# SOUND & COMMUNICATIONS

Volume 37 Number 4 April 25, 1991


## CHRIST CHURCH

This 244-year old Philadelphia landmark building is a national shrine. George Washington and Benjamin Franklin worshiped here. Seven signers of the Declaration of Independence are buried here. In 1990, 100,000 tourists visited here. Now, it's the proud owner of an evenly distributed and practically invisible system. **28**

## TRENDS IN CHURCH SOUND

The organist co-exists with the videographer in some churches. The sound designer is facing a wider range of demands than ever before — in both traditional and electronic churches. How does one support the organ and the speech intelligibility at the same time? , new designs, new equipment lead to . Barry McKinnon surveys the market. **20**

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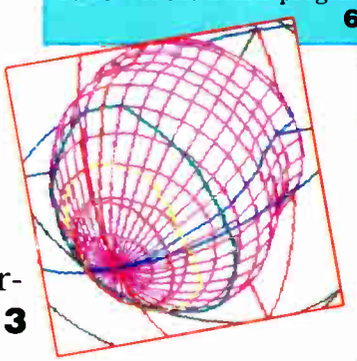
## SUBWAY SOUND

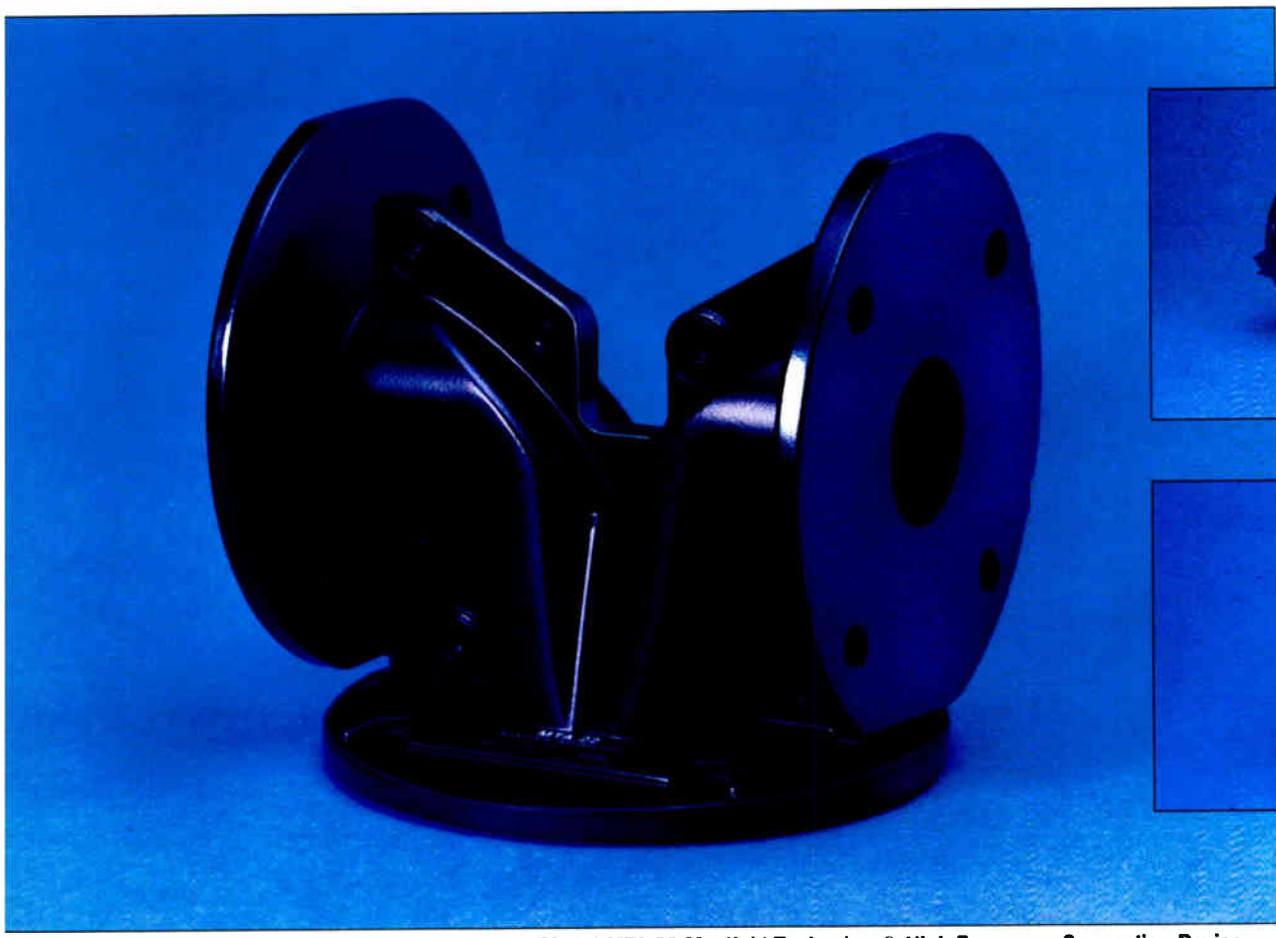
Sound & Communications digs into a $220 million upgrade in the New York subway's telecommunications system that includes the installation of 490 miles of fiberoptic cable and an effort to challenge the harsh reality of subway station acoustics. **44**

## CH SOUND — RICALLY SPEAKING

1940s, churches were constructed human voice could be projected olification. Then came the "decade – the 1950s. Joseph DeBuglio makes ational, controlled sound design in wor- **13**



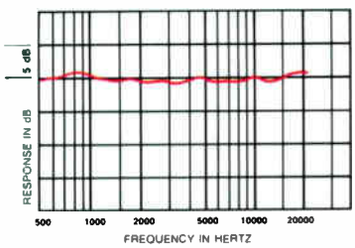
# ADAPTING TO FLAWLESS SUMMATION



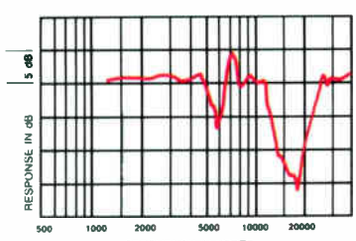
Model MTA-22 Manifold Technology® High-Frequency Summation Device

Model N/DYM® 1/2MT-16

Model DH1A/2MT




MTA-22 Summation Response




Y-Adapter Summation Response

The Electro-Voice MTA-22 is a Manifold Technology® high-frequency device for combining the outputs of two large-format drivers into a single two-inch-throat horn. This adapter, used in conjunction with either the N/DYM® 1mt or DH1Amt, provides a system that sounds virtually identical to a single driver with twice the power handling, twice the output capacity and the built-in redundancy factor of multiple drivers.

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The Manifold Technology concept was first introduced by Electro-Voice in the MT-4 four-way concert sound system where manifolding was applied in each of the four frequency ranges. The MT-4 has garnered considerable success in touring applications, worldwide. The recently introduced MT-2 compact concert system and the MTS-1 high-performance stage system feature Manifold Technology throughout. Now, with the driver packages featuring the MTA-22 Manifold Technology adapter, you can apply the same performance and physical size advantages of Manifold Technology to any of the our HP series constant-directivity horns.

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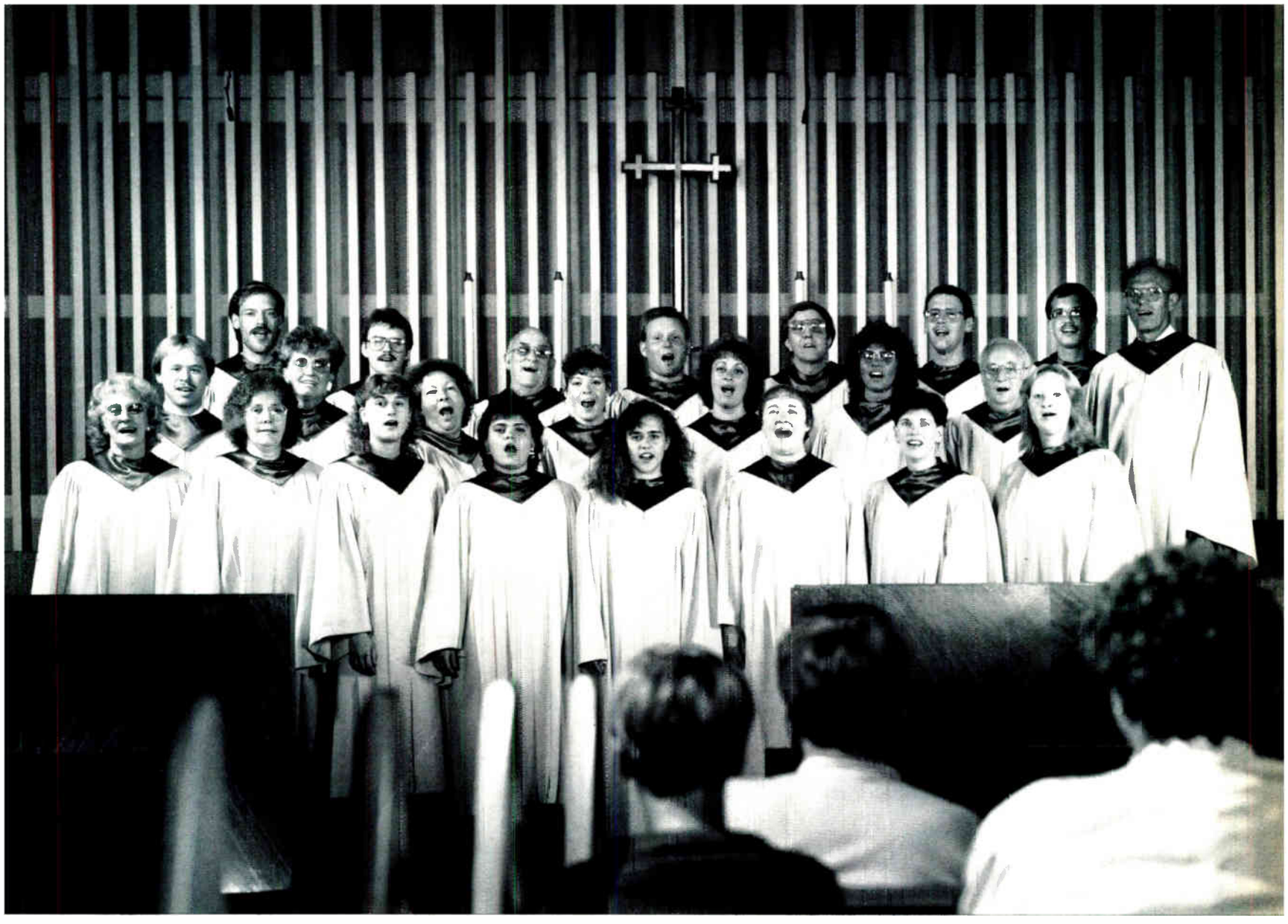
SOUND & COMMUNICATIONS



# Can you find the choir mics in this picture?

Neither can the audience.

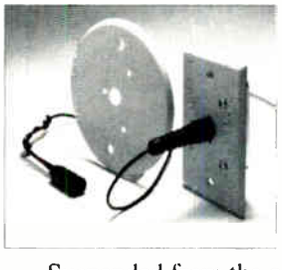
Introducing the new, affordable Crown CM-30 microphone. Destined to be heard—but not seen—in churches, auditoriums and schools everywhere.

Extremely compact, the CM-30 is nearly invisible when positioned over choirs or other large ensembles. But don't let its small profile fool you: the CM-30 is a giant when it comes to features.

This supercardioid electret condenser microphone delivers a smooth, wide-range response for natural reproductions of the singing voice, the organ or other musical instruments.

The CM-30 microphone filters out very low frequencies to reduce distracting "room rumble." And its tight directional pickup pattern rejects unwanted background noise and room reverb.

With impressive gain-before-feedback and higher output than many mics, you'll find the CM-30 an exceptional choice for church choirs, schools or stage productions.



Suspended from the ceiling by its own slim cable, the CM-30 installs quickly. The microphone connects easily to the power module with input/output terminal blocks which eliminate connectors. The module fits neatly into a standard electrical box for a clean, uncluttered appearance.

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## LETTER FROM THE EDITOR

# Church Sound Today; Cincinnati in May

What is a church? That question has occupied sages throughout the years, and has been the subject of schisms and philosophies, and even fullfledged wars between nations. For our purposes, the question is more simple, and yet more complicated. A church may take on the guise of a spare and traditional house of God, and in other forms becomes a full multimedia center. For the purposes of sound design, these distinctions are important. And the fashion of the moment in architectural design cannot be ignored. The sound and visual design and the equipment necessary to fulfill the congregation's mission are part and parcel of the architectural design and the full function of the church.

Churches make up a large proportion of the work of sound contractors and consultants. And for this issue of Sound & Communications we focused on several aspects of church design. Since churches are often the first buildings to go up in new towns and settlements, many of these buildings are attaining landmark status in our twentieth century drive to preserve our heritage. This was true of Christ Church in Philadelphia where this country's founders worshiped and where the government now strictly supervises and constrains new additions. Renovating the church and the sound system was therefore hardly a lark and necessitated extra care and respect for the environment while designing and installing a new and accurate sound system. You can read about the impressive process and the results in this issue.

The architectural design of any building follows the fashion and aesthetic thinking of the times. We asked Barry McKinnon to survey the consultant community for us and ask them how they're faring and what they think of trends in church building design and how those trends are affecting the actual sound design. That article is also presented in this issue. Additionally, Alex Rosner writes of the business aspect of dealing with churches. And we present a tongue in cheek view of the churches' attitudes toward sound systems.

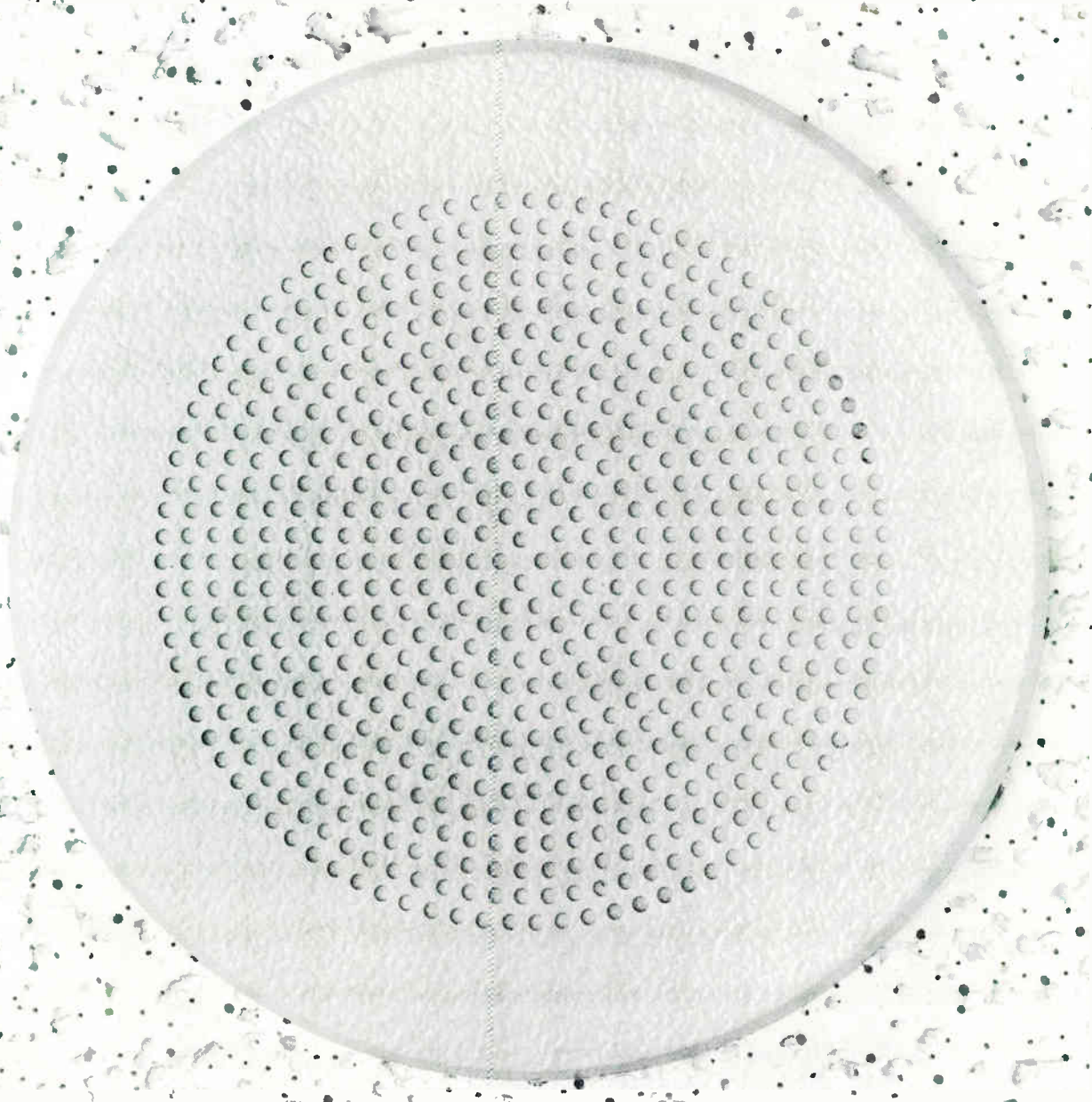
Next month, we'll see you all in Cincinnati, the venue of course of the National Sound and Communications Association convention May 20 through 22. From what we can tell of the preparations so far, this year's Expo promises to be more replete with exhibitors, seminars, networking and learning experiences than ever before. West Penn Wire will again be hosting its annual Appreciation Party (Tuesday night). And along with the Contractors Caper and other events, Cincinnati may just turn into fun city for the weekend.

For the serious side, a large selection of educational sessions is being planned. Among the sessions that we think will be most valuable is one being presented Tuesday at 10 AM by our own technical editor, Michael Klasco. Mike will be dealing with computer aided methods of predicting and evaluating sound system performance, in theory and — most important — in practice. Once you've determined what the perfect system will be, how do you deal with the client, the consultant, the venue in the real world? Some of the topics Mike will address are the prediction and evaluation of reverberation time, flutter echo, intelligibility measurement and ambient noise; designing the sound system to accommodate the room; acoustical treatments; and the role of the acoustical consultant. We hope you'll attend.

We'll see you in Cincinnati.
Best Regards,

Judith Morrison
Editor in Chief

# The Benefit is Easy to See— the Ceiling Baffle is Not!



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# NEWSLETTER

**NSCA EXPO**

The National Sound and Communications Association's NSCA '91 Contractor's Conference & Expo takes place May 20 through 22 in the Cincinnati Convention Center. Over 300 exhibitors and over 5000 attendees are expected.

In keeping with the general concept of the Expo, over 50 hours of classes are planned, with an expansion of pre-expo classes to include an MATV design course with a certificate of completion. The pre-expo courses are more structured, this year, being broken into basic and advanced sessions. Courses during the show are part of four basic tracks: audio, sales, management and specialty.

Among the speakers in sessions held during expo are Don Davis, speaking on Audio and Acoustics; David Marsh on the Behavior of Sound Indoors and Outdoors; Barry McKinnon on the Application of Coaxial Loudspeakers; and Frank Abrem on CCTV Design (with course certification). Michael Klasco, Technical Editor of Sound & Communications, will present a session on the use of software to predict room acoustics and intelligibility (and what to do with what you find).

West Penn Wire, for the fourth year in a row, will hold its "Appreciation Party," typically drawing over 3,000 people. This year's party is on Tuesday, May 21 from 6 PM to 8 PM at the Hyatt Regency ballroom. According to Lou Valente of West Penn, "NSCA is not just a show; it's *the* show. Our business is committed to the electronic systems contractor. We're thanking our customers."

**NEW SPEAKERS**

Tannoy will have its first showing at the NSCA Expo of the previously rumored "newest technology in 30 years in ceiling speakers." The ICT, or Inductively Coupled Transducers, have no windings, no voice coil, no crossover, and a bandwidth of over 20 kHz.

**YAMAHA DIVISIONAL CHANGES**

Yamaha's Pro Audio and Synthesizer, Guitar and Drum divisions have been consolidated into one division, the Audio, Guitar and Synthesizer Division with John Gatts as General Manager. Gatts was previously the general manager of the Pro Audio Division. Similarly, the company has merged its electronic keyboard sales group and piano sales group into the Keyboard Division with Terry Lewis division general manager. Sales and marketing responsibilities for drum sets have been transferred to the Band and Orchestral Division in Grand Rapids, Michigan.

John Gatts stated that the most significant change in his new division will be in its sales structure. "Great emphasis will be placed on getting closer to the market with people empowered to make decisions to respond faster to changing market conditions." The new sales structure has four regional managers (but no national sales manager) all reporting directly to Gatts. Jim Coffin handles the western region; Tom Weeber the midwest; Paul Gazarian the northeast; and Bob Shomaker the northeast. The regional managers operate from Buena Park headquarters.

In making the announcement of the changes, Ron Raup, senior vice president of Yamaha Corporation of America, said, "Our business is dependent on a healthy and growing distribution channel . . . It is imperative that we focus our attention on offering additional meaningful services to our dealers."

**OPTODIGITAL MOVES**

The Optodigital Designs Division of Monster Cable Products Inc. is moving its center of operations from South San Francisco, California to the University of Texas at Austin in June, 1991. Optodigital's operations will be housed within the university community to allow the company to use it as a "technology incubator," according to Rodney A. Herman, Optodigital Designs Division Managing Director, and will help the division in its proposed "expansion into broadbased multimedia." Optodigital presently manufactures the LightSpeed 12 system, an audio signal distribution system for stage, studio and broadcast applications.

# NEWSLETTER

**NSCA-TV NEWS TO AIR**

NSCA-TV NEWS will again air during the NSCA Expo. The on- the-spot news show will be transmitted to hotel room televisions in Cincinnati and to monitors on the exhibit floor. The program is produced and written by Testa Communications, publisher of Sound & Communications magazine.

**ODETICS SPACE RECORDERS**

Odetics Space Division has negotiated an $18 million agreement to provide Nippon Electric Company with nine space tape recorders to be used on the Advanced Earth Observation Satellite (ADEOS). ADEOS is funded by the Japanese Space Agency. Odetics has supplied recorders for two previous Japanese Earth Resources Programs — the Marine Observation Satellite where the recorders were used for telemetry data, and the Japanese Earth Resources Satellite with the recorders storing the actual sensor data.

**SONY TRAINING SESSIONS FOR YEAR**

The Sony Professional Audio Training Group is running training sessions throughout 1991 for service technicians and sales engineers. Courses are held in Fort Lauderdale, Florida and San Jose, California. The Sony Professional Audio Training Group is at 1400 W. Commercial Blvd., Fort Lauderdale, Florida 33309.

**NO NAMM SUMMER EXPO**

The National Association of Music Merchants will not proceed with plans for the 1991 NAMM International Music and Sound Expo which had been scheduled to be held in New York in August. The board of directors of NAMM voted overwhelmingly in favor of taking this action after surveying the Trade Show Advisory Committee and other senior retail and commercial members in the industry. NAMM still plans to hold a 1991 mid-year annual meeting of members. Jack Coffey, NAMM president, said, "We will continue to evaluate industry input and plan to review all options for 1992." The NAMM 1991 Winter Market, held in January, hosted more than 690 exhibitors and occupied 340,000 square feet of space in Anaheim. The winter show has eclipsed that of recent summer Expos.

**APT-X ENHANCED**

New enhancements have been added to the APT-X 100 Music Coding System by Audio Processing Technology. The digital audio data compression system now has Auto-Sync Mode, locking encoder and decoder units in a satellite or transmission link, automatic decoder detection of auxiliary data within the digital information, an eight-channel de-multiplexer mode, allowing up to eight coded channels to be multiplexed together.

**HOME THEATER PRICE DROP**

Shure HTS, The division of Shure Brothers specializing in the home theater, has announced a major price reduction of its Theater Reference System components bringing the original configuration to a price of under $6,000. Two new configurations have also been introduced, the LRS System, priced at $5,391, and the Super System priced at $9,485. According to Bob Schulein, General Manger of Shure HT, "Market penetration has reached the point where large numbers of people are beginning to appreciate more sophisticated surround sound audio." Schulein also applauded the entry of the THX Division of Lucasfilm into the home theater market.

**NEW STANDARD AVAILABLE**

The standard for data displays prepared by the American National Standards Institute is available in draft form. A copy of the standard is being provided through the ICIA (International Communications Industries Association). The title is IT7.215 — Data Projection Equipment and Large Screen Data Displays — Test Methods and Performance Characteristics."

# TOUCH THE FUTURE AT NSCA '91

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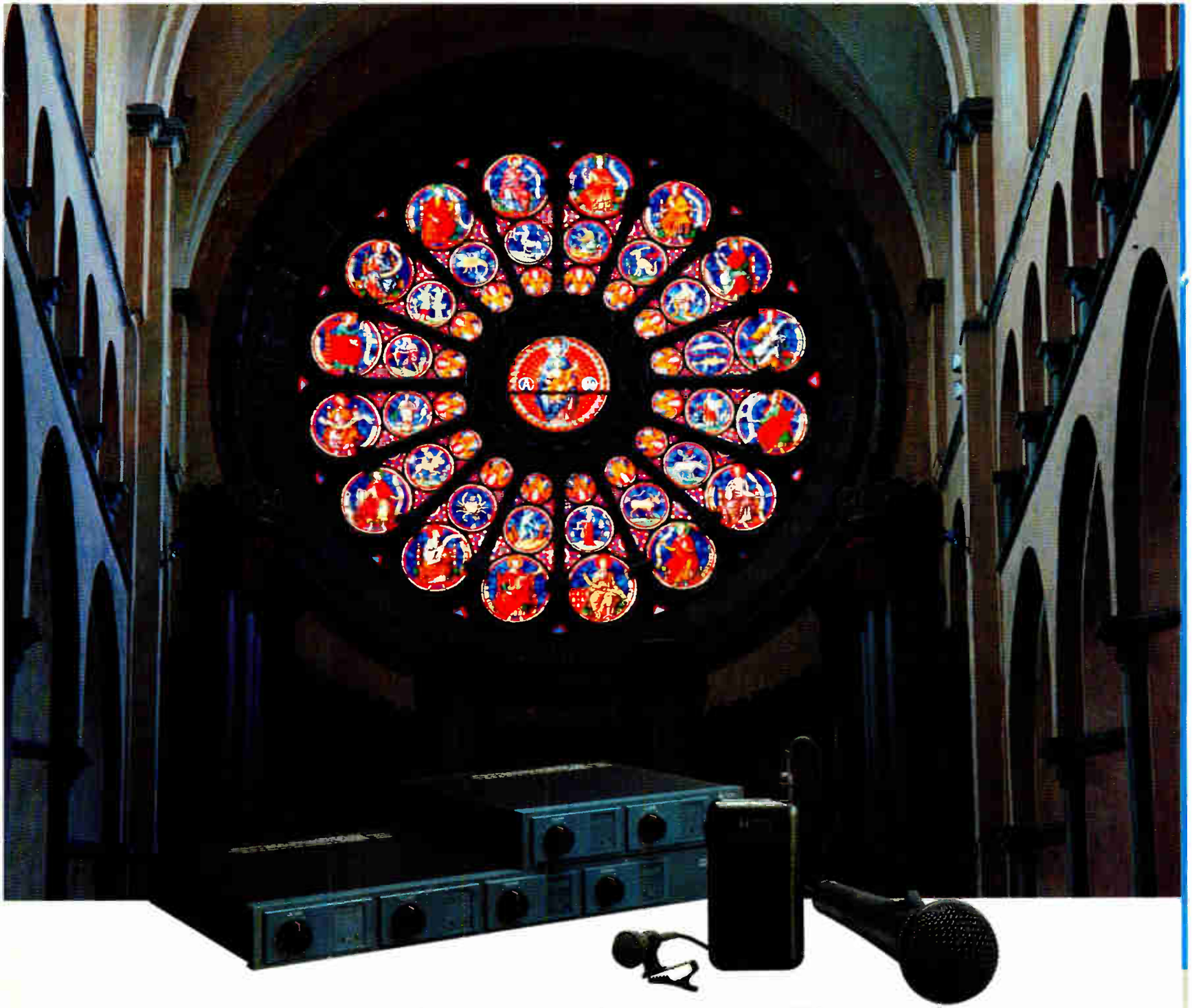

# Toa's New Family of Wireless Microphones Created to Reinforce the Spoken Word

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# WHY IS CHURCH SOUND SO CONFUSING?

By Joseph DeBuglio

**In the beginning was the Word and the words were not amplified and God saw that it was Good.**

On the second day the people gathered to hear the Words and so they assembled in natural spaces that amplified the words.

On the third day man built large rooms so that people could hear the Words where they wanted and it protected them from the weather. As man started to sing praises to God, he changed the design of the gathering places and called them "Churches."

On the fourth day, God allowed man to use Sound Equipment in the churches that were so large that they needed all the help that they could get. Churches had some of the best sound systems in the world and God was pleased.

On the fifth day the children of God saw how other people were doing sound as suggested by Satan. They claimed that it was cheaper and would do as good a job. (Instead they were less effective and discouraged people from coming to church).

It was this that caused the "dead spot" the "feedback" and the complaining from people of all ages. For a whole generation, churches were confused about sound and acoustics and they were afraid to invest in fear of getting more of the same. And God saw that it was not well in his churches.

On the sixth day, God showed a number of people how church sound should be done according to His will. Some people gave it a name and others were just grateful to be able to hear once again. And God was pleased because people began coming back to God's many Houses of Worship in which people could hear. But Satan did not take things lying down. Satan suggested other products to try and confuse people even more, but the Children of God who tasted good sound became wise and demanded the better sound system. Then God was pleased.

On the Seventh Day the Children of God rested and listened while God preached His word in all of the many different churches and it was well.

(Reprinted with permission from the HIS Systems Newsletter, Winter 1991).

WELL! Did this get your attention? It is hoped that this fun parody of the Creation story open our eyes to the many truths in it. Churches in the 1940s and 50s had some of the best and well thought out systems available and some of them are still working to their original design.

There is little information on the subject and many people have been brainwashed into believing that it only takes a couple of speakers, some wire and a mixer/amplifier; hook it all up and you will hear properly. What can be further from the truth? Yet, did you know that the church community led the way in the sound reinforcement standards of the late 1940s and early '50s? These standards were very high then and the successful church sound reinforcement contractor still follows them using the latest technology.

So what happened? Why don't most churches have good sound? Do these poor quality sound systems affect church attendance? Why is it that in some churches you feel like singing and in others you're afraid? When do we need a hearing aid system in the church?

## IN THE BEGINNING — 1940s

Historically, before the 1940s, churches were constructed in remote places and designed so that the human voice could be projected without amplification. Many of our older churches still standing today did not need sound reinforcement because they were designed "properly" but, because of our Sunday shoppers, vacationers and tourists (train, cars and airplanes), the human voice could no longer compete with the outside noises. These churches were not soundproofed. It is for this reason that many older churches have to invest in sound systems today.

When the age of sound reinforcement hit in the late 40's, builders of new churches suggested that they could save large sums of money by building a church without traditional acoustical engineering and use the PA System to make up the difference.

At first the idea worked. Building costs dropped considerably and very high quality sound systems were installed. (often as high as 7 percent of the total cost of building the sanctuary).

## THE DECADE OF CHAOS

In the mid to late 1950s, two events happened at the same time. Rock and Roll and Cheaper Electronics. The rock and roll era needed portable sound for one night stands. Through TV, concerts and shows, everyone was exposed to the "portable PA System." We often did and still do place speakers to the left and right side of the stage. This was a major compromise and people have learned to put up with it. The mistake churches made was using this very poor layout.

Cheaper electronics was also another major miscue for the church community. This new and cheaper equipment was never meant to be used in churches in spite of the advertisements. Most of it was meant for hotels, airports and clubs where people are on the move and they only have

to listen to sounds for brief periods or one night shows. A lot of this equipment was (and still is) often called "Architectural Sound Equipment" and architects were given this information for planning offices, malls and warehouses. When a church would ask an architect, "How much do we need to spend on PA equipment?," the architect would get the PA book he was sent and budget $2,000 on sound equipment for a new million dollar 500 seat church. Now remember, previous to this, churches were spending up to 7 percent of the building cost in the early '50s.

By the early '60s, new churches missed the lively congregational singing. Gone were the choral extravaganzas that made the hair on the back of the neck tingle with excitement and the thunder of the great swell 32 foot pipe organ. Churches wanted these things, but by now they'd become accustomed to spending little and wanting a lot.

## THE AGE OF CONFUSION

During the '70s some churches did try to build the old style church, with dismal results. Architects as a community had not been building churches with good acoustics for over 30 years and they had already forgotten the knowledge they once knew well. There was and is no more proper acoustical guidance except for a few people who are very busy fixing architectural mistakes.

In the '80s a new wave of churches sprung up. Packaged churches have become very popular. For a modest cost, a high quality, inexpensive church was built. This meant that almost any congregation could afford to have a church or expand at will.

These churches are designed strictly as a meeting place. Some ministers have described them as warehouses or funeral parlours. Most of these churches do not have "Good Sounding Congregational Singing." Hearing speech loud enough near the front without a PA is often impossible, and investing in an expensive organ is pointless. Acoustical guidance is nonexistent, although the builder will always say, 'The acoustics will be very good.' In some instances, the building design is so poor that any sound system at any price will not make the church suitable for comfortable listening.

The packaged church is often rushed, built on price and not meeting a congregation's (spiritual) needs. Some builders build as many as 10 "churches" in a year. The good news is that a packaged church, with a few alterations, could be the house of worship many of us want and remember. Often a higher ceiling, a sloped wall or different carpet could make a world of dif-

ference. Acoustical guidance is available, but you can not get it from an architect any more. In fact, if you asked an architect to hire an "acoustical expert," chances are the architects will hire a company that does 90 percent of its work for government projects or industrial noise control. Today, the average architect will do one to four churches in his or her lifetime. How can they possibly design a new church without proper acoustical guidance?

Acoustical and audio experts who do mainly churches spend a great deal of their time fixing other peoples mistakes. As a result, they become very sensitive to the design, materials and performance of the sanctuary in terms of sound quality. They plan in and expect high results in the performance of the choir and organ. Any engineering graduate can quickly learn how to keep the sound of the compressor from disturbing the office next door. It takes years to learn, know and recognize a 125 Hz $RT_{60}$ of over 2.4 seconds that is muffling sound, while interfering with both speech and music at the same time. House painters don't paint family portraits very well, but they do often use the same equipment and tools that artists use. Church acoustics require the aid of artists (acoustical experts who specialize in churches), not painters (architects and noise control acoustical experts). The same applies equally to the sound system designs too.

This chain of events over the past 50 years has caused havoc in the church community in many ways. Most of these poor buildings and bad sound systems (estimated to be around 80 to 90 percent) have a physiological effect on people. Many older people who have some hearing loss but can have normal conversation with anyone three feet away often can not hear well in churches 50 years old or newer. As a result, these people do one of three things. Some will come to church even if they are deaf. Some will come if you provide a hearing impaired system for them. Others who don't really need hearing assistance will stay home because the sound on the TV is clearer. This age group starts at 40 years of age and up. In some communities, this group of people can be up to 20 percent. Hearing of speech, the organ, the choir, the piano and the congregation singing affects us all.

If you have a good sanctuary and you have a high quality sound system, the only people who are left to complain about the sound are people you have to yell at while talking to them. Good acoustics and good

sound mean that people with hearing aids will have little or no problem hearing in such a church.

Young people who have good hearing want better sound for a different reason. Every day they are exposed to hi-fi, high quality car radios and so on. Young people spend all kinds of money on good sound, and they get it too. When it come to churches, we should make the same allowance for them. The facts are, if your church has a sound system that meets the needs of older people properly, it will also meet the needs of young people too and vice versa.

Churches need to reexamine the purpose of the Sanctuary and think long term. How often do we hear of a church that is paid for in less than 15 years and the average age of the members is 30. Where are the older people in a fast growing church? Young people can hear no matter what, but once you pass 40, you need a better listening environment. If churches thought long term, they would invest more money into their buildings and would most likely have a better return on their investment.

## THE 90's — THE AGE OF HOPE

As far as information goes, there are several good books on Audio. The best book on sound reinforcement is called "The Complete Hand Book of Public Address Sound Systems." Although it was written in 1978, it will not be out of date for a long time. Unfortunately, there are currently no books on church sound, so much of the information from this book will require some interpretation.

Good church sound and acoustics can be had all of the time and it comes for a price. The HIS System, and other companies that install systems like the HIS System, give the church value and high return on investment.

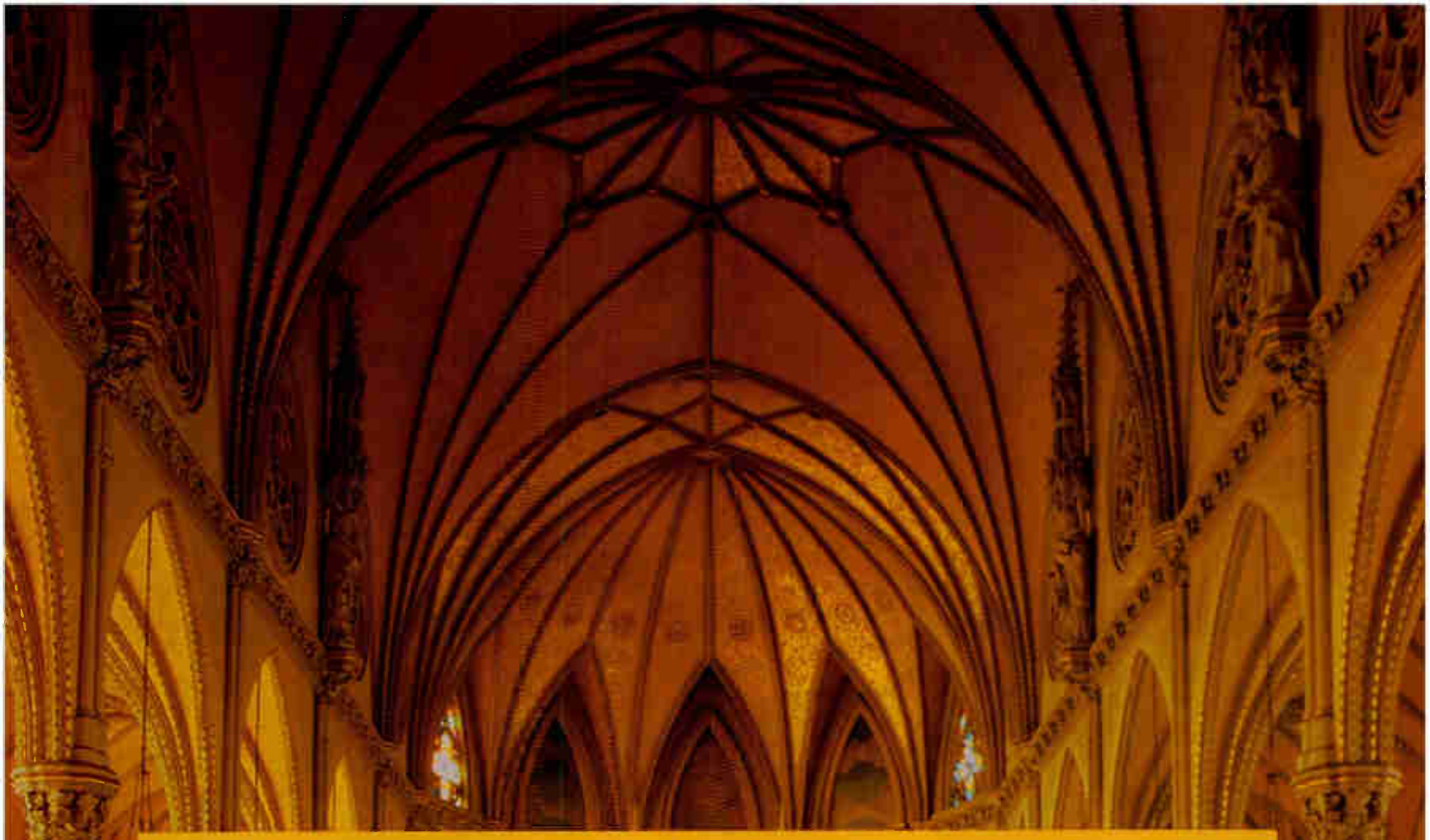
Young people often seek high quality sound and are always ready to pay for it. Elderly people often bequeath large sums of money for good sound and acoustics. Regrettably, this is how funding is arranged for many of the high quality sound systems installed today. It's too bad that some people can be heard better when they are no longer with us. The price doesn't have to be this high. ■





The information presented was collected by JdB, as well as from other professional sound companies that specialize in church systems and from over 60 articles from various church magazines. Since there is no known accurate historical record available or maintained of such events, the facts presented are based on actual experiences from over 500 churches in Ontario. All of the statements were based on what churches tell audio and acoustical contractors/consultants. This information is made available for your awareness and education and does not reflect any personal attitudes of a particular church, builder, contractor, audio company, music store or architect. Hopeful these facts are accurate according to the limited research available.

If you would like to contribute to this article, comments, or you wish other articles sent to you please contact: Joseph De Buglio 63 Lockerbie Ave. Weston, Ontario M9N 3A3 or call 1-416-241-4240



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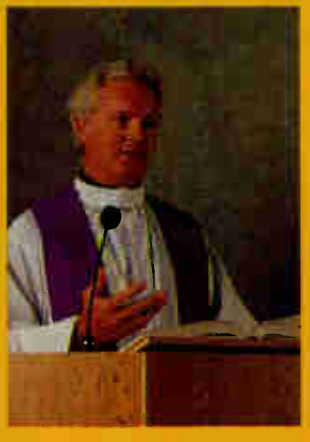

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# IT'S NOT ALL HEAVEN: A REPORT FROM A WORKER IN THE FIELD

By Alex Rosner

**Equipment manufacturers and feature editors have written excellent articles about the church market, and it is true that churches offer a wide opportunity for contractors, based on the need for good sound systems.**

But filling the need turns out to be not as easy as it might at first appear.

The biggest reason the church you walk into doesn't already have a good sound system is that churches have different priorities. You may feel that since they obviously have money for other more expensive things, their priorities are not right. But that's not their opinion and there's the rub.

A reasonable person would think that since the purpose of a church is to spread the word of God, a good sound system should be at least as important as carpeting, carpentry or painting. But here, as in other places, the primary function of the place is not clearly seen by many of those who are involved on the inside, and those who do see correctly are often discredited by stronger-talking types. It's politics, and it's non-denominational.

The priorities set by many churches effectively relegate the sound system to a minor role in their overall scheme of things. It may be that few of the decision makers have actually heard a good sound system in a church or they may have heard a really good one, not realizing that it was operating.

Compounding this is the difficulty that church officers have in agreeing on proposed solutions to acknowledged problems. We once demonstrated a perfect solution to a terrible reverberation problem by bringing in a complete system for a demonstration. All agreed that this was just what was needed. But before we got the order, one of the members persuaded the others that he could do it himself for half the price. With half the money wasted, it was years before the church considered the correct solution again. That our demo was paid for served only as a small consolation.

## SELLING THE JOB HAS NOT BEEN MADE ANY EASIER.

The good news is that as more young people are exposed to audio and video technology in their everyday experience, their awareness of the need for good sound systems also rises. As they grow older, and step into positions of authority

in their churches, we'll be dealing with more technically educated individuals. Their priorities will, most likely, be different. The bad news is that there will also be more technically knowledgeable amateurs to gum up the works. Churches will be subsidizing the technical education of these amateurs as they go about putting in more and more sound systems. But then, the resultant errors and confusion will lead to more business for us in correcting their mistakes.

There are churches right on the borderline of needing a sound reinforcement system. In the past, their pastors acclimated their voices to the room's acoustics and made sure they were heard by most of the congregation without any sound system. As the parishoners have aged and as their hearing has become weaker, as the attention span of young people has deteriorated and as the speaking ability of pastors has declined, not to mention the heavy foreign accents which are currently heard in some pastors' voices, these borderline places now have gone over the border and definitely need a few dBs of acoustic gain from the pulpit. This accounts for some new church sound systems.

The kinds of systems churches seem to be most happy with are unobtrusive an very simple to use, or completely unattended. Equipment manufacturers have responded with various new microphones, automatic mic mixers, time delays, fan-less

## THE BAD NEWS IS THAT THERE WILL ALSO BE MORE TECHNICALLY KNOWLEDGEABLE AMATEURS.

amplifiers, great-sounding speakers and computer design programs, all perfect to the task. But simplified high performance systems are not cheap, so selling the job has not been made any easier. Furthermore, the same manufacturers who have brought us these goodies to use are selling them now almost everywhere, making them more easily available to just about anyone who wants one. This provides more pitfalls for the well-meaning amateurs.

The problem is that a working knowledge of acoustics and plenty of experience is essential in order to make good use of these devices. Many churches have long reverberation times and, despite ads to the contrary, there are no simple hard and fast rules on solutions. The only quick fix I

## WHEN IT CAME TO THE MIC LINES, IT WAS IMPOSSIBLE, JUST TOO MUCH MARBLE EVERYWHERE!

know of, which sometimes works, is to shut off the sound system and tell the pastor to speak slowly.

Another reason high performance systems in churches are not cheap is because of the height at which loudspeakers often need to be installed. Overcoming gravity in getting speakers to reliably stay put at odd angles in all three dimensions, and at around 40 feet up in the air, is not quick and easy. And running cables to the speakers takes lots of time and skill because of the need to either penetrate very solid walls or artfully camouflage the cable along various surfaces. It's easy to underestimate. In one case we got the speakers up all right, but when it came to the mic lines, it was impossible. Just too much marble everywhere! So we put in six inexpensive wireless microphones in fixed locations, where needed. I call this a non-solution because it'll work for a while, only. Eventually the wireless units will have to be replaced with better ones, not to mention the constant battery replacement problem which will persist.

Some churches wisely hire consultants to write specifications which the church then puts out to bid. This reduces the risk of wasting their money, though it costs a little more up front. It's a good investment. While I've come across a few over-designed systems, most are right-on-the-money and I wish more church sound systems were designed by consultants. But don't think consultants have a picnic. We recently did a job which was originally designed three years ago by a consultant who estimated a $20,000 cost. His solution was fine. The church got bids which ranged between $20,000 and $25,000. They decided against spending the money and took someone else's advice in hiring a friend for $10,000. It took two years of suffering to realize that the solution was unacceptable. Did they then go back to the original consultant's recommendation? No; they hired another consultant, who they hoped would come up with a less expensive solution. When his solution cost $30,000, he was directed to cut it down, which he did, to $20,000. It was finally done for under $25,000.

## THESE BORDERLINE PLACES NOW HAVE GONE OVER THE BORDER AND DEFINITELY NEED A FEW DB'S OF ACOUSTIC GAIN FROM THE PULPIT.

Working in churches is great. It's quiet, not much interference from others, generally clean and a nice smelling environment, with people on their best behavior. Churches rarely go out of business, so an account will likely prove to be a long lasting association. Bills are generally paid on time and communications are excellent. It is possible to do one's best work there. It's no coincidence that some of man's greatest engineering, architectural and artistic expressions have been achieved in churches. So we have real precedent to follow. Unfortunately, standards have dropped and churches are not so special or important in our lives as they were. The concept of master and apprentice is insufficiently democratic today. So just about anyone can now get to do work in churches. The results speak for themselves. ■

# Trends in Church Sound

## *Consultants Find New Ways to Deal with New Design*

**BY BARRY McKINNON**

Identifying trends in church design is a bit like trying to describe trends in music. The variety of religious services that are available provide a wide range of church construction styles, all adapted to the needs of the religious denomination. With that caveat in mind, church designs are tending to fall into two categories: the traditional churches and the electronic church. That is not to say that the neighborhood church, which would not fit either category, does not exist anymore. Rather, it would be better to say that, of the type of churches seeking the services of acoustical consultants and sound system designers, they fall into the two general categories.

The two categories were well summarized by David Klepper of Klepper Marshall King Associates. Ltd. in White Plains, NY. Klepper said, "There are basically two kinds of churches, the traditional liturgical and the electronic." Klepper described the traditional church as often wanting fine pipe organs and a live and reverberant space so the congregation's voices can be heard. The purpose of the sound system is speech reinforcement. The electronic churches are getting more and more sophisticated sound systems; often the entire church is becoming a TV studio. "There are multiple mixes, one for TV, one for live sound and one for monitor and sound systems costing a million dollars," said Klepper. In describing their work in traditional churches, Jerry Marshall of KMK said, "Our philosophy is to design a totally hard space for the sake of musical acoustics and achieve speech intelligibility through sound system design." The approach on electronic churches is different,

**"Our philosophy is to design a totally hard space for the sake of musical acoustics and achieve speech intelligibility through sound system design."**

"Modern music churches have more of a Las Vegas acoustics," said Marshall.

Kurt Graffy of Paoletti Associates in San Francisco also identified the divergent demands of traditional churches. "Organ support and speech reinforcement are at the two opposite ends of the spectrum. Pick up any text from years ago and you'll find that discussed. In a traditional church it's important to have natural acoustics for the choir and the organ and they have a need for intelligible speech reinforcement." The long reverb times that the musical directors or minister of music find desirable for choir and organ is always at

odds with the design of small sound reinforcement systems with high intelligibility. Jim Carey of Jim Carey Associates in Nashville, Tennessee said, "Most of the churches we're dealing with have a shorter reverb time than a traditional church. It depends on how much say the organist gets. Obviously the organ people would like to see three to four seconds. Sound people have a hard time getting intelligibility in a two thousand seat room like that." High Q devices are never small, and the problem of where to locate these systems becomes a primary concern. David Eplee of Kirkegaard and Associates in Downers Grove, Illinois said, "The liturgy of the church and economics have an effect on reverb time. There's more attention being paid to sound system placement

**"Most of the churches we're dealing with have a shorter reverb time than a traditional church."**

so you can have the best of both worlds, the best development of musical acoustics plus speech intelligibility." Gary White of the Joiner-Rose Group in Dallas, Texas has found similar attitudes. "Churches are more accepting in where sound systems have to be located. More are saying, 'We hired you, if you say we have to put XYZ horn there, then we'll put it there.' "

There is no solid trend away from traditional design, even though other shapes are being built. Graffy said, "The last three churches I've worked on have been traditional cruciforms. The ones that are more performance oriented tend to be fan shaped. There is a tendency in new churches to do a thrust stage and one hundred and eighty degree seating which makes coverage a hard thing to achieve." The traditional church design perseveres, especially in parts of the country where the concern for historical buildings is high. In Boston, there is little new construction

compared to the renovation and restoration of old churches. Thomas Bouliane of Thomas G. Bouliane Audio and Acoustics in Boston, said, "We seem to be doing quite a bit of restoration work. Old church refits are often after improving musical acoustics by removing bad acoustical treatments of the past that were attempted to improve speech intelligibility." The speech intelligibility problems are being addressed through the sound systems, although in historical buildings there are few places to hide sound systems. Bouliane described the new construction market in the Boston area, "We do about twenty to twenty-five percent new church work. New churches are contemporary architecture, whether the denomination is two thousand years old or not. We recently did a Catholic church that looked almost evangelical."

The move to new shapes causes its own problems. Eplee said, "They are looking at geometric shapes to bring everyone in a bit closer, more of a story telling mode. This creates circles and fans and focusing surfaces. It's common across all denominations. It started with the Vatican II, that

**"The liturgy of the church and economics have an effect on reverb time."**

design opened the doors for Catholic churches to change from traditional designs." White sees the same developments. "What I've seen is even smaller ones going to some sort of fan shape to get more of an intimate feeling, bring people closer to the pulpit. The spread of side walls means you don't get any reinforcement from them." The move to shorter rooms have also led to an increase in the use of balconies. The balconies are often the cause of bad reflections back to the pulpit from the minister's voice or the sound system. Shadowing is a common problem, requiring the use of under-balcony systems. But the decision not to add balconies causes problems too. Eplee said, "There is a false impression that balconies cause a separation and disjointing of the space. They have tried to keep single level floors; this results in football field sized floors. You can't have changes like that without it affecting choir, organ and sound system placement." As the architects try to get large numbers of seats into a space that allows unaided viewing

of the pulpit, the move to fans and balconies is inevitable, as pointed out by Carey, "A church with 9100 seats means being fan shaped and having balconies."

The sound systems for large churches are undergoing some changes. Instead of the ubiquitous central cluster, a split cluster system with delays is becoming popular. Graffy said, "Split clusters minimize the power to any one and keep the reverb excitation down without having to go to really Hi Q devices." Carey shares that belief. "We've adopted the philosophy of trying to keep people as close as possible to a speaker. A ten thousand seat space with a central cluster won't work."

## "We recently did a Catholic church that looked almost evangelical."

The electronic churches are becoming more and more elaborate in their technical requirements, which of course impacts the room design and the resulting sound system and A/V design. Chris Janssen of the Joiner-Rose Group specializes in big charismatic churches, and he's seen the growth of the technology in these buildings. Janssen said, "There's a big trend towards theatrical production being used in services and Easter and Christmas concerts. Architecturally speaking, there's more focus on the stage, and we call it a stage deliberately." Janssen indicated that the priority of lighting demands and even the inclusion of full flyspaces over the stage, with motorized rigging in some cases, has affected the design of the space. "In effect we're looking at medium to low level theater," said Janssen. Graffy has seen the same trend develop, "Some churches are essentially performing arts centres, although those are still probably the exception rather than the rule."

The acoustic design of the church with a stage entails a different view. Janssen said, "We treat them as two spaces, the stage and the room. The stage is very dead; we use the flyspace to absorb sound." Absorbent gobos are used on the stage, soft materials installed in the flyspace. Hard surfaces are used near the choir, string sections and piano to direct the sound to microphones, not to the audience. The dead space does mean the choir will never sing unaided by amplification. This is one of the principle differences between traditional and electronic churches. The room is left moderately live to allow the congregation to be reinforced. Janssen said, "The roof of these buildings is generally pretty absorbent, and most are carpeted and have padded pews. We're increasingly trying to provide reflections from the ceiling to reinforce the congregation."

The need to provide the feeling of involvement for the congregation and provide speech intelligibility are again at odds with one another. Graffy said, "Electronic churches don't usually have a dead space; they're usually of medium reverb time, not as dry as you think you'd like them to be." Graffy has been using Hi Q speech systems with lower Q satellite clusters for choir and playback to try to achieve the balance. "Hi Q systems can sound unnatural for playback and music," said Graffy. The vocal intelligibility is critical, as Janssen explains. "It's a high priority to mix the vocal in the PA pretty strong." The lead singer and the backup singers need to come across to allow the congregation to keep in sync in charismatic services. "Charismatic people are very aware of the importance of sound to quality of worship," said Janssen.

The bandwidth of church sound systems for electronic churches has grown. The advent of MIDI based instrumentation has extended the required low frequency re-

sponse considerably. Carey said, "I don't think we've done a design in three years that hasn't had subwoofers." The subwoofer has become standard equipment for Graffy as well. "We're using three- and four-way systems, often with dedicated subs. It often used to be that a sub would be on a send to use as an effect. Now they have enough of a signal that they can use it all the time."

Recording and broadcast facilities are showing up in electronic churches regularly and even occasionally in traditional churches. Bouliane said, "There are not many broadcast ministries in the Northeast. The recording here allows the minister to monitor his own sermons and produce tapes for shut-ins." The charismatic churches are using more recording and broadcast equipment. White said, "More and more people are getting into broadcast. The Pentecostal and Baptist churches, if not doing video, are doing radio and tape ministries." This appears to be a definite trend. Carey said, "We haven't done a church in a long while that didn't have a broadcast production room, if for no other reason than to get a decent cassette. A good portion are doing live broadcast or cable broadcast." These churches are often using sophisticated video projection and production equipment for the services, Janssen said. "Most of these churches have full time production staff."

The churches are still generally reluctant to deal with acoustical problems at the design stage, and even less so at the construction stage, when the cost is determined. Carey said, "Selling acoustical treatment is still a battle. It's the nature of the way churches are being built. Every town has two or three church design and build companies. There's no place to plug in an acoustician or sound system designer. If the acoustics turn out good, it's an accident." The problem is one of customer's awareness of the importance of the integrated design of room acoustics and the sound system design. Carey said, "I don't know how to educate the churches to the need for acoustical design with the current design/build trends. Some design/builders are actually telling the churches not to waste their money on acoustical design." This is hardly a new trend. Churches have been ignoring acoustical problems as long as they have put sound systems in them. White said, "We get involved with some design/build people that have realized the need for acoustical design. The architect often says we cost them a lot of money, but it's really

money well spent, the materials and the treatment will make the room better." The early design input can be cost effective, as Carey pointed out, "You can make compromises and changes that will actually pay for the acoustician."

The acoustical problems created by bad room geometry need to be dealt with very early. Carey said, "If the problem is with room geometry, it will be there till they build a new building. Building corrections during construction cost a bunch, change orders are where the contractors make their money." Just how much influence the consultant may have at the design stage can be limited. Graffy said, "A lot depends on the architect; they're the ones that come back and say you will not have it. It's always dangerous to be generalist about that; some people are very good about that." The architects can learn to anticipate the acoustical requirements and actually provide some latitude in their designs. Some designs are more conducive to changes. Eplee said, "In a church of unusual geometry, angled walls are more acceptable to an architect than in a traditional design."

Specific types of treatment are becoming more commonplace. The use of diffusion is more accepted now, even demanded in some applications. Eplee said, "Diffusion is definitely something we're doing. With fan shaped churches, diffusion is an absolute given, it has to be there." In large rooms, the use of diffusion has its drawbacks too. By using diffusion at the sound source you get less acoustic reinforcement in the seats further back. As Graffy said, "Once you've diffused it, you've lost it," referring to the sound energy packet as something that can be controlled and 'pointed' to other areas. Absorption is being applied to specific problem areas, rather than to reduce the room's liveness overall. Janssen said, "The reverb time doesn't concern us as much as specular reflections, all surfaces the sound system points at are dead."

While some trends are hard to pin down, most everyone agreed on the trend to more easily embrace the need for technology. Graffy said, "The trend is not so much in architecture or hardware but in the expectations of the end users. There's more awareness and more critical appreciation for good sound." That thought was echoed by Carey, "I think the trend, in a nutshell, is to more sophisticated systems because the audience is more sophisticated." And the sophistication is extending to the people running the equipment, according to Janssen, "There's a trend towards more sophisticated operators." ■

# An Invisible Sound System

## *Intelligibility in a National Shrine*

**BY L. RICHARD FELD**

George Washington and Benjamin Franklin worshiped at Christ Church of Philadelphia. Seven signers of the Declaration of Independence worshiped here and are buried here. In 1990 alone, 100,000 tourists visited this monument to the events of the American Revolution.

The church was founded in 1695. The present building, completed in 1747, has been designated a national shrine by an act of Congress, and it would take literally another act of Congress to change the interior. The only lighting fixture in the nave is a 216-year-old chandelier that holds 24 candles. There is no air conditioning. You walk in and blink your eyes, and you are back in the Eighteenth Century.

The intelligibility of the rector's voice is considerably better than it was in George Washington's day. Since July 1990, Christ Church has had a most unique system of sound reinforcement. It is an evenly distributed system, invisible save for the slimline microphones. Low-power transducers have been attached to the insides of various structures. The sound is excellent from the gilded pulpit to the last pew, still reserved for President Washington, and no loudspeakers can be seen. Anywhere!

Thirty hidden transducers cause certain surfaces to radiate sound. Fourteen are attached to 2-foot × 2-foot panels ¾-inch birch plywood which we set into the ceiling beneath the balcony, then plastered, canvased over and painted. Two are attached to the 243-year-old wood inside the caps of each of our columns. Four are attached to the inner surfaces of the 243-year-old fascia panels on each of the two sided balconies. There are no surface holes. There is no apparent source of sound, other than the actual talker.

*In the pulpit, the microphone is unobtrusive.*

But the spoken word can clearly be heard and understood. Every seated listener is within critical distance of a transducer. Each transducer covering the main section of the sanctuary causes 150 sq. in. (or more) of balcony fascia surface material to radiate. The under balcony devices radiate over five hundred square inches. Very little displacement is needed; the distortion is low and the sound is natural. The Shure microphones selected (from many candidates) produce a most natural sound; and the IRP signal-processing system allows so little coloration that the listener is unaware that a sound system even exists.

The room is acoustically live. It carries music beautifully. The sound system carries only speech, and is designed accordingly. To overcome the noise of downtown Philadelphia (especially in summer, when the windows and doors are open), we have included a Symetrix SPC571 ambient-noise sensing controller. It automatically raises or lowers the volume in response to the noise-level changes.

With its automatic mixing, automatic gain control and automatic ambient-noise level control, the sound system has no manual user control except for a small, wall-mounted box with the words "sound system" and a pushbutton. Pushing it actuates an FSR automatic ac switcher, which sequentially powers the system up or down. The equipment rack is kept locked. At the church's request, Tekcom has taken sole custody of the keys.

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*L. Richard Feld is president of Tekcom Corporation in Philadelphia.*

*Christ Church of Philadelphia.*

Tekcom assured the church that the system's cost would not exceed $40,000. It did not. That included the cost of in-shop testing and research to determine the ideal combination of transducer, material and adhesive. The system was installed in June and July 1990, when tourist groups were coming through every 30 minutes or so, and power tools were silenced during the tour guides' lectures.

This whole project became a labor of love as well as a technical challenge. No one, to our knowledge, had done a distributed sound system using this type of transducer, anywhere. At least two consultants insisted that it could not be done. One consultant said it could be done: a regular associate, Jesse Klapholz, performed the electro-acoustic design and final system tuning.

**In 1990 alone, 100,000 tourists visited this monument to the events of American Revolution.**

In operation, transducer-and-wood speakers are basically no different than conventional direct-radiating devices. What is important here is that every listener must be within critical distance. At Christ Church of Philadelphia, this goal has been accomplished.

### AN OPEN INTERIOR

In the 56 × 72 foot interior area, the balcony extends 12 feet outward from the two sides and the rear, leaving a 32 x 60 foot open area that includes the aisle. Ceiling height rises from 28 feet at the sides to 46 feet at the center. Reverberation time is slightly under 2 seconds. A point of interest: The columns are built around tree trunks, which still have their bark. It was an intimidating experience, pulling wire and cable through construction materials over two centuries old, with almost a half day spent getting one cable run down the inside of one of the "tree-columns."

The church's historian and business manager, Bruce Gill, reports that intelligibility has always been a problem. Numerous sound systems have been attempted there, over the last 40 years. The latest before Tekcom (using an off-the-shelf powered mixer and a pair of full-range speakers) may have exacerbated the reverberation problem. This clearly was the time for a unique approach; albeit a gutsy one.

When a member of the Tekcom design team suggested radiating sound from existing structures, there was a profound silence. We were intrigued, and elected to give it a try. He then explained that many years earlier, he had worked for a hi-fi electronics manufacturer where some experiments were performed with certain transducers, the name of which he could not recall. Some checking around produced the vendor, Rolen Star. It seems that these devices have been around for years and employed in obscure applications, one of which is for masking speech in American embassy office windows around the world.

**You walk in and blink your eyes, and you are back in the Eighteenth Century.**

We ordered several makes and types of transducers, several species and thicknesses of plywood, and spent many days of experimentation. We considered solid lumber and hardboard as well, considered various means of fastening the wood to the transducers, invented mounting devices that went into the wastebasket, scrapped $800 worth of wood because it didn't sound right; and made baffle structures in an attempt to determine how the transducers would sound in place. At the church, we listened to the sound of transducers on the column caps and fascia panels.

*You can see where we set four panels into the under-balcony ceiling. Then we patched them with plaster, canvas and paint. If you visit the church soon and look closely, you may be able to see the panels' outlines, which will disappear with age and repainting.*

The client's hands-on help was invaluable. Bruce Gill was familiar with every

nook and cranny in the building. He oversaw the lifting and replacement of the balcony floorboards, where the wiring was run to every transducer. This information and support dramatically lessened the time necessary for the installation.

**There is no apparent source of sound, other than the actual talker.**

### SIGNAL PATH

Shure SM99 microphones are at the cupola, lectern, the two readers' desks, and at the rear of the chancel. Their output goes through two Industrial Research Products (IRP) DJ-4114 Voice-Matic microphone-mixers, which feed their summed signal into a DJ-4115 Voice-Matic master. These are reliable, well behaved mixers, seamlessly shutting off the inactive mics and turning on the active mic, thereby minimizing ambient noise and maximizing gain without feedback. The closed gates have high thresholds, preventing the input of music from the organ and choir, which are at the end of the church opposite the chancel. The mixers and six other components here are units of System 41, IRP's compact, modular signal-processing system. System 41 has been used in four of our installations and our expectations are to use it in many more. It is cost-effective, real-estate-effective, clean and elegant.

**The listener is unaware that a sound system even exists.**

The lavalier microphones' output (wired at the baptismal font, wireless elsewhere) is routed through a DJ-4106 notch filter, which is tuned for best gain before feedback. The DJ-4109 Level-Matic gain control automatically lifts for a soft voice and lowers for a strong voice; two or three people lead a typical service. Equalization is accomplished by a DJ-4117 29-band transversal equalizer, whose output goes to a Symetrix 571 ambient-noise-sensing unit. Its microphone is at the back of the church, near the ceiling.

*In the chancel, the microphones are barely visible.*

For delay, the signal re-enters System 41 and uses the four taps of the DJ-4132 basic delay unit and its DJ-4133 delay-output expansion unit. Each tap feeds a channel of a Crown CT-400 power amplifier, and each amplifier output channel feeds seven or eight transducers. Most are tapped at 16 or 32 watts; the eight that are farthest from the chancel are tapped at 32 watts (Soundolier HT327 transformers). In addition to the 30 transducers, there is a 4 inch speaker in the curio shop in the narthex (at the rear of the church) and a 4 inch monitor speaker in the rack.

**The columns are built around tree trunks, which still have their bark.**

The church's only user control (the red pushbutton mentioned earlier) actuates an FSR power-distribution system. In sequence, it powers up the System 41 mainframe, the noise-sensing system and the amplifiers. In reverse sequence, it powers them down.

When one sits in the middle of the nave, speech is heard from the resonation of the quarter-inch balcony fascia panels. Sitting beneath the balcony, speech is heard from the resonation of three-quarter-inch birch plywood panels. Speech information for the balconies originates from the resonation of the poplar column-caps. The sound in each area is slightly different. We could have made it more consistent by dedicating an equalizer to each zone, but the additional expenditure would not have been worthwhile, as people do not tend to move around while in church.

*The sound-system wiring is under the balcony floorboards. Each transducer makes a home run to a junction box near the balcony.*

Looking carefully in bright light under the balcony, only the installers may be able to see the vague outlines of the plywood panels above the painted canvas and plaster. We expect they will gradually disappear with time and grime, to become as invisible as the rest of the system. Invisible but effective.

**Speech information for the balconies originates from the resonation of the poplar column-caps.**

When only a few of the transducers were in, the installation crew and some church people started speaking through the microphones. That was an exciting moment: We and the church people looked at each other and said, "This is it!" None of us anticipated its sounding that good, even before we touched the equalizer.

The sound system's first users were the staff people who address the many visiting

**Only the installers may be able to see the vague outlines of the plywood panels above the painted canas and plaster.**

groups of tourists. One staff person claims the system has saved her from losing her voice, a real concern. Services are conducted every Wednesday at noon, and twice on Sundays. Comments from congregants and clergy have been consistently favorable.

Many distinguished speakers, including Presidents and, recently, the Archbishop of Canterbury, have occupied the pulpit at Christ Church. Now, for the first time, they can be assured of even coverage and excellent intelligibility at this unique religious institution of America history. ■

# Aesthetics and Acoustics

## *Construction at the Manhattan School of Music*

**BY MALCOLM HOWARD**

When two veterans of rock recording studios shook hands on plans for a facility that would act as both a digital recording studio and recital hall for a respected music conservatory, they knew they would have to test the basic tenets of good design.

The dual nature of Manhattan School of Music's Myers Recital Hall would test whether the sum of the parts — the recording studio and the recital hall — could add up greater than the whole. This apparently lopsided equation is a basic concept of good architecture: synergy. The different parts of a room, or building, mesh to create more than is apparently visible.

To accomplish synergy at Myers Recital Hall, it had to be acoustically flexible enough to project non-amplified performances clearly and brightly to the back of the 20-by-40-foot room. It must also be "dead" enough to record six-piece jazz ensembles onto digital two-track tape machines.

"The primary purpose of the room is as a recital hall," said designer John Storyk, of the Walters-Storyk Design Group, Inc. of New Paltz, New York. "So it had to be bright enough to be a recital hall, but there still had to be enough deadness for a recording studio."

### "EXPERIENCED" SYNERGY

Aside from acoustical synergy, there was a healthy sum of industry experience on the job. Storyk and partner Beth Walters' client in this case was Jim Marron, a longtime associate who first synergized with Storyk in 1969 when Jimi Hendrix's Electric Lady Studios was built in Manhattan. The pair also worked together on commercial post production facilities for Howard Schwartz Recording in 1987.

**The different parts of a room, or building, mesh to create more than is apparently visible.**

Marron's career led him to Bearsville, where he was manager, and to The Record Plant, where he was vice president and general manager. But Marron is now the facilities director for Manahattan School of Music (MSM) who spearheaded the studio project.

The Charles Myers installation also turned out to be an example of two partners whose contributions tallied up greater than the whole: Storyk and Walters (a husband-and- wife team who merged their businesses last year) worked hand-in-hand on the recital hall aesthetics, as well as on a complete renovation and redesign of MSM's student center lounge, lobby, cafeteria and commons. Construction on the roughly $150,000 project started as soon as students left for summer and was completed before their return in September, said Walters.

Walters' background as a textiles, display and gallery designer enhanced Storyk's acoustical and architectural expertise, the couple said. Aside from Electric Lady, his first studio design, Storyk designed the eclectic Margarita Mix in Los Angeles, Full Sail Recording Center For The Recording Arts, Commercial Post, Platinum Post in Orlando, Florida, and Whitney Houston's home studio, to name just of few of his more recent projects. Working as a team also gives them more control over the final product, because less work needs to be farmed out, the couple said.

MSM brought in another Storyk associate, Bob Spangler of Susquehanna Sound in North Umberland, Pennsylvania, as a general contractor and carpenter. Fleet Mechanical handled heating, ventilation,

and air conditioning (HVAC) while electrical installation was handled by Bob Wolsch. Marcy Ramos was the HVAC design engineer.

Originally built by The Juilliard School — the former occupant — the studio was already wired for synergy: It can record live performances piped in from any of conservatory's four other recital halls. But an endowment from Blake Byrne, the cousin of deceased alumn Charles Myers, allowed the school to turn an unisolated, 40-foot-by-20-foot room into a noise-free environment ideal for listening and recording. Now, MSM engineer Bill Seigmund can promise digital-quality acoustics for students using the recital hall to cut a demo, while recording up to two other recitals simultaneously. "We've done a triple," said Seigmund, who now uses two eight-channel Soundcraft boards to record the various student performances onto two-track digital Beta tapes or DAT.

*Architect's rendering of performance hall.*

## ACOUSTICAL SYNERGY

To accomplish acoustical synergy, Walters-Storyk used zone diffusion, modifying the walls and ceilings to reflect sound toward the audience in a diffused pattern before the listeners hear an echo from the back wall.

Achieving this was not necessarily difficult, but it did require complete overhaul. "The igatone nodes were very good," Storyk said of the acoustics in the pre-renovated room. "And the x-y-z ratios were good."

Still, there were some conflicts he'd have to live with.

"As a recording studio, I would have chosen not to have a stage," Storyk said. "But as a recital hall, you have to have one."

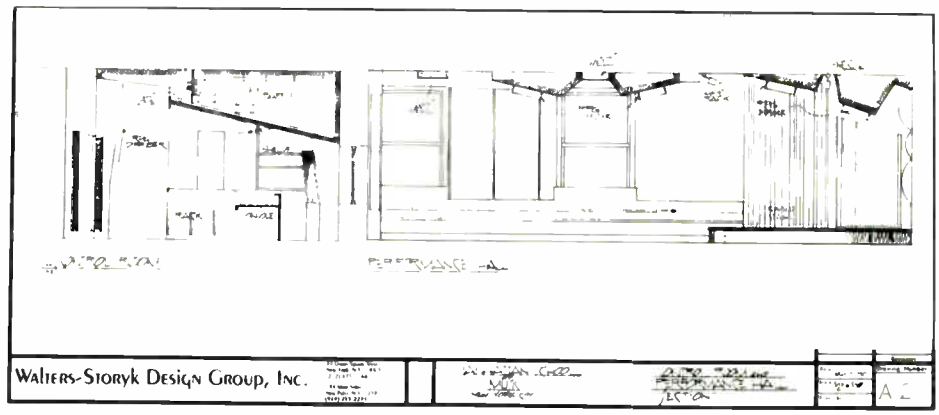
Storyk's basic task, therefore, was to diffuse the reflected sound enough to "cut down early and secondary reflections to a minimum and make sure there are no built-up hot spots."

But first there had to be isolation — both from outside noise and from a two-ton air conditioning unit installed on the left side of the stage. The architect built an inside skin around all walls and housed the AC in its own sound-isolated, closet sized room. Across the stage is a similar structure, added for geometry, Storyk said. After the room was isolated, sound measurements on stage only a few feet from the operating AC were NC 25, Storyk said.

Then came the challenge of creating the perfect acoustical environment for both the solitary soprano and the six-person jazz jam. The room would "remain pretty bright at the back of the room" during live performance. Storyk didn't want too much absorption, so he stategically added architectural touches — angular indents in the ceiling and products from RPG Diffusors — designed to evenly spray the sound through the hall.

Fortunately for Walters-Storyk, the Myers Recital Hall already had polycylindricals, wooden surfaces contoured like waves that eliminate much of the reflection of the otherwise reflective, parallel walls. This eliminated the problem of having to diffuse sound from the side walls.

The main challenge, therefore, was to diffuse the sound bouncing out from the stage. Storyk used two RPG Diffusors that tuned — opened and closed slightly like large doors — for various acoustical needs.




*Control room and performance hall sections.*

The Diffusors have two sides: The back side is an RPG Abffusor, designed essentially to absorb sound waves, and on the oppsosite side, facing out toward the audience, is a Quadratic Residue Diffusor, also a trademark of RPG.

By swaying the center of the Diffusors forward like opening a door, there's "a certain amount of absorption taking place," said Dr. Peter D'Antonio, president of RPG Diffusors. The ability to "tune" the stage — make it brighter or less bright — might come in handy if the engineer needed more absorption or "deadness" on stage when recording, noted D'Antonio.

The basic concept behind the QRD Diffussors is simple, he said.

"If you shine a light at a flat mirror, the light is going to bounce to a single place," said D'Antonio. "Now, if you carry the light anology a little further, and the light hits a [mirror shaped like a] Quadratic Residue Diffuser, it spreads out across the audience. . . . QRD diffusors have a polar pattern that is essentially a semi-circle. Sound is distributed uniformly in all directions."

By assembling wooden blocks of varying lengths into large surfaces — pockmarked with rectangular caverns between the blocks — the Diffussors add the appropriate delay to specific frequencies. When the sound waves are sent back to the audience, therefore, all frequencies arrive at once. The Diffussors essentially add delay to the fast-moving high frequencies that can travel in to the caverns between the blocks. Slower moving low frequencies do not travel into the wooden caves and are reflected back with less delay.

"Sound striking from any direction is uniformly scattered in many, many directions, independent of the angle of incidence and the frequency," D'Antonio said. "From bass to treble, they all scatter equally. . . . Other surfaces, such as statues, scatter high frequencies well, but not low frequencies. A Diffusor handles all frequencies equally."

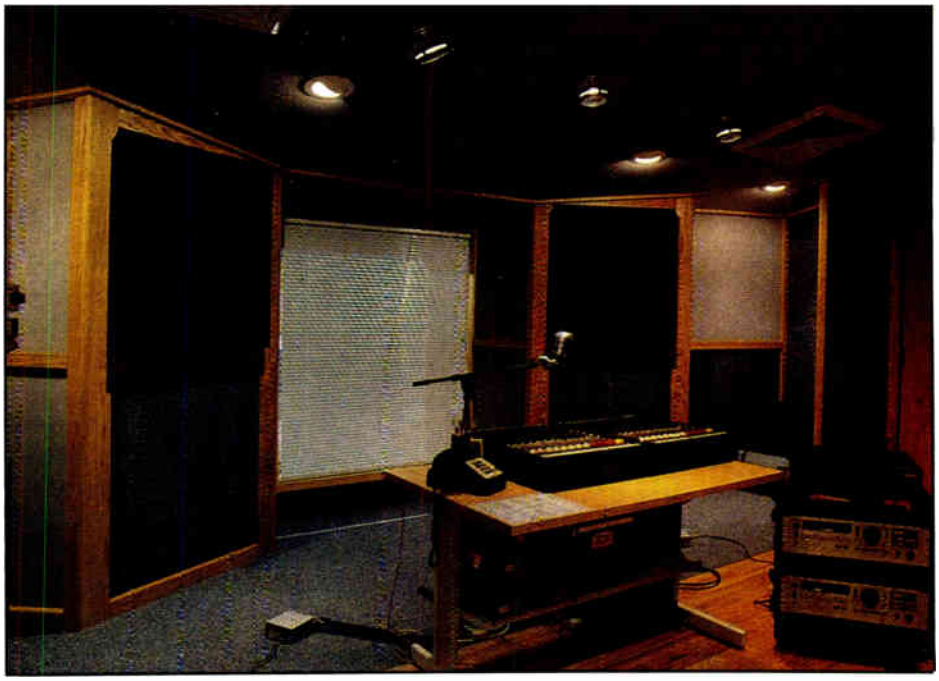
Aside from their acoustical properties, the natural wood-toned Diffusors add a nice aesthetic touch, Storyk noted. Despite some of the negative acoustical properties of glass, Storyk decided not to cover two large windows on one side of the room. "It was just too nice a view," Storyk said, noting a grassy yard and colorful fall leaves outside.

Because the sound was already diffused enough, Storyk felt that the flat back wall was also acceptable as is. During most performances, the back row listeners would still be a good five to ten feet from the wall, and they'd be hearing evenly diffused sound coming from all sides, he noted.

"The back wall is not that damaging," he added "If it's really crowded and people are packed against the back, they might get some bright spots, but not much."

## THE CONTROL ROOM

In the 18-by-20-foot control room — officially dubbed the Charles Myers Recording Studio — the designer must create a reflection-free zone for the engineer and producer sitting behind the console, D'Antonio said. That means little or no reflection from the front and side, so the true image of the recording comes through, not the idiosyncrasies of the room.



*The 18-foot by 20-foot Charles Myers Recording Studio.*

*The Charles Myers Recital Hall/Studio at the Manhattan School of Music.*

Behind the engineer, there must be some reflection, but it's desirable if that sound is diffused so that the "sweet spot" behind the console is broadened, D'Antonio said. That way, the engineer and producer are hearing the same mix. Ultimately, two RPG Diffusors were placed behind the engineer's left and right shoulders.

To make the front and sides absorptive, D'Antonio used gradual density fiberglass which reflects less sound than standard fiberglass, D'Antonio claimed. The top layer is softer and absorbs higher frequencies while the deeper, harder layers soak up the low frequencies being projected by two Urei/JBL 813 C monitors.

MSM engineer Bill Seigmund is using two Soundcraft 8-channel boards to adjust levels from the various performances, though Marron is seeking a larger console as a donation to the non-profit school. Student recitals are generally being recorded onto Sony PCM-601 Beta recorders via a Nakamichi DMP-100 encoder. The control room also sports six cassette dubbing decks — extra copies of the student's performaces for Mom and Dad — as well as a Panasonic SV-3700 DAT recorder. Myers Studio uses two Urei 6290 amps to power the speakers.

## AESTHETIC SYNERGY

Ultimately, the studio/recital hall's visual appeal must mesh with its environment and the people working, performing and listening there. There is little room for visual distraction in the highly particular workplace of the recording studio and the highly concentrated atmosphere of a classical performance.

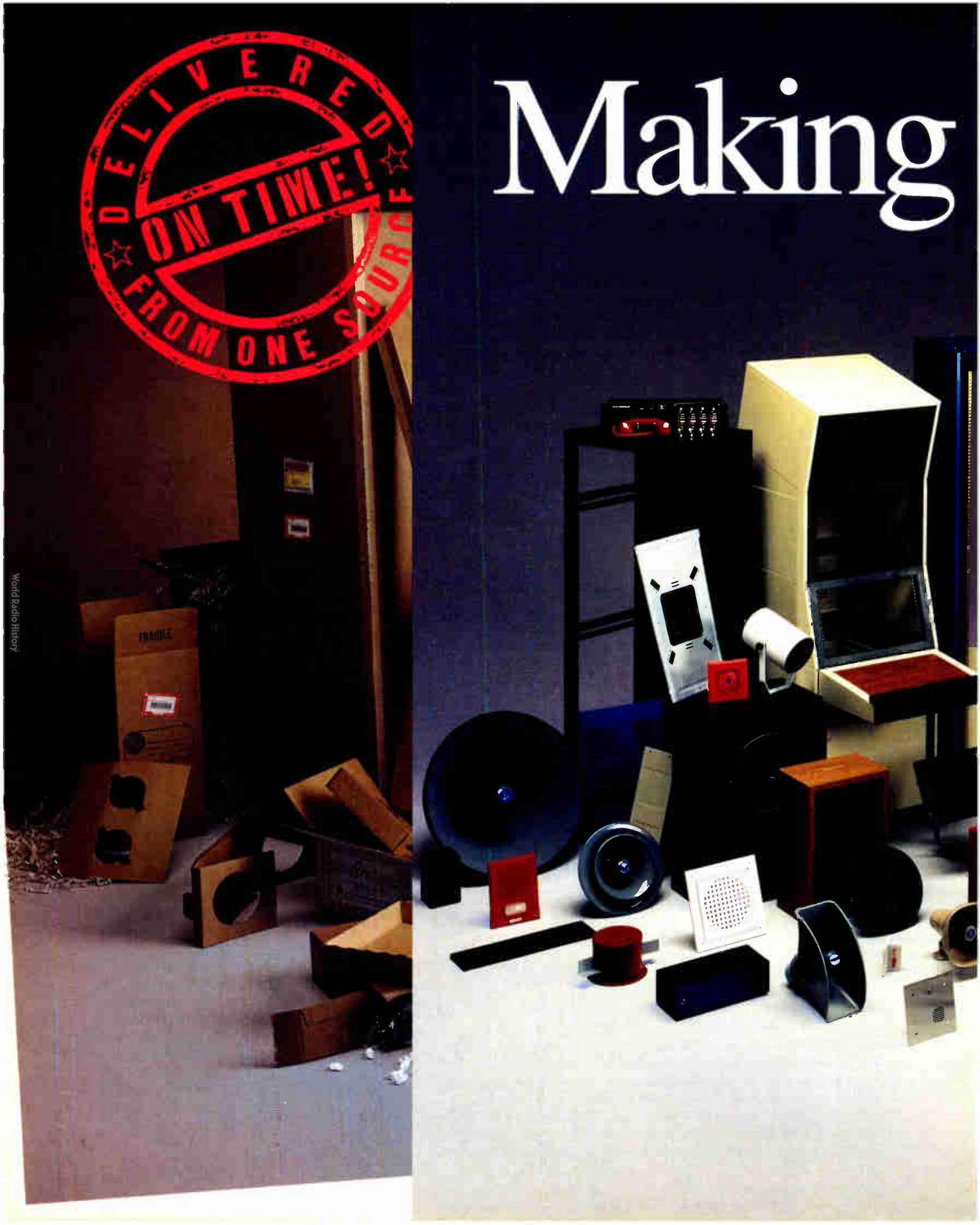
Like their other recent installs (Admusic in Burbank, California; a new audio suite at Crawford Post Production, Inc.; an expansion at Full Sail Center for the Recording Arts; and a new post-production suite for Howard Schwartz Recording), this job is drawing on the synergy of partnership.

"Every project now has to do with both of us," said Walters. "It's an advantage because otherwise, the client has to go to another interior designer, or the contractor would have to go outside. This way, we have more control."

The team worked together on "100 percent" of the aesthetic desicions, though Walters was essentially in charge of visual aspects of all the surfaces. "She's a much better colorist than I am," Storyk said. Still, he downplayed the notion that there is a consistent visual trademark of a Walters-Storyk design.

"Sure I have my own personal touches. but in general, I try to respond to each project and its needs," Storyk said. "In this case, we were looking at putting in a modern control room that looks out into recital hall atmosphere. All this is housed in a very traditional, old-style, and very famous building. That in itself moved our aesthetic decisions in a certain direction. . . . We were not going to put Florida colors into this one. We picked up colors from the marble in the hallways."

"There were the big pieces of glass there, too, but because the view was worth looking at, we kept them," he added. "We try to respond to the space." ■



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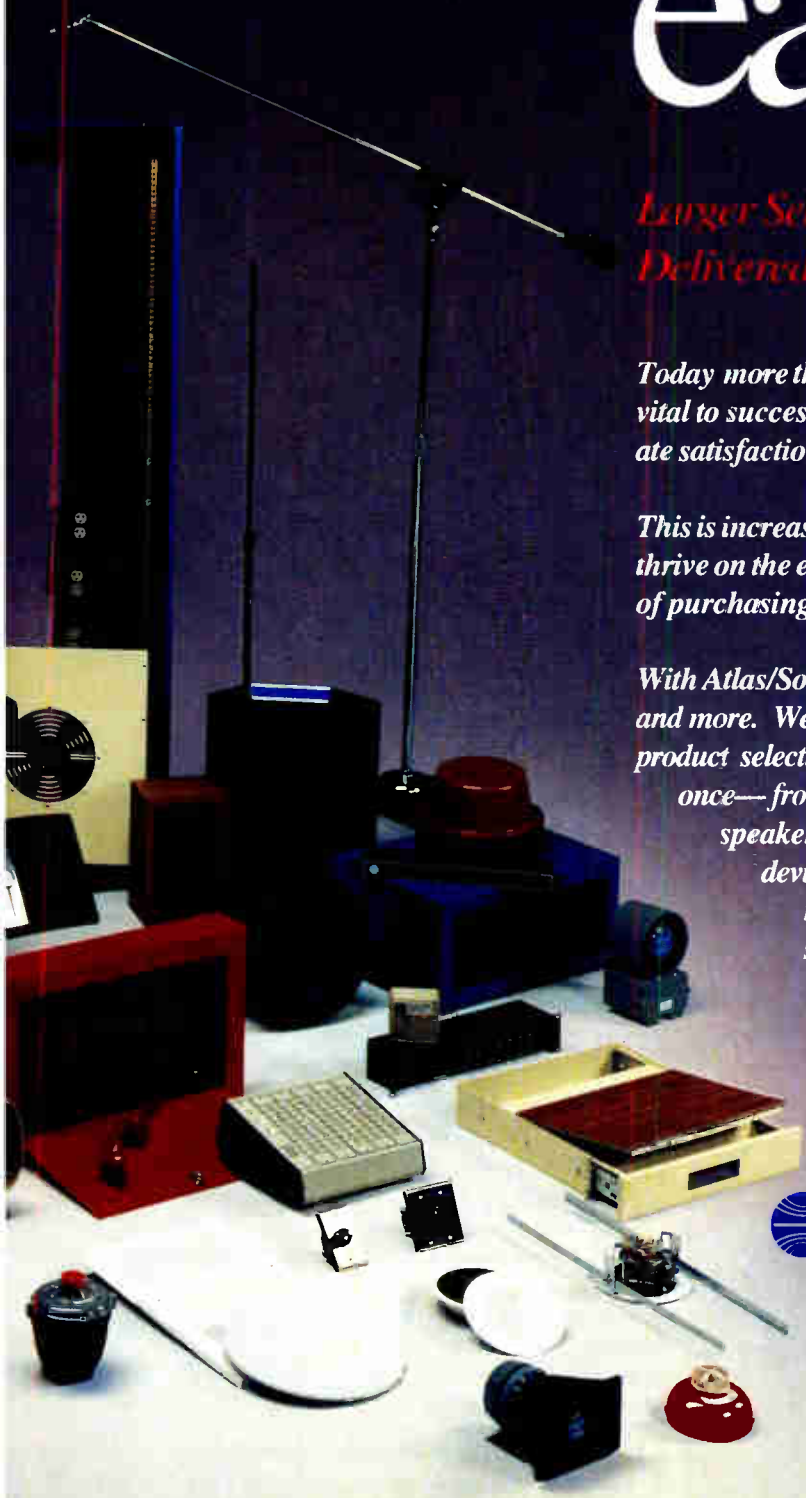

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# Fashion in a Flush Mount

## *In-Wall Speakers*

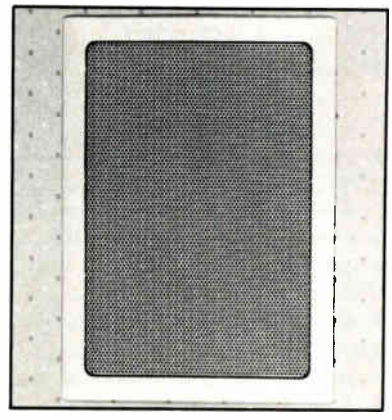
**BY PAMELA MICHAEL**

*Architecture begins where engineering ends.*
—Walter Gropius
*Less is more.*
—Mies van der Rohe

When it comes to architecture and interior design — in other words, to aesthetics — less is often more: A clean, uncluttered space usually improves the form and functionality of a room. Decorators and sound contractors have known this for years, and accordingly, have devoted much money and ingenuity to making speakers disappear—hiding them, making them smaller, and eventually, concealing them in ceilings and walls. Traditionally, due to differences in construction and materials, speakers used in commercial situations tended to be installed in the ceiling, and speakers used in residential jobs were generally recessed into the wall. The workings of wall speakers and ceiling speakers are pretty much the same: nothing metaphysical happens when you shift over about a foot down from ceiling to wall.

There are really no substantial differences between the two types ... unless you consider price. Until recently, with few exceptions, ceiling speakers were cheap and wall speakers were pricey — and in the case of wall speakers, "less" *cost* more. So, for many years, recessed wall speakers were confined mostly to audiophile, custom residential installations. Since the client was willing to pay a premium for style and good sound, high grade components were the standard, indeed, the only option. Lack of lower cost options didn't matter much — clients were buying a couple of $400 speakers for their living room, not hundreds of them for their hotel.

John McKinney, Sound Application Engineer for Bogen, believes that differences in dispersion patterns in wall speakers versus ceiling provide a disincentive for sound contractors to use wall speakers. "The problem is," he said, "that a wall-mounted speaker tends to be not as dispersed as a ceiling speaker. If you mount it in or on a wall, it's just going to project across the room, whereas a ceiling speaker projects down in a circle, covering a much larger area." McKinney cautioned that the dispersion patterns of ceiling speakers versus wall speakers often result in a need for more wall speakers to get the same coverage. Not everyone would agree with this assessment — it would seem to depend somewhat on which wall speaker as opposed to which ceiling speaker was used.



*PSB's HW-1 In-Wall speaker system.*

Another factor in choosing between wall or ceiling speakers is whether stereo or mono input is required — ceiling speakers are almost uniformly used monaurally, while wall speakers are more appropriately stereo.

As with any expanding market for a "luxury" item, eventually someone says, "Hey, if I can make these for less, more people will be able to buy them and I'll sell a lot of them." Twenty-dollar versions of $200 wall speakers with 60 — 70 percent of the performance became a reality, thanks to off-shore firms that tooled plates for OEM sales to companies who then add their own standard or specialized components.

Once wall speakers were an expensive hi-fi approach to sound system design. Now companies like Atlas/Soundolier, CSI, MG and International C are offering cost effective wall speakers for about the price of ceiling speakers. CSI (Speco) feels the market is becoming very competitive, according to National Sales Manager Eric Forman. CSI manufactures easy to install, inexpensive products mainly for the residential market. For the commercial market, they are fielding a new in-wall speaker (the SP 502T) with 70v transformer, and are working on an 8-inch due out shortly, the SP 902. No back boxes yet, but they do have a whole line of associated controls — attenuators and such.

Portland Instrument also has 70 volt models available. Their Paramount Series

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The wide dispersion dome tweeter in the SH2020 gives you much more flexibility of placement than that offered by conventional wall-mount or ceiling-mount units. When used in tandem with Model SH2510 Sub-woofer, true fidelity is reproduced across the entire sonic spectrum.

In fact, the music reproduction is so good, these Fostex systems, unlike typical wall-mounts, can be installed in homes as the primary music system--so they're ideal for surround sound entertainment centers.

Fostex In-Wall speaker systems are also perfect for offices, restaurants, hotel lobbies and other commercial applications for background music sources. Their outstanding clarity makes them ideal as public address speakers for halls and meeting rooms. Their thin profile, designed for recessed mounting in walls and ceilings, plus a unique "cam action" mounting method requiring no external screws, make them the easiest to install in standard 2 x 4 stud construction.

Space is already provided for in-line transformers when multiple SH2020 units are used in larger systems. When two SH2020s are wired to the SH2510 you have a full response stereo system which rivals that of many high end (and often visually unappealing) speaker systems. You can take advantage of the human ear's low directional sensitivity to bass response and position the SH2510 with a great degree of freedom--it does not need to be contiguous to the SH2020s.

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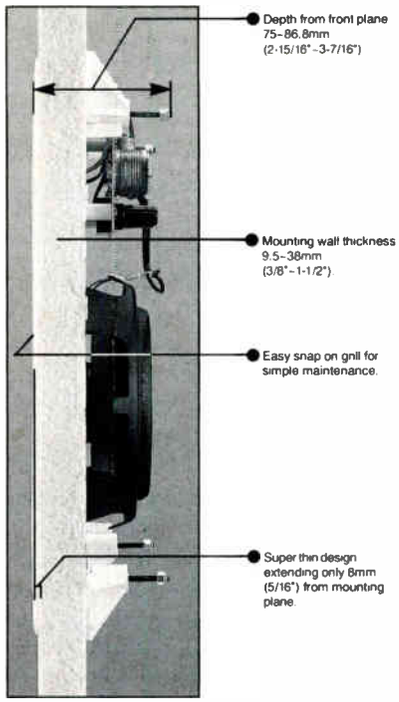



Photo: SH2020

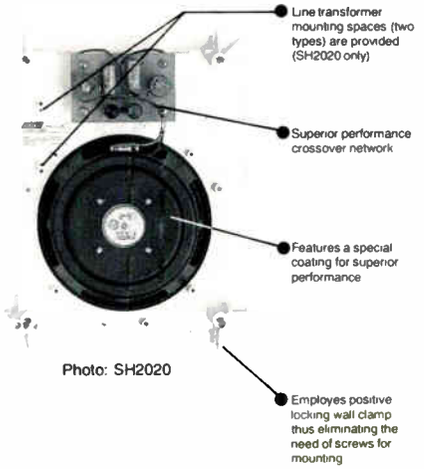
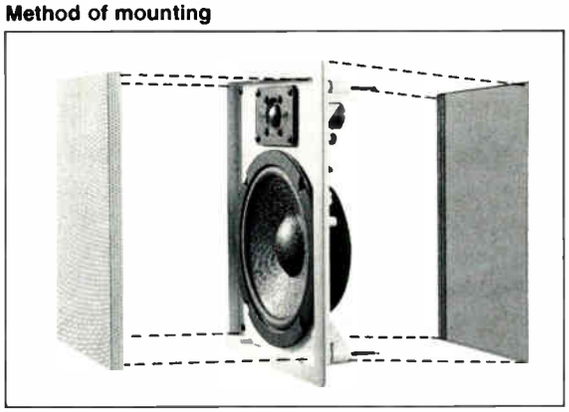
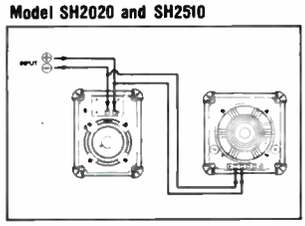



Photo: SH2020

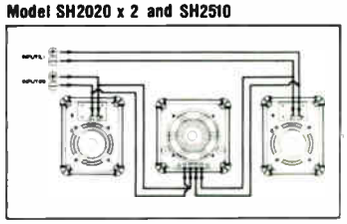
**Method of mounting**



**Model SH2020 and SH2510**



**Model SH2020 x 2 and SH2510**



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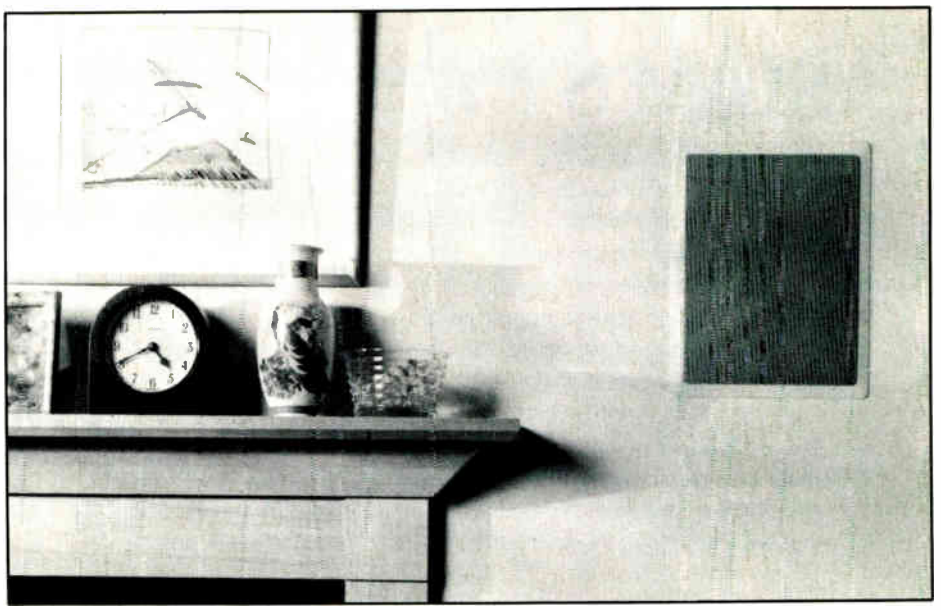
give a choice of oak or paint-ready frame and fabric or metal grilles. The line also includes two in-wall subwoofers, the Tech 6-1C and the Tech 6-2C, which have low Vas (tighter suspension), a help in stabilizing resonant frequencies in a wide range of enclosure sizes.

MG Electronics produces two models of "architectural" in-wall speakers, the IWS-1 and the IWS-2, straightforward units with one-piece injected molded construction. They include provision for 70/25v transformer mount. International C and Fourjay are components manufacturers with good track records — Fourjay has been in business since 1956 and has done a lot of the research and development on easy mounting techniques. Their SS-8W is square in shape. The CR-8W is round. Both are available with back boxes.



*The model 380 from Boston Acoustics' designer series.*

The proliferation of affordable, easy to install wall speakers with lots of attendant options makes them an increasingly attractive choice for sound contractors and

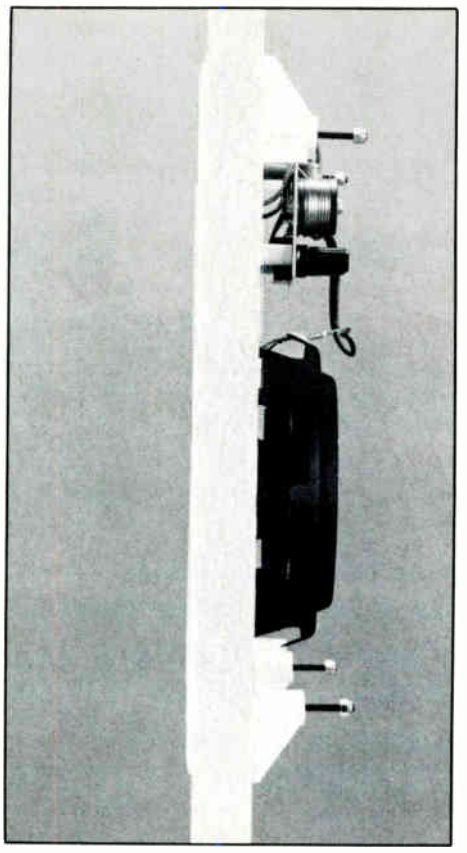
clients alike. These days, if you have a job where the ceiling is concrete and the walls are gypsum, you stick in wall speakers. This is a choice more and more sound contractors are making.

Along with an increase in the commercial use of wall speakers, many of the manufacturers and dealers I talked to while researching this survey spoke of the rapid expansion of the residential market. Bud Frawley, Director of Sales for Fourjay, predicts that the most active area of the wall speaker market in the next decade will be residential and custom installations. Boston Acoustics president Andy Petit agrees, "The consumer end of the market is growing," he says. "Given the option of speakers disappearing in a room, many people will choose an in-wall speaker, especially if it sounds good." There are still some prejudices to be overcome — some clients still associate built-in speakers with performance standards of

**The client was willing to pay a premium for style and good sound.**

the past that have long since been improved; today we see improved brightness, reliability, styling. Speaker designer Paul Barton, President of PSB, agrees the custom residential speaker market is booming. PSB introduced a high performance in-wall speaker last year, the HW-1, that is especially easy to install, and offers both new construction and retrofit mountings.

Also noted for ease of installation is the Boston Acoustics Designer Series, which has five models, including one, the Model 380, that company president Andy Petit describes as having the smallest "wall-print" of any on the market. At 9 ½ inches x 12 ½ inches, the Model 380 is certainly small for an 8-inch two-way. The line includes other compact packages, some with square configurations, that fit the bill for small rooms or hallways, and other places where primary speakers are not practical.



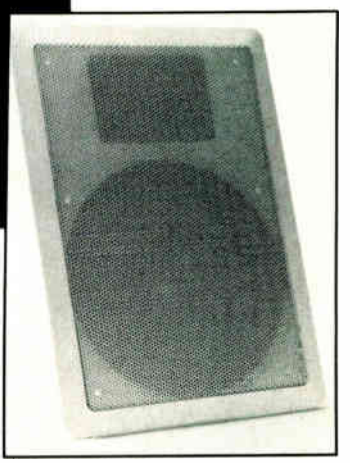
*The Fostex SH 2020 two-way in-wall speaker.*

Fostex introduced two in-wall models at CES that are extremely easy to install in standard 2x4 stud construction, and feature a spring loaded mounting method that requires no screws. Model SH2020 is a two-way with newly designed dome tweeter and coated woofer. The SH2510 is a subwoofer system with double voice coil and built-in crossover for single or multiple SH2020 units. Mounting is provided for 70v systems when multiple SH2020 units are used in larger systems.

Designed for use in a primary music system, as well as for use as ambient speakers in home entertainment centers, these new Fostex units are well suited for commercial applications in offices, hotels and restaurants for background music sources. They can be finished with paint, varnish or wallpaper to blend in smoothly with the surface environment.

Both J.W. Davis' Jack Tucker and Mitch Simon of Sonance see home theater installations as one of the growth areas for the '90s. J.W. Davis has responded to the tremendous call out for product and will be adding in-wall speakers to their line in a matter of months. Jack Tucker says, "Where a few years ago, you saw background music, now you see foreground music. The coming decade will see an increased demand for in-wall sound sources in hotels and in home entertainment centers." Similarly, Mitch Simon reported


*The a/d/s 750il in-wall speakers.*



*The CI 60 from the Custom Installation series from Phase Technology.*

Sonance will be introducing four to eight new products addressing the home theater market in June 1991. This will add to an enormous array of wall speaker products in the Sonance line, which currently offers nine different speakers and two subwoofers in several price ranges, from low to high end. Sonance was the first company to design a speaker for in-wall use from the ground up and continues to hold a large share of the market.

When contractors (and clients) tired of slightly-angled, ugly wooden boxes, some companies sought innovative ways to surmount objections. Webb Collins, Director of Marketing for a/d/s, says his company was the first to introduce hi-fi, in-wall speakers — in 1978. a/d/s engineers took their Model 300-I home speaker and modified it for in-wall mounting. The company has gone on to carve out a high end niche for itself, mostly in the residential market. Their architectural loudspeaker series offers the C300i/s and the C400i/s,

**These days, if you have a job where the ceiling is concrete and the walls are gypsum, you stick in wall speakers.**

designed for in-wall placement, particularly where buzz and rattle might be a problem. Their drivers are located a little farther forward than those in many in-walls, which can mean a reduction in boundary diffractions resulting from sound interacting with the wall. The C400i/s has a 6-inch cone and a 1-inch dome tweeter. The C300i/s

*The steps for installing B.E.S.T.'s CT-62.*

combines a 5 ¼-inch cone driver with a 1-inch dome tweeter.

Introduced in the last few months is the 750iL, the largest and most ambitious of the a/d/s loudspeakers. Unlike most in-wall speakers which are designed so that the grille, not the baffle, is flush with the wall, the 750iL places the drivers on the same plane as the wall. a/d/s designers claim that because this configuration eliminates cavity resonances and the diffraction of a recessed baffle, a fuller performance potential is likely to be achieved. Being more visible than some other wall speakers, the 750iL is styled to be seen, offering either walnut burl or white lacquer finishes. These high performance speakers retail for over $1000 a pair. a/d/s also manufactures a subwoofer that fires into the room through an air conditioning vent. Although they don't offer back boxes for their other models, they feel that sheet rock and 2x4 construction is adequate when working with very low bass frequencies, and so enclose their subwoofer in a cabinet. They currently produce no control accessories, but will offer their first this summer—multi-room electronics.

Look to Sonance for something new along this line, too, in June.

In addition to its multi-room system known as the Component Commander. 13-year-old Niles Audio makes a number of in-wall speakers contained in its BluePrint series. A recent addition to this

*(continued on page 66)*

# Light at the End of the Tunnel

## *Notes on Sound from New York's Underground*

**BY MALCOLM HOWARD**

The damp, reverberant and noisy caverns of New York City's subways are probably the worst environment in which to install and maintain a sound and communications system that links 15,000 speakers with 500 miles of cable.

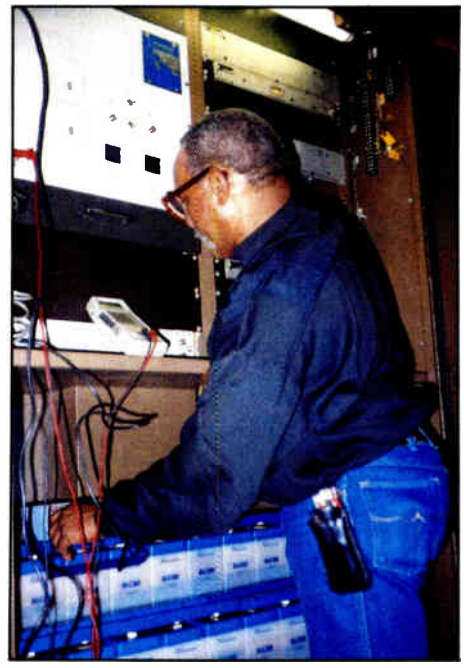
But the 3.4 million commuters and tourists who ride New York's subways every day don't care. Most riders probably don't even think about underground communications in the world's largest subway system unless it's out of order.

But there may be light at the end of the tunnel.

The New York City Transit Authority — the agency responsible for keeping the subway's 6,000 cars and 740 miles of track in order and on time — is now spending $220 million to replace old copper communication wires with fiberoptic cable and then hook-up new digital phone switching systems. While past capital programs hinged on rebuilding stations and ridding cars of graffiti, the NYTA now hopes to clean up its subterranean communications.

"In the mid-'80s, most of the improvements focused on the tracks," said Robert Previdi, a spokesperson for the NYTA, which rebuilt some 489 miles of track in the late '80s. "Future improvements will focus on passenger service and comfort."

Project Focus (short for Fiber Optic Communication Unified System) is a five-year, 13-contract capital outlay program allocating $140 million to replace 490 miles of 52-pair copper wire with fiberoptic cable, NYTA engineers say. The remaining $80 million will be spent replacing antiquated telephone switches, leased from AT&T and New York Telephone, with Authority-owned digital switches designed to interface with fiber optics.



*Telephone Maintainer Avery Clapp checks a PA cabinet at a key station during a routine check.*

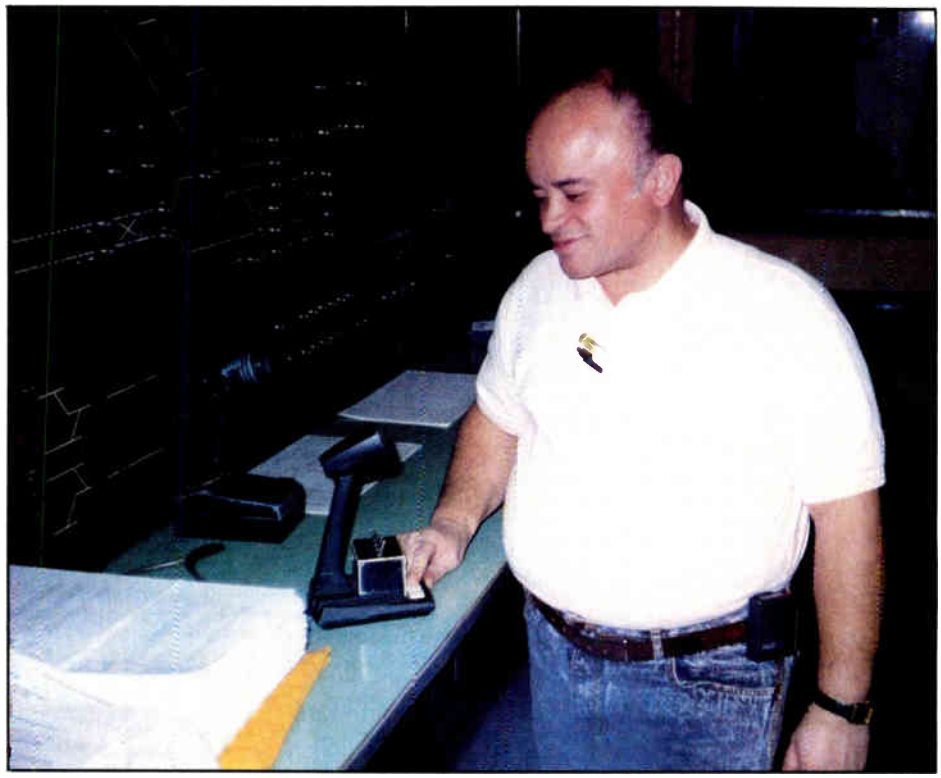
Focus will make routine and emergency calls between Central Command in Brooklyn and the 12 key dispatch locations cleaner, faster, and more accurate. But riders won't notice anything until the mid '90s, when seven rings of fiberoptic cable — the backbone to which the NYTA's communication lines will be linked — are spread through subway tunnels in Manhattan, Brooklyn, Queens, and The Bronx.

That's simply because the first communications links to the seven loops — which emanate from a Central Processing Center on 53rd Street in Manhattan — are mainly behind the scenes functions. By linking stations, signal towers and management offices to any one of 123 nodes, or "drop and insert" points, anything from interoffice modem links to emergency calls will be faster and more reliable, the Authority says.

The initial telephone hook-ups to the fiber optics network will indirectly make trains faster and more reliable. But commuters won't see the initial upgrades: A remote control of third-rail power — called a power-skating system — will be one of the first to go on line, and the Token Booth Emergency Communication Systems is another priority, the NYTA says. Emergency teams at Command Central will be able to respond to speedier and more accurate distress calls — and eavesdrop more effectively on developing crises via a two-way channel installed at all booths.

But the first visible upgrades passengers might notice are more automatic fare collectors (AFC), token machines that collect fares by scanning plastic cards. Already a pilot program, AFC machines have been installed at 69 stations.

"Fiber optics, in itself, is not what's allowing us to do these things, but the backbone of fiber optics is that it allows quiet communications," said Dr. Paul McGovern, director of planning and engineering for the communications group electrical department. "With copper cables, noise can be a limiting factor because how much information can be sent often depends on how sucessfully information is received. Fiber cables are impervious to outside interference."



*First level maintenance supervisor Jose Rodriguez makes a local announcement to one of four platforms at Rockefeller Station.*

Digging deeper into Gotham city's future undergound reveals a few other sights that the NYTA says is easier with fiber optics:

- There will be more passenger info on television screens and electronic bulletin boards or "annunciators".
- Security guards at central emergency dispatch centers will watch clearer videos of station platforms on an expanded closed-circuit TV system.
- Trains will be steered through a "moving block" system that automatical-

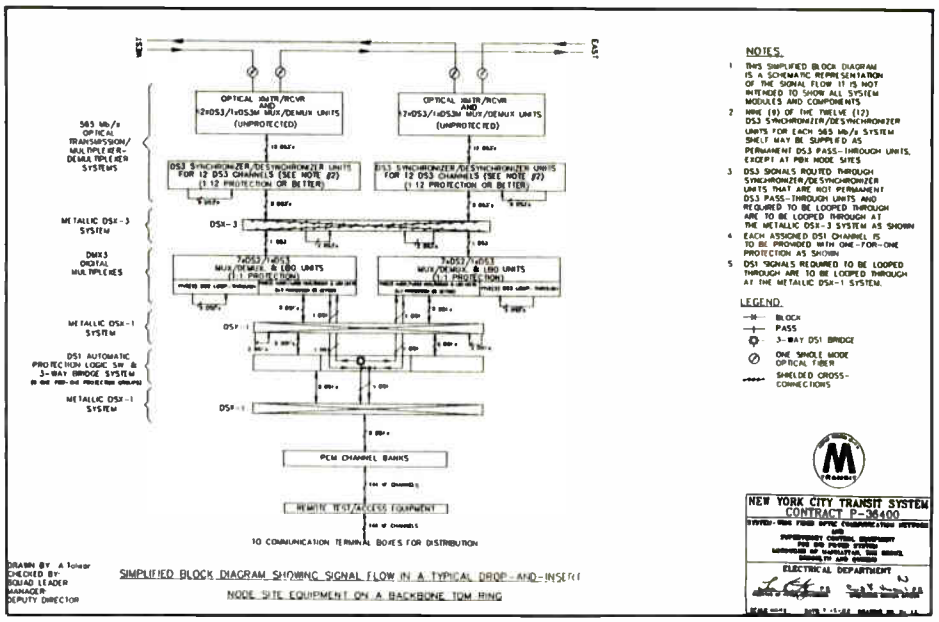
ly computes speed and time to judge its location in relation to cars and stations. Now being tested on Staten Island's SIRTOA line, the moving system replaces the "fixed block" method, which charts a train's progress through fixed segments of track.

- Control of radio communications, signal and substation controls, and various data lines will be hooked up.
- Some day, far down the line, patient passengers could even be listening to digital-quality audio.

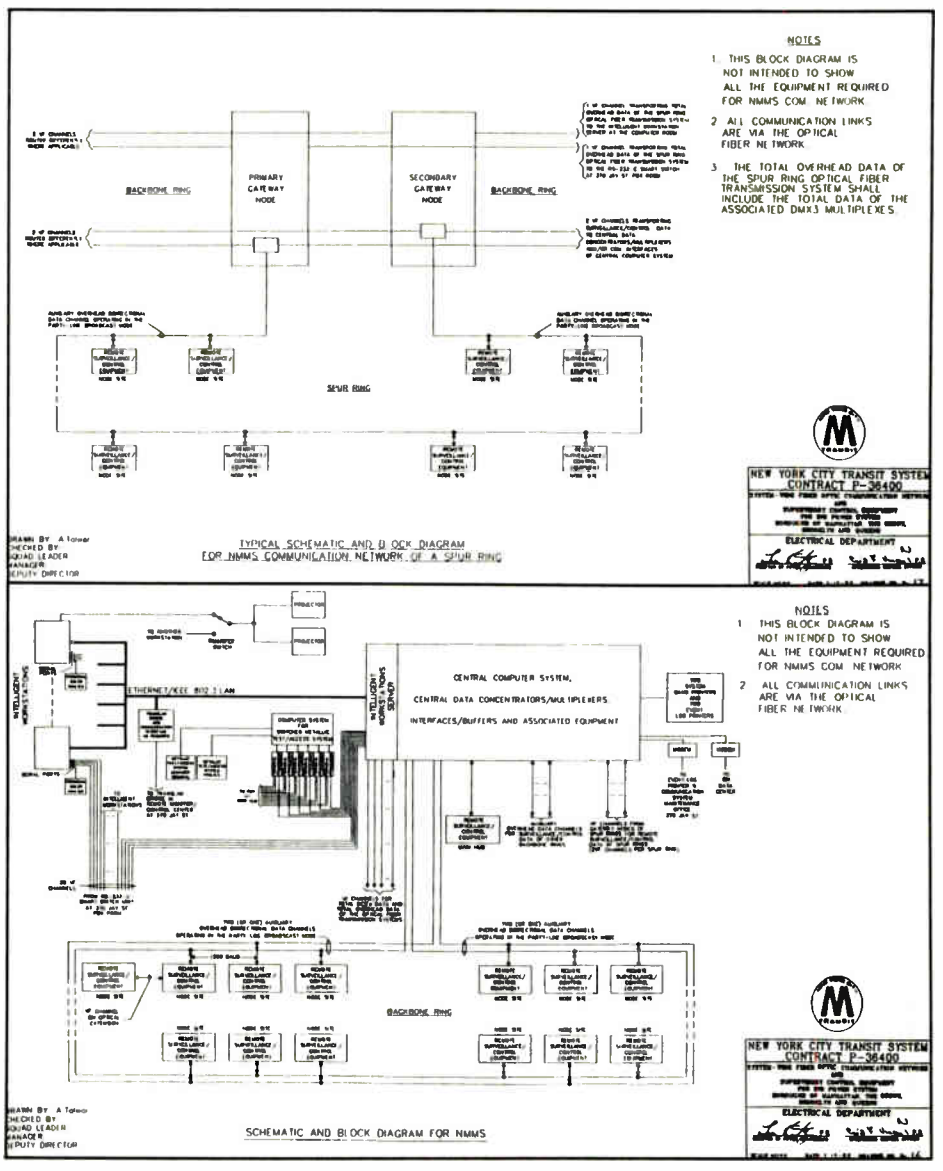
With over 6,000 rail cars scurrying over 740 miles of track on four distinct train lines (the IND, BMT, IRT, and SIRTOA), the world's largest subway system is also attempting to improve the sound on station platforms by using more cone speakers and unidirectional condenser mics in stations undergoing renovation.

*Jay Street Station in Brooklyn was the test site that pitted cone speakers (inside metal housings) and horn speakers.*

Although these aren't the typical jobs for sound contractors — most bids require a $1 million bond — the projects do reveal the process a large metropolitan agency goes through when it plans minor speaker upgrades, or converts its whole communications nervous system to a new medium.




*Users access the fiber optic system via 123 node sites (detailed in the above diagram). A typical node consists of as many as 12 DS-3 manufactured by Northern Telecom.*




*A central computer, located on 53rd Street in Manhattan, routes digital information along any of seven main rings of fiberoptic cable.*

## WHY GO GLASS?

Noise is perhaps the biggest hooligan hindering subway communications. Vital messages between dispatchers and trains, token booth operators and emergency personnel fall victim to the same ruffians that cause platform messages to distort: "The copper doesn't deteriorate, but the insulation around it drops away," said McGovern. "That introduces noise because there's nothing guarding it against being grounded.

"The engines on the trains are very noisy electromagnetically," he said. "There are surges that send out tremendous impulses; so they are a source of interference and noise."

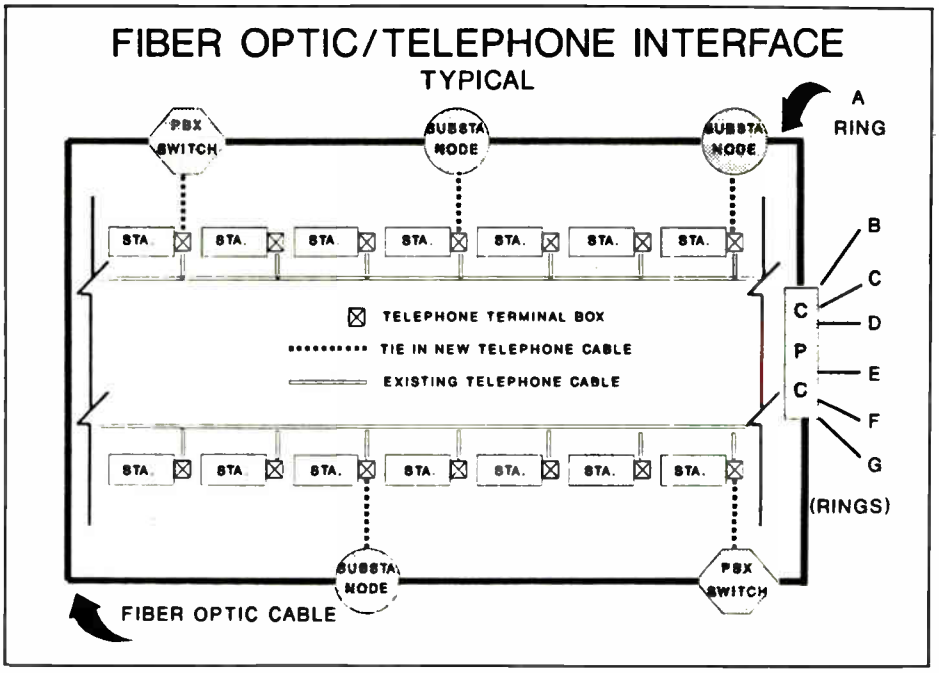
For the most part, the copper cables are not overloaded; they're only carrying 50-to-60 percent of their potential communications capacity, McGovern said. But since the 52-pair copper cables that snake through the dank caverns of the metro ain't what they used to be, interference can limit communications. With a life expectancy of about 40 years, some subway cables — such as some in the PATH trains to New Jersey — are 90 years old, he noted.

Indeed, there are many reasons NYTA is switching from copper wire to glass cables: maintenance is cheaper and the price tag on equipment ain't what it used to be either. "Fiber is relatively inexpensive compared to what it used to be," said Theodore Kaminski, P.E., acting chief electrical officer, division of Electrical Systems.

But the main reason is that fiber optics is the most compatible medium for today's digital telephone switches, which will be able to handle more calls than current system. Aside from the fact that the system is designed to use the North American digital hierarchy transmission standards, of Bellcore, that is readily available from suppliers, there are some basic scientific reasons that glass is a better conduit for the authority's information streams.

Because glass does not resist light energy the way conductors of electricity resist current, information arrives far less distorted on glass. In any medium, there is some distortion — as the signal reflects off the sides of the cable, for example. But virgin digital data, transmitted in pulses, or square-shaped waves, is corrupted more by copper than by glass, McGovern noted. By the time the signal reaches its destination on a copper cable, the tail end of each wave, or pulse, has tapered off. As the wave broadens, it overlaps with the wave behind it, making the data difficult to read, McGovern said.

The fiber optics means nothing unless the equipment that reads the data is adequate. For that reason, the system's bus-




iest telephone switch, a 15-year-old unit housed at the Jay Street headquarters in Brooklyn, and seven satellite switches, 30-year-old type 701 units, will be replaced with new SL-1/SL-100C switches made by Northern Telecom. Using Pulse Code Modulation and Time Division Multiplexing, the switches are also ISDN compatible. A Dimension 600 PBX at an East New York facility will also be replaced.

Aside from an expected "immediate increase in quality" — to quote a paper submitted at a rapid transit conference in June — the new switches will reduce the problems inherent in the current system: It's sometimes difficult to get through, and "party line" problems, when other voices come on the line, are not uncommon.

While some of the symptoms of age and overload are acute, the new equipment is being installed to anticipate future telephone use increases, engineers said. In the long run, it may save taxpayers money because the number of lines the authority has to lease from New York Telephone Company will be reduced. Because of the congestion, the authority leased additional business lines to get the calls through.

The NYTA's current telephone network can handle 7,330 separate telephone numbers, and an additional 1,000 auxiliary lines are leased from New York Telephone. The new system could ultimately be upgraded to 26,750 lines.

With a system operating at 565 megabits per second, the 2-12 fiber cable (consisting of 12 pairs) is more than enough to meet needs in the foreseeable future, say NYTA planners. At first, only two of the 24 total fibers will be used. That will allow for 8,064 channels, roughly 50 percent more than the initial anticipated demand, according to the Project Focus June report. If immediate demand is too great, the NYTA then can activate any of the additional 22 cables, the report says.

## TWO TIN CANS

The concept behind fiber optics is simple, said McGovern. A transmitter modulates pulses of light on one end and a receiver decodes that information on the other end. "People tend to have a big mystical idea of what fiber optics is, but it's really just like two tin cans with a string in the middle," McGovern adds.

The basic component of the tin can, in this metaphor, is called a T-1 (or an advanced version called either a T-3 or DS-3), manufactured by Northern Telecom Inc., located in Atlanta, Georgia. The T-1 or T-3 is a controller that takes thousands of digital samples of a signal or voice and arranges it for transmission into 24 time slots (per 1.544 microhertz) that is rearranged or decoded upon reception, McGovern said.

In simplest terms, the fiber cable supplied by Canada Wire, of Winnepeg, Manitoba, is a glass "string" that carries 64,000 bits of information per second, said McGovern. The strings are arranged in loops for redundancy that allows signals to be re-routed around the long way by the Central Processing Center in case of a cable break or malfunction, McGovern noted.

At a typical tin can, or node point, there might be as many as 12 DS-3s, each of which has 28 "shelves," access points of sorts for telephone switches. From these nodes, information is routed via copper cable to nearby token booths, administration buildings, signal towers, or key dispatch locations. Because copper cable can carry signal without a noticeable degradation up to five miles, only 54 node locations will be linked to the fiber at first.

## FOOTING THE BILL

Money for Project Focus comes from a hybrid of city municipal bonds, floated to fund capital improvement programs, and grants from the Urban Mass Transit Authority, said Previdi.

The $140 million price tag for the fiber optics installation breaks down into three major components: $37.9 million going to the power supervisory skating system that uses the fiberoptic cable to control system voltage levels, $72.4 million to fiberoptic cable, equipment rooms and node locations, and roughly $20 million for installation costs.

The fiberoptic cable supplied by Canada Wire is being installed by Jones & Daidone, a joint venture between J.A. Jones Construction Co., of Charlotte, North Carolina, and John Daidone, a Newark, New Jersey-based electrical contractor.

There are no exclusive sound contractors working on Project Focus. The design work (a two and a half year effort that ended in July '88) was done by in-house engineers and the installation contracts are generally awarded to electrical contractors. The Authority does occassionally hire consultants, however, and firms awarded NYTA communications jobs do subcontract some electrical and sound installation work, NYTA engineers said.

Project Focus was 15 percent complete in June and it's currently on schedule. By the end of 1992, one or two of the rings will be complete and by early 1993, the whole network will be in place, said Dr. Nabil Ghally. By the summer of 1993, the telephone system will be tied into the seven switches including one at a new facility that will house several Brooklyn facilities under one large building on Livingston Street, Brooklyn, in 1991, Ghally said. ■

# Sound Inside the Subways

Most bulletins a waiting New York subway passenger hears are recorded digitally and repeated on machines at Command Central, the brain that controls the New York Transit Authority's underground nervous system in Brooklyn.

But whether the message traveled 20 miles to Jerome Avenue in the Bronx, or came from a local dispatcher, PA announcements are victim to the same factors that make an announcement like this....

*"Due to track work, the Number One downtown local will be running on the express track. ..."*

sound like this:

*"#%$** #track work.(shreeek!)..%$&#$dowtown..(wonk!) .local&#$% express track."*

The majority of messages probably come through clearly enough. But with all the possible pitfalls, there isn't a commuter in Manhattan who hasn't had some experience with poor station acoustics, crosstalk caused by water seeping into a cable housing, incorrectly set or damaged amps in station PA racks. If those variables don't squelch the message, the dispatcher could muddy the message by mouthing the mic like Mick Jagger.

"It's a hostile environment," said Dr. Nabil Ghally of the NYTA. Arcing caused when the trains' power shoes suck power from the third rail, and energy surging (from equipment rooms, large power transmission cables, and train motors) add to the electromagnetic soup.

Ultimately fiber optics will help, he said.

"Once we change the carrier and introduce the PA through [the fiber optics system], the sound quality will improve drastically," said Ghally, noting that such a conversion would likely not come until the late '90s. "It will be more consistent; not subject to weather or variation — whether the signal is coming from a local station, or from Command Center."

But before sound in New York's subway goes all digital, the agency is experimenting with other upgrades designed to improve subway sound. While routine tests

and maintenance of station PA cabinets by NYTA electricians keeps the current system running, the NYTA is installing more cone speakers (in lieu of its traditional horns) and unidirectional condenser mics in stations selected to be refurbished under station renovation programs.

Of the 248 stations that have PA systems, 48 are getting new cone speakers and new microphones under five contracts already awarded to electrical contractors, said Dr. Paul McGovern, director of planning and engineering for the communications group electrical department. A total of 73 stations are earmarked for renovation next year, he said.

### ACOUSTICS OF A SUBWAY PLATFORM

Still, no one is deluded into thinking new speakers and mics will mean perfect sound on subway platforms — arguably the worse environment for listening to anything. New York's subway stations are a mosaic of tile, concrete, and steel. In quiet moments, the slightest sound from a street saxophone player echoes with a cavernous beauty. In the cacophony of rush hour — with crowds swelling and waning and cars rushing by — you're lucky if you can hear yourself talking.

Because an average car shrieks into a station at 100 dB — and hums at around 80 dB standing still — the PA system is attenuated so that it doesn't exceed 85 dB, say NYTA engineers. But because OSHA standards, and common sense, don't permit a louder PA signal, the NYTA's only hope is to match the levels of a stationary car.

"There's no way to compete with a subway car; you can't try to talk over that," said McGovern. If the authority did turn up the volume, it would probably get complaints from residents who live near outdoor stations, whose PA volume occasion complaints.

With amps and speakers sometimes separated by 10 city blocks of cable, there's nothing quite like the subway sound system. Acoustically, there are few comparisons also.

"A lot of people compare subways to airport sound, but you can't compare the two because airports don't have nine or 12-foot ceilings," said Eugene J. Valesio, deputy director of communications operations, who's worked for the NYTA for 13 years. "I think only if someone is educated about the way sound systems function, then they understand the difficulties. But a lot of people walk down here and say: "Gee, it doesn't sound like my home."

Valesio and other NYTA engineers admit the subway will never have living room-quality sound. But by installing cone speakers, the NYTA is now using speakers more like those in the passengers' homes.

Unlike the three major contracts that put more than 15,000 speakers in the IND, BMT and IRT lines for the first time in the early '80s, this upgrade is gradual.

Despite the fact that some horns — mostly Atlas compressed horns inside baffled Soundolier cannisters — have withstood 10 years of cleaning hoses, vandals and damp grime, the authority is installing cones for largely aesthetic reasons.

"People like cones," was one engineer's opinion, an appraisal that underscores the subjective side of sound installation. Nonetheless, there are some scientific reasons behind the move.

**Some horns have withstood 10 years of cleaning hoses, vandals and damp grime.**

"The basic problem with horns is that they have a greater directionality and a greater throw than a cone," said McGovern, who prefers cones. "Because the sound travels further, there's greater reflection. All our stations are mostly tiles, so if the echo is greater than 35 milliseconds, then what reaches the ear is distortion.'

Cone speakers also offer a flatter response and a wider dispersion, McGovern argued, while horns are intense within a smaller path and less effective outside that path. To some degree, the cone program is still being tested.

To test the merits of cones and horns, the NYTA set up a side-by-side comparison. The Authority installed six separate arrays — different mixtures and densities of horns and cones — on ceilings above platforms at the Jay Street station, directly under headquarters.

**There's been some interest in switching to a condenser mic program.**

Subjective evaluations by communications engineers showed as many opinions as there were arrays on which layout had the best intelligibility, sound quality, loudness, and coverage. In this case, the cones vs. horns debate is almost a six-of-one, half-dozen-of-the-other proposition.

- Cones use more energy and have not been field tested in New York's underground. "The Atlas horns are nice; they've worked well for us for 25 years," McGovern concedes.
- Cones project more bass that give them a warmer, fuller sound, as opposed to the harsh, shrill sounds horns can purvey. But some argue that horns perform best in frequencies where speech intelligibility is perceived — a rather important point if the idea is simply to get a message across.

The final point is one reason the NYTA is "focusing on cones with a bass response no lower than 200 cycles," said McGovern, who feels a higher density of speakers set at lower volume gives the best result.

"Ultimately, it's what sounds good to the ear," said Theodore Kaminski, acting deputy director of the communications group electrical department. "You can look at all the squiggly lines you want, but it has to sound good."

For its Jay Street experiment, and most of the stations now being refurbished, the

NYTA used cone speakers from Lenline Electronic Ltd, of Scarborough, Canada. The authority is still accepting bids, however, from other manufacturers who meet the basic specs: the cones must be waterproof, operate at roughly 200 Hz and up, and be able to stand the blasting cleaning crew hoses. A sturdy, vandal-proof housing and mount doesn't hurt either.

But solutions are unique to each station, so there's no cure-all formula.

At stations where there is nine feet from the wall to the passenger, the authority might install two cone speakers, each at 45-degree angles from the wall (or 90 degrees from each other).

Where the distance between the wall and commuter is greater, there may be three cone speakers: one facing straight out from the wall, and two at 45-degree angles, McGovern said. "In a location where the horns are 20 feet apart, we might even install the cones in between [the horns]," said McGovern.

The NYTA is experimenting with the microphones used.

"There's been some interest in switching to a condenser mic program," said Ken A. Mooney, P.E., director of operations engineering.

Most of the mics used within the system are now Astatic #877-L, dynamic mics with their gain preset in the electronics shop. As stations and token booths are renovated, the mics are replaced by Electro-Voice BK-1 cardioid condensers that will pick up less ambient room noise, Mooney said. Several hundred have already been installed in stations being refurbished but mics for future installations have yet to be determined. The levels of those mics will be adjusted using a pre-amp.

But communications administrators are quick to warn that equipment can't solve all problems.

"Good, clear sound depends on the person using the mic," said Kaminski. "Whether or not that person is enunciating properly, or is too close to the microphone, can make a big difference."

That's one reason the NYTA hired communication specialist Dr. John Diekman and mandates classes to trains dispatchers, conductors, token booth operators on everything from correct microphone use to basic enunciation skills, Kaminski noted.

There is one option for improving subway sound the NYTA has ruled out: Although the NYTA has erected sound barriers to cut down on some reflection and loud car noise, installing diffusers or

*(continued on page 56)*

# Installation Profiles

## *The Army's Arenas*

### *West Point's Basketball and Hockey Facilities' Redo*

**BY DAVID TOURVILLE**

The Army Athletic Association had a problem to solve: The Holleden Center which contains both the West Point hockey and basketball arenas had sound and reverberation problems that compromised the intelligibility of both announcers and music.

Both West Point arenas had been set up with multiple horns hung at ceiling height, making basketball announcements in the rear seating area fine but unclear to those sitting in the front row bleachers.

Hockey announcements covered the seating areas adequately but the facility also needed quality music on the ice for entertainment purposes.

West Point needed to solve both these problems with an efficient sound system that was, at the same time, economical.

On the suggestion of Carl Ullrich, the former Army Athletic Director, who had recently attended a game at the University of Lowell's Tully Forum Hockey Arena, Lou Federico, the arena manager, called Thom Stolar of DJM Pro Audio Systems in Salem, New Hampshire, the installer of the Tully Forum job.

After canvassing the West Point facility, Stolar took the arena plans back to DJM Sound Engineer David Tourville. Together, they assessed West Point's needs — taking into account their budget considerations — and devised a solution not unlike the one applied to Tully Forum. Through a competitive process, DJM was selected to install the new system.

*The Holleden Center's basketball arena.*

Rather than remove all the existing horns, DJM opted to remove only the four which were supposed to cover the front seating areas. Existing cabling was then extended to the area near the central scoreboard. Then four 2212-1 Soundsphere speakers were hung above the corners of the scoreboard so as not to block the view of the rear seating areas, which were higher than the scoreboard.

In order to maintain the use of existing speaker cables, 70V transformers were retrofitted to the speakers and tapped at 100 watts. Not confident of the old amplifiers, an Altec Lansing 9444A amplifier was installed with two 300-watt Automatch transformers. Each side of the amplifier was wired to operate two speakers.

The horns covering the rear seating areas and end zones were then channeled through an Audio Digital ADD-2 electronic delay so as to provide zoned low volume, high frequency reinforcement of the central speakers without increasing the room reverberation.

The Soundspheres and the horns were equalized separately so that the horns would not reproduce the same low frequencies already being handled by the Soundsphere speakers. This was achieved by adding an Altec Lansing 1750A ⅓-octave equalizer for the Spheres, in addition to the already existing equalizer used for the horns.

The final addition of Electro-Voice N/D357AS microphones to replace the old "push-to-talk" style mics assured vocal

*David Tourville is a sound engineer for DJM ProAudio Systems in Salem, New Hampshire.*

clarity prior to amplification.

Similarly the same solution was applied to the hockey arena, but only four horns were used to cover the far corners of the room where large beams blocked sound in these areas.

In both instances, the complete renovation was performed with a lot less hardware and in about two thirds of the time the job would have taken conventionally, allowing West Point both hardware and labor savings.

The results: systems with excellent bass frequency response for both music reproduction and complete coverage of the seating areas and the court and ice surfaces as well as a crisp, full sound for announcements. DJM accomplished this at a relatively low cost with a quick, simple installation.

Since the installation, DJM has received positive comments ranging from "excellent sound" to "a 400% improvement." In addition, as a result of DJM's installation, West Point has an even more multipurpose facility.

The installation as a whole accomplished the dual goals of solving a sound problem for West Point and doing it within their budget. ■

*The ice hockey arena at West Point.*

# An Audio Facelift

## Dartmouth Performing Arts Theater

**BY KEITH CLARK**

When it was built more than 30 years ago, the Hopkins Center at Dartmouth College in Hanover, New Hampshire was recognized as one of the premier performing arts facilities in the U.S. While that's still true, the facility has been undergoing some changes over the past few years. One of the more recent changes involved upgrading the audio system in one of the facility's three performance theaters.

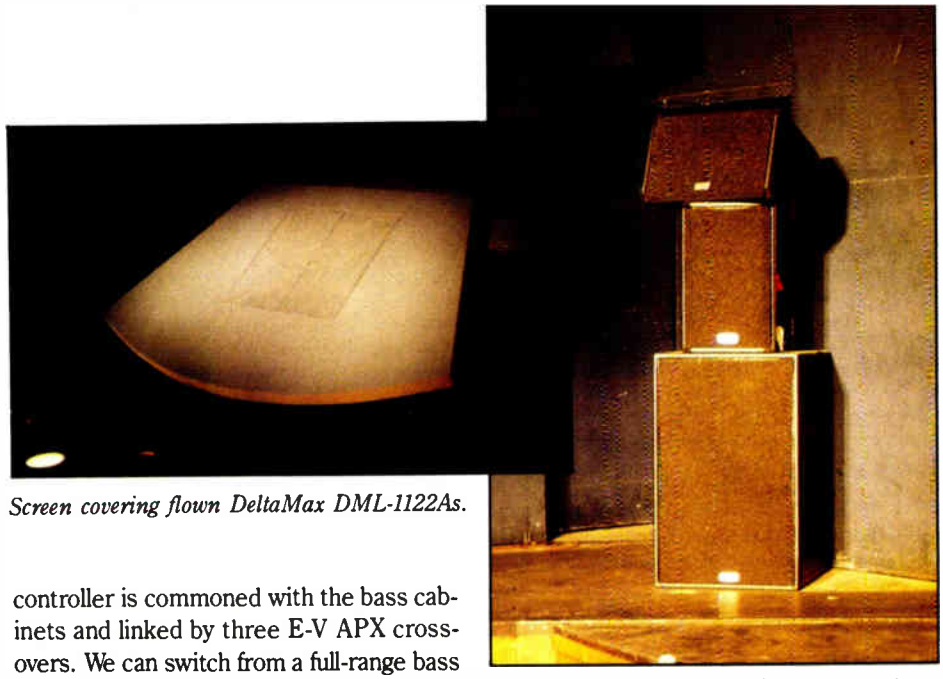
The room, with approximately 300 seats, features a large stage that hosts a variety of entertainment events, including theater productions, live music performances and dance troupes. The room is essentially square, and it includes a balcony set at a steeply raked angle.

The Mixingboard, a sound company in Burlington, Vt., was contacted to provide a new audio system for the facility. As Steve Hirsch of the Mixingboard points out, "This job presented a unique challenge due to some unusual circumstances."


*The Hopkins Center at Dartmouth College.*

An old RCA cluster had to first be taken down. It had been suspended above the stage, providing audio primarily to the balcony. However, the installing crew found the structure which had been supporting the old cluster needed to be fortified to conform to OSHA standards.

*Keith Clark is the Public Relations Director of Electro-Voice, a Mark IV company, located in Buchanan, Michigan.*



*Screen covering flown DeltaMax DML-1122As.*

Even after fortification, the structure still was not designed to handle a great deal of weight. A lightweight speaker system with exceptional output was required, and the Mixingboard team decided that Electro-Voice DeltaMax electronically controlled speaker systems were the answer.

Even so, it was determined that only two DML-1122A speakers could be suspended, due to the weight limitations. "One of the compelling reasons to go with the DeltaMax is the high output you get in a small package," Hirsch notes. "Because of them, we were able to get great sound while still conforming to the room's strict design standards." He adds that the speakers are vertically splayed for coverage to both the balcony and orchestra pit, located in front of the main stage.

Three DML-1122A speakers and one DML-2181 (for low frequencies) were placed on wings extending from each side of the stage. This also presented a unique challenge, because the wings are covered with heavy curtains. "Having the curtains covering the speakers definitely can create some interesting EQ problems," says Hirsch.

"We went with a global common bass setup," he adds. "A single E-V DMC-2181 controller is commoned with the bass cabinets and linked by three E-V APX crossovers. We can switch from a full-range bass sound through the DML-1122As."

A rack frame contains a line amplifier and line mixer, manufactured by IRP. Hirsch also notes that the APX crossovers were customized to be mounted on a card in the rack. QSC EX4000 amplifiers power the speakers, providing 2,000 watts per channel. "The low end is absolutely stunning with this combination," Hirsch says. "It is solid, tight and loud, and we never come near tapping the protection circuitry of the DeltaMax systems."

An Allen & Heath SRC32 mixing console with a wide variety of channel input modules, including many stereo input channels, was chosen because of the variety of uses for the facility.

"The extra channels really come in handy, especially for performance groups like dance troupes," Hirsch explains. "They have a wide variety of input, ranging from digital media to MIDI systems to computers."

*E-V DeltaMax systems are located at each side of the stage.*

The Mixingboard programmed two EQ curves, using three Rane MIDI equalizers linked to an Apple Macintosh computer. "We set up this system to be very simple and foolproof," he says. "Many performing groups supply their own audio crews, who may not always have the technical expertise to handle a complicated system. So you must make it as easy as possible."

Hirsch points out that staffers from Dartmouth helped with the installation, and he adds that they did a very nice job. "The system has worked out very well," he says. "The initial feedback from the Hopkins Center staff is that they love it." ■

# *Fire Department Intercom*

## *No Room for Mistakes*

**BY DANIEL STARKS**

In 1989, the Seattle Fire Department responded to nearly 50,000 fire and medical emergencies with an average response time of four minutes.

This kind of responsiveness demands effective and reliable communications. So, when the department began modernizing some of its fire stations, the decision was made to upgrade the intercom systems in all 33 of Seattle's fire stations.

The modernization campaign began in the fall of 1985. Like most big city fire

*The Seattle Fire Department has recently completed a major upgrade.*

departments, some of the station houses were built long ago and no longer met modern needs. The living quarters, for example, needed to be remodeled to accommodate the presence of women in the department.

The existing intercom systems had been installed over a 25-year period. While all were state-of-the-art systems at the time of installation, they now were outmoded and fraught with problems.

**SEATTLE FIRE DEPARTMENT**
**Equipment List**

**Description**

Aiphone NEM-10, NEM-20 or NEM-30 intercom master station
Aiphone NA/AN privacy type substation
Aiphone NA-NE flush mount substation
Aiphone NB-L ceiling type substation
Aiphone PG10A paging amplifier
Aiphone PS24N power supply
Ebelco remote monitor speakers
Signal Equipment ruthless preemption board
25-pair telephone pigtail

*The quantity of equipment installed in each station varied according to its size and layout.*

Signal Equipment, Inc., had been awarded the contract of servicing the Seattle Fire Department's computerized dispatch system and old intercom equipment. They found that several of the original intercom equipment manufacturers had gone out of business, making parts nearly impossible to find, and many of the intercoms had sliding controls or rotating knobs that couldn't withstand the punishing environment of a fire station. The major problem with some of the intercom systems was that servicing one intercom unit would disable a station's entire system.

Upgrading the intercom systems would eliminate these problems. It also would allow the department to fulfill its requirement that all firemen must be able to hear alerts and commands from any place in the station, regardless of closed doors or other obstacles. By installing the same equipment in each fire station, maintenance also would be much easier.

Since the installation project was a system upgrade, it fell under Signal's existing contract and no new bid process was needed.

The trust developed from the existing relationship with the department also helped keep the process moving smoothly. Lt. Michael Walsh, the department's communications officer, worked closely with Signal Equipment to assemble a "statement of function requirements" for the new systems. Together they decided the

new system would work directly with the computerized dispatch center, be modular for easy maintenance and expansion, and reflect modern technology.

Looking at what was on the market, the main challenge was to find an intercom system that would allow the dispatch center to automatically override any conversations taking place on the system at the time of an alert, as well as meet other needs.

The Aiphone NEM-10 system was selected for the fire stations. It has a provision for an external paging amplifier or background music source which is normally jumped through terminals to an external source. It is normally not active, so a ruthless preemption board was designed and installed to activate it. This enabled the system to automatically override any functions being performed at the time, including the unit's all-call function, when an alert signal was received from the alarm center.

The Aiphone system also has a separate 24-volt power source. This meant a standard 25-pair telephone pigtail could be attached and plugged into a terminal block for all the external connectors that made the system modular, enabling quick removal and installation of spare intercom units for servicing without interrupting the functionality of the entire system.

The power supply for the intercom system was not modified, so its UL listing wasn't compromised. Because of the low voltage used, the intercom units do not require UL listing.

Eagle Signal Corporation's Ebelco remote monitor speakers were installed to complete the system.

*The Aiphone NEM-10 system.*

The size of the crew required to complete an installation and the time it takes to complete the job vary depending on the size of the fire station.

And in this case, working with the government has been a real pleasure. Signal Equipment has found the Seattle Fire Department to be very cooperative. Upgrades have been completed on 15 of the Department's 33 stations, and the remaining are scheduled to be completed soon. ■

## NEW YORK SUBWAYS

*(continued from page 51)*

absorbers system-wide would be far too costly. Beyond that, the sound-damping material would also have to stand up to the high-pressure water blasting of clean-up crews, their harsh chemical cleaners, and the rigors of vandals.

For the most part, the way messages are relayed to passengers will remain the same.

Most basic messages are sent from Central Command. Using a custom-built rack-mounted relay system, Central Command console dispatchers such as Charles Skidmore can send single or repeated messages to groups of subway platforms within the three major metro lines just by flicking a switch.

Until late '89, the recorded announcements sent from Command Central were stored on analog audio cassettes. Now dispatchers such as Skidmore step into a sound isolation booth adjacent to the control board and record the message digitally on an 11-channel Digital Recording System. Because only one message goes out through each of the three racks at once, the dispatchers alternate messages by activating different channels.

The 12 key dispatch stations, responsible for carrying out the signal commands from Command Central, only interrupt in emergencies, or when service is affected in that station's locale. Without a message repeater system, key dispatchers and token booth operators have priority over repeated messages.

The average PA rack at a key station may have three amps, three line level preamps and a logic relay that routes signals from token booths, key station operators, or key dispatch locations, to platforms. Of the 248 stations that do have PA systems, 192 are "slave stations" that get messages via the amps and microphones housed in racks at 56 "key" stations.

Most of those cabinets, and the speakers they power, were installed under three main contracts in the early '80s. Two basic rack systems are used on the various lines, Valesio said.

Represented on subway by letters of the alphabet, the trains of the IND line use Pro Tech PA-8704 power amps, a Pro Tech 65304 level controller and a Pro Tech LA 2001 audio line amp. The carrier system is a Cardion Electronics Type 65-B, which is used in all the subway lines.

On the IRT (the numbered trains) and BMT (the later letters such as Q, R, and N trains) lines, the cabinets house a McMartin LT-1024B power amp (either 65 or 75 watts), a McMartin LR-1009 level controller, and an audio line amp, an ITI Electronics TLC 444 (8 ohm) or 445 (6 ohm) amp.

The IRT line contract was awarded in 1980 for $5.774 million and completed in '86 by National State Electric, said Valesio. The BMT line contract was awarded in '81 to Fishback & Moore Electric for $6.358 million and was completed in '86. The IND line, installed by Tap Electrical for $5.7 million, was awarded in 1983 and completed in 1987, Valesio said.

Routine checks of PA cabinet settings are conducted every three months by maintenance workers under Henry Esnes, director of communications operations. ■

# LITERATURE

## Shure and Tektronix Products

### Mics and Circuitry

Shure Brothers Incorporated has published a 25-page catalog for its line of sound reinforcement, recording and broadcast products. The catalog includes information and specifications on Shure's established products as well as data on new models.

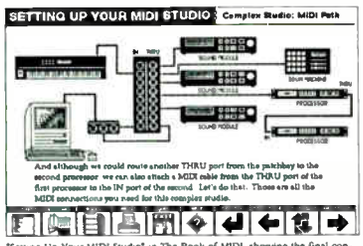
***Circle 24 on Reader Response Card***

### The Facts of MIDI

Opcode Systems, Inc. has released The Book of MIDI, an interactive HyperCard stack that teaches the user about MIDI (Musical Instrument Digital Interface), music, computers and synthesizers.

The approach is to allow the user to learn by watching, listening and playing. It lets the user hear digitized samples of synthesizer sounds and can emulate the functions of Opcode's EZ Vision sequencer using animation. It is designed to give an in-depth overview for all levels of MIDI users.

***Circle 25 on Reader Response Card***

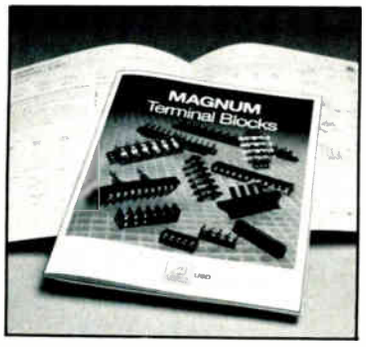



"Setting Up Your MIDI Studio" in The Book of MIDI, showing the final connection in the step-by-step explanation of the MIDI path

### Terminal Blocks

A 44-page catalog is available from USD Products. Specifications, illustrations, photographs and ordering information for Magnum terminal blocks are included in the catalog. Options available for the product line include special screws, independent terminals, quick connects, jumpers, fuseholders, mounts, terminal block covers and marker strips.

***Circle 26 on Reader Response Card***




### Testing, Computers and Television

Tektronix has released its 1991 customer catalog containing more than 3,000 products. The 388-page, hardbound catalog lists Tektronix' line of products in the fields of electronic test and measurement instruments, professional broadcast equipment and computer peripherals.

***Circle 27 on Reader Response Card***


### Fiber Optics

The Belden Division of Cooper Industries now offers its new fiberoptic catalog to assist engineers, network designers, distributors and end users in the selection and placement of fiberoptic cables serving the control and instrumentation, data comm and broadcast and CATV markets.

The color 72-page publication describes Belden's line of fiberoptic products including assemblies for FDDI applications, fiber cables and Belden's new line of hybrid cables.

***Circle 28 on Reader Response Card***

### Rack Accessories

BGW has released a color catalog for its metal products. Included in Rack Mount Accessories are vent panels made from a single piece of steel for aesthetic appearance.

***Circle 29 on Reader Response Card***

### Cable Assembly Systems

Brand-Rex Company has introduced a sales brochure highlighting its cable assembly systems products. The brochure describes Brand-Rex's customized cable assemblies for the computer, business machine, industrial equipment, transit, military and aerospace industries.

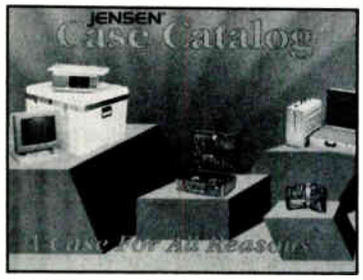
***Circle 30 on Reader Response Card***

### Mouser Manual

Mouser Electronics has announced its purchasing manual #566. This reference guide provides product data and pricing on more than 35,000 electronic components and 80 manufacturers.

Product index tabs have been added for product location and there is a new product section for recently added items.

***Circle 31 on Reader Response Card***




### Cases and Containers

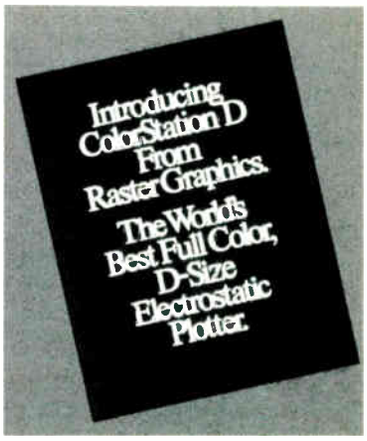
A catalog of cases and containers is available from Jensen Tools, Inc. The color catalog contains 32 pages of products including cases that can be custom designed for transporting cameras, lighting and sound equipment, mixers and other electronic equipment.

***Circle 32 on Reader Response Card***


### Case Poster

Schroff Inc. has made available a color poster containing its line of electronic cases. The 24-inch x 32-inch wall poster includes color photos, reference charts and configurations, and ordering information on Schroff's desktop and 19-inch format rackmountable electronic cases for various applications.

***Circle 33 on Reader Response Card***




### Plotter Brochure

Raster Graphics Inc. is offering its four-color, four-page product brochure on the ColorStation — a 400 dpi, laser quality, full color, D-size electrostatic plotter designed for CAD/CAE/CAM uses.

Included in the brochure is a matrix comparison chart, as well as information on software compatibility and cost per plot.

***Circle 34 on Reader Response Card***

### Bid Specs

Oval Window Audio has announced the availability of bid specifications pertaining to induction loop assistive listening systems (ILS) for the hearing impaired. Technical information concerning IEC 118-4 standards and physical characteristics of the company's product line are included.

***Circle 35 on Reader Response Card***

### Two-Way Cases

A 12-page reference book, "A Guide to Selecting Two-Way Radio Cases" is available from A.W. Enterprises, Inc. The book includes photos, illustrations and a seven-point specification chart for matching features to requirements. Design options, construction techniques, considerations for corrosive environments and maintenance are discussed.

***Circle 36 on Reader Response Card***

# Computer Audio Bulletin Boards

## *The Audio Party Lines*

**BY MIKE KLASCO**

A computer bulletin board is an electronic message and file service which can be accessed by your computer if you have a modem. A modem is a device that is connected between your computer and any telephone line. Prodigy, CompuServe, and Genie are a few of the popular services you might have heard of. With these services you can check plane flights and even book your ticket, shop by computer, send electronic mail, look up reference material, and so on.

Recently a reader wrote us asking about the availability of shareware and public domain software for speaker box design. I briefly responded that the bulletin boards for audio are the place for free audio software and promised a full tour of all these electronic hang-outs. Welcome aboard!

*Audio Projects BBS by Madisound Speaker Components*. Madisound is a speaker driver supply house, mostly for audiophile components such as Dynaudio, Morel, and other upscale woofers and tweeters that make up hi-fi and autosound sound systems. Their customers are retail shops, speaker system manufacturers and hobbyists. Madisound exhibits at the AES and gives away sample disks of what is on their BBS. The Madisound BBS, Audio Projects, was the first system dedicated to audio and was started about five years ago. It includes electronic mail conferences on all audio related topics, mostly related to some aspects of loudspeakers. Their bulletin board has endless free software programs on box design, crossover design, circuit board layout tools (easily over 50), plus demo programs from Audio Precision, MLSSA, LEAP, and others. There is over 145 Meg. in 2400 files at Audio Projects. EV uses the bulletin board as a "no man's land" to post directional files on its horns for JBL's CADP program. You can connect and leave messages and questions for other users, some of whom are well-known audio "heavies." Another interesting feature of this BBS is Audnet. These are files of electronic mail from a sub-group of Internet, called Usenet. Internet is an electronics mail communications network that is used by many large companies. Usenet is a conglomeration of discussion forums, a few of which are audio related, such as REC.AUDIO AND REC.AUDIO HI- END. While you cannot interact with this network using the Audio Projects BBS, you can get copies of these discussions in files labeled Audnet.

I have one serious warning about about Madisound and their bulletin board. A number of speaker nuts have been known to have entered this vast audio software playground, never to leave it.

Audio Projects membership is free. On your first visit you are allowed 45 minutes. You must eventually register, although there is no charge for this. To connect by modem, call (608) 836-9473 (8 bit, no parity, 1 stop bit), or to talk, call (608) 831-3433.

*AV-SYNC Atlanta* (Audio-Video Sync) is an electronic message and file service dedicated to pro sound, broadcast and post production. Among other special interest conferences and message bases is one specifically for sound, recording and acoustics. Over 3 gigibits of stuff are on this BBS!

The system is divided into several different areas, with a log-in section for general message base and public domain file area (for both MS-DOS and Apple based machines). Also there is a conference area for special interest files, software and public messages. The software contains a large selection of program demos, utility programs (such as programs for emulating calculators, doing conversions, plotting graphs, circuit board layout, etc) and MIDI programs and more. There are hundreds and hundreds of programs here, really overwhelming!

AV-Sync can be reached at (404) 320-6202 24 hours a day by modems running up to 2400 baud. Settings are: No parity, 8 Data Bits, and one stop bit (N-8-1). If this is a little too far out for you to jump into, give them a call at (404) 438-5858 and ask them how to get started. AV-Sync is a non- profit service, and costs only $25 per year for NSCA members for up to one hour per day, or $35 per year for an hour and a half per day. You can subscribe immediately by phone, but you are allowed 30 minutes to look around for free.

*Sound-Net* is a dedicated audio/acous-

tical electronic bulletin board system sponsored by the Toronto section of the AES. It has been in operation since 1988. Their newsletter, Sound Net News, was started in November '90. Sound-Net is a private BBS in that a full membership is required to access key services. Guest privileges are available to non-members and you can snoop around for up to 20 minutes, but you cannot receive any files or send any messages.

Sound-Net reports audio events and news, holds conferences and discussions, reviews software, offers public domain and shareware programs, and has an electronic mail service popular with the touring sound industry, and a classified section for jobs and business to business notices.

Sound-Net has a CAD symbol and drawing library for those who use computers for drafting. It is a specific file area loaded with audio, acoustical, electrical and electronic symbols compatible with most CAD packages.

A users group for the MLSSA test system has been formed by the Canadian distributor. Topics include measurement standards, third party software and hardware reviews, problem solving, etc. and is located in a separate discussion and file area.

Sound Net is located at 212 Fern Ave. #1, Toronto, Ont M6R 1K4, Canada. To reach them by phone call (416) 530-4423 or by modem (416) 538-8777.

*Ariel Corporation BBS.* Readers who have been reading our test equipment reviews know that one of MLSSA's competitors is the Ariel SYSid system. A BBS is operated by Ariel on all their products. Membership is free and you are allowed one hour of use per day. The bulletin board includes product demos that you can download, documentation and ap-notes for software including updates and corrections, experimental software enhancements for the adventurous, a message center, and a section for user developed programs for Ariel hardware.

Ariel Corp. is at 433 River Road, Highland Park, NY 08904. To reach them by phone call (201) 249-2900. The BBS number is (201) 249-2124.

Getting slightly off of purely audio bulletin boards, if you have "gone digital," aside from the Ariel DSP BBS, you will enjoy the AT&T DSPBBS, (201) 834-6068, Motorola's DSP BBS (also known as Dr. Bub) (512) 891-DSP2), Texas Instruments BBS (713) 274-2323 for the TMS320 DSP (which is used in the Ariel SYSid board and the Techron TEF 20). The AT&T, Motorola and TI BBS are only for hardcore individuals who have left the analog domain.

## Guest privileges are available to non-members.

Not all audio BBS have been success stories. Techron had a BBS three years ago, but TEF users didn't get involved, perhaps because the software had to be compatible with the TEF machines, which were not compatible with MS-DOS nor the Mac. With the TEF 20, which is compatible with both Mac and IBM compatibles, TEF users will be able to take advantage of just about all audio software, and maybe the time is right to resurrect the BBS.

Another BBS that was before its time was the Bose Modeler BBS. Lack of interest and activity led Bose to close its BBS in 1988. Only recently has audio related software and hardware appeared for the Mac, and the user base of Modeler has grown, so if there is enough user interest, maybe a Modeler BBS will reappear.

### GETTING STARTED

To get started, you will need a computer, a modem, and software. A few years ago modems moved data slowly, at 300 baud. Until recently 1200 baud was considered adequate, with 2400 baud considered fast. Now 1200 baud is "old fashioned" and these modems (which are really quite adequate) can be bought for well under $100. 2400 baud modems are at the $100 price point. Often the modem will come with software, which is needed to operate the modem. Modems connect to any phone line, although the computer end gets a little more complicated. Some modems will plug directly into the IBM compatible buss slot. Others (external) require a serial port and will work with both IBM and Mac computers.

Once you are set up and "on-line" (connected to the phone line) you are ready to go. Log-in means that you have connected to the bulletin board and given your name and maybe a password. After this point you can move about the bulletin board. At first you will probably find this awkward, but there are help menus and eventually you will learn your way around. Downloading means to copy a program or file from the bulletin board to your computer, while uploading is to send a file, message, or program to the bulletin board.

Bulletin boards, especially audio BBS, can be a fun source of programs, a way to get demos of software that you are considering purchasing and a forum for communications with your peers. Membership fees are nominal or free. Happy modeming! ■

# Software Review

## *Part II, Performance Simulations and Selecting Speakers with EASE*

**BY MIKE KLASCO**

In Part I of our review of EASE, we investigated how the program dealt with job management, room modeling, and Autocad file interchange. In Part II we will take a look at how the program helps the designer select and aim speakers, and, most importantly, begin our review of EASE's comprehensive performance simulations. In Part III, we will finish our exploration of EASE's intelligibility predictions, image modeling/ray tracing abilities, and overall conclusions on the program's substance.

### PROGRAM FLOW

After the room model is created, the next step is to select the speakers and see if they will be appropriate for the job. The speaker library files in the ancillary program EASEBASE are searched and candidate speakers are selected into a "short list."

Speakers, their locations and aiming points are tried out. The room can be viewed from three perspectives: from a selected loudspeaker (looking out from the throat of a horn), from a selected seat in the audience seating with a center perspective of the stage, and from an elevated overhead view. Simulations are run, including sound intensity maps of the room. Additionally, spot checks of specific seating locations can be taken using the "ProBe," in which intelligibility can be determined. As with all of these sound system design programs, the simulations and the speaker selection, location, and aiming is an interactive process, in order to optimize performance.

### VISUALIZING COVERAGE

#### Selecting, Locating, and Aiming Speakers . . . and related topics

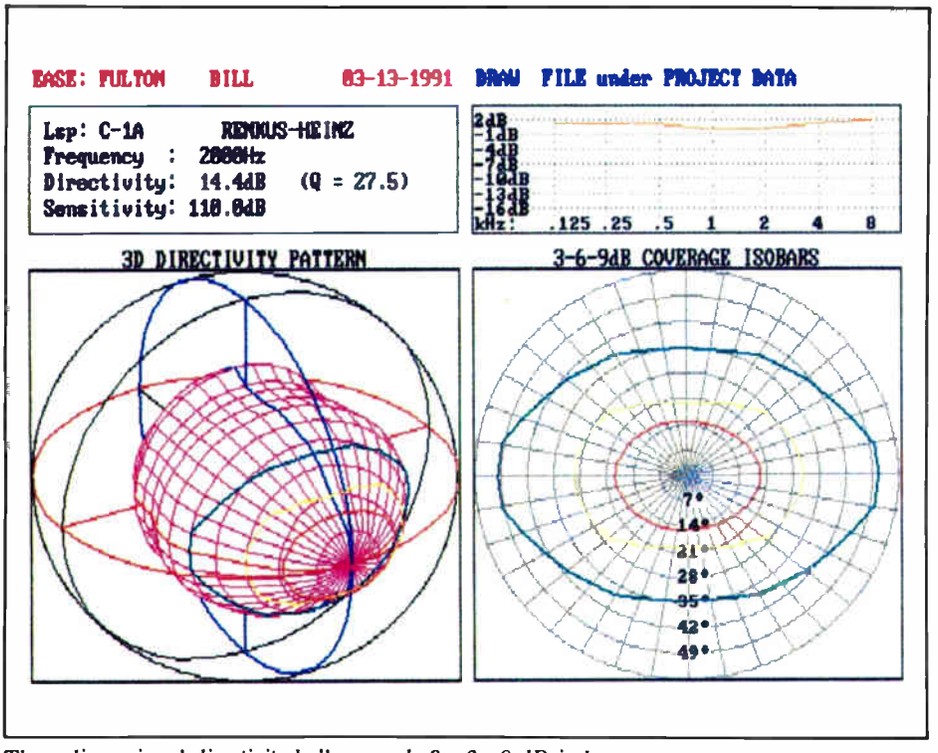
The loudspeaker data files are stored in the subdirectory SPEAKER; surface materials are similarly stored in a subdirectory SURFACE. A separate program, EASEBASE allows the operator to edit, add, delete, or create custom files for both loudspeakers and surface materials. EASE has a comprehensive speaker library and allows the operator to edit, add, or delete the speaker library, and these are very desirable features. EASEBASE automatically creates an "audit trail" when the data is modified and indicates when the speaker database has been diddled with. EASE is promising a full data library including speakers from JBL, Altec Lansing, E-V, Peavey, as well as the existing Renkus-Heinz, Frazier and a number of other firms.

**The viewer is placed into any of the Listener seats with a center perspective view of the stage.**

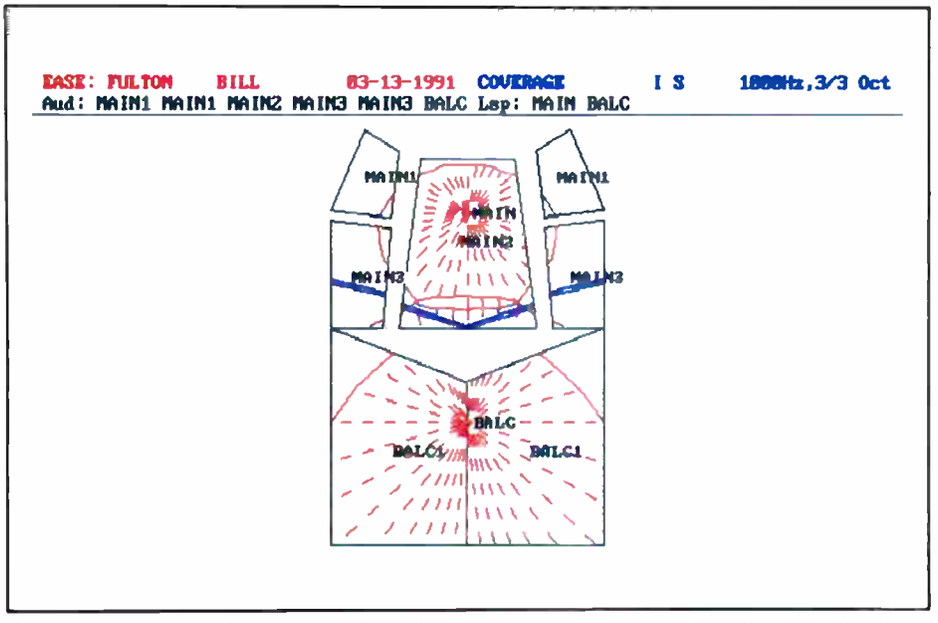
When you are in the EASE or EASEBASE programs, the directional characteristics of each speaker can be graphically displayed in 3-D, and general information such as sensitivity, impedance, efficiency, maximum power, etc. is listed. Other graphic displays show 3 dB, 6 dB, and 9 dB isobars and horizontal and vertical characteristics.

Moving though the speaker menus is a bit clumsy. Certain operations that are typical and repetitive in sound sound system design ought to be accomplished with a single keystroke, but instead require half a dozen, with opportunities for the uninitiated to screw up. The error trapping is robust and the program strongly resists crashing or hanging up. In talking to the program developers, I find they fully realize all this and explained that in their zeal to keep adding features, they also added too many patches. Remember, the program is only in its initial release and I think most of this will be cleaned up soon. For now, one shortcut is to use a third party "hot key" utility to create macros. For example, to get through certain aspects of the program you must jump through a number of keystrokes repetitively, so these can be "recorded" into a macro and stored in a memory resident utility program intended for just this purpose. A special function key (F1, F2, etc.) is assigned to call up this sequence of keystrokes. Each time you need to enter this particular sequence of keystrokes, you only need to hit the special function key.

In any case, all of this is more awkward than confusing. I found living with the program more than worthwhile, especially in light of the wonderful simulation capabilities. The real bottom line is not how easy the program's idiosyncrasies are to learn, but the quality of the information it gives you, in which case EASE is worth the EFFORT.




*Three dimensional directivity balloon and -3, -6, -9 dB isobars.*




*Projected isobars are shown in red, blue lines represent balcony shadowing in the main floor.*

## Back to the Job . . .

A "short list" is created from the full speaker library in EASEBASE. This will eliminate the need to sort through different subdirectories and instead locate all applicable speakers in one subdirectory. From the "short list" of candidate speakers you would pick a likely speaker and locate it in a promising location. EASE is especially strong as an intuitive aid to the sound system designer. In the past, I found the PHD program and Umbulus very powerful design tools, enabling the user to clearly envision the best speaker for the job, although these programs had other limitations. EASE provides all the capability of these programs and more. Umbulus allows the designer to look through the throat of a horn into the seating area it is aimed at. AcoustaCADD contributed the technique of isobeam contours projected into the seating areas. EASE offers all of these. EASE's visualization tools make the effort required for a detailed room model worthwhile.

By the way, there is an aspect of room modeling with EASE that I incorrectly described in Part I of this review that I would like to correct here. When creating the room model, defining the surface material is assigned in FACES. A "data page" is used to enter data for that FACE. All aspects of that FACE must be defined including surface material, before exit is allowed from "data page." If, while entering data, a mistake is made (calling wrong name for speaker or surface material) the entire available list is presented.

## Coverage Screen

EASE allows coverage simulations to be done for one of the audience areas, for groups of audience areas; or for all the audience areas; similarly for speakers. Some of the more important tools will be introduced here.

An Overlap option superimposes white "overlap" curves on the display. The curves labeled with "2" indicate areas where two sources contribute appropriately equal levels, a "3" indicates that three sources contribute approximately equal level, etc. This option is a useful tool for indicating if interference effects in specific areas may be a problem. Move is a tool for assuring desired acoustic coverage. A screen cursor appears at the aiming point of the selected speaker. The cursor keys control where you may re-aim the speaker. To lock in the new aiming point, the operator hits the ENTER key. The Redraw command is then used to redraw the display isobars for the new aiming points. ProBe is another tool, and used in all simulations. The ProBe is a cursor that the operator moves to points of interest, to test for intelligibility, frequency response, etc.

## Speaker View

Your perspective is from the acoustical center of the speaker that you have selected and positioned in the room. The perspective view covers ±45 degrees in the horizontal plane, with the initial aiming

set to your guesstimate when you last (or first) aimed the speaker. Superimposed on the room are -3, -6, -9 dB coverage isobars at the selected octave frequency. Actually, since the contours do not take into account the actual distance of the surface that they fall on, perhaps the term "isobeams" used in AcoustaCADD is more apt, as the inverse square law is not accounted for here. As with AcoustaCADD, I welcome this approach as a rough cut estimating tool for both selecting speakers with appropriate directivity and general aiming.

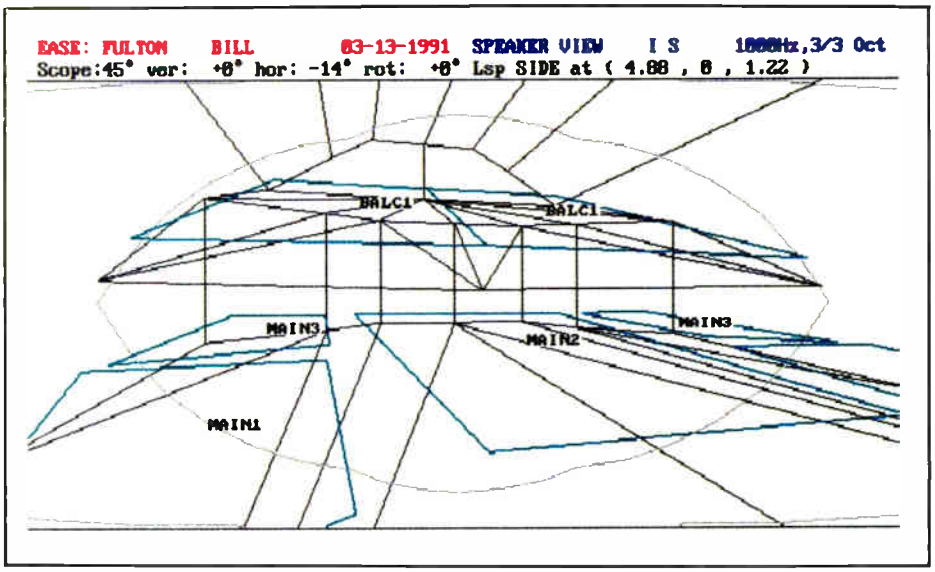
To obtain the Speaker View, the option TEST is selected from the menu. From the short list of speakers, a speaker is selected to be aimed. The room and the "isobars" will appear, along with a few control options allowing you to zoom in or out (change scale), up to a 170 degree "fish eye" perspective. The TURN option produces a cursor at the aiming point of the speaker. This cursor can be manipulated with the cursor keys. When you have the cursor at the desired aiming point in the seating (or wherever), you only need to hit the ENTER key to lock in the new aiming coordinates. The horizontal and vertical aiming angles are displayed and saved. The horn mouth may also be rotated (60 × 40 to 40 × 60, or somewhere in between). Overall, this technique for first stage refinement of speaker aiming angle is an excellent approach.

## Spectator View

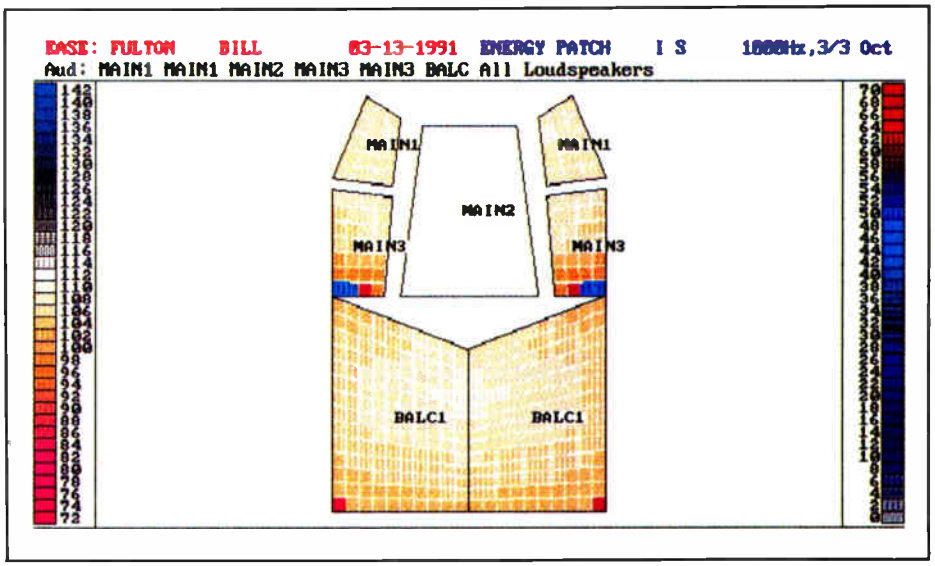
The viewer is placed into any of the Listener seats with a center perspective view of the stage. Zoom, TEST, and the other options of SPEAKER VIEW are available.

Speakers may be optionally mirrored; that is, if your cluster is symmetrical, you need only enter half the components, and its twin will automatically appear.

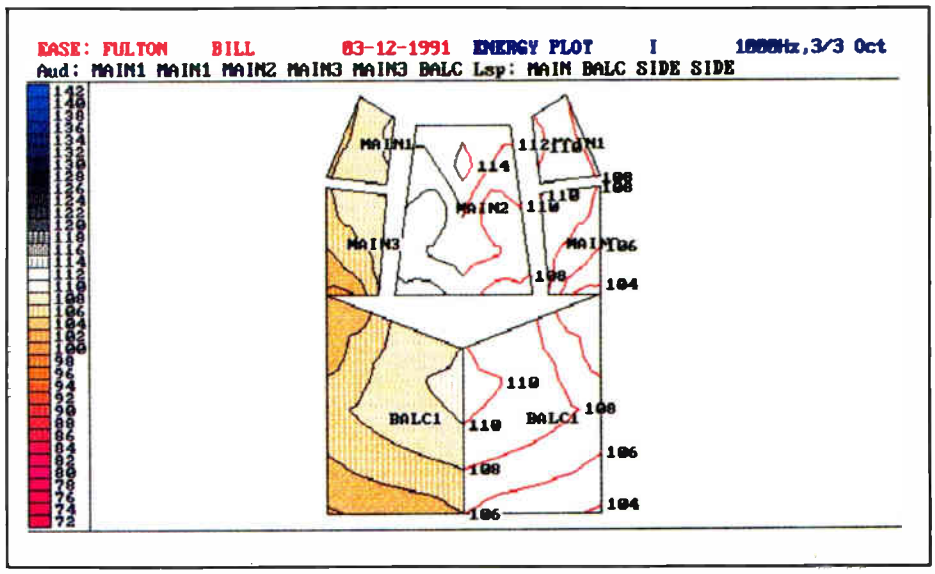
At the moment, EASE does not allow wholesale manipulation of clusters. This means that if you decide to see what happens if you drop the height of the entire cluster a few feet, each component must separately be re-edited. Cluster control is promised, and would be a real time saver.




*Speaker view from stage located effects speaker.*




*Left half of this figure shows Energy Paint, the right half is Energy Plot showing numeric isobars.*




*Blue and red areas in the Energy Patch screen show balcony shadowing of the main floor coverage.*

## SIMULATIONS FOR UNIFORMITY OF COVERAGE

### Overview

EASE provides five displays of sound distribution, three in two dimensions, two in three dimensions. This is a very comprehensive approach, with the different displays allowing graphic displays of uniformity of coverage, interference effects, and obstructions.

### Energy Plot and Energy Paint

These simulations show coverage, Energy Plot by isobars, Energy Paint by color contours. Energy Plot and Energy Paint are identical techniques, and differ only in the style of how they depict the data. Energy Plot shows isobars labelled in spl in dB while Energy Paint more graphically depicts spl levels by color. With either, the operator can select the Audience Areas and Loudspeakers that will be active. From the menus, the speakers and seating areas can be inspected and edited. In these simulations the ability to observe interference effects is optionally available, but viewing obstructions is not. Parameters used in these calculations include the directional characteristics of the speakers and attenuation caused by distance and air absorption.

**The room can be viewed from three perspectives.**

EASE provides the operator with control over the test signal "used" in the simulations. In the setup menu, not just the frequency, but the bandwidth of the signal can be defined. Octave, or 1/3 octave noise can be used, or for the most sensitivity in viewing interference effects, a sine wave can be specified. There are good reasons why the options of user defined bandwidth are provided, but the manual lacked adequate discussion (or bibliography) of this. By the way, the test signal only exists within the calculations used in the simulations. A future enhancement that I would like to see is the ability to view multiple frequency bands of coverage simultaneously.

### Energy Plot 3-D

Energy Plot 3-D offers another spl coverage display mode where isobars are plotted in 3-D above the audience areas. Interference cancellations are most apparent using this display, assuming a sine wave test signal. A corresponding dB scale is shown in the upper right hand corner of the screen.

**I found living with the program more than worthwhile, especially in light of the wonderful simulation capabilities.**

### Energy Patch and Grid 3-D

Energy Patch 3-D is similar to Energy Grid 3-D but displays a grid instead of isobars and is most useful in displaying smoothness of coverage. These modes are similar to Energy Plot and Energy Paint, but allow the use of "shadow cast," the option that depicts the acoustical effects of obstructions. The operator can enter the patch size in the setup menu, trading off computer time for resolution. EASE is the first MS-DOS program (IBM compatible) to offer shadowing in its 3-D model, with the only other program offering this capability being the Bose Modeler, which runs on the Mac. This is a valuable feature, for example, as an aid to the designer in deciding if underbalcony speakers are necessary.

### ProBe

ProBe, or the cursor, is used to spot check conditions that take into account early reflections and reverberation. With these simulations it is possible to calculate Energy parameters related to room acoustics and reverberation time. ProBe is one of the main tools of EASE and can be accessed from the simulation displays, such as the Energy coverage plots and BEAMSHOW simulations.

The cursor keys move the ProBe through the audience area on the screen. On the bottom of the screen the ProBe coordinates are displayed. When you select a location to examine and hit ENTER, a menu appears with these analysis choices:

- *Spatial direction of speakers* — the speaker's location relative to Probe location, including the direct sound vertical and horizontal angle of incidence.
- *Instant complex amplitude (phase)* — showing relative phase and amplitude of speaker signals at Probe location, based on time of arrival.

### Conclusion, Part II

In this part of our review we have explored the tools provided by EASE to aid the designer in visualizing what speakers might be appropriate for the job and their proper location and aiming. These include looking out the throat of a horn into the seating, and perspectives from the seating to the stage. Isobars can be projected from the speakers into the seating areas to further aid in the determination of speaker aiming. We have also investigated the coverage simulations, including specific plots for depicting speaker interference effects, acoustic shadowing due to obstructions, and 3-D perspectives, among others.

In both the domain of visualization of the job and in the comprehensiveness and sophistication in the simulation of coverage, EASE has set new standards. Unfortunately, the user interface has not received as much attention as the "meat" of the program, and is somewhat clumsy. Since this is only the initial release of the program, and the program developers are highly motivated, I would anticipate a timely cleanup of this aspect of the program.

In the final installment of our review, we will take a look at the sound system/room interface prediction capabilities of EASE, such as intelligibility and the reverberation time module. ■

## IN-WALL SPEAKERS

*(continued from page 43)*

series is an amplified, self-enclosed, in-wall subwoofer system known as the NSW-100 which is designed to complement the BluePrint series. The system consists of a stackable subwoofer amplifier, the SA-100 and the NSW-8, an eight inch acoustic suspension subwoofer in its own in-wall enclosure. The amplifier can drive a second subwoofer if desired. Retail for the set is $200 for the subwoofer and $500 for the amplifier.

Already making inroads in the "media center" market is Phase Technology. Its Custom Installation (CI) Series offers three 2-way systems , the CI 60, CI 40 and CI 20; as well as a CI SUB subwoofer.

Several Sonance dealers are doing commercial work, well within the trend toward commercial use of in-wall speakers. The company's "architectural audio" products applicable to non-residential installations include the Sonance IA, a relatively inexpensive model for mono or non-critical listening situations. The flagship Sonance 45 has a one-inch fabric soft-dome tweeter that uses a ten-ounce magnet; it carries a suggested retail price of $650 a pair. A wide range of models are between these.

**Some clients still associate built-in speakers with performance standards of the past.**

Several of the Sonance models are designed to fit the Spacesaver Wall Plate, a nifty little stamped steel plate with the dimensions and contours of a Sonance speaker that attaches to Sonance mounting brackets and fits over a wall cut-out made to accommodate a speaker which would be installed later. Many development homes and malls are being wired for later installation of multiple speaker systems. Spacesavers save the opportunity for installation at the new construction phase, when it is less expensive to place wiring, prepare walls, and install brackets. And when the installation is finally made, you remove the Spacesaver plate and pop in the speaker. When the plates are returned to the dealer by the consumer, the purchase price is credited toward the purchase of Sonance speakers.

Not all sound contractors are lucky enough to install systems during the construction phase. Retrofitting presents a whole different set of challenges. Many companies offer mounting frames for either new construction or retrofit. Fosgate Models AS502 and AS602, a 5-inch and 6-inch, respectively, offer both types of mounting frames. Two additional models, the AS 802 and the AS 803, are specifically designed for new construction installation. These are seen in residential sites, mostly, and are expensive, high performance air suspension three-ways designed mainly for home audio-video systems.

**Many development homes and malls are being wired for later installation of multiple speaker systems.**

The already fine line between commercial and residential products is blurring and shifting. Many wall speakers intended for home use are being installed in retail spaces, some with disastrous consequences, and some quite successfully. Most wall speakers are not intended for commercial application; even expensive models often cannot ...rate the high acoustic levels necessary for, say, a bar. Some, however, are designed to deliver a truckload of noise. Barring prior experience with a given speaker, the contractor can only check the power handling and sensitivity of a given model and decide what is needed.

One line of speakers originally targeted for the commercial market is AES. Jeff Myers, President of J & J Myers, the exclusive distributors of AES, sees the commercial market for wall speakers as in a state of rapid change: "For a long time, in the commercial end of things, business was divided into two camps. One camp was the very low fidelity camp; and the other was the fullblown, pro-sound sort of camp—and not a lot in between. I think there's a growing appreciation of mid-range products. Contractors and users realize that for not much more money you can get something with very clear voice and a pretty wide musical range. Particularly in boardroom and office applications, people are willing to spend a small amount of additional money for an appreciable increase in fidelity."

**"For a long time, in the commercial end of things, business was divided into two camps."**

AES Models 1 and 2 are suitable for new or retrofit installation. They both have a 6 ½-inch woofer and the AES-1 has a 2

*Wallspeaker Technologies series II (left) and series III (right) loudspeaker.*

*The Sonance IA in-wall speaker system.*

¼-inch cone tweeter, while the AES-2 has a 1-inch soft dome tweeter. Many companies, AES among them, are offering subwoofers to handle some of the problems inherent in in-wall systems, particularly in the drywall-laden residential field. Because most in-wall speakers have fairly small woofers — 6 inches or so — bass reproduction and power handling is necessarily limited. In addition, gypsum — drywall — is a highly flexible and resonant material that can degrade low bass reproduction even further with sympathetic vibrations — thus, the need for subwoofers in some installations.

## Retrofitting presents a whole different set of challenges.

Although subwoofers solve some of the problems of bass reproduction, they create a few problems of their own. Effective isolation of bass frequencies from front and rear walls can be tricky. While the sound in the room with the speakers may be terrific, the room on the other side of the wall may be pulsing with bass booms. And, since driver vibrations are transferred directly to the wall, items attached to the wall surface such as pictures and mirrors can rattle. To prevent the frustrating embarrassment of rattle or buzz, expert, thoughtful installation is especially important, with particular care given to the enclosure. Oregon manufacturer Triad includes braced, sealed enclosures filled with absorbent material in all its in-wall speakers to handle this problem. Their ported Inwall Five features Danish drivers and very gentle crossover slopes.

The AES-3 subwoofer, designed to combine with either the AES-1 or AES-2, features an isolating enclosure that installs between the wall studs and isolates bass frequencies from front and rear wall surfaces. Boston Acoustics' Designer Series model 360 has a new in-wall enclosure device that fits on 16-inch on-center framing. A flexible gasket creates an air tight seal that minimizes wallboard resonance. The AES-4 dual voice-coil subwoofer, which came out in December of 1990, accepts stereo input and has the same frequency response and low bass capability as a pair of AES-3s, according to Jeff Myers. Ultimately, they will not handle as much power, but offer a cost effective solution without practical sacrifice.

A recent addition is the AES-5, an in-wall satellite-type speaker, similar to the AES-1, that has on-board thermal shutdown and reset protection circuitry. These are seen as having mostly residential application, with some boardroom and retail/background uses. AES offers no back boxes at this time, but is interested in developing this product. Jeff Myers cites the difficulty in obtaining standards that would satisfy requirements, a lament I heard from many of the people I interviewed. In some cases, two or three agencies per state feel they have something to say about what gets installed where. Many times, regulations contradict each other.

Some manufacturers offer UL approved speaker assemblies. Often these are primarily designed for use in fire alarm signaling and paging. Dukane's 6A637/6A638 and 6A639/6A640 fit this profile. Legend Audio ups the ante (and the performance standard) with its Model 1000 and Model 2000. Both have UL-approved flame retardant frames and have optional, customized metal enclosures for new construction and retrofit brackets for commercial and high-rise fire code compliance — an acknowledgment of the increasing awareness on the part of manufacturers to the needs of the sound contractor.

## Most wall speakers are not intended for commercial application; even expensive models often cannot generate the high acoustic levels necessary for, say, a bar.

JBL Professional also has a UL rated series of flush mounts, the 8300 Series, which specifically addresses the priorities of the contracting market. The baffle and installation frame of both the 8305 and the 8306 are fabricated from GE Cycolac CK Series ABS, instead of the more common styrene. The mounting frames themselves are designed to accommodate several wall thicknesses, horizontal or vertical mounting orientation, and new or existing construction. JBL also gives a nod to the contracting market with its special "PG" Contractor Carton packaging, available in two-packs or six-packs. Because contractors frequently pre-install speaker fittings

and wiring some time before the speakers themselves are installed, JBL has developed packaging that separates installation mounts and speakers in separate sections of the same shipping carton. Mounts and instructions from one section are used first, leaving the speakers in another section which can be easily closed, protecting the speakers until they are needed.

Perhaps the most extreme example of in-wall sound source invisibility is the CT62 from B.E.S.T. The CT62 is mounted in the wall and then painted or papered over, completely concealing its presence. A sound transducer with a particularly wide dispersion pattern, the CT62's applications include foreground music and sound reinforcement. Although it was originally designed for commercial constructions, it has been widely used in both commercial and residential applications for over eight years.

Design work on a model specifically for home use is being done currently, according to Nina Babiarz, Marketing Coordinator for B.E.S.T. Babiarz says the CT-62 seems to turn the whole surface of the wall into a speaker, eliminating dead spots in the room. Popular with interior

**Gypsum — drywall — is a highly flexible and resonant material that can degrade low bass reproduction.**

decorators, the CT62 is often the only choice in interiors with antique decors where conventional speakers, no matter how flush, are inappropriate. "Also interior designers needn't worry about arranging furniture in relation to speaker placement," says Babiarz, "the sound is everywhere." A plaster ring is placed between the studs— either in new construction or retrofit—then the CT62 transducer is placed within a plaster ring. The seam between the plaster ring and the wall is then taped, the surface lightly plastered (to the thickness of a business card), sanded to a smooth finish and then painted over with latex (only) paint or covered with wallpaper.

Just as this article was going to press I came upon two in-wall speakers manufactured by a new company in Novato, California — Wallspeaker Technologies. As the name suggests, they specialize in wall speakers. To date, they market two

**In some cases, two or three agencies per state feel they have something to say about what gets installed where.**

models, The Series II and the Series III, which contain design features that pretty much guarantee their products a comfortable niche in the high performance in-wall market. Essentially, they have extended the contruction standards of free-standing cabinet speakers to the in-wall enclosure.

The enclosure "floats" between the studs on rubber isolation mounts which prevent bass vibration from going through the building structure. The full enclosure provides repeatable bass, and stops sound from carrying through the wall into adjacent rooms. Both the Series II (a two-way) and the Series III (a three-way) provide for post-installation adjustment to accommodate individual room acoustics. The tweeters swivel in four directions so you can dial in imaging; the tweeter adjustment level compensates for different listening environments, allowing you to balance the bass with the treble.

Intended as primary listening speakers in a custom system, these thoughtfully designed speakers are 4-feet and 6 ½-feet high (!), respectively, and can be ceiling mounted as well.

Many of the above mentioned speakers are weather resistant. Some can be ordered with special waterproofed components, suitable for applications in bathrooms, spas, etc. Next month we'll take a look at outdoor and underwater(!) speakers. ■

# CALENDAR

## Upcoming Events

### MAY

**Video Expo:** Los Angeles, CA: Contact: (914) 328-9157. May 14-16.

**NSCA (National Sound & Communications Association):** Cincinnati, OH: Contact: (800) 446-6722. May 20-22.

**Comdex/Spring: Atlanta, GA: Contact:** (617) 449-6600. May 20-23.

**Fiberoptic Competency Certification Program:** Sturbridge, MA: Contact: (508) 347-8192. May 20.

**Semicon West:** San Mateo, CA: Contact: (415) 964-5111. May 21-23.

**Rep Expo:** Milwaukee, WI: Contact: (708) 729-0100. May 22-23.

### JUNE

**Consumer Electronics Show:** Chicago, IL: Contact: (202) 457-8700. June 1-4.

**Expo Comm:** Moscow, USSR: Contact: (301) 986-7800. June 5-10.

**Nepcon East:** Boston, MA: Contact: (708) 299-9311. June 11-13.

**New Music Seminar:** New York, NY: Contact: (212) 473-4343. June 13-18.

**Test Engineering Conference:** Atlanta GA: Contact: (800) 223-7126. June 25-27.

### JULY

**Nomda/Southeast:** New Orleans, LA: Contact: (800) 228-9772. July 17-20.

**Communication Networks West:** San Francisco, CA: Contact: (508) 879-6700. July 15-18.

**Video Expo:** Chicago, IL: Contact: (914) 328-9157. July 29-August 2.

### AUGUST

**NESDA/ISCET (Nat'l Electronics Sales & Service Dealers Assoc./Int'l Society of Certified Electronic Technicians):** Reno, NV: Contact: (817) 921-9061. August 5-11.

**Surface Mount:** San Jose, CA: Contact: (800) 223-7126. August 27-29.

**ISC East (International Security Conference):** New York, NY: Contact: (708) 299-9311. August 28-30.

### SEPTEMBER

**Midcon:** Rosemont, IL: Contact: (213) 772-2965. September 10-12.

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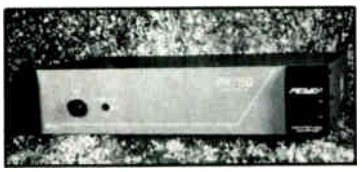
# Supplying Desert Storm; New Companies Formed

## Sound and Communications Companies in Desert Storm

The war in the Persian Gulf was attended by equipment from several companies in the sound and communications industry, as various products were fitted for military endeavors. Among the war news items that touched this industry:

Talk-A-Phone Co. was awarded a "Certificate of Recognition and Appreciation for "Contractor Support — Operation Desert Shield/Storm" from the U.S. Department of Defense. Talk-A-Phone Intercom Systems are provided to the Department of Defense for general communications needs, for security related applications and for "special needs" situations.



Seventy-five Peavey Architectural Acoustics IPA/150 amplifiers were sent to the Gulf from TNT Electronics in Pensacola, Florida to power "The Great Voice," a local area warning system.

*Major Mary Quinn presents Desert Storm award to Talk-A-Phone chairman Abraham Shanes and president Zvie Liberman.*

Harris Corporation loaned advanced radio equipment to allow U.S. Armed Forces personnel in the middle east to send messages free of charge to their families stateside.

Octel Communications provided voice mail services to service members stationed in the Persian Gulf via Worldcall 2000 and Continental Telephone of Minnesota, using an Octel voice processing system allowing Operation Desert Storm personnel to communicate through the exchange of recorded messages that can be sent and retrieved 24 hours a day.

Shape Inc. and BASF donated 20,000 audio cassettes containing the song "Stand Up" performed by Wizards. Additional space was supplied on each cassette to allow military personnel to send messages home.

Equipment is being donated to the Armed Services YMCAs by the consumer electronics industry to allow families to make videotapes to send to the Persian Gulf. The equipment includes at least 250 camcorders and vcrs and 3,000 blank videotapes.

Lectrosonics wireless microphones are in the combat zone, as are the products of many other companies: JVC Super VHS equipment reportedly was used to record aerial bombings, Hitachi LCD screens were reported to allow tank personnel to view the terrain, Sony 8mm equipment was being used. And CEL, the makers of standards converters reported their products being used to universalize information from a worldwide panorama of video makers.

## Loether Consults

Jeff Loether has formed Electro-Media Design, an independent consulting group in Rockville, Maryland which specializes in A/V systems for hotels, meeting and conference centers, restaurants, night clubs and corporate facilities. Loether's background includes 10 years with the Marriott Corporation directing a/v design for facilities worldwide. He was also instrumental in pioneering the practical use of automatic mixing/combining systems for hotel ballrooms.

*Jeff Loether*

## New Company Formed

Meridian Technologies, Inc. has been formed by Robert Klein, president, and Jack Krol, director of engineering. The company develops, manufactures and markets fiberoptic transmission systems for video, camera control, voice and data for industrial "security and surveillance." Klein and Krol were founders of American Fibertek. Meridian Technologies is located at 80 Mott Avenue, Suite 6, Inwood, New York 11696.

## Roland Corp. New Division

Roland Corp. has formed a new Pro Audio/Video Division with targeted markets including theme parks, government equipment, sound reinforcement, radio, recording, film, post production and broadcast. Tom Beckmen, president of RolandCorp US said, "The formation of the division is part of Roland's strategic plan to leverage its advanced technology base and experience to develop products for the professional industries. According to the company the move reflects "recent industry trends where industrial and professional markets and their respective products are overlapping."

Curtis Chan, formerly with Ampex Corporation, has been named General Manager for the division. Chan commented, " The audio industry is following trends similar to the video industry."

To complement the existing professional products, three new products are slated for delivery this year. The Roland Sound Space Processing System (shown at AES last September) enables the reproduction of a three-dimensional aural environment from a stereo playback system. A self-contained digital multi-track disk-based recorder comes in four and eight track configurations. The SBX-1000 MIDI Cueing Box provides SMPTE based synchronization of MIDI events for film and video editing.

*Roland DM-80 digital multi-track disk-based recorder.*

*Roland Sound Space Processing System*

## BBE in Forbes

The February 18, 1991 issue of Forbes magazine featured a full-page article on BBE Sound with an interview with the company's head, John McLaren. BBE has been moving steadily into licensing agreements with consumer electronics companies, having signed with International Jensen who will be incorporating BBE technology into premium priced products in its Acoustic Research, Advent, Jensen, Now Hear This and Phase Linear lines. BBE had previously licensed its technology to Aiwa.

## JBL Pro Installations

Markus Audio and Lighting Systems in Culver City, California, has completed several projects using JBL and Soundcraft products, according to JBL. Club Radio, a new nightclub, La Lagune Nightclub, and 127 Fashion Theatre are all using JBL equipment. In addition, the Katherine Cornell Theatre in Amherst, New York, has upgraded its main house systems with JBL components. The design and installation of the system was completed by Mark Sanfilipo of RHM Electronics in conjunction with Cornell Sound Labs.

## Apogee Sound in Screening Room

Apogee Sound has announced that its products are incorporated in the sound system for the six channel all digital Kodak screening room in Hollywood for Cinema Digital Sound. Three Apogee AE-4s, ten AE-1s and five SB Series subwoofers are included. The digital cinema system was co-developed by Optical Radiation Corporation and Eastman Kodak.

## Renkus-Heinz Seminar

The Renkus-Heinz system Design Seminar held in January attracted over 125 participants from 15 countries for an exchange of information. During the seminar Dr. Wolfgang Ahnert of ADA in Berlin and Dr. Feistel of Rostock University demonstrated acoustic simulation using data from the EASE program's post processing files and standard off-the-shelf hardware. Renkus-Heinz plans to offer that program along with the EASE system design software program in a complete package. The total cost is expected to be under $6,000; delivery is expected to begin in midsummer 1991.

On a sadder note, Renkus-Heinz has announced that Bob Haigler, chief electronics engineer, died in February. Harro Heinz commented, "Bob's sudden and untimely death came as a surprise. We all mourn for him. He will be missed . . . as a friend, as a warm and caring human being, and as a real professional."

## Altec Doesn't Fear Economy

In a statement to the press, Dave Merrey, president of Altec Lansing, said, "I'm of the opinion that bad talk breeds bad times. . . . If the new year will be one of intense competition, we are looking forward to it because we are prepared to get the business. Our plan for 1991 calls for targeting very specific opportunites in focused market segments. We've asked our customers to adopt this same focused approach with good results; some of them have actually added sales personnel."

## Electro-Voice in Detroit

Electro-Voice has made a point of the many points the company's equipment is seen just in the city of Detroit. Reportedly Tiger Stadium, the Silverdome, and the Palace all have EV components. Area high schools such as North Farmington and Harrison are using EV equipment. And Oakland University recently installed more than 120 EV speakers in its Shotwell Pavilion.

## IED Ships to Soka University

Innovative Electronic Designs has shipped its 5000 Audio Processing System to Ikeda Auditorium at Soka University in Tokyo. This installation includes the first commercial integration of Micro Audio's "POD Programer' equalizer software into the IED 590 computer. According to IED, the recently approved AES PA 422 standard interface enables the 590 computer to automatically control Micro Audio's equalizers from one central computer. Consultant Coffeen, Fricke and Associates chose the equipment. Installation is being supervised by T. Asahina of Mark IV Audio, Japan Ltd.

## Edcor Moves

Edcor Electronics has moved its complete operation from southern California, where it has been located since 1974, to Carlsbad, New Mexico. The Edcor Sound Products division and the Edcor Magnetics division will be located in a recently purchased facility. A new building is being completed for engineering and development and will be ready for occupancy in May 1991. The new address is P.O. Box 5098, 7130 National Parks Highway, Carlsbad, New Mexico 88220.

## University in Japan

University Sound equipment has been installed in Narita Airport, Tokyo's major airport, and Chinguko Train Station in Tokyo. University paging systems are used throughout the airport, while more than 100 different Musicaster 100 compact loudspeaker systems are installed in the train station, one of Japan's busiest transportation facilities.

## BASF Restructures Division

BASF Audio Video Professional Products has restructured its staff and product line in the United States to incorporate the recently acquired Agfa Magnetic Tape Division. The new BASF Audio Video Professional Products sales force will be led by Terry O'Kelly, director of national sales. Joe Tibensky has been named kay account manager, audio duplication tape products, and Jerry Shields is the new key account manager, video duplication tape products. Jeff Brown has been named marketing manager, retail and professional audio video products. Joanne Aliber is manager, professional audio video products.


*Jim Wischmeyer, president (left), and Henry Heine, director of engineering of Bag End Loudspeakers.*

## Bag End Has Birthday

Bag End Loudspeaker Systems is celebrating its 15th anniversary. The company was founded in 1976 by James Wischmeyer, Henry Heine and William Schwingel (who is no longer with the firm). In 1980, Bag End introduced "Time Alignment" in all its full range systems, under license from E. M. Long Associates. Through the years the company has serviced such performers as Chick Corea, Alphonso Johnson, Neil Young, Prince and the United States Air Force Band. Wischmeyer and Heine also operate a sister company, Modular Sound Systems, which specializes in the design and installation of computerized audio, video and lighting systems. The company has designed systems for the Arlington International Racecourse, Chicago Place, Ditka's/City Lights, and the Greater Grace Temple of Detroit.

## Million Dollar Account

Star Case Manufacturing has presented the "Million Dollar Account Award" to Rent Com, Inc. of Schiller Park, Illinois, the audio visual, video and communications sales and rental company. Glen Steinberg, General Manager, commented, "We're not buying metal corners or fiberglass panels, we're buying mobility, security and protection. Over one million dollars worth of Star Cases is evidence of our continuing commitment."

## DJL Video Security

DJL Video Security Service Center has announced its opening in Greensboro, North Carolina to provide video repair services. Owner and founder Dale Laslie noted, "DJL is designed to meet the needs of security users who require the fastest possible response to their repair needs."

## Fiber Options Expands

Fiber Options, the manufacturer of fiber optic based transmission systems, has expanded its existing facility to over 10,000 square feet. Bob DeLia, Fiber Options ceo said, "This is the second time in a year we have expanded to meet the growing demand for Fiber Options equipment."

## Meyer Speakers in Flight Pattern

A four-cabinet Meyer Sound MSL-10A system was used by Toby Payne of Stage Sound Inc. of Phoenix for the Fiesta Bowl at the Sun Devil Stadium at Arizona State University. During two days of rehearsals the rigged system, flown from a 220 foot crane fitted with a 100 foot boom, was in the flight pattern of Phoenix international Airport, and had to be put away each night. The system was reinstalled each morning in approximately 30 minutes, using a five-man crew and the crane operators.

*Left to right: Dan Evans, Glen Steinberg of Rent Com; Dennis Toma, Ralph Hoopes of Star Case.*

# Clair's Control; Crown's Condenser

## Loudspeaker Control

Clair Bros. Audio Enterprises, Inc. has announced the Coherent Transfer System. This electronic control system is a proprietary crossover/limiter that was designed by Clair for use with the S-4 Series II line of four-way concert speaker systems.

Using analog circuitry, it's claimed that the Coherent Transfer System has a dynamic range greater than 121 dB and offers harmonic distortion of less than .003 percent, 20-20,000 Hz, measured from system to transformer-isolated output with the limiters in circuit.

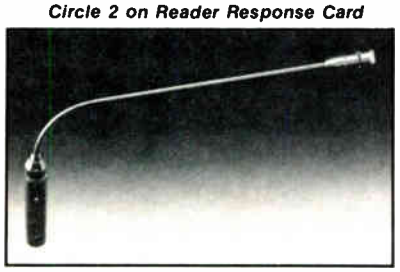
***Circle 1 on Reader Response Card***

## Gooseneck Mic

The Crown LM-300 miniature gooseneck microphone is a supercardioid condenser mic designed for use as a pulpit, lectern or conference table microphone.

Powered by 12—48V of phantom power, the 17-inch long LM-300 has a sensitivity rating of 3 mV/Pa and an impedance of 150 ohms (balanced). The LM-300 can also be used with an accessory shock mount that enables it to be plugged into the XLR connector of a standard microphone cable.

***Circle 2 on Reader Response Card***

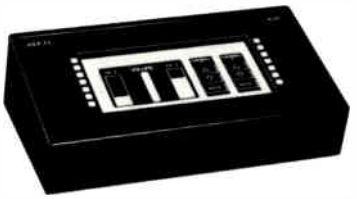


## Video Transmission

Sas-Tec U.S.A., Inc. has announced the FSE-501 video transmission system of realtime black/white or color video signals via twisted pair or coaxial cable.

The FSE-501 allows the transmission of video signals via twisted pair of wire over distances of 3000 meters per FSE-501. Each channel has video in and video outputs for transmission and, therefore, can be used as amplifying relays to a maximum distance of 35 miles with the use of 10 FSE-501s.

***Circle 3 on Reader Response Card***



## Touch Panel

AMX Corporation has announced a new version of its Touch Panel. The AXP-EL electroluminescent Touch Panel contains an RS-232 compatible port, active slide control icons and international font set.

The RS-232 port allows for use of a PC-compatible mouse for creation and editing of buttons, controls, icons, logos and screen drawings. The port also permits direct connection of RS-232 compatible devices such as computers, teleconferencing codecs, modems and other devices.

***Circle 4 on Reader Response Card***

## Reinforcement Console

TAC has announced the SR600 sound reinforcement console. The console is electronically balanced throughout and also incorporates parametric EQ, input metering, stereo effects returns, eight VCA/Mute groups and a 10 x 8 output matrix.

Chassis are available in 40, 32 and 24 input configurations and is considered by TAC to be its mid-priced console at a price point between the SR9000 Superconsole and the Scorpion II.

***Circle 5 on Reader Response Card***

## Control System

FSR, Inc. has announced the PCS-256 digital control system. Designed for control at "prices designed for everyone's budget," the PCS-256 contains custom remote panels (up to eight per system), expansion capabilities, programmable features and installation via the EZ-NET standard RJ11 connection. The system is meant for use in boardrooms, auditoriums, conference centers and lecture halls.

***Circle 6 on Reader Response Card***

## Explosion Proof Speakers

Atlas/Soundolier has introduced the explosion proof MLE series of loudspeakers designed for high efficiency amplified voice and electronic signaling systems in natural resource exploration and chemical processing situations.

Listed by UL and CSA for installation in combustible environments the 30-watt power handling compression-driven communications units comply with regulations governing electrical equipment at hazardous locations and with provisions of the National Electric Code.

The MLE 30 series models are equipped with a heavy fiberglass sound projector creating a 120-degree x 60-degree pattern, while the MLE 32 series units are equipped with a spun aluminum bell providing a 95-degree circular distribution emphasis.

***Circle 7 on Reader Response Card***

## Small Masking System

Dynasound has introduced the DS104 small masking system which is designed to provide office personnel acoustical privacy by eliminating distractions caused by office machines and other workers in open and closed environments. It is engineered for areas up to 10,000 square feet but can be expanded modularly.

The system comes with desktop masking generator, speakers, hanging assemblies, cables and instruction manual.

***Circle 8 on Reader Response Card***


## Cardioid Mic

Electro-Voice has introduced the RE38N/D dynamic cardioid microphone designed for sound reinforcement as well as recording and broadcast applications.

The microphone contains eight low frequency EQ combinations and two high frequency combinations for a total of 16 different frequency responses, designed so that the user can compensate for proximity effect, low-frequency noise and sibilance. The shock-mounting system uses a vibration-isolation material for the elimination of external shockmounts.

***Circle 9 on Reader Response Card***


## Wireless Distribution

Shure Brothers Incorporated has introduced the WA400 amplified antenna distribution system. The WA400 is a two-input, eight output amplified antenna distribution system permitting use of only two antennas with as many as four diversity wireless microphone systems or eight non-diversity systems. For applications where several wireless microphones are required, the WA400 is designed to "remove the clutter and interference associated with multiple antennas."

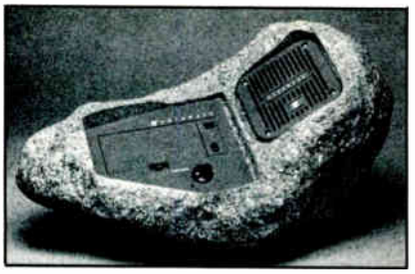
***Circle 10 on Reader Response Card***

## Another Leap

Audio Teknology Incorporated has released LEAP (Loudspeaker Enclosure Analysis Program) version 4.0. The new version has been expanded and is claimed to be a complete 20 Hz—20 kHz multiway design program. Among Leap 4.0's functions are non-linear modeling of low end driver response as well as passive and active crossover design.

Box design types include sealed, vented, passive radiator and sealed and vented rear chamber bandpass enclosures. spl and impedance can be manually entered into the program or imported from computer-based analyzers.

***Circle 11 on Reader Response Card***



## "Rock" Speaker

Datawave has introduced a wireless "Rock" speaker designed for use in gardens, patios, around spas or as part of an indoor decor featuring plants, waterfalls or any outdoor style.

The "Rock" speakers use FM radio technology to pick up signals through walls, allowing the user to place the speaker in the house or outside up to 150 feet from the transmitter.

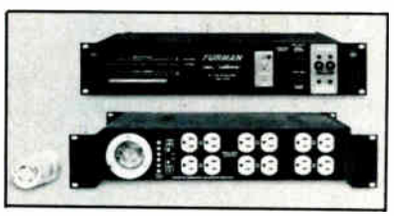
***Circle 12 on Reader Response Card***


## Compact CCD

CCTV Corporation has introduced the "GBC" CCD-100 series of compact solid state CCD cameras. Six models are included in the 100 series. While utilizing a solid state imager the camera does not require an auto-iris lens.

All models operate from low voltage, use identical electronics and come standard with a 4mm lens, a 120 volt ac to low voltage dc power module, and a mating video connector.

***Circle 13 on Reader Response Card***



## Voltage Regulator

The AR-PRO ac line voltage regulator is the latest in Furman's line of power conditioners designed for audio and live performance.

It handles 30 amps through a twist-lock connector. Housed in a two-rack space package it supplies regulated ac power at each of the 12 rear panel and two front panel outlets. It can supply a nominal 120-volts ac output from any input from 88 to 264 volts for power distribution in worldwide uses.

The AR-PRO uses a multiple-tapped toroidal autoformer and is not sensitive to line frequency.

***Circle 14 on Reader Response Card***

## Ten-Input Monitors

The AMP-2 and AMP-1A rackmount stereo audio monitors from Wohler Technologies are now available with 10 mono or 10 stereo inputs. This option allows monitoring of audio from multiple sources from a single location. A buffered output is also available as a separate option.

***Circle 15 on Reader Response Card***

## Compressor/Leveler/Limiter

Aphex Systems has announced a new version of the Compellor compressor/leveler/limiter. The new model 320 contains dual monaural circuitry which can be linked two ways for stereo operation. Stereo linking can be accomplished with a leveling link or a compression and leveling link.

Other features include reference level switching from the rear panel, leveling speed switchable from the front panel, peak limiter defeatable from the front panel and bypass relays with remote controllability.

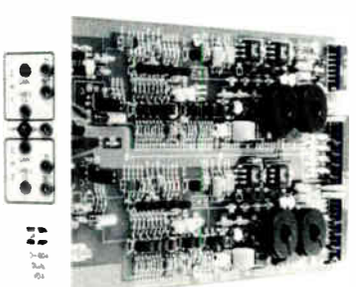
***Circle 16 on Reader Response Card***

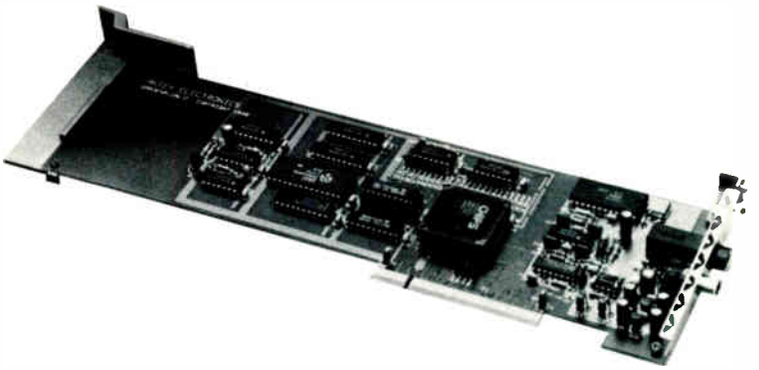
## Video Distribution

Datatek has introduced the D-804, a video distribution amplifier designed for use with Datatek's D-800 series 10 x 1 switching modules, and contains two channels, each with one input and four outputs.

The unit provides six matched video outputs from a single input. Frequency response is flat within 0.1 dB to 11 MHz and with a bandwidth of 30 MHz. It will handle subcarrier sine wave signals up to 3V peak to peak for use in subcarrier distribution. An optional plug-in cable equalizer allows each channel of the D-804 to be converted to an equalizing distribution amplifier.

***Circle 17 on Reader Response Card***





## Distribution Amp

ESE has added the ES-246 Quad 1x6 audio distribution amplifier. The unit comes standard with balanced inputs and outputs via terminal block connectors; or the optional XLR connector rear panel can be specified. This transformerless design also allows for up to 12 separate and isolated feeds for each input if unbalanced outputs are desired.

***Circle 18 on Reader Response Card***

## Digital Audio Board

Antex Electronics has announced the series 1 model VP800 digital audio board. The VP800 is designed to allow systems integrators and OEMs to add direct-from-disk playback of audio to their system designs.

The VP800 is meant to be used for audio replay only, where audio files would be created at a mastering workstation and replayed at standalone or remote locations. Applications include interactive learning systems, computer-based training systems, self-service terminals and information kiosks, public address systems, multimedia systems, etc.

***Circle 19 on Reader Response Card***


## Remote Control

R-Tec Systems has announced a remote control unit which can operate units that can be controlled by a relay via one two-conductor (twisted-pair) cable up to a mile away. Video Tape Machines, Cart Machines, Screen Curtains and Stage Effects can be controlled using the five user assignable and function programmable buttons to control five functions or series of functions at the press of a button. The components in the system include the MC50 machine controller and the RK50 remote keypad.

***Circle 20 on Reader Response Card***

## DAT Front End

Scantek, Inc has announced the release of a front end for Digital Audio Tape recorders. The Front-End type 112, from Norsonic, a/s (formerly Norwegian Electronics) is designed to be mounted on a Sony TCD-D10 Pro DAT recorder.

The type 112 has two microphone inputs (B&K socket type) with 0V or 200V polarization voltage , 28V preamplifier supply voltage, two line inputs and input amplifiers with calibrated settings used in lieu of the DAT amplifier. The dynamic range matches that of the DAT.

***Circle 21 on Reader Response Card***

## Dual Mono Amps

Stewart Electronics has introduced the PA-1200 and PA-1500 amplifiers which feature the "Switch Mode Power Supply" that recharges at 120,000 times per second, 1000 times faster than a 60 Hz power supply.

Each chassis contains two independent amplifiers for dynamic capabilities and for single-channel operation in the event of one channel failing. Other features include short circuit protection and auto impedance optimization.

***Circle 22 on Reader Response Card***


## Remote-Power Condenser

The PRO 35R remote-power condenser microphone from Audio-Technica is designed for close mic'ing of high-intensity instruments, claiming undistorted output in soundfields as high as 141 dB spl.

The mic includes an AT 8418 UniMount instrument mount, which surrounds the microphone with foam to eliminate instrument noise and provide a wind screen.

***Circle 23 on Reader Response Card***

# MARKETPLACE

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*FREE INFORMATION*

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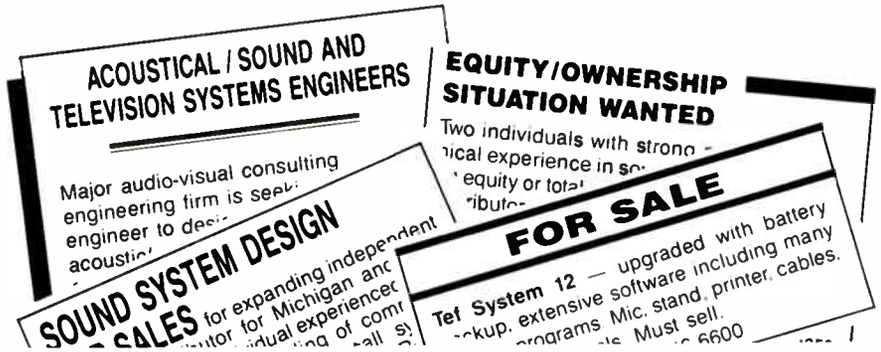


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# MARKETPLACE

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Chambers Electronic Communications is looking for an experienced sales professional to sell school communication products in Tucson and Southern Arizona.

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# Todrank Joins Roland; Gluck is AMS Prez

## Sales at Roland

Bob Todrank has joined Roland's Pro Audio/Video Group in Los Angeles as National Sales/Marketing Manager. Todrank has been based for the last 19 years in Nashville, Tennessee where he has worked in the pro audio industry as the owner of Valley Audio, a founder of Valley People, Inc. and as a studio designer and facility consultant.

Curtis Chan, General Manager of the group announced the appointment. "Bob's long term success and experience in the audio industry will be invaluable in helping to establish Roland as a committed player in the semi-professional and professional audio and video industries."

## President of AMS

John Gluck has been appointed President of AMS Industries Inc., the American subsidiary of AMS Industries PLC.

Gluck

Gluck joined AMS in 1986 as a sales engineer and was appointed Senior Sales Executive for the company. In his new position, Gluck is involved in the restructuring of the US sales operation, following confirmation that AMS is sharing resources with Rupert Neve Inc.

## Engineer and Chairman

Altec Lansing Design Engineer Manager, John Shepherd, has accepted the position of Chairman of the NSCA Product Safety Group for the coming year. In this position, Shepherd is responsible for the direction of safety standards relating to the audio equipment for UL, CSA and upcoming changes taken by the IEC in Europe for 1992.

## Ace Appointments

Ace Audio Visual has promoted Marc E. Hochlerin to Vice President of Sales and appointed Bruce D. Barnett to Sales Division/General Manager. Both have been in the industrial and consumer electronics industry for over 18 years.

## Weiner at JVC

JVC Professional Products Company has appointed Matthew Weiner to the new position of professional audio sales representative. In this position, Weiner is responsible for product management of the audio sales network as well as serving as audio technical consultant. Other responsibilities include involvement in marketing and promotion.

Weiner

Prior to joining JVC, Weiner was employed for seven years by Martin Audio, New York City, as an applications engineer. He is also a graduate of Syracuse University and has album and film credits.

## Toshiba Director

Steve Nickerson has been named Director of CTV Marketing for Toshiba America Consumer Products, Inc. Nickerson's responsibilities include coordinating all merchandise, marketing and sales activities for color TV products.

Nickerson had previously been Assistant Manager, CTV Marketing for TACP from 1984-87. Prior to rejoining Toshiba he was National Accounts Manager, CTV for Samsung Electronics.

## From Rep to Sales

Scott Robbins has left his position as a Crown technical representative to assume the position of Western Regional Sales Manager. Responsible for the direction of Crown's sales efforts for electronic products in all western states, Robbins has a background in sales, service and technical development and application.

Robbins

## Bergeron Joins Marshall Long

Dr. Katherina Bergeron has joined Marshall Long/Acoustics of Sherman Oaks, California as an acoustical engineer and sound system designer. Dr. Bergeron graduated Magna Cum Laude from the Czech Technical University. She has an MS in Electrical Engineering and a Ph.D in acoustics. She is working primarily in the audio/visual systems area.

## Mueller at Panasonic

Panasonic Communications & Systems Company has appointed Robert B. Mueller to General Manager of its Professional/Industrial Video Division. Mueller is responsible for all sales and marketing activities of the company's professional/industrial video products.

Mueller

Prior to joining Panasonic, Mueller was president of Greenwich Management Associates, Ltd. (GMA), a management consulting firm specializing in video and computer applications.

## Sales at Crestron

Randy Klein has been appointed Manager of Sales and Marketing for Crestron Electronics, Inc. Klein is responsible for all sales of Crestron Audio Visual control systems. His other responsibilities include advertising, sales promotion and public relations.

Before joining Crestron, Klein headed the sales and marketing department of Audio Visual Laboratories (AVL) and Genigraphics Corporation, respectively.

## Alpha Appoints Williams

Alpha Wire Corporation has appointed Bob Williams Managing Director of Alpha Wire International. Williams is responsible for Alpha's marketing operation and for distributing and selling Alpha's products in Europe.

Williams joined the company in 1985 and was previously a Vice President and General Manager for Fisher-Brownell.

## Brown Joins Freed

Michael Brown has been appointed to the position of account executive in the "Freed Sales Force." Brown is responsible for covering the eastern United States, Europe and Africa in his position.

Brown

Brown's experience is as a performer in the music business and has multi-lingual skills for use in overseas account management activities. He is based in Fort Worth, Texas.

## Brand-Rex Hires Gilbert

Brand-Rex Company has appointed Jerome A. Gilbert as personnel manager of its Jackson, Tennessee specialty electronic cable manufacturing facility. The facility is scheduled for completion in August 1991.

Gilbert

In addition, Gilbert will direct a cooperative training program for the work force sponsored jointly by the State Area Vocational Technical School for the Jackson area, and the Tennessee Industrial Training Service, a statewide job training agency.

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**2. New UHF technology has recently been made available.** For the UHF Series, Samson put four of our finest wireless engineers◇ on the case. Using up-to-date developments like Di-Electric filters, Gas-Fet and new cellular technologies, they were able to bring UHF up to a higher level of performance.

**3. UHF sounds better.** A dangerous generalization perhaps, but it *does* have wider RF dynamic range. And because we're the first to use dbx† Noise Reduction in UHF, the resulting audio quality is even more impressive.

**4. More frequencies are available.** Samson offers seven UHF frequencies that can be used simultaneously. If you're already running a lot of VHF on stage, you can place our UHF frequencies on top of these without any interference.

**5. Samson UHF offers more microphone options.** The all brass UH-4 hand-held transmitter is available with an incredibly wide variety of the industry's most popular mic elements. The streamlined UT-4 belt pack transmitter comes equipped with a broad range of high quality lavalier microphone capsules.

**6. Samson UHF antennas set new standards.** Custom made so they are acutely sensitive to our bandwidth, Samson's high efficiency cellular antennas can be either front or rear-mounted. Because they are positioned at a 45° angle to the front panel, several UHF systems can be cascade-mounted in a single rack with all antennas in the clear.

**7. UHF is more expensive. Until now.** Because of robotics assembly techniques and surface-mount technology, Samson was able to make UHF a realistically priced option for a whole new class of users.

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*In case you were reading to fast, we wanted to remind you that this ad is about *UHF*, not VHF wireless. ◇As long as you are reading our ad this closely, we thought we'd tell you who they are: Yukinaga Koike, Doug Bryant, Takao Horiuchi, Susumu Tamura. †dbx is a registered trademark of Carillon Industries.

*Circle 211 on Reader Response Card*

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## SR4700 Series

You've seen and heard our big systems, installed in major venues around the world and on tour with some of the biggest names in the music business. The SR4700 Series Loudspeaker Systems are equally at home on the road or in the hall.

Their legacy comes from Cabaret® Series, a prime player in small to medium club sound reinforcement since the seventies. Their influence is Concert Series,™ the new standard in packaged JBL systems. With Cabaret as the starting point and Concert Series as our current direction, we listened to your comments and suggestions, turning them into the sound system of the nineties and beyond.

The SR4700 Series is pure pro audio. Pure JBL components, the same caliber as those in our larger systems, including the Vented Gap Cooling™ low frequency drivers and the 2445J compression driver. Pure JBL enclosures, five times stronger than traditional designs, and protected by plastic-coated steel grills and super-durable fabric-laminated plywood cabinets. Pure JBL sensibility, interlocking enclosures with heavy-duty steel handles and recessed input connectors, so they travel tighter, set-up easier and last longer.

SR4700 Series, pure JBL. Be the first in line to hear them today at your local JBL dealer.


JBL

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