The Magazine of

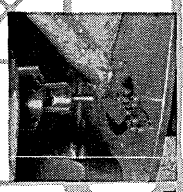
MATION

March / April

Research & Engineering

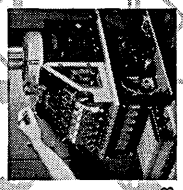
WESTERN JOINT COMPUTER CONFERENCE ISSUE

FOR CORES ARRAYS COMPLETE STORAGE MODULES

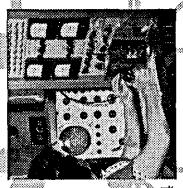


1

2

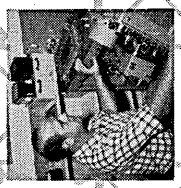


3

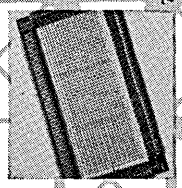


4

5

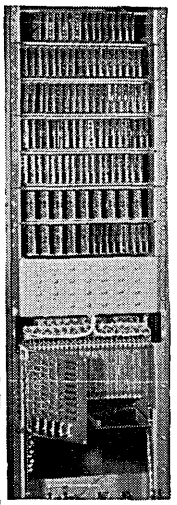


6



7

8



9

1 Die-forming of cores
2 Special furnaces for ceramic firing
3 18,000 cores graded per hour by special equipment
4 Rigid process control assures top quality
5 Production aids speed matrix assembly
6 Electronic test of completed matrix
7 Core matrix for a digital computer
8 Inspected matrices form complete storage module
9 TMI memory for ERMA computer

SPECIFY CORE TYPE:
80T5 for medium speed, transistor driver memories
80T1 for high speed, tube driver memories
80T1B for high speed, transistor driver memories
50T1 for super-speed, tube or transistor driver memories
180T5 for core switching application

UNDER ONE ROOF. At Telemeter Magnetics, Inc., ferrite core production and their end use are fortunately often merged into one functional design solution. *Core* production facilities work intimately with design engineers to produce magnetic cores of top quality at mass production rates. With this thorough grounding in magnetic core technology, TMI manufactures core *matrices* in a wide range of configurations and offers core arrays to individual customer needs. Core matrix assembly is done by highly trained production personnel and each matrix is tested under marginal conditions by special test equipment. With their own *cores, arrays* and *storage modules*, TMI has produced a series of *buffer storage* systems and random-access *memories* for General Electric, Remington Rand, ElectroData Division of Burroughs Corporation and others. If your problem involves ferrite cores, core matrices, or core storage systems, consult TMI first.

write for company brochure to: Dept. B

TELEMETER MAGNETICS *Inc.* 2245 Pontius Avenue, Los Angeles 64, Calif.

Circle 1 on Reader Service Card

DATAMATION 58

the automatic handling of information

volume 4, number **2**

OVER 23,000 CIRCULATION

Research & Engineering is circulated without charge by name and title to the manufacturers and users of automatic, information-handling equipment in all branches of business, industry, government and military installations. Qualified individuals in the United States and Canada are invited to request this publication on their company letterhead, stating position and the firm's business. Available to others by subscription at the rate of $10.00 annually; single issue, $1.00 when available. No subscription agency is authorized by us to solicit or take orders for subscriptions in the U. S. or Canada.

Published bi-monthly by The Relyea Publishing Corp., Frank D. Thompson, president. Executive & Circulation office: 103 Park Ave., New York 17, N. Y., LExington 2-0541; Editorial & Advertising office 10373 W. Pico Blvd., Los Angeles 64, Calif., BRadshaw 2-5954. Unsolicited manuscripts must be accompanied by return postage; although all reasonable care will be taken, the editor assumes no responsibility for their safety or return. Published and accepted as controlled circulation publication at Indianapolis, Indiana.

PUBLISHER & EDITOR *Frank D. Thompson*

VICE-PRESIDENT *Gardner F. Landon*

ASSOCIATE EDITOR *Santo A. Lanzarotta*

PRODUCTION MANAGER *Dorothy B. Creeden*

CIRCULATION MANAGER *Martha Knowles*

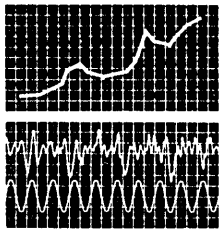
SALES MANAGER *Earl W. Wilken*

EASTERN REPRESENTATIVE *Paul S. & Donald C. Weil*
39-01 Main St., Flushing 54, N. Y., INdependence 3-9098

CLEVELAND REPRESENTATIVE *John J. Millar*
3537 Lee Rd., Shaker Heights 20, Ohio, WAshington 1-9370

MIDWEST REPRESENTATIVE *Gilbert Thayer*
201 N. Wells St., Chicago 6, Ill., FInancial 6-1026

WESTERN REPRESENTATIVE *Earl W. Wilken*
10373 W. Pico Blvd., Los Angeles 64, Calif., BRadshaw 2-5954



DATAMATION *in business and science*

TRANSISTORS TO DIODES—REVOLUTION?

A new electronic revolution may be in the making with the conventional transistor replaced in digital computers by a new form which may be called a transistor diode. This announcement was made by Dr. William Shockley, Nobel Prize winner and director of Beckman Instruments' Shockley Semiconductor Laboratory in Palo Alto, Calif. He stated that four-layer diodes have been used in new circuits to amplify digital signals in experiments recently carried out at the laboratory.

Pointing out that lower costs and superior performance may result from replacing transistors with transistor diodes, Dr. Shockley said, "This is a consequence of two facts: First, speed of operation of transistorized computers depends upon the thinness of layers in the semiconductors used, and second, it is difficult and costly to make contact to the middle layer of a conventional transistor. The difficulty increases as the layer becomes thinner and the speed of operation higher. The four-layer diode avoids this difficulty since it requires no connection in the middle two layers."

PHILCO CORP. INSTALLS TWO TRANSACS

Philco Corporation will install its first two TRANSAC S-2000 systems this year. The first S-2000 will be used at corporate headquarters in Philadelphia for processing business data and to assist the research laboratory in complex mathematical problems. The second unit will go to the firm's Western Development Laboratory at Redwood City, Calif., for special research work.

RESEARCHERS WANT 704 TO ABSTRACT

IBM researchers in New York have made an initial progress report on a method for producing abstracts of scientific and technical articles using a 704. Development of this literary editing technique was prompted by the growing need for faster and more efficient communications among the world's scientists. In "auto abstracting," the article to be treated is first punched out on cards, then transcribed to magnetic tape, in which form it is ready to be fed to the machine. As the tape is read, the program is activated.

The computer determines the significance of words by measuring the frequency with which they are used individually and the frequency of combinations and couplings. The article is scanned and submitted to a statistical analysis of word usage and placement, from which a table of values is made. The machine then analyzes each sentence based on the table and awards a significance factor to it. Then, depending on the degree of these factors, it will select the several highest ranking sentences and print them.

NAVY NAMES LIBRASCOPE—$17 MILLION

Contract awards totalling $17 million with the U. S. Navy for digital computers to be used in two current programs have been announced by Librascope, a subsidiary of General Precision Equipment Corp., N. Y. The Glendale, Calif., firm's contribution to the ASROC program, represented in a $12 million contract, will include the first digital fire control computers to be installed on Navy vessels. A similar contract (this one worth $5 million) for the Navy airborne digital computer CP-209, has entered the production stage.

IIT CONFEREES SCHEDULE EDP SESSION

Reducing costs in industry through application of scientific management techniques will be the theme of a conference for business and industrial executives at Illinois Institute of Technology, Chicago, May 8 and 9. This Cost Reduction Conference will consider many subjects, one of which deals with the proper time to introduce data processing equipment into an organization.

BIG COMPUTER CARES FOR 3½ MILLION

Datamatic 1000, a 40-ton computer, is now in operation in Detroit for the 3½ million Michigan residents who are members of the Blue Cross-Blue Shield medical plan. This was the first unit of its kind designed, constructed and installed (in January) by the Datamatic Division of Minneapolis-Honeywell. William S. McNary, a v-p of Michigan Hospital Service, activated the 24-section computer in mid-February. It is housed in a 5,000 sq. ft. installation.

The $37,000-a-month brain will search 1,400,000 records and bring an average of 25,000 of them up to date in just two hours. The rest of each working day will be used for billing operations and compilation of hospital plan statistics. The unit translates conventional records from paper or punched cards to three-inch tape. It accomplishes these functions at the rate of 60,000 decimal digits per second. A second Datamatic is now being installed at the First National Bank, Boston.

EPSCO AWARDED UNITED AIRCRAFT CONTRACT

Epsco, Inc., Boston, has been awarded a contract worth "several hundred thousand dollars" for a wind tunnel instrumentation system to function at United Aircraft's research center in Hartford, Conn., according to B. M. Gordon, Epsco president. The system, he said, is designed to accept approximately 20 channels of low level input information, digitize each channel in sequence, and prepare the digital information on magnetic tape for subsequent analysis by a digital computer. Delivery is slated within months.

LD COMPUTES FLUORESCENT COEFFICIENTS

Lighting Dynamics, a new subsidiary of Ecko Products Co. located in Dallas, is computing the coefficients of utilization for its fluorescent fixtures on an IBM 650. The results are accurate to five decimal places. All coefficients are based on the interflectance method. LD spent 50 hours coding its problem on tape. The tape contained all instructions and constants with alternative opportunities of calculating incandescant, mercury and fluorescent figures. After feeding this information into the computer, it was found that a complete set of calculations could be delivered in 10 minutes as compared to a previous requirement of eight hours.

JOHNSON WAX ORDERS FIRST NCR 304

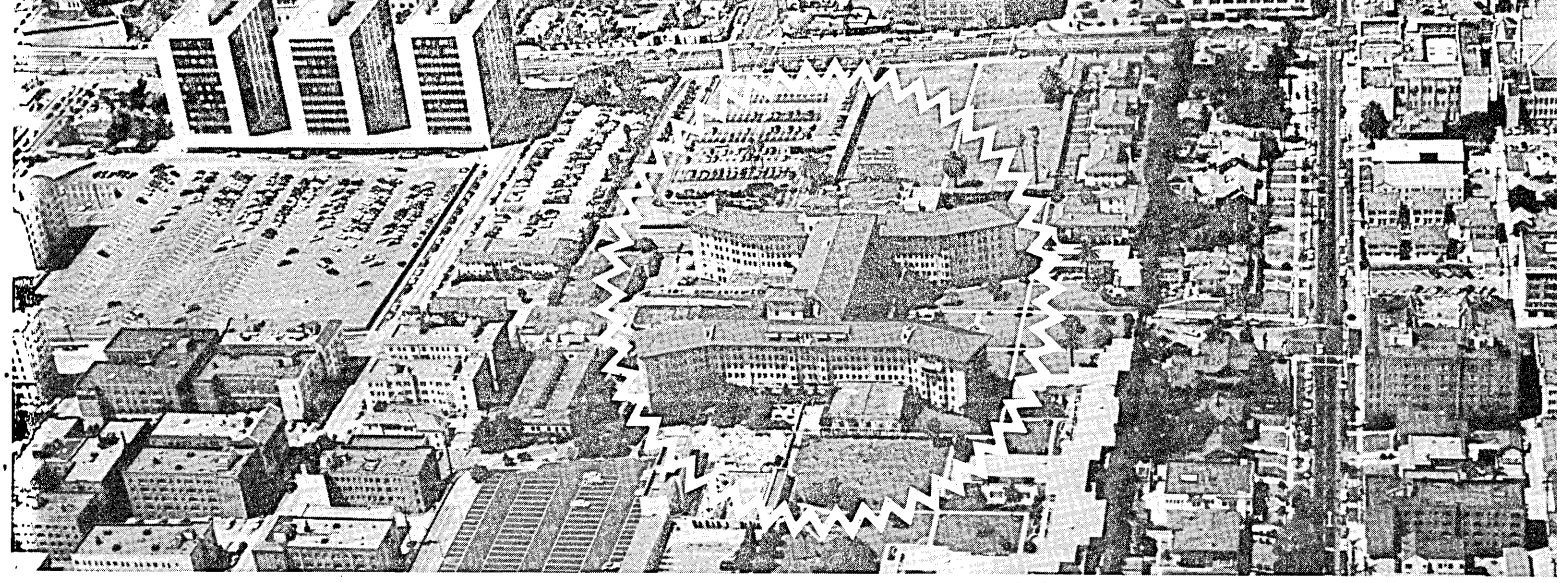
First order for National Cash Register's new data processing system, the 304, was placed by the wax and household products firm of S. C. Johnson and Son. Other orders have been received from American United Life Insurance and General Tire and Rubber. The U. S. Marine Corps has announced its intention of procuring three of the systems.

HOFFMAN GETS $11,000,000 AF CONTRACT—

A contract for $11,000,000 to engineer and develop a complete electronic reconnaissance system has been awarded by the U. S. Air Force to Hoffman Electronics Corporation through its Hoffman Laboratories Division, Los Angeles. The system, designated AN/ALD-3, code name—Tall Tom, will detect, record and examine transmissions over a wide range of frequencies and will process the data collected through computers for further analysis. It incorporates significant new technical advances which at this time are classified.

ARMY ENGINEERS ESTABLISH D.C. CENTER

The U. S. Army Corps of Engineers has established an engineering data processing center in Washington, D. C., to appy EDP techniques and equipment in the handling of reports and statistical data and in solving various engineering problems. The center will also coordinate activities at the Corps' various data processing installations. It is headed by Lt. Col. W. N. Lucke.



MAY 6-8 1958

During a period when many potential customers across the land are looking carefully at computers and data processing systems and weighing the value of their various applications before leaping into a no-turning-back purchase, the theme of the 1958 Western Joint Computer Conference—"Contrasts in Computers"—seems quite timely. It demonstrates that computer and EDPS manufacturers and users recognize a fact which Chairman Willis H. Ware pinpoints in his message of welcome on the following page, to wit: too many procedures and techniques will not contribute to progress within the field. Only through comparisons and an exchange of ideas will real advancement be possible.

Following this general theme, thousands of those involved in or interested in datamation will gather at Los Angeles' Ambassador Hotel for a three-day meeting beginning May 6. Six WJCC sessions will cover panel discussions of controversial aspects of computer design and application, and six technical sessions will be devoted to individual papers. The conference is being sponsored by the Association for Computing Machinery, the Institute of Radio Engineers and the American Institute of Electrical Engineers.

Nearly 50 exhibits of leading research laboratories, manufacturers, and manufacturers' representatives will be on display. All phases of computer technology will be represented including working computer systems, materials and components, input-output equipment, and storage systems. Exhibitors will demonstrate equipment and discuss applicability. The general public will be admitted to the exhibit area.

Field trips are scheduled continuously during the conference. Guests may view the facilities of System Development Corp., Bendix Computer Division, Ramo-Wooldridge Corp., Northrop Aircraft, National Cash Register Co., Burroughs' ElectroData Division and Jet Propulsion Laboratory.

There will be no preregistration at this conference. Registration booths, located at the center of the Ambassador lobby, will be in operation on Monday, May 5, from 7 to 9 a.m., on Tuesday, from 7:30 a.m. to 5 p.m., on Wednesday, from 8:30 a.m. to 5 p.m. and on Thursday, from 8:30 a.m. to 2 p.m.

Top men in the field have been brought together to participate in WJCC discussions and sessions. Setting the tone for these gatherings will be an opening panel session on May 6 under the chairmanship of Harry T. Larson of Aeronutronic Systems, who is also the conference vice-chairman. Exploring "The Social Problems of Automation" will be H. D. Lasswell, professor of law and political science at the Yale School of Law; O. A. Knight, president of the Oil, Chemical and Atomic Workers' International Union; and Cuthbert C. Hurd, director of Automation Research at IBM.

Ware, this year's conference chairman, was assisted by his committee chairmen in developing a well rounded program to accompany the more formal proceedings.

A get-acquainted cocktail party will be held for registrants and their guests from 6 until 8 p.m. on May 6. An official luncheon is set for noon on May 7 in the Cocoanut Grove.

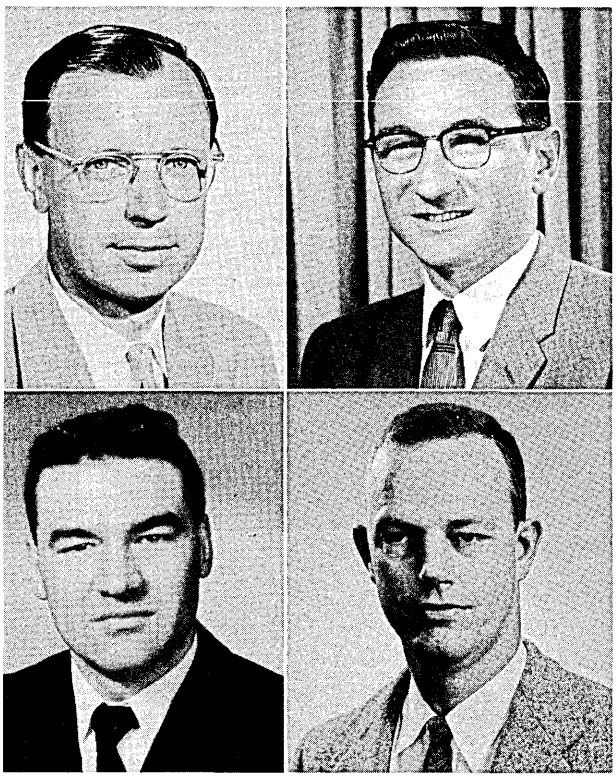
A number of activities are planned for the wives of registrants including tours through some of Los Angeles' most interesting sections. Limited TV and radio show tickets as well as baby sitter information will be available at the Ladies' Booth in the Ambassador lobby.

Fees to be assessed at the conference include registration fees of $5.00 per member of the sponsoring organizations, $6.00 per non-member and $2.00 per full-time student. Social fees—cocktail party, $4.00; luncheon, $4:00; field trips, $1.50 per tour and ladies' activities, $7.00 per day.

MESSAGES OF WELCOME . . .

Willis H. Ware
chairman
Rand Corporation

Harry T. Larson
vice-chairman
Aeronutronic Systems, Inc.



Richard E. Utman
secretary
Burroughs' ElectroData

Montgomery Phister
technical chairman
Ramo-Wooldridge Corp.

. . . from chairman ware

One significant indication of the west coast's growing importance as a center of activity and accomplishment in the field of automation is the ever-increasing success of the yearly Western Joint Computer Conferences. Since 1953, when the first such conference was held in Southern California, the number of both registrants and exhibitors has almost trebled and in 1958 the sixth annual W.J.C.C. will attract to Los Angeles more than 2,000 scientists, mathematicians and engineers from all over the United States and abroad. Over 60 major companies and organizations in the field will be represented by exhibits.

The modern computer has continued to establish itself more and more securely as the strategic "nerve center" of the electronic era, with scarcely a facet of our civilization that it does not promise in some way to affect critically or to transform radically. Progress in the application of computers, moreover, has inevitably been followed by a proliferation of techniques until today we are confronted with a vast and sometimes confusing array of alternatives. The 1958 Western Joint Computer Conference, under the general theme of "Contrasts in Computers," represents the first comprehensive attempt to compare the relative merits of some of these myriad methods and procedures in the hope of establishing certain criteria of applicability and performance which will serve to advance still further the state of the art.

. . . from vice-chairman larson

Electronic computers are being employed in steadily widening areas of activity. The outlines of these areas are now discernible. In the scientific and engineering fields, computers have proven to be powerful design and analysis tools. Computer design and application disciplines are having extensive effects on the very mathematical and engineering fields from which the techniques are drawn. These devices have become an integral part of the weapons, machines, and organizations building for wartime. The computer and its descendant, the data processor, are now being applied increasingly to business and industrial activities, in the office and in the factory.

The total effect of this body of equipment is compounding rapidly, due to the daily discovery of new uses and the sharply increasing quantities of computers and data processors going into action. The impacts of these powerful new tools will be sufficiently great to create discernible changes and reactions in the American society. The adjustments and responses may well create difficult problems in the American business, scientific, and social systems.

The opening session brings together a physical scientist, a social scientist, and a representative of the labor movement, to discuss the broad social problems arising from the introduction of computers and related automatic techniques into our industrial society. These men will present their views of problems they foresee, and will discuss methods for dealing with these incipient difficulties.

. . . from technical chairman phister

In the six panel discussions to be held during the 1958 W.J.C.C. various experts in the computer field will discuss their different points of view. Everyone recognizes that different organizations—industrial, academic and governmental—are designing and using computers in many different ways. Each of these organizations has developed a specific set of preferred methods and procedures. Each organization is aware of other ways of doing things, but for one reason or another believes its way is best. These panels will provide a means of comparing such theories directly.

Each individual panel member will present a prepared paper describing his viewpoint and telling of its advantages and disadvantages. After the prepared papers, the speakers will be allowed to make extemporaneous rebuttals of one another's papers, and the meeting will then be open to questions and comments from the audience.

WJCC COMMITTEE CHAIRMEN

responsible for conference activities, sessions, displays

W. F. Gunning
technical
Beckman, Systems Div.

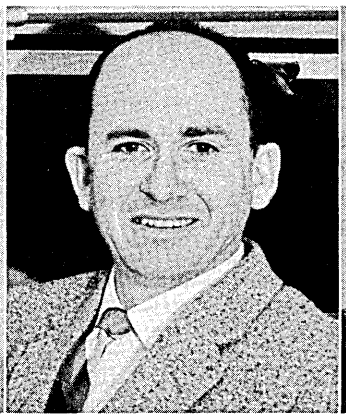
Nan Glennon
womens' activities
Ramo-Wooldridge Corp.

Billie Keesey
womens' activities
Telemeter Magnetics, Inc.

C. T. Leondes
technical
U.C.L.A.

M. Howard
registration
Ramo-Wooldridge Corp.

A. R. McKay
public relations
Lockheed Missiles



K. W. Uncapher
finance
Rand Corporation

A. Dowling
publications
Alwac Corporation

W. A. Farrand
printing
Autonetics, NAA

J. J. Seidman
accommodations
National Cash Register

D. F. Weinberg
exhibits
Ramo-Wooldridge Corp.

P. M. Brown
field trips
Aeronutronic Systems, Inc.

LADIES' TOURS

everything from fish to fashions

Tuesday—May 6

7:30 a.m.—Purchase tickets. Cost of each of the Tuesday and Wednesday tours is $7.00. On Tuesday, this will pay for cocktail, luncheon and fashion show plus entire tour.

9:30 a.m.—Board bus for sightseeing at 20th Century Fox Studio.

12:30 p.m.—Luncheon and fashion show at the Beverly Hills Hotel.

3 p.m.—See U.C.L.A., Sunset Strip, Grauman's Chinese Theater, Hollywood and Vine, CBS and NBC studios.

4 p.m.—Return to Ambassdor.

6 p.m.—WJCC Cocktail Party.

Wednesday—May 7

8 a.m.—Purchase tickets (unless you did so on Tuesday). On Wednesday, $7.00 will cover admittance fees, cocktail, luncheon plus the entire tour.

8:30 a.m.—Bus leaves for scenic tour of southern Los Angeles area.

10:30 a.m.—Marineland of the Pacific Show.

12:30 p.m.—Luncheon at the Plush Horse in Redondo Beach.

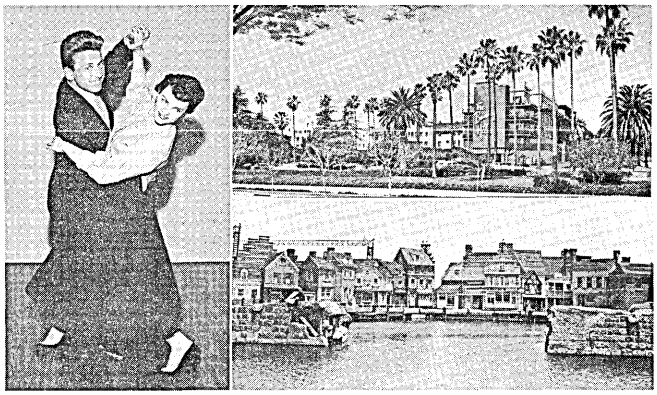
2 p.m.—See Arthur Murray's "Cavalcade of the Dance."

4 p.m.—Return to the Ambassador.

Thursday—May 8

No scheduled tour planned. Possible on-your-own activities include visits to Farmers' Market, Disneyland, Huntington Art Gallery, Knotts Berry Farm, Griffith Observatory, Griffith Park Zoo, County Museum, Los Angeles civic center, golf courses, beaches. Inquire at Ambassador booth for evening entertainment possibilities.

It will not be possible to accommodate children under 12 on the ladies' tours. Baby sitter information will be available at the booth. Limited TV and radio show tickets and other information are also being provided.



Ladies will see Arthur Murray "Cavalcade of Dance," enjoy lunch at Beverly Hills Hotel and tour 20th Century Fox movie lots, one of which is pictured.

Meal time at Marineland (part of May 7 tour) finds porpoises and deadly moray eel "reaching" for bit of food.

Second planned luncheon will take touring computer ladies to one of southland's newest restaurants, The Plush Horse.

LUNCHEON SPEAKER

DR. MARTIN L. KLEIN, inventor, author and television personality, will address WJCC luncheon on May 7.

the subject — "computers, '58"

Positioned midway in the WJCC schedule and billed as one of the conference highpoints is a luncheon address by the noted electronic scientist, Dr. Martin L. Klein.

Dr. Klein will speak on "Computers, '58" following the May 7 luncheon at the Ambassador's famous Cocoanut Grove.

The well-known inventor, author and television personality is currently director of the research division of Cohu Electronics, Inc., San Diego. Dr. Klein spends the major portion of his time at the company's research laboratory in Van Nuys.

Educated at Pennsylvania State and Stanford, Klein received his Doctorate from Boston University in 1951. He is author of 50 published articles and two books on electronic systems. He has a third book ready for early publication.

Instrumentation, Digital On-Line Transcriber is the name of one of the 17 patents on electronic devices held by Dr. Klein.

Two years ago, he originated a television science program which is seen weekly by thousands throughout southern California. "Adventure Tomorrow" (Tuesdays, 7:30 p.m., Channel 13, KCOP) has also been selected by the Armed Forces for viewing overseas.

In his professional career, Dr. Klein has been associated with Stancil-Hoffman, and Rocketdyne, a division of North American Aircraft. He has been named to head the ISA Data Handling Workshop to be held in Philadelphia in September.

WJCC

EXHIBITORS

Adcon Corp.
1117 Commonwealth Ave.
Boston 15, Mass.....70

Aeronutronic Systems, Inc.
Subsidiary of Ford Motor Co.
13729 Victory Blvd.
Van Nuys, Calif.....54

Aladdin Electronics
Div. of Aladdin Industries, Inc.
380 E. Green St.
Pasadena, Calif. 28

Ampex Corp.
Instrumentation Div.
934 Charter St.
Redwood City, Calif.....50-52

AMP, Inc.
Eisenhower Blvd.
Harrisburg, Penna. 3-4

Audio Devices, Inc.
840 N. Fairfax Ave.
Hollywood 46, Calif.....30

Autonetics Div.
North American Aviation, Inc.
5205 Santa Fe Ave.
Vernon, Calif. 16-17

Bendix Computer Div.
5630 Arbor Vitae St.
Los Angeles 45, Calif.....62-63

Benson-Lehner Corp.
11930 Olympic Blvd.
Los Angeles 64, Calif.....10-11

C. P. Clare & Co.
6047 Hollywood Blvd.
Los Angeles 28, Calif.....48

Coleman Engineering Co., Inc.
6040 W. Jefferson Blvd.
Los Angeles 16, Calif.....49

Computer Control Co., Inc.
Western Div.
2251 Barry Ave.
Los Angeles 64, Calif.....46

Computer Control Co., Inc.
Eastern Div.
92 Broad St.
Wellesley 57, Mass.....47

Datamatic
Div. of Minneapolis-Honeywell Regulator Co.
151 Needham St.
Newton, Mass.....74-75

Digital Equipment Corp.
Main St.
Maynard, Mass.....34

Electronic Associates, Inc.
Long Branch and Naberal Aves.
Long Branch, N.J.....31-33

ElectroData Div.
Burroughs Corp.
460 Sierra Madre Villa
Pasadena, Calif.....64-66

Electronic Engineering Co. of Calif.
1601 E. Chestnut Ave.
Santa Ana, Calif.....25-26

Encyclopaedia Britannica
2412 W. Seventh St.
Los Angeles 57, Calif.....15

Engineered Electronics Co.
Sub. of Electronic Engineering Co.
506 E. First St.
Santa Ana, Calif.....27

Ferranti Electric, Inc.
95 Madison Ave.
Hempstead, Long Island, N.Y.....59

Friden Calculating Machine Co., Inc.
San Leandro, Calif.....80-82

General Electric Co.
Rectifier Dept.
One River Road
Schenectady, N.Y.....2

G. M. Giannini & Co., Inc.
Datex Div.
918 E. Green St.
Pasadena, Calif.....5

Great Books of the Western World
672 S. LaFayette Park Place
Los Angeles 57, Calif.....57

Hughes Aircraft Co.
Florence and Teale Sts.
Culver City, Calif.....20-22

International Business Machines Corp.
590 Madison Ave.
New York 22, N.Y.....6-8

F. L. Moseley Co.
P. O. Box 791
Pasadena, Calif.....58

G. E. Moxon Sales
7553 Melrose Ave.
Los Angeles, Calif.....38

National Cash Register Co.
Electronics Div.
3348 W. El Segundo Blvd.
Hawthorne, Calif.....1

Potter Instrument Co., Inc.
Sunnyside Blvd.
Plainview, N.Y.....37

Ramo-Wooldridge Corp.
5730 Arbor Vitae St.
Los Angeles 45, Calif.....12

J. B. Rea Co.
1723 Cloverfield Blvd.
Santa Monica, Calif.....14

Remington Rand
Div. of Sperry Rand Corp.
315 Fourth Ave.
New York 10, N.Y.....40-45

Rese Engineering, Inc.
731 Arch St.
Philadelphia 6, Penna.....68

Research & Engineering
The Magazine of DATAmation
103 Park Ave.
New York 17, N.Y..... 69

Royal McBee Corp.
Westchester Ave.
Port Chester, N.Y.....23-24

Shephard-Winters Co.
7407½ Melrose Ave.
Los Angeles 46, Calif.....53

Soroban Engineering, Inc.
Box 1717
Melbourne, Fla.....9

Sprague Electric Co.
Marshall St.
North Adams, Mass..... 67

Stromberg-Carlson
1895 Hancock St.
Box 2449
San Diego 12, Calif.....77-79

Telemeter Magnetics, Inc.
2245 Pontius Ave.
Los Angeles 64, Calif.....60-61

Teletype Corp.
4100 Fullerton Ave.
Chicago 39, Ill.....35-36

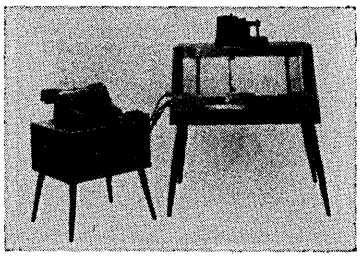
John Wiley and Sons, Inc.
440 Fourth Ave.
New York 16, N.Y.....39

Wright Engineering Co.
180 E. California St.
Pasadena, Calif.....18-19

Sponsoring Societies—ACM-AIEE-IRE
Exhibit Literature and Membership Information.....71-72

Walkirt
145 W. Hazel St.
Inglewood 3, Calif.....29

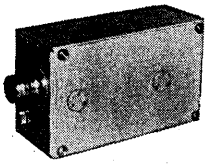
Weber Showcase & Fixtures Co., Inc.
5700 Avalon Blvd.
Los Angeles 11, Calif.....76



NEW OSCILLOGRAPH TRACE READER

item 436

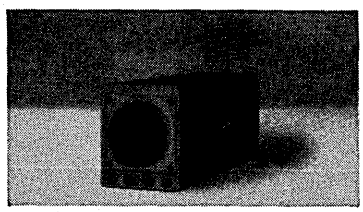
Benson-Lehner Corporation announces the availability of its new oscillograph trace reader, the OSCAR Model J. The unit is designed to function as a complete oscillograph data reduction system and is especially advantageous to smaller laboratories because of its flexibility and low cost. The OSCAR Model J handles either film or opaque records varying in width from 16 mm. film to 12" paper records. The calibrating reading head allows for application of linear or non-linear calibrations with automatic readout to electric typewriter and card or tape punch machines.



HIGH SPEED CAMERA

item 437

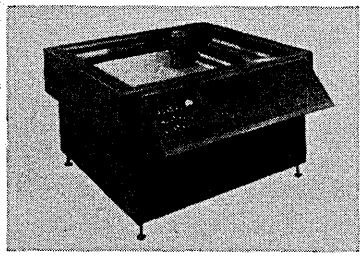
The Photo Instruments Division of the Benson-Lehner Corporation announces the availability of their new Model HS-16A Photographic Recorder. It is a 16 mm. intermediate high speed camera (400 frames/sec.) with 200-foot film capacity, daylight loading spools, designed to operate remotely while mounted on aircraft, missiles, sleds, or any vehicle where photographic information is required for test data or documentary purposes. The recorder movement is an intermittent register pin type which insures accuracy and against loss of loop while recording. Available with wide range of accessories.



SQUARE WAVE ANTICIPATOR

item 438

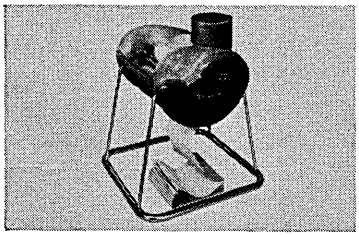
This unique instrument has an automatic lock-on feature making it able to follow the most violent gyrations in Research and Development programs. With a pre-amplifier on the Anticipator you can get one ahead of the game and even tell the Government which programs they are going to chop before they find out themselves. The Anticipator is particularly valuable to the Personnel Department, as it allows you to be hiring when everyone else is firing and vice versa. Equipment classification: SECRET.



NEW AUTOMATIC PLOTTER

item 439

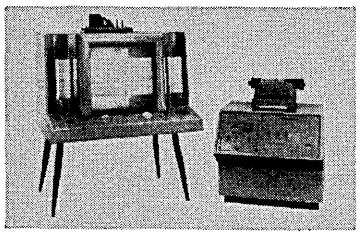
The Electroplotter S, manufactured by the Benson-Lehner Corporation, provides the first significant step toward the automation of drafting. It is designed with a unique printing head with 13 printing sectors. The print head provides a complete graphic display in one reading, including graphic and extensive numerical information. Typical applications are missile trajectory plottings, geophysical section mappings and useage as a computer output device.



NEW PORTABLE FOLDING MACHINE

item 440

A new portable folding machine, the Rollafold, has been introduced by Benson-Lehner Corporation. The machine is designed to produce neat accordion folds in a long strip or roll of paper, such as a chart from an oscillograph recorder. Fold spacing is continuously adjustable from 6.5 to 12.5 inches at a folding rate of one fold per second. Folded records are more easily stored after being processed by the Rollafold.



NEW RECORD READER

item 441

The Benson-Lehner Corporation's new OSCAR Model N-2 can be used for the reduction of both frame by frame film and multiple trace oscillograph records. (It operates on a radically new principle utilizing rugged plastic mounted cross-lines as the X-Y reading references.) Output range is 10,000 counts in both X and Y. Plugboard programmer makes this unit compatible with all existing digital computers.

This ad wanted to be a new products page. Why? Because the advertising research boys say new products pages get better readership than ads. Has it been successful? Naturally... otherwise you wouldn't still be with us way down here. Besides, maybe one of the products that caught your eye here will improve your data processing system. For information about any of these products, write:

benson-lehner *corporation*

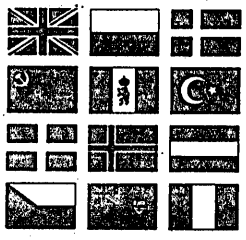
11930 Olympic Boulevard, Los Angeles 64, California

OFFICES: LOS ANGELES; SUMMIT, N.J.; WASHINGTON, D.C.; DAYTON, OHIO; TULSA, OKLA.; LONDON; PARIS AND OTTAWA

Service Centers in 25 cities throughout the world.

For a personal file of this ad series write to Benson-Lehner, Dept. 02 for your Adsmanship Handbook Folder.

Circle 3 on Reader Service Card



DATAMATION *abroad*

UNESCO AIDS INFORMATION PROCESSING

Paris or Rome will be the site next year of the First International Conference on Information Processing which will be held under the sponsorship of UNESCO and various computer societies, including the U. S.'s Joint Computer Committee. Subjects to be considered: mathematics, logic and common language; automatic machine translation, information storage and retrieval, pattern recognition and machine learning, and real time problems in meteorology and economics.

IN BRITAIN— COMPUTER CAUSE ADVANCING

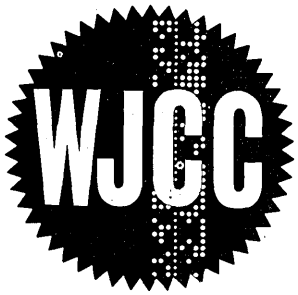
As a result of the meeting of the British Conference on Automation and Computation in London a year ago, a new, permanent group of societies has been formed to help promote collaboration in the computer field. The British Group for Computation and Automatic Control has met, elected officers and is considering admitting additional societies. Two other groups of societies concerned with the general field of automation may be formed in the near future. . . . The London firm of E. M. I. Electronics, Ltd., has completed what is claimed to be one of the world's largest analog computers. Working in conjunction with Laporte Industries, Ltd., chemical manufacturer, E.M.I. has constructed the computer as an electronic simulation of a Laporte factory. It will, they claim, afford a detailed study of plant operating characteristics and chemical plant design, eliminating the delay and expense of lengthy mathematical computation. . . . Establishment of an engineering department in the British Division of Benson-Lehner Corp., Southampton, and appointment of A. F. Appleton as chief engineer has been announced by E. J. Petherick, division director. According to Petherick, the division has completed its first year of operation with 21 data reduction installations in the U. K., the most recent being at Saunders Roe, Ltd., and Blackburn and General Aircraft, Ltd.

IN SWEDEN— MARKET TERMED 'GOOD'

Stockholm will be the site of a special electronics exhibition, May 21 - 30, held by English manufacturers at the internationally known St. Erik's Exhibition Hall. Authoritative sources state that Sweden promises to be a good market for industrial electronics, including computers and data processing systems, since local production covers only one-third of Swedish needs. . . . Two Swedish insurance companies will be the first in their country to convert to datamation. They are Trygg, which holds about 800,000 policies (mostly standard rate industrial averaging $40,000 each) and its associate Fylgia, with 700,000 car insurance customers (20 percent of the market, or 1,000,000 cars). Both are scheduled to convert to the automatic handling of their records late in 1958 with the delivery of a Ferranti PERSUES. The operation will be carried out by the newly created subsidiary, Datacentralen. . . . The correspondence school of Hermods in Malmo, Sweden, is offering a course called Electronic Data Processing in seven lessons. Most of the 1,000 students enrolled are sponsored by their employers.

GERMAN BOOK COVERS OFFICE AUTOMATION

A study of computers and their applications in Europe has been published in Germany. Titled "Automation in the Office and for Management," the German-language book was published by Albis G m b H, Hamburg-Stettingen, Germany, and authored by Max Mroos, an officer of the Hamburg Transit Company. The book is based on the experience of the author's firm in planning for and using a computer. Mroos analyses operating characteristics of leading computers available to European business, and shows how they can be used in every day data processing applications. . . . Ernst Leitz' optical firm in Wetzlar, Germany, will soon install a $120,000 Elliott 420F computer for the design of optical systems.



OPENING SESSION...

the social problems of automation

chairman: *H. T. Larson, Aeronutronic Systems, Inc.*

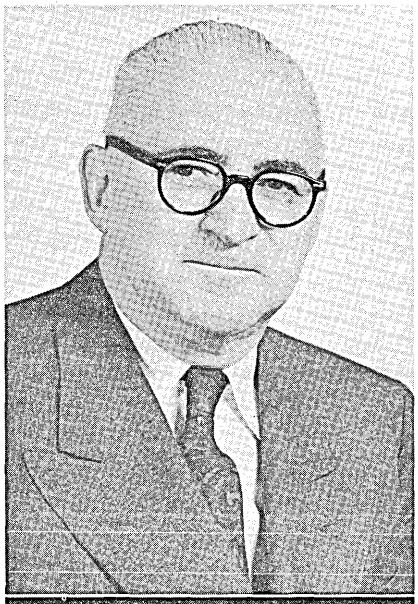
panel: *H. D. Lasswell, Yale School of Law*
O. A. Knight, Oil, Chemical and Atomic Workers Intl. Union
C. C. Hurd, Automation Research, IBM

Three distinguished panelists from varied walks of life have been brought together for the opening Western Joint Computer Conference session to be held in the Ambassador's Embassy Room from 9:30 a.m. until noon on May 6.

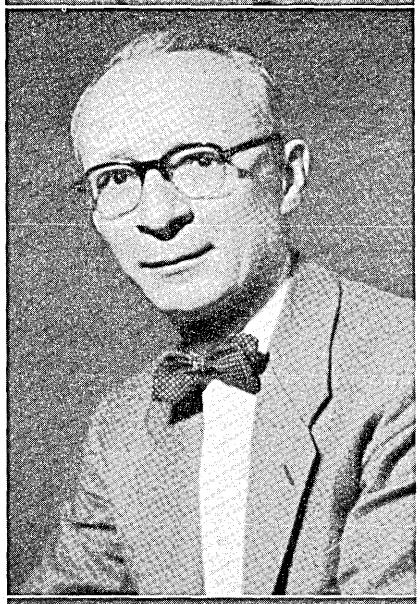
Electronic computers are being employed in steadily widening areas of activity. The outlines of these areas are now discernible. In the scientific and engineering fields, computers have proven to be powerful design and analysis tools. Computer design and application disciplines are having extensive effects on the very mathematical and engineering fields from which the techniques are drawn. These devices have become an integral part of the weapons, machines, and organizations building for wartime. The computer and its descendant, the data processor, are now being applied increasingly to business and industrial activities, in the office and in the factory.

The total effect of this body of equipment is compounding rapidly, due to the daily discovery of new uses and sharply increasing quantities of computers and data processors going into action. The impacts of these powerful new tools will be sufficiently great to create discernible changes and reactions in the American society. The adjustments and responses may well create difficult problems in the American business, scientific, and social systems.

The opening session brings together a physical scientist, a social scientist, and a representative of the labor movement to discuss the broad social problems arising from the introduction of computers and related automatic techniques into our industrial society. Panelists will present their views of problems they foresee and will discuss methods for dealing with these incipient difficulties.



HAROLD D. LASSWELL, professor at Yale University, is a nationally known authority on the psychology of public opinion.



O. A. KNIGHT is a union president, an AFL-CIO vice-president, a former oil refinery worker and has been a union leader since 1933.

DR. CUTHBERT C. HURD, now with IBM, has served in a variety of educational and scientific positions throughout his career.

PANEL DISCUSSIONS

six sessions, twenty-seven panelists

LOGICAL CIRCUITRY FOR TRANSISTOR COMPUTERS

May 6—2:00-5:00 p.m., Embassy Room
Chairman: J. H. Felker, Bell Telephone Laboratories

Panelists:

RESISTOR-TRANSISTOR LOGIC
T. R. Finch, Bell Telephone Laboratories

DIRECT-COUPLED TRANSISTOR LOGIC
J. B. Angell, Philco Corp.

SYMMETRICAL TRANSISTOR LOGIC
R. H. Baker, Lincoln Laboratories, MIT

CURRENT MODE LOGIC
J. L. Walsh, International Business Machines

CONTRASTING TOOLS AND TECHNIQUES FOR SIMULATION

May 7—9:00-12:00 a.m., Ambassador Ball Room
Chairman: W. Melahn, System Development Corporation

Panelists:

INCREMENTAL SIMULATION
M. Palevsky, Packard Bell

ELECTRONIC ANALOG SIMULATION
J. McCleod, Convair Astronautics

COMBINED ANALOG DIGITAL SIMULATION
W. Varner, Convair

GENERAL PURPOSE COMPUTER
H. Gray, University of Pennsylvania

DUAL MACHINE SIMULATION
H. D. Bennington, System Development Corporation

ACTIVE ELEMENTS FOR THE MACHINE

May 7—2:00-5:00 p.m., Embassy Room
Chairman: R. E. Meagher, University of Illinois

Panelists:

TRANSISTORS, INCLUDING COMMENTS ON DIFFUSED BASE AND ALLOY-TYPE UNITS, AND SPECIAL TRANSISTOR DEVICES.
I. M. Ross, Bell Telephone Laboratories

SPECIAL VACUUM TUBES SUCH AS BEAM SWITCHING TUBES, COUNTER TUBES, COUNTER TUBES AND ADDER TUBES
S. Kuchinsky, Burroughs Corporation

CRYOTRONS AND OTHER CRYOGENIC DEVICES (BUT NOT MEMORIES)
A. E. Slade, Arthur D. Little Co.

MAGNETIC CORES (BUT NOT MEMORIES)
J. A. Rajchman, Radio Corp. of America

COMMAND STRUCTURES

May 7—2:00-5:00 p.m., Ambassador Ball Room
Chairman: J. W. Carr III, University of Michigan

Panelists:

A COMMAND STRUCTURE FOR COMPLEX INFORMATION PROCESSING
T. O. Ellis, J. C. Shaw,
A. Newell, The Rand Corp.
H. A. Simon, Carnegie Institute of Technology

OMNITRAN, A HYPOTHETICAL COMPUTER FOR GENERAL SYMBOL MANIPULATION
J. McCarthy, Dartmouth College and MIT

GENERAL PURPOSE, A HYPOTHETICAL COMPUTATION AND DATA FILE SYSTEM FOR COMPLETE MACHINE CONTROL OF ITS OWN PROGRAMMING
A. W. Holt, W. Turanski, Sperry Rand Corp.

PRESENT DAY INSTRUCTION LANGUAGES UNDER ENGINEERING RESTRICTIONS
W. Buckholz, International Business Machines

LOGICAL DESIGN METHODS

May 8—9:00-12:00 a.m., Ambassador Ball Room
Chairman: G. M. Amdahl, Aeronutronic Systems, Inc.

Panelists:

L. Bensky, R.C.A.
R. K. Richards, Consultant
H. Engel, Ramo-Wooldridge Corp.
V. Hess, Litton Industries

VERY LARGE FILES

May 8—2:30-5:30 p.m., Embassy Room
Chairman: J. A. Postley, The Rand Corp.

Panelists:

RAM STORAGE UNITS
W. Heising, International Business Machines

DATAMATIC SYSTEM
R. Clippinger, Datamatic

LARC TAPE SYSTEM
E. Cuthill, Bureau of Ships

DATA FILE
J. W. Schot, M. K. Hawes, ElectroData

WJCC TECHNICAL SESSIONS

experts in their fields present the facts

SPECIAL DEVICES FOR COMPUTERS
May 6—2:00-5:00 p.m., Ambassador Ball Room
Chairman: *R. Brown,* ElectroData

MicroSADIC, a High Speed Data Preparation System With Variable Format Output
R. Brown, ElectroData

A Computer-Integrated, Rapid Access, Magnetic Tape System With Fixed Address
R. Best and *T. Stockebrand,* Lincoln Laboratory

A Device to Facilitate Combined Analog-Digital Operation in Small Computing Installations
B. Schwartz, et al, Battelle Memorial Institute

Direct Access Photomemory: Part I—Prototype Machine System; Part II—System Considerations
A. Critchlow and *F. Litz,* International Business Machines

DIGITAL COMPUTER SYSTEMS I
May 7—9:00-12:00 a.m., Embassy Room
Chairman: *G. Estrin,* University of California at Los Angeles.

The Flow Diagram Approach to Computer Logical Design Using the NCR 304 as an Illustration
R. Hudson, W. Edwards and *D. Eckdahl,* National Cash Register Co.

Cascaded Variable Cycle Control as Applied to the 220 Computer
E. L. Glaser, ElectroData Div., Burroughs Corp.

The RCA 501—A Transistor Computer System
G. E. Poorte and *A. S. Kranzley,* RCA, Camden

The Remington Rand Univac M-460 General Purpose Digital Computer
D. Toth, M. Macaulay and *J. Thornton,* Sperry Rand Corp.

A Special Purpose Solid State Computer Using Sequential Access Memory
W. A. Cornell, Bell Telephone Labs., Murray Hill, N. J.

DIGITAL COMPUTER CIRCUITS
May 8—9:00-12:00 a.m., Embassy Room
Chairman: *S. Ruhman,* Packard Bell Computer Corp.

A Direct Read-Out Bistable Circuit and Some Applications of It
H. Rodriques de Niranda, Philips Research Lab., Eindhoven, Holland and *I. Rudich,* Amperex Electric Corp.

Flow Gating
W. Poppelbaum, University of Illinois

Minimum Transistor Logic Modules for Airborne Digital Control Applications
A. Landy, Jr., Minneapolis-Honeywell Regulator Co.

Design and Application of a Transistor-Magnetic Bi-Logical Computer Element at One Megacycle
R. Angus, Jr., W. Dunnet, A. Lemack, Sylvania Elec. Prod., Inc.

High Speed Circuit Techniques Utilizing Minority Carrier Storage to Enchance Transient Response
L. Retzinger, Jr., Litton Industries

SPECIAL DEVICES II
May 8—9:00-12:00 a.m., Grove Lounge
Chairman: *C. T. Leondes,* University of California, Los Angeles.

The Design, Reading Methods, and System Aspects of the HD File Drum
H. W. Fuller, Laboratory for Electronics

Transistorized Modular Power Supplies for Digital Computers
T. C. Hams, N J E Corp.

The Dynamics of Toggle Action
N. L. Kreuder, ElectroData Div. of Burroughs

The Shiftrix—Machine Organization for High Speed Digital Computation
G. Estrin, University of California, Los Angeles

A Hybrid Data Processor with Magnetic Tape Input and Direct Pictorial Output
H. M. Katner and *S. H. Cameron,* Armour Research Foundation

DIGITAL COMPUTER APPLICATIONS
May 8—2:30-5:30 p.m., Grand Lounge
Chairman: *R. Minnick,* ElectroData

A Chess Playing Program for the IBM 704
A. Bernstein, M. de V. Roberts, T. Arbuckle and *M. Belsky,* International Business Machines

Applications of Digital Computers to Problems in the Study of Vehicular Traffic
W. Hoffman and *R. Pauley,* Wayne State University

The Role of the Digital Computer in Mechanical Translation of Languages
D. Johnson, University of Washington

The Application of Large Scale Electronic Computers to the Assignment of Telephone Facilities
M. Drandell, International Business Machines

An Experiment in Mechanical Searching of Research Literature With Ramac
F. Firth, International Business Machines

DIGITAL COMPUTER SYSTEMS II
May 8—2:30-5:30 p.m., Ambassador Ball Room
Chairman: *P. Levonian,* Ramo-Wooldridge Corp.

Communications Between Computers
R. Stuart-Williams, W. Knowles and *I. Wieselman,* Telemeter Magnetics, Inc.

The Universal Data Transcriber
M. S. Maxwell, U. S. Naval Proving Ground, Dahlgren, Virginia

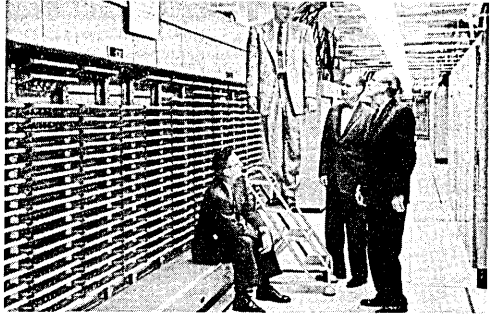
A Universal Computer—Language Translator
R. B. Bonney, Electronic Engineering Co. of California

A New Type of Computer Oriented Toward Spatial Problems
S. H. Unger, Bell Telephone Labs.

The Magnetic Ledger Card Computer
T. P. Holloran, National Cash Register Co.

FIELD TRIPS

see southern cal firms



SAGE computer at SDC

trip no. 1—may 7, 8

Buses leave at 6:30 and 7:30 p.m. each evening

SYSTEM DEVELOPMENT CORPORATION

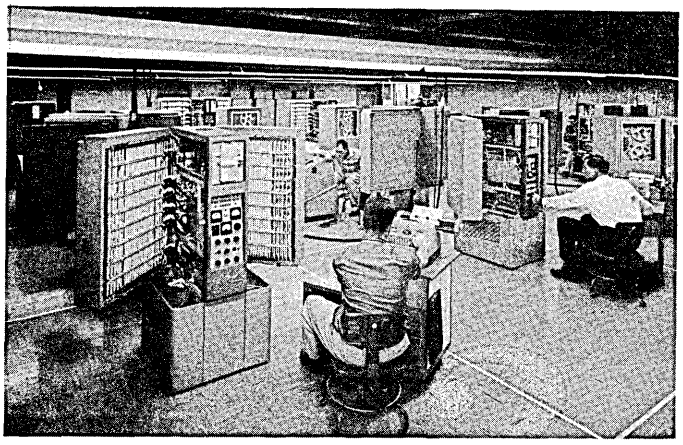
The SDC program will display, as a major point of interest, a modified SAGE computer. Highlights will include a demonstration of the "Situation Display Consoles." Other equipment included in the tour will be two IBM 704's, a tape to cathode ray tube converter, and an extensive array of peripheral equipment.

trip no. 2—may 7, 8

Buses leave at 6:00 p.m. each evening

BENDIX COMPUTER

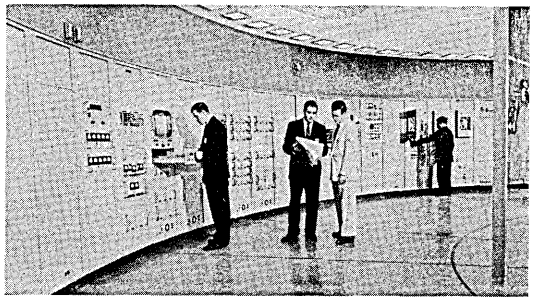
Bendix Computer will feature a guided tour of their Manufacturing and Test Departments. Visitors will be given an explanation of the manufacturing details of such computer components as printed circuits, magnetic recording heads, and plug-in packages as well as subassemblies like photoelectric tape readers.



Bendix computer center

RAMO-WOOLDRIDGE CORP.

Ramo Wooldridge will demonstrate (1) a UNIVAC 1103A system, (2) a 400 amplifier Electronic Associates analog computing installation, (3) a conversion unit, (4) a data reduction center, and (5) an IBM 704 system.



UNIVAC at Ramo-Wooldridge

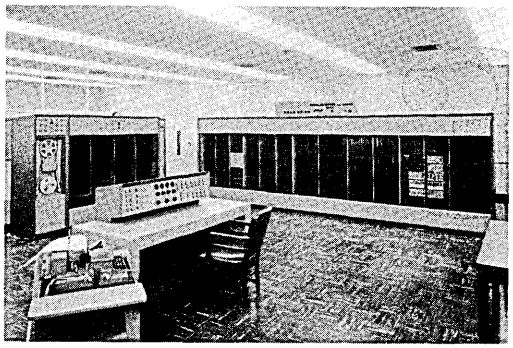
trip no. 3—may 7, 8

Buses leave at 6:00 p.m. each evening

NORTHROP AIRCRAFT

The Computing and Datamation facility located at the heart of Northrop's new Engineering Science Center will be visited and its operation explained as it relates to the operations of flight test, the wind tunnel, and test laboratories. Both digital and analog equipment may be viewed.

The 304 at NCR



NATIONAL CASH REGISTER

At National Cash Register there will be a general tour of the Hawthorne facility. Of particular interest is the NCR 304 computing system with peripheral equipment such as tapes, printer, and paper tape reader.

trip no. 4—may 7

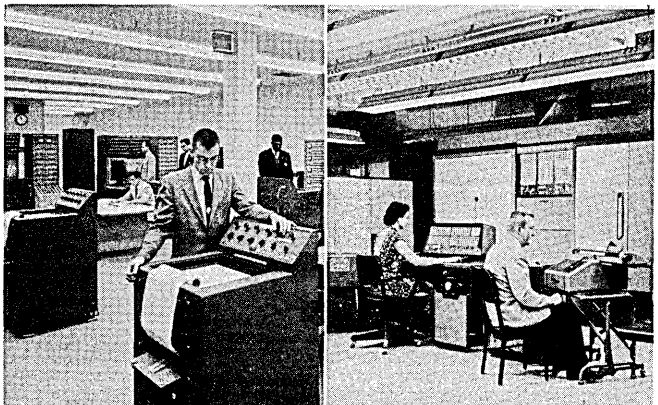
Bus leaves at 6:00 p.m.

ELECTRODATA

ElectroData will demonstrate their computer center with the explanation and solution of a short problem. Following this will be a guided inspection tour of the plant production line, assembly, final test, classroom and training facilities; plus a possible view of the new Datatron 220 system.

ElectroData

JPL center



JET PROPULSION LABORATORY

The equipment to be inspected at the Jet Propulsion Laboratory includes a model of the Explorer satellite and instrument package, a Datatron 205 digital computer, analog computer and the supersonic wind tunnel. All JPL visitors must be United States citizens.

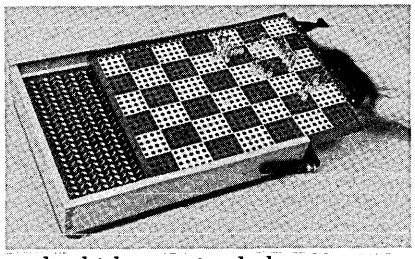
All trips will return to the hotel at about 10:00 p.m. Tickets ($1.50) may be bought at the registration booth.

WJCC NEW PRODUCTS ON DISPLAY

Products and exhibits on this page and the four following are among those which will be featured at the Western Joint Computer Conference, Ambassador Hotel, May 6, 7 and 8. Nearly 50 displays will be set up in the ballroom exhibit halls, casino floor.

Programming Systems

The manufacturer's conventional programming systems are designed to be face mounted. A new design was cre-

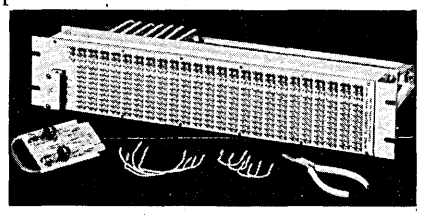


ated which permitted the systems to be mounted edgewise—turned on their side and assembled "building block" fashion resulting in a minimum of space being required. In this application, the programming systems are employed as a pluggable chassis. The removable patchcords serve as the chassis and the patchcord tips mating with the contact springs function as a plug and receptacle combination. In actual use, the board would be filled or almost filled with mounted components. To show more of the board detail in the picture, only a small portion of the components which would normally be in place are assembled. For information write AMP, INC., Harrisburg, Pennsylvania.

Circle 151 on Reader Service Card

Plugboard

Model PB101 provides standard 12-pin printed circuit connectors with guide pins for 24 transistorized 3C-PACs Se-

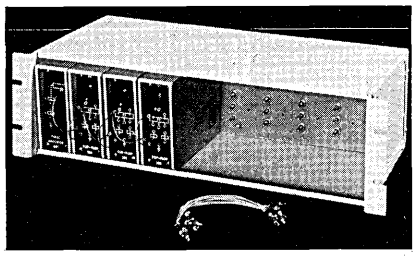


ries M. Any package of the Series M family may be mounted in any connector. All twelve terminals per connector are wired to the corresponding vertical column of paired jacks on the front panel of the plugboard to provide complete usage flexibility. Supply voltages for those PACs which require them are brought in via a small Jones strip on the left hand end of the front panel. Power is then distributed to the appropriate PACs by means of insulated jumpers. The power input jacks are also insulated. The front panel has standard dimensions of 19 in. by 3½ in. Depth of the unit is 6 in. The panel is notched for standard relay rack mountings. For information write COMPUTER CONTROL CO., INC., 92 Broad St., Wellesley, Mass.

Circle 153 on Reader Service Card

Building Blocks

In these building blocks, logical operations are performed by combinations of saturable transistor inverters. The

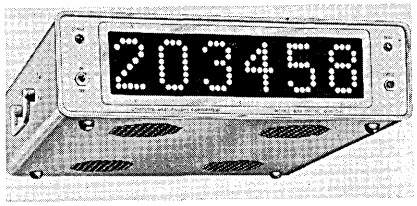


user can consider these as simple switches that are either open or closed. In the graphic symbology used, negative level on the input or base of a transistor inverter will "short" the output x to ground while a ground level in, will open the gate and the output will be −3 volts. For information write DIGITAL EQUIPMENT, Maynard, Mass.

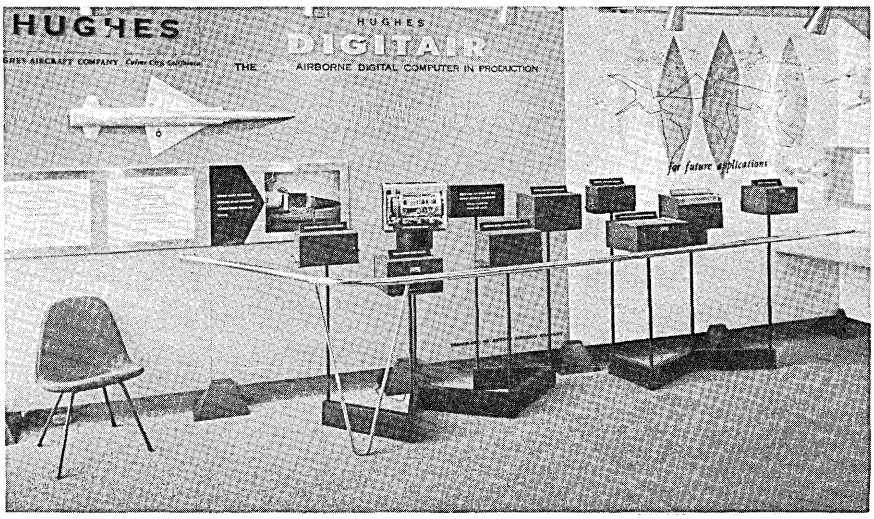
Circle 154 on Reader Service Card

Readout Device

This manufacturers' rep will display the products of three firms at W.J.C.C. Computer Measurements Corporation's



in-line readout (photo) features 2½-in. high numerals which can be viewed from a wide angle. Rutherford Electronics Co. will exhibit the ten mega-



The Hughes Aircraft Co. exhibit to be displayed at W.J.C.C. features the digitair computer and a complete line of semiconductor and electron tube commercial products. Nine digitair units will be shown with illustrations of current military uses, along with future commercial and military applications. Set for the show but not in this picture — the semiconductor line, the memoscope storage type oscilloscope, and the typotron direct view character display storage tube. For information write HUGHES AIRCRAFT CO., Culver City, Calif.

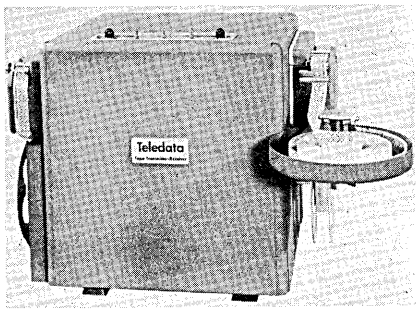
Circle 152 on Reader Service Card

cycle B5 pulse generator which has a continuously variable pulse repetition rate from one pulse per second through ten million pulses per second. The pulse width is variable from 20 millimicroseconds to 12.5 microseconds, and the pulse rise time is eight millimicroseconds. Navigation Computer Corp. will show a complete line of transistorized pulse programming units. Included will be a pulse generator, indicating shift registers, forward and reversible counters, electronic switch, "and" gates, and other logical circuitry. For information write G. E. Moxon Sales, 7557 Melrose Ave., Los Angeles, California.

Circle 155 on Reader Service Card

Tape Transmitter, Receiver

Because of its larger code combination capacity and its ability to check accuracy by means of a system of interlocks,

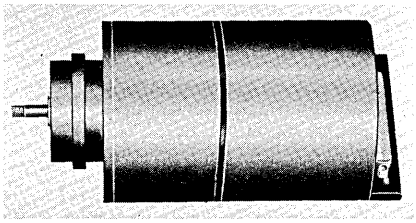


Teledata is particularly adapted to the transmission of data. The entire electromechanical unit is constructed to provide the highest degree of reliability and long life. Operator's duties are simplified on the Teledata because of a minimum of controls. Only three switches (power, tape feed and read) and two indicating lights (transmit error and receive error) are necessary for operation. For information write Friden Calculating Machine Co., San Leandro, Calif.

Circle 156 on Reader Service Card

Shaft Position Encoder

Type RD-13 is a high precision shaft position encoder which provides angular position data in 13 digit cyclic



binary code to an accuracy of ±1 digit or better than ±3 minutes of arc. The unit consists of a glass disc coded by an array of opaque and transparent segments, a flash lamp to illuminate a radius of the code disc, a multi-element photo-sensitive detector to detect presence or absence of illumination and a 13 channel transistor preamplifier. It has been designed to meet the applicable portions of MIL-E-16400A. The unit has a separable preamplifier assembly which can be removed by releasing one fastener. Each of the 13 transistor amplifier channels is potted separately and can be replaced readily in the field. For information write Adcon Corp., 1117 Commonwealth Ave., Boston 15, Mass.

Circle 157 on Reader Service Card

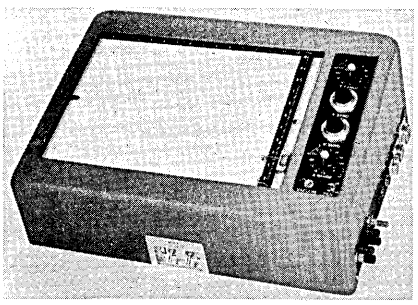
Pulse Generator

Model 1020 programmed current pulse generator is a "packaged" instrument, designed to provide precisely controlled, fully programmed current pulses for research and development of digital systems and components. The instrument is a complete integrated system, incorporating an extremely flexible program generator; highly stabilized, heavy duty power supplies; two negative and two positive output current drivers. The unit is 78 in. high, 23½in. wide and 21 in. deep. For information write Rese Engineering, Inc., 731 Arch St., Philadelphia 6, Penna.

Circle 158 on Reader Service Card

X-Y Recorder

This flat bed X-Y recorder has input ranges from 5 mv to 150 volts. It features zero offset; built-in vacuum pa-

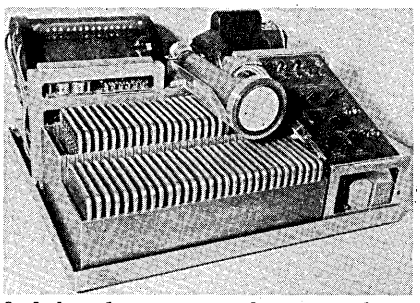


per hold-down, and inputs for curve following, point plotting and card or tape translator. For information write F. L. Moseley Co., 409 N. Fair Oaks Ave., Pasadena, Calif.

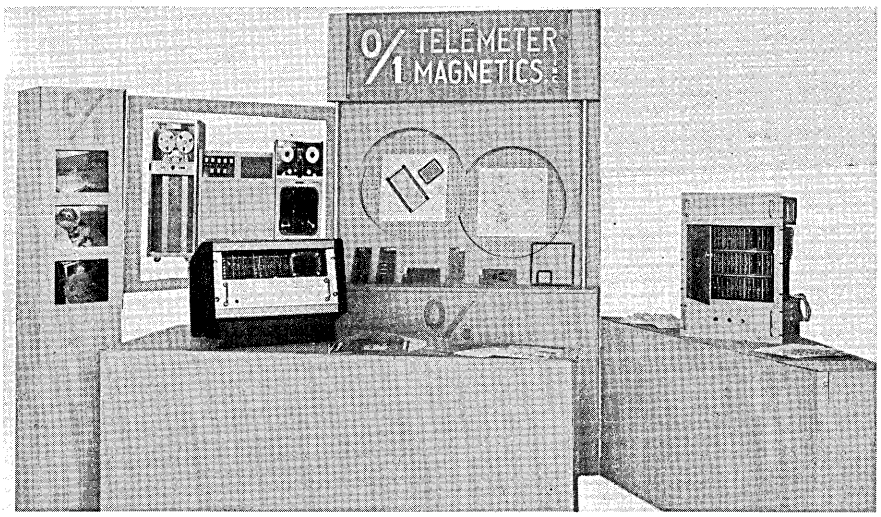
Circle 160 on Reader Service Card

Digital Simulator

This simulator can be made to operate as an interrelated system of logical gates and associated flip-flops as speci-



fied by design procedures involving Boolean algebra. Basically, the simu-



A close approximation of the W.J.C.C. booth of Telemeter Magnetics, Inc., is shown here. On display will be ferrite cores, matrices and etched circuit packages (pictured in the center of the display) and standard buffer storage units (shown at extreme left and right). Standard buffers are the heart of data translator systems. TM also manufactures large scale, high-speed random access memories and special purpose data processing systems. For information write TELEMETER MAGNETICS, INC., 2245 Pontius Ave., Los Angeles 64, Calif.

Circle 159 on Reader Service Card

lator consists of a circulating register, two pairs of channels of magnetic drum storage, and a related logical section which is used in a serial fashion in the processing of a simulated system. The circulating register is arranged such that each binary digit of its storage represents the current setting of a simulated flip-flop. Once each cycle of the memory, this register is altered to accommodate any flip-flop changes determined by the advance of the system simulated. For information write AERONUTRONIC SYSTEMS, INC. COMPUTER LABORATORY, 13729 Victory Blvd., Van Nuys, Calif.

Circle 161 on Reader Service Card

Electronic Printer

The S-C 5000 will print the output of electronic computers at 4,680 lines, about 65 ft., per minute and can be

used in both the on-line method of receiving electronic data direct from the computer, and the off-line method of receiving data from magnetic tape. A 7 in. charactron shaped beam tube that can display one million characters a minute is used in the new machine. It reproduces 64 characters—the letters of the alphabet, 10 numbers, and 28 symbols of the user's choice. For information write STROMBERG-CARLSON Co., Rochester 3, N.Y.

Circle 162 on Reader Service Card

Drum Storage

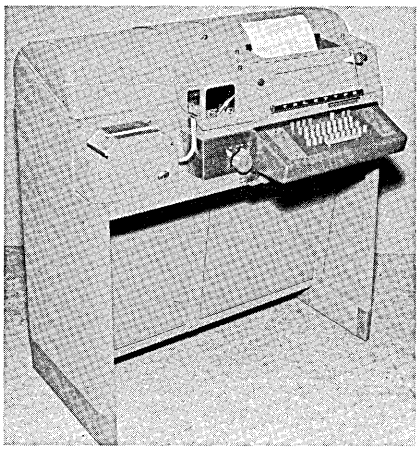
The Readix is a general purpose, digital, one-address, stored program computer of the medium speed class. It is available for either fixed point operation alone, or for fixed point and floating point operation. Alphabetic as well as numeric data may be operated on, assuring maximum flexibility for both commercial and scientific users. Each of the four thousand words of the internal drum storage consists of ten

decimal digits and sign, or two commands, complete with addresses. The drum will be on display at W.J.C.C. For information write J. B. REA CO., INC., 1723 Cloverfield Blvd., Santa Monica, California.

Circle 163 on Reader Service Card

Send-Receive Set

Teletype model 28 automatic send-receive set serves as a complete, high-capacity message originating station.

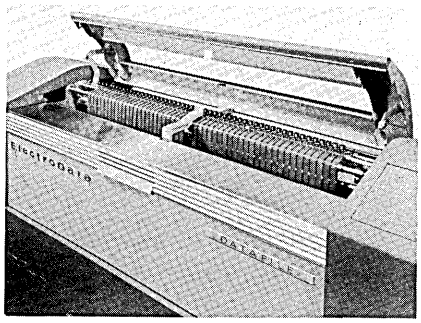


It incorporates combinations of the following model 28 basic mechanisms in a single, compact console: keyboard base, page printer, perforator, tape transmitter, motor unit, and electrical service unit. For information write TELETYPE CORP., 4100 Fullerton Ave., Chicago 39, Illinois.

Circle 164 on Reader Service Card

Magnetic Tape Units

Two hundred million digits of information can be stored by the Datatron 205 electronic data processing system



(500-million in the Datatron 220), through the use of the new Datafile multiple magnetic tape units. One Datafile "bin" can store 20-million characters. Up to 10 units can be integrated into one computer system. Conventional tape reels are replaced in the

Datafile with shorter, disconnected lengths of tape suspended loosely over guide-rods in the bin. Fifty tapes, each 250 feet in length, magnetically store records. Information is calibrated into addressable blocks of 200 characters each. Tapes move backward or forward over the guide-rods at the rate of 60 inches per second. For information write ELECTRODATA DIVISION, Burroughs Corp., 460 Sierra Madre Villa, Pasadena, Calif.

Circle 165 on Reader Service Card

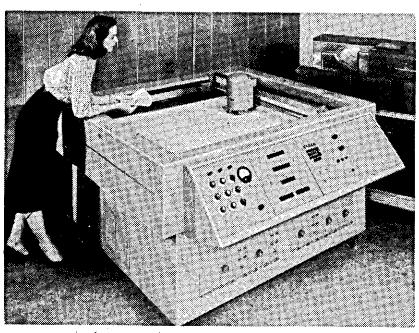
Computer Flooring

The floor panels are modular, and completely interchangeable, to permit easy access to cables beneath the floor, as well as to allow for any future rearrangement of the computer units. Since power cables can run in any direction beneath the floor, the position of units may be accomplished without costly rebuilding of raceways. Any openings required to accommodate air, power and signal distribution systems will be cut on the job. If the unit is later moved, the floor panels beneath it can also be moved to the new location without affecting the other flooring. This flooring has been so engineered that it has passed tests for structural rigidity. When fire regulations demand it, the floor can be covered with sheet metal. For information write WEBER-WALL DIV., Weber Showcase & Fixtures Co., Inc., 5700 Avalon Blvd., Los Angeles 11, Calif.

Circle 166 on Reader Service Card

Automatic Plotter

The Electroplotter S, a flexible, high-speed plotter, offers users of general purpose computers four degrees of

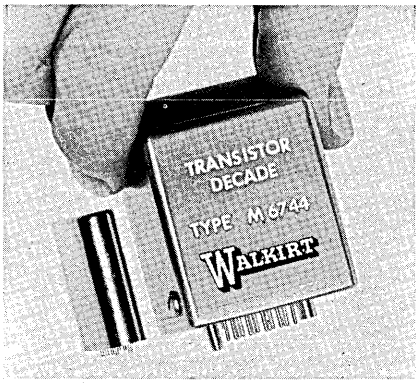


freedom in presenting output data in graphic form. Accepting information from punched paper tape, punched cards or magnetic tape, the unit operates as a computer output by printing a complete, four-dimensional graphic display in one reading. The simplest output of the machine is a two-dimensional X-Y point-to-point plot. The more complex displays include (1) the presentation of digital information at demandable positions over the plotting area; (2) the plotting of discrete points at any position, "flagged" by a line of digital and symbolic information; (3) the rotation of the entire printing mechanism forming the plotted point, or any simultaneous combination of the three. For information write BENSON-LEHNER CORP., 11930 W. Olympic Blvd., Los Angeles 64, Calif.

Circle 167 on Reader Service Card

Decade Counters

Designed and ruggedized to meet stringent military requirements, this plug-in circuitry has a maximum op-

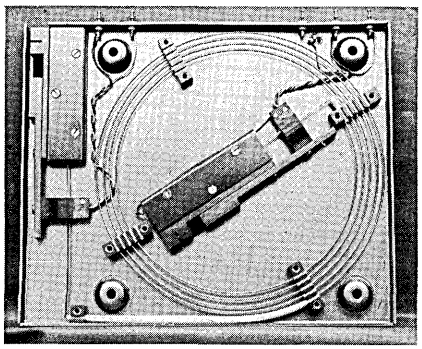


erational frequency of 1 megacycle and measures 1-3/16 in. x 1-11/16 in. x 1-7/8 in. plugged-in height. The decade consists of four binary circuits separately constructed in an individual cartridge assembly (see photo), each of which is independently usable as a flip-flop or binary stage. Each binary module is replaceable in the decade and packaged with an hermetically sealed header, additionally protected from environment by complete encapsulation in a tough, thermo-setting epoxy resin. For information write WALKIRT Co., 141 W. Hazel St., Inglewood, Calif.

Circle 168 on Reader Service Card

Delay Line

Magnetostriction delay line L 35 provides a convenient intermediate size package for lines up to 2.5 milliseconds delay, operating at up to 500 kc/s. The unit will also house lines up to 1 millisecond delay, operating at up to 1 mc/s. Some L 35 specs: size — 9 in. x

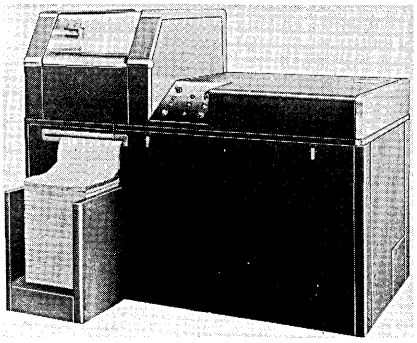


10 in. x ⅜ in., weight — approximately one pound, attenuation — 50 db approximately, signal to noise ratio — greater than 20:1, and delay adjustment range — 4 microseconds. For information write FERRANTI ELECTRIC, INC., Electronics Div., 95 Madison Ave., Hempstead, L. I., N. Y.

Circle 169 on Reader Service Card

Alphanumeric Printer

This new unit is an integrated system combining such desirable mechanical and circuit features as integral housing



of the mechanical printing assembly with the electronic storage and comparator system providing space and power economy, input adaptability to any source of digital data, and solid state devices, both transistors and magnistors, combined with modular type construction assuring a high degree of reliability and maintenance accessibility. Among special features of the magnityper is a 120-column storage system. It is capable of printing 10 lines of 120 alphanumerical characters per second on multiple copy fanfold paper. Up to 63 different characters are available including alphabetical, numerical, and special symbols in any desired combination. For information write POTTER INSTRUMENT CO., INC., Sunnyside Blvd., Plainview, L.I., N.Y.

Circle 170 on Reader Service Card

SYMPOSIUM - MAY 9TH

symposium committee

Paul Armer, Chairman	*The Rand Corporation*
Fred Gruenberger	*The Rand Corporation*
Owen Mock	*North American Aviation, Inc.*
James Tupac	*The Rand Corporation*

SMALL AUTOMATIC COMPUTERS AND INPUT/OUTPUT EQUIPMENT

A Report from the Manufacturers

In the past, technical papers describing computer systems and/or associated peripheral equipment have been presented at technical meetings such as the Joint Computer Conferences and meetings of the Association for Computing Machinery. The question often arose: "Is a paper given by a manufacturer describing his equipment a true and proper technical research paper for such a conference?" Two thoughts seem to run in opposition: first, the description of new equipment by a manufacturer is often an advertising venture and not proper for a technical meeting; and, second, public presentations of detailed technical aspects of new equipment are an important means of communicating information necessary and important to the user.

It seems clear, however, that it is entirely proper for the professional computer societies to provide a forum for the manufacturers to present and discuss new equipment. Since the stated purpose of these groups is to exchange and disseminate technical information in the computer field, such activity may even be termed a responsibility. In recognition of this and the increased needs for information exchange in this rapidly developing field, the Los Angeles Chapter of the Association for Computing Machinery is sponsoring this second annual symposium.

Embassy Room, Ambassador Hotel
9 a.m., Friday, May 9, 1958

Opening Remarks:
Paul Armer, The Rand Corporation

SESSION I

Chairman: Owen Mock, North American

CHARACTER READER FOR BANK DATA PROCESSOR.
R. H. Hagopian, General Electric Co., Computer Department, Erma Systems Lab, Palo Alto, Calif.
Hagopian will describe a transistorized reader for bank checks which are printed with magnetic ink.

SELFCHEK—A NEW COMMON LANGUAGE.
Clyde C. Heasly, Jr., Intelligent Machines Research Corp., Alexandria, Virginia.
Heasly's talk concerns a new high-information content type face called Selfchek, which can be read by humans or machines equally well.

INTERMISSION

THE DATAMATIC 1000 MODEL 1400 OUTPUT SYSTEM.
Irma Wyman, DATAmatic, Newton Highlands, Massachusetts
Miss Wyman will explain the workings of Model 1400 output system of the DataMatic 1000.

HIGH SPEED COMPUTER OUTPUT DEVICES UTILIZING THE CHARACTRON SHAPED BEAM TUBE.
Henry M. Taylor, Stromberg-Carlson Company, San Diego, California.
Taylor will describe equipment capable of producing readable output at rates up to 10,000 characters per second.

SESSION II

Chairman: Fred Gruenberger, The Rand Corp.

DATA TRANSLATORS.
Erwin Tomash, Telemeter Magnetics, Los Angeles, California
Tomash will describe devices which provide the translation link between computers which have a radically different internal language.

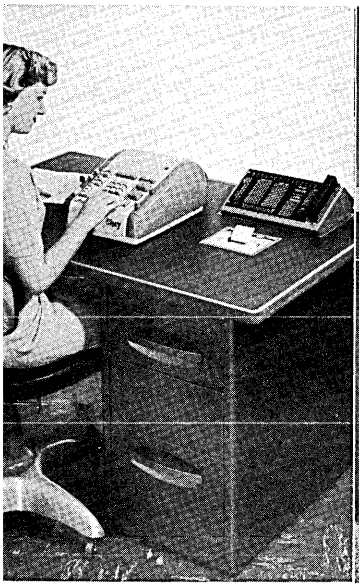
THE IBM TYPE 610 AUTO-POINT COMPUTER.
J. A. Dowd, IBM Corporation, Los Angeles
The talk on the IBM 610 will emphasize uses and applications of the machine.

INTERMISSION

THE RECOMP II DIGITAL COMPUTER
R. F. Geiger, Autonetics, Bellflower, California
Geiger will present the technical specifications and some applications of the RECOMP II computer.

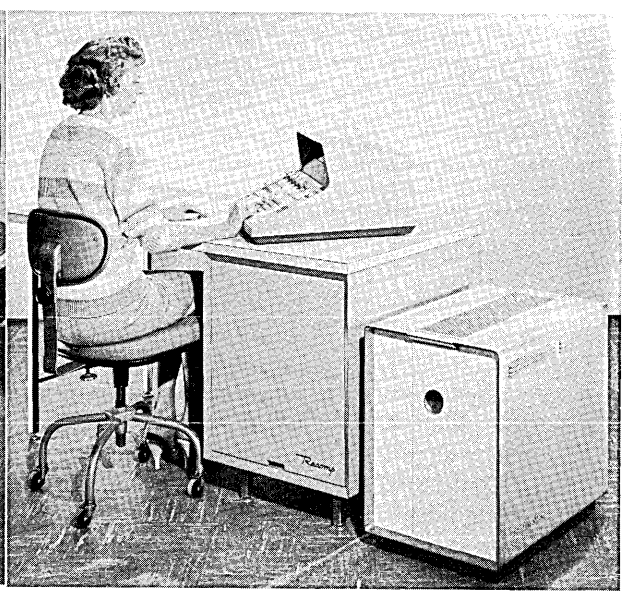
A SOLID STATE DIGITAL CONTROL COMPUTER
J. W. Cannon, Daystrom Systems, La Jolla, Calif.
The equipment to be described is a transistorized digital computer for use in a closed loop control system.

PAUL ARMER
Symposium Chairman, Rand Corp.

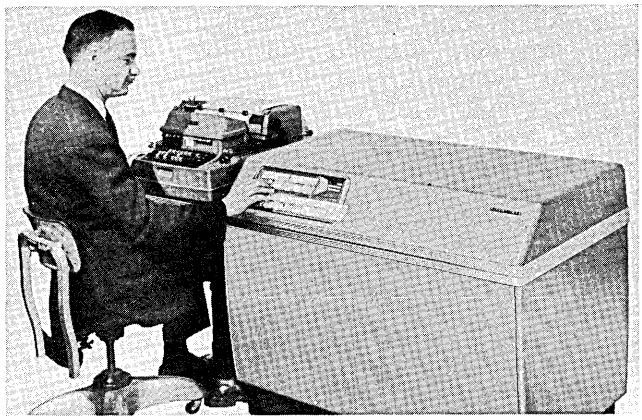


CM, Clary Corp.

Auto-Point 610, IBM



Recomp II, Autonetics



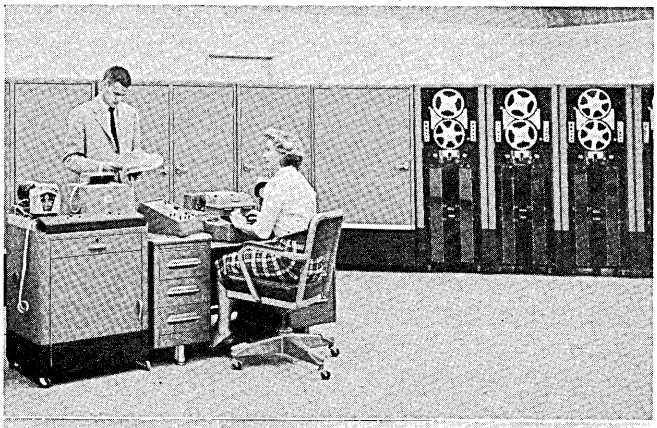
LGP-30, Royal McBee Corp.

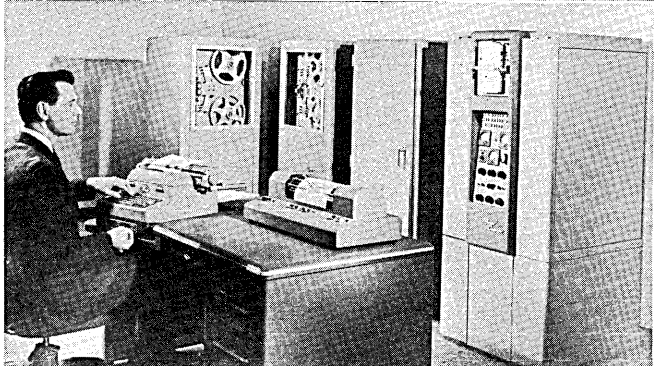
E-101, ElectroData

SOME EXAMPLES OF SMALL COMPUTERS . . .

Alwac III-E, Alwac Corp.

G-15, Bendix Computer





system, the principal component of which was the magnetic tape recorder. The specifications which evolved were the result of a compromise of various desired characteristics which would provide sufficient accuracy, recording time, frequency response, and number of data channels.

Using magnetic tape it appeared that the requirements above could be satisfied and other advantages gained including: (1) The ability to reproduce the analog voltage signal repeatedly for purposes of data reduction and analysis without detriment to the tape records; (2) adaptability to methods of rapid and automatic data reduction.

Packaging space limitations, and weight were of prime importance in the development and procurement of this system as the B-58 is virtually packed with other flight and accessory equipment. The specifications for this system were released to a contractor, and a team from Convair flight test coordinated and monitored the design and fabrication program until the system was complete.

A resume describing operation of the airborne recording equipment shown in the previous figure is as follows: Analog data in the form of electrical signals is furnished to the airborne equipment from pick-ups or transducers located at the signal source. The variable may be recorded continuously if the signal is dynamic (changing rapidly). In the case of slow-varying signals such as certain pressures and temperatures, the signals may be commutated so that a recorder signal channel contains samples of several transducer outputs. These signals are converted to frequency-modulated form by means of standard telemetry type oscillators. The outputs of the oscillators are then amplified and applied to separate channels of the airborne tape recorder.

In addition to 24 data tape tracks, tracks are provided for recording a reference frequency, time signals and audio information. These are used for correlating the data on playback. A calibration unit is used to record known values during flight for later compensation for drift in the operating characteristics of the channel. A control panel provides manual and automatic control as well as an indication of the operating condition of the equipment.

Magnetic Tape Recorder

The tape recorder is the principal component of the data handling system. The method of recording is FM (frequency modulation) wherein standard telemetering frequency channels as set up by the RDB (Research and Development Bond) are utilized. This allows that oscillators, amplifiers, transducers, and other equipment be obtained commercially, of the RDB channels specified, the highest frequency usable from the stand point of tape speed and recording time is channel No. 13 at 14.5 KC, center frequency.

In order that a high number of continuous data channels be available, a method known as "multiplexing" is employed. This means that a number of subcarrier oscillators at different center frequencies are modulated by the signals to be recorded and combined into one composite signal which is recorded on one tape track.

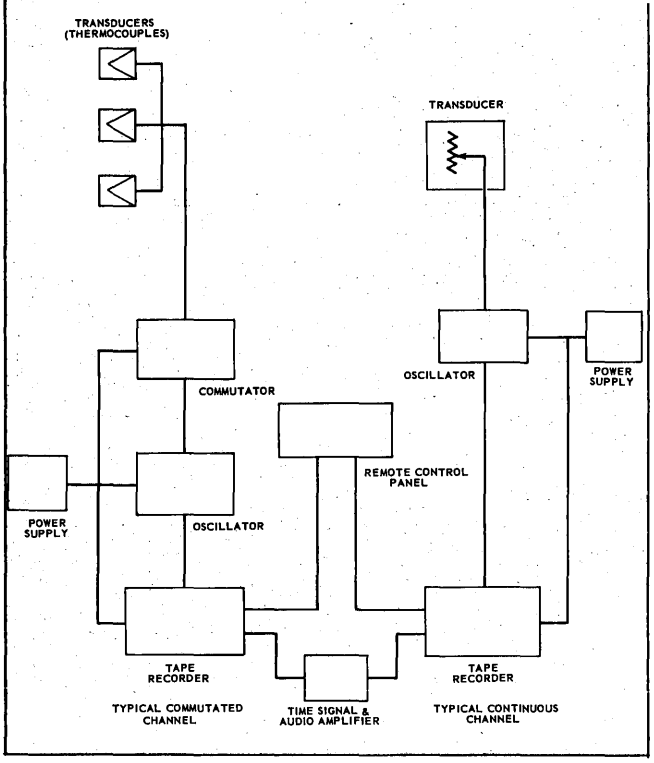


Figure 1: Block Diagram of Airborne Data Accumulation System

It is feasible to combine as many as six RDB frequency channels on each tape track. When using only one data channel to a track, channel 13 is used to obtain good frequency response. When multiplexing, then, successively lower channel frequencies are added. The RDB channels used are as follows:

Channel No.	Center Frequency
13	14,500 cps
12	10,500 cps
11	7,350 cps
10	5,400 cps
9	3,900 cps
8	3,000 cps

In order to record adjacent RDB frequencies on the same tape track, the center frequency deviation, and consequently the total bandwidth, is limited to a certain value. If the frequency bands are too close, the band-pass filter used for playback may not completely reject adjacent bands and "cross-talk" occurs. In this case, 7½% deviation of the center frequency was found to be the maximum allowable deviation which would allow for band pass filtering.

The two most important considerations in the design of recording equipment are accuracy and frequency response. An investigation into frequency modulation (FM) theory reveals that the two qualities are at cross purposes. In other words, frequency response must be limited to obtain high accuracy, and must be sacrificed to achieve high frequency response. The "modulation index" as applied in frequency modulation is the ratio of center frequency deviation to modulating frequency

$$M_f = \text{modulation index} = \frac{\text{Deviation of center Freq}}{\text{Modulation Freq}} = \frac{\triangle fc}{fm}$$

A mathematical analysis using Bessel's functions will

demonstrate that the distribution of energy within the band is determined by the modulation index. Considering the deviation constant at 7½% then M_f is in usely proportion to f_m. With an M_f of 0.5 or lower, the amplitude of the second and higher order side bands is low and the amplitude of the first order side band is almost exactly proportional to M_f. On the other hand, when M_f exceeds unity, important higher order side bands are included in the wave. An M_f of 1.0 is considered minimum for faithful reproduction of the original wave. Most FM broadcasting stations use a modulation index of 5.0.

Experimental results with magnetic tape recorders reveal that with a modulation index of 1.0, data can be reproduced with an accuracy of approximately 5%. By limiting the maximum modulation frequency and consequently, raising M_f to 5.0, the accuracy can be raised to 2% for full scale deviation.

Accuracy and frequency response for the six channels used are computed using $M_f = 1.0$ for 5% data (95% accurate) and $M_f = 5.0$ for 2% data (98% accurate). These are as follows:

Channel No.	f_c	Δf_c	*Frequency Response For 2% Accuracy	5% Accuracy
8	3000 cps	225 cps	45 cps	225 cps
9	3900	293	59	293
10	5400	405	81	405
11	7350	551	110	551
12	10500	788	158	788
13	14500	1088	218	1088

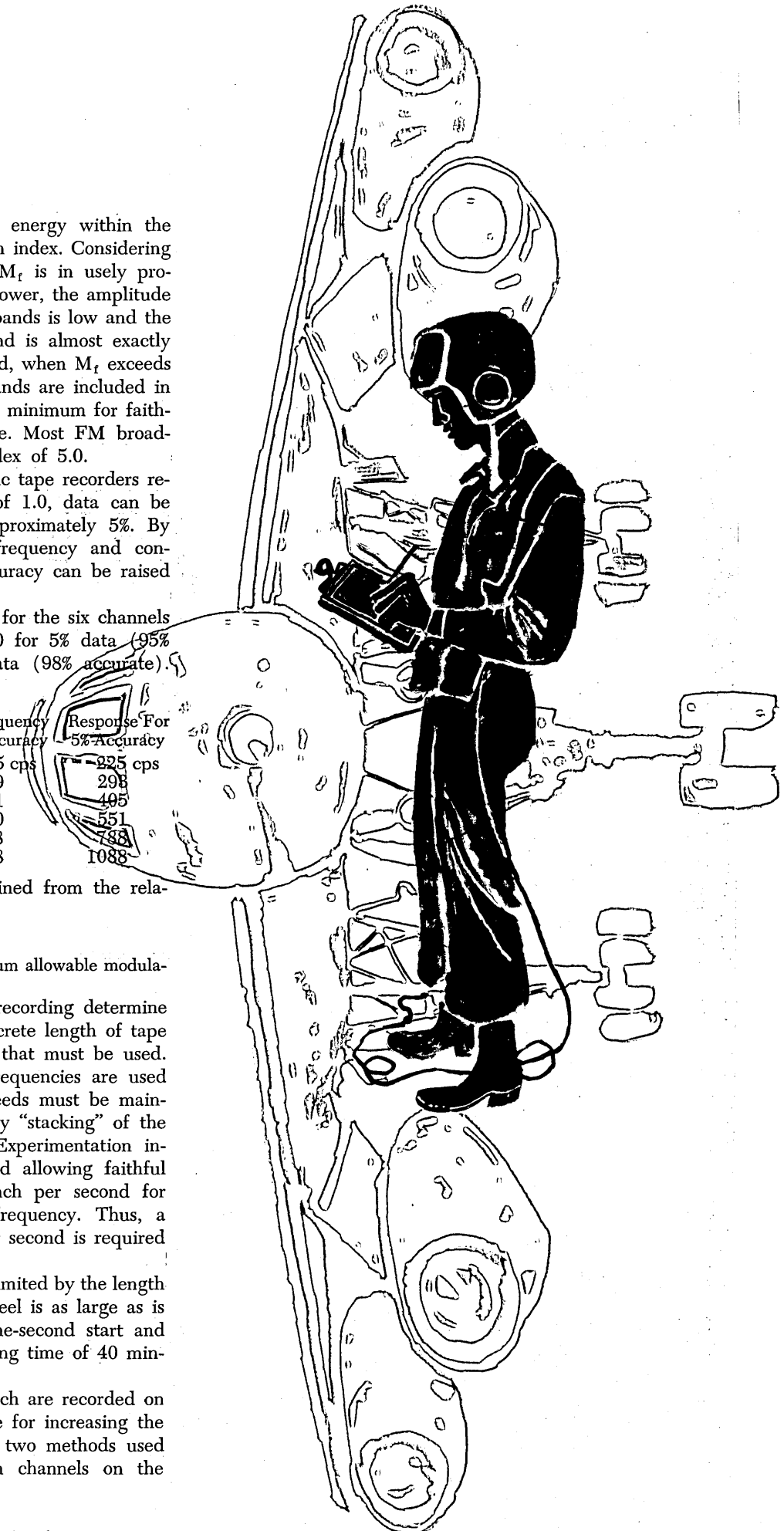
The figures listed above were obtained from the relationship, $M_f = \frac{\Delta f_c}{f_m}$

*Frequency response is defined as maximum allowable modulation frequency.

The carrier frequencies used for recording determine the playing time available from a discrete length of tape because of the minimum tape speed that must be used. In other words, since high carrier frequencies are used (up to 14.5 KC) then high tape speeds must be maintained to prevent distortion caused by "stacking" of the recording frequencies on the tape. Experimentation indicates that the minimum tape speed allowing faithful reproduction is approximately one inch per second for each kilocycle of recording signal frequency. Thus, a minimum tape speed of 15 inches per second is required for channel 13.

Recording time of the tape is thus limited by the length of tape on the reel. A 3000 ft. tape reel is as large as is considered feasible to allow for a one-second start and stop time. This results in a total playing time of 40 minutes per tape reel.

A recorder has 24 data tracks which are recorded on a 1½ inch tape. Methods are available for increasing the number of information channels. The two methods used involve recording several information channels on the same tape track:



(a) Frequency Division: Described previously, this is a scheme wherein various signals are recorded continuously on a single tape track by modulation of a number of subcarrier oscillators and superimposing them. This method is used where the signals are changing rapidly and require continuous recording.
(b) Time Division: A scheme wherein various signals are recorded on a single channel by sampling the signals is succession using a sampling device such as a commutator. This method can be used to record variables which change slowly, such as certain temperatures and pressures. Each commutator samples 20 such variables at the rate of 6 per second.

A transducer is a mechanism located at the signal source which converts the intelligence desired to be recorded into an electrical signal compatible with the recording system. The transducer (or pickup) is usually connected directly into an oscillator circuit and as such is the frequency-determining part of the circuit. Among various types of transducers used are variable inductance, resistance bridge, potentiometers, A-C or D-C generators, and thermocouples.

The control panel provides the operator with a means of controlling the equipment and monitoring the test signals. It is capable of detecting a modulated signal with or without the tape transport operating. The panel also has provisions for recording reference signal levels during flight for in-flight calibration.

Ground Data Handling

Of the advantages to be gained from use of a magnetic tape recording system, one of the most important is its adaptability for rapid data reduction. This means that the results of one flight can be determined for use in planning the next flight with a minimum delay for processing of data. Another advantage of data in the form of voltages is that it can be operated on repeatedly by filtering, computing, etc., and the original data is not destroyed or degraded.

Referring to Figure No. 2, a resume is given of the ground data reduction process as follows: On completion of a test flight, the magnetic tape is placed in a tape transport of the ground system, and the information recorded during flight is played back. The outputs of the 24 data tracks are fed into discriminator-demodulator units where the high frequency carrier is removed and the signal recovered in the form of a varying D-C voltage. The signal voltages may then be recorded on pen type recorders directly or may be processed through error correction devices as required. The latter includes 6 automatic calibration units for correction of static drift and gain changes, and 6 linearizers for correction of nonlinearities of the transducers. The varying D-C voltage output from the demodulators or error correction units should closely resemble in analog form the original intelligence recorded.

This analog signal can then be applied to a recording oscillograph or pen recorder and the output presented as time histories of varying amplitude on a film or paper roll. Alternately, the analog signal can be applied to an analog-to-digital converter which changes it into digital form consistent with the input requirements of an IBM 704 computer. The digital data is then recorded on magnetic tape suitable for use as a direct input to the IBM 704 digital computer for analysis.

Tape Playback Unit
General Configuration

The playback unit includes a tape transport similar to the one in the airborne data accumulating system. The capstan is driven by a synchronous motor operating on 115 volts and a nominal frequency of 60 cps. This frequency, and consequently tape speed, is varied during playback by means of a correction servo system to compensate for variations in tape speed of the airborne tape transport.

30 tracks are recorded on a 1½ inch tape, the playback heads being placed in two interlaced stacks with 15 heads in each stack. The heads are adjustable to allow for phase alignment.

If the tape playback speed is allowed to vary from the speed used while recording, the difference shows up as a deviation of the center frequency and a consequent error in the data magnitude. It is therefore essential that the two speeds be identical in order to produce accurate data. Speed differences occur in two forms, long term variations caused by friction or electrical power surges, and short term variations (wow and flutter) caused by vibration, capstan motor malfunctions, or tape alignment difficulties.

Two methods are used for correction of these effects: (1) a mechanical servo system to regulate capstan motor speed for correction of long term errors, and (2) an electronic correction system to counteract the effects of short term variations.

Referring to Figure No. 3 it is seen that the units common to both correction systems are the reference frequency playback head, the pre-amplifier, and the reference discriminator.

Functionally, the reference playback head reproduces the reference frequency as it was recorded in the air, including the long and short term variations. The signal is then amplified and fed to a reference discriminator whose center frequency is 16 KC. Thus, any deviation from 16 KC shows up as an output from the reference discriminator.

As shown in Figure 3, the output from the reference discriminator goes through a low pass filter to remove the high frequency components. The long term error voltate is then applied to a voltage controlled oscillator

whose normal output (for no input) is 60 cps. An error voltage from the reference discriminator varies the output frequency of the VCO which, after being amplified, feeds the synchronous capstan servo motor. Thus, the mechanical correction system drives the playback transport capstan motor in such a way as to play the tape back with the same long term variations that were present when the recording was made in the air.

Since the high inertia of the tape reel will not allow for short term corrections by the mechanical servo system, variations of more than 3 or 4 cycles per minute are corrected by electronic means. This is accomplished by developing a signal from the reference discriminator which is equal in amplitude but opposite in phase to the errors in the data. This signal is applied to the data discriminators to cancel out the errors.

This unit is essentially a counting device where the modulated carrier frequency from the tape controls the frequency of a multivibrator. Following the multivibrator is a differentiating circuit whose output is rectified and fed into a low-pass filter which eliminates the high frequency (carrier) components. The deviation of the carrier thus establishes the amplitude of the information signal and the rate of deviation determines the signal frequency.

Multiplexed signals (more than one carrier frequency channel on a tape track) require that a separate bandpass filter and demodulator be used for each multiplexed information channel.

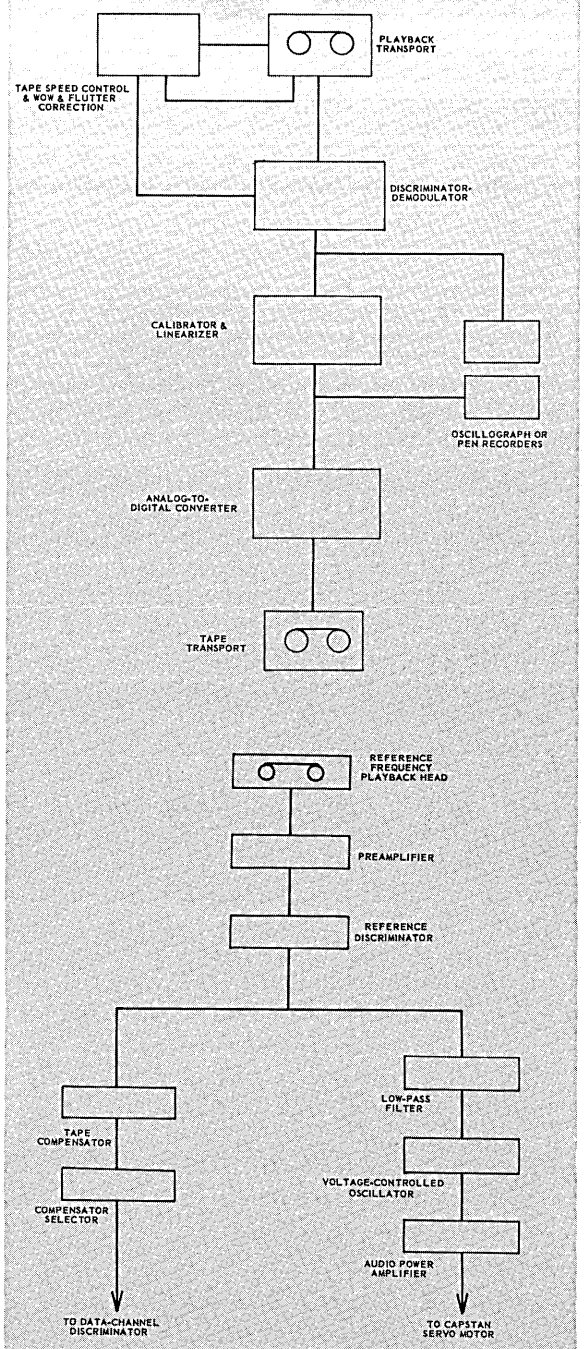
Figure 2 (top): Block Diagram of Ground Data Handling System
Figure 3 (middle): Tape Speed Control and Wow and Flutter Correction
Figure 4 (bottom): Diagram of Linearizer Unit

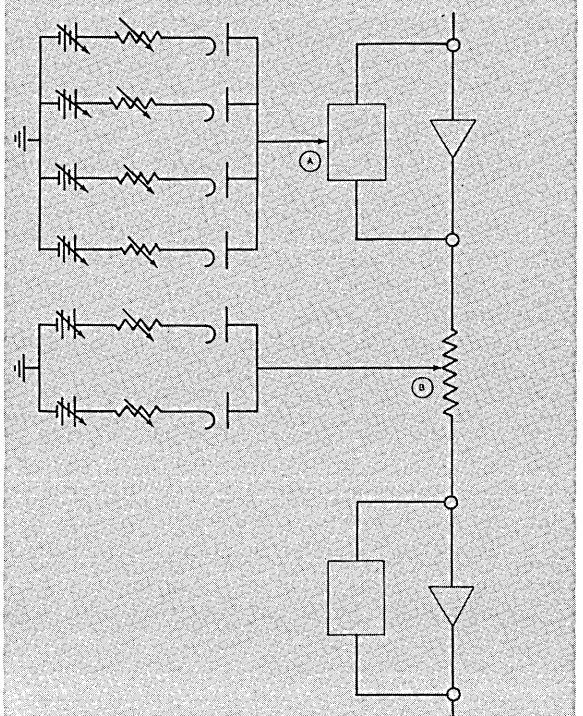
Six of the 24 data tracks have the capability of automatic calibration and linearization.

The automatic calibration units are used to adjust the zero point and gain of the discriminators to correct for errors due to gain changes and drift of the transducers, amplifiers, oscillators, and other components of the data system. A calibration signal placed on the tape periodically during flight provides records of input frequencies representing 80% and 20% of the discriminator full scale. These frequencies represent an output voltage from the discriminator of +15 and −15 volts, respectively, so that during ground playback a comparison is made in the automatic calibration units between the discriminator output and an accurate reference voltage. An error between the two actuates a potentiometer which adjusts the zero and gain of the discriminator.

The linearizer is a device used at the output of a particular discriminator to correct for non-linearities of the data caused by the transducer. It is an electronic amplifier whose transfer function from input to output may be varied through various degrees of non-linearity. Twelve such devices are available for each recorder.

Non-linear transfer functions are formed in the linearizer by combining six straight line functions. The in-





tersections of the adjacent straight lines are called break points. The break points position, the slope of the straight line, and the polarity of the slope may be varied to form an error correction curve.

The straight-line sections are produced by the use of six biased diodes connected in parallel. The bias of each diode is adjusted so that it becomes conducting at a certain input voltage. The diode bias settings then determine the break points of the correction curve—the slope is determined by the diode impedance.

The linearizer circuitry is made up of two amplifier stages as shown in Figure No. 4. Both stages have feedback loops, and the diode circuits are connected into the feedback loop of the first stage and between the two stages. Thus, if the diode circuit connected at (A) causes an increase in the effective impedance of the feedback loop, less signal is fed back and the gain of the amplifier is increased. If the diode circuit is connected at (B), impedance is added into the forward loop, the signal is attenuated, and the gain is decreased.

This arrangement allows for building the transfer function with sections of either positive or negative slope.

Presentation Of Data

When the signal emerges from the demodulator or from the linearizer it is in analog form and is as nearly like the original signal as possible. The purpose then is to present the data in a form convenient for analysis. This depends to a great extent on what type of analysis will be used. Data is of two general types, commutated and continuous.

Commutated Data

When a tape track containing commutated data is played back, the resulting trace is a series of square waves representing the variables sampled. The data in this form presents a problem because of the difficulty in sorting and assembling it in a meaningful arrangement. A method has been proposed for separating and recording the commutated data and is shown in a block diagram in Figure No. 5. The commutated signal if fed into a relay matrix and into a BCU (Binary Counting Unit) which controls the relay matrix. With this arrangement, the sixteen commutated signals are sorted by the BCU and relay matrix and each signal is fed to a separate pen recorder.

As seen in Figure No. 5 the composite signal is fed to both the control circuit and the relay matrix. In the control circuit the signal goes through a pulse-forming circuit to produce sharp pulses which are fed to the BCU. The BCU consists of four flip-flop circuits, each of whose output is in binary form (positive or negative). Thus the incoming pulses to the BCU produce 2 to the 4th power, or 16, different output combinations. The four outputs from the BCU are applied to the grids of thyratrons which conduct only when receiving a positive

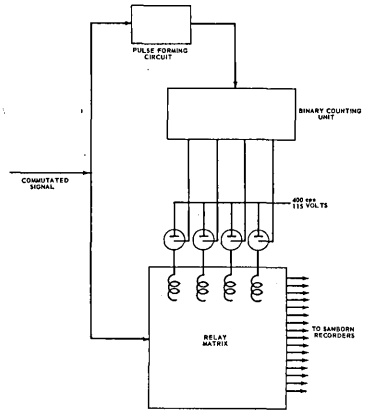


Figure 5:
Decommutation Circuitry

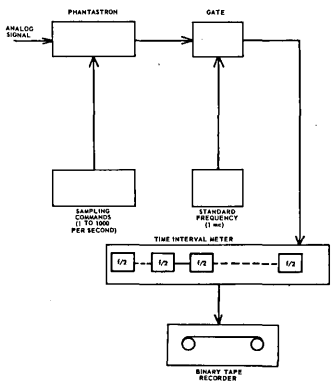


Figure 6:
Analog-to-Digital Converter

signal. Each conducting thyratron provides 400 cps power to energize a relay so that 16 On-Off combinations now exist in the relay matrix.

The four relays in the matrix consists of a single-pole, a 2-pole, a 4-pole, and an 8-pole relay. These relays are connected in tandem to form what is called a "tree" decoding circuit. Thus, the composite signal is applied to the first relay, and each pulse proceeds through the succeeding relays to reach a different output terminal, the route being determined by the On-Off arrangement of the four relays. The "Tree" decoder, then, has 16 outputs which can be connected to 16 separate recorders, and for each series of pulses (or revolution of the commutator), the recorders each receive one pulse which is a sample of a particular analog signal quantity.

Continuous Data

For most purposes the continuous signals will be fed into pen recorders or oscillograph recorders and presented as analog time histories of the variables under prescribed test conditions.

Editing of the data will include entering penciled notes on the recorder records describing the run number and the scale factors to be used in converting displacement of the trace to signal amplitude in the proper units (volts, degrees, etc.). This data will then be ready for manual reduction and analysis.

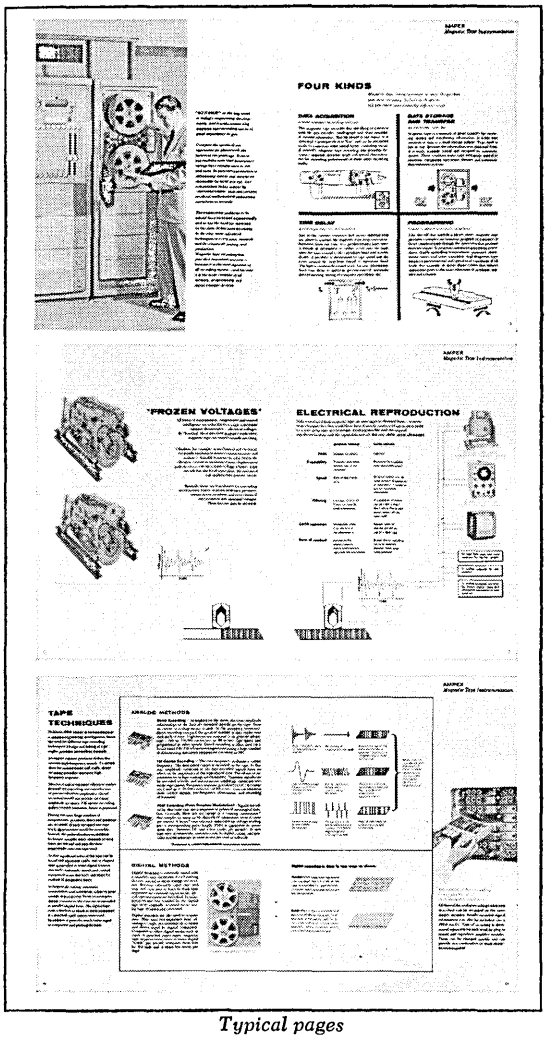
When data analysis requires that mathematical computations be performed on particular data channels, these analog signals emerging from the demodulator or linearizer are digitized and recorded in binary form on magnetic storage tape. The digital system includes an analog-to-digital converter which digitizes the analog data at sampling rates up to 1,000 per second. Also included are control circuits to frame the data, which is in binary form, so that it is acceptable as an input to the IBM 704 computer, and a magnetic tape recorder with which to store the digitized data. The tape may then be used as a direct input to the computer.

The story of the development of the Convair data handling system is now complete—the application of this system, however, has just begun. As the development of new weapons systems progresses, whether they be manned, pilotless or ballistic missile, the magnetic tape method of data gathering shall be the basic tool of flight test, and will enable Convair to continue giving our country more Air Force per dollar.

How to be a magnetic tape recording expert

Introducing a useful new brochure on tape in instrumentation

Tape is the stuff of which memories are made — the versatile data memories for a jet propelled age of electronic miracles. If you are one who keeps up with times and techniques, it is a field well worth knowing. This new brochure gives a wide-angle view of the whole subject.



Typical pages

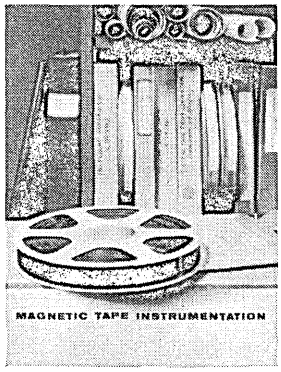
What kinds of applications do you think of when magnetic tape recording is mentioned? Sound recording, of course, and telemetering, if you are in that business. But what about simulating a rough road to test truck axles, controlling a milling machine to cut an aircraft wing section out of a solid billet, monitoring for a sudden occurrence that may happen only once in a year or two, recording data that can be reduced to graphs and tabulations without ever being touched by human hands? These and many more are described.

How significant is the fact that magnetic tape recording reproduces data in the same electrical form in which it was recorded? Enormously important, when you realize all the things the reproduced data can do that couldn't be done with the original signals or with the common forms of visual recording. For example the data can be slowed down to look at fast transients. It can be speeded up for wave analysis. It can be read out in any form. A tabular comparison between original signals and taped signals gives the full story. And a step-by-step pictorial demonstration of magnetic tape recording and reproduction puts the electrical-data idea into tangible, easily visualized form.

What does the data on magnetic tape look like? You can't see it, but the brochure will give you an idea of what it would be like if you could. And incidentally this may help to clarify the differences between various magnetic-tape-recording techniques.

Do you talk in tape's language? When is a tape recorder not a recorder? What is the difference between a channel and a track? What is a servo speed control? A much needed glossary gives the consensus of our views on terms.

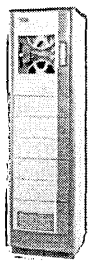
For whom did we write this booklet . . . the expert, or the man for whom the whole subject is new? Both. It is written and illustrated so that any engineer or technically trained person can readily grasp the concepts and gain a broad understanding of the subject. If you are one of those who has already worked extensively with tape, you will find some new twists in the way the subject is explained, and perhaps ideas on new areas you hadn't explored. And incidentally, a copy of this brochure in some handy file will give you a good start in indoctrinating that new man in the department.



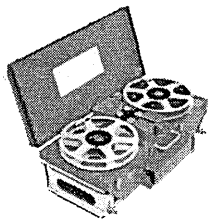
For your copy, write us today on your company's letterhead. Address your request to Department DD-5.

MAGNETIC TAPE APPLICATIONS BY AMPEX

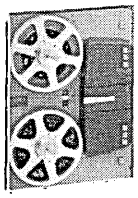
ONE OF 5 SERIES



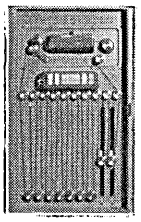
Series FR-100



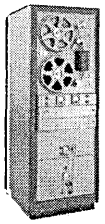
Series 800 Mobile and Airborne



Model FR-200 Digital



Series FL-100 Loop Recorders



Series FR-1100

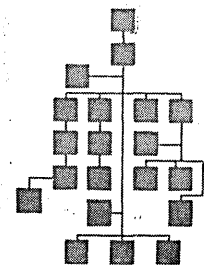
INSTRUMENTATION DIVISION AMPEX CORPORATION

FIRST IN MAGNETIC TAPE INSTRUMENTATION

934 CHARTER STREET · REDWOOD CITY, CALIFORNIA

District offices serving all areas of the United States and Canada; Foreign Representatives in countries around the world.

Circle 6 on Reader Service Card



people moving up in DATAMATION

HARRY LEHNE has been appointed vice-president of Sylvania Electronic Systems in Waltham, Mass. He continues as general manager of the Sylvania Electric Products Inc. division. Past Sylvania projects under Lehne's direction have included the automatic electronic defense system for the Air Force's B-58 bombers, the universal digital operational flight trainer (UDOFT) for the Navy, and a mobile digital computer (MOBIDIC) for the Army . . . . The board of trustees of Battelle Memorial Institute (Columbus, Frankfurt, Geneva) has announced the election of DR. B. D. THOMAS to the position of president. . . . NEAL J. DEAN, former director of data processing consulting for the Ramo-Wooldridge Corp., has joined Booz, Allen and Hamilton, New York City, national management consultants, as director of electronic data processing for the central region.

DR. MORRIS RUBINOFF, chief engineer for computers of Philco Corporation's Government and Industrial Division, is presently visiting potential European customers to describe the capabilities of the TRANSAC S-2000 and to study European computer concepts and techniques. He has been invited to give several talks on the S-2000 and will deliver a series of lectures on transistors while visiting England, France, Italy, Switzerland, Germany, Sweden, Belgium and Holland. . . . FRANK LADWIG is the new sales manager of Minneapolis-Honeywell's Datamatic Division in Newton Highlands, Mass. . . . REAR ADM. JACKSON S. CHAMPLIN, USN (Ret.), has been appointed assistant to Philias H. Girouard, director of DataTape Division, Consolidated Electrodynamics Corp., Pasadena.

N. S. BASSETT has been appointed sales manager of the Davies Laboratories Division of Minneapolis-Honeywell, producers of magnetic tape transports, missile data recorders, magnetic recording and reproducing heads, etc. He joined Honeywell in 1947 as a field sales engineer in Boston. . . . JOHN E. VOYLES, communications and data processing engineer, is now with the eastern office staff of Control Data Corp. as a senior engineer. He will work in Washington, D. C. with HENRY S. FORREST . . . . C. K. Components, Inc. announces that FRANKLIN W. HOBBS has joined the company as vice-president and treasurer. The firm manufactures miniaturized magnetic memory elements.

IBM has appointed a new assistant to the director of sales for its data processing division in White Plains. He is DR. HERBERT R. J. GROSCH, internationally known planner, organizer and operator of major computer installations. Grosch formerly managed the application section of G E's computer installation at Phoenix. DR. CUTHBERT C. HURD, IBM's director of automation research, has been elected president of the board of trustees of the Foundation of Instrumentation Education and Research. . . . MORGAN HUFF has been named assistant to the general sales manager of RemRand's UNIVAC Division.

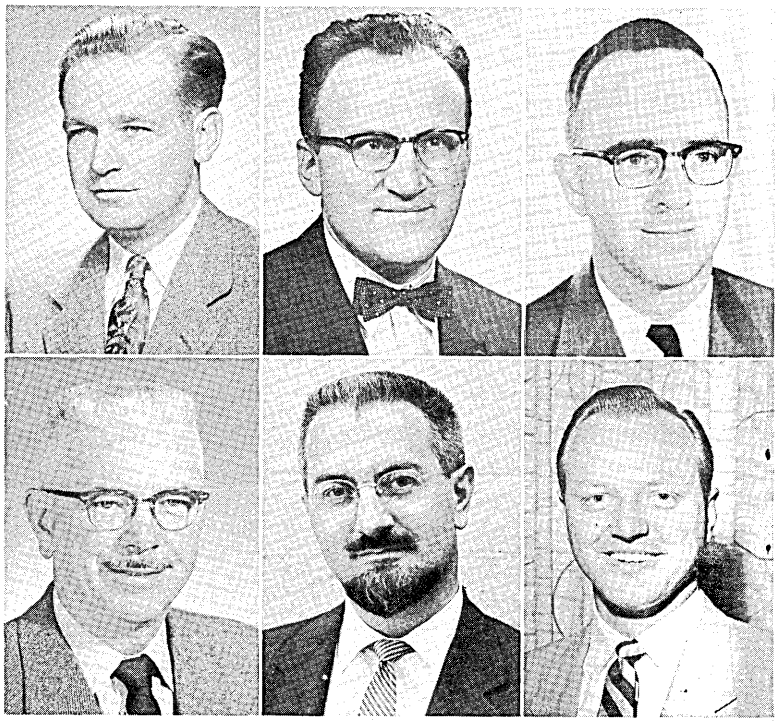
Formation of a systems and procedures division and appointment of BEN S. GRAHAM as its director has been announced by the Standard Register Co., Dayton. Major functions of the new division will be the development of systems and procedures, a data processing program and control reports for management. . . . DR. LLOYD V. BERKNER was elected early in March to the board of directors of Texas Instruments, Inc. . . . W. VERNON SMITH is now service department manager of Beckman Systems Division in Anaheim, Calif. Smith was formerly employed by G E as manager of automatic test data processing. Also moving up at Systems was RAY ST. ONGE, who is now advertising and sales promotion manager.

Three promotions have been put into effect by the Electro-Data Division of Burroughs Corp., Pasadena. E. R. LUND was appointed San Francisco district manager. He will head marketing operations there. Lund succeeds J. P. LEEBRICK who is the new Los Angeles district manager. Leebrick, with 15 years of experience in the data processing field, joined ElectroData in 1956. He, in turn, succeeds R. H. WAGNER, recently named Burroughs international division sales promotion manager for electronics products, Detroit.

HARRY LEHNE
Sylvania Electronic Systems

DR. M. RUBINOFF
Philco G. and I. Division

N. S. BASSETT
Minneapolis-Honeywell, Davies



BEN S. GRAHAM
Standard Register Company

HERBERT GROSCH
International Business Machines

E. R. LUND
Burroughs' ElectroData Division

DATA PROCESSING MANNING SURVEY

introduction, background and general survey results

(This is a special release prepared by the National Research Committee of the Systems and Procedures Association of America and released in booklet form by that organization. It is reprinted in DATAmation with the Association's expressed permission. The Data Processing Manning Survey was compiled in September 1957 under the direction of F. W. Wanner. —Ed.)

The personnel requirements in the field of data processing, accentuated by the rapid development of electronic data processing, have re-emphasized the need for reviewing related job titles, work descriptions, and salary ranges.

As a preliminary effort in this direction, a brief survey was conducted among companies in the New York City Metropolitan area which are either using or have ordered electronic data processing equipment. A total of thirty questionnaires was mailed and replies received from twenty-three. Out of these twenty-three respondents, sixteen reported information as requested on the questionnaire. Every effort has been devoted to maintaining the anonymity of respondents and any relationships to information.

It is recognized that the wide-spread difference in job responsibilities, authority, work performed, and place in organization structure make it most difficult to secure a completely comparable survey result. However, in spite of this and recognizing that wide variations in functional activity tend to distort direct results, the survey was conducted. This report of results obtained through the survey questionnaire has been divided into two sections: Section I—Salary Summary and Section II—Basic Job Descriptions and Position Titles.

Section I—Salary Summary (page 32) was prepared from information reported for these position titles by a varying number of the sixteen respondents. Normal minimums and maximums have been mathematically computed after an elimination of extreme minimums and maximums where such extremes obviously did not fall into the respective patterns. The normal average salary is based upon the normal minimums and maximums after the same exclusions. The overall pattern reflected in the Salary Summary indicates a fairly consistent pattern among the respondents.

Section II—Basic Job Descriptions and Position Titles shows twenty-three potential job titles and descriptions related to the activities as set forth in the questionnaire. In some cases, respondents did not have exactly comparable positions as those indicated. In other cases, job titles were somewhat different than those used on the questionnaire.

With respect to the number of individuals supervised by the top three positions listed on the questionnaire, there was a very wide variance due to the type of business involved. After elimination of the extreme maximum number of people supervised by the head of a group because of specialized conditions, the numerical range of personnel involved in data processing reported by respondents runs from a low of 16 to a high of 73. Likewise, the people involved in programming reported by the respondents ranges from a low of 6 to a high of 35, while the number involved in processing activities range from 20 to 47. It should be borne in mind that these figures pertain to companies in the New York Metropolitan area and are subject to varying degrees of centralization and decentralization and the "home office" aspects of data processing.

The inadequacies of this rather limited survey of such an important subject are recognized. The questionnaire, having been distributed to major corporations within the New York City area, naturally reflects the salary levels of that area. It is believed, however, that helpful conclusions may be drawn from the information developed and presented despite the limitations.

Any advancement toward the solution of problems in this field which result from this survey is due to the participation of the membership of the Business Electronics Round Table of New York and the collaboration of S.P.A. This cooperation is acknowledged and appreciated.

Job Descriptions, Position Titles

The position title used in the questionnaire to identify the respective positions is shown in capital letters, under which are the titles reported by various respondents as being used in their organization. It should be noted that there may be some variances in job content in respective respondents' offices as compared with the basic job content shown in the questionnaire. These titles are shown relying upon the interpretation of the respective relationship of the basic job content to the specific position titles as utilized by the respondents.

1. DATA PROCESSING DIVISION HEAD

Reports to Assistant Comptroller—full responsibility for programming, processing, planning, developing, installation, personnel, salary administration, inter-department relations, new applications, advancing new techniques and equipment for all electronic and EAM Data Processing Activities of company.

Machine Accountant
Director of Methods Research
Manager Computer Center
Manager - ECAD
Asst. Supervisor - Methods Develop.
Coordinator Electronics Program Div.
Head Supervisor
Manager - Electronic Research and Application Division
Data Processing Division Manager
Chief Systems Analyst
Manager - Computer Applications Research

2. ASSISTANT DIVISION HEAD—PROGRAMMING

Reports to Division Head—responsible for *complete programming,* planning, development, all data processing applications for electronic and EAM organization, personnel, training, supervision, testing, debugging, final programs to Processing Group.

Systems Methods Analyst
Asst. Manager - Programming
Programming Manager
Dept. Supervisor - Electronic Methods
Supervisor - EDP Systems Analyst
Asst. Manager - Electronics Research and Application Division

3. ASSISTANT DIVISION HEAD—PROCESSING

Reports to Division Head—responsible for *all operations* of electronic and EAM equipment, organization, super-

Position Title	Minimums		Normal	Maximums	
	Extreme	Normal	Average	Normal	Extreme
	(Monthly Salaries)				
Data Processing Division Head	$ 675	$1,000	$1,150	$1,400	$1,750
Asst. Division Head—Program	675	800	1,000	1,100	1,350
Asst. Division Head—Processing	650	750	900	1,000	1,350
Processing Coordinator	500	675	780	900	1,100
Section Head—Origination and Control	540	550	750	800	1,215
Section Head—EAM	460	550	760	800	1,068
Section Head—Computer Center	550	600	740	800	1,095
Senior Programmer	500	650	750	850	1,095
Computer Programmer	400	455	620	700	905
EAM Programmer	335	425	575	650	905
Programming Technician	315	350	445	540	700
Program Clerk	200	250	300	375	530
Senior EAM Operator	320	400	440	550	640
EAM Operator	210	310	350	470	503
Junior EAM Operator	200	235	315	375	469
Senior Console Operator	375	450	595	660	790
Computer Console Operator	335	375	480	625	700
Computer Operator	200	310	430	450	500
Junior Computer Operator	210	270	340	410	450
Sr. Data Examination Clerk	200	325	390	400	765
Data Examination Clerk	200	300	335	360	635
Key Punch Supervisor	246	320	400	425	750
Key Punch Operator	200	300	330	350	490

vision, personnel, planning, performing, controlling and internal scheduling, work standards and performance.

IBM Supervisor
Processing Manager
Asst. Auditor
Asst. Division Head - Operating
Manager - Electronic Machines Services
Asst. Manager - Operations
Asst. Manager in charge of Data Center
Department Supervisor - EDPM

4. PROCESSING COORDINATOR

Staff Assignment—reports to Assistant Division Head (Processing)—responsible for controlling, scheduling, coordinating all input (source material, content, text, due dates, etc.)/output (management reports, checks, invoices, etc.), to and from all company departments (liason and contact man). Coordinates work interrelationships with 3 Section Heads: Data Origination, EAM, Computer, i.e., "trouble shooter."

Production Coordinator
Administrative Asst. - Operations
Section Supervisor
Schedule and Control Supervisor
Asst. to Auditor
Processing Scheduler

5. SECTION HEAD—DATA ORIGINATION AND CONTROL

Reports to Asst. Division Head (Processing), organizes, supervises, responsible for preparation, accuracy, completeness, timing, overall control of receipt and release input/output; converting source material into cards, paper tape, examination of output prior to release to/from EAM and Computer Center.

Chief Accountant
General Service Supervisor
Supervisor - Input Department
Supervisor
Asst. Manager - Elec. Machine Service
Section Head - Origination and Control

6. SECTION HEAD—ELECTRIC ACCOUNTING MACHINE

Reports to Assistant Division Head (Processing)—complete supervision operations EAM equipment (sorter through 407 and 604), related work of operators, train new operators, establish, maintain, revise internal procedures, advisor on mechanical matters and work schedule, establish and maintain standards and performance.

Department Head - EAM
Asst. IBM Supervisor
Data Transmission & EAM Superv.
Chief of Machine Department
Supervisor
Section Supervisor - Machines Service.
Supervisor - Output Department
Supervisor - Data Center

7. SECTION HEAD—COMPUTER CENTER

Reports to Assistant Division Head (Processing)—complete supervision operations Computer Center (electronic computer, 10 magnetic tape units, printer and other equipment), work scheduling in Center, maintain magnetic tape records, operating procedures manuals, advanced equipment and techniques, personnel, training, establish and maintain work standards.

Computer Operations Supervisor
Computer Engineer
Section Head - Computer Section
Asst. Manager Electronic Machines Service
Supervisor - Computer Center
Computer Technician

8. SENIOR PROGRAMMER

Reports to Assistant Division Head (Programming)—converts business applications into machine instructions for *computer, EAM,* and *communication* equipment. Solely responsible for complete cycle of design, block diagrams, flow charts, machine language, tests, debugs programs for

machine processing. Works with representatives of departments whose applications are being programmed. Recommends new applications. Assists Assistant Division Head (Programming).

Methods Analyst
Supervisor Programming, Methods
Methods Planner
Sr. Electronics Systems Analyst
Systems Analyst
Sr. Programmer
Electronic (IDP) Systems Designer II
Programming Supervisor
Electronics Systems Analyst I
Computer Programmer I
Machine Programmer I

9. COMPUTER PROGRAMMER

Reports to Assistant Division Head (Programming)—converts business applications into machine instructions for *computer, EAM,* and communication equipment; designs block diagrams and flow charts, codes, debugs, completes all phases of programs for computer processing.

Asst. Methods Analyst and Systems Reviewer
Methods Planner - Jr.
Electronics Systems Analyst
Computer Programmer
Electronic Systems Designer I
Staff Assistant
Systems Analyst
Electronic Systems Analyst II
Computer Programmer II

10. EAM PROGRAMMER

Reports to Assistant Division Head (Programming)—converts business applications into machine instructions for *EAM* equipment. Designs block diagrams and flow charts, codes, tests, debugs, completes all phases of programs for EAM processing.

Tabulating Methods Analyst VI
IBM Technical Assistant
Methods Technician
Section Head EAM
Machine Programmer II
Tab Technician
Asst. Methods Analyst & Systems Reviewer
Programming Assistant
Systems Analyst (EAM)

11. PROGRAMMING TECHNICIAN

Assists programmers in developing application for conversion to machine processing, designs machine applications, writes instructions, debugs, installs new program under close supervision of programmers. (Primarily a training position.)

Machine Accounting Specialist IV
Machine Applications Technician
Computer Technician
Coder
Programming Assistant

12. PROGRAM CLERK

Clerical assistant to programmers, types, operates Flexowriter punching paper tape; under close supervision of programmers.

Clerical Assistant
Programming Clerk

13. SENIOR EAM OPERATOR

Reports to Section Head–EAM—performs all operations pertaining to all IBM punch card equipment. *Writes* procedures for machines, *designs* panel board diagrams, *wires* boards, *runs* complete job with little or no supervision.

Machine Accounting Specialist IV
Technical Operator
Lead Man EAM
Sr. Machine Operator
Tab Operator II
Clerical Supervisor

14. EAM OPERATOR

Reports to Section Head—EAM—operates all IBM punch card data processing machines, *interprets* written procedures, *wires* complex panel board *from diagram,* designs simple wiring; runs complete job with little or no supervision.

Machine Accounting Specialist III
Advanced IBM Operator
Tab Operator
Tab Operator I
Senior EAM
Machine Operator
Machine Operator I
Tab Machine Operator

15. JUNIOR EAM OPERATOR

Reports to Section Head—EAM—receives training from Senior and EAM Operators—operates *most* IBM punch card machines (more complex with supervision, less complex with little or no supervision).

Machine Accounting Specialist
IBM Operator
Junior EAM
Machine Operator II
Tab Operator
Jr. Tab Machine Operator
Machine Operator

16. SENIOR CONSOLE OPERATOR

Reports to Section Head—Computer Center—responsible for complete routine processing of debugged applications on electronic processing system, directs all units of equipment involved, interprets instruction manuals, makes current routine corrections, assists programmers in debugging new applications, keeps performance records. Assists Section Head in direction of Center.

Head Operator
Senior Operator
Electronic (IDP) Systems Designer I
Console Supervisor

17. COMPUTER CONSOLE OPERATOR

Reports to Section Head—Computer Center—operates all units of electronic data processing system, completes processing of debugged applications, interprets instruction manual, makes current routine corrections with little or no supervision; assists in keeping performance records.

Assistant Head Operator
Console Operator
650 Console Operator

18. COMPUTER OPERATOR

Reports to Section Head—Computer Center—operates peripheral units of electronic data processing system under direction of Console Operator. Responsible for proper operation of magnetic tape units, operates card, tape, input/output units.

EDPM Operator
Sr. Computer Technician
Computer Operator
Computer Operator I

19. JUNIOR COMPUTER OPERATOR

Reports to Section Head—Computer Center—operates magnetic tape units, handles tape reels, controls tape storage, etc. Operates peripheral equipment under close supervision, keeps forms in output units, keeps records of materials and supplies. Assists Console and Computer Operators.

Tape Control Operator
Jr. Computer Technician
Jr. Computer Operator
Computer Operator II

20. SENIOR DATA EXAMINATION AND CONTROL CLERK

Reports to Section Head—Data Origination and Control—maintains accuracy, correctness, appropriateness of input/output to data processing equipment through examination of source material, reports, documents prepared or other released material. Adherence to schedule, control and accuracy of *output.*

Group Head VI
Transaction Control Clerk
Sr. Examination Clerk
Senior Control Clerk
Reports Clerk

21. DATA EXAMINATION CLERK

Reports to Section Head—Data Origination and Control—maintains accuracy, correctness, appropriateness of input/output to data processing equipment through examination of source material, reports, documents prepared or other released material. Adherence to schedule, control and accuracy of *input.*

Jr. Control Clerk
General Machine Control Clerk
Records Clerk
Examination Clerk

22. KEY PUNCH SUPERVISOR

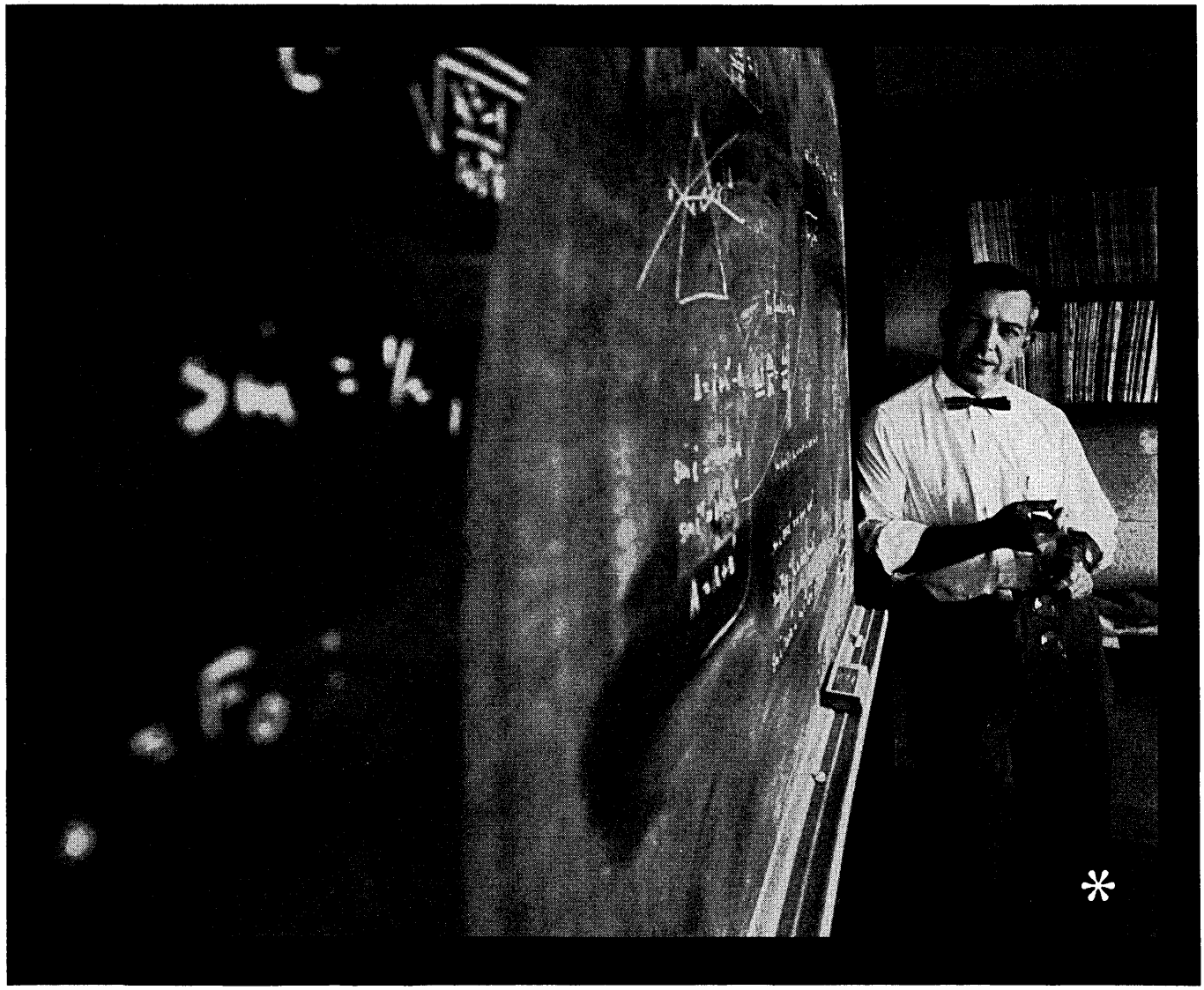
Reports to Section Head—EAM—supervises, trains, directs Key Punch Operators, maintains flow and volume of work, maintains production records and controls.

Section Supervisor - Key Punch
Key Punch Operator III
Section Head
Chief of Key Punch

23. KEY PUNCH OPERATOR

Reports to Key Punch Supervisor—performs usual operations of key punching and verifying source data into punched cards; keeps performance records.

Verifying Operator



an oblique look

tech/ops scientists know there are at least three ways of attacking a problem: head on, as an amphibious force hits a beach; flank-wise, as a tactician likes to strike; and *slantwise*, the offbeat way.

This is a basic principle in operations research, the new *team* method of attacking problems, in which *tech/ops* is a leader and pioneer. It is this habit of taking an oblique look—of applying a group of apparently unrelated disciplines to the problem—that has developed, at *tech/ops*, unique solutions in weapons systems, tactics, organizations and logistics.

You may profit by taking an oblique look at your own career problem—and joining a team of *tech/ops* scientists looking for new ways to the future.

Address: ROBERT L. KOLLER

TECHNICAL OPERATIONS, INCORPORATED
Burlington, Massachusetts

at your career in

BURLINGTON, MASS., or Washington, D.C.: mathematical statistician (PhD with five years' experience) for research in sensitivity of stochastic games, statistical analysis of such games; creative, with skill to develop essentially new mathematics in relatively unexplored area; also mathematician (PhD with five years' computer experience) to develop sophisticated computer programs.

FORT MONROE, VA.: Logician with computer knowledge; mathematical economist; electrical engineer with background in information or queuing theory; senior operations analyst, master's level or above, in physical sciences or mathematics.

MONTEREY, CALIF.: Applied mathematician with understanding of application of high speed computers to data analysis; scientist or engineer with heavy math orientation to act as project leader of field experimentation group; senior scientist on PhD level in operations research, math, physics.

(Please indicate location preference.)

tech/ops

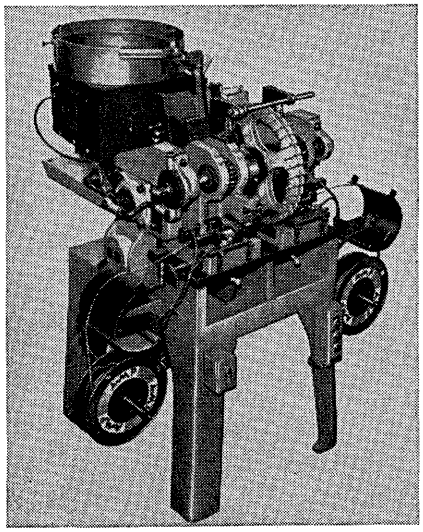
* *Dr. Eric Clarke, tech/ops vice president, takes a look at a problem in his office at Burlington, Mass.*

Circle 7 on Reader Service Card

new products in DATAMATION

Tip, Tipping Machine

A printed circuit component tip and a high speed automatic tipping machine (pictured) has been developed. A major

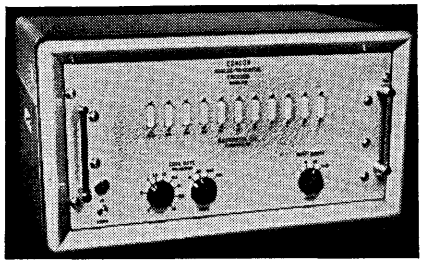


feature of the tip application is the prevention of cold solder problems by eliminating any movement of components during dipping cycle. The tip permits bridging or offsetting of components to improve air circulation and to eliminate temperature influence. Design of the tip promotes solder-wicking and uniform solder deposit and also protects fine semiconductor leads from heat and assembly damage. For information write AMP INCORPORATED, Harrisburg 34, Penna. Or use reader card.

Circle 171 on Reader Service Card

Analog-to-Digital Encoder

Analog-to-digital conversion of up to 2,000 codes per second may be obtained with model 2KB. The code is

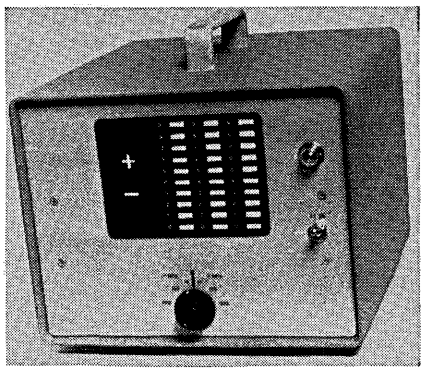


binary having 10 bits plus sign. The code accuracy is 1 part in 2048 or ±0.025%. The maximum bit rate is 22,000 per second. The unit features built-in integral power supplies. Drift of the comparator is less than ±0.001%. Analog input impedances is 1,000 ohms per full scale volt. Input ranges are 1, 10, 100, and 1000 volts. Internal and external bit and coding rate control are provided. Dimensions of encoder in cabinet are 21 ½ in. wide x 11 ½ in. high x 14 ¾ in. deep. Power requirements are 117 volts ±10%, 60 cycles ±2 cycles, 250 watts. For information write ANDROMEDA, INC., 3742 Howard Ave., Kensington, Md. Or use card.

Circle 172 on Reader Service Card

Transistorized Digital Voltmeter

This unit may be set for full scale readings of plus 10, 100 or 1000 volts or minus 10, 100 or 1000 volts and meas-

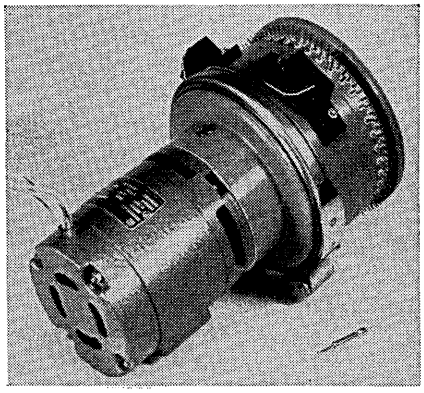


ures voltages to a full-scale accuracy of better than one-half of one per-cent. It operates from a 117-volt AC source (20 watts) and consists of transistorized computer elements including a precision digital-to-analog converter, comparator, logic and a reference power supply, which is held to an accuracy of better than one-tenth of one percent. For information write RANSOM RESEARCH, 323 W. 7th St., San Pedro, Calif. Or use reader service card.

Circle 173 on Reader Service Card

Sampling Switch

This high-speed, multichannel, low-level sampling switch has been developed and can be supplied in evaluation quantities. It is intended for use in systems

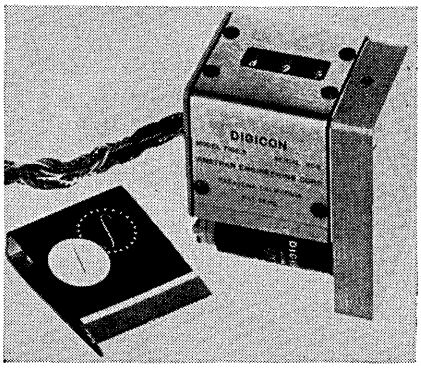


where it is necessary to measure voltages in the low millivolt region, such as those obtained from strain gages and thermocouples with high system accuracy. The switch uses a permanent magnet rotor to sequentially operate individually hermetically sealed contacts. Long life and low noise are achieved through the elimination of sliding type contacts in favor of stationary type contacts. For information write THE MAGNAVOX COMPANY, Research Laboratories, 2255 Carmelina Ave., Los Angeles 64, Calif. Or use reader service card.

Circle 174 on Reader Service Card

Mechanical Counter

The new model 7108 totalizes positive or negative pulses from computer systems, flow meters, navigation equipment



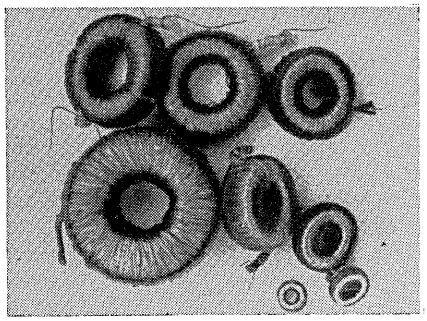
or ground test units and provides a visual as well as electrical readout with either potentiometers or contacts opposite each number wheel. It provides continuous voltage outputs from each number wheel proportional to the number indicated in the counter window.

Potentiometer-like out-put from each wheel gives a convenient means of telemetering digital data for controller recording. The unit withstands severe airborne environments. Size is 1.75" x 3" x 3". For information write THE DIGITRAN COMPANY, 45 West Union St., Pasadena, California. Or use card.

Circle 175 on Reader Service Card

High Tolerance Toroids

Of interest to manufacturers of memory devices, chokes, filters, transformers and other components utilizing toroids, are

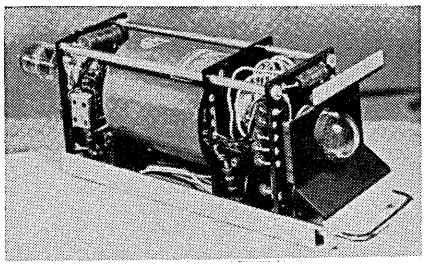


a new line of specials, wound on high-permeability cores. Sizes range from 7/8 in. to 3 in. OD with frequencies from 1000 cycles to 200 kc. They are available with inductance and Q values to specification. Manufacturer claims high degree of stability vs. voltage and temperature, and they can be designed to compensate for extreme variations in temperature. For information write BARKER and WILLIAMSON, INC., Canal Street and Beaver Dam Road, Bristol, Penna. Or use reader service card.

Circle 176 on Reader Service Card

Megacycle Decade Counter

Designed as a companion unit to the decade counters types 101 and 102 whose counting rate is 10 Kc and 100

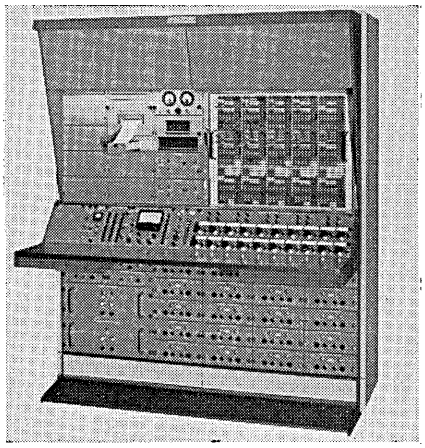


Kc respectively, this plug-in unit is designed to achieve the highest speed counting and resetting while still making all ten out-puts available for print-out or other general purpose applications. The power requirements are 300 v - 30 ma dc, and 6.3 v - 0.9 a. ac. The unit features high reliability through the use of the beam switching tube, according to the manufacturer. The indicator provides precise "in-line" figures visible 30 to 40 feet. For information write BURROUGHS ELECTRONIC TUBE DIVISION, North Plainfield, N. J. Or use reader service card.

Circle 177 on Reader Service Card

Analog Computer

The 231-R incorporates a new type of patch board design which features a modular grouping of components and

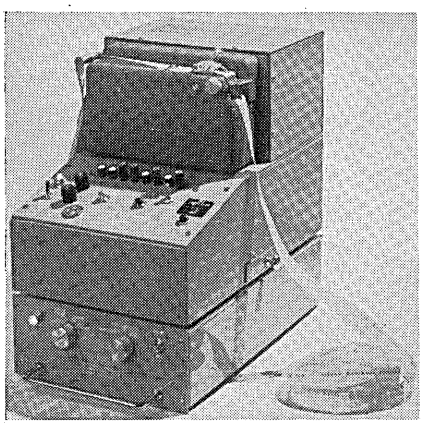


thus makes it possible for the operator to set up a problem on the patch board four times faster than with previous computers and without any patchboard clutter, according to the manufacturer. The computer has an automatic input-output system which automates hand operations. Its control panel design centralizes all controls and makes it possible for the operator to control all elements of the computer from one location; and the automatic extended readout makes it possible for the entire computer system to be scanned and values printed at a rapid rate. Other features: all-electronic digital readout, quadruple amplifier, and rugged rach structure. For information write ELECTRONIC ASSOCIATES, INC., Long Branch, N. J. Or use reader card.

Circle 178 on Reader Service Card

Tape Punch, Tape Duplicator

Electrically powered, the punch allows the operator to set up an entire eight-hole line on push buttons which illuminate when pressed. The line can be changed or corrected before the command to punch is given. The tape advances when punched, and a counter indicates the number of lines that have

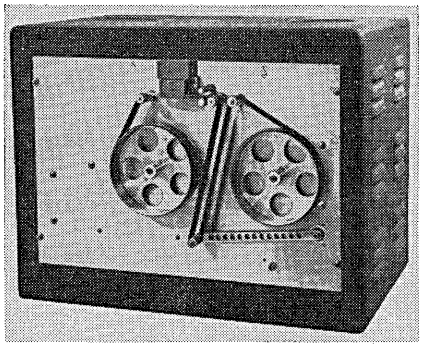


been completed. The duplicator automatically reproduces copies of tapes by co-ordinating the punch with the reader. Punching continuously at over 900 lines per minute, the device is extremely useful for making tapes for use at several stations and for quickly editing and revising old tapes. For desk-top or typewriter-stand use, the punch can be placed on top of the duplicator (as in picture). For information write CALIFORNIA TECHNICAL INDUSTRIES, 1522 Old County Road, Belmont, Calif. Or use reader service card.

Circle 179 on Reader Service Card

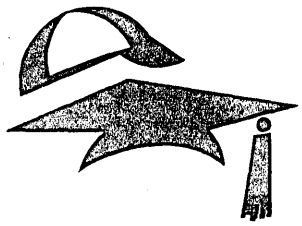
Random Access Memory

Storage of up to 10 million bits with an average access time of less than 1/2 second is provided by model 3270. The



unit furnishes one answer to the problem of storing large amounts of digital data for rapid and random access as required by computers and other data processing devices. It consists of a tape transport mechanism with completely transitorized drive and programming circuitry. Each of the two reels on the transport contain approximately 35 feet of one-inch tape which, starting from the center of the tape, can be swept past the head in either direction in less than 1/2 second. For information write POTTER INSTRUMENT COMPANY, INC., Sunnyside Boulevard, Plainview, L. I., N. Y. Or use reader service card.

Circle 180 on Reader Service Card



DATAMATION *on campus*

WATSONS SPONSOR BROWN COMPUTER CENTER

An elaborate data processing center will be presented to Brown University as a gift. Dr. Barnaby C. Keeny, president, said the center will be established in memory of the late Thomas J. Watson, Sr., a computer pioneer. Sponsors are his widow and their son, Thomas J. Watson, Jr., president of IBM.

Machines of various types and from different manufacturers will be installed at the center which will include a 2,000 sq. ft. computer room, adjoining lecture and conference room, offices and equipment space.

OSU CONFERENCE WILL INCLUDE COMPUTERS

A session on computers has been scheduled at the Fifth Annual Conference for Engineers and Architects, to be sponsored by the Ohio State University College of Engineering on May 2. The departments of civil and electrical engineering, engineering mechanics, and mathematics will moderate discussions on "Digital Computers—Principles and Applications," "Analog Computers," "Digital Computer Application to Highway Bridge Design," and "Analog Computer Simulation of Human Pilot Behavior."

FRIDEN TRAINS EXECUTIVES, SERVICEMEN

A 43-year-old building, once part of the University of Rochester, now houses the educational center of the Friden Calculating Machine Company in which businesspeople of all kinds receive varied courses in integrated data processing. For 12 months a year, Friden office managers, trainees, salesmen or servicemen and executives from all walks of business and government attend center classes.

Courses run from five days (for customer-prospect sessions) to 14 weeks (for an exhaustive service training rundown on equipment.) The center contains more than $700,000 worth of IDP equipment. Practical experience is the keynote and students actually operate the equipment under the direction of a specially trained faculty. Tuition is borne by the various companies and the center cost of a five-week course—$2,500.)

K-STATE FACULTY NOW PREPARING FOR 650

Plans to install an IBM 650 at Kansas State College this summer include intensive training, now in progress, of science, engineering and mathematics faculty members. Approximately 80 K-State engineers, physicists, chemists, mathematicians and statisticians have received 24 hours of instruction during a special two-week course. This has been followed by a series of weekly seminars. The school presently has a small analog computer, constructed by two staff members. It has 54 amplifiers, 16 of these capable of integrating operations; four servo multipliers, and a matrix board with 75 additonal potentiometers.

SMU USING UNIVAC SCIENTIFIC 1103

Professors and students at Southern Methodist University are using a Univac Scientific (1103) for academic research and training in their computer center. Projects are now under way in engineering, mathematics, psychology, law, religion, management and other subjects. The 1103 is provided for qualified projects of other universities, business and industry. The unit was installed last fall through a contractual agreement with Remington Rand.

NORTHEASTERN OFFERS MANY DATA COURSES

At Northeastern University's Evening School of Business, an extensive array of electronic data processing courses are currently being offered. Among these are "Electronic Data Processing for Business," "Advanced Data Processing for Business," "E. D. P. M.—Feasibility Studies," "Punch Card Accounting," "Office Systems and Procedures" and "Systems Analysis and Procedures."

COMMUNICATION BETWEEN REMOTELY LOCATED DIGITAL COMPUTERS

by GEORGE F. GRONDIN and FRANK P. FORBATH

(This article was originally presented as a paper by the authors at the Eastern Joint Computer Conference in Washington, D. C., Dec. 12, 1957. George F. Grondin and Frank P. Forbath are employed at the Collins Radio Co. Western Division in Burbank, California. Kineplex, mentioned in the article, is patented by Collins Radio.—Ed.)

The usefulness of complex data processing centers can be increased by rapid and accurate communication between remote locations. The problems encountered in the data transfer are not new to the communicator, however, the familiar characteristics of the communications link assume increased significance when the digital nature of the data, the high information rate and the required degree of accuracy are considered. The stringent requirements demand that the communication system place special emphasis on providing maximum utilization of channel capacity, on minimizing the raw error rate, and on using special coding techniques to achieve unprecedented error detection.

The reliability achieved even by near-optimum communications systems falls short of the accuracy demanded. In spite of the communication link's limitations, the desired degree of accuracy is attainable by error detection techniques and data repetition. The burden of error control as well as the task of providing compatibility between the various data sources and the transmission equipment falls on special converters (input-output devices). Their design is dominated as much by the inherent limitations and peculiarities of the communication system as by the characteristics of the data source. One such special converter intended for high speed punched card transmission over voice quality circuits is described and illustrates how a particular combination of parameters meets this specific requirement.

Since common wire line facilities represent a vast available network, economical data transmission depends on efficient utilization of the voice channel. Unlike speech, the inherent redundancy of digital data is extremely low and a single error may cause misinterpretation. Therefore, three important properties the transmission equipment must have are: (1) efficient utilization of bandwidth, (2) minimum binary error rate in presence of noise, (3) low undetected error probability. The first two are related to the binary communication system while the third is achieved by redundancy and coding techniques.

The system's basic error rate of susceptibility affects the information rate. It determines the percentage of data which needs to be retransmitted or corrected and the amount of redundancy that must be added to detect erroneous data. Although, theoretically any desired accuracy can be attained, the complexity and cost of doing so are directly related to this factor, and may be prohibitive.

Any error detection method should meet system requirements with minimum redundancy, simplicity of coding and freedom from systematic errors.

A communication system known commercially as Kineplex which uses "predicted wave" techniques is particularly well suited to digital data transmission. Its theory of operation and performance characteristics over radio circuits have been described in several papers.* 1, 2, 3.

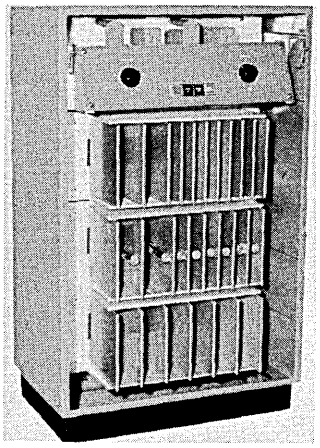


Fig. 1: TE-206 Kineplex Data System (above)

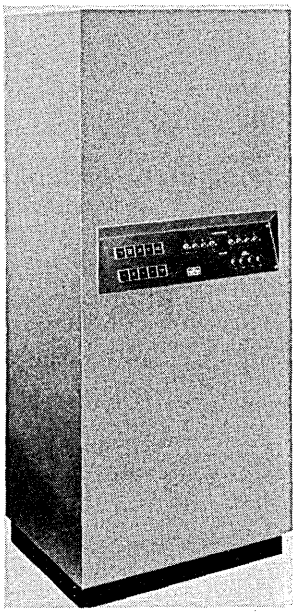


Fig. 2: Kinecard Converter (right)

Kineplex lends itself to frequency, time and phase multiplexing for spectrum conservation; near zero crosstalk between adjacent channels is effected by synchronous keying and sampling of infinite-Q detection filters. The de-

*1. "Binary Data Transmission Technique For Linear Systems"—Doelz, M. L., Heald, E. T., Martin, D. L.—Proc. of IRE. Vol. 45, No. 5, May 1957

*2. "Predicted Wave Signalling"—Collins, A. A., and Doelz, M. L.—Collins Radio Company. June 20, 1955

*3. "Kineplex, A. Bandwidth Efficient Binary Transmission System"—Mosier, R. R., and Clabaugh, R. G.—AIEE Transactions (not yet published)

tection method provides perfect integration of the signal over the pulse duration while noise which lacks phase coherence is increased only on a rms basis. Phase shift coding permits two independent bits of information to be encoded on each pulse by resolution of phase into quadrature components. Thus, predicted wave detection yields a gain in S/N accompanied by a lowering of usable signal threshold and a narrowing of the required bandwidth.

The above techniques have been applied in the design of the TE-206 Kineplex Data System, (fig. 1) a general purpose, high speed binary data transmission system for voice quality circuits. It features efficient band-

TRANSMISSION SYSTEM DETECTED BIT ERROR RATE	10^{-3}	10^{-5}
% CARDS IN ERROR (OFF-SET)	60%	1%
NUMBER OF ERRONEOUS CARDS UNDETECTED	1 IN 20	1 IN 200,000

Fig. 3: Error rate versus data accuracy

width utilization, low susceptibility to noise, adaptability to use with a wide variety of inputs, and parallel data transmission. Its proven superior performance is derived from the phase shift keying and the ideal detection techniques summarized and referenced above.

Specifically, it accommodates 2400 bits per second within a 2200 cycle minimum bandwidth. It provides eight parallel input channels and can therefore accept 8-bit characters at a rate of 300 per second. Each of the four tones, spaced 440 cycles apart, carries information from two input channels; the actual tone frequencies are determined by the line characteristic. To accommodate a majority of known facilities tone frequencies of 935 cps, 1375 cps, 1815 cps and 2255 cps were selected for the TE-206. The 3.3 msec. pulse length was selected to be several times longer than the expected duration of impulse noise, longer than the incremental delay distortion across the band of unequalized voice circuits and yet short enough to provide frequency error tolerance for carrier systems.

Since data can be handled in parallel by the transmission channels, the necessity of parallel to series conversion is avoided and the cost and complexity of associated converters is reduced.

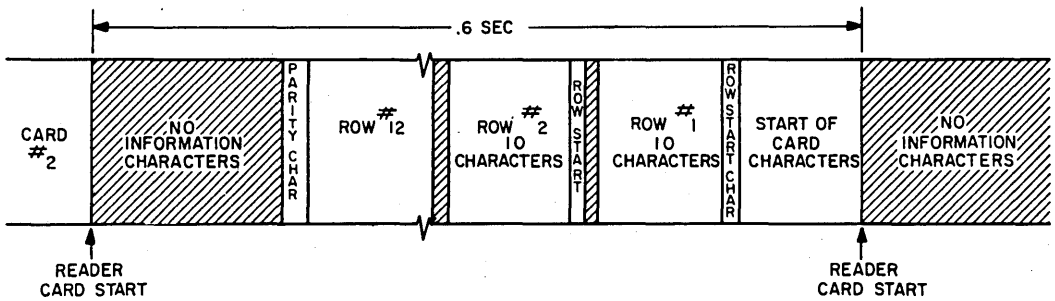
The wide use of the punched card as a versatile and reliable source document has produced the need to duplicate its information content at remote locations. The KINECARD converter system permits continuous and accurate transmission of scientific and business data from punched cards over common voice facilities. It illustrates how the various design parameters can be combined to maximize performance feasibly and economically.

Punched cards are processed at a nominal rate of 100 cards per minute. This makes possible on-line use of IBM 523 Gang Summary Punches for local reading and remote punching of cards. Data is accepted from the card reader, indexing markers and check characters are added and the information is presented as synchronous 8-bit characters suitable for Kineplex transmission equipment; at the remote end, the data is stored until required by the punch, its validity is checked, cards are punched and erroneous ones are off-set. Operation is continuous without provision for answer-back or automatic fills.

Other than establishing a communication link prior to a card run, no special operational procedures are needed. Interlocks prevent initiation of a run unless Kineplex, Kinecard and IBM punch are ready. The converter controls parallel the punch controls and the system can be operated from either.

It may be fairly stated that if cost and complexity are not considered, just about any combination of operating features may be provided. Features which were considered in Kinecard were code translation, format control, card verification, automatic error correction, and interchangeability of terminal devices. In its present form, Kincard is a special purpose device having reasonable efficiency and error detection for wire line applications.

Fig. 4: Transmitted card format



The punched card code contains twelve elements per card column to accommodate about 50 alphabetical, numerical and special characters. The 12-bit coding could be translated to a 6-bit code thus doubling the information rate of the transmission system. However, most card readers present the data row by row, 80 bits at a time, so that characters represented by each column cannot be fully interpreted until a whole card has been read and stored. Transmitting as-is, on a row by row basis eliminates extensive storage and code translating circuits.

The card reading and punching operations are not verified even though 2 or 3 machine errors per 10,000 cards are possible. Since these errors are not introduced nor aggravated by the communication equipment, their detection should be by accounting-type cross checks.

The error detection scheme takes into account the nature of the noise over wire lines and the related error probabilities introduced by the Kineplex equipment in deriving its phase reference. The impulse noise which may affect all channels and the possibility of occurrence of adjacent bit errors are countered by deriving two separate lateral parity check bits on each channel.

Assuming random error distribution the number of erroneous cards, detected and undetected, is tabulated as a function of system error probability. (Fig. 3.)

Operational tests are planned to determine the effectiveness of the error detection. If additional protection is required there is ample time between each card transmission to add more check bits.

Reference to the transmitted card format (Fig. 4) will help clarify operation of the converter.

Several control signals are derived from the card reader to indicate the start of the card reading cycle and to identify each row of information.

A reader card start impulse initiates the emission of several "start of card" characters which serve to index the remote punch control equipment.

As each row of information becomes available from the reader it is transferred into eight 10-bit shift registers. A row start character precedes each row transmission cycle which consists of reading out all eight registers in parallel with synchronous pulses derived from Kineplex. The register is emptied before the next row is presented by the card reader.

At the end of the 12th row the parity checks are inserted. Two parity check characters are obtained from alternate data characters; two bits per row are derived. Each bit is formed by adding the number of punches and complementing to an even multiple of two. Figure 5 is a simplified block diagram of the converter.

Since the reader undergoes speed variations, synchronization is achieved by inserting no-information characters between rows and between cards as required.

The remote punching is essentially reader controlled. The effective reader card rate is made less than the slowest possible punch rate of 97 cards per minute by delaying the start of each reading-cycle; this is accomplished by control of a 14-point clutch, a standard modification of the IBM 523 punch.

At the receiving terminal, card and row start markers are identified and they control the assembly of the incoming data into a magnetic core memory. The memory capacity is 72 characters. The punch operation is started when sufficient data has been stored in the memory to assure that the punch will not overtake the incoming information even if it is running at its fastest tolerance of 107 cards per minute.

An 80-bit storage register assembles a full row from the memory. The punched card is reproduced row by row. If the parity checks indicate an error, the punched card is offset in the stacker.

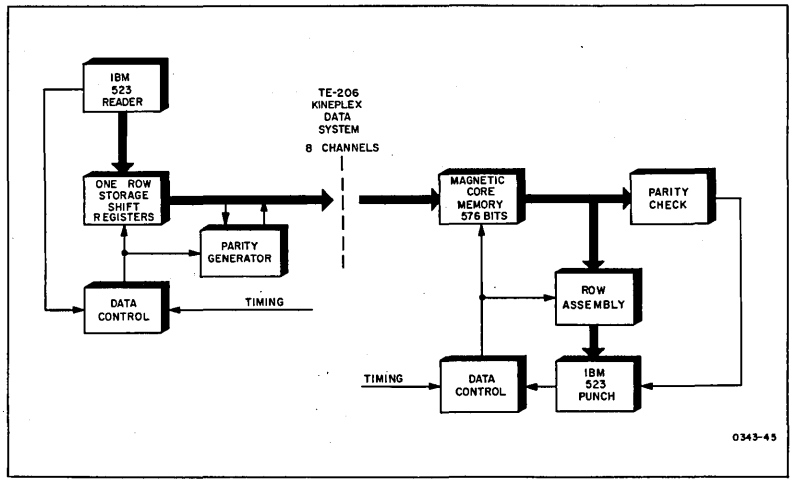


Fig. 5: Kinecard converter simplified block diagram

The converter is completely transistorized including the punch magnet drivers. Construction is modular and consists of printed circuit cards many of which are identical. A complete transmit and receive terminal is contained in a 5½ foot cabinet.

Reliable communication between digital computers and on-line use of business machines utilizing wire line and radio facilities can be accomplished with efficient data transmission systems and special purpose converters.

Economic considerations, clarifications of use requirements, lack of common language, format and data rate standardization, incompatability of equipments and operational inexperience are some of the limiting factors.

The Kineplex data transmission system provides a common signalling method for use with a variety of existing and future input devices which want to take advantage of available voice channels.

The Kinecard converter increases the speed of transmission of punched card data to the usual operating speed of punching machines thereby permitting on-line use.

DATAMATION *book capsules*

LOGICAL DESIGN OF DIGITAL COMPUTERS by Montgomery Phister, Jr., 1958, John Wiley & Sons, Inc., 440 Fourth Ave., New York City 16, 408 pp., $10.50.

Using synchronous circuit components almost entirely, this book describes and interprets the methods and techniques of various men in the field and applies them to a wide variety of problems in the logical design of digital computers. The book provides information, tools and procedures needed to carry out the complete logical design of a general or special-purpose computer.

Of particular interest are discussions of the Veitch Diagram method of simplification of Boolean equations, the "difference-equation" approach to memory elements, the Huffman-Moore model of digital systems, the complete solutions to flip-flop input equations, and a mathematical introduction to Boolean algebra.

A SECOND SURVEY OF DOMESTIC ELECTRONIC DIGITAL COMPUTING SYSTEMS by Martin H. Weik, 1957, Office of Technical Service, U. S. Department of Commerce, Washington, D. C., 440 pp., $7.00.

Engineering and programming characteristics of 103 different electronic digital computing systems are presented in this second survey (the first, 1955) compiled by the Ballistic Research Laboratories. Information presented covers application, numerical and arithmetic characteristics, input, output and storage systems, construction and checking features, power, space, weight and personnel requirements, production records, cost and rental rates, sales and lease policy, reliability and operating experience, engineering modifications and improvements, and other related topics.

An analysis of the survey data, fifteen comparative tables, a discussion of trends, a bibliography, and a complete glossary of computer engineering and programming terminology are included.

Additional features and remarks at the end of each system section provides the reader with practically all that could be presented in print to assist in choosing a system for any application.

COMPANY INVESTIGATIONS OF AUTOMATIC DATA PROCESSING by Peter B. Laubach, 1957, Division of Research, Harvard Business School, Soldiers Field, Boston 63, Mass., 258 pp., $3.00.

Laubach's book reports the results of one of a series of studies conducted as part of the data-processing research project of the Harvard Business School. It details approaches taken by various companies in investigating their data processing needs to determine what, if any, automatic equipment they should acquire. The author considers the fact that administrative problems might arise in connection with installing and operating new equipment and systems.

ADVANCES IN DOCUMENTATION AND LIBRARY SCIENCE, Jesse H. Shera, general editor, Interscience Publishers, Inc., 250 Fifth Ave., New York City 1, two volumes. Vol. 1, PROGRESS REPORT IN CHEMICAL LITERATURE RETRIEVAL, Gilbert L. Peakes, Allen Kent and James W. Perry, editors, 217 pp., $4.75. Vol. 2, INFORMATION SYSTEMS IN DOCUMENTATION, Shera, Kent and Perry, editors, 639 pp., $12.00.

Volume 1 contains the proceedings of two symposia of the Division of Chemical Literature, American Chemical Society, presented in 1955 and 1956. The papers of these symposia have been merged into a sequence designed to lead the reader from basic principles, to basic functions of various indexing tools, to practical applications of these principles and tools, and finally to research in progress in the indexing field.

Volume 2 records the papers presented during the Symposium of Systems for Information Retrieval held under the auspices of the School of Library Science of Western Reserve Univ. and of its Center for Documentation and Communication Research, April, 1957. Over 30 papers were presented at this symposium describing systems ranging from those based on traditional library techniques—through applications of punched cards and mechanical sorting based on machine coding—to prospective applications of photography, telecommunication, telefacsimile and computer-like mechanisms whether used separately or in any combination.

MICRORECORDING: INDUSTRIAL AND LIBRARY APPLICATIONS by Chester M. Lewis and William H. Offenhauser, Jr., 1956, Interscience Publishers, Inc., 250 Fifth Ave., New York City 1, 456 pp., $8.50.

This book sets forth in only broad outline the more important criteria of microrecording and of typical significant accomplishments made to meet them. The tabular data that describe equipment, while extensive for the more specialized forms, make no attempt to cover equipment used in common with other fields.

The objectives of the authors will have been met if a user, after reading this book, is able to determine and evaluate the primary considerations of his immediate problem. With suitable training in documentation procedures, the user will be in a position to know where additional data essential to the solution of his problem may be successfully sought.

ERRATA: An incorrect price was quoted for a book listed among those reviewed in the January/February issue. INSTALLING ELECTRONIC DATA PROCESSING SYSTEMS by Richard G. Canning, 1957, John Wiley & Sons, Inc., 440 Fourth Ave., N. Y. C. 16, sells for $6.00 per copy, not $16.00. Our apologies.

new DATAMATION literature

ENGINEERING REPORT: This is a 58-page report on 11 panel sessions, six of them dealing directly with computer use. Its title: "Report of National Conference on Increasing Highway Engineering Productivity." Panels one, two and three deal with the use of electronic computation: to expedite highway location and design; in bridge design and bridge geometrics; and in traffic studies, traffic simulation and research analyses. Panel four treats with the organization of a computer division, panel five with progress in developing computer programs and centers, and panel seven with development and instrumentation of a photogrammetric-electronic computer system for highway location and design. For copy write BUREAU OF PUBLIC ROADS, U. S. DEPARTMENT OF COMMERCE, Washington, D. C. (Attn: H. A. Radzikowski, Chief, Division of Development, Office of Operations.)

RUSSIAN-ENGLISH SOLID STATE GLOSSARY: This glossary contains over 4000 terms, culled primarily from several thousand pages of the most recent issues of Soviet physics journals. Included are terms in solid state theory, crystallography, semiconductors, etc., as well as terms in general quantum theory. Price — $10.00. For copy write CONSULTANTS BUREAU, INC., 227 W. 17th St., N. Y. 11, N. Y.

CATALOG DIRECTORY: This firm has issued a new, annotated directory of its technical catalog. The "Selectalog" is a 20-page, four-color booklet intended as a reference index for those concerned with modern electric circuitry and constitutes a digest of solderless termination techniques. The work also offers information on the firm's world-wide research and testing program. For copy write AMP INC., Harrisburg 30, Penna.

Circle 202 on Reader Service Card

MAGNETIC TAPES: A helpful new guide for selecting the right magnetic tape for your recording needs called "Which Tape Type Are You?" is now available. It illustrates the outstanding features of eight magnetic tapes for audible range recording with a "one man rogue's gallery" series of photos. In addition, the 16-panel accordion type folder provides descriptions of each of the tapes including such things as playing time, special features, backing thickness and applications. Accessory items are described and illustrated and a convenient playing time chart and tips on dry lubrication are included. For copy write MINNESOTA MINING AND MANUFACTURING CO., 900 Bush Street, St. Paul 6, Minn.

Circle 203 on Reader Service Card

DELAY LINE: This four page folder explains how the manufacturer uses a modified lattice arrangement in this delay line, based on the Fourier transform of the required pulse responses, instead of the ladder concept. Specifications are included for the L 10 and one page, illustrated with schematic drawings, gives the principle of operation. For copy write FERRANTI ELECTRIC, INC., Electronics Div., 95 Madison Ave., Hempstead, L. I., N. Y.

Circle 204 on Reader Service Card

COMPUTER INSTALLATION: A 13-page report entitled "A Case Study of the Ramac Installation for Inventory Control at Square D Company" has been issued. As the title indicates, this is an account of how a medium sized electronics firm chose a computer best suited to its needs. The first two sections of the report outline the problem and detail early preparations for the computer. The final six pages are devoted to the methods of programming adopted. Four charts are included. For copy write SQUARE D COMPANY, 4041 N. Richards St., Milwaukee 12, Wis.

Circle 205 on Reader Service Card

DIGITAL STRAIN GAGE MEASUREMENTS: A new four-page technical brochure "The Resistance Bridge Indicator and Its Applications" suggests many applications of this instrument which can be calibrated to indicate directly in microinches of strain, psi, pounds, ft. pounds, etc., depending upon the type of strain gate type transducer being used. Included is a simplified schematic diagram to show how the "shunting effect" across the transducer bridge is always the same regardless of the position of the follow-up potentiometer in the dual-potentiometer circuit. Another schematic illustrates how millivolt signals may be measured. The text discusses how this instrument, when supplied with an analog to digital shaft converter, becomes the heart of a multi-channel automatic digital recording system. For copy write DATRAN ELECTRONICS, 1836 Rosecrans Avenue, Manhattan Beach, California.

Circle 206 on Reader Service Card

PROJECT DATUM: This publication has been prepared for the information of engineers concerned with data acquisition and data processing. It describes the data acquisition and processing system known as Project Datum which is under development for the Air Force Flight Test Center at Edwards Air Force Base, California. For copy write ELECTRONIC ENGINEERING CO. OF CALIFORNIA, 180 S. Alvarado St., Los Angeles 57, Calif.

Circle 207 on Reader Service Card

READOUT DEVICE: Catalog Sheet 32A100 describes a new device which converts a shaft position representing the analog value of a variable into a coded digital output. The output of model 32AA2 can be fed into an electric typewriter, tape punch, computer, or printer. For copy write FISCHER & PORTER, 542 Jacksonville Road, Hatboro, Pa.

Circle 208 on Reader Service Card

CURRENT PULSE GENERATOR: Bulletin 57-C describes a high frequency (up to 500 kc) current pulse generator, which is capable of high current outputs (up to 3 amperes). The 2 page illustrated bulletin also points out that Model 1050 high impedance current pulse generator is unique among current pulse sources for research and analysis of magnetic logic elements and digital systems. Also included are brief descriptions of component circuits and complete specifications. For copy write RESE ENGINEERING, INC., 731 Arch Street, Philadelphia 6, Pa.

Circle 209 on Reader Service Card

INFORMATION SYSTEMS: A new concept, according to the manufacturer, incorporating a solid-state digital computer with magnetic core memory designed specifically for industrial data processing and "on stream" computation is detailed in technical bulletin 103. Following an introduction, sections are presented in the four-page folder on computational flexibility, programming flexibility, economic justification and specifications. The bulletin is illustrated. For copy write DAYSTROM SYSTEMS, division of DAYSTROM, INC., 5640 La Jolla Blvd., La Jolla, Calif.

Circle 210 on Reader Service Card

MAGNETIC TAPE: In this 16-page, two-color booklet, many uses for magnetic tape are explained and illustrated in a fresh and original manner. Typical titles of the sections: "How to Record 420 Channels of Simultaneous Data," "How to Cope With an Avalanche of Urgent Data," "How Magnetic Tape Converts Blueprints to Parts" and "How to Speed up a Digital Computer." For copy write AMPEX CORP., 934 Charter St., Redwood City, Calif.

Circle 211 on Reader Service Card

INDICATORS: Technical catalog 1015, 12 pages, describes construction, operation, specifications and typical applications of these plug-in indicators for data display, storage and transfer. For copy write UNION SWITCH AND SIGNAL—Division of WESTINGHOUSE AIR BRAKE CO., Pittsburgh 18, Penna.

Circle 212 on Reader Service Card

FILM LIBRARY INSTANTANEOUS PRESENTATION: This automatic microfilm searching machine is described in an eight-page illustrated booklet. According to the manufacturer, FLIP is a substantial step towards the solution of the problem of information retrieval involving large masses of documents. The booklet contains a complete system description and two pages of questions and answers. It also contains a summary specification sheet. (For more on this subject, see Book Capsules.) For copy write BENSON-LEHNER CORP., 11930 W. Olympic Blvd., Los Angeles 64, Calif.

Circle 213 on Reader Service Card

THREE-DIMENSIONAL FLIGHT SIMULATOR: The expense of testing missiles, aircraft navigational systems and associated components is costly when actual flight tests are used to prove each item of airborne equipment. This expense can be materially reduced through the use of a three-dimensional flight simulator comprised of a three-axis flight table and a complementing analog computer. A description of the system and its application are explained in a 24-page, illustrated bulletin now available. For copy write BENDIX COMPUTER DIVISION, 5630 Arbor Vitae St., Los Angeles 45, Calif.

Circle 214 on Reader Service Card

SOVIET IGY ACTIVITIES: "Soviet Bloc International Geophysical Year Information," PB 131632, is a weekly report of Soviet block IGY activities. The reports contain information selected and translated from foreign-language publications regarding Soviet bloc plans and endeavors in rockets and artificial earth satellites, upper atmosphere, meteorology, oceanography, latitude, seismology, glaciology and other subjects. For copy write OFFICE OF TECHNICAL SERVICES, U. S. DEPARTMENT OF COMMERCE, Washington 25, D.C.

MEMORY SYSTEMS: Five transistorized magnetic core memory systems are detailed in technical bulletin 104, four pages. An illustrated explanation of the general concept is followed by specific details of the ferrite core magnetic memory plane, transistorized high-current switch, transistorized sense and strobe amplifier, and transistorized high-current driver. Each system is accompanied by a photograph. For copy write DAYSTROM SYSTEMS, division of DAYSTROM, INC., 5640 La Jolla Blvd., La Jolla, Calif.

Circle 215 on Reader Service Card

GENERAL DESCRIPTION: Basically, this system consists of a shaft position encoder that operates in conjunction with a translator unit. This translator unit is of a type that utilizes long life telephone-type relays to decode the encoder information into decimal contact closures. To provide for long encoder life the relays in the translator unit are not operated directly from the encoder but utilize a transistor buffer amplifier that operates the relays, and thus eliminates the necessity of the encoder contact having to handle the "make and break" currents required by the relays. For copy write DATEX DIVISION, G. M. GIANNINI & CO., INC., 1307 S. Myrtle Ave., Monrovia, Calif.

Circle 216 on Reader Service Card

DC INSTRUMENTATION AMPLIFIERS: Complete performance data, specifications, illustrations and graphs are featured in this six-page, two-color brochure. Discussed at some length are construction, stability, offset control, dynamic compression, low noise strain-gage input circuit, output limiting and high current output. A summary of typical dc amplifier models is also included. For copy write DYNAMICS INSTRUMENTATION CO., division of ALBERHILL CORP., 1118 Mission St., South Pasadena, Cal.

Circle 217 on Reader Service Card

MULTI-CHANNEL PULSE HEIGHT ANALYZER: A new bulletin notes the features and applications of the Model PA-400 fifty-channel analyzer. According to the bulletin, pulse height analyzers are used in nuclear energy spectrometry, time-of-flight spectrometry, statistical data analysis, vibration analysis, nuclear chemistry analysis, and millimicrosecond time interval measurements. The illustrated bulletin carries specifications, and physical and electrical descriptions of the component parts of the various modules that go into the complete unit. For copy write ELDORADO ELECTRONICS, 2821 Tenth Street, Berkeley, Calif.

Circle 218 on Reader Service Card

BALL BEARINGS: Now available is the 1958 version of a 24-page bulletin describing miniature ball bearings used in the instrumentation, computer, aviation, guided missile and other industries which utilize rotating or oscillating miniature components. Detailed is a full line of bearings which range in size from 3/8 in. to 1/10 in., outside diameter. Information is included on standard radial miniature bearings including bore dimension charts on all radial types such as radial retainer, flanged, single and double shield, single and double shield flanged, high speed and flanged high speed. For copy write MINIATURE PRECISION BEARINGS, INC., Keene, N. H.

Circle 219 on Reader Service Card

PUBLICATIONS: Now available is a 12-page catalog listing recommended standards, specifications and engineering publications with alphabetical index. Publications are listed by number, title, date and price and are found in several classifications. For copy write EIA ENGINEERING OFFICE, Room 650, 11 W. 42nd St., New York 36, N. Y.

Circle 220 on Reader Service Card

Important dates in DATAMATION

April 10: *Production Engineering Conference,* Theme: "New Techniques for Production and Inventory Control," Bancroft Hotel, Worcester, Mass. Sponsored by the Production Engineering Division, ASME.

April 10-12: *Tenth Southwestern IRE Conference and Electronics Show,* St. Anthony Hotel and Municipal Auditorium, San Antonio, Texas.

April 14-18: *EDP Course 10,* "Electronic Data Processing for Business and Industry," sponsored by Canning, Sisson and Associates, Hotel Biltmore, N. Y., N. Y.

April 20-23: *Symposium on Numerical Approximation,* University of Wisconsin, sponsored by Mathematics Research Center, U. S. Army. Contact Michael Golomb, Mathematics Research Center, 1118 W. Johnson St., Madison 6, Wisc.

April 21, 22: *Conference on Automation, Operations Research and Business Planning,* Morrison Hotel, Chicago, Ill. Sponsored by the University of Chicago Downtown Center. Contact the center at 19 S. LaSalle St., Chicago 3, Ill.

April 22-24: *Electronic Components Conference,* Ambassador Hotel, Los Angeles, Calif. Sponsored by AIEE, IRE, EIA and WCEMA.

May 5-7: *Conference on Automation Techniques,* Hotel Statler, Detroit, Mich. Sponsored by IRE, ASME and AIEE. Contact J. E. Eiselein, RCA Building, 10-7, Camden 2, N. J.

May 6-8: *Western Joint Computer Conference,* Ambassador Hotel, Los Angeles, Calif. Theme: "Contrasts in Computers." Sponsored by IRE, ACM and AIEE. Contact Willis H. Ware, Chairman—WJCC, The Rand Corp., 1700 Main St., Santa Monica, Calif.

May 9: *Symposium on Small Automatic Computers and Input/Output Equipment—A Report from the Manufacturers* (to be held in conjunction with WJCC). Sponsored by the Los Angeles Chapter of ACM, Embassy Room, Ambassador Hotel. Contact Fred Gruenberger, The Rand Corp., 1700 Main St., Santa Monica, Calif.

May 8-9: *Third Annual Data Processing Conference,* University of Alabama, University, Ala. Sponsored by the Alabama AIEE, SAM, CPA and NAA. Contact G. E. P. Wright at the University Extension Division, P.O. Box 2987.

May 12-16: *EDP Course 20,* "Installing an Electronic Data Processing System," sponsored by Canning, Sisson and Associates, Hotel Roosevelt, N. Y., N. Y.

May 15-16: *Annual Meeting, Operations Research Society of America,* Sheraton-Plaza Hotel, Boston.

May 21-23: *Instrumentation and Automatic Control of Power Systems—Today and Tomorrow.* Sponsored by ISA Power Division and New York Section ISA. Contact W. Welch, Long Island Lighting Co., L. I., N. Y.

May 25-28: *NOMA Office Show and Conference,* Conrad Hilton Hotel, Chicago. Contact the National Office Management Association, Willow Grove, Penna.

June 2-4: *Sixth National Telemetering Conference,* Lord Baltimore Hotel, Baltimore, Md. Sponsored by AIEE, ARS, IAS and ISA. Contact G. M. Thynell, Applied Physics Laboratory, Johns Hopkins University, 8621 Georgia Ave., Silver Spring, Md.

June 9, 10: *Canadian Computer Conference,* University of Toronto. Contact H. J. Stowe, Manufacturers Life Insurance Co., 200 Bloor St., East, Toronto 5, Ontario, Canada.

June 9-13: *International Automation Congress and Exposition,* Coliseum, N. Y., N. Y. Contact Richard Rimbach Associates, 845 Ridge Ave., Pittsburgh 12, Penna.

June 11-13: *ACM National Conference,* University of Illinois, Urbana, Ill.

June 12-14: *Ninth Annual Conference, American Institute of Industrial Engineers,* Hotel Statler, Los Angeles. Theme: "Industrial Engineering—Gateway to Productivity." Contact Stanley Wolfberg, 1409 Thayer Ave., Los Angeles 24, Calif.

June 24, 25: *Fifth Annual Symposium on Computers and Data Processing,* University of Denver. Contact C. A. Hedberg, Electronics Division, Denver Research Institute, University Park, Denver 10, Colo.

August 6-8: *Conference on Non-Linear Magnetics and Magnetic Amplifiers,* Hotel Statler, Los Angeles, Calif. Sponsored by AIEE.

August 19-22: *Western Electronic Show and Convention,* Pan Pacific Auditorium, Los Angeles. Sponsored by IRE and WCEMA. Contact Don Larson, Business Manager, 1435 S. La Cienega Blvd., Los Angeles 35, Calif.

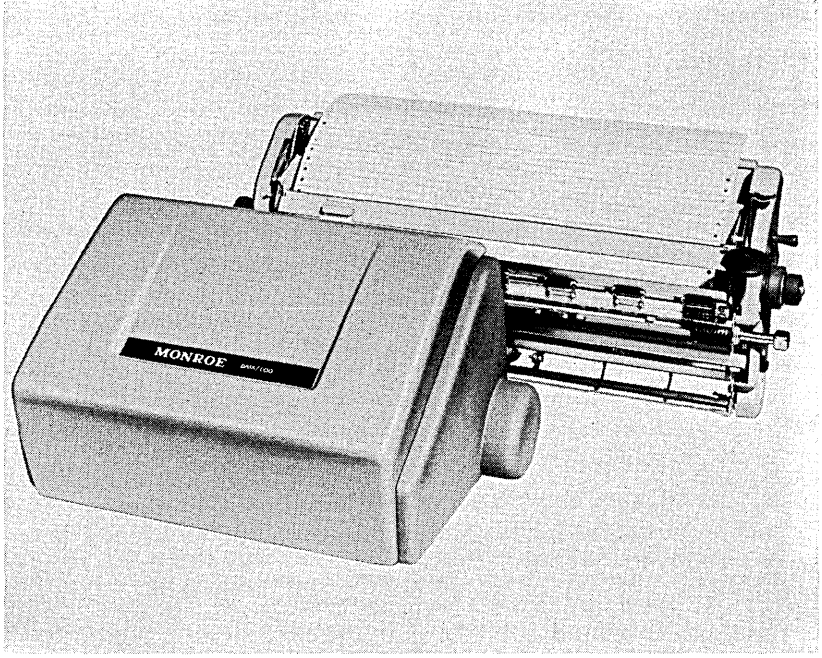
Sept. 15-19: *Thirteenth Annual Instrument-Automation Conference and Exhibit* (International), Philadelphia Convention Hall, Phila., Penna. Sponsored by ISA. Contact F. J. Tabery, 3443 S. Hill St., Los Angeles 7, Calif.

Oct. 20-24: *National Business Show,* Coliseum, N. Y., N. Y. Contact Rudolph Lang, Managing Director, 530 Fifth Ave., N. Y. 36, N. Y.

Oct. 23-25: *National Simulation Conference,* Dallas. Contact L. B. Wadel, 3905 Centenary Dr., Dallas, Texas.

Oct. 29, 30: *Fifth Annual Computer Applications Symposium,* Morrison Hotel, Chicago, Ill. Sponsored by the Armour Research Foundation.

Dec. 3-5: *Eastern Joint Computer Conference,* Bellevue-Stratford Hotel, Philadelphia, Penna.



MONROE TACKLES DATA RECORDING

A new approach to data recording has been claimed by the Monroe Calculating Machine Co., Inc. They have produced the Monroe Data Log Series MC-203, one of the series of Monroe electrically actuated printing machines. These machines have been designed specifically for use in the field of automatic data logging. The 203 units are completely equipped with their own separate power supply and control unit to assure the user of the utmost in reliability. Thus, the user needs only to supply simple external contact closures in order to operate the units at their optimum capabilities; there is no need to design a pulse and control circuit.

With a possible entry of up to fourteen digits simulanteously, and with a record paper width of eighteen inches on an automatically indexed carriage, the 203s provide higher rates of data entry, greater reliability and reduced wear due to the fewer number of operations required per data point. The entry of a number of digits simultaneously also reduces readout control circuit complexity and adds to the reliability of the system by reducing the number of operations required of the system control components.

These units are particularly adapted to large scale data logging systems, where quantities of data are to be entered on a sizeable logging sheet in a regular format. As many as 14 digits can be entered on one printing cycle, in any arrangement of 1, 2, 3, and up to 14, or in any grouping within 14 digits, such as three groups of four and one group of two. The carriage can be mechanically programmed to tabulate fixed or variable distances after any printout. The 203 carriage comes equipped with a four position carriage programming arrangement that can be manually set to any one of four different programs.

These machines are capable of a maximum of 150 printing operations a minute. Hence it is possible to obtain a speed of over 30 characters per second. With the 18 in. carriage, up to 136 characters and spaces may be printed on a single line. Optimum combination of printer and control is assured by the separate control unit and power supply. The control unit provides the proper pulse duration, currents and voltages for both keyboard and operation functions. The power supply is capable of operating the printer over a source voltage fluctuation of 100-125 volts.

The standard 203 machines require that the external data contacts be held closed approximately 250 milliseconds after start command, or until end of cycle contacts open. An alternate version is available which provides a memory circuit so that external data contacts can be released 30 ms. after the recording cycle is actuated. The data key memory can also be used to enter groups of data sequentially into the keyboard and then print all the groups at one time without moving the carriage.

THEY LET GEORGE DO IT . . .

. . . at argonne national laboratory

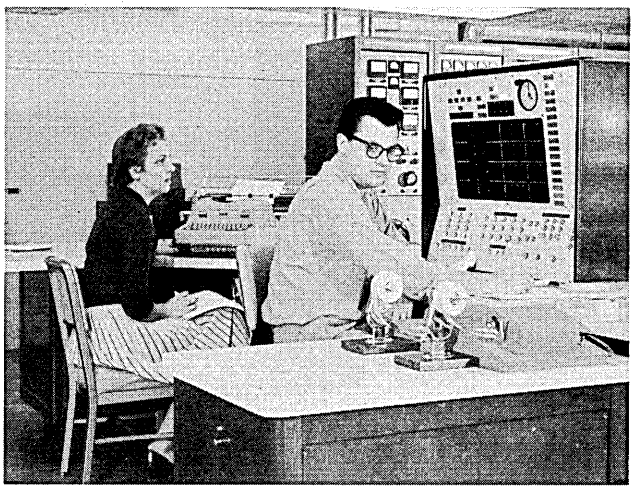
Recently, the Argonne National Laboratory in Lemont, Illinois, acquired a computer called GEORGE. It was designed and manufactured in part by the Argonne Electronics Division. GEORGE has a random-access magnetic core memory of 4,096 words of 40 binary bits. Punched tape may be fed through a high speed photo-electric reader capable of handling 200 characters per second. The reader is manufactured by Ferranti, a British firm.

A magnetic tape supplemental memory of Argonne-developed design is being constructed for GEORGE. The computer will have a floating decimal point when this mechanism is completed assembled. GEORGE is a two-address computer which can refer to two different memory locations in the course of a single instruction. It can also use one of these memory locations more than once.

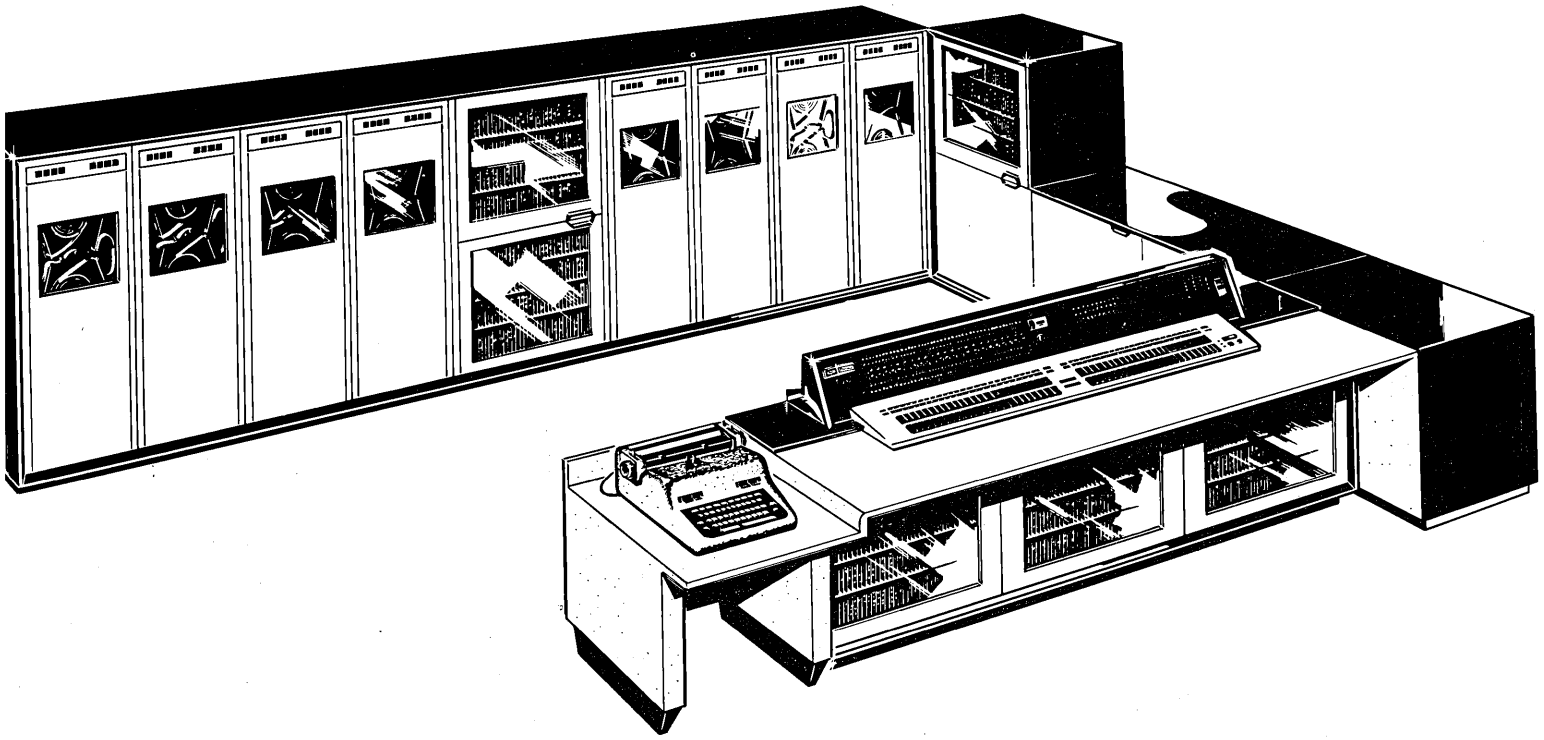
Two uses of GEORGE are being applied by Argonne scientists. One is in mathematical simulation of an experiment or piece of equipment in operation. The other is in analysis and interpretation of experimental data.

As an example of the first use, GEORGE is being used in planning a particle accelerator. With the computer, it is possible to determine what magnets of a certain design do to sub-atomic particles and, by process of elimination, to obtain the best magnet design.

Two high-speed digital computers have been installed for the Argonne Applied Mathematics Division. An IBM 704 is also in operation at the laboratory.



Miss Loretta Kassel and William Snow, programmers, check a program of instructions at the console of GEORGE, a computer recently installed at Argonne National Laboratory, Lemont, Ill. Snow is feeding punched tape through a high speed reader while Miss Kassel checks data from an electric typewriter, an output method used to obtain program results at a slower speed.



PHILCO'S TRANSAC S-2000 FEATURES HIGH SPEED

TRANSAC S-2000, a high speed electronic data processing system capable of handling business and scientific data, has been developed by Philco Corporation, Government and Industrial Division and is in production.

The high speeds are the result of Philco's surface barrier transistors and logical design concepts. The system uses a high speed magnetic core storage of 4,096 words which can be expanded in incremental blocks of 4,096 words each, up to 65,535 words. A control for input and output devices associated with the central computer operates independently of the computer's control mechanisms. This philosophy permits the user to employ various combinations of units without modification to the computer. Basically, the design of the S-2000 bears resemblance to the class of computers resulting from research by the Institute of Advanced Study at Princeton, New Jersey. The internal number system is binary and the arithmetic mode is parallel. This permits utilization of entire words at one time rather than a character at a time as is the case in serial type computers.

Thus, all operations of the central computer are asynchronous, that is, any operation starts as a result of a signal immediately after conclusion of the previous operation as opposed to waiting for equally spaced signals from a master clock.

The S-2000 arithmetic system is fixed point but a floating point system can be provided on an optional basis. The maximum addition and subtraction speed is 6.3 micro seconds (exclusive of memory access). Average is one microsecond. For division and multiplication, the average speeds are 28 micro seconds and maximum time is 245 microseconds.

Design of the S-2000 permits the use of up to 16 index registers. These registers, which facilitate programming, are used in address modification, counting, accumulating, etc., and result in saving valuable memory space.

Normal word length of the memory and arithmetic units is 48 binary bits which gives additional memory capacity depending upon the type of data being processed. For example, one word is equivalent to eight alpha-numeric binary coded characters or 15 decimal digits.

The unit's magnetic tape transport is compatible with its internal speeds. This feature is unique in the design of data processing systems. For example, reading and writing speed is 150 inches per second with a reading and writing rate of 90,000 characters per second. Tape rewind speed is 300 inches per second. It is possible to use up to 256 of these transports.

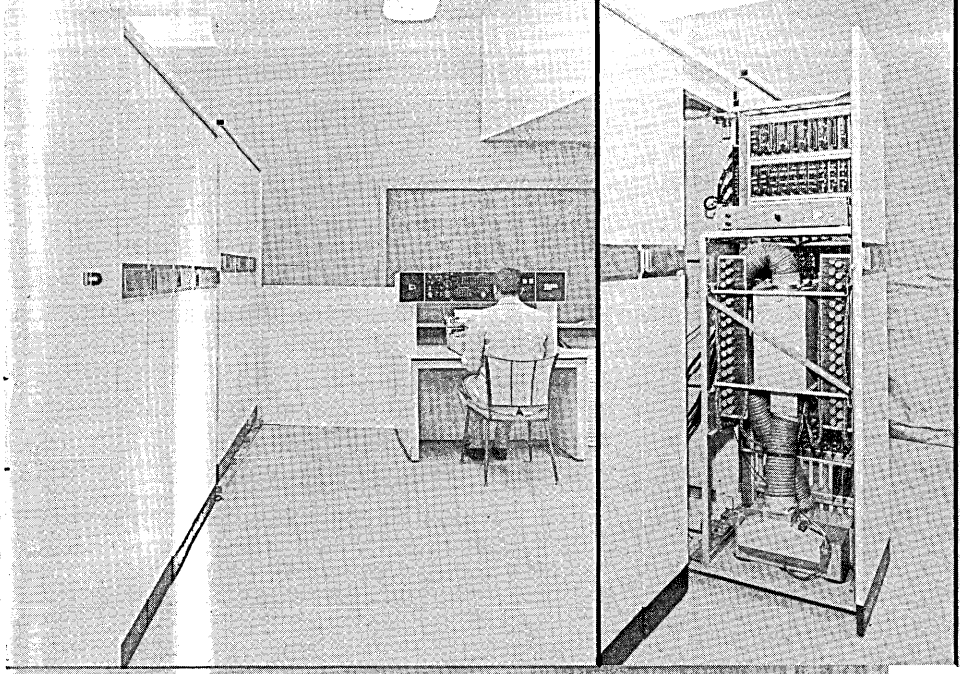
An off line search feature is available at the user's option. TRANSAC magnetic tape has a recording density of 600 characters per inch. This is made possible with "side by side" character recording.

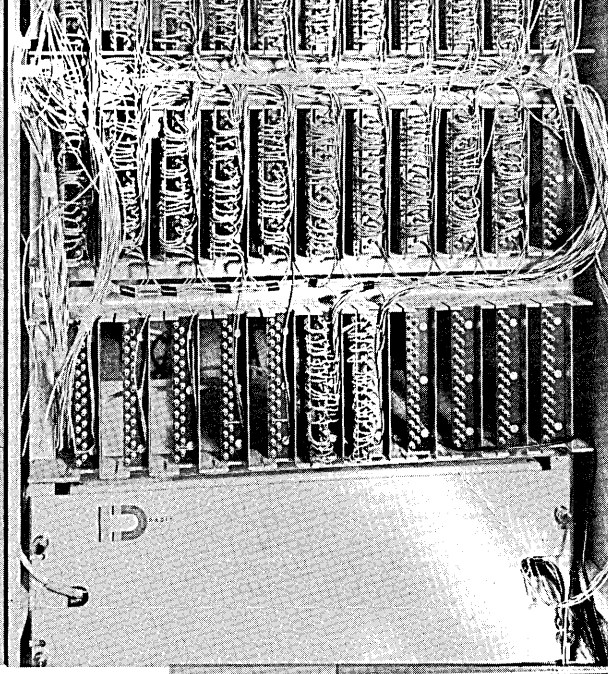
In addition, Philco offers a tape sequencing feature which permits several tape units to be operated concurrently with the arithmetic section.

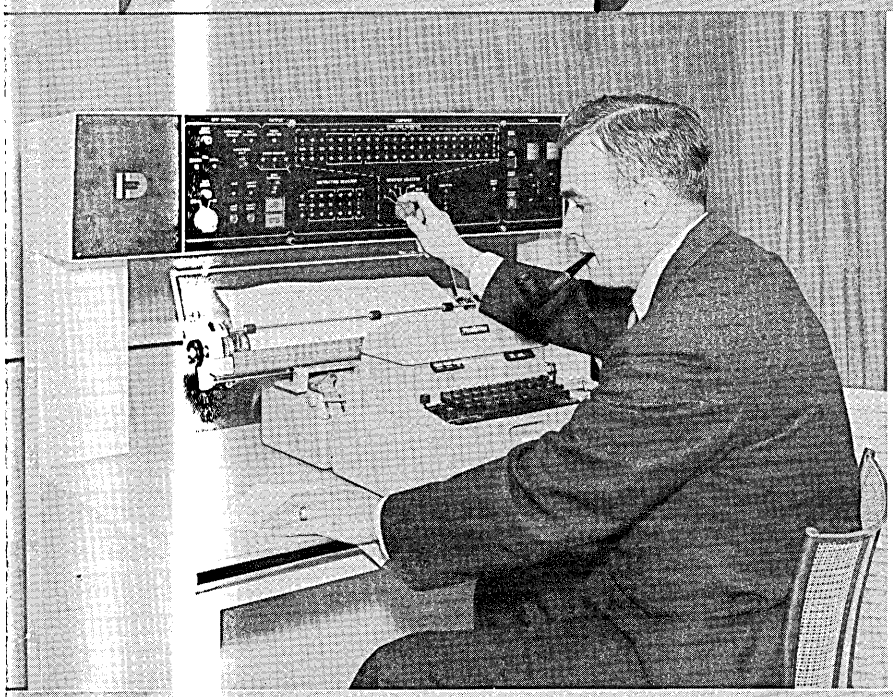
Because of the high speed transport device, Philco's magnetic tape reels contain up to 21.5 million alphanumeric characters or 129 million binary digits of information. The reels are 3,600 feet in length.

Also available is a dual purpose punch card-to-magnetic tape and tape-to-punch card conversion unit for 80 column cards, reading at 200 cards a minute and punching at 100 cards per minute.

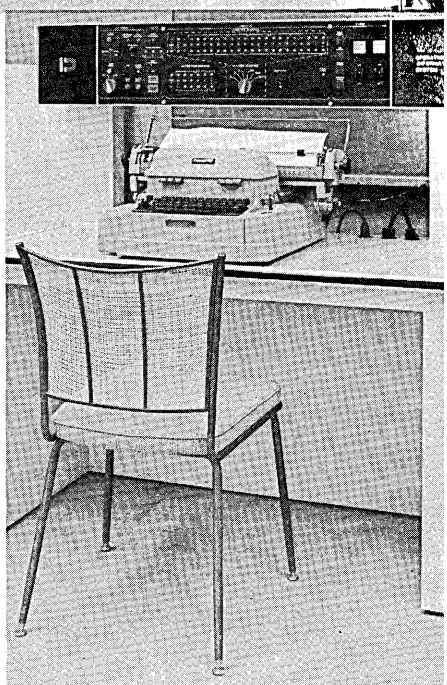
The S-2000 high speed printer prints from magnetic tape at the rate of 900 lines per minute with 120 characters on each line. The system provides for high speed skipping of up to 25 inches per second.

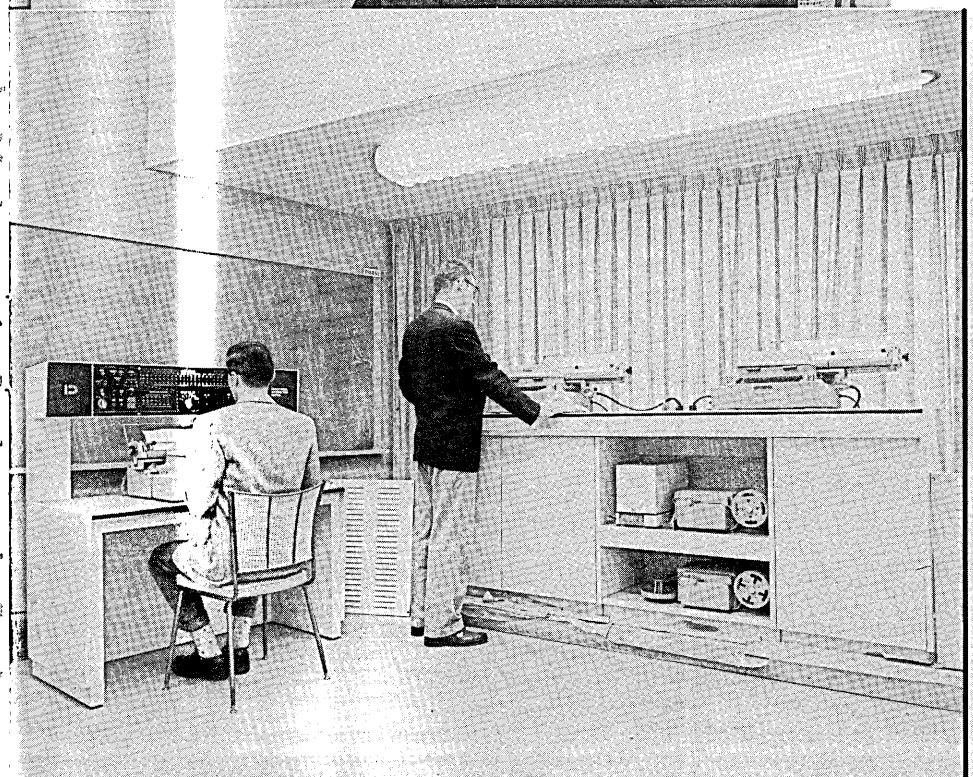


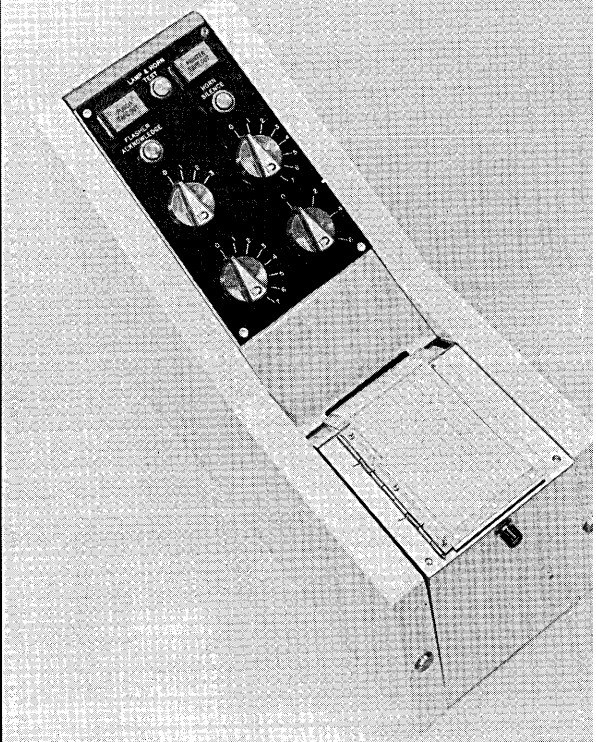




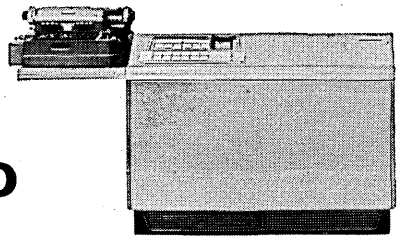
New all-transistorized computer . . . No moving parts . . . For delivery to the Louisiana Power and Light Company.







TODAY'S GREATEST VALUE IN ELECTRONIC COMPUTERS!



ROYAL PRECISION LGP-30

Compare it, feature by feature, with the other computers in its class

Feature	Computer A	Computer B	Computer C	Computer D	LGP-30	
Memory Size	220 words for data only	2160 words	1000 or 2000 words	84 words for data only	4096 words for data & program (either or both)	LARGEST CAPACITY IN ITS CLASS
Max. Speed Add Multiply	 20/sec. 4/sec.	Comparable to LGP-30	Comparable to LGP-30	 3/sec. 1/sec.	 Over 440/sec. Over 50/sec.	SPEED EQUAL TO MANY ROOM-SIZED COMPUTERS
Size	17 sq. ft.	6.5 sq. ft. plus table for typewriter.	45 sq. ft.	9.2 sq. ft. plus table for typewriter & control unit.	11 sq. ft.	COMPACT, DESK-SIZED, COMPLETELY MOBILE
Input-Output	Keyboard only — tape at extra cost.	Independent tape preparation at extra cost.	Extra cost peripheral equipment required.	Tape and typewriter for numerical input-output only. Independent tape preparation at extra cost.	Tape typewriter for alpha-numeric input-output standard equipment.	DELIVERED COMPLETE. NO ADDITIONAL EQUIPMENT NEEDED TO PREPARE DATA, PROGRAM OR REPORTS
No. of tubes	165	450	2,000	248	113	FEWER COMPONENTS MEAN LESS MAINTENANCE, FEWER CHECKOUTS
Voltage	220 V	110 V	220 V	110 V	110V	PLUGS INTO ANY REGULAR WALL OUTLET
Power	2.5 KW	3.0 KW	17.7 KW	1.65 KW	1.5 KW	NO SPECIAL WIRING OR AIR-CONDITIONING REQUIRED
Ease of programming & operation	Not alpha-numeric. No internal program storage.	Alpha-numeric at extra cost. 8 part instruction. Requires computer specialist.	Alpha-numeric at extra cost. Requires computer specialist.	Not alpha-numeric. No internal program storage.	Alpha-numeric. Complete internal program storage. Standard typewriter keyboard. Simplest command structure of all.	EASY TO PROGRAM AND OPERATE.
Cost Sale Rental	 $38,000 $1000/mo.	 $49,500 $1485/mo.	 $205,900 $3750/mo. up	 $55,000 $1150/mo.	 $49,500 $1100/mo.	LOWEST COST EVER FOR A COMPLETE GENERAL PURPOSE COMPUTER

Nation-wide sales and service. Trained staff of applications analysts. Library of subroutines available, plus programs for wide variety of applications.

For further information and specifications on Royal Precision LGP-30, call your nearby Royal McBee office, or write Royal McBee Corporation, Data Processing Division, Port Chester, N. Y.

ROYAL McBEE

WORLD'S LARGEST MANUFACTURER OF TYPEWRITERS AND MAKERS OF DATA PROCESSING EQUIPMENT

Circle 11 on Reader Service Card