

SOUND & COMMUNICATIONS

DECEMBER 1981



Annual Economic Report

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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.

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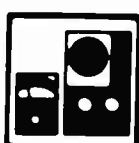
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JAPAN
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 31, 4-chome Doshomachi
 Higashi-ku, Osaka, 541
 Japan Tel: (06) 227-1380

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'81 – AN ECONOMIC ROUNDUP

From Bridgeport/California to Bridgewater/Maine, the response to the S&C yearly quiz, for dollar data, or units shipped, among manufacturers of interconnect gear, was “flat out.”

From Arrow Creek/Montana to Apache Creek/New Mexico, the response to the S&C yearly quiz for dollar volume/units installed by the interconnect contractor was: “scrambling for business.”

This report is an amalgam of data from these sources: The U.S. Department of Commerce and its several bureaus; NATA; the Electronic Industries Association; the Federal Communications Commission; Frost & Sullivan, Inc. and SOUND & COMMUNICATIONS' survey of the major suppliers and distributors of products covering the audio, radio and telephone circuits.

From the four corners of this industry, from manufacturer and local marketer, came this consensus about the business:

—there is no backlog of orders for switches. Once upon a time—during the first half of the year—a contractor had to wait from 45 to 60 days for delivery. By the end of the year, the manufacturer would drop-ship to the site—overnight!

—during the first half of the year, financing leases was a hurdle that could be vaulted if the client was prepared to pay 24 percent for the money, over a 36-month term. At year's end, money had loosened a bit, and now tax credits could be applied and accepted by the better heeled leasing companies—not the banks. But that has not eased the grip of “no sale” by the potential customer, despite the Reagan new tax law;

—for the manufacturer, the dollars that would normally be assigned to new product development, or by the purchase of newer chip circuits to be integrated into the electronic switch, had to be put on hold. The market was “flat out” despite all of the market surveys conducted by private economic organizations;

—the move toward the introduction of the peripherals—the call diverters, the accounting devices, the store-and-forward receptacles, the toll restrictors and the conference callers—did not pick up the slack; nor did the interconnect vendor move with any alacrity to introduce the peripherals into his product mix. The hesitancy was two-fold: (A) the call to or from the client did not raise a “Q”; and (b) the prime supplier was “out there” selling direct;

—the offering of specialized services—teleconferencing, for one, was immediately perceived as going to the big guys: AT&T, General Electric, and several others. Quantum Science Corp./New York City reported that the number of teleconferencing users had quadrupled in 1980, and the market for equipment and transmission is expected to expand out to \$380 million by 1985, from a mere \$16 million in 1980. The surveyor noted that the average video/teleconferencing room would have equipment worth about \$200,000 by 1985. Meanwhile, the interconnect vendor learned that AT&T had filed an application with the FCC for permission to construct and

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operate facilities for an initial 11-city video teleconferencing service. Both satellite and terrestrial digital transmission facilities would be using AT&T PicturePhone Meeting service, a 2-way simultaneous audio-visual teleconferencing service, in public rooms and customer premises linked by special terrestrial facilities at five satellite earth stations located at Cedar Hill, Texas; Lilburn, Georgia; Lisle, Illinois; Coram, New York and Three Peaks, California. The interconnect contractor, already in array against Ma Bell, has declared re video teleconferencing: "Be my guest."

—both manufacturer and marketer have found no comfort in S.898, the Senate's bill featuring the rewrite of the 1934 Communications Act. The three elements they craved did not appear in print: divestiture of some parts of AT&T's monopoly; a time element that would allow the competitive factors to establish a solid product and financial base to compete on "even terms" with Baby Bell, once deregulation was a fact; and the complete separation of Baby Bell from its parent in financing and operations that eliminated cross subsidization, totally. The industry, upon careful reading of S.898, found the language, intent and meaning to be favoring the monopoly—and highly specious;

—another move within the parameters of the industry that the independent interconnect vendor characterized as untimely and timorous was the prime suppliers' move to shave off the number of authorized dealerships, taking over the local operation, a la Rolm, General Dynamics Communications and others. He well understood the advantage that was his—leverage—in a territory, without too close competition from the same brand. But the increased movement in this direction by the prime supplier indicated a deliberate stunting growth pattern, at a time when the industry needed the strength of the independent and his dollars;

—the purveyor of sound systems, and radio pocket pagers and intercom systems, hopeful that most branches of the life-safety security systems would be his salvation, finds the more than 3000 counties minus a New York City Law 5, or an ordinance separating high and low-voltage systems into the electrical contractor's realm, and the sound system contractor's plot. Progress is made in inches, obviously.

To sum up—1981 appears to have been something like Joseph's coat: a stitched together garment of many colors, without a designer's form, ill-fitting and heavy around the shoulders.

The economist—in and out of government—is predicting a recession that could go into the second half of 1982.

Reagan Administration people are hopeful that their diced-up federal budget will solve high interest rates for money, high costs of living and high unemployment, thus producing a measure of prosperity.

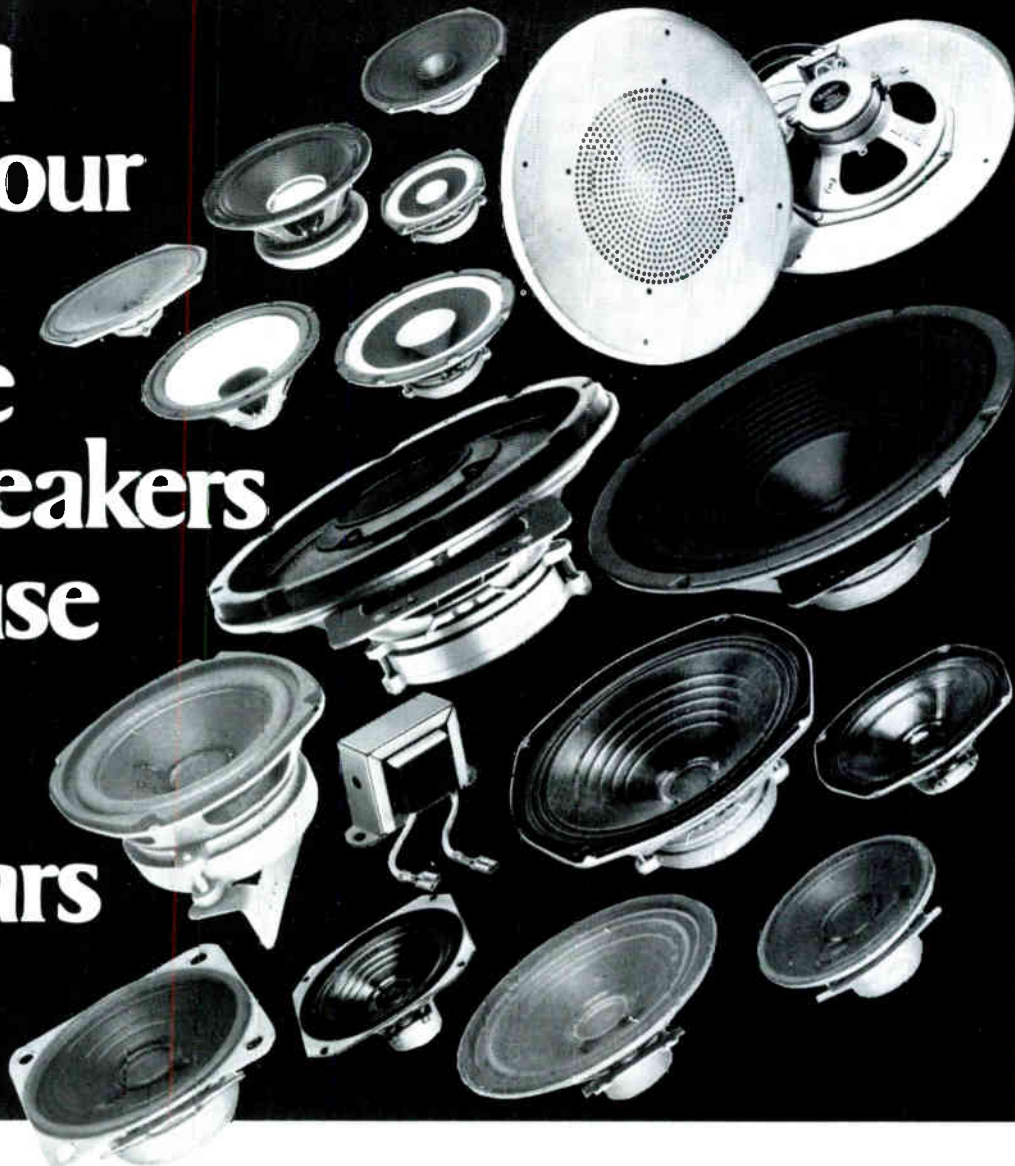
AT&T is betting that the new Communications Act will nurture a very healthy Baby Bell, able to run over the competition much as Mama has done for the past 100 years.

Prime switch suppliers are treading a mill, at an uncertain speed, while looking over their shoulders to see who will drop off and out of the marketplace.

The interconnect vendor is looking at some Social Security Board figures—the latest being for 1978—and reading an annual payroll for all industry at \$698,233,308, and the number of establishments in every major grouping, showing the employer of 5 to 49 persons as being the heaviest work force, reported quarterly at 1,338,364—and all needing public address paging, background music, intercom work stations, cabling for the work/processing functions, and security from fire, theft and vandalism.

There's more to this Economic Report in the following pages.
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Economic Report/AUDIO

A truism is: when you're driving uphill, you press down harder on the accelerator!

Audio component manufacturers—of amplifiers, microphones, speakers and signal processing equipment—pressed harder, driving for new technologies that would increase the sales of product in an economy that leveled off at the start of the second half of the year.

Sales tallies were:

Amplifiers—\$96,250,000

Speakers—\$110,100,000

Microphones—\$121,000,000

Signal Processing Gear—
\$32,400,000

Total sales—prime manufacturers to their distributor/dealer network—\$359,750,000.

Background music subscription services scored the unprecedented total of \$29,164,850 for the year. This figure was pumped up by the rapid adaptation by the interconnect side of the industry to offer Music-on-Hold with every PABX and key-phone sale!

A hop-scotching phone survey attributed this immense increase in audio product sales to a number of influences:

- The Pro Audio side of the business—that is, the portable systems incorporating lights, towers and recording facilities in addition to the normal amount of mikes,

amplifiers, three-way speaker systems and sound columns, cross-over networks, signal processors, all part of the traveling musical combo (Rolling Stones, Led Zeppelin, Mick Jagger and that ilk) ran up the cash register, and filled the till for an ever expanding group of audio contractors.

This side of the audio circuit (the other is the engineered sound system that is anchored to a wall or floor) attracted a great number of prime manufacturers, whose first market had been the musical apparatus field: Yamaha, Panasonic, Toa, producers of speaker systems, consoles, microphones and signal processors. Their distribution pipelines were choked; the musical apparatus sellers were also choked with product. The music field was flat. Nashville's recording industry was flat. The Bose, Community Light & Sound, Atlas Sound, University Sound and J.B. Lansing firms found their product moving into refurbishing audio distribution systems in houses of worship, airport sound systems, covered sports stadiums (Pershing in Michigan, Sportsdome in New Orleans, et al.). Some of the slack was absorbed.

- The 1-watt, 5-watt, 10-watt and 50-watt amplifiers kept up an oozing flow of sales, moving into the laboratories, consumer markets and replacement/upgrading areas. One of

the biggest areas to swallow product was the background music supplier. Three of the largest shippers of small power amplifiers—Bogen, McGohan and McMartin—had increased their sales volume by an average of 10%.

- The sound masking system, for the open office plan, took on formidable proportions as the distributor/contractor added this arrow to his quiver. Some years back, sound masking was for the effete office manager of a Fortune 500 company. Today, it is becoming more of a necessity, as the OSHA law spreads deeper into the plant and then into the office.

- The interconnect dealer, who's been shunning the sale of sound, has standardized on the 10-watt amplifier for his P.A. application. Despite his protesting that he does not actively seek the sound distribution order/job, he will not turn down his client's request for the ability to broadcast background music, to page outloud, and perhaps to turn that sound feature into an alarm system of some type.

Despite the quiescence that has gripped the construction industry—public and private building (F. W. Dodge reported, "After adjustment for seasonal variations, the first half housing total showed a 17 percent decline from the second half of

1980.") this circuit remains sanguine, and predicts an overall 7 percent increase in sales for 1982.

They point to these small signs for their confidence:

- the U.S. Commerce Department's Bureau of Economic Analysis' late July and August business survey indicated that capital spending was 8.8 percent more than in 1980—or \$321.5 billion for new plant. Spending in 1980 was 295.6 billion, 9.3 percent more than in 1979;

- George A. Christie/F. W. Dodge chief economist, indicated that total construction for the year steadied at 156 (1972 = 100 base) and that "it indicates a period of stability after a nine-month decline from November's 205 level. However, the conditions responsible for that decline, high interest rates and budget restraint on public work programs, remain as oppressive as before." Non-building construction contracts, valued at \$2.1 billion in August, showed a seasonally adjusted 9 percent gain over July's rate of contracting;

- the newer technologies that are moving into the marketplace will grip the buyer who sees spending cheap dollars today as the first step into physical improvements in plant, machinery and facilities for easing the business flow process.

One of the newer technologies that has established a solid footing in the audio circuit is the digital technique, which first appeared in the recording industry.

Digital recording consists of on-and-off pulses and not an electro-mechanical simulation of a sound wave. There is no way that imperfections in the recording medium—whether it is a tape or a disc—can effect the sound. Therefore, the quiet passages in a digital recording are totally silent, unmarred by any noise, and loud passages are distortion-free, since there are virtually no limitations in the dynamic range. An additional advantage in digital recording is that digital tapes and discs can be copied over and over again with no denigration in sound quality.

The recording industry, experiencing revenues (scored at constant

dollars by Frost & Sullivan, Inc.) estimated at \$6 billion by 1985—or an 8 percent annual growth—has opted for the digital technique over the videodisk, according to Frost & Sullivan. Their research indicated "many of the industry executives we spoke to think about the videodisk as being the technological savior of the recording industry. We feel, however, that the marketing potential of the videodisk remains to be tested in the marketplace... (and)...videodisk is not likely to have much of an impact on the recorded music market before the end of the 1980-1985 period."

The background music industry looms very large in the recording industry. The struggle between the two recording methods is of prime interest to the background music purveyor.

Economic Report/ INTERCOM

Thirty-seven suppliers of intercommunication systems—simplex and duplex—realized an annual sales of \$144.8 million to their distributor/dealer network.

This sales volume flattened out during the second half of the year, for the most obvious reasons: loss of new construction, a pulling in on expenditures for increases or upgrading of existing systems (especially in the institutional market); and the severe inroads made by keyphone systems offered by the interconnect dealer and the telco.

Despite these tribulations, several suppliers of duplex systems are gearing up for an almost 20 percent increase during the next 12 months.

The optimism is pivoted upon the growth of the office automation market, which is expected to triple in size—about \$36 billion by 1990, according to a study by International Resource Development Inc.—and more than 200,000 executive workstations in place by 1985. It would appear that an integrating network of office automating machines, coupled with intercom systems that can perform functions not now in vogue, is in the offing.

The executive workstation is visualized as an electronic center incorporating a CRT terminal, or an electronic mail terminal, a personal calendar feature and access to a variety of information held in electronic filing systems. The exec is interconnected with various departments within the organization by a phone system—financially ideal, a duplex intercom.

The early executive workstation products will be priced in the region of \$15,000 to \$20,000 each, while subsequent volume production and more efficient cluster configurations will lead to average prices as low as \$2,000 each by the end of the decade, the IRD report predicts. The justification for acquiring this type of equipment will be based

upon the time which executives save, and on the value of this saved time to the executive and his employer. The IRD report estimates that the executive workstation will probably pay for itself in four years, on the basis of the time saved by any executive earning more than about \$35,000 per year. The payback justification will broaden as advances in technology and quantity production lead to lower equipment prices.

Office automation equipment leaders are: IBM, Xerox, AT&T, Wang, Savin, Exxon, Canon, Lanier, Eastman Kodak and 3M. And some contenders for a market share include Rolm, Nippon Electric, GTE and ITT. Total shipments of executive workstations are projected to exceed 1 million units per year by 1990, worth more than \$2 billion in terms of the value of terminal shipments.

An unusual intercom application was recently reported out of Washington, D.C. The Roman Catholic Church is planning a nationwide telecommunications network, using satellite and cable, which eventually could link every parish, parochial school and Catholic hospital in the nation. Establishment of the satellite communications system "is comparable to the decision the church in this country made when it decided to build a school system," said Richard H. Hirsch, secretary of the U.S. Catholic Conference's communications department.

Initially the New York-based network will transmit 25 hours of programming a week, but eventually it is expected to operate around the clock. To participate, local dioceses must install dish-type receivers to decode and bring the signals down from the satellite. Programs will be recorded locally and aired over cable or commercial facilities, de-

While this market phenomenon is helping to pace the sale of duplex intercom systems, the banks and hospitals continue to provide a multi-million dollar annual sales. On both sides of the Atlantic, manufacturers are rushing development of international traders' consoles and conferencing equipment; while banks and international commodity traders and importer/exporter companies move toward satellite connections with the several record and voice carriers with transponders for hire.

The simplex intercom market continued to find volume business in the six-station systems, as well as FM wireless intercom product, some manufacturers reporting as much as 50 percent of the gross volume as their market share. The manifold applications possible with the simplex intercom system made it almost impossible to pin down its major installation.

pending on arrangements worked out by local church leaders. They can also be made available to parishes, schools or even individuals with home video recorders.

To date, Hirsch said, 71 dioceses have signed up to be part of the network. He estimated the dioceses' initial cost for the hardware necessary to participate at about \$30,000. Local dioceses will pay an annual membership fee of \$5,000, plus additional fees based on the type and amount of service used.

Planners of the new communications network believe the system ultimately could provide both a cheaper and a more efficient internal communications system for the church with its 170 dioceses, nearly 19,000 local parishes, schools, colleges and hospitals. According to church officials, the Catholic Church nationally has an annual telephone bill second only to the U.S. government's.

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Economic Report/ INTERCONNECT

NATA said that at year-end, the interconnect industry had a grand total of 71,125,000 systems installed, at a dollar revenue of \$1.4 billion—or 19 percent of the total PBX instruments installed by Ma Bell, independent telcos and the interconnect industry.

U.S. Department of Commerce/Bureau of Industrial Economics estimated that the 1981 growth of the telephone industry is almost \$11.5 billion in current dollars. In real terms, that is 8.4 percent, for a total of \$7.7 billion, while price increases will come to 6 percent.

Dr. John Wilson/president of J.W. Wilson & Associates Inc., Washington, D.C. (an independent economist organization), told the subcommittee on Telecommunications/U.S. House of Representatives: "PBX and Telephone Instruments—AT&T and the independent telephone companies, had 1980 revenues of \$4 billion in the PBX submarket and \$1.4 billion in the business telephone instrument submarket, compared to competitors' \$950 million and \$250 million. Even those figures are skewed in favor of the carriers, which lease equipment, resulting in relatively lower annual revenues than competitors, which sell equipment. A more telling comparison of market share: AT&T has 91% of the business telephone instrument submarket; the competitors have 9%."

S&C's survey revealed no dollar figures for the combined sale of PBX and keyphones—but it did verify that keyphones continued to outsell PBX by a ratio of 2.5 to 1. This ratio has been holding for the past three

years. And the assumption here is that the "big" system has been sold to the point of absorption; that the 200 and 500-phone system sales will inch along until an earlier generation of switches has been reduced in cost, through the dollar savings realized by customer ownership of systems.

A recent report from the May Company, which purchased Rolm Corporation telephone equipment, informed the business phone community that... "PBX sales have remained at the high level, and constant, because many large corporations—retailing chains, department stores and insurance companies with many branch offices—have adopted a policy of purchasing as many of their costly rental assets as they can. The May Company installed a private switchboard in each of its 13 stores from coast to coast, so as to no longer leave us at the mercy of inflation and outside companies."

The May Company expects a payback on the investment within three years, with \$5 million in annual savings of payroll and telephone company costs.

Another forecast, emanating from Eastern Management Group, Morris Plains, N.J., stated that approximately 20 percent of all businesses using PBXs will look for replacement equipment by early 1983.

"The impact of this accelerated search for new PBXs will contribute dramatically to a decline in the installed life of a PBX, which will reach 8.7 years in 1984 and 6.9 years in 1990. At the same time, the overall market size will expand

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from a present level of 225,000 PBXs to 335,000 by 1990."

Eastern Management Group said sales of PBXs are expected to reach 44,000 in 1985 and 64,100 in 1990. While PBX sales will grow from \$2.1 billion in 1981 to \$4.1 billion in 1985 and \$6.3 billion in 1990.

Withal, a hop-scotching phone survey to the contractor of interconnect systems revealed that the PBX market is flat out; that switch suppliers can make delivery overnight on any model switch; and if the model is not available from the prime source, then the distributor may have: North Supply, Buckeye, Famous Telephone, Midwest Telephone, Southern Telephone Supply, Sterling Telecommunications, Texcom, CEAC and others.

Meanwhile, the keyphone industry has developed a hole in its market that is unexplainable and perplexing. For the past five years, keyphone systems of 30 phones and above were being sold like the proverbial hotcakes. The telecommunications world went around with its tongue out, seeking technicians. Installations were calendarized at 30 or more days. The world was stirring up a big kettle of keyphones. Thirty-phone system and 10-phone

system orders were dropping in over the transom (some said), automatically.

Suddenly, the industry slowed to a limp and the contractor looked for the 15-phone system—to overcome the slack 30-phone system sale. None to be had. Question: Where's the 15-phone system? More importantly: Where's the market for every keyphone system, regardless of size?

Reaganomics is the big answer. The smaller answer might be found in the switch suppliers running for the big ticket and overlooking the "chase" system—keyphones.

A new market study by Frost & Sullivan, Inc. that examines digital communications products, finds that digital PBX shipments, which exceeded 4000 units in 1980, will increase the overall market growth to exceed \$3.5 billion in 1985. That digital communications is in the "earliest stage of its development" is confirmed by the results of a series of questionnaires sent out by Frost & Sullivan to a "broad base of telecommunication user and supplier businesses," including telcos, interconnect vendors and communications managers.

The F&S end-user survey also identifies digital telecommu-

A perplexing note arises out of Ma Bells' direct sales campaign to replace its standard 1A phone system with new key systems. Ma Bell is banking on the migration process to move its users from the 1A equipment to the newer ComKey 416. The prediction among the interconnect intelligentsia is that Western Electric could be cranked up to produce about 125,000 ComKey 416s a year—a challenge to the domestic and offshore producers of keyphones that might appear as most formidable, in a year that may have seen interconnection reach a pause in product/system sales.

nications applications likely to attract major market interest. Based on end-user responses, the number of electronic mail systems between 1980 and 1985 will triple; the number of electronic funds transfer users will have doubled; while the number of users employing computer conferencing, satellite transmission, and packet switching will have risen at least 150 percent each.

Downbeat areas, by comparison, include teleconferencing and digital networking, where growth over the five-year period will fall short of 100 percent. Notes F&S, "digital systems could significantly alter business travel."

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Economic Report/RADIO

The radio circuit continued to startle the industry with a compound annual growth rate of 15 percent.

Witness:

—there are more than 364,634 licensees operating in the land mobile radiotelephone area! That is just for one transmitter and one receiver—and there's no counting the number of added transceivers!

—in the CB and Personal Communications bands, there are, according to the FCC, over 14 million units in operation in the nation;

—radio controlled paging devices have been growing at a 27 percent annual rate; over 1 million pagers are in use, says the Bureau of Industrial Economics/U.S. Department of Commerce;

—industry studies indicate that sales of radiotelephones and pagers are expected to grow to \$2.7 billion by 1985.

What is hyping this segment of the sound and communications contractors market is the need for more circuits as the working population decreases through attrition, depression and the rising demand for servicing personnel on the move. And the FCC has been responding with the acceptance of the cellular mobile radio system within the 800 to 900 MHz spectrum.

The market has been split between the pocket pager and the mobile transceiver. Frost & Sullivan, Inc. examined the paging equipment market and forecasted that this market, at \$86 million in 1980, will increase to \$400 million in 1990. Other equipment markets analyzed included: radio scanners, from a current tally of \$130 million, will balloon out to an 80 percent increase by 1990;

remote telephones, now enjoying a boom market, perhaps doubling in volume by 1983, will drop off thereafter;

scramblers will experience a four-fold increase in market share by

1990;

CB radios will remain essentially flat through 1982 and then proceed to double by 1990, reaching \$215 million annually that year.

The cellular mobile radio market will generate roughly \$1 billion in equipment purchases cumulatively over the next 10 years, and \$1.5 billion in common carrier revenues over the same time frame, according to a study by Frost & Sullivan. When comparing the spectral efficiency of different radio systems, the cellular variety turns out to be as much as 34 times as productive as conventional radio systems and 19 times more so than trunked systems, the F&S study revealed.

The research firm discovered that the current year's cellular shipments amounted to a mere \$6.6 million, fueled by experimental systems in the main. But, this will jump nearly ten-fold to \$65 million by 1984, and by the end of the decade, equipment shipments on a cumulative basis will have reached \$244 million for central cell equipment; \$825 million for mobile sets.

Frost & Sullivan predicts that over the decade-long time frame the cumulative total for carrier revenues will break down into two-third proportions accruing to the wireline phone carriers and one-third to the radio common carriers.

The digital technique has been explored in the radio mode. Digital speech interpolation (DSI) offers an approach for improving spectrum efficiency in systems which utilize voice channels. DSI improves the utilization of channels by inserting digital voice or data information during the pauses that take place during normal speech on a channel. The DSI concept is similar to time assignment speech interpolation (TASI) which has been used for many years to multiplex analog voice signals.

Use of digital voice will increase

Behind the turn to cellular technology, of course, is the "long waiting lines" for mobile radio service. And even when such service is obtained, customers find "long waits" are often necessary when attempting to make a call. It is for this reason that the larger metropolitan communities will be the first to reap the benefits of new cellular systems which are in development stages and testing in Chicago and in the Baltimore-Washington region. Once the market opens up, the technology is expected to expand rapidly, with equipment costs thereby coming down in price as well.

F&S revealed that an extraordinarily price-sensitive market currently exists. At the current \$60 a month pricing level, five percent of prospective users indicated interest. That number jumped to 50 percent when the charge was dropped to \$30 per month. In addition, user-owned equipment, now costing as much as \$3500, would drop down to the \$1000 level in volume production.

The radio circuit—especially the pocket pager division—will continue to strengthen the base—product and financial—of many sound and communication systems contractors who are able to mix this service with other circuits.

in the land mobile services as the importance of secure communications continues to grow. However, it is unlikely that there will be substantial use of digital voice systems until equipment prices decrease significantly. Perhaps in 20 years, digital voice may become the standard, assuming that highly efficient low-cost digital systems become a reality, and the need to interconnect with digital Integrated Communication Networks develops.

—FCC Private Radio Bureau
Staff Report



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Economic Report/SECURITY

The security system market—incorporating home burglar alarms and fire detection systems, plus the larger life-safety systems for high rise buildings (hotels, institutions, apartment houses) and plants—billowed out to \$615.6 million, according to the Electronic Industry Association.

S&C's survey revealed that as almost double the volume of the two preceding years!

Of course, that figure includes the home systems—packaged—systems which the EIA placed at \$580 million. And the Association forecasts the shipment of product to the distributor/dealer network at somewhere beyond \$2.5 billion in 1984!

Narrowing down the figures for the larger commercial systems, the total market registered \$165 million sales to the distributor/dealer network. It included systems and products incorporating fire marshall stations within an establishment, intercom and public address features for panic control at the master station and at monitor positions.

Although voice was the primary system, closed circuit TV systems added another \$142 million in product sold by the prime source to the distributor/dealer network, for security applications.

Hard-wired systems dominated, yet radio-based systems moved with greater strides within the precincts of the industry. This was attributed to the advanced systems designed for RF security systems and the Federal Communications Commission's move to provide greater flexibility for the operation of wireless security alarm systems by pro-

mulgating a rule change that generally will permit intermittently operated low-powered devices to operate on most frequencies above 70 MHz at power levels previously limited only for radio-controlled garage door openers and with less stringent limits on the length of transmission permitted. Provisions are also made for general purpose transmitters to operate periodically at lower power levels with a mandatory silent period between transmissions.

In addition to the spectrum above 70 MHz, the FCC has made the 40.66-40.7 MHz band available and provided a flexible standard for bandwidths.

The FCC characterized its rule-making response as flexible and consistent with its broad objective of allowing industry to operate to the greatest extent possible in an unregulated competitive marketplace, while maintaining an essential minimum of control to avoid harmful interference.

The new flexible standard for bandwidths provides that below 900 MHz a bandwidth of 0.25 percent of the center frequency is allowed. Above 900 MHz a width of 0.5 percent is permitted. Manufacturers are cautioned that while no limit on frequency drift was incorporated, except for the 40.66-40.7 MHz band, devices must not drift into the restricted bands.

The security system business was reluctant to project a figure—either units shipped, or dollar volume for the ensuing year—other than to indicate that they would keep up with the increasing demand for systems and products.

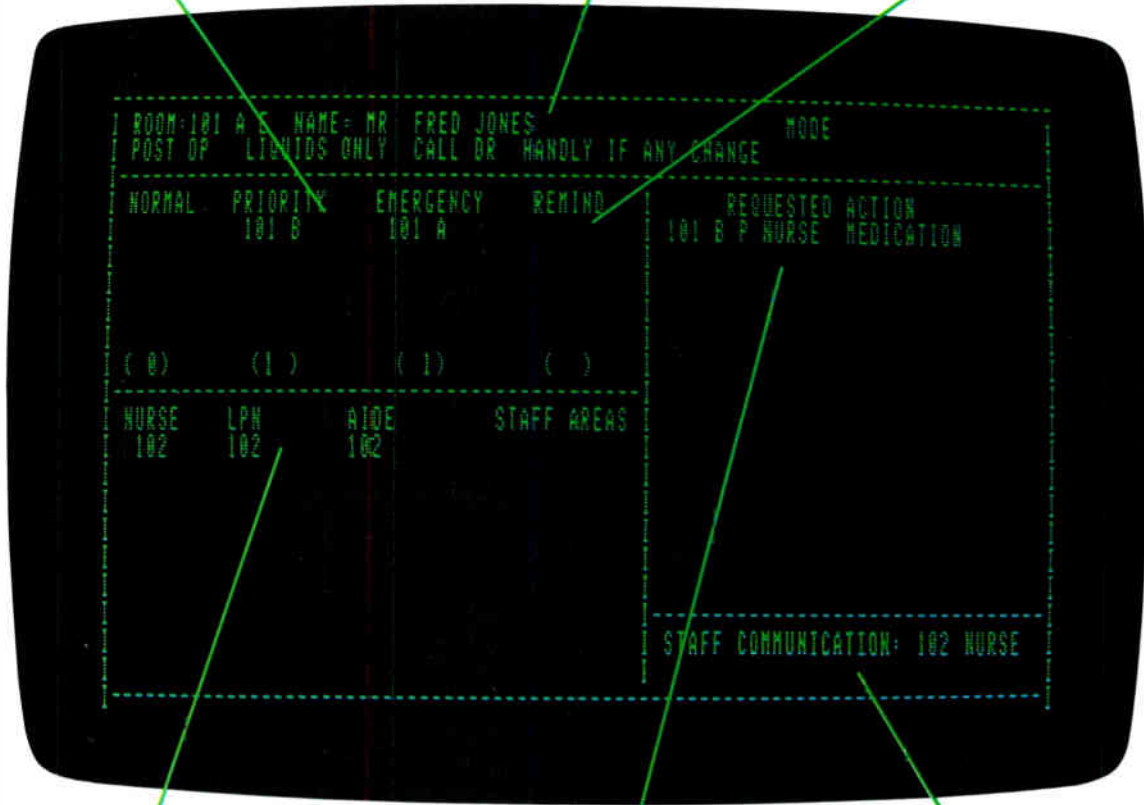
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ANALOG vs. DIGITAL TRANSMISSION

by Stan Rosenzweig

Evidence that the telephone interconnect industry has reached maturity can be found in the new aggressive marketing by many manufacturers.

In some respects this is good, and the fact that manufacturers are spending money on advertising, to reach not only interconnect distributors, but also end-users, is a sign of industry-wide financial health and stability.

However, the normal marketing process can be subverted by overzealousness which, in the telephone business, can only be countered by good public education.

Recently, many telephone system salesmen have been touting digital transmission, implying that, in today's marketplace, having anything less is purchasing premature obsolescence, unsatisfactory service, and the inability to welcome the "office of the future."

The fact is that, oftentimes, digital transmission has nothing to do with either of the two, and practically every switch on the market today with digital transmission lacks sufficient traffic carrying capacity to cope with future exotica, if and when it becomes available.

First of all, before we discuss digital transmission, let's understand what makes a telephone switching system tick. A switch, which is the heart of a telephone system, can be divided into three distinct areas for the purposes of this discussion. They are:

- the control technology;
- the method of transmission, analog or digital;
- the technology for the system matrix.

Control technology is used by the system to determine:

- what has to be done;
- how to effect what has to be done.

In the old days this decision-making was performed by the attendant. More recently, a good deal of this decision-making has been taken over by the system itself. By programming, we can determine who is allowed to make outside calls and to what areas, we can keep records of who calls where and when, we can determine who answers whose phone when people are busy or away from their desks, and an ever increasing array of features and options can be programmed, the number and sophistication of which are inhibited only by our imaginations.

In this aspect of a telephone switching system, digital technology has proven to be a major breakthrough, since digital control allows us to use general computer technology and programming to vastly increase our flexibility without proportionally increasing our costs. In other words, the most significant aspect is providing flexibility *cheaply*. If the flexibility that we seek would be provided as inexpensively without processor controlled digital technology, then, in this respect, the work "digital" would lose its allure. So far this hasn't happened, making digital control almost mandatory in modern system design.

The technology for method of transmission, on the other hand, is an entirely different story. Most recently, some telephone marketing people have been convincing end-users that telephone switches that utilize analog rather than digital transmission methods are woefully inadequate. They reason that modern telephone systems should be equipped to transmit data, which is digital by nature. Since analog switches require digital data to be converted to analog before transmissions, and then converted back again to digital, they reason that this is inherently objectionable.

Without going into too much de-

tail, ordinary voice conversation between two people is analog transmission. Ordinary conversations between two computers is digital. The national, even international, networks over which all telephone communications are carried are analog transmission.

It has been jokingly suggested that to change all analog facilities to digital would cost an amount equal to three times the Gross National Product of the United States. In fact, this might not be too far from the truth, and there are estimates that these facilities will not be changed to digital, or any other transmission medium, at least within the next decade and possibly not within our lifetimes.

Thus, connections between PABXs and Telephone Central Offices will most likely be *Analog Transmission* for the next twelve or fifteen years, even though many central offices are being converted to electronic digital control.

Therefore, how is it that some telephone system marketers can so easily postulate that analog transmission has no use to modern telephony? The answer must be that these salespeople are simply overreaching for self serving reasons, and they are getting away with it because nobody has taken the time to dispute them with the facts.

Before considering these facts, let's explore the third aspect of switching which will prove helpful in improving our understanding. That aspect is the so-called "matrix." The "matrix" is the method of getting the phone conversation or communication through the switch.

In older days the "matrix" was actually represented by a physical matrix of physical wires that cross-connected originating stations with terminating stations. This is called Space Division Switching. Today, there are various other methods of carrying conversations that enable us to provide service that is more efficient and less expensive. For instance, by building a system with an electronic clock and sampling conversation we can put many con-

Mr. Rosenzweig is the chief executive officer of American Teleconnect Corp. and is a consultant in the telecommunications field as well as an author and lecturer. This article is extracted from a book to be published shortly.

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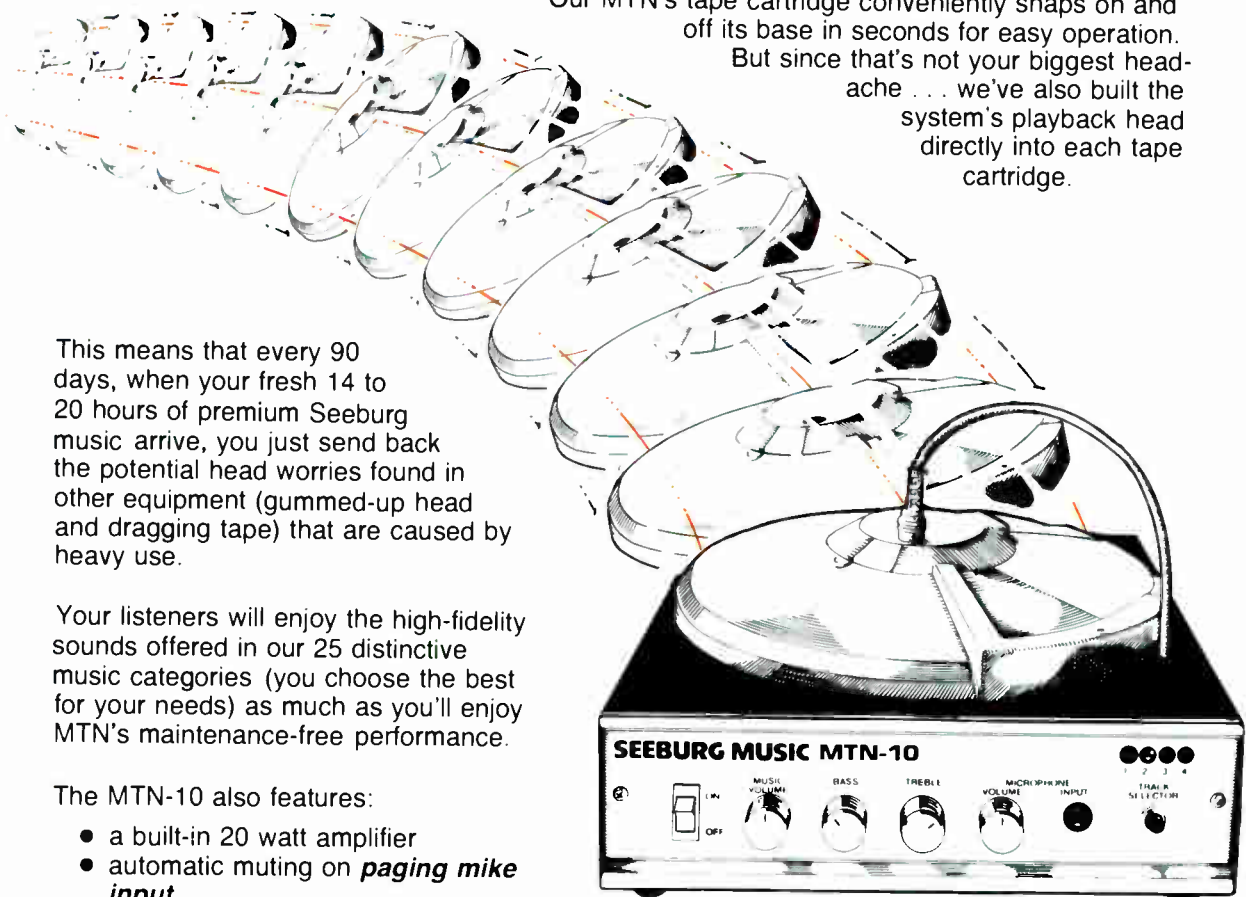
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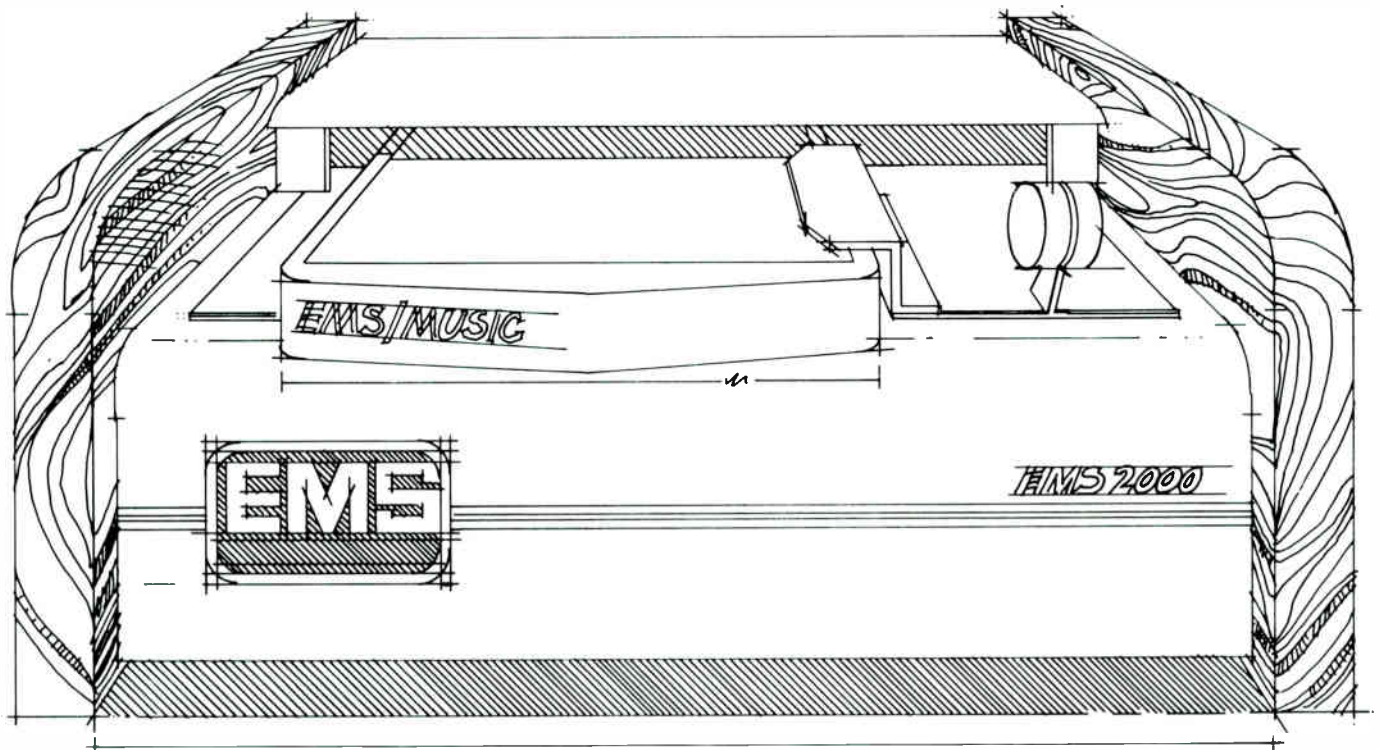
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versations on a single line. If we put two conversations on the same line and alternated the line between the one and the other at half-second intervals, this would be half-second sampling. Of course, this would create a very choppy conversation, but if we alternated between conversations 30, 50, or 100 times each second, we would lose our perception of the sampling, and this would give us the effect of two talking paths on a single circuit. This is called Time Division Multiplexing. By using our electronic clock, many systems now employ time division multiplexing (TDM) or other multiplexing methods in lieu of space division switching.

This in no way means that space division should be discarded. New electronic technology has enabled some manufacturers to eliminate the electromechanical aspects of space division switching and improve its performance and economy. Moreover, electronic space division switching often has the capacity of higher traffic volume for less cost, without introducing cross-talk, noise, or timing problems that time division and other multiplexing techniques can create.

People who sell each of these different methods of transmission tend to champion their products over everyone else's, for obvious reasons. But the arguments they give often fail to deal with the two central issues:

- how well does it work;
- how much does it cost.

Getting back to the analog-versus-digital issue, digital transmission lends itself to multiplexing, inasmuch as digital transmission itself is based on samplings as opposed to analog, which is often sound as nature created it.

Using modern microprocessing technology, either transmission method will work, as will either "matrix," so long as the design, engineering, and manufacturing quality of the individual product is good. Assuming all of these, the choice of technology usually becomes one of economics. As systems get larger, space division/analog may become very expensive to build, while at smaller system sizes, economies often run the other way.

Should one technology be generally accepted over another? People

who market digital switches unan- imously say yes. They claim that digital transmission is quieter and more error-free on long distances, allows data transmission without conversion requirements, and generally lends itself to office-of-the- future enhancements as they occur down the road.

This gives us the impression that digital transmission systems using electronic multiplexing switching rather than space division switching are better today and will be more current in the future. This really isn't so.

In the first place, in today's real world, except in unusual circum- stances, 95% of traffic is voice and 5% is data. Since voice is inherently analog and data is inherently digital, does it make more sense to convert the 95% analog traffic to digital, so that 5% digital traffic can be trans- mitted without conversion? Or does it make more sense to transmit the 95% analog signal without conver- sion and convert the 5% of traffic?

But it is the future that most of us are concerned with, and it is here that the digital mystique is most misleading. We are told that digital transmission is more noise-free. In fact, while arguments can be made both ways theoretically, in practice measurements can prove that there are some very quiet analog trans- mission systems around and, coupled with electronic space division switching, which is virtually noise- less, there are cases where, for economic as well as quality reasons, the much touted digital alternatives just don't hold up. They work as well, but at possibly two to three times the cost if the high quality of transmission is to be retained.

This is because, with most digital transmission technology, we time- divide every signal we transmit. Over the long haul (500 miles or more), the digitized message flows virtually noise-free. However, the time division process is noise pro- ducing inherently at the source, which means that digital transmis- sion technology must overcome the potential for trouble before the sig- nal ever gets a chance to go any- where.

Adding this to the need to convert all voice and data signals to analog for exchange network access, is it any wonder that space division pro- ponents shake their heads in dis-

cure the 10 most common nuisances in PA instantly



fact: These 10 problem solvers in your toolbox are like 10 new tricks up your sleeve. Or 10 hours of saved time. Or money in the bank. They make molehills out of troubleshooting mountains, without soldering, or splicing, or internal equipment modifications.

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Low-Frequency Noise	A15HP High Pass Filter—reduces low-frequency noises and proximity effect.
High-Frequency Noise	A15LP Low Pass Filter—reduces objectionable high-frequency noises.
Lack of Presence	A15PA Presence Adapter—adds intelligibility and brilliance.
Sibilance	A15RS Response Shaper—sibilance filtering, plus flattened response.
Line Level to Mic Input	A15LA Line Input Adapter—converts balanced low-impedance mic input to line level input.
Matching/Bridging/Isolating	A15BT Bridging Transformer—matches balanced or unbalanced devices of different impedances.
Trouble-shooting	A15TG Tone Generator—700 Hz signal helps check levels, connections, mixer inputs, and cables.
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belief at some of the claims of digital salesmen?

Currently, most systems being sold can just about adequately handle the ever growing voice traffic of today's business environment. Those marketing people who are promising office-of-the-future data transmission capability utilizing traffic handling capacities of current systems give us cause to question their integrity.

Telecommunications gurus have estimated that data usage in true office-of-the-future environments will require 2½ to 4 times the traffic handling capacity during peak-hour loads of systems that are currently being offered.

Do we honestly believe that the systems we purchase today will handle this kind of traffic? Do we honestly believe that it would be worthwhile to pay for the additional traffic capacity if it were available today? Can we justify building in future capacity in an area where we are not sure what interface protocols will be developed, what practical applications will be required, what peripheral hardware costs will be presented, and what new technologies might be developed that use neither analog, nor digital, nor any technology that we are now considering?

In fact, most people buy telephone systems because they are presently paying too much money for too little service. To presume that we know what the future will bring, to pay for future capacity that may never be used, and to assume that everything that could be done should be done in a single vehicle, is not the way successful people run businesses.

The office of the future will come. With it will come startling and cost-saving innovations. When those innovations come, cost benefit analysis will be considered and decisions will be made. To make those decisions today is less than competent. To avoid present change in anxious anticipation of the future is immature. To hold out promises of future technology that are truly not yet here, to denigrate present quality for blue skies, and to imply that you can do what traffic tables and common reason clearly show you physically cannot do, is a clear sign that our maturing industry still has a way to go. □

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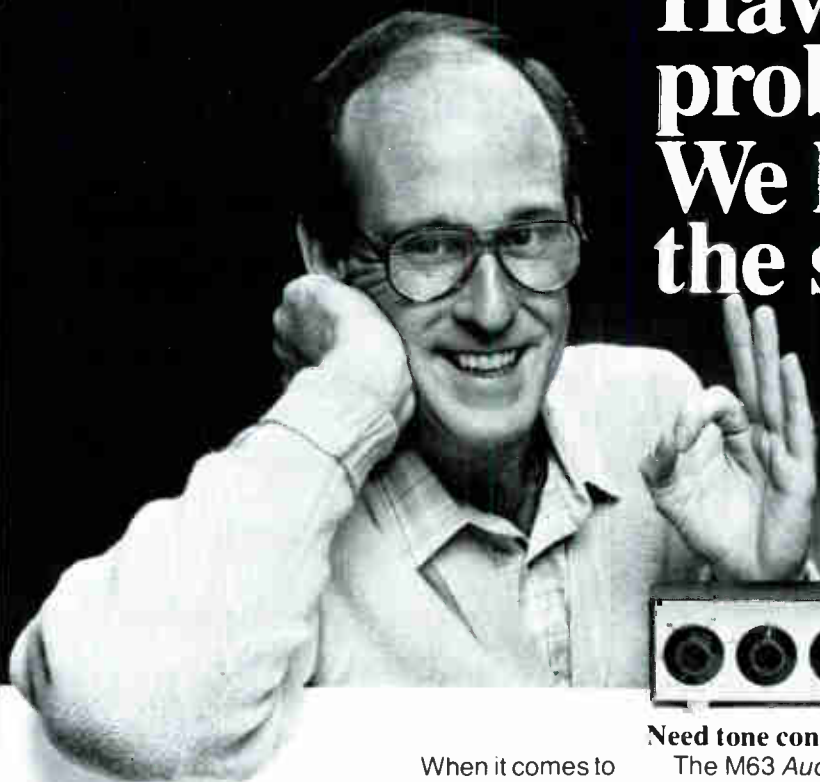
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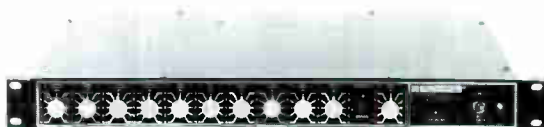
Trying to boost a low-amplitude signal?

The M64 Stereo Preamplifier boosts low-level signals in broadcast, recording, editing, and signal routing applications.

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Satellite Telecommunications: a New Vehicle for Auto Shows

In Detroit recently, a telecommunications network, linked via satellite, was used to present a two-hour new car and truck announcement show to 9,000 salesmen throughout the United States. Using the most advanced techniques of communication available, Chrysler beamed its 1982 models simultaneously into 21 locations.

The program, produced by Ross Roy, Inc., at Chrysler's Styling Dome, was divided into two separate broadcasts, one for Chrysler/Plymouth salesmen and the other for those selling Dodge cars and trucks.

nal and sent it to the meeting room via coaxial cable. A video unit projected the enhanced image on a 9-by-12-foot screen.

The meetings included product/sales training sessions and major presentations by key corporate officials, including an address by Mr. Lee Iacocca, chairman of the board.

According to Jack Oliver, Ross Roy vice president, Chrysler's use of the state of the art in modern communications systems was the most efficient method of presenting the new models and the top sales executives to all salesmen at one time. "This year's presentation was six months



Signals were transmitted from Highland Park over an elaborate TV production system to a ground station outside the Detroit area. Then they were re-transmitted, via the Weststar communications satellite orbiting 22,000 miles above the United States, to the 21 receiving stations.

At each meeting site, a portable satellite receiving dish, aimed at the Weststar satellite, received the sig-

in the planning and preparation stages and resulted in a savings to Chrysler of over 30%, compared to alternative methods considered," he said.

"The use of a satellite to present the new models, as well as in-depth sales training material, goes hand-in-hand with Chrysler's theme of 'High Technology for 1982.' In fact, as one of the salesmen indicated, it was the next best thing to being there," Oliver concluded. □



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Equalizing for High Frequency Sound

by Daniel Queen

Following nearly two decades of widespread use of sound reinforcement equalization, most users are at least conversant with the problems of direct, early and late sound that created so much confusion at one time. Yet, despite use of highly sophisticated equipment and techniques, so many sound reinforcement and theater reproduction systems fail, particularly in the high frequency range. Typically, systems designed for film and for sound reinforcement tend to sound harsh, thin, or dull, seldom having the natural smooth high-end characteristics of some of today's better high fidelity home reproduction systems.

This happens despite the use of transducer elements at least comparable in quality to those used in the home systems.

Harshness in many systems can be merely the result of a poor choice of components. However, in those where the components are of good quality, where levels have been adjusted to avoid distortion in all elements of the signal path, the harshness may be the result of improper consideration given to the directional characteristics of the transducers during the equalization process.

No real physical microphone or loudspeaker has a perfect directional pattern unvarying with frequency. Because the transducer has a finite unchanging size, while the wavelength of sound changes with frequency, the relationship between the wavelength and the transducer size must also vary with frequency. The degree to which the transducer designer overcomes the effects of this physical law often determines the sound quality of his product.

The most common high frequency equalization error occurs during the use of a measuring microphone. Contrary to popular belief, no omnidirectional microphone is truly omnidirectional. The microphone is omnidirectional below a certain frequency related to the relationship of

wavelength to the diameter of the microphone diaphragm and the case around it. As shown in Figure 1, when the diameter of the diaphragm is near a half wavelength of sound, the net pressure on the diaphragm approaches zero. At this frequency, the diaphragm can only pick up from its front and rear.

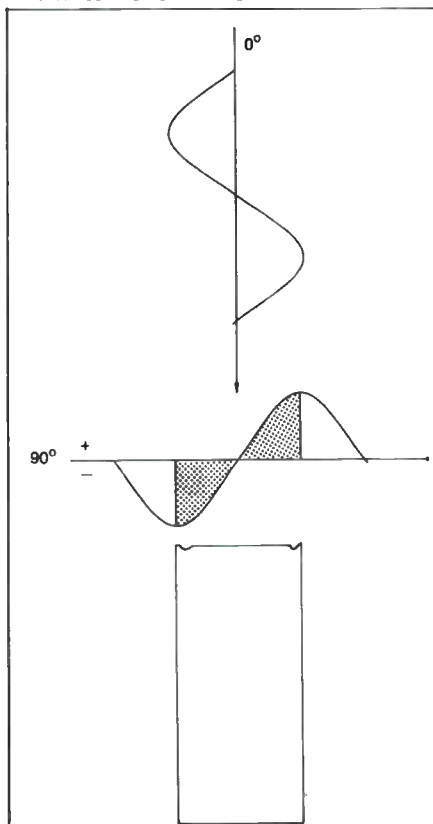


Figure 1. When the sound wave approaches 90° incidence, the + and - pressures tend to cancel when the diameter of the microphone equals a half wave length. However, no such cancellation occurs with 0° incidence.

However, because the sound has to diffract around the case in which the diaphragm is held, this relationship is never exact, so full cancellation cannot take place. Often, structures are added to the case in front of the diaphragm, to help to reduce the effects of the wavelength relationship.

Above this frequency, as the diameter approaches a wavelength

and begins to exceed it, the directivity becomes sharper. Thus, the sensitivity on the axis on the microphone compared with the random incidence response of the microphone is as shown in Figure 2. This figure shows that such a microphone placed in a diffuse field, that is, one in which sound is coming equally from all directions, will show a flat response. However, if the field is directional, the response will vary depending on the dominant direction in the field. If most of the sound impinges on the front of the microphone, the response will be peaked at the high frequencies. On the other hand, if most of the sound comes from the sides, the response may look flat. If the response tends to come from the back, the response will look deficient at high frequencies.

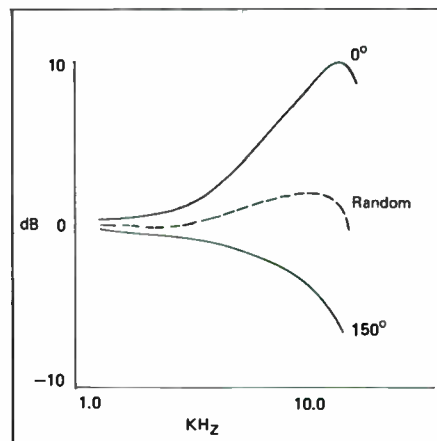


Figure 2. Comparison of response of a one-inch precision microphone to signals at 0°, 150° and random incidence.

Since one seldom finds a sound field which is truly diffuse, these directional effects always affect the accuracy of the high frequency equalization. The importance of this can be appreciated when one realizes that the error for a one-inch precision measuring microphone reaches 3 dB at about 4.0 kHz and maximizes at about 13 dB at 15.0 kHz. A half-inch measuring microphone improves the situation somewhat and a quarter-inch microphone

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almost puts the error out of the audio band.

Many microphones used for sound reinforcement equalization are effectively larger than a one-inch measuring microphone.

The degree to which such a problem exists during a measurement can sometimes be ascertained by rotating the microphone about during the measurement. However, this method will seldom provide an adequate compromise answer—partly because of the interference of the case and often, the interference of the device which is rotating the microphone (which frequently is all thumbs).

The best solution to this problem is the use of a small microphone such as a standard quarter-inch unit. The choice of such a microphone must be made with care, since the smaller a microphone, the lower its signal-to-noise ratio will be. One must pick a microphone which will have at least a 10-dB signal-to-noise ratio in the lowest level band to be read.

The problem is exacerbated by the inability of many sound reinforcement loudspeaker systems to provide a uniform sound field. Unless the system has a truly constant directivity with frequency, the sound field will be highly non-uniform. This can be seen by referring to Figure 3, in which the directivity pattern of a loudspeaker is superim-

posed upon a room showing the direction and relative amplitude of early reflections in the room.

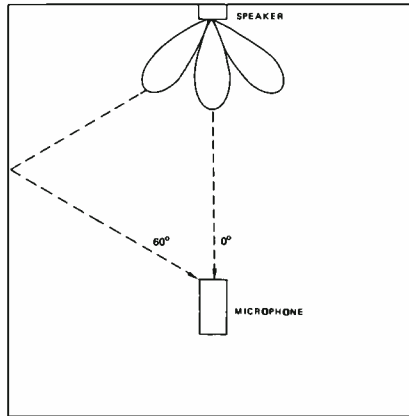


Figure 3. At some frequencies, the directional pattern of the speaker will result in waves arriving off-axis to the microphone at amplitudes exceeding that on-axis.

Such a pattern is frequently found in the high frequency response of many systems. What is worse, when one moves off the frequency from which this pattern was measured, the pattern will change radically. Nodes will become peaks, etc.

Even with a perfectly non-directional microphone, at all frequencies such a loudspeaker array would create problems for equalization, since there would be no way that the early sound in one area would be the same as the early sound in another area. It would be necessary with

such a system to provide a compromise equalization so that no seating area would be worse than any other. However, if the microphone is directional and non-uniform with frequency, then the probability of error in such a compromised equalization scheme becomes very high.

In reality, all loudspeaker systems have some defects with regard to uniformity of directivity. Seldom can one build a system which consists only of a single perfectly designed cluster. Usually, loudspeakers must be included to fill areas missed by the main units. Sometimes additional loudspeakers are required with delay in areas where features such as balconies shadow the cluster. Thus, we nearly always are dealing with a sound field which is not diffuse and which presents a different frequency response depending on the direction the sound impinges on the listener.

Since the listener is a slightly directional receptor, this situation is not entirely satisfactory. However, with skilled equalization, it can be made more than tolerable. Since each individual's hearing sense has a somewhat different directional characteristic, it would be difficult to design a microphone that would predict the response of the listener accurately. When one considers the special design details of the sense, such as head movement and central processing of the binaural sound, the design of an equivalent microphone becomes more difficult. The best answer therefore, is a truly nondirectional microphone.

In conclusion, it is necessary that when equalizing a room the smallest possible microphone be used, consistent with an adequate signal-to-noise ratio, and that careful attention be given to the characteristics of the loudspeakers. The microphone should preferably be no more than a quarter-inch in diameter and should be capable of placement at least two feet from solid objects, including the body of the person taking the measurement. Equalization can then be carried out using the guidelines available in the literature and from equipment manufacturers to provide the broadband equalization of the loudspeaker in the room. Narrow band equalization may then proceed, if necessary, utilizing the complete system including its own microphones. □

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IBMA MEETS

Arizona's air had a "chill" to it, but at the IBMA's 11th National Convention, held at Mountain Shadows in Scottsdale, October 11-14, the temperature was "hot." Enthusiasm was the theme. Membership rose and the attendance increased from 200 to 276. Many more manufacturers of amplifiers, tapes, background and foreground music systems were present.

Stacey Brown, Keen Smith and Bruno Fulde were nominated to the board of directors for the '81-'82 fiscal year. They, with the other board members, unanimously voted in the previous year's officers to serve another term. So Dan Lee will continue at the helm, with Peter Jordan as V.P., Dan Hart as Treasurer and Carol Mayer as Secretary.

Jack Berman's audience-captivating seminar on Effective Sales Techniques proved to be both educational and enjoyable. His Buddhist principle, ESHO FUNI (human and environment are separate but together) combined with Eric Berne's *Games People Play* and Dr. Harris' *I'm OK, You're OK* and right brain/left brain theories, simplified selling techniques. The point he made was not to sell the customer but to have him buy.

Don Rada, a 3M executive whose forte is Time Management seminars, reported on Joe Sugarman's book *Success Force*. Don elaborated on Sugarman's simple six-point positive force philosophy. The points are 1) always be honest, 2) cherish your failures, 3) relish your problems, 4) concentrate your powers, 5) do it differently, and Don's favorite, 6) clean your desk. If a businessman studies Sugarman's tenet, he can't fail.

Bruce Warden of Bruce Warden and Associates, Phoenix, Arizona,

discussed sound formulas and graphs to aid in masking and setting up the acoustically sound room.

Glen Tanner offered a seminar on the importance of the business computer today and how it will affect business tomorrow.

Manufacturers represented included:

Aiphone presented their EX micro-processor intercom system.

Argos Sound showed their baffle-speaker transformer units.

Atlas Sound displayed their OS-8v and OS-12v Omni Series microphone stands.

Audio Environments introduced their airline entertainment service.

Bogen showed their amplifier Series MBA-15, 30, and MBA-60.

Casco Background Sound exhibited their DD-880 direct drive console with dust cover.

Communications Company Inc. introduced their programmable dual-channel amplifier, the I-C 28.

Communitron presented their Drive-Thru system and their paging telephone systems.

Customusic Rowe International, Inc. showed their CPC line of background music units.

JW Davis & Co. announced their DF series amplifiers.

EMS/Music exhibited their packaged foreground music system, the EMS 2000 tape cartridge player.

Fanon introduced their public address amplifier, the PAA series.

Fourjay Industries exhibited their ultimate weathertight TELCO paging horn.

Horizon Industries, Inc. showed their visual high-image display.

Johnson Electronics exhibited their amps, tuners and RF equipment.

Magnetronics Inc. defined their Motivational Music.

Marsh Products highlighted their drive-thru mikes.

McGohan Electronics Inc. featured their 10-100 watt amps.

McMartin Industries highlighted their automatic level controller, the LR1009.

OZ highlighted their color-coded music library.

Quam-Nichols Company showed their 8C10C0 coaxial 8-inch loudspeaker.

Raytronics demonstrated their drive-thru communications systems.

Seeburg Music highlighted their satellite distribution and their MTN-10 tape cartridge system.

Tape-Athon exhibited their Messenger II and their automatic background music systems for broadcasting, wire service or CATV transmission.

Telephone Sales and Service displayed their electronic Private Automatic Exchange, the Select-O-Phone II.

Telex Communications Inc. presented their wireless microphone system.

3M exhibited their Cantata System, Intracom and drive-thru service.

Toa Electronics, Inc. showed their 900 series of PA amplifiers.

Trutone Electronics, Inc. introduced their 701 1-watt amplifier and their RPM audio voltage and power meter.

University Sound exhibited their outdoor and underwater speakers, UW-30.

West Penn Wire Corp. showed their Perfect Pair and Perfect Stripe multiconductors.

Yesco Foreground Music presented their Series One cartridge tape players, model 400, and their Series Two continuous cassette Alternative Models 501-510. □



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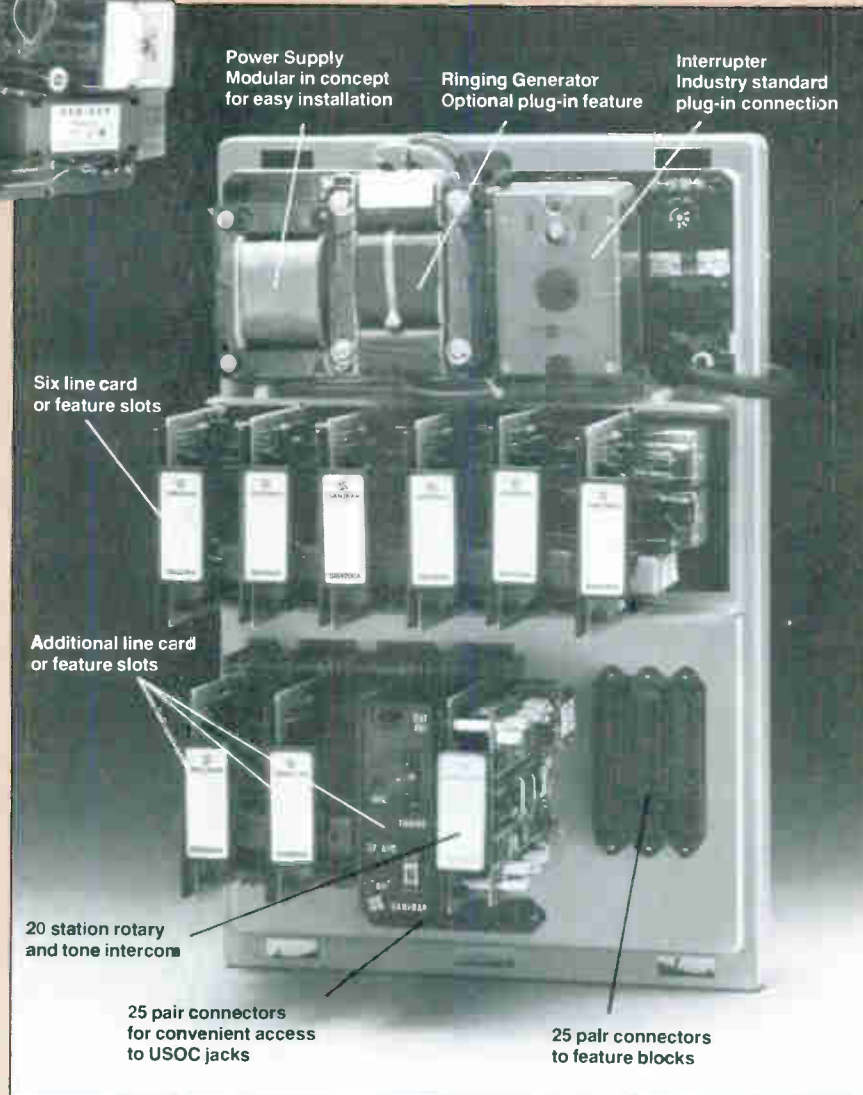
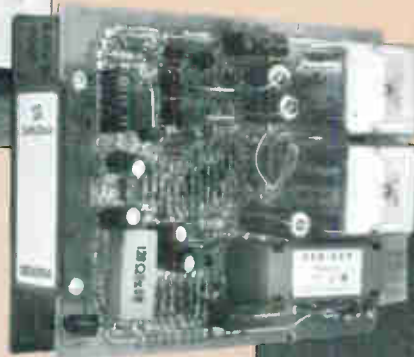
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- SB6680 6 line — voice announcing, soft paging and background music
- SB6615 14/29 line — 8-48 station multi-path intercom

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- Up to 20 stations of rotary and tone intercom
- 25 pair connectors rather than "66" type connecting blocks
- Small, lightweight — easy to install
- Economically priced with the same two-year warranty
- Versatility of a mixture of lines and special features
 - Off premise extensions — SB4100A
 - Music-on-hold line cards — SB4200A
 - FM receiver music source — SB4201A
 - Add-on-conference — SB4452B
 - Paging access — SB402C
 - Call announcing with handsfree answer back — SB6624A

For more information contact our Marketing Department at 1-800-527-4837.



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17422 Pullman St.
Irvine, CA 92714

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

Eyeing the Aisles at IBMA



Geoff Meagher of AEI.



From left, Paul Kitchka, Bob Johnson, Gene Magrine and Allan Ross, Customusic.



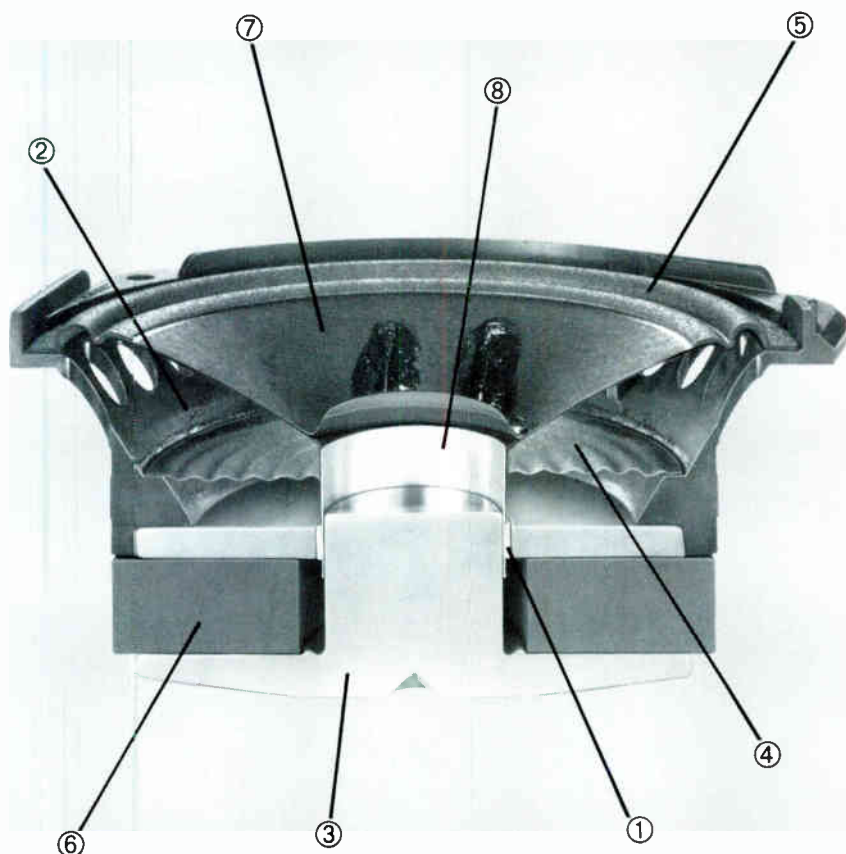
Jim McGohan and Rosalie McGohan Monk, McGohan Electronics.



From left, Bob Gray, Kathie Rubin and Mark Torrance of Yesco.

The Bose® 802 Driver

High technology. High performance.



Efficiency.

Low-impedance voice coil ① uses edgewound aluminum ribbon for maximum conversion efficiency. Nonmagnetic frame ② and one-piece backplate/centerpole ③ reduce flux leakage and wasted fringe field energy.

Accuracy.

Planar spider assembly ④ and foam surround ⑤ provide high linear excursion and low distortion. Syncom™ II computer analysis controls total radiated power spectrum of each unit for unprecedented manufacturing consistency.

Power.

12-ounce high-energy Ferrite V magnet ⑥ increases overall sensitivity and power output. Curvilinear cone shape ⑦ maximizes effective piston area.

Reliability.

Glass-reinforced polymer frame ② is impervious to warping. Aluminum bobbin ⑧ and exclusive high-temperature insulation system protect against voice coil deformation and burnout.

The advanced materials and construction of the Bose 802 Driver provide performance unobtainable from speakers of conventional design. And the acoustically coupled array of *eight* drivers in each Bose 802 System delivers smooth response, clarity and bass output that belie its compact size.

For more technical data and a demonstration of the Bose 802 Loudspeaker System, contact your authorized Bose Professional Products Dealer.

BOSE[®]
Better sound through research.

Covered by patent rights issued and/or pending.
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Bose Corporation, Dept. SC
The Mountain
Framingham, MA 01701

Please send me the Bose Professional Products Catalog and your technical data.

Please have your representative contact me.

Name: _____

Firm: _____

Street: _____

City: _____ State: _____ Zip: _____

Telephone: () _____



Joe Palmieri of Bogen.



Kilroy Hughes (left) and Bernard Kron of EMS.



Bill Little of Quam-Nichols.



Lou Valente (left) and Don Hastings of West Penn Wire.



Lee Tate of Tape-Athon.



Hiko Shinoda (left) and Jack Craig of Aiphone.



A new way to play the numbers and win big.

New Mini-Tridex intercom opens doors wide for dealers among smaller companies that couldn't afford a Tridex before.

Sure our microprocessor-controlled Tridex intercom for up to 5,000 stations is super. But a lot of smaller companies felt they couldn't afford it. The numbers weren't right for them. That is, until now.

Because now Ring is introducing its new microprocessor-controlled Mini-Tridex (CB900) for up to 56 stations *at a price that's virtually irresistible!*

Suddenly even small companies are prospects for this incredible hands-free intercom. With features like group hunting, conferencing, automatic callback on busy lines, priority call and more, it's an easy package to sell.

Dealers will now find the Ring-Master line even more competitive than before. Besides the new Mini-Tridex they can offer customers our famed Ring-Master Tridex for 30 to 5,000 stations; the advanced Moculex for 5 to 70 stations; and the handsome Simplex for 2 to 20 stations.

These profitable systems require little service, are easy to install and are backed by Ring-Master's

internationally-respected quality control and technical support.

We've got the winning numbers. Find out how to deal yourself in by calling 516-293-6700 or mailing the coupon. Ring Communications, Inc., 35 Pinelawn Road, Melville, NY 11747.



Ring Communications, Inc.
35 Pinelawn Rd., Melville, NY 11747

Yes! I'm interested in discussing an exclusive Ring-Master dealership. Contact me right away.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE _____



Shirley Tartak of Trutone.



Jerry Wade of Telex.



Peter Pavlian of Raytronics.



Tom Hendricks of Atlas Sound.



Bob Flynn (left) and Jim Trecek of Seeburg Music.



Bob Morrison of Fanon.



Dan Lee (left), IBMA President, and Jack Berman, Conference speaker.

THE NEW TOA RX SERIES SUB-COMPACTS.

THE TRAVELLING CONSOLES THAT WON'T DRIVE YOU TO THE POORHOUSE.

For any demanding high quality professional sound reinforcement requirement, there's now a choice between the real expensive and the embarrassingly inadequate: The TOA RX Series.

Starting as low as \$1,130.00 for our RX-5A console and all the way up to our 32 by 8 RX-7 Model, you now have the performance, features and flexibility to create a professional sound system that can handle the simple showcase gig or the big concert job. Of course, if you need to record, the necessary features are all there.

Our top-of-the-line Series, the RX-7 is available from 16 in/4 out (pictured below) to 32 in by 8 out.

It's modular, and has features too extensive to cover here. When an RX-7 is more than you need, we make three smaller RX Series consoles that will more than get the job done: The RX-5A (8 by 2); The RX-6A (12 by 2); and the RX-5/16A (16 by 2).

Whatever model you choose in the series, you get a -128dBm E.I.N. hum and noise figure (20Hz-20kHz). Quiet. THD at +10dBm is typically less than .08%. Clean. And crosstalk is -60dB (1kHz, input to output), -70dB on the RX-7 Series. Professional. All the way, including heavy-duty XLR type connectors on many of the I/O's.

Give us a call at (415) 588-2538.

We'll rush out all the spec's and the name of your nearest qualified TOA dealer. We're confident you'll want to sit behind the superb handling of an RX. The consoles that have performance and features to spare —and the serious subcompacts that won't drive you to the poorhouse while you're on your way to the top.

*Crafted in Japan.
Proven in the States.*



TOA Electronics, Inc.
1023 Grandview Drive
South San Francisco, CA 94080
(415) 588-2538 Telex: 331-332



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Don Speegle of Toa.



Jonas Olmsted of Oz Productions.



John Bolenz of Magnetronics.



Charles Round of University Sound.



Mike Jordan (left) and Peter Jordan of Communications Co.

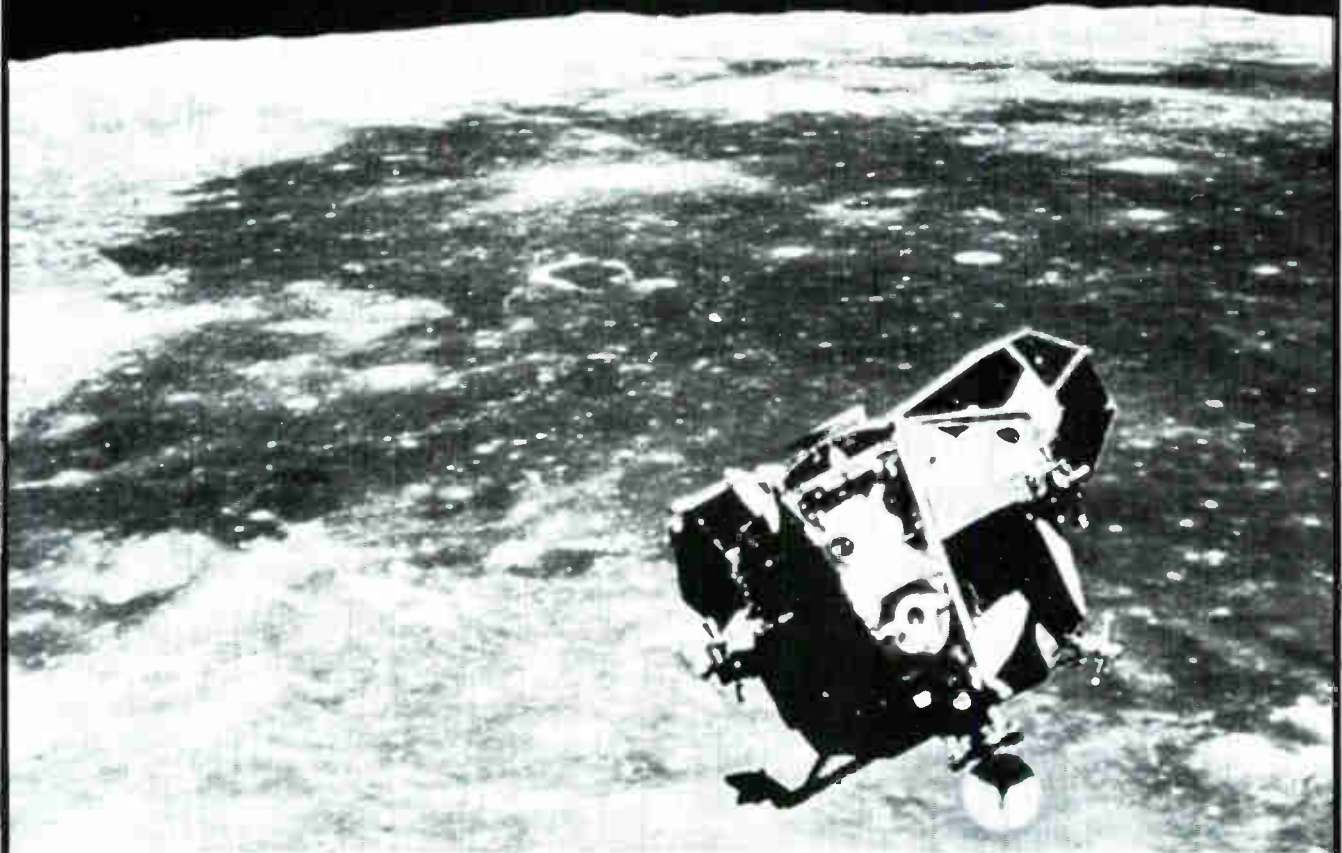


Jim Starkloff of McMartin.



Scott Vesper and Ann Bascom of Communitron.

Odds Are...



...17,000 to One OAKTRON Has What You Need

Maybe you don't need Oaktron's tough little communications speaker that went to the moon, along with some of the most reliable radio gear ever developed.

But whatever you're looking for in loudspeakers, odds are over 17,000 to one Oaktron has what you need.

Oaktron has made over 17,000 different sizes, models, and configurations of loudspeakers—to the most demanding specs imaginable—for some of the biggest names in the communications field. Plus the Hi-Fi, music, auto, security, and commercial sound fields as well.

Oaktron has the experience, the expertise, and the facilities to make the speaker you need—the odds are over 17,000 to one.

All Oaktron's manufacturing plants are in the heartland of America—easy to reach, deal with, ship from, talk to—and understand.

Ask for Oaktron's catalogs of over 185 models, ready to ship. Or, send us your specs—you may be surprised at what we can do.

YOUR BLUEPRINT TO BETTER SOUND
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INDUSTRIES, INC.

OAKTRON NATIONAL SALES
1000 30TH STREET, MONROE, WISCONSIN 53566
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Computerized Visual Communications

This year's International Background Music (IBMA) trade show in Scottsdale, Arizona featured a booth with a "visual" difference. The booth belonged to Horizon Industries—there to introduce their line of computerized visual communications systems.

The Horizon CT Visual Communications Systems are a compact, highly attention-getting and extremely flexible advertising and promotion medium employing sophisticated, state-of-the-art microprocessor technology. Each CT system produces bold letters, numbers and symbols in bright red, 2-inch-high LEDs on a contrasting black display board. The systems are housed in a handsome solid oak cabinet that can be set directly on a countertop,

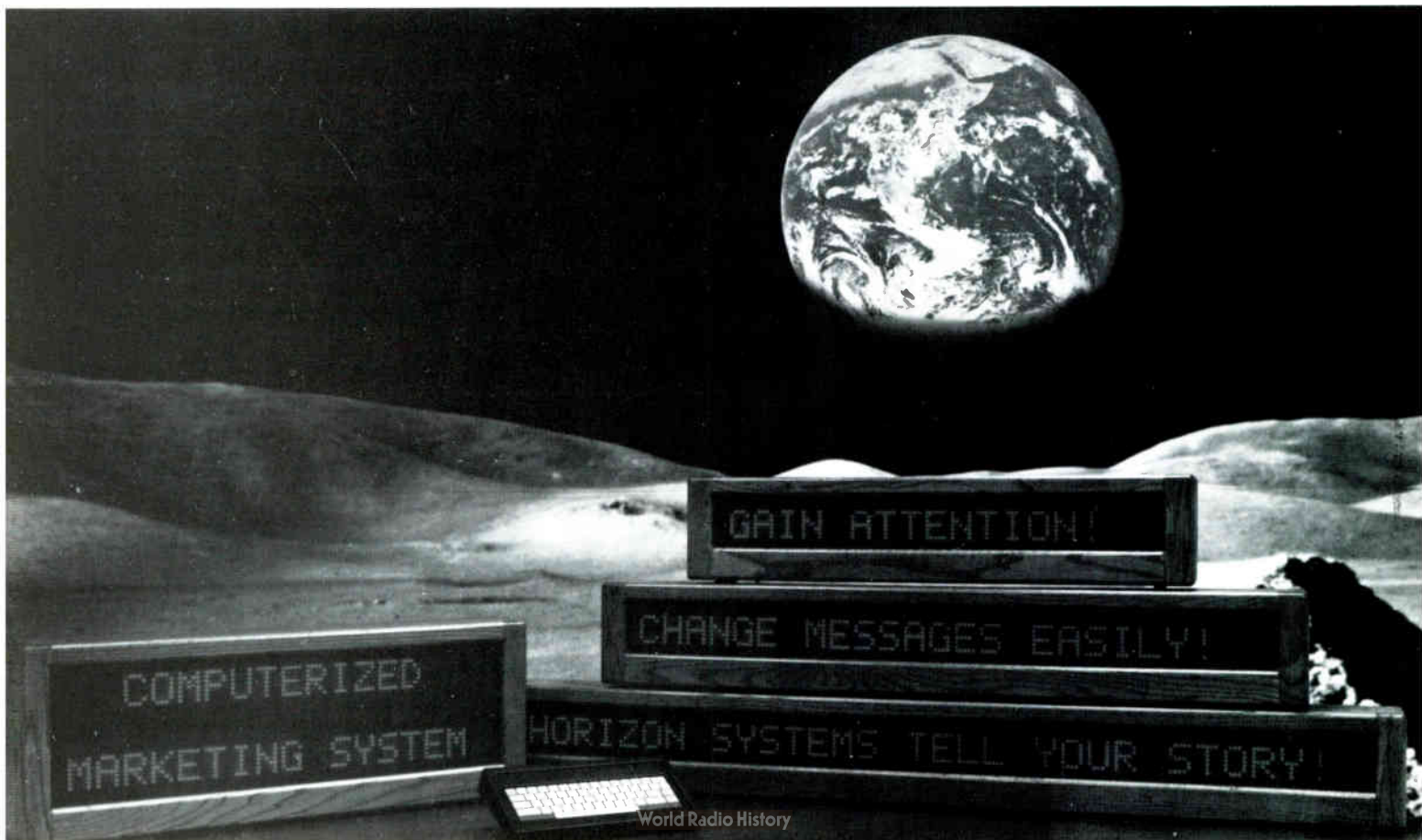
mounted on a wall or pedestal, or ceiling-suspended. There are currently four Horizon models available: the CT10, a one-line, 16-character display; the CT20, a one-line 24-character display; the CT30, a one-line 32-character display; and the CT40, a two-line 32-character display.

Each system is easily programmed via the detachable keyboard to display information in a variety of movement modes: flash (on and off), march (travelling right to left), write-on (letter by letter left to right), and scroll (bottom to top). Each unit's memory can store up to 900 characters, which can be subdivided into 3 segments, to be

programmed together or separately for display at a predetermined time.

But what, you may ask, do computerized visual communications systems have to do with background music systems? A fair question. And one for which Phil Sibinski, Horizon Industries' National Sales Manager, has a ready answer.

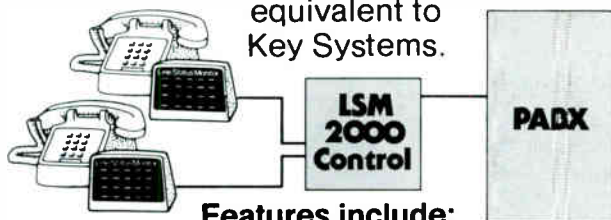
"Like background *audio* communications systems, the Horizon CT series of computerized *visual* communications systems are designed to influence consumer behavior. Our systems actually *reinforce* messages presented through audio media, because they have the ability to cut through other distractions yet are, in themselves, non-intrusive.



CUTTING COST Isn't The Only Reason You'll Like Our Line Status Monitor.



The LSM 2000, Line Status Monitor, expands the capabilities of your PABX system by utilizing the most modern and efficient features available. At the same time it eliminates the need for costly key telephone sets and still provides the functional equivalent to Key Systems.



Features include:

- Busy Station** — When a telephone in the group is in use, the associated LED is on steady.
- Idle Station** — LED is dark when telephone hand set is in place.
- Ringing Station** — LED associated with ringing station flashes on and off in con-

junction with an alert tone until station is answered or call is abandoned.

20 Station Group — The LSM 2000 may be used with groups from one to twenty.

Multiple Location — Same station monitoring may be accomplished at more than one location or several groups of same and/or different stations may be accomplished from one control unit.

The LSM 2000 for improved efficiency and reduced expense.



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Utilities**

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OKLAHOMA CITY, OK 73108

For more information call 405•946-1200



"There are two basic ways any sales business can grow: 1) sell more customers on your present product line, or 2) sell your present customers a wider range of products. Horizon systems can dramatically complement and expand the background music dealer's product line."

Horizon has identified over 40 possible markets for the CT systems gathered under nine major categories: financial institutions; lodging, food and beverage; automotive and recreational vehicles; general communications; major retailers; supermarkets and drugstores; entertainment centers; industrial sales and specialty shops.

Financial Institutions—In this increasingly competitive business, Horizon CT systems can bridge the gap between bankers and customers. The systems can be used in the lobby, at the drive-up teller and at remote banking facilities' automatic teller machines to assist in customer communications. They can provide current service information, highlight changing yield rates and new financial products and services, and further the bank's involvement in community activities.

Lodging, Food and Beverage—The hospitality industry can use the system to cross-sell customers on other products and services within their facilities. Hotels can advertise about restaurant specialties, lounge entertainment and other features. Fast-food restaurants have the ability to bring visibility to new products or "frill items," such as pies, sundaes or birthday parties for children.

Automotive and Recreational Vehicles—Factory rebates on new cars can be emphasized, as well as EPG

ratings and special discounts. A delineation of standard equipment on the sales floor can be presented. Horizon systems can also serve as a subtle reminder to salesmen to cover important points and at the same time convey important sales information to customer prospects.

General Communications—Radio and TV stations can promote upcoming remote broadcasts two to three days before they are held and/or provide the free use of a Horizon system as an incentive to advertisers who place multiple placement contracts with their stations. Travel terminals can use the CT system to communicate arrivals, departures, changes in scheduling, general routing, coordination and public relations.



Major Retailers—The systems can give shopping malls and shopping centers the ability to communicate to on-premises customers in spite of cutbacks in staff. Department stores can use the systems to direct attention to their products or departments as their marketing strategies vary.

Supermarket, Drugstores—Supermarket chains traditionally use mass media advertising of best buys to promote store traffic. Once customers are on the premises, the CT systems can bring up the visibility of the high-profit areas, such as the deli, bakery, etc. Drugstores find the systems effective in influencing customers at the prescription desk to buy other items while they await the filling of their order.

Entertainment Centers—Sports clubs of all types use Horizon sys-

tems to help build pro shop sales, promote upcoming member activities and tournaments, promote food and beverage sales, and generally to communicate in an attention-getting, tasteful way to members and guests. Movie theaters advertise upcoming attractions and sell time on the system to surrounding businesses, such as bowling alleys and restaurants, to solicit after-show business.

Industrial Sales—Manufacturing plants can use the CT systems to help the personnel department promote employee service recognition or upcoming employee activities. CT systems can also be used in trade shows and meetings to welcome VIPs to the plant and to communicate in-plant the services of the credit union.

Specialty Shops—With the Horizon systems, specialty shops have the flexibility to highlight slow sellers or high-profit items. The major objective in most specialty shops, such as nurseries or home-care centers, is to cross-sell the customer on more than just what they came in for. On-premises selling in high traffic areas is the major way the systems assist retailers.

Horizon currently plans some exciting developments in the CT series systems:

Networking will allow one central source to program indoor systems, remote systems or a series of both within a facility. Networking could have application in an airline ticketing gate, where information such as flight numbers, departure times and departure cities are changed frequently, often several times per hour. On the CT system, this information is stored on a computer, which automatically updates the information on a timely basis, avoiding the labor and confusion of frequent manual changes. Horizon plans to develop local and global networking. Global networking has the additional capability of communicating with message centers in numerous facilities over telephone lines or FM radio bands.

Foreign Language Capabilities—With simple internal software modifications, Horizon CT systems can currently perform in any of the romance languages. One of the developments still ahead is the adaption of the CT systems to virtually any foreign language. □



Swintek®

...the wireless microphone system small enough to be hidden anywhere

The sensational new Swintek dBS Wireless Microphone System features a mini-sized transmitter that is small enough to be hidden anywhere, yet it provides quality sound recording that meets the demands of even the most exacting professional filmmaker. The transmitter weighs only five ounces, will accept any type microphone and can easily be hidden in costumes, even a bikini. The receiver is fully portable and operates on either AC or DC. The entire system comes with a smart-looking custom carrying case and here's the best news of all — Swintek systems from \$995 to \$2275 complete, with a guarantee that it will equal or outperform any competitive brand. So write for our free specification data sheets.

Available for Sale or day, week or month Rental from:



Swintek MARK SM58/dBS Complete with antenna, BUB battery and mic stand. Girl optional.



Swintek MARK 2L/dBS complete with HAND-HELD NICAD, battery charger, and carry case.

Swintek

TELECOMMUNICATIONS DIVISION
1180 Aster Avenue, Unit J, Sunnyvale, CA 94086
(408) 249-5594 TELEX #172-150 SUVL SWINTEK

NEW PRODUCTS

SPEAKER SYSTEM

A two-way loudspeaker system, Model 711, boasts a 15-inch woofer, horn, and horn compression driver, all in a rugged, compact package.



Suitable for small to medium-sized performing groups as well as schools, churches and auditoriums, the systems have high-frequency horn and driver combinations in addition to both the horn and woofer front-mounted, for easy servicing in the field. Power handling capacity is 150 watts of continuous program material; impedance is 8 ohms and sound pressure level 101 dB at one meter with one-watt input. The system features a special variable sound dispersion control. Operation involves simply adjusting two sliding controls for one of four sound dispersion patterns: 60°, 90° left, 90° right, or 120°. The 60° setting is used where narrow, "long-throw" coverage is desired; the 90° settings are for medium-range coverage, or for odd-shaped rooms; and the 120° setting is for wide area coverage in "short-throw" applications. This feature allows covering a wide variety of room configurations with just two speakers. Model 711 is designed as a portable loudspeaker system and is truly roadworthy. It has a durable, lightweight plywood cabinet; a tough, acoustically transparent metal grille; and convenient, integral carrying grips built into the

sides of the cabinet. Overall dimensions are 702 mm H x 584 mm W x 402 mm D (27⁵/₈ in. x 23 in. x 15¹³/₁₆ in.). Weight is 30 kg (66 lbs.). An optional vinyl cover, complete with cable pocket, is available for each speaker. The rear-mounted jacks on the speaker cabinet allow the option of external bi-amplification, without internal wiring changes.

For more information write 100 on the inquiry card. Or write: Shure Brothers Inc., 222 Hartrey Ave., Evanston, Ill. 60204.

MONITOR AMP

The OMNI-Q is a stereo 8-channel-in, 1-channel-out general purpose cue and monitor amplifier. It provides a simple, compact method of handling a variety of monitoring and cueing situations with multiple



sources of audio. Functions include: remote/network line monitor and buffer amplifier; transmitter input selector and monitor; automation cue amplifier; tape recorder input selector; telephone line source selector; and earphone amplifier. Special features include stereo LED VU meters with front panel calibration (-20 to +8 dBm); capacity to drive external stereo speakers at 2 watts per channel; two built-in speakers; front panel headphone jack and speaker switch; built-in 3 frequency oscillator (40, 400, 7500 Hz) with level control for checking frequency response of audio sources; front panel jacks for easy connection of test equipment to switched audio bus; stereo or mono capacity; and compact, rack-mounted packaging.

For more information write 101 on the inquiry card. Or write: Conex Electro Systems, 1602 Carolina St. #3, Bellingham, Wash. 98225.

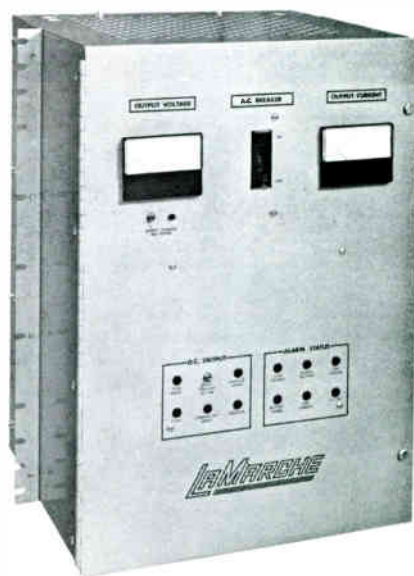
HEADPHONES

The DM-1 double-muff and SM-1 single-muff noise cancelling headphones have special aluminum in-line control boxes with microphone on/off switches, recessed volume controls and stainless steel belt clips. The units are rugged enough to withstand educational and rental applications.

For more information write 102 on the inquiry card. Or write: Minicom, P.O. Box 302, Walnut Creek, Cal. 94596.

CHARGERS

Recently engineered accessories for the telecommunications industry include Controlled Ferroresonant Chargers, DC Power Systems, and DC Power Bays. Other equipment offered comprises Uninterruptible Power Systems for battery back-up of AC PABX switches and key systems with power requirements from 100 to 20,000 watts.



For more information write 103 on the inquiry card. Or write: La Marche Manufacturing Co., 106 Bradrock Drive, Des Plaines, Ill. 60018.

VEHICLE ALARM

The Sonic Sentry provides burglar protection for trucks, vans and cars, with no exterior indication of an alarm system. When armed, it blankets the vehicle's interior with harmless, invisible beams. It is triggered only by an actual intrusion, and sounds a 60-second horn blast. At the end of the cycle the unit immediately resets itself; if the intrusion continues, so does the blast. Armed by a simple on-off switch, the system has 5-second entrance and 12-second exit delays, to allow the owner to de-activate and re-activate the alarm. Ultrasonic technology prevents the compact Sonic Sentry from being set off by anything outside the vehicle, thus minimizing false alarms.



□ For more information write 104 on the inquiry card. Or write: Mountain West Alarm, 4215 N. 16th St., Phoenix, Ariz. 85016.

WRENCH/STRIPPER

A combination CanWrench/Wire Stripper is designed specially for telephone craft work. It mates a Bradley insulation stripper with a 3/8-inch and 7/16-inch socket can-wrench. The wire stripping head is built into the center of the wrench handle, providing two stripping slots, one for the outside jacket of a four wire "quad" and the other for the individual conductors. The can-wrench sockets are of thin-walled construction, allowing easy access in tight spaces. The deep 1-1/8 inch sockets allow use over long binding posts. Overall length is seven inches. The tool is available in 22 awg or 24 awg.



□ For more information write 105 on the inquiry card. Or write: Harris-Dracon Div., 9541 Mason Ave., Chatsworth, Cal. 91311.

CABLE CHECKER

The K-Check cable tester consists of a test finger, a battery compartment (containing a 5.6V mercury battery), an LED-display and a female XLR-type connector. Each red LED is keyed to a corresponding contact ("pin number") in the female connector. Connection between the test finger and any contact in the female connector will cause the appropriate red LED to light. Connection between the test finger and the shell (housing) of the female connector (or any connector plugged into it) will cause the green (ground) LED to light. If connection is made to two or more contacts in the female connector, LEDs will light for each contact involved. This method can speed cable testing: simply connect the male XLR-type connector on the cable to the female connector of the K-Check; touch the test finger to each contact of the connector at the other end of the cable. Illuminated LEDs will indicate how the cable is wired. If the cable does not have a male XLR-



type connector, one may use the accessory test lead to make contact between one of the female connector's contacts and the contacts on the cable. This test lead also enables the K-Check to be used as a general-purpose continuity tester. For cables with female XLR-type on both ends, or 1/4-inch phone plugs on both ends, adapters (NAM-8 and NAM-9 respectively) are available for faster testing. Inputs for mixers, amplifiers, tape recorders, etc. may be tested to ascertain if they are balanced or unbalanced, and low or high impedance, by checking continuity between the various contacts and between each of the contacts and the chassis (ground).

□ For more information write 106 on the inquiry card. Or write: Neutrik Products, 77 Selleck St., Stamford, Conn. 06902.

COMMUNICATIONS SYSTEM

Microprocessor-based and digital-controlled, the Ultracom CX is a hybrid communications system that combines the features of an electronic computer-controlled key telephone with the technology and flexibility of a digital PABX. It provides the simplicity and ease of operation of dedicated feature keys and sophisticated cost control systems for information management. The system offers 32 incoming lines and 128 extensions, and has been designed and developed for the medium-sized business. The personal computerized station allows choosing add-on conferencing, automatic call-back, do-not-disturb, call forwarding, message waiting, parking in orbit, or recalling the last number dialed. Automatic dialing of frequently-called numbers inside and outside of the office can be accomplished with the touch of a single automatic dialing button. Confidential codes which access special network carriers such as Sprint, MCI, WATS can remain confidential by programming the numbers into the system's memory. Costly dialing errors are eliminated. A fluorescent display conveys up to four message waiting numbers, shows the number being dialed whether in memory or not, and also gives the cost of each call made. Other features include total hands-free capability on outside and internal calls, personalized parking orbits, station camp-on, paging, privacy and conferencing.



The system is expandable and modular in design, with thin, two-pair cable to reduce installation costs. To effect further cost reductions, the system can accommodate single-line phones wherever desired. On-site and remote diagnostics help provide inexpensive, trouble-free maintenance.

□ For more information write 107 on the inquiry card. Or write: TIE/Communications, Inc., 5 Research Dr., Shelton, Conn. 06484.

MIC STAND

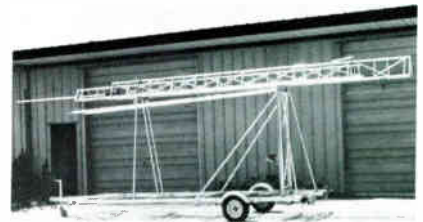
The "Omni Series" of professional microphone stands comes in floor models, for stand-up performers; lectern heights, for tabletop use; and with optional horizontal boom extensions. These angulated stands depart from single-position right-angle stands, and are supplied in a glare-free chrome finish for improved visual appearance on stage or in studio use. In addition to the traditional 90° setting, the units are equipped with adjustable fulcrums,

offering the advantage of controlled microphone-proximity, and the option of 75° or 105° angular tube-positioning. Floor stand Model OS-12V assures freedom of movement for the performer, and reduces line-of-sight interference. It features a wearproof grip-action clutch, with tube height adjustable from 32" to 61". For lectern application at banquet and meeting facilities, Model OS-8V combines the stability of the "Omni Series" base with the angulated options of a smaller telescopic tube assembly (variable from 12½"



to 24" height) that can materially assist in improved microphone positioning for reduced acoustic feedback. The steel tube assemblies in this line are finished in "veloured chrome," a new process that eliminates the spectacular reflective effects of high-intensity lighting and maintains prime appearance even after repeated use and transportation. "Omni Series" stands and boom extensions are equipped with the standard 5/8" #27 thread suitable for all U.S. microphone holders and accessories. Model OS-B is a modern, rectangular, counter-weighted, cast stand-base finished in baked black epoxy, weighing 15½ lbs. to assure optimum stability. For more information write 108 on the inquiry card. Or write: Atlas Sound, 10 Pomeroy Rd., Parsippany, N.J. 07054.

TOWER TRAILER



For mobile demonstration work, remote signal testing and many other special situations, a readily towed tower trailer combination may be easily employed for transporting



Reg. U.S. Pat. Off.

NO NEED TO SHOUT!

Speak Softly with Norcon Talk-Thru

The Norcon Talk-Thru carries voices directly, clearly and intimately. It provides clear, hands-free, two-way voice communications where security and environmental isolation are important.

Incoming volume is automatically compressed, so attendant hears at a constant level. And, with volume turned up, the Norcon Talk-Thru can be used for local paging and announcements.

The Norcon Talk-Thru provides total security in a bullet-proof environment. It is self-contained, tamper-proof and rechargeable battery operated.

Thousands of the Norcon Talk-Thru communicators are in effective operation speeding up customer handling in banks, theaters, hospitals, reception areas, industrial plants, rail and bus stations, airports, hotels and penal institutions.



NORCON

ELECTRONICS, INC.

Please write or telephone for full information.

1260 Ralph Ave., Brooklyn, N.Y. 11236 212-451-1112

and erecting aluminum or steel towers. Once in place, the tower is tilted up and cranked into position, with the trailer serving as a secure base.

□ For more information write 109 on the inquiry card. Or write: Aluma Tower Co., 1639 Old Dixie Highway, Vero Beach, Fla. 32960.

"SMART" PHONE



The Strategy Secretary interfaces with any PBX, and provides flashing light, off-hook, ringing and similar PBX indications using an LED display when 5 or 10 regular strategy phones are connected to the Secretary. This allows the Secretary operator to screen calls, transfer, monitor, set up conference calls, and otherwise duplicate PBX functions within a department. Monitored lines also ring audibly. The microprocessor design and proprietary software reduce the complex, difficult-to-remember PBX codes to one simple keystroke for all PBX features. A completely programmable 20-location memory will store up to 16 digits at each key location, allowing frequently-used telephone numbers to be stored also. For applications requiring more than 16 digits, storage locations at each key may be "nested" so that one key directs the Strategy to the next key in a sequence. Unlike key stations which require multiline cabling, the Secretary is a single-line terminal, using its intelligence to operate like a multi-line phone: calls can be screened, placed on hold, or parked, and then transferred or retrieved as an example. The phones have programmable automatic tone detection for detecting busy signals, control signals, and dial tones. The Secretary will redial and redial on busy. It can also dial through low-

cost networks such as SPRINT and MCI. A 16-character fluorescent display shows number called and call duration.

□ For more information write 110 on the inquiry card. Or write: Technology Applications Corp., 2660 Marine Way, Mountain View, Cal. 94043.

SPEAKER SYSTEM

Particularly suitable for foreground music applications, Model SB-20 is a high-intensity mini speaker in an attractive walnut-grain cabinet. The system handles 30 watts RMS, 50 watts peak power. Featuring an ultra-high-frequency

dome tweeter, the unit has 50-20,000 Hz response. An adjustable hang-on mounting bracket is included.



□ For more information write 111 on the inquiry card. Or write: MG Electronics, 32 Ranick Rd., Hauppauge, N.Y. 11787.



"The Bogen MBT-1...as good or better than any other SCA tuner we have had occasion to measure in our labs."

Leonard Feldman Electronic Laboratories, New York

If you're in the background music business, you'll want to read the reports of a respected, independent, testing laboratory on Bogen's new MBT-1 SCA Tuner and MBA Series Amplifiers. Here is more from the tuner report by Leonard Feldman Electronic Laboratories:

"In our opinion, and based upon measurements made in our laboratory, the Bogen MBT-1 SCA Tuner met or exceeded all of its specifications, often by a considerable margin. Having had some experience with SCA equipment, we were particularly impressed with the excellent cross-talk characteristics of the unit, its low subchannel audio distortion and its extremely good sensitivity. SCA subchan-

nels are radiated from a transmitter with but a small fraction of the effective energy radiated by main, or even stereo subchannels. It is therefore extremely important that an SCA tuner or receiver be as sensitive as possible if it is to be useful at considerable distances from the transmitter. The Bogen MBT-1 excels in this regard..."



The MBA Series Amplifiers

In a separate test report on the Bogen MBA-15, MBA-30 and MBA-60 Background Music Amplifiers, the same lab found:

- The MBA-15 delivered 15 watts at 0.5% THD or less; the MBA-30, 30 watts at 1.3% THD or less; the MBA-60, 60 watts at 2.0%

THD or less. Power output for 2% THD was as high as 25.5 watts, 45 watts and 68 watts, respectively, depending on the frequency and input mode used.

- Frequency response approximated 31-15,000 Hz \pm 1 dB, measured at full rated output, not at a nominal level of 1 watt or 10 db below rated output, as normally measured.
- S/N ratio was 75 dB or better, without inserting a weighting network, which normally improves the readings by 5 to 10 dB.

Need we say more? For full information on these new front-rank products for background music, including both test lab reports, just call or write:

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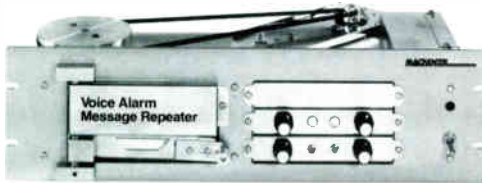
Access to the rear of the components is via a latching, hinged door. A.T.A. cases have been designed for short-depth rackmount components, such as signal-processing equipment, patch bays, etc. Another new item is the 12-in-1 Microphone Case, with 10-inch-deep cut-outs to accommodate quick-release cable attachments.

□ For more information write 112 on the inquiry card. Or write: Anvil Cases, Inc., 4128 Temple City Blvd., Rosemead, CA 91770-9990.

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Fireman's Return—An announcement explaining that an elevator car is returning to the ground floor during an emergency and reassuring passengers there is "no cause for alarm."

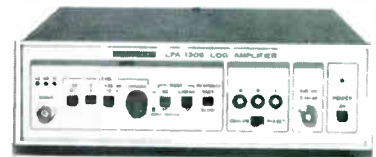
Code Blue—A coded hospital message which alerts emergency personnel that a cardiac arrest or some other situation requiring immediate attention is occurring at a specific location.

Emergency Message System—A combination of pre-recorded, selectable messages interfaced with a building's automatic alarm system, *Code Blue* annunciator or environmental monitoring system.

All MacKenzie systems are available with microprocessor-based memories and priority-sequence controllers to handle multiple and simultaneous messages. For details about specific applications, call MacKenzie toll-free at 800-423-4147.

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LOG AMPLIFIER



A linear/logarithmic amplifier, Model LPA-1305, can detect audio signals and eliminate the need for computations of voltage levels to relative dB levels, normally associated with swept frequency measurements. The unit is compatible with most low frequency sweep generators; it converts a linear frequency response envelope to a logarithmic DC output, enabling relative dB values to be measured directly from a linear scale, such as an oscilloscope graticule. After setting the amplifier's attenuator controls, a standard linear scale may be calibrated to equal increments of dB values. The unit features linear or logarithmic amplitude operation and a 20 Hz to 300 kHz bandwidth over an operating input range of -70 dBV to +40 dBV. There are three adjustable frequency markers and a built-in linear detector circuit, which has a switchable fast/slow response time for average readings of noisy waveforms. The human engineered front panel design ensures simple operation for production line as well as design environments.

□ For more information write 113 on the inquiry card. Or write: Leader Instruments Corp., 380 Oser Ave., Hauppauge, N.Y. 11788.

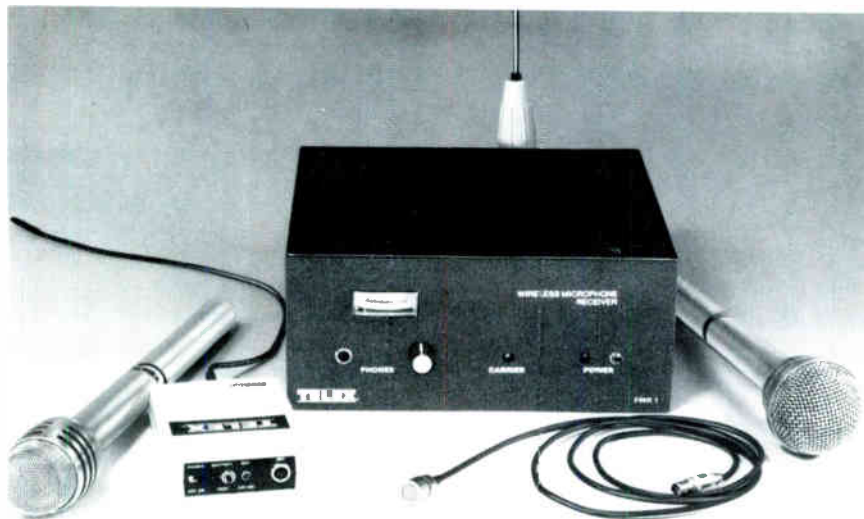
INTERCOM

The DX Intercom System is highlighted by a compact Microprocessor Central Exchange unit that handles 8 to 128 stations, and provides 18 standard programmed communication functions with no add-on options required. Switching is fully electronic for instant, hands-free conversation. The DX is a master-to-master system—each master provides the full range of 18 standard communication functions.



Sixteen talk channels make it virtually impossible to overburden the system. Among the 18 time-saving communication functions is Absence Memory, which enables the station to "remember" who called in the user's absence and automatically call them back in the same order the calls were received. Others include Camp-on Busy, Secretary Transfer, Privacy, Conference Calls up to six stations, and three paging modes: All Page, Zone Page (up to four zones) and Desk Page. There is a choice of four master station units: Open-Voice Console for desk or wall; Desk Console with handset; Telephone-type for desk or wall; and Telephone-type desk unit. All may be intermixed to tailor the system to each user's needs. A special noise reduction circuit to override ambient noise and fully electronic switching provide smooth, instant conversation. All stations have electret condenser microphones for superior voice fidelity.

For more information write 114 on the inquiry card. Or write: Aiphone USA, Inc., 1700 130th Ave. N.E., Bellevue, Wash. 98005.



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World Radio History

NATIONAL SOUND & COMMUNICATIONS CONFERENCE UPDATE

Plans for the Third Annual National Sound and Electronics Systems Conference still are being finalized, but S&C obtained a sneak preview of the program as the sponsoring National Sound and Communications Association envisions it.

The sound contracting industry's only forum for the exchange of ideas and information, the program, set for Thursday, Friday and Saturday, April 29-May 1, at the New Orleans Marriott Hotel, combines management and technical sessions with an intensive program covering new markets for the sound contractor. Themes for the conference are "Building Through Diversification" and "Managing Through Growth."

Once again, the conference offers the additional benefit of being con-

current with the Electronic Distribution Show, where a healthy percentage of the exhibits are of direct or indirect interest to sound contractors.

"Building Through Diversification" opens the NSESC program on Thursday, April 29, with a session covering strategic planning for the sound contractor. This session will provide the guidelines and the perspective required to help those participating in the conference to objectively examine their businesses and determine which avenues of diversification are suited to their organizations.

"This type of general overview is particularly important to making the design of NSESC succeed," said NSCA President Robert Ancha, of Ancha Electronics. "The second

part of the first day's program, 'New Business Opportunities,' features ten different sessions, each covering a specific new market for the sound contractor. Successful implementation of what is learned depends upon the planning abilities of the contractor."

Each new business session will be led by a prominent contractor who has made that market a successful and important part of his business. They will discuss why they entered the new market, what they see as the future for the market, and what one needs to do to enter the market.

Each of these sessions will be repeated so the participants can maximize the amount of new market knowledge available to them. The sessions are: Life-Safety; Access Control/Security; Health Care Systems; Sound Masking; Theater Sound; Conference/Board Room Table Amplification Systems; Background Music/Public Address Systems—New and Retrofit; Hands Free/Duplex Intercom Systems; Foreground Music; and Church Sound Systems.

Another new business opportunities program, covering video-conferencing, will be held on Friday, April 30. NSCA decided to dedicate an entire session to this subject because of the attractive potential it offers all sound contractors.

"The markets covered in the Thursday session are not new to all contractors," said NSCA Executive Secretary Francis C. Rebedeau. "But all contractors do not participate in them, nor are all contractors aware of the potentials they offer. Video-conferencing, however, is new in all respects, a burgeoning new market made possible by the rapid advance of technology."

In addition to this session, the second day's program will concentrate on "Managing For Growth." The first session will cover financial management, concentrating on the financial pitfalls that plague small businesses and how they can be avoided.

The second part of the program covers people management, focusing on employee motivation. This is an essential ingredient of a successful organization, Ancha said, and the program will review both modern motivational theory and the practical application of that theory in the development of incentive programs for key people.



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The third day of NSESC features a technical session on "Domed Stadia Sound System Design and Installation." This often complex sound application will be examined in depth by experts in the field and will include a tour of the Louisiana Superdome's sound system, one of the most extensive domed stadia sound systems in the world.

Each of the three days of programs will end by noon, permitting contractors enough time to tour the trade exhibits of the 1982 Electronic Distribution Show and Conference. Participating in these exhibits are manufacturers of sound and electronic systems products.

Sound-related exhibitors in the EDS '81 included Acoustone, Aiphone, American Life Safety Systems, Anixter Brothers, Argos Products, Astatic, Atlas Sound, Auth Electric, BGW Systems, Blonder-Tongue, Bell Audio Systems, Bogen/Lear Siegler, Bose, Calrad Imports, Channel Master, Cornell Electronic Products, Daburn Electronics & Cable, J.W. Davis, Dukane, Dyna-Systems, Electro-Voice, L.M. Ericsson Telecommunications, Florence Corporation, Fanon/Courier, General Electric-CCTV Div., Itera Ltd. and Jeron Electronic Systems.

Also: Lowell Manufacturing, M&G Electronics, Macon Industries, McGohan Electronics, McMartin, Notifier, Oaktron, Paso Sound, Perma Power Electronics, Pyle, Precision Electronics, Quam-Nichols, Remeo Products, Sound Publishing Co., Soundolier, Toa Electronics, Taco/General Instrument, Tape-Athon, Tektone, Telex Communications, Trans USA, Trutone Electronics, University Sound/Altec Lansing, U.S.L., Winegard, Winston International Ltd., Ico-Rally, Lindsay Specialty Products, Mura, Spectra Sonics, Phalo Corporation/S.P.D., and TEI Electronics, Inc.

Information about the National Sound and Electronic Systems Conference is available from the National Sound and Communications Association, 5105 Tollview Drive, Rolling Meadows, IL 60008. Telephone: (312) 577-8360.

Information about the 1982 Electronic Distribution Show and Conference is available from the Electronic Industry Show Corporation, 222 S. Riverside Plaza, Suite 1606, Chicago, IL 60606. Telephone: (312) 648-1140.

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Field Strength Meters

Field-strength (fs) meters are useful in the shop, as well as in the field, for making relative power and antenna radiation measurements. A simple field-strength meter, as shown in Fig. 4-1, consists of a dc microammeter and a multiplier resistor (R) connected to measure the rf voltage rectified by diode D. A short piece of wire suffices as an antenna at short range.

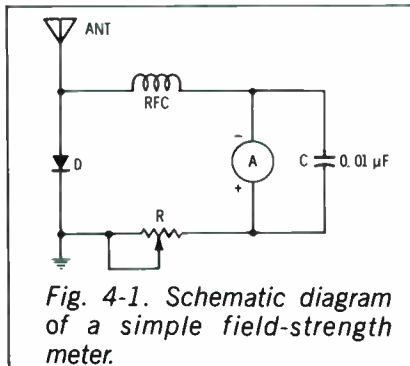


Fig. 4-1. Schematic diagram of a simple field-strength meter.

Heathkit PM-2

The frequency range of the Heathkit relative power (field-strength) meter, whose circuit is shown, is from 100 kHz to 250 MHz. It is a portable instrument with a magnetic base, which makes it possible to secure it to a car body. A front-panel knob enables the operator to control sensitivity.

Bruel & Kjaer 2007

The Bruel & Kjaer Type 2007 heterodyne voltmeter (Fig. 4-2) can be used for measuring gain, loss, signal level, intermodulation distortion, and fm deviation. It can also be used as a signal tracer and as a sensitive field-intensity meter through the frequency range 100 kHz to 350 MHz. There are eight tuning bands.

This instrument is basically a

tunable superheterodyne receiver with a built-in quasi-rms voltmeter. As shown in the block diagram of Fig. 4-3, the input signal is fed to a probe which contains a broad-band FET preamplifier. The output of the preamplifier is fed either to the 100-kHz to 8-MHz front end or to the 7- to 350-MHz front end. The 100-kHz

to 8-MHz front end uses a local oscillator whose frequency can be varied between 10.8 and 18.7 MHz to produce a 10.7-MHz i-f signal. The 7- to 350-MHz front end utilizes two mixers: the first mixer with its local oscillator whose frequency can be varied between 357 and 655 MHz, and the second mixer with its

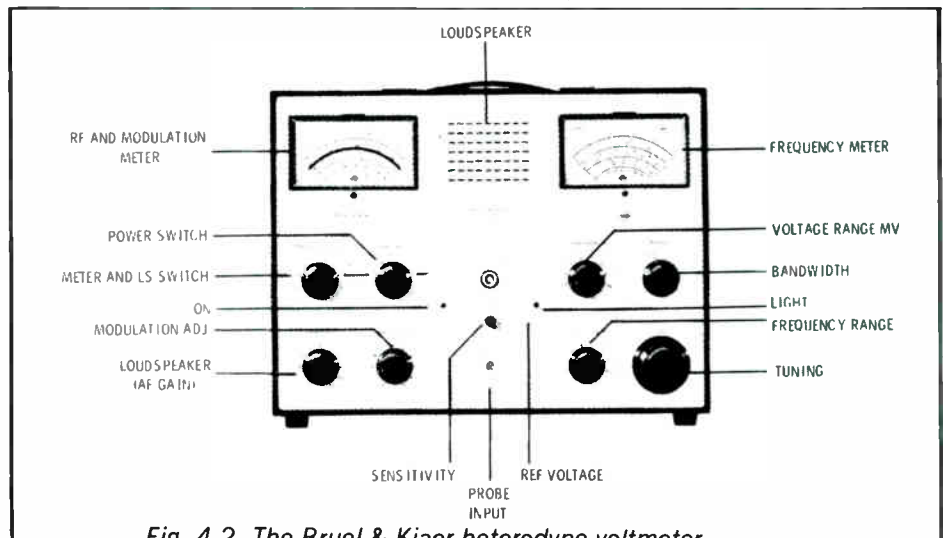


Fig. 4-2. The Bruel & Kjaer heterodyne voltmeter.

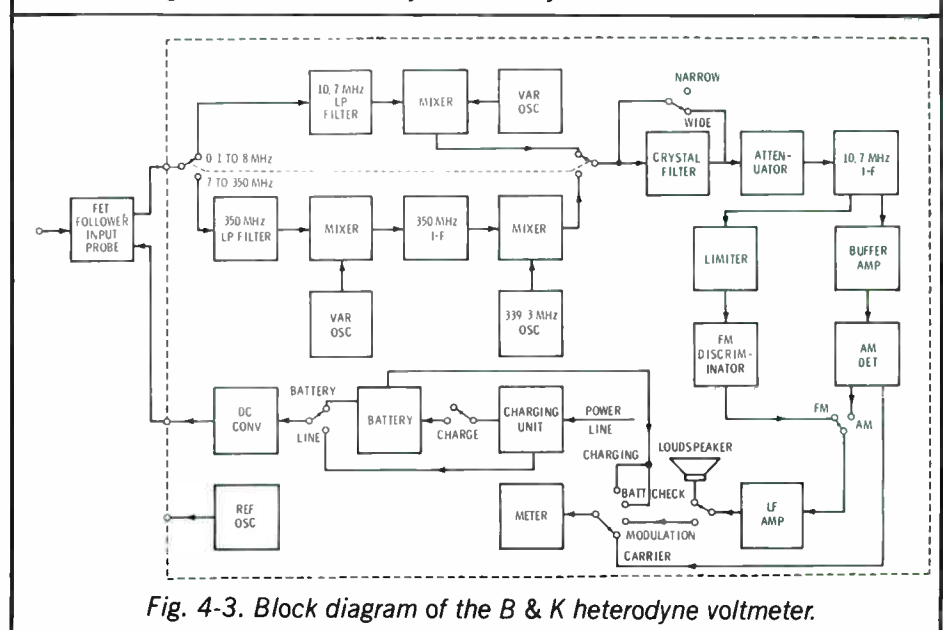


Fig. 4-3. Block diagram of the B & K heterodyne voltmeter.

fixed-frequency local oscillator operating at 339.3 MHz. The second mixer down-converts the output of the first mixer to 10.7 MHz.

The meter has six full-scale ranges: 100 μ V, 300 μ V, 1000 μ V, 3000 μ V, 10 mV, and 100 mV. When the meter is used with an external 60-dB attenuator, each range is expanded by a factor of 1000. Since the instrument contains both an a-m detector and an fm detector, it can be used to measure a-m in percent and fm in kilohertz.

Multimeters

The basic servicing instrument is the volt-ohm-milliammeter (vom), with which every technician is familiar. The most popular vom is the analog type (Fig. 4-4), which has several current, voltage, and resistance ranges. (Rapidly gaining in popularity, though, is the digital-type multimeter.) Although the 1000-ohms-per-volt type is rela-

tively inexpensive, the 20,000-ohms-per-volt type is more widely used in mobile radio work because it



Fig. 4-4. A typical volt-ohm-milliammeter, Mura's Model LCD-200.

causes less loading on the circuit being checked. For making semiconductor-junction differential measurements, the vom should have a low dc voltage range. The B & K (Dynascan) Model 120P, for example, has several full-scale dc voltage ranges from 0.25 volt to 1000 volts.

Particularly useful for mobile radio work is a vom with a 0- to 50- μ A dc range. This range can be used for general-purpose testing when a transceiver has test points calling for use of a 0-50 dc microammeter.

The Hewlett-Packard 970A handheld probe digital multimeter, has an illuminated digital display. It has five ac and dc voltage ranges (0.1, 1, 10, 100, and 1000 volts), five resistance ranges (1K, 10K, 100K, 1000K, and 10 megohms), and five ac and dc current ranges (100 μ A, 1 mA, 10 mA, 100 mA, and 1 A). The device automatically selects the required range. It is battery operated and is not much larger than a probe.

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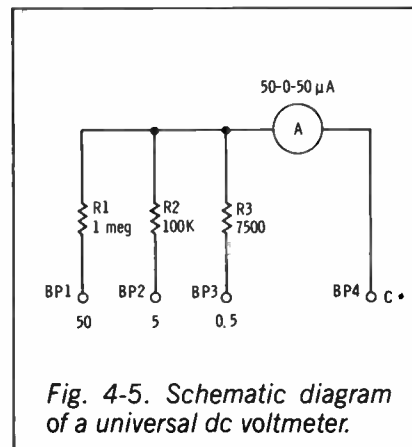


Fig. 4-5. Schematic diagram of a universal dc voltmeter.

Universal Voltmeter

Considerable troubleshooting time can be saved by using a universal voltmeter that you can build yourself. As shown in Fig. 4-5, it consists of a 50-0-50 dc microammeter (A), three multiplier resistors (R1, R2, R3), and four binding posts (BP1, BP2, BP3, BP4). All the parts can be assembled into a sloping-panel meter case. Triplet makes a meter case with four built-in binding posts and with holes for the meter. Or, you can use a Bud universal meter case, but you will have to drill additional holes to accommodate the four binding posts, all of which should be insulated from the metal case.

The reason for using a zero-center meter is to eliminate worry about voltage polarity. The meter needle will move to the left or right of zero, depending on the polarity. With the test leads connected to BP4 and BP3, the meter range is 0.5-0-0.5 volt; when the leads are connected to BP4 and BP2, the range is 5-0-5 volts; and when the leads are connected to BP4 and BP1, the range is 50-0-50 volts.

Using the lowest scale, you will be able to measure the base-emitter voltage of germanium transistors and the voltage drop across germanium diodes. When this scale is used the meter indication is divided by 100. Using the medium scale you can measure up to 5 volts, and the meter indication is divided by 10. Using the high scale, you can measure up to 50 volts, and the meter indications do not have to be translated.

The accuracy of the meter will depend upon resistor tolerance. Since accuracy is not of great significance when you are troubleshooting, 5-percent toler-

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ance carbon resistors can be used as the multipliers.

RF Voltmeters

The frequency range of the typical vom, vtvm, and FET/vom does not extend high enough for accurate measurement of vhf and uhf voltages. Instruments of special design are required for these measurements.

Boonton 92AB

The battery-operated Boonton Model 92AB is designed to measure rf voltages at frequencies from as low as 10 kHz to as high as 700 MHz with 3% accuracy and to 1200 MHz with 7% accuracy. This rf millivoltmeter has eight full-scale voltage ranges (from 1 mV to 3 V) and can be used for measuring rf voltage down to 200 μ V. And when used with the 917C 100:1 voltage divider, the instrument has eight more full-scale ranges (from 100 mV to 300 V). This kind of instrument can be used for measuring signal levels when signals are being traced and for measuring the rf voltage across a dummy load to determine transmitter output. Power output, when voltage and load resistance are known, is equal to E^2/R . For example, when the meter indicates 7.07 volts and the load resistance is 50 ohms, the power output is 1 watt: $(7.07 \times 7.07)/50 = 1$.

Motorola S-1340A

The Motorola Model S-1340A digital rf millivoltmeter provides accurate voltage measurement of very low rf levels at fm two-way radio-communication frequencies. This instrument facilitates such tasks as making stage gain measurements and metering the test points in radio pagers where a 1-millivolt range is required. The 4-digit LED display is blanked for over 105% of full scale and below 20% of full scale, with full-scale counts of 3000 and 1000. The calibrated frequency range extends from 10 kHz to 1.2 GHz, with uncalibrated response to beyond 8 GHz. Relative accuracy above 1.2 GHz is typically ± 0.5 dB. Eight ranges from 1 mV full scale to 3 V full scale are arranged in a 1-3-10 sequence.

Receiver Load and Output Indicator

The audio output of a receiver can be measured accurately with a General Radio 1840-A output power meter, which can also serve as a

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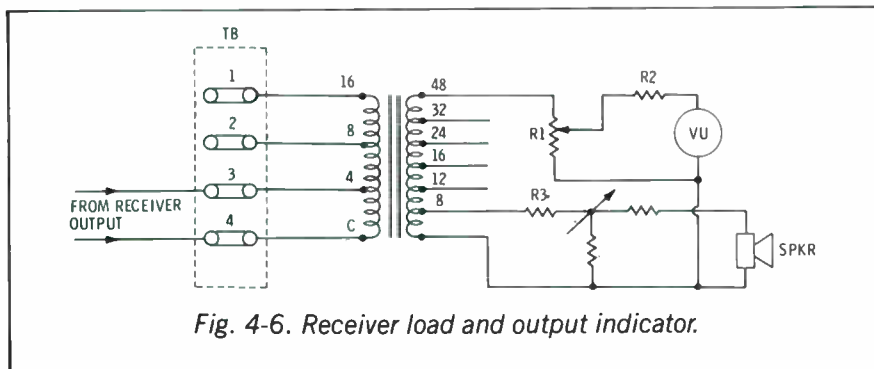


Fig. 4-6. Receiver load and output indicator.

dummy load. The instrument can be set to any of 48 individual impedances, from 0.6 to 32,000 ohms, by means of two front-panel controls. Its five-range meter indicates power from 100 microwatts to 20 watts.

If you cannot afford such a laboratory-type instrument, you can build a make-do substitute, using the circuit shown in Fig. 4-6. Transformer T is a Lafayette 33F75011 universal output transformer, rated at 10 watts, which has two tapped windings. One is tapped at 4, 8, and 16 ohms; the other at 8, 12, 16, 24, 32, and 48 ohms. Signal level is indicated by a VU (volume-unit)

meter, which can be a Lafayette 99F50932 or a Calectro D1-958 VU meter. The meter range is adjusted with R1, a 10,000-ohm audio-tapper potentiometer. The receiver load consists of R3, an 8-ohm T-pad (Mallory T8), and an 8-ohm speaker. A 4-terminal barrier block, TB, facilitates connection to a 4- 8-, or 16-ohm receiver output. To calibrate the device, proceed as follows:

1. Open the receiver speaker circuit.
2. Connect the receiver output to TB terminals 4 and 3 (4 ohms), to terminals 4 and 2 (8 ohms), or to terminals 4 and 1 (16 ohms).

3. Feed a 1000- μ V rf signal modulated ± 3.3 kHz to the receiver input.
4. Set R1 for minimum signal to the VU meter and R3 for low sound level from the test speaker.
5. Set the receiver volume control wide open.
6. Adjust R1 to obtain 100% (+3-VU) indication or for highest attainable indication.
7. Measure the af voltage across R1 with a vtvm, FET/vom, or digital ac voltmeter.
8. Determine the power level in watts (P) by dividing 48 ohms (R) into the square of the measured voltage (E). For example, if E is 22 volts, P will be approximately 10 watts.

To use a 1-watt reference level, set the receiver volume control so that the voltage across R1 is 7 volts, and adjust R1 for 0-VU (0.775-volt) indication.

The meter calibration in volume units will not be accurate, since the meter is not correctly loaded and since the signal is a sine wave, not a complex waveform. Nevertheless,

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the meter will indicate relative audio signal level.

By adjusting R3, the test speaker can be shut off or set for a comfortable sound level, and the receiver will still be terminated in the correct load. Since the Mallory T8 is rated at 15 watts audio peak, or 4 watts dc, the receiver output should not be advanced above 4 watts for sustained periods of time.

Dip Meters

A dip meter is handy to have for checking tuned circuits. A shorted turn in a coil or an open low-value capacitor may be hard to detect, except by measuring the frequency at which the tuned circuit is resonant. There are several grid-dip meters on the market that are tunable into the vhf range. When the dip-meter coil is placed close to the coil of a tuned circuit, and the dip-meter oscillator is tuned to the resonant frequency of the tuned circuit being checked, the meter needle dips. Plug-in coils provide coverage from 400 kHz to 250 MHz.

Distortion Analyzer

A distortion analyzer is used in mobile radio servicing for making 12-dB SINAD receiver sensitivity and audio-distortion measurements. Although higher-priced distortion analyzers are available, the lower-priced Heathkit IM-12 or IM-58 will meet most of your needs. A 1000-Hz filter is switched in and out of the voltage-measuring circuit when the rf signal is modulated by a 1000-Hz tone. With the filter switched in, the meter indicates the level of distortion products—signals at frequencies other than 1000 Hz. (A new instrument known as the Sinadder[®] was recently introduced. It permits 12 dB SINAD sensitivity tests without requiring a distortion analyzer.)

Spectrum Analyzer

The spectrum analyzer has become one of the most important tools for the mobile radio service shop. It is an expensive instrument which you may lease if capital is short. A spectrum analyzer can be used for the following functions:

1. Measurement of spurious emissions at the antenna terminal of a receiver or a transceiver in the receive mode.
2. Measurement of chassis radiation from a transmitter or receiver.
3. Measurement of spurious sig-

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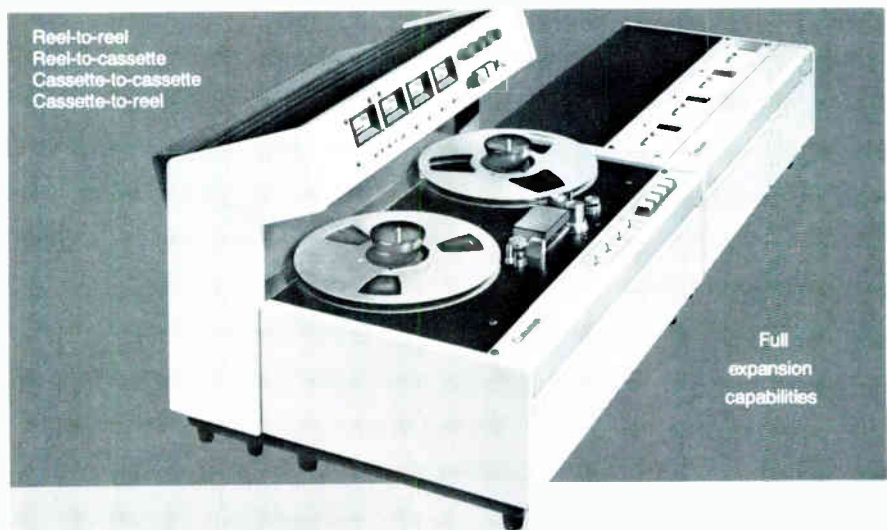
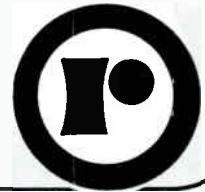
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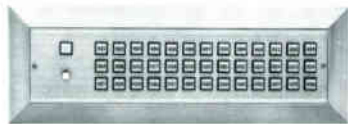
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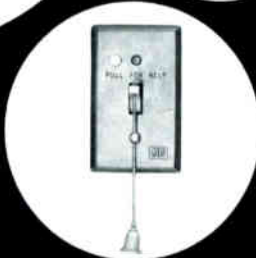
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10. Measurement of distortion in a modulated RF signal.

Transistor Testers

The simplest type of transistor tester will detect excessive leakage and measure gain. Leakage current is measured with the transistor base disconnected, as shown in Fig. 4-7,

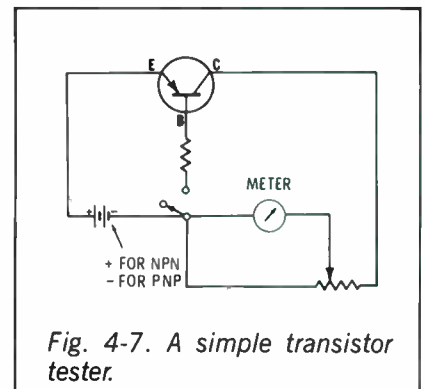


Fig. 4-7. A simple transistor tester.

and gain is measured by noting the increase in the meter reading when the switch is closed to apply forward bias to the transistor base.

An in-circuit/out-of-circuit transistor tester can be used to check most transistors without removing them from the set. By means of clip leads, the transistor is connected into the tester circuit. Transistor merit is determined by adjusting the control and noting the meter reading.

Also available are more-elaborate bench-type transistor testers, which measure gain, leakage current, and (by calculation) other performance characteristics. Switches are usually provided for setting dc voltages to the required levels for different types of transistors and diodes.

to be continued

TIP AND RING—

—NEC TELEPHONES, INC., Melville, NY, has won a dismissal, in the U.S. District Court of the Southern District of New York, of all allegations brought by Pacesetter Communications Corp., which charged that two of its former employees had conspired, together with others, to unreasonably restrain trade and monopolize the market for the sale of private telephones in the New York City metropolitan area in violation of the antitrust laws. Pacesetter sought damages of approximately \$10 million, as well as injunctive relief.

NEC Telephones denied all of the allegations and pleaded counterclaims for money due and owing from Pacesetter to NEC Telephones. At the close of the plaintiff's case, the defendants moved for a *directed verdict* in their favor on all of the plaintiff's claims. The motion was granted, ruling that on the evidence presented, no jury could return a verdict in favor of Pacesetter. The Court directed that NEC's motion for a Summary Judgment on its counterclaims be awarded monetary damages, again ruling that on the evidence presented, a reasonable jury could only have returned a verdict in favor of NEC Telephones.

—The U.S. Supreme Court refused to consider a securities and antitrust case involving LM ERICSSON TELECOMMUNICATIONS, Inc., Woodbury, NY, and Teltronics Services, Inc. The case rises out of a financing agreement between the companies dating from 1975. Under the agreement, Ericsson provided financing to Teltronics by guaranteeing substantial bank loans from Nordic American Banking Corp. and First National City Bank. Part of the agreement terms called for Teltronics to pledge to Ericsson rental agreements between Teltronics and its customers for the rental of telephone systems.

In February 1979, Teltronics allegedly defaulted on an interest payment to Nordic, which, in response, accelerated Teltronics' debts. Ericsson paid the debt and brought action in New York state

courts to recover the money, and notified Teltronics' lessees that rental payments should be made to Ericsson. Immediately, Teltronics filed suit in the Federal District court of New York charging Ericsson with violations of the Securities Act of 1934, by failing to file notice of its intent to acquire shares of Teltronics. It also accused Ericsson of restraining trade, alleging that Ericsson had threatened to cut off supplies and close Teltronics' Boston operation, because it was

competing with Ericsson offices there. The district court dismissed the case, because Teltronics had failed to state a claim of injury. Teltronics made no motion to amend the complaint and did not file an appeal.

In a second complaint Teltronics filed in the Southern District Court, the same issue was raised, and was dismissed, because a legal principle prohibits the retrying of an adverse judgement unless it has been appealed. Teltronics appealed to the U.S. Supreme Court, which rejected the request, letting stand the district court's ruling.

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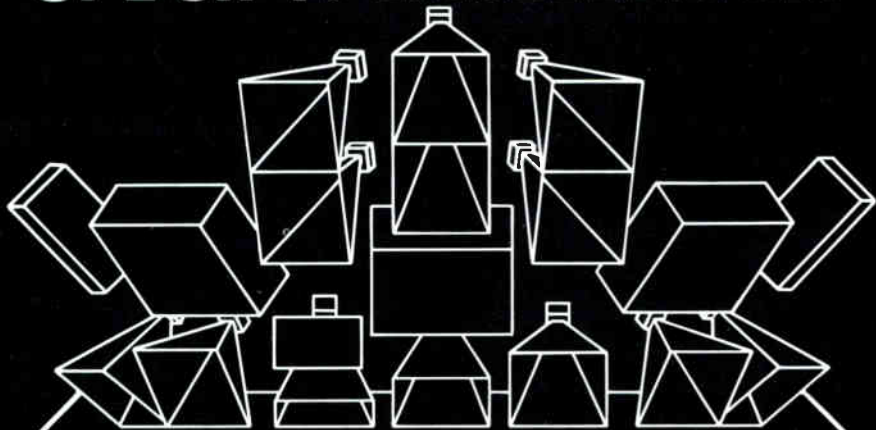
—JUDGE HAROLD GREENE, PRESIDING OVER THE ANTI-TRUST CASE IN FEDERAL COURT/RICHMOND, VA., DECLARED THAT THE DEFENSE DEPARTMENT OFFICIALS were "not within the bounds of propriety" when they consulted with Bell System employees on a report in which the DOD claimed that the breaking up of AT&T would harm national security. However, Judge Greene observed that AT&T was cleared of any blame by asserting that Bell employees "quite properly complied with the request for data by the DOD."

—COMMENTS BY SEN. ROBERT PACKWOOD (R/ORE) WHO HEADS THE SENATE COMMITTEE REWRITING THE COMMUNICATIONS ACT: On the matter of the anti-trust court case—"If the government can prove that even apart from the FSAs (fully separate affiliates) there is no way that you can have competition but for divestiture, that's their business. I'm not going to stand in their way. . . . If the court says, 'No, we don't think that even legislation is sufficient, that it doesn't allow enough competition, because the evidence we have is the following,' I'm not going to try to stop them, if that's the conclusion they come to."

On the matter of divestiture—"I am convinced that even if you have divestiture, even if some of the Bell operating companies had to be split off in a divestiture suit, defense would not suffer."

—JUSTICE DEPARTMENT REMAINS FORTHRIGHT IN DEMANDING THE BREAKUP OF AT&T, insisting that the company's "conduct reflects all the evils of a classic monopoly." The government's call for splitting AT&T's 23 local operating companies from the Bell System's long-distance, equipment and research facilities was made despite the willingness of the Assistant Attorney General for Anti-Trust, William Baxter, to drop the case in exchange for amended telecommunications legislation that Baxter has said would solve the problems raised in the suit. "There are uncertainties in life, and I wouldn't attempt to predict what will happen in Congress, but the goal of this litigation continues to be divestiture," Gerald Connell, Chief of the government's AT&T trial team, said in an interview. "I have no doubt that I speak for the Anti-Trust Divi-

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sion and no doubt that I speak for the plaintiff."

The Justice Department summed up its case in a 410-page memorandum, arguing that AT&T has willfully maintained a monopoly in long-distance services, pricing and telecommunications equipment markets, at the expense of competition. The government called 93 witnesses, provided more than 11,000 pages of testimony and introduced almost 3,500 pages of documents. In the long-distance market, the government said, "AT&T's actual control over entry and price, of course, is the most powerful evidence of AT&T's monopoly power. Regulation has been, and will continue to be, unable to control AT&T interconnection practices."

—THE FCC HAS APPROVED AN INQUIRY NOTICE LOOKING INTO THE PROCUREMENT PRACTICES OF THE 23 BELL SYSTEM OPERATING COMPANIES. The purpose of the inquiry is to determine how the FCC can best ensure that the Bell Operating companies comply with directives of the 1977 decision in Docket 19129—that a rapid and efficient telephone service be provided at the lowest cost, and that all telecommunications suppliers are treated on an "arm's length, fair and equal basis."

Western Electric Co. sales to the U.S. government and independent (non-Bell) telephone companies are less than 4 percent. The Bell Operating companies buy most of their telecommunications products from Western under a standard supply contract. In the final decision in Docket 19129, the FCC found that the pervasive role that W.E. played in Bell System procurement has impeded, or was likely to impede, the full achievement of benefits to ratepayers, because it precluded a fair opportunity for the General Trade (telecommunications equipment manufacturers other than Western) to serve the Bell Operating companies' equipment needs.

The FCC rejected a proposal submitted by Bell in response to the Docket 19129 decision, because the proposal did not satisfy the concerns expressed in that decision. It also denied, as unnecessary and unwise, a petition by ITT that the Bell Operating companies be directed to purchase at least one-third of their telecommunications equipment from the General Trade man-

ufacturers until AT&T institutes changes to ensure that the Bell Operating companies deal with W.E. and the General Trade on an equal basis in procurement matters.

—ITT WORLD COMMUNICATIONS IS NOW OFFERING TELEX SERVICE WITHIN NEW YORK STATE, according to an announcement by John B. McKinney, president. Now, for a flat rate of 32 cents per minute, all ITT Worldcom subscribers in New York will be able to access the more than 6,000 ITT teleprinter terminals throughout the state. ITT Worldcom's New York subscribers will also have access to ITT Worldcom's Timetran store-and-forward message handling service for an additional charge.

—THE ELECTRONIC INDUSTRIES ASSOCIATION'S ENGINEERING DEPT. has available (at \$24.00 per copy) RS-478, "Multi-Line Key Telephone Systems (KTS) For Voiceband Application." This 100-page document covers key telephone equipment. The third in a series being developed by EIA Engineering Committee on Voice Telephone Terminals (TR-41), RS-478 establishes performance and technical criteria for interfacing with and connecting the various elements of the public telephone network, and will be of value to producers and purchasers of key telephone equipment, and producers of auxiliary equipment intended for use with such systems.



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TCS-Total Concept Sound, Inc., developer and manufacturer of specialty sound and lighting equipment, is introducing "People Mover II," an electronic "table management" system for the restaurant industry.

"People Mover II" is a countertop electronic console with an exact seating plan of the restaurant at the hostess/maitre d' station. It instantly indicates table availability, for prompt, efficient diner seating.

The unit provides quick electronic

communication between hosting and bussing stations, offering management personnel exact table status without the necessity of a "roving hostess" searching for unoccupied tables.

"The computerized, 'People Mover II,' system eliminates logistical problems, unnecessary staffing and dead-table time," said Don W. Slack, president of Total Concept Sound. "It eliminates customers competing with a harried hostess for the next table and does away with a hostess running back and forth checking on tables," he said.

The 100% solid state device features the company's exclusive "bio" switches that operate on body electricity, a feature that guarantees a lifetime of use, since there are no moving parts. The panel is sealed, making the units spillproof.

As the hostess seats her guests, she simply touches the assigned table on the "People Mover II" display. A red indicator illuminates to designate that the table is now occupied.

Busboy stations have similar displays. As each table is bussed and prepared for the next diner, the busboy touches the available table on the display, sounding a tone and turning off the "occupied" indicator. The tone alerts the hostess to a status change so she can quickly and efficiently seat the next diner.

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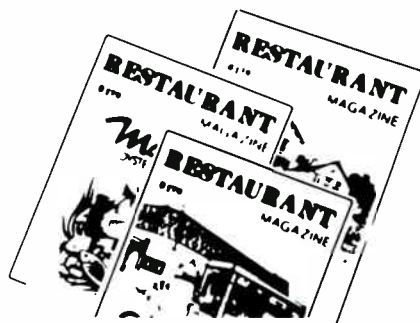
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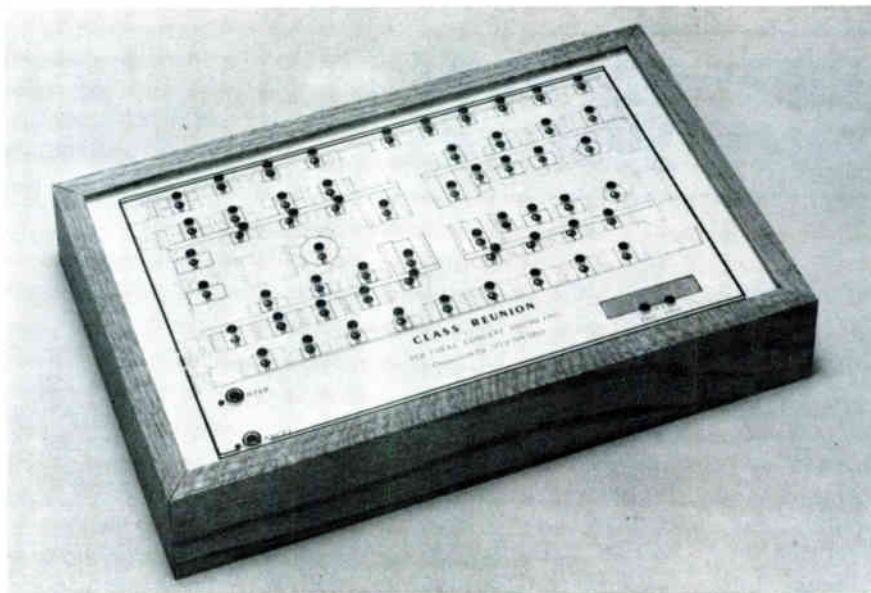
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rapid table identification.

"People Mover II" is a labor-saving device designed to increase the restaurateur's profits and diner turnover. "We consider the electronic device affordable by any size restaurant; in fact, if the average restaurant turns over only one additional table a day, or eliminates one roving hostess' wages, the system pays for itself in 90-120 days," Slack said. □

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BURGLARS ARE GETTING BUSIER, according to a report from the FBI. The federal police agency says that burglaries rose 13.9% last year, to more than 3.7 million. That works out to one burglary about every eight seconds. The increase has been somewhat higher in suburban areas, the FBI says, and even rural communities experienced a 12.9% rise.

THE NATIONAL BURGLAR & FIRE ALARM ASSOCIATION ESTIMATES that 9 of every 10 alarm signals monitored by local police around the country turn out to be false. About half of these false alarms are caused by owner abuse or negligence, the association says. Another fourth can be traced to faulty equipment or installation. The rest are attributed to storms, telephone line troubles and various unknown causes.

THE STATE OF KANSAS ENACTED LEGISLATION establishing rules for those who sell, install, repair, in-

spect, test or maintain fire protection equipment in that state. The new law applies to both portable extinguishers and fire extinguishing systems, and requires proof of competency and financial responsibility. The law also prohibits the sale of any fire equipment that does not carry an approval label from a "recognized testing laboratory."

CABLE TV COMPANIES ARE ENTERING THE HOME SECURITY MARKET because of the spiraling incidence of crime—break-ins and robberies, especially. Warner Amex Cable Communications, Inc. has signed up 6% of its Columbus, Ohio, customers. Warner Amex executives say the rising demand for their 2-way security system has given them a marketing edge over traditional alarm companies. "Only 3% of homes have a security alarm system (in Columbus)," says a senior vice president of Warner Amex. But cable

operators are expected to get a larger share of the home security market, because the cable systems are generally cheaper than traditional alarm services. Cable security is easier to sell, he says, because potential customers are generally already paying for the cable operator's entertainment services.

Cable security systems operate differently, although not necessarily more efficiently, than other alarm systems. A computer in the central monitoring station sends a message to the home, generally every 10 seconds, asking if everything is in order. A response is made by a control box that is connected by wire to sensors on doors and windows. If the control box signals an emergency, the monitoring station calls the police, generally after making a confirmation call.

Like alarm companies, most cable systems also offer fire protection and a medical emergency service. Warner Amex offers customers with chronic medical conditions a portable, wireless transmitter that can be used to relay a call for an ambulance.

In Columbus, a Warner Amex executive declared that his company was selling 40 to 70 systems a week.

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business-oriented communications system. Typical applications are bank drive-up windows, self-service gas stations, shipping/receiving docks, cashiers' windows, fast food windows and counter/kitchen stations. Switching between the two stations is practically instantaneous, assuring that the first syllables of words are not lost. Irritating mechanical or electrical pops, clicks and thumps are eliminated. Audio-feedback cannot occur in the system, since only one channel is open at a time.

VIDEO SYSTEMS: System-planned video consoles, stands, racks and storage setups for tape and film are shown in a full-color catalog from The Winsted Corp., Minneapolis. The plan-it-yourself 44-page guide allows the user to match his video equipment to the

activation is not considered desirable). The handsome console is a stand-alone unit, containing microphone, speaker, amplifier and controls. A small desk, counter or shelf near a standard electrical outlet is all the space required. The model 4011 is designed as a



specially-designed components he needs to obtain the full benefit of all system functions. All editing, dubbing and production needs are met by these roll-around and stationary units, which can handle all major brand video equipment.

INTERCOM: A folder from Columbia Scientific Industries Corp., Austin, Texas, describes the Model 4011 Single-Channel Intercom. The two-way communication system is fully automatic and voice-actuated (hands-off switching between the master and remote stations). Advantages include simple installation (only the remote station requires mounting and one connecting cable joins the remote and console with simple phono plugs); voice-tailored solid-state circuitry; call button at the remote station; standby and volume controls operated from the console; and manual switch (to be used at times when voice

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MOBILE COMMUNICATIONS

CELLULAR MOBILE TELEPHONE APPLICATIONS DATE POSTPONED PENDING RECONSIDERATION (CC DOCKET NO. 79-318).

The FCC had scheduled to start accepting applications on November 23/81. It has put ahead accepting applications until 30 days after it has acted on numerous requests for reconsideration of its report and order in the cellular mobile proceeding. It said it had received 25 petitions for reconsideration or clarification, 13 opposition pleadings, 13 reply pleadings and 3 motions for stay of the order, plus comments supporting and opposing the motions. The FCC said it expected to act on reconsideration requests during December 1981.

Because of the number and complexity of issues in the petitions, the FCC said it did not expect to be able to rule on them early enough to allow potential applicants ample time to prepare their applications by Nov. 23/81.

FCC Commissioner Joseph R. Fogarty issued a dissenting statement, declaring that the Commission's "cellular radio decision is sound in policy and correct in law and provides the *only* viable structure for making this revolutionary technology and service available, so far as possible, to all the people of the United States, on a rapid, efficient nationwide basis, and with adequate facilities at reasonable charges.

"My review of the petitions for reconsideration and related pleadings... indicates that the matters raised are, for the most part, essentially re-argument of issues which were fully addressed and resolved by the Commission in its original decision. I fail to understand why we cannot commit ourselves to ruling on reconsideration by early November and thereby avoid a stay of the cellular application filing date and associated delays in pressing forward with the provision of this new and needed service.

"I am also greatly disturbed that this stay decision may be interpreted as indicating a lack of Commission resolve in implementing the critical policy core of the original decision—the split frequency structure—which ensures the timely provision of cellular service and realistic competitive opportunities and benefits. Such wavering would be a travesty on the orderliness, continuity, and integrity of the Commission's process. Of course, we must address the pending reconsideration petitions in due course and with due process. However, the mere pendency of those petitions is no basis for signaling a lack of commitment to the policy judgement that is the view of this Commission."

Meanwhile, a group of 12 RCCs has formed a consortium to gain an edge in the expectant clamor for frequency allocations in the cellular field. The new firm is Cellular Systems, Inc. David Post, chairman of the CSI finance committee and president of Page America, New York City-based RCC, said recently that CSI expects to set up a cellular radio telephone system in every major market.

Post observed that "the FCC will grant two licenses in each market. One will go to the Bell System. We're going to attempt to be the other one."

CSI has about \$300,000 initial financing by the 12 founding RCCs, it's been learned. Post said that it represented the first phase of a major capital structuring program. The next phase, the CSI president said, will approach other RCCs located throughout the U.S. to become involved in the new firm. An eventual public offering of stock is planned, but Post did not place a time stamp on that move. Under the CSI plan, each RCC "member of CSI" would act as "an agent and a stockholder leasing the equipment and sharing in the profit."

In the long run, a national organization is visualized, with all cellular systems compatible throughout the CSI network, declared CSI president Ken Iscol, also president of Message By Radio, Inc., a Yonkers, N.Y. RCC.

Others named to executive posts in CSI are: Gerald Agliatta, pres./ Westchester Mobilfone Systems, Inc, White Plains, NY, as vice pres./



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CSI; Charles Sackermann, pres./Tray-Mar Communications, Union City, NJ, as CSI secretary; and C. Leonard Fink, pres./Mobilfone Radio Systems, Inc., NYC, as CSI treasurer.

RCCs named as part of CSI: Beep Communications Systems, Inc., NYC; Radiofone Corp., Englewood Cliffs, NJ; Radio Broadcasting, Inc., Lakewood, NJ; Litelco Communications Inc., Island Park, NY; Radio Call Corp., Melville, NY; Massachusetts-Connecticut Mobile Telephone Communications, Inc., Hartford, Conn; and Radio Telephone Answering Service, Staten Island, NY.

FCC HAS APPROVED THE ESTABLISHMENT OF A MOBILE SERVICES ADVISORY COMMITTEE to aid the FCC staff in revising the public mobile radio rules (Part 22) and to assist the Common Carrier Bureau in streamlining its licensing procedures and policies for the mobile services.

The Committee will take all steps necessary to assemble information and provide advice concerning:

- rules sections that are out of date or in need of revision;
- procedures or policies that are unnecessarily burdensome on the public;
- impact of rules on small businesses; and
- areas where deregulation is appropriate.

The committee will meet at least four times a year for three years and report to the Chief of the Mobile Services Division. For more information contact Charles Marietta at (202) 632-7513.

FCC CLARIFIES LICENSING POLICIES FOR SHORT-RANGE, LOW-POWER MICROWAVE SYSTEMS; DENIES TEMPORARY LICENSING (PR DOCKET NO. 79-337).

The Commission on request of Microwave Associates, Inc. and the General Electric Company, has clarified its position for licensing short-range, low-powered microwave and TV systems in the 21.8 - 23.2 GHz band, usable for short-distance TV communications, surveillance, and high-speed data transmission between offices and buildings—for example, inter-bank transactions.

However, it denied GE's request for reconsideration of modifying its decision to permit stations utilizing these transmitters to operate before they are licensed.

On August 1/80, the FCC authorized microwave systems that operate with low output power in the 22.0 - 23.6 GHz band to be licensed in the Private Operational-Fixed Microwave Services with somewhat more relaxed technical standards than are normally prescribed in Part 94 of the rules. In the adopted rules, among other things, the FCC assigned four channel pairs - 21.825/23.025 GHz, 21.875/23.075 GHz, 21.925/23.125 GHz and 21.975/23.175 GHz for such operations, with a 50-MHz bandwidth per channel.

In clarifying its license policies, the FCC said that as an initial point its current licensing policies authorize either channel in a channel pair to be used for single-channel operations on a routine basis. Operations on adjacent channel pairs normally are authorized in situations in which the bandwidth of a channel in which an existing system is licensed cannot accommodate the expanding communication requirements of its licensee.

The FCC declared that low power systems that are low density, narrow-bandwidth communications will be permitted if an applicant can demonstrate that all frequencies with a narrower bandwidth that can accommodate its communications requirements are unavailable; expansion of a current facility in the next five years will require greater bandwidth than now available; or the proposed facility is part of the main route or backbone of a communications network eligible for licensing in the 22.0 - 23.6 GHz band.

In denying GE's request for temporary licensing, the FCC said there is a possibility of interference from these types of systems, especially since the frequency band is shared with the U.S. government, the Domestic Public Radio Services and the Earth Exploration Satellite Service. On the basis of the record it said it was not persuaded that public interest would best be served by the adoption of GE's proposal.

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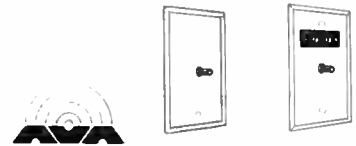
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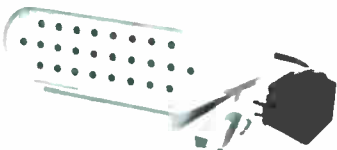
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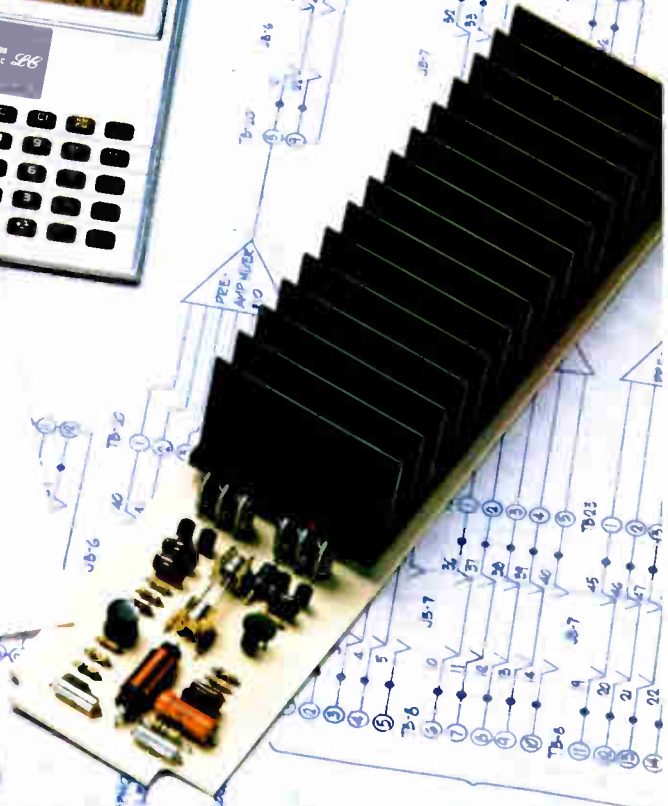
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