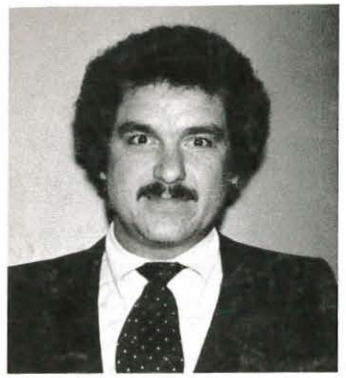
Chapter News



Roy Folk, Product Manager, Personal Software, Inc.

BAY AREA CHAPTER on October 20 was edified, in a well-attended meeting, by a program entitled "Software Interface to the Unsophisticated User . . . What Makes Visicalc Successful" by Roy Folk of Personal Software, Inc., Sunnyvale. Thanks to Mike Rehmus, Chapter Chairman, for both a picture of the speaker and a letter describing Visicalc, one of the new generation of software designed for persons untrained in computer programming. Quoting Rehmus: "The essence of Roy's talk and demonstration was to show the technology of allowing non-computer users to use and configure a very complex program without 'programming' as we think of it. Personal Software has carried the concept through their entire line of productivity improvement programs that work with Apple, H-P, IBM, and Radio Shack personal computers."

LOS ANGELES CHAPTER featured a demonstration and discussion on October 28 by Hank Stover of Genisco Computers Corporation, Costa Mesa. His topic was Space Graph, a new 3D computer display visible from front, back, top or bottom. This system does not use holography but presents full-scale 3D images. Space Graph applications include CAD/CAM systems, medical diagnostics, and CAT scanners. On November 18 a demonstration of the Xerox 5700 laser xerographic electronic printing system was provided by Tony Cinfini and Doreen Kushner. Using a laser to produce a dot matrix image of 90,000 dots/in^2, this system is capable of generating 43 pages per minute. Thanks to Kevin Kilcoyne, Chapter Program Chairman, for providing this information.

MID ATLANTIC CHAPTER on November 10 enjoyed an excellent discussion, accompanied by slides, viewgraphs, and demonstrations, entitled "Vision Research and Display Technology" by Dr. Bernice Rogowitz, Research Staff Member, Display Technology Group, T.J. Watson Research Center, IBM, Yorktown Heights, NY. Dr. Rogowitz pointed out that the output of all visual display devices requires human sensory perception and interpretation. Thus these human factors are an integral part of the total display system. The speaker, whose research includes studies of the spatial-temporal interaction of visual sensory perception, discussed recent work relative to the psycho-physics of such perception. Thanks to Sam Goldfarb, Chapter Chairman, for his good report.

MINNEAPOLIS/ST. PAUL CHAPTER deserves its usual gold star for prompt reporting of technical meetings. On October 16 there was a talk by Doris Berndt of the Minneapolis Star-Tribune on how home news is handled via computer and display technology at a large metropolitan newspaper. "Doris did an excellent job!" wrote Allen Taylor, Chapter Chairman. Attendance was good, too, with 16 SID members and 15 guests.

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The Official Journal of the Society For Information Display

DECEMBER, 1981

Dr. Ifay Chang, SID Treasurer, enjoying Munich during Eurodisplay '81.

Dr. Cornelis J. Gerritsma, Chairman of the Steering Committee, opening Eurodisplay.

EURODISPLAY '81. Every two years since 1970 display experts from around the world had met at the US Biennial Display Research Conference. This Biennial Conference has now evolved into an annual meeting which will alternately meet in Europe, the U.S., and Japan. Eurodisplay '81, held in Munich, Germany from September 16-18, 1981, was the first in this new series of annual display research meetings; the next meetings will be in Cherry Hill, N.J. (October 19-21, 1982) and Kobe, Japan (October 3-5, 1983).

Eurodisplay '81 brought together some 330 display experts for an intensive exchange of new ideas and results in all areas of display technology; about 10% of the attendees came from the U.S., and another 7% from the far East.

The conference covered a wide variety of topics in technical and poster sessions. Particularly strong were sessions on liquid crystal and electrochemical displays with 17 additional papers on these subjects presented at poster sessions. A number of papers covered new liquid crystal/dye systems, multicolor display panels, and multiplex or matrix addressing techniques.

The session on Human Factors with four additional poster sessions reflected the strong interest and widespread activity in this field in Europe.

Three more sessions offered the latest news in EL displays, CRTs and VFDs, and Plasma displays. Finally a session on Addressing described the many problems of addressing or multiplexing flat panels and potential solutions using TFTs or amorphous integrated circuits.

This conference gave evidence of strong activity and appreciable depth in the European display effort. Since most of the attendees and authors would not have been able to attend existing U.S. conferences, Eurodisplay provided a much needed forum in Europe for researchers to meet and discuss their work and ideas. All the papers, including poster sessions, are summarized in the Conference Proceedings available from SID, 654 North Sepulveda Blvd., Los Angeles, CA 90049.

EDITOR'S NOTE: We want to thank Dr. John A. van Raalte for this description of Eurodisplay '81 and the color photographs of SID Members Chang and Gerritsma. John, as you know, is one of the SID officers who provides invaluable services to the Society.

FRONT COVER MATERIAL WELCOMED: Every month **Information Display** usually features one or more active members of SID and the products with which they are most closely associated. Please send a glossy print and appropriate captions so that you, too, can be on our front cover. Send your material to Ted Lucas, Editor, P.O. Box 852, Cedar Glen, CA 92321, or to our National Office Manager, June Friend, for Information Display, 654 North Sepulveda Blvd., Los Angeles, CA 90049. Next deadline for material from you is January 10 for the February issue. if you miss that, try for the March issue. NOTE: We also welcome feature articles on interesting projects.

LIQUID CRYSTAL DISPLAYS*

by Dr. Allan R. Kmetz
Supervisor, Liquid Crystal Display Development
Bell Laboratories, Murray Hill, NJ

Introduction

Only ten years ago, there were no liquid crystal display (LCD) products. Liquid crystals had been known for a long time[1] as organic compounds which exhibit an intermediate liquid phase with long-range molecular order in a range of temperatures between the ordinary isotropic liquid and crystalline solid phases. Several industrial laboratories were working on a variety of liquid crystal electrooptic effects[2] in hopes of developing a practical display device.

Today world-wide LCD production is well over 200 million pieces annually, largely for consumer electronics applications such as digital wristwatches and credit-card calculators which would be inconceivable with any other type of display. The overwhelming majority use the twisted nematic effect[3] (Fig. 1), wherein the application of a few volts suffices to switch the polarization of transmitted light by 90°. The addition of segmented transparent electrodes (Indium Tin Oxide), polarizers and a reflector yields a device which can produce visible patterns by selectively modulating ambient white light.

The LCD achieves high contrast over an acceptable field of view with a power dissipation which is lower by three orders of magnitude than comparable displays which generate light themselves. Most LCDs today are used in battery-operated portable devices for this reason, but economies of batch fabrication rooted in its simple glass-sandwich structure have also made the LCD substantially cheaper than its competitors so it is beginning to find application on cost grounds even where power is not a factor.

Twisted Nematics

Simple Displays. The first important LCD product, after a few false starts, was the 3½-digit wristwatch. By the time customers recognized this happy marriage of the LCD with CMOS electronics, a thoroughly reliable display system was ready. Oblique evaporation of SiO produced stable, repeatable boundary conditions[4] for the liquid crystal layer. A glass-and-metal hermetic package and ac drive waveforms prevented contamination or degradation of the LC material. Elastomeric connectors were pressed into service for gas-tight interconnection between the LCD and its driver IC. After LCDs had driven out LEDs and generated a skyrocketing demand for digital watches, their reliability could be accepted on the basis of customer experience in the field. Recent studies[5] of hermetic LCDs project lifetimes in excess of ten years.

In a simple watch, every individual display segment is connected to its own independent driver. No voltage is applied to unselected segments, while selected segments are turned on as hard as the supply voltage (typically 3V) will allow. Because an unrestricted choice of drive voltage maximizes display performance, this simple "direct-drive" scheme is preferred whenever the number of display segments is not too large. For example, liquid crystal displays comprising complete automobile dashboards[6] now under development require direct addressing to drive them hard enough to turn on fast at −30°C, even with new low-viscosity LC materials.

Calculators, etc. Direct addressing proved too expensive, however, for hand-held calculators. At least two ICs are needed for direct drive of the more than 64 segments in an eight-digit display. Matrix addressing provided a solution by allowing each drive line to control several segments. Connecting the segments of a calculator display into a matrix with three rows as shown in Figure 2 reduced the number of drive lines from 68 to 28, making possible an LCD calculator with only one IC. Today most calculator displays are organized as matrices with three or four rows,

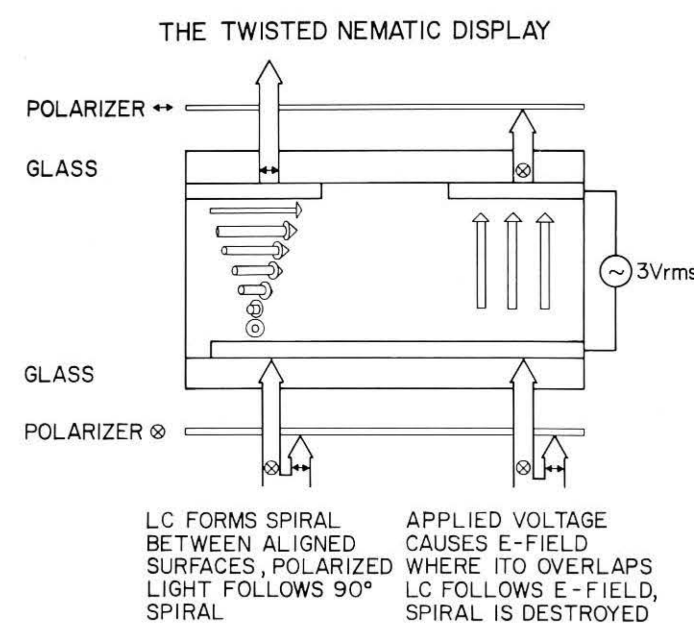

FIG. 1. Principle of operation of twisted nematic LCD.

*Reprinted from "Display Technology Review", Part 1, Electro/81.

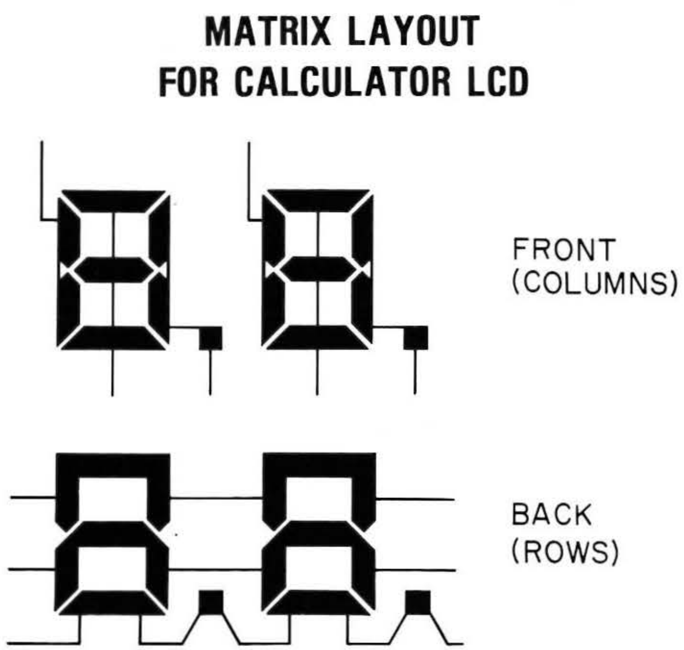

FIG. 2. Patterns of front and rear electrodes for a calculator display addressed as a matrix with three rows.

while complex watch displays may be two-line matrices. The same matrix addressing technology has been applied recently to electronic games, using the fact that the display "segment" at each matrix intersection can have a complex, even pictorial, shape. In one example,[7] each segment depicts one card of a complete gin rummy deck, the red suits being formed by a strip of color-selective polarizer.

Matrix addressing[8] achieves reductions in lead count at the cost of greater demands on the characterstics of the LCD. Typically rows are pulsed cyclically while the information to be displayed is multiplexed onto the columns by synchronously choosing the polarity of column voltages to add to or subtract from the corresponding row pulses. It follows that, unlike direct addressing, the unselected elements in a matrix see a non-zero voltage with rms value $\hat{V}_{off}$. In order for unselected elements to appear OFF, the LCD must have an electrooptic threshold higher than $\hat{V}_{off}$.

It turns out also that the rms voltage $\hat{V}_{on}$ which is seen by a selected element is not independent but is proportional to $\hat{V}_{off}$. Thus, raising $\hat{V}_{on}$ also increases $\hat{V}_{off}$ so a given segment can't be driven too hard without causing spurious turn-on of other segments connected to the same matrix lines. Successful multiplexed operation therefore requires that the LCD be turned ON acceptably by voltages not too far above threshold. Figure 3 shows schematically the kind of electrooptic characteristic needed for multiplexing. The attainable ratio[9] of $\hat{V}_{on}$ to $\hat{V}_{off}$ decreases as the number of rows in the matrix increases, because the dwell time for driving any given row becomes a smaller fraction of the addressing period. Clearly a steeper curve is needed for a matrix with more rows.

Hermetically sealed LCDs for wristwatches did not possess the sharp threshold needed for multiplexing, so a new technology was needed for calculators. Rubbed polymer films were substituted for the evaporated SiO surface treatment. This necessitated a low-temperature plastic seal, whose lack of hermeticity in turn required new chemically stable LC materials.[10] The resulting process not only made LCDs suitable for multiplexing but also was amenable to batch processing and large-area displays. Lifetimes of five years are claimed, temperature-humidity cycling being the toughest stress factor. This reliability appears to be acceptable for most applications since the low-cost plastic package predominates over recently developed hermetic processes[11,12] for the multiplexed LCD.

Complex Matrix Displays. Alphanumeric text in 5 x 7 format can be displayed on an LCD matrix with seven rows

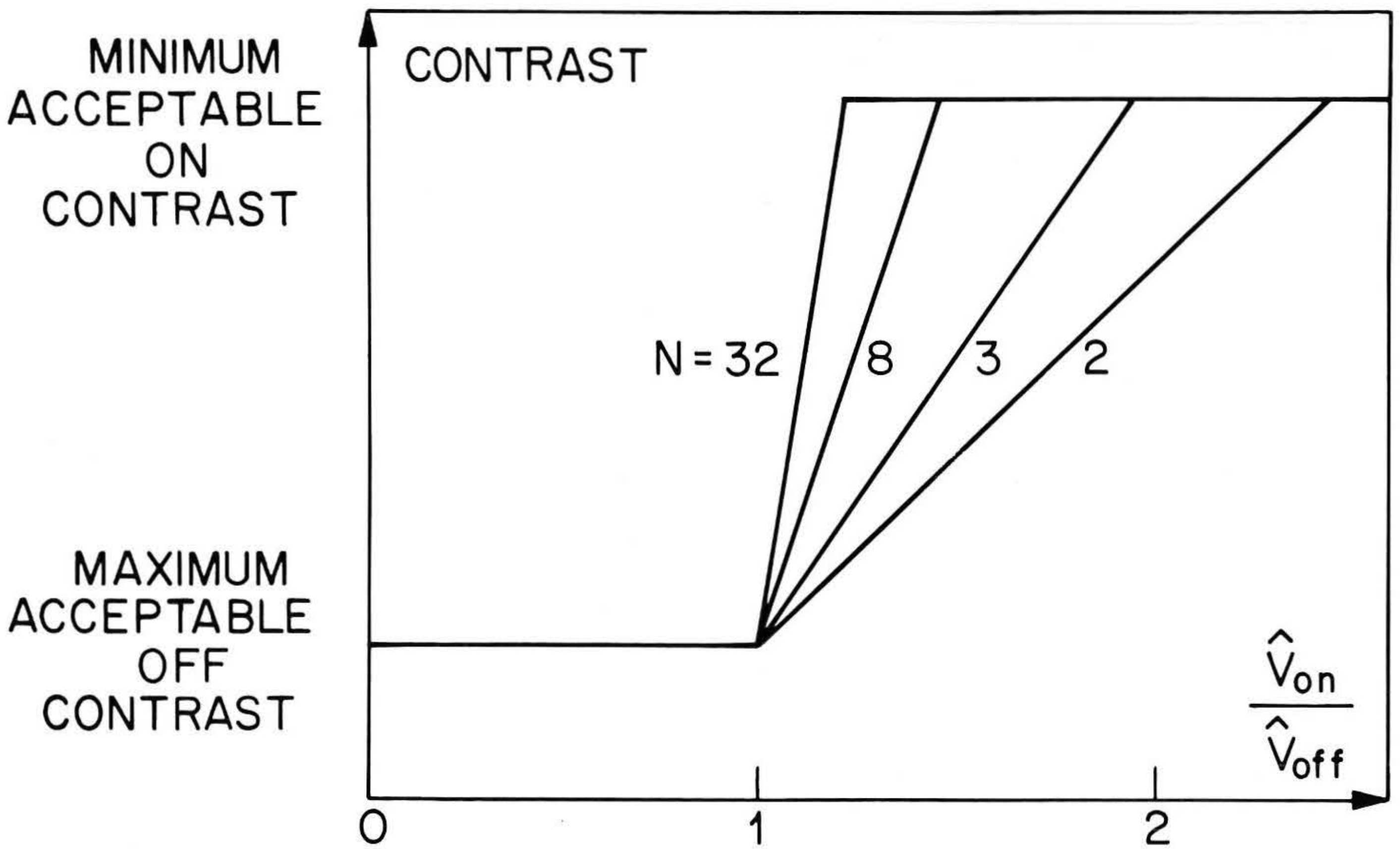

FIG. 3. An LCD with a steeper threshold curve is needed to address a matrix with a larger number N of rows.

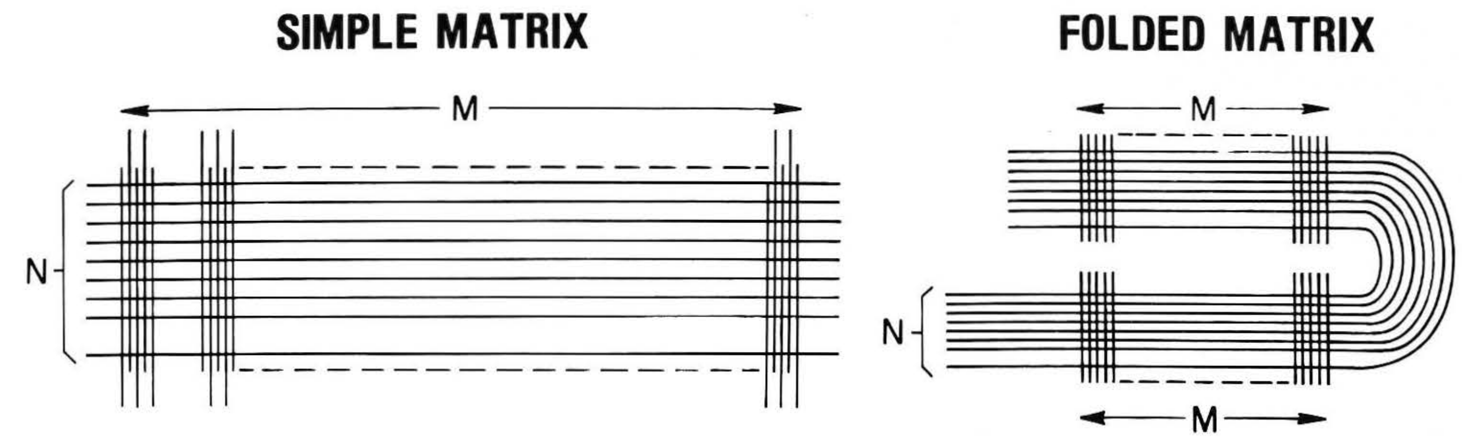

FIG. 4 Simple (a) and folded (b) arrangements for a matrix with N rows.

(eight with a cursor), but the multiplexing requirements are then much more stringent than in calculators. Evolution to such higher levels of multiplexing is a hard fight to bring down manufacturing tolerances while enhancing the intrinsic steepness of the electrooptic response through improved LC mixtures. This is a principal thrust of current LCD research and development, motivated by the substantial opportunities for displays in such emerging microprocessor applications as portable personal computers and inexpensive word processors.

The electrode layout for a single line of characters is particularly simple (Fig. 4a), but the number of drivers and interconnections is appreciable: for 40 characters, M + N = 208. An arrangement for two lines of characters with the same level of multiplexing (N = 8) is shown in Fig. 4b. The connections between rows can be made within the LCD or externally on the printed circuit board. Note that this approach can't be extended to three or more submatrices because there is no simple way to bring out the inner columns.

Both layouts in Fig. 4 require the same number of drivers to display a given total number of characters if N is the same. However the driver count is cut almost in half by doubling N. Alphanumeric modules including LCD and drivers with N = 8 are priced now at about $1/character in large quantity; modules with N = 16 are about 60¢/character. A width of 40 characters appears to be the present limit in production. An LCD with 80 characters in a line was announced,[12] but production has been delayed. The scheme of Fig. 4b has been used with N = 16 to manufacture a display with four lines of 32 characters.

Considerable progress is already apparent toward still larger LCD matrices for graphics. Hitachi has reported [13] a prototype monochrome TV based on an LCD matrix laid out as indicated by Figure 5. This "quad-matrix" method of interconnection allows their 120 x 160 array of picture elements to be addressed as a 30 x 640 matrix to reduce the demands on steepness of the electrooptic response. A field of view of 27.5° is claimed, with 16 gray levels and no visible smear of moving images. Pocket TV can be expected as a product in the near future; even with its high level of multiplexing, it will probably prove acceptable to customers who now buy portable radios with TV sound and no display at all.

Special Tricks. The trade-off between display performance and number of rows in a matrix can be ameliorated or completely circumvented in special cases where the application involves the display of a reduced subset of all possible matrix patterns. One example is the electronic game "Blockbuster"[14] which operates a 16 x 16 LCD matrix with the same performance as a matrix with five rows by taking advantage of the fact that only three rows of bricks and the two rows containing ball and paddle need be activated Another example is the LCD oscilloscope[15] which achieves performance comparable to direct addressing regardless of matrix size for the display of single-valued waveforms where one and only one segment is selected in each column.

Recently developed fabrication techniques are also helping to increase the information capacity of twisted nematic displays. Double-level "metallization", using two superposed ITO electrode patterns isolated by 8000Å SiO_2 on each glass substrate, provides an advantageous implementation of the aforementioned quad-matrix scheme as well as facilitating the display of two fixed messages/pictures in one cell or segmented digits with no gaps.[16] The idea one that two LCDs can display more information than one has led to an LCD "club sandwich" with three pieces of glass enclosing two layers of liquid crystal. By this means one wristwatch[17] switches at the touch of a button from the normal chronometer display in the upper layer to a complete calendar of the month in the lower layer. The middle glass plate is kept thin (≲0.5mm) to prevent a perceptible difference in the depth of the images. The same approach has been used[18] to combine

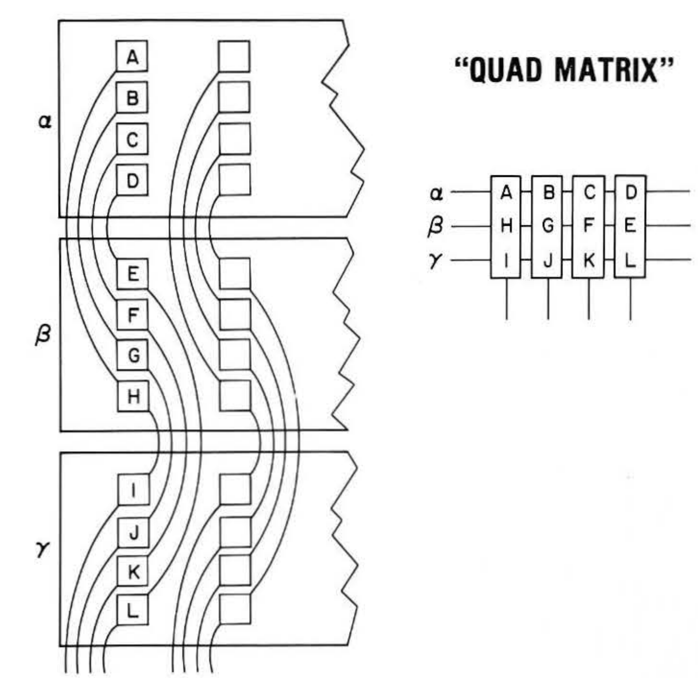

FIG. 5. The NxM picture array (left) is electrically equivalent to the addressing matrix (right) with N/4 rows and 4M columns.

two alphanumeric LCDs, arranged like Fig. 4b and multiplexed with 1/15 duty ratio, into a single unit displaying eight lines of 20 characters.

Some LC materials have a dielectric relaxation at a frequency of a few kilohertz where their dielectric anisotropy changes sign. Hence the LC molecules tend to align parallel to a low-frequency applied electric field but perpendicular to a high-frequency field. A high-frequency bias signal will thus inhibit turn-on of a twisted nematic, causing an effective increase in the threshold for low-frequency drive.[19] Since the slope of the electrooptic characteristic is unchanged by this shift to higher voltage, the ratio $\hat{v}_{on}/\hat{v}_{off}$ decreases to allow multiplexing with more rows in the matrix. However the LCD is essentially a capacitive load so power dissipation, proportional to frequency times voltage squared, is greatly increased by the high-frequency bias. Evidently dual-frequency addressing can improve multiplexing at the forfeit of low power consumption. In a recent demonstration,[20] a dual-frequency display with eight lines of 64 characters performed at 1/56 duty ratio with contrast, field of view and response times comparable to an ordinary LCD with only a single line of characters, but power consumption was more than 1W.

The twisted nematic LCD is now well understood and we can see its limitations.[21] Evolutionary advances can be expected, but we must look elsewhere for radical improvements in LCD appearance or matrix addressing.

Guest-Host Displays. The appearance of the twisted nematic display is less than ideal. It is usable only within a restricted angular field of view and, because sheet polarizers function by absorbing all light except that of the proper polarization, it looks dark in comparison to the surroundings. Guest-host displays[22] may be the answer (Fig. 6). When a pleochroic dye, which absorbs only light with a particular polarization relative to its molecular axis, is dissolved in a liquid crystal host, the dye tends to be aligned by the host. The intrinsic spiral order of a cholesteric liquid crystal assures that any polarization of incoming light finds dye molecules which are properly oriented to absorb it.[23] No polarizer is needed. An applied electric field which overpowers the cholesteric order and forces the molecules to stand up parallel to the direction of light propagation effectively switches off the dye absorption. The resulting display has constant contrast at all viewing angles and better brightness than the twisted nematic.

Several dyes which align well are known, and black mixtures with high order parameter have been reported,[24] but the search for an optimum guest-host mixture continues. Multiplexing of guest-host displays is even more difficult than the twisted nematic, a two-row matrix being just feasible at present.[25] The dye display described here has negative contrast, i.e. light characters on a dark background, and drive voltages are somewhat higher than twisted nematics. Several schemes have been proposed for positive contrast.[26]

An interesting alternative for a guest-host display uses the "club-sandwich" cell structure.[27] Instead of a cholesteric host, the dye is dissolved in a nematic LC so the molecules align uniformly in a single direction rather than in a spiral. Then each layer acts only on light polarized parallel to its alignment direction. Two orthogonally aligned layers displaying identical patterns are superposed to modulate all the incident unpolarized light. Nematics with large positive dielectric anistropy are available for low-voltage operation, or materials with negative anisotropy and homeotropic alignment can be used for positive contrast. Improved multiplexing is also claimed.

Active—Substrate Addressing. Matrix addressing can be enhanced by separating the functions of display and

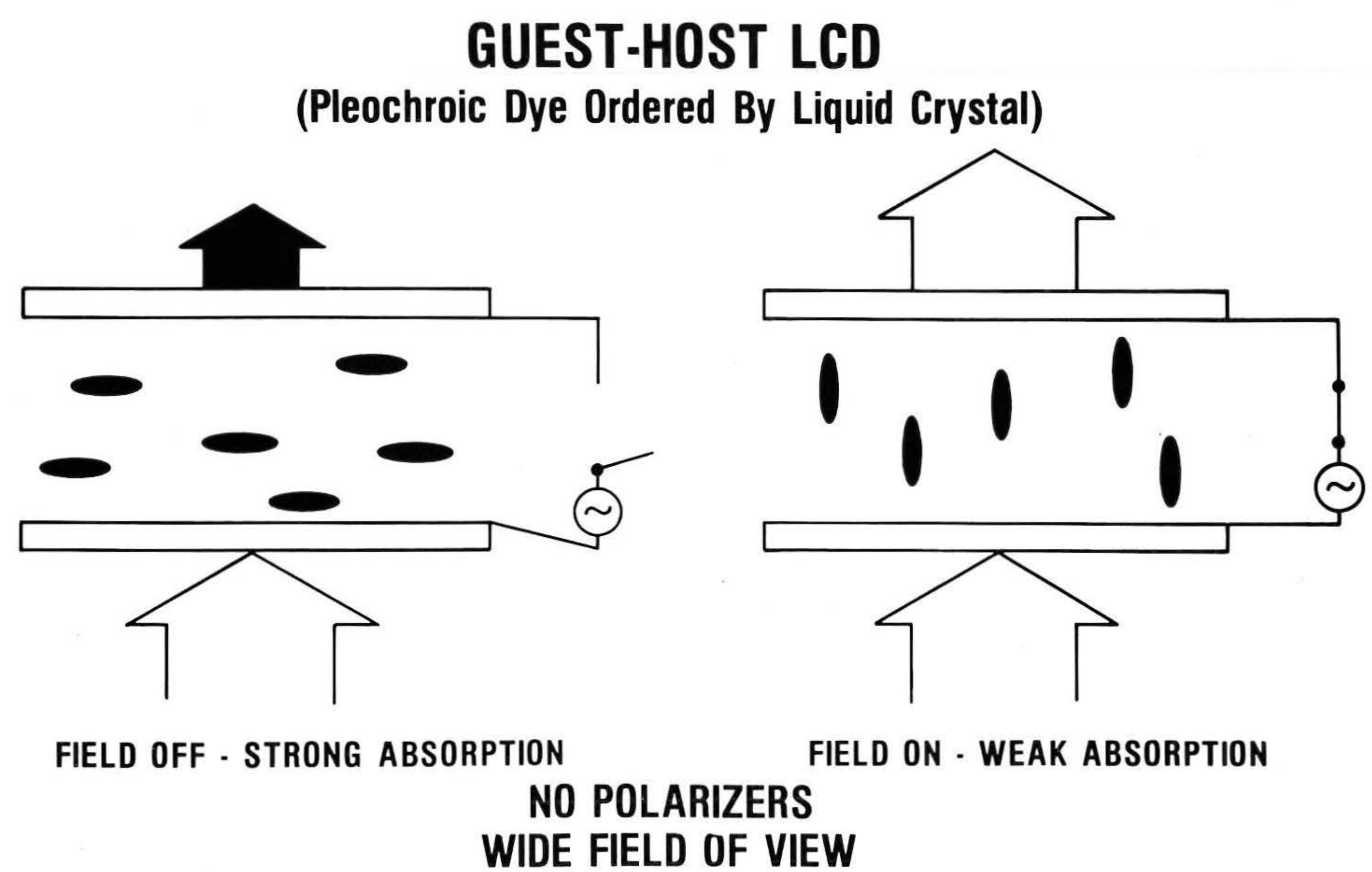

FIG. 6. The Guest-Host display is dark (colored) in the off state (left), turns bright (clear) with an electric field applied.

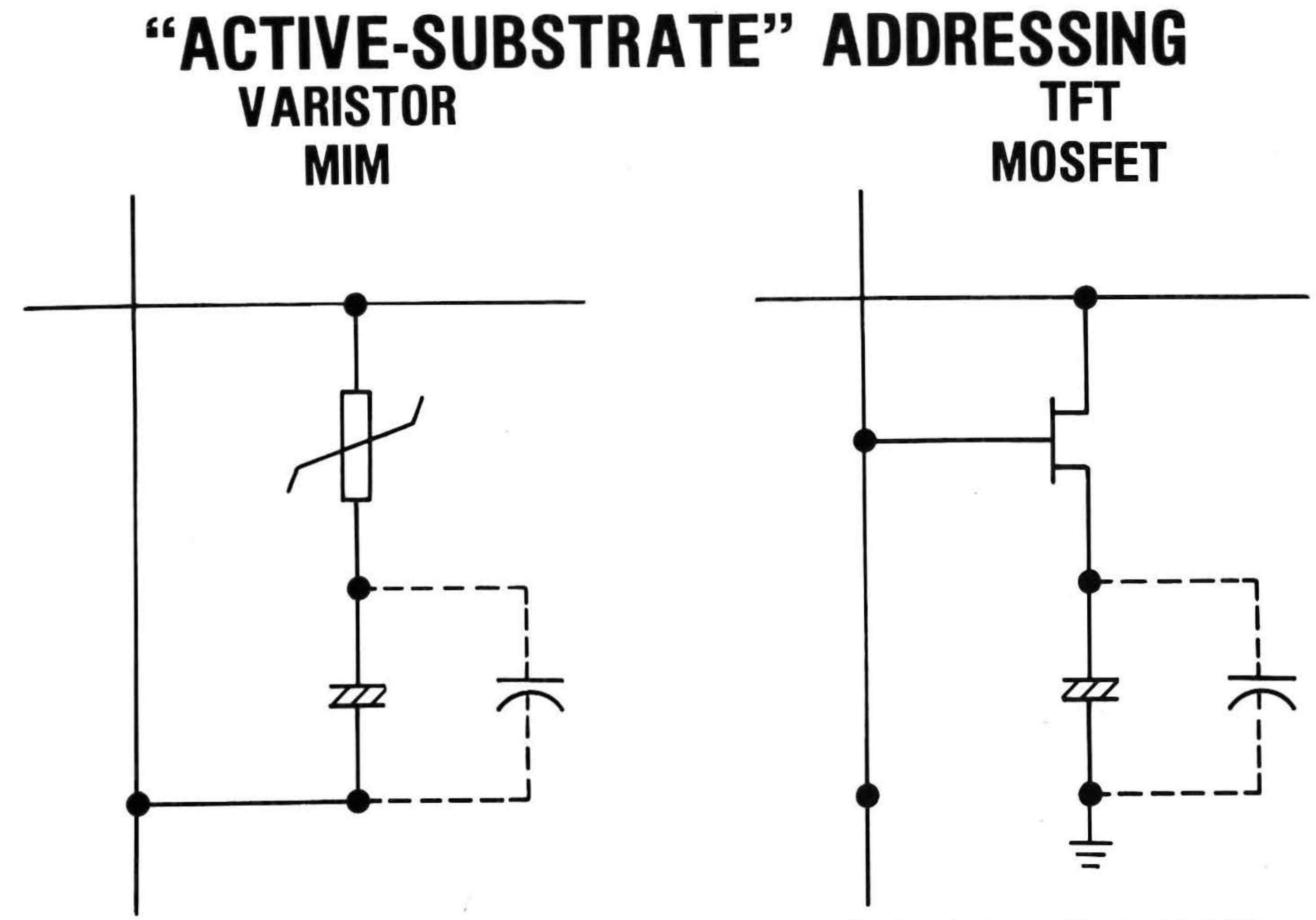

FIG. 7. A two-terminal threshold device (left) or a three-terminal gate in series with every display element enhances addressing. The storage capacitor is needed unless $C_{switch} << C_{LCD}$.

matrix selection. If the LCD nonlinearity is insufficient for multiplexing, then that task can be taken over by some other electrical component placed in series with each LCD.[28] Both two-terminal and three-terminal devices are under active consideration (Fig. 7)

Perhaps the most obvious approach is to put LC material and an electroded coverglass onto a processed silicon wafer bearing an appropraite matrix of MOS transistors. The opaque substrate precludes the twisted nematic effect with two polarizers,[29] so dynamic scattering has been employed.[30] The cholesteric guest-host effect is also applicable. A two-inch dynamic scattering TV display with 220x240 elements were also integrated on the 41x51 mm² "chip" to reduce the number of interconnections. In this approach, circuit complexity/density is lower than in typical ICs but the requirement of 100% yield across the whole wafer is severe. Display size and cost are limited by wafer size and cost.

The size restriction is relaxed with thin-film transistors on glass. Evaporated CdSe TFTs have been demonstrated in a six-inch square display.[32] Yield problems remain and TFT reliability is questionable, so recent research[33] has concentrated on the TFT itself. Laser-annealed poly-silicon is a promising alternative to CdSe.[34]

Two-terminal devices for display addressing are being pursued in the belief that a simpler device can be fabricated with higher yield. One contender is the ZnO ceramic varistor.[35] A guest-host display with 70x175 elements at the resolution of 36 lpi has been built on a 2"x5" ceramic substrate. Conduction voltage for the individual varistors varies ± 10% around 63V, so element-to-element nonuniformity is a problem. The varistor approach is limited by present fabrication techniques to moderate resolution. Another two-terminal nonlinear element which has been applied to LCD addressing is the Metal-Insulator-Metal (MIM) device[36] which operates by Poole-Frenkel conduction in a thin layer of anodically grown Ta_2O_5. A twisted nematic LCD incorporating an array of MIMs on glass has demonstrated 100-line multiplexing at voltage levels compatible with CMOS. Temperature sensitivity may be a problem.

Storage Effects. Liquid crystal electrooptic effects with intrinsic memory present another path around the obstacles to matrix addressing. Storage effects need not be refreshed, so the duty ratio constraints of refreshed displays are removed. As long as information once written into a given line remains undisturbed as other lines are written, the total number of lines is unrestricted. The practical limit is often determined by the writing speed.

When a cholesteric spiral has been unwound by an electric field, it will return to a clear state or to a scattering texture depending on whether the field is turned off abruptly or slowly.[37] The scattering state is metastable with a persistence of more than a week. Panels using this storage effect have been made as large as 306x576 electrodes in an effective area of 122x230mm². Similar displays with 212x272 elements at a pitch of 0.33mm have been used recently for Teletext images.[38] Research is also proceeding on non-scattering memory effects visualized by pleochroic dyes in which controlled boundary conditions interact with LC material parameters to yield configurational bistability.[39]

Smectic liquid crystals are more highly ordered than cholesterics. Disturbances tend to get locked in, so long-term memory is easily obtained, but more energy is needed to create a disturbance. A prototype TV has been reported[40] which uses a smectic A liquid crystal to display 240x240 picture elements at full TV rate. Each row of the matrix in turn is resistively heated above the transition to the nematic phase. There the LC is responsive to low-voltage signals on the columns. Elements which are aligned by the electric field as they cool back down into the smectic phase are locked into a clear texture; elements with no applied field are disordered and cool into a strongly scattering texture. For high speed and low power, the display is only 9.6 x 9.6mm^2 and is used in projection.

Conclusion. For the purposes of this paper, progress in LCD technology has been viewed as a quest for larger information capacity in matrix addressing. Beam addressed LCDs[41] were not considered, nor were other effects[42] with narrow application discussed. Topics were chosen which appear to relate to major LCD markets, now and in the near future. Other trends worthy of mention include the growth in active area of LCD cells, the increasing availability of color through advances in color-selective polarizers and dyes, and the use of bright lamps behind the LCD not only for visibility in the dark but also for visual impact.

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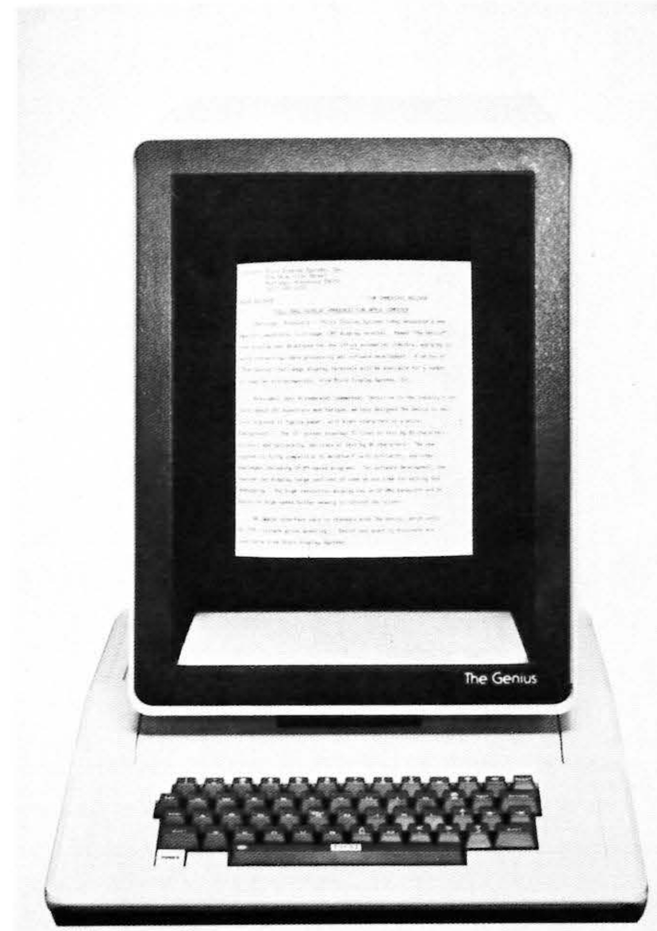
SID CALENDAR
DECEMBER 1981 to JULY 1982

1981		
December	1	Honors and Awards Nominations Deadline (Submit to I. Reingold, ERADCOM, DELET-B, Fort Monmouth, New Jersey 07703)
	7	Abstract Deadline for SID 1982 International Symposium (Submit to Leonard Klein, Palisades Institute, 201 Varick St. New York, NY. 10014)
	15	Nominations for National Officers and Regional Directors Due. (Submit to B. J. Lechner, Nominations Committee Chairman)
	15	Bylaws Recommendations Due
1982		
January	4	Proceedings, Volume 22, No. 4, 1981, Mailed
	20	Quarterly Chapter Rebates Mailed
	20-21	SID 1982 International Symposium Program Committee Meeting, Town & Country Hotel, San Diego
	22	National Board Meeting, Town & Country Hotel, San Diego, CA
February	15	National Ballot Mailed
March	5	Post-Deadline Papers for SID 1982 International Symposium
April	1	Proceedings, Volume 23, No. 1, 1982, Mailed
	12	National Ballot Return Deadline
	20	Quarterly Chapter Rebates Mailed
May	9	Executive Committee Meeting
	10	National Board Meeting, San Diego, CA.
	10-14	SID 1982 International Symposium, Town and Country Hotel, San Diego, CA.
July	1	Proceedings, Volume 23, No. 2, 1982, Mailed
	20	Quarterly Chapter Rebates Mailed

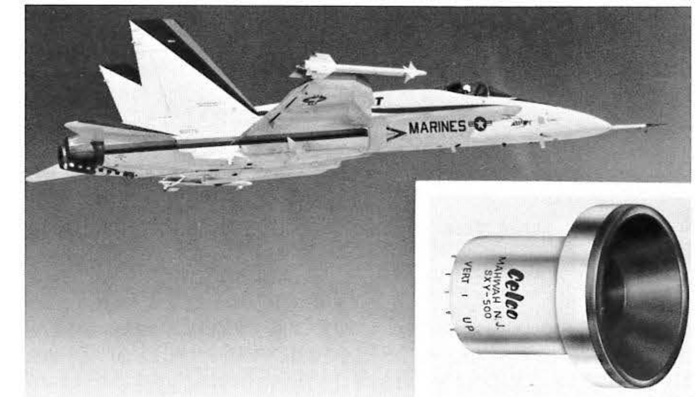
OTHER EVENTS

1982		
January	12-14	DPMA Conference on Information Systems Productivity, Atlanta, GA
	21-26	National Audio-Visiual Association Convention, Anaheim, CA
April	4-5	Office Systems Research Conference, San Francisco
	5-7	Office Automation Conference, San Francisco
	22-25	New York Computer Show & Office Equipment Exposition, Nassau Coliseum, Uniondale, Long Island, NY



Full-page display announced for Apple™ Computer. Micro Display Systems, Hastings, MN, recently announced this new Apple-compatible, full-page CRT display terminal developed for the office automation industry, applying to word processing, data processing and software development. The 15-inch screen displays 57 lines of test by 80 characters across, and optionally, 66 lines by 80. The new terminal is fully compatible with WordStar™ (with SoftCard™), and other packages including CP/M based programs. For software development, the system can display large sections of code at one time for editing and debugging. The high-resolution display has an 87 MHz bandwidth and 6K bytes of high-speed buffer memory to refresh the screen.

Three Rivers Computer Corporation's PERQ™ Systems includes main computer, display station and keyboard. Developed in Pittsburgh, PA, it will also be sold by International Computers, Ltd., Britain.



Super-sensitive Cockpit Yoke for HUD, Fire Control, Guidance and other Airborne CRT Displays

Constantine Engineering Laboratories Company (CELCO) of Mahwah, NJ and Upland, CA, recently announced the latest design in super-sensitivity for airborne CRT displays, the SXY-500 Deflection Yoke.

The CELCO SXY-500 is the most sensitive, lightweight CRT Deflection Yoke ever produced for airborne displays, and represents a new generation of high-speed, high resolution yokes designed for 7/8 inch neck CRTs, says the maker. It is available with 50° to 70° deflection angle, and weight as low as 6 ounces.

The New Parrot Family of systems from Shasta General Systems, Sunnyvale, CA — Xerox 820 hardware is combined with proprietary Shasta word and data processing software, enhanced memory capacities, and a choice of peripherals to create a family of specialized systems ranging from easy-to-use entry-level systems to fully featured business machines.

GREETINGS TO NEW SID MEMBERS!

Each month you'll find a roster of new SID Members, listed by Chapters with the Chapters in alphabetical order. If your name — or a friend's — should have been listed and was inadvertently omitted, please let June Friend or your Editor know immediately. We'll make amends in the next issue. See the front cover for your choice of addresses to which to send vital data.

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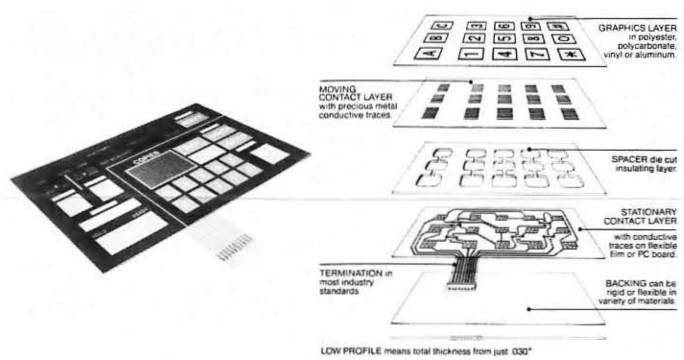
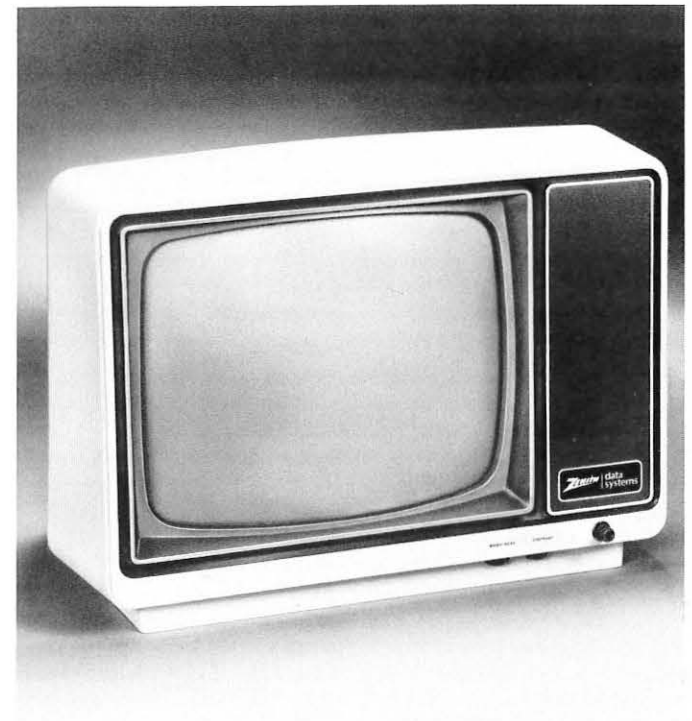


New Touch Panel Custom Manufactured by Cherry

New touch panel membrane keyboards from Cherry Electrical Products Corp., Waukegan, IL, are said to offer state-of-the-art technology and custom designed versatility suited for many electronic, appliance and manufacturing applications. Sealed construction and durable design assure reliability and long life in home and office areas as well as hostile industrial environments, says the maker.

Whether the application is home appliances or machine tool controls, medical equipment or automotive products, Cherry is geared to design a touch panel to meet any specification. Any key arrangement, legend, encoded or non-encoded switches, special housings, backlighting, additional electronic components and interconnected display systems are all available.

Typical touch panel switch design consists of five sandwiched layers: a graphics layer with key legends printed and/or embossed; a shorting pad with copper or precious metal trances; a spacer; a circuit layer; and a rigid or flexible backing. Termination may be edge card, friction fit or crimp connectors, solder pins, wrap pins or flex cable. Total keyboard thickness is normally .030 inches or more. Additional layers may be added for special applications.



A monochrome video monitor for use with microcomputers has been introduced by Zenith Data Systems. The low-cost monitor has a green screen, is housed in a tan plastic cabinet, and has a switch to select either 40- or 80-character display.

Video Monitor For Microcomputers Introduced by Zenith Data Systems

A low-cost 12-inch video monitor for microcomputers was recently introduced by Zenith Data Systems, Glenview, IL.

The new ZVM-121 monitor has a green screen and a switch to select either 40- or 80-character display. Housed in an orchard brown cabinet, the new monitor is compatible in styling, size and color with the Apple II and Apple III microcomputers. It is also small enough to sit on top of most other microcomputers without built-in video monitors. The ZVM-121 displays an 8 x 10 character matrix and up to 24 lines of information.

Exterior controls include power, black level, contrast, horizontal and vertical adjustment, and vertical size adjustment. A switch also permits selection of 40- or 80-character display.

The new video monitor has a bandwidth greater than 12.5 MHz and a rise time of about 60 ns, improving the definition of its characters. The DC-coupled video circuits used by the ZVM-121 are said to permit the display to retain its brightness when the screen is full of information. The refresh rate is 60 Hz at 60 Hz line frequency. Power dissipation is about 26 W at 120 V.

Dorler-Mosley Effect Technical Data

The Dorler-Mosley saturated transistor effect developed by Jack Dorler and Joseph Mosley, engineers at the IBM General Technology Division, East Fishkill, NY, yields circuits with very attractive picojoule ratings, and gives computer designers added flexibility. As silicon semiconductor process technology matures, improvements in circuit design are increasingly important. The Dorler-Mosley Effect is still experimental, but it may find pervasive use in both logic and array designs, according to IBM. The effect incorporates the following features:

1. Yields picojoule rating of 0.4 when implemented in experimental NOR logic circuit. This is a lower rating than with any bipolar logic used in the industry.
2. Improves picojoule rating in array decode circuits by approximately 45 percent.
3. Speeds up memory delay at a reduced power level allowing select current to be approximately five times greater than read current. This quickly discharges the capacitances associated with the array.
4. Enables development of novel large scale integrated circuits because high values of capacitance are achieved without sacrificing large amounts of area.
5. Dissipates high power only during transitions, while maintaining only enough DC power to assure noise margins.
6. Can be used in both current mode and voltage mode circuits.
7. Uses capacitive AC coupling to achieve attractive picojoule ratings.
8. Can be implemented as an AC pull-up or AC pull-down technique. In the former, the emitter follower drive is allowed to equal approximately the supply voltage. In the latter, negligible power is dissipated in the "off" state. During the off-on-off cycle, the current demanded by the output transistor goes from approximately zero to a very high value of transient current and back to approximately zero.

Saturated Transistor: Jack Dorler, senior technical staff member at IBM's East Fishkill Facility in New York, holds a wafer containing results of the Dorler-Mosley Saturated Transistor Effect experiment. The insert on the upper left is a magnification (about 500X) of the same wafer, showing a capacitor (A) and a pair of transistors (B). Saturating a transistor eliminates the need for the capacitor, giving circuit designers a dramatic size advantage.

Piiceon Introduces the PM 2010 Featuring New Ansi Standard Functions

A smart terminal said to feature the most complete set of ANSI standard terminal control functions available in the industry is now available from Piiceon, Inc., San Jose, CA.

Designated the PM 2010, it is claimed as the industry's first smart terminal to combine the new ANSI standard (X3.64-1979) with a powerful 8086 microcomputer, 32K RAM expandable to 256K RAM, and a full page, 66 by 80 character video display.

"This powerful combination of features on the PM 2010 allows users to define their own terminal characteristics," according to John Cosley, vice president. "For example, by using the down load and go function, users can down load programs from the computer to change the definitions of the keyboard characters.

"This capability will allow both systems houses and users to optimize the characteristics of the terminal to fit a virtually unlimited number of different applications," Cosley says.

The PM 2010 is plug compatible with any computer supporting standard ASCII terminals, but is capable of going well beyond this via the new ANSI standard. This new standard, along with other PM 2010 features, enables the terminal to pre-process data within the terminal that normally would need to be processed by the computer.

By pre-processing this data, the PM 2010 off loads work from the computer and helps minimize the transfer of data between the terminal and the computer. Some of the operations on data that are implemented by the terminal include: down load and go, form filling and transfer, area qualifiers, block mode transmissions, multi-page, and cursor controls with associated numeric parameters. Support for application program commands, operating system commands and privacy messages is also included.

Piiceon's PM 2010 combines implementation of ANSI standard terminal control functions with a 66-by-80 character video display, a 16-bit microprocessor, 32K RAM expandable to 256K, and 8K bytes EPROM.

The PM 2010 combines the 8086 microprocessor with 32K bytes of RAM (optionally expandable to 256K RAM) and 8K bytes of EPROM on a single board. The terminal has two RS-232C ports and a parallel printer port. Ten transmission rates between 75 and 19.2K baud are switch or software selectable.

The terminal's full page video display utilizes a 7-by-9 dot matrix in a 9-by-15 field for attractive, easy-to-read characters. Any combination of 128 characters, including upper and lower case with descenders, can be displayed in high or low intensity with blinking, reverse, blank and underline capability. The 107 key detachable keyboard consists of a full alpha-numeric set, with N-key roll over. The keyboard also include eight function keys, a numeric key pad and various dedicated keys.

Deaf Utilize Electronic Mail — The GTE Telenet Telemail™ service introduced to reduce costs and improve communications in the business world has been adapted for use by the deaf. Called Deafnet, the system has been widely praised by deaf persons who participated in a three-year test. Alfred Marotta (seated) demonstrates how the system works as James Emery and Mimi LaPlante (right) look on. Pointing to the information displayed on the terminal is Mary Robinson, Executive Director, Deaf Communications Institute Inc., Framingham, MA., which has launched a drive to expand the system nationwide during 1981 — the International Year of Disabled Persons.

Visual Technology Announces Visual 300 Terminal

Visual Technology Incorporated, Tewksbury, MA has recently announced the VISUAL 300, a microprocessor based video display terminal. This new addition to the Visual line is said to combine an extensive command set, field proven hardware and a host of human design considerations at a cost-effective price.

The VISUAL 300's command set complies with the ANSI x3.64 standard for display terminals and is well suited for a variety of applications. This unit acts as a simple conversational TTY replacement, a multi-paged text editing terminal, or buffered editing terminal.

Some features of the VISUAL 300 are: block and character transmission; 12 user programmable non-volatile function keys each capable of storing 32 codes; blink, underline, reverse, bold and blank video attributes requiring no display space; up to 8 pages of display memory; block graphics and line drawing character set; split screen; full editing; programmable non-volatile columnar tabbing, and forward, backward, and autofield tabbing.

Like all Visual terminals, the VISUAL 300 has a heavy emphasis on ergonomic features including a set-up mode which eliminates all cumbersome miniature switches. Terminal parameters are presented on the screen in an easy-to-read "menu-style" format. The user may then select any set of paramaters via the keyboard. Once the parameters are selected they may be stored in a non-volatile memory. This method of configuring the VISUAL 300 allows the user to determine the power-up state of over 60 different terminal parameters, from Line/Local to sophisticated transmission and editing modes.

Other design features include: 12" or 14" non-glare screen in either green or white phospor; high density 7x9 dot matrix characters; 7x11 on lower case; 25th non-glare keycaps; audible keyclick; 2-speed smooth scrolling and tilt screen.

Nominations Requested For AFIPS Officers

The AFIPS Nominating Committee is now accepting the names of interested candidates for officers for the 1982-1983 fiscal year which begins on July 1, 1982. Nominations should be submitted by January 22, 1982.

The officer positions to be filled are President, Vice-President, Treasurer, and Secretary. Elected persons will serve for one year and can be renominated for additional years.

The Nominating Committee will consider all current and past (at least six years) AFIPS and NCC Directors, AFIPS and NCC Committee Chairmen, and all society national or international officers who have actively participated in AFIPS activities who meet qualifications contained in the constitution and bylaws.

Persons interested should submit information which should include: position they are being nominated for; summary of the past six years of AFIPS, NCC or society experience; education background; current employment; a brief statement as to why they are interested in the particular office; and a statement of objectives they might have for the organization. For further information contact the AFIPS Nominating Committee Chairman:

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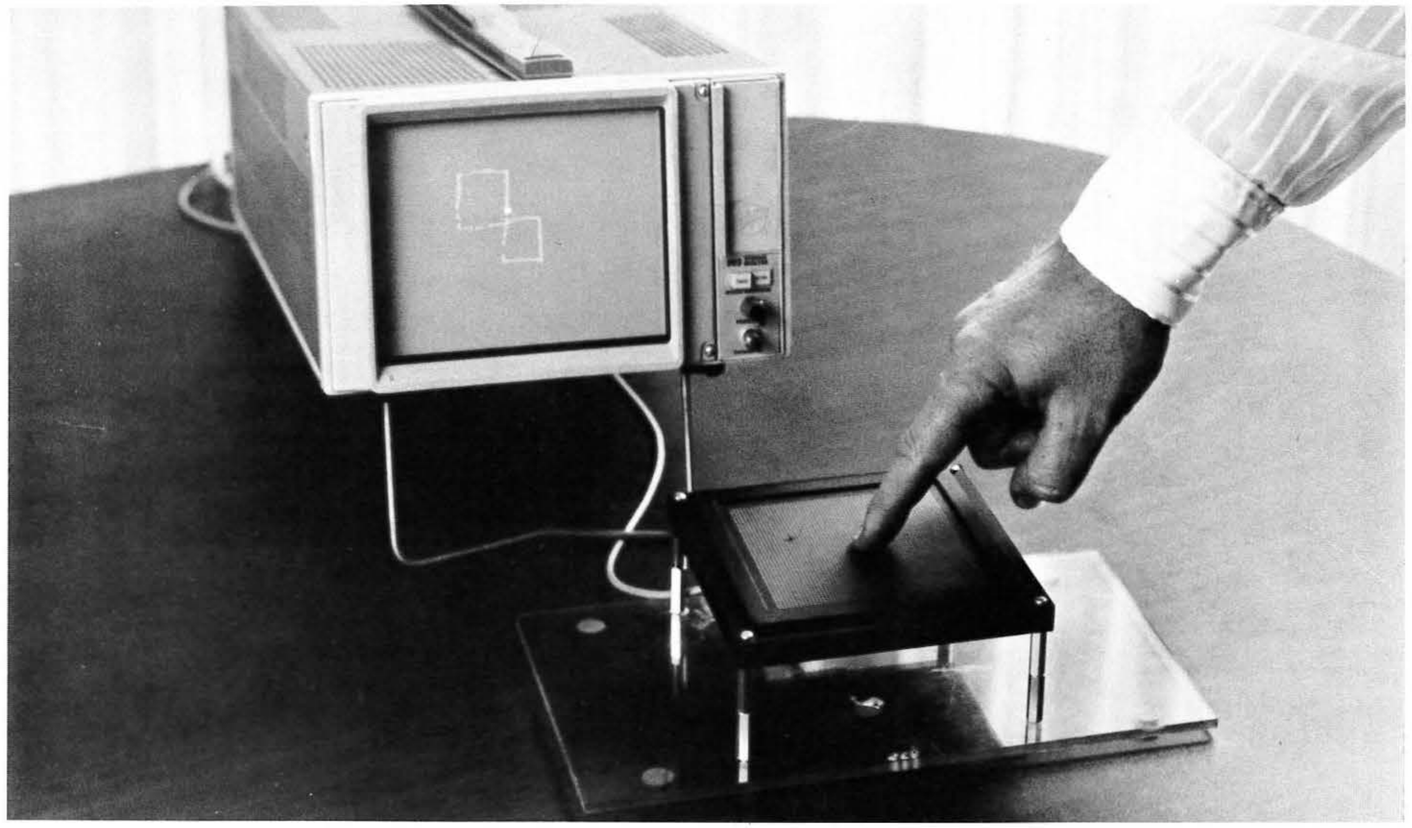
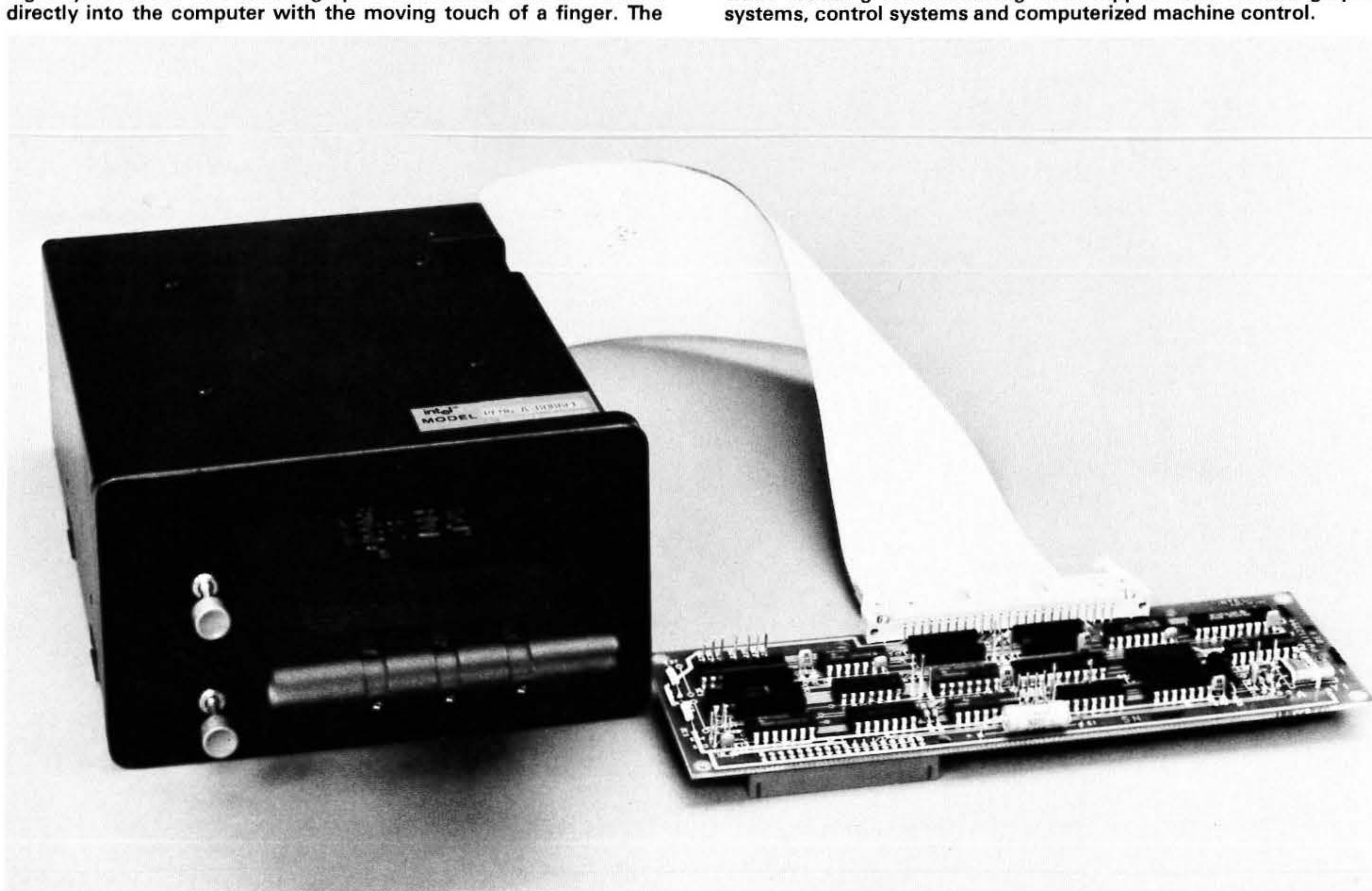
LASER OPTICS — A fiber-optic cable is used like a tiny flashlight to inspect the optics that form a sighting and laser path for the commander's sight in the U.S. Army's M60A3 main battle tank. Precision assembler Olivia Cannon checks the device which is part of the laser tank fire control system now in high-rate productions at Hughes Aircraft Company's Electro-Optical and Data Systems Group, El Segundo, CA.



Finger painting — Simply by drawing a finger across the surface of the new TouchGraphic™ x-y solid-state controller, made by Tasa, Inc., Santa Clara, CA, one can "draw" lines or patterns that are already digitally encoded. This means graphic information can be entered directly into the computer with the moving touch of a finger. The TouchGraphic controls are immune to triggering by external radiation, heat or electrical interference. This high-speed, real-time control is solid-state and is said to improve reliability and control life expectancy while reducing manufacturing cost. Applications include graphic systems, control systems and computerized machine control.



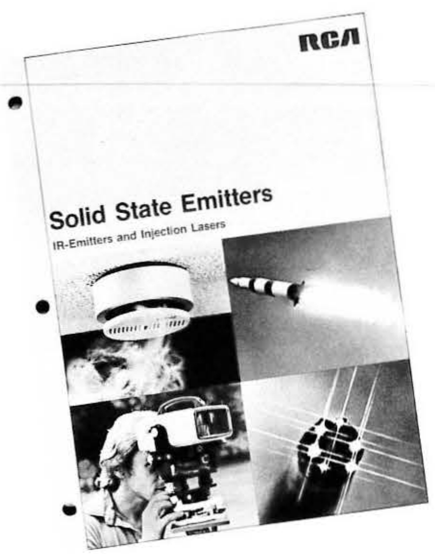
Plug-A-Bubble System cassette made by Intel Corp., Sunnyvale, CA, has 128K bytes of memory and plugs into a holder which is housed in a chassis. The entire system can fit into the same space as a 5¼-inch (13.33 cm) minifloppy system. Cabling runs from the chassis to the multimodule interface board, simplifying design and installtion.

New CELCO Dual-Axis Ramp Generator

A new model RG-116 ramp generator made by CELCO, Mahwah, NJ, provides 0.05% linearity in ramp waveforms with the operational flexibility in raster applications of a dual channel format.

The RG-116 is said to feature smooth control of ramp signal amplitude, sweep period, sweep duration, and dc bias level for each channel. Variable duty cycle sweep time is 10% to 90% of ramp period. The instrument provides broad time base coverage with a 4-decade, 4-position switch and optional range multipliers. Triggering versatility results from switch selectable trigger polarity and leading or trailing edge seleciton. Ramp output signal periods are from 10 s to 100 ms (to 10 seconds optional).

Application include use as a signal source in high resolution CRT and laser scanning systems, as a general purpose sawtooth signal source for laboratory and instrument use, and in CRT evaluation.



RCA Issues Product Guide on Solid State Emitters

A 24-page product guide providing tabulated data and outline configurations of its solid state emitters is available from RCA Electro-Optics and Devices, Lancaster, PA. Included are the following types of IR emitters and injection lasers: infrared emitting diodes, pulse and CW operated injection lasers, stacked diode lasers, and laser systems.

The product guide, SSE-100, features an applications section depicting schematics of typical drive circuits for IR emitting diodes and injection lasers. Selection guides are also included.

Datamedia Introduces a 132-Column Smart Terminal With ANSI Compatibility

Datamedia Corp., Pennsauken, NJ, recently introduced a 132-column buffered terminal that is said to incorporate advanced display, editing and ergonomic features.

Called the Excel 62, the new 12-inch CRT terminal features an 80- or 132-column display with a full 24 lines, block mode transmission, line and character insert and delete, protected fields, extensive visual highlighting plus double-wide and double-high/wide characters, smooth scrolling, and split screen/regional scrolling.

Frank Zelis, the company's vice president of marketing, explained that the Excel 62 and 64 with their smart, standalone functions are targeted at a wide range of data processing applications.

"The new Excel 60 series is designed to offer maximum flexibility and complete operator comfort at a competitive price, "Zelis states. "The terminals are geared to users who need form fill-in formats for such applications as sales, order entry, purchasing, invoicing, etc. The Excel terminal allows the form itself to be protected while the data to be entered remains unprotected. The operator can input the data, edit and verify it for completeness and then transmit the 'entire block' to the host processor.

"The 132-column display capability of the Excel 60 series allows users to view wider screen formats than are available today on most other buffered terminals. Coupling this transmission features, the Excel 60 series offers data processing users a powerful data entry tool."

The new Excel terminals feature complete ergonomic design that includes non-glare, tiltable screens with detachable keyboard and separate numeric pads all packaged in a stylized enclosure. These terminals contain built-in self-diagnostics and "works in a drawer" logic boards, states Zelis.

The terminals contain built-in self-diagnostics and "works in a drawer" logic boards.

The terminals are ANSI x3.64 compatible to facilitate their use on a large variety of computer systems. They directly compete with products like the DEC VT131/132.

GM Reduces CAD/CAM Time

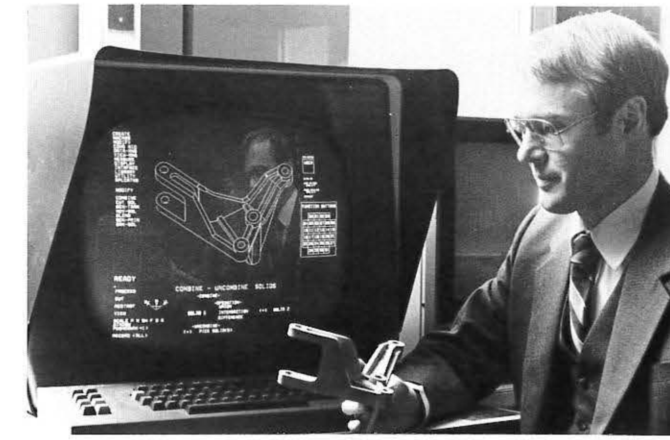
A computer graphics system that may telescope the time needed to design many GM automotive components, as well as tool and die pieces, is being developed by Dr. John W. Boyse of the General Motors Research Laboratories and a team of engineers from the GM Technical Center, Warren, MI. This computer graphics system provides a method of designing solid mechanical parts by using simple rules automatically to combine elementary geometric solids such as cones, cylinders, and spheres.

The software is called GMSOLID for Geometric Modeling of Solids and is the culmination of a research project Boyse initiated in 1975. In 1978, engineers from GM's manufacturing development teamed with Boyse to develop the interactive aspects of the graphics system. And in 1981, GM's engineering staff assigned a team of seven engineers to the project to accelerate the development effort.

"Our graphics system provides a complete, three-dimensional computer model of a mechanical part. This is a significant technical advance over the current system that represents surfaces with a network of lines like a wire mesh." Dr. Boyse explains.

"Current computer graphics techniques that handle lines and surfaces have proved useful for accelerating sheet metal designs, such as automobile body panels. But, mathematically, the design is represented in the computer in only two dimensions. The surfaces may curve and have a three-dimensional look but, like a Hollywood set, this is only an attractive front and there's nothing behind them.

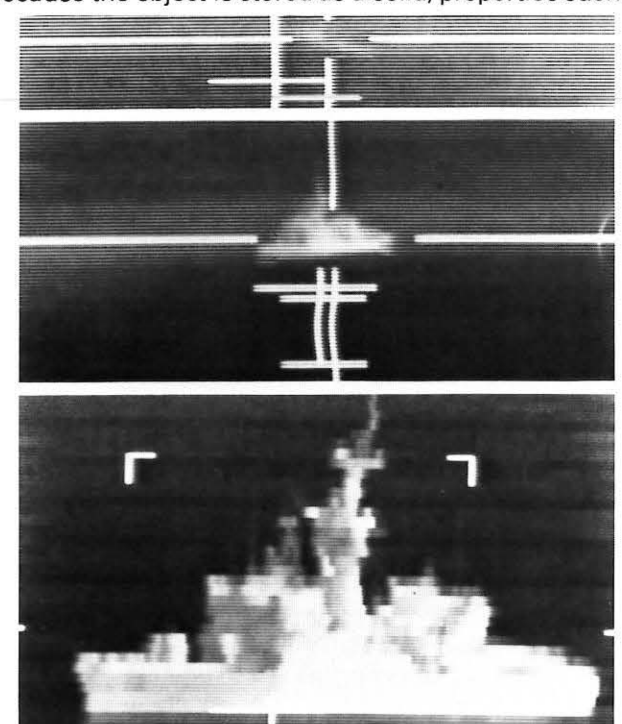
"GMSOLID, however, provides for a complete three-dimensional description of the solid object to be stored in the computer memory," Dr. Boyse says, "And, this is exactly what we need to accelerate the design and manufacture of chassis, powertrain and component parts. Because the object is stored as a solid, properties such as volume, weight and moments of inertia can be calculated; and hidden line removal when displaying pictures of the part is automatic."



Dr. John Boyse of the Computer Science Department at the GM Research Laboratories holds a generator mounting bracket in front of a GMSOLID display of the same part.

The programming was designed for maximum ease of use by the design engineer, according to Dr. Boyse "We paid particular attention to the human factor aspects of the software. Working with a light pen, an engineer chooses from a menu on the bottom portion of screen showing the 'primitive' solids he needs and the combining operation he wants to use to shape them.

"Outside of GMSOLID, no other solid-modeling system has an interactive graphics capability — an essential element to qualify the system as a practical design tool," Dr. Boyse says. "One of the key technical advances behind the interactive capability is the speed of the display response. GMSOLID's pictures are built up in seconds compared to the minutes needed for some other systems."



Maverick Imagery — This series of three photographs shows the images produced on a cockpit-type display by an infrared seeker for the AGM-65F Maverick missile during captive flight tests. In the top segment, the seeker "locks on" to the guided missile destroyer U.S.S Bagley at a longer range than the flight crew's visual range. In the middle, the image is shown at the time the ship was sighted visually by the flight crew. At the bottom, the Bagley is shown in what would have been the terminal stage of the missile's flight. Hughes Aircraft Company is developing this version of the Maverick missile family for the U.S. Navy.

Fluke 1720A and Keyboard

Fluke 1780A

Touch Sensitive Display and Minicomputer

New electronics from the John Fluke Manufacturing Co., Inc., Everett, WA, allow people to interact with machinery, information systems, filing systems, instruments, inventory, process control, orders, cash machines and numerical control systems just by touching a display screen. The 1780A Infotouch Display is a special display screen with a touch sensitive overlay. Messages, numbers, grahpics, menus, switches, and special characters can be displayed through computer programming to guide an operator's response step by step. Fluke's new 1780A can stand alone or be placed in a rack or enclosure. Almost any desktop computer, home computer, minicomputer or large computer system can use the 1780A as a man-machine interface.

The 1720A is a minicomputer with many diverse applications from controlling automated manufacturing to monitoring medical instruments. It features the touch sense display of the 1780A plus full computing capability, read/write memory, floppy disk and electronic disk memory storage, built-in interfaces, real time clock, automatic start-up, detachable keyboard and a provision for remote control operation. Computer languages available for the 1720A include: BASIC, FORTRAN and Assembly Language plus special software for electronic instrumentation. Up to eight 1780A Infotouch Displays can be controlled by one 1720A minicomputer. Both products use a 5" x 9" screen with 16 lines of 80 characters and feature 60 definable touch sense areas.