

# IBM 701

International Business Machines Type 701 Electronic  
Data Processing Machine

## MANUFACTURER

International Business Machines Corporation



Picture by International Business Machines Corporation

## APPLICATIONS

### Manufacturer

Commercial, scientific and engineering data processing.

### Government Sample

U. S. Naval Ordnance Test Station, China Lake  
Scientific data processing.

### Industrial Sample

Douglas Aircraft Company, Incorporated  
Aircraft engineering.

### United Aircraft Corporation

The United Aircraft Corporation provides a central computing facility located at the Research Department for the solution of engineering and research problems. It services the three UAC Divisions: Pratt and Whitney Aircraft, Sikorsky Aircraft, and Hamilton Standard which are engaged in the design and manufacture of aircraft engines, helicopters, propellers and other aircraft equipment.

Computing equipment includes: two IBM Type 704, one IBM Type 701, three IBM Card-Programmed Calculators, and three Burroughs Type E101 calculators. Additional features include a Universal Tape Selector on each IBM Type 704 calculator. This device was designed by UAC and permits electrical switching at the console of magnetic tape units to main frame or off-line input/output components.

## NUMERICAL SYSTEM

### Manufacturer

Internal number system	Binary
Binary digits per word	18 or 36 per data word
Binary digits per instruction	18
Instructions per word	2
Instructions decoded	32
Instructions used	32
Arithmetic system	Fixed point
Instruction type	One address
Number range	$-(2^{35}-1) \leq n \leq (2^{35}-1)$



Picture by University of California Radiation Laboratory

Timing            Synchronous  
 Operation        Sequential and partially concurrent

Government Sample

U. S. Naval Ordnance Test Station, China Lake  
 Each half or whole word is uniquely addressable.

### ARITHMETIC UNIT

	Microsec
Add time (exclud. stor. access)	60 or 36
Mult time (exclud. stor. access)	444
Div time (exclud. stor. access)	444
Construction	Vacuum tubes or magnetic cores
Basic pulse repetition rate	1 Mc/sec
Arithmetic mode	Parallel

Operation time of 60 microseconds is for CRT.  
 Operation time of 36 microseconds is for Magnetic Core.

Times given above include access to instruction.

### STORAGE

Media	Words	Microsec Access
Magnetic Core	4,096	12
Cathode Ray Tube	2,048 or 4,096	12
Magnetic Drum	8,192 or 16,384	50,000

Magnetic drum access time is average to first word

of group. All times given below are in microseconds. Computation time is available depending on programming technique. Subsequent word time is 1,280 per word of which 1,000 can be used for computation. Magnetic Tape - 300,000 binary words per tape. (Up to 4 magnetic tapes) Type 726. (2 magnetic tapes per frame. Pulse packing 100 groups per inch.) The time to accelerate magnetic tape to write status (75 inches per sec.) is 10,000 of which 6,000 is available for further computations. Time to write subsequent words is 792 each, of which 700 is available for further computation. Time to read subsequent words is 792 of which 540 is available for computation. Magnetic tape (1 magnetic tape per frame). Pulse packing 200 groups per inch. -- 900,000 binary words per tape. 540,000 binary coded decimal and alpha-numeric words per tape. Up to 10 tapes.

Time to accelerate magnetic tape to write status (75 inches/sec.) from standstill is 10,000 of which 7,000 are available for further computation. Time to write subsequent words is 400 each of which 336 is available for further computation. Time to accelerate magnetic tape to read status (75 inches/sec.) from standstill is 10,000 of which 3,000 are available for further computation. Time to read subsequent words is 400 each of which 288 are available for computation. Magnetic tape unit can rewind 2,400 feet of tape in 1.2 minutes.



Picture by General Motors Corporation

Either magnetic core or cathode ray tube storage is used. Time is in microsec.

**Government Sample**

U. S. Naval Ordnance Test Station, China Lake System has 4,096 words of magnetic core storage, 8,192 words of magnetic drum and 900,000 words on each tape unit. Access times are 12, 50,000 (random) and 10,000 (from standstill) microseconds, respectively. Ten type 727 tape units are utilized.

**INPUT**

Media	Speed
Punched Card Reader	150 cards/min
Magnetic Tape Type 726	12,500 dec dig/sec
Magnetic Tape Type 727	15,000 char/sec or 25,000 dec dig/sec
Cards to Magnetic Tape	250 cards/min

The punched card reader operates such that 177 millisecc are available between cards for computation. The Type 727 Magnetic Tape Unit operates at the above rates for alphanumeric characters and decimal digits respectively. For the card to magnetic tape converter the cards must be in decimal alphanumeric code. The magnetic tape is written in binary coded decimal alphanumeric code and simultaneously checked.

**Government Sample**

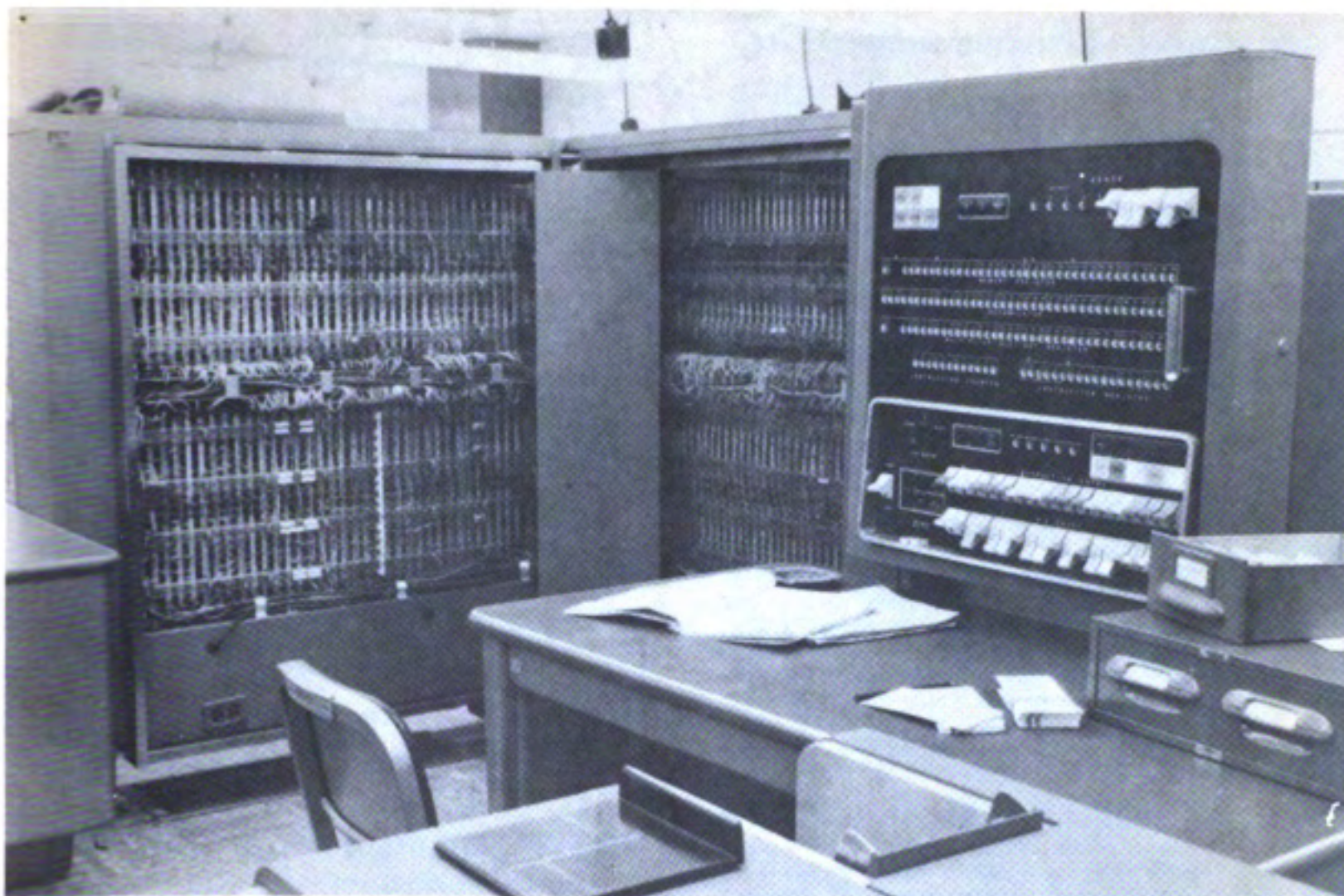
**Government Sample**

U. S. Naval Ordnance Test Station, China Lake Card reader, magnetic tape and card to tape converter are utilized. Information on tape written in binary coded decimal system of notation. The card to tape unit is peripheral equipment.

**OUTPUT**

Media	Speed
Punched Card	100 cards/min
Line Printer	150 lines/min
Cathode Ray Tube Display	8,300 data points/sec
Magnetic Tape Type 726	12,500 equiv dec dig/sec
Magnetic Tape Type 727	
Magnetic Tape to Card	100 cards/min
Magnetic Tape to Line Printer	150 lines/min

The punched card recorder may operate on binary or decimal cards. Binary cards contain 24 words. 342,000 microseconds are available for computing while punching one card. The printer is of the wheel type. It is connected to the computer through the analytical and logical unit. 322,000 microseconds are available for computation between successive lines. The CRT Display Unit consists of two display tubes: a 7-inch tube for photographic purposes and a 21-inch tube for visual displays. Magnetic Tape to Card Unit operates with Type 727



Picture by Lockheed Aircraft Corporation

Tape Unit only. Alphanumeric punched characters are automatically internally checked by unit. Magnetic Tape to Line Printer Unit operates with the Type 727 Tape Unit only. The printer is of the wheel type, 150 lines/min, 120 alphanumeric char/line. 1,000 lines/min operation is possible, with 60 char/line (wire matrix printer).

**Government Sample**

U. S. Naval Ordnance Test Station, China Lake System utilizes the following equipment:

Medium	Speed
Card Punch	100 cards/min at 72 columns/card
Printer	150 lines/min at 72 char/line
Magnetic Tape	2,500 words/sec
Tape to Printer	150 lines/min at 120 char/line
Tape to Cards	100 cards/min at 80 columns/card

The two peripheral converters accept binary coded decimal information on magnetic tape.

**CIRCUIT ELEMENTS ENTIRE SYSTEM**

Tubes	4,000
Tube types	35
Crystal diodes	12,800

**Government Sample**

U. S. Naval Ordnance Test Station, China Lake In addition to above system also consists 147,456 magnetic cores and 26 separate cabinets.

**CHECKING FEATURES**

Magnetic Tape (Type 726) - vertical parity bit check for each tape column.

Magnetic Tape (Type 727) - Horizontal and vertical parity bit check for each tape row and column.

Line Printer - Echo checking for each printed character.

Card to Magnetic Tape - checks magnetic tape as Type 726. Checks card.

Tape to Printer (Type 727 magnetic tape only) - horizontal and vertical parity bit check for each tape row and column. Echo checking for each printed character.

Tape to card - horizontal and vertical parity bit check for each tape row and column.

Arithmetic and Logical Unit - overflow in accumulator. Two extra positions are on left side of accumulator so that overflow is not lost. Divide check. Dividend Divisor

**Government Sample**

U. S. Naval Ordnance Test Station, China Lake Above checks are utilized. Echo checking must be wired in on Line Printer board. Instructions used to test condition of tape check light and overflow indicator.

## POWER, SPACE AND WEIGHT

	Weight (lbs)	KVA
Main Frame	2,850	34.4
Punched Card Recorder	720	0.7
Line Printer (Wheel Type)	2,795	3.1
Magnetic Drum	1,480	9.9
Cathode Ray Tube Frame	2,445	11.8
Power Frame No. 1	2,810	5.8
Power Frame No. 2	2,750	5.8
Power Distribution Unit	1,230	1.2
Magnetic Tape Unit (726)	1,270	4.6
Magnetic Tape Control Unit	1,636	6.0
Punched Card Reader	530	0.7

### Space Occupied:

Machine including two 726 frames - 3,000 sq. ft.  
Customer engineering requirements - 400 sq. ft.  
Air conditioning - 40 tons

### Government Sample

U. S. Naval Ordnance Test Station, China Lake  
System requires 80 KW, 136 KVA, 1,404 cu. ft., 1,400 sq. ft. The system area is 44 by 27 ft. and weighs 40,050 lbs., including peripheral equipment. The above power, space and weight does not include supporting machines such as key punches, reproducers, and sorters. This equipment would add 8 KVA and 8,000 lbs.

### Industrial Sample

Douglas Aircraft Company, Incorporated  
Total Engineering Building is air conditioned.

## PRODUCTION RECORD

Produced	19
Operating	16
Delivery time	Special

## COST, PRICE AND RENTAL RATE

Rental rates are subject to change.

System I.	Monthly Charges
Electronic Analytical Control Unit	\$8,100
Electrostatic Storage Unit (2,048 words)	2,600
Punched Card Reader	200
Alphabetic Printer (wheel type)	800
Punched Card Recorder	200
2 Type 726 Magnetic Tape Readers & Recorders (2 magnetic tapes per frame) for a total of 4 magnetic tapes)	1,700
Magnetic Drum Reader and Recorder	1,400
Tape Control Unit	2,500

System II.	Monthly Charges
Electronic Analytical Control Unit	\$8,100
Electrostatic Storage Unit (2,048) words	2,600
Punched Card Reader	200
Alphabetic Printer (wheel type)	800
Punched Card Recorder	200
4 Type 727 Magnetic Tapes (one magnetic tape per frame)	2,200
Magnetic Drum Reader and Recorder	1,400
Tape Control Unit	2,500

This system is compatible through common language tape units with the 650, 702, 704, 705 and the additional equipment listed below.

Either of the above systems may replace the 2,048 words of cathode ray tube storage with 4,096 words of magnetic core storage.

Tape to Card Punch and Card Punch Control Unit (punches 100 cards/minute)	\$1,050
Magnetic Tape to Line Printer (wheel type) and Printer Control Unit	1,800

Magnetic Tape to Card Reader and Card Reader Control Unit (reads 250 cards/minute)	\$2,400
Cathode Ray Tube Output Recorder	2,850

### Government Sample

U. S. Naval Ordnance Test Station, China Lake  
Rental rate for basic system is \$21,500/month.  
Rental rate for additional equipment \$8,550/month.

## PERSONNEL REQUIREMENTS

### Manufacturer

Maintained by IBM.

### Government Sample

U. S. Naval Ordnance Test Station, China Lake  
For three 8-hour shifts 6 engineers and 19 technician-operators are utilized. Approximately 9 mathematics aides, 10 mathematicians and 20 to 25 persons from outside the branch, program and run their own problems.

### Industrial Sample

Douglas Aircraft Company  
For three 8-hour shifts, 6 engineers, 4 technician-operators, and 33 programmers are utilized.

### United Aircraft Company

Two IBM Type 704 and one IBM Type 701 Computers are operated on a 24 hour, six-day week. Three CPC's and three Burroughs E101's are operated on an 8 hour, five-day week.

The Laboratory is staffed by 51 analysts, 11 operators, and 24 aides. Non-computing personnel operate CPC's and E101's. Non-computing personnel also program for all calculators.

## RELIABILITY AND OPERATING EXPERIENCE

### Government Sample

Atomic Energy Commission, University of California Radiation Laboratory

System accepted 26 April 1954; the average error-free running period is 6.2 hours; good time is 3,032 hours and the attempted to run time is 3,587 hours, resulting in an operating ratio of 0.85; the average error free running time is calculated by dividing the total hours less the total Scheduled Maintenance less Total unscheduled Maintenance less the Loss Time Claimed by Operator all by the Total number of Hours of Down and Lost Time reported. The above figures are given for the period January 1955 to June 1955 when operating 24 hours/day.

U. S. Naval Ordnance Test Station, China Lake  
A core storage was installed recently.

### Industrial Sample

Douglas Aircraft Company	
Average error-free running period	4 hours plus
Good time	4,068.1
Attempted to run time	4,351.8
Operating ratio (Good/Attempted to run)	0.934
Figures based on period	1 January 1956 to 30 September 1956

Power on 5,104.6 hours from 1 January 1956 to 30 September 1956

Preventive maintenance	13.6%
Non-scheduled maintenance	6.7%
Douglas machine time	79.9%

### General Motors Corporation

System accepted in April 1954; average error free running period is 4.5 hours derived from the records for 1 month; good time of 1,067 hours and attempted to run time of 1,154 hours yielding an operating ratio of 0.92 for a four month period.

Lockheed Aircraft Corporation  
 Systems accepted on 14 May 1953 and 15 July 1954;  
 average error free running periods of 3-4 hours on  
 one and 1-1/2 hours on the other; good time of 74.4%  
 and 80% where good time is considered as actual  
 production and the remaining 25.6% and 20% respect-  
 ively, consists of preventive maintenance, breakdown,  
 machine re-work and idle time. The average error-  
 free running period is reduced considerably when  
 tapes are used frequently. Short runs are made  
 wherever possible (1-5 hours), but the same program  
 is run for as long as 12 hours and would run longer  
 if time permitted.

United Aircraft Corporation, Research Department  
 Average error-free running period 2 hours  
 Good time 2,667 hours  
 Attempted to run time 3,473 hours  
 Operating ratio (Good/Attempted to run) 0.77  
 Figures based on period 1 February 1956 to 30 Septem-  
 ber 1956  
 Acceptance test 5 October 1953

Attempted to run time includes calculation, check-  
 out, machine error, unscheduled maintenance, and  
 scheduled maintenance time. The scheduled mainten-  
 ance for the above period was 367.96 hours and the  
 unscheduled maintenance was 290.75 these two figures  
 should be subtracted from the above "Attempted to  
 Run" figure.

### FUTURE PLANS

#### Government Sample

U. S. Naval Ordnance Test Station, China Lake  
 A modification has been made to the system to allow  
 asynchronous digital data to fill the entire storage  
 unit at one time. Such data are fed from magnetic  
 tape containing the digitized version of analog  
 information originating at the test equipment. The  
 analog to digital conversion is done as a separate  
 step, prior to entering the data into the computer.

#### Industrial Sample

Douglas Aircraft Company, Incorporated  
 System to be replaced by an IBM Type 704 system in  
 May 1957.

### INSTALLATIONS

#### Government Sample

U. S. Naval Ordnance Test Station  
 China Lake, California

United States Weather Bureau  
 Washington, D. C.

#### Industrial Sample

Boeing Aircraft  
 Wichita, Kansas

Douglas Aircraft Company, Incorporated  
 El Segundo, California

General Motors Corporation  
 Detroit, Michigan

Glenn L. Martin Company  
 Baltimore 3, Maryland

Lockheed Aircraft Corporation  
 Burbank, California

United Aircraft Corporation  
 East Hartford 6, Connecticut

University of California  
 Radiation Laboratory  
 Berkeley 4, California

### ADDITIONAL FEATURES AND REMARKS

#### Manufacturer

The following pertains to the first picture (at the  
 beginning of this system description)

In the center of the installation shown here, is the  
 Electronic Analytical Control Unit, and at its right  
 is a Card Reader. Behind the control unit is the  
 Power Distribution Unit. On the left are the  
 Magnetic Drum Storage Unit and the Electrostatic  
 Storage Unit. In the group at the right are two  
 Magnetic Tape Readers and Recorders, the Alphabetical  
 and Numerical Printer and the Card Punch. Two  
 Power Supply Units are not visible.  
 Overlooking the installation is a glass-enclosed  
 conference room.

#### Government Sample

U. S. Naval Ordnance Test Station, China Lake  
 Subroutines are available for most applications.  
 There are several general purpose programs. System  
 uses the PACT-I Compiler.

#### Industrial Sample

##### General Motors Corporation

Two interpretive systems are used, Speed Co and  
 ACOM. Speed Co 3-address while ACOM is 2-address.  
 Both provide for floating point arithmetic, trans-  
 cendental functions, In-Out operations, B-boxes, and  
 tracing all of which aid in coding and checkout.

##### Lockheed Aircraft Corporation

A general purpose system called FLOP, a contraction  
 of Floating Octal Point, was developed at Lockheed  
 by members of the Digital Computing Staff.

Flop converts the 701 into an entirely different  
 machine, one which performs all its operations in  
 a "floating octal system, but also permits all the  
 normal 701 operations to be executed in fixed  
 binary. The floating octal operations performed by  
 the system are add, subtract, multiply, divide (all  
 with real or complex numbers),  $\log_8 x$ ,  $8^x$ ,  $\sin x$ ,  
 $\sin^{-1}x$ , and square root. The system also provides  
 certain logical operations and control of the input-  
 output devices in three number systems: binary,  
 octal, and floating decimal.

This system was developed in order to obtain a  
 minimum of elapsed time from when a new problem  
 first enters the department to when answers are  
 obtainable.





Picture by the Bank of America

Industrial Sample  
 Bank of America  
 System may be used with a number range of  
 $10^{-511} < n < 10^{511}$  without multiple precision.  
 General Electric Company, Hanford Atomic Products  
 Operation  
 Variable word length; floating point programs are  
 10 and 2 decimal.

### ARITHMETIC UNIT

The time required to add is 23 microseconds, excluding the storage access time. The time required to multiply is given by

$$23 [N_p (N_c + 4) + 1] + 115 \text{ microseconds.}$$

The time required to divide is given by

$$23 [10 + N_d + (N_d - N_r) (7.5K + 15)] + 115 \text{ microseconds.}$$

where

$N_p$  = number of multiplier digits

$N_c$  = number of multiplicand digits

$N_d$  = number of dividend digits

$N_r$  = number of divisor digits

$K = N_r$  if  $N_r > 8$  and  $K = N_r + 0.005 (8 - N_r)$  if

$$N_r < 8$$

The arithmetic unit is constructed of vacuum tubes, crystal diodes and magnetic cores and operates serially by binary coded decimal character and parallel by bit.

### STORAGE

Media	Alphanumeric Characters	Microsec Access
Electrostatic or Magnetic Core	10,000	23 or 17
Magnetic Drum	60,000	8,120+40N
Magnetic Tape	5,760,000	10,140+67N

Magnetic drum has 300 sections of 200 characters each.  $N$  = number of characters.

Government Sample

U. S. Navy Aviation Supply Office

System has magnetic core storage unit in lieu of electrostatic.

Industrial Sample

Bank of America

System has magnetic core in lieu of electrostatic storage unit and does not have magnetic drum storage.

Chrysler Corporation Service Parts Warehouse

System has magnetic core and magnetic drum.

General Electric Company, Hanford Atomic Products  
 Operation

System has magnetic core, magnetic drum, and magne-





Picture by the Commonwealth Edison Company of Chicago

tic tape storage.

1,000 lines/min, 120 print pos.

### INPUT

Media	Speed
Magnetic Tape	75 inches/sec
Punched Card	250 cards/min

Government Sample

U. S. Navy Aviation Supply Office

Magnetic tape unit operates at 200 char/inch and 75 inches/sec. Card reader operates at 250 cards/min at 80 char/card.

Industrial Sample

General Electric Company, Hanford Atomic Products Operation

Card reader at 250 cards/min with off-line card to tape conversion. Magnetic tape speed is  $(10,000 + 67N)$  microseconds, where N is the number of characters.

### OUTPUT

Media	Speed
Magnetic Tape	15,000 char/sec, 75 in/sec
Punched Card	100 cards/min
Typewriter	600 char/min
Printer	500 lines/min, 120 print pos. 150 lines/min, 120 print pos. 1,000 lines/min, 60 print pos.

Government Sample

U. S. Navy Aviation Supply Office

System has all above output systems.

Industrial Sample

Bank of America

System has all above output systems.

General Electric Company, Hanford Atomic Products Operation

Magnetic tape to card and tape to printer conversion done on "off-line" basis.

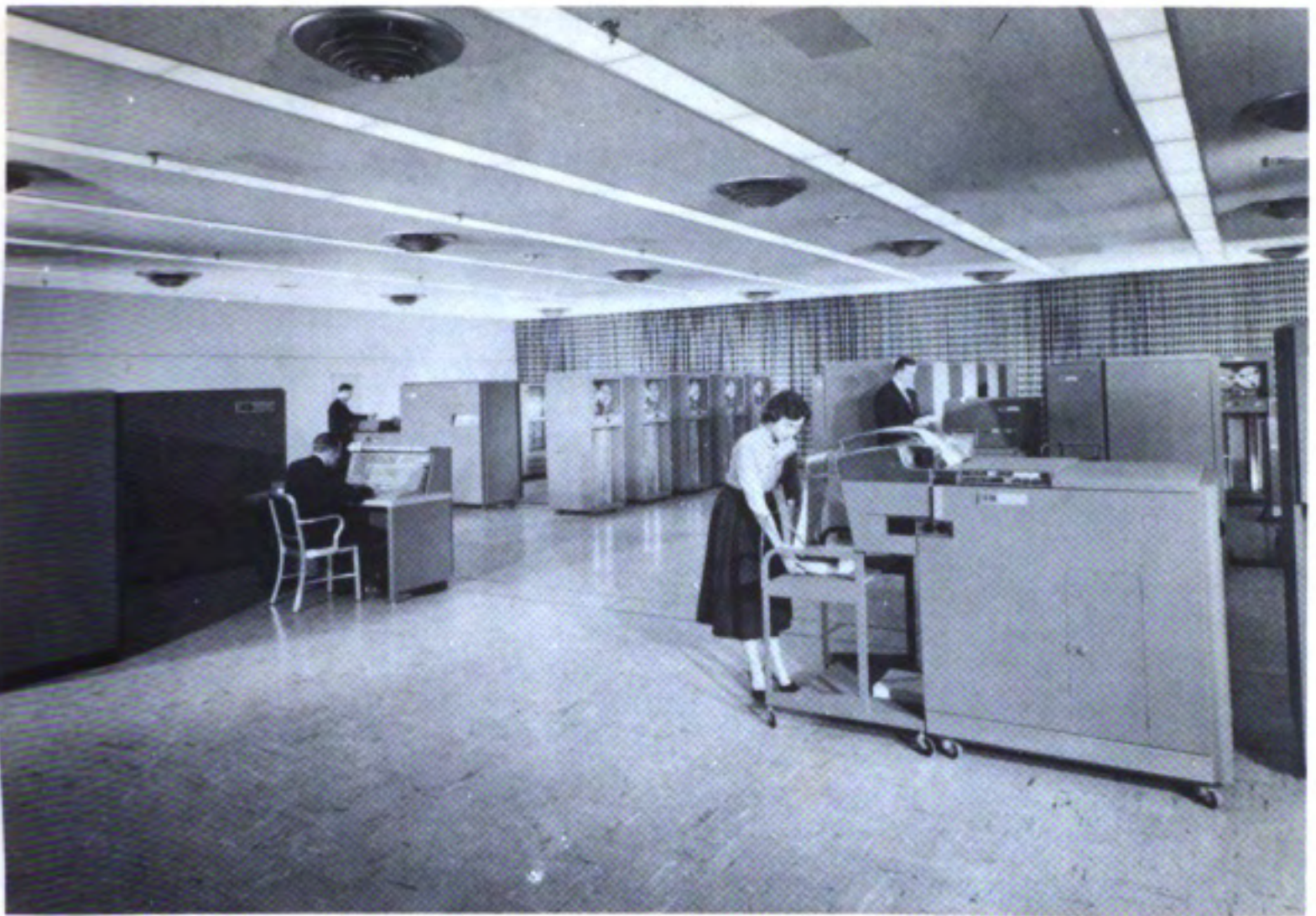
### CIRCUIT ELEMENTS ENTIRE SYSTEM

Tubes	10,000
Tube types	10
Crystal diodes	17,000

Industrial Sample

Bank of America

In addition to the above, the system has 165,000 magnetic cores. It utilizes tube types 6211, 5965 and 5687.



Picture by the International Business Machines Corporation

## CHECKING FEATURES

### Instruction

During the execution of an instruction, a character code error, an invalid operation part transfer, or an operation part interpretation, may be detected and indicated.

### Machine

The machine check indicator is turned on when a character code error is detected during the execution of all instructions (except write, write and erase, read, and read check) in which information is read from accumulator storage or memory. Read-Write -- checks the transmission of data from all input units to memory. It also checks the transmission of all output data from memory to the drum, tape unit, card punch record storage, printer record storage, and typewriter.

### Printer-Punch

This indicator reflects any error when information is punched in a card or when printed on the printer.

### Overflow

The overflow check indicator is turned on during an add or subtract operation when the number of digits in the result is greater than the number of digits in the longer of the original fields. An overflow is indicated as a result of a round off operation if a carryover is made out of the highest order position of the original accumulator storage field.

### Sign

The indicator turns on when a field addressed by an arithmetic instruction does not have plus or minus zoning over the right hand digit.

### Industrial Sample

#### Bank of America

The following checks are used:

Odd-even redundancy

Read-write operations

Longitudinal redundancy on magnetic tape processing.

General Electric Company, Hanford Atomic Products Operation

Parity check using 7 bit code with only six bits of real data is used for all internal operations and all input-output. All corrective action can be programmed or machine can be set to stop on error at the programmer's discretion.

Normally operated with internal error detection set to stop, but with input-output error correction programmed.



Picture by the General Electric Company

### POWER, SPACE AND WEIGHT

Type	Name	Qty.	Power K.W.	Current Amps.	Heat B.T.U.	Weight lbs.	Size Width	Length Height (Nearest Inch)	
702	Central Processing Unit	1	25.0	87	85,000	5,291	147	139	63
	Main Power Unit	1				2,961	34	61	66
	Console	1				508	35	61	46
712	Card Reader	1	5.0	17	17,000	1,053	43	28	49
756	Card Reader Control Unit	1				1,712	27	57	64
717	Printer	1	9.0	31	30,700	2,244	30	64	47
757	Printer Control Unit	1				1,866	27	57	64
722	Card Punch	1	7.6	26	26,000	1,176	25	53	50
758	Card Punch Control Unit	1				1,866	27	57	64
732	Drum Unit	1	6.9	24	23,600	1,775	27	62	64
	Drum Power Supply	1				1,646	27	40	64
727	Tape Unit	10	13.0	45	44,200	9,110	26	24	66
752	Tape Control Unit	1	8.4	29	28,700	1,636	27	57	64
	<b>Total</b>		<u>74.9</u>	<u>259</u>	<u>255,200</u>	<u>32,844</u>			

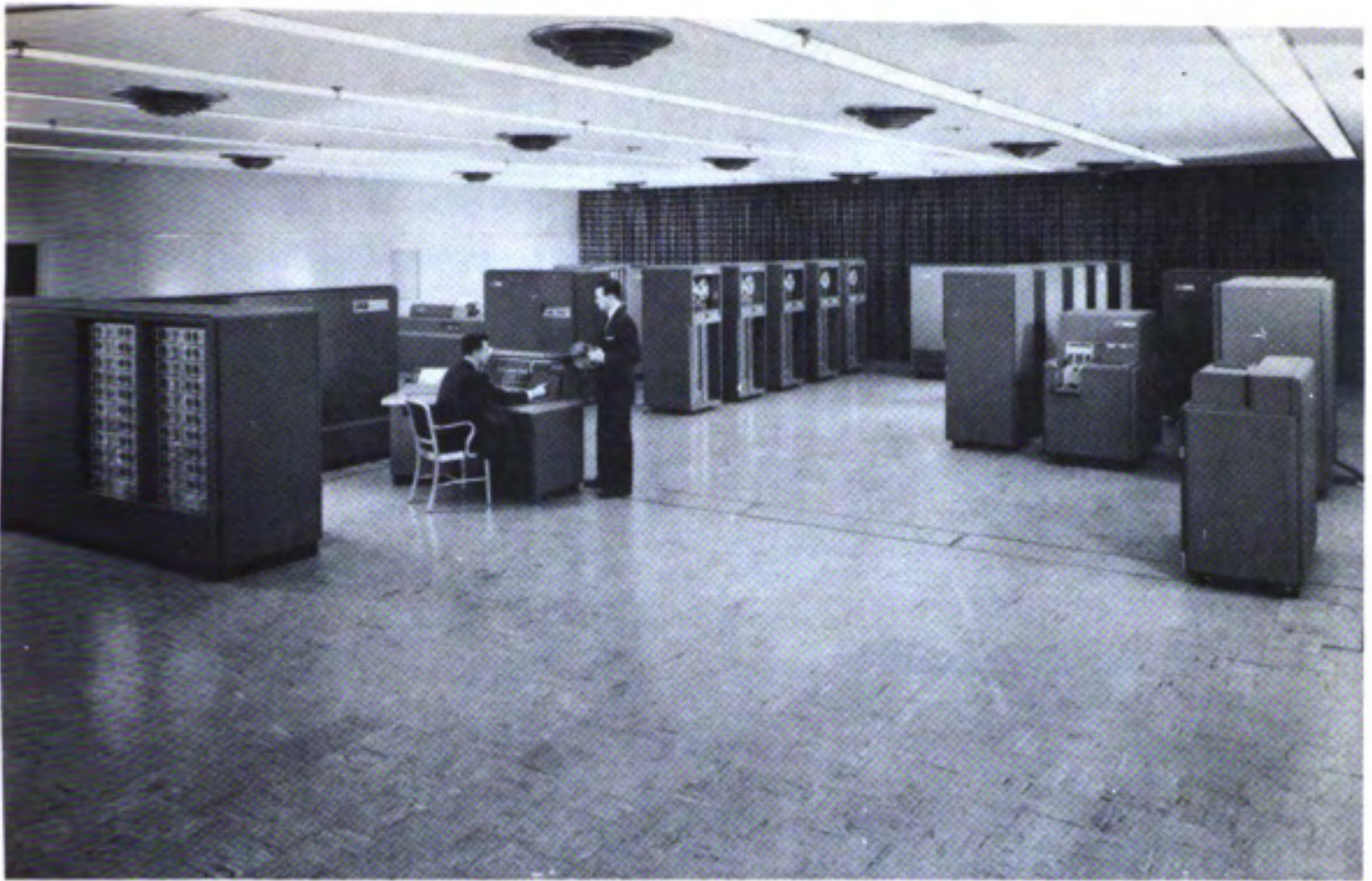
Approximately one Ton of air conditioning required for 12,000 B.T.U.

#### Government Sample

U. S. Navy Aviation Supply Office  
System requires 75 KW, occupies 19,494 cu. ft., 2,052 sq. ft., measuring 57 ft. by 36 ft. by 9-1/2 ft. The system weighs 33,000 lbs. The air conditioning consists of a 40-Ton unit and a 15-Ton unit, occupying 3,168 cu. ft. of space and 288 sq. ft. of area, measuring 12 ft. by 24 ft. by 11 ft.

#### Industrial Sample

Bank of America  
System requires 93 KW, 16,000 cu. ft., 2,500 sq. ft., measuring 55 ft. by 45 ft. by 8 ft. Air conditioner requires 68 KW, 2,552 cu. ft., 319 sq. ft., measures 29 ft. by 11 ft. by 8 ft., and has a capacity of 60 Tons. The air conditioning equipment designed to accommodate requirements for comfort conditioning of



Picture by the International Business Machines Corporation

engineering, mail handling, tabulating, and office personnel and space.

General Electric Company, Hanford Atomic Products Operation

Power service to system is 300 amps., 208 volts, 3 phase for computer and 105 amps., 440 volts, 3 phase for air conditioner. The machine room is 40 ft. by 60 ft. and the air conditioner requires an area of 20 by 20 ft. The air conditioner capacity is 52 Tons. Power consumption has been stated in terms of service supplied rather than actual machine consumption. The space required is a function of the amount of engineering and observation space and other miscellaneous working areas which are considered necessary or desirable to have in addition to the actual cubic footage of the equipment.

### PRODUCTION RECORD

Produced	14
Operating	14

### COST, PRICE AND RENTAL RATE

Rental Rates of System Components		Monthly Charge
Type		
702	Central Processing Unit	\$8,650
712-756	Card Reader and Card Reader Control Unit	1,050
717-757	Printer and Printer Control Unit	1,800

722-758	Card Punch and Card Punch Control Unit	1,050
727	Magnetic Tape Unit	550
752	Tape Control Unit	550
732	Magnetic Drum Storage Unit	2,800
719	Printer, 1,000 lines per minute 60 printing positions	1,400
730	Printer, 1,000 lines per minute 120 printing positions	2,100
760	Storage Unit for Printers and Tapes	1,850

There is no predetermined grouping of equipment. Any combination of above is available depending on customers needs. Rates subject to change.

Government Sample

U. S. Navy Aviation Supply Office

Prime shift monthly rental rate for system is \$30,200.

Industrial Sample

Bank of America

Rental rate is \$9,900 for basic system and \$15,475 per month for additional equipment.

Commonwealth Edison Company of Chicago

Serial No.	Description	Quantity	Unit Rate	Monthly Rental (Primary Shift)
702	Central Processing Unit	1	\$9,900	\$9,900
712	Card Reader	2	770	1,540

756	Card Reader	2	300	600
	Control Unit			
717	Printer	2	1,200	2,400
757	Printer Control Unit	2	600	1,200
722	Card Punch	2	750	1,500
758	Card Punch Control Unit	2	325	650
727	Magnetic Tape Units	17	550	9,350
752	Tape Control Unit	1	550	550
776	Record Storage Unit	2	1,850	3,700
732	Magnetic Drum	1	2,800	2,800
Total				\$34,190

2nd and 3rd Shift Rental charged at 50% of above rates.

General Electric Company, Hanford Atomic Products Operation

Rental rate is \$34,900/month for system, including average extra shift rental. Rental rate for punched card machines, including extra shift but excluding key punches and verifiers is \$2,175 per month.

### PERSONNEL REQUIREMENTS

Daily Operation	Engineers
One 8-Hour Shift	4
Two 8-Hour Shifts	7
Three 8-Hour Shifts	10

One console operator and 2 floor operators per shift are required. Programmers vary from 4 to over 30, depending on number of applications on system.

Government Sample

U. S. Navy Aviation Supply Office

Daily Operation	Engineers	Operators
One 8-Hour Shift	3	9
Two 8-Hour Shifts	6	12
Three 8-Hour Shifts	9	15

The operators are divided as follows: For first shift, 3 are on main frame, 3 auxiliary and 3 supervisory. For second shift, 3 main frame operators are required and for the third shift three operators are required for the main frame.

Industrial Sample

Bank of America

Daily Operation	Engineers	Tech or Operators
One 8-Hour Shift	3	2
Two 8-Hour Shifts	5	5
Three 8-Hour Shifts	6	

Commonwealth Edison Company of Chicago  
Three 8-Hour shifts require 9 engineers and 18 technician-operators.

General Electric Company, Hanford Atomic Products Operation

Three 8-Hour shifts require 5 engineers and 8 technician-operators. The engineers are employed by IBM. Personnel covers operation on a 7-day-a-week basis.

### RELIABILITY AND OPERATING EXPERIENCE

Government Sample

U. S. Navy Aviation Supply Office

Approximate reliability is 0.85, where reliability is obtained by subtracting the sum of Machine Error Time, the Unscheduled Maintenance Time and the Tape Trouble Time, from the Available Time and dividing

the difference by the Available Time. The above figure is based on the period from July to September 1956.

Industrial Sample

Bank of America

Average error-free running period 2 hours  
Good time 12.56 hours/day  
Attempted to run time 14.13 hours/day  
Operating ratio (Good/Attempted to run) 0.89  
Figures based on period 1 July 1956 to 30 September 1956.

Acceptance test 20 August 1955.

Of the 0.11 lost in the operating ratio above, approximately 0.037 was due to main frame down time, 0.037 was due to tape unit down time, 0.030 to corrective restart time and 0.006 was due to tape remake time.

Chrysler Corporation Service Parts Warehouse

Productive time, maximum 0.94  
Productive time, minimum 0.78  
Based on period 5 April 1956 to 27 September 1956.  
System accepted 22 August 1955.

Commonwealth Edison Company of Chicago

Average error-free running period 4-6 hours estimate  
Good time 18 hours  
Attempted to run time 20 hours  
Operating ratio (Good/Attempted to run) 0.90  
Figures based on period 1 October 1956 to 31 December 1956.

Acceptance test July 1955

General Electric Company, Hanford Atomic Products Operation

Average error-free running period 68 hours  
Good time 1,275 hours  
Attempted to run time 1,301 hours  
Operating ratio (Good/Attempted to run) 0.98  
Figures based on period 1 August 1956 to 14 October 1956.  
Acceptance test 1 July 1955

Core storage unit installed July 1956. Preventive maintenance is scheduled 4 hours/day for 4 days per week. Over the weekend 68 hours elapse between scheduled maintenance sessions.

The Prudential Insurance Company of America

It is expected that conversion from electrostatic storage to core storage will further reduce unscheduled maintenance from an overall average of 5.8% experienced between 14 November 1955 and 31 August 1956. Two-Shift operation occurred during that period.

### FUTURE PLANS

Industrial Sample

Commonwealth Edison Company of Chicago  
System will be replaced by an IBM Type 705 Electronic Data Processing Machine in March 1957.

### INSTALLATIONS

Government Sample

U. S. Navy Aviation Supply Office

Philadelphia 11, Pennsylvania

Industrial Sample

Bank of America

500 Howard Street

San Francisco, California

Chrysler Corporation

Detroit 31, Michigan

Commonwealth Edison Company

72 West Adams Street

Chicago 90, Illinois

**Ford Motor Company**  
Dearborn, Michigan

**General Electric Company**  
Hanford Atomic Products Operation  
Richland, Washington

**Monsanto Chemical Company**  
St. Louis, Missouri

**Prudential Life Insurance Company of America**  
Newark, New Jersey

System is being replaced by the Type 705.  
Autocoder system is used.  
Component units, which have various functions, are housed in a half-dozen or more separate cabinets, the number of each type depending upon the user's needs. The use of these separable units allows freedom in the design of the data processing system. Essential components include the arithmetical and logical unit, the operator's control console, magnetic tape units, an input card reader, and an output printer and card punch. Often a magnetic drum will also be included in an installation, or several drums might be used.

### **ADDITIONAL FEATURES AND REMARKS**

#### **Manufacturer**

Inter-tape-card-printer conversion.  
Rental rates include servicing, educational assistance through a 702 school, special representatives and programming service.