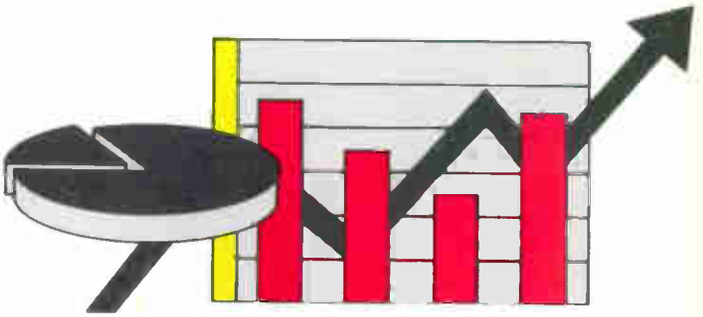
SOUND & COMMUNICATIONS

Volume 37 Number 10

October 22, 1991

RESIDENTIAL SURVEY

We asked you if you cared about the custom non-commercial installation market — and you answered "yes." But, do you really need the market? Most of you weren't quite so sure. The full story is inside. **23**



FIXING A RESIDENTIAL MEDIA ROOM

A disaster was in the making. The mirrors were up, the customized walls were finished. And the audio installer has gone bust. Somewhere behind those walls were the wires. Charles Ferrari came to the rescue. **30**

MOTOR COACH SOUND

The motor coach is a special kind of venue for sound and communications. Intercoms serve as conveniences and as security measures for the high end R.V. And for the price of a luxury home

RESIDENTIAL ROCK

When a major producer in the rock music field needed a whole-house music and video system, Bruce and Rani Gladwin went to work. From media room to cabana to guest house, the entire property is wired. The Gladwins tell how they did it. **64**

PERFORMANCE

THE PEAVEY PERFORMANCE SERIES™

The Performance Series™ 3680 Sound Reinforcement Console is the result of ongoing research by Peavey to meet the rigid requirements of today's sound engineers. Many technological advancements have been included with this new console, but we have also kept in mind the most needed and most often used features that are common to virtually every sound reinforcement application.

The totally modular concept, coupled with performance, function, features, and exceptional specifications, has offered to the sound engineer a console that is "tailor made"... and affordable!

ULTRA LOW-NOISE DESIGN

The input stage is discrete and contains the lowest noise transistors that are currently available. The signal-to-noise spec of the Performance Series 3680 input stage has approached the theoretical limit at -133 dB while maintaining 60 dB of gain.

DIFFERENTIAL SIGNAL ROUTING

All bus signals are differential to eliminate crosstalk and annoying ground conduction.

GOLD PLATED INTERCONNECTS

Gold plated connection contacts are used throughout for lowest noise and maximum reliability. The highest degree of signal integrity is maintained with all signal interconnects to provide "low-noise" operation.

IC SOCKETS

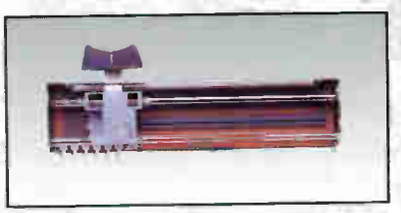
All ICs are individually socketed for ease of service as opposed to ICs that are soldered directly to the circuit board.

INPUT CHANNEL FLEXIBILITY

Now available in 24 and 36 channel versions, channel options are unlimited for the future and for special applications requiring more than 36 channels.

ELECTRONICALLY BALANCED INPUTS

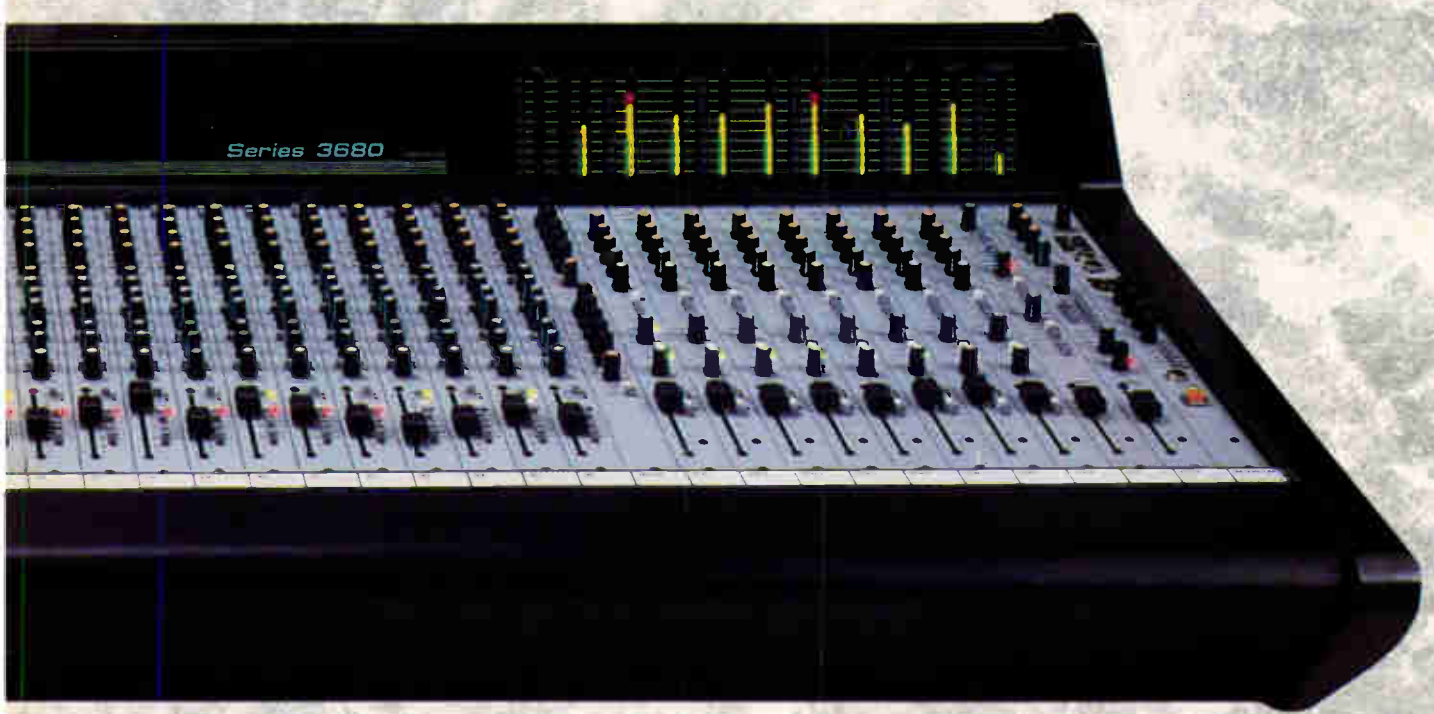
New electronically balanced input circuit offers 100 dB of common mode rejection, allowing the console to operate in most any environment without interference.

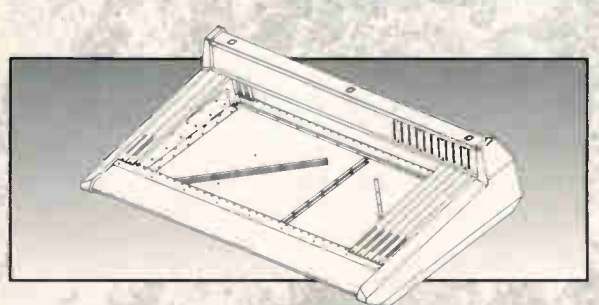


PREMIUM FADERS

Rails are center ground and highly polished to match perfectly with nylon bushings for a silky smooth feel. The shaft is offset to prevent dust and debris from entering the fader mechanism.

ENGINEERED...
SOUND REINFORCEMENT CONSOLES



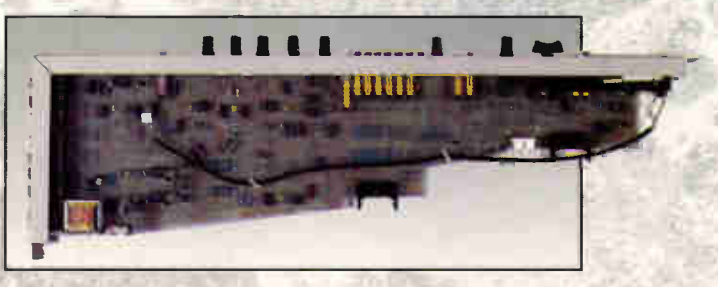


MONOCOQUE CHASSIS CONSTRUCTION

A unique monocoque chassis construction has been selected for maximum rigidity and resistance to "flexing" of the chassis mainframe. This super-strong chassis design minimizes electronic problems due to the mechanical "bending" of the console chassis during transportation, set-up, and tear-down.

EXTERNAL POWER SUPPLY

Rugged external power supply mounts in standard 19″ rack and occupies only two vertical rack spaces.



TOTALLY MODULAR CONCEPT

The Performance Series 3680 is a totally modular mixer from the standpoint of numbers of channels, and because channels may be removed separately. Each channel stands alone from the input to the 100mm fader. Removing the channel module also removes the entire array of input jacks and all patch points for that particular channel. From a service standpoint, the channel may be easily checked out on the bench or outboard from the main mixer housing since the input patch panel is part of the channel module.

PEAVEY®

ARCHITECTURAL ACOUSTICS®

A Division of Peavey Electronics Corporation
711 A Street, Meridian MS 39302-2898 (601) 483-5376 Fax: (601) 484-4278

Circle 204 on Reader Response Card

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FEATURES

DEPARTMENTS

Otari now has the products, and the pricing to make your next installation easier, faster and more profitable.

When you want your installations to *stay* installed, or when service contracts are a part of your business, Otari's legendary reliability makes our products an obvious choice.

With a selection of audio recorders from 2 to 32 tracks, a high performance cart machine, and a complete line of audio and video duplicators, you can choose *exactly* what's right for the application, and for your budget. What's more, these new machines will satisfy your present clients and win new ones with their advanced features.

For example, your customers will appreciate the convenience of a voice editing module that maintains normal pitch at twice normal speed, and the ability to select EQ and reference fluxivity values at the flip of a switch. Then there's that famous Otari sound that comes from features like transformerless balanced inputs/outputs, and gapless, seamless, punch-in, punch-out.

Before you begin your next installation, let us show you that Otari is *serious* about your business with our Sound Contractors Resale Program. Call Otari at 415-341-5900.

OTARI

Request for Information; New Notes

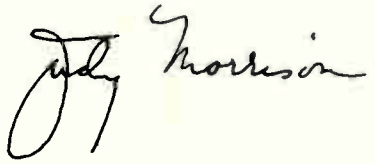
This is an open call to our readers. Each year magazines around the country make up their editorial calendars for the year. They're based on the state of a market and what the publisher and editors view as the readers' interests. But a year is a long time. I'd like to know from you what *you* would like to see more — or less — of. Let us know; we're always interested.

Many of our readers have expressed interest in the residential market. Some in fact are very active in that aspect of the business. And this month we present the results of a survey of the industry to indicate the interests now and for the future of the people who know how to do it. We hear two things coming out of the business. One viewpoint views the residential job as more esthetically creative. The other views it as a pain in the neck. The consensus seems to lie somewhere in between.

In case you haven't noticed, we've added a new feature in the past few months. Product Check is a survey of our contractor readers to ascertain what kinds of products they're using in particular venues. But you guys are too interesting for us to leave it as a cut and dried chart. You're offering information to our researchers that we thought would be of interest to all of our readers. So we've inaugurated an appendage to Product Check, called "Notes on Product Check," that gives an overall view of what people are saying, with quotes and comments from those of our readers who have participated in the particular survey. Again, we welcome your comments. If you have any particular venues you'd like us to investigate, let us know. We do what you want, because if you're not interested in the magazine, then it isn't valid. Sound & Communications is produced for our readers, and we want you to be a part of it.

We've just returned from the Funkausstellung, the Berlin audio and video fair. Some of the surprises included a large karaoke exhibit by both Pioneer and Sony. Philips was making a major show of its DCC digital tape format, although no new information was offered that had not been presented in the United States last January. BASF, however, did have on hand a prototype of the DCC tape. The format is expected by the companies to be on the market sometime in 1992. Meanwhile, Sony talked up its MD system of recordable mini discs, although again this wasn't anything new to Americans. Kenwood showed its recordable CD player (shown here at both the AES and CES). The floor of the exhibit hall was filled with 16 x 9 televisions, readying themselves for a probable major push at least in Europe by the end of next year. But this convention is also opened to consumers, and the crowds and throngs from all over Europe gave all of us in the press agita, although exhibitors weren't unhappy. It made us cringe at the idea of CES opening its doors to consumers. which is "under discussion." We'll fill you in as soon as we know more on that. Meanwhile, we're looking forward this month to both the CEDIA convention and DJ Expo. And next month we'll present a full wrapup of the Audio Engineering Society Convention in New York.

Best Regards,



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SOUND COMMUNICATIONS

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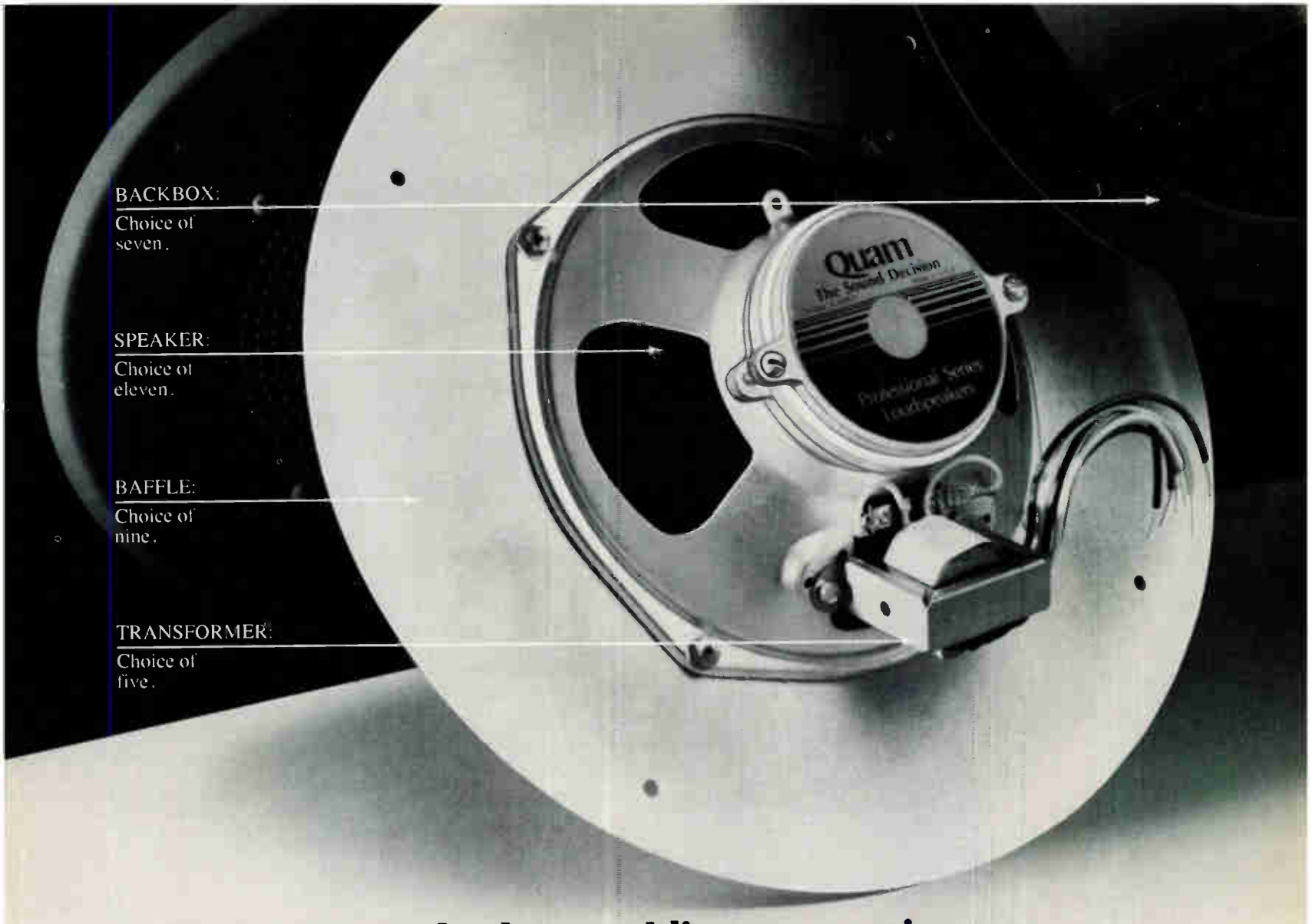

With 3450 standard assemblies, Quam gives you custom-designed flexibility with off-the-shelf delivery.

When we say Quam offers a broad line of 8" assemblies, we don't mean a few speakers with a lot of baffles. We mean 11 different speakers, with nine baffles, to suit virtually any application. Add any of seven backboxes and five transformers (and more of each coming), and you have more than 3450 combinations to choose from.

You specify it the way you want, and you receive it when you want. All the components are in inventory... 70,000 pieces! You order and we assemble and ship within 24 hours. No waiting.

Our broad commercial sound accessories line is a change from the days when Quam concentrated exclusively on speakers. And we'll continue to change, adding innovative, high-quality products that help make you more profitable. What will never change is our tradition of quality and service.

Make Quam your Sound Decision. Call or write now for your free Commercial Sound Products catalog, and we'll add you to our mailing list for catalog updates and product announcements as they occur.

Quam: The Sound Decision

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QUAM-NICHOLS COMPANY • 234 E. Marquette Road • Chicago, Illinois 60637 • (312) 488-5800

HOW TO LEVEL A HOTEL FOR UNDER $350.

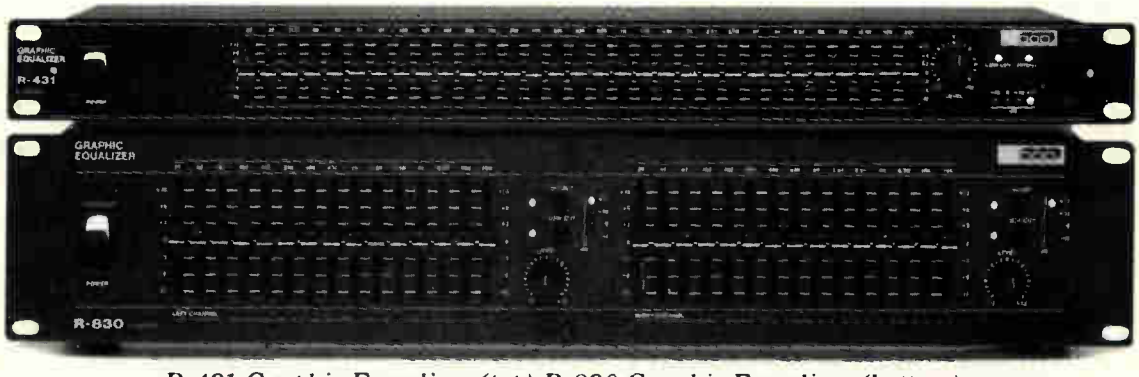
DOD graphic equalizers are veritable workhorses for improving public address sound quality in airports, shopping malls, hotels and public buildings.

That's because DOD makes more configurations of quality graphic EQs for more professional applications, than any other company in the world. For a lot less than you'd expect.

For a demonstration, see your professional audio dealer or sound contractor.

He'll recommend DOD with no reservations.

DOD



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

NEWSLETTER

APPOINTMENTS AT UNIVERSITY

Mark IV Audio has "restructured its organization to place more focus on the growth of University Sound's business." Doug MacCallum has been named president of University, with Dave Merrey assigned corporate direction and strategic planning. MacCallum had been general manager of Mark IV Audio Canada. Merrey is the president of Altec Lansing. University Sound was formed from the merger of University, Electro-Voice commercial, and Raymer product lines. Bob Pabst, president of Mark IV Audio, said, "Our strategic focus has now fallen on commercial sound. Our objective is to capture a top-three world market share."

PRODUCT MARKETING

Bill Thompson has been named new product marketing manager of Tektronix. He was previously with Analog Devices.

KARAOKE WITH DSP

Pioneer Laser Entertainment is introducing a karaoke unit with digital signal processing that provides hall, stage and arena sound. The soundfield processor can provide pop mode, jazz mode and other styles through electronic processing. The company is expected to introduce rackmount karaoke systems within the next year.

MULTIMEDIA DISC

Warner New Media is releasing its first multimedia exploration of choral music with Brahms' "A German Requiem." The program features nearly 70 minutes of digital audio, complete English and German texts, two real-time analyses of the music, a notebook, a Requiem Timeline and a full index and glossary — all accessible with an Apple Macintosh, compatible CD-ROM drive and audio playback equipment.

DOD MARKETING APPOINTMENT

Ferdinand Boyce has been named vice president, marketing of DOD Electronics. Boyce has been associated with Northshore Marketing in Seattle for the last eight years. He has also served as Chairman of DOD's rep council. Previously he was national sales and marketing manager for Tapco and western regional manager for Electro-Voice. DOD was recently named the U.S. distributor of Allen & Heath products, after AHB was acquired by Soundcraft in the U.K. (All three companies are part of Harman International.)

APT CONSOLIDATES

Audio Processing Technology has relocated the firm's sales and marketing division to Belfast. All operations including R&D, administrations and production of the apt-X 100 digital audio data compression system are located in one corporate headquarters . The company is majority owned by Solid State Logic. Four staff appointments have also been announced: Steve Cheung, sales and marketing manager, Gail Moore, marketing assistant, Mike Smyth, R&D manager, Paul Smith, R&D development engineer.

JBL APPOINTS

Rick Kamlet has joined JBL Pro in new product marketing. He was previously with TOA.

MATH ASSOCIATES ACQUIRED

Math Associates, Inc. in Westbury, New York, has been acquired by General Microwave Corporation. Math Associates retains its name and operates as a wholly-owned subsidiary of General Microwave with Sherman Rinkel (president of General Microwave) as president, Irwin Math as vice president and technical director, and Ellen Math vice president of administration. According to the company, the acquisition enables Math Associates "to tap its full potential" in the fiber optics market, and allows General Microwave to diversify into non-military products.

NEWSLETTER

CELCO PURCHASED

Mark IV Audio has sold Celco North America to Vinnie Finnegan and Norman Wright. Mark IV had acquired the distribution company as part of its acquisition of Klark-Teknik last year. Finnegan had headed up the marketing of Celco and other lighting products under the Klark-Teknik umbrella. Celco is moving to a new Long Island site by the end of this month.

TANNOY DISTRIBUTES B&K

Tannoy/TGI North America has become the exclusive U.S. distributor of Bruel & Kjaer professional audio products. Negotiations began at the NAB show in Las Vegas in April.

NEW MONITOR FROM PANASONIC

"Super Flat" is the English name for the newly introduced "television system" which has been successfully sold by Panasonic as a consumer product in Japan under the name "GOA." The new tubes have new phosphors, a new mask, darker glass, and active circuitry in the speakers. A professional version presentation model is expected to be introduced within the next few months. The Super Flat is also expected to be the basis for a 16 x 9 television to be introduced by Panasonic.

WOHLER AT OLYMPICS

CBS has ordered 71 Wohler Technologies AMP Series rackmount powered stereo monitors for installation in the network's broadcast center at the 1992 Winter Olympics in Albertville, France. VTRs in the facility will be equipped with Wohler units for dedicated monitoring of audio tracks. Additional units will be used to check audio quality on incoming remotes.

NEW TEAM AT TOA

TOA Electronics Inc. has appointed a new Engineered Sound Management Team, including: Product applications consultant Chuck McGregor, marketing development manager John Murray, and a group of regional managers — Walter Best, Robert Slaughter and Bill Ford. McGregor was previously senior consultant for electro-acoustic and acoustic design with the Joiner-Rose Group. Before that he was with Jaffe Acoustics. Murray was previously market development manager for professional sound reinforcement at Electro-Voice. Best was with Atlas/Soundolier; Slaughter was with Swank Audio Visuals; Ford was with Turbosound.

HOTEL SHOW SLATED FOR NOVEMBER

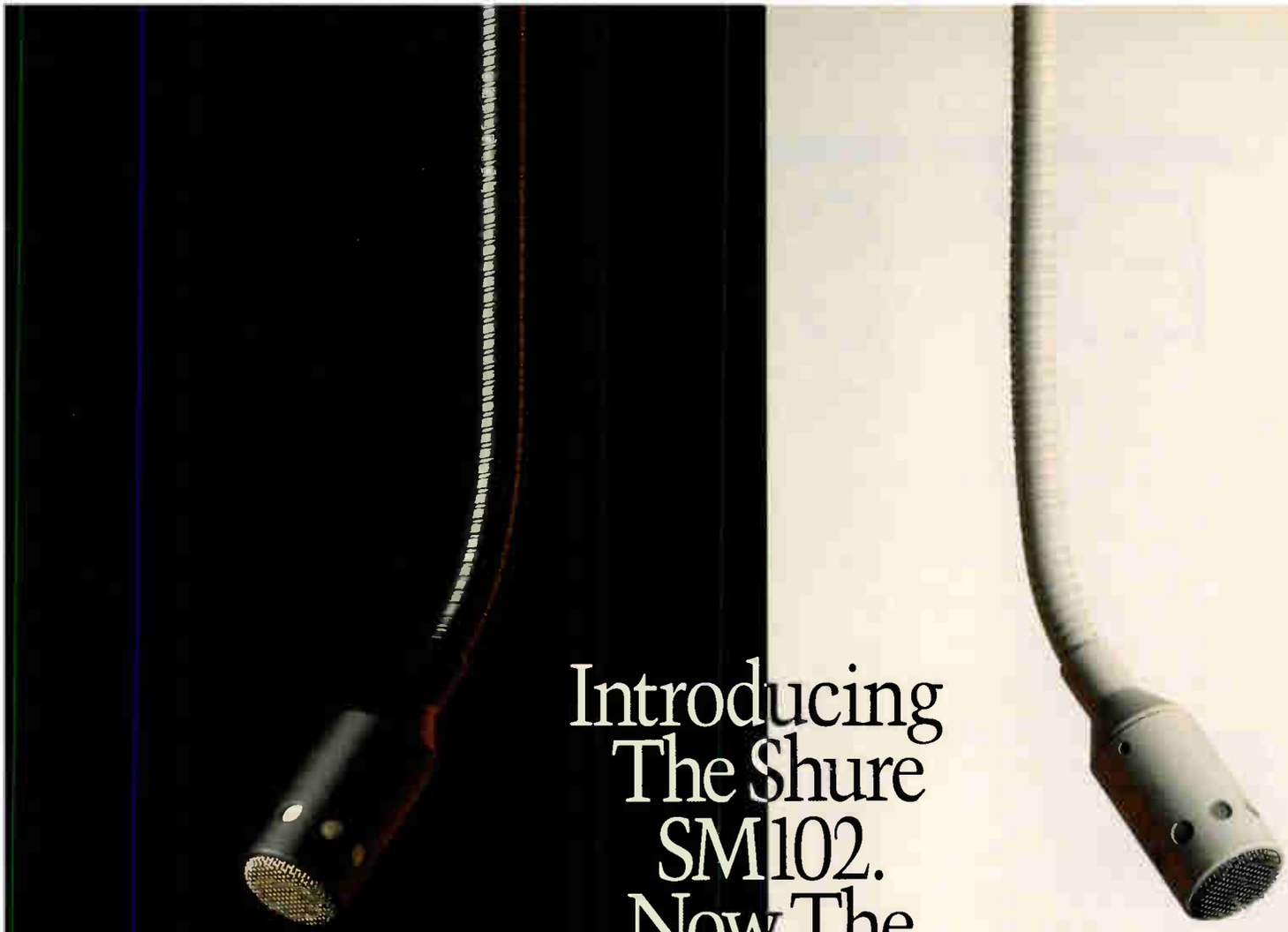
The 1991 International Hotel/Motel and Restaurant Show will be held at the Jacob K. Javits Convention Center in New York November 9 through 12. Show sponsors say advance registration is well above last year's numbers. The 1991 show features a new identification program for products and services to "help buyers locate specific types of exhibits."

"LONWORKS" DEVELOPER SIGNED

Arthur D. Little Inc. has been signed as the first independent developer for Echelon Corporation's intelligent distributed control technology and LonWorks product family. Echelon has also announced its Independent Developer Program. According to Stuart Lipoff, vice president of advanced electronic technology at Arthur D. Little, "Before Echelon . . ., product development in this area required custom protocols and hardware interfaces."

HEARING MEETING

The National Hearing Conservation Association's Second Annual Regional Seminar will be held on November 14, 1991 at the Hyatt Regency Hotel in Oak Brook, Illinois. The one-day seminar is titled, "Excellence in Hearing Conservation," and features topics on noise measurement, personal hearing protection, audiometric testing, education, and audiometric data analysis.



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

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

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

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

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

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

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

SHURE® microflex™

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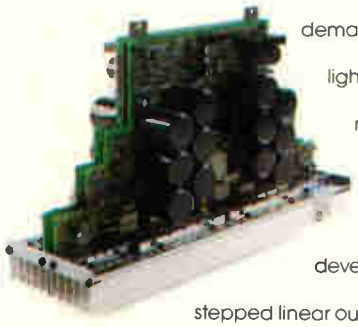
RAISING THE STANDARD FOR ENGINEERING SOPHISTICATION

EX SERIES

From the beginning we wanted it all: massive power, high efficiency and performance combined with unmatched flexibility and reliability. Together they represented the ultimate statement — amplifiers far more sophisticated than any available today. Our engineers accepted the challenge. **The result is the EX Series.**

MASSIVE OUTPUT POWER. The EX 4000 supplies 1,100 watts per channel at 4 ohms, enough power to drive today's most demanding speaker systems. No duty cycle lightweights, each model will deliver massive output power under high duty cycle conditions.



HIGH EFFICIENCY. QSC engineers developed an advanced high efficiency stepped linear output circuit to dramatically lower waste heat and AC current consumption. As a result, the EX 4000 can operate on a normal 15 amp AC plug. It's the only amplifier in its power class to do so!

CLOSED LOOP PROTECTION. A sophisticated closed loop thermal management and protection system measures actual operation and smoothly and progressively intervenes only to the degree necessary. This eliminates harsh clipping, false triggering chatter, shut down, and other forms of protection distortion.

OPEN INPUT ARCHITECTURE.™ Open Input Architecture provides the ability to interface with computers, digital audio, and fiber optic systems. It also allows you to incorporate signal processing capabilities within the amp. No matter what your needs will be, an EX Series amp has the flexibility to meet your requirements.

YOU CAN HAVE IT ALL. At QSC, our high standards of quality and value have remained the same for over two decades. We have also earned a legendary reputation for reliability. And we've done it the hard way, by performing flawlessly in the world's most demanding sound systems. Now, with the EX Series, we have raised the standard for engineering sophistication. It will change what you think a power amplifier should be.

QSC AUDIO

To learn more about the EX Series, contact an authorized QSC dealer for the EX Series White Paper.

Circle 214 on Reader Response Card

QSC Audio Products, Inc., 1926 Placentia Avenue, Costa Mesa, CA 92627 (714) 645-2540

Digital Planning and Correct 'Q'

Dear Answerman,

I enjoyed reading Mike Klasco's article in the December 21, 1990 issue on Digital Plan Measures. In the article he wrote that there are others on the market. I have not been able to find any on my own, perhaps because I do not know where to look effectively. Could you give me a hint or two on what trade journals would cover them, or what companies I should contact for information?

Joseph Heck
Wrentham, MA

Dear Joseph,

Digital plan measures may be found in mail order catalogs targeted for architects, draftsmen, and mechanical engineers.

For example, The Fidelity Graphics Arts Catalog has the Run-Mate Electronic Plan Measure for $140, which is somewhat similar to the Calculated Industries Scale Master mentioned in the December article. In case you missed reading the article, a digital plan measure is a handheld device in which you enter the drawing scale and then roll it along the line you would like to measure; and it will readout the length. This is especially useful for measuring curved surfaces on drawings, when drawings have been reproduced to a different scale than the original, as well as a very efficient way to get coordinates off an existing drawing for entry into a CAD program.

Other items of interest in the Fidelity Graphics Arts Catalog are the Placom Digital Planimeter and drafting machines. A digital planimeter calculates areas on prints automatically and is especially useful and fast for calculations of odd shaped areas. This neat device comes at the steep price of $690. A drafting machine mounts to a drafting board and serves the function of a protractor, straight edge, T-square, scales and so on. The drafting machines in the Fidelity catalog cost from $185 to $450, although they also have a Koh-I-Noor portable drawing board with a mini-drafting machine for $50.

Another mail order catalog house is Disco Print, who cater to users of drafting equipment, CAD systems, and desk top publishing. Disco Print sells the Calculated Industries contractor's calculators, range finders, as well as their Scale Master digital plane measure. Disco Print discounts the Scale Master to $100. Disco Print carries the Sonin range finders and Planix digital planimeters, which sell for $400 to $600. Also, drafting machines similar to the range featured by Fidelity are carried by Disco Print.

It is hard to characterize Abbeon's catalog, as it contains everything from radiation measuring equipment, to technical books, light tables, and circuit tracers. If the drafting machines mentioned above were of interest, but too expensive, the Rolling-Ruler, Techno-Rule, and Perspectaid in the Abbeon catalog might be of interest. The Rolling-Ruler consists of a 12-inch long ruler/straight edge attached to a rolling tube. The rolling ruler makes horizontal and vertical parallel lines that are perfectly spaced. By sticking in a pen hole you can make circles and arcs up to 22 inches. Finally, it makes cross-hatching to an intended angle easy. I played with this implement and it really works and is nicely made (especially for $18!). The Techno-Rule is a miniature drafting instrument with a 12-inch scale, mechanical plane measure (using a rotary dial calibrated in $\frac{1}{16}$-inch) and calibrated angular scale. With the Techno-Rule you can draw horizontal and vertical lines, as well as parallel lines at any angle. The Techno-Rule is $25. The Perspectaid is a tool to aid in the drawing of perspective drawings. If you struggle trying to make 'artist's renderings' and other perspective drawings, you may want to check out this $25 drawing aid.

Although the three firms carry a number of overlapping products, each has a somewhat different focus. Their catalogs are free and provide an endless source of both useful and useless gadgets.

Fidelity Products Co.
(800) 328-3034

Disco Print
(800) 258-7778

Abbeon
(805) 966-0810

WHEN IS THE FRONT NOT THE FRONT?

The following letter asks why the lab measurements taken by Mark Engebretson's Summit Labs show less than the maximum output of the B.E.S.T. speaker at the reference direction. That is, the output level is slightly higher off-axis than it is on-axis, and the "reference direction" is usually the point of highest output. Mark responds that the on-axis location may be defined by the point of highest output, but the 0 degree axis may be slightly lower than some other points due to lobes. Anyway, in practice the 0 degree axis will be selected and defined by the apparent front, ie. the way the product screws into the wall, not its point of highest output.

Dear Answerman,

In the recent Sound & Communications article entitled "The Low Q Alternative" [July 25, 1991], author Daniel Sweeney

A digitally controlled sound s
the largest airport or the

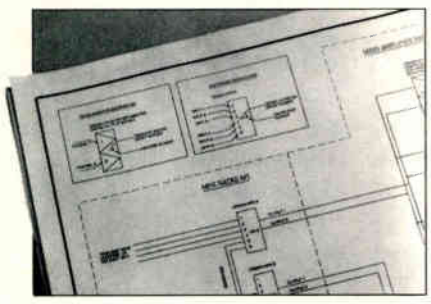
Crown introduces digital system control that's affordable for even small installations.

Installed sound is moving to digital control. But if you're like most contractors, the huge cost and steep learning curves of existing systems have made you think twice about specing digital sound control.

Crown changes all that with the introduction of the IQ System's MPX-6,™ SMX-6™ and IQ COM-Q components. Now, the same IQ System® with the capability to handle airports, stadiums and convention centers also makes economic sense in bringing digital control to churches and boardrooms. With its intuitive operation, no other system is as easy to use as the IQ System.

A different approach to digitally controlled sound.

The IQ System is unlike existing digital systems which are expensive, difficult to learn and susceptible to total system failure. Designed around highly sophisticated yet relatively inexpensive components, the IQ System is easy to use and highly reliable. IQ components are designed to keep the system operating even if a host computer should fail.



The IQ System gives you the flexibility to design systems that match the exact needs of an installation—no matter how large or small.

Entry-level IQ System: MS/PC-DOS-compatible computer, Crown Com-Tech 200, MPX-6, loudspeaker and microphones. Approximate retail price of this system is $3,700. Prices may vary depending on specific components and configuration.

Because of its outstanding flexibility, the IQ System may be tailored exactly to installation needs, while leaving further expansion possibilities wide open.

As additional components are introduced in the near future, you'll discover there's no more flexible or cost-efficient system than Crown IQ.

MPX-6. Expanding signal routing and control capabilities.

The MPX-6 is one of two IQ System multiplexers which make sophisticated control and routing of signals easy and affordable. Digitally controlled by a host computer or IQ COM-Q tape controller, an MPX-6 can route and switch six mic/line inputs, two summed outputs and two independent bussing outputs. Any level of any input can be routed to any output with a controllable range of 120 dB in 1/2 dB increments. This ability to route both incoming and outgoing signals provides unsurpassed system flexibility. But that's not all.

Multiple MPX-6 units can be combined to create 6x4, 12x2, 24x8, etc., mixing capabilities. In fact, you can control up to 24,000 inputs with just one IQ System!

The MPX-6 may also be used remotely in distributed intelligent control systems to reduce long microphone line runs.

With the addition of the MPX-6, the ability to route signals in complex routines is not only possible, but easy.

SMX-6. Sensing multiplexer.

The SMX-6 builds upon the MPX-6 with additional sensing and configuration capabilities. It contains six mic/line inputs and four outputs like the MPX-6, but adds the capability of monitoring the pre-attenuated levels coming into the inputs.

Unlike other devices such as automatic mic mixers, control and configuration of the SMX-6 are achieved with downloadable software. These downloadable instructions, called Algo™ Packs, allow the contractor to program specific capabilities into the processor of the "intelligent" SMX-6. Automatic mic mixing, video-follow-audio switching and impedance and equipment checking are just a few of the many possibilities. It may also be combined with the MPX-6 for in-

The Crown MPX-6 multiplexer and SMX-6 sensing muliplexer provide unsurpassed mixing and routing/switching capabilities.

'stem so versatile, it can handle smallest church budget.

IQ System software is available for both MS/PC-DOS-compatible and Apple Macintosh systems. Designed to be user-friendly and intuitive, the system eliminates the need for the extensive training required by other systems. The basic IQ software is available without charge with any IQ component.

creased mixing and routing capabilities at a reasonable cost.

PA-422 compatible.

Both IQ System multiplexers provide an option for being driven directly by any computer with RS422 or RS232 communication. An additional multiplexer option provides compatibility with the PA-422 standard and allows multiple PA-422 devices to be independently driven from each multiplexer. This permits control of compatible digital delay units, parametrics, third-octave equalizers and more.

No-Fee IQ System software.

Unlike other systems, the basic IQ System software is provided without charge with any IQ component. Software is available for both MS/PC-DOS-compatible and Apple® Macintosh® computers. Because of the many possible applications for these components, command codes and protocols are included so specific routines may be programmed by the contractor or system user.

IQ COM-Q. Complex system control made simple.

The IQ COM-Q component makes system configuration as simple as playing a cassette tape. Designed to digitally record the commands from an IQ host computer onto almost any tape medium (cassette, open reel, DAT), the COM-Q permits the system to be configured by simply playing back the appropriately recorded tape for a desired system change. This not only allows for quick and simple changes, it permits those without extensive training to control the system. Contractors can pre-program configurations in-house for an installation which then requires only an IQ COM-Q and interface-capable component to run the system. With multitrack recording, the COM-Q can initiate complex audio and system commands useful in applications such as theater productions and crowd movement at theme parks.

The IQ COM-Q makes sound system configuration as simple as playing back a cassette tape.

Installation ideas.

The design flexibility and sophistication of the IQ System may make you rethink how you design installations. Here are just a few of the many possible applications.

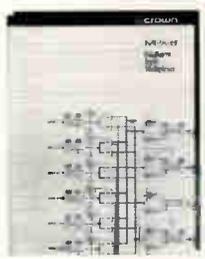
Small Conference Center

The IQ System multiplexers can decentralize audio system installations, reducing wire and associated costs, without decentralizing control. For example, one multiplexer and one Com-Tech® can be used to control the signal routing for two banquet rooms.

Surveillance/Security

The IQ System can be used to create a surveillance system in high-security areas. With strategically placed microphones and Crown multiplexers, audio or video-follow-audio monitoring is easily achieved.

For more information on the IQ System and system components, see your Crown representative or call toll-free: 1-800-535-6289.



Free literature on the IQ System and IQ components, including data sheets and application guide are available from Crown or your Crown representative.

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Circle 208 on Reader Response Card

discusses the concept of Q as applied to transducer sound emission.

Given that Q is the ratio of sound pressure squared, at a fixed distance and specified direction, to the mean squared sound pressure at the same distance averaged over all directions from the transducer; and that the reference direction is understood to be that of maximum response, how is it that lab measurements could yield a Q of less than 1 for some frequencies of the B.E.S.T. CT720 as discussed in the article on page 28?

Gregg I. Butensky
Project System Engineer,
Smith Fause & McDonald, Inc.
San Francisco, CA

Dear Gregg,

You correctly define Q, but err in the assumption that the reference direction is always that of maximum response. Convention specifies 'Q' along the 0° radiation axis which is *generally* the axis of maximum response. In the case of the B.E.S.T. CT-72D, maximum response does not always occur along the 0° axis, which accounts for 'Q' values less than 1 at some frequencies. This is not as unusual as it first appears.

Indeed, the reference direction *can* be specified, as correctly indicated in Butensky's definition of Q. A loudsepaker's 'Q' will be different for each axis of observation. For example, the 'Q' values for the 180° observation axis will almost invariably be less than unity. Most CD horns have side lobes at some frequencies, with greater directivity along the lobing axis than the 0° radiation axis. The B.E.S.T. CT-72D is a very low 'Q' device, with a 'Q' of 0.5 at 4 kHz along the 0° radiation axis when mounted in half space.

Mark Engebretson
Summit Labs

ANSWERMAN

MARK RESPONDS THAT THE ON-AXIS LOCATION MAY BE DEFINED BY THE POINT OF HIGHEST OUTPUT, BUT THE 0 DEGREE AXIS MAY BE SLIGHTLY LOWER THAN SOME OTHER POINTS DUE TO LOBES.

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Circle 201 on Reader Response Card

The Low Q Alternative, Part 2

Design Philosophy and Its Relation to Application

BY DANIEL SWEENEY

Companies marketing low Q loudspeakers account for a small proportion of the professional market, and in most instances the commitment to the professional market is not of long standing. Except for Bose, none of these companies has attempted to develop a comprehensive philosophy of sound reinforcement, though all of the manufacturers have produced fairly detailed application notes.

Bose design philosophy in regard to directivity is based on a number of premises. The first, as indicated, has to do with intelligibility, and is supported by numerous research findings by other researchers. To reiterate, Bose strives to take advantage of early reflections to reinforce direct loudspeaker output and enhance intelligibility. The second Bose principle is that the nonuniform directivity characteristics of most professional loudspeakers — the sort using direct radiator woofers and horn loaded compression drivers for the remainder of the spectrum — are inherently unnatural sounding, and therefore wide range, single element direct radiator speakers are to be preferred whenever possible. Bose's final objection to the use of high directivity horns is based upon the regions of interference created by such devices where coverage patterns overlap.

Bose engineers accept traditional wisdom regarding degraded speech intelligibility in the presence of extended reverberation times, and do not advocate the use of low or medium Q speakers where an adequate ratio of direct to reflected sound cannot be maintained.

According to Bose's Ken Jacob, "Low directivity speakers do tend to produce more late arriving energy than high directivity speakers, and so high Q horns do offer slightly better intelligibility. But that's a function of distance. By placing the low Q speaker closer to the listener, you can equal the intelligibility of the high Q speaker. Two things degrade intelligibility, late arriving sound and background noise, by approximately the same degree, and we believe that background noise has about the same effect on any system. That leaves late arriving sound, and we can control the effect of that by speaker placement. [Companies advocating high Q horns] build these huge centralized clusters. We can get the same results with distributed systems that are cost competitive and much less obtrusive. We don't try to compete with high Q horns in huge outdoor stadiums though."

Interference problems [of high Q horns] in overlap patterns are unavoidable and a serious limitation.

Jacob states further: "I don't think the component battle is really very meaningful anymore. The battle is in system design, not horns versus direct radiators. It's possible to get good sonic results with both. The issue is what the manufacturer is offering in system engineering."

Bose, it should be mentioned, offers regular seminars for professional sound contractors, a book on system engineering, and, of course, the Bose Modeler program.

None of the other manufacturers of low Q speakers have produced similarly detailed rationales for their designs. Daniel Queen, discussing the Soundsphere, states that, "For most speech and music applications, it [the Soundsphere] works surprisingly well. It works in areas where it theoretically shouldn't work. We haven't completely worked out why it works as well as it does, but Dan Gravereaux and myself are writing a technical paper on the subject. We believe that it has to do with the coherence of the reflected sound with the direct sound."

Echoing the Bose philosophy, Queen acknowledges that high Q horns can and do work well in sound reinforcement, but that the interference problems in overlap patterns are unavoidable and a serious limitation. "You can't avoid significant side lobes in highly directional speakers. They result from the same phase cancellations and reinforcements that make the speakers directional in the first place."

In fact Sonic Systems' Vice President of

Marketing, John Karamon, recommends the use of the Soundsphere in precisely those applications where conventional acoustical engineering wisdom indicates it should work least well — one more or less centrally located Soundsphere illuminating a large reverberant space such as a church interior, and Sonic Systems' advertising literature shows many such installations.

Karamon feels that such installations work because conventional measures of speech intelligibility are based on idealized environments. "The measurements are nearly always performed in empty rooms," insists Karamon. "When the room is full of people, its acoustics change."

B.E.S.T., while providing detailed application notes for ceiling mount distributed systems, offers little information on room interactions and their effects on intelligibility. B.E.S.T.'s Gary Rilling claims that B.E.S.T. speakers "work just as well [as high Q speakers] in highly reverberant rooms."

A common theme in the statements coming from all of these companies, Bose excepted, is that fewer speakers can be used in typical installations than would be the case were high Q horns employed.

Henry Wolcott of Wolcott Audio claims, "I've done temporary installations where I've used the same speaker both for sound reinforcement and stage monitoring."

John Karamon claims that for church installations three speakers will suffice for the largest spaces, and that one or two speakers will generally do the job.

The basic argument here is that lowering directivity ultimately means lowering costs because fewer units need be employed.

REAL WORLD APPLICATIONS

Too many reputable sound contractors have used low directivity speakers successfully for the unorthodox doctrines of their manufacturers to be dismissed out of hand. Still, the lack of a comprehensive guideline for sound system installations employing such speakers is troubling.

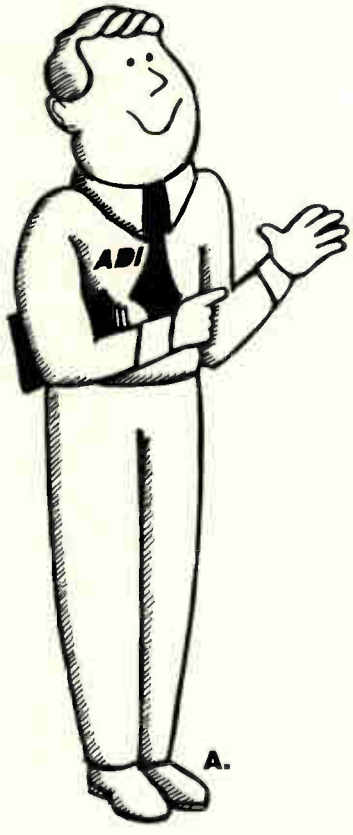
Probably the safest strategy for utilizing low directivity loudspeakers is to install them in locations where standard engineering theory would indicate acceptable results.

Where would a very low Q speaker be most likely to work? In an application where medium Q speakers are already being used — that is distributed systems for paging, public address, background music, but not high volume sound reinforcement.

For instance, Jaffee Acoustics has successfully used Soundsphere loudspeakers in pewback installations in houses of worship. Because of the directional characteristics of the Soundsphere, fewer speakers are required than would be the case with ordinary full range cones.

Soundspheres also tend to work well in

(continued on page 48)



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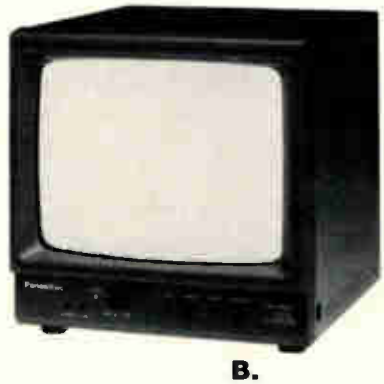

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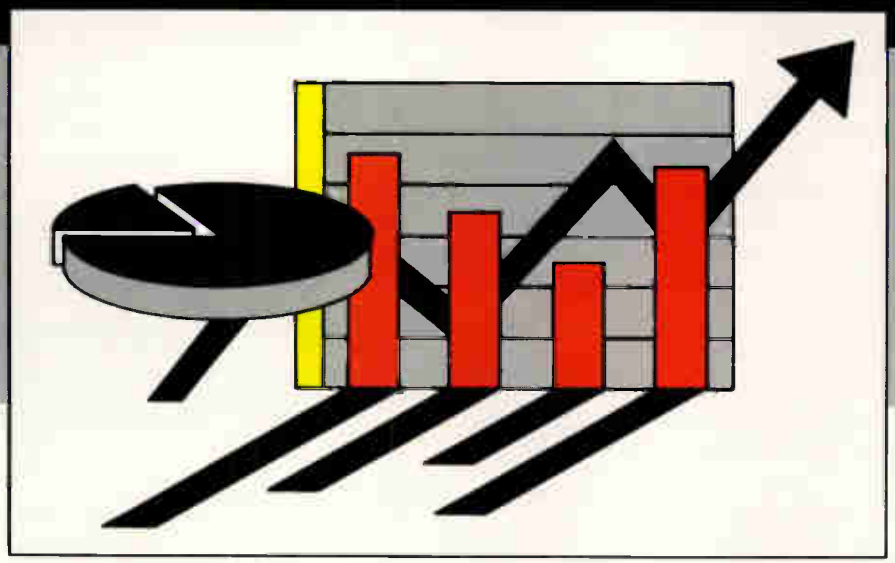
Circle 202 on Reader Response Card

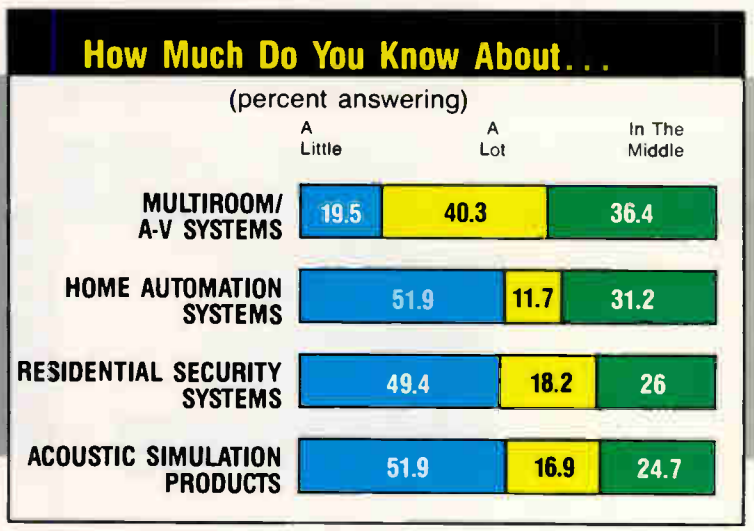
A Survey of the Residential Non-Commercial Installation Market

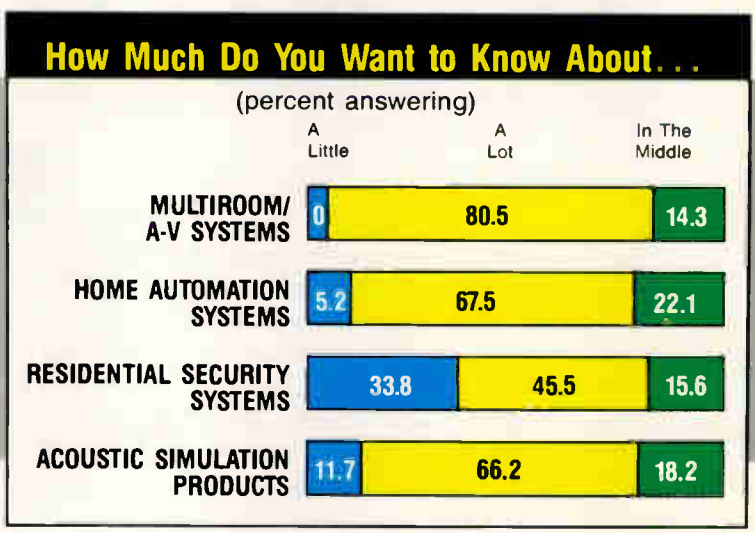


BY JUDITH MORRISON

Some months ago we published a survey in these pages and asked our readers to respond. The title of the survey was: "The Custom Non-Commercial Installation Market: Who Needs It? Who Does It? Who Cares?" The results are now in and we find that quite a large percentage of our readers do do it and do care about it. The question of who needs it is still up for an answer. We instituted the survey because we wanted some answers to some questions that came up internally. It occurred to us that our personal search coincided with some very real concerns of our readers and of a peripheral industry, that of the residential custom installation business. This company has serious roots in the consumer electronics industry, along with the professional audio and video business; and our discussions and experience said that something serious is happening to consumer electronics, encompassing such deep seated concerns as definition itself. What, after all, is the consumer electronics industry? Is it microwave ovens, televisions, home office supplies, high end home audio equipment?

Well yes, but coincidental with the dispersion of product categories in consumer electronics, there's been a parallel movement that has been around since the very early days of hi-fi and that accelerated with





the advent (pun intended) of large-screen television, the marketing of home surround sound, and the introduction of such products as the Yamaha DSP-1.

And who has been selling this? Audio retailers, for the most part, who became audio-video retailers as the video product traded up. Who has been installing this? That's been a polymorphous bunch, as audio-video retailers developed installation departments; as hi-fi specialists and aficionados began to install systems for their friends, and eventually became residential custom installation specialists, and as sound contractors themselves who had been prone to help their clients with their home systems found some measure of financial gain and professional pride in the residential system.

For the manufacturers, the distribution chain has been similarly dispersed. The home audio business has been thrown into turmoil by low margins, increased competition, narrowed demographics, recessionary influences, and most of all a change in product category to include video and perhaps in the future home automation, security, and multi-media entertainment and information products.

The residential audio business will never again be an off-the-shelf, out-of-the-box business for the high end. Loudspeakers go in the wall, video projectors go in the ceiling, sound effects project from around the room. And the installation of a true audio and video system often defies the homeowner (and, often, the traditional retailer).

Manufacturers who distribute through traditional retailers are having problems when they design a multi-media or multi-room system. Distributing through custom residential installers solves the installation problem, but creates a franchising problem and a limitation in pure numbers. And sound contractors, loyal to their commercial roots, rarely spend the time and attention that residential products demand.

So who cares about this non-commercial market? Well, it turns out that almost everyone does. Our readers do. Our manufacturers do. Our reps do. There are different levels of interest, different levels of expertise, and different numbers required.

The residential market seems to exist quite comfortably in the high-end rich man's bailiwick. But it can't become a broader market without the enlargement into the middle class, whose desires for electronic entertainment now encompass complex systems needing professional installation.

So that's the rationale behind our survey. What are the results?

We'll qualify them at the outset by stating that we presume that people who responded were interested first of all in non-commercial installations. We'll therefore assume that the answers don't represent the entire sound contracting community, but do represent sufficient interest on the part of commercial contractors for the residential work out there.

We asked, first of all, for our respondents to identify themselves — as sound contractors, audio-video retailers, and custom installer/designers. As expected, most people identified themselves as sound contractors (three-fourths). But another 22 percent identified themselves as audio-video retailers. And nearly half call themselves custom installers and designers. (The sum is over 100 percent, because we didn't ask respondents to identify themselves as exclusively any-

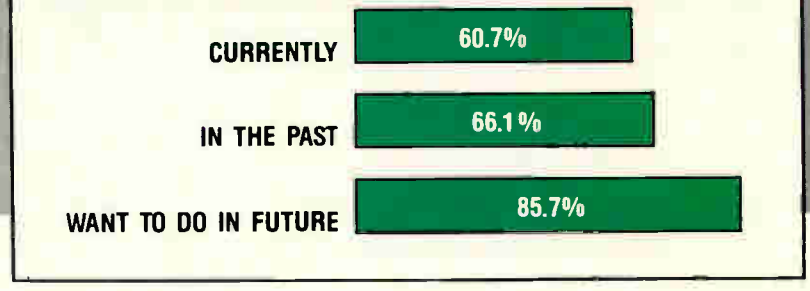
Biggest Problem in Selling Products and Services to the Residential Market

	Total	Sound Contractors	Retailers	Custom Installers
Interfacing with the Customer	13%	17.9%	17.6%	10.5%
Wiring	11.7	8.9	17.6	10.5
Getting the Equipment	5.2	5.4	—	7.8
Getting Qualified Installation Personnel	13	7.1	23.5	13.2
Selling the Product	9.1	10.7	—	10.5
Making a Profit on Equipment	9.1	10.7	11.8	7.9
Making a Profit on Labor	3.9	3.6	—	5.3

Smallest Problem in Selling Products and Services to the Residential Market

	Total	Sound Contractors	Retailers	Custom Installers
Interfacing with the Customer	20.8%	19.6%	11.8%	23.7%
Wiring	19.5	21.4	5.9	10.5
Getting the Equipment	15.6	14.3	17.6	15.8
Getting Qualified Installation Personnel	10.4	14.3	5.9	10.5
Selling the Product	13.0	10.7	11.8	15.8
Making a Profit on Equipment	6.5	8.9	—	—
Making a Profit on Labor	14.3	14.3	11.8	7.9

Sound Contractors Doing Residential Installations



thing; 58 percent of custom installers also identified themselves as sound contractors. Similarly, 39 percent of sound contractors identified themselves as custom installers.)

Of our respondents, 60 percent currently do residential installations, but over 85 percent want to do them in the future. This was true for small companies and large, for sound contractors, retailers and custom installers. (Custom installers had a favorable future expectation of over 95 percent, seeming to indicate they want to stay in their business.)

How much do our readers know? We asked "How much do you currently know about. . .?" and "How much do you want to know about. . .?" for the following classifications: multi-room audio/video systems; home automation systems; residential security systems; acoustic simulation products.

This is what our respondents know: A lot about multi-room audio/video systems (but only 40 percent know a lot, almost 20 percent know "a little"). Fifty percent of custom installers, and 34 percent of sound contractors said they know a lot. (That of course means 50 percent and 66 percent respectively *don't* know a lot.) Larger companies tended to know more.

They know a little about home automation systems (over 50 percent checked off "a little.") Only 11.7 percent felt they know a lot about home automation systems. Answers were stable across size of company.

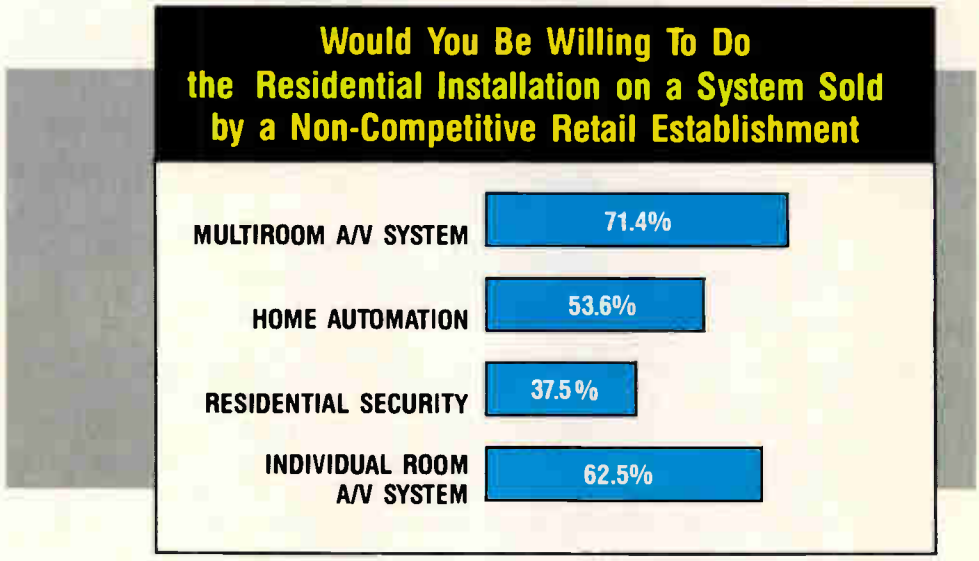
They know a little about residential security systems. Nearly 50 percent checked off "a little." Only 18 percent know a lot.

They know a little about acoustic simulation (51.9 percent said they know "a little.") Only 17 percent know a lot (23.7 percent for custom installers, as might be expected).

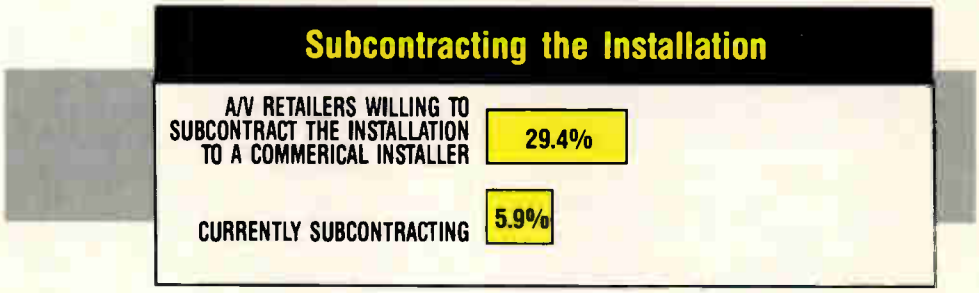
To summarize: Well under half of our respondents, who might be considered to be some of the most knowledgeable and expert sound system professionals, know a lot about multiroom systems. Even fewer know a lot about home automation, residential security, or acoustic simulation (12 percent, 18 percent, and 17 percent respectively).

But remember — nearly everyone wants to do more residential installation work. So there seems to be a cry for education and learning.

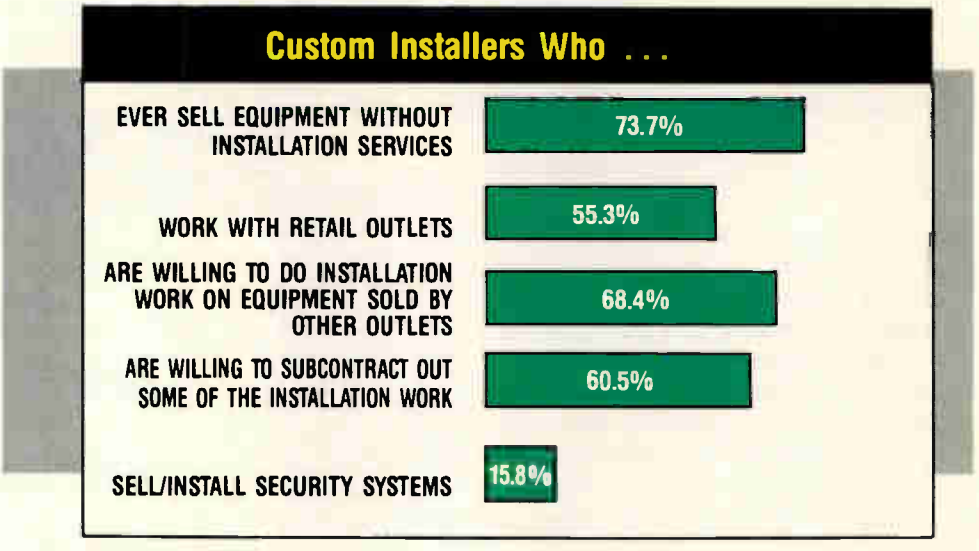
That's borne out by the next question: How much do you want to know?

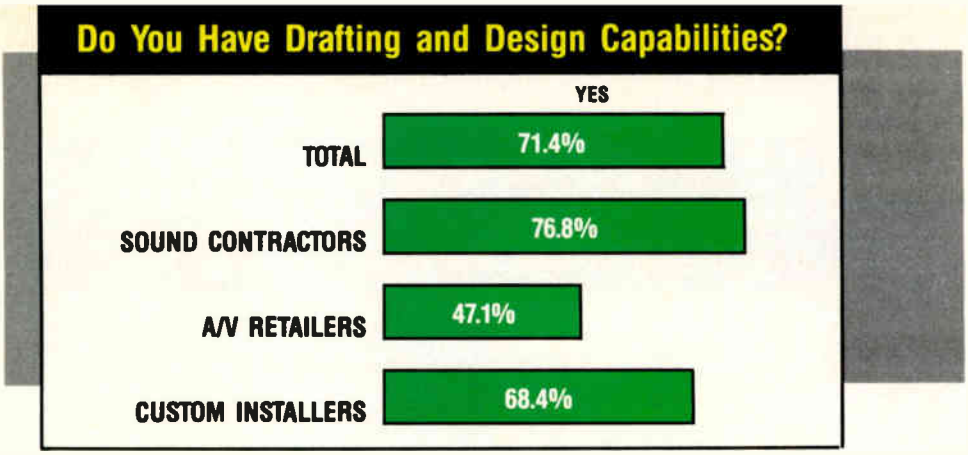


Nearly everyone (over 80 percent) wants to know a lot about multi-room audio/video systems. Another 14 percent want to know a middling amount. That's all across the board no matter how a respondent identifies himself and no matter how much he makes. Ninety percent want to know about home automation systems (over two-thirds want to know "a lot"). Sixty-one percent want to know about residential security systems (but a hefty 33.8 percent only want to know "a little"). Two-thirds of the respondents want to know "a lot" about acoustic simulation products, with another 18 percent wanting to know a middling amount. Only 58.8 percent of retailers want to know a lot.



Forty-four percent of our respondents have showroom facilities, about the same for sound contractors and custom installers. Smaller companies are less apt to have showrooms.





Over two thirds of the respondents want to increase the number of lines they carry.

Custom installers and sound contractors tend to have the same number of employees (the largest percentage having between 1 and 10). Retailers on the other hand have 10-20 employees in over 40 percent of the cases.

Over 76 percent of sound contractors have drafting and design capabilities (68.4 percent for custom installers; only 47.1 percent for retailers). Even companies with an annual volume of under a million dollars have drafting capability in nearly two-thirds of the cases.

We asked our sound contractor readers: "Would you be willing to do the residential installation on a system sold by a non-competitive retail establishment?" We broke this down into multi-room a/v system, home automation system, residential security system, and individual room a/v system. Over 70 percent said that they would do a multi-room installation even if they hadn't sold the equipment. Sixty-two percent would install an individual room system; fifty-three percent would install a home automation system. Only 37 percent was interested in residential security installation.

We then asked our retailer respondents whether they have their own installation facility, and if they would be willing to subcontract the installation out to a commercial installer. A resounding 100 percent of our respondents have installation capabilities. Yet 30 percent would subcontract the installation. But only 6 percent currently does so.

We asked a special set of questions to those identifying themselves as custom installers and designers. Do they ever sell equipment without installation? Surprisingly, over 70 percent do. (Our survey didn't ask how often this happens.) Fifty-five percent work with retail outlets. Sixty-eight percent are willing to do the installation work on equipment sold by other outlets. Sixty percent are willing to subcontract out some of their installation work. And only 15 percent of these people sell and/or install security systems.

What are the biggest problems in selling products and services to the residential market? Here, we saw some differences in the responses of various types of establishments.

Eighteen percent of the sound contractors, and almost as many retailers found interfacing with the customer to be the biggest problem. But only 10 percent of the custom installers agreed. (The mean was 13 percent).

Conversely, nearly 18 percent of the retailers found wiring to be the biggest problem. But a paltry 9 percent of sound contractors agreed. And over 10 percent of the custom installers agreed. As a matter of fact, almost a quarter of the sound contractors found wiring to be the smallest problem in a job.

Getting qualified installation personnel was almost no problem for the sound contractor. Only seven percent found it the biggest problem. But 23.5 percent of retailers found it the biggest problem. And 13.2 percent of custom installers agreed. Selling the equipment was the biggest problem for 10 percent of the contractors, 10 percent of the custom installers, but none of the retailers.

Making a profit on labor was the smallest problem for over 14 percent of the sound contractors, but only 11.8 percent of the retailers, and 7.9 percent of the custom installers.

Eighty-four percent overall carry liability insurance for installation personnel, 83.9 percent of sound contractors, 88.2 percent of retailers, but only 79 percent of custom installers.

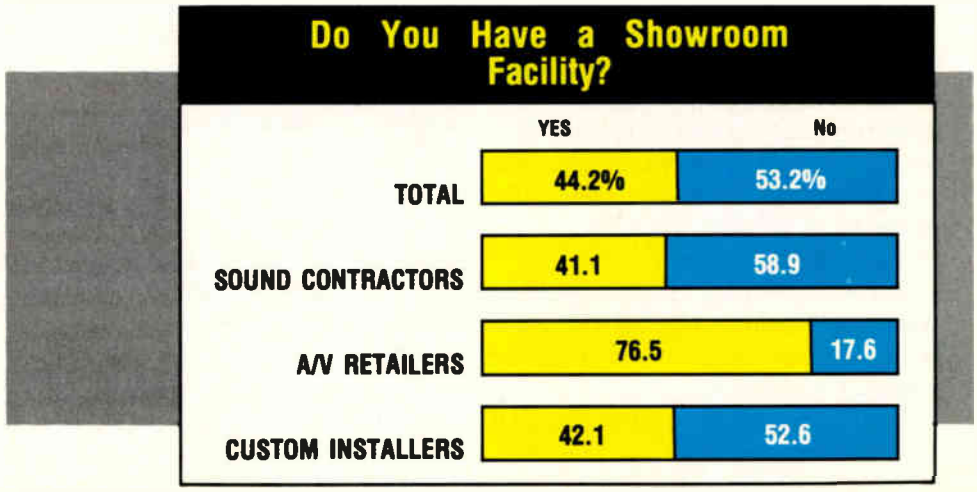
Most businesses involved in some way in installing audio and video equipment are also interested in the non-commercial market. The home and commercial installation markets do frequently overlap. Sound contractors doing residential work have the least amount of trouble making a profit off their labor and the least concern for wiring intricacies. Audio-video retailers have the most labor overhead, the least design facilities. Custom residential installers have the least problems dealing with the end user.

A large percentage of installers would consider an installation job even if they didn't sell or have the franchise on the equipment.

The survey confirmed our hunch about distribution being a limitation to wider acceptance of a custom residential market. Seventy-three percent of sound contractors and 66 percent of custom installers want to increase the number of lines carried.

And everyone needs to know more about everything. As the concept of home automation nears standardization and product development by major companies, audio and video professionals want to become more involved. Their reluctance to tackle security products is understandable — but it seems to us shortsighted considering the implications.

Nearly everyone wants to do more residential work. Everyone in the distribution and marketing chain — installers, salespeople, reps, manufacturers — needs to work together to increase the viability of the concept and the understanding of the end user.



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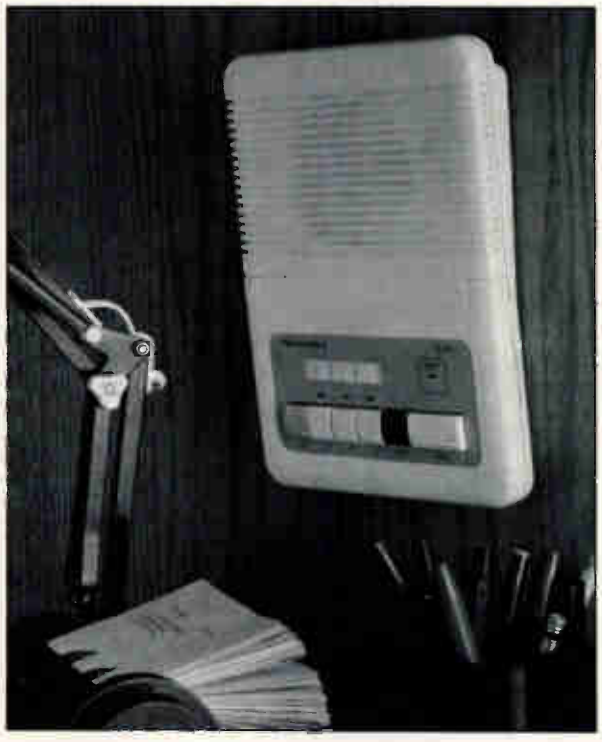

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BOOK REVIEW

"THE SCIENCE OF SOUND" DELIVERS AN ACCESSIBLE TEXTBOOK IN A COMPREHENSIVE FORMAT

By Neil A. Shaw

The science of sound, also called acoustics, is a broad interdisciplinary field encompassing physics, engineering, psychology, speech, audiology, music, architecture and physiology.

Some of the various branches of acoustics are architectural acoustics, physical acoustics, musical acoustics, psychoacoustics, electroacoustics, noise control, shock and vibration, underwater acoustics, speech and physiological acoustics.

In the second edition of "The Science of Sound," [The Science of Sound, Second Edition, by Thomas D. Rossing; Addison-Wesley Publishing Company, Reading, Massachusetts; 1990] Professor Thomas D. Rossing provides an introduction to acoustics that is written in non-technical language and is accessible to readers without a college level physics or mathematics background. A comprehensive and broad introduction to acoustics is given in a well organized and readable format.

Professor Rossing has taught courses in musical acoustics for 20 years. In addition to "The Science of Sound," he has written "Acoustic Laboratory Experiments" [Northern Illinois University Press, 1982] and "Teaching the Science of Sound" [Northern Illinois Press, 1982]. He was also the editor for "Musical Acoustics Selected Reprints" [American Association of Physics Teachers, 1988]. Dr. Rossing suggests that in a university course laboratory experiments be a part of any introductory course. For professionals out of the university environment, this may not always be possible, but, for many, it can happen. As Professor Rossing says, "Musicians readily appreciate that one cannot learn to play the piano by reading a book and listening to lectures, however erudite. . ." Similarly, many audio professionals know that practical experience is the best confirmation of abstract theory.

The book is organized into eight modules: Motion, Energy, Waves, and Other Physical Principles; Perception and Measurement of Sound; Acoustics of Musical Instruments; The Human Voice; The Electrical Production of Sound; The Acoustics of Rooms; Electronic Music; Environmental Noise. The first two parts are an introduction to the material provided in the rest of the book. Readers with a background in physics can start with the second part, and The Electrical Production of Sound section is a prerequisite to the part dealing with the acoustics of rooms. Other than these minor restraints, the book can be accessed in any order. Due to the depth and breadth of the material covered, the book is useful for almost anyone and everyone involved with audio, music, architecture and other related fields.

The material presented is almost overwhelming. For example, the four chapters in part 1 (Motion, Energy, Waves, and Other Physical Principles) cover motion, force, and energy; vibrating systems; waves and resonance. The four chapters in part 2 (Perception and Measurement of Sound) cover hearing, sound pressure, power and loudness, pitch and timbre and combination tones and harmony. The six chapters in part 3 (Acoustics of Musical Instruments) deal with musical scales and temperament, string instruments, brass instruments, woodwind instruments, percussion instruments and keyboard instruments. In part 4, The Human Voice, three chapters discuss speech production, speech recognition, analysis, and synthesis and singing. In part 5, The Electrical Production of Sound, which is of special interest to readers in the contracting field, the four chapters present a little about electricity, filters, amplifiers and oscillators, microphones and loudspeakers, and the recording and reproduction of sound.

"THE SCIENCE OF SOUND" IS LAVISHLY ILLUSTRATED WITH PICTURES, GRAPHS AND DRAWINGS.

Also of interest and great utility are the three chapters in part 6, The Acoustics of Rooms, which present auditorium acoustics, electronic reinforcement of sound, and high fidelity sound reproducing systems. In part 7, Electronic Music, the

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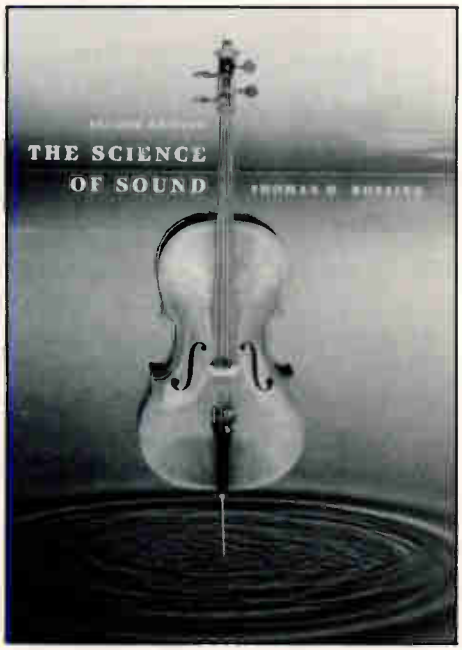


"The Science of Sound" by Thomas D. Rossing.

four chapters cover electronic organs and other musical instruments, electronic music synthesizers and digital techniques for generating and recording sound, and digital computers and musical sound. Part 8, Environmental Noise, has four chapters that discuss noise in the environment, the effects of noise on people, and the control of noise and measuring instruments. In addition, there is an appendix that provides information on units, logarithms, equation solving, graphs, a proposal for three new clefs and notation used for notes.

"The Science of Sound" is meant to be an introduction to acoustics, and so the textbook's chapters are written to be covered in no more than two or three class periods. Professor Rossing has suggested several ways in which the book may be used in a one-semester course in musical acoustics, physics of high fidelity/electronic sound and introduction to acoustics (speech, audiology, technology).

"The Science of Sound" is lavishly illustrated with pictures, graphs and drawings. In addition, the textbook has many examples of the ideas and physical principles presented. In each chapter the author also presents 'sidebars' that are used to present historical information or expand upon some point. At the end of each chapter the author offers references and suggested readings, a glossary, questions for discussion and problems (after all this is a textbook). At the end of the textbook, the answers to selected problems are given.

As an introduction and reference resource, "The Science of Sound" is invaluable. It is a worthy and readable addition to the library of all involved in audio and related fields. ■

A MEDIA ROOM STRAIGHTENED OUT WITH CLEVER EQUIPMENT AND LABOR

By Pamela Michael with Charles Ferrari

Sometimes, the solution to a technical problem rests in a creative, innovative application of existing technology. Finished homes with unfinished audio systems present special problems.

Charles Ferrari, President of Ferrari Custom A/V, solved a pesky (but fairly common) sound contracting problem by using a couple of devices traditionally used by cable TV installers and electrical contractors — the Amprobe Pasar Tracer and the Riser-Bond Time Domain Reflectometer.

The Amprobe Pasar Open Tracer OT-1000 indicates the location of a wire inside a wall. It uses electrostatic and magnetic sensors to trace wires and locate opens within walls or buried underground. The system consists of a transmitter and a probe, both battery powered. The transmitter hooks into the dead line and sends a high and low frequency complex signal through the wire. Holding the probe parallel to the ground and using a sweeping motion, the open is (hopefully) found. Signal strength is observed along a continuous wire. A 10-segment LED display is lit in sequence and the audible tone becomes increasingly louder as the probe nears the signal carrying conductor. As the location of the signal is approached, both indications (the tone and LEDs) begin to drop, disappearing at the location of the open. The transmitter is intended to be used on unenergized lines. The Amprobe cable tracer, about $415, can be bought from test equipment distributors such as Transcat [phone 800-828-1470].

PHOTO BY STEVE JACOBS

Contractor Charles Ferrari with the Riser-Bond TDR.

The Riser-Bond 1210 Time Domain Reflectometer (TDR), or [cable fault locator, is used to locate cable faults.] The TDR indicates the distance the termination, open, or splice is from where you are connected. A TDR can help locate problems such as opens, shorts, pinched cables, loose connections, water in the cable, rodent damage, or any cable problem which causes a significant change in the impedance of the cable. TDRs operate on the same principle as radar. The instrument generates a pulse which travels down the cable. As the signal travels, a fraction of the pulse is reflected back to the instrument from any impedance discontinuities encountered along the way. From the type of reflection returning to the TDR, the distance and type of fault can be determined. For a detailed treatment of TDRs see "Making Friends With A Time Domain Relectometer," Sound & Communications, September 1990.] Riser-Bond Instruments can be reached at 402-694-5201.

The hero of our story, Charles Ferrari, ran the Service Department at Sansui in the 1970s, and later headed the systems design group at GLI (the disco company) for many years. Charles started Ferrari Custom A/V in Levittown, New York in 1988. Recently, he was contacted by a homeowner who had been left adrift by a contractor gone bust in the midst of adding an extension to his house. He wanted Ferrari to complete the half finished audio installation, and (oh, by the way) his brand new, multi-room audio system wires were — somewhere — behind finished walls. There were no plans. The installer was nowhere to be found.

Ferrari visited the site and was chagrined by the obvious cosmetic problems of the job: the stucco exterior and frame and sheetrock interior were already up and expensively detailed with curving walls, skylights, built-in mirrors. Realizing that the cost of ripping out so much custom work would be astronomical and a difficult prospect for the client to face, Ferrari remembered a device he had heard about that could trace a wire through a wall using an RF signal. He called Mike Klasco at Menlo Scientific. (Klasco is also the Technical Editor of Sound &

Communications.) Klasco referred him to the Pasar Tracer and the Reflectometer and asked him to let him know how they performed. Using new equipment, and faced with an unmapped maze of hidden wires, Ferrari experimented, asked questions and improvised. He called Sound & Communications to share his findings and impressions. What follows is an edited version of Ferrari's account of how he approached the job and how he learned to use the nifty new gadgets in his toolbox.

After deciding that the cost and difficulty of ripping out sheetrock and moving mirrors to look for wires was prohibitive, I got ahold of the Amprobe Pasar Tracer, the Riser-Bond Reflectometer (TDR) and a 10-wire designator kit, the Riser-Bond ID Model 525. The Pasar Tracer sends an RF signal down the wire in question. It consists of a hand held receiver and a transmitter that connects to the end of the wire you want to trace. You set the receiver to a specific range and you then move the receiver along the wall until you pick up a signal. Presence of a signal is indicated by an LED, as well as an audio indicator. Both gain in intensity as you get closer to the wire. From what I understand, some people are bothered by the audio indicator sound and feel the device would work better if it were turned off. I think that might be true on certain jobs, although I had no problems with it. In fact, I found it quite helpful.

The main function of the Riser-Bond TDR is to find out how far away from some termination there is a bad connection — a short, or splice or opening in the wire. So, the Amprobe tells you where in the wall the wire is — it follows the path — and the Riser-Bond tells you how many feet from where you're connected the wire is spliced, or broken, or whatever. The Riser-Bond ID Model 525 is also a neat little device. It has one receiver and five transmitters in the kit. You have a bundle of wires and you need to know which one is what (sometimes with these multicolored wires it's hard to tell, they have five different shades of violet or something; or as in an old installation, the insulation is discolored or covered with dirt). With the Model 525, you connect five of these little transmitters on five of the cables in question. On each cable you can set a number from 0–10. You push the number you want. Then you go to the other end or wherever these wires might wind up in the structure and connect the receiver onto the cable. You don't even have to connect the ground — I didn't. As soon as you hook it up, a number lights up and lets you know if it's line 6, 7 or 8, or whatever. It works great.

PHOTO BY STEVE JACOBS

View of the Port Washington, New York media room.

Some people who had used some of this stuff in the field told me you have to use it coaxial, and that only cable companies use the RT69. I used it on intercom and speaker wires, and it worked fine. It let me know right away what the number was. It's a great device to have in your equipment box on a job. I had only one problem with it: The five little transmitters and the receiver all fit in these little 2-foot × 2-foot black boxes and they all look exactly alike. So if I had maybe 20 wires and I wanted to identify just one, I would just pull one transmitter out and connect it on one wire and forget about the rest, because there are 19 wires I don't care about. And then I wouldn't need the transmitter to go to the other end of this bundle of wires to find out which wire I had the transmitter on, but because they're all the same color and the same shape, I have to go through them all to find the receiver. If the receiver was a different color, like red, or had a dot on it, or something, so when it's in the box you can just grab it, that would help.

Other than that though, it's just a really nifty gadget. I use it all the time now. It lets you identify the cable and determine the continuity at the same time. And the Riser-Bond stuff is right on the nose. You have to know the propagation of the cable, though. The propagation of the RF signal through the wire is some portion of the speed of light (perhaps .90 for a specific type of co-ax, but this value varies for twisted pair or speaker wire). If you have that figure, then it lets you know exactly how many feet down the line there's a bad connection. If you don't know, you can pretty well estimate the footage. If you look at the building, you can usually sort of tell where the original wire was run. Most people follow the path of least resistance in laying cable. If you say — hey, it's 10 feet up the wall, 15 feet across the ceiling — you can set the sensitivity control using this rough estimate and do a trial run and check the termination. Then you can fine tune your setting depending on the results.

I found the Reflectometer instructions excellent. When I called Riser-Bond, my questions were answered by Duff Campbell. He really knows their equipment inside and out and was very helpful

in answering my questions. With Amprobe, on the other hand, it took a bit longer to get to the right person. Once we got to the right person who knew what was going on — Mel Hendrickson — it was just like dealing with Riser-Bond; they were really helpful. But going through the reps to find them — it was like going through a wall.

But here I was: I'm a contractor, I have these pieces of test equipment and a bit of a mystery. The customer decided they really only needed sound in the entertainment room, the wiring in the other rooms was no longer important to them. They sort of knew what they had specified to the original contractor for the entertainment: stereo surround sound, two speakers in front and two in back. There weren't too many choices for speaker placement, so we pretty much could assume visually where the wires were going to be. But we couldn't be certain enough to start tearing out sheetrock. As soon as you make a hole, that means you've got to plaster it up again, then you've got to paint and match colors, and worry about how the customer is going to feel about the match. Sometimes, it can match, but because it's been repainted, it looks different. You run into all kinds of problems. So you don't want to break wall unnecessarily.

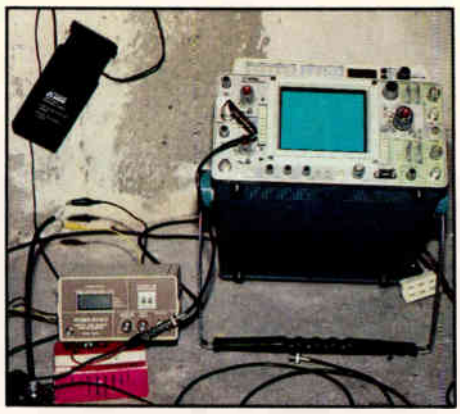


PHOTO BY STEVE JACOBS

The equipment in question: (clockwise from bottom left) Riser-Bond's TDR, Amprobe's Pasar Tracer and a Riser-Bond oscilloscope.

I'M A CONTRACTOR, I HAVE THESE PIECES OF TEST EQUIPMENT AND A BIT OF A MYSTERY.

As a contractor, I looked at this and said "Aha! There has to be one wire on the left, one on the right and two in the rear." So I already knew where I was going to go with this tracer by Amprobe. I got the thing out of the box. It consists of two units: a transmitter and a probe. Three sensors in the probe pick up the transmitter signal; so the device traces the wire by sensing a magnetic and/or electrostatic field.

I went through the manual. It says to connect the transmitter to the dead wire, turn it on, run around with the receiver. That's basically all it says. I did just that, connected it in the basement and checked to see that it was transmitting RF, which it was. I ran upstairs, put it on the wall and, sure enough, there's the left speaker wire (or so I thought). I labeled it Number 1. I ran back downstairs, ran back up and — yep — here's the rear speaker wire. But wait, now I'm getting another reading

PHOTO BY STEVE JACOBS

Ferrari tests in the basement.

that's wrong. What's going on here?

I went back down again and instead of finding the right speaker where it should be I found it where the other rear speaker was, just as strong as before. So I started trying different things. First, I checked my ground — to no avail. I really didn't know what's going on now. I got on the phone to Amprobe. They had a few suggestions about floating the ground and other ideas.

AFTER A COUPLE OF DAYS, I STARTED WONDERING WHAT I WAS GOING TO SAY TO THE CUSTOMER.

Next I called Mike Klasco [Technical Editor of Sound & Communications]. He suggested that because I was dealing with new construction, perhaps metal studs had been used, and maybe some of the studs might be reflecting some of the RF around and going into adjacent wires, something I hadn't thought of. So, after a couple of days of struggling with this problem, I started wondering what I was going to say to the customer. I called Amprobe back and they sent their engineer to the site and both of us went through the procedures. A couple of things came up that are good to know when using this equipment.

For one thing, there's a procedure that really isn't covered in the instructions. From what I understand, Amprobe is in the process of redoing their manual, incorporating the information gleaned from this job. What we learned is that you must consider how the unit is reacting to the specific environment you're in. This requires some thought. So you set the transmitter up and you make sure the ground is good. Say you've connected to a cold water pipe — good, reliable ground. Or is it? Maybe 20 or 30 feet down the line, the cold water pipe connects to PVC. You may not have a ground there; you'll

want to verify with the electrical ground. Use an ohmmeter to make sure there's a connection. Otherwise, if the ground is no good, you can get crazy readings and waste a lot of time. We found you have to check the unit out right where you set up the transmitter. What I did was to connect the transmitter to the wire in question, and connect the other end to the ground (and make sure it's ground). Now, while you're right there in the basement, measure the signal strength, the RF output at the wire in question, and at the same time, measure the RF output on all adjacent wires. This way you can get an idea of how much reading is taking place right down at the source area where you have the transmitter. Use this as a reference when you go back upstairs to do your running around checking the walls.

Another thing that proved to be very important was to draw a sketch of the entire layout. Label what you're sure of, add what you learn, record your readings as you go along. Say you're trying to figure wire X. First, you get a reading on the wall. Always start at the lowest range possible when you set the device up. So now when you come upstairs, as you move further away from the transmitter, if the signal drops, then you increase to the next range — you don't start at a high range. And when you do get a reading on the wall, and you find — Aha! This is the area, this is where the strongest signal is, so much the floor, so much here — write all this down on your sketch. You look at the tracer and write down on your plan where you find each reading and what range the unit is set for, and also how many LED's are lit up. This is the signal level.

After you do this on each wire, going back and forth and writing down what range you're on and what the signal levels are, then all of a sudden, when you look a the whole layout, you get an idea of what the real readings are, and what the reflections are. And when you look at the whole picture, you can pretty much see where X is.

On this particular job, we were doing all this and still getting a lot of double readings, a lot of discrepancies. Some readings were maybe one or two LED's different.

PHOTO BY STEVE JACOBS

Mel Hendrickson, Applications Engineer for Amprobe in search of wire.

The interesting thing was that when I finally drew the big X on the wall and cut the hole, I looked inside and didn't see a wire. "Oh oh," I thought to myself, "This is going to be a real pain in the neck job." I reached my hand in, and — sure enough — there it was. I smiled. We all smiled. But soon my relief and satisfaction turned to confusion.

IF THE GROUND IS NO GOOD, YOU CAN GET CRAZY READINGS AND WASTE A LOT OF TIME.

Surprisingly, there was not one wire, but two. You know — you're logically thinking, here's the rear channel. The rear channel is basically not a high power channel, a little speaker in the back for ambient sound, so we're not going to see it. So when I saw double wires in front, I figured maybe the guy wanted really heavy gauge. He's running double runs and he really wants to get that damping factor and all the other stuff in here, so he's running double parallel speaker wire. But in the rear!? You figure in the rear (everything in the system has 16 gauge) he would not run double, unless he's doing tweek stuff and he's stupid at the same time.

So, I was faced with a situation where a little bit of knowledge is a dangerous thing. We knew from the client that we were dealing with stereo surround sound, so this goes in the front, this in the rear. All they need is one wire for each speaker, maybe two in the front, if they're doubling, but not two in the back. What's going on here? And on one wall where we should have gotten a reading — we didn't. There was no wire there. So the Amprobe proved really useful. If I had gone in with my preconceived notions, based on what I knew or guessed, I would have probably eventually figured out what was going on, but with a lot of wall-breaking trial and error. The hard part in using the device for the first time was to believe the readings, because they didn't conform to my assumptions of what I was looking for.

The Amprobe instructions proved inadequate for this real life application, although they were quick to send an engineer to help. I think this failing in support material is due to their main market. They deal with a lot of electricians, guys who are running a Romex with a PX cable and a lot of this big stuff. They don't have much information for audio people who are dealing with much smaller wires. They came to the rescue with this job, though, and, as I said, they are in the process of incorporating this information into the manual, creating some sort of application

book.

The Amprobe people told me that now when people call them up, they now have the appropriate range and level settings to give them. This is especially important right down at the source, down in the basement, in the case of this job. I would look at the reading — how much RF was coming out of the wire in question — then I would get a reading for the adjacent wires. Multiple readings start to make more sense. But it's essential to jot down all this information on the sketch, so you can get an overview. You're running around the wall and you're looking at LED's going up and down, and at different settings it can be overwhelming unless you're careful to jot everything down on paper as you go.

IT'S ESSENTIAL TO JOT DOWN ALL THIS INFORMATION ON THE SKETCH, SO YOU CAN GET AN OVERVIEW.

Despite my initial confusion, I now wouldn't think of leaving home without my Amprobe Pasar Tracer! Once you know how to use it, it's great. As I said, when I cut that rectangle out of the wall based on what the device was telling me, and there the wire was, I thought well, maybe it's just luck. But I tried again on the other side of the wall, and there it was, just where we thought it would be, right on the nose.

I'll never know what those two wires were for, of course. But I guessed that perhaps the original sound contractor was a studio guy. You know how they are — always trying to create perfection to the ultimate, because a studio has to be a controlled environment. When these guys get into homes and clubs, though, it can be a disaster. They're prone to overkill, trying to make everything so pure. Often, the result might not even end up sounding that good, and the cost will probably be astronomical. So maybe that's what happened on this job. I'll never know. The important thing I learned is not to ignore the readings because of preconceived notions about

what I will find. If I had been looking for two wires, I would have said, "Oh look, here they are." This device was right on the nose.

I also used the Riser-Bond Reflectometer on this job for the first time. Sometimes on a job like this when the sheetrock is already up, a nail or a staple might have hit a wire. I thought maybe something like that had happened on this job, but no.

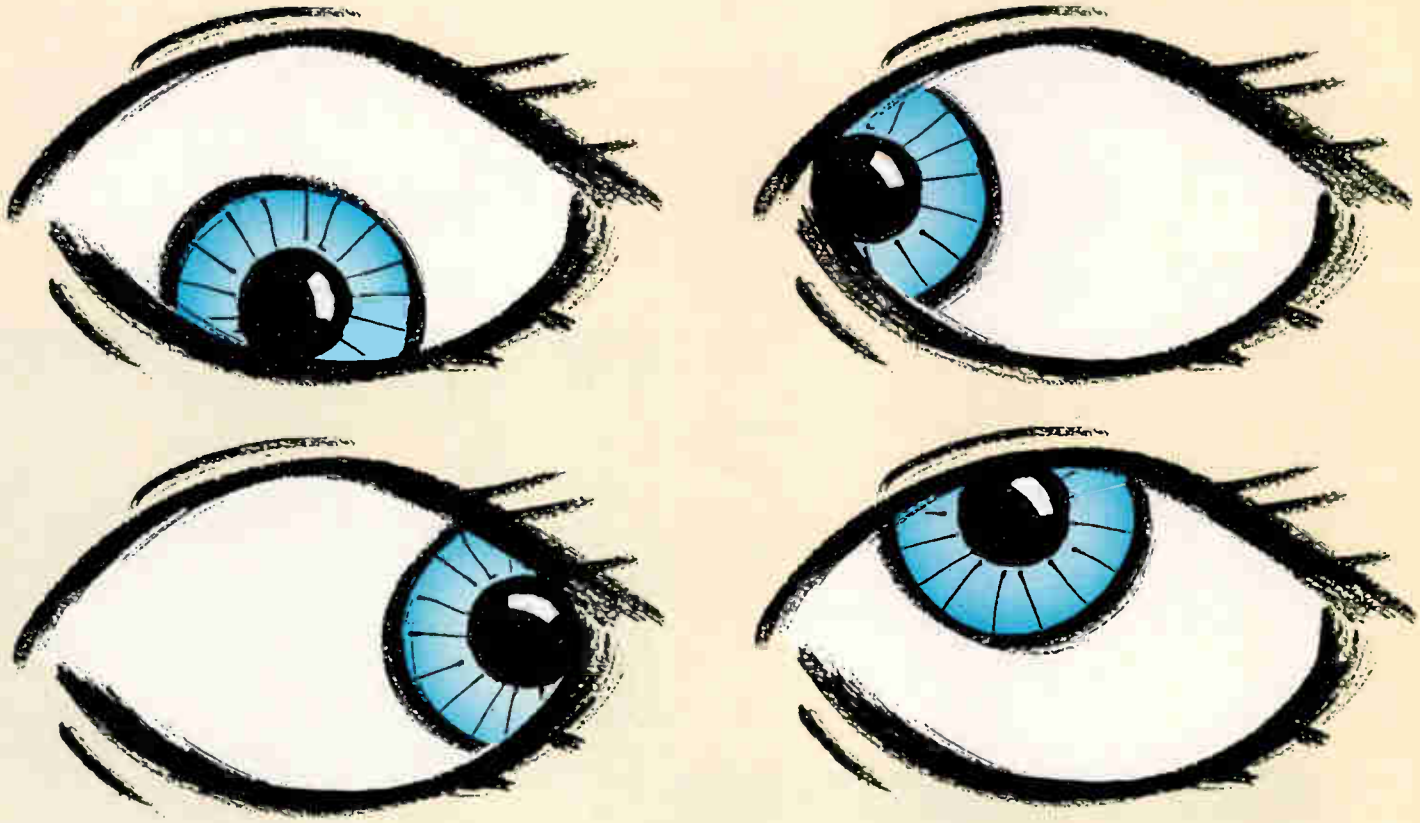
I tested by putting shorts in some of the adjacent rooms of the new addition. Each time I would measure the distance, and say at 25′ or whatever, the short would show up. Right on the nose. You can use a scope with this device, but you don't really have to because there's an LED display right on the unit, an indicator that gives you all the information right there. One possible problem that I mentioned earlier is to get the propagation specification, required by the TDR. The TDR puts an RF signal down the cable and counts the time for a reflection to come back. Therefore the TDR must know the speed the signal is traveling through the cable if it is to calculate the distance. If you have a straight run between terminations where you can measure the distance, then you can put an estimated number for the propagation time and then check the TDR's calculated result with the distance you have measured. But if you're in a big office building, this might be a real problem because your wires aren't going to go straight up — they might go all around the place. Maybe they're going up an elevator shaft or something like that, but it would be a problem. But for home application, using this device is pretty easy. Even with the sheetrock up, you can sort of see the framing, and in an area near a bathroom, say, you can "see" where the plumbing's got to go, right on the button. Co-ax, twisted pair, and other cables do have typical values, and you can contact the wire manufacturer and get the propagation spec.

The wire designator kit (Model 525) is very convenient. You don't even have to put a ground on it. The output connected to the wire is the screw-on type RG69. So I used speaker wire and intercom stuff. There is an adaptor with two alligator clips, but seeing it was set up for RG69 and coaxial, I wondered how good it would be on the other stuff. I didn't even [attach] the ground. I had the transmitter ground one wire, and the center wire was the hot. But on the other end of the bundles all I had to do was get the center connector and touch it and the number would light up on the display right away. Solid, all the time. I'd leave these things hanging and take out my number-labeling thing. That's a handy gadget, too.

I found you could use the transmitter and just one unit most of the time, because usually you're trying to identify one wire only. With the Riser-Bond Reflectometer, if you have the propagation number or are pretty sure of your footage, it's an excellent device.

WITH COST GOING UP ALL THE TIME THE DEVICE IS QUITE COST EFFECTIVE.

Time Domain Reflectometers (TDRs) used to cost $20,000, limiting their use to cable companies, engineering departments of broadcast networks and other big guys. Now, they cost about $600. Quite a difference. And with the cost of ripping out walls and labor in general going up all the time, the device is quite cost effective. So I went through a whole learning curve with these products, but can't imagine not having them at my disposal now. This particular job was an oddity — new construction, with no one knowing where the wires were. But in old construction, retrofitting, this is almost always the case. This equipment is invaluable there. Sound contractors are frequently working on "re-do's." There are a number of relatively new devices on the market that many people are unfamiliar with that can save time and money. We're seeing a steady progression of user-friendly, lower-priced equipment that, with patience and a willingness to learn a few new tricks, can really pay off. ■



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The Health Care Residence

Installation Challenges

BY KARL R. MEHLICH

One of the major requirements of a retirement community is that the residents have a feeling of safety in their residence. An emergency call system is not only primary to this requirement, but is critical for life safety. The following are some of the basic requirements for an emergency call system as well as solutions for problems encountered by installers.

DEPENDABILITY

Dependability is the primary importance of any system. In most cases, the call system in a residence is not used very often, but when it is used it is often a matter of life or death. For this reason, the system itself must be electrically supervised.

Problem. Most retirement communities are large and spread out. These large areas require long cables which are vulnerable to many hazards. Some hazards encountered are utilities burying their cable, landscaping of bushes and trees or even a resident planting flowers around the residence.

Solution. Before burying cables, make sure the grade of the landscape will not change after the cables are installed. Also, coordinate cable installation with other utilities. And, of course, use the proper cable for burial. The use of conduit is ideal if the cost can fit into a budget.

Problem. Lightning storms can be a major problem especially for spread-out systems with long cables. Even if lightning strikes several miles away, static charges may build up on the cables and destroy sensitive circuits.

Karl R. Mehlich is the President of Mehlich Electronics in Raleigh, North Carolina.

Solution. All spread-out emergency-call cable systems must have lightning protection. A complete grounded metal conduit system is a good solution to lightning problems, but is not always cost effective. When burying cables avoid burial near large trees. The lightning may follow the root system into the ground (The root systems spread out as far as the branch canopy). Voltage suppressors such as metal oxide varistors (MOVs) should be used between each conductor and ground that enters sensitive circuits in central monitoring cabinets and remote devices in the field. When purchasing systems, check for manufacturers that include MOVs as standard on their equipment.

When [the call system] is used it is often a matter of life or death.

OPERATION (STAFF)

The system should be easy to use by the central monitoring staff. The various monitoring indicators that are typically encountered at the central station are normal/emergency calls from skilled care patients, emergency calls from an outside resident, open exit doors and smoke alarm detection in a resident apartment. The fire alarm and fault indicators are among others that may be encountered.

Problem. The monitoring nurse station is a very busy place and if preplanning of distinctive audio and visual indicators are not considered there can be confusion between indicators. For example, many door alarms sound the same as an emergency call from a patient in the skilled nursing wing.

Solution. Before purchase of monitoring systems, be sure all the audio and visual indicators of all systems are distinctive and can be easily learned by the staff. If light panels are used, make the layout of each system logical and be sure panel identification is obvious. If a CRT monitor is used, make sure that the information displayed is clear with no confusing information.

OPERATION (RESIDENT)

All systems should be easy to use by the resident community since they are the reason for emergency call systems. Call cord switches should be located and accessible in the bedrooms and bathrooms. If audio is used, the speaker must be strategically located, in an apartment, to hear sounds from a bedroom, bathroom or living room. However, the resident should have privacy control. Resident privacy is a consideration, but must be automatically defeated when an emergency call is placed.

Problem. Locating a calling address at night is a problem with the wide spread communities.

Solution. Use an emergency call system that includes a flashing outside light on each apartment to guide the staff at night.

COST EFFECTIVE

The designing of a system is always based around cost.

Problem. Since most retirement com-

A typical retirement community needs emergency call systems for the safety of the residents.

munities consist of many acres of land, the cable requirements can be extreme and costly. The earlier systems used a home run cable from every apartment to a central monitoring station which is very costly especially for systems with audio which usually had at least four conductors for each home run.

Solution. There are systems today that use less cable or are wireless. Although wireless systems use no cables and are easy to install, they require periodic battery replacement and are not usually totally supervised. Also, the hardware for wireless systems is often expensive which may offset the cable savings. The hardwired systems typically require large amounts of wire but the hardware is generally less expensive. There is a third method available that has the best of both worlds. It is a no home run system that uses only a 14 conductor (16 conductors for audio systems) main trunk cable to which 100 remote addresses and 10 auxiliary unit addresses may be connected. This system significantly reduces the cable and hardware costs while priced in the same range of home run systems.

EXPANSION

Typically retirement communities are built with the expectation of expansion over the years.

Problem. Poor preplanning of the initial community usually does not consider that expansion may be a far distance from the central monitoring location. If a home run wiring system is used, enough conductors must be installed in the initial installation for the total expected addresses (including future expansion) creating a present cost for wires that may not be used for many years.

Solution. Use a system that has a reduced number of conductors and has the initial cable capacity for the total expected addresses (including future expansion).

SUMMARY

Retirement community emergency call systems are very important to the safety of the residents. Therefore, preplanning and selection of the proper system should be made with great care while keeping in mind present and future plans for the community. ■

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Swiss Watching

Security, Environmental and A/V Systems in a $15 Million Estate

BY STEPHEN FOOTE

Imagine the industrialist with $15,000,000 earmarked to build a 24-room home on a 14-acre lakeside estate in Switzerland. Safeguarding privacy and maximizing the quality of the family's lifestyle is the primary goal. Cost is a secondary concern. How is the estate equipped to derive the maximum benefits from today's electronic residential systems?

In September, 1990, this challenge was posed to three of the world's leading residential electronics companies. Each firm was given copies of architectural plans and invited to submit proposals for indoor and outdoor security, environmental controls, and audio/video entertainment systems.

Estate security was cited as the owner's chief concern. (His daughter had recently been kidnapped, and ransom was paid to obtain her safe release!) A frequent traveler, the owner also requested that all the estate's systems be capable of functioning automatically during his absence. A sophisticated audio/visual Media Room and Communications Center topped off the owner's electronic wish list.

Specific systems recommendations were left entirely up to the competing firms.

After weeks of deliberations, a $2,000,000 contract to design and install a fully-automated residential electronics system was awarded to Knox Security Engineering Corporation, headquartered in Stamford, CT.

In addition to supplying residential electronic systems, Knox also designs and manufactures security and surveillance systems for military and commercial applications worldwide.

Ofer Nissim, President of Knox, states, "We were told it was our security systems that got us this contract. That's what really impressed this client. We showed him how he could have the security protection he wanted, without making his estate look like a fortress."

OUTDOOR SECURITY SYSTEMS

Outdoor security systems for the 14-acre estate begin at the front gate and extend to lakeside waterfront areas.

Though the entire estate is under constant surveillance and protected by numerous electronic safeguards, most intruders would never be aware these systems had been installed," Nissim states.

The attractive front gate, for example, doesn't appear to be unusual, yet it is capable of stopping a 7-ton truck travelling at 50 mph. Access is controlled automatically by miniature electronic ID's attached to vehicles of family members and household staff. Visitors must enter a digital code or contact the main house via the gate's AV communications link. Time/date records of everyone entering or leaving the estate are logged automatically by computer.

Safeguarding privacy and maximizing the quality of the family's lifestyle is the primary goal.

Knox Forward Intelligence Gathering Systems (FIGS) provide continuous video monitoring of the estate grounds. FIGS camera units resemble a vertically protruding 16-inch periscope that can be buried, submersed or camouflaged to elude detection. When not in use, the FIGS video probe system retracts into its housing. Equipped with intensified day/night pan/tilt zoom lenses and digital wireless remote control, a total of 22 FIGS probes were installed at strategic locations around the estate.

All FIGS units are manually operated from FIGS monitoring and control stations (one is located in the estate's Security Room, another in the owner's Media Room). Using only two joy sticks, an operator can command the video probes to rise above the ground, rotate, pan, tilt, zoom, etc.

Motion sensors coupled to the FIGS cameras enable them to activate automatically, making video recordings of distrubances or intrusions.

Estate perimeters are also guarded by fiber optic security nets buried in the ground and suspended underwater in lakefront areas. Sensitive to pressure changes, the net's lightwave signal processor is programmed to discriminate between the weight of a person or a small animal, thereby reducing false alarms. Used in conjunction with FIGS cameras, they provide an "invisible" security barrier around the entire estate.

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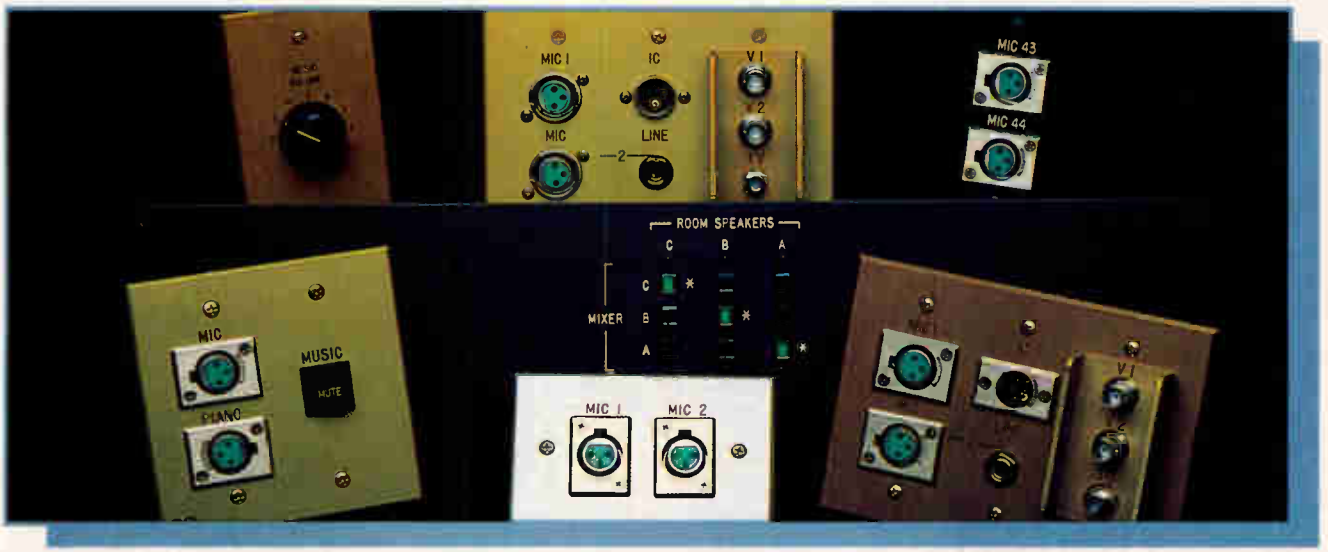

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"FIGS" in-ground video probe.

INDOOR SECURITY SYSTEMS

Access to living areas is controlled by programmable digital key pads linked to the central security processor. Separate security codes are assigned to individual doors. The private art collection, for example, has a code known only to the owner. Emergency codes were programmed so family members can summon local police, medical or fire personnel.

Interior video surveillance uses Knox Remote Observation Surveillance Electronics (ROSE). These miniaturized video pan/tilt cameras were discretely hidden behind decorative wall panels and mirrors. Like the FIGS video probes, the ROSE cameras are operated by wireless remote control.

Valuable art objects are protected by point-to-point laser sensors and digital video monitors directly linked to the home's fire and alarm systems. In the event of an actual theft, fire, or break-in, pre-recorded computerized voice announcements would alert occupants to the exact location of the problem.

For confidential business meetings, a shielded conference room was built incorporating a Knox CMS4009 countermeasures receiver designed to detect unauthorized transmissions. A fax monitoring machine was installed, along with digital scramblers to safeguard telephone and computer transmissions.

"The toughest part of doing these installations was coordinating our work with architects, interior designers, and local contractors," Nissim states. "Most of them had never seen systems like these before, so there were many planning meetings to iron out the details. Several times, we had to modify the original plans at the very last minute. And since we hired local electricians to do most of the wiring, the supervisors we sent over had some training to do for the more complex aspects of the job.

"All told, it took us over six months to complete the work. Generally, we found people were pretty excited to be working on a project like this. And once we got rolling, the job went a lot smoother than we had originally expected."

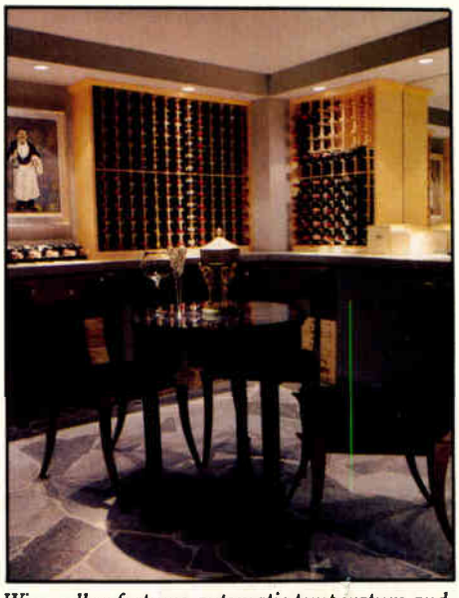
"FIGS" and "ROSE" control room for security room.

Valuable art objects are protected by point-to-point laser sensors and digital video monitors directly linked to the home's fire and alarm systems.

ENVIRONMENTAL CONTROL SYSTEMS

Zone heating, lighting, and air conditioning systems for the estate are controlled by touch-sensitive computer screens recessed into the walls. By merely touching simple schematic diagrams and symbols on the computer screen, family members could change settings in any area to match their personal preferences.

The environmental control system allows settings to be pre-programmed according to the time of the day or year. The rare-book library, art collection, greenhouse and wine cellar are all continuously monitored and regulated automatically.



Wine cellar features automatic temperature and humidity control.

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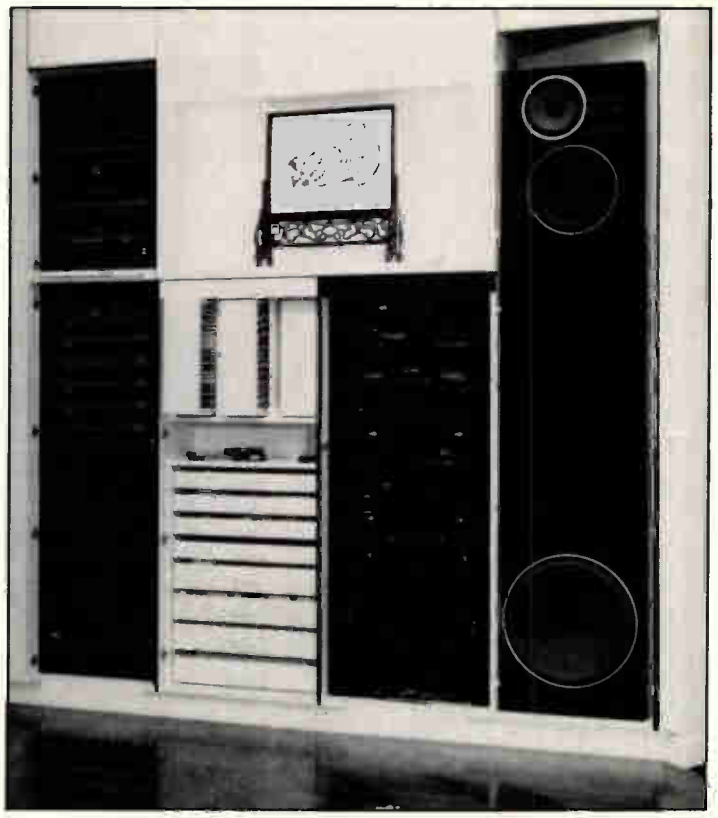
SYSTEMS INTEGRATION IN ACTION

Computerized systems integration allows the home's subsystems to work in tandem. For example, if a fire started in the kitchen, the CPU would receive an alarm signal from the kitchen's smoke detector. The CPU would then automatically initiate a series of pre-programmed events. Fire officials would be alterted. HVAC systems would be shut down to prevent smoke spreading. Computer voice announcements would warn occupants of the fire's location. Lights would go on to mark escape routes. The front gate would be opened to admit emergency personnel. Video cameras would be enabled and security personnel alerted. Similar types of instructions were pre-programmed to provide fully-integrated responses to a break-in or theft.



Master bedroom media control center.

AUDIO/VIDEO SYSTEMS

The Media Room for this luxury estate features a 20 ft. wide digitally-enhanced video projection system with Dolby stereo surround sound. The components selected for the lavish entertainment center include a Stewart projection screen, Ikegami TPP800 projection monitor, Ikegami DSC1050-S digital scan converter, Audio Research pre-amplifier, and Mark Levinson amplifier. Front speakers are Martin Logan Sequels; rear speakers are JBL UREIs.

Remote stereo speakers, amplifiers and subwoofers are located throughout the home, with separate volume and selection controls for each area. Different musical programs can be piped to any room. You can even instruct the system to "follow you" so music plays only in the area you're occupying.

If a fire started in a kitchen, the CPU would receive an alarm signal from the kitchen's smoke detector. The CPU would then automatically initiate a series of pre-programmed events.

Satellite TV links, on-line computer data services, FIGS and ROSE surveillance systems are all routable to the main video projection screen.

All of the estate's electronic systems can be controlled directly from the Media Room. The owner can relax in his lounge chair and do anything he wants to do electronically ... just by pressing a few buttons.

LOOKING TO THE FUTURE

"Obviously, most of these top-end electronic systems are too expensive for the average individual to consider," Nissim comments. "Even a small fully-integrated residential system might cost $250,000. But I do see the prices gradually coming down. Someday, I think you're going to see a lot of new homes equipped with these systems as standard features." ■

(continued from page 21)

The 360-Degree Sub-Group

Aside from the unique speakers covered in Dan Sweeney's article, there is a sub-group of speakers including both direct radiators and horns that strive for 360-degree sound coverage. These are simply pre-constructed arrays of speakers and are available from Frazier, KDM and LA East.

The Frazier F2240 QMD ceiling array consists of four identical modules arrayed at 90-degree angles for 360-degree coverage. Each module consists of a 4-inch cone speaker and a coaxially mounted compression driver horn. Each module is separately wired so there is flexibility in level adjustment. The QMD ceiling array is intended for distributed sound systems with ceiling heights of 15 to 20 feet. Specific applications suggested by Frazier include large retail stores and warehouse areas. The projection should be at least equal to conventional paging horns, but with wider bandwidth and without the nasal quality.

KDM has a series of "Octasound" 360-degree coverage speakers. Actually, while the enclosures are eight sided, on the less expensive model (SP800) a tweeter is used only every other side with a downward firing woofer, and in the higher output models the woofer and compression driver/horn alternate so there are really four systems, one for 90 degrees of coverage. The concept is similar to the Frazier QMD series, although the woofer on the KDM is direct radiating while the Frazier is horn loaded.

There is a sub-group of speakers including both direct radiators and horns that strive for 360-degree sound coverage.

LA East's SD48 Ceiling Series fits into the space of a 2 foot x 2 foot ceiling tile and has four 8-inch speakers. It is designed for both speech and music applications, and like the Frazier and KDM products, is intended to function as a central array with a 360 degree coverage pattern.

Frazier Petit Jean Mountain, RT 3, Box 319, Morrilton, AR 72110. 501-727-5543

KDM Electronics, Inc., 705 Progress Ave., Unit 59, Scarborough, Ontario M1H 2X1., 416-439-7158

LA East. 127 Union St., Hatfield, PA 19440, 215-362-2890

distributed systems in gymnasiums, shopping malls, ballrooms, exhibit halls, and other large enclosed spaces where extremely high sound pressures are not required. Ceiling mounted B.E.S.T. speakers are similarly efficacious in such environments, and with either system fewer loudspeakers will be required than would be the case with ordinary flush mounted cones.

Bose speakers, with their higher directivity, lend themselves more to central cluster and decentralized cluster type of installations, though they can be utilized in distributed systems as well.

More controversial are applications involving [low Q] sound reinforcement in concert settings.

More controversial are applications involving sound reinforcement in concert settings. All four companies' products have been used in such applications, but only Bose provides comprehensive guidelines for speaker placement in such applications. B.E.S.T. speakers have been used as freestanding panels with omnipolar radiation patterns through the midrange and

treble and dipolar radiation in the bass frequencies. Wolcott Audio Omnispheres have been employed in outdoor concerts with stacked pairs flanking the stage and additional speakers on delay lines distributed along the sides of the listening area. Soundspheres are frequently used in nightclub settings.

Subjective assessment of sound quality favoring [low Q] speakers cannot be ignored.

In the absence of a formal body of design work it is difficult to generalize here, but in sound reinforcement applications where extreme levels are not demanded and voice intelligibility requirements are not too stringent, the absence of horn colorations and pronounced peaks and nulls in overlap regions characteristic of low Q systems may be a strong point in their favor.

THE LIMITS OF REVISIONISM

All low directivity professional loudspeakers are relatively inefficient, which automatically limits their appeal. Except for the Bose products, all are being promoted without the benefit of software support and fully worked out installation programs. Many claims advanced by manufacturers are unsupported in the technical literature, and lack any firm basis in acoustical theory. And yet subjective assessments of sound quality favoring such speakers cannot be ignored. Simply too little is known about psychoacoustics to refute unequivocally the claims of such manufacturers that low Q speakers are suitable to use in a wide range of listening environments. But the burden of proof is on the manufacturers to support such claims, and we would hope they would work to develop a body of research findings to guide the sound contractor undertaking the low Q alternative. ■

Analyzing an Analyzer

Audio Control Industrial's SA-3050A ⅓ Octave Analyzer

BY MIKE KLASCO

The ⅓ octave analyzer is an indispensable tool for the sound contractor, even if he or she owns a more sophisticated TEF, MLSSA, or SYSid system. For small jobs, the budget may only warrant a quick ⅓ octave analysis. One-third octave equalizers, noise surveys or NC (noise floor) measurements can most effectively be handled by a real time analyzer. Still another aspect is the more intensive training and sophistication required to accurately operate complex analyzers compared to the comparatively more straightforward operation of a real time analyzer. Even if your firm already has a "super" analyzer, what will the "B" team use?

Of course, ⅓ octave analyzers have limits, and lack the frequency resolution to do a first rate job of calibration of parametric equalizers, electronic crossovers, and bass reflex tunings. Plain vanilla real-time analyzers are two dimensional and cannot measure signal arrival time offset or transient response or other "time domain" phenomena.

For this month's test equipment review we will take a look at Audio Control Industrial's SA-3050A. They have found a niche for their analyzer both in the sound contractor and auto sound markets. The SA-3050A is a decent product with a low price and good quality. In fact, this analyzer is the cheapest unit that I am familiar with that I trust. Specifically, the SA-3050A has earned a reputation for quality construction, stable, reliable circuitry and components, and has a good track record. The basic unit includes a measurement mic and analyzer and costs $995. The package that is more appropriate for sound contractors includes the analyzer with a built-in rechargeable battery, printer interface, and mic for $1,300. Other accessories that are needed include A and C weighting filter and soft carrying case, which add about $100.

The SA-3050A's control face is 10 inches x 4 inches and the case is 12 inches deep. Weight is 10 pounds. With the optional soft carrying case strapped over your shoulder and the cover flap open, the analyzer is easy to use "on the go." Still, this is not the "handheld" operation that you have with a unit like the Ivie IE-30, but that analyzer's cost has crept up over the years to over $5,000. External construction of the SA-3050A is solid, with a metal case, with a handle and feet. Appearance is attractive, with a well finished front panel that has a high-tech stereo component look. Internally, glass epoxy circuit boards, good soldering, and careful selection of passive and active components are apparent. The manual is informative, adequate, and pleasant to read.

The SA-3050A is a decent product with a low price and good quality. In fact this analyzer is the cheapest unit that I am familiar with that I trust.

OPERATION

The basic operation of the SA-3050A is simple, and most of its features can be used intuitively without referring to the manual. The analyzer is factory calibrated for absolute sound pressure measurements with its CM-10 microphone. The filters are ANSI Class II, which have 24 dB per octave skirts and are very respectable for field use. I have used the SA-3050A for some time and can say that it is a stable product. It holds its center frequency and amplitude readings over time and temperature.

The most obvious visual aspect of the analyzer is the LED display. Thirty rows of ⅓ octave frequency bands, each 9 LEDs high, dominate the control face. Center frequencies are ISO standard, from 25 Hz to 20 kHz and are marked on the bottom edge of the screen. Unlike an LCD display, the readings are easily visible in low light levels, at any angle, and legible even at a distance of a few feet. Step settings are 1, 2, 3, or 4 dB per LED, so with the high resolution setting the range is ±4 dB, and the wide dynamic range setting is ±16 dB. The lowest sound level that can be displayed is 44 dB and the maximum level is 136 dB. For some noise floor (NC) measurements the 44 dB noise floor figure would be a little high (you might hope for better in a theater or conference room). The 136 dB figure seems okay for most of us, although for the auto sound market it might be short about 10 dB (at least when the display is maxed out at 136 dB you would have some indication that it is

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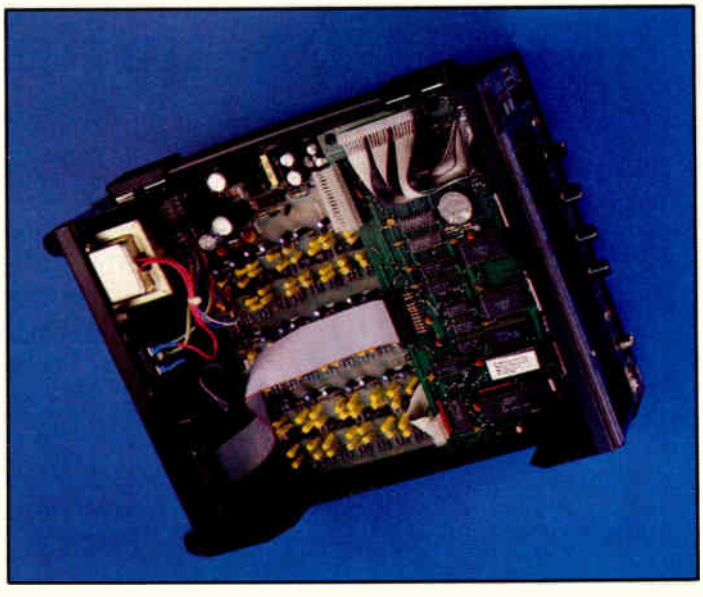
Audio Control Industrial's SA-3050A one-third octave analyzer with soft carrying case.

Internally, glass epoxy soldering boards, good soldering, and careful selection of passive and active components are apparent.



a good time for you to leave). The LED "ballistics" or decay time can be set to fast, medium, or slow. A peak-hold mode allows you to accumulate the highest peak level in any 1/3 octave band.

Response curves may be stored in the internal CMOS solid state memories. Up to six curves may be stored, each assigned to one of the six memory storage locations. Any and all of the six stored curves may be averaged and stored in one of the memory locations. The data in the memory locations are preserved even if the analyzer is turned off.

While this capability is a treat in an analyzer at this price, it is not anywhere as handy for data storage as a built in disk drive. I found that six memories were not enough for many of my jobs. The solution I worked out was to print out the results after every sixth measurement. The SA-3050A package includes a printer interface that is compatible with any parallel printer. Acceptable looking graphs are printed out using "text" characters, so graphics compatibility problems are avoided. Documentation information is provided for in the graphs, such as location, conditions, operator, etc. For field use there are now available at least four portable printers designed for use with laptop computers. Three use ink jet technology: the Citizen PN-48, Canon BJ-10e, and the Kodak Diconix 150Plus. Seikosha has also recently introduced a portable dot matrix printer. Prices of these printers range from $300 to $550, and they weigh from 2 pounds to 10.5 pounds. All of these are battery powered (or have optional battery packs) and you might be able to cram one of them into the analyzer's soft case pouch. All print out 8.5-inch x 11-inch sheets. The printout button is on the rear of the SA-3050A and looks tacked-on and a little out of place.

At times you may need the A- or C-weighted sound pressure in addition to the 1/3 octave response. The analyzer can display the spl on the display screen. The 1/3 octave display can be bypassed and the LEDs show the spl figure. The numbers are displayed a few inches high and can be easily seen from some distance. The A and C weighting requires an optional outboard filter that inserts between the mic cable and the analyzer. I found it a bit of a pain to have to constantly replace and remove the weighting filter as I jumped between spl and 1/3 octave analysis. It is easy to forget the filter and inadvertently leave it in the signal path.

A pink noise generator is built into the SA-3050A. (Usually the pink noise generator is an external extra cost item on 1/3 octave analyzers.) The pink noise generator has enough current output to drive a long cable or even an efficient speaker. If you do not want to be connected to the sound system during your measuring, then you might want to use a test CD. Audio Control Industrial distributes the Prosonus Test CD for just this purpose.

The battery option should only be omitted in permanent installations, in which case you may want the rackmount adapter option. The battery will operate the analyzer for almost five hours. For most applications this ought to be enough, although full recharge time is six to ten hours. Luckily, the initial recharge rate is fast, so the first hour of recharge will yield about one hour of additional operation. When you have 15 minutes of battery charge left, a warning light begins to flash. The recharger is built into the case and the analyzer can also be plugged into any power outlet.

SOME LIMITATIONS AND SOME STRENGTHS

The SA-3050A is a little short of perfect. The 12-inch depth and 10-pound weight eliminates handheld operation. The memory averaging scheme uses an arrangement that toggles between modes which lack clear indication when it has been properly engaged. A few other features, like the memory averaging, were added after the initial product introduction, including the spl meter and printer output. These are useful, almost must have items; but the use of double function or awkwardly placed controls detracts from the generally intuitive operation of the unit. Finally, the battery recharger does not give any indication of how charged the battery is, and if you do run out of juice the battery really ought to be able to be easily switched out with a fully charged battery (but this is not discussed in the manual).

In any case, after a ten minute orientation, any reasonable field tech should be able to handle the SA-3050A competently. And there is room in the soft case pouch for the manual, should any user get desperate.

When compared to handheld ⅓ octave analyzers from Ivie, Bruel & Kjaer, CEL, and Quest, the SA3050A lacks some of their refinement and miniaturization. The manual does not address the need for periodic recalibration, nor the application of a field calibrator for the mic. A mic sound pressure calibrator allows the sound pressure to be calibrated by placing a sound generator over the mic and reading the sound level on the SA3050A (usually at 1 kHz) and adjusting a trim pot. Calibrators from Simpson and CEL are available for under $200 and a worthwhile investment if you have a few analyzers. If you have access to a calibrator, Audio Control Industrial will talk you through the calibration procedure by phone or you can send the unit back for recalibration every year or two.

Of the portable analyzers mentioned, only the Ivie IE-30 and Audio Control Industrial SA3050A display all the ⅓ octave bands simultaneously in real time. The CEL, Quest and Bruel & Kjaer measure ⅓ octave response serially, that is, ⅓ octave at a time. I find this less intuitive than a graphic display of all the bands simultaneously in real time.

CONCLUSIONS

The SA-3050A is an excellent value. First of all, it is a real piece of test equipment, and perhaps at its price that would be enough to recommend it. The memory storage and averaging are useful, the printer outputs mandatory for documentation, and the A/C weighted sound pressure level meter capability saves you the cost of taking along a sound pressure meter. If you have a limited budget, but need a decent and flexible analyzer, then Audio Control Industrial's SA-3050A is your choice. ■

BOSE RESIDENTIAL MODELER'S SOFTWARE APPROACH FOR THE HOME

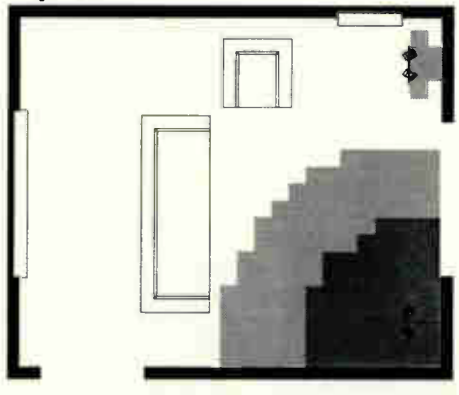
By Mike Klasco

Bose has an unusual angle on making residential installations easier by taking a software approach. Residential Modeler is a far less ambitious program than Modeler, the sound system engineering program we reviewed in a previous issue, but is targeted towards specific applications.

Residential Modeler is specifically intended as a design aid in preparing room and speaker layouts using Bose installed speakers. These include their popular circular baffles, unique track-lighting style speakers, and their wall mount enclosures. Intended for the Bose built-in home installation sound equipment, Residential Modeler would also be quite workable for commercial foreground music systems.

Only Bose Residential products are included in the speaker file library, but generally the Bose Pro versions are comparable, with only color or cosmetic differences.

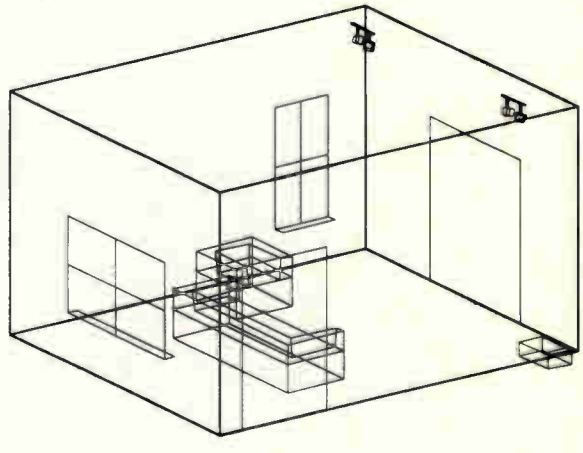
While the full scale Modeler program requires comprehensive room modeling techniques, where the operator defines surface materials for all room planes, Residential Modeler assumes typical rooms and comes with a library of rooms (and furniture), which may be quickly adjusted by the program user to fit the job. Residential Modeler also allows new rooms to be created from scratch, when required.



Stereo coverage of a study. Darker areas denote poorer coverage.

If you already are familiar with Modeler, then you can master Residential Modeler in one sitting. If you have never used Modeler before, but are familiar with the Mac computer, then you should have the situation under control in less than an afternoon. The program is fun to learn and the manual is easy to understand. Residential Modeler is not a toy version of Modeler, and actually has some unique and noteworthy features of its own. Specifically, Residential Modeler has its own "artificial intelligence" that enables it to recommend speaker locations, as well as point out when the operator is violating good design practice, and even locate the speakers automatically, if you so desire. The computer performance simulations are limited to uniformity of coverage with qualitative ("good," "bad," "ugly") ratings.

Residential Modeler was originally taken from the Pro division's Modeler program, but I think the fellows at Bose Pro ought to repackage this program for pro use, as a supplement to Modeler (with Modeler's comprehensive speaker library), for application as a super-fast job estimating program.

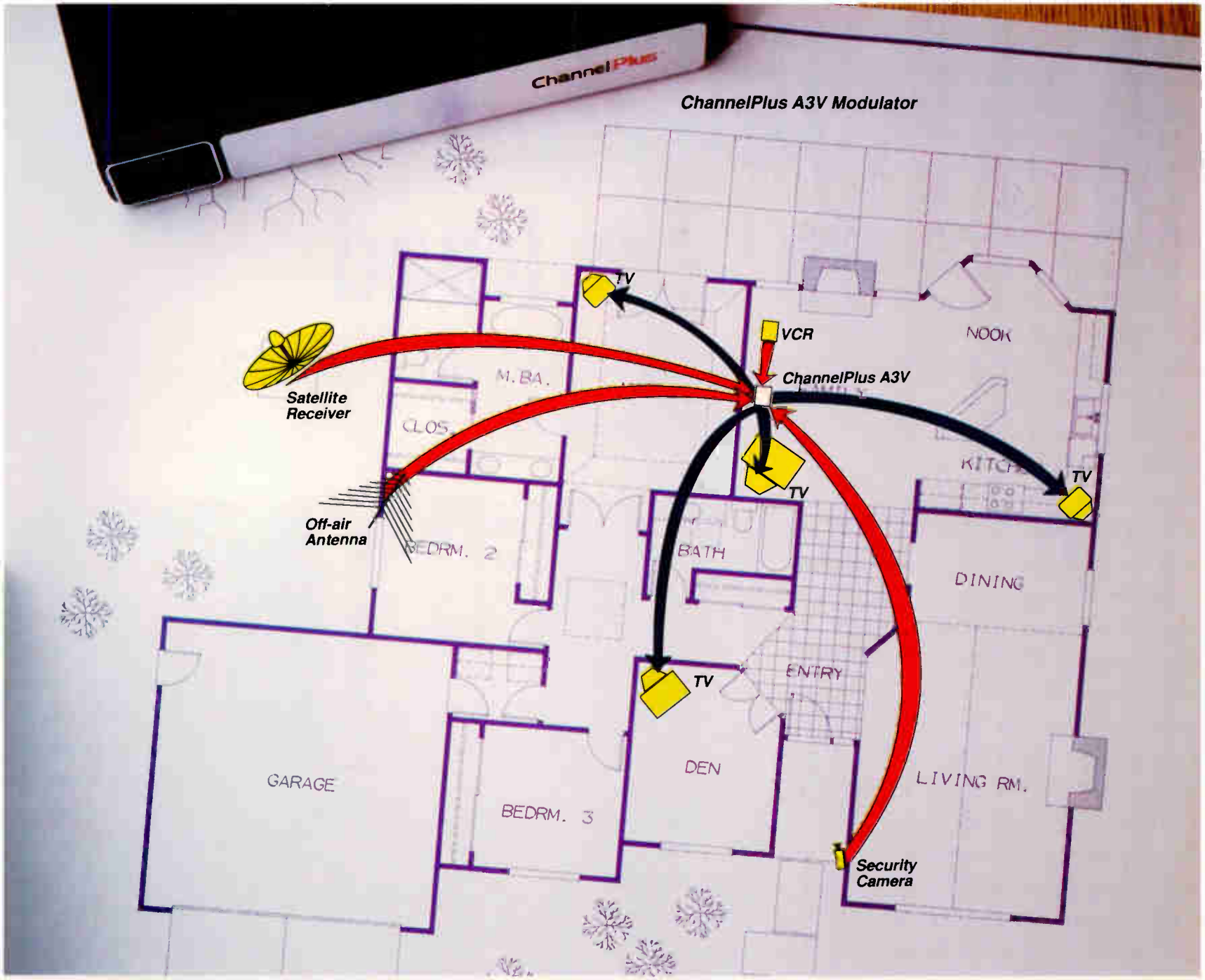


Three-dimensional view of same study.

Residential Modeler requires a Mac with a single disk drive and an Imagewriter compatible printer. Licensing requirements are reasonable; you just need to be a Bose Residential dealer. Cost is even more reasonable; the program is free to dealers.

I think this software would be ideal for designing sound systems for boutiques, department stores; and I really enjoyed using it. ■

Mike Klasco is The Technical Editor of Sound & Communications magazine.



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Circle 208 on Reader Response Card

Intercoms on the Road

Communication Means Security in the R.V.

BY TOM NESTELL

The desert surface undulates from heat waves as the big Marathon motor coach rolls through Death Valley.

Air Conditioning spares the driver from the blazing sun outside, but just looking at all that parched terrain is enough to make anyone start thinking hard about a tall, cool glass of water.

In lesser motor coaches, the driver might have to call back to fellow passengers for some liquid refreshments. But in the luxurious Marathon, he simply orders his drink by speaking in the direction of the Aiphone LAF-3B built discreetly into the hand-rubbed koa dashboard.

Passengers hear the driver's request through speakers in the galley, bedroom and even the bathroom of the 40-foot-long vehicle, and soon his thirst is slaked.

Intercoms in a motor coach? You bet. After all, these are top-of-the-line conversion coaches built in Marathon Motor Coaches in Eugene, Oregon.

For the price of the waterfront home, Marathon builds one-of-a-kind "land yachts" straight out of "Lifestyles of the Rich and Famous." Computer systems, entertainment centers, wet bars, and designer interiors are built into these 40,000-pound rolling homes powered by 736-cubic-inch turbocharged diesel engines.

Everything from the floor plans to the finishing touches is custom-built, and intercoms are a frequent option.

We first tried "wireless" intercoms that used the 110-volt internal wiring of the coach to transmit signals. It should have worked, but what came out was unintelligible.

The inside of the Marathon coach is completely custom built.

Our problems were solved when we switched to Aiphone intercoms, after learning that other conversion coach manufacturers had used them successfully. The systems have proven highly reliable and the sound is clear and intelligible.

As with most of our coaches, everything is an option, including intercom systems. We find some customers prefer the familiarity of a phone-like TD-3H and others the convenience of a hands-free LAF. Some want an outside intercom added to the side door so visitors can identify themselves before being allowed into the vehicle. Building an intercom into the door of a vehicle posed some special design problems, however. We needed a system that was waterproof, so we chose a stainless steel and Mylar speaker that is impervious to moisture and covered it with a stainless steel grate.

The outside speaker provides an added security function in that it serves double-duty as a microphone. Press a button, and occupants inside can monitor sound out-

Tom Nestell is president of Marathon Coach, Inc.

A Marathon motor coach driving through the Pacific Northwest.

side. If necessary, the driver can switch to the speaker mode and surprise and scatter prowlers with some carefully chosen words.

To ensure the clearest possible transmission, we use West Penn multi-conductor, non-twisted wire with an overall inductance shield. We also provide a 12-volt power supply isolated from the coach's 24-volt ignition system and 110-volt household current. All that juice is provided by 12 batteries, in case you were wondering, and can be recharged by a 300-amp alternator, outside current, or a built-in auxiliary generator.

For the price of the waterfront home, Marathon builds one-of-a-kind "land yachts" straight out of "Lifestyles of the Rich and Famous."

Of course, it is important to our customers that the system look as great as it sounds. To achieve this, we disassemble the master unit and build it into the dash. Our master wood workers craft the exterior cover from choice hardwoods so it blends with the rest of the decor.

Whether our customers are driving along the blistering asphalt of Death Valley or visiting a drenched Pacific Northwest rain forest, intercoms play a useful role in enhancing their traveling experience.

By communicating effortlessly with passengers, a driver can point out a scenic attraction, warn passengers about rough roads ahead — or simply ask for that cool glass of water. ■

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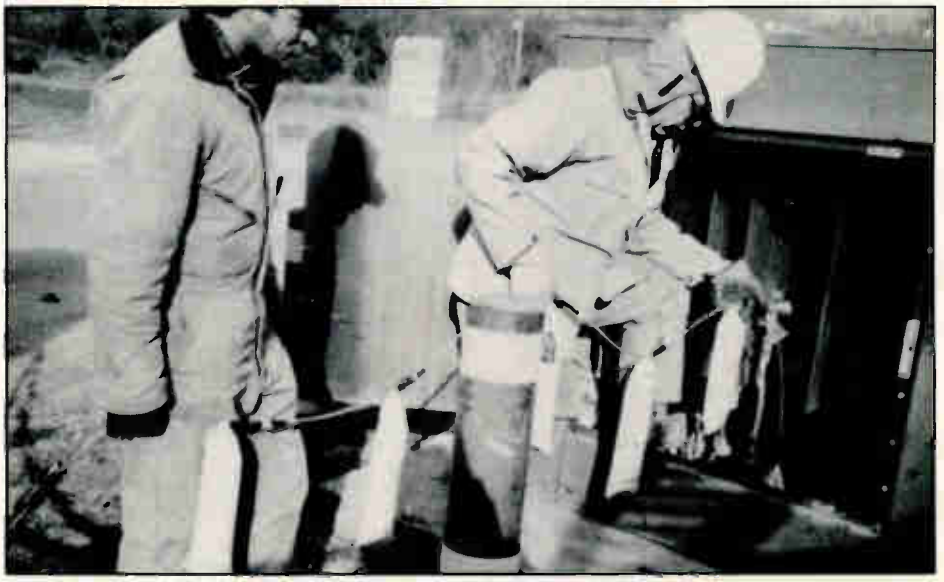
LUBRICATION AND PLANNING HELP GET CABLE IN OR OUT OF CONDUIT

By John M. Fee

Electronic systems contractors often need to install their cable in conduit using a method called 'cable pulling.' The basics of pulling are well-known to field installers: thread a line through the conduit, attach it to the cable(s), and drag the cable back through the conduit. For over 50 years, millions of miles of cable have been installed using this method.



In large conduit, a popular way to lubricate is with bags of gel lubricant. They are pulled through the conduit in front of the cable, lubricating as they go.

CABLE LIMITATIONS

Unfortunately, cable can be damaged during this procedure. Clearly, cable has a strength limitation and will break or stretch if too much force is needed to pull it into conduit. Less obvious, but more common, are cable jacket tears or crushed coax shields when cable is pulled too hard around a conduit bend.

Generally, the lower the force needed to pull in a cable, the better. Besides avoiding cable damage, lower forces produce less equipment wear and/or allow longer pulls with fewer splices.

REDUCING PULLING TENSION

Pulling tension comes from the frictional drag of the cable on the inside conduit wall.

Lubricants come in both liquid and gel forms for different types of installations.

To minimize tension, it is necessary to minimize this friction.

Cable pulling lubricants are used to lower friction and make pulling easier. These lubricants can reduce pulling tension from 30% to as much as 90%. Tension reductions of this magnitude can mean significant time and money savings in field work.

Pulling lubricants are sometimes called "soaps" or "greases." While hydrocarbon greases are excellent friction reducers, they can swell and weaken plastic cable jackets, and should not be used on most cable types. The soaps and waxes common in electrical wire pulling can stress crack the polyethylene jackets found on some coax and twisted pair cable.

The end-user should insure the lubricant selected is compatible with the

John M. Fee is the President of American Polywater Corporation in Stillwater, Minnesota.

cable. The most modern lubricants are water-based polymer materials, like PolywaterX or Dyna-BlueX, and are compatible with all common cable jackets.

There is no single pulling lubricant that is perfect for all situations. Liquid lubricants are popular for long, underground runs, where they can be poured into cable feeder tubes or pumped into duct. Thick gel lubricants work better for overhead pulls or conduits with many bends.

TENSION ESTIMATION SOFTWARE

There is a theoretical side to cable pulling. The pulling force needed to pull a given cable(s) into a specific conduit run can be estimated using a complex set of equations. Such calculations are useful when determining length of run, location of pull boxes, or direction of pull.

Use of the pulling equations can be time consuming, but PC software, such as American Polywater's Pull-PlannerX II, can make the calculations fast and convenient. The software is especially nice for what-if studies for different cable counts or conduit route design changes.

A loosener helps remove cable from conduit by softening binding agents as well as lubricating.

UNIQUE PULLING TECHNIQUES

It is possible to pull a cable into a conduit already occupied by other cables, but it is very tricky. The problem is the new cable can wedge and get stuck between existing cables, especially if there are conduit bends. While lubrication can help, it still won't prevent a wedged cable.

If the conduit is large enough, there are special 'subducts' available which are 'pushed' into the conduit. These subducts are shaped so that they ride on top of the in-place cable. Once the subduct is in place, the new cable can be pulled into it without wedging concerns.

Several techniques can be used to place long lengths if the cable is flexible and

Fiberoptic cable is placed in a large figure-eight for the next pull. Thinner cable will form much more compact figure-eights.

lightweight enough. In "figure-eighting," the total length of cable is pulled through the first section of conduit. This section is presumably the maximum length possible without surpassing maximum allowed pulling tension. The excess cable is laid out neatly in a figure-eight pattern (counter twists). The figure-eight of cable is then flipped over and pulling is begun into the next section of conduit. This procedure can produce long runs of unspliced cable. Care must be taken to keep the cable clean and protected while it is laid out.

Bidirectional pulling also involves figure-eighting, but no excess is pulled through the first conduit segment. Instead, the second pull is made in the opposite direction after the cable is figure-eighted off the reel onto the ground. The reel effectively sits at the middle of the run.

CABLE REMOVAL

Occasionally, during system upgrades, cable needs to be removed from conduit so that the conduit can be reused. The cable may have been in place 30 or more years.

A new product, CableFreeX Loosener, is now available to help with cable removal. The CableFreeX Loosener is a water-based dissolver/lubricant designed to loosen cables that are held in conduits by wax, rust, dirt, soap, or other adhesive residues. The Loosener also acts as a lubricant to lower the force required to remove the cable.

The CableFreeX Loosener, which is a liquid, is usually 'blown' into and through the conduit system using compressed air. The conduit is sealed and the Loosener allowed to sit and soak for a few hours. Then force is applied to break the cable(s) free and pull it out.

SUMMARY

Pulling cable into conduit can be easy and straightforward if proper planning is done. Installers must be careful not to put excess tension on cable as it's pulled. The special lubricants available, supplemented with the right line fishing and pulling equipment, can result in a fast, efficient pulling operation — both in and out. ■

TAKING THE PRODUCT ON THE ROAD

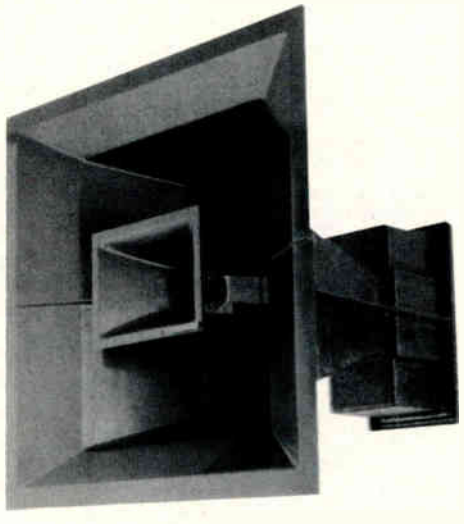
By Russell Redman

Thinking that hearing is believing, Frazier has been holding demonstrations of its CAT 79 loudspeaker for sound and communications consultants and contractors in major cities throughout the country to heighten industry awareness of its products.

Jay Mitchell, chief designer of Frazier CAT loudspeaker systems, detailed the technical background of the CAT 79 and the evolution of Frazier designs before a dozen consultants and contractors at a demonstration in Chicago. The loudspeaker — designed for speech reinforcement in large indoor or outdoor spaces — was tested for speech intelligibility, pink noise, dispersion and coverage characteristics. Similar demonstrations of the CAT 79 were held in Dallas, Los Angeles, San Francisco and Minneapolis-St. Paul.

"It's a type of audition we try to do from time to time in various cities when we come through with new products and developments," said Jim Truelsen, vice president of sales and marketing for Frazier. "After product announcements, they [consultants and contractors] often ask how soon they can hear them [the products] and talk with the designer about their concepts." In the case of the CAT 79 demo, he explained, it was a combination of introducing new technology and requests from several key consultants to hear the speaker.

"I believe product demos are very important," said Leslie Kirkeide, the manufacturer's representative for Frazier covering Illinois and Wisconsin, who helped organize the Chicago demonstration. "Consultants are always interested in seeing what products can do. It's often easier to bring a product, in this case the CAT 79, to one place and demonstrate it."



Truelsen pointed out that trade shows are often ill-suited for a company to demonstrate products like the CAT 79, which requires a large area to give consultants and contractors a good idea of how it sounds. "In shows like NSCA, the products are there, but they are not always available for demonstration; it's not the proper situation. So it helps to hold these demos from time to time."

Several consultants who were at the Chicago demonstration said that they liked having the opportunity to be able to hear the CAT 79 firsthand.

"It gave me better familiarity with the Frazier line. I had not had a chance to hear the product," said Peter Tappan, principal consultant for Kirkegarde and Associates in Downhurst Grove, Illinois. Jim Gundlach of Gundlach Associates in Naperville, Illinois agreed that the demo was beneficial. "The product is such that it's too large to demonstrate in my own facility," he said. "It was good to be able to see what it could do." And Jim Brown, principal consultant with the Audio Systems Group in Chicago, commented, "It allowed me to listen to the speaker and find out what its strengths and limitations are."

Still, demonstrations do not guarantee sales. At the time of this writing, none of the above consultants said they had incorporated the CAT 79 into a system — no matter how they viewed the speaker. Truelsen said the CAT 79 has "slowly but surely" become recognized, with installations occurring in places such as football stadiums, high schools and Purdue University.

"So many of these sales are dependent on whether a consultant determines whether or not [the product] is fit for the job and whether the contractor gets the bid," Truelsen said. And that's why product demonstrations — and especially manufacturers reps — can come in handy: they maintain contact and promote interaction between manufacturers, and consultants and contractors.

"We're a smaller company, and it's expensive to have a field or district rep on hand to meet with consultants and contractors," he explained, regarding the value of demos and reps. "This is an industry of ebb and flow; it depends on building a dealer following for a design concept, a factory or certain products." ■

Russell Redman is the Assistant Editor of The Music and Sound Retailer magazine.

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ROCK AND ROLL FANTASY — A MULTIROOM SYSTEM FOR A MUSIC IMPRESARIO

By Bruce and Rani Gladwin

Set on top of a hill in Marin County, California, with a commanding view of San Francisco Bay and the city beyond, lies the fantasy world of a prominent international rock promoter (who insists on anonymity).

PHOTO BY GARY ORNDORF

This 10-acre San Francisco Bay estate was designed for easy access to A/V systems throughout.

The house and grounds are arranged for extensive entertaining and casual living with regulation basketball, soccer and racketball courts, pool and cabana, guest house and large gardens. The rock memorabilia of past shows, and gifts from musician friends, crowd the house, occupying the walls and covering tables and display cabinets.

For audio and video in this environment, the client wanted a system that would enable him and his guests to have access throughout the 10 acre estate and main house. With that access, criteria were ease of operation and choice of source material (cassette, CD, VHS, Laserdisc, etc). For this task, we chose the Soundstream system, which was designed to perform complicated tasks in a multiroom situation and could be controlled throughout, with the touch of a keypad or use of an IR at each station. We then extended the multiroom idea to 13 Soundstream stations with independent systems at certain locations that could override the system when deemed necessary for individual work or entertainment. These dual sites are the master bedroom, master den, combination library/projection room, guestroom, pool cabana, racketball court and guest house. The flexibility of the system was an absolute necessity given the various functions of the estate — shifting from private home to the site of large parties occupying house, outer buildings, and gardens. With the Soundstream system, one main system could control and distribute the chosen audio or video program throughout the estate and still maintain individual control at each site for volume, on/off, or choice of a separate program selection.

The heart of this customized system is a rack cabinet housing the Soundstream, which is located in the main hall of the house. The cabinet itself (designed by Architect Robert Engman of Mill Valley, California) appears to be built-in, but because of hidden wheels is able to roll out for access to the rear. This feature allows easy wiring from the closet which houses eight of the 13 Soundstream amplifiers that control the main system. The rack equipment is composed of a Soundstream Simul-source, a Soundstream A/V switcher, Soundstream Simul-source expanders, a Soundstream FM tuner, the Pioneer 18 CD changer, a Pioneer 6 Cassette changer and recorder, a Yamaha Laserdisc player, a Toshiba Hi-Fi VHS, a turntable, and a pullout shelf for a work station. From the main rack, the living room area is controlled as a standard hands-on audio and video system because the client uses this system to listen to and analyze new music groups. The speakers used in the living room are JBL studio

Bruce and Rani Gladwin are the proprietors of Bruce and Rani Gladwin Media Rooms in Oakland, California.

PHOTO BY GARY ORNDORF

The poolside cabana provides A/V programming from the Soundstream system and from its own subsystem.

monitors for the '60's, which we rebuilt and which are favorites of the client.

The library contains the projection system, which remains hidden until the equipment is called into use via a button on the remote control. The Vidikron projector is lowered into place by a projector-lift hidden in the ceiling. Simultaneously, the electric screen lowers itself into place for viewing. With the equipment in place, the cable TV signal automatically comes on, at which point the client has the choice of using the independent A/V system in the library or the main house system as a signal source. Because the screening room is small and cozy, Bruce designed a Pro-Logic surround sound using a subwoofer and small satellite speakers by Jamo and a Surround Sound, Inc. Pro-Logic unit. The array of custom switching relays, programmable AC boxes and subwoofer is built in to the library bookcases and hidden from view with built-in grills. The effect of the emerging equipment

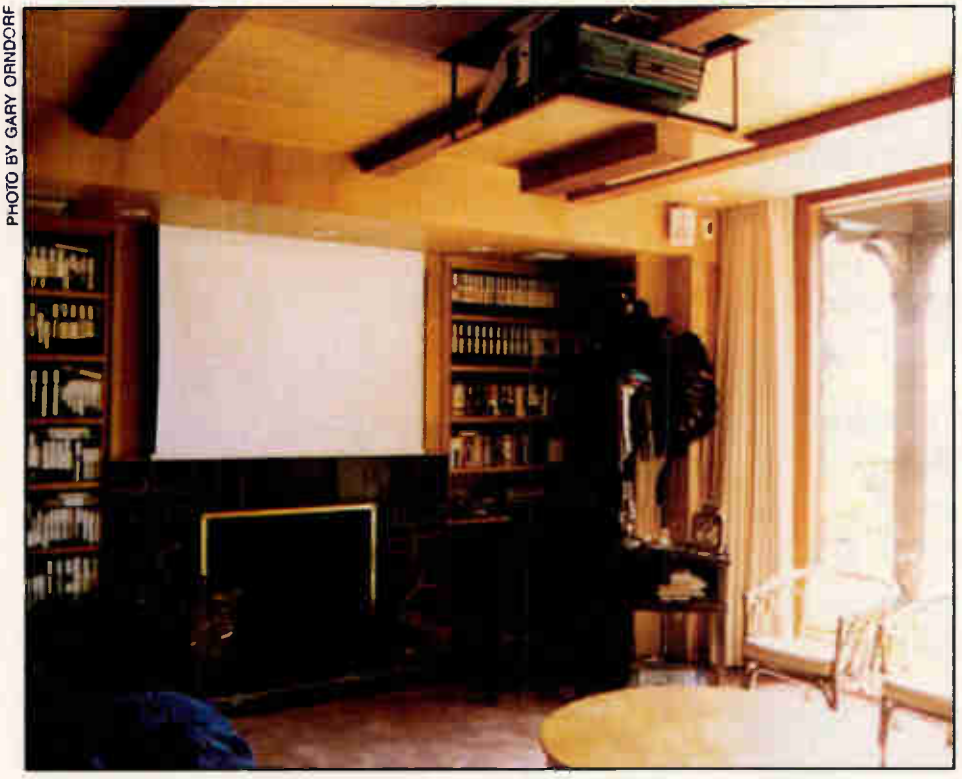


PHOTO BY GARY ORNDORF

The library's projection system remains hidden until the remote control calls it up.

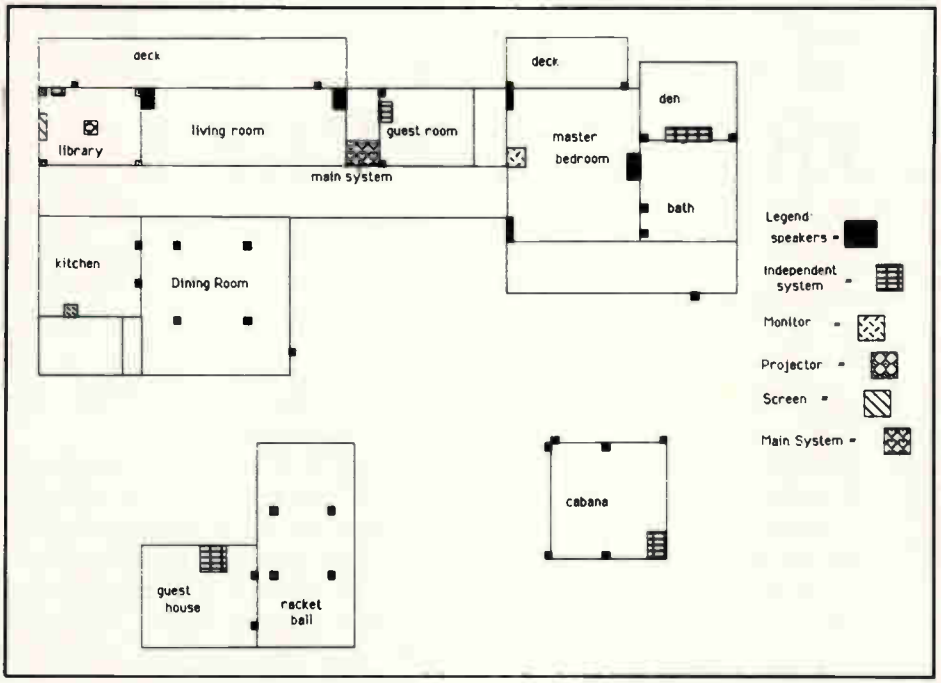
creates an exciting image as it changes the quiet library into an instant media environment.

The master bedroom suite, which includes bath, dressing area, deck, and den, is also a main listening area as well as work space. It is equipped with keypad and IR access to the main system as well as its own independent system, which takes precedence when switched on. Because the bedroom is an important listening area, custom speakers were designed and tailored to the owner's musical taste and desire for a "big" sound. This was achieved by mounting custom angled boxes (on the walls facing the bed) loaded with Dyna-Audio mid-bass drivers and Dyna-Audio Esotar tweeters. Because these speakers were designed to be unobtrusive, the speaker boxes appear shallow in depth, but the interior of the wall is used as additional airspace for the drivers. For the big bass sound, a custom 8-cubic-foot subwoofer with 2 Eton bass drivers was placed under the bed. The look of the bedroom remains visually unaffected by the speakers since the subwoofer is completely hidden and the wall-mounted main speakers are painted and grilled to match the walls.

PHOTO BY GARY ORNDORF

The garden and deck areas system's keypads are located next to seating.

[THE MASTER BEDROOM SUITE] IS EQUIPPED WITH KEYPAD AND IR ACCESS TO THE MAIN SYSTEM AS WELL AS ITS OWN INDEPENDENT SYSTEM, WHICH TAKES PRECEDENCE WHEN SWITCHED ON.



Flowchart of the estate.

The poolside cabana provides A/V programming both from the Soundstream system and through its own subsystem. It is equipped with a 27-inch Mitsubishi TV monitor, a Pioneer 6 CD Changer and a Carver dual cassette deck. With its complete cooking facility, the pool cabana is an all-round entertainment area. The racketball court and guesthouse now contain access to the Soundstream system will full A/V capability. This area is being expanded and will house another screening room

[THE POOLSIDE CABANA] IS EQUIPPED WITH A 27-INCH MITSUBISHI TV MONITOR, A PIONEER SIX CD CHANGER AND A CARVER DUAL CASSETTE DECK.

with a Barco projector as well as custom speakers with surround sound. As with the racketball area, the basketball and soccer courts are being enlarged to include a cabana too. This building will house a similar system to that in the poolside cabana.

The garden and deck areas are controlled by the soundstream system and are accessed by keypads housed in moisture-proof panels and located next to seating.

A FULL RANGE OF MEDIA ENTERTAINMENT IS EASILY ACCESSED ACROSS A LARGE AND DIVERSIFIED ESTATE.

Exterior speakers are all Babb waterproof speakers, which perform well under adverse weather conditions.

Overall, the system design has worked well for this unique client. Offering the ease of operation offered by the Soundstream system and the flexibility available through the use of independent systems, a full range of media entertainment is easily accessed across a large and diversified estate. ■

CLUB SOUND PRODUCTS FEATURED AT INTERNATIONAL DJ EXPO

By Judith Morrison

These are the days for dancing. And clubs are the places to dance. Despite recessions, or maybe because of them, the club lifestyle has undergone and is undergoing a change that follows the changes in music — electronic, sampled, spun and presented on the platters of choice.

Musicians don't like to admit it, but the DJ has taken hold of a large component of the club entertainment scene. If you add to the clubs those catering halls, churches and synagogues that cater to the mobile DJ, the market is enormous and needs to be attended to. DJ Times Editor Chuck Arnold says, "I would say that the hippest kinds of music — house and hip-hop, rap, are really dj oriented music. The early pioneers of "house" were DJs who went into the studio. C&C Music Factory and other pop successes have a background in the clubs. The club is an accessible way for DJs to become musicians, and it's less expensive.

"As far as the quality of the sound system, foremost in the DJ's mind in the past has been the records, but that's changing because there are a lot of pieces of equipment that they're becoming weary of. They're starting to see themselves as music makers rather than record players. They're now able to play around with the sampler, to customize mixes." And they're more critical of the club sound system. The rise in the DJ populace and recognition has led not only to the popularity of DJ Times magazine. It's spawned a convention of its own. The International DJ Expo takes on its third venue this month with DJ East in Orlando at the Dolphin Hotel. The convention is vastly expanded from its previous showing (in Los Angeles and Atlantic City). Begun just one year ago by Testa Communications, publisher of DJ Times (and Sound & Communications), this show has grown to a mammoth three days of information, product technology, dance music introductions, spinnoffs, and learning experiences.

"They're starting to see themselves as music makers rather than record players." And they're more critical of the sound system.

Over 25 seminars bring to life the real and the relative, with topics including "Sound Design in Nightclubs."

Over 25 seminars bring to life the real and the relative, with topics including "Sound Design in Nightclubs" and "Dance Club Design Trends."

New at this show are the First Annual DJ Times Awards, given in 15 music, DJ and equipment categories. And the First Annual International DJ Expo Spinoffs are being held at Disney's Pleasure Island. Exhibitors such as Denon, Bose, and Crown have shown their club-specific wares at the DJ Expo; and new product introductions are common.

The attendees are not only the DJs themselves. A sizable proportion of the people walking the exhibit floor are club designers looking for the newest equipment, and joining the seminars of choice. The choice of the Dolphin Hotel as a venue is a fitting one, having had a new sound system completed recently. Ron Sitow of Miami Sound did the installation featuring IED equipment.

Mike Klasco, technical editor of Sound & Communications, and a frequent contributor to DJ Times and speaker at DJ Expo, says of this rejuvenating market, "Club sound is a very specific kind of field, with much attention paid to subwoofers and the like. It's carried on through the birth and alleged death of disco music; and now with dance music, and despite a generally bad economy, there are people out there making good dollars designing and installing club sound systems."

Economies of the music and installation business have fostered the growth of the DJ market to some extent. One DJ takes the place of many musicians of course. And records are more consistent and more permanently placed than live musicians, leading to a more consistent and robust

The Walt Disney Dolphin is the venue for October's expo.

sound system when it is designed properly.

Dance music has proven to be the confluence of music and technology, where music gets as electronic as the times. In furthering the electronic picture, Testa Communications has inaugurated a new TV show in its group of convention news programs. DJ-TV News is being produced at this DJ Expo to introduce new recording artists, new video releases, and to demonstrate new products being shown at DJ Expo. (Testa Communications also produces NSCA-TV News, CES-TV News, NAB-TV News, AES-TV News and NAMM-TV News.) The cameras are stationed in Orlando for the events of each day of the International DJ Expo (October 14 — 16). ■

TOA Installs Kingdome; Peavey's Natural History

Saori in Kingdome

TOA has announced that Proshow U.S.A. has completed the largest SAORI installation in the world at the Seattle Kingdome. The Redmond, Washington based company has replaced virtually all of the original components. The refurbished equipment room houses four SAORI digital sound processors linked to a total of eight subframes, using the extended delay crossover modules. This is the largest configuration of SAORIs currently in operation. The installation also includes 42 of the company's weatherproof F-500 WP speakers on the concourse landings and at entry and exit gates, and A-906A six-channel mixer/power amplifiers in the ticket kiosks.

New SharpVision Model

The Model XV-101TU LCD projection system has been introduced. Bruce Pollack, national marketing manager LCD Products division, said, "While many consumers appreciate the flexibility and versatility of the SharpVision SV-120ZU portable unit, we also want to address the wishes of consumers who want to install an entertainment system as a permanent part of their home." The XV-101TU weighs 30 pounds, includes three three-inch LCD panels and a built in zoom lens. Remote control is also featured along with optional mounting brackets. The suggested retail price is $4,495.

Shure Participates in Awards

Shure Brothers Incorporated says it showed its support for the White House News Photographers' Association by participating in the association's 1991 annual awards ceremony in Washington. Shure Representatives Bob and Perry D'Angelo of S.K. MacDonald presented a Shure FP32 portable stereo field production mixer to Douglas Wilkes of WTTG-TV, the winner of this year's Best Series award. Wilkes was also honored as Cameraman of the Year.

Crestron Opens European Facility

Crestron Electronics, Inc. has opened European facilities headed by regional manager Frank Van Meeuwen of Future Vision Marketing in Brussels. Van Meeuwen has reportedly served distributors throughout Europe for over 25 years. Crestron says it expects substantial increase in distributor representation throughout Europe as a result of Van Meeuwen's appointment.

Promix Furnishes White Oak

ProMix, Inc. has announced that it provided a full Apogee system for the White Oak Dance Project tour for BLO Productions. Produced by Bernie Lawrence, the tour featured Mikhail Baryshnikov with choreography by Mark Morris. The Apogee system was designed and engineered by Brian English. System tech Scott Widney oversaw the hang which included a front of house system with flown clusters of Apogee 3 x 2's and AE5s. Three 3 x 3's and three AE5s were flown left and right and three 3 x 3's and four AE5s were flown center. Three AE5s per side were placed on the deck and four AE5s were hung from the truss for monitors. Three Apogee AE-12 concert series subwoofers per side provided the low frequency output. Each group of speakers had its own feed (including lawn systems left and right) for a total of 12 matrices.

In addition, Meridian Communications has said that Promix has purchased Meridian's Distramix expandable 8 x 8 audio mix matrix for use on the "White Oak Dances Project" tour. The Distramix is used to control multiple stereo outputs and the stage monitor mix. Promix is based in New Rochelle, New York.

Centel Award

The Centel Cellular Corporation's business office in Youngstown, Ohio was featured as the best of the 1991 Metal Buildings Manufacturers Associations buildings. The award was based on the facility which excels in design creativity through the efficient use of systems construction. Centel Cellular's office was developed by Realty Partnership Interests. The 9,960 square foot building was completed in six months and was custom designed for Centel's operation.

Consultant Selected

Wrightson, Johnson, Haddon & Williams of Dallas has been selected as the acoustical consultant for the following projects: General Dynamics Headquarters, Fairfax County, Virginia; St. Louis Stadium/Convention Center; McNay Art Museum, San Antonio; Oakland Arena; Bank One Headquarters, Dallas and Columbus; Chicago Stadium; SuperConducting SuperCollider, Dallas; Tampa Coliseum; Marine Sciences Research Facility, St. Petersburg; Tupelo Coliseum; Hyatt Resort, San Antonio; Cal State Arena, Long Beach, California; US Courthouse, Prince Georges County, Maryland; Reunion Arena and Cotton Bowl, Dallas.

Syscom Acquires Ultra-Live

Syscom Technologies, Inc., the Florida commercial security and video contractor, has announced its merger with Ultra-Live, the Florida based pro audio design company. Syscom now offers full service consultation, design and installation for audio, video and security. Enn Krepp has been named president. Richard LaVoir is vice president. The company is refurbishing the existing 5,000 square foot headquarters in Pompano Beach to include a pro audio demo room and an electronic test facility. Syscom's 200-plus client list includes county judicial/administration departments, land developers, auditoriums, laboratories, hotels, restaurants and theaters.

Sound for Skating

The first application of the new JBL ES52000 Digital Controller took place in July at the 1991 Olympic Festival held at the Great Western Forum in Los Angeles. The controller was used in a system purchased for the United States Figure Skating Association, consisting of 12 SR4722 12-inch two-way sound full range sound reinforcement systems, 10 SR6630 JBL/UREI power amplifiers, and the digital controller. According to JBL dealer Jeffrey F. Simpson, sales manager for Delicate Electronics Sales, Inc. of Camarillo, California, "The JBL Digital Controller solved all of the expected problems and performed flawlessly."

Telex Aids Hearing

Telex Communications, Inc. has announced a new application for its computer projection panels, as a communication tool for the hearing impaired. The SHHH organization (Self Help for Hard of Hearing People) has used the Telex MagnaByte 5090 as a captioning device at its convention and local chapter meetings. Instead of using an overhead and MagnaByte panel to project previously prepared and stored computer data, a "caption not taker" enters the speaker's words into a computer live, and projects them onto a large screen, using the MagnaByte panel.

Random Access Editor

Lightworks has announced the sale of two of their random access video editing systems to Duran Post Production Video, of Paris. Duran Post Production Video is a fully digital facility founded in 1984. It is reportedly ranked among the five top facilities in France. Lightworks is a non-linear, random access video editing system with 32,000 colors. The Editor allows up to 20 hours of sound and vision to be stored.

JL Cooper Moves

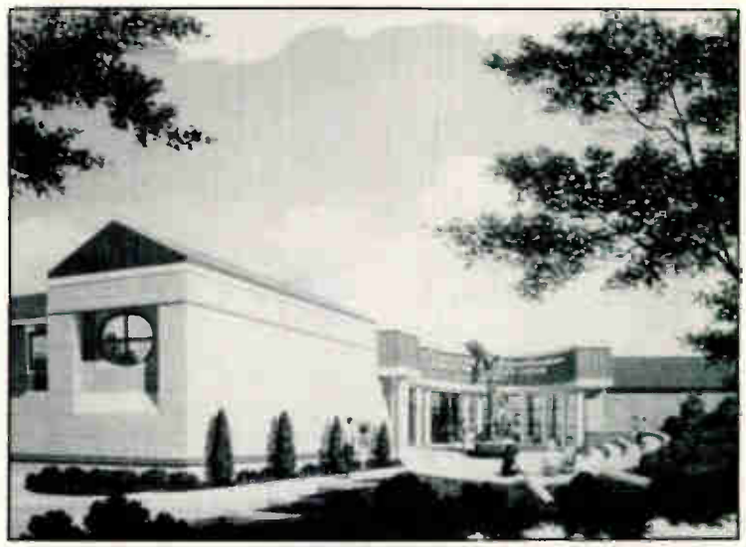
JL Cooper Electronics has moved to new and larger headquarters in Los Angeles. The new address is 12500 Beatrice Street, Los Angeles, California 90066. "We've effectively doubled our space in order to accommodate both the current size of our company and the expansions we are planning," said Steve Cunningham, vice president of sales and marketing for the company.

Time Lapse to Europe

Gyyr has increased its emphasis on the European security marketplace. Gyyr's European sales are handled by Tavcom Ltd. of Demead Hants, England. Gyyr's export product line includes 36 closed circuit video equipment products and options.

Intelix Holds Meeting

A three-day meeting was sponsored by Intelix Corporation to "start the development of a uniform method of communication for products within the professional audio, lighting and A/V industries." The main goal of the meeting was to start development of a common communication command set. "The communication command set works in the application layer, the seventh layer of the OSI seven layer model." An official statement regarding the OSI model was expected to be made by the AES working group at the AES Show.



Scheille Museum

Scheille Museum Selects Peavey

The Scheille Museum of Natural History in Gastonia, North Carolina celebrated the grand opening of its planetarium, which is equipped with Peavey products. Sterling Sound contracted with the city of Gastonia to install two CS800 power amps, two Automate equalizers, two 118 Sub 4 and four SP 5Ti enclosures in the new addition to the museum. A Peavey lavalier wireless microphone system will soon be added. The city of Gastonia invested two and a half million dollars in the new wing which houses the planetarium which is itself 50 feet in diameter and seats 152 people. Tom Watson, president of the Scheille Museum, said, "We are extremely proud of the musical presentation capability that John Howren [Peavey sales representative] designed."

Racetrack Using University

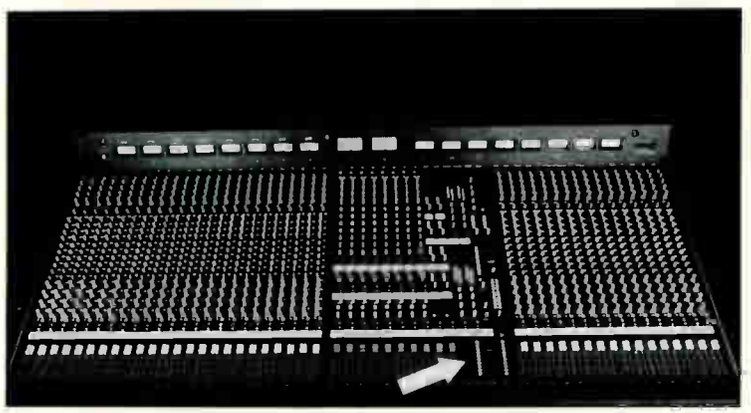
Gulfstream Park thoroughbred racetrack is using sound equipment manufactured by University Sound. An extensive renovation of the Florida track included installation of a sound system including 64 CRFID15T University horns, eight ID60CT drivers, and eight Cobraflex III horns. For "intelligible communication in an isolated area," the track installed a barn-wide paging system using 62 CFID15T horn speakers in the stable-barn area. Each barn has two horns mounted on both ends aiming toward the center, and paging is accessed at the identification office. During racing dates, this system is also used to page jockeys. Coverage also includes the paddock/walking ring, valet service paging and announcements, and a paging system for announcements to the track's mutual wagering staff and the jockey's locker room.

ProAudio Marketing Expands

ProAudio Marketing GmbH, the German pro audio distributor for manufacturers including QSC, Milab, AMS, and ProCo, has announced its move to a new location within Frankfurt and an enlargement of office and warehousing space, which has tripled. According to ProAudio, sales of QSC amplifiers almost doubled in the first six months of 1991. The company's new address is Buchrainstrasse 34, 6000 Frankfurt 70, Germany.

Mute Group Option

Panasonic/Ramsa has announced that a mute group option for the WR-S852 house console or WR-S840F monitor console is available. It is retrofittable to existing consoles and features ten mute groups, nonvolatile memory and MIDI interface.



Ramsa mute group option.

Agreement Reached on Digital Recording

Hardware and software manufacturers have reached an agreement on selling consumer digital recording products, requiring a royalty to be paid to a special fund. The agreement was reached among the Electronic Industries Association, the Recording Industry Association of America, the Copyright Coalition of songwriters and music publishers represented by the National Music Publishers Association. Representatives of these groups have agreed to seek compromise legislation from Congress to "remove any uncertainty over the legality of audio taping by consumers for private non-commercial use." The proposed legislation mandates the inclusion of Serial Copy Management System in all non-professional consumer digital audio recorders. In addition, manufacturers and importers of digital audio recording equipment will make a royalty payment into a special fund based on the manufacturers' price of the recording equipment (two percent) and blank media (three percent). The fund will be administered by the U.S. Copyright Office and the Copyright Royalty Tribunal. The legislation does not apply to equipment and media used for video recording or computer use or to professional digital recording equipment. In a separate agreement a lawsuit against Sony, based on the sale of DAT product to consumers, has been dropped. At press time, the proposed legislation had been introduced in Congress.

Photokina Cologne 1992

Photokina, the popular Cologne photography show, will be known beginning next year as "World Fair Imaging — Sound — Professional Media." Professional Media will be concentrated in halls 14.1 and 14.2 as a communications center for media production and applications. The focus will be on the product ranges in professional film, video, audio and lighting technology and their applications. At the upper end will be broadcasting systems. HDTV systems and large screen technology will be presented. Professional Media "will comprise the entire market for professional information and presentation systems. This will also include the Audiovision/Multivision segment which is increasingly moving away from the traditional film sector and moving towards video technology," according to show management.

Ringwood Promoted by Maxell

Maxell Corporation of America has named James J. Ringwood vice president of the Professional Products Division. Ringwood has been with Maxell for 15 years, and was previously the general manager of the Professional/Industrial Division. His responsibilities include managing sales for Maxell's professional/industrial audio and videotapes. In addition, John Selvaggio has been named national broadcast sales manager; he was previously eastern regional sales manager.

James Ringwood

Sony Showroom Planned

Sony Corporation of America plans to establish a showroom in downtown Chicago for consumer electronics. The 10,000 square foot showroom will be the largest display of Sony consumer electronic products under one roof in the United States. The showroom will occupy two floors of the former Saks building at 669 North Michigan Avenue. John Briesch, president of Sony Consumer Products Group, said, "The showroom's primary purpose is to complement Sony's current retail distribution. . . ." Names of Sony dealers and their special services, such as custom installation, will be made available to customers.

Panasonic Digital Effects

Panasonic's WJ-AVE3 Digital Effects Generator works on its own or with the company's WJ-AVE5 a/v Mixer allowing eight different effects for "near professional video." The unit retails for $1,100, and provides effects such as digital still and strobe, digital mosaic, and negative/positive reversal. The screen image can be reduced to one-quarter size and placed in any of nine different positions. The effects can be synchronized to the beat of accompanying music. It has built-in title memory.

REP NEWS

Meridian Appoints

Meridian Technologies has appointed several sales representative firms to market the company's line of fiberoptic communications systems: S/R Marketing; Repworks; J & B Marketing; Independent Security Products; MP Marketing; Hawkins, Frederickson Assoc.; and Ziskind Associates.

TOA Honors Reps

Six TOA rep firms who achieved more than 100 percent of quota in 1990 have been honored by the company. Rep of the Year was Vector Inc., which brought in sales totaling 139 percent of quota. Second prize went to Rancilio Associates. Third prize went to Kodo Associates, followed by LSM Associates, Avwest, Peregrine Southwest Reps.

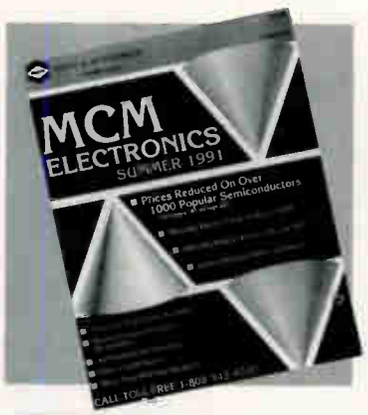
(continued on page 76)

MCM and Pace Catalogs

Parts and Components

MCM Electronics has announced its 204 page catalog of electronic parts and components. Out of the more than 17,000 parts and components included are more than 600 new additions. Among the categories of products offered are: semiconductors, television parts, computer equipment, power centers and regulators, telephone parts and accessories, connectors, tools, batteries, speakers, VCR parts, audio parts and accessories.

Circle 22 on Reader Response Card



Microprocessor Controlled System

Pace has produced a brochure highlighting the features of its new MBT(R) 250, a self-contained, microprocessor controlled system utilizing an array of specialized handpieces for complete SMT and Thru-Hole assembly and repair. Descriptions and photographs illustrate the applications that the MBT 250 is useful for.

Circle 23 on Reader Response Card

Circle 26 on Reader Response Card

Steel Ties

A new Technical/Application Data Sheet from Panduit Corp., Electrical Group. describes the use of Pan-Steel stainless steel ties in nuclear generating plants. The ties can be used in special situations to provide radiation resistance of 200 million rads, secure heat trace cable, fasten baffles and stainless steel ID tags. They can also be used throughout a plant to fasten wire and cable.

Field Recorder

Astro-Med's new eight-channel field recorder, which is capable of operating from its internal battery pack, is described in a 10-page brochure. The Dash 8 unit records real time data from dc to 25 kHz at speeds up to 200 mm/sec and stores captured data for later playback in any format. The Dash 8 is suited for use in steel mills, power generating plants, and hospital operating rooms.

Circle 25 on Reader Response Card

NEWS

(continued from page 74)

MIDI Mixer

JL Cooper Electronics has introduced MixMaster, an automation system that interfaces with any console to provide realtime audio control. MixMaster can also be used as a standalone 8 *x* 1 or dual 4 *x* 2 MIDI automated line mixer/submixer. A stereo mix input allows for cascading of multiple units to form a larger system. MixMaster is a single rack space unit, and can be used with sequencers, computers, or MIDI fader units.

Video Seven Selects E-Mu

Headland Technology, a subsidiary of LSI Logic Corporation, will incorporate E-mu's digital sampling audio technology into future Video Seven branch products. The announcement signals E-mu's entry into the personal computer multimedia arena and the company's first venture outside the music industry. Charles Askanas, president of E-mu Systems, said, "The audio element of the multimedia market has been slow to progress, but it is crucial to the effectiveness of a multimedia presentation." Video Seven, a business unit of Headland Technology, designs and markets a family of high performance graphics cards.

Audio Test and Service System

Neutrik's new A1 Audio Test and Service System contains a sweepable generator, analyzer and oscilloscope. It measures level, wow & flutter, noise, crosstalk, frequency, and THD+N. A backlit LCD shows single measurements numerically or as sweeps in graphical form. Hard copies of screens can be printed when connected to most standard dot matrix printers.

PEOPLE

Marketing at MTX; PARA Development

MTX Appoints Yount

Bill Yount has been appointed by MTX to the position of Director of OEM and Commercial Sales. Yount is based in the MTX Oaktron facility in Monroe, Wisconsin. His responsibilities include directing the sales efforts of MTX's commercial sound products and accessories manufactured by MTX Oaktron.

Jurena at Fairview-AFX

Tom Jurena has joined Fairview-AFX, Inc. as an Account Representative of the newly formed Audio Division. Jurena was formerly the owner of Matrix Electronics.

Davidson at Telcom

Neal J. Davidson has been named Vice President of Sales at Telcom Technologies. Davidson returns to Telcom after a four year stint with VMX Inc. He joined Telcom in 1984 as director of Bell Operating Companies and was responsible for designing a national account program and a sales training program for account managers and distributors.

Taylor at Northern Telcom

Northern Telecom has appointed Dr. John C.W. Taylor as Vice President, Business Strategies. Taylor will be responsible for market development, business development, and product and business strategy evaluation for the corporation worldwide. Charles Baker, Vice President, Market Development, and Ken Calmeson, Vice President, Business Development will report to Taylor.

Miller at Telrad

Telrad Telecommunications has named Jeff Miller to the newly-created position of Director of National Accounts. Mr. Miller will be responsible for directing and administering sales of the company's key telephone, hybrid, and PBX systems to large multi-user companies and government agencies. Miller, who will report to Ray Stiler, Vice President of Sales, joins Telrad from Toshiba America where he created and has managed their U.S. national accounts program since 1985.

Miller

Smith at PARA

PARA, the Professional AudioVideo Retailers Association, has named Debra Smith to the newly created position of Director of Development. Smith's responsibilities include developing and implementing plans for "PARA's future growth and stability." In addition she is responsible for membership development and member services.

Smith

Abramson at Syska & Hennesey

Alan Abramson, P.E., has been elected President and Chief Operating Officer of Syska & Hennesey Inc., Engineers. Abramson was co-founder and President of Syska's Electronics Systems Associates (ESA) subsidiary when he resigned in 1989 to become General Manager of Honeywell's Greater New York Commercial Buildings Group. Abramson first joined Syska & Hennessy in 1973.

R&D at Computer Communications Specialists

David F. Conner has been appointed Director of Research and Development for Computer Communications Specialists, Inc. Conner comes to CCS with over 10 years experience in new product development including Local Area Network and Wide Area Network technologies as well as T-! multiplexing equipment. Most recently, Conner worked as Director of Engineering at Racal-Milgo Information Systems.

New Products, New Technologies, New Ideas

Sometimes things come together perfectly. Seller meets buyer. Teacher meets learner. Pioneers open doors to new worlds, and whole industries follow.

Sometimes, one event serves an entire industry so well that it just keeps getting better, year after year.

INFOCOMM '91 set new records:

- All available exhibitor space sold out as exhibit sales soared up 12.7% from 1990 leaving a substantial waiting list of companies anxious to take part.
- Attendance rose 15.3% and seminar attendance doubled!
- There were more special events . . . more conferences . . . more meetings of affiliated organizations than ever before.

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The premiere trade exposition serving the huge, diverse world of video, presentation, multimedia, audio/visual and computer technology, INFOCOMM has earned its reputation for showing the industry what tomorrow holds . . . in technology, creativity and service.

Be among the very first to see the new products, new technologies and new ideas that will become commonplace in the industry as the 1990's go by.

Special events in '92 include:

- The INFOCOMM Projection Shoot-Out
- War of the Walls
- Integrated Learning Lab
- Interactive Video and Multimedia Conference and Showcase
- Interactive Media Presentation Center of the Future
- Producers Row
- *Plus*, the all new Special Teleconferencing Event, HDTV Today and Educational Software Row.

INFOCOMM International — the "must see" event of '92. For a detailed brochure including discount registration rates contact INFOCOMM at 3150 Spring St., Fairfax, VA 22031-2399, (703) 273-7200; Fax (703) 278-8082.

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BSS EQ; Aiphone Access Control

Dual-Channel Equalizer

BSS has introduced the FCS-960, a dual-channel, dual mode ⅓ octave graphic equalizer. Each channel is front panel switchable between wide and narrow constant bandwidth characteristics. This allows the same unit to be used for functions such as sweetening or response contouring in the wide mode and for fighting resonances and feedback problems in the narrow mode.

Circle 1 on Reader Response Card

Hiss Reducer

dbx has introduced the 563X standalone hiss reducer, a compact unit that can be strapped for stereo operation. The front panel slider can be adjusted for the hiss characteristics of a particular system. This activates a sliding filter network which evaluates the spectral content of a signal.

Circle 2 on Reader Response Card

Access Control System

Aiphone Corp. has announced the Video Sentry PariTilt, an audio and video access control system with pan and tilt camera operations. The Video Sentry PariTilt can scan 122 degrees horizontally and 76 degrees vertically and uses infrared emitters for seeing in total darkness.

Circle 3 on Reader Response Card

Headset Microphones

AKG has introduced the K270HC, K270HQ and the C410 headset microphones. The K270HC integrates a studio grade condenser microphone with a pair of sealed professional headphones which feature a parabolic dual-driver design to achieve high playback levels with very low distortion. The same condenser element is available by itself as the model C410. The K270HQ is identical to the K270HC except for the microphone element which is a dynamic design, with a frequency response shaped for speech applications.

Circle 5 on Reader Response Card

Podium Mics

Electro-Voice has introduced two miniature condenser podium microphones, the CP212 and CP218. Both feature a back electret condenser and a low frequency rolloff switch to configure the low-frequency response. The electronics output circuit utilizes a specially powered hum-bucking transformer to further attenuate external magnetic pickup from lighting or electrical power sources and provide a balanced, low output impedance.

Circle 4 on Reader Response Card

High Res Video Projector

Sharp Electronics has introduced the XG-2000 high resolution LCD video projector. The third-generation LCD video projector features a 650,000 pixel, high-resolution picture with 400 lines of horizontal resolution, zoom function capability from 20 inches up to 150 inches, Image Video Reverse function for rear projection and a Lighted Remote Control unit.

Circle 6 on Reader Response Card

"Notes on Product Check."

Health Care Facilities

This month we researched the Health Care market and have heard from you that the pulse is steady for most regions nationwide. The overall topic is general in "health care facilities"; included in the survey are nursing homes, adult residences and hospitals.

Although some manufacturers in this field require their contractors to specify their products in one-brand systems, we find that this requirement is being ignored where contractors feel a specific component would work better or be cheaper. Typically however, especially in hospitals where liability is critical, contractors are toeing the line in required same-brand system installations. And while a few manufacturers sell across the board, others tend to sell systems only through limited distribution.

One contractor mainly uses one of the more popular systems, but sometimes uses other brands to "save money." Some contractors choose to stay "neutral" and put together their own packages. Others feel "loyal" to the manufacturer and use the same brand to fulfill their quota. There was some amount of hesitancy among several contractors over going on the record on this subject. However, they are specifying individual components for a systems-designed package.

Some quotes from our survey participants;

"Our business is good. We don't pay attention to government economists. We just work real hard."

"Health care represents a market that's increasing...and goes on and on and on."

"Audio is always that non-budgeted item."

"Everybody's trying to define the niche to be everything for everyone."

The recession according to one contractor in Michigan was "...more attitude than reality. Everybody thought things were down so they held back."

Some contractors said their first quarter was slow, but things have picked up so well since then that they'll soon overtake last year.

For a closer look at the Product Check survey, turn to page 86.

—Liz Krumenacker

See page 86 for "Product Check."

Preamp/Mixer

Biamp Systems has introduced the Advantage DP/M 28, a combination distribution preamplifier and mixer. The DP/M 28 incorporates both a two channel mic/line mixer and an eight output distribution amplifier into one unit. The mixer includes two high performance balanced mic/line inputs with phantom power, pad switches, trim controls, peak indicators, and insert points for connection of signal processing devices. The output section includes eight balanced and floating line level outputs with independent level controls and 600 ohm drive capability.

Circle 7 on Reader Response Card

System Management Software

Galaxy Control Systems has developed a systems management software package. The program was written for the 200 series access controllers, and offers many features not previously available.

The package adds descriptive text to all system activities and stores all data on disk for subsequent report generation. Additional features allow reporting options, including reports output to screen, printer or disk; three password protected security levels; system memory backup/restore; and alarm annunciation with acknowledgment.

Circle 8 on Reader Response Card

Multi-Mode Crossover

The new 524E multi-mode crossover from Symetrix provides a complete set of tools for integrating electronics into sound system design. The 524E has four crossover bands and can be configured as a mono two-, three-or four-way crossover or as a stereo two-way crossover. Crossover points and filter slopes (6, 12 or 24 dB/octave) can be set for each band. In addition, each band can be individually processed with a driver protection limiter and a phase alignment compensation delay.

Circle 9 on Reader Response Card

Security Mic

Crown has introduced the PZM-11 microphone, which is designed for security and surveillance purposes and can be wall- or ceiling-mounted in a standard electrical outlet box. The unit has a balanced, low impedance output of 240 ohms. Power is provided by 12-48 volts of phantom power. The microphone has a frequency response of 80 Hz to 20,000 Hz, a power sensitivity rating of -47dBm/Pa, a signal-to-noise ratio of 68 dB at 94 dB spl, and a maximum spl of 120 dB spl which produces 3-percent THD.

Circle 10 on Reader Response Card

One-Third Inch CCD Camera

Sanyo has released the VDC2324 ⅓-inch CCD Camera. The camera has a resolution of over 400 horizontal and approximately 350 vertical lines. It features 24 volt ac power line with rear panel phase controls for system integration. Both standard C and CS type lenses can be used on the VDC2324.

Circle 11 on Reader Response Card

XLR for Lavaliers

Sennheiser has recently added the option of 3 pin XLR termination for the MKE 2 and MKE 40 lavalier microphones, eliminating the need for the K3U power module.

Circle 12 on Reader Response Card

DC-Powered Time Lapse

The AG-6024DC 24-hour, 12 Volt dc-powered Time Lapse Recorder (TLR) has been introduced by Panasonic CCVED. The recorder, designed for use in mobile security and mini CCTV systems, can record in two-hour, 12-hour and 24-hour modes. It delivers 300 lines of horizontal resolution in black-and-white and 240 lines in color. Functions include: record review, record lock, microphone input, on screen hour meter, auto repeat recording, and record mode retention after power failure.

Circle 13 on Reader Response Card

Time/Date/Titler

Burle Industries Security Products Division has added the TC8241 and TC8244 time/date/titlers to their line of system surveillance products. These time/date generator and titler units provide on-screen display of time in either U.S. or European formats and two lines of titling with 16 characters per line.

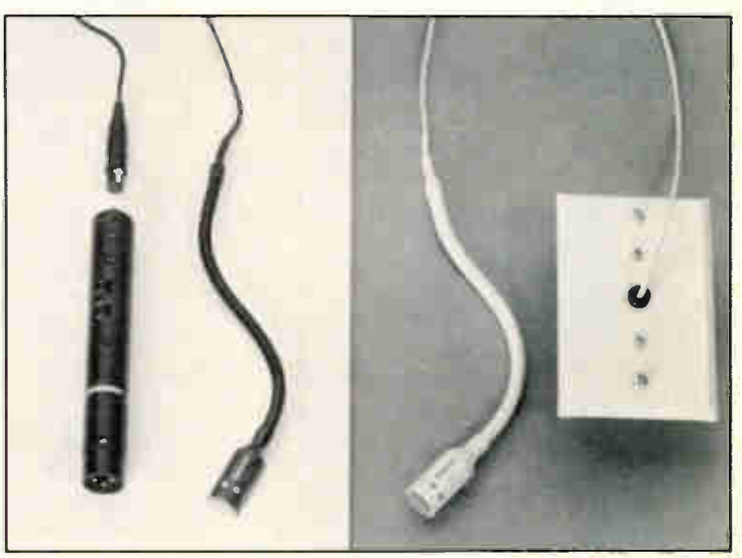
Model TC8241 provides time, date, titling, and video presence indicator for one video source. Model TC8244 provides displays and individual video presence indicators for four video sources.

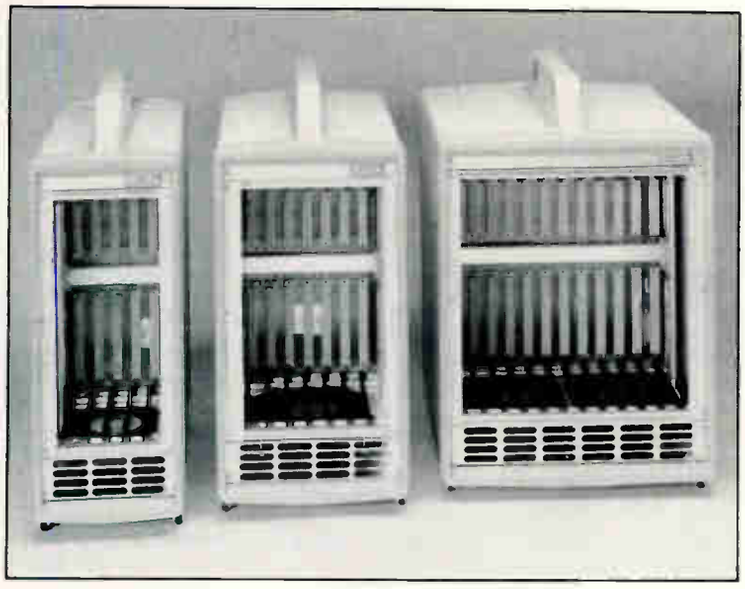
Circle 15 on Reader Response Card

Hanging Condenser Microphones

Shure Brothers has introduced the SM102 Series of Miniature Hanging Condenser Microphones, designed for sound reinforcement and recording of choirs, stage productions, orchestras, and boardroom meetings. The SM102 features a cardioid polar pattern, low noise, high sensitivity, and natural frequency response from 40 to 20,000 Hz.

Circle 14 on Reader Response Card





VME Towers

Elma has introduced a complete family of portable VME Towers. The system is available in three, five, seven and 12 slot versions. All systems come fully wired and ready to run with power supply, fans and J1 and J2 backplanes.

Circle 16 on Reader Response Card

Voting/Display System

Forces Mfg. has introduced a new electronic council chamber voting/display system. The system features a custom display board for television/public viewing, individual voting stations with yes, no, and abstain lights, a power memory unit, and a control unit. The system is offered for five to sixteen member councils.

Circle 17 on Reader Response Card

Cordless Mics

LightSpeed Technologies has announced the Impulse Series of professional cordless microphones. Each transmitter frequency employed in Impulse microphones has a tone code that will be acknowledged by its Impulse counterpart receiver. Only the appropriate tone code will open the receiver's audio section. The overall frequency stability ±.005 percent with limit controlled circuitry and have a maximum deviation range of ±15 kHz. The company claims that the system has a dynamic range of greater than 100 dB and a signal-to-noise ratio of 100 dB.

Circle 18 on Reader Response Card

Mic and Equipment Cases

The SKB Case Company has announced their new A.T.A. microphone and equipment cases. The cases available are the SKB-600 six-pack and the SKB-1200 12-pack.

Circle 19 on Reader Response Card

Standalone D/A

Benchmark has introduced the IFA-9, a one-in/six-out standalone audio D/A. The unit features 20 k ohms balanced input, +27 dBu input clip point, CMR 90 dB at 2 kHz, 75 dB at 20 kHz typical, and a master gain range of -10 to +20 dB. Also introduced was the IFA-10, a four-in/four-out assignable mixer. The mixer features 20 k ohms balanced input, +27dBu input clip point, CMR 90 dB at 2 kHz, 75 dB at 20 kHz typical and a master gain range of -10 to +20 dB.

Circle 20 on Reader Response Card

Yamaha Infrared

Yamaha has introduced a series of new products. The MCX-10 master zone controller, which can control and distribute the audio output from up to five audio systems to any one of five listening zones. It is possible to link two MCX-10s and double the capacity. The RCX-10 is a learning-capable remote control transmitter. The WCX-10 is a zone control/sensor that sends and receives signals from the MCX-10. The IRX-10 is a small infrared emitter designed to be mounted over the sensor to control individual components. The CSX-10 is a control signal splitter allowing instant connection of up to six IRX-10 emitters to any mini-jack output of the MCX-10 master zone controller. The IRX-20 is a high-power emitter that can fill a room or cabinet with infrared signals thereby activating many components at once.

Circle 21 on Reader Response Card

MIDI Amps

JL Cooper Electronics has introduced two new MIDI line amplifiers that are designed for sending MIDI data over long distances, the MLA-1 and the MLA-10. Both amplifiers can convey four independent lines bidirectionally. The amplifiers, which can be networked to multiple locations, convert the MIDI signal to a digital protocol that can travel over common twisted pair wire and then re-converts the signal to MIDI through another amplifier at the other end.

Circle 27 on Reader Response Card

Antenna Distribution

Nady Systems, Inc. has announced the AD-4 powered antenna distribution system. Each AD-4 component permits up to four diversity wireless receivers (or up to eight non-diversity) to operate with only two antennas.

Two optional antenna set-ups are available. The RA-10 is a four element ground plane antenna that can be mounted on a wall, road case or microphone stand. The RDP-2 is a remote dipole antenna with collapsible elements, junction box, and 25 feet of cable.

Circle 28 on Reader Response Card

Acoustic Pressure Equalizer

Bruel & Kjaer has introduced the Acoustic Pressure Equalizer (APE) attachment for their Series 4000 microphones (Types 4006/4003). The APE attachment is a passive acoustic processor functioning as a spectral and directional equalizer which uses diffraction to modify the sound field near the microphone diaphragm to change the frequency and polar response of the sound field.

Circle 29 on Reader Response Card

CALENDAR
Upcoming Events

OCTOBER

Audio Engineering Society 91st Convention: New York, NY: Contact: (212) 661- 8528. October 4-8.

CEDIA (Custom Electronic Design & Installation Association): San Francisco, CA: Contact: (708) 598-4888. October 9-13.

1991 International DJ Expo: Lake Buena Vista, FL: Contact: (516) 767-2500. October 14-16.

EIA Fall Conference: San Diego, CA: Contact: (202) 457-4900. October 16-19.

Syn-Aud-Con Seminar: Norman, IN: Contact: (812) 995-8212. October 17-19.

Comdex/Fall '91: Las Vegas, NV: Contact: (617) 449-6600. October 21-25.

SMPTE (Society of Motion Picture and Television Engineers): Los Angeles, CA: Contact: (914) 761-1100. October 26-30.

ISA/'91 (Instrument Society of America): Anaheim, CA: Contact: (919) 549-8411. October 27-November 1.

NOVEMBER

CyberArts International: Pasadena, CA: Contact: (408) 446-1105. November 14- 17.

WESCON: San Francisco, CA: Contact: (213) 772-2965. November 19-21.

DECEMBER

American Society of Mechanical Engineers (ASME): Atlanta, GA: Contact: (212) 705-7795. December 1-6.

Image World Miami: Miami, FL: Contact: (800) 800-KIPI. December 2-6.

JANUARY 1992

Consumer Electronics Show: Las Vegas, NV: Contact: (202) 457-4919. January 9-12.

NAMM (North American Music Merchants): Anaheim, CA: Contact: (619) 428-8001. January 17-19.

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Seam Tech	85	232
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Tektone Sound & Signal	41	215
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FREE INFORMATION

Use the Reader Service Card opposite page 18. Just circle the RS# of products that interest you. Detach, and Mail!

HELP WANTED

SALES MANAGEMENT OPPORTUNITY

Established Rauland-Borg distributor seeking individual experienced in the design, layout and bidding of school intercom, nurse call systems and commercial sound systems. Sales management opportunity. Salary, commission and benefits. Please send resume to:

M.J. Emerson, President
MTC Systems
P.O. Box 71002
Des Moines, IA 50325

ACROMEDIA CORPORATION
LOS ANGELES, CALIFORNIA

Established electronics contractor seeks systems engineer to work on variety of projects. Experience desired, but will also train.

Call Mr. Ferreghy at 213/410-4141.

FACILITY FOR SALE

MUSIC STORE

Family owned music store established 1939. Best location for music store in progressive city of 100,000. Outstanding franchises available like Peavey, Yamaha, Ibanez, Crate and more. School band instrument rental program with Selmer and Bundy. Private teaching rooms. Assume lease on present building with option to buy. Buyer must be willing to maintain family tradition of service and customer satisfaction. Contact:

C.C. Martin at Martin Music
Pueblo, CO
(719) 543-0775

HELP WANTED

ACROMEDIA CORPORATION

Los Angeles, California

Established electronics contractor seeks sales engineer with estimating experience, to work on bidding a variety of audio, video, audio-visual.

Call: Mr. Conner (213) 410-4141

How To Place a Sound & Communications Ad

Print or type copy indicating capital letters and bold type. All rates are based on column inch. 1X rate for a classifed ad is $52. (Includes borders, typesetting and company logo if desired.) 1X rate for a marketplace ad (product) is $80. Frequency discount available. Call for information.

CLASSIFIEDS

☐ Business Opportunities
☐ Employment Wanted
☐ Equipment for Sale
☐ Facility for Sale
☐ Help Wanted
☐ Miscellaneous

MARKETPLACE

☐ All product and services

Sound & Communications Ads Get Results!

Company Name _____ Name _____

Address _____ Phone _____

Method of Payment ☐ Check Enclosed ☐ Visa ☐ American Express ☐ MC

Card # _____ Exp. Date _____ Signature _____

Mail or Fax Copy to
Sound & Communications Marketplace
25 Willowdale Avenue, Port Washington, NY 11050
Phone: 516-767-2500 FAX: 516-767-9335

MARKETPLACE

PRODUCT CHECK: HEALTH CARE FACILITIES

Products used most frequently in health care facilities . . .

. . . NOW IN PROGRESS

PRODUCTS	1	2	3
Visual Call	DUKANE	RAULAND-BORG	JERON
Apartment Intercom	AIPHONE	DUKANE	JERON/TOA*
Audio-Visual Call	DUKANE	RAULAND-BORG	AIPHONE/FISHER-BERKELEY*
Intercom Paging	AIPHONE	DUKANE	RAULAND-BORG
● Nurse Call	● DUKANE	● RAULAND-BORG	● JERON
Speakers	ATLAS/SOUNDOLIER	QUAM	RAULAND-BDRG/DUKANE*
Equalizers	ALTEC LANSING	RANE/DUKANE*	PEAVEY/TOA*
Signal Processors	YAMAHA	WHITE/AUDIO DIGITAL*	ALTEC LANSING/SYMETRIX*
Intercoms: Duplex/Simplex	AIPHONE	PHILIPS	STENTOFON/TOA*
Security (CCTV)	BURLE	PANASONIC	VICON
Amplifiers	TOA/RAULAND-BORG*	ALTEC LANSING	DUKANE

* indicates tie

. . . IN LAST SIX MONTHS

PRODUCTS	1	2	3
Visual Call	RAULAND-BORG	DUKANE	CORNELL
Apartment Intercom	AIPHONE	SENTEX	AUTH
Audio-Visual Call	DUKANE	RAULAND-BORG	AIPHONE/JERON*
Intercom Paging	AIPHONE	DUKANE/RAULAND-BORG*	TOA
● Nurse Call	● DUKANE	● RAULAND-BORG	● JERON
Speakers	ATLAS/SOUNDOLIER	QUAM	RAULAND-BORG/DUKANE*
Equalizers	ALTEC LANSING	RANE/DUKANE*	PEAVEY/TOA*
Signal Processors	YAMAHA	SYMETRIX	ALTEC LANSING/WHITE*
Intercoms: Duplex/Simplex	AIPHONE	PHILIPS	STENTOFON/TOA*
Security (CCTV)	BURLE	PANASONIC	VICON
Amplifiers	TOA/RAULAND-BORG	ALTEC LANSING	BOGEN

* indicates tie

See page 78 for "Notes on Product Check."

SURVEY METHODOLOGY

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

4 Heads are far better than one!

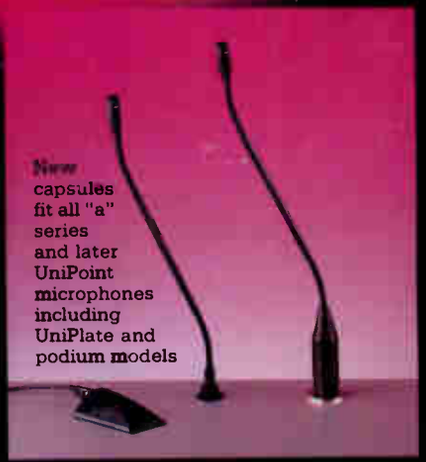
The basic cardioid microphone has long been the backbone of sound reinforcement, but there are times when only another pickup pattern will do. Yet you may not know which pickup pattern is truly ideal until you try several under actual acoustic conditions.

Now UniPoint® gives you full freedom of choice. With each of our six basic models, you can now choose from cardioid, supercardioid, omnidirectional and our new subcardioid polar patterns. And if requirements ever change, just change the capsule.

Best of all, every "a" series or later UniPoint or UniPlate® microphone can accept the new capsules. If an installation is picking up a bit too much reverb, or doesn't have a deep enough null to reject a nearby speaker, update the installation in moments by simply replacing the capsule. No soldering, no tools.

No other line of low-visibility microphones gives you this remarkable versatility. And no other line offers the low noise, dynamic range, and small size of true UniPoint design.

Indeed, the best keeps getting better...and far more versatile. Ask your A-T representative to explain the details today.



audio-technica

Audio-Technica U.S., Inc.
1221 Commerce Drive, Stow, OH 44224
(216) 686-2600 • Fax (216) 686-0719
In Canada call: (800) 258-8552

Circle 212 on Reader Response Card

Power. Play.

Loudspeaker design: To achieve high power handling capability, sensitivity suffered. You could get more power, but you had to accept less play.

Another Advance From JBL.
Ever since Jim Lansing flattened voice coil wire in the early thirties, JBL has continually edged loudspeaker design closer and closer to perfection. The introduction of our new 2200 Series models marks another JBL advance in transducer technology.

Vented Gap Cooling.™
As a voice coil's temperature rises, so does its impedance, causing power compression. Every dB of power compression translates into one less dB of output.

To reduce power compression and gain overall sensitivity, JBL created vents from the voice coil, through the magnet structure, to the rear of the loudspeaker. As the cone travels, heat is dispersed and cool air returned to the voice coil. The result, a true 600 watt loudspeaker with high sensitivity. You get twice the power handling plus greater output.

New SFG™ Magnet Structure.
Through computer modeling and simulation, the 2200 Series SFG magnet structure achieves optimum flux density and significantly lower distortion while realizing up to 20% weight reduction.

We Heard You Loud And Clear.
Whether you're looking for a mega-watt touring loudspeaker, or for a low distortion critical listening device, JBL has the model for you. All with the new SFG magnet structure with Vented Gap Cooling. The new 2200 Series models give you the best of both worlds. Power, and play.

JBL

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Circle 218 on Reader Response Card