

ELECTRONIC

Servicing & Technology

NOVEMBER, 1981

A look at Dolby noise reduction

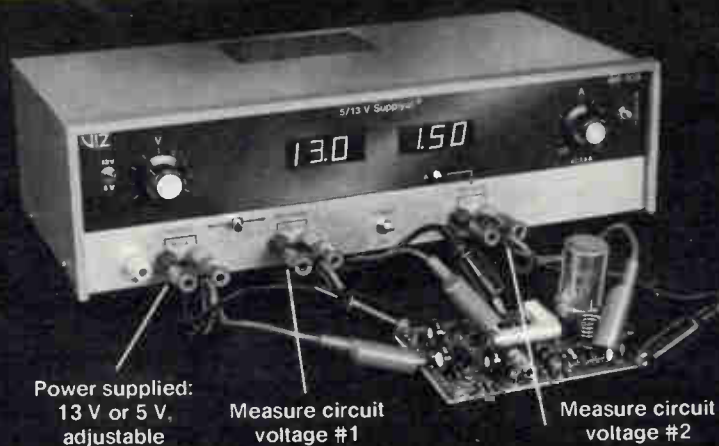
Winter CES preview



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Regional advertising sales offices listed near Advertisers' Index.



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ELECTRONIC SERVICING & TECHNOLOGY (USPS 462-050) (with which is combined PF Reporter) is published monthly by Intertec Publishing Corp., P.O. Box 12901, 9221 Quivira Road, Overland Park, KS 66212-9981. Second Class Postage paid at Shawnee Mission, KS 66201. Send Form 3579 to P.O. Box 12901, Overland Park, KS 66212-9981.

ELECTRONIC SERVICING & TECHNOLOGY is the "how-to" magazine of electronics. It is edited for electronic enthusiasts who are interested in buying, building, installing and repairing home-entertainment electronic equipment (audio, video, microcomputers, electronic games, etc.).

Subscription prices to qualified subscribers: one \$12, two years \$19, three years \$24 in the USA and its possessions. Foreign countries: one year \$17, two years \$27, three years \$35. Subscription prices to all others: one year \$25, two years \$50 in the USA and its possessions. Foreign countries: one year \$36, two years \$72. Single copy price \$2.25; back copies \$3.00. Adjustment necessitated by subscription termination to single copy rate. Allow 6 to 8 weeks delivery for change of address. Allow 6 to 8 weeks for new subscriptions.

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November 1981 *Electronic Servicing & Technology* 1

The how-to magazine of electronics...

ELECTRONIC

Servicing & Technology

November 1981
Volume 1, No. 1



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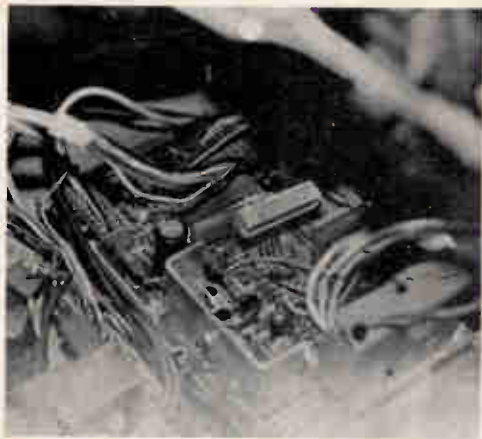
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ELECTRONIC SCANNER

Hitachi America to participate in EDS

Hitachi Semiconductors will be an Executive Suite participant in the 1982 EDS Industrial Distribution Conference, according to David L. Fisher, executive vice president of the Electronic Industry Show Corporation. The commitment to participate substantiates Hitachi's dedication to distribution as the most effective way of marketing its semiconductor products, Fisher said.

The EDS '82 Industrial Conference will be held April 29 to May 1 in New Orleans, LA. Major distributors will attend not only for the opportunity to confer privately with important suppliers, but to review the broad spectrum of electronic aftermarket products displayed in the companion event, the Electronic Distribution Show.

By its decision to participate in the conference, Hitachi will be following the pattern set by leading manufacturers of passive components over the past few years. EDS caters to such companies by providing a private meeting environment in hotel suites and conference rooms for one-on-one sessions between top-level management of manufacturers and their distributors.

General instrument invests in broadband networking company

General Instrument Corporation (GRL-NYSE) has announced the completion of the initial phase of a \$6 million investment in Sytek Inc., a privately held, data communications company in Sunnyvale, CA.

The affiliation of the two companies creates a vertically integrated data communications networking capability by combining General Instrument's broadband CATV resources, offshore manufacturing facilities and ser-

vice organization with Sytek's data communications expertise and broadband data networking products.

In subsequent phases of the financing program, General Instrument plans to increase its investment to provide required capital to finance anticipated Sytek growth. In addition, through the acquisition of a portion of the shares of Sytek's current stockholders, General Instrument will achieve a total of 51% ownership of Sytek.

I.C.S. offers 4-day courses

Digital filters and spectral analysis, voice input/output for computers, and digital image processing and analysis are covered in 1982 courses from Integrated Computer Systems. The 4-day courses will be held in various cities across the country between January and April. On-site courses are available on request.

The cost of the courses is \$795 each. For more information, contact Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., P.O. Box 5339, Santa Monica, CA 90405; (213) 450-2060.

I.C.E.C. offers training technical

Integrated Circuit Engineering Corp. is offering a series of training seminars and workshops for Fall 1981. Remaining courses include Semicustom and Custom LSI Implementation, Dec. 3-4 and March 4-5 in Scottsdale, AZ; and May 20-21 in Sunnyvale, CA; and Gate Array Design, March 29-April 2 in Scottsdale, AZ.

For more information, contact the ICEC Seminar Secretary, 15022 N. 75th St., Scottsdale, AZ 85270; (602) 998-9870.

GE's Los Angeles ICESD service center doubles size

General Electric's Instrumentation and Communication Equipment Service Department (ICESD) service center recently moved to a new and larger facility at 1200 Kona Drive in Compton, CA. The move is in response to the growing needs of the instrument market in southern California.

The 23,000-square-foot facility is twice the size of the previous facili-

ty and will enable GE's service center to provide an increased range of services to industries and businesses from San Diego to Bakersfield, CA.

The ICESD service center repairs, maintains and calibrates electronic and electrical equipment such as scopes, recorders, network and spectrum analyzers, plotters and test instrumentation; leases line printers, teleprinters, CRTs, modems, multiplexers, computer peripherals and telecommunications equipment; and performs temperature, vibration, pressure, telephone and other tests.

The Los Angeles center also features a measurement and diagnostic service which analyzes rotating equipment with capabilities ranging from field balancing to sophisticated computer analysis of torsional vibration; mechanical testing, including automated metallography, NDT, fatigue and other material property tests; and energy-related services such as thermographic surveys and power measurements.

The service center offers 24-hour in-shop and on-site service on both GE and non-GE equipment.

Home satellite terminal to boom as costs drop

Struggling to be taken seriously, beset by vested interest opposition and, until recently, only a hobbyist's or rich man's toy, the home satellite terminal nevertheless promises to be a key, not only to high resolution television, but also to the development of home information systems, according to a just-released market study.

"Improved TV broadcasting requires the technology inherent in small earth terminals," the report by Frost & Sullivan says. That is because such systems require easier-to-read TV screens than that possible with current 512-line sets.

And it is this need that could "launch another industrial boom," said Joe Savino, F&S project director. "It would be similar to that triggered by the advent of the personal computer or that of com-

mercial television," Savino said.

This new study on direct-to-home satellite broadcasting refers to home terminals that provide the reception for such satellite transmissions as "a blossoming new industry." A few thousand of these home satellite terminals are already installed, the study points out. "Home satellite terminals enable a family to receive a wider variety of channels and programs than can any other media," F&S notes. Signals are also less vulnerable to interference and multipath reflections.

The 289-page report, which identifies about 40 companies engaged in the manufacture and distribution of small earth terminal equipment, admits to finding major obstacles in the way of this industry. These include opposition by the broadcasting and communications industry in general and from foreign countries who fear the technology for its potential "to Americanize their culture."

Declining costs provide the biggest impetus to the use of satellite terminals by homeowners. Antennas used by the INTELSAT system, which link 120 countries and extend as much as 100 ft. in diameter, cost millions of dollars. Home satellite terminals, on the other hand, defined as an antenna 12 to 16 ft. in diameter which cost more than \$100,000 in 1975 and could handle only a single channel, now cost about \$12,000 and have 24-channel capacity.

Nortronics announces new manufacturer's representative

Nortronics, manufacturer of magnetic tape heads and tape recorder maintenance products, has announced that it has retained Audities 2001 of Denver, CO, as its manufacturer's representative for Montana, Wyoming, Colorado, Utah, southeast Idaho, New Mexico and El Paso, TX.

Michael Cluph and Paul Bird, manufacturer's reps with accounts throughout the West, formed the Audities partnership in 1979. The company represents many names in audio, including Infinity Systems, Nakamichi U.S.A., Dahlquist, Adcom, Otari and Cetec-

Gauss.

Audities 2001 serves a wide variety of accounts, including broadcasters, recording studios, mass merchandisers and home video retailers, but is particularly strong in the consumer audio market.

Marlee Electronics to open new headquarters

Marlee Electronics, a manufacturer of telephone-controlled access systems for apartment houses and office buildings, will celebrate its 9th birthday with a move to new company headquarters.

The Marlee Electronics Culver City, CA, property contains 10,000 square feet and will house a complete engineering laboratory, computer room, enlarged production area, a dealer training classroom, sales and marketing offices and expanded warehouse facilities.

The new address is 3965 Landmark Street, Culver City, CA 90230. The phone number is (213) 204-5045.

ASK announces public offering of common stock

ASK Computer Systems Inc. has announced the initial public offering of 1350 shares of its common stock, of which 750,000 shares are being offered by ASK and 600,000 by certain selling shareholders.

The proceeds to the company of approximately \$7,400,000 will be used for additional property and equipment to expand ASK's on-line remote processing service and facilities and for working capital purposes. ASK will receive no proceeds from the sale of shares by the shareholders.

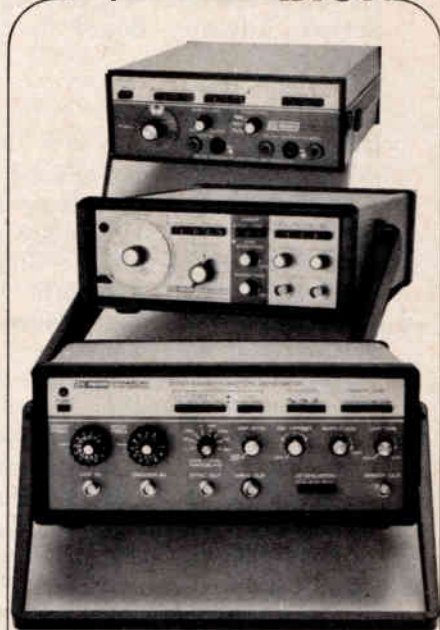
ASK designs, produces and markets turn-key computer systems consisting of ASK's MAN-MAN manufacturing and financial management proprietary software licensed along with purchased computer hardware.

For more information, contact Gary Yost, ASK Computer Systems, (415) 969-4442.

Journeyman CETs number 10,000

Kenneth C. Hill, CET of Corvallis, OR, became the 10,000th Journeyman Certified Electronic

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The three new generators all feature low-distortion, high-accuracy outputs and selectable lin/log sweeps. The 3030 offers the widest capabilities. It generates all seven of the most commonly needed waveforms and has wide-range variable symmetry control. Kelvin-Varley dividers provide ultra-high accuracy sweep-limits.

With a range of 0.005 Hz to 5 MHz, the new 3025 is more than able to handle most lab and field applications. In addition to sine, square and triangle waveforms, the 3025 offers a haversine function for more specialized needs.

Also new, the 3015 is a very compact generator intended for audio and ultrasonic applications. Unique in its price class, it covers 2 Hz to 200 kHz. Both variable and fixed TTL level outputs are featured.

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Technician when he passed his CET test August 30, 1981.

Hill works as a computer repair technician at Videx Corp. in Corvallis, OR. His exam was administered by Larry Broschart, CET of Portland, OR and approved by the Television and Radio Service Advisory Board for the State of Oregon.

MCE to demonstrate Uniray approach

When WESCON/81 opened its 3-day run in San Francisco, CA, one of the high technology advances on display was the Uniray (universal array) concept for designing semi-custom integrated circuits.

This method for moving ICs from the semi-custom stage to finished parts that meet unique customer requirements was demonstrated by Micro-Circuit Electronics Inc., the western U.S. affiliate of Micro-Circuit Engineering (MCE).

MCE's universal array approach is based on a broad selection of UNIRAY devices. These semi-custom ICs need only have their final mask specified before they become finished parts. The final mask dictates the interconnects among the numerous on-chip components that can provide analog, digital or combined analog/digital functions.

To simplify the task of defining the final mask's interconnect pattern, MCE offers a development and evaluation tool called UniDES. This breadboarding vehicle is a full-sized circuit board with full-color layout of a selected Uniray worksheet mounted on its surface. Beneath the circuit board are sockets which accept key parts to simulate the Uniray corresponding to the worksheet mounted on top.

UniDES breadboarding is accomplished with miniature patch-cords, which can be plugged into pin jacks that correspond to layout contact points.

Once the designer has implemented the interconnects as dictated by his design, he can test his creation under power and even over temperature excursions in an oven. If the circuit performance is

not acceptable, or if he would like to change resistor tolerances to simulate IC manufacturing variances, he can do so and then re-test the new configuration.

ALMO appointed AMP industrial distributor

ALMO Electronics Corporation, Philadelphia, PA, has been selected by AMP Inc. as one of its authorized industrial distributors. ALMO will carry AMP's commodity line products including terminals and splices, pin and socket connectors, ribbon cable connectors, sub D's, dip sockets, dip switches, flat ribbon cable, COAX connectors and edge connectors.

VHD joins in videodisc player coordination

VHD Programs Inc. has announced participation in a coordinated worldwide introduction for VHD videodisc player systems in the second quarter of 1982. The introduction was rescheduled to maximize effectiveness of player inventories on a worldwide basis, according to Gary Dartnall, president of VHD Programs Inc.

One complexity involved with an international introduction is creating compatibility between different TV systems: NTSC in North America and Japan, Secam in France and PAL in the rest of Western Europe. A significant number of manufacturers are in line to produce VHD videodisc players worldwide. All manufacturers will now be able to draw on this new VHD technology, which will require another few months to complete product lines based on the new compatible technology.

New plans call for a Japanese introduction in April 1982, closely followed by U.S. introduction in June 1982 and late June or July in Western Europe.

SAL cable establishes toll-free, 24-hour hotline

SAL Cable Communications Inc. has just established a toll-free, 24-hour telephone hotline. Now customers who need hardware or electronic components on an emergency basis can contact SAL anytime of the day or night.

According to Alan Scheinman,

SAL president, the hotline "enables us to react instantly to the emergency needs of our customers."

In the past, Scheinman explained, CATV franchisers and contractors in immediate need of a component, part or tool were shut out if the emergency occurred outside of normal business hours. "The hotline shortens downtime or construction delays in CATV systems as much as is humanly possible," he said. "Hospitals have emergency rooms; health organizations have 24-hour counseling. We're trying to satisfy the immediate needs of the CATV industry."

Scheinman also said that his company's ability to react instantly to customer emergencies is also made possible by SAL's computer-linked network of warehouses.

The toll free number is (800) 645-9062. The New York number is (516) 694-7110.

Strategic updates satellite report

Strategic Inc. has released updated forecasts and information in its report, *Small Satellite Earth Stations: U.S. Market Opportunities, 1981-1989* (No. 309). The new study contains current data and projections regarding direct broadcast to homes by satellites.

Marsha F. Adams, director of Audio/Video Services, reported that the projections by Strategic "are conservative, compared to manufacturers' claims." Restricted to the U.S. non-military market segment, Strategic predicts that the total small satellite communications earth station market will grow at an average annual growth rate of more than 48% (in units) through the 1980s. Declining prices, especially in the DBS segment, will limit the annual revenue growth (in constant 1980 dollars) to about 18%. Total equipment sales (receivers, antennas, transmitters, and amplifiers) will be in excess of \$1 billion over the 1981-1989 period.

The April 1981 FCC ruling that tentatively permits direct-to-home broadcasting represents a significant milestone in the development of the small earth station market. "However, there are still hurdles

to overcome," according to Adams. "Protests by cable TV companies, government red tape, lack of programming, competition by other video media for the viewers' time and delays of K-band satellite transmission until the mid-1980s" are all obstacles to be overcome. Strategic predicts sales of 160,000 antennas in 1989, assuming that DBS does not become a viable service until 1985-1986. Sales are then expected to increase tenfold each year in the early 1990s, as the DBS services increase.

The cost of the home earth station will decrease rapidly as DBS becomes a reality in the mid-eighties. The price erosion forecast by Strategic is from a minimum \$3,200 (antenna, amplifier and receiver) in 1981 to \$600 in 1990. Because of the decline in prices, DBS is predicted to be 96% of the total earth station market (# units) in 1989, but only 45% of the total 1989 revenue. This is illustrated in the accompa-

nying pie charts.

The report includes a company/product matrix of over 85 firms involved in the manufacture of small earth station equipment for the U.S. market.

The 120-page report is now available for \$1,500 from Strategic Incorporated, 4320 Stevens Creek Boulevard, Suite 215, San Jose, CA 95129, (408) 243-8121.

Columbia, SC, chosen for Sony color TV plant

Sony Corporation of America announced plans today to build a \$20-million color TV manufacturing facility in Columbia, SC. Sony was the first Japanese TV maker to build a U.S. factory when it opened its San Diego, CA, facility in 1972. Today that plant employs more than 1800 persons and in 1981 will produce approximately 750,000 Trinitron color TVs, with the vast majority sold in the North American market.

As demand for Sony TVs has grown, the need for an East Coast

factory became clear, according to Kenji Tamiya, executive vice president, Sony Corporation of America. "We undertook a major search of potential plant sites, focusing on the southeast because of favorable economic and geographic conditions," Tamiya said.

Working closely with the office of Governor Dick Riley, the South Carolina State Development Board and the Economic Development Commission of Greater Columbia, the company was able to pinpoint a 330-acre site just outside the Columbia city limits in Richland County. The initial phase of the project will see construction of a 200,000-square-foot TV assembly building which will accommodate about 500 persons according to Tamiya.

Sony has picked Ron Dishno for the new vice president and general plant manager from the ranks of its San Diego team. Dishno has been with Sony's San Diego operation since its inception in 1972.

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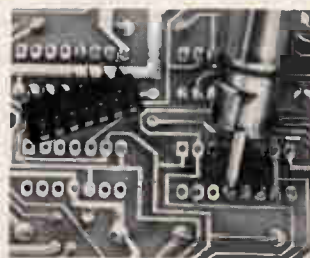
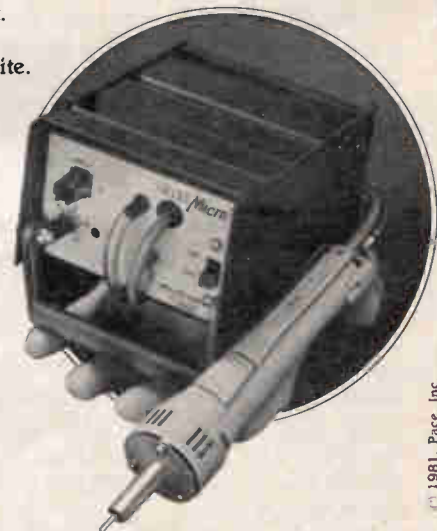
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ASSOCIATION NEWS

Color TV, VCR sales to retailers increased in August

Total U.S. market sales to retailers of color TV receivers and home VCRs increased in August 1981, over the same month last year, according to statistics compiled by the Marketing Services Department of the Electronic Industries Association's Consumer Electronics Group.

Monochrome TV receivers sales declined in August but remained ahead of last year on a year-to-date basis. Color TV sales in August 1981 amounted to 886,175 units; up 5.7% over 838,004 units sold in the comparable month of 1980. Sales of color TV sets on a year-to-date basis, 34 weeks into the year, reached 6,804,971 units by the end of August 1981, a gain of 6.7% over 6,376,014 sold in the first eight months last year.

Monochrome TV receiver sales were 392,643 units in August 1981, a decline of 13.3% from 452,891 sold in the same month of 1980. Year-to-date sales of monochrome TV in the 34 weeks of 1981 were 3,532,197 units, an increase of 9.4% over 3,228,414 units sold in the same interval last year.

Home VCR sales to retailers rose to 98,940 units in August 1981, a gain of 74.8% over 56,606 units sold in the same month a year ago. Sales of VCRs in the first eight months of 1981 increased to 730,049 units, a rise of 85.5% over 393,520 units sold in the comparable period of 1980.

Association changes name to include exporters

About 1400 member companies overwhelmingly approved a new name and new direction for American Importers Association, according to Lee A. Greenbaum, president of the association and

president of Kemp & Beatley, New York City. The association, which represents the interests of companies ranging from small businesses to conglomerates, will now be known as American Association of Exporters and Importers.

The association decided to take this step after a 1980 poll revealed that 50% of the membership either already exported or intended to begin exporting, and because of the growing conviction of the board of directors that the nation's economic vitality requires effective participation by American companies in global markets. As a result of the decision, the association is now in the unique position of representing the largest constituency of companies engaged in both importing and exporting.

The new American Association of Exporters and Importers will operate on the premise that businessmen, to succeed in an increasingly competitive world marketplace, must set long-range market strategies and become aware of how competitiveness is affected by U.S. and foreign laws and by differences which prevail among national business systems.

The new association will use the experience of its members to discover and oppose obstacles affecting U.S. exports, working closely with the U.S. government to eliminate foreign market impediments and reduce government burdens on exporters. It also hopes to help improve U.S. government programs, such as the Foreign Commercial Service, which assist U.S. companies in gaining access to foreign markets.

AFCEA conference set for Jan 12-14

The Armed Forces Communications and Electronics Association (AFCEA) will hold its third annual Western Conference and Exposition Jan. 12-14, 1982 at the Disneyland Hotel in Anaheim, CA.

Industry, military and government professionals who are expected to attend will see the full spectrum of electronics, from sophisticated systems to basic components for the latest in communications, command and con-

trol and intelligence systems (C³I). More than 200 industry and military exhibit units will be presented.

The purpose of the conference is to maintain and improve the technical cooperation and understanding among military, government and industry in the planning, design, procurement, maintenance and operation of communications, electronics, computer science, teleprocessing and intelligence systems.

For more information, call Plans and Programs at (703) 578-1037, or John Sparegeo, exhibits manager, at (703) 820-5014.

NATESA Convention a huge success

NATESA's 31st Annual Convention in Bloomington, IL, was a full-house success at all seminars, official business and refreshment sessions.

The theme was diversification of member service businesses and topics included security systems, satellite TV, computerization, direct mail use, proper billing practices and an open forum with key factory people who answered questions posed by members.

Re-elected to the Executive Council for the 1981-82 term were President Leo E. Cloutier, CA; Vice President Ellis Hall, OH; and Treasurer Richard Ebare, VT. Robert Neal, IL, was elected secretary, to replace Tom Leeney, IN.

Next year's convention is scheduled for Aug. 11-15, 1982, at Indian Lakes Resort.

RCA receives Friends of Service Award

The NATESA Friends of Service Award was given to RCA for willingness to promptly respond to problems posed by NATESA on behalf of servicers. High-level RCA officials were especially commended for their continuing liaison, support of NATESA Scope, high level of service data, and most recently, change in warranty agency policy authorizing return of videocassette machine parts for credit.

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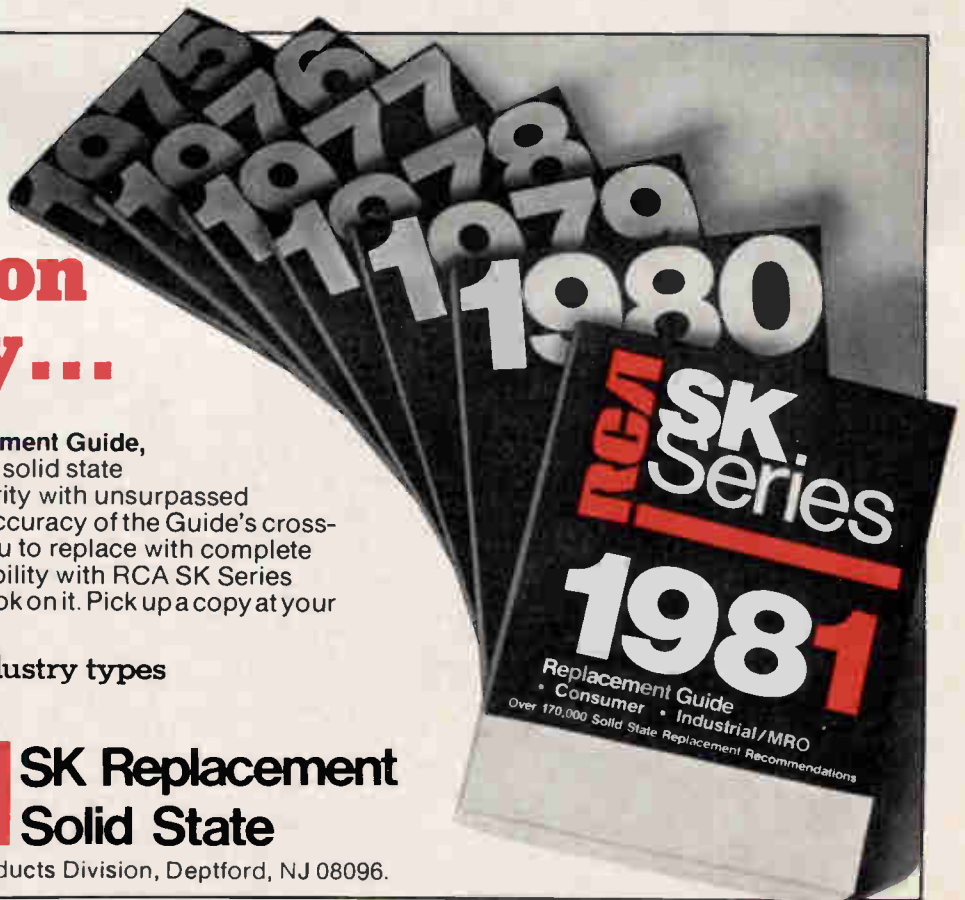
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A look at Dolby noise reduction

Dolby-B* noise reduction (NR) was a key factor in launching the cassette as a viable high fidelity medium. With the development of improved heads, electronics and tape formulations, the cassette with Dolby-B NR soon rivaled the

phonograph disc in frequency response and dynamic range. And so, Dolby B-type processing quickly became the standard noise-reduction system among consumers. Three major factors contributed to the success of Dolby-B NR: the system offered a decisive 10dB improvement in high fre-

quency signal-to-noise (S/N); audible side effects were minimal; and the circuitry was fairly inexpensive, especially after the development of Dolby IC chips.

Since 1968 when Dolby noise reduction was introduced, the phonograph record has become much better. The record industry

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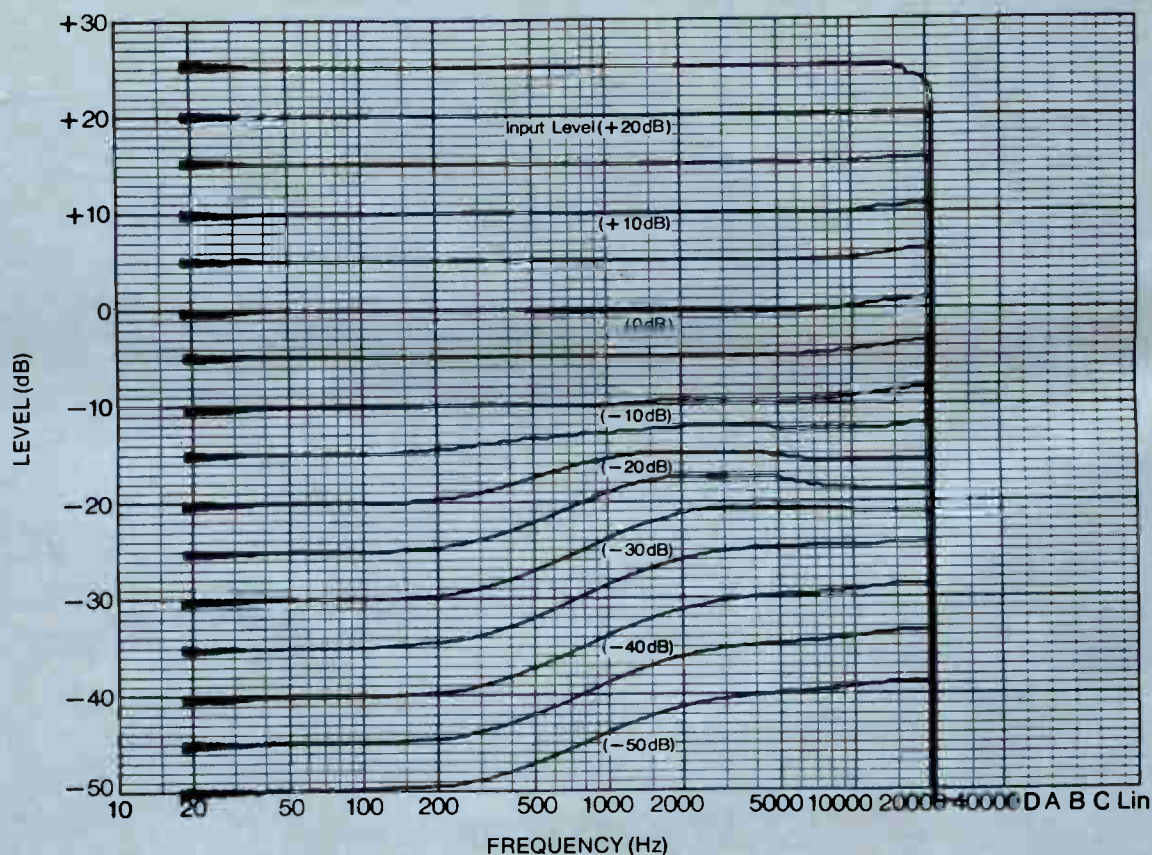


Figure 1 B-Type encode characteristics (level vs. frequency)

has moved toward direct-cut discs, digital mastering and half-speed cutting. Further improvement in cassette heads, electronics and tapes have broken the 20kHz barrier, and cassette recorders with response to 25kHz have become a reality. Taken together, these factors have created a demand for a noise reduction system with greater capability than Dolby B-type processing can realize.

Although simple wideband linear companders that offer greater dynamic range than Dolby B-type processing are available, they have unfortunate side effects—audible *pumping* and *breathing*. In short, they can be heard *working*, and this is unacceptable. Generally, the

greater the degree of noise reduction, the greater the possibility of audible coloration. In fact, the success of Dolby-B NR is due largely to its adroit tradeoff between S/N improvement and audible side effects.

The Dolby-B NR system

Dolby processing takes full advantage of the psychoacoustic phenomenon called *masking*. It has been established that human hearing is not sensitive to relatively low-level random noise when a coherent (musical) signal of substantially greater level is present. In short, high-level music masks tape noise so as long as

relatively loud music is present, noise is not detected. Only during quiet passages does this background hiss become audible. To be effective, therefore, a noise-reduction system needs only to operate during those low-level passages and the audible side effects of the noise-reduction system are minimized.

Linear companders function over the *entire* dynamic range. Although they realize greater noise reduction than Dolby NR on paper, much of this “improvement” is unneeded and is achieved at the expense of audibly noticeable side effects. In contrast, Dolby processing becomes effective only when the desired signal is so low in level

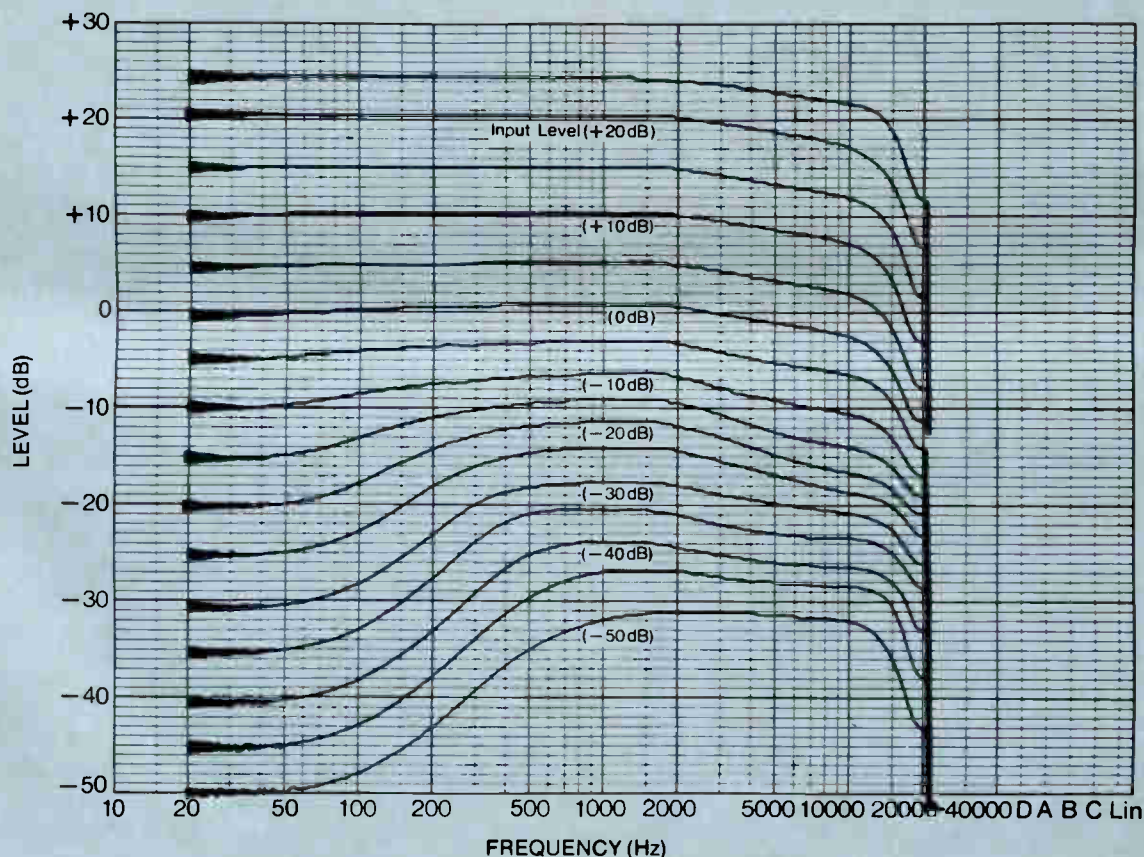


Figure 2 C-Type encode characteristics (level vs. frequency)

Noise reduction

that it cannot mask the noise. Thus, the benefit is achieved with much less side effect.

In reality, the masking phenomenon is frequency selective. That is, low frequency (bass) music is effective in masking low frequency noise, but it is not effective in masking high frequency hiss. Similarly, high frequency music masks high frequency noise, but it does not cover up low frequency noise. Ideally, a noise-reduction system should analyze the spectrum of the musical program and operate separately on each portion. When there is sufficient bass content to mask low frequency noise, the bass portion should be passed without alteration. However, if at that time there is little treble content, the high frequency portion of the program should be companded (compressed before recording and expanded upon playback) to realize noise-reduction benefits in the treble range. The professional Dolby-A system does just that; it uses four processors operating independently in different portions of the spectrum. The High Com II** system, offered by Nakamichi, divides the spectrum

into two parts and operates on each independently.

A system with multiple processors and band-splitting is expensive, and one of the major innovations of Dolby-B technology was the development of a *sliding-band* compander. Although only one compansion circuit is used, the degree of compansion is made a function of signal level. At high signal levels (greater than -5dB with respect to Dolby 0), there is no compansion at all. At somewhat lower levels (-15dB), a slight amount of compansion is used (approximately 3dB). As the musical content becomes weaker, more compansion is used to achieve greater noise reduction. Ultimately, when signal level is -40dB with respect to Dolby 0, 10dB of compression and expansion are used to achieve a similar degree of noise reduction.

The Dolby B-type encode characteristics, as a function of level and frequency, are shown in Figure 1. No compression is applied to signals that have frequencies less than 200Hz; hence no noise-reduction benefits are

This technical supplement was provided by Nakamichi USA Corporation, Santa Monica, CA.

achieved in the low-bass region. This tradeoff is quite purposeful. Human hearing is quite insensitive to low-level low frequency signals; hence, there is less need for noise reduction in this part of the spectrum.

Wideband linear companders offer noise reduction to a lower frequency than does the Dolby-B system, but they exact a severe price in terms of audible side effects for doing so. Consider a solo bass passage, perhaps the striking of a bass drum. Before the drum is struck, there is no signal, so the system is at maximum compression. When the drum is struck, the playback expander increases gain to restore the dynamic range, thus momentarily increasing tape hiss. Because the high frequency hiss is not masked by the low frequency drum, it is heard as a *puff* accompanying each strike of the drum. This is called *pumping* and is a common problem with single wide-band companders.

Dolby-C technology

Although the 10dB reduction in high frequency tape noise afforded by Dolby B-type processing is noteworthy, continued improve-

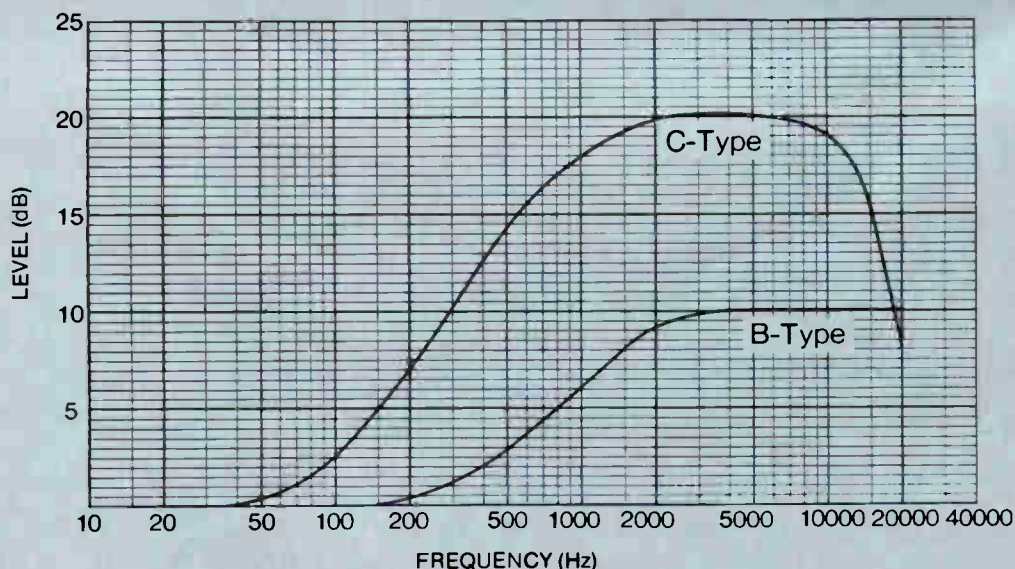


Figure 3 Low-level encoding frequency response.

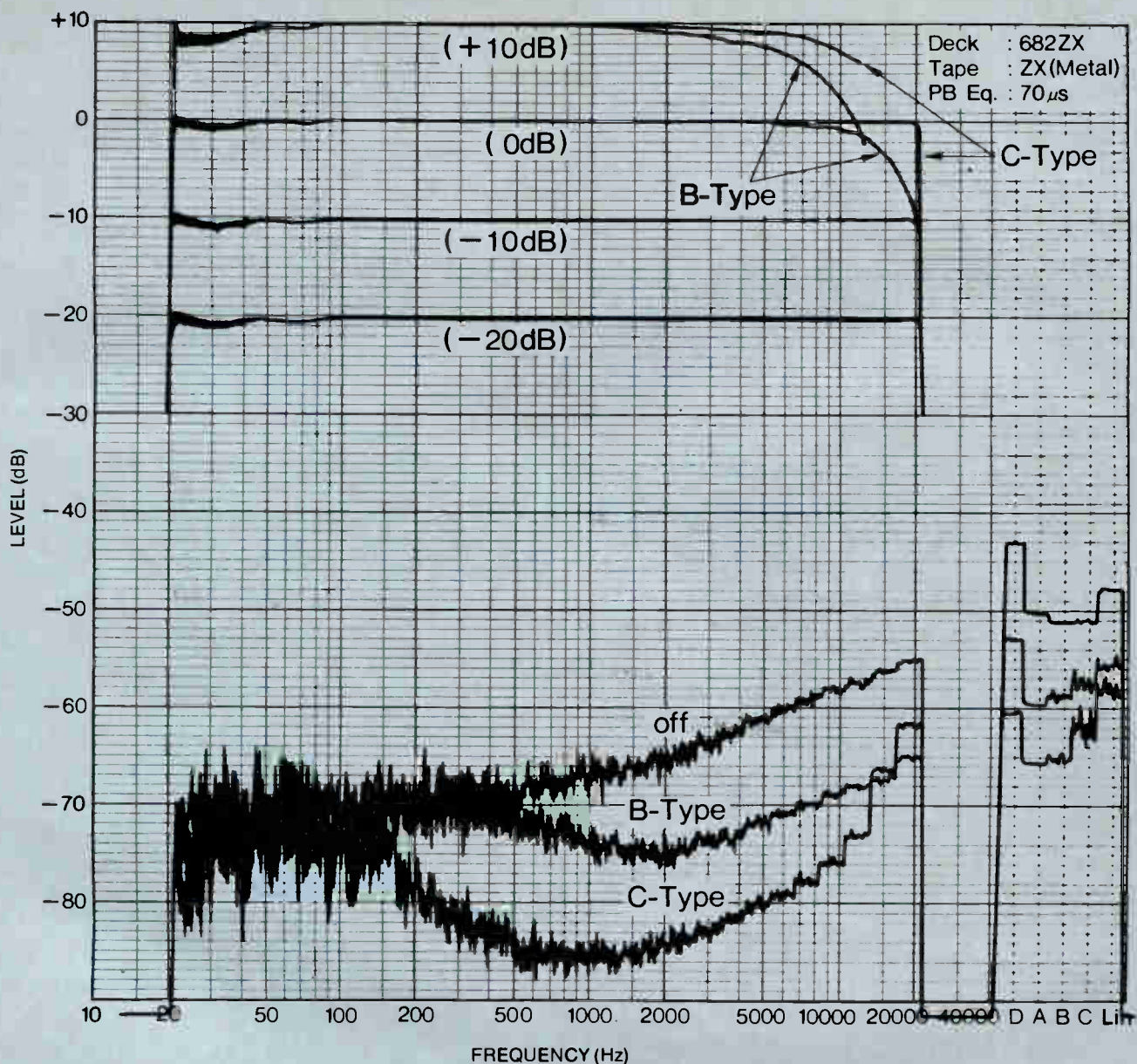


Figure 4

ments in cassette recorders and in program material have created a demand for a system with an even greater level of performance. Recently Dolby Laboratories developed a new C-type processor which, while based upon B-type technology, affords substantially more dynamic range without an increase in coloration. The Dolby-C system also is effective over a wider frequency range than Dolby-B NR.

As with B-type processing, the Dolby-C system employs a level-dependent, sliding-band compressor. High-level signals are passed through the encoder without compression and subsequently through the decoder

without expansion. At lower signal levels, where noise is not masked by music, mid- and high-frequencies are compressed during encoding and expanded in a complementary fashion upon playback. The amount of compression depends upon signal level, with the compression increasing as signal level diminishes (Figure 2).

In the Dolby-B system, maximum compression occurs with signals 40dB or more below Dolby reference level (200nWb/m) and amounts to approximately 10dB in the high frequency region. With complementary expansion upon playback, hiss is reduced by the same amount (10dB). In the C-type system, compression continues to

increase as signal level diminishes until it reaches a maximum of 20dB at -60dB re reference level. To maintain a subjectively uniform degree of noise reduction, the C-type system starts to have effect about two octaves lower in frequency than the B-type system.

Figure 3 indicates the amount of compression applied, as a function of frequency, to low-level signals; in this case, -60dB re. Dolby 0. As is apparent, Dolby-C NR employs 10dB more compression between 2kHz and 8kHz than does Dolby B-type processing and thus affords a comparable improvement in S/N over this range. C-type encoding begins more than 2 octaves below B-type encoding yielding a useful

Noise reduction

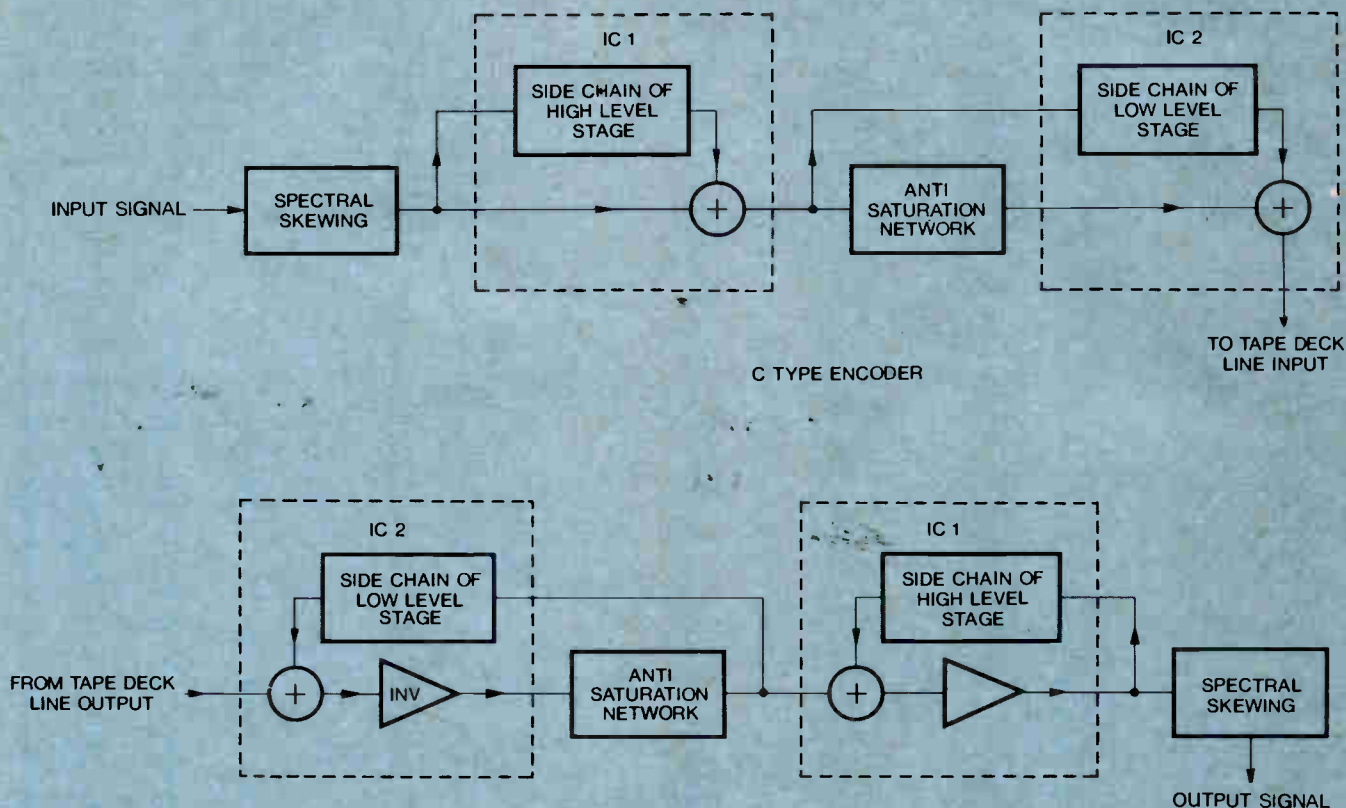


Figure 5 Dolby C-Type encoder/decoder block diagram.

5dB noise reduction at 150Hz.

Note that the maximum amount of compression in the C-type system diminishes above 10kHz and crosses the B-type curve slightly less than 20kHz. This reduction in high frequency compression is caused by the spectral-skewing circuits and anti-saturation networks in the Dolby C-type processor. These circuits prevent high frequency (short-wavelength) tape overload and intermodulation distortion. As a result, a C-encoded tape is remarkably clean and transparent in the upper register.

Figures 1 and 2 depict the B-type and C-type encoding

characteristics as a function of frequency and input level. Note that with B-type encoding (Figure 1), the response curves are approximately equidistant below -35dB, indicating that compression remains constant below that level. Above approximately -10dB, no compression is applied; no compression is applied to frequencies lower than 200Hz, but, from 10kHz to 20kHz, compression is relatively constant.

With C-type encoding (Figure 2), compression begins as low as 50Hz and continues to increase as input level diminishes to -50dB (the lowest input level depicted.) Further, the spectral-skewing and

anti-saturation circuits serve to modify the high frequency recording level as a function of input level.

For example, at the -50dB input level, a compression of 19dB is applied at 2kHz (yielding a 19dB S/N improvement at this frequency) while 14dB is applied at 15kHz (yielding a similar improvement in S/N). As signal level increases to -20dB, compression at 2kHz is 6dB; that at 15kHz is only 1.5dB. With a -10dB input, 2kHz signals are increased 3dB before recording while 15kHz signals are actually *decreased* 3dB. At the 0dB level, 15kHz signals are reduced 6dB before recording.

Of course, the decode characteristics of the B- and C-type systems are precisely complementary to their respective encode characteristics so that overall record/play (encode/decode) response is flat. But, by reducing the actual recording level on tape when the input signal contains substantial high-frequency energy (in the C-type system), less intermodulation distortion is generated, and the *effective* maximum operating level of the system is greatly improved in the upper treble region.

This is evident in Figure 4, which shows the record/playback frequency response and noise spectrum of a Nakamichi 682ZX recorder with Dolby B-type and C-type noise reduction. Note that response is virtually flat to 20kHz at the 0dB recording level with C-type encoding. Comparing noise spectra, "C" encoding becomes effective at 150Hz while the B-type does not come into play until 500Hz. Over these several octaves,

C-type noise reduction provides up to 13dB more noise suppression than an unencoded or B-encoded tape. From 500Hz to 8kHz, "C" encoding affords 10dB or greater reduction in noise relative to "B" encoding and as much as a 20dB improvement relative to an unencoded tape.

As shown in the block diagram of Figure 5 and the Compression/Expansion Diagram of Figure 6, Dolby-C noise reduction uses two processing stages operated in series. Each supplies 10dB of compression during recording and 10dB of expansion during playback. By limiting the amount of compression (and expansion) to 10dB per stage, dynamic overshoot (short-term mistracking of the compander) is minimized. This technique produces much better transient response than is possible with a single-stage compander of equivalent range. The two circuits operate at independent levels. One, identified as the high-level

stage, is sensitive to signals of about the same level as Dolby B-type noise reduction, while the other, the low-level stage, operates on signals of somewhat lower level. Because the two stages operate in tandem, their effect is to multiply the signal amplitude (or add and subtract in dB). Therefore, a total of 20dB of compression and expansion—and thus of noise reduction—is achieved.

Implementation

Dolby C-type processing can be implemented with two Dolby-B IC chips used in a modified way to carry out the two-level, 2-stage C-type scheme. An example of such an implementation is shown as a block diagram in Figure 7. One chip is used for the high-level stage and one for the low-level side chain. As the side chain of the high-level stage can be configured easily to provide a B-type characteristic and the side chain of the

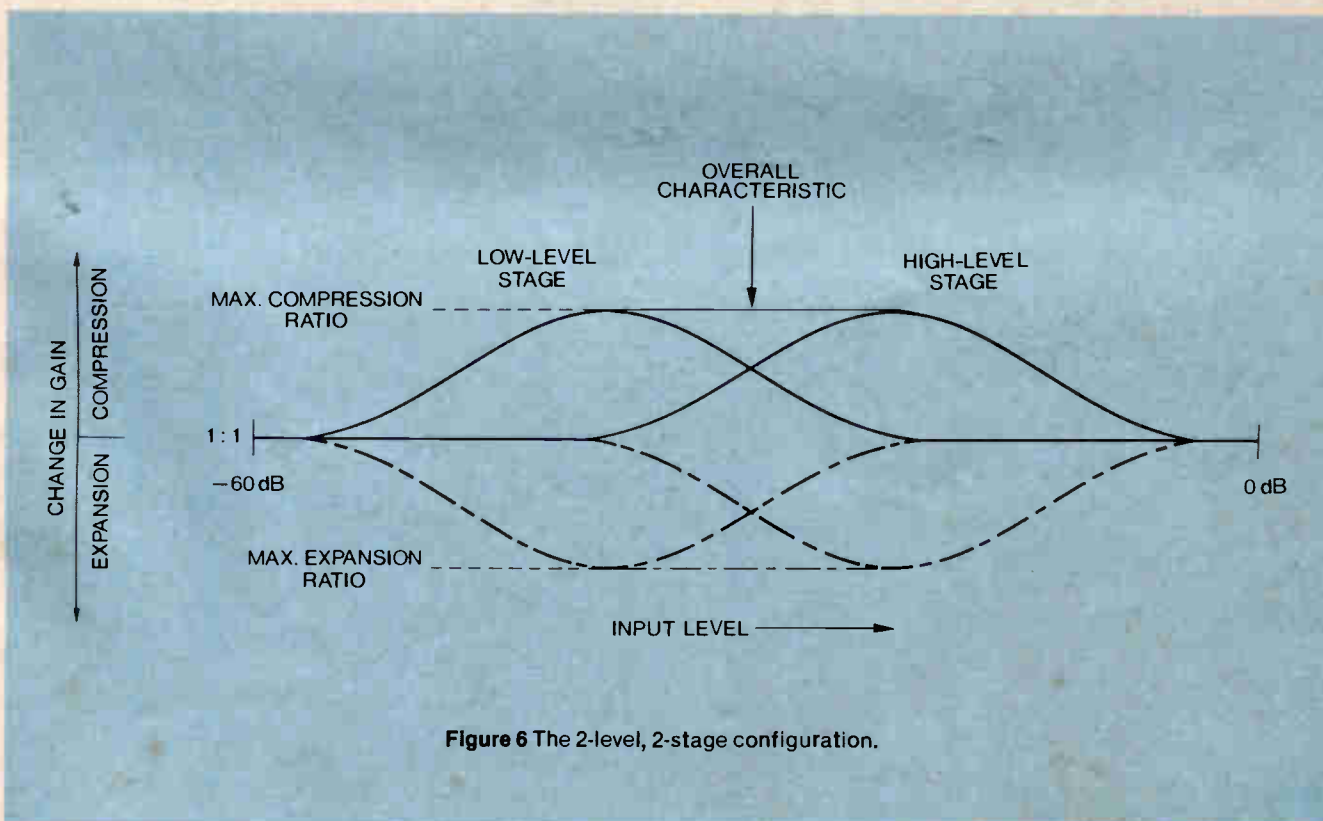


Figure 6 The 2-level, 2-stage configuration.

Noise reduction

low-level stage can be converted to a linear amplifier by a noise-reduction selector switch, the NR-200 provides *both* Dolby-B and Dolby-C noise reduction for compatibility with existing B-type recordings.

When the NR-200 works as a C-type processor, two additional special circuits—the spectral-skewing circuit and the anti-saturation network—modify system response to avoid high fre-

quency intermodulation and to increase tape headroom as described previously. The spectral-skewing circuit reduces signal level above 8kHz during encoding (recording) and compensates this totally during decoding (playback). Its purpose is two-fold to prevent deterioration of the tape's high frequency response as a side effect of the pre-emphasis, and to prevent intermodulation of the low frequency information caused by tape

saturation at high frequencies. The anti-saturation network serves to increase the tape saturation level.

To achieve its full potential, Dolby-C NR requires a high level of precision from the tape recorder with which it is used. Precise record/play level matching, wide and smooth frequency response, minimum hum, and extremely low wow and flutter are more important with C-type processing than with the B-type system. **ES&T**

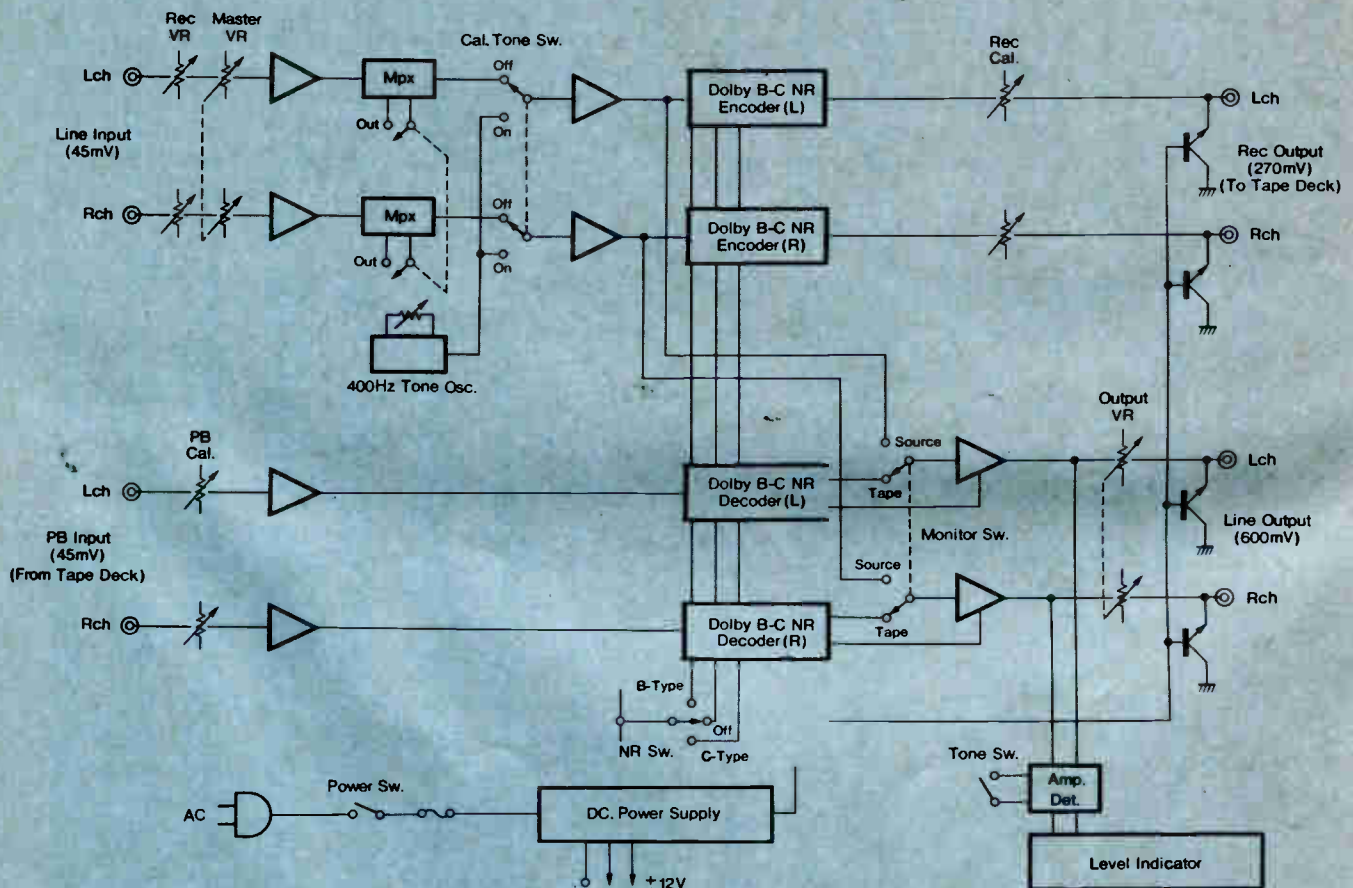


Figure 7 NR-200 block diagram.

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Dear Reader:

It is with great enthusiasm that we proudly announce a number of changes in ELECTRONIC SERVICING magazine. You have no doubt already noticed the new cover design, and name change to ELECTRONIC SERVICING & TECHNOLOGY

Our staff has been working hard to develop a new, expanded editorial package--one that you, our readers, have asked for. Beginning in January, 1982, ELECTRONIC SERVICING & TECHNOLOGY will bring you more articles, more pages, more pictures, more graphs and schematics, more magazine for your money.

Every issue of ES&T will contain the very best "nuts-and-bolts" servicing articles coupled with up-to-the-minute material on current electronic technology appealing to the avocational as well as vocational reader. You will find ES&T must reading whether you are a professional technician or an avid hobbyist.

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TECHNICAL TRAINING: The new challenge for industry

Increasing productivity and quality is one of the top priorities of American business. Large gains in efficiency are needed to make U.S. products competitive with those of foreign countries. But to accomplish that goal, the United States needs trained workers to design, build and repair high-technology equipment.

Such workers are in short supply. Douglas Bonham, director, Educational Products for the Heathkit/Zenith Educational Systems Division of the Heath Company, estimates the shortfall at about 1,000,000 people.

To overcome technological obsolescence among existing technicians, and to train new technicians, engineers and programmers, companies and schools are gearing up with technical training programs. Because technology is changing so quickly, technical training is a field that is constantly expanding to keep pace. Because the field is as young as the new technologies it teaches, its size and potential are still to be defined.

The technical training market is estimated at \$1 billion by Michigan-based Heathkit/Zenith, Educational Systems Division, which specializes in electronics, computers and related technologies. However, the overall size of the training market is much larger than \$1 billion, because industrial training encompasses areas such as management, sales, safety as well as technical disciplines.

This information was provided by the Heath Company, Benton Harbor, MI.

Estimates vary widely.

- A 1979 estimate by the American Society for Training and Development puts business and industry spending for training at \$30-\$40 billion.
- The U.S. Office of Personnel, in a 1978 report entitled *Employee Training in the Federal Service*, estimated that \$276 million was spent on federal civilian employee training in fiscal 1978. (This excludes military and postal service training.)
- The National Center for Education Statistics reports that in 1975 about 17 million adults were involved in some type of non-credit education. Of these, 48.7% (or 8.33 million) were doing it for some job-related purpose.

Although industry has always maintained educational programs of various types, the need for technical training has become particularly acute in recent years. In response to this need, the American Society for Training and Development formed a Technical Skills Division in the late 1970s to provide assistance in technical training. The division currently has about 3000 members.

Growth in technical training is being fueled as industries previously unaffected by electronics are "invaded" by new

technology. As the use of microprocessors spreads from computers to toys, games, cars and home appliances, the need for technicians to build and repair electronic equipment also increases. The result is a continuing technological shortfall. The scarcity of technicians limits the capability of industry to improve productivity and to grow.

Educational programs

Companies, schools and individuals are seeking to reduce the shortfall. Many companies offer their own programs to update their technical staffs on new advances and to train new technicians. School curriculums change to keep pace with the new technologies and the needs of adults, young people and industry.

Continuing education

Also, many adults continue their education on their own or by using corporate tuition reimbursement plans. Adult education is the fastest growing phase of education. The College Board has reported that about 20 million adults said they feel they lack competency in new technology—and the Census Bureau has estimated that as many as 40 million people between the ages of 16 and 65 are in career transition.

Four key trends in the technical skills training field have been identified:

- Self-study programs are a cost-effective alternative to tradi-

tional training methods. Paying the travel expenses of workers separated by distance, and the related costs of holding workshops and seminars, are making such meetings prohibitive.

- Students would rather have practical, hands-on training than have to sit and listen to lectures. Self-study programs are also effective learning techniques for adults motivated to continue their education for job-related reasons.
- Subject matter is shifting away from basic mechanical and electrical engineering disciplines to high-technology subjects such as microprocessors, advanced electronics and computers.
- There is a growing demand for customized training programs to meet specific needs. These types of programs are replacing the general theory training of some years ago. This means more corporate training is taking place in-house with internally designed programs or with highly specific courses designed by companies.

American industry's dependence on microprocessors, robotics, computers and related technologies continues to grow—and so does its need to educate the people who will operate the technology.

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Las Vegas plays host to winter CES



- Jan. 7-10, 1982
- Las Vegas, NV
- More than 900 exhibitor reservations

For the fifth consecutive year, Las Vegas will play host to the International Consumer Electronics Show (CES). The Winter Show now equals the Summer CES in size, space and importance to the industry. Hundreds of new products will be introduced. Virtually every exhibitor now uses the Winter Show to present programs and promotions to be used for marketing during the new year.

The Winter CES provides the entire industry, as well as worldwide press, with a unique opportunity to see the most recent technological and product developments and to understand the new directions the industry is taking.

Attendance has grown tremendously over the last four years. Las Vegas is a location that is particularly convenient for the important Western, Southwestern and Northwestern markets. And the climate continues to attract a large number of attendees from the Midwestern and Eastern states.

Both the Winter and Summer Shows are sponsored, produced and managed by the Electronic Industries Association/Consumer Electronics

Group—the national association for consumer electronics manufacturers—which also serves the industry through its government relations, marketing statistics, engineering standards and industry development programs.

Because of the overwhelming size of the show, exhibits will be found at three locations: The Las Vegas Convention Center, the Jockey Club and the Las Vegas Hilton Hotel. (Some earth station satellites will be located outside the Convention Center and the Hilton Hotel.)

The products

Technology in the consumer electronics industry is moving forward at a rapid pace. The Winter CES provides the entire industry with a unique opportunity to evaluate the most recent developments as seen in the hundreds of new and innovative products being brought to market by CES exhibitors. From digital audio to satellite receiving stations, from component TV to interactive videodiscs/computers, the Winter CES will provide attendees with an in-depth understanding of product trends for 1982.

Audio: Components, compacts, portables, tape hardware and software, car audio, radios and accessories.

Video: Televisions, tape/disc systems and software, TV games, personal computers and satellite earth stations.

Personal Electronics: Calculators, watches, telephones and telephone devices, hand-held games, healthcare and security systems.

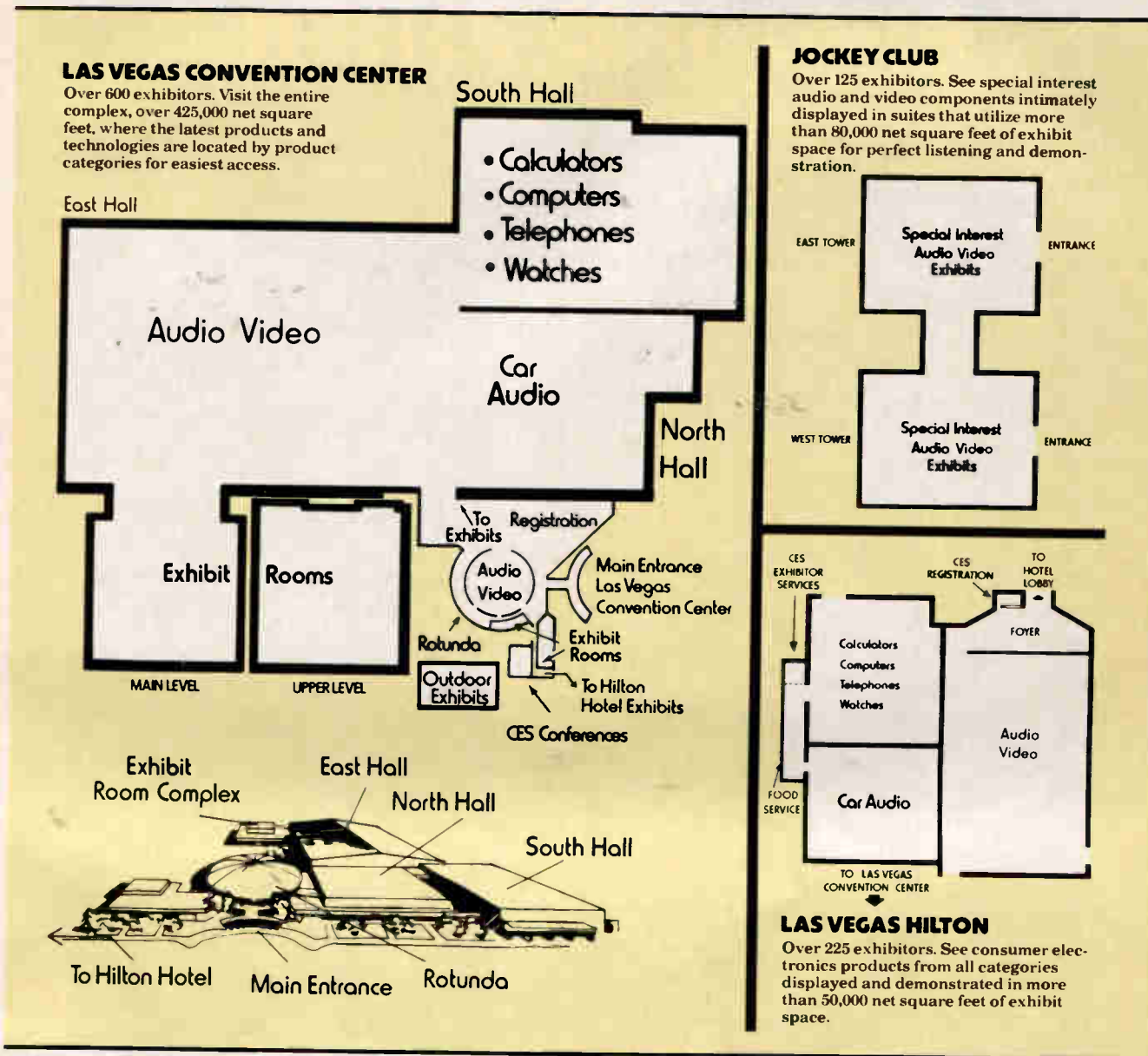
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CES Advertising and Promotion Showcase: This exhibit will be a large collection of advertising, pro-

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Hardware/Software Merchandising Exhibit: This center, sponsored by the EIA, NARM (National Association of Recording Merchandisers), and the RIAA (Recording Industry Association of America) will demonstrate techniques for effectively merchandising consumer electronics hardware along with audio/videodiscs and tapes.

Trade and General Press Exhibits: More than 50 press booths will be located at the entrance of the



motion and merchandising aids for consumer electronics retailers. Awards will be given for outstanding examples in the following categories: radio and TV advertising; print advertising; point-of-purchase materials; and specialty items, consumer premiums and promotional campaigns.

Retail Resource Center: Retailers will have the opportunity to talk with more than 15 national suppliers of retail services, including advertising, financing, computer systems, franchising, direct mail, management consulting, group insurance,

show. Major consumer electronics publications will be distributed in easily accessible bins throughout the show.

Consumer Electronics Trade Association Exhibits: More than 10 associations will have exhibits for the benefit of its members.

International Visitors' Center: The Winter CES is truly an international show that attracts more than 5000 overseas visitors from more than 50 foreign countries. This center will be staffed with bilingual personnel. Overseas visitors may register here and

use the multifaceted informational services provided.

Conferences, workshops, seminars

The Winter Show will feature six, 2-hour sessions devoted to product and marketing developments, retail merchandising, advertising, promotion and management.

CES Conference: Scheduled each morning are conferences presenting keynote speakers and industry executives who will address timely issues vital to this rapidly changing industry. Separate sessions will be devoted to video, audio and personal electronics.

CES Retail Management Seminar: Leaders in the field will present programs on how to increase profitability through better inventory management, expense control and personnel relations.

CES Retail Merchandising Workshop: Experienced professionals will conduct a session on how to build traffic and increase sales through advertising, direct mail, special promotions and effective on-site displays.

For more information, contact: William T. Glascow, Vice President, WCES, Two Illinois Center - Suite 1607, 233 N. Michigan Ave., Chicago, IL 60601; (312) 861-1040.

ES&T

1982 INTERNATIONAL WINTER CONSUMER ELECTRONICS SHOW SCHEDULE OF EVENTS SHOW DATES AND HOURS

THURSDAY, JAN. 7: 10 AM-6 PM

SATURDAY, JAN. 9: 9 AM-6 PM

FRIDAY, JAN. 8: 9 AM-6 PM

SUNDAY, JAN. 10: 9 AM-4 PM

All Conferences and Workshops Gold Room/Convention Center

WINTER CES EXHIBITORS - 1981

THURSDAY, JAN. 7

9-10 AM **CES "OUTLOOK '82" CONFERENCE**
The U.S. Economy and the Role of the Consumer Electronics Industry
An overview presented by an editor of a leading business magazine and a financial analyst.

10 AM-6 PM **CES EXHIBITS OPEN**

FRIDAY, JAN. 8

9-10:30 AM **CES AUDIO CONFERENCE**
Panel I: Home & Personal Audio
Panel II: Car Audio
Each session, with a press moderator, two leading manufacturers, and two leading retailers, will discuss product trends and marketing directions for 1982. Followed by a question-and-answer session.

9 AM-6 PM **CES EXHIBITS OPEN**

2-4 PM **CES RETAIL MANAGEMENT WORKSHOP**
With an industry expert as moderator, retailers discuss in round-table format inventory control, rentals, personnel relations and store economics.

SATURDAY, JAN. 9

9-10:30 AM **CES VIDEO CONFERENCE**
Panel I: TV/Projection TV/Cable
Panel II: Video Systems: VCR, Disc, Cameras, Games
Each session, with a press moderator, two leading manufacturers, and two leading retailers, will discuss product trends and marketing directions for 1982. Followed by a question-and-answer session.

9 AM-6 PM **CES EXHIBITS OPEN**

2-4 PM **CES RETAIL ADVERTISING & PROMOTION WORKSHOP**
With an industry expert as moderator, retailers discuss in round-table format sell-through methods and techniques: execution, costs and relative effectiveness.

SUNDAY, JAN. 10

9-10:30 AM **CES PERSONAL COMPUTER CONFERENCE**
A press moderator, two leading manufacturers, and two leading retailers will discuss product trends and marketing directions for 1982. Followed by a question-and-answer session.

9 AM-4 PM **CES EXHIBITS OPEN**



INTERNATIONAL WINTER CONSUMER ELECTRONICS SHOW EXHIBITORS • 1981

A AAL (American Acoustics Labs).
American Case Co., Inc.
A.A. Wonderland Records Inc.,
Of The Bestway Group
A.B.C. Import & Export Co.
A & B Enterprises
Acculab, (See RTR Industries,
Inc.)
Ace International
Acoustat Corp.
Acoustical Mfg. Co., Ltd.
Acoustic Research, (Teledyne)
Acousti-Phase, Inc.
Activision, Inc.
Adar Import Dist. Co.
ADC (Audio Dynamics Corp.)
ADCOM
Adult Video Corp.
Advanced Packaging, Inc.
Advance Transistor Co.
Advance Watch Co. Ltd.
Advent Corporation
Afco Electronics, Inc.
AFS Kriket
Aimor Corporation
Aiwa America Inc.
Akai America Ltd., Audio
Division

Akai America Ltd., Video
Division
Alaron Inc.
All Channel Products
Allied Plastics, Inc.
Allsop Inc., Fidelity
Accessories
All Star Video Corp.
Alphacom, Inc., Olivetti
Agency - Oem Printers
Alpha-Omega Applied
Electronics, Inc.
Alpine Electronics of America,
Inc.
Altec Lansing International
Amaray Sales Corp.
Amber Electronics, Inc.
Ambico Inc.
Amco Electronics
The Amcor Group, Ltd.
American Audio Components
Inc.

American Audio Corp.,
Auto Mobile Sound Division
American Film: Magazine of the
Film & Television Arts
American International Sound
Products Inc.
American Lighting Specialties,
Inc., A.L.S. Industries, Inc.
Ampex Electronic
Corporation, Hicksville
Division

Ampersand, Div. Ampco
Industries Inc.
Ampex Corp., Magnetic Tape
Div., Consumer Products
Amplification & Recording
(Cambridge) Ltd.
Anglo American Audio Co. Inc.
Anixter, Mark Antenna, Anixter
Bros. Inc.
Anso Photo-Optical Products
Corp.
Answerex, Inc.
Antenna Electronics Company
Antenna Incorporated
The Antenna Specialists Co.,
The Antenna Group, Inc.
Antler Antennas, (See MCM
MFG Co. Inc.)
Apture Ribbon Speaker, Div. of
ACR Industries, Inc.
APF Electronics Inc.
Applied Concepts, Inc.
Apres Audio Ltd.
APS Autovend Packaging
Systems
Apt Corporation
A R A - Motorola, Subsidiary of
Texstar Corp.
A & R Cambridge, (See Arcam
(USA) Inc.)
ARCAM (USA) Inc.
Arista Enterprises Inc.
Ariston Audio Corp.
Armiron Corp.
Armstrong Watch Industries
Arrow Trading Co. Inc.
Arvin Industries Inc., Consumer
Electronics Div.
Asian Sources Electronics,
Wordright Enterprises, Inc.
Aspen Recreational Products,
Ltd.
Astatic Corp.
Astronics Tele-Cine, Astro
Video
AstroVision, Inc.
Atari, Inc. Consumer Div.
Audax
Audible Illusions
Audio Authority Corp.
Audiobahn Electronics, Inc.
Audio Control
Audio Electronic Systems, Inc.
Audio Illusions, Inc.
Audio Interface, Inc.
Audio Magazine CBS
Publications
AudioMagnetics Corp.
AudioMobile Corporation
Audiophile Systems, Ltd.
Audio Protection Plan
AudioQuest
Audio Research Corporation

AudioSource
Audio-Technica U.S. Inc.
Audio Times Autosound &
Communications
Audio Video Digest, Audio
Consultants (SAC)
AudioVideo International
Audiovox Corp.
Aurora Impex Corp.
Autoalert
Automate
Automated Simulations
Auto Page, Inc., A Division of
Iwata Electric Co., Tokyo,
Japan
Autotek Corp.
Autotronics, Inc.
Avanti Communications Inc.,
(see Avanti Research & Dev.)
Avanti Products, Inc.
Avanti Research &
Development Inc.
Avon Electronics
Axiom Engineering
Laboratories

B Ballanda Corporation, Shiva
Time International
Ballanda Electronics, NY
BASF, Audio Video Div.
Beamscope, (see International
Marketing Services, Inc.)
Eric Beare Assoc., Ltd.
Beatty Electronics Inc.
Becker Electronics Mfg Corp.
Bedini Electronics,
Belles Research Corporation,
Audio Components
B.E.L.-Tronics Ltd.
Benjamin Electroproducts, Inc.
Bertagni Electroacoustic
Systems, Inc.
Beta Video, Inc.
Harold Beveridge, Inc.
Beyer Dynamic, Inc.
BIB
B-I-C Avnet
Billboard
Biometrics, Inc.
Bipolar Electronic Systems
Black Acoustics Corporation
Black & White Enterprises, Ltd.
Blaupunkt
Blue Video Co.
BMC USA, Inc.
BML
BML Electronics, Inc.,
Acoustics Div.
Bohse Inc.
Bohman Industries
Bone Fone Corp.
Bontempi Products, (see
Internete USA Inc.)

Boothroyd Stuart Meridian
Borg-Warner Acceptance Co.
Boston Acoustics, Inc.
Bozak Inc.
B. P. Electronics
BPI Audio Test Instruments
Braun, (see ADCOM)
Brinkmann Corp.
Brother International Corp.
Charles Brown & Co., Inc.
Bruce Instruments
Brunswick Corp., Consumer
Div.
BSR (USA) Ltd.
Budget Video, Inc., Hollywood
Home Theatre
Burbank Enterprises, Inc.,
Audio-Safe
Burhoe Acoustics
Buscom Systems, Inc.
Bush Industries Inc.
B & W Loudspeakers

C Cabellero Control Corp.
Cabasse
Cal-Count
Calfax, Inc.
Calrad Imports
Caltex Mfg. & Distr. Co. Inc.
Cal Vista Video
Cambridge Physics
Can-Am Video Supply Co. Ltd.
Canon USA, Calculator Div.
Canton North America
Capital Home Video
Pierre Cardin Electronics
Car Tapes, Inc., Jet Sound
Laboratories
Carter Corporation
H. H. Carver & Associates
Carver Corporation
Case Manufacturing Co.
Casio Inc., Consumer Products
& Timepiece Divs.
CB Magazine
CBS Industries, Complete
Business Services
Celestion Industries, Inc.
Century Distributing, Inc.
Certron, Audio Blank Tape
Cerwin-Vegal
CES Daily News, Hampton
International
Communications, Inc.
Character Phones Inc.
Chelco Sound Inc., Chase
Electronics Corp. Ltd. Hong
Kong
Cheromi, Inc.
Chikuma Corporation, Audio
Division
Cizek Audio Systems Inc.
Clarion Corp. of America

Cleveland Institute of Elec.
Clifford Electronics, Inc.,
Consumer Electronic
Products
Clifford Industries
Clover Ind., Inc.
Cobra Communications Prod.
Group, Div. of Dynascan
Corp.
Coleco Industries Inc.
Colormax Electronic Corp.
Columbia Pictures, Home
Entertainment Div.
Commadore International, Ltd.,
Micro Display Systems, Inc.
The Complete Buyer's Guide to
Stereo Hi-Fi Equipment, Div.
of Service Communications
Ltd.
Comprehensive Video Supply
Corp.
Computer Retailing Magazine
Comradar Corp.
Comus, Inc.
Concept Enterprises Inc.
Concept Video
Concert Hall, Div. Interstate
Industries Inc.
Concord Electronics
Conic Justin Products Inc.
Conrad Johnson Design Inc.
Consolidated Marketing Int'l.
Consumer Electronics
Monthly Consumer
Electronics
Show Daily
Continental Camera
Copal Corp. of America
Coreco Research Corp.
Cosmos Industries, Inc.,
Cosmomatic Division
Cosmo Time Corp.
Counterpoint Electronic
Systems, Inc.
Craig Corporation
Creative Computing
Creative Products, Inc.,
Formerly Takahashi Intl.
Crimestopper Security
Products, Inc.
Criterion Watch Co. Inc.
Crosspoint Instruments, Inc.
Crystal Clear Records Inc.
Curley Cords
Cybernet International, Inc.
Cygnus Computer Portrait
Systems
Cynex Mfg. Corp.

D Dahlquist, Inc.
Bill Daniels Co.
Data Display Systems, Div. of
Decora Industries
Davis Brothers Audio, Inc.
Daytron Electronics, Div. of
Daewoo Intl. (America),
Corp.
dbx, Inc.
DCM Corporation
Dealerscope, Inc.
Dealer Service Center, Inc.
Decoro Products Inc.
Dejay Corporation
Delphi Speaker Systems, Inc.
Delta Impex Watch Corp.
Dempa Publications, Inc.
Dennesen Electrostatic, Inc.
Denon America, Inc.
Design Acoustics Corp.
The Dictograph Mfg. Corp.
Dimension
The Discount Merchandiser
Dishwasher Group of
Companies
Walt Disney Home Video
Displays Unlimited Inc.
D & M Watch
Dong Won Electronics Co., Ltd.,
(See Sherwood)
Dorchester Electronics, Div. of
Apollo Electronics
E.I. du Pont de Nemours & Co.
D'Vincci Watch Co. Int., D'Vincci
Corp.

Dymarc Industries, Inc.
Dynamic Instrument Corp.
Dynosound, Div. of Data
Packaging
Dynavector Systems U.S.A.,
Inc.
E East Asia Publishing Co.
East Coast Enterprises, Inc.
Economic World Magazine
Edelex Electronic Corp. Ltd.
Ego Systems Loudspeaker
Elcom Memory Products (USA)
Corp.
Electra Co., Div. of Masco Corp.
of Indiana
Electric & Electronic Industries
Electro Brand, Inc.
Electro-Harmonix, Inc.
Electrolert, Inc., Fuzzbuster
Electronic Readout Systems

Electro Research Corporation,
Sales
Electro-Voice Inc.
Elram Corporation
Emerson Radio Corp.
Empire Machines & Systems
Inc.
Empire Scientific Corp.
Energy Loudspeaker Corp.
Enterprex International Corp.
Entex Industries, Inc.,
Games Toys
Eon Research & Development
Corp.
Equity Industries Corp.
ESS Inc.
Ettesac Inc., Ettesac Covers
Cassettes
Eumig (USA), Inc.
The European Consumer
Electronics Show
Evolution
Excelsior International Corp.
EXR Corporation

F FADA Industries, Inc.
Fannon Courier Corporation
Federal Transistor Co., Inc.
Feedback Ltd.
F & F Sales Co.
Fidelity Electronics Ltd.,
Microprocessor Div.
Fidelity Research of America,
Div. of Audel, Inc.
Fideltone Consumer Products,
Division of Recoton Corp.
"Firestik" Antenna Company,
PAL International Corp.
First Alert by Pittway
Fisher Corp.
Ford Industries, Inc.
Foremost Furniture, Sauder
Woodworking Co.
Fortune Star Prod. Corp.
Fournier Accessory Furniture
Inc.
Fracom Rovafone International
Franzuso Co., Inc.
Freeway Video Enterprises
Fuji Photo Film USA Inc.,
Magnetic Tape Div.
Fujitsu Ten Corp. of America

G Games Magazine, Playboy
Enterprises, Inc.
GBC CCTV Corp., Consumer
Products Div.
GC Electronics, Wallace Murray
Gemini Industries, Inc., Div.
Antenna
Gemini Sounds, Inc.
Gem Sound Corp.
General Electric, Housewares &
Audio Business
General Electric Co., Battery
Department
General Electric Credit Corp.
General Sound
Genesis Physics Corp.
The Otto Gerda Co., Electronic
Furniture Div.
Gift-Lux-Nortel Mfg. Co.,
Execu-Lux Ltd.
GIMIX, Inc.
Goldring (USA), Ltd.
Gold Star Elec. Intl., Inc.
Gould Inc., Portable Battery Div.
Grafyxo Audio Products, Inc.
Granada Electronics Inc.
Gran Prix Electronics, (Dick
Proctor imports)
Greenwood Forest Products,
Mariani Audio Furniture
Gruen Electronics Sound Tech
Systems
Grundig-L.A.S. East
Grundig-L.A.S. West
GTE Subscriber Equipment
Group, Consumer Sales
GTR Products
Guardian Electronics, Inc.
Gul Industries
Gusdorf Corporation

H The David Halfer Co.
Hagerstown Leather Goods Co.,
Tempo Cases
Hanabashiya Ltd., Bon Sonic
Hanimex (USA), Inc.,
Electronics Div.
Hannover Products
Harada Industry of America
Harman Kardon Inc.
Hartzell Custom Products, Div.
of Hartzell Manufacturing
Haskamp & Co. Ltd.
Hatzlachh Supply, Inc.
Heppner Sound
Herald Electronics
Herdeg & McFarlin, Inc.
Hervic Electronics, Inc.
Hewlett-Packard
HFD-Fairchild Publications
H & H International
High Fidelity Magazine
Hitachi Sales Corp. of America
HK Potak

Home Video Magazine, (United
Business Publications)
Hong Kong Trade Development
Council
Hong Kong Trader
Horian Engineering Inc.,
Calibron
House of Games, Inc.
Hustler, Inc.
Hy-Gain, Telex
Communications, Inc.
Hyundai Corporation (U.S.A.),
Consumer Electronics

I IBS Publications Ltd., IBS
Promotion Center (HK)
I. C. Instruments Ltd.
Image Computer Products, Inc.
Imaginamics Inc.
Imperial Camera Corp.
Independent Dealer Services,
Inc.
Infinity Systems, Inc.
Inkel Corp., (see Sherwood)
Innovative Concepts, Inc.
Inter-Cassette (USA) Inc.
Intercontinental Security
Systems, American
Intercontinental Trade
Group, Inc.
Interface Age Magazine
International Components
Corp., Distributor Products
Division
International Dictating
Equipment, Inc.
International Marketing
Services, Inc.
International Quartz Ltd.
International Radio-TV
Exposition 1981 Berlin, AMK
Berlin
Internete USA Inc.
Inter-Trade Publishing Co. Ltd.
Ion Systems, Inc.
Irish Magnetic Recording Tape,
Div. Morhan Natl. Sales Co.,
Inc.
Itera Ltd.
ITT Personal Communications

J JAMO Hi Fi USA, Inc., USA
Division
Japan CBM Corporation
Jasco Products Co., Inc.
Jazy Electronics, Inc.
Jensen Sound Laboratories
J & R Enterprises
JR Loudspeakers
JSR Electronics
JTS Research, Inc.
Jupiter Time Corp., Temlex
Industries, Inc.
JVC (US JVC Corp.)

K Kapco
Karl Video Co.
Katone Corp.
KEF Electronics Ltd., c/o
Intratec
Kent International Marketing,
Inc.
Kenwood Electronics, Inc.
Keytronics, Inc.
Kindel Audio
King of Video, Inc.
K & K Merchandise Group, Inc.
Klipsch & Associates, Inc.
KM Laboratories, Inc.
Kosmos International (U.S.A.),
Inc.
Koss Corporation
Kraco Enterprises Inc.
Krell Industries
Kribtron, Inc.
Kustom Auto Sound Simulator
Kustom Kreations Inc.
KVA Electronics

L Lake Communications Inc.
Lambda Electronics Ltd.
Lambda Tele-Equipment Ltd.
Lance Industries
Landia, Inc.
James B. Lansing Sound, Inc.,
Communications
Lasonic Electronics Corp.
The Last Factory, Gamma
Omega Associates, Inc.
Le-Bo Products Co. Inc.
Leisurecraft Products Ltd.
Leisure Time Development
Assoc.
Leisure Time Electronics
Magazine
Lenoxx Electronics Corp.
Lewis Lektronix Inc.
Libin & Associates
Linear Power, Inc.
Linn Products, Ltd., U.S. Sales
Div.
Lloyd's Electronics Corp.
Lockwell Industries Ltd.
Logical Systems, A Div. of
Metalogic Industries
LSR & D. Leach
Lucerne Time
The Lumiscope Company, Inc.
Luxury International, Inc.

M Madison Watch Co., Inc.
Magnadyne Corporation
Magnavox Consumer
Electronics Co.
Magnetic Video Corp.,
Consumer Prod. Div.
Magtone Electronics, Inc.
Majestic Electronics, Inc.
Marantz
Marcel Watch Corp.
Marcof Electronics
Marketex International, Inc.
Marsand Industries Inc.
Marshall Electronics
Marshall Electronics Inc.
Mart Magazine
Mason Camera & Electronics
Corp.
Matrecs Electronics Inc.
Mattel, Mattel Electronics Div.
Maxell Corp. of America,
Consumer Products Div.
Maxell Corp. of America,
Special Products Div.
Maxi Guard Corp. of America
MCA Videocassette, Inc.,
Non-Theatrical Sales
MCM Mfg. Co., Inc., Antler
Antennas
Media Home Entertainment Inc.
Megasonics Ltd.
Megatron Corporation, Mega
Tech
Mego Corp.
Memorex Corporation,
Consumer Products Group
Mercedes Communications Inc.
Merchandising A Gralla
Publication
Merchants Corp. of America,
Consumer Electronics
Mercury International Sales
Group, Sales Division
Mercury Time, (see Leisurecraft
Products Ltd.)
Mesa Electronics Sales Ltd.
Metra Electronics Corp.
Metron, (see Gerwin-Vega)
Metropolitan Tele-Tronic Corp.
Metro Sound
MFSL, (see Mobile Fidelity
Sound Labs)
M & G Electronics
MGM CBS Home Video, CBS
Video Enterprises
Micro-Acoustics Corp.
Microma, Inc.
Micronics International Inc.,
Commercial Products Div.
Micro Seiki
Microsonic Corp. Gruen
Mid America Plastics
Midland International Corp.
Midwest Tropical Enterprises,
Inc.
Miller & Kreisler Sound Corp.,
(Realtime Records Division)
Mini-Amp Corporation
Mission Electronics North
American Corporation
Mitsubishi Electric Sales
America, Inc.
M & M Electronics
Mobile Audio Development
Corp.
Mobile Fidelity Sound Lab
Model Rectifier Corporation
Modern Recording & Music
Monarch Electronics Co.
Monitor Crystal Service, Stam
Comm & Armstrong
Keith Monks (Audio) Ltd.
Monster Cable Company
Mordaunt-Short, Inc., Div.
Mordaunt-Short Ltd.
Morse Electro Products Corp.,
Morse-Electroponic Div.
Motorola, Inc., Div.
Piezo-Ceramic Products
MTI (Micro-Tech, Inc.)
MTI, Inc., Audio
Multi-Remote Manufacturing,
Inc., Electronic Div.
Mura Corporation
Music Retailer
Mustang Electronics Inc.,
Ambassador Imports-Silkco
Radio Corp. of Amer.
MXR Innovations, Consumer
Products Group

N Nagatronics Corp.
Naim Audio, Ltd., U.S. Sales Div.
NARDA Insurance, SHG
Associates, Inc.
National Lampoon
National Semiconductor Corp.,
Consumer Products Div.
The National Video
Clearinghouse, Inc.
Nautilus Recordings Orion
Marketing
NEC America, Inc.
Neikin Piper International
Paul Nelson Industries, Inc.
Nemarc Inc.
Ness Imports, Inc.
Network Marketing, Inc. Arkay
Trading, Inc.

New England Videoworks
 Nichco, Inc.
 Nikko Audio
 Nomadic Furniture
 Non-Parell Industries
 Norelco-Consumer Products.
 Microwave Division
 Northern Techn. Inc.
 Advanced Telephone
 Products Div.
 North Star Electronics, Inc.
 North Supply-Phoneworks.
 Communications
 Nortronics Co., Inc., Recorder
 Care Div.
 The Nostalgia Merchant
 Nova Electro Acoustics
 Novag Industries Ltd.
 Novag Industries Ltd.,
 California Intermarket
 Center Ltd., U.S. Representative
 Numark Electronics Corp.

O Oaktron Ind., Inc.
 Walter Odemer Co., Inc.
 Off Duty Magazine
 OHM Acoustics Corp.
 Olivetti Corporation
 Olympia U.S.A., Consumer
 Products
 OMNI
 Omnisonix, Ltd.
 One-Up, Inc.
 Onkyo U.S.A. Corp.
 Onyx Telecommunications Ltd.
 Opal Ltd.
 Optonica
 Orion Electric Co., Ltd.
 Orion Publishing
 Orovox Sound, Inc., Electronics
 Osawa & Co., (U.S.A.) Inc.
 O'Sullivan Industries Inc.
 Otron-Olympos Electronic Co.,
 Ltd., N.Y. Branch

P Pacific Accessory Corp., PAC
 Page Alert Systems, Inc.
 Paisley Research Limited
 Panasonic Company.
 Consumer Electronics
 Group
 Panasonic Company, Auto
 Products Division
 Panorama Magazine, Triangle
 Communications, Inc.
 Panoramic 2000
 Paramount Pictures Corp.,
 Paramount Home Video
 Pathcom Inc.
 Paul Nelson Industries, Inc.
 Peerless Vid-Tronic Corp.
 Penthouse Intl.
 Permo International, Div. of
 Fidelitone, Inc.
 Petroff Labs
 Petrous Electronics Corp., Div.
 Petrous Industries Inc.
 Pfanstiehl
 Phone-Mate Inc.
 Phonies, Inc.
 Pickwick International,
 Manufacturing Div.
 Pioneer Electronics of America
 Plasmatronics, Inc., Home
 Speakers Div., Amplifiers
 Division
 Plasti Plex Corp.
 Platter Matter Inc.
 Playboy Magazine
 Podame Intl. (HK) Ltd.
 Polaroid Corp., Commercial
 Battery Division
 Polk Audio
 Polydax Speaker Corp., Audax
 Popular Electronics, Div.
 Ziff-Davis Publishing Co.
 Port-A-Tune, Action
 Leathercraft, Inc.
 Powerlight Studio
 PPS
 Precisa Products (USA) Ltd.
 Precision Fidelity Electronics
 Pre-Pak Records & Tapes
 Prime Microelectronic
 Instruments, Inc.
 Printed Circuits International
 Professional Systems
 Engineering Inc
 Protone Industries
 Pulaski Furniture Corp.
 Pusher Products, Inc., Storage
 Module and Accessories Div.
 Pyle Industries, Inc.
 Pyramid Industries. (See Mobile
 Audio Development Corp.)

Q QED Questar Electronic Design
 Quasar Co., Matsushita Electric
 Corp. of America
 Quasar Microsystems Inc.

R The Rack Factory
 Radatron
 Radio-Electronics Magazine
 Radofin Electronics (USA) Ltd.

R AMCO
 Randix Industries, Ltd.
 Rank Hi Fi Inc.
 RCA, Consumer Electronics
 Rebel Electronics, Inc.
 Record A Call, (T.A.D. Avanti
 Inc.)
 Recolon Corporation
 Red Acoustics London, U.K.
 Red Fox Enterprises
 Reference Recordings
 Regency Electronics Inc.
 Remeo Products Corp., Wire &
 Cable Div.
 Resource Support, Inc.
 Reynolds Advance
 Rhoades National Corp.
 RKO Tape Corp.
 RM Films Intl., Inc.
 RMS Electronics, Inc., VCR Div.
 Road Sounds
 Roadstar Corp. of America
 Robins Industries Corp.
 Rockford-Fosgate
 Roller Phone
 Rolling Stone Magazine
 ROTEL of America Inc.
 Rover Enterprises Co., Inc.
 Royal Business Machines, Inc.,
 Consumer Products
 Royal Creations, Inc.
 RTR Industries Inc.
 Russound FMP, Inc.

S Sabor Corporation
 SAEC
 Sampo Corp. of America
 Samsung Electronics America
 Inc.
 Sanshu (America) Incorporated
 Sansui Electronics Corp.
 Sanyo Electric, Inc., Consumer
 Electronics Div.
 Sanyo Electric, Inc., Appliance
 & Consumer Calcs &
 Watches
 Satelco, Division of
 Thunder-Compute
 Savoy Leather Mfg. Corp., Sales
 Saxton Products Inc. (OTC)
 Scisys Electronics, Inc.
 SCM Corporation,
 (Smith-Corona) Consumer
 Products
 H. H. Scott Inc.
 Seal-O-Matic Dispenser Corp.
 Seas Fabrikker A.S.
 SEC Electronics Co., Ltd.
 Selecta Tape, Div. Pre-recorded
 Video Cassettes
 Select Essex Video
 Service Manufacturing Co. Inc.
 Seville Electronics Corp.
 Shahinian Acoustics Ltd.
 Shakespeare Co. EFD.,
 Electronics & Fiberglass
 Shape, Inc., Consumer
 Products Div.
 Shape West Norpac Marketing,
 Inc.

Sharp Electronics Corp.,
 Consumer Electronics
 Div. Consumer Calculator
 Div.
 Sharp Intl. Corp.
 Sheffield Lab. Inc.
 Sherwood, Div. of Inkel Corp.
 Showtime Video Ventures
 Shure Brothers Inc.
 S.I.A.R.E. Corporation
 Sight & Sound Marketing
 Sigma Products Inc.
 Signet
 Silver-Reed America
 Sinclair Research, Ltd.
 S & K Enterprises Inc.
 Smokey Patrol Mfg. Co.,
 (Aerospace Div. of Rebel
 Electronics)
 Snell Acoustics
 Solar Electronics of Tennessee
 Solarex Corporation
 Solar Textiles Co.
 Sonic International Corporation
 Sonic Research, Inc.
 Sonrise Audio Systems
 Sony Corporation of America,
 Various Divisions
 SOTA Industries
 Sound Arts Merchandising
 Journal
 Sound Concepts Inc.
 Sound Connections Intl., Inc.
 Soundcraftsmen, Inc.
 Sound Dynamics Corporation
 Soundesign Corp.
 Sound Guard Corporation
 Sound Lab, Inc.
 Sound-Mate, Inc.
 The Sound of O
 Sound Research, Inc.
 Sound Solutions Inc.
 Sound Suspenders, Inc.
 Sound Technology Inc.
 Soundtrac Electronic Furniture,
 Inc.

Southern California
 Retailer TAAD
 Sparkomatic Corp.
 Spartus Corp., (Subs. Walter
 Kiddle)
 Speaker Uppers, Home
 Entertainment Acc.
 SPECO, Components
 Specialties Inc.
 Spectral Audio
 Spectro Acoustics Inc.
 Spectron Electronics, Inc.
 Speed-O-Matic, Radar Division
 Spica
 SRW Computer Components
 Co., Audio Division
 "STAK-IT", by Visual Displays
 Standard Communications
 Corp.
 STAX Kogyo, Inc., Electrostatic
 Products
 STD (USA) Inc., (Strathclyde
 Transcription
 Developments)
 Stephens-Byers Corporation
 Steremote, Inc.
 Stereo Review
 St. Regis Publication
 Studer Revox America, Inc.
 Studio 44, Inc., Electronics Div.
 Sumiko Inc.
 Sumo Electric Company Ltd.
 Sun Coast Mdse. Corp.
 Sundial International
 Enterprises Ltd.
 Sunny International USA, Sales
 & Marketing Div.
 Superex Electronics Corp.
 Superphone Corp.
 Superscope Tele-Story
 Sutton Import-Export Corp.
 Swire Intermagnetics
 Sybex, Inc.
 Symmetry Audiophile Systems
 Corporation, (see RTR
 Industries, Inc.)
 SYS Industries of America, Inc.

T Tab Book, Inc.
 Taihan (America) Corp.
 Talbot Toys Ltd.
 Tamon International, Inc.,
 Tamon Auto Sound, Inc.
 Tancredi Div Kologel Co., Ltd.
 Tandberg of America, Inc.
 Tasco
 Tatung Co. of America Inc.,
 Marketing Div.
 TDK Electronics Corp.
 Technics
 Technidyne Corp.
 TEI Electronic Products
 Telcel Telephone USA Inc
 Telco Products Corp.
 Tele-Com, Inc.
 Teleconcepts
 Tele-Devices Corporation
 Telephone Extension Corp.
 Telephonics Communications,
 Inc.
 Teletone Co. Inc.
 Tele-Total, Incorporated
 Telex Communications, Inc.,
 (See Hy-Gain & Turner
 Divisions)
 Tel Products Inc.
 Telsec Corp.
 Termbay Electronics, (see
 Talbot Toys, Ltd.)
 Tetrad Company
 Texas Instruments
 Incorporated, Consumer
 Electronic Products
 Thiel Audio Products Co.
 Third Wave Communications
 Corp.
 Thomas Radio Corporation
 Thomson CSF Comp. Corp.,
 Power Supply Division
 3D Acoustics, Inc.
 3M Company, Magnetic
 Audio Video Prod. Div.
 Threshold Corp.
 Thunderfoot Engineering
 Tiger Electronic Toys, Inc.
 Timbercraft Mill & Cabinet, Inc.
 Timco (H.K.) Ltd., OEM
 Time Electronics
 Timely Products Corp.
 Time Pen International, Inc.
 Topp Electronics, Juliette:
 Ken-Tech Audio
 Topper Artistic, Products LTD
 Toshiba America, Inc.,
 Appliance & Consumer Elec.
 Div.
 Toshiba America, Inc., Business
 Equipment Div.
 Total Video Supply Co., TVS
 Trans Audio Marketing,
 ORACLE
 Transcriber Co. Inc.
 Tryom Inc.
 T T Systems Corp
 Turner, Telex Communications,
 Inc.
 TVX Distributors

U Ultimate Sound, Div. of R & C
 Chiu International Inc.
 Ultragroove Records
 Ultralinear Loudspeakers, Div.
 of Solar Audio Prod. Inc.
 Unarco-Rohn, UNR Industries,
 Inc.
 Unical Enterprises, Inc.
 Union Carbide Corp., Battery
 Products Div.
 Unisef Enterprises, Inc.
 Unisonic Products Corp.
 United Audio Products Inc.
 United Electronics Intl. Inc.
 United Technologies
 Automotive G.P., Div. Essex
 Speaker Systems
 United Video Buyers Assoc.,
 Consumer Products Div.
 Unitronex Corporation,
 Consumer Products Div.
 Universal Controls Corp.
 Universal Security Instruments
 Inc.
 U.S. Games Corporation
 U.S. JVC Corporation. (see JVC)
 U.S. Tron, Inc.

V Vanco-Chicago Inc.
 Vandersteen Audio
 Vanity Fair Industries Inc.,
 "Melville" Electronics
 Division
 The Variable Speech Control
 Co.
 VARTA Batteries Inc.
 VC II
 VCX, Incorporated
 Vehicle Security Electronics,
 Inc.
 Velbon International Corp.
 Veritas Electronics Corp.
 Victor Cabinet
 Vidair Electronics Mfg. Corp.
 VidAmerica, Inc. A Division of
 Video Corporation of
 America
 Video Action Magazine
 Video Communications Inc.,
 (VCI)
 Video Components Inc.
 Video Distributors
 Video Gems
 Video Magazine
 Video Marketing Newsletter
 The Videophile
 Videoplay Magazine Video
 Trade News
 Video Product News, Steve
 Tolin Enterprises, Inc.
 Video Review Video Business
 Video Specialties, Div. of Bauer
 Electronics, Inc.
 Video Store Magazine
 Videotape Products, Inc.
 Video X
 Video-X-Pix
 Vidicraft, Inc.
 Viking Electronics, Inc.
 Visioneering Productions Inc.
 Visonik of America Inc.
 Visual Effects, Inc.
 VMPS Audio Products Co.,
 Itone Audio Div.
 Votrax Div., Federal Screw
 Works
 VTS Enterprises, Inc.

W Walco-Linck Corporation
 Edward A. Waldman Co., Inc.,
 Fewa Watch Co.
 Wald Sound Inc.
 Warner Home Video Inc.
 Weatherair
 Webcor Electronics, (see
 Leisurcraft Products Ltd.)
 Weber Electronics,
 Loudspeaker
 Webster Watch Company, Inc.
 Welback Enterprises Ltd.
 Westclox U.S., Tally Industries
 Westinghouse Credit Corp.
 We've Got Your Number
 Whistler Div., Controlonics
 Corp.
 Wider International Corp.
 Wildcat Electronics, Interstate
 Industries, Inc.
 Windert Watch Co.
 Windsor Industries Inc
 Winegard Company
 Winn-Tenna Inc
 Wonderful World of Video
 Wood Specialty Products Inc.

X Xaxis Transducer Co (XTC)
 Xemus Corporation

Y Yorx Electronics Corp.
 YSL Records

Z Zeff Advanced Products
 Company (ZAPCO), Audio
 Div.
 ZOOM Telephonics
 ZTI Ltd.

Approximately 600 persons attended the 1981 NESDA/ISCET/FESA National Electronics Service Convention August 3-8 at Innisbrook resort in Tarpon Springs, FL.

The attendance reflects the renewed growth of ISCET, whose paid membership is up 20% over 1980, and of NESDA, whose membership has increased by 18% in the past year.

Some outstanding features of the convention were satellite TV information, comparisons of the videodisc technologies, a CATV seminar, the electronics instructors conference, the business education session, numerous technical learning opportunities and the trade show.

NESDA association actions

The NESDA House of Representatives met. Motions passed included:

- the concept of multicategory of state association affiliation (A through F) and varying privileges based on the number and/or percentages of state and/or NESDA members was ratified.
- NESDA would further explore the feasibility of providing timely new product service information and technical service tips to members via computer.
- Ways would be explored of requiring off-shore manufacturers to print legible and permanent model numbers and the U.S. address of parts and service information suppliers on the back of all electronics products.
- Manufacturers would be encouraged to provide needed parts kits for new products to authorized warranty stations on consignment or at the manufacturers' cost with full return privileges.
- The January 1982 House of Representatives meeting will be held in conjunction with the Winter Consumer Electronics Show in Las Vegas.

ISCET association actions

A major action of ISCET was to approve a totally rewritten set of bylaws that provides division status for the technicians' group equal to the service dealers' division. A 7-person Board of Directors was created to consist of four elected officers, the immediate past chairman and the NESDA president and executive director or their designates.

The bylaws clarify that "full and final authority resides with the society membership...(which) may

duced; a newly revised Associate Level exam and a new Radar Option test will be available to Certification Administrators before January; and the development has begun on another option: Digital Electronics.

Elections

Elections for officers of the three groups were held during the convention. For NESDA, Bill Abernathy of Fort Worth, TX, was elected president. George Bluze,

NESDA convention report

By W.S. (Bob) Harris

approve or disapprove actions of the ISCET Board of Governors." They further clarify that "NESDA shall not interfere in the affairs of ISCET except...by joint meetings of the ISCET governors and NESDA executive committee...to discuss mutual interests or possible cross purposes." Discussions and reports reflected completed or projected accomplishments in the following areas:

- Preparation of a projected CET study course to be shown on nationwide educational television.
- An imminent agreement with another international technical branch trade association to have ISCET provide the certification program for their technicians.
- A newly revised Medical Electronics Option has been intro-

duced; a newly revised Associate Level exam and a new Radar Option test will be available to Certification Administrators before January; and the development has begun on another option: Digital Electronics.

Officers for ISCET include Chairman, Frank Grabiec, CET, Phoenix, AZ; Vice Chairman, Ralph Pollmiller, CET, Jacksonville, NC; Secretary, Jim Parks, CET, Orlando, FL; and Treasurer, John Krier, CET, Wichita, KS.

New officers for FESA are President, Anita Parks, Orlando, FL; First Vice President, Ed Guary, Ft. Lauderdale, FL; Second Vice President, George Bluze, CSM, Largo, FL; Secretary, Hamilton Boyd, Ft. Lauderdale, FL; and Treasurer, Bud Fox, St. Petersburg, FL.

Seminars

During the business and per-

sonal education seminars, Dr. Robert Lindberg from the University of Texas at San Antonio presented *You, Too, Can be a 10*. A mini-seminar was presented by C. J. Rucker on preparing for the certified service manager test.

The electronics instructors conference was divided into four sessions. In session one, Gordon Burgess, CET, from Northern Maine Vocational Technical Institute, explained the theory of microprocessors, their use in modern electronics equipment and how to instruct students in servicing procedures.

During the second session, Joe Sloop, CET, from EIA, presented a hands-on seminar of TV symptom diagnosis from the block diagram approach.

The third session was a roundtable discussion on topics such as the need for more industry support, finding the best teaching methods and future conference programs. The fourth session, led by Bud Izen, CET/CSM from Davis, CA, involved discussing and approving a comprehensive written proposal for apprenticeship standards.

The seminar, *A Comparison of Four Videodisc Systems* was presented by Bebe F. McClain. She compared the systems on the market: capacitance/contact stylus; grooved (CED) and grooveless (VHD); optical/non-contact video laser player (VLP); reflective, a consumer-oriented system; and transmissive, an industrial oriented system.

CATV panel

A panel composed of servicers and association leaders that have been involved in interfacing with CATV, and engineers involved in the cable TV industry, discussed the mutual effects of the CATV technology.

It was stressed that most CATV companies have no interest in consumer product sales or service business, and that most want to work with the dealers. A general conclusion was that because there

are no enforceable national standards, the best defense against abuses of ethical competitiveness by maverick cable companies is a vigilant local association. Local business people and association leaders, it was agreed, must exercise their influence to persuade local politicians to protect their best interests.

Technical education

Among the technical education opportunities, J.A. Sam Wilson, CET, held a seminar on the use of wideband oscilloscopes, followed by a hands-on seminar on the use of the scopes in servicing. Wilson also presented a seminar on the use of microprocessors and memories in consumer electronics products. Bud Izen, CET/CSM, presented *Requirements for Successful Audio Servicing*, and Joe Wetherbee of General Electric offered technical service information on the VHD videodisc units.

In addition to the seminars, training tapes were also available for checkout.

Dealer/manufacture communications

A small group of dealers and manufacturers met for a private discussion on industry affairs. Reports of the discussions during each session were made and recorded but were not for publication or public viewing.

Included in the sessions were representatives from General Electric, N.A.P. Electronics (Philips, Magnavox and Sylvania), Panasonic, RCA, Sharp, Sony, Toshiba, U.S. Pioneer, Yamaha and Zenith.

National Service Conference

Six sessions held simultaneously were available, each set up in a different room. They were: the Manufacturer/Dealer Discussions, CSM study, a business licensing and regulation session, a discussion on using a computer in the service business, one on servicing microcomputers, and another led by Bob Harrison, *ServiceShop* and

T-E-A Times editor, on improving state and local association communications media.

Trade show

The NESDA/ISCET trade show, exclusively for the electronics service industry, featured the latest in high technology products used in sales and service. Attending were 22 companies offering products or services.

Awards

NESDA presented several awards during the show. George Bluze was named Officer of the Year for 1980/81, and C. J. Rucker, head of NESDA's management education committee, was named Committee Chairman of the Year.

ISCET awarded the Technician of the Year to Larry Broschart, CET, Portland, OR. The runner-up was John Krier, CET, Wichita, KS.

The Outstanding State Association President went to Bob Masa, CSM, president of the Ohio Electronics Service Dealers Association. Everett Pershing was awarded Outstanding Local Association President.

Named as the Outstanding State Association Publication was *The Transformer*, published by the Electronics Technicians Association of Georgia. The *TESA News* of St. Louis was named as Outstanding Local Association Publication.

Hall of Fame

The late Dr. Ernst F. W. Alexanderson, a prolific inventor with General Electric, was inducted into the Inventors' Division of the Electronics Hall of Fame. Alexanderson developed a receiver and demonstrated the first home and public TV reception in 1928 and 1930, respectively. At the time of his death in 1975, Alexanderson had amassed 315 patents, an average of one every seven weeks during his tenure with GE.

ES&T inc.

Test equipment update

By Jim Smith, Sencore

Digital is rapidly becoming the byword in the consumer, industrial, medical and communications fields. The microprocessor is controlling more circuits now than ever before with clock frequencies running as high as 10 and 12MHz. There are more ICs and fewer transistors, and many ICs are being combined into one larger IC through large scale integration, reducing the number of circuit components in many products.

The consumer is purchasing more TV receivers and sales of videotape recorders have doubled in just the past year. Electronics are also included in washing machines, microwave ovens and furnace controls. Even automobiles are using microprocessors to control engineering functions where manual controls were used in the past.

Test instruments will be changing to meet this new technology. Oscilloscopes will require greater bandpass and be simpler to use. Meters will have more functions, such as True and Average RMS ac voltage measuring functions. With the expanding video market, more servicing will be done with complete analyzers to meet the need for faster and more accurate service.

Technicians will have to use functional analyzing to divide and conquer troubles faster and keep up with the consumer demands. Industrial technicians will be required to make repairs quickly to keep production going, as downtime is costly. They will be looking for easy to use, but accurate instruments to give quick answers.

Component testers such as capacitor and inductor analyzers and transistor testers will still be needed. These instruments will become more important with the increased use of ICs. Signal tracing or signal injection can take a technician down to a stage, but he will also have to know if the components in that state are good or are causing the problem.

The trends in electronic test instruments have already started to

meet the demands of servicing digital and microprocessor circuits. There are complete analyzers for video systems, including TV, VCR and CATV. These analyzers provide the signals for injection into all stages of these systems, and are phased locked so the technician will know for sure where the problem lies. These analyzers are rapidly replacing those without the phase-locked signals, because they are not complete and do not provide the signals needed in IC circuits.

Signature analyzers

There are some specialized analyzers called signature analyzers. These are designed for complex, computer-type circuits. This analyzer can only be used to evaluate products designed to be tested with a signature analyzer. This is limited to special equipment in industrial applications. This technique will not be filtering down to the consumer products or basic controls systems for quite some time because of cost limitations.

There will be little change in analyzers for AM/FM stereo and audio products at this time. The delay in AM stereo means that the present equipment, which is generally up-to-date, will provide the technicians with what they need. Those shops that are not doing AM/FM stereo servicing should consider this market because it is rapidly expanding; the service is there for those who are ready. Present analyzers will provide these shops with the equipment they need for several years, and help them profit in this lucrative market.

Transistor tester

What about individual component testers? They will be around for some time, despite the need for circuit analyzers. The analyzer will enable the technician to get down to the circuit, but he will need the component tester to locate the defect in the unit.

A good example is the transistor tester. Despite the increased use

of ICs, there will be many transistors found in the circuits of today and tomorrow. Not only will the technicians need a transistor tester that will check in-the-circuit, the tester will also have to measure leakage out of circuit to be sure the transistor is good or bad.

Capacitors

Another area is capacitors. As the number of ICs has increased, so has the number of capacitors in the circuit. The capacitor, due to its size, cannot be included in the IC and therefore has to be added externally. Capacity change is not the most important factor in a defective capacitor. The technician will need a capacitor analyzer that not only measures the capacity, but can check leakage and other factors that could upset the circuit operation.

Digital meter

The digital meter will be changing. Some meters have already changed to meet the needs of modern circuits, while others will soon be following. Some of the important needs in a meter will include higher input impedance. Many op amp circuits are being loaded, even by the 10M Ω input of some of the digital meters. Special probes have been developed as additions for some meters to increase this loading factor to 150M Ω to make accurate measurements in these circuits. This high input impedance also prevents the meter from upsetting the operating of the circuit and providing misleading results.

Another function that will be closely looked at this coming year is the availability of True RMS ac voltage measurements on a meter. In some areas, such as industrial heating elements, scan-derived CRT filaments, or switching power supplies, True RMS will be an important measurement. In other areas, the voltages taken must match those taken previously with an Average RMS responding meter. Many technicians will find that they need both measure-

ments. One meter, the Sencore DVM56, already has both of these ac measurement functions.

Oscilloscopes

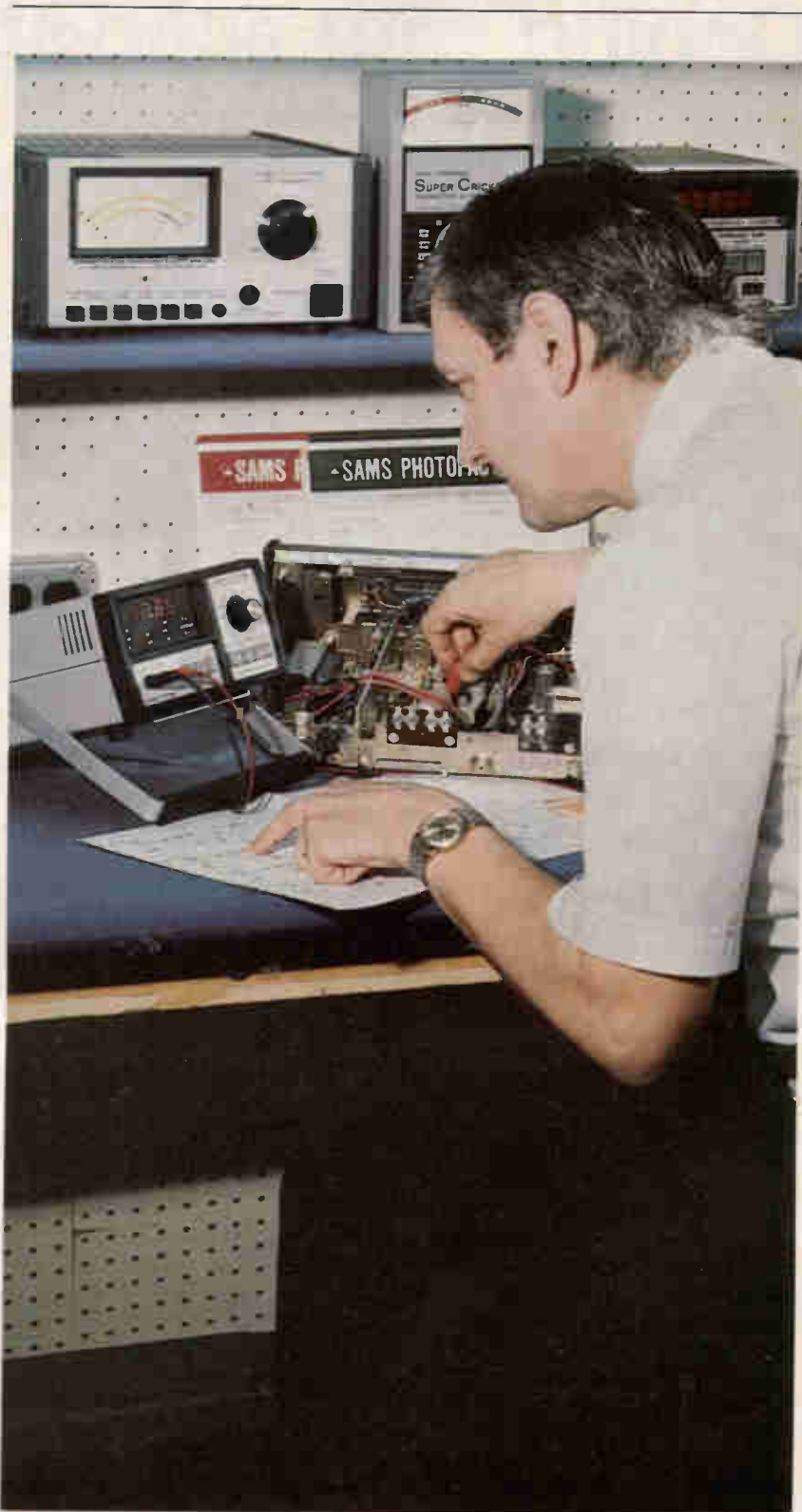
Oscilloscopes will still be one of the important service tools to the technician in digital and microprocessor circuits. The specifications of the service scope are rapidly changing due to these digital and microprocessor circuits. One area is in the bandpass response. Clock frequencies for the microprocessor are now up to 10MHz and may go as high as 12MHz. In order to see the square wave, the scope must respond to the fifth harmonic of the fundamental, or 5 times 12MHz equals 60MHz.

Not only have the bandpass requirements changed, but the usability of the scope as well. Scopes will have to be simple and easier to use as well as being more accurate to provide faster and easier service. With the present technician shortage, the scope used in the shop will have to be easy to explain and use by even an inexperienced technician to make his service profitable.

The manufacturers of the equipment being serviced will provide some training, but it will be up to the test equipment manufacturers to assist by providing back-up training with the equipment. This has proven to be an invaluable assistance to the technician, regardless of his field of electronics.

Test equipment will be changing, but will still require the technician to become familiar with the product and the equipment he is using to service it. No amount of written words in a service manual will provide the invaluable experience of hands-on training or the occasional assistance of a field engineer in the operation of the equipment. It is up to the technician to see that he not only gets the most up-to-date equipment, but the hands-on training and operation assistance for the equipment as well.

ES&T



A technician uses Sencore's DVM56 Microranger to test an AM/FM stereo receiver.

Coping with solid-state shorts

By Walter P. Weaver

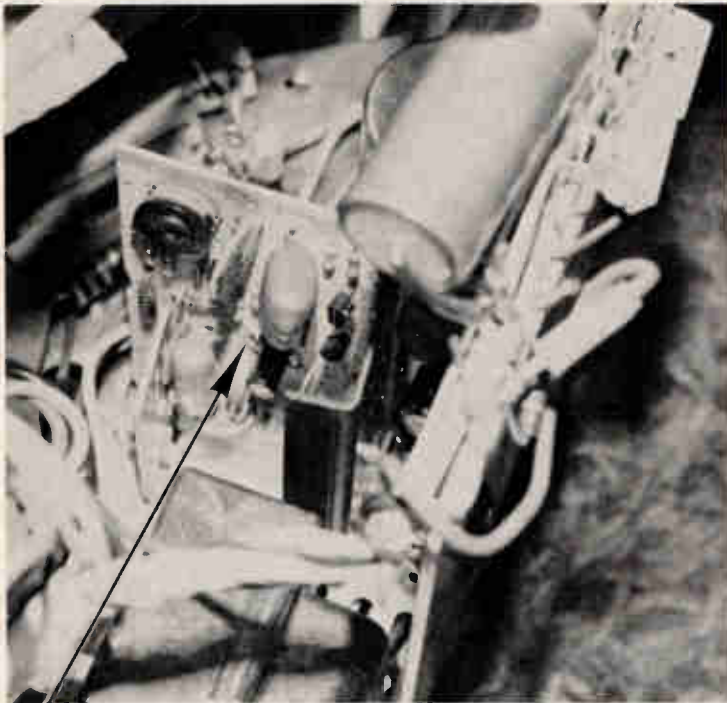


Figure 1 An arrow points to the power-supply module in a 5CS62 Philco color TV.

Shorts in solid-state color TV receivers bring additional problems from chain-reaction damages and difficulties in finding the original defect. These suggestions provide practical test methods.

One of the more common and serious headaches of all TV technicians is a fuse-blowing short, especially in solid-state-equipped chassis. In tube-operated models, a fuse that blows within the first second or two definitely indicates a power-supply defect, because the tubes had not yet become operative.

Tubes also allow a moderate amount of time (about one minute) to make voltage tests before a serious overload could endanger the tubes. These overloads usually

continue until the tube plate glows red before permanent damage is likely.

Solid-state components do not allow the small luxury of even less than a second of overloaded operation before permanent destruction occurs. Transistors and diodes often blow before a fast-acting fuse can remove the supply voltage. Therefore, power-on tests of solid-state televisions must differ radically from those that were effective with tube-type televisions.

Basic suspects

Most serious overloads originate either in the power supply or the horizontal-sweep and high-voltage circuits. Some problems involve both, because many of the newer solid-state receivers regulate the HV and width by regulating the B+ voltage applied to the collector of the horizontal-output transistor. A defect in either area can cause damage and blow fuses.

There are other possibilities, however, and these call for a more

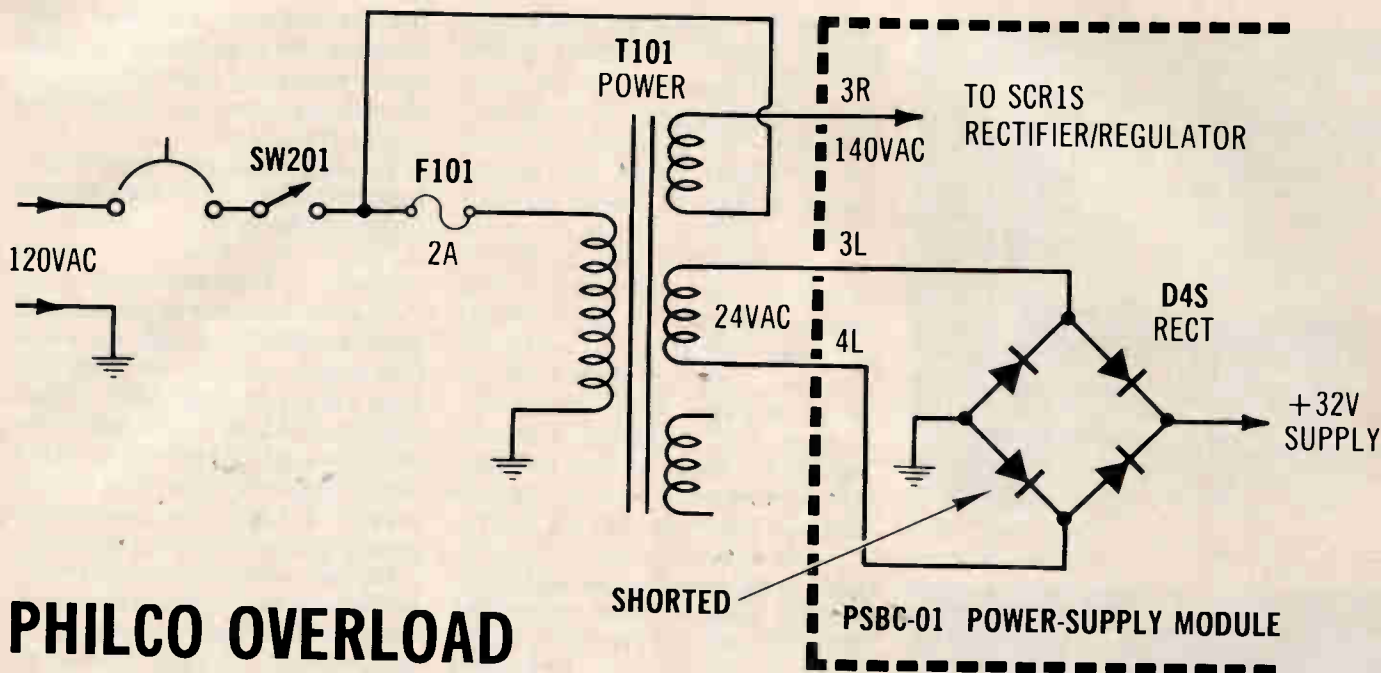


Figure 2 In the Philco model 5CS62, a shorted diode in the +32V supply overloaded the power transformer and blew the F101 fuse.

PHILCO OVERLOAD

methodical approach to solving the problem.

Exchange a module

The old rule of isolating the overload should be used in all these cases. Perhaps the power supply is contained largely on a single module that can be exchanged (if one is available). Problems arise for technicians who service many brands and cannot stock *all* modules used in *all* models. Therefore, a technician often is forced to repair circuits and replace discrete components on modules that are designed for easy exchange.

Isolate

In many cases, the problem must be isolated to a specific circuit or module area. First, locate the power supply and isolate it. A fuse is often used in the B+ line. Remove the fuse and apply line power while monitoring the positive voltage at the fuse's supply end. Remember that the voltage should be higher without

the normal heavy load.

If the *line* fuse blows (or the line circuit breaker trips), the overload is in the power supply, and not its load. Next, check the transformer ac voltage at the input of the rectifier section of the power supply. When the line fuse or breaker does not activate and the ac voltage appears to be normal, the defect might be a shorted rectifier, filter capacitor or B+ regular transistor (or SCR, in some models).

These isolation tests should prove which circuit has the overload, and resistance tests should be sufficient to locate the defective component.

A lamp fuse

An old technique that often provides time for tests (without ruining fuses or additional components) is to remove the B+ fuse and connect a 100W light bulb across the fuse terminals. Excessive current causes the bulb to light brightly, but the wattage is not sufficient to blow the bulb. At

the same time, the bulb resistance limits the maximum current that can flow (even with a dead short) and also reduces the voltage supplied to the B+ regulator and the horizontal-output transistor. Another advantage is the visible brightness of the bulb, which indicates the relative current. This test is particularly effective when the overload is intermittent.

Operation with a normal chassis usually produces a dim glow in the bulb and symptoms of low voltage, such as reduced HV and a small picture. Do not remove the bulb or plug in the fuse until it is certain that the overload has been repaired.

After the power supply has been repaired or found to be normal, the next suspect is the horizontal-sweep system.

Horizontal-sweep tests

Prime suspects in the horizontal-sweep system are the output transistor, the damper diode and the retrace-tuning capacitors that

Solid-state shorts

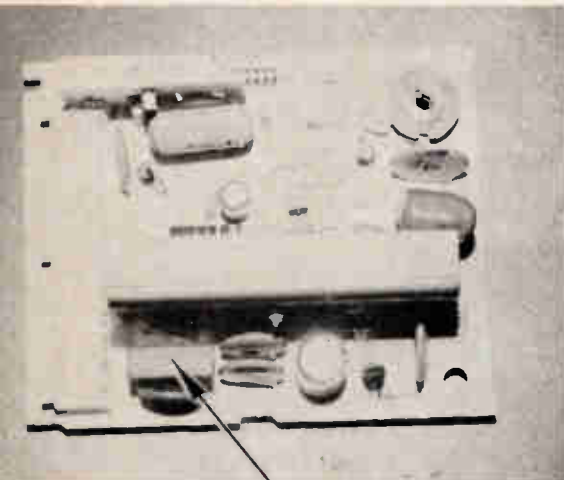


Figure 3 The +32V diode bridge is in one unit, shown by the arrow, on the Philco module.

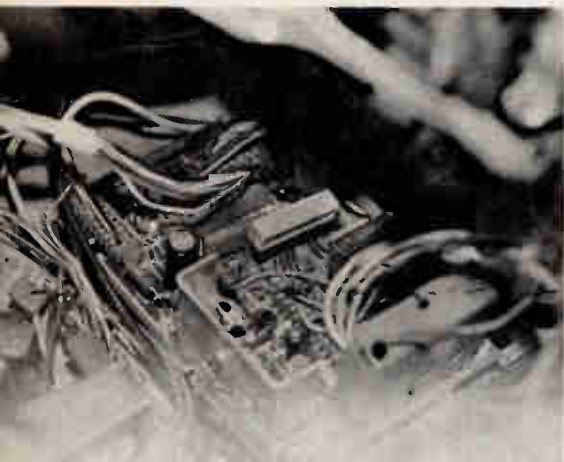


Figure 4 The power-supply module in the 19YC General Electric chassis is shown here.

parallel the damper. If one of these components is found to be shorted, carefully check the others before applying power again. Remember that an open in a retrace-tuning capacitor can increase the high voltage to 40kV or 50kV. This can ruin the picture tube, the output transistor or other sweep components.

Horizontal-output transistors are too expensive to use as fuses, so be certain the overload is repaired before removing the light bulb and restoring full power.

Beyond these general tips, each technician must use training,

memory of past problems, extemporaneous tests, imagination and intuition on the problem, because past this point the tests vary greatly according to the model and brand. Disconnect everything that does not kill the basic operation, such as convergence plugs, pin-cushion boards and plugs, vertical yoke windings and some flyback leads. If any of these disconnected circuits eliminates the overload, then that circuit must be checked carefully.

Try any practical test to narrow the area of suspicion, but first analyze to make certain that the

test cannot damage other components. Few problems produce more depression than the zapping of an expensive, newly installed output transistor.

The following case histories illustrate variations of this general testing procedure.

Case one

When power was applied to one Philco 5CS62 color receiver (Photofact 1487-3), the F101 B+ fuse immediately blew. This chassis obviously was designed for easy removal of the many modules, which is good if you have a large supply of Philco modules; otherwise, you must *repair* a module.

In this chassis, B+ for the horizontal-output transistor is interlocked through the yoke plug, so removing the plug disconnects any shorts there from the power supply. When the yoke plug was removed, the short still remained, proving the overload was not in the horizontal-sweep circuit.

Next, the power-supply module (Figure 1) was removed. A quick test at module pin 3R (Figure 2) showed sufficient ac voltage coming from T101 power transformer. Also, the fuse did not blow, indicating the short was somewhere on the power-supply module.

An SCR (SCR1S) is used as a pulse-width rectifier. A multivibrator oscillator varies the conduction time of the SCR each cycle to accomplish voltage regulation of the +124V supply to the output transistor. Most SCR defects are either open or shorted, so an ohmmeter can provide a fast test. With the positive ohmmeter lead on the anode, the negative lead at the cathode and nothing connected to the gate, the resistance should be open (infinite). A low resistance indicates an anode/cathode short. If the reading is infinite, then connect a wire between gate and anode without disturbing the connections to anode and cathode. The ohmmeter reading should change to a low resistance, showing that the SCR has been gated

into conduction. Caution: Use a VOM or the high-power mode of a digital multimeter. Low-voltage ohmmeters cannot trigger an SCR.

In this case, the SCR apparently was not defective. Next, I looked for other rectifiers, finding one bridge unit with four internal diodes (Figure 3). Not knowing the physical wiring connections, I found one that was grounded and another that supplied the +32V supply. Therefore, the other two were for ac from the power transformer. One of those ac terminals measured almost zero ohms to ground.

Evidently, one of the four diodes (Figure 2) was shorted. Replacement of the bridge eliminated the overload and brought back normal operation.

Case two

On another day, a General Electric 19YC (Photofact 1560-1) also exhibited an instant fuse-blowing problem. This chassis has a power-supply module with many plug connections (Figure 4). When the plug to flyback and horizontal-output transistor was disconnected, voltage of the +147V supply measured approximately +165V (about right for a lighter load), and the short was gone. Thus, the overload was proved to be in the horizontal-output or sweep stages.

I checked the output transistor and damper diode for shorts, but found none. Next, I removed the fuse and connected a 100-W incandescent light bulb across the fuse-holder terminals. The bulb lit brightly each time power was applied, indicating a serious overload.

I began to disconnect all possible leads to pincushion and convergence circuits but there was no improvement; the bulb glowed brightly each time. Finally, disconnection of the 2-pin plug that brought vertical-output signal to the vertical yoke windings and the convergence circuit increased the high voltage and provided a single

horizontal line across the picture tube's center. This line showed some waves at the left edge.

With the brightness turned down to prevent CRT burns, I scoped the signal output of the vertical sweep, finding a square wave of about 30VPP. Such a waveform and amplitude is expected when the yoke is disconnected from the vertical output. The short was gone, but it was not on the vertical module.

A search of the schematic confirmed a suspicion. Both ends of the horizontal yoke windings (Figure 5) are connected to the +147V supply, while the vertical-output voltage is usually about a volt or two on either side of zero. With the vertical plug disconnected, the vertical yoke winding measured +147V to ground. There could be no doubt; a short inside the yoke was connecting vertical and horizontal windings together.

Although this model has an in-line-guns picture tube, the yoke can be removed. I inspected the terminal connections and the plug for solder splatters or burned paths and looked for arc paths in the winding areas. No problems were found, so eventually a new yoke was installed, providing normal operation.

In retrospect, the reason became clear why the horizontal line had waves at the left side when the vertical was disconnected. The short unbalanced the two magnetic fields produced by the horizontal windings. Any imbalance (such as the wrong size of capacitor across one winding in the old tube yokes) produces ripples in the horizontal traces at the raster's left edge.

Toroidally wound yokes do not fail very often, but other technicians have reported a higher-than-usual failure rate of yokes in this specific model.

Case three

An Admiral 4MC10 (Photofact 1522-1) developed a series of problems. The first symptom was a

pulsating picture, with the raster collapsing and then expanding to full size about once a second. In these models, a pulsating raster indicates operation of the shut-down circuit. Any increase of the high voltage (perhaps because of excessive supply voltage) allows a raster to be seen for less than a second before the safety circuit kills the horizontal drive, thus eliminating the raster. This action continues, making the pulsating raster.

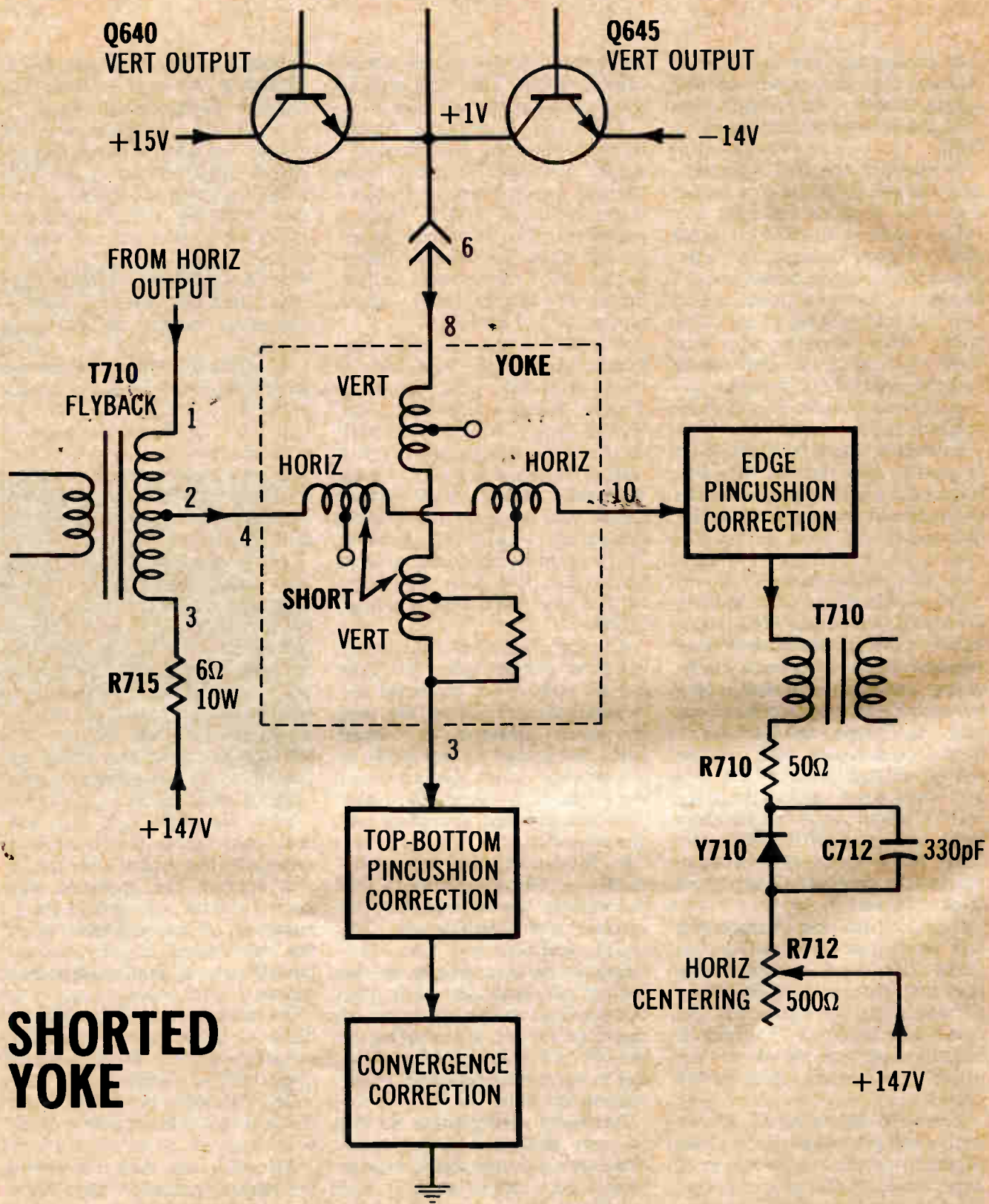
A series of voltage measurements followed by resistance tests in the power supply quickly proved that the Q900 regulator-driver transistor was shorted. After Q900 was replaced and the receiver operated on heat test for several hours, the television was returned to the customer.

A few days later the television was brought back to the shop, sounding similar to a loud motorboat when operated until a blown fuse silenced the noise. While the fuse was open, the incoming supply voltage showed no variations or signs of overload. The power supply evidently was not the problem this time, but the defect appeared to be somewhere in the main chassis.

Next, the 100W light bulb was connected across the fuse-holder terminals. For a time after power was applied, the operation was normal and the bulb glowed dimly. However, at unpredictable times the bulb flashed brightly, accompanied by a machine-gun-like sound.

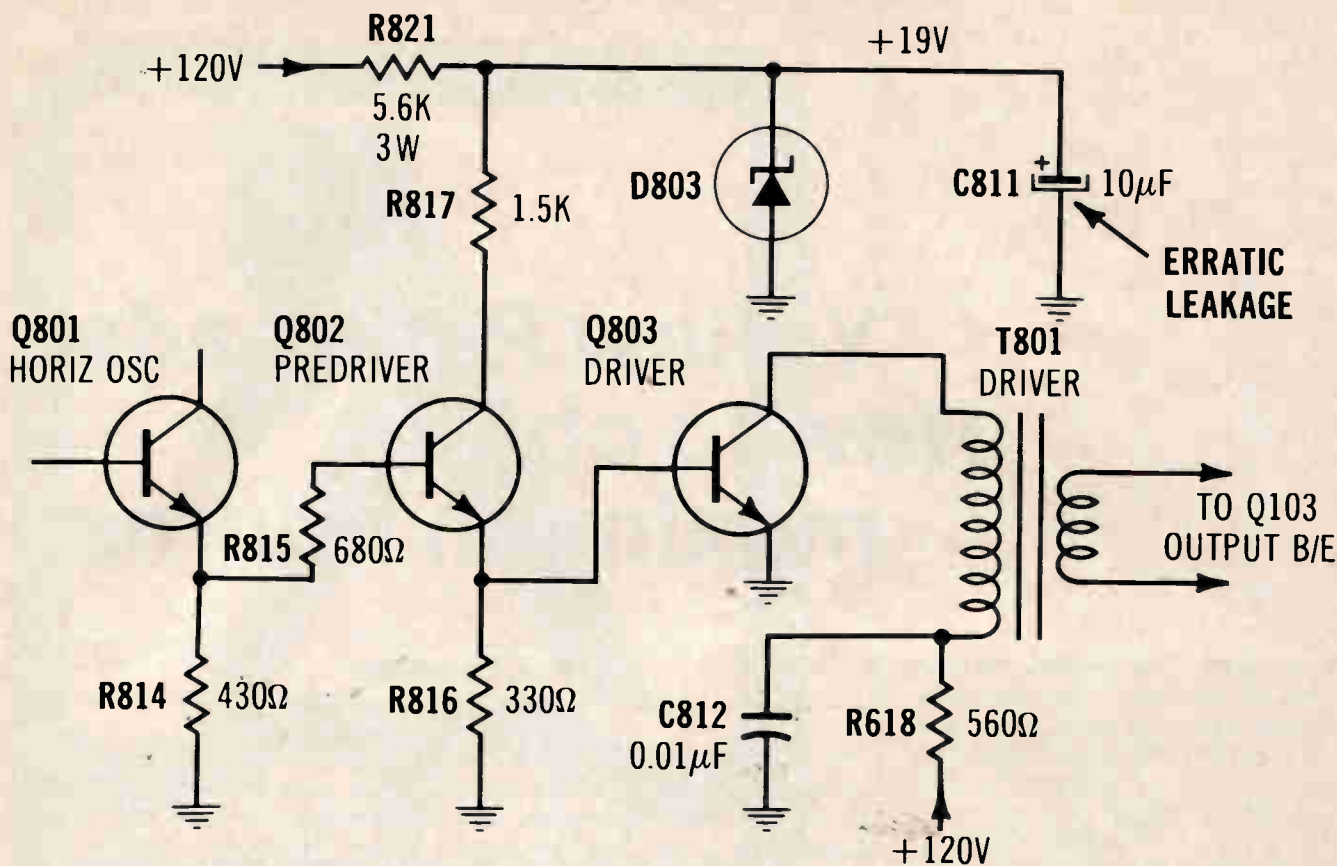
Preliminary tests of the flyback, damper diode and horizontal-output transistor found nothing questionable. Neither did the +120V supply vary enough to indicate that it was the source of the problem.

Attention was then directed to the output-transistor base drive signal. The Q103 base signal became a jumble when the noise occurred, which directed suspicion to the oscillator and driver circuits on the M700-M800 module. Five transistors and the zener-



SHORTED YOKE

Figure 5 A short between vertical and horizontal yoke windings in the 19YC GE shorted together the +147V, +15V and -14V supplies through conduction of the vertical-output transistors.



ADMIRAL ERRATIC SHORT

Figure 6 Intermittent leakage of C811 in an Admiral 4MC10 chassis produced a loud motorboat-like sound and caused fuse F900 to blow after a few seconds of operation.

regulated +20V internal supply are powered by the same +120V source that is applied to the horizontal-output collector.

Several components were tested under load by temporary replacement. When C811 (Figure 6) was replaced, the intermittent problem was solved. Apparently, C811 had been shorting erratically, although the zener-feeding resistor (R821) prevented any massive overload of the +120V source. However, the erratic drive of the output transistor probably produced excessive Q103 current, which ruined the regulator transistor before the previous repair.

Summary

There are two major recommendations for finding overload or intermittent problems in the horizontal-sweep and flyback circuitry:

- Limit the current or reduce the voltage to the horizontal-output transistor. In many cases, this will buy additional time for tests without instant destruction of the horizontal-output transistor. A 100-W light bulb (Figure 7) that is used to replace a fuse reduces both the voltage and the maximum possible current to the horizontal-output transistor. Alternately, a variable line-voltage transformer can be used to reduce the main supply voltage. Remove as many loads from the flyback and the various dcV supplies as is possible in the specific model (without ruining any components or eliminating vital functions). If disconnection of one load removes the overload, the defect is probably in that circuit.

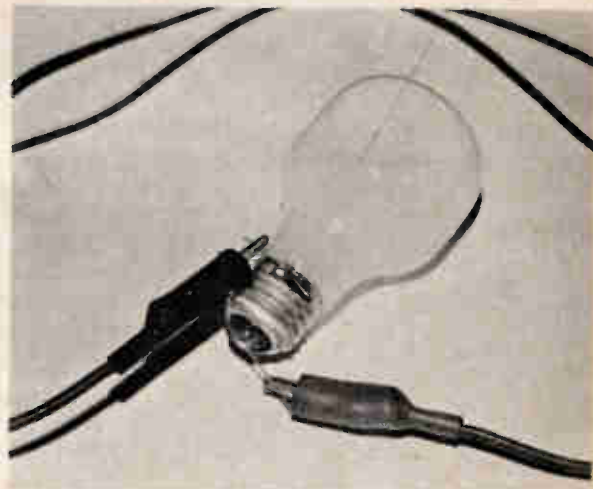


Figure 7 The 100W light bulb can be wired with a socket and wires with alligator clips on one end, or clip leads can be attached to wires that are soldered to the bulb contacts, as shown.

ES&T

Yellow Pages ads: How to obtain maximum returns

By Angela Phillips

Most managers and owners of electronic-service businesses know from their past experiences that display ads in the Bell Telephone Yellow Pages are effective in reaching paying customers. This conclusion is verified by a recent independent study made by Chilton Research Services. The study reveals that adult Americans refer to the Yellow Pages about 47 million times per year. And in 91% of the cases, a phone call or a visit to the shop followed.

Customers use these Yellow Pages ads in several different ways. Some check the addresses of companies performing the desired repairs, perhaps to locate a company in the immediate area. Another potential customer might be interested in a specialist for a certain brand. A third might want a home service call made in the early evening.

Therefore, the ad's composition becomes important. All essential information must be presented, of course, but it is also imperative that the layout not be cluttered. The desired information must be easy to locate.

Although there is no magic formula for writing successful copy for ads, several effective guidelines have been developed over the years. Essentially, these guidelines answer the five questions of *who*, *what*, *where*, *when* and *why*.

Who?

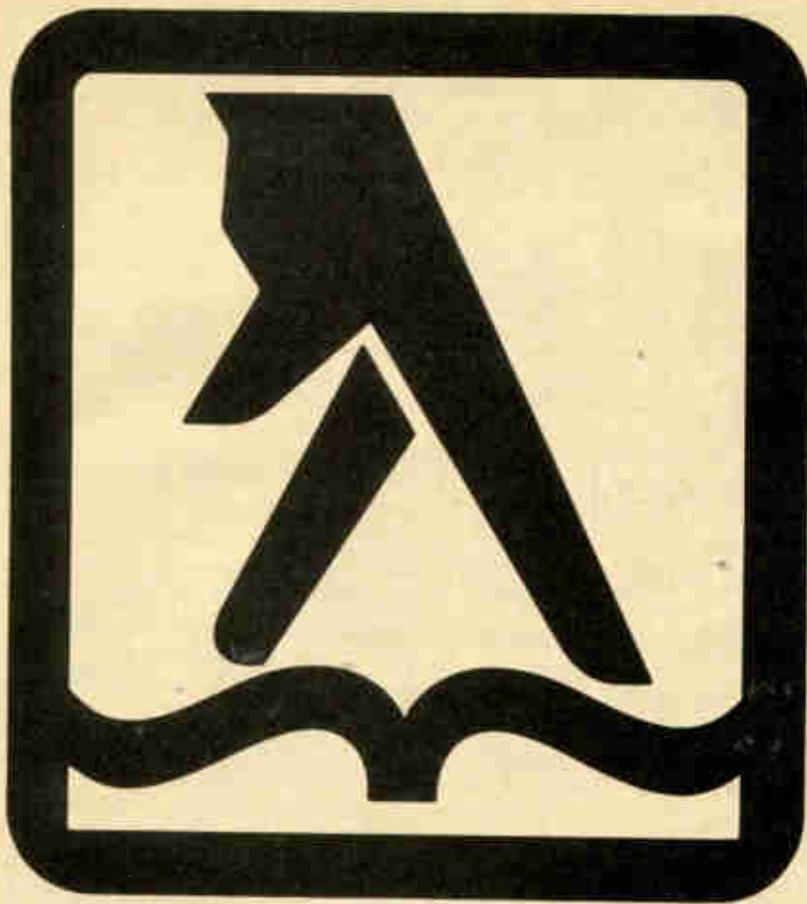
The advertiser of a service business is shown by the company name. Although a logical choice for a headline would be the company name, it is not wise to feature that name unless (1) the name describes the type of services offered (such as Jones TV Service), (2) it is officially allied with a nationally known brand (RCA, Zenith, GE, etc), or (3) the shop is well-known from extensive advertising in local media.

Otherwise, use an attention-getting headline to spotlight the important features, while placing the company name and phone number in a less crucial area. Your store's slogan, logo or emblem also should be included, because these often help a person associate the business through previous advertisements, or they might refresh the memory of a business name temporarily forgotten.

What?

Facts about what type of service your business offers should be shown clearly. If there is a specialty, list it first, then add other products and brands that are accepted for repairs.

Some manufacturers of products listed in your ad might share cooperative advertising funds. Make inquiries to the distributor. In all cases, however, ask permission before listing any brand names.



All major services and conveniences should be included in the ad. Some examples are shown by the following list:

- servicing and adjustments of TV receivers, radios, stereo equipment, audiotape decks, video-cassette recorders or video-disc players, CB radios and small appliances;
- installation of CB or TV antennas, auto tape decks or stereo radios;
- availability of loaners or rental merchandise;
- sales of used machines;
- same-day or evening service;
- walk-in and in-home service;
- pickup and delivery charges;
- types of estimates, and the cost if any.

Where and when?

Many of the people who read the ad will drive to your store, rather than call by phone. So it is important that the ad state clearly the exact location plus the days and hours the business is open. Additional location suggestions can include a shopping center or mall, a nearby highway, landmark or intersection. Even more helpful is a

small map showing the store's location. Just remember to keep the map simple and easy to read, especially when the final printing size is small.

If your business has moved or additional stores have opened in neighboring areas, be sure to include this information in the Yellow Pages ad. It will be helpful to both old and new customers.

Don't forget to list the business hours, for often the hours determine whether a potential customer calls for service or not. Many are attracted by Sunday hours or an offer of evening home service calls.

Why?

Why should a potential customer call your shop, rather than one of the many competitors? An attractive ad with important facts presented in an uncluttered format is a good beginning, but you should think of other incentives.

The Chilton Study reported that in 56% of the cases, the people referring to Yellow Page ads for entertainment-product technicians had no specific shop in mind. Therefore, it is important that

your ad features any unique services you offer. These unique services could motivate many people to select your service over those of other advertisers.

For example, any of the following could be listed:

- manufacturer-authorized warranty service;
- radio-dispatched vehicles;
- maintenance service contracts;
- service on all makes and models;
- 1-hour or while-you-wait service;
- senior-citizen discounts;
- ample and/or free parking; and
- acceptance of all (or specific) credit cards.

Another legitimate attraction is establishing that the shop has a professional, successful or long-time operation. If the technicians are factory-trained, certified, bonded or FCC-licensed; or if the shop or technicians belong to one of the industry trade associations, these facts should be included. Also, if the business has been in operation for many years, the ad might state, "Serving (name of town) since (year)."

How?

After the ad copy has been carefully evaluated for completeness, examine a mock-up for visual appeal. Does the design stand out from others; to leap out from the page? After reduction to the final ad size, is the ad cluttered with excessive information? Or is a drawing or map difficult to discern, because it is too complex or too small? These must be corrected.

SERVA-SET

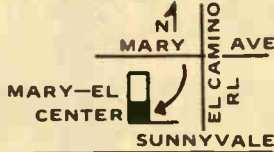
ELECTRONICS
26 YEARS IN SERVICE

- SERVICE IS OUR ONLY BUSINESS -
TELEVISION

SERVICE and REPAIR

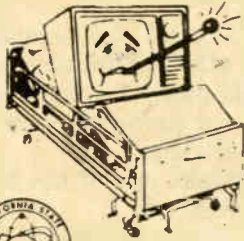
SPECIALIZING IN:

RCA Quasar
SYLVANIA - Zenith
Magnavox SPECIALISTS



CARRY IN & SAVE AT OUR MODERN SERVICE CENTER

SERVA-SET



Hours Mon. - Fri. 9 - 5:30
Saturday By Appointment

ANTENNA
INSTALLATION
MASTER SYSTEMS
APTS - HOMES

We Honor Major Credit Cards

HOME SERVICE DISPATCHER

245-5000

OR

S.J. 293-6192

984 W EL CAMINO REAL
AT MARY AVE. SUNNYVALE

Use of the company name as a headline is recommended if it is well-known. In this case, the name is in a stylized logo, which adds to the recognizability. Ordinarily, a company name should not be a headline.

Yellow Pages ads

An attractive and effective ad can be created by consultations between you and the Bell System Yellow Pages representative. Concise and uncluttered copy in a readable typeface can result from this planning.

After the ad is created, a decision must be made about its location in the Yellow Pages. This might call for placing an ad in more than one section. Probably the primary category should be "Television and Radio-Service and Repair," but about 14 other headings are available. Of course, the largest ad should be under the heading that is likely to attract the largest number of customers.

Ads are available in several sizes: larger display ads with or without artwork; business cards (small ads alphabetically arranged); bold type listings to make the business name stand out; and extra lines that allow space for more information.

Another possibility is advertising in neighboring-area directories. If other areas do not offer some of your shop's specialties, customers from there will often travel extra distances, thus broadening your market area. This is especially true with the booming auto-sound business and carry-in TV service.

Your business can benefit if sufficient attention is given to obtaining the best possible Yellow Pages ads.

ES&T

WESTGATE

TV - STEREO SERVICE CENTERS

- TELEVISION
- STEREO/HI-FI'S
- TAPE DECKS

- VIDEO TAPE RECORDERS
- MICRO-WAVE OVENS

- WE SERVICE ALL MAKES -

FACTORY AUTHORIZED SERVICE

FAST, EFFICIENT SERVICE BY QUALIFIED, CERTIFIED ELECTRONICS TECHNICIANS.
NORMAL 2 DAY SERVICE. ALL BRANDS SERVICED OUT OF WARRANTY.

SOUTH SAN JOSE:	
• 422 W. CAPITOL EXP.	281-8220
EAST SAN JOSE:	
• 841 HAMILTON AVE.	281-8223
WEST SAN JOSE:	
• 841 HAMILTON AVE. <small>Campbell (Near San Tomas Expy.)</small>	379-7670

SERVICE CALLS COUNTY WIDE

SAVE FREE SHOP ESTIMATES

Be sure to list all product types serviced by your shop, in addition to any specialized brands.

WE WILL FIX ANY BRAND

SERVING THE AREA SINCE 1950



SALES & SERVICE
TELEVISIONS • STEREO'S • HI-FI'S
ANTENNA SALES - SERVICE - INSTALLATION

tv center inc.
481-6969

244 BROWNSVILLE RD.
(5 MINUTES FROM LIBERTY TUBES)



A catchy headline draws attention to your ad, especially if it spotlights a potentially valuable feature for the customer.

SONY

AUTHORIZED SERVICE CENTER
• RADIO • T.V. • HI-FI
• VIDEO TAPE RECORDERS
SONY IS OUR ONLY BUSINESS

TRANSVISION

SERVICE CORP.

BOSTON
1026 Commonwealth Ave. **566-4323**

MANCHESTER
8 South River Rd.
Bedford, N.H. **603 623-5514**

Listing the brands serviced can be helpful. However, obtain permission from the manufacturer before using any company logo.

WASHINGTON TV & AUDIO

SALES & SERVICE CENTER

SONY

WE REPAIR ALL MAKES & MODELS
BRING YOUR PORTABLE TV OR AUDIO EQUIPMENT
TO OUR SHOP AND GET A:
FREE ESTIMATE-FAST SERVICE



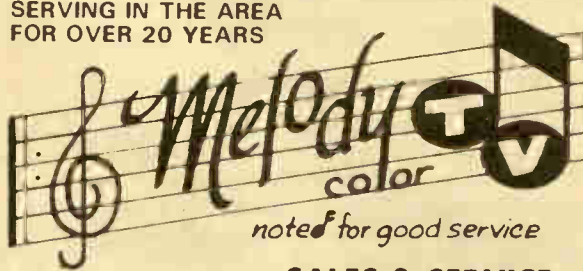
Call: 723-8822

306 KENNEDY STREET, N.W.
WASHINGTON, D.C. 20011

MON-FRI
9 AM - 6 PM
SAT
9 AM - 5 PM

Don't forget to show the store hours and address.

SERVING IN THE AREA
FOR OVER 20 YEARS



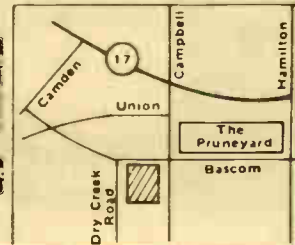
notes for good service

SALES & SERVICE

TRADE IN YOUR OLD TV EXTRA ALLOWANCE

OPEN MON.
& THURS
TILL 8 P.M.

Featuring **ZENITH**



2 1/2 BLOCKS SOUTH
OF PRUNEYARD

377-5800

2252 S. BASCOM AVE.
CAMPBELL

A small map showing important neighborhood landmarks can help customers find the shop.

STEREO SERVICE

- ELECTROPHONIC
- PANASONIC
- SHARP
- HITACHI
- ZENITH
- ADMIRAL
- MOTOROLA
- SYLVANIA
- MGA
- RCA
- CRAIG



PROFESSIONAL SERVICE ON ALL
STEREO'S HI-FI'S & PHONOGRAPHS
CALL

461-1000

OR BRING IN YOUR SET AND SAVE

- GARRARD
- SANYO
- SOUND DESIGN
- SONY
- JVC
- OLYMPIC
- JULIETTE
- CAPEHART
- BSR
- CHANNEL MASTER



ASSOCIATED ELECTRONICS, INC.

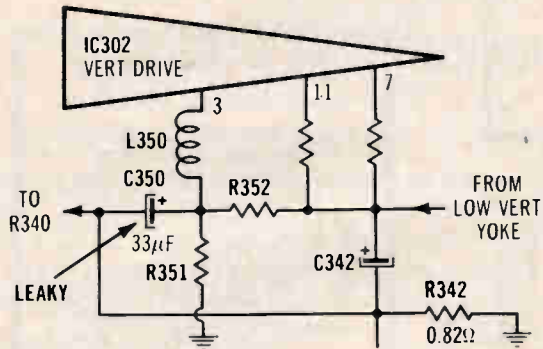
5204 W. FOND DU LAC AVENUE



Stress the technical competence by stating how long the business has operated, or by referring to membership in one of the national trade associations. This ad shows the logo of the National Association of Television & Electronic Servicers of America (NATESA).

**Chassis – Sylvania E21
PHOTOFACT – 1587-1**

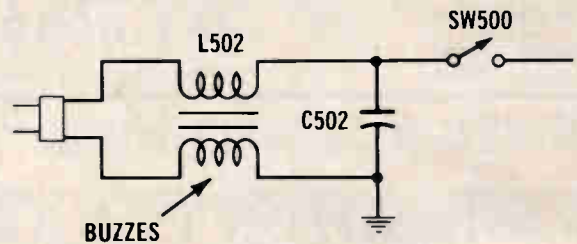
1



Symptom – Height compressed at bottom and folded over at top
Cure – Check capacitor C350, and replace if it is leaky

**Chassis – Sylvania E21
PHOTOFACT – 1587-1**

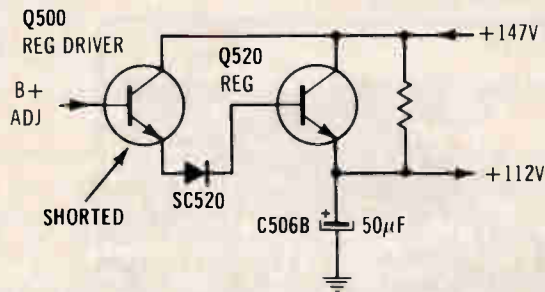
2



Symptom – Audible buzz, perhaps after several operating hours
Cure – Check L502 ac-line choke, and replace if it buzzes

**Chassis – Sylvania E21
PHOTOFACT – 1587-1**

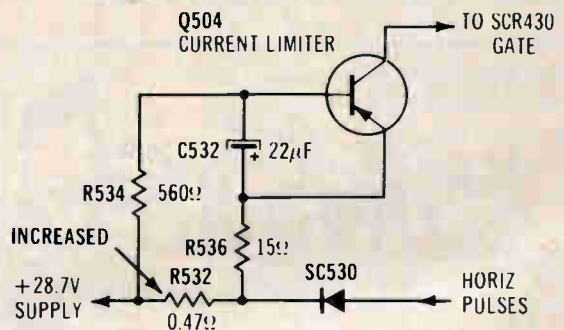
3



Symptom – Shut-down occurs after a few seconds each time power is applied
Cure – Check regulator driver Q500, and replace it if shorted

**Chassis – Sylvania E21
PHOTOFACT – 1587-1**

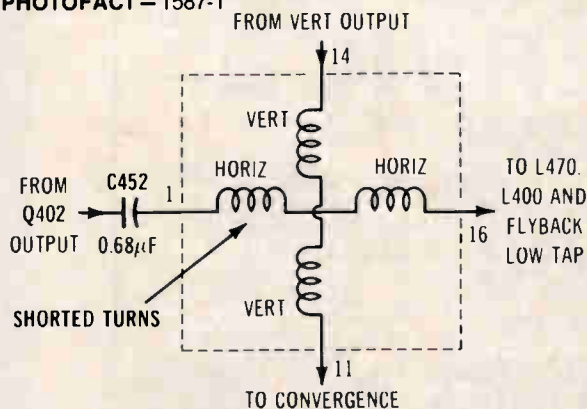
4



Symptom – Erratic shut-down, without overload or other symptoms
Cure – Check resistor R532, and replace it if increased in value

**Chassis – Sylvania E21
PHOTOFACT – 1587-1**

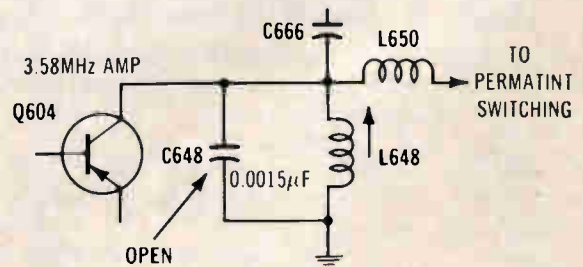
5



Symptom – Circuit breaker trips each time power is applied
Cure – Check all yoke windings, and replace yoke if it has shorted turns

**Chassis – Sylvania E21
PHOTOFACT – 1587-1**

6



Symptom – Wrong tints that cannot be corrected by tint-control adjustments
Cure – Check capacitor C648, and replace it if open

FREE CIE SCHOOL CATALOG
Helps you pick a CIE career course to match your experience and career goals.

For your free copy, write:
 Cleveland Institute of Electronics, Inc.
 1776 E. 17th St., Cleveland, Ohio 44114

Circle (6) on Reply Card

How much better off would you be with a solid knowledge of digital electronics and how to use it?



CIE Microprocessor Training Laboratory

Now, you can learn both the theory and application of modern digital electronics that you need from Cleveland Institute of Electronics. And, you don't have to leave home to do it. Because with CIE independent home study, you don't have to go to school—the school comes to you. Many CIE courses offer a wide range of sophisticated training aids. One course even includes a Microprocessor Training Laboratory for you to apply advanced digital technology. In addition, with CIE you can earn an Associate Degree entirely by independent study. Mail this card today for a free school catalog. School rep contact in some areas.

MAIL THIS CARD TODAY FOR FREE SCHOOL CATALOG

Print Name _____
 Home Address _____ Apt. _____
 City _____ State _____ Zip _____
 Phone (Area Code) _____
 Check here for G.I. Bill information Veteran Active Duty PF-86

CIE Cleveland Institute of Electronics, Inc.
 1776 East 17th Street, Cleveland, Ohio 44114

Formerly Electronic Servicing, a new, exciting, bigger and better-than-ever magazine for the electronics of today and the future!

The "how-to" magazine of electronics

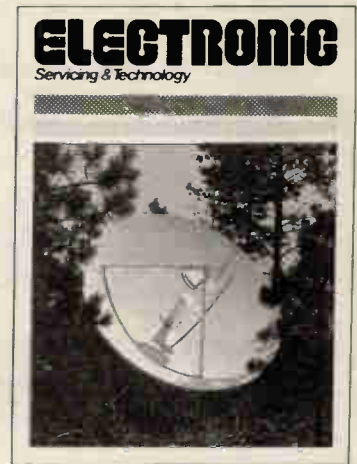
You will find Electronic Servicing & Technology must reading if you are to keep abreast of the rapidly changing technology in electronics whether you are a professional technician or an avid hobbyist.

Every month you will receive your personal copy jam-packed with the information you need and want...information that will save you time and money...the most complete and up-to-date service data on audio and video equipment...information that will help you make intelligent buying decisions...information that will take you into the future of electronics...information you just can't afford to be without.

At a very low cost you'll explore the exciting new developments in Satellite TVRO; Microcomputers; Television; Video Tape and Cassette Recorders/Players; Video Disc; Audio Products; Test Equipment; Ham, CB & Mobile Radio; Robotics; Security Products; Electronic Games, etc.

Nowhere else will you find such accurate and complete material. Charts, graphs, schematics and pictures generously supplement the easy-to-read and understand text.

You would probably expect to pay much more for a magazine of this caliber, but right now you can take advantage of a special, limited-time subscription offer. Don't hesitate...subscribe now!



Return this order card with your check to:

ELECTRONIC
 Servicing & Technology

P.O. Box 12901
 Overland Park, KS 66212

IMPORTANT!
 Please check your business classification.

- Type of Business**
 Check One
 Independent Electronic Service Organization
 Retailer with Electronic Service Department
 Independent or Self-Employed Service Technician
 Electronics, Radio, TV Manufacturer
 Industrial Electronic Service
 Wholesale, Jobber, Distributor
 Other (Specify) _____

- Position**
 Owner, manager
 Service Manager
 Technician
 Other _____

Be sure you have checked one box under each arrow.

YES! Enter my subscription to **ELECTRONIC**
 Servicing & Technology

- I PREFER:**
 3 years at \$24.00 (You save \$12 off regular price)
 2 years at \$19.00 (You save \$5 off regular price)
 1 year at \$12.00
 (please allow 6-8 weeks for shipment)
 Above rates apply only in U.S.A. and its possessions. Elsewhere, one year \$17, two years \$27.
 I enclose payment of \$ _____ Check Money Order or please bill me

Please Print Name _____
 Company _____
 Address _____
 City _____ State _____ Zip _____

Your signature, please _____



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NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 8685 CLEVELAND, OHIO

POSTAGE WILL BE PAID BY ADDRESSEE

CIE

Cleveland Institute of Electronics, Inc.

1776 East 17th Street
Cleveland, Ohio 44114



Writing to Electronic Servicing & Technology?

PREVENT DELAY BY USING THESE ADDRESSES:

ABOUT YOUR SUBSCRIPTION

Changes of address or any questions about your subscription should be sent to the address at right. Please advise us of a change of address at least 6-8 weeks in advance of your move, if possible. Also allow 6-8 weeks for new subscriptions.



Dee Manies, Customer Service
ELECTRONIC SERVICING & TECHNOLOGY
P.O. Box 12901
Overland Park, Ks 66212-0930

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Bill Rhodes, Editor
ELECTRONIC SERVICING & TECHNOLOGY
P.O. Box 12901
Overland Park, Ks 66212-0930

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Electronic Servicing & Technology does not have parts, books, or schematics for sale. Questions or orders for Photofact schematics of Sams technical books should be sent to:



Howard W. Sams & Co., Inc.
4300 West 62nd Street
Indianapolis, Ind. 46268



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Servicing & Technology

P.O. Box 12901
Overland Park, KS 66212



CALENDAR OF EVENTS

January

7-10

Winter CES, Las Vegas Convention Center, Las Vegas, NV. Contact Consumer Electronics Shows, Two Illinois Center, Suite 1607, 233 North Michigan Avenue, Chicago, IL 60601 (312) 861-1040.

February

2-4

Southcon '82, Orlando, FL, at the Sheraton/Hyatt. For more information call (800) 421-6816.

March

29-April 1

EIA Spring Conference, at the Shoreham Hotel in Washington, D.C. Contact the Electronic Industries Association, 2001 Eye Street N.W., Washington, D.C. 20006.

19-21

Computer Fair, Civic Auditorium, Brooks Hall, San Francisco, CA. For more information call (415) 851-7075.

April

23-25

Hamvention '82, Dayton Hara Arena, Dayton, OH. For more information call (513) 277-5314.

29-May 1

Electronic Distribution Show, New Orleans Hilton, New Orleans, LA. For more information call (312) 648-1140.

May

25-27

Electro '82, Hynes Auditorium, Boston, MA. For more information, call (800) 421-6816.

June

6-9

Summer CES '82, McCormick Place, Chicago, IL. Contact Consumer Electronics Shows, Two Illinois Center, Suite 1607, 233 North Michigan Avenue, Chicago, IL 60601, (312) 861-1040.

7-10

National Computer Conference '82, Astro Arena, Houston, TX. For more information call (703) 558-3600.

August

2-7

Joint convention of NESDA, ISCET, The Texas Electronics Association, the Louisiana Electronic Service Dealers Association, and Television Service Association of Arkansas. At the Hilton in New Orleans, LA. Contact The National Electronic Service Dealers Association, 2708 West Berry St., Ft. Worth, TX 76109, (817) 921-9061.

26-29

Personal Computing '82, Philadelphia Civic Center, Philadelphia, PA. For more information call (609) 653-1188.

September

14-16

Wescon '82, Anaheim Convention Center, Anaheim, CA. For more information call (800) 421-6816.

APPLIANCE REPAIR BOOKS



Thirteen Handbooks written in easy-to-understand language by experts in the service field with illustrations and diagrams! Acclaimed by instructors and professionals alike! How to diagnose and repair air conditioners, refrigerators, washers, dryers, ranges, microwave ovens, dishwashers, vacuum cleaners, electrostatic air cleaners, RV gas appliances, hair dryers, motors, water heaters, coffeemakers, can openers, floor polishers, steam irons, food mixers, lawn care appliances, electric knives, electric and digital clocks and many others. Also fundamentals of solid state, setting up a shop, using test instruments and more. Only \$2.65 to \$4.90 ea.

SEND FOR FREE PRICE LIST

Gamit, Dept. ES

110 W. St. Charles Road,
Lombard, Illinois 60148

Circle (7) on Reply Card

FREE CATALOG

Burglar/Fire Alarms

- Control • Wireless Components
- Ultrasonic • Microwave • Infrared • Sirens • Bells • CCTV
- Locks • Safes • Fire Systems

Mountain West

4215 N. 16th St. Phoenix, Ariz. 85016 800-528-6169

Circle (8) on Reply Card

It's no puzzle
to order Oelrich
Service Forms



For TV-radio and two-way radio service —
legal forms for Calif., Florida and Utah.
Now at parts jobbers or write for cat. B64.

OELRICH PUBLICATIONS

4040 N. Nashville Ave., Chicago, IL 60634
Now call toll-free! 800-621-0105

Circle (11) on Reply Card

Give the gift of love.



American Heart Association

WE'RE FIGHTING FOR YOUR LIFE

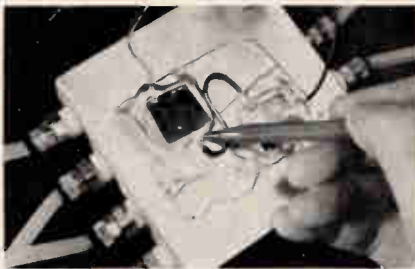
NEW PRODUCTS

Adhesive system

A new two-part aluminum based adhesive system with high thermal conductivity used to bond solar cells to heat sinks, is now available from *Aremco Products Inc.*

The adhesive has a slight elasticity after curing. This permits its use in thermal shock applications where components with dissimilar thermal expansion must be joined, such as hybrid circuits to aluminum heat sinks.

The adhesive can be applied by



screen printing, spatula or automatic dispensing techniques. The material can be cured at room temperature or in 10 minutes at 300°F.

Circle (20) on Reply Card

Microwave leakage detector

Radio Shack, a division of Tandy Corporation, is offering a small hand-held safety tester that lets microwave oven owners check for radiation leakage through doors and seals. The Micronta microwave leakage detector (22-2001) is easy to use and requires no batteries.

This small detector senses the level of microwave cooking signal present outside the oven while the oven is operating, and indicates this signal level on an easy-to-understand meter. The meter has a split red and green bar. As long as the needle is within the green area, the microwave leakage level is safe; but if the reading should



climb into the red area, that's a sign that the oven door seals have deteriorated to an unsafe condition—the oven should be immediately turned off and a repairman consulted.

The leakage detector gets its operating power from the microwave cooking signal itself, and requires no ac power or batteries. Operation is simple—just point and read—so regular safety checks require only seconds. Complete instructions are included with the unit.

Circle (21) on Reply Card

VCR video cleaner

Nortronics has introduced two drop-in videotape head cleaners, the VCR 130 (VHS format) and VCR 135 (Beta format).

The non-abrasive, wet system cleaners clean the entire tape path. Both models use a lint-free, static-free cellular cloth cleaning surface for maximum strength and absorbency. Another advantage of the VCR system is the continuously porous cleaning surface. Be-



cause each use brings a fresh surface in contact with the heads, they are cleaned more thoroughly.

Circle (22) on Reply Card

Solder extractor

An economy model of the solder extractor made by *Automated Pro-*

duction Equipment Corporation has been introduced. The portable EX-525 features a high-torque piston pump and a 2-year guarantee.

The pump provides a high-flow, controlled vacuum of up to 1.2 cfm. This strong suction permits the desoldering of components from multi-layer PC boards without reswetting. Like other A.P.E. solder extractors, the EX525 works to remove the solder joint, not just the solder.

Other features of the 525 include: footswitch-controlled air flow; a comfort-designed desoldering handpiece that delivers 15 to 65 watts of desoldering heat, plus vacuum, at the tip; front-mounted panel knobs; and a self-standing dual tool holder with tip cleaner brush.



Circle (23) on Reply Card

Flux material

Multicore Solders has introduced a flux material based on defineable pure chemicals rather than natural rosin.

Named XERSIN (free of rosin), the residues of the material are potentially so many times less corrosive than rosin fluxes, that in most cases it will not be necessary to remove the flux residue from a printed circuit board after the soldering operation. Yet its fluxing action is comparable to and compatible with rosin fluxes.

Also, the fumes given off during soldering are substantially reduced and are well within the limits of current industry standards. What fumes are given off contain no aldehydes that are found in rosin, and are used as a measure of environmental pollution (TLV for pyrolysis decomposition).

XERSIN passes the Copper Mirror Test normally used for mildly activated or pure rosin, and all

other performance requirements as specified in QQ-S-571. It also passes MIL-P-28809 Cleanliness Test without removal.

Circle (24) on Reply Card

Miniature splines

Moody Tools Inc. has introduced a series of Acu-Min miniature spline sets. They have been de-



signed for use with miniature spline-head machine screws.

Three kits are available—economy, standard and deluxe—each having five spline sizes of 0.033"-4, 0.048"-4, 0.048"-6, 0.060"-6 and 0.069"-4.

The economy version, part number 58-0155, has one handle and five interchangeable blades; the standard, part number 58-0156, has five handles each with an attached blade, and the deluxe, part number 58-0157, has five handles each with attached blades and five extra interchangeable blades.

Circle (25) on Reply Card

Mobile tool carts

LISTA's complete line of mobile tool carts consists of four different models. Each model is made from



heavy gauge, quality steel with an all-welded construction. The carts are used in shops to transport personal tools for repair or maintenance. The drawers can be subdivided into as many compartments as desired to provide for maximum storage efficiency and for ease of locating tools, instruments or parts.

The shelf-cart model SC has two adjustable and one fixed shelf. The top and center shelves can be arranged in desired height in 2-inch intervals. Model TB300 has top and bottom shelves in addition to the cabinet with 1 to 3 drawers. The cabinet has a cylinder lock. All shelves have 7/8-inch high retainers on all 4 sides and a rippled rubber mat on top. A handle is attached to the cart to provide easy directional control over the 2 rigid and 2 swivel 4-inch casters that lock swivel and wheel.

Circle (26) on Reply Card

Conductive coating

Plasticoat EC-121 from Plastic Systems Inc. is a 1-component, semiconductive coating formulated for the controlled dissipa-



tion of static electricity. This proprietary formulation contains electrically conductive carbon black dispersed in a vinyl-acrylic binder. The solvent system meets Environmental Protection Agency (EPA) requirements for Rule 66/3, and is designed for maximum relative safety for solvent based coatings.

Molecular bonding to porous and nonporous surfaces occurs without

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the need for priming or special preparation. Typical substrates include polycarbonate, vinyls, styrenics, acrylics, ABS, SAN, cellulose, urethane, Noryl, wood, paper, fabric, glass, aluminum and brass. An integral bond is formed to the substrate, thereby providing long-term resistance to humidity, weathering, thermal cycling, rub-off and flaking.

Circle (27) on Reply Card

Potting boxes

Polycase has added to its line of multipurpose electronic enclosures a group of five sizes of plastic potting boxes.

These boxes provide an efficient and inexpensive method of enclosing and/or encapsulating of small electronic assemblies in a neat and workmanlike package. Frequently, this eliminates the necessity of a large investment in tooling required to put a new product on the market.

The potting boxes are available with mounting feet top or bottom and without feet, in tough, fire and



moisture resistant ABS plastic.

Exact fitting covers are available for the four larger sizes. Covers are made of the same material and can be attached by means of ABS adhesive available from plastic supply houses and some hardware stores.

Circle (28) on Reply Card

Noise interference detector

A portable test instrument, formerly manufactured by Millen, for detecting power line noise interference and verifying when the problem has been corrected is available from *Caywood Electronics Inc.*

The type 71001 detector is a passive, portable test instrument that helps determine if EMI/RFI

noise problems are coming in on the ac or dc power line, or being generated by some device on the line. Used with an oscilloscope or panel meter-equipped radio receiver, it can also be used to confirm that the noise problem has been corrected.



Circle (29) on Reply Card

Projection TV

ITT/SEL has introduced the Novabeam projection TV to the European market during Funkausstellung Audio/Video Fair in West Berlin, September 4-11, 1981.

Kloss Video Corporation of Cambridge, MA has agreed to supply Novabeam projection TV to ITT's Standard Elektrik Lorenz AG division for distribution in Germany.

The first order of 40 NOVA-BEAM projection TVs that have been shipped were manufactured to meet U.S. NTSC broadcast standard, and will be converted to the European PAL broadcast standard by ITT/SET at their facilities in Pforzheim, Germany.

Circle (30) on Reply Card

Flat cable tester

A programming feature has been added to the *Hollex HX128* flat cable assembly tester. This capability allows users to test, within limits, complex cables. Acceptable open and short information is added to the unit's interface adapter boards.

Reprogramming is easily accom-



plished by the user. Prior to the availability of this now standard feature, the self-learning HX128P option was required, at additional expense, to test complex assemblies.

The tester features self-contained fixturing which accommodates interchangeable adapter boards. Standard boards are available for plugs, sockets, DIPs, D Type, Micro-ribbon, and more. Operational modes are a fast PASS/FAIL, Fault ID, and repetitive SCAN.

Circle (31) on Reply Card

Pulse/function generator

The model 514 from *Exact Electronics* contains two generators in one bench top instrument, with each section having a broad range of capabilities. The function generator section operates from 0.001Hz to 5MHz and offers sine,



square, triangle, trigger and gate operation with output waveforms of 20V P-P at the high output. A low output delivers 2V P-P. A 40db variable control attenuates the high and low output simultaneously.

Additional features are variable dc offset, VCF (voltage controlled frequency) input and sync output. The frequency/period dial operates in a 10 turn resolution mode or in a dial mode that gives 3 decade single turn operation.

The pulse generator section offers single pulse, double pulse and delayed pulse over a frequency range of 0.001Hz to 20MHz. The frequency/period dial sets the repetition rate and/or period. The period is adjustable from 1000 seconds to 50ns. Pulse width and delay are set by individual calibrated controls. The pulse width and delay are both adjustable from 100ms to 10ns. A

square wave mode is also provided and the pulse generator can be triggered and gated.

Circle (32) on Reply Card

RF wattmeters

The generation of RF Power Analyst directional wattmeters introduced by *Bird Electronic Corporation* has been expanded by the addition of seven models tailored to specific communications services.

These microprocessor-based digital Thru-line wattmeters are available as rack-mounted or portable instruments, with built-in or external coax line sections, and with measurement parameters geared to FM, AM, SSB/DSB, CW, TV or 2-way communications signals.

In addition to bi-directional power from 0.5 to 2300MHz and from 100mW to 250kW, the instruments measure VSWR, return loss, percent modulation, dBm and peak envelope power functions. A min/max memory of any displayed quantity makes equipment adjustments simpler than with an analog device.

Each of the models 4382 through 4387, as well as the original 4381, can be supplied for automatic testing with IEEE-488 bus and RS-232 compatibility.

Circle (33) on Reply Card

Resistor ladder networks

A line of thick-film resistor ladder networks is available from the electronic components division of *Panasonic Company*.



Designated as "EXB-LD Series," the ladder networks are suited for applications in analog-to-digital (A/D) converters, temperature control, and motor-speed control. In addition to their small size (a 10-bit unit is 1.24"x0.3"x0.1"), thick-film reliability, and convenient package (single-in-line package with 0.1" pin spacing), the lad-

der networks offer high-precision output, good matching ratio ($\pm 1/2$ LSB—least significant bit), minimal temperature drift, and long load life and humidity resistance. They are also available in high impedance values (standard resistance values are 10, 25, 50 and 100 k Ω).

Circle (34) on Reply Card

Static eliminators

Plastic Systems introduces a line of electronic and nuclear static eliminating equipment designed to eliminate static electricity in an efficient, safe and rapid fashion.

Plastistat equipment is available in various standard models and sizes, and can be custom fabricated to customer specifications.

The shock-free and spark-free design provides employee safety, and permits use in areas where hazards of ignition or fire may exist. They are approved by Underwriters Laboratories Inc. and Canadian Standards Association.

Circle (35) on Reply Card

Transistors

Two high voltage, high power transistors with improved SOA (safe operating area) curves have been introduced by the *RCA Solid State Division*. The chips are passivated for improved stability at high voltage and high temperature.

They are suited for high fidelity amplifiers, series and shunt regulators and linear/power amplifiers.

The RCA9166A has a voltage rating of 275V at 16A, and the RCA9166B has a voltage rating of 225V at 16A. The safe operating area for both devices is 80V, 3A, 0.5 seconds. Similar competitive units break down at 2A. Gain is 30 at 3A IC, 4V VCE and 3.2 at 16A, 4V.

These ballasted, epitaxial-base silicon n-p-n transistors are supplied in hermetically sealed JEDEC TO-204MA steel packages.

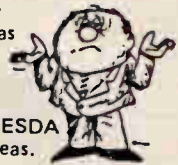
RCA has also introduced two power transistors which are Motorola equivalents. The MJ15024 has a voltage rating of 275 V at 16A and the MJ15022 has a voltage rating of 225V at 16A.

Circle (36) on Reply Card

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Circle (9) on Reply Card

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Arthur Ashe
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Sabtronics has available their short form catalog #811, describing multimeters, frequency counters, function generators, prescalers and frequency counter accessories.

Described are the model 2035A and 2037A handheld multimeters, models 2010A and 2015A multimeters, the model 5020A function generator, model PSC-65 600MHz prescaler, plus other models. The 6-page, full color brochure lists specifications and general descriptions.

Circle (40) on Reply Card

Weston Instruments announces the availability of an 8-page, 4-color technical bulletin describing the company's series 6400 and 6500 digital multimeters, a family of microcomputer-based instruments that provide, in addition to the basic measurement and signal processing functions, such features as self-diagnosis, flashing annunciator signals to prompt the operator through a chosen series of steps, and a number of special measurement modes that greatly extend operational versatility.

For example, the NULL mode displays the difference between an initial stored value and each successive measurement, that is, it focuses on successive small changes. The FILTER mode provides digital, binary-weighted filtering of measurements by preferred "ensemble-averaging" algorithm, insuring the dynamic stability that allows full use of the 10 V/10nA/10m sensitivity and the 20kHz bandwidth of the instruments.

Circle (41) on Reply Card

A 144-page catalog being issued free by **Electronic Tool Company Inc.**, is a buyer's guide illustrating thousands of electronic tools, tool

kits, test equipment and related products.

Included in the updated **ETCO** catalog is an extensive and expanded section on quality tool kits of interest to those engaged in repairing, maintaining and servicing electronic and electro-mechanical equipment. Name-brand hand tools, as well as an extensive coverage of test equipment are also fully illustrated and described in detail.

Circle (42) on Reply Card

A 1981 edition of the **RCA MRO** solid-state manual for JEDEC and commercial replacement devices has been announced by the **RCA Distributor and Special Products Division**.

The 64-page manual offers plant engineers and technicians involved with maintenance and repair operations on electronic equipment abridged data on 2800 JEDEC and Commercial Devices to meet their MRO replacement requirements. The manual has a cross-reference listing of 11,580 additional JEDEC and commercial types, and contains data on 12 axial-lead rectifiers for industrial use and 26 full-wave bridges from **RCA's SK series** replacement line.

Circle (43) on Reply Card

A 2-page bulletin from **Gould Inc.**, Instruments Division, describes the **OS3350/5 TV monitor oscilloscope**. This unit combines a line-by-line NTSC waveform monitor, a video monitor, and a conventional 40MHz dual-trace scope with 5mV/cm maximum sensitivity. It is designed for troubleshooting TV, CATV, CCTV, video recording, microwave repeater, mobile TV equipment, FLIR and digitally encoded signals.

The **OS3350/5** accepts composite video with or without sound-in-sync. It provides five different triggering modes, including rotary switch selection of lines 15 through 21 (fields 1 or 2), individual (up/down) line selection as indicated on a 3-digit LED display. field, line repetitive and field selector. Triggering delays up to 90µs allow portions of a line to be examined in detail.

Circle (44) on Reply Card

A 4-page folder from **Hickok Electrical Instrument Company** offers time- and effort-saving techniques for electronic troubleshooters. *A Sound Solution to the Five Most Common Troubleshooting Problems* includes new methods of tracing voltages around a circuit, troubleshooting circuits in hard-to-reach locations, tracing continuity, making tuning type adjustments and troubleshooting digital logic circuits.

The folder should be of interest to troubleshooters and those in charge of electronic field maintenance or bench testing operations.

Circle (45) on Reply Card

A 16-page reference brochure from **Data Precision** describes a broad range of digital instrumentation, including 5½-digit and 4½-digit lab and systems multimeters; 4½-digit portable/bench DMMs; 3½-digit hand-held portable DMMs; dc voltage/current standards; analog multiplexer; 488 interface; frequency counters; capacitance meter and thermometer.

Circle (46) on Reply Card

A 4-page *DMM Selector Guide* is now available from **Keithley Instruments Inc.** The guide is designed to help users choose the right instrument for the job, and covers 10 cost-effective service DMMs.

Two of Keithley's most recently introduced instruments, the models 135 and 176, are included. The model 135 is the first 4½-digit handheld DMM available from any manufacturer. The Model 176 is a 4½-digit bench/portable DMM with 0.05% basic dc accuracy.

The eight other service DMMs covered in the guide offer a wide variety of capabilities. A user may choose from features such as TRMS or ac averaging, extended current range, analog output, IEEE-488 interfaceability (three models), 2- or 4-wire input, and microprocessor signal conditioning.

Circle (47) on Reply Card

A full-line *Catalog and Buyers Guide* of electronic test and

measurement instrumentation is available from **Keithley Instruments Inc.** Products represented include those from Keithley's Instruments Division, Radiation Measurements Division and the Automated Parametric Test Systems Division.

The catalog covers product descriptions, capabilities, features, specifications and application information in a convenient format. In addition, each major section is prefaced with technical data, theory of operation and design considerations relative to the instruments being described.

The product line covered by the catalog includes the 3½- or 4½-digit bench and handheld service DMMs, IEEE-488 programmable instruments for systems applications and scientific products, which include electrometers, picoammeters and nanovoltmeters. Also described are sources, supplies and milliohmeters.

Circle (48) on Reply Card

Simpson Electric Company is offering their 64-page, 4-color Catalog 5100 listing their complete line of stock analog and digital panel meters, meter relays, controllers, sound level meters and test instruments.

New products in the catalog include Simpson's compact model 467 digital multimeter with Digalog Display, and the new 3300 series meter relays.

Circle (49) on Reply Card

Users and purchasers of electronic instrumentation can have a report that objectively compares instrument brands and models. This saves time and money when buying equipment, and helps insure the best instrument choice for various needs.

Venture Research introduces *Venture Instrument Ratings (VIR)*, a series of reports that compare various brands of a specific instrument type.

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Circle (50) on Reply Card

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1. Title of publication: Electronic Servicing & Technology
 - 1A. 462-050
2. Date of filing: Oct. 1, 1981
3. Frequency of issue: Monthly
 - 3A. Number of issues published annually: 12
 - 3B. Annual subscription price: \$12.00
4. Location of known office of publication (Street, city, county, state, zip code): 9221 Quivira Rd., Overland Park, Johnson County, Kansas 66215.
5. Location of the headquarters or general business offices of the publishers (not printers): 9221 Quivira Rd., Overland Park, Johnson County, Kansas 66215.
6. Names and complete addresses of publisher, editor, and managing editor. Publisher (Name and Complete Mailing Address): Cameron Bishop, 9221 Quivira Rd., Overland Park, Kansas 66215. Editor (Name and Complete Mailing Address): Bill Rhodes, 9221 Quivira Rd., Overland Park, Kansas 66215. Managing Editor (Name and Complete Mailing Address): Rhonda L. Wickham, 9221 Quivira Road, Overland Park, KS 66215.
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2. Mail subscriptions	34,306	34,364
C. Total Paid Circulation	34,509	34,554
D. Free Distribution (including samples) by mail, carrier delivery or other means	6,789	4,521
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