

SOUND & COMMUNICATIONS

COVERING TELECOMMUNICATIONS
AND ELECTRO-ACOUSTICS

NOVEMBER 1985

**AES
CONVENTION
REVIEW P. 28**

SCHOOL COMMUNICATIONS MARKET REPORT

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MARK GANDER
JBL INCORPORATED
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SALES SUGGESTIONS
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SOUND & COMMUNICATIONS

NOVEMBER 1985

Volume 31 #11

FEATURES

SCHOOL COMMUNICATION SYSTEMS

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Although a lack new school construction, the school communications market is still viable for business for the sound contractor, particularly in the area of retrofits and updates. S&C takes a look at the trends, the demands, and the new technology in this market.

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Jesse Klapholz of Klapholz Technologies and Allan Sohl of Professional Audio Systems discuss the development of electronic crossovers and their integral function in loudspeaker systems, in satisfying both the electrical and acoustical requirements simultaneously.

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The Audio Engineering Society recently met in New York for its 79th AES Convention. *Sound & Communications* was there and reports on the Convention, the seminars and workshops, and the products and technologies that were introduced.

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The threat of Japanese competition is becoming a very real concern to domestic sound and communications manufacturers. Chris Foreman discusses the situation and offers some insight to "the Japanese invasion."

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Selling in the sound and communications industry can be very tricky. Do you sell features, benefits, or solutions? Manufacturers and contractors offer differing views on selling in our industry today.

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ON THE COVER

This month's cover is of the installation of Barrie Communication Equipment's Telecor II Administrative Communications System at the Waverly Middle School in Lansing, MI. The contractor was Gibson-Clone Communications of Lansing, MI. Photo by Peter Jova of BCE/Edcom, Lewiston, NY.

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Typesetting
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National Advertising Sales Manager
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West Coast Sales Manager
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Vice President/Associate Publisher
PAUL G. GALLO

President/Publisher
VINCENT P. TESTA

Editorial And Sales Offices
Sound & Communications
220 Westbury Avenue
Carle Place, New York 11514
(516) 334-7880

Advertising/West Coast
15532 Cohasset St.
Van Nuys, CA 91406
(818) 904-9669

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Recently, Telex engaged Dr. Eugene Patronis, Jr., professor of Physics, Georgia Institute of Technology, to test the TE10 condenser microphone against the Electro Voice BK-1, Audio Technica ATM31R and the Shure SM87. Tests were conducted with complete objectivity without the presence of any Telex personnel. It is of further interest that the competitors' microphones were purchased randomly "off the shelf", and all had Pro Net prices that were considerably higher than the Telex TE10.

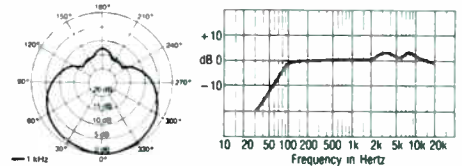
Telex ranks superior

Dr. Patronis tested the mikes by a wide variety of performance criteria and, overall, Telex ranked as a superior value. Telex fared especially well in the areas of **linearity, distortion and frequency response**. Here, Telex was either first or second in terms of performance. Put the TE10 to your own tests and you'll agree—this is a superior condenser microphone at an exceptional price.

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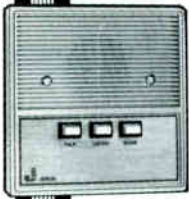
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IDEAS & VIEWPOINTS

COMPETING WITH THE JAPANESE

by Chris Foreman

A lot of Americans in the sound and communications business are worried about "the impending Japanese invasion" of U.S. sound and communications markets. Incidentally, the words "invasion" and "threat," while used here in a very "tongue-in-cheek" way, are words I've heard again and again (in private) by U.S. manufacturers! Some were farsighted enough to begin worrying at least a decade ago! Is there any merit to their worry? Probably, but the real "threat" is a lot closer to home than Japan.

Japanese Strengths and Weaknesses

One strength the Japanese have is their culture. A small island forces you to either get along with your neighbor or fight constantly. The Japanese chose to get along. Today they have a complex yet uniform culture that enables them to work together with a level of cooperation rarely seen in America.

Yet, the uniformity of Japanese culture may be a weakness, too. There's hidden strength in diversity and diversity is one thing Americans have plenty of. In addition, I've always suspected that one reason the Japanese have trouble dealing with American markets is because they're used to the uniformity of the Japanese culture and aren't really ready to deal with American diversity.

Another Japanese strength is their ability to take a good idea, or product, and make it even better (and often less expensive). While it didn't happen overnight, the Japanese have become expert manufacturers and have used that expertise to produce any number of excellent low-priced products. This is probably the one Japanese advantage we Americans fear most. Yet, ironically, the Japanese don't think this ability is such a big deal. In fact, the Japanese have, at least in the recent past, had believed that they were only good at copying and not creating.

Nothing could be farther from the truth. The Japanese are a very bright and creative people. Their skill at copying products is simply an indication of their willingness to accept good ideas from outside sources. American manufacturers, on the other hand, often seem to have a good case of the "N.I.H." (Not Invented Here) syndrome. They don't want to accept any idea they didn't think up themselves.

Perhaps the greatest strength the Japanese have is their skill at world trade. The Japanese islands are, relatively speaking, resource poor, which has forced the Japanese people to go looking for raw materials early in their history and to learn how to trade with other nations and other cultures. Maybe they still don't have a handle on the U.S. sound and communications market, but they know the U.S. market much, much better than American manufacturers know the Japanese market. Americans, with their huge, resource-rich continent, have almost never had to look far for raw materials. They have, at least until recently, never needed the rest of the world. As a result, American manufacturers worry about the Japanese taking over their markets but they have a little or no idea how to go about any kind of counter effort into the Japanese markets.

The Threat is Real

Given the strengths and admitting the weaknesses, can the Japanese compete effectively in our U.S. sound and communications markets? Yes, their engineering and manufacturing capabilities excellent and they know how to trade in world markets. In addition, I have seen good evidence that more than one Japanese company is paying real attention to learning how to market in the U.S.

At the Audio Engineering Society Convention I had a long talk with an American marketing consultant, who is currently working for a large Japanese sound and communications manufacturer. The question at hand is: "Considering the large group of fine products available at good prices from this manufacturer, why haven't they been able to penetrate the U.S. marketplace?" The answer appears to be complex, but I was convinced that the consultant had a good handle on the problem and had a good start towards an answer.

At another recent convention, Telecon V, an annual teleconferencing show in Anaheim, CA, I saw a similar situation. A large Japanese manufacturer took almost as much exhibit floor space as everyone else put together. This manufacturer displayed more products than any of the U.S. manufacturers and, yet, with its huge presence and diverse product line, this Japanese manufacturer has only a small portion of the U.S. teleconferencing market. Why? It's hard to say, but what's important is that they have just hired one of the best known marketing authorities in the U.S. teleconferencing business to answer that question.

These two examples show that the Japanese are willing to listen to outside ideas to compensate for their lack of understanding of the U.S. marketplace. If they are successful, and I expect they will be, the Japanese will have overcome the last important obstacle to their success in the U.S. sound and communications market.

(continued on page 47)

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Because of their small diameter, all UniPoint microphones exhibit more uniform off-axis rejection than larger mikes. All can be powered from any 9-52VDC phantom power source, with a battery or an external power source as options. The AT853, AT855 and AT857QM also include a switchable low-cut filter.

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SYN-AUD-CON HONORS HEYSER FOR EXCELLENCE IN AUDIO ACOUSTICS

Richard Heyser, whose Heyser Transform theory was applied in the Crown Techron TEF analyzer, is the first to receive the Excellence in Audio Acoustics Award from Synergetic Audio Concepts, the audio training organization known as Syn-Aud-Con. Carolyn Davis, principal at Syn-Aud-Con, said, "Dick Heyser is a remarkably brilliant man. The TEF machine is a manifestation of his Heyser Transform." His other contributions to audio acoustics include the invention of Time Delay Spectrometry, and he is currently continuing a series of software developments for use with the Techron System 10.

NSCA APPLIES FOR STANDARD CLASSIFICATION INDUSTRY CODE

The National Sound & Communications Association recently submitted a proposal to the Statistical Policy Office in Washington, DC, for the establishment of a Standard Classification Industry (SIC) Code for the Electronic Communications Systems Contracting Industry. According to Mel Wierenga, NSCA's treasurer from Ascom Inc., "By establishing our own SIC number, we will no longer be grouped with electrical contractors. Obviously, we're not working with the same risks as electrical contractors, so we shouldn't be paying the same premiums. A SIC number will mean substantial savings for our members." According to Mary Beth Rebedeau-Warden, NSCA's manager of membership services, the application is backed up by substantial industry figures, larger than previously expected. There are an estimated 4,600 electronic communication systems contractors, the average number of employees is 17.9, the medium industry worker has an income of \$20,000 per year, making the payroll about \$16.5 billion. The value added by contractors equals \$2.91 billion per year. Gross revenues for 1984 were \$5.4 billion.

AIPHONE OPENS FIRST EAST COAST OFFICE NEAR WASHINGTON, D.C.

Aiphone Corp., one of the largest intercom manufacturers, has opened its first East Coast office in McLean, VA. The office will initially function as a sales satellite off the Bellevue, WA, headquarters, but in the future will be expanded to serve as a regional warehouse as well, according to Hiko Shinoda, Aiphone president. Carol Mayer, who joins Aiphone from McMartin Industries, will manage the operation as eastern regional sales manager. She has 18-years experience in the commercial sound industry, including eight years as vice president of MusiCast, and has served on the board of directors of the IBMA.

BB&N'S NEWMAN MEMORIALIZED WITH NEW ARCHITECTURAL ACOUSTICS MEDAL

Friends of the late Robert Bradford Newman have established a student award fund to recognize merit in architectural acoustics. Newman, a founding principle of consulting firm Bolt Beranek & Newman Inc., served more than 30 years on the faculties of both the School of Architecture and Planning of the Massachusetts Institute of Technology and of the Graduate School of Design at Harvard University. The first medal is expected to be awarded in 1986. Carl Rosenberg of BB&N said, "Those of us who worked with Bob Newman were instilled with his enthusiasm for teaching. He really liked to teach so we think that this medal would be a way to remember Bob that would be most fitting." Contributions may be made to, and further information obtained from, The Robert Bradford Newman Student Award Fund, P.O. Box 349, Lincoln, MA 01773; (617)259-9299.

AUDIO GROUP AWARDED DUKANE CORPORATION NORTHWEST FRANCHISE

Audio Group Inc. of Portland, OR, has been awarded the regional franchise for Dukane Corporation communication products, it was announced by David Oberle, Dukane general manager. Dukane's intercoms, public address and background music systems, sound masking for open offices, emergency evacuation communications and other systems will be distributed by Audio Group in Oregon, southwest Washington, northern California, and Nevada. Audio Group reports that it has received approximately \$100,000 in contracts since receiving the franchise. Bruce Cauthers and Robert Kerr Jr., engineers at Audio Group, will be responsible for design, installation, and service of the Dukane systems, Oberle said.

ACOUSTICAL SOCIETY OF AMERICA PLANS 110TH MEETING IN NASHVILLE

At press time, the Acoustical Society of America was making final preparations for its 110th meeting, Nov. 4-8, in Nashville's Hyatt Regency Hotel, with a full list of technical topics, which include digital recording, a new area of interest for the ASA. At a special session Wednesday, several awards will be presented. The Pioneers of Underwater Acoustics Medal will be presented to Fred N. Spiess of the University of California Institute of Marine Resources; The Silver Medal in Physical Acoustics will be presented to David T. Blackstock of the University of Texas, Austin, and the Von Bekesy Medal will be presented to Jozef J. Zwislocki of the Institute for Sensory Research, Syracuse University.

NEW CLUBOWNERS FOUNDATION INCLUDES BUYERS CO-OP AND TRADE SHOW PLANS

A new organization designed to represent the interests of America's club owners has several features of particular interest to the dealers of sound and communications systems. The organization was founded in September to promote the nightclub and bar business in a positive light, educate club owners, and provide benefits for group members such as insurance information. According to Howard J. Rheiner, executive director of the Clubowners Foundation of America Inc., the group publishes a Buyer's Co-op book with advertising from suppliers, including system suppliers, who agree to give preference or discounts to club members. It is distributed to approximately 500 club owners in the U.S. Also, the organization is planning a convention and trade show in New York for December 1986, but may move the date up to some time next summer. For more information, contact CFA, 201-A Jamestown Square/1544 Longcreek Dr., Columbia, SC 29210; (803)798-8829.

NATA '85 CONVENTION SEMINARS TO INCLUDE COVERAGE OF PAYPHONES

The North American Telecommunications Association Convention Dec. 3-6 in Dallas, TX, will feature a special seminar on the payphone industry in conjunction with Private Payphone News, to address aspects of the newly competitive payphone industry including technology, marketing, cost legal and regulatory issues. A second special seminar will cover Underwriters Laboratories investigation of telecommunications equipment. Others will cover Shared Tenant Service Markets, Intergrated Voice-Data, Merger and Aquisition Trends, Marketing Strategies, and Public Policy Assessments.

NSCA INSTITUTES INSURANCE PROGRAM FOR VOLUNTARY GROUP LIFE

The National Sound & Communications Association and Home Life Insurance Company is now offering NSCA members a voluntary group term life insurance policy. Harold Lander, NSCA president and president of Signal Communications Inc. said, "According to recent national statistics, 35 percent of payroll is the average cost of the benefits that employers must furnish employees. NSCA is trying to lower that percentage for our members." The program includes \$25,000 of guaranteed issued coverage with additional amounts up to \$250,000 available. For more information, contact the NSCA at (312)593-8360.

SALES SOLUTIONS

by Nancy Peterson

You've been approached by your pastor about installing a sound system in the church and an intercom system between the church, the rectory, and the parish school. After doing your homework, you put together the specifications of a system you think will do the job. Now you must go down to the church and present it to the pastor. But how do you approach him? Do you talk dBs and frequency levels? Do you sell him on each individual piece of equipment or on the entire system? Do you talk systems at all or do you explain to him how this combination of speakers, amplifiers, and equalizers is going to allow the parishioners in the choir loft hear his sermon? Basically, how should a sound and communications contractor approach a potential end-user?

In talking to manufacturers and contractors from the industry, we received somewhat differing, yet insightful answers.

"The end-user doesn't want a sound system, he wants to communicate. The church priest is concerned because he can't be heard by everyone in the house."

According to Ron Means, the president of JBL Professional, 90 percent of a sound contractor's clients are not technically-oriented. Therefore, the features of a particular piece of hardware don't mean anything to them.

"The sound contractor wants to sell 'a solution to a communications problem,'" Means said, "not a particular piece of hardware."

"The end-user doesn't want a sound system, he wants to communicate. The church priest is concerned because he can't be heard by everyone in the house and people are falling asleep. He doesn't care what kind of equipment it takes to be heard—he doesn't want his parishioners falling asleep."

Means also noted that the sound contractor is selling the capability of himself and his company to do the job well and to be around to service the system should anything go wrong. He added that brand names are important from a credibility standpoint.

"People making the decisions about a system aren't usually technically oriented. The technical information provided by the manufacturers are only for back-up information in case the contractor runs into the local electronic guru," Means said.

"The real danger many contractors have," said Herb Jaffe, vice president of marketing for Atlas Sound, "is not properly translating that (technical) knowledge into a non-technical, functional sales approach."

"The end-user recognizes that he has a need to communicate and he needs a specialist who can tell him how. The contractor has to remember he's selling to a non-technical person who's looking for a 'functional' answer to a problem."

"For example, you have a lumber yard owner who wants to install a sound system. He doesn't care if the speakers are round, square, or rectangular—as long as his foreman out in the yard can hear him."

Jaffe also noted that it's important for sound contractors

to appear as professionals and give professional presentations. "If you come in like a serviceman, you're going to be treated like a serviceman," he said.

Maroun Atallah, general manager at Hannon Engineering, a sound contracting firm in Los Angeles, CA, said, "Today's client is a little more discriminating and often a little more educated than those in the past. He wants to know about quality, feedback, and intelligibility. But when approaching him use a common language that's not too technical. The customer is entitled to find out what kind of service he's going to get. And he must know ahead of time, because he is the one footing the bill."

"Today the sound contractor has to be a psychiatrist. You must find out what the customer wants and offer him what is best suited to his needs, without coming across as superior. If you guide him properly, you will both be satisfied," Atallah said.

Veteran contractor, Walker Cottrell, president of Cottrell Electronics in Richmond, VA, said that a combination of technical talk and system performance, both play a part in what works for him.

"It all depends on what the user's 'hot button' is," Cottrell said. "Mostly he cares about the utility of the system—does it work? Then he cares about the cost, how long will the system work. Finally, he wants to know if the system goes sour are we going to be around to fix it?"

"Try to find out what the customer feels he requires. Sometimes it takes a long time to pick his brains and talk to the various people concerned," Harold Lander, president of Signal Communications in Seattle, WA, said.

"You also have to find out the purpose of the facility you're talking about. For example, if it's an auditorium—will it be used for general events, sports, or assemblies, etc."

"When I first go into see a potential client I never bring a manufacturer's catalog or a price sheet, and I never push a product line," Lander said. "I just go in with a pen and paper pad to take notes on what they have to say and get all the information I can."

"The last thing you want to talk about is price," Lander said. "Sometimes it's difficult to make a client realize how much the job is going to cost. They might say they have a lot of money and they're talking about \$3,000. And you're talking about a job that will cost \$30,000."

Lander, who has been in the sound and communications industry for almost 40 years, also said he doesn't believe in brand-name dropping either. "It seems to make a bigger impression when you tell a client it's the same speakers that were installed in the sports arena downtown—than who the manufacturer is."

Sandy Schroeder, marketing manager for sound reinforcement products at Shure Brothers, takes a slightly different approach. He feels the better educated a contractor is about his product the better job he can do for the client.

"For a long time we were dedicated to the musical instrument (MI) market, now we're aggressively seeking expansion into the sound contracting industry. We recognize the difference between the sound contractor and the MI dealer. When a customer comes to an MI dealer, he usually already knows what he wants to buy. Sound contractors are called on

(continued on page 48)

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SCORPION 26/16'2
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The TAC logo is rendered in a bold, stylized font with a 3D effect. The letters are filled with a gradient of orange and yellow, and have a dark outline. The 'A' is particularly large and prominent.

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Reader Service #205

World Radio History

MINIMIZING REVERBERATION

by Bruce Bartlett
Crown International

Editor's Note: This article was written for us by Bruce Bartlett a microphone project engineer at Crown. Bruce discusses optimum mic placement to minimize reverberation pickup in a conference room situation. His analysis is thorough and technical enough to be useful. Bruce also includes a short BASIC program to help evaluate mic placement options. The article uses Crown and Shure microphones as examples, but the techniques should be applicable to other high-quality microphones with similar design and performance.—C.F.

When miking a conference or interview for recording, broadcast, or teleconferencing, we must reduce the pickup of room reverberation. Why? Sound reflections from room surfaces cause a time-smear of the original signal, which adds a muddy, hollow sound to speech and hampers intelligibility by slurring syllables together.

The goal is to maximize the

speech-to-reverb ratio. How should microphones be chosen and placed to reduce pickup of room reverberation?

First, we need to know what microphone parameters affect reverb pickup. These parameters are:

- (1) Microphone polar pattern (omnidirectional, cardioid, hemispherical, etc.).
- (2) Microphone-to-source distance.
- (3) Number of open microphones.
- (4) Angle of the sound source relative to the microphone axis.

Polar Patterns

The polar pattern of a microphone is a plot of the microphone's sensitivity to sounds arriving from various angles. An omnidirectional mic is equally sensitive to sounds arriving from all directions. A unidirectional mic is most sensitive to sounds arriving from one direction—in front of the microphone. The most common type of unidirectional pattern

is the cardioid pattern.

In general, as the microphone polar pattern becomes more directional, reverberation pickup decreases. The Random Energy Efficiency of a polar pattern is its reverb rejection compared to an omnidirectional pattern. The Random Energy Efficiencies of various polar patterns are as follows:

Omnidirectional	0.00 dB
Cardioid	-4.78 dB
Bidirectional	-4.78 dB
Supercardioid	-5.72 dB
Hypercardioid	-6.02 dB

As shown above, an ideal cardioid microphone picks up 4.78 dB less reverb than an omni microphone, when both mics are placed the same distance from the sound source.

If a microphone is mounted on a large surface (such as a conference table), the mic picks up 3 dB less reverb than it does when mounted in open space. This is because reflected sounds approach the microphone from all directions ran-

domly; that is, reverberation is random-incidence sound. The surface blocks half of the random-incidence sound, reducing its power by 3 dB.

Surface-mounted microphones (such as the Crown Pressure Zone Microphone® or PZM®) take advantage of this effect by mounting the mic capsule very near a hard reflective surface. The PZM has a hemispherical polar pattern, which is an omnidirectional pattern cut in half by the mounting surface (table top).

Also available are unidirectional surface-mounted mics such as the Shure SM91, AMS22, and Crown PCC-160.

Mic-to-Source Distance

The closer a microphone is placed to its sound source, the higher the Sound Pressure Level (SPL) at the microphone. The reverb level stays constant with miking distance. Consequently, the speech-to-reverb ratio increases as miking dis-

(continued on page 49)

```

100 PRINT:PRINT "REVERB PICKUP PROGRAM"
110 F=3.1416/180
120 PRINT:PRINT "ARE MICS SURFACE-MOUNTED (Y/N)?:INFUTSM$
130 PRINT:PRINT "POLAR PATTERN OF MICS IN USE:"
140 PRINT "O=OMNI
150 PRINT "C=CARDIOID
160 PRINT "B=RIDIRECTIONAL
170 PRINT "S=SUPERCARDIOID
180 PRINT "H=HYPERCARDIOID
190 PRINT "D=QUIT
200 PRINT:INPUT "YOUR CHOICE":F$
210 IFF$="D" THEN END
220 PRINT:INPUT "NUMBER OF OPEN MICS":NOM
230 PRINT:INPUT "MIC-TO-SOURCE DISTANCE IN FEET":DI
240 PRINT:INPUT "ANGLE OF INCIDENCE":AI
250 IFF$="D" THEN PDB=0:AM=1
260 IFF$="C" THEN PDB=-4.78:AM=.5+.5*COS(AI*F)
270 IFF$="B" THEN PDB=-4.78:AM=COS(AI*F)
280 IFF$="S" THEN PDB=-5.72:AM=.375+.625*COS(AI*F)
290 IFF$="H" THEN PDB=-6.02:AM=.25+.75*COS(AI*F)
300 IFSM$="Y" THEN PDB=PDB-3
310 NDB=10*(LOG(NOM)/LOG(10))
320 DDB=20*(LOG(DI)/LOG(10))
330 IFAM=0 THEN AM=.005
340 ADB=20*(LOG(AM)/LOG(10))
350 REVERB=INT(100*(NDB+DDB+PDB-ADB))/100
360 PRINT
370 PRINT "REVERB PICKUP="REVERB"DB":PRINT "RELATIVE TO
ONE OMNI AT ONE FOOT."
380 PRINT:PRINT "HIT ANY KEY"
390 GETB$: IFFB$="" THEN 390
400 PRINT:RUN
    
```

READY.

The BASIC program to help evaluate mic placement options.

REVERB PICKUP OF VARIOUS CONFERENCE MIKING ARRANGEMENTS
(4' x 8' TABLE)

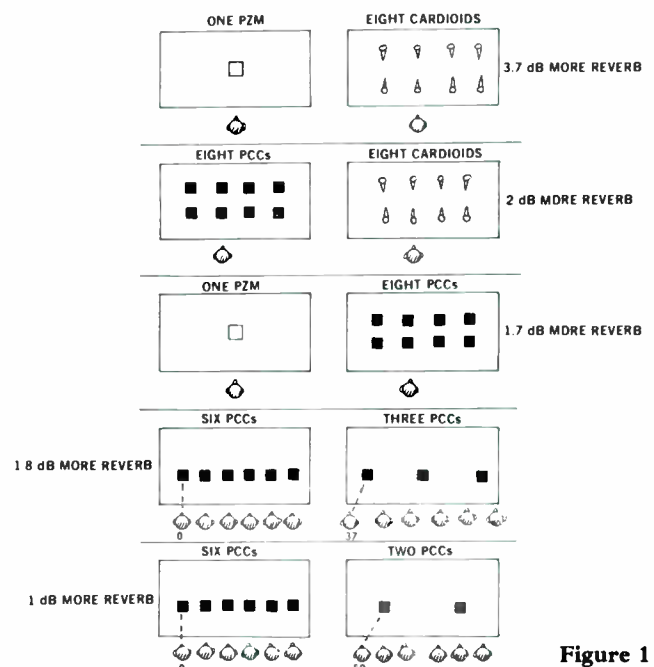


Figure 1



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RETROFITS + UPDATES

SCHOOL COMMUNICATIONS



“Basically, the old paging systems aren’t as effective as they were 20 years ago. And it has become more cost-effective for schools to replace their systems than repair them.”

by John Frantz



(Left) Teachers are able to have private conversations by using the additional handset unit on the Bogen intercommunication system.

(Top) Bogen's wall mounted WD-1 digital display lists all incoming calls, time of day, and has a top-priority flashing "Help" and room or phone number display on the station that signals the emergency.

(Right) Delta Communications 2600 Series Intercommunications System offers 78 classroom capability and dual channel intercom with program capability.

As the children born in the baby boom era during the 1950s and 1960s became of school age, the need for more space led to a construction boom of new school buildings. This growth also extended into the school communications industry, and business there, too, enjoyed growth.

But now, 20 years later, with school enrollment down and many schools merging and consolidating, the picture is not so pretty. Yet, the school communications market is still proving to be a viable area for business as old installations become outdated and obsolete. The need for more sophisticated systems as well as special applications such as security and outdoor installations, has kept the school communications industry healthy. Retrofits and updates have become key jobs for today's sound and communications contractor in the school communications market.

As the school communication systems have become more advanced and complex, so has the market which utilizes them.

"Anytime you sell or market something to a school in this day and time, you've got yourself a selling job," said Kenneth T. James, vice president of sales and marketing of Rauland-Borg.

Sales in the past were dependent upon specifications written into building plans. "If you wrote the spec, you generally got the job," James said.

Today schools have definite preferences for equipment, specialized requirements, and they've grown more sophisticated concerning function and value versus price, according to James.

"The principals and school boards were never directly involved as much in the selection of equipment in the past,"



said Sid Flothe, president of Delta Communications Co. of Tacoma, WA. "Today they have a much better feel for the new equipment that's available."

A standard school console consists of a control panel, intercom capabilities, pre-amplifier, program amplifier, and switching decks according to Thomas Garmhausen, sales manager for Communications Equipment Co., Inc., Glen Arbor, MI, which has manufactured equipment since 1963. The basic needs of a school is a system that has simple two-way intercommunication and general announcement capabilities.

Regardless of the technological advances of the industry and seemingly indispensability of the systems, there are still schools in the 1980s that don't have any kind of system. Some school district budgets have never warranted the money. "Many times a school under construction will run over budget," noted Garmhausen. "They can't cut out the plumbing and the lighting, so they cut out the sound system and the landscaping."

On the other hand, those installations that go toward the new construction of a building are usually specified as microprocessor gear. New construction bonds usually allot much more money to school communication than retrofits, according to Peter McLean, vice president of Ring Group of North America, Pelham, NY. "New construction is something a school district plans for, where as the replacement or repair of an existing unit many times takes them by surprise," McLean said.

Repair vs. Replacement

Repair versus replacement is also a confusing issue and well debated within the industry. Overhauling an older unit can sometimes take more money than the unit is worth. McLean of Ring Group backed up replacement



Rauland Borg's Telecenter IV is a multi-link internal telephone system with interconnect capability for up to 10 external lines.



Edcom 100 Series School System Console is equipped for single program and intercom distribution up to 75 rooms.

with a recent example. Using existing wiring in a California school console replacement with 125 classrooms, a Ring installer had a new Ring 3000 Series school communication system in place and working in less than two hours.

"We've seen an increase of demand for products for school systems. Mostly in the replacement area," said Jim Ganci of Speco in Lindenhurst, NY.

On traditional school communication systems, Jim Wood of Edcom said, "Although these systems have functioned reliably in the past, there is an inherent glitch in their actual operation. Since selection of the area where programs are to be distributed is done manually and incoming calls must be answered at the control console someone must be assigned to operate the system. The administrative staff in the schools usually have a number of jobs to perform. Consequently, it is bothersome to have to go to the console every time a call must be answered or a program output changed."

Gibson-Clone Communications Inc. of Lansing, MI, recently updated the system at the Waverly Middle School, there, with one of Edcom's school communications systems.

"Gone were the racks with rows and rows of room selector panels used to communicate with and transmit programs to the classrooms," said Wood who distributes the Telecor System which was installed in the school. "In their place, at each key administrator's desk is a key-telephone type console which allows all of the functions previously performed by manual

operation at the rack to be done at their fingertips."

The Telecor System is an all digital system consisting of a central processing unit mounted in a 10.5-inch high 19-inch card cage. The basic frame contains the necessary circuitry to permit two-way communications and program distribution to 150 stations.

"Basically, the old paging systems aren't as effective as they were 20 years ago. And it has become more cost-effective for schools to replace their systems than repair them," Ganci added.

"Many manufacturers no longer carry the parts for systems they installed 20 or 30 years ago. We can still service units that we've made all these years. The company is over 50 years old," said Dan Kagan of Talk-A-Phone in Chicago, IL, which offers the Master Selective System for small schools of one to 10 rooms. The system can be hooked up to cable which is already in place which makes system easy to install.

Knowing that replacement and upgrading is the major portion of the industry, Communications Equipment specializes in a system of panels that can be added on as the user requires more sophistication. "Many of the schools are still adequate from the baby boom era," explained Garmhausen, "but the units are beginning to need replacement. With our approach of one function per panel, we get a lot of replacement business. Plus, if an older console starts having problems the whole thing need not be replaced."

Rauland-Borg has been one of the leaders in the microprocessing push. Its development of microprocessor-controlled units has complemented its existing line of conventional school intercom equipment for a market James views as 50 percent retrofit and 50 percent new construction.



The Telecenter 5000 from Rauland Borg offers two-way communication, programmable clock, and programmable paging.

Dukane Digital Clocks

Digital master time-control systems from Dukane combine the modern approach of direct-reading LED digital clocks with many efficiency-building features not found in other systems.

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In addition to clock systems, Dukane offers other school communication equipment. For complete information send for literature today.

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announcements**



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The new construction installations are appearing mostly in Sunbelt states with an addition of California, according to Carl Dorwaldt, vice president of marketing for Bogen.

Dukane discovered an interesting statistic that 90 percent of its school equipment sales during a 10 month promotion which ended in October have been classified as retrofit. The 10 percent new construction installations, like Bogen, were shipped mostly to Sunbelt states.

Microprocessor-Based Units: The Wave of the Future

The trend today is toward microprocessor-controlled equipment. Sev-



The Ring 3000 School System, a two-channel system, can service up to 500 different rooms providing selective and all-call announcements, program feed and other features.

eral manufacturers have estimated some 10 percent of existing school

equipment already has some type of microprocessing control. Another 80 percent is accounted for by solid state equipment, popular in the 1960s. The remaining amount is made up of antiquated tube equipment left over from the pre-solid state era.

Before the building boom, there were a few provocative schools which began using prototype equipment as early as 1939. Adding to the boom was the installation of newly developed equipment in existing schools.

Unlike the past, the price of microprocessor-controlled equipment has finally become equal to that of conventional equipment according to James. "We introduced two new microprocessor-based systems last year and they've taken off like a rocket," James said. "The school market is conservative and changes slowly, however it *does* change."

"We see a strong, steady growth in the microprocessor-controlled market," said Dorwaldt.

Tom Balle, product group manager for Dukane explained that more microprocessor-based equipment will be chosen as baby boomers, who grew up with computer technology, begin landing positions requiring the selection of equipment.

Currently, microprocessor-controlled equipment accounts for some 25 percent of Dukane's annual school console sales.

Like Ring Group of North America, Televox Systems division of National Telesystem Ltd., is a Canadian company making an attempt at the American market. In the second quarter of 1986, it hopes to introduce the six-year-old Televox 3400 school communication system.

The Televox 3400 is a microprocessor-controlled unit aimed at what Vice President Howard Bowles sees as a void in the American market-efficient equipment at a low end price. The 50-year-old firm currently commands some 90 percent of the Quebec market and 10 percent of the Canadian market nationwide.

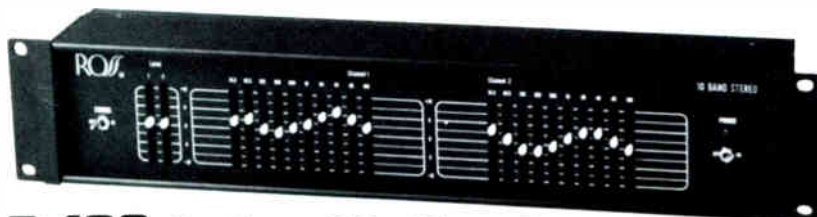
Architects and consulting engineers have hindered the transition somewhat, according to David Moore, national sales manager for Elvox Division of Paso Sound Products Inc. in Pelham, NY. Moore said much of today's specifications are the same as 10 years ago.

The change over to microprocessing systems will inevitably lead to the in-

(continued on page 41)

SOUND SHAPERS

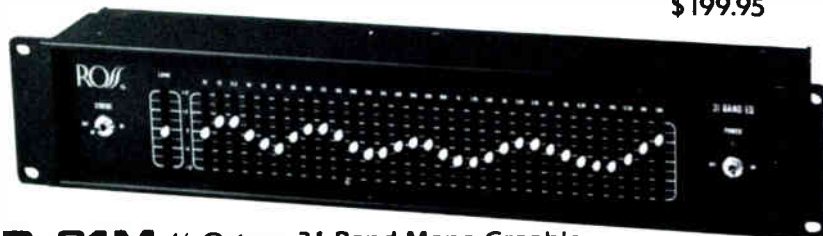
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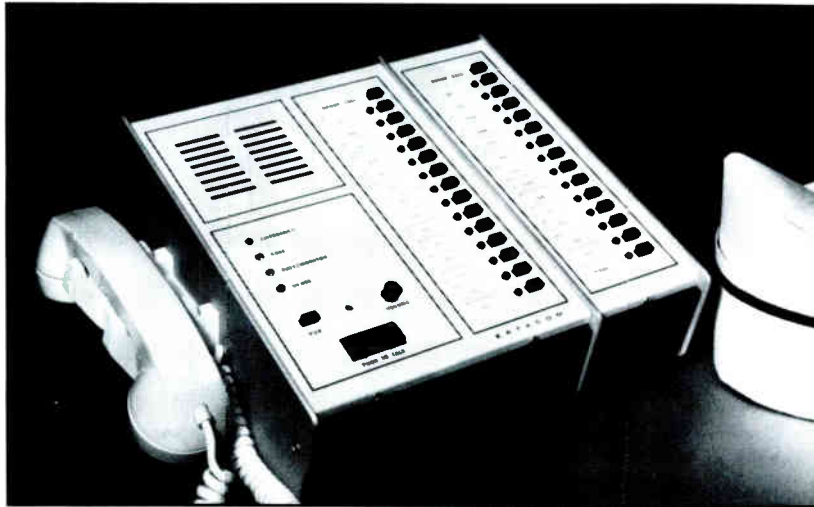


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ELECTRONIC CROSSEOVERS

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Since the first published design information concerning dividing networks for loudspeaker systems by Hilliard and Kimball in 1936, much research and development in the area of loudspeaker dividing networks has taken place. However, to date, most of the published works have been in the theoretical domain.

When designing a loudspeaker or sound system, the engineer must take into account the effects the dividing network will have on the polar response, electrical power requirements, imaging, and tonal quality of the loudspeaker system. With the exception of a few new entries into the crossover market, most commercially available loudspeaker crossover networks are not primarily concerned with the actual acoustical performance as applied in 'real-world' loudspeaker systems.

Through comparative measurements of a typical two-way loudspeaker system, the following will show the objectively measurable acoustical effects and subjective differences when using var-

ious dividing networks on a typical two-way loudspeaker system.

Crossover Network Development: A Brief Overview

It would be a monumental undertaking to discuss all the events involved in the development of crossover network design. For the sake of brevity, we will try to give a synopsis of the major events.

It was through Hilliard's pioneering, in the early days of 'talking' motion pictures, that crossover networks for loudspeaker systems basically got their start. Hilliard and Kimball's work, "Dividing Networks for Loud Speaker Systems," was originally published in 1936, in the *Journal of the Society of Motion Picture Engineers*. Subsequently, in 1938, The Research Council of the Academy of Motion Picture Arts and Sciences published a book entitled *Motion Picture Sound Engineering*; the chapters by Hilliard and Kimball remained the basis for crossover and equalizer de-



Illustration by Stuart Weiss

sign for many years thereafter.

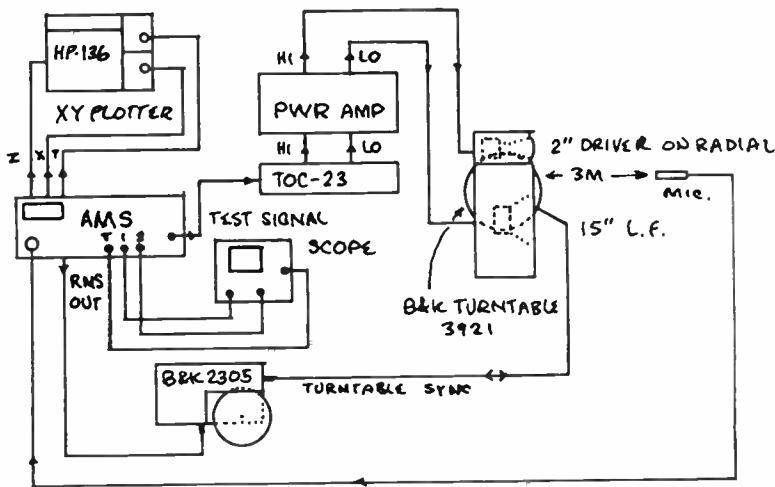
Hilliard and Kimball's work was based upon the previous work of Cambell, Zobel, Shea, Bode and Dietzold, and Johnson, all of Bell Telephone Laboratories during the 1920s through the early 1930s. Even though the applications were primarily for cinema sound reproduction, Hilliard and the others at MGM presented us with the problems of attenuation, impedance, phase, delay, and alignment characteristics, and loudspeaker characteristics (which we all seem to still be hashing out).

The constant-k and m-derived networks that evolved during the early cinema days remained state-of-the-art until the mid-1950s, when constant-resistance-type networks appeared. The constant-resistance networks claim to fame was their "constant-power" behavior. Constant-time-delay filters were introduced in 1954. A constant-time-delay filter is a Bessel filter with a transfer function that achieves an approximately constant

time delay through the crossover range.

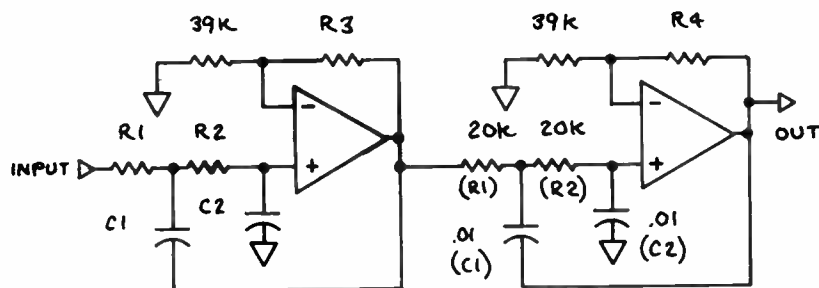
In the early 1950s, research focused on the problems of distortion, damping, power handling capabilities, and overall control of loudspeaker systems. The solution—electronic crossovers. Sallen and Key in 1955 and Thiele in 1956 were the earliest to publish information about replacing the inductor with an active element in the crossover circuit.

In 1962, Ashley described a second-order crossover whose outputs sum with a unity voltage function. Later, Small classified these networks as constant-voltage networks. Small thoroughly analyzed these networks and found they could not be properly implemented in most commercial applications without sacrificing acoustic power distribution. Alas, a whole new view on loudspeaker dividing networks began—the total acoustic field developed through the crossover network. (Perhaps, it was a resurgence of Hilliard's work.)



SET-UP

Figure 1



	R1	C1	R2	C2	R3	R4
2ND LINKWITZ-RILEY	0	0	0	0	0	0
2ND BESSEL-NIBO	0	0	0	0	0	10K
2ND BUTTERWORTH	0	0	0	0	0	22K
3RD BUTTERWORTH	0	0	20K	.01μf	0	39K
4TH LINKWITZ-RILEY	20K	.01μf	20K	.01μf	22K	22K

* THE HIGH PASS FILTERS HAVE THE TUNING ELEMENTS, (R1, R2 & C1, C2) INTER CHANGED.

Figure 2

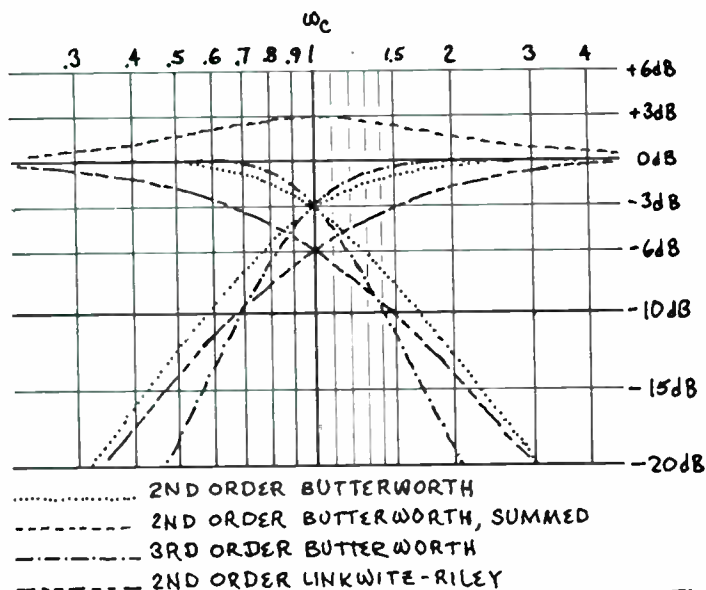


Figure 3

However, during the same period Ashley and Henne suggested the use of a third-order Butterworth crossover network with its ideal amplitude response, and claimed that its non-linear phase response was not audible. Consequently, this odd-order crossover network type has become one of the most popularly used designs.

Augspurger, in 1971, presented a clear picture of real loudspeaker systems, taking into account the actual acoustic field produced, as modified by the effects of loudspeaker directivity and the crossover network itself. Although Augspurger's findings were quite well founded, the 3rd order Butterworth continued its dominance for some years to come with no new designs until the late 1970s.

Frater and Linkwitz both were aware of the role that crossovers played in the total acoustic pressure field produced by loudspeaker systems, and both investigated the crossover's effects in real loudspeaker system designs. In observing the polar response characteristics of loudspeaker systems which used noncoincident drivers, they both demonstrated that when the low-pass and high-pass outputs yielded a smooth phase response, the loudspeaker's polar response was symmetric. As a result of Linkwitz's investigations, he developed a new crossover design for noncoincident drivers. Linkwitz's and Frater's work began what these authors consider to be the current generation of crossover network design.

The first effort of this generation was Ed Long's 1976 Audio Engineering Society preprint, concerning his Time-Align technique which was to become somewhat of a turning point in loudspeaker design. Long based his presentation on the earlier work in the field concerning loudspeaker phase/time response and its contribution to the overall transfer function of the loudspeaker system.

The Tests

The measurements described here were performed using a gated tone burst system with the addition of a Bruel & Kjaer (B&K) turntable and recorder to generate the polar plots (see Figure 1). This system does an excellent job of ignoring reflections. The measurements were done in a 40-by-80-foot room with a 20-foot ceiling.

The crossover system used is the TOC-23™ Frequency Dividing Sys-

tem with Time Offset Correction™. It is a two- or three-way device with adjustable time correction in the low and mid-range outputs. The dividing filters are 2nd order Bessels normalized to have a 180 degree phase difference between the low and high outputs. To facilitate the measurement of several types and orders of filters, a unit was adapted to use external filters. The circuit is the "Equal Component Value" type in which the frequency and damping of each 2nd order section can be adjusted independently (See Figure 2).

In selecting a loudspeaker system for the comparative evaluation, we felt that a single loudspeaker system, rather than several different types, would be helpful in presenting a clearer picture. The selection of such a system would therefore have to be based on what is most universally used (or at least very familiar) by those involved in any phase of the industry, including live PA, commercial sound, recording studio, and musical instrument amplification applications.

We therefore decided to use a two-way system, comprised of a direct radiating low-frequency woofer and a compression driver/horn tweeter. The

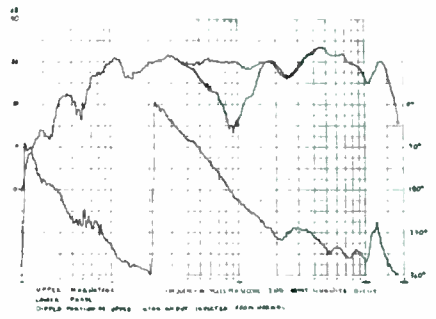
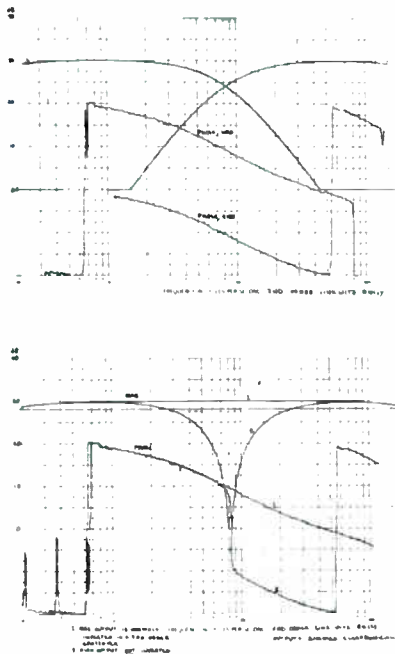


Figure 4: 2nd order Linkwitz-Riley filters.

woofer was a 15-inch studio-monitor type in a 4.5-cubic-foot vented box and a two-inch compression driver on a short throw horn. The horn was a radial type whose included angles were 120-degrees horizontal by 40-degrees vertical. In the bandwidth on which

the testing was primarily focused (the 800 Hz and 1 kHz octaves), the horn exhibited excellent constant directivity control characteristics.

This generic system was placed sideways on the B&K turntable with the mouth of the horn perpendicular to

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the floor (see **Figure 3**). This enabled plotting the lobes that result from the effects of the distance between the radiating centers of the drivers combined with the time differences that result at any angle other than directly on axis, equidistant between the low and the high sections.

The Filters

Five filters were investigated: 2nd order Linkwitz-Riley; 2nd order Bessel (normalized to 180-degrees); 2nd order Butterworth; 3rd order Butterworth; and 4th order Linkwitz-Riley.

The 2nd order Linkwitz-Riley filters are -6 dB at the crossover point. They sum flat electrically, have smoothly decreasing delay, and have very good transient response (**Figure 4**).

These 2nd order Bessel filters are normalized to be 180-degrees apart rather than a specific delay, or -6 dB. This makes them -4.75 dB at the crossover point and have a more constant delay. When summed electrically, they produce a very slight peak (1.25 dB) which is so broad as to be difficult to define. They also have very good transient response (**Figure 5**).

The 2nd order Butterworth filters are normalized to -3 dB at the crossover frequency. They are the most commonly used for dividing filters. Also, they are the most commonly misused, since many users simply get the component values from a chart calculated for the drivers 'alleged' nominal impedance. When summed electrically, they have a very broad peak of 3 dB in the frequency domain. Their outputs are 180-degrees apart, the impulse response has a slight ring, the step response has a slight (5 percent overshoot and the delay has a 16 percent peak somewhat below the crossover point (**Figure 6**).

The 3rd order Butterworth filters are also normalized to -3 dB at the

The 2nd order Butterworth filters are the most commonly misused, since many users simply get the component values from a chart calculated for the drivers 'alleged' nominal impedance.

crossover point, but sum flat electrically because they are in phase quadrature, or 90-degrees apart. (Actually, they are 270-degrees apart.) (**Figure 7**).

The 4th order Linkwitz-Riley filters are becoming noticed because they have 24 dB per octave slopes (affording better 'driver protection'), and they sum flat electrically. They actually are two 2nd order Butterworth filters in series which makes them -6 dB at the crossover point. The delay has a peak of approximately 20 percent, somewhat below the crossover point. Their outputs are in phase, meaning that they are of the same polarity though they actually have a phase difference of 360 degrees (**Figure 8**).

What's The Matter With 3rd Order Butterworth Filters?

The de-facto standard of crossovers in general use has become the 3rd order Butterworth network. One claim made by the advocates of these 3rd order Butterworth networks is that they have flat power-response characteristics. It has not been made clear in the past to the end-users of these networks that it is the electrical power response which has been the paramount design criterion. Furthermore, 3rd order networks have been promoted as optimal for high-frequency driver protection.

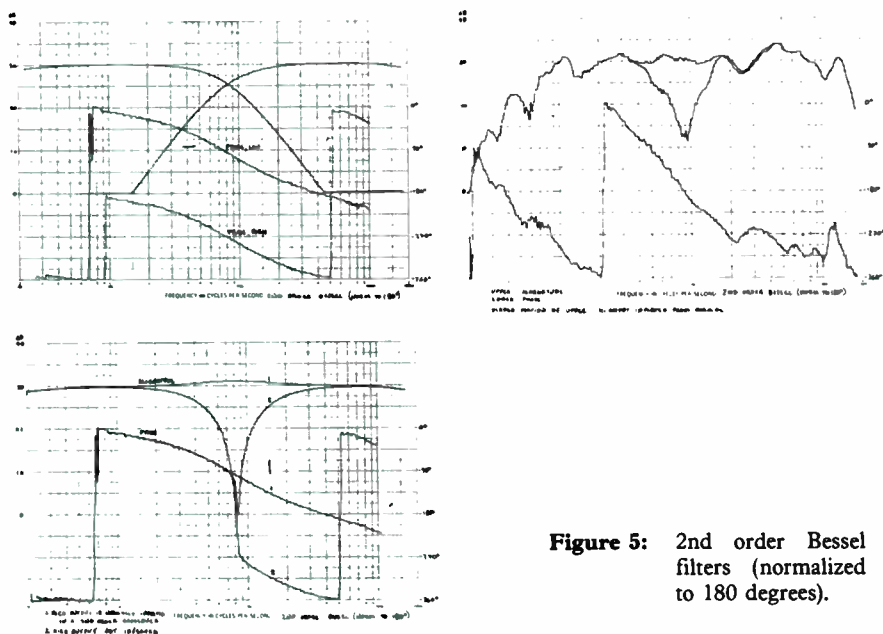


Figure 5: 2nd order Bessel filters (normalized to 180 degrees).

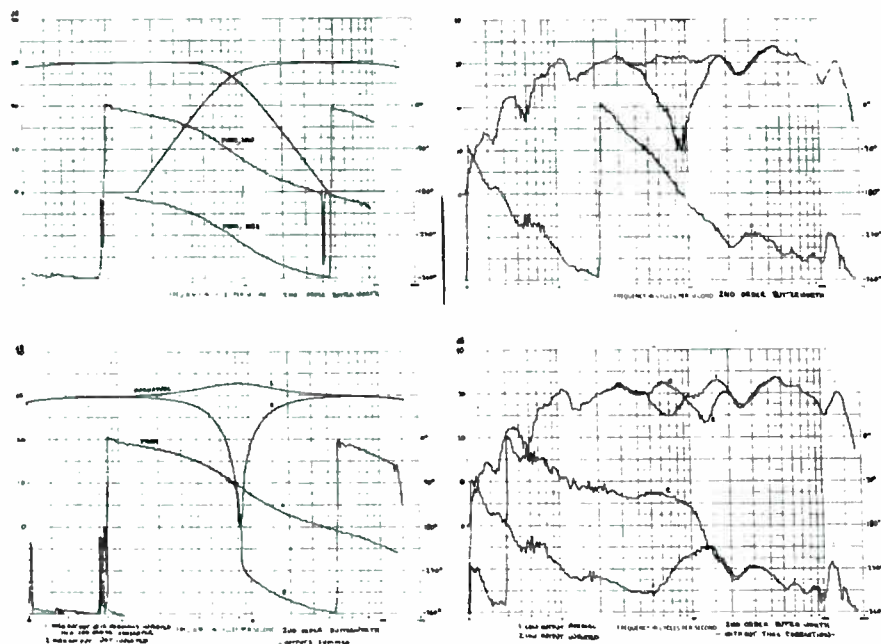


Figure 6: 2nd order Butterworth filters.

NEW

Vega PRO wireless at an affordable price.

Cetec Vega's famous high-quality "PRO" wireless microphones are now available in new, highly affordable versions. Enhance your sound installation with the new PRO 1-B and PRO 1-H systems. Ideal for all of your professional audio applications, these systems are great for broadcasting and entertainment applications, as well as for use in audio-visual systems for industrial seminars, church and school sound systems, etc.

The PRO 1-B system consists of the Model T-37 bodypack transmitter and Model R-31A receiver. The PRO 1-H system consists of the Model T-36 hand-held transmitter and R-31A receiver.

Both systems feature DYNEX® II, Cetec Vega's advanced audio processor for the highest signal-to-noise ratio, widest dynamic range, and most natural sound.

R-31A PRO Receiver

The R-31A PRO receiver features two easy-to-read LED bargraph displays—one for RF signal level and the other for audio level. The receiver is extremely sensitive, highly selective, and very stable. Either line-level or mic-level outputs may be selected through the rear-panel XLR connector. Line-level output is also available from the rear-panel terminal strip. The receiver can be powered by either AC or external DC.

T-37 PRO Bodypack Transmitter

The T-37 PRO bodypack transmitter accepts all positive-biased and most negative-biased electret lavalier mics via an easy-to-use mini 4-pin XLR connector. Conventional panel-mounted mic on/off and recessed power on/off toggle switches are featured. The ultra-rugged case stands up to hard use.

T-36 PRO Hand-Held Transmitter

The T-36 PRO hand-held transmitter uses the popular Electro-Voice BK-1 ("Black Knight") condenser element with an attractive black wind-screen. Housed in an attractively contoured black case, it has Cetec Vega's patented internal dipole antenna. An audio gain control and power and audio on/off switches are conveniently located on the bottom.

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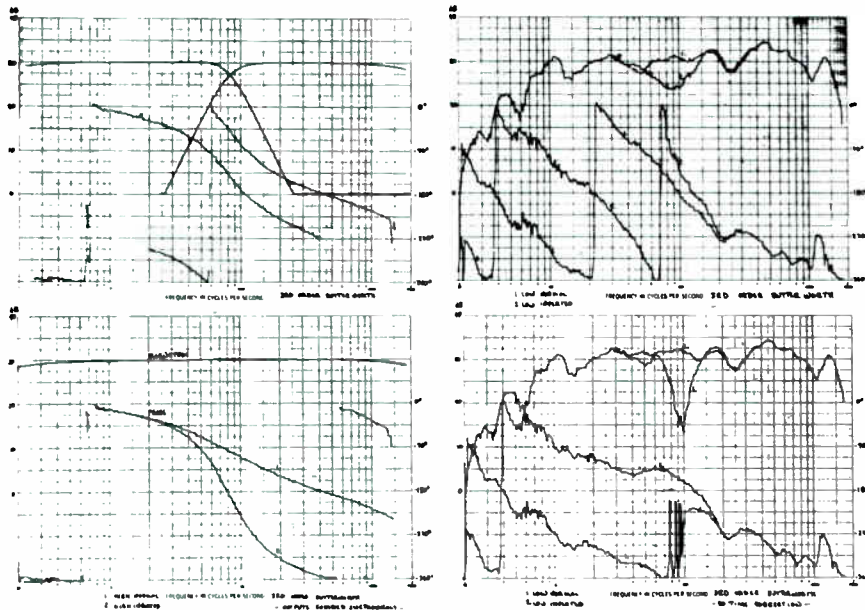


Figure 7: 3rd order Butterworth filters.

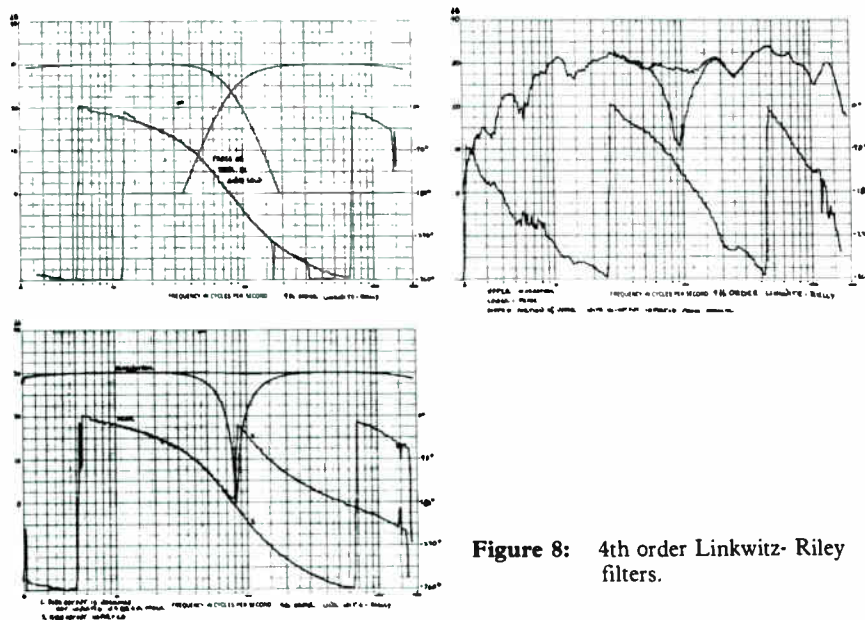


Figure 8: 4th order Linkwitz-Riley filters.

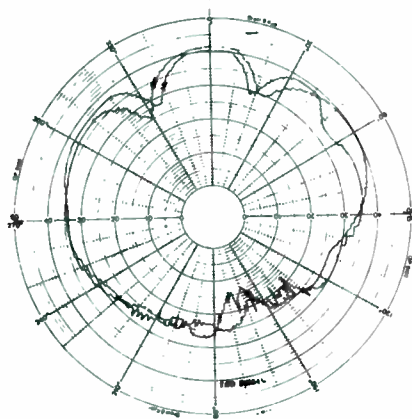


Figure 9: 2nd order Bessel filters (normalized to 180 degrees).

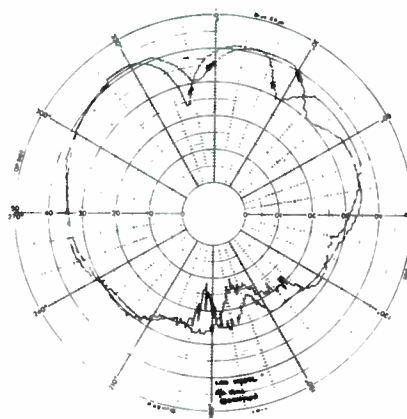


Figure 10: 2nd order Bessel filters (normalized to 180 degrees) without TOC (time offset correction).

Since the reason for dividing filters is to enable the use of drivers that are designed for specific ranges by preventing frequencies outside of their range from reaching them, it would seem that a steeper slope would be better. For even order filters, this could be considered to be true.

Everybody knows that filters are -3 dB at the cutoff frequency and everybody knows that if two signals of equal amplitude and equal phase (a key word here) are summed, the result is a 6 dB increase in voltage. Looking at the

Since the reason for dividing filters is to enable the use of drivers that are designed for specific ranges by preventing frequencies outside of their range from reaching them, it would seem that a steep slope would be better.

plots of 2nd order Linkwitz-Riley, one can see that these filters sum flat.

But look at the 3rd order Butterworth. It sums flat and the slopes are steeper—obviously we should use it. Looking a little further we get caught in the time domain (or is it a warp?): the outputs are everywhere 90 degrees from each other. (Actually, they are 270 degrees apart but it could depend on from whose viewpoint one is looking.) The sum of these phasors result in flat magnitude no matter which combination of polarities one chooses.

Comparing the 3rd order Butterworth plot with the 2nd order Linkwitz-Riley in **Figure 3**, we can see that both are 10 dB down at the same frequency, .7 of the crossover point. Realizing that -10 dB is one-tenth power, it would take significant incompetence on the part of the sound operator to destroy driver diaphragms if the 2nd order filters were used. Considering that $+3$ dB is twice the power, how much power is thrown away in the area between the first 10 dB of the 2nd order Linkwitz-Riley and the first 10 dB of the 3rd order Butterworth?

Discussion

The 2nd order Butterworth with time correction looks flattest through the crossover region (**Figure 4**). The reference that all levels were matched to is the 2nd order Bessel. It was centered on the 30 dB line. Without

time correction, there are additions and cancellations near the crossover frequency. This is what many systems look like. As we know, EQ really doesn't solve this. It may flatten the amplitude response at the expense of the time response.

Looking at the 3rd order Butterworth without TOC (Figure 7, trade 2), it looks nice. Even the phase plot looks good, though not as good as the 2nd order Bessel. This, we believe, is a major reason why 3rd order filters have sustained their popularity position: they can mask time domain problems.

Note the slope of the phase in all the 2nd order filter sets (Figures 4, 5, and 6 voltage only): as the crossover point moves up from -6 dB, the slope of the phase (and therefore the delay) increases. Looking at the slope of the phase of the 3rd order Butterworth summed, Figure 7 trace 1. It exhibits the same phase slope as the 2nd order Bessel. Trace 2, however, is steeper than the 4th order Linkwitz-Riley (Figure 8). This would indicate that the delay of this combination of signals would be a great deal closer to the crossover point than trace 1.

The 4th order Linkwitz-Riley would afford better 'driver protection' than 2nd order filters. It may sound different than the other filters due to the increased delay of the lower frequencies compared to the highs. We find this to be a possible answer to the observed clockwise dip at 1 kHz being deeper and slightly closer to the axis on the polar plot than it is in the polar plot on the 2nd order.

The polar plot of the 2nd order Bessel is more symmetrical than the 3rd order Butterworth and the 4th order Linkwitz-Riley, but when the time correction is not used, the lobes rotate and become quite asymmetrical (Figures 9 to 12).

Fortunately many systems have the drivers above each other, but when the listener is 20 degrees below on-axis, he would experience a 12 dB hole one octave wide at 1 kHz with with any of the dividing network systems shown.

Listening Tests

Listening tests were performed by many different people through the development, proto-typing, and production stages of the TOC 23. In listening to the various crossovers, when the system alignment was switched out, it was immediately apparent. When switching from the 3rd order to 2nd order filters, there was a

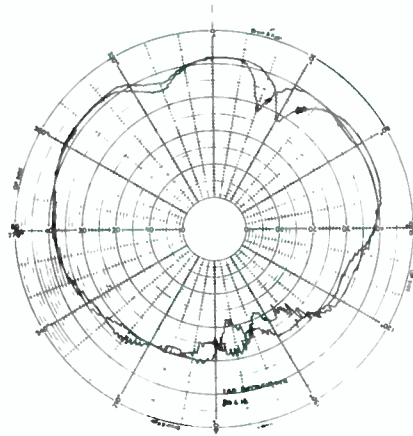


Figure 11: 3rd order Butterworth filters.

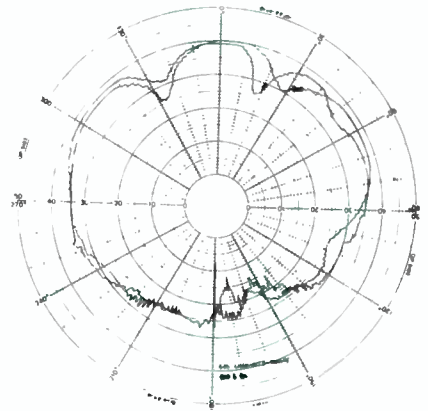


Figure 12: 4th order Linkwitz-Riley filters.

marked improvement in imaging, both laterally and front to back.

An interesting observation was made when listening to the playback of high quality sources containing reverberation. There seemed to be more reverberation in the phase coherent systems; this was most likely due to time smearing of transients in the non-aligned systems. Further, the transient response characteristics of the 2nd order Bessel normalized to 180-degrees, raised comments like, "tighter and

more coherent percussion sounds" and "much sharper and clearer sound".

Conclusion

Through both the study of the literature and our own practical implementations, one fact remains uncontested: the crossover must be considered an integral part of the loudspeaker design, as important as the loudspeaker elements themselves. Hence, a crossover must be capable of satisfying both the electrical and acoustical requirements simultaneously.

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CONVENTION REVIEW



(Top, Left) The exhibit was packed with what manufacturers were calling "high-quality" attendees.



(Top, Right) Audio-Technica's sales rep, Brian Trankle, exhibiting the company's Unipoint microphone to Gary Kocian (left) and James Evanik (right) of IBM.



(Right) A view down one aisle of the exhibit floor with HM Electronics and Eastern Acoustics Works booths on right.

by J. Klapholz

This fall marked the beginning of the switch from biannual to annual AES conventions here in the U.S. This year's program, the 79th Technical Meeting and Professional Exhibits, which once again took place at the New York Hilton Hotel, October 12 to 16, was promoted as, "A bridge to tomorrow's audio technology." With 36 informative technical sessions, workshops, and seminars, the AES easily fulfilled its promise.

The AES exhibits occupied the entire second floor of the hotel, as well as commandeering both the fifth and sixth floors with demonstration suites.

All in all, there were some 175 exhibitors at the convention representing the acoustic/audio measurement, acoustical products, broadcast, production, recording music synthesis, and last but not least, the communications and sound reinforcement sectors of the business. The 79th AES Convention, was in a word, although an understatement, comprehensive.

There was more of interest to the sound contractor at this AES Convention. Sound Reinforcement continues to grow in its overall importance to the organization, and more and more the traditional studio and touring sound

equipment manufacturers are gearing their lines toward the installation market. The convention opened a day earlier than usual with technical sessions devoted to sound reinforcement and architectural acoustics. While the AES is not the NSCA, there was much for an interested sound contractor to take in.

On Exhibit

Retaining its prominence on the exhibit floor was Innovative Electronic Designs, Inc. So many manufacturers start their names with adjectives like "professional," that the "boy that cried wolf" syndrome manifests itself

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in many cases. However, this is far from the situation at IED, because they are truly an innovative organization. IED is one of the first manufacturers to fully utilize the power of the microcomputer in the world of sound reinforcement.

Under the supervision of a Sony microcomputer, IED's systems use digital/logic control to maintain large complex sound systems throughout all phases of the operation, from initial set-up time in large systems from days to seconds. It can produce set-ups which were not even possible in the past. Of course, any of these set-ups may be stored on disk and used again at a future date.

The "master program" in all systems reside in bubble memory and E-PROMS (both are forms of permanent program storage with no battery back-up requirement) so that in case of power failure the system automatically returns to its "start-up" mode of operation. IED systems feature many subsystems that may be thought of as "building blocks" including microphone inputs and stations, audio distribution and matrices, digital record/playback systems, digitally controlled

relay boards, life-safety interface, digital attenuators, compressors, programmable gain control modules, mixers, and balanced output modules. While fully reporting on IED's systems' capabilities is beyond the space allowed here, just think of replacing hundreds of hardwired patch points and chords with color graphics and software menus. As an aside IED also showed its new 4000 series automatic microphone mixer—no knobs!

At the Emilar booth, a name from the past came up. Formerly with Altec Lansing Corporation, Rex Sinclair has been consulting with Emilar on its new line of low-frequency transducers. Emilar showed, in addition to its line of compression drivers and horns, a new 10-inch, 12-inch, and two models of 15-inch loudspeakers.

From Barcus Berry Electronics, the company whose sister company, Barcus Berry, Inc. became synonymous with musical instrument contact pickups, comes a line of unusual signal processors. Barcus Berry Electronics Inc. showed a line of multi-band processors based on their patented "differential load compensation" technology. The processors utilize high-speed

dynamic gain-control circuitry to audibly improve the reproduction of program transients. This adds brightness and presence without introducing the undesirable stridency often associated with "equalized" sound. The BBE processors further increase voice intelligibility by eliminating frequency-band masking when important sibilant and consonant elements are present in the program signal.

Making its debut at this year's AES convention was VAMP™ from Electro-Voice. The VAMP (Very Accurate Mapping Program) package enables the user to plot the seating boundaries of a room, select and aim appropriate horn/driver combinations, map the sound pressure level contours throughout the listening area, and set the drive levels for constant sound pressure levels throughout the seating area. The VAMP Kit consists of magnetic program cards for use with Hewlett-Packard HP-41 series calculators (we are told that a listing in BASIC is forthcoming), and specialized pressure-contour overlays for EV TransPlanar and H/R series high-frequency horns.

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Sessions, Workshops, and Seminars

Electro-Voice also showed its new 8108, 8-input/4-output mixer designed specifically for fixed-installation systems. According to Jim Long, director of marketing, professional sound reinforcement products at Electro-Voice, "The 8108 is EV's answer to extensive field input requesting a straightforward, rack-mount mixer that provides signal outputs for a main system, a monitor system, a remote system, tape recording, broadcast and others—all likely to require different mixes." EV also showed its new updated electronic crossover, the XEQ-3, featuring fourth-order (24 dB/octave) Linkwitz-Riley filters. As with the previous XEQ-2, the new XEQ-3 also features variable time-delay for cluster-component alignment and equalization for constant-coverage horns.

Meanwhile JBL exhibited its 4660, defined coverage loudspeaker system designed to provide controlled coverage in a rectangular space. The 4660's high-frequency coverage pattern is symmetrical from side to side, but is skewed front to back in such a way that the nominal front coverage angle is 110 degrees, while the nominal back coverage is 38 degrees. The 4660 is well suited for moderate to large meeting rooms and moderate-size houses of worship. JBL also showed its new 46710K oak-grain, vinyl-enclosed utility sound reinforcement system intended for applications where high power capacity, high efficiency, and aesthetics are important.

From Eastern Acoustic Works, came two additions as to its high-level sound reinforcement line: the model L12/CX2 wide-bandwidth coaxial loudspeaker, and the SCE6000 near field reference designed for high-fidelity, high-output distributed systems. The L12/CX2 fills the void between low-cost/low performance, eight-inch speakers and the more expensive 12-inch and 15-inch speakers. The SCD6000 monitor features a new mid-range/ high-frequency driver comprised of two dome-radiators built into a single magnetic assembly. The single magnetic scheme allows the drivers to be mounted extremely close together so they appear to the acoustic field (or listener) that the two driver elements are essentially one. This design has the benefits of exhibiting exceptional "imaging" characteristics as well as very smooth frequency and power response throughout the crossover region.

Anchor Audio featured, in addition

The educational portion of this year's convention was well attended by both participants as well as those on the receiving end. A new participant this year was Conference Copy Incorporated, who for a modest fee will supply anyone with cassettes of their favorite sessions, workshops, or seminars. These tapes are still available to anyone interested and a list may be obtained from CCI at 1671 East 16th St., Suite 212, Brooklyn, NY, 11229;

The technical sessions were categorized as follows: Transmission: Recording and Broadcasting-Digital Recording & Analog Recording and Broadcasting, Acoustics and Sound Reinforcement, Transducers, and Signal Processing-Filters-Mixing & Equalizing. There were a total of 58 technical papers presented, bringing us the latest in state-of-the-art audio technology. Among the papers were "Perceptions of Audio Perceptions" by Terry Pennington, "Another Approach to Time Delay Spectrometry" by John Vanderkooy, and "Peak Current Requirement of Commercial Loudspeaker Systems" by Matti Ojala and Pertti Huttunen.

Pennington's paper was a "light" paper on the subjective aspects of audio with some insightful findings—and entertaining reading. Vanderkooy's paper may end up as a "turning point" in this whole audio measurement technique debate. He proposes a measurement technique that digitizes the "chirp" (rapidly swept sine-wave) and does the rest in software. In the TDS system there is much analog pre-processing to bring the cost of using TDS techniques below the \$2,000 mark. Matti Ojala is the Finnish scientist responsible for bringing us TIM (transient intermodulation distortion).

There were a total of 16 workshops covering the entire gamut of audio, including: Smart Electronics for Sound Reinforcement, Stereo for Television, Multiple Loudspeakers, Sound Design for Broadway, FM Broadcast Audio, Radio Microphones, Bad Sound, CD

Players: Fact and Fiction, TV Audio Trauma, Digital Editing and Mastering, Concert Hall Acoustics, The All-Digital Sound Studio in Practice, Location Recording-Part 1: On the Repeal of Murphy's Law-Part 2: Classical Recording Techniques-Part 3: Popular Music Recording Techniques, Electronic Architecture, Electroacoustic Measurements for Sound Reinforcement, and Simple Stereo Microphone Techniques.

All of the workshops were standing room only and for those that were unable to attend any of them the cassette tapes may prove to be quite educational.

The Electronic Architecture Workshop hosted by Marc Beningson of Jaffe Acoustics was well-presented with a rather convincing live demonstration at its conclusion. In addition, Beningson prepared a good-sized manuscript with a bibliography containing 16 references.

The eight seminars were also equally well attended as they too contributed to the level of quality educational information presented at this year's AES convention. This year's seminars included Fundamentals of Architectural Acoustics, From Fourier to Hilbert and Back Again, Small Room Acoustics, Don't Get Lost Among the Poles and Zeros, The Business of Audio: Economics of Recording Studios, Digital Theory Demonstration, Optimizing Stereo Imagery, and Education in Audio: Meet the Committee.

The Digital Theory Demonstration presented by Stanley Lipshitz was exciting in that for most of those present who had read about all those ghastly "digital distortions and aberrations" here was an opportunity to hear them for the first time! This year's AES Technical Programs were once again successfully presented to further educate and disseminate audio engineering information among the audio engineering community—a job well done.

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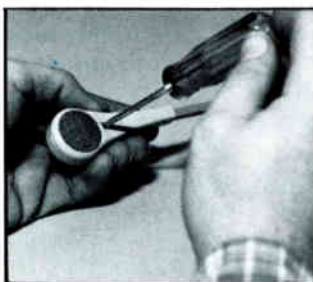
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to its line of portable PA products, the new AN-1000 portable/rack-mount powered speaker system. The AN-1000 features a small package (made possible by a computer-tuned, ported enclosure), 50-watt MOSFET amplifier, active equalization circuitry, front panel volume control and head-phone jack, and the unit may be rack-mounted in three spaces.

On the communications side, HM Electronics (HME) unveiled several new additions to its intercom line including the BH720 and BH721 belt pac stations, the RL742 rack-mount loudspeaker station, and the 700-18 lightweight headset.

Telex also introduced Audicom-Phase 2, a new line of intercom products complementing the existing com-gear line. The products shown included three power supplies, headset and speaker stations, and interface units. Telex also introduced an all new line of headsets, both more ergonomic updates of their popular single and dual muff headsets, as well as some new, lightweight "Walkman-type" models. Telex also showed a new line of low-cost wireless microphones the FMR-50 series, both handheld dynamic or condenser, and a body-pac.

What engineering convention would be complete without the showing of a product utilizing state-of-the-art engineering? Enter Audio Precision. Audio Precision has added functions to its System One audio test system (a comprehensive two-channel hardware/software package for the IBM PC) said to be the most complete intermodulation distortion testing capability for the professional and consumer audio industry. They are termed DIM/TIM (dynamic intermodulation-transient intermodulation) testing methods. Many experts suggest DIM/TIM phenomena as the reason why some audio systems sound differently from others even though they have the same specifications as measured by the older, more static test methods.

In "digital delay land" Audio Digital in addition to its line of delays and delay/processors showed the new ADX-2000 digital signal processor. The ADX-2000 is designed for any application where numerous inputs and outputs are required. The first module available performs delay, gain, and on/off functions making the unit applicable for cluster alignment, touring sound, and distributed system synchronization. User installable modules, programmability (either in-

A black and white photograph of a TOA 900 Series Amplifier control panel. The panel features several silver knobs and a toggle switch. Labels include 'INPUT 1', 'INPUT 2', 'INPUT 3', 'INPUT 4', 'INPUT 5', 'BASS', 'TREBLE', 'TONE', 'MASTER', and 'DEFEAT'. The text '900 SERIES AMPLIFIER A 903' is visible on the left side of the panel.

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ternally or externally via RS-232 buss), and software updates will further the potentials of the ADX-2000.

On the other side of “digital delay land” was the booth of Eventide Inc. Eventide, whose contributions to the world of DDL’s, is certainly a paramount factor in the development of DDL technology, has once again offered us something new—an analog impulse reverb tester. This “match book-sized” acoustical impulse generator reminds me of the “clicker” that Jackie Vernon used for his famous slide presentations on the Ed Sullivan Show.

Yamaha made quite a ruckus when it introduced the PM-1000 mixing console in the early 1970s, and again a few years later with the introduction of the PM-2000. Yamaha has outdone itself with the unveiling this year of the new PM-3000 series of professional mixing consoles. The copy reads, “The next generation has arrived.” The long-awaited 3000 may very well prove so.

The PM-3000 is available in three sizes: 24, 32, and 40 input, all with eight subgroups, stereo master, and 11x8 matrix. The most outstanding feature of the console is the eight VCA group masters section which controls the level of any input assigned to the VCA master (independent of the audio buss to which it is actually assigned). Another equally outstanding feature is the master mute function where each input may be assigned to one of eight mute groups which permit the channel’s on/off function to be remotely controlled by the corresponding eight master mute switches. Both the VCA and muting functions may be externally controlled via computer.

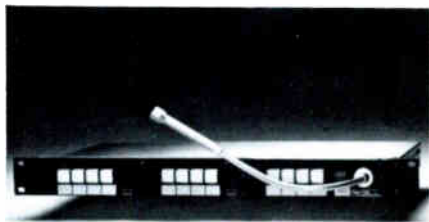
Yamaha also introduced its new P-series of commercial power amplifiers featuring the P2075C, an AC coupled 50/ch at 8 ohm amplifier.

Although it may not be directly applicable to our daily lives as sound contractors, Shure’s Home Theater Sound System was one of the more enjoyable demonstrations. The Shure HTS 5000 allows you to hear as if you were in a movie theater. “Avalanches, storms, battles, dramatic soundtrack music—all take on an exciting realism...” the Shure system “decodes” the Dolby Stereo information already encoded on stereo video cassettes and laser discs and provides a center “dialogue channel” as well as “surround channel” speaker outputs.

The HTS system must be experienced

(continued on page 39)

PRODUCTS IN REVIEW



NEW ZONE PAGING SYSTEM FROM CLEAR-COM

Clear-Com has introduced a new Zone Paging System for public address and paging applications. This system allows interruption of a facility's background music system for announcements or emergency calls to specific areas. The system's convenient size, ease of operation, and expandability can be used for many types of paging and security systems, including airports, bus terminals, theater complexes, shopping malls, factories, and medical centers.

Configured in "building block" modules (four channels each), the Zone Paging System permits up to 96 zones to receive audio programming and to be accessed from up to 50 locations. The system's output connects to power amplifiers feeding the paging speakers in various zones. The system includes adjustable, high-clarity goose-neck microphones, tally lights to indicate which zone is being accessed, and an All Page function that simultaneously accesses all zones.

The entire unit has a list price of under \$2,000.

□ Contact: Clear-Com, 1111 17th St., San Francisco, CA 94107; (415) 861-6666.

Reader Service #1



NEW AUDIO-TECHNICA CONDENSER MICROPHONE

A new phantom-powered unidirectional condenser microphone, the ATM33R, was introduced by Audio-

Technica at the recent Audio Engineering Society Convention last month. A Lo-Z (150 ohms) model is recommended for recording, broadcast, and sound reinforcement applications.

The response of the ATM33R, which covers a frequency range of 30 to 20,000 Hz, is described by the microphone's designers as being smooth overall, with a moderately rising high end.

Suggested pro net is \$250.

□ Contact: Audio-Technica U.S., Inc., 1221 Commerce Dr., Stow, OH 44224; (216) 686-2600.

Reader Service #2



NADY QUADPAK™ FOR WIRELESS OPERATION

Nady Systems, Inc. has introduced the QuadPak, a single case housing four Nady 701 VHF wireless receivers. The new QuadPak is rugged and portable, so it's useful for on-location use. With the Nady QuadPak, set up of multi-channel wireless systems is simplified. The unit also offers additional protection to the receivers during field production assignments.

The QuadPak can be powered by external DC, external AC or integral BP-90 type nicad battery packs. A single switch activates the multi-receiver system, and a single set of antennas attached to the face of the control panel serves all four receivers. The system can also be used with an external antenna.

Each of the Nady 701 true diversity receivers has an independent audio output. The receivers can be removed for repair or use outside of the unit.

□ Contact: Nady Systems, Inc., 1145 65th St., Oakland, CA 94608; (415) 652-2411.

Reader Service #3



EMERGENCY TELEPHONE INTERCOM SYSTEM

To provide emergency service for firemen and other authorized personnel, Soundolier has introduced a telephone intercom system that complies with the 1985 issue of NFPA Standard 72F for use of voice/alarm communications.

The modular system consists of a centrally located master control panel with appropriate audible-visual alarm annunciators for each fire protection zone. Either remote telephone stations or jack assemblies for portable handsets are used.

As many as five telephone stations can communicate with the master control panel at one time. The master control can also serve as switching facility to allow the telephone stations in remote fire protection zones throughout the building to intercommunicate.

□ Contact: Soundolier, 9380 Watson Industrial Park, St. Louis, MO 63126-1567.

Reader Service #4

CONTROLLED ACCESS SYSTEM BY MOUNTAIN WEST

Mountain West has announced a simple electronic door access system, designed for computer rooms, file rooms, accounting offices, etc.

This self-contained system may be fitted to most existing wood doors, and includes everything needed for installation and operation. The correct code combination unlocks the door in three to five seconds. Close the door and it automatically locks behind you. When personnel changes occur, simply change the four-digit code.

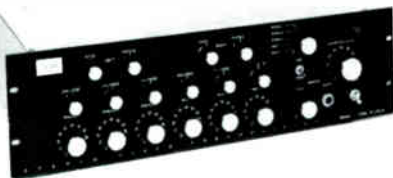
In addition to computer rooms and accounting offices, this access system is useful for residential door locks, in-



dustrial security, medical supply rooms, nursing homes, military secure areas, schools, small businesses, libraries, and museums.

□ Contact: Mountain West, 4215 N. 16 St., P.O. Box 10780, Phoenix, AZ 85064; 1 (800) 528-6169.

Reader Service #5



BOZAK OFFERS TWO NEW MIXER/PRE-AMPLIFIERS

Bozak has introduced its Model CMA-10-2DL and Model CMA-10-2DLS (above) stereo mixer/preamplifiers. The all-silicon, solid-state units were designed for professional reproduction of both live and recorded stereo programs.

Both units feature the ability to change any stereo input to phono or auxiliary, up to six stereo inputs, separate selectable cue for stereo input, two channel output, signal processing loop, broad dynamic range, and modular construction. Built for continuous use, according to the company, both units are rack mountable or portable.

As successors to the CMA-10-2D, the CMA-10-2DL and the CMA-10-2DLS are intended for night clubs and discos, small broadcast stations, background music and paging systems, and mobile sound systems.

□ Contact: Bozak, 68 Holmes Road, Newington, CT 06111; (203) 666-2536.

Reader Service #6



EVENTIDE ADDS REVERB & EFFECTS TO SOFTWARE

Eventide has enhanced its SP2016 Effects Processor/Reverb with four new reverberation programs, a vocoder program, and an automatic panner program.

The RMX Simulation Plus programs provide simulations of two of the most popular AMS RMX 16 reverb programs: Reverse Reverb and Non-Linear Reverb. But unlike the single channel AMS unit, the Eventide SP2016 gives the user two independent channels simultaneously.

As a counterpart to these special-effect-decay reverbs, a "Natural" Reverb, featuring natural decay ambience is also being introduced. A Gated Reverb program has also been added.

The newly-released Automatic Panner Program provides delay panning as well as amplitude panning functions. User-adjustable parameters make possible a wide variety of cross-fade and panning effects.

□ Contact: Eventide, Inc., One Alsan Way, Little Ferry, NJ 07643; (201) 641-1200.

Reader Service #7



NEW CTX PLUS CONSOLES FEATURE STATION STATUS

Centrex and PBX users now have a console (from Tone Commander) that provides department or group answering positions without a KSU. The consoles are completely self-contained and connect in parallel with the department lines providing station status monitoring and transferred ringing.

The CTX Plus consoles may also be

used in Centrex systems as primary answering positions for listed directory numbers and as alternate or back-up answering positions for primary back-up and forwarded extension calls.

The consoles have 10 or 20 assignable lines with distinctive ringing, auto-hold, hard-hold, transfer, privacy and night bell capabilities. They are fully compatible with Tone Commander's Centracom CTX for console back-up service and the CPC 600 console that provides the attendant with direct station selection, message waiting, station status, and busy lamp field.

□ Contact: Tone Commander, Box 1039, Redmond, WA 98052-1039; (800) 524-0024.

Reader Service #8



NEW SERIES OF SMALL CCTV-CAMERAS FROM RCA

A new series of CCTV cameras, featuring small size and offering the performance characteristics of a larger camera has been introduced by RCA Closed-Circuit Video Equipment.

The TC500 camera weighs less than 1.5 pounds. According to RCA, size is combined with high performance: the TC500s offer 500 lines of horizontal center resolution from a one-half-inch vidicon tube. Useable video pictures can be obtained from scene illuminations of only one footcandle.

Automatic light compensation adjusts to changes in scene illumination up to 10,000 to one and contributes to consistent picture quality; line locked for smooth switching and VCR operations.

Designed for any indoor general purpose applications, the camera can be used for both small applications and for large multiple camera systems.

□ Contact: RCA Closed-Circuit Video Equipment, Marketing, New Holland Ave., Lancaster, PA 17604-3140; (717) 295-6764.

Reader Service #9



BEYER DYNAMIC'S MODULAR SOUND CONTRACTOR LINE

Beyer Dynamic, Inc. has announced the introduction of a full line of modular sound contracting equipment. The new Beyer line includes a four channel mixer/amplifier, a 120 W power amplifier, a 10 W modular power amplifier designed to drive speaker zones, one and two-tone paging signal generators, an octave equalizer, a frequency shifter, relay controlled zone switchers, a 70 V line attenuator, modular jack fields, a complete line of acoustic speakers for ceiling or wall mounting.

The new Beyer sound contracting

product line features the E 2300 TE-1, a four-channel, 120 W mixer/amplifier with four balanced mic inputs, two auxiliary inputs and outputs for 50 V, 70 V or 100 V lines as well as a direct 8 ohm output and a +6 dB line for slaving other amps.

Like the E 2300, the E 2100 120 W power amp is short-circuit proof, open circuit proof and protected against thermal overload. The E 2100 is an expandable design which offers the same output flexibility as the E 2300. Plug-in modules are available to add either a treble and bass equalizer, low- or high-pass filters or a mic/preamplifier.

The E 2610 10 W amplifier module series has its own gain, treble and bass controls and an LED output meter. E 2610 modules are available with RC, studio level or microphone inputs, or with a studio level input with a reverse-sign relay for phase switching.

□ Contact: Beyer Dynamic, 5-05 Burns Ave., Hicksville, NY 11801; (516) 935-8000.

Reader Service #10

ASAP ALERT OFFERS ALARM MONITORING SYSTEM

Command Communications, Inc., has introduced the Asap Alert, alarm monitoring and alerting system, designed and tested to work with the new technology of digital display pagers.

The Asap Alert will instantly alert the user to any changing alarm condition within seconds via a display Pager, automatically displaying the programmed location code identifying which Asap Alert is calling.

The compact Asap Alert activates from either normally open or normally closed alarm contacts—momentary or permanent. With a total memory capacity of 40 programmable digits, the system will sequentially dial each programmed number, at adjustable two-minute intervals

□ Contact: Command Communications Incorporated, 8000 E. Girard Ave., Suite 416, Denver CO 80231; (303) 750-6434.

Reader Service #11

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Reader Service #219

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Reader Service #220

a closer look

by gary d. davis



BOSE DEBUTS MODEL 102 COMMERCIAL SOUND SYSTEM

Bose Corporation has introduced its Model 102 Commercial Sound System, the heart of which is the familiar 4.5-inch Bose full-range driver with helical voice coil. The driver is mounted in a ported enclosure, either in flush mount or surface-mount versions. Both versions are said to offer 80 Hz to 18 kHz frequency response, wide dispersion, and 25 watt power handling capability. They come standard with factory-installed transformers for all common constant-voltage standards, as well as with power tap selection switches. Both models are available without the transformer, in which case the impedance is 8 ohms.

Bose's product manager Paul McKinley said the 102 is designed to meet the requirements of a foreground music speaker, and to be easily installed. Ostensibly, the high performance drivers permit fewer loudspeakers to cover a given area, resulting in cost savings.

The flush-mount version is designed for retrofit into existing eight-inch "canned" installations, and for easy mounting into studded walls. It is compatible with industry standard mounting hardware and grilles, and an optional snap-on grille is available.

The surface mount version was developed for foreground applications where flush mounting is not possible. It has a rugged, injection molded enclosure, optional mounting brackets, and can be installed in a variety of configurations.

Bose said that its 102 System Controller optimizes speaker performance and eliminates the need for expensive signal processing equipment. This

chassis contains two channels of music-optimized equalization and one channel of voice-optimized equalization. Bose's Opti-Voice™ circuit electronically maximizes speech intelligibility for clear paging.

Comments: Over the years, Bose has offered quite a few interesting variations on its original theme of using small, wide-excursion cone-type drivers, along with compensatory EQ, to cover the full frequency range. The 102 represents a specialized packaging of this concept for contractors' use in foreground/background music and paging systems. The pre-wired transformer with power-selection switches should prove to be a time-saving feature, especially since the switch can be set from the front of the unit after it is installed.

By using a 4.5 inch diameter driver in lieu of the standard eight-inch driver, the speaker will certainly offer wider dispersion. The only problem then becomes getting enough sound level out at the low end of the spectrum. The wide excursion driver plus EQ has in other Bose products have delivered on the bottom end, but the trade-off is efficiency. The plastic enclosure is ported, which should help recover some of the low-end efficiency relative to open-backed eight-inch designs. Since the drivers are rated at 25-watts (pink noise with music EQ curve), they should be able to pump out a reasonable sound level. The trade-off for the system becomes one of fewer loudspeakers due to the wider dispersion (which certainly does save on installation costs and time), but more or larger power amplifiers due to the lower sensitivity.

The "opti-voice" EQ tailors the signal to match the sensitivity curve of the speakers. The voice input EQ includes a sharp cutoff at bottom end to avoid mic handling noise, and at the high end to reduce sibilance and feedback problems. The system controller also includes an AGC (compression circuit) for the voice input to further improve intelligibility. This affects the voice input, and can be calibrated to

the paging mic to avoid clipping the amps. The automatic voice-over feature simply gives priority to the voice input, mutes music down about 30 dB, and avoids the need to manually turn off the music. The voice-over feature can be switch defeated. This looks like an interesting alternative and is worth your closer look.

□ Contact: Bose Corporation, 100 The Mountain Road, Framingham, MA 01701; (617) 879-7330.

Reader Service #20

ADC INTRODUCES TWO SERIES OF PATCHBAYS

At the recent AES show, ADC Telecommunications unveiled two different series of patchbays, Pro Patch MKII and VAMP (Video Audio Modular Patchbay), both of which offer a unique approach to jack labeling. They feature ADC's self-adhesive identification label system (SAILS) which permits a standard computer printer to be used for creating jack designation strips.

According to ADC's Joan Nelson, the Pro Patch MKII Series are self-contained audio patching systems. The chassis is 2 x 24 jacks in size, and the jacks are T/R/S long-frame type, and are available with normals strapped at the panel, or they may be brought out of the bay. Connections are made via QCP insulation displacement connectors. The bay is field serviceable from the front or the back without removal from the rack (removing four front panel screws permits the floating jack panel to drop forward).

The VAMP Series is specially designed for broadcasters who don't necessarily work with 2 x 24 jack minimum configurations. Audio and video patching can be mixed in the same chassis, and as few as one audio and one video circuit can be installed, with blanks filling out the rest of the rack width.

□ Contact: ADC Telecommunications, Inc., 4900 West 78th St., Minneapolis, MN 55435; (612) 835-6800.

Reader Service #21

AES REVIEW

(continued from page 32)

cassettes and laser discs and provides a center "dialogue channel" as well as "surround channel" speaker outputs. The HTS system must be experienced at your local audio/video salon to be fully appreciated. It includes a digital delay for varying room sizes.

Amek Consoles introduced its Tex 10 Electronic Crossover Network which consists of a three unit high, 10 position rack with power supply, and is capable of up to five-way stereo performance.

In addition, Amek debuted its multibroadcast console (MBC) and its TAC Scorpion Recording Console.

Studer showed its A725 Professional CD Player which is designed for a wide range of applications, including broadcast production and on-air playback. Special control software provides multiple disc cueing modes, as well as exceptional cueing accuracy, according to the company.

TOA Electronics introduced its new J series condenser microphones. The J microphones are dynamic and are suitable in three different types of applications, according to the company.

The J1 is a switchable microphone allowing the user to use it in a voice mode or an instrumental frequency range. The J2 is utilized as an instrument pickup.

Community Light & Sound introduced the RS327i loudspeaker, which was conceived from a marketing study which determined a need for a version of the RS325i with additional low frequency response. Outwardly, this new enclosure is only slightly deeper and taller than the RS325i, while internally, the volume of space has almost been doubled, with a ducted port that runs the entire width of the cabinet, resulting in an extended low frequency response approximately one-half octave lower than the RS325i.

Community also showed its new series of performance/installation loudspeakers, the CS25 and CS35.

Audio Technica made two introductions at this year's AES. The company debuted its ATM5R miniature unidirectional handheld condenser microphone and the ATM33R condenser unidirectional microphone.

Sennheiser was also there with its new MZA 16 TU and MZA 16 P48 U power supplies which are said to provide 12 V A-B powering (-TU) or 48 V phantom powering (-P48U) for one

microphone, and are compatible with Sennheiser's one of RF condenser microphones.

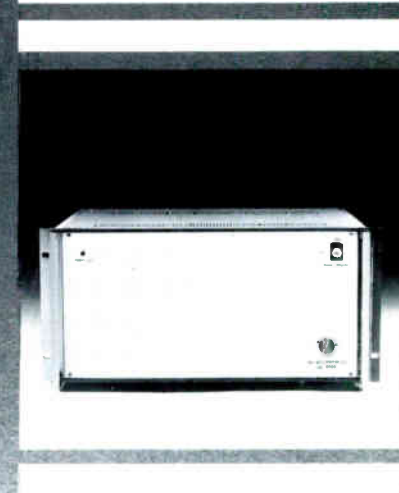
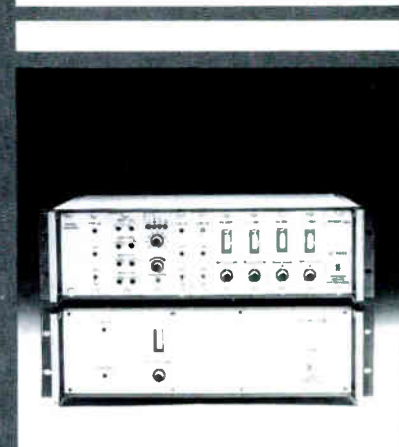
Each unit operates from a single 9 V rectangular "transistor-radio" battery, and employs a DC-to-DC converter to provide the appropriate operating voltage.

Meanwhile at the Shure booth, the company demonstrated its SM91 unidirectional condenser microphone and the SM90 omnidirectional condenser microphone—two complementary surface mount products.

Like the "pressure zone" microphones in common usage, the Shure SM91 and SM90 take advantage of the acoustic principle of boundary effect, according to the company. Because of this principle, placing either a Shure SM91 or SM90 microphone sufficiently close to a barrier or boundary, e.g., wall, floor, ceiling, table, piano lid, will cause it to perform with as much as 6 dB higher sensitivity and approximately 3 dB greater rejection of random background noise.

Other exhibits of interest included Beyer Dynamic which exhibited its line of dynamic microphones including its condenser mics, professional headphones, stands, booms, and accessories. AB Systems, Inc. showed its Model 1100, two-channel power amp which incorporates a "logic operated gated output" stage. ADC Telecommunications exhibited its latest generation of audio Patch Bays—including the Pro Patch MKII Series. RPG Diffusor Systems, Inc. had its complete line of reflection grating diffusors said to enhance the acoustics of any critical listening performing environment. Klark-Teknik Electronics was present with its DN780 Digital Reverb, DN300 series equalizers, Brooke Siren Systems DPR402 compressor/limiter, and the FDS300 series crossovers. Bruel & Kjaer introduced its RASTI method for measurement and analysis of speech intelligibility using B&K type 3661 Speech Transmission Meter. B&K also demonstrated instructions for audio, electroacoustic and acoustic measurements. Cetec Ivie displayed its line of octave and third-octave real time analyzers plus its 5000 modular commercial sound reinforcement electronics including mixers, EQs, compressors, and amplifiers. AKG Acoustics, Inc. showed its line of microphones, headphones, and reverb systems.

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Reader Service #221

NEW PRODUCT ANNOUNCEMENT FROM PANDUIT



Bulletin Describes Panduit® Winged Push Mount Cord Clip

A new bulletin is available for Panduit Corp. describing a winged push mount cord clip which retains wire, tubing and cable up to .38-inches diameter.

The cord clip is an integral mounting device which eliminates the need for additional mounting hardware. Snap the mount into a pre-drilled .250-inch hole in panels up to .105-inches thick. The cord clip portion is said to allow easy installation or removal of wire, tubing, or cable.

The winged design holds the mount securely in place even in installations subjected to vibration.

Contact: Inside Sales Dept., Panduit Corp., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981; (312) 532-1800.

1984 Index to IEEE Publications Lists Over 1300,000 Entries

The Institute of Electrical and Electronics Engineers, Inc. has announced the publication of the *1984 Index to IEEE Publications*. In 1984 IEEE's massive periodicals and publishing programs accounted for over 125,000 technical pages. The annual Index covers the totality of IEEE publishing.

The latest combined Index provides access to all IEEE-published papers, articles, conference records, and other communications covering electrical/electronic/computer science and engineering. The 1984 Index lists over 21,000 technical items and contains 130,000 entries. Information is provided by author and subject.

The *1984 Index to IEEE Publications* (JH73411) is priced at \$100 for IEEE

members and \$200 for nonmembers. Contact: IEEE Service Center, 450 Hoes Lane, Piscataway, NJ 08854-4150.



Micro Tech® 1000 Brochure Available From Crown

A four-color brochure detailing the operation and features of the Crown Micro-Tech® 1000 is now available from Crown International, Inc. The brochure provides four pages of text and photos describing the MT-1000 and its features. The Micro-Tech® 1000 is a miniaturized yet high technology stereo power amplifier for professional sound reinforcement and studio monitoring.

Contact: Literature Room, Crown International, Inc., 1718 West Mishawaka Road, Elkhart, IN 46517; (219) 294-8000.

Communications Equipment Guide Published by ICIA

The 1985-86 edition of *The Equipment Directory of Audio-Visual, Computer and Video Products* has been published by the International Communications Industries Association (formerly the National Audio-Visual Association).

The 31st edition of the guide features over 2,000 products from more than 450 manufacturers. In 564 pages, it includes some 1,500 product photographs and uniform specifications on all listed items — prices, model, dimensions, applications, accessories and technical details.

The price for users of communications products is \$25 per copy (prepaid), or \$29 per copy (billed).

Contact: ICIA, 3150 Spring St., Fairfax, VA 22031-2399; (703) 273-7200.

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Reader Service #222

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SCHOOL

(continued from page 18)

corporation of many electronically controlled concerns, such as telephone communication, energy management, and administrative techniques, into one centralized computer-controlled unit.

James said that he sees microprocessor-controlled equipment's largest advantage as being its decentralized features. "With our Telecenter 4 and Telecenter 5000, you can have multiple control positions on key administrator's desks," James explained. "Today's administrator doesn't have time to walk down the hall and flip switches. They want to satisfy their communication requirements and get on with the business of administering the school."

Bogen offers the Communitel I and Communitel II which combined with its Multi-Graphic series of conventional school equipment, has prepared the firm to service both the conventional and microprocessing market in the future, company officials said.

The Leader Series of conventional school equipment has been Dukane's main system. Now the company also offers the Modular 1200 microprocessor-controlled console featuring 800 call points.

Dukane said it plans to soon release a small microprocessor-based unit that will service small to medium applications with expandability features.

The Elvox division of Paso Sound Products Inc., has both the 142 and 144 Series of conventional school systems plus the newer Compucom system with 40 control points. The Compucom capitalizes on the decentralization method.

Elvox is one of the world's largest intercom handset manufacturers. The Italian-based firm has 75 percent of the market in its home base of Italy and a good share of the market internationally, according to Moore.

User programmable room numbers has become popularly requested in recent years as school administrators begin realizing features what today's technology can provide. User programmable features are invaluable when a school has been wired in an unorthodox manner. In the past, the system was indebted to the wiring configuration. Today, and combination can be programmed to fit the need.

"We did a survey a few years back, and we found that most schools don't

need multichannels," said Glaubitz. "Most schools use 'all call' in the morning for announcements or individual call for teacher contact. They're very simple systems."

Microprocessor-based equipment has livened up an industry which has remained quite stable. It has also enabled manufacturers the luxury of adapting the mainframe equipment to applications other than schools. Some manufacturers, for example, have been looking at hospitals with their microprocessor-based equipment.

According to Don Glaubitz of Cornell Electronic Products in Milwaukee, WI, "Many of our systems are put in nursing homes, military dormitories and BOQs. That's where the market is, they're just not building that many schools anymore."

Cornell offers the 7000 Series Intercom—a single paging channel intercom with zone free, all call, and individual and intercommunication via a telephone. The system can service up to 1,000 rooms.

Simplicity of operation, always a concern in school communications and especially so with the emergence of the sometimes more complicated microprocessing gear, has become a trade-off in engineering and price with many manufacturers. "Simplicity is the over-riding thing in this market," explained Dorwaldt. "To design a system that can do many things is easy, but to make that system so everybody can operate it is not as easy."

Fulfilling Special Requirements

One manufacturer of microprocessor-based equipment, Earl Zausmer of Siedle Intercom in Wynnewood, PA, offers a school communications system which features *no* central switching console. The system, the Siedle SIC Microprocessor-Controlled Series, was recently installed in a school in Pennsylvania. The school had previously used telephones as its communications system.

"We ran wire down the main hallway and each of the classrooms picked off of it," Zausmer explained. A microphone was also placed on each end of the hall for paging.

"The system allows every room to talk to every other room," Zausmer said, "as well as paging, monitoring, and music. In the classrooms, their is also an open voice handset for when the teacher wants to speak privately."

A variation of the same system was
(continued on page 43)



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off.**



Introducing the Shure 838—a moderately priced condenser lavalier mic you can count on. Other lavalier mics break down so often that announcers wear a backup mic on the air. But with the 838 you get Shure reliability. Plus an adjustable four position mount, a side exit tie bar clasp that conceals its cable and reduces noise, and an easily replaceable 9V battery and cartridge.

Why buy two mics when one will do the job? Check out the new Shure 838.

SHURE

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DATE	EVENT/COMMENT	LOCATION	CONTACT
November 21-22	Electronic Sound & Systems Conferences, Inc. Regional educational conference and exhibit sponsored by the NSCA and ERA.	The Sheraton-Washington N.E. New Carrollton, MD	Bob Barba (312) 593-8360
December 2-3	Electronic Sound & Systems Conferences, Inc. Regional educational conference and exhibit sponsored by the NSCA and ERA.	The Westin Oaks Galleria Houston, TX	Bob Barba (312) 593-8360
December 3-6	North America Telecommunications Association Show.	Infomart Dallas, TX	NATA Convention Department Washington, DC 20036 (202) 296-9800
December 5-6	Electronic Sound & Systems Conferences, Inc. Regional educational conference and exhibit sponsored by the NSCA and ERA.	The North Park Inn & Convention Center Dallas, TX	Bob Barba (312) 593-8360
December 9-13	Video Expo Orlando Exhibit of the latest video equipment and technology.	Hyatt Regency, Grand Cypress Orlando, FL	Video Expo (800) 248-KIPI (914) 328-9157 in NY
January 18-20	Commtext International Communications Show for A/V, video, computer hardware & software.	Las Vegas Convention Center Las Vegas, NV	Commtext (703) 273-7200

TEK-ENTRY SERIES



TekTone's Tek-Entry Series Telephone Entry Systems are complete, automatic call and entry control systems, designed for easy operation and reliability.

Entering a simple 2 (or 3) digit code initiates a system call to the correct phone number. Entry is then permitted by the tenant, if desired. Front panel programming is push button simple.

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SCHOOL

(continued from page 41)

used outside the school. "We set up a condenser mic with the European equivalent of a Dolby noise reduction system. The mic can monitor kids from 70-feet away. The mic also has a built-in heater, so it can be used year round. The system outdoors offers a frequency of 40 to 18,000 cycles. Indoors the frequency is 70 to 18,000 cycles.

A security system was also installed. A door unit at the main entrance is turned on after school hours. When someone comes to the door and pushes the button, the speaker pages all the rooms. So no matter where the janitor is working he can talk to whomever is at the door.

"The best thing about this system is since there is no central switching console, the system costs less than half the average system," said Zausmer.

In addition, today's school communication hardware is becoming smaller. "All that hardware that was so common in the past is not necessary due to the advancement in technology," said Moore. "That means easier installation, easier maintenance, and more room for a school."

Sound and Communication Dealers/Installers

Currently the network of school system distribution is approximately the same as it was 20 years ago. Sound and communication dealers have remained the major distributors and installers. This base will be tested for strength in coming years, some manufacturers believe, as more microprocessor-based equipment goes out on a market where most wiring and other technical expertise won't be needed in a predominately retrofit market.

One demise for the newer dealer is finding a manufacturer that is without a franchisee or dealer in his geographical area. Flothe, a 20-year veteran contractor of the industry, saw the problem as one of the inspirations to beginning his new manufacturing firm, Delta Communications. Flothe's initial product is the console, the Deltacom 2600, was introduced last spring.

"These people already have their foot in the doors of many schools because they've done repairs, but they aren't dealers for any one company," Flothe said. "They've never had the product to replace units with."

MOVING?

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

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COMPANY

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CITY STATE ZIP

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Carle Place, NY 11514

Studer Revox PR99

The Audio Production Machine



For quality recording and fast editing. Your production work will move faster thanks to the microprocessor control features of the new PR99 MKII. Features like a real-time counter with six segment LED display of hours, minutes and seconds. Accurate search-to-cue and search-to-zero. Automatic repeat of a timed tape segment of any length. Plus edit mode, tape dump, self-sync, track bouncing, and variable speed control (all standard). Options include roll-around console, carry case, and monitor panel.

For reliability and serviceability. One look inside and you know the PR99 MKII is built to last. Take note of the die-cast

aluminum chassis and headblock, precise Swiss/German craftsmanship, modular electronics, and industrial grade components. And it's all backed by an established worldwide parts and service network.

For cost-effectiveness. Add a sensible price to the list and you come up with an outstanding ATR value. The new PR99 MKII audio production machine is available now from your Revox professional products dealer.

STUDER REVOX

Studer Revox America, Inc., 1425 Elm Hill Pike, Nashville, TN 37210. (615) 254-5651

Reader Service #232

FACES AND PLACES



**Ruby
Hunsberger**



**Mack
Herman**

Crown International Announces Changes

Crown International has announced that Ruby (Moore) Hunsberger, co-founder and chairman of the board for Crown International, Inc. since 1979, has retired from the daily decision making of the company.

Mrs. Hunsberger cofounded Crown 35 years ago with her former husband, the late Clarence Moore. During Crown's beginnings, she managed all the household affairs and worked 50 to 60 hours a week as credit manager, supervisor of the office staff and Moore's secretary. When Clarence died in 1979, she assumed Chairmanship of the Board of Directors.

Mrs. Hunsberger has been serving as Chairman of the Executive Committee of the Board but has appointed her son, Clyde Moore to take her place in this position.

In addition, Crown has announced the appointment of Herman Mack as an engineer in its Prototype Engineering Group.

Mack comes to Crown from Baltimore Electronics Associates where he held the position of chief engineer. At Crown he will be responsible for working on electronic prototypes, preparing them for production.

Monster Cable Expands Sales & Marketing Department

Monster Cable is expanding its marketing and sales effort with the promotion of Paul Stubblebine to sales manager of worldwide operations; and the appointment of Karen O'Brien to the position of marketing manager, it was announced by Noel Lee, president of the firm.

Filling the newly created position, Stubblebine has responsibility for managing and coordinating the company's entire sales department, which includes the Hi-Fi, Pro Audio, Com-

puter, Export and Government Sales Divisions.

Previously, Stubblebine served as national sales manager for the firm's Pro Audio group. This position is now filled by Karen O'Brien.

O'Brien will be responsible for producing all new product literature, developing advertising and promotional campaigns, and coordinating trade shows.

Previously, O'Brien was an art director for Lechmere, a major department store chain in New England.

Vanguard Telephone Names Budelman Principal at Company

Frank J. Budelman has joined Vanguard Telephone as part of an effort that had its beginnings two-years ago to strengthen Vanguard's management team, according to David S. Calef, Vanguard president. Budelman will be a full principal in the corporation.

Budelman's major efforts will be in sales and marketing for Vanguard, as the company increases its staff throughout the New England region. The addition of another top executive assigned to administration, finance and personnel is planned for the future.

Audiotronics Appoints Oyama Product Development Director

The Board of Directors of Audiotronics Corporation, has announced the promotion of G.C. Oyama to assistant vice president, New Product Development.

Oyama has been instrumental in the design and development of Audiotronics' product line. He has played key roles in designing the Audiotronics audio-visual equipment and video monitors for closed-circuit television.

NSCA Appoints Warden Membership Services Manager

Harold B. Lander, president of National Sound & Communications Association, has announced that Mary Beth Rebedeau Warden has joined the NSCA administrative staff as membership services manager. This new position was created to develop support materials for NSCA members.

Position responsibilities include the

development of job and bid checklists and worksheets, labor unit, sales and labor cost surveys. The results will be distributed to NSCA members.

"Sharing information is what NSCA is all about," said Lander, president of Signal Communications, Seattle, WA. "Our membership services manager will be collecting this data and making it available to all of our members."



**Mary Beth
Warden**



**Gary H.
Rilling**

Altec Lansing Names Rilling Vice President of Marketing

F. Davis Merrey, Jr., president of corporation, a Gulton company, has named Gary H. Rilling vice president of marketing, and a corporate officer of the Altec Lansing Corporation. In his new post, Rilling will be in charge of distribution and promotion of Altec Lansing sound products worldwide.

Rilling joined Altec Corp. in 1974 as district manager, and was later promoted to regional manager. He was brought to company headquarters and made national sales manager in 1979, and was made vice president of commercial sales (USA) in 1981.

Silver Named President of Reeves A/V Systems, Inc.

Robert E. Trivers, president of the New York companies of Reeves Communications Corporation, announced that Joan V. Silver has been promoted to president of Reeves A/V Systems, Inc., a U.S. dealer of broadcast and industrial video equipment.

Upon making the announcement, Trivers said, "Joan Silver has the leadership and experience necessary for this highly competitive industry. Joan is cost conscious and profit-oriented—the qualities responsible for leading the Reeves Audio Visual Company to four consecutive profit-record years."

REP NEWS

The second annual **James B. Lansing Award** for outstanding achievement in overall sales and new market development, was presented to **Dobbs-Standford Corp.** of Dallas, TX, during JBL Professional's recent national sales meeting in New Orleans, LA. **Fred Dobbs**, president and **Mike Reed**, sales manager accepted the honor from JBL's president **Ron Means** and vice president/sales **Ken Lopez**.

LCA Sales of Tuckahoe, NY, has announced **Robert Dvorak**, director of operations at **Ritz AV-Cine**, as the first prize winner in LCA's **Birthdays Bash Contest**. Dvorak, who won a Sony Watchman, correctly guessed the total number of years of electronics experience for all the LCA employees combined. The correct number was 220.

Two second prize winners, **Philip Martin**, owner of **Adirondack Loss Prevention**; and **A. Harari**, vice president of **Capital Audio**, received Seiko Talking Quartz Clocks.

Three third prize winners, **John Jancef**, president of **Federal Electronics**; **Neal Rubin**, vice president of **Universal Video Electronics**; and **Irv Weissman**, national sales manager of **BES, Inc.**, received travelling telephone dialers.

USAudio has announced the appointments of several sales representatives, including: **Darmstedter Associates**, **Electro-Acoustic Marketing**, **Wilson Audio Sales**, **Bencsik Associates**, **RM Associates**, **Dobbs-Standford Corporation**, **YoreCo**, **North Shore Marketing**, and **Radon Associates**.

John Stiernberg, field sales manager for **Bose Corporation's** Professional Sound Systems Division, has announced a restructuring of product sales representation, to accommodate expanded product lines and increased business in dealerships throughout the country.

Formerly serviced by factory representatives, Bose pro dealers will now work with independent sales representatives in the commercial sound area. Factory people will remain in the field to support and manage this new effort, Stiernberg said.

The following rep companies have been named by Bose: **Vector Corpo-**

ration of Seattle, WA; **Westech Marketing** of Culver City, CA; **Rancilio Associates, Inc.** of St. Louis, MO; **Lichtenauer & Associates** of Antioch, CA; **Rep-Tech** of Terrell, TX; **Secom Systems** of Chamblee, GA; **Bencsik Associates** of Ocala, FL; **Kodo Associates, Inc.** of Minneapolis, MN; **Ziskind Associates** of Rolling Meadows, IL; **Piper Associates, Inc.** of Needham, MA; **Associates Sales Representatives, Inc.** of Baltimore, MD; and **Monfort Electronics Marketing** of Indianapolis, IN.

Panduit Corp. has appointed **FP Sales** of Albuquerque, NM, as its exclusive sales representative of the full product line.

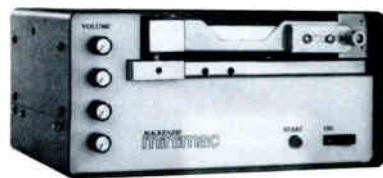
FP Sales will represent Panduit in New Mexico and El Paso County, TX. **John Fairchild** and **Pat Power** are partners in the firm which will call on electrical, electronic, and specialty distributors as well as OEM and other accounts.

Ray Updike, sales manager of **Valley People, Inc.**, has announced the appointment of the following representatives for the company's product line: **Darmstedter Associates**, **Electro-Acoustic Marketing**, **Wilson Audio Sales**, **Bencsik Associates**, **Dobbs Standard Corporation**, **YoreCo**, **RM Associates**, and **Radon and Associates**.

The **Electronic Representatives Association (ERA)** has announced the publication of the 1985/86 edition of its **Locator** directory. The 270-page issue is the largest ever produced by the association.

The **Locator** is designed as a reference source for electronics manufacturing sales personnel. It lists professional representation available in every geographic territory of the U.S., the Caribbean, Canada, Europe, and the Far East.

More than 7,000 copies of the 1985/1986 **Locator** have been printed, and distribution has begun to qualified manufacturing personnel. ERA also distributes the directory at 15 major electronic industry shows annually. Copies of the **Locator** may be requested by electronics manufacturers by contacting the ERA's national office at 20 East Huron St., Chicago, IL 60611; (312) 649-1333.



MacKenzie's New MiniMac Series II Message Repeaters

MacKenzie's new MiniMac Series II Message Repeaters are compact, full-fidelity, rugged tape players ideal for adding repetitive sound to:

- Exhibits and displays
- Trade shows
- Safety messages
- Training programs
- Museums
- Sales and POP

MiniMac is warranted for one full year of *continuous* service, even if you run it 24 hours a day. That's 8,760 hours, and even then we think we're being conservative.

For heavy-duty applications, MiniMac uses MacKenzie's exclusive *PourDrive* tape cartridge, a proven tape-transport system which greatly reduces friction, eliminates tape stretching, and provides exceptionally long tape life. For lighter-duty applications, MiniMac is also available with standard Lear-type tape cartridges.

MiniMac's solenoid-operated tape cartridges start and stop *instantly*. All pressure is removed from the tape when it isn't running, preventing pinch roller flats and tape sticking.

MiniMac is only 4½" high x 9¾" wide x 7" deep and weighs just 10 pounds. All models are stackable—great for audio visual installations where space is limited.

MiniMac comes in three models, all featuring cool-running, direct-drive DC motors and state-of-the-art circuitry. *MiniMac 1* has one audio track, a 'B' control track, built-in slide synchronization, power amplifier, and speaker. *MiniMac 2* has two audio tracks with line-level outputs, as well as built-in power amplifier and speaker. *MiniMac 4* has four audio tracks with line-level outputs. All models feature remote start and automatic stop.

For more information about these new MiniMac Series II models, call toll-free: 800-423-4147.

MACKENZIE

5507 Peck Rd., Arcadia, CA 91006 USA
Telephone (818) 579-0440



AUDIO CONNECTOR LINE FROM KULKA-SMITH INC.

Kulka-Smith Inc., a North American Philips Company, has announced the availability of a complete line of precision, Swiss-made audio connectors. Marketed in the United States exclusively by Kulka-Smith, the Neutrik line includes XLR connectors and receptacles, microphone shafts, and other performance-proven audio accessories and hardware.

Neutrik products offered by Kulka-Smith is the new "X" Series of XLR audio connectors that consist of only four parts and eliminate the need for set-screws or crimping. This new connector is available in both male and female styles, either in satin-nickel or black chrome finishes.

Of interest to designers and installers of audio equipment is the new Kulka-Smith line of Neutrik modules and adapters. These products allow for maximum flexibility in interconnecting various studio components, transformers, filters, switches, and other devices.

Contact: Kulka-Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736; (201) 223-9400.

Reader Service #15



NEW MIC POWER SUPPLIES FROM SENNHEISER

Sennheiser Electronic Corp. has introduced two power supplies for the

company's RF condenser microphones. Designated as the MZA 16 TU and MZA 16 P48U, these power supplies provide 12-V A-B powering (-TU) or 48-V phantom powering (-P48U) for one microphone.

Each unit operates from a single 9-V rectangular "transistor-radio" battery, and employs a DC-to-DC converter to provide the appropriate operating voltage.

In addition to providing operating power, the MZA 16s contain a 0/-10/-20 dB switchable attenuator, and a switchable 12 dB/octave low-frequency roll-off filter with corner frequencies of 20/80/140 Hz. Additional controls are an On/Off switch and a push-button battery test switch with LED indicator.

Contact Sennheiser Electronic Corporation, 48 West 38th St., New York, NY 10018; (212) 944-9440.

Reader Service #16

FSR ANNOUNCES SERIES OF MICROPHONE SWITCHERS

FSR, Inc., has a new, complete line of microphone switchers including the MIC-1, the MIC-2, and the MIC-8 Hi-Z. Each unit installs in its own mounting track, and features barrier strip mounting, and silent switching.

The MIC-1 is used to switch between a podium mic and a lavalier mic when both units have separate lines to the mixer. The MIC-2 is used if both mics feed one mixer input. The MIC-8 Hi-Z switches a maximum of eight different audio sources to a single output.

Contact: FSR, Inc., 40 Commerce Road, Cedar Grove, NJ 07009; (201) 783-3966.

Reader Service #17

MAGNAVUE INTRODUCES PHONE CLEANING SYSTEM

Magnavue, Inc. has introduced its Magnakleen cleaning system to the telephone industry. During the past few years, the Magnakleen Cylsonic cleaning system has been successful in cleaning electronic parts and components in the aerospace industry.

Now, Magnakleen has moved into the telephone industry. According to Magnavue, Magnakleen is designed to cut cleaning time and labor time up to 50 percent through the use of the new



system of cylsonics and biodegradable soaps.

Contact: Marketinc, 222 S. New York Ave., Suite 5, Winter Park, FL 32789; (305) 645-5825.

Reader Service #18



BECKMAN INDUSTRIAL DEBUTS EASY CABLETESTER

The Instrumentation Products Division of Beckman Industrial Corporation has added the new RS-232C Easy Cable Tester to its communications product line that is used for identifying cable configurations and testing new cables.

Called the Easy Cable Tester, Model 715, the test instrument enables the technician installing data transmission systems to verify that the cable is configured properly before installation. Using the optional Remote Indicator, the cable can even be tested after installation, even if each end is in different locations. This hand-held instrument will test all types of RS-232C cables.

Contact: Beckman Industrial Corporation, 630 Puente St., Brea, CA 92621; (714) 671-4800.

Reader Service #19

IDEAS & VIEWPOINTS

(continued from page 6)

Countering The "Threat"

There are three things American manufacturers can do to counter the "Japanese threat." First, they can simply continue to do what they are now doing: worry and talk. Second, they can lobby for government-enforced trade barriers. Third, they can re-examine the problem, understand the real threat and deal with it in a rational manner.

Obviously, the first solution is not effective, so let's take a look at the second alternative. It's one that has already been adopted by other U.S. industries. Effective trade barriers could prevent Japanese infiltration of U.S. sound and communications markets. That would keep U.S. manufacturers in business, save jobs, and so on. It would almost certainly work and could keep working as long as the barriers remain. So why not choose this alternative?

First there's the trade war possibility. The more U.S. barriers, the more barriers other countries will put up. "But," you say, "we already have the most open markets in the world. Why should we continue to accept goods from any country that has barriers against our goods?"

Because, the Japanese are, right now, dropping their trade barriers. No one thinks they are moving fast enough, but everyone agrees they are moving. Putting up more U.S. trade barriers now would be a poor response to this encouraging effort on the part of the Japanese and would leave us in a poor negotiating position to ask for more compromises.

Also, a very important component of the high standard of living in the U.S. is directly attributable to the 'open markets policy.' The "flood of low-cost foreign goods" coming into this country makes it possible for each American, as a consumer, to lead a better lifestyle than if they had to purchase the same goods, at higher prices, from U.S. manufacturers.

And, just for a moment, examine the harm those low-cost foreign goods do. There's no question but what, in the short run, jobs are lost and U.S. dollars flow out of the country. *But why is it so bad to see those dollars leave the U.S.?* This is a question I've asked again and again, and I have never received a satisfactory answer!

Consider this example. Assume I purchase a Japanese-made stereo receiver. The hi-fi business is, after all, the one example always used when American manufacturers worry about the Japanese taking over their sound and communications markets. Now, further assume I pay \$500 for that receiver. Chances are the retail store, the importer, and the U.S. government get about half of that which means \$250 goes to Japan. Now, someone in Japan has 250 American dollars. What can they do with those dollars? Convert them to Japanese Yen via a broker who might then use them to buy

Saudi Oil. Now the Saudis have my 250 American dollars. Perhaps some Saudi prince will use them to help purchase a German automobile. Now the Germans have my 250 American dollars.

What Goes Around, Comes Around

The point is, those 250 American dollars are effectively indestructible. You can't really *convert* them into any other currency. The only way you can ever get rid of them is to bring them back to the U.S. and purchase U.S. goods and services. What goes around, comes around.

I know the flaws in this argument. First, the American dollar is almost like gold. You can spend it in almost any country just like it was local currency. Thus, there doesn't seem to be any need to bring my 250 American dollars back to the U.S. to spend it on U.S. goods and services. Second, each day those dollars are out of the country is one more day they aren't doing any purchasing here in the U.S.

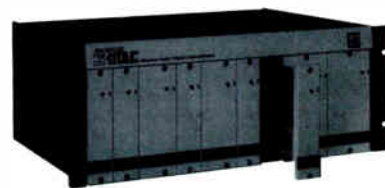
Nevertheless, anyone collecting a large group of American dollars must begin to feel some pressure to spend them here, or, at least, to invest them here. Even that investment is a good thing. If my 250 American dollars end up in a bank in New York, some manufacturer can borrow them to purchase capital equipment or to upgrade an existing plant or to hire new workers. The manufacturer gains from use of the money, the bank gains from the interest it earns and the overseas investor gains from the interest they earn. Significantly, the interest that the overseas investor earns is more American dollars. Eventually, those dollars are also going to come back and purchase U.S. goods and services.

When will that be? Probably not till the value of the dollar, compared to other currencies, comes down somewhat. But, how will that happen? It will happen when the economies of those other countries improve enough that the relative value of their currency begins to rise. How will their economies improve? By selling more of their own goods and services abroad. Who is their best customer? The United States of America, of course. Thus, I would argue that one of our best hopes for lowering the dollar and for improving our balance of trade deficit problem is to purchase more from overseas! I admit to oversimplification but I stand by my beliefs. What goes around, comes around.

And, what this little side-track is supposed to demonstrate is that it really doesn't make any sense to try to counter the "Japanese threat" by imposing more trade barriers. In the long run, it would be counter-productive.

Can We Really Compete?

I still hear things like: "American manufacturers can't compete with the Japanese companies because: A) The Japanese manufacturers are too big. B) Their manufacturers are supported by their government. C) They have the advan-



Simple, reliable AV control systems for boardrooms: Z-MAC

MacKenzie's Z-MAC modular audio visual control systems let you fully customize boardrooms, conference rooms, training rooms, or any other AV installation in just three simple steps:

1. You decide which equipment you want to control, then lay out custom control panels with our free, easy-to-use Z-MAC Design Kit.
2. We pre-engineer, pre-wire, and pre-package all the Z-MAC panels and modules and ship them to you completely ready-to-install.
3. You route the wire and plug in the modules.

It's just that simple! Think what that means when you're building an AV system. No need to re-invent for every application. Component specification is as easy as reading a shopping list. Z-MAC panels and modules are available for all types of AV equipment.

Z-MAC systems cost far less and are much easier to install than comparable built-from-scratch systems.

Attractive Z-MAC control panels—available in a variety of decorator colors—look great in even the most sophisticated AV environments. Compact Z-MAC modules may be stacked or rack-mounted.

Sound and AV contractors throughout the nation have discovered how simple, economical, and reliable Z-MAC systems are. Find out for yourself by sending for your free Z-MAC Design Kit.



FREE Z-MAC DESIGN KIT

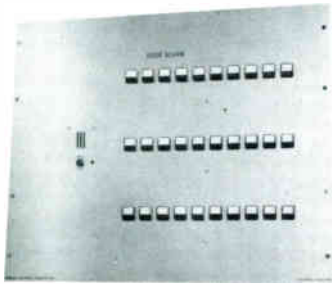
The kit contains everything you'll need to start "customizing where it counts" the simple way with Z-MAC. To get yours, call MacKenzie toll-free at 1-800-423-4147.

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5507 Peck Rd., Arcadia, CA 91006 USA
Telephone (818) 579-0440

Reader Service #233

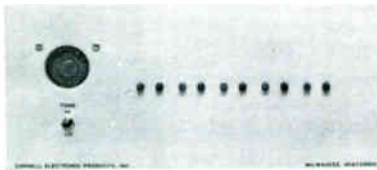
**A-1000 SERIES
DOOR MONITOR SYSTEMS**



MASTER PANEL



5 ZONE REMOTE CONTROL



5 ZONE REMOTE MONITOR



REMOTE ZONE CONTROLS



P
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**Cornell
Electronic
Products, Inc.**

P.O. Box 23411
4911 W. Good Hope Road
Milwaukee, Wisconsin 53223
(414) 351-4660

Reader Service #224

tage of cheap labor. D) They have no labor problems."

There are probably other reasons. Yet, under close scrutiny, few of these reasons hold water. Sure the Japanese manufacturers are big, but we all know big isn't everything. How many portable computers did IBM sell last year? How many did Compac sell? How big is IBM compared to Compac?

Okay, the Japanese government is pro-business. So is the U.S. government. There are an amazing number of government agencies and services waiting to help business that ask for it. Add to that a multitude of good tax benefits, and you can't say the U.S. government doesn't support business. Lately, our government even seems to be staying out of the way when large companies combine to make giant ones. No, the governmental barrier doesn't hold water.

How about cheap labor? Japanese wages are, on the whole, lower than U.S. wages, but not by much. And, my information is that the Japanese laborer is gaining on us. The proof that cheap labor isn't a real advantage for the Japanese is that they, too, are going "off shore" for much of their labor now.

And labor problems? Well, American manufacturers probably wouldn't have the problems they have if they treated their labor like the Japanese do. Cradle-to-grave employment and lots of job training are just for starters in Japan (and help make up for the slightly lower wages).

In other words, most of the "insurmountable advantages" the Japanese are supposed to have, simply do not exist.

Their other advantages are ones *American manufacturers could emulate* if they decided to do so.

Perhaps the greatest Japanese advantage American manufacturers must learn to emulate is the willingness to listen to ideas from outside their own limited spheres. If the Japanese have done well in design and manufacturing it was partly from listening to and copying ideas that were originally "made in America." If they have developed effective management styles, it is at least partly from listening to Dr. Demming and other American consultants.

The Real Threat is in America

I believe there are no Japanese competitive advantages that American manufacturers cannot overcome. The real threat, of course, is right here in America. It is the complacency and unwillingness to listen to new ideas.

Some Concrete Proposals

Here's my prescription. If American manufacturers are to stand up to the Japanese, they must:

- (1) Open up to good ideas, whatever the source.
- (2) Hire professional managers and give up the illusion that only people brought up in our industry can manage our industry.
- (3) Learn to look at the long-term (five and 10 year plans) instead of just the next quarter.
- (4) Allow marketing to drive engineering, not the other way around.
- (5) Learn to treat employees for what they are: the ultimate resource.
- (6) Begin to mount a serious effort to sell more in overseas markets.

SALES & MARKETING

(continued from page 10)

to make recommendations to a user who knows little or nothing about his products.

"Therefore, education of the contractor to my product is very important. The more he knows about a product, the more he uses it, and the more confident he feels when he has to recommend it to a client," Schroeder said.

About six months ago Shure instituted a program to educate contractors to new products. "We also have a program which allows legitimate sound contractors try out new products without any obligation to buy. We will also be starting a special information binder which will include all the current product information plus applications information—telling the contractor what products will perform well in a given application."

**LOOKING FOR SOMETHING
OR SOMEONE?
FIND IT IN
SOUND &
COMMUNICATIONS
CLASSIFIEDS**

THEORY & APPLICATION

(continued from page 12)

tance decreases. The closer the mic, the less the reverb pickup.

The appropriate equation is:
 $dB = 20 \log (D)$

where D is the mic-to-source distance in feet, and dB is the reverb rejection compared to the same microphone at one foot.

This is the inverse square law for a point source with an omnidirectional radiation pattern. Note that speech radiation is omnidirectional at low frequencies, but becomes more directional at high frequencies. Here, we will consider the voice to be omnidirectional.

Number of Open Microphones

As the number of "open" or "on" microphones increases, the reverb pickup increases. Specifically, the reverb increases 3 dB every time the number of mics is doubled. Two mics pick up 3 dB more reverb than one mic, and four mics pick up 3 dB more reverb than two mics. The equation is:

$$dB = 10 \log (N.O.M.)$$

where N.O.M. is the Number of Open Microphones and dB is the reverb rejection of the mic array relative to one open microphone.

Angle of the Sound Source

The farther off-axis a person is speaking into a directional microphone (up to a point), the less the output of the microphone. The less the output of the mic, the lower the speech-to-reverb ratio. Thus, best reverb rejection for directional mics occurs when the talker is on-axis to the mic.

If several people are on one microphone, some of them are at a wide angle off-axis, and so are picked up with a lower speech-to-reverb ratio.

REVERB PICKUP OF VARIOUS CONFERENCE MIXING ARRANGEMENTS (6 x 8 TABLE)

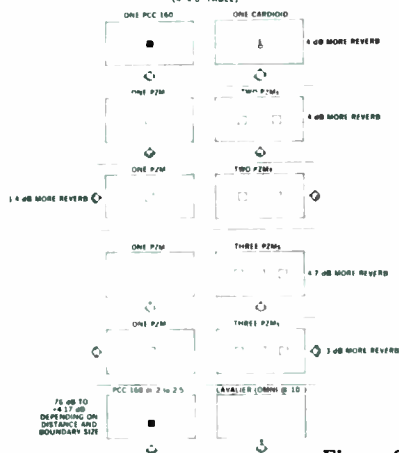


Figure 2

Finding the Best Compromise

Armed with this knowledge, let's compare the reverb pickup of several miking arrangements. Should you use one mic in the center of the table to pick up everyone, or should you use several mics— one per person?

If you use several mics, the Number of Open Microphones is high (so reverb pickup is high), but the mic-to-source distance is small (reducing reverb pickup). If you use fewer mics—say, one mic to cover every three people—the Number of Open Microphones is small (less reverb) but some talkers are far off-axis (more reverb). We see that many of the mix-array parameters conflict with each other.

A Program to the Rescue

To sort out these conflicts and determine the best compromise, a computer program was written. For those who want to type it in, an abbreviated program listing is shown below. It's in BASIC, with no error trapping or graphics.

To use the program, you enter the microphone polar pattern, number of open microphones, etc. (Assume that a mic on a desk stand is *not* surface-mounted.) The program will work through the equations mentioned before and will calculate the reverb pickup relative to an omni mic at one foot. By inputting various miking arrangements, you can determine the one providing the least reverb pickup in a given situation.

Figure 1 shows several pairs of microphone arrays on a four-by-eight-foot conference table, and their relative reverb pickup. The best arrangement in general is a Crown Pressure Zone Microphone in the center of the table (if the participants surround the table). Surprisingly, this single mic picks up less reverb than eight close-placed cardioids.

If a gated mixer or Shure's Automatic Microphone System is available, these provide the least reverb pickup. That's because they turn off unused microphones and decrease the Number of Open Microphones. A gated PCC-160, arm's length from a talker, picks up 7.3 dB less reverb than a PZM in the center of the table. Reverb pickup is very low, so the talker sounds "on-mike" or "close-up," and speech sounds clear (Figure 2).

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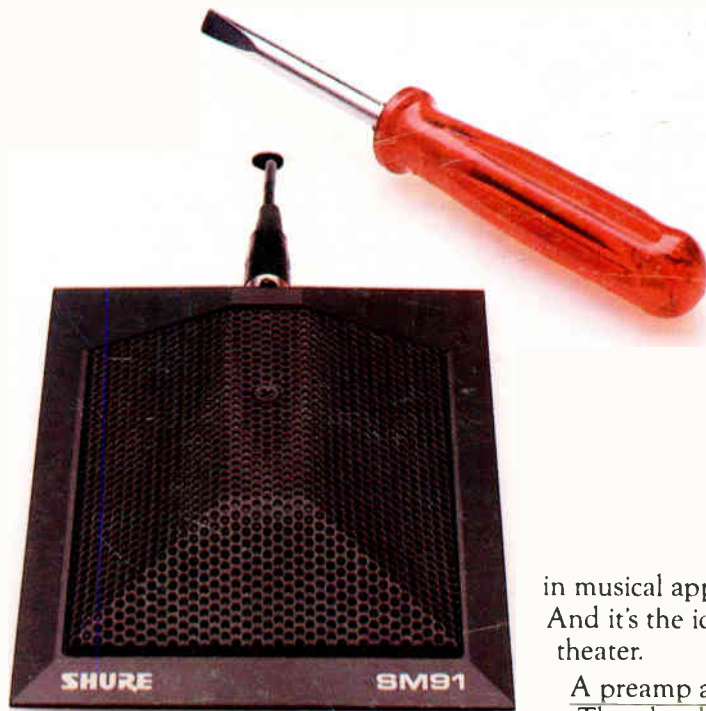
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