THE OFFICIAL JOURNAL OF THE SOCIETY FOR INFORMATION DISPLAY

INFORMATION DISPLAY

NOVEMBER 1986

TOUCH INPUT TECHNOLOGY

DISPLAY TERMINALS HEALTH HAZARDS

ONLY THE VG-807A GIVES YOU THESE PATTERNS AT 160 MHz

Today's High Resolution Color Monitors have to have the best possible performance to be successful in a very competitive marketplace.

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That's where the ASTRO VG-807A comes in. It gives you patterns with all color bars and up to 100 gray levels from 5 MHz up to 160 MHz. Yes...that's right–all this plus cross hatch, circles, and more–up to 160 MHz.

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Let us show you the difference in our 160 MHz.

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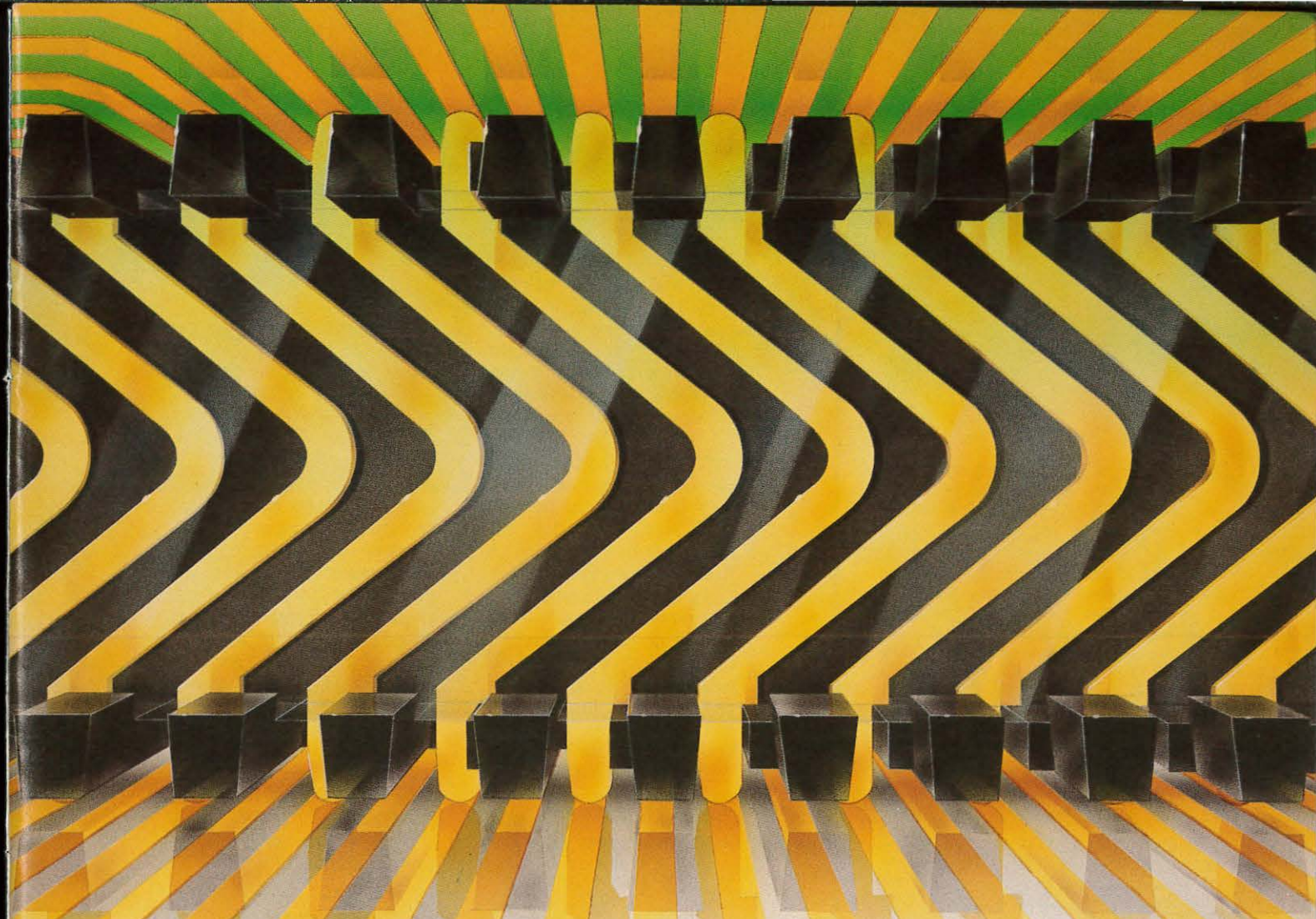
Images That Count

TEAM systems

Test & Measurement Systems, Inc.

Circle Reader Service #1



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Introducing ITT Cannon's Parallel Interconnect (PI).

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Using positioning pins, the connector is positively aligned, creating a gas-tight interface with printed circuit boards and glass panels. Its unique design allows it to perform to close tolerances over longer dimensions while handling higher voltages and currents.

In addition, the Parallel Interconnect expands and contracts with the glass or printed circuit boards, ensuring a positive contact interface.

The fast, accurate assembly and high dependability ultimately result in lower installed costs. You save time *and* money.

Talk to us about the Parallel Interconnect's wide range of applications, including board to board stacking. Or let us design-in specifically to your needs.

Contact ITT Cannon Components, a unit of ITT Corporation, 10550 Talbert Ave., Fountain Valley, CA 92708, or call 714/964-7400.

ITT CANNON

Circle Reader Service #2

Feedback

Less than professional...

I was most interested in your editorial in the August issue of **Information Display**. The market share lost by US manufacturers is regrettable, but in my opinion it will continue until two separate groups realize two separate points.

- **The American businessman** — Exporting goods for the American businessman is more closely related to "sport" than to serious business. In other words, it is an option and he takes it or leaves it at will.

  On the other hand, the Japanese learned long ago that failure to export equals failure to eat. The incentive, I submit is significantly different.
- **The American politician** — From top administration to county and city politicians who influence investment, taxes, and the resulting cash flow, everyone screams "dumping" when the Japanese sell a product for 10% below list into the American market.

  Not so, I submit. It is simply a basic concept taught in Economics 101 in most universities. It is called "Cash Flow."

  By way of example, XYZ Manufacturing has an account with ABC Bank. Average balance is $1 million per month. Average cash flow is approximately the same. If XYZ moves its account to DEF Bank (across town), there is essentially no positive or negative influence on the cash flow as it relates to that city or county. In other words, XYZ's loan with ABC Bank, payroll checks, vendors, and so on, will remain essentially the same to the economy of that city, county or state. Yet the cash flow through that bank will generally reach 4-6 times the actual balance on hand ($4-$6 million).

  When the Japanese "dump" they are in effect moving 90 cents on the dollar out of circulation in the US market and into circulation in the Japanese market. Thus, every dollar lost to the Japanese is a decrease of $4.00 in cash flow to the US entities, including taxing regulations and an increase of $4.00 to the Japanese.

I very much appreciate your conclusion that industry, government and academia must work together and reverse this trend. While I am extremely optimistic on virtually every point, I have yet to find the government accomplish anything satisfactorily that private industry could not do 100 times better. Academia, on the other hand, is often times the tail on the dog, when in effect, they have quite a bit of knowledge to share if anyone is willing to listen. Unfortunately, neither industry nor government cares to lend a concerned ear.

I have no doubt, however, that the trend will be reversed, simply because $12 billion (trade deficit) per month is more than this nation can stand for an indefinite time. I predict the Japanese will enter into a lackadaisical state, just as we have been for the last 20 years, while we sink into a condition of serious, and I do mean **serious**, cash flow problems. Americans then, being what they are with their backs to the wall, will stand and fight and in my opinion win. There are certainly some dues that will have to be paid for the less than professional attitude we have shown over the past decades.

Thomas L. Muir, President
Villa Precision Inc.
Phoenix, AZ

Dearth of pictures

For a magazine that focuses on display of information, your articles have very few (read that "no") pictures.

R. C. McBain
General Dynamics
Data Systems Div.

Editor's note: You are absolutely right . . . and while there are two reasons for it now, we hope the situation is temporary:

(1) Very few feature articles submitted for publication are supported with the caliber of professional photography or artwork required for reproduction. Product releases, on the other hand, are often accompanied by quality photos—perhaps because they usually come from a public relations or advertising firm.

(2) Space is limited by budget; this is only the second year of ID's relaunch and advertising has not yet caught up with the increased expenses of a larger magazine and a larger subscription list.

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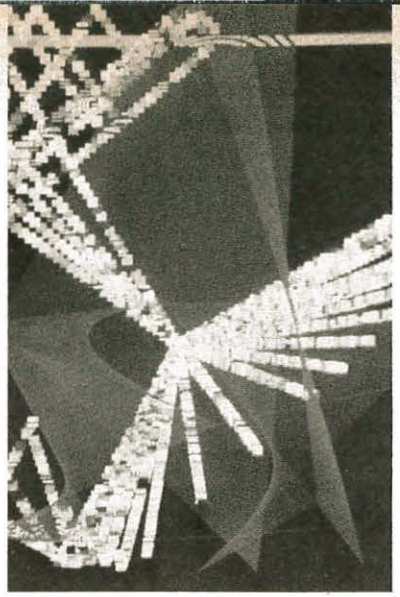
NOVEMBER 1986 VOL. 2 NO. 11



Cover display: Ultra-high resolution (1600H x 1280V) analog RGB monitor displays crisper and better defined images using a video bandwidth of more than 160 MHz.—**Monitronix Corp.**, Columbus, OH.

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.

Events

NATIONAL

NOVEMBER 16-21: WESCON '86 — Western Electronic Show & Convention, Anaheim Convention Center, Anaheim Hilton, Los Angeles, CA. Sponsor: IEEE-LA Council SFBAC. Contact: Dave Litherland, Electronics Conventions Inc., 8110 Airport Blvd., Los Angeles, CA 90045 (213/772-2965)

NOVEMBER 17-18: IEEE Computer Networking Symposium, Loews L'Enfant Plaza, Washington, DC. Contact: Computer Networking Symposium, Tuncay Saydam, Univ. of Delaware, Dept. of Comp. & Info. Sciences, 103 Smith Hall, Newark, DE 19716 (302/451-2716)

NOVEMBER 17-18: 1986 Third ASSP Workshop on Spectrum Estimation and Modeling, Northeastern University, Boston, MA. Contact: Chrysostomos L. Nikias, Dept. of Electrical and Computer Engineering, Digital Signal Processing Lab., Dana Research Center, 411, Northeastern Univ., 360 Huntington Ave., Boston, MA 02115 (617/437-3352)

NOVEMBER 17-19: 1986 IEEE Ultrasonics Symposium, Colonial Williamsburg Conference Center, Williamsburg, VA. Sponsor: IEEE-UFFC. Contact: R.A. Moore, Westinghouse Defense and Electronic Center, PO Box 746, MS-335, Baltimore, MD 21203 (301/765-4027)

NOVEMBER 17-20: 31st Annual Conference on Magnetism & Magnetic Material, Hyatt Regency, Baltimore, MD. Sponsors: IEEE-MAG, AIP, ASC, ONR. Contact: Diane Suiters, Courtesy Assoc. Inc., 655 15th Street, NW, Washington, DC 20005 (202/347-5900)

NOVEMBER 18-21: Western Electronic Show & Convention — WESCON '86, Anaheim Convention Center, Anaheim Hilton, Los Angeles, CA. Contact: Dave Litherland, Electronics Conventions Inc., 8110 Airport Blvd., Los Angeles, 90045 (213/772-2965)

NOVEMBER 19: Images, Information, Interfaces: Directons for the 1990s, New York Telephone Co. 1095 Ave. of the Americas, New York, NY. Annual symposium of the NY Metropolitan Chapter, Human Factors Society, will bring together human factors and film/TV specialists to examine human factors issues in designing graphic and full-motion interfaces. Contact: Renee Schultz or Derek Schultz, Media Design Associates, 151 Route 206, B24-5, Flanders, NJ 07836 (201/829-4284)

DECEMBER 1-3: Laser Optics & Beam Propagation — Short Course, Orlando, FL. Contact: Education Dir., Laser Institute of America, 5151 Monroe St. — Ste 102W, Toledo, OH 43623 (419/882-8706)

DECEMBER 7-10: 32nd Annual International Electron Devices, Westin Bonaventure Hotel, Los Angeles, CA. Sponsor: IEEE Electron Devices Society. Contact: Melissa M. Widerkehr, Courtesy Assoc. Inc., 655 15th Street, NW, Suite 300, Washington, DC 20005 (202/347-5900)

DECEMBER 8-12: Fundamentals & Applications of Lasers — Short Course, San Diego, CA. Contact: Education Dir., Laser Institute of America, 5151 Monroe St. — Ste 102W, Toledo, OH 43623 (419/882-8706)

DECEMBER 9-11: Optical Information Systems '86, Hyatt Regency Crystal City, Arlington, VA. Sponsor: Meckler Publishing, Westport, CT. Contact: Conference Management Corp., 300 Connecticut Ave., Norwalk, CT (203/852-0500)

DECEMBER 17-19: DEXPO East 86 — 11th DEC Compatible Exposition, Javits Convention Center, New York, NY. Contact: Expoconsul International Inc., 3 Independence Way, Princeton, NJ 08540 (609/987-9400)

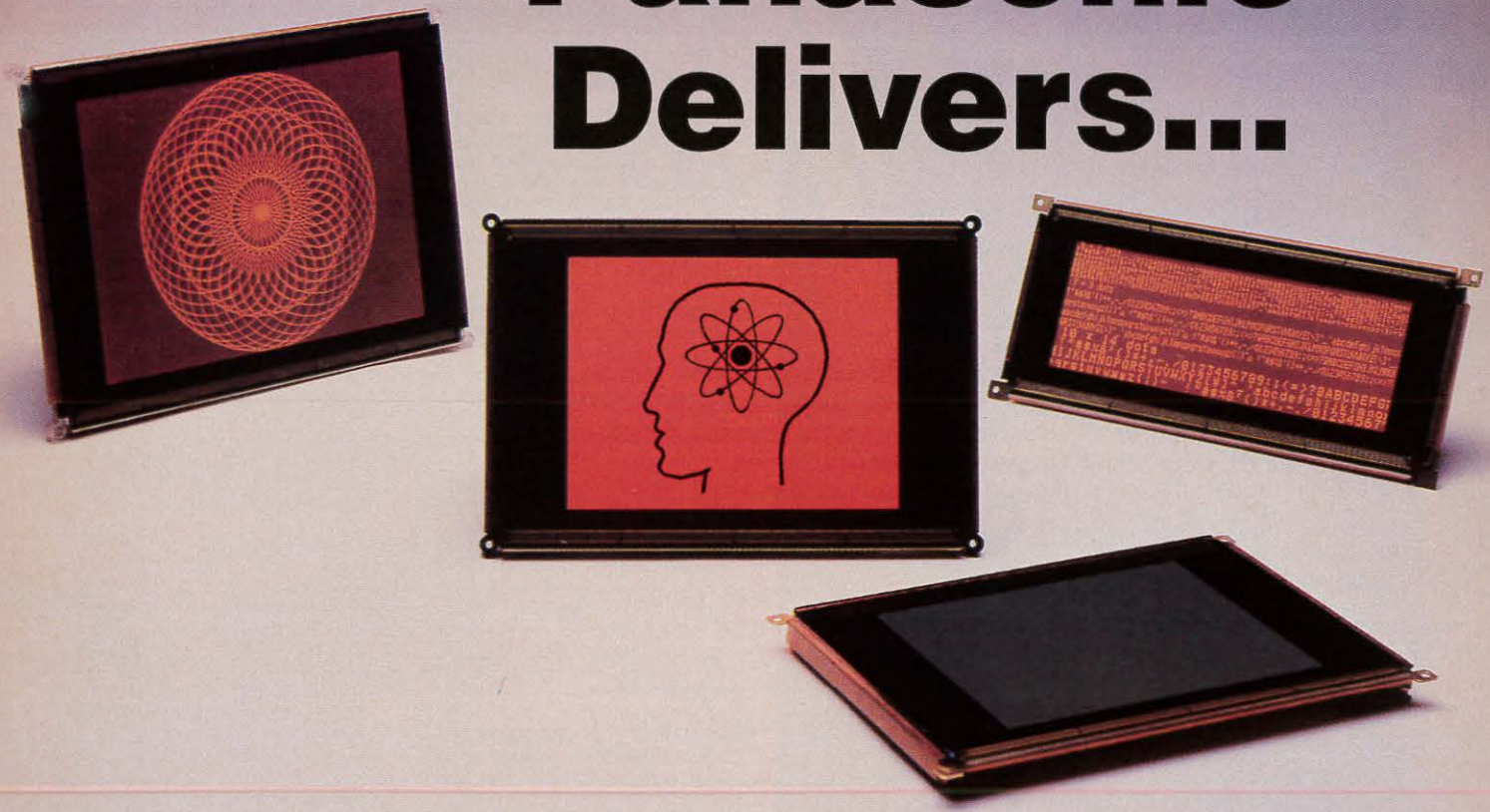
1987

JANUARY 6-9: 20th Hawaii International Conference on System Sciences, Kona Surf Hotel, Kalluа-Kona, Hawaii. Sponsor: IEEE Computer Society and Association for Computing Machinery. Contact: Ralph H. Sprague, University of Hawaii, College of Business Admin., R-303, Honolulu, HI 96822 (808/948-7430)

JANUARY 11-17: O-E/LASE '87, and concurrent symposium ELECTRO-OPTIC IMAGING SYSTEMS & DEVICES, Los Angeles Airport Marriott & Hilton Hotels, Los Angeles, CA. SPIE's Annual Symposium on Optoelectronics and Laser Applications. Contact: SPIE PO Box 10, Bellingham, WA 98227 (206/676-3290)

JANUARY 14-16: MULTI '87 — 1987 SCS Multiconference, Town & Country Hotel, San Diego, CA. Conferences: Modeling and Simulation on Microcomputers; Computer Simulation in Emergency Planning; MAPCON — Multiprocessor and Array Processor Conference; Simulation of Computer Integrated Manufacturing Systems and Robotics; AI and Simulation. Sponsor: The Society for Computer Simulation. Contact: SCS, PO Box 17900, San Diego, CA 92117 (619/277-3888)

Panasonic Delivers...



The DC Advantage.

Panasonic® DC Plasma Displays

For small-footprint designs where uniform image and construction quality are important, consider the advantages of Panasonic DC plasma panel technology.

The fixed matrix DC design produces crisp, clear images with uniform brightness and edge-to-edge consistency. Our panels deliver high resolution on a super-thin profile, flat screen. And the ergonomic design eases strain on the eyes.

Design flexibility

Your design options expand immediately with Panasonic DC plasma panels. Simple DC construction offers reliable performance, so you can confidently specify our panels for the most sensitive medical or engineering systems.

In fact, you can design them into virtually any system where compact, light-weight and durable construction is vital.

Many DC formats

Right now you can choose from a growing family of full- and half-page configurations.

Our popular 400 x 640 models offer viewing aspect ratios of 5:8 and 3:4. Both are available with either two-level or four-level gray scale capability. Our half-page 200 x 640 has two-level gray scale with a 3:8 viewing aspect ratio. And the new 12″ diagonal 350 x 720 features a 3:4 ratio and two- or four-level gray scale.

DC plasma technology is available now and Panasonic is ready to deliver OEM quantities. For more information, contact: Panasonic Industrial Company, Custom Components Division, Two Panasonic Way, Secaucus, NJ 07094. (201) 392-4710.

Panasonic
Industrial Company

Events

JANUARY 19-22: 1987 Conference on Optical Fiber Communication, Reno, NV. Sponsors: IEEE-LEO, OSA. Contact: OSA Meetings Dept., 1816 Jefferson Place NW, Washington, DC 20036 (202/223-0926)

JANUARY 19-22: 1987 International Conference on Integrated Optics and Optical Fiber Communication, Reno, NV. Sponsors: IEEE-LEO, OSA. Contact: OSA Meetings Dept., 1816 Jefferson Place NW, Washington, DC 20036 (202/223-0926)

FEBRUARY 1-6: Medical Imaging, Newport Beach Marriott Hotel, Newport Beach, CA. Sponsor: SPIE - The International Society for Optical Engineering. Contact: SPIE, PO Box 10, Bellingham, WA 98227-0010 (206/676-3290)

FEBRUARY 1-6: International Symposium on Pattern Recognition and Acoustical Imaging, Newport Beach Marriott Hotel, Newport Beach, CA. Sponsors: SPIE - The International Society for Optical Engineering, The International Association for Pattern Recognition. Contact: SPIE, PO Box 10, Bellingham, WA 98227-0010 (206/676-3290)

FEBRUARY 7-14: IEEE 1987 Aerospace Applications Conference, Mountain Haus Hotel, Vail, CO. Contact: Warren A. Schwarzmann, 4 Aurora Drive, Rolling Hills, CA 90274 (213/973-1121)

FEBRUARY 9-13: Fundamentals & Applications of Lasers — Short Course, Orlando, FL. Contact: Laser Institute of America, 5151 Monroe Street, Toledo, OH 43623.

FEBRUARY 16-19: Electronic Imaging '87, International Electronic Imaging Exposition & Conference, Anaheim Marriott, Anaheim, CA. Co-sponsors: Digital Design, Diagnostic Imaging, and Electronic Printing and Publishing. Contact: Ed Martin, MG Expositions Group, 1050 Commonwealth Ave., Boston, MA 02115 (617/232-EXPO)

FEBRUARY 17-19: CSC '87 — 1987 ACM Computer Science Conference, Adams Mark and Clarion Hotels, St. Louis, MO. Sponsor: Association for Computing Machinery. Contact: ACM, CSC'87-PR, 11 West 42nd Street, New York, NY 10036 (212/869-7440)

FEBRUARY 23-27: Flat-Panel and CRT Display Technologies — Short Course, Los Angeles, CA. Sponsors: UCLA Extension and the Society for Information Display. Instructor: Larry E. Tannas, Jr. Contact: UCLA Extension, Short Course Program, 10995 Le Conte Ave., Los Angeles, CA 90024 (213/825-3344 or 825-1295)

MARCH 2-5: IEEE Computer Society COMPCON Spring '87, Cathedral Hill Hotel, San Francisco, CA. Sponsor: IEEE Computer Society. Contact: COMPCON Spring '87, 1730 Massachusetts Ave. NW, Washington, DC 20036-1903 (202/371-0101)

MARCH 9-11: Office Automation Conference, Dallas, TX. Sponsor: American Federation of Information Processing Societies. Contact: AFIPS, 1899 Preston White Drive, Reston, VA 22091 (703/620-8900)

MARCH 15-20: 1987 Technical Symposium Southeast on Optics, Electro-Optics, and Sensors, Sheraton-Twin Towers, Orlando, FL. Sponsor: SPIE - The International Society for Optical Engineering. Contact: SPIE, PO Box 10, Bellingham, WA 98227-0010.

INTERNATIONAL

NOVEMBER 11-15: ELECTRONICA 86 — International Trade Show for Electronic Components, Semiconductors and Quality Assurance, Munich Trade Fair Centre, Munich, West Germany. Contact: Kallman Associates, Five Maple Court, Ridgewood, NJ 07450 (201/652-7070)

NOVEMBER 17-18: 1986 — 5th Annual VLSI Packaging Workshop, Hotel Saint James at Albany, Paris, France. Contact: Karel Kurzwell, BULL — Rue Jean Jaures, 78340 Les Clayes Sous Bois, France (1/34-62-70-48)

NOVEMBER 24-28: ESANZ — 23rd Annual Conference of the Ergonomics Society of Australia and New Zealand, Perth, Australia. Contact: David Kemp, Ergonomics Branch, Dept. of Occupational Health, Safety, and Welfare, Willmar House, PO Box 294, West Perth, Western Australia 6005 (09-327-8627)

NOVEMBER 26-28: 3rd International Exhibit and Symposium on Artificial Intelligence and Productivity, Paris, France. Co-sponsors: Association Francaise d'Intelligence Artificielle et des Systemes de Simulation, and the Society for Computer Simulation. Contact: Association Francaise d'Intelligence Artificielle et des Systemes de Simulation, 211 Rue St-Honore, 75001 Paris, France.

MARCH 3-5: 1987 Electromagnetic Compatibility Symposium and Technical Exhibition, Federal Institute of Technology, Switzerland. Contact: Dr. T. Dvorak, ETH Sentrum-KT, 8082 Zurich, Switzerland.

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"Concern for man (sic) himself and his fate must always form the chief interest of all technical endeavors..."

— Albert Einstein

What is happening to the vaunted US electronics industry leadership that catapulted the world into the electronic age not so long ago?

In recent months, several disturbing reports made headlines warning US manufacturers about losing ground to the Japanese electronics industry, specifically in the manufacture of semiconductor chips and in the introduction of HDTV — two areas of concern particularly close to the interests of the Information Display community.

Preliminary drafts of two independent Federal studies — one for the Department of Defense, the other for the National Security Council — cite the dangers inherent in the US relying on other nations (notably Japan) for semiconductors...the heart of computers, robots, missiles, and other electronic devices. One unpublished report (for the NSC) warns of "dire effects" for the American economy, which has become all but dependent upon Japan for chips. The report contends that "if Japanese companies wanted to withhold chips from the American market, they could be in a position to impede the ability of the US to compete in almost any area of manufacturing."

Both study groups are discussing bold recommendations that will include heavily stepped-up Government support for the computer chip market. One proposal goes so far as to call for creation of a consortium of semiconductor companies backed by considerable Federal financing to cooperate in production, development and manufacturing.

The basic questions that arise from this type of thinking are just how serious is the industry's vulnerability; and to what extent should the Government get involved to help the industry?

Indicative of the quandary the US electronics industry finds itself in is the scheduled demonstration early in January of HDTV display over two adjacent UHF channels in the Washington area using an NHK system from Japan (co-sponsored by the Association of Maximum Service Telecasters and NAB). According to AMST, NHK expects to be able to produce a monitor, VCR, and DBS dish package for about $1,500 within five years; while Japan plans to start HDTV direct broadcast satellite service by 1990 — when (Japanese) receivers will be on the market. Some industry analysts say it could take our broadcasting industry as much as 10 to 15 years to adopt HDTV.

Meanwhile, back at the ranch...each year SID's International Symposium on Information Display Systems attracts ever increasing numbers of technical papers from all over the world. And, although the US participants still command more than 50% of all papers delivered at the SID symposium, Japan over the past three years has steadily increased its share — from 20% to 30% — at the expense of US delegates.

The problem is very real; its solution, very complex.

Joseph A. MacDonald
Editorial Director

Industry News

Multidome video projectors key to flight simulator lab

A $20-million facility called the Integrated Technology Development Laboratory, which opens at the Boeing Developmental Center in Seattle this month, will provide computer resources for flight simulation, sensor display simulation, digital avionics, digital flight controls and artificial intelligence techniques.

ITDL will house multiple-dome simulators and a six-degree-to-freedom motion base simulator. The 30-ft-dia domes serve as spherically-shaped video projection screens, enclosing fully instrumented crew stations used in simulation of piloted flight under instrument or visual conditions.

Large array processors connected to the facility's main computers will enable high-speed, complex computing of flight control systems, airplane aerodynamic models and missile dynamics. Several color-graphics generating systems will project three-dimensional images in all modes of flight within the simulated cockpits. More than 125 miles of fiber optic cables provide ultra-high-speed transmission of data between computers (about 5,000 times faster than the standard for personal computers. The facility was built by The Austin Co., Engineers and Constructors (Cleveland, OH) for the Boeing Military Plane Co., Div. of The Boeing Co. (Seattle, WA)

Semiconductor process boosts ECL-IC speed/power, ten-fold

Under an agreement with Bipolar Integrated Technology Inc, of Beaverton,OR, Raytheon Co.'s Semiconductor Div., of Mountain View, CA, will have access to an advanced bipolar semiconductor process to produce high-speed gate array integrated circuits with low power consumption.

According to Raytheon, the revolutionary BITI process delivers a ten-fold improvement in speed/power performance of high speed emitter-coupled-logic (ECL) integrated circuits. It uses 2-micron lithography and polysilicon self-aligning techniques to produce ECL devices with performance data significantly improved over existing bipolar ECL technology or the CMOS process.

The speed, density, and power dissipation achieved by the new BITI process offer significant benefits for speed sensitive applications such as high-speed computing systems including graphics terminals, signal processors, military systems, super micro-and mini-computers, mainframes, and workstations. RAYTHEON CO., Lexington, MA (617/860-2414)

Circle Reader Service #21

Method for measuring plastic shielding effectiveness offered

A recently released publication discusses the many problems associated with measuring the shielding effectiveness of plastics used as binders or substrates in electomagnetic shielding applications. A solution, based on the use of a flanged coaxial holder for the plastic sample, is offered. To order: Shielding Effectiveness Measurements of Plastics (NBSIR 85-3035) Order No. PB 86-219680. Price: $9.95 prepaid. NTIS, Springfield, VA 22161.

Standards and measurements topics of electrical reference

The National Bureau of Standards recently compiled a volume that includes 66 papers NBS authors have published over the past twenty years on electrical measurements. Included in the compendium are many pa-

pers published in recent years on quantum methods of "realizing" electrical standards; the most recent of which were published during the past 3 years on investigations of the van Klitzing effect, which may provide a new basis of definitive standard of electrical resistance. Measurements of power, current, voltage, capacitance, phase angle, and other quantities are also covered. To order: Precision Measurement and Calibration: Electricity (SP 705) Order No. 003-003-02699-9. Price: $23.
US GOVERNMENT PRINTING OFFICE, Washington, DC 20402

Optical disc displays global mapping data

A digital world atlas, recorded and read by a laser beam has been developed by DeLorme Mapping Systems, of Freeport, ME, for an IBM PC or compatible. Pressed on a 4 ½-in.-dia disc, capable of holding the equivalent of 100 lb of paper maps, the World Atlas contains political boundaries, roads, cities and other place names, rivers, lakes, islands, land elevations, and worldwide ocean depths. A user can create overlays to display customized data, including symbols and text, using the overlays to keep changeable information constantly updated. The monitor map scale is about 20 miles to the inch for most of the world, with the US and Europe mapped to greater detail. The disc also includes many types of government database information, such as Census Bureau street maps and US Geological Survey digital maps.
DELORME MAPPING SYSTEMS, Freeport, ME (207/865-4171)

Circle Reader Service #23

Instrumentation market grows despite declining R&D funding

Annual shipments of analytical instruments will rise from $1.65 billion (1985) to over $2.35 billion (1990) even as federally-funded R&D program budgets are being cut, according to a 237-page report recently released by Frost & Sullivan. (Analytical instrumentation purchases are funded chiefly by R&D expenditures.)

The vitality of the technology-driven market is suggested by the fact that four product categories introduced since 1974 — HP-LC, ion chromatographs, FT-IR spectrometers, and ICP spectrometers — accounted for fully 22% of all analytical instrumentation shipped in 1984.

Chromatographic instruments form the largest with 1985 sales of $475 million, projected to grow to $700 million in 1990. Spectrophotometric instruments sales are expected to increase more slowly, from $300 million to $405 million. FT-IR spectrometers, photo diode array UV-VIS and fluorescence instruments are seen as the more dynamic product groups.

The spectrographic instruments group will be paced by plasma (ICP) spectrometers and energy dispersive X-ray spectrometers — with the whole to grow from a $145 million market in 1985 to $195 million in 1990. Instruments Data Systems (IDS) shipments are seen growing from $315 million to $494 million during the period — with laboratory information management systems, as opposed to dedicated instrument systems, seen capturing an increasing share of the total.

The report analyzes industrial, healthcare, university, government and export markets; and profiles key suppliers.
To order: The Analytical Instrumentation

Market in the US, #1593. Price: $1,900. FROST & SULLIVAN, 106 Fulton St., New York, NY 10038.

Hi-res X-ray tool permits real-time micron measurements

Materials scientists from government, industry, and university can have access to a materials science X-ray beamline, at the National Synchrotron Light Source, Brookhaven, NY, to conduct real-time, in-situ measurements on a micron scale for metal, ceramic, and polymer materials as they are exposed to different thermal, electromagnetic, or mechanical environments. The beamline combines the highest brightness, lowest emittance source of X-rays in the world with high-resolution X-ray optics for use in characterizing the microstructures of materials. For information on using the materials science part of the NBS X-ray beamline facility, contact: Dr. Gabrielle G. Long, A163 Materials Building (301/921-3603)
NATIONAL BUREAU OF STANDARDS, Gaithersburg, MD 20899

Technology transfer to spawn military computer system

Raytheon Co., Lexington, MA, and Digital Equipment Corp., Maynard, MA, have combined their technologies to produce an advanced and versatile family of computers for military use. Under terms of the licensing and technology transfer agreements, Raytheon will adapt Digital's VAX computer technology and advanced designs to provide a computer system that meets military specifications and a wide range of real-time processing needs—including command and control, ground, airborne, and shipboard military applications. The new computer family will consist of several processor configurations of increasing capability, each supporting higher performance military and commercial input-output channels.
RAYTHEON CO., Lexington, MA (617/860-2414)

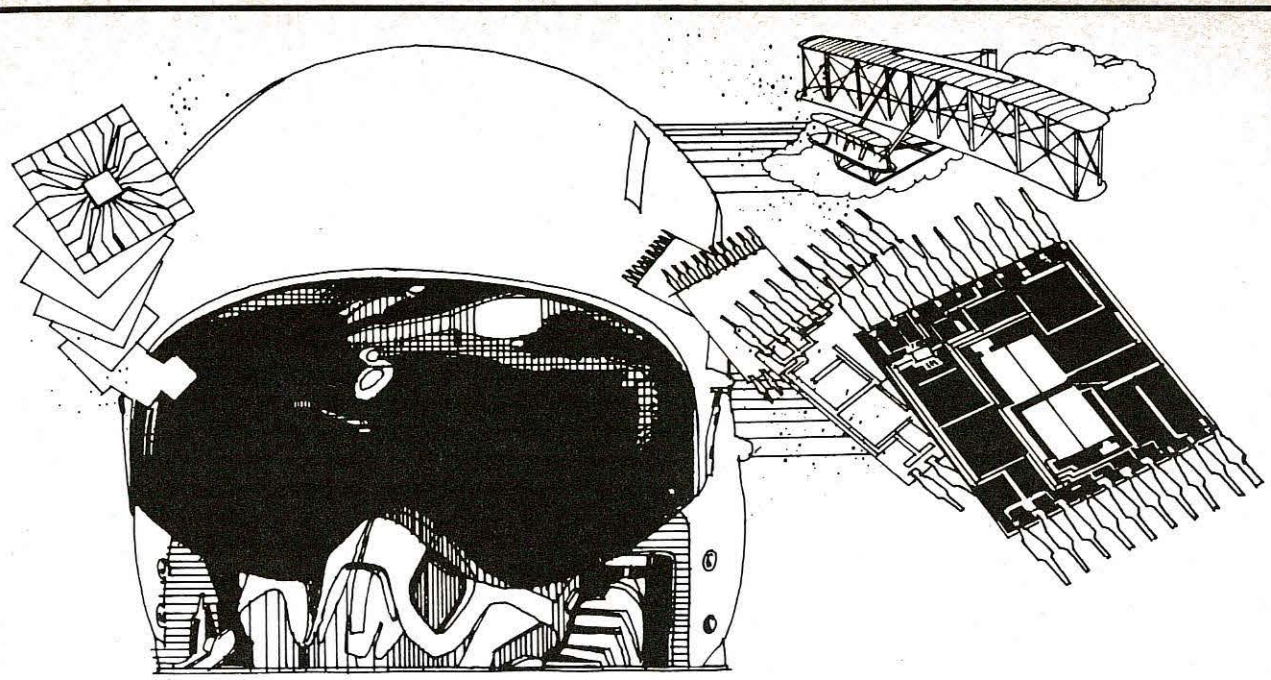
Circle Reader Service #22

Computer compatibility goal of joint-venture effort

Twenty-five industry and government organizations have agreed to jointly develop OSINET, an experimental computer network for Open Systems Interconnection (OSI) standards. Coordinated by the National Bureau of Standards, this cooperative network will help speed up the development and use of OSI in industry and government. OSI standards make it possible for different manufacturers' equipment and systems to communicate with each other through networks. The full OSINET network is expected to be in operation by the end of the year. As one of the first projects, when OSINET is operating, NBS and the Department of Defense will use the network to develop gateways between current DoD protocols and OSI protocols. Companies interested in participating in OSINET should contact: Shirley Radack, ICST, B151 Technology Building, NBS.
NATIONAL BUREAU OF STANDARDS, Gaithersburg, MD 20899

Imaging science center planned for degree programs and research

Rochester Institute of Technology, already established as the premier center in photography, graphic arts and imaging, plans to further strengthen its position in the field of



Dayton launched aviation... flights of imagination...SRL

We're Systems Research Laboratories, Inc. SRL is a growing company. Because we're located in a community that supports not only our technological efforts for government and industry but other high tech companies as well, we're expanding into new areas of research and development.

Our continued growth hinges on the quality of people who make up our team. Currently we are in need of the following professionals:

Section Manager - Digital Avionics Systems

Develop conceptual designs for innovative airborne avionics displays and EW systems. Responsible for digital hardware design, systems integration, proposal writing and marketing support. BSEE with 8-12 years experience in digital design for military avionics, EW and display systems required.

Design Engineer - Projection Displays

Responsible for raster deflection circuit design and projection system configuration, definition of test procedures and assisting new product development. Requires BSEE and 4-7 years of projection display design experience.

Product Development Manager

Responsible for directing engineering efforts in product definition and design, proposal preparation and marketing of color monitor and projection products. Requires BSEE and 10 years of display system development experience. MSEE or MBA preferred.

Program Manager - EO Systems

Direct, plan and provide technical direction for an advanced EO system program. Responsible for cost, technical direction, customer liaison and new business development. A minimum of a BS in Electrical Engineering or Physics is preferred with at least 5-10 years experience in management of R&D programs in a government acquisition environment.

Human Factors Engineer - Display System Design

Principal investigator in research studying displays and control for virtual space operation. Design and conduct experiments, collect and analyze data in evaluation of interface concepts and display formats. Requires MS and 3-5 years experience or Ph.D. and 1-2 years experience in either Cognitive Psychology or Human Factors Engineering. Familiarity with display design, cockpit interfaces, human/computer interface, auditory and somethetic studies are a plus.

We offer an excellent compensation and benefits package and a working atmosphere that encourages personal career growth and responsibilities. If you are interested in these opportunities, please send your resume, in confidence to Dept TR.

U.S. Citizenship Required

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Principals Only

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SYSTEMS RESEARCH LABORATORIES, INC.
2800 INDIAN RIPPLE ROAD, DAYTON, OHIO 45440-3696 • (513) 426-6000

imaging science with construction of an $8.5 million Center for Imaging Science.

The new center will be used academically for RIT's undergraduate and master's degree programs in imaging science, for the imaging science component of the Institute's microelectronic engineering program, and for future post-graduate development in imaging science. Research, however, will be the dominant focus of the facility — especially in the areas of photochemistry, optics and electro optics, digital imaging and remote sensing, robotic or machine vision, and medical and graphic arts imaging.

ROCHESTER INSTITUTE OF TECHNOLOGY, Rochester, NY (716/262-2626)

Calibration services available for pulsed laser power, energy

The National Bureau of Standards offers calibration services for low-level pulsed laser systems, such as those used in guidance receivers and range finders. Based on NBS-calibrated transfer standards that are sent to the customer's site, or used for measurements at NBS, the services are for laser pulses at 1,064 micrometers from about 10 nanowatts to 100 microwatts (peak power); and about 100 attojoules to 10 picojoules (energy). A detailed description of the services and instrumentation is included in **Documentation of the NBS APD and PIN Calibration Systems for Measuring Peak Power and Energy of Low-Level 1,064 Micrometer Laser Pulses.** Order number: PB #86-182367. Price: $11.95 (prepaid).

NATIONAL TECHNICAL INFORMATION SERVICE, Springfield, VA 22161.

Computer program combined to gain greater support

In an effort to obtain more visibility and a chance to argue for more protection under tighter budgets, the National Science Foundation (NSF) plans to combine all of its computer-related activities into one Directorate for Computer and Information Science and Engineering (CISE). The reorganization will bring together under one administrator the Divisions of Computer Research and Information Science and Technology, the Office of Advanced Scientific Computing, and several programs from the Directorate of Engineering. To carry out these changes successfully, NSF has requested a total budget of $1.69 billion for FY87, an 8% increase over 1986, which has already been targeted by the Gramm-Rudman bill for a 4.3% cut in FY86. NSF officials have predicted that the mandated cuts could have serious effect on science programs, and that strategies will have to be redeveloped.

AFIPS WASHINGTON REPORT, Reston, VA (703/620-8900)

Teltron, Inc., Douglassville, PA, has recently acquired the manufacturing capabilities of CRT Display. As a division of Teltron, CRT Display will specialize in the manufacture of radar and special purpose cathode ray tubes.

CalComp (Anaheim, CA) has become part of Lockheed Corp. Information System Group (ISG), forming one of the largest computer companies based in California. Established in 1959, CalComp has been a pioneer and innovator in computer graphics offering a broad product line that includes plotters, graphic displays, turnkey computer-aided design (CAD) systems and software, and digitizers.

Touch technology: variety of systems spur maturity

As the power, performance and complexity of interaction in computer systems have increased, so too has the need for a simpler, more direct means of entering data into the computer and then accessing its enhanced capabilities.

Quick response and virtually error-free input — without need for memorizing commands or referring to a users' manual — has recently stirred up considerable interest in touch-sensitive technologies for computer input systems.

Today, four major types of touch technology — membrane, capacitive, surface acoustical waves, and scanning infrared (IR) — are available. Each has its particular advantages and disadvantages, with selection of a system dependent upon specific applications and cost considerations.

TOUCH SYSTEM COMPARISONS

System Type	Resolution	Stylus	Trans-missivity	Parallax 13" CRT	Scan Rate	Environmental Considerations	Mounting	Bezel
Membrane								
Discrete	0.250 nom. pixel-software	—	50-70%	0.375	100	vandalism breakage glare	tape	no
Analog	1K x 1K, 4K x 4K	— —	50-70%	0.375	100	vandalism breakage glare	tape	no
Capacitive								
Discrete	32, 60, 80	finger	85%	0.375	4-15	body capacitance static discharge breakage	tape	no
Analog	100 x 100, 256 x 256	finger	85%	0.375	100	body capacitance static discharge breakage	tape	no
Surface Acoustic Wave	0.030 pixel-software	finger	92%	0.375	100	water breakage	tape	no
Infrared	0.250-physical pixel-software	—	100%	0.250-0.375 0.250-0.500	60-100	ambient light dust	metal brackets	yes

MEMBRANE

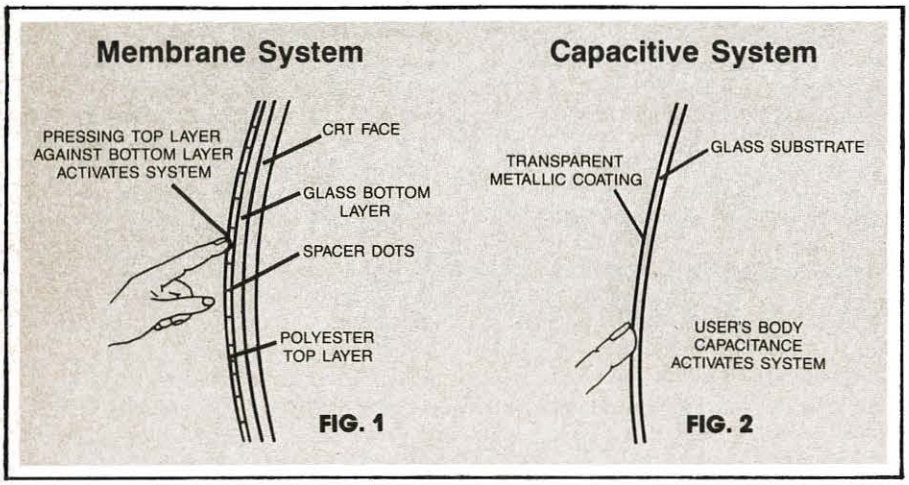
Membrane systems use an overlay, consisting of a top layer, a bottom layer, and separator dots between the two layers, that is attached to the display screen. (Fig. 1) The fundamental building block of both layers is a substrate — glass, plastic, or polyester film — on which is deposited a very thin transparent metallic film such as indium tin oxide (ITO) or gold.

One of the major considerations in designing membrane systems is achieving a balance between resistivity (resistance) and transmissivity (percentage of visible light transmission) of the metallic coating on the substrate. Resistivity of the metallized substrate increases as the visibility (visible light transmission) increases. Thus, reducing the thickness of metal applied to the substrate (to improve visible light transmission) will increase resistivity. And, conversely, adding more film to decrease resistance will greatly reduce visible light transmission. If the metallic film is too thin, however, continual use of one area of the membrane may cause wear or other problems.

Membrane systems can be either discrete or analog.

• **Discrete membrane** — consists of two layers: a metallized bottom layer of glass or plastic, and a metallized top layer of flexible polyester. Conductive lines are etched into both layers — with the top layer lines normal to those on the bottom layer, thus providing a grid for the X,Y orientation of the system.

An air gap must be maintained between the top and bottom layers. On flat-panel displays, a separator ring is used around the periphery of the sensor. The top layer is pulled tight over the ring to create the air gap between the two layers. On CRTs, the gap is maintained by silk-screening a matrix of spacer dots — small insulators, typically plastic — on the bottom layer. The top layer rests on the spacer dots (a few



thousandths of an inch above the bottom layer), thus providing the required air gap.

The user activates the system by touching the top layer and pressing it (or shorting it) against the bottom layer. When the top and bottom layer contact, at least one pair of X,Y wires will touch, activating the touch system. Sensor electronics detect the activation and transmit this information to the host computer.

In the sandwich-like construction of a typical discrete membrane system, the edges of the sensor are sealed, leaving only a small vent area. Without this vent area, a decrease in atmospheric pressure would cause the sensor to expand abnormally and fail to operate; and an increase in atmospheric pressure could cause the layers of the sensor to contact (short-out) and the sensor to fail. Despite having this venting area, when the sensor is subject to continuing atmospheric pressure changes in a high moisture environment, moisture may seep into the sensor itself, corrode or contaminate the conductors, and eventually cause the sensor to fail. Some applications may require the venting area to be filtered to prevent moisture and contamination.

One important design consideration associated with this type of system is that the polyester material used in the top layer may cause a problem with glare. To prevent this, a surface treatment such as an anti-reflective coating or contrast enhancement coating is usually placed over the polyester — which, of course, further reduces the transmissivity of the sensor. Another consideration is that the number of interconnections between the sensor and control electronics in a discrete membrane system must be proportional to the resolution and size of the panel. Thus, as the resolution and size increase, the interconnections become more of a design problem.

• **Analog membrane** — consists of two layers similar to a discrete membrane system with metallized glass for the bottom and metallized polyester on the top. The difference between the two is that in the analog system the metallized layers are not etched, but instead are continuous. Separator dots are silk-screened either on the top or bottom layer. Because this sensor is also constructed in a sandwich-like fashion it has the same problems with atmospheric pressure changes and moisture as does the discrete system.

To activate the system, the user simply presses the top layer causing it to touch the bottom layer. One layer in an analog system functions as the voltage layer, while the other functions as the probe. A voltage is applied to the top edge and ground to the bottom edge of the voltage layer. If the resistive metal layer on the substrate is uniform, then the voltage distribution from top to bottom should be uniform.

If a probe on a voltmeter is touched to the very center of the material, the voltage on the voltmeter should indicate half of the voltage that was applied to the top edge. The voltage indicated should be proportional to the distance. This distance indicates the Y-value. The X-value is obtained in a similar manner by applying a voltage to the left edge and applying ground to the right edge of the voltage layer. The probe layer acts as the voltmeter probe and sends the voltage reading to the electronics. In turn, the electronics convert the voltage reading into a digital value.

CAPACITIVE

A capacitive system differs from the analog membrane system in that it has only one layer — a glass substrate with transparent metallic coating, identical to the bottom layer (substrate) used in a membrane system. (Fig. 2)

Capacitive systems can also be either discrete or analog.

• **Discrete capacitive** — consists of a single glass substrate with metallic coating etched into a series of touch pads that represent the touch targets. Each of these pads has a conductive line to the edge of the sensor. When the user touches the metallized substrate, the change in capacitance is sensed over the conductive line by the sensor and is sent from the sensor to the electronics.

An important component of a discrete capacitive system is the timing circuit into which all touch pads are multiplexed. The timing circuit oscillates at a frequency determined by the capacitance and resistance of the pad and associated electronics. The system is calibrated by multiplexing one of the pads into the timing circuit, counting the number of oscillations in a fixed time period, and storing the count in the memory of a microprocessor.

Remaining pads are then calibrated similarly to obtain a specific count for each pad. Whenever the user touches one of these pads, the initial oscillating frequency is changed and thus the count is changed. The microprocessor then sequences through each of the pads by multiplexing a particular pad and placing it in a circuit with the timer. The number of oscillations in a fixed time period is measured and compared against the value for that pad stored in memory.

When the user touches the pad, the additional body capacitance of the user slows down the timer. The difference in the oscillating frequency caused by the extra body capacitance is reported to the host computer and the controller

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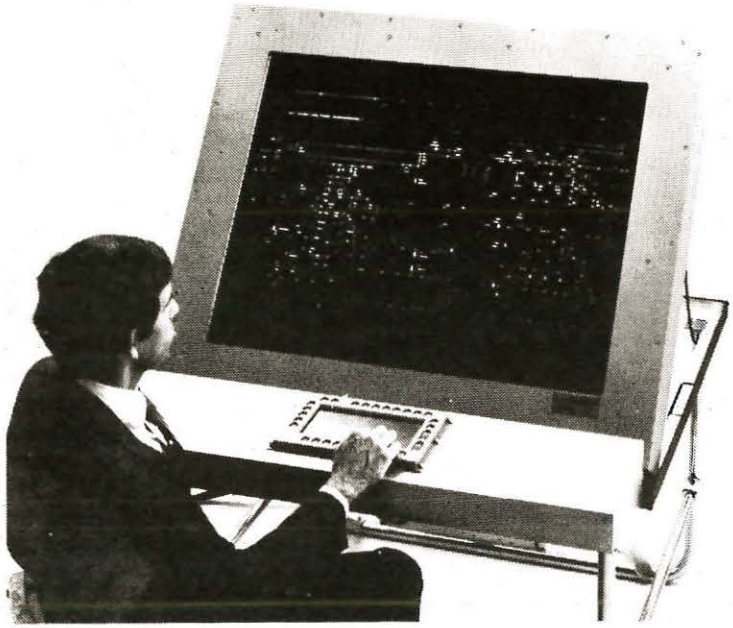

This is the world's first large area, high resolution, non-projected, flat display terminal. Utilizing AC gas discharge plasma display technology, the terminal has an active display matrix of 1600 by 1200 pixels measuring over 39 inches (one meter) diagonally with 5.3 square feet of viewing area and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

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

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

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

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

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

For Further Information, Contact:

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

Circle Reader Service #12

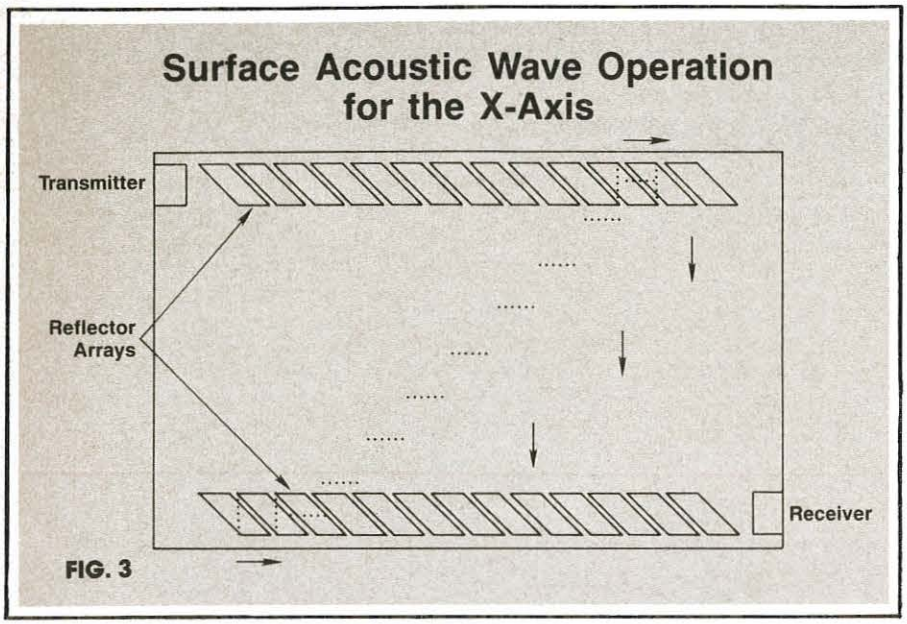

FIG. 3

to determine if one or more pads have been touched.

A primary design consideration for this type of system is that the electronics must accommodate for a wide variance in body capacitance from one user to another as well as the effect of the environment on body capacitance. In addition, resolution depends on the number of pads on the surface and is typically the lowest of any of the touch technologies. But because body capacitance is required to activate the system, any insulated stylus (such as a gloved hand) cannot be used. Also, because each pad is connected to the control electronics, the system must be designed so that static electricity from the user does not damage the electronics.

• **Analog capacitive** — consists of the same glass substrate with metallized coating as used in the discrete system. In the analog version, however, the metallized coating is continuous across the surface instead of being etched, as in the discrete system. The user activates the system by touching the surface, with the body capacitance of the user added to the capacitance being sensed by the electronics.

Several techniques are used for determining X,Y coordinates on an analog capacitive system. One involves attaching wires to each corner of the sensor. Each of these wires is then fed into an individual timing circuit that is controlled by the capacitive and resistive values. If the user touches the sensor in the exact center, the effect of body capacitance on the timing circuits associated with these wires will be the same and the X,Y coordinates are easily determined.

If the user touches anywhere except in the exact center, each of these timing circuits will sense a different value of the body capacitance. Because the timing circuits associated with each of these wires will be affected differently, X,Y coordinates are detemined using an algorithm that compares the different effect on each of these timing circuits.

ACOUSTIC WAVES

Surface acoustic wave systems (SAWs) consist of a glass substrate, two transmitters, two receivers, and four reflector arrays. Location of the transmitters and receivers is dependent on the location of the origin on the touch screen.

If the origin were positioned in the lower left-hand corner of the device, then for the X-axis, a transmitter is located on the upper left corner of the substrate, with a receiver located on the lower right corner. Arrays of reflectors are silk-screened on both the top and bottom of the substrate. (Fig. 3)

To scan the X-axis, the transmitter on the upper left corner of the substrate transmits a short burst of surface acoustic waves that travels horizontally along the top array of reflectors, positioned at an angle of 45 deg to the direction in which the waves travel. As the waves travel horizontally, they are partially deflected by each reflector and forced to travel down the substrate toward the bottom array of reflectors. The reflectors on the bottom are also angled at 45 deg so that the waves are then deflected into the receiver in the lower right corner of the substrate.

After the X-axis is scanned and those acoustic waves die out, the Y-transmitter is used to scan the Y-axis. In this case, the transmitter is located on the lower left corner of the substrate with a receiver on the lower right corner. Arrays of reflectors are silk-screened on both the right and left sides of the substrate. The Y-axis is then scanned in a manner similar to the X-axis.

Since the velocity of the acoustic wave in glass is known (approximately 3,000 meters per second) and the dimensions of the glass substrate are fixed, the time of arrival for each of the reflected waves is known. The wave reflected against the first reflector in the array will arrive at the receiver first, while subsequent waves reflected against succeeding reflectors will arrive sequentially thereafter.

When the user touches the glass surface of the display, the water content of the user's finger absorbs energy in the transmitted waves. As the energy is absorbed, the amplitude of the acoustic waves is attenuated. This causes a dip in the signal proportional to the amount of energy attenuated. The electronics then measure this dip to within ±0.5 microseconds and determine the X-and Y-coordinates — corresponding to a resolution of roughly 0.031 in.

In addition to the X- and Y-coordinates, the surface acoustic wave system can also provide a Z-axis component, which is determined by how hard the user presses on the screen. Because the amount of energy absorbed is dependent on the amount of surface contact with the glass substrate, pressing harder on the glass increases contact and results in more attenuation of the energy in the acoustic waves. This increase in attenuation, and hence how far down the signal dips, is measured by the electronics to determine a Z-axis .

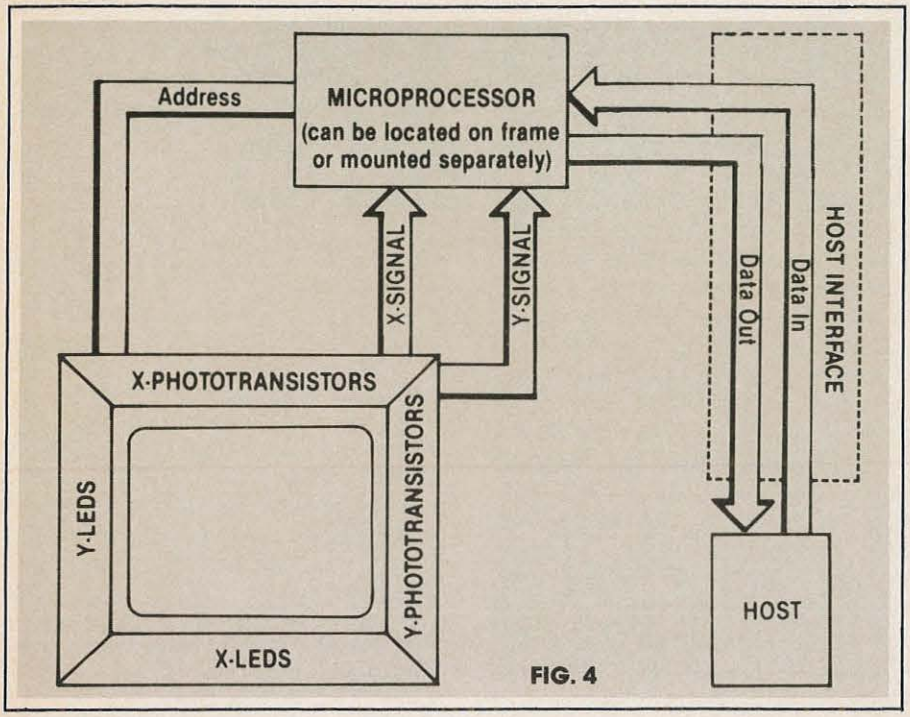

FIG. 4

SCANNING INFRARED

A scanning infrared system (IR) is composed of an opto-matrix frame, a microprocessor, and an infrared-transparent bezel. The opto-matrix frame consists of infrared, light emitting diodes (LEDs) located on two adjacent sides of the frame that emit light in the X- and Y-directions. Phototransistors, located on the remaining two adjacent sides of the frame opposite the LEDs, serve as detectors of the light emitted by the LEDs. An infrared-transparent bezel is placed around the frame, and both are then attached to the display housing. The microprocessor can be integrated in the frame or can be located on a printed circuit board and inserted in the display's card case. (Fig. 4)

The sequential pulsing of the LEDs creates a grid of light in the X-and Y-directions (scan rate varies with the system design over a range of 10 to 60 scans per second, with 30 being

typical). When a stylus, such as a user's finger, enters the grid of light beams, it obstructs the beams at a particular location on the grid. The phototransistor opposite the LED detects the absence of the light beam emitted by the LED, and transmits a signal that identifies the location on the grid in X- and Y-coordinates where the broken beam occurred.

The control logic program for the infrared touch system is contained in the microprocessor memory. The microprocessor scans the touch system by selecting an LED/phototransistor pair through a specific address. It reads the level of ambient (environmental) light present at the phototransistor selected, stores the level, then pulses the LED. The microprocessor then compares the signal level detected by the corresponding phototransistor with the level of the ambient light stored earlier. The difference between the two levels is compared to determine if a valid hit has occurred. To complete one entire scan of the opto-matrix frame, the scanning process is repeated for all remaining LED/phototransistor pairs on the frame.

Developers of this emerging technology have the opportunity at this early stage to establish standards that will allow and encourage continued growth. At present, however, individual touch manufacturers are developing their own hardware and software interfaces. Systems houses and OEMs must then generate their own drivers and development tools to support their applications of the systems, and these efforts may not always be transferrable to other applications. Some software companies, though, are beginning to include touch drivers in their products that would make touch application programming not only easier but more standardized across applications.

Establishing standards will not solve all the problems with touch systems, but it will be a major step in providing evidence that touch has emerged as a viable technology.

by Arthur B. Carroll, CEO
Carroll Touch Inc., Round Rock, TX

Are video displays a health hazard?

Despite long-running investigations (such as by the National Institute for Occupational Safety and Health) that to date suggest the widespread introduction of VDTs in the workplace has produced impressively few problems, the VDT radiation health hazard controversy will be with us for some time to come.

The VDT radiation issue is a very real and frightening one, having gained much notoriety within industry, government, and groups of VDT workers—primarily from a mis-informed trade and consumer press. Research evidence not yet being sufficient to assure workers that VDTs do not cause health problems hasn't helped either.

Exposure to radiation, however, occurs all the time, in all places, and under all conditions. Sitting in the sun, travelling in an airplane, or even walking along a city street past large concrete or stone buildings will result in elevated exposure to Ultra-violet or X-ray radiation. Urban areas are typically exposed to elevated levels of radio frequency radiation. Watching TV, opening the refrigerator, or using a hair dryer all contribute to the radiation an individual is exposed to.

Radiation is impossible to escape, especially when one considers that every individual emits electromagnetic radiation naturally.

The question for VDT workers, then, is whether they are exposed to radiation to such a degree that their relative risk is higher than it would be for safe and healthy working conditions.

Last May, in Stockholm, conferees at Work With Display Units (WWDU)—an international scientific meeting on VDTs and office work—discussed these and other questions pertaining to office ergonomics. Some 300 papers delivered at the conference focused primarily on the health and comfort aspects of using VDTs, including radiation emission, pregnancy outcome, skin disorders, vision impairment, physical well-being, and stress. The main findings and conclusions of the researchers in two general areas: The VDT "health debate"; and job satisfaction and work organization, are presented here in summary.

(Developed, with permission, from Office System Ergonomics Report, Vol.3-No.5, p. 10; and Vol.5-No.3, p. 18-22. Copyright 1984 and 1986 by The Koffler Group, Santa Monica, CA)

"The VDT revolution in the workplace has produced impressively few problems considering the scope of the technologic change."

Radiation emissions

- **X-rays:** VDTs do not emit ionizing radiation such as X-rays or microwaves above background levels found in the environment. One scientist (13) reported that X-ray levels can be **lower** in the vicinity of VDTs because the mass of the equipment shields some of the background radiation. Thus, VDT operators do not need to use protective devices such as lead aprons.

- **Electric fields:** Research indicates that there should be no cause for concern that electric fields emitted by VDTs may create potentially hazardous situations such as the inducement of static electric charges on VDT operators or the depletion of air ions. A Swedish biologist (5) reported that the intensity of the human body's own electric fields (generated by organs such as the heart and brain) are higher than the intensity of the electric fields generated by VDTs (measured at viewing distance). His conclusion was that the VDT's electric fields cannot cause any biological harm.

Another study (4) examined the direct current (DC) electrical environment surrounding VDTs under normal operating conditions. Concentrations of positive ions, negative ions and respirable particulates were also measured. The DC electric field strength was found to be higher near the VDT screen, but "the relative magnitude of this effect is comparable to everyday variations in the indoor environment that might be related to such variables as atmospheric changes and the wearing of synthetic clothing materials." Moreover, these levels rapidly decline to background levels between 1 and 2 meters from the screens. Both positive and negative ion concentrations were lower near the VDT, although "the absolute levels of air ions were well within the range of values encountered in everyday indoor and outdoor environments." Finally, VDTs were not found to affect the levels of respirable particulates.

These studies and others led researchers to dismiss the claim that VDT-induced electrostatic charges cause skin disorders.

- **Magnetic fields:** Overall, scientists at WWDU agreed there is insufficient data

to determine the effects of pulsed magnetic fields on the development of animal embryos. As expressed by one group of researchers, "it is quite likely that other factors than the pulsed magnetic field are of importance for causing an effect on embryonal development ... We must await further investigations on the effects of magnetic fields on embryogenesis before these questions can be finally settled" (15).

Another study with chicken embryos (7) did find some negative effects. The report states, however, that, "as the interaction mechanism between the magnetic field and chick embryos is not known, it is not yet possible to conclude whether similar effects could be expected in human beings. The threshold for the effect on chicken embryos," according to the study, "is about the same (roughly 1 Amp/meter) at several waveforms. Measurements indicate the total magnetic field strength (including frequencies from 50 Hz to 25kHz) at the position of VDU operators is usually below 0.2 Amp/meter."

Pregnancy outcomes

Four studies (2, 8, 10, 12) were presented at WWDU that examined possible links between adverse pregnancy outcomes and the use of VDTs. None of the researchers found that VDT use increased the risk of adverse pregnancy outcomes. As a matter of fact, no study has ever been reported that could lead anyone to suspect that such a link exists (news media reports to the contrary).

Sweden's National Board of Occupational Safety and Health presented a paper at the conference (1) stating that "based on the available data, an evaluation is possible, and demonstrates that VDT work has not been shown to constitute a risk of adverse pregnancy outcomes. Further studies, both epidemiological and experimental, are in progress, and will be evaluated when available. Additional research is warranted on some aspects reviewed in this paper. These include possible teratogenic or teratotoxic effects, and the possibility of effects on pregnancy outcomes of stress reactions. Both these research areas should include, but should by no means be limited to condition during VDT work only."

Additionally, two studies under way in the US were reported at WWDU. The first, conducted by researchers at the University of Michigan (3), monitored health and pregnancy outcomes of 1,500 women who work for the State of Michigan. (First results of the study, funded by the March of Dimes, indicate that pregnant women who work at VDTs do not have a higher risk of miscarriage than non-VDT users. The researchers noted that women who used VDTs from one to five hours a week had fewer miscarriages than expected—36 in 162 pregnancies, with 42 miscarriages expected. Women who worked at VDTs 21 hours or more a week had about four more miscarriages than expected—26 in 120 pregnancies. According to the researchers, the slight increase could not be considered statistically significant because the sample of pregnancies comprised such a small share of the total number of 817 pregnancies. They indicated more research is needed in this category.)

The second study (11) is being conducted by Mt. Sinai School of Medicine in New York. It is sponsored by 9 to 5 (National Association of Working Women) and the Service Employees International Union. This study will examine the pregnancy outcomes of up to 12,000 women over the next 2-3 years. Data will be collected by analyzing periodic urine samples, and by compiling information on reproductive histories, health, habits (such as smoking and alcohol intake), and work patterns. The study is expected to yield data relevant not only to VDT use but also to other suspected agents of adverse reproductive outcomes, such as physical and psychological stress, and exposure to chemicals commonly found in office environments. Results are expected by 1990.

Skin disorders

There was general agreement among the researchers at WWDU that skin rashes are probably related to the static discharge on the VDT users themselves, although this hypothesis has not been proved conclusively. As a Norwegian scientist (12) pointed out, the strength of the static field in the vicinity of a VDT worker is related more to the charge on and behavior of the operator than it is to presence of the VDT. Another researcher (9) reported that the VDT user's static charge was found to be related to the presence of symptoms, but the charge of the person was not influenced by the charge of the VDT.

Job satisfaction

● A study conducted by the School of Public Health at Columbia University in New York (17) compared VDT operators to non-operators on several work-related factors, such as job satisfaction and physical discomforts. Results showed no differences between part-time VDT workers and either part-time or all-day clerical workers, such as typists and general clerks. People who use VDTs for a full day, however, were found to have the worst jobs, the lowest levels of job satisfaction, the least decision-making latitude, the fewest opportunities to learn new things, and the lowest cognitive meaning in the materials they handle. Although all-day VDT operators complain the most about visual discomforts and excessively bright lighting levels, they have the same lighting conditions as other workers. They have the highest levels of environmental and psychosocial stressors, yet they have more adjustable furniture and report the most satisfaction with their work environment.

The researchers conclude that, "It appears justified on these data to raise questions about the widely held assumption that office automation will upgrade clerical work, an assumption that does not appear to be supported by these findings. In fact, these data suggest that the opposite may be true—in this population office automation has

"Some problems associated with the use of VDTs have been identified; but the evidence to date indicates these are relatively minor."

resulted in significant changes in the task characteristics of clerical jobs and appears to have significantly decreased job satisfaction and physical well-being of the all-day VDT users. The data, however, also appears to indicate that job design and job rotation may be powerful tools for offsetting this effect, since few significant differences were observed between part-time VDT users and other clericals."

Improved environmental conditions apparently are not sufficient to solve the problems. The failure of environmental modifications to eliminate discomforts and dissatisfaction is consistent with a study (16) in which job control models were found to account for more variation in visual and musculoskeletal distress than physical factors. In both studies, VDT users had less job control than non-VDT users.

• Researchers at Volvo (20) reported that the main predictor of visual and musculoskeletal complaints is not VDT use, but length of time at the VDT. They state that the breakpoint appears to be four hours per day. Other data they presented, however, indicate that time at the VDT was compounded with job type. Thus, it cannot be determined whether complaints were caused by long hours using a VDT, the type of work done at the VDT, or some combination of factors.

As a group, the people who participated in the study expressed positive views of automation because they believe it allows them to perform their jobs better. They also reported that they do not feel any increase in stress or reduction in the control they have over their work. The researchers report, however, that a sub-group of workers is less satisfied with their work. It consists mainly of women with a lower level of education, often part-time workers. They also found that clerks seem to be less educated, more motivated by money, more detached from their work, more prone to complain and work longer sessions at a VDT than, say, computer specialists. These two findings indicate that the cause of complaints may be job type rather than time spent at the VDT. Time at the VDT may be a good predictor of job type and, thus, complaints.

The researchers recommend that "unqualified jobs" such as repetitive and monotonous data entry work be minimized and alternated with more interesting tasks "which offer the opportunity for involvement and understanding of the significance of the individual in the work of the department."

• Another study (22), also at Volvo, found that VDTs can enhance work provided that individual needs, work requirements, work content, and workloads are properly handled. Criti-

cal factors for success are user participation in the design process, the way in which leadership is exercised, social relations, and opportunities for further education and personal development.

• A Dutch study (14) found no relation between type of VDT job (such as data entry, word processing, and data retrieval) and complaints of visual and musculoskeletal discomforts. The percentage of time spent working at a VDT was not found to be as important as expected. Instead, eye fatigue, musculoskeletal complaints, and headaches were found to be significantly affected by a combination of adverse conditions related to (a) percentage of time working at a VDT, (b) work pressure, and (c) work atmosphere.

These studies underscore the importance of an emerging area within ergonomics called macroergonomics, which is the study of sociotechnical systems, or the "organization-machine interface technology" according to one of the papers presented (6).

Microergonomics has been the traditional domain of ergonomics. It looks at the interface between people and technology. Macroergonomics, on the other hand, is important because "conceptually, we have begun to realize that it is entirely possible to do an outstanding job of microergonomically designing a system's components, modules, and subsystems, yet fail to reach relevant system effectiveness goals because of inattention to the macroergonomic design of the system."

Low relative risk

Considering information that is currently available, there is consensus that VDTs represent a very low relative risk. There may be some biological effects of radiation given off by VDTs; these may even be harmful (although there is currently no evidence of this), but relatively, would such effects be considered more harmful when compared with the general working environment? Because no evidence of hazardous radiation effects from VDTs has been forthcoming, the question cannot be asked legitimately. This suggests, however, that any heretofore unknown hazards would have very small effects, given they exist at all.

Relative risk must be factored into any discussion of VDT health hazards, including those purported to result from radiation. Yet it would not make sense to claim that VDTs are completely risk free—because there is always some parameter that has not been researched at every possible value. Describing low relative risk for VDT use would be a responsible message to send to VDT workers and those that are currently considering VDT work.

And, finally, more research is necessary to determine how the different physical, social, and organizational factors in the workplace contribute to job satisfaction, performance and physical discomforts. So far, it would appear that people performing monotonous or dead-end jobs complain the most. Often, the nature of these jobs forces the user to adopt working postures with high static load.

The implications for employers are clear. Although the importance of environmental and VDT ergonomics is not

(Continued on p 29 . . .)

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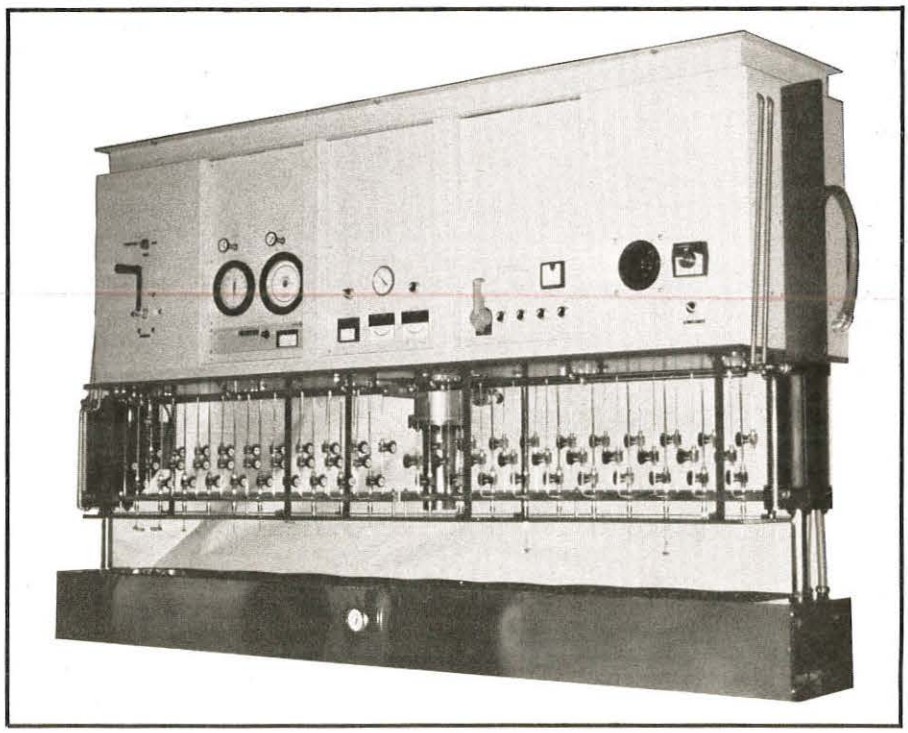
Processing system extends life of flat-panel displays

Up to 40 gas plasma display panels at a time can be processed in an automated system that produces units whose operational life is extended to 1200 hours—an increase of 700 hours over conventional gas plasma panel construction. The system automatically evacuates and purges flat gas-charged display panels while they are backing at up to 300C; then back-fills the panels with an active gas and pinches off the tube.

A unique three-valve stainless steel manifold with a quick disconnect (QD) for the display tube is provided at each display panel processing station. The quarter-turn valves are connected to a vacuum header, a purge gas header and final back-fill header—which results in the minimum use of gases and the fastest possible evacuation. Each QD-to-valve manifold header assembly contains only 8.34cc.

The vacuum system is designed so that if a display unit develops a leak during evacuation, an ionization gage sounds a signal to warn the operator. By closing each vacuum valve, or by using the helium spray method with the optional helium mass spectrometer, the operator can quickly identify the leaker and shut down that unit only. The system continues to process the other units so that no production time is lost.

The system's 300C radiant oven is mounted over the display units on hydraulic cylinders, which permit the oven to be raised or lowered to an insulated stainless steel table. The table protects the three-valve manifolds and tube QDs during the high temperature bake-out cycle. Typical process cycle time including installing the display units, repetitive evacuation and purge cycling (usually three times), active gas back-fill, and pinch off averages three to four hours for 40 units.



Multiple-flat-panel processing equipment automatically evacuates and purges glass units while they are baking, then back-fills them with active gas and pinches off the tube.

A cryogenic pump, or a liquid nitrogen trapped diffusion pump—with the necessary trapped mechanical pump and controls—is at the heart of the system. The vacuum pumping system is designed to protect the display units against oil backstreaming, one of the primary causes of poor display panel performance. Prices: $55,000 (20 unit-system); $75,000 (40-unit system).
HELIUM LEAK TESTING INC., Northridge, CA (818/349-5690)

Circle Reader Service #101

(. . . continued from p 24)

to be discounted, it cannot be used as the focus of change when trying to reduce musculoskeletal and visual complaints. Adverse physical conditions may lead to unnecessary physical discomfort and even injury, but it is likely that psychological and social factors may be playing a large role—if not the largest in many cases.

Abstracts of papers presented at *WWDU*, and summarized in this article can be found in the conference proceedings: *Work With Display Units*, Stockholm: Swedish National Board of Occupational Safety and Health, 1986.

[1] Bergqvist, U. Pregnancy and VDT work: An evaluation of the state of the art. *WWDU* (pp. 678-682).

[2] Bjerkedal, T., and Egenaes, J. VDTs and birthdefects: A study of pregnancy outcomes of employees of the Postal-Giro-Senter, Oslo, Norway (paper presented, but not included in *WWDU* proceedings).

[3] Butler, W. Reproduction outcomes of video display workers (paper presented, but not included in *WWDU* proceedings).

[4] Charry, J.M. DC electric fields, air ions and respirable particulate levels in proximity to VDTs (paper presented, but not included in *WWDU* proceedings).

[5] Frankenhaeuser, B. Video display terminals: Electromagnetic radiation and health. *WWDU* (pp. 57-59).

[6] Hendrick, H.W. Macroergonomics: The systems approach to VDU systems. *WWDU* (pp. 86-89).

[7] Juutilainen, J., and Saali, K. Effects of low frequency magnetic fields on the development of chick embryos. *WWDU* (pp. 71-72).

[8] Kurppa, K., Holmberg, P.C., Rantala, K., Nurminen, T., Tikkanen, J., and Hernberg, S. Birth defects and video display units; A Finnish case-referent study. *WWDU* (pp. 661-664).

[9] Liden, Carola, and Wahlberg, J.E. VDT work and skin. *WWDU* (pp. 801-802).

[10] McDonald, A.D. Birth defect, spontaneous abortion and work with VDUs. *WWDU* (pp. 669-670).

[11] Nussbaum, K. Study on video display terminals and pregnancy hazards. *WWDU* (pp. 672-673).

[12] Olsen, W.C. Facial particle exposure in the VDU environment: The role of static electricity. *WWDU* (pp. 797-800).

[13] Paulsson, L-E. Radiation emmissions from VDUs. *WWDU* (pp. 25-28).

[14] Pot, F., Brouwers, A., and Padmos, P. Determinants of the VDU operator's well-being. 2. Work organization. *WWDU* (pp. 322-324).

[15] Sandstrom, M., Mild, K.H., and Lovtrup, S. Effects of weak pulsed magnetic fields on chick embryogenesis. *WWDU* (pp. 60-63).

[16] Sauter, S., Gottlieb, M.S., Jones, K.C., Dodson, V.N., and Rohrer, K.M. (1983). Job and health implications of VDT use: Initial results of the Wisconsin-NIOSH Study. *Communications of the ACM*, 26(4), 284-294. (Reviewed in our volume 3, Number 1.)

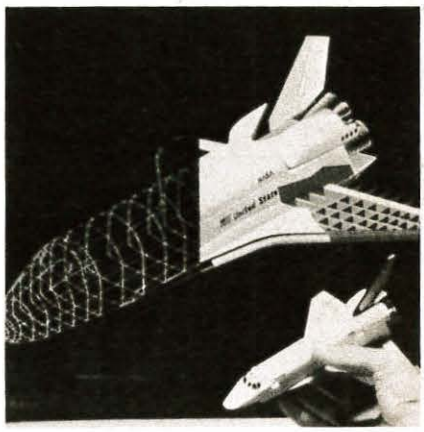
[17] Stellman, J.M., Klitzman, S., Gordon, G.R., and Snow, G. Comparison of well-being among full-time, part-time VDT users, typists and non-machine interactive clerical workers. *WWDU* (pp. 303-306).

[18] Stenberg, B. An outbreak of a rosacea-like skin rash in VDU-operators. *WWDU* (p. 803).

[19] Wallin, L. Work content, job satisfaction and health among VDU workers at Volvo. *WWDU* (p. 307).

[20] Wright, I. Identification and prevention of work-related mental and psychosomatic disorders among two categories of VDU users. *WWDU* (pp. 308-310).

Monitor displays photo-like images



Offering 1600H x 1280V displayable resolution at 0.25mm pitch, the MX-4190 raster-scan display is an ultra-high-resolution color monitor designed specifically for applications requiring near-photographic-quality color imaging—such as computer graphics, CAD, CAM, CAE, animation, and simulation.

The 19-in., analog RGB monitor features 60-Hz non-interlaced refresh rates. It incorporates a video bandwidth of more than 160 MHz that permits display of crisper and better defined images. Horizontal scan rates are user specified from 40 to 80 kHz, providing for full intensity and brightness regulation along the scan line. Brightness is guaranteed at 40 footlamberts (55 maximum) thus assuring display quality even in bright ambient light.

Misconvergence on the MX-4190 is less than 0.1mm within a centered 6-in. circle, with less than 0.4mm misconvergence elsewhere on the screen surface. Linearity is better than 1% over the entire visible display. Raster size regulation is 0.5% overall, and from 0 to 100% APL.

The monitor is built around a bus-structured architecture that promotes functional modularity and reduces the MTTR (mean-time-to-repair). All of the components of the monitor, with the exception of the power supply and the CRT, can be replaced in the field in just minutes. Price: $5,995 (quantity discounts available).

MONITRONIX CORP., Columbus, OH (614/262-0334)

Circle Reader Service #60

Data capture system

Reduced drawings sized A through E (in accordance with MIL-STD-804B) and microfilmed drawings on aperture cards can be digitally stored and retrieved efficiently with the ACES 200 Aperture Card Entry System. It can be used as a stand-alone or front-end turnkey data capture system, and interfaces with a host of computers including DEC VAX VMS and IBM MVS CMS operating systems through high-speed direct-memory access. With its open architecture, ACES 200 can be linked to a variety of storage and retrieval systems. The device can scan an E-size document, with user-selectable resolution of 200 dpi, at an average rate of six cards per minute; 360 cards per hour. Input hopper has a 600-card capacity that allows the scanner to run a batch of cards unattended.

SCAN-GRAPHICS INC., Broomall, PA (215/328-1040)

Circle Reader Service #41

Graphics presentation system

High-resolution turnkey computer graphics presentation system with film recorder produces presentation quality 35-mm slides. The STARBURST system with 240 displayable colors from a palette of 16.7 million colors, features job streaming that allows designs to be created by day while the system automatically records finished graphics on film at night. Options include additional fonts, printer and plotter interfaces, communications package, and software for computer graphics and video mixing. System includes 16-bit, multi-image computer capable of programming up to 30 projectors; a 10MB hard disk drive and 5¼ floppy disk drive; 12-in. monochrome and 12-in. color monitors; keyboard, digitizing tablet, and puck; and software for creation of word slices, business charts, and presentation previews.

AVL, Tinton Falls, NJ (201/544-8700)

Circle Reader Service #45

Network analyzer

LANalyzer EX 5000E Ethernet Network Analyzer is designed for use in developing, debugging, and characterizing LANS; for monitoring network traffic and measuring network performance; and for testing, troubleshooting, and maintaining LANs. The instrument operates on Ethernet (Versions 1.0 and 2.0) and IEEE 802.3 compliant LANs. All LANalyzer functions are realized by running tests, with test results viewed in real time, immediately upon completion of a test, or stored to an MS-DOS file for later examination and analysis. Hardware and software are available in a kit form that installs and operates on an IBM PC XT, IBM PC AT, or compatible.

EXCELAN, San Jose, CA (408/434-2300)

Circle Reader Service #54

Engineering tomography

PATRAN II Engineering Tomography software module allows users to work with 2-D slices of actual geometry derived from any source, including CT scans, NMR, and digital video images. It makes possible the comparison of the original engineering design with the "as-built" structure, as well as the study of density variations, and the identification of cracks, flaws, and tolerance accumulations in the final product. Module also provides capability to perform automatic edge detection and to generate edge definitions that can be used in the PATRAN II Advanced Geometry Modeling module. Statistical graphs can be produced on the same screen to show the variation of the parameter along an arbitrary ray.

PDA ENGINEERING, Irvine, CA (714/540-8900)

Circle Reader Service #48

Disk Storage

The MV21, parallel transfer disk storage system for use with the DEC MicroVAX II, offers a sustained transfer rate of over eight Mbytes per second. The system plugs directly to the MicroVAX II for commands and status, and also provides a high speed port for up to 9.3 Mbytes per second data transfers. Utilizing the M235PTD (Fujitsu, Ltd.), the MV21 storage system transfers data to and from the interface through five parallel channels, each at a 1.86 Mbytes/sec transfer

rate. One channel at a time is available to the MicroVAX II for data transfers; all five channels are transferred in parallel to the MV21's 16-bit bus. A complete MV21 storage system offers 1.9 billion bytes of data storage when configured with four M2350A PTDs. Price: $42,000 with one M2350A PTD.
STORAGE CONCEPTS INC., Costa Mesa, CA (714/557-1862)

Circle Reader Service #47

Disk controllers

Model MD23 and MD24 disk controllers are designed to connect up to four 5.4" Winchester disks with an Enhanced Small Disk Interface (ESDI) to the Small Computer System Interface (SCSI) bus. Single-ended model MD23 is restricted to a maximum 20-ft distance between controller and host. Differential version, MD24, permits placing the controller and host up to 80 ft from each other. Both systems feature ESDI drive interfaces with disk transfers up to 15Mbits/sec. Maximum I/O performance is achieved by 1:1 interleave and large FIFO data buffers that optimize the system's performance. Both hard and soft sectored ESDI drives are supported by both controllers. Prices: $435, MD23; $515, MD24.
EMULEX CORP., Costa Mesa, CA (714/662-5600)

Circle Reader Service #43

Video capture system

Add-on board — Palette Capture — for IBM PC, PC XT, PC AT, and compatibles, links a PC to ordinary RGB or NTSC (composite) video cameras for capturing high-resolution video images. Once captured, the images can be manipulated, retrieved, printed, and transmitted via modem, to remote computers as with ordinary computer data. Any viewable image can be captured and digitized in 1/3 sec, then displayed from a palette of 262,000 colors. Menu-driven software permits altering the position of the picture on display screen, compensating for lighting, and printing the image.
QUADRAM, Norcross, GA (404/923-6666)

Circle Reader Service #52

Flat panel display

Using MIM technology, the 1001 active dot matrix display provides the highest contrast (10:1), the widest viewing cone (90 deg) and the fastest speed (under 50 ms rise time) for a 640H × 200V high resolution display. Other features include ultra-low power requirements (100mW max) and the ability to interface directly to IBM PCs and compatibles. The LCSystems 1001 is an alternative for applications needing compact size or transportability without loss of functionality.
LCSYSTEMS, EAGLE-PICHER INDUSTRIES INC., Exton, PA 19341 (215/524-9944)

Circle Reader Service #44

Graphics projection screen

High resolution, large-screen graphics projector system, the Sony/Tektronix 4190, allows large groups to view high-resolution 2D and 3D graphics as they are displayed on the workstation screen during technical presentations, design reviews, and training sessions. The projector consists of a 3-gun, 3-lens projector and a 100-in. diagonal screen. It accepts signal rates of 64 KHz horizontal frequency, 60 Hz non-interlaced vertical frequency, and 90-100 MHz video bandwidth—and thus is able to duplicate both the addressable resolution (1280 × 1024 pixels) and the refresh rate, producing magnified images as sharp and detailed as those on the workstation display. Price: $68,995.
TEKTRONIX, Beaverton, OR (503/644-0161)

Circle Reader Service #53

Voice recognition system

Voice processing system for IBM PCs and compatibles provides Speaker Independent Recognition—the ability to recognize voice commands from any user without training, including digits, yes and no, and customized vocabularies developed for specific applications. The add-on card also provides continuous speech recognition in speaker-dependent mode, allowing users to speak naturally without pausing between words; and the system performs all voice functions over the telephone. Digital recording and playback is offered, along with an optional telephone interface to perform functions such as autodial, autoanswer, call progress monitoring, and touch tone sending and receiving. Price: $1,350.
VOTAN, Fremont, CA (415/490-7600)

Circle Reader Service #51

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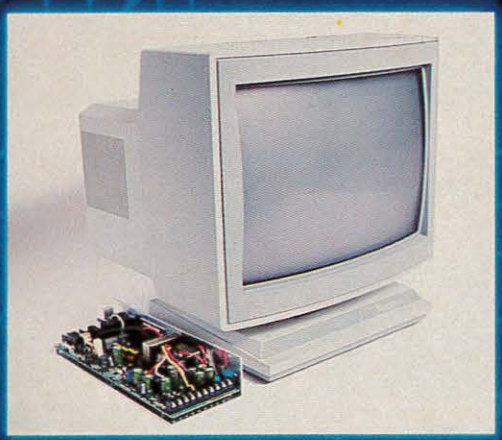

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Circle Reader Service # 7

President's Message

The sixth International Display Research Conference: Japan Display '86,—held in Tokyo from September 30th - October 2nd,—definitely ranks among the best IDRC's I have attended. Whatever doubts anyone may have had about this conference's ability to match the success of the first Japan Display conference in 1983 were shown to be unfounded.

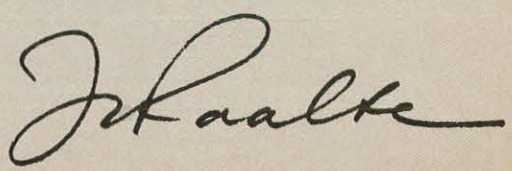
Dr. K. Miyaji (Conference Chairman), Dr. C. Suzuki (Executive Committee Chairman), Dr. S. Kobayashi (Program Committee Chairman), their committees, our co-sponsor ITEJ, and the Secretariat of Japan Display '86 are all to be thanked and congratulated for the excellent organization of this conference. During the three days of the conference some 130 papers were presented with two parallel technical sessions each day plus a poster session each afternoon; it was very difficult to catch all the interesting papers while also finding time to visit the posters which, in my opinion, were equally interesting.

It is not possible to highlight specific sessions or papers without expressing personal biases and interests. Certainly liquid crystal display developments were most numerous: two whole sessions were devoted to active-matrix addressed LCD's, another session to LCD technologies, another to supertwisted LCD's, and yet another whole session to ferroelectric LCD's; in addition there were 23 LCD poster papers! But LCD's were by no means the only news presented; other sessions were devoted to CRT's, electron guns and electron optics, EL displays, hard copy, human factors, PDP's, VFD's and LED's, electrochromic displays, and even a whole session devoted to automotive displays. I found the latter noteworthy in part because it has been difficult to organize such a session in the past, but also because there evidently is a lot of interesting work being done in this area - all of these reported efforts originating in Japan.

The work presented at Japan Display '86 included progress towards large displays, such as a 43" direct-view color CRT; flat displays, such as color PDP's and large active-matrix addressed LCD's; as well as high-resolution or small, personal displays. The marriage between displays and micro-electronics continues to fuel the information revolution as suggested by Dr. Ifay Chang in his invited address. And some day, when most of the remaining technological problems discussed by Dr. C.J. Gerritsma in his invited talk are solved, we can look forward to the ultimate personal interactive display—hinted at by Dr. T. Sasaki, in his keynote address "Information Displays for the Age of New Media Technologies."

Some 800 participants, including roughly 150 from the USA and 100 from Europe, attended this conference; many subsequently found time to visit the Japan Electronics Show, to visit one of several other trade shows in Asia, or to transact other business. Dr. Bob Durbeck (SID-IDRC Conference Chairman) and I spent a few days in Beijing for preliminary discussions and site inspections in connection with the next Asian IDRC in 1989; our discussions were fruitful and informative and I expect to report more on this possibility in the near future.

For those of you who were not fortunate enough to attend the Tokyo conference I can strongly recommend the proceedings of Japan Display '86 with some 600 pages of technical details about the papers presented. Copies of these proceedings are available from the SID Headquarters in California for $55 plus postage and handling while the supply lasts.



Chapter Notes

TWENTY-FIVE YEARS

SID

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Announcement to subscribers and advertisers

Starting with the January 1987 issue, *Information Display* will be published by Palisades Institute for Research Services, Inc., 201 Varick Street, New York, NY 10014.

All correspondence concerning the January issue and following issues should be directed to Jay Morreale, Publishing Director, Palisades Institute for Research Services, Inc. (telephone: 212/620-3371).

January editorial closing:	November 1
January ad closing:	December 1

Philip M. Heyman
SID Publications Chairman

Society for Information Display
8055 West Manchester Avenue
Playa del Rey, CA 90293.

UK & Ireland: November 12, 1986
Program: One-day Symposium
Location: British Telecom Research, Martlesham Heath, Ipswich
Topic: Interactive Displays
Speakers: Peter Alexander, Tube Investments — Touch System for a Flat Display; Simon Turner, Philips — Interactive Uses of Compact Discs; Tony MacLaren, Videologic — Interactive Uses of Public Information Terminals; Morgan Potter, British Telecom — Developments in Video Communications and Impact on Display Devices; Dave Pollard, British Telecom — Quality Requirements for Displays in Office Automation Environments.
Contact: Simon Bliss, Phosphor Products Co. Ltd., 1 Factory Road, Upton, Poole, Dorset BH16 5SJ (0202 632116)

Los Angeles: October 8 and 9, 1986
Program: Technical Meetings
Location: Sportsmen's Lodge, Studio City, Burbank (Oct. 8); Holiday Inn, Buena Park (Oct. 9)
Topic: State-of-the-Art Displays
Speaker: Kevin Nickels, Tektronix

At this first dual meeting of the year, Kevin covered the unique engineering features (circuits and CRT) of the GM-201 1500 x 2000 pixel monochrome monitor; the 19" color or 3-D liquid crystal shutter; supertwisted birefringent effect liquid (SBE) crystal panels; multibeam CRT developments (leading to very high resolution field sequential displays in conjunction with the LC shutter); and the unique electron beam addressed liquid crystal light valve (used for projection applications). He demonstrated the GM-201, displaying image data that has near photographic quality; the 19" LC shutter, in conjunction with a field sequentially operated GM-201 for high quality, excellent contrast, limited color display; and the liquid crystal panel.

Mid-Atlantic: September 11, 1986
Program: Technical Meeting
Location: Ramada Inn, Clifton, NJ
Topic: Trends in Computer Graphics
Speaker: Carl Machover, Machover Assoc. Corp.

Carl's presentation, augmented by slides and video tapes, illustrated what's been happening in systems, displays, hard copy, operator input devices and applications in the computer graphics field. According to Carl, graphics is a fast growing area with a shift in emphasis to lower cost systems changing the distribution channels and audience. The graphics "nut" market is saturated; vendors must now sell to everyman. As far as the future is concerned, software is presently the limiting factor for wider use; real-time (sub-second) response is vital to high productivity, which will justify the purchase of computer graphics systems. The VLSI revolution has resulted in a tremendous plunge in the cost of entry-level systems. Increased performance is now available at a reduced cost — a $30 chip now does what used to require a $100,000 system. (Contact Carl Machover for more information at 914/949-3777)

Minneapolis-St. Paul: August 31, 1986
Program: General Meeting for new officers and planning for coming year
Location: Sheraton Hotel, St. Paul-Midway
Speaker: Vern Born, 3M Co., St. Paul

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

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Learn More in Syntronic AP Notes

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

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

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