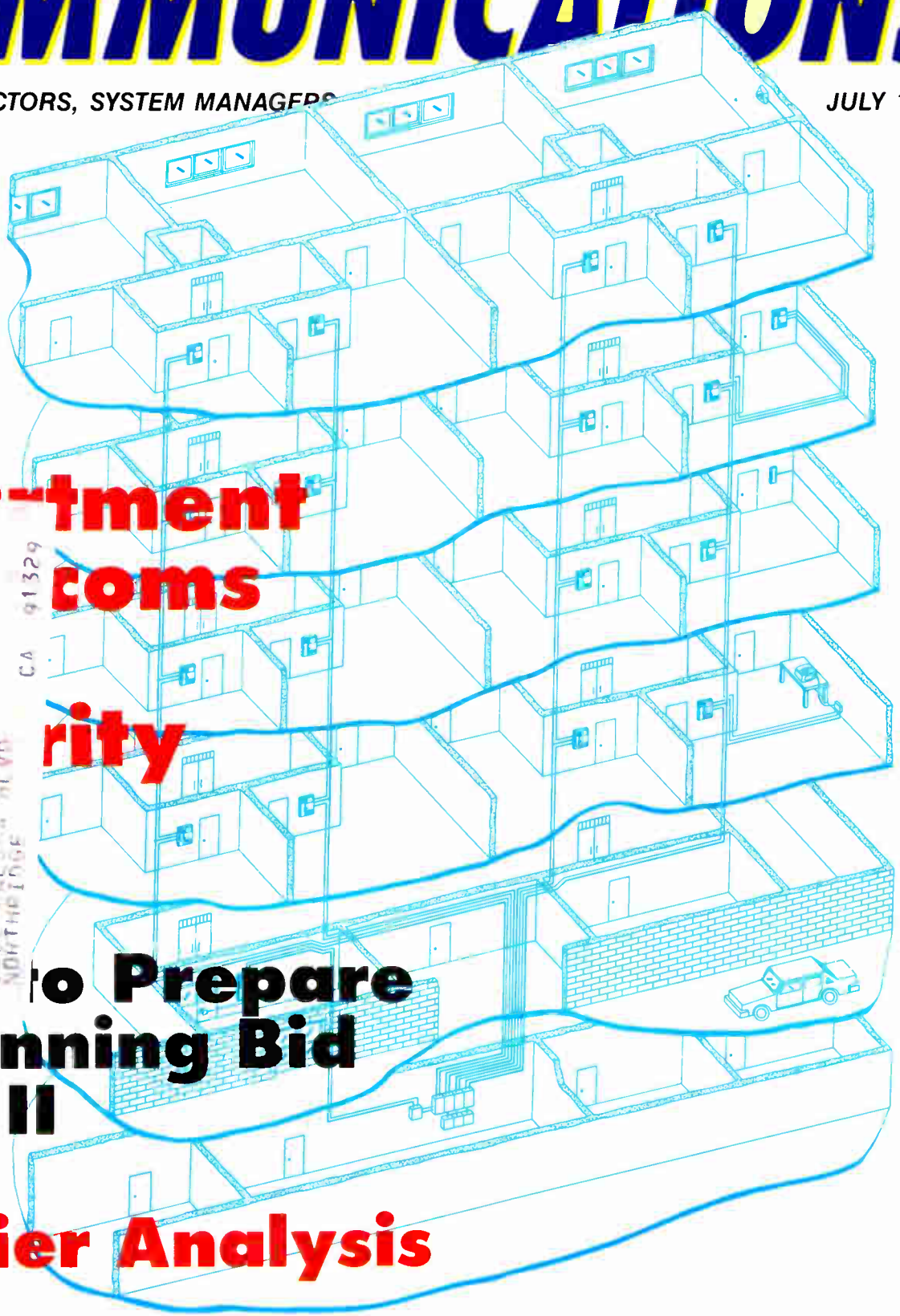
Lab Test: Symetrix 571 SPL Computer

SOUND & COMMUNICATIONS

FOR CONTRACTORS, SYSTEM MANAGERS

JULY 1987



Apartment Intercoms and Security

How to Prepare a Winning Bid Part II

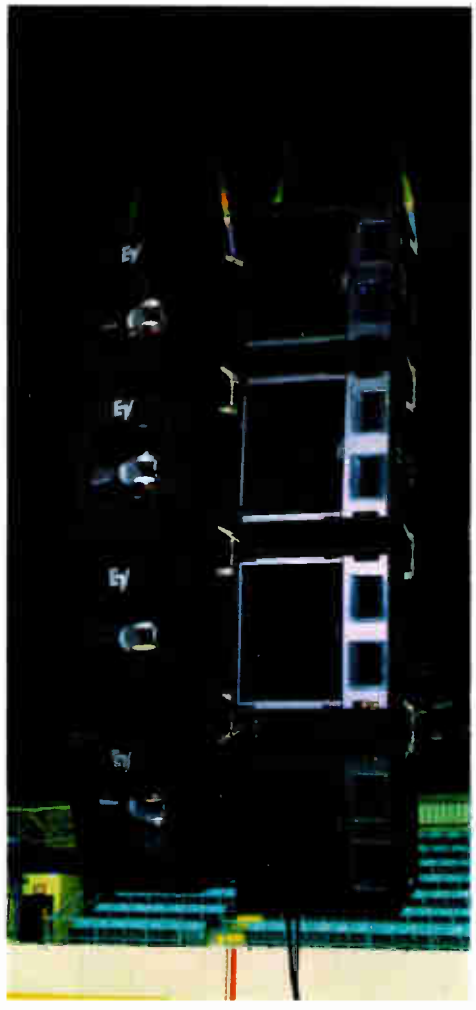
Fourier Analysis

Large scale concert sound reinforcement has a smaller future.

MT-4

Concert Sound System

50,000-Watt Array



Manifold Technology™ delivers...twice the output in half the space!

Concert sound is getting smaller. System size, that is, not tour dollars! In fact, the high-level sound market is stronger than ever. But high transportation and setup costs are forcing lighter, smaller and more efficient speaker systems. While audiences demand better fidelity.

That's why we've made Manifold Technology *systems twice as loud in half the space.* The two-box, 4-way active MT-4 uses 4 (four!) drivers in each bandpass for unequaled acoustic output. Now, your system can be one quarter the size or four times as loud compared to other designs.

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High output plus high fidelity

To produce high-level sound, most concert systems aim many horns at the same seating area. Unfortunately, this approach causes peaky frequency response, decreased sensitivity and ragged coverage patterns. With four drivers on each horn, a large-scale MT-4 system has fewer independent sources. For fewer phase-cancellation problems. Frequency response is smoother, sensitivity increased, and coverage perfectly constant.

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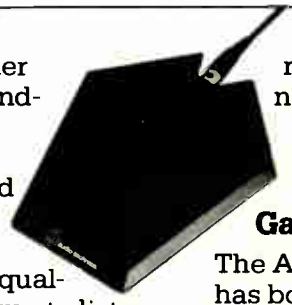
Who would believe a microphone this flat...

Model AT871 UniPlate™
Condenser Cardioid

could have a curve to match!



If you've tried other hemicardioid boundary microphones, you may have been disappointed in the sound... thin, peaky, and requiring lots of equalization. If so, it's time to listen to ours: the new AT871 UniPlate Condenser Cardioid.

UniPoint Technology at Work

Our experience pioneering UniPoint miniature condensers permitted us to take a new approach to boundary microphone design. We optimized the basic UniPoint cardioid element for boundary use, creating remarkable reach and presence, yet retaining extended high and low-frequency response so vital to natural sound reinforcement.

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The AT871 is solving problems in stage sound reinforcement, church sound, teleconferencing, boardroom applications... even TV and film locations. Wherever great sound is needed...unobtrusively. We urge you to test the AT871 side-by-side with any of the rest. Choose your most critical sound problems. The difference you hear will prove our point.

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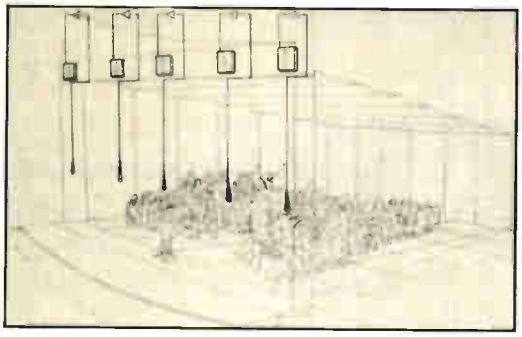
SOUND & COMMUNICATIONS

Volume 33 #7
July 1987



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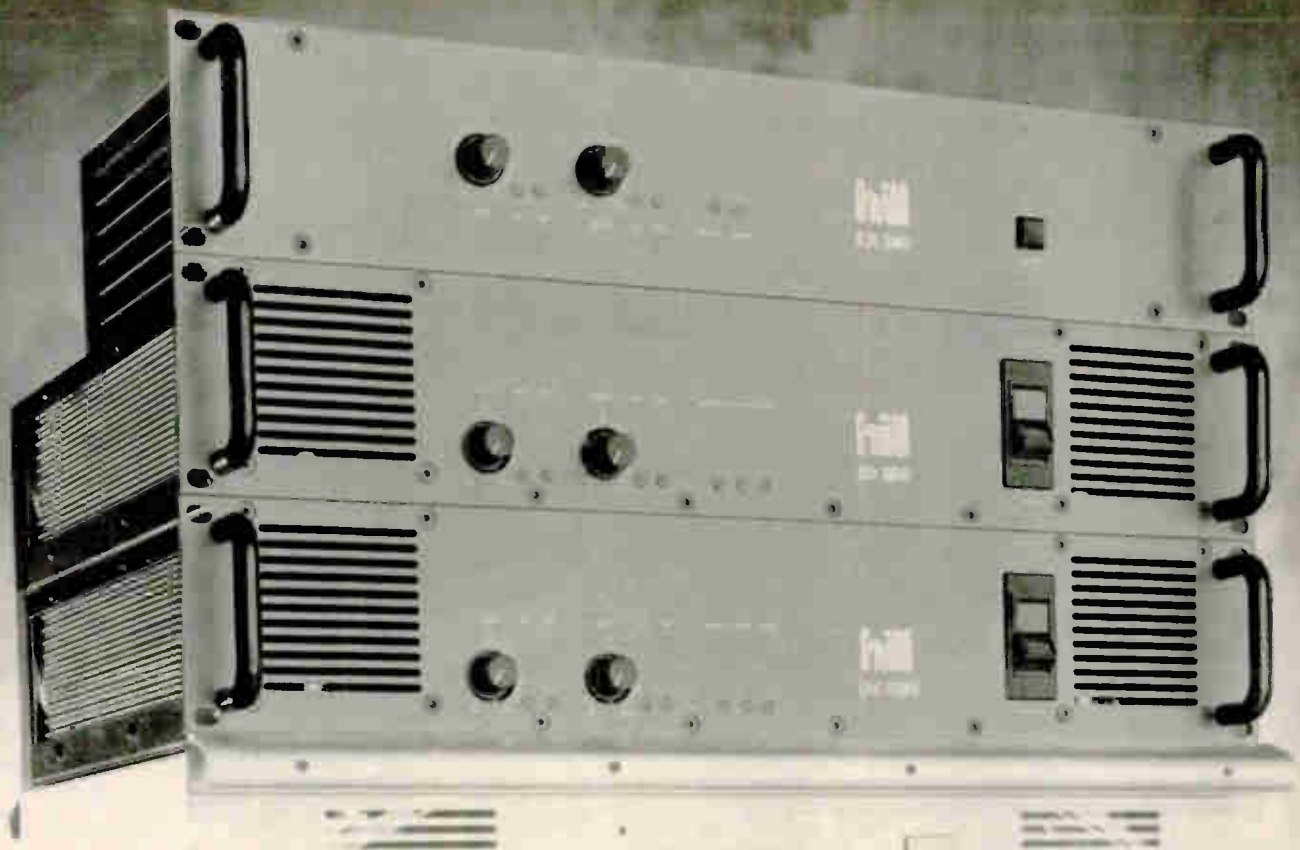
DEPARTMENTS

ON THE COVER

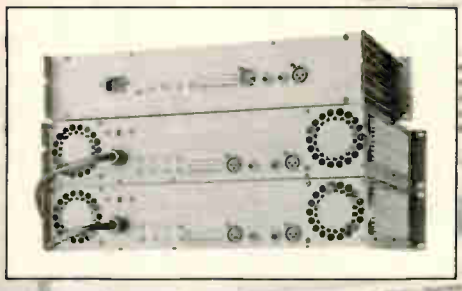
An example of an intercom system—The Imagecom® system by the Elvox Division, Paso Sound Products, Inc. This section displays at the basement sub-level a modular termination panel with a six port video distributor, a system power supply and a pre-heat power supply; at the lobby level is the lobby entrance station; and each apartment has a monitor.

FEATURES

COLUMNS



introducing the DX300, DX800 and DX1500 power amplifiers



The DX300, DX800 and DX1500 amplifiers all feature balanced XLR inputs, balanced and unbalanced ¼" inputs, banana outputs, ground lift switch and a terminal block with access to all inputs and outputs.

DX300 **output power:** **200** watts into 8Ω (per channel, both channels driven, 20Hz - 20kHz, -0.5dB) **400** watts into 8Ω, **450** watts into 4Ω (burst power*) **distortion** (250mW to rated power at 8Ω): IMD SMPTE: < 0.01%. THD (1kHz): < 0.01%. THD (20kHz DIN): < 0.02% **size:** 2 rack spaces, 8½" behind front panel **weight:** 7Kgs, 16 lbs. **cooling:** 2 passive heatsinks.

DX800 **output power:** **250** watts into 8Ω, **400** watts into 4Ω (per channel, both channels driven, 20Hz - 20kHz, -0.5dB), **800** watts into 8Ω (bridged mono), **800** watts into 4Ω, **900** watts into 2Ω (burst power*) **distortion** (250mW to rated power at 8Ω): IMD SMPTE: < 0.01%. THD (1kHz): < 0.01%. THD (20Hz-20kHz DIN): < 0.02% **size:** 2 rack spaces, 13" behind front panel **weight:** 13Kgs, 29 lbs. **cooling:** 1 servo controlled DC fan.

DX1500 **output power:** **300** watts into 8Ω, **500** watts into 4Ω, **750** watts into 2Ω (per channel, both channels driven, 20Hz - 20kHz, -0.5dB), **1000** watts into 8Ω, **1500** watts into 4Ω (bridged mono) **1500** watts into 2Ω, **1600** watts into 1Ω (burst power*) **distortion** (250mW to rated power at 8Ω): IMD SMPTE: < 0.01%. THD (1kHz): < 0.01%. THD (20Hz-20kHz DIN): < 0.02% **size:** 2 rack spaces, 13" behind front panel **weight:** 15Kgs, 34 lbs. **cooling:** 2 servo controlled DC fans.

*Burst power is a 1kHz tone for 10ms every 100ms, single channel (an indication of the amplifiers ability to handle music transients and tolerate deviations in nominal speaker impedance)

Total Audio Transparency

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Guest Editorial

A Changing Industry

Whenever an industry grows, there are companies who advance and prosper and some who fall by the wayside.

This last year has been one of great change. Javelin Electronics, Inc., Quickset and Pelco have all been bought by other companies. RCA was bought by General Electric and the CCTV Division is now being sold in a leveraged buy out to employees. Vicon was the target of a takeover attempt by Sensormatic and GE's CCTV Division was sold and absorbed by Diamond Electronics, itself a recent buy out from Arvin.

Several new companies have announced plans to enter the CCTV market. TOA and NEC both exhibited at ISC New York, but now almost a year later, still have not released products. However, North American Philips and Sony both have exhibited their product lines and established themselves in the market.

While Vicon and RCA, both industry leaders, realign to get back on top after the attempted takeover and buy out, smaller companies are growing stronger. Several companies have reported growth in excess of 25% in the last 12 months.

Recognizing this growth, the industry for the first time has established a professional association to address industry problems. The Closed Circuit Television Manufacturers Association (CCTMA) is now well established as a division of EIA (Electronic Industries Association), the Washington D.C. based organization leader for more than 50 years.

With legislation being considered for mandatory CCTV systems in all 24 hour C-Store operations, a whole new era may well be starting. Recognition of the value of CCTV in apprehension and conviction of felons by legislators will also alert insurance companies to lower rates to those stores installing CCTV.

Major realignment of companies will continue in the CCTV industry but one thing is certain: growth is assured for those companies who are willing to meet the challenge of a rapidly expanding and technologically advancing industry.

"The next challenge" to those who expect to survive will be increasing the sophistication of the dealer/installer network. Failure in advancing the knowledge level of dealers to keep abreast of technology may well be the biggest mistake a company can make. Can we as a manufacturing industry address this problem?

Already CCTV manufacturers are experiencing early equipment failures due to faulty installation. The problems are complex and the most probable solution is education.

CCTMA, the new industry association, may be the vehicle for a combined effort to address these challenges.

Dealers may have to yell for help before the manufacturers respond completely, but respond they will. They have to—they're survivors.

J. David Bittner
GYYR, a division of Odetics
National Sales Manager

Sound & Communications offers this space to those who wish to voice their opinions on issues that are pertinent to the sound and communications industry. Write to: Editor, Sound & Communications, 25 Willowdale Ave., Port Washington, NY 11050; or call (516) 767-2500.

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"I NEED IT, WHEN I NEED IT."

Quam's toll-free order line and factory inventory of over 100,000 products means you get exactly the products you want – even complete sound masking assemblies – shipped within 24 hours of receipt of your order.

So while speakers started it all, listening keeps us – and you – prospering. And we'll continue to listen – and respond to what we hear – while we refine and enhance our current products and create new ones to meet your evolving needs.

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NEWSletter

BOLT, BERANEK AND NEWMAN ALUMNUS STARTS OWN FIRM

Rollins (Rolly) Brook, a long-time consultant with Bolt, Beranek and Newman, has announced the formation of his own consulting firm, RB Systems. From its base in Tarzana, CA, RB Systems will offer nation-wide consulting services in the design of led by chief operating officer Adolph W. Santorine, Jr. "The financial strength of Rubicon Holdings will allow Astatic to make the transition to a market-driven organization, capable of serving the audio industry," said Santorine.

A STAR IS BORN IN CONNECTICUT

North Star Audio Video Corp. of Stamford, CT, was recently formed. The new company will be principally involved in sales and service of major professional audio gear to recording and broadcast facilities. Additional markets will include video production and post production centers and commercial sound installations. The address is 1367 High Ridge Rd., Stamford, CT 06903. Phone: (203) 968-2323.

TIE/COMMUNICATIONS RENEWS AGREEMENTS WITH CUSTOMERS

TIE/Communications, Inc. has renewed agreements to sell its systems to GTE Supply, Bell Atlanticom, NYNEX Business Information Systems and U.S. West Information Systems. TIE's agreement with GTE is for two years and includes small to mid-size key telephone systems. The contract continues a relationship between TIE and GTE that began in 1978. For Bell Atlanticom, NYNEX, and U.S. West, TIE is extending agreements for an additional two years. Contracts with each of these companies began in 1987 and, since that time, TIE has been providing them with key systems, hybrids and the Data Star PABX system.

RING GROUP BUYS DIGITIZED GREETING DEVICE FROM COM DEV

Com Dev Inc. recently announced receipt of an order from Ring Group of North America, Inc. for a digitized voice greeting device to be used with their ACD systems. The initial order is for several hundred units. Delivery is scheduled to begin in July. The device, to be known as Ring Mate, provides a single, digitized voice message 15 seconds in length when activated by an ACD operator upon answering a call. Ring Mate relieves the stress experienced by operators who handle large volumes of calls with a repetitious greeting. It also assures that the greeting is consistent and clear, an important characteristic in the 911 market that accounts for a large portion of Ring's ACD Sales. The message is recorded in the operator's own voice and takes only seconds to change, according to the company.

In a related issue, Contel Executone has announced it will begin marketing a family of hands-free, duplex intercom systems manufactured by Ring Group of North America, Inc. The internal communications systems will be provided under a two-year OEM hardware agreement, the first between the two telecommunications firms. Ring Group of North America will design and manufacture proprietary intercom stations for Contel Executone and will supply a range of central exchanges for different size installations.

RUBICON HOLDINGS ACQUIRES ASTATIC CORPORATION

Rubicon Holdings, Inc. has announced the acquisition of the Astatic Corporation. According to William J. Ross, president and chief executive officer of Rubicon, "Our acquisition of Astatic will allow the company to become an effective, profitable force

in the markets it serves." Ross indicated that this acquisition reflects Rubicon's strategy of purchasing companies in niche markets that are capable of earning a high rate on invested capital. Astatic will be operated by a new management team led by chief operating officer Adolph W. Santorine, Jr. "The financial strength of Rubicon Holdings will allow Astatic to make the transition to a market-driven organization, capable of serving the audio industry," said Santorine.

"INTENSIVE CARE" ARRIVES FOR MUSIC INDUSTRY

Rick Rosen, former national accounts manager for TOA Electronics, has announced the formation of Intensive Care, an agency offering a variety of services for the music, pro sound and electronics industries. Rosen said, "While working in the music industry for the past several years in a number of different capacities, I've identified some specialized areas where the industry's needs and my particular interfacing talents coincide." These areas, according to Rosen, include trade show consulting, shipping, mailing and literature services, marketing, merchandising, manufacturer/artist and retailer/artist liaison work, general industry promotion, and other related fields. Intensive Care is located at 2022 Taraval St., Suite 5408, San Francisco, CA 94116. Phone: (415) 589-2191.

JACKSON VOICE DATA ACQUIRES CONTEL OF NEW YORK

Jackson Voice Data, Inc., a division of the Hawley Group Limited, has acquired the assets of Contel Business Systems of New York for an undisclosed amount. Jackson Voice Data and Contel Business Systems of New York are major providers of business telephone systems for customers in Long Island, New York City and New Jersey. While Contel Business Systems of New York focuses on serving small and medium-sized businesses through its two operating units, Key Communications and Executone of New York, Jackson custom designs, installs and services business communications systems mainly for larger corporations.

VALLEY PEOPLE INC. CHANGES ITS NAME TO VALLEY INTERNATIONAL

Valley International, Inc. is the new name for Valley People, Inc. according to Norman Baker, its president. Baker stated, "During the last 18 months, our company has upgraded all existing products electronically and mechanically. We also undertook an exhaustive research and development effort which lead to the introduction of nine new products offering a new range of innovative, proprietary circuitry. In enhancing our existing products and introducing the many new ones, we also decided to incorporate a readily indentifiable company logo as a part of our front-panel graphics treatment."

SERVO DRIVE GOES ON TOUR

Intersonics, Inc. has reported a number of current tours using its Servo Drive subwoofers. According to Tom Melzer, sales manager of Servo Drive, "It is significant that many sound companies are utilizing SDL's as add-ons for their existing systems. The low frequency response is greatly improved with SDL's in an area where normal voice-coil woofers are falling off."

Current tours include Spandau Ballet, Alice Cooper, the Psychedelic Furs, Alabama, the Marlboro Country Tour and Oingo Boingo. Additionally, the Prince tour in Europe has purchased SDL-5's for stage monitors. In related news, Intersonics is now in production on a smaller subwoofer. Also, utilizing a computer-assisted cabinet design as the larger SDL-5, the SDL-4 is a compact subwoofer designed for smaller sound companies and limited-space installations.

by Jesse Klapholz

Standards: Do We All Use the Same Ruler?

Computers need to communicate. That is a basic necessity for many operations, both within systems and with other systems. They do so with a communications standard RS-232/422, IEEE, etc. Furthermore, so that computers can understand each other, they typically use ASCCII format for the interchange of alpha-numeric characters. Some computers deviate from the ASCII Standard and use a proprietary standard—making an entrepreneurial opportunity for translation software. Lately, a newer de facto standard has evolved for the printing of computer generated text—Postscript. Postscript is a page description language developed by Adobe systems—it may not be the best, but everybody is rapidly adapting to it.

During the 1930s, the SMPTE (Society of Motion Picture and Television Engineers) decided to 'standardize' to minimum requirements when designing motion picture theatres and sound systems. The result was a solid foundation for years to come. Later, organizations like EIA (Electronic Industries Association) and IHF (Institute of Hi-Fidelity) formed committees to standardize the specification of electronic components. Can you imagine if we never even agreed on a 19-inch rack standard?

Standards do in fact exist for many facets of our daily business. The AES (Audio Engineering Society) has adopted several standards, e.g., loudspeaker measurement specification, and digital audio information formats. The ISO (International Standards Organization) has many standards for measuring apparatus and testing procedures. Of course, we cannot forget the metric system, or 'SI' units (the official abbreviation of "International Systems of Units") we use daily. Recently, a standard for measuring speech intelligibility has been proposed.

Not long ago a new standard was an-

(continued on page 57)

Q: Where can I find the right power amplifier for my stadium installation?

A: The annual *Sound & Communications BLUE BOOK* has all the answers. Whether it's stadium power amplifiers, graphic equalizers, intercoms, CCTV monitors, or background music receivers . . . you can find it all in the BLUE BOOK — the purchasing directory of manufacturers.

COMING IN AUGUST • *THE 1987 SOUND & COMMUNICATIONS BLUE BOOK*

LETTERS

THE NEW AUDIO CYCLOPEDIA DISAPPOINTS READER

Dear Editor:

Regarding Ted Uzzle's review of Glen Ballou's book, *Handbook for Sound Engineers, The New Audio Cyclopedia,* I wonder if I may play devil's advocate and offer a few critical comments? Considering the book's $79.95 price tag, your readers might appreciate an alternative viewpoint.

First, let me say it *is* a good book. It is also an immense undertaking and I applaud Mr. Ballou and all the contributing authors on a monumental task well done. However, it is not without flaws. My main concern is with the title: As a *Handbook for Sound Engineers* it succeeds somewhat; as *The New Audio Cyclopedia*, it falls considerably short.

One way I evaluate the worth of any new book is to look up topics I am familiar with and see how well they are treated. In trying to do that with this book, I was repeatedly surprised to find I couldn't look up some of the most basic topics. They simply were not covered.

". . . You would think you could look up and find a section on active crossovers. That's pretty basic stuff to our industry, but there's nothing to be found!"

Dennis A. Bohn

My image of an encyclopedia is a general purpose, all encompassing, reference book covering all branches of knowledge about the field. It is where I can look up just about anything on the intended subject and learn about it. If this definition is even remotely close, then this book does not qualify. It lacks the comprehensive and objective treatment that encyclopedias possess.

I am disappointed to find the following shortcomings, because I have waited a long time for a revised *Audio Cyclopedia.* Sadly, this is not it. At this price, I think it only fair that the buying public be made aware. What they are getting, in too many of the covered areas, is a compilation of subjective information on one philosophical approach to sound system engineering. No attempt has been made to include alternative approaches in many of the areas covered. Please understand I believe there is nothing wrong in writing a book outlining only your favorite approaches. What *is* wrong, in my view, is claiming encyclopedia status for one approach versus general facts. I worry about too many trusting people falling victim to the seductive nature of the printed word. If it's written in an encyclopedia, therefore it must be the only truth—that sort of thing.

On to specifics: You would think you could look up and find a section on *active crossovers.* That's pretty basic stuff to our industry, but there is nothing to be found! No discussion on the various types, orders, slopes, problems, desirable features, caveats. A user should be able to look up Linkwitz-Riley, for instance, and learn something.

Or, how about trying to understand a *parametric equalizer?* How can you devote an entire chapter on equalizers and ignore parametrics? Where is the information on constant bandwidth equalizers? On transversal equalizers? On symmetrical versus non-symmetrical equalizer behavior?

What about power amplifiers? A modern treatment should include material on all the various *kinds* of power amplifiers available. It would explain rail-switchers, back slope regulations, shark fin regulators, digital amplifiers, bipolar and MOSFET amplifiers, as well as linear Class A and Class AB amplifiers—just to list a few uncovered items. Instead, we find a very confusing 51 page chapter on amplifiers (of all sorts) with 22 pages devoted to *automatic mixers* and *active filters*! And of the remaining 29 pages, 23 of them are schematics (I'm not making this up)!

There is no explantation of a 70.7V line. There is no definition of pink noise, or white noise, or how to get one from the other.

Steve Dove contributed a truly astonishing chapter (based, in part, on Ted Fletcher's excellent series in *Studio Sound* magazine) on the design of Alice, Ltd. consoles. However, it belongs properly in a *Handbook for Console Designers*, rather than buried in a *Handbook for Sound Engineers.*

And there are the mistakes: for example, I'm sure circuit designers everywhere will rejoice to find out that an analog-to-digital coverter is simply a comparator (p. 276, Fig. 11-40C). Or, that an integrator is really a sweep generator (p. 276, Fig. 11-40H).

Ted Uzzle's comment regarding ". . . mindless republication of product photographs and electronic schematics, . . ." unfortunately applies equally well to certain sections of this edition. For example, what merit is there in devoting nine(!) pages to the replication of schematics from one manufacturer's outdated equalizer (it has undergone two revisions since these schematics)? And this at the exclusion of all other manufacturers. This suggests a favoritism and lack of professional objectivity that has no place in a reference book.

Three pages of schematics cover an *obsolete home equalizer*! Another nine pages reproduce schematics of a *discontinued* power amplifier. Then 12 pages depict the schematics of yet another power amplifier. What's the point?

Finally, as interesting as it is, what is a chapter on *Image Projection* doing in a book on sound engineering?

These items exemplify the severe lack of basic information, cohesiveness and direction exhibited by certain sections of this book. Also, too many authors creating overlapping material contribute to the lack of unity and unevenness of the book. Some chapters are superlative. They are thorough, objective and demonstrate the scholarship their topics deserve. These are not the problem. In summary, I suppose the incompleteness and bias bother me the most.

I do not pretend to make light of the enormous task of compiling a comprehensive audio encyclopedia. It is a very difficult task, requiring several years. I'm just disappointed we must still wait.

Dennis A. Bohn
Rane Corp.
V.P. Research & Development

Ted Uzzle responds: Mr. Dennis A. Bohn's comments about the *Handbook for Sound Engineers, the New Audio Cyclopedia* lead me to wonder if he read the same book I did.

There are two things to understand about this book. First, it is indexed dreadfully badly. I gave examples of this in my review.

Secondly, this book was written in 1981, 1982 and 1983. It was closed, editorially, in early 1984, and scheduled for 1985 release. Delays in the publishing house held up the book for an additional two years, beyond the control of the editor or contributors. All products shown as current *were* currently manufactured at the time it was written. The an extent, the *Handbook* is an instantaneous snapshot of the sound industry, however, it is a snapshot four years old, or so.

Excluding products shown for historical interest, I would estimate that, overall, of the specific products shown in the book, by description, photo, or schematic, approximately 25 percent are no longer manufactured in just exactly the version shown, and maybe 5 percent are no longer manufactured at all. The delay in production resulting from corporate changes in the publishing house doesn't excuse the anachronisms, nor should it make them more palatable to readers. That is a problem with this book. I should, however, excuse the editor and contributors from being thought bizarre. A 40-pound reference book released in March 1987 would naturally have some difficulty reflecting the hot new ideas of 1985 or 1986, even without a production delay.

The *Handbook* is not as up-to-date as this issue of *Sound & Communications*, but a book that takes several years to prepare will necessarily be several years behind the newest ideas. Editions of *Sound & Communications* are one month apart, while the last edition of the *Cyclopedia* appeared 18 years ago.

A few moment's leafing through the book, however, confirms my recollection that active crossovers, parametric equalizers, pink noise, and transversal equalizer are *all* discussed and shown, at least with a function block diagram

(continued on page 34)

> ***"A few moment's leafing through the book, however, confirms my recollection that active crossovers, parametric equalizers, pink noise, and transversal equalizer are all discussed and shown..."***
>
> ***Ted Uzzle***

by William R. Thornton, Ph.D, P.E.
Thornton Acoustics & Noise

Fourier Analysis

This article discusses Fourier Analysis at an intuitive level instead of using rigorous mathematical theory. Subsequent articles will show how it is applied to solve practical audio and acoustical problems.

What is Fourier Analysis? It is a mathematical procedure for decomposing sound waves into the magnitude of the pitches and the associated phase angles. The magnitude at each frequency is normally the major concern. Consider a complex waveform such as the square wave in Figure 1. The Fourier Analysis of this square wave displays amplitude versus frequency and each "spike" represents the magnitude of a sine wave at the harmonically related frequencies of f_0, f_1, f_2, etc. "f_0" is the fundamental frequency and the others are harmonics, e.g. the first harmonic is f_1. As we will discuss later, these sine waves can be added together in phase in "real" time to form this square wave.

To develop an intuitive feel for Fourier Analysis, we will use a reverse approach and construct this square wave from a series of sine waves. Later we will see that *any* waveform can be constructed from a series of sine and cosine waves at various frequencies. Assume that we want to construct a square wave which has a fundamental period of 0.01 seconds which corresponds to a frequency of 100 Hz. First, a sine wave is selected which has the same period as the square wave, i.e. a sine wave at 100 Hz. We will *arbitrarily* choose the amplitude to be 1.0. When the sine wave is compared to a square wave, it fits the basic curve shape but the "corners" are too round as shown in Figure 2. To improve on this, we will add another sine wave at 300 Hz with an amplitude of 0.33 as shown in Figure 3. The waveform begins to resemble a square wave but the corners are still too round. When a 500 Hz sine wave with an amplitude of 0.14 is included, a substantial improvement occurs as shown in Figure 4. Things have improved but the "top" of this waveform "wiggles." With just three sine waves, the waveform strongly resembles a square wave. Observe that all sine waves are in phase! We could continue this exercise with sine waves at 700, 900, 1100 Hz and so on where each amplitude is (1/N) where N is the number of the odd harmonic. The addition of more and more sine waves will improve the result by "squaring" the corners.

FIGURE 1

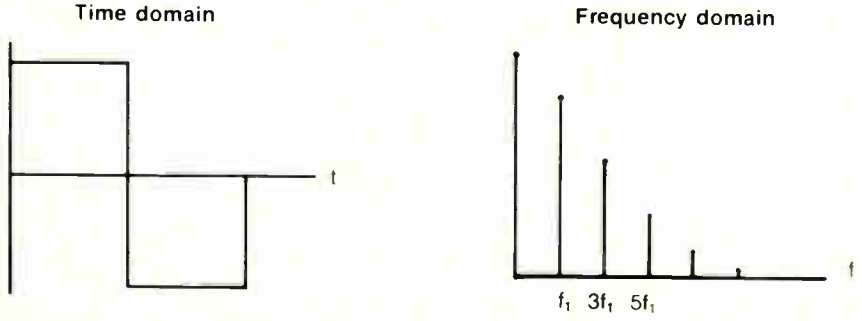
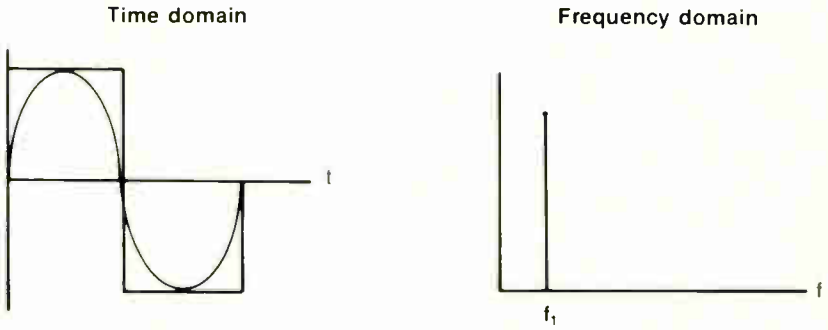


FIGURE 2



In mathematical terms, we could represent our square wave as a series of sine waves as shown in equation (1).

(1) $SQ(t) = \Sigma(1/N)\sin(2\pi f_n t)$

where:

f_n = frequency
$(1/N)$ = amplitude of "nth sine wave

In explicit terms the first three terms of the square wave are written as shown in equation (2).

(2) $SQ(t) = 1.0\sin(2*3.14*100t) + 0.33\sin(2*3.14*300t) + 0.14\sin(2*3.14*500t)$

How does this relate to Fourier Analysis? Very elementary! Fourier Analysis gives us the frequencies phase and amplitude information for sine waves which constitute the waveform under consideration. The Fourier Analysis is the reverse procedure where the time history such as this square wave is decomposed into magnitude and phase versus frequency information. The detailed mathematical procedure is beyond the scope of this article but the results for various common waveforms can be found in handbooks.

It is important to recognize that we could arbitrarily pick a sine wave and add another sine wave of a different

frequency and amplitude. For example, we could select a series of sine waves with amplitudes of 1.0 and frequencies which are multiples of 100 Hz, e.g. 100, 200, 300, 400 Hz, and so forth. By definition, the result would be a complex waveform which repeats itself every 0.01 second. Instead, we are more concerned with the Fourier spectrum. What will it look like? It will be a "line spectrum." A series of spikes occur in intervals of 100 Hz and each one has an amplitude of 1.0 as shown in Figure 5. In theory, there is no limit to the number of sine waves we can use. Function generators could be used to experimentally create this waveform. A series of function generators could be used in parallel where the amplitude of each generator would be set with a precision voltmeter, each frequency would be selected with a precision frequency counter, the individual sine waves of each generator would be summed with an operational amplifier, and the final results could be displayed on an oscilloscope.

So far we have limited our analysis to sine waves which are in phase. We can relax this requirement and each sine wave can have an arbitrary phase angle as shown in equation (3).

(3) $S_n(t) = A_n \sin(2\pi f_n t + \emptyset_n)$

where:

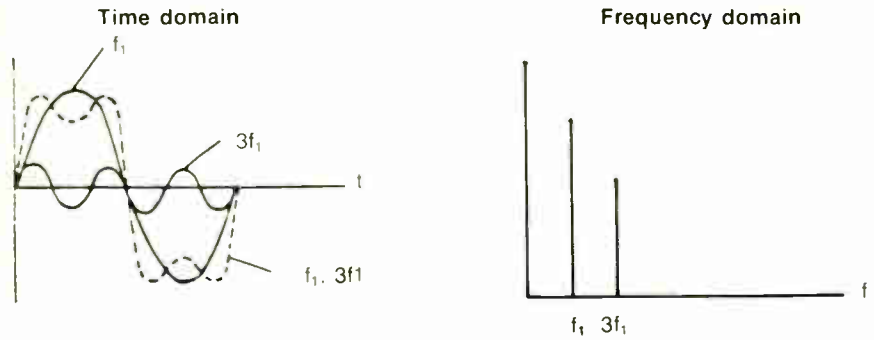
S_n = "nth sine wave

A_n = amplitude of "nth sine wave

f_n = frequency

$\emptyset_n$ = phase angle of "nth sine wave

FIGURE 3



The phase angle could be obtained from a random number table. If each one is chosen in an *arbitrary* fashion, the waveform would resemble noise if we used many sine waves. If Fourier Analysis was done on this waveform, the spectrum would be a line spectrum with "spikes" of the same amplitude as before but with *different* phase angles. The plot of phase angle versus frequency would be a figure with the same angles as were obtained from the random number table.

The key difference is phase. If all phase angles are the same, e.g. zero, a complex waveform results. If all phase angles are different, e.g. random, then the waveform is noise and it will not repeat itself.

We can relax the requirement that each amplitude has a constant value such as 1.0. Instead, amplitude could be selected from a second random number table. When these sine waves are added, the result will resemble noise as before. When Fourier Analysis is done, a plot of magnitude versus frequency will yield the same amplitudes as were originally obtained from the random number table. Again, the phase plot would be the same.

This exercise could become more complex by selecting sine waves which start at a frequency of 0.0001 Hz and proceed in .0000001Hz increments. A frequency range of 0 to 20,000 Hz could be used if desired. The amplitudes could be constants or random numbers from a table or any mix we prefer. The phase angles would be randomly selected. Fourier Analysis would yield a plot of the magnitude and phase versus frequency with the same values as taken from the tables. The magnitude plot would contain about 200 million spikes! Conceptually, 200 million sine wave generators could be used to accomplish this task without any loss of generality.

FIGURE 4

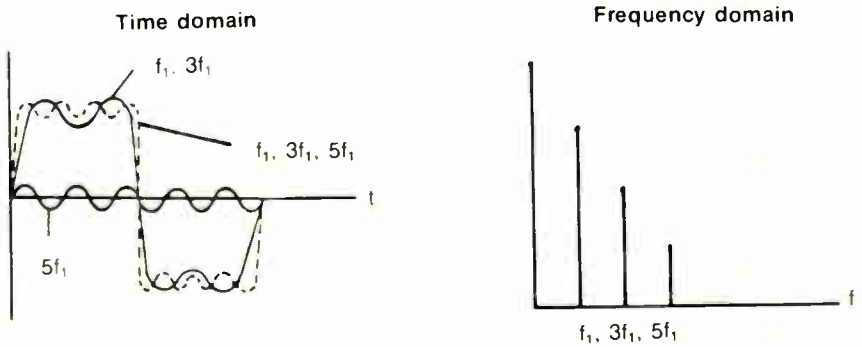
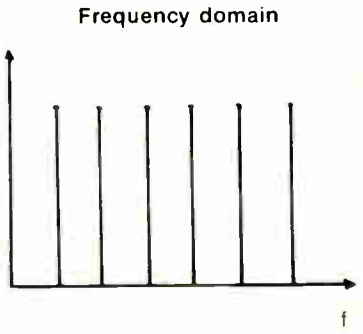


FIGURE 5



To review, Fourier Analysis is a procedure which results in a plot of amplitude and phase versus frequency which represents the constituent sine waves which cause the waveform and is observed on an oscilloscope in "real" time. There are no constraints on the amplitude or the spacing between the sine waves. The intervals could be arbitrarily small. In the limit, the interval could be zero and the plot of magnitude or phase versus frequency would be a continuous curve instead of discreet spikes.

Later articles will show how this analysis is of practical use in the audio and acoustics field. Articles will discuss the white noise, transfer functions, coherent output power, and related topics which are quite useful.

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Circle 208 on Reader Response Card

by Marc L. Beningson
Jaffe Acoustics, Inc.

Discussing Section 17

For the past several months, we have discussed the advantages of several different methods of structuring the sound contract. This month's column deals with a method that has received a great deal of attention: Section 17.

As discussed in a previous column, the construction industry and the architectural profession have adopted standard specification formats in order to eliminate confusion among contractors. We have looked at Section 16 (Electrical Systems) and Section 11 (Special Equipment). Section 17 was originally developed for low voltage electrical devices such as automated HVAC control systems. Because such installations were usually contracted directly to large manufacturers such as Honeywell and Johnson Controls, with the sitework subbed back to a local contractor, a distinct section was required to separate this workscope from the electrical and mechanical contractors.

"Generally the Section 17 contractor is responsible for the installation of the entire system."

". . . The sound contractor under Section 17 would now be the customer of the electrical (contractor) instead of his employee."

Lately, the role of Section 17 has been expanded to include all low voltage systems, that is, all systems that have wiring that is not required by code to be installed by a licensed electrical tradesman. Such systems may include building automation (lighting and HVAC control systems with occupancy detection), security control (access card readers and remote door lock systems), surveillance video, CCTV and MATV, intercom and signaling devices (nurse call, traffic control) and many other systems. It is logical that sound systems be included with these other (somewhat) high tech systems.

Generally the Section 17 contractor is responsible for the installation of the entire system. This means that if electrical power or conduit is required (and of course it always is), then the Section 17 contractor must subcontract out this work to a licensed electrical contractor (many Section 17 specifications are performance specs in which the electrical requirements will vary substantially depending on the methodology and vendor used by the contractor) and, although coordination with the electrical may still be tedious, the sound contractor under Section 17 would now be the *customer* of the electrical instead of his *employee*.

If the sound system is placed in Section 17, the sound contractor is put in a position of control and responsibility. He is the only contractor dealing with sound, and coordination with other trades is greatly reduced. He represents his own interests at project meetings and has a direct relationship with the general contractor or construction manager. There are fewer layers of "administration" between contractor and designer. And of course, with full responsibility for sound, there is much less chance of gaps in or overlapping workscopes with other trades—the workscope is perfectly clear—all of it. Lastly, as a prime contract, the bid can be administred so that only qualified contractors are involved and, as stated before in this column, a bid among equals is a competitive bid.

There are disadvantages to a Section 17 sound contract. As a prime contractor, the sound contractor is required to meet all general conditions that would have been the responsibility of the electrical under a subcontracting arrangement.

These conditions may include simple requirements such as providing water, ensuring safe working conditions or maintaining a dumpster. But there are other requirements that sound contractors may not be familiar with because their responsibility was absorbed by the electrical: there may be a performance bond required in case the contractor fails to complete his workscope properly; prevailing wage considerations may mean that you must pay your installers and technicians a minimum amount whether your shop is union or not; and there may be a minority participation requirement that a percentage of the contract must be performed by a certified minority contractor. This can be very difficult to meet on a small contract.

"If the sound system is placed in Section 17, the sound contractor is put in a position of control and responsibility."

Because there are costs involved in meeting the obligations of a prime contract, the sound contractor who does not identify these costs is writing away his profits directly. Section 17 is the way of the future because more and more sound contractors will become low voltage specialists and, eventually, all of the low voltage systems will be utilizing a single cable.

"Section 17 is the way of the future because. . . sound contractors will become low voltage specialists."

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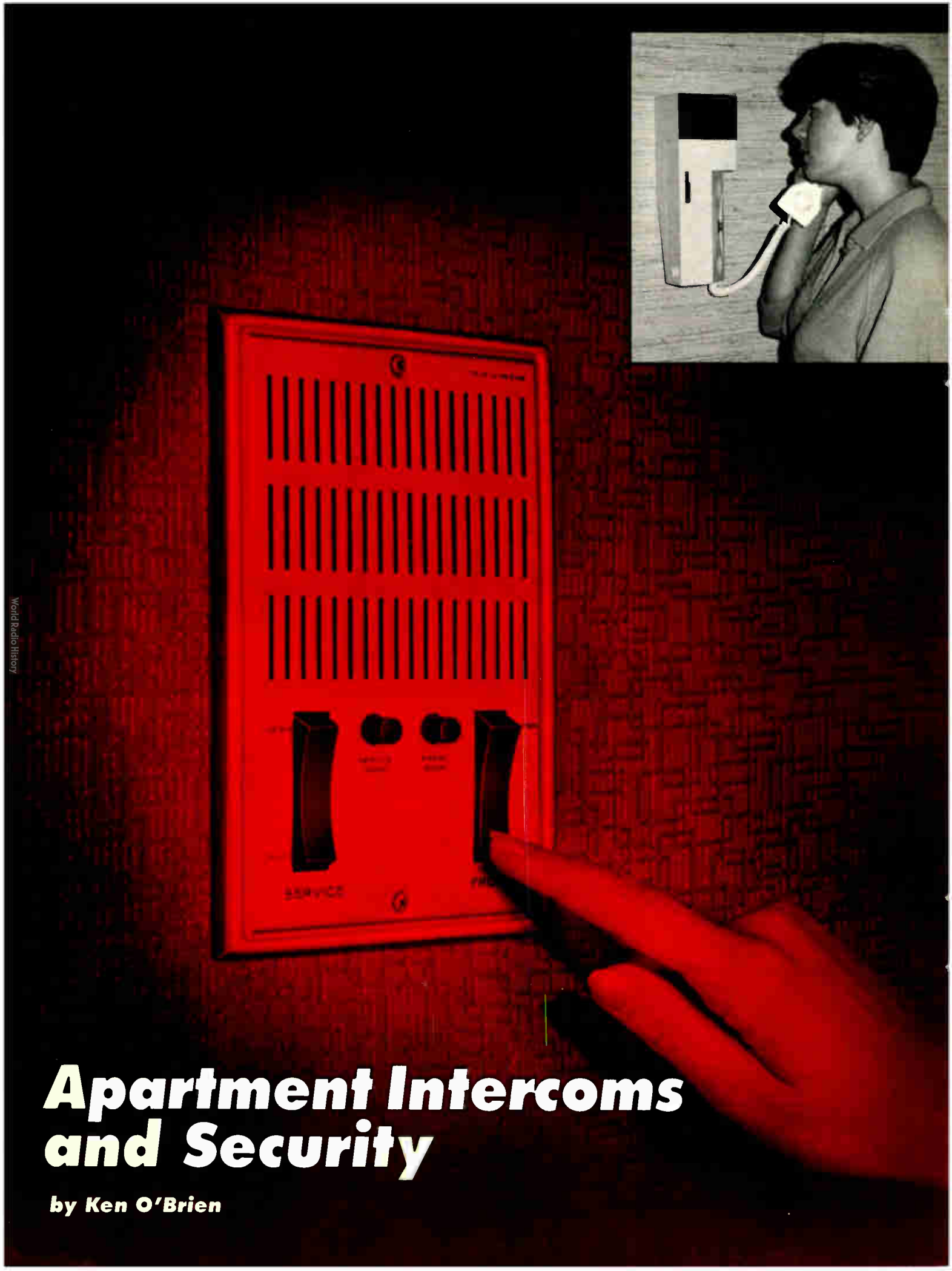
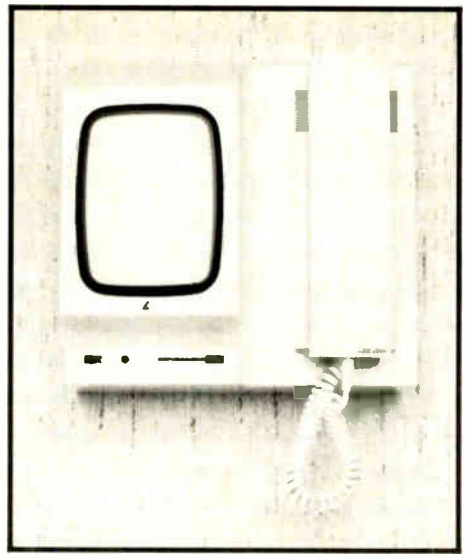


Apartment Intercoms and Security

by Ken O'Brien



(L-R) Talk-A-Phone's Model TA-2 apartment intercom unit • Amplyvox's Model 840 wall-mount video entry system monitor • Amtel's Classic II entrance access and security system • Lee Dan's Model VM-102A Enterview™ monitor.

The multi-residential intercom and security market is rapidly expanding and becoming more and more sophisticated. The upscale portion of the business has seen drastic increases in volume.

Gone are the days when the standard intercom installed was a three button open voice system. These systems thrived during the days when intercom was considered a basic necessity. In these cases, the lowest cost usually determined which system was installed. Differences between systems generally were not considered.

Today, a variety of features and functions are incorporated into these products. This allows everyone involved in the sale and installation of these systems from the manufacturer to the end user to benefit. Additionally, the mood is right at this time. Urban revitalization is progressing at a feverish pitch.

At the same time, consumers are demanding more flexibility and sophistication from every product they purchase. Real Estate Developers are vying for their niche in the market. The type of entry system used in a project becomes a saleable asset to the developer when he is selling or leasing residences. If his building has certain features, it can be considered more desirable than others. This will allow him to sell or lease his units more quickly or at a higher price or both. In this instance, the entry system becomes in addition to a security device, an amenity used to promote sales as would a fireplace, terrace or hot tub.

What To Look For

In the condo/co-op market, the same holds true. When a condo board or its representative building manager is looking for an entry system, it is to their benefit to install a system that would enhance the value of the building and the individual units. Every dollar invested into the system is generally returned multi-fold in the form of increased market value. It is this trend that adds a great deal of value to the higher priced systems.

More important than the monetary benefits is the security aspect of these systems. The more information that is made available to the resident about the visitor, the better able the resident will be to make the proper choice whether or not to allow the visitor into the building. Also, the system must be easy enough to operate so that all the residents will be able to utilize it. In a multi-residential building, the entry system has to be used properly by everyone or it cannot be used to its full potential.

The inherent benefits to the end user offered with each type of system make the work of the contractor much easier. In general, everyone would like to have a sophisticated entry system. The biggest fear of the buyer is the anticipated price. If the system can be presented based on the facts as detailed above, the ability to close the sale will dramatically increase.

Of course, a contractor should look for an intercom manufacturer with a proven, reliable track record. A larger satisfied installed base of systems is a testimony to the quality and prestige of a manufacturer. Contractor aids such as field test kits and modular wiring systems designed to ease installation are definite signs of that producer's dedication and understanding of the tools required in the market.

Versatility is another very important aspect of any entry system. Any engineer or contractor is well aware that every building and application is different. A well designed entry system allows you to tailor the system to the needs of a particular building with features and functions above and beyond the standard ones. This is obviously much more desirable than trying to modify the building or its operation to meet the requirements of the system being installed.

Another good judge of the dedication of an entry system manufacturer is by his documentation of all the features, functions, and options. This will be instantaneously evident in the catalogs, data sheets and wiring diagrams, offered. Obviously, the more detailed and complete these are, the more information you will be able to gather from them.

Differing Categories

Today's multi-residential intercom systems fall into a number of differing categories. Each one caters to a different segment of the market by offering various levels of performance, feature and value.

The first level is referred to as an open voice system. It consists of a station located at the building entry and a speaker with push buttons located in each apartment. To operate, the resident generally has to push one button to talk, push another to listen and push a third to release the door lock.

The main feature of this system is that it is relatively inexpensive. However, it is very difficult to use because a resident has to push multiple buttons to carry on a conversation. Also, people generally do not know how to speak into the stations. This results in either a loud distorted conversation or a soft inaudible one. Unfortunately, many times the fact is that you cannot identify who you are speaking to. This leads to a potentially dangerous routine of door release without visitor identification.

The next type is the dial entry system. This system actually interfaces an entry panel with a resident telephone. A visitor's call is identical to a standard telephone call. After the positive identification of the visitor, the resident can release the lock by dialing a pre-determined code into the phone.

A benefit of this system is that it is easier to use because it mimics an everyday function (using the telephone). Because of this feature alone, the system is bound to be better utilized. Another

Ken O'Brien is the product manager of Elvox Division, Paso Sound Products, Inc. He has had work published in several national magazines, including Real Estate Forum Magazine.

Aiphone's Video Base intercom system.

advantage is that there is generally very little wiring required at the time of installation.

The major drawback of this system is that it is not a dedicated system. Problems can arise if a visitor calls while you are on the phone, or if one of the apartment owners does not have a phone. One other drawback is that in many systems there is actually a monthly phone bill associated with the system. Calls made by the visitor may be chargeable phone calls. The best way to get around these problems is by installing a dedicated telephone intercom system. Each residence now will have a separate independent handset to use for communication with the visitor only.

Telephone Intercom Handsets

There are two major types of systems which both utilize a telephone intercom handset in each residence. In one system, the entry station is located at the building entrance and is utilized by the visitor. When signaled, the resident picks up the handset, identifies the visitor and releases the door lock. This system is by design inherently easy to use.

The second configuration utilizes a switchboard manned by the concierge. A visitor identifies himself, the concierge then calls the resident to confirm entrance into the building. As an additional dimension, the switchboard allows for the ability to make internal calls either from apartment to apartment or perhaps to the laundry or package room for instance.

Since these phone systems have minor wiring requirements, (as few as two wires) many times existing building wiring can be utilized. This can greatly reduce installation time and cost. If this is not possible, the small diameter cables still allow for quick easy wire routing. In either case, the dedicated telephone intercom handset allows for efficient use of the entry system.

Videointercom Systems

Without doubt, at the top of the line is the videointercom system. If the purpose of an intercom is to identify a visitor before allowing entry, the videointercom system meets and exceeds this purpose.

In this system, the entry panel has, in addition to the standard pushbuttons and speaker microphone, a closed circuit television camera. In each residence, there is a dedicated combination closed circuit television monitor and intercom handset. The combination is referred to as a monitor. The sequence when a visitor calls is as follows: the monitor will signal the resident when the call switch is depressed; the picture will automatically turn on. At this point in time, the resident has the option to respond or not based solely on the image he sees. This is very useful in avoiding certain types of visitors.

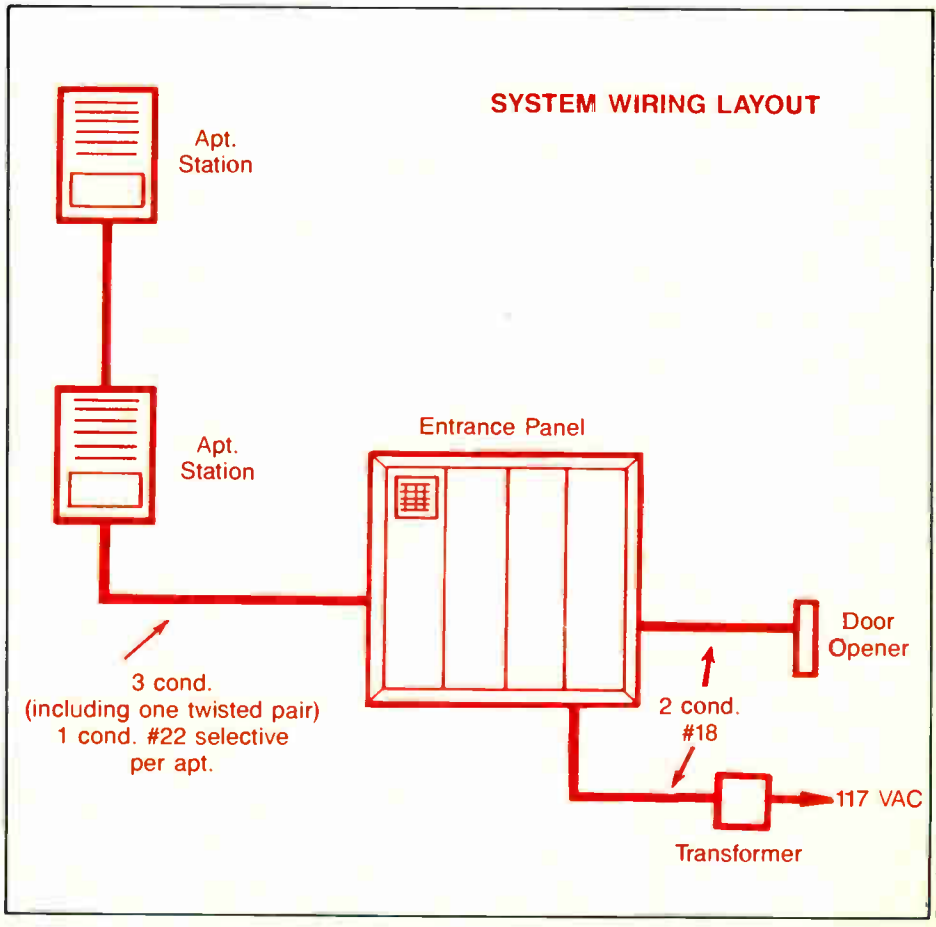
Next, the resident picks up the handset and can converse with the caller. He can request identification or whatever else the situation might call for. The big advantage is that this is all done before the front door is opened. Finally, when the resident is satisfied with the caller's identity, he can release the lock.

Tektone's Model IR-104R apartment station.

The amount of information (both visual and audible) and control that is afforded by the resident in this system encourages everyone in the building to utilize the system properly. Additionally, like the phone system, it is extremely easy to use.

A high quality videointercom system

(continued on page 47)



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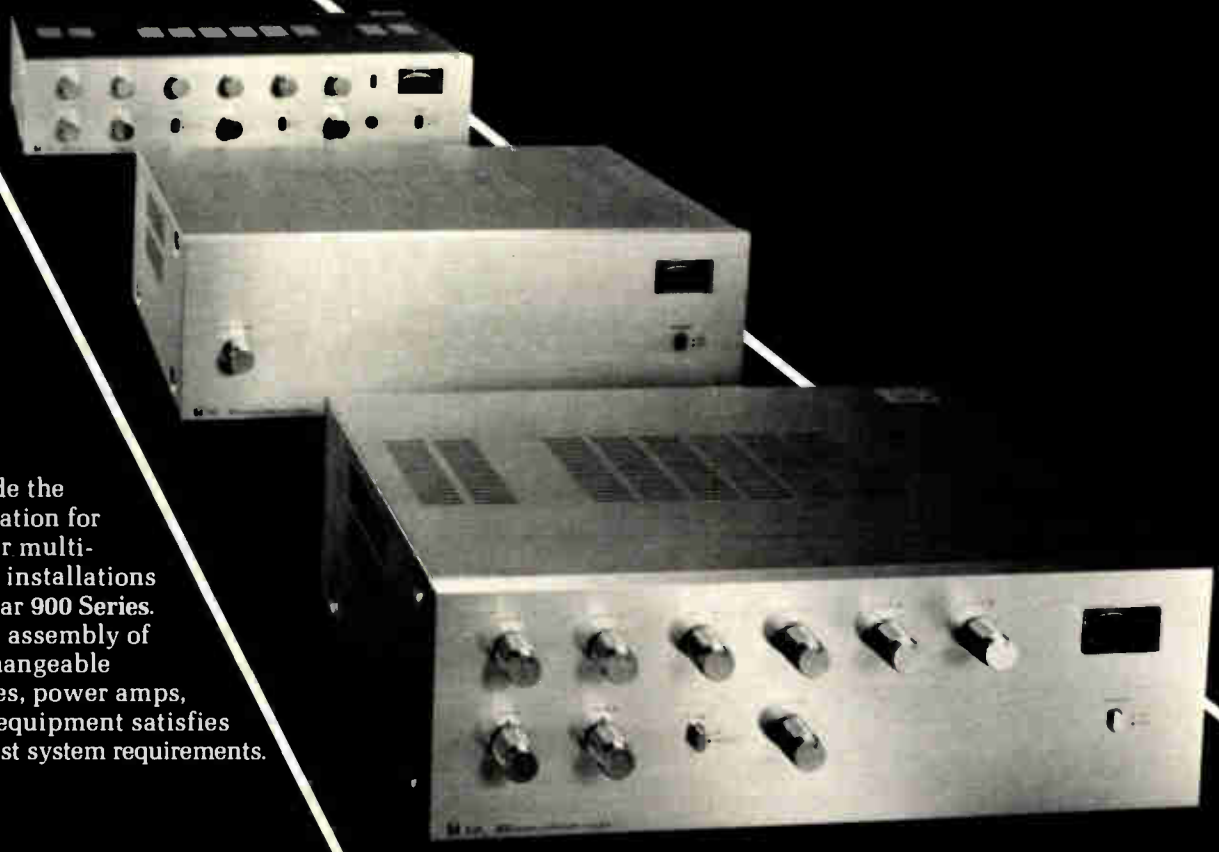

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a historical perspective STEREOPHONIC SOUND SYSTEMS

Part Two

by Neil A. Shaw

Stereophonic sound has become commonplace in today's world. The subject has been studied over the years, but the principles from which it has evolved have been overlooked in contemporary installations of theatre sound reinforcement systems and in home entertainment systems. This month part two of an article written by Neil A. Shaw will further discuss the fundamental theory underlying stereophonic sound as it was developed by Fletcher, Snow, et. al. at the Bell Telephone Laboratories in the 1930's. The differences between biaural listening and stereophony will also be discussed along with their similarities. Part I of this article in the June issue focused on Fletcher's basic requirements.

From Part I, the principle conclusions to be drawn from the early Bell Laboratory investigations are:

1. Of the factors influencing angular localization, loudness difference of direct sound seems to play the most important part. These effects can be predicted for most observer positions reasonably well.
2. Depth localization was found to vary with changes in loudness, the ratio of direct to reverberent sound, or both. The effects are not subject to a computational treatment. The actual ratio of the direct to reverberent sound, and the change in the ratio, both appeared to play a part in an observer's judgment of stage depth.
3. Observers in different parts of the auditorium localize a given source at different virtual positions, as is predicted using loudness computations. As an observer moves to one side of an auditorium, the virtual source shifts toward the same side of the stage. Moving backward and forward in the auditorium appears to have only a small effect on the virtual position.
4. Because of these factors, point-to-point correlation between pick-up stage and virtual stage positions is not obtained in two- and three-channel systems.
5. The three-channel system proved clearly superior to the two-channel by eliminating the recession of the center-stage positions and in reducing the differences in localization for various observing positions. For musical performance reinforcement, the center channel can also be used for independent control of soloist renditions.
6. The application of acoustic perspective to orchestral reproduction in large auditoriums gives more satisfactory performance than would probably be suggested by the foregoing discussions. The instruments near the front are localized by everyone near their correct positions. In the ordinary orchestral arrangement, the rear instruments will be displaced in the reproduction depending upon the listener's position, but the important aspect is that every auditor hears differing sound from differing places on the stage and is not particularly critical of the exact positions of the sounds so long as he receives some spatial impression.

Neil A. Shaw is an Associate at Paul S. Veneklasen and Associates. He is responsible for the company's electroacoustic and electronic systems designs.

Snow's Basic Principles of Stereophonic Sound

After these developments at the Bell Laboratories, multi-channel reproducing systems were increasingly used in and for motion picture soundtracks. However, in most cases the use was in a pseudostereophonic soundtrack, i.e., the soundtrack was produced with pan pots and not originally recorded with microphones set up to capture true stereophonic sound. Exceptions to this were the true stereophonic soundtracks produced for Cinerama starting in the late 1940's. In 1953, Snow's classic paper "Basic Principles of Stereophonic Sound" appeared in the Journal of the Society of Motion Picture and Television Engineers. Defined in his paper are:

Binaural - A system employing two microphones, preferably in an artificial head, two independent amplifying channels, and two independent headphones for each observer. This can duplicate normal listening.

Stereophonic - A system employing two, but preferably three, or more microphones spaced in front of a pick-up area, connected by independent amplifying channels to two or more loudspeakers in front of a listening area. This creates the illusion of sounds having direction and depth in the listening area between the loudspeakers.

It is very important to fully distinguish between these systems. A true or ideal binaural transmission system actually

duplicates in the listener's ears the sounds he would hear at the pickup point and, except for not being able to turn the dummy head, gives full normal directional sense in all directions. A stereophonic system produces a sound pattern at the listener's ears which the hearing sense *interprets* as indicating direction in the listening space. It has been said that the binaural system transports the listener to the original scene, while the stereophonic system transports the sound source to the listener's room.

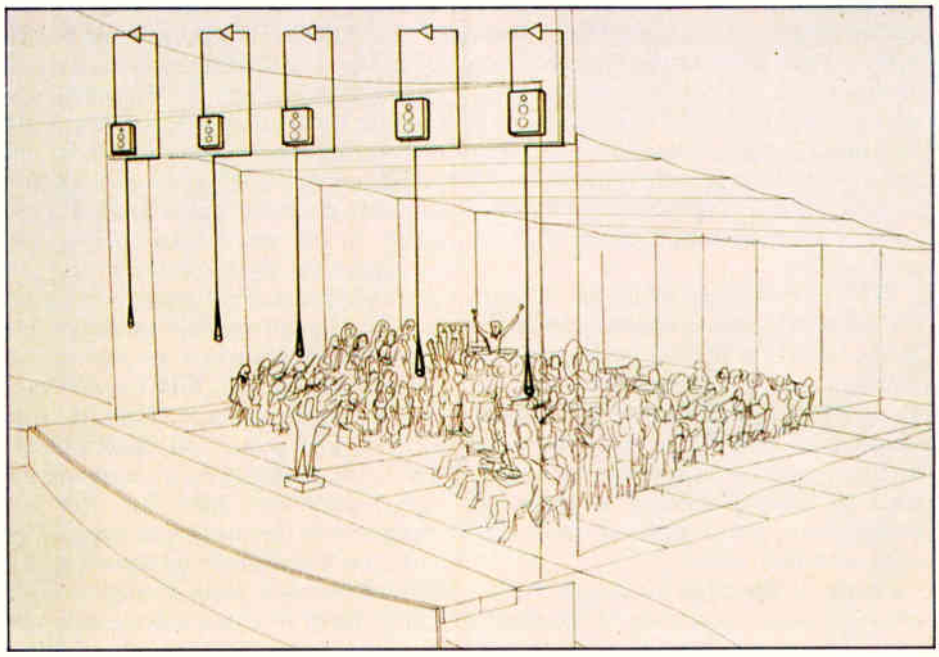
Electroacoustic Sound Systems

Figure 8 summarizes the differences and similarities of various electroacoustic reproducing systems. The "System" names in column one will be found in the literature. They conform to a uniform pattern, except "monophonic", which Snow used for convenience to denote the opposite of stereophonic. *Equivalent Normal Experience* refers to the everyday hearing experience that parallels listening over the system in question. *Pickup, Number of Channels, Reproducer,* and *Symbolic Schematic* are obvious. The basic differences between the various systems are given in the column *Direct Sound Reproduction of Single Sound Pulse.* This is the most important column. If a single sound pulse is produced, this column gives the resulting *direct* sound pulses at the observer's ears. The direct sound is the initial sound transmitted directly from source to observer by the shortest path. The direct sound arrives before any reflected sound. It is the direct sound that carries the information, making angular perception possible.

Binaural Reproduction

Arrival time and quality differences are identified by Snow as factors in angular localization for complex sounds. A complex wave pulse has an initial wavefront which arrives at the near ear a short time before it arrives at the far ear. This small time difference is used by the observer's hearing sense to determine small angular variations, particular for sounds in the median plane (straight ahead). Differences as small as one or two degrees, corresponding to 10 to 20 microseconds, can be perceived. Loudness differences at such small angles are slight. Arrival-time differences give the localization clues. The arrival-time effect is aided by the quality differences at the ear caused by sound diffraction around the head. The intensity differences due to diffraction are functions of frequency and direction and cause the complex sounds to have a different frequency-intensity mix, or quality, at each ear. This difference in quality aids in removing the ambiguities in direction which can arise from arrival-time differences alone, because the diffraction effects are so complicated a given quality difference corresponds to only one direction.

Sound reinforcement for orchestras.



Changes in both arrival time and quality are relatively small as a source is elevated in front of an observer. Therefore, the ability to distinguish angle in the vertical direction is poor.

Snow notes that the perception of the position of a sound source in space involves determining distance as well as angle. The ear depends on less definite clues than the eye's convergence mechanism for determining the source distance. Intensity, quality and reverberence are used by the ear to form an approximate idea of distance.

Stereophonic Reproduction

It has been customary to use the analogy of a screen of transducers to describe an ideal stereophonic reproduction system. Figure 9 shows an ideal stereophonic system, consisting of a screen of a very large number of very small non-directional microphones hung in front of the sound source. Each microphone is connected to a corresponding extremely small loudspeaker in a screen of non-directional loudspeakers hung before the audience. The sound projected at the audience will be a faithful copy of the original sound and the

Photos by Paul S. Veneklasen and Associates

The Portland Civic Auditorium.

HORN-HANGERS vs

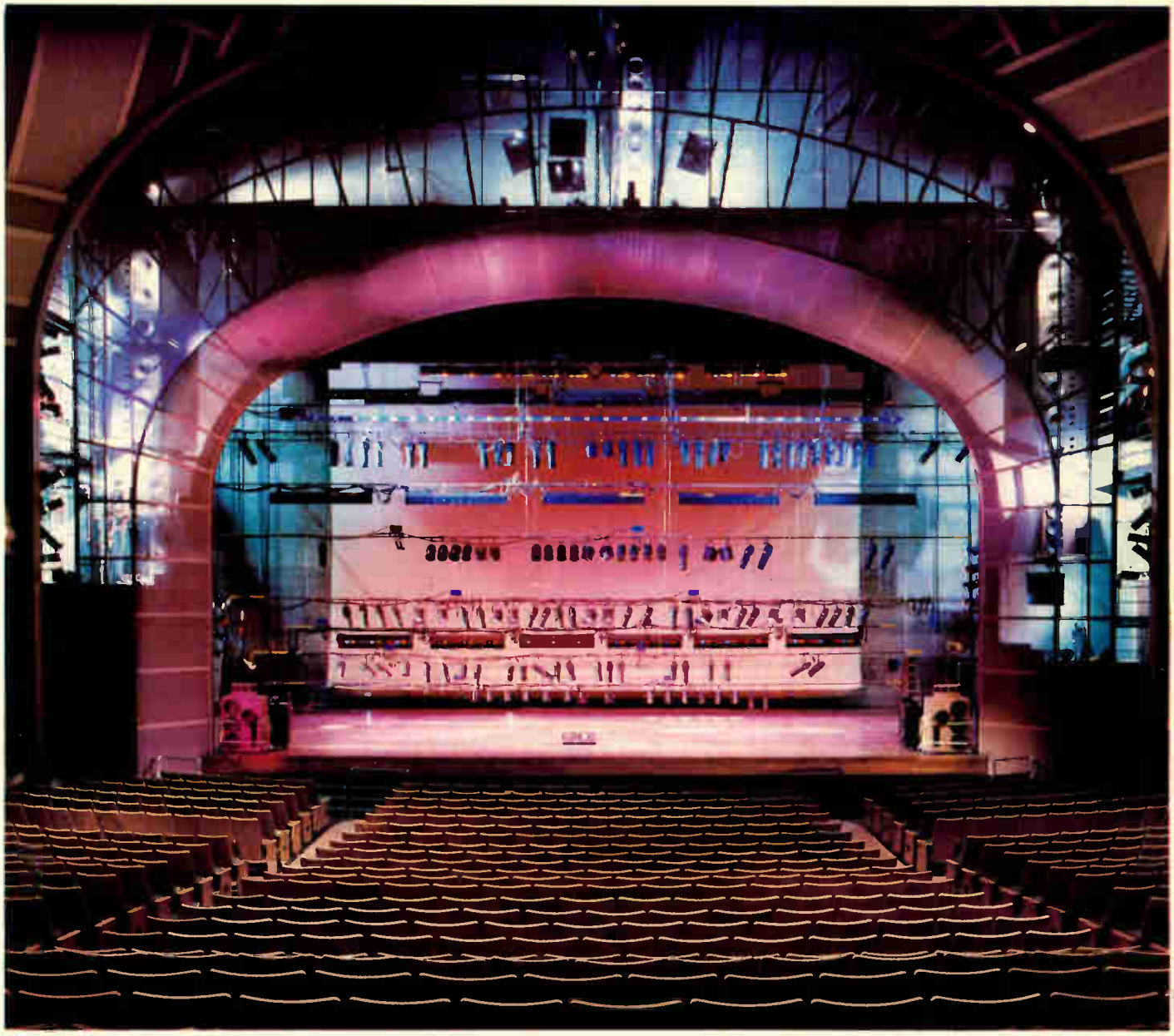


Photo courtesy JBL.

the ROCK & ROLLERS

Or What Difference Does it Make What You Hang Next to or Under the Catwalk?

by Jim Long

[redacted]

Performing Arts Center in Eugene, OR.

For many years, it has intrigued me that both the traditional sound contractor and the concert sound industry have used many of the same speaker components but in different ways. It seems that one has to choose between coverage uniformity and high sound pressure levels. Typical is the central cluster of horns and bass bins that work fine for commencement exercises and basketball games, but is all locked up when REO Speedwagon brings in their rented rig for the big weekend concert.

For example, to many sound contractors, the idea of covering a church or auditorium from a central point (central cluster) is very familiar. Typically, a wide-angle, short-throw horn might be used to cover the front of the seating space, with a narrow-angle, long-throw horn covering the rear. The fundamental idea is to have a single horn cover a given audience section, with as little pattern overlap as practical, in order to obtain a uniform direct sound field in the audience and as little sound as possible everywhere else. The various computer-aided array-design programs, especially the "graphical" ones which clearly show the coverage and interaction of individual horn patterns, encourage this state of affairs.

In contrast, touring systems might use the very same horns and drivers, but put them in big stacks on both sides of the stage, with many devices pointed in the same direction. In addition, the speakers are often very low in comparison to the far-throw distances involved, so the inverse-square-law level differences are enormous. This situation comes from (1) the desire for substantially higher sound pressure levels than can be provided by a single horn/driver combination feeding a seating area, and (2) the desire to have packages that can be easily moved from a truck and installed in the venue. The fact that the resultant radiator is basically a big acoustic comb filter—since every seat in the house is fed by multiple transducers handling the same frequency ranges and displaced from each other in space—is decidedly secondary. The fact that direct-field coverage is anything but uniform and the words are drowned in a sea of reverberation in the back rows is also secondary. After all, there is only so much money available and everybody has the words memorized anyway.

I think it is interesting to consider how fixed this dichotomy is. On one hand, it seems to be very fixed, if one considers these facts and conceptions:

1. Central arrays are expensive to achieve on the road, and they don't go loud anyway.
2. Many spaces cannot be uniformly covered from a central point, given the usual selection of horn coverage patterns.
3. Many house systems are poorly maintained; if one was a good enough design for my group once, how do I know if half the drivers aren't blown?

But there is evidence of moving away from the two extremes, and I believe there will be more. It is perhaps clarifying to consider some of these directions at once, in overview.

Semi-Distributed Systems

In the contractor camp, so-called semi-distributed systems have extended and increased the level of uniform direct-field coverage. A "time-zero" cluster, placed over the stage, is expected to provide uniform coverage and adequate level for only the front seats. Level and uniform coverage are provided for the other seats by a number of "satellite" clusters, relatively close to the audience being covered and appropriately delayed in time so the source-localization cues are provided by the cluster over the stage.

Depending on the room characteristics, of course, I know of such systems that can provide average SPL's as high as 105 to 110 dB and coverage uniformity within a 3- or 4-dB envelope. Thus, you get coverage far more uniform than the typical roading rock system and rather loud levels, lacking only the close-to-the-front 115-to-120-dB levels that qualify as "loud" and "very loud" rock.

In a very large, 60,000-seat stadium, where a practical semi-distributed system might achieve only 105-dB average levels—not quite loud enough—an interesting solution suggests itself. Bring the rental rig in for the stage and near-seat coverage. That makes the musicians and road crew feel at home and gets the 115 dB in the front seats. Then, tie into the appropriately delayed satellites to get uniform direct-field coverage and intelligibility in the rest of the seats. The coverage uniformity and intelligibility would be far higher than that achievable with the typical rig alone.

A variation of the above would be the arrayed and suspended touring system (see below), augmented by delayed arrays suspended back in the venue. I believe both variations have been successfully employed in the recent past, but neither is anything close to a norm.

Arrayable Boxes

Arraying has come to rock and roll via the fairly compact, trapezoidally shaped boxes offered by a number of manufacturers. The general suggestion is that all coverage problems are solved because the box shapes fan out the coverage. The experienced fixed-installation contractor or consultant would probably applaud the convenience but would also note that the fixed arraying angles and single coverage pattern (typically between 90° x 40° and 60° x 40°) are not necessarily those required to get uniform direct-field coverage and a minimum of pattern overlap in a given room/array-location situation. Also, the horns employed in arrayable systems are often not of the constant directivity type, which have become the rule in contractor-type clusters.

Of course, the coverage of any array of trapezoidal boxes would tend to be more uniform than that of a stack of full-range cabinets on either side of the stage and mostly aimed straight ahead. On the negative side, to the extent the arraying keeps the individual coverage patterns separated, an array of trapezoidal boxes may not deliver the very highest sound pressure levels, not unlike the problem of many conventional fixed-installation horn and bass-bin arrays.

Getting More Level

One way to increase the level in the seats from a single horn is to employ the kind of signal-processing electronics typically used with the systems mentioned above, where compression limiting, and crossover-point shifting are used to allow higher average sound pressure levels without destroying speakers or hard-clipping power amplifiers.

Another way to get more level without directly increasing multiple-source interference is to somehow get the output of more than one compression driver or speaker into a single loading device, such as a horn. This basic idea is old, stemming from the early days of cinema sound, where Y-adapters were used to combine the output of two high-frequency compression drivers on one horn. Such devices now have a bad reputation, however, because of internal reflections which result in out-of-phase cancellations and an associated very rough frequency response. However, it is possible to combine the output of multiple drivers coherently—without cancellations.

Jim Long received his B.S.E.E. from Purdue University in 1965 and his M.B.A. from Northwestern University in 1967. Since 1963 Long has been employed by Electro-Voice, Inc., in a broad range of technical and marketing positions. He was involved in Electro-Voice's entry into the high-performance sound reinforcement market in the mid 1970s and is currently director of marketing.

The Old Globe Theatre

Photos by Tony Tait

The Amiga A1000 computer's electronic analog faders (right) replaced the manually run Richmond Sound 1224 distribution board.

by Tony Tait

When the original 1935 Old Globe Theatre in San Diego, CA, burned in 1978, the rebuilding required the talents of many people. The theatre design was done by Richard Hay of Ashland, OR. Attention was paid to the acoustics from the start to ensure that even a whisper on stage can be heard easily in the last row. The new sound system was specified by Dan Dugan and Roger Ganns, both of San Francisco, and installed by Communications Co., a local sound contractor.

In keeping with the philosophy of many sound sources, the system was designed with many speaker locations both permanent and portable. There is a complete surround system consisting of 32, 70 volt, eight inch coaxial speakers with each speaker on a slider matrix of eight amp channels. Two floor to ceiling columns flank the stage, each made up of 13 Bose 802 drivers in a sealed acoustic enclosure.

The main system is two Meyer MSL-3's with Meyer B-650 subwoofers. These are placed according to the needs of each show. The theatre also owns two Meyer UPA-1's, four Bose 802's, four Electro-Voice S-200's and 12 Minimus 7's. The sound sources used are three four channel tape decks and, depending on the show, occasionally microphones and processors.

Description of 1224

The original sound console was the prototype Richmond Sound Design 1224. Charlie Richmond, president of Richmond Sound Design, LTD. of Vancouver, Canada, was once a sound operator at the Old Globe and developed the 1224 to answer the special needs of theatrical sound. Those needs were: a limited number of inputs, a lot of outputs and a way to crossfade smoothly from one level to another and one speaker to another. The 1224 had 12 inputs and 24 outputs and there were no printed circuit boards. Each connection was hand soldered and IC's were glued to the underside of faders. It was a conceptual prototype.

When the original Old Globe burned, this console was off the premises, so that when the new theatre was built, the 1224 was installed with the intention of replacing it when money became available. The 1224 consisted of three, four channel input group. The first two groups of four were duplicated in X-Y crossfading pairs with a switch and time slider between them. Under each input level slider were eight preset assign buttons. The last group of four inputs was non-crossfading; each input was assigned its own preset.

The output matrix consisted of 12 rows and 24 sliders each with a range of 40 db of attenuation. So running a cue consisted of assigning an input level, selecting a preset row (if using deck A or B), selecting and balancing outputs in that preset row, then running the tape deck for the cue.

As directors and designers became more demanding of the role of sound in production, the physical operation of the 1224 became more and more difficult. In 1983, the push began for a new console. Since the philosophy was still to have many sound outputs and control of direction and volume, I first contracted Charlie Richmond about building a newer, more flexible version of the 1224. I envisioned three crossfading four channel tape decks with more preset rows. We began to discuss computer level controls and assignors but the technology wasn't up to it yet. So we began to plan a new version of the 1224.

Tony Tait is the master soundman of the Old Globe Theatre who is responsible for the operation of the equipment in the theatres including the smaller Cassius Carter Theatre next to the Globe.

Hookups of the Richmond Sound Command Cue to the theatre sound system is through XLR connectors.

Outdoor Theatre Burns

Then in 1984, when the outdoor theatre across the street from the Globe burned, the Globe's priorities changed. Our first concern became rebuilding the outdoor Festival Stage. Between the fund-raising efforts and insurance, I had a set amount of money to spend on the new Festival Stage sound system. Bids were sent out and because the amount of money was known, came back using the entire sum. These bids were examined by Thomas Hall, our managing director, who passed them to me for evaluation. During this reconstruction, I had kept up my dialogue with Charlie Richmond concerning the sound console. It was during this time that chips became available to make a digital sound console practical. Charlie told me that he thought he could build a digital console that would have all the features that we had been discussing.

The problem then shifted from one of technical feasibility to financial feasibility. I then struck a deal with Tom Hall. I would submit a bid for the new equipment for the Festival Stage and save the estimated cost of the new console while not sacrificing quality or performance. I would then use this amount for the digital console for the Globe. The existing 1224 would be rebuilt by Richmond Sound Design and used in the new Festival Stage.

Digital Console Available

Between the time the digital board, now called the "Command Cue", was ordered and delivered, the concept evolved quite a bit. As originally discussed, the program controlling the console was going to be written for the Commodore 64, a low cost eight bit computer, and input was to be by joystick. Then when memory seemed to limit flexibility, the computer was changed to the Commodore 128.

In the late summer of 1985, I was sent a demo of the program to try out. We bought a 128 and played with it for about a week. The joystick was an awkward method of input. I could foresee days to input all the data for a typical show.

Around this time, more powerful 16 bit personal computers became available, such as the Atari ST and the Commodore Amiga. I had been suggesting to Charlie that the Amiga was probably a better choice for system control due to multitasking and memory expansion (up to 8.5 megabytes). After seeing one at a computer show he agreed. So a week after we bought the 128, we sold it in favor of an Amiga.

When the Amiga demo software arrived, it was obvious it was a tremendous improvement over the '64 software. The mouse pointer could manipulate devices directly. It was to be almost a year before we received the console—two years after our first talks about a digital theatrical sound console. Work was still being done on the computer interface card when the card frames arrived in late October of 1986. All wiring from the four card frames terminated at a Christmas tree style terminal block.

Everything in the Globe sound system is accessed through a central patch bay. I had the choice of hardwiring the terminal block directly to the patch panel or making a panel with XLR connectors and just plugging it in. I chose the latter so a panel had to be made and wired for inputs and outputs. I had also asked for the computer to have the ability to control tape decks, so I added RCA panel jacks for electronic switch outputs.

One of the concerns was installation without disrupting the current show. Fortunately, I had a two-week period when the theatre would be dark to install the card frames and input/output panel in the equipment racks in the Globe booth. The old console was moved out and shipped to Richmond Sound Design for rehabilitation. The Amiga computer was placed on the operating desk in its place and a ribbon cable was run from the Amiga via an underfloor conduit to the rack where the card frames were mounted. The audio cables were plugged into the panel. And then we waited for the interface card, the last link to arrive.

Sound control racks include three Bogen CT 100 monitor amps and a Lexicon Model 92 digital delay unit.

When the interface card arrived, I installed it in the expansion box on the side of the Amiga, plugged the ribbon cable in, and then booted the system. For a test, I connected a pink noise source to the number one input and patched the number one output to the booth monitor.

I ran the slider up on the screen, I expected the rush of noise. What I got then, and for the next five days was . . nothing! After head scratching and phone calls to Richmond Sound Design, the problems were solved. They involved DIP switch settings on the various circuit cards that make up the system. Now the audio part of the console was up, and at least I could route a signal to any output and change its volume and assigns via a recorded cue.

Next came the part about making the computer actually run the tape decks. The output of the digital switches is +5 volts when the switch is turned on. This had to be converted to a signal that would tell the tape decks to turn on or off without excessively loading the switch. With Charlie's help, I designed a circuit to interface the logic of the tape decks to the Command Cue. The computer was able to both start and stop the decks on command, but the time resolution of the computer was inadequate to accurately 'cue up' the decks after a tape cue had been played.

What I wanted was a way to run shows "hands off", to *never have to touch the tape decks* just the computer. This was done through the development of an optical

Microphones

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cueing device in conjuction with a logic interface that became a commerical product in its own right, the AutoCue.

Now I had a system that was totally automated. At the single push of a button, the Amiga would start the tape decks, start a timed fade up (or out), set the playback level, do all the speaker assigns, and, at the end of the cue, the AutoCue would stop the deck automatically, ready for the next cue.

This is not to say that there have not been problems with the system. With any device as complicated as this one, some initial problems are inevitable. Several resistor values had to be changed, capacitors bypassed, and IC's from a different manufacturer substituted in order to reduce noise and improve the performance of the system. I expect this to be an ongoing project as the system matures.

I believe in the future of computers in theatre sound. They have the ability to change the way a designer approaches a complicated show. Now the design question changes from "I wonder if I can do this here?" to "What would I like to do here?"

LETTERS

(continued from page 13)

of their use. All these discussions could usefully be expanded, and some of them ought to be much enlarged.

Those who would assemble a reference book must be very careful about allowing commercial bias to creep in, intended or not. Was there bias in the selection of illustrative products?

A few minute's leafing through turned up five different brands of equalizers illustrated by manufacturer and model number: two by schematics but no photograph, three by photographs but no schematics. One is a parametric equalizer. There are nine pages of schematics on one of the equalizers, but it is not outdated, has undergone no revisions, and is still manufactured in precisely the form shown. How would smaller schematics or incomplete schematics or schematics of one of the other equalizers have improved the book for readers?

The criticism, "And this at the exclusion of all other manufacturers. This suggests a favoritism and lack of professional objectively . . ." doesn't seem to be supported by the facts. If five isn't enough, how many is enough?

This book must select specific illustrative examples from among the *hundreds* of microphones, *hundreds* of mixers and consoles, and a *hundred* equalizers, *hundreds* of power amplifiers, and *hundreds* of loudspeakers, now distributed in the North American commercial sound marketplace. Not an easy job, and certainly not for the fainthearted. Those who make the choices must use coherent organizing principles but carefully avoid commercial bias, in substance or appearance. Those who criticize the choices must read the book carefully before charging bias, and ought to indicate the alternate organizing principles they would use.

My review included these comments, which had been edited out during copy fitting at the magazine:

Parts of the *Handbook* will be controversial. That's no disqualification for a major event in the sound business; in fact, controversy attends most events in audio, as in life. Where there

(continued on page 40)

HOW TO PREPARE A WINNING BID

PART TWO

Advice on how to prepare a winning bid was offered to attendees at a panel discussion by Sound & Communications *magazine during the recent NSCA convention in New Orleans. Marc L. Beningson of Jaffe Acoustics moderated the discussion. Glen Meeks, systems engineer for Midwest Communication, Mike Hoover, vice president of Julien Enterprises/Audio Technical Services, Dick Printe from Command Performance and Steve Simpson from Southwest Sound and Electronics were the panelists.*

Part one of this article focused on what a winning bid is. In this installment, the panel discusses how to estimate costs for a winning bid.

Beningson: We've touched on the fact that cost control is very important—how you estimate your costs. What tools did you use to come up with for your cost control?

Mike Hoover: Anybody who is trying to bid a job that is over $200,000 and does not use a computer today is crazy. That's all there is to it. I use Lotus I-II-III, which I'm sure everybody is familiar with. There are many other spreadsheet type systems. The value of Lotus is that it doesn't allow you to make stupid mistakes. You can make a different series of mistakes of a higher order of magnitude with computers, but if you billed in enough checks, which you can do, computers can give you a much better handle on identifying your costs. Also, on any large job, you've got to know ahead of time how to schedule the work flow, in order to be able to control your labor. You may have known that it takes 1.12 hours to install a back box in the ceiling, pull wire to it and put a loudspeaker in. But, if you don't know what the work flow on the job is, you may find yourself sending a man out to spend eight hours to put one speaker in, because he's got to put in four layers of scaffold to get to it.

We use a program called Microsoft Project, which is a computerized, critical path method scheduling program. If you put in all the information accurately, the program tells you how many men are going to spend how much time on what task, does all the math for you, and you've got a labor figure at the very bottom of the page. When we put together a bid, we also use a Lotus Sheet that I call an Estimate Summary Sheet that categorizes all the costs that we've collected from various and sundry sources, and identifies them in five separate areas. We've all talked about materials and those are pretty obvious, and labor is pretty obvious.

The other three methods that I use are what I call ODC (Other Direct Costs), overhead, and profit. Profit is the one that we've also eluded up to here, and that's what we're trying to make. The ODC concept is new to some people. Those costs are directly attributable to a job and should not be overhead, because if they're overhead, you're going to end up with high costs. These costs include field office expenses such as when you've got to rent a trailer to store materials on a job sight or travel expenses such as when the next town is 75 miles away, and you're going to be driving back and forth. That's not your normal everyday job, so the attributable costs need to be analyzed and put onto your spreadsheet, your summary sheet, as another direct cost. If you do that rigorously, you'll find that on some jobs the ODC is higher than on others and you won't find yourself losing bids, because your overhead rate is fictitiously higher to cover the costs that are truly ODC on another job. So you won't find yourself leaving money on the table on those jobs where your overhead rate is smaller.

Glen Meeks: How many of you know what your labor requirements are for 60 days from now? How about 90 days from now? 120 days from now? Those are real important things. It takes time. I also use Microsoft project which costs under $200. It's real important to know what your labor force requirements are whether you're a small guy or big guy. Do you have enough people to do the work you need to do? If all your work falls within three months of the year, you're in deep trouble. Now, hopefully what you've done is you've gone out and bid on things to where it gets spread out. That's what we all try to do—match our bidding with our work force capacity.

The other thing that you run into is when you finally get a technician or a good estimator or anyone that is good, you don't want to lose him after the job is over. So, you really need to know what your work requirements are. A software based estimating system will give you an extremely good handle on that type of item. There are some software-based estimating packages which support Auto-Cat, a computer-aided drafting system that costs about $2,700. I don't use Auto-Cat anymore. Instead I use a package called Drafix, which is about $600 and has interexchange files with Auto-Cat. I am finding that everybody is interfacing into the Auto-Cat system; consultants are using it and you can really get some productivity out of that package.

For a job of $200,000 that stretches over 12 months, you can do your job costing manually, keep track of it and make the money you're supposed to. When you have two or three of those going at the same time, forget it. At least that has been my experience in a manually operated system. You can save a secretary. Start thinking about that—that's $20,000 a year, when you talk about $12,000-$13,000 salary, expenses, vacations, and everything that goes with a person who sits there and does accounting for you. You can save that much in a year just by

going to some type of computerized system. XT's are selling for $1,500 to $3,000; you can get set up with software and hardware that could save you one position in your general administrative overhead. That's a one-time fixed cost. That $13,000-$14,000 a year cost plus the expenses equals around $20,000, that's going to increase each year.

So I can only recommend in today's age that you get into the software. Now, one problem. I will guarantee you there is nothing out there that is usable for our business. You cannot buy a software estimating package today that will handle our business. Everything is geared to the electrical contractor business where you've got 1,000 back boxes with a labor cost attached to it. The problem with all of the job costing systems that are out there now is that they do not break the labor cost away from the materials. There is no way to include labor costs for fabricating custom items. For example, we're doing a Jaffe Acoustics specification in Hartford and we have to fabricate 800 custom panels on one project.

Steve Simpson: If the job is in your home town, you're in pretty good shape. If it is x, y, z miles away, then you must be able to get all that information to the right place. Those are the things that over time and through the course of a lot of jobs, you're going to be able to learn. You're rarely too low the second time. When you're dealing with equal quality and reliable competitors, most of the time the bids are equal and competitive.

There was a large turnout at the seminar, "How to Prepare a Winning Bid," during the NSCA convention in April in New Orleans. Marc L. Beningson of Jaffe Acoustic (far right) was panel moderator. Seminar panelists were (L-R) Mike Hoover of Audio Technical Services; Glen Meeks of Mid West Communications Corp.; Steve Simpson of Southwest Sound and Electronics; and Dick Printe of Command Performance. *Photo by Jim Cresson.*

Dick Printe: The notebook doesn't really work very well for just doing takeoffs. You have to have checks and so on to verify the various things. Now, I guess you can use your own particular form that fits. We've made up our own. Ours lists all the item numbers down the side, quantities, the manufacturer, model, description, what drawings or specifications they got the page number from, and our unit cost. We have books on what the unit costs are going to be on each estimator's desk. We figure in our unit costs, and we also figure in a shipping figure. It's hard for them later on to pull those numbers out, and we've stuck them in on all the items. Then it's very easy when they go down, and if I want to spot check any of these things, I can go on a drawing real quick and just count, how many speakers, drivers, horns, or whatever is on what page. If it doesn't match, we have an instant quick check, because the page number you took it off of is on there. So, maybe I have those horns show up five times on this takeoff sheet. But they match page for page. It's very easy to go back.

All of the major projects come across my desk for checking, and in 10 minutes I can flip through this and the drawings, and I can pick things out quickly that they may have left out. Most of the time people leave out all the blank panels and the vent panels and all those little things that eat up a lot of little money and the guy has got to put them in. They don't spec how many blank panels are in there, you have so many racks drawn and so many amps, but you have got to count those spaces and you've got to figure what it's going to take. There are a lot of little things to consider. We have jobs that have 26 racks. There may be a lot of little panels and things in there that you forget about, and it will add up. There is a lot of cost in there.

One of the other consultants insists that all the vents and the racks be closed up. Well, that's the cost of doing that, and you've got to figure that in, and a lot of people forget about it. You go back and you're going to check on it and they say, "Well, you've got all these vents that have to be closed up on the sides and the backs, and only the vent on the bottom can be opened." Then you've got to put the fan at the top, so there are a lot of little things like that and you've got to keep it in mind. With these sheets, you have a nice organized pattern so that everybody can use it every time. If it's a real small job, a guy just wants a small little paging system in the lobby or a big arena. It helps to have everybody look at the same thing every single day.

Marc Beningson: Things that you forget effect a bid. The person who leaves out the most things gets the bids. So, we have equipment and ways of keeping track of equipment costs, we have labor, and associated costs of labor, then there are other little things that consultants like myself like to add. What are some other things that are commonly left out of an estimate?

Meeks: You have your travel and your lodging. If it's not in your home town, how much time does it take to get over there? You've got to get the labor cost into your labor estimate. If your guys are travelling out of town, you have to have the lodging, the food, scaffold, and other direct costs. Your bond has to go in there, and what about a special insurance package in case they may want something different, special, who knows? You are going to have to go get general liability umbrella beyond your normal package. Anything like that—make sure your contractors have included every thing and get it in writing. Other subcontractors may be responsible for subbing the conduit and wire, or may be painting the clusters. Make sure they do that.

There are any number of things. The steel workers have to handle the cluster. You get up into the northern part of the country and that's the type of thing you always run into. Do you have those types of costs pegged down? Try to think of your freight. Do you just take a percentage, how do you get your freight in? I know we look at who we are buying from, (this doesn't necessarily affect what manufacturer we choose to use on the project). So when you look at your shipping costs, you try to figure out what's my real shipping going to

PART TWO

be. I have found that if you take just 2 percent of your total project and plug it in, you're doing a $200,000 job and buying a lot of products from one or two vendors who may ship for free once you get over a certain amount. Well that 2 percent is an inaccurate balloon. That just simply drives you up non-competitive at that point. There are a number of different ways you can get extra costs in there.

The one thing I hear the guys up here saying to a degree, is that there is no easy way to do an estimate. It is not fun. To do a bid accurately is a very tedious process and you have to have checks and balances and you have to be thorough, and it takes time. If you don't have the time because of the workload, don't bid. We do that a number of times. Again, it doesn't matter if you are using electronics. Computers are great—trash in is trash out. If your original takeoff is not correct, it is not going to come out correct.

So, it is real important to be very thorough with your estimate. To me, that's the key for us. We know what our true costs are, we have an estimating system, we're very thorough with our estimates, we feel satisfied that that's our cost. I'm within a couple of percentage points of where I am going to end up being at the end of the job—barring any acts of God, so to speak, or strikes by the union, which sometimes can be the same thing.

Hoover: One thing I would urge all of you to do when you go back to your home companies is take the last four or five jobs that you bid and got and then go back to your accounting whether it's a shoe box or on an IBM 370. Figure what it actually cost you to do the job, compare the two, and that's the basis to start getting hold of your cost, so that you can be more accurate in bidding in the future. One of the other little keys is we "swag" small. Some of you already mentioned that "swag" is an engineering term meaning "silly wild guess." There is always something in a job that you've not done before and you cannot predict exactly what it's going to cost you to do. If you break it down to smaller component parts and guess at the smallest possible pieces and put it all together, you'll find that you are a whole lot more accurate, then saying that's a $10,000 piece.

Simpson: One other place is to stay with people that support you and they're known as the factory reps, the consultants, the engineer/architect on the job and also the manufacturers. They're the people that are looking at another forest while you only get to look at a few trees. Knowing that you are going to be doing a job that really won't get started until July or August of next year, there is a lot of time for price increases between now and then. If you haven't told those manufacturers, "Ship it the day before you have a price increase, then let the people that you are doing the project for know when it's going to be coming in so that you can get it on your draw schedule and stay within budget. If there are delays on the project that are beyond your realm of control, then keep copious notes and be able to point fingers at people and say, "I said on this day at this time in your office that this was what was going to happen." Unless he's got a bigger pencil or can get up higher on the wall, you win. That's where the architect/engineer will usually approve your request for additional money. So just stay up with what's going on and keep everybody informed of what's going on in your project.

Printe: That's very important. We try to get all the material on the jobs stored within 90 days. We had one, the University of Tennessee. We signed a contract in '84. We have not been on site yet other than to visit it and see how it is going. We have $365,000 worth of material that's onsite that the manufacturers agree to maintain the warranties for one year after it is there, after it is installed. But part way through the contract, the general contractor didn't like paying the bills, so we closed him up. We called his bond on him. Usually it's there after you. But we keep an attorney on staff to keep after the contractors so that they know we mean business. We called his bonding company and they closed him up because he was 60 days late on making his payment. A new contractor came on and he's very nice to work with, and we get our payments right on time. But, the project got delayed as a result of that. Getting that material on site and paid for and all that has saved a ton of money, especially since '84.

Beningson: That is one thing that I run into as a consultant on projects that take a long time. One project that I mentioned before, which has been delayed, will be open this spring. The specification was published in September 1983, and it went out to bid shortly after that. The contractor is dealing with some costs he estimated back in '83, although the opening isn't until this year. He is going to be on site for quite some time. He did not order a lot of the equipment right up front, and a lot of it became obsolete. And then what happens? Well, if there is another model available that's only a couple dollars more, it's not such a big deal. If you have a replacement model that cost $10,000 more than the model that was specified that's an interesting legal thing.

The contractor is responsible for supplying something that doesn't exist, but he has got to ask for an extra, because the replacement costs more. It all gets thrown back in my lap. Is this an acceptable substitute? Well, sure it is. It's better. It's newer. It's the greatest. I don't want anything to open with a piece of equipment that is obsolete. But, sooner or later I've got to go back to the owner and say, "It's gonna cost you $10,000 more."

If the equipment is purchased right away, at least that equipment exists, and we have equipment. We don't have to go back to the owner. On the subject of extras, one of the things I pride myself in doing, and is not always successful, is to try to wrap up my spec with the electrical and architectural specs so that all the work scopes are covered. Contractors who go into the job with a low bid, expecting to make it back on extras and ads, usually aren't going to win on one of my specs. A couple have, but that generally is not the case. I know general contractors and construction management do that a lot.

Printe: It does happen accidently. I had one at a large church in Denver. We had no plan of making any extras on it at all. It was a $75,000 job, it had a one-man cluster and five satellites, ceiling speakers, a few other odds and ends in it, and we completed the project. Our foreman was there and I flew in to be there during the equalization with the consultant and the snow storm held us up. So, we flew over the top of the airport for a while. In the meantime, the snow storm collapsed the whole church building right to the ground. So, they said "How much do we salvage?", and I said, "I don't

(continued on page 40)

PART TWO

The Symetrix 571 SPL Computer

by Jesse Klapholz and Richard Feld

The Symetrix 571 SPL Computer is a new approach to an old problem—gain riding over ambient noise. While there have been several units on the market to perform these automatic functions, a slightly different solution is offered in the 571. The unit is based on microprocessor control of the various functions. This allows the unit's interactive stages to be under tight control, and also allows for easy updates of functions. As with any microtype product the 'smarts' are built into non-volatile memory and can easily be updated without product obsolescence.

The unit is comprised of a full-function paging controller, with a balanced mic-level paging input, a balanced line-level input, a music input, and ducking for paging over music. To compensate for source level variations, the 571 has fast/slow selectable AGC (Automatic Gain Control). The audio path is kept in the analog domain and gain is adjusted by a VCA (Voltage Controlled Amplifier). The sensing inputs, however are run through an A/D and the rest is up to the computer.

The model we tested uses the latest software release REV SP1. A new feature is being introduced at the time of this writing that allows the unit to use the loudspeakers instead of the sense mics. As of this release, the unit is capable of sampling the ambient noise continuously, as directed from an outside source, internally when it senses blank space, or it can 'force' a sample. The 'force' sample feature is useful for foreground-music formats where there are no, or very short, pauses in the music. In this mode the unit fades the music down, takes a sample during a 1.5 second window, and fades the music up again. If a page occurs during this cycle, the unit restores the gain to the last setting.

The computer allows the unit to be operated under several different modes without a clutter of controls on the front panel. There are four basic modes of operation that are selectable by a single push-button: BYPASS, TEST, CAL, and OPERATE. The CAL mode allows the operator to sample the environment and set the lowest gain point and the highest gain point. All this info is stored in non-volatile memory. In essence, the computer analyzes the acoustical characteristics of the room, and makes the appropriate gain change decisions with this information convolved with real-time input from the sensing mics. Normal program material is used to calibrate the system; pink-noise and other test signals are not necessary.

Since the unit is computer-controlled, features like error detection, prompting, and mode-return have been included. For example, if the unit detects a fault that will cause a false action, it automatically returns to

Specifications:

	Manufacturer's	Lab Test's
Distortion THD	<.05%, unity gain, 2 kHz	<.005%, 20-20 kHz, +4 dBm <.025%, 20-20 kHz, +24 dBm
Distortion IM	n/a n/a	.006% @ +4 dBm .08% @ +24 dBm
Signal to Noise Ratio	<-85 dBm, unity gain, 20-30 kHz	-98 dB re: + 4 dBm, 20-30 kHz -92 dB re: +24 dBm, 20-30 kHz
Frequency Response	+1/-0 dB, 20-20 kHz	+0/-1 dB, 20-20 kHz

the last gain setting. The TEST mode is actually built-in to the unit to facilitate production testing. However, it may be accessed in order to check input signal levels.

The Tests

For our testing purposes, it was a little tricky in setting up. This came from not having used the unit before. Obviously, ensuring that trim pots, etc., were not changing the signal level were important. As usual, we used the Sound Technology 1710, and a Tektronix 502 oscilloscope. The testing procedures used for these tests are standard setups easily performed by any service techician field.

The unit did not clip easily. In fact, we had to input +24 dBm @ unity gain to show the onset of waveform deformation. We also observed that the BYPASS mode is active because it is under the micro-processor control. This did not concern us except that care must be taken when unbalancing the output without an output transformer.

In effect, we were actually only measuring the input, VCA, and output circuitry. The unit tested very well and in all cases exceeded the published specifications. Once we understood how the unit performed, we could easily set it up in any configuration. To this, we can only comment that better documentation would have helped. As overzealous audio guys, we like to dig into new audio products casting aside the manual.

Comments

Not having to use pink-noise to calibrate the unit allows the setup to take place, within reason, during normal operation of a facility. The Averaging Time control allows the unit to make gain changing decisions based on either "impulsive' noise, as in a factory, or long-term effects, like changing of activities in a space. Also, the downward gain change can be set sharper that the upward slope, i.e., when the system's level is raised, it can be quickly reduced if necessary. Some situations call for a more subtle change in system level and the 571 allows the ratio of noise increase to system increase to be set from 1:1 to 2:1.

Several control lines allow for modifications easily including remote control of output gain, and access to the VCA for special control features. Also, software AGC is a nice freebee. All the controls and inputs/outputs are easily accessible, are clearly and logically laid out, and made via barrier strip (XLR for the mics). The installation, setup, and operation is very easy, requiring no special tools, test gear, or training. A look inside showed a minimum of parts and solid contruction. If servicing becomes necessary it should be easy. Well done guys!

General Specifications:

Maximum Control Range	40 dB (-20 to +20)
Page Over Music	Variable from 0 to 14 dB
Inputs	2 sensing mic,1 paging mic, 1 line,1 music
Dimensions	1.75"H x 19"W x 6.25"D
Net Weight	7 pounds
Price	$799 pro net

LETTERS

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is not universal agreement in audio, then the major reference book in audio should neither omit the subject nor pretend different views don't exist. Remember that the *Handbook for Sound Engineers* consists of signed contributions, and not the omniscient tone of reference books written (or negotiated) by committees with Olympian detachment. Even the most passionate partisan must usually admit that his opinion is represented, even if without the church bells and fireworks he would wish.

To this I would venture to add two remarks: ignore the index; it will not reliably lead you to the parts of the book you may want; and, finally, *read the book.*

Ted Uzzle
Altec Lansing
Director of Marketing & Development

WINNING BID

(continued from page 37)

know the balcony has crushed the sound cabinets, all the clusters are laying under the rubble." So he says, "We'll see you next year." And, they just swept it all up and shipped it away. This year we did it again, and it's going to open up in two more weeks. This time it was $97,000 because it was time and material by the insurance company.

Beningson: So, the key elements we've talked about are knowing what your costs are; knowing what profit margin you want to or need to make; knowing what your labor costs are; and knowing what your competition is. Those are the key points. Does anyone have anything he'd like to add?

From the Floor: In cases where the job is delayed, usually you have a schedule set as far as payments are concerned, should you make every effort to go and get the money for your equipment, you're gonna have to sit there and hold it for awhile.

Hoover: You are legally obligated to try and minimize the damage created by delay of another contractor, but those damages that you suffer, you are also legally entitled to. The way to protect it is to have a schedule going in, submit it with your contract, get the general contractor, owner, whoever your contract is with to acknowledge it. Then if delays by others start delaying your project, start document-

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PRODUCTS IN REVIEW

Relay Box From Ethereal Concepts

The model CP8 Relay Box from Ethereal concepts allows remote installation of sound, light and video equipment. It provides a safe time sequenced power-up of all sensitive equipment via a key-switch on a remote control panel. The rack-mountable unit contains four separate switch legs rated at 20 amps. All components are UL approved.

Circle 1 on Reader Response Card

PAS's Modular Reinforcement System

Professional Audio Systems has introduced its Modular Reinforcement System. At the heart of the MRS-1 (Modular Reinforcement System 1) is the System Processor. This on rack space (1.75 inches by 19 inches) component is the system's brain and contains all the circuitry necessary for accurate reproduction—the proper delay for time correction, crossover filter, turn-on, turn-off transient protection and limiters controlling both the overall system and high frequency section.

The MRS-1 is a three way system. All the MRS-1 enclosures are constructed of a ¾-inch multi-ply with 2-inch by 3-inch bracing. Designed with multiple systems in mind, the cabinets in the MRS-1 are wedge-cut for clustering, allowing for the widest possible coverage and compactness.

The system's low frequencies are handled by a direct radiating double 18-inch woofer enclosure(2-18BM). This 16 cubic feet cabinet combines the features of high output, high efficiency wide bandwidth, power handling and structural durability. Its response is linear to 40 Hz.

Circle 2 on Reader Response Card

Gold Lines Real Time Analyzer

Gold Line has introduced a new ⅓ Octave Real Time Audio Analyzer. The model ASA 30B was designed to supplement Gold Line and Loft's line of audio products.

The new analyzer was designed in response to many requests for a professional ⅓ octave analyzer that is portable, battery operated and affordably priced, according to the company.

The ASA 30B features 30 bands on standard ISO centers, built-in microphone, SPL reading from 30-123dB, weighted curves: flat plus IEC A or C, external line input: −85dBm to +4dBm, power supply: one Gel cell 12V 1.2 amp hour rechargeable.

The suggested retail price is $599.95.

Circle 3 on Reader Response Card

Private Wire Dictation Adaptor

Quicklink™ has introduced a private wire dicatation adaptor that works with most major brands.

Among the things it offers are add immediate off-hook access to a dictating machine from up to four in-office stations; an access dictating unit from plain telset, cordless phone, vacant Key System or PABX trunk port; and control dictating unit from telephone keypad just as on outside line call. The unit weighs 20 ounces and measures 1½ by 5 by 5¼ inches and installs with modular cords.

Circle 4 on Reader Response Card

InterStat's Temporary Nurse Call System

InterStat is a radio controlled, tone-visual Nurse Call system that is rented to hospitals or other qualified health care institutions for the period of time necessary to replace, repair or upgrade the existing call system in occupied areas, so that patient care is not compromised.

Installation of bed or bath stations consists of loosening a corner screw on the existing station or wall box, and hanging the corner screw on the existing station or wall box, and hanging the InterStat transmitter on this screw by means of the bracket plate provided. Stations are battery operated, and no wiring is required within the patient room. The system is digitally encoded to prevent cross-signalling between rooms; the frequency codes are marked on each item of equipment, and bed station, bath station and corridor light must be matched accordingly.

Rental rates to hospitals are anticipated to less than $5 a day per bed, according to the company. Rentals arranged by the contractor to his customer are commissionable to the contractor at 12 percent of the total rental fee. (Under certain circumstances, arrangements can be made to permit the contractor to rent direct).

Circle 5 on Reader Response Card

Crown Unveils New Hand-Held Mics

Crown International, Inc. introduced its new line of hand-held microphones at the June NAMM show in Chicago. The CM-100 PZM® omnidirectional, the CM-200 cardioid, and the CM-300 Differoid™ models comprise the new line. All three hand-held microphones are electret-condenser types for studio or field use.

The CM line of microphones all have built-in pop filtering for suppression of explosive breath noises. All are designed to minimize handline and other mechanically induced noise. Each CM microphone can withstand repeated drops and abuse, as well as loud sound pressure levels without distortion. The outputs are balanced with low impedance, allowing long cable runs without hum pickups or loss of high-frequency signal. Each microphone can be phantom-powered from the console or another remote power source.

Combining some of the qualities of the cardioid mike and the differential mike, the Crown CM-300 Differoid mike is made for stage vocal use. The CM-300s differential (noise canceling) capsule provides gain-before-feedback. The CM-300 can be operated with extremely high stage-monitor levels without feedback.

Circle 6 on Reader Response Card

Samson's New Broadcast STD System

The new Broadcast STC (Synthesized True Diversity) Wireless System features 10 selectable, digitally-synthesized channels on both transmitter and receiver for signal strength and RF interference-free performance in various applications. The Broadcast STD System's features RF circuitry and built-in dbx Noise Reduction.

The Broadcast STD System uses the option of switching to any one of 10 digitally synthesized channels to insure reception in applications. A large and readable front panel display helps locate optimum channel/RF environment.

The Broadcast STD system also combines new diversity technology for no-drop-out performance with dbx's Type I and II Noise Reduction for expanded dynamic range and quiet operation.

Circle 7 on Reader Response Card

Otari's New Product Line is Otaritech

Otari Corporation has announced the creation of a new product line that will bear the Otaritech brand name. This new line will target the broadcast and recording markets.

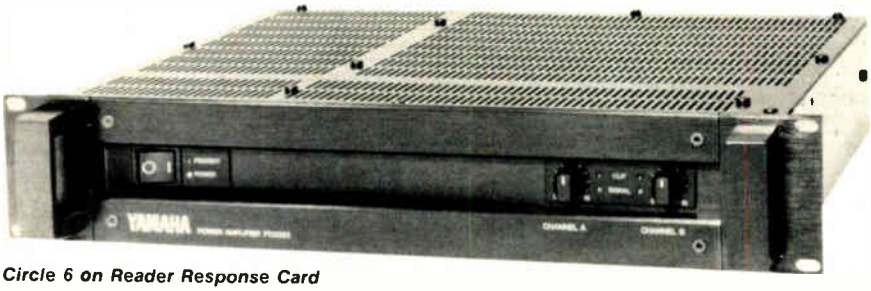
The first of the Otaritech line, available in August, is the TC-50 Center Channel Time-Code/FM Processor. The manufacturer claims that the TC-50 provides an inexpensive method for center-track time-code to be added to an audio tape machine. It will retrofit Otari MX-5050 two tracks, such as the B, BII, MKII-2, MKIII-2 or any other four head position tape recorders. The TC-50 allows the use of a ¼ inch tape two track machines to be synchronized to a video tape or film machine with stereo audio.

Circle 8 on Reader Response Card

PRODUCTS IN REVIEW

a closer look

by gary d. davis



Circle 6 on Reader Response Card

Yamaha Introduces Compact Professional Power Amplifier

The Professional Audio Division of Yamaha Music Corporation has recently begun shipping the Model PD2500. This dual-channel amplifier is capable of delivering 500 watts continuous average sine wave power per channel into 2 ohm loads. In bridged mono mode, the unit will deliver 1,000 watts into a 4 ohm load. Significant advances in power supply design, and an improved, forced-air cooling system, bring the weight of the unit down to a mere 25½ pounds and the size down to just 3½ inches of rack space.

The PD2500 utilizes a switching power supply which operates at 125 kHz. It achieves better regulation than transformer-based supplies, providing an audible improvement in low frequency reproduction. A highly efficient, variable forced-air cooling system, with two-speed thermally-regulated fan, reduces the required heat sink area. This enabled Yamaha engineers to create an air flow system that permits close rack-mounting of several amplifiers with no degradation in cooling efficiency.

Protection circuitry prevents damage to the amplifier and speaker systems in the event of overload or circuit fault. LED indicators are present to show when the amplifier is in protection mode, as well as when power is on, signal is present, or the output is clipping. Independent dB-calibrated, 31-positions detented input attenuators make level matching and balancing easy. The PD2500 features electronically balanced input circuitry with XLR type connectors.

Comments: Yamaha's original professional power amplifiers, such as the P2200, earned a reputation for reliability, and a mixed reputation with regard to cooling; they had large, side-mounted heat sinks and no fans. If a lot of the amps were placed in a rack, it was a really interesting engineering feat to blow air up the side of them. Subsequently, the Yamaha PC-Series addressed this issue with built-in fans and a revised heat sink configuration. Both of these series, however, were restricted with regard to driving very low impedance loads. Actually, to be fair, part of this was due to the fact that Yamaha makes a practice of obtaining U.S. approval on its products, and with low impedance loads the amps became too warm to satisfy U.L.—generally they would drive low impedances without difficulty. On the other hand, the older Yamaha amps were not necessarily "solid" when pumping a lot of power at low frequencies. At one point, Yamaha introduced the PC5002, a monster of an amp weighing over 125 pounds, and occupying a very sizeable 7 inches of rack space; it could drive subwoofers all night, but was not exactly easy to use for anyone in the touring sound business. It could also warp the rails in a rack or the bones in a back without much effort.

The PD2500 appears to be a significant improvement with regard to weight, size, and the ability to drive low impedance loads. I spoke with Bob Davis at Yamaha (no relation to Gary), who supplied some additional details. The PD2500 will deliver 250 watts per channel at 1 kHz into an 8 ohm load at 0.1 percent THD. This becomes 360 watts per channel at 4 ohms or 500 watts per channel at 2 ohms; since the power does not double as the impendance is halved, some power supply limitations may still exist (we would have expected 500 w/ch at 4 ohms, not two). The 1,000 watt output is possible by bridging the two channels for a mono source, and driving 4 ohms. That is impressive, and shows pretty good efficiency since the amp is doing that when connected to a standard 120V AC power outlet (1500 Watt of 1800 VA rated).

Its stereo power band width at less than 0.1 percentTHD is 20 Hz to 50 kHz (ref. 180 wats, 4 ohm load); mono the same bandwidth applies when measured at 360 watts into 8 ohms. Damping factor is greater than or equal to 250 for an 8 ohm load (1 kHz), suggesting a low output source impedance. Slew rate is 55 V/uS (8 ohms, full power). Channel separation is superb—better than 90 dB at full power (1 kHz), and at least 70 dB from 20 Hz to 20 kHz—so the two channels can be used for two sections of a biamped system or for completely different programs, if necessary. S/N ratio is specified at better than 115 dB (IHF-A weighted). Input sensitivity is +4 dBm for maximum output, and input impedance is greater than 15 kohms.

One note about the cooling; the front panel is simple and handsome, with controls in a recessed band for extra protection. Photos show no evidence of a cooling air intake but there are actually slots above and below that recess where air is sucked in; it is exhausted through slots in the rear panel. Additionally, convective cooling is possible through top panel perforations. Given Yamaha's reputation for sound quality and reliability, and the very compact design of this particular amp, we feel the PD2500 deserves *your closer look.*

DATAFILE *info. sources/new literature*

Toltec Industries Offers Free Inductor Catalog

A free, illustrated, 14-page catalog, describing its line of stock-value and custom-wound inductors, is now available from Toltec Industries, Inc.

The catalog contains both photographs and dimensional line drawings of Toltec's ferrite rod and bobbin inductors, high current hash chokes, high current toroids and toroid swing inductors. Extensive technical conformation on each series of inductors is included as well as "form, fit and function" replacement specifications for comparable inductors made by Miller, Dale and Caddell Burns, where appropriate.

Also shown are Toltec transformers and typical examples of the company's specialty inductors and subassemblies. Toltec is fully equipped to meet clients needs for inductors and transformers. They routinely design and manufacture to custom specifications.

Circle 17 on Reader Response Card

Nemal Electronics New Selection Guide

Nemal Electronics International has released its 1987 Cable and Connector Selection Guide. The 36 page guide includes more than 100 new cable and connector products covering a wide array of RF coaxial, microwave, broadcast, communications, and data applications. Extensive cross references and illustrations allow the user to easily select the appropriate cable, connector and tooling for any application.

The guide also includes information on design and production of Nemal's line of Cable assemblies.

Circle 18 on Reader Response Card

NESDA Makes Universal Invoice Form Available

A universal form for in-warranty billing as well as CODs is available to service dealers from the National Electronics Sales and Service Dealers Association.

The upgraded NESDA Form has been approved by almost every major manufacturer and is required by some for warranty fullfillment. The seven-part version has sections for logging customer receipts defect codes and manufacturer codes.

The form is available with high-grade NCR carbonless paper in five or seven parts, or with carbon in seven parts. One five-part form is designed with continuous feed to run through a computer printer. Customers may also choose a form without tractor feed with the company name imprinted.

The parts of the NESDA Form include an original copy, a sheet for warranty work, a customer copy for completed work, a service copy and a customer claim check. The two optional sheets are used for the servicer or manager and as a technical work copy.

Dealers should call NESDA at (817) 921-9061 to receive a block of invoice numbers before ordering the forms.

Circle 19 on Reader Response Card

Non-Linear Systems Offers Free Catalog

The new 64 page NLS Blue Book is Non-Linear Systems' 1987-88 full line catalog, which describes the company's latest offerings that encompass over 2,000 models of Digital Panel Meters and battery operated Portable Test Instruments.

New to the catalog is the model AP-105, a pocket sized digital multimeter, with nine functions and 23 ranges for $53.

Also new are the Instant Meterology Metermod DPM's featuring 3½ and 4½ digit models plus 24 option assemblies. The user may configure them to measure many input functions including process parameters.

Test instruments included in the catalog are digital multimeters oscilloscopes, frequency meters and circuit/component analyzers.

Digital Panel Meters come in three case styles—low profile, DIN/NEMA industrial and short depth DIN/NEMA. Panel Meters measure AC and DC volts and current ohms, frequency, line frequency, temperature, events preset events, period, time interval and current loop inputs. Fifteen optional features are available for special applications and systems integration.

Circle 20 on Reader Response Card

Canare Introduces Color Catalog

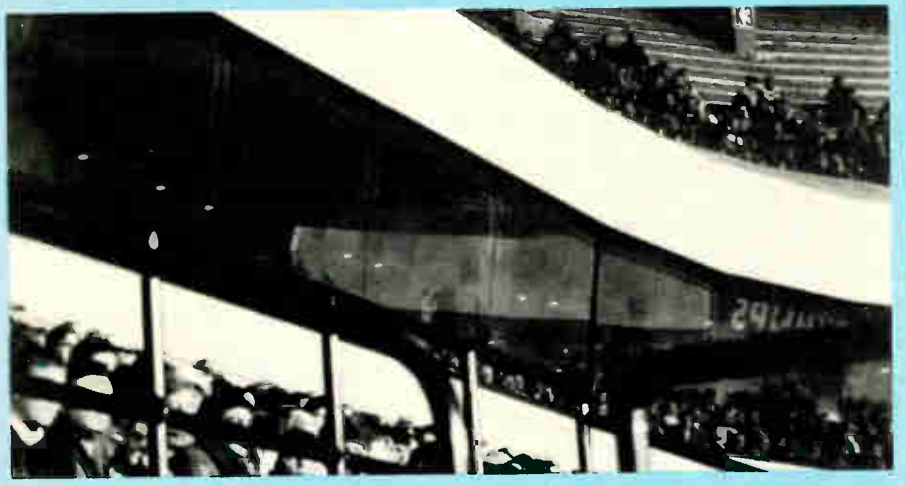
Canare Cable has introduced a free 20 page, full line catalog (No. Four), for the professional audio/video/broadcast and sound contractor market.

Highlights include: a comprehensive technical data section explaining Canare "Star Quad" cable construction theory, suggested grounding routines and termination/installation applications and techniques; and detailed cable specs and crossectional diagrams for all Canare bulk microphone/video speaker/data transmission and musical instrument cable.

New products featured in the catalog include: MR202-AT multichannel microphone cable for fixed installations and VAC*FB pre-wired BNC video patch cables that use Canare LV-61S (RG-59/U) flexible 75 ohm coax.

Circle 21 on Reader Response Card

Philips Scores at Anderlecht Stadium



Inside the Anderlecht Stadium, four mobile Video 50 cameras with zoom lenses have been provided.

The Anderlecht Football Club in Brussels, Belgium, has chosen Philips to help them in improving efficiency and the levels of entertainment and security in and around the stadium.

The existing Philips P.A. installation comprising SM4 modules, SQ4 amplifiers plus a wide variety of loudspeakers has recently been extended. In a central control area, a new audio rack has been installed which takes care of the handling and distribution of announcements, music and sounds from the actual field of play. These "live action" sounds are picked up by BPE microphones and mixed via an SM5 desk to ensure real atmosphere in the business seats and boxes which are sited behind glass.

At the center of the new rack is a Philips SM40 mircoprocessor controlled sound distribution center. It enables inputs from SM40 call stations to be routed via SQ40 amplifiers and the center to selected zones throughout the stadium. Music from a Philips compact disc or cassette player for example, can be relayed to boxes, the business seats, restaurants, entrance hall, plus reception and meeting areas on a selective basis. In addition, the SM40 concept features an automatic system override capability in the event of emergency announcements.

The Anderlecht Stadium also offers conference facilities through portable Philips CCS400 discussion equipment. For spectators, an electronics message/score board unit is installed which keeps them advised of what's new, and mobile radio communication equipment helps stadium staff and police keep in touch and means they can be quickly on the spot to prevent trouble from fans.

Also installed was a Philips CCTV system. Inside the stadium, four mobile Video 50 cameras with zoom lenses have been provided. These are used in conjunction with 11 fixed Video 40 cameras, which are located in and around the stadium. Pictures from all 15 cameras are relayed to a central security control area that's equipped with 10-high performance monitors and all necessary routing and switching equipment.

An additional monitoring facility is located in a specially designed cabin which is suspended above the stand. It features an audio rack and four video monitors which display the pictures from the cameras around the ground. This location ensures security personnel of a "birds-eye-view" of everything that is going on. Also selected pictures are simultaneously recorded onto three video recorders.

Pro Media Installs Cow Palace's Systems

Pro Media has announced the completion of a new high intensity sound system with versatile capabilities for the Cow Palace Arena in San Francisco, CA.

The system includes a JBL central loudspeaker cluster, Altec Lansing power amplifiers and a Klark-Teknik digital delay.

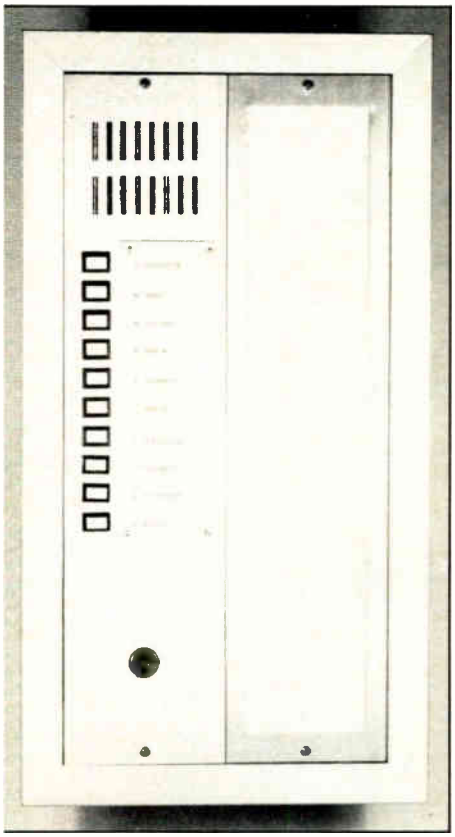
The JBL central cluster includes two types of Bass speaker systems, Model 4560 and 4550A Bass cabinets with 2225 Bass 15-inch speakers, and two types of High Frequency Bi-Radial horns, model 2360 and 2365 horns, all with 2445J drivers. The cluster is installed near the center of the arena, and suspended on electrical hoists (capable of 100 feet of lift from floor level) to enable easy access for servicing. This new cluster was added to accommodate most arena events. When staging events occur near the existing cluster location, both clusters will be used, with some of the speakers in the new central cluster cut-off and others used with Time Delays. The existing cluster was reconfigured.

The system was engineered by Charlie Catania to accommodate the multiple requirements of the Cow Palace by dividing the arena into three separate sections to be electronically tuned. Using ⅓ octave equalizer by White (4400) and an 18 dB per octave high/low filter—these units allow tuning of the system electronics to compensate for the acoustics of the Cow Palace. Also used in the system is a digital time delay DN 716 where the unit is capable of accessing and providing up to three independent time delays.

Catania commented, "In limited cases where time delay to the performers presents a problem—when people are talking, singing, or playing musical instruments in the stage area —only in these cases would the combined system be used."

INTERCOMS

(continued from page 22)



Cornell's 8102-10 entrance panel.

should allow for a variety of options and special features. Special considerations such as multiple entrances or multiple cameras should be easily incorporated into the system layouts. Provisions for internal communications within each residence should be available. Specialized terminal boxes are available from some manufacturers that simplify installation and allow for quick and efficient testing and troubleshooting of the units as they are being installed or later during maintenance.

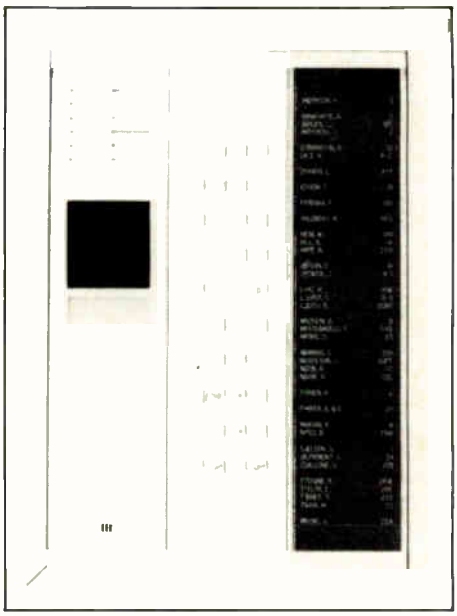
Jeron's AV-350 intercom system.

Portable test kits allow the installer to completely test the system before a single monitor is installed. These kits allow one person to ring out an entire building or localize a single wiring problem. The type of support that this auxiliary gear can bring is very important to everyone involved in any project. Videointercoms have set a legal standard for entry systems. But in the long term, they are only a platform from which future products will be built.

Multi-system Integration

Multi-system integration is rapidly being introduced in the multi-residential intercom market. Most popular is the integration of a residence burglar, fire and emergency alarm into one of the basic intercom units (most times, the telephone handset or videointercom). This trend allows the resident to maximize his features with a single source for installation and service. Since all the features are integrated into a single product, there is a direct savings on installation cost. Most importantly, maintenance of the system is allocated to a single responsible source. This allows for extended service.

Everyday new ideas and applications are presented. These ideas are the basis for many new products and modifications to existing systems. It is up to the truly dynamic companies to listen to and act upon these newly arising needs. It is in these daily experiences that the future of the multi-residential market will be created.



Paso's Elvox® 3050 entry panel.

Sentex's VISTA telephone entry system.

FACES AND PLACES

PETER WELLIKOFF

Celestion Names Head of U.S. Operation

Gordon Provan, chairman and managing director of Celestion Loudspeakers worldwide, has announced the appointment of Peter Wellikoff as executive vice president and general manager of Celestion Industries.

A professional with 18 years of experience in sales, marketing and general management in consumer electronics and professional audio, Wellikoff will be manager for overall operations and direct all marketing/sales efforts for Celestion's hi-fi, musical instrument and sound reinforcement speakers.

Wellikoff's background includes ownership of audio/video retail operations, independant consultanting in both the consumer and professional electronics industries, and stints with Philips Audio Video Systems, Inc. (AKG, Neutrick, K&M, Philips Audio and Video Products), Tandberg Audio and Kloss Video Corp. specializing in marketing.

S. WHEELER RAMEY

Elgin Announces Appointments To Two New Posts

Elgin Electronics has announced the appointment of Rob Gerstenberger to the post of product manager—Elgin telecom power products, and S. Wheeler Ramey as manager—Elgin Systems marketing and installation.

In his new capacity, Gerstenberger will be responsible for Elgin telecom power products in addition to current responsibilities of contract manufacturers and custom power programs. Also, he will interface with the firm's manufacturer representatives and distributors. Among Gerstenberger's duties are strategic and product planning, cost analysis and forecasting.

S. Wheeler Ramey has been appointed manager of Elgin Telecom Power Systems marketing and installation. He will be responsible for the application, engineering and installation of Elgin power systems and products. His duties encompass systems forecasting, site surveys and coordination of customer equipment needs with Elgin's power systems.

TOM HENDRICKS

Hendricks Becomes Director of Sales and Marketing

TekTone Sound & Signal Manufacturing has announced the appointment of Tom Hendricks as director of sales and marketing. His responsibilities will include the creation and implementation of a sales/marketing plan, as well as overseeing the national and internal sales forces.

Prior to accepting his new assignment at TekTone, Hendricks was national sales manager of Auth Electric Co. and Atlas Sound and served as general manager of Case Inc. of New Jersey.

Apogee Expands Facility Hires Setaro

Apogee Sound Inc. has expanded their cabinet producing facility in Petaluma, CA it was announced by Brian Glenn, vice president of marketing. "The expansion was necessary to keep up with the rapid growth experienced this year," said Ken DeLoria president. Robert Price has been hired to oversee all aspects of cabinet production at the facility.

REP NEWS

Jeron Electronic Systems honored its top sales reps with a presentation of engraved plaques. **John Charczuk**, vice president sales, presented the plaques to **Gerry J. Horne** of **R.G. Associates; Gus Gustafson Sr.** of **Gustafson Sales; Mike Schlarman**, of **M. Schlarman Associates; Jack Lehner** of **J.W. Lehner Company;** and **Darrell Gerhard, New West Agency.**

Klark-Teknik Electronics, Inc. has appointed Maurice F. Paulsen of **A.I.M. Marketing Groups** in Mishawaka, IN, to represent Klark-Teknik, **BSS** and **DDA** product lines in Michigan.

Community Light & Sound Inc. recently announced that two sales organizations have been appointed to further establish the company's distribution networks in New England and California. On the East Coast, **The New Resource** sales agency will act on behalf of Community interests in Vermont, New Hampshire, Rhode Island, Massachusetts, Connecticut, and Maine. With over 20 years of combined sales experience between them, **Chet Flynn** and **Sandy Duffy** are New Resource's principal members. In California, as well as Northern Nevada, **John G. Humble and Associates** will work to broaden Community's existing market profile. Southern California will be handled by **John Humble** and **Robert Welles,** while the rest of the state and Northern Nevada will be serviced by **Thomas Aye.**

Williams Sound recently presented awards to their three outstanding rep companies. Sales awards were given to **Paul and Marilyn Bunker of Sunrise Sales,** Romeoville, IL and to **Dick and Roy Pass of Pass Associates,** Langhorne, PA. Both Sunrise Sales and Pass Associates have nearly doubled their sales volume with Williams Sound within the last year. An award was also given to **Terry Richardson** of **Stan Sliz Associates** for outstanding account development in Utah.

SUPPLIES•SERVICES

Jacks for Various Electronics Applications

A complete line of jacks for electronics applications is available from Essex Electronic Supply, Inc.

Types of jacks available include: a nylon banana (turret and pierced), nylon test tip, military test made to meet MIL-C1 39024/11A (standard and economy), printed circuit test (standard and economy), and nylon made to MS-16108 Rev. C (wrap around, spade terminal and feed through).

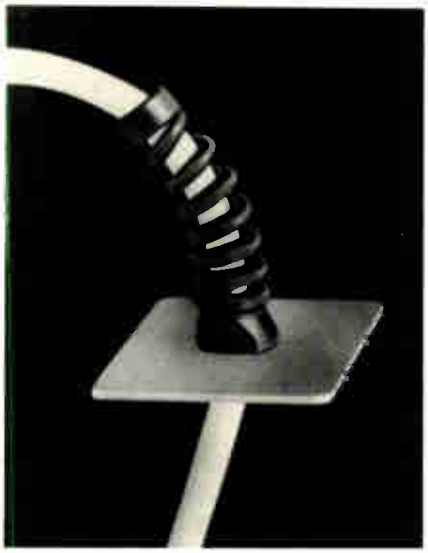
Circle 37 on Reader Response Card

GC Electronics Gold Plated Connectors

GC Electronics has introduced one of its newest product additions: Power Flex™ Gold Plated Connectors, suggested retail is $5.89 a pair.

Power Flex™ Connectors are available in three styles: Spad Lug, Pin Plug and Banana Plug. These gold plated, solid brass connectors provide ultra low resistance and prevent deterioration of contact surfaces, according to the company. Specially designed threadlock connectors ensure a 100 percent positive connection. These connectors can be used with Power Flex™ Cable or any other heavy gauge speaker cable not exceeding 10 gauge.

Circle 38 on Reader Response Card



HeyCo's Flex Protecting Strain Relief Bushings

Heyco Molded Products Inc. has introduced a new line of Flex-Protecting Strain Relief Bushings. The integral Flex-Controlling extension prevents the power supply cord from bending sharply while the strain relief portion of the bushing insulates, anchors and protects the cord against the forces of push, pull and twist, Six sizes assemble in ½ inch (.500) and 5/8 inch (.625) diameter holes in up to 1/8 inch (.125) thick chassis, are made of nylon, available in black or white and priced from $5 to $12 per 100, depending on quantity ordered.

Circle 39 on Reader Response Card

Samtec's Stamped and Machined Bottom Mount Connectors

Samtec bottom mount connectors are made for soldering and plugging from the same side of the board, for low profile connections and high temperature soldering. Stamped contact styles are available in single and double row strips up to 36 positions long. Screw machined styles are available in single row strips of up to 20 positions.

Stamped Phosphor Bronze contacts feature Samtec's tuning fork design for exceptionally gas tight connections in a variety of environments. Machined lead sockets feature a four-finger BeCu contact for highest reliability and minimum contact resistance in high insertion applications.

Circle 40 on Reader Response Card

S&C's Job Report

Format
STATE
city: Name of Job, $ Total of Construction, Phase of Project. Contact: Name, Company, City, State; Telephone Number.

TOTAL CONSTRUCTION
1—up to $1 million
2—$1 million to $9 million
3—$9 million to $17 million
4—$17 million to $25 million
5—$25 million and up
NA—Not Available

PHASE OF PROJECT
A—Planning = Consultant is designing system
B—Pre-Bid = Final plans near completion
C—Bidding = Bid date set
D—Starting = Electrical Contractor/ General Contractor/ Owner buying now

The following jobs are in various phases leading up to bid. If you are interested in any of the projects, please contact only the names printed below.

ALASKA

Fairbanks: Fairbanks Activity Center, NA, B. Contact: Craig Park, Paoletti/ Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Nome: Nome Elementary School, 1,D. Contact: Craig E. Park, Paoletti/Lewitz/ Associates, San Francisco, CA; (415) 391-7610.

CALIFORNIA

Beverly Hills: Ma Maison Hotel, 4,D. Contact Neil A. Shaw, Paul S. Veneklasen & Associated, Inc. Santa Monica, CA; (213) 450-1733.
Cerritos: Performing Arts Center, 4,A. Contact: Robert Long, Theatre Projects, New York, NY; (212) 873-7211.
Concord: Automatic Data Processing, 1,A. Contact: Craig E. Hall, Paoletti/Lewitz/ Associates, San Francisco, CA; (415) 391-7610.
Los Angeles: Ketchum Communications, 1,D. Contact: Craig E. Hall, Paoletti/ Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Los Angeles: Simon Wisenthal Center, 3, A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.
Millbrae: Western Hotel 1,D. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Milpitas: Sun Microsystems, 1, A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Modesto: Trinity Presbyterian Church, 1,D. Contact: Tom Corbett, Paoletti/ Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Oakland: East Bay Municipal Utility District, 1,A. Contact: Craig E. Hall, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Ojai: Ojai Valley Inn, 5,D. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates Inc., Santa Monica, CA; (213) 450-1733.
Palo Alto: Kleiner, Perkins, Caufield, Buyer, 1,B. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Pasadena: Lake Avenue Congregational Church, 4,A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.
Sacramento: Mercy Hospital, 2,D. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc. Santa Monica, CA; (213) 450-1733.
San Diego: UCSD Graduate School of International Relations, 1,A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.
San Francisco: First Interstate Bank of California, 1,A. Contact: Craig E. Hall, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 392-7610.
San Francisco: St. Mary's Cathedral, NA, D. Contact: Marc L. Beningson, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.
San Francisco: Portman Hotel, 1,D. Contact: Craig E. Hall, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.
San Jose: McDonnell-Douglas, 1,A. Contact: Craig E. Park, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7620.
San Jose: San Jose State University Recreation and Events Center, NA, D. Contact: Edward McCue, Paoletti/Lewitz/Associates, San Francisco, CA; (415) 391-7610.
Santa Monica: Santa Monica Bay Hotel, 5,A. Contact Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

CONNECTICUT

Hartford: Connecticut State Capitol Hall of the House of Representatives, NA, D. Contact: Marc L. Beningson, Jaffe Acoustics Inc., Norwalk, CT; (203) 838-4167.

FLORIDA

Miami: Bayfront Park, 2,C. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.
Naples: Naples Performing Arts Center, 4,B. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates, Inc., New York, NY; (212) 420-8787.
St Petersburg: Bayfront Center Auditorium Renovations, 3,C. Contact: Robert Long, Theatre Projects, New York, NY; (212) 873-7211.

ILLINOIS

Highland Park: Ravinia Young Artists Insititute, 2,C. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

KENTUCKY

Alexandria: Campbell County H.S. Gymnasium, 1,B. Contact: Richard J. Lemker & Associates, Covington, KY; (606) 261-9529.
Covington: Holmes High School Auditorium, 1,D. Contact: Richard J. Lemker, Lemker & Associates, Covington, KY; (606) 261-9529.

MINNESOTA

Minneapolis: Minneapolis Armory, NA, A. Contact: Steve Orfield, Orfield Associates, Minneapolis, MN; (612) 727-2557.

MISSOURI

Mokane, Callaway County: South Callaway R-2 School District, NA, C. Contact: J. T. Weissenburger, Engineering Dynamics International, St. Louis, MO; (314) 991-1800.

NEW YORK

Astoria: American Museum of Moving Images, NA,B. Contact: Wade Bray, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.
Jamestown: Palace Theater, 2,B. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates, Inc., New York, NY; (212) 421-8787.
New York: John Jay College for Criminal Justice, 5,D. Contact:Robert Benson, Knudson-Benson Associates Inc., Mercer Island, WA; (206) 232-2273.
New York: JP Morgan Bank Trust Committee Room, NA,D. Contact Marc Beningson, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.
New York: Metropolitan Opera, NY Philharmonic Summer Parks Concerts, 3,A. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

OHIO

Cleveland: Cleveland State Music Building, 5,A. Contact: Chuck McGregor, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.
Cleveland: Palace Theatre-Playhouse Square, 2,D. Contact: Marc Beningson, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.
Columbus: Ohio State Office Tower (Office) NA, C. Contact: Marc Beningson, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

(continued on page 57)

SOUND SYSTEMS

(continued from page 27)

from the orchestra in the shell was excellent. To preserve a good illusion the loudspeakers should have approximately the same spacing as the stereophonic channel microphones.

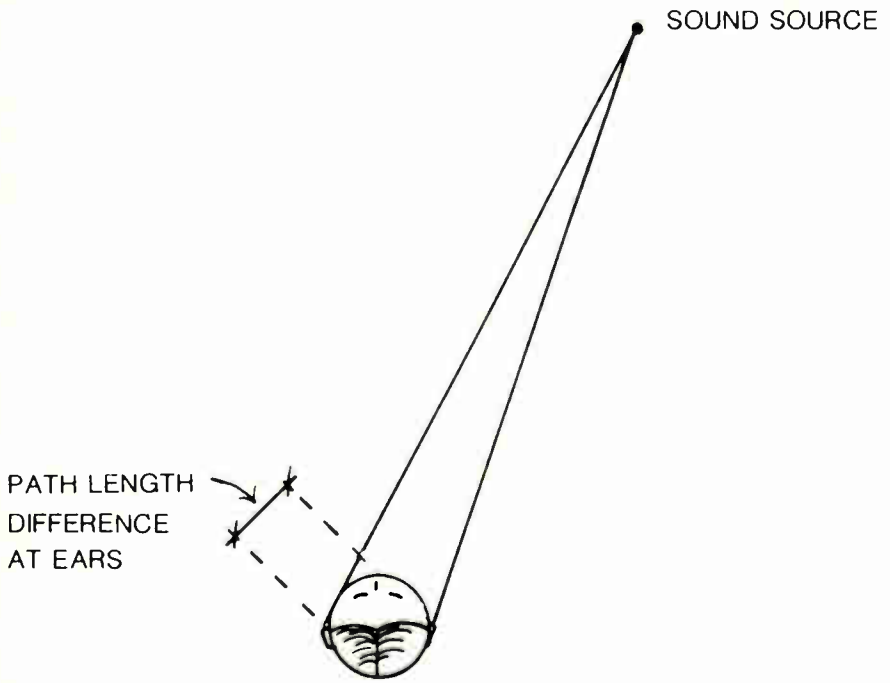
Microphones

Microphone placement may be simple or complicated, depending on the application. From what has been said, it will be evident that creating the stereophonic illusion is a compromise between many favorable and unfavorable factors, and microphone placement and movement can be used to advantage in effecting this compromise. Since the illusion depends upon differences in intensity and arrival time at the microphones, and changes in the ratio of direct to reverberant sound, the microphones must be placed close enough to the sources to create these differences. This means that each microphone "covers" only part of the stage. If pickup of action is necessary in a room where ordinary reverberation times exist, the necessity of close pickup is likely to accentuate depth effects, and will require a small stage area. Then dimensions are multiplied if a larger reproducing stage is used, and the speed of movement on the pickup stage must be slowed by an appropriate factor. Conversely, if the action demands a large stage, special microphone-handling techniques will probably be necessary.

For other stereophonic pickup, such as music, plays or sound reinforcement, fixed microphone positions aided by some mixed-in special pickups will usually suffice. The basic microphones are deployed in front of the stage. If all action is at front stage, the outside microphones should be at the outside edges. However, to secure the illusion of action on a rectangular stage requires a greater stage width at the rear line than at the front and some compromise must be made, so the side microphones are usually placed somewhere inside the edges. This is particularly true of a two-channel system where a compromise between "hole-in-the-center" sound and well-spread sound must be effected. In this connection, a bridged center microphone is frequently used and does fill up the hole for center observing positions. However, it obtains this effect by adding sound to the side channels at advanced arrival time, thus aggravating the shift of the virtual source as the observer moves to the side of the auditorium.

After considerable experimentation, the microphones for the Philadelphia Orchestra recordings demonstrated by the Bell System in 1940 were suspended 10 feet above the stage and 5 feet inside the front row of musicians. The orchestra

(continued on page 53)



Difference in path length and time of arrival when sound source is not in median plane.
(FROM MOIR)
FIGURE 11

CALENDAR OF EVENTS

DATEBOOK

DATE	EVENT/COMMENT	LOCATION	CONTACT
August 4-6	**Third Annual Physical and Electronics Security Symposium Technical Display.** Sponsored by the Philadelphia Chapter of the Armed Forces Communications and Electronics Association (AFCEA).	Philadelphia, PA	Rita Garbe Computer Sciences Corp. (609) 234-1672
August 24-26	**International Security Conference East.**	New York, NY	Electronic Industries Association (202) 457-4980
September 21-22	**Integrated Service Digital Networks.** Conference Sponsored by Frost & Sullivan.	San Francisco, CA	Frost and Sullivan (212) 233-1080
September 28-29	**NSCA Regional Conference.**	Detroit, MI	NSCA (312) 593-8360
October 1-2	**NSCA Regional Conference.**	Pittsburgh, PA	NSCA (312) 593-8360
October 5-9	**Sound Intensity Measurement Course.**	Champion, PA	AVNC (412) 265-4444
October 15-18	**International Business Music Association.**	Palm Springs, CA	IBMA (216) 833-4164
October 16-19	**Audio Engineering Society Convention.**	New York, NY	AES (212) 661-8528
October 31-November 4	**SMPTE**	Los Angeles, CA	SMPTE (914) 761-1100
November 9-10	**NSCA Regional Conference.**	St. Louis, MO	NSCA (312) 593-8360
November 12-13	**NSCA Regional Conference.**	Chicago, IL	NSCA (312) 593-8360
November 30-December 1	**NSCA Regional Conference.**	Los Angeles, CA	NSCA (312) 593-8360
December 2-4	**Unicom '87** Exhibition sponsored by NATA.	Dallas, TX	Karen Palermo (202) 296-9800
December 3-4	**NSCA Regional Conference.**	San Jose, CA	NSCA (312) 593-8360
January 7-10	**CES.**	Las Vegas, NV	CES (202) 457-8700
January 15-17	**NAMM.**	Anaheim, CA	NAMM (619) 438-8001

SOUND SYSTEMS

(continued from page 51)

width was about 40 feet and the outside microphones were 28 feet apart. In a fairly reverberant medium-sized room, a stage 15 feet wide by 6 feet deep, using three channels, with the microphones on 6 feet centers and 4 feet from the front line, proved satisfactory.

Veneklasen's Five Channel Stereophonic Reinforcement

The early development of multichannel stereophonic sound by the Bell Telephone Laboratories, for stereophonic transfer of orchestra performance from Philadelphia to Washington in 1933, was more broadly named Auditory Perspective. This technique lay dormant for many years in this country and was revived in its purest form by Cinerama Productions. Its potential for musical enjoyment is almost limitless through imaginative new effects which are possible for the musical and theatrical horizon. As a subtle reinforcement system within an auditorium, the complications are actually greater than in recording or transfer. Its potential benefts are: preservation of apparent source location and movement, increased dynamic range capability upon which the emotional impact of music greatly depends, adequate loudness level from small ensembles, more uniform loudness within the auditorium, and improved intelligibility from voices by improved ratio of direct to reverberant sound.

The multi-channel system is extremely flexible and can serve many kinds of performance and function. The basic five channel stereophonic reinforcement system is provided for stage performances, i.e., for an array of sound sources on the stage. Each of the five channels is completely independent, consisting of a microphone-amplifier-loudspeaker. For an inherently balanced performance, the simplest concept is that the sound passing through the proscenium plane is given a gentle "boost," and proceeds on from the proscenium plane to the audience at the slightly higher level. In this case, the microphones are mounted in low "plaques" on the floor, so that acoustically they are essentially flush in the floor. The loudspeakers are mounted across the head of the proscenium, each one directly above its channel microphone. The microphones are cardioid directional pattern, condenser type. The loudspeakers are generally two way systems in a column configuration. Each loudspeaker must cover the entire audience.

In a program where individual performers or small groups may require accenting, any microphone or an array of microphones can be suspended from a stage batten or on stands or hidden in scenery. For popular ensembles, several microphones can be used with each channel, each microphone being assigned to an instrument or small group, and to the channel associated with the location of the group on the stage. Thus, position, spread and distribution of reinforced sound corresponds with locations of sources on stage.

Veneklasen's General Objectives

The most general objective of sound reinforcement in an auditorium is to assure clarity, intelligibility and sufficient sound level to the audience for their full understanding and enjoyment of the program. Either the type of performance, or the artistry, or the size of the auditorium may make it impossible for the natural unaided sound sources to satisfy the audience. Sound reinforcement should not be used to justify or compensate for in-

(continued on page 55)

Looking back at SOUND & COMMUNICATIONS

30 Years Ago . . .

In the July, 1957 Issue of
Sound & Communications

The column "Late Lines" reported that a survey by the National Association of Radio and TV Broadcasters indicated that there were about 500-odd FM stations on the air. The survey didn't say what was odd about them.

"Smile! You're on Candid Camera" took on a new meaning when "Late Lines" reported that Electron Corp. of Dallas, Texas, a subsidiary of Ling Industries, Inc., was cranking out 50 CCTV's a month to sell for under $500. They were driving for stepped up production to 300 cameras a month for the following three months; then 600 cameras for the reminder of the year.

20 Years Ago . . .

In the July, 1967 Issue of
Sound & Communications

At the N.E.W show in Chicago's Conrad Hilton Hotel, Action Systems debuted the "Touch/Dial" intercommunication system that featured a secretary-transfer "S" button which automatically transferred calls; a "T" button to control the conversion, and an "X" button that canceled the call at a touch when completed. And the feature that caused secretaries the world over to collectively groan was that it could accommodate a maximum of 30 stations.

Sparta Electronics introduced a magnetic tape cartridge eraser that operated with a simple forward, reverse and return hand motion, and erased any tape in three seconds. Do you think Nixon was a reader of *Sound & Communications* in 1967?

15 Years Ago . . .

In the July 1972 Issue of
Sound & Communications

Late Lines said, "Summertime and the living ain't easy." Why? Reports from the near and far corners of the industry read: where private and public buildings are starting up some bids are being submitted—but for only "half" a system. When things improve, said the architects and consulting engineers, they'll add on. As a result, one of the leading sound system makers is suffering more than a 10 percent drop in business for the first half of the year.

Northern Telecom Inc, a subsidiary of Northern Electric Co., LTD of Canada, opened its first manufacturing facility in the U.S. at Point Huron Michigan.

10 Years Ago . . .

In the July, 1977 Issue of
Sound & Communications

1985 doubling of the world telecommunications equipment market was predicted by Arthur D. Little, Inc. The total world market for telecommunications equipment will grow from $26.2 billion in 1975 to $58 billion (in 1975 dollars) in 1985, a compound annual growth rate of 8 percent. Free world markets other than North America will experience the fastest growth as the world demand for telecommunications expands, the Arthur D. Little Inc., researchers said. The North America telecommunications equipment demand will grow at 6.5 percent. However, with a $24.5 billion market projected for 1985, North America will still account for more than half of the world total.

In *Sound in the Spotlight* by George delucenay Leon, the sound system to the Broadway musical "I Love My Wife" was examined. Part of the system was a custom built console that had 38 inputs with four outputs. What was really unique about the show's system was that . . ."more substantial proof of the newly recognized value of sound is that the producer gave up eight seats in the last two rows of the main floor to allow the installation of the monitor. . . each seat being worth . . . roughly $1,000 a week." One could say the system gave a grand sound.

SOUND SYSTEMS

(continued from page 53)

adequate or faulty acoustical design. Certain acoustical faults may be exaggerated by sound reinforcement to the detriment of the program, i.e., a good sound system may be faulted by bad acoustical design. Conversely, a good acoustical environment may be destroyed by a bad sound system. The auditorium should first be designed to assure the utmost natural value from the spoken word or musical instrument. In addition to sound reinforcement, a sound system may also be used and justified to produce theatrical sound effects or accompaniment, reproduction of sound from recordings, projection of electronic music, and certain enhancement of artistic effects if done with appropriate care.

The following specific objectives may be stated and used as a guide to design and to judge the adequacy of the equipment or its operation while viewing the sound system as an artistic aid to the performer or performance:

1. The system should augment the artist or performance; it should not assert its own presence or character. Ideally, a reinforcement system will be successful when its operation is not apparent. It should faithfully preserve the character and artistry of the performers.
2. The system should leave the control and nature of the performance, including all aspects of balance and dynamics, completely in the hands of the performer, conductor or director of the performance. Neither the system nor the operator should inject its own character into the performance. The operator must be the artistic ally of the artist. The system must assist the performer to produce the best performance. He will be able to perform more expressively, with more dramatic range, with the proper amount of high quality reinforcement.
3. The system can aid the performer by letting him hear or monitor his own sound as if he were in a smaller room, with the accompanying sound at supportive level.
4. The system should furnish essential clarity without excessive level presenting the sound as if it originated in its ideal environment: a play in a small auditorium, a light opera in a small opera house, a soloist in a living room or chamber hall, a jazz band in a dance hall.
5. The sound should be projected to all members of the audience with nearly equal loudness.
6. A good system will preserve the apparent location of the real sound source, from side to side on the stage, or from front to back. If the sound appears to come from a different location than the visible performer, naturalness is sacrificed.

To meet the above objectives requires the utmost in modern electro-acoustical technology and equipment, skillful maintenance and calibration, and competent cooperative operation.

References

1. Harvey Fletcher, *Auditory Perspective - Basic Requirements*, Trans. AIEE (Electrical Engineering), Vol. 53, No. 1, pp 9-11, January 1934.
2. J.C. Steinberg and W.B. Snow, *Auditory Perspective - Physical Factors*, Trans. AIEE (Electrical Engineering), Vol. 53, No. 1, pp 12-17, January 1934.
3. William B. Snow, *"Basic Principles of Stereophonic Sound," Journal of the SMPTE*, Vol. 61, pp 567-589, November 1953.
4. Paul S. Veneklasen, *Five Channel Stereophonic Reinforcement, Sound System Specification, Section 11790, part 1.10*, January 1986.
5. Paul S. Veneklasen *Objectives of High Quality Sound Reinforcement, Sound System Specifications, Section 11790, part 1.10*, September 1973.

In the June issue, Figure 1 is from Fletcher; Figure 2 is from Wente & Thuras; and Figures 3-7 are from Steinberg & Snow.

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ing that from the beginning.

Simpson: Part of that documentation package remember is to the general contractor's advantage not to tell you that there has been a delay, because he is going in to get additional dollars and he does not want to share it with anybody. It is encumbent upon your brave soul to keep up with that project and make sure you have a running gun battle with how many days you lost because of rain, snow, or whatever. But, if one of the other trades, the brick mason for example, can't get the building secured to the point where you are able to deliver equipment, that's not your fault. That's where you can go back and it might not cost you any more for dollars and materials.

Meeks: It has been my experience since the '70s that you can get paid for equipment that you have stored, 90–95 percent of the time.

Out of 20 people that we have done contracts for in the last three to four years, there is one company that will not pay. The way around it is to tell the company either pay for it now or we put an inflation clause in the contract. They won't put the inflation clause there. There's no way, typically they pay. Now, it has to be in a storage facility approved by the architect and general contractor, and you have to have insurance on it. So, that's back on the cost side. If you are planning to do that, you better have the rental of that facility built into the costs and the cost of the insurance rep facility if it's outside your normal work space.

Printe: We are given a time schedule and after that delay, he picks up the storage because it is not our fault. But you have to do it up front. You cannot go back later and try and pick that up. So, you try and get that built in somewhere up front. But, getting an exact schedule and CPM chart is very critical at the front end. That makes you look like you know what you are doing. You're not somebody he can push around later.

I've recently run across a contract that we read; they wouldn't pay for any material unless it was installed, and would pay for it once it got to the site, but they would only pay our invoice. You couldn't make any profit on it until it was installed. So, that wasn't necessarily an advantage. It wasn't a big project, it was approximately $50,000, so we told them we won't put any on until we needed it. It's going to be done in the next three to four months. All the equipment was there. They came up with it and they said, "There's one where we didn't read the fine clause in the back." The reason we didn't read it was because it wasn't in the sound contractor's part—it was in the electrical contractor's. We had to bill through the electrical contractor, and the electrical contractor can only bill his invoices, so we said, "We'll invoice you the full profit." They said, "No, now that you're working for the electrical, back in the very front end under general contractor, any subcontractor has to fulfill all the requirements of all contractors." And that did not show in the package of the sound. Our legal department looked at it and said we could fight it, but for that big of a project don't worry about it. So, what we did was get enough jobs so that all that $30,000 worth of material in the next 10 days was distributed to other jobs. But in a real large project, you can create a problem. So watch for those little bitty things where they keep tying it back to other people.

Simpson: One other thing can be done when it says it either has to be on site or in a bonded warehouse. We called our insurance agent one day and asked what it took to get a bonded warehouse and we had him come out and look at ours and we now have a bonded warehouse. We were then able to turn around and bill them extra for

bonded warehouse storage, because they said it had to be in bonded warehouses. There is not, other than having your fire, your extra insurance, and so forth, the ability there to designate a specific place. Our designated space was some bright yellow engineer tape that was staked off around the warehouse with the name of the project on it, and a fire extinguisher inside to get to it. That satisfied the requirements of the bond.

Meeks: I don't know if you've noticed, some of the guys here got jobs because they were innovative in coming up with creative solutions to engineering problems or creative solutions to cost containment. If you always approach every job the same way, you won't get them. There will be someone that comes up with something new. So, I really encourage you to look for other angles. Anything you can get. Just look for any angle at all. I know we've gotten a number of jobs from doing that type of thing.

TECHNICALLY

(continued from page 10)

nounced to the communications industry—ISDN (Integrated Services Digital Network). This standard has many interconnect companies running around installing fiber-optic cable links and digital switching equipment. Likewise, large manufacturers are gearing up with dedicated multifunction IC-chips, and integrated voice/data software-programmable digital phone systems.

Manufacturers, consultants and contractors agree that the NSCA (National Sound and Communications Association) has proven successful in its record-breaking conventions. The educational programs sponsored by the NSCA have been applauded by many, with visible strong and rapid growth. In short, the NSCA can do for our industry what many other organizations have done for the allied electronics industries—bring together competitive business and increase the marketplace strength and size.

We at *Sound & Communications* magazine believe that standards committees can easily be formed within the NSCA structure. These committees can have sub-committees that can draft proposals to the membership for adoption. Measuring sound systems' performance, acoustical performance, rigging, wiring, technicians' expertise, pin 2/pin 3 positive, etc., are just a few examples of easily adopted standards. In fact, many standards may be adapted from other organizations. A continual increase of our daily bread and butter services and products showing up in 'supermarket' type merchandising/distribution is easily observed. Isn't it about time we do something about it?

JOB REPORT

(continued from page 50)

Columbus: Ohio State Office Tower (Theaters), 5,C. Contact: Chuck McGregor, Jaffe Acoustics Inc., Norwalk CT; (203) 838-4167.

Columbus: Ohio State University Wexner Center for the Visual Arts, 5,D. Contact: Chuck McGregor, Jaffe Acoustics, Inc., Norwalk, CT; (203) 838-4167.

Dayton: US Air Force Logistics Command Post, 2, A. Contact: Marc L. Beningson, Jaffe Acoustics, Norwalk CT; (203) 838-4167.

Sharonville: Sharonville Municipal Building, 2,D. Contact: Richard Lemker, Lemker & Associates, Covington, KY; (606) 261-9529.

OKLAHOMA

Oklahoma City: Remington Park, 5,B. Contact: Neil Johnson, Ewing Cole Cherry Parsky, Philadelphia, PA; (215) 923-2636.

SOUTH CAROLINA

Columbia: University of South Carolina, Kogor Center for the Arts, 3,D. Contact: Chuck McGregor, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

WASHINGTON, D.C.

Washington, DC: National Council of Catholic Bishops Conference Center, 2,D. Contact: Marc L. Beningson, Jaffe Acoustics, Inc. Norwalk, CT; (203) 838-4167.

Washington, DC: US Holocaust Museum, NA, A. Contact: Marc L. Beningson, Jaffe Acoustics, Norwalk, CT; (203) 838-4167.

CANADA

NEW BRUNSWICK

St. John: Bicapital Theater Project, 2,A. Contact: Robert A. Lorelli, Brannigan-Lorelli Associates Inc., New York, NY; (212) 420-8787.

NOVA SCOTIA

Halifax: Art Gallery of Nova Scotia, NA,B. Contact: Peter Terroux, Halifax, N.S.; (902) 429-4616.

ONTARIO

Toronto: Greenwood Race Track, 2,A. Contact: Neil A. Shaw, Paul S. Veneklasen & Associates, Inc., Santa Monica, CA; (213) 450-1733.

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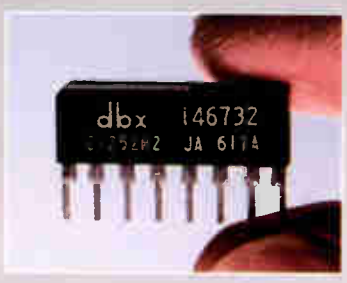

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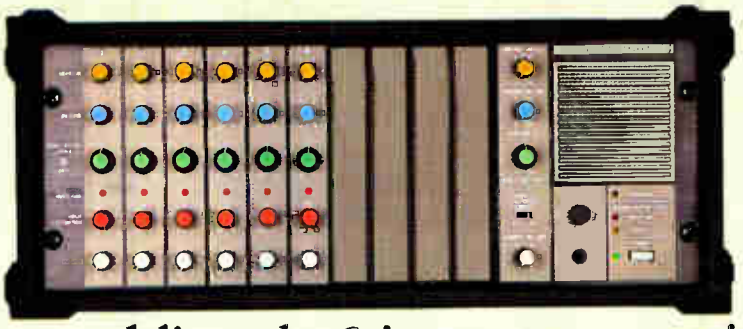

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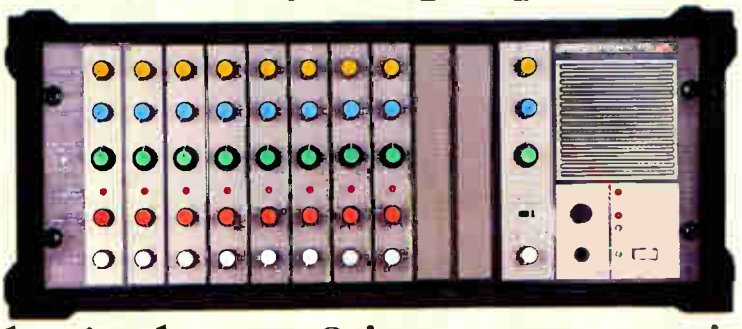

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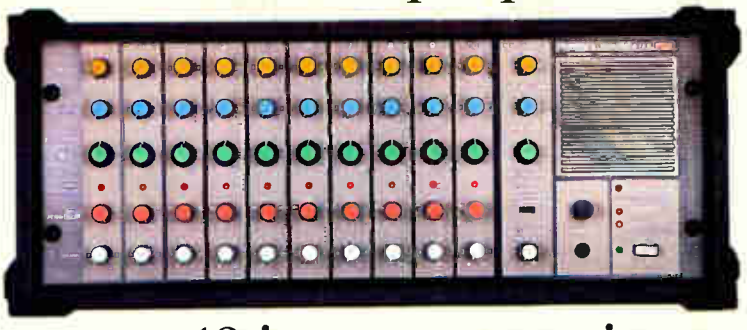

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