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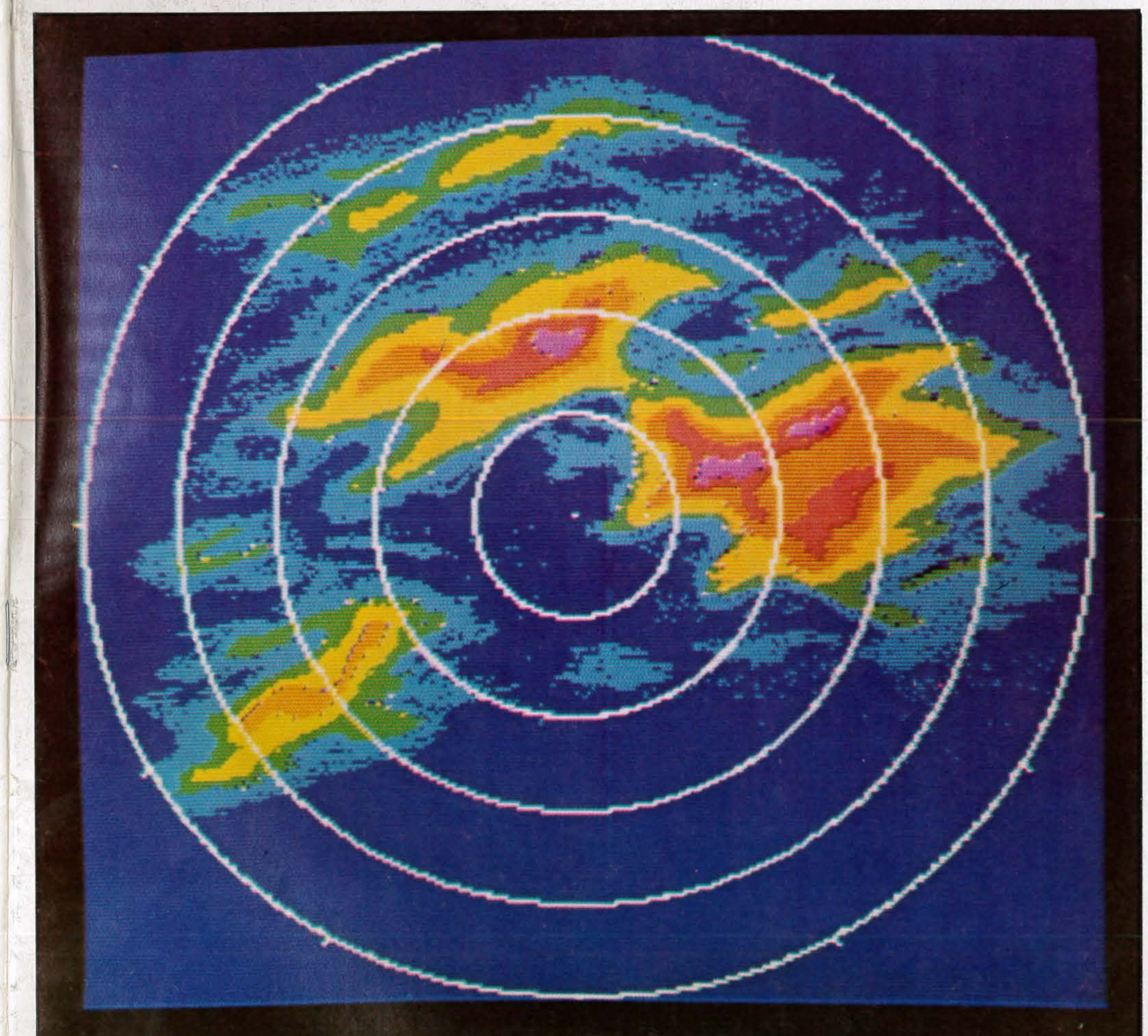

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CONTENTS

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PRESIDENT'S MESSAGE

Welcome to the 1975 SID International Symposium and to this very special issue of the SID JOURNAL. For the first time in the Society's twelve year history we have assumed full control and responsibility for its publication.

The first volume of the Journal of the Society for Information Display was published in October 1964, one and one-half years after the SID was chartered. It was published for us by Information Display Publications, Inc., with whose principals we enjoyed years of fruitful relationship, joint growth and success. Eventually the commercial needs of the publisher and the interests of the Society could no longer be reconciled, and SID withdrew its sponsorship from "Information Display".

Because of legal questions surrounding the title to the magazine's name, the Society elected to continue its publication in its present format, as the "SID JOURNAL", in May 1972. A different publisher, Blackwent Publications, assumed publications responsibility. Although subsequent agreements gave the Society clear title to the name "information Display", we decided to continue under the now well established "SID JOURNAL". From mid-1972 until August 1974, the bimonthly journal continued to be published by Blackwent with the financial support of SID and largely through the heroic efforts of Erwin Ulbrich, your Vice-President, and Vi Puff, our National Office Manager. Again we foundered on the conflicting needs of a publisher's commercial exigencies and the objectives of the Society.

Finally accepting the fact that, in the long run it wouldn't be possible to publish the Journal the way we wanted it under a parnership arrangement with a publisher, we decided to do it ourselves.

What you see before you now is truly our own Journal. With it we, or rather you, the members of SID, are assuming full responsibility and authority for its content — technical and editorial, solicitation of ads, mechanics of editing, printing and distribution, in other words, for the whole works.

We will continue to make use of professionals to put it all together but they will be working for us, not for themselves. From this moment on, and with this issue, the Society is the Publisher of the SID JOURNAL, and that means it has truly become your magazine.

We solicit your support, not only in the submittal of technical articles and chapter news, but we want to hear your comments about the Society — your compliments and your complaints. And if you decide that the SID JOURNAL is a good way to tell the display community about your products, advertise in your Journal.

Erwin Ulbrich is going to be looking for lots of help to build the same kind of organization for the Journal that Bernie Lechner structured so successfully for continuity of the Symposiums. You can expect to hear from him. Better yet, give him a call and volunteer.

To our advertisers, past, present and future, we pledge to make the SID Journal what you have every right to expect and what we, as SID members want it to be. That is a regularly published, quality magazine which will be of vital interest to every member of our technological community.

On behalf of the Society, I thank you for your past forbearance and solicit your continued support.

ROBERT C. KLEIN
President — SID

COMPUTER GENERATED TV IMAGERY

Raster scan now can generate solid object scenes at real-time TV speeds. Elements of pictures are created with high precision, though scenes tend to have a 'stylized' appearance. The system is being used by the Navy in a jet trainer simulator.

By Dr. B. JOHN SHINN – *General Electric Company*

With the advent of high speed digital logic, many "stick figure", or stroke-written image generator systems have been experimented with and developed into very useful "night time" scene generators. Although they offer great flexibility in vehicle dynamics, their inability to portray solid, opaque faces drastically reduces their usefulness for daytime visuals.

It remained for the development of raster scan image generation to produce solid object scenes of the world as we traditionally know it. The computation complexity of such scenes, however, was such that early efforts could produce realistic scenes in "slow time" only (i.e., a single frame of picture took from 8 seconds to 2 minutes or more to generate.) Improvements in algorithm efficiency, logic speeds and system organization have been combined to create realistic pictures in real time TV speeds. Such systems offer all the advantages of digital computers . . . precision, great dynamic range, unlimited vehicle dynamics, and great flexibility in modeling and environment (or data base) change.

The basic components of a Digital TV system are quite analagous to the TV model systems. Each incorporates a 3-D model of the world in which one can maneuver about, a properly positioned camera to scan the model and generate TV video signals and, finally, a TV display system to project this scene to the pilot. In the case of digital TV, the model is not made of plaster, plastic, or wood, but is in the form of digital numbers describing the models, dimensions, color, etc. These numbers are stored in a core memory and are collectively called the data base. Data bases can contain moving models as well as static terrain and buildings. The dynamics and position of these models can be anything that can be described by mathematical equation – linear or highly non-linear. Furthermore, many data bases can be stored off line on magnetic discs or tape ready for immediate change of environment merely by reloading the active memory . . . from airport to aircraft carrier at sea, from submarine to highway, to lunar terrain.

Mathematically Positioned

The "camera" of a CGI system is basically a mathematical implementation of its TV camera counterpart. It is mathematically positioned with respect to the coordinates of data base model so that the computed eyepoint instantaneously corresponds to that of the vehicle at 1/30 second intervals.

Models in the data base are made up of many simple straight line segments called edges. The end points of these edges are called vertices. Given the eyepoint position, an imaginary view window, as shown in Figure 1, can be defined to cover the field-of-view of interest just as in the case of a TV camera. The 3-D model can be transformed into a 2-D true perspective picture on this imaginary view window. By the use of simple geometry, the pierce points on the visual plane of rays from the eyepoint to each vertex can be computed. The edges so defined are used to enclose faces with assigned colors. The faces, in turn, form solid objects and models . . . all in true perspective because of the geometric calculations.

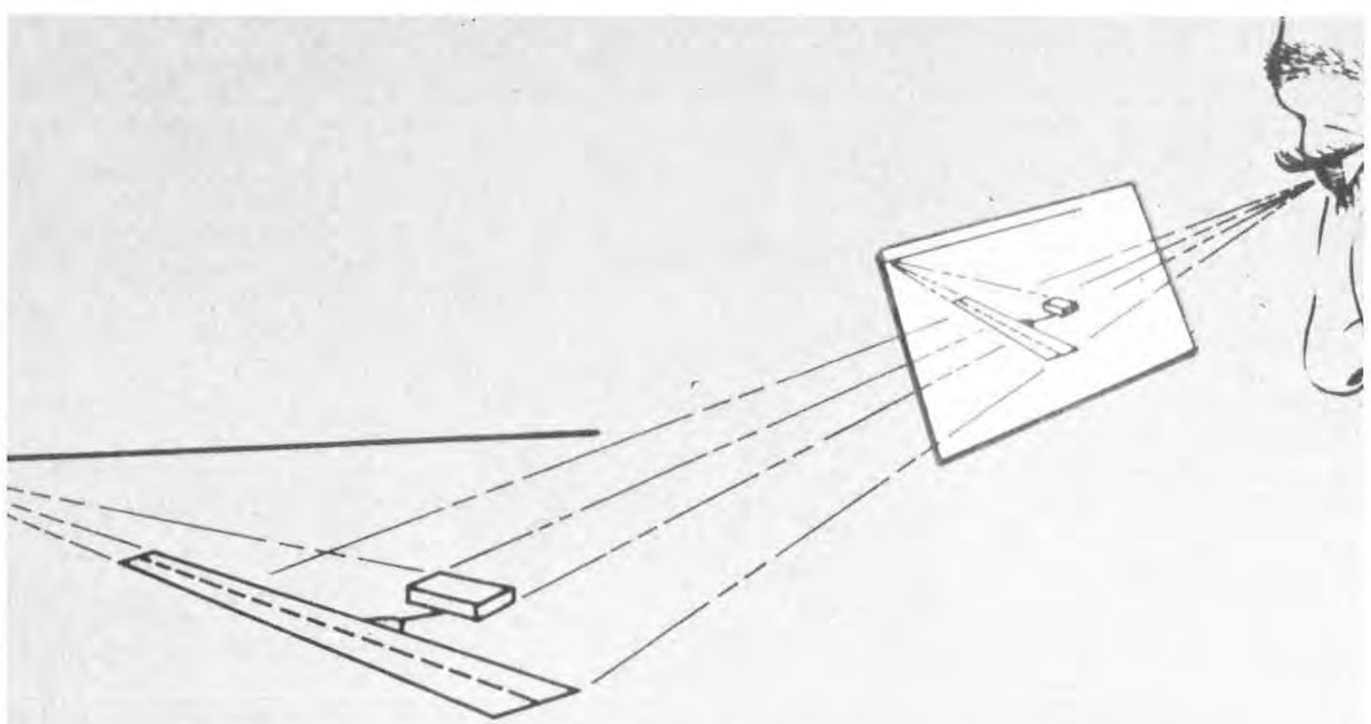

Figure 1. CGI View window concept

Convert 2-D Picture

Converting this 2-D picture into video is rather straightforward. The vertex positions on the view plane are measured in terms of number of raster lines down from the top of the picture and the number of segments (called elements) from the left side of the picture along the raster line. The intersections of every edge with the TV raster lines is easily computed, knowing the end points. The CGI system provides this edge crossing data in synchronism with the TV raster scan of the display system (e.g. Light Valve or CRT). The video is assigned a start color at the beginning of each raster line and this color continues until the raster reaches an edge crossing. The color will then be changed to that of the face being entered.

Many, many edges can be encountered on a single raster line, resulting in a very complex picture. Present day dynamic CGI systems can produce scenes involving 500 to 2000 visible edges in a scene. One important thing to remember about CGI is that the pictures are *not* stored. They are generated anew each 1/30 of a second, just as in the case of a TV camera. Thus, there are *no* restrictions to flight path such as with film systems.

Advantages Over TV Model

The digital characteristics of CGI which give it its advantages over TV model and film systems, also give rise to some difficulties. All elements of the picture are created with very high precision. This not only provides very accurate flight paths and mathematically perfect perspective, but also provides perfectly uniform color in fields and objects with no imperfections or texturing. In simple CGI systems, many of the visual cues we subconsciously use in the real world are missing and a conscious effort has to be made to generate them.

Unlike the real world, "fuzzy" or irregular, non-precision objects are more difficult to produce in CGI than crisp, straight-edged, precision objects. Cones and cylindrical towers are much easier to generate than scraggly sage brush and trees. Thus, digital TV scenes tend to have a more stylized appearance.

'Stair Step' Effect

Another characteristic of digital TV is the "stair step" effect on slanted edges due to quantization effects of the digital mosaic format, as shown in Figure 2. Fortunately, an "edge smoothing" technique has been developed which overcomes this problem. This technique was successfully developed first on a black and white system and, more recently, on a full color system.

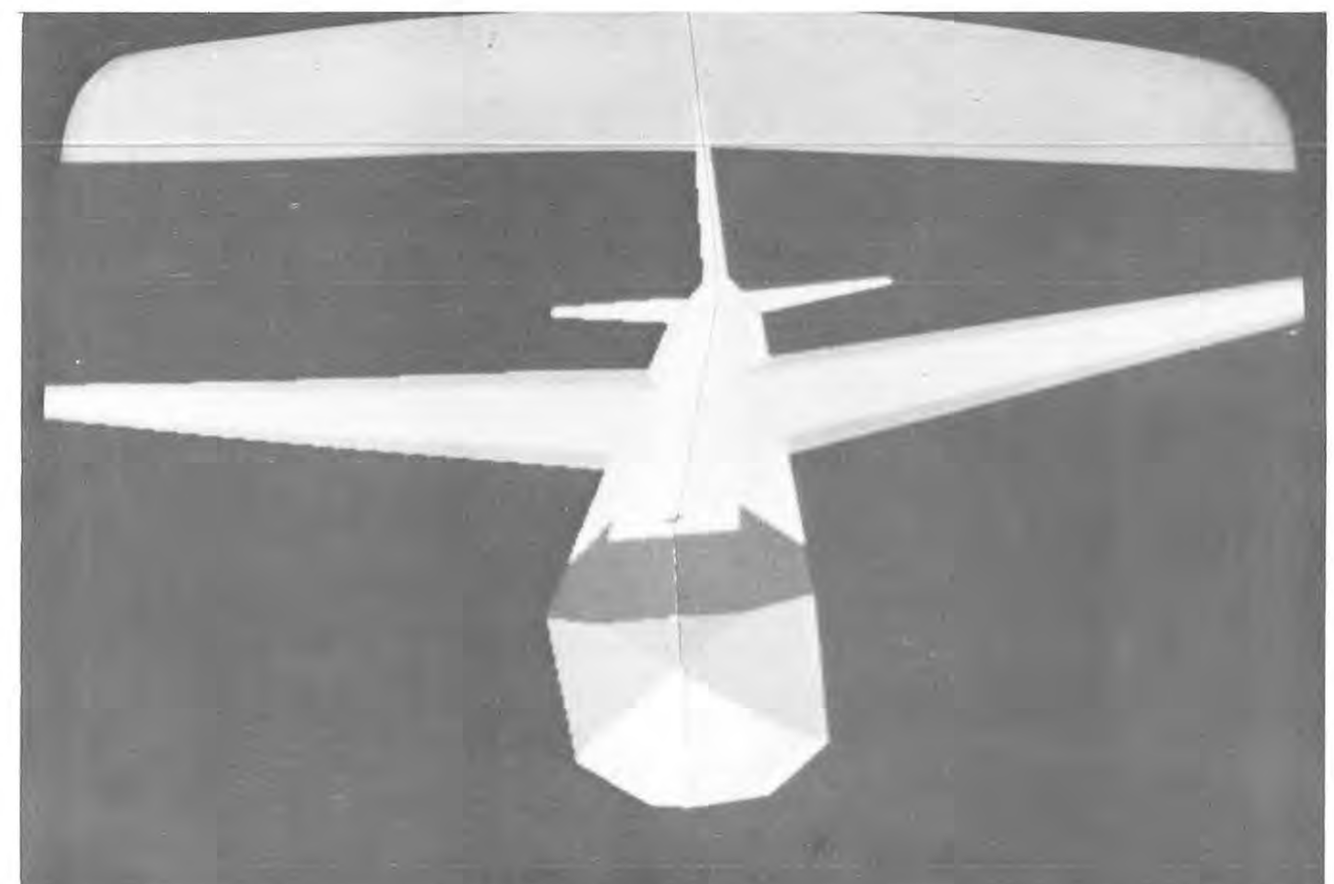

Figure 2. Effect of edge smoothing. Left, unsmoothed, right, smoothed

Digital TV System

The Navy has incorporated the first operational digital TV system on their Advanced Jet Trainer Simulator at NAS, Kingsville, Texas. It consists of three juxtaposed view windows (screens) which are illuminated by three light valve projectors. This provides a continuous field-of-view of 60 degrees vertically by 180 degrees in azimuth to the student pilot. This CGI visual system is integrated with the Goodyear 2F90 motion base simulator as shown in Figure 3. Data bases of both NAS, Kingsville airport and an aircraft carrier at sea are provided. The student can maneuver about in any desired path in these data bases. Various levels of haze and fog can be accurately generated to provide VFR, IFR and IFR/VFR transition practice. Figure 4 shows a typical CGI scene.

Future systems are already under development which will provide: (1) much higher resolution (more raster lines), (2) much higher scene detail (more edges), (3) wider field-of-view (more display channels), and (4) realistic image features, such as sun angle shading, curved surface shading, etc. □

Figure 4. Typical aerial scene

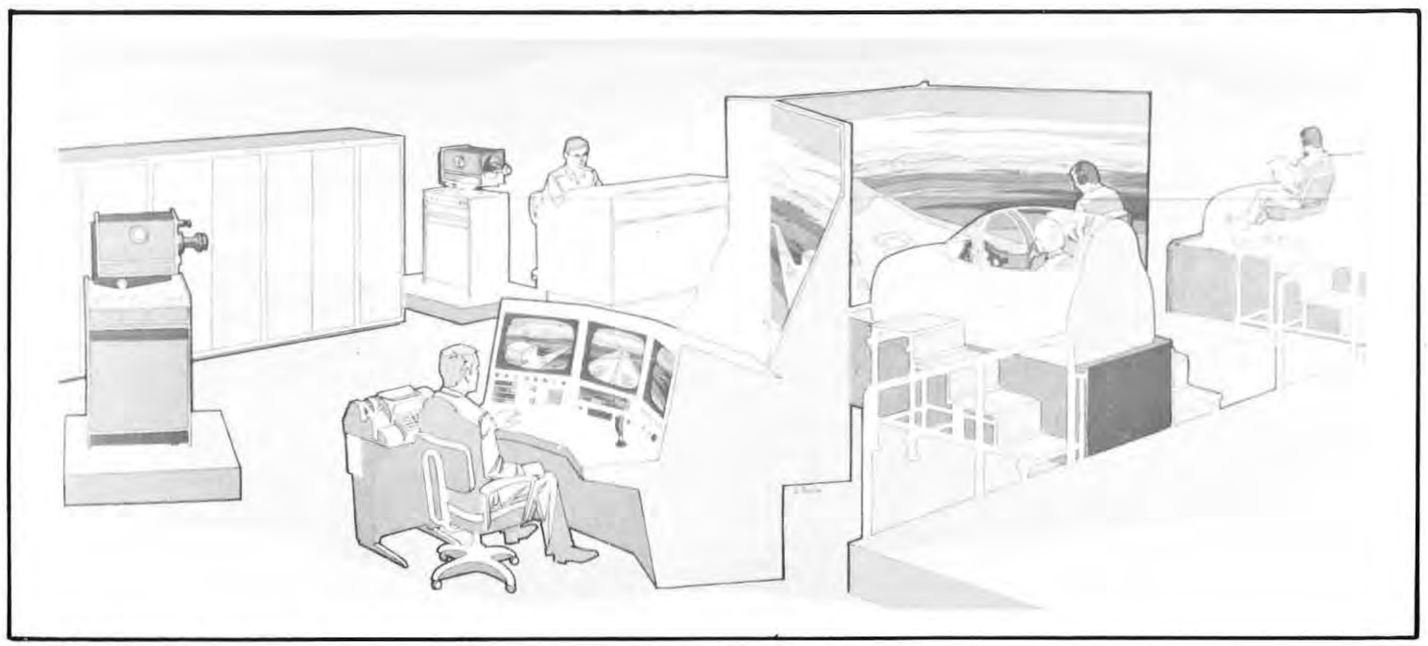

Figure 3. Artist's concept of Navy CGI system

about the author

Dr. B. John Shinn is Manager/Advanced Technologies Engineering for General Electric's Ground Systems Dept., Daytona Beach, Fla. Advanced techniques for Computer Generated Imagery (CGI) and Digital Radar Land Mass System (DRLMS) were developed in his laboratory. Prior to Daytona Beach, Dr. Shinn's career lay in consulting and project leadership. He is co-inventor on a patent for a triple redundant flight control system. He received his Bachelor's and Master's degree from the University of Connecticut in 1952 and his doctorate from Yale University in 1954.

A VERSATILE, MATRIX DRIVE - WAVEFORM GENERATOR FOR LIQUID CRYSTAL DISPLAYS

An electronic apparatus is described which supplies a variety of matrix selection waveforms which have zero dc content as required for liquid crystal display devices.

By P. PLESHKO and R. ABBATECOLA
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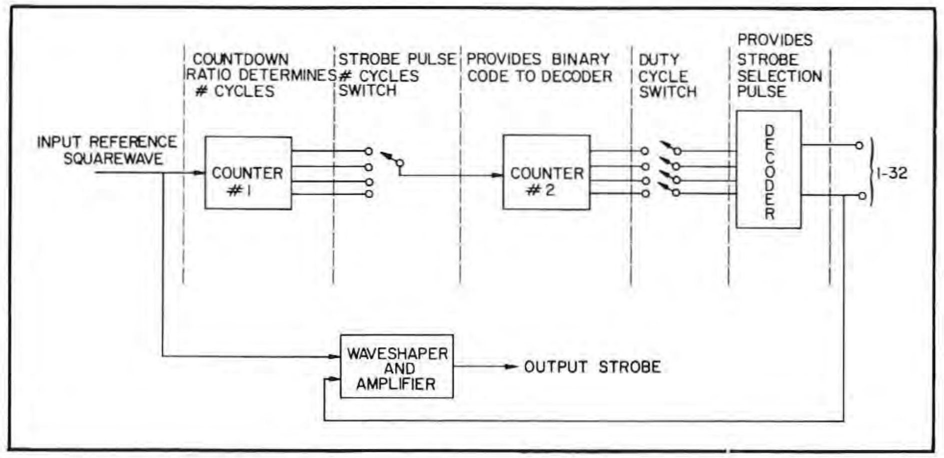

Figure 1. Functional Block Diagram of Apparatus

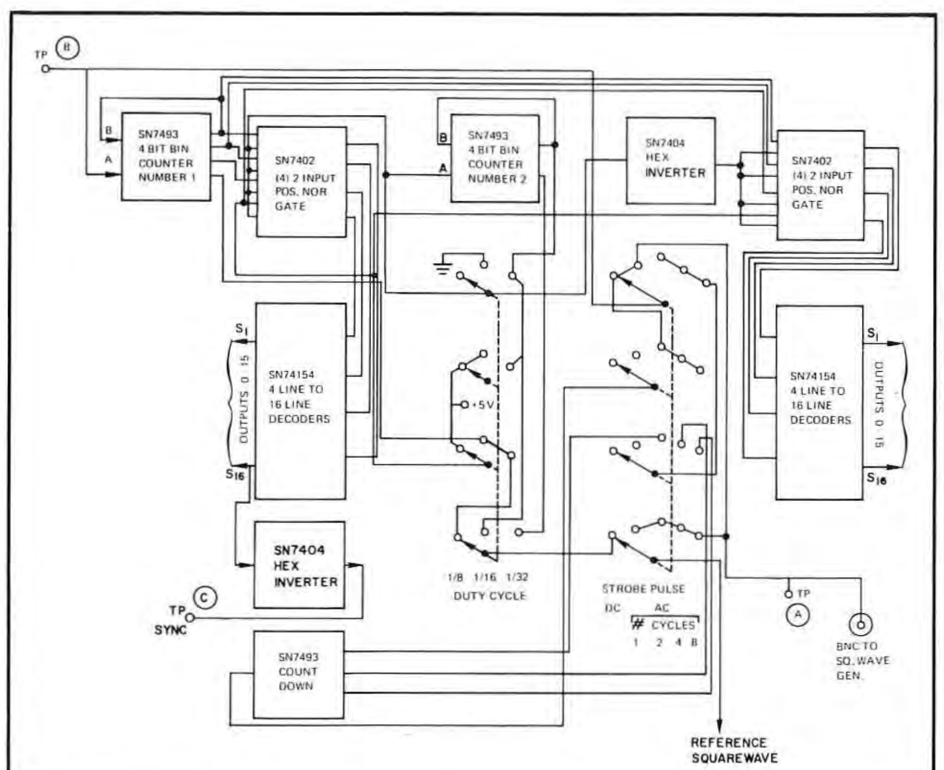

Figure 2. Timing Circuits for Apparatus

In our investigation of the scanning limitations of liquid crystal display devices, there arose a need for a waveform generator that could supply a variety of waveforms which would be compatible with matrix selection constraints and the liquid crystal device constraint of zero dc content in the waveforms across the cell.

The desired variety in the waveforms required the availability of dc or ac strobes and information waveforms, and variation in duty cycle and amplitude control. This apparatus was to be implemented using standard and inexpensive circuits where possible.

Elementary Block Diagram of System

The elementary block diagram of the system is shown in Figure 1. It is a requirement that one be able to vary both the duty cycle and the number of cycles in the strobe pulse. The number of cycles in the strobe pulse is used to determine whether one has a dc or ac strobe. The dc strobe has a 1/2 cycle per strobe pulse (no phase reversals) and ac strobes have 1 or more cycles per strobe pulse.

Performance of these two functions requires two counters. Counter #1 determines the number of cycles in the strobe pulse and counter #2 determines the duty cycle of the strobe pulse. The line decoder provides a strobe selection pulse with a duty cycle determined by the cycling period of counter #2. The waveshaping and amplifying circuits combine the output from the line decoder, which is counted down and provided with the correct duty cycle, with the reference square wave to provide either a dc or ac strobe dependent on the countdown ratio of counter #1.

Apparatus and Experimental Results

The block diagram of the apparatus constructed is shown in Figure 2. This shows all of the timing and control circuits, but excludes the waveshaping and amplification circuits.

Counter #1 and #2 discussed previously are labeled as such in this diagram with a switching arrangement so as to provide a dc strobe or an ac strobe with 1, 2, 4 or 8 cycles. The duty cycle can be varied from 1/8 to 1/16 to 1/32. In the 1/8 and 1/16 positions, the two line decoders operate in parallel.

The strobe circuit implementation is shown in Figure 3. An exclusive-or circuit is used to obtain polarity reversals of the strobe. If the reference waveform changes phase every other strobe selection pulse, the exclusive-or circuit will change the direction of the strobe selection pulse transitions every other pulse. If the reference waveform changes phase during the strobe selection pulse, the output of the exclusive-or will reflect these phase changes on its output. The output of the exclusive-or is applied to the inverting input of the operational amplifier. The reference square wave is applied to the non-inverting input for common-mode rejection. The output of the amplifier contains the strobe waveform without the reference waveform component. Amplitude of this strobe pulse is varied by a dual potentiometer on each operational amplifier. This dual potentiometer is required to keep the ratio of R_2 to R_1 constant to achieve a high common-mode rejection ratio. The amplitude of the strobe pulses is limited to less than 22 volts with standard operational amplifiers. For the liquid crystal devices, this amplitude was more than sufficient with the dc strobe waveforms. Figure 4 shows the strobe output waveform at point 5, in Figure 3. For ac strobe waveforms, higher voltages were obtained via the use of transformers. The Lafayette #TR120 is a small (1/2"x1/2"x1/2") audio impedance matching transformer with a maximum peak output voltage of 300 volts for a peak input voltage of 15 volts. The Argonne #AR141 is a physically larger transformer (1"x3/4"x3/4") with a maximum peak output voltage of 240 volts for a peak input voltage of 15 volts. Table I gives the useable frequency range of these transformers under different loading and output amplitude conditions. The waveform with ac strobe is shown in Figure 5.

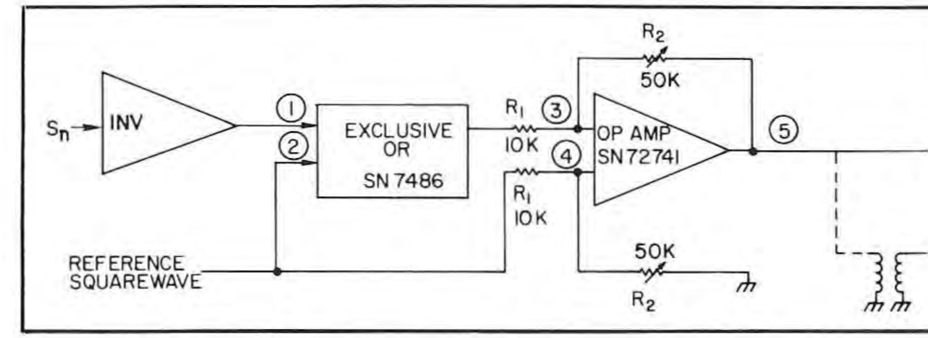

Figure 3. Strobe Waveshaping Circuit

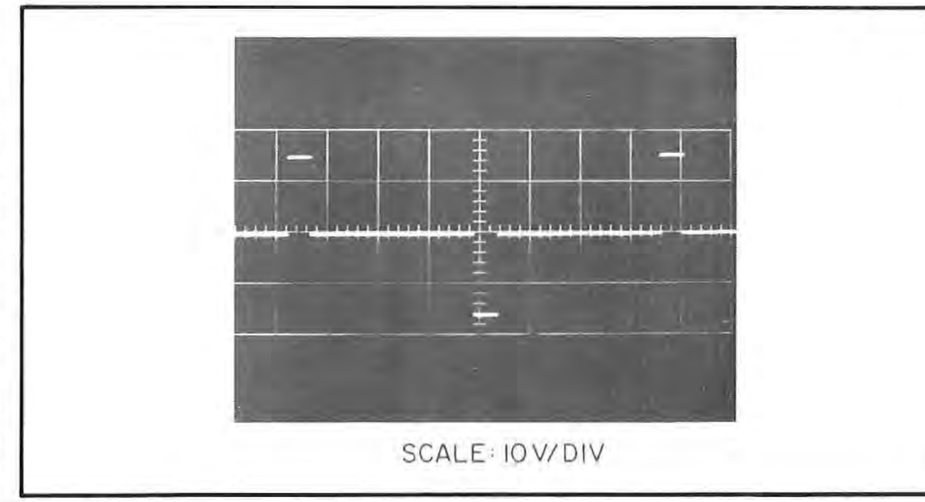

Figure 4. DC Strobe Waveform

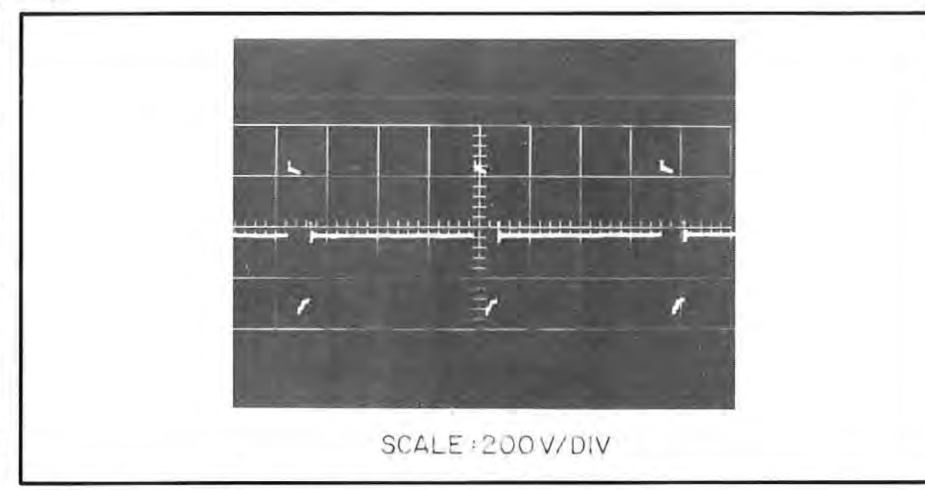

Figure 5. AC Strobe Waveform

TABLE I

Transformer	Useable Frequency range (KHz)	Amplitude (volts)	Load on Secondary
TR 120	6–10	300	Open
	3–20	100	Open
	3–10	100	62 pf
AR 141	.7–6	240	Open
	.6–4	240	62 pf
	.3–9	100	Open
	.3–4	100	62 pf

The information generation circuits are identical in their operation with minor differences in implementation as shown in Figure 6. The information signal to turn a device ON or to keep it OFF is dependent on the phase of the information signal relative to the storbe, which is governed by the input to the exclusive-or circuit. Waveforms for this circuit are shown in Figures 7 and 8.

Summing It Up

The apparatus and circuits discussed in this paper generate a wide variety of waveforms which have zero dc content. This flexibility allows for dc strobe and ac strobe waveforms, variation of number of cycles in the ac strobe, pulse, a choice of duty cycle and an output voltage amplitude range from less than 10 volts to more than 300 volts peak. This has been achieved with the use of standard, low cost components.

These waveforms were generated for use with liquid crystal display devices but are also useful for other display devices which have symmetrical electro-optical characteristics. □

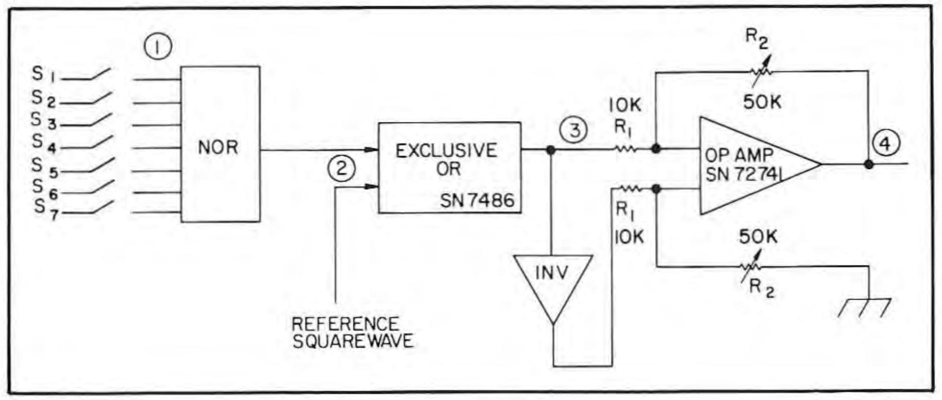

Figure 6. Information Waveshaping Circuit

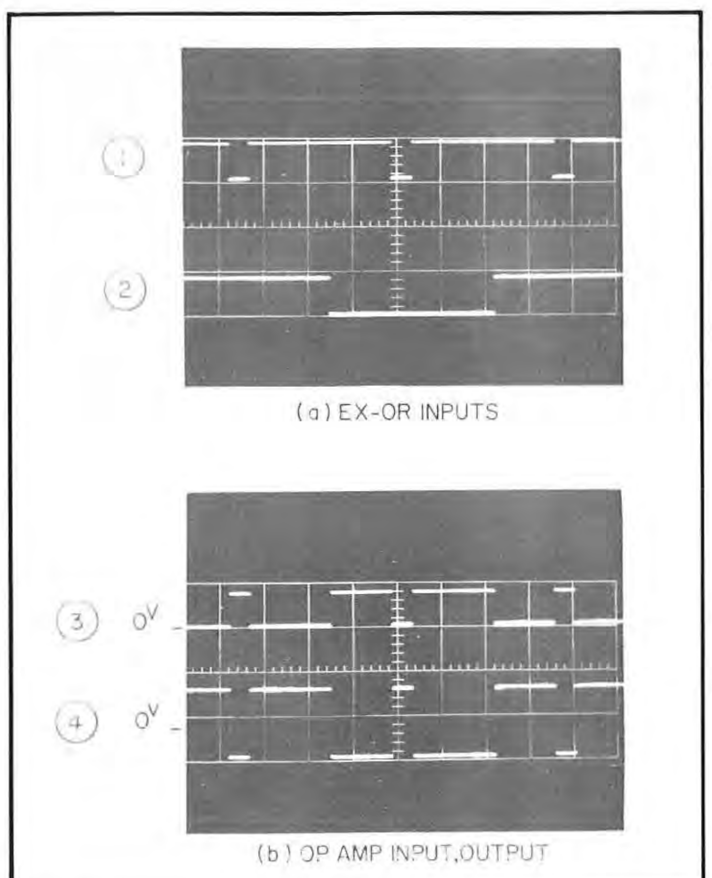

Figure 7. DC Information Circuit Waveforms

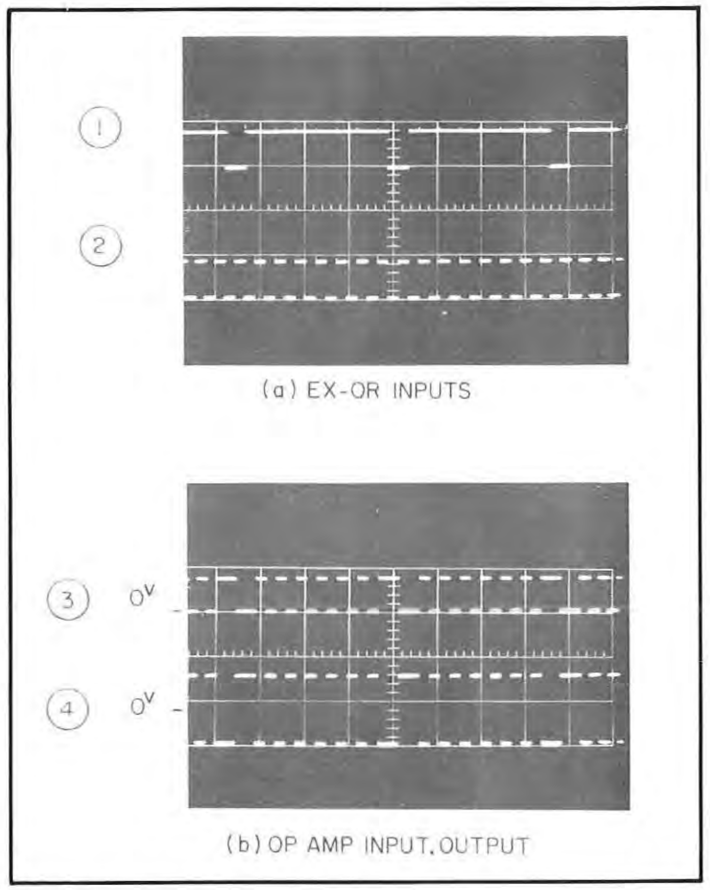

Figure 8. AC Information Circuit Waveforms

about the authors

Peter Pleshko, now manager of the Display Systems Group at the IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y., has been with the facility since 1963. Previously he was at ITT Laboratories and Kearfott. He holds his Ph.D. in electrical engineering from New York University, 1969, and is Secretary of the North-Atlantic Chapter of SID.

Robert Abbatecola graduated from RCA Institute in 1938 and 1947, majoring in radio operation and servicing. He joined IBM in 1950 and is presently a Technical Associate at the Thomas J. Watson Research Center and a member of the Display Systems group working on the electronics associated with display systems. Mr. Abbatecola has published 6 technical articles and is a licensed amateur radio operator.

Contrast Enhancement For Liquid Crystal Values

By GARY DIR, JAMES ADAMS, WERNER HASS and JOSEPH STEPHANY

Joseph C. Wilson Center for Technology, Xerox Corporation

The use of liquid crystals as the imaging member in a variety of light valves naturally raises the issue of readout considerations. In this article two new methods of contrast enhancement are described. Specific devices include displays and buffers, however, in all cases, the image characteristics depend in detail on the differences in optical properties of the addressed and unaddressed states and on the external optics. Images can consist of two or more of the various cholesteric, nematic and smectic textures comprising the addressed and unaddressed states, or more generally, may include field-induced perturbations of those textures, the isotropic state, the solid state, etc. For example, in the electric field-induced cholesteric nematic phase transformation,[1] the addressed regions are transparent (in the visible) and uniaxial positive, whereas the unaddressed focal conic regions are diffusely scattering. In the case of dynamic scattering[2] the addressed regions are diffusely scattering (but with a different angular distribution from the first example) and the unaddressed regions can be in the homeotropic, homogeneous or unoriented texture, depending on surface treatment. A reorientation of the optic axis without diffuse scattering occurs in the Fréedericksz Transition[3]. In this case the liquid crystal is uniaxial in both limiting states, and the special direction is rotated by 90° by an electric or magnetic field. In addition, more complex intermediate states can be achieved[4]. A variation on this theme involves twisted nematics in which the field "off" state comprises a distribution involving a gradual twist of the special direction which is always in the plane of the substrate, and turns 90° from one substrate to the other[5]. The field "on" state is substantially homeotropic. In the case of induced biaxiality[6], the addressed regions are biaxial and the unaddressed regions are uniaxial. Images comprising Grandjean and neighboring focal conic textures, whether electrically[7], thermally[8], or shear[9] induced, consist of diffusely scattering regions adjacent to regions which are optically active (dispersive) and uniaxial negative. All of these examples have many common characteristics regarding image readout (whether the input is optical, vis-a-vis a photoconductor, or electrical). The Grandjean focal conic texture transformation, coupled to a photoconductor, will be treated in detail. However, the concepts involved will apply to the readout of almost all liquid crystal images, either in transmission or reflection.

The specific device considered here consists of a liquid crystal film in contact with a photoconductor film, the combination being sandwiched between two conducting transparent electrodes[10-13]. The geometry is shown in Figure 1, and a projected image is shown in Figure 2. The device characteristics are shown in Table 1. The liquid crystal is a mixture of cholesterics and nematics, being 80% N-(p-methoxybenzylidene)-p-butylaniline (MBBAO and 20% oleyl cholesteryl carbonate (COC) by weight. The mixture has the property that an ac electric field of appropriate amplitude and frequency causes it to adopt the Grandjean texture[14], whereas a dc field produces the focal conic texture. The distributions of molecular orientations in these textures are known[15] and many of the characteristics of the scattering properties of the focal conic texture have been determined[16,17]. The reflections R_1, R_2, R_3 and R_4 (Figure 3) are all specular and are compared to unity input. The index of refraction of the photoconductor is around 3.0, so R_4 is approximately 15% when the liquid crystal is in the Grandjean texture. R_4 can be substantially increased through the use of reflecting metal islands on the photoconductor, a reflecting dielectric layer between photoconductor and liquid crystal, etc. However, each of these approaches involves a trade-off, either in sensitivity, resolution, or economy (in the case of very small squares), which is unattractive.

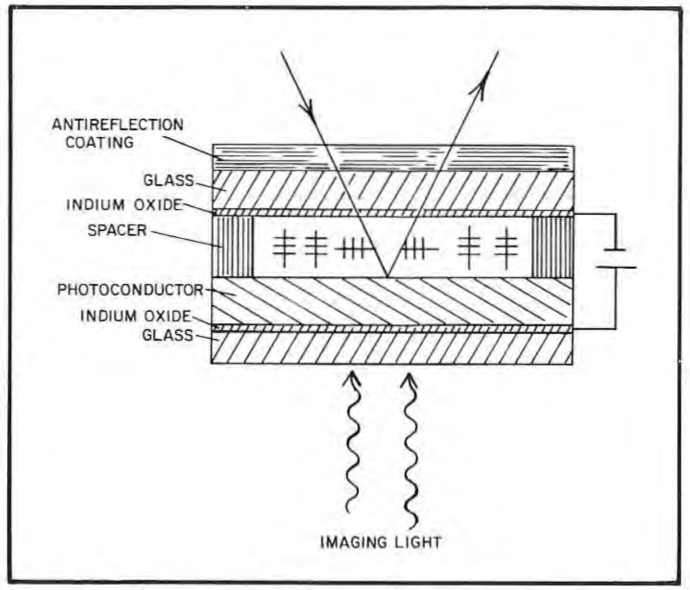

Figure 1. Schematic of Optical Buffer

Figure 2. Image Projected from Optical Buffer onto a Conventional Screen

TABLE 1. BUFFER CHARACTERISTICS

RESOLUTION	≈	35 ℓp/mm
SENSITIVITY	≈	25 ergs/cm^2
STORAGE TIME	≈	24 hours for 20 ℓp/mm
CONTRAST	≈	10:1
EFFICIENCY	≈	10%

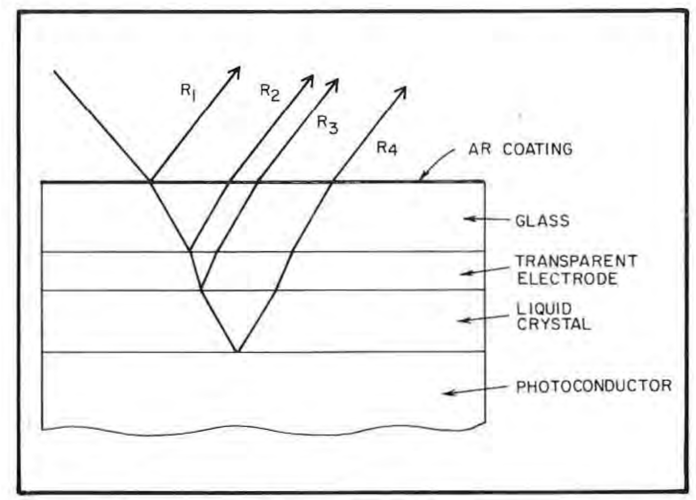

Figure 3. Schematic of Antireflection Electrode Geometry

In the focal conic texture, R_4 is greatly reduced, typically by over two orders of magnitude for a film thickness of 1/2 mil. The focal conic scattering is heavily forward and Figure 4 shows the integrated energy contained within a cone for different film thicknesses. We observe that the thicker film has a broader pattern, probably indicating multiple scattering. The dashed lines are data taken in transmission, on transparent substrates, using a Spectra Physics Argon Ion laser at 4880Å and at zero numerical aperture. The solid line shows equivalent data from the photoconductor device (in reflection), indicating similar behavior (double pass in photoconductor case). Even employing spatial filtering techniques, contrast is intrinsically limited by specular reflections. R_1 can be reduced to around 0.25% through conventional AR coatings[18]; however, R_2 and R_3 will typically be slightly over 1% and will limit contrast to around 4:1.

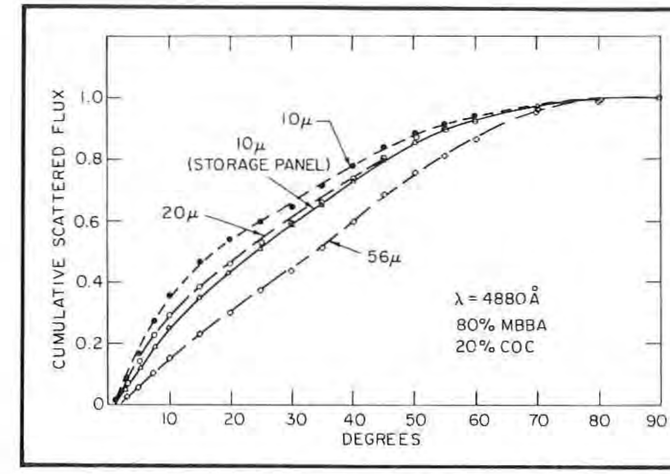

Figure 4. Scattering Characteristics of the Focal Conic Texture

Antireflection Electrode

Since the index of refraction of the glass and liquid crystal are almost the same (1.5), the amplitudes of R_2 and R_3 are essentially equal, independent of the index of refraction (n) of the electrode. R_2 and R_3 are also out of phase by

$$\pi - \frac{4\pi nd}{\lambda}$$

where d is the thickness of the electrode and λ is the wavelength of light. If d is chosen such that $4nd/\lambda << 1$, R_2 and R_3 interfere destructively for all wavelengths. In practice, films ranging down to 150Å were studied. The results for light of wavelength 4880Å are shown in Figure 5. R_2 and R_3 are plotted as a function of film thickness. In an associated experiment, R_2 and R_3 were measured as a function of wavelength for a film of thickness 150Å. The results are shown in Figure 6. These values are essentially independent of angle of incidence since refraction limits the angle of incidence in the indium oxide (n=2.0) to around 30°. Using this technique in conjunction with spatial filtering, operational contrasts of 10:1 were achieved. A summary of the combinations is shown in Table 2.

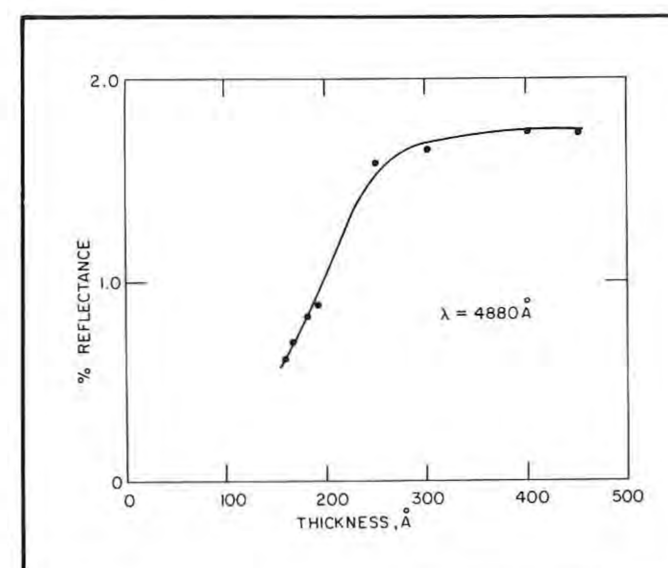

Figure 5. Reflectance vs. Electrode Thickness

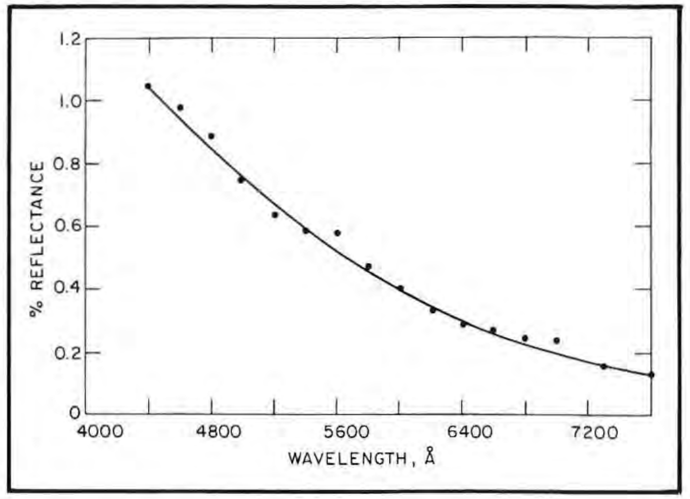

Figure 6. Reflectance vs. Wavelength

TABLE 2. CONTRAST AND EFFICIENCY FOR VARIOUS CONFIGURATIONS

	EFFICIENCY	CONTRAST RATIO
NO AIR COATING – THICK ELECTRODE	16%	10:1
AR COATING – THICK ELECTRODE	12%	4:1
AR COATING – THIN ELECTRODE	10%	2.5:1

Polarizers

In this case, the specular reflections (R_1, R_2, and R_3) are attached through the use of a polarizer and an analyzer, as seen in Figure 7. The azimuthal polarizer angles and the angle of incidence are adjusted such that R_1, R_2 and R_3 are essentially extinguished, whereas the combined effects of birefringence, optical activity, and reflection effectively bring R_4 into the acceptance plane of the analyzer. (In general, of course, R_4 will be elliptically polarized after emerging from the device). Contrast in this case is limited only by the scattering power of the focal conic. Contrast ratios of 28:1 were achieved employing this technique. The analyzer is

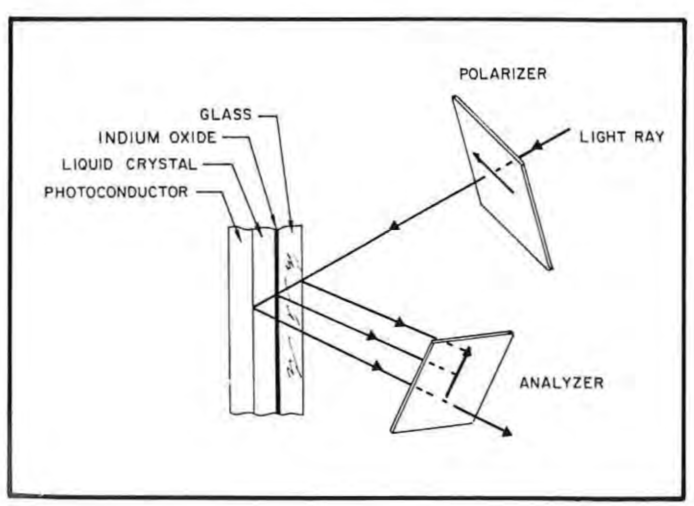

Figure 7. Polarizer-Analyzer Configuration

adjusted to minimize $R_1+R_2+R_3$. Optimum contrast is a complicated function of incident angle (θi), polarizer angle, wavelength, birefringence, optical activity and sample thickness. Some characteristic results are shown in Figure 8. In this series of experiments, the analyzer is adjusted to minimize front surface reflections for each polarizer setting. For 1/2 mil samples, 30^o was the smallest incident angle at which optimum conditions were observed (i.e., the major axis of the emerging elliptical light was in the acceptance plane at the analyzer and the ellipticity was small). The desirability of either of these two schemes will depend upon specific application. Tradeoffs between efficiency and contrast will probably by the determining consideration. □

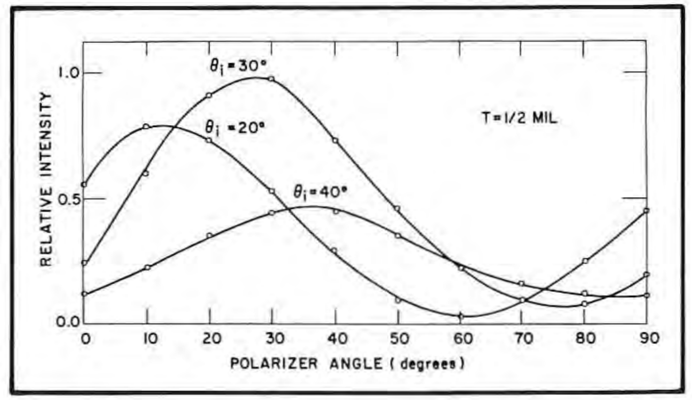

Figure 8. Transmission vs. Polarizer Angle

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Individual Privacy & Information Display

Including a description of how a computer was used to invade and raid that most private of all things, a bank account.

By ERWIN A. ULBRICH
Vice-President of SID

In May 1974 the then Vice President of the United States, Gerald Ford, invited AFIPS and its Constituent Societies to become involved in the work of the Domestic Council Committee on the Right of Privacy.

The invitation from Mr. Ford was contained in his address of May 9 to more than 4,000 attendees at the 1974 National Computer Conference in Chicago's McCormick Place. Commenting on the Privacy Committee which he headed, Mr. Ford stated, "... Interagency task forces were formed to make recommendations. Contributions have come also from the Congress, State governments, industry, citizens' groups, private individuals, academic experts, and some federal agencies not represented on the committee. We wish to invite our host, the American Federation of Information Processing Societies, and all constituent groups to become involved."

In response to this invitation, a Special Committee on the Right of Privacy has been established by the American Federation of Information Processing Societies, Inc.

"For a number of years, AFIPS has been active in areas involving privacy and data security," stated AFIPS President George Glaser. "However, the new Special Committee will provide a focus for our efforts on behalf of the U.S. information processing field and allow us to contribute directly to the work of the recently-formed Domestic Council Committee on the Right of Privacy. In line with this, I am pleased to announce that Dr. Willis H. Ware of the RAND Corporation has accepted our invitation to chair the new AFIPS committee."

Meanwhile, other agencies and persons are pressing forward with efforts in the area. Two of these that have recently crossed my desk follow:

"Computer Bill of Rights"

from Dr. Harold Sackman of Rand Corporation, Santa Monica, California, excerpted from July 1974 Conference Retrospect on International Human Choice and Computers.

"a. Individual citizens or groups should have a right of access to public information in order to use it for research, planning public debate, etc.

b. Every citizen should have the right of protection against the misuse of information which any organization has about him.

c. Every citizen should have a right of access to information held about him, and the right to query and correct it.

d. Individuals and groups should have the right of feasible access to information; information should be presented to them in a readily usable form, and should not be prohibitively expensive to obtain.

e. There should be controls over the way in which private bodies collect and use information.

f. Information should not be withheld from, or distorted in, the originating data base.

g. It should be recognized that man has a fundamental right to an interesting and challenging job. Any emotional stress caused through an approach to job design which does not take account of human psychological needs should permit compensation through legal processes in the same way as physical injury now does.

h. Every citizen has a right to become computer literate, if he so wishes, as part of his general and continuing education."

"Prevention of Information Privacy"

from Mr. George Zimmerman of Computer Air Companies, Dallas, Texas, 75240, excerpted from April 1974 article on Individual Privacy.

"Privacy, one of man's greatest treasures, is being stolen and sold by information traders. The greatest guarantee of privacy is the right of each individual to know all information about him which is held by others and to whom that personal data is to be given.

Beginning now, it must be the information holder's obligation periodically, not less than once each calendar year and when any file change is made, to inform the individual of the total specific personal data held and the complete description of the season, person and any others who have requested the data before releasing any part of the file.

First: Each file must be evaluated as to its right to exist compared to the right of the individual to privacy, protected by the Constitution of the United States of America.

Second: If a personal encroachment of privacy file is justified by passing the First individual right criteria, the total information on file must be disclosed to the individual at the expense of the file holder. Existing and new files must be submitted to the individual.

Third: The file holder, from the date of enactment of these principles into law must not give the file information to any but the individuals on file, giving an individual only her or his own file.

Fourth: An individual's receipted acceptance of the complete identification of others requesting an individual's file must be obtained and maintained by the file owner. The individual must have thirty days from the receipt date to approve or disapprove the release of any part or all of the file.

Fifth: A personal file or any part of it must not be released or disclosed with other than the subject individual of the file without prior written receipted release approval from the individual within thirty days of the request for file disclosure.

Sixth: Waiver, in writing, of any or all rights may be granted by the individual for release of the file data to specific requestors, for a duration of time or other terms agreed to in writing by the individual."

It may be that some of the readers of this journal may also have a position in this matter; when all is said and done, the machines of information display are what have created this problem if it is a problem. I have recently seen one piece of evidence that it may not be a problem:

On-Line Embezzlement

by Mr. Roswell Steffen excerpted from an article entitled "How I Embezzled $1.5 Million ... and Nearly Got Away With It!" from Bank Systems and Equipment Magazine, June 1974.

"Anyone with a head on his shoulders could successfully embezzle funds from a bank. And many do.

For every dollar taken from a bank in a holdup or burglary, many more are lost to embezzlers. While banks spend countless millions of dollars on external security devices they often neglect internal security.

I know. Over a period of three years I took $1.5 million from Union Dime Savings Bank in New York. And the bank never seemed to miss a penny of it.

Banks are sometimes lax in checking on shortages. Often a teller learns of the possibility of dipping into his own cash when a legitimate shortage occurs. Seeing that it is handled as routine and with little criticism, some tellers decide to "produce" shortages on a more regular basis.

Our bank was completely on-line. And while I wouldn't say it made it easier to steal, it did make it faster.

To select which accounts to use I would go through the tapes at the end of the day and see if any new, large-balance accounts were opened. Then I would use the system's override and make a correction for about half of the account's balance – $50,000 for example – and use that money for gambling.

I ran into some problems but for quite a while I had it easier than I expected. Once in a while I would be confronted by a teller who was dealing with an irate customer who found a discrepancy in his account. The depositor might have deposited $100,000 in his account and found that the computer had recorded only $50,000 of the transaction.

My solution was to tell the teller it was probably a data processing error which I would check out. I would then fake a call to the data processing department and tell the teller it was a simple error which I would correct. While this appeased the teller, it did not appease the computer. I would have to use the correction feature and take $50,000 from another account and deposit it in the account in question.

Probably, this could have happened at any bank where too much supervisory authority was placed in one individual's hands. It s no trick for a bank to set up elaborate internal controls. But if a larcenous employee is familiar with these – and has authority – he can sometimes stay ahead of the bank and the auditors.

Banks are also worrying too much about what they call "clever programmers" who might be rearranging computer programs so that they can embezzle funds. But the programmers should be the bank's least worry. The programmer does not have ready access to the cash. He can play with his machine and cover up thousands of possible thefts. But it will do him little good unless he can get to the vault.

As far as audit controls go, Union Dime's were as good as could be expected, I suppose; still I was able to circumvent them. All banks should carefully check entries on the proof sheets. Since proof entries usually mean accompanying deposits, a check of large entries would have shown cash shortages."

If this man could extract $1,500,000 in small bundles over four years, and since he was only caught when police detectives notified the bank that he was often losing $30,000 per day at a local bookmaker, why worry about some minor derogatory entry in some credit file somewhere? It would seem easier to misspell your name or forget your number.

What do you think? ☐

An automatic white blood cell analyzer

By GERHARD K. MEGLA, PhD.
Corning Glass Works

Since about 100 million white blood cell differential counts are made yearly in the U.S. alone, various concepts have been devised for automating this heretofore manual process. Prime considerations for any instrument designed to perform this function include an ability to identify several types of white cells, a manual cell inspection capability and the capacity to detect and count atypical white cells. Also, a review of red cell morphology and platelets should be available. As an added feature, the concepts used in such an automated system should be expandable to classify additional cells.

Corning Glass Works has developed an automatic white blood cell analyzer that consists of a computerized microscope that automatically classifies segmented neutrophils, band neutrophils, lymphocytes, monocytes, eosinophils and basophils. In operation, it also flags and counts all abnormal cells. The classification is performed using similar cellular morphological features used by cytotechnologists, such as shape, optical density, nuclear area, cytoplasm area and color.

Functional Description

The function of the LARC* white blood cell analyzer system is best described with the schematic of Figure 1. After the blood slide has been placed in a special holder between the objective and the condenser of the microscope and is brought into approximate focus, the automatic focusing system takes over and provides consistently sharp focus by automatically moving the objective in 0.1-μm increments over a range of 0.5 mm in z-direction during the entire differential count.

Direction and displacement for the automatic focus is controlled by means of the acuity features of the cells and subsequent differentiation. The x-y stage moves at 500 steps per sec. in 5-μm increments across a meander pattern 300 μm wide in search of white cells as described in Figure 2. When a white cell is acquired, the x-y stage automatically moves the cell into the center of a 20 x 20-μm TV camera window for image processing and cell classification. The cell image is scanned with 48 lines over 20-μm square, resulting in resolution of about 0.4 μm. The output of the TV camera provides an analog electrical signal of the optical image. This is digitized by an analog-to-digital converter so the optical density of each image point is represented by a single computer word. A typical digital histogram of a white blood cell displaying the frequency of occurrence of image points on the ordinate and the optical density on the abscissa is shown in Figure 3.

From the "electronic image" stored in the core memory of a general purpose digital computer, certain cell features are extracted by analyzing the historgram. The features of interest are similar to those used by technologists to identify cell types. To keep the computation size small without sacrificing classification accuracy, only the more important features such as nucleus size, shape and density as well as cytoplasm density, color and size have been selected to quantitatively describe cell morphology.

After the features of a cell have been extracted, they are compared with the standard values of those cells for which the machine has been trained. It could be said that the machine duplicates the processes a technologist uses in comparing what is seen with the recollection of what has been taught. The cell is then identified as a particular type, if all its features are

*LARC – Leukocyte Automatic Recognition Computer

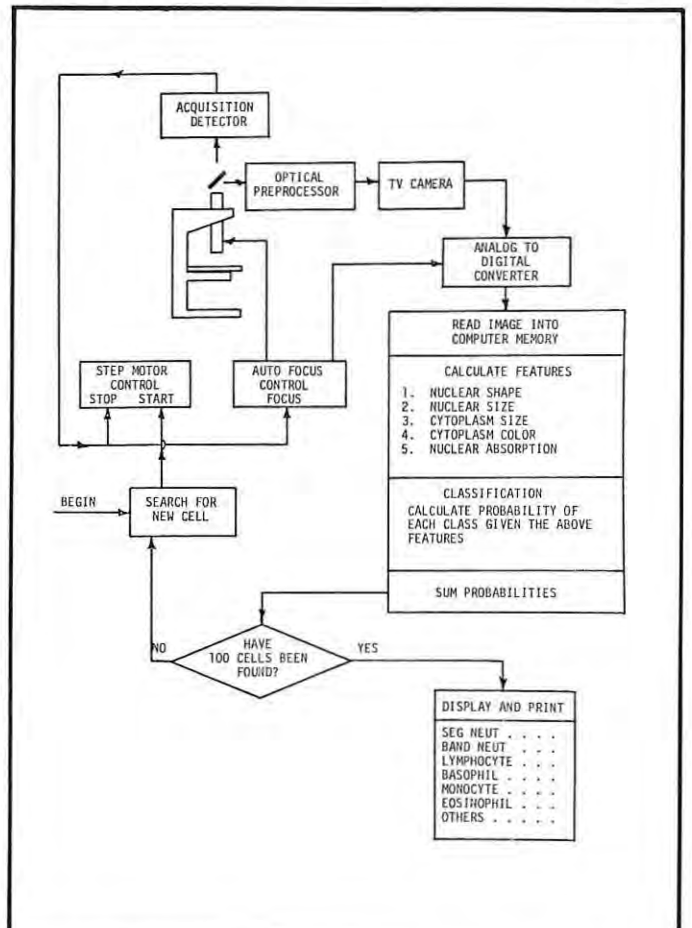

Figure 1. Principle Schematic of White Blood Cell Analyzer LARC-7

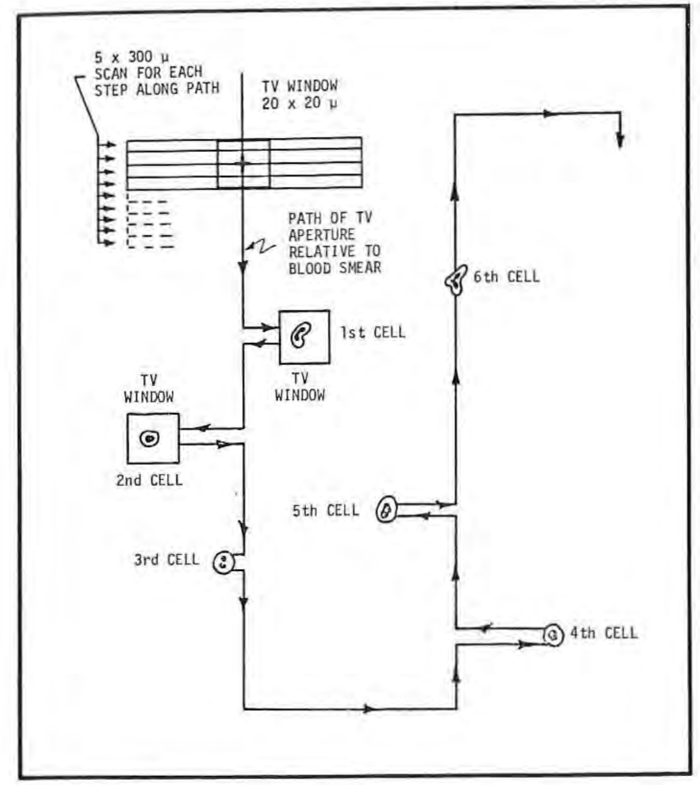

Figure 2. Acquisition Path

equal or close to those of an equivalent set of cells used in training the machine. If the cell features do not compare with any of the features of the training set of six normal types of white blood cells, the cell is classified as an "other."

The time to perform an automatic differential on each acquired object is determined by the sum of the times needed for x-y stage settling, acquisition, image read-in and histogram analysis. Since each of these functions requires between 0.1 and 0.2 sec. for the classification of one cell, a differential count of 100 white blood cells takes about 1 minute total time for a complete 100-cell differential, however, should include the time it takes to provide the hematologist with the total cytological information: i.e., sample slide preparation and staining, as well as the identification of abnormal white blood cells and review of red blood cell morphology, which use manual acquisition and focusing. The LARC white blood cell analyzer allows parallel determination of these last two operations by permitting the operator to survey them during the time the automatic differential count is being performed. This, therefore, efficiently minimizes the time required to complete all of the hematological tasks outlined above.

The operator interface is a carefully designed console engineered for maximum ease of operation. It contains input controls analog and digital displays and a printer.

The input controls allow the operator to use the microscope in the automatic or manual mode and offer options of 100, 200, 500 or 1000-cell classifications, as well as enabling starting, interrupting or stopping of the dynamic operation. Descriptive control buttons are also provided for "keying in" words or phrases for such information as red blood cell morphology or red blood cell conditions such as polychromasia, platelet concentration and a multitude of other frequently encountered conditions. Patient identification and other information can also be entered through the console which contains a 10-digit keyboard. Thus, each operator can devise his own code for identification and for the more frequent comments. All information entered through the keyboard can be stored in other data processing computers.

The completed white blood cell differential count is displayed on a panel having seven two-digit read-outs showing the distribution percentage of the six white blood cells and the total number of abnormals or "others." Also, comments entered by the operator are displayed for verification. Documentation of the computed differential is provided by pressing the "print" button for a print-out of the results. The console also houses a TV monitor that displays the cells as they are being scanned and counted. As the monitor holds an image while the machine stops briefly to classify each white cell, the operator can obtain valuable visual information and thus minimize the time needed to view the slide through the binoculars.

The console also contains a command button for automatically and exclusively reacquiring only the "other" cells, the locations of which have been stored during the count. With this mode, the operator can reexamine the atypical cells located by the machine, classify them, up-date and finalize the result and make any necessary comments.

The complete white blood cell analyzer, which has been designed and built in modular form for optimum space utilization in hematology laboratories, is shown in Figure 4. The total system consists of three parts: the mainframe, which includes the microscope with 1000-fold magnification, the stepping motors for moving the x-y stage, the automatic focusing optics, the acquisition components, the TV camera and the automatic oiler; the data processor, which includes the minicomputer, the electronic addressing circuitry and the power supply; and the operator console which allows selection of the various available options.

In order to obtain the types of prepared slides that are necessary for any automated differential system, Corning has also developed two accessories for the LARC system – a slide spinner for producing even monolayers of cells with cell distributions characteristic of the whole blood from which the sample is taken, and an automatic stainer to provide intense, uniform and reproducible coloration of the cells. These accessories assure that the automatic system "looks" at slides of identical preparation quality in each test.

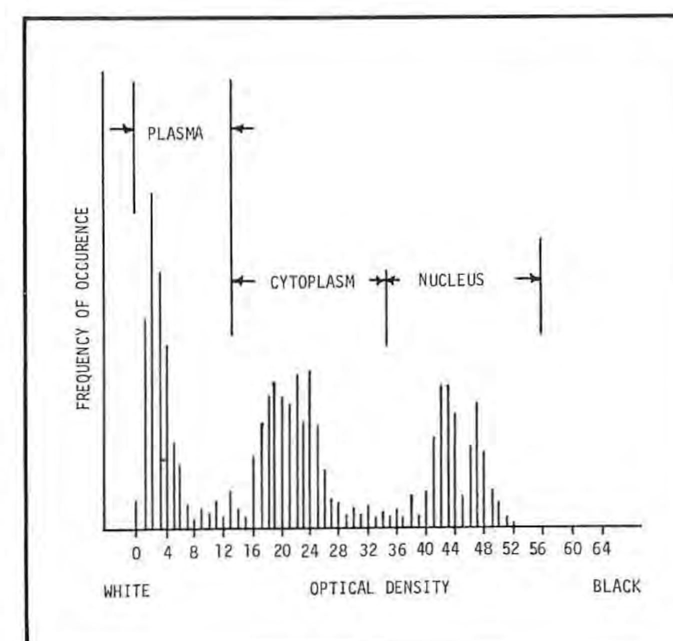

Figure 3. Histogram of Digital Density of White Blood Cells

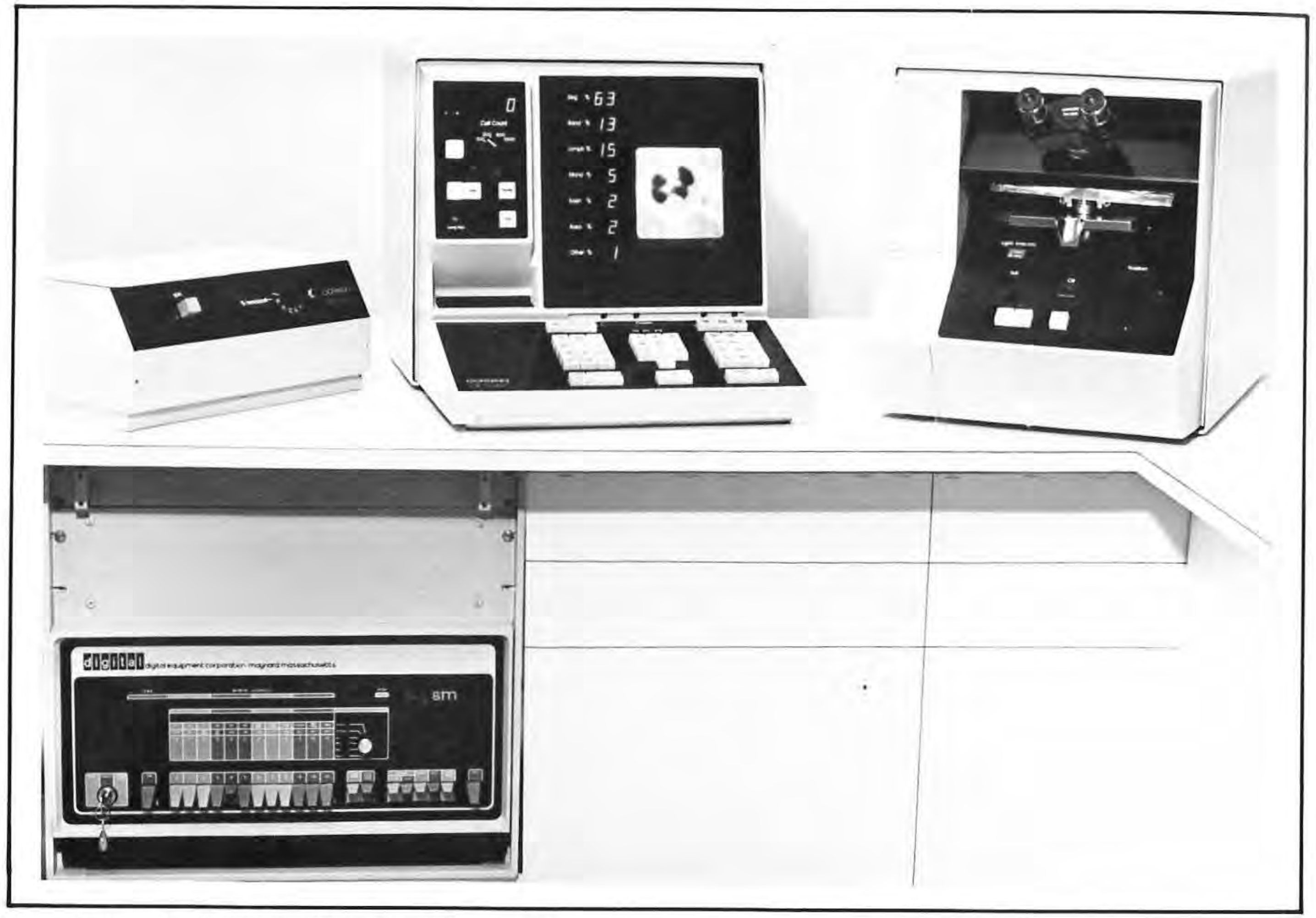

Figure 4. Complete Prototype White Blood Cell Analyzer

Field Test Results

To test the acceptability of the LARC white blood cell analyzer, a number of field tests in community and teaching hospitals were performed.

A comparison of the performance of the machine versus cytotechnologists was done by performing 25 differential counts of 100 cells each by machine and then by technologists. The 25 human differentials were averaged and the result was selected as the "true" differential count. The average of the machine differential counts and the technologists are:

	% SEGS	% BANDS	% LYMPHS	% MONOS	% EOS	% BASOS
Machine	39.8	4.2	41.7	9.4	4.5	0.2
Human	39.4	2.1	44.1	10.6	3.4	0.4

To include all statistical variations present in a typical hematology laboratory, field tests were performed under normal workload conditions at Presbyterian-St. Luke's Hospital in Chicago.[1] The results obtained from 860 slides showed that human and machine counts have similar profiles, which means that, on the average, the machine does not distort the differential count.

The next evaluation step was its use by lab technologists in hospital laboratories. Differential counts from the machine and from technologists done at separate times by different operators was compared in terms of the medical significance of the results.

This analyzer is now in production. □

Reference

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about the author

Dr. Gerhard K. Megla is director of Corning Glass Works' Biomedical Technical Center at Raleigh, N.C. He joined Corning in 1964 as research manager for electro-optics and microwaves and was named director of electronic research in 1966.

He received his formal education in Germany, receiving a B.S. degree in electrical engineering from the University of Berlin and his doctorate from the University of Dresden.

Dr. Megla is a member and fellow of the Institute of Electrical and Electronics Engineers (IEEE), the Society of Information Display, the Optical Society of America, the Society of Photographic Scientists and Engineers, and the New York Academy of Sciences. He has authored three books and numerous technical articles and is listed in American Men of Science.

Freedom's Edge – The Computer Threat to Society

By MILTON R. WESSEL
Columbia University School of Law
1974– 137 pp, paper-bound

It is the theme of this book that when our computer's impact on our data is great enough, it changes the environment in which we live. The author presents a tolerable sketch of the computer as it relates to society today: the privacy issue; the cashless society; good and bad data banks; the lagging legalities; point-of-sale marketing versus free competition; some philosophy on how the Establishment is securing itself using computers; and some provocative forecasts on how an objective computer may improve man's image of man. He omits some of the more important trends in computers to even lower costs and smaller devices with their impact on education and productivity.

The author concentrates largely on trying to suggest that kind of interest and concern that will stimulate action before it is too late. The analogy with the development of the automobile and its subsequent impact on our cities, GNP, and oil imports was omitted, although it seems very relevant. The author offers ten vague commandments of computer usage during the text, hoping that they are fundamental enough to help develop the principles of conduct necessary in the profession. Without some method of implementation, I fear that the many levels of the computer priesthood hierarchy will soon return to worshipping the golden CPU and to isolating the public from the computation process unless they pay through the nose.

E.A. Ulbrich

SID

NEW PRODUCTS

COMPACT OSCILLOSCOPE

Tektronix, Inc., announces the 10-MHz, dual-trace TELEQUIPMENT D32 Oscilloscope. This dual-channel oscilloscope offers 10-MHz bandwidth, vertical sensitivity ranging from 10 mV/div to 5V/div in 9 calibrated steps, and 19 sweep speeds from 500 ns/div to 500 ms/div, extended to 100 ns/div with a X5 magnifier. Other features include flexible triggering, automatic selection of chopped or alternate modes (depending on sweep speed setting), and automatic selection of TV/line or frame displays.

Its 8 x 10 division crt (0.7 cm per division) covers nearly one third of the front panel. The D32 offers a choice of battery or ac line operation with up to 4 hours continuous operation when working from its six rechargeable "D" cell batteries. The batteries, probes (2 each), and a molded front-panel protective cover are all included as standard equipment.

The D32's uncluttered front panel makes the instrument easy to use by those unfamiliar with oscilloscopes as well as experienced technicians. Lightweight and small (4"H x 9"W x 11"D), the D32 can be carried by either its three-position handle or an optional carrying case with a shoulder strap.

Tektronix, Inc.
P.O. Box 500
Beaverton, OR. 97005
Phone: (503) 644-0161

Circle #50 on Readers Service Card

CCD IMAGE SENSOR FOR FACSIMILE

Fairchild Camera & Instrument Corporation has introduced a 1,728-element charge-coupled linear image sensor that will reduce costs and improve fidelity in optical page scanning systems such as transmission of facsimile copies.

The new charge-coupled device, the CCD 121, is capable of reading a standard 8-1/2 x 11-inch page in less than a second. This can greatly increase the capacity of facsimile systems and reduce transmission costs, which are based on time used on long distance telephone lines.

The CCD 121 contains more than three times the number of image sensing elements in Fairchild's first linear image sensor introduced in 1973. This improves resolution (up to 200 lines per inch), and makes it possible to transmit facsimile prints of highly detailed images such as fingerprints and weather maps. Other uses for the CCD 121 include mapping, surveillance and machine control applications.

The device, fabricated with standard silicon integrated circuit technology, offers improved reliability over electromechanical systems, and its high dynamic range (200 to 1 at 1 MHz) enables it to operate over a broad range of light levels. The CCD 121 uses Fairchild's Isoplanar buried channel technology to provide high efficiency and fidelity. The device consists of 1,728 sensor elements and includes two charge transfer gates, two 2-phase 866-bit analog shift registers, an output charge detector/preamplifier and a compensation output amplifier. The analog shift registers feed information from the sensor elements to the charge detector, resulting in sequential reading of the 1,728 imaging elements.

The CCD 121 features low power requirements, with all operating voltages less than 20 V. The device is packaged in a 24-lead dual-in-line package with a glass window over the photosensor elements and a low-reflectance optical cavity.

Fairchild Camera and Instrument Corp.
4001 Miranda Avenue
Palo Alto, CA. 94042
Phone: (415) 962-3816

Circle #51 on Readers Service Card

30,000 HOURS LIQUID CRYSTAL DISPLAY

A life span of over 3 years, thousands of foot-lamberts visibility in sunlight and low power requirements from 3-15 volts and 1-5 microamperes are three of the salient features of the new Liquid Crystal Displays now being offered by Optix Corporation.

They are provided with glass-to-glass seal for reliability.

Characteristics include optional multiplexing or X-Y Matrix Address; MOS compatibility; 20:1 minimum contrast ratio; wide, single plane viewing angle; flat panel construction from a fraction of an inch to several inches; resolution of better than .001" with versatile format and character size and wide operating temperature range (0°C up to 100°C). Speed of response and switching is in millisecond range.

Three low profile standard types are available: 0-3302 for watch displays; 0-3300 for clock displays and 0-3601 for instrumentation display. Special displays including caricatures, symbols, and unique foreign language characters are available upon request.

Optix Corporation
Crestline Road
Norwalk, CT. 06854
Phone: (203) 838-9917

Circle #52 on Readers Service Card

RED, YELLOW AND GREEN LED DISPLAYS

Industrial Electronic Engineers, Inc., (IEE) has introduced the IEE-HERCULES Series 1712 and 1714 Red, Yellow and Green Light Emitting Diode Digital Displays.

The Series 1712 offers a choice of red, yellow or green displays in .3" high, 7-segment characters. Featuring a reflectorized design to accommodate variant ambient lighting, and to provide wide angle viewing, high contrast and uniformity of segmentation and characters, Series 1712 can be mounted in 2 to 8 digit multiples with easy to install IEE-ATLAS Universal Display Mounting Hardware.

The Series 1714 which offers large .6" high, 7-segment characters for wide angle and distance viewing, is also available in choice of red, yellow or green, common anode, left decimal displays. Among its other characteristics are 18-pin dual-in-line mounting, .83" wide x 1.00" high x .31" deep package and extremely low, IC-compatible power requirements.

Both series are available for immediate delivery. The Series 1712 in red, yellow and green is priced at $2.70 each in 100 piece lots, while the Series 1714 are $3.50 each at the 100 quantity level. Prospective users may take advantage of IEE's special introductory offer on limited quantities (not to exceed 10 pieces) for prototype evaluation at substantially reduced prices.

Also available is a new Product Profile covering both Series 1712 and 1714 displays. This technical catalog contains detailed dimensional outlines, opto-electric characteristics, absolute maximum ratings, pin assignments, and "second source" cross reference information between IEE's part numbers and other manufacturers' LED's.

Industrial Electronic Engineers, Inc.
7720 Lemona Avenue
Van Nuys, CA. 91405
Phone: (213) 787-0311

Circle #53 on Readers Service Card

MULTICOLOR GRAPHICS

Complementing their line of monochromatic CRT monitors, KRATOS Display Division now offers Beam Penetration Phosphor multicolor display capability with resolution comparable to that of their black and white, random position, XYZ units.

These monitors display characters, symbols and vectors in any of 4 standard colors which are selected by internally switching the CRT anode voltage. A fifth color is optional.

Several standard models are available with screen sizes from 5" to 25" in both

single chassis and dual chassis configurations. This allows for rack mounting of monitor and electronics or adaptation to the user's stylized console. Custom units are also available.

Kratos
403 South Raymond Avenue
BIN 45
Pasadena, CA. 91109
Phone: (213) 449-3090

Circle #54 on Readers Service Card

4-K PROM

A 4,096-bit programmable read-only memory (PROM) which the user can erase and reprogram repeatedly has been developed by National Semiconductor Corp.

The "MM5204" is a static, non-volatile memory organized into 512 words of 8 bits each. It is manufactured by means of a P-channel silicon-gate process that employs floating-gate avalanche MOS technology, which permits the PROM to be erasable as well as compatible with bipolar logic devices. The process is the same one that National uses to produce its "MM5203," a 2,096-bit erasable PROM.

Access time of the "MM5204" is 750 nanoseconds. The device employs Tri-State® outputs for use with bus-organized systems; this type of output easily permits expansion of the memory circuit. A chip-select input is also provided.

The "MM5204" PROMs are shipped from the factory with a logical "0" in each cell. With the application of a 50-volt pulse to each cell selected by the user, the "0" is replaced by a logical "1" in the form of a stored charge. The complete programming procedure takes approximately 30 seconds. The program is erased and all cells are returned to a logical "0" when the chip is exposed to short-wave ultra-violet light (253.7 nm).

Compatible with National's "MM5214" mask-programmed ROM, the new "MM5204" PROM operates from standard sources of +5 and -12 volts while drawing approximately 28 milliamperes. This means that power consumption is approximately 0.1 milliwatt per bit.

Through the use of a logic input known as the "Power Saver," sections of the PROM can be deactivated and operating current can be reduced to 6 milliamperes, while power consumption is cut to 20 microwatts per bit. The "Power Saver" is used only when the memory is not being accessed.

The "MM5204" is manufactured in a 24-lead dual-in-line package with a quartz lid that admits UV light. The PROM is rated for normal operation over a temperature range of 0°C to +70°C and can be stored at temperatures between -65°C and +125°C without damage or loss of program.

National Semiconductor Corp.
2900 Semiconductor Drive
Santa Clara, CA. 95051
Phone: (408) 732-5000

Circle #55 on Readers Service Card

SELF-CHECKING CRT

A newly developed technique introduces a precisely located patch of infrared emitting phosphor (1 micron emission) which is sensed by externally mounted photo-diodes. This is available in most CRT envelopes.

As the beam is deflected on the phosphor dot (IR), the output pulse is used in a variety of ways to assist the display engineer – either to calibrate X&Y deflection; to permit proportional gain adjustment, or to provide automatic contrast control in conjunction with an ambient sensor.

Thomas Electronics, Inc.
100 Riverview Drive
Wayne, NJ 07470
Phone: (201) 696-5200

Circle #56 on Readers Service Card

GAS DISCHARGE DISPLAY POWER SUPPLY

A new series of power supplies has been designed by Endicott Coil to operate gas discharge displays.

Designated the "900" series, these units work from a 12 VDC line and provide up to 250 VDC at 30 mu. Single or dual outputs are available, with a total output of 15 Watts. These units are encased in aluminum for heat dissipation and if need be, the case can be grounded for electrostatic shielding. The "900" is designed for PC board mounting and measure 2" x 2.5" x 1.12".

Endicott Coil Co., Inc.
24 Charlotte St.
Binghamton, N.Y.
Phone: (609) 797-1263

Circle #57 on Readers Service Card

COMPOSITE SYNC APPLICATION NOTE

Many engineers are faced with the problem of designing the proper synchronization signals for CRT monitor displays, since monitors are now widely used in such products as data terminals and video games. Advanced Systems Laboratories, Inc. has prepared an application note which helps take the mystery out of composite sync signal design and generation. The application note describes the timing for the sync waveforms and the blanking times, as well as a circuit for mixing TTL video and sync signals to make up the composite waveform. The two page note is available without charge from Advanced Systems Laboratories, Inc., Berlin, New Jersey 08009.

Circle #60 on Readers Service Card

PULSED VS SOURCE

A high intensity Pulsed Ultra-Violet Xenon Lamp with a light spectrum that is rich in the 2,000–4,000 Angstrom Ultra-Violet region has been developed by Xenon Corporation, Medford, Massachusetts.

This lamp features a pulse duration in the 1 to 10 microsecond region with a resulting "heatless" UV.

The Model-457 pulser will drive the lamp at repetition rates up to 60 PPs with a peak power range of 1 to 10 megowatts. The energy/flash valves are 1, 5, 10, 25, or 100 joules.

Xenox Corp.
39 Commercial St.
Medford, MA 02155
Phone: (617) 395-7634

Circle #58 on Readers Service Card

VERSATILE SIGNAL GENERATOR KIT BASED ON MONOLITHIC FUNCTION GENERATOR

A single integrated circuit provides most of the circuitry in a new function generator kit, allowing a versatile signal generator to be built for a small fraction of the cost of a comparable bench instrument.

The kit is based on the XR-2206 Monolithic Function Generator. The 16-pin IC contains a precision VCO (voltage-controlled oscillator) analog multiplier and sinewave shaper, amplifier for the sinewave/triangle wave output, buffered square wave output, current switches for frequency range control, and amplitude and symmetry control inputs.

As used in the function generator kit, the XR-2206 generates tunable sine, triangle and square wave outputs. The kit's circuit board also has terminations that allow the IC to be used as an AM/FM sweep generator. Other functions that the IC itself can perform include tone generation and FSK or PSK (frequency shift or phase shift keyed) modulation. It may also be used to build solid-state demodulators.

The IC's operating frequencies are established with timing capacitors in a resistor-capacitor network. The network components supplied in the kit provide four tunable frequency ranges: 1 Hz to 100 kHz, 10 Hz to 1 kHz, 100 Hz to 10 kHz, and 1 kHz to 100 kHz.

Typical operating characteristics of the completed instrument are: sinewave THD (total harmonic distortion), less than 1% from 10 Hz to 10 kHz and less than 3% over the maximum 1 Hz to 100 kHz range; sine and triangle wave amplitude range, 0 to 6 volts peak-to-peak; square wave amplitude, approximately the same as the power supply range (±6 or +12 V) for applications such as oscilloscope synchronization, or limited to 0 to 6 V swings for applications such as driving logic circuits. In AM/FM operation, the frequency ranges are the same and amplitude modulation range is approximately 55 dB. The instrument is relatively insensitive to temperature and supply drift. The XR-2206 features frequency stability of 20 ppm/°C and 0.01%/V. Its sinewave THD is typically 0.5%.

The function generator instrument's frequency ranges are selected by switching in the kit's timing capacitors. Nominal frequency accuracy is ±5%. Much higher precision can be achieved by using a frequency tuning dial large enough to permit accurate calibration. Three trimming potentiometers are included in the kit.

The kit's manual includes the schematic of a line-power supply (AC to DC converter) or the instrument can be used with a conventional DC supply of ±6V or +12V. The kit's printed circuit board fits a case 7X4X4 inches. Case, knobs and other front panels parts are not supplied.

Two kit models are available: XR-2206KA for $19.95 and XR-2206KB for $29.95. Both include the XR-2206 IC, etched, drilled and solder-plated printed circuit board, manual and additional design data on the IC. The "A" kit, which does not include the RC network or trimmer components, is intended for users who prefer to use their own RC components or experiment with the IC. The "B" kit includes the components.

Exar Integrated Systems
750 Palomar Avenue
Sunnyvale, CA 94806
Phone: (408) 733-7700

Circle #59 on Readers Service Card

SID 1975 INTERNATIONAL SYMPOSIUM and EXHIBITION
SHOREHAM AMERICANA HOTEL/WASHINGTON, D.C. /APRIL 22-23-24, 1975

PROGRAM HIGHLIGHTS

*THE GROWING INTERNATIONAL activity in display technology will again be underscored this year, at SID 75. Significant development/design reports by over 100 authorities from here and aboard — Germany, Finland, Norway, Switzerland, France, England and Japan — will be presented during ten daytime sessions.

*THE EVENT will also be highlighted by invited talks on video communications, automotive digital displays, a capacitive-sensing video display system, dithervision — a new display technique, and perceived information content of displayed information . . . Also a sparkling illustrated luncheon talk on Information Display and the Radical Revitalization of Society, by T.H. Nelson, University of Chicago, and author of Computer Lib.

*DURING FOUR evening-discussion periods, more than 20 global experts will assess EL layers and displays, microprocessor/memory technology, user needs and technology support, and interactive displays in medicine.

*AVAILABLE, TOO, at the meeting will be the annual DIGEST of TECHNICAL PAPERS with 800-1000 word illustrated condensations of all talks — invited and contributed — plus day-evening session overviews.

*AUTHOR INTERVIEWS, affording face-to-face chats, will again be held.

*AN EXHIBITION featuring a timely display of operational systems, components and accessories, valued at over $10-million, will be held.

*SEMINAR SESSIONS have again been scheduled for the day before and day after the symposium — Monday, April 21 and Friday, April 25. Cosponsored by SID and the Electrical Engineering Department of the University of Maryland, eight 1-1/2 hour in-depth tutorials will be presented.

*ADVANCE REGISTRATION fees for members are $35.00; nonmembers, $45.00. At-conference costs will be $45.00 for members and $55.00 for nonmembers. Additional DIGESTS will be available to members at $15.00, and $20.00 for nonmembers. Seminar registration fee for one day is $70.00 and $110.00 for both Monday and Friday sessions.

*SID 75 chairman is Joseph Markin, Zenith Radio Corp., Chicago; program chairman is Vernon J. Fowler, GTE Labs Inc., Waltham, MA.

DAY SESSIONS

TUES/APRIL 22

INVITED/Whither Video Communications
C.C. Cutler, Bell Laboratories, Holmdel, NJ
INVITED/Automotive Display Requirements
M. Trenne, GM Tech. Ctr., Warren, MI
INVITED/The Capacitance-Sensing Video Disc System
E.O. Keizer, J.K. Clemens, RCA Laboratories, Princeton, NJ
Low Cost Acoustooptic Modulators Molded from Plastic Materials
R.N. Blazey, Eastman Kodak Co., Rochester, NY
The Specification of Acoustooptic Deflector Performance
J.C. Owens, Eastman Kodak Co., Rochester, NY
Light Valve Projection Displays for Information System Terminals
D.W. Vance, Xerox Res. Ctr., Palo Alto, CA
Recent Advances in the Single-Gun Color-TV Light-Valve System
W.E. Good, General Electric Co., Syracuse, NY
A TV Projection Light Valve
A.D. Jacobson, J. Grinberg, W.P. Bleha, L.J. Miller, L.M. Fraas, D.D. Boswell, Hughes Research Lab., Malibu, CA
The Mirror Matrix Tube: A Light Valve for Projection Displays
R.N. Thomas, H.C. Nathanson, P.R. Malmberg, J. Guldberg, Westinghouse Res. Labs., Pitts., PA
A.S. Jensen, Westinghouse Def.-Elec. Sys. Ctr., Baltimore, MD
INVITED/Dithervision — A Collection of Techniques for Displaying Continuous Tone Still-and-Animated Pictures on Bilevel Displays
C.N. Judice, Bell Laboratories, Holmdel, NJ
Comparison and Optimization of Computer-Generated Digital Halftone Pictures
P. Stucki, IBM Zurich Res. Lab., Ruschlikon, Switzerland
An Adaptive Algorithm for Spatial Grey Scale
R.W. Floyd, L. Steinberg, Stanford University, Stanford, CA
Realtime Digital Color Interactive Image Restoration and Enhancement
H.C. Andrews, USC, Los Angeles, CA
Conversion of Digitally-Defined Conic Sections into Raster Scan Format by Special-Purpose Hardware
P. Lappalainen, University of Oulu, Oulu, Finland
Realtime Signal Processing for Image Display and Film Recording
J. Lowry, Digital Video Labs., Toronto, Canada

WED/APRIL 23

Electrochemical Displays: A Bird's-Eye View
W.E. Kramer, J.H. McGee, H.N. Hersh, Zenith Radio Corp., Chicago, IL
A Tungsten Bronze Electrochemical Character Display
J.H. McGee, W.E. Kramer, H.N. Hersh, Zenith Radio Corp., Chicago, IL
Features of an Electrochromic Display Device
R.D. Giglia, American Cyanamid Co., Stanford, CT
Positive Column Discharge Cells for Multicolor Display Panels
A.B. Budinger, GTE Labs. Inc., Waltham, MA
High-Efficiency, High-Luminance Gas-Discharge Cells for TV Displays
M.C. De Jule, G.J. Chodil, Zenith Radio Corp., Chicago, IL
Improving Performance of DVST Display Systems
T.B. Cheek, Tektronix, Inc., Beaverton, OR
Recording Storage Tubes for Airborne Applications
B. Courtan, Thomson-CSF, Saintsgrove, France,
R. Kleehammer, DuMont Electron Tubes-Devices Corp., Clifton, NJ
Measurements of Current Density of Focussed Electron Beams in CRTs
T. Saito, M. Ogawa, Sony Corp., Tokyo, Japan

WED/APRIL 23 (Continued)

Image Storage by a Thin-Film PN Cu_2S-CdS Heterojunction
G.H. Hewig, W.H. Bloss, Stuttgart Univ., Stuttgart, W. Germany
Image Contour Extraction with Analog MOS Circuit Techniques
P.I. Suciu, D.A. Hodges, Univ. of CA., Berkeley, CA
Liquid-Crystal Field-Effect Devices Operating in the Multiplexed Mode
L. Goodman, D. Meyerhofer, RCA Labs., Princeton, NJ
A Liquid Crystal TV Display Using a Silicon-on-Sapphire Switching Array
L.T. Lipton, M.A. Meyer and D.O. Massetti
Hughes Aircraft Co., Carlsbad, CA
A Realtime Matrix Liquid Crystal Display
K. Uehara, H. Mada, S. Kobayashi, Tokyo Univ. of Agr.–Tech., Tokyo, Japan
Electroluminescent Display with Nonvolatile Storage
T.P. Brody, K.K. Yu, L.J. Sienkiewicz, Westinghouse Res. Lab., Pittsburgh, PA
A 1250-Character DC Electroluminescent Display
R.W. Sarginson, Royal Radar Estab., Great Malvern, England
A. Vecht, Thames Polytechnic, London, England
Frame-Time Analysis of the Performance of Refreshed Matrix-Addressed Displays
P.M. Alt, P. Plesbko, IBM Res. Ctr., Yorktown Heights, NY
INVITED/Perceived Information Content of Displayed Images
R.W. Cohen, RCA Laboratories, Princeton, NJ
Legibility of Simulated Dot Matrix Displays
A.D. Poularikas, W.D. Lawing, Univ. of RI, Kingston, RI
G. Peters, Wright-Patterson AFB, Dayton, OH
Comparative Studies of the Legibility of CRT-Generated Displays
E. Schubert, Res. Inst. for Human Eng., Meckenheim, W. Germany
Visual Response Times in High-Ambient Illumination
R.N. Tyte, J.H. Wharf, B. Ellis, Royal Aircraft Establishment, Farnborough, England
A Saturation — Luminance Function for Color Displays
A. Valberg, University of Oslo, Oslo, Norway
The Functional Description Inventory as a Human Factors Tool in Evaluating Total System Effectiveness
W.R. Helm, Naval Air Test Center, Patuxent River, MD
Effect of Changes in Visual Parameters of Helmet-Mounted Displays on Target-Acquisition Performance
J.R. Bloomfield, K.J. McAleese, Honeywell Sys. Res. Ctr., Minneapolis, MN

THURS/APRIL 24

Light Pen Detection Over Dark Areas of an AC Plasma Panel
P.D.T. Ngo, Bell Laboratories, Holmdel, NJ
A Shift-Logic Plasma Display/Memory Unit
J.D. Schermerhorn, Owens-Illinois, Perrysburg, OH
Serial Input Plasma Charge-Transfer Device
W.E. Coleman, D.G. Craycraft, National Electronics/Varian Div., Geneva, IL
Low-Voltage Selection Circuits for Plasma Display Panels
T.N. Criscimagna, IBM System Devel. Div., Kingston, NY
A Driving Circuit for Plasma Display Panels
H. Tottori, E. Hatabe, F. Isogai, S. Yoshida
Mitsubishi Central R-D Lab., Hyogo, Japan
A Driving Technique to Stabilize AC Plasma Display
K. Murase, A. Andoh, S. Umeda, N. Nakayama
Fijitsu Laboratories Ltd., Hyogo, Japan

DAY SESSIONS

THURS/APRIL 24 (Continued)

Interactive Learning Terminal
M.C. Goddard, Eastman Kodak Co., Rochester, NY
A Line-Drawing Processing System for Interactive Storage, Retrieval and Editing
J.K. Yoo, J.T. Tou, Univ. of Fla., Gainesville, FL
An Interactive Map Projection Generation System
D. Edelheit, University of Connecticut, Storrs, CT
A Software Package for Graphical Display of 3-Dimensional Objects from Radioisotope Scintigrams
W.G. Wee, V. Vo, University of Cincinnati, Cincinnati, OH
Interactive Color Graphics for Waveform Analysis
F.E. Robbins, System Development Corp., Huntsville, AL
An Experimental System for Evaluating Datalink Cockpit Concepts and Devices
J. Sabath, U.S. Dept. of Trans., Cambridge, MA

EVE. PANELS

TUES/APRIL 22

E-1: Electroluminescent Layers/Display Devices
E-2: Impact of Low-Cost Microprocessor and Memory Technology on Display Terminal Architecture

WED/APRIL 23

E-3: User Needs and Technology Support
E-4: Requirements for Interactive Displays in Medicine

UNIV. OF MD/SID SEMINAR

Fundamentals of Liquid Crystals and Other Liquid Display Technologies
Joseph A. Castellano: Chairman, Princeton Materials Science Inc., Princeton, NJ

Plasma Displays — AC and DC
H. Gene Slottow: Assoc. Professor of Elec. Eng., Univ. of Illinois, Urbana — Champaign Campus, Urbana, IL

Holography and Information Display
Tung H. Jeong: Professor of Physics, Lake Forest College, Lake Forest, IL

Display Technology and Applications in Japan
Sanai Mito: Executive Director, Sharp Corp., Eng. Div., Nara, Japan

Review of Digital Image Processing
Fred C. Billingsley: Supervisor, Earth Resources Image Processing Group, J.P.L., Pasadena, CA

Fundamentals of Interactive Computer Graphics
Ira W. Cotton: Computer Specialist, Institute for Computer Sciences and Technology, National Bureau of Standards, Washington, DC

Principles of Colorimetry with Applications to Color TV
C. Bailey Neal: Manager, Adv. Dev., GTE Sylvania Inc., Batavia, NY

Contemporary Human Factors of Visual Display Systems
Harry L. Snyder: Professor, Va. Poly, Inst./State Univ., Blacksburg, VA

For further information, call Lewis Winner: 212-279-3125.

SID TENTATIVE AMENDMENTS TO SID BYLAWS

Article 12 — CHAPTERS

4. The finances of the chapter shall be the responsibility of the Chapter Treasurer and the Chapter Chairman. The Treasurer and Chairman shall not commit the local chapter to expenditures in excess of 75% of the chapter's funds without prior written approval of the National Treasurer.

5. No chapter officer or member is empowered to enter into agreements committing the Society, financially or otherwise, without the express written authorization of the Executive Committee. No member shall represent himself as speaking for the Society without express authorization from the Executive Committee.

6. Chapters which fail to sustain levels of activity consistent with the standard of the Society shall be subject to suspension and deactivation. The Executive Committee shall have the power to suspend a chapter after one year if the chapter does not hold at least four (4) technical meetings and one (1) annual general membership meeting.

7. Each Chapter Treasurer shall advise the National Treasurer of the disposition of chapter funds prior to the national General Membership meeting. Information shall include all bank account numbers and balances as well as investments and negotiable securities held by the chapter.

8. Upon suspension of a chapter:

a) All chapter members will be notified by the Society of the suspension. Members will be given the option of remaining with the suspended chapter or of affiliating with another chapter of their choice.

b) No monies shall be transmitted to the chapter. Any dues apportionment or other funds shall be held in escrow by the Society in an account specifically established for this purpose.

c) The seat of the Chapter Representative on the Board of Directors shall be declared vacant and the quorum of the Board adjusted accordingly.

d) The financial status of the chapter shall be determined by the Treasurer of the Society.

9. Restoration of a suspended chapter to active status shall be effected by the Executive Committee upon receipt of a petition signed by the majority of members in good standing of the suspended chapter or, at the discretion of the Executive Committee, upon satisfactory proof that the chapter is prepared to sustain levels of activity consistent with the standards of the Society.

10. A chapter shall be deactivated by the Executive Committee after one year of suspension. Upon deactivation:

a) All chapter members shall be notified of chapter deactivation. Each chapter member shall be requested to select another chapter for affiliation within 60 days. After this time period, the Secretary, with the approval of the Executive Committee, shall assign unaffiliated members to geographically appropriate chapters. The member and the receiving chapter shall be notified of the action.

b) Chapter finances shall be audited by the Treasurer of the Society.

c) All chapter funds shall be turned over to the Treasurer.

d) The Treasurer shall advise all banking institutions dealing with the chapter of the chapter's deactivation.

11. Reactivation of a chapter shall be subject to the same procedures as formation of new chapters.

Rationale: (4 and 5) The current bylaws make no explicit provisions which protect the Society from actions taken by individual members.

(6 thru 10) The current bylaws make no provision for the deactivation of chapters when they have ceased to function.

SUSTAINING MEMBERS

AYDIN CONTROLS
Fort Washington, PA 19034

BURROUGHS CORPORATION
Plainfield, New Jersey 07061

CHERRY ELECTRICAL PRODUCTS CORP.
3600 Sunset Ave., Waukegan, Illinois 60085

CONRAC CORPORATION
New York, NY 11017

DATA DISC, INCORPORATED
686 West Maude Avenue, Sunnyvale, CA 94086

DIACON, INC.
San Diego, California 92111

DISPLAY COMPONENTS, INC.
Littleton, MA 01460

DuMONT ELECTRON TUBES AND DEVICES CORP.
Clifton, NJ 07015

FERRANTI ELECTRIC COMPANY
Plainview, New York

GENERAL DYNAMICS ELECTRONICS DIVISION
Box 61127
San Diego, CA 92138

GML INFORMATION SERVICES
Lexington, Massachusetts 02173

HEWLETT-PACKARD COMPANY
Colorado Springs, Colorado 80907

HUGHES AIRCRAFT COMPANY
Culver City, CA 90230

IBM CORPORATION
Armonk, NY

NAC INCORPORATED
Minato-ku, Tokyo, Japan

OPTICAL ELECTRONICS, INC.
Box 11140, Tucson, AZ 85734

OWENS ILLINOIS, INC.
Box 1035, Toledo, OH 43666

PHILCO-FORD CORPORATION
Palo Alto, CA

PHOTO RESEARCH DIVISION KOLLMORGEN CORPORATION
Burbank, CA 91505

RANK ELECTRONIC TUBES
RANK PRECISION INDUSTRIES LIMITED
Sidcup, Kent, England

REDACTRON CORPORATION, INC.
Hauppauge, NY 11787

SIEMENS AG
Munich, West Germany

SINGER-LIBRASCOPE
Aerospace & Marine Systems Group
Glendale, CA 91201

SYNTRONIC INSTRUMENTS, INC.
Addison, IL

TEKTRONIX, INC.
Information Display Products
P.O. Box 500, Beaverton, OR 97005

THOMAS ELECTRONICS, INC.
Wayne, NJ 07470

THOMSON-CSF
Paris, France

XEROX CORPORATION
El Segundo, CA 90245

ADVERTISERS INDEX

'75 NCC PREVIEW

AN IMPERATIVE FOR COMPUTER PROFESSIONALS

Visitors to the 1975 National Computer Conference in Anaheim, Calif., May 19-22 will be able to choose from approximately 90 program sessions and over 900 exhibit booths. The '75 NCC is shaping up as the most varied and comprehensive computer conference ever held on the West Coast. All events will take place in the ultra-modern Anaheim Convention Center.

An estimated 400 speakers and session participants will explore key issues and answers in three vital areas . . . Data Processing Methods and Applications, Science and Technology, and Societal Issues. Under these broad headings, over 20 critical topics will be analyzed in depth. Many will be covered in "mini-programs" — one- or two-day updates on the most recent developments within each topic and held, where possible, at one specific location.

The '75 NCC exhibits are expected to fill 90,000 square feet, with some 300 exhibiting organizations anticipated. They will provide the visitor with a unique opportunity to examine the latest in data processing products, systems, software, and services.

THE INDUSTRY ON DISPLAY

The '75 NCC will include the largest computer exhibit ever held in a major West Coast city. Visitors will find a wide assortment of products and services — including mini-computers, mainframes, peripherals, terminals, package programs, communications systems, data processing services, technical publications, and much more. Many products will be displayed for the first time. There will also be live demonstrations, new product literature, and the opportunity for personal contacts with industry representatives.

Donal A. Meier
'75 NCC General Chairman

A PROGRAM VITAL FOR TODAY

The '75 NCC program has three primary objectives: to update the specialist on the latest in computer science and technology; to update users on methods and applications; and to promote interdisciplinary discourse leading to increasingly cost-effective systems and software.

Among key areas to be explored are training of user technical personnel, defining operational requirements and management objectives, privacy and confidentiality, and advanced system design techniques. Additional important areas will cover such subjects as government and legal issues, electronic funds transfer, medical/health care, computer architecture, interaction of hardware and software, memory technology, microprocessors, data base management, programming technology, interactive graphics, and communications and networking.

'75 NCC HIGHLIGHTS

- Approximately 90 program sessions.
- Over 400 leading speakers and program participants.
- Approximately 300 exhibiting organizations.
- Addresses by leading national authorities, high-interest special events, and a variety of social activities.

Stephen W. Miller
Program Chairman

MORE NCC DETAILS

Mail coupon for advance information on '75 NCC, or to preregister. With preregistration, you'll receive your NCC *Everything Card* covering the full conference and exhibits. Benefits include: a $15 saving over registration at Anaheim, conference luncheon discounts, advance housing arrangements, and the '75 *NCC Proceedings*.

SID

'75 NCC, c/o AFIPS, 210 Summit Ave., Montvale, N. J. 07645

_____ Yes, send me my *Everything Card*. I've enclosed $60, covering the '75 NCC program and exhibits, plus preregistration benefits.
_____ Please continue to send me all the facts.
_____ My company is interested in exhibiting at '75 NCC.

Name ______ Title ______
Company ______
Street ______
City ______ State ______ Zip ______

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