

SOUND & COMMUNICATIONS

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March 19, 1990

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MARK GANDER
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TOPANGA



Installation Profile

Avery Fisher Hall gets an upgrade, with attention to economies and to acoustics. **22**

Testing and Measurement

HIGH TECH TEST

The computer has changed everything. There's more to test and more ways to test it, as new hardware and software allow the viewing of more parameters. What are the new methods? What are the new views? **24**

WHAT'S THE LEVEL?

A primer on the subject by Don Davis. Levels matter, and how. Test yourself. **35**

VISUAL PRESENTATIONS, Part 2.

How visual products may be measured and evaluated. What are the methods, what are the parameters, what are the products you should have and know about? **29**

WIRE & CABLE

Neatness Counts

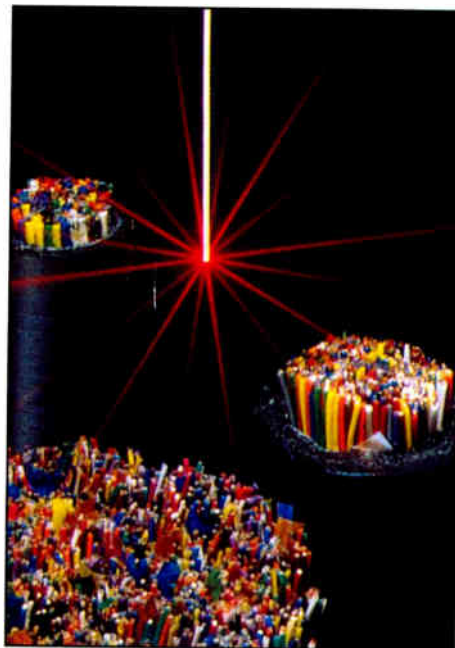
Sorting out the spaghetti. New methods of labeling and organizing rely heavily on high tech technology. What are the methods and how do they work — and how good are they? **40**

Testing Cable

Subjectivity's been the word when evaluating cable. Can cable be tested for sound quality? How? An advocate reports on one testing method. **38**

Fiberoptics

Fiberoptic is the buzzword of the decade. What does it mean to the future; what still has to be done; how immediate is the technology; and what problems occur when using it. **43**





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INTELLIGIBILITY ADDITION

I received the October edition of *SOUND & COMMUNICATIONS* and read your article on speech intelligibility. It was good, but could have been better: it could have included our highly regarded "RAMSoft" program running with the Norwegian Electronics Type 830 analyzer. This system computes and evaluates up to 12 of the newest and most respected measures for room acoustics for music and speech. Designed for the IBM-PC family of compatibles, the program calculates acoustical measures for music including three early/late sound ratios, center time, source strength, early decay and reverberation time, and, using a two-channel instrument, two lateral fractions. In addition, for speech, two useful/detrimental ratios and speech intelligibility are calculated. The useful/detrimental ratio is highly correlated with RASTI.

The program was developed by John Bradley and Robin Halliwell of National Research Council of Canada, both highly respected and influential acousticians dealing with room acoustics.

I wish you had included our program/analyzer, especially since the Type 830 can also measure reverb time, transmission loss (using ASTM E-90, etc.), sound absorption coefficients, etc. and can evaluate a space for music as well as determine measures for speech intelligibility.

Richard J. Peppin, P.E.
Scantek, Inc.

INTELLIGIBILITY OVERLOOKED

I have skimmed the Mike Klasco article on intelligibility and it looks like our contributions in this area were overlooked.

The Studio Reference Disk (SRD)

contains our MTF Test signal, the only copyrighted intelligibility test signal that is pre-recorded and distributed. We also have an earlier cassette version of this test signal. We are the first and only company to produce narrow band intelligibility spectrum analysis. The TEF (AL%cons) and the B & K (RASTI) produce intelligibility under which is a single number that rates performance (good/bad).

We are into diagnostics. It is not sufficient to know if something is "good" or "bad." Engineers have to fix it, and in audio they need spectral analysis in order to know which frequency range needs adjusting to go ahead with some degree of confidence. That is where we step in with narrow band Modulation Transfer Function (MTF) analysis. We are currently developing this great new product line of test equipment with Editron of Australia.

Arthur Noxon
Acoustic Sciences Corporation

KLASCO RESPONDS

Whoops! I thought I had the field covered, although after I finished the article [Intelligibility, *Sound & Communications*, October '89] I remembered having read about Scantek's new software and test gear in their newsletter. I admit to having been oblivious to Arthur Noxon's work at ASC.

I have invited Peppin and Noxon to prepare articles for *SOUND & COMMUNICATIONS* and their work and products also will be covered in the update article on intelligibility in a future issue, along with a synopsis of the Syn-Aud-Con workshop being held in May. Incidentally, ASC's test signal mentioned in Arthur Noxon's letter can be found on the Prosonus test CD (band 50). In addition to the intelligibility coverage, a comprehensive soft-

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ware review of RAMSoft and other acoustical programs from Scantek is also scheduled for mid-year. RAMSoft has a variety of intelligibility tests, although these measures will be more familiar to European audio engineers.

Another software program with a continental flavor is NexoCAAD from France which offers measures of 'Clarity' and prediction of flutter echoes. NexoCAAD's intelligibility module will be explored in the update article and a full review of the program is scheduled soon after the AcoustaCADD review. Speaking of AcoustaCADD, the first enhancement of this program will be shown at the NSCA.

Soon after the intelligibility article we will follow with an overview of reverberation prediction software and measurement techniques, so if you would like to see a particular piece of relevant test gear of software covered, let me know.

*Mike Klasco
Technical Editor*

NCAD ADDITIONS

Mike Klasco's review of my Horn Dispersion Contour Overlays ("NCAD: Non-Computer-Aided-Design") was both perceptive and well-written. However, a couple of additional points might be of interest to readers.

The first, which Mr. Klasco was not aware of, is that I developed this technique in the early 70's, making it the first to use the isobar concept. It has quite a track record! Second, the review failed to mention that anyone (in the U.S.) can obtain a set of overlays and instructions by sending \$10 to G.R. Thurmond and Associates, 1509 Brushy View Cove, Austin, TX 78754-2009. I am also available to answer questions. If the review had not been so favorable, perhaps I would have preferred the anonymity it provided!

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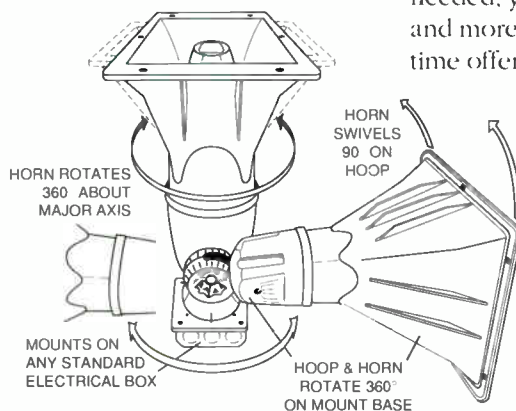
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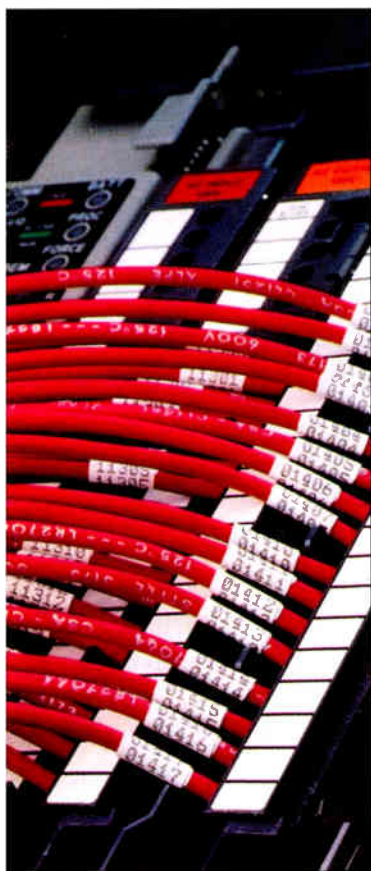
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By Mike Klasco

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By Keith Bose

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January's NAMM show was hip, crowded, and upbeat. We take a look at some of the highlights of the show.

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By Mike Klasco

The final installment of AcoustaCADD, including the performance simulations of the sound system engineering module.

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By Wendy Blatt

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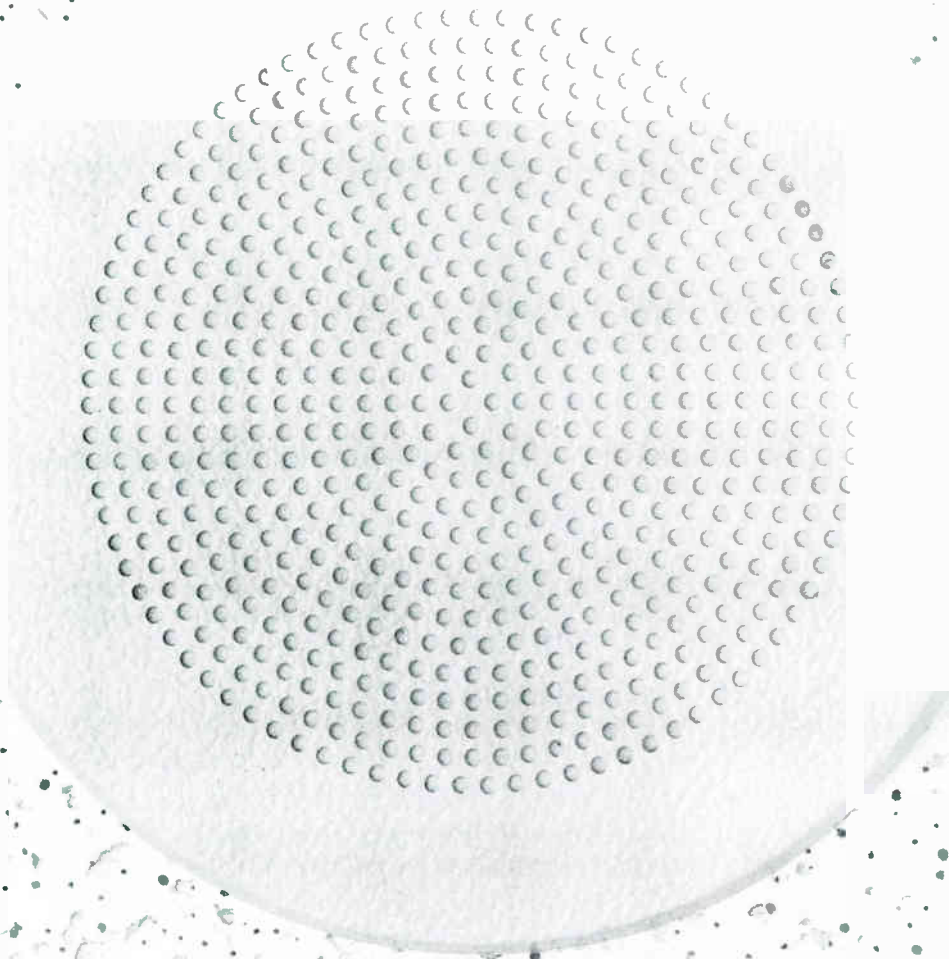
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NEWSLETTER

NEW MOVE

After 10 years with Sennheiser, Tony Tudisco is leaving to form his own rep firm in the Pacific northwest, based in Seattle. The company, to be called First Choice Marketing, begins operation on March 15.

NEW CHIP

Hughes Aircraft Company's Sound Retrieval System will be available on an integrated circuit chip. The 3-D audio effect was introduced to the home electronics market last fall on selected television receivers by Sony Corporation, the first licensee for SRS. The new microchip was designed at the Hughes Ground Systems Group in Fullerton, California.

REP NEWS

Furman Sound has named Taub Sales its Rep of the Year for 1989. Secom Systems was designated as having the Most Improved Territory. Taub Sales covers the mid-Atlantic area, Secom Systems the southeastern states. Furman has also designated Kodo Associates its rep in Minnesota and the Dakotas.

Jim Colquhoun has joined WesTech Marketing, covering northern California accounts and handling WesTech lines such as AMX, BGW, Bose, Telex and Wheelock.

Telecall America, a division of J. Bushfield's, has appointed several manufacturers rep firms: Brian Trankle & Associates for northern California and northern Nevada, the Pacific Group for southern California, southern Nevada and Hawaii, and Kaltec Communications for western Canada.

Biamp Systems has awarded its Rep of the Year award to Reflex Marketing of New York. This is the second year in a row that Bob Brennan and John McFadden, the principals in Reflex, have won the Biamp award.

Gauss Loudspeakers has appointed two rep organizations: Elrep Sales Company of Atlanta will cover North and South Carolina, Georgia, Tennessee, Alabama and Mississippi. New West Audio in Burbank will cover southern California, southern Nevada, Arizona and Hawaii. Ben Van De Kreke, president of Elrep, and Tim Schaeffer, president of New West Audio, will direct sales of Gauss loudspeakers for "recording studios, sound reinforcement, live music concerts, PA, and musical instrument applications."

UL LISTING

FSR, Inc. has announced that its DC-24R 2.5 power supply has passed testing by Underwriters Laboratories and is now UL listed. The power supply features 24 volts regulated at 2.5 amps; metal enclosure with power cord; and a rear rack mounting brace.

WORKSHOPS TO BE HELD

Video Design Pro is presenting Professional Workshops on Automating Facilities Design led by Walter P. Black, creator of VidCad. The workshops are being held at the Las Cruces Hilton in Las Cruces, New Mexico. Dates coming up are May 2 — 4 and May 30 — June 1.

NURSE-CALL UL TESTING COMPLETE

Jeron has announced that its System A-V-680 Audio-Visual Nurse Call System has completed testing by Underwriters Laboratories and is now UL 1069 listed. The system has a six inch flat screen backlit display for viewing of all rooms and calls simultaneously or to display the six highest priority calls in detail. It displays 29 different levels of priority using phrases and full sentences.

NEWSLETTER

A.R.T. MOVES

Applied Research & Technology has moved to new facilities and expanded production and assembly automation. The new factory is approximately double the size of the previous location. The address is 215 Tremont Street, Rochester, New York 14608.

MAY AES AUDIO CONFERENCE

The preliminary program has been announced for the Audio Engineering Society's Eighth International Conference on "The Sound of Audio," to be held in Washington DC May 3 through 6 at the Capitol Hilton Hotel. Floyd Toole of the Canadian National Research Council is Papers Chair.

LIFE SAFETY TESTED

Attendees at Infocomm in Anaheim in February had a chance to congratulate the business they're in when the life safety system at the Anaheim Hilton was activated. The system worked to alert hotel guests to "stand by for instructions."

While most of the guests did just that until the "situation was corrected," at least one marketing manager of an audio company, seeing smoke, wound up in the hotel lobby in his swimsuit. The intelligibility of the system, by the way, was excellent, according to one frightened guest.

D.A.T. ARCHIVING SYSTEM

Bruel & Kjaer has joined forces with Panasonic to produce a portable R-DAT archiving system. The digital archiving system consists of the Panasonic SV-255 portable R-DAT recorder and two Bruel & Kjaer Type 4006 professional microphones. The equipment is packaged in a Zero/Halliburton case. B&K says the system's applications range from digital sampling, orchestral, choir and sound effects to location archiving for music, film, television and radio broadcast.

A.E.S. DATES

The 89th Audio Engineering Society Convention at the Los Angeles Convention Center will be held Friday, September 21, 1990 through Tuesday, September 25, 1990. According to the AES, the choice of these dates will serve to increase the exhibit space and to allow the convention to be held in a single venue. The dates also avoid any conflict with the fall SMPTE convention. Ron Streicher is Chairman of the Convention, with Shelley Harrison acting as Vice Chairman. The theme is "Creating Illusions in Sound — the Fusion of Art, Technology and Imagination."

EXPORT AWARD

Rickenbacker International has received the E Award for Export Excellence from the United States Department of Commerce for creating substantial increases in the volume of exports over a sustained three year period. The company has sustained an average of a 20 percent increase in export sales each year since 1984.

LAMBDA TECHNOLOGY

Denon's DTR-CX digital audio tape recorder incorporates the company's "Lambda Super Linear Converter" technology. The unit contains editing features such as digital fade-in and fade-out, and a variety of ID code functions, and has both coaxial and optical digital inputs and outputs. The unit is a prototype.

THE SINGLE BOX SOLUTION:

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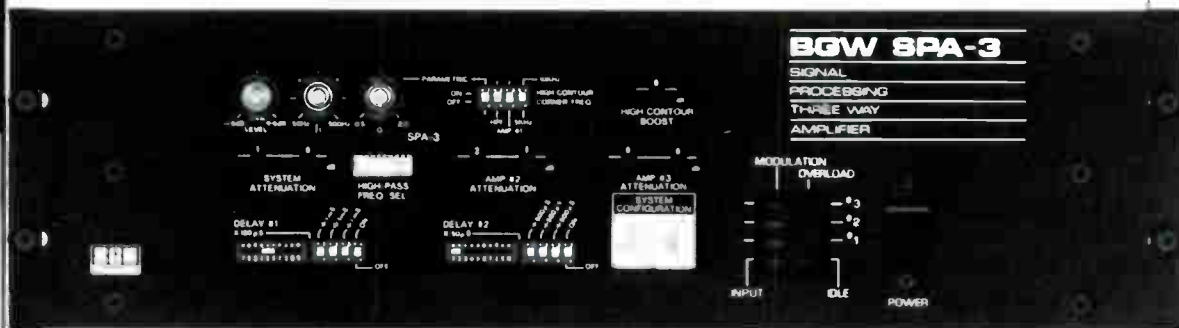
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wouldn't build it any other way!

The superior design, reliability and performance of the BGW SPA-3 has already proven itself in major installations from the Orange County (CA) Performing Arts Center to the OMNIMAX theatre in Australia. By the way, there's also a two channel Model SPA-1 with signal processing capabilities tailored to make it an ideal subwoofer amplifier. It's a time, space, aggravation and money saver too.

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WHITHER THE NINETIES: THE CONSULTANTS' VIEWPOINT: Part 2

The nineties; what will the new decade hold in store for us? This is the second in a series devoted to our consultant-readers, where we asked them for their insights and answers to our burning question: whither the nineties?

Consultant's replies have been coming in droves with an obvious bent toward increasing computer control, digital processing, and modular equipment, in general.

However, once again, it's time to let the consultants speak for themselves.

Jim Gundlach
INTEGRATED DESIGN
COLLABORATIVE, INC.,
Naperville, IL

I expect to see major changes in the 1990's. If I were to do a fast crystal ball, I would make an overall observation that the industry will be more technology driven than ever. By this I mean that for decades, manufacturers have been building product on the basis that they perceive a need for a given piece of equipment or function and then build it with the technology they have in hand. What will occur in the 90's is that the rapid rate of change and progress in technology, digital implementation for both audio and control, will result in manufacturers having "technology packages" on their shelves; and then they will be scrambling for a way to utilize that technological edge and develop a product that someone "might buy."

As the digital technologies become more commonplace, we will find more audio processing done in DSP. This means that the "blackbox" count in any given system will go down. Such things as limiters, equalizers, crossovers, and delays will all be in a single package. This will have tremendous impact upon individual manufacturers. While today, small manufac-

turers can survive by making specialty units such as "the world's best 1/3 octave equalizer," these items will tend to disappear from the marketplace.

I believe there will be more emphasis on "pre-packaged" systems. These will come in many forms. Contractors, as we know them today, will shop fabricate systems to the greatest possible extent before installing them in the field. This will be mandated by exceedingly high cost of field labor. I believe some manufacturers will begin getting into the systems busi-

"Contractors will shop
fabricate systems to
the greatest possible
extent before installing
them in the field."

ness. I envision many systems being installed on the basis that a factory fabricates the entire system and that the contractor will install that system much in the manner that telephone systems are installed today. In the telephone plant, a switch is factory assembled and arrives in a crate. An electrical contractor pulls the wire. The telephone contractor punches down the wires at the switch and the individual telephone ends, programs the software, and he is done. I believe that sound systems will go in this same general direction, whether they are shop fabricated in a manufacturer's plant or a contractor's shop.

There will be more need for consulting services. The emphasis of the consultant will shift more in the direction of properly

preparing the building, the power system, sight lines, etc., rather than the complex design of systems themselves since DSP will reduce much of the system complexity to a software programming effort.

I would like to go on but this letter has gone together piecemeal as it is. It will never end unless I just stop here.

Michael Callahan
CALLAHAN ASSOCIATES,
Winchester, MA

Thank you for your invitation to comment. First of all, my crystal ball is fearfully out of calibration, so of course my comments should be taken with a grain of salt.

First of all, I see a steady trend towards simplicity. Sound systems are no longer considered luxuries but instead are specced in as part of a building's fixtures. Hence, the systems wind up being used/operated by those with little or no training. Therefore, in order to be successful, the designer must be acutely aware of who will actually be using the system. I think "automatic" systems, such as the Industrial Research Products system 41, have a bright future. We recently completed a church installation involving 8 mics in which the only user-accessible control is the power switch.

As the technology becomes more and more sophisticated, it becomes even more imperative for the designer to fully investigate, and to fully understand the requirements and the inherent constraints of a project. If a system is too complicated to use, or the user confronted with too many choices, the system will not be used at all, or possibly worse, be used incorrectly.

I think the educational market will continue to grow. We have done a number of

CONSULTANTS

"media classrooms" for local universities. Typically these call for video projection, slide projection, speech reinforcement, and audio cassette record/playback. Here again, the key is ease of use. Typically, the instructor using the classroom has little or no technical background. We have found it preferable to trade ease of use for flexibility. When working with the client it is important to establish a climate of clarity regarding the system's capabilities. We have found, the fewer switches the better. We often design and build a custom input-selector panel with all function names called out in large engraved letters. Our goal is to make operation as intuitive as possible. I believe that built-in large screen video systems will become increasingly commonplace. Video projectors based on liquid-crystal, rather than cathode-ray technology, will gain market share.

Small video production facilities will

"The emphasis of the consultant will shift more in the direction of preparing the building, the power system, sight lines, etc."

become more common. With the proliferation of low cost camcorders, the need to edit video is being felt more and more. Facilities with one or two source decks, a recorder, character generator, special-effects generator and a small audio board are going into more and more businesses, educational institutions and churches. I expect the rapid pace of video to continue, with the Super VHS format becoming more and more widespread. I expect to see small installations turning out material of near broadcast quality. We've learned (not the easy way, either) that video editing can get very tricky, with our clients requiring a great deal of support. It's a specialty, which, while rewarding, requires commitment of both time and capital

equipment.

Another interesting application of video projectors will be their increasing use to display computer data. With any luck, more rigid standards will emerge, allowing for easier interfacing.

I think that sound-for-video will be a growing market. As the quality of the image improves, better sound will be demanded, on both the production and the

playback end. On the production side, small mixers, rugged microphones and reliable yet affordable wireless mics will experience growth. I think we in the industry would do well to educate our clients on the importance of good sound.

Needless to say, microprocessors will continue to find new applications. Among the successful ones will be those that allow quicker, easier installation and operation.

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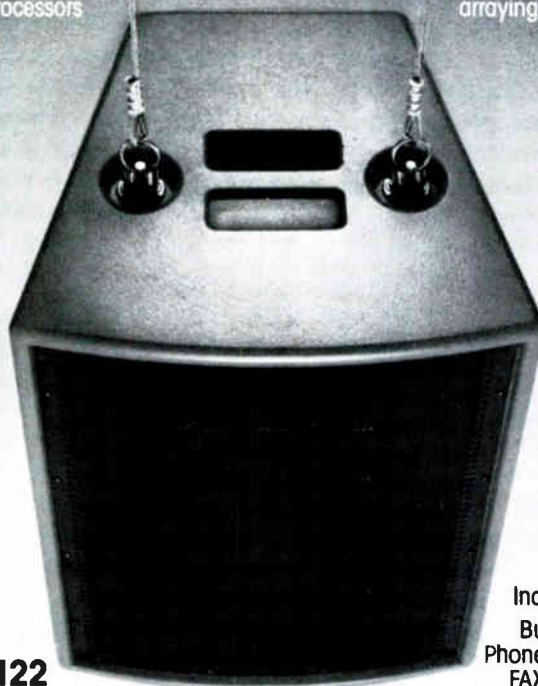
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I expect to see more and more pieces of audio equipment controlled by computer, and I would hazard a guess that the MIDI bus will emerge dominant. Increasingly, system design will be more and more a matter of configuration, via software, particular devices for a particular task.

Tim Lewis
T.A. LEWIS & ASSOCIATES, INC.,
Birmingham, AL

Thank you for the opportunity to jot down our perception of the future.

From our vantage point, we see the following significant trends.

Consulting companies: Consulting is still a personal services business that requires fact-to-face activity to achieve the highest level of usefulness to the client. For all that consultants do in the technical realm, they are still in the people business. We see growth in the numbers of consultants and their areas of specialization, but we do not see a great deal of aggregation of these specialists. The entrepreneurial spirit is just too strong.

Teleconferencing: Are the business and education markets ready for this technology? Yes; we are confident that in the 90's the utilization and enhancement of teleconferencing services and facilities will experience the type of tremendous growth the fax machine had in the 80's.

Premises wiring: As more and more information flows into, out of and around a building, the more important becomes the medium. We see real opportunities in existing and new construction for the design and installation of premises distribution systems (wiring network systems).

Fractional T-1: As quickly as the RBOC's convert hardwired to software definable parameters, users will be able to pick and choose exactly what they need in bandwidth. Some vendors provide such services today either through upgraded RBOC or bypass facilities. Clean fractional and, for that matter, wideband T-1 will be sorely needed if we are to realize the potential of current technology during the 90's.

Facilities management: Many of our current clients are asking us for technical solutions to what they perceive as technical

problems when, in fact, they should be looking toward management solutions. Many small things, for lack of management, become large and because they are related to technical devices, also become insurmountable. "We don't want to be in the telephone business," seems to be the common lament. We can substitute computer, paging, data and many other words for telephone in this sentence. Surely there are a multitude of opportunities for firms with expertise in management and technological areas to succeed in the facility management market during the decade of the 90's.

**"As the quality of
the image
improves, better
sound will be
demanded."**

S. Rajagopalan
ACADEMIC ENTERPRISES,
Nagpur, Indiana

I would say that the sound industry is just beginning to grow in this part of the world. Though telecommunication is undergoing fast changes, audio system equipments and their uses are very limited.

For this reason, I would foresee some better business for the sound & communication industry mainly because the need is arising in market segments like hotels, auditoria and multipurpose halls, training and human resource development, boardrooms etc. Video also stands a similar growth chance. Modular concepts are yet to become popular in audio equipment.

I hope to see some changes for the better during the latter half of the 1990's.

Duncan J. McCulloch
D.W. THOMSON CONSULTANTS, LTD.,
Vancouver, B.C.

A great deal of effort and money has been expended on advancing the "state of the art" in all sectors. Communications

companies have been no exception to this phenomenon. Unfortunately, all too often we get so wrapped up in the technology that we tend to forget the basics.

Time after time, with virtually every contractor with whom I have had to deal, I have had to reject work because simple, basic, "good engineering practice" techniques have been overlooked, or worse still, not even considered. The worst offenders are grounding, jackfield wiring, level/impedance matching, and documentation.

The best equipment in the world will not produce a good system if care is not taken to install the equipment properly, and the best troubleshooter in the world will not be able to repair a defective system if proper documentation does not exist.

It is high time we paid a little less lip service to the "fancies," and paid a whole lot more attention to the basics.

Dan Moran
MORGAN, DOWHAN
ENGINEERING, LTD.,
Edmonton, Alberta

We welcome the opportunity you have provided the consulting community to voice some of our thoughts for the upcoming decade.

In the past, the sound, communication, and security systems have occupied a secondary position in planning and designing buildings.

Today's public has access to quality sound systems, with compact disc players and video systems that rival broadcast standards, and will no longer accept mediocre sound reinforcement when attending sporting events or stage presentations, and are critical of video systems which do not offer the same picture quality that they can view in their own homes.

A sound system which strictly provides intelligible voice reproduction is no longer acceptable when events require music and vocal excitement to entertain their audiences.

With all the new products and technological breakthroughs, it is imperative that consultants stay on top in order to be able to recommend equipment which best

WHAT DO THESE PRESTIGIOUS AND DEMANDING SOUND INSTALLATIONS HAVE IN COMMON?

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In the age of computerization, Morgan, Dowhan Engineering Ltd. is heavily committed to computerized drafting, growing from one workstation to six within the last few years. We feel this trend will continue and are actively encouraging architects and other designers to become CAD operators as well.

We also feel that programs which aid in the design and testing of systems will be used more and with greater success. The most important aspect to keep in mind when using these computer-aided programs is that they are only tools and cannot substitute for knowledge and practical experience.

In summary, we feel the outlook for the sound and communications industry in the future is bright and that these systems will become a more prominent component of the facilities constructed in the future.

Michael H. Bader
HALEY, BADER & POTTS
Washington, D.C.

The final decade of the century will be characterized by the most significant communications developments of history. Whereas we have spent a century or more creating and installing the capability of understanding, transmitting and organizing intelligence, we now face challenges as to how to employ the apparatus.

Consider the development of transmission means. Radar led to microwave; optical research led to fiber; video was intermingled with oral transmission; video is being refined to a breathtaking fidelity, perhaps better than the human eye. Wires are passe; satellites long ago supplanted the ancient "networks" for programming connections; capacity of whatever means of telecommunications we examine has been enlarged to a stunning exponential

value.

It is idle to speculate on technology. It will roar ahead no matter what occurs. And it will be organized and managed by computer power never dreamed of by the Univac pioneers of but a few years ago.

The true challenge is how to employ all of this wondrous technology. With all of its miraculous character, telecommunications is still nonexistent on most of the land mass of earth. China and Russia, not to mention India and Africa, are barely into the "wireless age." And South America, Mexico, and whole worlds of our culture are similarly deprived. Our big job is to introduce the hardware we accept as part of our lives into their lives.

We may adapt our technology with brilliant effect in these areas. Why, for example, wire China? Why introduce hard circuitry into that nation when cellular could be the mode of public communica-

"I WOULD RECOMMEND THE SOUNDSPHERE SYSTEM TO ANYONE.."



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

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

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

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tions for most of the nation? This illustrates how we may start with a fresh designer's table in extending to our worldwide community the benefits we have had in place for years.

A huge market exists, provided the market can pay for itself. Let us consider the equipping of China. Let us say that US suppliers achieve a respectable market share of the handset-cellular-central office-computer needs of that land of one billion, one hundred million humans. Who pays? Do we open factories there to employ the masses to gain the wages that are needed to create a true consumer economy?

And how does the United States compete, if we are still the high cost provider. Will Asian manufacturers beat us to the order? Will the 1992 conglomeration of Europe's economy steal a march on us? I believe we may do very well since we control the technology for most of this, and

we have the capital, but we must appreciate the costing and financing of our task of the final decade. One must, in my estimation, is a series of partnerships which would have made our fathers turn purple. We must let "them" own us, just as we have owned "them" in the past. We must adjust our national pride and leadership so that we'll be partners, not the sole supplier.

There's no doubt, in my view, that the market is there. The reason is simple. Humans have an insatiable appetite for communications. We all want to talk, compute, transmit, control, see, hear, enjoy, and so on. This is what humans do best, and from my perspective, it is what is most important to peace and harmony. If we talk to the Georgians of Soviet Russia, we are most likely to love them and stay at peace with them. So, the market is breathtaking.

We must work on future computer and

communications projects jointly. We are no different from the Boeings of the world who have to face up to a staggering capital requirement for the next decade and century. They must "go supersonic," just as the telecommunications industries and computer fields have had to go "mega." They must partner with the Japanese, the French, probably the Russians to make it a reality. That is because humans, those folks with the insatiable appetites for communications, have an insatiable appetite for travel, too. One begets the other.

Our objectives are not just commercial development. I think we finally realize that we have a responsibility for peace. We cannot go to war. It's madness, not just because it kills most of us next time around, but because it makes an economic mess that could also kill us. Consider the legacy of the arms buildup of the 80's. Reagan declared war, in a way, when he

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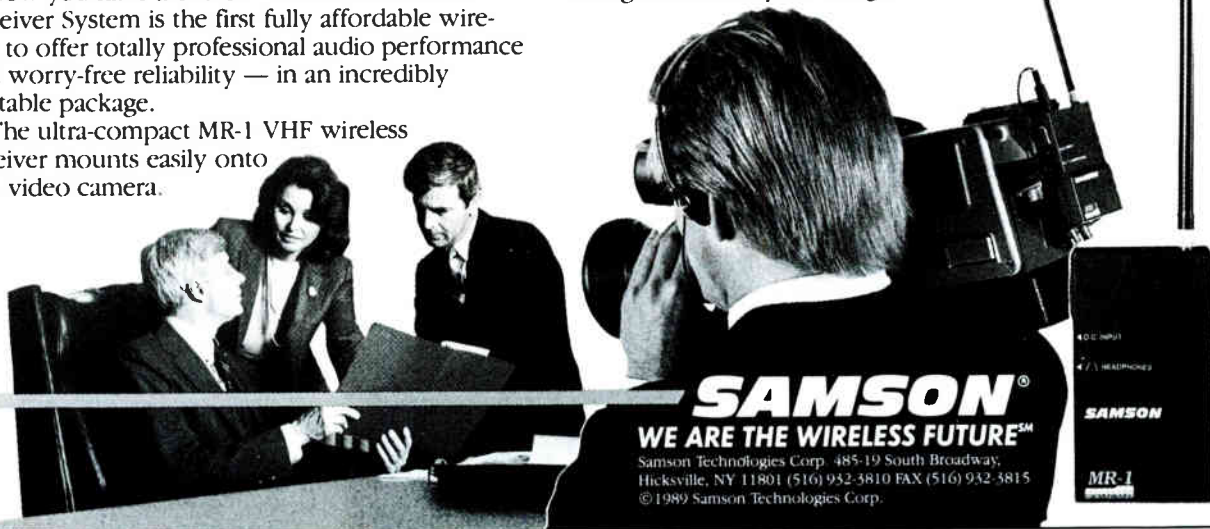
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took over. He armed the nation to the teeth, and nearly bankrupt it. Soviet Russia answered him, and is bankrupt. Now we must do a bailout. So, let us appreciate that we must approach international geopolitics with the realization that peace is an essential corporate objective. It makes good business sense.

The outlook? Excellent. Let us contain our tendencies to moan and groan every

time some high flyer reports a drop in earnings because of development costs for the telephone system or broadcasting network of Uruguay or Chad. Instead, let us exult in the knowledge that this is all very good R&D, and the future market will be fantastic. And let us proceed as good business people to meet the challenges of the next decade, and the next century, secure in the realization that we have a

great and growing market.

In all of this, we must remember the lesson of the thermos bottle. We put it in cold, it keeps cold; we put it in hot, it keeps hot. How does it know? We put it in hot to the emerging nations, we'll keep it hot. Let's not allow the thermos bottle to run things.

Manos Angelakis **INTERNATIONAL AUDIO VISUAL** **DESIGNERS, INC., New York, NY**

As crystal balling is a necessary evil for any professional company that expects to remain in business and make a profit, these are some of the assumptions we have made to survive and thrive in the 90's.

The first assumption is that the cut-throat competition of the '80s will continue, especially for projects in the major domestic metropolitan markets.

A major growth in installation redesign and revamping will become more evident with the increased use of stereo/hi-fi audio television and the expanded use of satellite based teleconferencing in the industrial/corporate market. Switch-overs to whatever format will emerge victorious in the HDTV wars will provide another opportunity for companies with expertise in the audio/video area, both in the domestic and international arena.

Budgeting and financing of major projects will become even more difficult, especially in the domestic market, as the dollar further declines and fluctuates vs. the other currencies, and more hardware production is outsourced by domestic manufacturers to cheaper overseas production arenas.

Personnel costs and equipment diversity are seen as rising during the 90's resulting in further reductions to staff numbers within companies and expanding the use of outside independent contractors hired on a project basis.

Larger consolidation of consulting and installing companies with multi-media capabilities is seen as a major trend in the domestic market.

As I said, these are some of our assumptions. ■

(Continued next month.)

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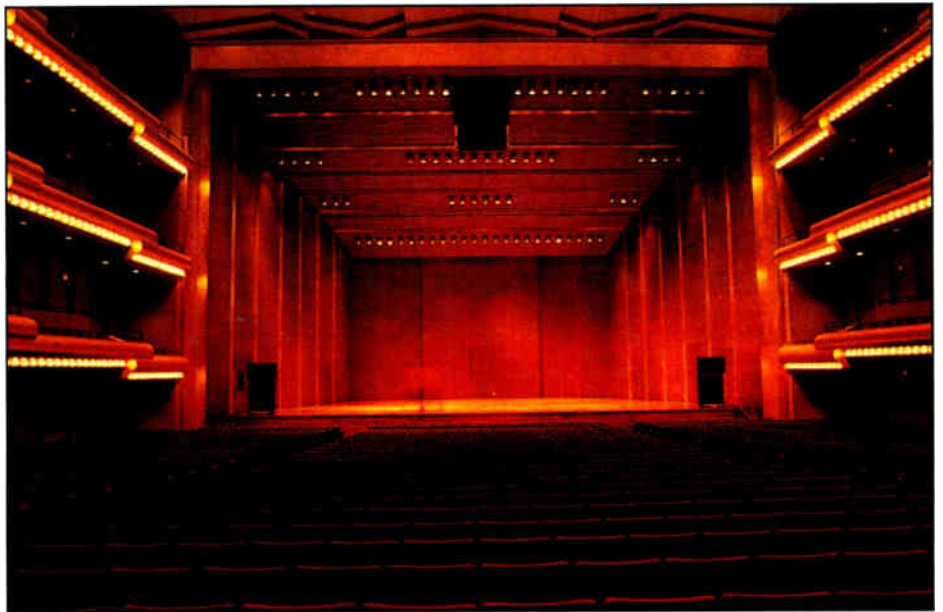
AVERY FISHER HALL “TRANSFORMATION”

BY BARRY RAY LUZ

New York's Avery Fisher Hall in Lincoln Center has seen changes through the years, the most recent being a transformation of a "concert hall with a sound system" into "a multi-use auditorium" used for concerts, stage plays, recitals and more.

In 1975 David Klepper, of the consulting firm Klepper, Marshall, King in White Plains, New York, was recommended as the consultant for the refurbishing of the sound system used in Avery Fisher Hall. Klepper was involved with the hall previously as a member of the design team from Bolt, Beranek and Newman (Cambridge, Massachusetts) that designed the original sound system for the hall. The budget for the 1976 refurbishment was very limited and more than a few components from the original system had to be used. Nonetheless, in December of 1981 David Klepper visited Avery Fisher Hall again, and further improvements were recommended. The hall received a grant from the New York State Council for the Arts. Improvements were agreed upon by the council with the condition that "every hall has to be used as a multi-purpose hall to earn its keep." Minor changes were made to the sound system from December 1981 to January 1988 when Gus Fleming, Manager of Avery Fisher Hall, and David Klepper finalized an equipment list to bring the system up to current standards.

ProMix, the sound rental and installation company located in New Rochelle, New York was called upon to go through the equipment list recommended by Klepper and to evaluate the sound and cabling needs as compared to the current equip-



Avery Fisher Hall with central cluster and Apogee AE-5/AE12's in position.

ment used in the hall. ProMix had supplied sound systems and intercommunication systems to Lincoln Center for quite some time and were very familiar with the hall's personnel and varied sound system needs. The design criteria as stated by David Klepper were: "to basically bring the sound system up to modern standards without major architectural or acoustical changes in the hall." This is the reason for "upgrading" the existing cluster with new drivers instead of purchasing a completely new system. The newly upgraded central cluster, along with the addition of some new sound system components, greatly improved the performance of the sound system for all kinds of musical performances.

The central cluster system, consisting of six JBL 2350 radial horns with 2440 drivers, were also upgraded to reflect newer technology. While it was deemed

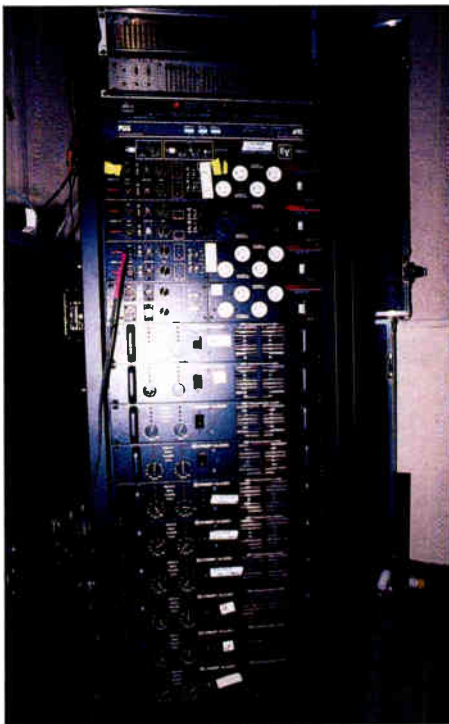


View of booth, mix positions.

Barry Ray Luz is the Marketing and Technical Training Manager of Apogee Sound.

too costly to exchange the actual horns of the cluster, the compression drivers were changed to the new JBL 2450J drivers. These drivers offer much greater output, sensitivity and wider frequency response than the older models. This gave the central cluster more presence and much greater output than the previous components. Also added to the central cluster system was the use of an Electro-Voice XEQ-2 active electronic crossover. This allowed system engineers the flexibility of selecting an appropriate crossover point of the system as well as obtaining the proper time alignment of system components to achieve good intelligibility.

Apogee Sound loudspeakers were chosen for the new side stage speaker system. There are three Apogee AE-5 loudspeakers and one Apogee AE-1 2 subwoofer speaker per side mounted on platforms with rolling casters. The casters allow stage hands to move the system around the stage easily during setup. In addition, the speaker system may be easily moved from their storage space to the stage when not in use. The Apogee system is used for main sound reinforcement for loud shows in addition to the central cluster, and is used for front audience "fill" during speech-only shows. Even though the system remains "portable," almost every show uses the Apogee system for either speech-only or speech and music. Increased coverage, output capability and sound quality are the reasons touring sound engineers use the system. One Apogee A-5 processor and one A-12 Subwoofer processor were used with the AE-5 and AE-12 speaker systems. Apogee processors are dual channel and provide fixed electronic crossover points, time domain alignment, fixed corrective equalization points and the Apogee PAR (Positive Amplifier Return) driver protection system. PAR functions by constantly monitoring the amplifier's output signal. When safe operating levels are exceeded, a low distortion limiter circuit acts to protect the drivers from damage. With such a great number of visiting sound engineers using the system night after night, the built-in protection of the system



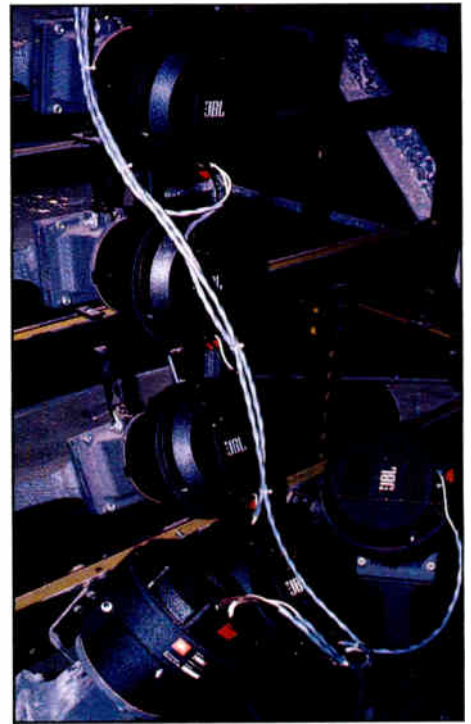
Backstage equipment rack.

from abuse made the Apogee system very attractive.

All power amplifiers for the installation except for the lobby system were Crest 4001's and 7000's. Crest power amplifiers were used because of their reliability, high output capability and sound quality.

House monitor systems are typically "whatever is left over" from the old system. Lincoln Center decided to purchase an in-house monitor system that complements the main system. Four Apogee AE-6 multi-angled monitor loudspeakers and two Apogee A-5 processors were chosen to provide on-stage monitoring and playback. The A-5 processor has an internal switch to select between the operation of the processor for use with the AE-6 floor monitor or the AE-5 multi-purpose speaker. This switch optimizes the upper low frequency response to compensate for the different enclosure shapes and extra low frequency coupling when the AE-6 is used next to boundary surfaces. Also included in the monitor system was a Furman PL+ power conditioner, two Klark-Teknik DN 360B 1/3 octave graphic equalizers and two dbx-166 compressor limiters.

The third sound system purchase by Lincoln Center was a lobby sound system designed to be very portable and extremely easy to set up. Ten Apogee AE-3 loud-



Rear view of the cluster.

speakers were selected and can be mounted on tripod stands for use in the lobby area. Two racks were constructed, each with specific components and ease of setup in mind. A twenty space Anvil rack case was built to contain two Carver PM-1.5 amplifiers, an Apogee A-3 processor, a Rane AD-13 delay and a ProMix plugging panel where line level and speaker level inputs and outputs occur. This rack is stored in a closet until needed and can be rolled out, plugged in, ready for use in a matter of minutes. A second ten space rack case contains a dbx 15-31 graphic equalizer and a dbx-166 compressor limiter. The two rack cases are interconnected via the ProMix patch panels.

One of the newly installed sound system components was the addition of two new DDA-S16 mixing consoles, one used in the sound booth and the other used as a "portable" mixing desk to be used elsewhere in the hall when needed by specific shows. The DDA-S consoles were chosen because of their flexibility in outputs. The need for a four by four matrix output with the addition of the eight auxiliary outputs gives the sound engineers the needed "feeds" for secondary sound systems throughout the building. Several microphone snakes were used to connect the console to the microphones used on

(continued on page 52)

AN OVERVIEW OF HIGH RESOLUTION INSTRUMENTATION FOR SOUND SYSTEM SETUP AND PROOF OF PERFORMANCE

BY MIKE KLASCO

Even the simplest commercial sound system should provide intelligible and esthetically pleasing quality. Uniformity of coverage, sufficient gain before feedback, adequate sound levels, and freedom from excessive distortion are usually part of the consultant's proof of performance specification and the client's expectations. Traditionally there has been a big difference between the sophistication of lab instrumentation and test gear for field use, but the gap is closing.

For sound system testing, basic sound pressure level meters gave way to octave band filter sets in the sixties. Energy (SPL) was measured serially, an octave at a time, with the output displayed on a meter and written down by hand. A popular unit was manufactured by General Radio. Now known as GenRad, the firm has graduated to producing automatic test equipment for integrated circuits and circuit boards. Multi-band equalizers were not seen outside of recording studio and laboratory use.

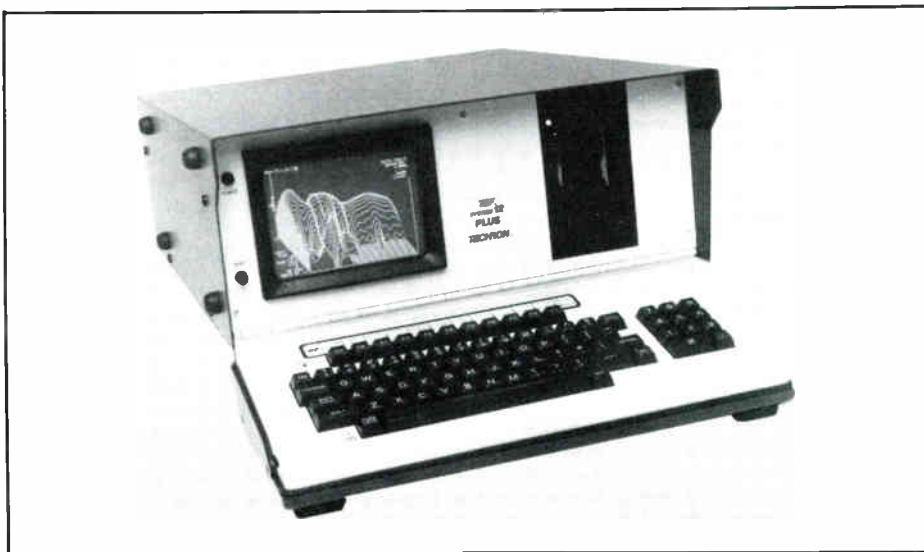
The next step was 1/3 octave analyzers, such as manufactured by B&K, which stepped through each band, with hardcopy generated by a chart recorder. The filters were passive so the lower bands used very large inductors. The test signal was pink noise. Speaker designers and a few of the more advanced consultants began to adopt this approach when Altec announced their Acousta Voicing 1/3 octave equalization system in the late 1960's. The Altec equalizer was used in conjunction with a another new device, the real time analyzer

(RTA) from Hewlett-Packard. The RTA was able to display all the bands simultaneously and equalization could be performed efficiently. HP introduced its first RTA in 1967 at \$10,000, but was encouraged by an Altec engineer by the name of Don Davis to make the design more cost effective. Only a year later a version of the analyzer was distributed by Altec for under \$2,000. Today 1/3 octave analyzers and equalizers are still the most common approach to response correction in commercial installations.

HIGH RESOLUTION ANALYZERS

Higher resolution measurement and equalization techniques existed even before 1/3 octave equalization. Swept sine wave oscillators were used with chart

recorders, and Heterodyne Spectrum Analyzers using tracking filters were in use in the 1960's. I had one of these monsters, (a "Panoramic") which used vacuum tubes; and it took about four hours to stabilize before consistent measurements could be taken. A modern version of this type of device is available from B&K (#2010) and can be found next to most anechoic chambers throughout the world. Even today, the combination of a heterodyne analyzer, distortion analyzer module and an anechoic chamber is the best way to measure driver distortion, but not exactly what you could call a portable field tool. A portable, modular and much less expensive version of this instrumentation is manufactured by Neutrik, and when used with the appropriate sub-systems is



Technon system 12 Plus.

a viable field tool. Boner, and later Augspurger, used narrow band notch equalization (5 Hz) techniques to treat room modes which required these high resolution response measurements. Although 5 Hz notch tuning techniques are rarely used anymore, 1/3 octave equalizers are not adequate for calibration of electronic crossovers, parametric equalizers, bass vent tunings, etc.

The time domain also warrants examination, such as the time alignment of speaker components in a cluster, delay settings between main clusters and distributed speakers, measurement of reverberation time and flutter echoes. The time domain can be viewed on an oscilloscope or chart recorder, but the need for an integrated test instrument is obvious. An inexpensive and unusual technique to calibrate delay settings to the main cluster is to use a hand held range finder. While short distance units are only accurate to 30 - 60 feet, the top-of-the-line devices will work to 250+ feet (and cost about \$150). Keep in mind that while the best models are accurate to a inch or so over 250-feet, the device can only indicate the distance to whatever it is pointed at and you must determine the real acoustic center of the horn. (Next month we will do a comparative review of electronic range finders.)

The modulation domain is a new and relatively unexplored dimension that is just beginning to receive attention. A gated or otherwise modulated signal is passed through the system under test and the "contrast" or dynamic range is determined by analysis of the settling time (vs. frequency) and noise floor. One measure of the modulation transfer function that will aid the contractor in qualifying the sound system in intelligibility is RASTI or STI (Speech Transmission Index) tests. B&K introduced the first test set for RASTI measurement, later followed by Techron expanding their software library to include this capability, and most recently by DRA's MLSSA system adopting this technique. A promising, but less documented approach is proposed by ASC (the Tube Trap people) which they call MATT—Music Ar-

ticulation Test Tape. It can be found on the Prosonus SRD test CD. The purpose of the test signal, which is a gated swept sine wave, is to function as a diagnostic tool to analyze the combined effects of the room's sound system, reverberation and ambient noise. Analysis of MATT can be accomplished by listening tests, a chart recorder, or perhaps the use of an analyzer with storage oscilloscope functions. ASC's Art Noxon is now in negotiation with test equipment manufacturers and we may see this test directly supported by some products soon. (There are many potentially useful aspects to this approach that cannot be adequately covered in this overview article, so next month in Sound & Communications we will have an article from Art Noxon on music articulation testing techniques.)

FFT ANALYZERS

HP and others developed computing spectrum analyzers for laboratory use in the early 1970's, but these systems cost \$100K and more. KEF, AR and Bose were some of the early users of this type of measurement system. These analyzers were not RTA, but rather event capture, a very different concept. A test impulse (a short square wave) was generated, sent to the speaker, picked up by the test mic and the signal captured (recorded) by the analyzer. The analyzer would then provide a storage oscilloscope function in which the amplitude versus time, (the waveform), could be viewed. Looking at the scopelike display, you would see a low level trace which is the ambient noise at the mic preceding the arrival of the impulse from the speaker, followed by the onset of the

“Even the simplest commercial sound system should provide intelligible and esthetically pleasing quality.”

Another test in the modulation domain was suggested by Fancher Murray, a compression driver designer at JBL. At the AES Sound Reinforcement Conference in 1988 his paper, "MTF As A Tool in Transducer Selection" discussed his findings of looking at the spectral decay of compression drivers from a top view (FTC frequency-time curve) to see the decay vs. frequency. A TEF analyzer was used for the experiments. About 20 years ago researchers at Pioneer used tone bursts as a test signal and viewed the response of speakers in three dimensions to this test signal (using a data acquisition system and a mainframe computer). I found these papers stimulating and look forward to attempting to use the MATT band on the Prosonus CD in conjunction with the three dimensional (time-frequency-energy) capabilities of various analyzers, to view the signatures of both acoustic spaces and transducers.

test signal, and then its decay. By starting the analysis from the onset of the rise and truncating the analysis at the tail end of the decay before any of the wall reflections, any room that was large enough could be used for measurement. The Fast Fourier Transform (FFT) computes the frequency content during some designated period of time. If you excite a speaker with the appropriate impulse and perform an FFT on the onset through the decay, you will have the frequency response of the speaker, more or less. Or you can analyze the energy a few milliseconds after the woofers and tweeters are "done" in order to look at the cabinet diffraction effects. Analyzing a cluster, reflections off adjacent components or the cavities between cabinets can be observed. Accurate low frequency measurements can be made either outdoors or by near-field techniques, placing the mic about 1/4-foot from the woofer cone (this effectively minimizes

room effects). From the impulse response, the frequency response, phase response, group delay, settling time, and even STI and RASTI intelligibility measures can be derived.

In the late 1970's impulse testing with computing FFT spectrum analyzers was embraced by most of the largest test labs, from Philips of Holland to Mitsubishi in Japan.

The first inexpensive impulse test system was the IQS 401, an FFT computing spectrum analyzer plug-in board for the Apple II personal computer. Introduced in 1981, it was a downsized version of the in-house minicomputer based system developed at Acoustic Research. This was an epoch making development as it brought the capability of measuring time domain measurements such as phase, group delay, transient response, frequency response measurements as well as three dimensional (time-frequency-energy) spectral decay plots within the budget of sound contractors. It was also one of the very first personal computer based test instruments available, a radical concept in the early 1980's.

While the IQS 401 was ahead of its time, it also was ahead of itself. The down side of this test system is that the impulse stimulus signal is very short, so under many real world conditions the signal-to-noise ratio is not sufficient for field use (such as testing sound installations). To get adequate dynamic range, the system under test was often driven too hard into non-linearity, resulting in erroneous data.

One solution was to sum and average impulses. The operator could tell the device to send out 4, 16, or even 256 test impulses and automatically sum and average them. Thus, the signal would add, but the noise would not. The signal-to-noise ratio would improve by 3 dB each time the number of averages would double. This was adequate for lab use, but not up to overcoming air conditioning noise, nor the sounds of clean-up crews, fork lifts operating during setup, let alone crowd noise. The Apple II was a poor platform for a transportable system, with umbilical cords running between the external



MLSSA Acoustical Measurement system running in a Toshiba T5200 laptop.

monitor, drives, and printer. The price was right though, with the combined cost of the computer and plug-in analyzer board being less than \$3,000. About 400 of these systems were sold, and most are still in use as secondary test systems at many speaker companies and the heart of many "garage" laboratories.

TIME DOMAIN SPECTROMETRY (TDS)

B & K at one point produced a TDS (Time Delay Spectrometry) system based on Heyser's work at the JPL, but it was an expensive and awkward conglomeration of equipment. A full functioning system required the 5842 TDS controller, a heterodyne analyzer, distortion control module, phase meter, high resolution real time FFT analyzer (for the ETC energy-time-curve), and an X-Y recorder. This "package" was eventually allowed to fade into obscurity. For distortion measurements, the system required an anechoic chamber. One of my clients installed this system in 1983 and I can tell you it is a bear to work with! Since all the equipment works fine independently, the TDS controller has long been put away and the remaining components are used conventionally. After the initial experience, B & K then put its effort behind dual channel FFT techniques, although the story of B&K and TDS is not over yet (and may have a happy ending).

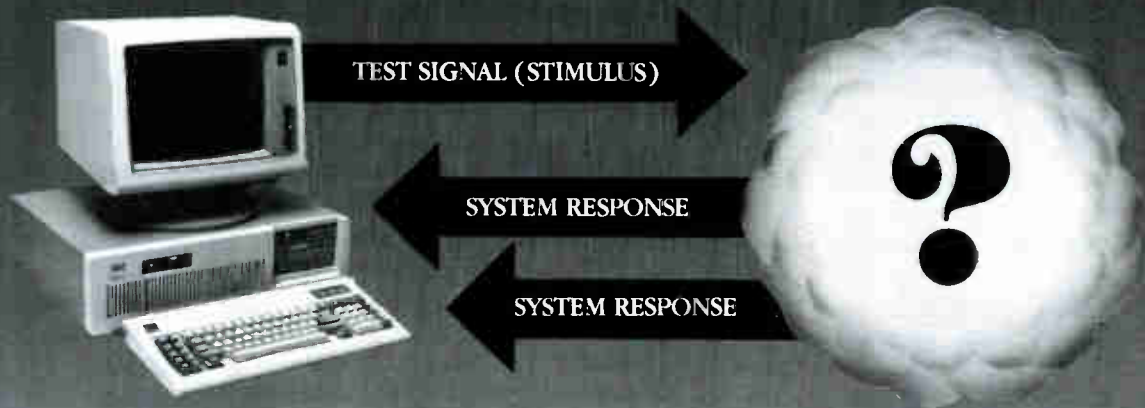
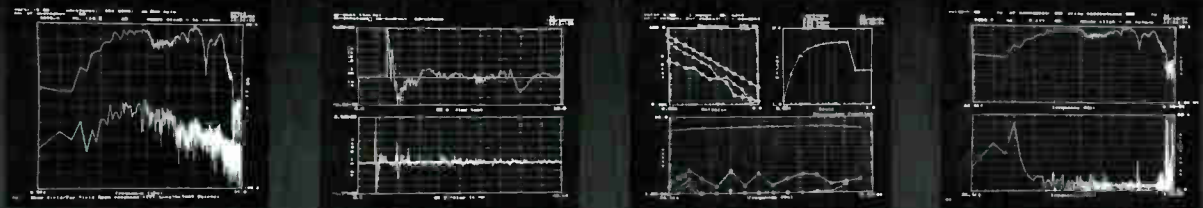
TONE BURSTS

Gated and windowed tone bursts have been suggested in a few AES Preprints (such as a Pioneer paper reprinted in the AES Loudspeaker Anthology which I referred to when discussing the modulation domain) and I saw one handbuilt system in use at a speaker company developed by Alan Sobel. Although this is a potentially viable solution, this technique has not been commercialized.

DUAL CHANNEL FFT TECHNIQUES

John Meyer's SIM system and Apogee's CORREQT systems use the transfer function between the two channels of the analyzer and can derive the response of the system off arbitrary dynamic signals, such as music. While I have seen and used quality control systems for speaker production that use this technique, its use in the field requires specially trained operators, many bands of parametric equalization, and extensive use of "secret sauce," *i.e.* special software and extensive experience on the part of the operator. I had the opportunity to observe the Apogee CORREQT system in use at the Grammy awards and it was truly able to extract an unprecedented amount of gain-before-feedback from the sound system, but demanded high operator skill and constant interaction. TOA introduced a varia-

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tion of this technique at the NAMM show in January. These approaches will not be a short term solution for the bulk of tour sound or permanent installation work. Another variation of using the music signal as the test source is the adaptive filter. This is essentially the same system as above, but frequency and phase response is adjusted automatically by digital signal processing circuitry. dbx attempted this approach in its 1/3 octave RTA-2 (which fell between the cracks when dbx was split apart and sold off). Some of this technology can be seen in a few ADC hi-fi/consumer "automatic" octave band equalizers.

Well funded labs could afford dual channel FFT analyzers and a room full of instrumentation, but a cost effective solution was still needed for field use. Gerald Stanley at Crown was intrigued by Richard Heyser's work on time delay spectrometry and began to develop an integrated one-piece system. The TEF 10 eventually emerged a few years later and sold for \$10,000. Using the TEF swept signal as the stimulus, this instrument was far more robust to spurious noise than FFT analyzers using an impulse averaging test signal. The TEF 10 was transportable and, like the IQS 401, could save jobs to disk for post processing and analysis at a later time. The TEF system has evolved and models TEF 12 and TEF 12+ have been introduced. Compatibility with MS-DOS has been improved as well as other functional enhancements. With considerable effort and commitment on the part of Crown's Techron division, Syn-Aud-Con and a number of devoted users, TEF became the state-of-the-art standard acoustical analysis system in the late 1980's. The range of functions that the TEF system can perform is staggering, including frequency response, phase, and group delay (all three displayed simultaneously), single channel FFT, SPL wide band, octave band, polar and polar ETC (energy-time-curve), reverberation time, intelligibility (STI, RASTI, AL%cons), oscilloscope, DVM (digital volt meter), 3-D time-energy-frequency, and more. From a hardware perspective, the TEF 12

is not state-of-the-art, with the circuitry and microprocessor architecture behind the digital signal processing systems that are used in the latest data acquisition systems. While the acoustical and audio

EasyTEF. Techron and Syn-Aud-Con have offered training courses to TEF users, but the TEF system is a commitment, both in money and training time. I believe the key to the success of TDS is its implementa-

“Well funded labs could afford dual channel FFT analyzers and a room full of instrumentation, but a cost effective solution was still needed for field use.”

software for the TEF 12 is more comprehensive than any of its competitors, the user interaction and general operation of the system is not intuitive, with a long learning curve. Set up parameters are critical and the time window parameters require good estimates of what the measurement results should be even before the test has been performed. With FFT techniques, the operator is able to view the the captured waveform and select the relevant segment to be analyzed. The TEF system is able to perform single channel impulse/FFT measurements, but we have already discussed the dynamic range problems of this approach. In the

tion with digital signal processing technology and revised software. A plug-in TDS board into a laptop computer would be very attractive. So would automatic setup of operating parameters (possibly not very different from the microprocessor automatic biasing and equalization systems used by cassette decks); pull-down menus for the user interface and various other approaches are going to be needed if thousands rather than a few hundred systems are to be commonly used. Aside from Techron, B&K has revived its interest in TDS and is actively working on its second generation system although there is no official product introduction date yet.

“The modulation domain is a new and relatively unexplored dimension that is just beginning to receive attention.”

hands of knowledgeable and experienced users who understand its theory and limitations, the TEF system is a powerful tool for sound system and acoustical analysis. Techron has attempted to move beyond the laboratory oriented software with a field report format program called

What are the alternatives? Various test signals and analyzers have been suggested and a few are now available that promise noise resistant test systems. These approaches are gated/windowed tone bursts, the chirp, dual channel FFT, and pseudo-random noise. ■

More next month

Visual Presentation Part 2

By Steven J. Orfield

Last month, the problem of evaluating presentation technologies was introduced, and the relationship between these technologies and perceptual quality evaluation was considered. This month, we will discuss some basic and advanced views of visual presentation measurement and of the interpretation of results. The discussion will center on measurement intent, accuracy and relevance.

At some point in the development of a visual presentation product, the manufacturer generally determines that:

- A market for the new product exists.
- This product should succeed in the market because it meets one or more of the following criteria: It is the first product in the market; it is higher

in quality than other products; it is lower in price than other similar products; it is better marketed and/or distributed.

While the A-V consultant may specify the product for many reasons, the most often noted reason is "that the product is higher in quality."

With visual product evaluations in particular, this judgment is usually subjective and narrative for these reasons:

- The viewing environment can radically alter the perception of product benefit.
- The view has no "high resolution" memory of other products viewed under similar circumstances.
- The media viewed as the on-screen example may very radically in its quality and "impressiveness."

Much like consumer selections of

loudspeaker systems by the notorious "A-B" method, and the viewer in many senses "views the answer without knowing the question." The question is or should be, "What is the least expensive method of achieving my visual presentation objective"? This question is in need of an objective or "program," which answers these questions:

- Is comparative quality an issue?
- How many persons are viewing this medium?
- Under what conditions is it viewed? (angle, distance, etc.)
- What is the visual complexity of the typical presentation? (computer graphics, spreadsheets, performance video, etc.)
- How important is information processing to this presentation facility? (Do errors in seeing have any consequences?)

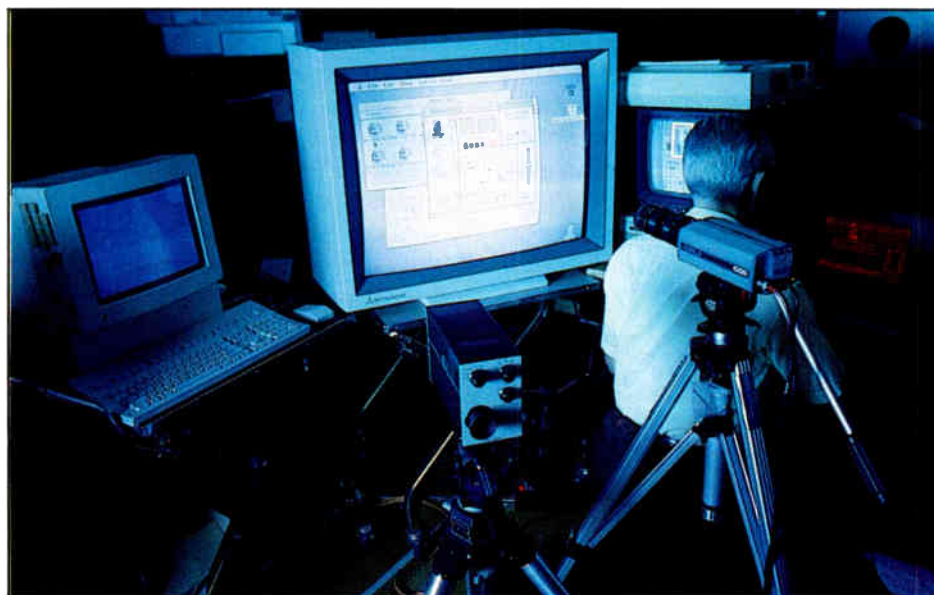
- Can any of these issues be dealt with via facility design rather than via A-V design, suggesting savings in A-V purchases as a result of facility design?
- Is there any "return" (monetary or otherwise) to better technology?

After a program has been developed for the viewing situation (or the most difficult set of viewing situations), then certain information becomes necessary:

- Can the typical display be easily seen/read in the known environment?
- What are the characteristics of the display which must be defined in order to determine this?

VISIBILITY EVALUATION

Beyond concerns regarding reduction in visibility due to room viewing conditions, in order to see a visual



CapCalc Measurement System

display, it must be controlled with regard to these variables, as seen at the viewer position:

- Detail size.
- Target (detail) to ground (background) contrast.
- Target and ground luminance.
- Viewing time available.

Secondly, since most visual display devices have clear changes in their output (display) at various positions on the screen, there is a secondary concern for evaluating minimum values versus uniformity. Third, there is a clear concern for color "accuracy"; fourth, in multiple "beam" media there is a concern for convergence and alignment. Finally, since most media is projected, there is a concern for distortion or "keystoning."

CURRENT MEASUREMENT PROCEDURES

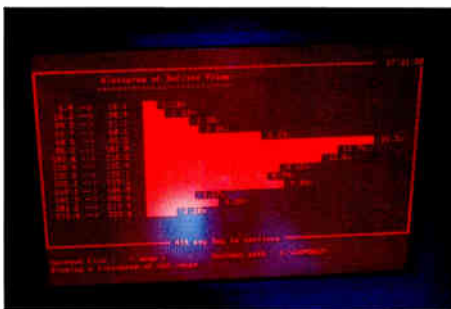
There are a number of current procedures in use to measure and calculate these visual quantities:

Quantity	Typical Unit
1. Projector Light Output	Lumen
2. Projector Uniformity	Min-Max Ratio
3. Projector Directivity	Angular Dist. Curve
4. Projector Resolution	Visual lines
5. Screen gain/reflectivity	Percent/Ratio
6. Screen Uniformity	Min-Max Ratio
7. Screen directivity/diffusion	Angular Dist. Curve

The following information provides a summary of some formal and some informal methods of generating these measurements. In many cases, the measurements are similar for projectors and for screens (directivity, uniformity, luminance, etc.). Many illustrations of standard measurement conditions are from the Wadsworth book noted later in this article. The use of the term "projector" as follows refers to any visual presentation device.

MEASUREMENT OF LIGHT OUTPUT/SCREEN LUMINANCE

Typical measurements of light output are based on a standard that does not consider the projector or the screen but rather the resultant level of light on the screen from the projector mounted in place. The screen is divided into nine equal parts. A footcandle (lux) meter is used to take illuminance readings at the center of each zone, and these nine readings are averaged. A final calculation is made by multiplying the screen width by the screen height and then by the average illuminance reading.



CapCalc Luminance Histogram

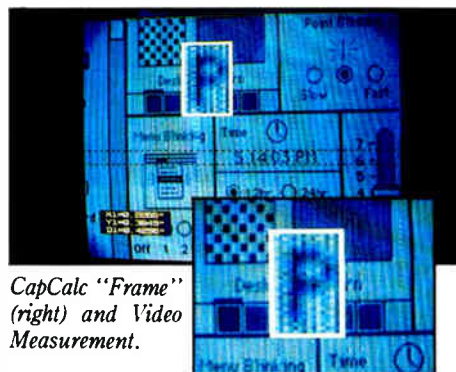
This type of measurement assumes these items as constant:

- Projector type.
- Bulb type.
- Lens type.
- Screen type and size.
- Distance/angle from projector to screen.
- Standard "clear" zoned slide.

By simply turning the light meter around, this method can also be used to measure screen luminance (light reflected from screen). These tests are often used in performance specifications.

MEASUREMENT OF LIGHT OUTPUT/PROJECTOR

The projector, itself, is evaluated more like a lighting system than the previous measurements, in that the result of this test is a lighting distribution curve (light output versus angle curve). Generally, a measurement distance is chosen that is characteristic



of product use or that allows the device to be considered as a point source of light. A "clear" image is projected on a screen area, and measurements are taken at set increments, such as one foot, horizontally and vertically. Each of those measurements is then corrected for off-axis measurement (cosine correction) and divided by the square of the distance between the projector and the screen. This resultant value would provide the lighting output of the projector for the angle of measurement.

A more complex and more accurate method of measuring projector output would be to mount the projector on a goniometer (angular positioning device) and to rotate the projector through its arc, leaving the measuring detector stationary. This would preclude the need for cosine correction.

MEASUREMENT OF RESOLUTION

Resolution normally refers to the evaluation of the capability of the visual device to provide detail. It is similar to the concept of "visual acuity" when referring to the eye, and most people have had a "resolution" test in their optometrist's office. When referring to a visual product, this can refer to either the theoretical resolution of the device, often defined in term of scan lines or pixel density for video. Resolution can also refer to the actual resolution provided by the product in use, and this may be a function of many variables, including viewing conditions.

The needed resolution of a device may be highly dependent upon the viewed material, the visual conditions, etc. It is interesting to note that when very high resolution products are

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specified, high luminance, lower resolution products may provide a better image.

MEASUREMENT OF COLOR

The evaluation of color of visual images, and especially of video images, has been based primarily on a comparison scheme. The technician sets up a visual bar pattern on the screen and compares this to a color chart that is generally printed on paper. Short of a manufacturer's test of color output which uses a spectrophotometer (lighting color computer), the set up and site testing of color distribution/accuracy is generally a very poor test for these reasons:

- There are great individual color vision differences among viewers.
- The ambient lighting and daylighting in the room at the time of a comparative test can grossly change the perception and evaluation of both the hand held color sample and the screen image.
- The results of viewing tests do not suggest the logic of correcting the image.

There are now devices on the measurement market that allow for modest cost testing in-situ or in lab of the visual image. One of these devices that we use for this evaluation is the Minolta Chroma Meter. This meter can be color calibrated, aimed at the visual test pattern, and can provide "color space" values, based on the Xyy format or on other psychophysical color scalings. With its associated calculator and printer, it can be easily and quickly used to measure both the luminance and the color distribution of a visual image. It can also measure changes due to room lighting, daylighting and other sources of color shifts. (There are now a number of computer products emerging on the market that contain calibration detectors for computer video screen calibration.)

NEWER ISSUES AND MEASUREMENT PROCEDURES

The Illuminating Engineering Society has, for over 20 years, been interested in the problem of visibility. (The ability to see a given visual task.) It has been known for some time that visibility, in a given case, is principally a result of:

- Task luminance
- Task size
- Task contrast
- Speed of viewing
- Viewing distance
- Task visual difficulty
- Task conceptual-linguistic difficulty
- Task familiarity
- Visual accommodation
- Visual adaptation

(In this listing, it is apparent that the visual task problem is somewhat parallel to the acoustic problem of intelligibility; it is a classic signal-detection and masking problem.)

"The CapCalc system was intended to provide both measurement capability and calculation of RVP."

Recently, after a number of years of research, the director of the lighting program for the National Research Council/Canada completed a theoretical model of "visual performance." This model was not only aimed at basic visibility but was oriented to evaluating the contribution of visibility changes to changes in the speed of performing the visual task. This model of visual performance was termed, "relative visual performance" or RVP.

In addition, Rea developed a video photometer and analyzer known as the CapCalc system. This system was intended to provide both measurement capability and calculation of RVP. Four of these systems were originally pro-

duced by NRC, and Orfield Associates commissioned the first of these systems. The CapCalc system consists of:

- A 286-based computer.
- A monochrome image capture board.
- A monochrome viewing monitor.
- A monochrome or color computer monitor.
- A calibrated video camera.
- A set of calibration files on disk.
- Software for system control and for calculation.

This recording video photometer can capture an image in 1/30 of a second and then digitize the image into approximately 250,000 luminance values. It can frame and zoom in on details of the image, it can create histograms of image luminance and can be used to identify detail and background for RVP calculations. Unlike photometers with a fixed angle of view, this device has a zoom lens and computer framing, which combine.

CapCalc MEASUREMENTS

The CapCalc system can be aimed at a screen, monitor, etc. and the technician decides by computer command when to capture a visual image. That image is captured instantaneously and is digitized in about 30 seconds. The image can then be analyzed by moving a cursor around on the screen or by creating "framed" areas of the image for evaluation of local luminance of RVP. Given the need to perform screen luminance measurements, for instance, the CapCalc system can take the necessary data, along with measurements at dozens of seats in an auditorium, in less than an hour. This information can then be processed for specific desired conclusions later. Additionally, RVP calculations can be performed to determine visual performance.

(The system can also be used to evaluate alignment and keystoneing.) This same system can be used, along with goniometer photometry to provide more complex and controlled measurements. It can also be used at close

range to provide what is becoming known as "near field photometry" (measurements of local minimums and maximums, rather than averages). Via the use of this new video photometry system, the process of visual presentation product analysis should be given much impetus.

SUMMARY

We are quickly approaching the time when formal specifications in the visual presentation area can, in fact, provide significant information regarding the benefit of a visual product under a defined set of circumstances. Hopefully, the manufacturing community and the standards bodies will move toward more and more relevant standards, based on significant benefit, in order that this process can accelerate.

In the interim, there is no substit-

tion for "psychophysical performance testing" which is, in its simplest form, the in-situ (identical to end use) evaluation of a visual presentation product by a series of viewers. The product should display images of the maximum complexity expected in use, and the viewers should rate, under short-timed exposure, their clarity and preference making results easily tabulated.

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So You Know How to Measure Level!

By Don Davis

One of the most seemingly innocent, and yet ruthlessly revealing questions you can ask any audio man is, "What's the level out of that unit?"

Let's say, for the sake of this first example, that it's a device with two lights — one that should always light if a signal is present and a second one that lights only when the device clips. The interest would be in what "level" made that second light turn on.

WHAT ARE LEVELS?

Are levels voltages? Are they impedances? Are they arbitrary? By definition levels are always in decibels. Therefore, levels are always power levels because decibels are always computed from power ratios. The ratio may be that of one power to another power (dB by itself) or it may be some ratio above or below some established reference (dBv, dBm, dBw).

THE PROFESSIONAL REFERENCE

The professional reference power is

0.001 watt (one one thousandth of a watt or one milliwatt). The professional reference power level is the dBm where the lower case 'm' stands for one milliwatt (1/1000th of a watt).

Please note that no voltage is involved nor is any impedance involved. Any combination of voltage and impedance that equals 0.001 watt is a power level of 0 dBm. A power of 1.0 watt would be a level of 10 Log

$$\frac{1w}{0.001w} = + 30 \text{ dBm.}$$

A power of 1 microwatt (0.000001w) would be a level of:

$$10 \text{ Log } \frac{0.000001w}{0.001w} = -30 \text{ dBm}$$

For example:

- 0.010v across 0.10Ω = 0.001w
- 0.10v across 10.0Ω = 0.001w
- 1.0v across 1000Ω = 0.001w
- 10.0v across 100,000Ω = 0.001w
- so incidentally does
- 0.775v across 600Ω = 0.001w (see slide rule figure #1.)

The only bearing all of the above have on the subject at hand is the fact that they equal 0.001w.

THE FLY IN THE OINTMENT

So long as the audio world used matched systems (i.e., the input impedance equalled the output impedance) then all you had to do was place a pre-calibrated voltmeter across any link circuit and read the level. For telephone circuits, which often used to be 600Ω, the voltmeters 0 dB point was opposite 0.775v. For 150Ωs used by CBS and NBC, the 0 dB point was opposite 0.387v. The fly in the ointment is that contemporary systems are not matched systems but constant voltage systems. What is meant by the term "constant voltage" is that the source impedance is much less than one tenth the load impedance (often one one hundredth) and raising or lowering the load impedance two or three to one does not affect the signal voltage amplitudes. The three basic interconnection circuits are constant voltage, matched, and constant current.

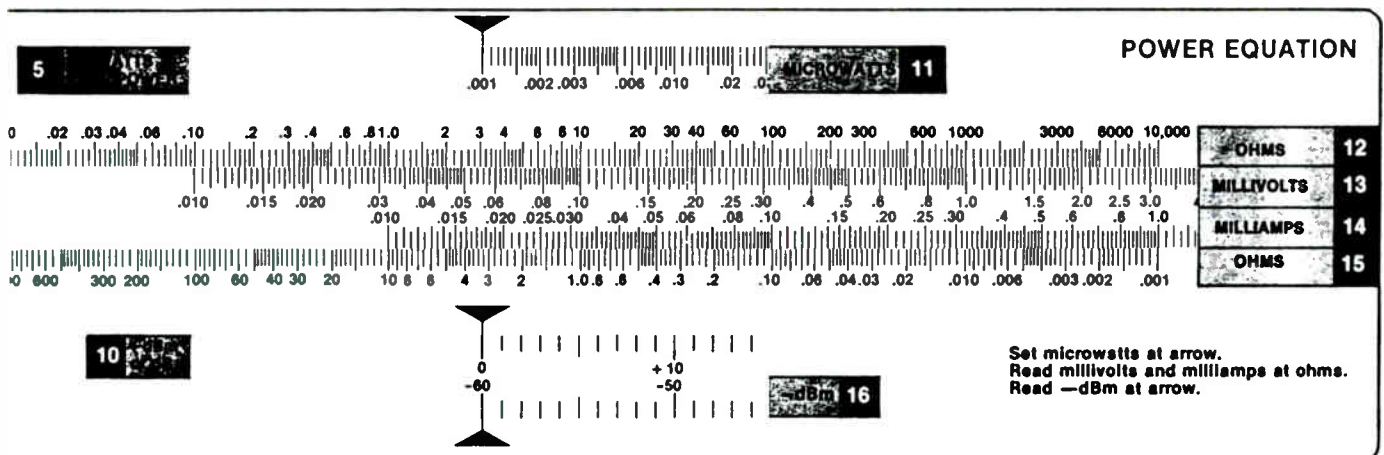
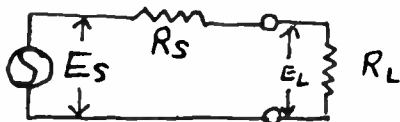


Figure 1 — Slide set to a power of one milliwatt or a power level of 0 dBm

POWER MATCHED, CONSTANT VOLTAGE, AND CONSTANT CURRENT CIRCUITS

At the interface between devices there is a source generating an E_S with a source resistance or impedance R_S and a load across which E_L appears with a resistance or impedance of R_L .

This is shown in conventional schematic form as



The E_S and R_S may be properties of a mixer while E_L and R_L may belong to the input circuit of a power amplifier.

When $R_S = R_L$ the circuit is said to be a power matched circuit because it can transfer the maximum possible power from one device to another. When R_S is much less than R_L ($R_S \ll R_L$) the circuit is said to be a constant voltage circuit. Much less means, as a minimum, a ten-to-one difference.

When R_S is much greater than R_L ($R_S \gg R_L$) the circuit is said to be a constant current circuit. These three configurations are illustrated in Figures 1 and 2.

The most commonly encountered configuration is the constant voltage circuit as a majority of manufacturers make the input impedance high and the output impedance low on the devices they build.

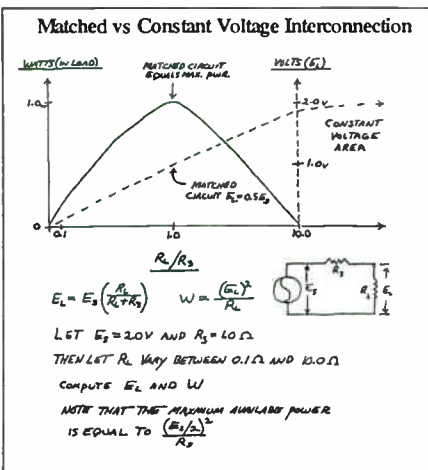


Figure 1

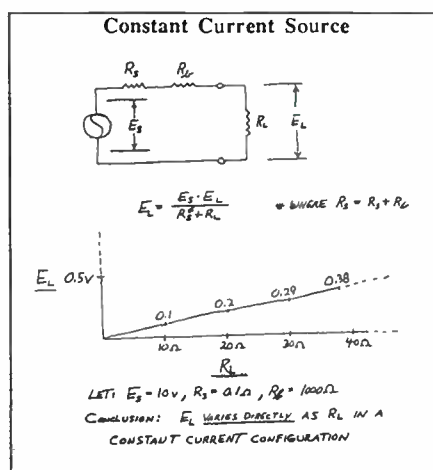


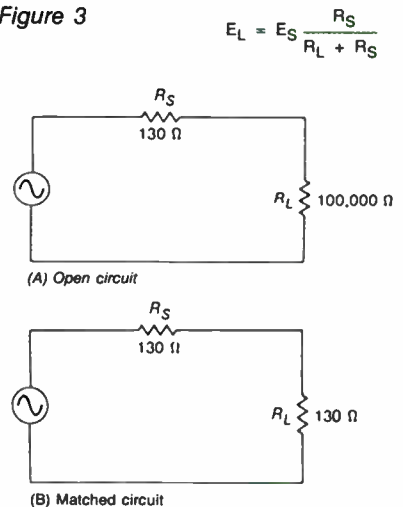
Figure 2

Voltage sources are effective and widely used. The sole problem they cause in level measurements is that the pre-calibrated voltmeter can no longer be correctly used. We now must find the actual source impedance of a device sending a signal to the next device and its open circuit voltage as well. (I appreciate that in a truly open circuit no current flows but what is meant when the term is used is a very high impedance relative to the source's impedance.)

THE DIFFERENCE BETWEEN OPEN CIRCUIT AND MATCHED CIRCUIT

If we measure the open circuit voltage, and then follow with a second measurement with a load attached that is equal to the source's internal impedance, what happens? The circuit in figure 3 illustrates the point. We have constructed a voltage divider circuit so that one half the voltage appears across the internal impedance and one half across the load. (i.e., the output of the device drops 6 dB.)

Figure 3



Comparison of open and matched circuit.

Let $E_S = 1.0$

Then: $\frac{100,000}{100,130} \approx 1.0$ And: $\frac{130}{260} = 0.5$

$20 \text{ LOG} \left(\frac{0.5}{1.0} \right) = -6.02 \text{ dB}$

THE LEVEL OF AVAILABLE INPUT POWER

The level of available input power L_{AIP} is the power level in dBm theoretically available from the source into a matched circuit. Since we are not going to match the circuits, why should we care about this theoretical level? We care because the very definition of the "gain" or "loss" of the device this source will drive is the level of that device's output power level minus the level of available input power the device ahead of it presents to it. Note carefully that what power is dissipated at the input of the device we want the gain or loss of has absolutely nothing to do with the measurement of that gain or loss. When the gain or loss is ascertained in this manner, then plugging this device into a system will raise or lower the level at a listener's ears,

as seen on a sound level meter, by the exact amount as the gain or loss value. The equation for L_{AIP} is:

$$L_{AIP} = 10 \text{ Log} \left(\frac{(E_S)^2}{0.001R_S} \right) - 6 \text{ dB}$$

For all voltage sourced equipment this technique is employed. The E_S value is equal to the open circuit voltage E_O .

THE POINT IN THE CIRCUIT WHERE POWER IS ACTUALLY DISSIPATED

At any point in the system where power is generated specifically to be dissipated in a load (i.e., loudspeakers connected to power amplifiers) then we measure the impedance of the load

and the voltage across the load:

$$L_{OUT} = 10 \text{ Log} \left(\frac{(E_L)^2}{0.001R_L} \right)$$

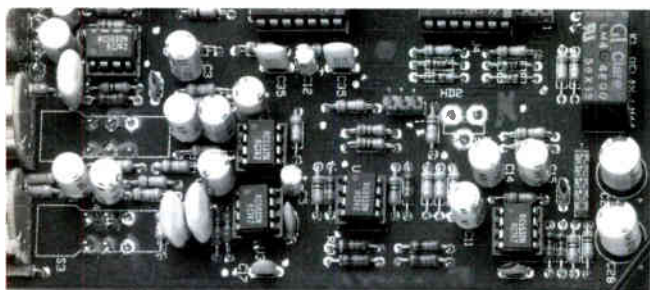
Note that in this case, and only in this case, do we deviate from measuring the open circuit voltage and now measure the voltage across the load.

A SHORT QUIZ

You have our congratulations if you reach the correct answers. You know your way around system levels. If you obtained a different answer, it's only your minds way of telling you to read the article again; it didn't get it the first time. Next month: answers.

See our quiz on page 70.

(continued on page 70)

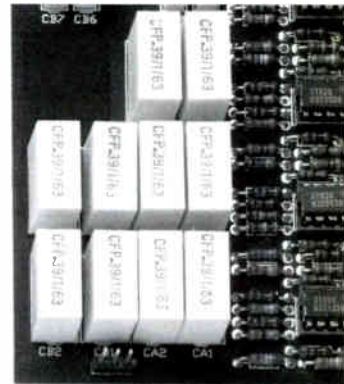


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Dynamic Range	+117 dBm	+114 dBm	+112 dBm	+112 dBm
Frequency Response	18 Hz to 30 kHz +/-0.5 dB	10 Hz to 40 kHz +/-0.3 dB	20 Hz to 20 kHz +/-1/-2 dB	20 Hz to 20 kHz +/-0.5 dB
Number of Bands	31	30	30	30
THD plus noise	Less than .005% @ +22 dBm @ 1 kHz	Less than .01% @ +4 dBm	Less than .5% @ +22 dBm	Less than .01% @ +4 @ 1 kHz
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*All specs taken from manufacturers' published literature.



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World Radio History

Distortion In Wire — Who Cares?

By Barry Thornton
Monster Cable

This article is about how we measure distortion in wire, but to place it in context I need to explain why you should even care about distortion in wire. I would like to make this a practical view and pass on the theory, so permit me to use the personal narrative form and deal with practical problems like profits and the marketplace (installed sound).

In talking with contractors, designers, and other equipment manufacturers, I hear a wide range of complaints about the marketplace. There seem to be two dominant themes to these observations. The first is a mix of (a) how cheap the customers are, and (b) how competitive the market is. Ringing a profit out of the work is a craft unto itself and a severe anguish generator.

The second is how lucky it is to have high-end jobs. The ones where quality was the purchase criterion and cost is somewhat secondary. For many installers it's those houses with \$20,000 to \$250,000 audio and video systems, for others it's the plush corporate boardrooms of offices. For some it's the high-end retail stores, presentation rooms, sales salons, etc.

What you probably have not thought about is that if you do this kind of work, you are no longer that special. Daily we talk with installers who do this kind of work. Everybody seems to have a few of these jobs. Some of them have even figured out how to do only this kind of work. If you are not doing this kind of work, it's probably because you either don't want to or you don't know about it. If it's the former, stop reading this article and I apologize for wasting your

time. If it's the latter, please read on.

High-end work is typically not lowest bid in nature. One usually either gets a sound designer on staff, or works with independents. You learn a new language and get a new education in products, technologies, and techniques. You will have to unlearn some old attitudes about both people and technologies. Those crazy folks that say they hear differences in amplifiers, wire, and the like, will now be paying the bills. Maybe they're not so crazy.

And many of the old, solid technical truths that made it a black-and-white world now must give way to more fluid view, more shades of grey. The people side you will figure out. The new customer tends to be more sensual and less cold in nature. His ideas will probably bother you at first, especially when he tells you there is a difference in the sound of wire. And with that cue we get to what this article is about, wire.

When someone tells you that different wires (cables) have different sounds you probably think "how ab-

surd." After all, everybody knows that cable is cable. Oh, sometimes thicker cable may have a bigger bass sound, but this is simply lower resistance. And all that gobbledygook about skin effect at audio frequencies, well, everybody knows that only happens in RF. And on and on. The fact is that current physics has only a mottled understanding of how audio signals travel through cable. Most engineers don't think about the fact that the audio band is over 10 octaves wide (this would be the equivalent to a 1 Hz to 1024 Hz RF signal bandwidth). No other frequency range of electric energy transfer covers anywhere near this bandwidth. It is generally accepted that this bandwidth is not practical in RF, and Maxwell's Equations aren't frequency dependent. It is quite likely that what happens in a cable is more complex than normally assumed. And in reality, it is.

Over the years we have developed a wide range of tests which permit us to measure the distortion and errors in cables. We have used the results of

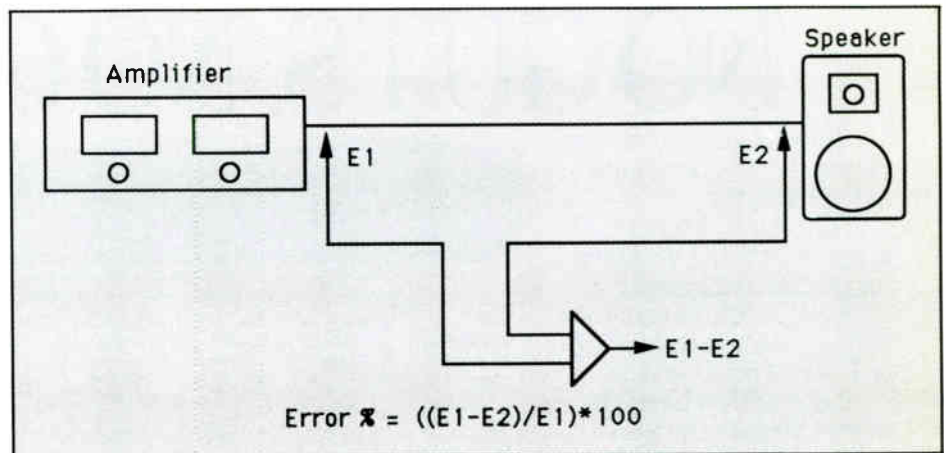


Diagram 1

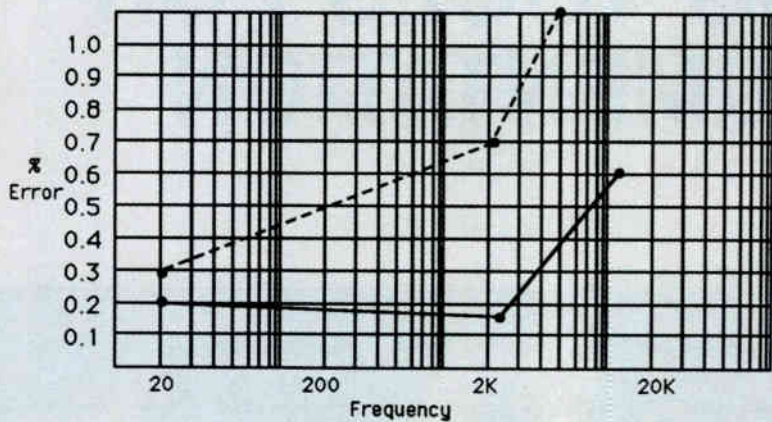


Diagram 2

these tests to develop and patent cable technologies which our end users say sound better than the "industry standard" cables. They like it enough to cause it to be installed and, because it costs more than "industry standard" cable, make more *profit* for the installer. Did I say something that got your attention? I hope so.

Measuring distortion in cable is based on a variant of Peter Walker's (Quad Electronics, an old and highly reputable English hi-end hi-fi manufacturer) to compare the input and output to see what happened in between.

To do this we subtract what went into the cable from what came out of it. We use a differential amplifier to do this when applied to speaker cable. One big difference is that we use a loudspeaker as a load. We use a simple two-way speaker (the same Braun L200 for the last 10 years), and we do our testing at low levels (0.5 volts RMS). The results are quite meaningful and consistent. Our internal adoption of the Braun L200 has meant that we have a historic audit trail for our engineering work.

Using real-world loads at modest levels, we find the results rather impressive. Diagram 2 is a comparison between an 11-foot piece of a 14-gauge zip-type cord and a low-cost cable designed employing this technique. The horizontal axis is frequency, the vertical is the percentage of the input

voltage that appears across the cable (we call this the distortion). This is done after we null out the effects of the simple resistance in the cable. The solid line represent the advanced cable design, the dotted line is the zip-type cable.

As a cable is supposed to only have resistance, capacity, and inductance, it becomes clear that something else is going on here. The fact of the matter is that contemporary cable analysis avoids using dynamic loads and sources. Cable is typically evaluated in an unreal laboratory condition with a carefully buffered generator and an ideal resistive load. As we see here, the zip cord has a strong tendency to have a frequency dependent rising error level. The cable designed for speaker use tends to be both lower in errors and more consistent with frequency. It would seem plausible that if the end user says he likes the sound of the special cable over the zip cord, there may be a reason for it.

What is most important is that there is more going on here than meets the eye or ear. The audio myth that wire is wire and can't have a "sound" has been passed on from classroom to classroom without being tested. Hi-fi cable designers have built a growing industry based on end user observations. Today's high-profit work is being dictated by hi-fi type designers; maybe it's time for you to take a closer look. ■

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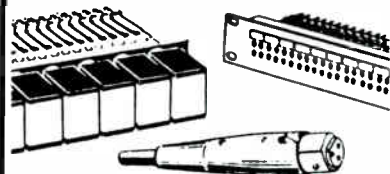
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ENGINEERING TOOLS FOR CABLE DOCUMENTATION

BY MIKE KLASCO

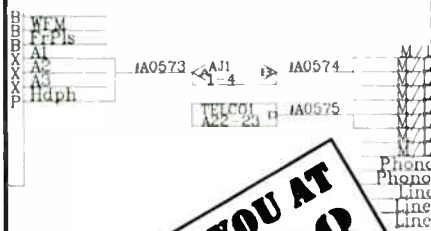
This month we have several capsule reviews of products for cable identification and documentation. The most comprehensive is Video Design Pro's CableDOC which is used in conjunction with AutoCAD or Generic CAD, and VDP's audio and video equipment libraries. Less ambitious, but extremely flexible and easy to use is the Bradylabel software for generating any sort of marker or identification for cables or other components. A less expensive alternative is the Seiko SLP package which not only in-



Seiko Instruments' "Smart Label Printer."

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cludes software for either the MAC or IBM computer, but also the label printer itself!

CableDOC2 is used with VDP's AudCAD or VidCAD, which in turn are used as file libraries for AutoCAD. AutoCAD is a computer-aided drafting program.

CableDOC uses information attributes from AudCAD or VidCAD libraries to extract the source and destination along with the input/output name and type. This information, along with the other data fields in CableDOC, are used to create a cable for the system flow drawing. This cable has a part number and can be looked up, edited, included in the bill of materials, etc. The complete cable information is transferred to an input file for CableDOC. This file can be used in a variety of ways; but generally it can be read as data and provides for sequential numbering.

CableDOC provides for run-list reports and offers several standard report formats. A custom report generator module is included for the ambitious. CableDOC can

update drawings from a cabling database and then tells AutoCAD to Red-line changes needed. CableDOC also provides for label generation and supports Brady, and Thomson & Betts label materials.

The PathROUTER is an optional module for CableDOC from VDP. PathROUTER automatically traces signal paths and branches of any or all signals of a system. It then graphically lists them and calculates the length of each path. The program is useful in simplifying maintenance procedures, generating user programmable reports, and a detailed bill of materials. PathROUTER is primarily intended for video cabling and for this purpose provides calculations of video delay lines, RF loss, and estimation of H-phase.

If all this seems like a bit too much for you, VDP offers training seminars on the use and efficient operation of their programs. On the other hand, your jobs may only be audio, and typically your installations may be discos, nightclubs, or intercoms, rather than recording studios or

broadcast stations. To satisfy potential users with smaller appetites for cable routing and labeling, VDP has recently introduced Generic Designer.

Generic Designer integrates with CableDOC for a package cost much less than AutoCAD with AudCAD and CableDOC. While AutoCAD release 10 and the associated VDP programs will cost well over \$5000 for the software, the Generic Designer package will run about \$500 total. A sound system library is one of the special versions of the program, along with other modules for Broadcast Audio, AV, Industrial Video, and Broadcast Video.

Late this year I plan on attending VDP's seminars and reporting in-depth on all their software.

W. H. Brady specializes in markers and labels for electrical and electronic components. Specific products for endless applications are listed in their 90 page catalogue, including the Bradylabel Software program. Other items are markers and labels for wire cable, terminal blocks, tags, sleeves, ICs and other electronic components and so on.

Cable labels normally consist of a pressure sensitive adhesive backed cloth tag, with the identification printed repetitively across the width. A clear protective overwrap sleeve is generally used.

Bradylabel is a complete label generating package and is a fast and efficient way to supply product identification. Bradylabel runs on IBM PC, XT, AT or compatibles with at least 512K memory. Dual floppy or hard drives can be used. Color and monochrome monitors are supported. The program is optimized for creating label files on Brady's line of labels, sleeves, and markers, although any brand of label can be used. For example, a manufacturer could generate serial number tags with the program, or use the program to print successive numbers on preprinted tags. The software has a large library of stock label formats available as well as the option to create custom templates. The software's editing features simplify random wire identification. Font (type style) placement allows for character spacing requirements

CUSTOM FORMATTABLE CABLE LIST						
Cable Number	Source	Dest Comp	Cable Length	Cable Type	Signal	Srcce Rack Dest Rack
V0286	VTRVM	J1	47.0	RG59	VTRVM-V1	1 1
V0397	VTRDM1	J1	60.0	RG59	VTRDM1-V1	1 1
V0401	VTRDM1	J1	48.0	RG59	VTRDM1-V3	1 1
V0505	VTRS1	J1	26.0	RG59	VTRS1-V1	1 1
V0509	VCRIS1	J1	10.0	RG59	VTRS1-V1	1 1
V0513	VTRX2	J1	45.0	RG59	VTRX2-V1	1 1
V0518	VTRX2	J1	10.0	RG59	VTRX2-V3	1 1
V0520	VCRA2	J1	22.0	RG59	VCRA2-V1	1 1
V0525	VCRA2	J1	10.0	RG59	VCRA2-VMON	1 1
V0527	VTRMR1	J1	55.0	RG59	VTRMR1-V1	1 1

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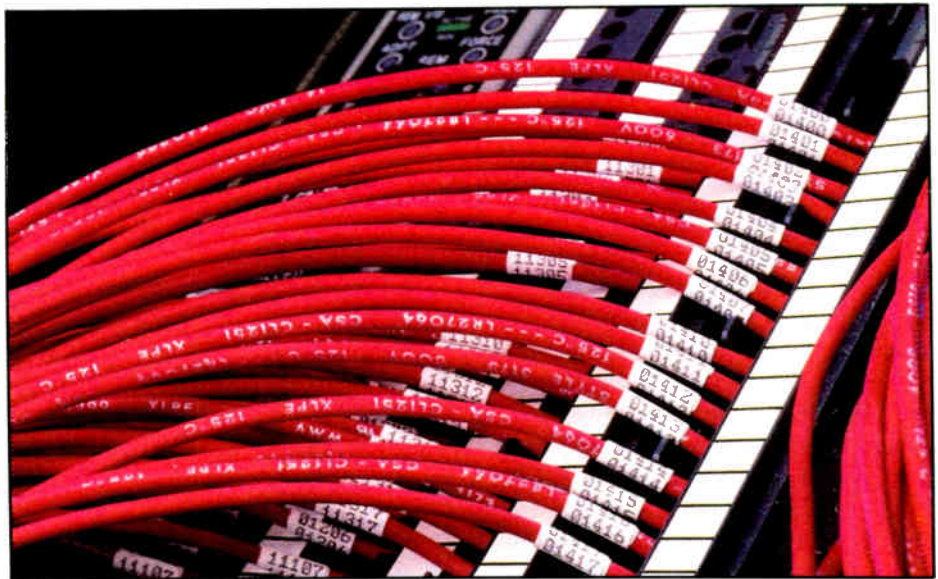
WIRE & CABLE

to match English or metric terminal blocks, and is limited only by the printer's font options. The software features data import, DOS file management, printer-directed file output (i.e. more than one printer can be used), complete HELP screen facilities, menu driven self-prompting screens, horizontal and vertical line centering; and complete printer supported type size selection (both lines per inch and characters per inch). The software configuration set-up supports many printers, but requires them generally to operate in the Epson emulation mode. The popular (non-Epson standard) OKI printers are also supported.

I was pleasantly surprised at the smooth operation of the program, especially considering that it is version 1.0 and that Brady is a cable company, not really in the software business. Either they have a capable programmer on staff, hired a competent consultant, or just got lucky. In any case, operation is intuitive, efficient and painless to use even the first time you turn the program on. I generally did not need to use the on-line help function, let alone open the manual. The ease of user interaction with the program extended to the initial set up, which requires your configuration system file to be modified. Usually this is awkward for computer users who do not know the ins and outs of editing computer files, but the Bradylabel software already contains the correctly edited file and the program user can simply direct the software to modify the configuration system file. It was quick, easy, and painless, more than I can say for the set up procedures of some other software programs and computer based test equipment that I am now in the process of reviewing!

Brady's prices on their blank tags and labels are reasonably priced, although the program is a little expensive, at \$425. If you prepare a lot of identification tags and can afford the program, I can recommend Bradylabel.

If you are like me, you find changing the paper and inserting the labels a big pain. A slick solution is the Seiko SLP 1000 label printer for \$250, including the software. Versions are available for both the Mac and



Brady label is a complete label generating package and runs on IBM PC, XT, AT or compatibles.

IBM compatibles. The package includes a cute printer, software, and cables. The printer connects to a serial port. Only Seiko's blank labels can be used as the printer uses an advanced thermal printer technology. The labels are permanent, and the printing is highly legible and letter quality. For protection, Brady's self sticking clear vinyl overwrap should be used over the labels. Even with the overwrap, the paper label will not be as permanent as Brady's cloth based labels. Also, the single size (3½" x 1⅞") may limit the SLP



Brady label software program.

in some applications. Seiko's software allows you to generate a library of commonly used labels (mic I, amp 7-left channel, etc.), and these can be all be printed out automatically. On the Mac, the software is a desk accessory, while on the IBM it is in a pop up (memory resident) format.

Physically, the printer is both stylish and well finished. The casing is two tone light grey/dark grey, with a clear acrylic cover over the label supply reel. Size is 3.6" x 6.3" x 6.3" and weight is only 1 lb.

While the Seiko lets you justify the printing left, center, or right, select condensed, normal, expanded, bold face, type face size and even font style selection, at present labels can only be printed lengthwise. Conventional wire markers are generally printed repetitively across the width so you can read the label at any angle of the cable. The Seiko is able to print the same (or different) data on each line (lengthwise), up to four to size lines, depending on the type size. In any case, the label is 3.5" x 1⅞" which should be adequate for almost any application. Other duties for the SLP 1000 are generating serial numbers, bar codes for inventory, and its originally intended purpose, mailing address labels for envelopes.

If you want to keep your label budget capital expenditures down, and you already own a computer and word processor, then you can simply buy Panduit's Rag Tag non-adhesive labels. They are wrapped around the harness and pulled through a pre-slit opening. Made from flexible flame-retardant, polymer-coated vinyl cloth, they are supplied on a perforated carrier for use on your computer printer.

Similar products are also available from Brady, and Thomson & Betts.

(continued on page 70)

FIBER OPTICS: THE SOLUTION TO TRANSMITTING INFORMATION?

BY KEITH BOSE

The quest for a technology to transmit information by pulses of light instead of electrical signals is finally paying off. With optical transmission, the amount of information per dollar is becoming less every day. Information, whether it is in the form of the human voice, a symphony orchestra, or streams of data from an accounting office, is converted to light pulses in digital code; millions of pulses per second move over a hair-like glass fiber and are then reconstituted into original form. A fiber optical cable can carry over six thousand telephone conversations.

Coaxial cable can never equal this because it is electrically impossible.

The telephone industry has been in fiber optical development for a long time because the economic benefits of optics in telephone distribution are massive. Telephone cable crews are out across the nation now replacing copper with fiber. Underground fiber cable, it turns out, can resist long term environmental damage in some cases better than copper. Electrical signals in digital form can be switched in much greater order. Optics together with digital switching has contributed more to

telephone technology than anything since Alexander Graham Bell. Other industries can now benefit.

Fiber optical cable was developed with a single objective, to get information over the greatest distance at least cost. But once developed, fiber optical cable made it possible to reap other important benefits:

- Fiber cable is immune to crosstalk and electromagnetic interference.
- Glass fiber has no grounding or shorting problems. If a cable is broken there is no shock or fire hazard. A fiber cable

	
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FIBER OPTICS

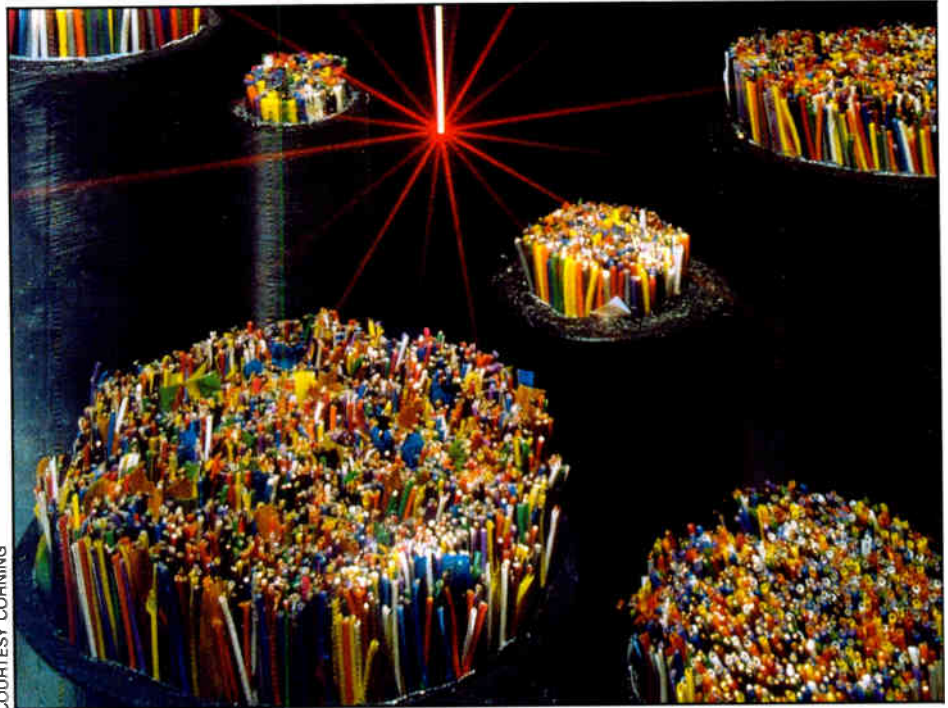
thrown across a high tension line is inert.

- Lightning is not a threat in outdoor installations.
- Fiber is flexible for installing around corners; tensile strength is high,
- Fiber cable can be half the weight of twisted copper pair.
- Covert tapping of optical signals is very difficult and can immediately be detected by noting the increased error and attenuation.
- Fiber can resist deleterious environment for long periods.

These are enormous advantages, but there are tradeoffs in specific applications. Fiber has its own complications. Terminating or joining fiber cable requires special splicing techniques and connectors. Unique test equipment and tools are essential. Although central manufacture of cable in standard lengths relieves some complications of on-site installation, optical terminating equipment requires unique devices; light sources and detectors must be combined with specialized circuit boards and chips. It will take time and economic favor to develop off-the-shelf devices to suit all of the applications that can benefit from optical fiber.

Although fiber is rapidly drawing ahead in its battle with copper, at this moment many applications are still more economically served with copper. Applications which require many taps or connections may be best served with coaxial cable until fiber techniques and connecting costs come down. Even if existing optical equipment can theoretically be adapted to a specific application, the design cost cannot be amortized until a sufficient market exists. Niche markets must wait.

Many applications simply do not need the huge transmission capacity of fiber. A single channel of high quality digital sound requires roughly 100 kbs of bandwidth. One analog video channel of NTSC quality requires 4–6 MHz. This can easily be satisfied with coaxial cable, as it has been for many years. Some new installations are nevertheless specifying fiber even though copper can handle existing data rates. This allows future data rate expansion without added cost.



COURTESY CORNING

Indeed, in some cases the advantage of optical transmission is not bandwidth at all. Some installations have been made with fiber only because of its safety from lightning and electrical shock. Lightning damage to outdoor installations can be a continuing expense in many areas where there is incessant thunderstorm activity. Another factor has been the freedom from frustrating electrical ground loops and crosstalk which can plague an installation.

Certain technical factors that govern optical communication deserve mention. Analog signals cannot flow effectively in an optical medium. Signals must first be digitized. When sound or video has been converted to digital code, any number of separate channels may be made available by multiplexing. Control data may be incorporated into separate channels. When many electrical channels converge at the point that they are to become light pulses, the converging electrical streams must be treated with special microwave techniques. A highly developed light sensor receives the pulse stream at the termination point. Once the signals again become electrical, conventional electronic techniques apply and channels are multiplexed as ordinary digital electric pulses.

Light pulses are originated either by

laser or a special form of light emitting diode (LED). Lasers transmit more power concentrated at a specific portion of the light spectrum. LED's have more spectral dispersion and less power but tend to be more reliable for given cost. The specific characteristics of the optical cable determine the choice of either LED's or lasers. As a rule, systems with less bandwidth and distance requirements favor LED transmission and are available at less cost. Such systems will increasingly become available for custom installation of sound, video and various local networks. The secondary characteristics of optics; electrical inertness and electromagnetic noninterference will result in optical use in automotive, aircraft, and other places where distance and information capacity are secondary.

Modern fiber cable is produced in various forms with characteristics that affect cost and application. Fiber used in high capacity telephone trunk lines may be expensive. Low capacity fiber may be cheap enough to justify its use over copper for connecting only a few video or sound channels. When evaluating fiber over copper, a general rule is that when transmission rates exceed one mb/sec over more than a hundred meters, fiber becomes a strong

(continued on page 70)

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NAMM Winter Market 1990

The NAMM winter show in Anaheim this January was hip, crowded and upbeat. In the early 80's the winter show was really just a regional show and there were a few years where it seemed that we saw more reps and factory people than dealers. That trend reversed itself later in the decade, and the winter show has become the main show, with the summer show's existence frequently called into question, and currently undergoing changes. Over 600 manufacturers exhibited, and aside from the guitars, pianos, purple hair and Spandex pants, there was new technology in speakers, amplifiers, mixers, software, digital multi-track (home studio) tape recorders and signal processors to be seen at many booths.

Some of the highlights of the show:

MIXERS

Alesis, best known for signal processing devices, showed its 1622 live sound 16 channel mixer, with 6 sends and XLR mic inputs for \$800.

DOD showed its range of low cost mixers, from the 820 stereo 8 channel mixer to the 1220 RM 12 input channel stereo rack mount mixer.

Soundcraft 200 Delta is an upscale version of the 200B. Individual group modules and a separate master section enable the 200 to be configured with subgroupings or as a straight stereo mixer without sub-grouping.

Yamaha had previously previewed their 12, 24 or 32 channel model 1200 mixer at the AES, but for many dealers it was the first chance to see this high performance downpriced version of the PM3000 series. The DMR8X was also on display, although it is not just a mixer, but a complete digital recording studio (including multi-track DAT recorder) in one unit.

AUDIO COMPONENTS

Carver has created a "hi-fi" product line for commercial installations. Products include tuners, tuner-preamps, cassette



Yamaha DMR8X

decks; and a multi-CD player is also on the way. Of course Carver's light weight/high power amplifiers have already established a niche for themselves in many applications.

DISCO GEAR

Numark debuted a dual CD player (CD9020) intended for DJ operation. Also, the DJC4 lightweight molded DJ console was introduced, which has room for a pair of turntables and a mixer. A new mixer, the DM1275, is a mid priced rack mount unit with dual band equalization, meters, crossfader and toggle switches for fast

"transformer" fades. Some decent looking amplifiers were also on display.

Gemini was showing its first sampling mixer, the PDM5000. Gemini was also displaying rack mount cassette decks, one with pitch control.

Both Numark and Gemini had just finished with the CES show about a week earlier in Las Vegas; pity the poor exhibitors!

Vestax (Midco) introduced a mixer with built-in sampling, the model DSM330S. Vestax also displayed power amplifiers and speakers.

On the lighting end, American DJ Supply



Numark CD6020

showed its full line of strobes, lighting controllers, lighting fixtures, etc., but also more speakers and a couple of disco mixers this year.

MICS AND RELATED STUFF

Audio-Technica expanded its series of boundary mics. The expanded series includes the AT851A which is a miniature design, a wide pattern mic, the AT841A, and a high sensitivity element version, the AT871R.

Beyer introduced the TG-X line of mics featuring EM-Field (Neodymium) rare earth magnets. Higher sensitivity and faster rise time are claimed. The Tour Group series is designed for high level live concert work.

Rhythm Tech has a good idea, a foam hand grip for mics. It reduces handling



Beyer TG-X line

powered FM antenna, dbx noise reduction (compander) and true diversity operation. On the low end of the price range, Samson introduced the VLP, a high performance, low cost wireless system.

Sennheiser showed the ME 80/K supercardioid lobe mic. The ME 80 back electret Condenser supercardioid has a shotgun pickup characteristic, yet is not much longer than a conventional cardioid mic. It is most useful in solving PA feedback problems due to its tight pattern.

SIGNAL PROCESSING

C-T Audio Marketing (the C-Ducer pickup people) displayed the Omni-Craft noise gate, a dual channel multi-function device also featuring 24 dB per octave hi and lo pass filters.

dbx has become part of AKG. Noise reduction units, limiter-compressors, and multi-function devices with noise gate, compressor-limiter and peak clipper were displayed. Limiter/compressors with the dbx Easyover circuit were also shown, now including the added flexibility of hard limiting.

Orban, also under the AKG umbrella, displayed in the same area as DBX. The new 764/B programmable parametric equalizer will have applications in concert equalization systems that use the music as the test signal.

DOD Digitech featured MIDI programmable equalizers. The MEQ 14 is a dual channel 14 band device with recall, EQ curve comparison, and ISO standard frequency centers. The 4 channel MEQ 7 is a 7 band device, while the MEQ 28 is a single channel 1/3 octave system.

Rane also displayed programmable equalizers similar in function to the Digitech product. The model MPE 28 is

a single channel 28 band 1/3 octave MIDI programmable equalizer. The unit allows program changes as well as curve modification in real time through the use of MIDI system messages. One application is interactive equalization during performances, a technique introduced by Meyer, and more recently tried by dbx with its RTA-2 analyzer.

Rocktron introduced the Pro Hush, a MIDI programmable noise gate which can be used for mixdowns, fadeouts, and for noise gating.

TOA first displayed a prototype of the SAORI all-in-one DSP contractor product at the AES and again featured this combination of equalizer, electronic crossover, delay line at the NAMM show.

Yamaha displayed the DDL-3, first shown at the AES. This is a delay line with 3 taps, with either a digital (parametric) equalizer on each output, or it can function as a 3 way electronic crossover.

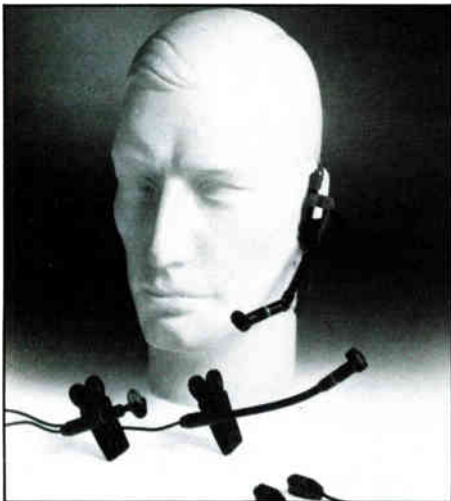
Zoom, a new company, created a lot of interest in its innovative single rack space multi-function 9010 signal processor. Four independent configurations are possible, with 16 bit, 44 kHz clock rate and 90 dB dynamic range. Both individually and in combination, up to seven effects can be used at once including delay, reverb, compression. The processor may be used under MIDI control.

POWER AMPLIFIERS

Ashly started out as an electronic crossover/parametric equalizer manufacturer, but has been producing and expanding their line of MOSFET power amps for quite a few years. Models include fan cooled 120, 200, and 300 watt per channel (8 ohm) versions.

Crest showed a number of new amplifiers, as well as its established series of concert sound reinforcement amplifiers. The less expensive CV and FA series were shown and are intended for more cost sensitive applications.

Hafler, now a division of Rockford (which owns autosound supplier Fosgate, and also has hi-fi speaker divisions), is reasserting itself in the commercial/pro-sound market. Revised models included



AKG Acoustics Micromics

noise, slipping, and fatigue, while offering protection from electrical shock.

Audix showed its improved line of VLM mics, now made in the U.S., but their DS-8 8 channel digital snake for \$500 was the most interesting.

AKG showed its micro-mic series. These are very tiny mics, each intended for a specific application, such as percussion, banjo, acoustic guitar, etc. The shape, attachment, and sound of each mic are contoured for its intended application.

Samson introduced the Super TD, a wireless mic system intended for touring sound applications. The Super TD has a

NAMM WRAP-UP

the P500 and P505, P125. These models feature MOSFET output devices, fan cooled, and are bridgeable. A new, high output model, the Pro6000, was announced at the show.

Soundcraftsmen has recently developed two new amplifiers, the DJ900 and the DJ600. Surprise! They are intended for the disco market. The DJ900 is 205 watt per channel @ 8 ohm, the DJ600 is 125 watt per channel @ 8 ohm.

Stewart, known for direct boxes and related support equipment, introduced a range of low and medium power half rack width amplifiers. The design is based on rugged autosound designs and feature pulse width modulated power supplies. Half rack products could be seen at various booths at the show, including Rane (one of the proponents of this format), dbx, Symetrix, ART, Furman, and others.

Yamaha introduced the P2350 (175 watts x 2) and P2700 (350 watts x 2) amplifiers which feature built in fans and no-thump muting. The units are 3 rack spaces high, but more importantly, they feature a good price/performance ratio.

SPEAKERS

Apogee, best known for signal processing compact high output speakers that are expensive, introduced a more cost-effective product line known as the Artist series. The signal processing has been retained along with the original speaker components, but more efficient enclosure construction is credited with the cost reduction.

Cerwin Vega displayed its large one-box 3-way speakers, the CVX line. The CVX 15-3 uses a 15-inch woofer, large 2-inch throat compression driver/horn, and super tweeter; the CVX 253 uses double 15-inch woofers; while the CVX H18-3 has an 18-inch woofer. Mid and high frequency components are the same on all models.

Community showed a full range of product, from the cost effective product for musical instrument stores to the popular RS880 compact concert system. The RS 880 is an arrayable 3 way box which can also be used with the VB 5415 subwoofer.

Electro-Voice was out in full force,

displaying the Manifold and Delta-Max series, as well as raw speaker components and microphones. The MTS-1 Manifold Technology Stage system debuted. This is an innovative one-box bi-amped 2-way system using double 15-inch woofers and double compression drivers (mounted to a 90 degree constant directivity horn). This is the first one-box full range system introduced using manifold technology.

Galaxy showed the famous Hot Spot, one of the original personal monitor speakers, and a redesigned version of the larger 15-inch woofer system which now features a co-axially mounted tweeter. The enclosure of the Pro Spot 2 is constructed of engineering plastic and the mounting hardware is molded-in.

OAP has a line of road-worthy one box speakers with built-in rigging hardware, including one unusual model (the C-1) that hangs upside down, uses a co-ax as the main speaker and also has an aimable horn for coverage of a secondary area.

ProSystems displayed both raw drivers and compact speaker systems, including a new floor monitor. Although not well known among sound contractors, ProSystems has established a good reputation among MI shops for reliable and cost effective products.

Radian, a relatively new company, displayed both compression drivers and small coax new field speakers. The coax speakers looked and sounded good and would probably be an outstanding upscale ceiling speaker for quality jobs. Fostex also showed its established line of coax near-field monitors.

Renkus-Heinz was easy to find, with a big stack of speakers on display. For the disco market they are introducing the Sub 152 which uses two 15-inch woofers in a bandpass (double tuned) enclosure and a complementary set of angled ceiling mount speakers. One version is the SMS-151C, the other the SMS-121C. The enclosures may be angled 15 or 30 degrees.

SoundTech, best known for its low end mixers and speakers, has expanded the product line upward. One innovative speaker model was a 2-way speaker for club use, but with the addition of a small monitor speaker built into the side of the cabinet!

Yamaha's new Club series models included the S110 PH which is a 2-way system with a 10-inch woofer intended either as the main speaker for medium-small PA applications or as part of a disco system when used with Yamaha's 18-inch subwoofer. The S112 PH is a 2-way system



TOA Saori

NAMM WRAP-UP

with a 12-inch woofer and is intended for multi-media presentations. Also new from Yamaha was the MS60S powered speaker. This is a 2 way 60 watt 8-inch woofer system featuring Yamaha's Active Servo Technology. An optional rack mount adaptor is available for the speaker.

Yorkville had a comprehensive line-up of speaker systems, including the up-scale Pulse series featuring "waveguide" style horns (which acoustical textbooks and Yorkville, call "tractrix"). Aside from the special flare, they also have elliptical mouths. Horns of a similar concept were also shown on a concert stack at the Peavey booth.



Soundcraft Delta 200

SOFTWARE

Most of the software at the show was for musicians or production work, such as musical scores, MIDI effects control, time code, signal editing on hard disk

recorders/workstations and so on. On the business side, Tyler and a few other firms were selling software packages for running your company, *ie.*, accounts payable, receivable, inventory, etc.

More business related exhibitors are expected at the summer NAMM in June. Show management is actively soliciting these people. Stay tuned.

—Mike Klasco

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AcoustaCADD, Part 3

BY MIKE KLASCO

This is Part 3, and the conclusion of our review of Altec Lansing's AcoustaCADD program. Please refer to the January and February issues of SOUND & COMMUNICATIONS for the rest of the review.

—Editor

THE PERFORMANCE SIMULATIONS

Remember that the isobeams are an estimating design aid, but do not attempt to predict how loud the sound will be at the seating, or uniformity of coverage, or such other parameters as direct/reflected ratio or intelligibility.

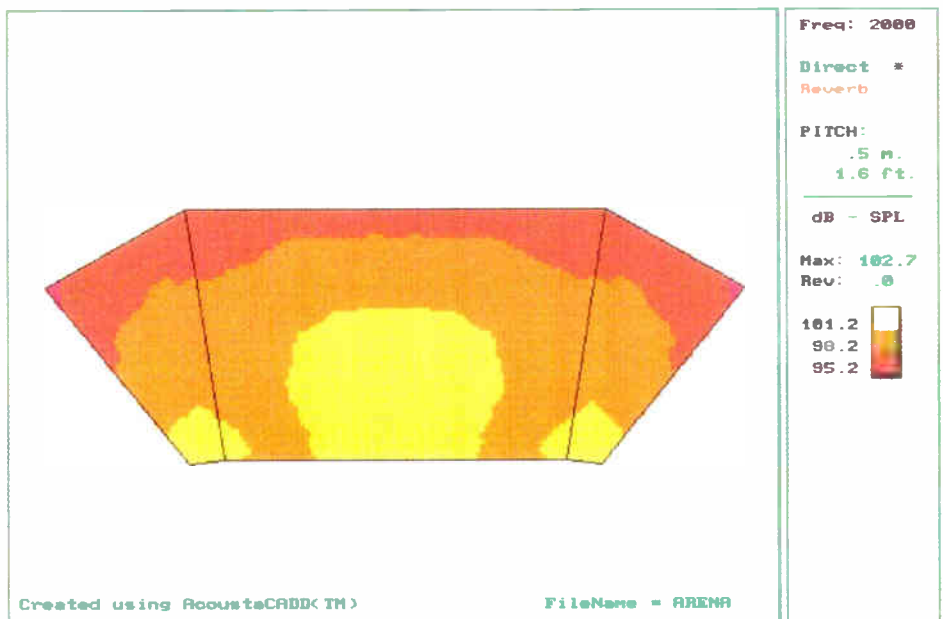
Two types of performance simulation formats are used, mapping and data point reports. Room maps show sound level distribution while the data point reports show direct, direct/reflected, and intelligibility.

SOUND PRESSURE LEVEL MAPPING

An Octave band is selected, with 2 kHz the default (as this band is most critical for intelligibility). Ear height is specified with 4 feet the default. The default values of 2 kHz and 4 feet are set by the user during the setup phase of installing the program. They may also be adjusted later by the user as desired in order to create SPL maps for several different octave bands or ear heights. Coordinate entry by mouse or keyboard entry is selected.

You also select whether the reverberant field is calculated into the sound pressure map.

Each SPL map shows the expected sound pressure levels at the specified ear height above a set of floor boundary surfaces selected by the user. The map may be displayed as a color areas map or as a contour line map. The contour map is most effective with gray scale monitors such as



SPL Distribution Map with 3 dB per color resolution.

a laptop computer or monochrome printers.

The grid density of the map can be set by the user from roughly two data point tiles per seat up to a resolution as coarse as three or four seats per tile. The trade-off for the higher resolution is computer processing time. If only a small area is to be examined in detail then you can zoom in on that area and then map it. Without leaving the SPL module, you can turn speakers or clusters on or off or adjust individual level and then remap. Status reports of what all the speakers are set to can be printed out to document the maps. Interestingly, the program knows the maximum levels that the speakers can handle. If you set higher levels than the maximum ratings of the drivers then the program will limit the signals to the speakers' rated maximum. Big brother is watching!

Each speaker can be delayed or the entire cluster can be delayed and a table of speaker delay settings can be printed.

In addition to the sound pressure level

mapping predictions, the program provides a spot check of the numeric readout of the direct, direct/reflected and ALcons intelligibility calculations in a report format similar to the PHD program. Unlike the PHD Program, it is not possible to vary the ambient noise level at different points throughout the room. The noise level can be set by the user, but the adjustment must be made in the setup portion of the program.

The mouse pointer is located at user selected points and the mouse is clicked. The data are then displayed on the screen. If you desire additional points you press the return key and the screen is wiped clean and you point again. This section is not the strongest aspect of AcoustaCADD and I think the performance simulations can be developed further. For example, if the spot check data could remain on the screen, this would aid viewing uniformity of coverage. Also the spot check function might be a more useful part of the isobeam module and full data point mapping of

numeric predictions could be provided for both sound levels and intelligibility (Bose Modeler provides full room mapping as an option to its grey scale mapping, and JBL's CADP provides numeric mapping of both intelligibility and sound levels although it does not offer grey scale mapping).

MECHANICAL DESIGN

AcoustaCADD does not provide a mechanical design program to aid in the construction of the speaker cluster. Some sort of drafting or sketching program function is sometimes provided in sound system design programs to check for collisions between speaker components, specify rigging hardware and interlinks between horns, create working drawings for the cluster frame, aid in the visualization of how the speakers will appear within the room, determine the cluster center of gravity, calculate the weight of the cluster and so on. AcoustaCADD's developers plan to have an AutoCAD "shell" which will provide pre-drawn speaker components. Ideally, the loudspeaker locations, weights, centers of gravity, acoustic centers, apex angles and aiming angles should be exportable from AcoustaCADD to AutoCAD and the complete speaker cluster would appear in AutoCAD. The launch release of AcoustaCADD, however, does not provide any means of exporting speaker locations and aiming information directly to AutoCAD.

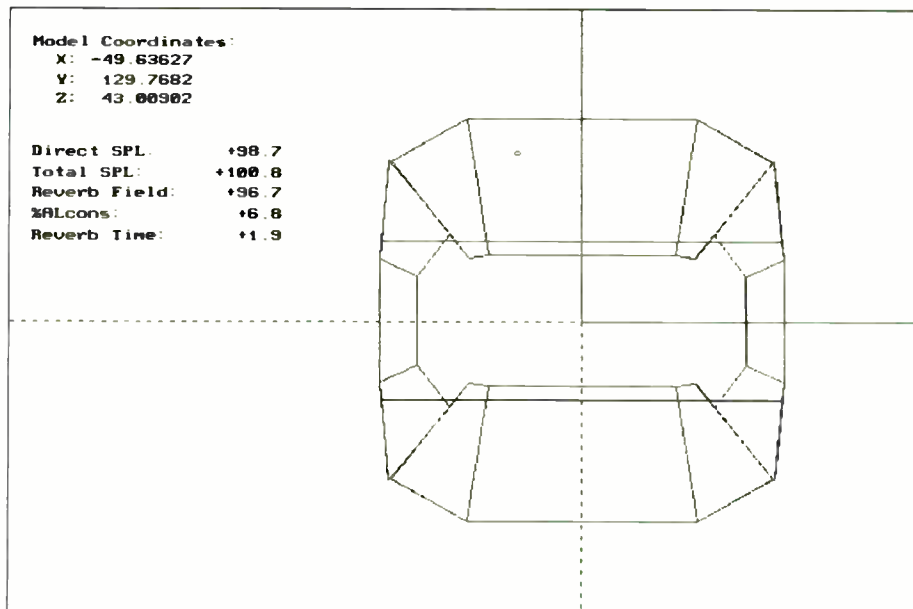
SYSTEM DIAGRAM AND BILL OF MATERIALS

AcoustaCADD does not have a system flow charting module. Designers could use Pattons & Pattons Flow Charting II, Haverhill's Easy Flow or VDP's Audcad and/or Router programs.

A partial bill of materials is generated by AcoustaCADD, but these are only the speaker components.

CONCLUSION

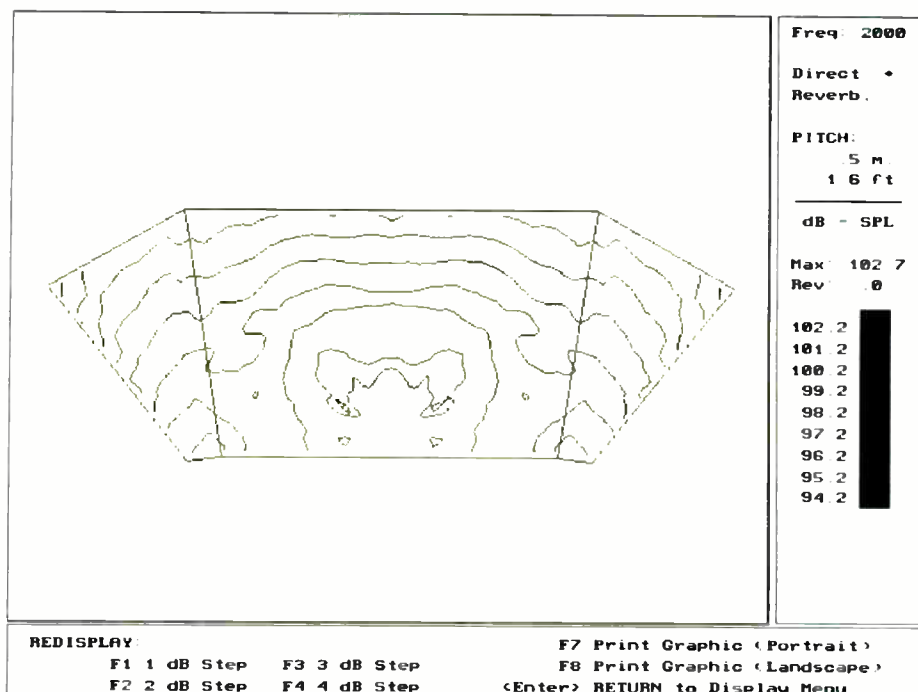
AcoustaCADD is a comprehensive and powerful engineering tool for acoustical and sound system design. The program is practical for medium and large scale jobs,



Printout of the screen of the Single Point Performance module. One point is marked and the performance data listed at the left of the screen.

although the creation and manipulation of the room model is too ambitious a task for smaller or tightly budgeted (time or money) projects. The user interface is generally good with the program options clearly defined on the screen display, although the use of the cursors and the mouse should be extended to a number of data entry operations that now require

the tedious use of numeric entry of coordinates. The documentation supplied is clearly written and adequate, although many sections of the manual are still being prepared (such as pictorials, index, advanced techniques, etc.). As this is the first release I would anticipate that loose ends will come together during the next few months. Surprisingly, for a new soft-



Contour line type display of SPL map.

SOFTWARE REVIEW

ware release that is so sophisticated, the error trapping is excellent and whatever bugs exist are minimal and unobtrusive.

The ability to use only Mark IV Audio products (Electro-Voice and Altec Lansing for now, with University Sound to follow) may limit the usefulness of this program for a number of potential users. Perhaps file translation programs will be developed (by third parties) that will allow other sound system engineering programs and maybe even test systems (TEF, MLSSA, SYSID) to prepare high resolution polar measurements and data files.

AcoustaCADD offers the isobeam technique as a design tool for visualization and for selection, locating, and aiming speakers. I think this is a valuable preliminary design step that encourages good engineering, although its implementation is marred by the numeric data entry of coordinates rather than direct control of the aiming by the cursors or the mouse.

The performance simulations of the sound pressure level mapping are dramatic in high resolution color, although I would also like to see full floor plan mapping of intelligibility and numeric sound levels in this format in addition to the spot check provided. The spot check would be an ideal adjunct to the isobeam aiming step.

Throughout the documentation or the program I did not see any reference to gain before feedback or the factor of critical distance. It would be quite possible to fully prepare a design simulation that would look acceptable that would be a totally unworkable design for live performances.

INSTALLATION PROFILE

(continued from page 23)

stage. One 24 mic channel 9 send 300 foot snake is used for signals from the sound booth to stage left. Another snake, 32 in by 9 out, is used for the "house mix" position and also terminated stage left. Two 16 pair mic snakes are used on stage for grouping mic channels and each snake being 150 feet long can be used as "sub group" snakes.

Cluster: MAIN	Device: HF-5	Clipping: OFF
Speaker: ALTEC MRI1594A + 299-8A/-16A		
Freq: 2000	Contour: -3 dB	
Loc: X = +60.0	Ain: EL = -20.0	
Y = +0.0	AZ = +68.0	
Z = +45.0	ROT = +90.0	
Beam Center:		
SPL = 81.1 dB (Re: 1W/1M)		
Distance = 106.1 ft.		
Path time = 95.1 millisec.		
Edge Points:		
-4.2 dB re: center.		
-16.7 dB re: center.		
-2.5 dB re: center.		
0.4 dB re: center.		

Boundary Surface No. 4	Press <ESC> to Abandon and Exit to Menu	
F1 = ACCEPT & SAVE DATA	F4 = Change Aim	F7 = Change Surface
F2 = Change Device	F5 = Change Location	F8 = Toggle Clipping
F3 = Change Isobeam	F6 = Change View	F9 = Change Ear Height

Working boundary surface. Loudspeaker is shown rotated 90 degrees on axis.

While the manual warns the user that he should know what he is doing in sound system engineering before he starts, some sort of discussion of what is needed to be done external to the program for a balanced design would be appropriate. I find that in sitting down and enveloping yourself in the flow of any of these programs requires you to disrupt your normal order of design somewhat. A discussion of the sins of omission by the software developer would be in order for the opening pages of the manual. This is a common problem for many of the sound system engineer-

ing programs I have reviewed so far.

The bottom line is that although this is the first release and it has some rough edges and omissions, AcoustaCADD is an exciting program that is a useful, balanced and powerful design tool. A completed manual, the addition of RASTI and STI intelligibility predictions, data coordinate export to AutoCAD and more are planned for the next release in a few months. If you are a sound contractor or a consultant who works predominantly with products from Mark IV companies then I recommend this program. ■

NEW YORK'S WORLD FINANCIAL CENTER: A STUDY IN HIDDEN DESIGN

BY WENDY BLATT

What sound system can handle performances in a seven-story marble-floored greenhouse full of 50-foot palm trees? Especially when the atrium in question is part of a high-ticket shopping center/office complex with corporate tenants like Dow Jones and Merrill Lynch, where "mall food" is French cuisine at cafes whose tables have views of performances ranging from symphonies and jazz to chamber music and dance? When developer Olympia & York decided to institute an Arts & Events Program at their World Financial Center in Manhattan, Los Angeles-based consulting engineering firm Smith/Fause was called on to answer that very question. If that wasn't difficult enough, they also had to do it quickly and invisibly.

"We got involved" remembers Ken Fause, "when some people from Olympia & York retail development group happened to walk into the Hard Rock Cafe in New York and notice the system we did there. They loved the sound and couldn't see speakers." Even for a company used to designing sound for stadiums and City Halls, the World Financial Center was a challenge. "When not in use for performance, the architecture of the space was to be left unchanged" Fause notes. "The hardest part was keeping the system invisible, while doing what the owner wanted it to do." Even ignoring visual esthetics, a 140-foot tall glass and marble round room presents unique sound difficulties. "Reverberation time in the room is between 6½ and 8 seconds" he says. "We got around that with a very large distributed sound system with short distances between the loudspeakers and the listeners."

By the time Smith/Fause began design,



Photo by Robin Holland

World Financial Center

construction was far enough along to turn audio installation into a fast-track retrofit. "Our feasibility study was presented in September 1986, reviewed by project ownership through the spring, and two sets of full scale mockups were done. We're a consulting engineering firm; we don't sell or install anything. Olympia & York put out the contracts to bid and controlled and directed the project team, of which we were a part. We worked with the

design architect (Cesar Pelli of New Haven), the construction architect for that building and the structural engineer, mechanical and electrical engineers, architectural lighting consultants, fabricators and installers. It was a good sized project team. We met every month in design phase and every week during construction. The project was put out to bid in late '87, awarded in spring '88 and opened in October '88."

**WINTER GARDEN HOUSE
SOUND SYSTEM**

Howard Smith explains how they worked with New York City's Future Tense Limited to create the on-stage fabric structures. "We wanted to have something there as an acoustic shield to prevent live sound hitting that barrel vault; also, for the afternoon shows with the sun coming in at a fairly low angle they had to have some kind of a backdrop, and if there was a backdrop it should be acoustically absorptive. We did the acoustic design and they came up with a bunch of shapes."

And every step of the way, everyone involved followed the progress of the only palm trees north of the Mason-Dixon line. "They're from Anza Borrega," Smith explains. "They had a 'palm tree boot camp' out there, where they put them in boxes so their roots could get used to being confined, and they hung nets over them to get them used to low light. They acclimated them for about three years. John Caiazzo, of Olympia & York, flew out with the landscape architect for the final selection. We have a New York Times article pinned up on our bulletin board showing the trees being put into place."

Philadelphia's Peirce-Phelps was ultimately chosen to build the sound system headed by project manager Doug Wilkins. Installation was handled by electrical contractor L. K. Comstock of Long Island City with IBW craftworkers. "The field

Portable Control Consoles

- Ramsa WR-S852
- Yamaha M-916
- Yamaha M-508 (SC3)
- Monitor Console Yamaha M2408

Portable Racks

- Microphone Splitter Rack
- 3 Production Racks
- Processing Equipment Available at Patch Bays:

- 1 Alesis Midiverb II
- 1 Tascam 122MKII Cassette Deck
- 6 Ramsa WZ-9320 equalizers (single channel 1/2 octave)
- 4 dbx 166 limiters (dual channel)
- 4 Symetrix 522 expander/compressor/gate/ducker (dual channel)
- 2 dbx 166 limiters
- 1 Ramsa WP9055 amplifier

■ 2 Amplifier Racks

House System

■ Loudspeaker Distribution

In each of the 16 palm tree pits, there are:

- 4 Ramsa WSA-10 speakers
- 1 Ramsa WSA-240 woofer

In each of the 10 air vents over the entrances to the Winter Garden retail stores, there is:

- 1 JBL SLT-1 speaker

At each corner of the Winter Garden, there is a speaker output panel to drive additional speakers:

tri-amplified Ramsa WSA-240, WSA-200, or amplified Ramsa WSA-10 speakers
In the ceiling above the Monumental stairs, there are:
12 Altec 920-8A speakers

Accessories

- 10 AKG C-451EB Microphones
- 12 Shure SM-81 Microphones
- 6 Crown PCC-160 Microphones
- 12 Shure SM-58 Microphones
- 5 Beyer M-500 Microphones
- 12 ElectroVoice RE-18 Microphones
- 5 Sony ECM-55B Microphones
- 20 Canare ECO 50 ft. Microphone Cables
- 50 Canare ECO 25 ft. Microphone Cables
- 25 Canare ECO 25 ft. Microphone Cables
- 4 Urie 315 Direct Boxes
- 10 Atlas MS-25 Mic. Stand, Heavy
- 10 Atlas DS-7 Mic. Stand, Short
- 20 Beyer SCH-211/2 Mic. Stand, Boom
- 20 Beyer SCH-201 Mic. Stand, Light Weight
- 10 Atlas Gooseneck, 6 inch
- 7 Atlas Gooseneck, 13 inch
- 10 Atlas Gooseneck, 19 inch
- 10 Atlas CO-1B Clamp Adapter
- 150 Atlas LO-2B Quick Disconnect Adapter
- 2 Audio-Technica AT-838G Microphone

- 20 Clearcom RS-201 Intercom Beltpak
- 2 Clearcom PS-20 Intercom Portable Power Supply
- 3 Clearcom HS-6 Intercom Handsets
- 15 Clearcom CC-75B Intercom Headsets, Single Muff
- 8 Clearcom CC-240B Intercom Headsets, Dual Muff
- 5 Sennheiser MD-421 Microphone
- 2 Shure SM89 Shotgun Microphone
- 2 Shure A89SM Shock Mount
- 2 Shure AS7E Swivel Mount
- 2 Otari 5050 B-II Quarter Inch, Two Ch. Reel to Reel
- 8 JBL G-731 Monitor Speakers
- 2 JBL 4602B Monitor Speakers
- 10 Ramsa WSA-10 Miscellaneous Speakers
- 8 Galaxy Audio "Hot Spot" Speaker Mini-Monitors
- 8 Ramsa WSA-240 Modified for use with Tri-amplification
- 8 Ramsa WSA-200 Modified for use with Tri-amplification
- 6 Self-powered Loudspeakers (SPL) custom built Bi-amplified cabinets containing four JBL 2204 woofers, 2 Ramsa WP-9220 Power Amplifiers, 1 Rane AC-22 Cross-over with capacity to drive 2 Ramsa WSA-10 Speakers

craftsmanship was magnificent," says Fause. "It puts to rest the old song that 'electrical contractors can't install a sound system.' It depends who the electrical contractor is."

Comstock's foreman, Bruno Cascino, was well-equipped to deal with the under-

taking, having already done a great deal of work on the building. Comstock's project manager, Joe Maikisch, notes their experience with "heavy electrical work — we've done everything from nuclear power plants to traffic and street lighting work." He believes the WFC system was easier for them than it would have been for another contractor. "By the time we started the audio installation, we had already done enough work in the Winter Garden that we knew the ins and the outs of the project," Maikisch points out. "For the speakers installed around the palm trees, we had to crawl in spaces that weren't much more than 14 inches wide to put in pipe and wire. The speakers in the palm tree pits were waterproof and wiring had to be in waterproof boxes. To install those speakers, our first plan involved driving some kind of stake into the dirt. We ended up putting in a bracket and attaching it to the steel around the pit area instead, so we wouldn't chance disturbing the roots."

Since the Arts & Events Program went into full swing two years ago, Production



Herbie Hancock performs at the World Financial Center.

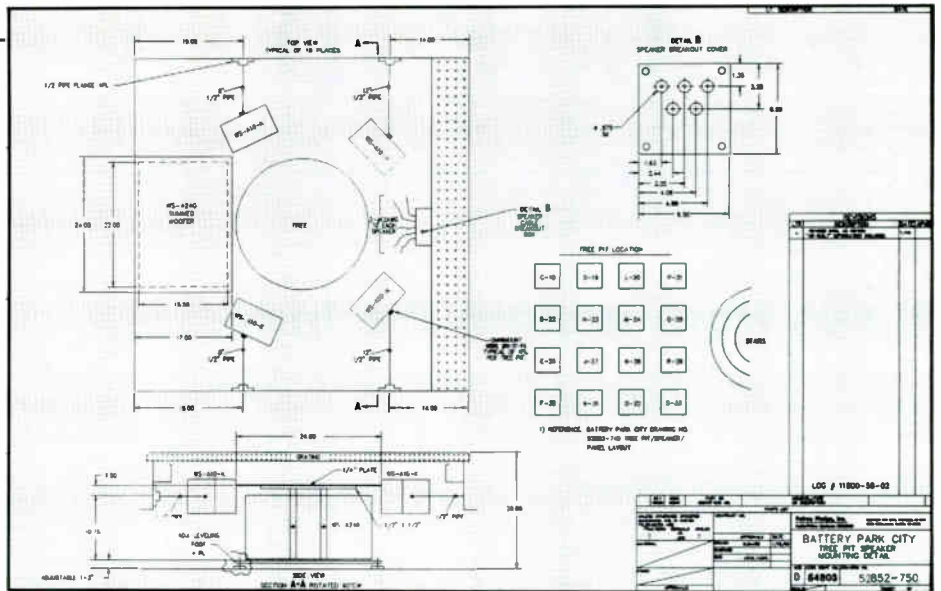
Photo by Robin Holland

Manager Lisa Rollins and Technical Director Allan Abrams have gradually learned how best to use the system. Rollins remembers the improvisation required for early productions. "We started doing shows in December of '87. The first was with an outside system. Over the course of the year, as items were purchased and arrived on site for the permanent system we began to use them. Around March or April of 1988 we started using the Ramsa speakers that eventually went into the tree pits. We used to just sit them on top of the grills.

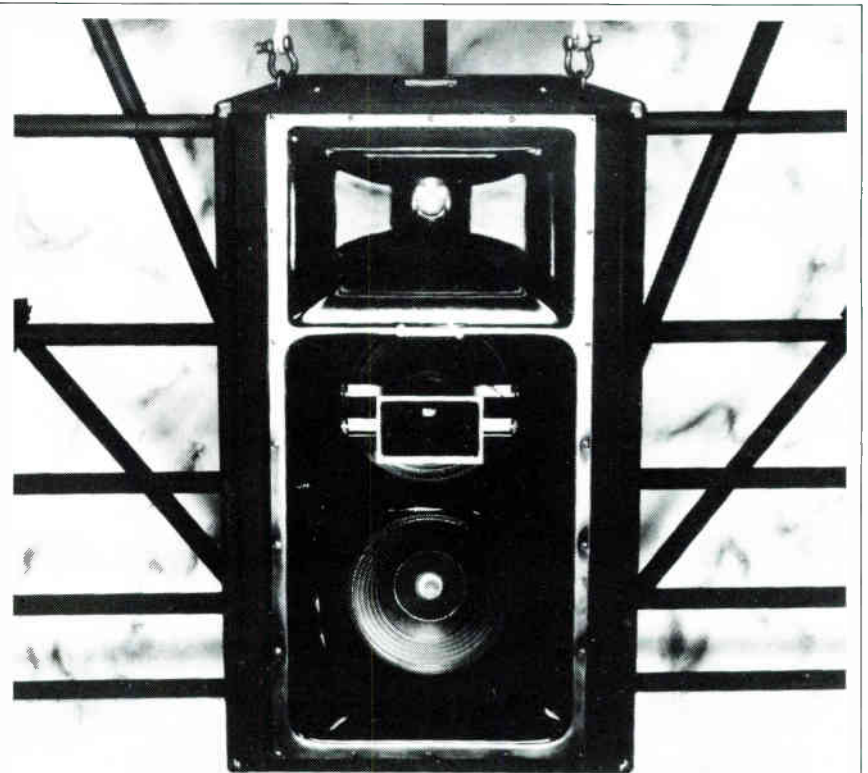
"We've made some refinements based on our experience in the room. We get 2 to 3,000 people for every show, which means every cranny of the Winter Garden is filled. We bring in small speakers for a couple of places to help fill in. There are times when we take out the vent speakers around the side of the room, because there's too much reverberation, or the ceiling speakers over the top of the steps. By monkeying a little bit with the system we get a cleaner sound. It's pretty flexible." And they're still experimenting. "For one program we did a show where we put the singers up in the balconies. We wondered if we could run monitor speakers and mics up to the balconies and have a distinct sound from the stage sound. It kind of worked, though we're not sure it was the best use of the space from a visual point of view.

"A classical chamber group need only bring themselves and their instruments. Brian Eno or John Hassell is another story. Eno was commissioned to do a sound installation for the space ("Sounds of the Amazon Jungle", September 1989) for which we rented DAT machines and hooked them into our system. And for 'regular' tapes (such as the Christmas music cassettes compiled by the ARChive of Contemporary Music, or the Celtic music programmed on St. Patrick's day), our cassette deck can handle up to seven tapes. There's been talk of transferring Brian's tapes to 'regular' cassettes and making that installation a regular thing on Saturdays. We don't tend to do much elec-

(continued on page 70)



Battery Park City tree pit speaker mounting detail.



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Circle 244 on Reader Response Card

World Radio History



News from around the industry

Sound in Europe; Remotes Use MIDI

Sound in Eastern Europe

Altec Lansing has offered sound clinics in Frankfurt, West Germany and Zagreb, Yugoslavia. More than 200 Altec distributors, customers, consultants, electrical engineers and contractors attended each of the two-day clinics hosted by Altec Lansing—Europe. The program was translated into German, Russian and Serbo-Croatian. Special seminars were held on AcoustaCADD along with presentations ranging from architectural acoustics to sound system design. Speakers included Dave Merrey, president; Gary Rilling, marketing manager Europe. Guest lecturers were David Joiner of the Joiner Rose Group and John Fricke of Coffeen, Fricke and Associates.

Midi to Remote

AMX has added MIDI interface capability to its AV Video Remote Control products. MIDI signals can now be distributed via any of the three AMX SX-DCU output channels. According to the company, applications include remote and real time control of audio levels, equalization, signal distribution, machine control and lighting commands.

Philips Distribution

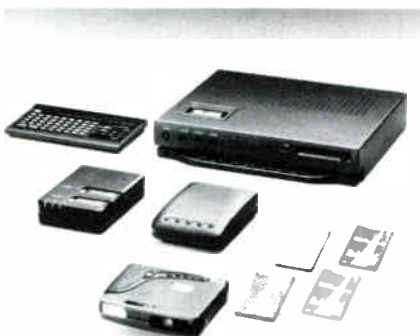
The Philips Super Projector introduced in the U.S. is sold and serviced in the northeastern corridor by A.F. Associates. The multi-screen, multi-projector system has been marketed in Europe for the past two years. A.F. Associates is marketing the system directly in addition to establishing a network of dealers. The Super Projector provides an 83-inch screen, folds down to 34 inches and rolls on built-in wheels.

Move for FSR

FSR, Inc. is relocating to a 30,000 square foot facility which the company has purchased in West Paterson, New Jersey. According to Janice Sandri, vice president of FSR, the building is a historic site on the banks of the Passaic River. The new address is 244 Bergen Boulevard, West Paterson, New Jersey 07424.

Still-Video with IC

Fuji has announced two new additions to its line of still video products, the ES-30TW to be marketed to consumers, and a new digital still camera system using an IC memory card, to be marketed to professional users. The system stores images on the memory card using signal compression technology developed by Fuji and Toshiba. Toshiba has been exhibiting a similar product at consumer electronic shows.



Video Walls for Helicopters

VSC Presentations used the Ultrawall for a presentation by Boeing and Sikorsky to demonstrate a new helicopter. Using a videotape supplied by Boeing and Sikorsky, VSC programmed the videotape, added special effects and projected the images on to a 16 screen, 4 x 4 configuration Ultrawall.

ITA Meet

The International Tape/Disc Association's twentieth annual seminar March 14-18 includes seminars on EC-92 and its Impact on the Global Marketplace, Rewritable Optical Comes of Age, and seminars on tape duplication and other topics. The event is in Palm Springs, California.

Resource Created

A northern California based market research consulting firm named Resource has been created by Ron Neilson and Richard Elen with Angela Langdon and Leona Aroha. Neilson was previously with the Neilson/Anklam advertising and public relations agency and was later marketing and information services director of Mix magazine. Elen was editor of Sound International, Studio Sound and Broadcast Sound magazines, and has been a public relations and marketing consultant in Britain specializing in pro audio.

Communications Meet

The International Communications Association will hold its 43rd Annual Conference and Exposition May 20-25 in New Orleans. More than 16,000 attendees are expected, with 300 exhibitors with voice, data, video, systems and network integration products and services.

Leader Europe

Leader Instruments Corporation has established a European subsidiary, Leader Instruments Europe, Ltd. John Pierce has been named General Manager of the subsidiary, which will be based in London. Pierce was previously regional sales manager of the mid-west region for Leader.

Infrared Speakers

Niles Audio Corporation is planning to build infrared sensors for its infrared repeater system into its BluePrint in-wall speakers beginning in mid-1990, making use of a fiberoptic rod as a light pipe to channel the IR signal from the front to the back of the speaker where the sensor is located. Retro-fitting of existing BluePrint in-wall speakers will be possible.

New Name

The Fluorocarbon Company has changed its name to Furon Company because of "negative connotations associated with chlorofluorocarbons that are allegedly polluting the atmosphere."

Processor Board

Spectrum Signal Processing Inc. has unveiled a development board designed with a special prototyping area that "eases DSP application development on the PC." The DSP32C Processor Board is designed around AT&T's 32 bit floating signal processor, the DSP32C. Users can include their own analog or digital input/output circuitry within the prototyping area.

New Stock Issue

Digital Sound Corporation has filed with the Securities and Exchange Commission a registration statement relating to the proposed initial public offering of common stock. The company was founded in 1977 and designs, manufactures and markets "general purpose platforms that can operate multiple voice processing applications simultaneously."

Molding Service

Sano International's Express Molding Service provides custom molds for plastic parts that "are a problem to locate to fit a particular product." Minimum quantities are 2,500; standard or custom colors may be specified. Delivery of production samples are promised within eight weeks of drawing approval.

Speech Synthesis

Votrax, Inc. has announced that it has received a patent on a method of speech synthesis. The design provides the ability to change parameters such as pitch or speed rate as a part of the programmable microprocessor.

Remote Control System

MKO Electronic Systems, Inc. has introduced a built-in audio, video and home remote control system called Ambiance which uses a wall keypad or wireless remote control. The system uses the wireless Leviton power line carrier system. MKO Chairman Daniel J. Ferrario commented, "Our research has made it crystal clear to us that consumer acceptance of presently available home automation systems has been poor. Home builders, especially those here in the midwest, are still installing Nutone intercoms to provide a *music system* in custom homes."

Facility Completed

East Coast Video Systems has completed construction on all audio and video facilities for the multi-story complex of Ogilvy & Mather in New York City. The new facility includes 23 video tri-standard conference rooms, building-wide 160 "drop" RF distribution system, a 60 "drop" baseband building-wide AV system, along with 36 video suites, a new business presentation theater, board room, meeting room and other amenities. Rich Bisignano, president of ECVS, estimates that since January 1981 his company has installed over 40 million dollars worth of hardware.

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Late Penalties

Federal agencies who forget to pay interest on overdue bills can now be required to pay an additional penalty according to new rules of the Office of Management and Budget. The additional penalty has been set at 100 percent.

Vibration Diagnostics

Computational Systems, Incorporated is offering a technical support package to provide expertise in vibration diagnostics. The package includes remote support for the MasterTrend database set up, optimization and bearing information. The cost is \$500 for eight hours of remote assistance.

DEC Products

Digital Equipment Corporation has announced three products based on the AT&T ISDN Gateway, building upon a June 1989 agreement with AT&T to develop integrated voice and data solutions. Two of the products include a link between Digital's VAX computers and the AT&T Definity Communications System. The third product is a development tool, a software applications interface that can be used to make existing call center applications capable of using the ISDN information of the Definity system.

Digital Radio

Digital Cable Radio (DCR) is soon to be launched by Jerrold Communications. DR is a commercial free cable audio service delivering digital sound through a DCR tuner capable of receiving 96 channels. Jerrold claims commitments from over a million potential subscribers represented by cable companies such as Warner, Cox Cable and others.

People

**Yoshida at JVC;
VSC Hires Torchio**

JVC Finds VP

JVC Professional Products Company has appointed Mike Yoshida as vice president. Yoshida has been associated with JVC since 1968. He has worked as a salesman and as the sales administrator for JVC's special equipment sales divisions and the export administration division. Yoshida, in 1975, became an assistant to the president of JVC's professional video division. In 1979, Yoshida was given the responsibility of supervising the installation of the company's computer system. For the past seven years Yoshida has held the position of overseas marketing manager, supervising VTR sales for the Video Communications Division.

New Director at VSC

VSC Presentations has appointed Fred Torchio to the newly created position of director of presentation services. Torchio will oversee VSC Presentations' Business Theater development, providing creative and technical services for corporate and association presentations. Torchio is a 15-year veteran of the business meetings industry.

Torchio most recently headed the AV department at the Marriott Marquis in New York City and was general manager of the New York office of Projection, Inc. a Washington-based audio-visual support company.

Alpha Sales Manager

Alpha Audio of Richmond, Virginia has named Richard Foate as National Sales Manager. Foate's primary focus will be expanding the national and international markets of Alpha's Automation Systems Division. His respon-

sibilities will include the launching of the DR-2, a digital disk-based recorder.

Foate comes to Alpha Audio from Krupin-Foate & Associates, a corporate financial services firm in Richmond, and has almost ten years experience in investment banking.



Director for Akai

Woody Moran has been appointed Director for all Akai Professional and Digital products in the United States. Mr. Moran will be responsible for coordination and direction of all Akai activities in the U.S.

GM at Muzak

Muzak Limited Partnership has appointed Charles Zigler, General Manager of its Minneapolis Owned Affiliate office. Zigler has eight years of sales and marketing experience with such companies as Dow Chemical and The Bic Corporation.

As General Manager, Zigler is responsible for aligning Muzak's products and services with the needs of all businesses in his area, including existing customers and potential accounts.

Theatrix Hires Sales Manager

Theatrix Inc., a stage lighting and production contractor located in Belchertown, MA has appointed Frank "Doc" LeDuc to the newly created

position of company Sales Manager.

LeDuc's background is in both professional and consumer audio Sales Management, and has field experience as an audio engineer and technical director for performing arts events.

Bose Finds a New Voice

Kurt M. Wagner has joined Bose Professional Products. Wagner comes to Bose from Nashville where he owned Wagner Audio Consultants. Wagner is the new "voice of Bose Pro," available to answer questions concerning product applications and general product information.

Marketing Manager for Sony

The Video Conferencing and Satellite Systems Division of the Sony Corporation of America named Fabio Pansolini marketing manager for satellite systems. Pansolini will be responsible for integrating satellite systems into Sony's video communications products for use in international business television applications.

Pansolini comes to the Video Conferencing and Satellite Systems Division from Sony's Telecommunication Technology Laboratory, where he served as manager for new business development. Prior to that, Pansolini was a software project manager for Sony's Intelligent Video Division and served as project manager for Sony Information Products Division.

Anixter Names National Sales Manager

Anixter Bros., Inc. has appointed Bob Senoff to the position of national sales manager — Digital Equipment Corporation. Senoff is responsible for the coordinating of all sales and marketing functions.

Senoff has held positions with Anixter for eight years, and has held a variety of sales and management positions including branch manager of the Chicago sales office, regional sales representative and sales manager — Pacific Telesis.

Products

New Flex; Video Entry

Intrusion Detection

The AD4000 DigiTect is a video intrusion-detection system by American Dynamics. When motion is first detected in a video picture, system analysis is initiated to verify an intrusion before signalling a full alarm condition. After intrusion is confirmed, the Digtect initiates audio and visual alert signals, provides video outputs of the alarmed cameras, and activates different relays for use with external equipment or for system integration. Separate video outputs are available for an alarm monitor, a VCR, and an AD1454 frame freeze recorder.

Circle 1 on Reader Response Card



Rane Adds to Flex Series

Rane Corporation has announced two additions to its line of Flex Series modular signal processors, the FPS 28 Program Splitter and the FLM 82 Line Mixer. The FPS 28 allows two mic or line level inputs (with switchable mic phantom) to be split to eight mono or four stereo outputs via independent level controls. The FLM 82 provides eight mono or four stereo line inputs, each with separate level control and pre/post assignable auxiliary send control for effects processing or another independent mix.

Circle 2 on Reader Response Card



Telecall Intros Security System

Telecall has introduced the TD-1NW 2 Wire Infrared Video Entry Security System. The door station has a MOS chip infrared camera with wide angle lens. The monitor has a 3.5 inch backlit LCD screen, picture control and call tone volume control. The system works with Telecall's power supply or an AC 24V/40VA bell transformer.

Circle 3 on Reader Response Card





Programmable Mixer/Amp

University Sound has introduced a programmable mixer/power amplifier, the MA-1506, for use in "exhibit centers, auditoriums, meeting and conference rooms, and music systems." The rackmountable unit combines a 150-watt "low distortion" power amp with a flexible mixer whose programmable inputs have individual gain trim, attenuation padding, and variable high pass filters. The unit accommodates up to six mic or line level input sources, and includes a multipin interface connector. All outputs are balanced, 600 ohm ports.

Circle 4 on Reader Response Card

Floor Monitor

SoundTech has begun production on a dual angle floor monitor speaker with built-in power amp module. The PM12H with MC100 power amplifier module features a 12 inch STS speaker and a 90 by 40 die cast horn and compression driver. The PM12H is covered with Ozite material and features a kick-proof metal grille. The power amp module is a 100 watt RMS with input level attenuator and five band graphic equalizer. The module can be matched to any monitor out signal from a mixing console or compact powered mixer by use of the input level control.

Circle 5 on Reader Response Card



Mini-Kat from Burle

Burle Industries has introduced the TC8245IR series Mini-Kat near infrared light source for indoor CCTV applications. The lights are specifically designed for use with Ultricon III cameras and solid-state CCD cameras (with the IR cut filter removed). The product is "ideal for covert viewing in special situations in correctional facilities, hospitals and nursing homes," along with nightclubs and other interior locations where visible lighting is limited or obstructed. The Mini-Kat is available with two beam spreads, and includes two brackets for camera, ceiling or wall mounting.

Circle 6 on Reader Response Card



Multiverb III

Applied Research & Technology has introduced the A.R.T. Multiverb III with 400 percent more processing than previous versions. It has over 53 effects (up to four simultaneously) including sampling, stereo chorus and flanging, 21 delay types (two full seconds), stereo panning, pitch transposing, 24 reverbs, 200 memory locations, full programmability and performance MIDI.

Circle 7 on Reader Response Card



Delta 200

The Soundcraft 200 Delta console featuring individual group modules and a separate master section enable it to be configured with less than four subgroups or as a straight stereo mixer with no subgrouping facilities. It is available in four frame sizes or as an eight channel rackmount and can be specified with any combination of input modules: standard, deluxe, stereo or dual line, a new feature which doubles the number of sources than can be brought into the console.

Circle 8 on Reader Response Card



Monitor Speaker with YST

Yamaha has introduced the MS60S monitor speaker system using YST (Yamaha Active Servo Technology). The MS60S has three inputs and a built-in power amplifier. It is a powered two-way loudspeaker with an eight inch low frequency speaker and a bullet type high frequency unit. YST, by using a negative output impedance amplifier, yields extended low frequency response for the size of the unit. The MS60S is the first commercial product to use the Yamaha technology.

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Audio Delay

The Professional Audio Division of Yamaha Corporation of America has introduced the DDL3 Commercial Audio Delay featuring a single input and three outputs and two models of operation. It can be used as a one-in/three-out digital delay with an individual digital equalizer on each output, or as a one-in/three-out crossover with delay on each output. The DDL3 uses Yamaha DSP technology and the Yamaha Delta-Sigma 18-bit A-D/D-A conversion, yielding signal-to-noise ratio in excess of 100 dB. When the unit is placed in the "delay line" mode, each of the three outputs has a maximum of 1.3 seconds of delay, settable in 20 μ sec steps, allowing a user to match the audio delay requirement of the venue to the system. The DDL3 is programmable, and level, equalization and delay parameters can be stored in 15 memory locations which can be recalled by remote contact closure or via MIDI.

Circle 10 on Reader Response Card



Color CCD

The 6800 Series remote head color CCD camera is the first color model in Cohu, Inc.'s line of remote head CCD cameras. Features include separate outputs for RGN, Y-C, and NTSC video. The color CCD camera has a two-speed electronic shutter, a two piece configuration, 50 dB signal to noise ratio.

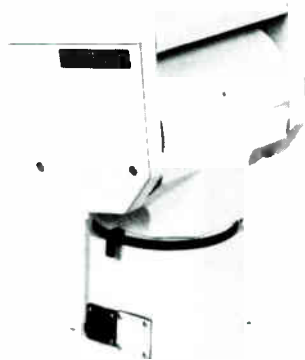
Circle 11 on Reader Response Card



Pan/Tilt for Outdoors

Javelin Electronics has introduced the Omni-Trak 2420 Pan/Tilt for both indoor and outdoor applications. The entire line of this model has been engineered to be weatherproof. According to Javelin, Omni-Trak's sealing system will not allow intrusion of moisture even when the drive is mounted outdoors in an inverted position. The pan/tilt is compatible with industry standard controls for manual or autopan operation, while the built in accessory control unit eliminates the need for a separate ACU when used in Javelin's OMNI II Security Management System. The exterior is constructed of polycarbonate thermoplastic, while internally the model uses heavy duty AC motors. The motors are thermally protected.

Circle 12 on Reader Response Card



Mixer Line

Galaxy Audio has introduced a new line of mixing consoles for permanent installations and portable applications. I/O mixing consoles come with four to 24 input channels in four channel increments, and four channel modules may be added with a factory upgrade. The four and eight channel models are available as rack units, and all units are available as table top units, with oak end panels. Other features include 16 gauge steel construction and external power supply.

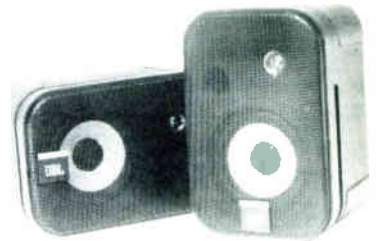
Circle 13 on Reader Response Card



Additions to Camera

CCTV Corp. has introduced the CCD-500B low light level charge coupled device CCTV camera, the second generation of the GBC CCD-500 series. A one piece extruded aluminum case has been added, along with the availability of Genlock, adjustable Gamma, and selectable manual or automatic gain control. The price is \$650.

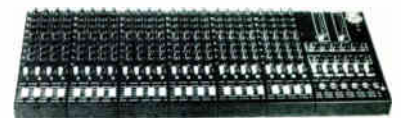
Circle 14 on Reader Response Card



Control Plus

JBL Professional has added the Control 1 Plus to its Control Series line of loudspeakers. The Control 1 Plus measures 9 inches tall by six inches wide and offers wider bandwidth, deeper bass and higher sensitivity than the Control 1. Control 1 Plus features a 5 1/2-inch woofer, a larger magnet assembly and new cone material which combine to produce bass output to 60 Hz. A pure titanium diaphragm tweeter has been added. The Control 1 Plus accepts all the same accessories for wall, ceiling, desktop and microphone mounting as the Control 1.

Circle 15 on Reader Response Card





Control Panel

York Controls has introduced an electroluminescent graphic control panel with a compact size and a display measuring four inches by eight and one half inches. The GCP-2 panel is "easily programmed" and has a feedback mechanism to give positive tactile reinforcement when a command is selected. It is available as part of a complete media control system.

Circle 23 on Reader Response Card

Wireless Drive-Through

HM Electronics has introduced the System 2000A Wireless Drive-Thru. offering "affordable cost, durable construction and the lightest belt-pac available." The system allows maintenance of the previously wired system and use of it if necessary at the flip of a switch. A grille monitor speaker is offered as an option.

Circle 16 on Reader Response Card

Multi-Dynamics Processor

Symetrix has added the SX206 Multi-Dynamics Processor to its 200 Series half-rack system. A "four-in-one" dynamic range controller, the SX206 operates as a compressor/limiter, gate, downward expander, or ducker. CMOS switching changes the operating mode, and simultaneously

shifts the function of the range/ratio control to match the mode selected. Features include cross-coupled active integrators, which make the attack and release times program sensitive, low noise VCA, soft-knee transition, and ultra-stable feedforward control circuitry.

Circle 17 on Reader Response Card



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Bogen System

Bogen Communications has announced Multicom 2000, an administrative communication system designed for institutions and commercial facilities, combining private telephone and loudspeaker intercom with the capabilities of a paging and program distribution system, including emergency call priority. The system is microprocessor controlled and can include from 24 to 120 stations, expandable in increments of 24. It permits up to eight simultaneous telephone to telephone conversations. For each station, the system supplies a built in 20-watt program amplifier and an 8-watt intercom amplifier. Program distribution is initiated through designated administrative phones and can select one of three program sources, either built-in modules or external devices.

Circle 18 on Reader Response Card



Concert Upgrade

JBL has introduced upgraded versions of the Concert Series line of loudspeaker systems. The upgraded models combine the recently introduced Vented Gap Cooling low frequency transducers and the 2450J compression driver. JBL says the combination significantly reduces overall system weights. New wedge Diffraction Monitors models 4802A and 4805A incorporate Vented Gap Cooling low frequency transducers and the 2450J compression driver coupled to a new 2396 diffraction horn. Vented gap cooling pumps air through the magnetic gap and directly over and around the voice coil.

Circle 19 on Reader Response Card

Sound System Control

Powered by custom software, the IQ System 2000 by Crown enables you to remotely monitor and control the functions of up to 2000 amplifiers in a single sound system. Designed for touring sound and permanent installa-

tions the system 2000 offers sound engineers the ability to locate amplifiers closer to loudspeakers, or nearer to a convenient AC power source. The system also allows engineers to locate amplifiers in environments that are inaccessible or hazardous, while maintaining control of the system.

The main components include a host computer, an IQ-P.I.P. Card, and an IQ System interface. The system is compatible with all Macro-Tech and Com-Tech amplifiers.

Circle 20 on Reader Response Card

Powered Mixer

Ross Systems, a division of IMC, has introduced the PC6400 powered mixer. Each channel features two band EQ, reverb/effects send, monitor send, channel level control, XLR mic, and quarter-inch line jacks per channel. It has a compact "head" style package with 400 watts at four ohms output.

Circle 21 on Reader Response Card

Portable Sound

The Argos Sound EX-300 portable PA system is "ideal for small meetings, parking lots, swimming pools" etc. says the company. Equipped with amplifier, speaker, microphone and controls, the unit can go from storage to use in 30 seconds, says Argos. The power supply is either a standard 12 volt lantern battery or 120 vac with the addition of an accessory power pack.

Circle 22 on Reader Response Card ■

30 Years Ago

It was March 1960 and Sound & Communications (then known as Sound Merchandising) was telling its readers about "The Karlson Rocket," "a low-cost, high efficiency speaker designed for publicasting that could well initiate a new era for the art." John Karlson, of Karlson Associates explained that the "Rocket" could provide hi-fi sound at prices comparable to inexpensive p.a. speakers; the solution being an acoustic transducer that

took into account acoustic impedance matching.

Sound Merchandising also focused on the issue of CCTV as an educational tool. The original idea was to use CCTV in universities and secondary schools to make up for the lack of teachers. But universities didn't find it profitable and secondary schools had multiple problems including fearful school boards and low governmental aid.

The Products section of March's issue spoke of Roberts Electronics

adapter for playback of "RCA type cartridge tapes" on Roberts reel-to-reel recorders. The adaptor could be mounted on the take-up and supply reel spindles and was driven by a belt connection from capstan to a flywheel beneath the adapter.

Advertising included Soundolier's Audio Lites which combined church lighting and sound in "one ornamental fixture." Models ranged from Gothic to modern, and claimed to solve high ceiling acoustical problems. ■

—Steve Jacobs



Literature

Hardware and Software Catalog

The National Instruments Corporation has made available its 1990 catalog. The 360-page, full-color catalog describes the company's line of hardware and software products for engineering/scientific applications. The catalog is aimed at scientists, engineers, and technicians who have RS-232, IEEE-488 (GPIB), VXI, and PC-based data acquisition applications. Each section includes a tutorial on how the products are used in typical applications. In addition, the new product section has a detailed technical specifications for many products.

Circle 24 on Reader Response Card

Ballroom Audio Booklet

A booklet on hotel audio combining for divisible ballrooms is available from FSR, Inc. The book contains details and application notes on both the ML-112 and ML-132 Combining Systems, and actual installation sites with installation contractors.

Circle 26 on Reader Response Card



New IC Master

The 17th annual edition of IC Master has been released with new sections and categories in each volume. It provides the design engineer with a data base that references, cross-references, and organizes product information on 80,000 standard IC's including 14,000 new IC's. Volume 1 is a guide to IC's grouped by basic category — Digital, Microprocessor, Linear, Interface, and Memory. Volume 2 is a stand alone volume with over 1,000 manufacturer's data pages. It includes a Product Index, an Application Note Directory, and a Manufacturers and Distributors Directory. Volume 3 is a Systems Level Volume which includes a guide to Custom/Semicustom IC's and a section on Programmable Logic Devices.

Circle 28 on Reader Response Card

Capacitor Brochure

A four-page brochure from Murata Erie describes the firm's new line of CLA single plate monolithic capacitors for microwave integrated circuits. Included are complete technical specifications, dimensional drawings and performance characteristics.

Circle 27 on Reader Response Card

Voice Mail Guide

Robins Press has recently released The Voice Mail Reference Manual and Buyer's Guide. The manual has been designed as a sourcebook for the telecommunications professional, an informational resource for perspective buyers and as a sales aid.

Circle 29 on Reader Response Card

CALENDAR

Upcoming Events

APRIL

SUPERCOM: Atlanta, GA. Contact: (312) 372-5060. April 16-19.

NSCA (National Sound & Communications Association): Las Vegas, NV. Contact: (312) 598-7070. April 17-21.

National Relay Conference: Stillwater, OK. Contact: (219) 264-9421. April 22-24.

Fiber-Optic Splicing and Termination Workshop: Sturbridge, MA. Contact: (508) 437-8192. April 23-27.

EDS (Electronics Distribution Show): Las Vegas, NV. Contact: (312) 648-1140. April 23-26.

MAY

ISC WEST (International Security Conference): Anaheim, CA. Contact: (312) 299-9311. May 1-3.

Elec. & Elec. Eng. '90: Hanover, West Germany. Contact: (609) 987-1202. May 2-9.

International Instrument Symposium: Denver, CO. Contact: (919) 549-8411. May 7-10.

International Trade Fair & Congress for Entertainment Technology, Equipment, and Management: Berlin, Germany. Contact: (312) 245-5230. May 8-10.

ISE (Ideas in Science & Electronics): Albuquerque, NM. Contact: (506) 262-1023. May 8-10.

MTT-S (International Microwave Symposium & Expo): Dallas, TX. Contact: (617) 769-9750. May 8-10.

ELECTRO: Boston, MA. Contact: (213) 772-2965. May 9-11.

Video Expo: Los Angeles, CA. Contact: (914) 328-9093. May 14-18.

Midwest Electronics Expo: St Paul, MN. Contact: (800) 223-7126. May 15-17.

ICA (International Communications Association): New Orleans, LA. Contact: (800) ICA-INFO. May 20-25.

ADVERTISER INDEX

Company	Page	RS #
AMC Sales (213) 869-8519	59	279
Ariel Corp. (201) 249-2900	27	201
Ashly Audio (716) 544-5191	49	236
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Cal Switch (800) CAL-SWCH	39	281
Canare Cable (818) 365-2446	39	280
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TECHNICALLY SPEAKING

(continued from page 37)

TEST QUESTIONS

1. Match the following terms with their definitions

- ___ dB (a) The power level referenced to 0.001 watt
- ___ dBm (b) The number of dB above or below 1 volt
- ___ dBV (c) A power ratio
- ___ dB_(0.775) (d) A voltage ratio expressed relative to a nonstandard reference

2. In a constant voltage circuit. (circle one)

$$10 \log \frac{P_1}{P_2} \text{ the equivalent of } 20 \log \frac{E_1}{E_2}$$

1. $R_S < R_L$
2. $R_S = R_L$
3. $R_S > R_L$
4. None of the above

3. The decibel always represents what kind of ratio? (circle one)

1. Voltage
2. Current
3. Resistance
4. Power
5. Reactance

4. In the dBm system what is the reference value? (circle one)

1. 0.775V
2. 0.775 across 600 ohms
3. 1 watt
4. .001 watt
5. 1 volt across 1 ohm

5. Constant current circuits are characterized by: (circle one)

1. $R_S < R_L$
2. $R_S = R_L$
3. $R_S > R_L$
4. None of the above

FIBER OPTICS

(continued from page 44)

candidate. When electromagnetic interference, safety, or lightning protection becomes a factor, even very low transmission rates may suggest fiber.

In general, light pulses travel in only one direction at a time over fiber. It is possible, however, to pass light in two directions at a time by using wavelength division multiplexing. This technique transmits light pulses of one color in one direction and in the opposite direction by using a noninterfering color. Terminal elements of the system are sensitive only to their respective light color. Another method is to transmit a burst of pulses first in one direction and then in the other. Also, cable is available with two or more fibers combined. Multiple fiber cable is available with as many as 12 fibers. Although the large signal capacity of a single fiber may not require additional fibers, additional optical circuits can simplify multiplexing and switching requirements in terminal equipment.

Standards for optical connecting and interfacing are rapidly emerging to suit various fields. The American National Standards Institute has been active in establishing specifications. Another group

is the Technical Advisory Group of IEEE 802. Much of the work in computer local area networking can be extrapolated to other fields such as sound and video. Products are appearing on the market that point to opportunities for firms that already specialize in custom electronic installations to expand their capabilities to include fiber optics. The technology of fiber optics is within reach of any capable and properly equipped installation team. Choice of cable, splicing techniques, and testing will be explored in future issues of Sound & Communications. ■

INSTALLATION PROFILE

(continued from page 57)

tronic or experimental music that requires synthesizers or elaborate processors. Our stuff is much more straightforward than that, because primarily what works best in the space is acoustic music."

There are 102 hidden speakers permanently installed, 10 more added for some shows, and 90 amps in use, each with 10 built-in delay settings. "Depending on the position from which we do the shows" explains Abrams, "we set the amplifier delays so that the sound always seems to be coming up at the same time. The mixing board can be set up in any one

of four locations, although 9 out of 10 shows are done from the same one. We mix through a 32-channel Ramsa S840, and the monitor mix is done on a 16-channel Yamaha MC2408."

The building itself, and its location, impose limitations on the system's capabilities. "We can't use wireless microphones," Abrams notes. "There's so much radio interference around here that we could never be sure we wouldn't pick up tugboats going down the Hudson. The World Trade Center (next door) has a large antenna and a transmitter. There's a lot of ambient noise, a murmur that's here all the time. There are spots that are very difficult, where the sound becomes garbled because of all the reflection. We had an opera singer hit a note in rehearsal that came back so piercing it hurt the ears. She had to tone the whole thing down because the sound was bouncing all over."

"This system gives the space intelligible, articulate sound" concludes Rollins. "It's never going to be Carnegie Hall. The performance site is a public space, and if you're going to come to see shows here you're going to have to accept imperfect conditions. Certainly the system Smith/Fause has given us lets us do as broad a variety of things as we would ever want to do in that space." And how do the famous palm trees enjoy the program? "I think they really loved Brian's piece" she smiles. "I don't know how they felt about all that continuous Christmas music." ■

WIRE & CABLE

(continued from page 42)

CONCLUSIONS

Each of these packages is quite a different animal. The VDP programs are the most ambitious with interactive modules for cable routing documentation, bill of materials, cable labeling, and system flow diagrams. The Bradylabel software is a comprehensive program for generating every conceivable marker or label for cable or component identification. The Seiko label printer/software package is a general purpose labeling system that may be adequate for generating your cable tags as well as addressing your envelopes. ■

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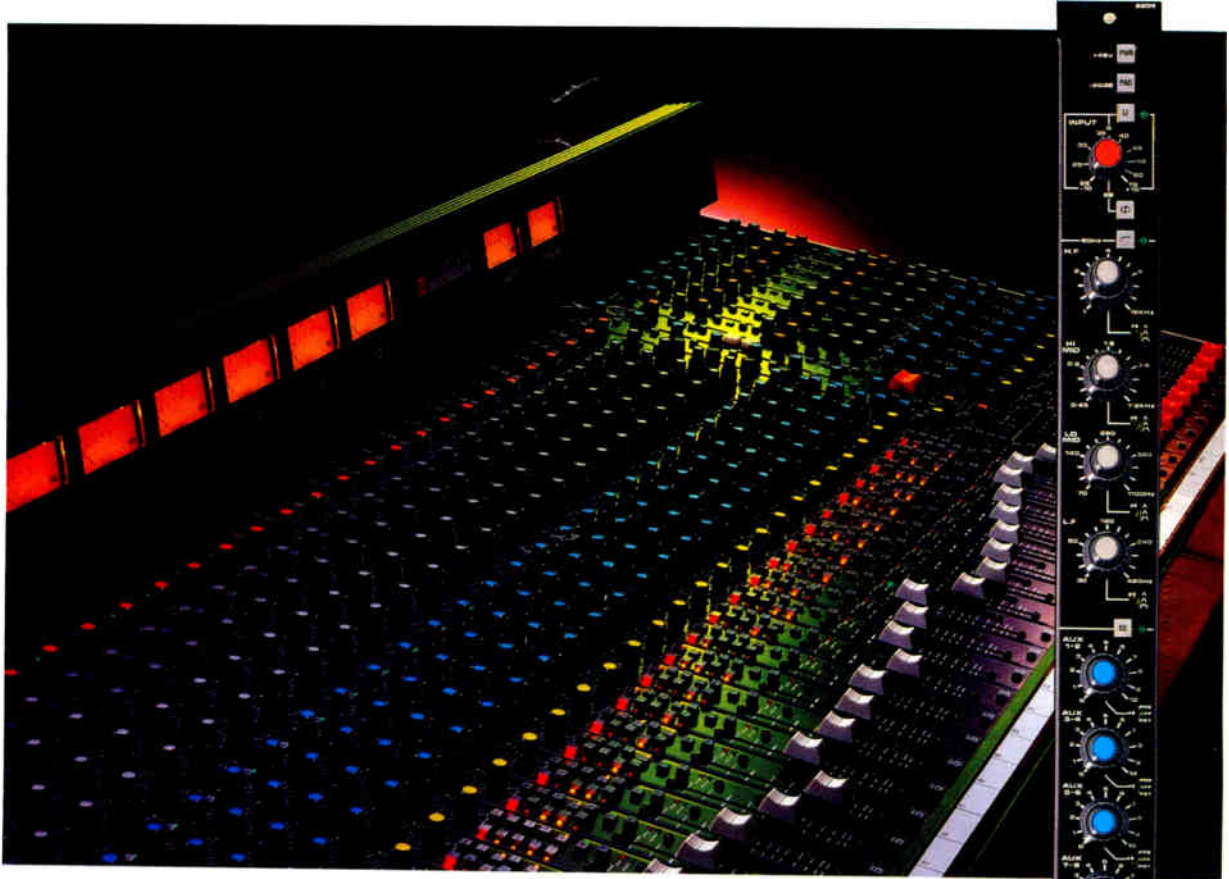
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The Series 8000 input module is available with LED metering or VCA subgrouping, and incorporates four-band parametric EQ giving you the subtle control needed to produce dramatic results.

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Soundcraft 8000

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