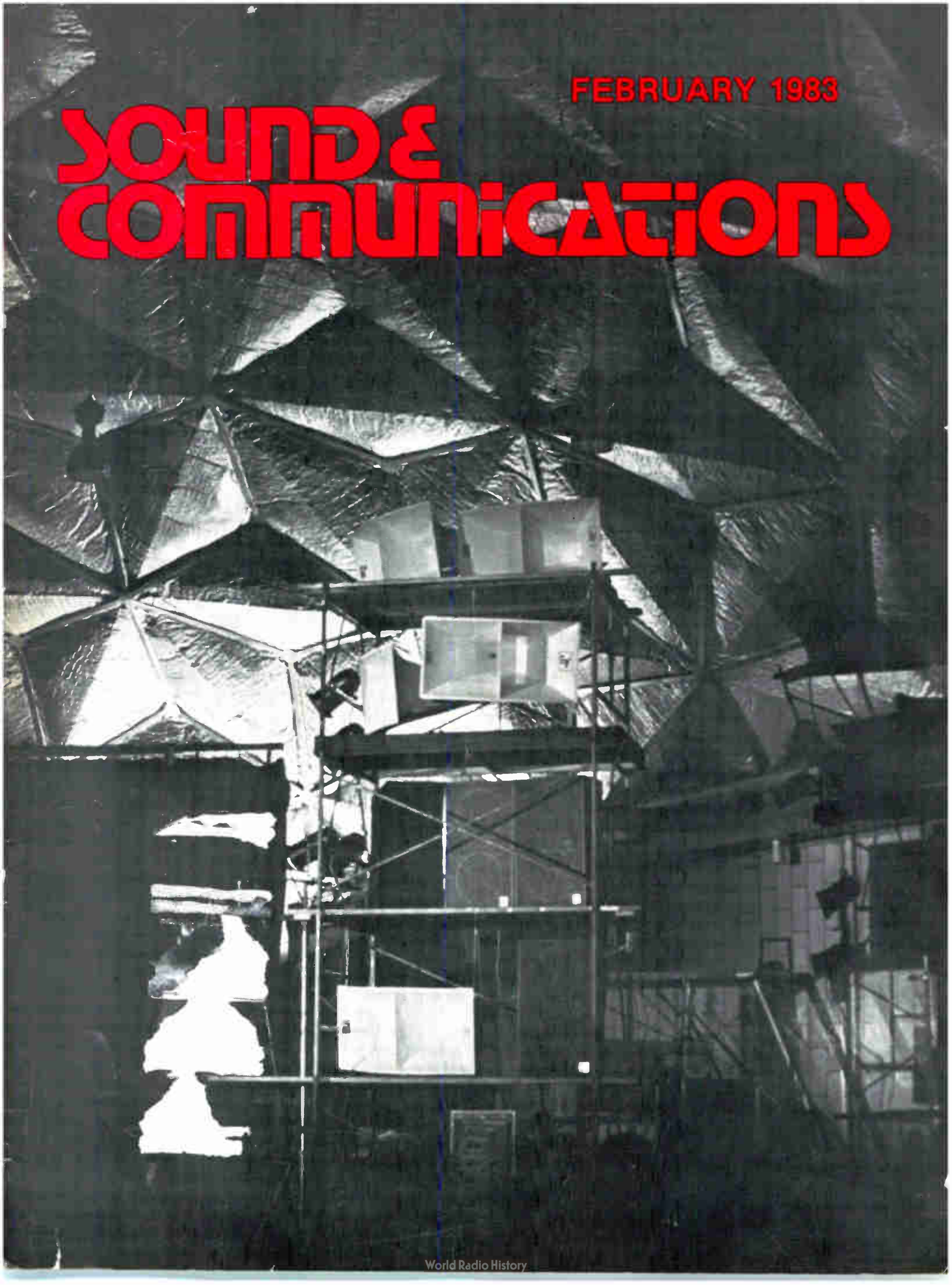


FEBRUARY 1983

SOUND & COMMUNICATIONS



EV PRO SOUND PRODUCTS

The competition in the professional sound field is pretty fierce. Ask anyone who has ever competed for a contract with EV Professional Sound Reinforcement products and they'll tell you that on a head-on, feature-for-feature, dollar-for-dollar basis, there's really no competition at all. Especially when EV's "Sound in Action" line is pitted against Altec and JBL. The truth is that many of their basic products are based on technologies that go back more than 50 years, to the first sound motion pictures. But designing sound products that are capable of filling a theater, concert hall, auditorium or stadium with high quality sound is a lot more demanding than reproducing the sound tracks of yesterday's talking pictures. In addition, the mechanical design and manufacturing processes of today and yesteryear are miles apart. (We ought to know, since EV's been making transducers since 1927).

For example, you've been hearing recently a lot about the sophisticated theories of A.N. Thiele and Dr. R. H. Small, as applied to low-frequency systems. What you probably *don't* know is that Electro-Voice applied these theories to product design ten years ago. EV *invented* the Constant Directivity™ horn. And we developed the first high-performance compression driver that can really "take it," and handle high-level inputs on a long-

term basis. In other words, EV examined what was wrong with yesterday's products and combined up-to-date design, manufacturing techniques and materials in a product line that provides better acoustic performance, as well as significant weight, size and cost advantages.

Want proof? EV Pro Sound products are making hearing as exciting as seeing in such diverse places as Disney World, the Pontiac Silverdome, Circus World, Sun City Sundome, Yankee Stadium and the E.J. Thomas Performing Arts Center at the

FEATURE-FOR-FEATURE, IT'S TOUGH TO EQUAL EV PRO SOUND PRODUCTS. DOLLAR-FOR-DOLLAR, IT'S IMPOSSIBLE.

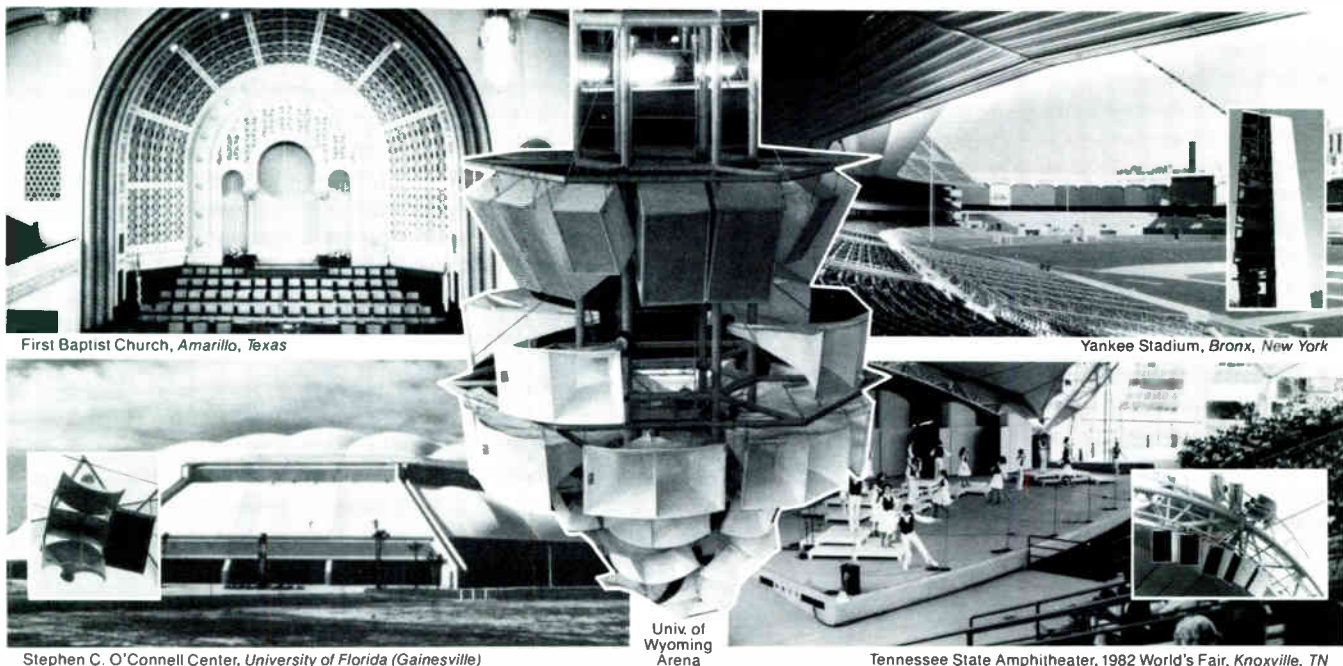
University of Akron, as well as countless numbers of churches, schools, theaters and clubs all over the country.

And to help you get to know more about our products and installations, there's a new catalogue that not only describes the complete

line of EV Pro Sound Reinforcement Products, but outlines EV's contributions to the field. There's also information on product performance testing and EV's standard-setting Engineering Data Sheets.

To put EV Pro Sound Action on your side, send for our new catalogue and get a good look at the EV position. Write to: Jim Long, Electro-Voice, Inc., 600 Cecil Street, Buchanan, MI 49107

gulton company



First Baptist Church, Amarillo, Texas

Yankee Stadium, Bronx, New York

Stephen C. O'Connell Center, University of Florida (Gainesville)


Univ. of Wyoming Arena

Tennessee State Amphitheater, 1982 World's Fair, Knoxville, TN



Try our hand-held money machine!

The Model AT814 Dynamic Vocal Microphone. Your best capital investment!

 Music may be mostly art. And sound may be based on engineering. But together they're a business. The music business. And the AT814 is a tool. A *music business* microphone.

We also call it a *vocal* microphone. Not because it can't be used for anything else, but because every detail of design is based on helping every voice to sell. On stage. In front of the paying customers.

The AT814 response is smooth, but it isn't flat. Rather, it's tailored to help punch through instrumental backing and noise without screaming or forcing. The sound is natural. And great.

The AT814 is also designed to work best very close up. Like most singers want to work. But without spitting, popping, or overload problems. And with a controlled proximity effect which builds bass without booming. Or complements an equalizer to control feedback if preferred.

Even our cables are special. With a conductive coating on both interior wires to make them some of the lowest-noise cables in the industry. And built to take repeated flexing without failure.

And the AT814 is **STRONG**. In capital letters because it's so important. Our windscreen is three structural layers of mesh, soldered (not glued) and backed up by foam. In every respect, the AT814 is built to deliver. Night after night. Town after town. Because you can't afford a reputation for bad sound any more than we can.

We can't promise the AT814 will make more people like your customers' singing. But we can promise they'll be heard at their best. And once you've sold the AT814, we think you'll sing its praises too. Call or write to learn more today! AUDIO-TECHNICA U.S., INC., 1221 Commerce Drive, Stow, Ohio 44224. (216) 686-2600 In Canada: Audio Specialists, Inc. Montreal, P.Q.

audio-technica[®]

Great sound right from the start!

SOUND & COMMUNICATIONS

devoted to the professional and business interests of independent contractors, dealers and distributors of private communications systems, employing audio, radio and telephone circuits, in mixes of interconnect/intercom, sound distribution/reinforcement, 1-way/2-way radio paging and life-safety/security systems; in industrial, commercial, institutional and government applications.

FEBRUARY 1983, VOLUME 28, NUMBER 10

Founded 1955

ARTICLES

- 10 Reinforcing Rock—Creatively: Part 4
by William Gillette
- 12 Heavy Conversation
by David H. Bryan
- 18 Selecting Audible Signalling Devices
by Herbert M. Jaffe
- 28 SCA Cautions
by Lee Poole
- 30 Sound Level Meters—Part 4
by Daniel Queen
- 44 Telephone Usage Control
by Fred Goldstein & Nelson Hanover
- 54 An Electronic Work Station
- 58 Mobile Radio Servicing—Part 13
by Leo G. Sands

DEPARTMENTS

- | | |
|--------------------------|---------------------------------------|
| 4 Late Lines | 51 Tip & Ring |
| 38 New Products
Audio | 56 New Products
Telecommunications |
| 50 New Literature | 64 Classified |

This month's cover: Setting up the sound system at Notre Dame's Collegiate Jazz Festival. See story Page 10.

combining SOUND MERCHANDISING & MODERN COMMUNICATIONS

© SOUND PUBLISHING COMPANY, INC., 1983

Reprint of any part of contents without permission forbidden.

Titles Registered in the U.S. Patent Office.

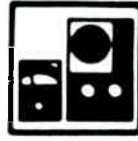
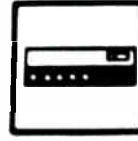
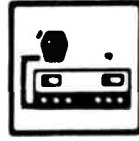
Sound & Communications (U.S. P.S. 943-140) is published by Sound Publishing Company, Inc., 156 E. 37th St., N.Y., N.Y. 10016. 212-685-3480.

President J.J. Brookman; Treasurer, R.F. Brookman, Secretaries, J.E.B. Lapidus, W.F. Brookman.

Subscription rates: U.S. — 3 years \$37.50, 1 year \$15.00. Canada and Mexico — 3 years \$48.00, 1 year \$18.00. Foreign and South America — 1 year \$25.00.

Controlled circulation postage paid at Easton, Pennsylvania 18042.

Postmaster: If undeliverable notify on Form 3579 address correction.



ADVERTISERS

Aiphone Intercom Systems.....	46
Alpha Paging Systems, Compage Div.....	59
Atkinson Dynamics.....	61
Atlas Sound.....	58
Audio-Technica U.S., Inc.....	1
Benjamin Electroproducts, Inc.....	35
BGM International.....	64
Bi-Tronics Inc.....	16
Bogen.....	17
Bose Corporation.....	7
Cabletronix.....	64
Cetec Corp., Trutone Div.....	51
Communications Equipment Co., Inc.....	60
Communitron Corp.....	48
Community.....	63
Crown.....	14
Ditek Industries, Inc.....	62
Dolphin Components Corp.....	64
Dyna-Systems, Inc.....	59
Electro-Voice, Inc.....	Cover 2
Electronic Industry Show Corporation.....	47
Fisher Berkeley Corp.....	30
Florence Corp.....	63
Grommes Precision Electronics, Inc.....	61
House of Metal Enclosures, Inc.....	60
Ideal Wire Products Inc.....	64
Industrial Research Products, Inc.....	23
ITT/DESD.....	37
JBL, Professional Products Div.....	29
MacKenzie.....	28
McGohan Electronics, Inc.....	64
Music Supply Co., Inc.....	64
Opamp Labs Inc.....	64
Pentagon.....	52
P/H Electronics, Inc.....	16
Phase Linear Pro.....	27
Projected Sound, Inc.....	64
ProTech Audio.....	50
Quadrent Associates.....	64
Quam-Nichols Company.....	13
Rofu International Corp.....	62
RTS Systems Inc.....	15
San/Bar Corporation.....	49
Shure Brothers Inc.....	20, facing 30, Cover 4
Sound products/3M.....	36, 54
Talk-A-Phone Co.....	22
Tape-Athon.....	21
TekTone Sound & Signal Mfg., Inc.....	8
Tele-Path Industries, Inc.....	45
Telex Communications, Inc./Turner.....	53, 55
Toa Electronics, Inc.....	5
Tone Commander Systems, Inc.....	19
University Sound.....	9
UREI.....	43
Wanlass Industries, Inc.....	6
White Instruments, Inc.....	41
Xtel.....	Cover 3

STAFF

publisher & editor
JEROME J. BROOKMAN

managing editor
HERB FRANK

manager of production
MARIE PONZO

contributing editors
GEORGE LEON-East Coast
DAVID H. BRYAN-West Coast

DOUGLAS J. GREEN
 Telephony

DANIEL QUEEN
 Electroacoustics

ALBERT PETERSON
 Washington Bureau

national advertising sales manager
JILL BROOKMAN

business manager
RHODE F. BROOKMAN
LEAH SPECTOR

circulation director
J. ERAN
FLORENCE LEVESQUE
ADREA JACOBS

reader service
MILENA M. KREPINSKY

sales offices

EAST COAST & MIDWEST

156 E. 37th St.
 New York, N.Y. 10016
 (212) 685-3480

WEST COAST

JOBSON, JORDAN, HARRISON & SCHULZ, INC.
 119 W. Bellevue Drive
 Pasadena, CA 91105
 (213) 796-9200

ENGLAND

E.G. RIVERA
RIVERA MARKETING
 7 Mayfield Road
 Royal Tunbridge Wells
 Kent TN4 8ES
 England Tel: 0892-42574

JAPAN

NISHIHATA ASSOC. INC.
 Doshomachi Bldg.
 31, 4-chome Doshomachi
 Higashi-ku, Osaka 541
 Japan Tel: (06) 227-1380
 or 222-1104 (direct)

Circulation audited by
 Verified Audit Circulation Corp.



LATE LINES

1983: PURVIEWS AND PREVIEWS—

HONEYWELL, INC.: Edson Spencer, chairman and chief executive officer: "We expect the economy to improve gradually next year; industrial spending, which trails changes in consumer spending, will only start to increase toward the end of the year."

CALIFORNIA P.U.C. COMMISSIONER RICHARD D. GRAVELLE addressing the 94th annual NARUC convention: "As I see it, we've reached the point now where every day of the year is Mother's Day. . . . I think you all know the Mother to whom I refer. . . . Despite the best efforts of state regulators, we see that what I can only refer to as a federal conspiracy, carefully orchestrated by Mother, has placed an economic noose around the (telephone) ratepayers' necks, and is only waiting for the appropriate moment to drop the trap door out from under their feet."

HERBERT N. JASPER, executive vice-president/Ad Hoc Committee for Competitive Telecommunications, speaking at the American Society of Access Professionals' symposium: "As to equipment competition, the inroads made by competitors vary markedly within different areas and equipment categories. For example, of the total 1981 installed base of PBX and keysets, Western Electric had about a 70% share, the independent telephone industry had about a 15% share, and the competitive interconnect industry had about a 15% share. However, in certain markets where the competitors are extremely active, they are winning as much as one-half of the contested bids for new installations of these kinds of terminals."

NATA NOTES: "Reagan antitrust chief William Baxter still maintains that Judge Greene erred in lifting CPE curbs on BOCs, but is pessimistic about prospects for reversing the ruling on appeal. Speaking at the NATA convention, Baxter said the Greene modification was 'particularly regrettable with respect to complex equipment (PBX, key). The BOCs again will have the opportunity to make interconnection difficult and expensive.' Baxter urged CPE vendors to report abuses to the Justice Dept., but warned against crying wolf."

AN INTERNATIONAL RESOURCE DEVELOPMENT INC. survey predicts that the restructuring of the telecommunications industry will result in "convulsive" changes in the market for telecommunications equipment leasing services. In terms of new equipment placed on lease, the market for telecommunications equipment leasing is expected to increase about 50% over the next ten years, from about \$4 billion today to some \$6 billion in 1992. This increase will come despite the move away from renting/leasing by American Bell and by local telephone companies and despite the less liberal tax benefits related to leasing which result from the 1982 changes in the law on leasing (Tax Equity and Fiscal Responsibility Act of 1982). The IRD report evaluates the probable impact of the tax changes on the market for telecommunications equipment leasing, and concludes that there will be some impact on the finance leasing of high-ticket PABX systems, but little overall effect on the telecommunications leasing business.

WALL STREET JOURNAL reports on subscribers facing a new problem: Should they buy a telephone? "As of Jan. 1, American Bell Inc., the new

WHEN YOU'RE UP AGAINST A WALL

THE NEW TOA 900 SERIES IN-WALL AMPS.

When your next sound system has you up against a tight budget and a wall, TOA has the economical and profitable answer: the new, modular 900 Series in-wall amplification control centers.

The compact and shallow package (3 $\frac{7}{8}$ " backbox) was engineered to satisfy a wide variety of commercial sound requirements including hotel and educational facilities. Your choice of either a 60 or 120 watt power amplifier is combined with a modular, plug-in component preamplifier input section which can accommodate up to six separate input sources. Because the wall unit is a modular design, you have the flexibility to choose from over a dozen solid-state input and output modules including new mic and aux versions with remote volume control—the very same components that work with our 900 Series!

Each input features individual gain control and to optimize the integral mixer's output, a nine band equalizer is provided. Add to this, switchable high and low pass filters and even a fast-acting compressor with adjustable release time. A highly regulated, stable output includes self-protection circuitry and will work into your choice of 4 or 8 ohms and 25/70 volt applications. Above the front-locking electronics access door, two L.E.D. indicators show A.C. mains and power amplifier peak power. Fusing, power and terminal blocks are all easily accessible. Should you need to add your own customized features, a removable blank panel reveals the space to accommodate them.

The new TOA 900 Series in-wall amps have everything you need to get the job done—including low-noise, low distortion, and wide frequency response performance for outstanding sound quality.

When your next job has you climbing the walls on budgets and turnaround time, specify the TOA system that's a breeze to install. Spec' an in-wall sound system that lets you move on to more business—not continually come back to it.

Contact us now for detailed technical information on the sound solution when your problems have you literally backed up against a wall.



*Crafted in Japan
Proven in The States*

TOA Electronics, Inc.
480 Carlton Court, S. San Francisco, CA 94080
(415) 588-2538 Telex: 331-332

In Canada:
TOA Electronics, Inc.
10712-181 Street, Edmonton, Alberta T5S 1K8
(403) 489-5511 Toronto: (416) 624-2317

offspring of AT&T, began selling phones, and several local phone companies already offer their subscribers the option to buy. More companies will follow suit. Dozens of other companies also are selling equipment that hooks up to the Bell System's wires. Prices and buying options are dizzying: For a basic desktop telephone, AT&T's Northwestern Bell unit charges \$18.75 in North Dakota. AT&T's New York Telephone Co. wants \$45 in New York city for the same phone. American Bell sells it for \$39.95."

JAY JACOBSON, Personnel Resources president: "The recession has resulted in a slowing of telecommunications industry hiring. There have been a moderate amount of layoffs. Some firms have instituted hiring and salary freezes. However, the overall telecommunications industry picture is substantially better than most U.S. industry and the long range outlook remains bright. The trend of takeovers, mergers and acquisitions continues in our industry. In fact, there were at least two sizable organizations which were sold twice in recent months. Each sale resulted in reorganizations—all with its impact on employee morale and turnover. The impending AT&T reorganization looms as a major future development on employee mobility and opportunity within telecommunications."

FROM THE ARTHUR D. LITTLE TELECOMMUNICATIONS FORUM: Robert S. Gordon, ADL telecommunications specialist, noted that "companies can be expected to place increasing emphasis on complex expensive software in the design and implementation of digital telecommunications systems... Suppliers tend to underestimate development time and rising costs," he said, adding that the situation is exacerbated by a continuing shortage of software specialists and the lack of standardization.

Lack of standardization also will slow the market development for local area (on user premises) networks, according to Anthony F. Culmone, ADL telecommunications specialist. Culmone sees two local area network types emerging: Stand-alone networks and integrated systems that include data



PRESENTS: THE ELEGANT WIRELESS PORTABLE LECTERN



THE TA8W

One or two wireless microphones plus a wired mike allow the speaker to be up to 650 feet from the receiver. This self contained portable lectern can be carried anywhere indoors or outdoors and can be set up in a few seconds on its screw on legs. The handsome vinyl covered cushioned case contains a solid state amplifier, dual speaker system and speech filter for uniform sound coverage with amazing clarity. It operates on standard "D" size flashlight batteries or AC with optional AC adapter accessory No. 27/801.



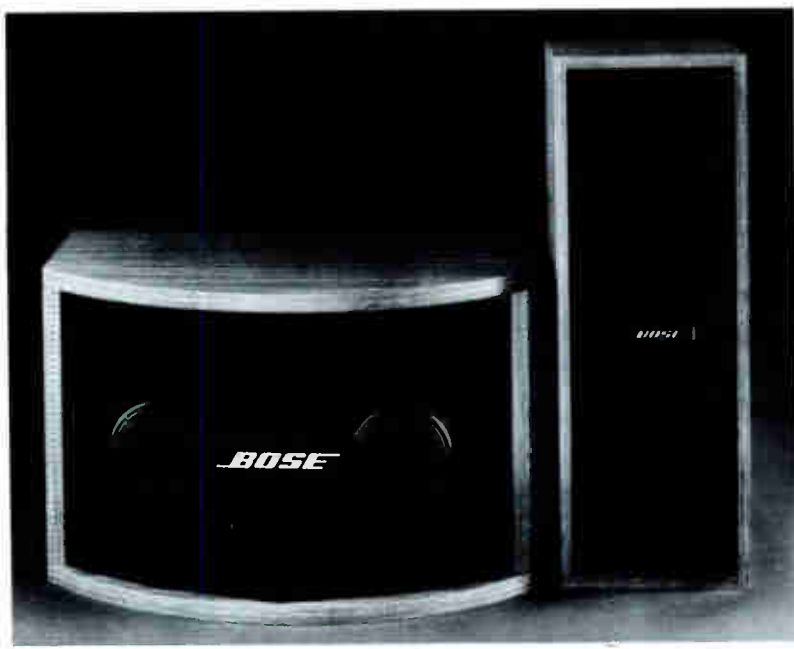
WISSCO, exclusive distributor of Wireless Sound Products
A DIVISION OF WANLASS INDUSTRIES, INC.
1599 Superior Ave. A-1 • Costa Mesa, CA 92627
Toll Free (800) 854-6280 • (714) 645-1281 • (415) 777-4533

The Problem Solvers:

Articulated Array™ Loudspeakers by Bose®

More and more sound system designers and installers are turning to Bose Loudspeakers for their "problem jobs" as well as their routine requirements. They have found that Bose's Articulated Array™ system offers the coverage and intelligibility they need to reach every seat, in almost any type of room.

The multi-faceted baffle design of the Bose 802-W and 402-W speakers orients each transducer in a precise 3-dimensional relationship. This unique Articulated Array™ system delivers an unusually smooth horizontal radiation pattern, reducing the hot and dead spots caused by conven-

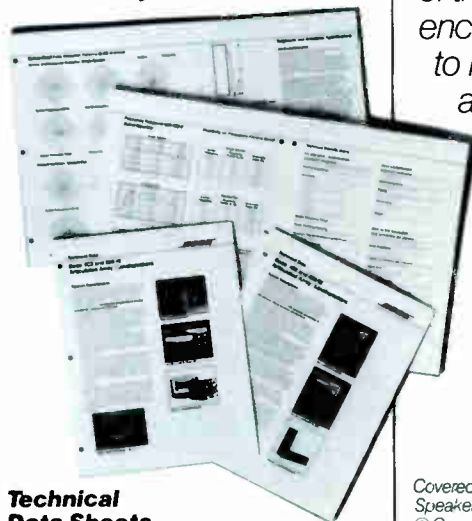


tional horns or columns.

The gradual "skirts" of the vertical radiation pattern provide exceptionally uniform front-to-back room coverage. And the compact, modular design of the 802-W and 402-W enclosures makes it easy to install central clusters and distributed units that meet the needs of a wide variety of room shapes.

Send in the coupon for complete technical data on

the Bose 802-W and 402-W Loudspeakers. Then listen to the 802-W and 402-W, and hear how the technology of Bose's Articulated Array™ system can help solve your next sound installation problem.



Technical Data Sheets

Covered by patent rights issued and/or pending. Speaker designs are trademarks of Bose Corporation. © Copyright 1982 Bose Corporation.

Bose Corporation, Dept. SC
The Mountain
Framingham, Massachusetts 01701

- Please send me the Bose Professional Products Catalog and your technical data
- Please have your representative contact me

Name _____
Firm _____
Address _____
City _____
State _____ Zip _____
Telephone () _____

BOSE®
Better sound through research.

DID YOU MISS

the special December issue of Sound & Communications, featuring the Annual Economic Roundup? This unique survey reports on the year's financial activities in the areas of Audio; Intercom & Engineered Cable Systems; Interconnect; Radio; and Security.

IT'S NOT TOO LATE

For a limited time only, new subscribers can receive December as their first issue. Use the subscription card facing page 24—write "December issue" on the card and mail it with your check today.

processing equipment. Commenting that the integrated system business will be strongly influenced by IBM's long awaited entry, he noted that the embryonic stand-alone networks are attracting many new vendors. "Their ranks undoubtedly will be thinned when the market enters its growth stage," he said.

NEIL J. HYNES, Plantronics, Inc., expressing his views on the Tele-Electronics Explosion before an EIA Telecommunications Trends & Directions seminar: "In the field of microprocessor-based terminal equipment, the capability exists for a host of features to be introduced in both the home and office environment. The tele-electronic product orientation of the 80s will be focused on such items as:

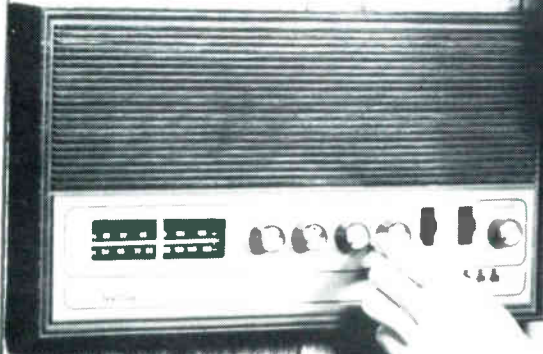
- Information retrieval, display and storage;
- Health monitoring;
- Emergency/security;
- Household management'
- Environmental control;
- Telecommunications cost control;
- Travel substitution.

COMMERCE DEPARTMENT/BUREAU OF ECONOMIC ANALYSIS reports that small increases in spending for new plant and equipment are planned by U.S non-farm business in the first two quarters of 1983. When adjusted by the Bureau for price changes, the plans show declines in capital spending in the first half of 1983. Both constant-dollar and current-dollar capital spending estimates indicate declines from 1981 and 1982. Current-dollar spending in the third quarter of 1982 decreased 2.3% from the second quarter, to an annual rate of \$315.8 billion, 1.4% lower than planned spending reported three months ago.

Constant dollar spending (capital spending adjusted for price changes) in the third quarter of 1982 declined 2.2%. Constant dollar spending in 1981 was about the same as in 1980. □

HEAR THE SOUND

of TekTone's AM/FM Master Radio Intercom with built-in call tone signal. Featuring eight station selectivity and hands-free reply at master, room to room communication from inside or patio station and home entertainment.



EDS '83

Come See the TekSound EK-804 at EDS '83 in Las Vegas, May 3, 4, and 5. Booth P8.

TekTone SOUND & SIGNAL MFG., INC. 1331 S. Killian Drive, Lake Park, Florida 33403
(305) 844-2383 (Call toll free to place your order - outside FL. only) 800-327-8466

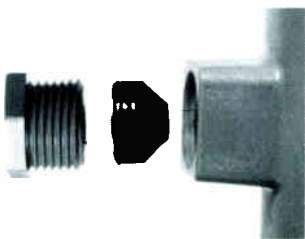
TLX: 51-3438

HOW TO PICK A PAGING SPEAKER.

First of all, look for a paging/talkback loudspeaker with a built-in 70- *and* 25-volt line transformer. Only University Sound's CFID-15T (15 watt) and CFID-32T (32 watt) paging speakers give you that kind of choice.

Next, look for features like the *six* screwdriver-selectable wattage taps of the CFID series.

That's more than you'll find in any other loudspeaker line. And University horns are the only ones with the exclusive Lexan® gland nut connection. In addition to providing a weather-tight seal for 22- or 14-gauge cable, the gland



nut allows easy mounting on any standard half-inch conduit.

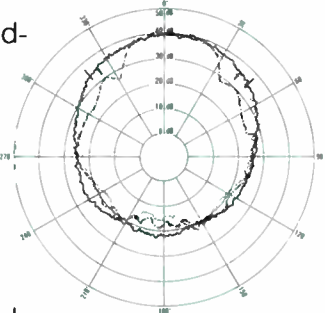
How about sound quality? For a paging speaker to reproduce critical low frequencies, bigger is definitely better.

The CFID-15T horn bell is the largest of its type, and it's the only 15 watt horn capable of producing the controlled horizontal dispersion



you see in the polar curve shown here. For voice/music systems requiring even broader frequency response, the CFID-32T is the logical choice, with a bell area 30% larger than competing models.

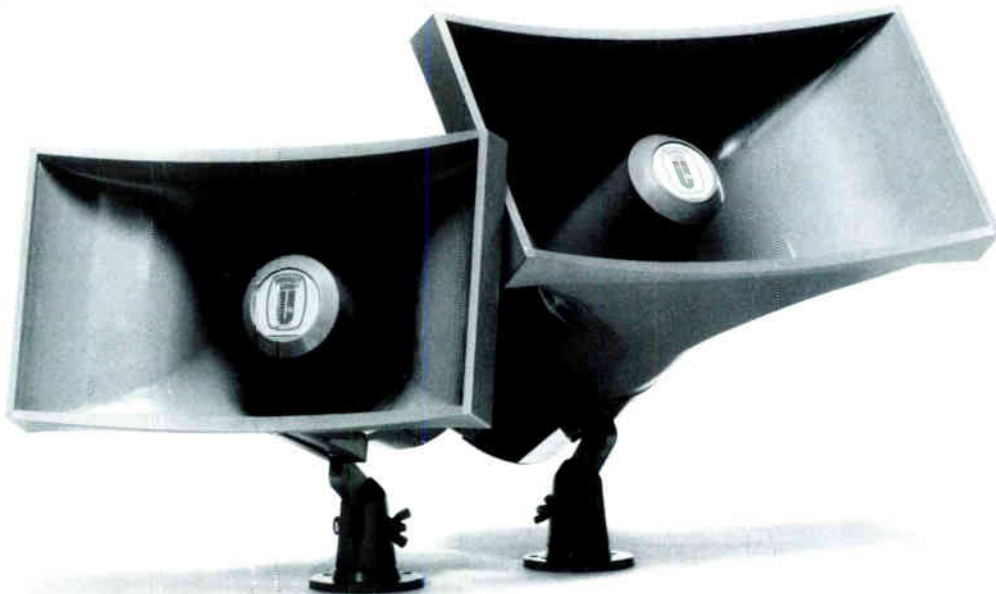
Finally, check for additional features like University Sound's weather-resistant horn/housing construction; field replaceable voice coil assembly for on-site repair in less than two minutes; and the versatility of flush or surface mounting.



The University Sound CFID-15T and CFID-32T—everything you need to know about picking a paging/talkback loudspeaker. For more information, contact Charles Round, Sales Manager, University Sound, 1515 South Manchester Avenue, Anaheim, CA 92803; 714-774-0251.



UNIVERSITY SOUND®
ALTEC LANSING SOUND PRODUCTS
A Division of Altec Corporation



Reinforcing Rock-Creatively

Part 4

by William Gillette

Each spring for a number of years (says my E-V history handbook), Electro-Voice has erected and operated a sound reinforcement system for the Collegiate Jazz Festival at Notre Dame University, South Bend, Indiana. The Collegiate Jazz Festival at Notre Dame is perhaps the premiere event of its type, and attracts big bands and jazz ensembles from all over the United States.

The festival is held in Stepan Center, a geodesic dome structure with cement floor and concrete-block walls. It would be a compliment to say that the acoustics of Stepan Center leave a lot to be desired. Over the years, various split stack systems have been erected on scaffolds on either side of the portable stage. Directive horn stacks have always kept things under reasonable control, providing the required bandwidth, dynamic range and coverage, not to mention the good times and hands-on experience for E-V marketing and engineering personnel.

In 1981, however, after the successful single-source experience at the Music Box, someone said, "Let's arrange for a system just like last year, but have the stage-right stack get ambushed on its way to Notre Dame." This way, we could have the advantages of a single cluster with the portability of the traditional split system erected on a scaffold. It took ten minutes for the laughing to die down.

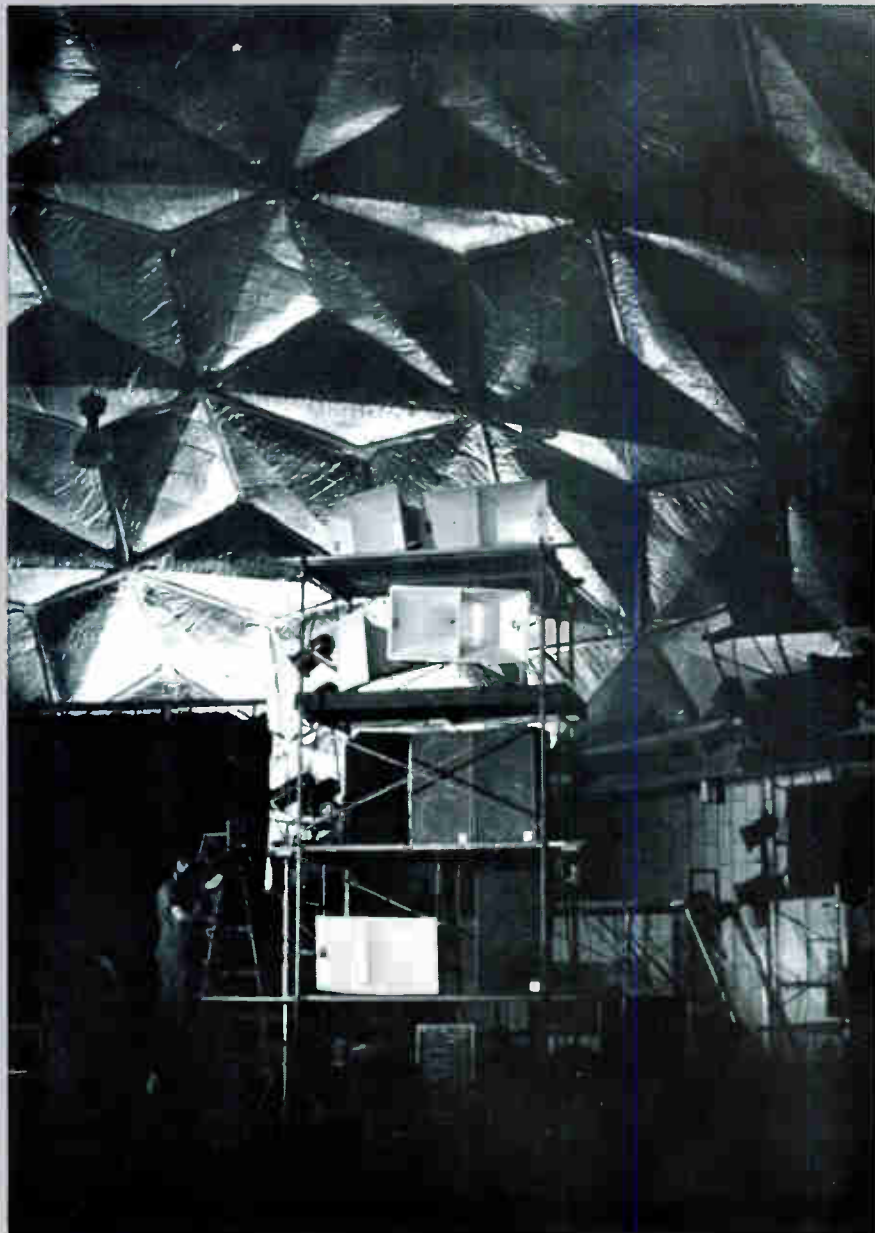
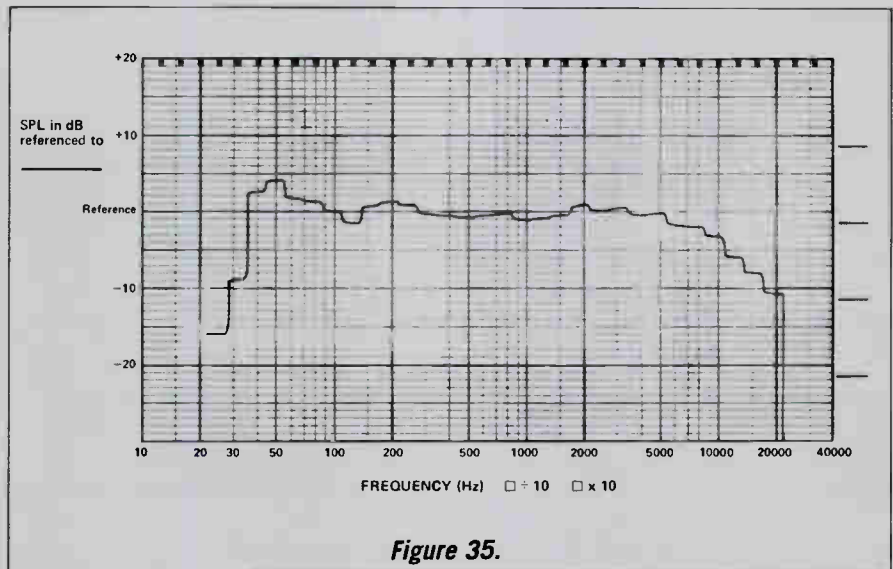
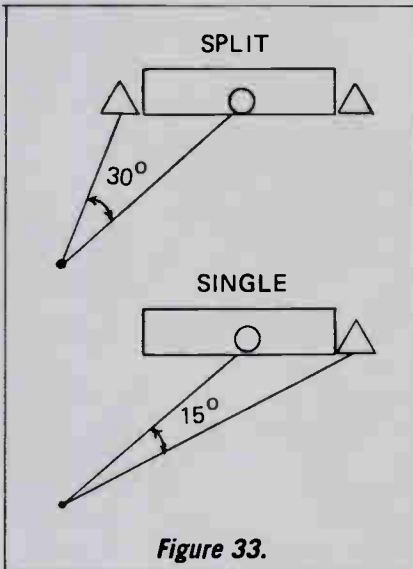
While this was going on, one of the corporate "elders" made some sketches to show how the audience, supposedly covered by the missing stack, could be covered from the other stack with a couple of appropriately aimed 40° x 20° horns. With the scaffolding high enough, these horns could be kept sufficiently clear of any on-stage action.

But who wants to hear a jazz band coming from stage left? Doesn't everybody know you need the balance provided by the split stacks to make the sound from the speakers seem as though it is originating from the stage? Again, the elder made a sketch which showed that the error in source location was no worse for the single side stack of speakers than for the standard split stacks. Look at the examples shown in Figure 33 to see the argument.

System Layout

A scaffold was erected stage left. A pair of HR4020A 40° x 20° horns was arrayed on the uppermost platform (27 feet high) and aimed to direct an 80° x 20° pattern on the farthest audience areas. Immediately below the top horns, a second pair was similarly arrayed to cover most of the rest of the audience. A fifth HR4020A, in the lowest horn position, was aimed to cover an area directly in front of the speaker stack. Horn angles were fine tuned, using the general visual guideline that only one horn throat (easily recognizable as a dark spot in the midst of the white horn color) should be visible from any given seat. Three different very-close-in areas were covered with wide-angle, wide-range speaker systems, e.g., the judges' area immediately in front of the stand which received no direct coverage from the main horn array. No time delay appeared to be necessary because (1) source distance differences were less than about 40 feet and/or (2) listeners in front of the fill speakers were markedly out of the direct-field coverage of the main array.

Figure 34 shows the cluster, as located just to the right of the stage. Note how only one horn's throat is visible from the picture-taking location.



System Balancing and Equalization

The three-mike-averaged frequency response of the main cluster in the audience area, with microphones widely spaced, is shown in Figure 35. Note that this result was obtained only with appropriate level adjustment of the high-frequency horns with respect to each other and the bass bins, selection of the relative phase between low- and high-frequency sections that produced the smoothest response in the crossover region, and application, in the crossover network, of the frequency tailoring which produced essentially flat free-field response for the horn/driver combination used (DH1506/HR4020A). We had a rack of one-third-octave equalizers available to equalize the short-, mid- and long-throw horns but the system measured so well and sounded so good that not a single pot was touched!

Conclusion

The two preceding cases demonstrate that an alternative to "rock-and-roll" tradition does exist, an alternative that can actually improve the quality of the sound system. All that these ideas need is a little exposure and experimentation in the field. Technology and its application in the sound industry is booming and new concepts are being introduced every day. These may not be perfect for every situation, but I think time and experience will prove their value. □

HEAVY CONVERSATION

by David H. Bryan

Asked what would happen if a heavy fork-lift truck were to accidentally bounce off one of their wall-mounted intercoms, Ed Watson, Operations Manager of Atkinson Dynamics, hastily says, "We don't recommend treatment like that!"

Asa Bullock, Sales Engineer, laughs at the question and tells about some of their intercoms returned to the factory for refurbishing. "One unit had a big chunk bitten out of the heavy aluminum case; it must have been whacked several times by a sledgehammer to show that much damage. Another one had been thoroughly coated with rock-hard concrete; it took a man a good hour of chiseling to get the intercom free. And speaking of being hit by a fork-lift truck—we once had units come back that had been run over and dented by a bulldozer or scraper—some of those units still worked and all were repairable."

Watson cautions, "We want to emphasize that our intercoms are made for heavy industrial use in

factories, foundries, in the field—anyplace where dirt, water, grease, dust, fumes in mills and chemical plants, temperature extremes and bad weather are the normal ambient. They're resistant to mechanical shock, but they're *not* intended to be bulldozer-proof. We really don't know what would happen if a heavy fork lift truck bounced off one of our intercoms."

Bullock ventures, "I think the wall would go down first." But he says it with a smile and a twinkle in his eyes.

Atkinson Dynamics, or ADCO, manufactures rugged intercoms. The internal circuitry is solid state silicon, to meet the high temperature limit of 150 degrees Fahrenheit. The low temperature end, minus fifty degrees, requires that special low temperature electrolytic capacitors be used—normal electrolytics just stop working when it gets that cold. The entire package is sealed in a very thick, cast-aluminum case, with a gasket under the cover for protection against bad

weather—ice, rain, snow or salt water. Watson made a point, "The cover is tightened down evenly, to maintain the seal." He adds, "And we use stainless steel screws in the event there is a corrosive atmosphere at the site."

The results of such "canning"? Bullock remarks, "They're used in such places as fire department ladder trucks, in snowy and icy environments such as out-of-doors guard posts or freight loading docks, aboard ships, and even by seismological field crews exploring for oil." He pauses and adds, "Actually, so far there have been very few environmental situations too tough for our intercoms." Watson agrees.

But for all the intercom's ruggedness, it's simple to install. Watson says, "Installation is no more involved than, say, installing lamp fixtures. There are two cables—audio and power—with models available in either AC or low voltage DC." The two cables are plainly identified on the cover—in fact, engraved: *Power* and *Audio*. He emphasizes, "Engraving is *permanent*. Even if layers of grease and dirt obscure the labels, a person can wipe them clear to read and identify the wiring. That might not be possible if they were just labeled."

A number of the special features required by various customers over the past twenty years have been incorporated today as standard options. Bullock explains how one model came into being. "At one time navy surplus sound-powered telephones were quite popular, but they didn't work well in noisy environments. We made an intercom with a higher input impedance which wouldn't load down a sound powered system, was completely self contained, and would put out more than five watts to the very efficient folded horn loudspeaker. That design took care of the prob-



Don't be chicken about buying the best baffle assemblies...Quam!

You can't get a good omelette if you don't start with a good egg. And Quam's not just clucking when we say that you can't get a good baffle assembly if you don't start with a top-grade speaker. After all, which came first—the speaker or the ceiling baffle?

Quam's speaker assemblies—with speaker, transformer, and ceiling baffle mounted, ready for installation—are your most practical choice—because it makes sense to buy your assemblies from the most experienced manufacturer of the most important element—Quam!

Quam starts you off with a choice of 10 different 8" speakers, covering a variety of p.a., background music and related sound system applications, to handle virtually any performance, installation or price requirement.

Yoke it to any of five matching transformers, then top it off with either of two white baffles—steel or plastic. Scramble the elements eggs-actly the way you like; the result will be a complete assembly that won't lay an egg when it comes to convenience, flexibility, and speaker quality.

And here's some news that'll have you sunny side up: there's no charge for the assembly; you pay only the price of the components themselves!

When you're choosing baffle assemblies—don't have egg on your face. Rely on the most eggs-perienced manufacturer—Quam.

Quam-Nichols Company

234 E. Marquette Rd. • Chicago, IL 60637
(312) 488-5800



Quam: the sound decision

lem. We're still selling them today, even though most of our applications do not require sound-powered telephone systems. Some customers are using sound-powered models as extra speakers to 'tack on' extra loudspeakers to existing public address and paging systems where they need additional coverage—perhaps in a new area they've added to their plant. It's easy for them to use because all they have to do is mount our intercom where they want it, plug into power and connect the audio lines."

Certain models are used primarily for monitoring or paging, and have no talk-back provision. Other models are intended for hands-free talking in normal use, except when addressed by a model with override provision that lets the talker hear speech from the other end. Bullock says, "That's exactly the combination that's used on some of the New York Fire Department ladder trucks. The man at the top of the ladder just talks 'hands-free' to the ground crew, who can cut in with warnings, anytime, and he'll hear them."

Lightning protection is another optional feature, as are units for use with a hand-held, noise-cancelling microphone.

Watson discusses the hand-held microphone feature. "It's not just for noise cancellation. It's sometimes very convenient for a user to look in a different direction than towards the wall-mounted intercom. It gives him a flexibility that's important. For example, he might be near the intercom—perhaps in a steel mill close to a rolling or pouring operation, or the intercom might be mounted on the console of a ship loading crane which he's operating. The user can even be a greater distance from the intercom by use of a microphone extension cable."

Are there situations where ADCO doesn't fit the application? "Yes," says Watson. "We've concentrated on keeping our intercoms functional. While we can provide systems with selection and privacy features, our standard and most popular models employ a 'party line' approach. In those applications where an automatic telephone sys-

tem is really required, we do not suggest our product. But," he smiles, "a man can use most of our intercom models while wearing heavy mittens. He can even operate them okay with the back of his hand or with an elbow. It sometimes isn't a private conversation, but does that matter if he's a steel worker asking the stockroom to send him another roll of wrapping tape?"

Watson comments on distance limits. "We can have a dozen intercoms in different buildings, scattered blocks apart, or a mile away from another unit, and they'll all work normally. That's because each unit has its own power supply, amplifier, controls and loudspeaker. Distance hasn't been a problem."

Both AC and low voltage DC power inputs are standard options. Why the DC feature? Bullock says, "Sometimes customers don't want 'dangerous' AC power run out to a front gate of their property. Then too, our units are often used on ships and boats, and in security systems operating on battery power for emergencies." He adds, "It's surprising how many customers use only direct current to power their intercom system."

Some systems are a mix of AC and DC powered ADCO intercoms. This arrangement might be used in situations where a business shuts down and turns off the AC power, while the intercoms in the network for the night security operate from DC power. Bullock says, "It's possible, and entirely good practice, to mix AC and DC power intercoms in the same system, if it's done right and with the proper models wired correctly." Regarding various DC power supply voltages he says, "It's not critical because models can be supplied in a wide range of DC voltages."

"Typical" customers are hard to define, since they cover the entire industrial field. Watson says, "A customer might have from two to fifty or more units in a network. Sometimes all units are standard, but occasionally a few units will be supplied with foot-operated push-to-talk switches, extra loudspeakers, a hand-held noise-cancelling microphone, or other options." The ADCO intercom is traditional in that the loudspeaker doubles as a microphone, but unlike most competitive units it's a folded horn for efficiency



Best dressed for sound.

PZM[®] redundant, clip-on microphone. This new microphone technology provides better reach, better sensitivity and more freedom, especially for on-camera interviews.

For information, write:

 **CROWN**[®]

1718 W. Mishawaka Rd., Elkhart, IN 46517, (219) 294-5571

RESPONSIVE SOLUTIONS CREATED BY POPULAR COMPLAINT



You've heard the complaints a thousand times. The sound is muddy, distorted, unintelligible! The system just isn't doing the job! The darn thing is in trouble again! Yet these inadequate communications systems are continually patched, reworked and rebuilt, running up costs and ruining schedules.

The field-proven RTS Systems' TW INTERCOM effectively solves these problems to deliver outstanding sound quality in any teleproduction, broadcast or industrial application. It's a high-performance conference-line system that offers remarkable reliability, coupled with extensive capabilities.



A selection of 30 components make up virtually any custom configuration. It's everything you need and want in a system, but never thought you could get.

All of this performance translates into lower costs, smoother operations, and production schedules that are met, time and time again. The TW INTERCOM

SYSTEM, engineered by the company dedicated to providing responsive solutions to communication problems - RTS Systems. So stop complaining!

Call or write Marie Hart today for more information.

RTS
Systems
INC



Cordless

Simultaneous Interpretation System

Here's the portable system that meets the needs for multiple-language transmissions to any number of listeners with complete freedom of movement.

Send for free brochure!



P/H ELECTRONICS, INC.

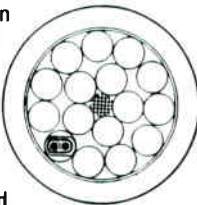
413 E. Helena St.
Dayton, Ohio 45404
Telephone: (513) 461-5898

OUR GUARANTEE

The most flexible
**MICROPHONE AND SNAKE
CABLE you've ever used.**

AVAILABLE FROM 1 TO 24 PAIR

- Maximum definition of complex musical information.
- Minimum loss from miniature pairs of balanced cable.
- Each twisted pair individually shielded and jacketed.
- Cross link P.E. minimizes jacket melting during soldering for easy trouble free installation.



STEP DOWN TRANSFORMER

FOR CCTV, SOUND AND SECURITY
APPLICATIONS. PLUG-IN DESIGN.
U/L APPROVED.

Stocking 12 & 24 Volts, 20 & 40 VA

Call or Write for our low prices
Dept F

BI-TRONICS INC.

BOX 125, TUCKAHOE, N.Y. 10707
(212) 585-1645

and is protected by a heavy, aluminum casting.

Atkinson Dynamics sells direct to users, or through dealers located throughout the country. The dealers are not required to stock an inventory, since the factory can ship specific models needed from their inventory, either immediately or within a few days. Technical help in ordering is available by calling the factory. Bullock smiles and says, "But our units are easy to install. Both cables are #18 oil-resistant type SJO. You just plug the power cable into the proper power source and connect the audio cable to the audio line. That's it. What could be simpler? Instruction sheets accompany each shipment and our data sheet explains standard options and models." Watson remarks, "If the installation is a big, perhaps complicated application, the dealer often will confer with us for ideas or engineering advice—but usually all they want is the data sheet and perhaps a few minutes time on the telephone. It's a product that's easy to understand, install and maintain."

Watson cautions against possible noise source problems. Bullock agrees. "We have heard of noise problems when either silicon-controlled rectifier circuits or power lines are tightly bundled in with unshielded audio wires." He adds, "If an installer foresees such situations, he can use a shielded audio line. The lower input impedance of ADCO intercoms will greatly reduce the possibility of interference. But, with those exceptions, noise is an almost non-existent problem for our customers."

ADCO has intentionally kept their design straightforward and uncomplicated, because they want to provide reliable equipment that field personnel and users can install and even repair—without using complicated test equipment, taking special training, or having to stock hard to find replacement parts. In ADCO's market, complicated signal switching among a large number of stations isn't usually necessary, but ultra-reliable performance is. Watson says, "We do refurbish or repair units for customers on a time and materials basis, which is much cheaper for them than replacement." He smiles and notes, "There's really not much that goes

wrong with them—the most usual damage is when a knob or switch is broken off." He reflects on his statement and adds, "That's excepting the possibility of improper installations, of course."

For users with special needs, a number of options can be provided. A customer may want a model that provides a "call tone" in the system, selective switching, noise canceling microphone for extremely high noise areas, low temperature operation, etc. The flexibility provided by the available options readily solves most special needs.

How about installations where power isn't available at an intercom location? "No problem," says Bullock. "Usually that unit can be driven by a nearby unit that does have power. We designed the power supply in our units to be strong enough to operate another unit, and in fact to drive a third unit if the user can accept a slightly reduced audio power output. It's a very conservative design."

Watson talks about why ADCO's intercom business is successful in these times of hard economics and tight money. "It's a first-class product, of course, and that helps. The market is growing because people are finding that the right kind of intercom is a handy way to communicate—and that earns money for them. The product is easy to use in the field or factory. Ice and snow don't interfere with a man using an intercom, noise doesn't matter—a beeping sound can catch his attention. Intercoms aren't usually private, like telephones, but that's often an advantage in our kind of market. And finally, our units can be used in both intercom and paging system applications."

Going back to his original theme, communications, he says, "I think an intercom, in many cases, is the best way to deliver a message or a thought—without a lot of lost motion or delay. That's good economics for our customers, and that's what our business is all about."

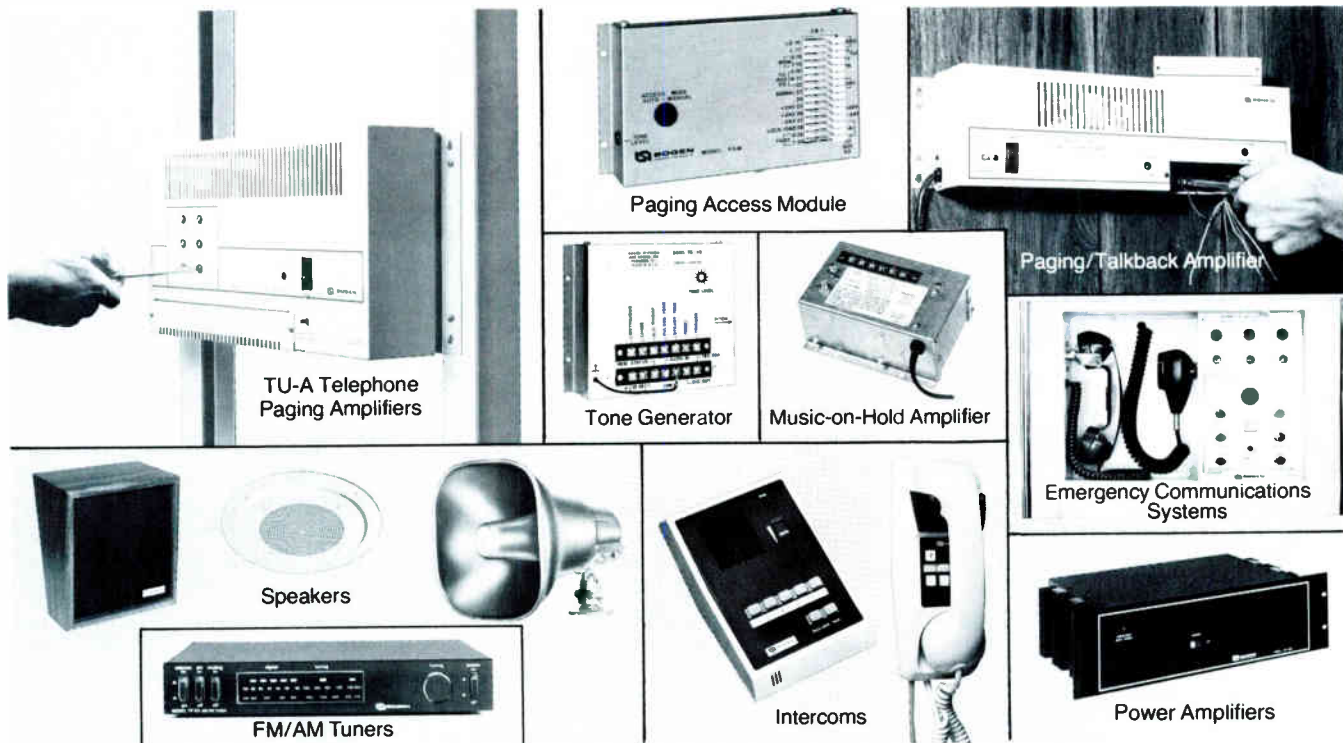
He concludes, "I don't think it should ever be suggested that our intercoms can stand being hit by a fork-lift truck and receive no damage; that's absurd." With a broad smile he adds, "Especially if it's a *big, heavy* fork-lift truck."

Considering the ruggedness of their intercoms, maybe he was only half kidding. □

Why it Pays to Page with Bogen

Telephone-access paging is a fine source of income for you as more and more customers find it invaluable for reaching personnel, making announcements, serving their customers, improving productivity.

But it requires the right equipment, at the right price, and with the kind of dependability that minimizes servicing. That's where Bogen shines.



Products Designed for Telephone Applications

We've developed a group of products specifically for telephone paging. For example, our TU-A series amplifiers, 35, 60 or 100 watts, with three 600-ohm inputs and individual volume controls. All connections and control settings are made by screwdriver. 48-56 VDC (positive or negative ground) or AC operation. Built-in protection against shorts and overloads. Rack or wall mounting.

Talkback Amplifier Registered under FCC Part 68

Our TBA-20A paging/talkback amplifier meets all the stringent requirements of Part 68, FCC Rules, for two-way conversation between phone and speakers, with hands-free response. 20 watts output, 600-ohm input, electronic switching, protection against shorts and overloads. Again, hook-up and adjustments are by screwdriver. Power may be 24 VDC (positive or negative ground) or AC; installation in rack or wall-mounted.

We have dozens of other amplifiers, including the rugged little GA-2, a 2-wattner perfect for music-on-hold, and the new MT-C series power amplifiers rated at 60, 125 and 250 watts. The MT-Cs will deliver full power continuously for 250 hours or more and are the first to be listed under UL's demanding 1480 Standard.

New Interface Simplifies Installation

Our new PAM paging access module makes it easy to connect a paging system to a telephone circuit (dial, manual, key or non-key phones, PBX, PABX or Centrex station lines) or dial intercom.

24 VDC positive ground, convertible to 48VDC.

The TG-4B tone generator can produce any of four tones (including chime) continuously or in double bursts. It's ideal for pre-announce or alarm signals, with precedence over an interconnected program source. Operates on 15-26 VDC (positive or negative ground) or AC, with an optional adapter.

Wider Choice, Single Source, Prompt Delivery

The Bogen line is so extensive that we can only illustrate a sampling here. It includes loudspeakers for wall, ceiling, or outdoor installation, FM/AM tuners to provide music, intercoms of loudspeaker and phone types, systems for emergency alerting, control and intercommunication, and much more. This means you can provide exactly the right units for each requirement, all conveniently from one source. And we are famous for off-the-shelf availability, which means shipment is almost always prompt and complete.

Reliability and Value

With 50 years of sound engineering and manufacturing experience behind them, Bogen products are renowned for performance, reliability and value. We invite you to request full information, compare them, try them.

Just write or phone:

BOGEN[®]
 A DIVISION OF LEAR SIEGLER, INC.
 P.O. Box 500, Paramus, NJ 07652
 (201) 343-5700

50 Years of Sound Leadership

Selecting Audible Signalling Devices

by Herbert M. Jaffe

False alarms—every single police department and neighborhood is flooded with them! They're caused by improper operation of facilities and faulty equipment, as well as by pranksters.

Alarm devices that fail, and signals that aren't heard, add up to a pattern of unreliability that has made some local authorities so resentful that they have actually started charging for "wild-goose-chase" visits. Yet, far more important than nuisance charges is the fact that many security and protective alarm systems simply aren't doing their intended job, and that such failures do not become noticeable until the very instant when the need for optimum performance is greatest.

In many cases, this lack of effectiveness stems from a mistake in pre-qualifying the reliability and suitability of the system's components. Because of the complex operational and functional demands on each equipment-item in a protective alarm system, there is probably no other application where proper selection of these vital accessories is so difficult, or so frequently neglected.

Basic Considerations

To assure the best loudspeaker or audible signalling device selection, consideration should first be paid to

a number of constraints particular to the intended application:

1) The functions which the audible devices will be required to perform.

2) Sound power (SPL: Sound Pressure Level) output-capability sufficient to protect the premises or to warn the occupants anywhere within the area.

3) Performance reliability in relation to environmental factors.

4) Determination of sound distribution requirements.

5) The capability (by design and component-quality) to meet such stipulations as Underwriter's Laboratories (UL) listing requirements and NFPA Standards, and to obtain approval by the local or state authorities with jurisdiction.

Step 1: Determining the Type of Audible Signal Transmission Device

From the technical point of view, alarm applications involve either mechanical devices (bells, klaxons, sirens, etc.), or electro-acoustic signalling (loudspeakers). In comparing the two, it is important to consider how they work and what the warning and alarm system is intended to achieve.

Protecting a particular area or property can be accomplished by alerting people to an intrusion in three different ways: sounding an alarm at the area of origin; alerting people in the surrounding vicinity; or generating so much noise in the area where the violation occurs that the intruder is literally driven out.

The functional differences between mechanical devices and electro-acoustic signalling are fundamental. Mechanical sirens or bells make but one distinct sound that can be very limiting for protective alarm installation and frequently provokes confusion for occupants and visitors alike.

Electro-acoustic devices, on the other hand, utilize electronics for signal generators and can provide a limitless variety of identifying tones (not merely alerting to an undefined violation or emergency, but even pinpointing its nature and location) and, most importantly, can follow it up with pre-recorded announcements and/or informative live voice-transmissions. Their versatility makes electro-acoustic systems the optimum choice for intrusion warning, theft-sensitive area protection, and the emergency-communications requirements of today's society.

The selection of loudspeaker type should be predicated upon the electronic alarm signal itself, which is a square wave that alternates between two limits—from no sound (total rest) to maximum output and back in a very short time. In contrast to voice or music, where the output is a sine wave that generally modulates around an average value without peaking or hitting "valleys," the square wave-form used in electro-acoustic signalling imposes maximum demand upon the loudspeaker diaphragm.

Since the type of construction and the voice coil-materials used

Mr. Jaffe is Vice President, Marketing, for Atlas Sound, Parsippany, N.J.

**AT LAST,
A 19 STATION
INTERCOM
WITH BUILT-IN,
SELECTIVE CALL
ANNOUNCING
FOR ONLY \$165.**

\$165.



Tone Commander's new HF-1900 is the most flexible 1A2 intercom available anywhere:

- Proven, reliable 19 station intercom.
- Built-in, hands free call announcing and answerback for all, or just a few stations.
- Easy to install. No need to go into station set. Use with the telephone that's right for the job: ITT 2870, K174A or K174B call announcers.

Easy to sell.

Hands free call announcing is a benefit customers like. And at only \$165, it's a price you'll like.

Three Year Warranty.

Tone Commander Intercoms are backed by a three year warranty. They're the first choice of most of the nation's telephone companies and the military. Find out more about our 10, 19 and 36 station key systems intercoms, up to 80 station multi-link intercoms, multi-purpose relays and pagers, hold circuits, amplifiers and complete 10 to 120 station key and PABX systems.

Get the Facts.

Send for our latest Product Guide. Call, circle reader service number or write Tone Commander Systems, Inc., 4320-150th NE, Redmond, WA 98052. Call 206/883-3600. Telex 32-8055.

**TONE
COMMANDER**



The Atlas Sound SVT Series electro-acoustic devices, including 2-watt cone speakers, are used for "localized area" applications.

must be selected to withstand this acoustic assault, a heavy-duty loudspeaker or compression-driver designed for the intended application, and tested by UL for the specific service, should be the only recommended equipment for warning and protective communications applications as an audible signalling device.

Step II: Sound Power-Handling and Output

The chosen electro-acoustic signalling device must provide the right "amount of sound" or SPL and, in many locations, be able to meet the output and transmission standards legislated for certification of audibility by representatives of the insurance carriers.

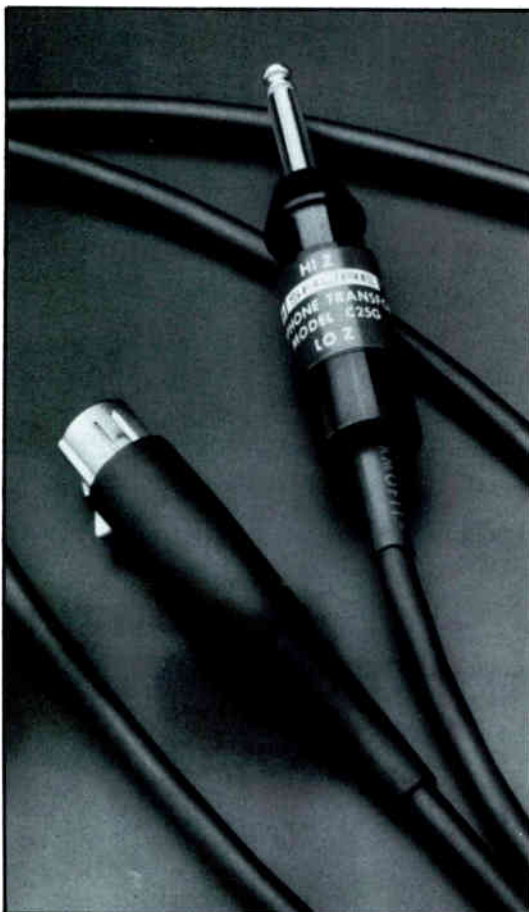
It should be appreciated that loudspeakers range from a fraction of a watt to huge PA systems, and that SPL is generally stated in dBs measured 4 or 10 feet away from the loudspeaker. (Due to the peculiarities of human hearing, it takes double the amount of power to gain 3 dB, the lowest perceived loudness variation.)

Specifications for a typical re-entrant compression-driver speaker might read "SPL of 97 dBA, 4 feet on axis at rated power." An ostensibly "similar" commercial grade loudspeaker may cost \$10.00 less while claiming a rating of only 92 dBA under identical conditions. The SPL difference may appear insignificant, but the ostensibly "similar" substitution will require the expense of appreciably added equipment to



A recessed-mounted 7.5-watt loudspeaker, the Atlas SVTF Series, is suggested for "multi-occupancy" areas. It provides 91 dBA sound output at 20 feet and has maximum protection against tampering and vandalism.

attain truly parallel results, or to obtain approval for the system-effectiveness when challenged for lacking intelligibility by representa-



Success means having the right connections.

If your microphone goes dead during a performance, you'll never hear the end of it. That's why Shure designs and builds microphone cables to insure optimum audio performance under the worst possible conditions.

This design superiority is most apparent in the critical area where the cable and connector meet—the cable connector interface. Here, special design attention insures long-life durability and flexibility. On Shure's "Triple-Flex[®]" cables, for example, a unique flex relief allows you to use this thin cable without it breaking or kinking.

Shure cables are also subjected to the most rigorous tests in the industry for appearance, strength and durability. For example, they must undergo a variety of environmental torture tests, including temperature extremes of -20° to +165°F and humidity of 95 to 99%. In addition, they are subjected to a series of stress tests including rocking, pulling and twisting to insure strength and long-life flexibility.

And, to guard against on-stage signal loss and external noise interference, Shure cables are designed to pass rigid capacitance, leakage, and shielding requirements.

It's no wonder Shure "Audio Connection" cables are the industry standard. Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204, (312) 866-2553.

SHURE[®]

THE SOUND OF THE PROFESSIONALS[®]...WORLDWIDE

Distance From Loudspeaker	2-Watt Cone Speaker (SVT/SVTF) For "localized areas" such as: residential houses, executive offices, apartments & condominiums, hotel rooms, detention centers, conference rooms, health-care and geriatric facilities, etc.			7.5-Watt Cone Speaker (SVT/SVTF) For "multi-occupancy areas" such as: offices, farms, stores, dormitories, banks, elevator cabs, restaurants, schools, service centers, community facilities, etc.			15-Watt Compression Driver (VT/VTF) For "public areas" such as: periphery, stairwells, lobbies, food service and leisure facilities, manufacturing and distribution areas, transportation terminals, governmental buildings, auditorium.		
	SPL In dB	No. of Spkrs. Req'd.	Amplfr. Watts Req'd.	SPL In dB	No. of Spkrs. Req'd.	Amplfr. Watts Req'd.	SPL In dB	No. of Spkrs. Req'd.	Amplfr. Watts Req'd.
10 Ft.	91 dBA	1	2	97 dBA	1	7.5	101 dBA	1	15
20 Ft.	85 dBA	1	2	91 dBA	1	7.5	95 dBA	1	15
40 Ft.	—	2	4	85 dBA	1	7.5	89 dBA	1	15
80 Ft.	—	4	8	—	2	15	83 dBA	1	15

Number of loudspeaker units and amplifier-power requirements in comparison, for an installation requiring 83 dB minimum SPL for speech and signalling application.

(Pink Noise 400-4000 Hz., Limited Band)

TABLE 1

AUDIO-MASTER AMPLIFIERS

by Tape-Athon®



Call Toll Free
800-421-1029
(EXCEPT CALIF.)

12 "BRAND NEW" VERY AFFORDABLE MODELS

From our compact **SERIES II** at 40 watts to our **120 watt SERIES IV** with 16 selectable inputs.

Tape-Athon®

502 S. Isis
Inglewood, CA 90301
(213) 776-6933



Recommended for "public area" applications, the Atlas Sound VT Series is equipped with 15-watt compression drivers and delivers 109 dBA of electro-acoustic signals at 4 feet. These units overcome most ambient noise interference.

tives of the local authorities.

Table 1 provides a guideline of achievable SPL results for the fun-

damental types of loudspeakers, reflects the specific design objectives for recommended applications, and offers distance and amplifier power-requirement comparisons.

Step III: Analyzing Environmental Factors for Performance-Reliability

In selecting a loudspeaker for electro-acoustic use, it is important to also consider the environmental conditions of its installation-location that can affect performance and longevity. Most locations fall into one of three basic categories: protected areas, exposed environments, and special surroundings.

A "protected area" can be any kind of indoor location where a loudspeaker is not directly exposed to the elements. Surprisingly, even in environmentally-protected locations, the very security of system components (or the lack of it) should be a pre-purchase consideration. Properly designed electro-acoustic speaker housings are difficult to violate. While conventional cone speakers are frequently silenced by vandals or disabled simply by sticking a pencil through them, such

temptation for tampering can be avoided by recessed mounting of the entire loudspeaker assembly, or protective design of the surface-mounted speaker baffle.

"Exposed environments" are any locations where a loudspeaker may be subjected to rain, humidity cycling, the activation of a sprinkler-head, or extremes of temperature. (Weatherproof loudspeakers are inherently "exposure-resistant" and not vulnerable to malfunction due to corrosion of sensitive interior mechanisms.)

Environments designed as "special surroundings" include locations with explosive or combustible atmospheres, such as print shops, refineries, grain elevators, extremely dusty areas, marine applications, vibrations-exposed or mobile applications, or any location where the audible device may have to resist unusual environmental demands. (Loudspeakers specifically designed for such are a mandated requirement for these locations.)

Surrounding trees and other vegetation may be absorbing the audio signal, and outdoor sound distribution must compensate for a variety of mechanical obstructions, ambient factors (temperature, humidity, wind, etc.), and lack of sound-reflecting surfaces (such as walls, ceilings, and floors). It therefore, requires higher SPL levels than indoor application.

Step IV: Determining the Sound Distribution Requirements

A major consideration in determining distribution of audio is ambient noise—not merely the amount (volume), but the type (or frequency range) of sound in a given acoustic environment.

There are several ways to attain the best sound distribution; the simplest solution may be to place the sound source at a central point, but a more effective and fail-proof technique, in many applications, is to locate a number of loudspeakers throughout the area to transmit the desired SPL in a uniform audio-level pattern while automatically assuring the safety factor of multiple audio sourcing.

Optimum distribution of indoor sound can only be attained when appropriate consideration of the cubic envelope of the area and logical separation-distance of the loudspeakers has been added to the

Where quality talks it's TALK-A-PHONE

Instant and direct two-way conversation between any 2 points

TALK-A-PHONE

Intercom

The low cost assistant with the "Built-in-Brain" and exclusive "Dynasonic Selector"

REDUCES COSTS



BEST BY DESIGN

Dept. SC

TALK-A-PHONE CO. 5013 North Kedzie Avenue
Chicago, Illinois 60625

The VOICE-MATIC™ Automatic Microphone Mixer

**JUST GOT
EVEN
BETTER**

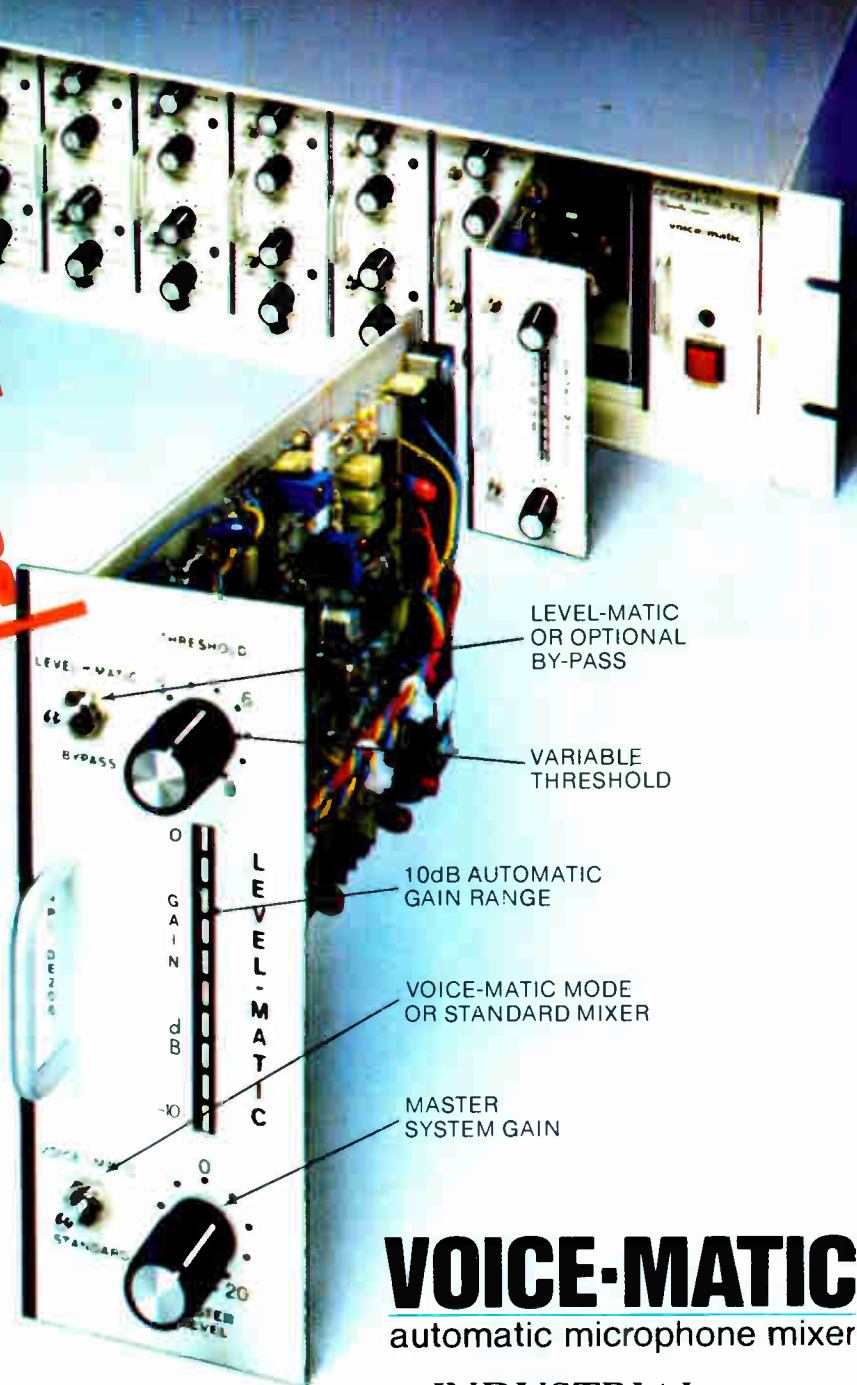
Introducing the LEVEL-MATIC™ module option

The Voice-Matic Model DE-4013 has received wide acceptance in sound reinforcement, broadcasting and teleconferencing applications by eliminating feedback and fading sound levels. With the NEW LEVEL-MATIC master module option, the Voice-Matic is totally automatic.

- Soft talkers receive added gain.
- Loud talkers and background sounds are attenuated.
- A smooth, uniform output level is the result.
- Retrofits all existing DE-4013 mixers.

Once you hear it, you won't want your sound system without one.

Call or write today for more information on how the Voice-Matic mixer with the Level-Matic option can improve your sound installation...automatically!



VOICE-MATIC™
automatic microphone mixer

INDUSTRIAL
RESEARCH
PRODUCTS,
INC.

A Knowles COMPANY

321 Bond Street • Elk Grove Village, IL 60007
(312) 439-3600

BOOK SHELF

SPECIAL COMBINATION OFFER. Two reprints from **SOUND & COMMUNICATIONS'** series on PABX systems, written by Douglas Green, and long considered the "standard" work by the interconnect industry. The work has been hailed by sales managers for its thoroughness in presentation, its clarity, its sweep of the subject, and its expertise. Service managers have declared it the definitive work for training installation crews.

2 pamphlets\$6.00

PRACTICAL GUIDE FOR CONCERT SOUND by Bob Heil is the sum collection of notes, experiments and logs of a man who spent over half a decade building/servicing/fashioning sound amplification systems for some of the country's best known travelling musical combos and rock concert stars. There are 19 chapters, ranging over the full line of amps/mikes/speakers/compressors/crossovers . . . but, there is also a spelling out of balanced and unbalanced lines; the care and feeding of cables, and the interfacing of hi-fi gear with pro sound equipment.

Soft Cover\$10.95

HANDBOOK ON ESTIMATING is the combined knowledge of four men who've accrued almost 100 years of experience in the sound system business, estimating jobs price-tagged from a few hundred dollars to over a hundred thousand dollars. You won't find a circuit diagram, nor a discussion of acoustics, time delays, or installation techniques—this is strictly a volume devoted to the plain arithmetics concerning time, materials, men, overhead, insurance and taxes, that are a vital part of the estimate that brings in the dollars, and **MAKES A PROFIT!** Each element of these items—and more—are given their proper treatment, and are shown in their relation to one another, broken down into pennies (an hour's time for a technician is broken into its 60-minute segments, and the price for that minute is scored and tallied with the rest of the estimate). Equipment suppliers are invited to seek quantity purchase price discounts.

Soft Cover\$15.50

INSTALLING & SERVICING ELECTRONIC PROTECTIVE SYSTEMS, by Harvey Swearer, is wholly concerned with alarm systems for industry/commerce/retailers and homes. The author has included every method employed in alarm systems—electromechanical alarms, photoelectric alarms, ultrasonic detection systems, sensors and detectors, microwave systems, proximity systems and audio and visual alarms. Of particular interest for sound system people who are moving into this "circuit" is the chapter dealing with specialized systems — Holobeam Personnel Access, pulse alarm detection and sensing type vehicle alarms. Added features include the full Federal Crime Insurance Regulations from the Dept. of Housing & Urban Development, a glossary of terms; a list of manufacturers. Profusely illustrated.

Soft Cover\$7.95

COMMUNICATIONS STANDARD DICTIONARY by Martin H. Weik, D.Sc. clearly defines terms used by designers, developers, manufacturers, vendors, users, managers, administrators, operators and maintainers of communication systems and components. All entries are arranged in alphabetical order and every significant word in a multiple-word entry is also featured in the main listing. There are illustrations, cross-references and easy-to-spot italicized terms.

Hard cover\$39.50

SOUND SYSTEM ENGINEERING, by Carolyn & Don Davis, is the masterwork of the professional/engineered sound system field. Starting with basic system configurations, individual chapters discuss Audio Environment, Interfacing the Electrical & Acoustic Systems, Equalizing the Sound System, and Instrumentation. This volume explains fully the steps in designing, testing, installing and maintaining a sound system, along with photos and graphs that enhance the text. Don Davis has included test questions (with the answers) about the mathematical science in acoustics, to hone your skills. Hard Cover\$22.00

LEASING PRINCIPLES & METHODS by Jack Leonard Green, 320 pages/hard cover, grew out of a series of articles that first ran in **SOUND & COMMUNICATIONS** on money management. The author expanded the six articles into a full explanation of leasing—its advantages over outright purchase—and fleshed out the work with 32 pages of documents and financial instruments, covering every financial exigency. Interconnect phone dealers and duplex intercom distributors will find this volume of exceptional use in crafting lease arrangements for telecommunications systems.\$49.95

MODERN COMMUNICATIONS SWITCHING SYSTEMS/2nd Edition by Marvin Hobbs is a step-by-step treatment of telecommunication switching techniques by the telco, into crossbar and microcomputer switching techniques for the customer-owned system. The elements of Stored-Program Control are detailed, as well as Time-Division Switching Systems. There is a complete presentation of PBX systems. This work will find a ready audience among the interconnect dealers whose installation and servicing crews are "crossing-over" daily with the telco.

Soft Cover\$9.95

VIDEO SECURITY SYSTEMS, by Keith Bose, is a work of increasing importance now that security systems are becoming more sophisticated and an integral part of the communications system for industry, commerce, institution, school, and the leisure/housing markets. The technical aspects of the CCTV camera and its peripherals are presented in word and picture—from installation tips to maintenance practices. Two chapters are of especial interest: Cameras, Monitors and Video Recorders covers the range of tubes, signals, night viewing cameras. Signal Processing, Special Effects and Color deals with amplification, equalization; then special effects, screen splitting and character displays. Hard Cover\$16.95

CONCEPTS IN ARCHITECTURAL ACOUSTICS by M. David Egan is the "textbook" used by Bob Davis/Altec Lansing in his technical seminars on sound distribution systems. Mr. Egan created this work for the professional seeking answers to: How to Ensure Speech Privacy. How to Provide Effective Isolation. How to Choose the Best Room Surface/Shape. Packed with illustrations, tables and step-by-step computations for help in understanding the behavior of sound in the environment.

Hard cover\$42.50

ambient noise considerations (i.e., "public areas" such as lobbies or ballrooms obviously require a different loudspeaker type, more units, and higher level of sound output than such "localized space" as individual condominium apartments, a hotel room or an executive conference room, where ambient is relatively constant).

Summary of Considerations:

Alarm and warning systems are a capital investment where dependability of performance is the key requirement for many years to come.

Today's security and emergency communications system buyer must wade through many non-standardized specifications that are obscured by competing manufacturers' claims.

The audible signalling device selection process can be simplified by concentration on units equipped with compression drivers, or cone speakers treated against water damage, that provide the highest power-handling efficiency within the 400-4000 Hz spectrum needed for protective applications, and that are optimum in amplifier-power to sound-output conversion efficiency.

The ability to analyze true costs takes more than examining a few catalogs or comparing seemingly equivalent units. Be aware that an initial saving on the equipment price may be offset by an unexpected costly obligation later on.

Like plumbing and lighting, the security and protective communications system should be designed by qualified engineers with advice and assistance from specialists in the field. It should be bought on competitive bids, based on certificate performance results, and installed by qualified contractors per the equipment suppliers' recommendations. The bidder should also handle the final checkout and provide a maintenance contract just as with electrical equipment.

All in all, a cost-effective deterrent and information system is neither an install-it-yourself package nor cheap. Compromising the selection of the electro-acoustic accessories may result in reduced reliability that contradicts the original premise of the investment, and could harm your reputation as a professional in the security and protective alarm market. □

THE POWERFUL NEW FORCE IN PROFESSIONAL AUDIO

A15 65W Into 8Ω; 100 W Into 4Ω; 190 W Into 8Ω (mono); with no more than 0.05% T.H.D. Variable slope limiter on each channel for up to 15dB of overload protection.

A30 120W Into 8Ω; 180 W Into 4Ω; 350 W Into 8Ω (mono); with no more than 0.05% T.H.D. Slew rate: 100V/msec. DC and subsonic sensing output relays.

A60 225W Into 8Ω; 350 W Into 4Ω; 650 W Into 8Ω (mono); with no more than 0.05% T.H.D. Slew rate: 100V/msec. LED Indication for signal present/thermal overload/fault.

PRO 700 360 W Into 8Ω; 550 W Into 4Ω; with no more than 0.09% T.H.D. Here's the amplifier that first turned professionals on to the Phase Linear sound. More durable and road rugged, it still delivers.

RELIABLY READY

That's the essential characteristic of these four new power amplifiers. In the studio, on the road, job after job, they deliver the kind of predictable, repeatable performance that professionals demand. Connect with your Phase Linear Pro dealer or us for details on all our products, including equalizers and active crossover.



4134 N. United Parkway Schiller Park, Illinois 60176 (800) 323-4815
In Illinois (800) 942-8833 A Division of International Jensen, Inc.

SCA Cautions

by Lee Poole

Basically, there are three situations to be aware of in the utilization of the SCA. The first is a 10% loss in audio modulation, which can be recovered with today's modern audio processing equipment, such as Optimod & Harris equipment.

The second is the term first referred to as "cross talk," whereby the main channel filters into the SCA or vice versa. This situation should not occur if your system is properly adjusted and in good operating condition.

Another concern could be the possibility of a nine or ten-kilohertz (kHz) whistle in the main channel, caused by combining the SCA and stereo. This so called whistle is not in the transmitted signal, but in the function of old stereo receivers.

Here, briefly, are the steps neces-

sary in predicting your SCA coverage area. Through extensive field testing, and years of experience, I feel reasonably confident in suggesting a rule of thumb to follow in predicting the range in which you should expect to work with your SCA. Don't be misled into thinking that the reliable SCA coverage is equal to that of your station's main channel. Although both signals travel via the same carrier, main channel has an 8 to 1 audio advantage over the SCA. The rule of thumb is to determine three circles of increasing size around the transmitter location of the SCA station.

Inner circle is the 1,000-microvolt, grade A predicted contour of the station. Within this circle, you should expect to serve all locations without problems. The next circle out is the

500-microvolt limit, in which you should sell with caution. A signal strength test should be made at each location prior to, and during, an installation. Outer circle is defined as the predicted 250-microvolt radius. In this band it is definitely dependent on each location, and advance testing is a necessity.

This of course does not take into account severe terrain features, such as a very high ridge or unusual low area. These will have a serious effect on coverage at FM broadcast frequencies. The radii of these three circles are tabulated in the following list, for a full facility station, in each of the three operating classes. Any station which operates with less than full facility, and power or height, must be reduced accordingly.

Class A 3-kw power at 300 ft. above average terrain
Station 14.9 miles—primary SCA area
 20 miles—sell with caution
 26.8 miles—probable trouble zone

Class B 50 kw power at 500 ft. above average terrain
Station 32.4 miles—primary SCA service area
 40.7 miles—sell with caution
 49.3 miles—probable trouble zone

Class C 100 kw power at 2,000 ft. above average terrain
Station 57.4 miles—primary SCA service area
 63.7 miles—sell with caution
 78.2 miles—probable trouble zone

This information should be helpful to contractors operating an SCA channel, or associated with an SCA service. □

Mr. Poole is Corporate Director of Engineering for Seeburg Music, Div. of Capitol Broadcasting Co.

AV control systems made simple: Z-MAC



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

1. You decide which equipment you want to control, then lay out your custom control panels with our easy-to-use Z-MAC design kit.

2. We pre-engineer, pre-wire and pre-package all the Z-MAC panels and modules and ship them to you completely ready-to-install.

3. You route the wire and plug in the modules.

It's just that simple! No need to re-invent for every application. And Z-MAC systems cost far less and install far faster than comparable built-from-scratch components. Z-MAC modules and panels are available for virtually every kind of AV equipment: projectors, videotapes, filmstrips, programmers, dissolvers, screens and drapes, dimmers, remote volume controls—you name it!

Send for your free Z-MAC design kit.

The kit includes everything you need to learn how simple it is to 'customize where it counts' with Z-MAC.

MACKENZIE

5507 Peck Rd., Arcadia, CA 91006 • Toll-free (800) 423-4147

JBL Industrial Series Loudspeakers.

Designed around the simple belief
that what goes up
should stay up.



Every time you install a distributed sound system you stake your reputation on its reliability and performance. And every time a piece of equipment fails, you lose. Not just the loss of profit that comes with make-good service calls, but a loss of goodwill and customer confidence.

At JBL, we understand the critical role product reliability plays in each of your installations. So we designed our new Industrial Series Loudspeakers to stand up to constant, long-term use under even the most adverse conditions.

Each speaker, for example, features a heavy-gauge steel frame that resists warping and corrosion. For maximum power capacity, the speakers utilize exceptionally large, aluminum voice coil formers and

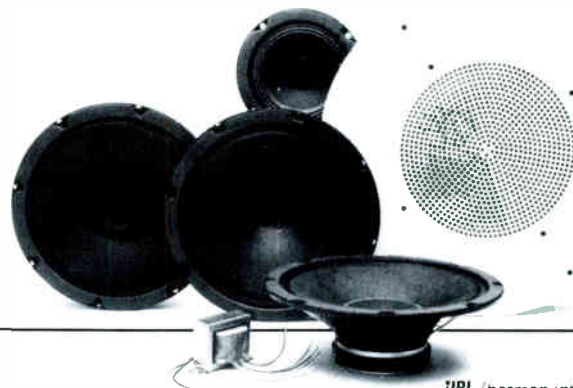
high-temperature adhesives. And to ensure high reliability, the loudspeakers are subjected to extensive environmental and power tests.

Of course, even the most dependable speakers can be a problem if they don't offer the performance you need. So JBL Industrial Series Loudspeakers are also engineered to provide unsurpassed on and off-axis frequency response and excellent intelligibility. Additionally, the speakers incorporate a cold-formed back plate that improves magnetic circuit performance. And for those applications that demand extended response, the Model 8140H Co-Motional™ co-axial loudspeaker features a high frequency element mounted directly to

the woofer cone. This unique design offers outstanding high frequency response while eliminating the diffraction problems normally associated with post or strap mount designs.

For maximum flexibility, the speakers may be ordered in a wide range of sizes and configurations to match the requirements of any installation. Optional accessories include a high quality, dual voltage transformer and a white, metal ceiling baffle. Best of all, the loudspeakers' reliability, performance, and flexibility are available at highly cost competitive prices.

So before you specify your next installation, look into JBL Industrial Series Loudspeakers. Because what goes up should stay up.



JBL Incorporated
8500 Balboa Boulevard, P.O. Box 2200
Northridge, California 91329 U.S.A.

JBL/harman international

SOUND LEVEL METERS

Part 4

by Daniel Queen

Use of Sound Level Meters in Sound Reinforcement System Measurement

With the exception of the response of motion picture theaters, no standard exists for the measurement of sound reinforcement systems. For motion picture theaters, the International Standardization Organization has issued Recommendation 2969-1977, which has its counterpart in American National Standard PH22.202M. This standard calls out

minimum requirements for the design of motion picture sound systems and provides recommendations for measuring these systems.

Generally, sound system measurements can be made at fairly high levels, on the order of 75-95 dB, so that smaller microphones may be used to avoid problems of diffraction. The amount of sound pressure generated depends on the capability of the sound system being mea-

sured. In general, the rms voltage output of the power amplifiers in the sound system should be kept 12 dB below the clipping point, to assure accuracy and to prevent damage to the high frequency drivers due to the random high amplitudes characteristic of random pink noise.

The problem in these measurements will occur at the extremes of the frequency response where, for example, at the low end the output capability of the drivers is going down and at the high end both the maximum output capability possibly going down and the equalization curve chosen may result in a substantially lower sound pressure level in the room than at mid-band. Thus, for example, a reinforcement system capable of producing average levels of 80 dB would be tested broadband at approximately 68 dB.


If most of the output were produced in the range from the 125-Hz octave band to the 4-kHz octave band, then the output in any one octave band would be approximately 60 dB. If the response is set, for example, according to the Motion Picture Academy curve, the 8-kHz octave band could be 17 dB down from this point or 43 dB, dangerously close to the noise floor of some quarter-inch microphones, which in that octave band is about 42 dB. Thus, care would be required to be sure that the measurement being made is of the sound system response and not of the test equipment noise.

At low frequencies the measurement problems are compounded by the nature of room noise. Indoor

EKTACOM L

The EKTACOM L is one of the best sounding, smoothest operating digital dialing, duplex intercoms available! It has decentralized logic which eliminates the expensive central 'switch'; every station has all-call which functions even if a conversation is in progress—(this lets you get through when the system is in 'busy') and costs dramatically less than multi-channel systems. Plug-in wiring, only three pair, circulating; UL Listed power supplies; incredibly rugged marine-industrial masters available nowhere else! Time tested circuits that work.

You should know more about the EKTACOM L! Write Today!



FB FISHER BERKELEY CORPORATION
5800 Christie Ave., Emeryville, CA 94608 (415) 655-9696

INTRODUCING THE SMART MIC* SYSTEM



**The world's first and only
Automatic Microphone System.
From Shure.**

*Microphones and Intelligent Circuitry

World Radio History

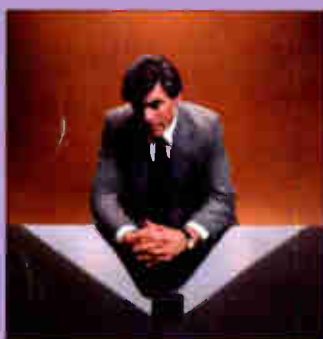
A trouble free microphone system to solve

The Shure Automatic Microphone System (AMS)—Complementary microphones, mixers and logic circuitry provide the key.

Now, the most aggravating problems brought on by multiple microphone installations can be solved. For the first time ever, Shure has combined unique microphone, mixer and logic technology into a dedicated, totally integrated system. A system where the microphones and mixer actually operate as one to provide the clearest, smoothest, most reliable automatic sound performance in the industry.

Smart Microphones—the newest angle on sound sensitivity.

Each microphone and mixer channel in the Shure Automatic Microphone System contains logic circuitry. This enables every microphone to act independently in the system when turning on or turning off. And, each microphone actuates only when addressed within a specifically tailored 120° acceptance window. Sound originating outside a microphone's acceptance window will not, in any way, actuate that microphone. In addition, each microphone continuously analyzes its own local acoustic environment allowing each channel to adjust itself



independently as audio conditions change. This unique feature assures quick and easy set up by eliminating time-consuming sensitivity or threshold adjustments.

Two microphone styles—an edge in design and versatility.

The surface mounted AMS22 Low-Profile Microphone features a revolutionary design—a look so unimposing, even a first time speaker won't shy away from it. The sleek AMS26 Probe Microphone is, in every way, the technological equal of the Low-Profile, and can be mounted on a table, floor stand, or gooseneck.



AMS22



AMS26

A system that works together to produce outstanding sound performance.

Advanced microphone, mixer and logic technology enable the AMS to turn on to the sound source quickly, quietly and automatically—and turn off with a smooth whisper. From beginning to end—no clicks, pops, noise “pumping,” or missed syllables. And, when more than

AMS8000 Mixer

- ① **Channel LED Indicator:** Lights when a microphone turns on.
- ② **Microphone Gain Control:** Controls channel volume only. The click-off “O” position is a “channel disable” feature. This eliminates unused microphones from the automatic gain compensation circuit.
- ③ **Master Control:** Controls output level of the combined microphone and aux input signals.
- ④ **Auxiliary Input Control:** Determines the level of the aux input.

- ⑤ **Headphones Output:** 1/4" phone jack, suitable for most stereo or mono headphones.
- ⑥ **Auxiliary Jacks:** Allows convenient connection to a tape recorder for playback or recording.
- ⑦ **On-Off Switch:** Push button controls power.
- ⑧ **Power-On LED:** Lights when the power is on.
- ⑨ **Normal LED:** Lights when the output level rises above approximately -20 dBV.
- ⑩ **Overload LED:** Flashes when the Line Mic, Aux., and Phones outputs approach clipping.



...the most troublesome audio problems.

one microphone is actuated simultaneously, the system provides automatic gain compensation to prevent the annoying problem of feedback.

What's more, AMS operation is so easy and automatic, an operator's only concern is adjusting the individual volume controls. Setup is also quick and easy. And, there's never a need for repeated readjustment after the system is installed.

AMS—the system with a built-in future.

Every Automatic Microphone System incorporates advanced logic terminals which provide unprecedented flexibility for expanding the system's capabilities. These special capabilities include:

- *Privacy or cough button.*
- *Chairman muting.*
- *Channel priority—lets one speaker override another.*
- *Filibuster capability—allows only one microphone on at a time, to prevent interruptions.*
- *Zone loudspeaker muting.*
- *Remote channel indicators.*

The AMS system can even be connected to a computer programmed for even more sophisticated control operations. And for large gatherings such as symposiums or congressional meetings, AMS mixers (both 4 and 8 channel available) can be easily linked to effectively control over 200 individual microphones. In addition, when connected with the optional microcomputer-based Shure AMS880 Video Switcher Interface



component, the AMS will control commercially available video switchers. In doing so, television cameras will automatically follow the microphone channel activity to visually monitor prescribed areas.

Reliability—on location.

The Shure AMS is so technologically advanced, its conception marks the beginning of a sound revolution wherever speech related, multi-microphone systems are employed:

Churches. Shure's AMS microphones turn on and off smoothly and quietly—greatly reducing muddy sound and feedback.

Courtrooms. A direct output on each channel easily connects to a multi-track tape recorder to provide a word-for-word account of the proceedings.

Meetings and Conferences. The optional filibuster mode prevents interruptions by allowing no more than one microphone to be on at any time.

Teleconferencing. AMS can reduce the distant, "barrel" effect caused by room reverberation.

Security. When an intruder's sounds activate an AMS microphone, a television camera can automatically switch to visually monitor the trespassed area.

Broadcasting. Accurate mixing is guaranteed during fast-paced news and talk shows.

- ⑪ **Off-Attenuation Switch:** Determines the amplitude of microphones that are not turned on. Keeping all microphones slightly on at all times contributes to smooth audio operation. Attenuation may be fixed at a recommended level of -15, or adjustable over a wide range.
- ⑫ **Link Jacks:** Links up to 25 AMS mixers together to provide an input capability of as many as 200 microphones.
- ⑬ **Hold Time Switch:** Determines how long a microphone stays on after the speaker stops talking. This delayed turnoff keeps the microphone on during brief pauses in speech.
- ⑭ **Line/Mic Level Output:** Provides the combined gated microphone and non-gated aux input signals.
- ⑮ **AMS Microphone Input:** The AMS mixer is supplied with either four (AMS4000 unit) or eight (AMS8000 unit) microphone inputs.
- ⑯ **Logic Terminals:** Connections to these terminals allow the AMS to perform a variety of sophisticated functions.
- ⑰ **Direct Output:** Provides a non-gated signal from that channel's microphone.



Specifications

AMS4000 & AMS8000 Mixer

Output Level:

INPUT	OUTPUT					Input Clipping Level at 1 kHz
	Line	Mic	Aux	Direct	Phones	
Microphone Input (72 dB SPL in)	+15.8 dBV (+18 dBm)	-34 dBV	+17 dBV	-56 dBV	-4 dBV	128 dB SPL
Aux Input (-22 dBV in)	+15.8 dBV	-34 dBV	+17 dBV	-	-4 dBV	+7 to +20 dBV*

*Depending on Aux control setting.

Frequency Response:

Aux Input to Outputs: 30 to 20,000 Hz \pm 2 dB
 Mic Input to Outputs: 70 to 20,000 Hz \pm 2 dB
 (controlled low-frequency rolloff below 50 Hz)

Outputs:

OUTPUT	IMPEDANCE		OUTPUT Clipping Level
	Designed for Use With	Actual (Internal)	
Mic	150 Ω balanced lines	1 Ω	-34 dBV
Line	600 Ω balanced lines	150 Ω	+15.8 dBV (+18 dBm)
Aux	10k or greater	2.2k	+17 dBV
Direct	10-50k unbalanced mic circuit	900 Ω	0 dBV
Phones	200 Ω	2.2k to tip 2.2k to ring	-4 dBV

Equivalent Input Noise:

27 dB SPL, A-weighted, with AMS26 Probe Microphone

Distortion:

THD 0.35% or less, 30 to 20,000 Hz at +15 dBm output
 IMD 0.5% or less up to +15 dBm output

Gating:

Attack Time: 4 msec
 Hold Time: 0.5 or 1.0 sec (switchable)
 Delay Time: 0.3 sec after Hold interval

Off-Attenuation:

Fixed: -15 dB Variable: $-\infty$ to -8.5 dB
 (Single mixer; attenuation increases as additional mixers are linked)

Operating Voltage:

105-132 Vac, 50/60 Hz, 20W. Can be rewired for 210-264 Vac, 50/60 Hz, 20W.

Dimensions:

Height: 89 mm (3 1/2 in)
 Width: 483 mm (19 in)
 Depth: 298 mm (11 3/4 in)

Weight:

AMS8000: 6.6 kg (14 lb 8 oz)
 AMS4000: 5.8 kg (12 lb 13 oz)
 AMS8000 (pkgd): 8.4 kg (18 lb 8 oz)
 AMS4000 (pkgd): 7.6 kg (16 lb 13 oz)

Certifications: Listed by Underwriters Laboratories, Inc.

AMS22 Low-Profile Microphone

Type: Condenser (electret bias)

Polar Pattern: Hemi-Cardioid

Acceptance Angle: Microphone turns on for sounds within 60° \pm 10° of front axis

Output Level: (Open circuit voltage at 1KHz)

-47 dB typical (0 dB = 1V/ μ bar)
 at AMS mixer direct output

Noise: 20 dB equivalent SPL typical, A-weighted

25.5 dB equivalent SPL typical, weighted per DIN 45405

Cable: Non-detachable 6.1m (20 ft), 2-conductor, shielded, with

3-pin professional audio connector to mate with Cannon XL series, Switchcraft A3 (Q.G.) series or equivalent connectors

Case: Black plastic base and brown steel-mesh screen with black trim

Dimensions:

Height: 31.8 mm (1 1/4 in)

Width: 88.9 mm (3 1/2 in)

Depth: 76.2 mm (3 in)

Weight:

Net: 174 grams (6.1 oz) including cable

Packaged: 360 grams (12.6 oz)

AMS26 Probe Microphone

Type: Condenser (electret bias)

Polar Pattern: Cardioid

Acceptance Angle: Microphone turns on for sounds within 60° \pm 10° of front axis

Output Level: (open circuit voltage at 1KHz)

-54 dB typical (0 dB = 1V/ μ bar)

at AMS mixer direct output

Noise: 27 dB equivalent SPL typical, A-weighted

32.5 dB equivalent SPL typical, weighted per DIN 45405

Connector: Three-pin professional audio type to mate with Cannon XL series, Switchcraft A3 (Q.G.) series, or equivalent connector

Case: Brown vinyl-enameled brass handle with brown steel-mesh grille

Dimensions:

Length: 144 mm (5 21/32 in)

Diameter: 35.9 mm (1 13/32 in)

Weight:

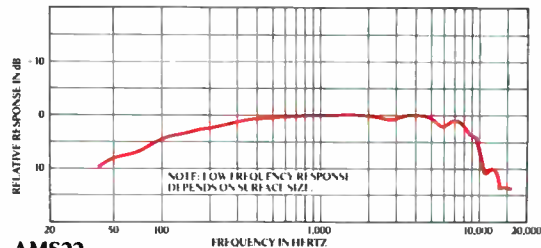
Net: 127 grams (4.4 oz)

Packaged: 366 grams (12.8 oz)

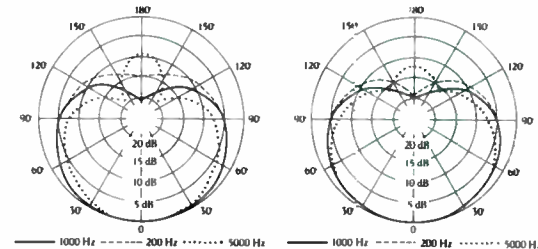
Furnished Accessories:

Windscreen RK229WS

Swivel Adapter A57D

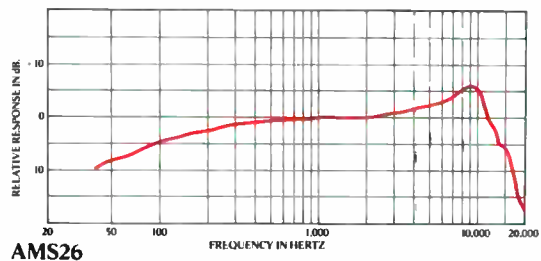


AMS22



AMS22

AMS26



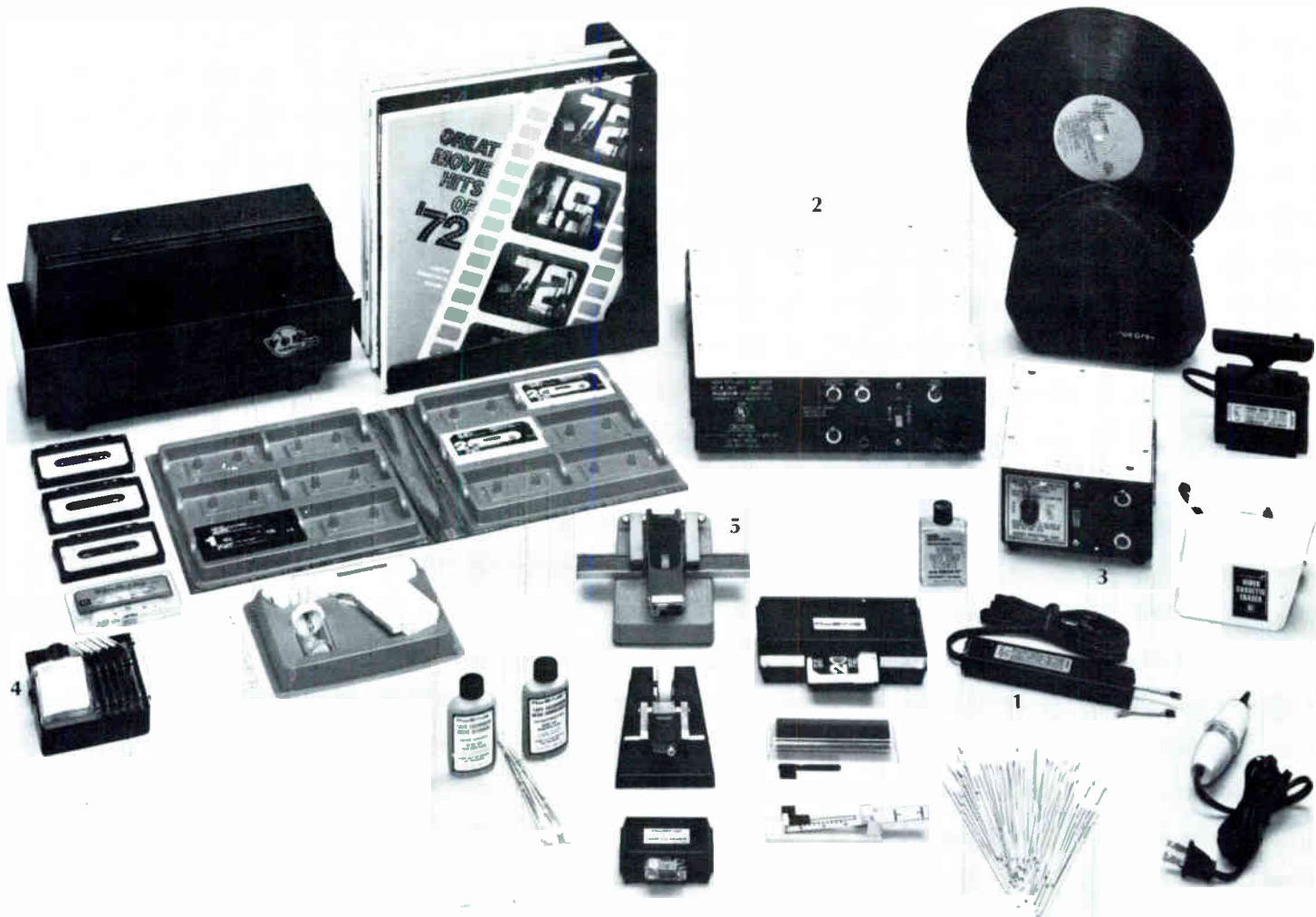
AMS26

AMS880 Video Switcher Interface

Write or call for specifications.

SHURE®

SHURE BROTHERS INC., 222 HARTREY AVE., EVANSTON, IL 60204



Robins Professional Accessories

Choose from Robins' complete line of accessories for professional quality care of your audio-visual equipment. These fine products are designed to deliver optimum performance and extend the life of valuable records, tapes, and audio and video equipment. For equipment maintenance, tape erasing, splicing, storage, and more, there's a Robins accessory for every need.

- 1 **Universal Head Demagnetizer.** An excellent all-purpose demagnetizer. Removes accumulated magnetism from heads and other metal parts for like-new performance and clear, distortion-free sound. Interchangeable tips permit use with most reel-to-reel, cassette, video and computer equipment. With switch 117V. UL listed. Cat. #25-023.
- 2 **Audio/Video Industrial Bulk Tape Eraser.** Erases audio and video tape up to 1" wide (3/4" helical scan video tape) on reels up to 17" diameter. Built-in blower, cooling system, overheat warning light and auto cutoff. Size: 12" x 14" x 13 3/4". Wt. 38 lbs. UL listed. Cat. #24-026.
- 3 **Audio/Video Bulk Tape Eraser.** Industrial grade, erases 1" wide (3/4" helical scan video tape) on reels up to 10 1/2" diameter. Features overheat warning light and auto cutoff, fused circuits, heavy-duty switch and power cord. Size 7 1/2" x 5 1/2" x 8 3/4". Wt. 17 lbs. UL listed. Cat. #24-022.

- 4 **VCR Head Cleaning Kit.** Powerful, safe, wide-spectrum, Freon® TF based cleaner. Removes plasticizers and dirt quickly and efficiently, extends life of expensive, sensitive heads. Maintains picture and audio quality, reduces tape wear. Features 5 long-reach, angled applicators with chamois-like tips to remove contaminants, and 1 oz. bottle of cleaner. Cat. #29-500.
- 5 **PROFESSIONAL "GIBSON GIRL"® AUDIO/VIDEO TAPE SPLICER**—Heavy-duty with precision features. The accepted standard of professional and industrial users. Tape guide and arms secure tape. Operating level has control knob for precise "Cut" and "Trim" positions. Produces "Gibson Girl" waists at sides of splice. Precision blade centering adjustment for lifetime accuracy. Patented.
 - 26-048 1/4" Audio/Visual Tape Splicer
 - 26-051 1/2" Audio/Visual Tape Splicer
 - 26-081 3/4" Audio/Visual Tape Splicer
 - 26-054 1" Audio/Visual Tape Splicer

For information on the complete line of Robins professional accessories, contact:

ROBINS

Division of Benjamin Electroproducts, Inc.
75 AUSTIN BLVD., COMMACK, N.Y. 11725 (516) 543-5200

BENJAMIN

spaces are rated by "Noise Criterion" curves (see Figure 14).

Noise Criteria curves are labeled with numbers similar to Sound Level decibels. However, the Noise Criterion number usually will be about 8 decibels below the corresponding measurement of the well-known "A-Weighted Sound Level" measured on a standard Sound Level Meter.

Thus, in a hall meeting an NC-35 criterion, the 63-Hz octave band sound pressure level of the noise would be higher than that produced by the sound system. The sound system could not therefore be properly equalized.

What, in fact, might happen is that the sound system installer measuring the background noise would reduce the low-frequency gain in his sound system resulting in a low-bass starved system—a condition not uncommon in recently opened movie theaters. The simplest solution, in this case, is to turn off all ventilation equipment during equalization, if possible, bearing in mind that excessive humidity will cause substantial errors at higher frequencies, due to the lack of molecular absorption that would be obtained were the dehumidification of the

ventilation system in operation.

Nevertheless, once the ventilation system has been turned off, the principal noise becomes the microphone itself—and the noise in the lower octave bands tends to be high. Thus, while the 63-Hz octave band, using the Academy Curve, is down 10 dB from the 60-dB mid-band reading, the internal noise of the mike is 65 dB, which again is higher to the measurement being made.

In such a case, a one-inch microphone would be required for the low-frequency equalization, while the

high-frequency response might be measured by driving the loudspeaker with a narrow band (1/3 octave) to obtain a higher level. Proper band level adjustments would have to be made.

The basic Sound Level Meter configuration is also the basis for other instruments often used in sound system design, installation and testing. These include filter sets, response plotters, real-time analyzers, and reverberation analyzers. These will be covered in subsequent articles. □

For your Business Music Customers



- Background/foreground
- Original artists
- Rent or purchase

Dealer inquiries invited.

Write or phone: 612-733-0447

Sound Products/3M
3M Center
St. Paul, MN 55144

3M hears you...

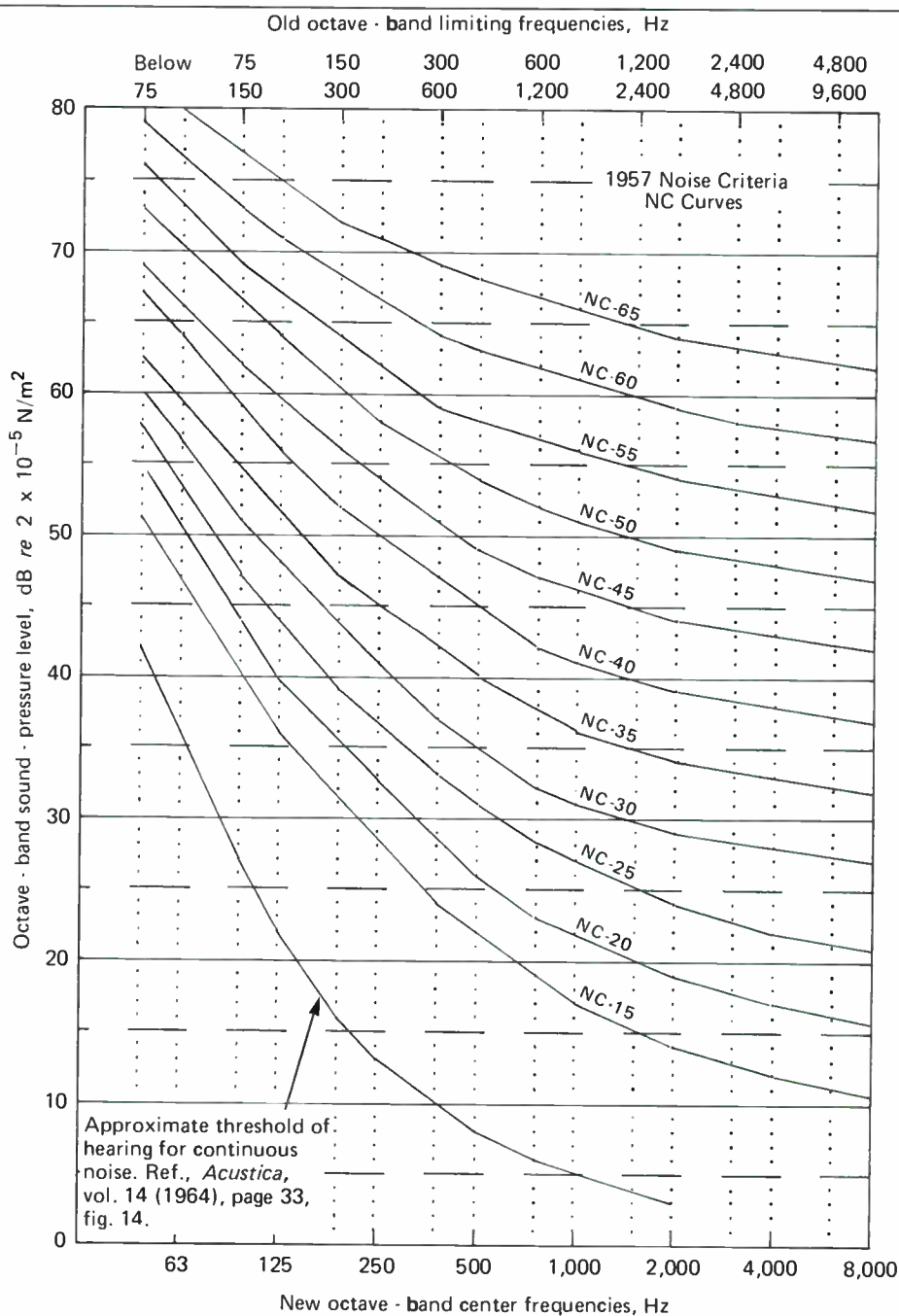


Figure 14.

From "Noise and Vibration Control" by Leo L. Beranek. Used by permission of McGraw-Hill Book Co.

Wouldn't it be easy to sell a total communications system offering radio paging, background music, time signalling, emergency alarm, smoke detection, after-hours security and a host of other easily-installed options... very cleverly disguised as the world's best intercom!

You bet. And recent sales figures prove it. It's ITT's microprocessor-based System 511E: Flexible enough to help your customers' businesses run smarter, faster and leaner. Designed for fast, easy installation. And priced to sell.

For more information on our distributor program go right to the top. Call our President, Ron Stone, at (212) 839-0500. And find out how the 511E can ring up profits for you.

ITT DESD

One World Trade Center, Suite 8927
New York, NY 10048



NEW PRODUCTS

PA. AMP

The Vecor 622 public address amplifier offers 30-watt voice power output with line voltage switchable from 12 VDC to 110/120 VAC, 60 Hz or 220/240 VAC, 60 Hz. An adapter is provided for converting the American-type plug to the European type.

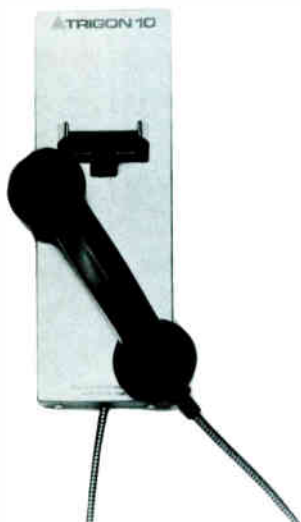


Two 50K-ohm microphone inputs are supplied, with a 100K-ohm auxiliary input, all with standard phone jacks. Individual controls allow mixing/level adjustment. Speaker output impedance is 8 and 16 ohms.

□ For more information write 346 on the inquiry card. Or write: Vidair Electronics Mfg. Corp., 150 Buffalo Ave., Freeport, N.Y. 11520.

DIALER/ACTIVATOR

A programmable, single-number automatic dialer/activator, Model 10, has a touch-tone-controlled circuit for remote control of an external



device, such as a door strike or a gate control. Simple to install, the device can activate equipment at any distance. It may be used to identify personnel, provide access to a secured entry location, notify

emergency services and activate auxiliary surveillance equipment.

□ For more information write 347 on the inquiry card. Or write: Trigon Electronics, Inc., 1220 N. Batavia, Orange, Cal. 92667.

COAX SPEAKER

The Model OA125 coaxial speaker now has a special "off-set" driver system: the 3-inch Piezo tweeter is offset to avoid symmetrical "standing wave" effects. Sound dispersion has also been increased, from 90 to 115%. These features offer increased power handling and smooth transition, without holes or dips in the cross-over range.

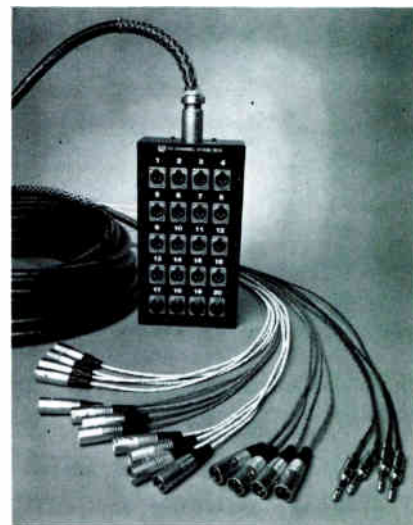


□ For more information write 348 on the inquiry card. Or write: Oaktron Industries, Inc., 1000 30th St., Monroe, Wisc. 53566.

AUDIO CABLE

Designed for sound reinforcement applications, portable sound systems and recording studios, Helix multipair audio cables come in 16 and 20-pair configurations. The individual strands of each conductor are twisted tighter than those in standard multipair cable, for greatly improved flex life. Each pair is then twisted to reject common-mode noise and 100% foil-shielded, to eliminate interference and crosstalk. The mutual capacitance

of each pair is over 10% lower than "off-the-shelf" cable, for improved high-frequency response. A tough matte-black jacket overall provides abrasion resistance and a distinctive professional appearance. The box is formed and welded from 18-gauge cold-rolled steel and finished in durable black epoxy paint. A hefty industrial wire-mesh cable grip provides positive strain relief. A trio of interchangeable panel connectors from Neutrik allows many options and easy retro-fitting to suit future system requirements. Male and female XLR and special 3-conductor latching-type phone jacks are available; all channels are wired in balanced configurations. All connectors are conveniently located in the cover of the box, secured with vibration-proof rivets and clearly identified with bold silk-screened numbers. At the other end of the cable, tough polyolefin heat-shrink tubing and a wire-mesh support grip provide ample strain relief for the individual "tails." Color-coded into groups of four, each channel is insulated with polyolefin, with the appropriate number permanently hot-stamped the full 36" length for easy, snarl-proof identification.



Standard connectors are diecast Neutrik XLR-types, with special chuck-style nylon cable clamps, rubber strain relief boots and shielded Switchcraft 3-conductor phone plugs.

□ For more information write 349 on the inquiry card. Or write: Pro-Co Sound, Inc., 135 E. Kalamazoo Ave., Kalamazoo, Mich. 49007.

INTERCOM

The DM-200 Series Office Intercom System provides communications for up to 28 master and staff stations and is suitable for offices, homes, medical centers, warehouses, and many other areas. Master stations feature digital station selection, tone calling, single-button all-station capability and a music control switch. The speaker-microphone is a 125 x 78 mm high-sensitivity type with voice frequency response. In-use indicators, automatically timed reset and modular plug-in connectors to 4-pair common cable are additional features. Staff stations have the same receiving and communication facilities.



Optional equipment is available to provide voice paging, handset, group call and system expansion. A remote adapter provides for remotely located door speakers, connections for 1 or 2 speakers connected in parallel, plus 1 and 2-tone chime calling for front and rear door.

□ For more information write 350 on the inquiry card. Or write: Tek-Tone Sound and Signal Mfg. Inc., 1331 S. Killian Dr., Lake Park, Fla. 33403.

INSULATOR



Clear Urethane Seal Coat is an electrical and electronic insulator that also seals out corrosion causing moisture and contamination. The stable, single component poly-

urethane coating dries fast, adheres well and forms a flexible, durable and non-corrosive film. It provides long term protection against rust and combines high dielectric strength and high surface and volume resistivity to make it a useful spray-on insulator for almost all electrical or electronic applications, such as printed circuit boards. It is available in 12-ounce aerosols and in 1 and 5-gallon bulk containers.

□ For more information write 351 on the inquiry card. Or write: CRC Chemicals, 885 Louis Drive, Warminster, Pa. 18974.

VOA

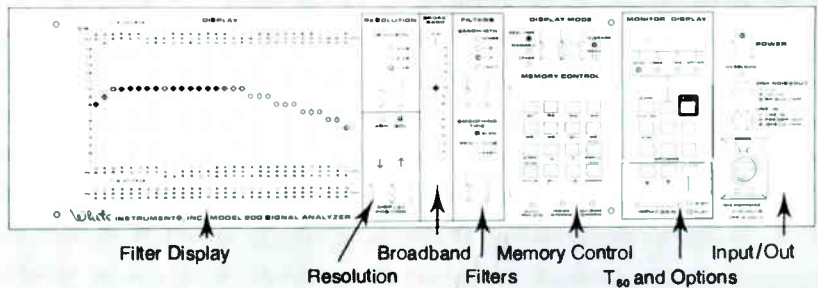
The Slim-Snap volt-ohm-ammeter, Model TD-6, is pocket size and features a 600-VAC rated fast-acting, high-interrupting-capacity fuse in its "ohmprobe." The instrument's low mass meter movement provides maximum protection against damage from shock. Operable with only one hand, the meter has teardrop-shaped jaws for easy use in tight places. Other features include a pointer lock for dimly lit locations, a range selector switch with color-coded window display, twist and

lock safety test leads, a safety swivel wrist strap, and a shock-resistant ABS plastic housing. The instrument is supplied with a carrying case, test leads, the ohmprobe and a battery.



□ For more information write 352 on the inquiry card. Or write: A.W. Sperry Instruments Inc., 245 Marcus Blvd., Hauppauge, N.Y. 11788.

THE EXPANDABLE SYSTEM 200



Advanced Microprocessor Controlled Real Time Analyzer.

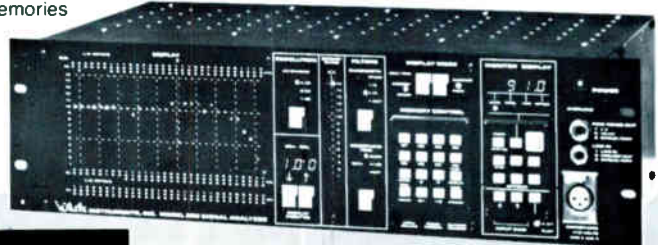
Featuring:

- Interchangeable Filters
- 45 dB Dynamic Range
- 16 × 31 High Intensity LED Display
- 8 Non-volatile Memories

- 3 Smoothing Time Constants
- Simultaneous Peak and Average Processing
- 0.5 dB Precision
- T_{60} Measurements

- 3 dB, 2 dB or 1 dB Resolution
- Built-in Pink Noise Generator
- 15 V Microphone Power
- Oscilloscope and Plotter Drive
- Optional Function Generator

All Functions
Microprocessor
Controlled.
Plug-in Options
Available



White

instruments, inc.

P. O. Box 698, Austin, Texas 78767 • 512/892-0752 • TELEX 776409 WHITE INST AUS

SWITCHBOX

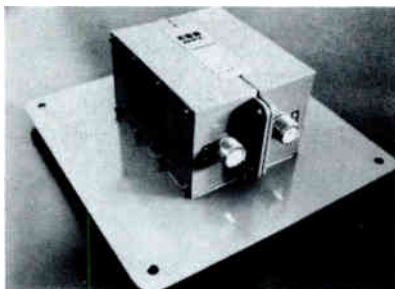
The VES-42 "Sens-O-Matic" switchbox series combines electronic switching with a broad selection of features. The device has four inputs and two outputs; any of the inputs may be directed independently or simultaneously to either of the outputs. This permits such functions as viewing one channel while taping another, directing a program or prerecorded tape to two sets, etc.



The solid state unit has no moving parts; it offers a membrane touch-control faceplate and LED indicators which show which input or output has been activated.

For more information write 353 on the inquiry card. Or write: RMS Electronics, Inc., 50 Antin Place, Bronx, N.Y. 10462.

COMBINER/DIVIDER



The 30/70 MHz Combiner/Divider can reduce the cost of antenna installation by allowing the use of a single antenna or single coax run for mobile base stations and repeater stations. Maximum insertion loss is .25 db; isolation 30 dB, min.; VSWR both bands 30.0 dB, min.; power handling 35 watts at 70/80 MHz, 450 watts at 30/40 MHz. The device is especially suited to a simulcast paging repeater station.

For more information write 354 on the inquiry card. Or write: Radio Page Communications, 2 Pendleton Dr., Cherry Hill, N.J. 08003.

LOUDSPEAKER SYSTEMS

A two-way loudspeaker system, the TA-12, has capabilities of up to 300 watts continuous program, sensitivity of 103 dB SPL, 1 watt, 1 meter, a nominal impedance of 8 ohms, and frequency responses of + or - 3 dB 125 Hz to 17 kHz, and + or - 6 dB 70 Hz to 19 kHz, respectively. Time offset correction techniques utilize sophisticated filter networks and precisely calculated speaker placement to insure that sound from both drivers reaches the listener's ear at exactly the same time. The resulting sounds are reproduced in a natural sequence, and are most realistic.



Two drivers are employed: a constant directivity-type horn/tweeter that reproduces frequencies above 3.5 kHz, and a 12-inch loudspeaker with a rear-vented, 80-ounce magnet assembly. The horn/tweeter is protected by a specially-designed "passive limiter." More than a simple circuit breaker, the limiter actually dissipates excess energy, and prevents component failure without switching the unit off. Offered in either floor monitor or rectangular configurations, each TA-12 cabinet is ruggedly constructed with interlocking joints and birch baffles for maximum strength and durability. Exteriors are constructed of domestic or birch plywood. The domestic plywood cabinets feature a black textured paint finish, and the imported birch cabinets are handsomely stained with dark brown walnut oil.

For more information write 355 on the inquiry card. Or write: Bag End Modular Sound Systems, Inc., P. O. Box 488, Barrington, Ill. 60010.

EXTRA

copies of the
SOUND & COMMUNICATIONS
1982 BLUE BOOK
the unique
Annual Purchasing Directory

Copies are still available,
IF you hurry!

\$8.50 each - check or cash with order,
please, to

Sound Publishing Co.
156 East 37th St.
New York, N.Y. 10016

ENCLOSURES

A line of heavy-duty chassis enclosures, the CH Series, is of modular, rack-mount design, tooled for communications, electrical and electronic equipment packaging.



Available in four standard EIA rack panel heights (3.5, 5.25, 7 and 8.75 inches), the enclosures are 19-inch rack wide, 19 and 12 inches deep. Precision die cast aluminum front handles act as both structural members and EIA rack-mounting brackets. Four extruded aluminum mount rails connect the sides together, allowing removal of top, bottom, front, and rear panels for easy access. Solid or perforated top and bottom covers are available. Options include additional chassis mounting rails, horizontal or vertical mounting chassis, and solid bearing chassis slides.

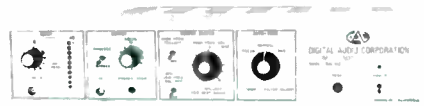
□ For more information write 356 on the inquiry card. Or write: Tracewell Enclosures, Inc., 7032 Worthington Galena Rd., Columbus, Ohio 43085.

VOICE FILTER

The DAC150 automatic voice filter may be used to enhance voice signals and remove degrading noise in communications and law-enforcement applications. It can restore unintelligible tape recordings, among other uses. The self-adjusting device has an internal computer-based processor which analyzes the input audio and distinguishes between correlated noises and voices. The noise components, which include buzz, room acoustics, tones, reverberations, and other

background noises, are precisely filtered, leaving the voice essentially unmodified. The filter continuously analyzes the incoming noise and is able to track and reduce varying noises, such as music masking a voice. The DAC150 has been specifically designed for non-technical users. The operator merely adjusts the input and output volume levels and sets the shaper tone controls for the most pleasing audio. The precise noise filtering is carried out automatically, without operator interaction. Application of the unit is straightforward: it may be

installed between a tape player and a recorder. A noisy recording would thus be played into the filter, and its enhanced output simultaneously recorded, producing a new copy. The original recording would be altered.



□ For more information write 357 on the inquiry card. Or write: Digital Audio Corp., 2042 W. Lincoln Ave., Anaheim, Cal. 92801.

225 W per Channel In Only Three Rack Spaces. The UREI 6300.

And, 750 watts in mono! That makes the UREI 6300 the most powerful amplifier of its class. More important than its compact size is its clean sound... in fact, you could compare the sound to the most esoteric *audiophile* amplifier. But, the 6300 is built to give the same performance day after day, night after night.

The 6300 was designed for the rigors of the working sound professional. The rugged chassis and extruded front panel make the 6300 extremely roadable and the continuously variable fan helps assure reliable operation. A totally modular chassis assures fast, easy service in case of difficulty with this rugged and reliable amplifier.

Electronically, the 6300 is also built to UREI quality standards, to provide extremely clean and transparent sound. Hear the UREI 6300 at your professional sound dealer today, or contact UREI for more information.

Uri From One Pro to Another

United Recording Electronics Industries
a URC Company
8460 San Fernando Road
Sun Valley, California 91352
(213) 767-1000 Telex. 472 0889 UREI SNVY
Canada: E.S. Gould Marketing, Montreal



© UREI 1983

Telephone Usage Control

by Fred Goldstein & Nelson Hanover

One of the most popular features to come from the computerization of the telephone is Station Message Detail Recording (SMDR). This ability to measure each telephone extension's usage and provide detailed cost allocation reports has been the key factor in making telephones a manageable resource. Unfortunately, SMDR has often been a very costly feature in terms of up-front costs. Many users have had a hard time justifying the investment.

A complete SMDR system has three basic functional subsystems: data gathering, data recording, and data processing. The cost of each of the three subsystems has come down considerably within the past few years, and proper selection of an SMDR system can provide substantial savings over the costs of more traditional approaches to management.

Data gathering predates the electronic PBX era

The first SMDR systems were available in the early 1970s as add-ons to electromechanical PBX or centrex systems. All three component subsystems were relatively costly. A typical SMDR data collection unit required an interface device across each PBX line, connected to a port on a scanner circuit. The scanner port monitored the activity on the PBX and allowed each extension's dialing to be tracked and recorded. For each call, or even (in some devices) each time the extension went off-hook or rang, a record would be output to the data recording unit. The cost of a scanner subsystem was basically proportional to the overall PBX system's

size.

The major breakthrough in this portion of the SMDR picture came about with electronic PBXs, whose common control circuitry was able to provide data output without additional scanning circuitry. As long as a single computer processed activity for all calls anyway, it was only a minor matter to output data records about each call to a single point. Today almost all PBXs being marketed have some provision for SMDR output.

SMDR may involve some extra costs on a PBX nowadays, for additional hardware like a computer interface card, and a license fee for the software feature, but the cost is generally much less than it would be for a scanner unit. Scanners are still available for those who need them from Conrac Alston and General Dynamics' Com Dev unit, but their popularity is declining.

AT&T has upgraded its No. 1 ESS central offices that provide centrex service to be able to provide full SMDR detail as well, in addition to the message toll billing feature that has always been a part of that package service. SMDR with centrex is generally provided for a monthly fee plus a per-call charge. Dimension PBX is able to provide SMDR to several different output devices with Feature Package 4 and Feature Packages 7 and above.

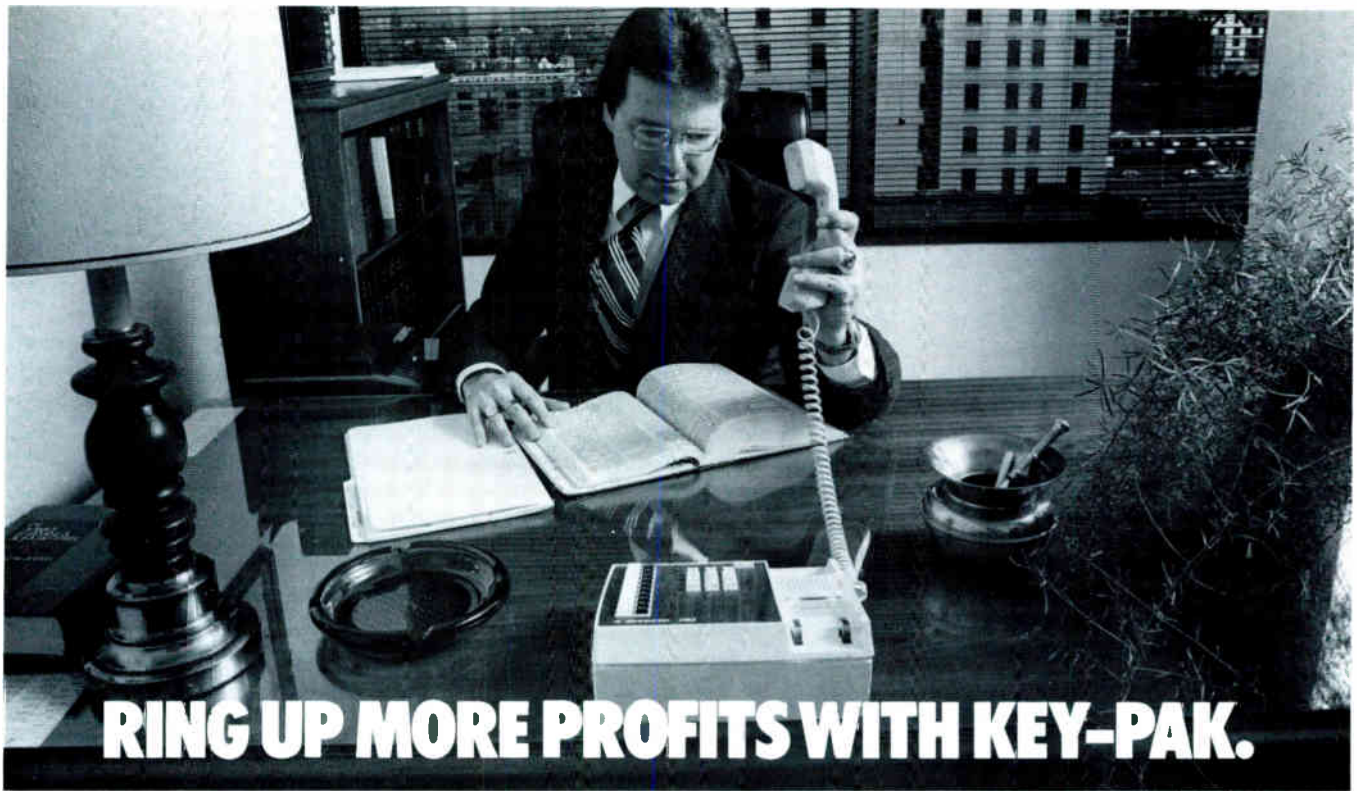
While most PBX users are concerned primarily with outgoing usage measurement, some systems provide output for incoming and internal calls. The computerization of the data gathering function has made the raw output of this stage somewhat more functional than

before. The earliest "event recorder" SMDR units recorded all call activity, and required considerable data processing to filter out unwanted records. Later units, including many PBX data output features, permitted calls of less than a certain duration to be ignored, and can selectively record calls made on certain trunks and not on certain other trunks. Some can even ignore or record calls based upon the number dialed. The Rolm CBX, for example, allows a table of prefix codes to be defined as an "exclude table." Calls to those prefix codes (such as local calls on flat-rate trunks) are left off while toll calls are recorded. Since the cost of data processing can increase as the quantity of data collected increases, this feature can save money as well as extend the time before the recorded medium (tape, disk, etc.) needs to be changed.

Data recording device choice grows

Since the earliest SMDR systems were intended to accompany large telephone systems, they required high-capacity data storage devices. This usually meant 9-track magnetic computer tape. About the only other commonly available output devices were printers and paper tape. Printed output was not especially useful, because it needed to be keypunched before it could be processed to provide cost data; it usually accompanied paper tape punched on a Teletype or similar printing terminal.

While 9-track tape is very widely used in the computer industry, and its formats are standard among most computer vendors, it does not come



RING UP MORE PROFITS WITH KEY-PAK.

You'll register more sales and profits when you offer Key-Pak™ from Tele-Path. The 1A2 key system that's ideal for so many different businesses. Because it's so versatile, you can customize the capabilities of any phone system. Large or small. New or old.

And Key-Paks can form the core of an all-new system that you can quickly and easily create, too.

GET ONE TOTALLY INTEGRATED SYSTEM FROM ONE SUPPLIER.

The Key-Pak System begins with the installation of our 302A Tone Dial Intercom. This Key-Pak equips an office with a network of up to 27 phones which can make and receive inner-office calls.

With the addition of a 349 Key-Pak, a standard business telephone can be turned into a handsfree response system.

Other standard features include station busy, camp-on busy, busy override, privacy (with privacy phones), and add-on conference.

THE MORE KEY-PAKS, THE MORE IMPRESSIVE THE PHONE.

For any business that's growing, a phone capable of assuming more

sophisticated features is essential.

That's why Key-Pak provides popular options like:

- **TPI349A KEY-PAK™ HANDSFREE TALKBACK**

Works with the TPI301A or TPI302A Intercom to provide call announcing with handsfree reply. Permits mixing of handsfree, buzzer and ringer signaling.

- **TPI304A KEY-PAK® EXPANSION UNIT**

Expands TPI301A or TPI302A Intercom from 27 to 55 stations.

- **TPI321A BASIC LINK EXPANDER**

For first nine stations.

- **TPI322A AUXILIARY LINK EXPANDER**

For each additional nine stations.

- **TPI345A OFF-PREMISE STATION ADAPTER**

Provides access up to three off-premise stations with bridged ringing over a loop of up to 2000 ohms.

- **TPI346A TRUNK ADD-ON®**

Permits a call on any one of 4 central

office trunks to be extended to an intercom-only station of a key system.

- **TPI378A KEY SYSTEM MULTI-ZONE PAGING ADAPTER**

Paging access for four zones plus all zones simultaneously.

OUR MODULAR APPROACH MAKES MORE SENSE FOR CUSTOMERS. AND MORE DOLLARS FOR YOU.

Tele-Path's unique modular approach to 1A2 key systems allows customized expansion with exactly — and only — the options your customers need. And allows connection of speaker phone dialers and all standard auxiliary equipment.

So you can count on a high return business as the businesses you equip with Key-Paks grow and require additional phone capabilities.

And with off-the-shelf delivery, you can get whatever Tele-Path product(s) you need practically overnight.

Call or write Tele-Path today. We'll make your phones and cash register ring with response from customers.



Tele-Path Industries, Inc.
2760 Mary Linda Avenue, N. E.
Roanoke, VA 24012 (703) 982-8844

cheap. A modest drive unit often costs more than \$10,000, which is hardly affordable for a small PBX user. While a 600-foot (7-inch diameter) reel of tape can hold more than 100,000 records, few systems with less than 500 extensions need that type of capacity. Magnetic tape cartridges and cassettes are less costly, and can store a few thousand records on a single cartridge. Cassette drives cost less than half as much as a 9-track unit. Unfortunately, standards are less common in these media. A PBX may use a Techtran cassette storage unit, for example, and its reports can be

processed by a service bureau using a Techtran of its own. But some other digital cassettes may be unreadable by that same service bureau. Except for the SMDR service bureaus, relatively few computers have cassette capacity. Thus, the choice of a service bureau or in-house computer is limited. This should be considered in selecting a recording unit.

Floppy disks, inexpensive magnetic storage units that have become popular with mini- and microcomputers, are also found in some PBX installations. An 8-inch floppy disk can store several thou-

sand call records, and newer units have double density and two-sided recording capacity. Because formats were standardized by the computer industry a few years ago, most computers with floppy disk drives can talk to most others. The cost is generally under \$3000 for a single floppy disk drive and its associated control circuitry.

Rolm builds a floppy disk drive into its CBX line of computerized PBXs, as an option for SMDR (which it, like some other vendors, calls "Call Detail Recording," or CDR). However, they provide two different disk formats: the "IBM" format, which is an industry-standard, and the "Rolm" format, which can only be read by their own service bureau, the Rolm Analysis Center. The Rolm format fits more calls onto each disk, but locks the user into one service bureau, Rolm's, because standard computers cannot read it. Floppy disks are also supported by Bell's Dimension PBX via a unit called the Comm-Stor.

Another approach to data storage forgoes any "permanent" magnetic recording medium, instead storing call details in a computer memory. Both solid-state RAM (read/write Random Access Memory) and magnetic core are found. RAM is volatile—it loses its contents from long-term power failures—but a local memory is used only for short-term storage until the data is either processed or copied onto a different site by means of a polling unit. This is relatively inexpensive, since RAM is now quite cheap, as are the microprocessors that control it.

Some SMDR service bureaus will poll memory units located at their customer's premises, using a telephone line and modem. A multi-site user can also purchase a poller equipped with a single recording device and record the data from a number of PBXs onto a single place. A typical polling system dials up each pollable memory unit daily, verifies data transmission, and clears the local memory to go until the next polling time.

Data processing is often the biggest expense

By itself, a record of each call made on a PBX system is quite useless. To create useful management reports requires a computer programmed to determine the cost of each call, sort the calls by

MONEY TALKS.

ARE YOU LISTENING?

If you're not handling Aiphone's line of intercom systems, you're missing sales.

Want proof? Compare the intercom line you handle to Aiphone. Can it meet *all* your clients' communication needs? Aiphone will. We have a versatile selection of 24 different systems.

Compare availability. Aiphone processes your order within 24 hours. And we stock a three month supply of over 200 items.

Compare promotional support. Aiphone's advertising program is the best in the business. It pre-sells your customers for you. What's more, we supply 4-color sales and promotional literature free of charge.

Compare quality. Aiphone gives you something else that no other intercom system can offer: Aiphone quality. That means maintenance free reliability for your customers. And no call backs for you.

More sales. And good margins. Money talks when you handle Aiphone. Call today and ask how you can add Aiphone to your product line.

AIPHONE Smart talk for the 80's.

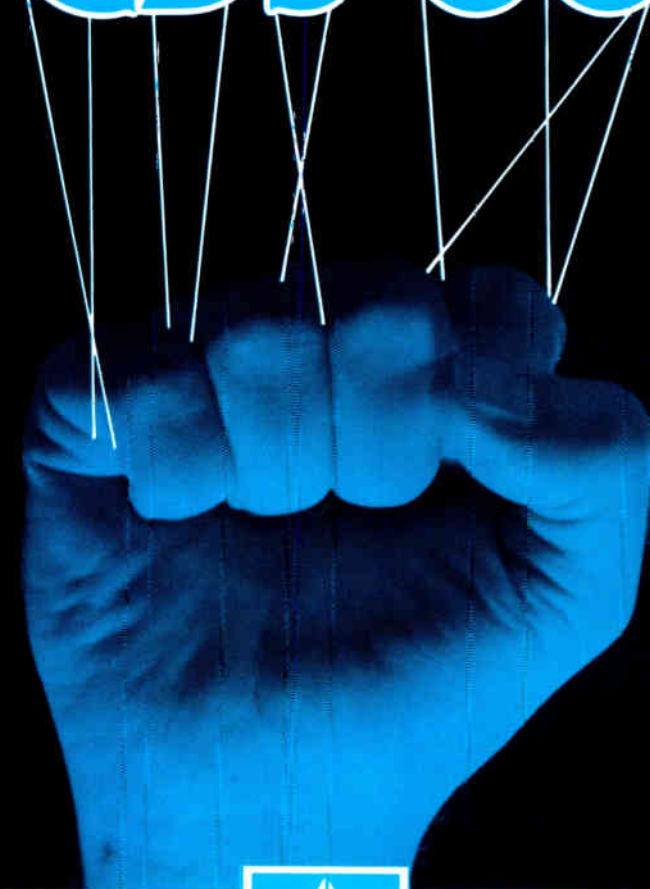
1700 130th Ave. N.E.
Bellevue, WA 98005
206-455-0510/Telex 32-0288

24 SYSTEMS: Two Station •
Loud Speaker • Telephone Type •
Speaker Phone • Special Applications



SEIZE THE OPPORTUNITY!

EDS '83



Don't miss the only time and the only place that the total electronics distribution industry meets. The Electronic Distribution Show and Conference is the critical element in forging your future.

EDS offers you the opportunity to hone your competitive edge and increase profitability. You'll meet with suppliers, present and potential, to plan for profits, to undertake new programs, to solve old problems. You'll profit from exposure to new ideas, from the NEDA Management Conference, from the NSCA Sound Conference, from the experts, from your peers.



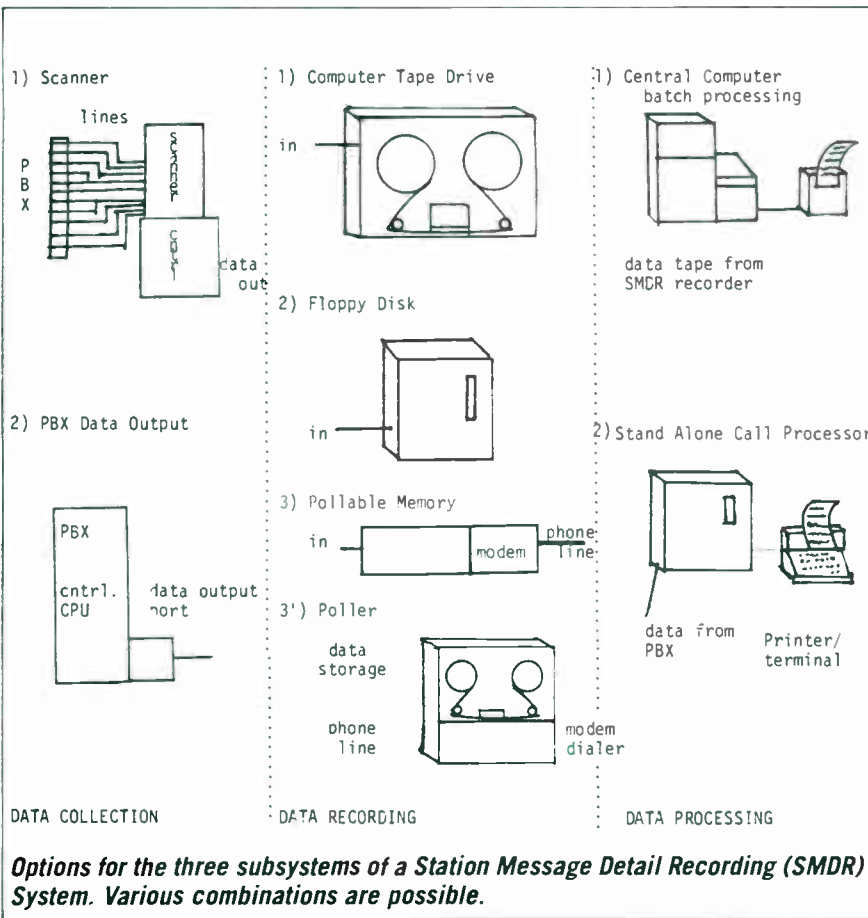
1983 ELECTRONIC DISTRIBUTION SHOW AND CONFERENCE

Las Vegas Hilton Hotel
Tuesday, Wednesday, Thursday, May 3, 4, 5

NEDA Management Conference,
Monday, May 2

For badges and hotel reservations contact
ELECTRONIC INDUSTRY SHOW CORPORATION
222 S. Riverside Plaza, Suite 1606
Chicago, IL 60606
Telephone 1 312 648-1140.

**DON'T LET YOUR COMPETITOR SEIZE YOUR OPPORTUNITY.
MAKE YOUR PLANS NOW TO BE AT EDS.**



extension, department, and various other parameters, and print a report. Most of the earliest SMDR analysis programs were rather similar. Generally written in COBOL for running on a large-scale mainframe computer, these programs were costly to run and could only be licensed from their vendors for large sums (typically \$10,000 to \$20,000). The service bureau approach was thus more popular and remains so; the cost per extension for a monthly SMDR report generally runs between one and two dollars.

It still takes a large computer to handle the volume of data found in many large PBX usage reports, and to handle the data base that associates each dialed area code and prefix with a city and cost. What has occurred, however, is the emergence of a simpler type of analysis capable of providing "95-percent accurate" cost allocation and reasonably comprehensive reporting. Stand-alone call detail processors are now marketed by several companies, including Bitek, Com Dev, TMS, and Sax. All include some form of data recording and processing. The Com Dev Call Quest can store between

stor-com

Total System Concept

Stor-Com offers you:

Superior

- Quality
- Versatility
- VALUE

Featuring

- Two talk paths
- Two Page Zones
- Compatibility with existing 300 series systems
- Electret Microphone
- Single screw removal of phone from subpanel
- Plug in construction
- Stor-Com design simplicity and dependability
- **OUTSTANDING PRICE**

Call us today for Information on all of Stor-Com's Total System Concept Components.

Toll Free Number
1-800-835-2256

Communitron Corp. 1429 N. Halstead
Hutchinson, Kansas 67501

3303
Paging
Telephone

New

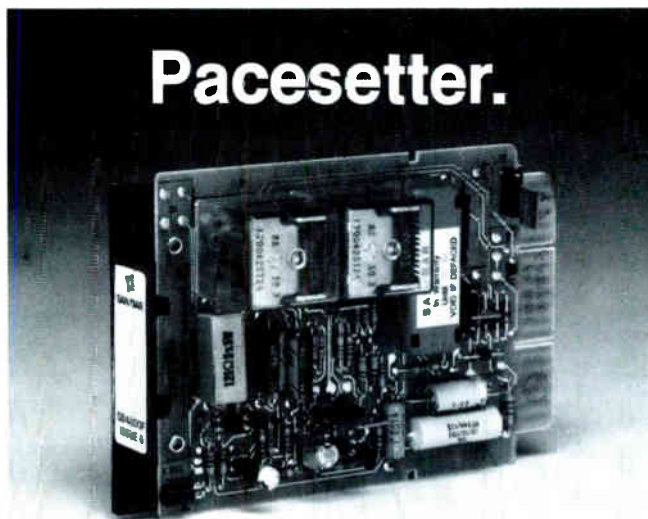


five and ten thousand calls on its floppy disk, about the same capacity as the Bitek Ascend which uses magnetic core memory. The TMS Zap-Call can store up to fifty thousand calls on a floppy disk. The Sax 1100 has optional core memory for as many as 150,000 records.

None of these devices is really suitable for the large or very sophisticated user who needs full reporting capacity. With typical installations costing up to and above \$20,000, stand-alone call processors are not suitable for very small PBX users either. But for the medium-sized (100-1000 line) user concerned with providing accountability for telephone usage, these units are often quite suitable. They provide certain features, such as reports available on demand (instead of monthly), that are not feasible with large computer or service bureau processing. Turnaround on reports is also almost instantaneous, unlike most (or all) service bureaus.

Finally, the most recent approach is to integrate report generation into the PBX itself. While some active computerized telephone management systems, such as the Data-point Infoswitch, have long been able to produce reports, the first PBX-based reporting package is the Rolm CBX Management Reporter (CMR). While CMR does not provide detail reports for all extensions, due to limited storage capacity, it can accumulate details on designated extensions, as well as costs by department and division, and provide special reports on demand. CMR can be a substitute for full-scale SMDR reporting or a supplement to floppy disk storage leading to service bureau processing. While not an inexpensive option, it is a novel approach that may well be emulated in the future by many other PBX vendors. General Dynamics, which acquired Com Dev some time ago, has added a larger stand-alone processor called the Data Bank, with a nominal capacity of up to 200,000 calls and 2000 extensions. Northern Telecom has also announced a stand-alone processor option, to be connected to its SL-1 PBX. □

This article initially appeared in Trends in Communications Management, a monthly newsletter published by TELEMATION.



Pacesetter.

When San/Bar first designed the SB4000F KTU line card for use in 1A2 Key Systems, it quickly became the industry standard. And, it still is today!

As key systems and applications have become more and more sophisticated, the SB4000F has continued to set the pace in modem line card flexibility. San/Bar has designed and built the latest in 1A2 for 20 years, and our expert engineering staff intends to keep it that way.

So, next time you need line cards, or any 1A2 key telephone equipment, ask for San/Bar. Continuing to set the pace in 1A2.



SAN/BAR Corporation Business Telephone Systems Division

2405 South Shiloh Rd.
Garland, Tx. 75041
Phone: 214-840-2710
Toll Free: 1-800-527-4837



First Place.

San/Bar has earned its position of leadership in the 1A2 marketplace with a solid record of innovation in cost-saving features and applications engineering.

Our customers tell us they get fast answers from friendly people in our technical services group. And our marketing and sales personnel are committed to helping you make the most of your 1A2 marketing plan.

Our products and our people have made San/Bar the first place to go for 1A2 for 20 years. That's why you should ask for San/Bar in the first place.

Our line cards have made us a leader in the field for years...now we're taking the lead in key systems.



SAN/BAR Corporation Business Telephone Systems Division

2405 South Shiloh Rd.
Garland, Tx. 75041
Phone: 214-840-2710
Toll Free: 1-800-527-4837

NEW LITERATURE

For free copies, write company names on the inquiry card.



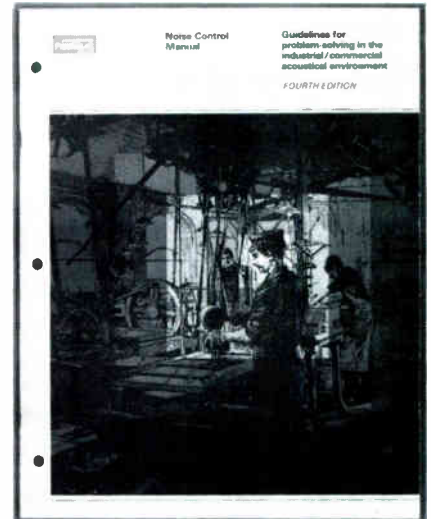
I.D. PRODUCTS: A booklet from Seton Name Plate Corp., New Haven, Conn., shows more than 240 identification products, including truck signs, decals, name plates, employee badges, valve tags, pipe markers, etc. Featured are such

items as electrical conduit markers, pocket-size wire marker books and self-sticking property identification name plates.

SOUND REINFORCEMENT: The Professional Sound Reinforcement Catalog from Electro-Voice, Inc., Buchanan, Mich., compiles data on loudspeaker components, systems and accessories. In addition to performance specifications, it offers special sections on how the firm tests and rates its drivers, and a discussion of the meaning and purpose of constant directivity horn technology.

PLENUM CABLE: An explanation of how to achieve economical installations in plenums and other air-handling spaces, without using rigid metal conduit, is the

highlight of a brochure from Berk-Tek, Reading, Pa. Both plenum cable and fluoropolymer insulation systems are defined. Among the typical applications illustrated are inside telephone and teleprinter systems, CCTV and intercom, paging, background music, fire alarm and security systems, computer interconnect and CATV network installations.



NOISE CONTROL: "Guidelines for Problem Solving in the Industrial/Commercial Acoustical Environment" is the title of a manual by Owens-Corning Fiberglas Corp., Toledo, Ohio. The 40-page publication incorporates data on new materials and test reports applicable to industrial, commercial and institutional buildings. It discusses reducing noise at the source, along the path, and at the receiver. The manual proposes a methodology for control of reverberant sound in auditoriums, gymnasiums, stores and other commercial buildings, and in industrial facilities. There are acoustical statistics on sound absorbing and sound attenuation materials.

COUPLERS: Designed as a quick reference to FCC-registered voice-connecting and data-access arrangement services, the Voice & Data Coupler Guide from C-E Elgin Electronics, Waterford, Pa., makes selection of the arrangement easier, by means of the simplified equipment diagrams provided. A useful "What It Does" reference permits customers to suit the coupler to the application.

think ambicon™

for a sound PA paging system



in factories,
shopping malls, airports, lounges,
mass transit systems, racetracks,
you name it, you profit.

The Ambicon listens to ambient noise and automatically adjusts PA levels to compensate for variations. Ambicon, preferred in sound reinforcement by leading professionals. Increase profits and reliability. Call or write today for the complete story.

ProTech Audio (516) 584-5855
Flowerfield Bldg #1
St. James, N.Y. 11780

TIP & RING

TELECOM PLUS INTERNATIONAL, INC./LONG ISLAND CITY, NY, HAS NAMED NOEL L. CAMBORDE director of operations. In his new position, Camborde is responsible for coordination of the company's technical services and for standardization of methods and procedures for installation and repair, productivity, cost control and transmission services.

S M TELECOMMUNICATIONS CORP., FAIRFAX, VA, HAS BEEN ESTABLISHED BY THOMAS SULLIVAN AND PETER MADSEN to manufacture telecommunications ancillary products — a hook-switch flash circuit for use with electronic PABXs and the CCA-1, a common carrier access dialer. Peter Madsen is president, Thomas Sullivan is vice-president, engineering.

THE U.S. COURT OF APPEALS/DISTRICT OF COLUMBIA, HAS UPHELD THE 1980 FCC DECISION TO DEREGULATE THE TELEPHONE INDUSTRY. The unanimous decision by a 3-judge panel upholds the Computer II FCC directive which deregulated the telephone equipment market. The court also upheld the FCC's decision to allow AT&T to enter unregulated competitive businesses by setting up separate subsidiaries.

The court's decision, written by Judge Edward Tamm, does not directly involve the recent anti-trust settlement between AT&T and the Justice Department. But without this ruling, the FCC would have had serious difficulties overseeing the breakup of the Bell System and pursuing its efforts to introduce competition into the communications marketplace.

Commenting upon the decision, Thomas J. Casey, a private attorney who, as a commission official, helped formulate Computer II, said: "Assuming this is upheld on any further appeals, what this means is that one of the central elements in the restructuring of the American telecommunications industry can now be relied on as secure."

TANDY CORP./FT. WORTH, TX, HAS BOUGHT THE ASSETS OF INTERCONNECT TELECOMMUNICATIONS SYSTEMS, INC./LEXINGTON, KY, for an undisclosed price. Tandy Corp.'s John Roach, chairman and chief executive officer, said that the move was prompted by the greater competition in the growing telecommunications area. Tandy currently sells telephones and related equipment, such as answering machines, at its Radio Shack stores. The company intends to mesh its mostly consumer-oriented products with Interconnect's business-oriented PBX systems.

Tandy's telephone and related-equipment sales grew about 35% during their fiscal 1982, which ended June 30, and accounted for about 6.5% of their \$2-billion sales total for the year. For the same period, Interconnect's sales were about \$8.5 million. Timothy Diachun, Interconnect's chairman,

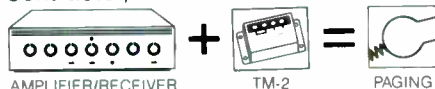
will join Tandy in a new position as the Radio Shack Division's vice-president of telephone marketing.

Other communications products that attract Tandy, Roach reports, are pagers for "cellular telephones," wireless phones and pocket pagers.

Analysts have expected Tandy to begin selling pagers for some time. They say the company's experience in selling CB radio and telephone equipment fits well with the new product line. The market for pagers is expected to grow by about 20% annually between 1983 and 1990, to become a \$2-billion industry, according to Clayton Niles, chairman of Communications Industries, Inc., Dallas, TX, a RCC.

ARTHUR YOUNG & COMPANY CONDUCTED A STUDY OF COMMUNICATIONS EXECUTIVES' PAY, FOR THE FINANCIAL EXECUTIVE INSTITUTE, LEARNING that top executives earned

Simple, economical, easy to install — that's Raymer's 1+1 answer for easy phone paging access. Our nifty little TM-2 telephone input transformer, plus any reliable Raymer amplifier or receiver, go together to make a top-quality, out-of-sight paging system — small, medium, or large. For the sound contractor, 1+1 is a sure winner. And of course, it's a Raymer All-American.



Trutone Division of Cetec Corp. 7315 Fulton Ave., No. Hollywood, CA 91605 (213) 875-0423

23% more in 1981 than the previous year, outstripping the 13% average salary increase for executives in 27 major U.S. industries. Top communications executives earned an average of \$166,874 in total compensation, the third highest level reported. Earnings for chief executives of companies furnishing communication services averaged \$317,820 in 1981, an increase in total compensation of 25%. Arthur Young & Company is an accounting, tax and consulting firm, headquartered in New York City, with offices in 84 cities.

THE MARKET FOR ENERGY MANAGEMENT SYSTEMS IS EXPECTED TO REACH \$6 BILLION BY 1992, according to a new 187-page report by International Resource Development Inc. While over half those revenues will come from office buildings with more than 100,000 square feet of space, the rate of growth for smaller office space will also be strong, and is expected to reach \$1 billion, representing a compound annual growth rate for the period of 50%. Other key growth markets will be health care facilities and energy intensive supermarkets, food stores and restaurants.

AT&T, THE JUSTICE DEPARTMENT, AND THE STATE OF MARYLAND HAVE ASKED THE U.S. SUPREME COURT TO RESOLVE THE IMPENDING RESTRUCTURING OF THE DOMESTIC TELECOMMUNICATIONS INDUSTRY. The three petitioners seek to bypass the court of appeals level, because an early decision is in the public interest. The Justice Dept-AT&T-Maryland action was prompted by recent notices of intent-to-appeal the consent decree by Maryland, NATA, Telephonic Equipment Corp. and Jack Faucett Associates. Since that filing, similar appeals have been submitted by the states of Arizona, Alabama, Delaware, Illinois, Missouri, New Hampshire, North Carolina, Tennessee, Wisconsin, and Virginia; the public utility commissions of Alabama, Kentucky, Tennessee, West Virginia, Wisconsin, Virginia and South Dakota—and by Tandy Corp.

JUDGE GREENE'S ANTI-TRUST SETTLEMENT IS BEING CHALLENGED BY 11 STATES, 7 STATE REGULATORY COMMISSIONS AND SEVERAL PRIVATE PARTIES. Judge Greene noted that several states and public utility regulators have indicated that they will seek orders from other federal judges blocking divestiture where it conflicts with their policies. He said that this could lead to conflict between federal district and appeals courts that could be resolved only by the Supreme Court. However, if the Supreme Court declines at this time to consider the case, it will be sent to the appeals court in Washington, D.C.

U.S. COURT OF APPEALS/DISTRICT OF COLUMBIA UPHOLDS THE FCC'S COMPUTER II ORDER, WHICH DEREGULATES TELECOMMUNICATIONS, evoking comment from Henry Geller, formerly with the U.S. Office of Technology: The appeals court ruling suggests that the states will have "great difficulty" arguing that a federal scheme to resolve an issue can't foreclose their authority. "This court seems to be saying that the states will just have to work around the federal policy."

FCC Chairman Mark Fowler, hailed the court ruling for upholding "pro-competitive policy initiatives advanced by the Commission," saying that it "bodes well for consumers and suppliers alike." The FCC decision was formulated under Fowler's predecessor, Charles Ferris.



4 auto reversing cassette players for continuous play.
CP4010 Stereo/Mono Selectable

Create the ideal mood for—

- ♪ Restaurants
- ♪ Doctors Offices
- ♪ Factories
- ♪ Business Offices
- ♪ Retail Stores
- ♪ Super Markets

Cassettes can provide the ultimate in music selection and programming control to achieve precisely the right mood for your environment.

To operate the CP4010, simply insert the cassettes and everything is automatic thereafter. Both sides of the cassette are played, then advanced to the next cassette. Features include automatic advance, individual eject switch, automatic gain control, LED indicators and optional rack mounting.

Superb performance and styling will meet your needs...and more. Write or phone Toll Free for full details today.



4751 North Olcott Ave.
Chicago, IL 60656
(312) 867-9200
TLX 253058
Toll Free 800-621-3867

FW. DODGE SAID THE VALUE OF CONSTRUCTION CONTRACTS AWARDED IN 1982 is expected to be about \$150.2 billion, about the same as in 1981, but 9% less than the \$165.3 billion forecast earlier in the year.

THE PBX MARKET HAS NOT LIVED UP TO ITS ONCE HERALDED POTENTIAL, according to a report by the Eastern Management Group, Morris Plains, N.J., John Malone, President. The report notes that under a steady-state environment, the PBX market is an attractive one. Real Business telephone instrument growth increases by 4.5%-5.5% annually, while users replace their PBXs every 7-17 years, depending on line size. Malone said: "The 1980s environment would have, in fact, continued along this trend had nothing upset the status quo; but, something did." According to Malone, AT&T's migration strategy alone put an estimated 72,000 PBXs up for grabs almost overnight in the early part of 1980. Then there is the

user migration away from centrex, which promises to dump about 15,000 centrex systems into the market by the close of 1987. And, of course, few of the newer PBXs installed in the mid 1970s are ready to come out. The impact? The migration strategy has been successful to date and when it has finished running its course the majority of the 64,000 systems it will have uprooted will not need replacing again until the mid 1990s."

According to the study, beginning in 1985, all PBX markets under 400 lines will begin to temporarily erode. In some line sizes, the erosion will be particularly severe: the 300-400 line market from 1984 to 1985 will experience more than a 50% decline in system installations. That will be followed by another 50% decline in 1987 as installations in the 300-400 market drops from a high of 700 units in 1984 to a low of 100 units in 1987. Although not as severely as the 300-400 line category, other sub-400-line markets will also be hit. The report states

that the 200- to 300-line category will suffer a 30% decline from 1984 to 1985, while the 100-200 line market undergoes a 36% decline in the same period.

A FOLLOW-UP STUDY OF THE SMALL PBX MARKET BY MALONE'S EASTERN MANAGEMENT GROUP reveals that lucrative opportunities lie ahead in the sub-100-line PBX market. From 13,100 shipments in 1982, the quantity will jump to 15,500 in 1987. In 1985, there will be a temporary drop to 11,500, due to the virtual elimination of displaceable, older Bell products. But, after a relatively short 12-month slump, a recovery will ensue. By 1988, the market will chalk up about 20,000 small PBX shipments—then soar to 35,000 shipments in 1992. Why the boom? John Malone notes "small line PBXs are going toe to toe with key telephone systems...and the PBXs are starting to come away as winners." Malone adds that the big profits in the early years promise to go to Mitel, Harris and little known Melco Labs.

Sound Reinforcement and Paging MICROPHONES

Select sound reinforcement mics to fit the application by styling, size, directional pattern or cost.

Or choose from over 20 paging mics; desk-top style, gooseneck mounted, hand held or wall plate models from single to multi zone paging.

All with dependable dynamic elements for reliable performance and smooth frequency response. And all competitively priced.

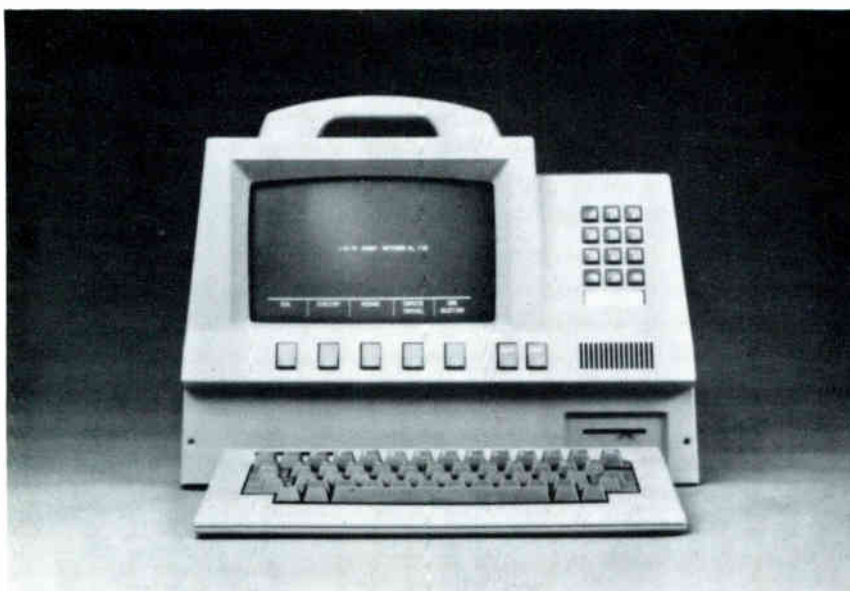
Turner has More!



TELEX **TURNER**

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So. Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte Office 711 Centre d'Affaires Paris Nord 93153 Le Blanc-Mesnil France



AN ELECTRONIC WORK STATION

**For business
and industry...
a proven intracom
Communications System**



- Fast food
- Retail Stores
- Manufacturers

Distributor inquiries invited.
Write or phone: 612-733-0447

Sound Products/3M
3M Center
St. Paul, MN 55144

3M hears you...



A low-cost communication work station for professional office workers, capable of providing advanced telephone, electronic mail, voice mail and computer terminal features in a compact, desk top console, has been developed by Basic Telecommunications Corporation, Fort Collins, Col.

The desk-top, easy-to-use work station, designated DataVoice, allows the user to:

- electronically send and receive data and voice messages at any time, independent of office hours;
- jointly review data during a telephone conversation with remote offices;
- easily retrieve information from host computers and/or information data banks;
- compose, edit and print memos and reports;
- organize time using an electronic



calendar;
dial phone calls automatically
from a DataVoice directory; and
transmit retrieval information
from a computer to remote loca-
tions.

The most distinctive feature of the DataVoice is that it is a stand-alone, intelligent telecommunications terminal. Therefore, it does not have to be part of a larger system with a centralized processor to provide functions such as word processing, electronic mail and voice store-and-forward. Additionally, the station can be used to access data bases either over the telephone or by direct connection through an RS-232 port.

DataVoice meets the requirements of a wide variety of businesses. For a one-person office or department, it reduces the need for secretarial, messenger and phone answering services. Large businesses can use it effectively as a stand-alone station or integrate several into complex communications systems. □

SPECIFICATIONS:

Display: Cathode-Ray tube, 9" diagonal, UL listed, non-glare etched face. Green phosphor characters on dark background. Sixteen or twenty-four lines of 80 characters displayed. Three lines reserved for soft key labels. Automatic scrolling.

Keyboard: Detached, stepped and sculptured, standard size, 57 key typewriter format, full travel capacitive type keys.

Data Format: ASCII code, full duplex, conversational or block send modes, eight selectable baud rates from 110 to 9600 baud.

Communications Interfaces: EIA RS-232C serial port and Bell 103 compatible direct connect modem. Integral modem provides full duplex communication at 300 baud.

Printer Interface: Industry standard parallel Centronics type.

Telephone: Compatible with all phone systems. Standard handset and 12-button keypad. DTMF or rotary dialing.

Data Message Buffer Memory: 4,480 characters stored as a 56-line by 80-character page with 13 or 24 lines displayed.

Data Retention: Battery backed RAM.

Size: Display housing—15 $\frac{7}{8}$ " (40.3 cm) wide x 12 $\frac{3}{4}$ " (32.3 cm) deep x 10 $\frac{3}{4}$ " (27.3 cm) high. Keyboard housing—13" (33.0 cm) wide x 6 $\frac{5}{8}$ " (16.8 cm) deep x 2 $\frac{5}{16}$ " (5.8 cm) high.

Weight: 18.5 lbs. (8.4 kilograms).

Power: 105-120 VAC, 50-60 Hz, 50 watts. Circuit breaker protected. Six-foot, three-prong terminated power cord.

UNCOMPROMISING WIRELESS MICROPHONES

Finally, you can choose a wireless mic to fit the application. The Telex WHM-300, the electret wireless transmitter mic for uncompromising speech clarity. Or a Telex WHM-400 dynamic wireless transmitting mic for vocal entertainment with rich, full bodied audio quality. Both elegantly tapered and without trailing antenna wires. Or select the miniature electret WLM-100 lavalier mic (or any standard dynamic mic) with our belt-pack transmitter.

Combined with the superb Telex dual diversity* FM receiver, you'll have a wireless system that is as good as any hard wired mic, and at a reasonable price. Write us today for full details.

Quality products for the Audio Professional

TELEX®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave So. Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte Office 711, Centre Affaires Paris-Nord 93153 Le Blanc Mesnil France

*U.S. Patent No. 4293955. Other patents applied for.

NEW PRODUCTS

OPERATOR ACCESS

The AD-404A has been designed for special applications in which operator assistance is required for all calls. When it receives an off-hook signal, a relay will pulse and dial "0" to summon the operator.



The off-hook condition is achieved by either lifting the handset, or operating a rotary lever switch used in conjunction with speaker/microphone arrangements. Designed for quick and easy installation, the unit mounts conveniently on any flat surface and is compatible with any C.O. or PABX line that accepts rotary dial pulses. The device has received F.C.C. registration.

□ For more information write 358 on the inquiry card. Or write: Melco Labs, 14408 N.E. 20th, Bellevue, Wash. 98009.

SURGE NETWORK



The 711 Series of instrumentation may now incorporate surge testing to FCC Docket 19528, Part 68, with the incorporation of the Model P9

Surge Network. It produces both surge waves specified for use on telecom lines (10 x 160 us to 1.5 kV, and 10 x 560 us to 800 V), plus the required AC line surge of 2 x 10 us to 2.5 kV. Other surge networks are available for the 711 Series to meet international telecom specifications, automotive standards, and AC power line requirements, such as the new IEEE Std 587-1980. Standard options are available to perform AC line coupling/filtering for the 2 x 10 us wave, plus provide the ability to place the surge with respect to the AC voltage phase angle.

□ For more information write 359 on the inquiry card. Or write: KeyTek Instrument Corp., 12 Cambridge St., Burlington, Mass. 01803.

TESTER



A portable Equipment Tester, Model 282, simulates the central telephone office to test all types of key telephone systems, as well as many PBX systems and multi-line telephone sets. Featuring simultaneous testing of two lines, the unit provides 48 v with 1800-ohm built-in loop resistance on each line for the talk battery. It simulates incoming and outgoing trunks, and contains a HI/LO voltage, 20-cycle Ringing Generator. All types of key telephone systems can be tested, as well as PBX systems using either loop or ground start trunks, telephones, and pre-installed telephone distribution systems. Easy to use, the tester has visual indicator lights to indicate loop and ringing current, and conveniently grouped front

switches. Accessories, including a rugged leather carrying case with shoulder strap, alligator clips, 284 TAC slip-on plugs, and an Interface Pair Selector, are available. The unit also comes with an optional DTMF (TT) Decoder (for key pad testing), on the Model 282 A.

□ For more information write 360 on the inquiry card. Or write: Murphy Laboratories, Inc., 916 Fisher Dr., Houston, Texas 77018.

INTERCOM

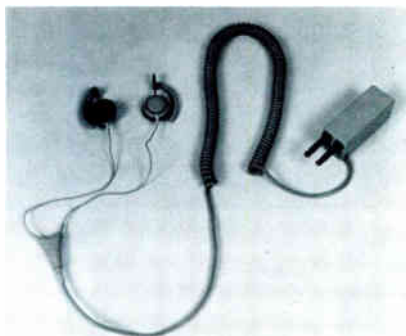
The 511E microprocessor intercom system has been designed to offer a sophisticated array of features while maintaining compatibility with older equipment already in place. All functions are controlled by a single microchip. Potential expansion is up to 4000 stations. Reliability is assured by the solid-state circuitry. The system is available with or without a handset; it may be used on a desk or wall or flush-mounted.



□ For more information write 361 on the inquiry card. Or write: ITT/DESD, One World Trade Center, New York, N.Y. 10048.

HEADSET

The lightweight Symmetry OpenEar headset offers binaural sound. The headband, insertable eartips and microphone boom of the conventional lightweight telecommunications headset have all been eliminated, to provide the maximum comfort and performance. Elimination of the microphone boom creates a headset that meets the hands-free communication needs of all office applications. The unit is available in conventional configurations for use on PBXs, ACDs and modular desk telephones. Two symmetrical earphone modules support the electret microphone, which is an integral part of the interface cable assembly. Each earphone rests comfortably on the outside of the ear, eliminating the irritation that is common with eartip inserts. Each module is supported by an adjustable hook that permits both up-and-down and rotational positioning of the earphone.



Special attachment adaptors for use with eyeglasses are unnecessary, due to the very narrow profile of the ear hook. Normal conversations are not impaired when wearing the headset, since there is no eartip forming a tight acoustic seal to restrict the sound. The open-cell, hypo-allergenic foam earpads allow sound to pass through and are easily removed for cleaning or replacement. The headset can be positioned quickly, allowing the operator the freedom to remove and reposition the headset during a call. The "on-ear" design and the binaural technology of the OpenEar allow the use of a large earphone that delivers quality sound at a lower sound level than other lightweight headsets. The lower sound level reduces operator fatigue and, more importantly, reduces the chance of gradual hearing loss. The maximum

sound pressure level from the earphones is electronically limited at a safe level. The symmetrical design locates the microphone at the base of the user's throat. This location increases transmission efficiency by picking up sound from the mouth, the throat, and the chest of the user. The microphone is out of the user's way, but remains properly located for consistent transmission levels. An operator does not have to raise her/his voice to compensate for a microphone boom that has been moved away from the mouth. Consequently, background voice noise in crowded installations is reduced. Communications are conducted more efficiently, with less fatigue and fewer errors and repeats. A 10-foot combination coil/straight cord connects the earphone-microphone assembly to a modular connector inside the amplifier housing. Headsets and amplifiers can be spared separately. The amplifier interfaces with telephone equipment using PJ327 dual plugs or a modular connector. The receiver amplifier, the volume control, and the transmitter amplifier are all contained in the single housing.

□ For more information write 362 on the inquiry card. Or write: DEKA, Inc., 1745 Dell Ave., Campbell, Cal. 95008.

PHONE SETS



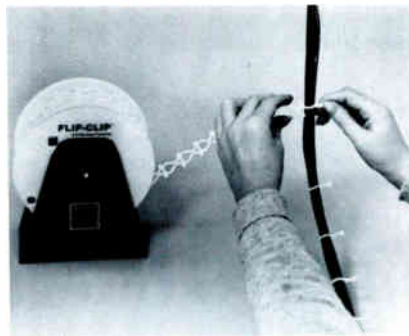
The Superset 4 is an advanced electronic telephone set designed to operate with the family of Super-switch PABXs. The set features a liquid crystal display which guides the user in its operation, making it interactive and "user friendly." The display acts as a message center, advising users of the status of their own sets or that of the person they are trying to reach. It also indicates who, within the system, is calling, before the line is answered. Up to fifteen buttons can be programmed

for selection of lines, speed-call numbers or direct access to co-workers extensions. Auto answer and speakerphone, which allow the user to answer calls without touching the set, are other features. The Superset 4 incorporates "soft" keys for easy access to PABX features such as call forwarding, camp on, conference calling, last number redial and automatic callback.

□ For more information write 363 on the inquiry card. Or write: Mitel Corp., 603 Eagleson Rd. N., Kanata, Ont., Canada K2K 1X3.

FASTENERS

A special molding process produces the Flip-Clip fasteners on a continuous strip, each one lightly connected to the next at two points. Bundling costs are reduced, due to the economical manufacturing process and the increase in productivity the continuous strip design makes possible. Available in 500 or 1,000-clip reels, held in a bench-stand dispenser, the fasteners can be positioned, flipped closed and snapped off the continuous strip in one easy motion. No tools are needed and there is no time wasted in picking up and orienting individual pieces during assembly operations. The fasteners feed directly from the reel onto the item to be bundled, secured or tied. Waste is virtually eliminated. They can be repositioned, removed or reused easily. Molded from type 6/ nylon in natural, black or special colors, the fasteners have a loop tensile strength of nine pounds and will bundle diameters up to one-half inch with a simple twist.



□ For more information write 364 on the inquiry card. Or write: Dennison Manufacturing Co., 300 Howard St., Framingham, Mass. 01701.

Mobile Radio Servicing

by Leo G. Sands

Part 13

FIELD SERVICING continued

Mobile Frequency Checks

Transmitter frequencies can be checked without removing the set from the vehicle when a portable, battery-operated frequency meter is used. In extremely cold or hot weather, the frequency measurements may be inaccurate if the frequency meter is not temperature controlled. (The transmitter frequency may also vary under such climatic extremes.)

When making transmitter-frequency measurements with the

mobile unit connected to a radiating antenna, listen to make sure the channel is clear before turning the transmitter on. Keep test transmissions short, and be sure to announce the station call sign. If the channel is too busy to make such measurements without causing interference to others, disconnect the antenna and connect the mobile-unit antenna terminal to a dummy load.

Receiver Performance Check-Out

When radio signals can be heard,

it is easy to determine if the receiver is sensitive—you merely have to listen. In the absence of such signals, you can use a frequency generator as a signal source. Connect a short piece of wire or a plug-in whip antenna to the frequency meter, and place the instrument at a reasonable distance from the mobile unit. With the mobile-unit squelch control set to the fully unsquelched position, turn the frequency meter on and off and note if the signal quiets the receiver background

THE SOUNDS OF PROTECTION

ATLAS SOUND is the world's leading manufacturer of loudspeakers specifically designed for use with electronic siren, emergency warning and high power mobile public address systems for land, air, and marine applications.

U.L. & C.S.A. listed for installation in hazardous locations where explosive or combustible atmospheres may exist. For indoor or outdoor use in conjunction with intercom, sound signaling, and electro-acoustic communications systems.

Functional dependability and extensive area-coverage combined with the advantage of minimum size. Voice-Tone loudspeakers are recommended for application in high-rise and multi-occupancy building emergency communications where certified operational requirements and attractive appearance are prime considerations.

U.L.-listed, temperature-rated, Voice Control speakers specially designed for high intelligibility, life-safety, fire alarm, security, and signaling system application. All-metal, environment-resistant, waterproof construction.



RCC, RCR SERIES



HLE SERIES



VT SERIES



AP SERIES

ATLAS SOUND • DIVISION OF AMERICAN TRADING AND PRODUCTION CORPORATION
10 POMEROY ROAD, PARSIPPANY, NJ 07054 • (201) 887-7800

noise.

Excessive Noise

Rushing background noise indicates that the receiver is sensitive but that the signals are not strong enough. This condition is usually due to a defect in the antenna system. However, sometimes it is due to the fact that the signals being heard are coming in from a great distance and are not strong enough to override the residual noise that is present in a normally operating receiver.

Popping noises heard when the vehicle engine is not running are usually picked up from other vehicles in the vicinity. Popping noises that are heard when the vehicle engine is running and that vary in rate as the engine speed is changed are caused by the ignition system. A whining sound heard only when the engine is running is usually caused by the generator or alternator.

Many cars are factory equipped with ignition and alternator noise suppressors. Instead of conventional spark-plug and distributor suppressors (series resistors), wire possessing several thousand ohms of resistance per foot is often used as spark-plug leads and as the distributor-to-ignition-coil lead. A capacitor is generally connected between the alternator output terminal and the alternator frame. Another capacitor is connected between the body ground and the battery "hot" lead, generally at the ignition switch or ammeter.

Various types of noise-suppression kits, designed especially for mobile radio, are available. Estes Engineering Co. manufactures an ignition noise-suppression kit that includes shielded ignition cables, shields for the ignition coil and voltage regulator, and spark-plug shields. Sprague Products Co. offers a noise-suppression kit that is designed specifically for mobile radio use. Considerable work has been done in the field of radio-interference suppression by the Belden Manufacturing Co. This has led to the development of a special cable for use in auto ignition systems.

John Lenk, in his book, *Eliminating Engine Interference*, published by Howard W. Sams & Co., Inc., shows many ways of determining the source of automotive interference and eliminating it. Also available is a booklet entitled *Giving Two-Way Radio Its Voice from the Automotive*

MASKING SOUND SYSTEMS

A GROWING AND PROFITABLE PRODUCT LINE
MORE PRODUCTS

with

Better Profit and Lower Price

- MASKING GENERATORS • MIXER/EQUALIZERS
- SMALL COMPLETE SYSTEMS • LOUDSPEAKERS
- TIME VARYING MIXERS • ZONE LEVEL CONTROLS

Buy From The LEADER

dyna-systems, inc.

The Sound Conditioning Company

5371 Tennyson Street, Denver, Colorado 80212 (303) 455-5400

NEW LOW COST ON SITE PAGING SYSTEM!!



FEATURES INCLUDE:

- DESK TOP CONSOLE (calculator size)
- NO HARD WIRING (simply plugs in)
- COMPLETE PORTABILITY
- MULTI BUILDING PENETRATION
- INSTANT LICENSING
- COMPACT BEEPERS
- EMERGENCY & NORMAL ALERT CODES
- EXPANDABLE COVERAGE RANGE (up to several miles)
- TWENTY (20) BEEPER CAPACITY

The new PA-410 combines the latest state of the art electronics together with low price to provide the solution to on site paging needs at schools, hotels, hospitals, restaurants and many other commercial applications where intercom and public address systems won't completely satisfy your customer's requirements.

Compage Division, Alpha Paging Systems, 1924 Pacific Coast Highway, Redondo Beach, California 90277 • (213) 376-5189 • (213) 372-2318



**Protect People with
Audio Surveillance**



Protects Patrons in the
Hard to Protect Areas ■■
Elevator Lobbies,
Parking Ramps, Etc.

**COMMUNICATIONS
EQUIPMENT CO., INC.**
Glen Arbor, Michigan 49636
616 334-3081

DEL: 4-6 WKS!



**HOUSE OF
H-O-M-E METAL
ENCLOSURES, INC.**

Manufacturer of
Standard, Custom &
Modified Electronic
Racks & Enclosures

Please send for our NEW catalog:
P.O. Box 225 Hermann, MO 65041
314/486-3111

Technical Services Department,
Champion Spark Plug Co., Toledo,
Ohio.

The location of the antenna may contribute to noise pickup. Generally, the antenna should be as far from the engine as possible. Care should be exercised in routing the cable away from any wiring that may act as a carrier for ignition noise.

Most late-model cars are equipped with alternators in lieu of a dc generator. Since a commutator is not used, the whining generator noise is eliminated. However, there have been cases where the built-in silicon rectifiers combined with the alternator frame to produce radio signals at frequencies that cause interference.

Base-Station Servicing

At a base station there may be troubles that require the attention of a technician at the base-station site. These troubles may exist in the antenna system or power source or may be troubles that exist because of the base-station environment.

Base-Station Antenna Troubles

Usually, a base-station antenna is inaccessible for inspection. To avoid having to take down the antenna for inspection, it can be checked with an in-line wattmeter. If the antenna is defective or is not cut to be resonant at the operating frequency, the vswr will be high, since excessive energy is being reflected back from the antenna. When the coaxial-cable, antenna, and transmitter-output impedances are exactly the same, the vswr will be 1:1. In practice, this condition is not attainable. A vswr of 1.5:1 is considered normal. When measuring vswr with an in-line rf wattmeter at the base-station end of the coaxial cable, indications lower than 1.2:1 may be inaccurate.

High vswr can also be caused by a coaxial cable that has been crushed

at one or more points or has been bent too sharply. Another possible cause of high vswr was found in Duluth, Minnesota where, during extremely cold weather, the inner conductor of the coaxial cable shrank and pulled the plug pin out of its associated female receptacle.

If vswr is abnormally high, the antenna should be inspected and the coaxial cable tested. If the antenna end of the coaxial cable is accessible, the cable can be checked with an ohmmeter. Disconnect the cable from the antenna and from the base station. Then connect the ohmmeter across the plug terminals at the base-station end of the cable. This applies a small voltage across the cable, causing it to charge like a capacitor. An open-circuit indication should be obtained. Then reverse the ohmmeter leads (to reverse polarity); the meter needle should kick to indicate that the charge in the cable dielectric is discharging.

To check cable continuity, short the far end of the cable and measure the resistance across the two conductors at the near end of the cable. The ohmmeter should indicate low resistance.

The most accurate way to check coaxial cable and to measure its loss is with an rf wattmeter. First, connect the rf wattmeter and a 50-ohm dummy load directly to the transmitter, as shown in Fig. 13-1. Key the transmitter and read the indication on the rf wattmeter. Then connect the coaxial cable to the transmitter, and the rf wattmeter and dummy load to the antenna end of the cable,

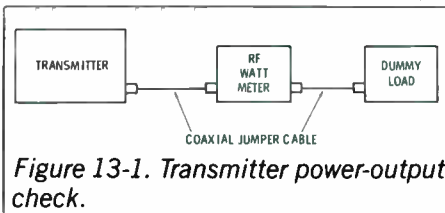


Figure 13-1. Transmitter power-output check.

**CONTRACTORS *only*
CONFERENCE**

**May 3rd, 4th and 5th, 1983
Las Vegas, Nevada**

as shown in Fig. 13-2. Again, key the transmitter and check the watt-meter reading. Compare the power readings. If the coaxial-cable attenuation is 3 dB, for example, the power indication obtained at the far end of the cable will be one half of that obtained at the transmitter.

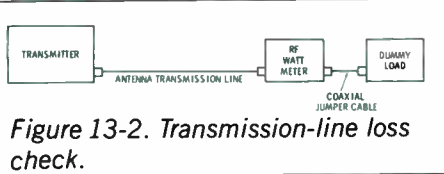


Figure 13-2. Transmission-line loss check.

Base-Station Transmitter Check-Out

To determine if the transmitter is generating a carrier, hook up an rf wattmeter and dummy load to the transmitter, as previously shown in Fig. 13-1. Key the transmitter on and off several times to determine if it is stable and if the TR switching circuitry is reliable.

No direct connection to the transmitter is usually necessary to measure frequency and fm deviation if the instrument(s) is placed close to the transmitter. If indirect signal pickup is inadequate, direct connection can be made through a pick-off attenuator, such as the International Model 150-286, when the attenuator is connected as shown in Fig. 13-3. This device has an insertion loss (from transmitter to dummy load) of 0.2 dB at 30 MHz, rising to 0.75 dB at 460 MHz. Its attenuation (from transmitter to meter) is around 46 dB at 30 MHz, falling to around 22 dB at 460 MHz. This device introduces sufficient attenuation to protect the measuring instrument(s).

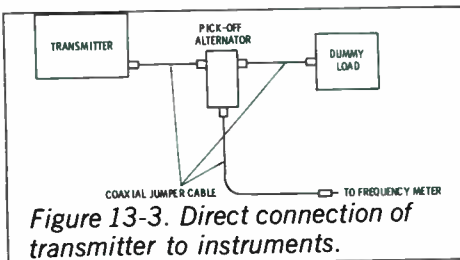


Figure 13-3. Direct connection of transmitter to instruments.

Both frequency and fm deviation can be measured with a deviation-type frequency meter or a communications service monitor. To use a frequency counter and a modulation meter simultaneously, a coaxial "T" connector can be used at the pick-off port of the attenuator.

Base-Station Receiver Check-Out

A quick way to determine if the antenna system is the cause of unsatisfactory reception is to try a

HIGH NOISE PROBLEM? ADCO Intercoms are the solution

We design intercoms specifically for high noise area use— to deliver clear, penetrating voice communication under the most difficult conditions. In factory production areas, machine shops, steel mills and foundries, loading areas, etc.

Intercom housing is a heavy-duty aluminum casting . . . fully sealed against dust and dirt, corrosion-proof, weatherproof for use indoors or out. All transistorized for dependability. Effective range is from a few feet to several miles.

Each unit both transmits and receives, so only one is required per station. Installation is simple, practical: plug each intercom into power source, make ordinary 2-wire connection between units.

Full range of models includes compatibility with existing sound-power telephone systems. Request complete catalog.



ATKINSON DYNAMICS

A Division of
Guy F. Atkinson Company

10 West Orange Avenue
Department R
South San Francisco,
CA 94080

Phone (415) 583-9845



Grommes- Precision



PE-112

PE-112—AM-FM TUNER has latest FET and IC drift free circuitry, flywheel tuning, tuning meter and high sensitivity.

NEW! NEW! NEW! NEW!



G-222

G-222—6 CHANNEL PREAMPLIFIER features transformer balanced inputs that switch to microphone or line level. Rear panel bass and treble controls switch to 2 or 6 channels.



G-8L

G-8L—AUTOMATIC LEVEL CONTROL with 2 independent channels that can operate as a continuously variable limiter or a fixed compressor with ratio of 2:1. Meters indicate line level output and LED's indicate gain reduction.



G-252A

G-252A—250 WATT MONO OR 2 x 125 WATT STEREO POWER AMPLIFIER features DC coupled circuitry with overload protection and 25-70 volt output transformers.

G-4EQ—1/3 OCTAVE EQUALIZER has 28 bands plus low and high frequency cut off filters, balanced IC line input and output and gain control.



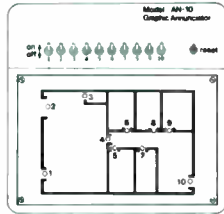
G-4EQ

PRECISION ELECTRONICS, 9101 King Street, Franklin Park, IL 60131 • (312) 678-5350

In Canada: TorTec Marketing, Toronto, Ont. • Foreign: Morhan Exports, New York, NY

DESKTOP GRAPHIC ANNUNCIATOR

Model AN-10 — Ten Zones



- CUSTOM SILK SCREENING FOR FRONT PANEL LAYOUT
- RELIABLE SOLID-STATE CIRCUITRY
- CONCEALED LED LAMPS BACK LIGHT EACH ZONE
- SELF CONTAINED POWER SUPPLY AND TONE GENERATOR

For more information call or write

DITEK INDUSTRIES, INC.
796 MERUS INDUSTRIAL CT.
FENTON, MO. 63026
314-343-1575

821016-01

bpt means security!

For CCTV - Systems:

- Monitors
- Sequential Switchers



re

For further information contact:

ROFU INTERNATIONAL CORPORATION
230 CARSON MALL DR. • CARSON, CA. 90746/U.S.A.
(213) 327-8540 • Telex: 1TT 499-0129

plug-in antenna in place of the outside antenna. While such an antenna is seldom as satisfactory as an outside system, better performance with an indoor antenna usually indicates that the outdoor antenna system is at fault. This may not be the case when the outdoor coaxial cable is excessively long and therefore causing excessive signal attenuation.

Listening to radio signals is the quickest way to determine if the receiver is operating in a reasonably satisfactory manner. When there are no signals from other stations, use a frequency meter as a signal source, as explained earlier.

Base-Station Power

The base-station electric power source is usually 60 Hz ac at approximately 120 volts. Most sets will operate satisfactorily when the line voltage is as low as 110 volts. At lower input voltages, instability may occur.

The availability of power can be easily determined by temporarily connecting a lamp to the ac outlet. If there is power at the outlet, there should be power at the base-station unit when its power cord is plugged into the outlet. If not, the set fuse may be blown or there may be an open connection. Look particularly for a broken connection at the molded ac plug at the end of the cord. If this is the case, or if this is strongly suspected, snip the cord an inch or so from the plug and install a new plug with screw terminals.

If the unit power plug fits loosely into the ac outlet, or if it is necessary to bend the plug blades to make contact, try another ac outlet and advise the customer to have the power receptacle replaced. Poor connections here are a source of noise and erratic operation.

Power-line voltage should be measured with an ac voltmeter, preferably the expanded-scale type.

If the power-line voltage is abnormally high or low, or varies widely, an automatic line-voltage regulator should be used to stabilize base-station operation and to extend component life.

Interference

When a receiver is desensitized or unwanted signals (other than cochannel or adjacent channel) are received, it is probable that intermodulation interference is being caused by a nearby base-station

transmitter. It may be necessary to install a ferrite isolator or cavity filter at the output of the transmitter. Information about cavity filters may be obtained from Decibel Products, Inc., 3184 Quebec St., Dallas, TX 75247, and Phelps Dodge Communications Co., Route 79, Marlboro, NJ 07746. Intermodulation interference is a common problem, especially in areas where there are several base stations.

To avoid causing interference to others using the same channel, keep transmissions short. If prolonged test transmission is required, disconnect the antenna and feed the transmitter power into a dummy load.

Field-Intensity Measurements

The radiation pattern of an antenna and relative radiated power can be determined by measuring field intensity at a distance of 100 feet or more (in the far field) from the antenna. A simple field-strength meter (FSM) is not sensitive enough. Such an FSM is generally used in the near field for determining if the antenna is radiating. Sometimes a mobile unit equipped with a limiter voltage meter is used. The measurements are relative, since they are affected by reflections and shadows, which differ as the vehicle is driven from one location to the other. But, from a practical standpoint, the measurements provide practical good/poor indications.

More-precise measurements can be made with a Blonder-Tongue Empire field-intensity meter (FIM) and a half-wave dipole antenna. Or, a heterodyne voltmeter, such as the Bruel & Kjaer Type 2007, can be used to indicate signal level at the end of the 72-ohm coaxial cable used as the transmission line of a tuned, half-wave dipole antenna. When the instrument is connected as shown in Fig. 13-4, it indicates rf voltage across the 75-ohm terminating resistor (R). The instrument is tuned to the transmitter frequency and is set to indicate voltage on any

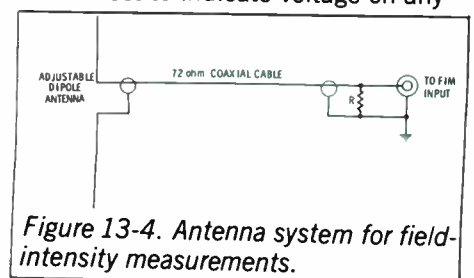


Figure 13-4. Antenna system for field-intensity measurements.

of six full-scale ranges: 100, 300, 1000, 3000, 10,000, or 100,000 microvolts.

The meter indicates input signal level in microvolts (μV), not field intensity in microvolts per meter ($\mu V/m$). The meter indications can be translated into $\mu V/m$ by referring to the graph, Fig. 13-5. The graph shows that at 25 MHz when the meter indicates 9 μV , the field intensity is 5 $\mu V/m$. But, at 450 MHz, the meter indication is only 0.5 μV when the field intensity is 5 $\mu V/m$. And at 50 MHz, the two figures are almost the same. This relationship holds only when the dipole antenna is one half-wave long. It is based on:

$$\mu V = 0.32 L (\mu V/m)$$

where,

$\mu V/m$ is the field strength in microvolts per meter,
 L is the dipole length in meters,
 μV is the input signal level in microvolts.

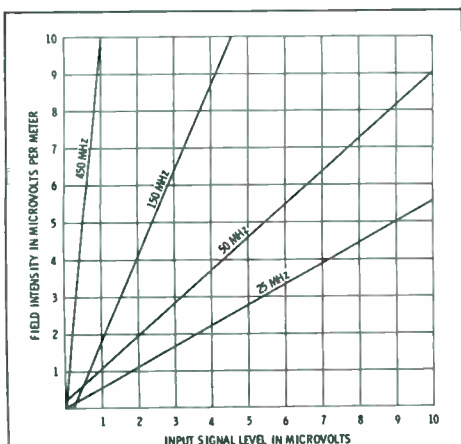


Figure 13-5. Field intensity versus input signal level.

When the signal strength is greater than 1 μV , add a zero to each number for each multiplication factor of 10.

Mobile Shop

Many mobile-radio service establishments have one or more mobile shops, which are used when technicians make "house calls." While most work involving taking a set apart is performed in a shop at a fixed location, a mobile shop makes it possible to do repair work in the field. This can be a valuable capability, particularly when the technician is servicing a distant base, repeater, or control station. □

A class 1 idea from a first class company.

Community's new Class 1 Program makes a select Class 1 group of high-quality Community products available at extremely competitive prices and on a hassle-free non-exclusive basis. So you get the best quality sound components money can buy at about the same price you'd pay for a mere copy... an idea that's Class 1 all the way down to the bottom line. Call for complete information today. And stop settling for second best.

Community
 333 East 5th St.,
 Chester, PA 19013 (800) 523-4934

Emergency Call Signalling Systems

For Elderly Housing Buildings and Nursing Homes

UL Listed

Famous for Handcrafted Quality since 1934

For complete information ask your local AF representative for bulletin EC-7 or call/write.

FLORENCE CORP.
 2101 N. ELSTON AVE., CHICAGO, IL 60614 • 312/384-3310

The Enhancer



From 1 Watt—Through 100 Watts
We stack peerless power and performance into every solid state amplifier in the line—Because we know what you need in the field to make a PROFIT: Reliability. Features. Delivering the Promise: Call now for Specs and Prices.

McGohan Electronics, Inc.



1033 Fairway Drive
Bensenville, Ill. 60106
312-595-2342

WANTED! Customers For



SPEAKERS Various Models for Sound Systems and P/A

Write or phone:
PROJECTED SOUND, INC.
P.O. Box 112
Plainfield, IN 46168
(317) 839-4111

Manufacturers and Direct
Suppliers of Quality Speakers
Est. 1959

CLASSIFIED

Classified listings are accepted up to the 1st of the month preceding publication. Rate — \$47.00 per column inch. Check with order.



call
800-431-WIRE

cabletronix
366 Washington Street
P.O. Box 3003
Newburgh, N.Y. 12550
(800) 942-5843 New York State only

**WIRE&CABLE-TIE WRAPS
INSTALLATION HARDWARE**

FREE 32pg Catalog & 50 Audio/Video Applic.



PHONO, MIC, PWR SUPP. EQ, TRANS, ACM, TAPE, VIDEO, LINE, OSC
Stereo/Mono Pwr Ampl. TV Audio & Recd Prod Consoles
Video & Audio Dist Amps. 8-in/2-out, 12-in/4-out, 18-in/4-out
OPAMP LABS INC (213) 934-3566
1033 N Sycamore Av LOS ANGELES CA, 90038

Background Music for SCA-CATV-Telephone BGM INTERNATIONAL

A Division of
F. T. C. BREWER COMPANY
P.O. Box 8057
Pensacola, Florida 32505
904 433-7932



Manufacturers of quality sound & communications cable.
Stock & price list mailed on request

TIME SAVERS

- PUSH-PULL RODS Get Cable through tight places.
- TEST-SET. For the Audio Serviceman
- EASY-KARY™ Wire Reel Holders — 3 sizes.
- SPEAKER SUPPORT TRUSSES (T-Bar Bridge) Prevent ceiling sag. Speed Installation.
- SPEAKER GRILLES For 8" Speakers
- EXTENSION CORDS 3 ft. and 10 ft. U.L. Listed

CALL — WRITE — 30 DAY FREE TRIAL
Tex. Call Collect (214)946-8450, All Other 1-800-527-1522

INSTALLATION & SERVICE AIDS

IMMEDIATE FUNDING

From a new capital source.
QUADRENT ASSOCIATES
Offers a unique plan to contractors and dealers seeking financing for Rental and Lease contracts.
Write, call today for details.
Quadrant Associates
550 Frontage Rd. #3060
Northfield, IL 60093 (312) 441-6100



DOLPHIN COMPONENTS CORP.
74 ONEIOA AVENUE
SOUTH SETAUKET, N.Y. 11720
(516) 751-2999

SPECIAL SALE CABLE TIES

(UL/MIL SPEC.)

4" CABLE TIES (OC-4)

OR

6" CABLE TIES (OC-6)

\$9.00/m LIMITED TIME ONLY

Quantity: 5000 or more.

OTHER TYPES AND SIZES AVAILABLE AT SIMILAR SAVINGS.

Dyna-Systems, a manufacturer of masking sound systems, is expanding its sales effort and requires a

NATIONAL SALES MANAGER

Individual must have experience with commercial sound system sales. Position requires development and supervision of all sales and marketing activities. Send resume in confidence to:

Robert Chanaud
Dyna-Systems, Inc.
5371 Tennyson St.
Denver, CO 80211

ELECTRONICS TECHNICIAN WANTED

Dukane or Rauland experience. Can you reliably service and install school, intercom, nurse call, paging, clock, fire alarm, & MATV systems? Are you good at what you repair and does it stay fixed? Call Richard, 608-271-2133, Madison, Wisconsin.

CAREER OPPORTUNITY FOR PROVEN PRODUCER

Requirements: Experience selling professional sound, school and health care communications, CCTV, intercom & other electronic communication systems. Sunbelt market of 1 1/2 million. Earnings potential: \$25,000 - \$50,000. Company has been in business for over twenty years; financially strong, excellent fringe package. Altec and Rauland contractor. Call: (512) 223-2923/Bill Bathrope.

NATIONAL SALES MANAGER

Fast-growing northwest-based U.S. sales company for international manufacturer of premium line of intercom systems seeking experienced executive. Must relocate. Min. salary / commission package \$50M. Excellent benefits. Tell all in first letter. Write to Box 114, Sound Publishing Co., 156 East 37th St., New York, NY 10016.

Any Telephone Can Have The

VOICEPAC

**Hands-Free
Voice
Response
Paging!**



**Now you can
offer your
PABX customers all these
features from Voicepac:**

- Individual Station Calling
- All Call Paging
- Group Paging
- Do Not Disturb
- Privacy Tone
- Station Add-On
- Up to 336 Stations and 4 Links

These are among the most wanted features in today's business telephones ... and now you can supply them regardless of the type telephones used.

- No External Speaker
- Easy Installation
- Best Audio Quality On The Market
- Works On Any Key System or PABX
- Voicepac Transducer Fits Inside Telephone Base (see photo)

No Modifications To Telephones Required

**Increase your profits
with Voicepac,**

providing hands-free intercom for standard key telephones. A feature often thought available only on electronic telephones.

**Hands-Free Intercom For
Standard PABX And Key
Systems**

For more information call **405•946-1200**

xtel

1301 CORNELL PKWY
SUITE 800
OKLAHOMA CITY, OK 73108

a new name for Southwest Utilities



Solve your perplexing paging problems...

No one microphone is correct for every paging situation—different circumstances require different and sometimes unique solutions. That's why Shure has drawn on its unparalleled knowledge of microphone design to create a series of paging microphones specifically designed to reduce or eliminate the most common paging problems.

- If you're facing high ambient noise levels, use the Model 562;
- moderate background noise levels require Model 515SBG or 515SB-G18;
- for permanent mounts, Model 561;
- mobility for paging or dispatching calls for Model 450;
- if you have limited space,

use Model 414B; • an excellent limited space model that can stand up to extreme abuse is Model 507B; • and if these won't solve your problem, read on.

...by the book

For all the facts on Shure's full line of paging microphones fill cut and return the coupon below for your FREE copy of our new 72 page catalog describing over 150 microphones. No matter what your needs, there's a Shure microphone right for you

Yes, send me your new Full Line Microphone/Circuitry Catalog, AL700. (Outside the U.S., enclose \$2.00 for postage handling.) PLEASE PRINT

Name _____

Address _____

City _____ State _____ Zip _____

N 1 82 SC 283

SHURE®

THE SOUND OF THE PROFESSIONALS... WORLDWIDE

Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204