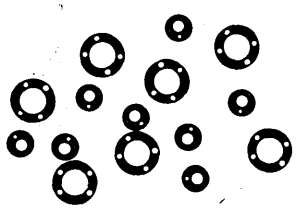
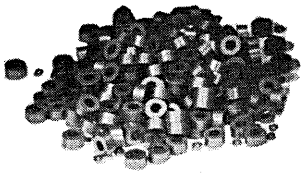
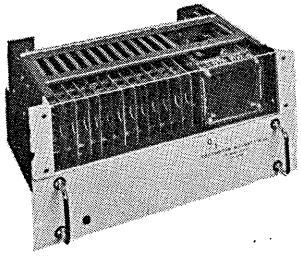
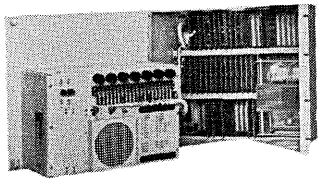
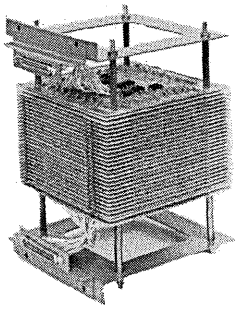
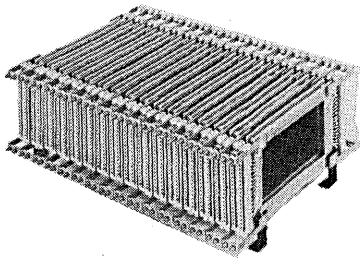
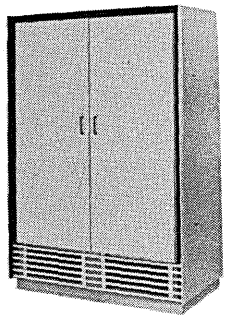
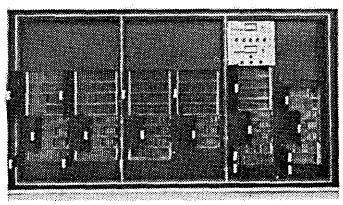
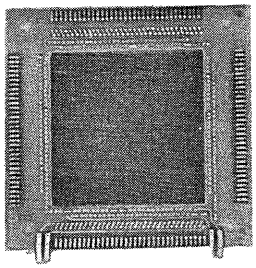
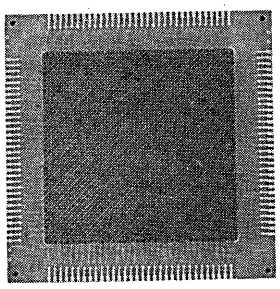
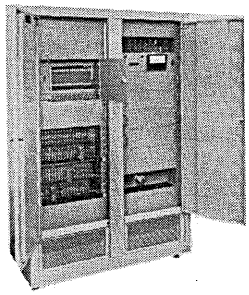
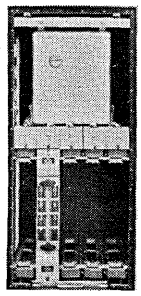
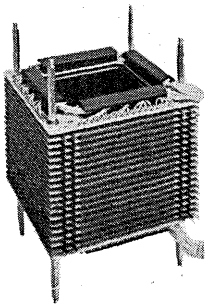
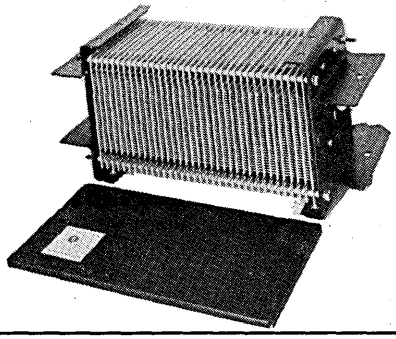
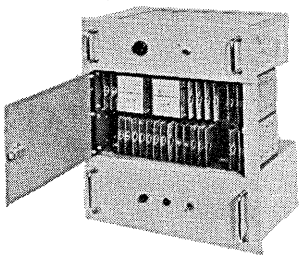
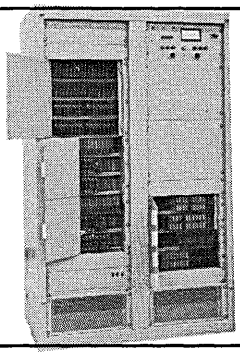
DATAMATION 60

November/December

page 13 A CHART FOR EDP EXPERTS

EASTERN JOINT COMPUTER CONFERENCE

TMI, THE LARGEST MANUFACTURER OF MEMORY PRODUCTS • FERRITE CORES • CORE ARRAYS • MEMORY STACKS • MEMORY SYSTEMS

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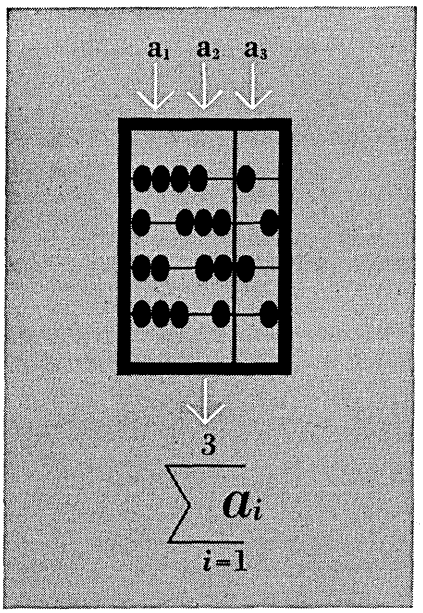
Data Equipment Division

CIRCLE 1 ON READER CARD



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When responding, a mention of DATAMATION would be appreciated.

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to the editor . . .

Dear Sir:
In the systems field as in most professional fields it is difficult to resist the temptation to spot minor errors in other people's work. In the September-October issue of DATAMATION, there is an error in the algorithm shown at the bottom of page 11. ("A Progress Report on Machine Intelligence")
This is of course, just a detail; otherwise the article by Daniel McCraken was one of the most interesting I have seen in an always interesting magazine.

FRANCIS C. STACEY
General Analyst
American Mutual Liability Insurance Co.

Editor's Note—Yours was the first of many letters citing this DATAMATION error. See the corrected algorithm below.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Dear Sir:
We have been very interested in reading about COBOL in your lively magazine. You and your readers may be interested to know that we—International Computers and Tabulators Ltd. of London, England—are implementing COBOL—the first non-U.S.A. company to do so.

At present we are on a fact-finding tour of America and have called on the automatic coding experts of Sylvania, Honeywell, R.C.A., Burroughs, General Electric, and we will be calling on I.B.M. and Remington Rand. We are in Washington for discussions with Mr. Phillips of the Department of Defense. You can see, therefore, that COBOL has a good chance of becoming an international language—especially since we have sold computers outside the U.K. in Sweden, Germany, South Africa, Australia, France, India, etc.

There seems to be so many disparagers of COBOL that I think it is worthwhile to point out that a non-American firm is supporting this first effort at a common business language. It is true that nothing at this present stage can be fully "compatible," but at least this is an advance as opposed to the attitude of sitting back and waiting in a corner.

R. MURRAY PAINE
International Computer and Tabulators Ltd.

Dear Sir:

Page 12 of the September-October issue ("A Progress Report on Machine Intelligence") squarely raises the issue of reliability in computers. If one assumes that the computer is giving the answers in the dialogs attributed to Turing, one must conclude that with increased intelligence computers become more subject to the human errors. It is depressing to note that a machine clever enough to see the trap in the question about the diagonals of an isosceles triangle has forgotten how to perform simple addition. Normally 34957 plus 70764 gives a sum of 105721, but the intelligent machine described has (1) dropped a bit in the hundreds digit, (2) simply sacrificed the mathematical preciseness of its less intelligent ancestors, or (3) tried talking to a wide awake human too early in the morning. It is hoped that the American Standards Association will recommend means for keeping low I. Q. tasks within the range of competence of high I. Q. machines.

HERBERT R. KOLLER
U. S. Department of Commerce

P.S. If you have received 8,926 other letters on the same subject, please consider this as merely another fan letter for your proofreaders.

Editor's Note—The author, the proofreaders, the editor and *at least* 8,926 readers allowed the machine to get by with this one, Mr. Koller.

Dear Sir:

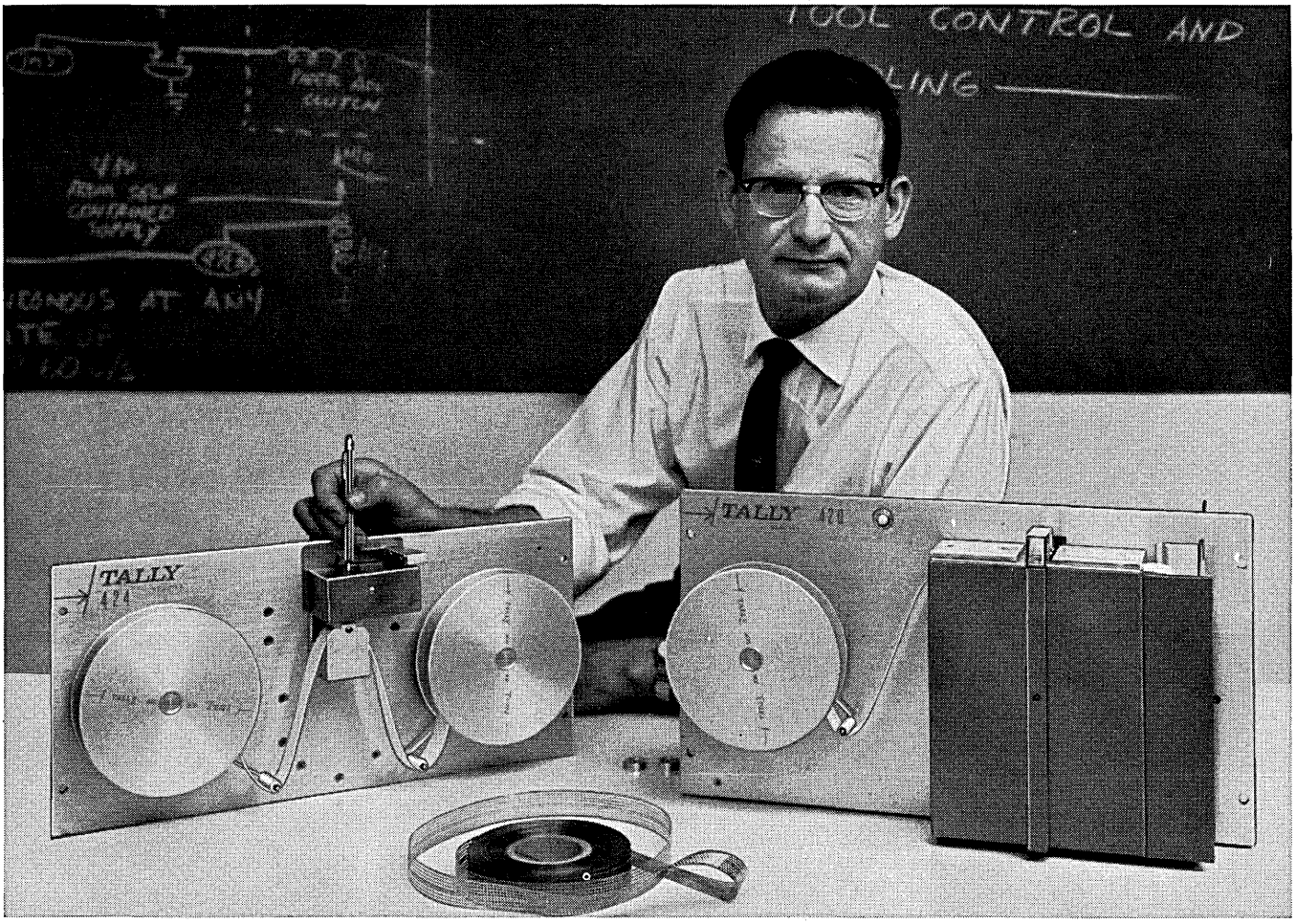
The little "gag" write-up on the Postal Input Buffer Device in your last issue has brought a number of favorable comments from my associates, and inquires as to the meaning of the cryptic byline: "Robertson Osborne, Joe & Gil."

As pointed out in my letter accompanying the copy, the original idea was not mine, and "Joe & Gil" would have been credited if their identity were known. I would appreciate your making this clear to your audience . . .

ROBERTSON OSBORNE
Burroughs Corp.

Editor's Note—Contributor Osborne informed DATAMATION at the time he submitted his "product announcement" that inspiration for the piece had come from a memo directed to "Joe" from "Gil." After reading the memo, Osborne attempted to establish the identity of both men but was unsuccessful. In keeping with the spirit of the piece, DATAMATION decided to give full credit to all concerned, known and unknown.

• *A message of importance to engineers using punched paper tape equipment for machine tool control & data handling*



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...and long

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Tally perforators operate *asynchronously* at any rate up to 60 characters per second. Their unique wire clutch drive lets you vary speed for slaving to other equipment, simplifying design of logical systems. Prices for perforators start at $1,000.

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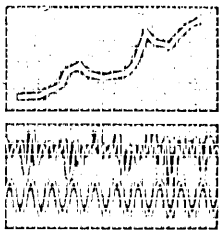

RESTRICTIONS ON MICROWAVE RELAXED

On October 5, the Federal Communications Commission delivered a ruling which will effect the installation of microwave equipment throughout the country. The ruling reinstated a 1959 order which liberalized microwave licensing policies. Microwave licensing had previously been available only to government agencies and right-of-way companies. Other firms could use microwave only if common carrier facilities were not available.

By its latest action, the FCC has again stated the policy of utilizing mobile radio eligibility standards for microwave licensing. Since any legitimate business is eligible for a mobile radio license, any business is now also eligible for a microwave authorization. The FCC specified, however, that business radio users must operate on frequencies above 10,000 megacycles. The policy for other licensees is that intracity or local systems also utilize channels above 10,000 megacycles. Thus 6,000 and 2,000 megacycle bands are reserved for long haul type systems.

In the first two applications by previously ineligible concerns, the FCC acted as follows: An application by Minute Maid Corporation of Orlando, Florida, was "granted in part" with the Commission advising the company that it must apply for a license after completion of the instruction and testing of the stations. In assigning frequencies, the Commission specified that certain of the hops in the Minute Maid system were of local nature and the company must use frequencies above 10,000 megacycles. In other hops, the requested channels in the 6,000 megacycle band were approved. Similar action was taken with respect to the second application from the University of Texas.

BRIGHT HEADS COMPUTER STANDARDS GROUP

In a move which bodes well for the computing industry in general and for the Office Equipment Manufacturers Institute in particular, Herbert S. Bright was recently appointed director of engineering activities for that organization's data processing group in New York City. As director of engineering activities, Bright will be chairman of the OEMI-sponsored American Standards Association Section Committee X3 on Data Processing Machines. This committee is engaged in a program for the international standardization of computers and data processing machines and there has been some concern voiced that this project was progressing without the full participation or cooperation of professional computer societies. Bright, as chairman of the standards committee of the Association for Computing Machinery; associate editor of that organization's monthly journal, the COMMUNICATIONS OF THE ACM; and a member-at-large of the ACM Council, brings a considerable amount of professional computer experience to his new position.

IMM FORMS NEW FIRM -- INTELLUX

The former president and founder of Librascope, a division of General Precision, Inc., Lewis W. Imm, has left the Glendale, Calif. firm and has formed a new company in nearby Reseda -- Intellux, Inc. Imm, with a contingent of 10 ex-Librascopers, states that his firm will specialize in applications of thin film techniques. The firm's operations include a glass products division and a scientific components division and plans are set for a division devoted to rotary components and another to design and produce military systems. An Intellux spokesman said that work on military systems would be followed by commercial contracts and that within two years, the firm may be ready to enter the computer field.

JUG INVITED TO ORGANIZE WITHIN ACM

JUG (Joint Users Group) has been invited by the ACM to organize within that society. Immediate consideration was given the proposal and further action on the matter is expected at the next meeting on Dec. 16 in N.Y.C. Representatives of computer user groups met first in May and agreed that a need for communications among such groups exists. The second meeting in August produced almost unanimous ratification of a resolution defining this need (DATAMATION, May/June, 1960). The consensus of JUG representatives seem to favor some form of affiliation with ACM and definite action is expected to result from New York meeting.

CONTROL DATA ACTIVITIES WORTH NOTING

This has been a busy Fall for Control Data Corp. of Minneapolis. After announcing that they had doubled sales and nearly doubled earnings in their third fiscal year, CDC answered an amended Sperry Rand complaint, negotiated an agreement with the National Cash Register Co., and continued to sell computers at a respectable clip. The lawsuit which Sperry Rand instituted against CDC in April 1958 and the legal developments since that time are too complicated to go into in detail here. Briefly, Sperry Rand alleges that CDC is using trade secrets in producing competitive computing equipment and further states that CDC illegally contacted Sperry Rand customers. CDC denies all charges and its president, William C. Norris, has filed a separate counter-claim stating that Sperry Rand owes him $17,000 in outstanding wages. The entire conflict should be settled sometime next year, say sources close to the battle.

The CDC-NCR agreement involves the former supplying the latter with a variation of the 160 computer for use with NCR's data processing line for certain financial and retailing applications. Notably, the 160 will become part of the NCR banking package. Both Control Data and NCR will market the computer abroad in all fields of record keeping. The contract also provides that NCR will provide CDC with high-speed printers, card readers, paper tape readers and other peripheral equipment.

CDC announced the installation of a 1604 to the NBS, Boulder Labs, and the sale of a machine to the Univ. of California at La Jolla.

FEIN FINE, THANKS

Omitted from the roundup of individual computer consultants (DATAMATION, Sept./Oct.) was Lou Fein of Palo Alto who recently returned from England and a consulting job for ICT of England.

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DATAMATION 60

the automatic handling of information

volume 6, number 6

Eastern Joint Computer Conference

Articles

Departments

THIS ISSUE—34,000 COPIES

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DATAMATION will accept and consider articles dealing with small, medium and large electronic data processing systems; articles covering development and application of components, subsystems and systems; and other general articles of interest to those in the data processing industry. Material submitted should be accompanied by pictures and illustrations when possible. Unsolicited manuscripts to be returned to writer should include return postage but editor assumes no responsibility for their safety (although all reasonable care will be taken).

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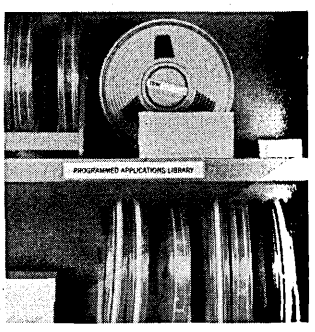

The Programmed Applications Library will make complete industry programs available.

'ghost writers' for computers

Expert IBM programmers help customers cut costs

Working behind the scenes at IBM is an unusual group of over 300 men and women. They're specialists who develop computer instructions, or "programs."

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Programming is a demanding process. And it takes time. It took, for example, the equivalent of 45 man-years to develop the FORTRAN (FORmula TRANslator) systems which IBM released in 1957. Containing 75,000 programmed instructions, FORTRAN is *still* the most widely used system for solving scientific problems on IBM computers.

New system to use everyday business language

IBM programmers are now implementing COBOL*, the COmmon Business Oriented Language translator. This, like the IBM Commercial Translator introduced last year, is a programming system in which everyday business language becomes the language of computer instructions. The result of all these machine languages is a saving in programming costs that might easily equal 40% of a customer's data processing system investment.

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**This is a joint effort of computer manufacturers and users under the guidance of the Department of Defense.*

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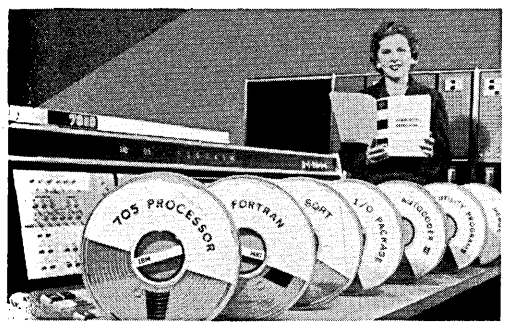
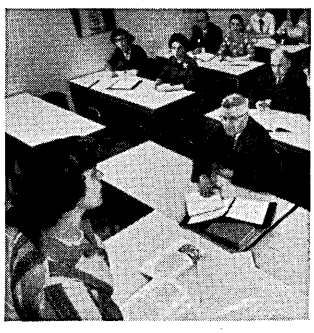


Programming routines that translate business problems into computer language are provided to IBM customers without charge.



An IBM programmer teaches customers the latest programming techniques.

The layman's guide:

by Charles W. Adams,
President, Charles W. Adams Assoc.

A CHART FOR EDP EXPERTS

LAST SPRING Jack Gilmore, the vice president of our embryonic consulting firm, in heated discussion with several top-level representatives of an important client, was asked a very simple question: "What is the access time of the RCA-501?"

In common with all those who have a wide interest in electronic data processing, and particularly with those who have the gall to represent themselves as consultants in the field, Jack had looked over the extensive technical information which RCA had provided. Back at the office on the five-foot shelf there was a manual which gave not only the access time but almost all other pertinent information on the system. It happened, however, that Jack had not worked with the 501, had not anticipated any interest in the system by this particular client, had not yet taken a Dale Carnegie course on memory improvement, and did not have our five-foot shelf in his pocket.

"What we need," he told his unsympathetic associates later, "is a pocket-sized chart listing all of the important characteristics of all of the computers that we should be expected to know about." The work involved in preparing such a chart seemed so prodigious that his friends greeted him with silence. With sudden inspiration he added, "It would be just the thing to print on the back of our new brochure so that the people who receive it won't be quite so likely to throw it away." Thus unburdened, he turned his back on the quietness that often greets a good idea to go on about his business.

A few weeks later Norman Statland, Adams Associates' walking encyclopedia of computer facts, found himself with two free days; so with Allen Rousseau's help he put together a chart of the type Gilmore had suggested. Four months, 87 phone calls, 117 letters, eight visits by Alder Jenkins to Boston's best compositor, and 56 man-days of work later, the results of Norman's two-day effort appeared before the computer world in a privately-published brochure and simultaneously, in condensed form, in an article about it prepared by the editors of BUSINESS WEEK. The complete chart, brought up to date through October 15 and arranged in a format suitable to DATAMATION, is presented here.

which and what

The most immediate problem facing one who sets out to make a chart of computer characteristics is, of course, which computers to include and what data to present about them. Since the basic purpose of our chart was to serve as a convenient, compact reference for technically competent EDP people, a number of items of data were quite obviously needed. Arranging these data into columns served the dual purpose of making the chart more manageable in size and of permitting a rapid scanning of individual columns should one need to know which of the available computers have a fast on-line printer, built-in floating point, or any other feature desirable for a particular job.

Numbers standing unqualified in columns often lead to difficulties for the computer characteristics chartist. Frequently there are two or more devices available, optionally or in combination, so that a single number alone is misleading. Sometimes the speed, size, or even the existence of a particular feature becomes a question of semantics or a problem of averaging. This is no doubt the reason that few charts similar to the one presented here have ever been compiled and that fewer still have received widespread acceptance.

For better or worse, these problems were resolved by us in a combination of three ways: a second row of numbers for each computer was included wherever necessary; values which seemed to need qualification or clarification were referenced to footnotes; and the definitions of some of the column headings were deliberately left loose (**caveat emptor**). Most important of all, since each computer has unique or unusual features which cannot readily be expressed as numbers in columnar form, these features together with footnote information unique to one computer were put together into relatively terse sentences comprising a kind of editorial remark about each individual computer.

speed and price

What is an average monthly rental? What is the effective speed of a computer? For what uses is it primarily intended?

The reader, I am sure, will agree with us that there is no general answer to these questions. We hope he will agree that the data we have presented, while making no pretense of answering these questions, is useful information. No doubt he will feel, and perhaps we will agree, that other data could have been provided in place of or in addition to that which was actually chosen. For example, while detailed rental costs, option by option, seemed out of the question, minimum monthly rental might have been a valuable added column. There is no widely accepted criterion for measuring effective speed, but multiply time might have been useful.

On the other hand, average rental does at least establish the ball park in which each system can compete, and can be used as a criterion to bring systems of like size close to one another in the chart. The optimized add time and the average access time actually given in the chart, taken together with the number of instruction addresses and other information, should give the computer specialist a good multi-parametric feeling for the speed of the machine. And, in the final analysis, one must remember that this chart was never intended to replace completely the reference manuals available for each computer.

In the chart, which follows on the next four pages, characteristics given for all but the first two machines have been confirmed by their respective manufacturers.

Following are the manufacturers and their computers represented in the chart: AUTONETICS, Recomp II; BENDIX, G-20 and G-15; BURROUGHS, 220, 205 and E-103; CONTROL DATA, 1604 and 160; DIGITAL EQUIPMENT, PDP-3 and PDP-1; EL-TRONICS, Alwac III-E; GENERAL ELECTRIC, 210 and 225; IBM, Stretch (7030), 7090, 7080, 709, 705, 704, 7070, 7074, 650, 1401, 305 and 1620; HONEYWELL, H-800 and H-400; MONROE, Monrobot XI; NCR, 304; PACKARD BELL, PB 250; PHILCO, 2000; RCA, 601, 501 and 301; REMINGTON RAND, Larc, 1105, 1103A, U II, U III, File Computer and SS 80/90; ROYAL MC BEE, RPC 9000, RPC 4000 and LGP-30.

COMPUTER CHARACTERISTICS CHART

	GENERAL CHARACTERISTICS					INTERNAL SPEED		MAGNETIC TAPE			PERIPHERAL EQUIPMENT: Input				PERIPHERAL EQUIPMENT: Output			SPECIAL FEATURES					
	Average Monthly Rental	Solid-State	Storage Capacity and Type	Word Size	Instruction Addresses	Add Time	Average Access Time	Thousands of Characters per Second	Input-Output Channels	Buffering	Maximum Tape Units	Cards per Minute	Paper Tape Characters per Second	Cards per Minute	Paper Tape Characters per Second	Printer Lines per Minute	Index Registers	Indirect Addressing	Floating Point Arith.	Console Typewriter	Random Access File	Random Inquiry
1 **IBM 7030 STRETCH**	$200,000	√	16-262K core	64b	1[1]	2μ[1]	1μ[1]	62	32	MRWC	256	1000[2]		250[2]		2		√	√	I/O	√	√
Information is preliminary, not confirmed by manufacturer. The computer features an interrupt system, an input-output exchange (which relieves the computer of all input-output control) with a variety of peripheral equipment available. Effective speed will sometimes be faster than shown because of use of look-ahead and look-behind features permitting simultaneous access to several core storage units.																							
2 **UNIVAC LARC**	$135,000	√	10-97K core	12d	1	4μ	4μ	25 133[1]	10	MRWC	60	1	1	1	1	1	99	√	√	I/O	√	√
Information is preliminary, not confirmed by manufacturer. System includes a versatile processor unit which controls all input-output operations. A second computer unit can be added. The fast add time shown is obtained by means of an instruction look-ahead feature. Many types of peripheral equipment are available, including a high-speed film printer. Numeric information can be read at a rate of 200,000 characters per second.																							
3 **IBM 7090**	$64,000	√	32K core	36b	1	4.4μ	2.2μ	15-62	8	MRWC	80	250[2]		100[2]		150[2]	3	√	√	I/O	√	
A computer which features multiple read-write-compute by use of a 7606 Multiplexor and up to eight 7607 Data Channels. Each Data Channel acts as a separate input-output unit and as many as ten tape units can be attached. The computer may have equipment for direct transmission of data between it and an external data device.																							
4 **IBM 7080**	$55,000	√	80-160K core 1K core	1a	1	12μ[1]	2.2μ 1.1μ	15-62	4	MRWC	40	250[2]		100[2]		150 500[2]	0	√		O	√	
A variable-word length computer which has a program interrupt feature. Provision has been made for many combinations of on-line input-output devices, including a 1,000 lpm printer. Add time assumes a five-character field. Simultaneous transmit feature allows internal movement of data in parallel with other computer operations.																							
5 **UNIVAC 1105**	$43,000		8-12K core 16-32K drum	36b	2	44μ	8μ 17m	25	2	RWC	20	120 300[3]	200	120[3]	60	600[3]	0		√	I/O		
A completely buffered version of the UNIVAC 1103A with increased storage facilities and faster tape drives. A visual display can be attached for on-line output. A program-interrupt feature enables processing of data from other on-line units on a priority basis.																							
6 **IBM 709**	$40,000		4-32K core	36b	1	24μ	12μ	15	6	MRWC	48	250[4]		100[4]		150[1]	3	√	√	O	√	
The computer can have an auxiliary storage drum of 2,000 to 8,000 words. A maximum of three 766 Data Synchronizers may be attached to a system, each of which has two data channels. Each channel may have up to eight tape units attached. A cathode-ray tube display is also available for output. A 500 lpm and a 1,000 lpm off-line printer are available.																							
7 **UNIVAC 1103A**	$35,000		4-12K core 16K drum	36b	2	44μ	8μ 17m	13	2	RC, WC[1]	10	120 240[3]	100	120[3]	60	600[3]	0		√	I/O		
The computer utilizes magnetic tapes with forward and reverse read and a lattice arrangement (addresses on drum spaced according to word times) to reduce drum access time. Tape buffering limited to one word. A program interrupt feature permits a switch to another program in microsecond time.																							
8 **CONTROL DATA 1604**	$34,000	√	8-32K core	48b	1	5μ	4.8μ	30	6	MRWC	96	1300	350	200[4]	60	1000[4]	6	√	√	I/O	√	√
A computer with two instructions per 48-bit word, overlapped core memory banks for increased speed, real-time clock, and program interrupt feature. It is compatible with IBM tape units. MRWC is achieved through the use of multiplex-type device to scan three input and three output buffers.																							
9 **RCA 601**	$32,000	√	8-32K core	56b	2[1]	6μ	.9- 1.5μ	22-120	16	MRWC	63	600[4]	1000[4]	100[4]	100[4] 300[4]	600[4] 900[4]	8[1]	√	√	I/O		√
The computer uses variable-length instructions on either a character, word, or half-word basis; operations within the computer are in parallel within these categories. Overlapped core memory banks and the processing of different programs simultaneously are features. Eight index registers are available for each program. Double precision arithmetic is available.																							
10 **IBM 704**	$32,000		4-32K core	36b	1	24μ	12μ	15	1	RC, WC	10	250[4]		100[4]		150[4] 500[3]	3		√	O	√	
The computer can have an auxiliary storage drum of 2,000 to 8,000 words and use of a 774 Tape Data Selector is available to facilitate off-line printing selection. A cathode-ray tube display is also available for output. Part of the arithmetic unit is used as a one word tape buffer. The write instructions permit binary and BCD recording modes.																							
11 **PHILCO 2000**	$30,000	√	4-32K core	48b	1	15μ[1] 4.5μ[1]	10μ[1] 2μ[1]	90	16	MRWC	256	2000[4]	1000[4]	100[4]	60[4]	900[4]	32		√	I/O	√	√
A parallel asynchronous system with a wide variety of instructions stored two to a word. Up to 32 auxiliary storage drums (32,768 words each) are available. Overlapped core memory banks, multiple memory banks and special instructions increase internal speed. The difference in internal speeds is due to the availability of two different core memories of 10 us and 2 us cycle times.																							

FOOTNOTES

[1] — See remarks immediately beneath the computer data in question.
[2] — The IBM 1401 system (entry #28 in the chart) is available for use as an off-line input-output device.
[3] — This peripheral equipment is available off-line only (i.e., it can be connected to a magnetic tape unit independently of the central computer).
[4] — This peripheral equipment is available with the same characteristics both on-line and off-line.
[5] — The cost of magnetic tape units has not been included.

	GENERAL CHARACTERISTICS					INTERNAL SPEED		MAGNETIC TAPE			PERIPHERAL EQUIPMENT					SPECIAL FEATURES					
											Input		Output							
	Average Monthly Rental	Solid-State	Storage Capacity and Type	Word Size	Instruction Addresses	Add Time	Average Access Time	Thousands of Characters per Second	Input-Output Channels	Buffering	Maximum Tape Units	Cards per Minute	Paper Tape Characters per Second	Cards per Minute	Paper Tape Characters per Second	Printer Lines per Minute	Index Registers	Indirect Addressing	Floating Point Arith.	Console Typewriter	Random Access File	Random Inquiry
12 IBM 705	$30,000		20-80K core	1a	1	86μ[1] 119μ[1]	9μ 17μ	15-62	6 10	RWC	60 100	250[4]		100[4]		150[4] 500[3]	0	✓		O		
	A variable-word length computer which can be used as a five-digit word computer. Magnetic tapes are controlled in Models I and II by either a 754 Tape Control, a 777 Tape Record Coordinator, or a 760 Control and Storage unit. In Model III, a 767 Data Synchronizer is used. The use of more than one 767 allows MRWC. Add time assumes a five-character field.																					
13 UNIVAC II	$28,000		2K core	12a	1	200μ	40μ	25	2	RWC	16	240[3]		120[3]		600[3]	0			I/O		
	Features two instructions per word and magnetic tapes with forward and reverse read. Off-line equipment includes the Unityper II for direct recording of data on magnetic tape, and a paper-tape to magnetic-tape converter which can also be used to produce paper tape from magnetic tape. Duplicate circuits are used to permit checking of all operations.																					
14 IBM 7070 7074	$24,000	✓	5-10K core	10d	1	60μ[1] 10μ[1]	6μ 4μ	15-62	4	RWC[1]	40	500[2]		250[2]		150[2]	99	✓[1]	✓	I/O	✓	✓
	A computer which features priority processing (making it possible to interrupt one program, switch over to a second program, execute the instructions in the latter, and then return to the first at the point of departure). Add time is variable by the number of digits in the field to be added. Indirect addressing is limited to scatter and gather operations. MRWC is possible when four channels are used. The rental of the 7074 is $5,300 more per month.																					
15 HONEYWELL H-800	$22,000	✓	4-32K core	12d	3	24μ	6μ	64[1]	16	MRWC	64	240[4] 650[4]	200[4] 1000[4]	100[4] 250[4]	60	150 900[4]	64	✓	✓	I/O		✓
	A computer with facility for running up to eight independent programs concurrently. It uses an automatic error correction feature, called Orthotronic count, when reading magnetic tapes in either direction. The computer can be used as a binary machine with a word size of 48 bits. Numeric information can be read at a rate of 96,000 digits per second.																					
16 BENDIX G-20	$20,000	✓	4-32K core	32b	1	15μ	6μ	120[1]	6	MRWC	500	800[4]	500[4]	250[4]	100[4]	1000[4]	63	✓	✓	I/O		✓
	All input-output units may operate either on- or off-line under program control. Input-output supervision can be delegated to control buffers. Variable instruction length permits multiple indexing. Numeric information can be read at a rate of 240,000 digits per second. A program interrupt signal can be initiated by a control buffer which can have up to 70 input-output units attached.																					
17 UNIVAC III	$20,000	✓	8-32K core	6d	1	9μ	4.5μ	25 133[1]	5	MRWC	32	700[1]		300[1]		700[1]	15	✓		I/O	✓	✓
	A computer featuring a flexible storage word which may have four alphabetic, six decimal, or 27 binary characters. An instruction may process up to four data words. Standard off-line input-output units of the UNIVAC line are available. Numeric information can be read at a rate of 200,000 digits per second. Program interrupt and scatter and gather operations are other features.																					
18 BURROUGHS 220	$17,000		2-10K core	10d	1	200μ	10μ	25	1	none	10	300	1000	100	60	150 1500[4]	1		✓	I/O	✓	✓
	A computer featuring a magnetic tape system which can search and scan independently of the central computer. Five hundred million digits of random access memory are available. Card input-output can be obtained through the use of Burroughs Model 293 and 292. A line printer, Model 289, is also available.																					
19 RCA 501	$16,000	✓	16-262K core	1a	2	360μ[1]	15μ	22-66	8	RC, WC or RW	63	400[4]	1000	150[4]	100 300	600[4] 900[3]	8	✓[1]		O	✓	
	A variable-word length computer featuring four-character (tetrad) parallel transfer, and magnetic tapes with forward and reverse read and dual recording. Indirect addressing is limited to scatter and gather operations. Add time assumes a five-character field and uses duplicate adder circuits to permit checking of arithmetic operations.																					
20 GENERAL ELECTRIC 210	$14,000	✓	4-8K core	6d	1	64μ	32μ	30 50	2	RWC	13	400 1500	200 500		60	1000[4]	1			I/O	✓	
	A computer which features on-line and off-line handling of magnetically encoded documents through 1200-document-per minute sorter-readers (of which a two-pocket or a twelve-pocket unit is available). The printer can print magnetically encoded characters. The computer can be used in a double precision (twelve-digit) mode.																					
21 NCR 304	$12,500	✓	2-4K core	10a	3	600μ 120μ[1]	60μ	30	8	RW[1]	64	2000[4]	1800[4]	250[3]	60[4]	850[4] 1200[4]	10		✓	I/O		✓
	A computer which uses two words per instruction. The internal commands include sort, merge, pack, unpack and a repertoire of microflow, single-address instructions. Pack and unpack can be used to condense numeric data in connection with the magnetic tape system which uses tapes without a space between records. In processing inactive records, RWC is achieved.																					
22 UNIVAC File Computer I	$12,000		20 core 1K drum	12a	3	8.6m	.9m 3.1m	10.4	10	RWC	31	150 240[3]	200	150 120[3]	60	600[4]	0			I/O	✓	✓
	A computer which can have up to ten general storage drums of 180,000 characters each (average across time is 17.6m). A search command for locating records on the drum is incorporated. The computer can be used in a scan mode to cycle through 32 possible input-output units. An off-line sort-collate unit is available.																					
23 UNIVAC SS 80/90	$9,000	✓	4K drum 1K fast	10d	1[1]	85μ	1.7m .425m	25	1	RC, WC	10	600 450		150 120[3]		600[4]	3				✓	
	The last part of the instruction word indicates the address of the next instruction. In addition to working with binary coded decimal, some operations can be performed in binary. Random access drums (Randex) at six to 24 million characters are available. It can be used as a satellite computer for any of the UNIVAC series.																					

	GENERAL CHARACTERISTICS					INTERNAL SPEED		MAGNETIC TAPE				PERIPHERAL EQUIPMENT					SPECIAL FEATURES					
												Input		Output								
	Average Monthly Rental	Solid-State	Storage Capacity and Type	Word Size	Instruction Addresses	Add Time	Average Access Time	Thousands of Characters per Second	Input-Output Channels	Buffering	Maximum Tape Units	Cards per Minute	Paper Tape Characters per Second	Cards per Minute	Paper Tape Characters per Second	Printer Lines per Minute	Index Registers	Indirect Addressing	Floating Point Arith.	Console Typewriter	Random Access File	Random Inquiry
24																						
IBM 650	$9,000		1-4K drum 60 core	10d	1[1]	.7m	2.4m .1m	15	1	RC, WC	6	155- 250	60	100- 250		150[4]	3		✓		✓	✓
	The last part of the instruction word indicates the address of the next instruction. Tape records can be written in either BCD mode (six-bit characters) or straight numeric form (four-bit characters). It is possible to use the 774 Tape Data Selector as an off-line tape editor. The Ramac units can store up to twelve million characters per unit, of which there can be a maximum of four units.																					
25																						
HONEYWELL H-400	$8,700	✓	1-4K core	12d	3	220μ	8μ	64[1]	3	RW	6	650	1000	100 250	60	900	3					
	A computer having some of the same features as the H-800. It offers Orthotronic count, magnetic tapes, and the same word flexibility, i.e., eight alphabetic characters, twelve decimal characters, and 48 binary bits. Numeric information can be read at a rate of 96,000 digits per second.																					
26																						
GENERAL ELECTRIC 225	$8,000	✓	2-16K core 8-32K drum	20b	1	40μ	20μ	15 55	7	MRWC	64	400	100 1000	100	60	600	3	✓	✓	O	✓	✓
	Double hyphen precision operations are included as part of the instruction repertoire. Facilities for handling magnetically encoded documents are available through 1200-document-per-minute sorter-readers. The computer can be connected with a transmitter-receiver unit for communication purposes.																					
27																						
BURROUGHS 205	$8,000		4K drum 80 fast	10d	1	1.7m	8.5m .85m	6	1	none	10	300	540	100	60	150	1		✓	I/O	✓	✓
	A computer system with fully buffered and edited card input-output and line printer. Independent search on magnetic tape for up to one million 200-character records, and a full paper-tape system are features of this equipment. The magnetic tape system features addressable blocks.																					
28																						
IBM 1401	$7,500	✓	1.4-16K core	1a	2[1]	230μ[1]	11.5μ	7.2-62	1	none[1]	10	800		250		600	3					
	A variable-word length computer using variable-length instructions. With the 1403 Chain Printer, this system can serve as an off-line input-output device for the 7070, 7080, and 7090 systems. Add time assumes a five-character field. A 500-character per second paper-tape reader and output typewriter are available. Magnetic tape start time may be shared with computing.																					
29																						
RCA 301	$5,000	✓	10-20K core	1a	2	189μ[1]	7μ	7.5	2	RC, WC or RW	12	600	100	100	100	600	1	✓			✓	
	A variable-word length, character-addressable system featuring magnetic tapes with forward and reverse read. Random access is available through disc Record Files (up to five, each with a capacity of 4.6 million characters). A special model featuring faster speeds in arithmetic and data transfer operations plus floating point arithmetic is also available. Add time assumes a five-character field.																					
30																						
DEC PDP-3	$4,400[5]	✓	4-32K core	36b	1	10μ	5μ	15	4	RC, WC	128		400		60		511	✓		I/O		
	A computer which features 511 words of main memory as index registers. The multiplication rate is 40,000 per second (25 microseconds complete), and the memory is expandable to 262,144 words. An optional feature is a cathode-ray tube display unit with light pen.																					
31																						
IBM 305	$3,600[5]		100 core 2000 drum[1]	1a	2	30m	10m	15	1	RC, WC	4	125	20 60	100 200		30-50[1] 150	0			I/O	✓	✓
	The computer has a 200-instruction capacity drum and the ability to call in additional instructions from the disc file, which is available in modules of five to 40 million characters (average access time is 250m). Input editing, logical decisions and character analysis are usually made through the 305 Control Panel. Each output unit has a separate control panel for format control. The "Stick" printer prints one character at a time.																					
32																						
EL-TRONICS ALWAC III-E	$3,600[5]		4-8K drum	33b	1[1]	1m	4m	21	1	RC, WC	16	100	200	100	60	150	1			I/O		
	Two, three or four instructions may be contained within one word. Hexadecimal notation may be used without affecting the operation of the computer. Magnetic tape units can be searched simultaneously with computer operations.																					
33																						
AUTONETICS RECOMP II	$3,000	✓	4K disc 16 fast	40b	1	9.5m 1.49m	9m .95m						400		20		0		✓	I/O		
	A desk-sized computer with magnetic disc memory, control console with decimal readout, and logical echo checking of output. The 49 commands are stored two per word and feature square root and absolute value instructions in both fixed and floating point operations.																					
34																						
RPC 9000	$2,500	✓	72 delay[1]	12a	1	.23m	.8m	52[1]	15	MRWC	120	400	60 500		30 300	150 1000	0	✓		I/O	✓	✓
	A computer using magnetic tape loops for external memory, each loop storing up to one million characters. Internal memory consists of nickel wire magnetrostrictive delay lines and is easily expandable. Separate buffers for input and output units allow mutiple-input-output and search-on-content operations. The 52,000 characters per second is a calculated search rate. Rental includes one magnetic tape unit.																					
35																						
DEC PDP-1	$2,200[5]	✓	1-4K core	18b	1	10μ	5μ	15	2	RC, WC	64		400		60		0	✓		I/O		
	A parallel-circuit computer which features logical instructions, twelve types of shifts, and ten test instructions. The memory is expandable to 28,672 words. Optional devices include a cathode-ray tube display with light pen, magnetic tape and others.																					

	GENERAL CHARACTERISTICS					INTERNAL SPEED		MAGNETIC TAPE				PERIPHERAL EQUIPMENT					SPECIAL FEATURES					
												Input		Output								
	Average Monthly Rental	Solid-State	Storage Capacity and Type	Word Size	Instruction Addresses	Add Time	Average Access Time	Thousands of Characters per Second	Input-Output Channels	Buffering	Maximum Tape Units	Cards per Minute	Paper Tape Characters per Second	Cards per Minute	Paper Tape Characters per Second	Printer Lines per Minute	Index Registers	Indirect Addressing	Floating Point Arith.	Console Typewriter	Random Access File	Random Inquiry
36 RPC 4000	$1,800	✓	8K drum 128 fast	32b	1[1]	 1.0m	8.5m 5.0m						60 500		30 300		1			I/O		
	The last half of the instruction word indicates the address of the next instruction. A desk-sized computer featuring a repeat execution command which allows groups of from one to 128 successive words to be operated on within memory by one command at high speed.																					
37 IBM 1620	$1,600	✓	20K core	1d	2	560μ[1]	20μ		1			250	150	125	15		0			I/O		
	A variable-word length computer with overlapped memory banks for increased speed. Alphabetic characters are represented by two decimal digits. Magnetic tapes may be added. Add time assumes a five-character field.																					
38 BENDIX G-15	$1,500[5]		2K drum 16 fast	29b	1[1]	 1.08m	14.5m .54m	.43	1	RC, WC	4	100	400	100	60	100	0			I/O		
	One part of instruction word indicates address of next instruction. Magnetic tapes, cards, graph plotters, and a digital differential analyzer are available. Alphanumeric input-output is completely buffered. Special accessories permit on-line use with analog systems.																					
39 CONTROL DATA 160	$1,500[5]	✓	4K core	12b	1	12.8μ	6.4μ	15 30	1	none[1]	20	1300	350		60	1000	0	✓		I/O	✓	✓
	A desk-sized computer featuring parallel circuitry and versatile input-output capabilities for peripheral equipment. The instruction code allows no address, direct address, indirect address, and relative address modes. Magnetic tape start time may be shared with computing.																					
40 PACKARD BELL PB 250	$1,200[5]	✓	1.8-16K delay 16 fast	22b	1	 24μ	1.5m .09m	2	1	none	6		10 300		10 110		1			I/O		
	The commands include double-precision arithmetic, variable-length multiply, divide, and square root. Peripheral equipment includes card equipment and analog-to-digital and digital-to-analog converters. Internal storage is magnetostrictive delay lines.																					
41 RPC LGP-30	$1,100		4K drum	31b	1	2.26m[1]	8.5m						200		20		0			I/O		
	A desk-sized computer featuring an interlaced pattern of word addresses on the drum, which reduces memory access time. An oscilloscope displays contents of control register, instruction register, and accumulator.																					
42 BURROUGHS E-101	$900		220 drum	12d	1	50m	10m						20		10	60	2			I/O		
	A desk-sized computer using pinboard programming. Multiple paper-tape input and output and card input and output are optional. Simplicity of programming and operator control are major characteristics of this equipment. (Machine now being marketed as the E-103.)																					
43 MONROBOT XI	$700	✓	1K drum	32b	1	9m	6m					15	20	15	20					I/O		✓
	Limited random access inquiry is available via the drum and one or two paper-tape loops. Input-output facilities, up to any combination of three units, are time-shared.																					

EXPLANATION OF COLUMN HEADINGS

Average Monthly Rental: Rough approximation of what a customer might expect to pay for a complete system with basic peripheral equipment and tapes when available. With so many options available on every system, no precise standard of cost measurement is possible. The figures given should not be used for direct comparison of competitive equipments.

Solid-State: Checkmark indicates that the central system contains few, if any, vacuum tubes. Presumably this, in turn, implies greater reliability, smaller size, lower power requirement, and less heat generation than would be the case were vacuum tubes used.

Storage Capacity and Type: Number of words of addressable internal storage available, K representing "thousand" (e.g., "16-262K core" for the RCA 501 indicates that the internal storage consists of magnetic cores and that from 16,000 to 262,000 words are available at the user's option, a word in this case being a single alphabetic character as shown in the Word Size column). "Fast" indicates a serial-type, fast-access secondary storage, found primarily in drum computers.

Word Size: Number and type of digits comprising one word in storage. (a = alphanumeric, d = decimal, b = binary)

Instruction Addresses: Number of separate storage addresses in a conventional instruction.

Add Time: Time required to acquire and execute one add instruction, in millionths (μ = microseconds) or thousandths (m = milliseconds) of a second. In the case of drum machines, where the add time is lower than the average access time, maximum optimization has been assumed.

Average Access Time: Storage cycle time (including, for example, half of the drum revolution time in the case of drum storage) in millionths (μ) or thousandths (m) of a second.

Thousands of Characters per Second: Transfer rate from computer to tape or vice versa, measured in six-bit characters (one alphabetic, one decimal, or six binary digits) unless otherwise noted.

Input-Output Channels: Number of separate groups of magnetic tapes, usually with a separate buffer for each channel.

Buffering: Combinations of the three operations of reading magnetic tape (R), writing it (W), and computing (C), that can be performed simultaneously. MRWC indicates that multiple reading and writing is possible simultaneously with computing.

Maximum Tape Units: Maximum number of tape units connectable to and addressable by the computer, without regard to simultaneity.

Peripheral Equipment: Speed of each available punched card, punched tape, and printer equipment available. See footnotes for meaning of superscript numbers.

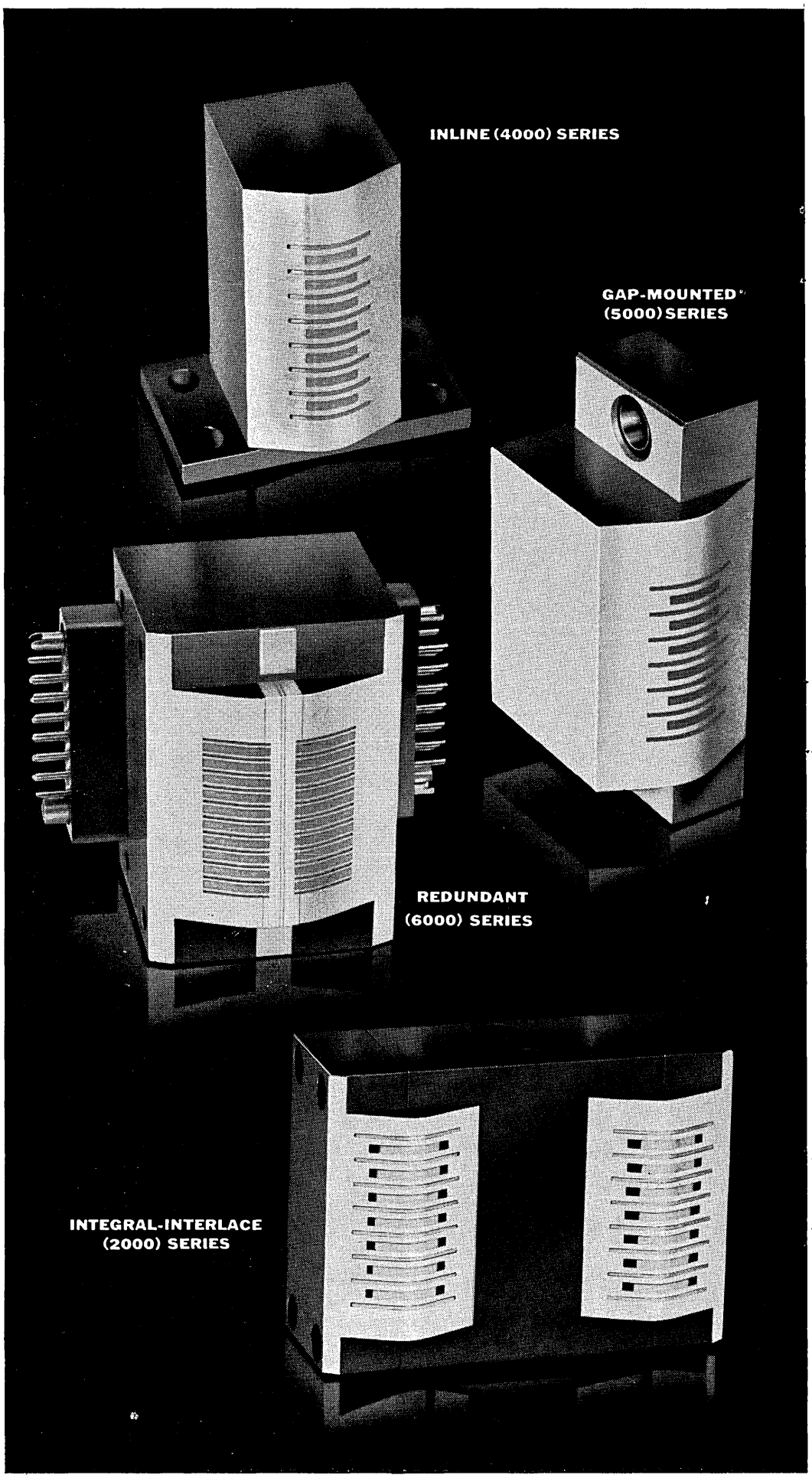
Special Features: Checkmark indicates that some form of the special feature in question is obtainable. In the case of index registers, the maximum available number of such registers is shown, while in the case of console typewriters, O and I/O are used to represent typewriters usable for output or both input and output. Floating point arithmetic can, of course, be programmed in any system in which it is not available as a built-in feature; only built-in features are marked here.

INTEGRAL-INTERLACE (2000) SERIES: Two inline head stacks (with interlaced channels) mounted on integral "H" block record more channels per inch of tape width, while maintaining high output per channel and strong shielding against channel crosstalk. Patented "gap-mounted" feature ensures accurate location of each stack. IRIG telemetering standard available (exclusive design maintains IRIG time relationship despite normal head wear). Identical (non-interlaced) stacks can be used in redundant analog applications.

INLINE (4000) SERIES: Records or reproduces simultaneously on many channels of a single tape or drum. Precise perpendicularity and colinearity of gaps and accurate track width and location with reference to other tracks and base assures reliable data transfer to and from media. Base and full metal-face machined for correct azimuth and contact angle (standard and special base mountings available).

GAP-MOUNTED® (5000) SERIES: Unique head stack mounting permits quick interchangeability without critical adjustment of head azimuth, contact angle or gap perpendicularity. Adjoining faces of head and mounting structure are lapped with reference to the gap line. Mounting structure is adjusted permanently and four set screws hold head in precise location.

REDUNDANT (6000) SERIES: Two identical head stacks are mounted opposite each other in a single structure, with closely spaced gap lines (down to .150 inch). Digital data recorded by first stack is read for reliability check by the second stack. Close spacing between gaps reduces storage capacity required in checking register.



SIMPLIFY RELIABLE RECORDING SYSTEM DESIGN WITH...

CLEVITE

"optional characteristic" magnetic heads

An analysis of present usage and future trends in magnetic recording heads, transports, media, and associated electronics indicates areas for partial standardization of these interdependent components. Within the framework of these partial standards, Clevite offers "optional characteristic" magnetic heads to simplify the design of reliable analog and digital recording systems.

These new designs provide a choice of electrical characteristics. Four basic mechanical configurations are available in six compatible tape formats with track widths from .020 inch to .050 inch, and spacings of .050 inch to .140 inch. These provide from 7 to 20 inline channels per inch.

Detailed mechanical drawings and specifications plus actual electrical performance data are available *before the fact*. This allows the design engineer to predict reliably the overall recording system performance.

Clevite continually produces beneficial design improvements in such areas as high resolution and flux-responsive readout, and high-efficiency record structures. As these developments are field-proved they are adopted in Clevite "optional characteristic" designs. These dynamic standards thus offer recording system designers magnetic heads that include up-to-date advances in recording technology.

Write today for Bulletin 9398 on Clevite "Optional Characteristic Magnetic Heads"

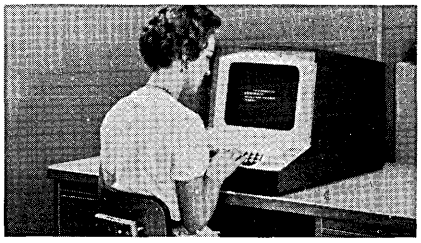
brush INSTRUMENTS
DIVISION OF
37TH AND PERKINS — CLEVITE CORPORATION — CLEVELAND 14, OHIO

ELECTRICAL CHARACTERISTICS						
	Designation	Description	Inductance (maximum)	Gap Length	Bias Current*	Record Current**
ANALOG	ARL	Low impedance record head. Used with transistor driver.	1.30 MH	.0005"	6 to 20 MA, up to 1 mc	0.7 MA 8db below saturation
ANALOG	ARH	High impedance record head. Used with vacuum tube driver.	10 MH	.0005"	2 to 4 MA, up to 500 kc	0.2 MA 8db below saturation
ANALOG	APH-ACH	High impedance playback head or combination record/playback head.	80 MH	.00025"	1 MA up to 60 kc	.09 MA
ANALOG	ACL	Low impedance combination record/playback head for use up to 100 kc at 60 ips with 400 kc bias, or to 200 kc at 120 ips with 1 mc bias on half winding.	15 MH	.00025"	2.5 MA	0.1 MA
DIGITAL	DRL	Low impedance record head. Used with transistor driver. 12 volts single ended, or 6 volts double ended.	4.5 MH	.0005"	——	9 MA peak
DIGITAL	DRH	High impedance record head. Used with vacuum tube driver. Used as playback with DRL head.	55 MH	.0005"	——	3.5 MA peak
DIGITAL	DRP	Redundant record playback head.	18 MH	.0005" each	——	4 MA peak

*Depending on bias frequency and channel spacing.
**Analog—8db below saturation for minimum distortion.
Digital—for 130% saturation at 200 flux changes per inch, 60 ips.

datacom

This electronic display and control link accepts digital information at line speed, automatically translates it to ordinary alpha-numeric characters and presents a cathode ray tube display. As the information is being displayed, the



operator may approve its contents, or he may alter them in part or in total by striking a standard typewriter keyboard. Both incoming and outgoing records are held in the display unit until the operator punches the send button, causing the unit to retranslate the information to coded form and transmit it automatically to the computer or other equipment. Capable of receiving and sending digital data at speeds of approximately 3600 characters per second, the unit provides automatic interface matching between data processing units or between communications and data processing systems. The complete unit is packaged on a desk-size console. THE ELECTRADA CORP., Northrop Bldg., 9744 Wilshire Blvd., Beverly Hills, Calif.

CIRCLE 200 ON READER CARD

magnetic shift register elements

A new magnetic shift register element that can operate at low power levels and permits extremely dense packaging of components, can be assembled in modules with up to ten elements per inch. Its wafer construction permits assembly of shift registers of any desired length, and is adaptable to semi-automatic fabrication and testing techniques. Initial electrical design of the serial driven, gated transfer element permits operation at an information rate of 100 kilocycles per second at a peak shift pulse power of only 0.1 watts. With all of the component parts arrayed in a single plane instead of the conventional three-dimensional assembly, the shifting function is accomplished with a single turn on each magnetic core. GENERAL ELECTRIC CO., 212 N. Vignes St., Los Angeles 12, Calif. For information:

CIRCLE 201 ON READER CARD

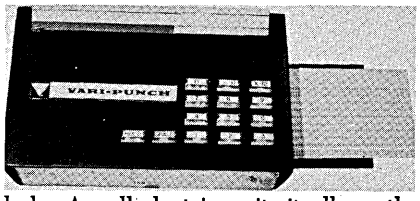
digital computer

The E103 combines all of the features of the E101 with data processing capability, according to the manufacturer. An accounting machine printer and a new control unit will be standard equipment on the E103. The machine's problem-solving capabilities may be extended by optional paper tape and/or punch card equipment for input and output. The general purpose computer also will feature a magnetic drum memory with storage capacity for 220 word (12 digits plus sign). Simplified external pinboard programming permits use of the computer with a minimum of operator training. BURROUGHS CORP., Equipment & Systems Div., Detroit 32, Mich. For information:

CIRCLE 202 ON READER CARD

processing unit

A new portable data processing unit permits "on-the-spot" processing of IBM cards. The unit, while punching IBM holes, simultaneously prints on the card, inline with the punched holes, a number identifying the "tabulating value" of the



hole. An all-electric unit, it allows the insertion of variable data on an IBM card, directly at the source. It is available in two production models, will punch and print 40 columns (model A) or 80 columns (model B). VARIFAB, INC., High Falls, N.Y. For information:

CIRCLE 203 ON READER CARD

printed circuit module

A new transistorized printed circuit module translates four bit binary codes to decimal. Called the CM-104 circuit module, it is designed for plug-in mounting and contains ten AND-gates with inverters. Eight input lines enable a four-bit binary code and its complement to be entered for translation. To define a decimal number in binary form, four binary inputs to each not-and gate are necessary. The inputs are obtained by appropriate combinations to the eight inputs. The output of each not-and gate is a binary voltage representing one decimal number. DATEX CORPORATION, 1307 S. Myrtle Ave., Monrovia, Calif. For information:

CIRCLE 204 ON READER CARD

transistors

Two series of gemanium alloy junction transistors designed for use in computers at increasing frequencies have been announced. The NPN and PNP types, eight in all, have the following maximum ratings: Collector to base voltage – 25V, emitter to base voltage – 25V, collector current – 300 MA, power dissipation in free air – 150 MW, and temperature range – –65°C to +100 C. SYLVANIA ELECTRIC PRODUCTS INC., a Subsidiary of General Telephone and Electronics Corp., 730 Third Ave., New York 17, N.Y. For information:

CIRCLE 205 ON READER CARD

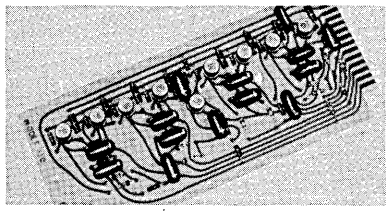
line programming rack

A line programming rack can handle a large number of signal lines and also features change of programming in a matter of seconds. Model 254 line programming rack can crosspatch and/or terminate 2360 signal lines for data separation and data presentation equipment, an unusual amount for the size of the programming rack. Rapid change in programming, which can be accomplished in seconds instead of hours, is made possible through the use of a color coded programming panel and taper pin connections. Another feature is that all rear terminations are located on swinging doors for easy access. A total of 575 patch cords are supplied and a color coded removable programming patch panel is used. E D P CORPORATION, 3501 S. Orange Blossom Trail, Orlando, Fla. For information:

CIRCLE 206 ON READER CARD

binary decade counter

A transistorized binary decade counter, model 11G, is designed to count in the 1-2-4-8-mode. The unit provides compatibility with the IBM data coding. Complementary outputs in the form of



direct collector connections enable up to three milliampere loading for many external logical manipulations. Designed to operate from zero to 100 KC the counter supply voltage may be varied by over 2 to 1 margin. This feature

new from **Clary**

a data input unit that fits in any system!

Now from Clary comes a revolutionary new direct entry keyboard!

It's flexible – works with any checkout, data-logging, testing, or other system; with any computer; with any digital instrument... can be rack or console mounted.

It's versatile – features a 10-key keyboard, with up to *30* control keys. (Standard model shown has 5 control keys.) Indicator lights are available for special applications.

It's easily adaptable – requires no outside technical help for integration into existing systems.

It's reliable – made by the company, with over 20 years' experience in designing and manufacturing precision keyboards.

It's low in cost – lower in initial cost, lower in maintenance and repair costs.

For complete information on how this Clary input keyboard can fit in your system, simply write direct to the Clary Electronics Division and state your requirements.

Clary CORPORATION
San Gabriel, California

CIRCLE 10 ON READER CARD

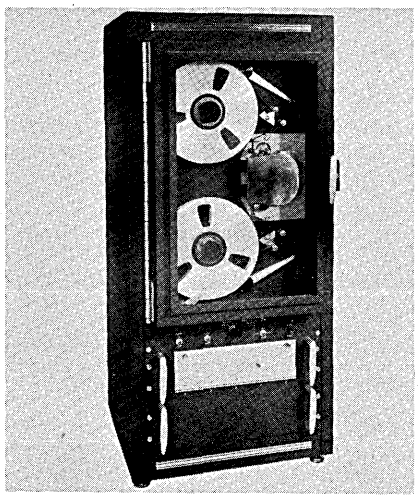
NEW PRODUCTS . . .

permits application of the model 11C to existing power sources in the range ±7.5 volts to ±17 volts. It is constructed in conformance with MIL-STD-275. ELECTRONICS COUNTERS, INC., 155 Eileen Way, Syosset, L.I., N.Y.

CIRCLE 207 ON READER CARD

digital tape transport

A new, low speed digital tape transport, model DT 10, will read, write, or read after write from 0.1 to 15 inches per second in specifically selectable speeds or continuously variable speeds controlled manually or remotely for any type computer format. Constant tape tension is insured by separate reel



servos. Uni- or bi-directional fast stop-start modes are possible for all types of programs. Both fast forward and fast reverse modes are servo controlled for constant tape tension, thus assuring gentle tape handling. SHEPHERD INDUSTRIES, INC., 103 Park Ave., Nutley 10, N.J. For information:

CIRCLE 208 ON READER CARD

transistor

The 2N769 MADT switching transistor features an 800 mc gain bandwidth product, low hole storage factor, and low emitter and collector diode capacities. The new PNP germanium units are intended for usage in saturated switching circuits at switching rates up to 300 mc. The transistor is displayed in a 150 mc binary counter. The circuit is resistor-capacitors coupled and sine-wave triggered through three steering diodes. A 75 mc output is shown on an oscilloscope. PHILCO CORP., Lansdale Division, Lansdale, Penna. For information:

CIRCLE 209 ON READER CARD

high-frequency current probe

The P6061 ac current probe and type 131 amplifier constitute a current-detecting system for use with a wideband oscilloscope. This system provides accu-

New from Royal Precision... RPC-9000

THE LOWEST-PRICED COMPLETE DATA PROCESSING SYSTEM ON THE MARKET TODAY!

Economical design: The new, completely-transistorized RPC-9000 is designed for serial mode of operation. This feature utilizing magnetostrictive delay lines for high-speed memory permits great reduction in original equipment costs. Tape transports using continuously revolving loops of magnetic tape rather than "start-and-stop" techniques further cut initial investment.

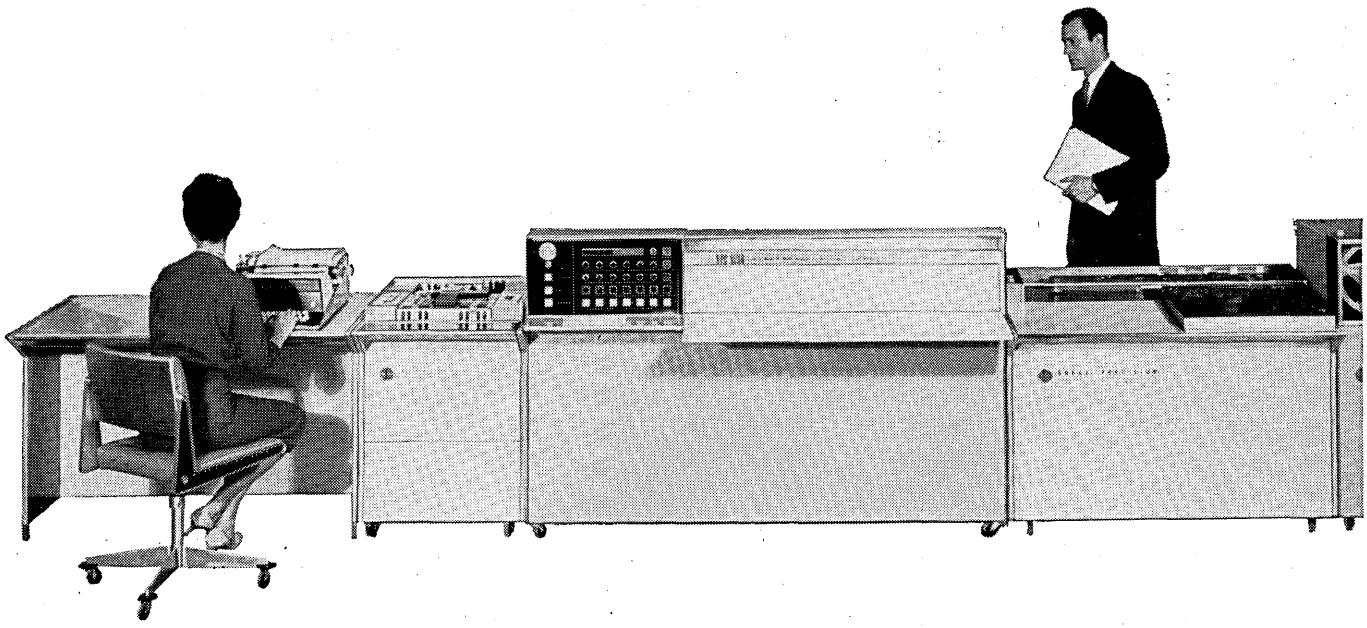
Efficient operation: The RPC-9000 processes data "in line." Data are accepted in random order, and all affected records are automatically updated in a single uninterrupted sequence of operations. No batching or sorting is necessary. Data are recognized by content, not location. This eliminates the need for location codes, and allows efficient utilization of storage capacity. Eight separate records are searched simultaneously. Completely buffered input-output permits simultaneous operation of all system components.

Tailored to your needs: With the RPC-9000 you buy the exact amount of data processing you require. Start with the basic system—computer, tape-typewriter, magnetic tape storage unit. Then, as your volume grows, you can add high-speed paper-tape punches and readers; punched card readers; line printers; additional tape typewriters; more magnetic tape cartridges; more internal memory. You can operate up to 30 of these devices at the same time.

Economical in use: The RPC-9000 is designed for ease of operation and maintenance. It uses power from any ordinary wall outlet, requires no air conditioning or site preparation. This low-cost system will perform the full range of your data processing needs. See your nearby Royal McBee Data Processing Systems Sales Representative without delay, or write to the address below for comprehensive brochure.

Royal Precision Corporation

Royal Precision—producers of the LGP-30, the RPC-4000 and the RPC-9000—is jointly owned by the Royal McBee and General Precision Equipment Corporations. Sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing Offices.



MARKETED BY ROYAL McBEE, DATA PROCESSING DIVISION, PORT CHESTER, N. Y.

If you have sales ability, and are interested in electronic data processing contact your nearest Royal McBee Data Processing Office, or write Sales Administration Director, Royal McBee Corporation, Port Chester, New York.

CIRCLE 12 ON READER CARD

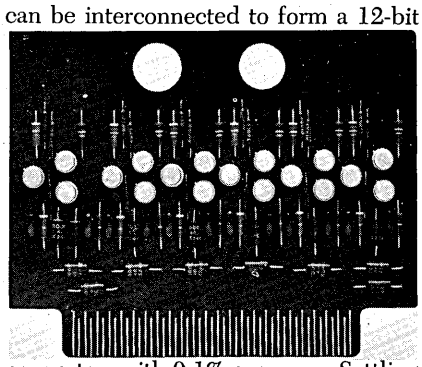
NEW PRODUCTS. . .

rate displays for observation and measurement of current waveforms of low amplitude and fast risetime. Current range is 1 ma to 10 amps. Passband, with a 30-mc oscilloscope, is 50 cps to 17 mc. A second system comprises the P6061 with a passive termination. Although less versatile, the system provides observation and measurement of current waveforms at frequencies to 20 mc and sensitivity of either 2 or 10 ma/mv. TEKTRONIX, INC., P.O. Box 500, Beaverton, Oregon. For information:

CIRCLE 210 ON READER CARD

analog-to-digital converter

The BDA-6 is an accurate digital-to-analog converter available as standard plug-in etched modules. Each module contains 6 stages and can be used as a 6-bit converter. Two identical modules can be interconnected to form a 12-bit



converter, with 0.1% accuracy. Settling time for a full scale voltage change, 10 volts, is 2 usec. The converter can be driven by stroke gates and flip-flops. Output impedance of the converter is 2250 ohms. ABACUS, INC., 3040 Overland Ave., Los Angeles 34, Calif. For information:

CIRCLE 211 ON READER CARD

digital computing units

A new series of low-cost digital computing units is used in data-processing and other equipment where computations are desired but the complexity of a costly general-purpose computer is not needed. The model 3-300 series perform on-line digital computations in any mode—addition, subtraction, multiplication or division. These fully-transistorized units are adaptable to any type of digital system and will handle various data codes. Each unit includes its own power supply, internal programming and control, and self-checking circuitry. APPLIED DEVELOPMENT CORPORATION, 12838 Weber Way, Hawthorne, Calif. For information:

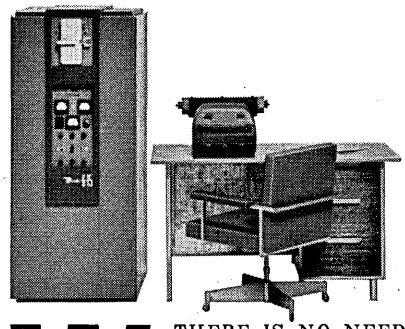
CIRCLE 212 ON READER CARD

generator and display system

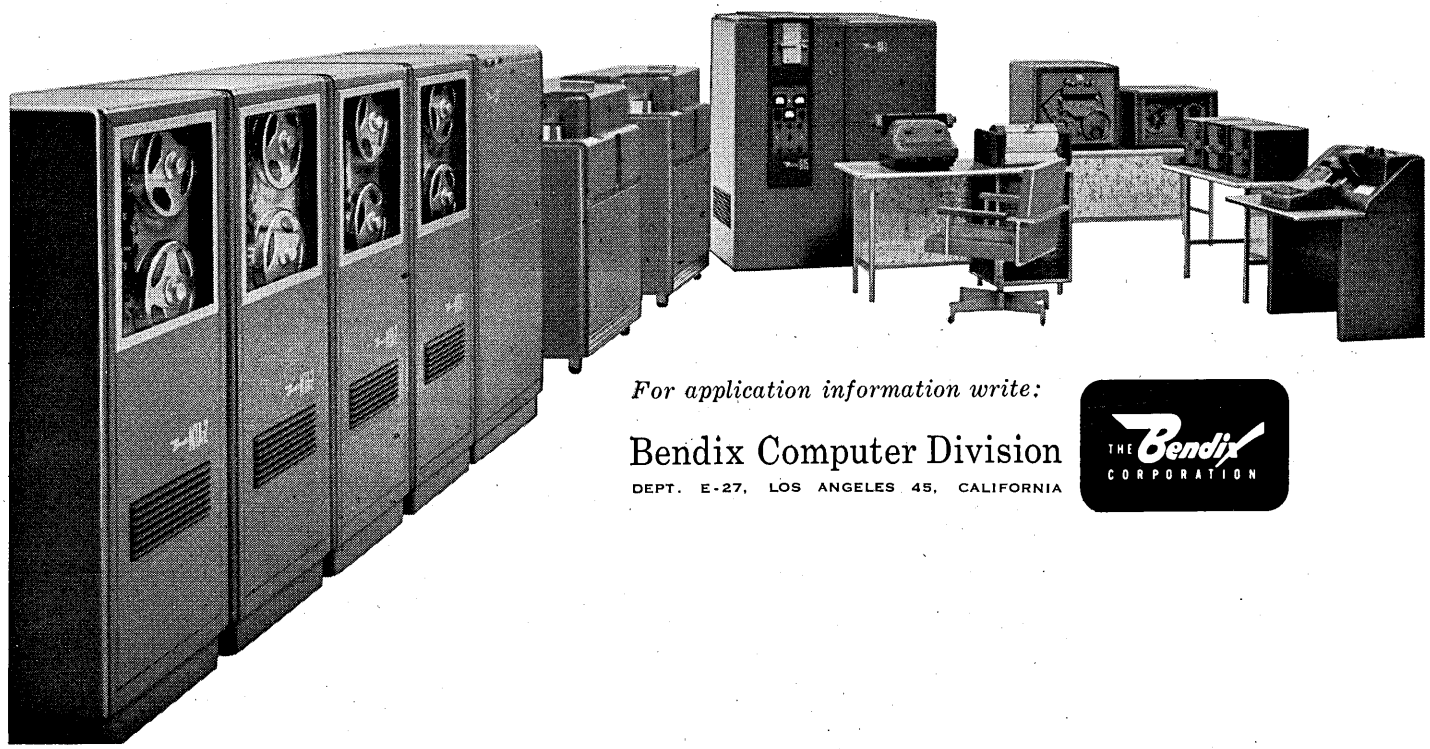
A new character generation and display system provides generation and display of symbols, alphanumeric characters, or any arbitrary pattern of lines on the face of a cathode ray tube or other projection

WITH THE BENDIX
G-15 COMPUTER YOU CAN

START NOW



THERE IS NO NEED TO DELAY that important decision to install a computer. At a low initial investment . . . without adding special personnel or facilities, you can *start now* to provide your firm with the money-saving speed and precision of proven electronic computation. ● And you can inaugurate your computer program with the foreknowledge that the G-15 can be easily expanded, easily adapted to your computational growth . . . without re-programming, without awkward modifications. You know from the beginning that your G-15 will be able to easily assimilate the full range of input-output devices—paper tape, punched cards and magnetic tape, in addition to special code conversion, printing and graphic output units . . . all proven in a wide variety of applications. Simplified, minimum-cost application expansion is made possible by an extensive library of Bendix routines and automatic programming systems. ● Thus, with equal efficiency, the G-15 has served a one-man company and corporations of many thousands. More important, that one-man company has grown to a team of 47—still economically served by an enlarged G-15 system. ● These facts point to the practical economy and ease of initiating your data processing program . . . moving from a low cost basic G-15 computer to a powerful, integrated medium-scale system, capable of spanning the full range of scientific and commercial applications. They make clear that there is a G-15 system to match your data processing requirements . . . *starting now.*



For application information write:

Bendix Computer Division
DEPT. E-27, LOS ANGELES 45, CALIFORNIA

THE Bendix CORPORATION

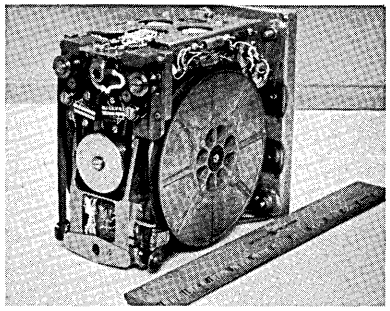
CIRCLE 13 ON READER CARD

tube equipment. Characters or symbols are formed as a sequence of closely adjacent luminous dots, which are held motionless at the required deflection positions to form a precisely defined spot and then instantaneously deflected to the adjacent position. Simple resistor networks divide a single reference voltage into the desired X, Y coordinates for each spot. A high speed stepping switch selects resistors required to generate a symbol. GENERAL PRECISION, INC., Link Division, Binghamton, N. Y. For information:

CIRCLE 213 ON READER CARD

recorder/reproducer

A five-pound magnetic tape recorder/reproducer will record, reproduce and erase teletype communications between the ground and a satellite. It has a capacity for recording five minutes on one channel at 30 inches per second, after which the tape can be reversed and will reproduce on the return. Erasing will be accomplished by a permanent magnet erase head both after reproduce and before record to

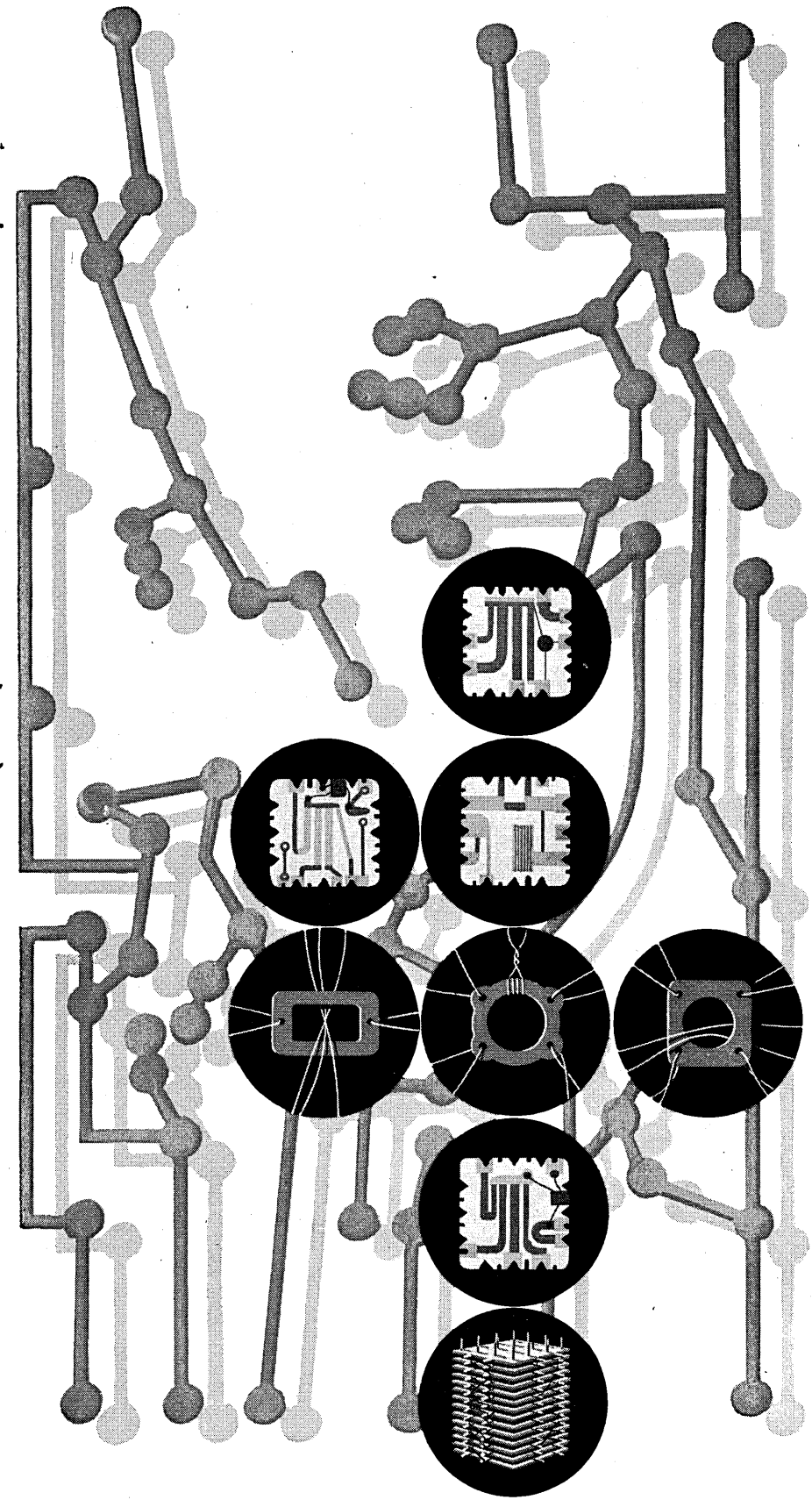


insure reliability. The tape unit includes a tape remaining indicator that transmits its information to the ground along with its communication data. All electronics use solid-state components and include record and reproduce amplifiers and a power supply which converts dc to ac for the drive motor and regulates the dc supply. CONSOLIDATED ELECTRODYNAMICS CORP., 360 Sierra Madre Villa, Pasadena, Calif. For information:

CIRCLE 214 ON READER CARD

transducer equalizer

A new transducer equalizer provides a method to receive and observe in real time, as well as to accurately record analog data otherwise masked and destroyed by the limitations of the measuring system. It virtually eliminates undesirable ringing which results from the excitation of the transducer at or near the natural resonant frequency. Essentially an analog computer, it performs by inserting into the data a complex transducer function which is reciprocal of the transducer transfer function. Designed for on-line



ADVANCED COMPUTER RESEARCH AT LOCKHEED

Challenging new concepts in the computer field are being investigated at Lockheed's Missiles and Space Division research laboratories in Palo Alto, California. Important progress is being made in pure and applied research as well as in the development of new and unusual design concepts.

Advanced research programs are being carried on in such areas as: Switching theory • Modular codes • Logical design • Mechanical language translation • Digital system theory • Ferrite-wire logic circuits • Tunnel diode circuits • Microwave digital techniques • Magnetic thin films • Micro circuitry

Engineers and Scientists who are able to make contributions in these areas are invited to write to: Research and Development Staff, Dept. L-46, 962 West El Camino Real, Sunnyvale, California. U.S. citizenship or existing Department of Defense industrial security clearance required.

Lockheed

MISSILES AND SPACE DIVISION

Systems Manager for the Navy POLARIS FBM; The Air Force AGENA Satellite in the DISCOVERER, MIDAS and SAMOS Programs

SUNNYVALE, PALO ALTO, VAN NUYS, SANTA CRUZ, SANTA MARIA, CALIFORNIA
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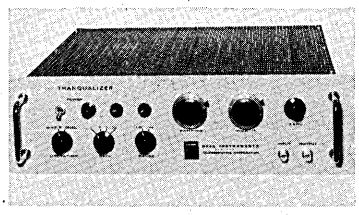
when responding, a mention of DATAMATION would be appreciated



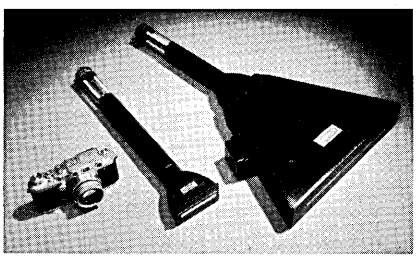
use, it can also recover data and thereby simplify this operation. Principally used with high-response data acquisition systems, it analyzes and records high-speed changes in pressure, temperature, acceleration, and luminosity. TELECOMPUTING CORP., 12838 Saticoy St., North Hollywood, Calif. For information:

CIRCLE 215 ON READER CARD

NEW PRODUCTS . . .

electrostatic printer tubes

Four new electrostatic printer tubes can translate electronic signals into printed words and pictures on paper. The high speed tubes can print 20,000 characters per second or more than 10,000 lines of computer output information a minute. The new tubes resemble flattened cathode ray picture tubes with wire matrices resembling stubby beads across their faces. Wires, .001 in. thick and spaced 250 to the inch, extend brush-like through the faces of the tubes. Two of the new

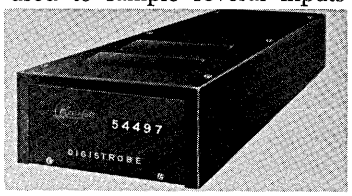


tubes were designed for label and short copy printing. The other two can print electronically-stored or transmitted information on full-page sheets. All four of the tubes employ a medium persistence green fluorescence and have magnetic deflection and focusing. RAYTHEON COMPANY, 55 Chapel St., Newton, Mass. For information:

CIRCLE 216 ON READER CARD

digital display

A new digital display employs the stroboscopic principle to provide an in-line, in-plane, white-on-black display. Through the use of a unique shutter arrangement, a single diode-encoding matrix is shared by all columns. Because of its speed, a single display can be used to sample several inputs on



command, thus replacing as many as fifteen individual displays of existing types. Since this unit operates directly from the output register of a computer, counter or allied equipment, intervening circuitry is rarely required. GENERAL PRECISION INC., Kearfott Division, 1150 McBride Ave., Little Falls, N.J. For information:

CIRCLE 217 ON READER CARD

logic circuit plug-ins

A new series of 2011 five megacycle Logix Blocks, is a complete set of high speed, logic circuit plug-in cards, for layout and assembly of digital computers, data processing equipment, high speed magnetic memories, digital communication links, digital simulation and related equipments. Transistor operated, with data rates from dc to five megacycles, these new circuit modules feature gates, flip-flops, inverters, amplifiers, and pulse generators. RESE ENGINEERING, INC., 731 Arch St., Philadelphia, Penna. For information:

CIRCLE 218 ON READER CARD

stepping relay

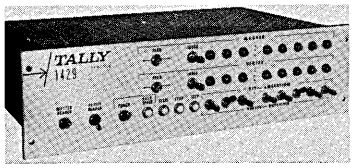
A new midget stepping relay is available for multiple applications including use in computer circuits. High contact rating: three amps resistive, one amp inductive made possible by contactor action, dual make-break, positive circuit isolation contact mechanism. The units eliminates wiping contacts, bridged cir-

cuits and, in most applications, slave relays. It operates on continuous duty from 3 to 230 v.d.c.; continuous rotation—up to 30 steps per second. No reset is present in production items which include: dc continuous duty; ac intermittent duty; ac continuous duty now in the development stage. GUARDIAN ELECTRIC MFG. CO., 1550 W. Carroll Ave., Chicago 7, Ill.

CIRCLE 219 ON READER CARD

tape verifier, duplicator

Model 1429, used in conjunction with punched tape readers and perforators, automatically duplicates and verifies or verifies and duplicates error free tapes

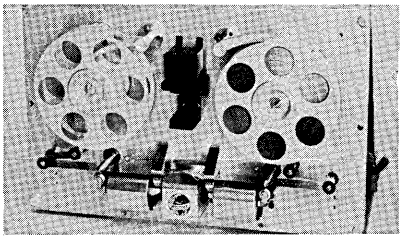


in one operation. The new unit handles tapes from one through eight channels in any code structure. The 1429 will verify duplicate at 60 ch/sec and failure to verify automatically stops the duplication function without punching an error character. Characters in disagreement are displayed for possible correction. Electrical requirements – 115V, 60 cycle AC at approximately four amperes. TALLY REGISTER CORP., 1310 Mercer St., Seattle, Wash. For information:

CIRCLE 220 ON READER CARD

punched tape reader

A high-speed punched tape reader capable of stopping on character at the normal tape reading rate of more than 200 eight-bit characters per second is now available. The unit will read characters on punched one-inch Mylar or paper tape, with a tape capacity of 550 ft. An optical scanning system reads the



characters without stopping the tape. Photo-sensitive silicon diodes and completely transistorized circuits provide dc response characteristics in the data channels. WESTREX RECORDING EQUIPMENT DEPARTMENT, 6601 Romaine St., Hollywood 38, Calif. For information:

CIRCLE 221 ON READER CARD

data originator

The first source data originator designed exclusively for data processing in accountancy is available in both single-register and duplex models. Compatible

WHICH COMPUTER?

Before you make the decision here are 9 significant facts about Control Data's Customer Services

From the very beginning of your studies... these services are provided:

1. SYSTEM PLANNING
Control Data provides system analysts to assist your personnel in determining system procedures, techniques, and operations.

2. FEASIBILITY STUDIES
Control Data's technical representatives present the facts and answer questions for your feasibility committee about the capabilities of the 1604 Computer and its use in your system.

3. APPLICATION STUDIES
Control Data's application analysts assist you in making the necessary timing analyses, in perfecting optimization techniques, in obtaining subsystem utilization, in performing operational evaluation for your system.

After you have selected the 1604 Computer... these complete customer services are also yours:

4. PROGRAMMING ASSISTANCE
Control Data provides programming assistance to help you obtain the most efficient programs possible. Of course, large numbers of 1604 programs are automatically yours. These include standard service library routines, debugging routines, mathematical functions written in both fixed and floating point arithmetic, input-output routines, tape handling routines—as well as assemblers and simulators.

5. FORTRAN II COMPATIBLE COMPILER—Control Data provides the Fortran II Compatible Compiler, which will accept any problems written in Fortran language.

6. COMPUTING CENTER FACILITIES
Control Data provides your programming personnel the facilities of a high-capacity computing center *while your 1604 Computer is being built.* The center includes the large-scale 1604, the desk-size 160, and complete line of peripheral equipment. Your personnel are also assisted as they assemble, check-out, or time your system programs.

7. CUSTOMER TRAINING COURSES
In Control Data's regularly scheduled classes, your personnel are trained in programming, maintenance, and operation of the 1604 Computer. Equipment in the computing center is used by customer trainees as a regular part of the course work.

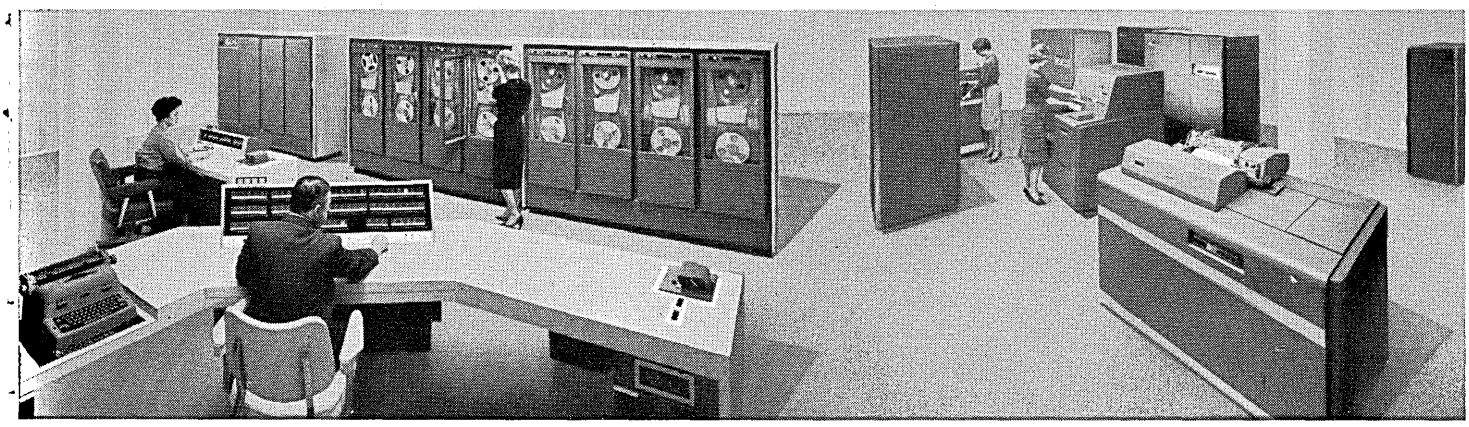
When your 1604 is installed...

8. INSTALLATION—Installing the 1604 Computer and associated equipment is the responsibility of the *same* project engineer and team who "lived" with the computer during its assembly, check-out, and pre-delivery acceptance tests. *Average installation time is 5 days.*

9. MAINTENANCE—Control Data provides comprehensive maintenance with either the rental or purchase of the 1604 Computer. If you elect to rent a 1604, Control Data places a maintenance team on your site—on call 24 hours a day. Where the 1604 is purchased, Control Data provides complete maintenance under contract, or a technical representative to assist and advise your maintenance personnel.

Other significant facts...

Control Data's advanced, large-scale 1604 Computers have been customer-operated an average of 72.3 hours per week since acceptance—with an uptime of 98.5%. The 1604 costs hundreds of thousands of dollars less than comparable computers.

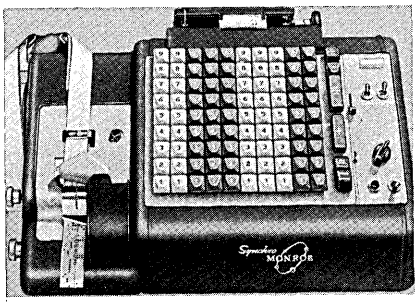


FOR COMPLETE INFORMATION *about Control Data's customer services and full-line of completely transistorized computers, Phone FEderal 9-0411 . . . wire or write:* **MR. GEORGE S. HANSON,** *Director of Sales*

CONTROL DATA CORPORATION

501 PARK AVENUE • MINNEAPOLIS 15, MINNESOTA

When responding, a mention of DATAMATION would be appreciated.



with data processors of all service bureaus, the portable accountants' program machine universalizes source data origination in processing for accountants. The machine features automatic repetition of all code information, eliminating the need for re-indexing repetitive reference numbers. MONROE CALCULATING MACHINE CO., INC., Orange, N. J. For information:

CIRCLE 222 ON READER CARD

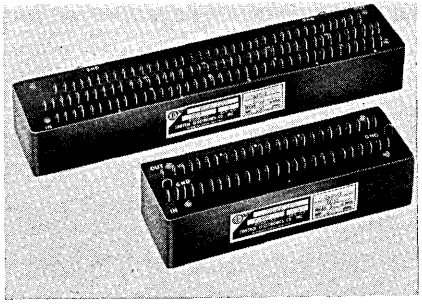
printing reperforator

T2PN printing reperforator is the first teletypewriter which will produce a printed message on a standard 11/16" punched tape fully compatible with electronic readers and integrated data processing systems, according to the manufacturer. The T2PN is a full-capacity teletypewriter. In both sending and receiving messages it prepares a conventional, fully-perforated, 11/16", five-channel tape. At the same time, the machine prints a typewritten message between the feed holes of the perforated tape. The tapes produced by the T2PN are the first printed-and-perforated media which are compatible with optical or electronic tape readers, the manufacturer states. Also, the T2PN provides printed and perforated tapes which can be stored under systems now used only for uninterpreted tapes. That is, tapes from existing reperforators pose a storage problem which is eliminated with the T2PN. For information write The TELautograph Corporation, 8700 Bellanca Ave., Los Angeles 45, Calif.

CIRCLE 223 ON READER CARD

constant delay line

A lumped constant delay line, totally encapsulated in epoxy resin and utilized internally in computers, eliminates the need for terminal boards which commonly trap moisture. Designated as models F-577A and F-578A the delay lines are moisture proof, reliable and of inexpensive molded construction. Model F-577A has a total delay



of 10.0 microseconds. Rise time is 0.5 microseconds maximum. The unit features multitaps every 0.20 microseconds. Model F-578A has a total delay of 15.0 microseconds with a rise time of 0.4 microseconds maximum. Multiple taps on this particular unit are featured every 0.125 microseconds. CONTROL ELECTRONICS CO., INC., 10 Stepar Pl., Huntington Station, L.I., N.Y. For information:

CIRCLE 224 ON READER CARD

transistor tester

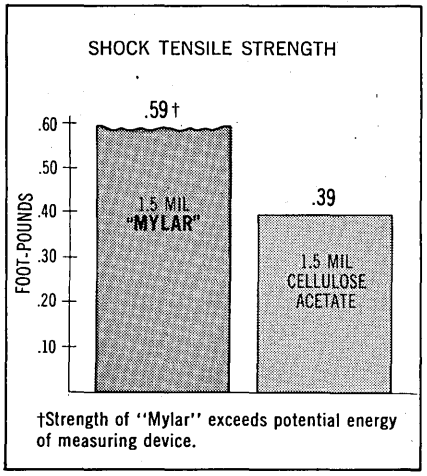
Medium and high power transistors can now be tested under variable duty cycle conditions with the model NC-1 direct reading test set. It employs a pulse drive technique to make direct measurements of DC parameters at power levels equal to the maximum dissipation of the transistor. For information write BAIRD-ATOMIC, INC., 33 University Rd., Cambridge 38, Mass., or use reader service card.

CIRCLE 225 ON READER CARD

How magnetic tapes of "Mylar"® help insure maximum reliability

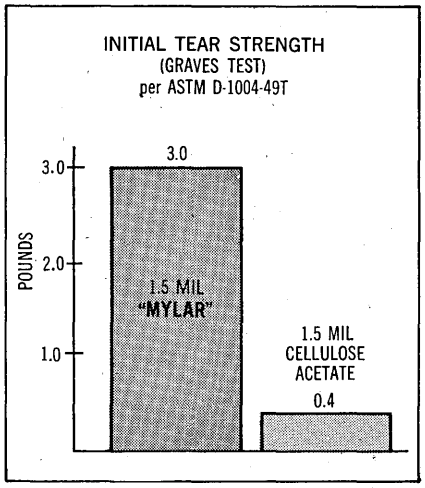
Stresses of high-speed transport . . . quick starts and stops can cause tape breakage or stretching that results in loss of data or chance for error. Magnetic tapes of "Mylar"* polyester film minimize these hazards because of their greater strength and durability. Their additional cost is more than offset by savings on tape replacement and reconstruction of broken or damaged tapes. Here's why·

CHART NO. 1



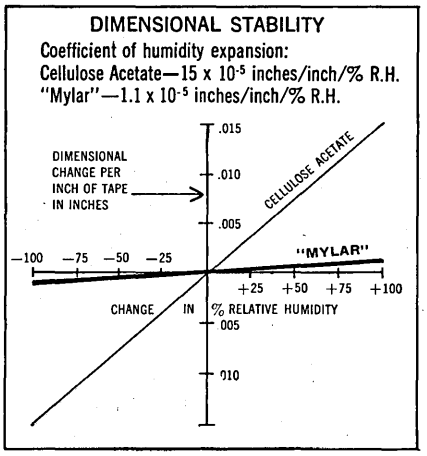
Less breakage from shock. Chart 1 compares shock tensile strength of "Mylar" with that of cellulose acetate. The strength of "Mylar" actually exceeds the range of the measuring device, while acetate failed at 0.39 foot-pounds. With "Mylar" you'll have less tape breakage from high-shock loading sometimes created by operating conditions. And, "Mylar" does not lose its strength with age, repeated playbacks or storage, because it has no plasticizer to dry out.

CHART NO. 2



Reduced breakage from edge nicks. Chart 2 shows the initial tear strength of "Mylar" is over seven times that of acetate. "Mylar" resists edge nicking and retards growth of tears if nicking occurs. Since most tape breaks start as edge nicks, you'll have less tape breakage and loss of valuable information with "Mylar".

CHART NO. 3



Fewer weak or garbled signals. Chart 3 shows dimensional change in "Mylar" with temperature or humidity change is negligible compared with that of cellulose acetate. This exceptional stability prevents tape shrinking, swelling or cupping that could result in shifting of tracks or loss of contact with the recording or playback head. Possibility of signal dropout or garbled or weak signals is minimized, and reliability of recorded data is improved.

Tapes of "Mylar" can make an important contribution to the reliability and economy of your data processing. Ask your magnetic-tape supplier to recommend the specific tape of "Mylar" for your needs.

DU PONT
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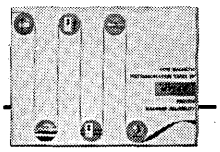
Better Things for Better Living . . . through Chemistry

DU PONT **MYLAR**® POLYESTER FILM

*"Mylar" is Du Pont's registered trademark for its polyester film.



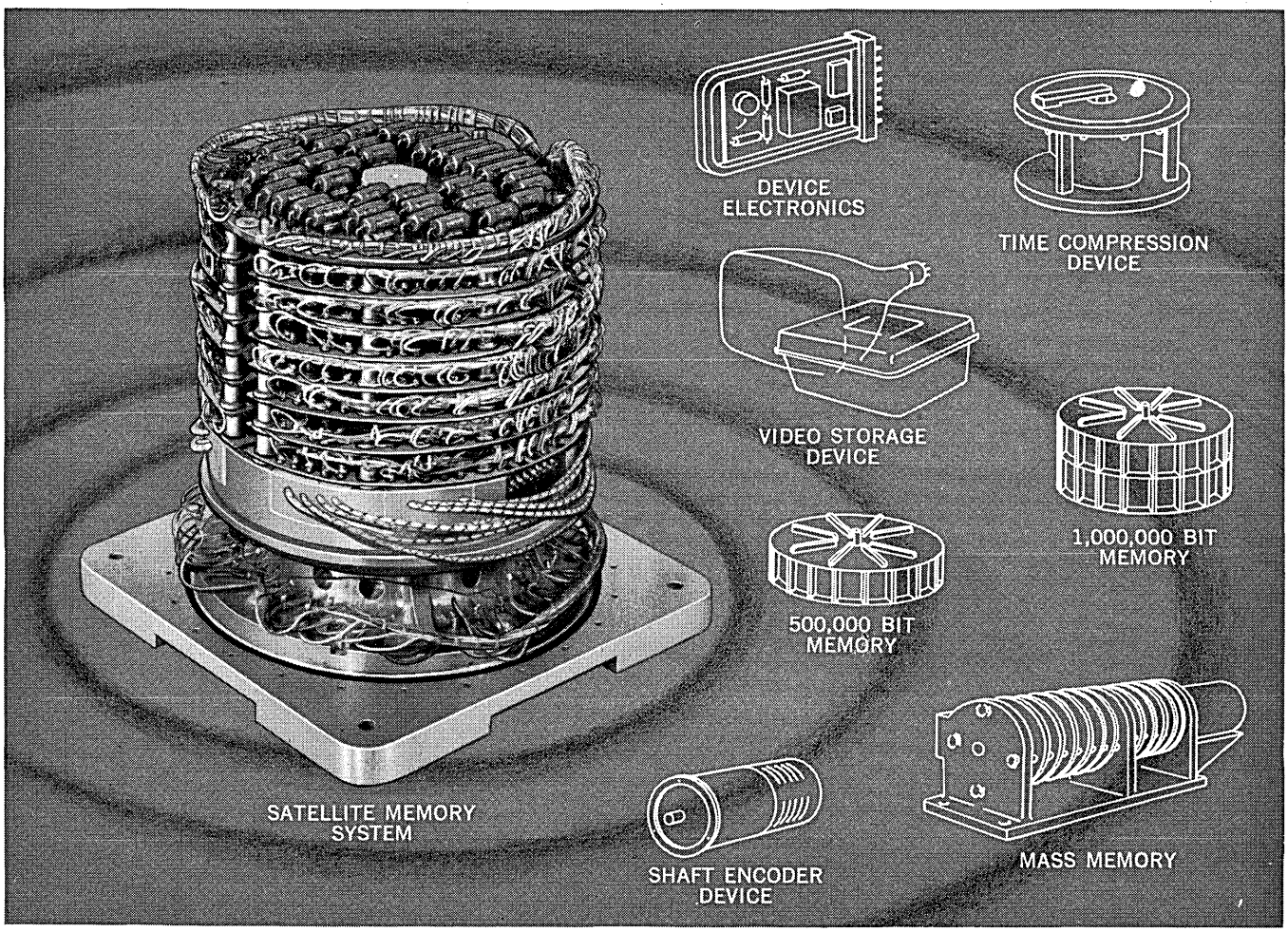
E. I. du Pont de Nemours & Co. (Inc.)
Film Department, Room #12, Wilmington 98, Delaware

Please send free, 12-page booklet of comparative test data to help me evaluate magnetic-tape reliability.

Name_____ Position_____
Company_____
Address_____
City_____ Zone____ State_____

CIRCLE 18 ON READER CARD

Extension of the Bernoulli Disk Principle...



through advanced development programs in the LFE Applied Research Laboratory

An advanced development team of engineers, physicists and mathematicians is performing theoretical studies and experimentation towards the realization of a new generation of data storage, communication and instrumentation devices utilizing the Bernoulli-Disk principle.

The problem of measuring disk to backplate separation has been solved by other highly trained staff members. They have designed and constructed an optical measurement instrument providing an accuracy of plus or minus 40 microinches.

A third order non-linear differential disk equilibrium equation has been derived. It can be solved by computer techniques.

Current programs of investigation include measurement of the effects of significant variables, in such areas as video storage, high density recording, file memories, time compression devices and shaft position encoders. These variables include angular velocity, separation, hub diameter, manifold diameter, disk thickness, gas properties, manifold pressure, power, temperature and electrostatic charge.

Such comprehensive investigations of the Bernoulli-Disk principle will add new scope to the LFE line of inherently reliable rotating storage devices and related computer products.

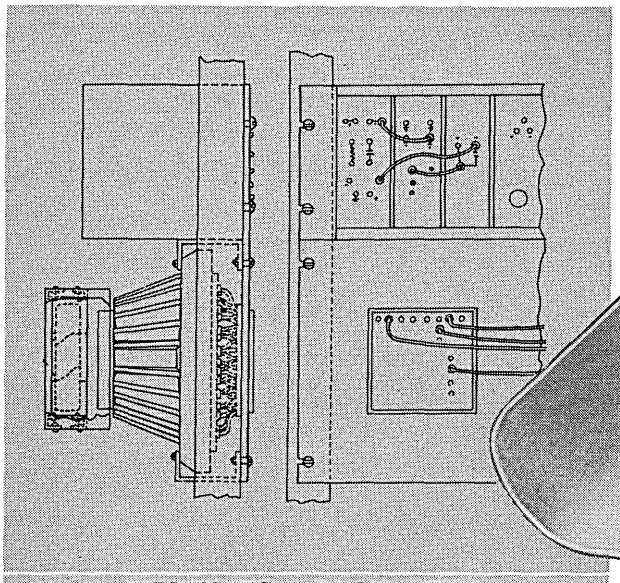
LFE
COMPUTER PRODUCTS DIVISION

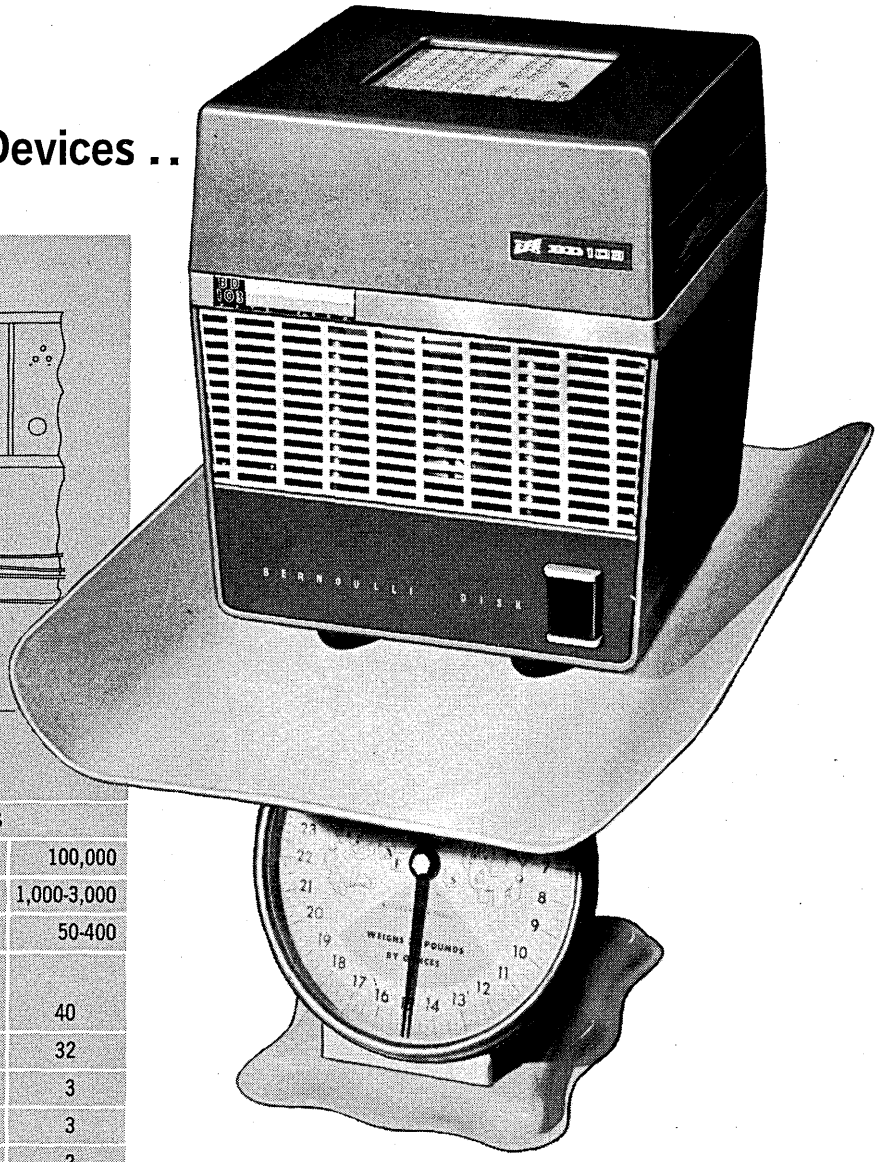
LABORATORY FOR ELECTRONICS, INC.

1079 COMMONWEALTH AVE. • BOSTON 15, MASSACHUSETTS

Meet the men from the Applied Research Laboratory at the Eastern Joint Computer Conference. Booths 26–27.

In Rotating Storage Devices..





SPECIFICATIONS BD-100 SERIES	
Storage Capacity Nominal Bits	100,000
Bits Per Track	1,000-3,000
Bit Rate — kc	50-400
Track Layout As Required	
Typical:	
Total Tracks:	40
Data Storage Tracks	32
Spare Track	3
Clock and Timing Track	3
Register Track	2
Number of Registers	4
Register Length — Bits	32
Register Adjustment — Bits	±3
Disk Speed — RPM Induction or Synchronous Motors Available	1800-8000
Power Source — cps	60-400
Magnetic Heads (Compatible with solid state circuits)	
Typical: (For 200 kc Operation)	
Inductance (Per Leg. — C. T. Coil) — uh	55
Write Current (O/P Manchester) — ma	125
Read Out (Min. P/P Full Coil) — mv	20
Size — Inches (Less Electronics)	9 x 9 x 5
Weight — pounds	
Basic unit	15
With electronics	25

Wide variations from typical specifications can be made to meet customer's requirements.

...LFE Bernoulli Disks Deliver More Reliability Per Pound!

No other rotating storage device can match the LFE Bernoulli-Disk Memories for small size, light weight, low cost and high resistance to shock, vibration and temperature changes.

Simplicity is the key! A flexible magnetic disk, headplate and precision motor are the basic components. Positive separation between disk and headplate is maintained by centrifugal force and Bernoulli principles of fluid motion. The unit's low mass plus a cushion of air make damage to disk or read/write heads virtually impossible under even the most severe environmental conditions.

Available in standard customized models for bench or rack mounting, the BD-100 Series (illustrated) is compatible with all fixed station or mobile digital computers utilizing magnetic storage media. For complete information please write Sales Manager, Data Storage Operations.

LFE
COMPUTER PRODUCTS DIVISION

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Visit our exhibit at the Eastern Joint Computer Conference • Booths 26-27 • December 13, 14, 15, New Yorker Hotel.

New line on way?

NCR TO PRODUCE LARGE, SMALL 315's

NATIONAL Cash Register Company has under test the prototype of a new general purpose digital computer – a single address, solid state system – the Class 315. Estimated time of delivery of the first production line machine is 18 months.

National had previously designed the 304 which was produced by General Electric with some design modifications and marketed by NCR. The company's announcement of a new machine and their obvious intention to handle all aspects of its sale and service has prompted speculation within the industry that NCR has entered a new phase of computer activity. It is felt that the company may be ready to produce a line of machines and compete across the board with other multi-machine manufacturers.

The central processor of the 315 is new but is similar in some design respects to the NCR 304. Much of the input/output equipment used with the 304 will be incorporated into the 315 system.

The processor is available with five different memory sizes capable of storing 6,000 to 120,000 decimal digits or 4,000 to 80,000 alpha-numeric characters.

The system may include from one to eight magnetic tape files, each containing 3600 feet of ½-inch magnetic tape and capable of storing 21 million alpha-numeric characters or 31 million decimal digits of information.

The input system for the 315 may include up to four magnetic character sorter-readers, a punched card reader, a paper tape reader and the console typewriter as well as the magnetic tape handlers.

The output system may include up to four high-speed line printers and card punches in any combination, a paper tape punch, the console typewriter and the magnetic tape handlers. Input, output or memory units may be added as required.

To permit maximum efficiency in the use of input and output units (time sharing), the peripheral units can interrupt a program automatically. The sorter-readers, the card punches, the card reader, and the high-speed line printers have the ability to interrupt the main program to demand processor attention when they have completed an operation previously assigned to them. Thus, the input-output units may be kept running at maximum rate, while the processor is performing some other job. Occasionally the main program will be interrupted for a brief interval to attend to one of the input-output units, and then immediately resume, while the slower unit continues to operate independently at its own speed. These features together enable the processor to coordinate the simultaneous operation of a number of peripheral units, each functioning continuously at its own rate of speed.

Each unit has its own power supply and contains circuitry which provides a sequence of automatic reliability tests. Control panel switches isolate the unit from the rest of the system.

For users requiring a large computer-small computer combination, with the small computer serving as an input/output converter and editor for the large, two memory sizes for the 315 will be available.

Thus programmers need learn but one machine since only the memory sizes will differ and peripheral equipment may be used by either processor depending upon need.

data processor

The processor responds to a fully developed list of computer instructions. The basic cycle time is six micro-seconds.

The processor has 32 index registers and 32 jump registers. It has a directly addressible control register (instruction counter) and automatically stores up to three independent program links.

sorter-reader

The Pitney-Bowes National sorter-reader processes documents at the fixed rate of 750 per minute, regardless of size. It can operate either under control of the processor or independently of the processor.

When the sorter-reader is connected to the processor, the sorter reads documents into the processor memory and may also make a 12-way distribution of the documents as directed by the processor program. The sorter-reader reads each document into its own buffer memory and then transmits the information to the processor at high speed. This leaves the processor free to do other work during more than 99 percent of the time the sorter-reader is operating. The processor may control four sorter-readers at the same time.

When operating independently of the processor, the sorter sorts on a digital basis according to instructions set into its control panel.

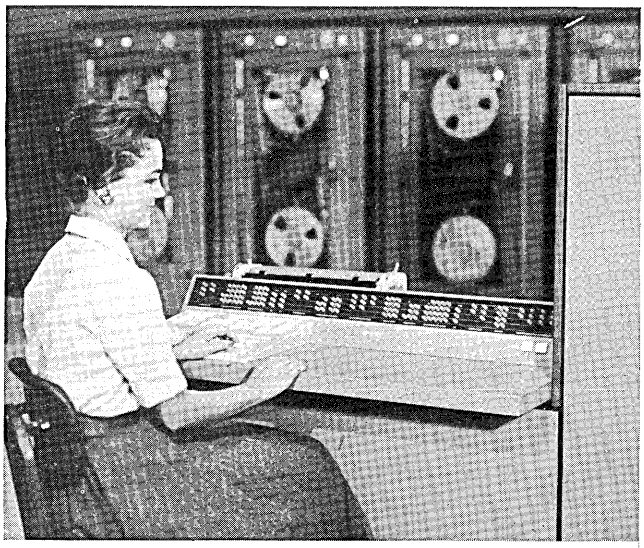
The documents may vary in width from 2½ to 4½ inches, in length from 5¼ to 10 inches and in thickness from .003 to .007 inches. The sorter-reader reads The American Bankers Association's Type E-13B magnetic ink type font.

punched card reader

The punched card reader photoelectrically reads all the columns or any section of columns of a card at the rate of 400 cards per minute. The cards can be read singly, continuously or in batches of any quantity.

The reader can read any code, standard or non-standard, punched in the cards. This includes codes involving

Operator at console of new National 315



binary, multi-punch or split-column configurations. Reading always proceeds at full speed for any code since the card code is translated into the processor code while the reader is scanning between card columns.

The processor is free to do other work between card columns and also between cards.

paper tape reader

The paper tape reader reads 1000 characters per second photoelectrically from five-, six-, seven-, or eight-channel tape. The system accepts any tape code at full speed, since the paper code is translated into processor code while the reader is scanning between characters. The tape stops between characters when reading is complete.

high speed printer

The high speed printer prints 680 lines of alpha-numeric characters a minute with 120 characters to a line. The unit can print 56 different characters and can produce an original and five copies. Forms may vary from four to 22 inches in width.

When numeric lines are printed, the printing rate automatically increases to 900 lines per minute. The skipping rate is 5040 lines per minute over any number of lines. Vertical format is controlled jointly by a punched loop and by the processor. A multiple-list attachment enables the printer to operate as three independent listers with separate paper transports on each.

paper tape punch

The paper tape punch punches 120 characters per second in any desired output code. The tape may have five, six, seven or eight channels. Punching density is 10 characters per inch. The processor is free to do other work between characters.

card punching

The 315 system will operate a standard 250-card per minute punch through National's card punch buffer. Any code configuration including binary, multi-punch, or split-column may be created in the system. Card punching is a completely time-shared operation.

Up to four card punches and printers in any combination may be operated by a 315 system.

magnetic tape file

The 315 system may incorporate two different tape handler models, one capable of operating at a 40 kc transfer rate, the other capable of operating at 40 kc and 60 kc transfer rates. A transfer rate of 40 kc transmits 40,000 alpha-numeric characters or 60,000 digits per second; at a transfer rate of 60 kc, the figures become 60,000 and 90,000 respectively.

At the highest rate, the system stores 750 decimal digits in an inch of tape, almost 32 million decimal digits in a single reel. Each handler holds one reel of ½-inch Mylar tape 3600 feet long. Information is stored on the tape in variable length records containing from two to 16,000 alpha-numeric characters.

Both tape handlers are fully compatible with IBM magnetic tapes, reading and writing 200-character per inch tape at 24 kc.

A write-lockout system prevents writing on master file tapes. At the option of the operator, a use-lockout prevents writing on other tapes after rewinding.

As information is recorded on magnetic tape, it is read back and checked to insure that the writing was correct. Up to eight magnetic files may be incorporated in a single system.

console

The system console is a desk-type display unit which permits complete monitoring of the entire system. It provides a binary coded display of the main memory address and a complete indication of the cause of an error halt.

The operator can modify the program or cause the system to operate one cycle at a time through the console. Desired information can be printed out directly by the console printer.

CIRCLE 100 ON READER CARD

GERBER DEVELOPS DIGITAL PLOTTER

New design features high accuracy

by H. JOSEPH GERBER,
President, Gerber Scientific Instrument Co.

PRESENT DAY plotters with the exception of the new Gerber Digital Plotter Model GDP-48 have one basic thing in common, namely "heritage." Whether a plotter accepts digital or analogue information, whether the input is a voltage or a resistance, the method used to drive the printing head to the required coordinate point is fundamentally the same. Electronic logic, bridge circuitry, amplifiers and servo motors are all used similarly in the overall design.

The analogue approach has many characteristics that make it very useful in applications where high precision and accuracy are not too important. For instance, since the balance of the bridge is upset by varying the reference resistors in the legs of the bridge, the scale factors as well as zero offsets can easily be introduced.

When we speak of accuracy, we must define what we mean. Analogue plotters have been made to meet ± 0.05% overall accuracy. Since all components must be much better than .05% to meet this accuracy and must maintain long term stability irrespective of variations in temperature and voltage, the operator must quite often recalibrate and adjust the instrument. In many applications the incoming analogue information is in itself not as accurate as .05%, which makes the analogue plotter accurate enough to record this information and a very useful tool.

An overall accuracy of .05% defines a ratio rather than an absolute quantity. When we speak of digital accuracy, percent accuracy has no meaning. It has little or no meaning when absolute distances are important. To explain this better, let us look at an actual example, such as how we dimension drawings. Suppose we have to dimension two matching sets of holes in two bars with bar lengths of two inches and twenty inches. The center to center distance of the holes in each bar is one inch. If we note on the drawing that the tolerances to be held are within ± .05%, it is quite obvious that such designation is foolish since the error is not only too large for most machining applications, but is also dependent on a proportion rather than absolute length of say ± .001". Where four to five digits of digital information are required, .05% plotting accuracy is obviously worthless.

Plotters on today's market designed to accept digital information are really analogue plotters with an additional black box containing relays or transistors which shunt in or out resistances matching the digital input information. The sum total of the pulled resistances approaches the numerical input value to a little better than .05%.

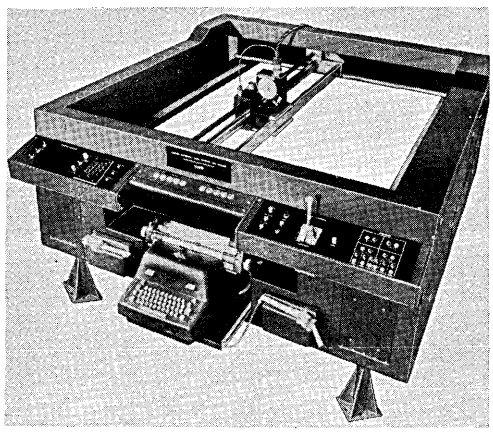
To plot digital information properly, accuracy must be established on a linear measurement basis instead of on a percentage basis. The accuracy of the new Gerber plotter is given as plus or minus one count or plus or minus 00.001". It will maintain this accuracy without drift, irrespective of temperature, friction or drag forces in the system and plotting speed. It will not oscillate over the point of null before plotting but will always approach this point with sufficient force until it reaches coincidence and then plot without overshoot.

The design of the Gerber Digital Plotter is quite different from that of the analogue plotter. The input to the plotter can come from IBM cards, punched paper tape, keyboard or magnetic tape. The incoming information is stored in two relay registers, one for the X direction and the other for the Y direction. An IBM typewriter produces a verification copy simultaneously with information entry. The drive for each axis is provided by a constantly running motor driving a speed and direction control gear box which, in turn, drives a zero backlash ball bearing lead screw and a shaft position digitizer. A relay and diode logic matrix for each axis makes the following decisions: First, it compares the number logged in the input memory with the position digitizer and decides in which direction the carriage should move. Next, it evaluates the distance to the point to be plotted, selects the correct driving speed and controls all approach speed changes. Finally, it actuates the plot command when the plotting head reaches the correct point.

Tests on the new Gerber plotter have shown that accuracies of plus or minus 00.001" on a 48" x 48" plotting surface can be obtained. Approach speeds and slewing speeds can be varied depending on customer requirements.

The plotting surface with respect to the position of the print head is ground flat to ± 0.001" anywhere in the 48" x 48" plotter field so that if the user wishes to rule precise grid lines or engrave on scribe coat he will have no errors. The surface is made of fairly hard rubber (80-85 durometer) which contains about 100,000 vacuum holes to hold the work rigidly on the surface. These holes are only .025" in diameter, small enough not to interfere with the ruling pen or scribing tool.

The print head has eight individually operated print wheels and a pin to punch the precise location of the plotted point. More print wheels are easily added to the print head. The print wheels carry numbers 0-9 and two symbols. They can be easily made to carry twelve symbols or any combination of numbers and symbols. Individual print wheels can be exchanged. The print head has its own ribbon advance mechanism and standard IBM Mylar typewriter ribbon is used which produces a constant density print. The print head can be removed and replaced with an opaque viewing screen which has two intersecting hairlines marked on the screen surface. The opaque projector will read a surface of 1¼ x 1¼ and enlarge the area sixteen times. In this way, points once plotted can be easily read back by moving the carriage in the X, Y direction until the projected image of the point is at the X, Y hairline until the projected image of the point is at the X, Y hairline intersection. A joystick type, X, Y control handle is provided for easy carriage positioning. Carriage speed is proportioned to joystick deflection.

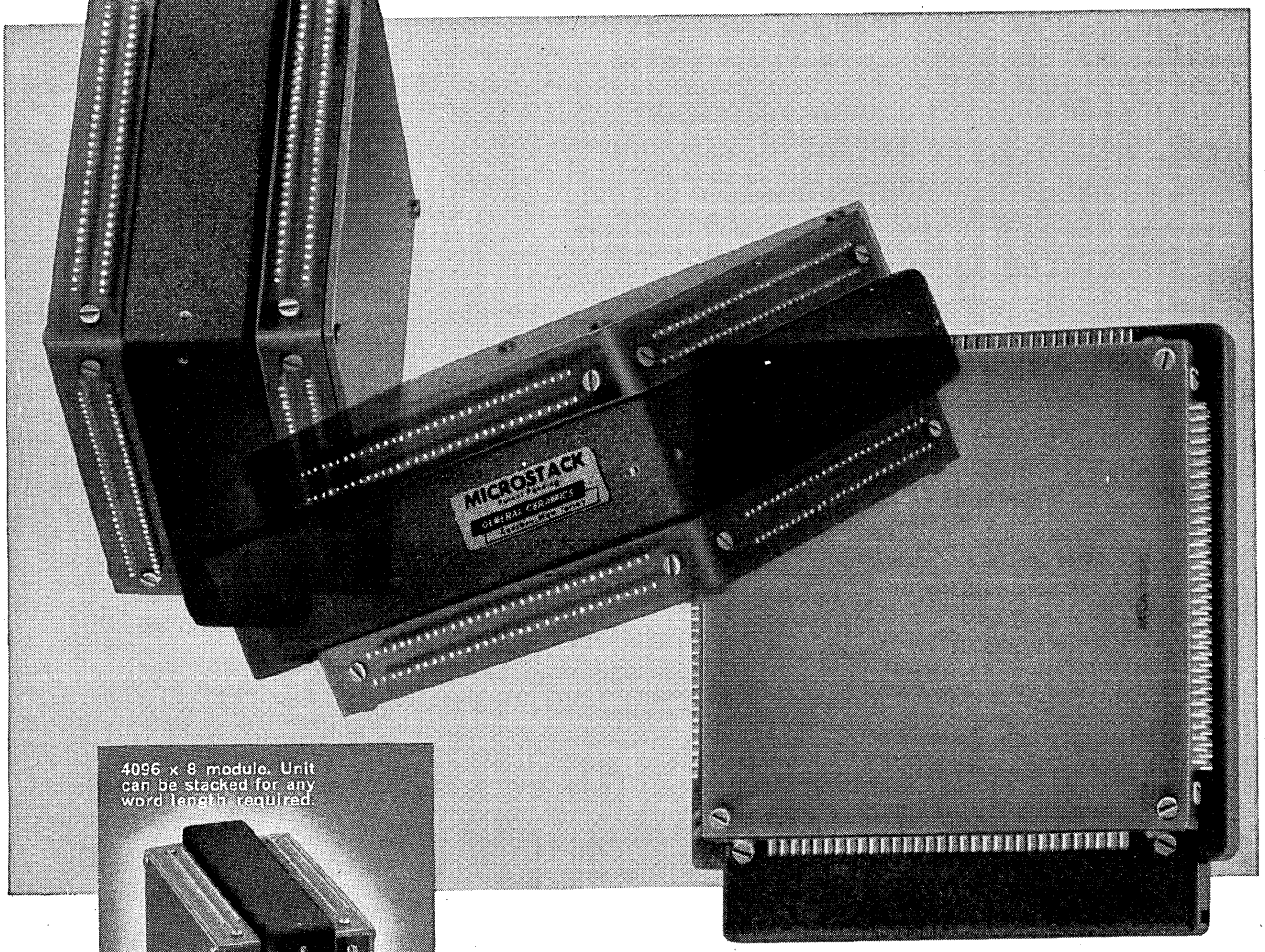


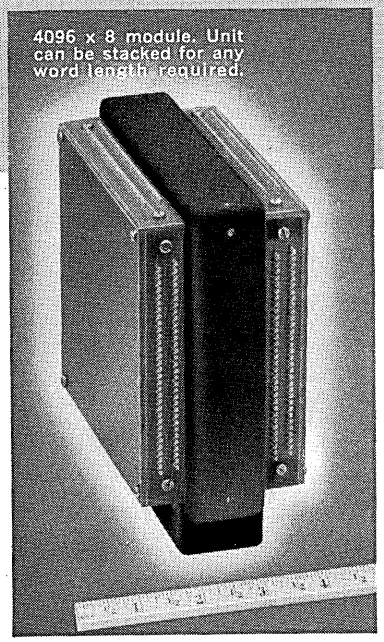
Gerber's Digital Plotter

New temperature controlled MICROSTACK® meets

-55°C to +85°C

MILITARY REQUIREMENT




4096 x 8 module. Unit can be stacked for any word length required.

The General Ceramics MICROSTACK, one of the most important advances in memory core packaging, now operates in a temperature range of from —55°C to +85°C. Core characteristics remain constant. By maintaining temperature stability inside the MICROSTACK unit, General Ceramics engineers have developed a memory core package that is smaller, more rugged, requires no external cooling or heating, and meets MIL shock and vibration specifications.

For additional information, please write on company letterhead. Address inquiries to Section

DIVISION OF INDIANA GENERAL CORPORATION

APPLIED LOGIC DEPARTMENT

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KEASBEY, NEW JERSEY, U.S.A.

TECHNICAL CERAMICS, FERRITE AND MEMORY PRODUCTS

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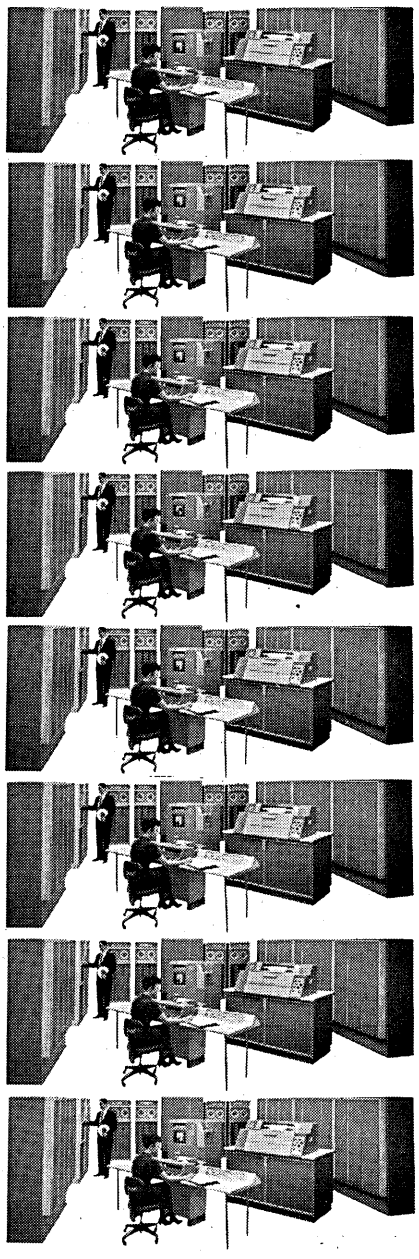

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We say Honeywell 800 will process more data per dollar per working day than any high-speed electronic system now on any office floor (or on any drawing board). We can afford to say this, because Honeywell 800 lets you process up to 8 jobs all at once. And we're including *big, company-size* jobs — like running off a payroll, scheduling production, controlling inventory, or preparing a complete sales analysis. Each job has its own program, too. No complicated system of priorities or costly super-program is needed. In a way, you get up to 8 individual computers to work with.

You can see how this versatility (we call it Automatic Parallel Processing) cuts operating time and costs to the bone. To find out more about this Automatic Parallel Processing and many other design "firsts" built into Honeywell 800, just write Minneapolis-Honeywell, Datamatic Division, Wellesley Hills 81, Mass.

CIRCLE 23 ON READER CARD

Honeywell

H HONEYWELL *Electronic Data Processing*

EJCC

EASTERN JOINT COMPUTER CONFERENCE

THE CHAIRMAN'S WELCOME

THE 1960 EJCC will be held at the Hotel New Yorker and the Manhattan Center in New York City on Tuesday, Wednesday, and Thursday, December 13, 14, and 15. The committee that has been working with me on the plans has held consistently to the objective of making the conference intellectually rewarding to the conferees. Our objectives have been to promote scientific communication by means of formal presentations, opportunities for informal communications, exhibits, and the Proceedings. To support these objectives, we have made every effort to set up agreeable and efficient arrangements in the hotel, lecture hall, and for exhibit space.

We have planned for the wives. There will be a hostess who knows New York and who will provide information and advice. On Tuesday at a coffee, Dr. Grace Murray Hopper will tell the ladies about computers. If enough interest is shown, there will be a fashion show, a tour of Manhattan, a luncheon, a champagne breakfast, and a matinee theatre party. If not, most of these activities will be available on an individual basis.

At the conference banquet, a special prize of $300 will be awarded for the best paper. In selection of the winning paper, particular emphasis will be given to the speaker's excellence of organization and presentation.

A careful study of conferees' habits and appraisals of the value of other conferences led us to believe that informal communication *in the halls and lobbies* was one of the very important features of a conference. The requirement did not seem to be satisfied by arrangements at previous conferences so the 1960 EJCC will provide a new kind of communication facility. For at least one-half hour after each session, each speaker will be at a specified location in the rear of the lecture hall. People who wish to ask further questions may take this opportunity to do so. Furthermore, people whose interests are aroused by the talk will find near the speaker, others whose interests have been aroused by the same talk. This arrangement will also provide a means for people with similar interests to gather before going to meals. We hope that the conferees will take full advantage of this opportunity.

I hope to welcome many of you in New York in December.

NATHANIEL ROCHESTER, General Chairman of the 1960 EJCC, received his B.S. in Electrical Engineering from MIT in 1941 and joined the MIT Radiation Laboratory where he worked on semiconductor diode rectifiers for radar. In 1943 he joined Sylvania Electric Products where he headed a department which designed and produced model shop batches of radars and other military equipment. One of these jobs was the arithmetic unit of Whirlwind I. In 1948 he joined IBM.

With J. A. Haddad he was jointly responsible for engineering the IBM type 701 and later he managed the engineering of the entire 700 series of machines. In 1955 he turned from engineering to research and is now Director of Experimental Machines Research.

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SILICON TRANSISTORS	2N332 Series, 2N497 Series, 2N734 Series, 2N738 Series, 2N1564 Series, 2N1572 Series, 2N1586 Series — Logic and Medium Power Driver 2N389 Series, 2N1714 Series, 2N1717 Series, 2N1722 Series — Electromechanical Driver	TI 450, TI 451 — High-Speed Transistors 2N706A Series, 2N753 Series, 2N1252 Series — High Speed 2N726 — PNP High Speed 2N696 Series, 2N702 Series — Medium Speed J-460 Series, 2N337 Series — Low Speed	2N696 Series, 2N1252 Series, 2N1508 Series — Driver	2N337 Series —A — A—Amplifier 2N342B Series—D — P—Power 2N389 Series —P — D—Driver or 2N497 Series —D — Medium Power 2N726 —A 2N734 Series —A 2N738 Series —A 2N1047 Series —P 2N1564 Series —A 2N1572 Series —A 2N1714 Series —P 2N1718 Series —P 2N1722 —P
SOLID CIRCUIT* Semiconductor Networks		Type 502 bistable multivibrator and custom designs for logic circuits	Type 502 Set-reset Flip-Flop	
SILICON DIODES	1N2175 (Photo)	C 01 — Low Cost 1N650, 1N651, 1N652, 1N653 — Gallium Arsenide Tunnel Diodes 1N914 Series — High Speed	C 01 — Low Cost 1N650, 1N651, 1N652, 1N653 — Gallium Arsenide Tunnel Diodes 1N914 Series — High Speed	1N746 Series — Reference 1N1816 Series — Power Regulators
SILICON RECTIFIERS	TI-010, TI-025, TI-050 — Controlled Rectifiers			1N253 Series, 1N538 Series, 1N1124 Series, 1N1614 Series — General Purpose Rectifiers 2N1595 to 2N1604 — Controlled Rectifiers
CAPACITORS	***tan-TI-cap*®** Solid tantalum electrolytic capacitors—type SCM—203 standard ratings—6v to 35v—1 μf to 330 μf			
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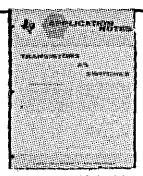
* Trademark of Texas Instruments Incorporated

SEE THESE AND OTHER TI PRODUCTS AT EASTERN JOINT COMPUTER CONFERENCE BOOTHS 41-42



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EJCC

EASTERN JOINT COMPUTER CONFERENCE

BANQUET SPEAKER, WILLY LEY

WILLY LEY, a man considered by many to be the country's foremost writer in the field of space conquest, will be the banquet speaker at the 1960 Eastern Joint Computer Conference. His topic will be "Conquest of Space—With Special Emphasis on Computers and Automata."

Ley, who will address assembled conference guests on Thursday, December 15, after the 6:30 p.m. banquet, has stated that "space exploration is progressing at tremendous speed these days and within 10 or 20 years space flight will be an almost everyday occurance." Computers, Ley adds, "will play a vital part in the evolution of space travel."

Ley's prognostications are based on a solid background of scientific research over more than thirty years. Born in Berlin in 1906, he studied at the Universities of Berlin and Konigsberg in East Prussa, concentrating on paleontology, astronomy and physics. He was, from his early high school days, fascinated both by all aspects of scientific fact and by the history behind scientific discoveries. This interest in scientific history, as Ley readers can attest, is one of the unique features of his books.

As a youth, Ley planned to be a geologist. Then he read the fundamental book on rocket theory by Professor Hermann Osberth in 1925 and became interested in the theoretical work being done on rockets and space travel. A year later, he published his own first book in Germany, "Trip Into Space," which was concerned with rocket ships.

He won the interest of other young German scientists in forming a pioneering rocket research organization, the forerunner of the present day German Rocket Society, of which he is an honorary member. In cooperation with other experimenters in the group, he helped to build liquid fuel rockets and to launch them. He introduced to the organization Wernher von Braun, who later headed the project that created the German V-2 rocket and who today heads the NASA project at Huntsville, Alabama. Ley was von Braun's tutor in rocket research.

In 1935, after the advent of Hitler, Willy Ley left Germany for "an extended vacation" in England; He arrived in the United States later that year and became an American citizen in 1944. In America, Ley found the public and newspapers unsympathetic to rocket theory and made what he calls "a precarious living" writing articles in the field of Zoology and other branches of science for such magazines as Coronet, Esquire, Fauna and Natural History.

During World War II the U.S. Government called on Willy Ley for consultation, particularly after the first V-2 rocket struck London. He served as a research engineer for the Washington (D.C.) Institute of Technology and later as consultant to the office of technical services of the U.S. Dept. of Commerce.

In 1949 Willy Ley's "The Conquest of Space," illustrated with the famous paintings of Chesley Bonestell, was published.

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Arnold's overall magnetic knowledge, and unequalled facilities for manufacture and test, are of prime importance in assuring you a source of cores that are highly uniform, shipment after shipment. You'll find them dependable, not only in permeability and resultant inductance at high frequencies, but in high mechanical strength and dimensional accuracy as well.

The Arnold line also offers a wider range of shapes and sizes of iron powder cores for your selection than any other one brand on the market. It includes bobbin cores, cups, toroids, plain, sleeve and hollow cores, threaded cores and insert cores, etc. Facilities for special cores to your order. Ask for new Bulletin PC-109A. ● Write *The Arnold Engineering Company, Main Office and Plant, Marengo, Illinois.*

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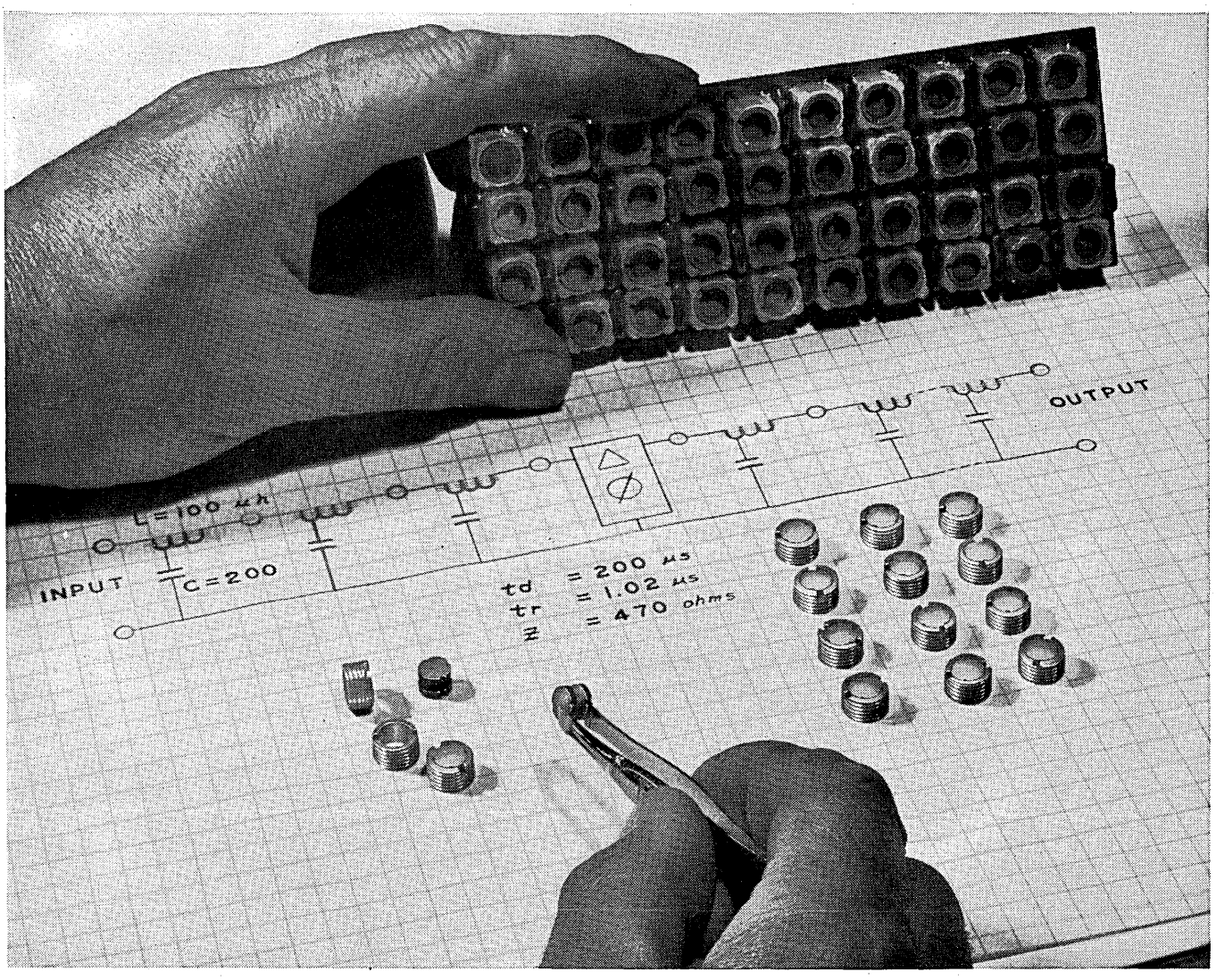


EJCC

EASTERN JOINT COMPUTER CONFERENCE

THE CONFERENCE

FOLLOWING UP ON successful innovations initiated last year, the committee planning the 1960 Eastern Joint Computer Conference has added a few new wrinkles which promise to make this gathering a profitable one indeed.

General Chairman Rochester in his welcome, has pointed up one new venture which should prove quite popular—that of arranging after-session informal gatherings. The single session technical program, the $300 prize for best address and the broad range of subjects covered . . . all these hold promise of an extremely valuable exchange of technical information.

Six technical sessions—30 addresses—are planned and this year's technical content concentration is heavily in the area of hardware. (The technical program may be found beginning on page 49.)

In the exhibit area, located on the New Yorker's mezzanine floor, 66 firms will display their equipment in 106 booths. Admission to the area is free, of course. Exhibitors may begin installation of their displays at 7 a.m. on Monday, Dec. 12. The exhibit area opens on Dec. 13 at 11 a.m. and will close for the day at 6 p.m. On Dec. 14, exhibit hours are 9 a.m. to 6 p.m. and on the 15th—9 a.m. to 5:30 p.m. Deadline for removal of exhibits is midnight of Dec. 16. (A list of EJCC exhibitors and a map of the exhibit area will be found on pages 46 and 47.)

A special conference registration period has been arranged for Monday from 6 to 10 p.m. at the New Yorker Hotel. Registration during the three days of the conference will take place at Manhattan Center. The times—on Tuesday from 8 a.m. to 4 p.m., on Wednesday from 8 a.m. to 4 p.m. and on Thursday from 8 a.m. to 1 p.m.

All joint computer conferences are sponsored by the Association for Computing Machinery and the computer groups in the Institute of Radio Engineers and the American Institute of Electrical Engineers. As in past years, the Simulation Council is a participating organization.

Registration fee for members of the above-mentioned societies is $7. Fee for non-members is $9 and students (with identification cards) need pay only $1.

A 6:30 p.m. cocktail reception is planned for Tuesday, Dec. 13 at the Manhattan Center ballroom (seventh floor). The EJCC banquet on Thursday, Dec. 15, at the Hotel New Yorker is also scheduled to begin at 6:30. Noted author Willy Ley is guest speaker. The $300 prize for best presentation of a technical paper will be awarded during the banquet.

Conference attendees will not be charged for EJCC proceedings which will be distributed at the time of registration. Additional copies may be ordered at the conference or from any of the sponsoring societies.

EJCC

EASTERN JOINT COMPUTER CONFERENCE

EXHIBITORS

American Telephone & Telegraph Company ...102, 103, 104
32 Avenue of the Americas
New York 13, N.Y.

AMP, Inc. 63, 64, 65
Eisenhower Boulevard
Harrisburg, Pennsylvania
patchcord programming systems, pin boards, multiple aperture devices (MAD), maintainable electronic component assemblies (AMP-MECA), AMPincert connectors, printed circuit edge connectors

Ampex Data Products Company 81, 82, 83, 84
Computer Products Division
934 Charter Street
Redwood City, California
magnetic tape handlers and magnetic tape

Anelex Corporation 72
150 Causeway Street
Boston, Massachusetts
high speed printers

Audio Devices, Inc. 95
444 Madison Avenue
New York 22, N.Y.
EP audiotape

Automatic Electric Company 76
400 North Wolf Road
Northlake, Illinois
relays and computer components

Autonetics 57, 58
A Division of
North American Aviation, Inc.
9150 East Imperial Highway
Downey, California
Recomp computer

The Bendix Corporation 15B, 16
Computer Division
5630 Arbor Vitae Street
Los Angeles 45, California
Bendix G-15 general purpose digital computer with MTA-2 magnetic tape unit in operation, small scale models of both G-15 and G-20 data processing systems

Bryant Computer Products 20
Division of Ex-Cell-O Corporation
850 Ladd Road
Walled Lake, Michigan
magnetic storage drums, magnetic storage drum systems, magnetic storage disc file systems

Burroughs Corporation 96, 97, 98
6071 Second Avenue
Detroit 32, Michigan
Burroughs 220 high speed printer system

CBS Laboratories 6
High Ridge Road
Stamford, Connecticut
VIDIAC 35G solid state character generator

C-E-I-R, Inc. 14
1200 Jefferson Davis Highway
Arlington 2, Virginia
closed circuit television monitor from the New York computing center

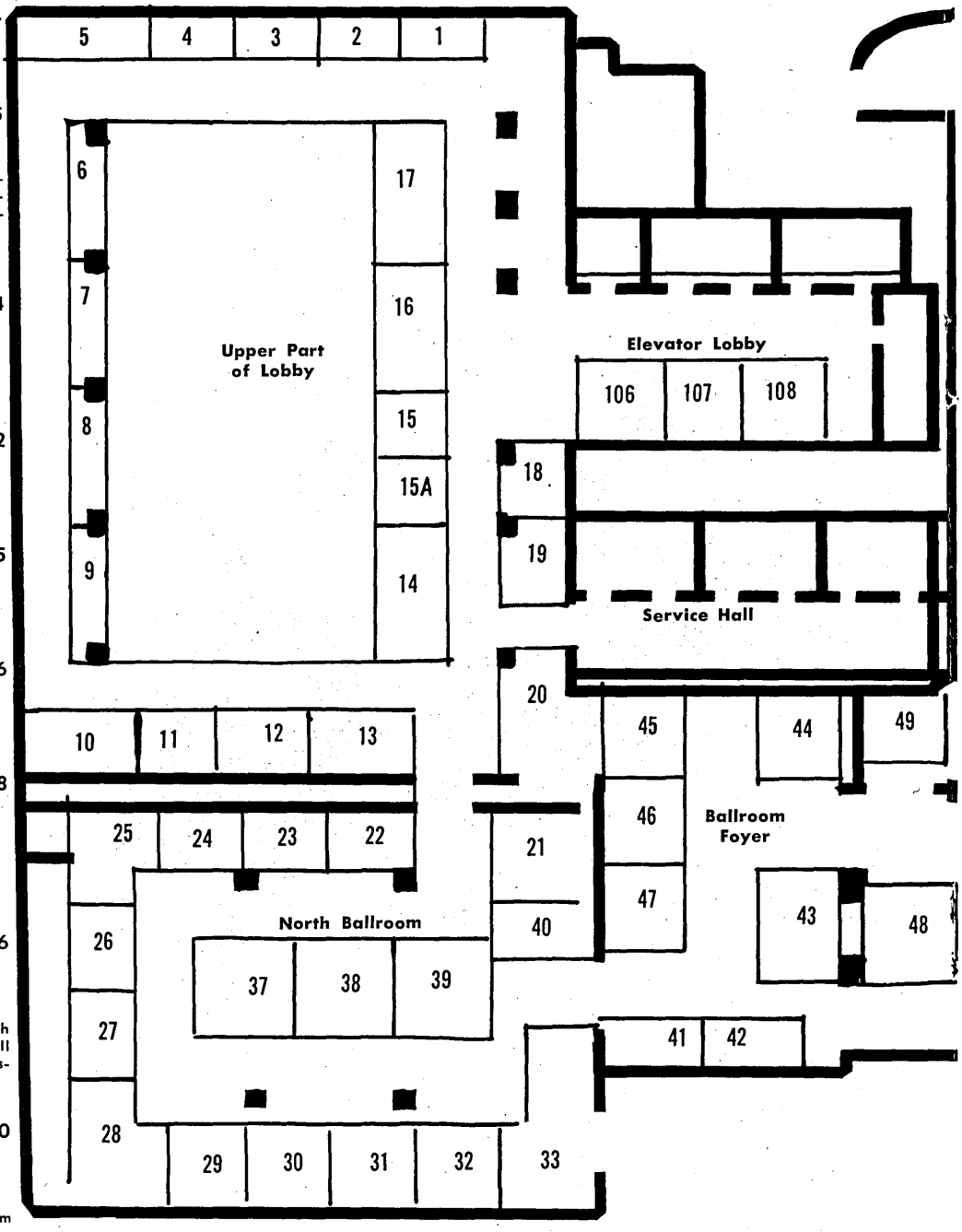
C & K Components, Inc. 9
101 Morse Street
Newton 58, Massachusetts
encapsulated magnetic shift registers, encapsulated logic elements, preset electronic counters, miniature neon indicator lights

C. P. Clare & Company 1
3101 West Pratt Boulevard
Chicago 45, Illinois
relays, stepping switches, mercury wetted relays, clareed relays, lever keys, wired assemblies

C. P. Clare Transistor Corporation. 2
260 Glen Head Road
Glen Head, Long Island, New York
germanium alloy, germanium alloy diffused base switching transistors

Computer Control Company, Inc. 69, 70
983 Concord Street
Framingham, Massachusetts
high speed digital modules, code bar switches, special purpose digital systems

Consolidated Electrodynamics Corporation 92, 93
360 North Sierra Madre Villa
Pasadena, California
digital tape recorder/reproducers



Control Data Corporation 22, 23
501 Park Avenue
Minneapolis 15, Minnesota
160 computer, 180 source data collector, 161 typewriter & controls for print out of data gathered on 180 tape and processed in 160 computer

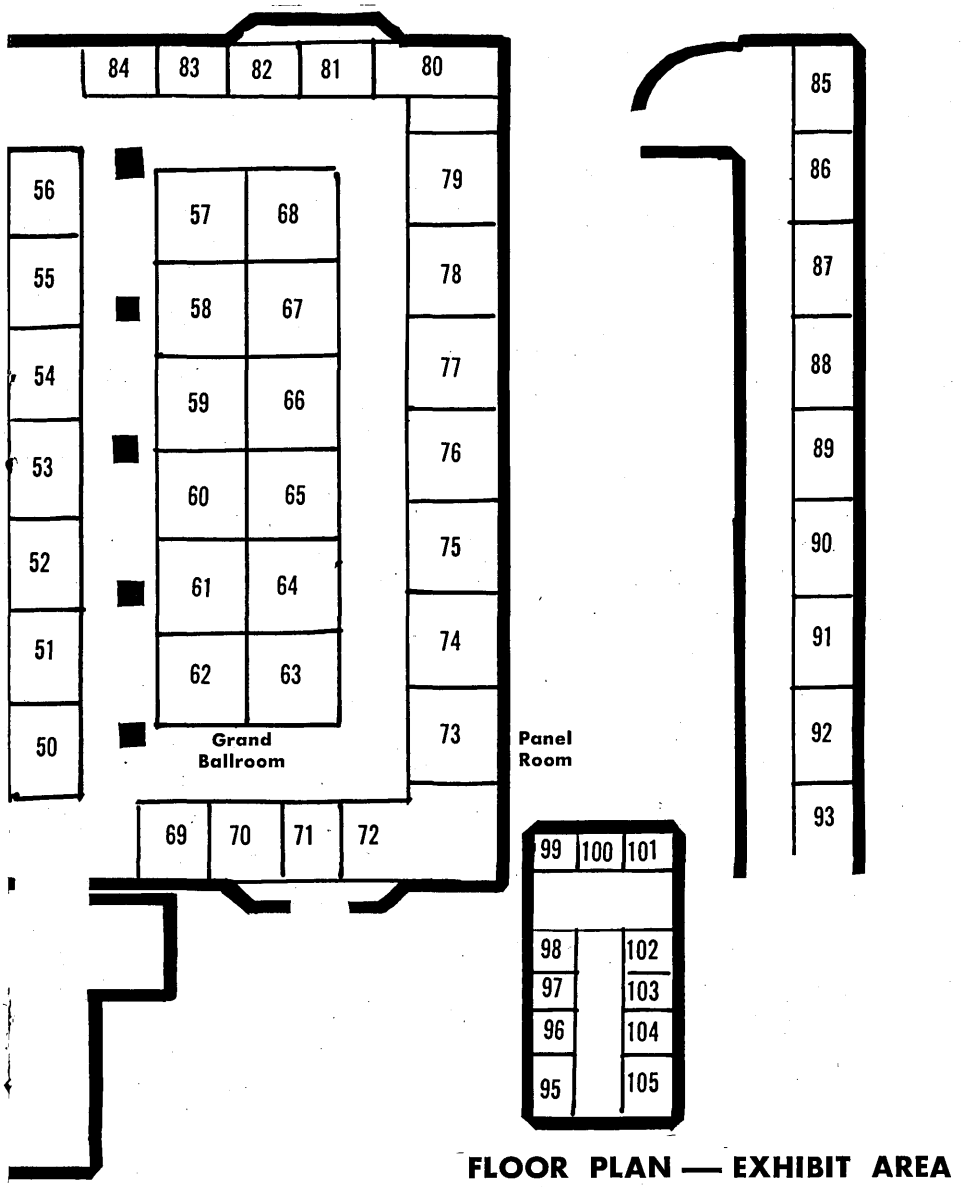
DI/AN Controls, Inc. 49
40 Leon Street
Boston, Massachusetts
magnetic shift registers, memory systems, buffer storages, decimal indicating reversible counter, time code generator, magnetic logic breadboard, data converter, miniature and low power digital building blocks for high temperature, digital integrators

"DATAMATION" 15a
F. D. Thompson Publications, Inc.
141 East 44th Street
New York 17, New York

Digital Equipment Corporation . . 31, 32
146 Main Street
Maynard, Massachusetts
digital building blocks, programmed data processor, digital test equipment

The Digitran Company 7
Division of Endevco
660 South Arroyo Parkway
Pasadena, California
DIGISWITCH, a digital finger-detenting switch for converting a decimal dial setting to a computing-code electrical output

Digitronics Corporation 75
Albertson Avenue
Albertson, Long Island, New York
high speed perforated tape readers, tape to digital subset for telephone line communications



FLOOR PLAN — EXHIBIT AREA

NEW YORKER HOTEL

EJCC

EASTERN JOINT COMPUTER CONFERENCE

Dynacor, Inc. 19
1010 Westmore Avenue
Rockville, Maryland
magnetic core materials

ELCO Corporation 101
"M" Street below Erie Avenue
Philadelphia 24, Pennsylvania
Varicon connectors, printed circuit-rack & panel Varipak printed circuit card cases, tube sockets, E-Z mate sockets, tube shields, Varitwin-pin contacts

Electronic Associates, Inc. 5
Long Branch Avenue
Long Branch, New Jersey
TR-10 transistorized analog computer, 3100 data-plotter system, transistorized digital voltmeter, AC-DC converter

Engineered Electronics Company 85, 86
1441 East Chestnut Avenue
Santa Ana, California
transistorized and vacuum tube plug-in circuit modules, counters, etc., high density packaging, miniweld, and transistorized indicators

Epsco, Inc. 89
275 Massachusetts Avenue
Cambridge 39, Massachusetts
instruments, components and systems

Fairchild Semiconductor Corporation 43
545 Whisman Road
Mountain View, California
micrologic elements, diffused silicon transistors and diodes

Ferranti Electric, Inc. 44
95 Madison Avenue
Hempstead, New York
tape readers and delay lines

GPS Instrument Company, Inc. . . . 10
180 Needham Street
Newton 64, Massachusetts
GPS statistical analog computer

General Ceramics 53, 54
Division of Indiana General Corporation
Crows Mill Road
Keasbey, New Jersey
memory cores, planes and stacks, coincident current memories, ferrite cores for recording heads, pulse transformers and multi-aperture devices

General Electric Company 66
Light Military Electronics Department
600 Main Street
Johnson City, New York

Genesys 88
10131 National Boulevard
Los Angeles 34, California
tape reader, card reader, magnetic disc memory, magnetic tape & drum heads, coincident point read-out

EJCC

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EXHIBITORS

Kenneth E. Hughes Company, Inc. . . 87
4808 Bergenline Avenue
Union City, New Jersey
components and building blocks for digital to analog computer systems

Hughes Semiconductor Division . . . 40
P.O. Box 278
Newport Beach, California
diodes, rectifiers, transistors

International Business Machines Corporation 59, 60, 61, 62
590 Madison Avenue
New York 22, New York
data processing equipment and components

Laboratory For Electronics, Inc. . . 26, 27
Computer Products Division
1079 Commonwealth Avenue
Boston, Massachusetts
SM display equipment and Benoulli disc storage devices

Lenkurt Electric Company, Inc. 77
1105 County Road
San Carlos, California
high speed data transmission systems

Librascope Division 28, 29, 30
General Precision, Inc.
808 Western Avenue
Glendale 1, California
shaft to digital encoders, x-y plotters, solid state digital control computers

Micro Switch 48
A Division of
Minneapolis-Honeywell Regulator Company
Chicago & Spring Streets
Freeport, Illinois
switches and switch assemblies, illuminated push-button, toggle, mercury, snap-action basic, sub-miniature, single pulse, hermetically sealed, door interlock, rotary input

Mnemotron Corporation 8
P.O. Box 203
Orangeburg, New York
Mnemotron

F. L. Moseley Company 91
409 North Fair Oaks Avenue
Pasadena, California
autograf x-y recorders, digital-analog converters, digital magnetic tape plotting system and photo-electric long strip curve follower

The National Cash Register Company 34, 35, 36, 37, 38, 39
Main & K Streets
Dayton 9, Ohio
accounting machines, adding machines and data processing equipment

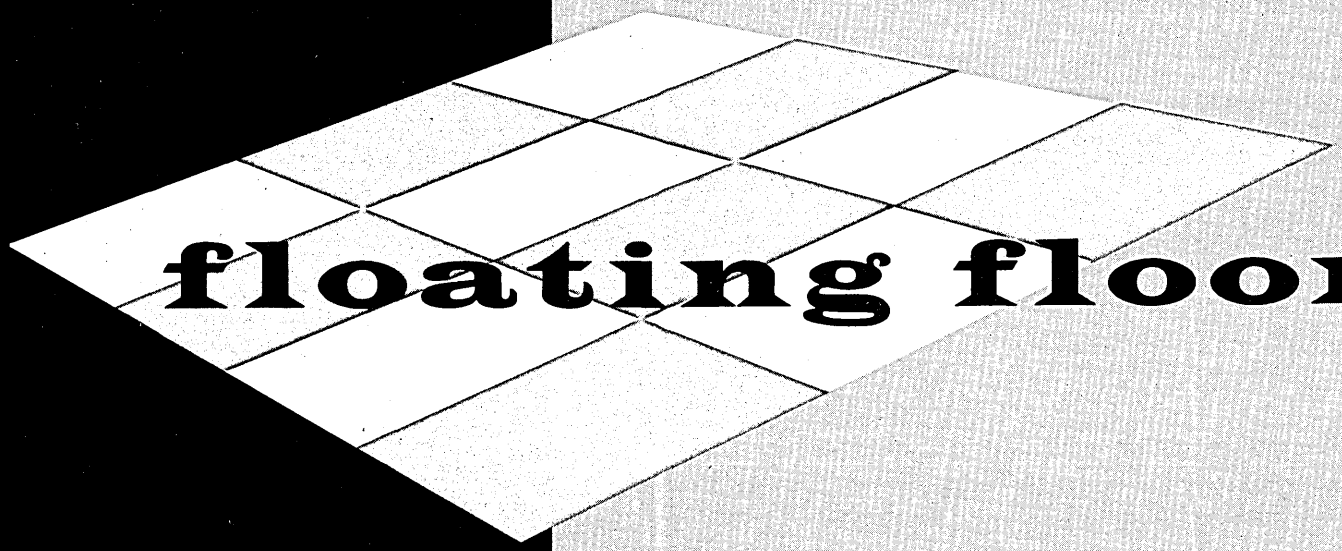
Navigation Computer Corporation 99
1621 Snyder Avenue
Philadelphia 45, Pennsylvania
transistorized digital system modules

Packard Bell Computer Corporation 73,74
1905 Armacost Avenue
Los Angeles 25, California
PB250 general purpose computer, digital circuit modules, dc amplifiers, analog to digital converters

Philco Corporation 24, 25
Government & Industrial Group
4700 Wissahickon Avenue
Philadelphia 44, Pennsylvania
Philco data processing systems

Photocircuits Corporation 90
31 Sea Cliff Avenue
Glen Cove, New York
photoelectric tape reader series, printed dc servo motors for computer tape drive, tape reel drive assemblies, electronic speed control systems, printed motors for positioning servos

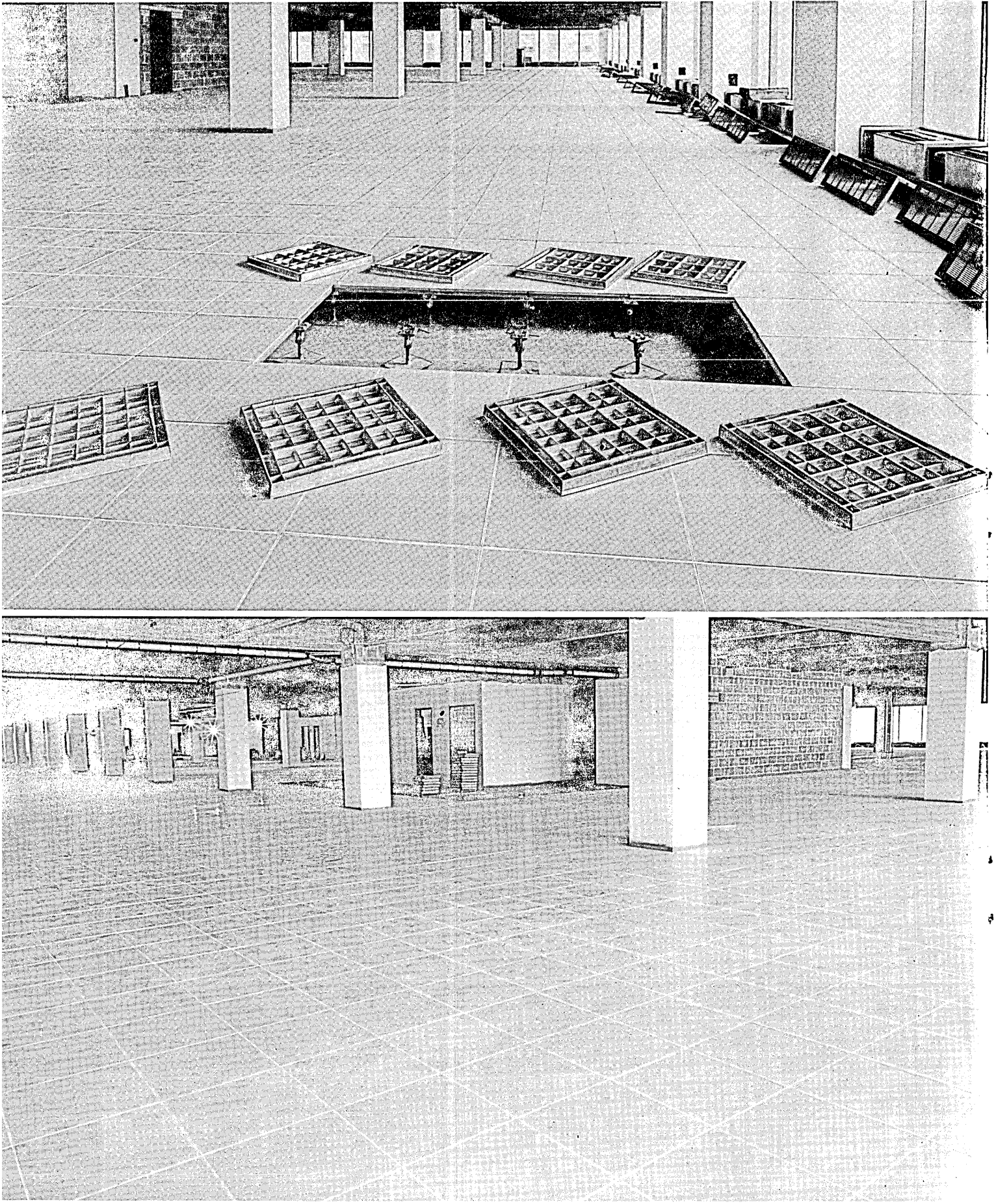
Potter Instrument Company, Inc. 67,68
Sunnyside Boulevard
Plainview, New York
new improved digital high speed transports operating in racks, transistorized high speed printers in operating demonstration



floating floors

announces

- **largest installation in the world — over 150,000 sq. ft.**
- **first complete computer room "package" concept**
- **first non-waxing, non-dusting, protective coating for data processing floor surfaces**

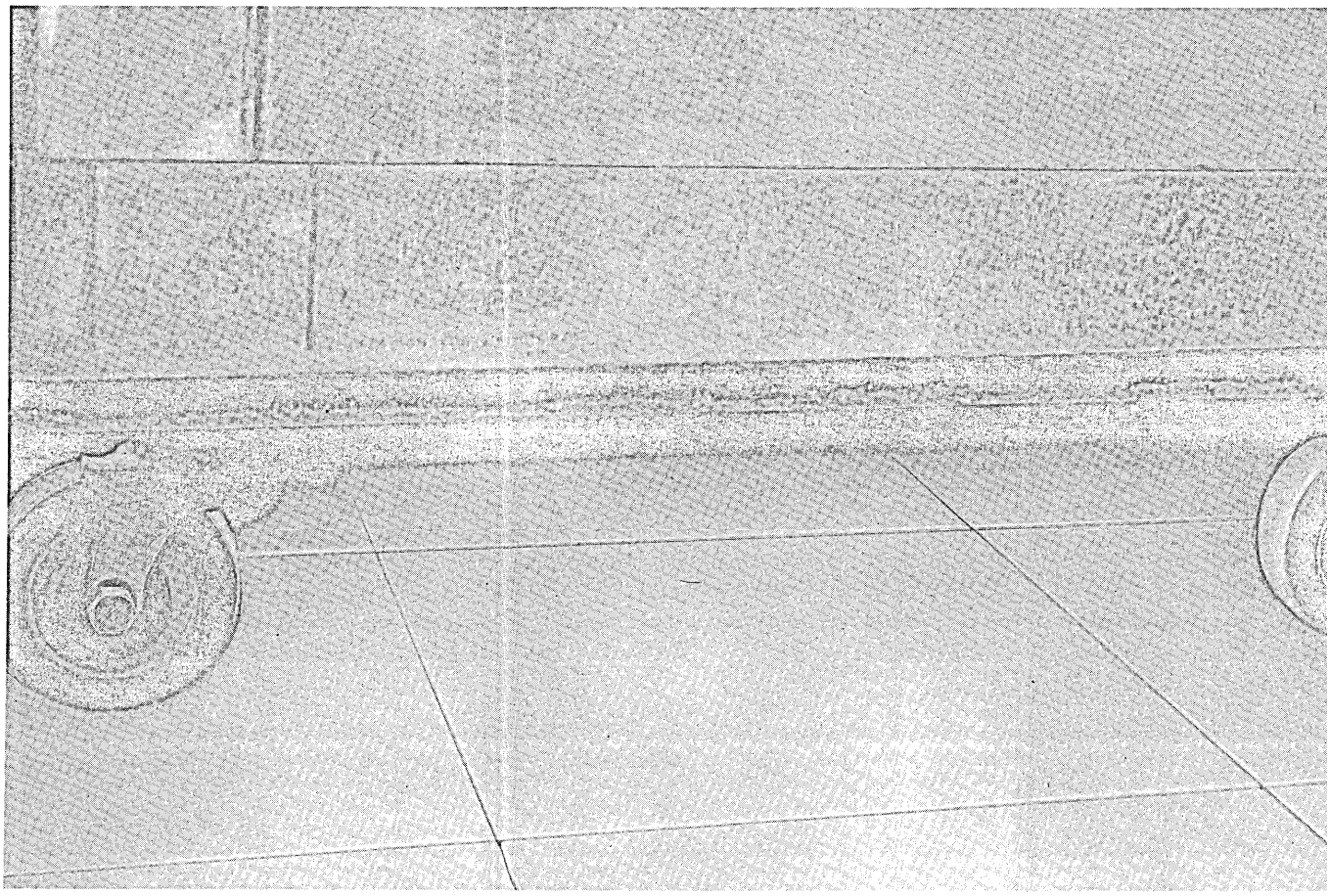


Largest floating floors installation in the world—over 150,000 sq. ft.—located in New York City. This job is designed with floating floors non-conductive lip, available in any color. Safety factor on floor is 4,000 pounds concentrated load. See test photograph at bottom of next page.

a floating floor is...

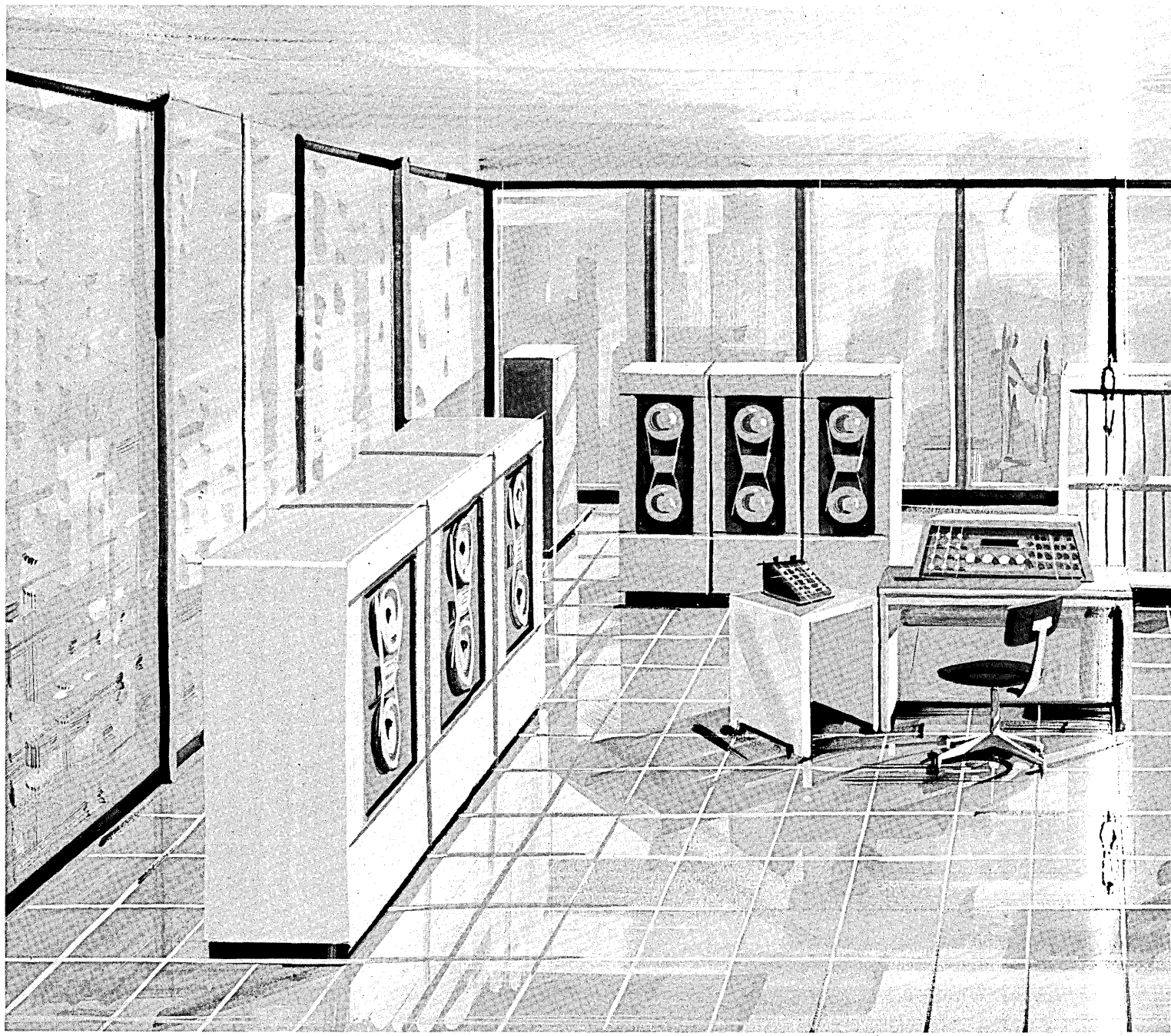
a floor superimposed upon an existing area providing infinitely accessible space under the floor. floating floors can be bought or leased. Although equipment is densely located in room, complete floor accessibility is still available because of floating floors smaller module.

Floating floors, which provide infinite access, are accessible and light.

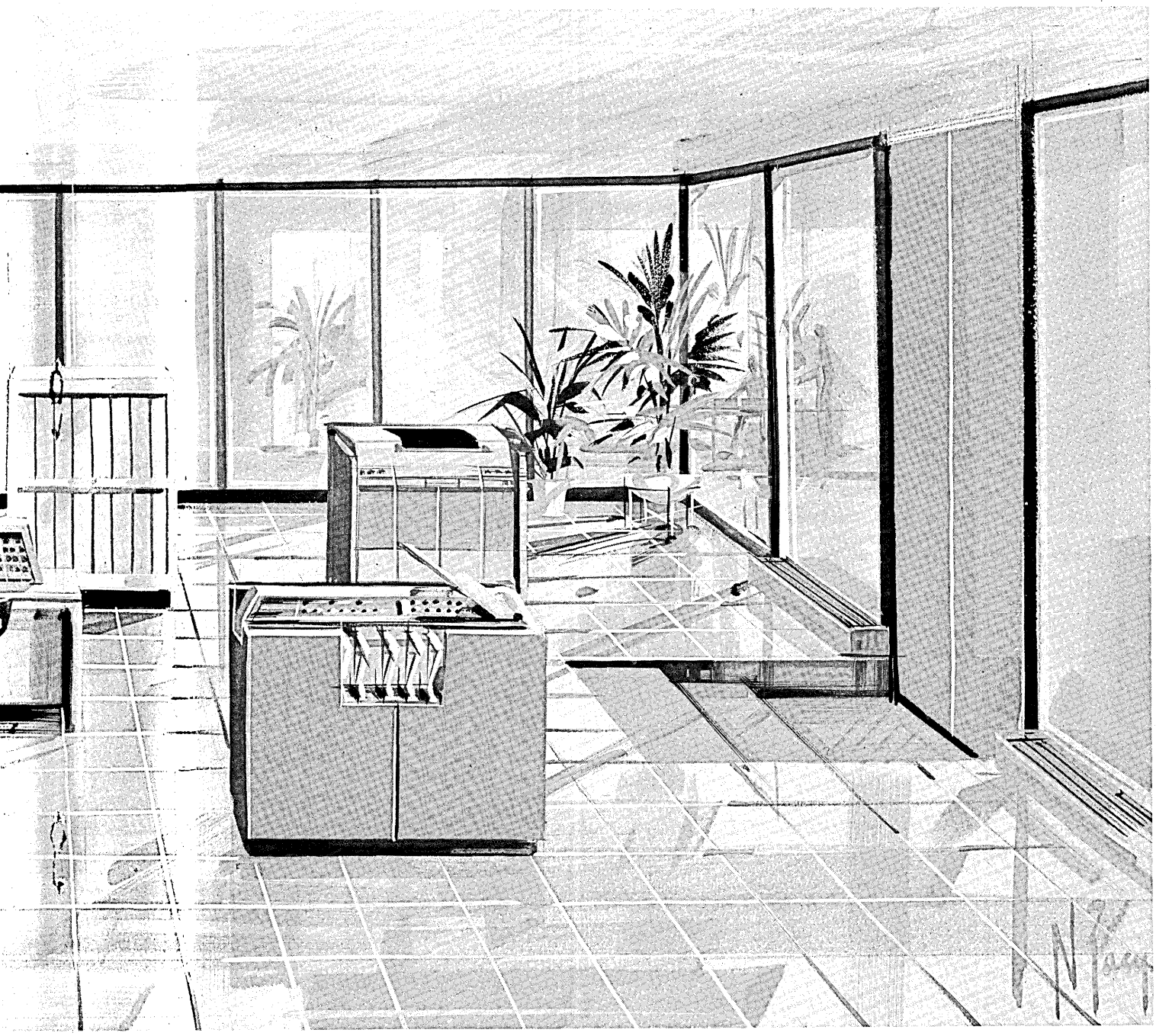


Acceptance test above was simulated with elevator weights which were wheeled backwards and forwards approximately 100 times over floating floor vinyl surface and rigid plastic lip. No rippling or indentation occurred—test was successful beyond expectations.

floating floors offers first complete c

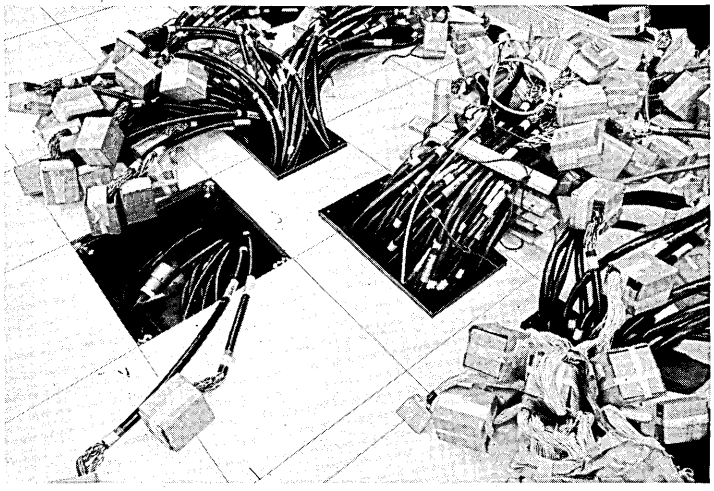


e computer room "package" unit

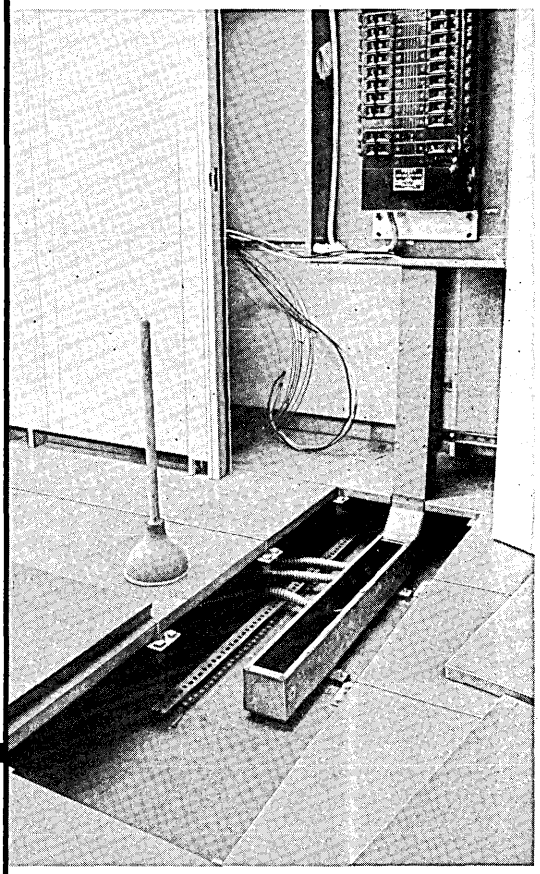


This totally new floating floors computer room "package" unit includes air conditioning requirements, power panel, humidity and temperature controls, and partitions. This floating floors "package" will be engineered and guaranteed to meet data processing equipment requirements. Send us your data processing equipment selection, and we will furnish you complete details and information on this floating floors "package" unit.

Various applications of floating floors

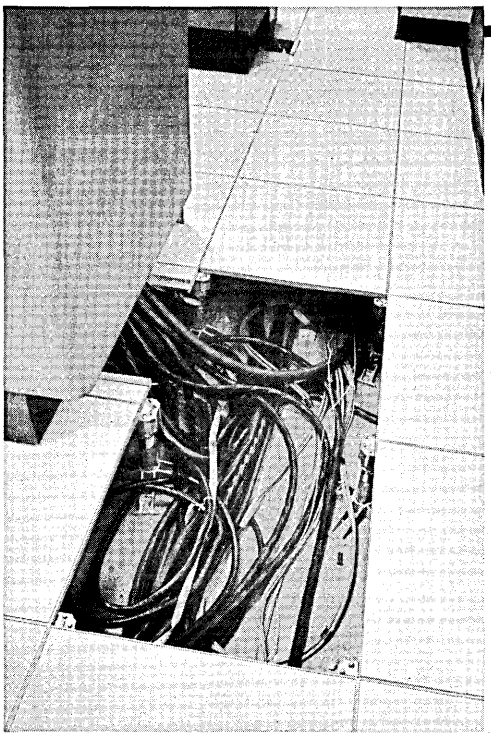


Unusual conditions can be met with floating floors. Cable cutouts can be located at any place required. The raised edges prevent casters from dropping into cable opening when moving machines.

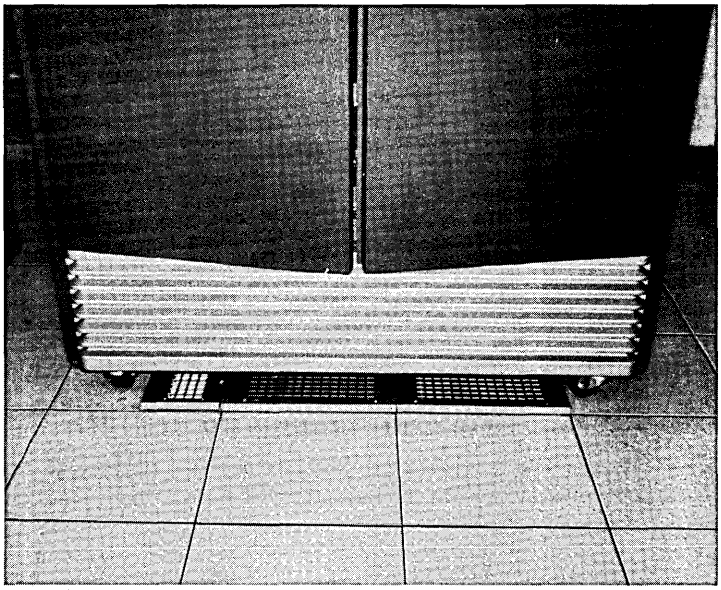


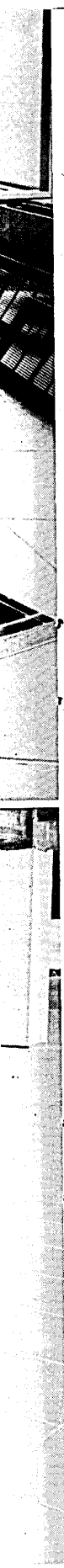
Electrical power panel entry into floating floor.

Signal cables between machines can be easily placed and removed, if required. Note that there are no supporting cross members to interfere with cables.



Floating floor panel makes it easy to feed air directly into machine.





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General Tire & Rubber Co., Akron, Ohio
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Bendix Corporation, Detroit and South Bend, Ind.
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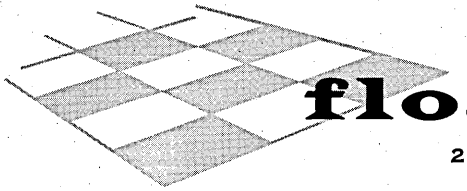

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EASTERN JOINT COMPUTER CONFERENCE

TECHNICAL PROGRAM INTRODUCTION

THE 1960 EASTERN Joint Computer Conference program will include papers which cover a very broad range of subjects. More than 130 excellent papers were submitted for consideration from which the Program Committee selected those of exceptional significance, originality, timeliness and interest.

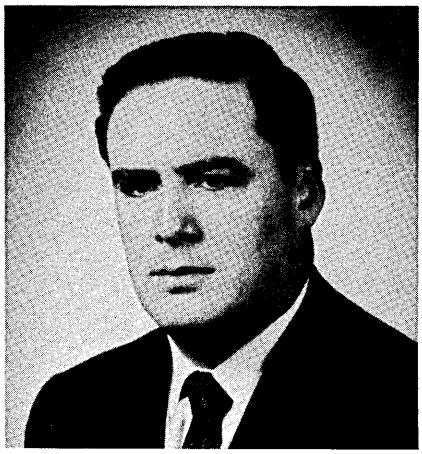
In order to allow as much freedom as possible in submission and selection of papers, no theme was set for the Conference and little preliminary consideration was given to planned sessions covering fixed topics. Instead, sessions were arranged topically, to the extent possible, after the selection of papers was completed.

Papers include descriptions of new machines and devices as well as unusual applications and programming techniques. They will cover such subjects as data transmission, military systems, techniques for using computers in business as well as scientific data processing, application of computers in the design of new computers and personnel aptitude testing through the use of an electronic logical device.

At this year's Conference, the discussion time for each paper will be shortened and questions will be restricted to those of general interest. Immediately following each session, authors will station themselves at specified locations at the rear of the auditorium, offering an opportunity for direct communication.

It is hoped that this arrangement will allow the Conference to proceed most efficiently, while providing a means for unrestricted discussion.

—E. C. KUBIE



Upon graduation from Columbia University in 1950, ELMER C. KUBIE, the 1960 EJCC Program Chairman, joined the Applied Science Division of IBM as a mathematician. He spent several years in the scientific computing service applying a Card Programmed Calculator to various scientific and engineering problems. In 1952, Kubie was transferred to the IBM Laboratories in Endicott, New York, where he headed the Applied Science Mathematical Planning Group located there. In this assignment, he contributed to the design and release of the IBM 650. In 1954, Kubie became a consultant in General Electric Company's Management Consultation Services Division. In 1955, he became one of the founders of Computer Usage Company. As President of CUC, he now heads a staff of more than eighty computer specialists.

TECHNICAL PROGRAM

TUESDAY—morning

Tuesday: December 13 9:30 A.M.

SESSION CHAIRMAN: Louis Wilson—Remington Rand

OPENING REMARKS: N. Rochester, Conference Chairman, IBM and E. C. Kubie, Program Chairman, CUC

A LOGICAL MACHINE FOR MEASURING PROBLEM SOLVING ABILITY

Charles R. Langmuir—Psychological Corporation

The magnitude of costs incurred by assigning unsuccessful or even marginal personnel to tasks involving EDP systems design and programming justifies a much greater effort in the selection of personnel than the use of conventional aptitude tests implies. A small desk-top machine named the Logical Analysis Device is described, its logical organization is explained, and its operation as a method of observing and testing an individual's problem solving abilities is illustrated with slides. Some comment describing the wide variation of performance among several hundred college graduates employed in various professions is included but the principal emphasis is given to data pertaining to the performance characteristics of persons in computer and data pocessing activities.

A METHOD OF VOICE COMMUNICATION WITH A DIGITAL COMPUTER

S. R. Petrick and H. M. Willett—Air Force Cambridge Research Labs

A pattern recognition procedure for achieving automatic recognition of spoken words has been developed and instrumented using an eighteen channel vocoder and a general purpose medium scale computer. If the speaker's own voice is used to prepare "masks" of the words he wishes to be recognized, correct identifications are made and printed on the computer flexowriter with almost 100 percent accuracy. Arbitrary new spoken input words may be added in real time to the computer vocabulary. Other programs dependent upon this word recognition facility which have been written include: An interpretive routine which enables a speaker to say a sequence of words which are followed by a print out of the words spoken and the value of the expression defined; a speaker recognition program which identifies the talker with appropriate comments as well as the word he spoke.

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FILTER—A TOPOLOGICAL PATTERN SEPARATION COMPUTER PROGRAM

Daphne Innes—Lawrence Radiation Laboratory

The advent of high energy particle accelerators and liquid bubble chamber detectors has added the demands of high-speed data reduction to the many problems of modern nuclear physics research. For example, one six month experiment on the University of California 72-inch Hydrogen Bubble Chamber yields photographic records of millions of nuclear events. This paper discusses one of the new measuring and topological identification devices which has been developed to analyze these great volumes of research data. Dr. Bruce McCormick has proposed a scanning technique which allows rapid recognition, separation and measurement of the photographic records of star type nuclear events. A device known as the Spiral Reader measures background and star type event features, impartially discriminating against non-radial patterns by the geometry of its rotating scanning element.

REDUNDANCY EXPLOITATION IN THE COMPUTER SOLUTION OF DOUBLE-CROSTICS

Edwin S. Spiegelthal—Consultant

There are many data-processing applications for which exact algorithmic processing schemes are either not strictly required or defy precise specification or both. Such applications as machine translation, automatic abstracting and automatic indexing fall in this category. The human beings who execute these tasks make heavy use of the redundancy of the input data. What is required for their automation is some heuristic scheme for taking advantage of this redundancy. One such scheme is described in the present paper. This scheme, in its first concrete realization, has been used to solve Double-Crostic puzzles. Both the 704 programs for Double-Crostic solution and the general heuristic scheme are discussed in the paper.

TUESDAY—afternoon

Tuesday: December 13 2:00 P.M.

SESSION CHAIRMAN: Sidney Cashton—CEIR

A COMPUTER FOR WEATHER DATA ACQUISITION

Paul Meissner, J. Cunningham and C. Kettering—National Bureau of Standards

In order to meet a growing need for more rapid and detailed reporting of weather information, the U.S. Weather Bureau has been conducting an extensive program for the development of automatic weather stations. The National Bureau of Standards has had an opportunity to participate in this program and has developed a small, specialized computer for use as the control component in such a station. The computer is intended as a research tool for exploring the application of automatic data processing equipment to this type of problem. Basically, the computer must sample a number of weather-sensing instruments, suitably process the instrument data, and prepare outputs in the form of local displays and teletype messages.

A SURVEY OF DIGITAL METHODS FOR RADAR DATA PROCESSING

F. H. Krantz and W. D. Murray—Burroughs Corporation

This paper reviews the growing number of declassified techniques for automatic processing of radar data by digital means. Emphasis is placed upon signal time-sampling and quantization, integration methods, rejection of stationary targets, radar trigger manipulation, and a new high-speed device for recording digitized radar video. These techniques are discussed individually and are also shown combined in a hypothetical radar data processor design.

THE ORGANIZATION AND PROGRAM OF THE BMEWS CHECKOUT DATA PROCESSOR

A. Eugene Miller—Auerbach Electronics Corporation and

Max Goldman—Radio Corporation of America

The BMEWS Checkout Data Processor (CDP) is probably the first medium-size digital processor to perform the real-time, on-line checkout of an entire operational radar detection and processing system. This paper is the first to publicly discuss the unique organization of the BMEWS CDP and the unusual structure of the CDP program. The CDP has separate memories; one for storing constants and instructions, and one for storing data. The means for jointly using these two different types of memories, while maintaining the flexibility associated with single memory machines, is explained. The tailored features of the CDP, efficiently handling its unique problems, are emphasized. They include real time program interrupt signals and a complex input-output.

ULTRA-HIGH SPEED DYNAMIC DISPLAY SYSTEM FOR DIGITAL DATA

Burton G. Tregub—Melpar, Inc.

A new ultra-high speed direct view cathode ray tube presentation of digital input data is described. This system is capable of locating a point anywhere on a 16 inch electrostatic cathode ray tube within 5 microseconds with an overall repeatability (including amplifier settling times) of .05 percent. The present system as it exists in production is actually a dual unit which is capable of plotting lines, dots and cursor patterns on the face of the cathode ray tube as ordered by data blocks on a magnetic drum during 33 usec intervals. Color displays are also presented by means of the field sequential technique. Input data utilizes 12 binary bits per point to identify each of the X and Y coordinates for each end of the line.

HIGH SPEED DATA TRANSMISSION SYSTEMS

R. G. Matteson and J. D. Barnard—Stromberg-Carlson Company

With the rapid increase in the use of digital computers for business scientific control and military applications requirements are created for the high speed transmission of data so that these computers may be utilized for more and diversified applications and so that computers may be utilized a greater percentage of the time. This paper will describe areas of application of high speed data transmission equipment and will describe equipment developed and installed by Stromberg Carlson for the transmission of digital information over standard telephone lines at 2400 bits per second.

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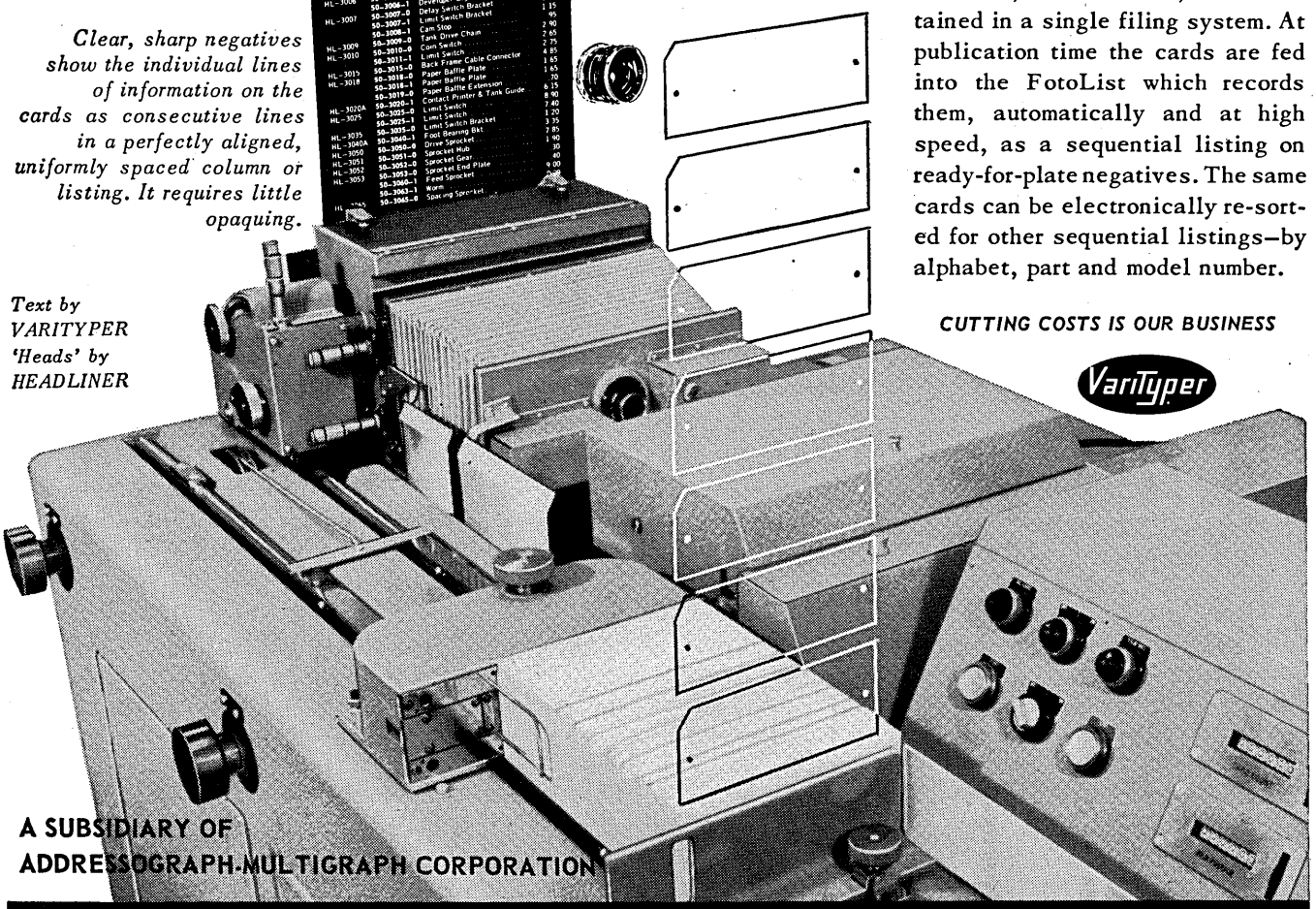

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TECHNICAL PROGRAM

WEDNESDAY—morning

Wednesday: December 14 9:00 A.M.
SESSION CHAIRMAN: Charles Jones—Shell Oil Company

PARALLEL COMPUTING WITH VERTICAL DATA

William Shooman—System Development Corporation

A novel technique called Vertical Data Processing (VDP), for the manipulation of data on digital computers is presented. Multiple data are processed simultaneously one bit at a time using boolean operations. Several classes of problems appear adaptable to this technique. A hypothetical VDP computer which embodies both VDP as well as conventional techniques is proposed and its advantages discussed.

THE TABSOL CONCEPT

T. F. Kavanagh—General Electric Company

This paper describes how Decision Structure Tables can be used to describe complex, sequential, multi-variable, multi-result decision systems. TABSOL, an automatic programming technique for solving structure tables on any computer is also discussed. The structure table and TABSOL concepts are major steps forward in describing complex operating decision systems since they replace both flow charting and computer coding. In addition, changes can be readily introduced by the systems designer, greatly simplifying the systems maintenance problem. By forcing a logical step-by-step analysis, these techniques highlight business causal relationships and simplify debugging in the systems designer's own language.

THEORY OF FILES

Lionello Lombardi—University of California—Dept. of Mathematics

A system language called "ABL" is considered which allows the use of mathematical methods for the description of non-numerical information processing. Files and sets of files are defined and discussed mathematically. The nature of the laws which coordinate the flow of data of non-numerical systems is investigated. These laws, which appear to be common to all non-numerical procedures, can be stated by means of certain Boolean variables.

POLYPHASE MERGE SORTING—AN ADVANCED TECHNIQUE

R. L. Gilstad—Minneapolis Honeywell Regulator Company

New merge sorting techniques have been developed by Honeywell that utilize tape drives more efficiently than conventional sorting methods. A report on one of these techniques, the Cascade or "N-1" sort, was presented a year ago. A review of the Cascade sorting method is presented in the current paper as background for a new advancement, called polyphase sorting. The methods used in polyphase sorting are explained in terms recognizable by anyone familiar with merge sorting on computers. Arguments are brought forth comparing the merging power of normal merge sorting, Cascade, and polyphase techniques. These arguments show that Cascade sorting and polyphase sorting represent techniques that make the new generation of computers even more powerful than before, in one of the most common areas of computer usage.

WEDNESDAY—afternoon

Wednesday: December 14 2:00 P.M.
SESSION CHAIRMAN: Richard Clippinger—Minneapolis Honeywell

HIGH SPEED PRINTER AND PLOTTER

Frank T. Innes—Briggs Associates, Inc.

The high speed printer and plotter is capable of plotting ten simultaneous curves each at a rate of 100 points per second or of printing at a rate of 66 lines per second. Its principal application is in producing annotated plots with grid lines and alphanumeric annotation. The machine uses magnetic tape input, hybrid resistor-transistor and diode logic, with a multiple stylus electrolytic recorder for output with paper moving at ten inches per second. Programming general organization and design features will be discussed. Typical annotated plots from the machine will be shown.

THE USE OF BINARY COMPUTER FOR DATA PROCESSING

Gomer H. Redmond and Dennis E. Mulvihill—Chrysler Corporation

The paper presents a case concerning the use of binary machines for data processing. Based on experience gained by the Chrysler Corporation, the paper discusses the need for the establishment of a consistency of concept for all phases of problem organization and solution. Specific advantages inherent in binary machines are pointed out, along with some of the pitfalls which would result if the consistency of concept is not maintained. In their treatment of this subject, the authors also sound a warning to those concerned with the development and use of generalized business oriented languages that certain abilities of binary machines have not been exploited in these programs. In their conclusion, the authors state that the abilities of binary-type machines will become more indispensable as management techniques, extant today, become more sophisticated and acceptable.

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TECH. PROGRAM

A DESCRIPTION OF THE IBM 7074 SYSTEM

R. R. Bender, D. T. Doody and P. N. Stoughton, IBM Poughkeepsie

The IBM 7074 System provides increased processing power by improvements within the framework of the 7070. A new circuit card and the IBM Standard Modular System of packaging make possible system growth by substitution of functional units rather than by replacement of an entire system. Program compatibility with the 7070 is retained. Circuits, packaging, and machine organizaton will be described. Examples of instruction execution times will be given and their effect on system performance will be discussed.

THE RCA 601 SYSTEM

K. Kozarsky and A. T. Ling — RCA — Camden, New Jersey

The design aspects of the RCA 601 System are discussed with particular emphasis on the three dimensions which may be readily modified—speed, function and capacity. The structural organization of the system and associated memory formats are described. The programming and system features which enable the system to utilize the fast memory and tapes, an arbitrary degree of simultaneity and the generalized word and character structure are explored. Emphasis is placed upon variable instruction length, address modification and listing structure. Design features, such as a 1.5 microsecond memory, 120 KC tapes, and generalized word structure are also described.

ASSOCIATIVE SELF-SORTING MEMORY

R. R. Seeber, Jr.—IBM—Poughkeepsie, New York

A major problem in data processing is the sorting of data. This paper proposes a memory system which automatically performs the sorting function. An associative memory, based on cryotron circuits, is extended to permit high-equal-low comparison of the interrogating word with all words in memory. This comparison permits the new word to be placed between the proper pair of sorted words in the memory. A double shifting operation is used to move the appropriate block of words to make room for the new word.

UNIVAC — RANDEX II — RANDOM ACCESS DATA STORAGE SYSTEM

G. J. Axel — Remington-Rand Univac Div., Sperry-Rand Corp.

A random access drum file, having 198.6 million bits total storage capacity, a bit density of 650 pulses per inch, and 385 milliseconds average data access time, is described in this paper. Two flying-magnetic-recording-heads transfer data to and from the drum file unit. They are self-supported, by a hydrodynamically generated air film, over two magnetically plated drums (24 inches diameter and 44 inches long). The heads, drums, and head-positioning servo are enclosed in a sealed and pressurized chamber to prevent their contamination by foreign material normally found in the atmospheric air.

HOT-WIRE ANEMOMETER PAPER TAPE READER

John H. Jory — Soroban Engineering

A hot-wire anemometer type reader is proposed as a method of achieving reliable, high-speed reading of perforated paper tape. The principle of operation concerns the change in resistance of a fine coil of wire of known temperature coefficient of resistance when subjected to an air stream directed through a perforation in a paper tape being read.

THURSDAY—morning

Thursday: December 15 9:00 A.M.
SESSION CHAIRMAN: Donald Pendery—IBM

DATA PROCESSING TECHNIQUES IN DESIGN AUTOMATION

W. L. Gordon—Minneapolis-Honeywell —Newton Highlands, Mass.

By providing a computer with basic information concerning the design of a device as complex as the modern computer one not only obfains an efficient record retention system but also brings to bear the full decision making abilities of the computer on the design problem itself. A major thesis of this paper is that the automation of the design of a complex system is primarily a data-processing problem in which the most powerful tools reside in the ability of the computer to perform such jobs as editing, extracting, sorting, and merging pieces of basic design information. This contention is substantiated by describing the system in use to provide mechanized aids to design and production.

IMPACT OF AUTOMATION ON DIGITAL COMPUTER DESIGN

W. A. Hannig and T. L. Mayes—General Electric—Phoenix

The impact of Design Automation techniques upon the design, construction, and maintenance of digital computers is discussed. Specific items described include: The logician's use of these programs as a design tool; the use of the documents produced by these programs; the effect that the use of these programs and program-produced documents has upon the human organization using them. This paper further describes the use to which automation programs were put in the design of presently operating digital computers, starting with Boolean equation input data and ending with factory release information.

CALCULATED WAVEFORMS FOR TUNNEL DIODE LOCKED PAIR

H. R. Kaupp and D. R. Crosby—RCA —Camden, New Jersey

This paper presents an introductory analysis of the tunnel diode locked pair circuit. The characteristics of the tunnel diode, together with the simplicty of the locked pair circuit, making it a major contender for use as a high speed computer element. High speed and high gain are the locked pair's main advantages; the three phase power supply and lack of a simple means for logical inversion are its main disadvantages. The basic circuit consists of two tunnel diodes in series, the node common to the tunnel diodes being both the input and output terminal. As a computer element, the locked pair functions in much the same manner as the phase locking harmonic oscillator (PLO). Like the PLO, the locked pair overcomes the difficulty of coincident input and output terminals by using a three phase voltage source.

ON ITERATIVE FACTORIZATION IN NETWORK ANALYSIS BY DIGITAL COMPUTER

W. H. Kim, C. V. Freiman and W. Mayeda, Columbia University, Department of Electrical Engineering

The need to determine the sum of all tree admittance products occurs in almost all applications of topological network theory. This paper describes a method of obtaining this sum through an iterative factorization of the sum of tree admittance products of successively more complex subnetworks. Computational efficiency is achieved in that: (1) it is not necessary to test sets of branches for the presence of circuits; and (2) it is not necessary to calculate each tree admittance product. A digital computer program has been developed for use on an IBM-704 which accommodates networks of up to 13 nodes and 77 branches. The program is designed to reduce computation time when the present network corresponds to a minor modification of the previously investigated network.

A COMPUTER-CONTROLLED DYNAMIC SERVO TEST SYSTEM

V. A. Kaiser and J. L. Whittaker—Douglas Aircraft Company

A computer-controlled dynamic servo test system has recently been placed in operation by the Testing Division of Douglas Aircraft Company. The manual operations normally performed in the testing of a missile control system are now entirely accomplished by this computer installation. In obtaining the frequency response and stability characteristics of a control system, the computer operates to (1) generate a prescribed sequence of driving functions, (2) sample the resulting outputs, (3) compute from these samples the gain and phase characteristics, and (4) provide tabulated or plotted results in a form ready for analysis. A description of the equipment used and the analytical techniques employed to enable automatic dynamic testing is given.

TECH. PROGRAM

THURSDAY—afternoon

Thursday: December 15 2:00 P.M.
SESSION CHAIRMAN: Herbert Grosch—Consultant

THE FLYING SPOT SCANNER AS AN INPUT SENSOR TO A CHARACTER READING SYSTEM
J. S. Bryan, J. B. Chatten, F. P. Keiper and C. F. Teacher, Philco Corporation
It is shown that the Flying Spot Scanner meets most of the requirements of an ideal sensor for a character recognizer. Advanced electron optics and phosphor technology now make practical the all-electronic scanning of an entire page of printed material. The signal to noise ratio is such that picture element errors due to the quantum fluctuations at the photocathode have the probability of occurance of only 2.5×10^{7} when the video bandwidth is 6 mc and the CRT beam current is sufficently low to insure good tube life. Techniques are presented which minimize spacial quantization errors that are inherent in conventional scanning procedures. Other techniques are discussed which increase the readability of degraded printing for a recognizer.

USE OF A DIGITAL/ANALOG ARITHMETIC UNIT WITHIN A DIGITAL COMPUTER
Donald Wortzman — IBM Advanced Systems Development Division
This report discusses the use of a Digital/Analog Arithmetic Unit in order to increase the computational power of digital computers. In some problems the inherent high accuracy of digital computers is unwarranted either because the input digital information is limited in accuracy or because the input information is in analog form. It is in these instances that the Digital/Analog Arithmetic Units' high speed, ease of programming, and ability to operate on combined analog and digital information may be welcomed.

PB250 A HIGH SPEED SERIAL GENERAL PURPOSE DIGITAL COMPUTER USING MAGNETOSTRICTIVE DELAY LINE STORAGE
Robert Mark Beck—Packard Bell Computer Corp.
The requirements for a small general purpose computer that can serve as a system component as well as a general computing device are described, together with an analysis of alternate methods of mechanization. The PB250 is then described and evaluated as an optimum solution to these requirements methods for minimizing active elements and logical devices that service to increase flexibility are described in detail.

THE INSTRUCTION UNIT OF THE STRETCH COMPUTER
R. T. Blosk—IBM Poughkeepsie
The purposes of this paper are to describe the major functions of the unit, to give a general picture of the internal machine organization, and to present several examples of how some performance goals are achieved. The INSTRUCTION unit, which is a large, complex, high speed computer, is designed and built to provide the major function and control ability for the STRETCH Computer. The INSTRUCTION unit has a variety of functions—most important are the fetching and indexing of all instructions for the computer, and the execution of a large set of instructions dealing with index arithmetic, branching, and word transmission. The size and complexity of the unit are determined by the instruction buffering and the extensive amount of simultaneous operations required to achieve the high performance goals set for the computer.

THE PRINTED MOTOR: A NEW APPROACH TO INTERMITTENT AND CONTINUOUS MOTION DEVICES IN DATA PROCESSING EQUIPMENT
R. P. Burr—Circuit Research Company
The printed DC motor is characterized by high pulse torque capability and freedom from cogging or preferred armature positions. These attributes lead to a variety of applications in data processing equipment ranging from reel and capstan drives in magnetic and paper tape transports through detenting and positioning mechanisms. Analysis of the motor on a velocity basis yields a simple equivalent circuit which is a powerful tool for designing both the machine and its drive circuits into a specific requirement. Since there is no rotating iron in the structure and since the field is supplied by permanent magnets, the speed-torque curve of the motor is a straight line whose slope defines a "mechanical source impedance." Inertia of the proposed load appears as a capacitor in the same dimensional system. A typical example of an application in a paper tape transport is described.

An Explanation of ALGOL 60

PART TWO by DR. IVAN FLORES, Consultant,
Dunlap & Associates, Inc., Stamford, Conn.

BY SIMPLY CALLING FORTH the procedure identifier, a large piece of processing can be specified anywhere in the program. The procedure declaration gives the directions for performing this processing.

The syntax of this declaration is found in Figure 13. The type (integer, etc.) (a) may precede the procedure symbol (b). Just one identifier follows (c) as part of the procedure head (d). Next comes a formal parameter list (e). If present, it contains the dependent variable (f) followed by other parameter names and corresponding symbols (g). In the value part (h), if such is required, the symbol **value** (i) is followed by a list of identifiers (k). All of these identifiers must have values assigned to them when the procedure statement is made.

The specification part (m), of which none, one, or several may be present, contains a specifier (n) and is followed by one or more identifiers (o). Each specifier may be identified by type (p) but must have a symbol (q) indicating its nature.

Finally, a statement (r) comprises the body (s) of the procedural declaration. It tells how to combine the parameters and variables to yield the desired function. Here are a few examples:

```
procedure Spur (a) Order : (n) Result : (s); value n;
array a: integer n; real s; begin integer k;
s := 0;
for k := 1 step 1 until n do s := s + a[k, k]
end
```

The Spur procedure for matrix a of order n has results called s. The value n must be supplied as well as an array a. We find n is an integer and s is real. We start with an integer k and set s to 0. Then we find

$$\sum_{k=1}^{n} a\,[k, k] \text{ and put it at } s.$$

```
procedure Transpose (a) Order : (n); value n;
array a; integer n;
begin real W; integer i, k;
for i := 1 step 1 until n do
    for k := 1 + i step 1 until n do
        begin W := a[i, k] ;
            a[i, k] := a[k, i] ;
            a[k, i] := W
        end
    end Transpose
```

The transpose procedure for a matrix a of order n requires a value for n, an array a and n must be an integer. The block begins with a *type* declaration. Here a is a working storage needed when $a[i, k]$ are interchanged. Notice that the initial value of k is $1 + i$ in order to prevent an already transposed element from being reworked.

```
procedure Absmax (a) size : (n, m) Result : (y)
    Subscripts : (i, k);
comment The absolute greatest element of the matrix a, of
    size n by m is transferred to y, and the subscripts of this
    element to i and k;
array a ; integer n, m, i, k ; real y ;
begin integer p, q ;
y := 0 ;
for p := 1 step 1 until n do for q := 1 step 1 until m do
if abs (a[p, q] ) > y then begin y := abs (a[p, q] ) ;
    i := p; k := q
end end Absmax
```

The comment after the procedure head tells the story here. As each element is examined, the largest *abs* so far is placed in y and its indices in i and j. The procedure is complete when $a[n, m]$ is examined.

type declarations [5.1]

The type of a simple variable can be declared using the syntax of Figure 14A. *Local* or *own* (1) may be specified; the variable may be declared to be real, integer, or Boolean (2); the identity of such variable is then given (3).

array declarations [5.2]

The array of any dimension is declared as in Figure 14B. First type is declared if desired (1); then the fact that this is an array is made known (2); one or more array segments follow (3). The segment contains one, none, or several variable symbols followed by one, none, or more composites; each composite is a variable symbol followed by one or more pairs of upper and lower bounds in square brackets. Here are examples:

```
real array q[ - 7 : - 1]                                    (1)
own integer array A[if c < 0 then 2 else 1 : 20]            (2)
```

switch declarations [5.3]

The switch declaration defines all the number of "positions" of a "multiposition switch." Each position has a positive integer associated with it. The first item in the list has 1 associated with it, and so forth. In using the switch, it is called for by name and a position is specified. This brings forth the expression in the corresponding position in the switch list.

In Figure 14C the switch symbol (1) is followed by the switch name (2) and the switch list (3). The latter is a set of designational expressions. Here are examples:

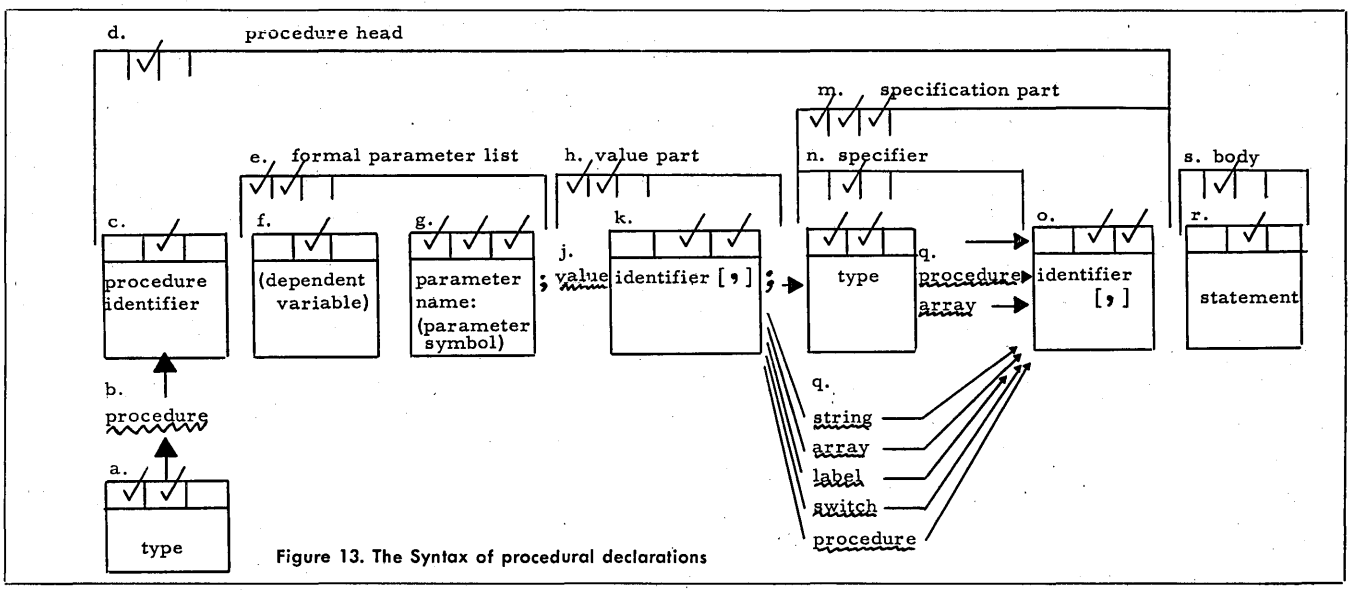


Figure 13. The Syntax of procedural declarations

switch Q := S1, S2, R[M] (1)
switch T := fl, w, **if** v > − 5 **then** S3 **else** S4 (2)

basic symbols [2]
Any language must have basic symbols. For a reference or publication language, this "alphabet" can be large; for the hardware language, it is necessarily restricted to those recognizable to the computer. We shall be concerned here only with the reference language.

ALGOL 60 uses the *letters* and *digits* with which we are familiar. They appear in Table 1. The Boolean truth values are symbolized by **true** and **false.** Then there are delimiters. The arithmetic operators refer to the arithmetic processes; add, subtract, multiply, divide and exponentiate (the arrow pointing up). The relational operators are qualitative (less than, etc.). Logical operators are also familiar, and represent, reading from left to right in Table 1, "if and only if," "if . . . then," "or," "and," and "not." The sequential operators are self-explanatory.

In the list of separators (10) is used for floating point notation; **comment** is used to insert narrative information within the program which the compiler is to ignore up to the next semicolon. Brackets must be used in pairs. Each kind of bracket has a meaning: variables in functions are enclosed in parentheses; square brackets enclose the indices of arrays. The declarators and specifactors have been discussed earlier.

identifiers [2.4]
Any combination of letters and digits beginning with a letter may be used as an identifier.

numbers [2.5]
Number are of conventional types and their syntax is displayed in Figure 15.

strings [2.6]
Arbitrary sequences of basic symbols can be composed by placing quotes about them. This entity is called a string. A space in the string is indicated by #.

expressions [3]
There are many meaningful ways to combine the basic symbols to make cogent units. These are now discussed.

Table 1. Basic Symbols.

Letters	A B C . . . Y Z
	a b c . . . y z
Digits	0 1 2 3 4 5 6 7 8 9
Values	true false
Delimiters	
Operators	
Arithmetic	+ − × / ÷
Relational	< ≤ = > ≥ ≠
Logical	≡ ⊐ ∨ ∧ ⊐
Sequential	go to if then else for do
Separators	, . : ; := # step until while comment
Brackets	( ) [ ] begin end
Declarator	own Boolean integer real array switch procedure
Specificator	string label value

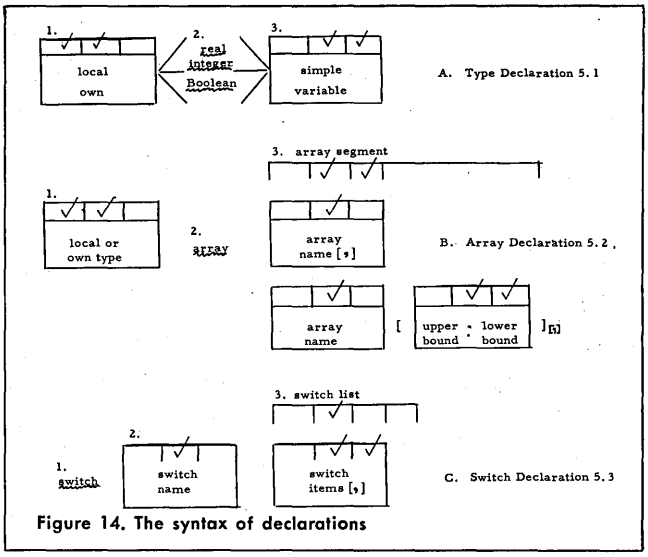


Figure 14. The syntax of declarations

variables [3.1]
A variable's name is an identifier which may be followed by a subscript list. The list is enclosed by brackets. Within are one or more arithmetic expressions separated by commas, as below.
X[3.1] (1)
f[12, g [7, 5]] (2)

function designators [3.2]
A function designator defines a value. This value is obtained by following a procedure. This procedure is either:
defined in a procedure declaration,
or is one of the standard functions of Table 2.
The function designator illustrated in Figure 17 hence resembles the procedure statement. Here are examples:
sin (a − b) (1)
s (x − 5) Temperature : (T) Pressure : (P) (2)

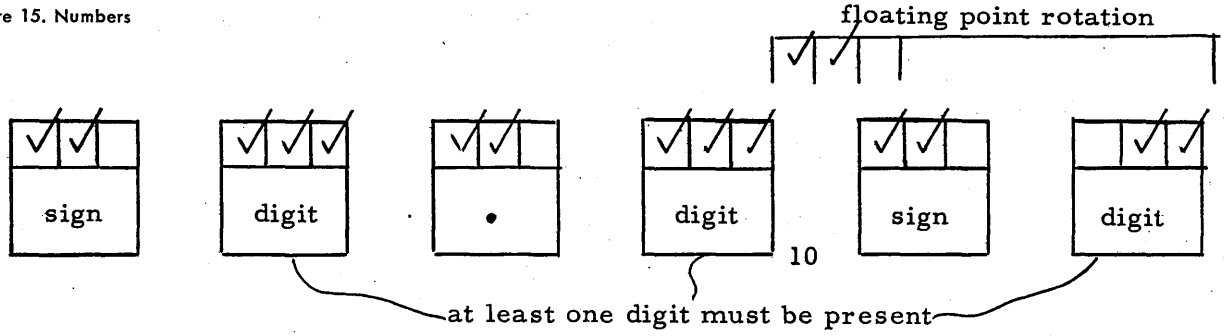
arithmetic expressions [3.3]
In Figure 18 we start with primaries (a) which may be: unsigned numbers, function designators, variables, or parenthesized arithmetic expressions. These may be raised to a power of a primary to form factors (b). These may be multiplies or divided by factors to make terms (c). Terms may be added or subtracted to form simple arithmetic expressions (d). Notice that nesting takes place so that "3" can be used as a primary, factor, term, simple arithmetic expression, or arithmetic expression.

The simple expression may be preceded by an *if clause* and an *else clause* whose object is an arithmetic expression.

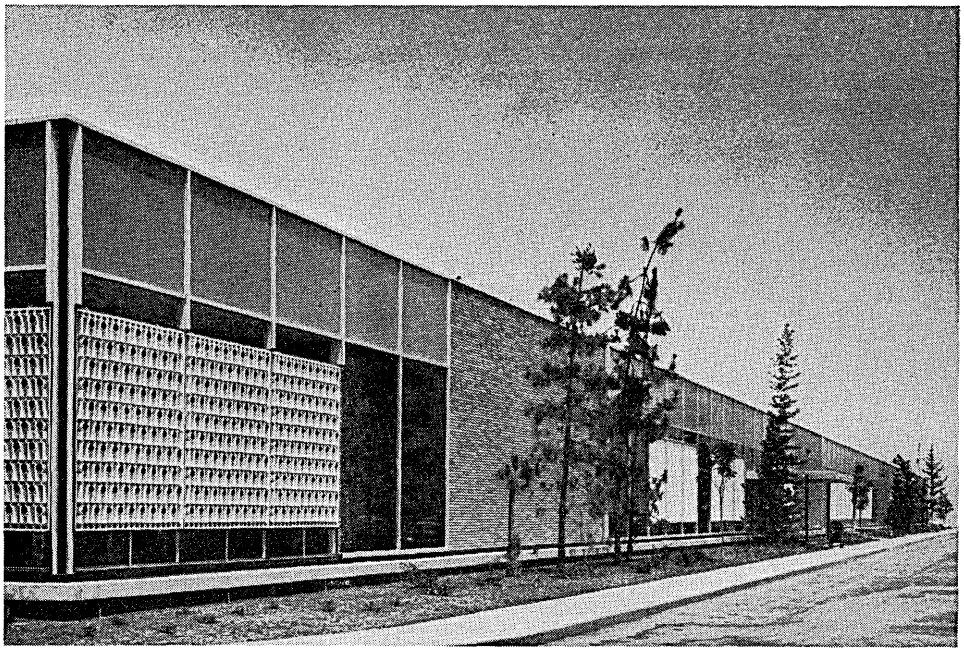
boolean expressions [3.4]
In Figure 19 we begin with a Boolean primary (a). This may be a logical value, variable, function designator, or parenthesized Boolean expression. It may also be a relation composed of two arithmetic expressions connected by a single relational operator. The primary may or may not be negated (b) to form the secondary (c). The *and* function connects secondaries to form Boolean functions (d); these are connected by *or* to make Boolean terms (e); these in turn, connected by "if . . . then." become implication (f). The biconditional connects implications to get simple Boolean expressions (g).

A simple Boolean expression may be surrounded by an *if clause*

Figure 15. Numbers

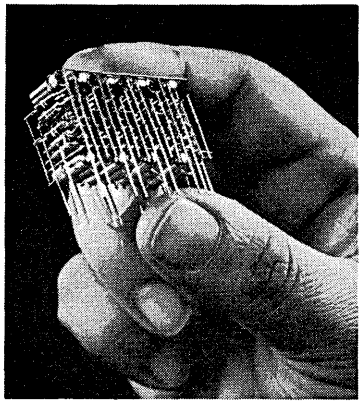


ADVANCED FACILITY TO IMPLEMENT ADVANCED CONCEPTS IN COMPUTER SYSTEMS



This 180,000-square-foot building is the first unit of a facilities complex which eventually will comprise 825,000 square feet in the Los Angeles suburb of Woodland Hills, California. This facility of the Electronic Equipments Division of Litton Industries is designed for maximum convenience, comfort, and efficiency.

Merritt MacKnight, Manager, Systems Development Department, demonstrates the sophisticated design of a Litton digital computer assembly for the new Grumman A2F.



Welded wire techniques substantially increase component packing densities.

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(h) *and* and *else clause* (j) whose object is a Boolean expression. This is then the Boolean expression.

designational expressions [3.5]

The purpose of this kind of expression is to provide a means for supplying a destination in the form of a label in *"go to"* statements. A label consists of a combination of digits and letters. As in Figure 20 this may be done with a simple designational expression (a) using a switch designator (b) consisting of a switch identifier (c) and a subscript expression (d) in square brackets. Otherwise a label on another parenthesized designation expression is used. The simple designational expression may be surrounded by both an *if clause* and an *else clause* whose object is a designation expression.

a programming example

The Euler series transformation is defined for an oscillating series of terms, a_i. The fact that it oscillates is indicated by sign (a(i)) := sign ((− 1) ↑ i).

The Euler transformation carries

$$a_0 + a_1 + a_2 + \ldots . \qquad (1)$$

into

$$\frac{a_0}{2} + \frac{a_0 + a_1}{2^2} + \frac{a_0 + 2a_1 + a_2}{2^3} + \frac{a_0 + 3a_1 + 3a_2 + a_4 + \ldots .}{2^4} \qquad (2)$$

or

$$c_0 + c_1 + c_2 + c_3 + \ldots . \qquad (3)$$

where

$$c_i = \frac{\sum_{0}^{i-1} \left[b\,(i, k+1)\; a_k \right]}{2^i} \qquad (4)$$

and

b (i, k) are the binomial coefficients.

Below is a table of binomial coefficients:

i\k	1	2	3	4	5	6	7
1	1	0	0	0	0	0	0
2	1	1	0	0	0	0	0
3	1	2	1	0	0	0	0
4	1	3	3	1	0	0	0
5	1	4	6	4	1	0	0
6	1	5	10	10	5	1	0
7	1	6	15	20	15	6	1

Notice that to obtain the binomial coefficient in a given horizontal row and vertical column, we examine the row above it and add the number in the same column to the number directly to its left. Thus 5 in row 6, col. 2 is found by adding 4 (in row 5, col. 2) to 1 (row 5, col. 1); and 10 (row 6, col. 3) is found by adding 6 (row 5, col. 3) to 4 (row 5, col. 2). In general

$$b\,(k,i) = b\,(k\text{-}1.\,i) + b\,(k\text{-}1.\,i\text{-}1) \qquad (5)$$

Suppose we have the binomial coefficient, b (i) in row k; we can transform them to those of row $k + l$ in ALGOL as follows:

```
binomial k := k + 1; for i := k step − 1 until 1 do
    b (i) := b (i) + b (i − 1);                    (6)
```

Now to get a new term in the Euler series we first sum the products of the binomials and the terms of the original series thus

```
for i := 0 step 1 until k do
```

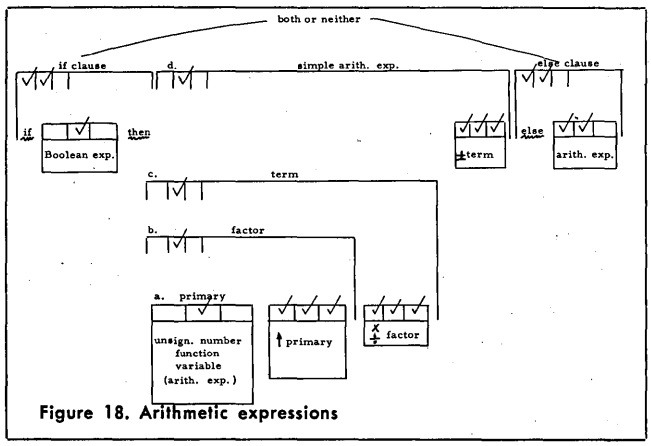

Figure 18. Arithmetic expressions

```
    begin sum := 0; sum = sum + a (i) × b (i) end  (7)
```

This must be divided by 2^k thus

```
c (k) := sum/2 ↑ k ;                               (8)
```

Our series calculation would continue indefinitely unless we have a criterion for stopping. Let us say that we stop if the new term is less than epsilon (eps) a specified number of times (tim) in a row or after 15 terms are calculated, thus

```
if (abs (c [k] ) < eps) ∨ (k > 15 − tim)
then t := t + 1 else t := 0
if t < tim then go to binomial                     (9)
```

The output is the sum of the terms

```
for i := 0 step 1 until k do
    out := out + c (i)                             (10)
```

Now let us incorporate these steps into a routine.

```
procedure eulertrans (fct, out, eps, tim); value eps, tim;
integer tim; real procedure fct; real out, eps;
comment eulertrans computes the sum of fct(i) for i from
    zero to infinity by means of the euler transformation. The
    process is stopped when the new term is less than eps,
    tim times in succession, or after 15 times. Required are
    a function fct with integral argument, an upper bound
    eps and an integer tim.
    Out is the output;
begin integer i, j, k, n; array b [0:15], a [0:15], c [0:15];
    i := j := k := n := sum := 0;
for i := 0 step 1 until 15 do b [i] := c [i] := 0;
for i := 0 step 1 until 15 do a (i) := fct (i);
binomial:  k := k + 1 for i := k step − 1 until 1 do
               b [i] := b [i] + b [i-1];
sum:       for i := 0 step 1 until k do
```

Table 2. Symbols for standard functions.

Symbol	Representing
abs (X)	absolute value of X
sign (X)	sign associated with X
sqrt (X)	square root of X
sin (X)	sine of X
cos (X)	cosine of X
arctan (X)	principal value of arctangent of X
ln (X)	natural logarithm of X
exp (X)	e^X

Note: The occurence of X on the right means "the value of the expression, X."

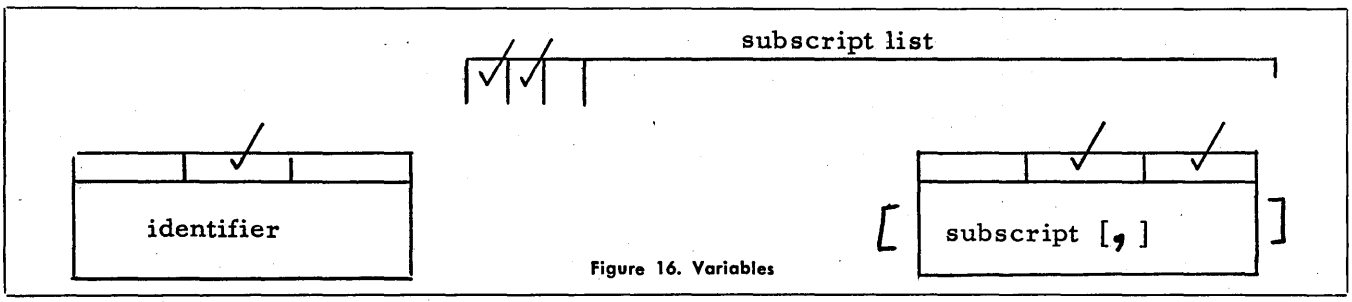

Figure 16. Variables

Applied Mathematicians and Computer Programmers to Participate in Advanced Space Programs

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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BSEE, Physics or Math degree required. Will plan sequence of computer operation, determine the circuitry for engineering problems, set up and operate computer.

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```
        begin sum := 0; sum := sum + a [i] + b [i]
        end sum
term:   c [k] := sum/2 ↑ k;
test:   if (abs (c [k] ) < eps) ∨ (k > 15-tim)
        then t := t + 1 else t := 0;
check:  if t < tim then go to binomial;
finale: for i := 0 step 1 until k do
        out := out + c [i] end euler
```

summary and conclusions

The algorithmic language ALGOL 60 has been reviewed here. A summary of the kind of entities in ALGOL 60 and their areas of usefulness in a problem language is found in Table 3.

Table 3 shows that all the entities used in ALGOL 60 do have a need in problem languages. As far as a comparison of the structure of this language with that of others is concerned, this will have to await a more sophisticated treatment. Suffice it to say that the symbology of ALGOL 60 is concise and explicit and should prove satisfactory.

Let us refer to The List introduced at the beginning of the paper and see how many of the functions are provided for. Items 1, 2, and 4, of The List are input/output functions and do not have representations in ALGOL; however, these functions can often be built into the compiler program and hence can be provided for semiautomatically. Arithmetic (3a) is provided by the language by the connective; information transportation and reflexive operations are inherent in the statement structure. Editing is lacking.

ALGOL provides sufficient flexibility for most scientific problems but not for business problems. The latter require an extensive editing facility and format control which are provided only with an extensive command structure for input/output control and editing. Editing could be implemented if the string definition were given teeth by providing string manipulation statements.

Table 3.
Kinds of entities in problem language and their need.

Entity	Need
Statements	Commands
FOR	Loops
Conditional	Decisions
Dummy	Program revision
Go To	Decisions, procedures
Assignment	Evaluation
Procedure	Compactness
Blocks	Ease of handling symbols
Compound	Ease of handling symbols
Declarations	Reference
Procedure	To implement procedure statement
Type	Record keeping
Array	Looping
Switch	Decision making
Expressions	Manipulation
Arithmetic	Processing
Function designators	Complex processing
Boolean	Decision making
Designational	Decision making
Variable	Evaluation
Basic elements	Alphabet and dictionary

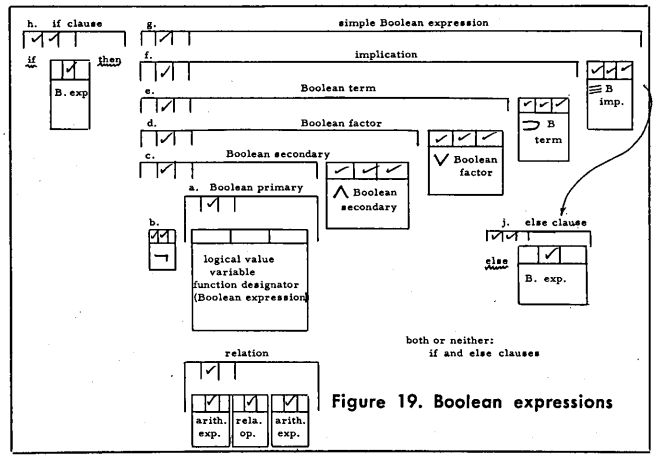


Figure 19. Boolean expressions

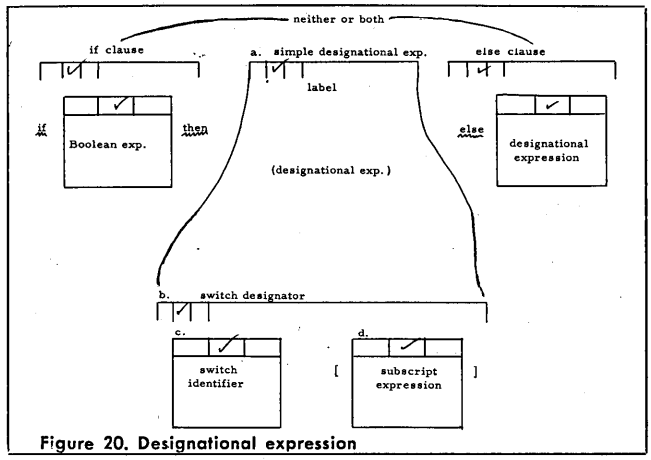


Figure 20. Designational expression

Another feature which is lacking in ALGOL is provision for program debugging. FORTRANSIT, for instance, provides a *pause;* this causes the computer to stop when at this point in the object language routine for the operator to check intermediate results. The conditional punch command of FORTRANSIT does a similar job for punching. Unlabeled punch statements produce machine language statements which are obeyed only when the appropriate console switch is depressed. Again this feature may be incorporated automatically in the compiler, but it then loses flexibility.

The common business language, COBOL, a problem language designed especially for business problems, seems to provide the editing and input/output facility which ALGOL lacks. COBOL is just about "out of committee" and compilers are already being prepared for it by some manufacturers.

combination language

It would be nice if, before ALGOL 60 and COBOL become accepted facts, the powers that be could get together and make a combination language (COMBO?) which would include features of both. There are areas for which each is uniquely suited and where each would prevail; the other areas do not differ so much that compromises could not be made. Certainly the result would be a powerful tool. *(Corrections of Part One may be found on page 76.)*

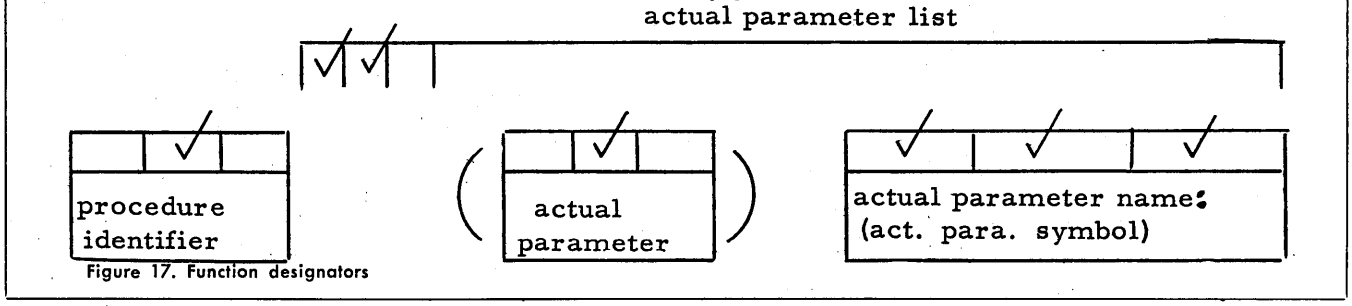
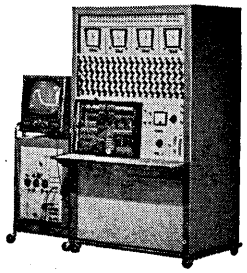
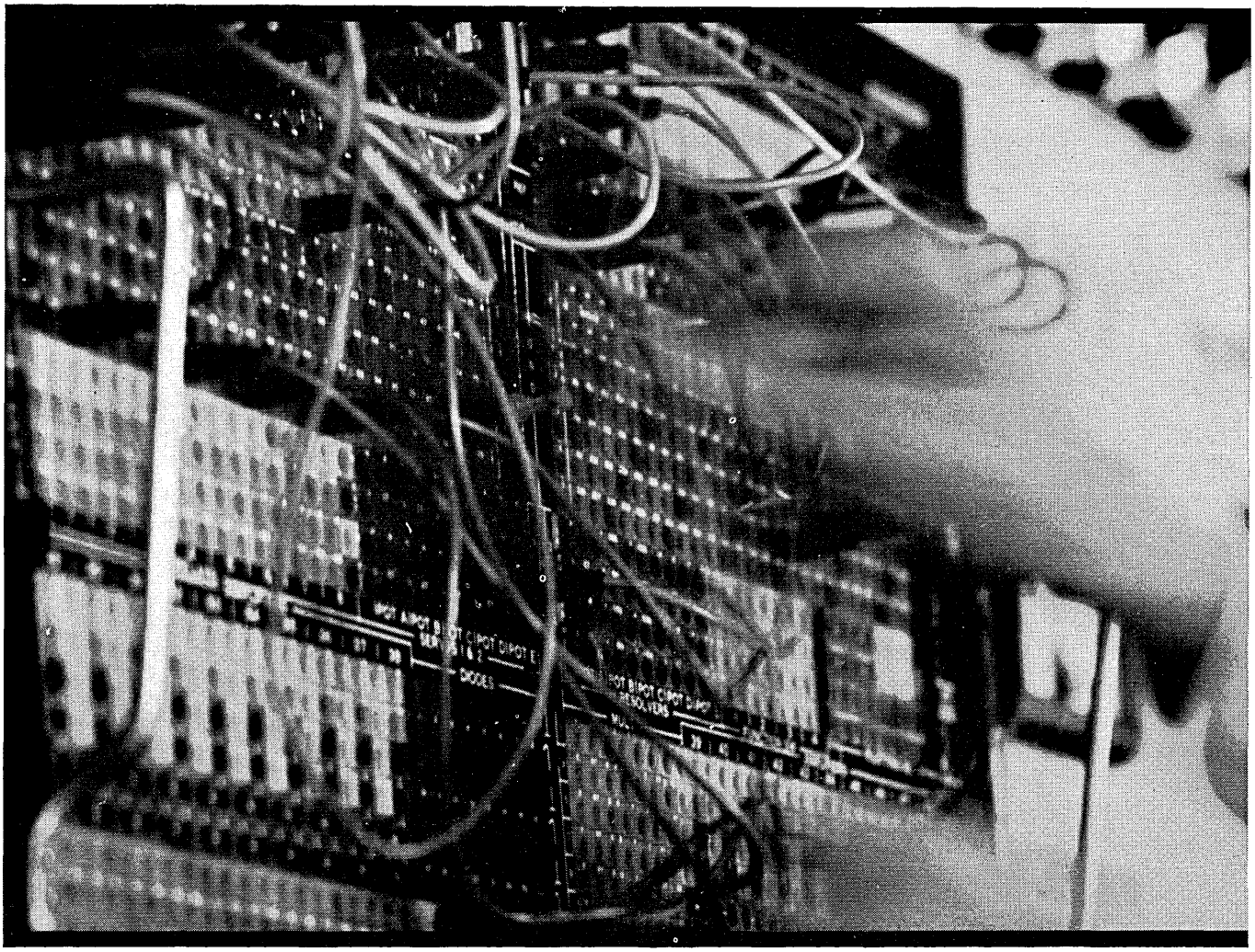


Figure 17. Function designators

DYSTAC*





A MAJOR BREAKTHROUGH IN PROBLEM SOLVING

*DYSTAC: Dynamic Storage Analog Computer, developed by CSI, incorporates high-speed repetitive capabilities with dynamic storage of analog data to an accuracy of 0.01% and with a time-base accuracy of ±0.5 microsecond. This development has tremendously increased the versatility, economy, and speed of solution associated with analog computers.

DYSTAC provides unique time-sharing of computer components and high speed reiterations. These features make possible economic and rapid solution of complex problems that have required too many computer components or too long a solution time to be considered practical for either digital or analog techniques. Different combinations of this new development readily solve problems in four broad categories.

- Sequential calculation, as encountered in the distillation problem. Here, successive solutions to algebraic matrices are obtained from cycle to cycle at a repetitive speed of 60 cps until the problem is solved.
- Definite integral calculations. Varying definite integrals are evaluated from one cycle to another and held in memory for the successful solution of optimization problems.
- Rapid evaluation of multiple integrals. This technique can be employed for the solution of partial differential equations.
- Transient problems and difference-differential equations are solved with continuous memory.

For complete information or to arrange for a demonstration write, phone, or wire:

COMPUTER SYSTEMS, INC., Culver Road, Monmouth Junction, N. J. • DAvis 9-2351

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A report on:

Northwest Joint Computer Conference

by W. J. STADLER,
Boeing Airplane Co., Seattle, Wash.

INSPIRATION and information dealing with general computing and special applications were some of the features which made the Third Annual Northwest Joint Computing Conference at Portland, Ore. (Sept. 30, Oct. 1) memorable.

There have been larger conferences; about 200 persons attended. And there have been longer conferences; only two days were required. However, all too few meetings provide audience and speakers alike with the intangible extras which were provided at Portland. Participants really believed that their ten-hour-per-day work was significant.

Jackson W. Granholm provided the inspiration in his keynote address which challenged listeners to admit that, "our work is changing the face of the world." He prophesied that computers will, "revolutionize the arts of communication, control, accounting, diagnosis, teaching, journalism, and many others." As in other messages (March/April '60 DATAMATION), Granholm declared that technical people are loathe to think or talk in terms of human creativeness; this is considered corny. He points out that technical accomplishments are made by individual effort, not by committees. We should, "take ourselves a little less seriously, and our work, a little more seriously."

ordinary data gathering?

Without allowing the audience to fall into the usual polite listening-trance, Dr. A. R. Tunturi, from the University of Oregon Medical School, shocked newly-awakened imaginations with slides showing experiments on animal nervous systems. In particular, one picture showed a fifty-wire probe, sending data to fifty cathode ray tubes, from the auditory cortex of an animal brain. It has been found that specific locations in that region of the brain yield representations of sound intensity and frequency in reference to the external environment. "Statistical studies of the electrical activity in these areas have shown that the memory of an anesthetized animal is rather good but in the unanesthetized animal all information appears to be destroyed." Whatever new avenues of research this paradox opens—the necessary data gathering and computing equipment, as used in the experiments, no longer seemed "ordinary" to the audience.

"data evaluation"

Dr. William McKune, of Patrick Air Force Base, Florida, discussed the data involved in the testing and launching of scientific satellites. Dr. McKune is supervisor of programs planning for Pan American World Airways which contracts to provide launch support in collecting, transmitting, and processing data at the Atlantic Missile Range. Their laboratory is unique . . . "extending from Florida approximately halfway around the world and up, or out, depending on one's viewpoint." Dr. McKune told about ten-thousandths of a second timing of missiles over a 9000 mile range and of the inexact survey methods which complicate his work. Even the tides cause difficulties in computation because Cape Canaveral is "floating."

humans and machines

Final immunization against audience lethargy was administered by Edmund C. Berkeley with, "The Social Implications of Computers and Automation." If Mr. Berkeley meant to start a thinking controversy, he certainly succeeded. If he meant precisely what he said (and Mr. Berkeley is a very precise speaker), then some passage of time will test his theorems:

1. A machine can do anything a human can do.

2. The machine can probably do it better.

applied mathematics

Professor A. T. Lonseth discussed, "Applied Mathematics." He said that, "At Oregon State, mathematics has considerable breadth . . . Number theorists and topologists mingle with numerical analysts, computer logicians and experts on boundary value problems, integral transforms, and radar signal detection."

Dr. M. C. Gilliland of Beckman Instruments, presented, "Evaluation of Digital Techniques With The Analog Computer."

reports to management

Harold J. Etkin, British Columbia Electric Company, discussed "Budget Control." He emphasized that management requires rapid assimilation of the various factors which affect business. Computers can be used to indicate areas which require attention in order to maintain a profitable earnings situation. In reply to a question, he indicated that a large scale computer is required to process volumes of information in a small amount of time in order to be useful.

computing information

R. E. Trueman of Touche, Ross, Baily, and Smart presented "The Use of Linear Programming in the Determination of Optimum Product Mix." R. J. Hansen discussed computer usage in the Washington State Highway Department. Thomas N. Allen presented "Post Office Automation." Various workshops were available on subjects such as, "Numerical Analysis," "Banking Automation," and "Operations Research." Leo Hegstrom of the Oregon State Motor Vehicle Department entertained and enlightened with his, "Evaluation and Selection of EDPM Systems."

The conference was jointly sponsored by the Oregon State System of Higher Education, General Extension Division, Oregon State University, and the Northwest Computing Association (NCA).

DATAMATION news briefs

FORTRAN HELPS 650 'SEE THE LIGHT' AT SYLVANIA

In a paper presented to the Illuminating Engineering Society, Lambert L. Montgomery of Sylvania Lighting's research and development staff, described how Fortran can be used to predict rapidly the performance of new lighting fixtures. The basic formulas for calculating lighting specifications are first written in Fortran language and punched into cards. These are then fed into the 650, which produces a second deck of cards representing an actual set of machine instructions for repeated future use.

CIRCLE 102 ON READER CARD

'ELECTRONICS AND JUSTICE' CONFERENCE SESSION THEME

The Law School of the University of California, Los Angeles sponsored a National Conference at Lake Arrowhead, October 21-23, for the purpose of exploring the present and future interrelations of law and electronics. An entire session of the conference was devoted to the theme of "Electronics and the Administration of Justice" on the evening of October 21. Speaker at this meeting was Richard F. C. Hayden, past chairman of the American Bar Association's Committee on Electronic Data Retrieval.

READER INQUIRY INFORMATION PROCESSED ELECTRONICALLY

All of DATAMATION's reader inquiries are being handled electronically, according to Frank D. Thompson, president of F. D. Thompson Publications, Inc., and publisher of this magazine.

Marketing Management Associates, Inc., specialists in edp activities generally in the publishing field, and particularly in the area of reader service cards, readership studies, market research and related advertising sales studies, has leased a UNIVAC Step computer for its data processing needs.

Some features of this service include faster inquiry processing for readers and advertisers, duplicate copies of editorial and sales leads provided for each inquiry, file copies of leads, and summary reports with each mailing to give current reader response, previous totals and immediate measurement of reader interest.

CIRCLE 103 ON READER CARD

RCA SCRAMBLING DEVICE WILL BE TOUGH ON FORGERS

Radio Corporation of America has developed a scrambling device which makes its virtually impossible to forge passbook signatures in the withdrawal of savings bank deposits and, also reduces customer waiting time at the tellers window. The device reproduces a passbook signature as an unrecognizable mass of broken lines. The firm expects banks to use the device in conjunction with electronic data processing systems situated in their main offices.

The new protection system makes use of fiber optics to produce an imprint as mixed segments of lines thousandths of an inch in diameter.

CIRCLE 104 ON READER CARD

ENGINEERS JOINT COUNCIL RELATES STRONG EDP AIMS

An Information Processing Committee has been formed by the Engineers Joint Council. Stated aims are to provide coordination of activities within the member societies in the fields of design and application of information processing systems . . . and to provide channels of communication between member societies for dissemination of technology and its applications that will expedite the economic use of new information processing systems. Also, to provide a central source of data on information processing technology in engineering for use by member societies, other professions and public agencies.

SDC AWARDED AF CONTRACT CONTINUING SAGE PROGRAM

System Development Corporation has been awarded a $30.5 million Air Force contract for continuing development and implementation of training programs for the Air Defense Command manual and SAGE system training. The contract also calls for the preparation, adaptation and revision of computer programs used in the SAGE system.

SAGE is rapidly becoming operational throughout the country. The latest SAGE site, was activated August 1, at the Spokane Air Defense Sector, Larson AFB, Wash.

ACM TECHNICAL SYMPOSIUM ADDRESSED BY DR. HUSKEY

The Washington, D.C. Chapter of the Association for Computing Machinery held its First Annual One-Day Technical Symposium October 20 in Washington. Sol Rosenthal presented the

BURROUGHS CORPORATION STATES OFFICIAL STAND ON COBOL

Burroughs Corporation recently informed DATAMATION of its official position on COBOL (COmmon Business Oriented Language).

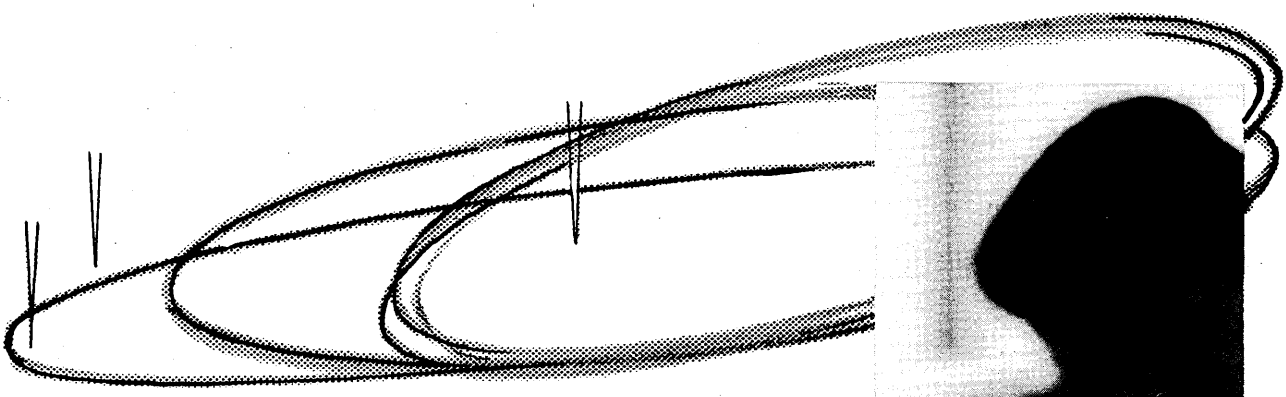
On Sept. 14, the following statement was forwarded to Mr. C. A. Phillips, Chairman, Executive Committee, Conference on Data Systems Languages:

> The Burroughs Corporation is in full support of the CODASYL effort. The Corporation has contributed to the COBOL development throughout the past fifteen months and expects to continue to do so until a common and powerful business problem oriented language has been designed and accepted. We intend to implement COBOL for use with out next electronic data processing system. In order to achieve commonality, we will implement at least those features of the present language which the COBOL Maintenance Committee agrees are required for first level implementation. . . .

In a letter to DATAMATION, Mr. Ken T. Bement further stated (in part):

"The Corporation is fully aware that the present specifications still contain certain deficiencies and ambiguities. However, we are confident that the COBOL Maintenance Committee will resolve all necessary points in order to properly freeze the specifications by December 31, 1960 for first level implementation . . ."

(In our March/April 1960 issue, a statement representing IBM's official position regarding COBOL was published and in DATAMATION's July/August issue, RCA officially stated its COBOL intentions.)



... at the outer edge of computer science—

here's where the professional person discovers, and does his most constructive work.

Exciting career opportunities at this "outer edge" now exist in the digital computer group of the General Motors Research Laboratories. Newly instituted projects directed toward the research and development of novel high-speed computer applications have created challenging positions in the following areas:

- Numerical Analysis
- Pattern and Character Recognition
- Development of Advanced Programming Systems
- Development of Engineering Oriented Languages

These long-range projects will involve the latest EDP equipment (including the 7090) and require:

- MATHEMATICIANS
- ENGINEERS
- PHYSICISTS

(advanced degree preferred)

who have proven capability of doing original work in the above areas.

Qualified and interested? Here are four of the many reasons we invite you to investigate further:

Challenge and advancement in a small but rapidly growing computer group;

Stability of a large corporation with primarily company-sponsored research projects;

Opportunities to grow in professional stature (advanced education at four nearby universities, a liberal publication policy, and promotion based on merit);

A modern campus-like atmosphere in suburban Warren 15 miles north of Detroit's new civic center.

See D. E. HART or J. B. SPARHAWK at the New Yorker Hotel while you are attending the EASTERN JOINT COMPUTER CONFERENCE, New York City, December 13, 14, and 15.

or send your resumé in confidence to: J. B. Sparhawk, Personnel Staff

General Motors Research Laboratories ——— Warren, Michigan

NEWS BRIEFS . . .

welcoming address. The keynote speaker was Dr. Harry Huskey of the University of California and president of ACM. The session topics included Government Computing Activities, Computing Needs for the Future, What's New in the Capital Computing Centers?, and Computer Applications and Operating Systems.

'ALGOL 60' CORRECTIONS APPLY TO FIRST INSTALLMENT

In the September/October issue, DATAMATION ran the first half of an article entitled "An Explanation of ALGOL 60." Due to mistakes made in the original transcript, errors appeared in the text and the following corrections are in order. The "R" and "L" after the page numbers refers to the right or left column.

Page

47R $\frac{1}{\text{em}}$ appears twice instead of 1-em dashes.

48R Colon missing after "for i" in second ALGOL example under "loop."
Colon missing after "for i" under "during statements."
then missing after A = B in line 1 of (2) under " 'go to' statements."
Colon missing after "for", line 2 of (2) under " 'go to' statements."

49L There should be a period after V + 1 in the procedure statement example. The second example is
Spur (A) Order: (7) Results to: (V)

50L There should be a colon before "=" in (lb).

The second half of this feature begins on page 65.

BOWLING ROUTINE DEVELOPED

A special bowling score program has been developed by the civil engineering firm of J. E. Greiner Company of Baltimore for use with the Bendix G-15 general purpose computer. The program accepts the results of three bowling games and computes the total pins and games for each player of ten, ten-man teams (including substitutes and blinds).

CIRCLE 105 ON READER CARD

✓A Stromberg-Carlson S-C 4020 high-speed microfilm printer/plotter has been leased by the University of California, for installation at the Los Alamos Scientific Laboratory in New Mexico. The printer will be used in conjunction with research sponsored by the Atomic Energy Commission.

CIRCLE 106 ON READER CARD

✓Occupancy of Computer Systems' recently completed 30,000 sq. ft. plant in Monmouth Junction, N. J., is now 90 per cent complete. The new facility, expandable to 200,000 sq. ft., is fully air-conditioned and houses laboratory, engineering, production and administration facilities. Production of Dystac analog computers, is now proceeding at the rate of two units per month.

CIRCLE 107 ON READER CARD

✓Banks may now purchase any one of seven configurations of the RCA 301.

CIRCLE 108 ON READER CARD

✓Control Data Corporation announced recently the installation of a 1604 at the National Bureau of Standards, Boulder Laboratories, Boulder, Colorado. Frank C. Mullaney, VP and general manager of Control Data's Computer Division, said that the 1604 computer was assembled and operating on the customer's site within a period of two weeks.

CIRCLE 109 ON READER CARD

✓A 600,000-word Russian-English dictionary has been developed on a

704 at the University of California. The dictionary will be used by a computer as part of a program of linguistic research designed to result in the automatic translation of Russian technical literature solely by means of electronic equipment.

✓Steven Pardee of the Thompson-Ramo Wooldridge Computer Corporation was guest speaker at the initial meeting of the Atlantic County Computing Association October 4 in Atlantic City. The ultimate aim of the group is the establishment of a chapter of the Association for Computing Machinery.

✓The Air Force has stamped "unconditional approval" on Burroughs Corporation's 3000-word-per-minute S-203 electorstatic teleprinter, Jack C. Lindley, manager of defense sales has reported. This represents the first approval of a high speed teleprinter given by any of the armed services.

CIRCLE 110 ON READER CARD

✓The Data Systems Department of United Aircraft Corporation has occupied new facilities at 3501 Harbor Blvd., Costa Mesa, Calif. This move consolidates operations that were formerly conducted at three locations.

✓Citizens National Bank installed a new IBM 1210 Reader-Sorter in October. The 1210 reads and sorts checks at speeds up to 950 units per minute.

CIRCLE 111 ON READER CARD

✓Over a quarter-million dollar computer development contract has been awarded by the U.S. Navy to Ramo-Wooldridge, a division of Thompson Ramo Wooldridge Inc., Los Angeles. It will be a general purpose computer incorporating "stored logic."

CIRCLE 112 ON READER CARD

✓Data Display, Inc. has received a $193,600 contract from Lockheed Aircraft's Missiles and Space Division for two high-speed data display systems to be used in current Air Force satellite programs. The system will accept digital inputs from other digital sources, store that data and present visual information for the use of ground control console operators.

CIRCLE 113 ON READER CARD

✓Laboratory For Electronics, Inc., has been awarded a contract by the Office of Naval Research for continued "Research in Ferromagnetics with Applications to New Storage Device." The firm has been investigating this area of solid-state physics for ONR during the past two years.

CIRCLE 114 ON READER CARD

✓A high-speed, 26 column, numeric printer made by Potter Instrument Company has been selected for use in the Air Force AN/GJQ-9 automatic ground checkout system for the Douglas Skybolt missile. The equipment will be used at depots and launching sites to check launching of the Sky bolt.

CIRCLE 115 ON READER CARD

✓General Electric Company's Computer Department has plans for opening 11 new-data-processing centers in major cities across the nation. Five data-processing centers will open next year with six more scheduled during the first half of 1962.

CIRCLE 116 ON READER CARD

✓Chemprint Corporation, a new electronics firm with headquarters in Menlo Park, Calif., will produce precision plated circuit boards for military and industrial uses in computers and other electronic equipment. All production will be carried out in Menlo Park.

CIRCLE 117 ON READER CARD

✓A new analog-to-digital conversion and data storage system was recently delivered to Argonne National Laboratories at Lemont, Illinois by Packard Bell Computer Corp. It will be used on nuclear reactors for data acquisition related to reactor power measurements.

CIRCLE 118 ON READER CARD

✓Electronic Associates, Inc. has been ranked fifth in the list of ten top space

NEWS BRIEFS . . .

contractors for the National Aeronautics and Space Administration during fiscal 1960. According to NASA, EAI was awarded $2,497,000 in contracts during the period.

✓A Datatron 220 has been purchased by Case Institute of Technology for use in its $2.5 million Computing Center. The 220 will be used initially by Case students for two fall programs.

CIRCLE 119 ON READER CARD

✓The Republic National Bank of Dallas inaugurated its totally automated electronic check handling and posting system. The system, linking a computer with paper handling equipment, is the first installation of its kind to be installed by IBM.

CIRCLE 120 ON READER CARD

✓The University of Wisconsin has received a $400,000 grant from the National Science Foundation to help purchase a CDC 1604. Additional support from the U.S. Army Mathematics Research Center on campus will complete the financing for a computing system whose total cost will be more than $1,000,000.

✓Membership in the G-15 User's Exchange Organization grew by 50 percent in the last year, it was reported recently at the fifth annual conference held at the Pittsburgh Hilton Hotel. One-hundred fifty programs were submitted to the library since the last meeting and more than 500 were distributed to members during the same period.

✓IBM has announced plans to construct a major product development laboratory in Poughkeepsie, N.Y. and another development laboratory in San Jose, Calif. The New York project will add more than 800,000 sq. ft to the firm's facilities in the area. The California addition will be 150,000 sq. ft.

✓The University of Arizona Numerical Analysis Laboratory's proposed conference on Data Processing Techniques and Systems, scheduled for March 16 and 17, 1961 has been indefinitely postponed. No reasons were given.

✓The messaging instrumentation serving the Department's of Defense's Courier communications satellite features the first use of paper tape readers developed especially for the project by Tally Register Corp. of Seattle. The Satellite readers were built by Tally

General Electric Computer Department Embarks On Vigorous New Program In Industrial And Commercial Computers

It is estimated that the next 2 years will see a 33% increase in non-military use of computer equipment. We are meeting these projected needs with a vigorous program of design, applications and sales. The first steps are 1) G.E.'s new 225 computer system for large and small scale applications; 2) a significant expansion of our sales structure right now.

We are now conducting a successful operation, and anticipate tremendous growth and capture of an even larger share of the market. Since we have set out to establish leadership and accelerate growth, the men we add to our staff must be of the highest competence. For these men, the market situation in which we are operating means that there will be plenty of technical challenge and right with it, room for rapid personal advancement as we expand.

Current Opportunities:

APPLICATIONS CONSULTATION

Consult with customers on systems applications and implementation both before and after order. After training in Phoenix, assignments will be made to customer locations throughout the U.S. Requires 2-3 years experience in computer programming and systems analysis. BS in Business Administration, Math and/or Engineering.

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Can grow to managing a district sales office. Initial assignment on business data processing line. Will include preparation of customer presentations, development and maintenance of customer relations. Requires experience in computer sales or programming and applications. BS in Business Administration, Math and/or Engineering.

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Document Handling Equipment
Requires: BS or MS in EE, Physics, Math or ME. Experience in computers or electronics systems design.

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COMPUTER DEPARTMENT

GENERAL ELECTRIC

P.O. Drawer 270, Phoenix, Arizona

CIRCLE 83 ON READER CARD

NEWS BRIEFS . . .

for the Western Development Laboratories of Philco Corp., Palo Alto, which designed and developed the satellite.

CIRCLE 121 ON READER CARD

✓The Western Division of Collins Radio Company, Burbank, will furnish a data transmission system for the Electric Boat Division, General Dynamics Corp. for installation aboard a converted Victory Ship. It will be part of a shipborne missile-tracking system to be used in gathering data for Cape Canaveral missile firings.

CIRCLE 122 ON READER CARD

✓A $68,400 contract for an exploratory study into file organization which will permit great masses of scientific information to be sorted, classified and made available by the file itself, has been awarded to the Advanced Information Systems Company, a subsidiary of The Electrada Corporation by the National Science Foundation.

CIRCLE 123 ON READER CARD

✓An IBM 7090 was delivered to Union Carbide Corporation in October. It is being installed on the 36th floor of the firm's headquarters at 270 Park Ave., New York City. The "90" will be shared equally with C-E-I-R.

CIRCLE 124 ON READER CARD

✓The Electrada Corporation, Los Angeles, has formed a new subsidiary, the Advanced Information Systems Company, and named Dr. Robert M. Hayes as president. The new firm will provide a service in the research, design, and implementation of complex information systems.

✓BIO-RAD Laboratories, Richmond, Calif., has organized a special department to provide a computing service for the solution of complex problems in chemistry and physics. Dr. Frank E. Harris heads the new department.

CIRCLE 125 ON READER CARD

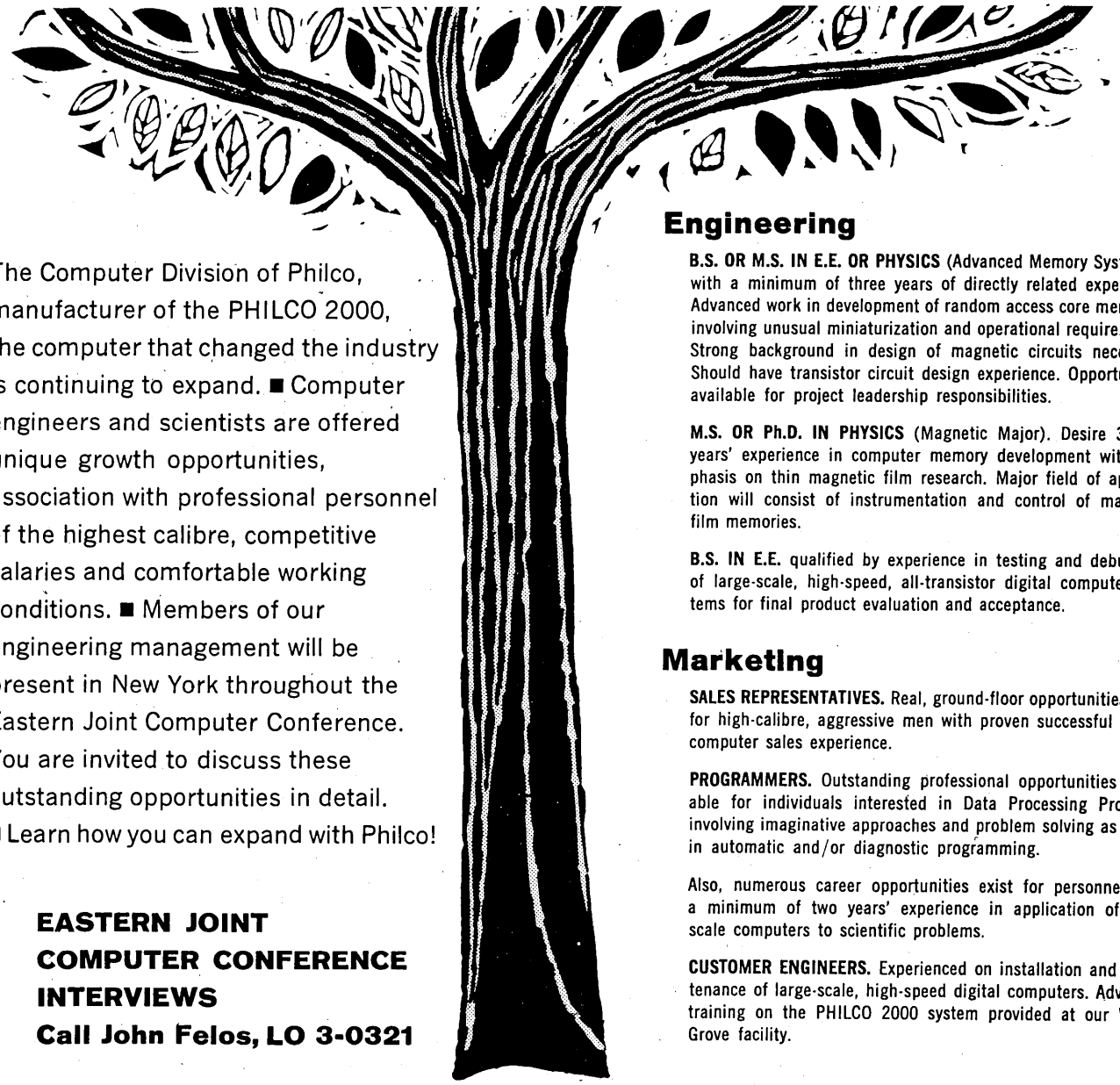
✓Nationwide Mutual Insurance Company will install a National 304 in January. It will be in full-scale operation next spring. The 304 will analyze statistics from Nationwide's 15 regional offices throughout the U.S. representing the firm's more than 2 million individual policies.

CIRCLE 126 ON READER CARD

✓The nuclear and digital divisions of the Harvey-Wells Corp., a wholly-owned subsidiary of Hercon Electronics Corp., have expanded into two separate and independent organizations. The new Harvey-Wells Electronics, Inc., will specialize in the advancement of the parent organization's lines of high-speed digital building blocks and related digital products.

CIRCLE 127 ON READER CARD

COMPUTER GROWTH OPPORTUNITIES



The Computer Division of Philco, manufacturer of the PHILCO 2000, the computer that changed the industry is continuing to expand. ■ Computer engineers and scientists are offered unique growth opportunities, association with professional personnel of the highest calibre, competitive salaries and comfortable working conditions. ■ Members of our engineering management will be present in New York throughout the Eastern Joint Computer Conference. You are invited to discuss these outstanding opportunities in detail. ■ Learn how you can expand with Philco!

EASTERN JOINT COMPUTER CONFERENCE INTERVIEWS
Call John Felos, LO 3-0321

Engineering

B.S. OR M.S. IN E.E. OR PHYSICS (Advanced Memory Systems), with a minimum of three years of directly related experience. Advanced work in development of random access core memories involving unusual miniaturization and operational requirements. Strong background in design of magnetic circuits necessary. Should have transistor circuit design experience. Opportunities available for project leadership responsibilities.

M.S. OR Ph.D. IN PHYSICS (Magnetic Major). Desire 3 to 5 years' experience in computer memory development with emphasis on thin magnetic film research. Major field of application will consist of instrumentation and control of magnetic film memories.

B.S. IN E.E. qualified by experience in testing and debugging of large-scale, high-speed, all-transistor digital computer systems for final product evaluation and acceptance.

Marketing

SALES REPRESENTATIVES. Real, ground-floor opportunities exist for high-calibre, aggressive men with proven successful digital computer sales experience.

PROGRAMMERS. Outstanding professional opportunities available for individuals interested in Data Processing Problems involving imaginative approaches and problem solving as found in automatic and/or diagnostic programming.

Also, numerous career opportunities exist for personnel with a minimum of two years' experience in application of large scale computers to scientific problems.

CUSTOMER ENGINEERS. Experienced on installation and maintenance of large-scale, high-speed digital computers. Advanced training on the PHILCO 2000 system provided at our Willow Grove facility.

OR WRITE TO MR. J. FELOS, **PHILCO/COMPUTER DIVISION, WILLOW GROVE, PENNSYLVANIA**

PHILCO®

Famous for Quality the World Over

IMPORTANT DATES IN DATAMATION . . .

• The Eastern Joint Computer Conference will be held December 13-15 at the New Yorker Hotel and Manhattan Center in New York City. For information contact Dr. Nathaniel Rochester, IBM, Yorktown Heights, N. Y.

• The Combined Analog Digital Computer Systems Symposium will be held at the Sheraton Hotel, Penn Center Plaza, Philadelphia, December 16 and 17. For information contact Martin Paskman, General Electric Company, Missile & Space Vehicle Dept., Philadelphia, Penna.

• TRANSAC Users Group, Meeting No. 7, will meet January, 1961 in Washington, D. C.

• The IRE National Convention will be held at the New York Coliseum and the Waldorf-Astoria Hotel, New York City, March 20-23, 1961.

• The annual meeting of POOL, the LGP-30 and RPC-4000 computer users group, will be held on March 27-30, at the Jung Hotel, New Orleans, Louisiana.

• The annual meeting and Convention of the National Microfilm Association will be held April 4-6, 1961 at the Hotel Sherman in Chicago, Ill.

• The USE Meeting will be held in El Paso, Texas, April 18-21, 1961. For information contact James W. Nickitas, 315 Park Ave., New York City, N.Y.

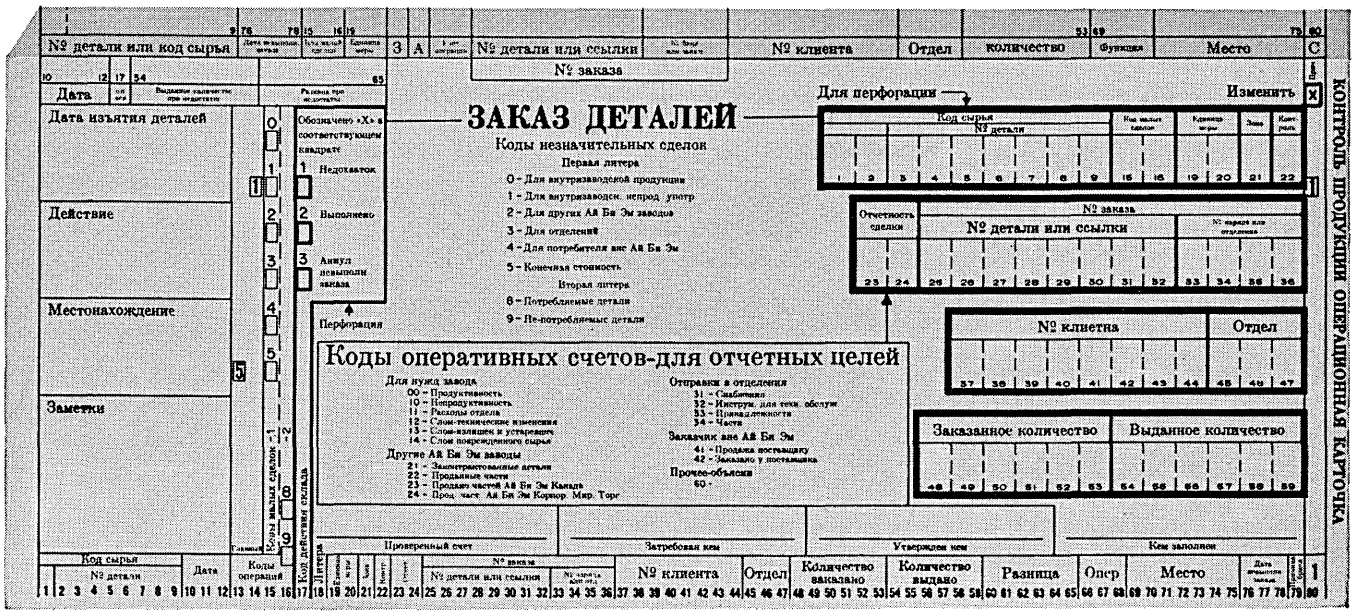
• The 5th CUE Meeting, will be held in April, 1961 in Chicago, Ill.

• The Western Joint Computer Conference is scheduled for Los Angeles' Ambassador Hotel, May 9-11, 1961. For information contact Dr. W. F. Bauer, Ramo-Wooldridge Co., 8433 Fallbrook Ave., Canoga Park, Calif.

• TRANSAC Users Group Meeting No. 8 will be held in Hartford, Conn., in May 1961.

• NMAA Annual Meeting will be held June 28-30, 1961. For information contact William F. Mauk, NMAA Administrative Headquarters, 1700 W. Central Rd., Mt. Prospect, Ill.

EVERYONE'S USING COMPUTERS...



BUT HOW MANY ARE USING THEM WELL?

The production potential of modern computing equipment is greater than ever. Yet, within most data processing installations are problems that go unsolved because of heavy routine work loads or shortages of specialized personnel. If this is true of your installation, there's a way to get more out of your computer investment. Use CSC to solve neglected problems and to augment your staff when the need arises.

Computer Sciences Corporation furnishes consultation, analysis, and programming in all areas of commercial and scientific data processing. Among CSC clients are such distinguished firms as Minneapolis-Honeywell, Sperry Rand, and Douglas Aircraft. CSC is also available to serve you, whether you manufacture, use, or should be using a computer. A telephone call or letter will bring to your office some of the top computer talent in the country.

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Challenging and rewarding positions exist at CSC for those who are outstanding in the computing and data processing field.

COMPUTER SCIENCES CORPORATION

Malaga Cove Plaza, Palos Verdes, California

CIRCLE 88 ON READER CARD

People Moving Up . . .

★ Chrono-log Corporation, Philadelphia, has elected Saul Meyer and Arthur Freilich vice presidents. They will be responsible for the management of the firm. Meyer was previously associated with Eckert Mauchly (UNIVAC) Division of Remington Rand and was technical advisor for the Systems Division of Minneapolis-Honeywell Regulator Co.

★ L. Peter Retzinger has been named director of the Computer Systems Laboratory of the Guidance and Control Systems Division of Litton Systems, Inc. He replaces John R. Thorne, who resigned recently to pursue new interests in the electronics field. Francis Dedona has been named assistant director of the laboratory.

★ W. A. Ogletree has been named general manager of Computer Systems, Inc. He has held a series of technical management posts during seven years with Burroughs Corp. His last position there was manager of engineering for the Military Electronic Computer Division.

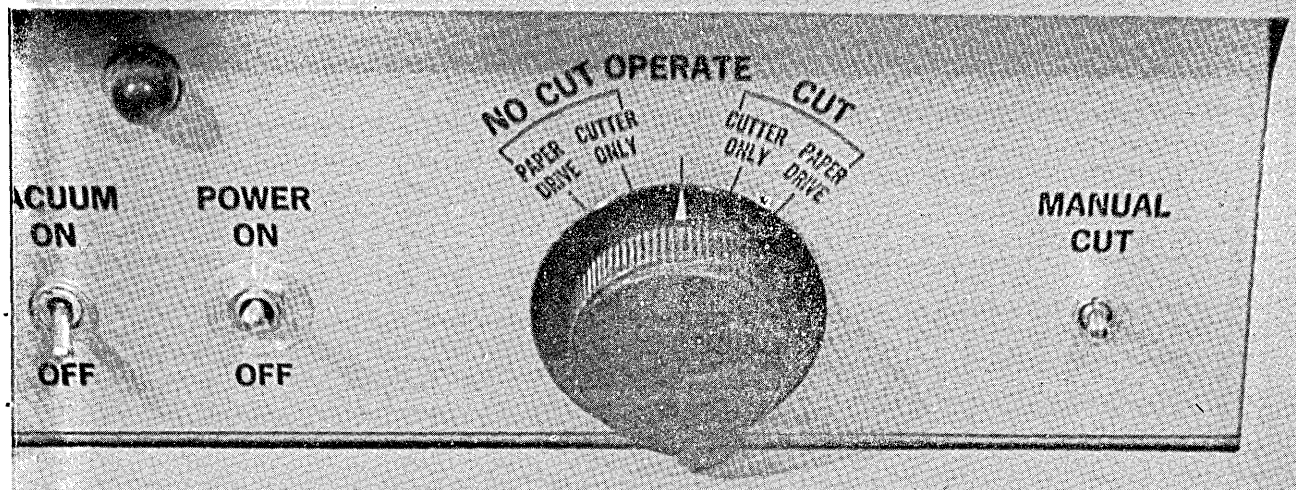
★ Control Data corporation, Minneapolis, has named Seymour R. Cray as director of development. He will be responsible for the development of new products in the Computer Division. Also, R. N. Kisch has been named the division's director of operations and James E. Thornton has been appointed head of the Computer Development Dept.

★ Richard P. Halverson is now a staff consultant on the professional engineering staff at the Remington Rand Univac Military division, St. Paul. He has been employed at various times as an engineer, consultant and instructor at Univac and Minneapolis-Honeywell Regulator Co., Aero Division.

★ Computer Sciences Corp., Inglewood, Calif., has named David Roberts, Dr. H. Gordon Rice and Joel Erdwinn to positions with the firm. Roberts, formerly with STL, will be involved with computer applications of test missile problems with emphasis on data analysis. Dr. Rice will serve as a consultant specializing in systems design and automatic programming.

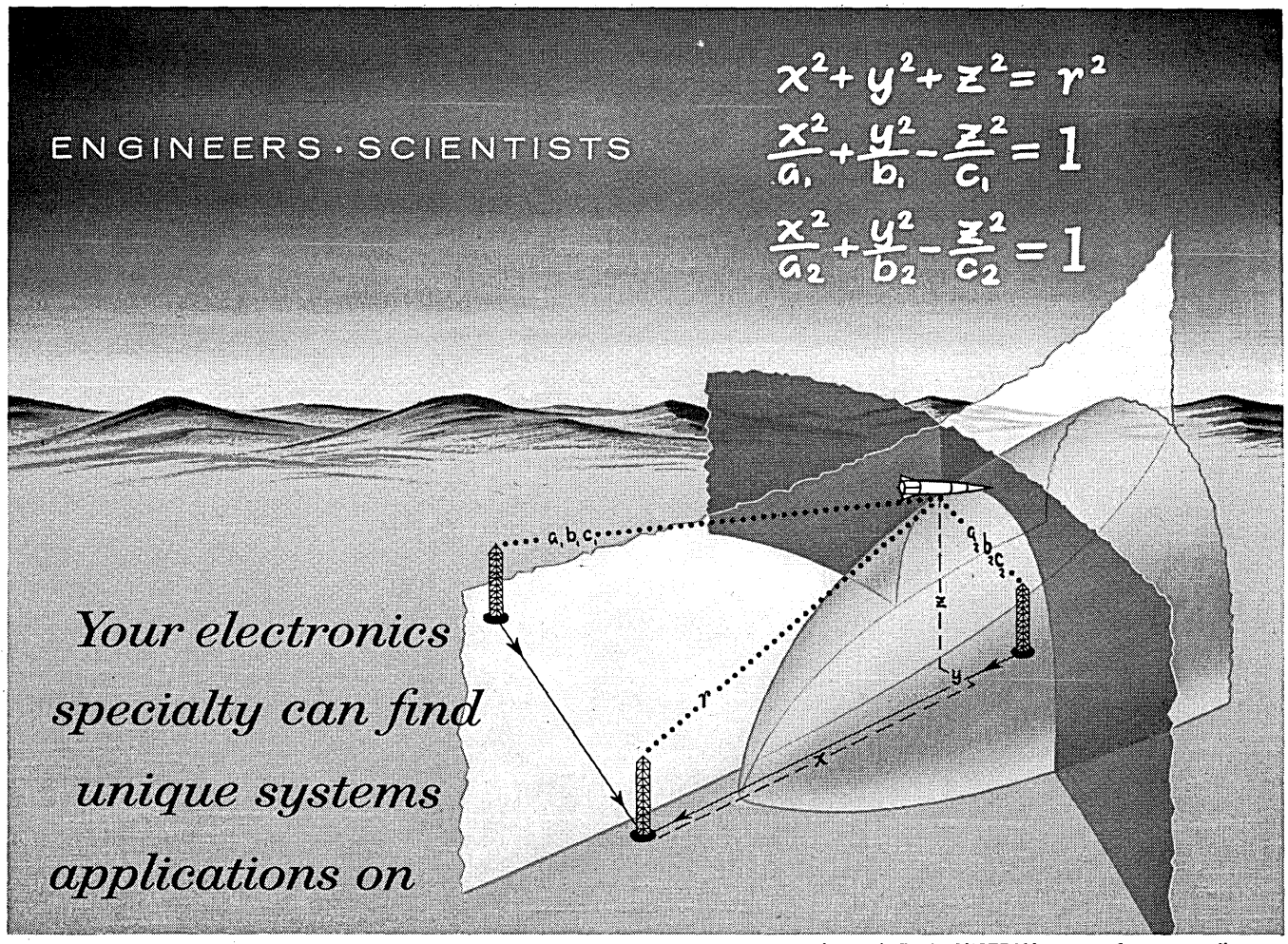
★ Norman Statland, chief architect of the computer chart which appears elsewhere in this issue, has been elected a vice president of Charles W. Adams Associates, Inc.

CIRCLE 34 ON READER CARD →



See high-speed computer printout
from remote source
at Eastern Joint Computer Conference.
Stromberg-Carlson
High-Speed Binary Data Transceiver
and High-Speed Communications Printer
will be demonstrated.

STROMBERG-CARLSON / GENERAL DYNAMICS



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... the next generation system for precise missile trajectory measurement being developed by General Electric's Defense Systems Department

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▶ For a more complete technical description of MISTRAM —and full details of current opportunities on a broad scope of systems programs at DSD—write today to Mr. E. A. Smith, Box 11-U.

DSD DEFENSE SYSTEMS DEPARTMENT
A Department of the Defense Electronics Division

GENERAL ELECTRIC

Northern Lights Office Building, Syracuse, New York

▲ Basic MISTRAM system features radio receiving stations in "L"-shaped configuration. Signals from missile transponder are measured on CW carrier for computer calculation of phase differences. These yield missile position, velocity and trajectory data through spatial intersection of a sphere (range from central receiving station) and hyperboloids of revolution (range differences from remote receiving stations).

DSD's important new MISTRAM System embodies these features:

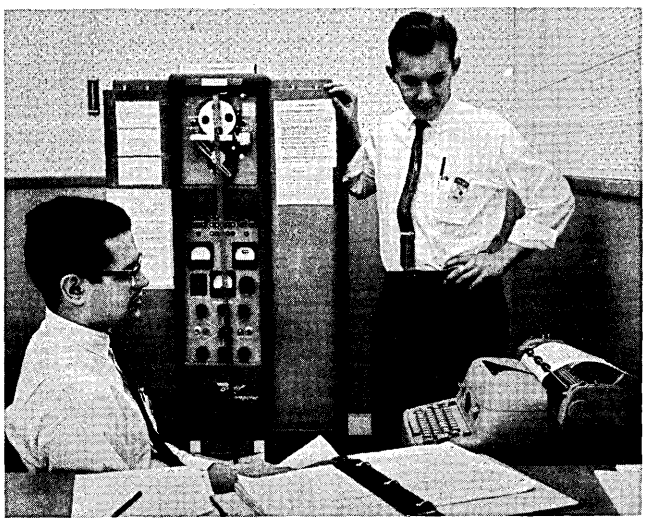
- Greater accuracy and range than any existing missile trajectory measurement system
- Reduction of many previously standard tracking system components by **eliminating** high precision radar tracking antennas
- Instantaneous correction of electrical baseline length errors through phase stabilization techniques
- Ability to utilize orbiting satellite to virtually eliminate present day survey errors

Defense Systems Department is Prime Contractor for MISTRAM.

DSD is now developing a basic system unit which can be multiplied many times over and integrated into a vastly extended MISTRAM system, using G-E's 'building block' approach. Ultimately this would provide hemispheric coverage for missile trajectory measurement.

CIRCLE 92 ON READER CARD

SMALL COMPUTERS IN A LARGE COMPUTER ENVIRONMENT



by FRANK COLE, Missiles & Space Systems Engineering Department, Douglas Aircraft Co.

The G-15D in use at Douglas.

WHILE THE CASUAL READER IS SKIMMING this 4-minute article, Douglas Aircraft Company will be far from casual about spending some $600 (every four minutes) for data processing equipment and the salaries of the personnel directly connected with its use.

Specifically, nearly 1000 people are employed to utilize 45 computers, costing approximately $650,000 per month. Needless to say, certain problems are inherent in an operation of this magnitude. One problem in particular, which is the basis for the present discussion, stems from the fact that the Douglas Company is not primarily in the data processing business.

Douglas designs and manufactures airplanes and missiles. Activity in missiles at Douglas began prior to World War II. Since 1940, Douglas has produced over 35,000 missile units and systems.

Missile research and design is the function of Missiles and Space Systems Engineering Department and this one department is responsible for seven of the aforementioned 45 computers at an expenditure of approximately $160,000 per month. It is the largest departmental user within the company. These 7 computer systems range from a large scale IBM 709 system (IBM 7090 on order) down to 4 Bendix G-15D computers.

The proper use of these computers in Missiles and Space Systems Engineering is one of the responsibilities of the Computing Engineering Section.

But what is meant by "proper use" of this equipment?

Certainly, the professional and technical specialists in the Computing Engineering Section are in the data processing business but the department's business is missiles research and design. Thus, the computing equipment is implemented to serve other engineering goals.

It can be shown that one buys the most computer power per dollar by using the newest, largest, fastest equipment on the market. But this in itself certainly will not lead to proper use. The computing group is responsible for both computing power per dollar and the processing of a wide range of engineering problems. All too often the latter responsibility suffers to some extent when measured by its role as the prime responsibility.

Missiles and Space Systems, as an engineering organization, competes successfully for a widely diversified technical staff and this results in groups of highly sophisticated engineering talent. When employees of this caliber boil design problems down to the data processing stage, the computing equipment and, in fact, the computing group may emerge as a roadblock in the mind of the engineer. This is understandable since the engineer has seemingly surrendered his contribution to a machine. Somewhere between the large machine in a closed room and the desk calculator lies the correct system for each individual engineer with data processing problems.

By providing the proper environment, the computing group can encourage increased automatic data processing by orders of magnitude. First, and most efficient, organize a professional programming group which can accept an engineer's problem statement, program the problem on large scale equipment, and get good answers out fast. Second, provide suitable general purpose abstractions which can be programmed by the engineer for processing on large scale equipment. And, third, select smaller computing systems for direct access programming and operating by the engineer. In some degree, all three tools are available to all engineers in Missiles and Space Systems Engineering at Douglas.

There is a mistaken impression that small problems belong on small machines and large problems belong on large machines. Actually, all problems belong on the largest machine available – if cost is a primary concern. Why provide the small direct access computer at all?

There are at least three good reasons for the small direct access computer in an engineering organization. One, immediate access for small problems requiring rapid service. Two, since the small machine is no more expensive per hour than the engineer, halting the machine and on-line monitoring are permissible, and this may be important at times. Three, there is often legitimate reason for keeping certain design problems at the finger tips of the engineer, and this may very well include the computing phase of the problem.

Computing speed is important in all the foregoing, but how important?

The engineer has a problem which would take a month

of hand calculations. On the small machine, it may take one hour.

As used in Missiles and Space Systems Engineering Douglas feels the small direct access computer has amply demonstrated its place and worth.

The engineer couldn't care less if another machine would do the problem in 30 minutes. After all, he has probably spent four hours programming the problem, 30 minutes input time, one hour of checkout, debugging, and correction and finally the computing phase, which is a small part of his total time. Now, if the problem has to be run repeatedly, or takes 12 hours to run a one-shot case, he probably should have used the large system. So, speed is a factor, but not all-important.

In any use of the small machine, the engineer needs facilities to input, troubleshoot, correct, compute, preserve for possible re-run, and obtain answers in reasonable format. And, since he is not a computer specialist he wants to do these things with as little operating procedure as possible. Then how important are all the special features, such as variable width paper tape, magnetic tape, punched cards, interchangeable plug-in circuits, solid state components, off-line input/output adaptability, compatibility with other systems, non-volatile memory, etc.

Let's look at the literature on any small computer. It emphasizes speed — which is not a primary concern — and a variety of features — which detract from possible design simplicities.

Industry is certainly sufficiently familiar with the Bendix G-15 to make its description here unnecessary. Our use for it is entirely in the floating point mode by means of the Bendix Intercom abstraction. Douglas has trained nearly 300 engineers and technical employees in its use by means of an initial 8 hour in-plant course.

It was at first thought that potential users requesting instruction would diminish, but as it turns out, the more users we have, the longer the waiting list grows. Also, it was originally hoped that the machines would be used about 80% of the time, thus making them readily available for problems demanding immediate answers. During the past one and one-half years, G-15 usage has never dropped below 110% of the first shift during any week, and generally runs about 125%. (Naturally, the percentage over 100 represents overtime these users considered necessary.)

There may come a time when the G-15's will be replaced by equipment not yet available or by large scale abstractions to which thought is presently being given.

What sort of system are we looking for?

In the past, we have specified the various characteristics a machine and coding system should have for engineer direct access use. Specifications of this nature have proven of limited value. In fact, we do not care whether the next machine is core or drum, whether it has an access time of 1.5 micro-seconds or 0.1 seconds, whether it has 450 pentodes or is completely transistorized, and so on.

What is required of the next system?

It is hoped that the following list will provide some idea of the approach.

1. **Programming System**
   a. Adaptable to the complete spectrum of engineering problems.
   b. Can be readily learned by the non-programmer engineer.
   c. Can be easily recalled by the engineer after 6 months disuse.
   d. Easily and readily transcribed on paper by the engineer.
2. **Machine Hardware**
   a. Cigar box operating console containing 3 (maybe 4) functionally labelled buttons and 2 (maybe 3) status labelled display lights.
   b. Breadbox input console providing some yet to be developed technique for rational number input. The present typewriter keyboards, full 10-key calculator keyboards, and 10-key adding machine keyboards require too much procedural knowledge. The ideal console may also contain a display light.
   c. Receptacle-reader for accepting hand written programming forms on first check-out pass and possibly machine generated program input medium on subsequent passes, the latter capable of being loaded with one hand.
   d. Printed output mechanism; output easily removable with one hand.

In view of this list, what would the reader guess is our opinion of punched paper tape (for example) as a program preservation medium? The new reader-punches read up to 500 characters per second. Should this influence us toward the machine employing such readers? If the engineer decides to automate some numeric solution, he will be involved 4-12 hours from start to finish, including a one-shot pass on the machine. The old tape punches may eat up as much as 10 minutes of this time and the newer punches will do the same job in 1 minute. So what? Similar comparisons and conclusions are reached concerning the photo-reader involved in each re-run.

But this argument is nonsense. Everyone knows that when it comes to paper tape mechanisms, fast is Good and slow is Bad. But why require the engineer to handle paper tape at all? It has only 3 uses.

1. Can be punched out by the machine.
2. Can be read by the machine.
3. Complicates the engineer's handling procedure.

Now, if 3 above is eliminated, that leaves output and input, and nothing else. The conclusion is not to output it. Keep the program in the machine, and in face do away with the paper tape entirely.

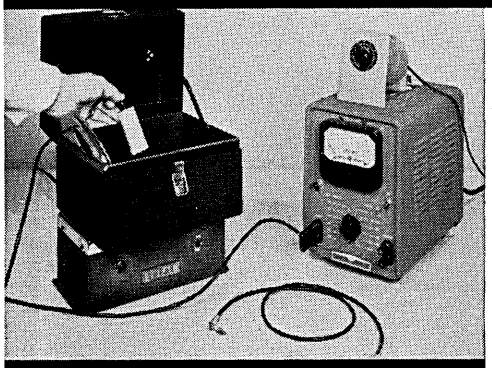
Arguments similar to the preceding can be applied to most of the present hardware characteristics. Certainly a machine and system as basic as required for our applications has a reduced market potential and may be (?) more costly, but market potential and cost are at best relative value judgments and certainly should not cause activity to be directed in opposite directions to those discussed here.

As used in Missiles and Space Systems Engineering Douglas feels the small direct access computer has amply demonstrated its place and worth.

THE RECORDING THAT WASN'T

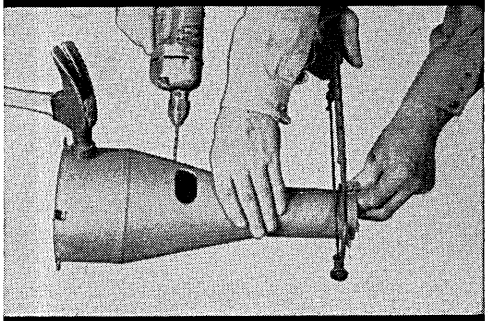
. . . It's happened to lots of magnetic tape users

Burton browne advertising



Test factually demonstrates shielding effectiveness of Netic alloy material and enclosure design. Instrumentation used: magnetic field radiating source, AC vacuum tube voltmeter, Variac, pickup probe and Netic Tape Data Preserver. For complete test details and results, request Data Sheet 142.

For safe, distortion-free storage of large quantities of vital magnetic tapes. Designed for Military Establishments, Radio & TV Broadcasters, Automated Plants, Libraries, Laboratories, Gov't. Agencies, etc.



Composite photo demonstrating that magnetic shielding qualities of NETIC alloy material are not affected by vibration, shock (including dropping) etc. Furthermore, NETIC does not retain residual magnetism nor require periodic annealing.

Maybe you've been one of these unfortunates . . . who've spent thousands of dollars . . . plus many man hours . . . to record valuable information on magnetic tapes . . . only to find the data useless from accidental distortion or erasure.

Unexpected exposure to an unpredicted magnetic field, and presto!—your valuable data is filled with irritating odd noises. Distortions may result in virtual data erasure.

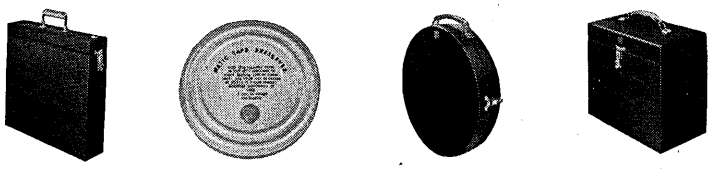
Unprepared tape users never realize the danger of loss until it's too late.

Such losses have become increasingly common from damaging magnetic fields during transportation or storage. These fields may be produced by airplane radar or generating equipment or other power accessories. Also by generators, power lines, power supplies, motors, transformers, welding machines, magnetic tables on surface grinders, magnetic chucks, degaussers, solenoids, etc.

Since 1956, many military and commercial tape users successfully avoid such unpleasant surprises. Their solution is shipping and storing valuable tapes in sturdy NETIC Tape Data Preservers.

Data remains clear, distinct and distortion-free in NETIC Preservers. Original recorded fidelity is permanently maintained.

Don't take chances with *your* valuable magnetic tapes. Keep them *permanently clear* and *distinct* for *every* year of their useful life in dependable NETIC Preservers. Can be supplied in virtually any size and shape to your requirement. Write for further details today.



For complete, distortion-free protection of valuable tapes during transportation or storage. Single or multiple containers available in many convenient sizes or shapes.

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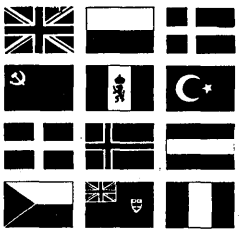
Originators of Permanently Effective Netic Co-Netic Magnetic Shielding

CIRCLE 36 ON READER CARD



DATAMATION *abroad*

U.S.S.R.

The Presidium of the Academy of Sciences Ukrainian SSR has organized new sections on cybernetics within the Institute of Mathematics. One section is concerned with the simulation of higher nervous activity and is headed by Dr. M. M. Amosov. The basic tasks of the Institute of Cybernetics, when it is finally organized in the near future, will include the study of the theoretical principles of cybernetics (general theory of automata, algorithms and controlling systems, information theory, game theory, and theory of random processes), automation of accounting and planning (cybernetic problems of economics), and the study of human higher nervous activity, theory of regulation in living organisms, simulation of sensory organs, and problems of mathematical linguistics and the theory of information machines (including the question of automatic diagnostics).

SWITZERLAND

At the recent meeting of the Council of the International Organization for Standardization held in Geneva, Switzerland, five new international standards projects were approved and technical committees created. Through the American Standards Association, the United States has the secretariat for standardization in the field of digital computers and data processing machines.

SWEDEN

An international licensing agreement between AB Atvidabergs Industrier, Stockholm, Sweden and North American Aviation, Inc. involving the products of Facit Electronics has been signed. Terms of the agreement provide for the manufacture and distribution of Facit electronic computer accessory equipment by Autonetics in the U.S., Canada and Mexico. The Swedish firm will have similar rights in Sweden, Norway, Denmark and Finland with Autonetics' Recomp computer and Nifte automatic factory testing equipment.

DENMARK

Students of electrical engineering at the Technical University of Denmark are taught the operation and use of the digital computer from their first year of study. Although the study of computer programming is optional in the beginning of the student's under-graduate career, he is required to take a course introducing him to the operation of the computer in his final year at the university. Five and one-half years are required for a master's degree (no bachelor's degree is offered).

GERMANY

A 7070 has been installed by Neckermann Versand KG in Frankfurt, Germany, one of Europe's largest mail order houses. The system is the largest installed so far in Europe. With it the firm can step up order-filling operations by 40% and make possible the processing of 150,000 orders a day.

$$Re = \frac{20500}{D} \qquad F = 0.1\left[\frac{K_1}{\text{Log } Re} - k_2\right] \qquad \Delta P = \frac{0.135 f L Q^2}{D^5}$$

The equations:

ALGOL language:

```
RE=2050·Q/D;      F=0.1(KI/LOG(RE)-K2);
DP=0.135·F·L·Q*2/D*5
```

Now, with this new high-speed Algebraic Compiler, you can use a concise algebraic notation—the natural language of problem solving—to formulate problems for solution on the Burroughs electronic computer systems.

ALGOL*

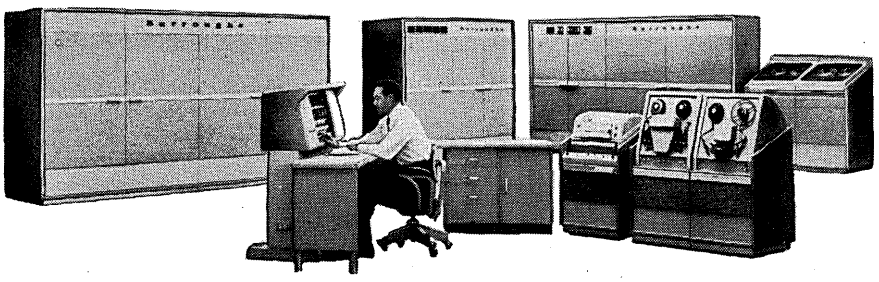
NOW AT WORK FOR BURROUGHS COMPUTER USERS

High-speed development harnesses **ALGOL** *international language, reduces programming time, speeds results*

Already in operation at a large number of Burroughs electronic computer installations, the new Algebraic Compiler features high translation speeds of 500 machine-language instructions per minute on the average, and extensive, built-in diagnostic facilities and symbolic debugging aids. Rudiments of this automatic programming system can be mastered in a few hours. (Note the straightforward quality of the ALGOL statement of the equations for computing head loss in a specific piping problem.)

Other features of the Burroughs Algebraic Compiler: one-pass operation; semi-automatic segmentation; powerful indexing ability; comprehensive means for communicating with external equipment and with sub-programs, including independent, self-contained procedures; and extensive switching, decision-making and editing facilities.

Take advantage of the important savings in programming time, in effort and in problem-solving costs inherent in the Compiler. For full information, call our nearby branch, or write Burroughs Corporation, Detroit 32, Michigan. Burroughs—TM.



**algorithmic language*

Burroughs Corporation

"NEW DIMENSIONS / in electronics and data processing systems"

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IN TOUCH WITH NEW DIMENSIONS

Another achievement of IBM Applied Scientists: general computer program for job shop simulation

Creating imaginative solutions to problems never solved before is a job of IBM Applied Science Representatives. Through unique applications of data processing, they are exploring new dimensions in engineering, the sciences, and business.

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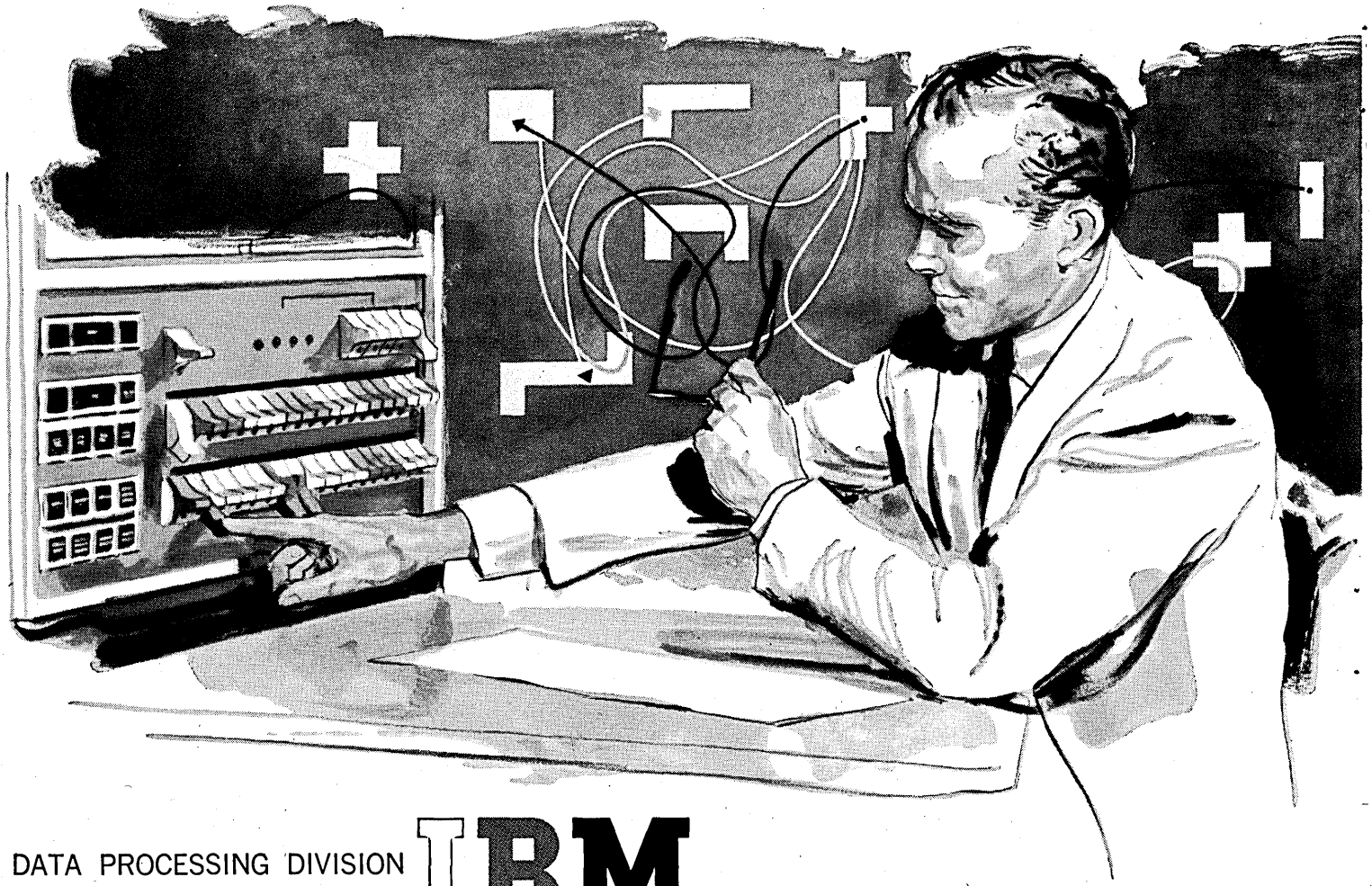


DATA PROCESSING DIVISION IBM®

CIRCLE 89 ON READER CARD

new DATAMATION literature

OPTICAL SCANNING PUNCH: A new eight-page, multi-color brochure describes an optical scanning punch. The unit performs its reading and punching work at the rate of 150 cards a minute. By eliminating the need for manual card punching from original source documents, it effects a reduction in what is normally the most time-consuming phase of any punched-card data processing procedure. It automatically detects improperly marked cards. The publication includes diagrams and specifications. REMINGTON RAND, Div. of Sperry Rand Corp., 315 Fourth Ave., New York 10, N.Y. For copy:
CIRCLE 260 ON READER CARD

DIGITAL VOLTMETER: A new six-page, two-color brochure describes the V44 all-electronic digital voltmeter for high-speed measuring and data logging applications requiring maximum accuracy, reliability and stability. The new publication lists specifications, charts, photos and other technical information concerning the V44. The front panel displays four digits. NON-LINEAR SYSTEMS, INC., Del Mar, Calif. For copy:
CIRCLE 261 ON READER CARD

PROCESSING SYSTEMS: A new 28-page booklet covers over a dozen major data processing systems which are controlled automatically by business machines. Step-by-step illustrations and concise explanations of such diversified applications as letter writing, purchasing, manufacturing control, and bank check coding convey the overall flexibility of this equipment. Most of the manufacturer's tape operated machines are presented. The building block concept is also indicated, whereby various auxiliary input-output units may be connected to a unit to provide degrees of automation as the system demands. FRIDEN, INC. 1 Leighton Ave., Rochester 2, N.Y. For copy:
CIRCLE 262 ON READER CARD

DIGITAL COMPUTER: The PB 250, a recently announced general purpose digital computer, is fully described in a new three-color, six-page brochure. The command repertoire as well as complete specifications is included in the presentation. PACKARD BELL COMPUTER, 1905-1907 Armacost Ave., Los Angeles 25, Calif. For copy:
CIRCLE 263 ON READER CARD

PORTABLE RECORDERS: A new four-page, three-color, illustrated brochure describes the Mark II portable direct-writing recorders including both electric and ink writing types. The new brochure discusses the choice of either ink or electric writing for specific applications and the types of data that can be recorded on the four channels of the Mark II systems. Described are the ways which chart paper can be loaded, the sensitivity offered by the built-in amplifiers, and the overall flexibility of operation. Operating data and front panel controls are listed, and an adapter for rack mounting the Mark II is illustrated. BRUSH INSTRUMENTS, 37th and Perkins, Cleveland 14, Ohio. For copy:
CIRCLE 264 ON READER CARD

PROGRAM CONTROLLERS: A four-page application note describes the use of the manufacturer's instruments as automatic program controllers. The note, AN-102, outlines the requirements for optimum digital and analog program controllers, and points out how digital to analog translators and curve or line followers effectively meet these requirements. Among the instruments described in the note is the new type F-2 optical line follower, which tracks a pencil or pen line and produces a continuously varying output voltage in accordance with the program. F. L. MOSELEY CO., 409 N. Fair Oaks Ave., Pasadena, Calif. For copy:
CIRCLE 265 ON READER CARD

STANDARD PROGRAMMING PACKAGE: A new brochure briefly describes the components of a standard programming package for the 1401 data processing system. Also included in the publication are some of the features which may be applied to the user's advantage. The primary purposes in the development of this material are: Elimination of the necessity for individual input-output routines; standardization and interchangeability of program sections and subroutines; establishment of rigid programming standards which optimize core usage and reduce programming cost; and sharing of experience in systems development, programming and documentation. WALTER R. OREAMUNO & CO., 40 Exchange Pl., New York 5, N.Y. For copy:
CIRCLE 266 ON READER CARD

ALGO MANUAL: A manual is available to both users and non-users describing a universal language programming system after the proposal of the Association for Computing Machinery and other members of the ALGOL committee. Its close parallel to algebra allows inexperienced programmers to solve problems on the computer with the aid of a self-teaching manual that makes previous knowledge of computers and programming techniques unnecessary, says the manufacturer. The BENDIX CORP., Computer Division, 5630 Arbor Vitae St., Los Angeles 45, Calif. For copy:
CIRCLE 267 ON READER CARD

SEMICONDUCTOR CATALOG: A 24-page catalog covers over 800 semiconductor devices, including ratings, characteristics and descriptive data on silicon glass diodes, silicon small power, medium power and high power rectifier cells, high voltage cartridge rectifiers, zener diodes and reference elements, silicon controlled rectifiers, silicon and selenium rectifier stacks, silicon solar cells and selenium contact protectors. Also included is a comprehensive listing of rectifier types, with cross reference to device classification, rating and page number. For copy write, on company letterhead only, to INTERNATIONAL RECTIFIER CORP., 1521 E. Grand Ave., El Segundo, Calif.
CIRCLE 268 ON READER CARD

SPECIAL PURPOSE COMPUTERS: A new concept in the design and application of special computers is described in a 4-page brochure. Advantages of special purpose computers in terms of low initial investment and minimum upkeep are also described. LOCKHEED ELECTRONICS COMPANY, U. S. Highway 1, Metuchen, N. J. For copy:
CIRCLE 269 ON READER CARD

PRODUCT CATALOG: A new 4-page form catalog contains brief description and prices of all the latest products of the manufacturer. The catalog lists the new magnetic tape search and control systems, time code generators, data handling equipment and products of the firm's Anaheim division. ELECTRONIC ENGINEERING COMPANY, 1601 E. Chestnut Ave., Santa Ana, Calif. For copy:
CIRCLE 270 ON READER CARD

Move Over ACM

NMAA Meet Rated N.G.

by JACKSON W. GRANHOLM,
Computer Consultant,
Thousand Oaks, Calif.

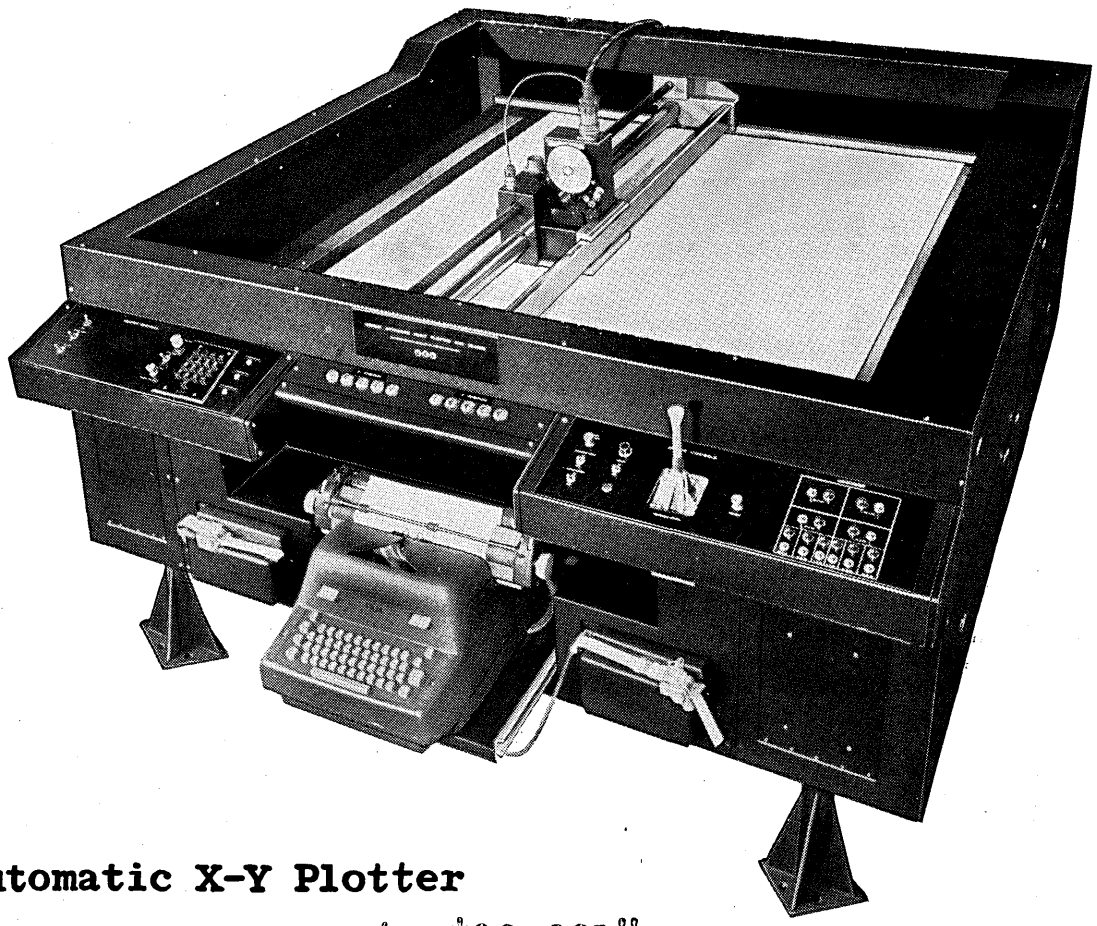
ORGANIZATION BATING is a simpler process than people bating. All one needs to do is single out some great amorphous group of humanity (like "the government") and tee off typewriterwise, giving them whatfor all over the landscape. In people bating one gets more specific. A statement like, "Joe Glitch is a fat-head!" can be dangerous. Glitch might shoot you; or, at least, sue you. This is true even if he is a fat-head.

ACM bating, in particular, seems a catholic sport. The reverend leadership of the ACM has been durned and dashed so thoroughly for everything from lackadaisical outlook to chronic weenieism that incumbent and and emeritus members of the Council have been known to flinch even when not shot at. So common and ordinary is ACM bating, in fact, that yr. obt. author, when writing in defense of the ACM (no easy thing to do), has received irate letters accusing him of all manner of sins from myopia to Grosch error, thus illustrating the commonly-accepted axiom that the ACM is going to be spoken of derisively, if spoken of at all.

Therefore it is indeed news of the first water when someone resorts to NMAA bating. This has been done in an editorial (unsigned) on page 50 of the August, 1960, issue of DATA PROCESSING.

Here is truly information of the man-bites-dog variety. Heretofore, one

Sometime DATAMATION contributor Jackson Granholm, editor and publisher of COMPUTING NEWS, is waging a spirited war against chronic fault-finders in an industry where it is admittedly quite easy to find fault. While we feel we must resort to the pat "publication of Mr. Granholm's views do not necessarily imply endorsement of those views by DATAMATION," we will rarely pass up a chance to print his offerings.



New, automatic X-Y Plotter

assures accuracy to ±00.001"

on 48" x 48" working surface

Here is Gerber's answer to the pinpoint precision demanded in today's cartography, missile tracking, aircraft lofting, meteorology, automatic machining, seismography, printed circuit layouts and related areas.

It's the world's largest and most accurate, automatic Digital X-Y Plotter.

And its introduction means that now — for the first time — engineers can plot data with the same exactitude used in collecting, recording and computing it. For the first time, in short, you can plot any data you can collect and reduce.

To obtain this high precision, Gerber has developed a plotter relying on all digital logic, completely eliminating warm-up time and possibility of drift. The input converter and all relay drivers are transistorized.

Newest addition to Gerber's complete line

The accuracy and reliability of Gerber's standard X-Y Plotters and data reduction equipment have long been recognized by engineers.

Now this new 48" x 48" plotter introduces even greater precision. And the digital logic concept makes it possible for Gerber to design this accuracy into even larger plotters if desired.

Gerber engineers will be pleased to discuss with you either the standard line or new plotters developed to meet your needs.

A new concept in accuracy & versatility

Plotting area: 48" x 48" (inquiries for special sizes invited)

Accuracy: to ±00.001" (digital range 0 to 99,999 over a 48" surface)

Slewing Speed: .004", .08", .8" or 4" per second; faster speeds also available

Plotter Inputs: punched cards, punched paper tape, keyboard, magnetic tape

Printing Head: eight print wheels with twelve symbols or numbers each plus precise location prick marks (additional wheels if desired); scribing tool and ruling pen available for grid lines; routing head also available.

All Digital Logic: No drift.

GSI

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CIRCLE 39 ON READER CARD

had come quite naturally to assume that the NMAA genus of the computermanship family was made up of a finite set of simon-pure species, but such is apparently not the case.

If one may believe the DATA PROCESSING editorial, the NMAA convention in San Francisco (June, 1960) was an utter kludge. First of all, it missed the anticipated attendance of 1500 by three or four hundred. Further, those who attended ". . . were disappointed to find that more than half of the seminars were conducted by manufacturers or suppliers of data processing products or services."

One wonders why the attendees were so disappointed. Couldn't they read the program before they went? One should also note carefully the description "manufacturers or suppliers of data processing products or services." One could presume that every member of the NMAA is at least a supplier of data processing services.

In these days, it is well to note that even the big makers of computers are also big users of computers and computer-like devices. It is possible that some very interesting seminar information might come out of their representatives.

The DATA PROCESSING editorial grouses on, noting that San Francisco is too far out in the weeds to qualify as a convention city. So, apparently, is New Orleans —next year's convention city. The editorial suggests some "conveniently located" city, such as Chicago. Chicago is convenient to Detroit. It is on a big railroad, if one is still running. However, only very brave people fly into Chicago. Most who value their lives get off and walk in from South Bend.

The opinion sampling which led up to the editorial may have been left over from the LITERARY DIGEST, for there seemed to be a number of folks in San Francisco in June who were having a pretty good time rummaging around in "the planned inadequacy of the facilities" at the Fairmont, the Mark Hopkins, and the Masonic Building. The Fairmont Hotel, of course, is noted for having three more bars than any other two hotels combined in the United States and Canada. If this be "inadequacy of the facilities," we need more of it.

At any rate, Mr. Neumiller and his committee have duly gotten their lumps. They can now ask the Council of the ACM to move so there will be room to lie down alongside.

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Digital Tape Transports

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HIGH PERFORMANCE

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Data Stor Model 59 tape transports incorporate the highly reliable features of military tape transport systems developed by the Cook Electric Company for the Atlas, Titan, Polaris and other missile programs.
These features include exclusive use of solid state circuitry for all control and read/write electronics, proportional reel drive servo systems, and tension error sensing by synchro transmitters. Field adjustments are eliminated by building tolerances into a single rugged tape deck casting.

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Experienced recording systems engineers are invited to apply for existing employment opportunities.

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CIRCLE 41 ON READER CARD

IF YOU WANT TO TAKE A CHANCE ON FALLING IN LOVE WITH A COMPUTER

When we designed Recomp we had just two people in mind: the man who would use it and the man who would approve the investment.

We told our design engineers we wanted Recomp to 1] have a large capacity, 2] be versatile, and 3] be easy to program. Then we urged our cost engineers to see to it that Recomp stayed in the lower price range.

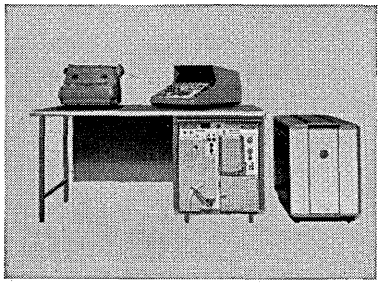
Quite honestly, this posed some problems. On occasion a designer would plead for his brainchild while the cost analyzers demurred.

No coins were tossed to settle such disagreements. If the designer could prove his idea made Recomp a better computer it was incorporated. That's how Recomp came to be the first solid-state digital computer on the market. And also why it was (and still is) the only compact computer with built-in floating-point arithmetic.

Fortunately when we were all through we found Recomp would sell at a sensible price. So, due to this strict attention to the computer's capability and cost, we're truly able to say **Recomp is the very best computer in the low-cost computer field.**

While they were at it, our engineers had some rather original ideas on how to present Recomp to you. "No gobbledygook," they said, "just give them the facts." So we painstakingly winnowed down a mass of superlatives to these plain facts:

1] Exclusive built-in floating point arithmetic.
2] Easy to program.
3] Efficient programming; 49 basic instructions expandable to 72.
4] Fast access time due to high-speed loops.
5] Magnetic disk memory with large capacity—up to 8192 instructions.
6] Large word length of 40 binary bits.
7] Each word contains two instructions.



8] Solid-state reliability.
9] Built-in square root command.
10] Large sub-routine and program library.
11] Active users group.
12] Built-in automatic conversion from decimal to binary.
13] Visual display of any word in memory.
14] Simple correction of errors.
15] Easily installed anywhere.
16] Can use conventional teletype equipment.
17] Low cost per computation.
18] High-speed input and output.
19] Programming training provided.
20] Large program exchange.
21] Coast-to-coast sales & service.

With all respect to our engineers, facts are fine but they can hardly do full justice to Recomp. For example, it's only fair to mention Recomp's appearance. Its soft color and modern shape bespeaks quiet efficiency; blends in the finest of surroundings. In this case you *can* tell the book by the cover. Recomp is truly a masterpiece of design (both in function and form). It's built to look as good as it is; a genuine pleasure to have around.

By the way, many of the points we listed above can be claimed by some other compact computers—but Recomp is the *only one* that can claim them *all,* and as standard equipment. You're never hemmed in on a problem by a lack of equipment.

True, you can get a computer that does more than Recomp, but this should only be if the size of the job justifies a much larger investment (and Recomp *does* have features you won't find in computers costing three times as much). Naturally, you can always find a computer that costs less.

But if you want a low-cost compact computer that performs favorably with the giants in size and cost, you should make a date to see Recomp. However, it's only fair to warn you, unless you want to take a chance on falling in love with a computer, don't write AUTONETICS INDUSTRIAL PRODUCTS, Dept. 122, 3400 East 70th Street, Long Beach, California. The Autonetics Division of North American Aviation, Inc.

ADVERTISERS' INDEX

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Experienced graduate E.E.'s with 3 to 5 years in logic design and transistorized circuit design of digital equipment. Assignments will entail logic and circuit design of buffer storage units and digital peripheral equipment.

TRANSISTOR CIRCUIT ENGINEERS
Seniors & Intermediates

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.

PRODUCT ENGINEERS
Seniors & Intermediates

Assignments entail design analysis and technical liaison to develop a producible product; establishment of design requirements from standpoint of cost, product ability and standardization; recommendation of changes for ease of manufacture. Positions require substantial knowledge of manufacturing methods, practices, shop equipment and facilities; solid background in electronic design of digital equipment; E.E. degree.

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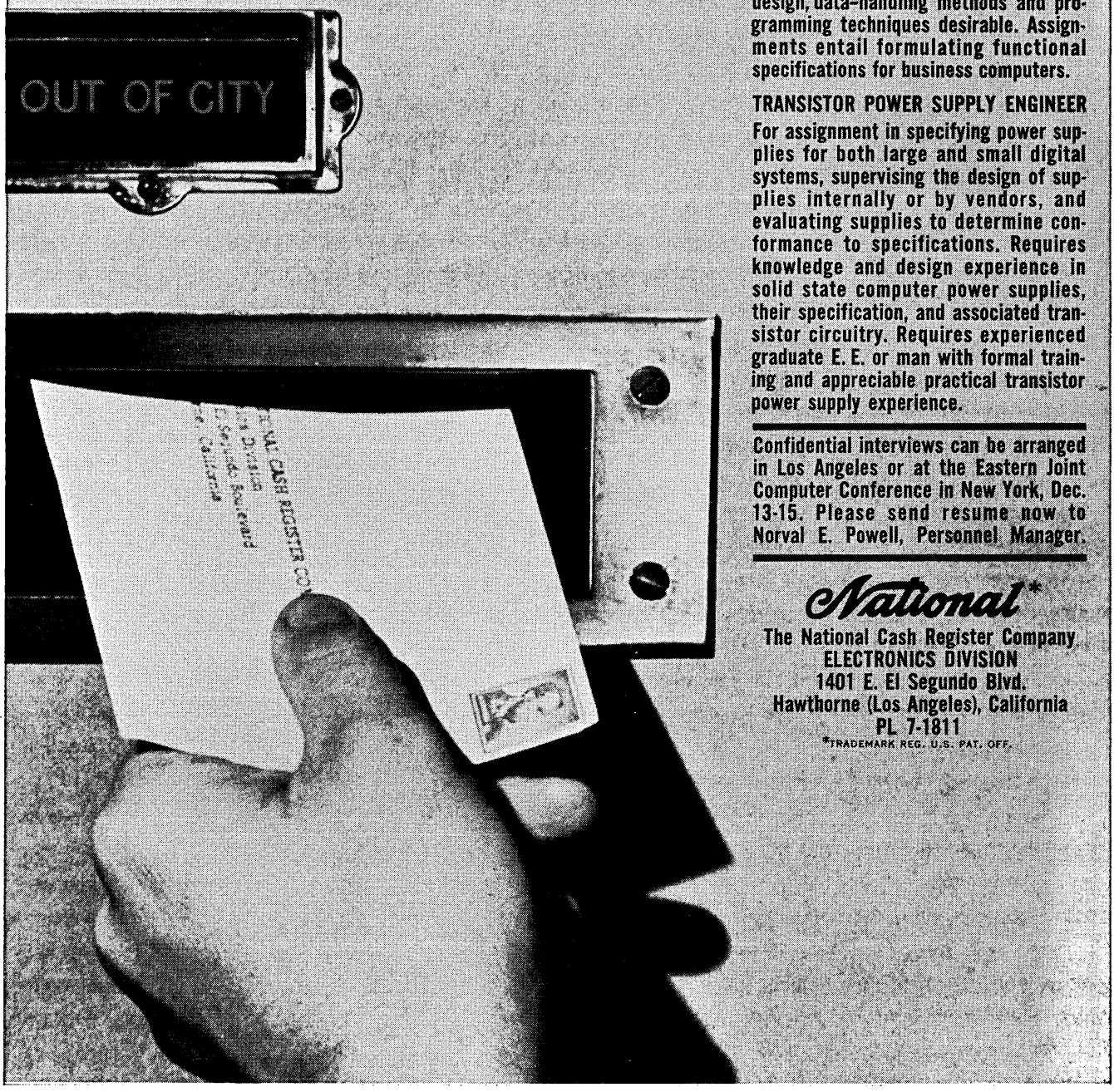
Experience required in formulating functional design specifications for digital computer systems (buffer storage, punch card, paper tape, magnetic tape, random access devices, system organizations, command structures). Training in logical design, data-handling methods and programming techniques desirable. Assignments entail formulating functional specifications for business computers.

TRANSISTOR POWER SUPPLY ENGINEER

For assignment in specifying power supplies for both large and small digital systems, supervising the design of supplies internally or by vendors, and evaluating supplies to determine conformance to specifications. Requires knowledge and design experience in solid state computer power supplies, their specification, and associated transistor circuitry. Requires experienced graduate E.E. or man with formal training and appreciable practical transistor power supply experience.



Confidential interviews can be arranged in Los Angeles or at the Eastern Joint Computer Conference in New York, Dec. 13-15. Please send resume now to Norval E. Powell, Personnel Manager.

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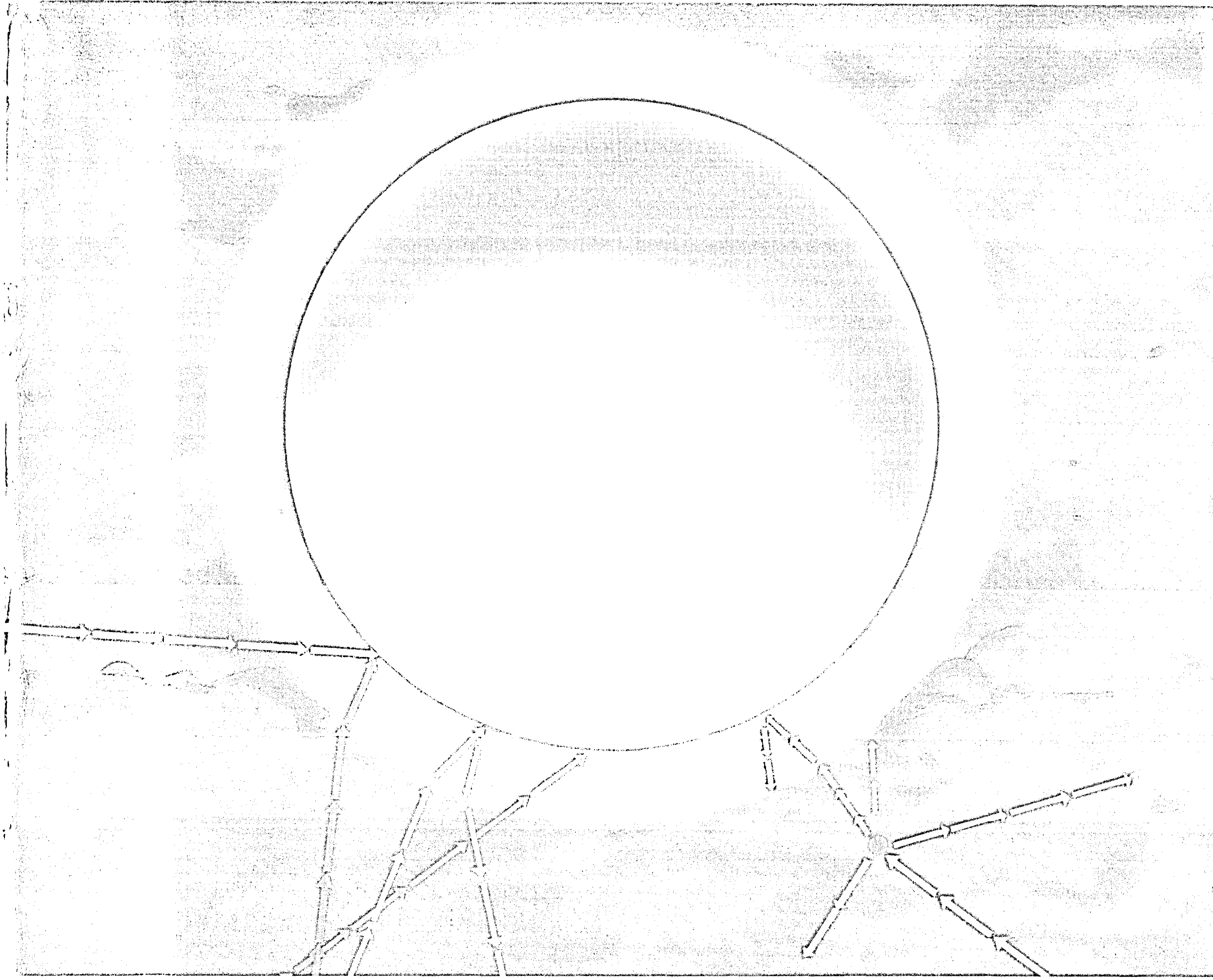

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International Electric [illegible] of controlling and supporting [illegible] throughout the world.

Creation of this digital data processing system involves operations research, systems analysis, formulation of equipment requirements, programming and the systems engineering of an integrated complex of electronic subsystems to meet operational requirements. Electronic systems engi- [illegible] opportunity [illegible]

[illegible] systems engineering, logical design, equipment development, preparation and performance of acceptance test design and application of peripheral equipment. Programmer positions involve creation of advanced techniques in real time programming, automatic programming simulation and automatic recovery. To inquire about these positions, write Mr. J. J. Crawford, Director of Industrial Relations.

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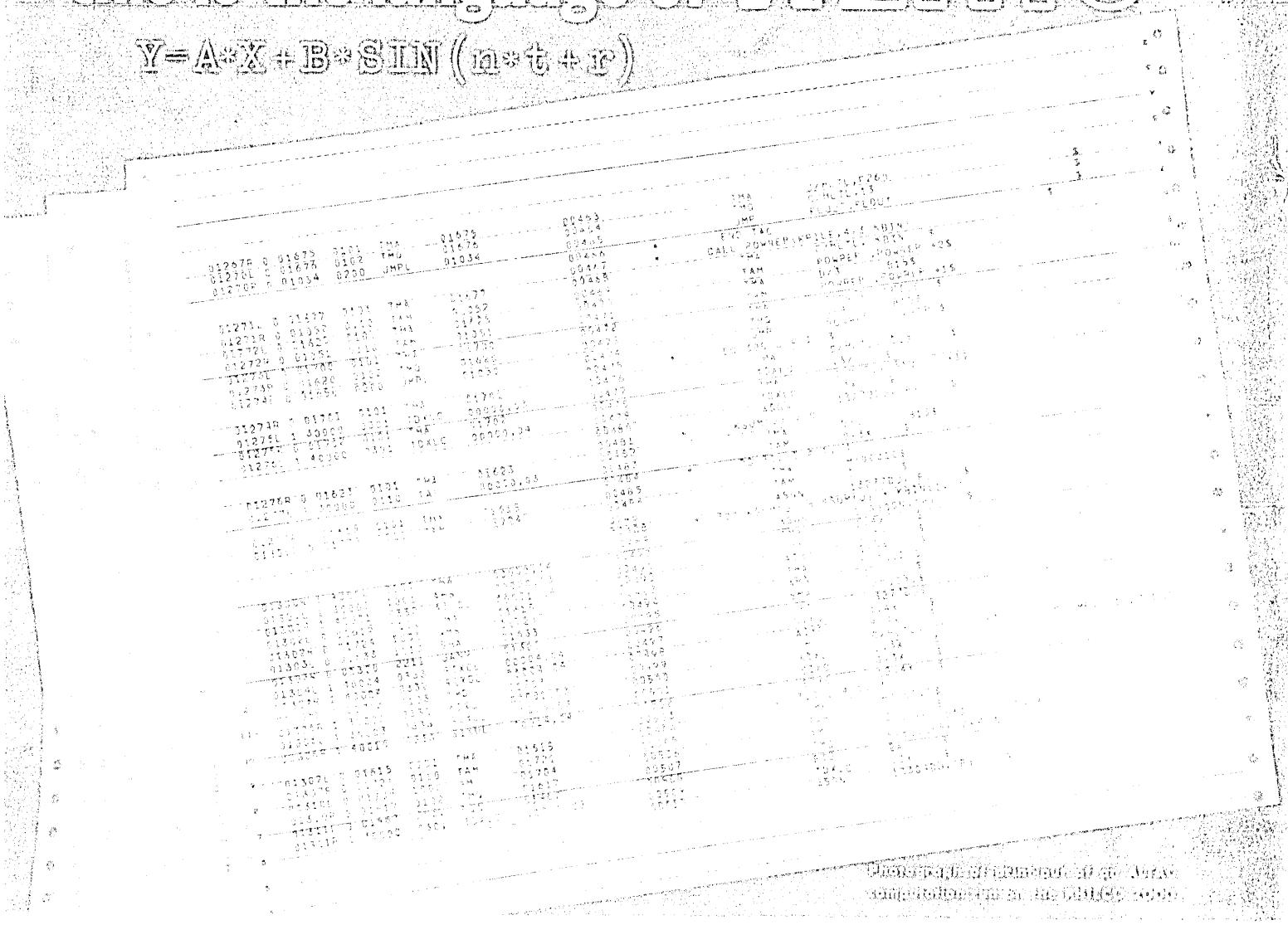
$$Y=A*X+B*SIN((n*t+r))$$



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THAT ACCEPTS PROGRAMS WRITTEN IN MATHEMATICAL LANGUAGE

ALTAC is the Philco mathematical language compiler which operates in conjunction with TAC, the Philco Translator Assembler-Compiler . . . a powerful, computer-oriented language with extensive library features.

ALTAC is completely compatible with the most popular algebraic languages in use today . . . permitting thousands of existing programs to be run on the Philco 2000 Computer without change. It produces a fast, efficient running program. TAC language inserts may be included at will in ALTAC language programs.

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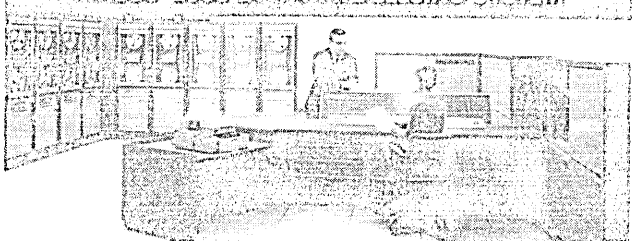

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