audio measurements. The typical "clone" IBM compatible was never intended to be used as part of an acoustic measurement system. Aside from all sorts of spurious noise on the buss (where the audio instrumentation plugs into the computer), the computer's power supply is of the switching type, at 20kHz, and the video card is spitting out noise somewhere between 16kHz to 70kHz (depending on the video standard of your monitor). Audio Precision and Techron (in the TEF 20) have opted for an external enclosure, separate from the computer. Ariel uses a plug-in card, but gets around the noise both by "smarts" and careful and meticulous engineering. Even a quick lookover of the DSP-16 shows that the attention to detail is apparent: coax cable between the circuit board and the inputs and outputs; balanced inputs and outputs; shielding on the card; and a multi-layer board for an integral ground plane. The interface to the outside world is through mini-XLR connectors, which "lock in" to prevent accidental pull-out. This makes me feel warm all over! (except that none of the

connectors are labeled, but this should be resolved shortly as I am going to send Ariel my old Dymo label maker!).

In any case, to really get above the muck inside the computer, Ariel recommends that you drive the DSP-16 board with a mic preamp that can swing 10 volts. I have been using the Stewart Electronics mic preamp, which can put out +8 dBm and this combination works perfectly. We are now preparing a round-up of "cheap" measurement mics appropriate for field use as well as preamps with phantom power supplies and a mic calibrator or two for an upcoming issue.

Depending on what you are measuring, you can get a dynamic range of about 90 dB, potentially 20 dB better than the MLSSA system! The DSP-16 boasts real-time 16-bit analog conversion on two channels with sample rates up to 50 kHz. The MLSSA provides only 12-bit conversion, but offers autoranging which consistently gets the most out of the system. I found the autoranging feature very desirable when I used the MLSSA, as it eliminated a hit or miss approach to level setting. It also saved time compared to the TEF analyzers. When you start the sweep, if you overrange the instrument will simply stop and you have to start the measurement sequence over again. The autoranging requires a few seconds to "hunt" for the optimum level, so when I was using test CDs with short time duration test signals the MLSSA was not always able to set levels and catch the test signal in time. With the MLSSA, when the autoranging got in the way, I used the option to defeat it and set the levels manually. Until SYSid can offer autoranging, the field-use dynamic range (for the contractor who has limited time) is about the same as the MLSSA.

The DSP-16 uses a "digital signal processing engine," specifically a fast clock speed version of Texas Instruments 320C25. This is a popular DSP chip for audio processing, and the same series chip is used in the TEF 20. In the SYSid software, the test signals are generated by the DSP chip, while the analysis of the device under test is by your computer's math coprocessor chip. The MLSSA also uses

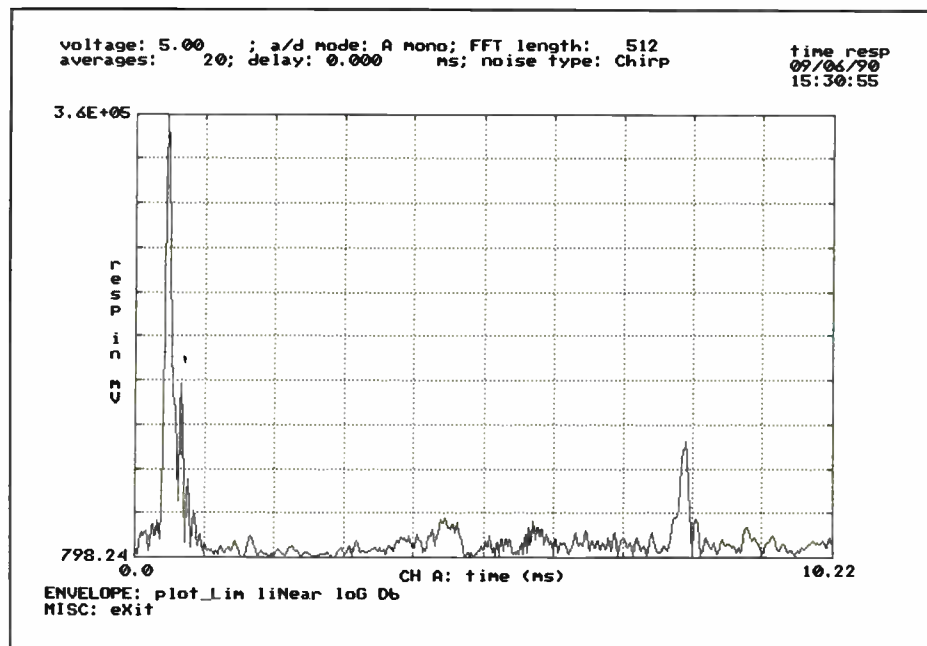


Figure 4: Energy-Time curve derived from impulse response.

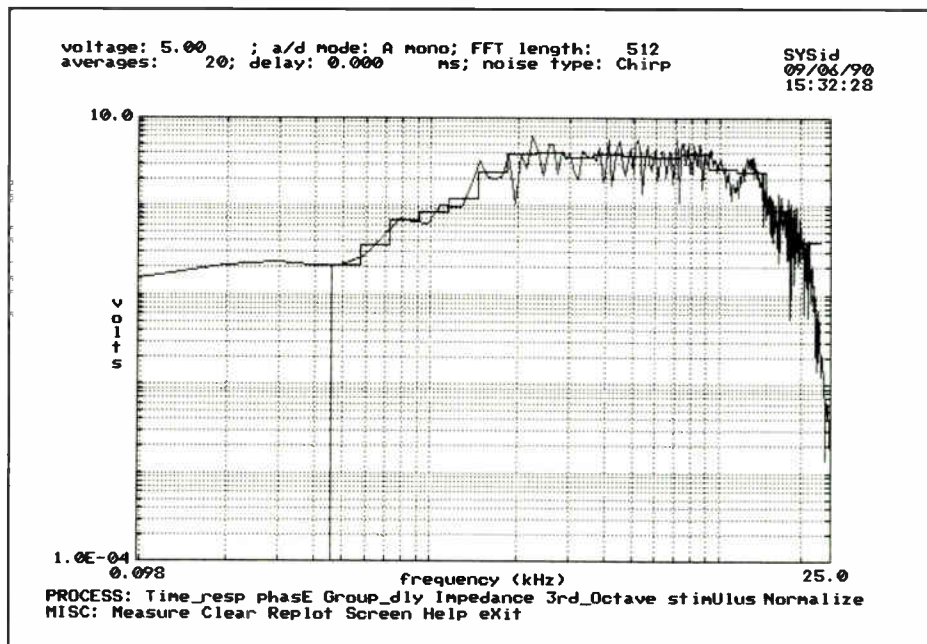


Figure 5: Frequency response of tweeter with 1/3 octave overlay.

your computer's math coprocessor to calculate the response. The Ariel hardware is capable of generating sine waves including swept tone, single or multiple tones and even MLS noise. All of these are supported in the present software release. Even full TDS operation is possible with the DSP-16, although this technique is not part of the SYSid approach and has not been licensed by Ariel. Also the MLSSA does not use an on-board digital signal processor and its 1-bit DAC is limited to generating square waves and impulses (aside from the MLS noise signal). For MLSSA harmonic distortion

measurements you must use an outboard signal source, such as a signal generator or a CD test disc (see article on CD test discs in this issue).

### THE ARIEL DSP-16 PLUG-IN BOARD

The DSP-16 is a dual-channel system, with two sets of inputs and outputs. SYSid supports dual-channel operation, so you can test both channels of a stereo component simultaneously. The MLSSA hardware is dual-channel, but the software does not support dual-channel operation. Dual-channel operation is restricted to the

same settings and functions for each channel. For speaker impedance measurements, SYSid requires both channels using the ratio between a known (precision resistor) resistance and the speaker. While SYSid was intended to measure transducers such as speakers and microphones, it certainly is up to the task of accurately characterizing equalizers, electronic crossovers, limiter/compressors, and electronic reverbs. Distortion can be measured down to about .005 percent, which is just a bit lower than the speakers I design and adequate for proof-of-performance for even the most finicky consultant. For state-of-the-art electronics lab work, go buy yourself an Audio Precision, Sound Technology, Tek, HP or similar instrument.

#### DOCUMENTATION AND SUPPORT

The manual is fairly comprehensive and includes a number of diagrams which are helpful. Factory support is very good and Ariel has an electronic bulletin board that can be hooked-up to by modem. Between the program's somewhat limited on-line help, the on-screen command menu, the reasonably clear manual (which includes a good tutorial), SYSid is relatively painless to get used to. Application notes on obscure uses are supplied, but info on how to measure a speaker is omitted. An expanded manual is in the works. If you want to learn how to measure a speaker, you ought to buy the two AES Loudspeaker Anthologies and perhaps take some courses (for example, Syn-Aud-Con for sound system measurement, B&K or Ed Long's courses for speaker testing). Mic locations and general measurement procedures are the same for TEF, MLSSA, and SYSid.

SYSid's learning curve is not quite as fast as the MLSSA system, but after a few weeks with the program you get used to its little idiosyncrasies. Since its introduction two years ago, the improvements to SYSid, in functionally and user interface have been dramatic. Just in the last few months I have seen meaningful improvements, and quite important additional enhancements are on their way. The more I work with this system, the more I enjoy it. Part of the problem is the manual has

not been updated as quickly as the software, so many neat features and shortcuts are not apparent at first. I think most users will get over this initial hump in a couple of weeks. After that it's smooth sailing. Don Davis has been working with a SYSid system and next month will be voicing his perspective on the system in "Technically Speaking."

#### HARDWARE HOST COMPUTER REQUIREMENTS

The DSP-16 plugs into any XT or AT slot that accommodates a full size card. A special version, that has a higher performance filter option (54 dB per octave rather than 18 dB per octave) requires a full size slot and the space behind a half size card (to accommodate the filter daughter board). Special applications that benefit from this option will be covered in the third part of this review. The DSP-16 is power hungry, maybe 10 watts, which isn't a problem for a desktop, but even a Toshiba 3200sx with a fully charged battery won't stay juiced-up for long. The "super" filter version will only fit in a few "shoe box" portables and requires close to 14 watts. Aside from being power thirsty, heat build-up in a tight portable case should be considered, although aside from these drawbacks, I prefer using this version.

### **The MLSSA and SYSid can be fully operational for less than \$5000.**

Although the present version of SYSid does not require the full 640K of memory, no doubt future versions will. The program will run from a single 360K low density floppy drive, or from a sophisticated hard disk system. Graphics support is comprehensive, including the common Hercules monochrome, low resolution CGA color, medium-high resolution EGA color, high resolution VGA color, as well as a couple of very high 800 x 600 super VGA color boards. Hardcopy capability is ade-

quate, including Epson compatibles and even laser support. Still, an excellent investment is Pizazz, a popular print utility which will give you color print-out capability, size scaling, and much wider printer support. In trying to use Pizazz for this month's review, I ran into problems trying to load both SYSid and the print utility. Apparently, there is not enough memory to run both programs even with 640K. To compound the problem, neither program wants to run in memory above 640K (LMS, EMS, extended EMS, etc.). The developer of Pizazz warns that although some users run Pizazz successfully above 640K with a memory manager, many users have problems with buggy operation and crashes. If I can find a way around this problem, I'll bring this up next month.

A math coprocessor is required (8087, 80287, 80387sx, 80387) and the type you select depends on your machine as well as your budget. Once upon a time only Intel made this chip, which can speed up many programs two to 10 times. Now Intel and Cyrix offer 387 versions, with the Cyrix offering higher performance. Intel, Cyrix and IIT also offer 387sx versions, with Intel again coming in last. In addition, Intel, IIT and AMD offer 287 versions, with the IIT being the fastest and the Intel and AMD being equal, but with AMD offering a very heavy price advantage (\$99 retail!). I would not keep babbling about coprocessors every month, except that very few computers have them installed and many CAD programs (from AutoCAD to AcustaCADD) and computer based test instruments (such as MLSSA and SYSid) simply will not function without a coprocessor.

Next month we will continue our review with emphasis on the nitty gritty of the SYSid's operation. We will take a look at setting the unit up to make frequency response measurements, looking at the impulse response and energy-time curves, the automated distortion subsystem, the reverberation time utility, impedance measurements, programmable automated "macros" for QC measurements, 3D waterfall capabilities and file import/export to other programs. ■

## WIRING

(continued from page 34)

significant percentage of costly service calls which in some cases could offset the loss of revenue from second-set hookups. Unfortunately, TCI is virtually alone among large multisystem operators in taking this approach, and TCI's implementation has been delayed by problems in manufacturing the Starport terminal. Thus, until it receives enough boxes to begin converting its major systems, many local TCI operations are hanging onto the second-set hookup philosophy. NCTA, the trade association, hasn't taken sides in the issue because it has members on both sides.

TCI and other large operators have embarked on an aggressive wiring program involving new construction in their franchises. Gambling that most homeowners will opt for cable service and that no developer will want to admit that cable isn't available in all his new homes, system managements are encouraging local managers to scout out new homesites and make the necessary arrangements sometimes before ground is broken.

The Electronic Industries Association's point man for CEBus, Tom Lauterback, suggests that until the issue is resolved, the wise course may be parallel wiring — a CEBus harness to carry telecommunications signals other than those generated by cable, installed by a low-voltage professional; and dedicated cable company coax to feed cable signals to TV receivers throughout the household. What advice does Sony give an installer, wire-cutter in hand, who's confronted by cable-company wiring? "It is our position that coaxial cable is suitable for carrying DSP signals in the home. We are not advocating that the installer violate the law," a public relations spokesman said. Company brass and attorneys were not available for further discussion. ■

## BOARDROOMS

(continued from page 44)

and lent itself to plausible simulations when used with stereo software. Spencer was also impressed with the fact that Ambisonics permits considerable latitude in both the number of speakers employed and their positioning in the listening space. Spencer recommended that the company

acquire an Ambisonics recording and decoding capability, and eventually negotiated a deal with the British firm Minim to supply Gold Ribbon with an Ambisonics PC board. Currently Gold Ribbon supplies assistance to corporate videos in the Ambisonics format for optimal playback with the Gold Ribbon SoundWalls systems.

With a more practical speaker system completed, and unique surround sound capabilities, Simon felt the company now had an attractive package to present to corporate clients. And pricing was much more reasonable than had been the case with the ribbon based system. Where a single ribbon speaker cost thousands of dollars and requisite amplification just as much, SoundWalls were \$2,000 apiece and acoustic panels \$379. A complete four channel system could be had for a little over 10K, complete with installation.

The company has targeted Fortune 500 firms and sold to such clients as Union

Carbide, Apple Computers, and AT&T Interactive. In a little over a year of active selling, more than 50 systems have been delivered according to Simon. Most of the selling is done direct from the factory, but Gold Ribbon has recently acquired distributors in a number of major cities.

Simon is optimistic about the future. "Fifty installations in a year isn't bad, and this is essentially a new business. In most cases no one is bidding against us, we've got the niche to ourselves. And we're not only selling sound. Video computer graphics is a rapidly emerging presentation tool, and we're heavily into that."

Simon sums up with a phrase he's undoubtedly used to good effect in sales presentations. "A company's presentations say a lot about the company's public image. Does a Fortune 500 corporation really want to be perceived as monophonic and low definition?" ■

	
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# A PERSONAL VIEW OF EASE

By Don Davis

**Dr. Wolfgang Ahnert visited us at our Indiana farm in June 1990. He shared with us the remarkable events in eastern Europe, which meant a lot to us for we had stood on both sides of the then impenetrable Berlin Wall in 1988 as the guests of the Janssen organization, who does so much audio work in Moscow.**

Our first contact with Dr. Ahnert was in 1985 at the AES convention in Eindhoven, the Netherlands. We knew him previously through his book, "Grundlagen der Beschallungs Technik" written with his mentor, Professor Walter Reichardt. Dr. Ahnert traveled with us in June 1987 to tell Syn-Aud-Con classes about his work in Delta Stereophony.

As a result of his being able through those years to work occasionally outside of the Iron Curtain (his work produced dollars so he received special privileges), he became aware of our work with Syn-Aud-Con and more specifically with our enthusiasm for the work of the late Richard C. Heyser (Whom Ahnert met at a Syn-Aud-Con workshop in Hamburg) and TEF analysis.

### EASE

When the best of the West's measurement systems was combined with the best

of the East's theoretical training and experience with huge culture halls, the synergy that "EASE" represents became inevitable.

Dr. Ahnert showed us a very advanced computer program developed by himself and Rainer Feistel of Rostock (formerly East Germany) when he visited us in June.

### THE MANUAL FOR THIS ONE IS GOING TO BE GOOD-SIZED.

Electro-Acoustical Simulator for Engineers is the name given this new effort. This is the first acoustic design package we have seen that answers almost all of the requirements we feel are fundamental to useful applications of such programs to the prediction of what real systems might do when installed.

Just a few of the highlights are:

### THIS IS THE FIRST ACOUSTIC DESIGN PACKAGE WE HAVE SEEN THAT ANSWERS ALMOST ALL OF THE REQUIREMENTS WE FEEL ARE FUNDAMENTAL.

- When multiple sources are turned on and are out of alignment, the windowed frequency response curves superimposed on the drawing of the space show the appropriate comb filters.

- Normal polars, horizontal, vertical and 3D can be called up in 1/3 octave intervals and the "Q" of the loudspeakers is taken into account during the virtual image tracing.

- You can bring up an icon called the "probe" and move it on the room perspective to any measurement point desired and see: the RT60; the RASTI and AL%cons; the C7, C50, C80, C100, etc.; the ETC; surface reflections; spatial direction to source; and magnitude vs. phase.

- The coverage plots wrap around real space obstacles in the proper manner and the program can see "shading" by balconies, etc.

- Absorption, diffusion, and diffraction will be accounted for in the final version of the virtual imaging process.

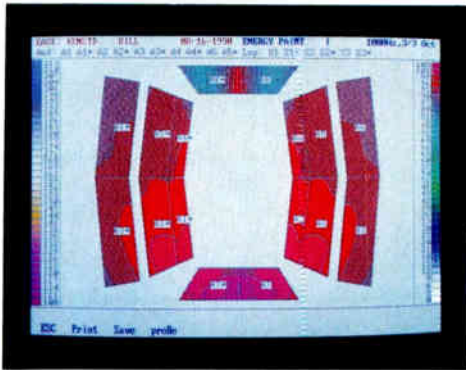
The manual for this one is going to be good-sized just to tell all that it can accomplish. Again, we had not expected to see a program this complete until late in this decade.

EASE is technically correct, in color, with windows for operator choices, including amplitude and phase, and is capable of 500 virtual image traces that includes the effect of speaker Q in one minute and 11 seconds on my 386-33 IBM clone. It certainly stands as a benchmark for other sound system design programmers. We are currently demonstrating a beta version in our farm classes.

### RENKUS-HEINZ TO DISTRIBUTE EASE

Renkus-Heinz has acquired exclusive distribution rights for the English language version of EASE. (Harro Heinz and Dr. Ahnert were both born in villages only a few miles apart and have been friends for

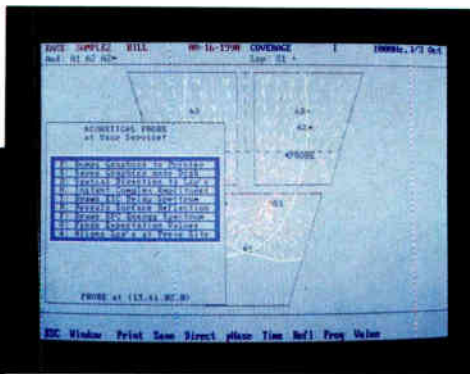




Energy Paint

several years.)

EASE will have an open database and Renkus-Heinz is encouraging others to supply their data. Since first viewing EASE help screens, import and export capabilities to other CAD software such as AutoCad for room entry and cluster draw-

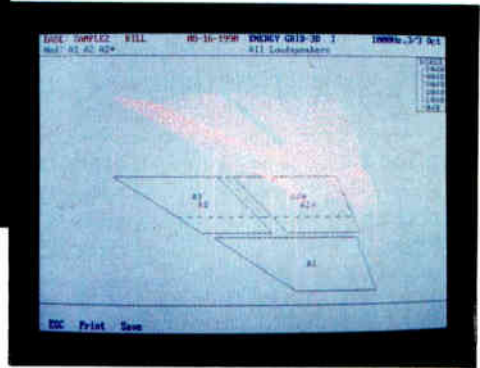


Coverage

WE WOULD RATE *EASE* AS THE *EASE-IEST* SOFTWARE WE HAVE ENCOUNTERED.

ing have been enabled. We would rate EASE as the EASE-iest software we have encountered as well as the most complete.

Dr. Ahnert and his associates are proof



Energy Grid — 3D

once again that good men, even under a totally repressive regime can maintain their mental integrity and, even without proper tools, use their minds as free men.

We have no doubt that such men must exist everywhere and the world needs to find them. ■

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Circle 248 on Reader Response Card

## Off-Track Paging System; New Installations

### Paging for Bettors

QSC has announced that two of its MPS 2300 music and paging systems have been incorporated to provide power for background audio, program audio and paging facilities for a new off track betting parlor in Lancaster, Pennsylvania. Ninety-six television monitors in four lounges display racks from eight in-house channels: four channels devoted to racks, and four channels for "totes," or betting odds on horses. The audio/video components were assembled by Midwest Communications. The QSC MPS 2300 is a two zone music and paging system featuring two mic inputs with built-in AGC, four music inputs, two auxiliary inputs, built-in limiters and a transformerless audio circuit.



*Installation at off-track betting parlor in Lancaster, Pennsylvania includes QSC equipment.*

### TSI Projects

TSI of Mineola, New York has reported the completion of several installations. A training center for New York Clearing House consists of two identical rooms that share a projection booth. An Elmo video overhead is used for document presentation. Wireless mics are used. The architect was Fox & Fowle Interiors. Equipment such as amplifiers and equalizers are secured inside a booth for access by technicians only. Video tape machines and audio tape players can be accessed from inside the training rooms. Rear projection of slides from Kodak slide projectors are cued by an audio cassette deck, and rear projection of video/computer data and graphics is provided by a Sony VPH 1270Q. The rooms have audio and video recording capability. A standard touch tone telephone is mounted in the presentation room to be used by the trainers in demon-

strating the firm's account debiting services. The telephone tone and voice audio are heard through ceiling speakers in the presentation room.

### Soundcraft Installs

Among the recent purchases of Soundcraft consoles reported by the company are the following: Riverside Baptist Church in Denver has installed a 200 Delta Console. RLE Inc. was the dealer. Christ Church United Methodist has installed a 200SR console, sold by Bruce Warden Associates, for the main sanctuary. Cornerstone Evangelical Baptist Church in San Francisco has installed in the main sanctuary a 24 channel 200 Delta console sold to it by Pro Media. Gand Pro Audio has installed a 40 channel Soundcraft 500 console with an 8 by 8 matrix at the Drury Lane Dinner Theater in Oakbrook, Illinois. RMS Sound has reported Soundcraft installations by Microsoft (a 200 Delta), Boeing (a 200 Delta) and Nike (a 200 B/VE console).

### Ramsa in Northwest

Ramsa reports the largest Ramsa console installation the Northwest. Overlake Christian Church in Kirkland, Washington, installed a \$65,000 sound system and booth construction which included a 64-input Ramsa WR-S852 house console. The 2,200 seat church presents three large scale musicals each year with a total of 28 performances, plus a made-for-TV taped session of the Christmas program. Tim Johns, minister for media of the Church worked with Dick Summers of Morgan Sound on the installation which includes three custom-made TT patch bays, five custom made military patch bays, a custom made box for 100 duplicated stage inputs, Ramsa WP-9220 amplifiers for monitors, 19 miles of wire, 258 mic inputs and the house console.

### Electro-Voice Survives Earthquakes

Electro-Voice has made it known that its products have survived intact in several natural disasters. The San Francisco earthquake demolished a four-story building, but not the Entertainer system which was inside and belonged to two musicians. It reportedly worked perfectly. Another EV speaker system was knocked loose from its rigging and plunged into a swimming pool, where it was left for days. When it dried out, the system worked.



*Suguru Okuma (right), President of Denon Digital, Almon Clegg (left), Consultant to Nippon Columbia, present check to John P. Crecine, President of Georgia Tech.*

### Eastman Relocates

Eastman Wire & Cable has relocated to new facilities after a December, 1989 fire destroyed its administrative and manufacturing offices and plant. A central computer system had been installed a month before the fire. The new facility in Pennsauken, New Jersey includes 29,000 square feet of manufacturing space with an option to add another 12,000 square feet. Eastman has installed two new production lines and plans to add two more in early 1991. The company's current product line of plenum cable and UL electric wire will be expanded to include low capacitance wire and cables, according to Jack Leporati, president of the company.

### Research on Multi-Media

Denon Digital Industries, Inc. and its parent company, Nippon Columbia, have announced a research grant to the Georgia Institute of Technology to aid in the formation of a Telecommunications-Multimedia Initiative, the seed for development of a research center to specialize in digital multimedia technology. The new center will pursue developments in interactive multimedia technology such as digital signal compression methods, DSP, digital data transmission, multimedia display systems.

Denon's engineers also aided Georgia

Tech and the City of Atlanta in its successful proposal to become an Olympics host-city in 1996. A multimedia segment of the presentation was designed.

### Ramada Renovation

The R&R Nite Club at the Ramada Renaissance Hotel in Atlanta has been renovated at a cost of close to \$500,000. The designer was Joseph Almasian of Almasian Associates in Boston. Project managers were Alan Printer and Associates in Atlanta. Seriously Sound, Inc. in Atlanta worked on the project. A TV matrix to the right of the dance floor consists of 16 26-inch monitors controlled by an Imtech 4x4 video wall processor. The club is on three levels with the stage and sound booth on the lower level.

*R&R Nite Club has sound room on lower level.*



## Pavilion in the Park

The Carlos Mosely Music Pavilion, which was introduced in New York's Central Park in August, goes on the road in 1991 at 24 sites in and around New York City where the New York Philharmonic and Metropolitan Opera give performances in the parks. The sound system was installed by Maryland Sound. Jaffe Acoustics was the consultant. Equipment includes 96 Linear Power amplifiers, along with a complete complement of other sound products. The stage platform has prefabricated wiring built in for the microphones. Wireless technology is used for transmission to the 15-foot tall sound towers. Within the system are 24 white towers which are placed in concentric circles in the audience. Maryland Sound carried out full wireless tests of all 24 proposed sites. Each tower is equipped with Sennheiser receivers. A Brooke Siren 360 crossover feeds four Linear Power 5002 amplifiers. Other aspects of the equipment list include: EAW, Audio Digital, Sennheiser. Six deep discharge marine batteries feed the system in each tower. A Ramsa WRC 900 console controls the systems. A front of the house system includes equipment by Lexicon, Aphex, Klark Teknik and Sennheiser.



*Bicron Toroidal Transformer.*

## Bicron UL

Bicron Electronics has announced UL 1411 recognition for its toroidal transformers. The company claims the products "belly band" assures low EMI" and the shallow height saves up to 50 percent.

## Shapiro Appointed

Gary J. Shapiro has been appointed group vice president for the Electronic Industries Association's Consumer Electronics Group, succeeding Thomas P. Friel. Shapiro has been EIA's vice president and general counsel. In announcing the promotion, EIA President Peter F. McCloskey said, "Gary's significant experience as well as his impressive knowledge of the consumer electronics industry make him an excellent choice to lead the CEG into the 90's."

## Altec Lansing Installations

Several installations have been announced by Altec Lansing. Sound equipment in the Valley Beth Shalom in Encino, California includes two Altec 9844 two-way 800 Hz speaker systems with self-contained crossovers in the sanctuary. The auditorium has 1594 amplifiers and two-way 500 Hz speaker systems, biamplified, with the crossover located in the equalizer. The synagogue also uses Vega microphones in the sanctuary and University Sound speakers in the foyer and choir-loft.

Four baseball stadiums are using Altec Lansing sound systems: Yankee Stadium, Riverfront Stadium; Shea Stadium; and the Chicago White Sox training camp stadium in Sarasota. Norcon Electronics was the contractor at both Yankee Stadium and Shea Stadium. Industrial Communication & Sound Company upgraded Riverfront Stadium's system. Ferguson Electronics completed the sound installation for the training facility.

Western Sound has used Altec's AcoustaCADD computer software program to help design a new sound system in a church sanctuary for the Cloverdale Bible Way Church in British Columbia.



## New Antennas

Sata-Link Inc. has introduced a mini Ku-Band/C-Band satellite antenna system with a diameter of four feet, priced under \$1,300 for a complete system. Separate models are offered for homes, apartments, cabins and rec vehicles. A flat area of six inches by 16 inches is needed to mount the antenna.

## REP NEWS

### White Appoints Jones

Jones Audio Sales is representing White Instruments in Texas, Oklahoma, Louisiana and Arkansas. Personnel include Chris Jones, Duke Ducoff and Steve Chapman.

### Design Factors Adds Smith

Porter Smith has joined the rep firm Design Factors. Smith, formerly with JBL, assumes a position with the commercial and engineered sound side of Design Factors, serving southern California, southern Nevada and Hawaii.

### Westech Reps IED

Westech Marketing of Cuiver City, California has been appointed the manufacturing representative of Innovative Electronic Designs. Westech represents IED in southern California, Nevada and Arizona. Wes Alderson and his staff at Westech have attended IED's full training session.

### Sonance Raps for Reps

A Sonance rep breakfast featured a rap number written and performed by Sonance Sales Manager David Donald. The previously unheralded performer was costumed in sunglasses, cap and a spray-painted gold M30 speaker baffle and grille worn as a medallion. The rap told the saga of an installation dealer and incorporated an increasingly assertive refrain, "We came to put it in the wall." At the meeting, reps honored included: Greg Grasso, Sound Choice Marketing, "Most Inspirational"; Bill Morton, High Tech Inc., "Most Improved Territory"; and Bill Grover, Morris-Tait Associates, "Most Valuable Player."



## Desktop Video

Digital F/X, Inc. has introduced a new product, the Video F/X, a desktop video production system which integrates video, audio and graphics into a single editing system. The product uses the Apple Macintosh II platform as a user front-end, video tape decks and a video monitor. According to the company, the Video F/X gives "a generation of computer users the ability to create professional quality video presentations."

## ERA Publication

The Electronics Representative Association has announced publication of its 1990/90 edition of the Locator, the directory of manufacturers' representatives in the electronics industry. The 2,000 member firms of ERA, which now sell in excess of \$40 billion annually in electronic products for over 8,000 manufacturers, are listed in the directory according to their geographic chapters and ERA marketing groups.

## APT Award

Audio Processing Technology has announced its selection as a finalist in the Prince of Wales Award for innovation and production. Seven finalists were chosen from over 500 entrants. The award was based on recognition for the development of the APT-X 100 digital audio data compression technology. According to the company, "The APT-X 100 process has been ROM-masked into a DSP chip."

## PRODUCTS

# Rane Intros Equalizers; Columbia Scientific Announces Intercoms

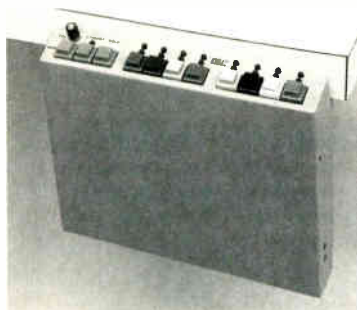


### Commercial Equalizers

Rane Corporation has introduced four equalizers designed and distributed for commercial applications. The series includes the MQ 30 and GQ 30 in 1/3 octave formats and the MQ 15 and GQ 15 dual 2/3 octave configurations, in one and two rack spaces respectively.

All models feature complimentary balanced inputs and outputs via both barrier strip and three-pin connectors, as well as Interpolating Constant Q filters for bandpass response both on and in between ISO centers.

Circle 1 on Reader Response Card



### Edge-Mounted Intercoms

Columbia Scientific Industries of Austin, Texas has announced its Model 4040E and Model 4080E edge-mounted intercom systems. The intercoms have their switches located in an edge-mounted counter console only 1 1/2 inches thick. The intercom switching circuitry is located in an under-counter remote unit.

The Model 4040E intercom is designed to allow operators to interchangeably use either of two switching consoles, reaching any of four remote speaker/microphone locations. The Model 4080E is designed so that operators can interchangeably use any of four switching consoles, reaching any of eight remote speaker/microphone locations.

Circle 2 on Reader Response Card

### Modular Consoles

Hill Audio has announced the new Datum series of modular consoles. The series will consist of 4 standard frame sizes (31, 39, 47, and 55 module spaces)

and 12 module options (standard input, deluxe input, stereo input, dual group/output module, recording group (single group/double monitor), matrix group (8 matrix outputs), mix master, function master, FX return (two mono and one stereo return on each FX return module), monitor input, dual stage monitor output, and stage monitor functions module).

Features available include: sweep E.Q. on both inputs, tape returns on all inputs, 8 aux sends, 48 volt phantom power, phase reverse, and high pass filter (Deluxe input), E.Q. on all returns, L.E.D. meter bridge (standard on recording consoles—optional on sound reinforcement consoles), on-board oscillator, solo function, and three 2 track returns.

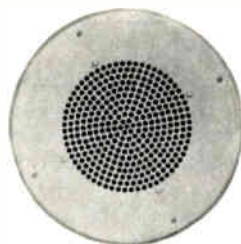
Circle 3 on Reader Response Card

### Tamper-Proof Baffles

A line of tamper-proof ceiling baffles for 8-inch loudspeakers has been introduced by Quam-Nichols Company. The line is designed for use in stadiums, prisons, subways, parks and other areas prone to vandalism.

Made of extra-durable .075-inch carbon steel, the baffles are furnished with tamper-proof hardware and an interior security screen. The two-piece baffle construction combines a carbon steel grille with a tensile strength of 55,000 lbs. per square inch with a uniquely designed speaker screen of acoustically transparent 23-gauge steel.

Circle 4 on Reader Response Card



### Sweep Generator

Production Devices has introduced the model 125B Sweep Generator. The pocket-sized generator provides low distortion sine waves at fixed, variable, or swept audio frequencies. The standard sine wave output may be converted to a square or triangle wave by changing one internal wire.

Features include five fixed frequencies (20 Hz, 1 KHz, 3 KHz, 10 KHz, 20 KHz), 0 to 20 KHz automatic sweep, and a manual frequency control that may be set from 0 to 20 KHz. The output amplitude, once set, remains flat from 20 Hz to 20 KHz ( $\pm 1/4$  dB). The sine wave output is adjustable from 0 to 1.5 volts P.P.

Circle 5 on Reader Response Card



### Protection Systems

Electronic Specialists has expanded its Network Protection product line to include Balun systems for twisted pair network installations. BAL-Net installs directly on equipment to be protected and includes the coaxial — twisted pair conversion system together with spike, surge, and interference control elements. Common and differential mode suppression is incorporated and optional RFI interference suppression is available.

Circle 6 on Reader Response Card

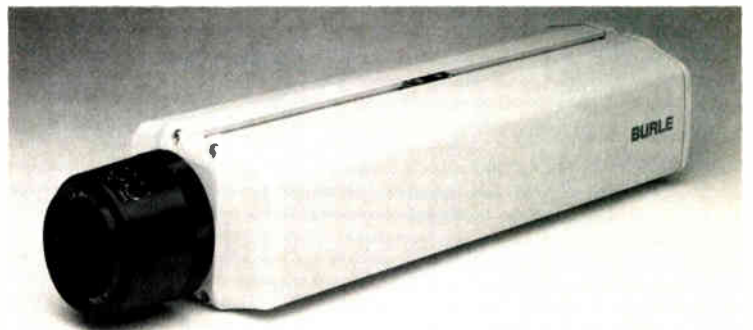


### CCD Cameras

Burle Industries Inc. has introduced the TC440/TC440X and TC446/TC446X Series double intensified CCD cameras designed for demanding ultra low-light level security, military and industrial applications.

The newly designed image sensor used in these cameras consists of a 1:1 first generation image intensifier coupled in series with a first generation demagnified intensifier which is fiberoptically coupled to a high resolution CCD chip. The system provides 500 TVL video at a minimum scene illumination of .000003 foot candles.

Circle 7 on Reader Response Card



### Probe Kit

Probe Master Inc. has developed a "Master Kit" containing 3 complete heavy duty probes and accessories. The 20 piece kit contains a 1X 25 MHz, 10X 200 MHz, and a 1X/10X switchable 15/200 MHz probe in a protective case. The 4 ft. probes use new soft molded strain relief techniques.

Accessories feature a fully enclosed rotating snap-on ground lead, "screw in" replaceable tips and repairable sprung hooks for ease of operation and maintenance. Tip insulators, IC test tips and trimmer tools round out the kit.

Circle 8 on Reader Response Card



### Half-Rack Addition

Symetrix has announced the SX206 Multi-Dynamics Processor, the latest addition to the 200 Series half-rack system. The SX206 operates as a compressor/limiter, gate, downward expander, or ducker. Silent CMOS switching changes the operating mode, and simultaneously shifts the function of the range/ratio control selected.

Features include program sensitive attack and release times, which allow the user to establish appropriate time constants for a particular situation, as well as a front panel selectable slave function allowing two units to operate as a tracking stereo pair.

Circle 9 on Reader Response Card



### Wrist Watch Pager

Motorola Inc. Communications Sector has announced its Motorola Wrist Watch Pager. Initially, the pager will be offered through U.S. Radio Common Carriers (RCCs), businesses which provide and operate paging services and radio networks. The pager is compatible with many RCC's existing paging systems and can be used throughout the country including every Metropolitan Statistical Area (SMSA) in the U.S.

The device, which weighs approximately two ounces, features an LCD display showing the caller's phone number and can store up to eight "time stamped" messages.

Circle 10 on Reader Response Card



mounting to a lectern, pulpit, or podium.

The mics have a frequency response of 70 to 20,000 Hz and feature a low-frequency roll-off switch that is provided to configure the low-frequency response proximity effect, background noise, and mechanical vibration. The switchable low-frequency response is not load sensitive and offers a constant corner frequency regardless of mixer input impedance.

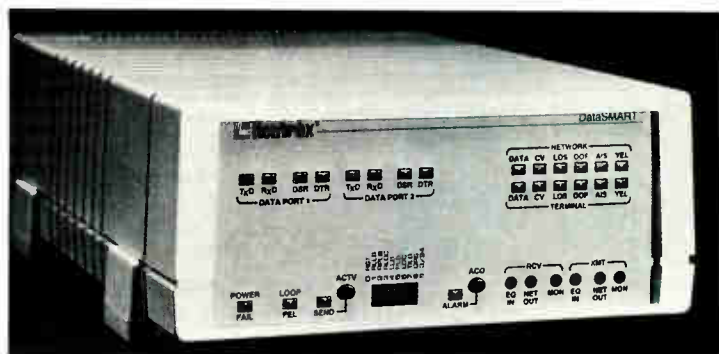
Circle 13 on Reader Response Card

### Test Station Software

National Instruments Corporation has introduced its new LabVIEW 2 Run-Time System — a compact, operate-only version of the popular LabVIEW 2 graphical programming software. The system is tailored to end-users and VARS who want only to run ready-to-use programs in applications for test stations, process monitoring and control systems, and other turn-key data acquisition and instrument control solutions.

With the full-development system, users create software modules called virtual instruments (VIs). Each VI is composed of a graphical front panel user interface and executable program expressed as a block diagram. With the runtime system, an operator can load and execute VIs, change the value of controls, and observe the values of indicators. However the operator cannot look at or edit VI block diagrams, thus protecting the source code from changes. A developer can also use a new feature in the full-development system that saves a VI without its block diagram, so that even an end-user with a full-development system cannot edit the VI.

Circle 14 on Reader Response Card



### Power System

Bally has announced the PPS-1500, a complete, pre-engineered photovoltaic power system providing "continuous, reliable" power for communications equipment at remote sites.

Provided as a complete package, the PPS-1500 includes photovoltaic generator, storage battery, controls, and the Bally equipment shelter. The system supplies 24 VDC as a standard; 12, 48, and 120/240 VDC are optional.

Circle 11 on Reader Response Card

### Integrated Voice/Data

Kentrox Industries Inc. has announced the DataSMART multiport DSU/CSU System of intelligent products for T1 and Fractional T1 integrated voice/data network access. The DataSMART System uses a modular design that permits multiple units to be cascaded and distributed in support of FT1 applications such as video imaging, CAD/CAM workstations, Group IV facsimile, LAN-to-LAN communications and video teleconferencing. DataSMART also supports typical T1 applications such as front-end processors, host-to-host bulk data transfers, and voice communications. DataSMART allows high speed synchronous transmission rates from Nx56 Kb/s or Nx64 Kb/s up to 1.536 Mb/s. DataSMART is the first T1 DSU/CSU to take full advantage of the newly adopted ANSI T1.403 and AT&T TR 54016 ESF standards and to provide clear channel capability adopting both B8ZS and ZBTSS standards.

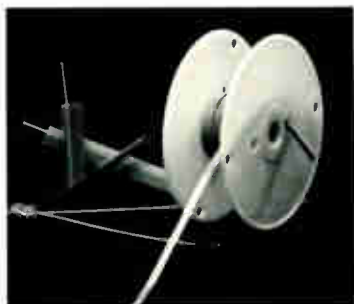
Circle 12 on Reader Response Card

### Plenum Line Cord

Cable USA has introduced a plenum line cord, Type CMP. It contains a flat, modular design, which allows it to use standard, self-stripping connectors for terminating.

Type CMP is available in 4, 6, or 8 conductor count and solid or stranded 26 AEG or 24 AWG conductor styles. The wire contains Halar E-CTFE compound, and is for use in ducts, plenums, and other air handling spaces.

Circle 15 on Reader Response Card



### Front Slope Consoles

Cabtron Systems Inc., has introduced a line of 30-degree front slope consoles. A wide range of accessories and optional features enables these enclosures to hold monitors, control panels, and electronic equipment. The consoles can be modified to fit control room layout.

Circle 17 on Reader Response Card



### Voltage Tester

The genuine Wiggy solenoid voltage tester is available from Klein Tools. The tester reads 120 to 600 volts dc or ac (50/60 Hz ac current) and will quickly locate grounds and blown fuses. The tester requires no batteries and comes with 28-inch long replaceable test leads that are protected with built-in strain relief. The unit has two prods that are encased in spring-loaded sleeves for work in confined areas. When testing in open areas, the sleeves can be withdrawn and locked into position.

Circle 16 on Reader Response Card

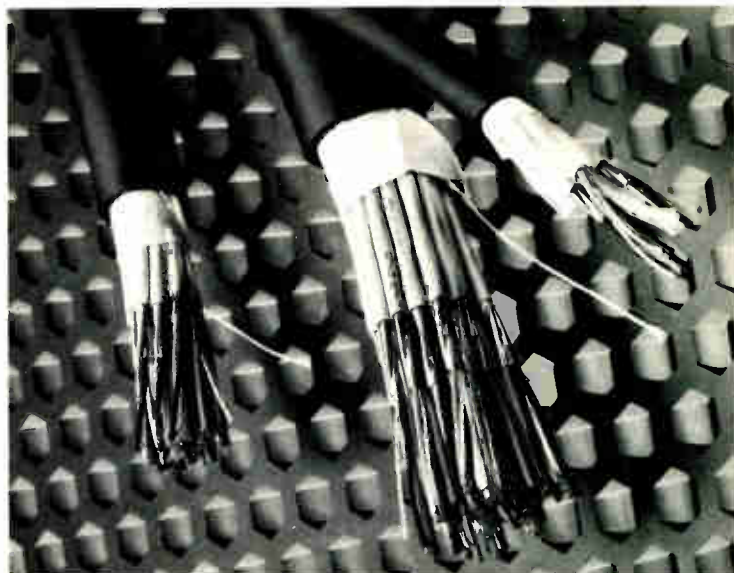


### Video Systems and Floor Mounted Systems from JBL

Harman Electronics' JBL Video Products Group has introduced the JBL Video 6800 Series and the RSVP line of floor mounted systems.

The centerpiece of the 6800 Series is the model 6850, a self-contained projection television designed for the home theater market. Built in to the 6850 is a high brightness optical system and a full featured 178 channel cable compatible tuner with three RF inputs. Viewers may also select from two additional audio/video sources and an S-VHS input. All input, switching, picture parameters, and audio setting are controlled by a standard wireless remote control. To meet future needs, the 6850 is equipped with both fixed and variable audio outputs, as well as a built in 10 watt per channel audio amplifier. The 6850 is available with optional HD-6ML data grade multi-coated lenses. Also available in the 6800 Series is the 6810 which features a built in tuner and audio amplifier.

The RSVP line is a floor mounted system including a built-in tuner with multiple inputs, remote control operation



and a built in Dolby Surround Sound decoder. RSVP projectors are available in 4 custom versions ranging from a basic Series I model to the fully equipped RSVP-HR with features including S-VHS capability, high brightness tubes, and HD-6ML lenses.

Circle 18 on Reader Response Card

### Digital Audio Disk Recorder

360 Systems has introduced DigiCart, a random access, 16-bit linear, cart-style recorder that will store up to 10 minutes of 15 kHz stereo audio or 20 minutes of mono on a magnetic digital audio disk.

DigiCart offers extensive non-destructive editing and cut sequencing features, with instantaneous startup of any cued cut. Automation system interface is via an EIA-232 port. An internal hard disk option can provide a maximum of one hour of additional storage time and an SCSI port accesses external hard drives.

Circle 19 on Reader Response Card



### Multi-Pair Snake Cables

Belden Wire and Cable now offers nine multi-pair snake cable for installation between walls. The cables are useful for interconnecting audio equipment, recording equipment (primarily for studio applications), television and radio equipment, and post-production facilities. The cables are designed for permanent hard-wire applications and are available in pair counts of four to 32.

Circle 20 on Reader Response Card

### Pan/Tilt

Javelin Electronics has introduced the JPT2410, a lightweight pan/tilt with auto-pan capability. Load capacity on this new unit is 10 lbs. in either upright or inverted position.

This 24VAC model can be used with most solid state cameras and lens combinations. With automatic braking, the unit pans at 6 degrees per second and tilts at 3.6 degrees per second.

Circle 21 on Reader Response Card

### Noise Gate

Omicraft has introduced the GTS Stereo Noisegate, which uses optical switching in order to lower noise. Features include: gating at mic or line level, balanced inputs and outputs (on XLRs), two 24 db/octave filters per channel, two different triggering modes, ducking mode, and keying input.

Circle 22 on Reader Response Card



# CALENDAR

## Upcoming Events

### NOVEMBER

**Urban Jam:** Tampa, FL Contact: (813) 963-1170. Nov. 1-3.

**PASIC:** Philadelphia, PA Contact: (217) 367-4098. Nov. 7-10.

**National Fire Protection Conference:** Miami, FL Contact: (617) 770-3000. Nov. 12-15.

**Comdex/Fall:** Las Vegas, NV Contact: (617) 449-6600. Nov. 12-16.

**Lighting Dimensions:** Orlando, FL Contact: (212) 353-1951. Nov. 17-19.

**Acoustical Society of America:** San Diego, CA Contact: (212) 661-9404. Nov. 26-30.

**North America Broadcast Security/World Association for Christian Communication (NABS/WACC):** Ft. Lauderdale, FL Contact: (716) 458-4250. Nov. 26-30.

### Single Port Module and Data Connector

A new single-port module brings the adaptable voice and data connection of the AMP Communications Outlet to modular furniture, floor fittings, and other areas with strict space requirements. The outlet has interfaces that are compatible with IBM Token Ring, DECconnect, StarLan, Ethernet (over twisted pair), ISDN, and other networks. It accepts a number of network cable types, including shielded or unshielded twisted-pair and coaxial.

Circle 23 on Reader Response Card

### Karaoke Products

Nikkodo is marketing a series of 20 CD-G discs containing a total of 360 karaoke songs. Presently Nikkodo is marketing a 30W/channel amplifier with digital echo (DA-200) and another 30W/channel amplifier with digital echo and key controller (DA-220). Nikkodo will introduce a CD-G player with a built-in graphic decoder in September. According to Stuart Sollod, Vice President of Sales and Marketing, "Karaoke is a kind of philosophical experience and we want to build on that concept."

Circle 24 on Reader Response Card

### Video Tuner/Controller

Harman Electronics' JBL Video Products Group has introduced the TC-1, a video tuner/ controller for RGB input devices such as large screen projectors.

The TC-1 contains a 178 channel cable compatible tuner with three separate RF inputs which let a viewer select cable direct, a cable converter, or antenna inputs. Video inputs may be selected from either a dedicated composite video or S-VHS input, while a third video input is switchable between either composite or S-VHS sources.

One set of operating conditions may be stored in one of five personal reference memories. This lets each member of the family have the TC-1 automatically adjust to a favorite channel, preferred picture conditions, and control settings at the touch of a button. Other features include: digital picture in picture from a second video source, a 12 volt output to control the relay for electric screens or blinds, and built in extension jack for the remote control sensor.

Circle 25 on Reader Response Card



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## Atlas/Soundolier Appoints Gushwa; Numark Appoints Meals

### Sales at Atlas

Chuck Gushwa has been appointed to the newly created position of Director of Sales at Atlas/Soundolier. He is responsible for coordinating the administrative and support functions of Atlas/Soundolier in the sound contractor, music industry, electronic distribution, and security alarm segments.



**Gushwa**

Previously, Gushwa was Manager of Marketing and Sales at Crown International. Prior to his current assignment, Gushwa was Chief Financial Officer of Pro Co Sound.

### Panasonic Appointments

The Closed Circuit Video Equipment Division (CCVED) of the Panasonic Communications and Systems Company has appointed James Warren to the position of Technical Support Administrator and



**Warren**

Frank Abram to a newly created sales management position.

Warren is responsible for CCVED's trade shows and sales training activities. He will also interface with CCVED's dealers in the design of CCTV systems. Abram is



**Abram**

responsible for special projects involving sales planning and market development.

### Entek Gets Marketer

Michael J. Roedersheimer has been appointed Marketing Director at Entek. Roedersheimer has been the Marketing Communications Manager since joining Entek in 1987.

### Numark Appoints Sales Manager

Numark PPD has appointed George Meals to the post of East Coast Regional Sales Manager. Prior to joining Numark, he held Sales Management positions at Emilar, Renkus Heinz, and OAP. He also previously worked as a Senior Broadcast Sound Engineer for the Swedish Broadcasting Company.

### Manager for AGK Divisions

Scott Heineman has been named Product Manager for dbx Professional Products and Orban Broadcast and Professional Products, both divisions of AGK Acoustics Inc. Heineman will be responsible for providing technical support to reps, dealers, and customers. His other responsibilities include strengthening existing product lines, offshore product management, factory training, sales, and technical advice.



**Heineman**

Before joining AGK, Mr. Heineman served as Senior Service Technician and Customer Service Specialist with Otari Corporation. Previously, he was a duplication facility maintenance technician for Westape Audio Production/AudioTek Duplication Systems, a quality control and duplication technician at Capitol Records, and a sound reinforcement and sound systems technician for Zeta Sound Systems.

### Marketing at Fibertron

Scott Coryell has been assigned the responsibilities for marketing communications and new market development with Fibertron Corporation, a West Coast distributor of fiber-optic components and test equipment. According to Vice President of Sales and Marketing, Mark Spiegel, Coryell will be responsible for all advertising, sales promotion, public relations, trade shows, catalog and sales literature development, co-op promotional programs, and other new market development programs currently underway.

Coryell joins Fibertron after serving as an account executive with J2 Marketing Services in Brea, Ca. Previously, he has

held management with companies including Beekman Instruments, Marshall Industries, Anaconda Telecommunications and Uniloe Corporation.

### Cable Officers

The Board of Directors of the Society of Cable Television Engineers elected their officers for the coming year. The officers are: Wendell Woody, President; Vic Gates, Eastern Vice President; Richard Covell, Western Vice President; Jim Farmer, Secretary; Les Read, Treasurer.



**Woody**

### International Appointment

Anixter has appointed Mike Heaton Director of Transportation and Customs, with a focus on international functions and has named Al Corsi Product Vice President of Electrical Wire and Cable. He will be involved with vendor relationships, product management and marketing, as well as working with the company's top industrial customers.

Prior to joining Anixter, Heaton was Manager of International Transportation for a manufacturing company in Illinois. Corsi has been with Anixter since 1969 as has held various positions in sales, product management, and marketing.

### Senior VP for Anixter

Anixter Brothers, Inc. has appointed Jim Warren to the position of Senior Vice President-International Sales. Warren has been with Anixter for 22 years in various sales and management positions and most recently was Senior Vice President of Major Markets.

### MultiLink VP

Bruce Bower has been named Vice President of Sales and Marketing by MultiLink, Inc. Bower has a total of 20 years of experience in the Sales and Marketing of communications and computer systems. He was most recently the Vice President of Sales and Marketing of Technology Development. Prior to that, Bower held senior sales and marketing management positions with IBM Corporation and Rolm Systems Marketing.

### VP at Strategic Telecom

Richard Bedford has been named Vice President of Marketing at Strategic Telecom. He was previously President of Travelhost Inc., where he was responsible for launching a new franchise, implementing a hotel-room videotext system, and publishing an in-room magazine.

### U.S. West Appoints VP/GM

U.S. West Communications has appointed Joanne R. Crosson to the position of Vice President and General Manager for its Consumer Public Services market unit. Crosson is responsible for the overall management, sales, and operations of a 700 employee organization across U.S. West's 14 state territory.



**Crosson**

Crosson replaces Gregory M. Braden who accepted the position of Vice President, Sales for the Western Region of the company's Large Business Services market that serves businesses with 100 or more employees.

### Schuenemann Joins Rep Firm

Robert E. Schuenemann has joined the Enright Company, a manufacturers representative firm, in Sales and Dealer Sales Management. Schuenemann will serve parts of Orange County plus San Diego and Arizona. He has experience as an A/V and video dealer and as a manufacturers rep in Southern California.



**Schuenemann**

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loudspeaker systems, from the ultra-compact Control 1™ and Control 5™ to the powerful Control 12SR™, are designed to work perfectly with a wide variety of mounting hardware.

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Next time you find yourself in a tight spot, remember Control Series then call your JBL representative. We'll send you complete product information and specifications.



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