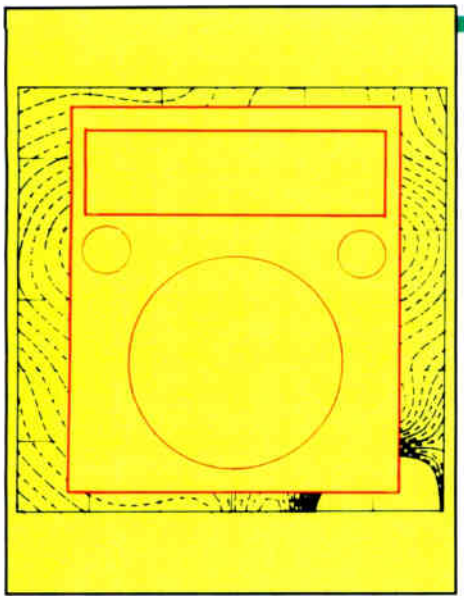
SOUND & COMMUNICATIONS

Volume 35 Number 7 July 24, 1989



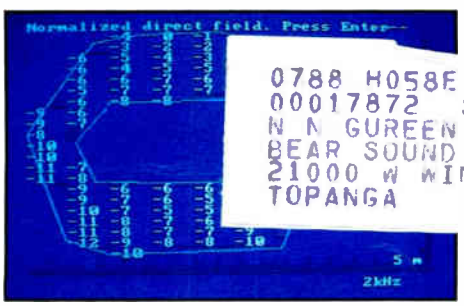
SOUND INTENSITY

Today, many members of the acoustics community have gained a progressive understanding of such acoustical measurement variables as SPL level, frequency distribution, time distribution, and energy distribution. As the process of acoustical measurement becomes more complex, the benefits of that process increase in proportion. Rather than measuring and/or calculating sound pressure level, sound intensity analyzers measure both pressure and particle velocity in order to determine sound pressure level, intensity, and direction. Is the measurement and analysis of sound intensity the next major advance in the process of acoustical measurement? **28**

WIRELESS INTERCOM SYSTEMS

Today's wireless intercoms perform as well as their conventional wired counterparts. They are being manufactured with improved dynamic range and smaller transponders, a result of better compandor integrated circuitry and advanced circuit design techniques. The flexibility provided through the use of these wireless systems is indispensable in many production, training, security, and industrial applications. A variety of wireless intercom equipment is presently available in various configurations. The applications of these systems are limited only by the imagination of their users. **40**

CAD TOPICS: COMPUTER-AIDED DESIGN AT NSCA '89

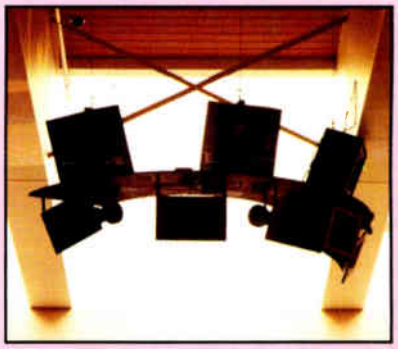


0788 H058E Q211UA1A 07SC
00017872 STOP
N N GUREEN R2
BEAR SOUND & COMMUNICATION
21000 W WINFIELD RD
TOPANGA CA 90290

This year's NSCA Expo was a pivotal [illegible] (CAD) [illegible] In the [illegible] red as [illegible] were [illegible] vitable [illegible] system designers. We present a comprehensive review of CAD at the Expo. **24**

SOFTWARE REVIEW: UMBULUS

The Umbulus Array Design Program from North Star Sound consists of two separate programs: Room Mapper and Array Designer. In this second part of our review, we examine the pros (and cons) of Array Designer. The program, consisting of various functions ranging from the automatic to the completely manual, is one of the most comprehensive available, and will serve its users well if they are prepared to put in the required effort. **34**



You can't build a better mousetrap unless you know your mice.

For years, those of you who wished to enjoy the many benefits of processed speaker systems had to endure one major drawback: loss of sound quality when the system switched into the protect mode.

The new DeltaMax™ electronically controlled loudspeaker systems put an end to such frustration.

We built our knowledge of loudspeakers . . . and their destruct modes . . . into a controller which addresses overexcursion, voice-coil overheating, and amplifier clipping without altering frequency response—the system's incredible clarity remains unchanged.

In addition, front-panel LED's indicate these problems clearly and distinctly. From that point, it's your option to either make a change in the mix yourself or allow the controller to compensate automatically.

We also rigged these systems for flight—with optional three-point harnesses equipped with steel-reinforced pan-fitting hardware, perfect for safely arraying speakers in multi-cabinet clusters.

DeltaMax is brought to you by the same company that invented a variety of better mousetraps for the audio world, including constant-directivity horns and the world's first neodymium compression driver, the N/DYM® 1.

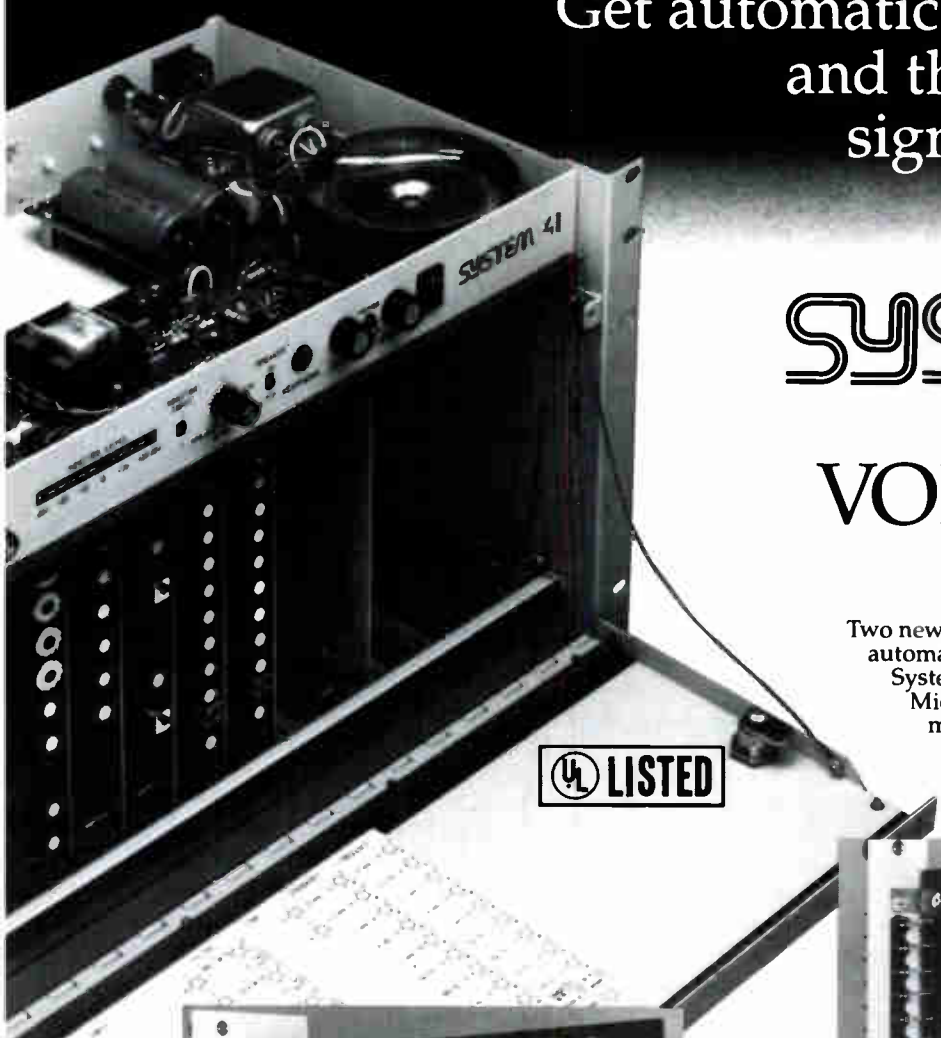
Give us a call today for more information and engineering data sheets.

Circle 202 on Reader Response Card

Electro-Voice®
a MARK IV company
600 Cecil Street
Buchanan, MI 49107
Phone: 616-695-6831

In Canada: Mark IV Audio Canada, Inc.
345 Herbert Street
Gananoque, Ontario K7G2V1

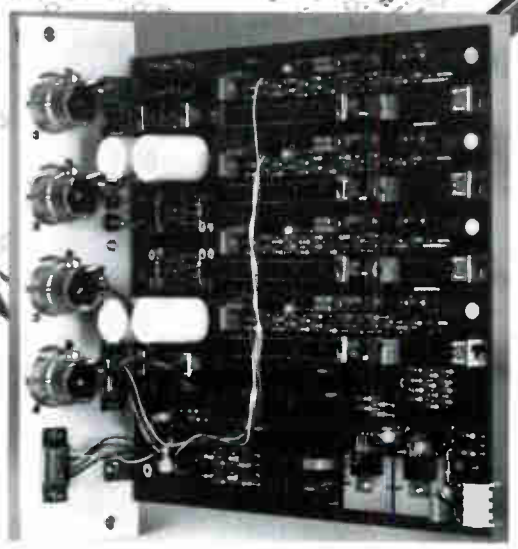
Get automatic mixing capabilities and the best modular signal processing.



SYSTEM 41...
with VOICE-MATIC® Modules

Two new Voice-Matic microphone mixer modules add automatic flexibility and operating performance to System 41 installations. The DJ-4114 Voice-Matic Microphone Mixer Module and DJ- 4115 Voice-matic Master Module offer noise-free interconnection and total compatibility with all other System 41 components.

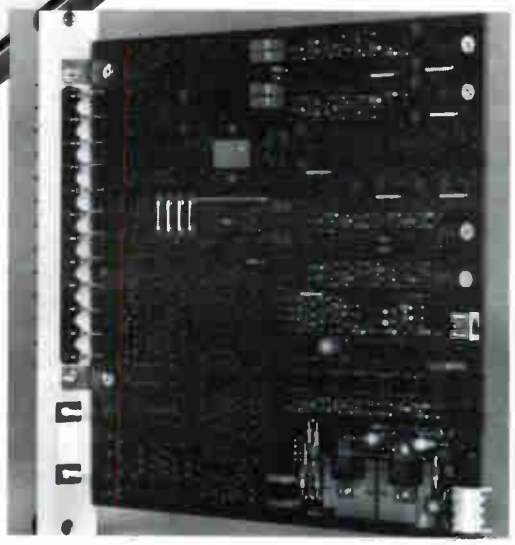
UL LISTED



Model DJ-4114
Voice-matic Microphone Mixer Module

The DJ-4114 Input Mixing Module features buffered pre-amp outputs, pre or post gates, status LED and logic outputs and 18 volt phantom power supply. Optional features include remote level and input controls and 48 volt phantom power.

All IRP Products are made in the U. S. A.



Model DJ-4115
Voice-matic Master Module

The DJ-4115 Voice-matic Master Module mixes the microphone signals from all DJ-4114 Modules in the system along with any auxiliary input signals. Various remote controls are optional.

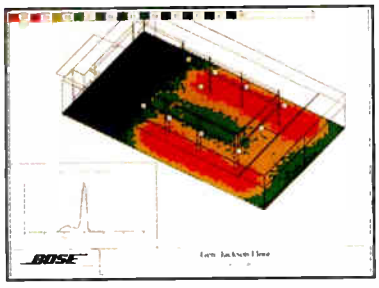
IRP industrial research products, inc.
A Knowles® COMPANY

321 Bond St. • Elk Grove Village, IL 60007
TOLL FREE: 1-800-255-6993 • In IL: 312-439-3600
TELEX: 701845 • FAX: 312-640-9607

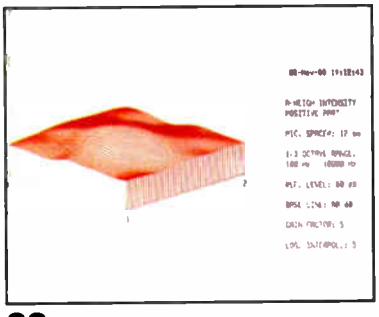
Circle 204 on Reader Response Card

CONTENTS

Volume 35 Number 7 July 1989



24



28

34

FEATURES

24 CAD Topics: NSCA '89
By Mike Klasco
Seminars, a special exhibition area, a comprehensive demonstration — this year's NSCA Expo demonstrated that CAD programs for sound system design are truly coming of age.

28 Measuring Sound Intensity
By Steven Orfield
As the process of acoustical measurement becomes more complex, the benefits of that process increase in proportion. Is sound intensity the next major advance in measurement process?

34 Software Review: Umbulus, Part Two
By Mike Klasco
The Umbulus Array Design Program from North Star Sound consists of two programs: Room Mapper and Array Designer. In part one, we explored Room Mapper; in part two, we examine the advantages (and disadvantages) offered by Array Designer.

40 Wireless Intercom Systems
By Gary Davis
The flexibility provided through the use of wireless intercom systems is indispensable in many production, training, security, and industrial applications. And the applications of these systems are limited only by the imagination of the users.

COLUMNS

12 Viewpoint
By Michael E. Lamm

16 Theory & Applications
By Edward Foster

22 Business Management
By Monroe Porter

57 A Closer Look
By Gary Davis

DEPARTMENTS

9 Newsletter

49 Update

Contracting Close-up	49
People	50
Products	52
A Closer Look	57
Literature	59
Calendar	62

61 Classifieds

SOUND & COMMUNICATIONS

Coming in August . . .
The 1989/90 *Sound & Communications Blue Book Directory*—the industry's only comprehensive reference guide to the manufacturers who serve the contracting community. Don't miss it!

When it's all on the line.

Samson Wireless.

When every system has to perform flawlessly with superior sound and the quiet performance of dbx Noise Reduction.

When you need absolute structural integrity and longterm reliability because your professional reputation is on the line.

Samson. The only choice when nothing less than *perfect* wireless will do.

SAMSON®

WE ARE THE WIRELESS FUTURE℠

Circle 212 on Reader Response Card

SOUND & COMMUNICATIONS

Editorial Director/Publisher
Vincent P. Testa

Managing Editor
Bill Intemann

Assistant Editor
Maria Conforti

Contributors
Gary Davis, Edward J. Foster, Cliff Henricksen, Ralph Jones, Mike Klasco, Michael E. Lamm, Steven Orfield

Technical Council
Dr. Mort Altshuler
Professor Audiology, Hahneman University, Chief of Audiology, V.A. Hospital, Phila, PA
Mike Biegel
EPD Technology Corporation
C. Leroy James
Rees Associates, Inc.
Richard N. Jamieson
Jamieson and Associates, Inc,
Russell Johnson
Artec Consultants, Inc.
Richard Negus
Purcell Noppe Associates, Inc.
William Parry
Maryland Sound Industries, Inc.
Daniel Queen
Daniel Queen Associates
Jon Sank
Cross Country Consultants
William R. Thornton
Phd, PE

Art Director
Gerard Caramannello

Staff Artist
Steven E. Ingram

Typesetting
Leo Ancona

Circulation Director
Robert Evans

Advertising Director
Nancy Davis

Vice President/Editorial
Judith Morrison

Editorial and Sales Office
Sound & Communications
25 Willowdale Avenue
Port Washington, New York 11050
(516) 767-2500

BPA MEMBERSHIP APPLIED FOR MAY 1988

TESTA COMMUNICATIONS

Sound & Communications • DJ Times • Post
Sound & Communications Blue Book
The Music & Sound Retailer • The Retailer Red Book
The Music & Sound Buyer's Guide
CES-TV News • NAB-TV News • NAMM-TV News
NSCA-TV News • CROSSTALK / AES-TV News

Today's most intelligent wireless microphones aren't the most expensive.

A battery life breakthrough and interference-free performance make Toa modular wireless systems first choice among smart contractors.

INVENTIVE.
Toa's revolutionary tone-key circuit uses a guardian "password" frequency for interference-free transmission. In a word. Smart.

VIBRANT.
Unique compander circuits deliver extended dynamic range and S:N ratios unheard of at Toa's installed cost.

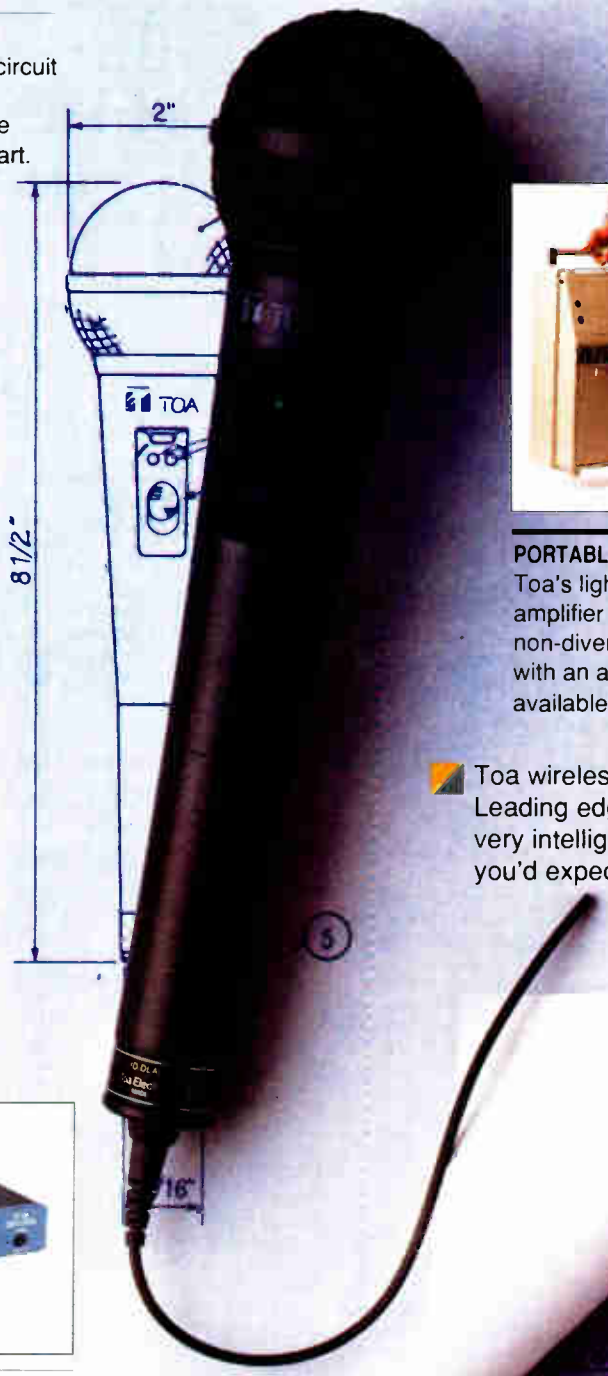
CONSIDERATE.
A simple tab-stop keeps the mic from rolling off tabletops and lecterns. An obvious convenience, perhaps, but another Toa feature.

THOUGHTFUL.
LED's warn of low battery power not minutes, but hours before replacement is due.

REVOLUTIONARY.
Toa's mics deliver 40 hours or more from a single AA battery.

FLEXIBLE.
Both diversity and non-diversity systems allow you to add multiple mics by simply plugging in receiver modules.
No tools. No fuss.

COMPACT.
Lightweight, 2.8 oz. body pac and lavalier microphone for clear, reliable, hands-free presentation.

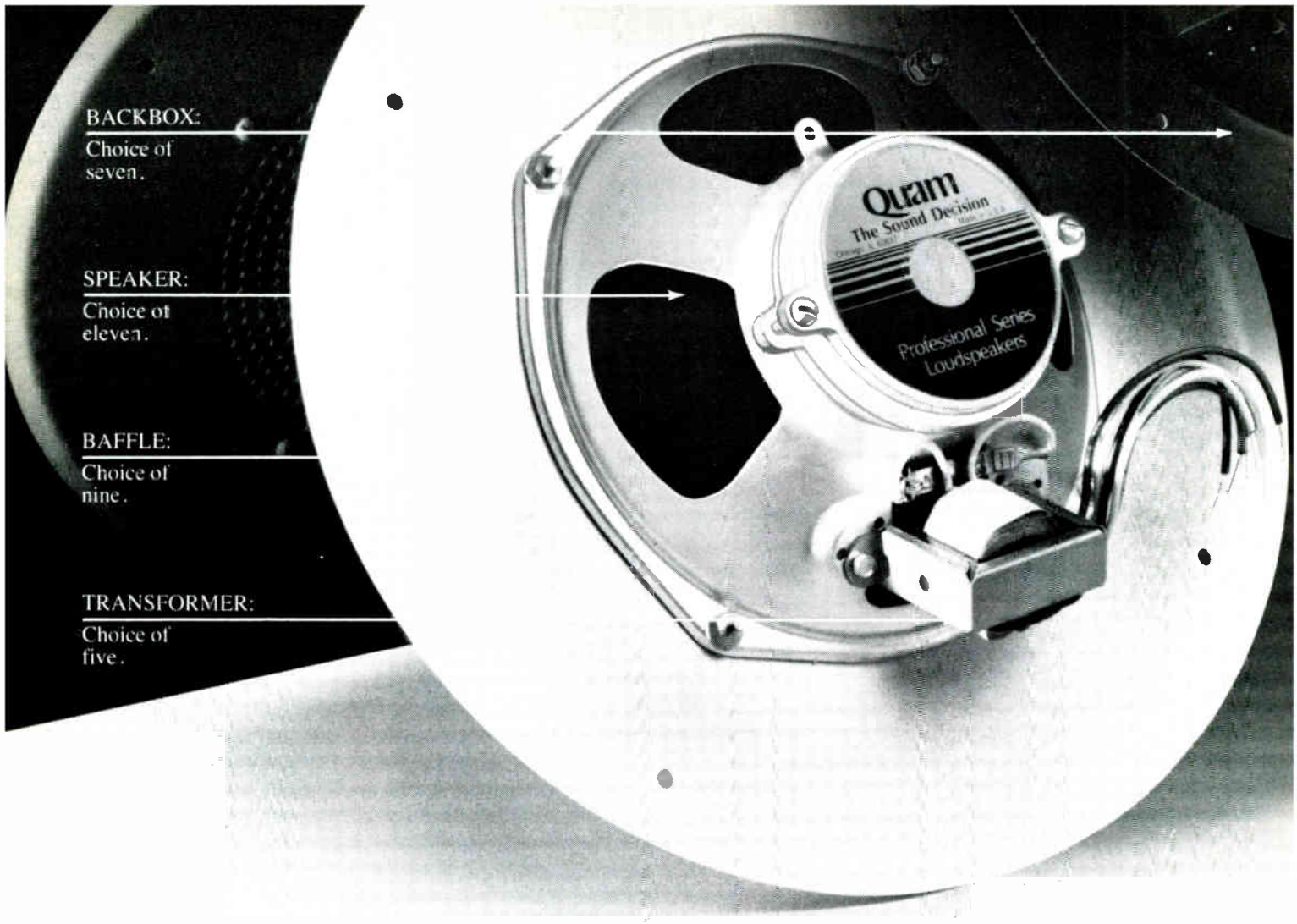


PORTABLE.
Toa's lightweight wireless amplifier accommodates twin non-diversity receivers. A model with an auto-reverse cassette is available.

Toa wireless microphone systems. Leading edge performance at a very intelligent price. Just what you'd expect from Toa.

Circle 209 on Reader Response Card

TOA



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

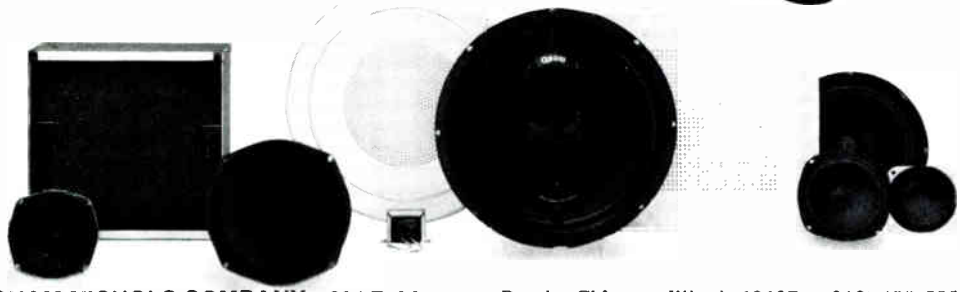
When we say Quam offers a broad line of 8" assemblies, we don't mean a few speakers with a lot of baffles. We mean 11 different speakers, with nine baffles, to suit virtually any application. Add any of seven backboxes and five transformers (and more of each coming), and you have more than 3450 combinations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

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

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

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

Quam: The Sound Decision



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

Circle 205 on Reader Response Card

NEWSLETTER

NSCA CONVENTION BREAKS RECORDS — AGAIN

The National Sound and Communications Convention held this past May broke all previous attendance records. Almost 290 exhibitors displayed their wares to 4,582 attendees.

"The ratio of sellers to buyers was almost one to one," said Bud Rebedeau, NSCA executive director. "It was a very positive conference, everything was upbeat. My only concern is how we're going to top this next year."

Rebedeau said the good attendence could be attributed in part to Nashville's geographical convenience for many of the country's sound contractors. Seminars were generally well attended, he noted, adding that good marks went to the speakers.

1989 IBMA CONVENTION

Plans have been finalized for the 1989 IBMA annual meeting to be held at the Mountain Shadows resort in Scottsdale, Arizona, September 20th through 23rd, 1989.

The theme for this year's convention will be "Dynamics for the 90s" and will include a seminar discussion on "Money in Your Office You Didn't Know You Had." Also on the agenda will be a Industry Music Panel from various end-users of business music and why they use it in their store operations. The featured guest speaker will be Rocky Bleier along with a keynote speaker.

The annual IBMA meeting is open to members only. To obtain membership information and an application, contact Mr. Jerry Anderson, New Member Chairman, 300 West Main Street, Northboro, MA 01532 or call (508) 393-2591. Early registration deadline is August 31, 1989.

CONSUMER INSTALLATIONS: 100-PERCENT GROWTH?

Custom installation of audio and audio/video systems could account for about $250 million in business by the end of 1989—an increase of 100 percent over 1988's figure, says Sonance President Scott Struthers. Reasons Struthers cites for the growth are an increase in smaller, cooler-running, wall-mount equipment, and an increase in qualified contractors who either build the systems into houses as they are going up, or prewire the structures for the eventuality of a custom system.

Robert Kaufman, president of Audio Command Systems (Rockville Center, NY), also sees the home installation business doubling in a year, and gives more reasons for it: Those buying homes today—25- to 40-year-olds—are simply more interested in music than their parents were. Furthermore, the prevalence of the two-income family unit makes what was a luxury 10 years ago more feasible today. Sonance spokesperson Bill Kanner adds that the price of a home system being built into mortgages or home equity loans softens what would normally be a larger financial blow.

Kaufman says that intercom, security and lighting wiring with central control capability is becoming more and more standard in custom-built and finer quality homes as well.

NEWSLETTER

NY ELECTRONICS REPS ELECTION RESULTS

The New York Chapter of the Electronics Representatives Association (ERA) recently elected officers for the two-year term running through the year 1991. M. Clifford Agress was elected president; Fred November, senior VP; William Winch, VP components and materials; Irv Brown, VP sound, signal, security and audio visual; Bert Aaron, VP microwave; Mike Berish, VP membership; and Ivan Robbins, secretary/treasurer. Steve Race, Paul Kurland, and Dick Eden were elected to the board of directors for three years, and Tom Marchiano was appointed chapter advisor, consumer products.

WORAM PENS NEW BOOK

John M. Woram has announced the publication of his book, the Sound Recording Handbook. The volume just recently became available from Howard W. Sams & Company.

Ironically, another currently available book about recording studios incorrectly credits Woram as its primary author. Woram said, " Although its usually rather nice to see one's very own name in print, in this case I'd like my many industry friends and colleagues to know that I have had absolutely nothing to do with the production of this book."

For information on the Sound Recording Handbook, contact Woram at Rockville Press, Inc., 45 Lakeside Dr., Rockville Centre, NY 11570, (516) 764-8900.

CLARIFICATION

In last month's Newsletter, we reported on an agreement reached between Interludes Productions Corporation (Miami Lakes, FL) and the International Planned Music Association. That report may not have made the relationship between the two clear. For the record, Interludes Productions Corporation is servicing the International Planned Music Association of Muzak franchises and other independent Muzak franchises.

REP NEWS

Dick Bellew and Dave Formet of Dick Bellew Sales (Rochester, NY) were presented with Ashly Audio, Inc.'s annual award for outstanding sales during their 1988-89 fiscal year. Dick Bellew Sales represents Ashly products in Texas, Oklahoma, Louisiana, and Arkansas. "We are extremely pleased with the way Dick and Dave have handled a most difficult territory," explained Ashly Senior Vice President Robert C. French. "The Budget goals for this territory were a significant challenge, due to the obvious problems with the region's economy, and yet Dick Bellew Sales exceeded quota by over 50 percent! We sincerely thank both Mr. Bellew and Mr. Formet for the hard work that went into turning this territory around."

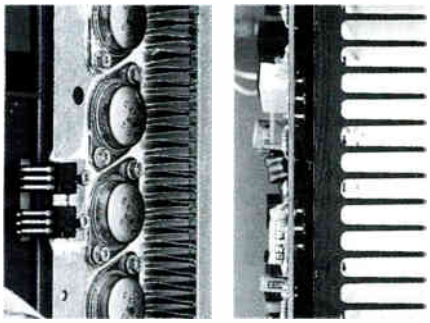
ProSystems (Meadville, PA) has appointed the following sales representative organizations: Online Marketing (Wadsworth, OH), Essential Marketing (St. Joseph, MO), On The Road Marketing (Upper Montclair, NJ) and Audio Associates (Fulton, MD).

Warning: To Avoid Risk Of Shock,

Ignore This Amp-To-Amp Confrontation.

Let's be frank. We're out to change your idea of what—and who—makes a professional power amplifier. So if you just bought a Crown MacroTech, turn the page — this comparison won't be a polite one. But it will stick to the facts.

A look inside these two amps will give you a better idea of why BGW amps like the GTB Grand Touring Amplifier are built like no others in the world. And raise some questions about Crown MacroTechs.



Left: *The MacroTech uses mostly air to dissipate heat, not metal. The closely spaced fins are vulnerable to airborne dust and dirt.*

Right: *BGW uses ten pounds of aluminum to absorb thermal transients, extending power transistor life.*

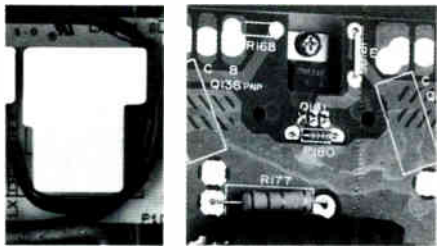
TAKING THE HEAT

If the MacroTech heat exchanger reminds you of an air conditioner, you've grasped its design. This approach works, at least until dust and dirt clog the fins. But as soon as the air flow slows or stops, temperature rises. Soon after that, the Crown shuts off — it could even fail.

The GTB uses massive extruded aluminum heat sinks with widely spaced fins. The mass of metal absorbs thermal transients without straining the fan. And without quick changes in transistor temperature. That's important: Transient musical loads put the worst kind of stress on power transistors. The effects of thermal cycling fatigue may not show up until after the warranty, but they can destroy lesser amps. Meanwhile, BGWs keep right on delivering clean, reliable power.

REAL SPEAKER PROTECTION

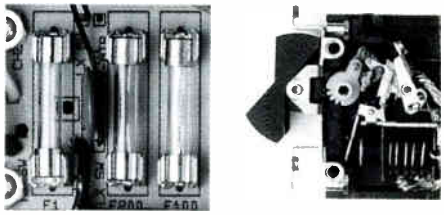
Most amps today are direct coupled, so a blown output transistor (the most common failure) connects the power supply directly to the speakers. Earlier MacroTechs had no protection against DC. Now Crown has learned their lesson — or have they? The sensing circuit and relay they now use shuts off the power transformer, but allows the filter capacitors to discharge stored DC energy directly into your drivers — risking real damage.



Left: *Crown uses a slow-acting, less reliable relay. It can allow the filter capacitors to discharge stored energy directly into your drivers.*

Right: *BGW's modular power output section protects your speakers against DC damage with an instantaneous Thyristor Crow Bar. And the module is easily replaced in the unlikely event of failure.*

BGW pioneered DC speaker protection in 1971. We stopped using relays years ago, when they no longer met our reliability standards for BGW amps. The GTB, like all BGWs over 200 Watts, uses solid-state Thyristor Crow Bars to keep DC from ever reaching your valuable speaker cones or compression drivers.



Left: *Time is money, and with Crown's MacroTech you can lose plenty of both: You have to pull it out of the rack every time a fuse blows.*

Right: *The GTB's power switch is also a rocker-actuated magnetic circuit breaker. You can reset it in a second if power lines hiccup.*

MAKE YOUR OWN COMPARISON

Before you buy or spec your next power amp, call us at **800-468-AMPS** (213-973-8090 in CA). We'll send you tech info on BGW amps and the name of your nearest dealer: He can arrange a demo of any BGW model against any amp you choose. Then you'll be able to appreciate the advantages of BGW engineering with your ears, as well as your eyes.

BGW SYSTEMS

13130 Yukon Avenue, P.O. Box 5042
Hawthorne, CA 90251-5042
Tel 213-973-8090 • Fax 213-676-6713

Circle 206 on Reader Response Card

The Importance Of Education

by Michael E. Lamm

Perhaps the single most pervasive problem in this industry is the lack of education. A rather broad statement, but one I think can be supported.

Fact: One cannot get a Bachelor's degree in audio engineering or in acoustics. Such programs do not exist. Period.

Fact: There is no certification system or licensing authority for validating any level of knowledge or competence in the field of sound contracting or sound reinforcement. None.

Unfortunately, most people seem get into this business through the back door. For example, technicians usually have trade school training, an associate's degree, or military training in electronics. All well and good. They know something about circuitry. But their training in transducers, in microphone and loudspeaker theory and application, is likely to be minimal. And their knowledge of acoustics is almost certainly nil.

The graduate engineer with a degree in electrical engineering may know even more about circuitry, but has the same problems as the technician in other areas.

The person who wanders into the business from a musical background has a good idea what audio sounds like and probably has a good "feel" for acoustics. His problem is that he lacks the technical tools and knowledge to get to the point that his ears want to reach.

The business background person can make money in audio—if he could just figure out what all the technical terms mean and how all that equipment is supposed to go together.

The ideal sound contractor should be 50 percent technician (How does it work? What are good specifications? How do we wire it together?), 50 percent musician (How does it sound? How could it sound better?), 50 percent physicist (What are the acoustics of this space? How do we work with the room? How do we work around the room?), and 50 percent businessman (How do we make money at this? How do we keep some of the money to buy beans?). Adding these percentages together very carefully, we can see that it only takes 200 percent of a person to be a good sound contractor. A few do manage to pull it off. Most are lacking in at least one, and possibly in all four of these areas, often to a sad degree.

So, you should get out of the business, right? Well, frankly speaking, yes—if you want easy work that doesn't require that you keep up with a rapidly changing technology. However, for the truly dedicated audio professional the present state of affairs presents a tremendous opportunity. With so many doing work of mundane quality, a bit of hard work on your part can give you a tremendous advantage over your competition.

The way to do this is through continuing education. I work for a company [J.W. Davis, Dallas, TX] that has a long history of providing educational material. We publish a catalog, 20 percent of which is devoted to technical notes that provide practical theory, design considerations, and reference material. We also have published "Jay's Jargon," a technical newsletter, for the past thirteen years. We offer two major reference books (and even give them away with large orders). We are a Syn-Aud-Con sponsor, helping to present educational seminars all over the country. Of course, many other manufacturers are committed to the cause of education as well.

Here are some of the things *you* can do that will help give you that competitive edge:

Join the NSCA and the AES. Attend the conventions. They are not parties: They are hard work! Frankly, joining the associations without attending the conventions is a little like owning a Ferrari and only driving it to the corner convience store. You gain a little prestige, but most of the car's potential is wasted. These conventions allow you to see new products, talk to the manufacturers, and get the latest literature.

Even more important, there are workshops and seminars to keep you up to date on important discoveries and industry trends. And there is no way to assign a dollar value to all the ideas you will get from the informal "bull sessions" with your associates from all over the country. If you are a contractor in Florida and you are talking with a contractor from Iowa, he is not a competitor, he is a resource! Share your ideas freely and you will get more new ideas in return.

Attend a Syn-Aud-Con seminar. The basic seminar is held in cities all over the country throughout the year. There's sure to be one held near you. More advanced workshops on specific topics are held two or three times a year. We know of no single thing you can do that is more informative than this. The classes are taught by Don Davis. There are very few people in this

Lamm is chief engineer, J. W. Davis & Company, Dallas, TX.

AKG's 568EB. Stand Back.

AKG's C568 short shotgun offers you real directivity in a remarkably small and convenient condenser microphone. Only 10" long, the C568's sensitivity, wide frequency response, durable metal housing, and integrated impedence converter/preamp easily meet the demands of live on-air or recording applications. A perfect balance of pressure gradient and interference principles means the C568 can be up to three times as far from a sound source than normal mics and still yield the same ratio of direct to indirect sound. Used close, it reduces indirect sound levels by 8 dB for improved isolation. So whether it's for ENG, film, theatre or church sound reinforcement, or music applications, AKG's C568 means business. And at half the price of the competition. Just stand back and take a listen.

AKG acoustics

Focusing on new technology.
77 Selleck St. Stamford, CT 06902
(203) 348-2121

field who can claim to know as much about both the well-rounded basics of audio and the leading edge of technology in our industry. And still fewer are as willing to share this information so freely. There are over 3000 graduates of the Syn- Aud-Con seminars and they carry on a perpetual brainstorming session via the quarterly Syn-Aud-Con Newsletter. The people you will meet, the things you will learn, and the ideas that will be shared are truly invaluable.

Subscribe to industry publications. *Read* them faithfully (see Ferrari analogy above).

Collect your own reference library—and *use* it. One of the most useful books you can own is *Sound System Engineering, 2nd Edition* (by Don and Carolyn Davis). And you should also own a copy of *Handbook for Sound Engineers* (edited by Glen Ballou). There are many other books available, of course, and your specific needs will determine which ones you will need in addition to those listed.

Read the manufacturer's literature. We don't print dimensions, weights, or technical specifications just to fill up white space on the page. Writing is work and printing is not cheap—we provide this information because you will need it.

All of this may sound like hard work. (It is.) Some of these things are expensive. But the dividends your investment will yield in the long run are well worth the cost. What it all comes down to is, can you afford *not* to make this investment?

Consider this: if your competitor is more knowledgeable than you are, keeps more current than you do, doesn't make as many mistakes, and produces better installations...where does that leave you? ■

For more information, contact:

Synergetic Audio Concepts
(Syn-Aud-Con)
R.R. #1, Box 267
Norman, IN 47264
(812) 995-8212

National Sound & Communications Association (NSCA)
10400 South Roberts Road
Palos Hills, IL 60465
(312) 598-7070

Audio Engineering Society (AES)
60 East 42nd Street
New York, NY 10165-0075
(212) 661-2355

Make Your Life Easier with QUADRAVERB

Four signal processors in one box including...

- 11 Band Graphic EQ
- 5 Band Parametric EQ
- 750 ms Stereo Delay
- Digital Reverb
- Programmable Mix

ALESIS
STUDIO ELECTRONICS

LOS ANGELES: Alesis Corporation, 3630 Holdrege Avenue, Los Angeles, CA 90016, 213/467-8000

LONDON: Alesis Corporation, 6, Letchworth Business Center, Avenue One, Letchworth, Hertfordshire SG62HR

Made in USA

Circle 208 on Reader Response Card

Audio in Digital Times: AES 7th International Conference

by Edward J. Foster

Seven years ago in Rye, New York, the Audio Engineering Society gambled on a new concept—a "conference" (rather than a "convention") that focussed on one theme and carried a hefty admission fee. Evidently, the concept has been successful, for in each of the past seven years there has been a new "AES International Conference." Last year's, on Sound Reinforcement, was held in Nashville, Tennessee; this year's, in Toronto, Canada, returned to the subject of the first foray, Digital Audio. For four days in May, the AES held sway at Toronto's Royal York Hotel with the presentation of 47 papers during 10 sessions. As with each previous International Conference, all papers were "invited" so they could be targeted to cover the field as completely as possible with as little overlap as feasible.

The idea was to review the past, outline the present, and suggest the future direction of digital audio, and in that the conference planners succeeded admirably. There was an historical overview (by Denon), tutorial demonstrations by the renowned team of Drs. Lipshitz and Vanderkooy from the University of Waterloo in Canada, reports of current progress in analog-to-digital (A/D) and digital-to-analog (D/A) converters, digital signal-processing ICs, recorders, and more (by a variety of authors), and predictions of what the future might have in store for us especially in the way of new digital storage media.

How does this affect readers of *Sound & Communications*? Most directly in the areas of digital signal processing (DSP) and in analog-to-digital and digital-to-analog conversion, for these have a direct bearing on the filters, equalizers, delay systems, and even the loudspeaker arrays that will be used in the future. Just comparing the number of DSP papers presented this May with those of seven years ago shows how far the industry has advanced. In that first conference there were only a couple of DSP-related papers and they were tucked away in an "applications" session.

> "DSP applications may be virtually limitless, but implementing them is not simple."

This year, two of the ten sessions were devoted entirely to digital signal processing (albeit one of them concentrated on the music applications of DSP chips) and there were a scattering of papers in other sessions that had a direct bearing on the future of DSP.

Take, for example, the question of A/D and D/A conversion. Whereas, time and time again, Drs. Lipshitz and Vanderkooy have offered proof that, with proper implementation, 16-bit linear quantization at 44.1 kHz theoretically provides about everything that human hearing should desire, some in the industry remain unconvinced that digital sound is all it's cracked up to be. The reason for the skepticism lies in those three key words—"with proper implementation."

Lipshitz and Vanderkooy's demonstrations in Toronto of the importance of converter linearity and of the need to "dither" (add random noise to) the signal not only before primary analog-to-digital conversion but whenever the signal is "resampled" without appropriately increasing the number of bits (as, for example, is the case in many of today's digital filters) will undoubtedly point the way towards better digital sound in the future. If nothing else, the Lipshitz/Vanderkooy tutorial clearly showed how dangerous it is to apply digital techniques willy nilly to faders, equalizers, filters, and the like without a thorough understanding of what one is about. At low levels, quantization distortion is a constant concern and, although it can be eliminated by proper dithering, each time dither is added, the noise floor increases. At high levels, indiscriminate processing can (and does) cause accumulator overflow and signal clipping. Quite obviously, the word "digital" can, but does not necessarily, mean good sound.

On the converter front, Burr-Brown's Jimmy Naylor described the company's latest 18-bit dual A/Ds which are based upon an extension of present-day switched-capacitor successive-approximation techniques. Despite

1200 WATTS, FOUR INDEPENDENT CHANNELS, FLEXIBLE, 2/3/4 CHANNEL SELECTABLE...

Four independent channels for multi-speaker and/or multi-zone systems or bi-amping...Switch to the *two-channel mode* for high power-600 watts per channel @ 8 ohms per channel...or to drive two 70-volt distributed line systems.

Three channel mode is ideal for systems with a subwoofer, or where tri-amping is desired.

The 300X4 has two completely independent power supplies and power transformers. It is completely protected against short circuits, open circuits and input overloads. Thermal protection is provided by Multi-Sensor Phase Control Regulation as well as two multi-speed cooling fans, and Automatic Resetting Thermal Sensors.

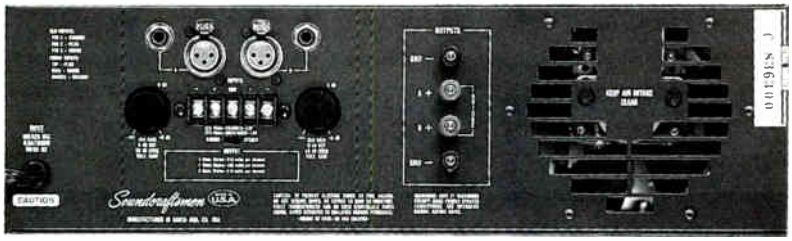
The front panel features extremely accurate clipping indicators for each of the four channels, as well as six Mode indicators for two, three or four channel operations.

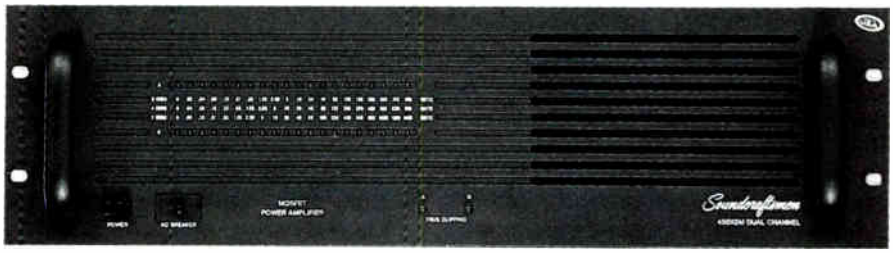
Circle 203 on Reader Response Card

Circle Reader Service Card # for 200-watt Amplifier Comparison Chart and 1989 Buyer's Guide to Professional Products, with Specs and Prices.

Our **Sound Contractor Program** includes:...all models in inventory for next-day-shipment to you...maximum discount on small orders ...and Engineering Answers as close as your telephone!...

...our **20 years experience** building high-powered Professional amplifiers right here in Santa Ana, Cal., assures you of Reliability and Direct Factory backup!



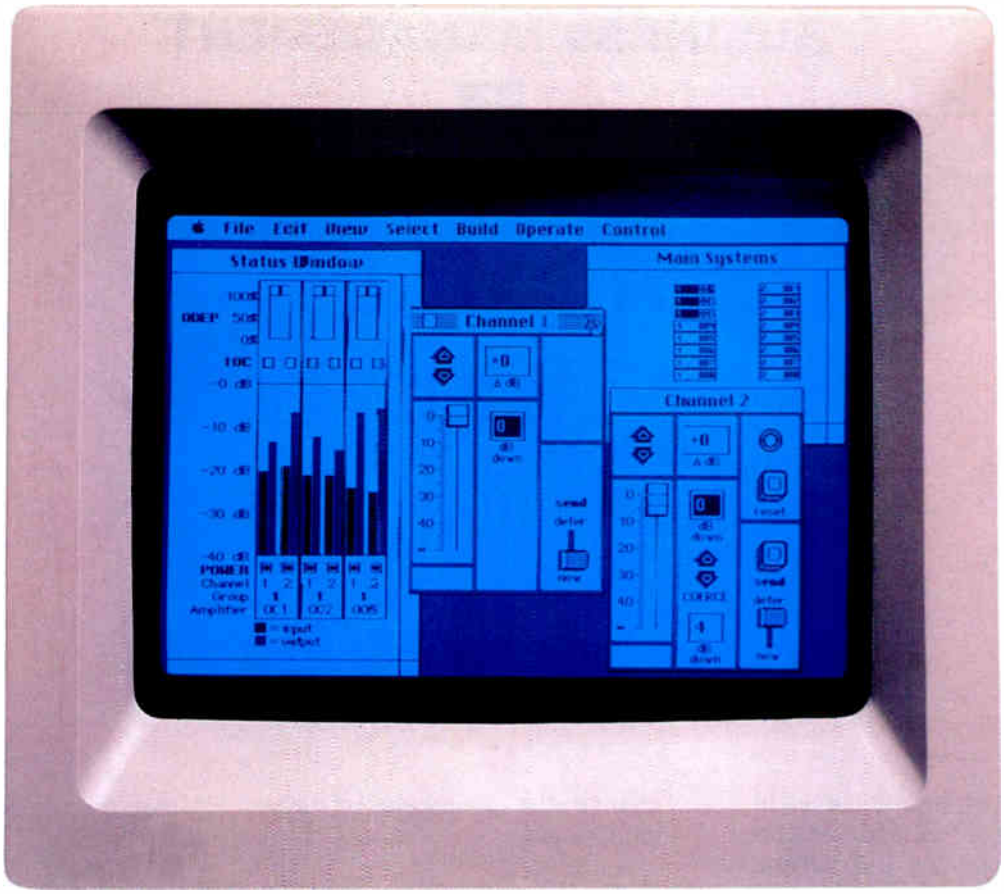


PROFESSIONAL PRODUCTS by Soundcraftsmen MADE IN U.S.A.

• 2200 SO. RITCHEY, SANTA ANA, CA 92705 • TELEPHONE: 714-556-6191 • FAX: 714-662-0750 •

Burr-Brown's latest chip, future trends in high-resolution A/Ds are likely to lean towards super high-speed low-resolution conversion and "noise shaping" according to Robert Adams of Carillon Technology (formerly of dbx) and E. C. Dijkmans of Philips in separate papers. By sampling and converting the signal at an extremely high rate, it can be quantized relatively crudely (with an accuracy of just a few bits or even a single bit) and then "decimated" ("undersampled") by a digital filter to trade sampling rate for increased accuracy. In a sense, the conversion error is spread out over many samples (that is, over a very wide bandwidth) so that, after decimation by the digital filter, the average error is very low. "Noise-shaping" algorithms skew the majority of the noise into the ultrasonic region where it can be filtered out and, since the actual converter is handling relatively few bits—1 to 4 is typical—"bit matching" is much less critical and conversion linearity is greatly improved over a 16- or 18-bit successive-approximation converter. The frosting on the cake is that, with very high-speed sampling, the requirements on the anti-aliasing filter are greatly reduced and, with single-bit "flash" converters, even the sample-and-hold circuit can be eliminated.

Oversampling or undersampling digital filters are far from DSP's only application. DSP techniques can be applied to create almost any filter or equalizer function imaginable, including many that would be impractical (if not impossible) to implement in the analog domain. (Peter Schuck of Canada's National Research Council described a digital FIR filter for a loudspeaker crossover that simultaneously equalized the frequency and phase response of the drivers.) But, although DSP applications may be virtually limitless, implementing them is not that simple. Word length can grow by leaps and bounds for, almost invariably, every mathematical manipulation that goes on within the DSP ends up increasing the word length. Just multiplying two 16-bit words, for example, produces a 32-bit word that cannot simply be truncated to its 16 most significant bits without producing an error that propagates through the system. Even with the 32-bit internal arithmetic used in some of today's DSP chips, one cannot blindly design a system without a thorough appreciation of what's going on inside. The papers presented at the AES 7th International Conference not only establish that point, they serve as a guide to the future. ■



Test Our IQ.

Install Crown's new IQ System 2000,™ the smartest way *ever* to monitor and control amplifiers.

You're looking at something that no sound contractor has ever seen, or possibly even *imagined*, before. A system that can digitally monitor and control each channel of up to 2,000 remote amplifiers at once. All from one cost-saving location.

It's the incredible new IQ System 2000 from Crown. Using a common personal computer, easy-to-install IQ components, and Com-Tech™ amplifiers, you can now do in *minutes* what used to take days.

IQ Interface, Software & P.I.P. Module

Simultaneously adjust levels, power up, change polarity, monitor features (like Crown's exclusive IOC™ and ODEP™), do diagnostics, and more. No running back and forth to each remote location. No expensive, long runs of speaker cable.

With the IQ System 2000, you're free to locate amps *anywhere* you like—even in previously impossible remote locations.

To learn more about this innovative new system, contact Crown today. Because when it comes to combining advanced technology with surprising cost efficiency, the Crown IQ System 2000 just could be the smartest choice you'll ever make.

crown®

1718 W. Mishawaka Road, Elkhart, IN 46517
219/294-8000

Advertising Supplement

Circle 215 on Reader Response Card

Dealing With Difficult Employees

by Monroe Porter

The difficult employee comes in all shapes, sizes, and categories. You can recognize the difficult employee in your organization by the type of annoying behavior he or she exhibits: constant whining, arguing, sulking, and/or complaining. When uncontrolled, the difficult employee can spread anxiety and unrest throughout an organization.

Many of these difficult employees *will* work—but only under close scrutiny and discipline, rebelling and resisting at every opportunity. The difficult employee is often smart and quite capable, and can in fact be one of your best workers. But because their behavior causes so much trouble and takes up so much of everyone's time, dealing with a difficult employee can become an ongoing nightmare.

The following guidelines may be of value to you when dealing with difficult employees:

1. Bear in mind that your organization is probably not at fault: the complaints, demands, and needs expressed by the difficult employee are far more likely to be the result of their own personality disorders and insecurities. Giving in to these demands can frequently make the problem worse. In any event, your goal is to set and control an environment, not change the personality of the employee.

2. Difficult employees work best when they are isolated and overloaded. Do not give them time to conjure up problems and complaints. Isolation also keeps them from "poisoning" the rest of the work force.

3. When all else fails, the best advice I can give is to attempt a peaceful termination of the difficult employee's position. As soon as he or she is employed somewhere else, their new employer becomes the source of their problems. (In fact, difficult employees often complain that their previous place of employment was much better than where they are presently working. If things were so great there, why did they leave?)

   Why not terminate up front? At times, these difficult employees can be good workers. Good workers are hard to find. As long as you can isolate and control the situation, the difficult employee can be a productive member of your work force. And their replacement may be easier to get along with—but less technically skilled. Some of the best craftsmen tend to be prima donnas.

4. Don't play games with the difficult employee. Give clear, concise instructions and ask for feedback. Dealing with difficult employees in a straightforward manner forces them to operate in the open.

5. Watch out for potential problems when hiring new employees. The fact that a highly skilled worker has changed jobs frequently may be an indication that he or she is a difficult employee. Common sense dictates that employers will try to keep their best workers. A potential recruit who has moved around a lot spells potential disaster.

   Ultimately, termination of difficult employees may be the best solution, but as a manger you must work with the team of workers you have. If several of these workers are difficult employees, you must learn to deal with them as they are until a suitable replacement can be found.

Utilizing the guidelines listed above should help make the difficult employee a little easier to deal with. ■

Porter is vice president of Proof Management Consultants, Richmond, VA.

Want to stay on top of this aggressively competitive industry?

Read Sound & Communications' Special Features

Every April, our *Contracting Business In-Depth Market Report*
tells you what's happening now and what's on the horizon for the sound & communications market.

■

December we bring you our *Economic Report,*
keeping you aware of economic trends and developments on their effect on this industry.

■

Every August is *Blue Book* month,
this industry's only complete directory of manufacturers, their products and key personnel.

■

Special pull-out sections —
on everything from mixing consoles to alarm and security devices — that provide the sound contractor with the concise and definitive information needed for intelligent and informed product selection.

■

Look for these special features and more in upcoming issues of Sound & Communications.

NSCA '89: *CAD* COMES OF AGE

BY MIKE KLASCO

This year's NSCA Expo, aside from being successful in a general sense, was also a pivotal event for computer-aided design. In retrospect, this show will be remembered as the point where CAD techniques for sound system design reached "critical mass." In marketing, this term describes the point where use of a particular item has become so widespread that it becomes apparent to everyone that the item is going to evolve into a commonplace, lasting phenomenon (such as fax machines).

Three events at the NSCA focused on CAD for audio: a demonstration center with active displays was set up in front of the exhibit area for the duration of the show; I moderated a panel session; and Joel Lewitz of Paoletti/Lewitz and Associates organized a comparative demonstration of CAD programs (all using the same design project) aboard the General Jackson paddleboat.

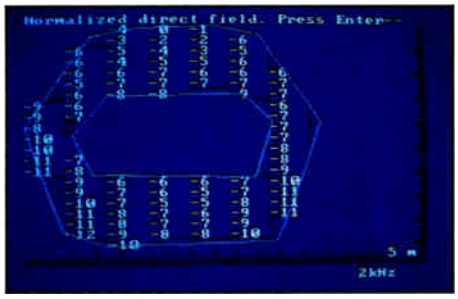
The following is an overview of CAD-related news from NSCA Expo '89.

CADP I: 4.5 AND CADP II

JBL was showing both CADP I and CADP II at the CAD demo area. In addition, Steve Romeo gave a talk on CADP I at the panel session, and a full analysis of CADP 4.5 was given by Drew Daniels at the General Jackson demonstration.

JBL surprised most of us at the show with CADP I 4.5. As they are busy working on CADP II (an entirely new program that will be introduced in January 1990), we really didn't expect much more for CADP I. It is an indication of JBL's increased focus on CAD that while it took five years to go from CADP 1.0 to CADP 2.0, it took only six months to go from 2.0 to 4.5. Since another review of this program is not planned, we will take a good look at the program here.

Although my review on CADP 2.0 (*Sound & Communications*, January/February 1989) was positive in general, I did have some specific criticisms: The video resolution was poor, the performance simulation graphics lacked intuitive feel, and the menu organization needed improvement.



CADP/JBL Professional

While the overall changes in CADP I release 4.5 are not major from a programming perspective, the efficiency and enhancement of the overall operation and functionality of the program is significant and immediately apparent. The graphics and text resolution are now high resolution color (you will need an EGA monitor). JBL has ingeniously and effectively used color to make the existing performance simulations more intuitive. Difference levels (such as excellent, good, fair, poor, or in some simulations, dB variations) are now keyed by color, which provides a very intuitively satisfying contour effect. Previously the performance data was all the same color. Small changes, big benefits.

With these new high resolution EGA graphics, data points on the performance simulations have been doubled. The mechanical design section is also high resolution color, a major improvement over previous releases. Line color can be defined, so seating planes can be separated from stages, speakers, etc. Of course, printouts look much better now that the resolution has been upgraded, and if you have a color printer you can obtain some dramatic results.

Additionally, a utility (DFX conversion) program for export into Autocad and other CAD programs is now available directly through JBL. This program permits manual, but manageable erasure of hidden lines from within mechanical CAD programs. Once you are in Autocad, you can also print out large-scale drawings (if you have a large format printer or plotter) or whatever else is required for presentations or working drawings. The utility also provides multi-window viewing of all three views of the cluster.

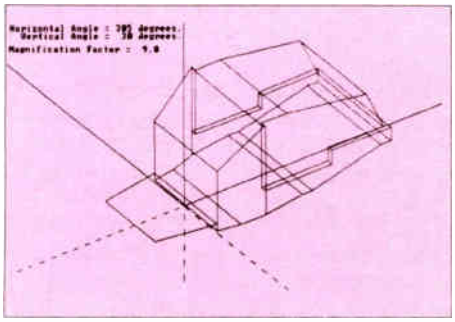
Other enhancements of CADP I: 4.5 include accurately scaled printouts to all dot matrix printers (not just certain Epson models), and the program runs faster as well. Co-processor support is now offered, resulting in up to 10 times faster speed. The screen count-down on the simulations has been eliminated, which further picks up speed of execution. The menu structure has been improved, with a more rational organization and simply smoother operational flow.

These enhancements have been implemented with almost surgical precision. Having briefly used a prototype version of CADP I: 4.5, I can say that the learning curve for adapting to the new release is negligible (that is, some efficiency improvement over CADP 2.0 is achieved instantly). JBL's programmers have come through with a major improvement.

Klasco is president of Menlo Scientific, Berkeley, CA.

Now that all of that is said, CADP I still has some limitations: no window/pull down menu user-interface or mouse support (although these are under consideration); room modeling does not show obstructions; there is still a lack of sophisticated graphic manipulation of 3-D mechanical designs and other features found (or promised) in some other third generation programs.

JBL is addressing these concerns, however, and is putting the finishing touches on CADP II with anticipated release in January 1990 for the IBM and the summer of 1990 for the Mac version. Some features will be VGA (very high resolution 16 color graphics), full import

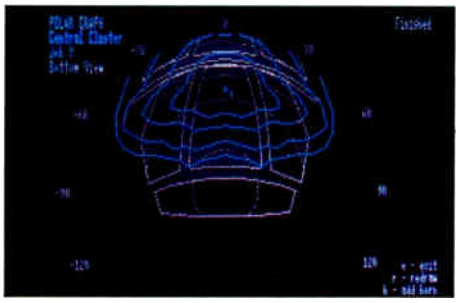


AcoustaCADD/Altec Lansing

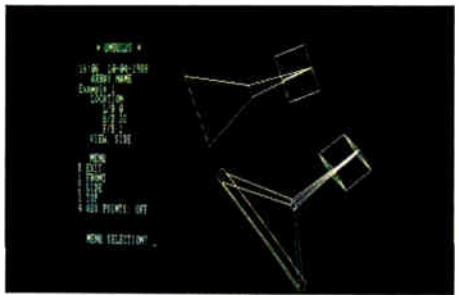
and export to Autocad, ray tracing, obstruction shadowing, windows and mouse support, and just about every other feature that is offered or promised by competing programs. More details soon.

ACOUSTA-CADD: 1.0

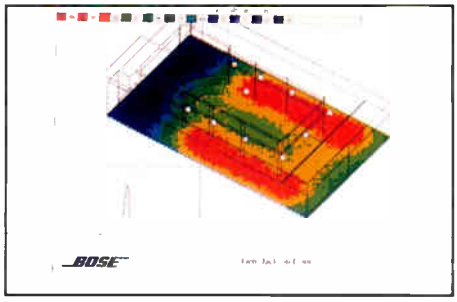
Acousta-CADD, from Mark IV, was present at all three NSCA CAD events: in addition to the demonstration at the CAD exhibit area, John Lanphere spoke at the CAD seminar and gave a full run-down of the program at the Paddleboat event.



PHD/Prohs



UMBULUS/North Star Sound



Modeler/Bose Corporation

Altec's and EV's new sound system design program for IBM compatibles will be released in August. The initial release will have high resolution color graphics, including an interesting visualization technique which they call "isobeams," user-definable complexity of the room modeling (seating planes only to complete mechanical design details), export to AutoCADD and more. Future releases will include an AutoCADD shelf for mechanical drawing of cluster designs (providing a library of pre-drawn speaker components), and more sophisticated performance simulation capabilities (such as shadowing of obstructions). We will take a detailed look at Acousta-CADD this fall.

PHD: 3.2a

John Prohs provided demonstrations of his program at the demo area and gave a talk at the CAD Panel. David Marsh of Marsh, Pelton and Kinsella demonstrated the features of the PHD program at the Paddleboat.

The PHD program, release 3.2a, will be reviewed early this fall. Distribution is by both *Sound & Communications* and Renkus-Heinz (to their dealers). This release permits mapping to be performed entirely within an IBM compatible computer with CGA color graphics. Lack of proper documentation has plagued this release, but Melissa Prohs has recently remedied the situation and a manual is now available.

UMBULUS: 3.0

Tom McCarthy spoke at the CAD panel, although time constraints limited his participation to showing Umbulus at the CAD demo area only on Saturday. There was much interest in his program, which is the subject of this month's review. (See Umbulus, page *34*.)

MODELER: 3.0

Mark Christensen gave demos of the Bose Sound System Software series at the CAD demo area, Ken Jacob spoke at the CAD panel and Bruce Meyers gave Modeler an impressive workout on the Paddleboat. Modeler 3.0 was featured and will be released this summer. We will review this significant new release after Acousta-CADD and CADP II.

Even though preliminary info had leaked out about 3.0, I think everyone was dazzled by how much more efficient the room modeling was compared to earlier versions of Modeler. I would estimate that for the most complex layouts, the time to model a room would be at least cut in half.

Although planes of up to 10 corners had been previously mentioned as a feature of this new release, most everyone was astonished at how quickly the various new drawing tools would let the designer create the room model. After each plane is entered the surface material is asked for, which significantly reduces both data entry time and reduces potential operator errors.

Dramatic use of color (on the Mac II) is offered by Modeler 3.0, but so far no support is offered for color hard copy printouts. The much-discussed intelligibility module and a gain before feedback module did not make it into this release. On-line help is now provided without needing to ask for it (a help window is on-screen). Many new performance simulations have also been included. Hit point rays of the direct sound from the loudspeakers are now provided. Visualization of obstructions in the direct SPL module was stunning, with sound level contours depicted in color.

Another powerful enhancement is a pseudo-animated effect that can be created where the varying overage of different frequency bands can be visualized. This frequency sweeping effect was suggested by Meyers of Purdue University whose visionary concepts of sound system engineering software have appeared in AES preprints during the last five years.

How fast some of these modules will work on the slower Macs remains to be seen, and some of the other functions (such as frequency response to a point in the room) raised some eyebrows as to the accuracy of this and certain other functions. Some consultants also questioned at what point the software oversteps what a sound contractor should be attempting to analyze in terms of the contractor's qualifications for interpreting the results. No doubt there will be much discussion on these points in the near future (in CAD Topics and elsewhere).

In any case, I liked what I saw, and was very impressed. In my mind, 3.0 is in a different category than Modeler 2.0. As for some of the "questionable" modules, I am more than willing to avert my eyes from those "offending functions." Software

(continued on page 62)

THE POWER OF SIX.

The MA 6 Flexible Six-Channel Amplifier.

We know what you're probably thinking. Why six channels?

Think about this for a minute. If almost every sound system out there uses more than two amplifier channels, wouldn't it make sense to put a bunch of channels in one box and save space, weight and cost?

We thought so. That's why we invented the MA 6.

Dollar-per-watt-per-pound-per-rack-space it's a killer. This one amp can drive an entire stereo 100/300 watt bi-amp speaker system. It can drive six passive monitor wedges with separate programs. Or two tri-amped side-fills. Or six separate background music zones. No matter how your sound system requirements change, the flexible MA 6 is an investment that never becomes obsolete.

If less weight, less space, less cost and greater flexibility sound good to you, then go with the power of six. The MA 6: 900 watts of innovation from Rane.

RANE

10802-47th Ave. W.,
Everett, WA 98204.
(206) 355-6000.

Circle 211 on Reader Response Card

MEASURING SOUND INTENSITY

BY STEVEN J. ORFIELD

Last fall, Orfield Associates was invited by the Acoustical Society of America to give a lecture on sound intensity measurement to the joint Japanese and American Acoustical Societies, in preparation for which we considered in some detail the context of intensity measurements and their value to the acoustical measurement community.

Orfield Associates has been using sound intensity measurements for a number of years, first renting existing intensity equipment and then purchasing the first of a new generation of analyzers to appear in the U.S. Our interest in intensity has not been in its specific application to our ongoing work; rather, a number of years ago, it was decided that the use of intensity measurement looked promising enough to justify a major investment ($70,000 in total) and the risk of evaluating its use with the thought that it might fundamentally change our acoustics, audio design and testing practice. The risk was well worth the cost, and this fundamental change is indeed under way.

RECENT MEASUREMENT HISTORY

Over the last 10 years, the acoustical measurement community has proceeded through a revolutionary set of changes in terms of its ability to measure and analyze acoustical phenomena. This change has taken the serious acoustical profession through the various applications of sound pressure level (SPL) measurement capability listed in Figure 1.

At this point, many in the acoustics community have participated in all of these measurement applications, and as they have advanced through these measurements and devices, they have gained progressive understanding of such acoustical measurement variables as SPL level, frequency distribution, time distribution, and energy distribution.

As the last of these measurements is encountered, the measuring process can become more complex, but the benefits of the process increase in proportion to its complexity. Sound intensity is the next major advance in measurement process.

Figure One: SPL Measurement Types and Systems

Measurement Type	Measurement System
Precision SPL	Type 1 SPL Meter
Statistical SPL	Environmental Analyzer
Frequency	SPL Meter w/Octave Filters
Real Time Frequency	Octave Real Time Analyzer
High Resolution Frequency	1/3 - 1/24 Octave RTA/FFT's
Constant Bandwidth	FFT Analyzer (constant)
Time	Recording Analyzers/Meters
Energy-Time-Frequency	Time Delay Spectrometry

1) Sound intensity: a valuable addition to these measurement processes.

SOUND INTENSITY THEORY

While all of the previous measurement procedures and devices measure and/or calculate sound pressure level, sound intensity analyzers measure both pressure and particle velocity to determine sound pressure level, intensity, and direction.

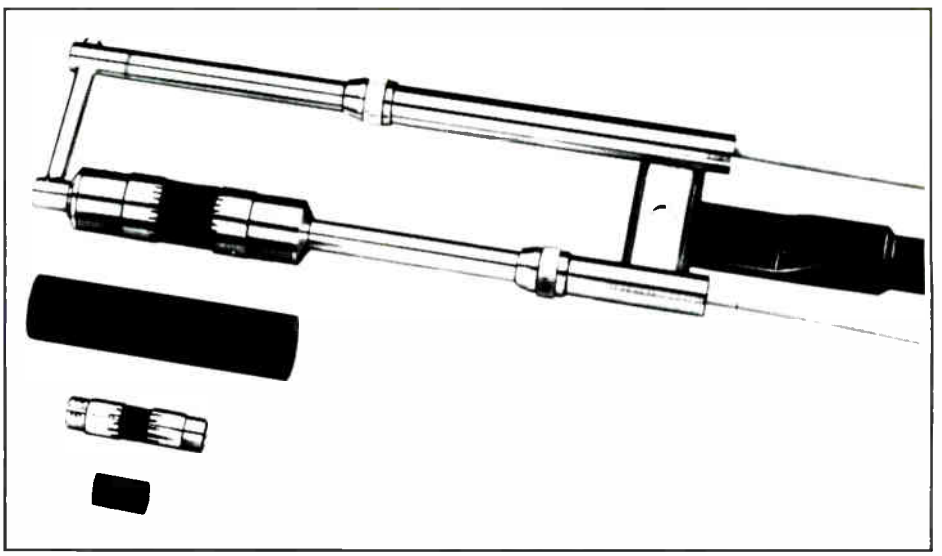
The measurement of sound intensity employs a dual-microphone probe; microphones can be positioned in a number of configurations, including facing parallel with a known space between them or can be "face-to-face" with diaphragms aimed toward each other and separated by a spacer of known dimension. The analyzer measures the two channels simultaneously and uses the phase difference between the two microphones to determine the intensity. Both the separation between microphones and the phase match of measurement system determine the limits of the accuracy of the intensity measurement. Note the phase match of the Bruel & Kjaer 2133 Intensity System shown in Figure 2, and the photo of a typical sound intensity probe shown in Figure 3.

A measurement of sound intensity displays the analysis of the direction in which sound is flowing (generally, in a constant active or reactive sound field). This display is much like that of a real time

Orfield is president of Orfield Associates, Minneapolis, MN.

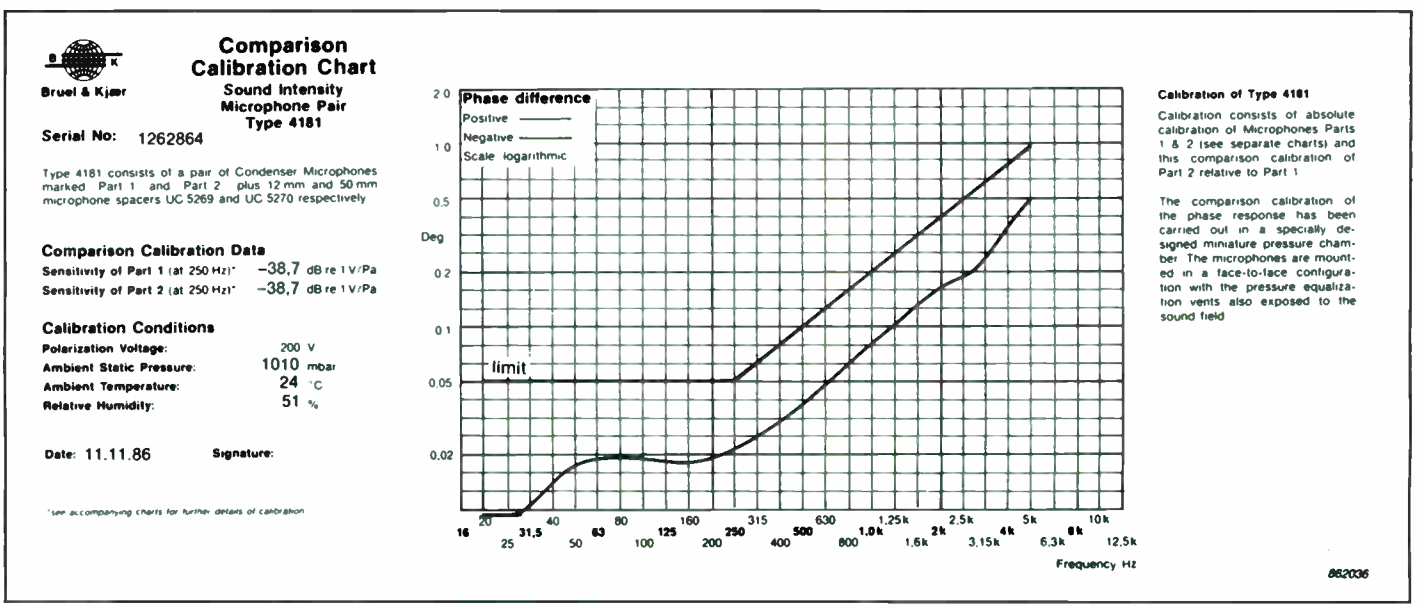
analyzer, with the exception that each frequency band displayed appears in one of two colors, indicating sound flow toward the front of the probe or toward the rear of the probe the polar pattern of the intensity probe attenuates sound as it reaches its apparent source at the midpoint of the probe. See the Figure 4 for an intensity probe polar response.

The use of time delay spectrometry is usually based on an interest in measuring the instantaneous value of sound pressure level in order to determine level and thereby impute direction. Sound intensity is generally used in the opposite type of sound field; that is, one that is already "steady state" rather than "impulsive." (This is not always true, as sound intensity can also measure "gated" phenomena.) And while TDS measurement, like most SPL measurement, is oriented to evaluations of the "receiver" or listener position, sound intensity is generally used to measure the sound field and describe the properties of the sound source. In fact, the vast majority of its current uses are for the purpose of deriving sound power levels of equipment (HVAC and the like) and to determine localized sources of sound within devices for further design attenuation.



3) The Bruel & Kjaer Sound Intensity Probe Type 3519, showing the two 0.50-inch mics separated by the 12mm spacer.

Due to its ability to measure energy flow at known positions in a steady sound field,



Comparison Calibration Chart

Bruel & Kjær

Sound Intensity Microphone Pair Type 4181

Serial No: 1262864

Type 4181 consists of a pair of Condenser Microphones marked Part 1 and Part 2 plus 12 mm and 50 mm microphone spacers UC 5269 and UC 5270 respectively

Comparison Calibration Data

Sensitivity of Part 1 (at 250 Hz)* −38,7 dB re 1 V/Pa

Sensitivity of Part 2 (at 250 Hz)* −38,7 dB re 1 V/Pa

Calibration Conditions

Polarization Voltage: 200 V

Ambient Static Pressure: 1010 mbar

Ambient Temperature: 24 °C

Relative Humidity: 51 %

Date: 11.11.86 Signature:

*see accompanying charts for further details of calibration

Phase difference

Positive ——

Negative ——

Scale logarithmic

limit

Deg

2.0 1.0 0.5 0.2 0.1 0.05 0.02

16 20 25 31.5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1.0k 1.25k 1.6k 2k 2.5k 3.15k 4k 5k 6.3k 8k 10k 12.5k

Frequency Hz

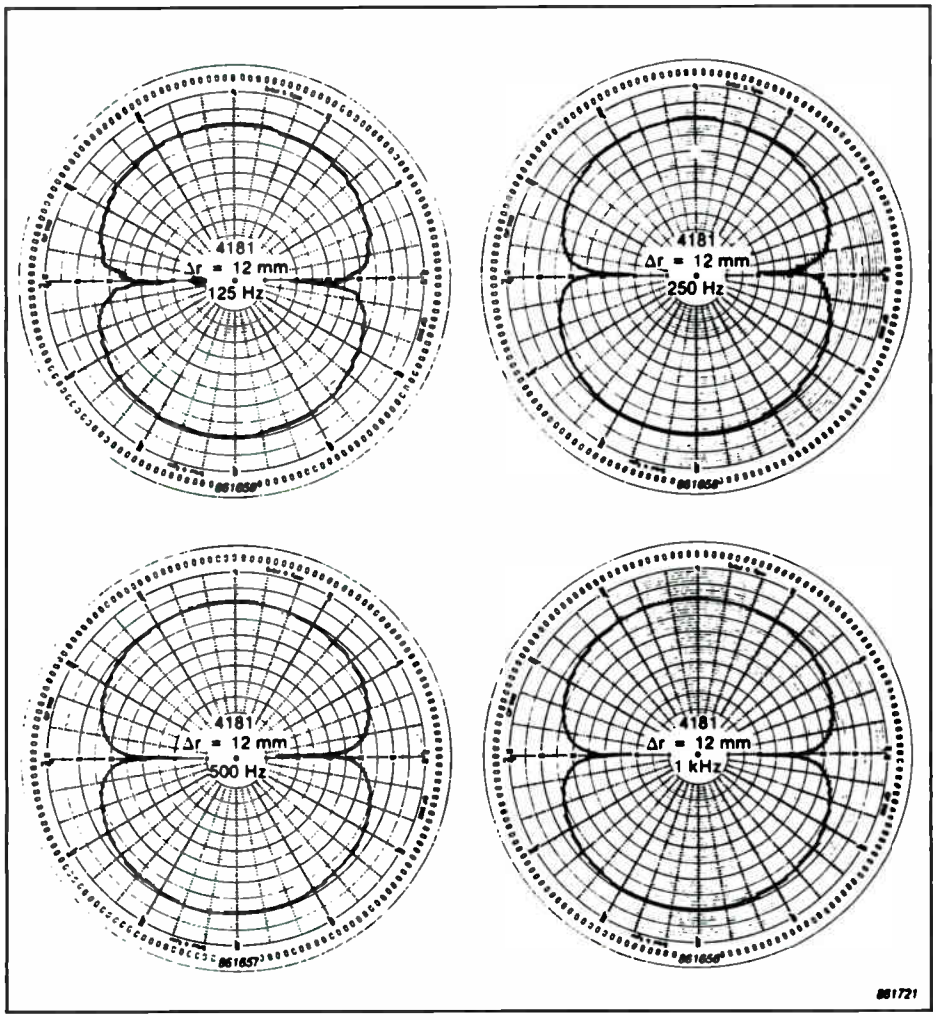
Calibration of Type 4181

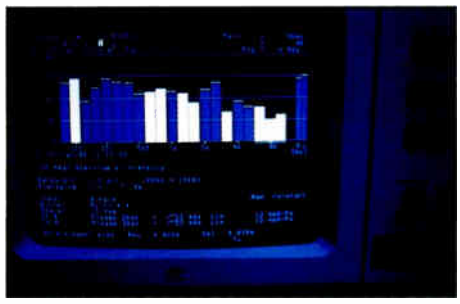
Calibration consists of absolute calibration of Microphones Parts 1 & 2 (see separate charts) and this comparison calibration of Part 2 relative to Part 1

The comparison calibration of the phase response has been carried out in a specially designed miniature pressure chamber. The microphones are mounted in a face-to-face configuration with the pressure equalization vents also exposed to the sound field

862036

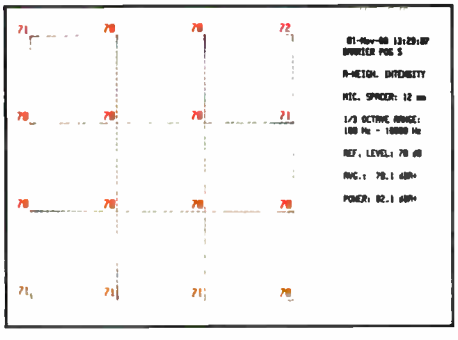
2) Calibration charts supplied with the 4181 mic pair.



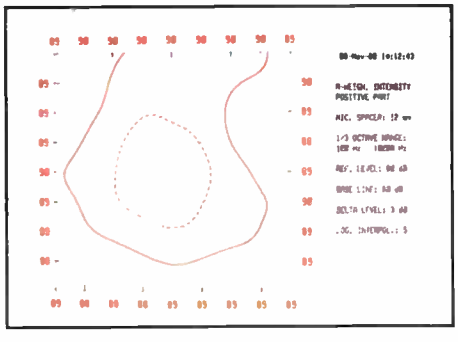


4) At left, polar response showing variation of the measured intensity as a function of angle of incidence for the 4181 in the 3519 probe.
4A) Shown above is a view of the 1/3-octave screen display.

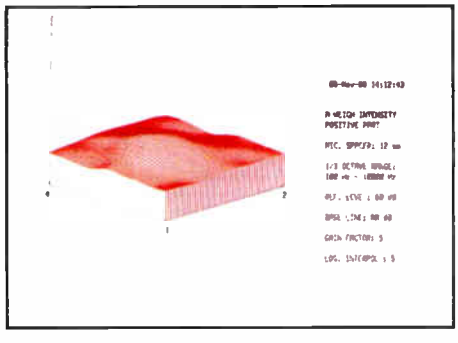
sound intensity can be used to map and to visualize sound phenomena. Thus, sound intensity data is usually measured and displayed as calculated "number maps," "contour plots," 3-D maps, or vector diagrams. As a basic single point measurement (akin to SPL measurements), sound intensity has little value; as a multi-point (and multi-axis) global description of a sound field, it becomes far more useful. Examples of sound intensity plots are shown in Figures 5 through 7.



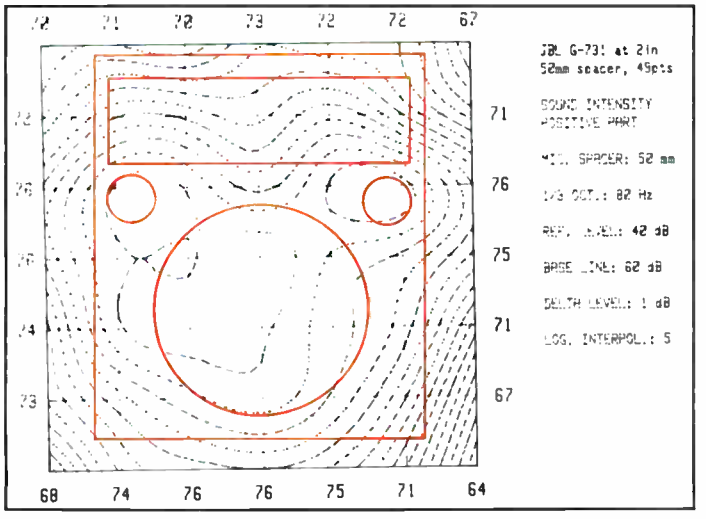
5) Intensity: Number Map



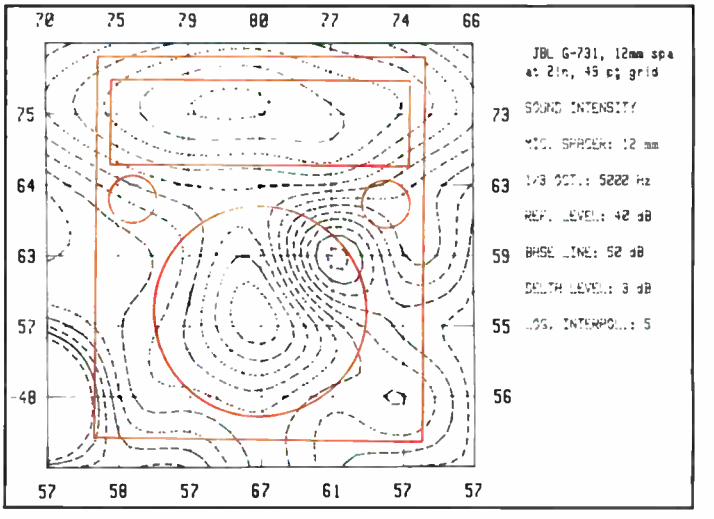
6) Intensity: Contour Map



7) Intensity: 3D Map



8) Sound localization at 80 Hz.



9) Sound localization at 5000 Hz.

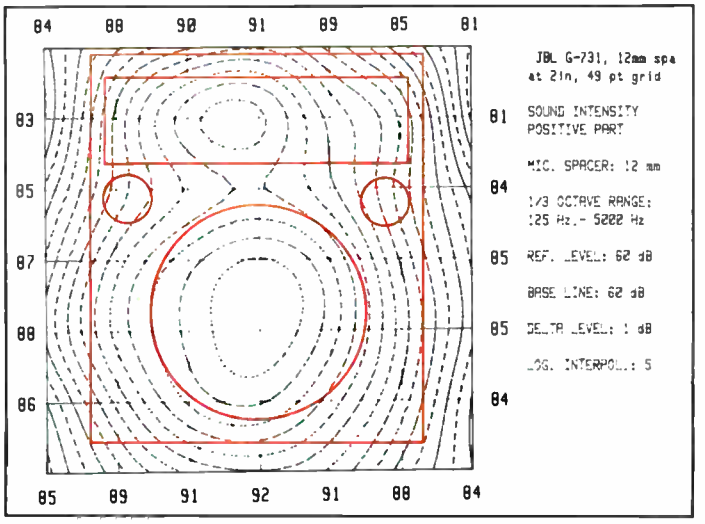
PRESSURE/INTENSITY INDEX

Sound intensity measurement is affected by the acoustics of the measurement environment, both in terms of background noise levels and in terms of reverberation or the "residual intensity" of the environment. The PI index shows the relationship between the measured pressure and the calculated intensity; via its use, the limits of confidence of the measurement can be determined. In environments that are highly reverberant, this PI Index may suggest reverberation reductions before intensity measurements take place. This index can be calculated and displayed for any combination of microphone spacings, microphone types, and analyzer phase match levels.

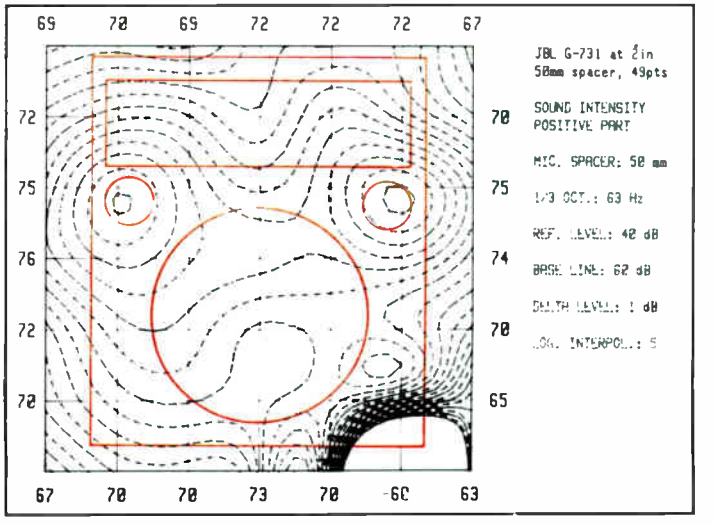
APPLICATIONS

Sound intensity achieved its original notoriety due to its ability to reject signals (calculated based on a cosine model) not received on-axis with the intensity probe and to determine therefore the direction of net energy flow in a sound field. Specifically, this allowed certain types of measurements, such as sound power rating, to be performed in ordinary environments rather than in an anechoic for hemi-anechoic chamber.

The same capability has more recently been applied in the measurement of Sound Transmission Class (typically as measure



10) Broadband sound localization



11) Sound localization at 53 Hz.

of wall attenuation). The ability to measure sound power with high noise rejection allows high precision in the evaluation of field performance of a wall system and in the local mapping of sound transmission phenomena to determine flanking paths (that is, floor, window, or ceiling leaks around walls).

Additionally, sound intensity is being used by the HVAC manufacturers among others to identify the source location of noise within a given device. This ability to map "sources" has established another major subgroup of users.

Moving on to fields more familiar to *Sound & Communications* readers, sound intensity can be used to map out the performance of a loudspeaker at different frequencies, demonstrating (for example) the results of a particular "ported" enclosure design. It can also be used to map diffraction effects of sound curving around a surface. A number of recent examples are of interest here.

LOUDSPEAKER ENCLOSURE MEASUREMENT

A common floor-monitor loudspeaker was measured using a pink noise signal, a B&K 2133 Dual Channel Frequency Analyzer, and a B&K 3545 sound intensity probe. The intent of this measurement was to look at the intensity distribution at the front of the enclosure cabinet. With this in mind, the enclosure was measured in 1/3-octaves from 63 Hz to 5000 Hz. The results of this testing show, by frequency, the mapping of the forward field of the device.

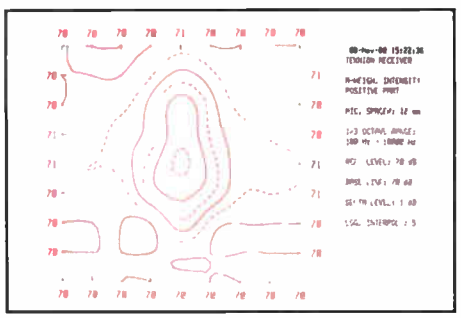
An array of measurement positions was selected that had a total of 49 points, and the spacing between positions was 2 inches. A view of a 1/3-octave screen display at one position is noted in Figure 4.

Subsequently, the performance of the loudspeaker at a number of different frequencies was plotted to show the pattern of sound emission compared to the transducer component positions and port within the enclosure, as shown in Figure 4.

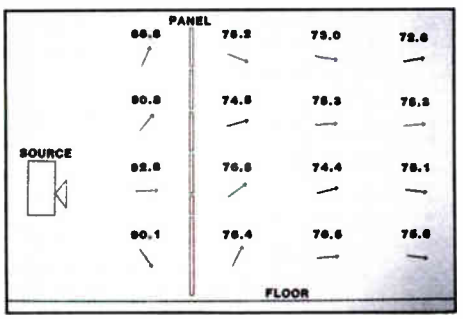
Additional plots at other frequencies were overlaid on a diagram of the device and its transducer and port positions, as shown in Figures 8 through 11. It can be seen that the actual sound power field in front of the enclosure is quite frequency dependent, as one would expect.

OPEN PLAN SCREENS

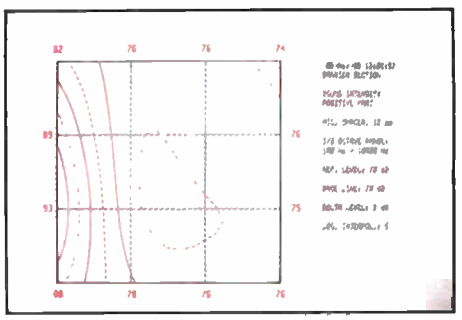
A final example of the ability of sound intensity measurement to display and visualize sound fields is a set of measurements completed on an open office system. A



12) Receiver Intensity



13) Vector Map



14) Diffraction Plot

workstation was set up, and vertical section measurements were taken on both sides of one acoustical panel to determine if the diffraction of sound over the panel could be calculated and displayed. Figure 12 shows the sound intensity on the receiver side of an acoustical screen assembly. In Figure 13, the calculated intensity vector map of this same measurement can be seen, based on an "A" weighted average, and Figure 14 shows a contour plot of sound diffraction around the panel.

CONCLUSION

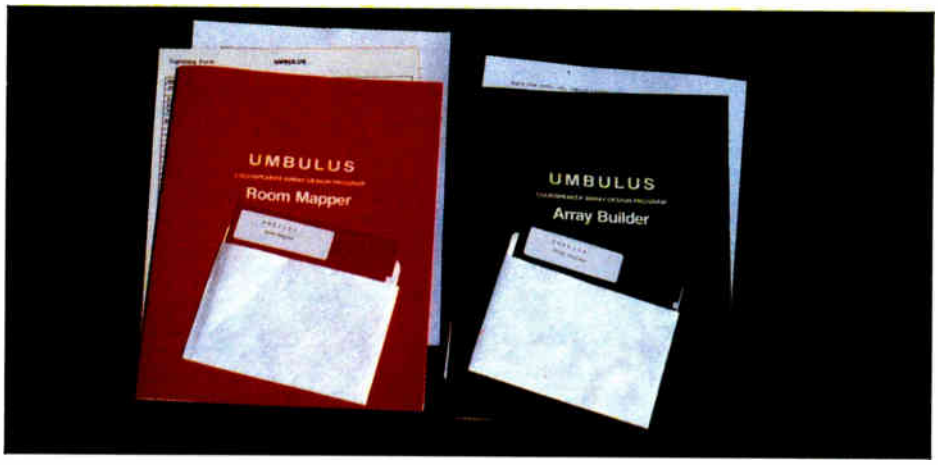
This short introduction to intensity measurement is meant to provide a brief look at its theory and its applications. Intensity measurement is a new frontier in acoustics and should be within the scope and interest of many serious acoustical practitioners. ■

UMBULUS, PART TWO: NORTH STAR'S ARRAY DESIGN PROGRAM

BY MIKE KLASCO

Tom McCarthy named this program after Umbulus, the mythical keeper of the celestial horns. (This clearly points out the danger of requiring engineers to study classical literature in higher education.) Umbulus actually consists of two separate programs, Umbulus Room Mapper and Umbulus Array Builder.

Although Room Mapper and Array Builder are typically used together, each is really a stand-alone program. Some acoustical consultants use only Room Mapper, as they feel the actual array construction is the sound contractor's problem. Some designers are used to other mapping techniques, such as the Prohs and Harris Sphere Program (once distributed by Community), or are accustomed to the convenience of mapping the room entirely within the computer, such as with the Prohs and Harris PHD program release 3. Umbulus Room Mapper is more convenient and practical to use than the sphere, and offers better visualization than the PHD program, but each of these programs has its own strengths and weaknesses. [An in-depth comparison of mapping techniques used in sound system design programs is being prepared for publication in an upcoming issue.]



Umbulus: Room Mapper and Array Builder program kits.

Room Mapper produces a view of the room as seen from inside a large sphere hung at the center of the proposed array location. It's as though you were standing inside the sphere, looking out at the room from the sphere's center: from this perspective, you would be able to see that every point in the room can be represented by a point on the surface of the sphere.

After the user models the room into the computer (using measurements taken from blueprints, sketches, or the actual room), the array location is selected. The room is then plotted, coverage is calculated, and aiming angles are determined. The user then proceeds to Array Builder, which is the subject of this month's review.

UMBULUS ARRAY BUILDER

Essentially, Array Builder is an aid for constructing clusters. Modules are provided for determining the packing tightness, viewing and printing out locations within the cluster of the horns and drivers, and calculating the hanging linkages.

The designer starts with a description of the array (normally generated by Umbulus Room Mapper). This should include the driver model number, list of horns in the array, and the aiming angles of each horn. The ENTER NEW ARRAY module is run, using the SKETCH ARRAY and ADJUST PACK (cluster packing density) function. The PRINT ARRAY REPORT module is run which provides the data points to manually draw the array (or coordinates can be used with an external computer-aided drafting program such as AutoCAD). The horn points needed to be connected are determined and the Linkage module is run. The Link length data is used to specify the links, and then the array is constructed.

GETTING STARTED

Enter New Array. The designer enters the name of the array, the driver number, a list of horns and their aiming angles

Klasco is president of Menlo Scientific, Berkeley, CA.

WE'LL TAKE YOU THERE

VIDEO CASSETTES NOW AVAILABLE WITH FULL COVERAGE OF ALL THE INDUSTRY TRADE SHOWS IMPORTANT TO YOUR BUSINESS.

You and your key personnel can travel to the trade show on your VCR. Each video cassette contains 3 full days of on-the-spot show coverage of the people, products, and hottest news in the industry.

DON'T MISS A THING! ORDER YOUR TAPES TODAY.

Please check the Show(s) you want.
First tape **$49.95**; Additional tapes just **$24.98** each

- ☐ **NSCA-TV NEWS — Nashville**
  Nat'l Sound & Communications Assn Contractors Expo '89
- ☐ **NAB-TV NEWS — Las Vegas**
  Nat'l Assn. of Broadcasters Show
- ☐ **NAMM-TV NEWS — Chicago**
  Nat'l Assn. of Music Merchants Expo
- ☐ **CROSSTALK, A Television Symposium**
  Audio Engineering Society Convention, LA
- ☐ **CES-TV NEWS — Chicago**
  Consumer Electronics Show

All shows are independently produced by **Testa Communications**

Please send _____ tape(s).
1 Tape, **$49.95**; 2 for **$74.93**; 3 for **$99.91**; 4 for **$124.89**; All Five for **$149.87**.

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone: _____

Indicate payment method: (prepayment required)

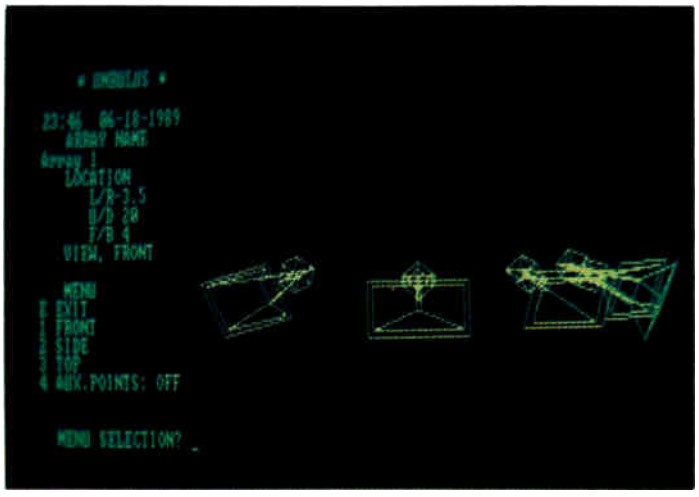
Credit Card # _____

☐ Visa ☐ MC ☐ AmEx ☐ Check Enclosed

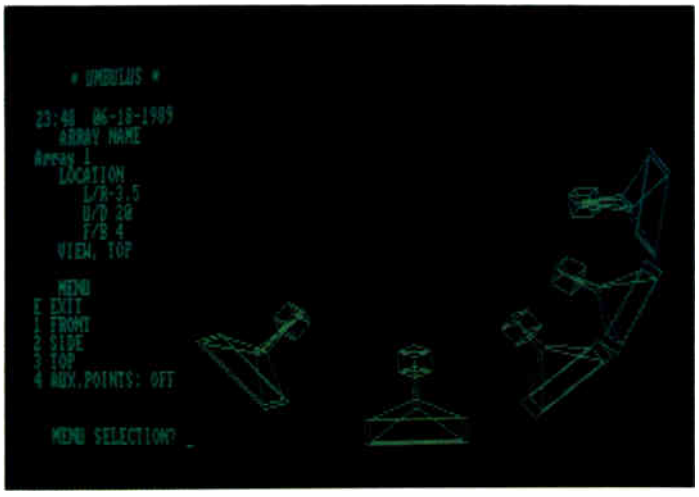
Expiration Date _____

Signature _____

Mail to: **TV TAPES,** 25 Willowdale Avenue, Port Washington, N.Y. 11050



A list of horns and their aiming angles (in this case, generated in Room Mapper) is entered into Array Builder.



A top view of the proposed array. Video sketches provide the means to discover if adjustments are needed, and what their effect will be.

(which has previously been prepared). Driver selection is limited to one choice for all the horns within any one frequency band.

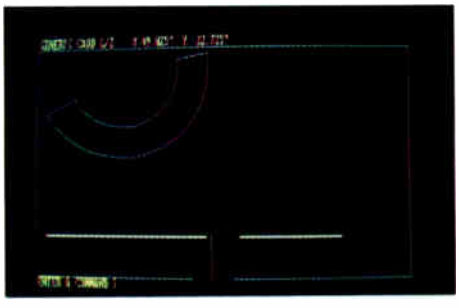
The Enter New Array module consists mostly of keyboard data entry of the coordinates of the horns, with the computer doing the calculations. The program automatically determines the array packing density for a coherent cluster. You may instruct the computer to tighten the cluster, or expand the array for better serviceability, to clear obstructions (clusters are often located above scoreboards), or to prevent collisions between components. (Unlike the Bose SpeakerCAD program, Umbulus Array Builder does not provide a collision alarm; component collision must be checked by observation in the Video Sketch module.) The packing module defaults toward looser packing to avoid collisions. Packing density is specified by defining the radius of a sphere whose surface contains the diaphragms.

An Array Report is compiled by the program providing array location speaker elements, driver, components, weight (less rigging and frame), and center of gravity.

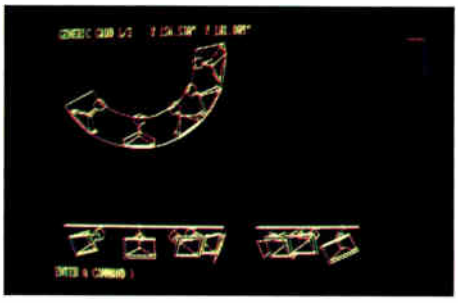
Video Sketch Array. Video Sketch is meant to be used only for making preliminary evaluations of arrays as the display is low resolution (CGA graphics). The detail is not adequate for presentation quality or engineering drawings. As the program is monochrome, the color capabilities of CGA graphics were not exploited, and if color was not used, then the higher resolution (and very popular) Hercules monochrome standard should have been selected.

The relatively crude graphics mean that Video Sketch is only helpful in visualization of packing adjustments and determination of which horn points to link. Considerable duplication of effort is required to generate engineering working drawings either by use of a computer-aided drafting program or by manual drafting techniques. Drivers are depicted as square, which was originally done to save memory, a compromise no longer necessary. Images of horns are shown in wire frame without the option of hidden line removal. One nice feature is the ability to toggle on and off auxiliary points, which include mounting holes, center axis, and center of gravity.

Print Array Drawing Data. This module is used to generate the plotting values needed to draw (manually) an array. The designer first determines the scale, detail level (standard or short plot, which eliminates flanges, etc.) and selects the desired view(s).



It is decided to mount the elements to a chassis constructed of ¾-inch plywood. Using information provided in the Array Report, a chassis is designed. (In this case, an off-the-shelf computer-aided design program was used, Generic CADD from Generic Software, Inc., but manual drafting techniques could have been used instead.)



Horn drawing data from Umbulus is entered into the CAD program to enable the drawing of the horns in position under the chassis. Again, manual drafting techniques could have been used instead. Knowing the center of gravity enables the user to design the rigging so that weight is distributed among hanging points, and mechanical stability is assured.

The most reliable house keeper since Hazel.

It might be nice to have a little help around the house for a change.

Well, here's a hard-working, entirely capable volunteer for your house system. The new Yamaha PM1800 Professional Audio Mixing Console.

First off, the PM1800 inherited most of its features and capabilities from the legendary PM3000. So it's already got a lot going for it.

Most importantly, though, the PM1800 is remarkably reliable. Performance after performance. With system after system. Through pratfalls and curtain calls.

The design, just like its predecessor the M1500, is familiar in all the right aspects and improved in the others. Such as a unique transformer option, so you can work with or without them. And wide use of internal jumpers so you can change signal flow just about any way you want.

Head for the nearest Yamaha Professional Audio Dealer to take a look at the new PM1800.

It's so reliable, it won't even ask for Thursdays off.

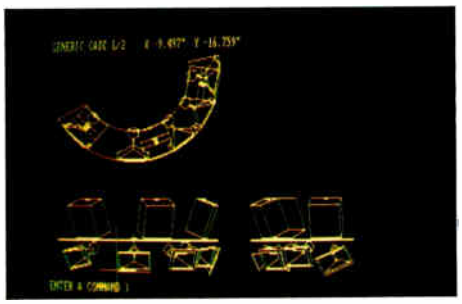
Yamaha Music Corporation, Professional Audio Division, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Avenue, Scarborough, Ontario M1S 3R1.

YAMAHA®
Engineering Imagination™

Circle 219 on Reader Response Card

Here, the array as constructed and installed in The Church of The Risen Savior, Burnsville, MN.

Drawing The Array. This can be performed externally from Umbulus using a CAD program or manually with drafting equipment. There has been a good deal of discussion as to whether the array working drawings should be created within a dedicated array program (such as Bose SpeakerCAD), or in a shell for AutoCAD/ Generic CAD (such as is being developed as a supplement by Mark IV for their AcoustaCADD sound system design program). This will be explored in depth in an upcoming CAD Topics.



Low-frequency enclosures are added to the top of the chassis. The Umbulus Link module is used to tie the horns to each other and to the chassis. Link can also be used to tie the low-frequency enclosures to the chassis, to locate ceiling mounting points in the room, and to tie ceiling mounting points to array mounting points. The shop and field people can now build and install the array.

Link Lengths. This module determines the array points to be connected, and how they should be connected in order to construct a coherent array with the correct aiming angles. Using the Video Sketch module, the auxiliary points are toggled ON. The horns on the drawing are then labeled. Two points that should connect are determined (and should be written down in your workbook). This is continued until all the likely points have been added to the drawings. From the Array menu, Linkage is selected, and through keyboard entry the data requested is entered.

Array Linker. This is the next module to be run, and generates a report providing "from" and "to" points, as well as element name with linkage lengths.

CONSTRUCTING THE ARRAY

This section in the manual is referred to for the actual construction of the array. Techniques for properly cutting the link lengths to size and drilling mounting holes are provided, as well as a good deal of practical advice. This is all serious business, and you must have competence and experience in these areas.

CONCLUSION

Umbulus Array Builder is an array design aid consisting of various functions ranging from the automatic to the completely manual, and the utilization of many of these functions requires tedious effort. On the other hand, it is the most comprehensive, "soup-to-nuts" program available, and will serve its users well if they are prepared to put in the required effort.

The program is a mixed blessing, and really would benefit from EGA high-resolution color graphics. Also needed is a re-working of the Video Sketch module into a serious CAD drafting program (or at least the provision of some sort of DXF file standard export for file interchange with AutoCAD or Generic CAD). For such a quality-oriented performance program, too much emphasis is placed on using entry-level computer equipment (no hard disk drive support, low memory requirements at the expense of extensive operator effort, poor graphics quality, and so on).

In this front view of the array, it can be seen that the completed array is aimed and positioned as depicted on the drawings.

In many ways, Umbulus has the clearest vision and direction of all the sound system engineering programs I have reviewed (perhaps because the developer has been designing sound systems for over 20 years), yet the program is missing much of the convenience and graphics sophistication that are so appealing in some of the software from the big guys.

AN ENGINEERING TOOL

BY TOM McCARTHY

In the late 60s, when we began the work that led to the development of Umbulus, we had no intention of developing a loudspeaker array design program; we simply wanted a way to determine the *Q* of a loudspeaker array. One thing led to another, and we soon found ourselves dealing with additional aspects of array design, starting with room blueprints and progressing right through to the final assembly and hanging of the array. And through this process, Umbulus was born.

The basic purpose of our program, it's reason for existence, has always been to provide the working sound contractor and consultant with tools that had been here-to-fore missing. Much can be learned from using Umbulus, and it can certainly aid in making a sale. However, Umbulus is first and foremost meant to be a legitimate engineering tool, complementing and enhancing existing tools and providing a way to progress in an orderly and rational way from room blueprints to the completed loudspeaker array.

Considerable effort is made to keep the program practical: it is designed to be easy to learn and to use, to require a minimum of computer paraphernalia, to guide and inform (rather than grab the reins), to deal with the whole array design problem with equal resolution, to standardize procedures, to present information in a usable form, and to be flexible.

In our estimation, Umbulus makes the best use of the most common computer, the IBM PC & compatibles, and the program does what it is intended to do.

McCarthy is chief engineer, North Star Sound, Minneapolis, MN.

WIRELESS INTERCOM SYSTEMS

BY GARY DAVIS

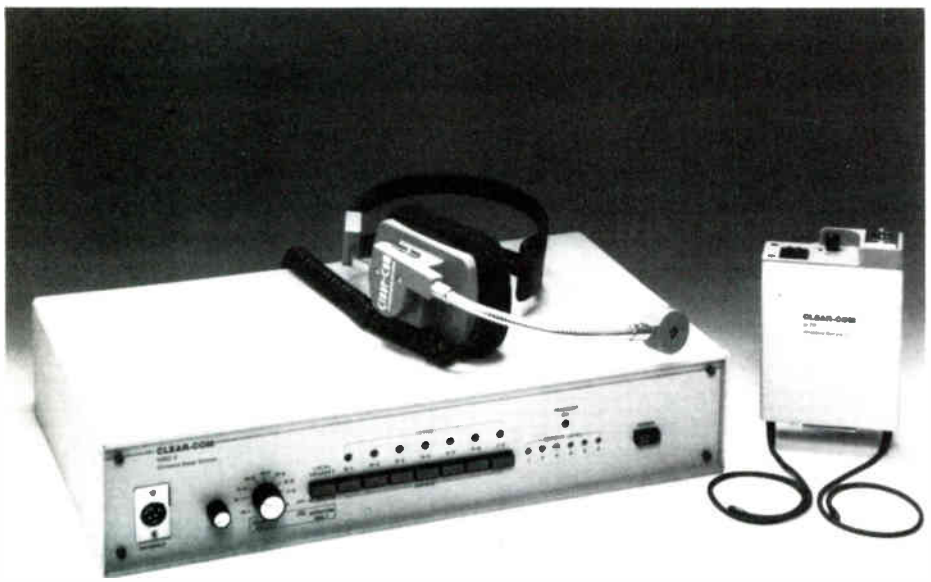
A wireless intercom is a system by which two or more people can communicate from reasonable distances apart. Its equipment is miniaturized, and is not connected by wires or cables, thus providing maximum mobility to its users.

There are two basic types of professional, wireless intercom systems. One type is operated with a console base station and one or more wireless, remote units. The other type is operated with a battery powered, wireless transceiver and one or more wireless, remote units. The remote units consist of small belt pack transceivers, and headsets with attached microphones. The base station operator can communicate simultaneously with all crew or team members using the belt packs.

Davis is president of Gary Davis & Associates, Santa Monica, CA, and has been a technical writer and audio consultant since 1974. Along with his associate, Ralph Jones, he authored the Yamaha Sound Reinforcement Handbook.

APPLICATIONS

Wireless intercom systems have become a necessary part of many communication networks in recent years. The flexibility provided through their use is indispensable in many production, training, security, and industrial applications. Rapid growth in the videotape production industry has created a need for wireless intercoms to be used as extensions of wired systems already in place. They are invaluable as communication aids between directors, stage managers and camera, lighting and sound crews in theater and film productions. In sports events, wireless intercoms are not only used by coaches, spotters and players, but also by sportscasters and news production crews. In activities such as stunt filming, circus acts and gymnastics, in which cues and timing are crucial to safety and successful performance, the wireless intercom has become a critical asset. The applications of wireless intercom systems are limited only by the imagination of their users.



The WTR-1 wireless belt pack and WBS-6 wireless base station from CLEAR-COM.

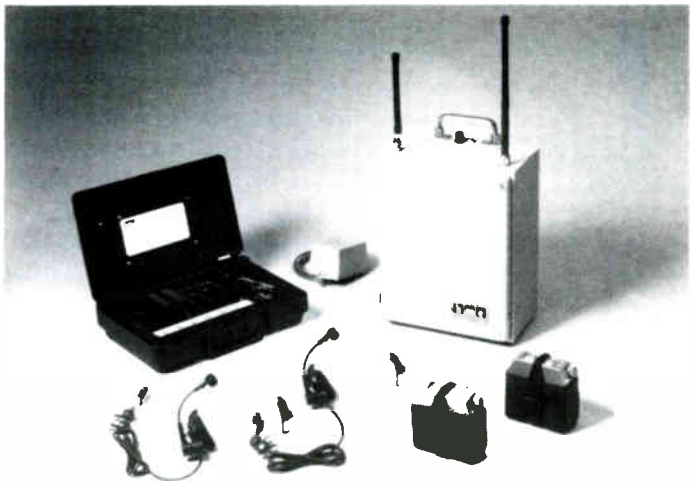
DEVELOPMENT

Early intercom systems generally consisted of fixed units, which were wired in place. Any mobility depended on the length of cable connecting their headsets to base stations. As the users moved around, the cables had to be dragged with them and lifted over obstacles. Outside interference noise was also a problem.

Walkie talkies were the earliest form of wireless intercoms used. They were heavy and cumbersome and had to be connected to large batteries from which they obtained their power. Their reception was easily distorted and noisy. Wireless communication has come a long way since the walkie talkie.

Technological advances since the late 1960s have tremendously affected both the size and performance of wireless intercoms. The development of semiconductor technology improved their dynamic range and audio quality significantly.

Technology in the early 1970s introduced the integrated circuit compander, which was incorporated into wireless intercoms to reduce noise. Later, the application of



The System 8100 wireless intercom from HM Electronics.

Swintek's Mark 200 wireless intercom system.

diversity reception minimized the problem of dropouts (transmission losses), greatly improving system reliability. The Federal Communications Commission (FCC) allocation of specified frequency bands for wireless intercoms has eliminated radio interference from other services.

Today's wireless intercoms perform as well as conventional, wired intercoms. In the 1980s they are being manufactured with improved dynamic range and smaller transponders, a result of better compander integrated circuitry and advanced circuit design techniques. A variety of wireless intercom equipment is presently available in various configurations.

WIRELESS INTERCOM TYPES

There are three basic types of wireless intercom systems: simplex, half-duplex and full-duplex. A simplex system permits one-way communication only, such as ordinary radio broadcasting in which the listener can hear the announcer but cannot respond. A half-duplex system operates like a walkie talkie, allowing the users to communicate one at a time, only while pressing a button. A full-duplex system, however, provides continuous two-way communication without pressing a button. This is the most desirable type of system, since it provides complete hands-free mobility to the user with the advantages of normal uninterrupted conversation. Brief descriptions of each type of system are given below.

Simplex. Since only one-way communication is possible in a simplex system, it is useful only in dispersing information when no reply is necessary. Paging systems at airports or in department stores and hospitals are simplex systems. Because of its simple circuitry, this is the least expensive type of intercom system.

Half-duplex. Because of its affordable price range and the fact that it provides two-way communication capabilities, this is the most popular type of wireless communication system. Half-duplex systems consist of one unit which serves as the base station and several remote units. The base station may either be a console which plugs into an AC outlet or is powered by a 12 volt battery, or it may be a mobile belt-pack unit with a miniaturized transceiver.

The base station operator, usually a

director or crew supervisor, can communicate freely with all crew members, transmitting and receiving simultaneously. His instructions can be heard by all crew members at once. Thus, priority messages from the director reach all crew members without delay. The base station also simultaneously rebroadcasts all incoming messages. Each crew member's communication with the base station can thereby be heard by all fellow crew members. Although crew members cannot communicate directly with each other, they can communicate via their supervisor or director. Crew members can hear incoming messages at all times. In order to transmit from a remote unit, crew members must press a button on their belt

The AD913 radio adaptor from Technical Projects.

packs. Only one member is able to transmit at a time. The half-duplex is cost effective and efficient for most operations.

Full-duplex. This is the ideal form of wireless intercom system since it provides the only truly hands-free operation. With a full-duplex intercom, uninterrupted communication is possible, as in a normal telephone conversation. The major difference in this system and the half-duplex is that a full-duplex intercom is capable of continuous transmission in both directions. It is not necessary to press a button to transmit.

The discrete full-duplex system operates with only two units: a base station and one remote unit. Transmitting and receiving by these units is done on two different frequencies. A message is transmitted on one

The M3330 wireless headset from the David Clark Company.

frequency by one of the units and received on that same frequency by the other and visa versa. If a larger communication network is required with more than two wireless belt packs, the system becomes complex.

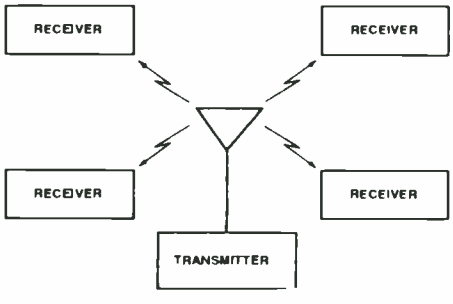
In order to accomplish this, a base station that will transmit to all the wireless belt packs on a single frequency is needed. At the same time, separate receivers for each wireless belt pac are necessary at the base station. The base station then functions as a repeater, receiving messages from each remote unit and retransmitting them back to all the remote receivers at once on a single frequency. The complexity of this extended full-duplex system increases its cost significantly and is therefore not cost effective for all operations.

Currently available systems permit use of four to six full-duplex, wireless remote belt pack units in this fashion, providing full hands-free communication to all users at once.

INTEGRATED SYSTEMS

There are as many varied configuration requirements for wireless intercom systems as there are users. Systems may be integrated in almost any imaginable combination. One user may need to link a PA system (simplex) to a full-duplex system. Another user may want to hook up several half-duplex wireless belt pack units to an existing cabled intercom system. A typical remote belt pack transceiver has provisions for either half-duplex (push-to-talk) operation or may be switched to full-duplex, which provides continuous hands-free transmission and reception. With nine volt alkaline batteries, the belt packs may operate continuously for eight to ten hours. More than four wireless belt packs may easily be accommodated by adding base station for additional channels, or by letting several belt packs use the same transmit frequency.

In this case, push-to-talk is mandatory because only one signal can be transmitted without interference at a given time. Wired stations, generally used at fixed positions for cameras and lights, are the most cost effective. But the director or crew supervisor may prefer wireless stations for mobility. Wireless systems are also needed for positions that are not practical to wire. Whatever its application, the wireless intercom provides greater mobility than its cabled counterpart.



A typical simplex wireless system.

FREQUENCIES USED

Audio bandwidth is not a critical factor with wireless intercom systems. Some frequency bands are more subject to interference from adjacent frequencies than others. For example, the 400 to 470 MHz, ultra-high-frequency band, of which wireless intercoms and microphones utilize the 450 to 451 and 455 to 456 MHz frequencies, is also used by police, fire and

HME Intercom Systems:

First for Performance, Built to Last.

HME intercoms are fast becoming the favorite of concert halls, theatres, churches and broadcast facilities.

It's well known that superior audio quality reduces fatigue and makes for less mistakes. Which is why HME's broadcast-quality audio means a lot to producers who care. We even have AGC on every mic line so everyone from shouters to whisperers are understood.

HME intercoms are truly built with the user in mind, from form-fitting belt-pacs to compact wireless transmitters, and from hands-off power stations to models with IFB, stage announce, telephone interface, and up to 6 x 12 matrix switching.

They're unbeatable for reliability. Current foldback in the power supplies eliminates damage to components from short circuits, and acts as an exclusive built-in fault locator to help you find a shorted cable quickly. HME's years of wireless microphone experience has helped develop the most rugged electronics packaging this side of space.

HME designs and manufactures 100% of our cabled and wireless intercom equipment, so custom designs and interfaces can be made much faster with the same high reliability as our standard products.

Call your HME dealer/distributor now for all the details.

hme®

HM ELECTRONICS, INC.

6675 Mesa Ridge Road
San Diego, CA 92121, USA
Phone: (619) 535-6060
Telex: 350-771
FAX: 619-452-7207

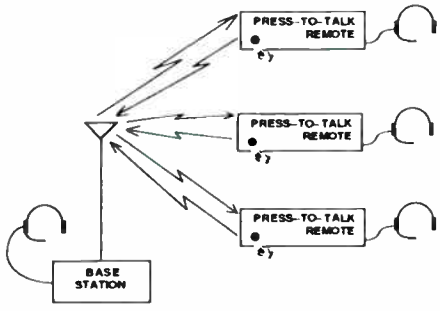
HME Products are distributed internationally:
In Canada—GERRAUDIO Distribution Inc. • PH: (416) 868-0528 FAX: 416-868-6419
In Central America—Servicios Electronicos al Espectaculo • PH: (905) 544-1345 FAX: (905) 549-6509
All other countries—Global Representatives, Inc. • PH. (201) 492-8140 FAX: 201-492-2566

Circle 214 on Reader Response Card

public health service radios. Any time nearby frequencies such as these are in intermittent use, there is a risk of random interference that was not detected during equipment setup.

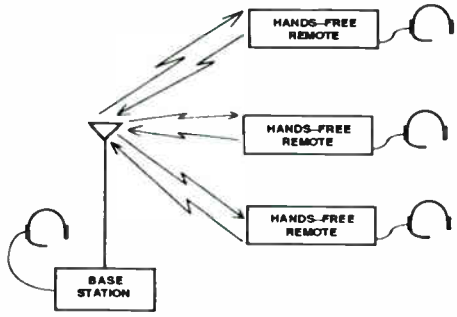
The most practical and commonly used frequency band for wireless intercom systems in the U.S. is the VHF band, from 26 to 27, 35 to 43 and 154 to 174 MHz. Different manufacturers use different frequencies, and their systems are necessarily preset to those given frequencies. The buyer must be aware of these factors in choosing the most appropriate system in order to avoid interference from local broadcast. Interference from harmonics of scheduled broadcast must also be considered. That is, if an FM radio program is being broadcast at 88 MHz, it will also appear at 176 MHz, and other multiples of the primary broadcast frequency.

Some manufacturers utilize a "split-band" system. In this type of system, the base station may transmit on the VHF high



A typical half-duplex wireless system.

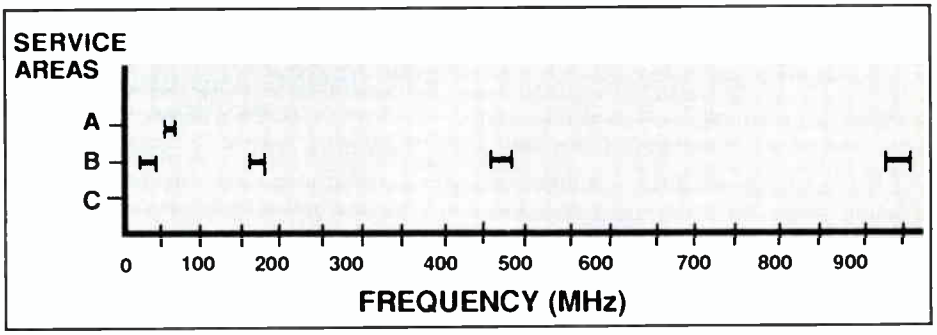
band, while the remote units transmit at VHF low band. In split-band operation, coordination with the FCC is important to be sure that both frequencies are in compliance with the same section under FCC regulations.



A typical full-duplex wireless system.

To operate a wireless intercom legally in the United States, a Federal Communication Commission station license is required. The type of license depends on the use to which your intercom will be put. Local FCC offices or the equipment

manufacturer should be contacted for further information. Figure 10-30 indicates the radio frequency allocations for wireless intercoms in the United States. In other countries different frequency allocations as well as operating regulations may apply. Local authorities should be consulted prior to system selection or operation.



Wireless intercom frequency bands.

IMPROVED RANGE AND NOISE REDUCTION

There are now numerous systems designed for improved audio range and noise reduction. Wireless intercom systems do not need to have high level dynamic range since they are used primarily for speaking and do not have to produce a natural or enhanced musical quality. However, it has been demonstrated that the natural voice quality of today's systems is less fatiguing over a long period of time than the highly compressed audio sound of a few years ago. This is a benefit of the improved range and signal-to-noise ratio of state-of-the-art wireless intercom technology.

Prior to the late 1970s, most wireless intercoms could not efficiently reduce unwanted noise. Today, many systems include compander circuitry, the most advanced noise reduction technology. In a compander circuit, a full-range compressor is built into the intercom transmitter and an audio expander into the receiver. When the signal is compressed, the audio level

remains well above the residual noise floor. When it is expanded again, the noise is reduced and the signal is much cleaner and relatively noise-free. Low level hiss and static are virtually eliminated. Companding the audio signal also provides improved dynamic range over a straight transmission. In some cases the wireless intercom may actually be quieter than its cabled counterpart.

EVALUATING AND SELECTING A SYSTEM

There are a number of criteria that must be considered in evaluating and selecting a wireless intercom system suitable for professional use. Ideally such a system must work perfectly and reliably in a variety of tough environments with good intelligibility and must be useable near strong RF fields, lighting dimmers and other sources of electromagnetic interference.

Operating Frequency. If a wireless intercom is going to be used effectively at frequencies adjacent to other strong signals which might interfere with the clarity of its reception, the extra expense of a more complex receiver will be necessary. Thus the operating frequency of a wireless intercom system is a factor to be considered in selecting your equipment.

Diplexer. Wireless intercom and microphone systems normally operate on like frequency bands, thereby often benefitting by combining systems, enabling a director or crew supervisor to have closed and open communication. Up to 24 discrete VHF high-band microphones and intercoms can be operated in the space of a single TV channel. However, such complex systems often experience desensing, the muting of a receiver because another mic or intercom is transmitting in close proximity, thus limiting its effective range. Some systems have antenna diplexers and may therefore be immune to the desensing problem.

Side Tone. An important feature to look for in an intercom is side tone, which confirms that communication is actually taking place. Side tone simply means that the user hears his voice as he talks, but only after it has been retransmitted to him. Non-duplex systems cannot offer side tone or have local side tone in which the voice is fed directly into the earpiece through a preamp and thus does not conform two-way communication.

Headsets. Some wireless intercoms are built entirely into headsets. While these units are very compact, they are often heavy and uncomfortable as well as poor in serviceability and sound quality. In other intercoms the transceiver is packaged separately and is designed to work with a variety of headsets. This will usually be most cost effective for the buyer who already has headsets. To assure compatibility, investigation should be made

(continued on page 62)

U P D A T E

Contracting Close-up

Reports From Shuttlesound, Sesco, LeBlanc & Royle, and Revelation Sound

King Abdullah's Mosque

King Hussein of Jordan recently commissioned a sound installation in King Abdullah's Mosque in the city of Amman. The job was carried out by the contracts division of Shuttlesound Ltd. (London, U.K.) and designer Peter Barnet of A.M.S. Acoustics Ltd., with on-site installation provided by Nasri Nazzal of the Jordan-based International New Technical.

The system can be divided into six subsystems that can communicate with any other or act independently:

The main mosque contains a central cluster of Altec horns and bass bins hidden behind an acoustically transparent screen. This system provides priority output to enable prayers said within to be heard throughout the complex.

The minaret system had to be able to cover as wide an area as possible while maintaining clarity of speech. It uses Altec constant directivity horns and Altec 299-8A compression drivers.

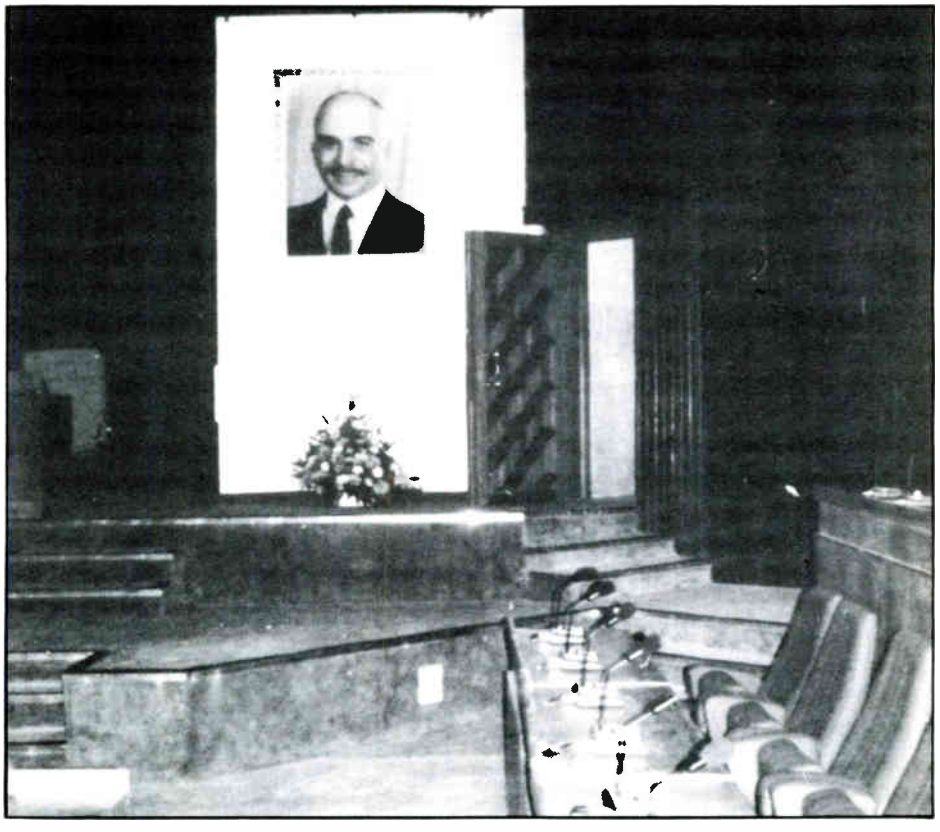
The women's prayer room uses a small independent system that can be overridden by the main mosque system when a speaker talks over that system.

The outside system, which uses University horns, is overridden by the main mosque and has to be time-aligned to give the appearance that the sound is originating from the main mosque.

The two-location, six-zone paging system covers all areas, but also gives priority to the main mosque in the event that prayers are being called during an announcement.

The conference room is equipped with an Altec central cluster with delay ceiling speakers to cover a 400-seat conference hall and a 24-channel Soundtracs mixing console.

With the exception of the women's prayer room, all speakers operate at 100v and are driven by Altec 9444-A amps. Processing is a combination of Altec, Furman, and Audio-Digital delays.



The King Abdullah Mosque, Amman, Jordan

Boston U's Performance Center

Boston University's on-campus theatre, Hayden Hall, was recently renovated. The sound installation, begun in April of last year, was completed in January by Sesco, Inc. (Boston, MA), along with general contractors Jackson Construction and electrical contractors, S.M. Brown.

Now called the Tsai Performance Center, the approximately 600-seat theatre houses opera, concerts, multimedia presentations and school as-

semblies. It is now fully audio-video capable, with complete post-production facilities. In addition, says Sesco Senior Audio Engineer Dennis Smyers, the overhaul gives the University's reputable music department a necessary classic music space for intimate performances.

By picking up the acoustic sound at the presidium and delaying it digitally at more than 50 intervals, then recombining and redistributing it into the hall through about 35 JBL ceiling speakers, the sound of a larger venue is simulated. Besides the many JBL ceiling speakers, the installation required products from the likes of AKG, Audio-Digital, Audio-Technica, Clear-Com, Klark-Teknik, ProTech, QSC and Sennheiser.

"I've never seen such a professional university system. There was a lot of attention to detail in terms of the architectural acoustics," Smyers says.

Lodestar Towers

Lodestar Towers (North Palm Beach, FL) recently erected its eighth independent, multipurpose communication and broadcast tower. The 1049-foot structure was designed, fabricated and erected by LeBlanc & Royle (Oakville, Ontario, Canada). Located within 5 miles of New Orleans' central business district, it has an elevator and communications platform. The tower accomodates over-the-air radio systems such as microwave, paging, mobile telephone, hospital emergency, fire, police, ambulance and shipping communications. Others like it are in Jacksonville, Orlando, Daytona, St. Petersburg and North Palm Beach, Florida; St. Louis, Missouri; and Charlotte, North Carolina.

First Baptist Church

Dallas-based Revelation Sound, Inc. recently completed an installation at the First Baptist Church in De Ridder, Louisiana.

The church structure, at least 40 years old, has a square sanctuary that seats about 2,000 and has an approximately 40-foot-high ceiling. A balcony overhangs the rear half of the sanctuary.

Reverberation that resulted from the church's leaded glass ceiling was attacked by splitting the front speaker system to the left and right of the pulpit, reports Revelation Sound President James Jackson.

Included in the installation were two 24-input JBL Soundcraft 200SR mixing consoles, one for TV broadcast of the parish's outreach services, and one for in-house reinforcement. ■

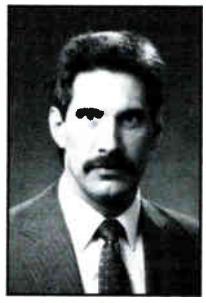
People

Electro-Voice Promotes McGuire, Murray

E-V Promotions

Paul McGuire, formerly vice president of marketing at Electro-Voice (Buchanan, MI), was recently promoted to executive vice president. In this position, he assumes operating responsibility for the engineering, manufacturing, sales, and marketing functions of E-V in the U.S. and Canada.

John Murray was recently appointed marketing development manager for pro sound reinforcement. His responsibilities include consultant relations and contractor training seminars.



John Murray

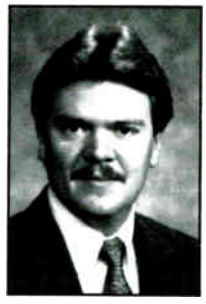
Promotions At Meyer

Mark Johnson has been appointed director, technical marketing at Meyer Sound Laboratories, Inc. (Berkeley, CA). He is responsible for trade show design and coordination, advertising and PR, and technical support.

Cindy Ramos has been promoted from sales support representative to the position of national sales manager at the company. She now qualifies new dealers, and maintains the existing dealer network, production coordination and order expediting.

Harris Appointed At Boston Acoustics

Robert Harris has been appointed to the position of national sales manager-designer series at Boston Acoustics (Lynnfield, MA). He will be responsible for managing the sales of the company's custom installation wall-mount products. Previously, Harris was an area sales manager at L.D. Allen (Syracuse, NY).



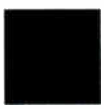
Robert Harris

Brassard Named VP/General Manager

Paul Brassard has been named vice president, general manager of Arkon Resources, Inc. (Arcadia, CA). Brassard, who joined the company in 1985, later became general manager. He will oversee all marketing, sales, product development and advertising for the Arkon brand.

Paul Brassard

The AES Heyser Scholarship Fund



The Richard C. Heyser Scholarship Loan Fund has been set up to honor Dick Heyser, a highly gifted, loved and respected engineer, with a lasting memorial. The scholarship loan will financially assist promising graduate engineering students in the field who, otherwise, could not continue with their studies.

In March of 1987 Dick died, just a few months before he would have assumed the office of AES President. He not only was active in AES but he contributed greatly to the audio field through his Time Delay Spectrometry discoveries. He gave of himself on a personal level as well. Carolyn Davis, Co-Founder of Synergetic Audio Concepts, said of the fund, "Dick, himself, gave so much to all those with whom he came in contact, especially those just starting out; we feel Dick would have been pleased to know he is being remembered in this way."

In conjunction with this memorial, a major update of The PHD Program† will be dedicated to Dick Heyser and all the proceeds will go to the Richard C. Heyser Scholarship Loan Fund.

You may obtain a program for a donation of $300.00 or more; prior owners may upgrade for a donation of $50.00 or more. Make your check payable to the Richard C. Heyser Scholarship Loan Fund. Send to the Richard C. Heyser Scholarship Loan Fund, c/o *Sound and Communications*, 25 Willowdale Avenue, Port Washington, NY 11050.

† Trademark of Ambassador College.

Ruzek Moves Up

Judy Ruzek has been appointed national sales manager for The Winsted Corporation (Minneapolis, MN). She will oversee Winsted sales and customer service throughout the continental U.S. Ruzek joined the company in 1984.

Judy Ruzek

'International' Importance

Colin Lane-Rowley has been appointed international sales manager for Soundtracs Plc (Surrey, UK). He is responsible for supporting established distributors in Europe, Scandinavia and the Far East, while he approaches new market areas and geographical territories.

Colin Lane-Rowley

Apogee Hires Lavry

Analog engineer Dan Lavry has joined Apogee Electronics Corporation (Santa Monica, CA) to head design of high-performance A/D and D/A conversion systems. Lavry was formerly chief engineer and manager of advanced technology at Analog Solutions in San Jose, California.

Anixter Appointments

Roland Watkins was appointed senior vice president of engineering and product management, where he will be responsible for the organization and operation of the product and engineering functions for the company. Watkins was most recently vice president of engineering and product management.

Jim Warren was promoted to senior vice president sales-major markets, where he is responsible for the company's major accounts program and industry sales group. Warren was most recently vice president of sales and marketing for Anixter.

Sclater Promoted

After joining AMX in the last quarter of 1989 as sales engineer, Ken Sclater has been promoted to sales manager. He now provides telephone support, systems design and quotation to dealers for the Dallas-based company.

Yancey Named At Spatial Sound

Spatial Sound Inc. (Mill Valley, CA) has appointed Dave Yancey as national sales manager. He is responsible for sales strategies and direction of representatives and distributors, marketing and advertising and customer relations.

Cavanaugh Tocci Adds Three

Three new members have been added to Cavanaugh Tocci Associates (Sudbury, MA): Doug Bell as principal consultant in vibration analysis, Shari Solomon as senior consultant, and Larry Tedford as marketing manager. Bell will expand the company's existing vibration analysis capabilities, and provide predictive maintenance services to industrial plants. Solomon will apply her knowledge of meteorological effects on atmospherically propagated sound to the firm's efforts in community noise assessment. In addition to his duties as marketing manager, Tedford will provide technical assistance for management and computer information systems. ■

Products

New Mixer/Power Amp From Dukane

Multifunction Mixer/Amp

The 1A1660 is Dukane's new mixer/power amp for schools, correctional facilities, factories, healthcare and commercial facilities. It features a telephone page input, an auxiliary input and four additional inputs that can be enhanced. Individual controls for inputs one through five, bass and treble controls, a master control, and an illuminated power switch are located on the front panel. The telephone/page control is rear-mounted.

Circle 1 on Reader Response Card

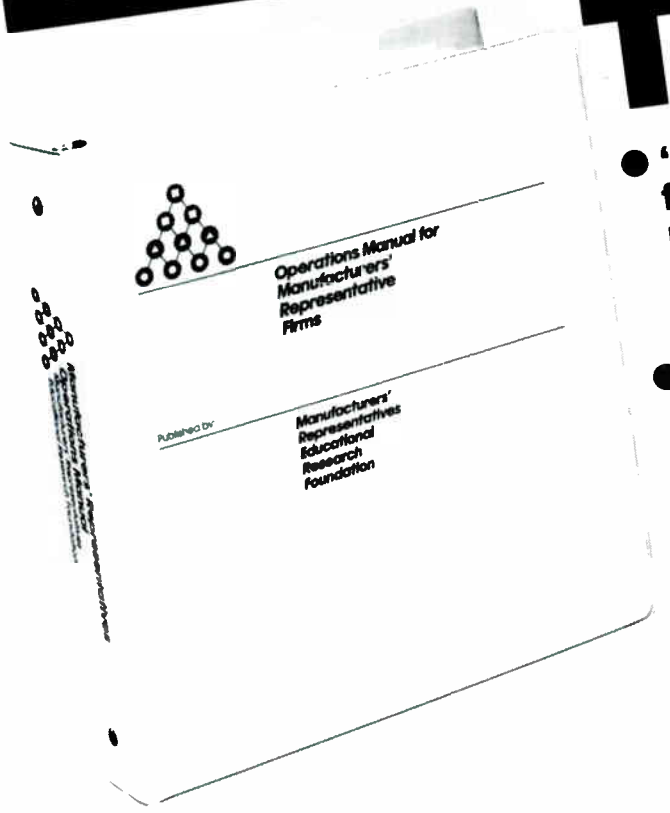
Podium Mics

The SHM series by Beyerdynamic was designed for podium installations in pro audio, sound contracting and broadcast markets. The SHM 420 dynamic hypercardioid, the SHM 422 dynamic sypercardioid and the SHM 10 condenser hypercardioid all have a non-glare black anodized finish, and are attached to a matte black gooseneck. Each model is available in 220 mm, 300 mm and 500 mm lengths.

The DT 770 and DT 990 pro headphone sets are meant for music monitoring in studio or field recording,

If you are a manufacturers' representative —

You Need This Book!



The indispensible guide and How-To book for operating as a sales representative

- **"Hands-on" advice from 25 successful reps, plus consultants and academics who know the rep business inside-out**
- **Over 50 chapters — hundreds of pages — dozens of valuable forms, work-sheets, checklists**
- **Covers**
  - **Organization and General Procedures**
  - **Administration and Operations**
  - **The People in Your Business**
  - **Sales Management**

Published for Your Profit by the Not-for-Profit
Manufacturers' Representatives Educational Research Foundation

Order the Operations Manual today

RISK FREE

If not satisfied, you can return it in 15 days for a full refund Send back the coupon, or order by phone **(312) 208-1466,** for same-day shipment.

Manufacturers' Representatives Educational Research Foundation
P.O. Box 247
Geneva, Illinois 60134

Please rush me a copy of the Operations Manual for Manufacturers' Representative Firms.

ERA/NEMRA Member price: $84.95 plus $5.00 postage & handling.
Non-member price: $99.95 plus $5.00 postage & handling.

☐ I enclose my check for $_____ payable to Manufacturers' Representatives Educational Research Foundation. (Sorry . . . at this low price we cannot bill you.)

☐ Charge to my ☐ Visa ☐ Mastercard
Account No. _____ Expires _____

Name: _____

☐ ERA Member ☐ NEMRA Member ☐ Non-Member

Company: _____

Address: _____

City: _____ State: _____ Zip: _____

radio stations and music cataloging.

TourGroup mics are made for sound companies and touring musicians. The M 88TG, M 69TG, M 300TG, M 500TG are the moving coil models, and the

MCE 80 and MCE 81 are condenser mics. The M 380TG is meant for bass drum, and the M 420, M 422 and M 201 are built for additional percussion applications.

Circle 2 on Reader Response Card

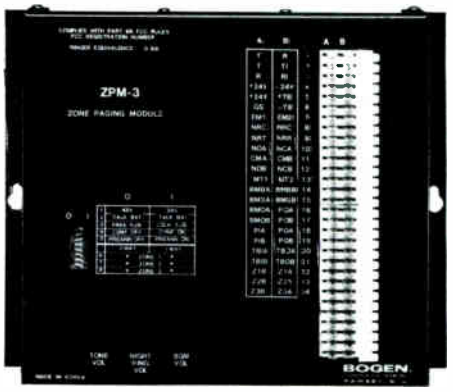
DJ Products

The MT4000 DJ turntable is a quartz direct drive unit with pitch control, start/stop cueing, electronic breaking, and a straight tone arm with standard cartridge mount. The PMC30 pro mixer incorporates 12 sets of stereo inputs, EQ per channel, stereo 7-band graphic EQ, two effects send/return plus one Aux send per channel, and selectable cross fader per channel.

Circle 3 on Reader Response Card

Zone Page Modules And More

Bogen's ZPM-3 and ZPM-9 can direct voice paging announcements to any of three or nine zones, respectively, to a group of zones, or to all zones at once. The modules may be used with either one-way or two-way (talk-back) paging systems, and are compatible with both centrally amplified and amplified-loudspeaker types of systems, says the company.



Circle 4 on Reader Response Card

What's new? Each month, *Sound & Communications* Products Department showcases many of the new products being introduced by both large and small manufacturers. And noted technical writer and consultant Gary Davis focuses on one new product each month in his commentary, A Closer Look.

Don't be left out!

Send all your product news (with photos) to:

Bill Intemann
Managing Editor
Sound & Communications
25 Willowdale Avenue
Port Washington, NY 11050

Secure Sound

Louroe says its Piggy Back Kit adds sound to CCTV coax with no interference. By installing the microphone and transmitter at camera and adding the audio base station receiver at the CCTV monitor, one can listen, record, and play back a VCR for sound and picture.

Circle 5 on Reader Response Card

Hospital Headphones

Crest Electronics says its pillow speaker headphones let patients enjoy hi-fi sound without bothering other patients or being disturbed by external sounds. The units plug into the pillow speaker with the volume control knob on the pillow speaker. The headsets come in red, orange, blue or black, and can be used for binaural or stereo sound, depending on how the pillow speaker is wired.

Circle 6 on Reader Response Card

Cable Test Kit

Jensen's Test-All IV Kit features new surface mount technology, labels and packaging. It qualifies up to 8-wire voice or data lines before installation of equipment and combines four test functions in one: polarity reversals, wire transpositions, 400 card operation in 1A2 Key equipment, continuity, DC and AC volts, opens and shorts. The kit will work with AT&T's four-pair wiring plan and the newest electronic PBXs, says Jensen.

Circle 7 on Reader Response Card

Audiopro Series Addition

The AP-3000 is Yorkville Sound's addition to its top-of-the-line Audiopro series. The high-power amp features a power headroom capacity of 1500 watts per channel for music reproduction into 2 Ohms.

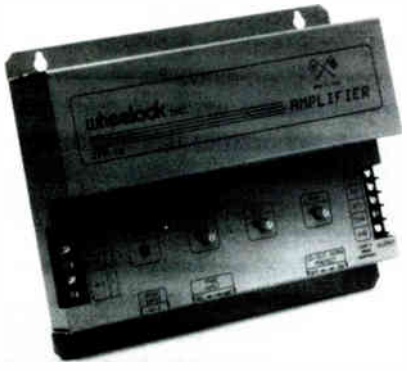
Circle 8 on Reader Response Card

Better Camera Control And More

AMX Corp. has a joystick option available on any of its Softwire control panels. The joystick allows for enhanced control of pan and tilt functions of a video camera.

The KI-One Computer Keyboard Commander allows one to control the computer keyboard with a wireless radio-coded, remote device that can transmit through walls, screens, drapes or any other line-of-sight obstruction, claims the company.

Circle 9 on Reader Response Card



Paging Amp Features A Variety Of Inputs

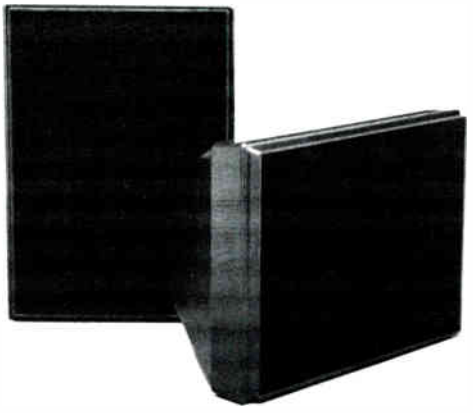
The TPA series from Wheelock is a set of telephone paging amps with inputs for telephone, microphone and music. The TPA-10, the latest addition to the line, is a 10-watt model, and can be shelf- or wall-mounted.

Circle 10 on Reader Response Card

Color Video Surveillance Camera Switcher

The SW-C300U camera switcher by JVC provides control of up to four JVC TK-895U color video cameras that are each connected via a single cable. It features auto sequential camera switching including skip function, variable switch timing, manual override for camera switching, and independently adjustable white balance for each camera. The SW-C300U also allows each of the other cameras to be alarmed.

Circle 11 on Reader Response Card



Indoor/Outdoor Speaker

The Pro Spot 2 from Galaxy Audio is a sound reinforcement speaker designed for indoor or outdoor use. It features a wedge-shaped design and built-in T-nuts, and weighs under 45 pounds. It is available in oak, walnut, black and white, or gray, which can be painted.

Circle 12 on Reader Response Card

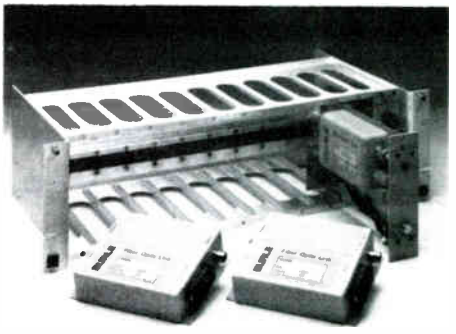
3-Way Cabinets

The KB156 and KB156STS 3-way enclosures from SoundTech feature a 15-inch speakers in their own baffle and 6-inch mid range cone transducers coupled to Electro-Voice ST350 tweeters. Their biampable cabinets are suited for keyboard monitor, PA, and side fill monitor usage.

Circle 13 on Reader Response Card

Burle Debuts Fiber Optics And More

The TC4600 series from Burle is a fiber optic system for video or data



transmission for closed circuit television system performance. Used in pairs, the TC4611 and TC4612 transmitter and receiver are designed for transmission and reception of video signals. The TC4611S and TC4612S are for the transmission and reception of video sync signals.

The TC8135C and TC8135CX controller/followers are two pan/tilt and motorized lens controllers for use in conjunction with Burle's TC8112 and TC8124 sequential switchers. They are used to control the position and field of view of a camera selected by the video switcher.

Circle 14 on Reader Response Card

Financial Trading Speaker Systems

The All Call speaker system series is compatible with any trading turret, says Turret Equipment Corporation. They can also be used as stand-alone systems, providing duplex, hands-free communication over a standard two-wire telephone line.

Circle 15 on Reader Response Card

Mounted Mic

The SM99 is Shure's miniature gooseneck mounted condenser mic (electret bias) designed primarily for mounting on a lectern, pulpit, or conference table. It features a supercardioid polar pattern

Circle 16 on Reader Response Card

A Closer Look

Crown IQ System 2000™

by Gary D. Davis

Crown International, Inc., of Elkhart, Indiana, has recently introduced a new computer-based remote control system for its Macro-Tech and Com-Tech series of audio power amplifiers. Said to have been in development since 1986, the IQ System 2000 utilizes a plug-in circuit card for each amplifier, a Crown interface unit, and an Apple Macintosh computer running proprietary software. The system permits sound reinforcement professionals to monitor the status of up to 2000 Crown amplifiers from a centralized location, and to remotely control their functions either individually or in groups.

HARDWARE COMPLEMENT

The IQ P.I.P.® (Plug In Panel) card is the device which allows Macro-Tech or Com-Tech amplifiers to communicate with the host computer (Micro-Tech and Power Base amplifiers may be factory-modified to accept the card, as well). It replaces the amplifier audio connector panel, and is fitted with a pair of XLR-type female connectors for the audio inputs, as well as a pair of DIN connectors for serial I/O. (A 5-pin DIN is used for the serial input, and a 4-pin for the output, so as to avoid potential misconnections.) An auxiliary connector provides a +15 V, 15 mA trigger pulse for remote control of lighting, cooling fans or other auxiliary equipment.

In addition to audio signal-handling circuitry, the IQ P.I.P. card holds a microprocessor for input data selection and command execution, a communication address selector switch (used to give the amplifier a unique serial address), and line drivers for the serial I/O. The card receives +5 and ±15 VDC power from the amplifier through a mating edge connector.

Individual amplifier cards communicate serially with the host computer via a self-contained, external IQ System Interface unit. Serial connections originate at the IQ Interface, then loop from one P.I.P. card to the next; a total of eight individual serial loops (each having up to 250 amplifiers on it) may be accommodated. Each loop may be wired in segments of #26 AWG or larger wire to a maximum length of 1000 feet. Communications between the interface and the amplifier cards occur at 38,400 Baud (38 kiloBaud).

The IQ Interface, in turn, features an RS232, RS423/RS422 interface with a 25-pin D connector for the host computer connection. In order to accommodate the host computer's requirements, the Baud rate here is variable from 300 to 38,400. Switches accessed through the side of the interface chassis select interface type and Baud rate. Under direction from the host computer, the interface interrogates specific P.I.P. cards with data requests, receives replies from the cards, and reports back to the host.

SYSTEM SOFTWARE

Designed to run on the Apple Macintosh family of computers, the IQ System Software utilizes a graphic, icon-driven interface with pull-down menus and resizable windows. Format options permit tailoring the graphic displays for a particular operator's requirements.

The Set Up window (labeled Main House in the figure) comprises the primary graphic display for defining and viewing system configurations. In this window, amplifiers appear as small boxes in groups, identified by number. You may define the quantity of amplifiers in each group, number the amplifiers, name the groups, and move groups around to configure the display as desired. The Status window shows data from the IQ P.I.P. cards in a graphic format; amplifiers are identified by group and number, as defined in the Status window. Bar graph-style indicators provide a continuous display of input/output signal levels and ODEP status. "Radio button" indicators denote power and IOC status. You may choose to view a single amplifier, one or more groups in any combination, or

all amplifiers at once. The window may be resized and moved as desired.

The Control window provides a group of mouse-activated buttons and sliders which affect a selected amplifier or range of amplifiers. From this window, you may command channel 1 or 2 individually to turn on or off, mute or unmute, and invert polarity. You may also control input attenuation by channel, activate the amplifier's DSPI and/or auxiliary output, and turn all amplifiers on or off. The Control window may be selected to appear as either a single window showing both channels, or as separate windows for each channel.

Many of the main software functions feature command-key equivalents, so they can be invoked from the computer keyboard as well as with the mouse. Some functions appear only in the pull-down menus, while others are duplicated in both the menus and the windows.

COMMENTS

Centralized computer control of amplifier functions is certainly an idea whose time has come. In touring sound, contracting and theatre reinforcement, the demand for greater automation of sound system functions has steadily increased in recent years. Nor should this come as any great surprise, for the concept offers substantial benefits.

The ability to monitor amplifier status from a central location, alone, should be extremely attractive to sound reinforcement professionals: no more running to remote corners of the installation space, just to see if an amp is turned on and passing signal. Amplifiers can be located near AC service and/or loudspeaker positions, saving on the expense of large-gauge power and speaker cables. Testing and optimizing of sound systems can be much more efficient, given the capability to turn sections on and off, balance levels, and control polarity from a single computer console. The IQ System 2000 potentially offers all of these benefits, and more.

We did not have a full working system to evaluate, nor do we routinely test any equipment in preparing this column, so we must rely on Crown's reputation as a professional component manufacturer for indications as to the quality of the system's performance.

Judging from the literature, it appears that the IQ System 2000 is designed to be as simple and trouble-free as possible. Serial connections require only a simple twisted pair, minimizing the cost and complexity of wiring (one could even use a mic snake, though it would be difficult to keep high frequency, square wave digital signals from leaking into ajacent audio pairs if both were mixed in one multipair cable). Both the P.I.P. card and the IQ Interface are programmed to reboot if they encounter noise spikes or glitches, and this should help to avoid system hangups in the middle of a show. The P.I.P. card is bypassed when the serial interface is not connected, so the amplifier should operate normally when not connected to the IQ System.

We obtained from Crown a copy of the demo version of the system software, which we ran on a Macintosh II computer (it also works on smaller Macs, though a large display screen makes things much easier). In general, the software seems reasonably well

thought out. It closely follows the intuitive Macintosh user interface, so we were able to figure out most of its functions without benefit of a manual.

The graphics are quite good, and are immediately understandable to the eye. Choices of pull-down menu options, command key equivalents and window button functions generally reflect a sensitivity for actual operational concerns. The software is clearly not yet finished, however. In the demo version, the Status window feels rather rudimentary and unsatisfying. The amplifier icons seem a bit small, making the display hard on the eyes (perhaps this is an attempt to accommodate Macintosh Plus and SE users). One wishes, moreover, that it were possible to enter text in the system layout: while you can name amplifier groups, those names don't appear in the layout, so there's no simple and direct way to identify groups at a glance. In large systems, this could be quite frustrating. Nor could we discover any way of specifying the serial addresses of amplifiers to the computer. (Presumably these things will be improved in the release version.)

Small quibbles aside, Crown International deserves considerable credit for having been one of the first companies, if not the first, to bring an amplifier automation system to market. (We believe IAD earlier introduced some of this capability, but in a large custom computerized setup designed more for monitoring and switching entire sound systems.) Given the growing demand for greater automated control over sound systems, we can expect to see similar systems from other manufacturers in the near future. (We know of at least one other manufacturer who is pursuing this goal, though they are still in the R&D stage).

Crown appears to have done most everything right in the IQ System 2000, and it will be interesting to see how audio professionals make use of this powerful tool. We certainly believe that it deserves your *Closer Look.* ■

Davis is president of Gary Davis & Associates, Santa Monica, CA, and has been a technical writer and audio consultant since 1974. Along with his associate, Ralph Jones, he authored the Yamaha Sound Reinforcement Handbook.

Literature

Info Available From Shure, Atlas/Soundolier

Help For Audio

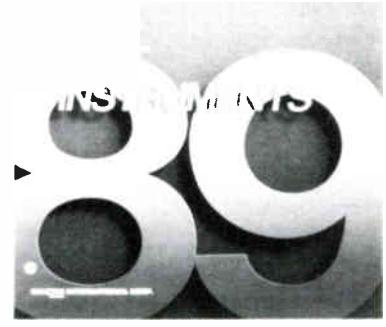
Shure's *Guide to Better Audio* is written to help video specialists improve the audio quality of their productions. The 25-page booklet, available for free, provides explanations of the type of mics and other audio equipment for pro video uses, along with guidelines for their most effective use. Tips on which kind of mics are best for certain applications, how to use an audio mixer, and which cables and connectors can help achieve optimum results are included.

Circle 17 on Reader Response Card

Atlas/Soundolier Brochure

Atlas/Soundolier has detailed its UL-listed communications signal products in a six-page summary catalog. The new literature includes application information and specifications of voice/tone/strobe loudspeakers; vandalproof baffles; emergency telephone communications; bells, bells/strobes, horns; piezo and piezo/strobe annunciators; visual signal devices; racks and console systems; and CCTV camera housings and mounts.

Circle 18 on Reader Response Card



Test Instrument Material

The BK-89 Instrument Catalog covers B&K-Precision's line of test instruments. The products can be used in engineering, research and development, production line testing, industrial maintenance and repair, and field service and education fields. The catalog contains performance and mechanical specifications, features, and photos of each products. Comparison charts that highlight key features and performance characteristics are also included.

Circle 19 on Reader Response Card

Equipto Offers Quote/Order Form

Equipto Electronics Corporation is offering a simplified quote/order form to be used with its Heavy Duty, Challenger and Solid-System vertical and sloped front cabinets. The engineer checks boxes to designate standard sizes and options needed or writes in special sizes and custom requirements. Cabinet colors and laminates can also be selected.

Circle 20 on Reader Response Card

AD INDEX

Company	Page	RS #
AKG Acoustics (203) 348-2121	13	—
Alesis Studio Electronics (213) 467-8000	15	208
Audio Logic (801) 268-8400	33	242
BGW Systems (213) 973-8090	11	206
Cal-Switch (800) CAL-SWCH	58	290
Crown International (219) 294-8000	23	215
Electro-Voice (616) 695-6831	CII	202
Fisher Berkeley Corp (415) 655-9696	48	243
Frazier (800) 643-8747	39	231
HM Electronics Inc. (619) 535-6092	43	214
Industrial Research Products (312) 439-3600	3	204
Innovative Electronic Design Inc. (502) 267-7436	6	260
JBL Professional (818) 893-8411	CIV	201
LDI Show (212) 677-5997	55	244
Mackenzie Laboratories Inc. (800) 423-4147	47	241
Mfr's Representatives Educ.Rsch.Foundation	53	—
Pro Co (800) 253-7360	6	261
Quam-Nichols Co. (312) 488-5800	8	205
Rane Corporation (206) 774-7309	27	211
Samson Technologies Corp. (516) 932-3810	5	212
Sonance (714) 661-7558	CIII	207
Sonic Systems Inc. (203) 356-1136	32	246
Soundcraftsmen (714) 556-6191	17	203
Tappan Wire & Cable (914) 359-9300	14	247
TekTone Sound & Signal (407) 844-2383	44	249
Telex Communications (800) 328-3771	25	230
TOA Electronics Inc. (800) 843-4753	7	209
West Penn Wire (800) 245-4964	18	240
Yamaha Pro Audio (714) 522-9011	37	219

MARKETPLACE

FOR SALE

CUSTOM SERVICES

CLASSIFIEDS

HELP WANTED

SHARE THE PROFITS

SERVICE, DESIGN, AND INSTALLATIONS Positions available in Club/Hotel and Theme Park divisions with projects local and worldwide.

INSIDE AND OUTSIDE SALES POSITIONS are also available in our rapidly expanding corporation. Team leaders/managers share in the profits you create. Unlimited future potential with possible shared ownership of our locations. Send resume to:

William Dettman
Pro Sound & Stage Lighting
13110 Magnolia
Garden Grove, CA 92644
(714) 530-6760
or (800) 678-9700

Washington, DC: Virginia, Maryland
Muzak—AEI—3M Distributor
Immediate openings. Background, Foreground Sound System Installers/Servicemen needed at once. Experienced only. New satellite technology requires additional top field personnel, salary commensurate with experience/potential.
Contact:
Mr Roy Evers, VP-Engineering
Music Incorporated
1341 L Street NW
Washington, DC 20005
(202) 737-4051
Telephone collect or write, detailing background.

APPLICATIONS ENGINEER

JBL Professional, the manufacturer and marketer of JBL loudspeakers and UREI electronic products for the professional audio marketplace, has an immediate opening in the area of technical product applications at its Northridge, California factory.

The successful candidate will have a minimum of 3-5 years experience in the design of sound systems for both fixed installations and portable applications. Major emphasis will be placed on good communication skills and a positive, problem solving attitude, since customer contact comprises a major portion of the job. Familiarity with each of the various vertical markets within professional audio, such as sound contracting, home and studio recording, musical instruments, broadcast, cinema, tour sound, etc., is required. Personal computer proficiency is also necessary.

JBL Professional offers a competitive salary, comprehensive benefits package and the challenge of working for an industry leader. If you would like to be part of our team, please submit your resume including salary history in confidence to:

JBL

Mark Gander, Vice-President Marketing
JBL Professional
8500 Balboa Blvd.
P.O. Box 2200
Northridge, CA 91329

REPS WANTED

THE AUTH COMPANY

One of the nation's oldest manufacturers of Apartment House Intercoms, Nurse Call Systems and Fire Alarms is currently seeking representation in a few choise territories. Send Resume to:

Steven Weil, Nat'l Sales Mgr.
The Auth Company
505 Acorn Street
Deer Park, NY 11729
Or telephone: (516) 667-9000

SALES PROFESSIONALS

One of the country's largest musical instrument retailers is currently looking to fill sales engineering positions in our pro division. The successful candidates will have experience in both analog and digital professional audio products, proven success in pro audio sales, as well as familiarity with vertical markets such as home recording, musical instruments, broadcasting, touring sound and audio/video post production. We offer a comprehensive benefits package and the opportunity to work for an industry leader, and make things happen. Experience and professionalism consummates pay. If you would like to join our team, send reply in confidence to:

John Larabee, Sound Center
5822 N. Milwaukee Avenue
Chicago, Illinois 60646
(312) 774-9719

SOUND CENTER
A Division Of Guitar Center

Rate Information (per column inch)	CLASSIFIED	MARKETPLACE
	1 time $42	1 time $76
	6 times $38	6 times $68
	12 times $34	12 times $60

To Place an ad, call **RICH KOBEL, (516) 767-2500**

CALENDAR

Upcoming Events

JULY

Electronics Technician Association (ETA): Boise, ID. July 20-22.

Sound Engineering Seminar: Norman, IN. Contact: 812-995-8212. July 21-23.

International Association of Auditorium Managers (IAAM): Reno, NV. Contact: 914-683-1000. July 29-August 1.

AUGUST

National Heat Transfer Conference and Exposition: Philadelphia, PA. Contact: 212-705-7793. August 6-9.

International Society of Certified Electronic Technicians (ISCET): Tuscon, AZ. Contact: 817-921-9101. August 6-12.

DASH Format Seminar: Fort Lauderdale, FL. Contact: 305-491-0825, ext. 186. August 10-11.

Sound Engineering Seminar: Norman, IN. Contact: 812-995-8212. August 24-26.

International Security Conference/ East (ISC): New York, NY. Contact: 312-299-9311. August 29-31.

SEPTEMBER

NAB Radio '89: New Orleans, LA. Contact: 202-429-5300. September 13-16.

IEEE Broadcast Symposium: Washington, D.C. Contact: 212-705-7900. September 21-22. ■

CAD TOPICS

(continued from page 26)

developer Thomas Birkle deserves accolades for this milestone, and the other third-generation software developers have a clear target to shoot for.

ARRAY LOBING EFFECT PROGRAMS

Two interference-effects utilities for IBM compatibles could be seen at NSCA. These programs aid in predicting lobing effects of stacked or otherwise arrayed loudspeakers, and enable corrected measures to be viewed, such as staggering time delays between speakers, varying horn patterns, etc. Effects within column speakers and other direct radiator or horn radiator speakers can also be simulated.

Renkus-Heinz was showing Rex Sinclair's ALS Array Lobing program. Halo Heinz spoke at the CAD panel and the program was demonstrated at their booth. Interference effects of speaker location, time delay, and directivity could be graphically seen at a selected frequency band, using simulated pink noise or sine wave.

Peter Mitchell demonstrated his lobing program at the J.W. Davis hospitality suite. Sound distribution, intensity, and frequency could be viewed simultaneously though the application of high resolution EGA color contour plots.

Neither of these programs takes into account phase information into the calculation of the predicted results, and both assume generic speaker components of flat frequency response. At first glance, I do not see a way to include effects of crossover networks into the results either. Aside from these apparent limitations, these programs would be very helpful in a tutorial way for speaker system and cluster/array designers, in determining points where you would want to crossover to a horn from a multiple woofer system, as well as aiding in the configuration of array hanging hardware. ■

As there has been much interest generated in the area of computer-aided sound system design programs, Sound & Communications *will be running a monthly column under this title, "CAD Topics," which will feature all the latest news on program development, capsule reviews, and letters from program developers and users alike.*

INTERCOMS

(continued from page 48)

regarding which kind of headsets are best suited to the particular transceiver under consideration.

Batteries. The type of batteries used in a wireless intercom must also be considered. A rechargeable system can be economical over a long period of time. On the other hand, fresh throw-away batteries before each show provide confidence that a wireless intercom will last to the end of the show. The system should be capable of operating at least 4 to 6 hours on one set of batteries. Rechargeable nickel-cadmium batteries are more economical in the long run, but they are also more difficult to maintain. If not deep-cycled (fully discharged and recharged), they will not yield nearly as long an operating life between charges as a set of fresh, non-rechargeable alkaline batteries.

Future Needs. One of the most important considerations to be made in wireless intercom selection is future needs. A system should be compatible with other types of systems and equipment to allow the greatest possible adaptability to future needs. Perhaps one system may be somewhat more expensive than another, but it may be much more economical in the long run in maximizing future operational capabilities.

CONCLUSIONS

Today's wireless intercoms are a great improvement over the cabled systems of just a few years ago. The mobility they provide is an invaluable asset to nearly any industry. Their versatility, through integration with existing cabled intercom systems, as well as with wireless or cabled microphone systems, is another advantage. Their audio bandwidth and signal clarity far exceeds the requirements of most users. They excel in sound quality, and in their ability to solve many types of production communication problems. ■

Some information contained in this article was originally written by Davis in cooperation with Bill Swintek of Swintek Enterprises, Sunnyvale, CA, and is used with permission. Additional information was provided by HME Electronics, San Diego, CA. The author would like to express his appreciation to both companies for their assistance.

Music made Beautiful

Sonance makes music more beautiful with "Architectural Audio:" Custom in-wall stereo speakers and controls that blend unobtrusively into your home's most discriminating decor.

All Sonance speakers and controls can be painted or cloth covered to aesthetically match any room's delicate design. Precision flush mounting insures excellent high fidelity response and consistent decorative perfection.

To experience "Architectural Audio:" we invite you to call your local Custom Audio/Video Specialist.

SONANCE®

A DIVISION OF DANA INNOVATIONS

32992 CALLE PERFECTO, SAN JUAN CAPISTRANO
CALIFORNIA 92675 (714) 661-7558
Outside CA (800) 582-7777 FAX (714) 240-4995

Canadian Distributor: Atalex Acoustics Ltd., 33 W. 8th Ave. Vancouver, B.C. V5Y 1M8. (604) 873-4475

Sonance Products include Five variations of Speakers, One Passive & One Active Subwoofer, a Speaker Distribution System and Five different Volume Controls & A/B Selectors. (All Built-in Products fit in "2×4" wall)

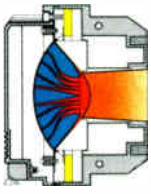
Circle 207 on Reader Response Card

It Takes More Than A Little Neodymium To Change The Face Of Driver Technology.

2450J

Hailed as the catalyst for a new generation of high performance compression drivers, the rare earth compound neodymium showed up in our R&D lab shortly after it was first formulated. But its extremely high cost and sensitivity to heat had to be overcome before neodymium could live up to its full potential.

The availability of this highly magnetic, extremely lightweight material coincided perfectly with our development of the Coherent Wave™ phasing plug.



JBL's 2450J Neodymium Compression Driver with Coherent Wave™ phasing plug provides in-phase combining of sound waves for extended high frequency performance. JBL's patented diamond surround titanium diaphragm with new embossed dome greatly reduces distortion and damage at high SPL.

This new design, a phasing plug with annular apertures of constant path length, uniformly directs sound through to the throat providing in-phase combining of sound waves for extended high frequency performance. This new technology is combined with our patented diamond surround titanium diaphragm, incorporating a new embossed dome, to reduce the possibility of distortion or damage at high SPL.

The 2450's smaller size translates to tighter spacing of horn arc arrays, more even and precise coverage and greatly reduced requirements for delay. Plus, the 2450 nets out at a mere 4.8 kg (10.5 lb). The benefits of this dramatic weight reduction include lower shipping costs to the site or on the road and significantly less load bearing requirements for both structures and rigging. With built-in mounting points, the 2450 will take much less time to install.

Yes, it took more than a little neodymium to change the face of driver technology. But we're confident you will find the breakthrough results were certainly well worth the wait and the effort.

JBL

JBL Professional
8500 Balboa Boulevard, Northridge, CA 91329

Circle 201 on Reader Response Card