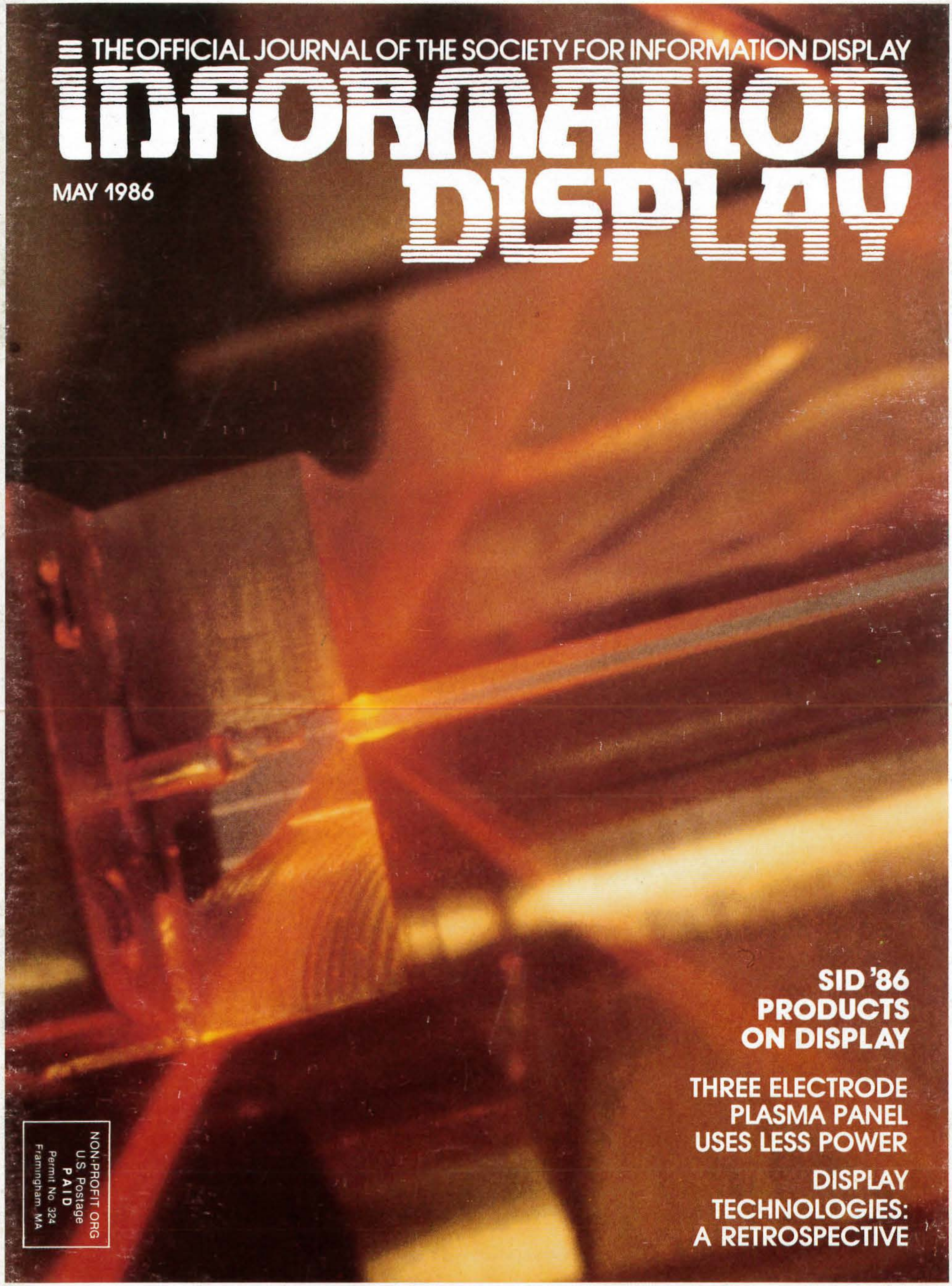
THE OFFICIAL JOURNAL OF THE SOCIETY FOR INFORMATION DISPLAY

INFORMATION DISPLAY

MAY 1986

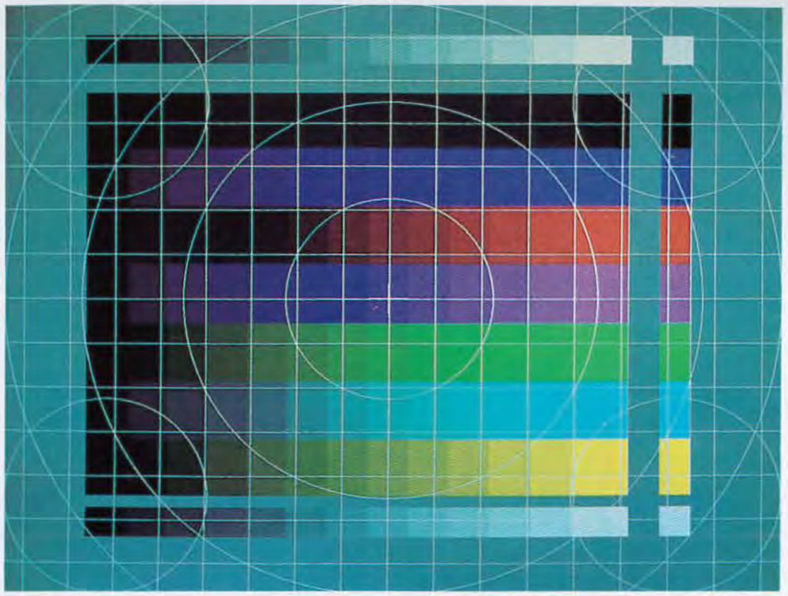


SID '86 PRODUCTS ON DISPLAY

THREE ELECTRODE PLASMA PANEL USES LESS POWER

DISPLAY TECHNOLOGIES: A RETROSPECTIVE

ASTRO HAS DESIGNS ON YOUR MONITOR, NOT JUST A PRETTY PICTURE



ASTRO DESIGN Inc. ,is the leading supplier of programmable video signal generators and other graphics related equipment and systems such as image processors and graphics processors. Most American and Japanese CRT monitor manufacturers and a number of European manufacturers are using our products to test, evaluate, and demonstrate their products efficiently and effectively. Satisfied customers — all.

Some of the patterns that can be generated are:

- Character patterns
- Gray-scale patterns
- Color-bar patterns
- Center marker, edge and corner markers, etc., etc.
- Circular patterns
- Dot patterns
- Cross-hatch patterns
- Window patterning functions

⬅ This is a sample display frame generated using the VG-807A. It shows the superimposition of circular patterns, cross-hatches, horizontal color bars, vertical gray-scale patterns, a center marker, and six windows on a gray background plane.

THE VG-807A PROGRAMMABLE VIDEO SIGNAL GENERATOR.

The ultimate in programmable video signal generation is here. The VG-807A Programmable Video Signal Generator lets you generate virtually infinite varieties of video signals for testing, adjustment, evaluation, and demonstration of your video display/output devices — from commercial CRTs to the latest in super-high resolution CRT monitors, laser printers, etc.

FEATURES

THE VG-807 IS FULLY PROGRAMMABLE: Press a few keys and you get a new video signal tailored to your own needs. All timing parameters can be programmed. All outputs can be controlled. All patterns and colors can be combined at ANY frequency.

USER ROM FOR INSTANT LOADING OF PROGRAMMING DATA: The programming data for over 100 signal formats can be loaded in the form of a preprogrammed 8K byte ROM inserted in the user ROM socket.

SIMPLE TO OPERATE, EASY TO USE: A large, easy-to-read 20-character by 2-line fluorescent alphanumeric display guides the operator in a simple conversational mode.

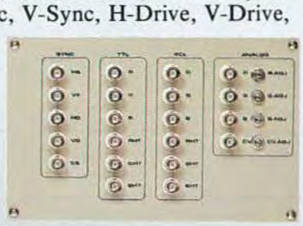
LARGE VARIETY OF OUTPUT SIGNALS: All types of video signals are output separately.

VIDEO OUTPUTS:

Analog outputs*: R, G, B, and composite video.
ECL Outputs: R, G, B, and half-tone R, G, B outputs.
TTL Outputs: R, G, B, and half-tone R, G, B outputs.

SYNC OUTPUTS: H-Sync, V-Sync, H-Drive, V-Drive, and composite Sync.

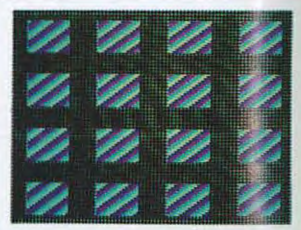
- The analog output level can be programmed in the following range:
  Video level: 0.3 V ~ 2 V across 75 Ohms
  Sync level: 0V ~ 1V
  Set-up level: 0V ~ 0.5 V

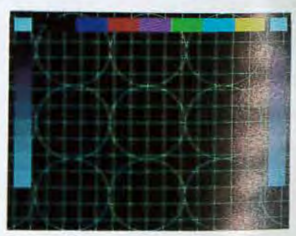


SUPER-HIGH RESOLUTION: Signals for super-high resolution monitors can be generated with H-Sync frequencies up to 200 kHz and dot clock frequencies from 5 to 160MHz.
H-Sync periods: 5.00 *us* ~ 81.92 *us* in 20 ns steps.
V-Sync periods: 100 H ~ 4000 H in 1H steps.

SUPERB PATTERN GENERATION FUNCTIONS: The most complex of patterns can be generated with utmost ease due to the use of the following four basic planes in addition to windowing functions that allow flexible operations on window areas selected anywhere in the display area.

- Graphic plane: 2048 × 2048 dots giving high resolution.
- Color bar plane: Freely selectable width, color combination, and intensity.
- Gray-scale plane: Gray-scales with up to 127 levels can be displayed with freely programmable bar width and initial intensity.
- Background plane: The intensity and color of the background plane can be set as required.





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THE OFFICIAL JOURNAL OF THE SOCIETY FOR INFORMATION DISPLAY

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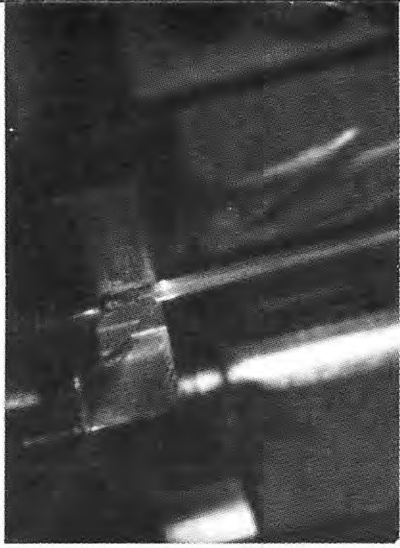
MAY 1986 VOL. 2 NO. 5



Cover: A GaAs photoconductive detector attached to the end of an electro-optic crystal provides high-speed pulse sampling.—*J. Valdmanis, AT&T Bell Laboratories*.

FEATURES

afips
American Federation of Information Processing Societies

DEPARTMENTS

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.

NATIONAL

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

MAY 25-30: 152nd National Meeting of the American Association for the Advancement of Science, Philadelphia, PA. Contact: AAAS, 1333 H Street NW, Washington, DC 20005 (202/326-6400)

MAY 28-30: Performance 86 and ACM Sigmetrics—1986 Joint Conference on Computer Performance Modeling, Measurement and Evaluation, Raleigh, NC. Co-sponsored by Association for Computing Machinery (ACM) Sigmetrics, and IFIP WG. Contact: Harry G. Perros, North Carolina State University, Raleigh, NC 27695 (919/737-2858)

JUNE 1-6: Third International Network Planning Symposium— Networks '86, Tarpon Springs, FL. Contact: Warren Falconer, AT&T Bell Labs, Crawfords Corner Road, Holmdel, NJ 07733 (201/949-1500)

JUNE 2-4: 1986 IEEE MTT-S International Microwave Symposium, Baltimore, MD. Contact: Edward C. Niehenke, Westinghouse Electric Corp., PO Box 746, MS 339 Baltimore, MD 21203 (301/765-4573)

JUNE 3-5: Vision 86—International Conference and Exposition on Applied Machine Vision, Detroit, MI. Cosponsored by Society of Manufacturing Engineering (SME), Machine Vision Association of SME, and Automated Vision Association. Contact: SME 1 SME Drive, PO Box 930, Dearborn, MI 48121 (313/271-1500)

JUNE 3-5: First Annual Conference on Optical Storage for Large Systems, The New York Hilton, New York, NY. Contact: Judith P. Hanson, TOC Conference Coordinator, Technology Opportunity Conference, PO Box 14817, San Francisco, CA 94114-0817 (415/626-1133)

JUNE 4-6: NECC '86—7th National Educational Computing Conference, Town and Country Hotel, San Diego, CA. Contact: Susan M. Zgliczynski, School of Education, University of San Diego, San Diego, CA 92110 (619/260-4821)

JUNE 8-11: 1986 IEEE International Symposium on Applications of Ferroelectrics, Lehigh University, Bethlehem, PA. Contact: Dr. Wallace Arden Smith, Philips Laboratories, 345 Scarborough Road, Briarcliff Manor, NY 10510 (914/945-6032)

JUNE 8-13: 1986 International IEEE/AP-S Symposium and USNC/URSI Meeting, Wyndham Franklin Plaza Hotel, Philadelphia, PA. Contact: Charles C. Allen, General Electric Space Div, Valley Forge Space Center, Room U4018, PO Box 8555, Philadelphia, PA 19104 (215/354-4595)

JUNE 9-11: Color Reproduction Principles for Hard Copy Systems, Rochester, NY Contact: Peter G. Engeldrum, Imcotek Inc., PO Box 113, Walworth, NY 14569 (315/597-2276)

JUNE 9-13: International Quantum Electronics Conference, Phoenix, AZ, Contact: Joan Carlisle, Meetings Manager, Optical Society of America, 1816 Jefferson Place NW, Washington, DC 20036 (202/223-0920)

JUNE 10-13: Conference on Lasers and Electro-Optics (CLEO '86), San Francisco, CA. Contact Joan Carlisle, Meetings Manager, Optical Society of America, 1816 Jefferson Place, NW, Washington, DC 20036 (202/223-0920)

JUNE 12-13: 25th Annual Technical Symposium—Distributed Information Systems: Emerging Uses and Technology, National Bureau of Standards, Gaithersburg, MD. Contact: Wilma M. Osborne, B266 Technology Building, National Bureau of Standards, Gaithersburg, MD 20899 (301/921-3545)

JUNE 16-19: NCC '86—National Computer Conference, Las Vegas, NV. Sponsored by American Federation of Information Processing Societies (AFIPS), Data Processing Management Association (DPMA), IEEE Computer Society (IEEE-CS), Association for Computing Machinery (ACM), and Society for Computer Simulation (SCS). Contact: AFIPS Conference Dept., 1899 Preston White Drive, Reston, VA 22091 (703/620-8900)

JUNE 18-20: 3rd Mid-Central Ergonomics/Human Factors Conference, Oxford, OH. Sponsored by the Tri-State Chapter of the Human Factors Society. Contact: Leonard S. Mark, Psychology Dept., Miami University, Oxford, OH 45056.

INFORMATION DISPLAY (ISSN 0362-0972) is published monthly by MetaData Inc., 310 East 44 Street, New York, NY 10017, Telephone: 212/687-3836

Subscription: US & Canada - $36 one year, $64 two years, $90 three years; Elsewhere - $72 one year, $128 two years, $180 three years. Single copy: US & Canada - $3.00; Elsewhere - $6.00.

"Let us dare to read, think, speak and write . . ."
—John Adams

Even as we bask in the success of SID '86 and the records set at this year's international display forum—in terms of quality and quantity of technical papers presented, as well as number of participants—its future as a showcase for American-originated ideas for the technological developments of information display systems faces a growing challenge from Japan and Europe.

As a recent *New York Times* overview on high technology pointed out, "America's market share of high technology ideas seems to be slipping . . . and, more seriously, its capacity to turn those ideas into manufactured goods has virtually been eroded away."

The *Times* report goes on to cite government statistics on the steady drop since the early 1980s in industrial spending on research and development as a percent of our gross national product. "For more than a decade now," the report says, "US spending on high technology R&D has been lagging behind Japan and West Germany—which are now reaping the fruits of their research. Additionally, foreign ownership of US patents, particularly in electronics, biotechnology and telecommunications, is increasingly on the rise."

Yet, despite the government's recognition of this fact, current Congressional efforts to balance the national budget threaten to further retard US R&D efforts.

In particular, Federal budget cuts mandated by the Gramm-Rudman deficit reduction act will prove particularly devastating to National Science Foundation (NSF) grants to the research community. The already small amount of NSF funds allocated to support programs such as Industry/University Cooperative Research Projects and others will be further eroded. Such grants to date have been successful in leveraging significant industrial funding support.

Although major interruptions in R&D efforts may not be felt this year, since much of the funding is on a multi-year basis, cuts are bound to occur as the budget winds its way through Congress. And, the current Congressional-White House impasse over a balanced budget is sure to result in major cuts in FY 1987.

As George A. Keyworth 3rd, who recently resigned as President Reagan's science advisor, warned last year, "basic research is no place to cut corners. These are the pursuits that ultimately yield results for the American economy."

The US scientific and engineering community as a whole has an obligation to respond to this challenge—expressing its concern in unified voice. Despite public opinion to the contrary, constituent opinion does matter to most members of Congress.

If NSF's constituency speaks up, supportive members of Congress will listen.

Joseph A. MacDonald
Editorial Director

Events

JUNE 18-20: American Control Conference, Seattle, WA. Co-sponsored by American Institute of Aeronautics and Astronautics (AIAA), American Institute of Chemical Engineers (AIChE), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), Instrument Society of America (ISA), and Society for Computer Simulation (SCS). Contact: Joseph Bossi, University of Washington, Dept. of Aeronautics, FS-10, Seattle, WA 98195.

JUNE 22-26: Computer Vision and Pattern Recognition, Miami Beach, FL. Sponsored by IEEE Computer Society (IEEE-CS). Contact: CVPR, 1730 Massachusetts Ave. NW, Washington, DC 20036 (202/371-0101)

JUNE 25-27: Workshop on Visual Languages, Melrose Hotel, Dallas, TX. Sponsored by IEEE Computer Society (IEEE-CS). Contact: Professor Robert R. Korfhage, Southern Methodist University, Dept. of Computer Science, School of Engineering & Applied Sciences, Dallas, TX 75275 (214/692-3083)

JUNE 23-27:CPME 86—Conference on Precision Electromagnetic Measurements, National Bureau of Standards, Gaithersburg, MD. Contact: Norman Belecki, B146 Metrology Building, National Bureau of Standards, Gaithersburg, MD 20899 (301/921-2715)

JUNE 29 - JULY 2: 23rd Design Automation Conference, Las Vegas, NV. Co-sponsored by Association for Computing Machinery (ACM) SIGDA (Design Automation), and IEEE-Computer Society (IEEE-CS). Contact: J.D. Nash, Raytheon Co. Bedford, MA 01730 (617/274-7101)

INTERNATIONAL

JUNE 3-5: 13th Annual International Conference on Computer Architecture, Tokyo, Japan. Contact: IEEE Computer Society, 1730 Massachusetts Ave., NW, Washington, DC 20036-1903 (202/371-0101)

JUNE 16-20: COMPEURO '86, Congress Center Hamburg, CCH, Hamburg, FRG. Contact: COMPEURO '86, IEEE Computer Society, 1730 Massachusetts Ave. NW, Washington, DC 20036-1903 (202/371-0101)

JUNE 16-19: International Conference on Intelligent Manufacturing Systems, Budapest, Hungary, Co-sponsored by Scientific Society of Mechanical Engineers, and Computer and Automation Institute. Contact: Conference Secretary L. Gold, Computer and Automation Institute, Hungarian Academy of Sciences, H-1502 Budapest, POB 63, Hungary.

JUNE 19-20: 1986 AIC Interim Meeting on Color in Computer-Generated Displays, Toronto, Ontario, Canada. Co-sponsored by the Canadian Society for Color, York University; and the Working Group on Design Education, Ryerson Polytechnic Institute. Contact: Peter Kaiser, Dept. of Psychology, York University, 4700 Keele St., Downsview, Ontario, Canada.

JUNE 22-25: ICC '86—International Conference on Communications, Sheraton Hotel, Toronto, Ontario, Canada. Contact: Hugh J. Swain, Andrew Antenna, Ltd. 606 Beech St. Whitby, Ontario, Canada L1N 5S2 (416/668-3348)

JUNE 23-27: Second IEEE International Conference on Computers and Applications, Beijing, The People's Republic of China. Contact: Computers and Applications, IEEE-CS, 1730 Massachusetts Ave. NW, Washington, DC 20036-1903 (202/371-0101)

JULY 7-10: 2nd International Conference on Conduction & Breakdown in Solid Dielectrics, Kongresszentrum, Erlangen, Germany. Contact: Dr. P. Fischer, Siemens AG, Abt. ZFE CWV 2, PO Box 3240, 8520 Erlangen/ Germany (09131-75690)

JULY 7-11: 14th International Optical Computing Conference, Hebrew University, Jerusalem, Israel. Contact: Professor Joseph Shamir, Dept. of Electrical Engineering, Technion, Haifa 3200 Israel (04-293273)

Electronic Imaging

Authors are invited to submit technical and applications papers for presentation at Electronic Imaging '86—The Third Annual International Electronic Imaging Exposition & Conference, Sheraton-Boston Hotel, Boston, MA, November 4-6, 1986

Subjects include: Professional & Engineering Workstations, Intelligent Copier/Printers, Optical & Videodisk, Electronic Printing & Publishing, Machine Vision, Computerized Slide Making, Satellite Image Transmission, CD-ROM Systems, Photo Sensors—Visible Infrared, Pyroelectric, X-Ray, and UV, Image Processing, Display & Hardcopy Output, Digital Facsimile, High Definition TV, Electronic Photography, Scientific Applications, Medical Imaging, Graphic Arts, Video Teleconferencing, Computer Graphics, Fiberoptics, Optical Memories, Laser Printers, and Array Processing. Additional suggested topics will be considered.

Send a 150-word abstract and short biography to: Richard Murray, Papers Chairman, c/o Institute for Graphic Communication, 375 Commonwealth Ave., Boston, MA 02115

Deadline for submittal: May 30,1986.

Electron Devices

Papers are sought for the 1986 IEEE International Electron Devices Meeting, Westin Bonaventure Hotel, Los Angeles, CA, December 7-10, 1986.

Topics requested for papers include: Detectors, Sensors, and Displays; Electron Tubes; Solid-State Devices, Modeling and Simulation; Integrated Circuits, Device Technology; Quantum Electronics, and Compound-Semiconductor Devices.

Authors should submit a one-page abstract (500 words maximum) that clearly states the purpose of the work; the manner and degree to which it advances the art; and specific results that have been obtained and their significance. Accompanying the abstract should be two additional pages of figures and drawings (no text) that define the planned 20-min paper and emphasize the findings.

One copy of a covering letter and 40 copies of the technical material (collated and stapled) should be sent to: Melissa M. Widerkehr, Courtesy Associates Inc., 655 15th Street NW—Suite 300, Washington, DC 20005.

Deadline for submittal: July 14, 1986.

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PAPERS ON DISPLAY

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.

Science, engineering, and technology competition promoted

In an effort to develop an industrial competitiveness stature in US industry, the National Academy of Engineering (NAE) and the Department of Commerce (among others) have initiated respective "industrial competitiveness programs."

NAE, with its Decade III Program, hopes to promote industrial competitiveness in such areas as space and energy, international trade, communications and new technologies that create overlaps of national boundaries. NAE will be assisted by the National Academy of Sciences through the National Research Council and the Committee on Science Engineering and Public Policy.

The Commerce Dept. is studying cooperative R&D ventures, promotion and development of innovative financing methods for private sector R&D funding, preparation of economic profiles for state governments, and provisions for greater access to government data/facilities for research.

R&D cooperative ventures exempted from anti-trust

US high-tech firms for some time now have been buffeted severely by competition from foreign companies that not only are able to collaborate on expensive research and development work, but also enjoy government support.

That may be changing now that the National Cooperative Research and Development Act has begun to attract US companies that wish to pool their R&D efforts under certain exemptions from antitrust suits and government prosecution.

The new law eases antitrust regulations for corporations engaged in joint research and development ventures covering areas of theoretical analysis, exploration and experimentation, exchange of research data, contracts for research and development, and construction of research facilities.

Under the Act, companies must first register their joint project proposal with the Justice Dept. and the Federal Trade Commission. In exchange for registration, rewards in anti-trust suits will be limited to actual damages, interest, and cost of suit. Companies also will be able to recover legal fees from the plaintiff, if unsuccessfully sued. And, there will be no government prosecution of registered joint business ventures, unless their undertakings are clearly restricting competition.

Types of consortiums protected under the law range from large-scale operations, with autonomous staffs, to pools of funds for university research. While the full results of the law will not be seen for several years, the new law may eventually save many companies valuable time and money by allowing them to combine information and resources on project research.

(Developed from AFIPS Washington Report and Federal & State Legislative Update—February 1986.)

Engineering and computing highlighted at AAAS meeting

Supercomputers, biomedical imagery, and lasers will be among the many subjects covered at the 152nd national meeting of the American Association for the Advancement of Science (AAAS) in Philadelphia, May 25-30.

Among the engineering and computing sessions scheduled are:

- Direction in Engineering Research: An Assessment of Opportunities and Needs
- Biomedical Imagery: Functional

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Mapping and Real Intelligence

- Recent Trends in Supercomputers
- Nonlinear Phenomena, Computer Graphics, and Mathematics
- Applications of Lasers in Medicine and Industry
- Status of the NSF Supercomputer Initiative
- Computers and Society: Is There a Computer Revolution?

In addition, the program will feature symposia covering physical, earth, and planetary science; materials science; science policy; environmental science; and more.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Washington, DC (202/325-6440)

Access to Japanese technical literature topic of report

How the US can gain better access to Japanese technical literature in electronics and electrical engineering is the topic of a 155-page report that summarizes a recent seminar held at the National Bureau of Standards in Washington, DC. The report includes transcripts of presentations by representatives from Congress, industry, universities, and federal agencies whose interests are in maintaining current knowledge of technical progress in Japan despite language barriers.

The seminar presentations offer several possible answers on how to gain access to the 80% or so of Japanese technical literature that never gets published in English. These include: a more active translation role for professional societies, as well as support from American industry. To order a copy: *US Access to Japanese Technical Literature: Electronics and Electrical Engineering* (SP 710) Stock number 003-003-02709-0. Price: $6 (prepaid).

SUPERINTENDENT OF DOCUMENTS, US Government Printing Office, Washington, DC 20402

Artificial Intelligence topic of new magazine

A monthly industry publication—*AI EXPERT*— that debuts in July will focus on practical AI programming strategies for applications and system development. Subscription: $27 (12 issues).

C.L. PUBLICATIONS, San Francisco, CA (415/957-9553)

Need stressed for reliable optical fiber measurements

Improved measurement technology will play an important role in the ability of US fiber optic businesses to compete with countries such as Japan, according to a National Bureau of Standards report to Congress.

In testimony on the proposed FY87 NBS budget, John W. Lyons, director of the NBS National Engineering Laboratory, described the difficulties in measuring characteristics of optical fibers and components. "Despite the sophistication of individual firms in the business," Lyons said, "there are very substantial difficulties in making measurements to characterize components of the system, both for buying and selling them, as well as for evaluating them in place."

Today's sophisticated fiber optic technology has made the need for reliable measurements more pronounced, says Lyons. NBS is seeking a $950,000 FY87 budget increase for fiber optic measurement research and services. Another $750,000 will be transferred from existing research areas at NBS, for a total of $1.7 million for the fiber optics program.

US computer manufacturers pool efforts to communicate

The latest of several current efforts to produce and adopt international standards for computer and communications systems got underway earlier this year when twenty US computer manufacturers formed the Corporation for Open Systems (COS). The group, whose members include AT&T, Control Data Corp., Digital Equipment Corp., National Cash Register, and others, plans to expand its membership to include firms outside the computer manufacturing community.

COS will support open systems interconnection (OSI) standards currently being developed by the International Standards Organization (ISO). The group plans to continue OSI goals, not by setting its own standards, but by choosing a set from various existing international standards. COS will also develop product tests and a certification program according to the new consensus of standards.

Four of the seven OSI protocols have already been adopted by members of the Consultative Committee on International Telegraph and Telephone (CCITT) and by Japan. Three segments of the OSI protocols address the difficult problem of applications and are still being developed. Once fully produced and accepted, these protocols should help computers made by many different manufacturers to communicate with one another.

Besides the ISO, the CCITT, and the new COS, there exist two private US groups and one European consortium also working on the problem: Boeing Co, General Motors Corp, and Standards Promotion and Awareness Group.

(Developed from AFIPS Washington Report, February 1986.)

Engineering standards index updated for easy reference

More than 28,000 standards, specifications and recommended test methods can be quickly located with a Key-Word-In-Context (KWIC) Index of US Voluntary Engineering Standards published by 422 US trade associations, technical and professional societies.

The revised microfiche index, first published in 1971, provides title, date, source, and number of the standard for each entry. Titles can be found by all significant keywords. For information contact: Standards Code and Information Office, National Bureau of Standards (301/921-2092). Order number: PB 86-154408. Price: $13.50 (prepaid)

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Laser plotter displays large paperless drawings

A reusable electronic color slide is the key to a newly developed graphic display system that provides static or real-time, high resolution color plots of 2-D and 3-D drawings, up to 34 in. wide, without using any plotting media.

Images are displayed on the system's 40-in.-diagonal screen directly from a computer-aided design workstation. The graphic image is written onto the slide (permenantly integrated in the device) by a low-power semiconductor laser and projected onto a rear-illuminated viewing screen. As a result, the high-resolution image produced has no flicker or distortion.

Softplot, as the system is called, can operate in both vector and raster modes in the same drawing, allowing maximum speed for both text and graphics. It produces line widths from 10 mils to 50 mils in a single pass, offers a choice of 16 colors from a 256-color palette, and has an 8-level gray scale. White or black background is user-selectable.

The system also features 120 million addressable points, 400 dpi addressability in both the X and Y axis, vector write/erase speed of 2000 in./sec, maximum geometric distortion less than 0.05%, and a large area contrast ratio of 16:1.

GREYHAWK SYSTEMS INC., Milpitas, CA (408/945-1776)

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Newsletter provides access to imaging, display articles

A monthly resource newsletter, written specifically for the scientist, engineer, and manufacturer in the Electronic Imaging and Display industries, provides quick access to current articles on systems and technologies, such as:

Computer Input Devices
Storage/Memory Systems
Electronic Information Displays
Non-Impact Printers
Human Factors Engineering
Imagers and Scanners
Facsimiles
Fiber Optics.

More than 100 publications are reviewed from scientific and professional journals to business and technical periodicals, such as:

Information Display
Laser Focus
Applied Optics
American Journal of Nursing
New Scientist
Business Week
Technology Review
Electronic Design
Research & Development.

All entries include article title, author, publication, date, and page numbers. Subscription: $72/year (12 issues).

PROFESSIONAL PUBLICATIONS, PO Box 319, Huntington, NY 11743.

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- ☐ Both precision in-line gun and delta gun configurations.
- ☐ Neatly packaged for ease of maintenance, with or without an enclosure.
- ☐ Exceeds safety and emissions requirements: UL, CSA, FCC, IEC and VDE
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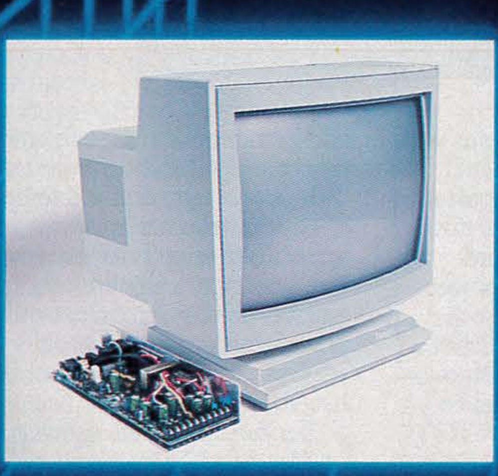
- ☐ Offered in both open frame and enclosed designs.



Together, or alone, when you consider great technology, at economical prices, the name to watch is Ikegami.

Ikegami®

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Northeast: (617) 579-4992 East: (201) 368-9171 Northwest: (415) 449-1794 Southwest: (213) 534-0050

Touch system adds third coordinate to display screen

Simple components, simple electronics, and simple acoustical elements have been combined to produce an inexpensive touch-sensitive entry device that can be applied directly to a CRT or flat display screen or to a glass overlay. In addition to providing the conventional x-y coordinate matrix, the newly developed system also offers a third—z—coordinate capability.

The principle behind it involves generating surface acoustical waves (SAWs) of ultrasound across the face of a display screen along both the x and y coordinates. Touching the glass panel with a finger produces an amplitude dip in the transmitted acoustical signals whose timing and depth indicate location (x-y) and finger pressure (z).

Unlike earlier attempts to produce SAW-type touch devices, the new system uses only two transducers for each coordinate (the older systems used multiple transducers along all four edges of a display) and reflector strips along each edge to move a pulse wave across the screen.

by Robert Adler, Peter J. Desmares and James J. Fitzgibbon
Zenith Electronics Corporation, Glenview, IL.

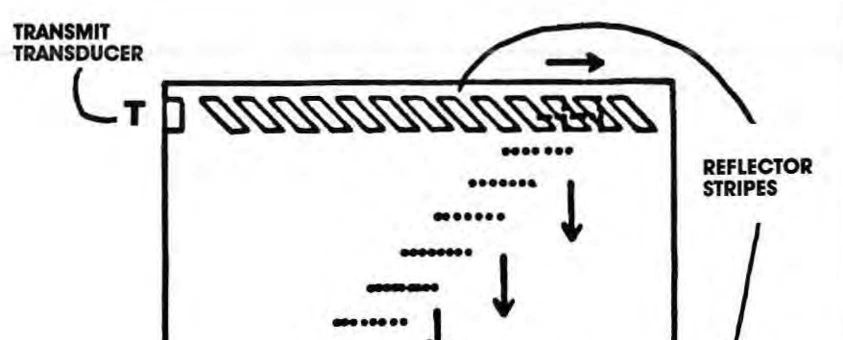

FIG. 1

To illustrate: For the x coordinate, reflectors are placed along the top and bottom edges of the screen with a transducer located on the left end of each strip (Fig. 1). A short pulse transmitted by the top transducer travels from left to right over the top reflector strip and is partially deflected downward all along the strip. The pulse moves along as many closely spaced parallel vertical paths to the right side of the screen. As each downward pulse strikes to bottom reflector strip, it is partially intercepted and then redirected to the receiving transducer at the bottom left of the screen.

By the time the bottom transducer receives these deflected pulses, the wave has acquired a long rectangular shape that completely covers the screen, with each point in time corresponding to a specific vertical path across the panel. The same scheme is repeated for the y coordinate thus forming a matrix of points covering the entire screen.

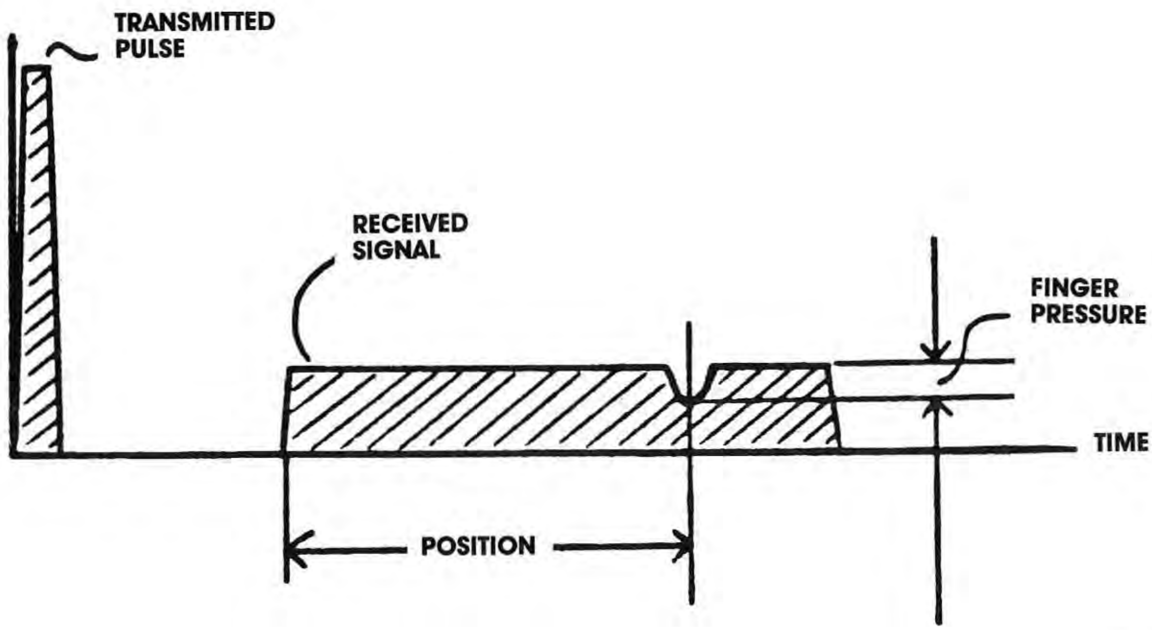

FIG. 2

On a typical 13-in. monitor screen, the reflective strips along each edge form bands of 3/8" to 1/2" wide that are hidden under the screen's bezel. Five microsecond pulses of 4 to 5 MHz are applied. The dip produced by a finger touch measures about 5 microseconds between half-amplitude points; however, because of the high signal/noise ratio, the electronics can locate the bottom of the dip to within $\pm$ 1/2 μsec, which corresponds to $\pm$ 1/32 in.

The reflector strips are about 0.2 mils (5 microns) thick; they are deposited by silk screen printing. (In the demonstration monitors, frit (powdered glass) was used because of its compatibility with the glass screen and its excellent acoustical properties; it, however, requires baking at 430C. Other printing inks or other methods of forming the strips, such as etching, could be used.

The transducers are thin rectangular bars of piezo-ceramic, 3/8" to 1/2" long, attached to small lucite wedges that direct the longitudinal waves of ultrasound produced by the ceramic bars into the glass at the correct angle for conversion into SAWs.

Electronics serve to recognize the presence of a dip in the output signal and to determine the time and depth of its lowest point. Typically, the response is not quite flat even in the absence of a touch. In a very simple system, this is neglected; one must push hard enough to make the signal drop below a preset threshold. Such a system is very inexpensive to produce, but obviously not very sensitive.

Touch system resolution on a 13-in. CRT monitor is 320 x 256, with 16 pressure steps. The monitors are programmed to permit an operator to perform certain functions, such as screen scrolling at variable speeds (the higher the finger pressure, the faster the scroll speed), moving a cursor in 1/32" increments, or finger-painting (pixel size and color is selected by finger pressure). Such features require somewhat more complex electronics and software than would be needed in most practical applications, but the acoustic elements (transducers and reflector strips) are the same regardless of whether the application calls for 3x2, or 300x200 touch points. (This is quite different from, for example, infrared systems, where a change in the touch point pattern requires re-tooling.) With this system, only electronics and software need be adapted to the specific task.

The same holds true for the z-coordinate: having just two pressure steps—high and low—provides a useful switching option, equivalent to a push button everywhere on the screen. This may be all that is needed, even in systems with high resolution in x and y, but additional intermediate pressure steps can easily be made available simply by providing appropriate electronics. The extra pressure coordinate, available at very little incremental electronic cost, represents a bonus not easily duplicated by more conventional touch systems.

(Developed from A *Three-Coordinate Touch System for Computer Displays*, by Robert Adler, Peter J. Desmares, and James J. Fitzgibbon, Zenith Electronics Corporation, Glenview, IL—SID '86, International Symposium on Information Display, San Diego, CA, May 5-9, 1986.)

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SP-333	3	0.33"	(8,4mm)
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SP-352	2	0.55"	(14,0mm)
SP-354	2½*	0.55"	(14,0mm)
SP-353	3	0.55"	(14,0mm)
SP-355	3½*	0.55"	(14,0mm)
SP-356	4	0.55"	(14,0mm)
SP-324	4	0.23"	(5,8mm)
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SP-358		0.55"	(14,0mm)
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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)

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DP-0416-C1	4 x 16	0.33"	(8,4mm)
DP-0832-C1	8 x 32	0.25"	(6,4mm)
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DP-1240-C1	12 x 40		
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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)
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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

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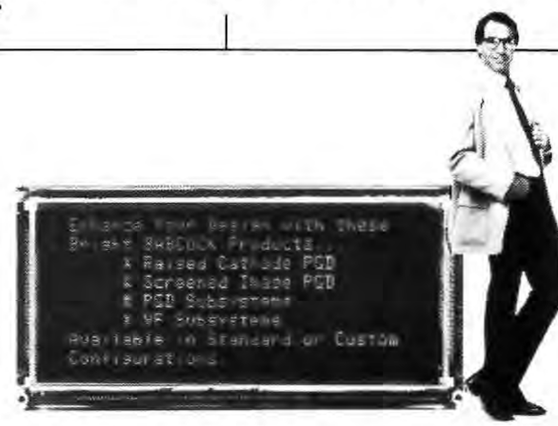

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For information circle Reader Service #13

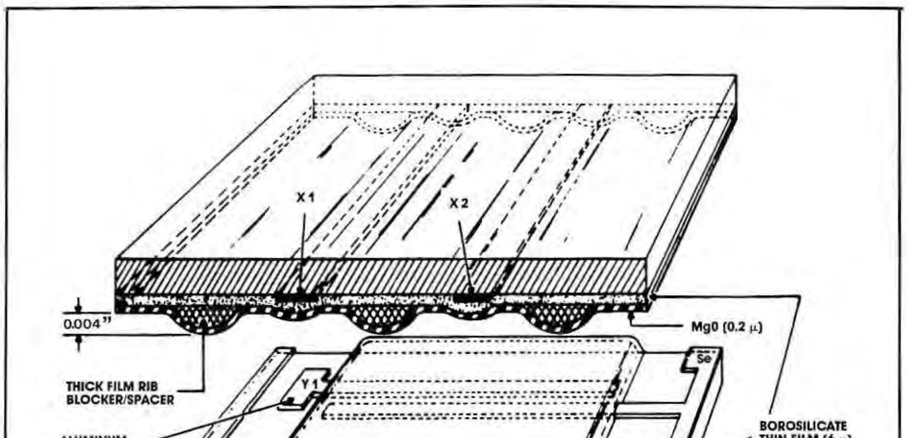
Three-electrode plasma panel cuts power requirements

By isolating the glow sustaining high-current pulses from the write-address vertical cover electrodes of an ac plasma display, engineers have produced a gas discharge panel that uses smaller-area and lower-power integrated circuit chips; and eliminates the need to retain low cover-electrode resistances.

In typical plasma displays, only a few hundred ohms drive-line resistance is permitted to achieve good operating margins (peak sustain currents of 25-100 mA per line are obtained, depending on panel size and number of "ON" pels).

With this new design, however, since only one or a few pels need be written or erased simultaneously per cover electrode, the currents required for these operations alone are typically only a few milliamps and the requirements for low voltage drops are also not severe. Thus transparent ITO (Tin-oxide electrodes) with 10-20K ohms resistance can be used for non-sustaining X-axis drive electrodes. These permit essentially all light generated by the display to be seen directly.

To simultaneously sustain the on-state or glowing pels, a "3rd" set of electrodes is added to the substrate beside the existing electrodes (Fig. 1). The added electrodes can all be driven from one or two sustain pulsers whose polarity or phase is opposite to the conventional sustain drives used on the horizontal addressing electrodes "Y_i."



But, to achieve wide operating sustain margins, some means is required of at least partially isolating glows from neighboring cells without seriously limiting the passage of priming particles across the display surface. In the conventional ac plasma panel discharge spreading is controlled by field non-uniformity in the gas. Thus, for discharges to be extended along the electrodes away from the crossover point the discharge path is forced to proceed in lower electric fields and for greater distances. Various metallic blocking structures have been used with single substrate types to enhance field or path length gradients.

In this new system, a thick-film blocking or rib structure placed on the

(Continued on p. 20 . . .)

by G.W. Dick
AT&T Bell Labs, Reading, PA

(... *continued from p. 18*)
cover achieves essentially ideal isolation in the X or glow-spreading direction without unduly increasing capacitive drive loads. This design retains the "non-aligned" assembly feature of the basic ac plasma panel. It does, however, require good height uniformity in the ribs. (Placing the ribs on the substrate, parallel to the cover electrode, would relax this height-uniformity requirement but would then necessitate assembly alignment.) Besides limiting glow-spread, or crosstalk, the ribs also function as plate separators.

For most current applications, horizontal line-at-a-time or CRT-type addressing is desireable so as to permit easy interfacing with existing display controller chips and software. The new three-electrode panel is readily driven in this mode, especially when a data buffer is provided in the X-axis drivers, thus permitting storage of a full line of data while a new line is being serially input. Then, at a suitable write-pulse interval, the full line of stored data is simultaneously applied to the cover or X-lines to write a just-previously erased line of the display.

Updating or re-writing of all lines of the panel can occur at normal raster-scan rates, that is, from 30 to 60 frames a second. Flicker does not occur with this display regardless of frame rate due to the display-memory mode of operation.

The use of a third sustaining electrode, as well as a thick-film glow blocking and cell separating structure, yields an ac plasma display that operates with good margins and excellent viewability. And using transparent electrodes for the low current cover sheet conductors provides high optical efficiency (0.3 lumen per watt) such as achieved with a purely single substrate design without the high crossover capacitance associated with that type. With peak cover electrode currents reduced about an order of magnitude over substrate drives, driver design and coast for this axis of the panel is greatly reduced.

(Developed from Three-Element per Pel AC Plasma Display Panel, by G.W. Dick, AT&T Bell Labs, Reading, PA—1986 International Display Research Conference, San Diego, CA, October 15-17, 1985.)

For information circle Reader Service #103

For information circle Reader Service #14

Laser-optics measure sub-picosecond speeds of electronic devices

Ever increasing processing speed is the driving force behind development of tomorrow's computers, displays, and communications systems.

The key to achieving these improved speeds lies in new ultrafast electronic and opto-electronic devices and circuits now being devised to operate the next generation of systems. Measuring the characteristics of these devices, however, is next to impossible using conventional electronic instruments that operate at much lower speeds than the devices themselves.

To cope with this problem, several new techniques have recently been developed that operate in the picosecond time range. One of these is unique, in that it is an entirely optical sampling system, relying only on an electric field coupling between the electro-optic sampling medium and the circuit under evaluation. It therefore does not require charge to be removed from the circuit for measurement.

Electro-optic effect

Developed by J.A. Valdmanis and G. Mourou at the Laboratory for Laser Energetics, University of Rochester, (Rochester, NY), the electro-optic sampling technique employs the oldest known technology of any current sampling system—the Pockels, or electro-optic effect. In this system, when an "electric field is applied to some crystals, the birefringence properties of the crystals are changed, thus changing the polarization of light that propagates through it. By placing the crystals between crossed polarizers, the transmitted light intensity changes as a function of the applied field," according to the researchers.

Coupling this approach with a new short-pulse laser technique enables electro-optical sampling having the highest time resolution known for testing the new ultrafast devices and circuits.

Optical pulses are exploited directly as sampling gates in the electro-optic medium. The fastest electro-optic sampling systems in use today employ 100 fs pulses generated by mode-locked ring dye lasers capable of measuring electrical transients only a few picoseconds long with temporal characteristics of less than 300 fs.

Split-beam sampling

In this electro-optic sampling system, the optical pulse train is divided into two beams. One beam repetitively triggers the generation of the electrical signal to be measured. The other synchronously samples the field-induced birefringence in the electro-optic medium due to the electrical signal.

The trigger beam is passed through a modulator operated at a frequency below that of the laser repetition rate to facilitate lock-in detection of the sampling beam. It then initiates the generation of the electrical signal to be measured either directly from a photosensitive device or indirectly by using the electrical pulse generated by a photodetector to subsequently drive another electrical device such as a transistor.

The sampling beam is passed through a variable delay line that is synchronized with a display device that permits an operator to scan the electrical signal. Next, the scanning pulse train is focused through the Pockels cell configuration where the intensity of each pulse is changed in proportion to the amplitude of the segment of the electrical signal that it experienced as it passed through the electro-optic medium.

Photodiode measuring

A conventional "slow" photodiode is used to measure the sampling beam intensity. A lock-in, or tuned, amplifier measures the amplitude of the modulated intensity and yields a dc output proportional to the amplitude of the sampled electrical signal. The output signal is plotted as a function of the optical delay, thus yielding an equivalent time representation of the electrical signal under study.

Some recent sampling systems provide for delay scanning between electrical and optical signals by slightly offsetting the repetition frequencies, thereby obtaining repetitive scanning at the different frequency. This electronic technique eliminates the need for an optical delay time and permits operation at much higher scanning speeds.

(Developed from *Electro-Optic Sampling: Testing Picosecond Electronics* by J.A. Valdmanis, High-Speed Materials and Phenomena Research Dept., AT&T Bell Laboratories, Murray Hill, NJ; and G. Mourou, Sr. Scientist, Laboratory for Laser Energetics, University of Rochester, Rochester, NY. Permission received from Advanced Technology Group, PennWell Publications to abstract from the full paper, appearing in LaserFocus/Electro-Optics, Part I: February 1986; Part II: March 1986.)

For information, circle Reader Service #104

Display technologies: A retrospective on systems, applications

Technological change "is not linear with time, but follows an S curve," said Dr. Frederick J. Kahn, in a recent interview. The vice president of Greyhawk Systems (Milpitas, CA) explained, "Progress is slow at first, followed by rapidly accelerating progress as breakthroughs overcome potential barriers . . . and finally saturation as the potentialities of the new technologies are fully realized."

Display technologies are no exception, with the principles behind many of today's more successful display devices having been discovered as early as the beginning of the 19th century—yet only having reached practical application within the past 10 to 20 years. In this short span, the industry has seen a leap from laboratory prototypes to mass-produced products for a number of different display technologies. And, according to current market research studies, the information display field has a long way to go before reaching its peak.

As Dr. Kahn further points out, "If we look too narrowly at specific segments of the display industry—for example the (maximum potential) number of multiplexed rows of LCDs—we will see its 'S' curve saturating by the year 2000. But, if we look more broadly and see the wider frontiers that these technologies open up—such as light valve displays and electronic imaging—continued growth without saturation may be expected for at least several (more) decades."

To properly assess the future of display systems and their applications necessitates first reviewing the evolution of technologies and developments of various systems. Then, knowing where the various display concepts are "coming from," we can more realistically project the potential for these new technologies to be fully realized.

This first part of a two-part article draws upon contributions from several acknowledged authorities on various display technologies who examine the origins of both emissive and non-emissive displays, including CRTs, VFDs, ELs, LEDs, GDPs, and LCDs. In the article's second part (June 1986), leading display industry specialists will offer their observations on the state of the art and share their projections for display technology developments through the 1990s.

Joseph A. MacDonald
Editorial Director

Cathode-Ray Tubes

The CRT has its origins in experiments conducted by several investigators toward the end of the 19th century, with their work as an outgrowth of discoveries in the field of electricity and magnetism in the first half of that century.

William Crookes, who made several key contributions to the evolution of the CRT, is considered to have invented the CRT in 1879. His studies led him to believe that cathode rays were actually electrified gas molecules projected from the cathode region with high velocities. The luminance of the glass was caused by the impact of the molecules on the surface of the glass. He concluded that the luminance was dependent upon the nature of the material they struck.

But, it was not until 1896 that Ferdinand Braun conceived of using the CRT as a display device or indicator of some kind. He designed and had built a

tube that was able to monitor the ac output of electric generators operating at high frequencies. As the CRT further evolved, other applications soon followed.

Paul G. Nipkow demonstrated the first practical television system in 1884, using a mechanical scanning device to both scan the subject and create its reproduction. The device was a spinning disk with a spiral pattern of holes punched in it. For pickup, the spinning disk was interposed between an intense light and the subject. Only the light passing through one hole could illuminate the subject. For reproduction, a second spinning disk was placed between the observer and a lamp.

The idea of all-electronic television was not pursued, however, until the 1920s—culminating in the demonstration by Vladimir K. Zworykin of such a system on November 18, 1929. The pickup was by means of a camera tube, the iconoscope, and reproduction was accomplished with a CRT called the kinescope. Then, on July 30, 1930, NBC began operating an experimental television station in New York City. But it was not until September 1946 that the first postwar TV sets went on sale.

Development of the shadow-mask color tube used in today's TV sets began at the RCA laboratories in 1949, with the initial demonstration of the color tube in 1950, followed on October 31, 1953 by the first hour-long broadcast of a program in color.

Those first-generation tubes employed a flat aperture mask with the screen deposited on a flat plate inside the tube. But in late 1953, under the direction of Norman Fyler at CBS Hytron, a tube was built with a curved mask having the phosphor deposited directly on the curved inside surface of the face plate. The resultant picture was larger and more appealing than that achieved with the internal flat screen-plate. This curved-mask design became the industry standard for color tube manufacture.

A technological advance of immense significance to CRT displays was the development in 1964 of rare-earth phosphors. Rare-earth red phosphor made possible substantial increases in the brightness of the direct-view TV tube and provided the basis for the manufacture of practical projection-TV displays. Several newer developments that have significantly improved tube design include: Sony Trinitron (1968), Black Matrix Screen (1969), and Precision In-Line System (1972).—*Norman H. Lehrer, Consultant, Cupertino, CA.*

Flat Cathode-Ray Tubes

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posed in September 1952 by professor D. Gabor, of the University of London. Although a somewhat similar device had been independently conceived in the spring of 1951 by R.W. Aiken, at the University of California Radiation Laboratory, a patent for it was not filed until 1953 (ID, July 1985, p 12). The Aiken tube was developed for both US Navy and commercial color TV applications, with the technology currently being used in a miniature portable TV marketed by Sinclair Research and Timex of Scotland.

In the late 1950s through the early 1960s, Philips Mullard developed an unusual flat CRT (called the Banana Tube) which, however, couldn't compete with the shadow-mask CRT. Then in 1962, a flat-panel CRT display program was initiated at Northrop Electronics. Called the Digisplay, the display conceived by L. Jeffries and D. Hultberg differed from earlier devices in that it utilized an area-cathode and a series of switching grids to sequentially control the area of phosphor to be excited. The Northrop program was active until 1973, when the patent rights and equipment were sold to Texas Instruments (TI).

After trying to adapt the Northrop design to produce a direct competitor to the home TV CRT, TI was forced in 1979 to abandon its efforts, as costs could not be reduced sufficiently to enable the system to compete with conventional color TV receivers.

Then in 1967, the Japanese company ISE introduced the first commercially successful flat CRT—calling its device a Vacuum Fluorescent Display (VFD).

The VFD uses a multifilament area-cathode similar to that developed at Northrop and a low voltage phosphor instead of the more conventional TV phosphors. These tubes have been quite successful in applications requiring small numbers of digits and alphanumerics.

Also, in the mid 1960s, Stanford Research Institute (SRI) began research on still another concept for a flat CRT that used an array of field emitters as the electron input. Work on the field emission cathode is still active for special applications, although work on the CRT version was discontinued in the early 1970s.

Then at the 1976 SID Symposium, Zenith first reported a flat CRT that used a cold ion feedback cathode and a series of electron multipliers (dynodes). Meanwhile, another group at Zenith had developed a hybrid system that used a plasma discharge as the electron source for a flat CRT—somewhat similar to the Northrop device. (These researchers left Zenith in the early 1980s to form their own company—Lucitron).

RCA, at the 1978 SID Symposium, in San Francisco, reported on a very similar flat CRT device that also used an ion feedback cold cathode and multiplexer dynodes, and had a self-supporting structure. Work on it, however, has since been terminated.

More recently, though, flat CRT concepts have been described by Philips and Sony. The Philips approach uses a channel-plate type multiplexer for enhancing the brightness in a structure that revives many concepts originally put forth in the Gabor and Aiken displays. While Sony, in 1982, introduced its flat CRT, hand-held TV version that is similar to the Aiken device and uses magnetic focusing in one axis. At SID '86, a team from Lucitron described its successful production of a 35-in. diagonal gas discharge, monochrome video display panel only 5 in. deep.—*Walter F. Goede, Northrop Electronics, Hawthorne, CA*

Electroluminescent Displays

Electroluminescence (EL) in polycrystalline electroded phosphors was first observed in June 1936, by Professor Georges Destriau, of the University of Paris. Before and after WWII, Destriau delivered several other papers that expounded on the fact that luminescence in a polycrystalline phosphor could be achieved solely through the application of an electric field. Scientific examination and engineering application of Destriau's results, and dissemination of this information, were delayed because of the war.

When the war was over, scientists and engineers then returned to this new and exciting phenomenon. In the US during the 1950s and 1960s, there was a great surge of interest in EL as the universal luminaire and display media.

The first practical electroluminescent lamps were made in the Sylvania Laboratories in 1949, with GTE Sylvania first demonstrating their panelescent lighting at a solid state conference in the spring of 1952 at MIT. It was in the 1960s that the Instrument Div. of Lear Siegler developed hermetically-sealed alphanumeric EL displays, with the integral neutral density filter, for the Apollo and Lunar Module vehicles for NASA's manned lunar program. By 1964, these display assemblies were sunlight readable and had a life (to one-half luminance) of 2000 hr.

Thin-Film EL—Several Thin-Film (TF) phosphor screens were made for CRT application before Destriau discovered EL, with the first patent for evaporating luminescent phosphor films issued in 1934 to J.H. De Boer and C.J. Dippel. These films, however, were not very stable under electron bombardment.

By 1957, Charles Feldman and Margaret O'Hara, of the US Naval Research Laboratory, reported on extensive studies of thin-film phosphors that showed the chemistry of the powdered material was applicable to thin films. And, as early as 1959, W.A. Thornton was using thin-film phosphors specifically for EL display purposes. Most of his attention was devoted to dc thin-film EL, using copper and silver as activators. The material, however, was too highly conductive and thus the device was susceptible to uncontrolled breakdown.

Then in 1961, the first real breakthrough came at Servomechanisms, in Santa Barbara, CA. A team led by Edwin J. Soxman successfully used thin-film technology to deposit Zn:Mn phosphor with a dielectric in an ac configuration. A year later, he demonstrated high luminance and matrix addressability using breadboard substrates with a 5×6 matrix array.

Martin Reder, Edwin Soxman, and Gordon Steele, in 1963, acquired the Santa Barbara laboratory and formed Sigmatron. They then developed a double-sided dielectric sandwich to improve upon the configuration they had originally demonstrated at Servomechanisms. And in 1965, they completed their first large matrix-addressed EL panel—10 x 10 in. with 25.6 lines/in.

Sigmatron then demonstrated their technical accomplishments at the sixth National SID Symposium under the name LEF (Light-Emitting Film), showing an EL panel that included a black-layer behind the transparent phosphor, was matrix-addressable and readable in sunlight.

Among several other research teams working on thin-film ELs was Sharp, having begun in the early 1950s. Although the Sharp team had done considerable research in EL since the early 1950s—first with powders and subsequently with thin films—it was not until the late 1960s, after having visited Sigmatron facilities, that Sharp improved the technology using E-beam evaporation of the ZnS:Mn and applied better dielectrics to its devices. Then, at SID 74, in San Diego, they presented their findings and in September 1978 demonstrated a 240 × 320-line thin-film EL monochromatic TV for the first time in the US, at the Consumer Products Show in Chicago.

The Sharp device did not use a black layer, but rather incorporated a diffuse reflective aluminum back electrode and a front polarizer or neutral density filter to achieve good contrast in high ambient illumination. The displays, however, were not readable in direct light. Since then, Sharp has made additional technical advances such as thin-film addressed matrix displays with memory, TV stop motion, and direct electronic readout capability.

Although almost all of the US research and development teams that had been working on EL during the 1950s and 1960s had been disbanded by 1974, the Sharp disclosures triggered a revival of R&D in this field by a number of US high-technology companies. Much of this was stimulated by R&D contracts awarded by the US Army, Ft. Belvoir, VA, and Ft. Monmouth, NJ.

About the same time, A. Vecht, at the Thames Polytechnic, London, with a dc powder EL demonstrated a wide range of product applications, using different colors and having matrix addressability with high luminance.

During the early 1970s, Westinghouse Research Laboratories, Pittsburgh, and Aerojet Electro Systems, Azusa, CA, used thin-film transistors (TFTs) to extrinsically address ac powder EL displays. "Hypermaintenance" phosphor powders, developed by W. Lehrman at Westinghouse, were used to achieve longer life. Two TFTs and a capacitor were used at each pixel to achieve memory and matrix addressability, which was not otherwise possible with ac powder EL.

These researchers have also applied TFTs to ac thin-film ELs. Such a device is intrinsically matrix-addressable, but addition of the TFTs reduces line address voltage, adds memory, increases duty cycle to 100% for higher luminance, and separates power input to display from image input, thus saving power. The life problem of ac powder EL, however, has yet to be eliminated.

In the 1980s, intrinsic matrix addressing of ac thin-film EL, using custom LSI DMOS electronics for direct high voltage line drive, overtook the extrinsic TFT approach. This resulted from a combination of factors: Marked progress on DMOS technology; development of high performance, high voltage ac thin-film ELs; and the slow progress of monolithic TFT and powder or TFEL structures, due to their complex structure.

The first major breakthrough to get EL out of the laboratory and into display products was the evolutionary development of high performance ac TFEL using ZnS:Mn phosphor; the second, has been the availability of custom LSI DMOS.—*Larry E. Tannas, Jr., Rockwell International, Anaheim, CA.*

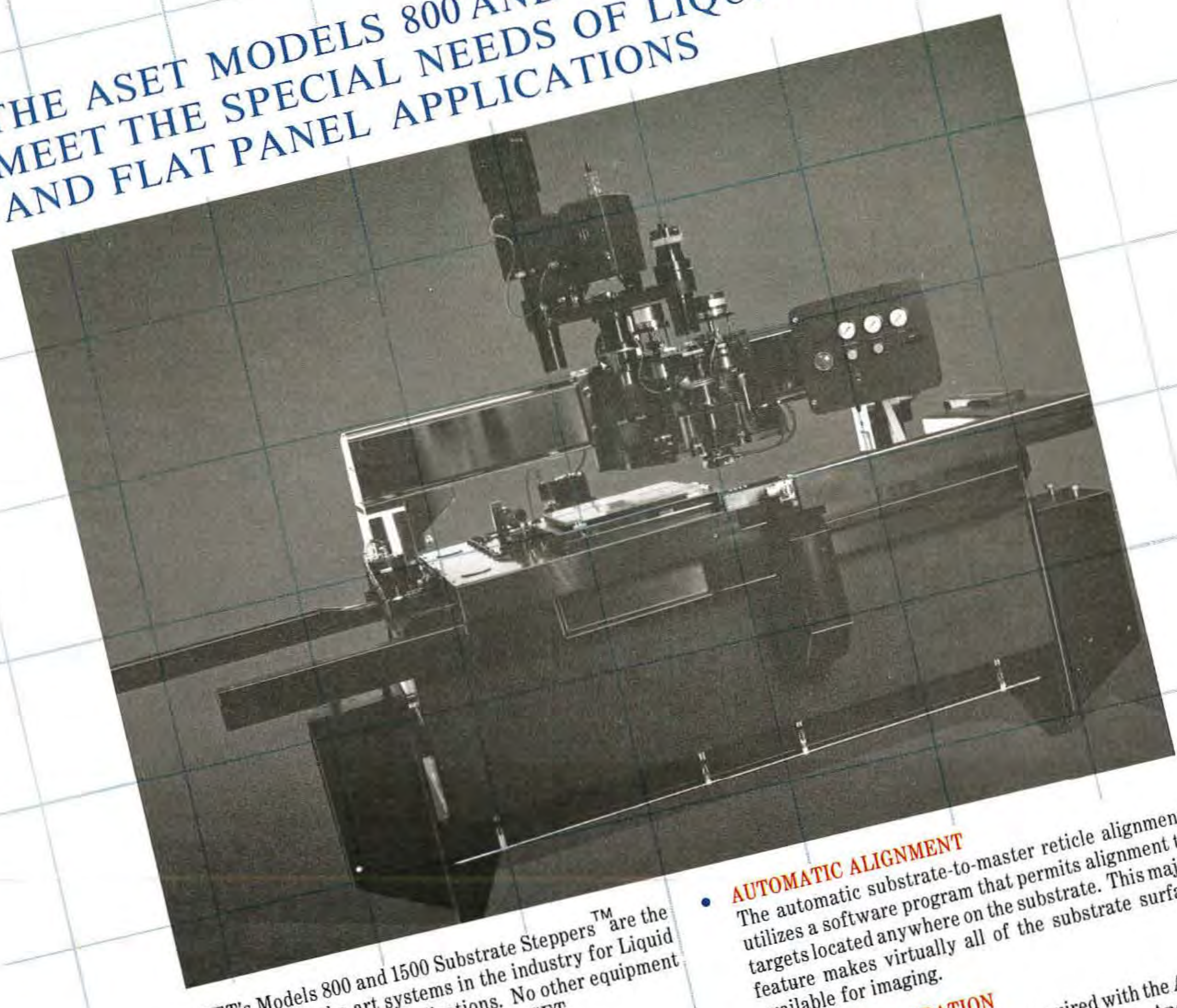
Light-Emitting Diodes

Light-emitting devices (LEDs) were observed as early as 1907 when yellow light was produced by passing a current through a silicon carbide detector. This phenomenon was studied in some detail prior to 1928.

The history of today's commercial LED displays, however, can be traced to the observation of light emissions from p-n junctions in compound semiconductors—only twenty years ago—and the fabrication of visible injection lasers in gallium arsenide phosphide (GaAsP). Following this discovery, several laboratories began the development of GaAsP for LED display applications. This work resulted in the commercial introduction of LED displays in 1968, by Monsanto and Hewlett-Packard.

In parallel with the GaAsP research in the 1960s, development of gallium phosphide (GaP) LEDs was also being pursued at a variety of laboratories, including Bell Labs and IBM. This work utilized for crystal growth a liquid-phase epitaxial technique (LPE) instead of the vapor-phase epitaxial technique (VPE) used to produce GaAsP devices.

THE ASET MODELS 800 AND 1500 DESIGNED TO MEET THE SPECIAL NEEDS OF LIQUID CRYSTAL AND FLAT PANEL APPLICATIONS



ASET's Models 800 and 1500 Substrate Steppers™ are the finest state-of-the-art systems in the industry for Liquid Crystal and Flat Panel applications. No other equipment can match the precision provided by ASET.

The Model 800 accommodates substrates ranging in size from 5x5 inches to 8x10 inches, in thicknesses of 0.060 inch or 0.090 inch. The Model 1500 can handle substrates up to 15 inches square.

Both ASET Models 800 and 1500 employ a Carl Zeiss 5X29mm field diameter, 0.20 N.A., g-line lens. Environmental control for the systems is provided by the ASET Model 6000 Chamber.

FEATURES:

- AUTOMATIC AIR GAGE FOCUSING CAMERA
  This camera focusing system automatically drives the camera lens to the optimum focal altitude above the substrate, thus compensating for unevenness in the substrate surface.
- AUTOMATIC RETICLE HANDLING SYSTEM
  The reticle handling system accommodates up to four reticles, automatically loading, aligning, edge masking, and unloading with no operator intervention. This design safeguards the reticles from contamination when they are removed from the stepper. The system is capable of handling reticles with or without full-field pellicles.
- AUTOMATIC ALIGNMENT
  The automatic substrate-to-master reticle alignment utilizes a software program that permits alignment to targets located anywhere on the substrate. This major feature makes virtually all of the substrate surface available for imaging.
- SIMPLIFIED OPERATION
  Less operator time and work is required with the ASET stepper than any other stepper on the market. And with full automation, the potential for operator error is greatly decreased.
- PERPETUAL PERFORMANCE
  Additional features of the Models 800 and 1500 Substrate Steppers include the use of ASET's high-speed X-Y stages which operate on frictionless air bearings, so that the stages will virtually run forever.

In short, we believe that the ASET Models 800 and 1500 Substrate Steppers are the optimum systems available for working with both today's technology and the evolving technologies of the future.

We welcome the opportunity to demonstrate our commitment and world leadership in microlithography equipment.

For more information, please give us a call at (818) 884-5050 or write to ASET, 6110 Variel Ave., Woodland Hills, CA 91367

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Both red and green GaP LPE devices were developed. GaAsP became the dominant commercial technology for red-emitting LEDs; while GaP grown by both LPE and VPE has been extensively used for green LEDs, with LPE becoming the dominant technology in the late 1970s. By the early 1980s, red emitting gallium aluminum arsenide (GaAlAs) had become important commercially.

The key breakthrough, though, occurred in 1966 when workers at Bell Labs found that the addition of nitrogen to GaP substantially improved the performance of green emitting devices. Then in 1971, nitrogen doping was used in the GaAsP systems and the fabrication of high performance RYG devices, using VPE technology, was made possible.

The first LED devices were designed to replace the vacuum tube displays, which through the late 1960s and early 1970s dominated the instrument market. These early LED devices were followed by smaller numeric devices used in hand-held calculators, which in turn established LED technology as a significant commercial enterprise.

Between 1973 and 1975, the calculator market became highly competitive, with LED displays pitted against VFDs and LCDs—the latter ultimately becoming the dominant technology. LEDs then quickly moved to the forefront of watch displays, only to soon lose out again to LCDs by 1976-1978.

Since then, however, a broadly-based steadily growing market for LED devices has evolved, encompassing a variety of consumer, industrial, and military applications. New applications for LEDs are continually being developed—many of which are closely coupled to the microprocessor evolution.—*M. George Craford, Hewlett-Packard, Palo Alto, CA.*

Gas Discharge Panels

The early history of gas discharge follows closely the early history of electricity. Unlike those of solids or liquids, discharges of gas afforded a wide range of intriguing effects that were used to great advantage in the investigation of the fundamental properties of electricity. Likewise, many of the significant gas-discharge discoveries followed shortly after the major discoveries in electricity.

The first gas-discharge in an evacuated vessel was discovered in 1675 by the astronomer Jean Picard. Discharge was observed in a mercury barometer made by filling a glass tube with mercury and then inverting it into a cup of mercury, so that the falling mercury would evacuate the top of the tube. When the mercury was agitated, static electricity built up and caused a gas discharge in the mercury vapor, which gave an intriguing weak flash of light.

In 1705, Francis Hauksbee performed a series of experiments directed toward understanding Picard's results, culminating in a machine having an evacuated glass ball that was rotated at high speed by a hand-cranked lathe arrangement. The gas inside the glass ball glowed when the operator's hand touched the rotating ball.

Continuous gas discharge, however, had to await the development of the battery by Volta in 1800. Then in 1801, Humphry Davy demonstrated an impressive carbon-arc lamp that was powered by electric batteries. Although the brilliance of this new lamp exceeded anything at the time, its practical application had to wait half a century for a more practical power source—the dynamo. With the development of the dynamo, though, the first practical use of a gas discharge was made possible. Frederick Holmes in 1858 installed an arc-lamp system in the lighthouse at South Foreland, England. Arc lamps remained in common use throughout the last quarter of the 19th century for many types of illumination.

The first experiments on a gas discharge between two metal electrodes placed in an evacuated glass bulb were performed in 1838 by Michael Faraday. But it was not until 1854 that Heinrich Geissler, a glassblower at the University of Bonn, began making evacauted-gas-discharge tubes in large numbers to be used in laboratories for demonstration and entertainment. Some of these tubes used a special glass having fluorescent salts that gave added color—the forerunners of fluorescent lights.

By 1875, William Crookes was experimenting with a gas-discharge tube that could achieve unprecedentedly good vacuum. He noted the fluorescence of various substances when electrons in this gas discharge hit them—and called these electrons cathode rays (early ancestor of CRTs). Then, using a similar gas-discharge device, Wilhelm Roentgen discovered the X-ray in 1895; and J.J. Thomson, by applying magnetic and electric fields to the Crookes tube, discovered the electron in 1897.

Peter Cooper Hewitt, in 1901, commercialized the low pressure mercury discharge lamp. In 1910, Georges Claude, who developed a technique for obtaining low-cost neon gas, constructed the first commercial neon sign.

Plasma panels—In a very early flat panel display, the Bell System used a receiver based on a gas-discharge device to demonstrate live TV in 1927. The display panel (an array of 50 × 50 gas-discharge cells, with a display area of approximately 24 × 30 in.) was constructed of a neon-filled glass tube bent back and forth 50 times in a zig-zag manner. It had 2,500 electrodes cemented to the outside of the tube, each being excited by an ac voltage. This display demonstrated a full gray scale TV image at 16 frames per second. As with many of today's flat panels, however, the state-of-the-art of the drive electronics was the major limiting factor for the visibility of this early flat panel display.

A number of gas-discharge devices were then developed in the 1940s and 1950s for use in computer switching and logic; and one of these developed into a rather successful product. It was a counting device called the Dekatron—having multiple cathodes arranged in a ring with a common central anode. The appropriate voltage pulses would make the gas discharge jump from one cathode to the next in a shift-register fashion. This counting device doubled as a display since the state of the counter could be determined by observing which cathode was discharging.

Then, early in the 1950s, the NIXIE tube was developed at Burroughs Corp. It was the first commercially successful electronic numeric indicator and had the ability to rapidly display changing numbers with unprecedented clarity—opening the way for many new product possibilities. Each cathode electrode was constructed in the shape of a different numeral.

The potential for a variable-format display having an array of x-y electrodes and a display element at each intersection was finally realized in the late 1950s and early 1960s. Experiments in this technology led to the development of arrays of gas-discharges that could be made to emit light efficiently. With this arrangement, however, no more than one cell could be on in a line, because once a single cell discharged it would hog current and lower the voltage on that electrode, thus preventing other discharges from igniting.

A key breakthrough came in 1964 when Bitzer and Slottow, at the University of Illinois, realized a capacitor could be used to exploit the memory of the gas-discharge in a dot-matrix panel. The capacitor could store a charge and, when combined with the negative-resistance characteristics of the gas-discharge, memory could be achieved when excited by the proper ac voltage. This new device was named the plasma display (gas-discharge) panel.

Initially, though, this plasma panel operated only a few hours at a time. The next breakthrough occurred in 1968 when Owens-Illinois developed the rigid substrate open cell structure that was capable of the high temperature bake-out necessary for long operating lifetime. With this development, the ac plasma display panel emerged as a rugged practical device that was mass-producible.

In 1970, Holz and Ogle at Burroughs introduced the Self-Scan display that used the internal logic ability of the gas-discharge to greatly reduce the number of circuit drivers by making the display act as a shift-register. Two years later, Umeda and Hirose, of Fujitsu, presented the development of an ac plasma display that acted as a shift register. About the same time, researchers at Zenith and Bell Labs demonstrated high quality, real-time television pictures on a self-scan display. The excellent performance of these systems stimulated a great deal of research into flat-panel TV using gas-discharge.

During the 1970s and early 1980s, the plasma display moved from pilot production stages to full-scale production making plasma displays the dominant flat-panel technology for large-area displays.—*Larry F. Weber, University of Illinois, Urbana, IL.*

Non-Emissive Displays

The history of commercially important non-emissive electronic displays began with a series of papers by Heilmeier and co-workers in 1968, on two liquid crystal displays (LCDs): the dynamic scattering mode and the dichroic dye mode. Other non-emissive display technologies that came into existence about the same time included electrochromic and electrophoretic, both of which have yet to become widely used in products.

The technological development of large-scale integration of semiconductors, at this time, made possible computations of great complexity in a portable format.

When LSIs were combined with LCDs and LEDs, the portable calculator and digital watch market came into its own.

In 1970, a new dielectric effect known as the twisted nematic (TN) LCD was discovered. This LCD had high contrast and very low power consumption and good reliability. By the mid 1970s, TN LCD had become dominant in portable displays of low and intermediate information content.

LCD research in the early 1980s has concentrated on increasing the information content and size of display to achieve full-page alphanumeric and graphic displays as well as to extend the reliability into automotive and industrial markets. The impetus in the latter half of the 1980s has shifted to gray scale, color fidelity, and larger display area.

As useful as the TN LCD is, the loss in brightness associated with the polarizers required gives a generally dull appearance. One way to increase the apparent brightness of the LCD is to back light it.

Baur and Greubel in 1977 presented a method of collecting ambient light and discharging it through a TN LCD, calling it fluorescence-activated display (FLAD). Key to FLAD is the fluorescent dye contained in the plastic, that absorbs light in the blue end of the spectrum and re-emits the light at longer wavelengths, in the green or orange ranges, resulting in a large brightness gain. The principle is used commercially in draftsmen's drawing triangles.

Two display modes invented in 1980 specifically took advantage of carefully constructed defects in the LC to produce a memory-type operating characteristic. Also in 1980, Berreman and Heffner invented a bistable display that employed the cholesteric LC phase. All these systems, however, lack the contrast characteristics of the TN display.

Despite their widespread application, TN LCDs have three drawbacks: limited information content, limited color capability, and poor brightness—thus a number of other non-emissive technologies continue to be studied. These, however, have yet to exhibit the combination of advantages and reliability of LCDs.

Some non-emissive displays still in laboratory study stages include:

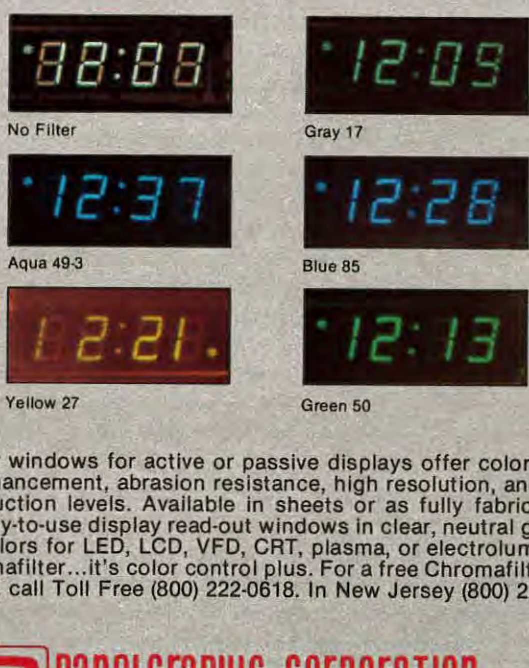
Electrochromic (ECD)—a battery, electrochromic cell that has one of the electrodes serving a display function.

Electrophoretic (EPD)—a colloidal suspension that is electrically active. Suspended particles are positively charged and their color is white. As the field is applied, the particles migrate to the negative electrodes of the seven-segment digit, appearing as bright white against the black of the surrounding fluid.

Electroactive—these include ferroelectric displays and ferromagnetic displays, in which the solid materials interact with light.

Electromechanical—several different types of devices, including foil-shutter and rotating ball, employ electrostatic and ferroelectric forces to physically generate a display image.—*P. Andrew Penz, Texas Instruments, Dallas, TX.*

(Developed from *Flat-Panel Displays and CRTs*, edited by Lawrence E. Tannas, Jr., Van Nostrand Reinhold Co., 1985.)



Products on Display

Color CRT yokes

Line of deflection yokes for color avionics displays and color, high-resolution graphics displays now includes 19-in. terminal-size color CRT yokes (PIL and Delta) suitable for cockpit displays, flight simulators and high-resolution monitors.
SYNTRONIC INSTRUMENTS INC., Addison, IL (312/543-6444) BOOTH: #4
For information, circle Reader Service #57

VFD converters

Series E700VF DC-DC/AC converters for Vacuum Fluorescent Displays (VFDs) provide both DC Anode and AC filament outputs from a low voltage DC input at efficiencies exceeding 80%. Units are 1.1 x 1.2 x 0.91 in. and fully encapsulated for superior environmental protection.
ENDICOTT RESEARCH GROUP INC., Endicott, NY (607/754-9187) BOOTH: #63
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VDT filters

Glareban VDT filters cut the glare bouncing off computer terminal screens by over 90%. Made of tough optical glass, chemically coated on two sides, the filters are distortion free and can be installed in about 10 sec with no tools. The filters are attached by velcro strips and will fit the terminals of all popular desk top and portable computers.
DENTON VACUUM, Cherry Hill, NJ (609/424-1012) BOOTH: #98
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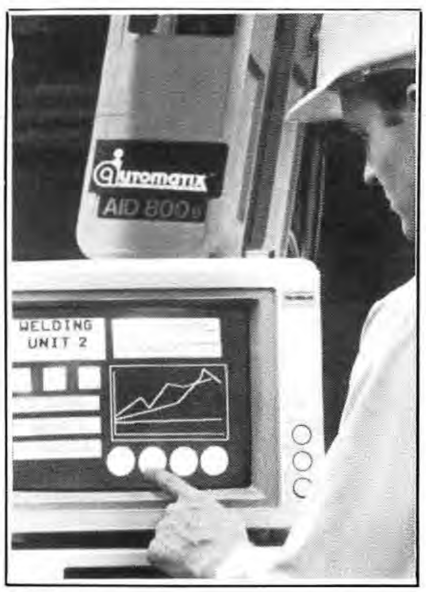


Touch screen

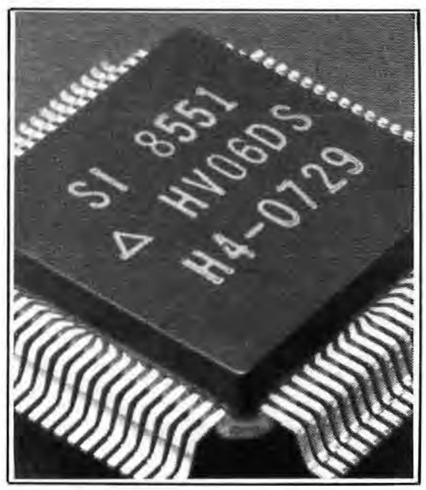
MicroTouch analog capacitive touch screen provides a resolution of 256 x 256 in the calibrated screen area and is designed to fit most PC monitors, terminals, and CRTs. Because of its glass surface, this screen is virtually impervious to damage under normal operation and will not distort the display image, making it especially suitable for industrial or public access use.
MICROTOUCH SYSTEMS INC., Woburn, MA (617/935-0080) BOOTH: #25
For information, circle Reader Service #60

Substrate stepper line

Designed for liquid crystal and flat panel applications, line of large substrate steppers are designed to accommodate substrates. Model 800 ranges in size from 5 x 5-in. to 8 x 10 in. in thicknesses of 0.060 or 0.090 in.; Model 1500, up to 15 in. square. Units feature automatic air gage focusing camera, automatic master reticle loading and unloading, automatic master reticle-to-camera alignment, and automatic substrate-to-master reticle alignment utilizing a software program that permits placement of layer-to-layer alignment targets anywhere on the substrate, and HP Series 200 computer coupled to a 14-in. monochrome video display with graphics capability.
ASET, Woodland, CA (818/884-5050) BOOTH: #99
For information, circle Reader Service #67

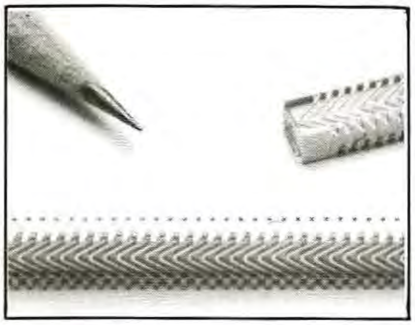
Contrast enhancement filters

Monolithic contrast enhancement filters meet specific requirements for producing vivid visual contrast in cockpit, color CRT displays. Filters are designed for durability, environmental stability, mechanical strength, and optimum transmission characteristics in commercial and military aircraft flying at high altitudes in intense ambient light conditions.
HOYA OPTICS INC., Fremont, CA (415/490-1880) BOOTHS: #13, #14
For information, circle Reader Service #59



Surface-mount power array

Series VN01A "NE" surface-mount power MOSFET Quad Arrays contain four devices in a single package that are completely isolated from one another to allow flexibility of use. The arrays, containing four VN01A power MOSFET die, only 0.07 in. high, are packaged in a 16-terminal, surface mount ceramic leadless chip carrier (LCC) that measures 0.23 x 0.41 in. The arrays are offered with a 3 Ohms maximum ON-resistance and breakdown voltages of 60 V and 90 V. Price: $11.35, 60 V; $12.04, 90 V (in quantities of 100 to 999)
SUPERTEX INC., Sunnyvale, CA (408/744-0100) BOOTH: #87
For information, circle Reader Service #89

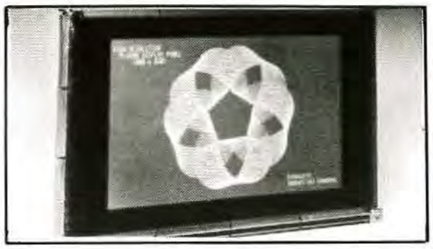


Solderless interconnectors

Parallel interconnect, solderless high density interconnecting device, features contacts on 0.030-in. grid, and has a thermal coefficient of linear expansion closely matching glass and printed circuit board, low profile (0.275 in. board-to-glass board), low resistance (30 milliohms max with glass tight joint), and high voltage breakdown (600 V DC). Device is environmentally tested for vibration, thermal, and mechanical shock.

ITT CANNON, Fountain Valley, CA (714/964-7400) BOOTH: #10

For information, circle Reader Service #68



Plasma display panel

Multiple gray scale plasma display panel provides 400 x 640 pixel configuration and allows users to vary brightness levels within the displayed image from 0% (background) to 33%, 66%, or 100% (full brightness). Panels include both anode and cathode drive circuits and a 60 Hz scan speed; thus while the cathode row is activated, four-bit parallel data is supplied to the anode columns in TTL levels. Further, the panels display up to 20 MHz of data in real time, and offer the choice between 0.33 mm x 0.33 mm, and 0.36 mm x 0.30 mm dot pitch designs.

PANASONIC INDUSTRIAL CO., Secaucus, NJ (201/392-5653) BOOTH: #51

For information, circle Reader Service #55

AC gas discharge panels

Complete family of AC gas discharge (plasma) displays range in size from diagonals of one centimeter to one meter. Addressable matrices include 256 x 256, 252 x 508, 512 x 512, 1024 x 1024, 1212 x 1596, 1024 x 2048, and 2048 x 2048.

PHOTONICS TECHNOLOGY, Luckey, OH (419/666-0762) BOOTHS: #8, #9

For information, circle Reader Service #50

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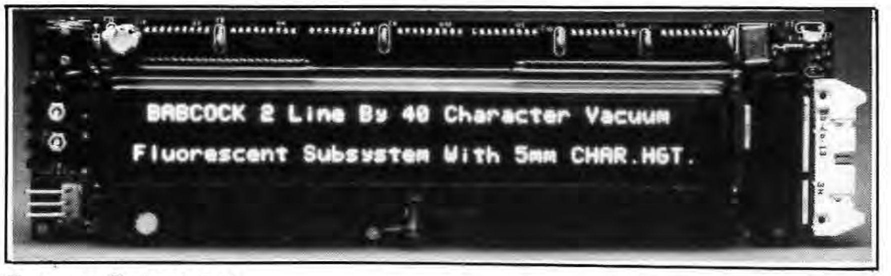
For information circle Reader Service #26

Products on Display



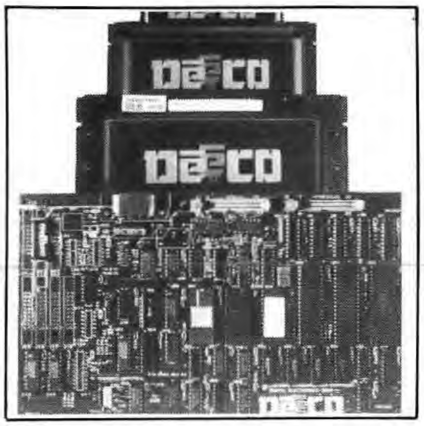
Vacuum fluorescent

Model VF-0240-01 vacuum fluorescent subsystem features a 2 line by 40 character display with blinking character capability. An on-board microprocessor-controller takes care of display refresh and control functions. A DC/DC converter generates all the required voltages to drive the display. Only a single +5 VDC power supply is required to operate the subsystem.

The device's 5 x 7 dot matrix character format allows generation of upper and lower case alphabet characters, as well as numerals, punctuation and commonly used symbols. Also included as standard features in the software are alternate Japanese "Katakana" and European characters. Price: $239 (in lots of 100).

BABCOCK DISPLAY PRODUCTS INC., Anaheim, CA
(714/491-5112)

For information circle Reader Service #77

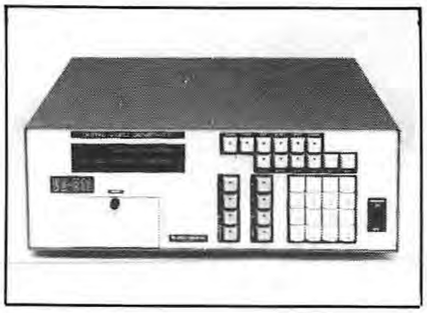


VID graphics controller

DeeCO "C2" series graphics controllers for flat panel, display applications interface with most electro-luminescent and gas plasma dot matrix flat panel displays, including the 512 x 256 panels from Planar, Lohja, Sharp, NEC and others. The controllers have both 8066 and NEC7220 processors to provide dual pipelined architecture for fast drawing speed using simple handler commands. Either 8-bit parallel or RS-232C (or RS-449) host interfaces are available. An IBM-PC (scan code signal) style keyboard connector is standard; a touch panel interface is optional. An optional EEPROM allows defining and storing 2 KB of user characters and permits storage of up to 6 KB of local retained graphic segments. The controller operates on +5 V (DC) input. Dimensions are 5.7 x 9.63 x 1.23 in. Price: $895 (in 100 quantity).

DIGITAL ELECTRONICS CORP., Hayward, CA (415/786-0520) BOOTHS: #15, #16

For information, circle Reader Service #52



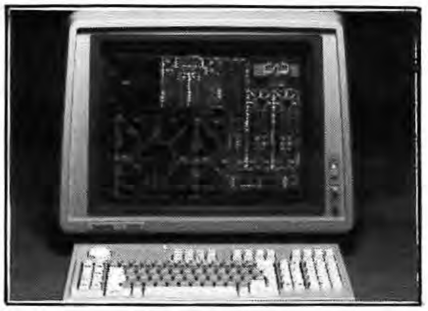
Video signal generator

Model VG-811, high performance video signal generator, produces video clock frequencies from 5 MHz to 120 MHz and horizontal scan rates up to 2000 KHz—making the instrument suitable for testing, alignment, inspection, and evaluation of most current high-resolution color and monochrome video monitors. The VG-811 can store and recall up to 99 separate program pattern and timing set-ups in an EE-PROM without the need for an additional PROM programmer. Full graphics capability is provided by a standard ASCII character set plus 16 user-definable characters, dots, cross hatch and burst patterns. Color bar and gray scale patterns can be selected for size and sequence, including random mode. The VG-811 has analog, TTL, and ECL outputs. All functions are remotely programmable through GPIB or RS-232C interfaces. Price: $10,750.

TEST & MEASUREMENT SYSTEMS INC., Sunnyvale, CA (408/720-8877) BOOTH: #54

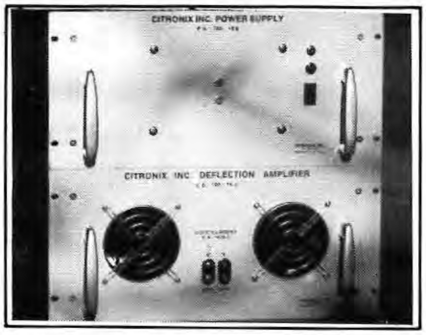
For information, circle Reader Service #72

Products on Display



Color graphics terminal

The CX4111 color graphics computer display terminal offers a 19-in., 1024 x 768 pixel display area, with a virtual graphics space of 4 billion by 4 billion points. Sixteen colors can be displayed simultaneously from a palette of 4,096 shades. The display provides direct, coaxial attachment to IBM 3274 controllers, a 3270-style keyboard and a full-screen, color 3270 alphanumerics. IBM Models 2, 3, 4, and 5 screen formats are supported. Price: $13,950.
TEKTRONIX INC., Beaverton, OR (503/644-0161) BOOTHS: #93, #94, #95
For information, circle Reader Service #63



CRT test station

Magnetic deflection amplifier, CRT test station, with up to ± 20 amps output at ± 60 V DC, is mounted inside a 19-in. rack-mount chassis. The mating power supply is mounted inside two additional 19-in. rack mount chassis. Power supplies are regulated with fold back current limiting. Add-on features include voltage on demand (up to 150 V DC) for fast fly to, or retrace, and resonance fly back with fly back voltage up to 250 V.
CITRONIX INC., Orangevale, CA (916/961-1398) BOOTH: #33
For information, circle Reader Service #66

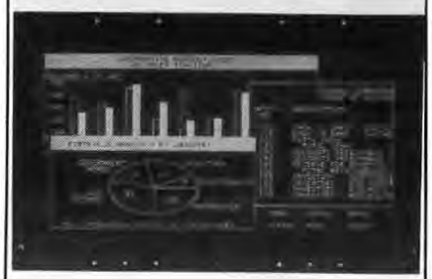
Polyester substrate

Type OC low resistivity film,—a polyester substrate coated with indium tin oxide—has a sheet resistivity (R_s) of <80 ohms per square and a visible light transmittance (VLT) of > 80% on optical grade polyester.
ANDUS CORP., Canoga Park, CA (818/882-5744) BOOTH: #49
For information, circle Reader Service #70

Cathode ray tubes

Line of cathode ray tubes for use in both commercial and military applications includes: high brightness, high resolution CRTs for use in quality performance projection system; ruggedized CRT assemblies for general purpose and military avionics displays; and miniature electrostatic and electro magnetic CRTs available with shields, yokes, potted leads, and mating connectors.
THOMAS ELECTRONICS, Wayne, NJ (201/696-5200) BOOTHS: #42, #43
For information, circle Reader Service #54

For information circle Reader Service #28



Electroluminescent monitors

Model EL6648MX electroluminescent flat panel display with 512 x 256 resolution, has a viewing area of 7.68 x 3.84 in., is 0.75 in. thick, and weighs 18 oz. High-resolution graphics, or 80 characters by 25 lines of alphanumeric text, in bright yellow-orange, can be easily viewed under low ambient light, and even from an angle greater than 120 deg. A 60 Hz refresh prevents flickering. No special control signals, high voltage, or shielding are required. Model EL8358M is an MS-DOS compatible electroluminescent monitor that offers display quality of a CRT with 640 x 200 resolution. Only 0.55 in. thick and weighing 25 ounces, the device is suitable for portable personal computers, industrial control, or any application using MS-DOS graphics, text, or utility software packages.

PLANAR SYSTEMS INC., Beaverton, OR (508/690-1100) BOOTHS: #90, #91, #92

For information, circle Reader Service #49

Tin oxide conductive film

Electro-optical tin oxide coated Electric Glass provides transparency, durability, abrasive resistance, chemical stability, and conductivity at given ohms/square, thermal stability up to 560C, and is unaffected by moisture. SnO_2 is deposited on standard float glass of varying thickness that will meet the quality requirements for federal specifications DD-G-451-D. Flatness and optical quality nominally remain as good as industry standard float glass after coating, with the substrate virtually stress free, allowing for ease of subsequent cutting.

CHERRY DISPLAY PRODUCTS CORP., El Paso, TX (915/779-7774) BOOTHS: #58, #59

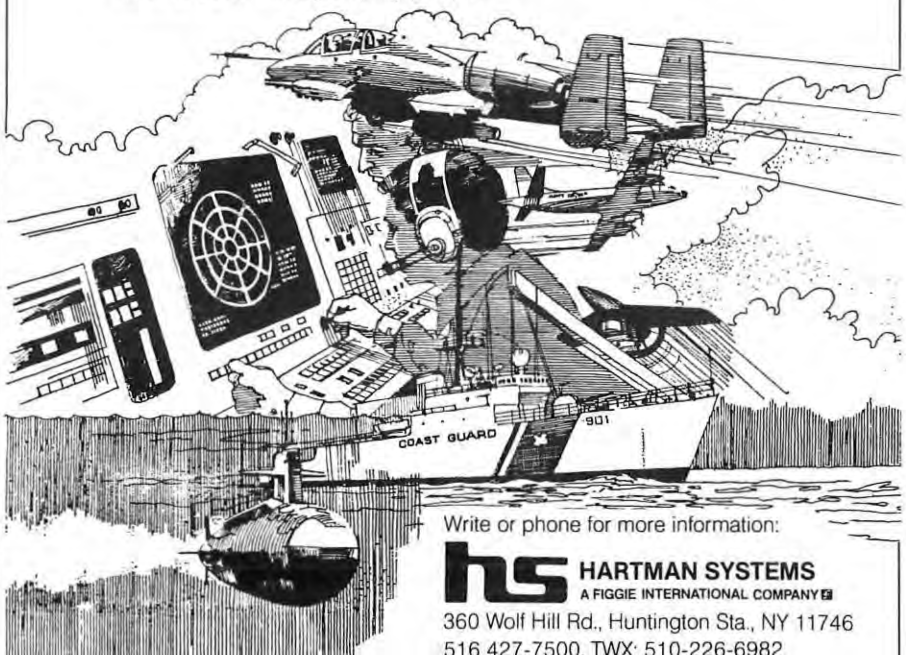
For information, circle Reader Service #65

Image transfer system

The Opti-Beam 1600 FPD exposure machine, designed specifically for primary image transfer from a phototool onto a glass substrate for flat panel displays, features a video alignment system for fine position control, automatic exposure controller, highly collimated UV light for soft or off-contact imaging and a large image area. Automatic material handling methods and other phototool alignment systems are available to meet user specifications.

OPTICAL RADIATION CORP., Azusa, CA (818/969-3344) BOOTH: #55

For information circle Reader Service #75



Battery-operated radiometer

Model GS-1400 ANVIS Compatibility Radiometer measures radiance of instrument panels according to military Aviators Night Vision Imaging System, AN/AVS-6 specification. The battery operated instrument can measure either ANVIS green or ANVIS yellow radiance, allowing both operating and warning lights to be tested for ANVIS compatibility. When measuring for green, the user is signaled if the radiance exceeds the threshold sensitivity of 1.70 x 10^{-10}; for yellow, the user is signaled if radiance is within the acceptable range of 1.70 x 10^{-8} to 4.00 x 10^{-8}. A standard fiber optic probe, with a measurement spot diameter of 1.6 mm, measures ANVIS radiance over a wavelength of 450 to 930 mm.

EG&G GAMMA SCIENTIFIC INC., San Diego, CA (619/279-7034) BOOTHS: #44, #45

For information, circle Reader Service #56

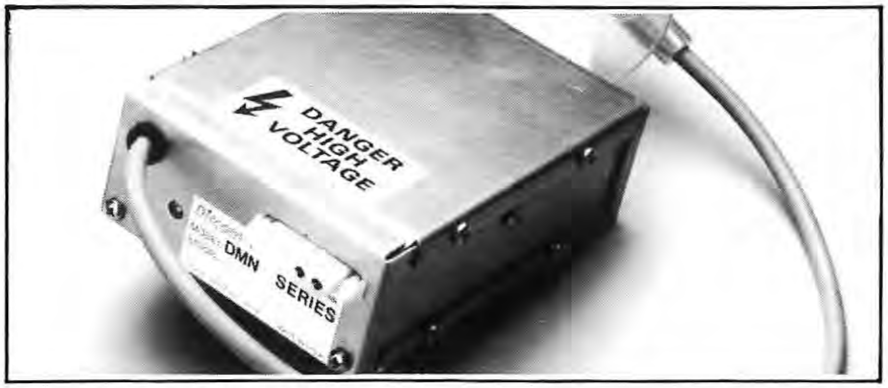
Color avionic display

Model M18-E851 color CRT, designed for avionic applications, provides a high resolution, high brightness 5" x 5" display area and is packaged in a rugged assembly designed to meet stringent environmental requirements of a high performance aircraft cockpit. Display modes include raster scan, stroke write, or hybrid.

AEG-TELEFUNKEN CORP., Somerville, NJ (201/722-9800) BOOTHS: #64, #65

For information, circle Reader Service #61

For information circle Reader Service #30
See us at S.I.D. '86 - Booth 63
Reader Service #31



High voltage power supply

Series DMN high voltage power supply units provide tightly regulated voltages up to 20 KV at 10 W for direct-view monochrome CRTs. The regulator, constructed on a hybrid circuit using surface-mount components for enhanced reliability and smaller size, makes available room for well-filtered G1 and G2 outputs, overvoltage crowbar protection, digital on-off control, and power input lead filtering, all of which are available together if needed. DMN converters feature 100 KHz power conversion for 0.01% p-p ripple and noise, and load transient peaks of 0.2% and recovery in 500 μs with 10-W switched loads; output voltages to +20 KV, loads to 10 W; G2 voltages to + 1 KV; G1 voltages to - 200 V (or cathode voltages to 200 V); input voltage of + 24 V standard, 15 to + 100 V available.

DISPLAY COMPONENTS INC., Westford, MA (617/692-6000) BOOTH: #1

For information, circle Reader Service #53

Cathode Ray Tubes

On display at the Litton booth are several types of CRTs: miniature 1" dia, packaged assembly, complete with shield and coil, for use in helmet-mounted displays, armored vehicles, FLIR readout; high-resolution color recording CRTs and imagery produced by the above—4000 lines, supplemented red phosphor; multi-beam CRTs for multi-thousand line, flicker-free direct view displays, and for high-speed film recording; fiber-optic CRTs for strip chart recording, photo typesetting, and medical imagery.

LITTON ELECTRON DEVICES DIV. Tempe, AZ (415/591-8411) BOOTH: #85

For information circle Reader Service #79

Display modules

Quantum Wall Terminal plasma display modules can be used as stand-alone displays or grouped together forming a large scale display for such applications as data processing, network/system monitors, building directories, passenger information displays or industrial information outputs.

QUANTUM ELECTRONICS, Lewistown, PA (717/242-1132) BOOTH: #97

For information circle Reader Service #78

Products on Display

Video signal generator

Programmable video signal generator, Model VG-804, for testing and evaluating color and monochrome video monitors, operates at horizontal scan rates up to 99 KHz and dot clock frequencies from 4.38 MHz to 50 MHz. The ASTRO DESIGN signal generator has both analog and TTL outputs for connection to the monitor under test and is easy to program because it offers independent timing and dot-clock controls. The VG-804 generates vertical and horizontal color bars and gray scales, cross hatch and characters. All timing and pattern parameters can be programmed from the front panel or the information can be "burned" into a PROM that fits behind the front panel. Price: $5,700.
TEAM SYSTEMS INC., Sunnyvale, CA
(408/720-8877) BOOTH: #54
For information circle Reader Service #58

Electroluminescent displays

VU-100 display module displays video pictures on a TFEL panel—an array of 76,800 light pixels arranged as a 320 x 240 matrix. The system accepts composite analog video and digitizes the picture portion of the signal into 320 data samples per line. The sample rate is 6 MHz, and each data sample is encoded as a 4-bit word to control 16 shades of brightness for each pixel in the line. This process is repeated for 240 lines to display the first "field" of the picture "frame." The second "field" is displayed on the same corresponding pixels as the analog video signal is processed (the second "field" is not physically interlaced with the first "field" as is done on CRTs.) The unit can be used to display data from computers and other sources by adjusting the stream of incoming digital data for compatibility with the VU-100 internal clock and digitizer, which processes 320 samples per line.
HYCOM INC., Irvine, CA
(714/261-6224) BOOTH: #77
For information, circle Reader Service #71

Thermal video system

The Series 300 thermal video system, designed for applications requiring light weight and portability adds image processing functions to the operation of the Hughes Probeye infra-red viewer. The new series enables the user to see differences in thermal patterns in up to 16 distinct colors for full evaluation and analysis of thermal problems. Key features include higher resolution display (200 TV lines) with improved color output; and remote control operation (a detachable wireless keyboard enables analysis of thermal problems from a distance). Three models cover a temperature range from −20C to +1500C, with a temperature resolution as fine as 0.1C. Price; $29,950.
HUGHES AIRCRAFT CO., Carlsbad, CA
(213/414-6307) BOOTH: #52
For information circle Reader Service #76

For information circle Reader Service #34

Night vision testing

ANVIS (Aviators Night Vision Imaging System) compatibility measurement capabilities have been added to the PR-1500 Spot-Meter, producing an instrument capable of testing radiometric, photometric and (optically) colorimetric compatibility of panel displays and other light sources in aircraft, helicopters, ground vehicles and other military equipment. A wide range of optical accessories provide up to a seven-degree collection angle (three degrees with standard objective lens) and down to 0.003-in. spot size.

An adjustable detection threshold generates an audible signal when a specific reading exceeds a user-selected maximum value of AR units. Thus, the device can be used in GO/NO-GO testing for rapid on-line inspection of devices. The instrument can also be used for conventional luminance measurements (in footLamberts).

PHOTO RESEARCH, Burbank, CA (818/843-6100) BOOTHS: #21, #22

For information circle Reader Service #73

VFD module

Bright blue-green vacuum fluorescent display modules have a resolution from 0.005 in. for small displays to 1.0 in. for large outdoor displays. Modules feature: extremely bright characters with luminance of 5000 cd/m^2 (1460 fL), operating temperatures from −20C to +50C, direct drive from MOC ICs, low voltage operation, low power consumption, and direct connection to system data bus. BOOTH: #68

IEC CO., Santa Ana, CA (714/543-6295)

For information circle Reader Service #87

Optical disk system

A writable optical disk system provides information storage and rapid random accessibility. A single writable disk drive with controller and autochanger holds up to 50 disks. The disk measures approximately 12-inches in diameter and can hold up to 3.2 Gigabytes (3,200 Megabytes) in a constant angular velocity format. A disk controller functions as an error correction monitor, a data encoder/decoder and a logic addressor. A parallel or SCSI interface are available with the controller, which handles up to eight drives. Price: $6,730 (Controller); $9,614 (disk drive)

SONY CORP., Park Ridge, NJ (201/930-6432) BOOTH: #79

For information circle Reader Service #51

Head-up displays

High-luminance 2½-in. cathode-ray tubes are designed to deliver the brightness and resolution required in a head-up display (HUD) to provide a clear display of navigational and weapon data. Designated type WX-34446, the tubes are designed specifically for the Northrop F-20 Tigershark development program. The new cathode-ray tube has a peak line brightness of 13,500 fL and a line resolution of 0.006 in. at 37% peak amplitude. Its screen uses P-53 phosphors.
WESTINGHOUSE ELECTRIC CORP., Industrial and Government Tube Div., Horseheads, NY (607/796-3260) BOOTH: 35, 36

For information circle Reader Service #74

Custom coatings

Full line of custom powder coatings, engineered finishes, and solid film lubricants for applications in the military, aerospace and nuclear industries are featured. Other products include: Microseal processes, evershield electrically conductive coatings for EMI/RFI shielding, decorative finishing, and a variety of pretreatment processes.
EM CORP., West Lafayette, IN (317/463-2511) BOOTH: #86

For information, circle Reader Service #62

Silicone-carbon compound

Low resistivity, SC-CONSIL compound offers a 2.0 ohm-Cm resistivity for molded parts and 6 ohm-Cm for extruded parts. The compound provides electromagnetic shielding and environmental sealing and offers voltage handling capability for grounding, static discharge, and corona applications.
TECKNIT, Cranford, NJ. (201/272-5500)

For information circle Reader Service #106

Light pen program

Light Pen driver program, controller, allows users to operate Microscoft WINDOWS program by touching the pen to the screen, and then touching the desired target with the tip of the pen. Operation is faster than a Mouse or keyboard. Controller is free with purchase of Light Pen. Price: $199.99.
WARP SPEED COMPUTER PRODUCTS INC., Los Angeles, CA (213/822-0647)

For information circle Reader Service #107

OCR software

Character Image Recognition (CIR), an Optical Character Recognition (OCR) software, operates with Series 700 scanners to combine image capture and manipulation with optical character recognition. Two versions are available: CIR I features a menu-driven interface and has interactive capability, where unrecognized characters are displayed in context so that an operator can enter the appropriate letter; CIR II offers an interactive learn mode where software displays the characters for identification. A batch learn mode is also included. Both software products will automatically go through the available font files to select the appropriate font. Price: CR I $695; CR II $1,995.
DATACOPY, Mountain View, CA. (415/965-7900)

For information circle Reader Service #108

Teleconferencing system

DataBeam CT 2000, an advanced data teleconferencing system, transmits and displays paper documents and computer data on a large 4 x 4-foot projection screen. The system includes a CCRT Light Valve projection display and is coupled to any standard Group 3 facsimile machine that is used as a document scanner. After the first page is displayed, subsequent pages are transmitted and stored in internal memory. Operational control of the meeting is via numonic icons on the graphics tablet. Price: $49,500.
DATABEAM CORP., Lexington, KY. (606/273-3204)

For information, circle Reader Service #109

Ruggedized Raytheon airborne CRTs are seen in the toughest places.

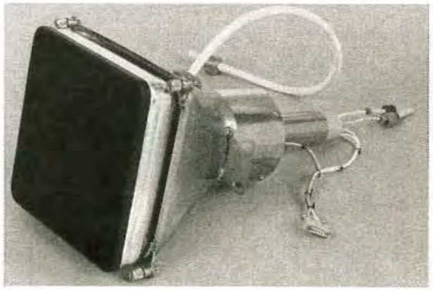
• Seen clearly in cockpits full of sunlight -- in more than 10,000 foot-candles of ambient light. Because of Raytheon's patented RAYVUE® filter.

• Seen in the AH-64, B-1, B-52, F-4, F-111, F-14, F-15, F-16, F-18, P3C and S3A aircraft. Because of Raytheon's high-performance ruggedized CRTs and techniques for packaging with yokes and shield.

• Seen whenever vendor responsibility and reliability are needed most -- when environmental conditions couldn't be worse.

• Raytheon CRTs are seen, too, in vital ground and shipboard displays and in H.U.D.s because they have proven themselves in critical applications -- around the world.

For information on how they can meet your exacting display requirements, contact the Marketing Manager, Raytheon Company, Industrial Components Operation, 465 Centre Street, Quincy, MA 02169, (617) 479-5300.



See us at S.I.D. '86 - Booths 23 & 24

Raytheon

For information circle Reader Service #37

Source book examines flat-panel developments

Flat-panel display technologists are very highly motivated, Larry Tannas tells us in his preface, to find a replacement for one of the last vestiges of the vacuum tube age—the CRT. Progress has been slow and often frustrating. Flat tube developments, which promised to provide TV on the wall, have failed repeatedly for nearly 40 years. Substantial efforts earlier, by Sylvania and Owens Illinois, to launch commercial EL and plasma panels were unsuccessful. And it is still not possible to predict when the full-sized flat television receiver will be available in the consumer market.

by Peter Seats
Director, Display Technology
Thomson-CSF Components Corp., Dover, NJ

Without doubt, we must agree (*we* being display engineers with a tube background) that flat panel displays are indeed "the wave of the future." In fact, in many application areas, the future has already arrived—it is the very success achieved by LEDs, LCDs, VFDs and other flat devices in burgeoning non-television display applications that is helping to lay the foundations for the final assault on the tube.

The publication of this book, therefore, is very timely, providing both the neophyte and the professional engineer or researcher with an excellent distillation of operating principles and application status of electronic display technologies. *Flat-Panel Displays and CRTs* covers Cathode-Ray Tubes, Flat CRTs, Electroluminescent, Light-Emitting Diode, Gas Discharge (Plasma Panels), Liquid Crystal, and other displays. It clearly explains the display system requirements, performance measures, and technical capabilities of electronic displays. Unifying theories are presented to allow the direct comparison between flat panels and CRTs, as well as emissive and non-emissive displays.

Expert contributors examine the visual system, image quality, and each of the technologies in detail:

- Tannas contributed three chapters, as well as the introduction. He covers the subjects of display systems design in general and flat-panel design issues in particular, as well as presenting a detailed review of EL technology. His long experience as researcher and teacher is evident in the sophistication of his treatment.

(Continued on p 50 . . .)


AEG

(... continued from p48)

- Harry Snyder, of Virginia Polytechnic Institute, provides two chapters dealing with the principals of image perception and characterization of image structure and quality.
- Specific display technologies for flat CRTs, plasma panels, LEDs, and non-emissive devices are reviewed by Walter Goede (Northrop Electronics), Larry Weber (University of Illinois), George Craford (Hewlett-Packard), and Andrew Penz (Texas Instruments), respectively.
- A chapter on the CRT, prepared by Norman Lehrer (consultant, formerly with Markins-Johnson), was included because, as Tannas notes, the CRT has defined the performance standards by which newer display devices are compared.

Many readers of ID will find the above names familiar. Including the reviewers of the individual chapters, the collective contributors to this book represent a veritable "who's who" of the leading specialists in the information display community.

The authors of the individual articles in no way attempt to compare or rate the various display technologies or to predict the future—except perhaps, by strong implication, the demise of the tube. Readers who expect guidance in the somewhat bewildering variety of available display alternatives must judge the respective merits for themselves.

Derived in large measure from tutorials presented by the contributors, under UCLA or SID auspices, *Flat-Panel Displays and CRTs* is unusually lucid and well organized. The attention to fundamentals in this book will keep it on nearby shelves for many years.

Nevertheless, even the best of texts must suffer in rapidly evolving fields, and it is hoped that Tannas will issue supplements or revisions periodically as the fields continue to advance. In particular, one would wish for a more comprehensive LCD treatment, in view of the remarkable progress in color TFT devices and high contrast techniques demonstrated since publication. In the CRT field, we need to be kept up to date on progress in meeting the needs of coming HDTV systems.

Flat-Panel Displays and CRTs
Edited by Lawrence E. Tannas, Jr.
Van Nostrand Reinhold (1984)
512 pages, $52.50

For information circle Reader Service #105

Free Literature

Gas plasma display
A four-page, color brochure describes gas plasma, touch-input display assembly with design flexibility and a variety of man/machine interfaces for use in industrial automation, military equipment, point-of-sale systems, controllers and special applications fields. Illustrations and specifications are included for the Viewpoint II.
GENERAL DIGITAL CORP., E. Hartford, CT (203/528-9041)
Circle R-S #81

Video delay lines
A four-page technical paper details bidirectional, video delay lines suitable for professional grade television broadcasting equipment. Charts, pin function and technical data are provided for modules.
MATTHEY ELECTRONICS, Television Equipment Associates, Inc., South Salem, NY (914/763-8893)
Circle R-S #82

Suppression devices
A 47-page catalog presents an overview of EMI/RFI suppression devices, conductive elastomers, wire-oriented in silicone products, knitted wire mesh, and related materials. Specifications, material properties, performance parameters and ordering information are also provided.
EKS NORLAND INC., El Cajon, CA (619/562-5992)
Circle R-S #83

CRT products
A 35-page, color brochure illustrates magnetic and electrostatic deflection tubes, avionics displays, high resolution fiber optics and projection tubes, and phosphor screens, providing a representative listing of CRTs from broad and increasing complete line. Selection includes examples of designs which may meet requirements with little or no modification. Specifications and drawings are available upon request.
THOMAS ELECTRONICS INC., Wayne, NJ (201/696-5200)
Circle R-S #84

EL displays
An eight-page brochure describes compact, lightweight Electro Luminescent (EL) displays for use in office and factory automation, home computers or any application requiring a man-machine interface. Drawings, specifications, ratings and optional devices are included.
SHARP ELECTRONICS CORP., Paramus, NJ (201/265-5600)
Circle R-S #85

AC plasma display
An 8-page brochure describes the NEC AC-neon plasma display that is compatible with a wide range of application requirements and conditions. Summary of characteristics, application notes and diagrams are provided.
WORLD PRODUCTS INC., Sonoma, CA (707/996-5201)
Circle R-S #86

EL plastic film
Four-page brochure, with seven additional pull-out sheets, describes electroluminescent plastic film for use in aircraft, control panel systems, automotive, electronics, military and other applications. Design specifications, properties, charts and electrical characteristics are also provided.
DUNMORE CORP., Newtown Industrial Commons, Newtown, PA (215/968-0442)
Circle R-S #88

High resolution CRTs
A five-page color catalog, with four-page insert, provides technical data for line of high resolution photorecording and projection CRTs for industrial, medical and military markets. Insert provides general data, phosphor screen characteristics and charts, performance data and ratings for projection CRTs Series C82016. Guide also includes diagrams, distribution curves and safety hazards for both CRTs.
RCA CORP., Lancaster, PA (800/233-0155)
Circle R-S #99

Color filters
A three-page color brochure, and a two-page guide on separators with a 20-page surplus filter catalog, provide information on color filters and separators. Dichroic, additive and subtractive are detailed for applications including TV cameras, film printers, studio illumination and signal lighting. Specifications and wavelength/transmission charts are also included. Separators include mirrors DC and DRC, with descriptions, specifications and applications included.
BALZERS OPTICAL GROUP, Marlborough, MA (617/481-9860)
Circle R-S #90

Plasma display/memory
Four-page brochure with four additional sheets details plasma display/memory unit power supply (model 256 FP), head and interface models RS256/512-1, and RS512/512-1 and Smart Terminal interface model RS100. Sheets provide features and specifications for each model; color brochure offers illustrations and specifications on plasma display.
ELECTRO PLASMA INC., Milbury, OH (419/838-7511)
Circle R-S #91

Free Literature

CRTs
A four-page selection guide describes cathode ray tubes listing 34 models on a chart with 16 categories including screen size, deflection angle, voltage, yoke characteristics and applications including film scanner, helmet-mounted display, FLIR and map reader. Summary specifications and operating characteristics in the guide are designed to meet specific requirements.
HUGHES AIRCRAFT CO., Carlsbad, CA (619/931-3000)
Circle R-S #80

Thin-film coatings
Four-page color brochure describes sputtered thin-film coatings that stand up to high technology requirements. Advanced methods including reactive sputtering, state-of-the-art facilities, the management team and customer satisfaction information highlight the guide.
ANDUS CORP., Canoga Park, CA (818/882-5744)
Circle R-S #92

Scanning systems
An 8-page catalog on spectral and spatial scanning systems introduces a modular family of fast scanning spectro-radiometers and microphotometers. Models include the PR-713/702AM SpectraScan Extended Spectral Range system, PR-1980B/SC SpectraRadiometers and PR-1500 Spotmeter. Specifications, capabilities and photographs of the systems are provided.
PHOTO RESEARCH, Burbank, CA (818/843-6100)
Circle R-S #93

Oceanographic systems
A four-page, color brochure provides introduction to oceanographic systems and recorders designed to meet specific survey needs with flexibility in performance and application. Systems include bathymetric system for deep ocean or shallow coastal water surveys, digital survey fathometer and a channel sweep system. Five new systems are detailed, and photographs and charts of instruments are included.
RAYTHEON OCEAN SYSTEMS CO., Lexington, MA (617/862-6600)
Circle R-S #94

Photosensitive glass
Six-page brochure with four-page pullout, describes technical data of photosensitive glass—Peg3—that can be used for nozzle for ink printer, cell sheet for plasma display, optical connector parts and other applications. Pullout includes information on four divisions of firm, industrial filters and applications, plus chart detailing various industry products and filter types.
HOYA CORP., Tokyo, Japan (0425/41-3131)
Circle R-S #95

Power supplies
A four-page brochure, with technical data sheets, presents information on high-voltage power supplies; provides specifications, options and applications. Series include ULC, MPC (Medium Power), CMC (Shadow Mask), GPM (General Purpose Military) LCM connectors and lead assemblies and TF testers.
PTK CORP., Los Osos, CA (805/528-5858)
Circle R-S #96

CRT data displays
An eight-page brochure on CRT data displays describes both monochrome and color displays, custom configurations, and electrical specifications. Color photos, technical data, performance and options are included.
BALL CORP., Electronic Systems Division, Westminster, CO (303/939-5400)
Circle R-S #97

Photo-Imaging Systems
An eight-page brochure on advanced photo-imaging technology covers products to meet varying requirements as well as design and production services. Included are specifications sheets for UV photo exposure systems providing contact and off-contact printing on a wide range of products such as hybrid circuits, integrated circuits, printed circuit boards, liquid crystal displays, solar cells, and ceramic substrates.
OPTICAL RADIATION CORP., Azusa, CA (818/969-3344)
Circle Reader Service #100

 For information circle Reader Service #44 **For information circle Reader Service #43**

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

As we prepare to celebrate the 25th anniversary of the founding of SID (1962), it is with great pride and a modest sense of accomplishment that I step aside as your Society's president at SID '86 and turn the gavel over to your incoming president John van Raalte. I wish him the very best with smooth sailing at the helm for the next two years; and I urge each and every member of SID to accord John the same enthusiastic support you have shown me during the past two years.

To effect a smooth transition from one administration to another, let me briefly review our progress over the past 24 months and restate the objectives and goals the Executive Committee set for your Society back in June 1984.

At that SID '84 meeting in San Francisco, a primary goal of the Society was to increase its membership by 5% per year to match the display industry growth. Both have exceeded expectations and early projections: SID membership has climbed from about 2,000 to over 2,400, at last count; and the display industry has exploded, as recently published market statistics on the U.S. flat panel market indicate, for example, from $30 million in 1984 to $113 million in 1986. The market for such devices is expected to soar beyond $1 billion by 1992. What will SID's membership be then?

Another goal was to improve the Society Journal and expand its readership to individuals outside the ranks of SID, but within the display community, as well as to increase advertising support. Accordingly, Information Display was redesigned (winning recognition from the American Society of Association Executives for "its excellence as a Society Journal."); circulation was increased to 10,000 (from 2,000); editorial pages were expanded to 318 (from 141); number of advertisers grew to 72 (from 44); and advertising revenue to $189,000 (from $54,000).

Two new committees were formed: one to foster creation of new active chapters; the other to develop specific technical groups within SID (for such ancillary technologies as printing, memory/storage, and input devices).

On June 5, 1985, the UK & Ireland Chapter held its inaugural meeting, at which its officers were formally inducted; and on April 23, 1986, the Canada Chapter inaugural meeting and induction of officers took place. We congratulate the hardworking committee members and others responsible for bringing about these two enthusiastically welcomed additions to our Society. A second Japan Chapter is in early discussion stages.

Two sub-committees examined group interest in technologies outside of pure display systems—specifically, hard-copy printing and disk memory/storage. As a result, active participation at both SID and IDRC has increased on the part of printing technolgy specialists—including four technical sessions presented at SID '85; three, plus a seminar, at SID '86.

The sub-committee on disk memory/storage technologies, however, found interest currently centered on another industry conference dedicated specifical-

(Continued on page . . . 57)

Chapter Notes

UK & Ireland: April 17, 1986
Program: Technical Meeting
Topic: The Role of Venture Capital in the Display Industry
Speaker: Dr. John Walker,
Charterhouse Japhet Venture Fund

Los Angeles: March 26, 1986
Program: Annual Joint Meeting with Human Factors Society
Topic: Application of Color to Displays in Various System Environments
Speakers: Gerald Stone, Sr. Staff Engineer, Hughes; Phil Joujon-Roche Sr. Scientist, Hughes; Kirk Moffitt, Sr. Scientist, Anacapa Science

Stone discussed potential uses of color in sonar displays; Joujon-Roche examined the benefits of color to air traffic control and command and control systems; Moffitt reported on *"Color Display Performance Under High Ambient Illumination"*—the results of ongoing Army Avionics Laboratory-funded perceptual studies on color coding for use in aviation displays.

Delaware Valley: March 13, 1986
Program: Technical Meeting
Topic: The Psychophysics of Color
Speaker: Charles P. Halsted, SID Fellow,
Aydin Corp., Computer Systems Div.

The light that stimulates the retina can be measured, but the response to the stimulus is sometimes elusive. This presentation discussed and illustrated the fundamentals of human color perception, as well as presenting the chromaticity diagram and metameric color relationships. Demonstrations included additive and subtractive color mixing, negative after-image, static and dynamic adaptation, and so forth, along with some of Aydin's latest developments in colorgraphics equipment and systems.

Mid-Atlantic: February 11, 1986
Program: Technical Meeting
Topic: Electron Optics for Avionic CRTs
Speaker: Jacques Chevalier
Thomson-CSF Products
Dover, NJ

Mid-Atlantic: January 8, 1986
Program: Technical Meeting
Topic: High Contrast Display (> 4 Mpels)
Speaker: Nate Caswell, IBM
Watson Lab, Yorktown, NY

(... continued from p.55)

ly to that technology—and thus no immediate action in this area is scheduled. There exists, however, great incentive for exploring other group interests and encouraging their participation in future SID conferences.

The two principle technical and social events of your Society—Annual Symposium, and Research Conference—have each year exceeded the preceding in terms of number and quality of papers presented, as well as number of participants (technical session attendees and exhibiting vendors). And, there's no end in sight, as word spreads within the display community and beyond.

And, finally, the Sustaining Membership roster passed the 100 mark earlier this year.

There is still room for growth and improvement in the Society, its Journal, *Information Display*, its Symposium and its Research Conference. John has his work cut out for him and he will be turning to you to help make it happen during the coming months.

In closing, I want to thank the officers of the Society and all the people who have provided me direct assistance, as well as those who have worked in the planning and organizing of our several activities. That we have such successful and smoothly run programs is due to the abilities of the various committee members and the many volunteer workers that give of their time and energy.

And, especially thank you, Bettye, for keeping the day-to-day operation of SID on a level keel.

Good luck John, to you and your staff of new officers and committee chairmen.

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 International Symposium San Diego, CA
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 will require your input of advance notice for upcoming meetings.)

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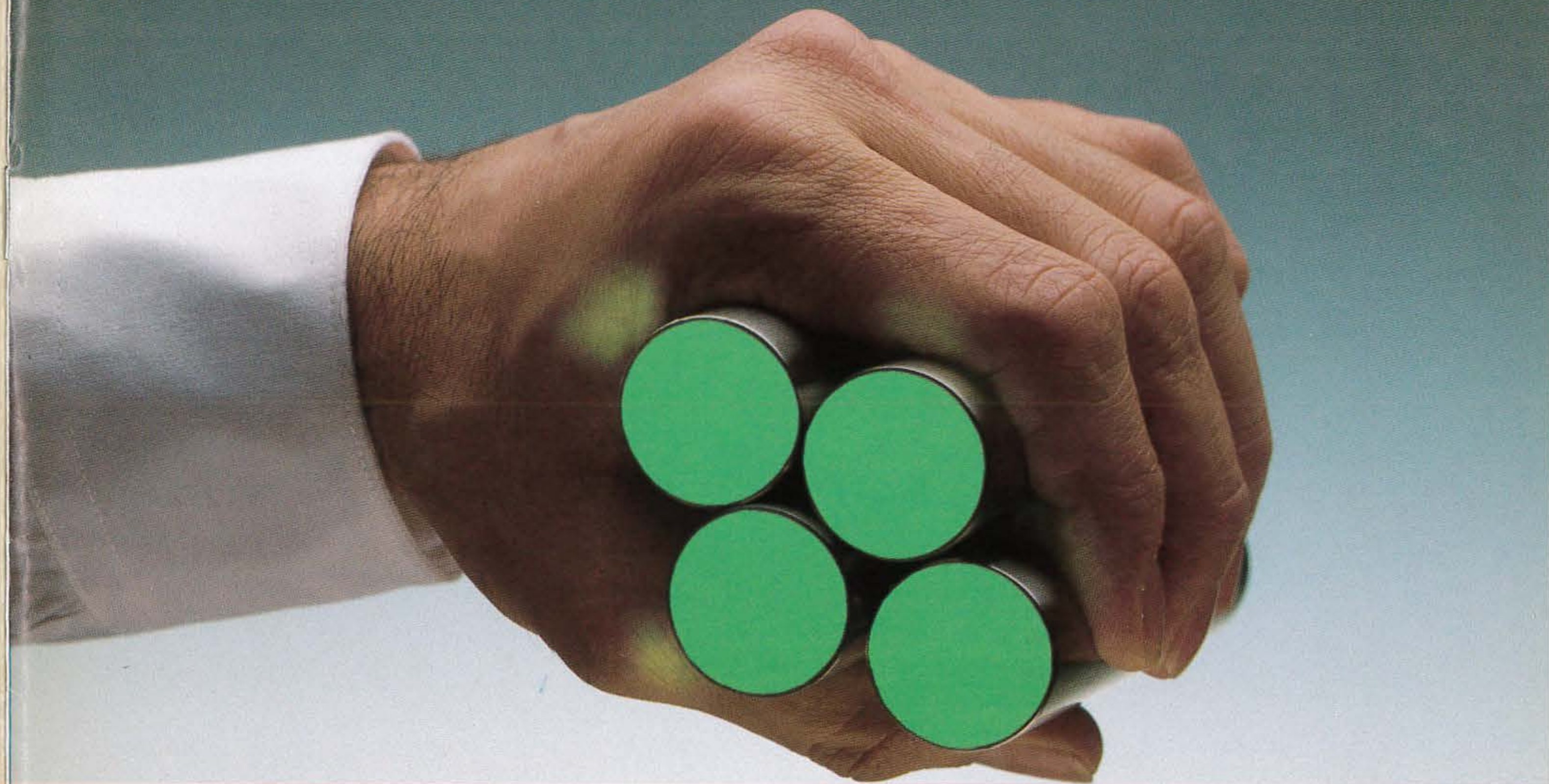

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