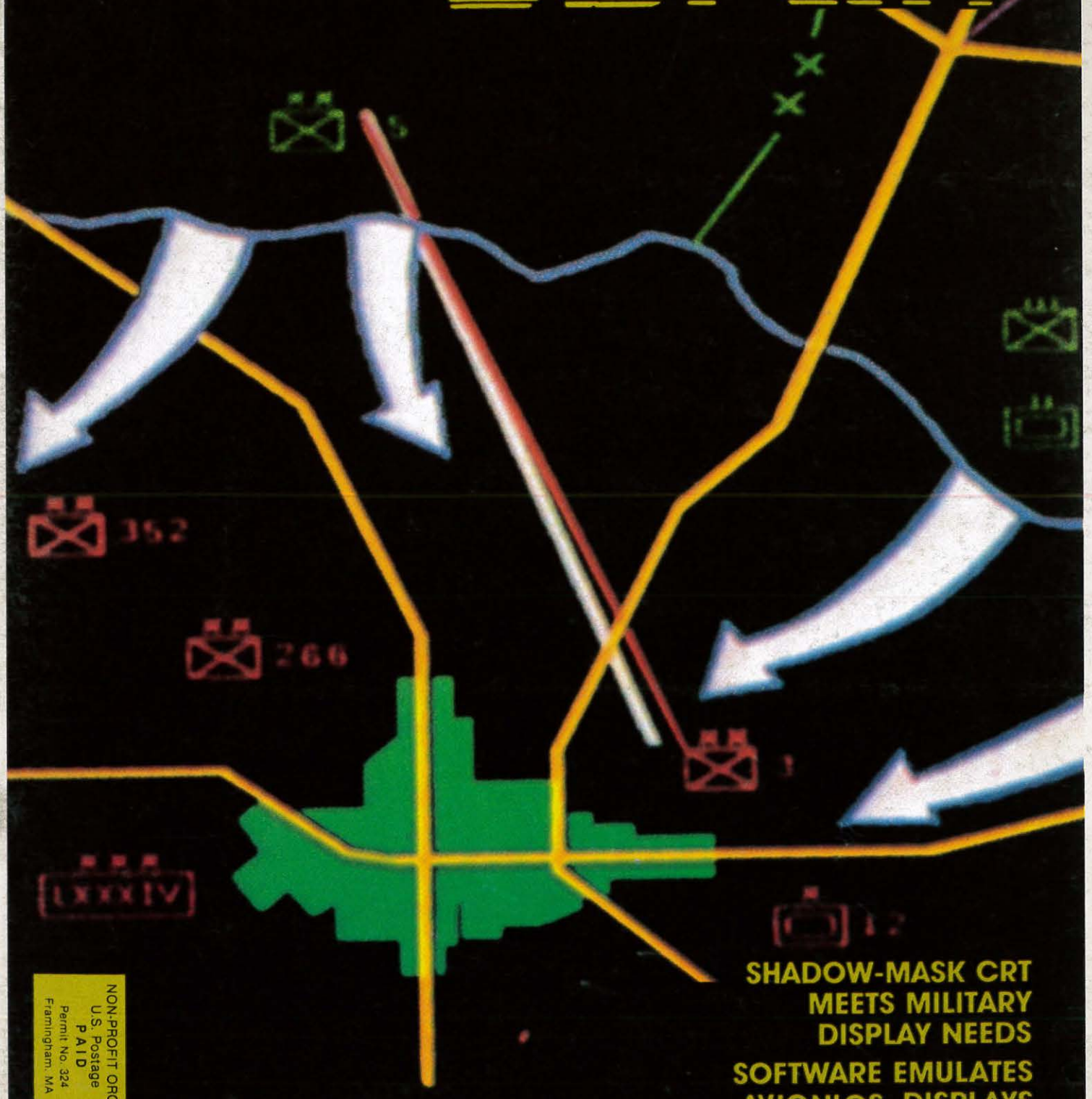
THE OFFICIAL JOURNAL OF THE SOCIETY FOR INFORMATION DISPLAY

INFORMATION DISPLAY

NOVEMBER 1985



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Events

NATIONAL

NOVEMBER 2-6: 1985 Fall Joint Computer Conference, INFOMART, Dallas, TX.—Exploring the Knowledge-based Society, co-sponsored by the Association for Computing Machinery and IEEE Computer Society. Contact: Nancy Keene, INFOMART, 1950 Stemmons Freeway—Suite 6038, Dallas, TX 75207 (214/746-3602)

NOVEMBER 3-6: 17th Annual Information Industry Assn. Conference & Exhibition, The Shoreham Hotel, Washington, DC. Contact: IIA Meetings Dept., 316 Pennsylvania Ave. SE—Suite 400, Washington, DC 20003 (202/544-1969)

NOVEMBER 4-7: Seventh IEEE Symposium on Mass Storage Systems, Tucson, AZ. Contact: Bernard T. O'Lear, NCAR, PO Box 3000, Boulder, CO 80307 (303/497-1268)

NOVEMBER 4-7: SENSORS '85—Conference on Sensors for Untended Manufacturing, Society of Manufacturing Engineers, Detroit, MI. Contact: Society of Manufacturing Engineers, One SME Drive, PO Box 930, Dearborn, MI 48121 (313/271-1500)

NOVEMBER 5-7: ARTELL '85, International Symposium and Exposition on the Industrial Applications of Artificial Intelligence, Philadelphia Civic Center, Philadelphia, PA. Contact: Access Conference Associates Inc., PO Box 160, Gaithersburg, MD 20877. (301/921-9424)

NOVEMBER 6-8: American Ceramic Society, Glass Div. Meeting, Corning Hilton, Corning, NY. Contact: James E. Shelby, Alfred University, Alfred, NY 14802 (607/871-2470)

NOVEMBER 11-14: 1985 International Congress on the Applications of Lasers and Electro-Optics (ICALEO '85), Cathedral Hill Hotel, San Francisco, CA. Contact: Laser Institute of America, 5151 Monroe St.—Suite 102W, Toledo, OH 43623 (419/882-8706)

NOVEMBER 11-14: 1st International Conference and Exhibit on Computer Workstations, San Jose Convention Center, San Jose, CA. Contact: IEEE Computer Society, 1109 Spring Street, Suite 300, Silver Spring, MD 20910 (301/589-8142)

NOVEMBER 12-15: IEEE International Conference on Systems, Man and Cybernetics, Tucson, AZ. Contact: A. Terry Bahill, Systems and Industrial Engineering Dept., U. of Arizona, Tucson, AZ 85721. (602/621-6551)

NOVEMBER 13-15: 1st Videotext Engineering and Technology Forum, Meridian Hotel, San Francisco, CA. Contact: Cynthia Parsons, OnLine Intl., 989 Avenue of the Americas, New York, NY 10018 (212/279-8890)

NOVEMBER 17-22: Imaging Science & Technology Show and Exhibit, Society of Photographic Scientists, Fall Symposia, Marriott Crystal Gateway, Arlington, VA. Contact: David A. Fatora, M.F. Graphics, 12700 SE Crain Hwy., Brandywine, MD 20613 (301/372-1245)

NOVEMBER 17-22: 25th Fall Symposium of the Society of Photographic Scientists and Engineers (SPSE), Marriott Crystal Gateway Hotel, Arlington, VA. Contact: SPSE, 7003 Kilworth Lane, Springfield, VA 22151 (703/642-9090; or Dr. Harry A. Hoyen, Chairman, (716/477-4519)

NOVEMBER 17-22: 25th Fall Symposia Imaging, National Crystal Gateway, Arlington, VA. Contact: Executive Director, Society of Photographic Scientists and Engineers, 7003 Kilworth Lane, Springfield, VA 22151.

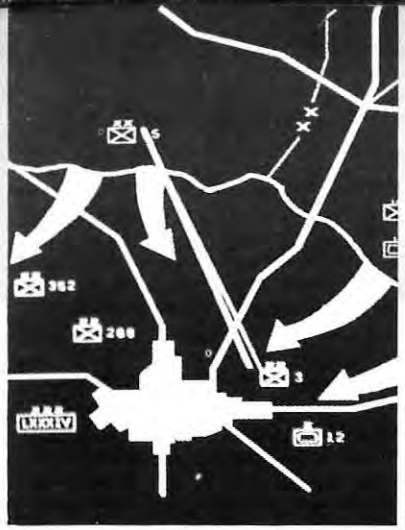
NOVEMBER 18-22: Tutorial Week, (Washington '85,) IEEE, Hyatt Crystal City Hotel, Arlington, VA. Contact: Martez A. Camilleri Dir. of Tutorials, IEEE Computer Society, 1730 Massachusetts Ave. NW, Washington, DC 20036 (202/371-0101)

NOVEMBER 18-22: Tutorial Week Washington '85, IEEE Computer Society, Hyatt Crystal City, Arlington, VA. Contact: Martez A. Camilleri, IEEE Computer Society, PO Box 639, Silver Spring, MD 20901 (301/589-8142)

NOVEMBER 21-22: Ninth Annual Western Educational Computing Conference, California Educational Computing Consortium, Oakland, CA. Contact: Alexia Devlin, CECC, San Francisco State University, Accounting Data NADM-358, 1800 Holloway Ave., San Francisco, CA 94132.

NOVEMBER 25-29: 2nd International Technical Symposium on Optical and Electro-Optical Applied Science and Engineering, Palais des Festivals et des Congres, Cannes, France. Week A - Fiber Optics and IR Technology, Imagers & Remote Sensing Instrumentation.

DECEMBER 2-6: Fundamentals and Applications of Lasers, Albuquerque, NM. Contact: Laser Institute of America, Education Dir., 5151 Monroe St.—Suite 102W, Toledo, OH 43623 (419/882-8706)



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NOVEMBER 1985 VOL. 1 NO. 11

Cover: *A wide range of colors and high-resolution graphics that meet military application needs is achieved using a Precision-In-Line Gun, Shadow-Mask CRT. — Hartman Systems, Huntington Station, NY.* (Page 16)

FEATURES

CRT displays full-color 3-D images 12

A single CRT display generates true stereoscopic images in full color that can be viewed in 3-D using only a pair of simple polarized eyeglasses.—*Tektronix, Beaverton, OR.*

Shadow-mask CRTs meet military color-display needs 16

A military display system employing a Precision-In-Line (PIL) gun, shadow-mask CRT with permanent self-convergence alignment provides a wide range of colors, 2-to-1 high-voltage range, and rapid switching speeds required for high resolution graphic displays.—*by Stanley W. Roth, Sr. Research Engineer, Hartman Systems, Huntington Station, NY.*

Software emulates avionic displays and environment 17

A 10-module software tool, used with an Apple II microcomputer, enables avionic display designers to visually inspect alternative displays under simulated conditions, thus allowing the optimum design to be selected prior to prototype production.—*by John Laycock, Royal Aircraft Establishment, Farnborough, Hants, UK.*

Requirements for electronic scanning of drawings 24

Although setting the scanning pixel size to twice the minimum line width found in engineering drawings will yield good image resolution for a fixed threshold binarization, equivalent results have been obtained by scanning drawings at lower resolution (larger pixel size) and using an adaptive threshold binarization that operates on local areas—*by Thomas J. Bilotta and John J. Lumia, EIKONIX Corp., Bedford, MA.*

Proposed Bylaws Amendments 34

In accordance with Article 13—AMENDMENTS, Society for Information Display Bylaws (as of 1 June 1983, SID Directory 1984/85), the SID Secretary hereby submits the proposed amendments, together with the review committee recommendations for approval by majority vote of all members in good standing, concurrent with the next ballot.

DEPARTMENTS

Events	2	Chapter Notes	33
Editorial	7	New SID Members	41
Technology Update	8	Sustaining Members	43
Products	28	Advertisers Index	44
President's Message	32		

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American Federation of Information Processing Societies

INFORMATION DISPLAY (The Official Journal of the Society for Information Display) is edited for corporate research and development management; and engineers, designers, scientists, and ergonomists responsible for design and development of input and output display systems used in various applications such as: computers and peripherals, instruments and controls, communications, transportation, navigation and guidance, commercial signage, and consumer electronics.

Editorial covers emerging technologies and state-of-the-art developments in electronic, electromechanical, and hardcopy display devices and equipment; memory; storage media and systems; materials and accessories.

Events

DECEMBER 9-12: Short Course—Peripheral Array Processors for Signal Processing and Simulation, UCLA Extension, Los Angeles, CA. Contact: Walter J. Karplus, Program Coordinator (213/825-2929); or Registration, PO Box 24901 Dept. K, UCLA Extension, Los Angeles, CA 90024 (213/825-1295)

DECEMBER 9-13: 2nd Conference on Artificial Intelligence Applications, Fontainebleau Hilton, Miami Beach, FL. Sponsored by IEEE Computer Society. Contact: IEEE Computer Society, 1730 Massachusetts Ave. NW, Washington, DC 20036 (202/371-0101)

DECEMBER 11-13: DEXPO West '85, Anaheim Convention Center, Anaheim, CA. Contact: Carol Henderson, Project Mgr., Expoconsul International Inc., 55 Princeton Junction, NJ 08550 (609/799-1661)

DECEMBER 16-18: Sixth International Conference on Information Systems, Indianapolis, IN. Co-sponsored by the Society for Information Management and The Institute of Management Sciences in cooperation with the Association for Computing Machinery. Contact: Ananth Srinivasan, Publicity Chairman, Asst. Prof/MIS, Graduate School of Business, Indiana University, 10th St. and Fee Lane, Bloomington, IN 47405. (812/335-8449)

DECEMBER 16-20: First International Conference on Supercomputing Systems, Innisbrook Resort, Tarpon Springs, FL. Contact: Supercomputing Conference, IEEE Computer Society, PO Box 639, Silver Spring, MD 20901. (301/589-8142)

INTERNATIONAL

NOVEMBER 11-14: Sixth Chilean Electrical Engineering Congress, Universidad Catolica de Chile, Santiago Chile. Contact: Dr. Hugh Rudnick, Electrical Engineering Dept., Casilla 114-D, Santiago, Chile. (562-513553)

NOVEMBER 18-21: Canadian Computer Show & Conference, Canadian Information Processing Society, Toronto International Center, Toronto, Canada. Contact: Robert Grainger (418/252-7791)

NOVEMBER 18-21: CommuniTech & Computer '85 Malaysia, Putra World Trade Center, Kuala Lumpur, South East Asia. Contact: CommuniTech & Computer '85 (01/486-1951)

DECEMBER 2-6: 2nd International Technical Symposium on Optical and Electro-Optical Applied Science and Engineering, Palais des Festivals et des Congres, Cannes, France. Week B - Applications of Holography & Optics; Instrumentation for Submillimeter & X-Ray Astronomy; and Ophthalmic Optics Image Processing Symposium.

NOVEMBER 25-DECEMBER 6: 2nd International Technical Symposium on Optical and Electro-Optical Applied Science and Engineering, Palais des Festivals et des Congres, Cannes, France. Contact: Society of Photographic & Instrumentation Engineers, PO Box 10, Bellingham, WA 98227.

DECEMBER 5-7: SEMICON/Japan, Tokyo Trade Center, Tokyo, Japan. Contact: Bill Galarneau, SEMI. (415/964-5111)

TO NON-SID MEMBERS

Be sure to fill out one of the cards in this issue, either to start your own membership, or to request your subscription to *ID*, so your name is not removed from the mailing list.

Electron-optical techniques

Eight-page, color paper describes electron-optical techniques critical to the achievement of state-of-the-art performance in a Cathode-Ray Tube-based, ultra-high resolution color film recording system. The paper is illustrated with 35-mm output imaged on the CFR-4000 ultra-high resolution color film recording system.
CELCO, Mahwah, NJ.
For information, circle Reader Service #36

Test/measurement instruments

A 16-page brochure covers test and measurement instrumentation including portable instruments for electrical and electronic test and measurement; communication systems test instruments; nucleonics, electrical power system test and measurement automatic testing equipment; programmable power supplies; panel meters; and chart recorders.
THORN EMI ELECTRONICS, Hayes, Middlesex, England.
For information, circle Reader Service #37

Fiber optics

Full-color, 12-page brochure provides background on fiber optics and fiber optics systems. It describes new and innovative services resulting from the introduction of fiber optics, and discusses integration of technologies that are complementary to fiber optics.
SASKTEL, Regina, Saskatchewan, Canada.
For information, circle Reader Service #38

Opto-electronic devices

A 24-page replacement guide covers the 208 components available in the ECG Opto-Electronic Devices product line. Devices are grouped by category, with electrical and mechanical specifications presented in a format that simplifies the process of selecting the correct replacement. A cross-reference section lists the replacements for over 2000 industry part numbers.
PHILIPS ECG, Williamsport, PA.
For information, circle Reader Service #39

Electro-optical signal processor

This 16-page, user-tool brochure is designed to help systems engineers and microprogrammers in the DoD contractor community use the Electro-Optical Signal Processor, which achieves throughputs ranging from 100 million operations per second (MOPS) to over 800 MOPS in one processor stage. Brochure describes tools (documentation, hardware, software) available to users of the EOSP chip set, including: user manual, functional simulator, microprogramming, and hardware development system.
SIGNAL PROCESSING TECHNOLOGIES, HONEYWELL INC., Colorado Springs, CO.
For information, circle Reader Service #34

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Section Manager

Directing a department of 30 engineers and support personnel, you will be responsible for the design of CRT based display systems from concept through production. Display design will include LVPS, HVPS, CRTs, Video and Deflection amps. Your functions will also encompass proposal and budget preparation.

Requires a miniumum of 10 years' display design experience including 2 years at the management level. Excellent communication skills are necessary. A background in military products is helpful.

Display Design Engineer

Responsible for design of CRT display system involving analog and digital circuit design and analysis; specification of CRTs and HVPS; analog and digital video processing; A/D and D/A conversion at rates up to 100Mhz; electronic optics correction, deflection and dynamic focus amps.

Requires BSEE or equivalent with 6 plus years' experience in CRT display circuit design, including elementary thermal analysis, grounding and EMI techniques.

Low Voltage Power Supply Engineer

Responsible for design of LVPS that are off-line, pulse width modulated multiple output voltage, 100-500 watts at 85% efficiency operating at frequencies up to 100 Kilohertz. Involves circuit design and analysis, magnetics design and specification, EMI and packaging.

Requires 6 plus years' experience designing LVPS for custom packaging in CRT display systems and BSEE or equivalent. Familiarity with military LVPS, airborne LVPS, system grounding, detailed magnetics design and computer-aided circuit analysis is desired.

Send your resume for prompt consideration to: **Professional Employment, Dept. SJM163, 2701 Orchard Park Way, San Jose, CA 95134.** An Equal Opportunity/Affirmative Action Employer.

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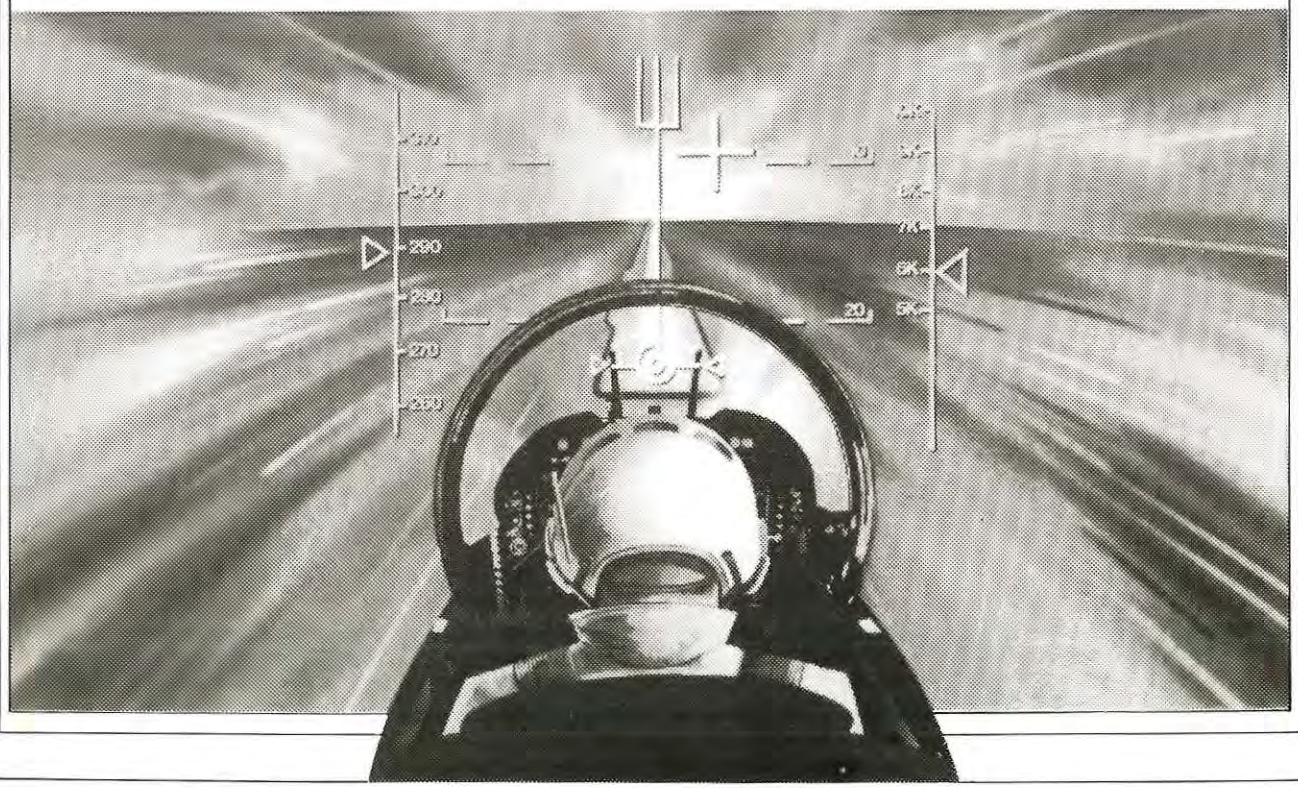

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". . . A man's (sic) judgment cannot be better than the information on which he has based it."
—Arthur Hays Sulzberger

In the August issue of ID, we introduced the ubiquitous "bingo card" (reader service card) found in most business and professional publications to help readers locate more detailed information quickly and easily. Initial returns indicate favorable reader response that warrants our continuing the inclusion of these cards, at least through several more issues, before evaluating returns and reaching a final conclusion about their effectiveness. The ultimate success of this card program, obviously, depends upon the number of inquiries that represent potential end-users of the products, literature, and services being offered.

* * *

With ID's new design already more than well-received (see President's Message, October 1985, p. 33) by subscriber and advertiser alike, and with the 1986 editorial plans already in motion, we now turn our major efforts toward improving the overall production process of your Journal. Beginning with the December issue, our publication date will be the 25th day of the preceding month—thus assuring (to the best of the Postal Service's ability) delivery, hopefully, within the first 10 days of each month (in the U.S.).

This past summer's production schedule went totally awry as a number of unrelated—but cumulative problems—cropped up. Not the least of which was hurricane Gloria, which threw a curveball at our printer—for some reason the presses just don't work without electricity. Then of course, overlapping summer vacations and installation of a new larger capacity press further compounded any slip in delivery of editorial material to the printer. These are problems that the new editorial closing dates should help resolve. At best, they won't recur; at worst, they'll be less noticeable to you.

* * *

We still have human factors to contend with, though, at editing and typesetting stages of production—just as surely as you do when designing a display system. Despite the use of computers to set type for us, we still rely heavily on the human display system to process and proofread editorial copy.

In "*CRT displays full-color 3-D images*" (ID August 1985, p. 16), we inadvertently used the wrong artwork and its descriptions for the right story. We thus wound up with a hybrid article that made little or no sense to the knowledgable, and of course, misrepresented the system to the unknowledgable. We have yet to pinpoint how such a mixup occurred, especially since each story was scheduled for publication in a separate issue. In an effort to rectify this editorial faux pas, we've repeated the story as originally intended for the August issue—this time with the correct diagrams and minus the confusing copy. The second story will be rescheduled for a future issue.

* * *

Then, as if to reinforce one of the primary design considerations discussed in our September cover story—chromatic abberration—the cover line somehow wound up trying to prove that old axiom "what you see is not always what you think you saw, but rather what you wanted to see." (Score 10 points if you spotted the problem upon first receiving your copy of the issue; 5 points if you have to go back to the cover and look at it again; only 1 point, if it takes you longer than a minute to solve the enigma. Sorry, no prizes for perfect 10 scores.)

Large-scale flat panel displays full color image

Using a new technology that has been undergoing development for more than seven years, research engineers at Lucitron Inc. have successfully produced and demonstrated a 35-in. diagonal video display panel only 5 in. deep. The display's four-square-feet of viewing area is capable of showing computer-generated legends and images, TV pictures or information from any other electronic source, according to Joseph Markin, Lucitron president. Markin (member, SID) and two vice presidents of the firm, Alan Sobel (member, SID) and Michael DeJule developed the display.

Although the current demonstration model is in monochrome, Markin says full color will be available early next year. "Future models" he says, "will be only 3 in. deep, weigh about 30 lb, and will operate hanging on the wall like a picture. First applications will be for military and commercial purposes; eventually it could be used in home TV sets," according to Markin.

The Lucitron display uses a gas discharge technology invented by DeJule in which the gas is manipulated to provide a source of electrons. The source is then scanned over the area of the display and electrons are extracted from it. The electrons, in turn, are modulated and accelerated to produce light from phosphors such as those in TV picture tubes. Scanning and modulation is controlled by an array of electrodes, in which each element of the array produces a tiny segment of the total picture—90,112 segments in the screen.

Displays can be built in sizes of 6-ft-diagonals or more without increasing the depth or distorting the image. And, panels can be put together to create whole walls of displays.

LUCITRON INC., Northbrook, IL (312/564-8383)

Tech receives contract for ultra-fast computers

Georgia Tech engineers are designing ultra-fast computers under a five-year, $21.3-million, Strategic Defense Initiative (SDI) contract awarded by the US Army's Ballistic Missile Defense Advanced Technology Center.

Tech's research in this field of computer engineering began in 1975, when Dr. Cecil Alford, an electrical engineering professor, and a PhD. student designed a prototype computer they called SPOCK I (Special Purpose Operational Computing Kernel.) The computer is a parallel-processing system, capable of simultaneously solving a very high number of mathematical problems.

A series of small, one-year initial Army contracts resulted in the design of a more sophisticated version—SPOCK II—having 32 parallel processing elements. The new contract calls for Georgia Tech to design and evaluate a

(Continued on p 11 ...)

(... continued from p 9)
third-generation SPOCK computer with 128 of these elements.

Faculty and students also will be producing a version of SPOCK II with VLSI microchips 100 times more powerful than those currently in use. This will pave the way for the design of a SPOCK IV computer with 1,000 parallel processing elements.

GEORGIA INSTITUTE OF TECHNOLOGY, Atlanta, GA (404/894-3444)

Society honors optical scientists

The Optical Society of America honored a distinguished group of scientists at its annual meeting in Washington, DC, last month that included:

- Emmett N. Leith, University of Michigan/Ann Arbor—Frederic Ives Medal: the society's highest award, for contributions to modern holography, information processing, and electromagnetics.
- Roy J. Glauber, Harvard University—Max Born Award: for distinguished contributions to physical optics.
- John T. Hougen, National Bureau of Standards—Ellis R. Lippincott Award: for contributions to the development of new group theoretical techniques for the analysis of vibrational, as well as rotation-vibration spectra.
- Thodor W. Hansch, Stanford University—William F. Meggers Award: for his discoveries of powerful techniques for high-resolution laser spectroscopy, and their applications to fundamental problems of physics.
- David H. Auston, AT&T Bell Laboratories—R.W. Wood Prize: for pioneering work in the field of picosecond optical electronics, and for the invention of the picosecond optoelectronic photoconductive switch.
- William H. Steel, CSIRO National Measurement Laboratory, Australia—C.E.K. Mees Medal: for his technical achievements in image diffraction theory, interferometry, and optical design.

Optical disk storage holds great promise

Though optical disk drive technology is still in its formative stages, indications are that the market will grow 419% through 1990, with shipments expected to exceed $4.5 billion (up from 1984's $2.5 million), according to a recently released Frost & Sullivan study.

According to "Optical Disk Drive Market for Computer Data Storage" (F&S No. 1474), this growth will be achieved as optical drives prove themselves to be reliable and cost-effective means for mass storage of data. Optical disk storage combines the ease of use and portability of floppy disks, while having a greater storage capacity than hard Winchester-type disk drives.

The first generation optical disk products have been introduced and models with improved technology are just now becoming available. Three optical disk formats are currently available, or under development:

- Read only—allows for inexpensive mass replication and distribution of prerecorded data to computer users.
- Write-once—allows users to write data to a particular location on an optical disk only once. (Data can be read repeatedly without damage to disk or data.)
- Erasable—still in development, but expected to be introduced during 1986.

This 249-page report (plus appendices) includes descriptions on current state-of-the-art of optical disk technology and projections as to what the future will hold. In addition, the report profiles the major vendors in this area and includes detailed product descriptions. Price: $1,675.

FROST & SULLIVAN INC., New York, NY (212/233-1080)

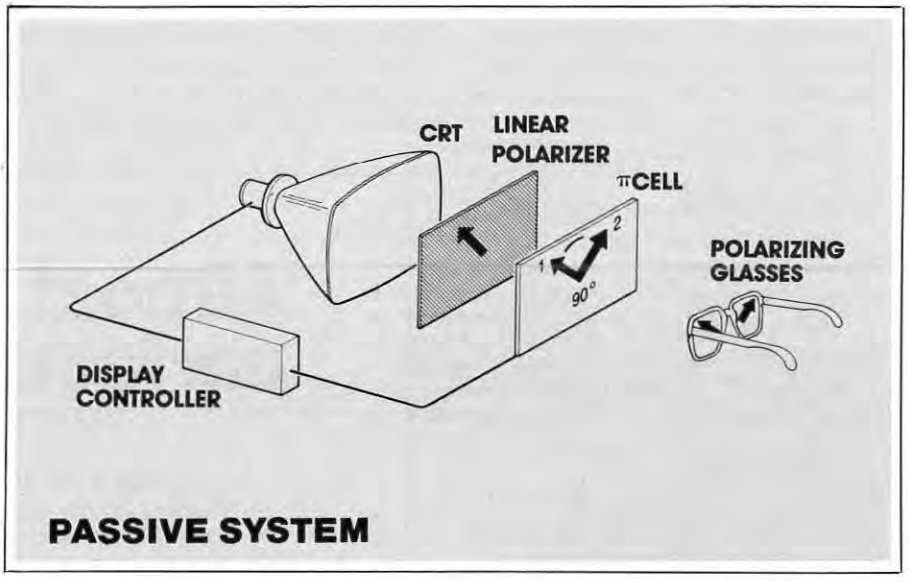
CRT displays full-color 3-D images

True stereoscopic images can be viewed in full color on a single CRT display recently developed by Tektronix Inc. (Beaverton, OR). The 3-D system requires only that the viewer use eyeglasses having polarized lenses, similar to ordinary sunglasses.

Creation of stereoscopic images is accomplished using a Liquid Crystal Shutter that acts as a very fast light switch in a time-multiplexed, 3-D system to select one of two slightly different images for each of the viewers' eyes. The two images are displayed in alternating fields on the CRT while the LCS allows each field to pass through only one eye. A single image depth is perceived from the two rapidly alternating images.

Previous methods of producing such images on a CRT have produced varying degrees of success:

- Anaglyph—this inexpensive method uses two-color encoded images (red/blue) displayed simultaneously, that are then separated by similar color filters worn as glasses by the viewer. The resulting image quality is not good, having unnatural colors and some blurring.
- Space-multiplexing—this side-by-side method requires two separate CRTs displaying the two different images. Light from each display is routed to one of the viewer's eyes using lenses or mirrors. The technique provides good images, but is costly because it requires two CRTs.
- Time-multiplexing—this technique presents the two views in a single device, each view displayed sequentially on alternate scan fields. A light-switching mechanism must be used to allow each eye to see only the intended field.



Among the various light-switching methods available, one uses mechanical shutters, which are cumbersome, expensive, and susceptible to malfunction. Another uses PLZT (lead lanthanum zirconate titanate) ceramics as the optical switch. Such switches have low light transmissivity and require high voltage in the user-worn eyeglasses. Both the mechanical shutter and PLZT methods are interfaced to their respective display devices by an "umbilical" cable.

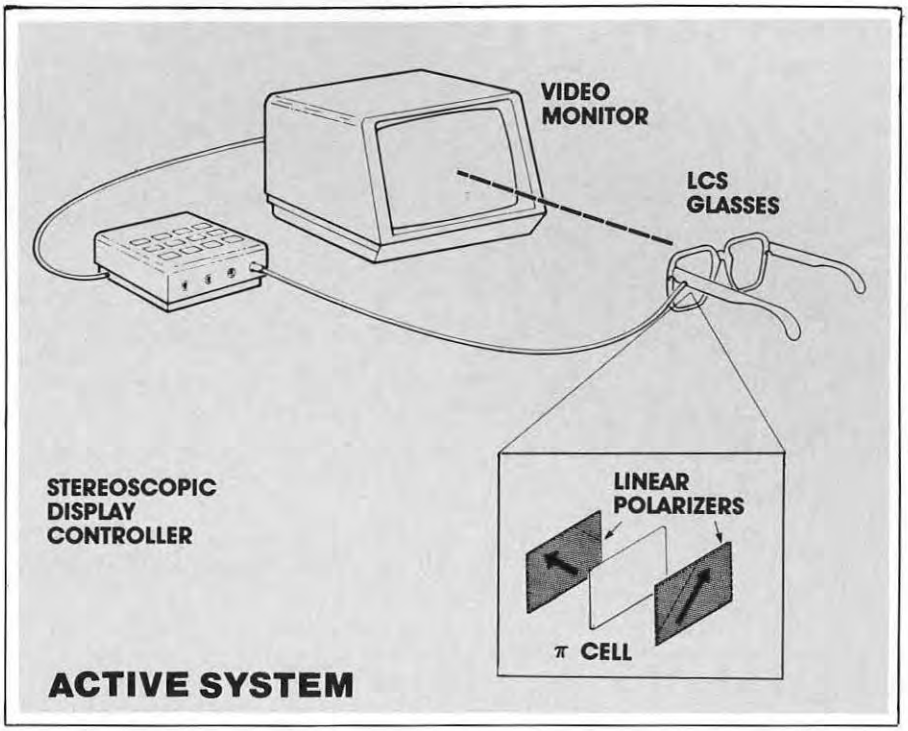
But, with the Liquid Crystal Shutter method, light switching is done by an LCS panel that fits over the front of the CRT display. The stereoscopic 3-D images are then viewed through simple polarizing glassses.

Passive and active

This LCS method of stereoscopic display can be either a passive or active system. The passive system consists of a linear polarizer and proprietary "π-cell" that selectively rotates light 90 deg under control of external voltage. The passive LCS is effectively a polarization encoder. When a voltage is applied, light passing through the cell exits polarized in direction 1. When the voltage is removed,

light passing through the cell is polarized in direction 2. The polarizing glasses worn by the viewer consist of separate linear polarizers (rotated 90 deg) that pass the correct light transmission to each eye.

In an active 3-D device, the LCS replaces the light-switching element in user-worn devices. The active system consists of the π-cell sandwiched between two linear polarizers that are rotated by 90 deg. Each eye observes the display through a separate active system LCS cell. When voltage is applied to the cell, light transmission is stopped; and when removed, the cell transmits light. As the left eye view is displayed on the monitor, the cell in front of the left eye is transparent (voltage removed) and the cell in front of the right eye is opaque (voltage applied). Alternatively when the right eye view is presented on the monitor, the left LCS cell is opaque, and the right LCS is transparent.



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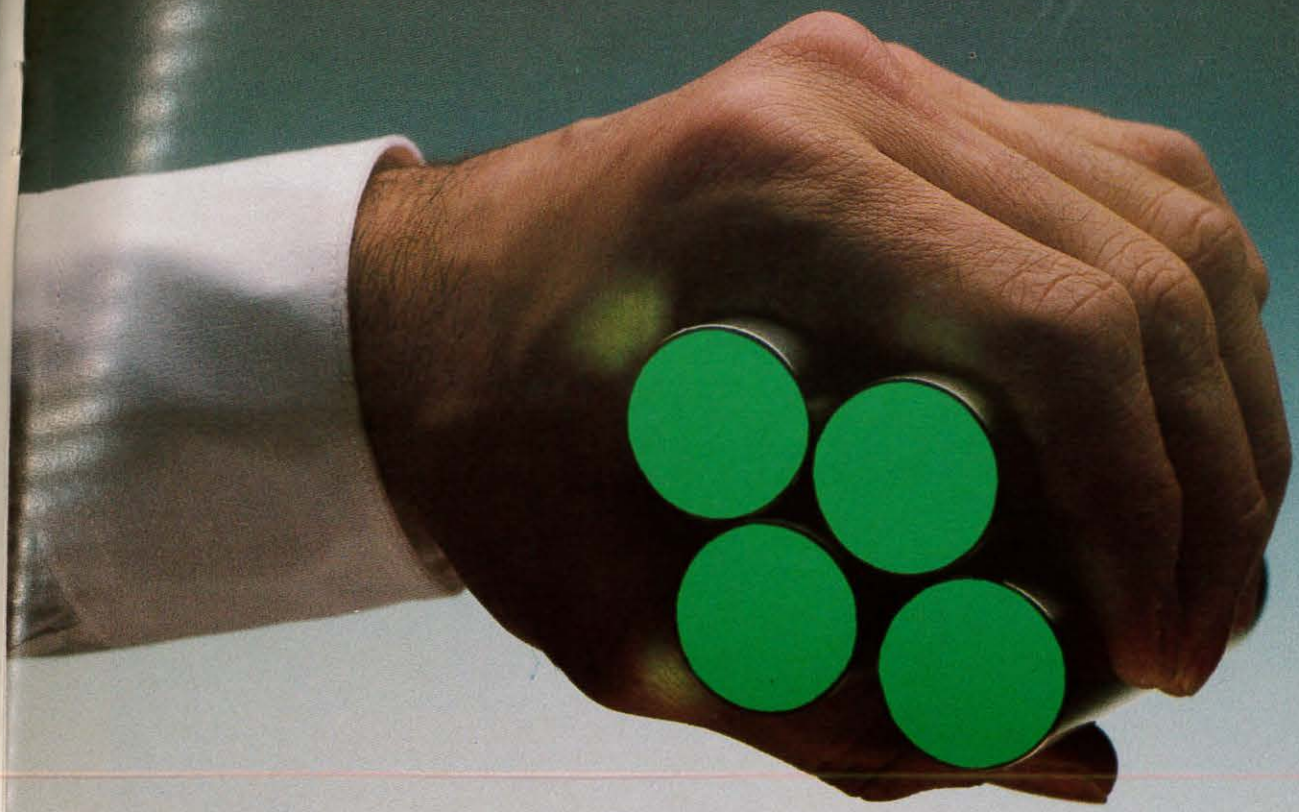
Institute of Systems Science ISS

Our new CRTs are quite a handful.



Introducing Litton's 1" tube.

Now let's see. What could you use a miniature CRT for?

How about a helmet-mounted display.

A compact film recorder.

A hybrid typesetter.

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Litton's L-4272 cathode ray tube is the newest sub-miniature on the market.

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You can buy it as a stand-alone item or with a small coil and magnetic shield.

To get the small picture, contact Litton Electron Devices Division, 1215 S. 52nd Street, Tempe, AZ 85283. Phone (602) 968-4471. TWX: 910-950-0149.

Litton Electron Devices

Shadow-mask CRTs meet military need for color displays

Introduction, over the past few years, of high- and ultra-high-resolution CRT displays coupled with developments in computer graphics, has spurred demand for full-color, military displays—in aircraft, surface vessels, and submarines.

While the US military has been using full-color CRT displays for some time now, most devices were limited to stroke-write systems or commercial CRTs, originally built to operate in benign environments, but then adapted for rugged use. Today's full-color militarized CRT monitors, however, are designed specifically to operate at extreme altitudes, temperatures, and climates; or to withstand severe shock and vibration typical of most military use environments.

One series of such monitors, the HSD 7030 developed by Hartman Systems (Huntington Station, NY), employs a Precision-In-Line (PIL) Gun, Shadow-Mask CRT with permanent self-convergence alignment that provides a wide range of colors, 2 to 1 high-voltage range, and rapid switching speeds required for high resolution graphic displays.

by Stanley W. Roth, Sr. Research Engineer
Hartman Systems, Huntington Station, NY

Hartman's early experience with military CRTs indicated that shadow-mask technology was the most promising for imaging the type of information required for military operations. Although in the 1970s a mask using an elongated vertical slot with a pitch of 0.60 and 0.80 mm had already been used successfully with commercial CRTs, the devices had serious shortcomings for military applications—namely a lack of horizontal support in the mask and aperture stability.

CRT-gun choice

After considering all available practical technologies for color displays, the choice was narrowed to the PIL Shadow-Mask CRT. One alternative system that had been seriously considered was the beam penetration color tube, which does not use a shadow mask, but instead relies on depth of beam penetration of the screen phosphors. Its limited range of colors, however, and difficulties encountered in meeting high voltage and switching speed requirements eliminated it from further consideration.

Another alternative considered, the Delta Gun tube, also utilizes a shadow mask. It provides better beam alignment than the PIL tube, because its 30-odd convergent alignment controls permit aligning and superimposition of the three beams to appear as a single beam at any point on the screen. But, the triple gun easily goes out of alignment whenever the monitor is moved. This necessitates going through a time-consuming convergence adjustment after every move, a procedure that is totally unacceptable in a military environment. Additionally, such a sophisticated adjustment is not readily possible under field-operating conditions.

With the PIL gun tube, however, a pre-aligned yoke tube assembly creates a permanently converged CRT configuration that remains aligned as long as the initial alignment is not changed. Prior experience with the PIL indicates that even aging components generally do not introduce any significant change in this pre-set convergence until all components simultaneously incur extreme aging.

An inherent problem in the PIL gun tube, however, is the presence of a nominal convergence around the screen's edges. Fortunately, this is not a severe problem and can be factory-corrected. One solution was to limit the sweep with an underscanned screen. Also, the tubes were given an additional

(Continued on p. 26 . . .)

Software emulates avionic displays and environment

Designers of avionic displays have tended to approach development of new systems through a five-step process: critically assessing existing equipment; attempting to remove the poor features; enhancing the good features; introducing novel ideas; and finally, building a prototype for visual inspection.

by John Laycock
Royal Aircraft Establishment
Farnborough, Hants, UK

This traditional approach, however, dictates that if the merits of alternative designs warrant, it is necessary to construct several prototypes—with all the inherent time and cost penalties. Because avionic displays must be engineered to exceptionally high specifications, fabricating multiple prototypes becomes prohibitive.

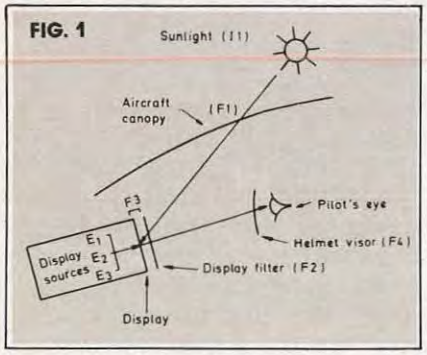
Consequently, alternative methods have had to be developed to enable a designer to decide which single configuration would best fulfill the pilot's needs. Among such methods is a computer simulation approach that uses:

- Software to manipulate the physical characteristics of the optical components of the display, as well as the optical properties of the environment in which the display is used; and
- Software to manipulate psychophysical data about the pilot's visual sensitivity.

This article discusses in brief the software package that permits alternative display designs to be visually inspected, under simulated conditions, thus allowing the optimum design to be selected prior to prototype fabrication.

Design problem

An example of the type of problem faced by the avionic display designer (Fig. 1) involves an external illumination source being modified by the aircraft's canopy (F_1), which acts as a filter. The filtered illuminant strikes the display device, which reflects some of the ambient both at the display filter (F_2) and at the front surface of the display itself. These two reflections may be combined and considered as a single filter (F_3).

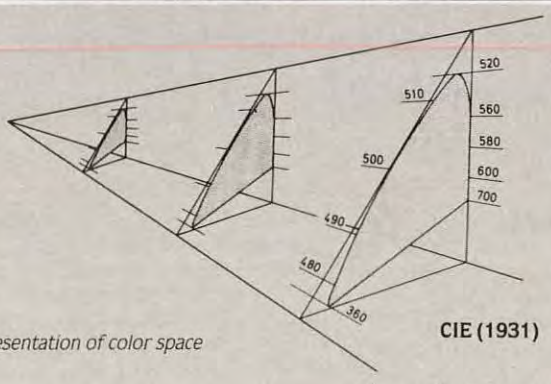


Cockpit display: *Schematic of optical elements in a representative configuration.*

The emitted light from the trichromatic display passes through the filter combination and is added to the reflected light, before proceeding towards the pilot who views the display through a protective visor (F_4), which also has filtered properties.

This situation can be represented in more general terms as a flow chart (Fig. 2), where the display and environmental sources are individually filtered and summed prior to the final stage of filtration.

If required, within each branch multiple sources and filters may be considered undergoing common or independent filtrations. The effects of the



3-D representation of color space

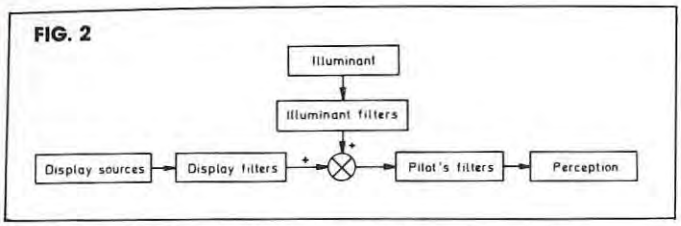
CIE (1931)

CIE System

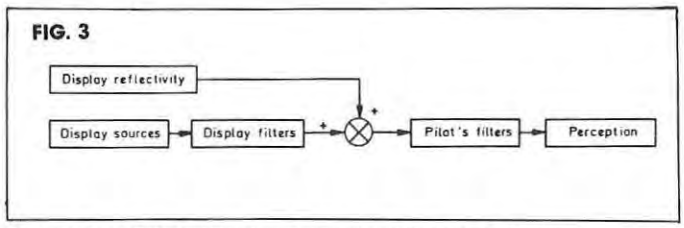
Over the past 60 years, several systems have been developed to describe the physical attributes of emitted or reflected light. None has been more widely used than that devised by CIE—Commission Internationale l'Eclairage (International Lighting Commission). The CIE (1931) system is one of color specification in which the color of an object is defined in terms of the light that radiates from it. By considering only radiated light, the system is able to deal equally well with objects that are emissive sources as well as those that are reflective surfaces that may be viewed under differing illumination.

With this method, colors are numerically represented within a 3-D space in such a way that each color occupies a unique position within the space. When colors are added together the position of the resultant color may be calculated by simple vector geometry.

Although the system is based upon physical attributes of a stimulus, the space represents relationship between the energy of light of a given wavelength and its color-producing effects.



General case: *Combination of illuminant, display sources and filters.*

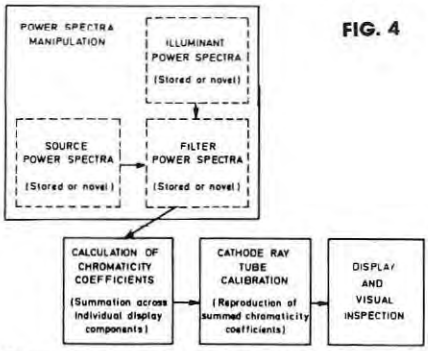


General case: *Effect of illuminant represented by display reflectivity.*

ambient cannot be summed in a simple fashion with the display sources, as the spectral properties of the reflecting surfaces must be taken into consideration (Fig. 3).

For surface color design problems, the display sources may be removed so that the figure reduces to a surface reflectivity term that incorporates the effects of the ambient.

In principle, all that is required to represent elements of Fig. 2 and Fig. 3 within a computer are the power spectral properties of the materials involved. In the left-hand portion of Fig. 4 are three modules that contain the spec-



Physical emulation: *Constituent components of computer model.*

tral properties of the various sources and filters. Only a single filter module is required because illuminant filters, source filters, and surface reflections can all be represented in the same power spectral form.

If only surface colors viewed under illuminants are to be considered, the source power spectral module becomes redundant.

Given an extensive library of spectral files, it becomes possible to mix illuminants, sources, and reflections to produce a combined power spectral output to the next module. Within this module, the resultant power spectrum of the mixture is multiplied by the Color Matching Functions to deduce Tristimulus Values and Chromaticity Coefficients of the mixture.

For some applications, a numerical representation of the mixture may be sufficient to allow the designer to decide whether the selected materials are adequate, or whether it is necessary to select alternative illumination of filtration to achieve the desired end-product.

In many situations, however, it is difficult to envisage how adequate the visual image would be simply from a table of numbers, or a set of curves. Fortunately, the existence of metamerism means that to appreciate the appearance of a power spectrum it is not necessary to precisely reproduce the power spectrum, but it is sufficient to produce a metameric match.

Within Fig. 4, the final two modules indicate how this is achieved. By calibrating a color cathode-ray tube so that specific chromaticities can be demanded and reproduced, it becomes possible to produce a visual inspection. And, by making repetitive passes through the power spectral data, the individual colors of all the image elements may be computed so that eventually a complex polychromatic, geometrical image can be generated.

By using an interactive terminal that allows both geometry and color content of the image to be precisely varied, a designer has the ability to systematically investigate the effects different ambient illuminations will have on both sources and surfaces, and thus allow the optimum materials to be selected. In addition, the geometry of the image can be manipulated to allow the interaction of areas of color to be rapidly appreciated.

Design tool

To apply these principles, a set of software tools—IDEAL (Integrating Display Elements And Light)—was developed for use with an Apple II microcomputer system. The package contains 10 modules (Fig. 5) whose routing is critical, since calculations must be performed in a specific order. This allows the software to check whether valid routes have been selected.

- FORM FILE—Module allows the essential library of data files to be entered and assembled on the computer. Data can be entered by numeric keypad or graphics tablet. If available in a compatible form, data can also be read di-

POSSIBLE DISPLAY CONFIGURATION COMPONENTS

TYPE OF COMPONENT	COMPONENT
Emissive display	Phosphor
	Light emitting diodes
	Liquid crystal (transmitting)
	Electroluminescent display
	Film transparencies
Non-emissive display	Electromechanical display
	Liquid crystal (reflecting)
Illuminants	Incandescent lamp
	Fluorescent lamp
	Daylight/starlight
Filters	Cockpit transparencies
	Window glass
	Contrast enhancing filters
	Anti-reflection coatings
	Visors
Reflecting surfaces	Display surfaces
	Matt black reflectors
	Paint
	Printed maps

Table itemizes only a few of the component types and specific components that are capable of analysis by IDEAL. Although the components are listed independently, IDEAL is capable of analyzing complex combinations of the discrete components.

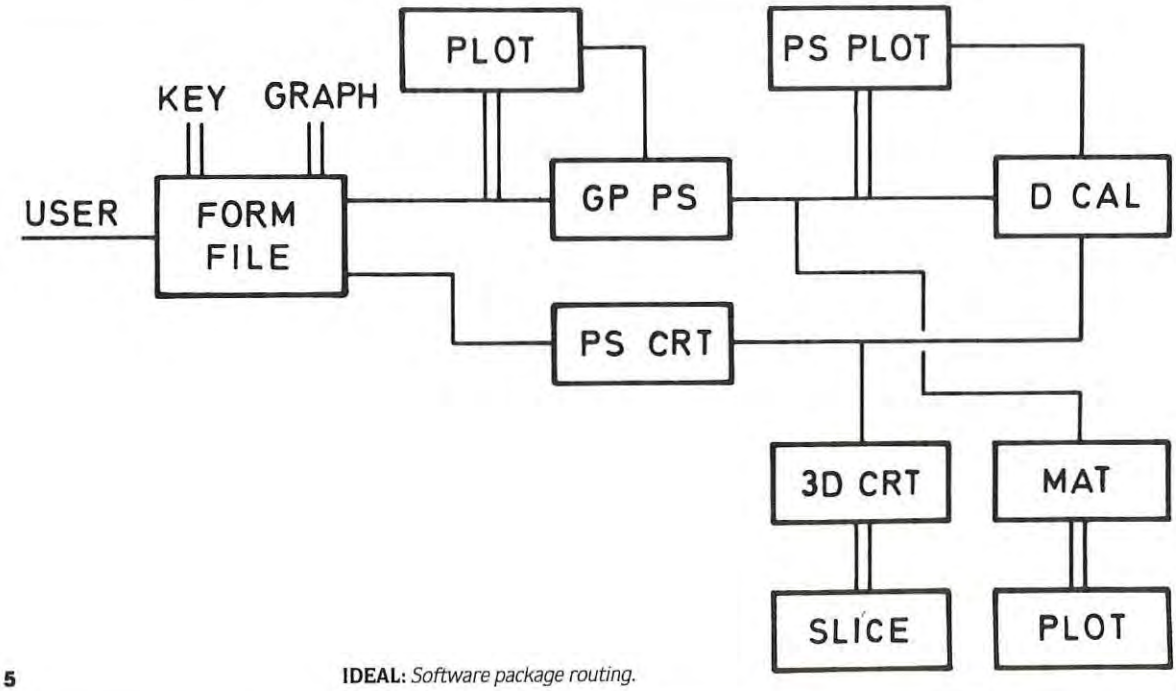


FIG. 5 **IDEAL:** *Software package routing.*

rectly from the disk of a computer-controlled spectroradiometer. Once within the computer, all source data are normalized to 1 cd m^{-2}, while filters and reflection spectra are stored as absolute values relative to 100% transmission or reflectance.

- **PLOT**—Routine retrieves data assembled by FORM FILE, or a spectroradiometer disk, and presents them in graphical form either on a VDU or as hard copy on a line printer. Data may be displayed at 1 nm or 10 nm resolution within the range 380-770 nm. A hard copy catalog can be assembled, allowing rapid reference to materials without having to search numerous computer disks.
- **GP PS**—General Purpose Power Spectrum program may be used to calculate the power spectrum and CIE coordinates of combined and filtered sources. Within this program, an unlimited number of sources may be processed, each being passed through a maximum of 10 filtration or reflection processes. Power spectral calculations are achieved by adding and multiplying data arrays retrieved from disk, before a final multiplication process, involving the Color Matching Functions (CMF), occurs to obtain Tristimulus Values and CIE coordinates. The program is not only able to deal with continuous spectra, but incorporates calculations for dealing with line elements.
- **PS PLOT**—Routine allows data from GP PS to be plotted, if the tabular output is not easily interpretable. Spectral plots are derived and displayed in cascade, showing each source passing through each filtering or reflecting process in turn. The entire plot can be copied to a line printer, along with the file names of the materials used.
- **PS CRT**—Program is a specialized version of GP PS—required for CRT design that permits calculation of the final coordinates of the three phosphor primaries of the CRT when subjected to the modifying effects of illumination and various filters. Up to three illuminants may be considered, each passing through up to four filters, two of which must be common to all illuminants. The illumination may be modified by up to three filters on the front of the CRT. Both emitted and reflected light may pass through up to three filters positioned in front of the pilot's eyes. Data used in these calculations is derived from FORM FILE or input for GP PS.
- **3D CRT**—Plotting routine uses previously stored summary data to plot a 3D graphics projection of the CRT chromatic and luminance rendering envelope in ambient illumination. The software allows the projection angles of the plot to be changed by the operator, thus permitting the volume to be rotated and viewed from any angle.
- **SLICE**—Routine permits viewing a slice through the volume plotted by 3D CRT, when details of the chromatic rendering capability of the CRT are required at a specific luminance level, under given illumination and filtering conditions.
- **D CAL**—Module converts CIE coordinate data into display emissions at those coordinates by calculating the RGB drive required at the input to the computer terminal by knowing the response characteristics of the terminal. Details of the coordinates of the three phosphor primaries incorporated within the terminal must be entered along with the luminance output against drive level (in volts or bits) for each of the three guns. Data are obtained by simple photometry.

- **MAT**—Routine manipulates the coordinates of the three CRT primaries and the derived white point. This routine is applied for specialized applications where it may be necessary to derive the matrix equations for CRT gun drive, to allow the CRT to produce precise color coordinates in the PAL, NTSC, or other standard broadcast systems.
- **PLOT**—Module permits numerical output from MAT to be plotted to facilitate interpretation.

The IDEAL software has already been used successfully for designing many display devices. The approach, however, requires critical assessment of a displayed image or expert analysis of numerical data. While a small inexpensive microcomputer is capable of running IDEAL, it is necessary to utilize a sophisticated image processor for inspecting an image.

(Developed from "Avionic Displays", John Laycock, Royal Aircraft Establishment, Farnborough, Hants, UK - SID Seminar Lecture Notes, Vol. II: May 3, 1985, p. 5.2)

For Paper, circle Reader-Service # 103

Resolution requirements for electronic scanning

One important application of electronic digitizers is the scanning of line art, such as engineering and equipment parts drawings, with the ultimate goal of obtaining binarized art.

Resolution requirements for scanning this information are sometimes difficult to calculate, and thus are usually determined by subjective evaluation or through trial-and-error methods. Too much resolution is inefficient and consumes unnecessary resources, while too little resolution may be incapable of resolving detail adequately.

One method frequently used is to set the scanning pixel size at twice the minimum line width found in the drawing. This will yield good results for a fixed threshold binarization, assuming an even illumination.

Equivalent results, however, can also be obtained by scanning at lower resolution (larger pixel size) and using an adaptive threshold binarization that operates on local areas.

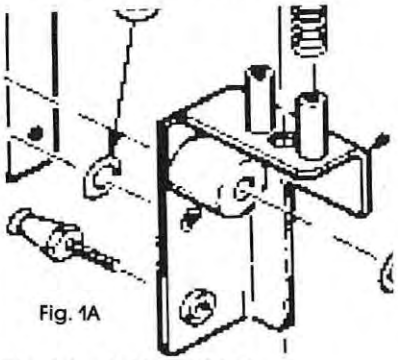
Effects of resolution

The process of scanning using a sensor, or array of sensors such as a linear array, converts the object to be digitized

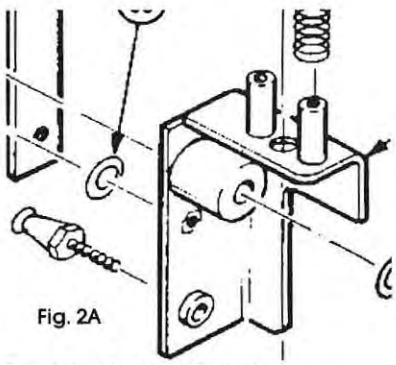
by Thomas J. Bilotta and John J. Lumis
EIKONIX Corp., Bedford, MA

Scanning line art drawings

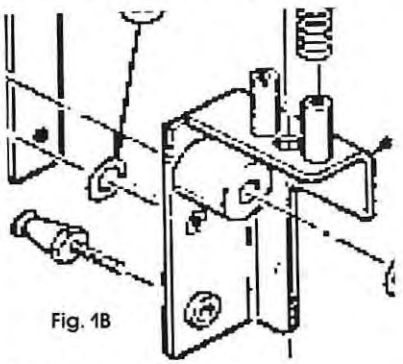
A parts drawing having a minimum line width of approximately 0.01 in. (100 lines/in.) was digitized at 100, 200, and 500 lines/in. at approximately 5 bits/pixel. The results are shown below.



Fixed threshold – 100 LPI

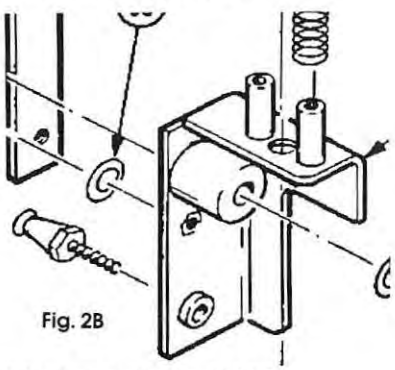


Fixed threshold – 200 LPI



Adaptive threshold – 100 LPI

The adaptive threshold appears to retain the fine detail compared to the fixed threshold.



Adaptive threshold – 200 LPI

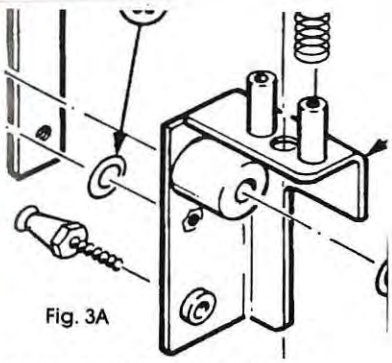
The adaptive threshold is marginally better than the fixed threshold.

into discrete picture elements (pixels) by use of an optical system that projects the sensor-active area onto the object.

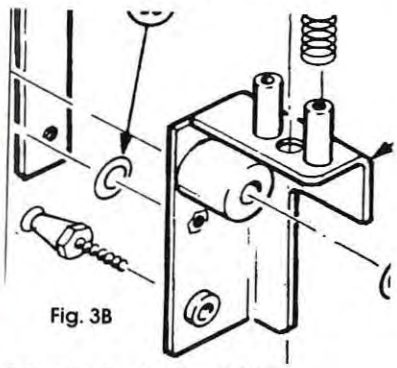
The resultant pixel size is the sensor size scaled by the magnification of the optical system. For example: Consider the scanning of a resolution target that consists of alternating black and white bands of equal width, using an array of sensors at the same effective frequency as the target frequency.

If the target is perfectly aligned with the array, the data will show maximum contrast or modulation. If, however, the target is shifted by half a pixel, each pixel images half of the black and white bars, effectively yielding zero modulation, hence the pattern is unrecoverable.

In practice, this is an isolated case, and most edges will provide a modulation between these two extremes. By sampling at twice the target frequency (Nyquist sample theorem), all of the information is recoverable, with the resultant modulation never going to zero, regardless of any shift.



Fixed threshold — 500 LPI



Adaptive threshold — 500 LPI

There is no significant difference between the fixed and adaptive thresholds.

In the process of binarization, the continuous input dynamic range is reduced to two levels, black and white (or 0 and 1). This requires determining a threshold point in the input range, in which one value is considered below, and the other value above, that point. The process can be done with either analog input or after the signal has been digitized.

Picture data binarized in this manner is considered to be a fixed threshold in which the dynamic range of the sensor is reduced to 1 bit, regardless of the signal-to-noise ratio characteristics of the detector.

Adaptive thresholding, on the other hand, takes advantage of the signal-to-noise ratio of the detector by locally processing the gray scale information to arrive at a dynamic threshold. Thus, the effective dynamic range of the system is much higher. In practice, the location of edges in a document, with respect to the sensor, can be considered random; and also the document line-frequency will most likely be variable due to different line widths.

Selecting the pixel size (e.g. inches/pixel), based on smallest line width, in effect specifies the scanning resolution (pixel/inch) which is defined as the capability to distinguish two close lines separated by a space (or vice versa) in typically a 1:1 ratio. The smallest such target resolvable is considered to be the limit of resolution. Lines and spaces, however, rarely occur at a 1:1 ratio.

Optical considerations

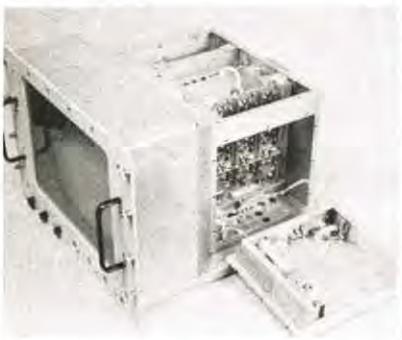
These do not take into account the effect of optics on the scan results. When a lens is used, the result is to degrade the contrast as a function of frequency, commonly characterized as the lens MTF. This, combined with the MTF of the sensor, or sensor array, will limit the maximum contrast of the system.

It is important that the system MTF never go to zero at frequencies higher than the target frequency of interest, otherwise aliasing will occur. In addition, the MTF at the target frequency should be high enough to handle the input target contrast.

Thus, to be able to scan the target frequency with minimal loss of information, the system should be capable of digitizing to an appropriate number of gray levels and to process the data using an adaptive algorithm that analyzes local areas to determine the proper threshold for that zone.

For information circle Reader Service # 101

(... continued from p. 16)



Currently, the configuration most in demand is a 19-in. diagonal, color display monitor comprised of eight primary modules, all housed in a 4-cu-ft package. Its 20-in. width fits comfortably into a 24-in. rack; and snugly, into a 19-in. rack. Its 15-in. height exceeds tube height by 2 in., allowing ample room for shock mounting as well as the base tray. The 16-in. deep CRT allows sufficient space to house its eight major assemblies in the overall 20-in.-deep unit.

convergence alignment, which reduced edge mis-convergence to acceptable levels.

The PIL assembly is pre-aligned for static and dynamic convergence, thus eliminating dynamic convergence circuitry and periodic convergence alignments. Mis-convergence is held to less than 0.15 in. within a 9-in.-dia circle in the center of the screen and 0.02 in. elsewhere—with no operator adjustments required. Internal color correction circuitry mixes the red, green, and blue (RGB) video inputs to produce a white raster brightness greater than 20 ft-lamberts.

Image writing format

Although stroke-image writing is primarily favored by subjective CRT users, those requiring a large quantity of data, as well as quality of image, ordinarily opt for raster-scan writing.

The benefits of stroke writing—greater versatility, with a wider selection of alphanumeric fonts—are more than offset by the raster scan's ability to incorporate large quantities of data on the screen. Additionally, with a raster scan flicker, jitter, and screen addressability are greatly simplified. A straight raster scan format proved to be the most practical and universally acceptable format for a fully militarized full-color CRT monitor.

The system's CRT and yoke assembly is configured as a single entity, with degauss and optical filter. Its unique mounting provides shock and vibration isolation, reducing axial inputs to the mask, and transverse inputs to the gun, while maintaining the unit's compact size. Tests have verified that the CRT can operate efficiently at vibration levels to 5g (sinusoidal to 500 Hz) and shock levels to 60g.

Field maintainability and ease of system serviceability were prime considerations in system design, with all subassemblies readily accessed via quick-release hardware or built-in extractors. Internal and external connectors were keyed to prevent improper mating, which could result in possible damage or circuit malfunction.

A proprietary Built-In Test (BIT) system, containing two fault detection modules, eliminates the need for special test equipment. The modules are:

- Dynamic pattern generator—This fault detection circuit provides a cross-hatch pattern with a 7-color bar for color verification and a gray scale of 7 shades for contrast and brightness alignment. With this pattern, an operator can quickly determine whether the fault is within the unit or due to a problem with the incoming signal.
- Active module—Each major module in the system is provided with its own fault indicator circuit that denotes fault status by activating an LED. These circuits are combined in a front panel LED indicator.

The full-color PIL system provides the military with an increased range of information display capabilities, including maps, photographs, serial imagery, status charts, damage assessment, and fire control graphics, among others—thus enabling quicker detection and interpretation of information displayed.

For information circle Reader Service # 100

For information circle Reader Service #20

How Syntronic helps you meet the design challenges of high-frequency, high-resolution CRT displays.

The demands for higher frequencies and higher resolution in CRT displays are more evident today than ever before.

Syntronic recognized this demand years ago. We began —and still are—responding with improvements in CRT deflection component designs for modern high-frequency scan circuitry.

Syntronic offers technical assistance for product development supporting commercial, industrial, and military systems.

High Frequency

At high scan frequencies, ordinary deflection yokes lose efficiency or may even melt, as in raster-type systems.

Syntronic has developed yoke designs incorporating low-loss cores, multi-stranded (Litz) wire, and high-grade molded housings utilizing a flow-through venting system to dissipate heat without forced cooling.

High Resolution

To maintain high resolution from corner-to-corner (with high-speed, low-inductance yoke designs), Syntronic utilizes precision stator-type cores, contour matched to the CRT neck profile.

The coil distribution characteristics are then optimized for the application.

Syntronic stator-core designs allow production repeatability and low spot-growth that is mandatory for modern wide-angle, high brightness displays.

This repeatability, or consistency, assures the user the same product from prototype through production.

Learn More in Syntronic AP Notes

Syntronic publishes a series of Application Notes that detail these and other deflection yoke considerations.

Send for your copy of these AP Notes to learn more about Syntronic and its efforts in high-frequency, high-resolution CRT displays.

syntronic

Syntronic Instruments, Inc.
Department 6A
100 Industrial Road
Addison, IL 60101
Phone (312) 543-6444

Products

Miniature electrostatic camera

Combining flashlight-like maneuverability with standard 525-line TV resolution, a miniature electrostatic tube camera fits into a shirt pocket. It weighs less than six ounces and requires less than one watt to transmit standard EIA signals. This low energy requirement permits extended field operation when powered by ordinary penlight batteries.

Electrostatic focusing and a deflection mechanism eliminate the need for bulky, energy-demanding coils that are normally used in conventional cameras for beam resolution. This makes the camera extremely compact, lighter and more energy efficient than other type video cameras.

SONY INDUSTRIES, Paramus, NJ.

For information, circle Reader Service #51

Sealed LED photoconductor

A series of photomods combine a photoconductive cell and an LED in a hermetically-sealed TO-5 package that assures high reliability and long life, and provides easier circuit board mounting compared to units with axial lead configurations. The hermetically-sealed package also allows more thorough circuit board cleaning than plastic package isolators.

The characteristics of the photoconductive cell, both as a component and as an opto-isolator, when matched with an LED, make the CLM 7000 series well-suited for audio, analog controls, computer interface, telecommunication filters, distortion analyzers, voltage-controlled oscillators, and automatic gain control applications. Price of the series varies with the specific unit from $1.46 to $1.61 each, in quantities of 1,000 units.

CLAIREX ELECTRONICS, Mt. Vernon, NY

For information, circle Reader Service #52

Video graphic recorder

Photographic-quality, monochrome, continuous-tone, hard-copy images can be produced directly with the VGR 5000 Video Graphics Recorder. Designed specifically for use with computer graphics systems and other high-resolution video sources, the VGR 5000 hard-copy recorder prints images from raster scan video sources up to 1116 lines per fame, 60 Hz, non-interlaced; or up to 2233 lines per frame, 60 Hz, interlaced. Equivalent 50 Hz refresh rates can be used.

The VGR interfaces directly with the video display using BNC cables. No CPU time or special software are required. Copies are composed of 16 or more shades of gray, using a new dry silver paper designed specifically for the VGR 5000. The 8½ x 11-in. glossy copies have high resolution and acuity with a minimum-to-maximum density range from 0.2 to 1.6.

HONEYWELL INC., TEST INSTRUMENT DIV., Denver, CO.

For information, circle Reader Service #53

Military optocouplers

Single- and dual-channel Darlington-output optocouplers feature hermetically-sealed, eight-pin ceramic packages to meet the rigors of military and aerospace applications. Operating over the full military temperature range of −55C to +125C, both products are available in high-resolution in high-reliability versions tested to MIL-STD-883 Class B. Shallow diffusion depths and small transistor base areas of the HCPL-5700 and HCPL-5730 photo ICs mean lowered susceptibility to radiation damage.

Each optocoupler channel consists of an A1GaAs light-emitting diode, optically cou-

pled to an integrated high-gain photon detector. The high-gain output stage features an open-collector output providing both lower output saturation voltage (0.11 V typical) and higher signalling speed than possible with coventional photo-Darlington optocouplers. Minimum current-transfer ratio (CTR) of 200% at an input current of only 0.5 mA makes the new optocouplers suitable for use in low-light current applications such as MOS, CMOS, low-power logic interfaces or line receivers.
HEWLETT-PACKARD CO., Palo Alto, CA.
For information, circle Reader Service #54

Touch-screen monitor

Cyclops® Touch-Screen Monitor uses an infrared optical system that replaces scores of costly LEDs or membrane switch matrixes with a single infrared LED, phototransistor, and scanning detector. The Cyclops eliminates the need for membrane overlays, which can impair CRT resolution, transmission characteristics, and contrast, as well as being susceptible to surface damage.

Packaged as a complete unit, the Cyclops monitor, is IBM PC compatible and is available with resolutions ranging from TV-grade (0.63 dot pitch) to high (0.31 dot pitch) resolution, and comes with either TTL or analog outputs. Input is RGB, TTL Video; and RGB, Analog. Display area is 2,000 characters (80 x 25). Price: $540 (and up).
ITW ENTREX, Chicago, IL
For information, circle Reader Service #55

Video signal generator

Model VG 807A Programmable Video Signal Generator, designed by Astro Design (Japan), generates H-sync frequencies up to 200 kHz with dot clock frequencies from 5 MHz to 160 kHz. All horizontal and vertical timing parameters can be adjusted to meet the needs of the monitor under test.

A full range of patterns are built into the generator with complete flexibility for the operator to mix them as required. Any dot combination up to a cell size of 64 × 64 can be used to form special characters.

The VG 807A is easily programmed from its front panel, or programs can be accessed from an internal 8K PROM. Using the PROM prevents any unauthorized tampering with the test routines, making the device ideal for incoming test and production applications.
TEST & MEASUREMENT SYSTEMS, INC., Sunnyvale, CA.
For information, circle Reader Service #66

Automatic measurements

A computer-controlled, high-speed system automatically measures spatial characteristics on a CRT. The GS-1000 System permits determination of beam width, beam centroid location, and beam luminance profiles, with output data in both tabular digital and graphic form. Complete production line characterization is possible of every high performance CRT or display system manufactured, with reduced need for skilled testers and elimination of human errors.
EG&G GAMMA SCIENTIFIC, San Diego, CA.
For information, circle Reader Service #56

Signalling protection

An electronic device, OCAD, protects low frequency ac signalling systems from the effects of the loss of ac power to traction rectifier equipment. The unit continuously monitors the rectifier and, on loss of conduction, provides an output to trip the ac supply to the rectifier at a speed that avoids signal malfunction. It is an intelligent unit that discriminates between a spurious, transient condition and a genuine fault, thus avoiding unnecessary trips.
THORN EMI ELECTRONICS, Hayes, Middlesex, England.
For information, circle Reader Service #57

Raytheon's airborne CRTs exceed even tough MIL-SPEC requirements.

For an airborne CRT display, reliable operation on board a combat helicopter is one of the toughest tests there is.

MIL-STD-810C requires that helicopter-mounted equipment withstand 5G vibration from 5 to 2000 Hz on 3 axes for 9 hours. But ruggedized Raytheon CRTs pass at 20G: *four times* the required level.

And along with high performance, you get high visibility, too. Raytheon's patented RAYVUE® filter produces multiple grey shades even under intense ambient light conditions.

High reliability and high visibility. That's why Raytheon CRTs have been selected for the AH-64A and the Agusta helicopter systems, as well as for many other fighter and bomber aircraft, ATC, AFV and shipboard applications.

Let Raytheon work with you on your next tough environment display requirement, starting at the design phase. Contact Displays Marketing Manager, Raytheon Company, Industrial Components Division, 465 Centre Street, Quincy, MA 02169, (617) 479-5300.

Raytheon

Epoxy seals

Designed for sealing hybrid circuit packages and high temperature wire bonding, EPO-TEK H73 is a thermally conductive, electrically insulating epoxy designed for use in the 300C-400C range. A 100% solids epoxy, it contains no solvents or thinners that can cause excessive outgassing. The degradation temperature is 400C and the epoxy exhibits a Tg of 115C.

Leak rate testing in metal to metal flat packages show leak rates to be less than 10^{-7} cc/se Helium, even after 7 days at 150C, followed by temperature cycling from −55C to 125C, five times.

EPOXY TECHNOLOGY INC., Billerica, MA.

For information, circle Reader Service #59

DC Electroluminescent display

A flat-screen, full field, DC electroluminescent display, designed for commercial applications, is only 1.1 in. thick, 6.0 in. high by 11.5 in. wide. The display provides 640 columns x 200 rows (128,000 pixels) for both text and graphics. Display color is amber. Pixel size is 0.0215 by 0.0008 in.

CHERRY ELECTRICAL PRODUCTS CORP., Waukegan, IL.

For information, circle Reader Service #60

Programmable display

The PD-2816 programmable alphanumeric intelligent display is an end-stackable, 8-character, 18-segment display featuring built-in interface circuitry and is compatible with any 8- or 16-bit microprocessor. Each red character is 0.16 in. high and has a decimal point PLUS underline. The module is 2 in. wide and has a viewing angle of ±35 deg. Each display is intensity coded for ease of matching in multiple module designs. Advanced functions include three-level brightness control plus blanking, highlight capabilities, intercharacter blinking, character underline, and a lamp test that will turn on all the segments at half brightness without disturbing the internal character memory. Price: $32.95 each in 1,000 quantities.

SIEMENS COMPONENTS INC., Cupertino, CA.

For information, circle Reader Service #61

Infrared viewer

New version of the Probeye infrared viewer combines numerical temperature readout features of the Model 686 thermal data viewer with the thermoelectric cooling features of the all-electric Model 664.

Designated Model 699, the unit is a thermal scanner that sees heat the way a camera sees light and instantly converts it to a visual image viewed through the instrument's eyepiece. The thermal data feature of the model shows a continuous digital display in degrees (either Centigrade or Fahrenheit) of the object directly under observation. A sighting circle at the center of the image permits precise positioning and resolution for accurate measurement, and microcomputer control provides the ability to capture and hold temperature for analysis.

HUGHES INDUSTRIAL PRODUCTS DIV., Carlsbad, CA.

For information, circle Reader Service #62

Digital image scanner

Model 4434 scanner digitizes up to 36" x 46" size drawings and maps without electronic seaming, in less than 4 minutes. The E-Z SCAN, as it is called, scans a drawing with a single linear 4096-element, charge-coupled-device (CCD) array housed in the Series 850 digital imaging camera system mounted in the base of the scanner.

A wide range and quality of input media can be handled including original line art, maps, blueprints, sepias, vellum, and mylar prints ranging in size from A to E. Control buttons on the machine permit users to set lightness/darkness range, format size, and input media type. The scanner interfaces to numerous computer systems, such as DEC Q-bus, DEC Unibus, and Multibus systems; as well as the IBM PC, Hewlett-Packard, Tektronix, Data General, and Prime computers among others.

EIKONIX, Bedford, MA.

For information, circle Reader Service #63

Test pattern generator

Model 2503A programmable test pattern generator is configured especially for performance evaluation of monochrome medical imaging devices in which low contrast detail reproduction is important. A feature includes 5% and 95% contrast flags in the gray scale test pattern to verify that subtle, contrast variations are properly reproduced, not obscured by improper display calibration.

The generator has permanent memory capacity to store 65 separate rasters, which may include different scan rates or the same scan rates with variations in pattern or pulse widths. Rates may be stored, recalled for use, edited, or deleted, all by keypad code entries. Parameters and timing are indicated on a 16-segment alphanumeric display.

VISUAL INFORMATION INSTITUTE INC., Xenia, OH.

For information, circle Reader Service #65

President's Message

SOCIETY FOR INFORMATION DISPLAY
8055 West Manchester Avenue-Suite 615
Playa Del Rey, CA 90293 - 213/305-1502

During the summer months, the Society's national office sent 81 letters to potential sustaining members: companies with four or more employees who are members of SID; companies who have advertised in *INFORMATION DISPLAY* this year; and companies who exhibited at the 1985 Symposium. We are happy to report that the following firms joined us in August:

EM Industries, Advanced Chemical Division
Hazeltine Corporation
Magnavox Government & Industrial Electronics Company.

In addition, Particle Data Inc., Planar Systems Inc., and Racal Microelectronic Systems have requested membership. And while writing this message, we received a telephone request from Sigmatron Nova Inc. . . which makes it an even 100.

We also wish to welcome Panasonic, one of the acknowledged leaders in design and development of electronic display systems, as the first Japanese manufacturer to advertise display products in our Journal—the recognized communications leader for the display industry. (See p. 5.)

* * *

I am happy to inform you that I have just taken up an exciting IBM international assignment as the Director of Research at the Institute of Systems Science (ISS), National University of Singapore. The Institute was set up in 1981 under a four-year partnership agreement between IBM and the University.

ISS has two divisions - Research, and Education. The Research Division (inaugurated in August) has the mission to carry out quality applied research in computer technology and software within the University and to create and stimulate a research climate for the entire country. Therefore, joint projects with industry will be encouraged and people from industry will be able to spend sabbaticals at ISS. Several projects, quite interesting from an information display point of view, are being initiated in the areas of public information systems, multi-lingual computer systems and office automation.

As the Director of Research, my immediate task is to build up a core of 35 research staffers in information technology. Professionals (worldwide) with PhDs or their equivalent in computer science, electrical engineering, and related disciplines are key recruiting targets. A full-page recruitment ad appears on page 14 of this Journal, as well as in various publications in Singapore, U.S. and U.K.

Some of you might wonder how I can continue to serve SID as its president while in Singapore. The major difference now is that I am travelling to the U.S. instead of from the U.S. and, with the continuing staff support that IBM has provided me, I feel confident I can complete my term effectively. If at any time, however, the workload becomes too heavy for me to serve you efficiently, your Vice President, John Van Raalte, will take over.

By the way, SID does have several members in Singapore. Please do make an effort to visit us.

I-fay Chang

Mid-Atlantic: October 8, 1985
Speaker: Shinji Morozumi
Manager R&D
Suwa Seikosha
Topic: Active-Matrix-Addressed LCDs
In a sneak preview of his invited presentation to the IDRC (San Diego), Dr. Morozumi described the structures, processes, and applications of active-matrix LCDs, using TFTs and diodes. Dr. Morozumi's group at Suwa Seikosha produced the color TFT/LCD display leading to the Seiko/Epson product, and two consecutive "Best Paper Awards" at the SID International Symposia of 1984-85. His company's development of active-matrix LCDs has enabled the production of display systems with improved image quality over conventional, highly multiplexed TN-LCDs in TV and computer displays.

Scheduled Meetings:
November 14: IDRC '85 Panel Critique, led by Alan Kmetz, AT&T-BTL
December 12: Cockpit Displays and Advanced Packaging Howard Sherman, Grumman Aircraft Co. (at Grumman, Bethpage, NY)
January 8: High Content Display (> 4 Mpels) Nate Caswell, IBM

Los Angeles: October 2, 1985
Speaker: Dick Winner
Hughes Aircraft Co.
Los Angeles, CA
Topic: Night Flying—Helmet Visor Display
At our first meeting of the new season, Dick Winner presented Hughes Aircraft's answer to the question: How do I fly at night without getting killed? To those in the know, the answer might seem easy. But for the rest of us, here is the challenge: Fly at night, below 50 ft. altitude, at high speed, through unfamiliar territory under cover of total darkness (no moon, no stars); don't get lost; don't hit any moving, movable, or immovable objects; and return safely. Dick described and showed us the special helmet visor display that is used, the information that the imaging system displays; and a video tape of actual flights in the dead of night.

For those of you who couldn't make the joint-meeting with the LA Chapter of the Human Factors Society (in September), Dr. Gerald Murch of Tektronix delivered a presentation on psycho-physical aspects of supplying color to computer displays. His talk was laced with practical guidelines, and supported by some striking illustrations. Following a Q&A period, Ken Miller and Pete Baron gave short presentations on color standards and legibility considerations for color shadow-mask CRTs, respectively.

Minneapolis-St. Paul: September 27, 1985
Speaker: Mike Lynch
3-M, St. Paul, MN
Topic: Electronic Document Image System

Mid-Atlantic: September 18, 1985
Speaker: Dr. R. Feigenblatt
IBM - Yorktown Heights, NY
Topic: A Miniature CRT Projection Display
Dr. Feigenblatt's presentation covered the development of economical, transportable quality displays that use traditional CRT projection techniques. Such systems achieve a useful packaging advantage over direct-view CRTs. According to Dr. Feigenblatt, one of the major problems confronting the flat-panel display designer is human I/O devices of portable computers, because human dimensions must be made small enough to be easily transportable. He noted that flat (thin) panel technologies promise the most desirable packaging configurations for a display—lots of window area for a little system volume. For many applications, however, he noted that presently available flat panel displays suffer either from inferior legibility or excessive cost.

Call for Student Papers - SID '86

The Society for Information Display (SID) will sponsor its first travel grant program for students to attend the 1986 SID Symposium (May 6-8, Town and Country Hotel, San Diego, CA).

This new subsidy program provides a total of $10,000 in grants of up to $2,000 each for a professor-student duo to travel to the conference and present an original technical paper. The same acceptance criteria will be applied to papers submitted by students as are applied to other contributed papers.

In addition to the travel grants, a $500 cash prize will be awarded for the best student paper. To be eligible for the prize, the student must deliver the paper at the symposium.

The SID Program Committee plans a formal presentation of the cash prize shortly after the conclusion of the Conference; however, the Committee reserves the right to withhold the cash award in the event that no more than two student papers are accepted.

Papers are sought in the following technical areas: Hard Copy/Display Storage; Interactive I/O Technology; Display Systems and Applications; Flat Panel Displays, Human Factors; Large-Area Displays; CRT Displays; and Display Addressing/Packaging.

Student authors are invited to submit both a 35 to 50-word abstract and a 3 to 7-page technical summary—accompanied by a covering letter identifying the paper as student work—to:

Hildegarde Hammond
Palisades Institute for Research Services Inc.
201 Varick Street—Room 1140
New York, NY 10014

If the student is interested in a travel grant to attend the Symposium, it should be so stated in the covering letter. **Deadline** for receipt of all materials is **Monday, December 9, 1985.** The Program Committee will notify authors of its decision on acceptance by January 27, 1986.

Proposed Bylaws Amendments

In accordance with Article 13—AMENDMENTS, Society for Information Display Bylaws (as of 1 June 1983, SID Directory 1984/85), the SID Secretary hereby submits the proposed amendments, together with the review committee recommendations for approval by majority vote of all members in good standing, concurrent with the next ballot.

EXISTING BYLAWS	REVISED BYLAWS
Article 2 - PURPOSE AND SCOPE	
2. The SID shall maintain its principal offices in the **State of California** from which it shall carry out its general administrative functions in accordance with applicable laws of that state.	**PROPOSED:** The SID shall maintain its principal offices in the USA ... with applicable laws. **EXPLANATION: Makes it possible for SID to locate its offices anywhere in the USA. Removes an unnecessary restriction.**
Article 3 - MEMBERSHIP	
1. Grades and Qualifications - The membership of the SID shall be composed of **six** grades ...	**CHANGE:** ... six grades ... to seven grades. **ADD:** f) Affiliate Society Member - An organization, other than a corporation or business, interested in furthering the purposes of SID.
f) Life Member - An Individual, at least 60 years of age, retired from business ...	**CHANGE:** Current 1.f) to 1.g).
2. Privileges. a) All members in good standing (except that Student, Associate **and** Sustaining Member ...	**INSERT:** "Affiliate Society Member" after "Sustaining Member." Move, "and" to follow sustaining member. **EXPLANATION: Makes it possible to extend SID contacts and services by joining the activities of other societies. Intended for geographical areas where currently SID is not well represented.**
b) (1) Their names and addresses shall be listed in an appropriate manner in each issue of the Journal **and Proceedings.**	**DELETE:** ... and Proceedings. **EXPLANATION: Unnecessary to have this in the Bylaws. Deletion brings the Bylaws into conformance with current practice.**
3. b) Non-payment of dues - Loss of status as member-in-good-standing will occur 30 days after required date for payment of dues. After notice in writing of the member's status **and possible penalties** ...	**DELETE:** ... and possible penalties ... **EXPLANATION: Unnecessarily threatening and difficult to implement.**
Article 4 - DUES AND FEES	
1. d) Life Member: $1.00.	**PROPOSED:** Life Member: As determined by the Board of Directors. **EXPLANATION: Provides the Board of Directors flexibility for review.**

CHANGE: Current 1.d) to 1.e)

ADD: 1.e) Affiliate Society Member: As determined by the Board of Directors.

EXPLANATION: This supports the change in Article 3-1.f).

ADD: 1.f) The Board of Directors may also approve a discount fee for multiple-year dues and for new member registrations at SID Symposia.

EXPLANATION: Fee structures/policies should be set by the Board of Directors and reviewed periodicaly.

2. Dues shall be payable on or before **March 1** of each year.

PROPOSED: December 31

New Members other than Student Members shall be permitted a one-half proration if joining the Society during the latter half of the **fiscal year**.

PROPOSED: Calendar Year

EXPLANATION: This makes the Treasurer's job easier and brings SID into conformance with standard practice.

Article 5 - OFFICERS

ADD: 5.) If an officer is unable to attend an Executive Committee Meeting or a Board Meeting, his/her responsibilities must be delegated to a SID member in good standing.

5. Vacancies occuring for any reason during the year in the office of President will be filled by the then Vice-President.

CHANGE: Current 5 to 6.

EXPLANATION: This assures that Executive and Board meetings will have adequate representation and that all important topics will be addressed.

Article 6 - BOARD OF DIRECTORS

1. a) The Board of Directors shall consist of the elected officers, the immediate past-President, **elected Representative** from each chapter . . .

CHANGE: . . . elected representative from each Chapter . . . to . . . one elected representative from each Chapter . . .

EXPLANATION: Clarifies intent of the Bylaws.

c) The regional Representatives shall be appointed each year by the **prior** Board of Directors . . .

PROPOSED: The Regional Representative shall be appointed each year by the Board of Directors . . .

ADD: The Regional Representatives will prepare the proposals for the formation of local chapters in their region for approval by the Board of Directors. This should include selection of temporary officers and assistance in formulating bylaws for the local chapters that are consistent with SID Society Bylaws.

EXPLANATION: Clarifies how a regional representative is to be appointed and explains what he or she must do.

2. b) **The Regional Representative shall be appointed by the Board of Directors.**

DELETE: The Regional Representative shall be appointed by the Board of Directors.

EXPLANATION: Redundant with 1.c).

ADD: b.) The Chapter Representative will assist local chapters in maintaining a level of technical activities that encourages participation by local SID members and attracts new members.

EXPLANATION: Additional explanation of Chapter Representative's duties.

Article 7 - NOMINATIONS AND ELECTIONS

1. The Nominating Committee will provide a slate of at least one candidate for each elected office. Said slate will be submitted to all qualified members in good standing at least **60** days before the annual general business meeting.

PROPOSED: 90 days

Suitable steps will be taken to assure the anonymity of the completed ballot which must be returned at least **30** days before the annual meeting . . .

PROPOSED: 45 days

EXPLANATION: Provides more (adequate) time for the mailing and return of ballots.

2. Counting of the votes will be **made** by an independent auditor in time to permit installation of newly elected officers and directors at the next general business meeting. A plurality of the legal votes cast for each office will be sufficient **to elect for that office** . . .

CHANGE: . . . will be made by an . . . to . . . will be done by an . . .

CHANGE: . . . will be sufficient to elect for that office . . . to . . . will be sufficient for election . . .

EXPLANATION: Clarification of wording.

Article 8 - STANDING COMMITTEES

1. The following standing committees shall be appointed annually as further defined in later sections of this Article:
   a) Executive Committee
   b) Nominating Committee
   c) Membership Committee
   d) Symposium Advisory Committee

CHANGE: Symposium Advisory Committee to Convention Committee.
EXPLANATION: The Committee represents all SID sponsored conferences, not just the Symposium.

ADD: i) Chapter Formation Committee.
j) Group Formation Committee.
EXPLANATION: Allows the President to appoint these committees when the need exists. i.e., when there is an opportunity for new chapters or groups.

2. Executive Committee.
   a) The Executive Committee shall consist of the President, Vice-President, Secretary and Treasurer with the President as Committee Chairman.

CHANGE: . . . with the President acting as Committee Chairman.
EXPLANATION: Specifies the committee chairmanship.

3. Nominating Committee.
   a) The Chairman and other members of the Nominating Committee shall be appointed by the Board of Directors at the Board of Directors meeting associated with the general business meeting.

PROPOSED: The Nomination Committee shall consist of the last three Presidents and additional members as may be appointed by the Board of Directors at the Board of Directors meeting associated with the general business meeting.
EXPLANATION: The proposed change brings the SID Bylaws into conformance with existing tradition.

6. The Symposium Advisory Committee shall . . .

CHANGE: "Symposium Advisory Committee" to "Convention Committee."

   e) Recommend other technical meetings, both national and international, to be sponsored or cosponsored by SID and, upon approval by the Board of Directors, arrange for their implementation in a businesslike and professional manner as with the symposium.

DELETE: . . . as with the symposium.

7. The Honors and Awards Committee shall:
   a) Review candidates for election to Fellow and make such recommendations to the Board of Directors.

PROPOSED: Review candidates for Fellow, Frances Rice Darne Award, Beatrice Winner Award and Special Recognition Awards, and make . . .
EXPLANATION: Specifies which awards are to be reviewed by the committee.

8. The Publications Committee shall:

PROPOSED: The Publications Committee shall:

   b) Encourage submission of and review all papers and articles prepared by members carrying the society name in any way.

   b) Encourage submission of and review of papers and articles for publications in Society Journals.

   d) Provide guidance and direction for the editor and/or editorial staff of offical SID journals and other publications as may be required.

   d) Provide guidance and direction to the editor and/or editorial staff of official SID publications as may be required.
EXPLANATION: Clarifies the intent of the Bylaws.

11. All members of the Executive Committee shall be ex-officio members of all other committees except the Nominating Committee.

CHANGE: 11 to 13.
ADD: 11.) The Chapter Formation Committee shall:
   a.) Promote the activities of SID and the formation of new chapters world-wide.
   b.) Formulate specific proposals for new chapter formation and present these to the Board of Directors for review prior to implementation.
   c.) The SID will support new and existing chapter activities by helping them organize mini symposia or workshops. SID will assist in inviting world renowned experts to participate. These experts will be selected from among members of the society.
EXPLANATION: Specifies the purpose and duties of this Committee.
ADD: 12.) The Group Formation Committee shall:
   a.) Promote the activities of SID and the formation of new technical groups for the purpose of encouraging growth and participation in emerging technical areas of interest to SID.
   b.) Formulate specific proposals for new technical group formation and present these to the Board of Directors for review prior to implementation.
EXPLANATION: Specifies the purpose and duties of this Committee.

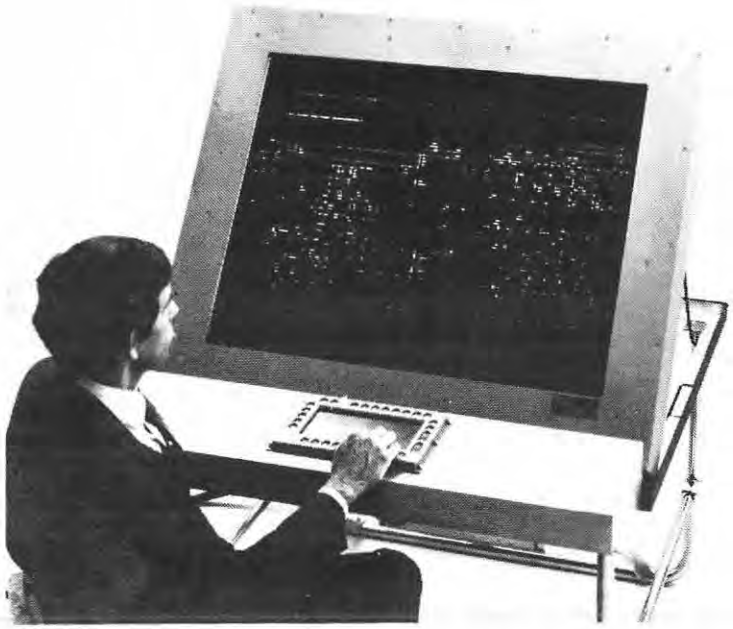
PHOTONICS TECHNOLOGY, INC.

PIONEERS AND LEADERS IN THE Design, Development, and Production of AC Gas Discharge Displays

PHOTONICS TECHNOLOGY PRESENTS

THE WORLD'S FIRST METER-SIZE, HIGH RESOLUTION FLAT DISPLAY TERMINAL

DEVELOPED FOR MILITARY PROGRAMS INCLUDING U.S.ARMY AFATDS



This is the world's first large area, high resolution, non-projected, flat display terminal. Utilizing AC gas discharge plasma display technology, the terminal has an active display matrix of 1600 by 1200 pixels measuring over 39 inches (one meter) diagonally with 5.3 square feet of viewing area and a resolution of 2500 pixels per square inch. All drive electronics are mounted in a 4 inch thick picture frame package around the perimeter of the transparent, thin (0.5 inch) display screen allowing for rear-projected and see-through applications.

Jointly developed by Photonics Technology, Inc., Luckey, Ohio and Magnavox Electronic Systems Co., Ft. Wayne, Indiana.

Photonics and Magnavox are presently completing the development of AC gas discharge flat panel displays ranging in size up to 3 meters with active display matrices up to 4096 by 4096 pixels. Multicolor displays are also being developed.

Photonics is the world's leading developer and manufacturer of sophisticated, high technology AC gas discharge displays. We are able to design and manufacture flat display panels, monitors, and/or terminals in a variety of sizes at relatively low costs. Our flat displays range in size from a few centimeters up to one meter. Some of our standard and custom displays include the following:

Panel Size, Pixels	Resolution, Pixels Per Linear Inch
128 x 256	40, 60
128 x 512	60
256 x 256	60
256 x 512	64
512 x 512	60, 64, 73, 83
512 x 1024	60
1024 x 1024	60, 73, 83
1200 x 1600	50.8, 101

Our standard display resolution ranges from 30 to 100 pixels per linear inch (900 to 10,000 pixels per square inch). Display resolutions up to 200 pixels per linear inch are available.

For Further Information, Contact:

Donald K. Wedding Sr., VP Marketing Photonics Technology, Inc., P.O. Box 432, Luckey, Ohio 43443, 419-666-0033.
Research, Development, and Manufacturing facilities located at 6967 Wales Road, Northwood, Ohio 43619.

Article 9 - FINANCES

1. All funds of the SID other than petty cash shall be kept in recognized banking and savings and loan institutions . . .

ADD: The Executive Committee will review and approve by a majority vote the Treasurer's recommendation of the bank and/or financial institution in which the SID funds are to be kept.

Expenditures of funds in excess of that amount shall have the approval of **the President and the Treasurer.** All expenditures shall fall within the budgets as approved by the Board of Directors.

PROPOSED: . . . Expenditures of funds in excess of that amount shall have the approval of any two members of the Executive Committee.

EXPLANATION: Provides additional safeguards for major financial decisions and for large expenditures.

2. **The President and Treasurer** shall be bonded for the duration of their terms in office at the expense of the SID.

PROPOSED: The President, Vice President, Secretary, and Treasurer shall be bonded . . .

EXPLANATION: This change supports the proposed change in Article 9-1.

Article 10 - MEETINGS

2. The order of business of the annual general business meeting shall be . . .
   - e) Reports of standing committees.
   - f) Reports of special committees.
   - g) Unfinished business.
   - h) New business.
   - i) Announcements.
   - j) Adjournment.

DELETE: e), f)

CHANGE: g) to e), h) to f), i) to g), j) to h).

4. In all matters not covered by the bylaws, the SID shall be governed by Robert's Rules of Order **Revised, Seventy-fifth Anniversary Edition.**

DELETE: . . . Revised, Seventy-fifth Anniversary Edition.

EXPLANATION: Brings the Bylaws into conformance with current practice. SID members interested in details beyond those discussed at the Annual General Business Meeting are welcome to attend the Board Meetings.

Article 12 - CHAPTERS

1. **Upon submission of acceptable petitions,** the Executive Committee shall approve the formation of Chapters.

PROPOSED: Upon submission of acceptable petitions including a set of Chapter Bylaws consistent with SID Bylaws, the Executive Committee shall . . .

EXPLANATION: This clarifies the intent of the current statement referring to acceptable petitions.

2. . . . Chapters shall have funds apportioned to their use, at a rate determined annually by the Board of Directors for each member of Associate or Member grade by the **national** society Treasurer . . .

DELETE: "national"

3. Members petitioning for a new chapter shall submit a set of chapter bylaws consistent with the **national** society bylaws.

DELETE: "national"

Chapters shall maintain these bylaws in consonance with any changes in the **national** bylaws approved by the SID membership.

CHANGE: "national" to "society"

4. . . . without prior written approval of the **National Treasurer.**

PROPOSED: SID Treasurer

EXPLANATION: The intent of the Bylaws is to emphasize the international scope of SID.

6. . . . The Executive Committee shall have the power to suspend a chapter after one year if the chapter **does not hold at least four (4) technical meetings and one (1) annual general membership meeting.**

PROPOSED: . . . The Executive Committee shall have the power to suspend a chapter after one year if the chapter has no elected officers, or no technical activities, or neither.

EXPLANATION: Provides the necessary flexibility and authority to the Executive Committee.

7. Each Chapter Treasurer shall advise the **National** Treasurer of the disposition of Chapter funds prior to the **national** General Membership meeting.

PROPOSED: SID Treasurer

PROPOSED: SID

EXPLANATION: Eliminates reference to SID as a national organization.

9. Restoration of a suspended chapter to active status shall be **affected** by . . .

CORRECT SPELLING: effected

10. a) . . . The **member** and the receiving chapter shall be notified of the action.

PROPOSED: . . . The members and the receiving chapter . . .

EXPLANATION: Spelling corrections.

We extend a sincere welcome to these newest SID members, who have joined our Society during the past summer.

Bay Area Chapter

Brodie, Ivor
Dir. Physical Electron. Lab.
SRI International

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Ad-Vance Magnetics, Inc. 18
Burton Browne Advertising

Artistic Glass Products Co. 29

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CELCO (Constantine Engineering Labs. Co.) ..... Cover IV,19,21,23,25
Stano Advertising

Computer Parts Mart 31

Eagle Magnetic Co. Inc. 1
Owen & Owen, Inc.

Elston 42
Graphics Plus

EPID, Inc. (Division of Exxon Enterprises) 41
Sobel Knight Advertising

Hughes Aircraft Co. 4
Bernard Hodes Advertising

Institute of Systems Science 14

Kaiser Electronics 6
Thompson Recruitment Advertising

Litton Electron Devices 15
Bonfield Associates

Litton Electron Devices 22
Bernard Hodes Advertising

Magnetic Radiation Laboratories, Inc. 28
Harrison Advertising, Inc.

Metavac, Inc. 26
Ad Methods Advertising Inc.

Microvision 28

Panasonic Industrial Co. 5
Sommer Inc.

Photonics Technology 39

Photo Research ..... Cover III
Darryl Lloyd, Inc.

Polytronix, Inc. 29

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Raytheon Special Microwave Devices 30
Provandie & Chirurg Inc.

Simmonds Precision 41
Burke & Associates Advertising Inc.

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Special Purpose Technology Corp. 8

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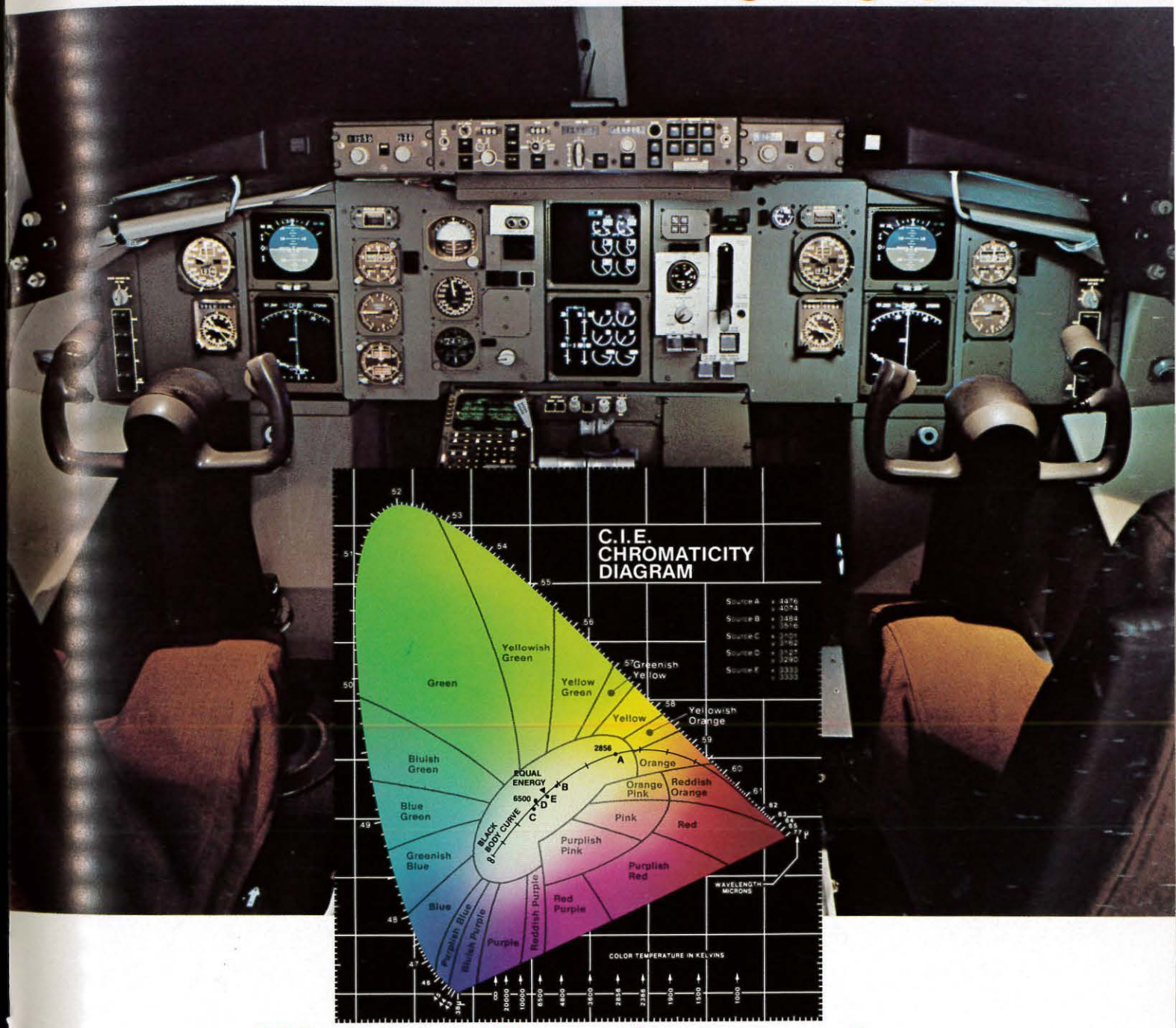

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