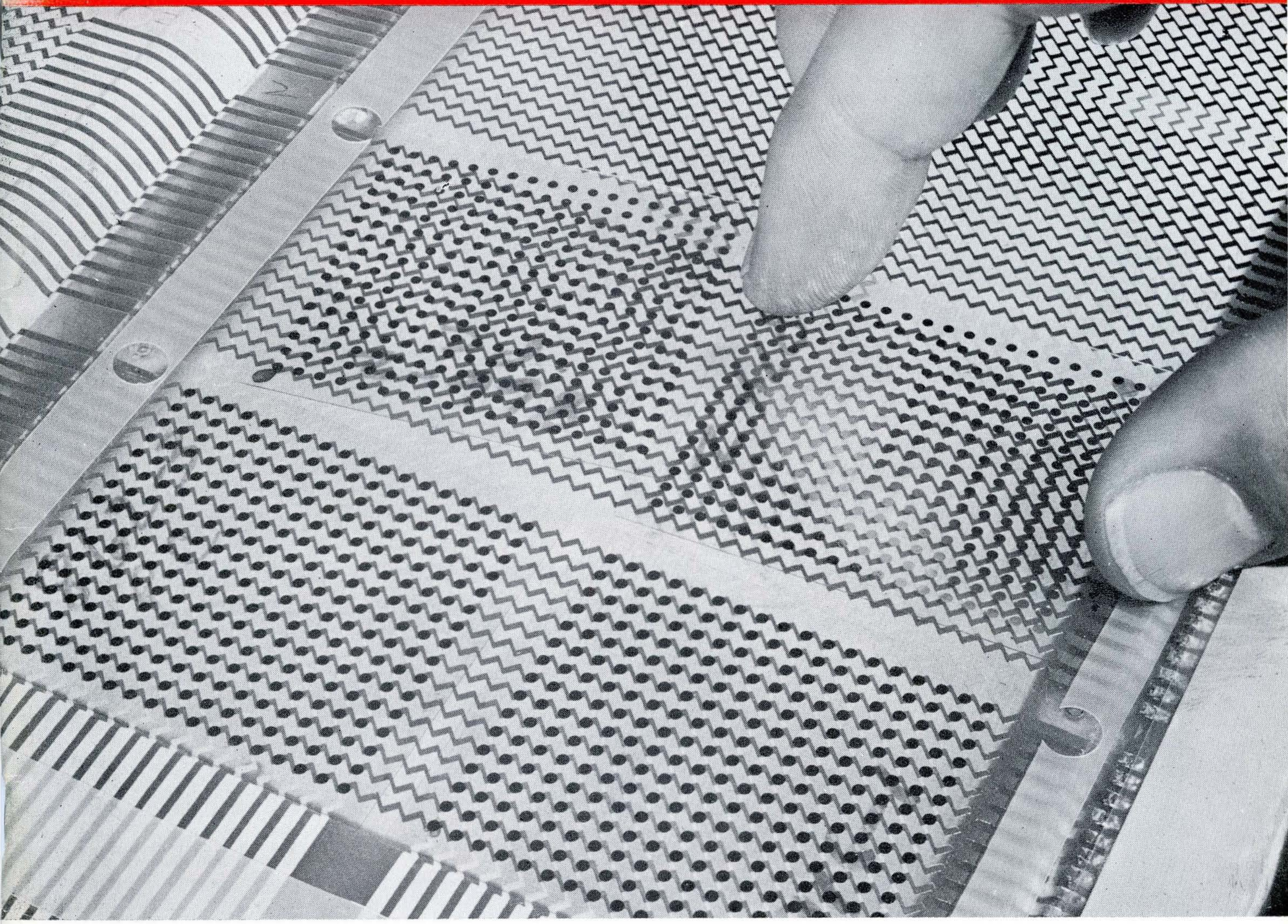
COMPUTERS
and AUTOMATION

COMPUTERS AND DATA PROCESSORS, AND THEIR CONSTRUCTION, APPLICATIONS, AND IMPLICATIONS, INCLUDING AUTOMATION



1960 PICTORIAL REPORT ON THE COMPUTER FIELD

Survey of Computing Services

Automation — Its Evolution and Future Direction (Part 2)

DECEMBER
1960
•
VOL. 9 - NO. 12 & 12B

ONLY HONEYWELL GUARANTEES ITS SYSTEMS WON'T DAMAGE YOUR TAPES!

NOW...HONEYWELL EDP SYSTEMS AIR-CUSHION MAGNETIC TAPE TO PROTECT VALUABLE RECORDS

Honeywell electronic data processing scientists have developed the world's most reliable tape drive mechanism. It virtually eliminates the common causes of tape damage which can shut down the equipment for costly minutes or hours. This new technique is so reliable that Honeywell is the only computer manufacturer that guarantees its Systems will not break or damage your tapes during processing. If they do, tapes will be replaced without charge.

NO PINCH ROLLERS — ANYWHERE. Only Honeywell 800 and 400 high-speed Systems transport magnetic tape *by air* throughout the processing cycle. Vacuum capstans take the place of old-fashioned pinch rollers, dramatically reducing wear and tear, flaking and scratching. The recording surface is touched only by the recording head and only when information is read or recorded. Since nearly every read-write error can be traced to tape surface damage, it is clear why Honeywell tape drives are intriguing managements in all parts of the business world.

ADD ORTHOTRONIC CONTROL — AND MAKE SURE. Added to this advanced technique of vacuum transport is Honeywell's exclusive Orthotronic Control, which insures uninterrupted accuracy during processing. Using Orthotronic Control, Honeywell Systems can re-create lost or damaged data instantaneously — without human aid, without reprocessing. Errors can be detected and corrected *automatically* in 1/20th of a second. Where other systems would stop and blink signals for human help, Honeywell 800 and Honeywell 400 will simply do what needs to be done and keep humming right along at top speed.

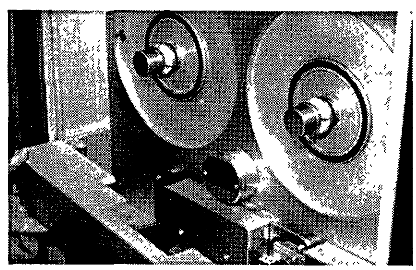
ELIMINATE UNPRODUCTIVE MACHINE TIME. This self-correcting ability plus the protection inherent in airborne tape combine to boost your profit potential on any data processing application. These Honeywell scientific advances help eliminate machine downtime, which methods men know can often cancel the economic gains of electronic data processing.

INVESTIGATE HONEYWELL 800 AND 400 SYSTEMS. Greater reliability in data recording is but one of the several major factors that multiply the cost advantages to users of Honeywell EDP Systems. If your company is now considering the move to electronics, we respectfully suggest you put Honeywell Systems at the top of your list for investigation. Our applications engineers will be glad to discuss your individual requirements.

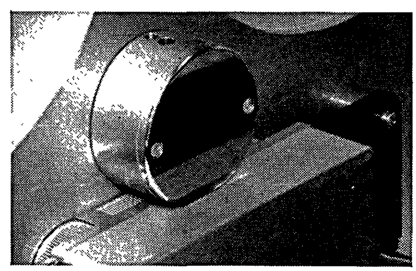
For more information, get in touch with your nearest Honeywell office. Or write Minneapolis-Honeywell, Datamatic Division, Wellesley Hills 81, Massachusetts; or Honeywell Controls Ltd., Toronto 17, Ontario.

75th YEAR PIONEERING THE FUTURE

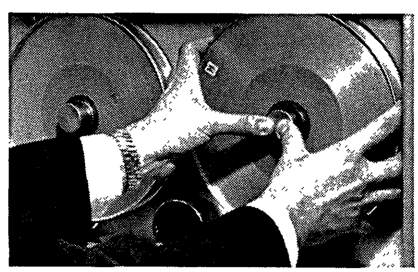
WHY HONEYWELL RECORDING TECHNIQUES ARE FASTER, MORE RELIABLE



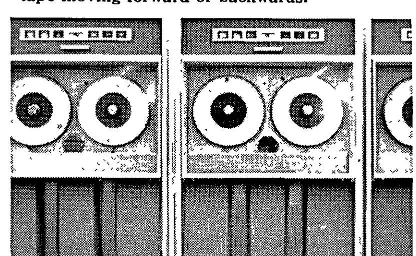
Vacuum capstans propel tape gently and precisely throughout processing cycle, removing danger of damage by pinch rollers.



Recording head alone touches recording surface of magnetic tape, reads information with tape moving forward or backwards.



Tape changes can be made in less than 25 seconds. Changes on other data processing systems often require several minutes.



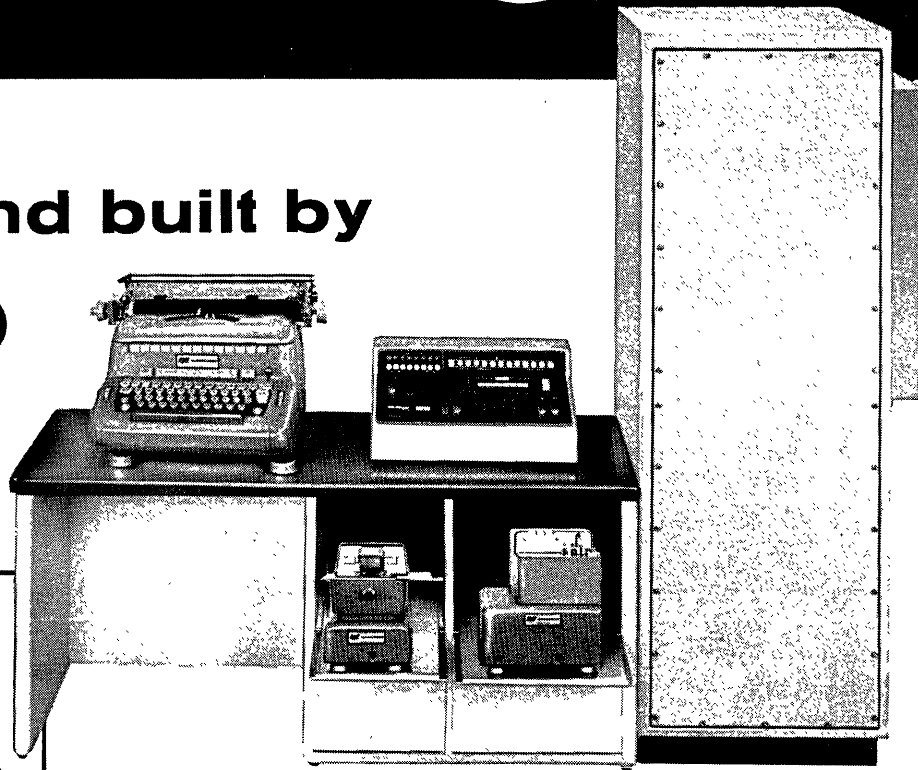
Information is read or recorded with tape moving 120 inches per second, a transfer rate of 96,000 decimal digits per second.

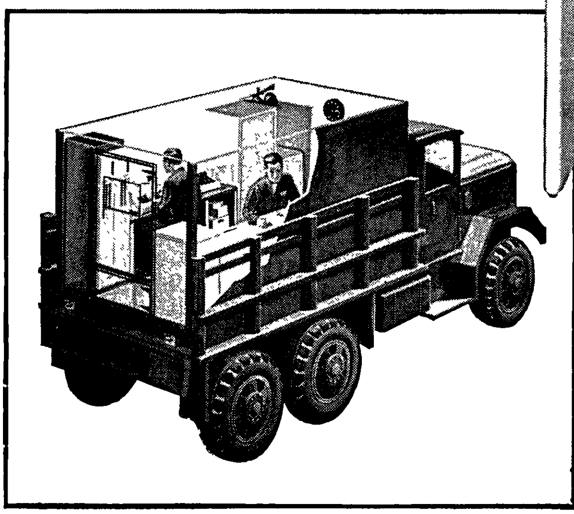
Honeywell

Electronic Data Processing

BASICPAC

Designed and built by PHILCO





A tactical computer for the Army's FIELDATA family of data processing devices

CHARACTERISTICS

General—General purpose, stored program • Medium to high speed • Binary, synchronous, serial by character, parallel by bit • Alphanumeric six-bit characters, FIELDATA Code

Operation Time per Word (including two access times)—Addition, 22 to 26 usecs • Multiplication and division, 238 to 242 usecs • Transfer of control, 16 usecs • Memory cycle, 12 usecs

Internal—Word length, 38 binary digits, including sign and parity • Arithmetic, signed magnitude, fixed point • FIELDATA Instruction Code, 40 orders • Index registers, four (expandable to seven) • Memory capacity, 4096 words (expandable to 28,672 words)

Input-Output—Control panel • keyboard and paper tape equipment • magnetic tape • line printer • punched card equipment • up to 54 I/O devices with up to seven operating simultaneously • real-time I/O—up to seven real-time input sources and seven real-time output sinks operating simultaneously with I/O equipments • FIELDATA language code and interface

Physical—Central Processor Weight, 609 lbs. • Volume, 17.8 cu. ft. • Environmental conditions, —35° C to +55° C, 0 to 97% relative humidity

Power Requirements—2.5 kilowatts (60 or 400 cycles)

Basicpac is a rugged, mobile, solid state data processing system being developed by Philco in conjunction with the U.S. Army Signal Corps, for use in forward area tactical situations. Basicpac will be a very important part of an integrated automatic data processing system for the entire field army . . . for such uses as logistics, administration, intelligence, command support and fire support.

Basicpac can be transported and operated in an S-109 shelter mounted on a 2½-ton truck or operated from a fixed installation. This unique system is designed to meet all military specifications for shelter mounted, air and truck transportable equipment and will be highly reliable, easily operated and maintained under extreme field conditions. Incorporated throughout the design are the latest technological advances in solid state circuitry and semiconductor components. This assures a compact, flexible and highly mobile data processing system completely adaptable to all the environmental and climatic extremes experienced by the military.

Basicpac will be delivered in December to the U.S. Army Signal Research and Development Laboratory for final acceptance testing.

A more informative brochure, plus technical assistance in adapting Basicpac to your requirement, are available. Write today.

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COMPUTER DIVISION, 3900 WELSH ROAD, WILLOW GROVE, PA.

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COMPUTERS *and* AUTOMATION

COMPUTERS AND DATA PROCESSORS, AND THEIR CONSTRUCTION, APPLICATIONS, AND IMPLICATIONS, INCLUDING AUTOMATION

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September 1951

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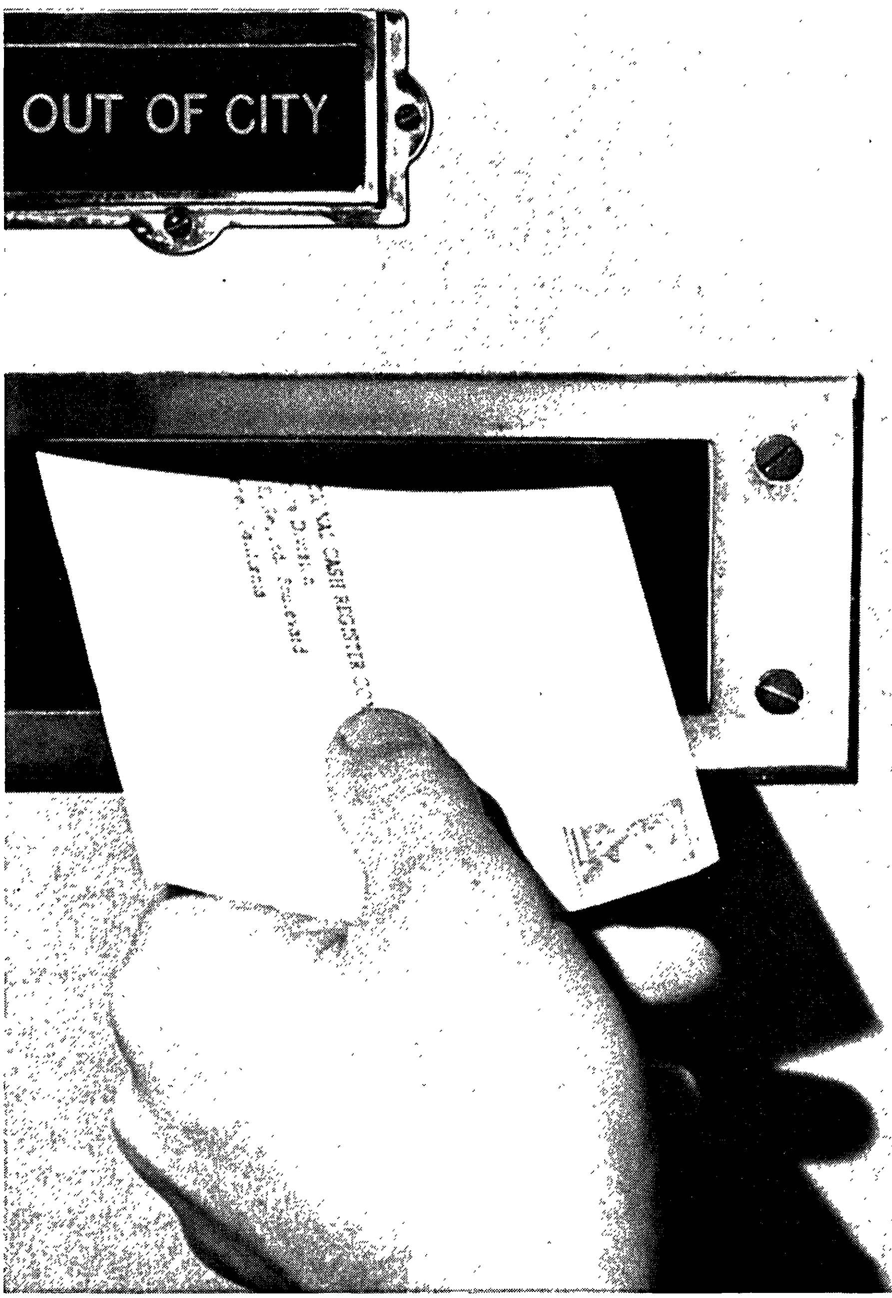
Vol. 9, No. 12B

News of Computers and Data Processors: ACROSS THE EDITOR'S DESK

. . . . inserted between pages 12 and 13 and between pages 32 and 33

DIGITAL COMPUTER ENGINEERS—

COMMERCIAL EXPANSION AT NCR CREATES OPENINGS IN LOS ANGELES FOR:



COMPUTER ENGINEERS
Seniors & Intermediates

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

TRANSISTOR CIRCUIT ENGINEERS
Seniors & Intermediates

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

PRODUCT ENGINEERS
Seniors & Intermediates

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

SYSTEMS ENGINEER

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

TRANSISTOR POWER SUPPLY ENGINEER

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

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

National*

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Hawthorne (Los Angeles), California
PL 7-1811

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COMPUTING SERVICES SURVEY

Neil Macdonald
Assistant Editor
Computers and Automation

Here is the second cumulative "Survey of Computing Services" published by **Computers and Automation.** It is based on replies to questionnaires sent out in September and October. The first cumulative survey was published in July 1958 (vol. 7, no. 7); there were two supplements, in October 1958 (vol. 7, no. 10) and in December 1958 (vol. 7, no. 12).

Each of the following entries contains: Name and address of the computing service / Equipment / Problems specialized in / Size (number of employees) / Established (year established).

The abbreviations have the following meanings:

Ls — large size, over 500 employees; Ms — medium size, 50 to 500 employees; Ss — small size, under 50 employees.

Le — Long established organization, 1930 or earlier; Me — organization established a "medium" time ago, 1931 to 1950; Se — organization established a short time ago, 1951 or later.

Following is the questionnaire used:

1. Brief description of the quantity and types of computing machines and equipment which you have? . . . . .
2. Brief description of the types of computing problems which you specialize in? . . . . . .
3. Number of employees? . . . . . .
4. Year established? . . . . . .
5. Any remarks? . . . . . .

Filled in by . . . . . . Title . . . . . .
Organization . . . . . . Address . . . . . .

We shall be grateful to any reader who reports the data for a computing service which should be included but is omitted. We shall also be grateful for any additions or corrections to the following entries. The supplementary information will be published in an early issue of **Computers and Automation.**

Aeronutronic, A Div. of Ford Motor Co., Mathematics and Computing, Research Operations, Ford Rd., Newport Beach, Calif. / EQPM: IBM 709 (IBM 7090 on order for delivery in 1961) / PROB: missile trajectories, rocket motor performance, aerothermodynamic heating, ordinary and partial differential equations, business data processing / Ms(60, mathematical services personnel) Se(1956)

ALWAC Computer Div., El-Tronics, Inc., 13040 S. Cerise Ave., Hawthorne, Calif. / EQPM: ALWAC III-E general purpose electronic digital computer, a drum storage serial binary machine with 8192 words main memory, 128 words fast access, completely alpha-numeric; decimal input-output equipment with 80-column card in and out; high speed paper tape in and out; and two magnetic tape units / PROB: general service bureau applications including accounting, numerical research, engineering, cataloging / Ms(60) Se(1952)

American Machine & Foundry Co., Digital Computer Facility, 140 Greenwich Ave., Greenwich, Conn. / EQPM: IBM 650 magnetic drum machine with alphabetic and special character device; IBM 653 floating decimal arithmetic unit and 3 index registers; digital plotter (10½" x 17"), plus standard peripheral equipment / PROB: general engineering calculations; shock & vibration; nuclear reactor, electrical, and petroleum engineering; data processing / Ss(6) Se(1956)

Armour Research Foundation, 10 West 35 St., Chicago 16, Ill. / EQPM: UNIVAC 1105 computer and off-line high-speed printer: 8,192 words core storage, 32,768 words magnetic drum storage, 17 magnetic tape units buffered from central computer / PROB: engineering and scientific problem-solving, programming-system development, management-science calculations / Ls(1250) Me(1936)

Bendix Computer Div. of the Bendix Corp., 5630 Arbor Vitae, Los Angeles 45, Calif. / EQPM: not generally considered a service bureau, but do market time on Bendix G-15's at factory-marketing headquarters / PROB: no specialty, programming services available / Ls(700) Se(1952; computer div.)

Berkeley Division, Beckman Instruments, Research Department, 2200 Wright Ave., Richmond, Calif. / EQPM: 50-amplifier general analog computer / PROB: research and computation techniques, general purpose problem solving / Ss(5) Se(1960)

Broadview Research Corp., 1811 Trousdale Dr., Burlingame, Calif. / EQPM: arranged for / PROB: design and implementation of automatic programming systems, including the construction of scientific and business-oriented compilers; symbolic assembly programs; design and implementation of special-purpose, problem-oriented compilers; analysis and programming of scientific problems, including applications in celestial mechanics, photogrammetry, geodesy, civil engineering, and statistical analysis of data from experiments. / Ms(80) Se(1951)

Brown University Computing Laboratory, 180 George St., Providence 12, R. I. / EQPM: IBM 7070 data processing system / PROB: scientific research, scientific and commercial data processing / Ss(10) Se(1956)

Burroughs Corp., Computer Facility, Marketing, 460 Sierra Madre Villa, Pasadena, Calif. / EQPM: Burroughs 220 (10,000 words core, complete punched card and paper tape input-output, 7 magnetic tape units, 25 lines per second high speed printer with 2 magnetic tape units); Burroughs 205 (4080 word drum, complete punched card and paper tape input-output, 4 magnetic tape units); Burroughs E-101 (220 word drum, paper tape input-output / PROB: all types, scientific, data processing, etc. Used by the Marketing Div. for program checkout, demonstrations, and rentals to outside customers / Ss(5, plus engineers) Se(1954)

Case Institute of Technology, Computing Center, Cleveland 6, Ohio / EQPM: Univac I, card-to-tape, high-speed printer, unityper; Burroughs 220, 4 tape drives, Cardatron input-output; auxilliary IBM punched card equipment / PROB: scientific and engineering calculation, business data processing, student classroom work / Ss(30) Se(1956)

C-E-I-R, Inc., Arlington Research Center, 1200 Jefferson Davis Highway, Arlington, Va.; New York Research Center, 270 Park Ave., New York, N. Y. / EQPM: Arlington: IBM 704, IBM 7090 and peripheral equipment, New York: IBM 7090 and peripheral equipment / PROB: linear programming, mathematical model building, operations research, military command and control systems, war gaming, information storage and retrieval, weapons systems analysis, space vehicle trajectories, transportation optimization, production scheduling, management decision-making systems, business strategy games, sampling and statistical design, site selection studies, financial analysis, marketing research, process-analysis and inter-industry analysis, application of Monte Carlo methods, matrix calculations, engineering problems, reliability and quality-control programs, design of experiments and field tests, engineering and industrial research, electronics and communications, radio-spectrum utilization, value engineering, etc. / Ms(300) Se(1954)

Clary Corp., Computer Div., 408 Junipero St., San Gabriel, Calif. / EQPM: Clary DE-60 digital computer, operator oriented console, subroutine cartridges and automatic program control unit / PROB: numerical problems whose programming time on a large scale computer is at least five times greater than the computation time; preliminary and check-case computations that become tedious on a rotary calculator / Ss(10) Se(1958)

Computer Engineering Associates, Inc., 350 No. Halstead, Pasadena, Calif. / EQPM: Direct Analog Computer, built by Computer Engineering Associates, Inc., using electronic amplifiers and passive elements (resistors, capacitors, inductors, and transformers) / PROB: dynamic mechanical and aeroelastic vibration problems; static stress analysis; heat transfer and heat flow problems / Ms(50) Se(1952)

Control Data Corp., 501 Park Ave., Minneapolis 15, Minn. / EQPM: Control Data Model 1604 digital computer, advanced, large scale, solid state; Model 160 digital computer, desk-size, solid state; Model 180 data collector / PROB: business and accounting, engineering, scientific, data processing / Ms(460, computer div.) Se(1957)

Cook Research Laboratories, subdivision of Cook Electric Co., Morton Grove, Ill. / EQPM: Univac Solid State 90 Computer, card input-output and high speed printer / PROB: trajectory calculations; data reduction; many varied scientific problems; inventory control; payroll / Ls(4700) Le(1897)

Cornell University, Computing Center, Rand Hall, Ithaca, N. Y. / EQPM: Burroughs 220 Datatron, 4 IBM key-punch machines, card sorter, IBM 101 statistical machine, card reproducing and comparing machine, tabulator, IBM 407 on-line printer / PROB: research computation and teaching / Ss(10 full time, 13 part time) Se(1953)

Data Processing, Inc., 572 Washington St., Wellesley 81, Mass. / EQPM: none; have access to IBM 704, 709, 7090, H-800, LGP-30, PDP-1, G-15, SS-80/90, and others on commercial basis / PROB: advanced logical applications (e.g., compilers, comprehensive large-scale systems, simulators, translators); consulting, analytical, and programming services in scientific and business applications of digital computers / Ss(19) Se(1957)

Dian Laboratories, Inc., 611 Broadway, New York 12, N. Y. / EQPM: Dian 120 computers, 444 summing and integrating amplifiers, 70 multipliers, associated function-generating equipment, recorders and plotting boards / PROB: ordinary and partial differential equations: heat transfer, aircraft guidance and control, nuclear reactor kinetics, process control, simulator design / Ss(12) Se(1955)

Douglas Aircraft Company, Inc., 3000 Ocean Park Blvd., Santa Monica, Calif. / EQPM: IBM 650, 701, 704, 709, 1401, and 7090 computing systems and peripheral equipment. Remington Rand Univac file computers, Univac solid state computers, Univac electronic tabulators, and No. 120 computers / PROB: rental of machine time for all scientific, engineering, manufacturing, and business problems / Ls(1,000) Se(1959)

Dynatech Corp., 639 Massachusetts Ave., Cambridge 39, Mass. / EQPM: access to: IBM 650 and 704, Philco Transac, RCA 501, Univac, Bendix G-15, Philbrick Analog / PROB: general scientific and engineering; specific experience in rocket propulsion, thermodynamics, heat transfer; systems and control dynamics / Ss(40) Se-(1957)

EAI Computation Center at Los Angeles, Inc., a subsidiary of Electronic Associates Inc., 1500 E. Imperial Highway, El Segundo, Calif. / EQPM: one 100 amplifier computer, one 60 amplifier computer, one 48 amplifier computer, one 40 amplifier computer, of Electronic Associates' manufacture / PROB: aircraft, missile, and aerospace applications, fluid power control (hydraulics and pneumatics), microwave electronics, water conservation studies, nuclear reactor kinetics, petro-chemical process control, physiological applications / Ss(9) Se(1956)

Electronic Associates, Inc., Princeton Computation Center, Box 582, Princeton, N. J. / EQPM: general purpose analog computers / PROB: complex engineering problems; simulation of complex systems to minimize extensive trial and error methods / Ss(20) Se(1954)

Electronic Data Processing Center, Inc., 2221 S.W. 5th Ave., Portland 1, Ore. / EQPM: Burroughs 205 EDP machine system, 4 magnetic tapes, paper tape, card in and out, on-line printer, typewriter out. Also, complement of IBM punch card equipment / PROB: engineering, commercial and scientific / Ss(8) Se(1959)

The Franklin Institute Computing Center, 20th & Parkway, Philadelphia 3, Pa. / EQPM: modified Univac I data processing system with associated ancillary equipment including card-to-tape, tape-to-card, low-speed and high-speed printers and unitypers / PROB: business data processing; scientific and engineering computations; large-scale inventory control problems; man-machine simulations; photogrammetric problems / Ss(26) Se(1957)

General Kinetics Inc., 2611 Shirlington Rd., Arlington 6, Va. / EQPM: computer input devices on hand; access to customer or rental computers / PROB: programming services for all general purpose computers; recommendation, design, and construction of automatic programming and automatic checking systems to fit specific needs; mathematical studies; numerical analysis; data-reduction; information retrieval / Ss(25) Se(1955)

KCS Ltd., 20 Spadina Rd., Toronto 4, Canada and Suite 104, 640 Cathcart St., Montreal, Canada / EQPM: IBM 650, 4 tapes and ancillary equipment / PROB: traffic research; data processing; scientific calculations; linear programming; simulation; etc.; for business, industry and government / Ms(55) Se(1954)

Land-Air, Inc., Mattern X-Ray Division, 7444 Wilson Ave., Chicago 31, Ill. / EQPM: Bendix G-15D, digital, standard unit. Electronic Associates Inc. Model 1631R, analog, 168 amplifier. EAI Model 1100A x-y plotter; 28 servo multipliers; 16 function generators / PROB: complete design of power distribution transformers in range from 1½ to 2000 KVA, 120 volt to 13,200 volt; lens ray-trace program; antenna impedance characteristics; transmission line impedance characteristics. Engineering, research, manufacturing or production problems / ?s Me(1949)

Lehigh University, Packard Laboratory, Bethlehem, Pa. / EQPM: LGP-30 / PROB: education, training, research, data processing / Ss(6 part time) Se(1957)

Minneapolis-Honeywell, Electronic Data Processing Div., 60 Walnut St., Wellesley Hills, Mass. / EQPM: Datamatic 1000's in operation in Brighton and Boston, Mass., and Detroit, Mich., on Honeywell Service Bureau assignments. Automatic programming aids, such as FACT and the Algebraic Compiler. / PROB: business record keeping; scientific computing / Ms(90, service bureau only) Se(1956)

National Bureau of Standards, Computation Laboratory, 415 South Bldg., Washington 25, D. C., successor of the Mathematical Tables Project, New York, 1938, which pioneered in using punched-card equipment for solving scientific problems and preparing mathematical tables / EQPM: IBM 704 with 32,000-word core, 8000-word drum storage, half-word logic. Off-line printer. Punched-card peripheral equipment / PROB: problems arising in the physical sciences, engineering, and operations research; numerical experimentation; statistical analysis; preparation of mathematical tables; etc. / Ss(45) Me(1947)

The National Cash Register Co., Hawthorne NCR 304 Data Processing Center, 1401 E. El Segundo Blvd., Hawthorne, Calif. / EQPM: National Cash Register Type 304 Data Processing System, 4800 word memory with 2000 card per min. input, 1800 char. per sec. paper tape input and 600 lines per min. printed output. (Both on and off-line systems available) / PROB: data processing for large and small businesses; wiring lists; contract programming for scientific and business applications / Ss (21) Se(1960)

Northrop Corp., Norair Div., Computing and Datamation Center, 1001 E. Broadway, Hawthorne, Calif. / EQPM: Digital: one IBM 704, to be replaced in December 1960 by IBM 7090 with IBM 1401 as "off-line" equipment; one IBM 607 with 407 and tally high-speed plotter attached; auxiliary punchcard equipment. Analog: (as calculators) 336 d-c operational amplifiers; 20 servo multipliers; 4 resolvers; 25 function generators; 7 recorders; 4 special coefficient racks. Analog: (as simulators and model testers) 142 d-c operational amplifiers; 5 recorders. Data Handling Equipment: (for reducing test data) 3 telereaders with telecorders; 1 telereadex with telecorder; 2 Richardson readers; assorted miscellaneous equipment for editing / PROB: all types of digital and analog engineering calculations; simulation; model testing; manufacturing control; numerical control milling machine tapes and pre-processors; war gaming; operations research studies; reconnaissance data handling; engineering and scientific research and development / Ss (46) Me(1949)

George A. Philbrick Researches, Inc., 127 Clarendon St., Boston, Mass. / EQPM: Philbrick K5 Analog Computer System composed of all-speed linear and non-linear computing modules and associated output display equipment / PROB: dynamic analysis of engineering systems / ?s Me(1946)

Philco Corp., Computer Div., Service Bureau, 3900 Welsh Rd., Willow Grove, Pa.; also Western Development Laboratories, Palo Alto, Calif. / EQPM: Philco 2000: asynchronous operation, parallel logic, transistorized circuit design, fixed word of 48 bits in units of 4,096 to 32,768 words with 10 microsecond access time or 32,768 words with 2 microsecond access time / PROB: all scientific and commercial applications / Ss(48, in Service Bureau) Se(1958)

Purdue University, Computing Laboratory, Engr.. Admn. Bldg., W. Lafayette, Ind. / EQPM: Datatron 204 with 2 mangetic tapes, punched card input and output, automatic floating point, 407 on line; delivery of Univac solid state 80 tape system immiment; complete complement of 80 and 90 column punched card equipment / PROB: educational and research problems which arise in connection with the work of the staff of the university / Ss(40) Se(1954)

Rand Corporation, Santa Monica, Calif. / EQPM: Johnniac, IBM 7090 / PROB: linear programming, modelling, scientific computing generally / Ls(900; 100 in Computer Sciences Dept.) Me(1947)

Recording & Statistical Corp., 100 Sixth Ave., New York 13, N. Y. / EQPM: Univac No. 1 with peripheral equipment / PROB: fire and casualty insurance; commercial / Ms(214) Le(1910)

Rich Electronic Computer Center, Georgia Institute of Technology, Atlanta 13, Ga. / EQPM: Burroughs 220 (5,000 words core and 4 tape units), IBM 650, Univac Scientific (ERA 1101) with a 4096 word 1103A core memory added / PROB: research work in science and engineering; also educational work in these areas / Ms (50) Se(1955)

Scientific Computing Service Ltd., 23 Bedford Sq., London, W. C. 1, England / EQPM: access to: Ferranti, Elliott, English Electric, I.B.M., and Cambridge University EDSAC electronic digital computers; miscellaneous electric and hand desk calculators / PROB: general consulting; computations for commerce and industry; advanced applied research; pure research; developing problems in mathematical and statistical fields to the point where they may be effectively computed, then recommending the means / Ss(16) Me(1939)

Southwestern Computing Service, Inc., 910 So. Boston, Tulsa 19, Okla. / EQPM: one Alwac III and one IBM 604 / PROB: process design, heat exchange, inventory control etc. / Ss(8) Se(1953)

Stanford University, Computation Center, Stanford, Calif. / EQPM: Burroughs 220, 8000 words, 5 mag. tapes, paper-tape read/punch, card read/punch, line printer (IBM 407); IBM 650 (basic), 402; assorted card preparation equipment / PROB: all numerical problems generated in an academic community; some non-numeric problems / Ss(15) Se(1955)

System Development Corp., 2500 Colorado Ave., Santa Monica, Calif. / EQPM: IBM 709 (7090 on order); AN/FSQ-7 (SAGE Military Computer); Philco S-2000 on order / PROB: information processing and command control systems such as SAGE and SACCS / Ls(3400) Se(1957)

Technical Advisors, Inc., Municipal Court Bldg., Ann Arbor, Mich. / EQPM: 2 Royal-McBee LGP 30's, with photo-electric reader, high-speed punch and off-line Flexowriter / PROB: surveying and civil engineering computations / Ss(13) Se(1958, computations)

Technical Operations, Inc., South Ave., Burlington, Mass. / EQPM: none; access to computers / PROB: automatic programming systems; digital simulations; war gaming; scientific computation / Ms(250) Me(1950)

Telecomputing Services, Inc., 8949 Reseda Blvd., Northridge, Calif. / EQPM: IBM 650 and IBM 704 computing systems, and peripheral equipment / PROB: data reduction; business data processing; accounts receivable and payable; labor distribution; payroll; inventory control; production scheduling; etc. / Ms(230) Me(1947)

U. S. Air Force, Structures Section, Analytical Systems Branch, Resource Analysis Div., AFAMA-3B, Hq. USAF, Washington 25, D. C. / EQPM: IBM 7090 / PROB: development of USAF planning and programming documents; analytical computations for management; and requirements computations / Ss(25) Me(1949, under the name: Planning Research Div., Hq. USAF)

U. S. Air Force, Digital Computation Branch, Systems Dynamic Analysis Div., Wright-Patterson AFB, Ohio / EQPM: Univac Scientific 1103A, Datatron 204, IBM 7090 (to be installed 11/15/60) / PROB: solution of scientific and engineering problems and related data reduction for USAF research and development programs / Ms(70) Me(1950)

U. S. Army, Computing Laboratory, Ballistic Research Laboratories, Aberdeen Proving Ground, Md. / large-scale, high-speed, digital computers: EDVAC (Electronic Discrete Variable Automatic Computer), ORDVAC (Ordnance Variable Automatic Computer), BRLESC (BRL Electronic Scientific Computer), and data reduction equipment / PROB: U.S. Army Ordnance Corps' problems in ballistics, scientific computations / Ms(100) Me(1940)

U. S. Dept. of Commerce, Bureau of the Census, Washington 25, D. C. / EQPM: Univac I (2); Univac 1105 (2); Unitypers (2); Remington Rand Buffered High-Speed Printers (2); Card-To-Tape Converter (Remington Rand); FOSDIC (5) / PROB: statistical data processing: monthly, quarterly, annual surveys; periodic population, industry and trade censuses; service activities for other government agencies / Ms(130) Se(1951)

U. S. Navy, Aviation Supply Office, 700 Robbins Ave., Philadelphia, Pa. / EQPM: two 705's, Model III; three 1401's, plus three on order; 150 punch card machines including 31 IBM transceiver machines / PROB: inventory control of 500,000 stock numbers of aviation material, navy-wide / Ms(300) Se(1951)

U.S. Navy, Computation & Analysis Lab., Naval Weapons Lab., Dahlgren, Va. / EQPM: NORC (Naval Ordnance Research Calculator); IBM 7090 system; Universal data transcriber; IBM 1401 system (Jan. 1961); plus auxiliary equipment / PROB: orbits of earth satellites and space vehicles; trajectories of all types of weapons; computer wargaming; general scientific and engineering problems / Ms(300) Me(1946)

Univac Service Centers, Remington Rand Univac Div., Sperry Rand Corp., 315 Park Ave. So., New York 10, N. Y., and 40 Univac Service Centers in large cities / EQPM: whole range of Remington Rand equipment; punched cards, Univac 60, Univac 120, Univac File Computer, solid state 80/90 with tapes, Univac I, II, Univac Scientific / PROB: all punched card data processing applications; all paper tape and magnetic tape data processing applications; all scientific applications / ?s ?e

University of California, Computer Center, 201 Campbell Hall, Berkeley 4, Calif. / EQPM: IBM 704, 32,000 words core memory; 7 on-line tapes; 150-line-per-minute off-line printer. IBM 701, 2 frame, with 4 drums; 4 on-line tape units / PROB: all types of scientific calculations arising from research on a large university campus / Ss(49) Se(1957)

University of California, Numerical Analysis Research, Los Angeles 24, Calif. (formerly administered by the National Bureau of Standards until 1954 and now a part of the Dept. of Mathematics of the Univ. of Calif.) / EQPM: The National Bureau of Standards Western Automatic Computer (originally the "Zephyr," known as SWAC), a medium-sized, high-speed computer with 256 word electrostatic (Williams type) memory, and an 8192 word drum storage. Peripheral punch card equipment. / PROB: study of discrete variable problems; use of diffuse surface optical model of the nucleus in the analysis of elastic scattering of charged particles by complex nuclei; analysis of the crystalline structure of vitamin B12; determination of many of the larger prime numbers; semi-groups; traffic simulation, growth of cloud drops, counter gradient methods; queueing theory; correlation and factor analysis in psychology / Ss(34) Me (1948)

University of Colorado, Numerical Analysis Center, Boulder, Colo. / EQPM: Bendix G-15D, Flexowriter 35-4, two IBM 026 card punches, IBM 056 verifier, IBM 082 sorter, series 10 card punch, 11 desk calculators, Boeing analog computer / PROB: computer instruction (student work) / Ss(5) Se(1958)

Univ. of Durham Computing Laboratory, 1 Kensington Terr., Newcastle upon Tyne 2, England / EQPM: Ferranti Pegasus Computer; a Decca Twin Magnetic Tape Unit with Ferranti Controlled System / PROB: research problems arising in the University; scientific and commercial problems / Ss(5) Se(1957)

University of Illinois, Digital Computer Laboratory, Urbana, Ill. / EQPM: ILLIAC, large general-purpose binary asynchronous machine built by Univ. of Ill.; IBM 650 / PROB: all research problems arising in University research / Ms(110) Me(1949)

The University of Manchester, Computing Machine Laboratory, Manchester 13, England / EQPM: Ferranti Mercury / PROB: scientific; punching and running programs, but not programming, although advice is given on customers' problems; customers may also buy machine time and run their own problems / Ss(20) Se(1949, laboratory; 1955, computing service)

University of Michigan, Willow Run Laboratories, Ann Arbor, Mich. / EQPM: IBM 709, 32,000 word core, memory, 8 tapes on line, 8000 word drum, off-line printer (720) / PROB: simulation / Ss(40) Se(1959)

University of Rochester, Computing Center, Rochester 20, N.Y. / EQPM: IBM 650 augmented with 4 tape drives / PROB: scientific computing in general, statistics, symbol manipulation — principally for University of Rochester and for other educational institutions / Ss(10) Se (1956)

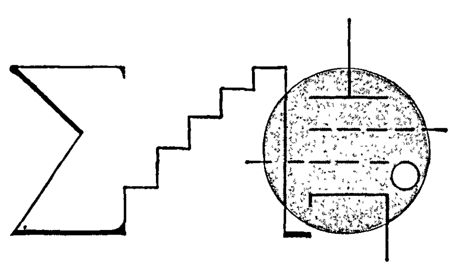
George Washington University, Logistics Research Project, 707 22nd St., N. W., Washington 7, D. C. / EQPM: ERA Logistics Computer, special drum 400,000 decimal digits, drum 180,000 decimal digits, 220 KC serial card-in-out, paper tape in-out / PROB: simulation of operations (logistic) characteristic of naval planning / Ss (40) Me(1949)

Wayne State University, Computing Center, 4841 Cass, Detroit 2, Mich. / EQPM: a highly modified IBM 650 having a sign in the program register, 60 words of core storage, three indexing registers, one Ramac unit, two magnetic tape units / PROB: research service for the university; statistics; physical and medical sciences / Ss (29) Se(1952)

Westgate Laboratory, Inc., P. O. Box 63, Yellow Springs, Ohio / EQPM: NCR bookkeeping machine, Remington Rand Univac special purpose digital computer, miscellaneous office calculating machines / PROB: cross-correlations; use of computer logic in circuit designs; research and development work in electronics, electromechanical and optical equipments / Ss(30) Se(1956)

Westinghouse Electric Corp., Advanced Systems Engineering & Analytical Dept., 4-L-38, Braddock Ave., E. Pittsburgh, Pa. / EQPM: digital: until Nov., 1960, IBM 704 with 8K core, 8 tapes, drums; after Nov., 1960, IBM 7090 with 32K core, 2 channels, 12 tapes, full peripheral equipment. Analog: Anacom (passive element transient analyzer), electronic differential analyzer, A.C. network calculator, D.C. network calculator / PROB: engineering and scientific: electric utility planning, control systems, electrical and mechanical design and application, etc. / Ms(80) Me(1948)

Wolf Research & Development Corp., 462 Boylston St., Boston 16, Mass. / EQPM: Whirlwind I computer system; Bendix G-15D computer system, with two magnetic tape units, special curve tracing input device, card input equipment, off-line flexowriter and IBM 026 key punch unit / PROB: scientific, engineering, business, industrial, and military applications. Service routines. Data processing. / Ms(100) Se(1959)



NEWS of Computers and Data Processors

"ACROSS THE EDITOR'S DESK"

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September 1951

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A QUARTER BILLION DIGITS STORED IN NEW DRUM SYSTEM

J. W. Schnackel
Remington Rand Univac Division
Sperry Rand Corp.
New York 10, N.Y.

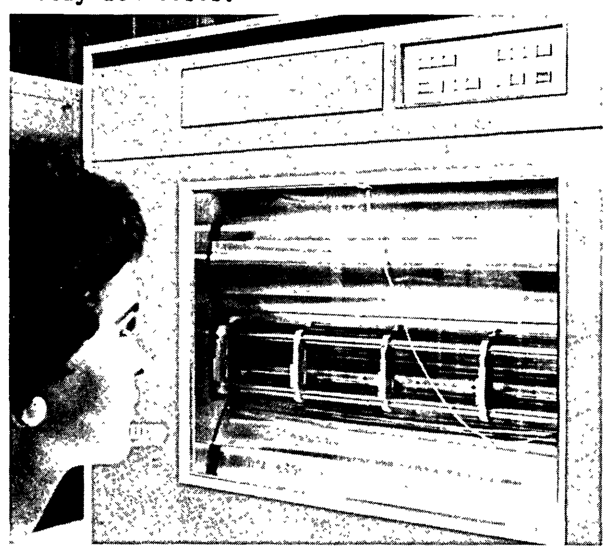
A quarter billion digits and signs available within milliseconds in a new mass storage system, make greater computer speeds possible in billing, inventory control, general accounting and sales analysis involving millions of items.

The new system, known as Univac Randex Storage, introduces a magnetic drum which stores more information than any other in existence. Each storage unit, designed for use with Univac Solid-State and STEP computers, is comprised of two drums capable of containing 24,000,000 digits and signs. The system can be expanded to as many as 10 storage drums.

The steps involved in feeding a source document into the computer system to the issuance of the final invoice are greatly simplified. While processing takes place, every file affected by the transaction is internally updated automatically -- including inventory and accounts receivable. Purchase orders can be automatically written when a reorder point is reached.

The Univac Randex Storage System operates "on line" -- that is, the data are fed directly from "memory" to the central computer, and returned, without intermediary steps. Moreover, transferred data are automatically checked for accuracy.

Searching, reading, writing, punching, processing and printing operations are performed simultaneously. These coordinated data processing operations permit the handling of large amounts of information at relatively low costs.



-- Operator watches as 24,000,000 digits and signs -- largest drum "memory" storage capacity in existence -- are stored on spinning drums of the new Remington Rand Univac Randex Storage System. Any item in this huge file can be retrieved in thousandths of a second. If stored on punched cards, this same amount of data would require a stack of cards 9-stories high.

GLOBAL SYSTEM FOR INTERNATIONAL COMMUNICATIONS VIA SPACE WILL SOON BE POSSIBLE

Philco Corporation
Philadelphia 34, Pa.

This company has called for adoption of a system by which international space communications would be provided and operated by the United Nations.

In a speech before the Peninsula Manufacturers Association, Palo Alto, Calif., Mr. James M. Skinner, Jr., Philco president, said such international control would represent a major step toward global peace and understanding, thus strengthening the United Nations.

"We will shortly have the technical capability, to establish an entirely new and economical way of providing all kinds of communications between all the countries of the world."

A global communications system might work utilizing space satellites in two steps.

First, messages of all kinds -- voice, telegraph, teletype, even television -- would be brought together in each country through the local communications service to some point -- say, the Nation's capital. Second, all messages would be relayed by satellites to a central receiving point in some other country, there to be distributed through the local service of that particular nation.

Mr. Skinner said, "The United States now has the opportunity to give a convincing demonstration of its intention to use its technical achievements in space for peaceful purposes and thus bolster its position of world leadership."

Noting that America's space communications leadership is usually linked to military purposes, Mr. Skinner asked, "Would it not be a major asset in the court of world opinion if we could demonstrate not only our peaceful motives, but also the use of these developments of ours to provide a service which would be useful to everyone?"

"It seems almost essential that these satellites be under control of some world body to avoid the opportunity for unscrupulous people to play on the fears and superstitions of less-informed peoples of the world.

"The worries, concerns and possible misunderstandings could best be avoided by having the United Nations provide the service, be responsible for the satellites, and guarantee their innocence."

MAIL TO BE SENT BY ELECTRONIC SCANNER

Stromberg Carlson
Division of General Dynamics Corp.
Rochester 3, New York

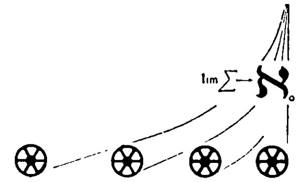
An electronic reading and printing system, which makes it possible to transmit mail from one city to another in seconds, has been developed.

This facsimile transmission of mail is in three steps. A letter is placed before an electronic scanner. The scanner sends an image via standard TV-type communications lines to a distant point. There an exact reproduction is made. In the method being studied by the U. S. Post Office Department, the facsimile would then be treated as private mail and delivered in the normal manner.

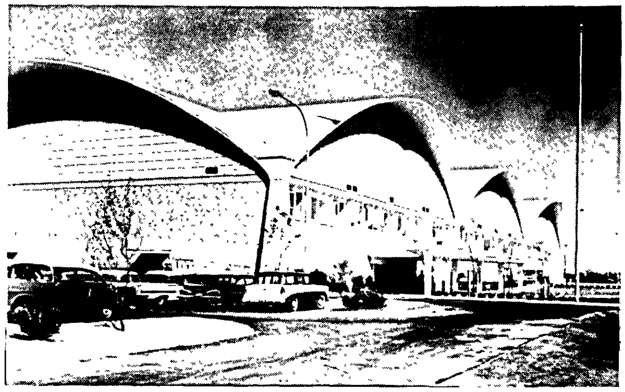
The scanning portion of the system will "read" any mechanically printed or hand-written material or line drawings. The printing portion of the system will then reproduce this material exactly in black and white.

Among the key equipments in the prototype Speed-Mail system being tested by the Post Office Department are the scanner developed in Stromberg-Carlson's San Diego facility, and a specially designed xerographic printing device created by Haloid Xerox, Inc., Rochester, N.Y. Intelex Systems, Inc. a subsidiary of International Telephone and Telegraph Corporation, is the systems manager for the Speed-Mail program.

The development contract with the U. S. Post Office Department calls initially for design and installation of 14 high-speed facsimile printers and 8 mail scanners at test sites to be designated. Fifteen standard letter-size pages per minute may be sent on the machines. This is 400 times faster than the present facilities of the major press associations for transmitting pictures.



AUTOMATED POST OFFICE AT PROVIDENCE, R.I.



This picture shows the front of the new "Project Turnkey" automated post office at Providence, R.I., showing the concrete, poured-in-place, parabolic domes and the Thinlite curtain wall system in the arches beneath them. This curtain wall system provides high insulation reducing the cost of air conditioning equipment in summer and the heating equipment in the winter. Thinlite is manufactured by Kimble Glass Co., subsidiary of Owens Illinois, Toledo, Ohio.

NEW DATA ACQUISITION SYSTEM AIDS IN MINE DETECTION

Monitor Systems, Inc.
Fort Washington, Penna.

A new automatic Data Acquisition System for digital reoording of analog values at rates of up to ten four-character points per second has been developed for evaluation of mine detection apparatus at the Engineering Research Development Laboratory at Fort Belvoir, Virginia. The new system measures analog signals generated by the mine detection apparatus, converts these signals to binary-coded-decimal form, converts this to teletype code, and provides a digital record on five level punched paper tape. The tape record is suitable for teletype printout or may be converted to punched card form.

The mine detector under test travels along a hundred foot track at a rate of 10 inches per second. Pulses generated by light sources spaced at one inch intervals along the track are received by a photoelectric cell mounted on the carriage carrying the mine detector. These pulses are summed by the MSI System to indicate carriage position and are used to initiate the conversions.

A pinboard programmer permits suppression of data acquisition for desired intervals of the test run. These suppressed intervals serve to change the computer program from "average" to "peak" and back to "average" in analyzing the recorded signals received from the mine detecting apparatus. Peak values are normally read for those periods when the mine detector is over a mine. Rotary switches provide for initial entry of fixed data such as date, time, and identification of the test run.

The new system is expected to result in considerable time saving. Though developed specifically for evaluation of mine detection apparatus, with suitable modifications the new system could be applied to similar applications requiring conversion and readout of analog values in digital punched tape form for subsequent high speed computer processing.

INCREASED USE OF COMPUTERS IN STATE AND LOCAL GOVERNMENTS SHOWN BY SURVEY

The Diebold Group
40 Wall Street
New York 5, N.Y.

The number of electronic computer installations in use by state and local governments will double within the next two years, according to a survey of manufacturers of electronic computers.

The results of this first comprehensive survey of the use of automatic data processing by state, city and county governments have just been published in the ADP Newsletter, edited by The Diebold Group of management consulting companies. The survey found not only increased use of automation in "standard" business data processing but a variety of projects extending automation into new areas.

The survey reports extensive use of automatic equipment for such diverse purposes as:

- In New York, maintaining the employment accounting records and making out the salary checks for over 160,000 city employees.
- In almost all states, performing complex engineering calculations for the design and construction of highways and bridges.
- In Chicago, recording and "memorizing" all traffic violations for the last ten years.
- In Texas, keeping track of all the textbooks in circulations in a school system.

Some applications just getting underway or in planning:

<u>In education</u>: While such standard business functions such as payroll accounting has been around for a long time, "pupil accounting" is just getting underway. This involves the use of tabulating equipment, and in some cases, computers, for keeping track of pupil records. The chances are very good for, in the near future, pupils' report cards to be filled out by a computer; the computer system will even provide the storage for the pupil's grades, attendance record, conduct and other pertinent data.

<u>In public safety</u>: For example, a driver behavior measurement system is being developed by the International Association of Chiefs of Police. Installed in Wisconsin, a series of random pick-up points, employing photographic and speed measuring equipment, gathers data to be processed by a computer. The computer can then calculate various highway driving characteristics such as average automobile speeds and interplay (passing, overtaking and following.) Such information is valuable in understanding traffic congestion problems, correlations involving highway accidents and other data pertinent to highway safety.

The survey found that at least 131 electronic computer systems were installed and in use in state, city and county governments; about 80% of these installations are found at the state level, with the remainder about equally divided between city and county governments.

ELECTRONIC COMPUTER BECOMES AUTOPILOT FOR A JETLINER

Sperry Phoenix Co.
Division of Sperry Rand Corp.
Phoenix, Ariz.

An electronic computer took the reins of one of the world's fastest jet airliners recently, the Convair 880, and flew it with precision exceeding that of any human pilot.

The Federal Aviation Agency has concluded performance testing of the Sperry automatic control system and approved it for everyday use on the new jetliner. Delta Air Lines immediately became the first Convair 880 operator to employ the system.

The SP-30 system provides a set of electronic "brains and muscles" which enable the jetliner to cruise automatically at altitudes up to 40,000 feet and, when desired, make automatic landing approaches more accurately than any human pilot.

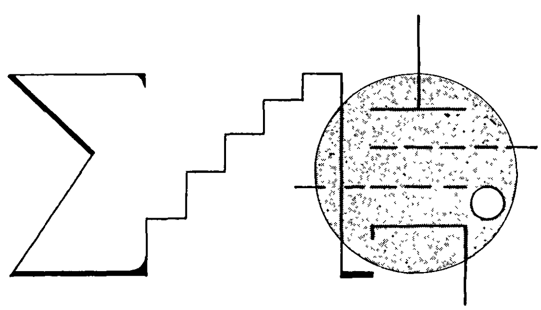
At the press of a button, the pilot can "lock" the jetliner onto any desired course at any altitude, or fly to a distant radio station without touching his manual controls. Turning a knob places the jetliner in smooth turns without disturbance to passengers or crew.

Flying on top of the weather, where the 615-mile per hour jetliner cruises most efficiently, the system automatically holds the plane within 10 feet of a desired altitude.

The SP-30 system was not developed as a replacement for the human pilot, but instead, achieves smoother flights by freeing the pilot from a host of manual flying tasks. It enables him to concentrate on important duties such as navigation, communication, and watching for other aircraft in flight.

Automatic safeguards not even contemplated a few years ago are routine with the new system. The control unit actually scrutinizes its own operation, warns the pilot in case of a malfunction, and disengages itself before it will allow the jetliner to enter an undesired maneuver.

Features of the system permit use with fully automatic landing systems. It also will accept signals from Doppler automatic navigators for pinpoint navigation anywhere in the world.



ELECTRONIC SIMULATORS OF MISSILE FLIGHTS USED TO AID U.S. NAVY TRAINING

Radiation, Inc.
System Development Div.
Orlando, Fla.

The AN/ARW-T2 Ground Pilot Trainers are missile simulators, no larger than home TV sets, and are being used by the Navy on land and sea around the world to train pilots and increase capacity to hit targets.

The simulator is equipped with a read-out device which automatically displays the pilot's "miss-distance" at the conclusion of each simulated task. This device greatly increases the trainees' motivation by producing intense competition among them.

The Navy uses the Trainers to economically familiarize and train pilots in the operational aspects of the Bullpup air-to-ground weapon system.

This training device allows pilots to become highly proficient in the use of the weapon without expending operational missiles. A single trainer in one day's time can provide several pilots with hundreds of simulated missile firings, which would otherwise take many days of training involving operating aircraft and attendant supporting personnel and equipment.

The Trainers are designed to withstand the extreme shock, vibration, temperature and humidity environments associated with Naval shipboard equipment and require no specialized support equipment or specially trained maintenance personnel. These features allow the Trainers to be easily and quickly integrated into U.S. Navy complexes all over the world, either on land or at sea.

Training is accomplished by simulating the missile's flight characteristics on the face of a cathode ray tube display. These characteristic motions are controlled primarily by the trainer in the same manner that is used to control the missile under actual operation. Missile characteristics that are not under the control of the pilot-trainee are electronically generated within the Trainer.

The Trainer consists essentially of an analog computer that provides real-time simulation of the dynamics of a missile. The computer output voltage is analogous to the missile motions and is displayed as a deflection on the face of a cathode ray tube.

The computer is capable of simulating virtually hundreds of variations and missile conditions. Several non-linear functions of time associated with missile characteristics, and all automatic control, is performed by an electro-mechanical function generator and programmer assembly.

AUTOMATIC CREDIT ECONOMY IN BRAVE NEW WORLD

Neal Dean
Booz, Allen and Hamilton
380 Madison Avenue
New York, N.Y.

A truly universal and automated "credit card" system that would eliminate the exchange of cash, checks, money orders, invoices, receipts and other paper, is a factual possibility in the next 10 years with only modest improvements to existing equipment.

The center of the system would be a "financial utility" similar to today's banks, which would control each person's "fund account" on magnetic tape. Input to the fund account would be accomplished by transmitting the employee's payroll record to the utility on magnetic tape. The essential data for the financial part of any business transaction could be obtained by low-cost, simple, recording devices in stores and transmitted automatically to the financial utility where the debt obligation would be recognized, the fund account charged for the amount involved and the appropriate store credited accordingly.

Electricity, gas, and telephone services would be charged by automatic metering on magnetic tape; the services would be billed directly by the financial utility and paid entirely without human intervention.

The Internal Revenue Service could dispense with most of its investigating agents; income tax revenue would rise because virtually every financial transaction would be recorded as it occurred. No individual income tax returns would be necessary. Instead, the individual's fund account would be automatically charged, as a result of a governmental calculation, on an exact, accurate basis.

600,000 WORD DICTIONARY IN COMPUTER

University of California
Berkeley 4, Calif.

A 600,000-word dictionary, developed at this university, will be used by a computer as part of a program of linguistic research designed to result in the automatic translation of Russian technical literature solely by means of electronic equipment.

The new Russian-English dictionary has apparently the largest vocabulary in the machine translation field. The U.C. system has as its ultimate goal the translation of 100 words per second, resulting in a fraction of the cost of human translations.

The mechanical dictionary is designed to be used in conjunction with a program on the University's IBM 704 digital computer which looks up the words needed for specific translations.

While all dictionaries for human use have entries consisting of a heading and a definition following immediately after, in the computer dictionary however, the definitions are completely separated from the headings. When the computer looks up a word in the mechanical dictionary, a reference number associated with the heading tells the computer where to find information on the word. No actual reference number is stored within the computer; the location of the word in the dictionary reveals to the machine the "address" of the information about that word.

The job of putting the dictionary into the special format needed for this system will also be done automatically by the use of another computer program.

When the computer arrives at the new address, it will find three types of information on the word in question: a code giving syntactic and semantic information on the word, rules for dealing with the word in context, and the addresses of equivalent words in English.

One of the features of the programs for look-up and dictionary arrangement is that they may be used with a similar mechanical dictionary for any language. While the U.C. dictionary is specifically designed for the translation of Russian biochemical works, the overall machine translation system will produce intelligible English sentences out of any language for which a mechanical dictionary exists.

Construction of a mechanical dictionary, however, is a difficult and time-consuming task. Development of the system to this point has already required an exhaustive linguistic analysis of 30,000 words of Russian text. With the Russian language, the researchers have been able to take advantage of a considerable body of existing linguistic information, while for many languages such information has never been gathered.

Another advantage of the U.C. machine translation system is that it is being designed to work on any large-scale digital computer. In the past many researchers thought that special machines would have to be invented for dictionary look-up, since no economical method of using general computers for this purpose was believed possible.

The system, when completed, will be as fast as the computer with which it is used. For example, dictionary look-up operates at a rate of about 125 words per second on the 704. But on the faster IBM 7090, it would do about 500 words per second, or 30,000 words per minute. At this rate, it would take about one minute and twenty seconds to look up all the words in the average Russian technical journal.

For the complete machine translation system from start to finish the 704 would do about 70,000 words per hour, assuming that a very good quality translation was desired. On the IBM 7090, a translation of about 360,000 words per hour, or a journal every seven minutes is expected.

Work is also developing on a Chinese mechanical dictionary. Reasons for the interest in Chinese are twofold. The Chinese are now starting to build up their scientific strength, and the volume of their scientific literature is expected to increase greatly in the next few years. In addition, there are very few competent translators of Chinese in the United States.

The first step in the Chinese program will be to make an intensive linguistic analysis of the Chinese language, which is much less well understood linguistically than Russian. Special problems exist for Chinese, where characters are used instead of an alphabet.

For purposes of a Chinese mechanical dictionary, items will be arranged numerically by assigning an arbitrary code number to each Chinese character. The linguists will make good use of the Chinese telegraphic code, which already has code numbers for 10,000 different Chinese characters.

FULLY AUTOMATED ACCOUNTING APPLIED IN THE LARGEST PHILADELPHIA BANK

Burroughs Corp.
Detroit 32, Mich.

The First Pennsylvania Banking and Trust Company, Philadelphia's largest bank, has installed a completely new, fully automatic, electronic, bank bookkeeping system.

The new system, made by Burroughs, is very flexible. It has the built-in ability to perform all of the bank's major banking operations -- in addition to check handling. It links live media processing with high-speed computing from multiple methods of input -- MICR encoded checks, punched tape, or punched cards and magnetic tape.

The last sub-system of the master system to be installed and placed in operation was a B 301 Magnetic Document Processing System. It operates on the principle of MICR (Magnetic Ink Character Recognition), the common machine language selected by the American Bankers Association for use throughout the United States.

This check-handling sub-system offers more completely automatic accounting steps than have before been available. It automatically provides all essential initial

-- The Burroughs B 301 Magnetic Document Processing System is the heart of the automatic electronic bank bookkeeping system installed in the First Pennsylvania Banking and Trust Company. The system reads, sorts and edits information encoded in magnetic ink on checks and other documents; and records the information on magnetic tape for feeding into the Burroughs 220 computer. Shown above are two Burroughs sorters, a control unit in the background, magnetic tape transport unit on the left and the electrostatic printer on the right. --

accounting steps necessary to the handling and processing of all checking accounts:

1. It "reads" the MICR characters and numerals on the bottom of the check.
2. It edits the information.
3. It sorts and classifies the check.
4. It records onto magnetic tape all the information from the checks or deposits necessary to process the transaction.
5. It accumulates all the totals necessary for proper settlement and control.

The processing of special checking accounts has been selected as the first check-out application. Benefits are expected later to come from using the system for processing regular checking accounts and other applications. Revolving credit, installment loans and mutual funds are currently being processed daily on the computer system.

Input records on these operations are not confined to one single type -- such as punched tape -- but actually encompass all of the popular and most widely used methods of input.

Up until now each of these steps individually has been laboriously performed by hand or was a semi-mechanized operation.

The magnetic tapes, prepared as a regular operational product of B 301 operations, are the link between the actual check-handling phases and the high-speed accounting, recording and statement preparation performed in the complete system by the Burroughs 220 electronic computer with high-speed printer.

Using this taped information the computer updates customer account records and automatically prepares customer statements, printing them out on another unit of the new system -- a separate ultra-high speed printer which operates at speeds up to 1,500 lines of 120 characters per minute, and turns out customer statements at a rate of about 1,400 statements per hour.

The sorter-reader "reads" checks and deposit tickets at speeds up to 1,560 documents per minute -- reading and sorting the MICR coding. It performs the same amount of work in three hours it formerly took 30 hours to complete by hand methods.

-- Console and tape units of one of the two Burroughs 220 electronic computers installed as part of the fully automatic electronic bank bookkeeping system at the First Pennsylvania Banking and Trust Company, Philadelphia. Information recorded on magnetic tape by the B 301 Magnetic Document Processing system provides input to up-date customer account records which in turn are used to prepare customer statements. Virtually every banking operation can be carried out using this system. --

HUGE COMPUTER LARC TO AID PHYSICISTS AT U.C.

University of California
Lawrence Radiation Lab.
Livermore, Calif.

The UNIVAC LARC, one of the fastest and most advanced computer systems in operation, has been accpted at the University of California's Lawrence Radiation Laboratory in Livermore, California.

The LARC (Livermore Advanced Research Computer), was designed and built in Philadelphia by Remington Rand Univac, a division of the Sperry Rand Corporation, under contract with the Lawrence Radiation Laboratory. Funds for the system were supplied by the Atomic Energy Commission.

The huge solid-state electronic digital computer, which took five years to design and build, will be used in a variety of AEC-supported research projects to solve problems of almost unbelievable complexity -- problems that were unapproachable with existing computer systems.

Almost all of the LARC's efforts will be devoted to nuclear weapons projects and fundamental studies of problems in nuclear physics of direct or potential application to the nation's weapons program.

Among the more interesting projects which is not classified and can be discussed is one involving the behavior of neutrons in reactors and nuclear weapons. Here, LARC scientists will use a statistical method known as the Monte Carlo technique to determine the behavior of large numbers of individual neutrons under a given set of circumstances.

Another important problem to be analyzed on the LARC is one advanced by Dr. Edward Teller, associate director of the Lawrence Radiation Laboratory. The physicist will provide the LARC with the basic set of equations which according to work by Balacz Rozsnyai, represents the structure and properties of the atomic nucleus. Dr. Teller expects that it will be possible with the aid of the LARC to predict stability, charge distribution, and quadripole moments of nuclei. One of the many possible benefits to be reaped is a more fundamental understanding of how the process of nuclear fission takes place.

As time permits, other interesting problems will be attacked by the LARC. One of these involves the development of a system of weather prediction. Dr. Cecil Leith, mathematical physicist, explained that use of the computer would make it possible to treat the Earth's atmosphere as five separate layers, with simultaneous interaction between layers going on continuously.

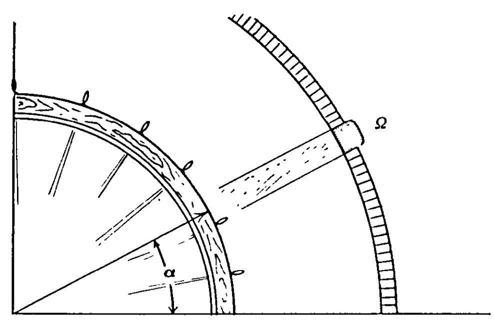
Data drawn from weather stations throughout the nation on wind velocity, temperature, pressure, and humidity could be recorded on magnetic tapes and fed into the LARC. From its computations the LARC would then draw a weather map for each atmospheric layer. Such weather maps would be expected to provide a degree of reliability in weather prediction never before realized.

The computer may also be used in an attempt to solve the famous many-body problem of astronomy. The problem, which has been studied by practically all of the great mathematicians of the past three centuries, concerns three or more astronomical bodies, each exerting a gravitational attraction upon the others. A general solution to the problem would enable scientists to predict the positions and motions of the bodies as a result of forces interacting between them.

The UNIVAC LARC is capable of performing 250,000 additions of 125,000 multiplications each second.

The computer's high-speed magnetic core memory will store up to 97,500 words (or 11-digit numbers), while an additional six million words may be stored on high-speed drums.

The computer's mechanical printer will print 720 lines of results per minute. But for much faster operation, the LARC is equipped to display results on the face of a cathode ray tube. These results are automatically photographed and developed later. The photographic process will record up to 9,600 lines of output per minute, and can also be used to draw graphs of results, plotting an average of 120,000 points per minute.



SPECIALLY DESIGNED MAGNETIC TAPE AND RECORDER IN USE IN SATELLITE

Minnesota Mining and Manufacturing Co.
St. Paul 6, Minn.

Moving through space at 20,000 miles per hour, special magnetic tape carried by the Courier 1B satellite is recording over 3 1/2 million words a day in the U.S. Army's "delayed repeater" communications satellite experiment.

Circling the earth 14 times daily, Courier stores information on a magnetic tape until commanded to transmit. When in range of a ground station at either Puerto Rico or Fort Monmouth, N.J., Courier can receive 340,000 words in a five-minute period. Five tape recorders in the satellite store this information, which is later relayed to the next station.

The tape units -- each no larger than a transistor radio -- were developed by Consolidated Electrodynamics Corporation. Although the unit can record, reproduce and erase, in a package weighing only 5 1/2 pounds, primary consideration in design of the tape unit was reliability. The recorder and magnetic tape were expected to operate in extreme environmental conditions of altitude, temperature, humidity, vibration, and shock -- such as withstanding 30 g's acceleration and vibration to 14 g's at 2,000 cps.

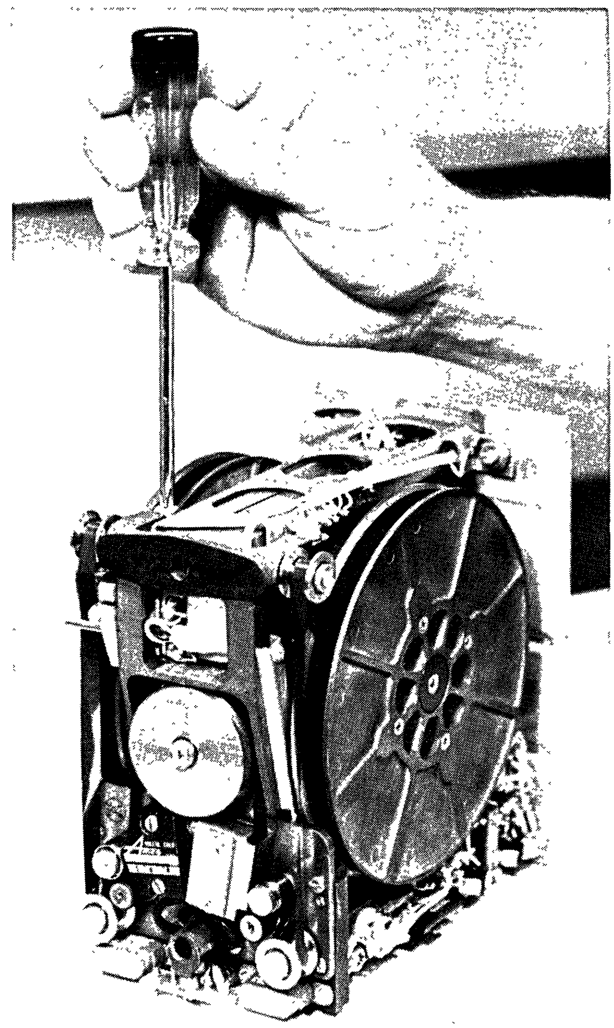
Since the satellite is intended to orbit for at least a year, the tape in the recorders had to be designed with a relative wear factor five times greater than that of standard tapes. The requirement was for a tape that would stand up under extreme conditions of operating speed, temperature and head-to-tape pressure for a minimum of 10,000 passes across the recording heads.

The tape selected is a heavy duty instrumentation tape with a 0.45 mil oxide coating on a 1 mil polyester backing.

Binder materials were developed specifically to meet the highly critical demands of video recording and are used in the new tape to achieve a tougher, more durable tape surface.

The binder system minimizes rub-off and head fouling. It has 1,000 times greater conductivity than conventional tape, thereby reducing static charge buildup which causes tape to momentarily "stick" to equipment. Field tests of the new tape have proved it wears a minimum of five times longer than conventional instrumentation tapes, yet maintains good resolution and freedom from dropouts.

Tapes in the five Courier recorders, 775-foot lengths, move past the recording heads at 2 1/2 feet per second. The five tape units function in sequence. Four are designed to store teletyped digital communications data, the fifth to test system capability with analog or voice information. Each has capacity for recording five minutes on one channel, after which the tape reverses and reproduces on the return pass upon command from the ground.



-- Five tape recorders like this one are orbiting the earth in Courier 1B, the communications satellite which is recording, reproducing and erasing teletype messages transmitted to it from ground stations. The heavy-duty magnetic instrumentation tape used is produced by Minnesota Mining and Manufacturing Company. The tape units, developed by Consolidated Electrodynamics Corp., record or play back analog signals in the range of 300 to 50,000 cycles or digital signals up to 55,000 bits per second.

COMPUTER EXPERTS CONDUCT POST-MORTEM ON ELECTION EVE CONTEST OF THE ELECTRIC BRAINS

Association for Computing Machinery
Washington Chapter
Washington, D.C.

Why did two out of three giant electronic computers forecast Nixon's victory early on election eve? How did the third one make an extremely accurate prediction of the size of Kennedy's victory from the very first trickle of returns, even when Nixon appeared to be running 2% ahead of Eisenhower in 1956? How were all three computers programmed to handle and analyze economic, religious and other factors affecting the vote?

These and many other questions about the election eve battle of the computers were discussed November 17th -- when a panel of three computer experts, representing the three competing network teams, spoke on the topic, "A Post-Election Post-Mortem," at a meeting of the Washington, D.C. Chapter of the Association for Computing Machinery, the nation's largest computer organization.

The speakers were:

Dr. Eugene E. Lindstrom of IBM, who directed computing activities for the IBM/CBS team.
Dr. Jack Moshman of C-E-I-R, INC., who led his company's activities on the joint C-E-I-R/RCA/NBC team.
Prof. Max Woodbury of New York University, Consultant for the Remington Rand Univac/ABC team.

The open meeting, held at the Broadmoor Hotel in Washington, D.C., marked the first time that all three team leaders met to discuss details of their election models. Until now, this information was a closely guarded secret because of the intense competition among the three networks, which collectively spent millions of dollars to get their computers ready for the election eve contest.

COMPUTER CENTER FOR SERVICING INSURANCE COMPANIES

Recording and Statistical Corp.
100 Sixth Ave.
New York 13, N.Y.

A computer center designed to furnish insurance companies with a centralized, economical facility for electronic data processing has been established in New York. The large Univac computer system has been installed to provide full flexibility in handling insurance data.

The center facilities also include converter equipment and a high speed printer.

Some insurers have been known to undertake electronic programs, only to encounter heavy expense and unforeseen complications which required immediate and broad changes in internal operations. Other insurer managements, now considering electronic processing, wish to avoid these complications and unnecessary expense. The new center has been designed to meet their needs at a cost which makes available to companies, large or small, a service specifically set up to keep them in a competitive position under present demanding conditions.

An interesting feature of the program is that any company's present equipment can be integrated with the computer techniques at the center to obtain maximum efficiency from both. For example, it is often advantageous to pre-process work on punched cards, or to process data in the computer only up to a selected point, and then reconvert the data to cards and complete the reports on tabulating equipment. This integration can be accomplished using the center's punched card facilities, thereby eliminating or reducing home office equipment.

125,000 OPERATIONS PER SECOND FOR SYLVANIA 9400 COMPUTER

Sylvania Electric Products, Inc.
Div. of General Telephone & Electronics Corp.
730 Third Ave.
New York 17, N.Y.

A powerful general-purpose digital computer called the Sylvania 9400, developed to serve as the nucleus of large-scale, custom-designed data processing systems, was announced November 16. The first installation is expected to be in operation in Sylvania, Needham, Mass., in January 1961. It is one of the most powerful computers in production for both engineering and scientific applications and general administrative data processing. It is to be marketed mainly to government agencies and operating telephone companies. The General Telephone Company of California, an affiliate of Sylvania, has announced that it purchased one of the new systems, expected to be delivered by October 1961.

The 9400 is a multiple-computer system, incorporating a central information processor and associated data input-output processors.

As a result, it is capable of performing four separate tasks on a continuing basis at the same time that its primary function is being carried out at the rate of 125,000 operations per second. Addition time is 8 microseconds; multiplication time is 41 microseconds. The machine word is 38 bits of binary information, including 1 sign bit and 1 parity bit. The internal storage includes 16,384 or 32,768, 38 bit words of fast storage, and an additional 80,000,000 alphanumeric characters on magnetic discs.

Completely transistorized, the 9400 has been developed for "second-generation" data processing users who desire a large-scale system custom-designed to their requirements. It is capable of direct operation through voice circuits, teletype lines, and microwave communications networks; it may also be used with both regular and special digital display and control equipment.

Because of the 9400's high operating speed and powerful instruction system, the computer will be suitable for nuclear research computations, determination of satellite orbits, high-volume accounting, etc.

The 9400 and related equipment are presently in production at the Data Systems Operations of Sylvania Electronic Systems in Needham, Mass.

The 9400 effort includes, in addition to equipment, over-all systems analysis and programming, and all aspects of study, implementation, training and maintenance for large-scale data processing systems.

NEW SYSTEM TURNS ELECTRONIC DATA INTO FILM IMAGES

Kalvar Corp.
909 So. Broad St.
New Orleans, La.

High-speed recording of electronic data as visible and projectable images has been developed.

The new system can transform data at electronic speeds into written or numerical characters on film, and into a "TV image" for giant screen projection.

An electrostatic tube converts the electronic data to film images at the rate of several feet per second. With this system a rocket's flight can be tracked and projected as a good TV image, within a fraction of a second. For example, with the new technique, a missile range safety officer can see immediately the missile's flight path and whether the missile is performing properly or must be destroyed.

The new development in high-speed recording systems for business and government is feasible because of the unique characteristics of heat developable photographic film made by this company. It is the only photographic film now marketed upon which a "discrete" or localized electric charge can be placed, a basic element of the new system. The coating on the plastic-base film has the property that the latent image on the exposed film is developed by heat alone in the completely dry process. All chemicals are eliminated by the technique used.

GREETINGS TO COMPUTERS

For Christmas, we wish our subscribers, our readers, and all computer people a 28506 70413 67

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                 A Y H R C S
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                       M M S Y A
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(Solve for the digits; each letter stands for just one digit 0 to 9.)

This is a Numble, a number puzzle for nimble minds -- an arithmetical long division, in this case. For hints for solution, if needed, write us. The solution will appear in January.

We offer once again our annual challenge to all automatic computers -- to solve this problem by an automatic program. This challenge is now offered for the 7th December -- but during 1960, two readers reported computer programs for solving this kind of puzzle, and our challenge is no longer completely unanswered!

1960 Pictorial Report on the Computer Field

This is a pictorial report for 1960 on the computer field, including computers, data processors, components, etc. To put together this report, we sent out a letter to many organizations in the computer field, asking for:

> "interesting, striking, and dramatic pictures related to the computer field in 1960 — pictures that answer questions:
> What does a . . . . . look like?
> What goes into a . . . . . ?
> How is a . . . . . made?
> How does a . . . . . operate?
> and similar questions."

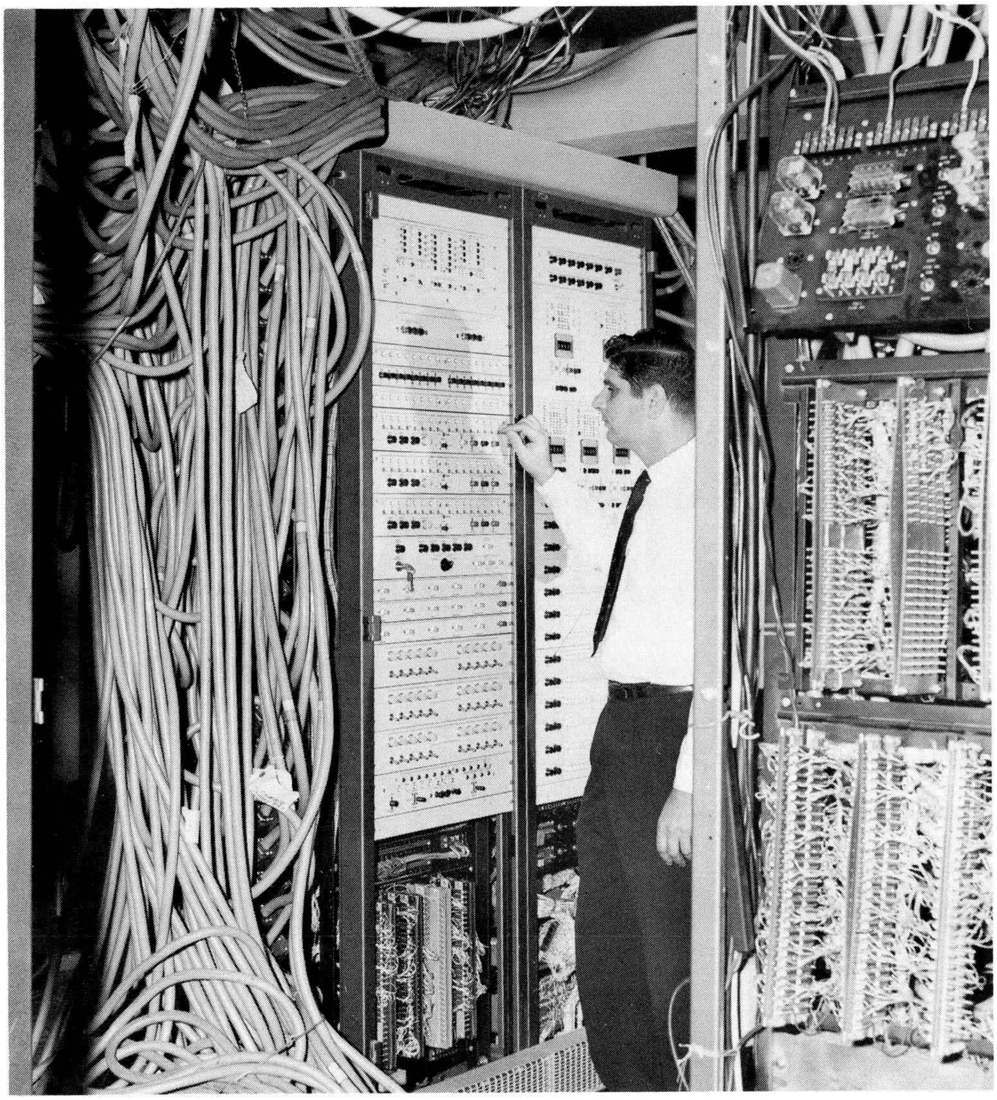
We said we wanted to avoid pictures that showed only "smooth and featureless outside coverings."

A number of good pictures have been sent to us, and we are grateful for them. Many of these have been printed as a part of this report, which includes the front cover also; but there is not room for all of them to be published in this issue, and so we shall plan to publish more of them in later issues.

The present report is a continuation of our previous pictorial reports: "A Pictorial Manual on Computers," first printed in two parts, one in December 1957, the other in January 1958, subsequently reprinted as a special issue of "Computers and Automation," vol. 6, no. 12B; "1958 Pictorial Report on the Computer Field," printed in the December 1958 issue of "Computers and Automation," vol. 7, no. 12; and "1959 Pictorial Report on the Computer Field," printed in the December 1959 issue of "Computers and Automation," vol. 8, no. 12.

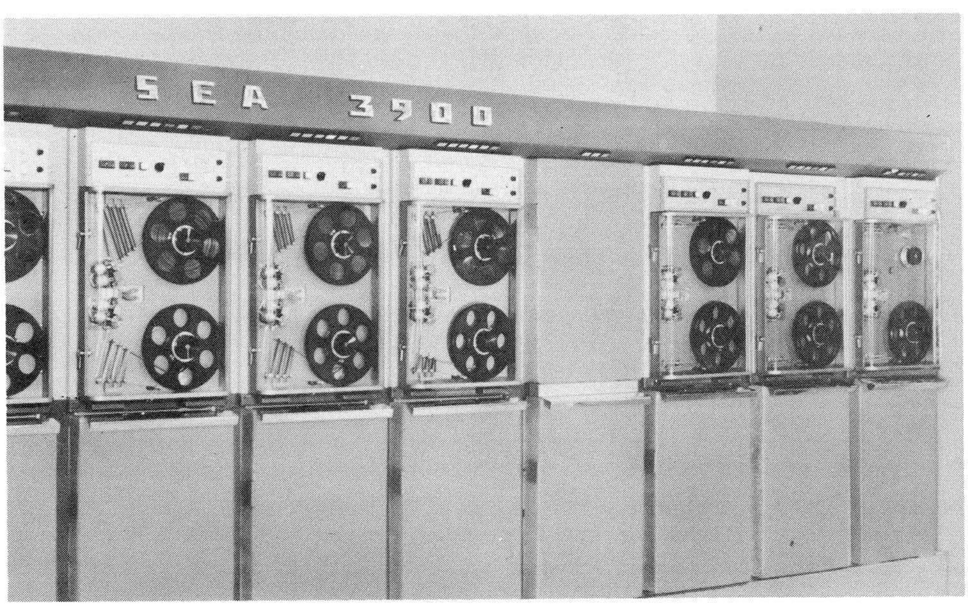
1. Computers

This is one of three equipment areas in Space Technology Laboratories, Inc. new Data Reduction Center located in Southern California. This equipment is used in the conversion of missile and space flight telemetry data into suitable forms for study and analysis. (Figure 1)

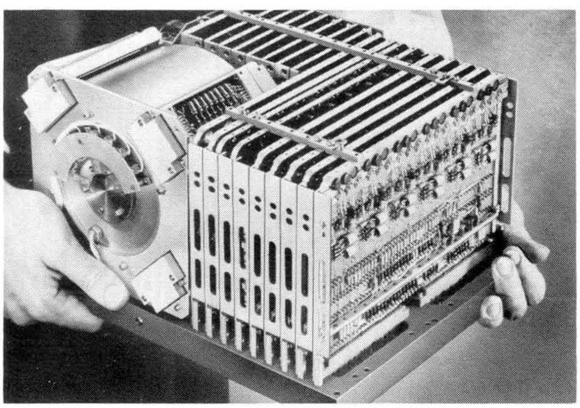


Miles of wire are exposed to view during a systems test of a new Telefile® real-time data-processing system. Telefile systems are currently being installed by three savings banks and a major air line. In the background is test engineer Gene Martinelli at a system control console, which contains 28,000 connections. At the right is the undressed back of a processor-control console. Teleregister Corp., Stamford, Conn. (Figure 2)

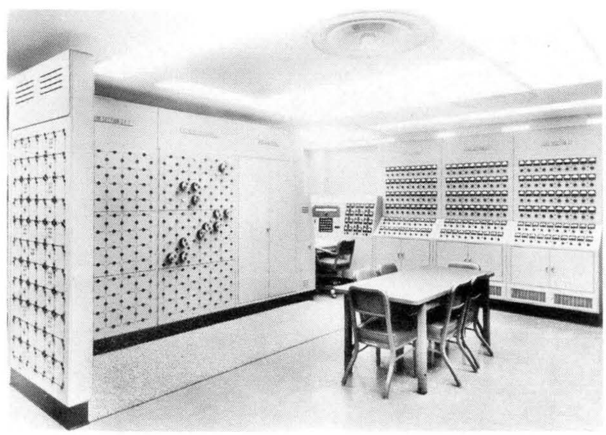
Shown is one of the new European-made computers, the SEA 3900. The system operates character by character on variable-length data, the length being adjusted to the type of work to be performed. Designed by the Société d'Electronique et d'Automatisme, Puteaux (Seine), France, the system comprises (1) an arithmetic and logic unit, (2) 4 to 16 magnetic tape units, (3) punched tape or card-reading and perforating units, and (4) a high-speed output printer.



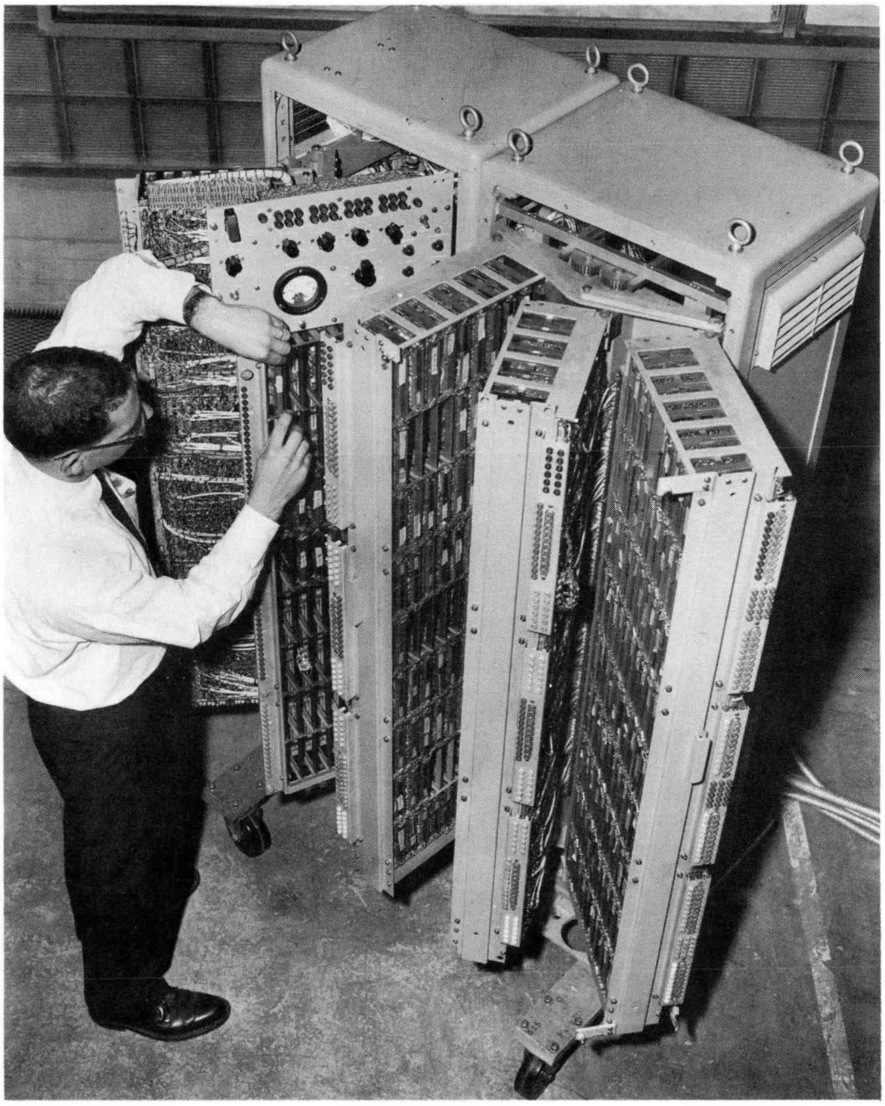
This computer-ized X-ray instrument is shown automatically comparing unknown samples of metal alloys with known standards, and printing out the ratios on tape. The instrument can be programmed to handle in any one cycle up to 24 elements, selected from atomic number 12 to atomic number 98. It is produced by Philips Electronic Instruments a division of Philips Electronics and Pharmaceutical Industries Corp., Mt. Vernon, N.Y. (Figure 4)



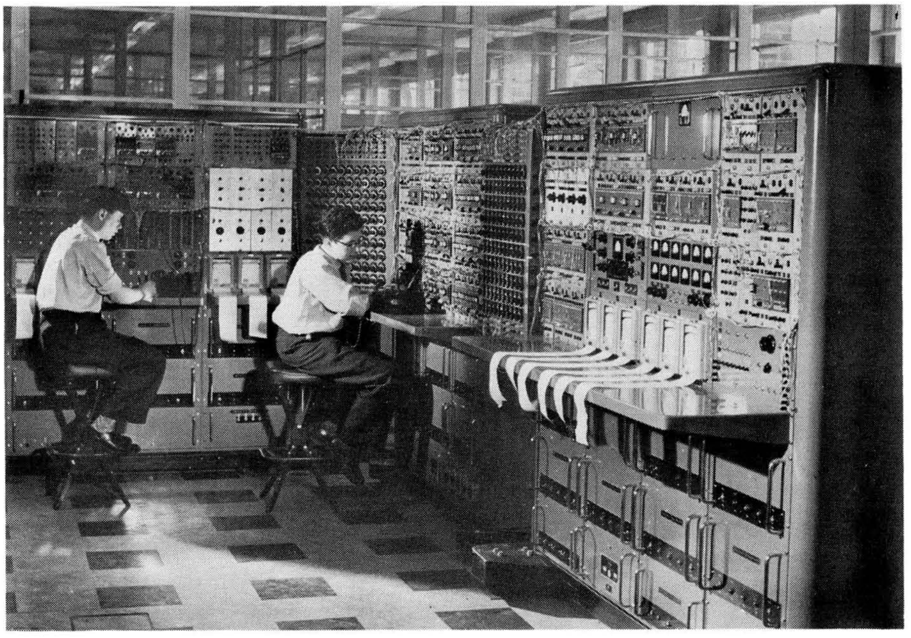
Shown is the McIlroy Fluid Network Analyzer at the Western New England College in Springfield, Mass. The system will be used to simulate steady state conditions in a pipeline network. It is used by water and gas utilities to determine, in advance, a pipeline system's performance under projected conditions of use. The analog computer will also be used to train students in the operation of computing equipment. (Figure 5)



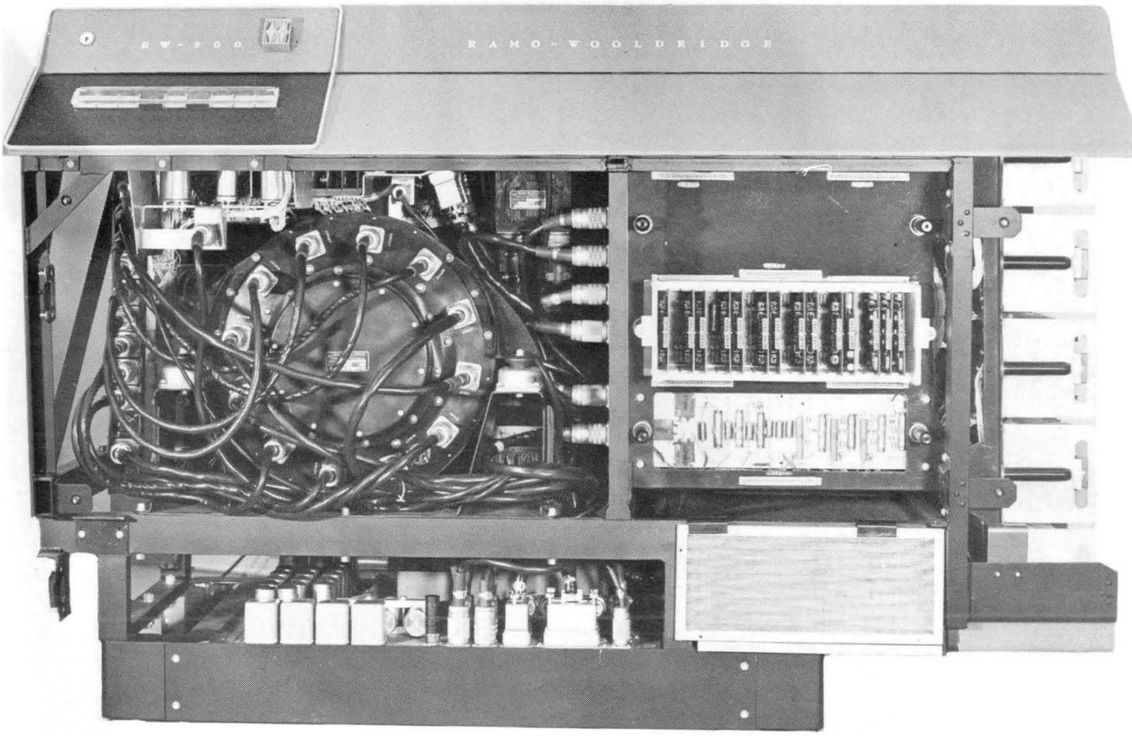
Here is a miniaturized digital computer that will aid in guidance of the Centaur space rocket. The computer accepts information from the inertial platform, performs the necessary guidance computations, and then provides the steering signals to the Centaur's control system. The unit is made by Librascope, Inc., Glendale, Calif. (Figure 6)



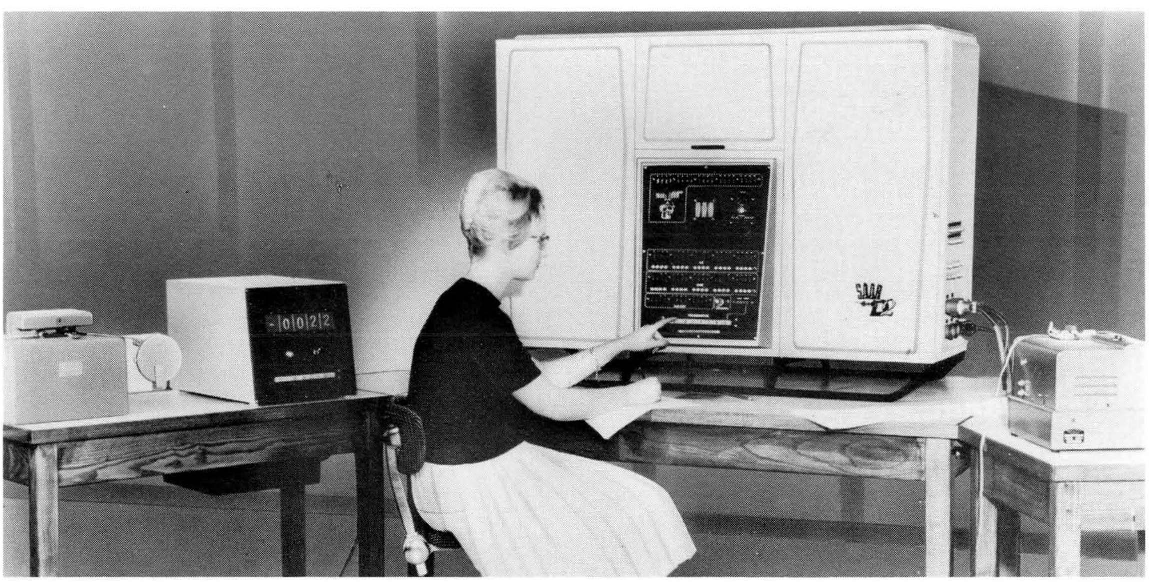
Easy access to computer components is demonstrated in the STARDAC solid-state computer developed for the U. S. Navy's missile-firing submarines by Epsco, Inc., of Cambridge, Mass. The computer's 88,600 components are mounted on keyed, plug-in, etched circuit boards, which are all immediately accessible from the front of the computer. (Figure 7)



Here electronic simulators are being used extensively to verify the operation and safety of a reactor design and its control system. The unit shown is one of three simulators at the Whetstone Laboratories of the English Electric, Babcock & Wilcox, Taylor Woodrow Atomic Power Group, in England. (Figure 8)



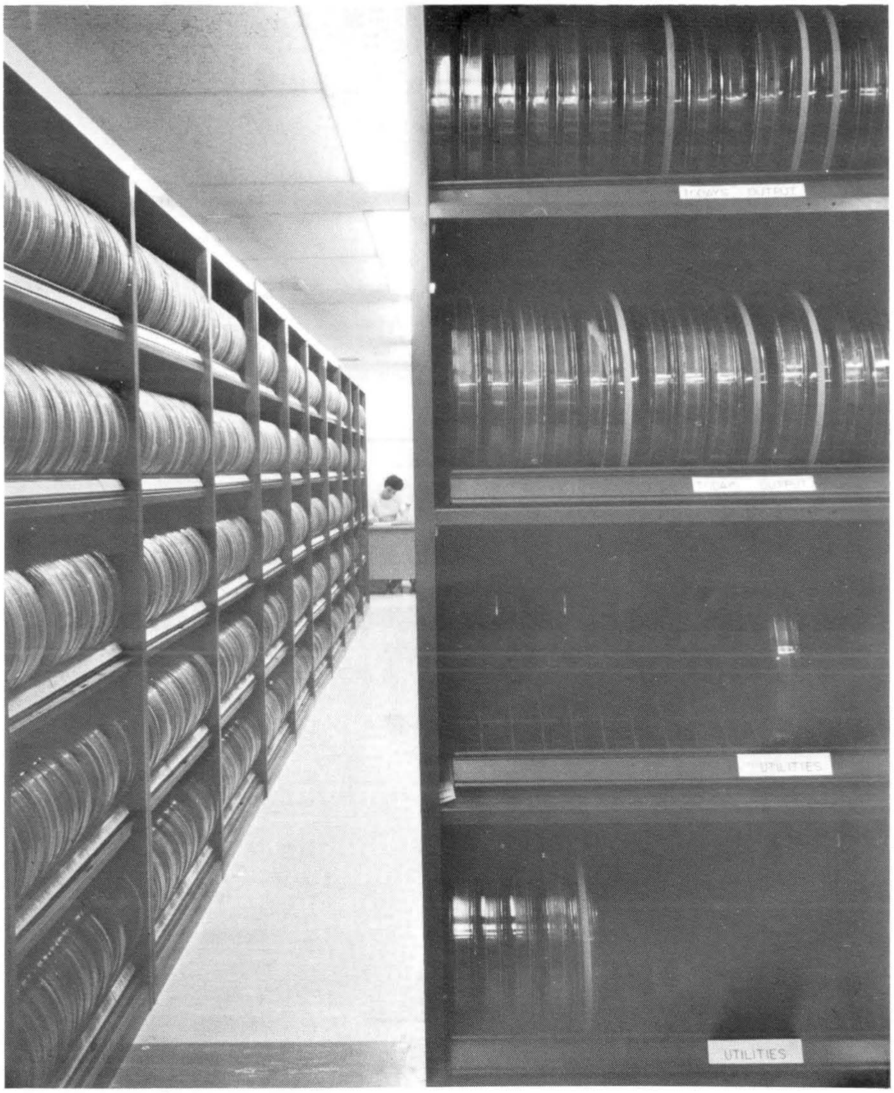
The RW-300 Digital Control Computer (here shown in front view with cover removed) is a transistorized, desk-size machine combining high speed with extremely high reliability. It is designed specifically for closed-loop process control, automatic testing, on-line data logging and reduction, and simulations. The RW-300 is marketed by TRW Computers Co., a division of Thompson Ramo Wooldridge, Inc., Beverly Hills, Calif. (Figure 9)



A girl is shown operating the control panel of the SAAB D2, a small, transistorized computer designed by the Saab Aircraft Co., Linköping, Sweden. The upper part of the control panel contains register displays for service use and the control loudspeaker. The lower part contains displays for the address register, order address register, and the address register for the order store, and also push button switches for program interruption, program selection, and step-by-step operation. (Figure 10)

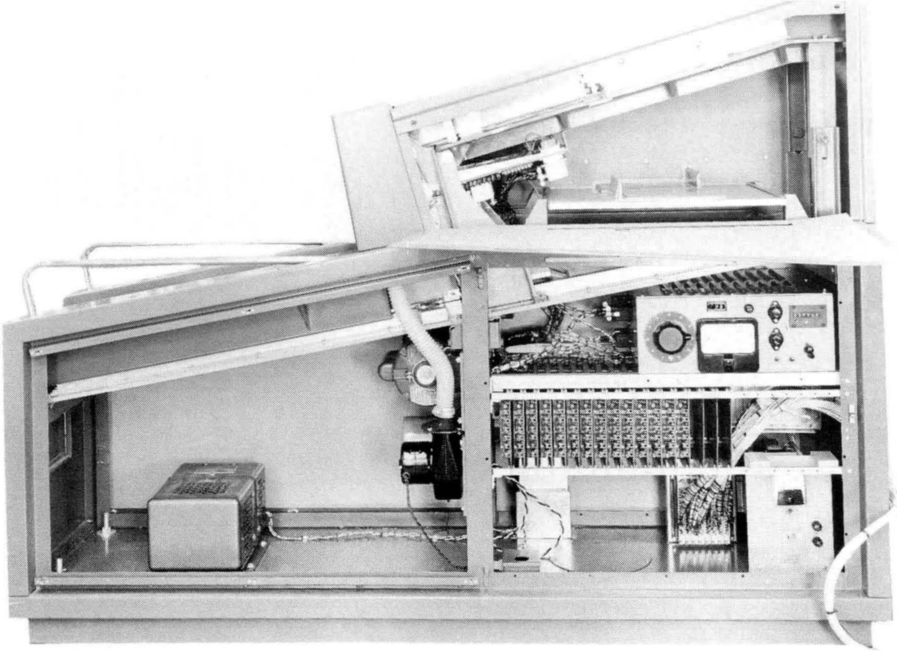
2. Input-Output

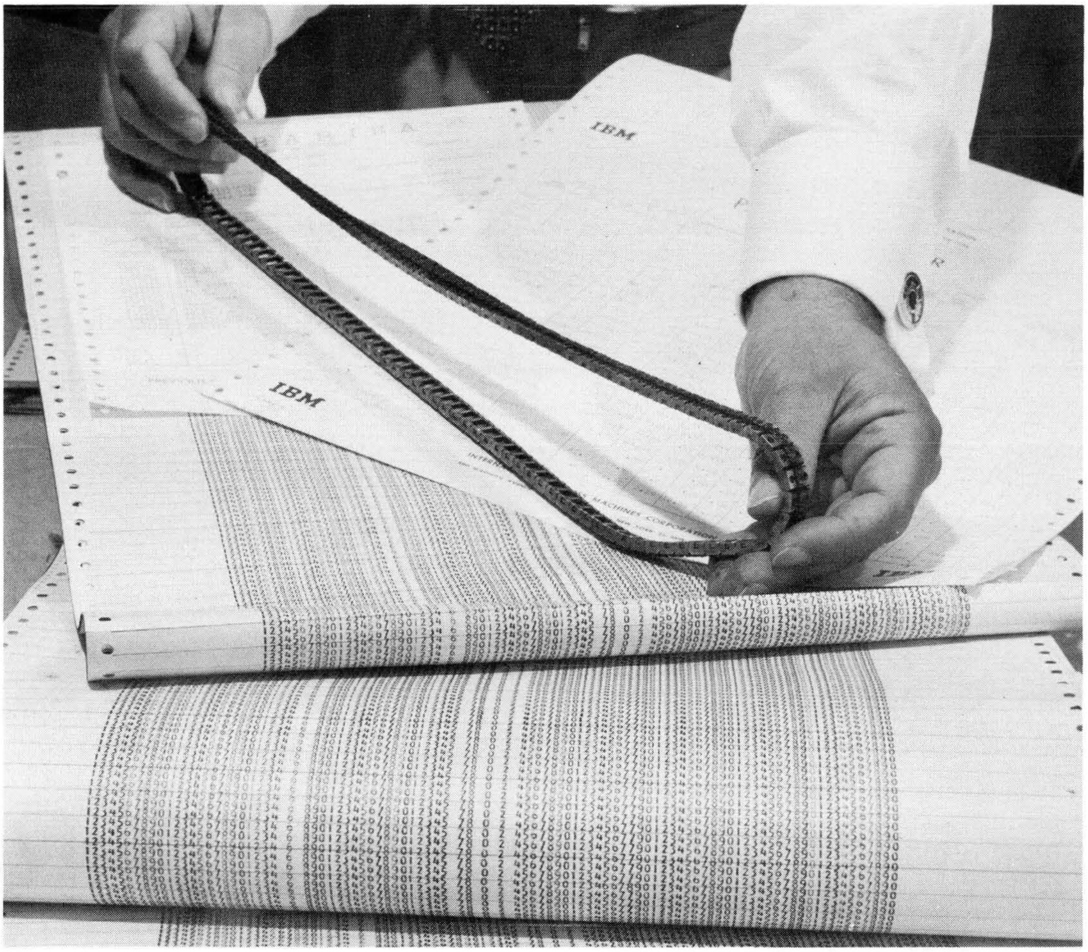
The IBM 870 document writing system shown here speaks in three languages — typewritten script, punched cards, and punched paper tape. The system includes (from top to bottom) an auxiliary card punch; an auxiliary keyboard; the control unit — with a keyboard, a card punching and a reading station, and a tape reader; and two electric typewriters. The system is controlled by a wired panel such as held by the engineer. It is designed by International Business Machines Corp., White Plains, N. Y. (Figure 11)



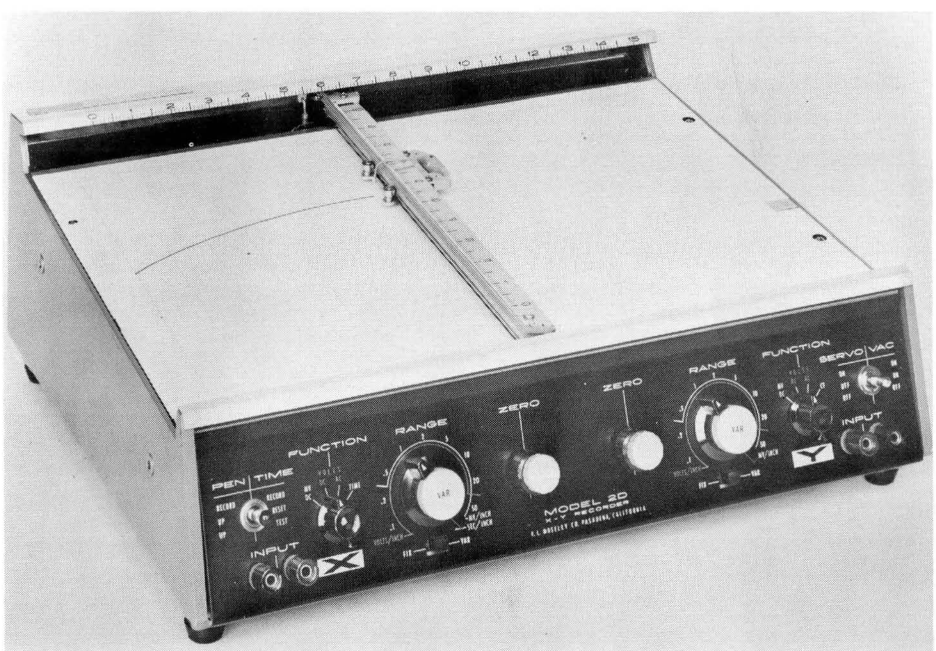
Here is a portion of the magnetic tape library at the Computation and Data Reduction Center of Space Technology Laboratories, Los Angeles, Calif. Each of these magnetic tapes can hold the information contained in 50,000 standard 80-column punch cards. (Figure 12)

Here is a side view — with panels removed — of the punched card reader used with the Philco 2000 electronic data processing system made by the Philco Corp., Philadelphia, Pa. (Figure 13)

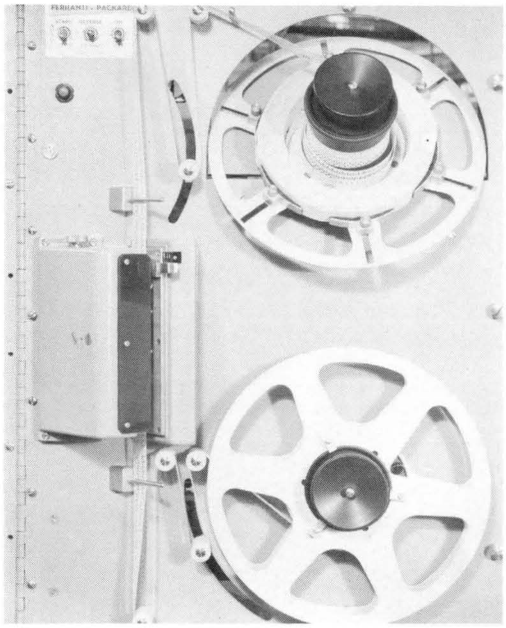




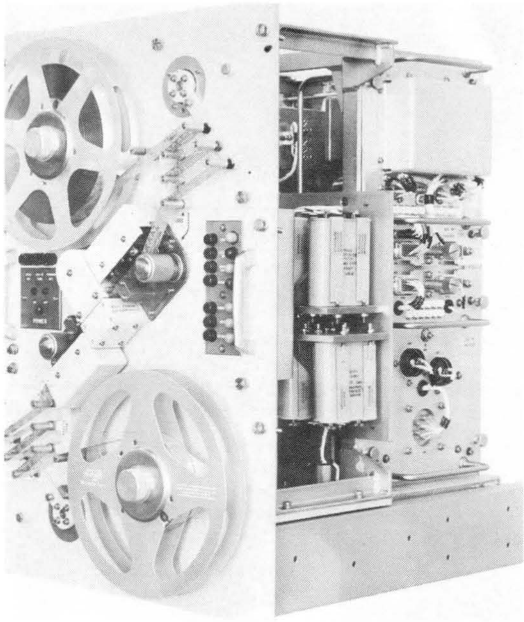
Here is a chain printing device used in the International Business Machines 1403 printer, which prints 10 lines a second. The chain whirls horizontally across the document at the speed of 7-1/2 feet a second, while 132 electronically timed hammers controlled by a program bring paper, ribbon, and metal type face together at the precise instant for each imprint. (Figure 14)



This is a new D2 X-Y Recorder designed to plot Cartesian coordinate graphs from DC electrical information. The model also plots functions of time, accepts AC input data, and operates with punched tape and card converters, keyboards, and logarithmic converters. The unit is made by F. L. Moseley Co., Pasadena, Calif. (Figure 15)



Shown here is the Ferranti Type 196 tape reader which reads paper tape at 270 characters per second, and incorporates inside spooling. It is made by Ferranti Electric, Inc., Hempstead, N. Y., and is part of their "Rapid Access Look-Up System." (Figure 16)



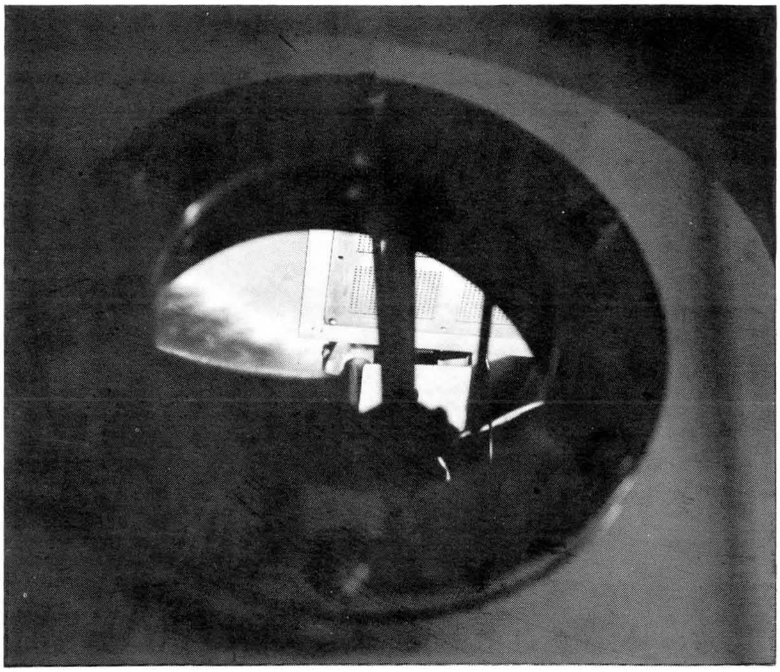
This is a photo-electric tape reader which will hold 1500 feet of tape or 1.5 million bits of information. Tape speed is 60 inches per second; start-stop time is less than 45 milli-seconds. It is made by Cook Electric Co., Skokie, Ill. (Figure 17)

3. Components

FRONT COVER: MAGNETIC FILM MEMORY

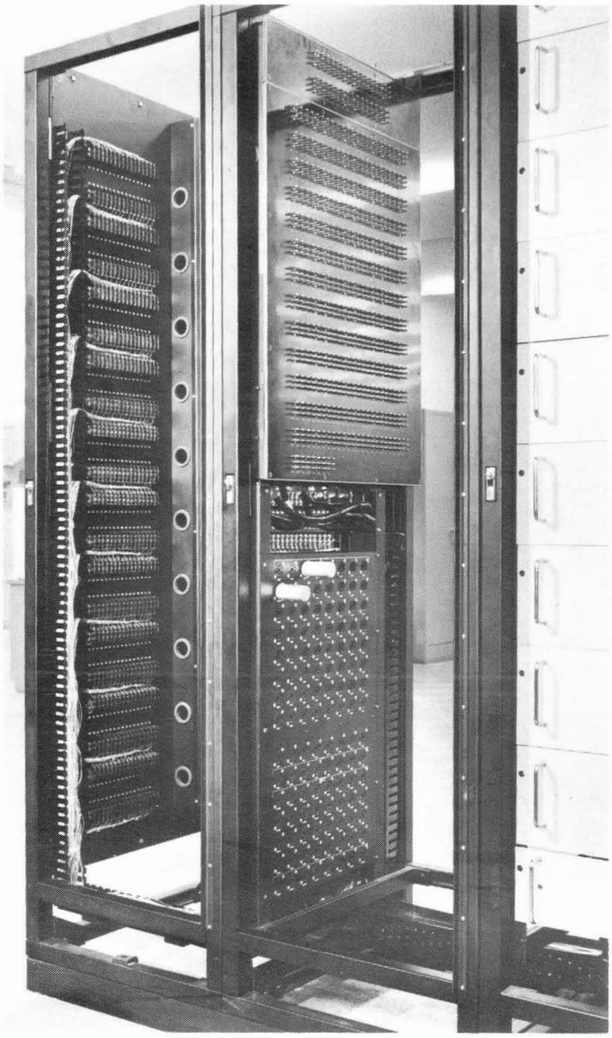
A technician at Remington Rand Univac Military Div., St. Paul, Minn. is inserting glass substrates 6 mils thick (containing 50 mil "spots" of thin magnetic memory film) in an etched, multi-layer, circuit plane.

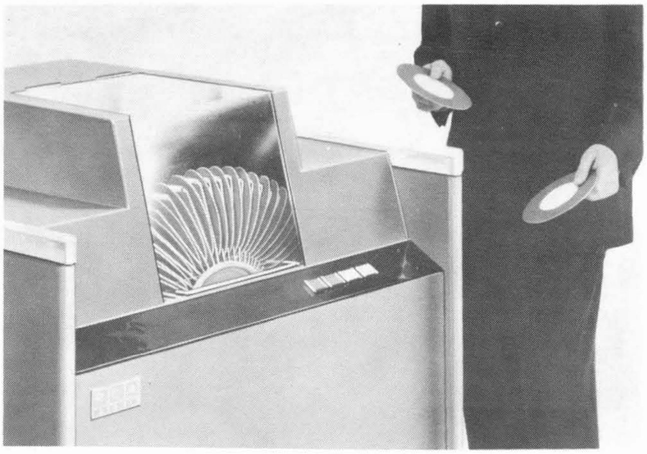
A memory plane is composed of the etched multi-layered circuitry and substrates. Several "layers", such as shown, are stacked together to form a thin-film memory plane.



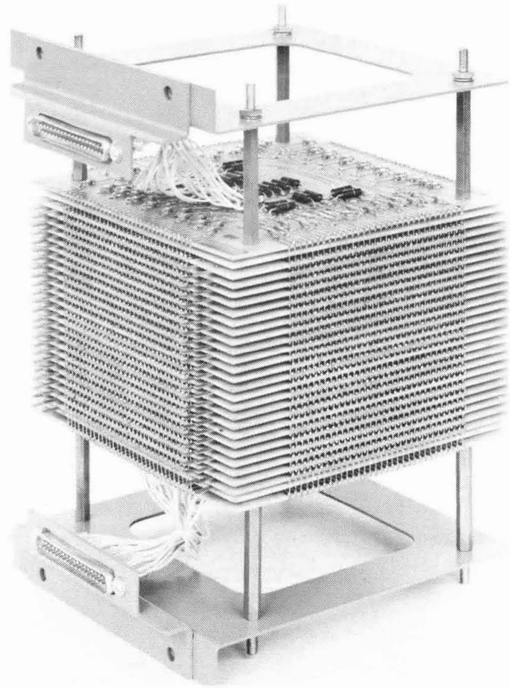
In this "porthole" view (pictured right) of a "bell jar", a substrate is shown, during the actual process of deposition of a thin film of a magnetic permalloy. Deposition occurs in the air-exhausted jar in the presence of a magnetic field. The vacuum allows the molecules of metal to rise in straight lines from the crucible of molten alloy (not shown) upward to the substrate. The magnetic field is necessary to give proper anisotrophy to the magnetic film. Deposition occurs on glass or other substance in back of the metal mask. Remington Rand Univac Military Division, St. Paul, Minn. (Figure 18)

Here computer building blocks at Minneapolis Honeywell's electronic data processing division in Boston, Mass., are being assembled, using automated soldering techniques. Circuit boards ride across the solder jets in the foregound, and streams of molten solder make wire and component connections uniform. Solder joints of very high quality are made by this precisely controlled automatic technique. (Figure 19)



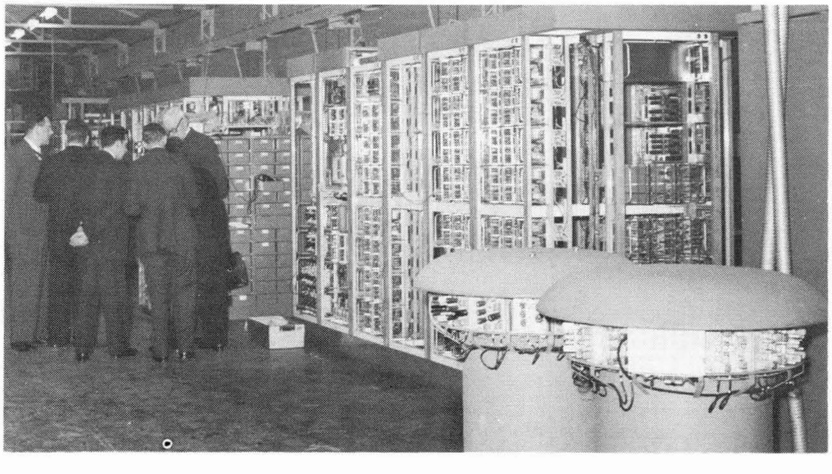


Individually replaceable magnetic discs, as shown above, are a feature of the bulk storage available with the RCA 301 computer system of the Radio Corporation of America, Camden, N. J. (Figure 21)

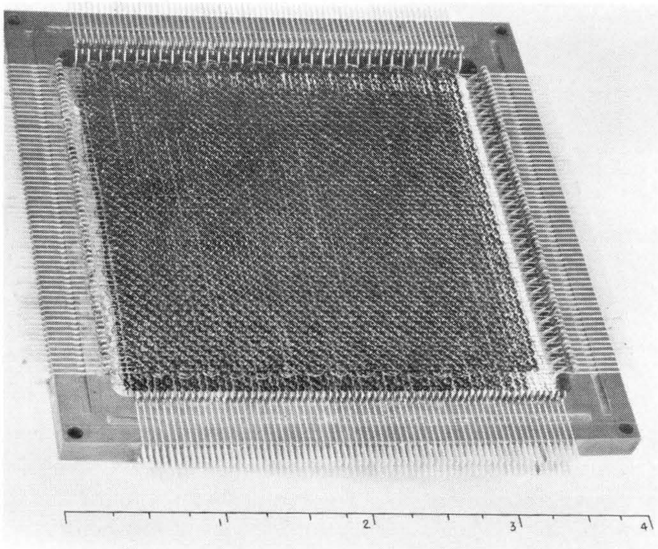


Shown is part of the input racks for a process control computer made by Daystrom, Inc., La Jolla, Calif. The left hand terminals on the first rack accept voltage and current input signals. They then go to the lower half of the second rack which shows two of the signal range modules for normalizing the input signals. The upper half of the second rack shows the three-prong receptacles for thermocouple inputs. (Figure 20)

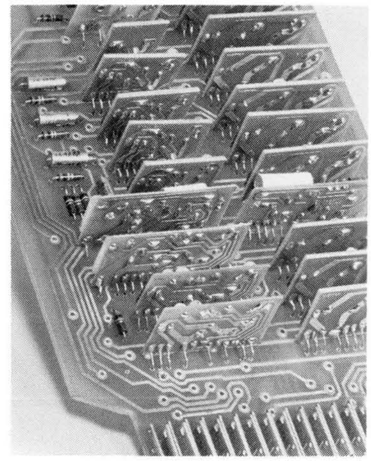
Above is a memory stack that will operate at a speed of 200 kc using both random and/or sequential addresses and coincident-current methods. Its storage capacity is 1024, 24-bit words. It is part of a general purpose commercial memory made by Telemeter Magnetics, Inc., Culver City, Calif. (Figure 22)



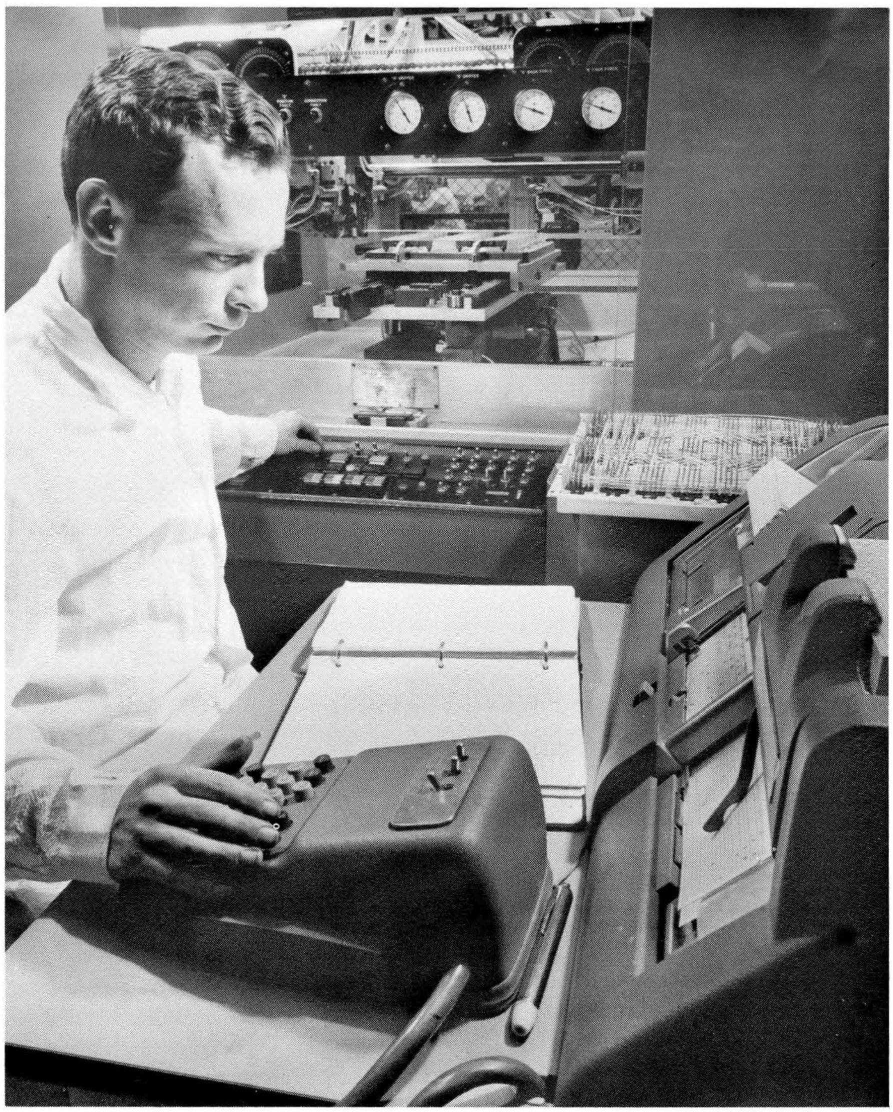
At left is a computer assembly line at The English Electric computer factory at Kidsgrove, Staffordshire, England. The visitors are a Russian trade mission. (Figure 23)



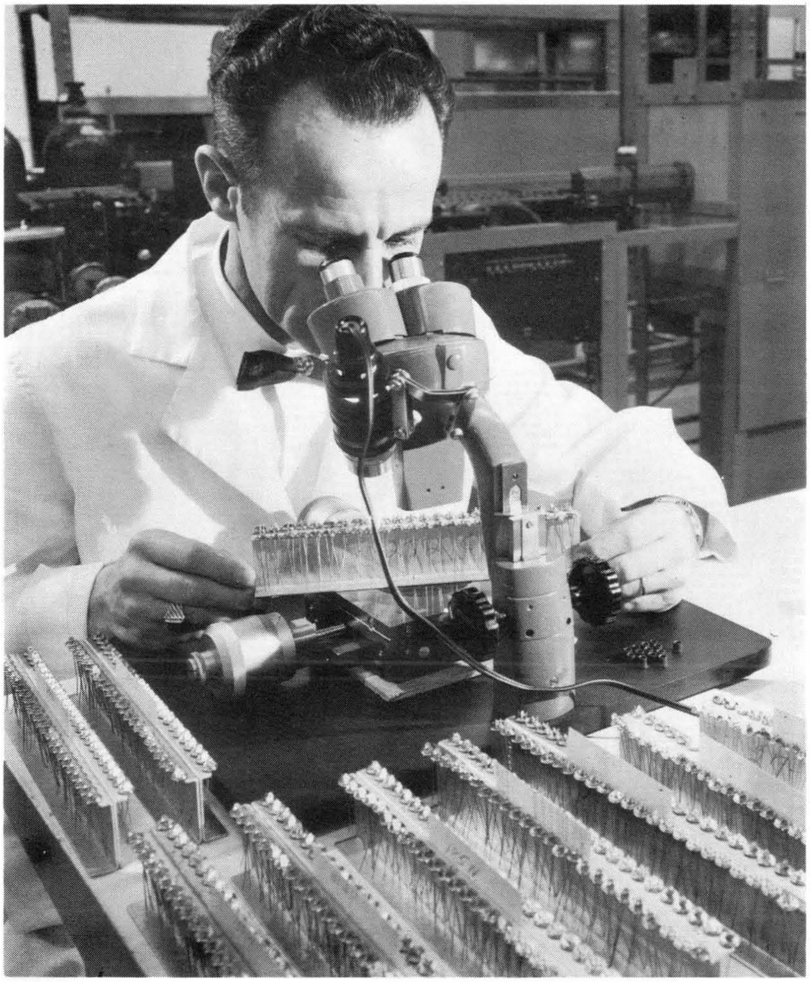
Shown above is one of the metallic core memory planes used in the Philco 2000 electronic data processing system made by Philco Corp., Philadelphia, Pa. (Figure 24)



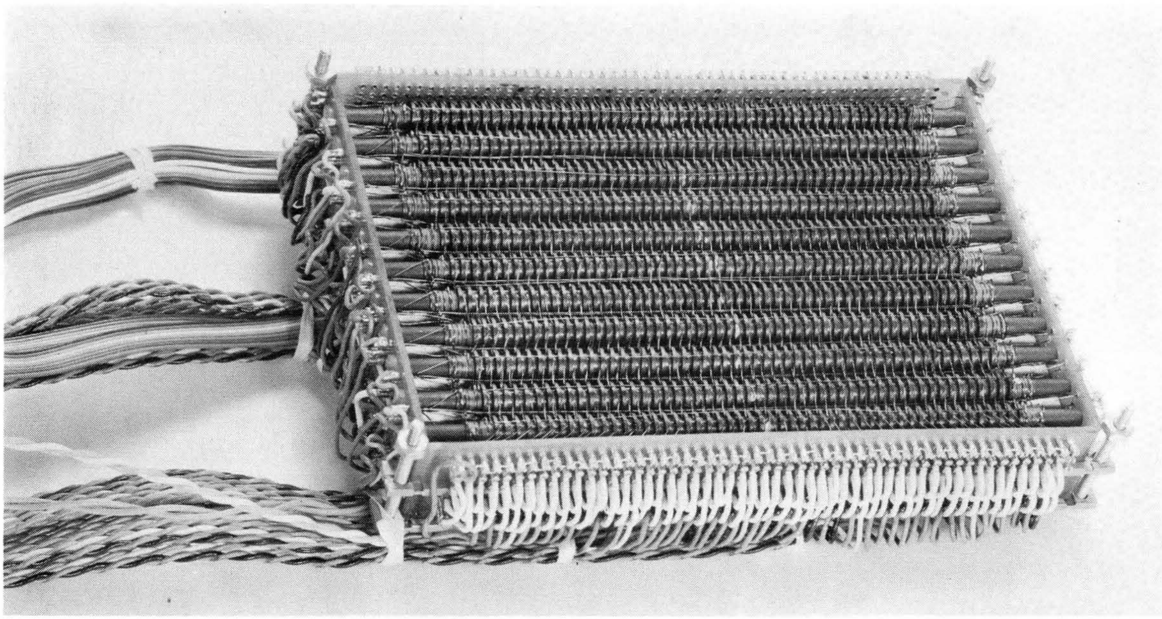
Here is one of the printed circuit boards used in the Philco 2000 electronic data processing system of Philco Corp., Philadelphia, Pa. (Figure 25)



Here automatic wire-wrapping techniques are being applied by Minneapolis Honeywell's electronic data processing division in Boston, Mass. This enables high-speed assembly of electronic computer circuits. The wiring machine shown here, cuts, positions, and connects a wire every six seconds — twenty times faster than by hand methods. Instructions for the operation of the machine are provided in the form of punched cards, which have been prepared and checked by a DATAmatic 1000 computer. A back-wiring panel on which the machine-wiring is complete is shown at the right of the switch control position. (Figure 26)

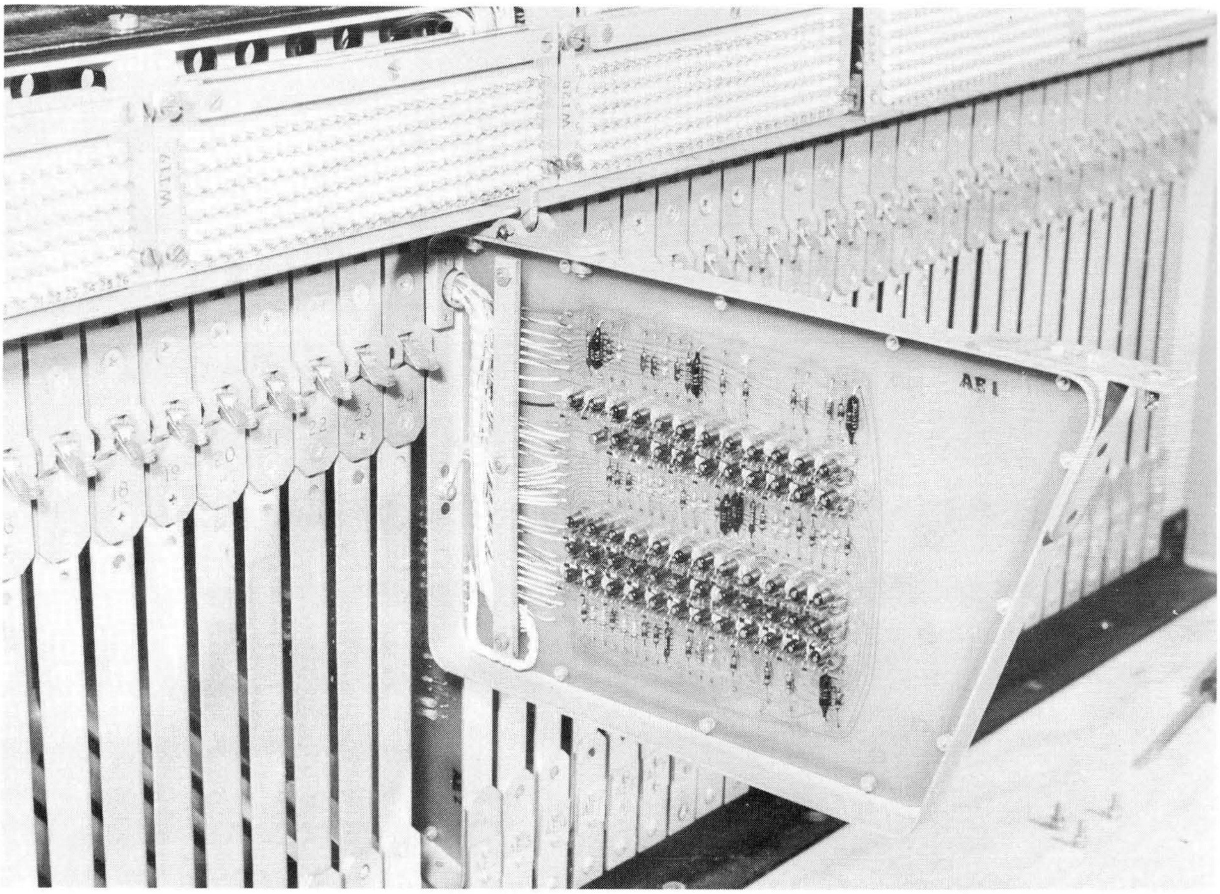


Here are eleven minutes' output of a new automated transistor assembly system, developed by International Business Machines Corp., White Plains, N. Y., shown at the final inspection station. The machine produces transistors of far greater uniformity, and at a rate roughly five times faster, than previous semi-automated methods. (Figure 27)



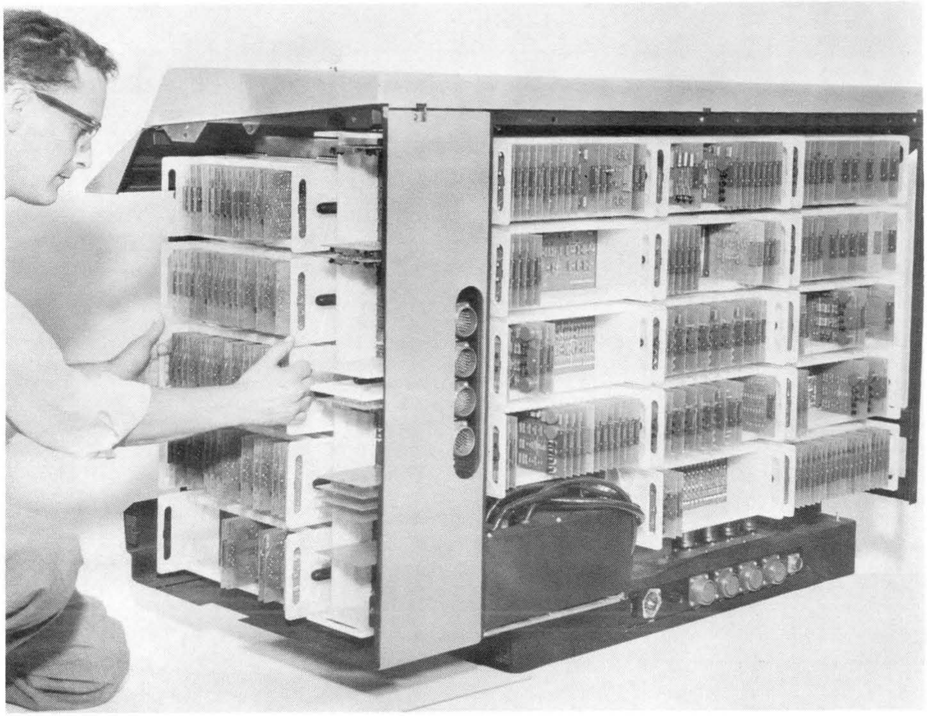
This is a memory stack for a satellite memory before it is potted. The unit uses polyaperture devices as the memory elements; they permit nondestructive readout. This unit will store 2200 bits of information; and will withstand 50 G's for 11 milliseconds. It is made by Telemeter Magnetics, Inc., Culver City, Calif. (Figure 28)

4. Production and Assembly



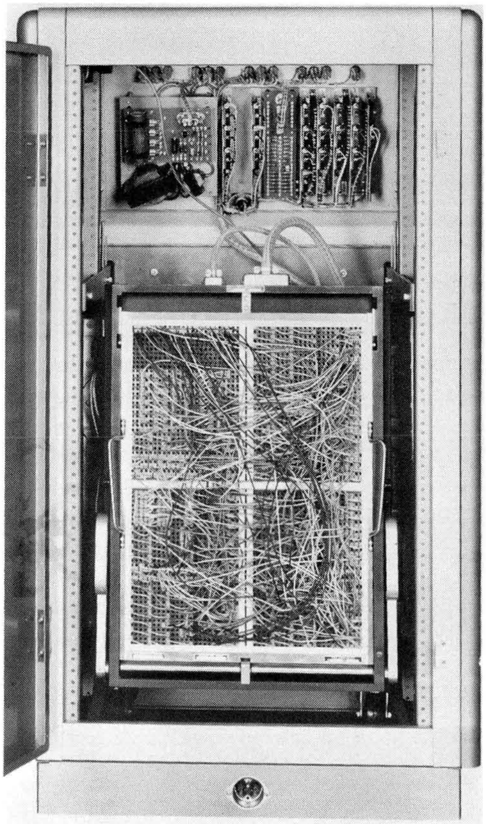
Shown is one of the arithmetic units during assembly of the SAAB D2 transistorized computer of Saab Aircraft Co., Linköping, Sweden. The computer is designed for table-top operation; it contains around 6000 transistors and 3500 diodes; and it can handle thirty-two different logical and arithmetic operations. It operates in pure binary. (Figure 29)

Here a skilled operator threads the magnetic cores together for a memory plane at the Philco Corp. plant in Philadelphia, Pa. (Figure 30)



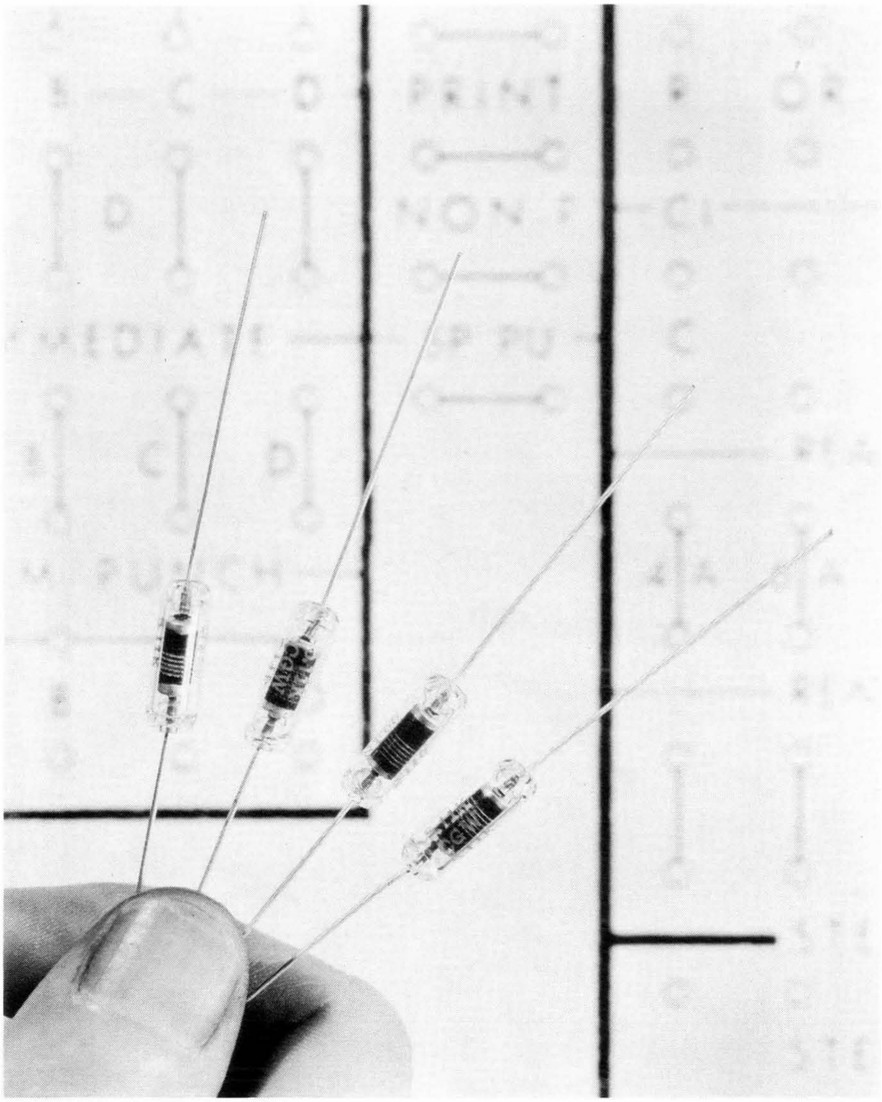
The advanced modular design of the RW-300 digital control computer eliminates much hand wiring. All active circuits are mounted on insert cards which are plugged into modules, which are in turn plugged into the computer's subframes. If a component fails, the trouble can easily be traced to a single module or insert card, which can be quickly replaced with an identical unit, minimizing computer "downtime." TRW Computers Co., Beverly Hills, Calif. (Figure 31)

Here an engineer replaces a circuit card in the IBM 1009 data transmission unit that allows computers to exchange data core-to-core. Housed in a single standard modular system (SMS) module, the 1009 utilizes toll or leased telephone lines or high-speed telegraph lines to link solid-state computers located any distance apart across the country. The new unit has a "swinging-gate" construction which gives fast access to its electronic component cards. The unit is made by the International Business Machines Corp., White Plains, N. Y. (Figure 32)



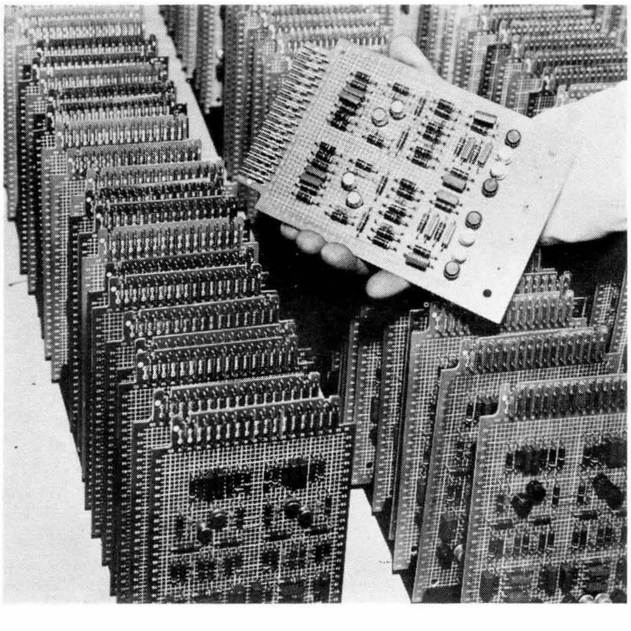
In the Stored Program Computer (SPEC) built by Computer Control Co., Western Div., Los Angeles, Calif., this rear view, bottom, shows the replaceable general-purpose patch panel which effects all internal logical interconnections between plug-in modules. By replacing this board with another specially prewired panel the machine is converted to a digital differential analyzer containing 20 integrators. The top right of cabinet shows the rear view of decimal to binary conversion keyboard. (Figure 33)

Shown below is one of the electronic component cards featured in the solid-state IBM 1620 data processing system of International Business Machines Corp., White Plains, N. Y. The button-like components at right, top and bottom, are transistors, with resistors and capacitors located near the fingers. Printed wiring matched with automatic soldering make the cards very reliable. (Figure 34)



Here are glass-enclosed, precision, film resistors with zero moisture absorption. They were put into mass production recently by Corning Electronic Components, a division of Corning Glass Works, Corning, N. Y. They have found use in circuits in miniaturized missiles, computers, high frequency, radar, switching, and other areas requiring exceptional performance. (Figure 35)

The printed circuit modules shown are part of a new vote tallying system used this year in Los Angeles County, Calif. The system is made by Norden, a division of United Aircraft Corporation, Calif., and the modules are constructed by Elco Corp., Philadelphia, Pa. (Figure 36)



5. Applications

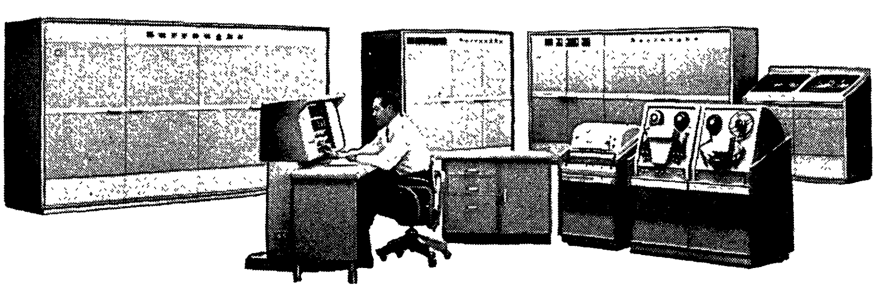
One of the favorite problems of the business computer is inventory control. Shown on the table are some of the hundreds of items that make up a six-cylinder diesel fuel-injection pump. They are displayed under the view of S. E. Miller, Vice President and Division Manager of the American Bosch Co., which uses the IBM RAMAC 305 to keep a running check on the inventory of all the materials involved. (Figure 37)

Not a bit awed by electronic "brains" or mathematical formulas, two 11-year-olds, Kathleen Woodruff and Victor Morton, are shown operating a Clary DE-60 Computer at the four-day Business Equipment Exposition at Los Angeles Sports Arena. The pair mastered the operation of this simplified general-purpose computer after only 14 hours of instruction. The machine is made by the Clary Corporation, San Gabriel, Calif. (Figure 38)

The projected performances of the Saturn missile — which will send multi-ton payloads into earth orbit; around the moon and back; and into deep space — is being studied while the huge verhicle is on the ground. Saturn's 1,500,000-pound-thrust booster will be mathematically "flown" thousands of times by the IBM 7090 computer before reaching the launching pad next year, with each flight taking only a few minutes. Here Dr. Wernher von Braun (right), Director of Marshall Space Flight Center, Huntsville, Ala., reviews solar-system flight calculation with Dr. Helmut Hoelzer (left), Director of the center's Computation Division; and Dr. Eberhard Rees, the center's Deputy Director for Research and Development. (Figure 39)

Air traffic controllers are shown using flight progress strips to coordinate information that will insure clear channels for all plane flights. The progress charts are automatically prepared by an IBM RAMAC computer at the control center. The men standing behind the controllers coordinate their activities as flights move from one man's jurisdiction to another's. This air traffic center is run by the Federal Aviation Agency at Indianapolis, Ind. (Figure 40)

Here is an RW-300 Computer Control System installed in the B. F. Goodrich Chemical Company plant at Calvert City, Kentucky. The RW-300 Digital Control Computer is in the foreground, the operator's console with input-output typewriters, and a conventional graphic panel. The system automatically reads instruments in the plant, prints out operating variables and calculated values, and controls a unit producing vinyl chloride monomer as well as a near-by acrylonitrile unit. (Figure 41)



AUTOMATION — ITS EVOLUTION AND FUTURE DIRECTION

Part 2

James T. Culbertson, Math. Dept.
California State Polytechnic College
San Louis Obispo, Calif.

(Continued from Computers and Automation, November, 1960, page 18)

No personnel were required in Hooke's automatic weather station in 1670; it kept a record of wind velocity and direction, rainfall, and time on a punched paper tape. One of the first and simplest feedback devices was Papin's pressure cooker (1680) with steam pressure control and safety valve — little more than a kettle with a very heavy lid. Watt made his "centrifugal governor" in 1788 and the first thermostat was patented in 1830. Somewhat more advanced was the first "power steering" for steamships by means of servomechanisms in 1872, and servomechanisms in all fields are spreading widely at present.

The first industrial automation appears with Oliver Evans. In 1784 he built a completely automatic water-powered continuous-process flour mill near Philadelphia. It is said that no human labor or guidance of any sort was required from the time the grain entered one end of the mill to the time the thoroughly refined flour was put into bags at the other end. But after Evans no more was done along these lines for a long time.

The next big step in automation was Jacquard's loom (1801) which rapidly expanded the textile industry. This device controlled the weaving of the cloth into intricate colored patterns by means of punched cards similar to IBM cards.

Biscuit making for the British Navy was made almost completely automatic in 1833, and other examples of automation occurred during the last century. Like Oliver Evans' completely automatic mill, the remarkable analytic engine (1830) of George Babbage led to no immediate results, but it was the first development in modern computers. Computers very directly supplant human brain work, but we omit their history and present stage of development [5] in this very short report on automation, and likewise we cannot discuss logical calculators and intelligent machinery.[6]

Selecting just a few highlights of automation we have automatic controls in bakeries about 1850 with the loaves passing slowly and continuously through ovens on endless belts, automatic telegraph recorders (1854), automatic bottle-making machines (1907), and A. O. Smith's factory for automatic production of auto chassis (1920).

The big industrial push in automation, i.e., replacing human control by automatic control, began in the 1920's, and has started to accelerate again recently. This artificial guidance is remarkably complete in many plants such as bottle-making plants and soft-drink factories. In the latter, for example, the bottles are cleaned, moved into position, filled, capped, labelled and put into cartons under completely automatic guidance, and the entire production of their contents has likewise been monitored "inhumanly."

Similar thoroughgoing artificial guidance is also approached in electric power plants, telecommunication installations (e.g., the telephone exchange), chemical and petroleum plants, plants processing paper products, synthetic fertilizers, soaps, detergents, cement and bricks, as likewise in breweries and distilleries.

Thoroughgoing automation is however not yet feasible in glass factories, steel mills and similar establishments where much is automated but still many laborers and skilled workers are required. Shipbuilding is even less artificially guided. Skilled operations such as surgery may be among the last human operations to become automated.

Stage 8. Self-Repairing Automation.

Let us consider the evolution of a shoe factory. At the mechanization stage, workers are operating power-driven machinery to cut the leather and stitch it together to make the shoes. At the simple automation stage, these workers are unnecessary as all processes are completely automatic, the raw material entering one end of the factory, let us say, and the shoes emerging at the other. (Probably some plastic would be a more suitable raw material than leather for this stage.) Workers are necessary, however, to keep the automatic factory in good running condition and to make sure that supplies reach the machines.

At the self-repairing automation stage, no maintenance men are necessary. The self-directing machinery repairs itself as any breakdown occurs. Detecting devices locate the breakdown; computers determine the nature of the difficulty, and direct other machinery to convey spare interchangeable parts from the store room and make all the necessary repairs.

Stage 9. Self-Reproducing Automation.

We now come to a stage which can be foreseen but which hardly yet exists: self-reproducing automation. A number of investigators have offered proof that machines can be constructed to reproduce themselves; the mathe-

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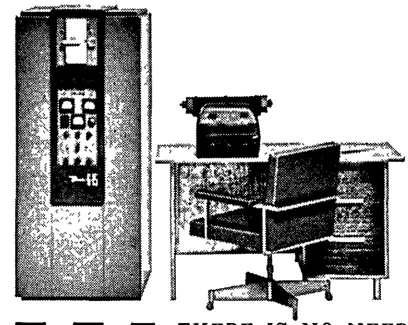

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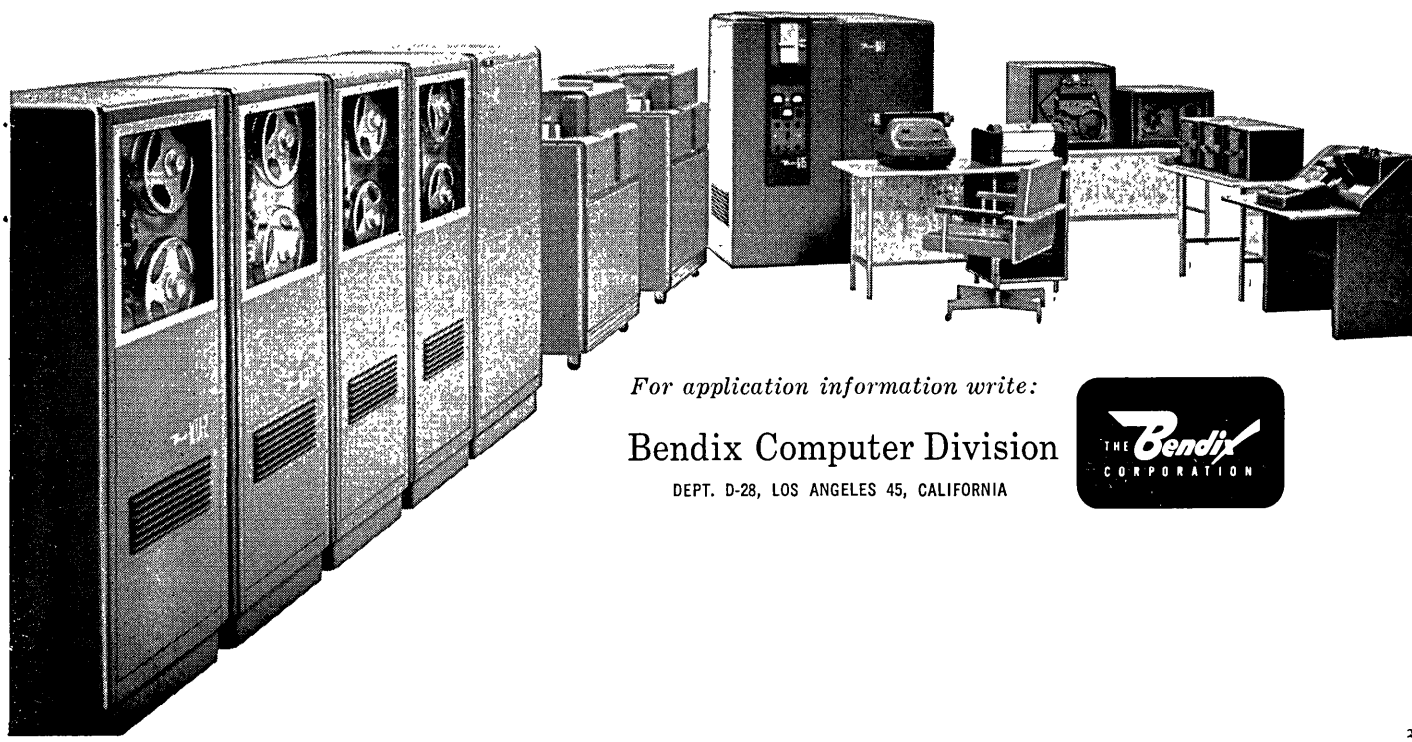

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matician John von Neumann wrote a logical analysis of the necessary devices.

When a living organism reproduces, it puts together material so as to make another organism like itself. Besides the genes in its chromosomes, the material is in its near environment in the form of food. The product or offspring does not resemble the parent completely at first but approximates it closely after a period of growth.

In essentially the same way (except for postnatal growth, since the reproduction is made adult size), von Neumann's self-reproducing machine organizes part of its environment into a duplicate of itself. He describes a device of about 180,000 cells, but there is actually no upper limit to the complexity of a machine which can reproduce itself. It has a main body and a genetic tail. Von Neumann shows how in his machine the body can (1) follow instructions from the tail and how it can (2) copy the tail. But the tail contains a coded description of the body, so that the body can be instructed to build a duplicate body out of the surrounding environment. Then the body makes a copy of the tail which it attaches to the new body. There are now two individuals and each of these can further reproduce.

There seems to be no theoretical reason why we could not make our self-repairing shoe factory also self-reproducing. Suppose the population served by the factory is increasing so that after a time the output of the factory cannot equal the demand. This fact is recorded by the computer running the factory and it triggers off the reproduction program, so that the factory starts reproducing itself from a warehouse of raw material and spare parts. The offspring factory might be assembled at some distant place for a suitable spread of factories.

Stage 10. Complete Automation.

By complete industrial automation we refer to the industry of some nation, or perhaps the whole world, running itself entirely without any human intervention. By complete automation in general we imply that all services to mankind are made automatic.

Considering again the automatic, self-repairing and, when necessary, self-reproducing shoe factory, in the tenth stage all raw material would be brought to it in a completely automatic way, prepared for it by other automatic factories. All mining, agriculture, any procurement of raw material, would be conducted without human guidance. Likewise at the output end of the shoe factory there would be completely automatic distribution via pilotless cars on belts to distribution centers, perhaps still called shoe stores. No clerks or other personnel would occupy the shoe store. The customer would enter and put his feet in a measuring device. Perhaps it has an individual preference knob which he can turn to "tighter" or "looser" than ordinarily desired. Then he would copy down the number that appears on the register so he could order by telephone next time if he wished. The number recorded would determine the box of shoes that is automatically sent out from the shelves. He would not have to try the shoes on; he would know that they will fit.

If this kind of picture seems fantastic and unbelievable, reflect for a moment that we are steadily approaching this kind of automatic service in voice communication over a whole country in the automatic dial telephoning system.

So far as engineering is concerned, there does not seem to be any theoretical limit to the future application of automation. Whether complete automation in all fields would be beneficial to man, however, is an interesting question often asked and variously answered. One often-made guess is that general automation could be disastrous to man since, after a certain stage, he would seem to be a superfluous impediment to the future evolution of automatic, computer-programmed, learning, and self-reproducing machines.

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5. Berkeley, E. C. and Wainwright, L.; *Computers, Their Operation and Applications,* Reinhold, 1956.
6. Berkeley, E. C.; *Symbolic Logic and Intelligent Machines,* Reinhold, 1959.

STATEMENT OF OWNERSHIP AND MANAGEMENT OF COMPUTERS AND AUTOMATION

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 3260

Edmund C. Berkeley, Editor

SWORN TO and subscribed before me, a notary public in the Commonwealth of Massachusetts, on September 26, 1960.

Esther W. McHugh, Notary Public

My commission expires October 31, 1964.

Readers' and Editor's Forum

TWO MILLION OPERATIONS PER SECOND

I. From John Doe Los Angeles, Calif.

In a Los Angeles paper recently, I saw mention of acquisition by C-E-I-R, Inc., of an IBM Stretch computer, with a speed of two million calculating operations per second.

Why is this speed useful, aside from cutting down the cost of computing operations?

Can you describe to me some problems for which this kind of computer is necessary and which other modern computers, with say 50,000 operations per second, cannot practically solve?

II. From I. J. Seligsohn C-E-I-R, Inc. Arlington, Va.

In regard to the usefulness of Stretch's speed, there are these things to be said:

Many large-scale design problems have not been attempted thus far on existing machines because the machines would be tied up on one problem for too long a period of time. This is the chief reason why the Atomic Energy Commission, for example, ordered a Stretch computer.

Even more important than such problems are large-scale simulation problems and dynamic programming problems with very large numbers of variables.

Also, we have large-scale simulation problems with real-time components — such as weather prediction models. Obviously speed is of the essence in the solution of such problems.

In all these problems, a relatively modest increase in conceptual complexity results in a vast increase in computation requirements, with the effect that previously existing computation systems have been severely limiting. The Stretch computer will in many cases permit the removal of such limitations and the achievement of dramatic new objectives.

Two of the most important applications for Stretch are these: large scale economic models, both corporate and governmental; satellite and space vehicle computations, in which monitoring can be done at much more frequent intervals and can take into account more perturbation effects, resulting in a far greater precision than is now possible.

My personal feeling is that the truly significant applications for these giant speed computers will lie in the simulation of complex realistic business, industrial and governmental operations.

Finally, is there any user who would be indifferent to the solution of a problem in eight hours rather than in a full calendar month? Or, in a shorter time scale, surely the management of a business would prefer having information necessary to decision making in a matter of hours rather than days.

TELLING THE COMPUTER'S RESPONSES FROM THE PEOPLE'S RESPONSES — A BATTING AVERAGE OF 52%

(See the article "Can You Tell the Computer's Responses from the People's Responses?" by Patrick J. McGovern, in **Computers and Automation**, September 1960, p. 12 .... There the problem was stated of distinguishing 25 responses from a computer from among 225 responses from people, in a brief conversation about the weather.)

I. From: Robert A. Sylvester Swissvale, Pa.

In response to your request for batting averages on the computer quiz, I am submitting my not too boastful 13 correct answers out of the possible 25.

I must point out that some of the replies made by the computer are quite unrelated to the question asked.

II. From the Editor

Thank you for your letter reporting your batting average on the computer quiz. I do not see how you could guess this well, and I would be interested to know more about the system you used for guessing. Did you compare the responses from question to question, or did you go straight through selecting which you thought was the computer's response?

III. From: Robert A. Sylvester
Swissvale, Pa.

I will try to relate the system, if you can call it one, that I used in determining my selections.

First, I did answer each question one at a time. Second, I reasoned that for the computer to answer a question it must have to store a key word in the question and then repeat it in some form or other in the answer. But this did not prove true in all cases.

Although I did notice similarities in the responses of several questions, they did not enter into my selection.

IV. From the Editor

Apparently, then two items of knowledge were made use of: (1) that one of the responses was from a computer; and (2) the deduction that there would be a definite peculiarity — word or idea repetition — associated with the computer's responses. To say it another way, the batting average of 52% as compared with the average guessing of 16.8% (see page 10 in the September issue) was achieved by making more powerful use of the knowledge that one of the responses was from a computer.

But if a person did not know definitely that one of each set of ten responses was from a computer, he might well think that all of the responses were from people.

CALENDAR OF COMING EVENTS

December 13-15, 1960: Eastern Joint Computer Conference, New Yorker Hotel, New York City; contact Dr. Nathaniel Rochester, IBM, Yorktown Heights, N.Y.

Jan. 16-19, 1961: ISA Winter Instrument-Automation Conference & Exhibit, conference at Sheraton-Jefferson Hotel, exhibit at Kiel Auditorium, St. Louis, Mo.; contact William H. Kushnick, Exec. Dir., ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

Feb. 1-3, 1961: Winter Convention on Military Electronics, featuring Communications, Telemetry, Data Handling and Display, Los Angeles, Calif.; contact Dr. John J. Meyers, Hoffman Electronics Corp., Military Products Div., 3717 S. Grand Ave., Los Angeles 7, Calif.

Feb. 15-17, 1961: International Solid State Circuits Conference, Univ. of Pa. and Sheraton Hotel Philadelphia, Pa.; contact Jerome J. Suran, Bldg. 3, Rm. 115, General Electric Co., Syracuse, N. Y.

March 16-17, 1961: Conference on Data Processing Techniques and Systems, sponsored by Numerical Analysis Laboratory at the University of Ariz., featuring "Discussions of data processing problems in engineering and scientific research," Tucson, Ariz.; contact Miss Betty Takvam, Conference Secretary, Numerical Analysis Lab. Univ. of Ariz., Tucson, Ariz.

Mar. 20-23, 1961: IRE International Convention, Coliseum and Waldorf-Astoria Hotel, New York, N. Y.; contact Dr. G. K. Neal, IRE, 1 E. 79 St., New York 21, N. Y.

April, 1961: Joint Automatic Techniques Conference, Cincinnati, Ohio; contact J. E. Eiselein, RCA Victor Div., Bldg. 10-7, Camden 2, N.J.

Apr. 19-21, 1961: S. W. IRE Reg. Conf. and Elec. Show, Dallas, Tex.; contact R. W. Olson, Texas Instruments Co., 6000 Lemmon Ave., Dallas 9, Tex.

May 2-4, 1961: Electronic Components Conference, Jack Tar Hotel, San Francisco, Calif.

May 7-8, 1961: 5th Midwest Symposium on Circuit Theory, Univ. of Ill., Urbana, Ill.; contact Prof. M. E. Van Valkenburg, Dept. EE, Univ. of Illinois, Urbana, Ill.

May 9-11, 1961: Western Joint Computer Conference, Ambassador Hotel, Los Angeles, Calif.; contact Dr. W. F. Bauer, Ramo-Wooldridge Co., 8433 Fallbrook Ave., Canoga Park, Calif.

May 22-24, 1961: National Telemetering Conference, Chicago, Ill.

May 22-24, 1961: Fifth National Symposium on Global Communications (GLOBECOM V), Hotel Sherman, Chicago, Ill.; contact Donald C. Campbell, Tech. Program Comm., I.T.T.—Kellogg, 5959 S. Harlem Ave., Chicago 38, Ill.

May 23-25, 1961: Symposium on Large Capacity Memory Techniques for Computing Systems, Dept. of Interior Auditorium, C St., Washington, D. C.; contact Miss Josephine Leno, Code 430A, Office of Naval Research, Washington 25, D. C.

June, 1961: Joint Automatic Control Conference, Univ. of Colorado, Boulder, Colo.; contact Dr. Robert Kramer, Elec. Sys. Lab., M.I.T., Cambridge 39, Mass.

July 9-14, 1961: 4th International Conference on Bio-Medical Electronics & 14th Conference on Elec. Tech in Med. & Bio., Waldorf Hotel, New York, N. Y.; contact Herman Schwan, Univ. of Pa., School of EE, Philadelphia, Pa.

July 16-22, 1961: 4th International Conf. on Medical Electronics & 14th Conf. on Elec. Tech. in Med. & Bio., Waldorf Astoria Hotel, New York, N.Y.; contact Dr. Herman P. Schwan, Univ. of Pa., School of Electrical Eng., Philadelphia, Pa.

Aug. 22-25, 1961: WESCON, San Francisco, Calif.; contact Business Mgr., WESCON, 1435 La Cienega Blvd., Los Angeles, Calif.

Sept., 1961: Symposium on Information Theory, M.I.T., Cambridge, Mass.

Sept. 4-9, 1961: Third International Conference on Analog Computation, organized by the International Association for Analog Computation and the Yugoslav National Committee for Electronics, Telecommunications, Automation and Nuclear Engineering, Belgrade, Yugoslavia.

Sept. 6-8, 1961: National Symposium on Space Elec. & Telemetry, Albuquerque, N.M.; contact Dr. B. L. Basore, 2405 Parsifal, N.E., Albuquerque, N.M.

Sept. 6-8, 1961: International Symposium on the Transmission and Processing of Information, Mass. Inst. of Technology, Cambridge, Mass.; contact Peter Elias, RLE, MIT, Cambridge 39, Mass.

Sept. 6-8, 1961: 1961 Annual Meeting of the Association for Computing Machinery, Statler Hotel, Los Angeles, Calif.; contact Benjamin Handy, Chairman Local Arrangements Committee, Litton Industries, Inc., 11728 W. Olympic Blvd., W. Los Angeles, Calif.

Sept. 11-15, 1961: The Third International Congress on Cybernetics, Namur, Belgium; contact Secretariat of The International Association for Cybernetics, 13, rue Basse Marcelle, Namur, Belgium.

Oct., 1961: National Symposium on Space Elec. & Telemetry, Albuquerque, N. Mex.; contact A. B. Church, 1504 Princeton S. E. Albuquerque, N. M.

Dec. 3-7, 1961: Eastern Joint Computer Conference, Sheraton Park Hotel, Washington, D.C.

A Census of West-European Digital Computers

Joseph L. F. De Kerf
Research Laboratories
Gevaert Photo-Production N. V.
Mortsel, Belgium

In a previous paper, "A Survey of European Digital Computers" (**Computers and Automation**, Vol. 9, No. 2, p. 24), a census of the installations and orders of the described commercial computers was announced.

This census was opened on the 1st April and had to be closed on the 30th April 1960, but several manufacturers were late with their data. As a consequence, some of the numbers presented in the accompanying table are those for the month of May.

The census below lists 21 manufacturers and 65 different computer types, electronic calculating punches included, but restricted to purely European constructions. When the computer is marketed by another firm, the name of the latter is added between brackets. The numbers given for Schoppe & Faeser refer to the deliveries to and orders from Royal McBee International. The number of orders given for the Ferranti computers are estimations, based on those orders which have been announced in the press.

The number of machines installed amounts to 1835. The number of machines on order amounts to 516. The total number is much more than the estimation given in the above-mentioned paper (about 2000 for installations and orders together), and this is especially true as the U.S.S.R. and other East-European computers are not included in this census. If we consider only the stored program computers, the number of installations is reduced to 428 or about 23.5% of the total. According to a recent census, compiled by John Diebold & Associates for their ADP Newsletter, the corresponding proportion is for the U.S machines about 36.5% (Cf. **Computers and Automation**, Vol. 9, No. 7, p. 13).

A list of the organizations, where most of the British computers and calculators (including those delivered by Burroughs Adding Machines Ltd and IBM United Kingdom Ltd) are installed, may be found in the quarterly "Survey of Digital Computer and Calculator Users and Orders", compiled by D.G. & R. Pedder and published in **Automation & Automatic Equipment News** (Vol. 5, No. 8, p. 436). As far as available, the range of applications is given for each installation.

Since the writing of "A Survey of European Digital Computers", several improvements and new computers have been announced. Up to 16 magnetic tape units, with a read/write speed of 30,000 char. per sec, may be connected to the X 1 computer of N.V. Electrologica. A transistorized immediate access magnetic core store has been incorporated by Elliott Brothers Ltd in their National-Elliott 405 (type 405M) and by LEO Computers Ltd in their LEO II (type LEO IIC). A fully transistorized transportable digital differential analyser, CORSAIR, has been built at the Royal Aircraft Establishment, Farnsborough. Associated Electric Co. Ltd, formerly known as Metropolitan-Vickers Electric Co. Ltd, has completed the first production model of the AEI 1010 Data Processing System (previously announced as Metrovick 1010). A new data processing system, named KDP. 10 and based on the RCA 501, is marketed by the English Electric Co. Ltd. Another data processing system, ORION, is marketed by Ferranti Ltd. Finally, Manchester University is developing, in collaboration with Ferranti Ltd, a prototype computer for their own use (MUSE). The commercial version, ATLAS, has been announced by Ferranti Ltd recently. Descriptions of KDP. 10, ORION and ATLAS are added to this census as an appendix. More details about ORION may be found in the **Digital Computer Newsletter (Communications of the Association for Computing Machinery**, Vol. 3, No. 1, p. 42).

Acknowledgments are due to the British and West-European computer manufacturers for their kind co-operation.

Census

Each item in this list consists of: Manufacturer / type of computer / number installed / number on order, — except that where two or more types of computers are made by the same manufacturer, the manufacturer's name is listed only once.

FRANCE

Bull / Gamma Calc. / 591 / 51
Gamma M.D. / 81 / 7
Gamma M.D.E. / 12 / 3
Gamma 60 / — / 11

Intertechnique / RW-300 / 2 / 3

S.E.A. / CUBA / 1 / —
CAB 1000 / 2 / —
CAB 2000 / 2 / —
CAB 3000 / 4 / 2
CAB 500 / — / 10
CAB 600 / — / —
CAB 5000 / — / —

S.N.E. / KL. 901 / — / 1

GERMANY

Schoppe & Faeser GmbH (Royal McBee Int.) / LGP-30 / 20 / 20

Siemens & Halske AG / Siemens 2002 / 6 / 12

Stand. El. Lorenz AG / ER 56 / 5 / 16
Spec. Purp. Comp. / 3 / 2

Telefunken GmbH / TR4 / 1 / 4

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Wharf Eng. Lab. / APEXC / 4 / —
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MANUSCRIPTS

WE ARE interested in articles, papers, reference information, and discussion relating to computers and automation. To be considered for any particular issue, the manuscript should be in our hands by the first of the preceding month.

ARTICLES: We desire to publish articles that are factual, useful, understandable, and interesting to many kinds of people engaged in one part or another of the field of computers and automation. In this audience are many people who have expert knowledge of some part of the field, but who are laymen in other parts of it.

Consequently, a writer should seek to explain his subject, and show its context and significance. He should define unfamiliar terms, or use them in a way that makes their meaning unmistakable. He should identify unfamiliar persons with a few words. He should use examples, details, comparisons, analogies, etc., whenever they may help readers to understand a difficult point. He should give data supporting his argument and evidence for his assertions.

We look particularly for articles that explore ideas in the field of computers and automation, and their applications and implications. An article may certainly be controversial if the subject is discussed reasonably. Ordinarily, the length should be 1000 to 3000 words. A suggestion for an article should be submitted to us before too much work is done.

TECHNICAL PAPERS: Many of the foregoing requirements for articles do not necessarily apply to technical papers. Undefined technical terms, unfamiliar assumptions, mathematics, circuit diagrams, etc., may be entirely appropriate. Topics interesting probably to only a few people are acceptable.

REFERENCE INFORMATION: We desire to print or reprint reference information: lists, rosters, abstracts, bibliographies, etc., of use to computer people. We are interested in making arrangements for systematic publication from time to time of such information, with other people besides our own staff. Anyone who would like to take the responsibility for a type of reference information should write us.

NEWS AND DISCUSSION: We desire to print news, brief discussions, arguments, announcements, letters, etc., anything, in fact, if it is likely to be of substantial interest to computer people.

PAYMENTS: In many cases, we make small token payments for articles, if the author wishes to be paid. The rate is ordinarily ½c a word, the maximum is $15, and both depend on length in words, whether printed before, etc.

All suggestions, manuscripts, and inquiries about editorial material should be addressed to: *The Editor,* COMPUTERS *and* AUTOMATION, *815 Washington Street, Newtonville 60, Mass.*

Appendix

— English Electric Co. Ltd: KDP. 10

Operation mode: serial (or parallel in groups of 4 characters). Base: alphanumeric, 6 bits per character (plus parity bit). Word length: variable. Point working: fixed. Instructions: 2 address type. Instruction length: 8 char. Number of instructions: 49. Number of index registers: 7. All transfers and arithmetic operations are internally checked.

Store: magnetic cores. Capacity: up to 16 units of 16,384 characters (max. cap.: 262,144 char.). Access time: 7.5 microsec per block of 4 char. Magnetic drums may be added as random access files. Capacity: 1,500,000 char. per drum. Av. access time: 192 ms. Up to 62 magnetic tape units may be connected. Tape width: 3/4 inch (mylar base, dual recording). Tape length: 2400 ft. Stop/start time: 3.5 ms. Read/write speed: 33,333 char. per sec. Density: 333 1/3 char. per inch. Higher speeds will be made available. Read/write, read/compute and write/compute operations are performed simultaneously.

Input: battery of 7-channel punched tape readers (1,000 char. per sec). Output: monitor printer with tape punch (10 char. per sec). An high speed line printer (600/900 lines of 120 char. per min) is optional. Off line input: card to magnetic tape converter (400, 80-column cards per min). Off line output: magnetic tape-to-card converters (150 cards per min) and Xeronic-type printers (3,000 lines per min). Operation speeds: 0.28 ms for addition and subtraction (5 char. ± 2 char.), 2.91 ms for multiplication (5 char. x 2 char.) and 3.70 ms for division (5 char. : 2 char.).

Power consumption (typical installation): 35 kVA. Room accommodation required: 12 — 1400 sq. ft. Technical data: 400 kc/s prf, 24,000 diodes, 33,000 transistors, 4,500 plug-in boards. Price: $600,000 to $1,700,000. Rented if required.

— Ferranti Ltd: Orion

Operation mode: semi-parallel. Number base: binary. Word length: 48 bits (more than 14 decimal digits). Alphanumeric representation: 6 bits per char., 8 char. per word. Point working: fixed (floating point optional). Instructions: 3 address type or modified 2 address type. Special instructions for fast conversion to and from other radices such as decimal and sterling. Priority processing. Automatic time sharing.

Store: magnetic cores. Capacity: 4,096 to 16,384 words. First 255 words are index registers. Auxiliary store: double-drum units (single-drum units can be provided). Capacity: 16,384 words per drum. Average access time: 12 ms. Up to 64 magnetic tape units (Ampex FR 300) may be connected. Read/write speed: 90,000 char. per sec.

Input/output: Flexowriters with punched tape reader and tape punch (10 char. per sec), Ferranti photo-electric punched tape readers (TR 5 at 300 char. per sec and TR 7 at 1,000 char. per sec), Teletype punches (60 char. per sec), Creed tape punches (type 25 punch at 33 char. per sec or 3000 type punch at 300 char. per sec), card readers (up to 600 cards per min), card punches (100 cards per min), line printers (100 lines per min) and Rank Xeronic Printer (3,000 lines per min).

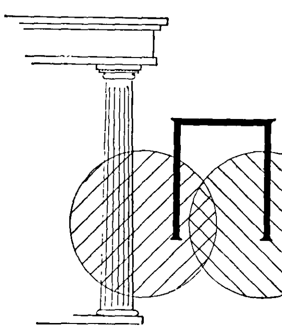
Operation speeds: 64 microsec (3 address instr.) or 48 microsec (unmodified 2 address instr.) for addition and subtraction, about 165 microsec for multiplication and about 550 microsec for division. Technical data: 500 kc/s prf, 16,000 transistors and 4,000 plug-in boards (typical installation). Price: expected between $250,000 and $850,000.

— Ferranti Ltd: Atlas

Operation mode: parallel. Number base: binary. Word length: 48 bits. Alphanumeric representation: 6 bits per character. Point working: fixed and floating. Number of instructions: 300 (including subroutine instructions).

Main store: magnetic cores. Capacity: 8,192 words and up, in blocks of 4,096 words. Access cycle time: 2.0 microsec. A fixed store, constructed of ferrite rods and with a minimum capacity of 4,096 words, is used for holding subroutines. Access time: 0.2 microsec. A further block of 1,024 words of core store is used as working store for these routines. In addition a register store, with a capacity of 128 B-registers is provided. A large number of magnetic drums may be attached. Capacity: 24,576 words per drum. Up to 8 magnetic tape control units, each associated with up to 4 Ampex FR 300 units, may be connected. Input and output equipment: basically the same as for Orion.

Operation speeds (fixed and floating point): 1.1 microsec for addition and subtraction, 3.5 microsec for multiplication and 6 microsec for division. No further details are available for the moment.



NEW PATENTS

RAYMOND R. SKOLNICK
Reg. Patent Agent
Ford Inst. Co., Div. of Sperry Rand Corp.
Long Island City 1, New York

June 14, 1960

2,940,669 / George W. Hobbs, Scotia, N. Y. / General Electric Co., a corp. of N. Y. / A decimal to binary radix converter.

2,940,670 / Tom Kilburn, Manchester, Eng., and David B. Edwards, Pontypridd, and Gordon E. Thomas, Port Talbot, Wales / I.B.M. Corp., New York, N. Y. / An electronic digital computing machine arranged to effect computing operations with a floating radix point.

2,941,073 / Thomas J. Scuitto, Santa Monica, Calif. / General Dynamics Corp., Rochester, N. Y. / A high speed flip-flop circuit arrangement.

2,941,089 / Alfred B. Brown, Jr., Montclair, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A magnetic core counter circuit.

2,941,090 / Arthur W. Lo, Fords, N. J. / R.C.A., a corp. of Del. / A signal-responsive circuit.

2,941,091 / Herbert A. Schneider, Coytesville, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A pulse selector circuit.

2,941,092 / Nicolas J. Harrick, North Tarrytown, N. Y. / North American Philips Co., Inc. / A pulse delay circuit.

2,941,189 / Harold J. McCreary, Lombard, Ill. / Automatic Electric Lab., Inc., a corp. of Del. / A magnetic memory apparatus.

2,941,191 / William V. Tyrlick, Rochester, N. Y. / General Dynamics Corp., Rochester, N. Y. / A solid state character sequence detector.

June 21, 1960

2,941,719 / Paul F. Gloess, Paris, and Paul P. Namian, Asnieres, Fr. / Societe d'Electronique et d'Automatisme, Courbevoie, Seine, Fr. / A device to form the two's complement of a train of binary coded pulses.

2,941,720 / Byron O. Marshall, Jr., Park Ridge, Ill., and John D. Dillon, Indialantic, Fla. / ——— / A binary multiplier.

2,941,722 / Roland L. Van Allen, Alexandria, Va. / ——— / A single quadrant analogue computing means.

2,942,192 / Willard D. Lewis, Mendham, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A high speed digital data processing circuit.

2,942,193 / John G. Tryon, Chatham, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A redundant logic circuit.

2,942,194 / Alan T. Brennan, Rochester, N. Y. / General Dynamics Corp., Rochester, N. Y. / A pulse width decoder.

2,942, 240 / Jan A. Rajchman, Princeton, and Arthur W. Lo, Elizabeth, N. J. / R.C.A., a corp. of Del. / A magnetic memory system using multiapertured storage elements.

2,942,241 / John H. McGuigan, New Providence, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A magnetic core shift register circuit.

2,942,242 / John J. Sharp, Stevenage, Eng. / International Computers and Tabulators Lim., London, Eng. / An information reading arrangement from a data bearing rape.

June 28, 1960

2,942,778 / Daniel Broido, Cockfosters, Eng. / International Computers and Tabulators Lim., London, Eng. / A data processing machine.

2,942,779 / Marion L. Wood, Highland, N. Y. / I.B.M. Corp., New York, N.Y. / A cyclical analogue to digital value integrating converter.

2,942,780 / Arthur H. Dickinson, Greenwich, Conn. / I.B.M. Corp., New York, N. Y. / A multiplier-divider employing transistors.

2,943,248 / Orral W. Ritchey, Seattle, Wash. / Boeing Airplane Co., Seattle, Wash. / A digital to analog servosystem.

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Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisement appears / name of agency if any.

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	⅛ watt to 2 watt—MIL-Line—Precision Film—Standard Resistance Values from 10 ohms to 50 meg Ω			
	⅛ watt to 2 watt—Molded—Precision Film—Standard Resistance Values from 10 ohms to 45 meg Ω			

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