

THE OFFICIAL JOURNAL OF THE SOCIETY FOR INFORMATION DISPLAY

# INFORMATION DISPLAY

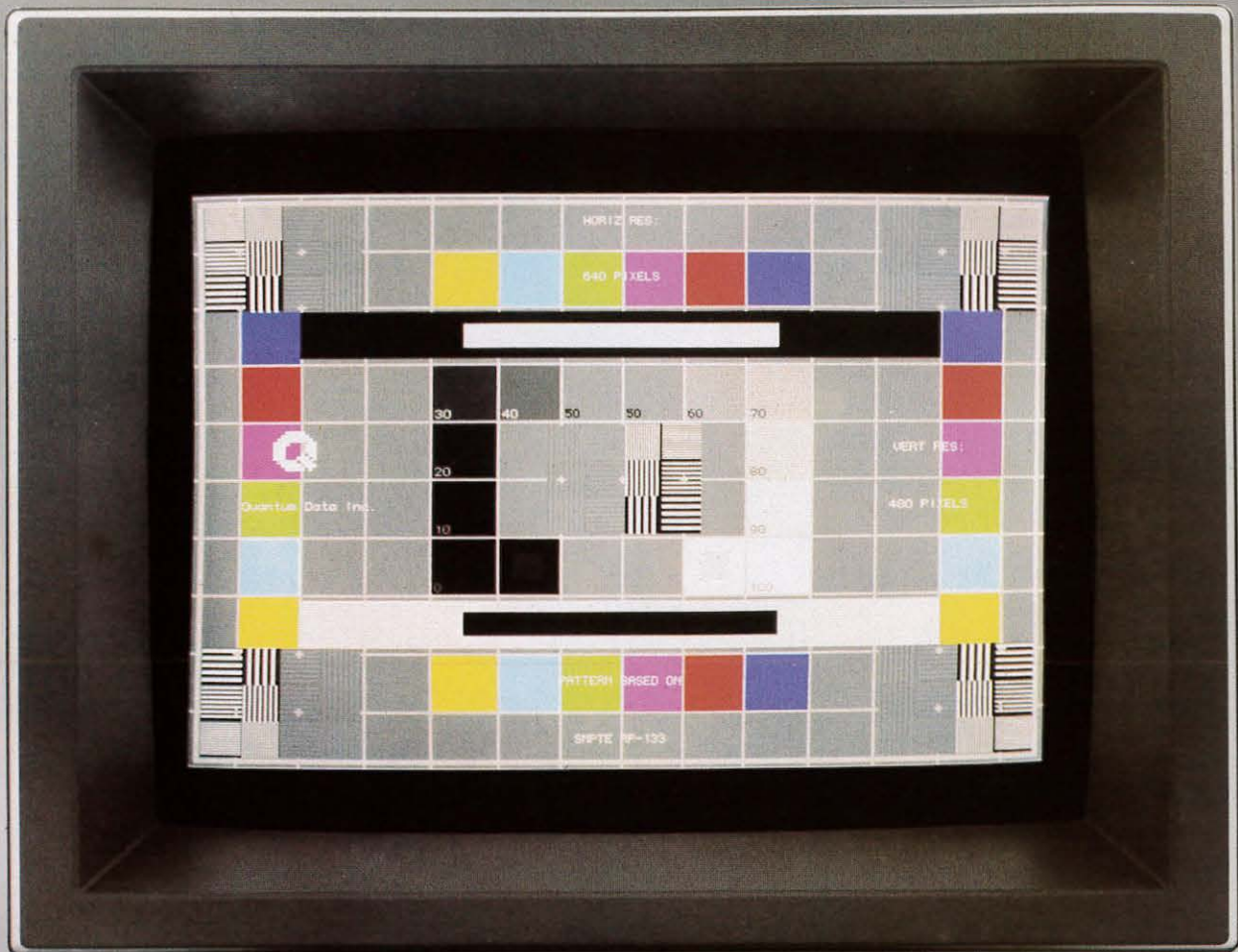
APRIL 1986

**AUTOMOTIVE  
DISPLAYS  
FEATURE 3-D**

**SID'86  
HIGHLIGHTS**

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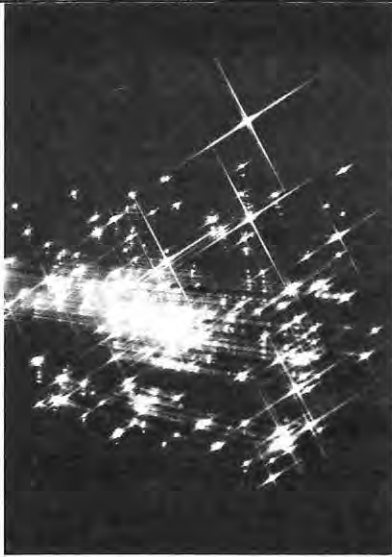
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\*Based on the recommended practice of the Society of Motion Picture and Television Engineers (SMPTE RP133).



**Cover:** Array of minute optical fibers displays light transmitting phenomenon, which permits transmission of optical images or communications signals that have high resolution, efficiency, and low distortion.—EM Industries Inc., Hawthorne, NY.

## FEATURES

### 3-D characters, images enhance automotive display panels 12

In their ever-continuing effort to develop more sophisticated and visually attractive displays for automotive systems, Japanese carmakers last year introduced the first 3-D Fluorescent Indicator Panels (FIPs) in automobiles.—*by Yukitoshi Yoshida and others, NEC Corp. and NEC Kagoshima Ltd.*

### Oversized facsimile prints gigantic displays in color 14

A jumbo facsimile machine, developed by Japanese engineers, produces billboard-sized posters (52 ft x 23 ft) for advertisers in about 90 minutes—considerably faster and less costly than having painters do it by hand from a scaffold.—*Matsushita Graphics Communication Systems.*

### Bigger, better, flatter systems on display at SID '86 18

The SID '86 program committee has singled out a number of excellent presentations that offer insight into new technologies and methods having exciting application possibilities.

### Guide to SID '86 19

Alphabetical listing of exhibitors at this year's International Symposium/Seminar/Exhibition, to be held in San Diego, May 5-9, includes exhibit hall floor plan, booth numbers, descriptions of products on display, and vendor personnel to provide information for SID '86 Show attendees.

### HUD CRT phosphors exhibit distinctive preferential qualities 24

Selection of a phosphor screen for a HUD CRT depends upon a number of factors affecting the communication of information vital to a pilot. Three phosphor types are analyzed for their characteristics and performance.—*by Roger S. Seymour, Jr., Sr. Design Engineer, Industrial & Government Tube Div., Westinghouse Electric Corp., Horseheads, NY.*

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**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.

## DEPARTMENTS

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## NATIONAL

**MAY 5-9: SID '86—1986 International Symposium on Information Display**, San Diego, CA. Sponsored by the Society for Information Display. Contact: Mark Goldfarb, Symposium Coordinator, Palisades Institute, 225 Varick St., NY 10014 (212/242-6864)

**MAY 5-9: Short Course—Gallium Arsenide (GaAs) Integrated Circuits**, University of Maryland University College, College Park, MD. Contact: UCLA Extension Dept. of Engineering and Science, PO Box 24901, Los Angeles, CA 90024 (213/825-1047)

**MAY 6-8: Short Course—Industrial Lasers: Solving Manufacturing Problems**, Hilton Head, SC. Sponsored by Laser Institute of America. Contact: Jack Dyer, Laser Institute of America, 5151 Monroe St., Toledo, OH 43623 (419/882-8706)

**MAY 10-12: ESC '86—1986 Eastern Simulation Conferences**, Norfolk, VA. Sponsored by Society for Computer Simulation. Contact: SCS, PO Box 17900, San Diego, CA 92117 (619/277-3888)

**MAY 11-15: Computer Graphics '86 Exposition**, Anaheim Convention Center, Anaheim, CA. Sponsored by National Computer Graphics Assn. Contact: NCGA, 2722 Merrilee Dr., Ste 200, Fairfax, VA 22031 (1-800/225-NCGA)

**MAY 12-14: Workshop on Motion—Representation and Analysis, Kiawah Island Resort**, Charleston, SC. Sponsored by IEEE. Contact: Prof. Ramesh Jain, University of Michigan, Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI 48109 (313/763-0387)

**MAY 12-16: TUTORIAL WEEK DALLAS '86**, Farimont Hotel, Dallas, TX. Sponsored by IEEE Computer Society. Contact: IEEE Computer Society, 1730 Massachusetts Ave., NW, Washington, DC 20036 (202/371-0101)

**MAY 12-16: Short Course—Kalman Filtering**, University of Houston, Houston, TX. Contact: UCLA Extension Dept. of Engineering and Sciences, PO Box 24901, Los Angeles, CA 90024 (213/825-1047)

**MAY 13-15: ELECTRO '86, Bayside Exposition Center**, Boston, MA. Sponsored by IEE. Contact: Dale Litherland, Electronic Conventions Inc., 8110 Airport Blvd., Los Angeles, CA 90045 (213/772-2965)

**MAY 18-22: SPSE '86—39th Annual SPSE Conference**, Amfac Hotel, Minneapolis, MN. Sponsored by Society of Photographic Scientists and Engineers. Contact: Dr. Dietrich Schultze, Exec. Dir., SPSE, 7003 Kilworth Lane, Springfield, VA 22151. (703/642-9090)

**MAY 19-23: 6th International Conference on Distributed Computer Systems**, Cambridge, MA. Sponsored by IEEE Computer Society. Contact: IEEE Computer Society, 1730 Massachusetts Ave., NW, Washington, DC 20036 (202/371-0101)

**MAY 19-23: NAECON '86—National Aerospace and Electronics Conference**. Contact: NAECON '86, 110 E. Monument, Dayton, OH 45402.

**MAY 20-22: 1986 North Coast Conference and Exhibit, Cleveland, OH**. Sponsored by Instrument Society of America. Contact: Meetings Manager, ISA, PO Box 12277 Research Triangle Park, NC 27709 (919/549-8411)

**MAY 20-22: STANCON '86—Computer Standards Conference**, Dallas, TX. Sponsored by IEEE. Contact: STANCON '86, 1730 Massachusetts Ave. NW, Washington, DC 20036 (202/371-0101)

**MAY 26-28: International Symposium on Multiple-Valued Logic**, Virginia Polytechnic Institute and State University, Blacksburg, VA. Sponsored by IEEE. Contact: Dr. Joseph G. Trout, Symposium Chair, ISMVL-86, Dept. of EE, Virginia Polytechnic Institute, Blacksburg, VA 24061 (703/961-5067)

**SID '86  
MAY 5-9, 1986  
San Diego, CA**

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*"... He who moulds (sic) public opinion, goes deeper than he who enacts statutes or pronounces decisions."  
—Abraham Lincoln*

Over the past few years, a considerable amount of consumer press coverage about the "ill effects" of using VDTs has led to widespread public perception that display terminals are hazardous—this despite independent studies by both government health agencies and professional medical groups that have failed to find any scientific evidence to support the charges. The relatively quiet press to date on these reassuring findings has done little to change people's beliefs.

While it has been determined that more than half the people who use VDTs on the job do suffer some eyestrain, blurred vision, and other temporary visual problems, as well as headaches caused by VDT-induced eye fatigue—it is probably not the machine that causes the problems, but more likely the people using them. According to a Harvard Medical School Health Letter, "The display terminal is not just a piece of office furniture. It is a tool that brings a structure and a rigor to the work . . . and changes (profoundly) the nature of the work people do. And that can spell stress and dissatisfaction."

Fear of being replaced by a machine, monotonous repetitive tasks, machine pacing of work, and lack of social contact are among the many factors that can be more potent causes of stress problems than the supposed hazard of the terminal itself. As one researcher on the subject sums it up, "VDTs can be the ultimate in non-supportive bosses."

Most of the adverse effects reported by VDT users can be reversed by changing working environments or work styles—better lighting, better furniture, and frequent breaks, among others. And, of course, technology too can make a difference. Manufacturers have been increasingly addressing themselves to reducing screen glare, improving display resolution, and changing component features (such as detaching the keyboard from the terminal, providing tilt and rotation of screen, etc.) in an attempt to remain competitive. More recently, a Human Factors Society committee completed the first set of proposed national standards for VDT workstations now under consideration for adoption by ANSI.

But, dispelling the current widespread public attitudes toward VDT use will require that display professionals get the message out to the general public—as well as to their peers. This year's SID '86 scheduled panel discussion "VDT Health Issues: Evidence and Impact" (Tuesday, May 6, 8:00 pm - 10:00 pm)\* presents just such an opportunity to clear the air and get the true facts out into the open.

Both the consumer and business press should be given the opportunity to participate at the session and get the experts to set the record straight. Only by reaching out beyond the conference and display professionals can the display community position itself in the role of protagonist—rather than antagonist.

*Joseph A. MacDonald  
Editorial Director*

\*Panelists: Gerald M. Murch, Tektronix, Moderator; James Greeson, Ergonomic Design Specialist, IBM Corp.; Charlotte LeGates, Manufacturer's Representative Specialist, CBEMA; Edward Rinalducci, Visual Effects Specialist, Georgia Institute of Technology; and Michael Smith, Stress Effects Specialist, University of Wisconsin.



## INTERNATIONAL

**MAY 5-7: Conference on Electron Tubes and Vacuum Electronics.** Garmisch-Partenkirchen, Federal Republic of Germany. Sponsored by IEEE - Germany. Contact: Dr. Ing. F. Coers, German Section IEEE, Stresemannallee 15, VDE-Haus, D-6000 Frankfurt 70, Federal Republic of Germany.

**MAY 12-15: Conference on System Design for Human Development and Productivity.** Humboldt University, East Berlin, German Democratic Republic. Sponsored by International Federation for Information Processing. Contact: Dr. Hal Sackman, Chairman TC-9, Business Information Systems Dept. CSULA, 5151 State University Dr., Los Angeles, CA 90032.

**MAY 12-15: International Scientific Conference: Work With Display Units.** Stockholm, Sweden. Sponsored by Scientific Organizing Committee. Contact: WWDU, % Stockholm Convention Bureau, Box 1617, S-111 86 Stockholm, Sweden.

**MAY 20-23: EURIT 86—European Conference on Information**

**Technology in Education.** Co-sponsored by Commission of the European Communities, International Federation of Information Processing and Association for Teacher Education in Europe, Enschede, Netherlands. Contact: Pieter Sinninghe Damste, % Twente University of Technology, COI, PO Box 217, NL-7500, AE Enschede, Netherlands.

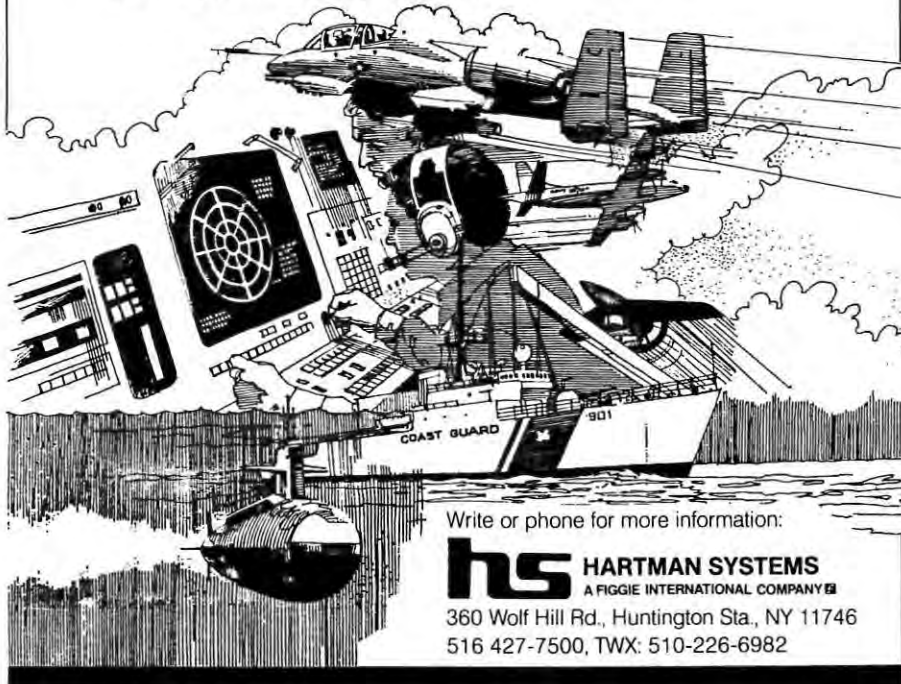
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## Local Computer Networks

Six copies of original papers on local area networks—"Current Bottlenecks" and "Practical Experience"—are solicited by IEEE Computer Society TC-Computer Communications for the 11th Conference on Local Computer Networks, to be held in Minneapolis, MN, October 6-8, 1986.

Topics of interest include: Software protocols, Gateways, Host OS interfaces, Network management, Fast software, New network concepts, Interfaces to wide area networks, Distributed applications, Networking operating systems, Performance evaluation and measurement, Installation planning and experience.

Authors should submit six copies of their paper with the first page to contain author's name, affiliations, complete mailing address, telephone number, and 150-word (max) abstract—in English—to:

Dr. Ron Rutledge  
US Dept. of Transportation  
Transportation Systems Center  
Cambridge, MA 02142  
(617) 494-2768

**Deadline for submittal: May 1, 1986.**

## Japan Display '86

Original papers, previously unpublished, presenting new scientific or technical contribution, or both, covering all the disciplines in various aspects of electronic displays are solicited for the 6th International Display Research Conference, co-sponsored by the Society for Information Display and the Institute of Television Engineers of Japan.

Areas of interest include, but are not restricted to: Electro-optic materials, CRTs, Flat-panel displays (gas plasma, electroluminescent, light-emitting diodes, vacuum fluorescent, and other emissive displays), Flat-panel displays (liquid crystal, electrochromic, electrophoretic, and other non-emissive displays), Projection and large-area displays, Addressing, Hard-copy (impact and nonimpact printers and facsimile), Storage/memory devices, Electronic imaging systems, Human factors, Standards, characterizations, and measurements, and other related topics.



Authors should submit an original and two copies of their abstract and summary to:  
Professor Shunsuke Kobayashi  
% Secretariat of Japan Display '86  
Japan Convention Services Inc.  
Nippon Press Center Bldg.  
2-2-1 Uchisaiwai-cho, Chiyoda-ku  
Tokyo 100, Japan  
Cable: JACONSERVING TOKYO  
**Deadline for submittal: May 31, 1986.**

### Computer Science Conference

Papers for review are sought for the 1987 ACM Computer Science Conference (CSC '87) to be held at the Adams Mark and Clarion Hotels in St. Louis, MO, February 17-19, 1987.

Topics include, but are not limited to: Artificial Intelligence, Expert Systems, Innovative Uses of Computers in Education, and PhD Candidate Research-in-Progress. Papers should be no longer than 10 pages; presentations, no longer than 20 minutes. Authors should submit five copies of the completed paper for review, accompanied by a statement of intent to attend the Conference.

Short reports are also solicited on current research activities being conducted by students, faculty and other researchers. Abstracts are limited to a maximum of 500 words; presentations, to 12 minutes.

For further information on technical program participation, contact:

Arlan R. DeKock, Conference Chair  
CSC '87, MCS 325  
Univ. of Missouri-Rolla  
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Information Display is soliciting original articles that cover all aspects of display technology and applications—display systems, sensing and imaging instrumentation, printing technologies, input/output devices, interactive graphics, storage media, and human factors engineering.

Notes for contributing authors and specifications for submitting manuscripts can be obtained from the Editor of ID. Address all inquiries and submit contributed articles to: The Editor, Information Display, 310 East 44th Street, #1124, New York, NY 10017.

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## Artificial Intelligence market moves out of labs, into offices

Artificial Intelligence is expanding rapidly beyond basic research communities and into private corporations, and is expected to reach \$1.6 billion in sales by 1990, according to a report by Frost & Sullivan.

The 311-page study indicates that sales of AI hardware, software and services have nearly doubled from \$181 million in 1984 to \$342 million in 1985 with projections for 1987 to reach \$665 million. According to the study, the market is emerging as a result of technological advances in symbolic processing and natural language interfaces.

Falling costs of AI hardware, says the study, will help spur unit sales to rise faster than dollars; however, with the AI market multiplying by a factor of 40 between 1984 and 1989. Software products are expected to climb from 40% of the market in 1985 to nearly half of it by 1989.

According to the study, natural lan-

guages will account for more than one-fifth of sales (31% of volume) and be popular in mainframes and personal computers due to the higher proportion of novice users. Further, the study projects expert systems will comprise 35%, and AI applications will make up the remainder. Image processing and robotics will be "the two most promising areas for future applications of symbolic processing, constituting the largest segment of the market between 1985 and 1990, according to the study. Price: \$1,800.

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

For information circle RS #31

## Laboratory offers professionals opportunity to check products

The Essex Usability Laboratory, in Fairfax, VA, provides professional research teams a fully-equipped centralized laboratory in which to conduct studies including: analysis of computer screens, keyboards, manuals, and

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ESSEX CORP. Alexandria, VA (703/548-4500)

For information circle RS #32

## Magazine provides end-users access to on-line databases

*Database End-User*, a monthly magazine, integrates news on changing developments in on-line products.

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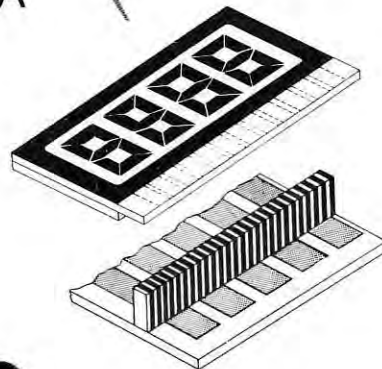
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software, and the information industry. The new publication focuses on data quality, search protocols, and cost factors to keep professional end-user researchers up-to-date on databases and search services for gathering information.

MECKLER PUBLISHING, Westport, CT (203/226-6967)

For information circle RS #33

## On-line software directory services microcomputer users

A comprehensive electronic directory of all commercially available USMI-registered microcomputer software is now available on NewsNet. *Software In Print* is designed to permit rapid and flexible access to a current and accurate compilation of software information from 1700 software producers.

Each producer product, and the specific hardware configuration needed to support each product is identified by means of a Universal Software Market Identifier. Listings include: producer's name, address, software price, author,

and version number. New entries and updated information on listed products are added every 30 days. A full-text delivery and back-issue retrieval of specialized business news is also available. INDEPENDENT PUBLICATIONS INC., Bryn Mawr, PA (215/527-8030)

For information circle RS #34

## Thin-film LCD panels display explosive growth

Major growth potential for modules and enhanced LCD flat-panel displays (using thin-film semiconductors instead of multiplexing) is forecast for 1986 through 1992, according to a Stanford Resources report. *Flat Panel Displays: The Impact of Enhanced LCDs on the Market for High Information Content Displays* projects that the worldwide market for this type of flat-panel display will grow from \$126 million in 1986 to \$3.758 billion by 1992; while the same market for all types of high-information content (more than 200 characters) flat-panel displays will grow from \$747 million in 1986 to

\$4.978 billion by 1992. Price: \$2,450. INTERNATIONAL PLANNING CORP., Menlo Park, CA (415/364-9040)

For information circle RS #36

## Microcomputer vendors profiled in survey

*Single-user Personal Microcomputer Survey (P150/AB)* profiles 183 microcomputers from 110 vendors, covering units selling for under \$10,000. A quick-reference summary index provides basic information on operating systems, CPU, multi-user capability, base configuration, GSA schedule and price. The index is followed by formatted descriptions of each product, arranged alphabetically by vendor and includes: Classification, system software, applications software, systems hardware, mass storage, printers, and display/keyboard characteristics. Price: \$25.

DATA DECISIONS, Cherry Hill, NJ (609/429-7100)

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## Large-screen LCD TV system uses fiber optics technology

Researchers at Penn State (University Park, PA)-Behrend College (Erie, PA), working with a fiber optics research company, are in the first stage development of a large-screen flat panel color TV system that uses fiber optics, image-transmission technology.

Instead of a picture tube, the set will consist of thousands of independent colored liquid crystal cells, activated electronically and illuminated by fiber optics. First-stage of the project, funded by a grant from the Ben Franklin Partnership, includes feasibility studies on the set design and construction of several fiber optic crystal cells. Phase one also includes having a 24-cell color screen operational, within the year.

Phase two of the project involves building a 9-in. diagonal set capable of displaying graphic images. Phase three includes construction of a 50-in. diagonal set displaying full color images; while the final phase calls for construction of a 12-ft. diagonal screen having fully developed color images.

Dr. Robert Marande, assistant professor of physics at Behrend College; Dr. Alan Jircitano, assistant professor of chemistry; and Michael Redinger, president of Tru-Lyte Systems fiber optic research company, comprise the research team. Its goal, directed to the "giant screen" video market, is to build a less-expensive and simpler operational system that will provide images superior to existing screens at stadiums and sports arenas.

## Graphics standards await final approval

Two graphics standards, being developed by Technical Committee X3H3 (American National Standards Institute) are currently expected to be finalized early next year.

PHIGS (Programmer's Hierarchical Interactive Graphics System), an application programmer's interface to a device-independent graphics environment, is designed to support such important applications as CAD/CAE/CAM, command and control, molecular modeling, simulation, and process control. It emphasizes the support of applications

needing a highly dynamic, highly interactive operator interface and expects rapid screen update of complex images to be performed by the display system. Within the US, the working draft of PHIGS is undergoing review; while at the international level, through the International Standards Organization, the draft proposed version of PHIGS will not be circulated for comment until September.

CGM (Computer Graphics Metafile), a snapshot of the final image that a program has created, provides a file format suitable for the storage and retrieval of picture description information. The file format consists of an ordered set of elements that can be used to describe pictures in a complete device-independent way. Within ANSI, CGM (formerly known as VDM, or Virtual Device Metafile) has completed public review as draft proposed American National Standard X3.122, and is expected to be approved some time this summer. In-

ternationally, CGM (known as ISO Draft International Standard 8632) is expected to be finalized by ISO in 1987.

For information, contact: Peter R. Bono, Chair, ANSI X3H3, c/o Graphics Software Systems, PO Box 648, Gales Ferry, CT 06335.

### NEW! for SID Members —

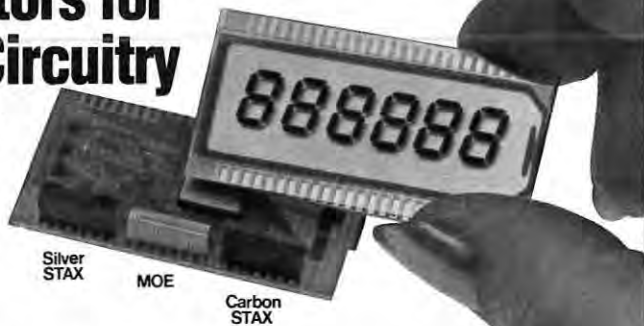
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Society for Information Display

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PCK-102



# 3-D characters, images enhance automotive display panels

**E**ver since Fluorescent Indicator Panels first appeared in the automotive environment a few years ago, applications for FIPs have steadily expanded to encompass a wide range of gages and meters including oil/temperature, speed, and rotation as well as user convenience devices such as radios, trip-computers, and so forth.

In their ever continuing effort to develop more sophisticated and visually attractive displays for automotive systems, Japanese carmakers last year introduced the first 3-D FIPs in automobiles.

This article describes three technologies developed by NEC engineers that offer attractive 3-D fluorescent displays having unique and sophisticated characters and graphic patterns.

## Color contrast

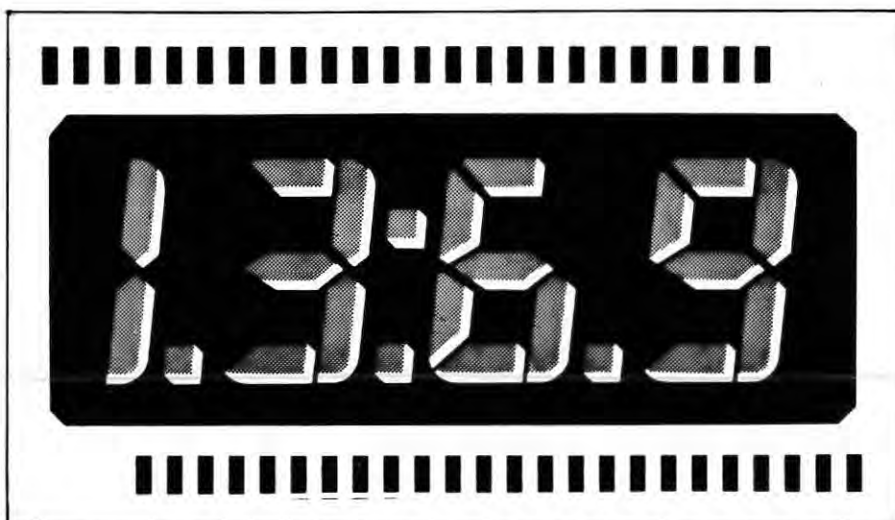
The first approach used in obtaining a 3-D appearance for characters and images displayed on FIPs is the selection of phosphors having specific color contrasts. Color has its own unique psychological effects, and NEC engineers selected a blue-green/yellow-green color combination for a new speedometer display—based on extensive ergonomic (human factors) studies.

Font design also played an important part of the concept in making the display appear to be 3-D.

## Aperture opening

The second method to achieve 3-D appearance in a display involves construction of a FIP surface light-emitting device. This has several advantages over

12 Information Display



Seven-segment 3-D appearing FIP using two different color phosphors.

| COLOR        | PEAK<br>WAVE LENGTH<br>(nm) |
|--------------|-----------------------------|
| RED          | 630                         |
| ORANGE       | 610                         |
| AMBER        | 587                         |
| YELLOW       | 560                         |
| YELLOW-GREEN | 545                         |
| BLUE-GREEN   | 505                         |
| SKY BLUE     | 465                         |
| BLUE         | 460                         |

more conventional types, such as: wider viewing angle, better readability, minimal depth from glass surface to the font.

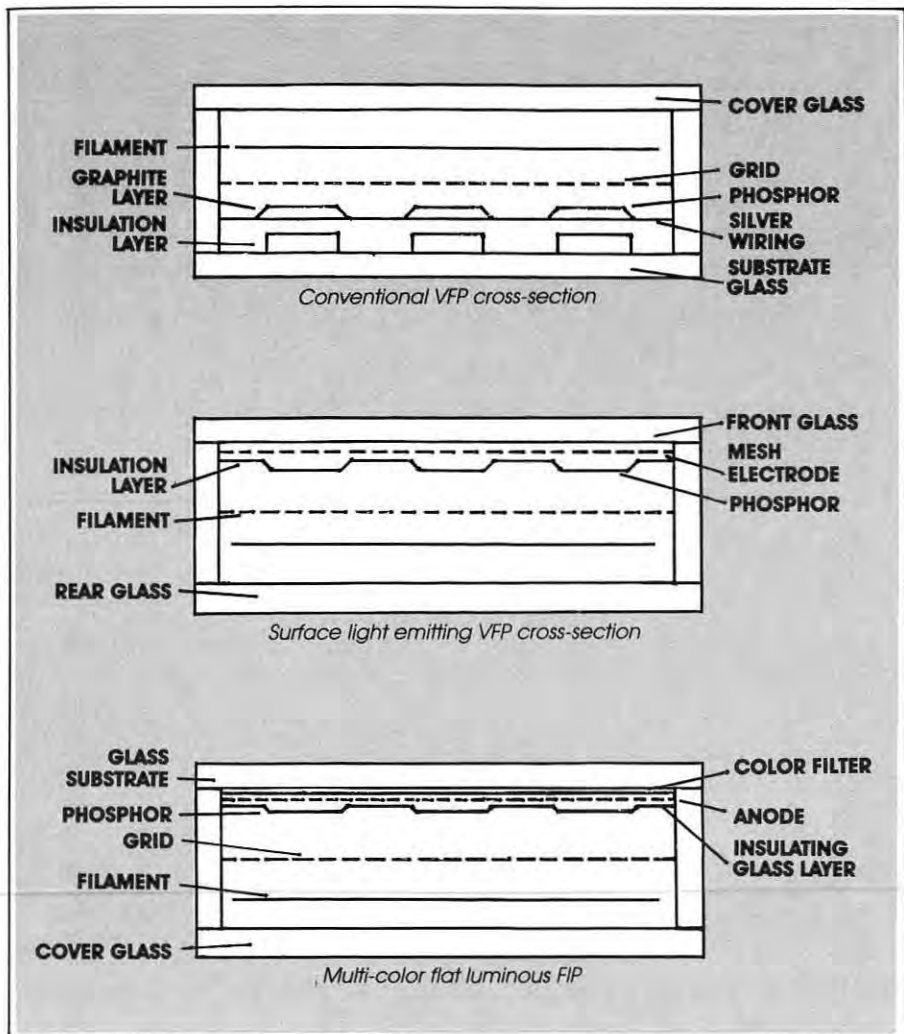
The surface light-emitting FIP structure has an electronic pattern that is semi-transparent. By changing the opening ratio of these semi-transparent electrodes, it is possible to change the

brightness level. Varying this brightness level with a segment or from one segment to another will produce a 3-D appearance of a character or image being displayed.

In a segment having two different aperture openings, the wider aperture opening will transmit more light output than the narrower one. This brightness difference, along with basic font design, will create a 3-D appearance in the display.

## Color coating

A third method combines surface light emitting construction with color filters. Light output from a FIP using the standard blue-green phosphor can be filtered to any other color by placing filters over the phosphor.



The most suitable filter position for surface light emitting FIPs is inside the glass substrate. This filter, a thin film layer, is placed directly on the glass substrate before the other interconnect pattern is put in place. It coats a selected segment or part of a segment to create the special 3-D effect without any parallax problem.

The color filter coating works not only as a color changing mechanism, but also as a light output attenuator that enhances the effects desired—thus producing a multi-colored 3-D appearance with a single phosphor.

Zinc-oxide-zinc (ZnO:Zn) phosphor is used to get the standard blue-green color because it is the most efficient phosphor and has a wide spectral output (from 400 nm to 700 nm) and, as a result, is filterable from blue to red. This method also has the advantage of having no spacing between different colors

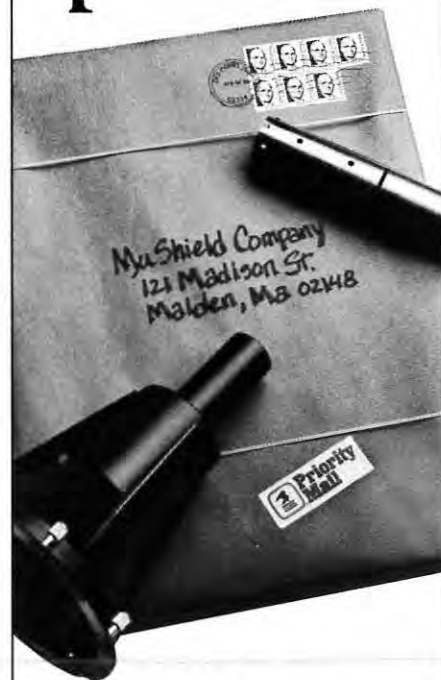
on one segment, which is not feasible with the ordinary phosphor printing methods.

Brightness ratio between normal segments and shadow segments (by either aperture opening or color coating) in 3-D FIPs developed by NEC was selected as 100:30, based on the findings of their ergonomic studies. It can, however, be changed to meet the end user's own criteria.

(Developed from *A New Design Concept for the Graphics of FIPs for Automotive Applications*, by Yukitoshi Yoshida and Fukuji Maruyama, NEC Corp.; and Togo Miyazaki, NEC Kagoshima Ltd., presented at SAE's Automotive Electronic Displays and Information Systems, International Congress & Exposition, Detroit, MI February 25-March 1, 1985.)

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For information circle Reader Service #9



# Oversized facsimile prints gigantic displays in color

**A** jumbo facsimile machine, developed by Matsushita Graphics Communications Systems, produces billboard-sized posters (52 ft. x 23 ft) for advertisers in about 90 minutes—considerably faster and less costly than having painters do it by hand from a scaffold.

The Full-Color Jumbo Facsimile, as the system is called, consists of three electronically-controlled units: digital scanner, image processor, and spray-gun printer.

Color prints or transparencies, paper drawings, or other graphic materials (letter-size or smaller) are first scanned into the system where they are processed digitally and enlarged. Images then are printed out on a variety of materials including paper, cloth, or metal sheets.

Various image processing and enhancement techniques are performed on a color CRT. These include synthesizing patterns, adding text, changing or modifying colors of original art, enlarging, reducing, masking and gray-scale and color correction, among others. Once processed, images are then stored on magnetic cartridge tape.

In the final step, the digitized image is transmitted to the oversized printer—a 14-ton machine having a microcomputer-controlled spray-gun mechanism with four color nozzles (cyan, magenta, yellow, and black). A pair of 8-ft-dia rotating drums, each 30 ft long, roll the output material past the spraying mechanism that generates the oversized print.



|                       |   |                    |  |
|-----------------------|---|--------------------|--|
| <b>SCANNER</b>        |   |                    |  |
| Effective size        | 102 x 127 mm, min.<br>210 x 297 mm, max | Printing area      | 7.0 m x 8.0 m<br>(max/one drum)<br>7.0 m x 16.0 m<br>(max/two drums)               |
| Pitch<br>(5 µm incr.) | 20 µm, min.<br>1000 µm, max             | Printing mechanism | Four spray-gun<br>system   |
| Output data           | 8 bits/pixel<br>(Blue-Red-Green)        | Printing ink       | Water soluble<br>(dye-stuff)   |
| <b>PROCESSOR</b>      |   | Drum speed         | 12 rpm   |
| Computer              | HP-9000 series                          | Painting time      | 1.36 hr/16 mm pitch<br>2.75 hr/8 mm pitch<br>5.5 hr/4 mm pitch<br>11 hr/2 mm pitch |
| Disk memory           | 132 MB                                  | Coating            | Automatic hydric<br>resin coating  |
| Maximum<br>data size  | 4096 x 4096 pixels,<br>4 colors, 67 MB  | Input data         | Cartridge tape,<br>67 MB   |
| Monitor display       | 20" RGB<br>512 x 480                    | Buffer memory      | 10 MB  |
| Output data           | Cartridge tape,<br>67 MB                | Size               | 22.5 m x 2.75 m<br>x 3.16 m  |
| <b>PRINTER</b>        |   | Weight             | 14 tons  |
| Drum dimensions       | 2.5 m diameter<br>9.0 m long            |                    |  |





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



### Margins & Tabs

- L Set Left Margin
- R Set Right Margin
- X Release Margins
- I Set Tab
- N Clear Tab
- C Center Text
- S Set Line Spacing

### Toggles

- W Word Wrap (On)
- J Justify (On)
- V Vari-Tabs (Off)
- H Hyphen Help (On)
- E Soft Hyphen (Off)
- D Print Display (Off)
- P Page Break (On)

### Block Operations ^K

- B Begin
- K End
- H Hide/Display
- C Copy
- Y Delete
- V Move
- W Write
- N Column On

September 6, 1985

Miss Betty Smith  
Acme Business Institute  
207 Harrison Place  
Rockdon, WI 07201

Dear Miss Smith:

Most companies have a definite preference as to letter style. A few leading business corporations still insist that all letters be typed in semi-block style. This style combines an attractive appearance with utility. Many private secretaries, who are not usually concerned with mass production of correspondence, favor it. Here is a sample to add to your correspondence manual.

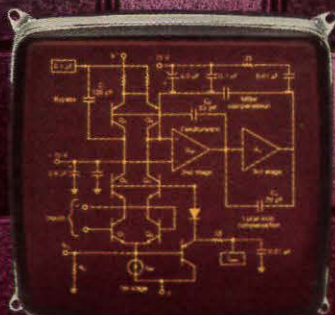
This style differs from the block form in only one respect--the first line of each paragraph is indented five or ten spaces. In this example the paragraphs are indented ten spaces. As in all letters, there is a double space between paragraphs.

The date line is flush with the right margin, two or four spaces below the letterhead. The complimentary close begins slightly to the right of the center of the pages. All lines of the signature are aligned with the complimentary close. Open punctuation is used in the address.

No identification line is used in this example. As the dictator's name is typed in the signature, his initials are not necessary. The typist's initials are shown on the carbon copy.

Very sincerely yours,

Helen Jones  
Supervisor





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a new generation  
in CRT design  
technology**

**the  
square  
sixteen**

**offering you  
the ultimate  
flexibility in your  
software design**

**It virtually eliminates two format sizes**

The new Clinton SQUARE SIXTEEN displays as much information as a 17" CRT in a size no wider than a 15" CRT. It lets you eliminate two inventory models — that can result in dramatic cost savings. Combines your portrait and landscape programs into one "fits all" format.

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With a useful screen area of 11" x 11" you can display a standard 8½ x 11" page in either the landscape or portrait modes with perfect margins for "prompts."

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**It operates on standard componentry**

The Clinton SQUARE SIXTEEN is designed for existing componentry. It requires no major modifications or design compromises. And it's available in the largest selection of proprietary phosphors available.

**It offers advanced ergonomics**

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**The innovators in CRT technology**

For information circle Reader Service #5



# Bigger, better, flatter systems on display at SID '86

**P**roviding readers of ID with a sneak preview of some of the more innovative and significant technological developments in display systems, which will be discussed at SID'86 in San Diego, CA (May 5-9), is a risky exercise—to say the least—given the quality and quantity of papers being presented at this year's International Symposium on Information Display.

Nevertheless, the SID'86 program committee has singled out a number of excellent presentations that offer insight into new technologies and methods having exciting application possibilities—from a full-color, flat Cathode-Ray Tube with super-high resolution to a direct-touch entry device for LCDs that is an integral part of the display panel itself.

## CRTs

Advances in displays for computers and office workstations include a revolutionary flat-faced CRT from **Zenith Radio Corp.** The color CRT has a perfectly flat 14-in. diagonal screen. A flat, tensioned shadowmask with 0.2 mm pitch is used to increase thermal stability and electron beam efficiency.

High resolution 20" × 20" Trinitron (color) and monochrome CRTs, developed by **Sony Corp.** for CAD/CAM workstations, are capable of displaying 100 pixels/inch at a brightness of 30 fL. The color CRT monitor has 2048 ×

2048 addressable points at a 60 Hz non-interlaced refresh rate, a 127 KHz scan rate and a video bandwidth of 300 MHz.

An approach to high resolution CRTs being pursued by **IBM** is their multi-beam CRT. Dynamic electron optical corrections are made to the deflection to achieve a 9.3-million pixel resolution on a 19-in. diagonal CRT. Another multibeam CRT, being developed by **Tektronix Inc.** for high resolution applications, uses eight beams that are scanned at once to achieve higher brightness and resolution.

## LCDs

The breakthrough disclosure at SID'85 of the Supertwisted Birefringent Effect is followed this year by a similar **Hitachi** development that achieves a full-page (640 × 640) LCD having high contrast and a wide viewing angle.

Rapid progress continues on liquid-crystal TV displays with active-substrate-addressing by thin-film transistors. The trend seems to favor amorphous silicon TFTs with a triangular arrangement of RGB filters for best color resolution. **Sharp** obtains good performance and reliability with anodized Ta<sub>2</sub>O<sub>5</sub> as a gate insulator for their 3.2-in., 240 × 360 screen. A fresnel mirror provides uniform illumination.

**Fujitsu** applies its self-aligned technique for gate fabrication to reduce parasitic capacitance. Their demonstration

TV has 210 × 320 pixels with a 5.8-in. diagonal.

## Plasma displays

The field of plasma displays has produced new results in addressing techniques to minimize power consumption or increase write/erase speeds. AT/T **Bell Laboratories** researchers describe a new CMOS drive scheme that results in power consumption under 30W for a 320 × 576 pixel AC plasma panel with 60 pixels/in.

**IBM** researchers describe a doubling of the write/erase speeds to 100 frames/sec. in their 960 × 768 pixel AC plasma panel.

And, a report from **Interstate Electronics, Inc.** describes an asynchronous video addressing scheme for AC plasma panels incorporating brightness control.

## EL Displays

In the quest for multicolor, large-area displays, electroluminescent (EL) displays continue to make progress. Two full sessions on the subject include a paper from **Planar Systems, Inc.** that describes a green-yellow-red 320 × 240 pixel, color thin-film EL panel, consisting of green-emitting and red-emitting layers in a stacked configuration.

And, researchers from **GTE, Hycom, Supertex,** and **US Army LABCOR** are

*(Continued on p. 23 ...)*



# SID '86

Society for Information Display

1986 INTERNATIONAL SYMPOSIUM/SEMINAR/EXHIBITION

Town & Country Hotel, San Diego, CA May 5-9, 1986

## SID '86 Guide to Exhibitor's Displays

**Ad-Vance Magnetics Inc.** 2 & 3  
Products: Magnetic Shielding.  
Personnel: Lester Dant, VP; Kay Nixon,  
Sls Mgr; Richard Vance, Pres.  
625 Monroe St., Rochester, IN 46975  
(219/223-3158)

**AEG-Telefunken Corp.** 64 & 65  
Products: Electrostatic and Magnetic De-  
flection Display Tubes including Oscillo-  
scope CRTs, Military CRTs and a 5" x 5"  
Color CRT; IR Converters; LCDs, and  
others.  
Personnel: F. Jungbauer, VP; P. Mikels,  
Sls Mgr; H. Seifert.  
Rt 22-Orr Drive, Somerville, NJ 08876  
(201/722-9800)

**Amperex Electronic Corp.** 71  
Products: Flat panel CRTs, Photomulti-  
plier Tubes, CRTs.  
Personnel: Paul Oranges, Prod Mktg  
Mgr; Mike Brown, Prod Mgr CRTs; R.  
Van Der Veen, Mktg Mgr; Martin Jervis,  
Prod Mgr.  
230 Duffy Ave., Hicksville, NY 11802  
(516/931-6200)

**Andus Corp.** 49  
Products: Single & multi-layer sputter  
deposited conductive coated flexible  
plastic thin films.  
Personnel: Linda A. Hoitt, Dir/Mktg; John  
B. Fenn Jr., Pres.  
21019 Osborne St., Canoga Park, CA  
91304 (818/882-5744)

**ASET** 99  
Products: Model 800 LCD stepper, Model  
1500 LCD stepper, lithographic expo-  
sure equipment specifically designed for  
the manufacture of flat panel displays.  
Personnel: Peter Baxter, Sls Mgr; Ralph  
Miller, Sr VP Mktg.  
6110 Variel Ave, Woodland, CA 91367  
(818/884-5050)

**AT&T Components & Electronic  
Systems** 69  
Products: AC Plasma Products

Personnel: Janice Marchok, Jerry Coyne,  
Maureen Backe, Jeff Kohler, Hans  
Verluer.  
555 Union Blvd., (Cedar Crest) Allen-  
town, PA 18103 (215/770-3217)

**Babcock Display Products, Inc.** 76  
Products: Gas discharge display compo-  
nents and subsystems and vacuum fluo-  
rescent display subsystems.  
Personnel: William Williams, Dir/Mktg &  
Sls; John Hackney, Natl Sales Mgr; Paul  
Smith, Dir of Engrg.  
1051 South East St., Anaheim, CA  
92805 (714/491-5100)

**CELCO** 67  
Products: Deflection yokes, deflection  
amplifiers, CRT text equipment, CRT  
systems.  
Personnel: Michael J. Constantine, Pres;  
John M. Constantine, Jr., VP; Peter M.  
Constantine, Sls Engr; Robert F. Reese,  
Gen Mgr.  
1150 E. 8th St., Upland, CA 91786  
(714/985-9868)

**Cherry Display Products Corp.** 58 & 59  
Products: Electric glass.  
Personnel: Jack J. LaSpina, Jr., Mktg  
Mgr; Margaret L. Pepin, Mktg Admini-  
strator.  
15 Founders Blvd., El Paso, TX 79906  
(915/779-7774)

**Citronix Inc.** 33  
Products: Magnetic deflection amplifiers,  
dynamic focus amplifiers, colligraphic  
display.  
Personnel: A. Pletz  
5342 Halsted Ave., Carmichael, CA  
95608 (916/961-1398)

**Clinton Electronics** 40 & 41  
Products: Cathode Ray Tubes  
Personnel: Dennis Kocent, Regl Sls Mgr;  
Marc Calvan, Regl Sls Mgr; Ed Larkin,  
Appl Engr; Larry Somerville, Appl Engr;

Randy Schroedl, Engrg Mgr; Jay Pollitt,  
Appl Engr.  
6701 Clinton Road, Rockford, IL 61111  
(815/633-1444)

**Corning Glass Works** 83 & 84  
Products: Range of CRT bulbs & compo-  
nents, large & small, & flat panel display  
products.  
Personnel: Don McLaughlin, Sr Sls Rep;  
Neil Izatt, Sls Engr/Info Displays; June  
Patton, Prod Engr; Josef Prikopa, CRT  
Dept Head; Ajit Thakur.  
MP 21-3-5, Corning, NY 14831 (607/  
974-4102)

**Denton Vacuum** 98  
Products: Anti-glare screens for CRTS.  
Personnel: Peter Denton, Pres; F. Lee  
Swilling, Mktg Mgr/Denton Glass.  
2 Pine Oak Ave., Cherry Hill, NJ 08003  
(609/424-1012)

**Digital Electronics Corp.** 15 & 16  
Products: Electroluminescent & plasma  
graphic & alphanumeric modules &  
controllers.  
Personnel: John McKinney, Dan Young.  
26142 Eden Landing Road, Hayward,  
CA 94545 (415/786-0520)

**DISCOM/Display Components, Inc.** 1  
Products: High resolution deflection  
yokes, & a new class of high efficiency  
high voltage power supplies.  
Personnel: C.E. Sawyer, Pres; B.C.  
Iannotta, VP; H.C. Masterman, VP Engrg;  
William Santelman, VP Power Supplies.  
334 Littleton Rd, Westford, MA 01886  
(617/692-6000)

**Dontech, Inc.** 46  
Products: EMI/tempest windows  
(display, computer room, structural)—  
optically enhanced, high resolution, fine  
wire mesh, narrow band, P-43, and gen-  
eral contrast; to 26" CRT's & 4' x 8' flat  
wire laminates.



# SID '86 Exhibitors

Personnel: Richard Paynton, Pres; Doreen Paynton, VP.  
700 Airport Blvd., Doylestown, PA 18901 (215/348-5010)

## EEV Inc. 47 & 48

Products: Standard & customized liquid crystal displays, CRTs.  
Personnel: Stuart Hesselson, Mktg Mgr/Display Prod; Ron Leonardo, Sls Mgr/CRTs; Dennis Wickham, Mktg Mgr/CRTs; Guy Wilkinson, Sls Corresp/CRTs; Rodger Wheeler, Mgr/CRTs; Glenn Barone, Prod Sls Mgr/LCDs.  
7 Westchester Plaza, Elmsford, NY 10523 (914/592-6050)

## EG&G Gamma Scientific, Inc. 44 & 45

Products: Radiometers/Photometers, spectral & spatial instruments for CRT measurements, laser power/energy instruments, night vision compatibility instruments, instruments accessories.  
Personnel: Robert Ruff, Sls Mgr; Henry Flesch, Reg Sls Mgr; Gary DeMonto, Sr Prod Specialist.  
3777 Ruffin Road, San Diego, CA 92123 (619/279-6044)

## Electro Plasma Inc. 34

Products: AC plasma displays.  
Personnel: Wendy Fisher, Sls Coord; Mike Horner, Elec Ops Mgr; Jerry Schermerhorn.  
4400 Martin Moline Road, Millbury, OH 43447 (419/255-5197)

## Electrographics Int'l Corp. 62

Products: Polykon 6300 H for large area displays & high resolution photo tooling; computerized step & repeat back; plate defect inspection system.  
Personnel: Al Gillen, Engr; Ann Grossi, Sls; Mike Vye, W.C. Sls Rep.  
1707 B Stout Drive, Warminster, PA 18974 (215/443-5190)

## EM Industries 86

Products: High purity fine chemicals for production of displays; liquid crystals, evaporants & sputtering targets for electroluminescent displays; high purity chemicals for crystal growth, thin films & optical fibers.  
Personnel: Dr. Frank Allen, John Webb.  
5 Skyline Drive, Hawthorne, NY 10532 (914/592-4660)

## Endicott Research Group Inc. 63

Products: DC-DC converters, DC-AC smart force inverters.  
Personnel: Michael Foldes, Sls Mgr; Robert Rakowski, Pres.  
2601 Wayne St, Endicott, NY 13760 (607/754-9187)

## Finlux Inc. 66

Products: Electroluminescent displays.  
Personnel: Ulf Strom, Pres; Eero

Jarvinen, VP; Birgitta Strom, Asst Treas.  
20395 Pacifica Dr, Cupertino, CA 95014 (408/725-1972)

## Galileo Electro Optics Corp. 12

Products: Fiber optics & related electro-optic products.  
Galileo Park, Sturbridge, MA 01518 (617/347-9191)

## Hoya Optics, Inc. 13 & 14

Products: Glass filters for image enhancement & night vision compatibility, optical glasses & panel substrates.  
Personnel: Donald L. Bailey, Sls Mgr; David Barnicle, East Coast Sls; Judy Birk, Sls.  
3400 Edison Way, Fremont, CA 94538 (415/490-1880)

## Hughes Aircraft Company 52

Products: Special purpose CRT & assemblies, liquid crystal light valve & liquid crystal moss display.  
Personnel: John Roy, Mktg Mgr; Cathy McGrath, Mktg Admin.  
6155 El Camino Real, Carlsbad, CA 92008 (619/931-3586)

## IEC Company 68

Products: Flat Panel Displays, EL lamps.  
Personnel: Eugene Hu, Pres; Ted Lucas, Mktg Rep.  
1450 E. 17th St, Santa Ana, CA 92701 (714/543-6295)

## Incom, Inc. 31

Products: Fiber optic face plates for CRTs, image tubes, and CCD arrays.  
Personnel: Anthony Detarando, Pres; Jerry Burke, Project Engr; Richard Jeskey, VP; John Lewis, Product Engr; David MacGrath, Cust Svc.  
205 Chapin St, Southbridge, MA 01550 (617/765-9151)

## The Inter-Technical Group, Inc. 6

Products: Magnetic shields.  
Personnel: Mick Eastland, Sls Mgr; Thomas J. Ellis, Sls Engr.  
1 Bridge St, Irvington, NY 10533 (914/591-8822)

## Int'l Planning Info/ Stanford Resources Inc. 11

Products: Market research & technology/business planning reports.  
Personnel: Murray Disman.  
465 Convention Way, Redwood City, CA 94063 (415/364-9040)

## ITT Cannon 10

Products: "The Parallel Interconnect"—solderless high density interconnecting device for flat panel displays.  
Personnel: W. Judd Clark, Dir/New Prod Devel; Richard Cassidy, Sr Prod Specialist.  
666 E. Dyer Road, Santa Ana, CA 92702 (714/754-2194)

## Kennedy Technology Inc. 78

Products: Touch screen & associated accessories.  
Personnel: John Hays, Dir of Mktg; Stephen C. Price, Mktg Communications.  
4830 Viewridge Ave, San Diego, CA 92123 (619/268-8555)

## Litton Electron Devices Division 85

Products: A variety of types of cathode ray tubes, including the mini CRT for film recording & other applications.  
Personnel: Jim Abendscham, Jim Wurtz, John Marshall, Bob Hager, Mark McIntyre, Bob Sims.  
1215 So. 52nd St, Tempe, AZ 85281 (415/591-8411)

## Microfield Graphics, Inc. 53

Products: The T4 graphics controller board & the Microfield development tool kit.  
Personnel: Jack Liskear, VP Mktg/Sls; Hank Merlitti, W. Regl Mgr.  
8285 S.W. Nimbus Ave, Beaverton, OR 97005 (503/626-9393)

## MicroTouch Systems Inc. 25

Products: The Microtouch Screen, monitors & graphics software development tools.  
Personnel: Robert Warner, VP/Sls; David Van Camp, Reg. Sls Mgr.  
Ten State Street, Woburn, MA 01801 (617/935-0080)

## Microvision 5

Products: CRT measuring equipment.  
Personnel: Stan Buckstad, Pres; Dave Buckstad, Engr.  
4855 Atherton Ave, San Jose, CA 95130 (408/374-3158)

## Minolta Corp. 88

Products: TV color analyzer, color temperature meters, luminance meters & illuminance meters.  
Personnel: Mike Preston, Mfg Rep; Tim McCann, Tech Rep.  
101 Williams Drive, Ramsey, NJ 07446 (201/825-4000)

## OCLI 60 & 61

Products: Anti-glare glass panels & filters.  
Personnel: Bob Carlson, Sls Mgr; Brenda Ledyard, Trade Show Coord.  
2789 Northpoint Pkwy, Santa Rosa, CA 95407 (707/525-7526)

## Optical & Conductive Coatings 77

Products: Thin film coatings for display to provide EMI shielding, contrast enhancement, anti-reflection and filtering. Monolithic glass & plastic & laminated filter products.  
Personnel: Clark I. Bright, Tech Dir; Glenn G. Grupe, Mktg Mgr.  
428 N. Buchanan Circle, Pacheco, CA 94553 (415/798-6066)



**Optical Radiation Corp. 55**

Products: UV photo exposure systems for the microelectronics industry.  
 Personnel: Chuck Sahli, Micro Elec Mktg Mgr; Deborah Lerch, Mktg Coord.  
 1300 Optical Dr, Azusa, CA 91702  
 (818/969-3344)

**Owens-Illinois, Inc./  
 Nippon Elec. Glass 32**

Products: Glass envelopes & parts for CRTs.  
 Personnel: James E. Kyle, Accts Mgr; R.N. Smith, Engr; L.J. Weaver, Sls Mgr; M. Matsumoto, NEG Sls; S. Ohmori, NEG Sect; N. Shano, NEG Sls Rep.  
 711 Southwood Ave, Columbus, OH 43207 (614/443-6551)

**Panasonic Industrial Co. 51**

Products: 400x640 DC plasma display panel with 2 new DC panels, a 200x400 half-page DC panel & an enhanced version of the 400x640 panel.  
 Personnel: Mr. Paul Wasek, Prod Spec; Sam Matsuno, Engr.  
 1 Panasonic Way, Secaucus, NJ 07094 (201/392-4077)

**Particle Data, Inc. 72**

Products: New Elzone 180 microprocessor particle counter/size analyzer.  
 Personnel: Eric H. Berg, Sls Rep.  
 111 Hahn Street, Elmhurst, IL 60126 (312/832-5653)

**Penn-Tran Corp. 70**

Products: H.V. power supplies, stator yokes, saddle yokes, flyback transformers & vidicon assemblies.  
 Personnel: Norman Lewis, Chief Engr; Donald Hill, HVS Design Engr; Donald Alexander, Yoke Design Engr; Jeffery Krauss, Asst Controller; William Holt, Gen. Mgr.  
 Rt 144 North, Wingate, PA 16880 (814/355-1521)

**Phosphor Products Co. Ltd. 75**

Products: D.C. electroluminescent displays, systems & interactive systems.  
 Personnel: Tony Poole.  
 PPC House, 1 Factory Rd, Upton, Poole, Dorset, BH16 5SJ UK (0202/632116)

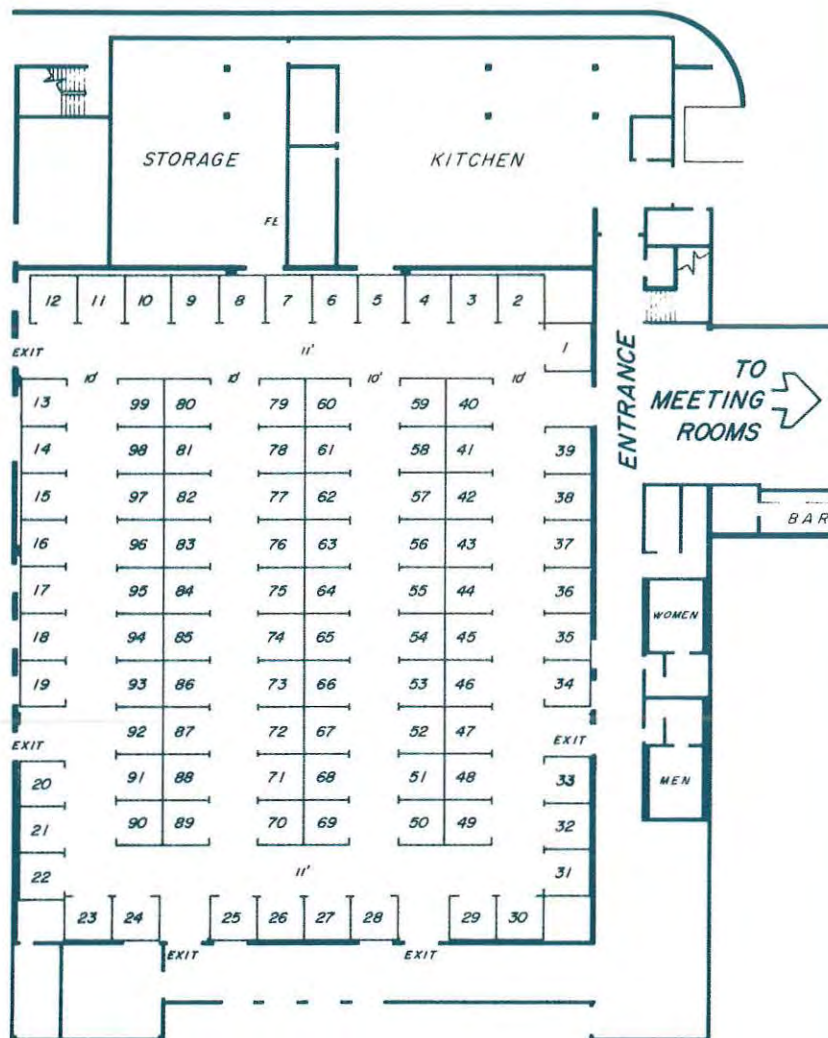
**Photo Research 21 & 22**

Products: Light measurement equipment.  
 Personnel: Alan McGinnis, Dir. of Mktg; Mike Klein, Appl Engr; Rob Fawcett, Appl Engr; Ken Miller, VP; Steve Mansell, Appl Engr.  
 3000 N. Hollywood Way, Burbank, CA 91505 (818/843-6100)

**Photonics Technology 7, 8 & 9**

Products: AC gas discharge (plasma) display ranging from a few centimeters to one meter.  
 Personnel: P.J. Hoehn, R.A. Stoller, D.K.

## MISSION BALLROOM



Wedding, T.J. Soper.  
 6967 Wales Road, Northwood, OH 43619 (419/666-0762)

1400 N.W. Compton Drive, Beaverton, OR 97006 (503/690-1100)

**Planar Systems, Inc. 90, 91 & 92**

Products: EL6648MX 512 x 256 EL flat panel display; EL8358M 640 x 200 EL flat panel display with MS/DOS compatibility; 320 x 240 two color EL display with multiple gray scale levels; Custom glass only products.  
 Personnel: Rolland Von Stroh, VP Mktg & Sales; Steve Hix, VP, Advanced Display Concepts Group; Jeff Hopkins, Sales Mgr; Brian Dolinar, Appl Engr.

**PTK Div, Emerson Electric Co. 50**

Products: High voltage power supplies.  
 1173 Los Olivos Ave, Los Osos, CA 93402 (805/528-5858)

**Rank Electronic Tubes 29 & 30**

Products: Cathode Ray Tubes.  
 Personnel: Ray Griggs, Mktg Mgr; Ronald Johnson, Ch Op Off.  
 4658 Scotts Valley Drive, Scotts Valley, CA 95066 (408/438-6440)



**Raytheon Co. 23 & 24**

Products: Special purpose cathode ray tubes. Electro-sensitive & thermal hard copy recorders.

Personnel: Alvin Luftman, Mgr/Display Devices; Sam Bello, Mktg Mgr.  
465 Centre Street, Quincy, MA 02269  
(617/479-5300)

**RCA New Products Div. 56 & 57**

Products: Projection kinescopes, high resolution photorecording CRTs, phototypesetting CRTs, flying spot scanners.

Personnel: C.L. Rintz, Marketing; P. Koustas; George Robinson, Mktg; George Brody, Dir/EO Mktg.  
New Holland Ave, Lancaster, PA 17604 (717/295-6865)

**Rohm Corp. 73**

Products: Thermal printheads, & LED printheads.

Personnel: Bob Peckham, Prod Mgr; Jiro Oi, Prod Support Engr.  
8 Whatney, Irvine, CA 92718 (714/855-2131)

**SAES Getters/USA, Inc. 20**

Products: Evaporable and non-evaporable getters for CRTs and plasma displays and other vacuum related products.

Personnel: Lee Ramey, Sr Appl Engr; Tom Kelly, Mktg Services Mgr.  
1122 E. Cheyenne Mountain Blvd., Colorado Springs, CO 80906 (303/576-3200)

**Schott Group 38 & 39**

Products: CRT bulb glass, monitor panels, LCD spacers, solder glasses, CRT faceplates, contrast enhancement filters, glass to metal seals, glass sleeves.

Personnel: Bill McLaughlin, Grp Mktg Mgr; Jim Speicher, Schott Glass Technology; Diether Katz, Pres, Schott Electronics.

3 Odell Plaza, Yonkers, NY 10701 (914/968-8900)

**Scriptel Corp. 37**

Products: SPD-series transparent digitizer in sizes of 12" x 12", 12" x 18", 20" x 20", & 24" x 36". SPC-series opaque digitizer in 12 x 12.

Personnel: Nick Venetis, VP Mktg; Joe Marsalka, Pres; Bill Schlosser, Sr VP; Bob Kable, VP Engrg.

4145 Arlingate Plaza, Columbus, OH 43228 (614/276-8402)

**Sony Corp. 79**

Products: A 20" x 20in<sup>2</sup> high resolution Trinitron color graphics monitor & a test signal generator for high resolution CRT displays.

Personnel: Sony personnel & engineers.  
16450 W. Bernardo Dr, San Diego, CA 92127-1898 (619/487-8500)

**Supertex, Inc. 87**

Products: High voltage/smart power IC's, including display drivers & power MOSFET's.

Personnel: Fred Tsang, VP; Richard Siegel, VP Sls Mktg; Douglas Schliebus, Dir of Mktg.

1225 Bordeaux Dr, Sunnyvale, CA 94088 (408/744-0100)

**Syntronic Instruments, Inc. 4**

Products: State-of-the-art military & commercial deflection yoke designs, focus coils & related magnetic components; innovations in deflection yokes for delta gun & in-line gun, full color shadow mask CRTs. Precision CRT mounting systems.

Personnel: Gardner Marcy, Pres; Paul Evans, VP; Eugene Jenzen, VP; Matthew Honnert, Appl Engr

100 Industrial Road, Addison, IL 60101 (312/543-6444)

**Taliq 82**

Products: Plastic LCD & integrated control panels.

Personnel: Richard Wiley, Mktg Mgr; Andrew Dalisa, VP/R&D; Charles McLaughlin, Pres; Steve Marsland, Prod Mgr; Robert Simpson, VP Sls Mktg; James Ferguson, Cons/R&D.

265 N. Whisman Road, Mountain View, CA 94043 (415/967-2990)

**Tektronix, Inc. 93, 94 & 95**

Products: Monitor, CRT's, touch panel avionics color CRT.

1880 SW Merlo Drive, Beaverton, OR 97075 (503/642-8747)

**Teledyne Kinetics 89**

Products: Custom display connectors, surface stack PCB connectors, lever-loc connectors.

Personnel: George Pugsley, VP Mktg; John Schuler, Mktg Mgr; Don Johnson, VP Engrg.

410 S. Cedros Ave, Solana Beach, CA 92075 (619/755-1181)

**Test & Measurement Systems Inc. 54**

Products: Programmable video generator, hard copy video printer, 32-level grey scale printer.

Personnel: George Stoeppel, Pres.  
394 Cobalt Way, Sunnyvale, CA 94086 (408/720-8877)

**Texas Instruments 26, 27 & 28**

Products: Semi conductor—linear applications.

Personnel: Barbara Veal, Mktg Mgr; Greg Draper, Mktg Mgr; Ken Melvin, Mktg Mgr.

POB 225474, Dallas, TX 75265 (214/997-3871)

**Thomas Electronics, Inc. 42 & 43**

Products: CRT's

Personnel: Bruce Piaget, VP Sls; Ben Settigase, VP Mktg; Dennis Young, Sr Engr; Doug Ketchum, VP Engrg; Carmen Guerrie, Display Engr.

100 Riverview Dr, Wayne, NJ 07470 (201/696-5200)

**Thomson CSF Components Corp. 18 & 19**

Products: CRTs, CRT assemblies from 0.9" dia to 23" dia; rectangular, & square tubes 22" x 22"; and plasma panels from 96 x 200 up to 1024 x 1024.

Personnel: George Petro, Mktg Mgr; Charles Martino, CRT Prod Mgr; Andre Martin, Image Tube Dir; Peter Seats, Dir/Display Tech; Supersaid Baidyaroy, Dir/Engrg.

550 Mount Pleasant Ave, Dover, NJ 07801 (201/328-1400)

**3M 96**

Products: MSR High resolution display system.

Personnel: Robert Decker, Mktg Mgr; Bruce Evans, Proj Engr; Allan Solyntjes, Grp Leader

3M Co. Office Systems Division, 3M Ctr. Bldg. 235, MS 3B21, St. Paul, MN 55144

**Venus Scientific, Inc. 17**

Products: Power conversion systems.

Personnel: Sylvester Meola, Regl Sls Mgr; Barbara Standish, Eastern Regl Mgr.

399 Smith St, Farmingdale, NY 11735 (516/293-4100)

**Visual Information Institute 80 & 81**

Products: Models 2501A, 2502A & 2503A video test pattern generators. Model 151A camera test generator, Model 110, SMPTE test pattern generator.

Personnel: John H. Harshbarger, Pres; June Harshbarger, VP; Larry Butcher, Mech Engr.

719 Lower Bellbrook Road, Xenia, OH 45385 (513/376-4361)

**Westinghouse/IGTD 35 & 36**

Products: CRTs for photo typesetting, medical recorders, microfilm, color graphic film recorders; head-up display CRT assemblies and multi-function display CRTs for avionics. Image tubes.

Personnel: R. Baker, Sls; L. Crawford, Sls; V. Muccigrosso, Sls Mgr; J. Malonoski, Mgr/Devel & Appl Engrg; P. Ponzi, Mktg Mgr; J. Nivison, Sls; K. Cooper, EO Display Engrg.

Horseheads, NY 14845 (607/796-3350)

**World Products Inc. 74**

Products: NEC flat plasma displays.

Personnel: Judd Lynn, Steve Watley.  
19678 8th Street East, Sonoma, CA 95476 (707/996-5201)



(... continued from p. 18)

announcing a 512 × 640 pixel display (10" × 12.6") that is operated in an analog video mode.

### Large-screen displays

Large-area displays, from large audience viewing to teleconferencing, this year include a new version of Sony's Jumbotron (demonstrated at the Tsukuba Expo in Japan) for smaller audiences. The 16-ft to 25-ft diagonal mosaic CRT is made up of modules that contain 8 RGB triplets.

A full color, single-lens liquid crystal light valve projector, described by Seiko Epson Corp., is only 15 × 20 × 30 cm, weighing only 4 Kg. The portable projector has a 250 TV line resolution, suitable for teleconferencing and home TV.

Another light valve projector, from Tektronix Inc., uses a single CRT to address a liquid crystal light valve with stripe color filters. Brightness of 400 lumens with 640 × 480 line resolution is achieved.

### Printers

Printers continue to be an area of growing interest to SID members. Three full sessions plus a tutorial at the seminar include several notable highlights, aimed at enhancing productivity in the increasingly automated office.

A precision multi-nozzle head, central to piezoelectric drop-on-demand ink jet printers, can now be manufactured inexpensively by a new NEC "space forming" process. Sheets of ceramic are stacked and sintered to form internal electrodes, ink passages, and actuators in one operation.

In the competing technology of thermal ink jet devices, designers of improved bubble-forming pressure drives have been given an essential tool in the acoustic analysis reported by HP.

A low-cost alternative to laser printers is the aim of a Westinghouse development of a linear array of edge-emitting, thin-film electroluminescent elements that takes advantage of light-piping to achieve a light output of 0.5 W/cm<sup>2</sup>.

Professor C. Hellmuth Hertz of the Lund Institute in Sweden, a pioneer in ink jet printing, reports half-tone color image quality appreciably higher than conventional dither methods, even ap-

proaching offset printing, which he obtains by controlling the number of ink drops deposited in each picture dot.

### Interactive technology

A new session has been added this year in the important field of interactive technology. Touch-entry systems are the subject of four papers with systems described for LCDs, ELs, and CRTs.

AT/T Bell Laboratories researchers will describe a novel algorithm to determine the stylus location on a uniform resistive sheet.

Researchers at Zenith Radio Corp. will present details on an economical touch system that uses surface acoustic waves to locate the point of touch. A signal proportional to finger pressure is also derived.

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# HUD CRT phosphors exhibit distinctive preferential qualities

**S**election of a phosphor screen for a HUD CRT depends upon a number of factors affecting the communication of information vital to a pilot:

- Visual display is directly input to the pilot's eyes. This influences specification of color (hue), brightness, and resolution.
- Symbology is projected so it appears to be at infinity in the pilot's field of view, superimposed on background terrain. Information would be unintelligible unless the display provided good contrast between background and symbology.
- Visibility is required both day and night; in ambients ranging from  $10^4$  to  $10^{-3}$  fL. This necessitates consistent display performance over a continuous luminance range of 100:1 to 1000:1.
- Readability is essential with symbology sharp, free of flicker, and ghosting. Specifications require symbology to be small enough not to clutter the display; yet large enough for adequate perceptability.

Three phosphor types currently dominate HUD CRT applications: P1, P43, and P53. Each of these phosphors has properties that meet the general requirements of a HUD CRT screen. And each has distinctive qualities that may make them preferred material as deter-

## HUD CRT phosphors

P1 phosphor holds a leading position among the dozens currently registered.

P43 is a narrow-band emitting phosphor with very high luminous efficiency that gives a distinct advantage over many phosphors and permits the implementation of non-conventional imaging techniques.

P53, a rare earth phosphor that has a predominantly green emission, is called a "super phosphor" because of its extreme ruggedness at high screen current location.

mined by the requirements of the HUD designer, mainframe manufacturer, and ultimately the pilot. In each case, trade-offs may need to be made (such as color or luminance) in arriving at a specification for a practical, feasible CRT.

This article, an overview of their characteristics and performance, is not intended to be an exhaustive study of phosphors as used in HUD CRTs. But, the conclusions reached are germane to most, if not all, HUD systems currently in use or development.

Many of the data presented, particularly those relating to luminance and resolution performance, come from studies of the three phosphors on the Westinghouse WX34446P—a 2.5-in.-dia high-resolution HUD CRT that is currently in use on the F-20 Tigershark.

## Color and color contrast

The position of P1 on the Kelly Chart is indicative of a fairly saturated green luminescence. Along a line extending from

white (at chart center) to the diagram's edge, P1 is much nearer the edge. Consequently, symbology displayed on a P1 phosphor screen is easily discerned from its background: the display has good color contrast.

P43, however, is located much closer to the center of the Kelley Chart than P1. Its luminescence is less saturated, having more white than that of P1. Consequently, unfiltered P43 symbology often appears more washed out and does not contrast as well with background terrain, thus making P43 symbology less readable.

The color coordinates of P53 indicate it is slightly stronger in red than P43. Nonetheless, it also appears washed out next to P1 and the consequent reduced color contrast of the P53 display may hinder the continued acceptance of this phosphor in avionic displays. One approach to solving this problem is the use of filter coatings on HUD optical components that would block transmission of light above approximately 575 nm. The new color coordinates then would fall much closer to P1.

## Spectral energy distribution

The spectral energy distribution of P1 shows a single, broad peak emission. The radiance maximum occurs at 525 nm, quite close to the peak eye response of 555 nm. Therefore, although its radiant efficiency is low (4-5% on a W/W basis), its luminous or photo-optic efficiency is good, reaching 30 L/W. As a practical consequence, peak-trace (sym-

by Roger S. Seymour, Jr., Sr. Design Engineer  
Industrial & Government Tube Div.  
Westinghouse Electric Corp.  
Horseheads, NY



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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.

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|-----------------------|---------------------------------------|
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| 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.



# Show your true colors with Hoya filters



Color CRT Display



Design engineers who want to show their system's true colors in their displays are using Hoya's new contrast enhancement filters.

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The new cockpit color displays in commercial and military aircraft can rely on Hoya's AC-series enhancement filters. In order to display great amounts of information while flying at high altitudes in intense ambient light conditions these Hoya filters are



P-43 Phosphor Display

critical to the optimum operation of the system.

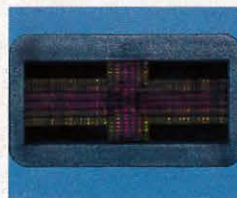
Hoya filters are also used extensively in P-43 green phosphor displays in military aircraft and radar applications.

Two more applications of Hoya glass filters are their use in plasma and LED displays for increased contrast and less eye strain.

Hoya's monolithic filters possess distinct advantages

over composite filters, laminated dye filters or interference filters with respect to durability, environmental stability, mechanical strength and transmission characteristics.

Hoya produces over 100 different types of high-grade glass filters. Please contact Hoya Optics for your specific requirements. Custom-shaped finished filters and anti-reflection coatings are also available on request.



LED Display



Plasma Display

## HOYA OPTICS

LOOKING BEYOND THE HORIZON



bology) luminance of 10,000 fL—a typical HUD CRT light output requirement—is easily achieved with P1.

P43 has received special attention due to its emission characteristics. Because of the narrowness of P43's central peak, diffraction optics may be used to form the final image on the HUD. That is, instead of relying on semi-reflective glass plates to direct the HUD imagery into the pilot's field of view, a holographic diffraction grating is used to accomplish the same thing. If the same technique were applied to a P1-screened CRT, output would be dispersed and the display resolution would be unacceptable—because of the P1 peak width (90 nm at 10% amplitude).

Using diffraction optics in the final combining glass of the HUD results in less overall light loss. HUD designers have taken advantage of this to increase the size of the display while maintaining typical symbology luminances. Some diffractive or holographic HUDs boast fields of view of 20 deg by 30 deg,

roughly nine times the viewing area of early HUDs.

P43 phosphor owes its remarkable efficiency to the concentration of much of its radiated power in a narrow peak—15 nm wide at 10% peak amplitude—at 545 nm. Luminous efficiencies of 35-40 LW are typical and make this phosphor very useful in large-area displays, in particular the Head-Down systems.

P53 emission is not very efficient, particularly when compared to P43. The primary peak of this rare earth phosphor is at 550 nm, and is actually a juxtaposition of at least two emission peaks that become resolvable at a monochromator slit width of 2 nm or less. Area efficiencies of P53 HUD screens of 20 to 25 LW are typical.

#### Persistence

P1 is classified as being of medium persistence. Depending on its formulation, P1 will decay to 10% in 2 to 20 ms, typically closer to the shorter extreme. On a

50 or 60 Hz display (symbology refreshed every 17 to 20 ms) there is negligible flicker and ghosting.

As with P1, and appropriately for phosphors used in visual displays, P43 is a medium decay phosphor. Phosphorescent decay to 10% occurs in approximately 1.2 ms. P43 may exhibit flicker, though not an objectionable amount.

The persistence of P53 is longer than those typical of P1 and P43—approximately 11 ms decay time to 10%.

#### Luminance and current saturation

Although it would appear that peak luminances of 20,000 fL or more can be attained by a P1 screen, attempting to meet such a requirement within the framework of typical HUD CRT operation would result in a short-lived tube—with regard to the maintenance of both screen output and adequate thermionic emission levels. In a low-duty cycle display (typical of a HUD), peak luminances of 13,000 to 15,000 fL are reasonable goals.

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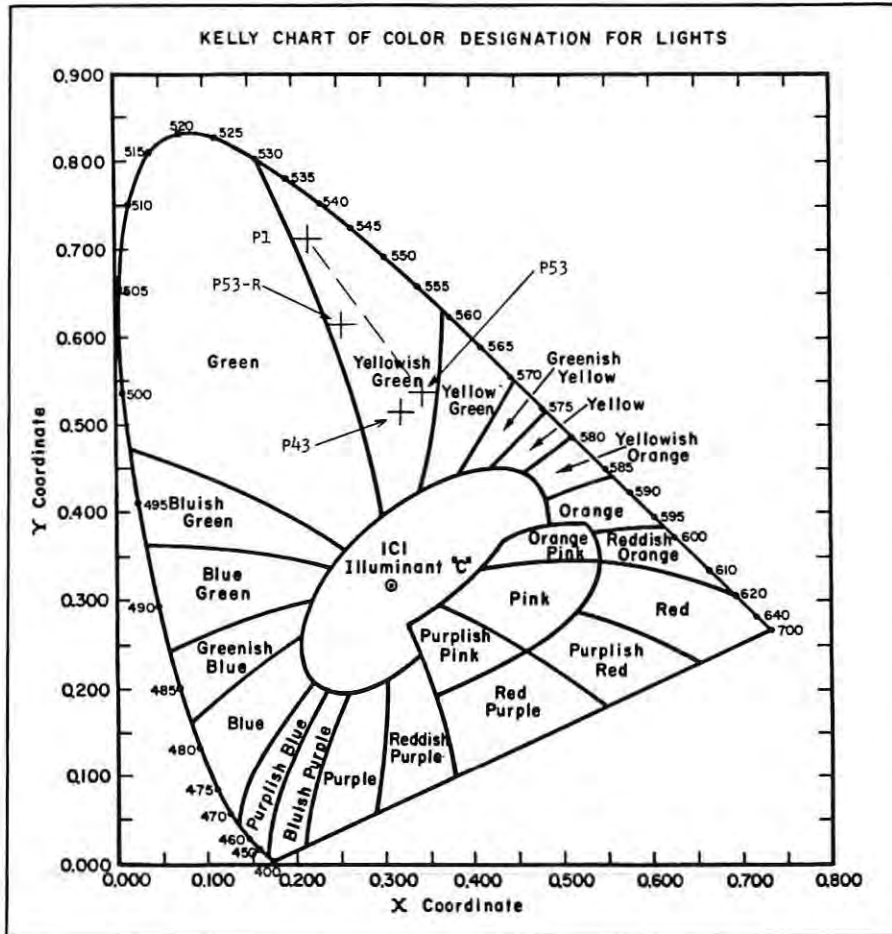
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P43 has some shortcomings, since it saturates severely at screen-current densities of approximately 0.02 A/cm and greater. At these loadings, P43 is incapable of more than 7500 fL at trace center unless the line is defocused. Saturation observed in P43 is due in part to thermal quenching of the phosphor's emission. That is, as the phosphor is heated from the very high power density of the electron beam (the average beam power density at high drives may exceed 1 MW/m<sup>2</sup>), luminescence falls off.

In the HUD CRT, this effect is compounded by the relatively slow stroke writing rate. Actual measurements of traces on P43 screen CRTs at high drive show a depressed center with the luminance rising to a maximum of 8500 fL on either side. Nonetheless, P43 remains an interesting phosphor for HUD applications. Current development efforts are targeting a P43 HUD CRT screen capable of 13,000 to 15,000 peak fL.

P53, on the other hand, is very reluctant to saturate. Peak line luminance shows no roll off at levels of 40,000 to 50,000 fL. Under modified operating conditions, peak luminances in excess of 80,000 fL have been reported.

The fact that P53 has historically been overlooked for HUD applications can perhaps be explained by the fact that at typical light output levels of 8,000 to 10,000 fL, at the CRT screen, the lower area efficiency of P53 puts it at a disadvantage with respect to P1. With the recent push for larger displays (20 deg of field of view) of comparable resolutions and brightness, however, the P1 screen has been pushed to its limit.

Recent HUD proposals require screen luminances in a range of 12,000 to 35,000 fL, the low end corresponding to the maximum available output from P1 in a practical display. These luminances, however, fit comfortably inside the operational range of a P53 CRT.

The practical limitations in these

CRTs no longer relate to the screen. Instead, current density at the cathode surface, outgassing within the CRT, and heat dissipation determine the serviceability of the tube. For the typical HUD CRT, very high brightness requirements can substantially reduce lifetimes—possibly to less than 500 hours.

### Resolution and graininess

The resolution performance typical of P1 is a function not only of the resolution characteristics of the phosphor, but also of the electron gun. What is pertinent is the contribution of the phosphor screen to the overall line width. Scattering, both of electrons as they penetrate the aluminum screen backing and of light reflected inside the phosphor layer, causes growth of the line width. Based on empirical studies and computer simulation of the electron optics involved, it is known that this relatively fine-grain, gravity-settled P1 screen contributes 0.001" to 0.002" to overall line width.

The P43 studied has physical characteristics, in terms of particle size, similar to P1 and performs accordingly. Scattering is comparable to that observed with P1. Like P1, the line-width changes dramatically, about 2:1, from low to high drive levels.

The P53 used has an average particle size that is significantly larger (7.5 μm) than those of the P1 and P43 screens. Its resolution characteristic is noticeably different; low level line-widths are 0.001 in. larger and line-width increase with drive is reduced to 30%.

The relatively small change of P53 line-width with drive is typical of what might be called a phosphor-limited resolution characteristic; that is, the line-width is independent of beam size, particularly at low drive levels, and is determined by the particle size and scattering in the screen.

The converse of this, or beam limited mode, occurs in CRTs having fine-grain screens exhibiting a resolution characteristic predominantly determined by the contribution from the electron beam. Line width, then, is very sensitive to drive and focus conditions. The performance of the P1 and P43 screens tends more toward the beam-limited mode.



# Bright Display Designs From...

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### MARATHON RAISED CATHODE DISPLAY COMPONENTS

Raised Cathode PGD components operate with a single +180 VDC (nominal) power supply. Accessory high voltage driver/decoders and DC/DC converters are available.

| Model Number | Number of Characters | Character Height |
|--------------|----------------------|------------------|
| NUMERIC      |                      |                  |
| SP-102       | 1/2"                 | 1.0" (25.4mm)    |
| SP-101       | 1                    | 1.0" (25.4mm)    |
| SP-331       | 1 1/2"               | 0.33" (8.4mm)    |
| SP-332       | 2                    | 0.33" (8.4mm)    |
| SP-334       | 2 1/2"               | 0.33" (8.4mm)    |
| SP-333       | 3                    | 0.33" (8.4mm)    |
| SP-351       | 1 1/2"               | 0.55" (14.0mm)   |
| SP-352       | 2                    | 0.55" (14.0mm)   |
| SP-354       | 2 1/2"               | 0.55" (14.0mm)   |
| SP-353       | 3                    | 0.55" (14.0mm)   |
| SP-355       | 3 1/2"               | 0.55" (14.0mm)   |
| SP-356       | 4                    | 0.55" (14.0mm)   |
| SP-324       | 4                    | 0.23" (5.8mm)    |
| SP-325       | 5                    | 0.23" (5.8mm)    |
| CLOCK        |                      |                  |
| SP-358       |                      | 0.55" (14.0mm)   |
| ALPHANUMERIC |                      |                  |
| SP-252       | 2                    | 0.55" (14.0mm)   |

\* = 1/2, with + or - sign

### AZURE VACUUM FLUORESCENT SUBSYSTEMS

Vacuum Fluorescent subsystems operate on a single +5 VDC power supply and accept TTL level parallel or serial ASCII data.

RS-232 serial is optional.

| Model Number                    | Rows x Columns | Character Height |
|---------------------------------|----------------|------------------|
| 14-SEGMENT CHARACTER FORMAT     |                |                  |
| VS-0116-01                      | 1 x 16         | 0.35" (9mm)      |
| VS-0120-01                      | 1 x 20         | 0.35" (9mm)      |
| VS-0132-01                      | 1 x 32         | 0.20" (5mm)      |
| 5x7 DOT MATRIX CHARACTER FORMAT |                |                  |
| VF-0120-02                      | 1 x 20         | 0.35" (9mm)      |
| VF-0120-03                      | 1 x 20         | 0.59" (15mm)     |
| VF-0140-02                      | 1 x 40         | 0.20" (5mm)      |
| VF-0220-01                      | 2 x 20         | 0.20" (5mm)      |
| VF-0220-02                      | 2 x 20         | 0.35" (9mm)      |
| VF-0240-01                      | 2 x 40         | 0.20" (5mm)      |
| VF-0240-02                      | 2 x 40         | 0.20" (5mm)      |
| VF-0240-03                      | 2 x 40         | 0.20" (5mm)      |
| VF-0640-01                      | 6 x 40         | 0.20" (5mm)      |

### MESSENGER GAS DISCHARGE DISPLAY SUBSYSTEMS

DP series PGD subsystems operate with a +5 VDC and +185 VDC power supply and accept TTL level parallel ASCII or graphic data. An optional serial interface is available.

| Model Number   | Rows x Columns | Character Height |
|--|----------------|------------------|
| MULTILINE ALPHANUMERIC 5 x 7 DOT MATRIX CHARACTER FORMAT |                |                  |
| DP-0216-C1   | 2 x 16         | 0.42" (10.7mm)   |
| DP-0416-C1   | 4 x 16         | 0.33" (8.4mm)    |
| DP-0832-C1   | 8 x 32         | 0.25" (6.4mm)    |
| DP-0840-C1   | 8 x 40         | 0.21" (5.3mm)    |
| DP-1240-C1   | 12 x 40        |                  |
| FULLY POPULATED DOT ADDRESSABLE GRAPHICS                 |                |                  |
| DP-32G96-C1  | 32 x 96        | VARIABLE         |
| DP-64G192-C1   | 64 x 192       | VARIABLE         |
| DP-96G240-C1   | 96 x 240       | VARIABLE         |

### SM SERIES SUBSYSTEMS

SM series subsystems operate with a single +5 VDC power supply and accept parallel TTL level ASCII data. SM & SG canned message subsystems also accept TTL level or RS-232 level serial data.

| Model Number              | Rows x Columns | Character Height |
|---------------------------|----------------|------------------|
| SINGLE LINE SUBSYSTEMS    |                |                  |
| SM-810-001                | 1 x 40         | 0.24" (6.1mm)    |
| SM-810-002                | 1 x 20         | 0.47" (11.9mm)   |
| SM-810-004                | 1 x 20         | 0.47" (11.9mm)   |
| CANNED MESSAGE SUBSYSTEMS |                |                  |
| SM-0120-C1                | 1 x 20         | 0.47" (11.9mm)   |
| SM-0140-C1                | 1 x 40         | 0.24" (6.1mm)    |
| SG-0220-C1                | 2 x 20         | 0.45" (11.4mm)   |

**Ask for a demonstration and judge the quality of Babcock Displays for yourself.**

**For further information contact your local Babcock representative or the factory.**

### PLASMAFLEX SCREENED IMAGE DISPLAY COMPONENTS

Screened image PGD components operate with a single +180 VDC (nominal) power supply. Accessory high voltage driver/decoders and DC/DC converters are available.

| Model Number | Number of Characters | Character Height |
|--------------|----------------------|------------------|
| NUMERIC      |                      |                  |
| SP-450-013   | 6                    | 0.50" (12.7mm)   |
| SP-450-019   | 8                    | 0.70" (17.8mm)   |
| CLOCK        |                      |                  |
| SP-431       |                      | 2.0" (50.8mm)    |
| ALPHANUMERIC |                      |                  |
| SP-462       | 4                    | 2.0" (50.8mm)    |
| SP-452       | 16                   | 0.50" (12.7mm)   |
| SP-450-026   | 16                   | 0.50" (12.7mm)   |
| SP-450-018   | 20                   | 0.50" (12.7mm)   |
| DOT MATRIX   |                      |                  |
| SP-480-006   | 8                    | 1.0" (25.4mm)    |
| SP-480-002   | 20                   | 0.47" (11.9mm)   |
| SP-480-001   | 40                   | 0.24" (6.1mm)    |

\* = without flying leads

### ACCESSORIES

Babcock offers a host of accessories for our displays, including:

- Circular Polarized Filters for the SM and DP series of Gas Discharge subsystems
- Acrylic Filters for the Azure series of Vacuum Fluorescent subsystems
- Display Connectors for both Raised Cathode and Screened Image displays
- Connector kits for all subsystems
- Pin Straighteners for Raised Cathode displays
- +5 VDC to +180 VDC DC to DC Converters and Line operated +180 VDC Power Supplies
- Decoder/Driver integrated circuits

### Informative Design Guide Covers Display Fundamentals.

The booklet, *Selecting The Right Display*, will assist you in choosing a display to match your design.

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Many Babcock units are available in Evaluation Kits which provide the display of your choice, plus the accessories required to evaluate it.



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In spite of an inherently larger line width, the phosphor-limited mode of operation has advantages for the HUD display. Many HUDs have no dynamic focus capability; thus, focus is set to give the best balance of center and edge line widths, with resolution degraded over most of the CRT screen. In CRTs having fine-grain screens, line width will vary significantly—perhaps as much as 2:1—from center to edge. Using a coarser screen, variations of the phosphor-limited line width can be reduced to 1.3:1.

Measurement history of the WX34446 shows a change in the line width range from 0.0030"-0.0055" (fine-grain P1) to 0.0040"-0.0052" (coarse P53) under the same operating conditions. This smoothing effect of the phosphor-limited operating mode also improves performance when the CRT is subject to large changes in drive. It compensates for the reduction in beam size

at lower drive—for nighttime operation—as well as for modulation defocusing or the change of the CRT focus with large changes in drive.

### Burn characteristics

Luminance maintenance of a phosphor is a function of charge influx. At 10 C/cm<sup>2</sup> P1 has lost approximately one third of its initial light output. This charge accumulation roughly equates to a typical HUD CRT screen (2.5-in. usable area) being flooded with symbology at maximum brightness, running for nearly 900 hours at 100% duty cycle.

The luminance maintenance characteristic of the P43 screen is somewhat out of the ordinary. Close to 10% of the initial efficiency is lost in a relatively short period of time. Afterwards, the decline is quite gradual, reaching only a 14% reduction in luminance after 10 C/cm<sup>2</sup>. From the standpoint of reliability and long term stability of light out-

put, it behooves the HUD manufacturer to assure an appropriate screen burn-in be done prior to final acceptance testing.

Despite its ruggedness under conditions very demanding for any phosphor screen, P53 loses efficiency in a manner comparable to P1—with higher initial losses but a faster rate of change that equalizes the two near 10 C/cm<sup>2</sup>. The severe body burn visible on the unexcited screens of old P1 tubes, however, has not appeared in any of the P53 CRTs in the field thus far.

(Developed from *Phosphors for Head-Up Display Cathode Ray Tubes*, by Roger S. Seymour, Jr., Sr. Design Engineer, Industrial & Government Div., Westinghouse Electric Corp., Horseheads, NY, presented at the Electronic Displays and Information Display Systems Conference and Exhibition, London, UK, October 29-31, 1985.)

For information circle Reader Service # 101

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## Educational computing

*The Journal of Educational Computing Research* is a quarterly periodical for the exchange of information on new research in the theory and applications of educational computing. Contents include original research papers, critical analysis, reports on research in progress, design and development studies, authoritative book and article reviews, grant award listings, and reader commentary. Price: \$85 BAYWOOD PUBLISHING CO. INC., Farmingdale, NY. (800/547-7500)

## Document microfilming

Association for Information and Image Management (AIIM) has issued a report that sets forth guidelines to assist public agencies in obtaining microfilm of adequate quality for public documents having permanent value. *Guidelines for Public Records Microfilming (#T006)* covers original first-generation microforms, including rolls, microfiche, aperture cards and jacketed film. Price: \$7.75, members; \$10, non-members.

AIIM, Silver Spring, MD (301/587-8202)

## Flow camera image quality

A technical report on quality and a proposed new method for measuring quality in flow cameras (image in motion during exposure), discusses the mechanical and photographic characteristics of this type of microimaging cameras and provides a test chart for measuring the photographic and mechanical quality of 16-mm systems.

AIIM, Silver Spring, MD (301/587-8202)

## Computer communications

*Increasing Your Business Effectiveness Through Computer Communications* shows how to build an integrated computer system for two to 200 people, with or without mainframe. This hands-on guide covers the ABCs of computer communication, modems, connecting printers to two or more computers, hardware and software angles of tapping into data, security techniques, installation of multiuser systems, computer networking to share databases, accessing micros for data acquisition and control in the plant or field. Price: \$17.95. CHILTON BOOK CO., Radnor, PA (800/345-1214)

## Power protection

*Power Buyers Guide* is a semi-annual reference on the operation of computers and computer-based systems that contains near-

ly 300 pages of technical data and other information on power connection and conditioning equipment. It lists 2,000 computer power sources and power conditioners from over 70 manufacturers; and covers six major categories and 31 sub-categories by power level and manufacturer. Price: \$29.95.

WELLSPRING ENTERPRISES, San Diego, CA (619/484-4479)

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# Products

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CANON INC., Lake Success, NY (212/688-1200).

For information circle Reader Service #54

## Image scanning system

High resolution scanner, model 730 WIPS, featuring image resolutions of 300 and 200 dots per inch (dpi) over an 8½ x 11-inch document, is designed to interface to the IBM Personal Computer XT or AT, and most compatibles. The device consists of the Model 230 Image Scanner, an interface board for the IBM PC, interconnecting cable and WIPS (Word Image Processing System) software.

Resolutions of up to 2552 by 3508 pixels are provided at 300 dpi over an 8½ x 11-inch document. Windows can be created in either mode with the WIPS software to scan only a portion of the full area. The copier-sized scanner (15.2 x 19.5 x 5.6 in.) weighs less than 18 pounds. Price: \$4,950. DATACOPY CORP., Mountain View, CA. (415/965-7900)

For information circle Reader Service #50

## Color printer

Single pass thermal transfer color printer, CP-804GV, incorporates one pass of the specially designed thermal line head over a three color ribbon to produce color registration hardcopy images. The image (alphanumeric and/or graphic) can be reproduced on regular, Z-fold or roll paper as well as transparencies (for overhead projection), and can print up to seven colors in a single pass. The printer interfaces directly with an IBM PC (or compatible) RGB video CRT display or a 640 x 400 pixel high resolution image, and prints the screen image, dot-for-dot. Color printing is accomplished at 2 inches per minute, or approximately 2 minutes per 640 x 400 pixel full screen image. The printer provides density of 101 dots per

inch, or 4 dots/mm with the printing width 8-3/16 or 832 dots. CP-804GV operates at under 55 dBA and weighs 34 pounds. Price: \$900 and up.

SHOSHIN, U.S.A., INC., Santa Ana, CA. (714/250-4073).

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For information circle Reader Service #20

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SPERRY CORP., Blue Bell, PA. (215/542-4213).

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MOTOROLA INC., Schaumburg, IL. (312/576-7700).

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TECKNIT, Cranford, NJ (201/272-5500).

For information circle Reader Service #62

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HEWLETT PACKARD, Palo Alto, CA (Contact local distributor).

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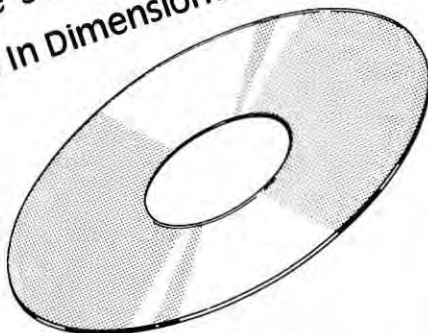
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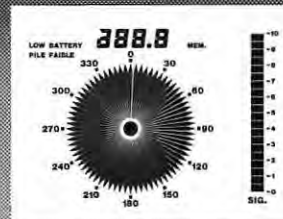


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April 1986 35



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## SOCIETY FOR INFORMATION DISPLAY

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

**A**s we prepare for the Society's annual gathering in San Diego next month, a few observations on how to get the most out of the more than 100 technical papers being presented might be in order.

For SID '86 to be a successful conference for our Society, and a rewarding experience for you in the display industry, requires that you participate—not merely attend.

The purpose of a conference is, of course, the exchange of ideas, the enrichment of our own views through the support or challenge provided by the views of others. It is a situation created especially for the purpose of communication. And participation is the key to communication.

There are two aspects to communication. One is the matter of output—the speaking and writing, which involves problems of rhetoric, composition, logical presentation, coherence, knowledge of the subject, and so forth. The other aspect of communication is the problem input—especially the problem of how to listen well.

Too often speakers and audiences fail to interact—primarily because of the manner in which a paper is presented, but also as surely by the audience's poor listening habits. For a conference to result in the exchange of ideas, both participants must come to the meeting prepared to reap synergistic benefits.

### Suggestion #1:

If you are presenting a paper (which at SID '86 is only a digest, and information that everyone in the audience already has in hand), try to give your audience something extra by not merely reading what you've written, but instead by expanding your thoughts to get your audience involved in listening more acutely, taking notes, and asking questions. This is a sure way to have people talk positively about your presentation and what they got out of participating in the session.

### Suggestion #2:

If you are listening to papers, you also should give something more than just being part of an audience. "Listening," says S.I. Hayakawa, "does not mean simply maintaining a polite silence . . . it requires entering actively and imaginatively into the other (person's) situation and trying to understand a frame of reference (that may) be different from your own."

"A good listener does not merely remain silent (but) also questions . . . motivated by curiosity about the speaker's views".

The important thing is for each and every one of us to come away from SID '86 with a fund of information . . . about what other people are doing and thinking and why. While the result of communication successfully *imparted* is self-satisfaction, the result of communication successfully *received* is self insight.



**Los Angeles:** February 27, 1986

**Program:** Technical Meeting

**Topic:** The World of 3-D Techniques

**Speaker:** Dr. Dave McAllister

Professor, Computer Sciences,  
North Carolina State University

Dave gave a comprehensive overview of 3-D techniques feasible today: holography; stereoptic displays using alternating pairs or lenticular techniques (autostereoscopic) and stereoscopes, shutters, and passive viewers (viewers needed); and real 3-D displays using varifocal mirrors, rotating mirrors, and other techniques (parallax stereogram, parallax panoramagram, moving slit methods, and so forth). He also showed a video tape of a surprisingly effective (though noticeably flickering) 3-D technique using regular broadcast TV techniques developed at NCSU.

**Topic:** CRT Stereoscopic Displays

**Speaker:** Dick Holmes, President

Electronic Image Systems

Dick described two very practical 120 Hz refreshed CRT stereoscopic displays (19" and 25" diag) currently being designed at EIS that use a liquid crystal polarizing switch to create the stereo pair images.

**Bay Area:** February 25, 1986

**Program:** Technical Meeting

**Topic:** Phosphors for Heads-Up Display  
Cathode Ray Tubes

**Speaker:** Larry Crawford, Western Sales

Director, Westinghouse

Industrial and Government Tube Div.

Heads-Up Displays are the leading edge display systems of aviation electronics, and Larry presented information on the physical properties of phosphors for these devices from a paper, recently presented in London, by Roger Seymour, Sr. Design Engineer at Westinghouse (see Table of Contents).

**Delaware Valley:** February 6, 1986

**Program:** Technical Meeting

**Topic:** Application of Dichroic Liquid  
Crystal Displays for Avionics/  
Military Equipment

**Speaker:** Dr. Derick Jones,

Electronic Display Systems Inc.,  
Hatfield, PA

**Minneapolis-St. Paul:** January 31, 1986

**Program:** Technical Meeting

**Location:** Laserdyne Corp.  
Minneapolis, MN

**Topic:** Controlled Laser Technology

**Speaker:** Ron Sanders, and Terry Vander Wert  
Data Card Corp.  
Minneapolis, MN

**Minneapolis-St. Paul:** December 13, 1985

**Program:** Technical Meeting

**Location:** Grove Street Library

**Topic:** Display Update—Panasonic  
FT-70 Computer

**Speaker:** Richard Jamieson, Jamieson and Associates,  
Minneapolis MN

## JAPAN DISPLAY 86

### 6th International Display Research Conference

**Date:** Sept 30 - Oct 2, 1986

**Venue:** Tokyo, Japan

### Other Related Events in Japan Trade Exhibitions

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**CALL FOR NOMINATIONS:** Nominations of qualified candidates for Fellow, Frances Rice Darne Memorial Award, and Special Recognition Awards are now being accepted. For nomination applications contact: National Headquarters, Society for Information Display 8055 Manchester Avenue, Suite 615, Playa Del Rey, CA 90293 (213/305-1502).

### CHAPTER MEETINGS PLANNER

#### MAY 20: Mid-Atlantic Chapter

**Place:** Roosevelt Hotel,  
New York City  
**Program:** SID '86 Panel Critique  
**Contact:** T.J. Nelson, Secretary  
(201/582-3760)

#### JUNE 1 & 2: Mid-Atlantic Chapter

**Place:** Atlantic City, NJ  
**Program:** Annual Banquet  
FAA tour/talk  
**Contact:** T.J. Nelson, Secretary  
(201/582-3760)

#### JUNE 10: UK & Ireland Chapter

**Place:** GEC Research, Wembley  
**Program:** Highlights from SID '86,  
San Diego International  
Symposium  
**Contact:** Simon Bliss,  
Phosphor Products,  
1 Factory Road, Upton,  
Poole, Dorset. UK  
(0202 - 632116)

*(This quick-glance calendar is intended to help SIDers plan their business trips around local Chapter meetings—but to make it work, it will require your input of advance notice for upcoming meetings.)*



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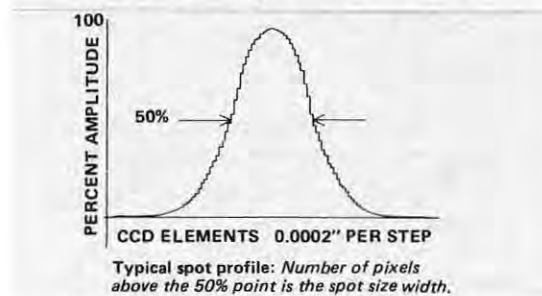
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Nominations are now being solicited from SID members for candidates who qualify for SID Honors and Awards.

- **Fellow**—Conferred annually upon a SID member of outstanding qualifications and experience as a scientist or engineer in the field of Information Display, and who has made a widely recognized and significant contribution to the advancement of the display field.
- **Frances Rice Darne Memorial Award**—Presented periodically (but not more than once a year) to a SID Member in recognition of outstanding technical achievement (as opposed to teaching, publication, or service) in, or contribution to, the display field.
- **Beatrice Winner Award**—Awarded periodically (but not more than once a year) to a SID Member for exceptional and sustained service to SID.

**Special Recognition Awards:—**

- Outstanding technical accomplishments,
- Outstanding contributions to the literature, and
- Outstanding service to the Society

granted to members of the technical and scientific community (not necessarily to SID Members) for distinguished and valued contributions to the Information Display field.

Nominations should comply with the 1986 Guidelines for SID Honors and Awards Nominations and should be submitted to the Honors and Awards Committee Chairman before September 1, 1986.

For information circle RS#108





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