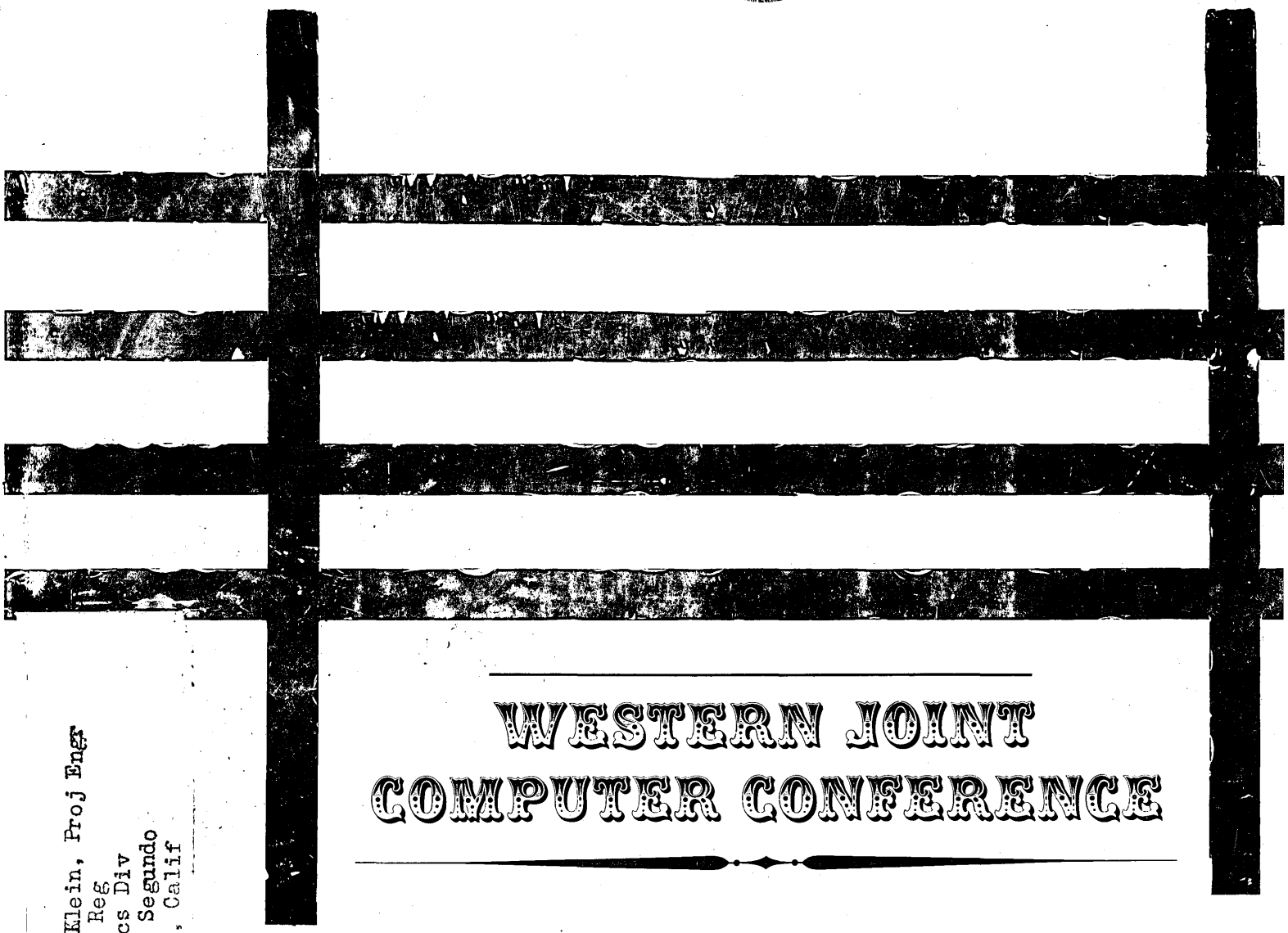
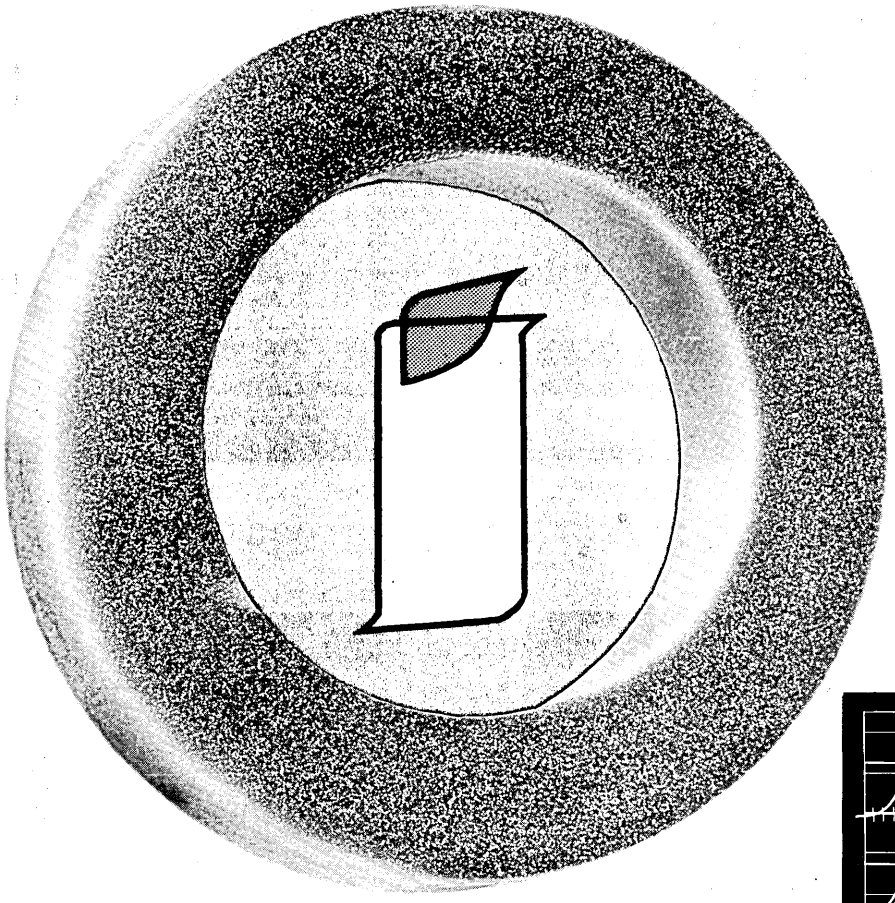
DATAMATION 60

March / April

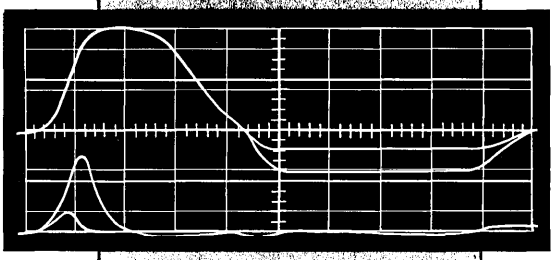


WESTERN JOINT COMPUTER CONFERENCE

Now...one microsecond



Complete Core Memory Cycle with TMI Word-Select Technique



Oscillogram showing drive pulse and switching time for TM 301-02 core. Time scale 0.02μs/division.

TMI pioneers again to make commercially available a newly developed advanced core memory product. Type LQ memory products provide a complete **clear/write** and **read/restore** memory cycle at rates to one megacycle, utilizing a new word-select design technique. These products are offered by Telemeter Magnetics in any form desired — from cores to complete memory systems.

Cores For those memory manufacturers who prefer to wire their own arrays, TMI word-select ferrite cores may be ordered now. These high speed cores provide extremely fast switching with low drive current.

Arrays and Stacks You may take advantage of the skill and production efficiency developed at TMI in manufacturing millions of cores, most of which have been assembled into arrays and memory stacks. This know-how is being applied to assembly of the new word-select cores into configurations to meet virtually any high speed computer design need.

Memories A new ultra-speed memory—the Type LQ—is available for commercial delivery in late 1960. Operating speeds up to 1.0 microsecond random access cycle time are now economical and result from the development of special ferrite cores and advanced driving and sensing circuits. The LQ word-select memory permits application to a wide variety of speed and capacity requirements.

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TELEMETER MAGNETICS Inc

P.O. Box 329, Culver City, California
Data Equipment Division, 9937 Jefferson Blvd., Culver City, Calif.
® Components Division, 2245 Pontius Ave., Los Angeles, Calif.

For complete specifications or to discuss your problem with a TMI applications engineer write or call

PIONEERS IN DEVELOPMENT AND MANUFACTURE OF CORE MEMORY PRODUCTS

Circle 1 on Reader Service Card.

a commentary

QUO ANIMO?

by JACKSON W. GRANHOLM

The year 1959 was memorable for a number of things. Not the very least of these was the publication in DATAMATION of expurgated, quasi-verbatim accounts of parts of a session held March second at the RAND Corporation in Santa Monica. Various greater or lesser lights (yr. obt. author included) were invited to this meeting. It was a no-holds-barred, let-your-hair-down (where possible) kind of thing.

Reaction to this session (and particularly to its publication) was remarkable for two reasons. The first was that this reaction was rather violent. A massive and untoward amount of wailing, teeth gnashing, garment rending, and crying-towelmanship came to pass. The second reason, dependent upon and stemming from the first, is that the session can hardly have been that important.

This latter viewpoint is expressed quite succinctly, if brutally and truculently, by the Honorable Wolf J. Flywheel (possibly a pseudonym?) of Camden, New Jersey, in his letter to the Editor of DATAMATION (Volume 5, Number 5, Page 2). Flywheel indicates that, in his opinion, the whole matter is ridiculous.

Certain noted past presidents of ACM were reported by competent observers at the fall, 1959, ACM session in Boston to have become positively livid over the RAND session, illustrating the first point above.

Now all this is hardly without historical precedent. The independent organization, founded on common interest, and organized around such interest, is one of the most time-honored institutions in our nation. The Revolutionary War was won by what was, essentially, a loose amalgamation of independent organizations.

Today there exist many such organizations, some of which do work

(Continued on page 50)

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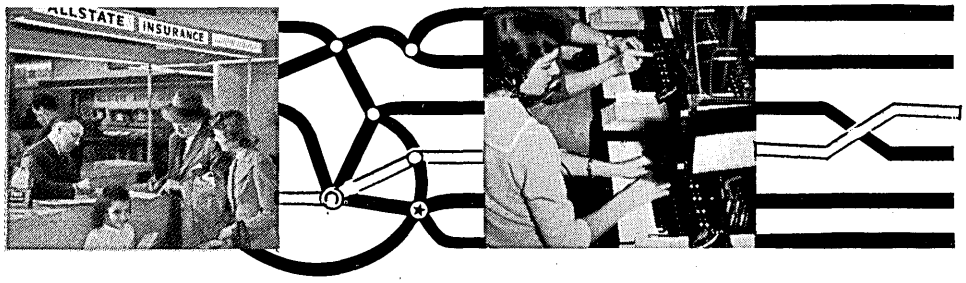
A Statement from Allstate Insurance Company:

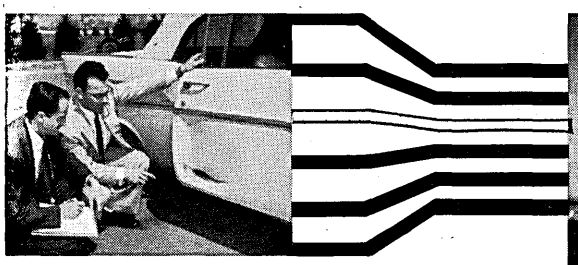
"We bought our first Burroughs computer in 1954, now own seven, and have more on order... these are big reasons why Allstate will continue to offer speedier customer service at low cost."

JUDSON B. BRANCH, *President of Allstate Insurance Companies*



James A. Reynolds, Vice-President of Allstate's Services Department (left) confers with Allstate's President, Judson B. Branch.

Back in 1930, the Sears Board of Directors considered the idea of applying Sears business methods to the sale of automobile insurance. They felt that by selling direct to the public, and keeping operating costs low, quality insurance protection could be sold at low rates. And by keeping customers satisfied through fast, fair service, they hoped to build and maintain a volume of insurance business that would make the low-overhead methods pay off. They settled on the name "Allstate" for the new company, and opened the first office in a Sears store in Chicago in 1931.



Since that time Allstate has had a dramatic rise in the insurance industry and has pioneered many new and more efficient ways of doing business.

In its first year, Allstate took in $118,000 in premiums through advertising in the Sears Mail-Order Catalog. In 1958, Allstate's volume had skyrocketed to a whopping $376,000,000. Today, Allstate is one of the world's largest stock companies offering insurance of almost every major kind. The company recently added accident and sickness insurance, and boat-owners insurance. Its comparatively new commercial insurance lines are booming. Allstate Life Insurance Company, a recently-formed subsidiary, already has over a billion dollars of insurance in force.

Allstate operates a vast network of zone, regional and district service offices in the United States and Canada, with foreign expansion now under way in Switzerland. At the present time there are more than 1,300 sales and service locations with more than 5,000,000 policies in force. One of the big reasons behind Allstate's growth is its dedication to customer service through fast, fair claim settlement, prompt response to inquiries, and lower premium costs. A powerful tool in aiding the company to provide swifter and better service is its use of Burroughs electronic data processing systems.

After a careful analysis of their needs, Allstate purchased a Burroughs 205 Computer, with magnetic tape equipment, in 1954. With the many complexities of insurance rating, endorsements, billing and coding, Allstate found the computer extremely useful in "cutting red tape" and speeding up policyholder service. More and more policyholders discovered that the protection they purchased through their Allstate policy was delivered promptly because the time consuming annoyance of manual handling was now replaced with electronic methods. Allstate also used the computer for statistical and management reports assembled in a fraction of the time formerly required.

Allstate's Assistant Vice-President and Head of Research, L. L. van Oosten.

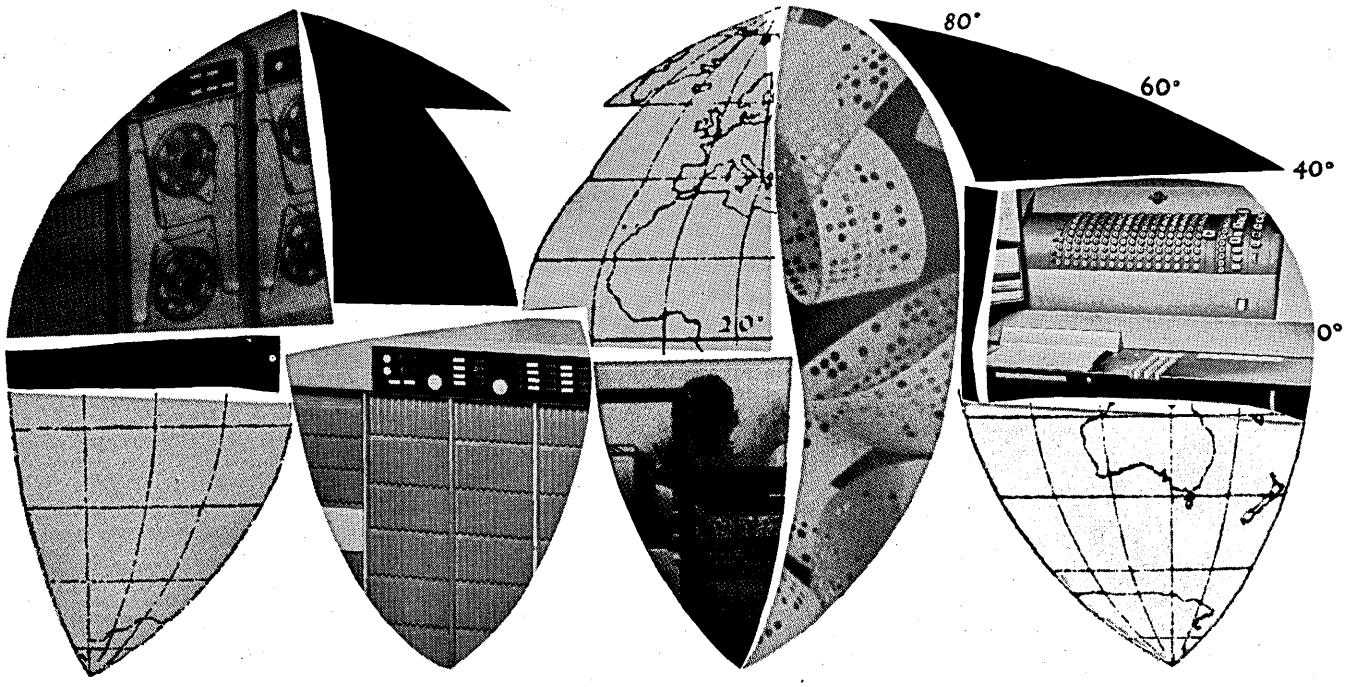
In 1957 and 1958 Allstate purchased three more Burroughs 205's and used them for billing, accounts receivable, rating policy issuances, and endorsements. When Burroughs announced its large 220 System, with expandable core memory, Allstate purchased three of these and had them installed in 1959. More 220's are scheduled for installation this year.

In speaking of the over-all benefits to Allstate from its use of Burroughs Computers, Mr. Judson B. Branch, Allstate's President, said, "Primarily, we've been able to give our customers faster, more efficient service at much lower costs. The computers help us to 'cut red tape' and thereby speed our service and help us provide insurance at lower rates. They also provide us with a means of absorbing our substantial growth without a corresponding increase in our operating expenses. We've had other benefits, too. By developing vitally needed statistics, our computers have made available, on a regular reports basis, valuable up-to-date information for our management. In addition, they enable us to promote many of our present employes to positions of greater importance, productivity and interest."

In a company where efficient business methods have been a key factor in providing better service at lower rates, the cold eye of economic justification is constantly focused on its Burroughs equipment. A continual assessment and appraisal of its electronic data processing program has been made over the last five years.

As a result of its analysis, Allstate is not turning back, but relying on Burroughs for a continuation and expansion of its electronic data processing program.

There are hundreds of other commercial and industrial users doing the same. Burroughs' complete line of electronic computers is backed by a coast-to-coast team of computer specialists, all prepared to tell you how Burroughs can help you in your business. For additional information, write Electro-Data Division, Pasadena, California.



Commercial expansion at National creates

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TRANSISTOR CIRCUITS ENGINEERS —
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Highly creative positions are available in circuit analysis and design. Duties include advanced mathematical studies in transistor circuitry, evaluation of transistor circuitry, component studies and keeping abreast of computer circuit advances. Circuit analysis ability and solid understanding of transistor theory essential. E. E. degree required.

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Opportunities available for graduate E. E.'s with 2 years of ferrite magnetic core design experience. Transistor design experience helpful. Work will entail ferrite core design on general-purpose digital buffers.

ELECTRONIC PRODUCT DESIGN ENGINEERS

To form nucleus of a new product engineering and manufacturing liaison group. Positions require 2-3 years of electronic design experience, preferably in digital computing equipment or transistor circuits.

SENIOR PROGRAMMERS

For development of advanced automatic programming techniques for a general-purpose data processor, acceptance testing, etc. Experience should include construction of auto codes, service-type routines, simulators or diagnostic routines.

RECENT GRADUATES

Excellent opportunities for recent graduate engineers with 6-18 months' experience. Positions are in the areas of transistor circuit and magnetic circuit techniques, logical design.

Please send resume to D. P. Gillespie, Director of Industrial Relations

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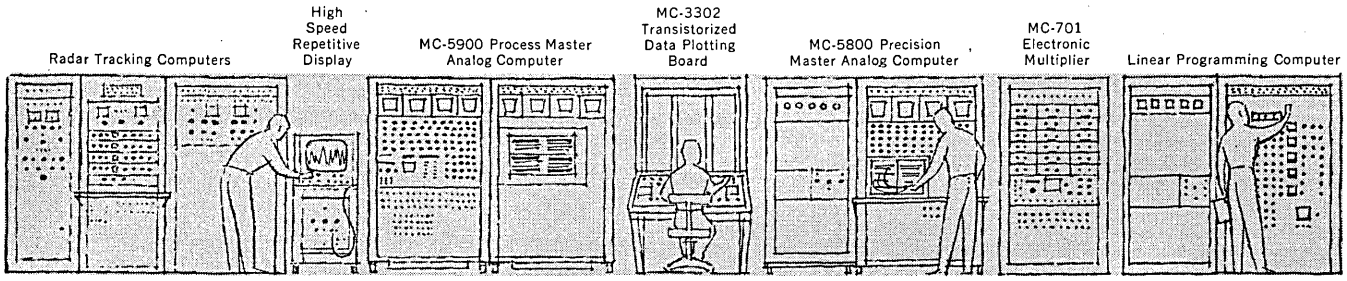

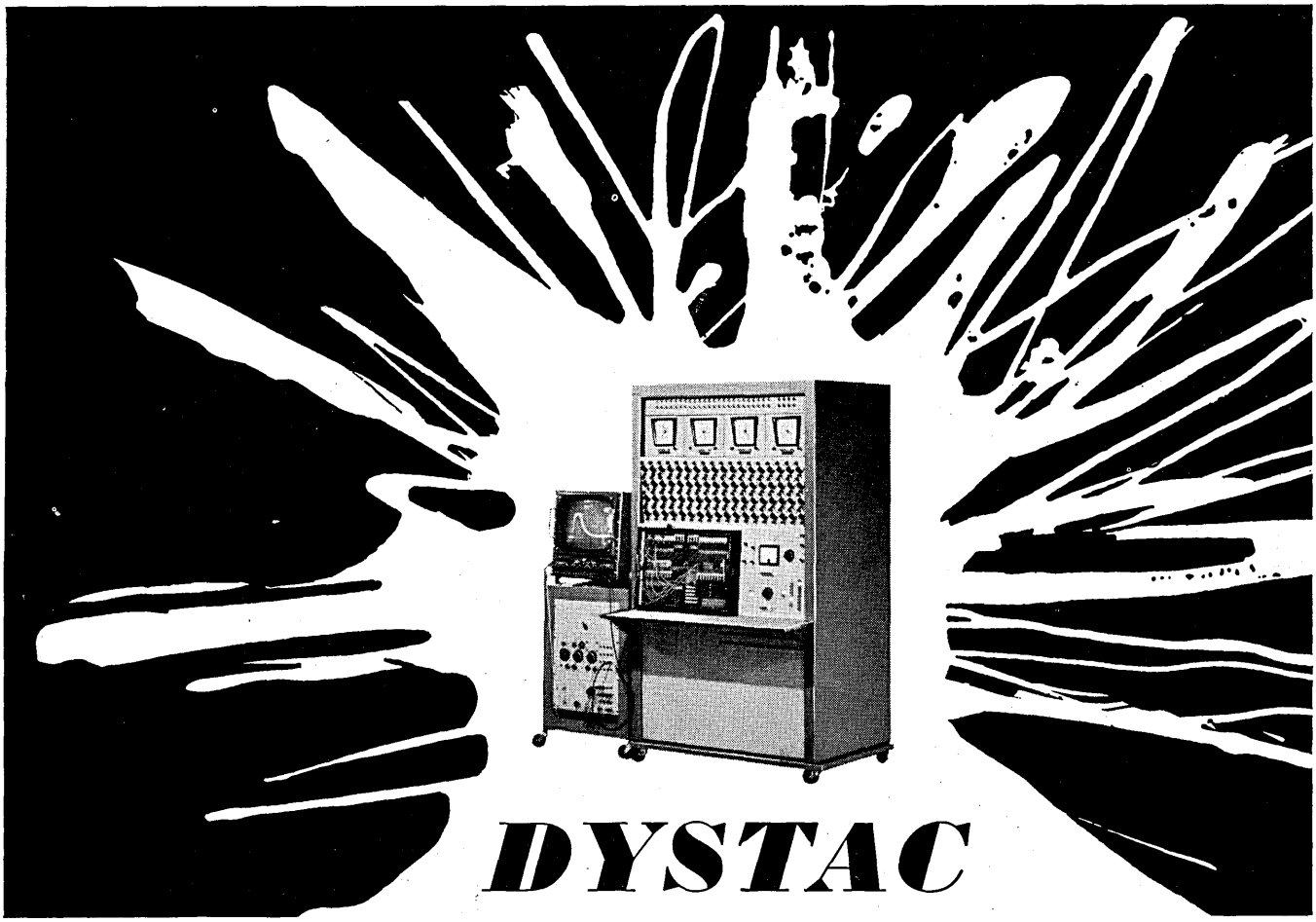

A NEW COMPUTER TECHNOLOGY

solving problems hitherto unsolvable

DYSTAC (Dynamic Storage Analog Computer) synthesizes the advantages of both analog and digital computers. DYSTAC combines the analog's speed, lower cost, ease of programming, and improved output data presentation with the digital computer's unique capacity for data storage and time sharing of computer elements. With DYSTAC you can now solve the most complex problems, ranging from distillation column design to multi-dimensional heat transfer... from boundary value problems to transport lags.

In distillation column design, for example, DYSTAC employs only 44 amplifiers on a four-component problem; the number of amplifiers required is independent of the number of plates. With any other analog computer each plate must be reproduced in the circuitry—for a 30-plate column, over 1200 amplifiers are needed unless manual reprogramming is employed. What's more, only DYSTAC yields a plate-by-plate display of all column conditions.

In heat transfer studies, DYSTAC will speedily and accurately solve hitherto unsolvable partial differential equations. It also makes practical for the first time instantaneous solutions to such trial-and-error problems as automatic optimization, automatic correlations, data fitting, probability distribution, Fourier analysis, convolution and superposition integrals and eigenvalue.

When you buy a CSI computer with DYSTAC you are buying more than the finest general purpose analog computer. You buy additional capacity as well as capability. For when DYSTAC elements are not in use as memory devices they are available to the computer as operational amplifiers. Planning to interconnect digital and analog computers? DYSTAC is the answer.

See DYSTAC in operation at our plant. If you can't attend a demonstration write, phone or wire for full information.

COMPUTER SYSTEMS, INC., 611 Broadway, New York 12, New York, SPring 7-4016

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NOW! A NEW CONCEPT
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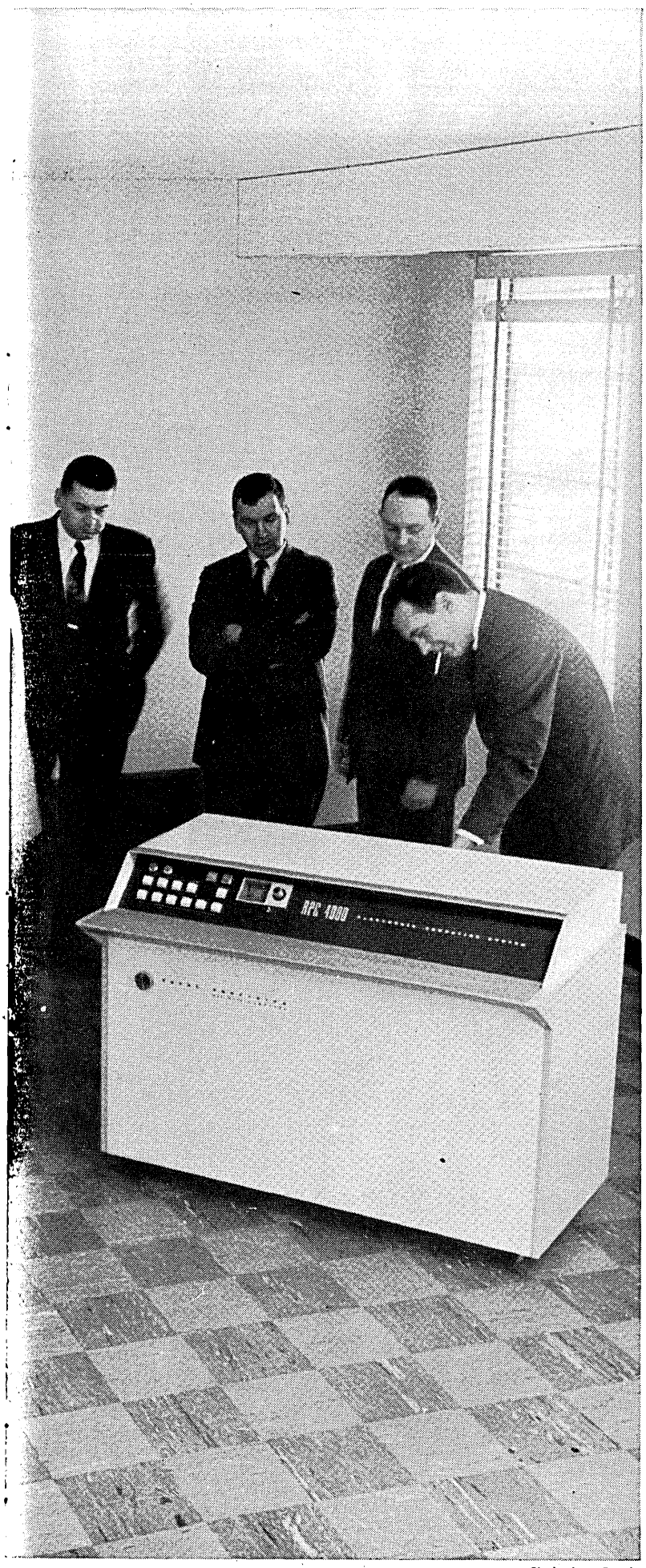
SETS A NEW STANDARD
OF VERSATILITY AND VALUE!

THE FULLY-TRANSISTORIZED

RPC-4000
ELECTRONIC
COMPUTING
SYSTEM



The RPC-4000 is a new, fully-transistorized electronic computing system with the largest memory, greatest problem-solving capacity and flexibility in the low- or medium-priced field. It is the latest member of a growing family from the people whose LGP-30 has become the world's leading small-scale computer.

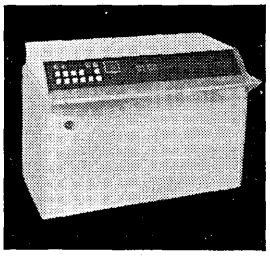
Wide range of applications: the RPC-4000 has been designed for engineering, scientific, business data processing and management control functions. Such jobs as product and process design, statistical analysis, research, inventory control, payroll and sales analysis are all well within its capabilities.

Easy to use: the RPC-4000 is simple to program and operate. Royal McBee compiling and translating routines allow even non-technical personnel to obtain maximum results. Versatile command structure gives programming speed and flexibility.

Available at low cost: high capacity, flexibility and ease of operation make the RPC-4000 the outstanding computer value on the market today.

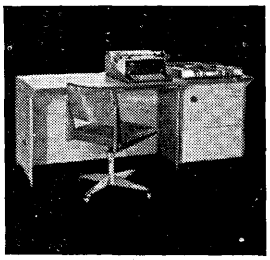
Minimum operating costs: the RPC-4000 requires no site preparation or special maintenance. It is powered from any ordinary wall outlet.

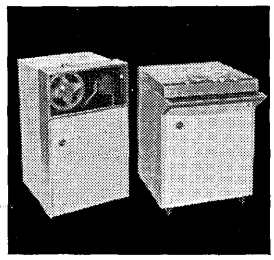
Continuing assistance: users benefit from free training, an information exchange service, and library of programs.



Heart of the RPC-4000 system is a new transistorized computer with advanced design concepts that provide substantial computing speed and capacity in a low-cost unit. Magnetic memory drum stores *8008 words*. Operating speeds are as high as 230,000/minute.

Standard input-output is a tape typewriter system which includes a Royal electric encoding-decoding typewriter complete with desk and chair, plus a tape punch-read console. Read speed is 60 characters/sec., punch speed 30 characters/sec. Typewriter, punch and reader may be interconnected in any combination for both on-line and off-line operations.





A new 500 character/sec. photoelectric tape reader and a 300 character/sec. punch are available as optional input-output equipment. A magnetic tape unit and a line printer will be available soon. As many as 17 input-output devices (60 with minor modification) may be connected on-line to the basic system. All peripheral equipment is under automatic program control of the computer.

Royal Precision Corporation

Royal Precision is jointly owned by the Royal McBee and General Precision Equipment Corporations. RPC-4000 sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing Offices. For full, detailed specifications on the new, transistorized RPC-4000, write **ROYAL McBEE** data processing division, Port Chester, N.Y

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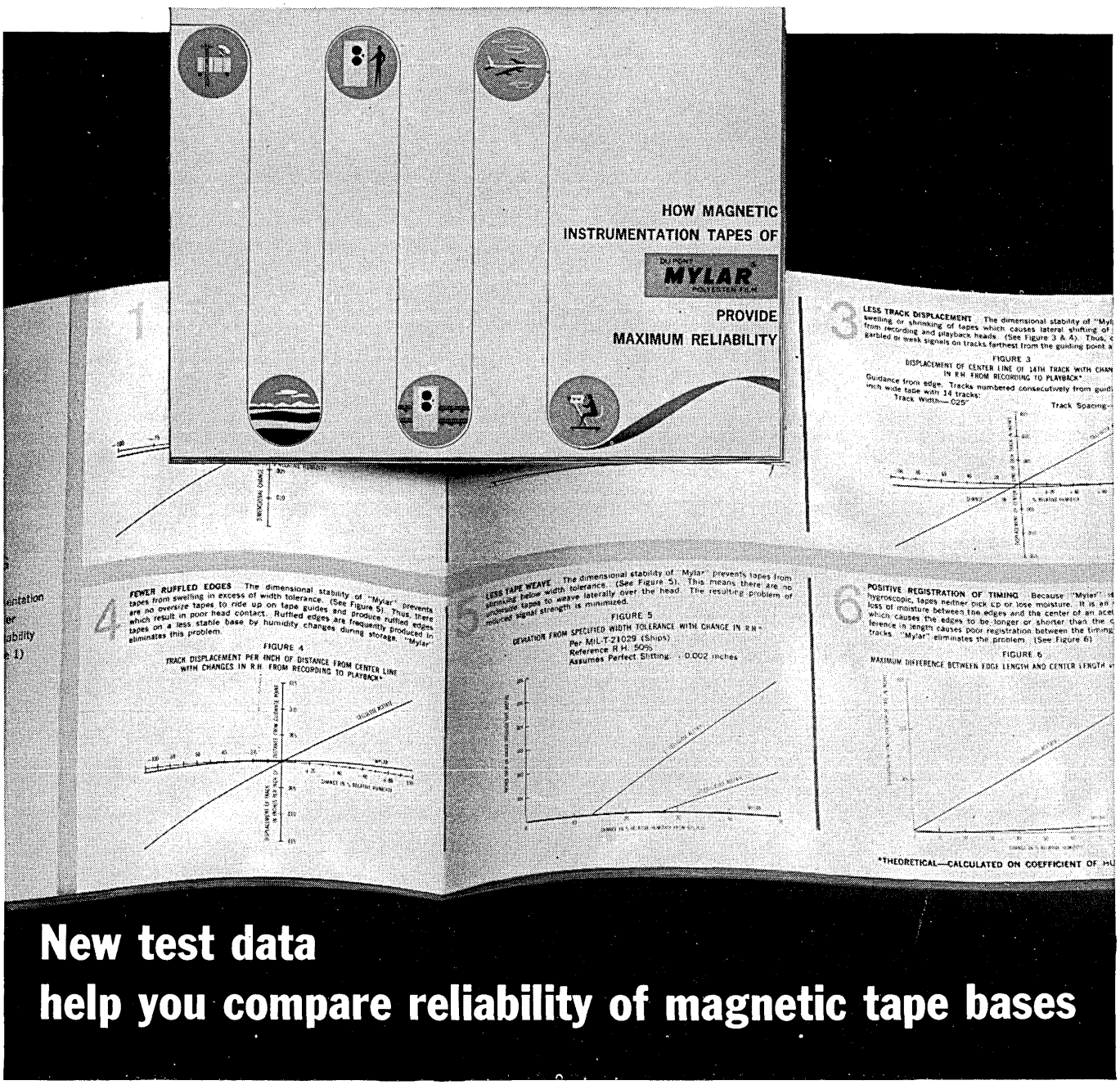
FREE BOOKLET FROM DU PONT



New test data help you compare reliability of magnetic tape bases

■ Free, 12-page booklet of charts and test data compares performance of "Mylar"* polyester film with cellulose-acetate tape base. Booklet includes sample strips for you to make a simple comparison of the greater toughness of "Mylar". It's free . . . no obligation . . . mail coupon or write for your copy. E. I. du Pont de Nemours & Co. (Inc.), Film Department D-3, Wilmington 98, Delaware.

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From the computer industry's most experienced engineers comes a concept which can save your company millions of dollars in computer cost and manpower

The New Satellite Computer System

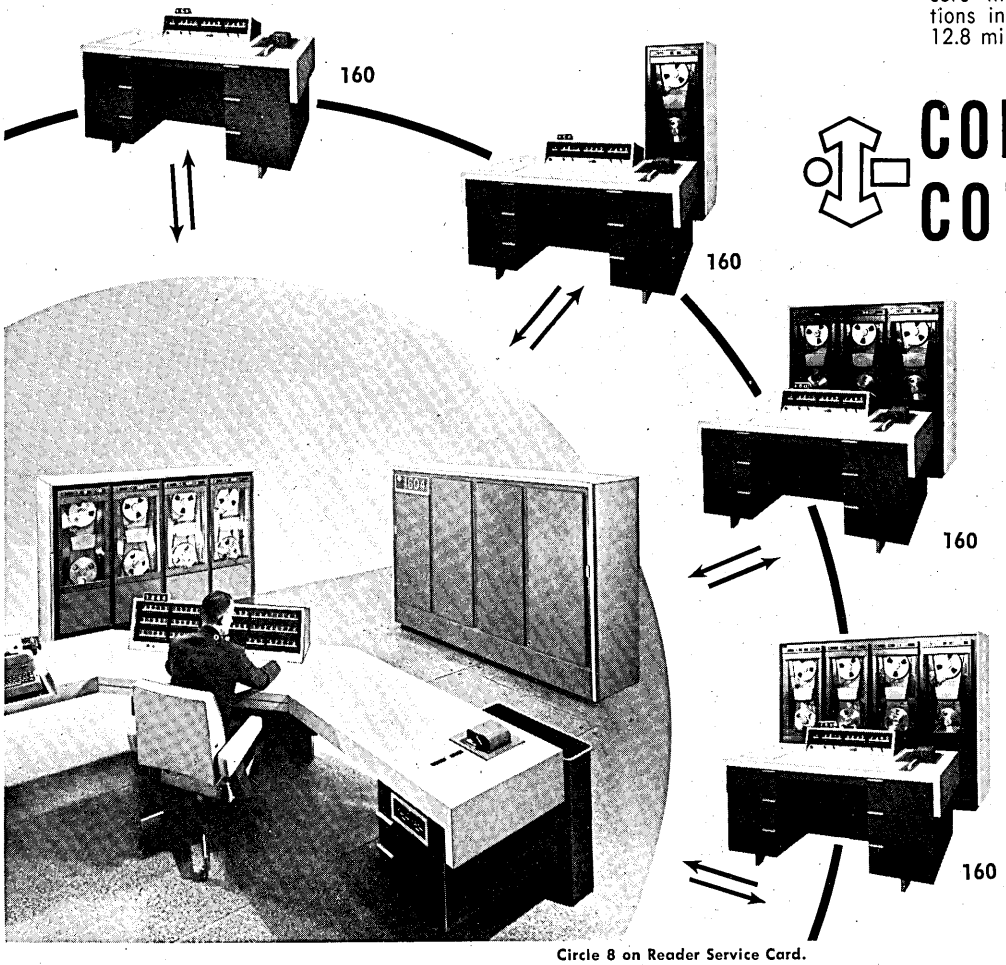
The Satellite Computer System is a new and ultra-powerful computing concept which permits you to operate data processing centers with *maximum efficiency and economy*. The system employs the two most versatile all-transistorized computers in use today: Control Data's large-scale 1604 Computer and the desk size 160 Computer. In the Satellite Computer System, the desk size 160's are used in small, independently operated data processing centers that have direct access to the large-scale 1604 Computer.

For example, your company's accounting department, engineering departments, and statistical departments can each operate a 160 in its own center and direct its own data processing activities. In addition, each center has *direct access at any time* to the tremendous speeds and computing capacity of the large-scale 1604. The 1604 has such large capabilities and great speeds that it can accept data from several such centers while simultaneously processing vast amounts of other data.

Thus, the small data processing center, operating within the framework of the larger center by utilizing the 1604 Computer, can realize a new magnitude of data processing and computing power.

- provides flexibility for processing **every type of problem**—from the largest scientific and business data processing problems to small calculations and routine data processing activities.
- provides for **direct transfer of data between 1604 and 160** (or vice versa) without hooking up "black boxes."
- data transferred from 1604 to 160 at rate of 160,000 characters per second; 160 can interrupt 1604 and transmit data at same rate.
- data is also transferred from 1604 to magnetic tape unit that is directly available to 160 (or vice versa) — 160 accepts this data from **same** tape reel on **same** tape drive used to transmit data to and from 1604, thus eliminating the necessity of changing tape reels between computers.
- large-scale 1604 holds up to 65,000 instructions in magnetic core memory of 32,768 words—has 48-bit word length, and performs additions in 1.2 millionths of a second.
- 160's are fast and versatile desk size computers — all transistorized with magnetic core memories — execute 60,000 instructions in one second, perform additions in 12.8 millionths of a second.

One to six Control Data 160 Computers act as independent "satellite" data processing centers, or work in conjunction with the Control Data 1604 Computer.



CONTROL DATA CORPORATION

501 PARK AVENUE
MINNEAPOLIS 15, MINN.
FEderal 9-0411

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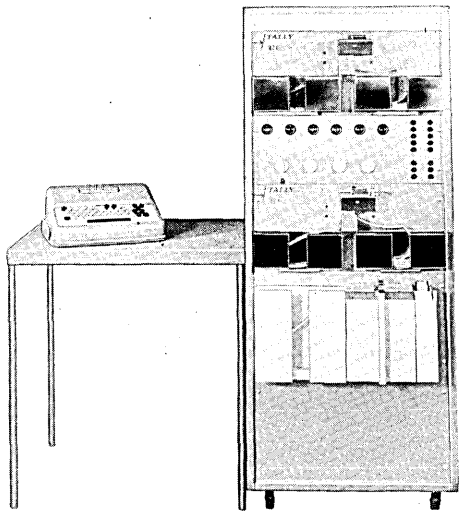
One sound solution
to the problem of quickly providing error free paper tapes to program equipment ranging from machine tools to satellite communications gear is Tally/Seattle's Model 150 Tape Console.

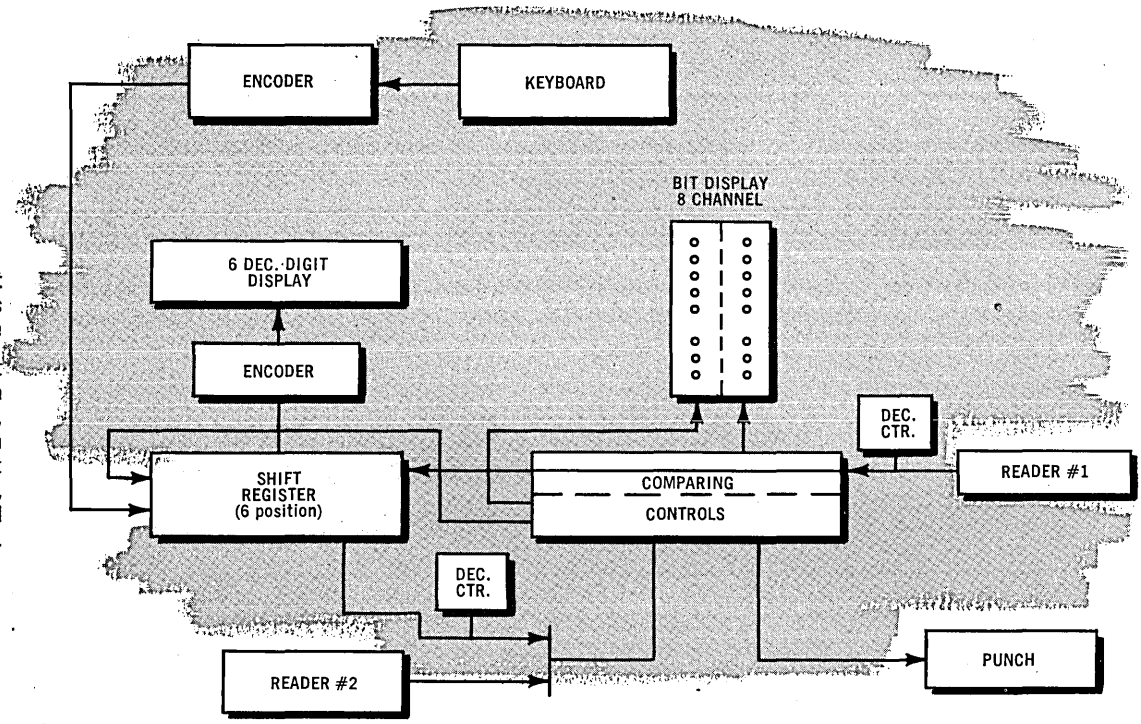
Here is a device which fully automates tape production. It is the only unit available specifically intended for the high speed preparation, verification, and duplication of error free perforated tape.



Tally tape consoles are available in either vertical or horizontal cabinets.

SIMPLIFY AND AUTOMATE

PUNCHED PAPER TAPE PRODUCTION WITH THE NEW TALLY TAPE CONSOLE



Schematic Arrangement of Components in Tally Tape Console

Basically, the unit consists of an alpha numeric keyboard, control and comparison section with six-digit decimal display, two tape readers and one tape perforator.

ADVANTAGES...

1. *Overall system flexibility and versatility with full operator control.*
2. *Keyboard entry to shift register and visual display which lets the operator edit keyed information prior to actual tape punching.*
3. *Produces accurate and complete copy without overpunching, cutting, or splicing of tapes.*
4. *Tape to tape duplication and/or verification at up to sixty characters per second.*

Want more information? Your nearby Tally engineering representative will be glad to provide you with complete technical information or you may write directly to Department 23.

SPECIFICATIONS—OPERATING SPEED: Variable from 0-60 characters per second. STANDARD CODE CHANNELS: 5, 6, 7, or 8. STANDARD TAPE WIDTHS: 0.687, 0.875 and 1.000 inch (interchangeable). SUPPLY AND TAKE-UP: 6" reel for 400' maximum; 10" reel for 1000' maximum; Fan Fold for 400' maximum. CODE HOLE SIZE: 0.072" ±0.002 diameter on standard 0.1" centers. FEED HOLE SIZE: 0.047" ±0.002 diameter. ALIGNMENT: Code holes and feed holes have a common center line. POWER REQUIREMENTS: 117 vac ±10%, 60 cps, 500 watts. DIMENSIONS: 51¼" H x 20⅝" W x 23⅝". PRICE, f.o.b. Seattle: $8,000.

TALLY
REGISTER CORPORATION
1310 Mercer Street
Seattle, Washington
Phone: MAin 4-0760

Prepared by BONFIELD ASSOCIATES, INC.
for Spring issues of *Automation, Automatic Control, Control Engineering* and *Datamation*.

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DATAMATION 60

the automatic handling of information

volume 6, number **2**

IN THIS ISSUE—

FOUR NEW COMPUTERS

ARTICLES

WESTERN JOINT COMPUTER CONFERENCE

DEPARTMENTS

EDITORIAL OFFICES — 10373 W. PICO BLVD., LOS ANGELES 64, CALIF.

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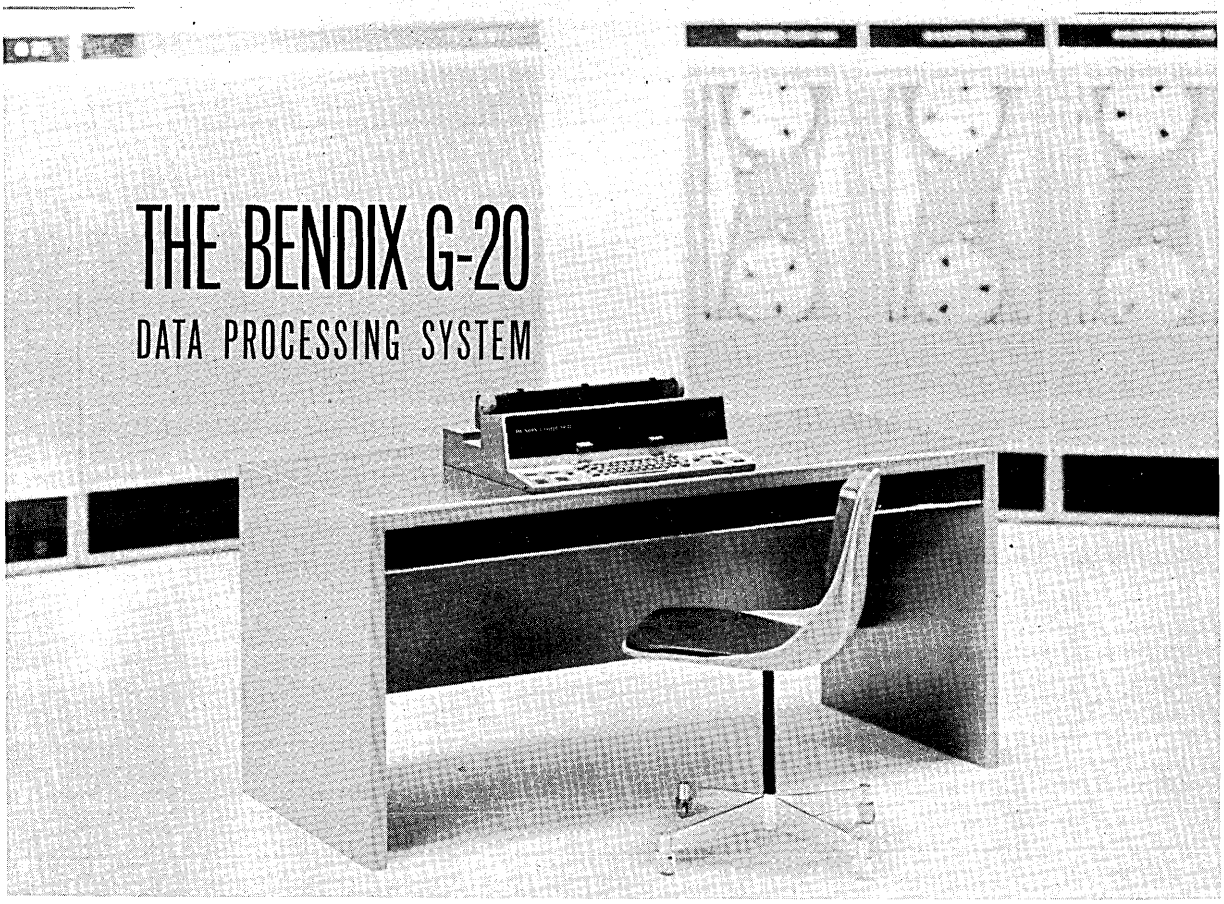

by DAVID C. EVANS, Chief Engineer and CHARLES A. PIPER, Mgr., Applied Mathematics
Bendix Computer Division

Bendix's new G-20 system is composed of a high-speed central processor, a control buffer and matched input-output units including magnetic tape, high-speed printer, and punched card and punched tape equipment as pictured in Figure 1. These elements operate in a common language and are interconnected by a communication system which permits their operation in a wide variety of on-line and off-line systems.

For a small system the central processor may operate a number of accessory devices directly as illustrated in Figure 2 (page 16). Such a system permits the high speed of the central processor to be used at modest cost for engineering and scientific problems requiring minimum input and output. It is also an effective system for a modest data processing task, in which case much of the time of the processor might be used in the detailed controlling and operation of accessory units.

To meet larger requirements the system may be expanded by adding memory to the central processor, by adding more direct computer communication lines, and through the addition of buffer units. Figure 3 (page 17) represents a medium scale system in which only an operators console and high speed control buffer and magnetic tape units are operated directly by the central processor. For larger scale systems the processor may be equipped with additional communication lines. These lines afford direct simultaneous communication with the processor's memory. In Figure 3 the control buffer units, which are small stored program computer-like devices are each directed by the computer to perform a sequence of operations which they can perform with little or no computer assistance, leaving the computer free for other tasks. When a control buffer unit, with its associated sub-system, has completed its assignment or encountered a problem beyond its capability, it may interrupt the central processor, informing it of the status of that part of the operation which it has performed. This interrupt system, along with the real time clock provided in the G-20, permits it to manage a system including a number of control buffer operated sub-systems efficiently.

In addition to on-line operation as described, the control buffer may operate as the center of a variety of off-line systems. In the on-line and off-line systems the same printer, punched card and tape, and magnetic tape equipment are used.

The G-20 system can be used as a scientific computing, data processing, or business computing system. It has facilities for automatic compilation of programs from algebraic and business oriented languages. In the paragraphs which follow the various system elements are described in some detail.

central processor

The G-20 is a high-speed single-address computer with magnetic core storage and parallel arithmetic. Operations are performed in extended precision floating-point octal to 14 digits. Two forms of floating-point storage are available: single precision, equivalent to half the precision of the arithmetic unit, and using one word; or extended precision, the full precision of the arithmetic unit, using two words. A fixed-point mode of operation is available using storage of 9 octal digits. Sixty-three conventional index registers are available and the command structure

permits addressing of almost unlimited flexibility. Thirty-two of the commands can be repeated automatically any desired number of times on a sequence of operands. Input-output simultaneous with computation is available.

The basic central processor contains about 5,000 transistors and 30,000 diodes in addition to one or two modules of core memory containing 4,096 words each. (Additional core memory is in a separate cabinet.) Components are fixed to printed circuit cards mounted on strips. The strips are arranged on hinged panels which swing out to make all parts of the unit easily accessible. The equipment is 66″ wide, 28″ deep, and 64″ high and weighs 2,000 pounds. With 4,096 word memory it requires 2.5 KVA of 115 or 230 volt, single phase, 60 cycle power. Other voltages or frequencies are available on special order.

The minimum core storage supplied for the G-20 data processing system consists of 4,096 words of 32 bits each. Up to 7 additional 4,096 word modules may be added to the basic system to provide a total core memory of 32,768 words, with each word directly addressable.

addressing facilities

The G-20 provides for flexible addressing and indexing without disturbing the contents of the accumulator. A string of numbers and/or addresses is built up in a register known as the operand assembly register. This string can be used as an operand, or an address, or as the address of the first term of a new string. The process can be continued indefinitely. This makes possible operands of the forms:

1. A + B + . . + (I) + (J) + . .
2. (A + B + . . + (I) + J) + . .)
3. (A + B + . . + (I) + (J) + . .) + D + E + . . + (K) + (L) + . .
4. ((A + B + . . + (I) + (J)+ . .) + D + E + . . + (K)+ (L) + . .)

where A, B, etc. are based addresses
I, J, etc. are index addresses
( ) = contents of

The way in which this is accomplished is explained in more detail in the following paragraphs. Some elementary examples are also given. A command word in the G-20 (see Table 1) carries, in addition to the operation code and flag bits, a 2-bit mode code and two addresses: a base address A of 15 bits and an index address I of 6 bits. The mode bits specify the way in which A and I are to be interpreted to form an operand or an operand address. The information can be summarized as shown in Table 2 which indicates

2	2	7	6	15
FF		OP	I	A
31	mode	opcode	index	base address 0

Table 1. Command word

Table 2. Addressing modes

Mode	Action
0	(OA) + A + (I) = X
1	(OA) + (A) + (I) = X
2	((OA) + A + (I)) = X
3	((OA) + (A) + (I)) = X

where OA = operand assembly register, X = operand, A = base address, I = index address, ( ) = contents of

the manner in which the operand X is formed from the previous contents, if any, of the operand assembly register, combined with the two addresses.

In the simple case where one word is used for a command the initial content of OA will be zero. For this case the operand, X, for each of the four modes will be:

0 A + (I) → X
1 (A) + (I) → X
2 (A + (I)) → X
3 ((A) + (I)) → X

It can be seen that Mode 2 represents the conventional indexed operand address where A is the base address and I one of the 63 index registers. For problems requiring a greater number of indexes, any number of words can be combined in one command using as indexes any number of locations situated anywhere in core memory. This flexibility is made possible through the use of "preparation" Op codes, which perform address computation, leaving the computed address standing in the operand assembly register as indicated by (OA) in Table 2. The symbolic assembly routine provided with the equipment selects the number and variety of command words to perform the required addressing. Thus, a command requiring three indexes is written:

CA A + (I) + (J) + (K)

which might mean clear and add the term A_{ijk} of a three dimensional array.

operation codes

The operation codes of the G-20 include arithmetic operations, arithmetic tests, logic operations, logic tests, as well as store, register, index, and transfer control commands. There are also address preparation commands and input-

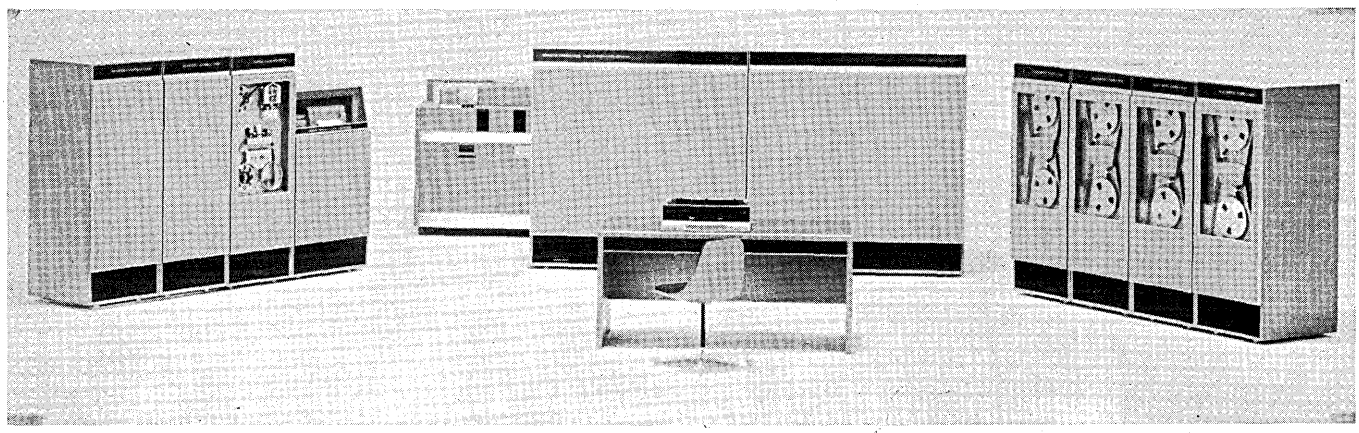

Figure 1. Representative G-20 data processing system

output commands. A repeat command applicable to add/subtract operations, arithmetic tests, logic operations, and logic tests permits a command to be repeated any number of times on a sequence of operands.

In general, arithmetic commands are automatically carried out in extended precision floating-point (14 octal mantissa plus 2 octal exponent) in the arithmetic unit. The distinction between extended precision and single precision exists only in store commands.

Logic operations are carried out to 32-bit precision and the other bits of the accumulator are cleared. Arithmetic and logic test commands leave the accumulator undisturbed.

arithmetic

The G-20 performs all arithmetic in integer floating-point octal. Numbers have the form of a positive or negative octal integer multiplied by a positive or negative integral power of 8. Hardware representation is 3 binary digits for each octal digit of the number.

The command structure makes available automatic adjustment of the exponent to a pre-assigned value, or to zero, to facilitate operations in fixed point or in integers.

The arithmetic unit performs all arithmetic to 14 octals precision and the numbers can be so stored. It is also possible to store automatically the most significant 7 octals, a fixed exponent number of 9 octals, an integer of 9 octals, or an integer of 7 octals.

The maximum range of numbers handled without scaling is:

$$\pm 8^{-63} \text{ to } \pm 8^{77} \text{ to } \pm 10^{-57} \text{ to } \pm 10^{69}$$

approximately. In single precision the upper limit is $\pm 8^{70}$ or about $\pm 10^{63}$. A non-biasing round-off rule is applied automatically except in division and "integer" operations, where truncation is used instead.

operating speeds

Times for representative operations appear in Table 3.

	One-Word Precision		Extended Precision	
	Fixed Point	Floating Point	Fixed Point	Floating Point
+	7	13	13	13
−	8	13	13	13
×	49	49	62	62
÷	98	98	78	78

Table 3. Average execution times in microseconds

The accessory units which may be attached to the G-20 system include the control buffers, control consoles, paper tape stations, magnetic tape units, card and printer couplers, line printers, and core memory modules.

control buffer

The control buffer is a stored program computer-like unit employing a 1,024 character magnetic core memory. This memory is used as a store for commands as well as a buffer for input-output data. It connects to two communication lines; the computer line and a buffer line as shown in Figure 3. In operation it communicates briefly with the computer or magnetic tape equipment at high speed on the computer line and then operates the slower input-output equipment on its buffer line.

The buffer can execute complex programs including conditional transfers of control based on its own state, interrupt requests it has received, and specific queries it has made of associated units. It receives and transmits blocks of information and translates character codes at high speed. It receives and transmits interrupt signals which can be used to interlock a multi-element system in the performance of a complex operation.

A representative control buffer operation might be as follows: The G-20 transmits instructions over its communication line to the buffer shown on the left in Figure 3. The control buffer then begins executing the instructions which cause it to switch from the computer communication line to the buffer communication line. It then instructs the card reader to read several cards, transmitting the information to the communication line. The buffer receives and stores the information from the cards. It may then translate the punch card codes to a code specified by the central processor, after which it stores the information in a block on magnetic tape. After repeating this sequence of operations until all cards have been read, the buffer then transmits an interrupt request directly to the central processor indicating completion of the assigned task.

As an example of off-line control buffer operation, consider the case of a buffer, a magnetic tape unit, and a printer at a location remote from the central processor. In this case output tapes prepared by the processor are transported to the remote location. The initial blocks of information written on the tape may contain instructions to the control buffer for listing the data written on other blocks of the tape, permitting an essentially automatic remote printing operation.

control console

The control console provides the G-20 operator with the facilities necessary to initiate and control the execution of programs. It has three important functions:

1. To permit, when required, manual control of the G-20 system via a typewriter.
2. To provide a typed record of all manual console operations.
3. To type messages, under program control, to the operator.

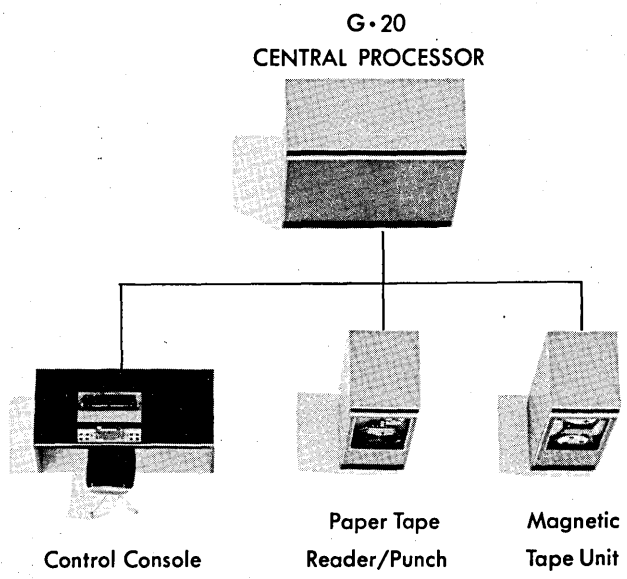

Figure 2. Small G-20 system having three accessory units

The typewriter keyboard is equipped with 88 characters which provide for the typing of upper and lower case letters, digits, and 26 special characters.

paper tape station

The Bendix paper tape station PT-10 provides punching (Teletype Corp. punch) at 100 characters per second and reading (Digitronics Corp. reader) at 500 characters per second for standard 8-hole paper tape.

magnetic tape system

Any number of (Potter Instrument Co.) tape units may be connected to a computer line or buffer line. Information is recorded on the tape in blocks formed from characters of 8-bits plus parity. One word is, therefore, recorded as four 8-bit characters. The data transfer rate for reading and writing on tape is 60,000 8-bit characters per second. Individual tape units can move the tape forward or backward a specified number of blocks while off-line. It is recommended, but not required, that magnetic tapes be connected to the computer line whether the system contains buffers or not. This gives complete flexibility in the use of magnetic tapes and permits access to any tape by the G-20 or any control buffer. The fraction of computer primary line time occupied by transfer of information to and from magnetic tapes is not the limitation in most practical systems. Although the tape can operate with blocks of arbitrary length, to facilitate continuous addressing, information on magnetic tapes is stored in blocks of fixed length. Any block can be written over. The standard block length for which service routines are provided is 512 words or 2,048 characters. If the recommended system is used, each word in G-20 tape library is uniquely addressable and the beginning address of each block is written on the tape at the beginning of the block. The programmer need only specify the tape address he desires and the supervisory routine keeps track of which physical tape handler contains the tape reel in question.

card and printer coupler

The card and printer coupler is used to control line printers and 80-column card machines. The coupler, when used to drive an output device, receives information serially by characters and delivers information in parallel to all of the columns of the output device. It is also able to perform the inverse operation.

Once an input-output function has been initiated, the card and printer coupler controls subsequent transmissions until an entire card has been read or punched or a complete line has been printed.

The card coupler is capable of reading and punching cards in three formats. An extended Hollerith code of 256 different characters includes as a subset all of the code configurations which can be produced by a keypunch or read by a tabulator. Row binary and a column binary modes are also available for processing cards using other character representations or for compact information storage.

When operating a high-speed printer, the coupler is capable of either fixed cycle or so-called free wheeling cycle operation. In this mode the printing process begins at the completion of any paper feed cycle without waiting for the character roll to return to a fixed index.

line printers

G-20 (Analex Corp.) printers provide for line-at-a-time printing of numeric or alphanumeric data at rates of from 600 to 1250 lines per minute with up to 120 characters

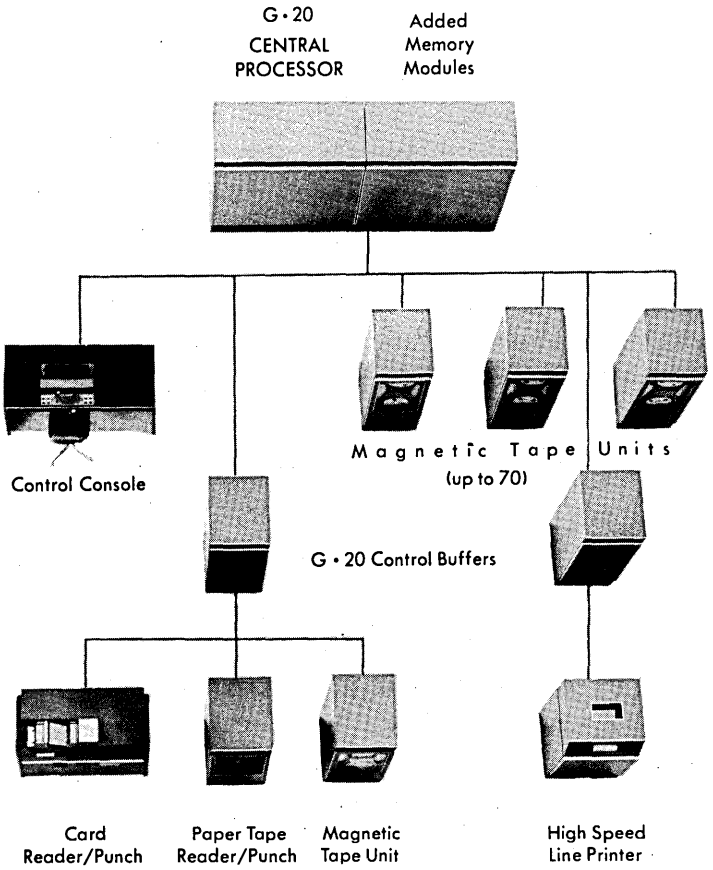

Figure 3. G-20 system showing use of control buffer unit

per line. A continuously revolving print roll carries a number of complete sets of printing characters, each set occupying one circumferential track on the print roll. A line of print is created by driving the paper and ribbon against the print roll by means of a set of individually timed hammers, one for each print column. Timing of each hammer determines the character to be printed in that column. The paper remains stationary during printing and is upspaced after a complete line has been printed.

The print cycle can begin at any character position and need not begin at the same character for succeeding lines. The standard character set uses a 63-character alphabet.

communication system

The Bendix Digital Communication System is an approach toward organizing all of the components of a complex system on a common language basis. The common language understood by all units is a language of 10-bit characters which, in general, mean the same to all units. The first 8 of the 10 bits are coded command or data information. These 8 bits correspond to one character in the buffer, one typewriter character, one character on magnetic tape, one character on paper tape, or one character in the G-20. The 8 bits can also represent in card operations one extended Hollerith character, the upper or lower half of a card column (with 2 leading zeros) in column binary, or 8 successive positions in row binary. Inside the G-20, four characters are combined to form a word, but the decomposition and recombination of characters to G-20 words is automatic. The 9th and 10th bits are data flag and odd parity respectively. The maximum distance permitted between units in the G-20 communication system is 1,000 feet, dictated by transmission characteristics of the lines. ●

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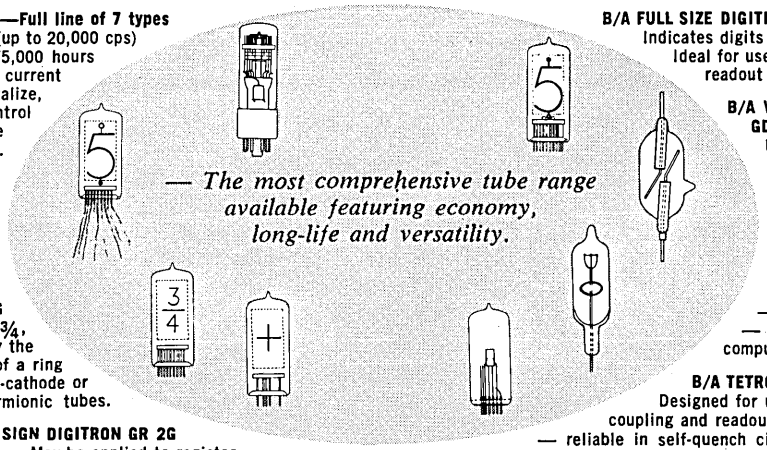

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a survey

DIGITAL MAGNETIC TAPE RECORDERS

by **BERT BERLANT, Consultant**

On the following two pages, DATAMATION reviews the basic characteristics of reel-type digital magnetic tape recorders which are primarily designed for the storage and reduction of digital data in computation and digital control systems. Included are commercially available mechanisms with their required read and/or write preamplifiers and the control amplifiers needed for their operation.

Analog reel to reel magnetic tape recorders, drum type recorders, bin type recorders, and special application recorders are to be covered in surveys now in preparation.

Ease of read and write, high information density and large storage capacity, and reasonably rapid access to desired data are the major factors that have led to widespread use of the reel to reel magnetic tape recorder as a memory bank in digital computers of all kinds. The most commonly used mechanism for this purpose is the high speed shuttle which scans the tape in search of the desired information, located by an address system; then repeatedly re-scans the desired block of data until the information has been fully utilized by the computing system. The tape mechanism is then directed to search for the next desired block of data by address.

Control of the mechanisms is achieved by pulses or level change signals transmitted from the computer control center to the mechanism. The various base functions common to virtually all mechanisms in this category are Fast Forward, Forward Drive, Stop, Reverse Drive, and Fast Reverse. Modes of operation are usually Read or Write. Automatic control and automatic read/write are usually supplemented by manual control and read/write, with the manual controls located on the mechanism and sometimes duplicated in a remote control panel.

In addition to these control functions, the designs usually incorporate end of tape sensing, operating condition readiness signals, and many interlock refinements to insure proper operation.

Some basic problems are involved in the design and construction of these high speed digital tape shuttling mechanisms. These include near instantaneous start and stop of the tape. It will be noted from the specifications that the tape goes from standstill to full reading speed within a few milliseconds from reception of the "go" signal, and comes to a dead stop in the same few milliseconds from arrival of the "stop" signal, restarts in the opposite direction to the beginning of the desired block, stops and again repeats the entire cycle rescanning the data block until the information is no longer required by the sink.

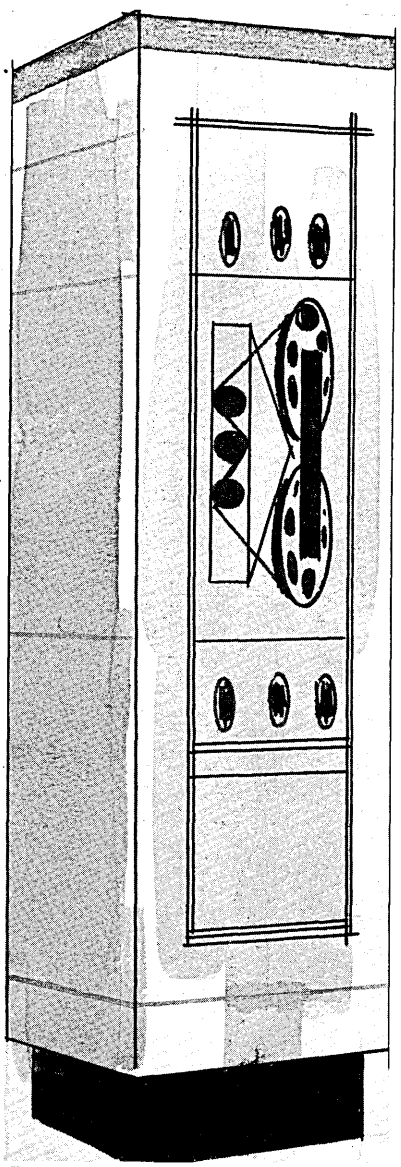
Another problem involves control of the tape storage reels to permit the tape to be supplied and collected to satisfy the near instantaneous high speed start and stop demands without creating excessive stress and strain on the tape itself, and without allowing slack which will result in malfunction. This is achieved by servo-controlled collection and payout controlled from a buffering system interposed between the shuttling mechanism and the spooling mechanism to give the scanned portion of the tape opportunity to achieve maximum inertial performance independently of the mass of the reels.

These buffering systems fall into two broad types; vacuum buffers, and mechanical buffers. Generally vacuum buffering is found in maximum performance equipment using the highest tape speeds and maximum packing density, and mechanical buffering in systems with lesser demands.

The stringent mechanical requirements of these high speed shuttling operations are not obvious upon casual observation; a little consideration of the tremendous inertial loads imposed upon both shuttling mechanism and spooling system to meet the rigorous demands imposed upon these devices will bring a new appreciation of the skill and ingenuity that has gone into their design and construction.

Rack panel mounted or in their own consoles, most of these units were designed for computer center conditions and require air conditioned environments with temperature and humidity controlled.

(Information in this survey was compiled from data supplied by the manufacturers.)



Emmanuel (Bert) Berlant, formerly president of Berlant Associates, is a pioneer in the magnetic recording field. He headed the firm which bore his name from 1946 until 1955. In 1956, when the firm was absorbed by American Electronics and became Berlant Instruments, he remained as director for another year.

Between 1943 and 1945, Berlant was supervisor of the Pictorial Engineering Research Laboratories, Signal Corps Photographic Center, U.S. Army. Prior to that, he was director of research and development at Optical Research, Inc., New York City.

Berlant, who lives in Southern California, is a consultant in the magnetic recording field.

DIGITAL MAGNETIC TAPE RECORDERS

	Reel Size	Hub	Max. Tape Width	Maximum Read/Write Tape Speed	Metered Rewind Speed	Rewind Time	Maximum Tracks
POTTER 908	10½″	*NAB Opt.	1¼″	150 **ips	300 **ips	1¾ mins. 2400′	48
″ 906	10½″	NAB Opt.	1¼″	150 ips	300 ips	1¾ mins. 2400′	48
″ 910	10½″	NAB Opt.	1¼″	100 ips	225 ips	2¼ mins. 2400′	48
″ 3280	10½″	NAB Opt.	1¼″	10 ips	****NA	2 mins. 2400′	48
AMPEX FR 300	10½″	NAB Opt.	1″	150 ips	225 ips	2 mins. 2400′	21
″ FR 400	10½″	NAB Opt.	1″	75 ips	not metered	2½ mins. 2400′	21
SHEPARD LABS.	10½″	NAB IBM	1″	200 ips	360 ips	1⅓ mins. 2400′	16
FAIRCHILD F-411	10½″	NAB Opt.	1″	75 ips	NA	6 mins. 2400′	20
DATAMATIC	10½″	Spec.	¾″	120 ips	360 ips	82.6 secs. 2400′	10
NCR 304	10½″	NAB	½″	150 ips	225 ips	2 mins. 2400′	8
PHILCO 2000	10½″	Spec.	1″	120 ips	225 ips	2 mins. 2400′	16
RCA 581	10½″	NAB	¾″	100 ips	100 ips	4.6 mins. 2400′	16
REMINGTON RAND Univac II	10½″	Spec.	½″	100 ips	100 ips	5 mins. 2400′	8
BURROUGHS 546	10½″	NAB	¾″	90 ips	120 ips	4⅓ mins. 2500′	15
″ 53368	10½″	NAB	¾″	90 ips	120 ips	4⅓ mins. 2600′	15
″ 551	10½″	Spec.	¾″	120 ips	120 ips	5.83 mins. 3500′	12
″ 544	10½″	Spec.	¾″	60 ips	120 ips	4.2 mins. 2500′	12
IBM 727 III	10½″	Spec.	½″	75 ips	not metered	70 sec. 2400′	7
″ 729 I	10½″	Spec.	½″	75 ips	not metered	70 sec. 2400′	7
″ 729 II	10½″	Spec.	½″	75 ips	not metered	70 sec. 2400′	7
″ 729 III	10½″	Spec.	½″	112.5 ips	not metered	40 sec. 2400′	7
″ 729 IV	10½″	Spec.	½″	112.5 ips	not metered	40 sec. 2400′	7
COOK 59	10½″	NAB Opt.	1″	150 ips	225 ips	2 mins. 2500′	32
″ 750-7300	8½″	Spec. Opt.	1″	75 ips	120 ips	NA	39
SANGAMO	14″	NAB	2″	90 ips	NA	2½ mins. 2500′	32

**NAB — NARTB standard hub; Opt. — special hubs or a cable; Spec. — proprietary hub design*

***ips — inches per second*

For POTTER information circle 101.
For AMPEX information circle 102.
For SHEPARD information circle 103.
For FAIRCHILD information circle 104.
For DATAMATIC information circle 105.
For NCR information circle 106.
For PHILCO information circle 107.

Start Time	Stop Time	Buffering	Char. Transm. Rate	Circuitry	Write Method	Power
3 ms	1.5 ms	VAC.	½" - 45KC 1" - 90KC	***Mod. S.S.	RZ NRZ	115V. 60 cycle 15 amperes
3 ms	1.5 ms	MECH.	½" - 30KC 1" - 50KC	Mod. S.S.	RZ NRZ	115V. 60 cycle 10 amps.
3 ms	1.5 ms	MECH.	½" - 18.8KC 1" - 30KC	Mod. S.S.	RZ NRZ	115V. 60 cycle 5 amps.
3 ms	1.5 ms	MECH.	NA	Mod. S.S.	RZ NRZ	115VAC 60 cycle 3 amps.
2 ms	1.5 ms	VAC.	1" - 90KC ½" - 45KC	Mod. S.S.	NRZ	117 AC–50 or 60 cycle 15 amps.
5 ms	5 ms	MECH.	1" - 45KC ½" - 22.5KC	Mod. S.S.	NRZ	117 AC–50 or 60 cycle 4 amps.
2 ms	2 ms	VAC.	1" - 51.2KC ½" - 25.6KC	Mixed	RZ NRZ	220V–3ø–60 cycle
5 ms	5 ms	NA	NA	Tubes	RZ NRZ	450 watts
3 ms	3.5 ms	VAC.	64 KC Alph. 96 KC Dec.	Mod. S.S.	NRZ	N.A.
3 ms	2.5 ms	VAC.	33KC	Mod. S.S.	NRZ	2KVA
8.6 ms	8.6 ms	VAC.	90 KC	Mod. Mixed	NRZ	1.024 KVA
2 5 ms	2 ms	MECH.	33 KC	Mod. S.S.	RZ NRZ(Mod)	1.4 KVA
2-5 ms	2-5 ms	VAC.	25 KC	Tubes	RZ	2.2 KVA
7 ms	7 ms	VAC.	Depends on info. format	Tubes	RZ NRZ	115 VAC ± 10 V.
7 ms	8 ms	VAC.	Depends on info. format	Tubes	RZ NRZ	105-125 VAC, 60 cycle, 750 watts
3 ms	3 ms	VAC.	25 KC	Mixed	NRZ	5.3 KVA
6.5 ms	6.5 ms	VAC.	60 KC	Tubes	NRZ	1.2 KVA
10 ms	5 ms	VAC.	15 KC	Tubes	NRZ	3 ø 208V. 6 amps.
7.5 ms	5 ms	VAC.	15 KC	Tubes	NRZ	4100 BTV per hour
7.5 ms	2 ms	VAC.	15 KC 41 KC	S.S.	NRZ	3 ø 208V–4 amps.
5 ms	2 ms	VAC.	62 KC	S.S.	NRZ	3 ø 208V–4 amps.
5 ms	2 ms	VAC.	22.5 KC 62.5 KC	S.S.	NRZ	3 ø 208V–4 amps.
3 ms	3 ms	MECH.	90 KC	Mod. S.S.	RZ NRZ-RS	115V. 60 cycle 500 W.
3 ms	3 ms	MECH.	45 KC	Mod. S.S.	RZ NRZ-RS	115V 60C 400 cps ± 28 VDC
2 ms	2 ms	NA	NA	Mod. S.S.	NA	117V. 60C. 6 amps.

****Mod — modular; S.S. — solid state; mixed — solid state and tubes*

*****NA — No Answer*

For RCA information circle 108.
For REMINGTON RAND information circle 109.
For BURROUGHS information circle 110.
For IBM information circle 111.
For COOK information circle 112.
For SANGAMO information circle 113.

RPC QUICKENS PACE; 9000 ANNOUNCED

new dp system has 'in line' records-processing

Royal McBee has announced a new, modular electronic data processing system. The fully-transistorized RPC-9000 is the latest product of the Royal Precision Corporation. The 9000 provides automatic "in line" records-processing. Data is accepted in random order, and all affected records are automatically updated in a single uninterrupted sequence of operations.

The basic system includes: a central processing and control unit which operates in microseconds, performs the calculations, controls the program, and searches the external memory tape; a continuous magnetic tape file for data storage; and an input-output tape typewriter system that reads paper tape at 60 characters per second, and punches tape at 30 characters per second.

Optional high-speed input-output units also available include: a 400 cards-per-minute photoelectric reader for input of data contained in 80-column punched cards; a 500 characters-per-second bi-directional photoelectric paper tape reader; a 300 characters-per-second tape perforating unit; a 150 lines (of 120 alpha-numeric characters each) per minute printer; a high-speed 666 or 1,000 lines (of 120 alpha-numeric characters each) per minute printer; additional tape typewriter systems for on-line or off-line use and additional paper-tape punch/read on-line units.

Information can be entered into the computer from punched paper tape, punched cards, or through the typewriter keyboard. Forty-three commands provide programming flexibility. No binary conversion is necessary for machine computation.

Internal operating memory consists of nine blocks of magneto-strictive delay lines capable of storing 432 instructions or seventy-two 12-character words of data. This may be expanded to approximately 2000 internally stored instructions, or 328 words.

The external data memory is contained on endless loops of magnetic tape. Each tape loop will store up to 1,000,000 alpha-numerical characters; and 100% of capacity may be used for data or instructions. Separately stored cartridges of tape expand memory capacity indefinitely.

Cross-communications between input units, computer and output units is by separate buffers which speeds up the overall computer operation, and allows multiple input, multiple search and multiple output operations. Eight separate records may be searched simultaneously. Up to 30 input and output units may be operated simultaneously "on-line."

The system accepts – at random – information from such records as time cards, sales reports, and other business data, and updates the appropriate files. Data are recognized by content, not location. Every item of data is inspected on every cycle and every item is verified by the parity checking feature of the computer.

The basic system requires 150 square feet of floor space with little or no site preparation, no air conditioning, and it is operated by ordinary house current. The entire system is protected from power failure by a built-in "on-line" emergency power supply.

The RPC-9000 has been application-engineered for the full range of data processing needs. Some of these, common to most business, include payroll, inventory control, production control, accounts receivable and payable, sales analysis and forecasting. Other specialized data processing requirements can be handled with equal facility.

The RPC-9000 is available on lease, lease with option to purchase, or purchase. Monthly rental for the basic system is approximately $2500. Installation, operational start-up (including personnel training) and follow-up services are included.

Sales and service for the RPC-9000 Electronic Data Processing System will be available through the nationwide Data Processing Division offices of Royal McBee.

Royal McBee also announced the 910 Computer Typewriter, a sequence controlled unit designed to speed billing operations. All figures entered on the new machine are computed regardless of their position on a form.

The new equipment automatically types all extensions, sub-totals and totals. A stored program control makes it possible to print automatically descriptions of taxes, discounts and rates, and other calculations without recourse to manual keystrokes.

For further information, contact John G. Vogeler, Royal McBee Corporation, Port Chester, N.Y. ●

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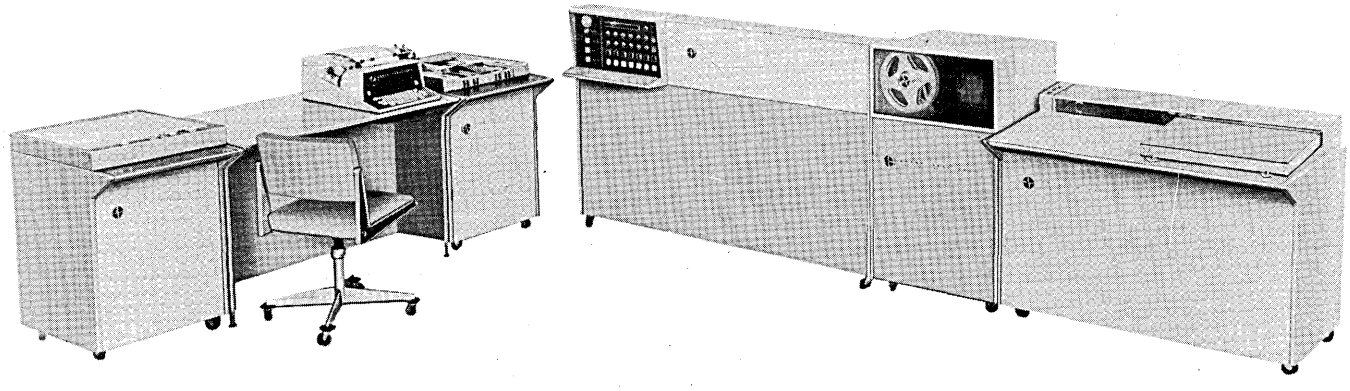


Plus & Minus

by Herb Grosch

Ever since Uncle Norbert invented cybernetics, the digital computer, and social responsibility (and on the seventh day rested), I've been a willing victim of **cacoethes carpendi.** This column is, in fact, a sort of heat engine, hopefully converting some fraction of the resulting fever into useful action, with invective as the working fluid. And if the combined stickslip frictions of moribund JCC, feeble ACM, and furtive IFIPS prevent action, maybe the condensate can be used to wash a little dirty linen!

Like the **ex post facto** nature of the societies that ratified the IFIP charter, hmm? The charter required ratification by a small number of national groups, and made no requirements as to size, length of existence, legal incorporation, exclusiveness, professional competence, or required financial contribution. That last one especially is real cute, and I sounded off about it in Paris last May. It has a double effect: first, the real men-from-boys separator is lacking, and any impecunious bunch of abacus lovers can sign up; second, it guarantees that the Federation will be too poor to do anything worthwhile in the foreseeable future.

So, between ICIP and XMAS enough premature babies were incubated to sign IFIPS into existence. And the three JCC components fell for it, hook, line and perquisites! All right, esteemed colleagues, you now have one vote with which to express a million American man-years of computer experience – the same vote as the Cuban Computer Commissariat (membership, six; machines available, IBM 610 on order; annual contribution, one metric ton of sugar cane).

Have fun!

MACHINE TRANSLATION PROCEEDINGS AVAILABLE

Proceedings of the National Symposium on Machine Translation, which was held at U.C.L.A. early in February, will be available sometime during May, DATAMATION learned. The volume, covering the 11 sessions held, will be sold for approximately $8.00 (trade edition) and $6.00 (college edition).

Copies may be obtained by writing Prentice-Hall, Inc., Englewood-Cliffs, New Jersey or college book stores.

THE MOST TAPE HANDLER FOR YOUR MONEY

The Potter 906 II, the high-speed digital magnetic tape handler that has come of age gives you higher performance, greater reliability and lower cost than any other tape handler on the market—bar none.

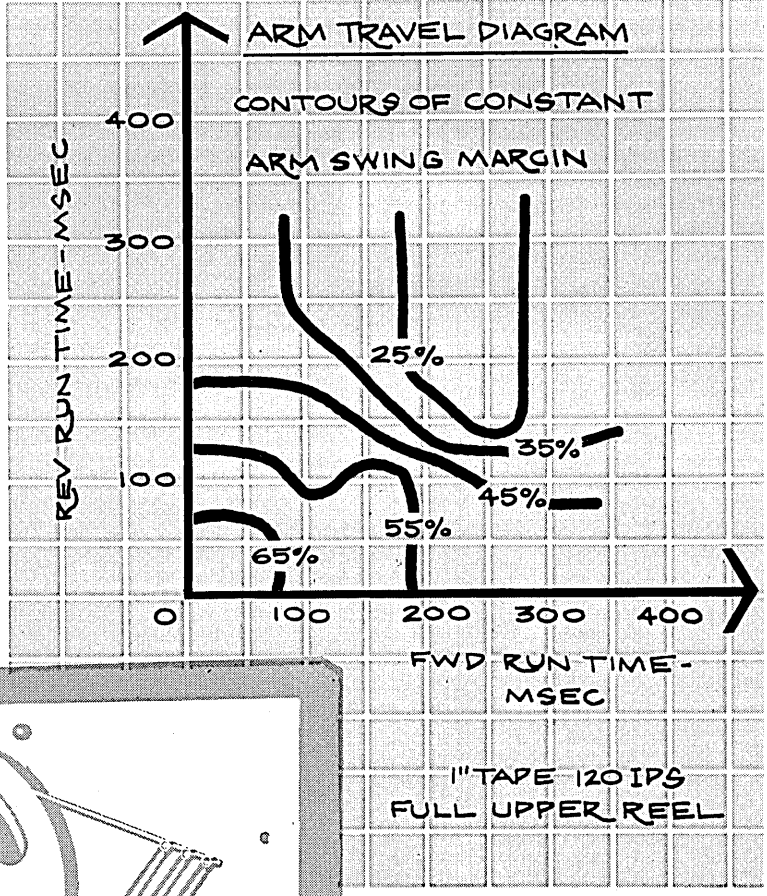
If you're interested in computer efficiency, you'll appreciate the kind of high performance shown by the actual test results plotted to the right. The Potter 906 II is the first and only tape transport to offer full forward-reverse cycling at 120 ips with 1" tape.

You'll be interested, too, in the other advantages that the 906 II now gives you for the first time. Among these are—

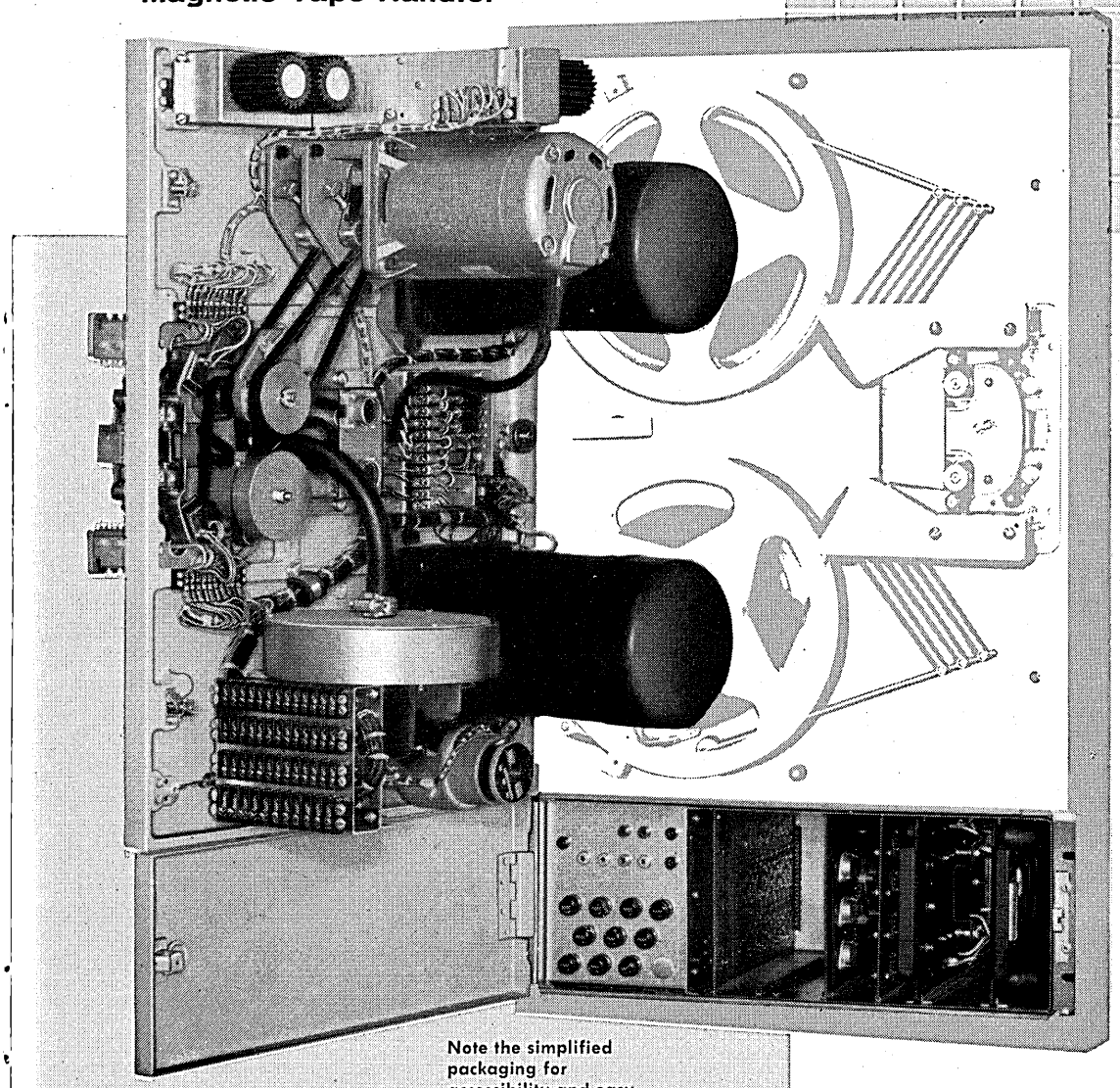
1. Low skew tape guide permits conventional recording at 400 bpi density.
2. Densities of 1500 bpi can be achieved by using this transport with the Potter Contiguous Double Transition system—450,000 8-bit characters per second on 1" tape.
3. Transistorized control of all functions simplifies computer design.
4. Simplified packaging for easy maintenance.
5. A price—far below other makes—that proves the economy of superior design.

Compare them any way you like—spec for spec, dollar for dollar, space for space—and you'll agree that the high-performance, low cost, Potter 906 II is the most tape transport at any price.

HERE'S PROOF



MODEL 906 II
Magnetic Tape Handler



Note the simplified packaging for accessibility and easy maintenance.

SPECIFICATIONS

TAPE SPEED
100 and 50 ips, standard. Maximum speed: 150 ips. Minimum speed: 1.0 ips.

START TIME
3 milliseconds or less.

STOP TIME
1.5 milliseconds or less.

STOP DISTANCE
0.100" ± .035" at 100 ips.

REWIND
300 ips constant speed either direction. 1¾ minutes for 2400 feet, millisecond start-stop, with 1/2" tape.

INTERCHANNEL TIME DISPLACEMENT
±2 microseconds at 100 ips from center clock to outside track on 1/2" tape.

COMPUTER INPUTS
All functions including speed selection, FWD, REV, FAST FWD, FAST REV, controlled with 0 volt "OFF," −5 volt "ON," level type signal. Other level or pulse control signals can be accommodated on special order.

BLOCK FEED REP RATE
200 blocks/second maximum.

TAPE TENSION
3 oz. nominal, 1/2" tape. Maximum tension in guide system, approximately 6 oz.

SIZE
24½" high swing-out panel for 19" rack mount. Hinge mounts separately for ease of installation.

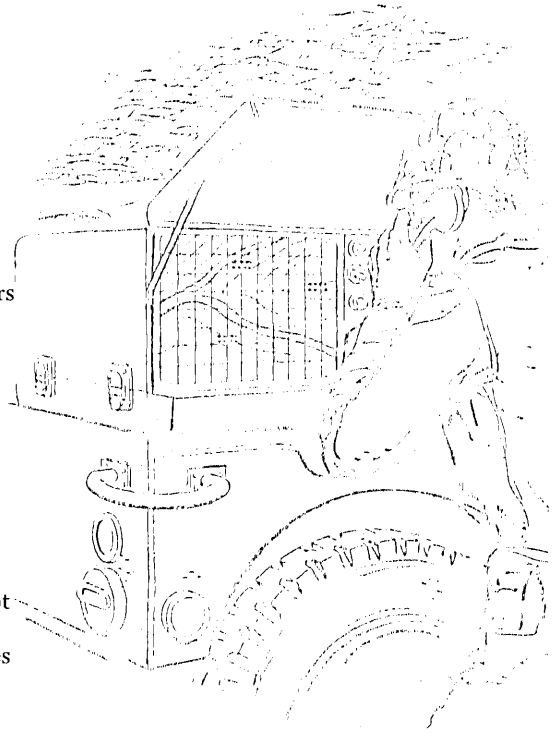
POTTER INSTRUMENT CO., INC. Potter **Sunnyside Boulevard, Plainview, L. I., N.Y.**
OVerbrook 1-3200

Circle 14 on Reader Service Card.

FOR THE COMBAT MARINE

Stromberg-Carlson-San Diego, in cooperation with the U.S. Marine Corps, has developed a revolutionary new tactical communications concept that will instantaneously transmit intelligence from forward observers and present a simultaneous tactical display to command. Known as BASIC (Battle Area Surveillance and Integrated Communications), it works this way:

Forward observers are equipped with small, hand-held digital message generators on which reports are "set up" through a series of switches. After checking the accuracy of his message, the observer sends the entire message in a short burst over his standard field communications equipment. The burst transmission doesn't interfere with simultaneous voice communication over the same radio channel.



Back at the command post, surveillance information is instantly displayed on a tactical map and simultaneously presented on typewritten cards showing target identity, location and other important information. Data may be fed directly to tactical computers for artillery fire control.

The same techniques and equipment used for the Marine Corps' BASIC concept are readily adaptable to a multitude of other military and commercial communications and display systems. For information about how BASIC techniques can solve your problems, contact Stromberg-Carlson-San Diego, Dept. A-36, 1895 Hancock Street, San Diego 12, California. Telephone CYpress 8-8331.

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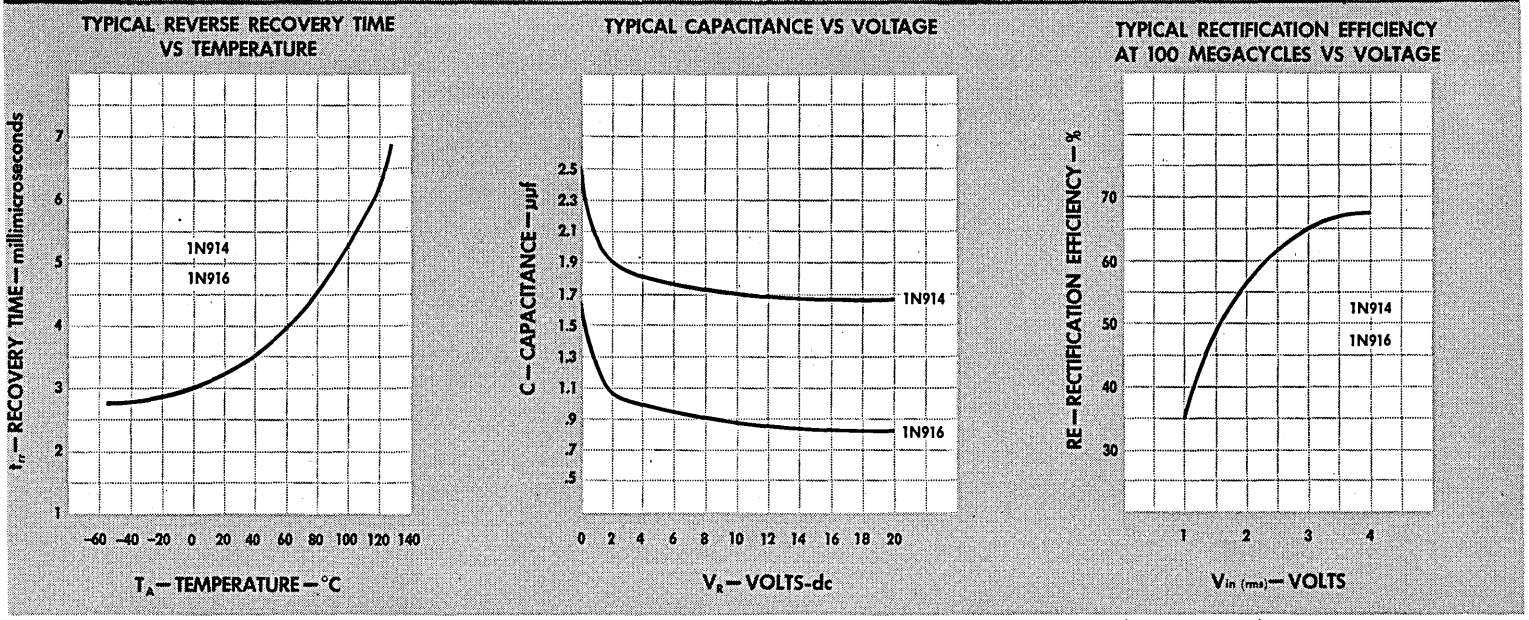
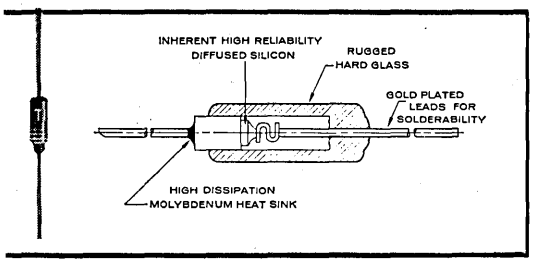
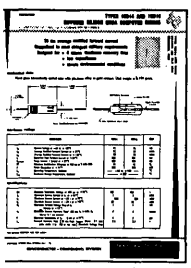
4-millimicrosec silicon mesa computer diodes

...INDUSTRY'S FASTEST!



- ☐ **High maximum average rectified forward current (75 ma)**
- ☐ **Low maximum capacitance (2 μμf or 4 μμf at zero volts bias)**
- ☐ **High minimum forward conductance (10 ma at 1 v)**
- ☐ **Maximum reliability (TI mesa process, TI hard-glass case)**





Contact your nearest TI sales office today for complete specifications on the 1N914 and 1N916 (Bulletin DL-S 1203).

Design NOW with industry's *fastest* high-voltage computer diodes and benefit from the speed of 4-millimicrosecond switching* and the design safety provided by 75-v PIV.

TI 1N914 and TI 1N916 silicon mesa computer diodes also feature high rectification efficiency (45% at 100 mc), ruggedness and reliability through the combination of the TI mesa process and the TI hard-glass package. Both types meet or exceed MIL-S-19500B, withstanding acceleration of 20,000 G's, shock of 1,000 G's for 1.5 msec, and vibration of 30 G's.

Put them to work NOW in your high-speed computer circuitry for missiles and space vehicles. They are ready in production quantities through your nearest TI sales office, or in 1-999 quantities off-the-shelf at factory prices from your authorized TI distributor.

*10-ma forward, 6-v reverse, recover to 1-ma reverse

ANOTHER NEW DIODE/RECTIFIER PRODUCT FROM TI!

ENERAL PURPOSE DIODES • PHOTO DIODES
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SOME MORE FACTS ABOUT COBOL

In May 1959, a Conference on Data Systems Languages (CODASYL) was convened for the purpose of establishing a common business language. This was to be an industry-wide effort employing the best talent available from computer manufacturers and users alike.

Three committees were established. The Executive Committee was responsible for administrative functions. The Short Range Committee was to produce a workable common language in as short a time as possible. The Intermediate Range Committee was to follow with a more sophisticated language package. The Long Range Committee (never actually formed) was to eventually produce a truly common computer language.

The Short Range Committee, after eight months time, presented the result of their efforts to the Executive Committee in the form of COBOL (COmmon Business Oriented Language). The Intermediate Range Committee worked on various possibilities but could make little progress until COBOL was assessed and a definite time schedule for implementation could be set up.

DATAMATION presented a brief summary of events which led to the adoption of COBOL in the January/February issue. Another report follows.

It became public knowledge in mid-February that one of COBOL's biggest sources of thrust may have been cut off when, at the national SHARE meeting held in Los Angeles, an IBM representative informed some 150 delegates attending a session devoted to COBOL and the IBM Commercial Translator, that his company was not satisfied with COBOL, that IBM would not implement it now and that work on the Commercial Translator was continuing. (Commercial Translator program specifications were promised sometime this month [April]).

In an attempt to establish this as the official IBM position DATAMATION asked of that company and received the statement presented at the right. IBM obviously is not turning its back on COBOL but is stating that it will not adopt a deficient common language.

The question may now be asked – what is the future for COBOL? Plans were implemented for COBOL publication by the U.S. Government Printing Office as a government report. Likewise, mechanisms for editing and maintaining the language have been set up with a reorganization of CODASYL.

Excerpts from a meeting of the Executive Committee at the Pentagon on February 12 will serve to provide a brief idea of COBOL's present standing. We quote:

"This first publication of COBOL should be identified as 'preliminary specifications' for a programming language and . . . a statement should be included to caution prospective users that there is no guarantee, expressed or implied, that programs written with COBOL will run on any processor."

Item 6 on the agenda, Maintenance of COBOL, covered recommendations of a planning sub-committee appointed to work out details for maintenance. The subcommittee recommended establishment of a Technical Committee and a Maintenance Committee and recommended certain changes in the membership and functions of the Executive Committee. The latter group adopted these recommendations with minor changes.

The Executive Committee further adopted a recommendation that the Intermediate Range and Long Range Committees be consolidated to form a Development Committee.

An official description of three of the committees follows:

The Technical Committee shall consider, from the manufacturers' standpoint, all proposals to supplement COBOL for need, technical feasibility and practicality and shall approve or disapprove **as a Committee action** all such proposals. Proposals generated within the Technical Committee will be sent to the Executive Committee for assignment of a proposal number and referral to the Maintenance Committee for concurrent consideration.

The Maintenance Committee shall consider, from the users' standpoint, all proposals to supplement COBOL for need, technical feasibility and practicality and shall approve or disapprove **as a Committee action** all such proposals. Proposals generated within the Maintenance Committee will be sent to the Executive Committee for assignment of a proposal number and referral to the Technical Committee for concurrent consideration.

The Development Committee will review research in the field of programming which will permit use by all systems analysts regardless of their professions or subject-matter specialty, to describe the process to be performed in such a manner as to be meaningful and appropriate for any concept of implementation. Proposals for Develop-

(Continued on page 70)

OFFICIAL IBM COBOL STATEMENT

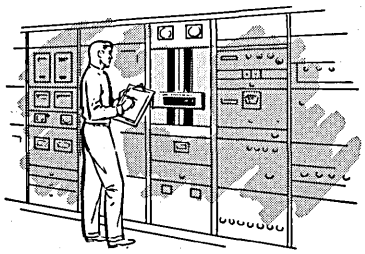
IBM has been working with the Conference on Data Systems Language in the development of a common business language for data processing. We will continue with this effort until this goal has been achieved.

The present status is this: preliminary specifications for such a language, called COBOL, are being edited for publication. The foreword states "the executive committee wishes to emphasize the fact that the deficiencies in preliminary specifications are well recognized. . . ."

Representatives of the interested manufacturers constitute a technical committee which is now working toward full and proper definition of this language. IBM is one of these interested manufacturers and is contributing the full power of its resources in language development. Since a date for the completion of this revision cannot be predicted now, IBM will continue to implement a workable language and translator.

We plan a dual effort: the Commercial Translator is being reworked as nearly in the COBOL spirit as possible. When the technical committee completes its effort, we hope to be able to modify the existing processors to handle the COBOL language. We wish to insure that the end result will be a single workable language for data processing.

the pb 250 / a general purpose,



The design of the PB 250 enables it to be mounted as a systems component in 31½ in. of a standard relay rack.

SPECIFICATIONS

TYPE
Serial, binary, internal program

COMMAND STRUCTURE
Single address with index register

NUMBER OF COMMANDS
46

OPERATION TIMES

Add/subtract	12 microseconds
Multiply	276 microseconds (max.)
Divide	252 microseconds (max.)
Square root	252 microseconds (max.)
Average access time	1,540 microseconds
Average access time to fast memory	96 microseconds
Maximum operational rate	40,000 instructions per second

WORD LENGTH
21 bits plus sign

MEMORY
Type:
Magnetostrictive delay lines
Capacity:
1,808 words (Up to 15,888 words internal storage at additional cost. 16,384 words external core memory also available.)

INPUT-OUTPUT
Standard:
Automatic alphanumeric typewriter
Paper tape punch and reader
32 control outputs
30 control inputs
High-speed block input-output (85 KC word rate)
Optional:
High-speed paper tape punch and reader
Magnetic tape units (six maximum) employing IBM 700 series format
Punched card equipment
Analog-to-digital converters
Digital-to-analog converters

PHYSICAL DESCRIPTION
30 in. high, 19 in. wide, 24 in. deep
110 pounds
Fully solid-state construction
Completely modularized

POWER REQUIREMENT
115 volts, 60 cycles, at 100 watts

Completely Solid State Internally-Stored Program

From Packard Bell Computer comes the first truly "second-generation" medium-scale computer. The PB 250 is a general purpose digital computer that may be applied to an extremely broad range of scientific, industrial, and military problems. The PB 250 combines a large, expandable memory and a versatile command structure with a computing speed in the microsecond range.

A FEW OUTSTANDING FEATURES OF THE PB 250

MICROSECOND SPEED

Computing speeds of the PB 250 rival those found only in expensive, large-scale systems. Addition and subtraction require 12 microseconds. Multiplication and division are variable length commands requiring 276 and 252 microseconds, maximum, respectively. All floating point operations require less than three milliseconds.

EXPANDABLE MEMORY

Minimum memory capacity of the PB 250 is 1,808 words, including one 16-word fast access line. The memory is economically expandable to 15,888 words internally, plus 16,384 words of external core storage.

VERSATILE COMMAND STRUCTURE

The extensive command list of 46 instructions contains 14 data transfer commands, 8 arithmetic commands (including divide and square root), 14 logical and program transfer commands, and 10 input-output commands.

SIMPLE PROGRAMMING

Programming simplicity is achieved by single-address instructions, command indexing, and automatic double precision operations. Symbolic programming routines are supplied at no extra cost with the PB 250.

FLEXIBLE INPUT-OUTPUT SYSTEM

The PB 250 is adaptable to a wider range of peripheral equipment than any computer in the low-priced field. This equipment includes high-speed tape readers and punches, magnetic tape units, card readers and punches, printers, analog-to-digital and digital-to-analog converters. Standard equipment includes an automatic typewriter, paper tape reader, and punch.

EXCEPTIONAL RELIABILITY

Maximum reliability is achieved through conservative solid-state design, a small component count (less than 350 transistors), and absence of moving parts.

All memory operations are parity checked.

SYSTEMS INTEGRATION

Flexible input-output design enables the PB 250 to be easily integrated into existing systems, either on- or off-line.

The PB 250 may operate as a universal format-to-format converter.

microsecond computer for $30,000

THE
pb 250
will be displayed at the
Western Joint
Computer Conference
May 3, 4, 5
Jack Tar Hotel
San Francisco, booth 17

PACKARD BELL COMPUTER

A Subsidiary of
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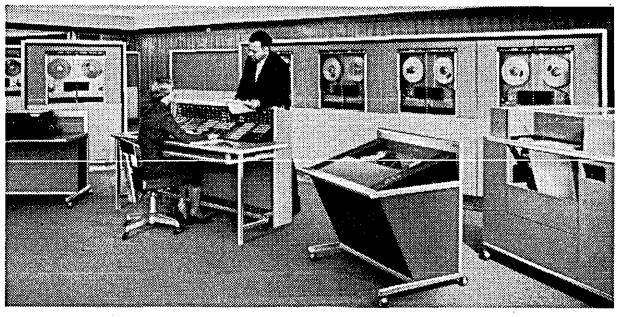
RCA 501 helps achieve accounting modernization for a growing utility.

Atlantic City Electric Company serves the industrial, commercial fishing, agricultural and dairy farming counties, as well as the world renowned recreational areas, of southern New Jersey.

With the RCA 501 Electronic Data Processing System, Atlantic City Electric Company will handle a heavy flow of paperwork in one-half the time formerly required. 12,000 customer bills a day can be speedily processed by the 501—at the lowest cost per unit of work in its price class. But speed is just one of the reasons it was selected; accuracy, efficiency and easy expansibility counted heavily. Also, the all-transistor construction provides reliability and drastically reduces size and weight, as well as power and cooling requirements.

In addition to the tremendous job the RCA 501 will do for Atlantic City Electric Company, RCA Electronic Data Processing Systems are daily demonstrating power in other fields—insurance, banking, manufacturing as well as in government agencies. For full information on the advantages of RCA EDP for your business, write to—



In every engineering feature, RCA EDP Systems reflect the electronic experience and knowledge of the world leader in electronics. Arrange to see the modern Data Processing Center in Cherry Hill, near Camden, New Jersey

RCA ELECTRONIC DATA PROCESSING

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RADIO CORPORATION of AMERICA

ELECTRONIC DATA PROCESSING DIVISION • CAMDEN 2, NEW JERSEY

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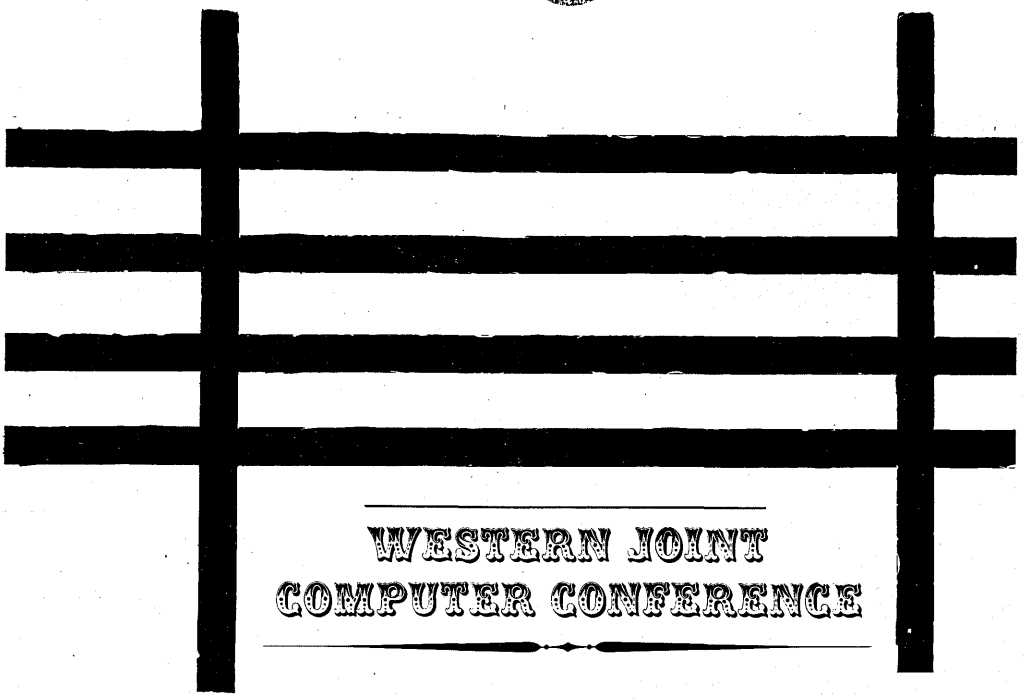


In this industry of million dollar machines and billion dollar potentials one must be careful in labeling a given development as "the ultimate." While we won't make this claim in advance for the Western Joint Computer Conference, which will have a three-day run at San Francisco's Jack Tar Hotel, May 3-5, we must admit to a great deal of genuine enthusiasm. And even the cautious critic, in evaluating the proposed program for the WJCC, should recognize qualities of imagination and inspiration displayed by this year's conference committee.

The mark of inspiration will be apparent from the moment the expectant delegate registers. In addition to his receipt, badge, program and other assorted literature, he will be presented with a copy of the Conference Proceedings—a complete collection of the papers and addresses which will comprise the heart of the 1960 meeting.

There is more behind the issuance of these volumes than the "they said it couldn't be done" concept. Conference speakers are aware of the issuance of proceedings and are preparing to expound on key points in their papers. There should not be a single paper *read* at this conference—a notable first by any JCC standard.

As an additional incentive to prepare thoroughly, speakers need only remember that close at hand, at the conclusion of their talks, will be duly authorized panelists—experts in the speaker's field—who will review facets of the subject presented. These exchanges will then be expanded to include the audience.

Among complaints heard after past JCC's was the fact that outside of bars and restaurants, there were no fairly calm areas provided where delegates could relax and informally exchange views. Just such places are being prepared at the Jack Tar.

Other encouraging trends are slightly less evident . . . Chairman Bennett points out in his message of welcome that trends and techniques will be stressed at this conference rather than new hardware. And the exhibitor list seems to grow every year, despite occasionally uttered misgivings by those who associate bigness with badness.

Our prediction for this particular computer conference—it will be an outstanding success *if* the 3000-odd conferees in attendance participate to their fullest. One thing is certain, the organizing committee has done its part.

THE CONFERENCE—Western Joint Computer Conference, 1960; **THE PLACE**—Jack Tar Hotel, San Francisco; **THE DAYS**—May 3, 4 and 5.

REGISTRATION—WJCC registration will take place in the lobby of the Jack Tar on Monday, May 2, from 6 to 9 p.m.; on Tuesday, May 3, from 8 a.m. to 4 p.m.; on Wednesday, May 4, from 8:30 a.m. to 4 p.m. and on Thursday, May 5, from 8:30 a.m. to 1 p.m.

Registration for speakers, panelists, session chairmen and conference committeemen will be in the special committee room provided.

There will be no advance registration. The general registration fee includes admission to the technical sessions and one copy of the Conference Proceedings (students excepted). Registration fees are: sponsoring society member—$6.00; non-member—$7.00; student—$2.00. Extra copies of the Conference Proceedings will cost $3.00.

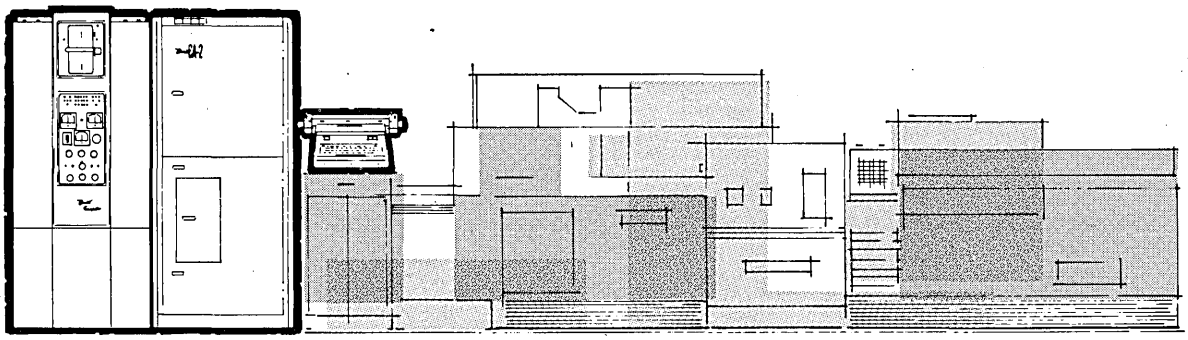
EXHIBITS—Exhibits will be located adjacent to the technical session areas and will be open to the public on Tuesday, May 3, from noon to 6 p.m.; on Wednesday, May 4, from noon to 9 p.m.; on Thurs., May 5, 9 a.m. to 6 p.m.

SPECIAL EVENTS—A cocktail party will be held on Tuesday from 6 to 8 p.m. in the patio of the Jack Tar. Tickets will be $4.00 per person.

The conference banquet will begin on Wednesday at 6:30 p.m. in the Jack Tar ballroom. The charge will be $5.25 per person. (See page 48.)

For details on Women's Activities, see page 48.

PROCEEDINGS—Additional copies of the proceedings may be obtained at the Conference or from the sponsoring societies at $3.00 per copy.



PRICE: LESS THAN 1/2 THAT OF ANY EQUIVALENT SYSTEM!

....THE BENDIX G-15 IS THE LOWEST-COST PUNCHED CARD COMPUTER YOU CAN RENT OR BUY

By adding the Bendix Punched Card Coupler to the basic G-15, you have full alphanumeric punched card capabilities combined with the G-15's powerful computing ability. Price: less than 1/2 that of any equivalent system. The Punched Card Coupler allows the G-15 to use seven standard models of card readers, punches, and accounting machines. Up to three may be connected on-line at one time, and all input-output is fully buffered. And with the G-15, as standard equipment, you have a fully alphanumeric typewriter, a paper tape punch, and a searchable high-speed photo-electric paper tape reader. Low-cost magnetic tape units are also available. The great versatility of this business-scientific system, at such a remarkably low price, is setting new standards of computing economy.

Write for details.

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DIVISION OF BENDIX AVIATION CORPORATION

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WESTERN JOINT COMPUTER CONFERENCE

ROBERT M. BENNETT, JR.
General Chairman

Robert M. Bennett, Assistant to the Manager of the Advanced Development Laboratory, IBM, San Jose, joined the corporation in 1955 and was assigned to the planning group for the 705 computer at the Poughkeepsie Laboratory. Later that year he transferred to San Jose to work on the engineering model of the RAMAC. He also worked on debugging the initial production RAMAC engineering prototypes. In December, 1957 Bennett was assigned to the Research Laboratory—where he pursued special systems applications studies.

Bennett came to IBM from Bendix Aircraft Corp., where he worked on the design and development of special purpose radar and missile systems.

MR. BENNETT'S WELCOME

CONFERENCE ARCHITECTS

We are pleased to use this issue of *Datamation* as an opportunity to offer an advance welcome to San Francisco, to the Jack Tar Hotel, and to the 1960 Western Joint Computer Conference.

This year's committee has instituted a number of innovations which will, we hope, make this an outstanding conference. In keeping with the theme of the conference, "Challenge of the Next Decade," papers have been selected on the basis of trends in techniques and applications rather than descriptions of existing or about-to-be-announced equipment. We are interested in where we are going rather than where we are. The area of analogue computation will be given a significant emphasis in the program.

The exhibit area will include the greatest number of manufacturers ever represented in the history of the Western Joint Computer Conference. Facilities will also be provided for informal colloquiums.

The computing field has had a phenomenal growth in the last fifteen years and has reached a degree of sophistication indicating a "coming of age." Not too long ago the programmed electronic computer, per se, was an interesting and useful engineering "gadget" suitable for solving various and sundry scientific problems. Additional applications were found requiring the modification of the "gadgetry" to fit the specific uses. Following this, the next stage was a tremendously accelerated take-off in technological improvement in both macro- and microscopic concepts. These technologies involved not only the physical components necessary for the organization, design, and construction of computing systems, but studies in the improvement of communicating with and control of, these systems. We have now reached a stage wherein the emphasis is more on problems and applications—the systems approach.

One of the purposes of the conference is to assemble varied professional interests for mutual discussion and appreciation of their respective problems and approaches. If we, who attend, can gain some understanding of one anothers' problems and be stimulated into a rigorous analysis of where we stand and where we are going, attendant with a feeling for social implications and justification of motivations, the conference will have been a success.

R. M. BENNETT

George A. Barnard
vice chairman
wjcc

Mary Fraser
women's activities

Harry K. Farrar
exhibits

Charles Elkind
public relations

Gene E. Morrison
local arrangements

Harold N. Wells
registration

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secretary

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printing, mailing

Jack E. Sherman
vice chairman
technical program

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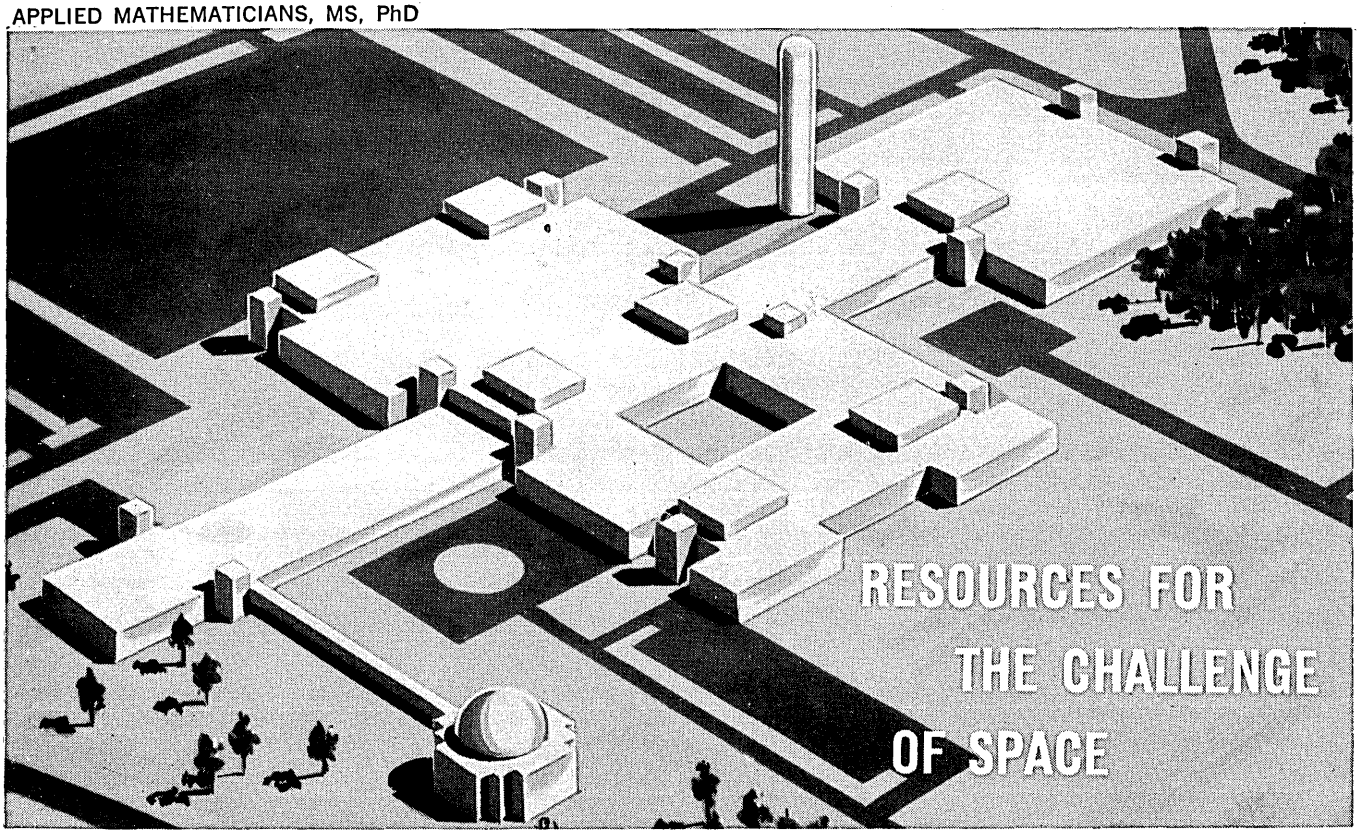

...General Electric's New $14,000,000 Space Research Center, to be built near Valley Forge Park 17 miles from Philadelphia

The Missile and Space Vehicle Department of General Electric—a recognized leader in the development of instrumented re-entry vehicles—is now pursuing a number of even more advanced space programs. Basic to progress in these programs is the solution of a diversity of interesting mathematical problems. These include trajectory and navigation studies and analysis of flight telemetry data and space communications.

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ANALOG COMPUTER PROGRAMMERS

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WESTERN JOINT COMPUTER CONFERENCE

HOWARD M. ZEIDLER
Technical Program Chairman

Howard M. Zeidler is head of the circuit systems group of the computer laboratory, Engineering Div., Stanford Research Institute, Menlo Park, California. He joined the Institute in 1949, and since then has participated in the development of electronic data processing equipment. Zeidler came to Stanford from the Hewlett-Packard Company, where he worked with low-frequency and micro-wave instrumentations. From 1943 to 1946, he was a research associate at the Radio Research Laboratory, Harvard University, concerned with the development of microwave broad-band oscillators.

Zeidler is a member of the Institute of Radio Engineers and has written several papers on reflex-klystron oscillators and pentriode amplifiers. He obtained his M.S. degree from Massachusetts Institute of Technology in 1943, and holds an electrical engineering degree from Stanford Univ.

MR. ZEIDLER'S PREFACE

THE TECHNICAL PROGRAM

The Technical Program Committee of the 1960 Western Joint Computer Conference welcomes this opportunity of inviting members of the computer community to participate in the technical sessions on May 3-5 in San Francisco.

For the past four months, session chairmen have been engaged in reviewing submitted papers and in working with accepted authors to optimize the basic material. Final drafts are being incorporated into the Conference Proceedings which will be distributed at the registration desk to those attending the sessions.

Advance printing of the Proceedings has been arranged with the primary aim of implementing the effectiveness of the technical sessions. Advance availability will give individuals the opportunity of being informed on the subject matter before the material is presented orally by the speakers. The oral presentations are not to be mere "readings" of the published texts—the speakers are being encouraged to diverge from the published material as appropriate with supplementary philosophies or with reports on results from the laboratories.

A wide range of analog and digital subjects will be of interest to everyone associated with the many facets of the computer field. Some of the individual sessions dealing with trends in computer development and growth for the future will be of interest to virtually everyone—regardless of the specific nature of the man's work. Examples are those on "Computer Organization Trends" and "Learning and Problem Solving Machines." A third session which extrapolates even further into the future is the one dealing with "Design, Programming, and Sociological Implications of Microelectronics."

Other sessions such as those on analog machines, and those on "Logical Design" and "Components and Techniques" are tailored to the specific interests of certain groups. In each session, panelists will contribute their interpretations and comments to add further food for thought, and to stimulate participation from the audience.

In addition to the technical sessions, a special panel discussion will analyze and propose solutions for the general problem of communications among the various segments of the computer industry. The panel will consist of three well-recognized editors of computer publications.

It is sincerely hoped that the conference sessions will stimulate effective planning for the next decade of computers.

H. M. ZEIDLER

Session on COMPUTER ORGANIZATION TRENDS
Tuesday, May 3—9:30 a.m. to 12:30 p.m.
Chairman: Arthur J. Critchlow, IBM, Mohansic

Revolutionary changes brought about by computers can be expected in the new decade. This session will attempt to answer the question, "Which way are computers evolving?" and thus aid in pointing out how computers may affect our civilization in this decade.

Computer organization may be categorized into three types:

1. Classical stored program organization as developed by, J. Von Neumann and others. These computers handle instructions in serial fashion and have one instruction counter. They will be discussed in a short historical review of computer development.
2. Improved machines which provide sophisticated logical structure to improve performance. Typical techniques are asynchronous operation, overlap of instruction and high speed memory.
3. Multiplex information precessors, which carry out several operations simultaneously, may have separate memories and are made up of modular units which can be joined in a flexible way.

"The Historical Development and Predicted State-of-the-Art of the General Purpose Digital Computer"
C. Bourne and D. Ford, Stanford Research Institute

"The Harvest System"
P. S. Herwitz and J. H. Pomerene, IBM, Poughkeepsie

"Organization of Computer Systems—The Fixed Plus Variable Structure Computer"
Gerald Estrin, UCLA

"Horizons in Computer Systems Design"
W. F. Bauer, Ramo-Wooldridge Corporation

Panelists: Gene Amdahl, Aeronutronics Corporation; Morton M. Astrahan, IBM; J. Wesley Leas, RCA

Session on DATA RETRIEVAL
Tuesday, May 3—2:30 p.m. to 5:30 p.m.
Chairman: Robert M. Hayes, Electrada Corporation

Technical advances in the computer field and the increasing understanding of the usage of these devices combine to make feasible the solution of hitherto unapproachable data processing problems. The principal one is "data retrieval." The problems are of immediate in-

terest because of their importance and because the tools of their solution seem to be at hand.

Data retrieval, combining as it does problems in both logical manipulation of information and physical handling of storage media, brings the computer field directly into an area which has previously been considered peripheral. Large capacity data storage equipment can no longer be treated as external to the computing system; it is no longer merely an input-output medium; it can no longer be limited to the role of providing data to the "main frame." The organization and handling of large files of information must be considered as integral to the data processing and manipulation.

"A Multi-Level File Structure for Information Processing"
Louis Miller, Jack Minker, W. G. Reed, W. E. Shindle, RCA

"Symbolic Logic in Language Engineering"
H. M. Semarne, Douglas Aircraft Company, Inc.

"The Fact Compiler—A System for the Extraction, Storage, and Retrieval of Information"
Charles Kellogg, Ramo-Wooldridge Corporation

Panelists: John Postley, RAND Corporation; Mrs. P. B. Bremer, FMA, Inc.; M. E. Maron, RAND Corp.

Session on COMPONENTS AND TECHNIQUES

Tuesday, May 3—2:30 p.m. to 5:30 p.m.
Chairman: Robert Minnick, Stanford Research Institute

New computer component development continues at a rapid pace. In recent years there has been phenomenal progress in solid-state devices. This session will deal with magnetic components. The first paper deals with a nondestructive multiapertured core memory; the second with a permanent translating device which relies on magnetically-coupled wires; and the third with characteristics of a multiple-layer vacuum-deposited magnetic memory.

"A Word-Oriented Transistor Driven Non-Destructive Read-Out Memory"
T. C. Penn and D. G. Fischer, Texas Instruments, Inc.

"Unifluxor: A Permanent Memory Element"
A. M. Renard, Aeronutronics; W. J. Neumann, Remington Rand Univac

"Characteristics of a Multiple Magnetic Plane Thin Film Memory Device"
K. D. Broadbent, S. Shohara, and G. Wolfe, Jr., Hughes Aircraft Company

Panelists: Donald A. Meier, NCR; Norman L. Kreuder, ElectroData

Session on ANALOG EQUIPMENT

Tuesday, May 3—2:30 p.m. to 5:30 p.m.
Chairman: R. M. Howe, University of Michigan

The development of new computer components generally falls into two categories: components which represent improved performance over previous components used for the same computing tasks; and components which allow computations based on entirely new principles. The three papers in this session are in the latter category.

"Analog Time Delay System"
Charles D. Hofmann and Harold L. Pike, Convair Astronautics

"DAFT: A Digital/Analog Function Table"
Robert M. Beck and Jack M. Mitchell, Packard Bell Computer Corporation

"Mathematical Applications of the Dynamic Storage Analog Computer"
J. M. Andrews, Computer Systems, Incorporated

Panelists: Vernon L. Larrowe, University of Michigan; Mark E. Connelly, MIT

Session on LEARNING AND PROBLEM SOLVING MACHINES

Wednesday, May 4—9:00 a.m.—12 noon
Chairman: Theodore A. Kalin, M.I.T. and Air Force Cambridge Research Center.

The development of machines to simulate the behavior of living organisms is a rapidly expanding branch of the computer art. Many papers and several symposia have been devoted to this effort in recent years. For the present session we have selected papers representative of three areas of especial interest to computer designers and users. Dr. Doyle describes a computer program which adapts itself to humanly-important criteria in character recognition, eventually achieving satisfactory performance on its own. Dr. Gelernter's machine, also embodied in a computer program, exhibits inductive and deductive logical powers sufficient to prove geometrical theorems taken from high school final examinations. And, looking forward to the coming decade, Dr. Greene treats the problem of machine symbolization of meaning from the viewpoint of the philosopher and psychologist, and proposes an adaptive model for perception of significant wholes.

"Recognition of Sloppy Hand-Printed Characters"
Worthie Doyle, MIT

"Empirical Explorations of the Geometry Theorem Machine"
H. Gelernter, J. R. Hansen, and D. W. Loveland, IBM, Yorktown Heights

"A Suggested Model for Information Representation in A Computer That Perceives, Learns, and Reasons"
Peter H. Greene, University of Chicago

Panelists: Oliver Selfridge, MIT; J. C. R. Licklider, Belt, Beranek, and Newman, Inc.; H. J. Bremermann, University of California, Berkeley

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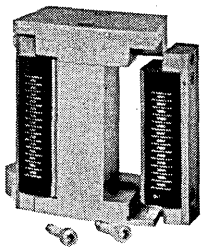
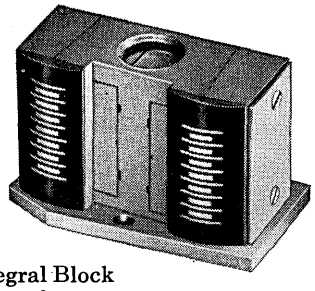


"Gap-Mounted."*



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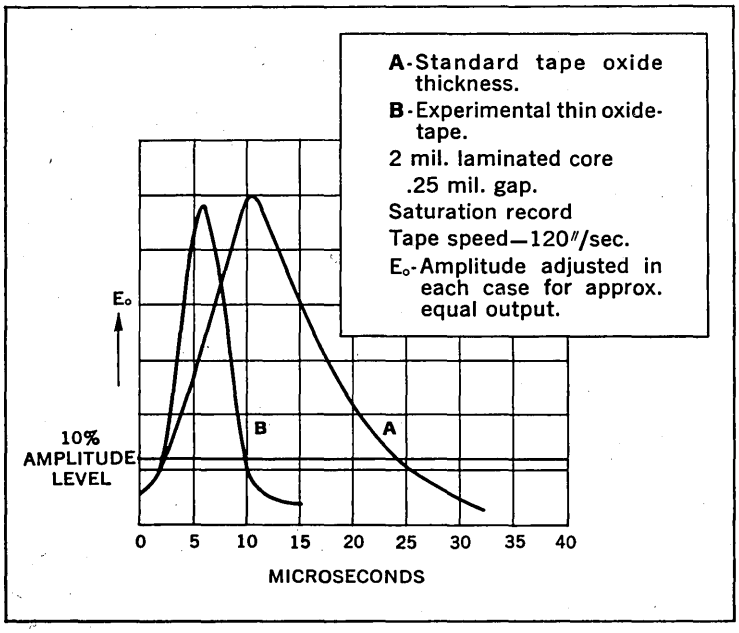

Pulse width comparison—standard and thin oxide tape.

CAPACITY— Five series of Clevite "Brush" multichannel heads give channel format variety for standard tape widths from ¼" to 2". A single block will handle up to 16 channels per inch of media width—an interlaced block up to 32 per inch. Clevite heads read pulse widths down to 1½ mils recorded to saturation on 0.3 mil coating instrumentation tape—approximately 600 pulses per inch with self-erasing saturation recording. More than 300 ppi packing is possible on 1 mil coated drums, operating 0.2 mils out of contact with a 3 mil pulse width on the drum.

ACCESS— Careful choice of material plus unique design and construction techniques enable Clevite "Brush" heads to provide uniform performance at very high processing rates. The heads themselves respond to wave lengths down to .15 mils (1.5 MC at 240 IPS) but standard instrumentation tapes and transports usually reduce the practical repetition rate of saturated recording to approximately 30 KC and 15 KC for RTZ and NRTZ respectively.

RELIABILITY — Clevite "Brush" tape and drum heads hold track width and location to ± 0.001-inch tolerance. Azimuth, contact angle and gap perpendicularity are true ± 0 deg., 5 min. and can be held even closer when required. "Gap-mounted" head (see photo) has lapped bracket and cartridge surfaces for fast replacement without critical adjustment. Redundant and interlaced (see photo) designs provide immediate checking of recorded data and higher output per channel respectively. All multichannel heads available in epoxy or full metal face (to reduce oxide pickup) at no extra charge.

* Patent Pending

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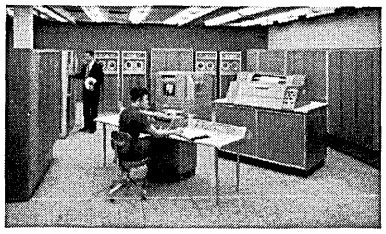

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FACT LANGUAGE SHORTENS THE GAP BETWEEN MAN AND MACHINE

FACT lexicon is made up of familiar words of everyday business usage such as FILE, ENTRY, PROCEDURE, REPORT, DELETE AND UPDATE. Source programs are initiated by combining lexicon words with the names of data units (files, entries, fields) to form ordinary English sentences and paragraphs. FACT accepts programs stated in this language and automatically creates the detailed machine language programs required to direct the data processing system in its work.

FACT also provides complete printed information about its own operation, including program listings, memory assignments and diagnostic data pertaining to source statement errors encountered during compilation. All of these outputs and aids are expressed in language easily understood by the programmer.

FACT WORKS WITH SMALL AS WELL AS LARGE SYSTEM CONFIGURATIONS

FACT can compile programs using as few as four magnetic tape units and 4096 words of memory. It can take advantage of any additional equipment that may be available and programs can be compiled on one Honeywell 800 for execution on any other Honeywell 800 system.

The programmer uses environment statements to describe the equipment array available for compilation as well as the array on which the object program is to run. Each object program is compiled to operate as efficiently as possible with the allotted machine units.

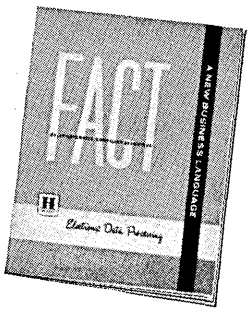
WITH FACT, FEWER PEOPLE WRITE MORE PROGRAMS IN LESS TIME

FACT may be used to prepare many different types of programs at many different levels of complexity including: input card reading and editing, creation of data files, data sorting, arithmetic computations, updating of data files, and generation of printed or punched reports based on input data, file data or program results.

The resulting compression of programming time and effort means that a given amount of work can be done with a smaller staff, jobs can be placed on the data processing system faster, programs can be modified more easily to meet changing requirements, and the data processor can be used profitably on a wider range of jobs.

HONEYWELL 800 CUSTOMERS ARE WRITING PROGRAMS IN FACT LANGUAGE RIGHT NOW

Honeywell Service as well as Honeywell EDP equipment is setting the pace for the industry as evidenced by the fact that customers for Honeywell 800 systems are even now writing programs in FACT language. Experts in the field of automatic programming, including compiler creators as well as users, have quickly recognized the outstanding characteristics of the Honeywell business compiler. If you would like to make your own comparison of FACT features with those of any other compiler, write for a copy of the new 94-page manual, "FACT — a new business language." Address your request to: Minneapolis-Honeywell, Datamatic Division, Wellesley Hills 81, Massachusetts, or Honeywell Controls Limited, Toronto 17, Ontario.



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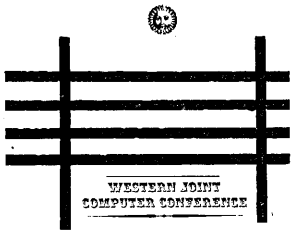

THE TECHNICAL PROGRAM

Session on ANALOG TECHNIQUES

Wednesday, May 4—9:30 a.m. to 12:00 noon

Chairman: Harold Skramstad, NBS

The presentation and discussion of three interesting techniques for using analog computers will be the subject of the session. These are concerned with their use in plotting Bode and Nyquist diagrams; the reduction of error by use of constraint equations; and the use of parameter influence coefficients obtained with the problem solution.

"Analog Computer Techniques for Plotting Bode and Nyquist Diagrams"
G. A. Bekey and L. W. Neustadt, Space Technology Labs, Inc.

"The Use of Parameter Influence Coefficients in Computer Analysis of Dynamic Systems"
Hans F. Meissinger, Hughes Aircraft Company

"On the Reduction of Error in Certain Analog Computer Calculations by the Use of Constraint Equations"
R. M. Turner, Lockheed Aircraft Corporation

Panelists: G. A. Korn, University of Arizona; Walter Brunner, Electronic Associates, Inc.

Session on TRENDS IN COMPUTER APPLICATIONS

Wednesday, May 4—9:00 a.m. to 12 noon

Chairman: Thomas W. Wilder, Broadview Research Corporation

A major trend in applications of digital computers is toward an increased interest in problem areas which combine features of scientific computing and data processing. The trend has important implications not only for users of computer-obtained results, but also for the programmer and hardware designer. In addition, new potential areas of computer applications will be discussed.

"Data Processing—What Next?"
John M. Salzer, Ramo-Wooldridge Corporation

"The Outlook for Machine Translation"
Franz L. Alt, National Bureau of Standards

"Computers for Artillery"
Lt. Col. Louis R. van de Velde, Fort Sill, Oklahoma

Panelists: Clair E. Miller, Electronic Computing Center, San Francisco; A. R. Zipf, Bank of America; George W. Evans, Stanford Research Institute

Session on LOGICAL DESIGN

Wednesday, May 4—2:00 p.m. to 5:00 p.m.

Chairman: Richard Tanaka, Lockheed Aircraft Corp.

The area encompassed by computer logical design is wide and varied. Efforts in this field range from research of an entirely theoretical nature to the investigation of techniques directly related to hardware realization of digital machines.

The sampling of papers for this session obviously cannot represent logical design activities in the larger sense; the papers do describe new techniques and new points of view and will stimulate thought and indicate directions of planning of computers for the next decade.

"Communications Within a Polymorphic Intellectronic System"
G. P. West and R. J. Koerner, Ramo-Wooldridge Corporation

"Encoding of Incompletely Specified Boolean Matrices"
T. A. Dolotta and E. J. McCluskey, Jr., Princeton University

"A Built-in Table Lookup Arithmetic Unit"
R. C. Jackson, W. H. Rhodes, Jr., W. D. Winger, and J. G. Brenza, IBM Corporation

Panelists: A. Jennings, California Computer Products; D. Aufenkamp, GE; B. Elspas, SRI

Panel Discussion: HOW WELL ARE WE PROCESSING OUR OWN INFORMATION?

Wednesday, May 4—2:00 p.m. to 5:00 p.m.

Panelists: Sandy Lanzarotta, Editor, DATAMATION, Panel Chairman; Jackson W. Granholm, Editor, COMPUTING NEWS; Fred J. Gruenberger, News Editor, COMMUNICATIONS OF THE ACM

Session on DESIGN, PROGRAMMING AND SOCIOLOGICAL IMPLICATIONS OF MICROELECTRONICS

Thursday, May 5—9:00 a.m. to 12:00 noon

Chairman: Louis Fein, Consultant, Palo Alto, California

Secondary emission vacuum elements, magnetics, semi-conductors, cryogenics, and ferroelectrics, etc., are being studied and researched for use in systems variously called microelectronic, or microminiaturized, or molecular electronic. A few people are concentrating their attention on the kinds of computers they would build out of such components and systems, if they were available. Still others are thinking about how they would program such computers; finally, the sociological implications of having and using such programmed computers are contemplated. From among all these possibilities in hardware, design, programs, and uses, the speakers in this session will pursue one of the large variety of potential chains of implications of microelectronics.

This sequence of four papers covers the following topics: (1) design problems in developing one class of microelectronic components, structures, and systems; (2) how this class of components, structures, and systems might be put together to implement the logical design of one kind of computer; (3) how this kind of computer might be programmed for one type of use — as an "intelligent technician"; (4) what the potential of such an "intelligent technician" might be as an aid to the solution of the bargaining problem.

"On Microelectronic Components, Interconnections, and System Fabrication"
Kenneth R. Shoulders, Stanford Research Institute

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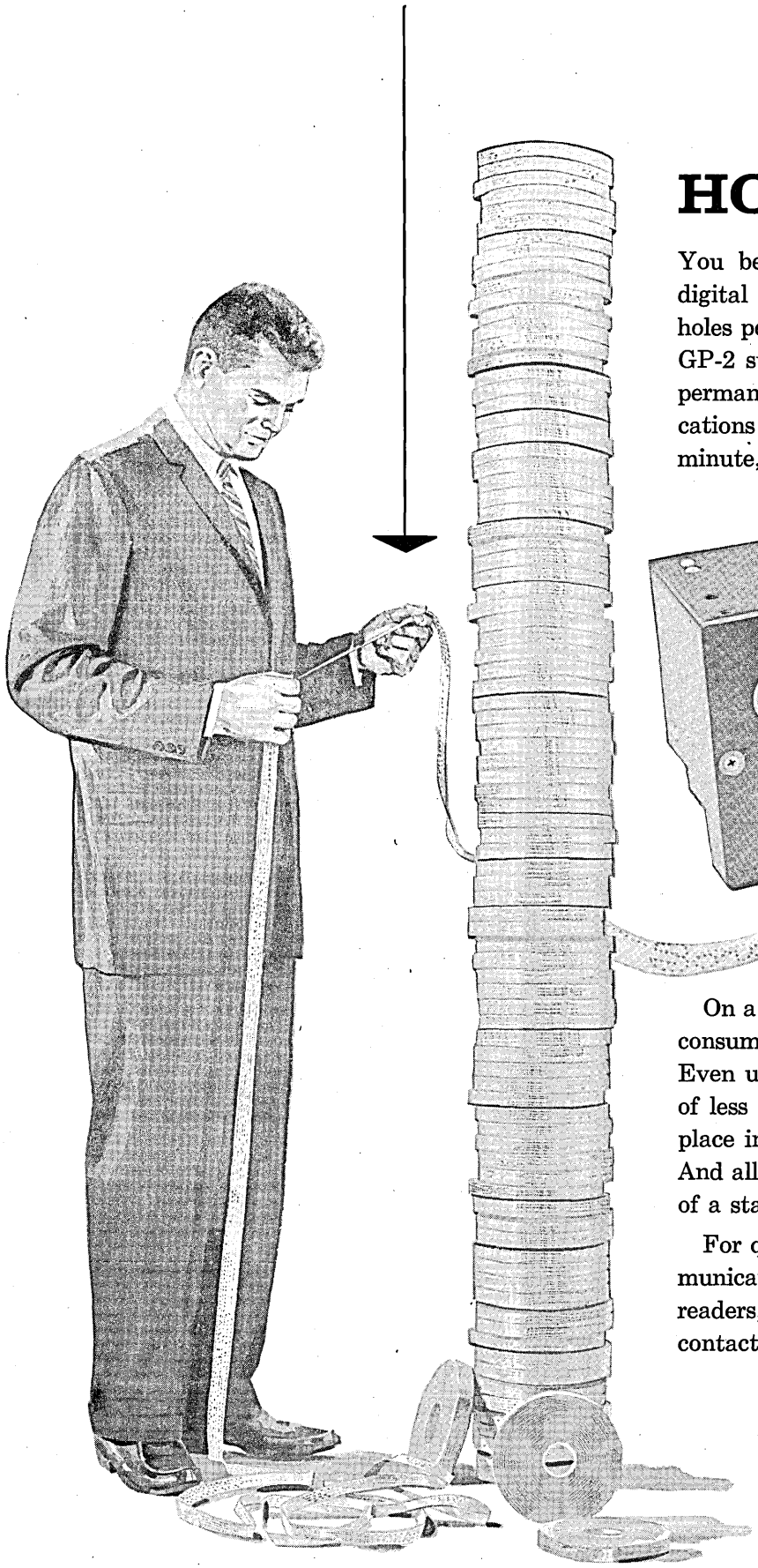

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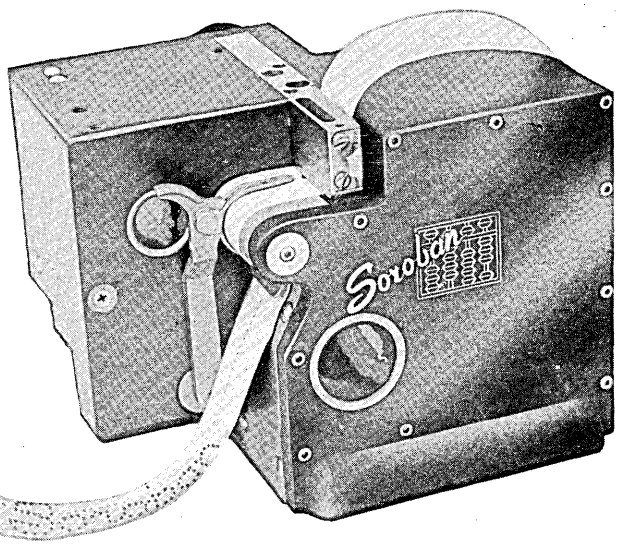

On a single eight-hour shift, the GP-2 often consumes a stack of tape higher than a man. Even under such operation, error frequencies of less than one in 100 million are commonplace in GP-2 produced punched paper tape. And all this from a device the size and weight of a standard press camera!

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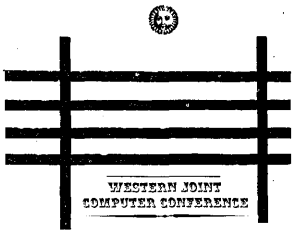


THE TECHNICAL PROGRAM

"On Iterative Circuit Computers Constructed of Microelectronic Components and Systems"
John H. Holland, University of Michigan

"On Programming a Highly Parallel Machine to be an Intelligent Technician"
Allan Newell, The Rand Corporation

"On A Potential Customer for an Intelligent Technician"
C. West Churchman,
University of California, Berkeley

Session on ANALOG APPLICATIONS

Thursday, May 5—9:00 a.m. to 12:00 noon
Chairman: Lou Wadel, Chance Vought Aircraft, Inc.

Simulation, the substitution of elements having mathematical properties in common with the system to be studied, facilitates the studies in a number of ways: (1) it permits relatively inexpensive laboratory investigations of complex dynamic systems in advance of construction to verify proper operation; (2) it makes possible the rapid trial of many possible designs to aid optimum systems synthesis; (3) it provides means for operator training at drastically reduced cost and with the elimination of danger to operator and the system.

An electronic analog computer offers a convenient, flexible means of simulating dynamic systems. The procedure involved in constructing a simulation program is normally straightforward, but it becomes tedious for large problems which may require the inter-connection of several hundred separate elements. Since the construction of the program is a logical procedure, it seems reasonable that a digital computer can be used to program an analog computer automatically.

"ANATRAN—First Step in Breeding the DIGINALOG"
Lee A. Ohlinger,
Norair Division of Northrop Corporation

"Using an Analog Computer for both Systems Analysis and Operator Training on the Enrico Fermi Nuclear Power Plant"
Samuel Irwin and Robert Kley,
Holley Carburetor Company

"Real-Time Automobile Ride Simulation"
Robert H. Kohr, General Motors Corporation

Panelists: John H. McLeod, Convair; Donald F. Zawada, Ford Motor Co.

Session on PROGRAMMING SYSTEMS

Thursday, May 5—2:00 p.m. to 5:00 p.m.
Chairman: George H. Mealy, RAND Corporation

Programming systems, all but unheard of five years ago, have become as large and complex as the computers with which they are used. Their purpose is to facilitate communication between the programmer and the machine and to sequence and coordinate execution of object programs and components of the system. Their importance may be indicated by the fact that most computer users will not consider ordering a machine without a programming system.

Systems of the first variety may be called translators. These are typified by the various compilers for UNIVAC, the symbolic assembly programs for the IBM 650 and 709, SOAP and SAP, and algebraic translators such as FORTRAN. The second type of programming system is generally called a monitor, or operating, system. Although they started as relatively simple affairs intended to sequence jobs through the machine and make certain debugging aids available to the programmer, present operating systems, such as SOS, the SHARE operating system for the IBM 709, generally include several translators as subsystems, together with input-output and debugging facilities.

System programmers are currently faced with three major problems: (1) How can we construct a single system (at least, from the point of view of the programmer using the system) that will operate on a variety of machines; (2) how can we construct subsystems that will coexist comfortably within the same operating system; and (3) how can we smooth the transition to the next machine, as concerns both the task of constructing the new programming system and re-educating users of the system?

"A Man-to-Machine Communication and Automatic Code Translation"
A. W. Holt and W. J. Turanski,
Moore School of Electrical Engineering,
University of Pennsylvania

"The Computer Operation Language"
G. F. Ryckman, General Motors Corporation

"A New Approach to the Programming Problem"
William Orchard-Hays, C-E-I-R

Panelists: Robert L. Patrick, Manhattan Beach, Calif.; Ascher Opler, Computer Usage Co., Inc.; Richard K. Ridgway, IBM Applied Programming

Session on INPUT-OUTPUT AND COMMUNICATIONS

Thursday, May 5—2:00 p.m. to 5:00 p.m.
Chairman: John A. McLaughlin, IBM, San Jose

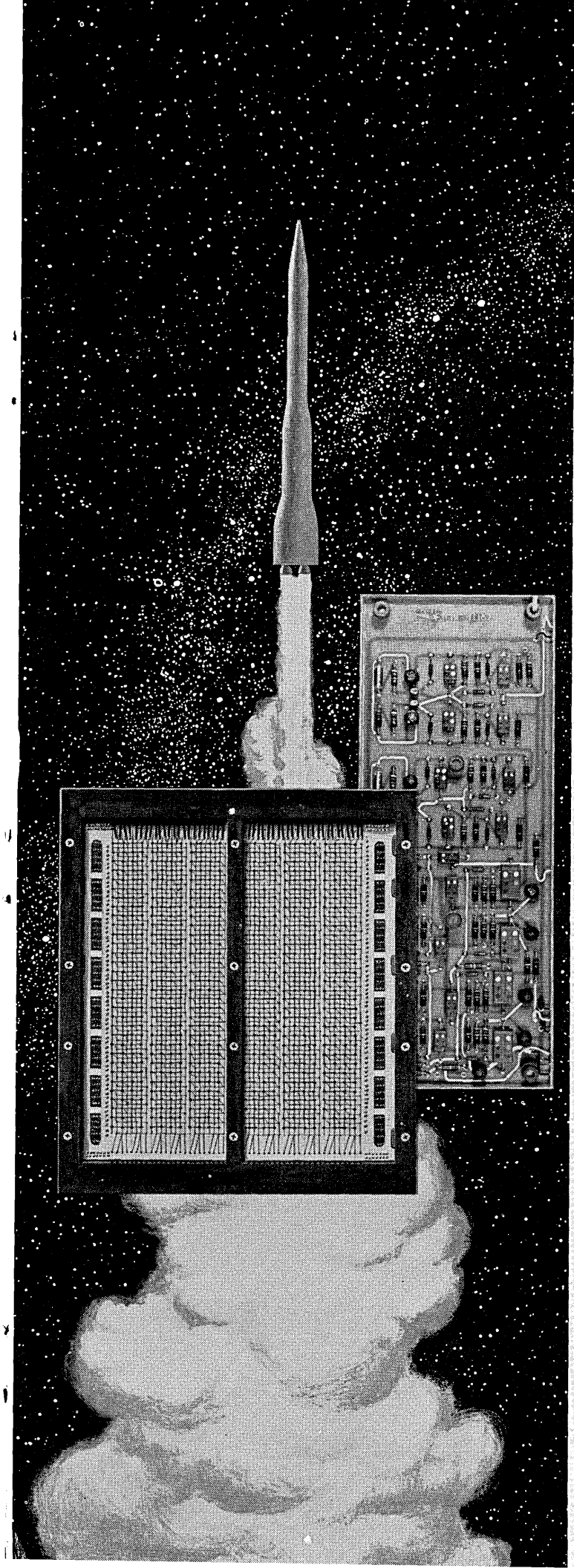
Although noteworthy progress has been made, input-output continues to be a major problem in many data processing systems. The development of new techniques for solving input-output problems is being emphasized.

"A Line-Drawing Pattern Recognizer"
Leon D. Harmon, Bell Telephone Laboratories

"Automatic Store and Forward Message Switching System"
T. L. Genetta, H. P. Guerber, and A. S. Rettig,
RCA

"The Videograph Label Printing System Developed for Time, Inc."
B. H. Klyce, Time, Inc.; J. J. Stone,
A. B. Dick Company

Panelists: J. Svigals, IBM; G. Warfel, Bank of America



Expanding the Frontiers of Space Technology in

COMPUTER DEVELOPMENT

Space Vehicle Command – An important advance in the control of space vehicles has been accomplished with the development by Lockheed scientists of space-borne, command decoders and sequence programmers. Basically, the programmers store information and, at a predetermined time when the vehicle is out of contact with ground stations, cause commands to be executed by the various subsystems. In this way, versatility of vehicle missions can be markedly expanded.

In addition, when the vehicle comes in range of ground command stations, the programmer can be given new instructions for either future or immediate action. All of the programmer's components are solid state devices. There are no moving parts nor vacuum tubes. The ferrite core memory in which information is stored is a two core-per-bit matrix.

A primary design goal was to reduce power requirements. Although the Lockheed programmer is highly complex and employs over 600 transistors, the average power consumption is only 3.5 watts, less than a Christmas tree light bulb. The development of such complex circuitry that will withstand the shock, vibration and a temperature range from −40°C to +85°C is in itself a significant achievement.

The highly precise timing necessary for the execution of the various programmed assignments is accomplished by means of a crystal oscillator – maintained at an exact temperature by means of a two phase mixture of solid and liquid inert chemical.

Engineers and Scientists: Lockheed's capability in design and development of computers is contributing to the advancement of the state of the art in a number of areas. Work is being carried on in research and development of ultra reliable digital circuitry, ferrite logic systems, and millimicrosecond switching techniques; radically new devices for pattern recognition operations; high speed digital plotters; self-organizing systems; large scale systems for the automatic storage and retrieval of information; microminiature packaging techniques; and systems research and engineering of large scale information handling complexes.

If you are experienced in work related to logic design or computer development, you are invited to inquire into the interesting work being conducted and planned at Lockheed. Write: Research and Development Staff, Dept. D-46, 962 W. El Camino Real, Sunnyvale, California. U.S. citizenship or existing Department of Defense clearance required.

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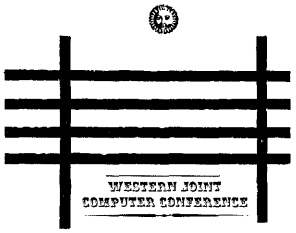

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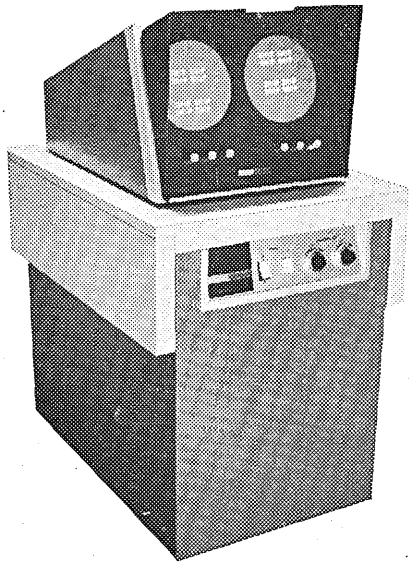

Keeps pace with your computer and spells it out in plain English. Up to 4100 simultaneous characters without flicker. The presentation is so sharp and steady you can read it from across the room. Invaluable for debugging, maintenance, real time data monitoring, and rapid display of alphanumeric information. A variety of models in production.

More quick facts:

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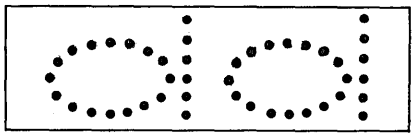
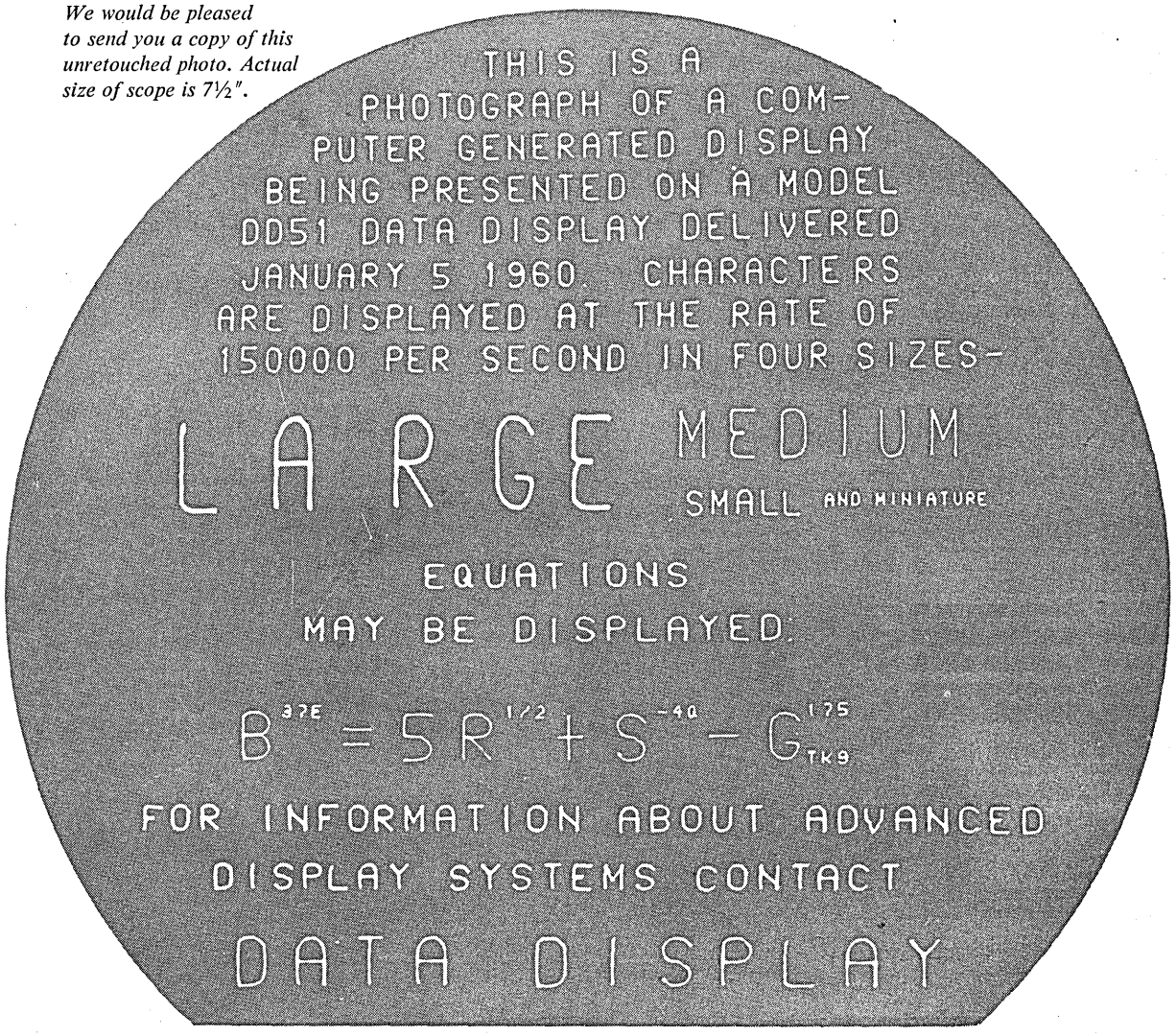


We would be pleased to send you a copy of this unretouched photo. Actual size of scope is 7½".



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WESTERN JOINT COMPUTER CONFERENCE

BANQUET SPEAKER

LADIES' ACTIVITIES

PROF. H. VON FOERSTER
Banquet Speaker

On Wednesday, May 4, at 6:30 p.m., Prof. H. Von Foerster will speak at the WJCC banquet. Concerning his proposed address, Professor Von Foerster says:

By "Living Computers" one can understand either of two different things: those who run around on two, four, six or a thousand legs (as, for instance, people, dogs, ants or millipedes) and, on the other hand, those which are bolted to the floor, plugged into an electric powerplant and may perform intellectual tasks which would arouse an onlooker to exclaim: "They are alive!" While the former are known to be extremely clever, yet relatively slow, the latter are still relatively stupid, yet extremely fast.

Some of the remarkable tricks living computers have developed over the last billenium in order to survive in a tremendously complex but beautifully structuralized environment will be described. The application of these principles to man-made systems utilizing the momentous progress in modern high speed computer technique and the possibility of interacting with such systems in a similar way as one does with living, intelligent organisms will be discussed.

Heinz Von Foerster, has been Professor of the Department of Electrical Engineering, University of Illinois, since 1951. He joined the University research staff in 1949 after leaving his native country of Austria. Since that time—along with his present position—he has been active in a consulting capacity to many organizations: 1949-1955, Secretary, Josiah Macy, Jr., Foundation, Conference Program-Cybernetics; 1956-1957, Guggenheim Fellow; 1957 to date, Consultant, U.S. Department of Health, Education and Welfare; Brookhaven National Laboratory; National Cash Register Corporation; and Nelson Fund, Inc.

Professor Von Foerster is a member of the American Association for the Advancement of Science, the Illinois Academy of Science, and the Biophysical Society.

Delegates attending the 1960 Western Joint Computer Conference may cheerfully neglect their wives for business-at-hand, knowing that a well-rounded program of social events has been organized expressly for the benefit of the ladies.

This year's conference, May 3, 4 and 5, will be held at the newly opened Jack Tar Hotel and registration and coffee service will take place in the hospitality suite on the opening morning between 9 and 11 a.m.

Apart from the usual attractions of shopping and sightseeing offered by San Francisco, Miss Mary Fraser of IBM, San Jose, heads a committee which has planned plenty of diversions for the several hundred women expected to attend.

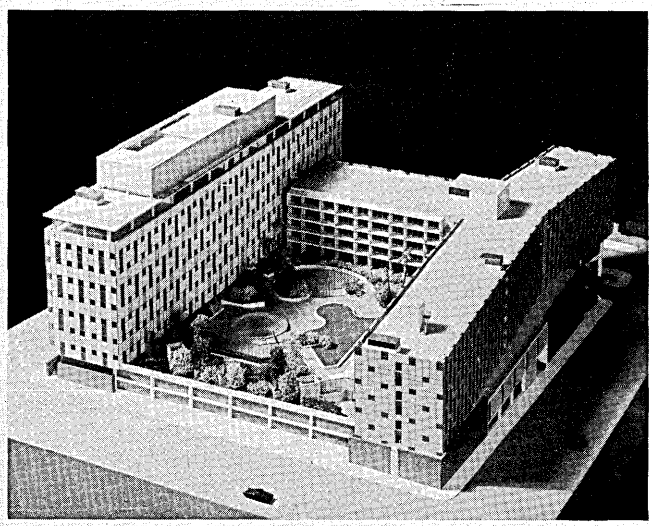
At 2 o'clock on May 3, at the nearby Century Club, Miss Phyllis Baxendale of IBM will describe some oddities in the conference's technology in a speech entitled "Conversations with Computers."

In the late afternoon of the same day the ladies are invited to the conference cocktail party to be held in the patio of the Jack Tar.

Wednesday morning at 11:45 a.m. chartered buses will leave for a trip over the Golden Gate bridge to Sausalito for a luncheon and fashion show at the Alta Mira Hotel, overlooking San Francisco Bay. A tour of handicraft shops in the Village Fair will follow.

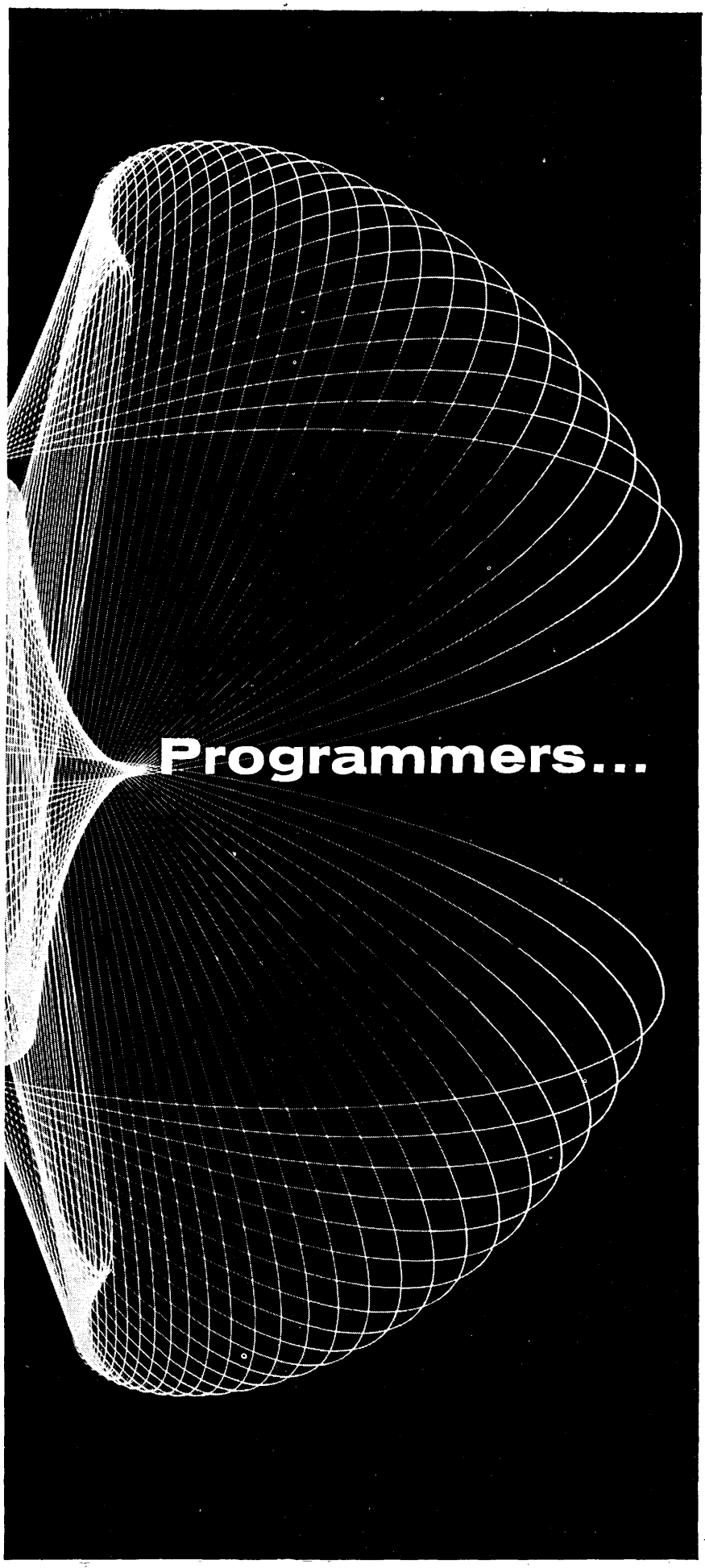
Ladies will rejoin their husbands for dinner that evening in the International Room of the Jack Tar. Shopping and more tours are planned for Thursday.

Serving with Miss Fraser on the committee are Mrs. Eleanor Schmidt, co-chairman, and Mrs. Marilyn Richardson of IBM, San Jose; Miss Marilyn Black of Stanford Research Institute and Miss Connie Pope of General Electric, Palo Alto.



Model of the Jack Tar Hotel

ROUTE TO HOTEL—To reach the Jack Tar Hotel by auto, follow the freeway system along U.S. 101 north to the Franklin St. exit. Follow Franklin to Post. A right turn on Post followed by a right turn on Van Ness, brings you to the hotel entrance.



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QUO ANIMO?

(Continued from page 2)

we all depend on mightily (The American Red Cross, for example) or whose efforts are officially recognized or chartered by The Congress (like the Boy Scouts of America).

That there should be organizations of computer people is hardly remarkable. It would be remarkable if there were not.

Also that the ACM, for example, should not differ greatly from many, many other organizations built around the technical arts is to be expected. And, in fact, it does not so differ.

The problems, if there be any real ones, that were discussed that spring day at Santa Monica are not unique nor remarkable. They are found in virtually every technical organization.

One may well say, "What does it matter?". Or one could say, as was stated at a certain table in the Statler bar, Boston, on December second last, "If the ACM were to collapse utterly tomorrow, the world would little note nor long remember."

Yet no computerman can accept this premise in the deep recesses of his heart. For he knows full well, though he be the lowliest of programmers, that, as Al Perlis might say, "The whole world is a computable algorithm." He knows that there is something unique about electronic digital computers and the art of using them. He knows that, in his scribbled flow charts, he holds power to remake the world.

Yet, technical people are loathe to talk this way and think this way. They have trained themselves by long habit to be insufferably dull.

To inject the question of the purpose of man's work, or the origins of human creativeness into technical discussion is to be, at best, corny. One who brings up such subjects under the title of, for example, "Social Responsibility," as Berkeley has done, is apt to be rewarded with apathy squared.

There are, in the United States of America, over one-hundred-fifty organizations whose nature is primarily that of technical or engineering societies. The majority of them accomplish as little as, or less than, the ACM. This is not to criticise such societies. Rather it is a reflection of the outlook of the average member.

For societies are not, and cannot be, more than the sum of their parts. The prestige of the ACM is not likely to enhance the prestige of the individual member, but the reverse is not true. The reaction is unidirectional. Great societies are composed of great men. Unfortunately, and remarkably for the age of such endeavor, the computing field seems permeated by a particularly cautious and backward-looking brand of creeping weenieism.

Part of this creeping weenieism stems from prevalent outlooks of today in many technical fields. Among erroneous common beliefs treading unchallenged through the computing field are the following: "Anything can be accomplished by committee." "Standardization is an admirable thing, regardless of context." "People may be completely defined by properly categorizing them (i.e., 'He is a left-nostril specialist')." These and many other unchallenged suppositions thread through our discussions.

We need instead a more down-to-earth set of truisms including, for example: "The performance of computers is no better than that of the people who design and use them." "No one has yet devised an information handling system so perfect that its conception wrenched the capabilities of the human mind." "It may be possible for one man to do more than one thing well."

For if our work is important at all to us, it is very important. The computerman spends long hours at his flow charts or his logical equations. If he cannot find fulfillment, fascination, and creativeness in these to his heart's content, he is in the wrong field.

Outstanding accomplishment is admittedly difficult today, and recognition of it is hard to come by. One is led to suspect that if Charles P. Steinmetz were to apply for a job at most any big, technical industry, he would never get by the personnel men. But technical accomplishment has never been easy. In this respect it resembles most worthwhile human accomplishment.

Grousing and complaining about the ACM, the NMAA, or any other organization or its officers is fun, but does it really accomplish anything?

Whether computing becomes a vital and useful force in the life of man does not depend on the ACM. It depends on you! ●

PACKARD BELL ANNOUNCES PB-250

desk top-size machine to be shown at wjcc

by MAX PALEVSKY, Vice Pres. and Director
Packard Bell Computer Corporation

During the past five years general-purpose digital computers have been developed in size, speed, and flexibility, but this development has been concentrated in the field of large-scale computers, while medium and small computers have shown little change. A glance at a comparative chart of these latter computers shows that aside from the appearance of transistorized devices, no significant change has occurred – except, perhaps, that more recent computers are more costly. The result is a comparative de-emphasis on small and medium-sized computers, and a growing tendency to large-scale centralized computing. Two things are required if this trend is to be reversed: 1) less expensive small computers, and 2) computers which can better compete on cost-per-unit-answer with large-scale machines.

The PB-250 – to be introduced by Packard Bell Computer Corporation at the Western Joint Computer Conference – is the first computer with both of these characteristics. Costing only $30,000, it performs up to 40,000 operations per second. Add time is 12 microseconds, multiply requires 276 microseconds, while divide and square root each takes 252 microseconds. Further, the last three operations are variable in execution time, depending upon the length of the terms. The quoted times are for a word consisting of 21 bits and sign. Floating point operations with a 37-bit mantissa and a 7-bit characteristic require less than three milliseconds.

In addition to the speed with which arithmetic operations can be performed, the PB-250 overall speed is attributable to its command structure. Forty six commands include double-precision operations, block transfer, gray to binary conversion, and an elaborate input/output system. Cost-per-unit-answer depends upon programming ease as well as computing speed. Packard Bell's machine is provided with a symbolic programming system employing nmemonic instruction codes and a variety of subroutines.

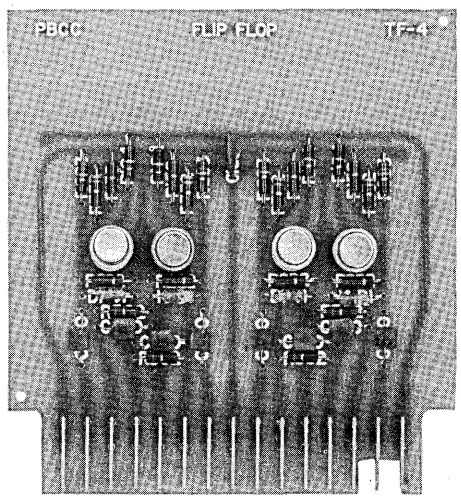
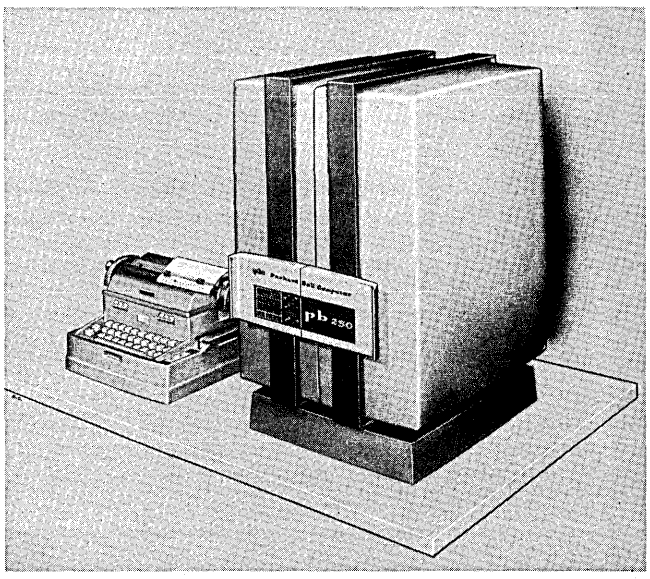


Figure 1. PB 250 Basic Module



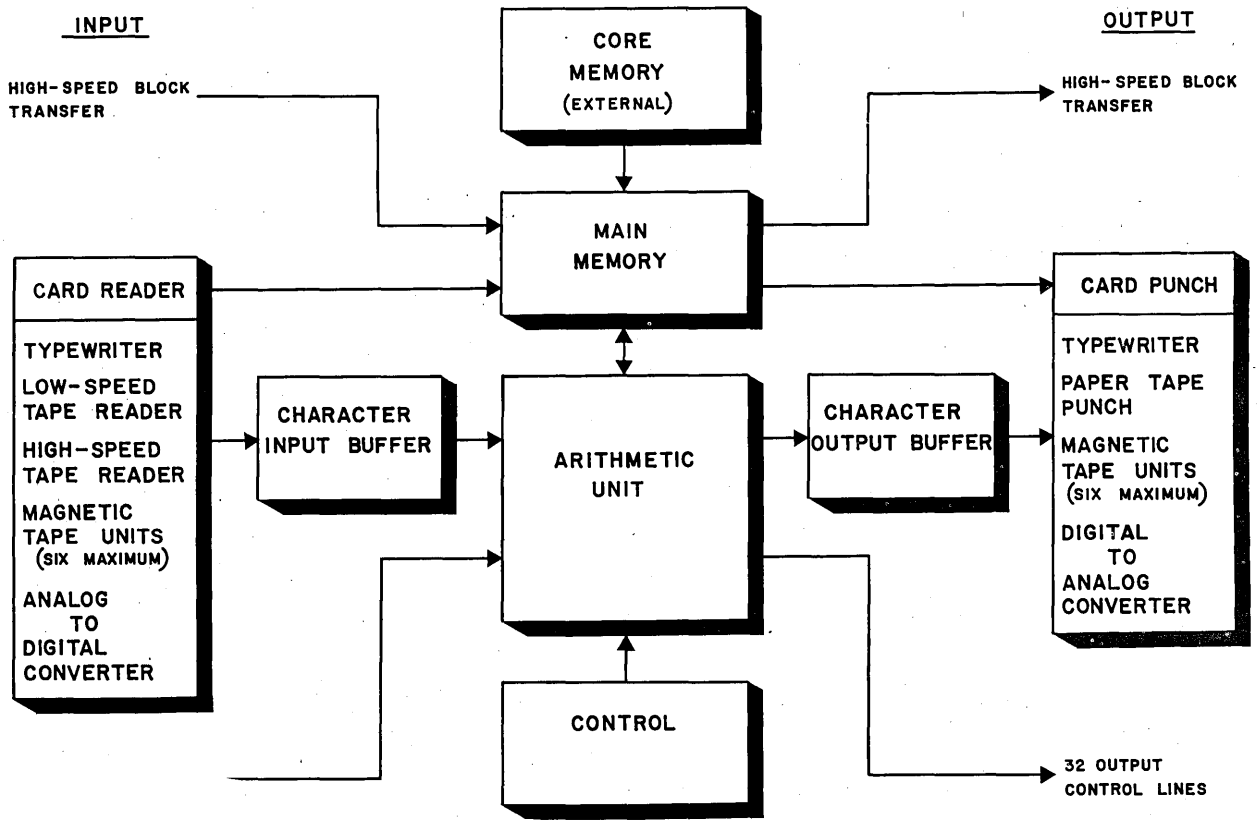
Packard Bell's PB 250

An additional cost factor that often has made small computers impractical is that of expanding the memory. The PB-250 uses magnetostrictive lines which, together with their associated circuitry, are mounted on plug-in etched modules. The memory can be inexpensively expanded to 16,000 words by the addition of these modules and, further, these can be fast-access as well as bulk storage lines. Also 16,000 words of core storage can be added externally. All memory operations are parity checked.

Both input and output information can be processed while computation proceeds. Standard input includes an alphanumeric typewriter, a paper-tape punch and reader, high-speed (2 megacycle) block input and output, 32 control outputs and 29 control inputs. The latter provide a means for controlling a wide range of peripheral equipment and other devices. High-speed paper tape equipment and up to six magnetic tape handlers are optional equipment. The magnetic tapes employ the IBM 700 series tape format, although any code using up to eight channels can be employed.

Punched card equipment will be available in the near future. Standard Packard Bell Computer Corporation multiverters are available as analog-to-digital and digital-to-analog converters.

The PB-250 can function as a universal format to format converter. The cost of such converters has been prohibitive up to now, even without complete universality. The PB-250, because it is a general-purpose computer, can perform any transformation between formats and media and perform a variety of editing and arithmetic operations in the process.



Block Diagram of the PB 250 Computer

The final cost to be considered in the operation of a computer is in maintenance. The PB-250 is completely solid-state and uses 350 transistors. Furthermore, it is the first commercial computer to be completely modularized. The basic module is shown in Figure 1. All circuits are of this type. One hundred and forty-five such cards, together with a plug-in magnetically-regulated power supply and a Flexowriter make up the entire computer.

Size of the computer is 30" x 19" x 24". Low density packaging has been used to assure long life and high reliability; approximately 25% of the module spaces are not employed in the basic computer. The computer proper requires 30 watts and 2 voltages. A rack-mounted version of the PB-250, using 31½" of a standard 19" relay rack, permits easy integration of the computer into a wide variety of on-line and off-line computing systems.

SPECIFICATIONS

Type:	Serial, binary, internal program
Command Structure:	Single address with index register
Number of commands:	46
Operation Times:	
Add/Subtract:	12 microseconds
Multiply:	276 microseconds (maximum)
Divide:	252 microseconds (maximum)
Square Root:	252 microseconds (maximum)
Average Access Time:	1,540 microseconds
Average Access Time to Fast Memory:	96 microseconds
Maximum Operational Rate:	40,000 instructions per second
Word Length:	21 bits plus sign
Memory:	
Type:	Magnetostrictive delay lines
Capacity:	1,808 words (up to 15,888 words internal storage at additional cost. 16,384 words external core memory also available.)
Input-Output:	
Standard:	Automatic Alpha-numeric Typewriter
	Paper tape punch and reader
	32 control outputs
	30 control inputs
	High-speed block input-output (85 KC word rate)
Optional:	High-speed paper tape punch and reader
	Magnetic tape units (six maximum) employing IBM 700 series format
	Punched card equipment
	Analog-to-digital converters
	Digital-to-analog converters
Physical Description:	30 inches high, 19 inches wide, 24 inches deep
	110 pounds
	Fully solid-state construction
	Completely modularized
Power Requirement:	115 volts, 60 cycles, at 100 watts

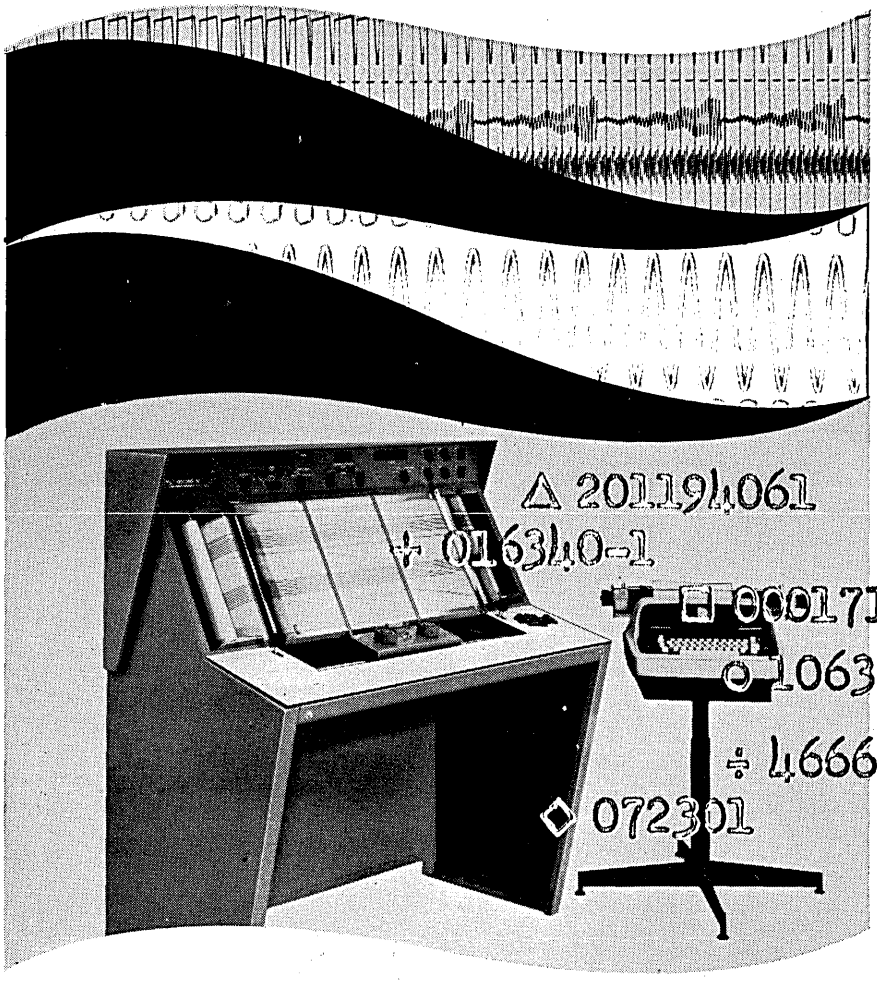
Circle 115 on Reader Service Card.

new! from benson-lehner...

a complete, compact

record reading system

for only $4990!



Now, a new record reading system that doesn't require a tremendous investment in money or space. Benson-Lehner's new OSCAR Model K is only 43.5" wide, 25" deep, 49" high, weighs only 250 pounds, and costs only $4990! OSCAR Model K reads transparent, translucent, or opaque film or paper trace records with an accuracy of plus or minus 0.1% of full scale. Takes records up to 12½" wide and 500 feet long in either direction at a motorized variable speed. Output is to a Benson-Lehner Electrotyper or an IBM Keypunch 024 or 026. There's never been a record reader so compact, so flexible, and so inexpensive! Write for information or to have an applications engineer help establish your exact needs.

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USER GROUPS TO MEET IN SAN FRANCISCO

A joint meeting of representatives of user groups seems a certainty now, according to Jerry L. Koory of System Development Corp., representing SHARE. Twelve groups have indicated interest in a May 6 meeting at the Jack Tar Hotel, San Francisco. This meeting would follow the Western Joint Computer Conference. According to Koory, the meeting was called in order that "several items of common interest . . . could profitably be discussed." Tentatively, representatives of the following organizations will attend: GUIDE, EXCHANGE, POOL, RUG, USE, CUE, MCUG, SHARE, TUG, CAMP and the computation committee of the AIChE.

PHILCO COMPUTER HAS NEW STATUS, HOME

Philco Corp., which announced the formation of a separate Computer Division by its Government and Industrial Group recently, states that they will soon have some significant announcements concerning the PHILCO S-2000. The company disclosed that "several" of the large computers are scheduled for delivery before the end of April. The new division is located at a recently completed plant near Willow Grove, Pa.

H-800 BACKLOG SUBSTANTIAL; FACT OUT

Minneapolis-Honeywell disclosed that it has a Honeywell 800 backlog worth $35,000,000 (as of Feb. 4). M-H also officially announced its FACT compiler which, it states, can be applied "to all typical functions of business data processing, including card input reading and editing, creation of data files, data sorting, arithmetic computations, updating of data files and generation of printed or punched reports based on input data, file data or program results."

TEXAS, ENGLAND GET C-E-I-R CENTERS

C-E-I-R opened its Southwest Regional Research Center in Houston April 1. William Orchard-Hays, who directed computer services at the firm's Arlington center, will be general manager of the southwest office. Orchard-Hays was one of the early developers of 704 linear programming codes and more recently directed development of C-E-I-R's 709/7090 linear programming code for Texaco, Gulf, Shell, Socony-Mobile, Esso and Union Carbide. A 7090 will be installed in the Houston center in November . . . C-E-I-R also established a wholly-owned subsidiary in London on March 1. Managing director of C-E-I-R Ltd. is Tom Cauter, formerly managing director of the British Market Research Bureau. Prof. Alexander S. Douglas, presently director of the Univ. of Leeds Computer Laboratory, will be a director of the new company and will supervise computer services in Britain.

GEN. SARNOFF SAYS RCA MEANS BUSINESS

Brig. Gen. David Sarnoff, Chairman of RCA, disclosed in a recent address that as of March 1, the firm had orders for sixty 501's and had delivered 15 systems. As if to give substance to the general industry impression that RCA is indeed quite serious about garnering a sizable chunk of the computer market, Gen.

Sarnoff said, "In our already substantial strides into the data processing field, we are tilting with an economic paradox; the more successful we are initially, the larger our accounting losses are -- initially. The rental -- or deferred income -- nature of the business makes this inevitable. It is also inevitable that large sums must be spent on research and engineering to develop a family of data processing systems; to forge a strong, national distribution system with trained systems men; to train a large service organization devoted to quality, and to establish training and educational facilities for customers. What must be spent, we are spending to establish RCA as a major participant in this still-formative industry. In 1959, we incurred what I call 'money in the bank' losses on data processing, and the losses will continue in 1960. But the day is not far distant when this resolute effort should be rewarded . . . "

BENDIX TO HAVE MORE ROOM, NEW NAME

Bendix Computer will build a new manufacturing plant in Los Angeles this year. The new facility will increase the size of the present plant by 70%. Engineering, marketing and general administrative offices, including a computer center will take over the present manufacturing space . . . . Bendix Aviation Corp. also announced plans for a 650,000 sq. ft electronics center to be located in the northern San Fernando Valley . . . And finally, Bendix Aviation won't be Bendix Aviation after June 1. Stockholders have voted a new name -- The Bendix Corporation.

UNCOL EFFORT DEFINITELY UNDERWAY

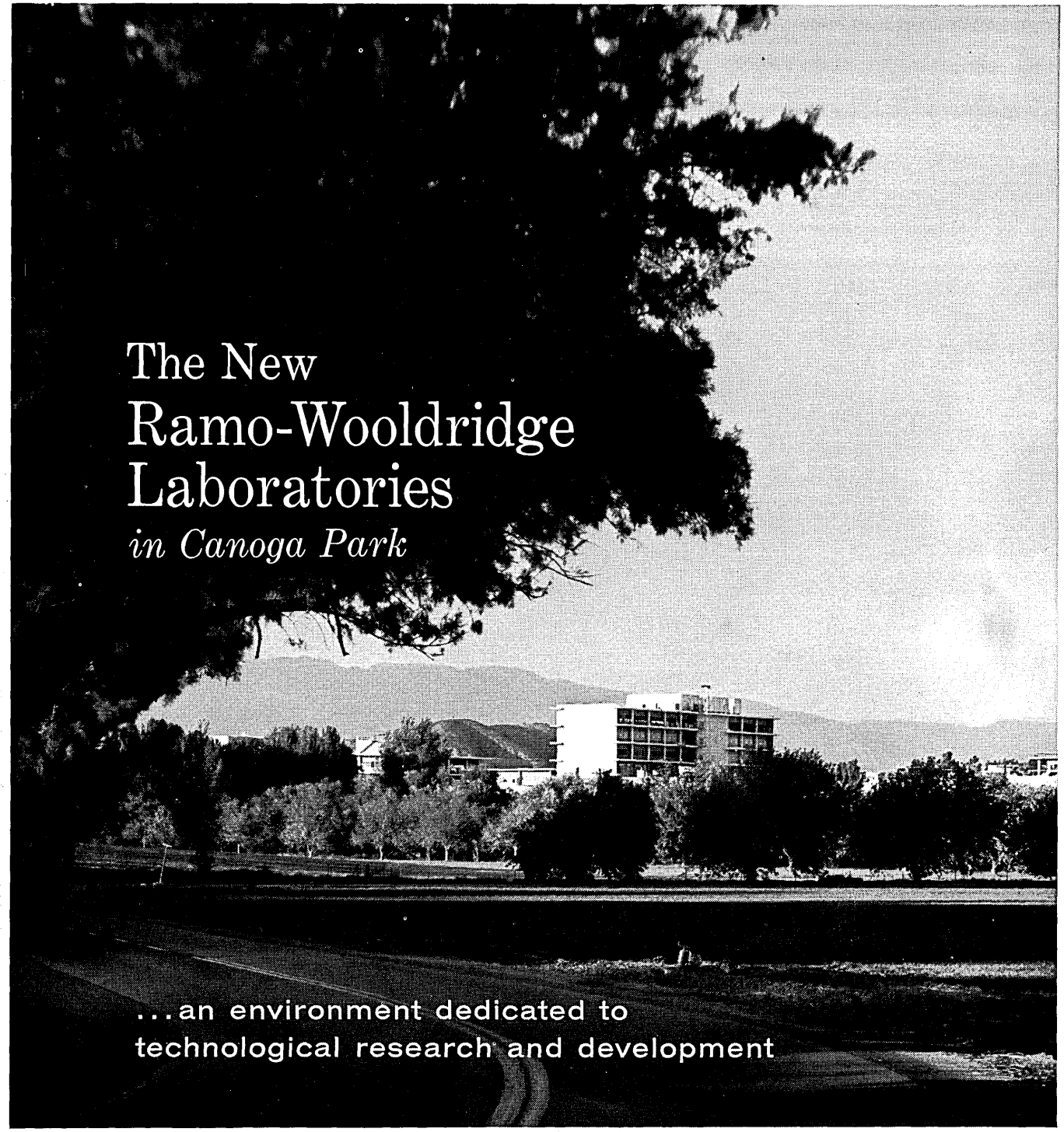
Those who think of UNCOL (DATAMATION, January/February, 1960) as a pie-in-the-sky concept should be advised that an effort of considerable magnitude, in quality if not quantity, is underway to make the UNiversal Computer Oriented Language a reality. Representatives of manufacturers and users from all parts of the country have met and are meeting to attempt to put UNCOL on paper. DATAMATION will soon present reports on progress being made.

TMI ANNOUNCES FASTEST COMPUTER MEMORY

Telemeter Magnetics Inc. announced in March that their engineers have developed a one-microsecond memory which will be made available to computer manufacturers and user-builders in about a year. At present, an operating experimental model (64 word capacity) exists and work on larger models is progressing.

RANDOM ACCESS

Don Madden, president of the Los Angeles Chapter of the ACM, says membership of that group passed the 900 mark (that's nine hundred) in March . . . Dr. Leo Esaki, discoverer of the Esaki diode, has joined IBM as a resident consultant. He will work with the IBM Semiconductor Research Dept. at Poughkeepsie . . . General Mills has entered the gp digital computer field with three machines -- the 2001, 2002 and 2003. The first and last mentioned are the same machine, different sizes. First details reached DATAMATION concerning the 2003. It is a parallel, transistorized, microsecond machine with 1000 words of core storage (up to 4000). It will sell for about $220,000 . . . Regardless of what you may have heard, read or seen, IBM did not sponsor the Winter Olympics.



The new Ramo-Wooldridge Laboratories in Canoga Park, California, will provide an excellent environment for scientists and engineers engaged in technological research and development. Because of the high degree of scientific and engineering effort involved in Ramo-Wooldridge programs, technically trained people are assigned a more dominant role in the management of the organization than is customary.

The ninety-acre landscaped site, with modern buildings grouped around a central mall, contributes to the academic environment necessary for creative work. The new Laboratories will be the West Coast headquarters of Thompson Ramo Wooldridge Inc. as well as house the Ramo-Wooldridge division of TRW.

The Ramo-Wooldridge Laboratories are engaged in the broad fields of electronic systems technology, computers, and data processing. Outstanding opportunities exist for scientists and engineers.

For specific information on current openings write to Mr. D. L. Pyke.

THE RAMO-WOOLDRIDGE LABORATORIES

8433 FALLBROOK AVENUE, CANOGA PARK, CALIFORNIA

Please mention DATAMATION to advertisers.

MONROE ENTERS SMALL MACHINE ARENA

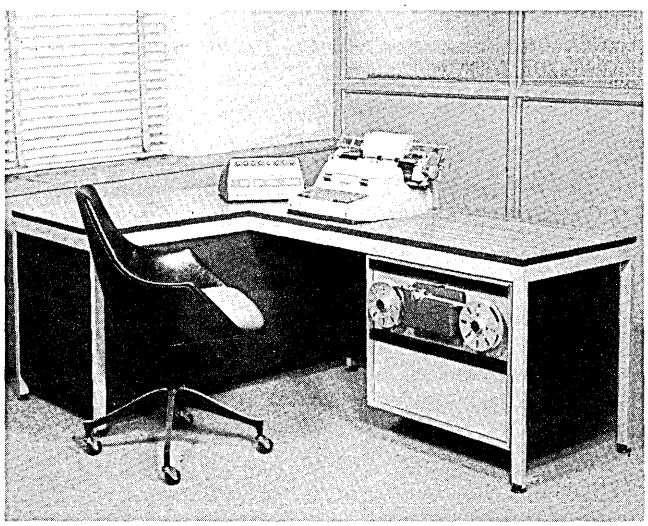
monrobot XI is solid state, drum computer

Weighing in at 375 lbs. and measuring 48″ x 22″ x 28″, Monrobot XI, a product of the Monroe Calculating Machine Co., Inc., is another entry in the fast-growing class of small computers.

Monrobot is a small, general purpose digital computer. It is a binary, single address, sequentially controlled, magnetic drum, stored program, transistorized machine. The basic unit costs $24,500.

There are 1,024 words of storage, seven of which are fast access registers. Each word contains thirty-two binary digits and can be used to hold two instructions. Instructions and constants use a common storage. Negative numbers are stored in complemented form.

Input and output can be performed by paper tape, 80 column cards, typewriter, teletype or a sixteen key numeric keyboard (input only). Three input and output de-



vices can be attached in any combination. Information is read and written one character (alphabetic or numeric) at a time into a hopper and is checked for parity errors in input. Characters can be simultaneously sent to all the output units with one command.

The calculating unit will accumulate thirty-two bit factors to form a thirty-two digit total, perform a thirty-two bit by thirty-two bit multiplication to form a sixty-four bit product and divide a thirty-two bit dividend by a thirty-two bit divisor to form a thirty-two bit quotient.

Monrobot's optimized add time is 2.92 ms for single address addition. Subtract time is 3 ms and multiply time is 28 ms (these times exclude average storage access time of 6 ms). The XI's magnetic drum spins at 5200 rpm.

The machine has a command vocabulary of 26 basic commands with 10 additional minor orders. Programming methods include a system which Monroe calls "Easy Programming" which "provides powerful micro commands and simpler general coding." Also available is a "Monitor Program" described by Monroe as "linked debugging routines including a trace program." The latter was developed by Western Electric Research Laboratory.

Asked by DATAMATION to list strong points of their machine, Monroe provided four. These are 1. simultaneous (one instruction) output on different units; 2. wide range of I/O equipment; 3. price and 4. powerful instructions.

Circle 116 on Reader Service Card.

NEW PACE FEATURE ANNOUNCED BY EAI

High Speed Repetitive Operation is now available as an accessory for all PACE 231R analog computers, manufactured by Electronic Associates, Inc. The new feature offers a means of solving a variety of engineering problems that would be difficult through real time techniques alone, the company states.

To obtain an optimum design in a real problem with several variables, a great many problem runs are required. These are normally drawn on automatic recorders where speeds are limited by the mechanical characteristics of the recorders. With repetitive operation, the solution appears as a continuous plot on the 17 inch display screen. The effect of a change in the problem variables can be observed immediately on the display screen, without the necessity of resetting the equipment and drawing additional plots. When the optimum design is reached, the computer may be switched back to real time operation so permanent plots can be made of the final and more detailed solution. High Speed Repetitive Operation is particularly well suited to problems involving the simulation of servomechanisms, optimization of chemical, petrochemical and physical systems, and the solution of boundary-value and eigenvalue problems.

A computer equipped with High Speed Repetitive Operation can be operated either repetitively or as a real time simulator at the throw of a switch without degradation of its real time accuracy. Pre-patch panel arrangements remain the same in either repetitive or real time operation and do not require the use of more amplifiers than on real time studies.

Computing times of from 10 to 80 milliseconds are available and may be controlled from either the repetitive operation control unit or the display unit. Both stepped and continuously variable control of computer time are provided to permit the operator to obtain maximum length of solution and avoid overloads.

The display unit consists of four chassis units in a single bay EAI rack and allows simultaneous viewing of eight problem variables plotted against time or seven variables plotted against an eighth on the 17 inch screen. In the display unit, 21 voltage calibration lines are references to computer voltage within 0.1%. Time lines are generated by a crystal oscillator accurate to 0.05%.

Circle 117 on Reader Service Card.

DATAMATION *news briefs*

ICIP PROCEEDINGS SELL FOR APPROXIMATELY $20

Proceedings of the International Conference on Information Processing, held in June, 1959, was published in March by Unesco, who sponsored the ICIP and housed the conference and exhibit in its Paris headquarters.

The 600-page single, cloth-bound volume will contain the following: general introduction; the full text in English or French of the 61 papers discussed at the conference; summaries of each of these papers in English, French, Russian, and Spanish; introductory and summary reports of the discussion in English or French; summaries of about 65 lectures given in the course of the symposia held during the conference; a general report of the conference in English and French.

Price of the volume will not be less than ten thousand francs – or approximately $20. Orders may be placed with Unesco sales agents, and additional information may be obtained by contacting Documents and Publications Service (DPV), Unesco, Place de Fontenoy, Paris 7e, France.

UNIV. OF TEXAS SERIES TO CONCLUDE IN MAY

Final addresses in a lecture series on the Impact of Computers on Behavioral Sciences Research, at the University of Texas, Austin, will interest some DATAMATION readers.

On Tuesday, April 12, Joe H. Ward, Jr., Research Psychologist at the Personnel Laboratory, Lackland AFB, Texas, will present, "Markov and Monte Carlo Models Applied to Decision Making." On Monday, April 25, a public lecture will be held, entitled "Using Computers to Study Human Perception." Tuesday, April 26, is the date Dr. Bert F. Green, Jr., Lincoln Laboratory at M.I.T., will deliver "Generating Stimuli for Perceptual Research with Computers."

Another public lecture will be held on Thursday, May 5, entitled "Future of Automatic Programming," and on Friday, May 6, the lecture series will be concluded with a paper by Dr. Alan J. Perlis, Director of the Computation Center, Carnegie Institute of Technology, "Computer Techniques for Information Processing."

COLLINS'S KINEPLEX WORKS FOR CHRYSLER

First known on-the-site industrial demonstration of a high-speed digital data communications system was successfully completed recently when Collins Radio Company's Western Division transmitted over 500,000 punched cards at the rate of 100 per

minute by a telephone line for the Chrysler Corporation.

The Chrysler card transmission circuit linked the automaker's general offices in Highland Park, Mich., with the Dodge main plant in Hamtramck, Mich. Purpose of the demonstration was to show application of Collins Kineplex data communications systems in industrial and business data processing. Kineplex systems have been operating between military and government data processing and communications centers for several years.

Circle 118 on Reader Service Card.

ELECTRONIC ASSOCIATES OFFERS ANALOG COURSES

Two week courses in analog computer applications are being offered, on a tuition basis, by the Computation Division of Electronic Associates, Inc. These courses have been instituted to introduce, explain, and illustrate to practicing engineers, scientists and teachers the widespread uses, applications and economics of general purpose electronic analog computers.

Two courses are planned for the first half of 1960: April 4-15, "Analog Computer Applications in Process and Process Control Studies," and June 6-17, "Analog Computer Applications in the Design of Aircraft, Missiles and Weapons Systems."

SIX MILLION (COUNT 'EM) NUMBERS IN ONE BOOK

The largest table of numbers ever published, consisting of 18 million digits – originally comprising a three-foot stack of 4,800 tabulated pages – has recently been issued as a slim book by the Microcard Foundation for The RAND Corporation.

The First Six Million Prime Numbers by C. L. Baker and F. J. Gruenberger is a pure scientific endeavor providing heretofore unavailable data on primes for mathematicians interested in number theory. The mathematical table has been reduced 500 times by high resolution photography and printed on both sides of 62 glossy 3 x 5 cards slipped within pockets attached to the book.

Circle 119 on Reader Service Card.

DEC'S OLSEN HONORED AS YOUNG ENGINEER OF '59

The president of Digital Equipment Corp., was honored as a "Young Electrical Engineer of 1959" by Eta Kappa Nu, national electrical engineering honor society, at a testimonial dinner on February 1st.

Kenneth H. Olsen, 33-year-old chief officer of DEC is one of four engineers whose professional achievements were recognized by the society. His selection is particularly noteworthy since he is the only recipient connected with small business.

EPSCO RELEASES PATENTS

Epsco, Incorporated, has announced completion of negotiations whereby it has acquired exclusive rights under early patents, which are considered basic in the field of analog-digital conversion, (Patents 2,641,522 and 2,754,503). Epsco is now making these patents available to industry, on a non-exclusive license arrangement, as well as all of its related inventions and patents in this field.

Epsco's President, Bernard M. Gordon, stated that the purpose of this new patent pact is to encourage the wide-spread use of analog-digital techniques wherever possible.

Circle 120 on Reader Service Card.

IS 20,000,000 TOPS?

Documentation Incorporated has just expanded the storage capacity of their RAMAC 305 by installing two double-density disc units. This brings the RAMAC storage capacity to 20,000,000 alphanumeric characters. Is this the largest "in computer" store in existence?

Circle 121 on Reader Service Card.

✓Completion of the installation of a ZA-100 Computer Language Trans-

NEWS BRIEFS . . .

lator system at the System Development Corporation was announced by the Electronic Engineering Company of California. The translator makes it possible for computers or data processing systems with "foreign" media or formats to intercommunicate. Total cost of the ZA-100 system is in excess of $205,000.

Circle 122 on Reader Service Card.

✓Laboratory For Electronic's Computer Products Division announced the award by Lockheed Missile and Space Division of a production contract totaling over ½ million dollars for LEF's Bernoulli-Disk Memory System.

Circle 123 on Reader Service Card.

✓Establishment of the Douglas Computing Service to sell excess computing machine time outside the company was announced by Douglas Aircraft. The center includes IBM 709, 704, 701 and 650 machines as well as IBM 722 tape-to-card, IBM 720 card-to-printer, IBM 717 card-to-printer, IBM 714 card-to-tape, the Univac file computer and the Univac tape printer.

Circle 124 on Reader Service Card.

✓RCA's new $4,500,000 Electronic Systems Center has been opened in Wall St., and represents "a full-range electronic data processing center designed to serve all types of firms in New York's financial and business community," according to that firm.

✓Data processing centers offering the use of electronic computers to businesses as small as neighborhood retail stores, will be opened sometime this year by National Cash Register Co., in New York, Dayton, Ohio, and Los Angeles.

✓A new $600,000 Computer Center was opened at New Mexico State University. The center, which uses a Burroughs 220, will be used for work contracted by its $2½ million a year Physical Science Laboratory.

DATES

✓The National Conference on Banking Automation, sponsored by the Detroit Research Institute, will be held at the Detroit Leland Hotel, Detroit, Michigan, May 10 to 12. For information on this conference contact Detroit Research Institute, Mr. Arvid W. Jacobson, 10 West Warren, Detroit 2, Mich.

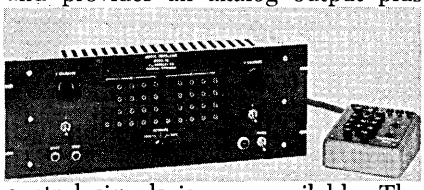
✓A Symposium on Superconductive Techniques for Computing Systems will be held on May 17 and 18, sponsored by the Information Systems Branch, Office of Naval Research. The Symposium will be held in the Department of Interior Auditorium on C Street, between 18th and 19th Streets, N.W., Washington, D.C. Preliminary Symposium program is available by contacting Miss Josephine Leno, Code 430A, Office of Naval Research, Washington 25, D.C.

✓The Denver Research Institute of the University of Denver is holding its Seventh Annual Symposium on Computers and Data Processing at the Stanley Hotel, Estes Park, Colorado, on July 28 and 29. Further information can be obtained from W. H. Eichelberger, Chairman, Arrangements, Denver Research Institute, University of Denver, Denver 10, Colorado.

✓The 1960 Computer Applications Symposium sponsored by Armour Research Foundation of Illinois Institute of Technology will be held October 26 and 27 at the Morrison Hotel, Chicago. Inquiries concerning the conference should be addressed to Andrew Ungar, conference program chairman, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

digital translator

A new digital translator which accepts virtually any kind of digital data and provides an analog output plus



control signals is now available. The instrument, Model 42, permits automatic operation of x-y records. Accuracy of the digital-to-analog conversion is 0.1%. Model 42 is compatible with IBM summary punches and card readers includes Models 514, 523, 524, 526, etc. It may also be driven by mechanical punched tape readers such as Friden, Soroban solenoid and Teletype motorized readers, without modification to either the translator or driving equipment. The new digital translator is supplied with a 10-key serial keyboard for manual input. The instrument accepts 4 digits and sign per axis and provides a front panel display of matrix contents. For information write F. L. MOSELEY CO., 409 N. Fair Oaks Ave., Pasadena, Calif., or use reader service card.

Circle 200 on Reader Service Card.

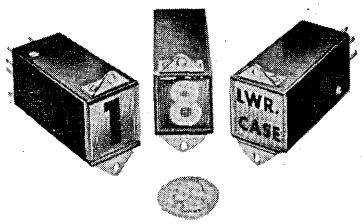
silicon diodes

Five new silicon mesa computer diodes, designed to be used as universal computer diodes, combine high breakdown voltage and exceptionally fast recovery time. Maximum recovery time when switched from the forward bias with 10 milliamps current flowing, to reverse bias of −5 volts, is four millimicroseconds. These miniature, glass packaged diodes will satisfy the requirements of future computer circuitry for ultra-fast recovery time, higher breakdown voltages, and silicon mesa construction to meet operating temperature requirements, according to the manufacturer. For information write MICROWAVE ASSOCIATES, INC., Burlington, Mass.

Circle 201 on Reader Service Card.

digital display

A miniature incandescent digital readout which displays the digits zero through nine on a common 1 in. x



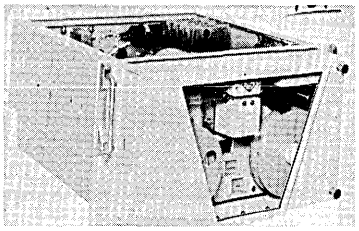
1 in. area is now available. Type LD-11 presents high density white-on-black (or black-on-white) numerals in-

stantaneously with the lighting of each bulb. Special units which can display as many as ten complete messages in the same inch square viewing area are also available. The LD-11 utilizes an adaptation of the manufacturer's lenticular optic technique which eliminates the need for projection lenses. Other advantages are its modular construction designed for direct panel mounting and its small over-all size (1 in. x 1 in. x 3 in.) which reduces the behind panel space requirements. For information write BURROUGHS CORPORATION, Electronic Tube Division, P.O. Box 1226, Plainfield, N.J., or use card.

Circle 202 on Reader Service Card.

tape transport

Model 81 tape transport permits the interchangeable use of plug-in type photoelectric or magnetic head assem-

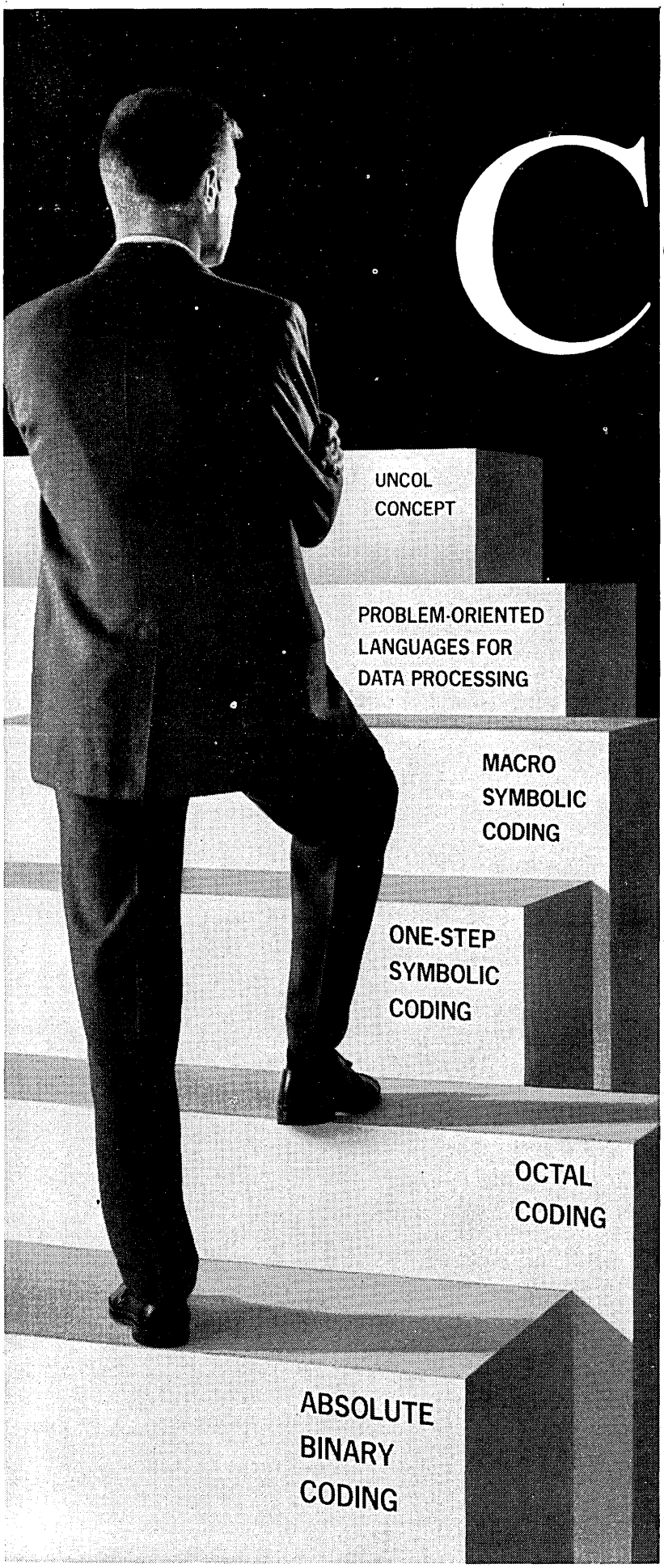


blies, and accommodation of standard printed circuit models of control logic and read and write amplifiers. When used as a tape reader, it is suitable for on-line service in computer, communication, and control applications. Typical magnetic tape applications include both analog and digital modes. The photoelectric reading head system will accommodate 5, 6, 7, and 8 level codes. Integral adjustable tape guides will handle 11/16, 13/16, ⅞, and 1 inch wide tapes. Metered tape speeds of up to 75 ips, in either direction, can be furnished. Short strips can be read. It is capable of moderate stop/start times and can be controlled remotely or locally. For information write COOK ELECTRIC COMPANY, Data-stor Division, 8100 N. Monticello Ave., Skokie, Ill.

Circle 203 on Reader Service Card.

memory exerciser

A new memory exerciser designed to locate defects automatically in coincident current core memory systems has been completed by the manufacturer, for the Archbald, Pennsylvania Military Electronics Division of Day-



Computer Programmers:

Where do you stand in programming progress?

Are you currently in a position to move upward and forward into newer, more interesting levels of programming? Or is your topmost step still well below the height of the art?

The advanced areas in which we work, e.g. MACRO symbolic coding, problem-oriented language for data processing, and research in Universal Computer Oriented Language only partially indicate the importance of computer programming at SDC.

There is also a basic professional advantage in the fact that programming is a primary function at SDC, rather than a service activity. This unusual situation stems directly from the fundamental nature of our work—developing extremely large computer-centered control systems. Among the many professional values in this strongly computer-oriented environment are the large number of supervisory positions open to programmers, and the fact that most programming supervisors have programming backgrounds.

Positions now open at all levels (at Santa Monica, California and Lodi, New Jersey).

The extension of SDC's programming activities into new areas of large computer-centered control system development has created openings for Programmers at several levels of experience, including senior status. Please send your inquiry to D. B. Price, SDC, 2478 Colorado Avenue, Santa Monica, California.

"SP-127 ANCHOR An Algorithm for Analysis of Algebraic and Logical Expressions," a paper by Howard Manelowitz of SDC's staff is available upon request. Send request to Mr. Price at SDC.

SDC

SYSTEM DEVELOPMENT CORPORATION

Santa Monica, California • Lodi, New Jersey

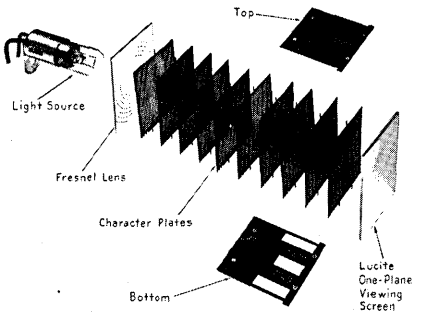
Circle 77 on Reader Service Card.

strom Incorporated. The Type 1513 exerciser, which is constructed entirely with building blocks and power supplies, will test memory systems with planes up to 128 by 128. It detects and counts defective cores that are either dropping a "one" or picking up an extra "one." The exerciser provides a variety of checkerboard patterns to facilitate operation under "worst case" noise conditions. Its variable timing cycle is capable of operating down to 5 microseconds. For information write DIGITAL EQUIPMENT CORP., Maynard, Mass. or use reader card.

Circle 204 on Reader Service Card.

slide plate readout

The slide plate accepts binary coded decimal (BCD) input and displays alpha-numeric characters. This means



that the unit does its own translating and does not need auxiliary translators, relays, or diodes. It will accept any BCD or teletype code up to 6 bits, do its own translating, and display the proper character. The unit can be connected directly to transistor or vacuum tube flip-flops without intermediate buffers or amplifiers and without overloading the flip-flop. It can be connected into computers and other electronic equipment.

This new readout stores and displays the last signal entered into it until commanded to accept and display a new signal input.

Besides the signal inputs to each slide plate, there is a single "set-pulse" input. To command the slide plate to change to a new number and store the new number, it is merely necessary to impulse the "set-pulse" lead of the slide plate or bank of slide plates. This commands the units to drop the old digit and accept and display and store the signal information available to each slide plate at that moment.

The slide plate has suitable check-

back and verification circuits to verify that the signals have been properly accepted. It also has storage readout so that digits or characters previously read into a bank of slide plates can be read back into the source equipment at some subsequent date or time.

The readout will display numeric information, and all of the alphabetic information plus special symbols. The slide plate will be available with 16 characters, 40 characters, and for special applications, up to 64 separate characters may be presented by a single slide plate. A numeric unit with up to 16 plates will cost approximately $35.00. An alphanumeric unit (up to 40 plates) will be in the $65 to $75 range. For information write INDUSTRIAL ELECTRONIC ENGINEERS, INC., 5528 Vineland Ave., North Hollywood, California.

Circle 205 on Reader Service Card.

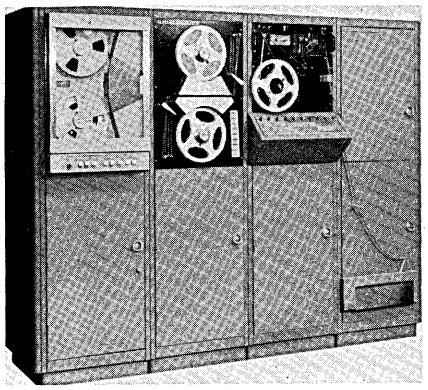
typing calculator

Model 632 electronic typing calculator incorporates five-channel punched paper tape output. The addition of paper tape output to the 632 will permit the transmission of local billing information over the nation's telegraph wires to a central location for analysis and final report preparation, or for direct input into many data processing systems. The new Model IV is in addition to three previously-announced 632 typing calculators. The primary application for the 632 is billing. For information write INTERNATIONAL BUSINESS MACHINES CORP., 545 Madison Ave., New York 22, N.Y., or use card.

Circle 206 on Reader Service Card.

tape converter

Model D104 converts information directly from punched paper tape produced by teletype transceivers to



magnetic tape in any parallel 7-bit alphanumeric code. In the other

NEW PRODUCTS

mode, data on magnetic tape produced by the computer are converted directly to their corresponding form on teletype paper tape. Paper tape data are introduced into the D104 converter by a photoelectric reader operating at 300 characters per second. Magnetic tape is read or prepared in a form completely compatible with the computer it is to feed. In addition to certain editing capabilities the converter can be made to recognize the distinction between legitimate data and items in nonstandard format. Distinctions between types of records can be made and, depending on the record, spaces or other preselected characters are emitted on to the magnetic tape. After manual initiation the translation proceeds automatically until the end of input tape data. For information write DIGITRONICS CORPORATION, Albertson Ave., Albertson, Long Island, N.Y., or use card.

Circle 207 on Reader Service Card.

comparatron

Comparatron is an electronic device which performs continuous digital comparison of command and feedback signals and produces an accurate analog drive signal. Two models are available – one accepting up to two 24-bit parallel binary numbers, and the other up to two 24-bit parallel binary-coded decimal digits. Input data may be presented from a storage register, handset switches, or shaft encoder. By a process of digital comparison, an error-modulated a-c output is produced for direct use as a positioning signal. Features of Comparatron are an inherent accuracy of within ± ½ the least significant digit or bit, high speed comparison, proportional error signal up to a predetermined saturation level, and compatibility with standard resolvers and servos. For information write NORDEN DIVISION, United Aircraft Corp., 58 Commerce Rd., Stamford, Conn., or use reader service card.

Circle 208 on Reader Service Card.

encoder translator

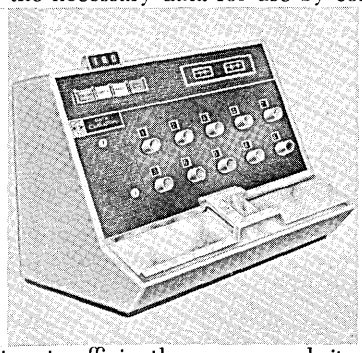
A new, compact, solid-state translator that will translate up to 14 bits of Gray code to binary code, producing at the same time the binary signal and its complement is available. The TR-702 provides improved reliability at

high encoder speeds, according to the manufacturer. The encoder output is filtered and clipped, thereby eliminating the possibility of errors due to brush bounce. For information write DATEX CORPORATION, 1307 S. Myrtle Ave., Monrovia, California.

Circle 209 on Reader Service Card.

data collector

Model 180 data collector, collects and records in computer-intelligible form, all the necessary data for use by com-



puters to efficiently process such items as payroll, work-in-process inventory, costs and scheduling operations. The 180 automatically assembles into a punched paper tape variable data (such as job-lot number and amount produced) identification data from pre-punched IBM cards (such as employee number & item number), fixed data (such as department number and data collector number), and time from an internal clock (to the nearest 0.01 hour). The variable data are inserted from 10 manually-operated dials. The identification data are selectively read from IBM cards by a card reader. Variable card lengths may be used; bent or wrinkled paper cards and plastic cards can be read with high reliability. Output data is recorded at the rate of 15 characters per second on 5, 6, 7 or 8 level punched paper tape. For information write CONTROL DATA CORPORATION, 501 Park Ave., Minneapolis 15, Minn.

Circle 210 on Reader Service Card.

control chassis

Model K-111 control chassis translates dates or other binary-coded inputs into decimal or other binary-coded outputs, and upon command stores the input information for remote readout. The new control chassis has been designed to utilize transistor storage of encoder data and combines this buffer storage input with relay output. For information write DATEX CORPORATION, 1307 S. Myrtle Ave., Monrovia, Calif.

Circle 211 on Reader Service Card.

SOME MORE FACTS ABOUT COBOL

(Continued from page 29)

ment Committee projects can originate in the Committee, the Executive Committee or from outside sources and will be assigned a project number by the Executive Committee. The Committee will make periodic reports on the status of such projects.

There are other items worth noting in these minutes. The Executive Committee agreed to meet with the Intermediate Range Committee in New York on April 7th. Also, tentative plans were announced to convene a general Conference on Data Systems Languages in May.

The minutes also note that Intermediate Range Chairman A. Eugene Smith, presented several recommendations adopted by that group on October 8th and 9th, on October 14th and on January 22nd. The Intermediate Range Committee had recommended consideration of the Honeywell Compiler as a basis for COBOL. It had also recommended that a panel be established to evaluate COBOL. The Executive Committee rejected both of these suggestions by pointing out that "events had overtaken the recommendations." (DATAMATION's only comment here would be to note that both of the above suggestions were made last October. – Ed.)

The Executive Committee also rejected a proposal to establish a group responsible for COBOL marketing, pub-

lic relations, publication and publicity. "The Committee believes," the minutes state, "it has inherent responsibility for such limited publicity as may be necessary together with problems of public relations and publication. It is strongly opposed to the idea that a 'marketing attitude must pervade everyone's thinking' to gain acceptance of COBOL. The committee believes that a 'marketing attitude' would be detrimental and that any attempt to commercialize COBOL must be avoided."

After analyzing the reactions of both manufacturers and users, DATAMATION must conclude that COBOL's future is doubtful. It is doubtful because of the trend, already apparent, to make COBOL in reality a manufacturer-developed language. If other manufacturers follow this lead, the industry will have only the beginnings of a common business language. Firms will develop their own compilers and offer COBOL on the side. Some manufacturers will be concentrating on their own packages, others will be solely committed to COBOL.

Too, the effort's future is doubtful because not enough is known about what has been done and what is planned. The Executive Committee's stand that COBOL should not be "marketed" is commendable but their contention that only "limited publicity" is necessary is questionable at best.

Finally, COBOL's future is in question because many of the larger manufacturers may not be convinced that they are ready for a truly common language. COBOL appears to be the first real outside impetus to a more competitive computer industry. It may be that the entire CODASYL concept was conceived 10 years too soon. We hope that concept won't be stillborn. ●

INTERNATIONAL STANDARDS FOR COMPUTERS

u.s. participates in initial consideration

United States participation in two new areas of international standardization – office machines and digital computers and data processing machines – was considered at a general conference held under the sponsorship of the American Standards Association in January. Isaac L. Auerbach represented the National Joint Computer Committee at the meeting in New York City.

The American Standards Association, which is comprised of over 110 national technical societies and trade associations, serves as the United States member to the International Organization for Standardization (IOS). The IOS is organized for the development and promotion of international standards in such universal fields as engineering, industry, commerce, safety. Over 30 countries are members of the IOS.

Based upon proposals for the establishment of international standards in the new areas, as submitted to the General Conference by the Office of Equipment Manufacturers Institute, the American Standards Association was requested to create committees for this work and to designate the Office of Equipment Manufacturers Institute as its working society.

The efforts of these committees will result, in the case of the committee for data processing machines, in a single standard for logical representation of characters and character format in the media used for interchange of instruction, data, and control information between data processing equipments, together with orderly provision for expansion and alternatives; and a standard terminology and definition of data processing operations and functions.

This standards project will encompass an area which can be termed logical systems standardization, and could eventually lead to related hardware standardization. Systems standardization covers those standards which are concerned with the operation of a group of machines as a single system or of several different systems with one another as in the interchange of information.

There are four principal parts in this project:

1. A standard character set and coded representation for the character set including the alphabet, numbers, special symbols and marks by which information is made machine readable.

2. A standard format for defining the meaning of strings of characters into data fields, data records, program instructions and the like.

3. A common problem-oriented programming language governing the operation of data processing equipment. This programming language is to be machine independent so that it is applicable to data processing equipments of various manufacturers. Its purpose is to establish a common language for data processing in which to describe the processes to be carried out.

4. Precise definition of data processing operations at machine level to insure identical results for different equipment when using the problem-oriented language.

Standardization in these areas will provide a basis for passing information from one data processing system to another, for performing the same process on different machines, and reducing the effort expended in preparing programs describing data processing.

Representatives at this General Conference included top officials and corporate officers from over 40 national technical organizations and office equipment manufacturers actively engaged in or having a peripheral interest in data processing systems and office equipments within the United States and Canada. For more information, contact American Standards Association, K. G. Ellsworth, Public Relations, 70 E. 45th St., New York 17, N.Y.

NEW DATAMATION LITERATURE

GP COMPUTER: Catalog sheet S-482 gives complete specifications and description of the RPC-4000 system. The basic stored program, general purpose computing system consists of the computer, punched paper tape typewriter input-output unit, with optional high-speed input-output equipment available. For copy write ROYAL McBEE CORP., Data Processing Division, Port Chester, New York.
Circle 260 on Reader Service Card.

MODULES: A four-page illustrated folder details seven pieces of this company's equipment, along with diagrams and prices: Model BD-101 binary decade counter; NX-101 NIXIE indicator driver; D1-101 d-c inverter amplifier; SD-102 solenoid driver; ST-102 schmitt trigger; OM-102 multivibrator; and LA-101 indicator amplifier. For copy write COMPUTER CONTROL CO., INC., 983 Concord St., Framingham, Mass.
Circle 261 on Reader Service Card.

PAPER TAPE ACCESSORIES: Three new paper tape accessories for the G-15 are described in a single-page data sheet. These units are: the PR-1 auxiliary photoelectric paper tape reader; PR-2 multicode high-speed tape reader; and the PTP-1 auxiliary paper tape punch. For copy write BENDIX COMPUTER DIVISION, 5630 Arbor Vitae St., Los Angeles 45, Calif.
Circle 262 on Reader Service Card.

VOLTAGE DIGITIZERS: A six-page folder titled "The Expanding Line of Voltage Digitizers" is available, along with price list on the eight types described and illustrated therein. General specifications given include inputs, outputs, accuracy and speed. For copy write ADAGE, INC., 292 Main St., Cambridge 42, Mass., or use card.
Circle 263 on Reader Service Card.

ANALOG COMPUTERS: A line of general and special purpose analog computers and accessories are described in a four-page brochure. In-

cluded are descriptions and specifications of the MC-5800 Precision Master Analog Computer; Linear Programming Computers, etc. Also described is the DYSTAC system which incorporates the capability of digital computers while maintaining the speed and ease of use of analogs. For copy write COMPUTER SYSTEMS, INC., 611 Broadway, New York 12, N.Y., or use reader card.
Circle 264 on Reader Service Card.

MEMORIES: Bulletin DF 115-1 describes a series of general purpose high speed memories available from this manufacturer. Designated Type RB, the new memories are made in sizes ranging from 128 to 1024 words and from 4 to 24 bits per word. They operate at rates up to 125 kc – provide both random access and sequential types of operation. For copy write TELEMETER MAGNETICS, INC., P.O. Box 329, Culver City, Calif., or use reader service card.
Circle 265 on Reader Service Card.

CUSTOM EDP EQUIPMENT: Four-page bulletin S1159 describes all solid-state electronic data processing equipment custom-designed for various commercial applications. Among the units described are magnetic tape-to-paper tape converters, data acquisition and reduction systems, magnetic tape file interrogators, etc. For copy write DYKOR SYSTEMS DIVISION, Digitronics Corp., Albertson, L.I., N.Y., or use reader card.
Circle 266 on Reader Service Card.

INPUT/OUTPUT: Details of the CODEWRITER – a new electronic component for data processing and data handling systems – have been released in a brochure, IP-01. The input model, output model, and combination input-output model are described and a typical application in a process control computer system is presented in flow chart form. For copy write ROYAL McBEE CORP., Industrial Products Div., 740 N. Main St., West Hartford 17, Conn., or use card.
Circle 267 on Reader Service Card.

COMPUTER SYSTEM: This company's new GE 210 data-processing computer system employs magnetic character recognition, a building-block design for expansion, for use in such areas as banking, utility-billing, and government departments. Details

and full illustrations are available in a 12-page brochure CPB-81P. For copy write GENERAL ELECTRIC CO., Computer Department, Deer Valley Park, Phoenix, Arizona.
Circle 268 on Reader Service Card.

SWITCH DEVICES: Catalog 67 deals with the Series 2 lighted display and pushbutton switch devices. Using split pages, information on all mounting styles of operator-indicator units are given on the top half, details of the switch units on the bottom half, the catalog allows any operator-indicator style to be lined up with any switch unit for quick comparison of details, dimensions and capacities. For copy write MICRO SWITCH. A Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill., or use card.
Circle 269 on Reader Service Card.

ELECTRONIC COMPUTER: A twelve-page book (includes coding sheets) is available on the Honeywell 800. Subjects dealt with are: basic specifications, central processor, input-output, automatic programming, simultaneous computing and processing, automatically controlled parallel processing and some performance examples. For copy write MINNEAPOLIS-HONEYWELL REGULATOR CO., DATAmatic Division, 151 Needham St., Newton Highlands 61, Mass.
Circle 270 on Reader Service Card.

DATA LOGGING SYSTEM: Application Sheet N-07 (1) describes the use of a 100-channel sequential data logging system to record test results of components exposed to nuclear radiation. Schematic diagram of operation, specifications, modes of operation, time per channel, visual displays and channel switching, are included. For copy write LEEDS & NORTHRUP CO., 4934 Stenton Ave., Philadelphia 44, Pa., or use card.
Circle 271 on Reader Service Card.

COMPUTER BIBLIOGRAPHY: The 54-page booklet entitled "UNIVAC Educational Series No. 3" is an annotated bibliography of large scale digital computers. This booklet is a revised edition of an earlier one and provides a relatively comprehensive listing covering the whole history of digital computers. Three main sections are: theory and operation; applications; backgrounds and sources. Journals, magazines and periodicals

are included along with most of the recent books on computers, both general and technical. For copy write REMINGTON RAND, Division of Sperry Rand Corp., 315 Fourth Ave., New York 10, N.Y., or use card.
Circle 272 on Reader Service Card.

MAGNETIC TAPE RECORDER: Third generation in the 100 Series of instrumentation magnetic tape recorders are covered in a 20-page booklet on the FR-100B. Performance figures for direct, fm, pulse duration modulation and digital recording are included as well as a number of on-the-job applications. For copy write AMPEX DATA PRODUCTS CO., 934 Charter St., Redwood City, Calif.
Circle 273 on Reader Service Card.

SAMPLING RELAYS: Technical details of a new line of "Micro-Scan" relays are contained in a catalog. Illustrations are included in the catalog of the relays, designed for D.C., asynchronous and synchronous switching of low microvolt level to moderate level signal circuits, such as found in digital, analogue and measurement applications. For copy write JAMES ELECTRONICS, INC., 4050 N. Rockwell St., Chicago 18, Illinois.
Circle 274 on Reader Service Card.

CARD PUNCH DATA: Card-punching information for testing over 1,000 receiving and industrial tube types with this company's automatic electron-tube tester, is provided in a 44-page booklet. Instructions for preparing new punched cards for testing are given, along with data on popular foreign types of tubes in a separate listing. For copy send $1.00 to RCA Commercial Engineering, RADIO CORPORATION OF AMERICA, 415 S. Fifth St., Harrison, N.J.
Please Do Not Use Reader Service Card.

DIGITAL COMPONENTS: A new folder containing four spec sheets on digital components, is available. Included are read amplifier characteristics, write amplifier characteristics, flip flop characteristics, and blocking oscillator characteristics, with diagrams and illustrations of the units. For copy write AERONUTRONIC, Computer Operations, Ford Road, Newport Beach, Calif., or use card.
Circle 276 on Reader Service Card.

AUTOMATIC CHECKOUT: Four-page brochure describes four new automatic checkout equipments: an RMS-to-DC converter, a voltage-to-digital converter, a timer-counter, and a digital printer. All units are completely militarized, designed to meet environmental requirements of MIL-E-4158B, and are in use in a missile automatic checkout system. For copy write EPSCO, Inc., Equipment Div., 275 Massachusetts Ave., Cambridge 39, Mass., or use reader service card.
Circle 277 on Reader Service Card.

PLUG-IN MODULES: Series 2010 Logix Blocks are a complete set of transistorized, digital logic circuit plug-in cards for "building block" design and construction of special purpose digital computers. Bulletin 59-B illustrates and describes the eight plug-ins, as well as Model 2010-SU power supply, 2010-CG mounting cage and type 2010-LO wiring layout sheets. For copy write RESE ENGINEERING, INC., 731 Arch St., Philadelphia 6, Penna., or use reader service card.
Circle 278 on Reader Service Card.

DATA COLLECTING: A new 20-page booklet provides complete descriptions and illustrations of this company's Collectadata . . . a data collecting system which automatically channels information from work stations to a central processing plant. Subject headings in the booklet include: equipment, applications, benefits, systems diagrams. For copy write FRIDEN, INC., San Leandro, Calif.
Circle 279 on Reader Service Card.

CAPACITORS: Complete technical information is contained in QE Bulletin NPJ-110, on this manufacturer's Type QE computer grade electrolytic capacitors. Dimensional drawings, performance characteristics and table of stock values are given. For copy write AEROVOX CORPORATION, New Bedford, Mass., or use card.
Circle 280 on Reader Service Card.

LANGUAGE TRANSLATOR: Model ZA-100 computer language translator is described in a 16-page application information manual. Descriptions include the data translation capabilities, the basic translation system, and common translation modes. An illustrated appendix outlines CLT systems now

in operation in various parts of the nation. For copy write ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA, 1601 East Chestnut Ave., Santa Ana, Calif., or use card.
Circle 281 on Reader Service Card.

CHARACTER GENERATOR: VIDIAC-3SG (Visual Information DIsplay And Control) solid state character generator was designed to provide a solution to the problem of electronic generation of symbolic information. Description, diagrams and specifications of this system are provided in a four-page bulletin, 463-2. For copy write CBS LABORATORIES, Stamford, Conn., or use reader service card.
Circle 282 on Reader Service Card.

TAB PUNCH: This manufacturer's keysort tabulating punch internally code-punches values and simultaneously accumulates and prints details on a tape; a by-product of normal control listing. Summaries may be taken and printed at will. Details are available in style sheet S-565R59. For copy write ROYAL McBEE CORP., Data Processing Division, Port Chester, N.Y., or use reader service card.
Circle 283 on Reader Service Card.

DATA/LOG: Basic specifications, description and illustrations of the Series MC-200 DATA/LOG digital printing and calculating machines are contained in a four-page bulletin No. 200. For copy write DATEX CORP., 1307 S. Myrtle Ave., Monrovia, Calif.
Circle 284 on Reader Service Card.

DELAY LINES: Information on the theory of operation of fixed and variable magnetostrictive delay lines is contained in Data Sheet M-1001. Included are the range of design characteristics available for these delay lines. Of interest to engineers and those concerned with analog and digital computers, aerial navigation systems, coding devices, etc. For copy write CONTROL ELECTRONICS CO., 10 Stepar Place, Huntington Station, N.Y., or use reader card.
Circle 285 on Reader Service Card.

SMALL MANUFACTURERS' NEWSLETTER: "Management Aids for Small Manufacturers" is the name of a monthly, four-page, bulletin put out by the Small Business Administration group in Washington. The November, 1959 issue (No. 109) con-

tained an article on using computer services in small business, by I. J. Seligsohn, of C-E-I-R, Inc. For copy write SMALL BUSINESS ADMINISTRATION, Washington 25, D.C.
Circle 286 on Reader Service Card.

INFORMATION SEARCHING: Bulletin CPB-57, a four-page, illustrated folder, describes the GE 250 information searching selector. In its basic form the selector provides: 1) storage of information; 2) storage of search questions; 3) means for comparing 1 and 2, detecting information, and recording the result. For copy write GENERAL ELECTRIC CO., Computer Department, Deer Valley Park, Phoenix, Ariz., or use reader card.
Circle 287 on Reader Service Card.

DIGITAL MODULES: Catalog M-2 is a twenty-page, fully illustrated booklet entitled "Transistorized Modules for Digital Systems." General characteristics and specifications are given on flip-flops, gates and buffers, variable frequency oscillator, inverter amplifier, and other modules. For copy write COMPUTER CONTROL CO., INC., 983 Concord St., Framingham, Mass., or use reader card.
Circle 288 on Reader Service Card.

UNIVERSITY CENTERS: Two recent publications highlight the work being done at universities and colleges in computing and edp: Bulletin E-123 lists typical applications at universities which have installed the E101 desk-size computer; the November issue of Data (from ElectroData) describes complex computational work being done at Georgia Tech and at Georgetown University. For copies write BURROUGHS CORPORATION, ElectroData Division, 460 Sierra Madre Villa, Pasadena, Calif.
Circle 289 on Reader Service Card.

INPUT SWITCHES: Details on a new line of rotary switches for use on computer control consoles, are given in Data Sheet 170. The switches are used to introduce information by converting decimal constants to a positional number code. For copy write MICRO SWITCH, Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill., or use reader card.
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ADVERTISERS' INDEX

The new LFE SM-2 converts digital computer language into a visual message . . . displays alpha-numeric characters, arbitrary or abstract symbols, schematic or logical drawings, graphs, charts and maps.

Twenty-one inch, flicker-free, display tube clearly displays up to 13,000 character messages, or 90 characters per square inch . . . is easily readable with ordinary office lighting . . . features self-contained storage. Brightness and storage are completely independent of the number of characters on any given page.

SM-2 is readily adaptable to data storage and retrieval systems as the on line output device. Typical of this application is LFE's commercially available RASTAD system.

Other applications include air traffic control, intelligence systems, inventory control, production control, process control monitoring, and other applications where information retrieval and display must be simultaneous. Additional specifications available by writing to Dept. D4.

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The Philco 2000 Electronic Data Processing System is the world's fastest because it is the only asynchronous system commercially available today! Each operation starts the instant the previous operation is completed, without waiting for a pre-set clock pulse. Asynchronous operation eliminates the time lag that occurs in all clock-timed systems . . . processes more work in any period . . . saves costly waste of time. The Philco 2000 is the pioneer in all-transistor logic and circuitry . . . the computer that changed the industry.

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Because the Philco 2000 is truly asynchronous, newly developed components and design improvements may be incorporated at any time, without redesign of equipment and with no reprogramming. The system can always be updated, at minimum cost.

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Philco provides every important service, including: automatic programming, programming library, on-site maintenance and training tailored to your needs.

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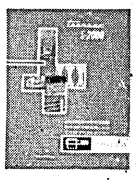
WRITE today for your copy of this new brochure on the Philco 2000 computer . . . the *first* fully-transistorized large scale data processing system and the *only* asynchronous general purpose system available.



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