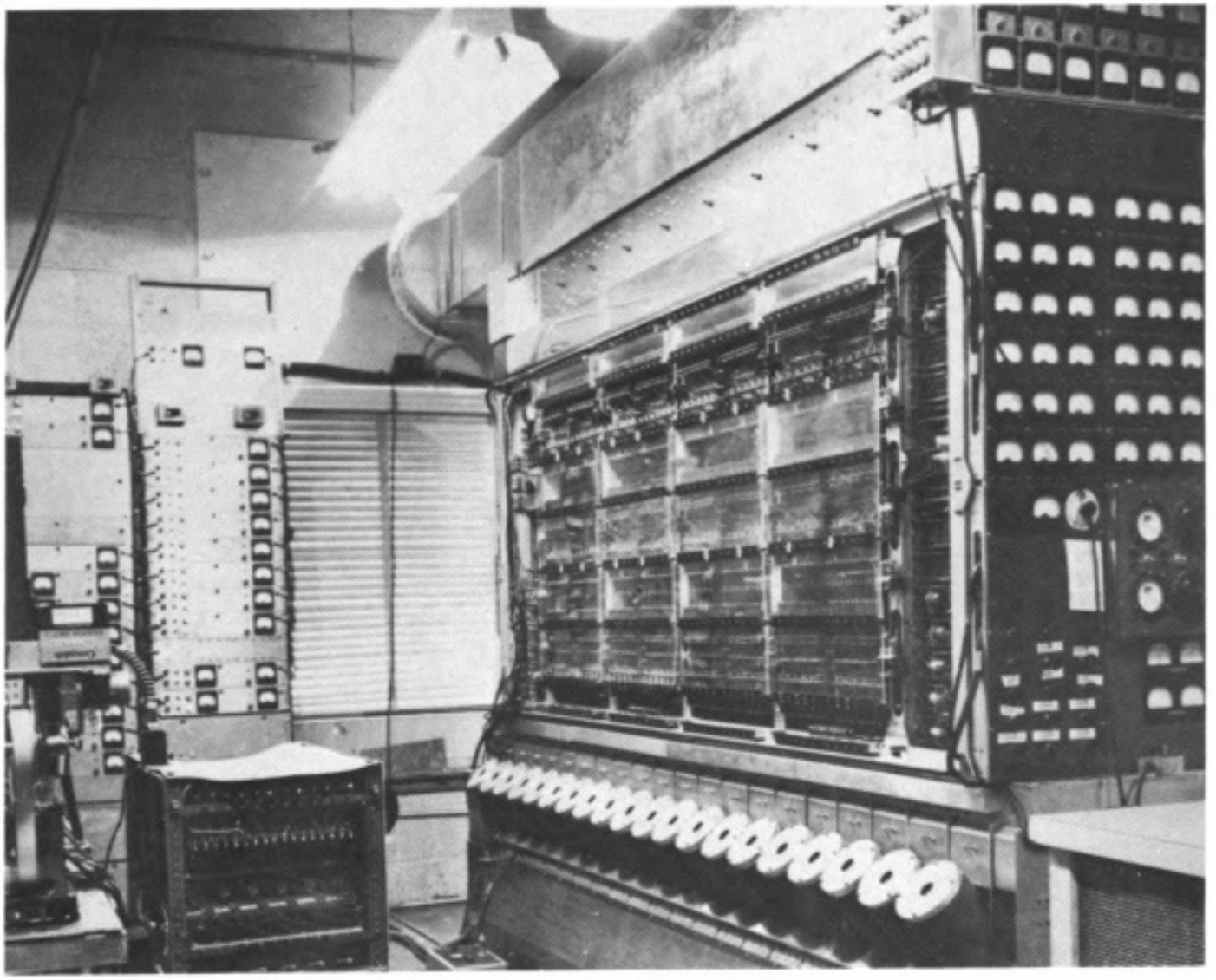
# IAS

Institute for Advanced Study Computer

**MANUFACTURER**

Institute for Advanced Study



Picture by the Institute for Advanced Study

## APPLICATIONS

Mathematical research in ballistics, aeronautics, hydrodynamics, elasticity, statistics, physics and chemistry. Some applications in management engineering. A high speed system, it is best suited for problems requiring moderate input-output. Served as the parent and forerunner to many of its type, e.g. AVIDAC (Lemont), GEORGE (Lemont), ILLIAC (Urbana), JOHNNIAC (Santa Monica), MANIAC (Los Alamos), MSUDC (East Lansing), ORACLE (Oak Ridge), ORDVAC (Aberdeen) SILLIAC (Sidney), TRANSAC 1000 - 2000 (Philadelphia), Michigan and Iowa State University planned computers.

## NUMERICAL SYSTEM

| | |
|---|---|
| Internal number system | Binary |
| Binary digits per word | 40 |
| Binary digits per instruction | 10 |
| Instructions per word | 2 |
| Instructions decoded | 30 |
| Arithmetic system | Fixed point |
| Instruction type | One address |
| Number range | $-1 \leqslant n < +1$ |

Negative numbers are represented as twos complements.

## ARITHMETIC UNIT

| | Incl. Stor. Access Microsec | Excl. Stor. Access Microsec |
|---|---|---|
| Add time | 70 | 40 |
| Mult time | 700 | 670 |
| Div time | 1,100 | 1,070 |
| Construction | Vacuum tubes | |
| Rapid access word registers | 4 | |
| Arithmetic mode | Parallel | |
| Timing | Asynchronous | |
| Operation | Sequential | |

Multiply time, including storage access is average value.



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## STORAGE

| Media | Words | Digits | Microsec Access |
|---|---|---|---|
| Electrostatic (CRT) | 1,024 | 40,960 | 30 |
| Magnetic Drum | 16,384 | 655,360 | |

Access time for electrostatic (CRT) (Williams-tube) storage is average value. Access time for magnetic drum is 35,000 + 64n microseconds, where n is the number of words transferred.

## INPUT

| Media | Speed |
|---|---|
| Punched Cards | 1,200 words/min |

Each card contains 12 words, IBM 514 Reproducer is used.

## OUTPUT

| Media | Speed |
|---|---|
| Punched Cards | 1,200 words/min |
| Graph (7 in. CRT) | 7,000 points/sec |

Data to be plotted is stored on drum.

## CIRCUIT ELEMENTS ENTIRE SYSTEM

| | |
|---|---|
| Tubes | 4,500 |
| Tube types | 10 |
| Crystal diodes | 400 |
| Separate cabinets | 5 |

Above values are approximate. Tube types used include the 5844, 5965, 5687, 5670, 6J6, 6AH6, 6AU6, 6080, 12AU7, 12AX7. The tube complement is primarily 5844, 5965 and 5687.

## CHECKING FEATURES

Fixed

A monitor which constantly observes magnitudes of "prime" and derived voltages and indicates deviations of approximately 1.5 volts in 200 volts. Monitor also checks the state of 20 fuses and will dump D. C. if any fuse "blown". Also, check system prevents turn-on of power if any fuse is "blown". Individual neons provide a record of which fuse is not good. A spill check is made on division.

Optional

An alarm, but no dump, if fuse is blown. This feature is never used. Special summation instruction forms (+, -, abs.) of storage contents starting with address given by instruction and continuing through position 1023 (last word). Two such instructions provide the sum of any selected block of the storage. This instruction is very useful in checking input-output operators.

## POWER, SPACE AND WEIGHT

| | | |
|---|---|---|
| Power, computer | 20 KW | |
| Power, air cond. | 8 KW | |
| Space, computer | 176 cu.ft. | 22 sq. ft. |
| Space, air cond. | 157 cu.ft. | 15 sq. ft. |
| Weight, computer | 1,000 lbs. | |
| Weight, air conditioner | 2,000 lbs. | |

Computer alone measures 2 ft. x 8 ft. x 11 ft. Air conditioners measures 2 1/2 ft. x 5 ft. x 3 ft. and 4 ft. x 3 ft. x 10 ft. Total installation weight is approximately 3 to 4 tons. Main power supplies, regulator rack, etc., occupies 207 cu. ft. and 33 sq. ft. Newly added drum and cabinets require 144 cu. ft. and 24 sq. ft.

## PRODUCTION RECORD

| | |
|---|---|
| Produced | 1 |
| Operating | 1 |

Served as a parent and forerunner of many similar, operating systems. (See Application.)

## COST, PRICE AND RENTAL RATE

Approximate cost of basic system $ 500,000
Approximate cost of additional equipment $ 50,000

Rented unit is the IBM 514 reproducer for input-output. Rental is $ 110/month.
The system was developed under Contract W-36-034-ORD-7481 with the U. S. Army Ordnance Corps. The project had additional support of the AEC, ONR, and the USAF. The logical design and development provided the basis for the present day systems of its kind.

## PERSONNEL REQUIREMENTS

| Daily Operation | Engineers | Tech an Operators |
|---|---|---|
| 1-8 Hour shift | 1 | 2 |

Second shift (1 additional technician) consists of production running by student-operator. Maintenance is provided by "on call" basis of day (first shift) staff.

## RELIABILITY AND OPERATING EXPERIENCE

Average error-free running period 20 hours
Operating ratio (Good/Attempted to run) 0.70
Figures based on period 1952 to 1956.

## FUTURE PLANS

Development activity on this system has been terminated. Some machine modifications will be made, including a replacement of the present 5 inch Williams CRT storage tubes by 3 inch tubes. The IBM input-output will be incorporated into the new external control which was built for the new drum. Later, it is planned to convert the IBM input-output so as to use an IBM 528 Reproducer instead of the present IBM 514. Advantages are increased read-in speed, separate (independent) feeds on read and punch. A new drum will increase capacity by 4096 words.

## INSTALLATIONS

Institute for Advanced Study, Princeton, N. J.

## ADDITIONAL FEATURES AND REMARKS

Left-shift and addition spill check (coded). Write inhibit to preserve selected portions of drum holding test codes and sub-routines. Division spill will stop machine. The overall organization of the computer is such that it should be able, on numerical problems, to spend about 20% of its time on multiplication and 80% on addition operations. In one 8-hour shift, the machine should handle a problem involving 10,000,000 multiplications.



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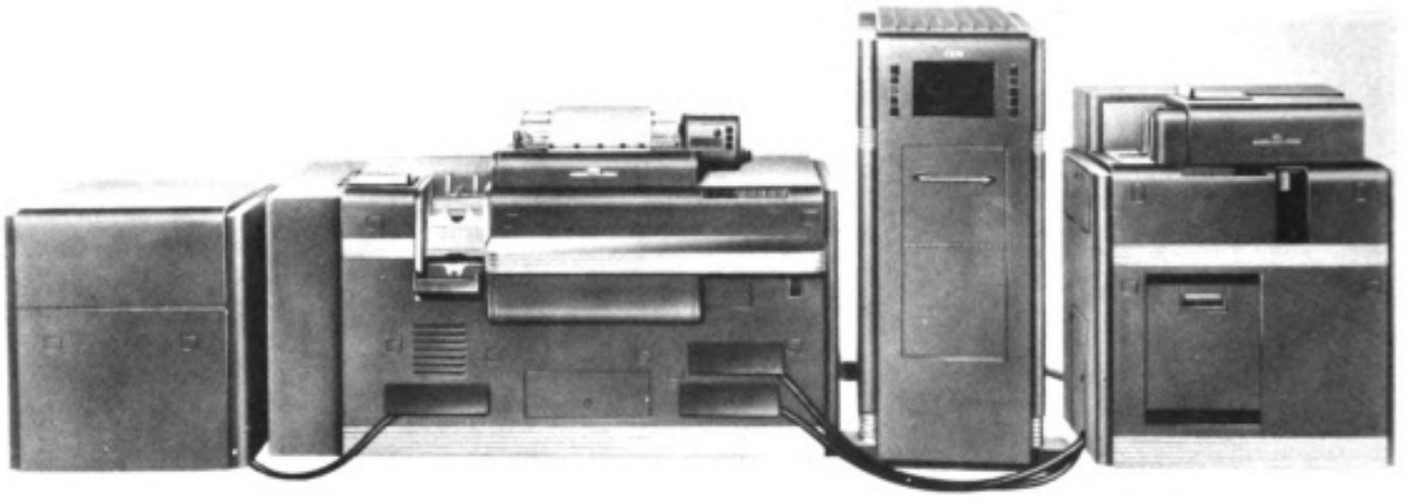
# IBM CPC

Card Programmed Calculator

## MANUFACTURER

International Business Machines Corporation



Picture by International Business Machines Corporation

## APPLICATIONS

Manufacturer

Business and scientific calculating.

Government Sample

U. S. Army Ordnance, Frankford Arsenal

Along with a Burroughs E101 and 2 UNIVAC 120's, the following utilization is made: Field Service National Stock Accounting, Fire control instruments, gage accounting, production control, payroll accounting, internal arsenal accounting including fiscal, budget, property and cost accounting, scientific computations in the field of fluid dynamics, interior ballistics, theoretical physics and certain aspects of nuclear physics.

Industrial Sample

The Griscom-Russell Company

Used for both commercial and scientific work.

## NUMERICAL SYSTEM

| | |
|---|---|
| Internal number system | Binary coded decimal |
| Decimal digits per word | 3 or 5 |
| Arithmetic system | Fixed point |
| Instruction type | One to two address |
| Number range | Dependent upon programming |

## ARITHMETIC UNIT

| Time | Microsec |
|---|---|
| Add (exclud. stor. access) | 760 |
| Mult (exclud. stor. access) | 13,180 (average) |
| Div (exclud. stor. access) | 15,480 (average) |
| Construction Vacuum tubes | |
| Rapid access word registers | 4 |
| Basic pulse repetition rate | 50 KC |
| Arithmetic mode | Parallel |
| Timing Synchronous | |
| Operation Sequential | |



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Picture by University of California, Radiation Laboratory

## STORAGE

| Media | Words | Digits | Microsec Access |
|---|---|---|---|
| Electronic tubes | 9 | 37 | 760 |
| Accumulator (Mech) | 6 | 80 | 400,000-800,000 |
| Mechanical | 48 | 480 | 400,000-1,200,000 |

## INPUT

| Media | Speed |
|---|---|
| Card reader | 100-150 cards/min |

## OUTPUT

| Media | Speed |
|---|---|
| Printed record | 100 or 150 lines/min |
| Summary punch | 50 cards/min |

## CIRCUIT ELEMENTS ENTIRE SYSTEM

| | |
|---|---|
| Tubes | 1,500 |
| Tube types | 4 |

## CHECKING FEATURES

Checking may be performed through control panel wiring.

## POWER, SPACE AND WEIGHT

| | |
|---|---|
| Power, computer | 9.57 KVA |
| Space, computer | 375 cu. ft. 64 sq. ft. |
| Weight, computer | 5,755 lbs |

The above figures include the 412/418, 605, 527 Group. No special air conditioning is required.

## PRODUCTION RECORD

| | |
|---|---|
| Produced | 693 |
| In production | 0 |
| Operating | 588 |
| Delivery time | Discontinued |

## COST, PRICE AND RENTAL RATE

Manufacturer

Approximately $2,200/month and up.

Industrial Sample

The Griscom-Russell Company

Basic system $2,000/month, additional equipment $1,000/month.



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## PERSONNEL REQUIREMENTS

Industrial Sample
The Griscom-Russell Company
One 8-hour shift requires 1 engineer and 3 technicians or operators.

## RELIABILITY AND OPERATING EXPERIENCE

Manufacturer
Average service time for all machines is approximately 25 hours/month.

## FUTURE PLANS

Industrial Sample
The Griscom-Russell Company
CPC to be replaced by a medium sized stored program computer within next few years.

## INSTALLATIONS

Government Sample
U. S. Army Ordnance, Frankford Arsenal, Phila., Pa.
NACA, Langley Field, Virginia
Industrial Sample
Allis-Chalmers Manufacturing Company
Battelle Memorial Institute, Columbus 1, Ohio
Esso Standard Oil Company, New York 19, New York
The Griscom-Russell Company, Massillon, Ohio
Republic Aviation Corporation, Farmingdale, Long Island, New York
United Aircraft Corporation, East Hartford 8, Connecticut
Southern Bell Telephone Company
University of California, Radiation Laboratory

## ADDITIONAL FEATURES AND REMARKS

Manufacturer
The IBM Card-programmed Electronic Calculator solves problems involving any number of sequential steps to obtain a single solution. It is a combination of several units, including three standard IBM machines, and has many applications in engineering, scientific and actuarial computations. One standard unit is an electronic calculator capable of 2,174 additions and subtractions or 86 multiplications and divisions a second. Other units include an accounting machine for interpreting instructions and for accumulating and printing results, a storage unit for retaining data for later use in a problem and a punching unit for recording results in IBM cards.
Numerical instructions in IBM cards direct the sequence of operations. These instructions tell the electronic calculator where to obtain factors; whether to add, subtract, multiply or divide, and what to do with the result -- print it, punch it, hold it for later use, or perform combinations of these possibilities.
When not being used for this type of computation, the accounting machine and electronic calculator may be disconnected and used to perform standard accounting and computing operations.


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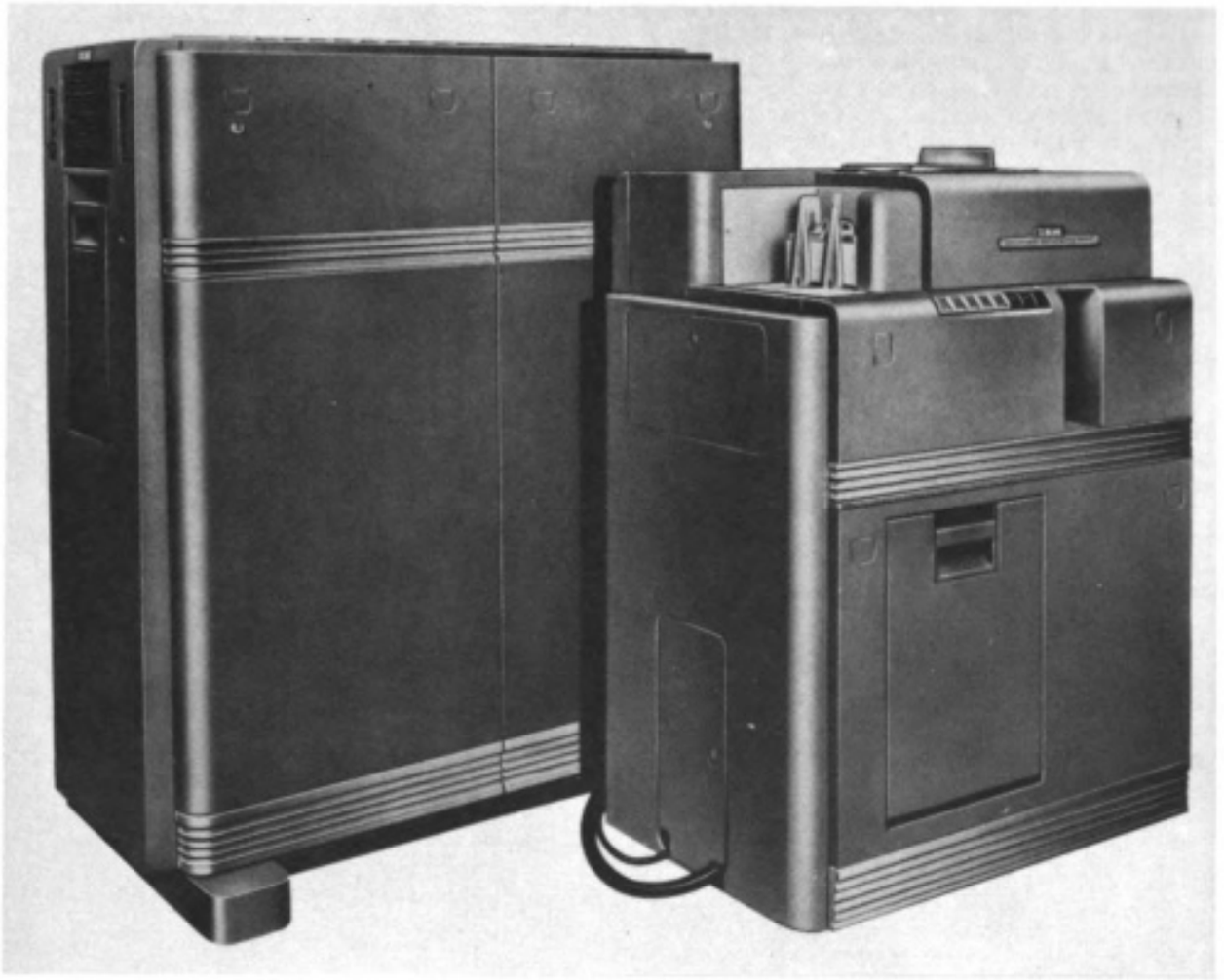
# IBM 604

Type 604 Electronic Data Processing Machine

**MANUFACTURER**

International Business Machines Corporation



Picture by International Business Machines Corporation

## APPLICATIONS

Manufacturer
Business and scientific.

Industrial Sample
Bridgeport Brass Company
Payroll, standard cost, sales price extensions; machine is basically a multiplier.

## NUMERICAL SYSTEM

| | |
|---|---|
| Internal number system | Binary coded decimal |
| Decimal digits per word | 3 or 5 |
| Instructions used | 9 |
| Arithmetic system | Fixed point |
| Instruction type | One or two address code |
| Number range | Variable |

## ARITHMETIC UNIT

| Time | Microsec |
|---|---|
| Add (exclud. stor. access) | 500 |
| Mult (exclud. stor. access) | 14,000 average |
| Div (exclud. stor. access) | 17,000 average |
| Construction | Vacuum tubes |
| Basic pulse repetition rate | 50 KC |
| Arithmetic mode | Parallel |
| Timing Synchronous | |
| Operation Sequential | |

## STORAGE

| Media | Words | Microsec Access |
|---|---|---|
| Electronic Tubes | 9 | 500 |

## INPUT

| Media | Speed |
|---|---|
| Card Reader-Punch | 100 cards/min |

## OUTPUT

| Media | Speed |
|---|---|
| Card Reader-Punch | 100 cards/min |



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## CIRCUIT ELEMENTS ENTIRE SYSTEM

| | |
|---|---|
| Tubes | 1,250 |
| Tube types | 4 |

## CHECKING FEATURES

Checking is possible through control panel wiring.

## POWER, SPACE AND WEIGHT

| | |
|---|---|
| Power, computer | 7.59 KVA |
| Space, computer | 73.9 cu. ft. 19.4 sq. ft. |
| Weight, computer | 1,949 lbs. |

Industrial Sample
Bridgeport Brass Company
Power requirement is 5.1 KW.

## PRODUCTION RECORD

| | |
|---|---|
| Produced | 2,994 |
| Operating | 2,904 |
| Delivery time | 12 months |

## COST, PRICE AND RENTAL RATE

Manufacturer
Approximately $550/month and up.

Industrial Sample
Bridgeport Brass Company
Rental rate is $660/month, including 10% tax, for basic system.

## PERSONNEL REQUIREMENTS

Industrial Sample
Bridgeport Brass Company
Three operators or technicians utilized.

## RELIABILITY AND OPERATING EXPERIENCE

Manufacturer
Average service time for all installed machines is approximately 10 hours per month.

## INSTALLATIONS

Government Sample
U. S. Department of Commerce, Coast and Geodetic Survey, Washington 25, D. C.

Industrial Sample
Bridgeport Brass Company, Bridgeport, Connecticut
Chesapeake and Potomac Telephone Company, Baltimore, Maryland
Dow Chemical Company, Midland, Michigan
General Electric Company, Schenectady, New York
Hercules Powder Company, Wilmington, Delaware
Manning, Maxwell and Moore Company
Raybestos Company
Singer Manufacturing Company
Southwestern Computing Service, Tulsa, Oklahoma

## ADDITIONAL FEATURES AND REMARKS

Manufacturer
The IBM 604 Electronic Calculator is a general purpose electronic digital computing machine which is helping solve problems in science, engineering, business and government.
Reading problem data from IBM punched cards at a constant speed of 100 problems (cards) a minute, it can go through as many as 60 separate steps, such as multiplications and divisions, to obtain the solution to a single problem. Answers are recorded in the same cards which carry the problem data, or they can be punched in specially designated cards.
The smaller of the two cabinets is the electrical card reading and punching unit. The larger cabinet is the all-electronic unit which includes the following sections: power, timing, arithmetic, storage and switching.
Many built-in features make this electronic calculator easy to operate and service. These include interchangeable control panels for changing from one type of operation to another, and testing devices and pluggable subassemblies which facilitate rapid maintenance and service.
These machines have been produced on the assembly line at IBM's plant in Poughkeepsie, New York, since early 1949.

Industrial Sample
Southwestern Computing Service
Utilized for providing contract computing service.



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# IBM 607

Type 607 Electronic Data Processing Machine

**MANUFACTURER**

International Business Machines Corporation

Picture by International Business Machines Corporation

## APPLICATIONS

Manufacturer
Business and scientific calculating.

## NUMERICAL SYSTEM

| | |
|---|---|
| Internal number system | Binary coded decimal |
| Decimal digits per word | 3 or 5 |
| Instructions used | 10 |
| Arithmetic system | Fixed point |
| Instruction type | One or two address |
| Number range | Variable |

## ARITHMETIC UNIT

| Time | Microsec |
|---|---|
| Add (exclud. stor. access) | 520 |
| Mult (exclud. stor. access) | 12,940 |
| Div (exclud. stor. access) | 15,700 |
| Construction Vacuum tubes | |
| Basic pulse repetition | 50 KC |
| Arithmetic mode Parallel | |
| Timing | Synchronous |
| Operation | Sequential |

## STORAGE

| Media | Words | Microsec Access |
|---|---|---|
| Electronic tubes | 37 | 520 |

## INPUT

| Media | Speed |
|---|---|
| Card Reader-Punch | 100 cards/min |

## OUTPUT

| Media | Speed |
|---|---|
| Card Reader-Punch | 100 cards/min |

## CIRCUIT ELEMENTS ENTIRE SYSTEM

| | |
|---|---|
| Tubes | 2,584 |
| Tube types | 7 |



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## CHECKING FEATURES

Check possible through control panel wiring.

## POWER, SPACE AND WEIGHT

| | |
|---|---|
| Power, computer | 13.5 KVA |
| Space, computer | 178.9 cu. ft. 36.5 sq. ft. |
| Weight, computer | 4,330 lbs. |

## PRODUCTION RECORD

| | |
|---|---|
| Produced | 268 |
| Operating | 258 |
| Delivery time | 12 months |

## COST, PRICE AND RENTAL RATE

Rental rates of basic system approximately $800 per month and up. Rental rate includes engineering maintenance and parts.

## INSTALLATIONS

Shell Oil Company
New York Life Insurance Company
Consolidated Edison Company, New York, New York
Bausch and Lomb Optical Company, Scientific Bureau, Rochester 2, New York

## ADDITIONAL FEATURES AND REMARKS

Manufacturer

The IBM 607 Electronic Calculator is designed for use by business and industry. Because of its expanded capacity, the overwhelming majority of business calculations requiring multiple machine operations are performed and checked in a single operation. It is capable of performing and checking 14,000 computing operations a minute.

The "memory" capacity of the 607 makes it possible to use intermediate calculated results as well as original data in solving a problem. Other necessary information not punched in cards, such as tax percentages, discount rates and overtime factors, may be entered as required.

Industrial Sample

Bausch and Lomb Optical Company

The system is utilized for the design of optical equipment and other scientific calculations.



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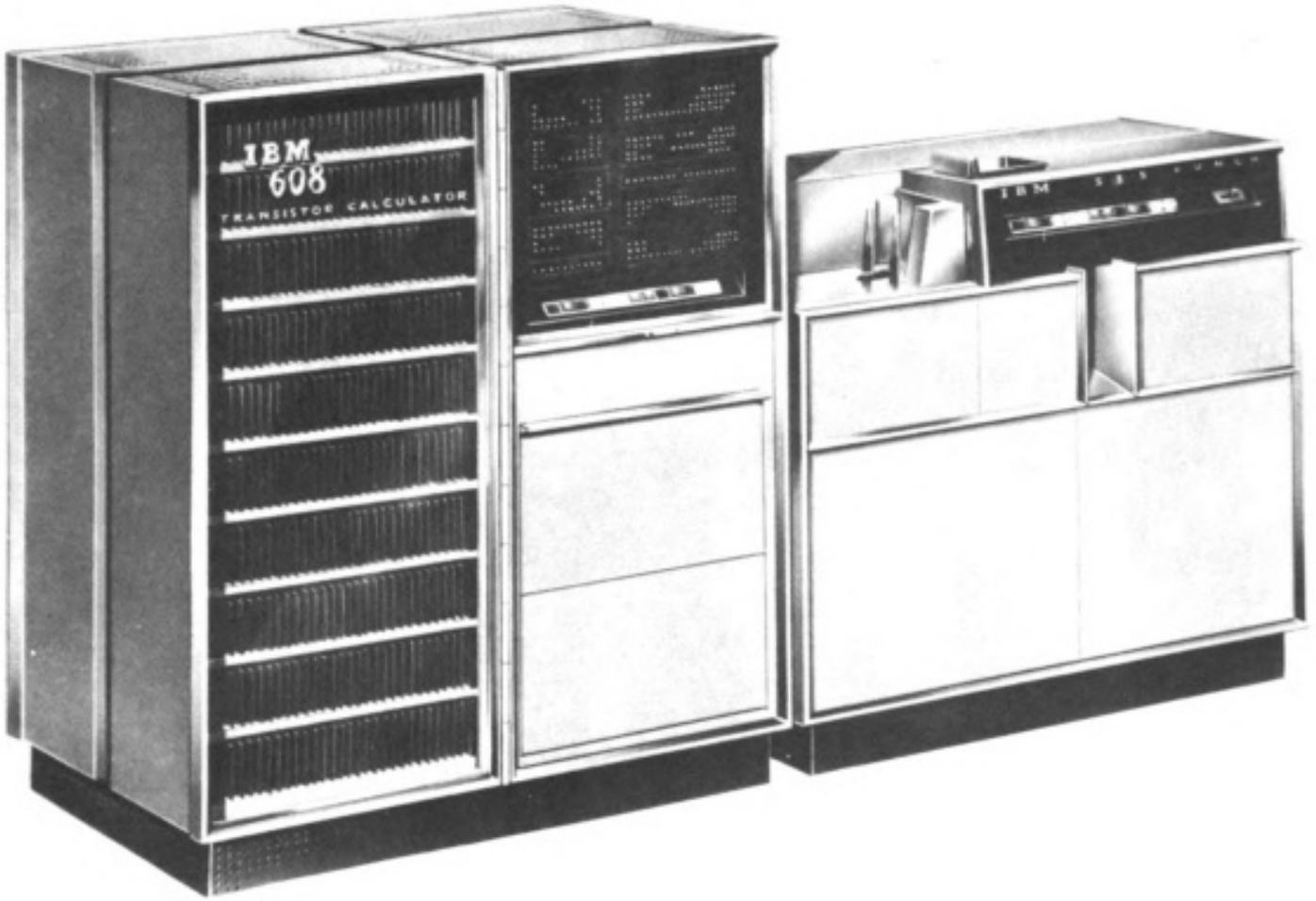
# IBM 608

Type 608 Transistor Calculator

**MANUFACTURER**

International Business Machines Corporation




Picture by International Business Machines Corporation

## APPLICATIONS

Manufacturer
Business and scientific computing.

## NUMERICAL SYSTEM

| | |
|---|---|
| Internal number system | Binary coded decimal |
| Decimal digits per word | 9 |
| Instructions used | 12 |
| Arithmetic system | Fixed point |
| Instruction type | One or two address |
| Number range | Variable, depending on program |

## ARITHMETIC UNIT

| | Time Microsec |
|---|---|
| Add (exclud. stor. access) | 220 |
| Mult (exclud. stor. access) | 11,000 average |
| Div (exclud. stor. access) | 13,420 average |

Construction Transistors and cores
Basic pulse repetition rate 100 KC
Arithmetic mode Parallel
Timing Synchronous
Operation Sequential

## STORAGE

| Media | Words | Digits | Microsec Access |
|---|---|---|---|
| Magnetic cores | 40 | 360 | 220 |

Each word may be split into a 3 digit and 6 digit word with separate signs.

## INPUT

| Media | Speed |
|---|---|
| Card Reader-Punch | 155 cards/min |

## OUTPUT

| Media | Speed |
|---|---|
| Card Reader-Punch | 155 cards/min |



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## CHECKING FEATURES

Checking possible through control panel wiring.

## POWER, SPACE AND WEIGHT

| | |
|---|---|
| Power, computer | 2.3 KVA |
| Space, computer | 160 cu. ft. 30 sq. ft. |
| Weight, computer | 2,400 lbs |

## PRODUCTION RECORD

Models have been produced. None are in customer service.

## COST, PRICE AND RENTAL RATE

Rental rates of basic system $1,600/month and up. Rental rate includes engineering maintenance and parts.

## ADDITIONAL FEATURES AND REMARKS

Manufacturer

IBM's new "608", the first completely transistorized calculator for commercial applications, operates without the use of a single vacuum tube.

Transistors -- tiny germanium devices that perform many of the functions of conventional vacuum tubes -- make possible a 50% reduction in computer-unit size and a 90% reduction in power requirements over a comparable IBM tube-model machine. They are mounted, along with related circuitry, on banks of printed wiring panels in the 608.

The machine's internal storage, or "memory", is made up of magnetic cores -- minute, doughnut-shaped objects that can "remember" information indefinitely, and recall it for use in calculations in a few millionths of a second.

For IBM, the 608 marks the achievement of production techniques for the manufacture, on a large scale basis, of computing and data processing equipment combining transistors, printed circuits and other forms of miniaturization.



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# IBM 650 RAMAC TAPES

International Business Machines Type 650
Magnetic Drum Data Processing Machine

International Business Machines Corporation

Picture by International Business Machines (Basic)

## APPLICATIONS

Manufacturer /
Commercial, scientific and engineering data processing.

Government Sample
Ames Aeronautical Laboratory, NACA
Wind tunnel and flight data reduction and scientific calculations.
Signal Corps Engineering Laboratory
Scientific and engineering computations.
U. S. Naval Avionics Facility
Research.
U. S. Naval Ordnance Laboratory, White Oak
Scientific computation.

Industrial Sample
American Telephone and Telegraph Company
AT & T has 15 IBM 650 systems operating, including Bell Laboratories. Typical applications of these systems, completed, in progress and planned, include:

Property and Cost - Material Distribution - including retirements, pricing, loading and summarizing.
Property and Cost - Perpetual Inventory and Average Prices.
Payroll (all weekly) - traffic reported by trick codes.
Depreciation Calculations.
Business Office Work Volume Report.
Customer Attitude Survey
Payroll - (a) All departments up to District Level
(b) All departments District Level and above.
Salary Advances
Savings Bonds
Quarterly Wage and Tax Computations (941A & W-2)
Quarterly Anniversary Listing
Blanket Payroll Change for General Increases
Pricing and Loading Overhead for Engineering Sources
Payroll Data Used in Developing Predetermined Average Hourly Rates
Labor, Motor Vehicle, Special Tool, and Overhead Distribution



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Picture by International Business Machines Corporation (Tapes)

Voucher Distribution
Specific Estimates
Material Distribution
Management Survey
Wage Survey
Commercial Measurements
General Trunk Studies
Quarterly Outside Plant Construction Results Plan
Annual Continuing Property Record
Development of Capital Tool and Material Disbursed Prices
Wages of Employees Residing in Indiana for State Income Tax Purposes
Labor, Motor Vehicle, Special Tool, and Overhead Distribution
Annual Census
House Service Distribution
Million Conductor Feet Report
Telephone Set Movement Report
Prorate of Transportation Charges Reported on Western Electric Bills
Flash Report of Expenses and Current Month Maintenance Report
Sampling Inventory of Station Apparatus for Simplified Station Accounting
Revenue Accounting - Billing - Toll ticket billing work, message register billing, local service charge and miscellaneous billing, customer payments and coin telephone collecting and accounting.
Community Chest Contributions
Preliminary studies of seasonal variation analysis (as a training problem), Toll Service Observing, Message Mile Minute and Exchange Plant Trouble Analysis.
Punching Airline Mileages into Message Sample Cards

Aeronutronic Systems, Incorporated

General purpose.

Batelle Memorial Institute

Commercial, scientific and engineering.

Bell Telephone Laboratories

Two IBM 650's on research, 1 on network calculations.

Chrysler Corporation, Chrysler Engineering

Engineering applications in Computer Laboratory

Chrysler Corporation Missile Operations

Ballistic missile trajectory analysis and other engineering computation.

Chrysler Corporation, Plymouth Division

Material requirements determination, sales statistics, production reports, payroll.

Chrysler Corporation, West Coast Division

Material requirements calculations, production reports, payroll.

Cook Research Laboratories

Engineering and scientific.

Cornell Aeronautical Laboratory, Incorporated

Scientific computing, engineering, accounting.

Indiana University

Used for research and instruction by members of the faculty and staff of Indiana University. This equipment is not used for routine administrative calculations.



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Prudential Insurance Company of America
Statistical and other mathematical applications.
Republic Aviation Corporation
Aircraft engineering, research and development.
Stanford Computation Center
Scientific computing and education.
University of California Radiation Laboratory
Scientific calculation.
University of Rochester Computing Center
Physical research, statistics, educational tool.
Westinghouse Bettis Atomic Power Division
Scientific calculations.

## NUMERICAL SYSTEM

| Manufacturer | |
|---|---|
| Internal number system | Decimal |
| Decimal digits per word | 10 plus sign |
| Instructions per word | One |
| Instructions decoded | 89 |
| Arithmetic system | Floating and fixed point available |
| Instruction type | Two address |
| Number range | $-10^{10} < n < 10^{10}$ |

Government Sample
Ames Aeronautical Laboratory, NACA
Modified one-address (one address and location of next address), 37 instructions used.
Signal Corps Engineering Laboratory
Floating point through interpretive system, modified one address with three address interpretive system.

Industrial Sample
Bell Telephone Laboratories
"Interpret" most work to make it look like floating point. Eight digits plus two digit exponent. Interpretive systems use 3-address order structure.

## ARITHMETIC UNIT

| Manufacturer | Microsec |
|---|---|
| Add (exclud. stor. access) | 672-768 |
| Mult (exclud. stor. access) | 2,210-19,600 |
| Div (exclud. stor. access) | 6,000-23,400 |
| Construction | Vacuum tubes and diodes |
| Rapid access word registers | 3 |
| Basic pulse repetition rate | 125 Kc |
| Arithmetic mode | Serial by decimal digit, parallel by bits |
| Timing | Synchronous |
| Operation | Sequential and partially concurrent |

Government Sample
Ames Aeronautical Laboratory, NACA
Assuming optimum programming, the add time is 288, multiply time 10,000, and divide time 12,000 microseconds.
Signal Corps Engineering Laboratory
Access time ranges from 0 to 4,800 microseconds, yielding the following, including and excluding median access time respectively, add time 3,360, 960; multiply time 13,344, 10,944; divide time



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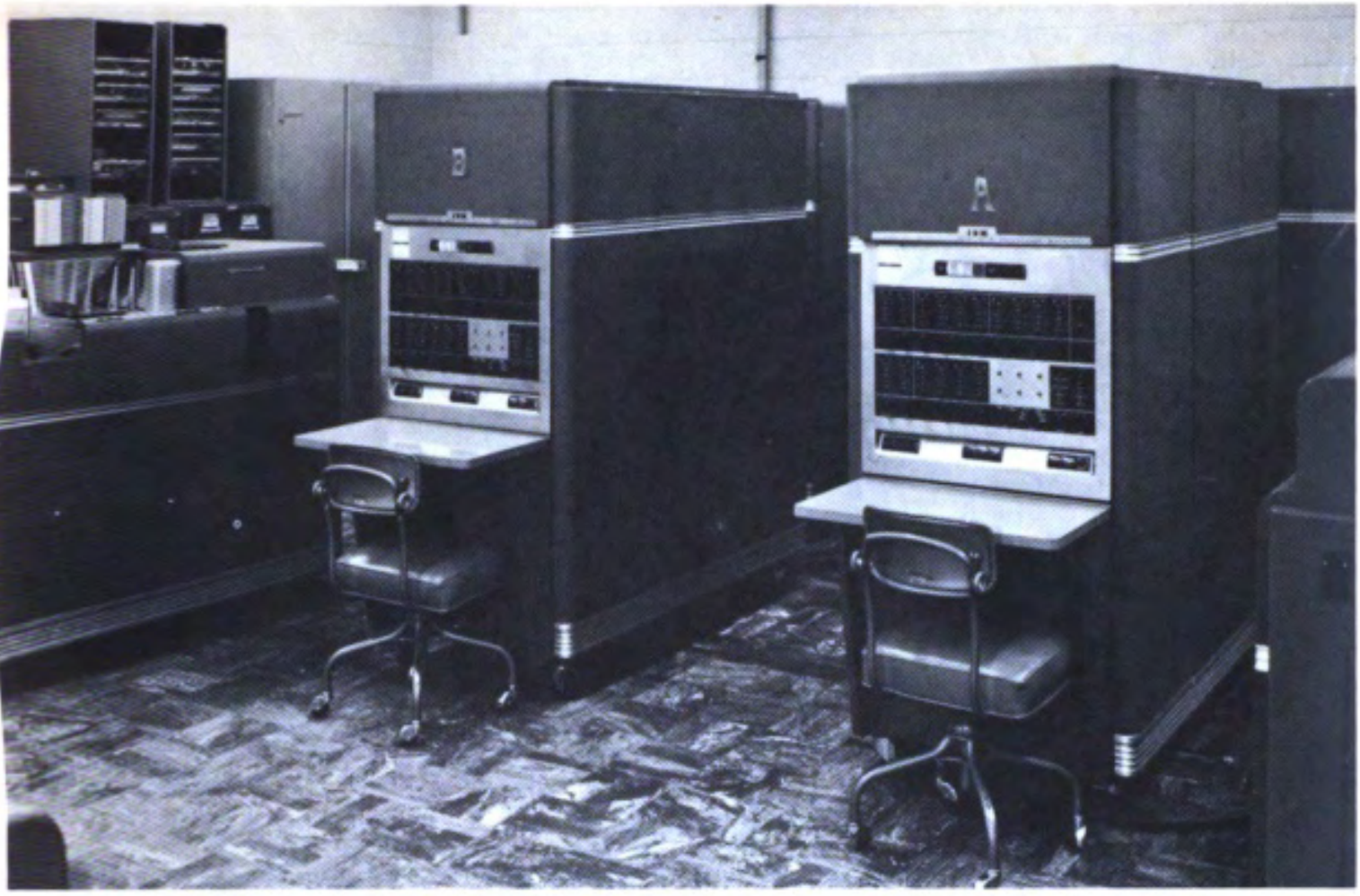

Picture by University of California Radiation Laboratory

17,184, 14,784 microseconds.

Industrial Sample

Aeronutronic Systems, Incorporated
Respectively 700, 12,000, and 14,000 microseconds with optimum programming, excluding storage access.

Cornell Aeronautical Laboratory, Incorporated
For including and excluding storage access time, respectively, add 10,176 (worst case), 672; multiply 29,186 (worst case), 2,400; divide 33,024 (worst case), 6,240. Higher figures represent worst possible programming whereas lower figures indicate better programming.

Republic Aviation Corporation
Vacuum tubes used in arithmetic unit are 6350, 6211, 5965, 6AL5, 6AY7, 0C3.

University of California Radiation Laboratory
Including and excluding storage access, respectively, add 5,472 (average), 288; multiply 15,360 (average), 10,560 (average); divide 15,648 (average), 14,400 (average); microseconds.

## STORAGE

| Manufacturer Medium | Words | Microsec Access |
|---|---|---|
| Magnetic drum | 1,000 or 2,000 | 96 min 4,800 max |
| Magnetic core | 60 | 96 |
| Magnetic tape | 500,000 per unit | |
| Disc (RAMAC) | 600,000 | 800,000 max/60 words |

Maximum of six tapes possible. Time to accelerate tape to read or write status (75 inches per second) from standstill is 10 millisec of which 9.7 millisec are available for further computation. Magnetic tape is compatible with EDPS IBM 701, 702, 704 and 705. Magnetic tape unit can rewind 2,400 feet of tape in 1.2 minutes. The RAMAC stores 600,000 words (6,000,000 dec. dig.) on magnetic discs. Up to four units may be used on one system. Access time is 800,000 microseconds maximum, for 60 words; 300,000 microseconds maximum track to track access, same disc and 180,000 microseconds track to track adjacent disc. Average write access is 125,000 microseconds; average read is 100,000 microseconds.

## INPUT

| Manufacturer Media | Speed |
|---|---|
| Punched Card Reader | 200 cards/min |
| Magnetic Tape | 15,000 char/sec |

150 cards/min may be read from read feed of type 407 Accounting Machine when attached. A 10-word input buffer is provided which allows computation to proceed for 272 millisec of the 300 millisec necessary to read a card. A 60-word magnetic core buffer is available between magnetic tape and the magnetic drum. Each of these words of core is addressable between the magnetic tape and the magnetic drum. Each of these words of core is addressable and can be used for rapid access storage when not



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reading or writing magnetic tape (96 microsec per word access). Tape from IBM 702, 704 or 705 System can be read by this tape unit. Rewind time for 2,400 feet of tape is 1.2 minutes. The IBM 650 (RAMAC) (355) and the IBM 650 (Tapes) utilize a .537 Read-Punch Unit operating at 155 cards/minute.

Industrial Sample

Cornell Aeronautical Laboratory, Incorporated

At the maximum input rate of 200 cards/minute up to 257 milliseconds are available for computing. This is approximately 2,700 word times or 54 drum revolutions. If more time is required between read instructions, the input rate is necessarily decreased.

## OUTPUT

| Manufacturer Medium | Speed |
|---|---|
| Punched Card Recorder | 100 cards/min |
| Magnetic Tape | 15,000 char/sec |
| Line Printer (Wheel type) | 150 lines/min<br>120 char/line |
| Line Printer (wire matrix) | 1,000 lines/min<br>60 char/line |

A 10-word output buffer is provided which allows computation to proceed for 565 milliseconds of the 600 milliseconds necessary to punch a card. A 60-word magnetic core buffer is available between the magnetic tape and the magnetic drum. Each of these words is addressable and can be used for rapid access storage when not reading or writing magnetic tape (96 microseconds per word access). Printer connected directly to main frame of computer through a 10-word print buffer. Printer connected to magnetic tape frame, independent of computer. The IBM 650 RAMAC and IBM 650 Tapes Systems utilize a 537 Read Punch Unit with a speed of 155 cards/minute.

Industrial Sample

Cornell Aeronautical Laboratory, Incorporated

At the maximum card punching rate of 100 cards/minute up to 544 milliseconds are available for computing. This is approximately 5,600 word times, or 110 drum revolutions. If more time is required between punch instructions, the maximum rate is necessarily decreased.

University of Houston Computing Center

Machine is equipped with alphabetic and special character devices.

## CIRCUIT ELEMENTS ENTIRE SYSTEM

| Manufacturer | |
|---|---|
| Tubes | 2,000 |
| Tube types | 7 |
| Crystal diodes | 4,000-5,280 |

Tube types are 5965, 6350, 5687, 6211, 12AY7, 2D21, and 6AL5. 1,000-word drum has 119 heads; 2,000-word drum has 219 heads.

## CHECKING FEATURES

Manufacturer

Validity character check. This check is placed on data and instructions in arithmetic and logical units every 96 microseconds. (Every word time). The check accomplishes the following:

Dropped and picked up bits are immediately detected.

Only 10 admissible combinations out 128 possible combinations.

The register in question is indicated on console.

Non-existant addresses and order codes are detected as errors. Clocking checking circuits are provided for magnetic drum. Card feed errors are indicated.

A double punch or a blank column in any column which has received a punch instruction for the output cards causes an error indication light to switch on and the operation will stop.

Overflow of accumulator.

Divide check Dividend divisor.

Horizontal and vertical parity checks on magnetic tape.

Magnetic tape to card check.

Government Sample

Ames Aeronautical Laboratory, NACA

Address stop and half-cycle switches.

Signal Corps Engineering Laboratory

Biquinary validity checks, timing checks and overflows are fixed checks. Double-punch, blank column are optional checks.

Industrial Sample

Aeronutronic Systems, Incorporated

Check on proper biquinary representation of decimal digit, check on proper range of addresses.

Battelle Memorial Institute

Validity checks on both data and instructions. Non-existant addresses are detected as errors. Non-existant orders are detected as errors. Clocking checking circuits are provided for magnetic drum. Card feed errors and blank or double punch column detection.

Chrysler Corporation, West Coast Division

Biquinary and double-punch, blank-column detection.

Cook Research Laboratories

Validity checks, read checks, punch checks, control checks.

Cornell Aeronautical Laboratory, Incorporated

Validity checks, 3 checking stations at strategic points in computer to check transmission of numbers internally; also read check and punch checks are incorporated at input and output. Control checks, which detect the following: Illegal addresses, illegal operation codes, timing circuitry discrepancies, and accumulator overflows not anticipated by the programmer.

Republic Aviation Corporation

Fixed checks are bit check, timing check, invalid address check, overflow check, card feed check. Optional checks are double punched, blank column detection.

University of California Radiation Laboratory

Validity character check, clocking circuits, card feed errors.

Westinghouse Bettis Atomic Power Division

Redundancy and validity are fixed, double punch blank column on output only is optional.

## POWER, SPACE AND WEIGHT

| Manufacturer | | |
|---|---|---|
| Power, computer | 17.7 KVA | |
| Space, computer | 270 cu. ft. | 45 sq. ft. |
| Weight, computer | 5,656 lbs. | |

IBM 650 RAMAC requires 35.5 KVA, 9,000 cu. ft., 1,000 sq. ft., weighs 14,000 lbs. and requires 8 Tons of refrigeration. IBM 650 Tapes requires 42 KVA, 9,000 cu. ft., 1,000 sq. ft., weighs 15,000 lbs. and requires 9 Tons of refrigeration.

Government Sample

Signal Corps Engineering Laboratory

Installation requires 25 KW, 200 cu. ft., 36.6 sq. ft., weighs 6,060 lbs. and utilizes 5 Tons of refrigeration.



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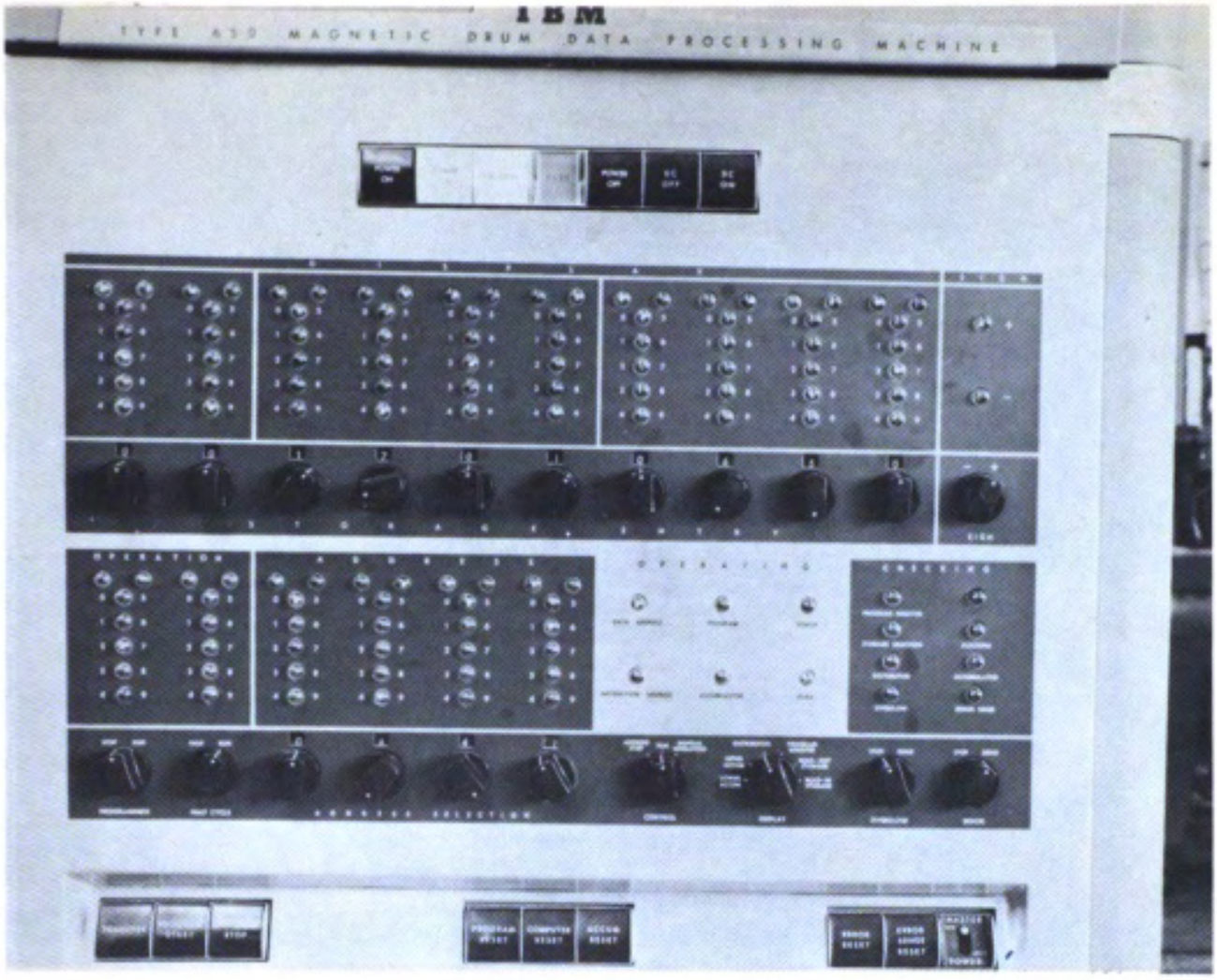


Picture by U. S. Naval Air Missile Test Center, Point Mugu, California

Industrial Sample

Aeronutronics Systems, Incorporated
Installation requires 19 KW, at 0.87 power factor, 225 sq. ft.

Battelle Memorial Institute
Installation requires 17 KW,55,000 BTU, 225 sq. ft., weighs 5,500 lbs.

Chrysler Corporation, Plymouth Division
Installation 22.5 KW, 225 sq. ft., 30 Ton air conditioner.

Chrysler Corporation, West Coast Division
Installation requires 208-230 volts, 100 amps., 500 sq. ft., 4,500 lbs.

Cook Research Laboratories
Installation 17.7 KVA, 199 cu. ft., 40 sq. ft., 5,360 lbs., 7.5 Tons.

Cornell Aeronautical Laboratory, Incorporated
Installation requires 17.62 KVA, 84.7 amps at 208 volts single phase, 60 cycle. 5,360 lbs. Power space and weight of computer are for the basic 650 system, i.e. type 655 power unit, type 650 console unit and type 533 Read-Punch Unit. The read punch dimensions are 59-7/16 in. x 25-3/8 in. x 49-1/8 in. Power unit dimensions 62-1/8 in. x 30-5/16 in. x 71 in. Console Unit is 76-1/2 in. x 30-5/16 in. x 71 in. Air conditioning requirements must be such that the following conditions are met, (1) Temperature 50° F to 90° F and (2) Relative humidity 0% to 80%.

Republic Aviation Corporation
Installation requires 14 KW, 16.6 KVA, 0.86 PF, 2,875 sq. ft., 5,360 lbs.; 10 Tons of refrigeration.

University of Houston Computing Center
Air conditioning 6-1/2 Tons (5 Tons freon refrigeration and 1-1/2 Tons chilled water) operating in the room containing the IBM 650, 407 and 082. However, the amount of air conditioning is not adequate.

Westinghouse Bettis Atomic Power Division
Installation requires 16 KW, 21 KVA, 0.76 PF, 600 sq. ft. (machine space only).

## PRODUCTION RECORD

| Manufacturer | |
|---|---|
| Produced | 524 |
| Operating | 507 |
| Delivery time | Special |



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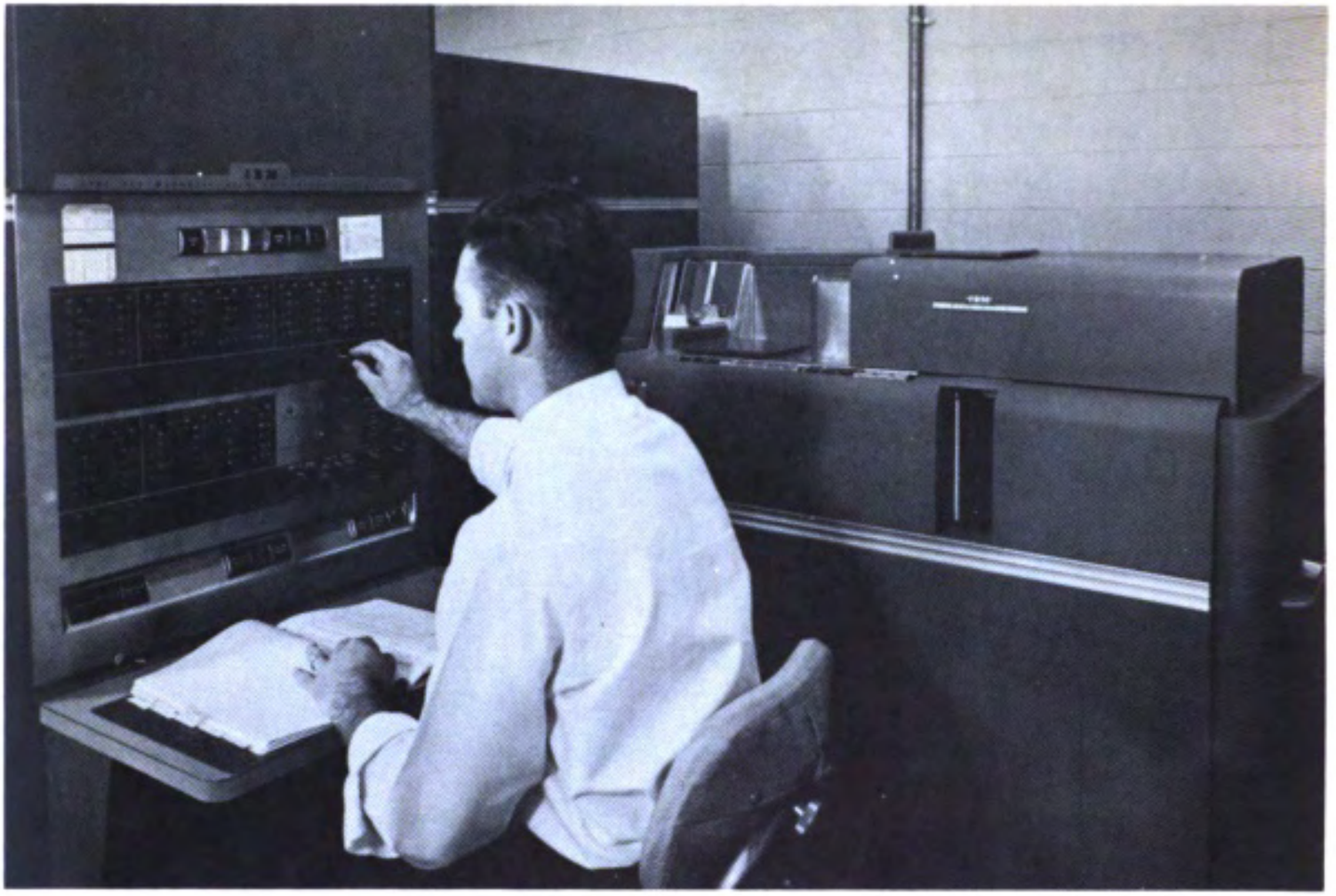

Picture by University of California Radiation Laboratory

## COST, PRICE AND RENTAL RATE

Manufacturer

Rental rates of basic system $3,250/month and up.
~$975/month for RAMAC Disc Unit only.

Government Sample

Ames Aeronautical Laboratory, NACA

Basic system rental rate $3,750/month.

Signal Corps Engineering Laboratory

Basic system rental rate $4,000/month, additional equipment $900/month.

U. S. Naval Avionics Facility

Basic system $3,800/month.

Industrial Sample

Aeronutronic Systems, Incorporated

Basic system $3,725/month, additional equipment $1,700/month.

Battelle Memorial Institute

Basic computer $3,750/month includes maintenance and parts, additional equipment $1,300/month.

Chrysler Corporation, Chrysler Engineering

Respectively, $3,200/month, $800/month.

Chrysler Corporation, Missile Operation

Basic system $3,600/month.

Chrysler Corporation, Plymouth Division

Basic system $3,700/month.

Chrysler Corporation, West Coast Division

Respectively $3,750/month, $450/month.

Cook Research Laboratories

Approximate price $205,900, $3,750/month.

Cornell Aeronautical Laboratory, Incorporated

Approximate price of basic system (Purchase Price) is $205,900. Rental rate, basic system $3,750/month. Immediate access (core) storage with Floating Decimal Arithmetic and Indexing Accumulators rental rate is $2,350/month.

Indiana University

This equipment is rented with a 60% Educational Contribution from IBM.

Republic Aviation Corporation

Basic system $3,750/month, alphabetic device is $325/month.

Stanford Computation Center

Standard IBM charges with educational contribution.

University of California Radiation Laboratory

Basic system $3,650/month for 1st shift, $400/month for 402 printer.

## PERSONNEL REQUIREMENTS

| Manufacturer | | | Tech and |
|---|---|---|---|
| Daily Operation | Engineers | Math | Operators |
| 1-8 Hour shift | IBM | 3 | 2 |
| 2-8 Hour shifts | IBM | 6 | 4 |
| 3-8 Hour shifts | IBM | 9 | 6 |

Government Sample

Ames Aeronautical Laboratory, NACA

Two 8-hour shifts require 1 engineer, 2 tech or operators, programmers do some operating.



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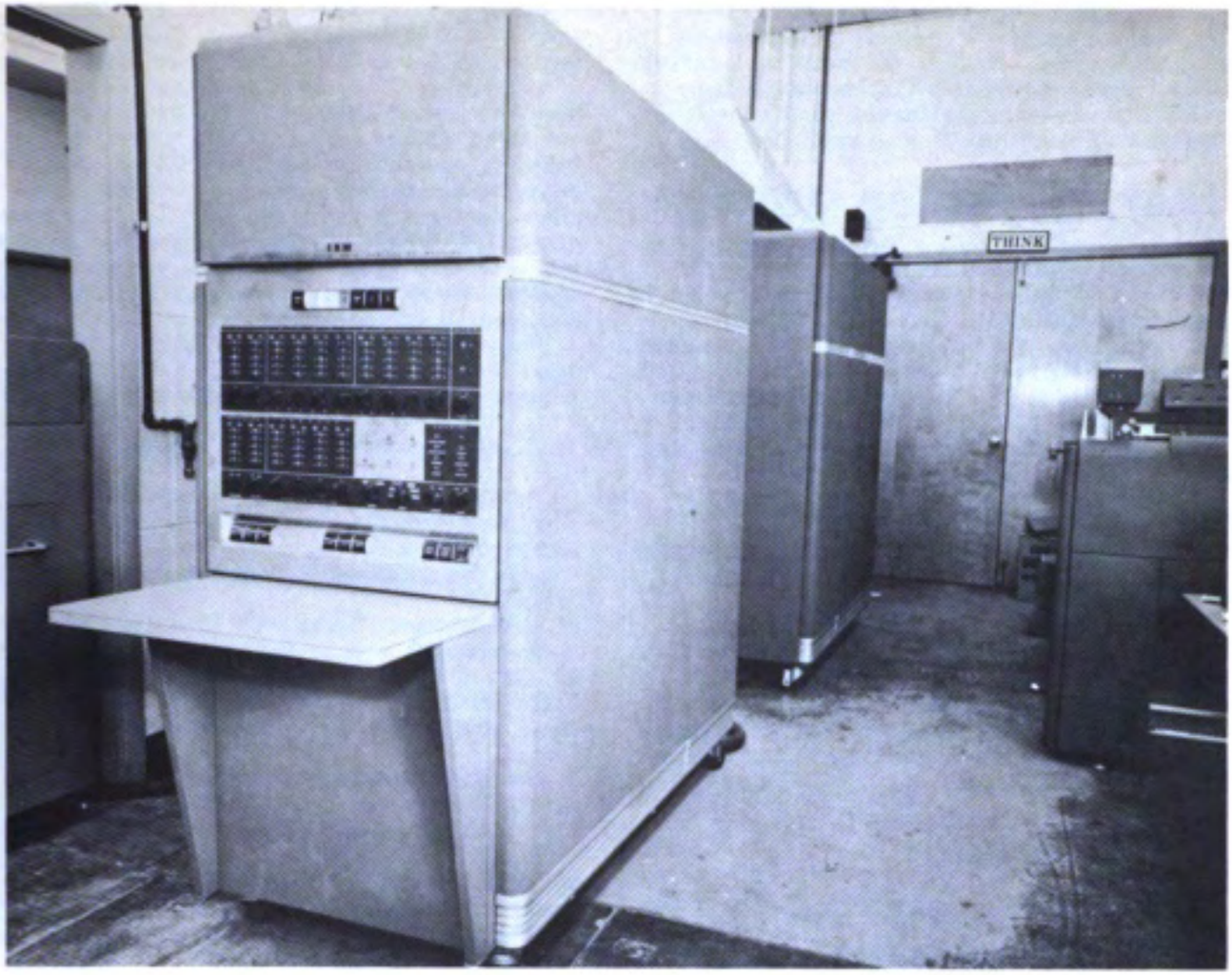


Picture by U. S. Naval Air Missile Test Center, Point Mugu, California

Signal Corps Engineering Laboratories
Nine mathematicians utilized with system.

U. S. Naval Avionics Facility
4 engineers and 4 technicians or operators utilized.

U. S. Naval Ordnance Laboratory
The Applied Mathematics Division consists of 23 technical people. Other "open shop"personnel also use and operate the machines. The maintenance is done by IBM.

Industrial Sample

Aeronutronic Systems, Incorporated
One 8-hour shift requires 0.5 engineer and 1 tech or operator.

Battelle Memorial Institute
One 8-hour shift requires 4 mathematicians and 2 technical operators.

Bell Telephone Laboratories
One operator is capable of operating two machines per shift. The "open shop" system is utilized. Staff to program and code for one machine for one 8-hour shift is 3 engineers and 12 assistants.

Chrysler Corporation, Engineering Computing Laboratory
One 8-hour shift 3 technicians or operators. Understaffed by 3 at present. (All operators are programmers).

Chrysler Corporation, Missile Operation
One 8-hour shift 5 coders, 2 technicians or operators.

Chrysler Corporation, Plymouth Division
Three 8-hour shifts require 3 programmers plus 3 console operators.

Chrysler Corporation, West Coast Division
One 8-hour shift 1 operator and 2 programmers; one additional operator per additional shift.

Cook Research Laboratories
One 8-hour shift 3 engineers, 2 technicians (engineers are programmers).

General Dynamics Convair Division
Operated 7 AM to 1 AM by programmers.

Cornell Aeronautical Laboratory, Incorporated
Two 8-hour shifts require 2 engineers and 4 operators.

Indiana University
An "open shop" installation in which faculty and students do their own programming. There is one permanent chief programmer and a small temporary staff consisting largely of graduate students who do key-punching and program special problems. IBM services the equipment.

Minneapolis-Honeywell Regulator Company, Aeronautical Division
Staff consists of 7 engineers, 6 technicians, "open shop" arrangement.

Republic Aviation Corporation
Two 8-hour shifts require 3 operators, maintained by IBM. This does not include programming.

Stanford Computation Center
One 8-hour shift 3 to 10 operators, "open shop".

University of California Radiation Laboratory
Two 8-hour shifts 0.5 engineer; service on two machines.



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University of Rochester Computing Center
One 8-hour shift requires 4 operators, including a Burroughs E101 System. Usually operated on "open shop" basis. Most programming and operating is done by the user who is not attached to the Computing Center.

## RELIABILITY AND OPERATING EXPERIENCE

Government Sample

Ames Aeronautical Laboratory, NACA
Average error-free running period 36 hours.
Good time 211.3 hours
Attempted to run time 234.9 hours
Operating ratio 0.900
Above figures based 29 November 1956 to 28 December 1956. System passed acceptance test 11 September 1955. About 3.6% of the "attempted to run" time is scheduled maintenance. This time is not entered under "good time".

Signal Corps Engineering Laboratory
Accepted February 1956. Except for May 1956, machine has been very reliable and practically error free.

U. S. Naval Avionics Facility
Average error-free running period is 85% of available running time, based on period 1 June 1955 to 1 December 1956. Accepted 1 June 1955.

U. S. Naval Ordnance Laboratory
Respectively as under Ames Aeronautical Laboratory above, 4 hours, 40.5 hours per machine week, 42.7 hours per machine week, 0.95, May 1956 to June 1956, May-June 1955.

Industrial Sample

Bell Telephone Laboratories
Operating ratio 0.95.

Chrysler Corporation Engineering Computing Laboratory
Respectively 32 hours, 1,900 hours, 2,400 hours, 0.80, July 1956 to October 1956.

Chrysler Corporation, Missile Operations
Respectively, average error-free running period 60 hours, operating ratio 0.90, period 1 May 1956 to 1 November 1956, acceptance 1 May 1956.

Chrysler Corporation, Plymouth Division
Average error-free running period two weeks, good time 500 hours, attempted to run 504 hours, based on 1 month period.

Cook Research Laboratories
Respectively 40 hours, 6,020 hours, 6,622 hours, 0.90, 1 June 1956 to 1 January 1957, 28 May 1956.

General Dynamics Convair Division
Average error-free running period 24 hours, operating ratio over 0.99.

Cornell Aeronautical Laboratory, Incorporated
Respectively 49.7 hours, 298.6 hours, 336 hours, 0.888, March 1956 to August 1956. The figures are for the New York Central RR, Buffalo, N. Y., IBM 650 System for indicated 6 months period.

Indiana University
The equipment was installed in July 1956 and apart from the first month of operation there has been very little unscheduled down time. Repairs have been made relatively promptly and far less trouble has occurred with the 650 than with a CPC in a previous year.

Minneapolis-Honeywell Regulator Company, Aeronautical Division
Unscheduled down time not over 5% of scheduled hours. Monthly schedule at least 200 hours/month.

Republic Aviation Corporation
Respectively 424 hours, 443 hours, 0.95, 1 October 1956 to 30 October 1956, January 1956.

University of California Radiation Laboratory
Respectively 12 hours, 3,597.4 hours, 3,744.9 hours, 0.96, October 1955 to September 1956 (12 months), Machine A accepted April 1955, Machine B accepted October 1955. Data is from 2 machines.

University of Houston Computing Center
Based on period 16 August 1956 to 31 October 1956, one tube failure occurred, causing a delay of about 4 hours. No noticed machine errors. Jams in the punch feed mechanism occur approximately twice a month during the first two months. This frequency appears to be diminishing as operators improve card handling technique. Four hours per month preventive maintenance has been the average thus far. System accepted 16 August 1956.

University of Rochester Computing Center
Operating ratio 0.95, period 10 July 1956 to 1 November 1956, accepted 10 July 1956.

## FUTURE PLANS

Government Sample

Signal Corps Engineering Laboratory
Additional IBM 650 on order, including indexing accumulators, alphabetic device, automatic floating decimal.

Industrial Sample

American Telephone and Telegraph Company
AT & T has 23 IBM 650 Basic, 7 IBM 650 Tapes, and 4 IBM 650 RAMAC systems on order for applications shown above. One RAMAC is now undergoing IBM field test.

Battelle Memorial Institute
Alphabetic Device, Floating Point, and Index Registers will be available January 1957.

Bell Telephone Laboratories
The IBM 650's will soon be inadequate for the total load and a larger machine is on order.

Chrysler Corporation, Engineering Computing Laboratory
Built in electronic floating decimal has been ordered. At present, the floating decimal is attained by programming. Additional storage capacity may be acquired in the RAMAC attachment.

Chrysler Corporation, Missile Operations
Addition of IBM 653, containing automatic floating decimal unit, indexing accumulators, and also addition of an on-line 407 Tabulator.

Chrysler Corporation, Plymouth Division
Propose to install IBM 650 with 407 input and output, also propose to install 650 RAMAC, with additional tape storage.

Continental Oil Company ✓
A second 650 on order with tapes and RAMAC.

Cook Research Laboratories
Second shift operation to be started 21 January 1957.

Indiana University
Additon of auxiliary equipment to basic 650 during 1957, including an electronic floating point, a small core storage unit, three B-registers, magnetic tapes and direct connection to an IBM 407 Tabulator.

Republic Aviation Corporation
A second 650 is on order, with a type 653 auxiliary unit to incorporate 60 words of magnetic core storage, 3 four-digit index accumulators and floating point arithmetic.

Aeronutronic Systems, Incorporated
Intend to rent an IBM 704 or a Remington Rand 1103A in about one and half years.

University of California Radiation Laboratory
Floating point instructions and index registers will be added when available.

University of Rochester Computing Center
A symbolic three address assembly-interpretive floating point system is in process of development for basic 650.



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Westinghouse Bettis Atomic Power Division
May add magnetic tape, depending upon results of an economics study.

## INSTALLATIONS

Government Sample

Ames Aeronautical Laboratory, NACA, Moffett Field, California
Bonneville Power Administration, Portland 8, Oregon
Department of Public Works, State of California, Sacramento, California
Lewis Flight Propulsion Laboratory, NACA, Cleveland, Ohio
Signal Corps Engineering Laboratory, Fort Monmouth, New Jersey
U. S. Naval Avionics Facility, Indianapolis, Indiana
U. S. Naval Ordnance Laboratory, White Oak, Maryland

Industrial Sample

Aeronutronic Systems, Incorporated, Glendale, California
American Telephone and Telegraph Company, New York 7, New York
Armour Research Foundation, Chicago, Illinois
Battelle Memorial Institute, Columbus 1, Ohio
Bell Aircraft Corporation, North Tonawanda, New York
Bell Telephone Laboratories, Murray Hill, New Jersey
Chrysler Corporation, Chrysler Engineering, Computing Laboratory
Chrysler Corporation, Missile Operations, Detroit 31, Michigan
Chrysler Corporation, Plymouth Division, Detroit, Michigan
Chrysler Corporation, West Coast Division, Los Angeles 54, California
Clark Brothers, Incorporated, Olean, New York
Continental Oil Company, Ponca City, Oklahoma
Cook Research Laboratories, Skokie, Illinois
Cornell Aeronautical Laboratory, Incorporated, Buffalo 21, New York
Dow Chemical Company, Midland, Michigan
El Paso Natural Gas Company, El Paso, Texas
Equitable Life Insurance Company, New York, New York
General Dynamics Convair Division, San Diego, California
General Electric Atomic Research Laboratory, San Jose, California
Harrison Radiator Company, Lockport, New York
Indiana University, Bloomington, Indiana
Lockheed Aircraft Corporation, Sunnyvale, California
Minneapolis-Honeywell Aeronautical Division, Minneapolis, Minnesota
New York Central Railroad, Buffalo, New York
Ohio State University Research Center, Columbus 10, Ohio
Olin Mathieson Chemical Company, Niagara Falls, New York
Allstate Insurance Company, Skokie, Illinois
The Atlantic Refining Company, Philadelphia, Pa. ✔
The Atlantic Refining Company, Dallas Texas ✔
Chesapeake and Potomac Telephone Company, Baltimore 12, Maryland
Iowa State College, Ames, Iowa
New York University, College of Engineering, New York 53, New York
Northwestern University, Aerial Measurements Laboratory, Evanston, Illinois
Pittsburgh Steel Company, Pittsburgh, Pennsylvania
Prudential Insurance Company of America, Newark, New Jersey
Republic Aviation Corporation, Farmingdale, New York
Stanford University Computation Center, Stanford, California
State College of Washington, Pullman, Washington
University of California Radiation Laboratory, Livermore, California
University of Houston Computing Center, Houston 4, Texas
University of Rochester Computing Center, Rochester 20, New York
Washington University, Saint Louis, Missouri
Westinghouse Atomic Power Division, Pittsburgh 30, Pennsylvania
And many others.

## ADDITIONAL FEATURES AND REMARKS

Manufacturer

A program is available which will automatically optimum program any existing program. Magnetic tape is compatible with 701, 702, 704, and 705. Index Registers: 3 four-digit plus sign registers are available. Each register is uniquely addressable from the logical element. Floating point hardware is available. The system is based on 8 significant digits of data and a 2 digit exponent.

Government Sample

U. S. Naval Ordnance Laboratory

The NOL has developed two very efficient speed coding systems, one is a fixed decimal system and the other a floating decimal system. In addition, a system of automatic programming called ADES has been constructed and is now in process of final checkout.

Industrial Sample

Battelle Memorial Institute

Automatic program available for coding problems.

Bell Telephone Laboratories

A fairly elaborate interpretive system is used for ease of coding.

Chrysler Corporation, Plymouth Division

Greater system advantages due to increased speed and storage capacity.

Cornell Aeronautical Laboratory

Basic system is supplemented by addition of 3 four-position indexing accumulators, 60 words of magnetic core storage, automatic floating decimal unit and an on-line printer.

Indiana University

Most coding has been done in one of two ways - short programs requiring not very much storage and rapid programming have been constructed using Bell Labs system described in IBM Tech Newsletter No. 11. Longer programs have been constructed using IBM Symbolic Assembly Routines, SOAP and SIR.

Republic Aviation Corporation

Unusual reliability.

Stanford Computation Center

Standard 650 with alpha unit and additional selectors and 1/2-time emitter.

The following miscellaneous information arrived too late to be included in the above outline:

Army Ballistic Missile Agency

Model 2 to be delivered in May 1957.

United States Department of Agriculture, Commodity Stabilization Service

Applications

Preparation of precomputed invoices covering warehousing charges due to Grain elevators - approximately 4,000 invoices are prepared monthly.



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Preparation of settlement statements for warehousemen covering quantity and quality difference on grain delivered as opposed to ordered for delivery, also covers final settlement for warehousing charges - approximately 2,000 settlements are prepared per month.

Applications Planned

We are now making an office-wide survey preparatory to commencing feasibility studies to determine the practicability of placing a number of the other voluminous activities on this data processing equipment. Some of these activities are: Inventory accounting and management operations, transit tonnage operations, loan accounting, other type general accounting, etc.

Bonneville Power Administration, Portland 8, Oregon

Air conditioner is common with tabulating room. A duct system is installed to convey generated heat from the IBM 650 system to the outside.

Reliability and operating experience:

| | |
|---|---|
| Good time | 930 - 44 = 886 hours |
| Attempted to run time | 930 hours |
| Operating ratio (Good/Attempted to run) | 0.95 |

Figures based on period July 1956 to December 1956. Acceptance test 18 April 1956.

Very little down time for emergency outages. The above down time figure of 44 hours includes field installations and emergency repair, but does not include scheduled maintenance.

An alphabetic feature has been requested.

Allstate Insurance Company

One IBM 650 Tape and one IBM 650 RAMAC are on order.

Atlantic Refining Company, Philadelphia

Utilized for accounting purposes.

Atlantic Refining Company, Dallas

Utilized for payrolls, package stock accounting, crude oil accounting, gas accounting and research problems.

The Chesapeake and Potomac Telephone Company

System is rented for $4,175 per month.

System is utilized for:

Computations related to property and cost accounting (Labor and material cost distributions to accounts, overhead loadings, engineering cost distribution to accounts, material price calculations and perpetual inventory records) have been adapted to 650 operation recently.

Payroll computations (interpretation of time-of-day assignment codes, rating, calculation of State and Federal tax, accounting for allotments and tax withholdings) are expected to be adapted to 650 operation in February 1957.

The development of life tables in connection with depreciation studies, is being adapted for current work.

Accounting for plant projects (accumulations of charges and comparison with authorization for each class of plant with related administrative reports) is expected to be programmed and adopted later in 1957.

Further adaptations of clerical work and records will be considered later.

E.I. du Pont de Nemours and Company

Basic system used for payroll. RAMAC used for product inventory control.

General Electric Company

As a general comment, system reliability is very high.

New York University, College of Engineering

System accepted 10 January 1957.

Southwestern Computing Service

System is utilized for contract computing service.

State College of Washington, Computing Center

System is to be installed in July 1957, with built-in flouting-point and index accumulator.

Syracuse University, Computing Center

System is to be received 1 February 1957, including a 2,000 word drum storage unit, and alphabetic and special character devices. The system is to be rented under the IBM Educational Program, therefore the system will be used at least half time for teaching. The rest of the time will be devoted to scientific and data processing problems for members of the faculty and research students with a small amount of time being sold to local industry.

Government Sample

Army Ballistic Missile Agency, Computation Laboratory, Huntsville, Alabama

New York Naval Shipyard, Brooklyn 1, New York

United States Department of Agriculture, Commodity Stabilization Service

Industrial Sample

Southwestern Computing Service, Tulsa, Oklahoma

Syracuse University, Computing Center, Syracuse 10, New York

Wayne State University, Detroit, Michigan

Armour Research Foundation of Illinois Institute of Technology

Digital computation for the Foundation is performed with the IBM 650 (20,000 digit storage), supplemented with an extensive array of ancillary equipment. IBM 650 library of routines is continually being increased. Development and maintenance of this library frequently makes it possible to avoid delay and expense in programming and coding specific problems.



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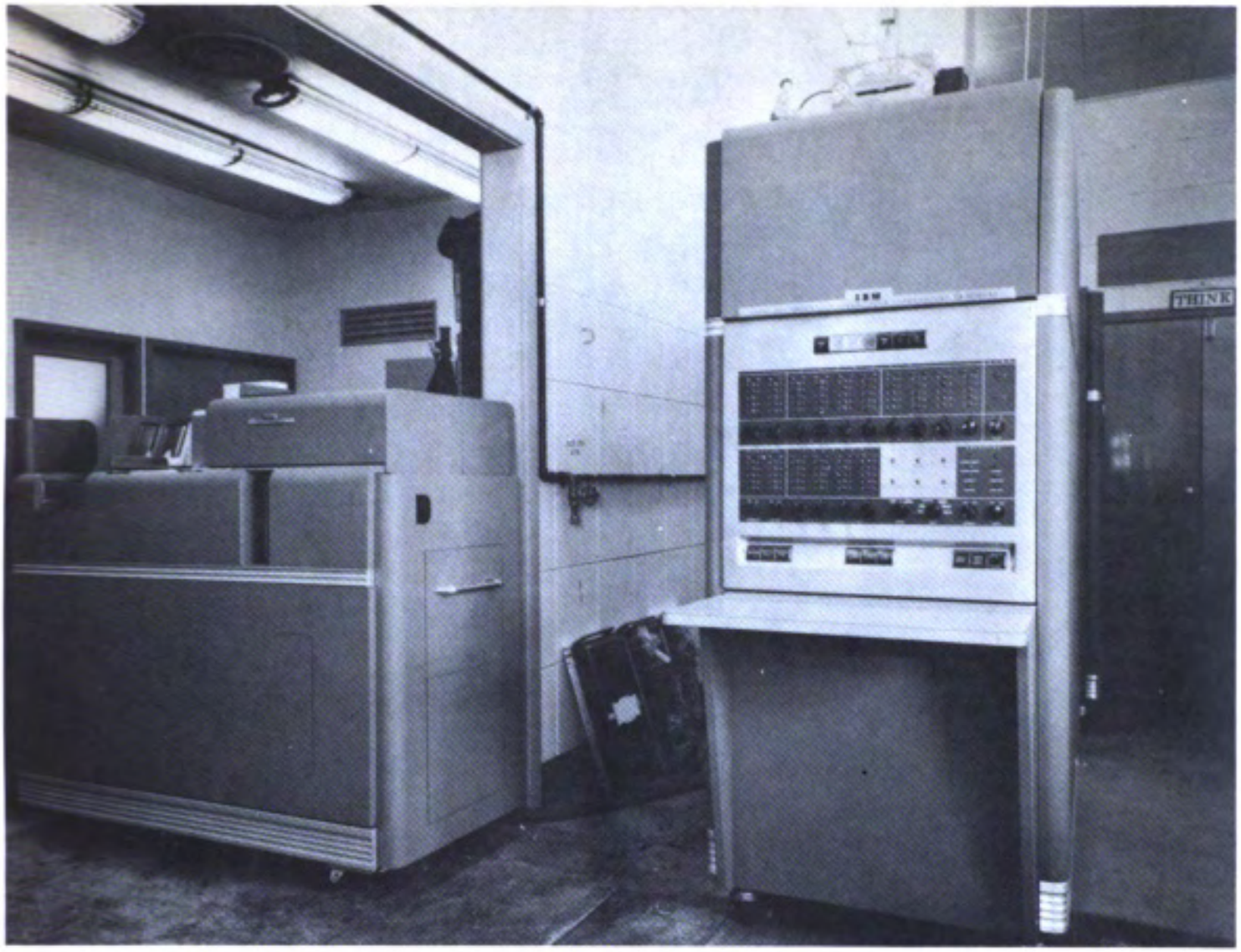


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