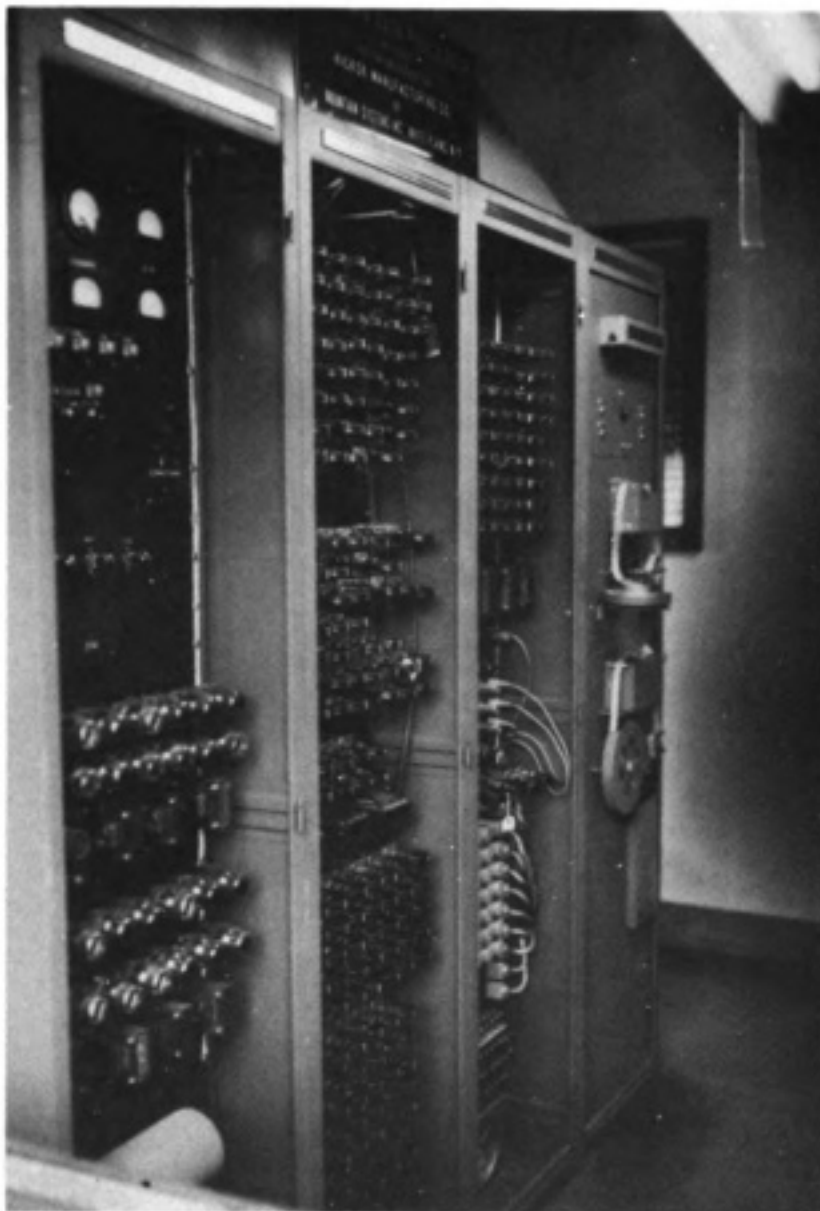# MODAC 5014

Mountain Systems, Incorporated
(MSI) Data Processor Model 5014

MANUFACTURER

Airborne Instruments Laboratory, Incorporated (Parent)
Mountain Systems, Incorporated

Picture by Mountain Systems, Incorporated

APPLICATIONS

Manufacturer
Business data processor.

Industrial Sample
Hickok Manufacturing Company, Incorporated
A perpetual inventory, furnishing reports to the
Central Planning and Packaging Departments.

NUMERICAL SYSTEM

|	
Internal number system	Binary
Binary digits per word	20
Binary digits per instruction	60
Arithmetic system	Decimal-binary
Instruction type	One address, consisting of two parts Address "A" selects a magnetic drum read-record head and address "B" selects a

particular location on
the drum.

Number range	"A" ranges from 0 to 66 "B" ranges from 0 to 150

ARITHMETIC UNIT

	Microsec
Add time (Includ. stor. access)	32
Construction	Vacuum tubes, using a combination of trigger pairs, pullers, and cathode followers. A crystal diode matrix is also used.
Arithmetic mode	A combination series-parallel shift register is utilized.
Timing	Synchronous
Operation	Sequential

Three types of pulses are used to control operation.
Serial feed is by use of 5 channel paper tape.
Basic operations are addition, subtraction and
"reading out" a balance.
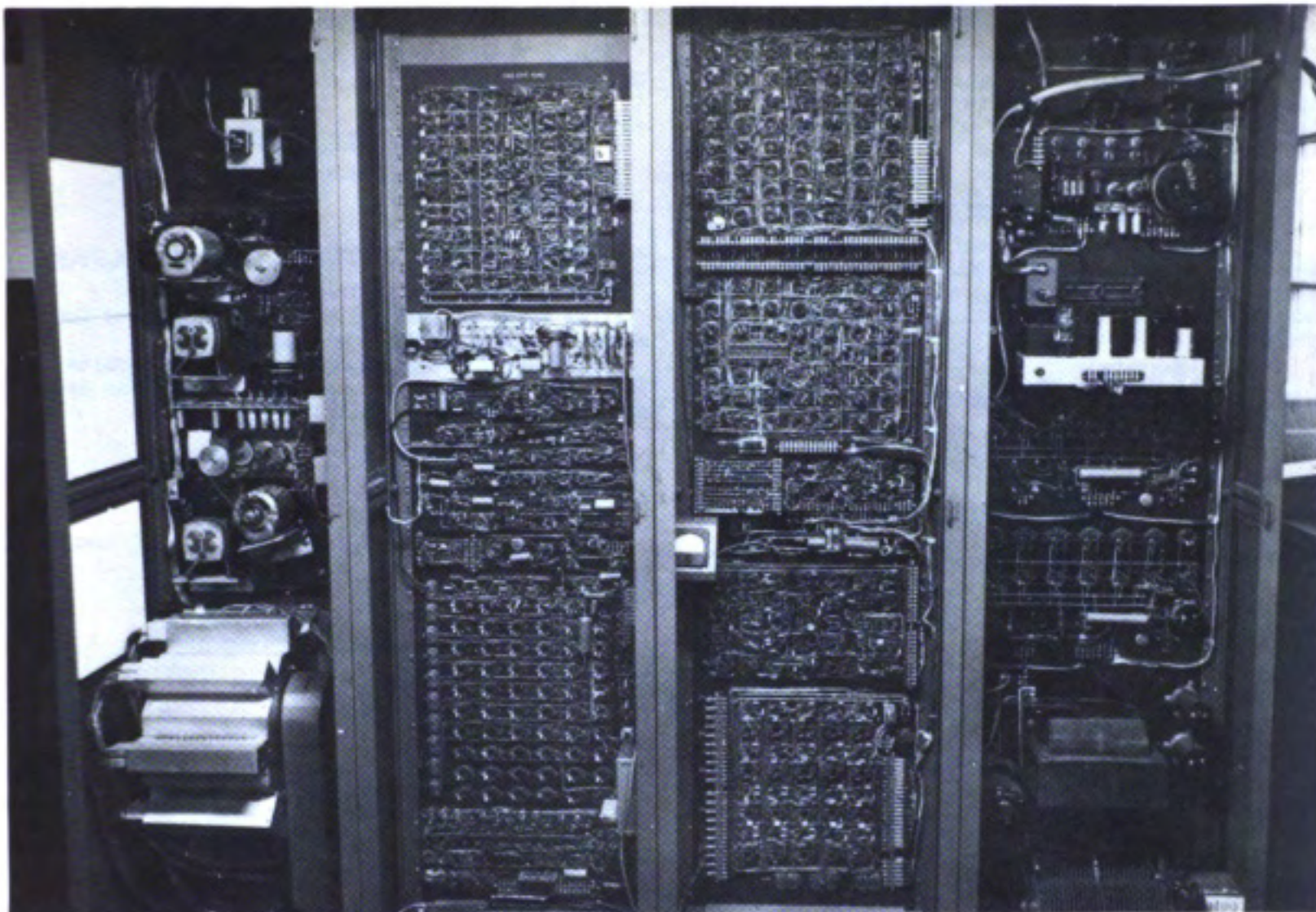
Picture by Mountain Systems, Incorporated

STORAGE

Media	Words	Digits	Microsec Access
Magnetic Drum	10,000	50,000	17
Shift Register	1	5	32
Paper Tape			

Paper tape is utilized for permanent storage in order to release the magnetic drum for other purposes.

The magnetic drum is 8 inches long and 7 inches in diameter. There are 66 recording heads. The address system is composed of a relay pyramid and an electronic counter.

INPUT

Media	Speed
Paper Tape	600 char/min

Above tape is 5-channel tape, which is prepared by an IBM 063 Card-to-Tape Converter or a Flexowriter typewriter.

OUTPUT

Media	Speed
Paper Tape	600 char/min

Direct to paper tape or via a Flexowriter typewriter.

CIRCUIT ELEMENTS ENTIRE SYSTEM

Tubes	535
Tube types	8
Crystal diodes	150
Separate cabinets	4

Crystal diode types used are the 1N35 and the 1N116.

Tube types used are the 5965, 5915, 6AN5, 12BH7, 12AX7, 2D21, 5963, and 6AS6. All four cabinets are inter-cabled.

The IBM 063 Card-to-Tape Converter and the Flexo-writer are located in an adjoining room. The Flexo-writer can be cabled directly to the computer so as to print out in hard copy as the computer is in operation.

CHECKING FEATURES

Checking is performed by using predetermined "heads" and "spots" on the drum and tapes with known answers. A visual check is made.

POWER, SPACE AND WEIGHT

Space, computer	120 cu ft, 16 sq ft
Four cabinets	2 by 2 by 7.5 ft each
Weight, computer	600 lbs.

MODAC 5014

COST, PRICE AND RENTAL RATE

Hickok Manufacturing Company, Incorporated
Approximate cost of basic system $85,000
Approximate cost of Flexowriter   1,200
Rental rates of IBM 063 Card to Tape Converter
($65.00 plus $6.50 tax)/month.

PERSONNEL REQUIREMENTS

Hickok Manufacturing Company, Incorporated
One operator and 1 clerk are utilized to operate the
system on a one 8-hour shift/week basis. One
engineer is utilized for developing methods and
procedures.

RELIABILITY AND OPERATING EXPERIENCE

Average error-free running period   30.25 hours
Good time   702   hours
Attempted to run time   936   hours
Operating ratio (Good/Attempted to run)   0.75
Figures based on period June 1954 to July 1954.
Acceptance test July 1954.

FUTURE PLANS

Hickok Manufacturing Company, Incorporated
Use of equipment is being developed further.

INSTALLATIONS

Hickok Manufacturing Company, Incorporated
Rochester, New York

ADDITIONAL FEATURES AND REMARKS

Hickok Manufacturing Company, Incorporated
First picture shows a complete front view of the
machine, including the power panel.
Second picture shows a rear view of the machine,
including the lower left section, the magnetic drum
and general internal wiring of the computer.

MODAC 5014

MONROBOT III

Monroe Computer Model III

Picture by Monroe Calculating Machine Company, Electronics Division

APPLICATIONS

Air Force Cambridge Research Center
Scientific calculation.

NUMERICAL SYSTEM

Internal number system	Binary coded decimal
Decimal digits per word	20
Decimal digits per instruction	10
Instructions per word	1
Instructions decoded	11
Instructions used	11
Arithmetic system	Fixed point
Instruction type	Four address
Number range	$10^{-10} \leqslant n \leqslant 10^{10}-1$

ARITHMETIC UNIT

	Microsec
Add time (includ. stor. access)	120,000

Mult time (includ. stor. access)	540,000
Div time (includ. stor. access)	540,000
Construction	Vacuum tubes
Basic pulse repetition rate	10 Kc/sec
Arithmetic mode	Serial
Timing	Synchronous
Operation	Sequential

STORAGE

Media	Words	Microsec Access
Magnetic Drum	100 numbers	15,000
Magnetic Drum	100 instructions	15,000

INPUT

Media	Speed
Keyboard	Manual
Paper Tape	10 dig/sec

OUTPUT

Media	Speed
Typewriter (Flexowriter)	10 dig/sec
Paper Tape (Flexowriter)	

CIRCUIT ELEMENTS ENTIRE SYSTEM

Tubes	800
Tube types	4
Crystal diodes	100

POWER, SPACE AND WEIGHT

Power, computer	2.5 KW
Space, computer	Desk size
Weight, computer	1,000 lbs.

PRODUCTION RECORD

Produced	1
Operating	1

PERSONNEL REQUIREMENTS

One technician or mathematician is required to operate system.

RELIABILITY AND OPERATING EXPERIENCE

Good time	28 hours
Attempted to run time	35 hours
Operating ratio (Good/Attempted to run)	0.80

Figures based on period 1 February 1955 to 1 September 1956.
Acceptance test 1 February 1955.

Approximately 1 hour/day is required for maintenance therefore "attempted to run time" is considered to be 40-5 or 35 hours.
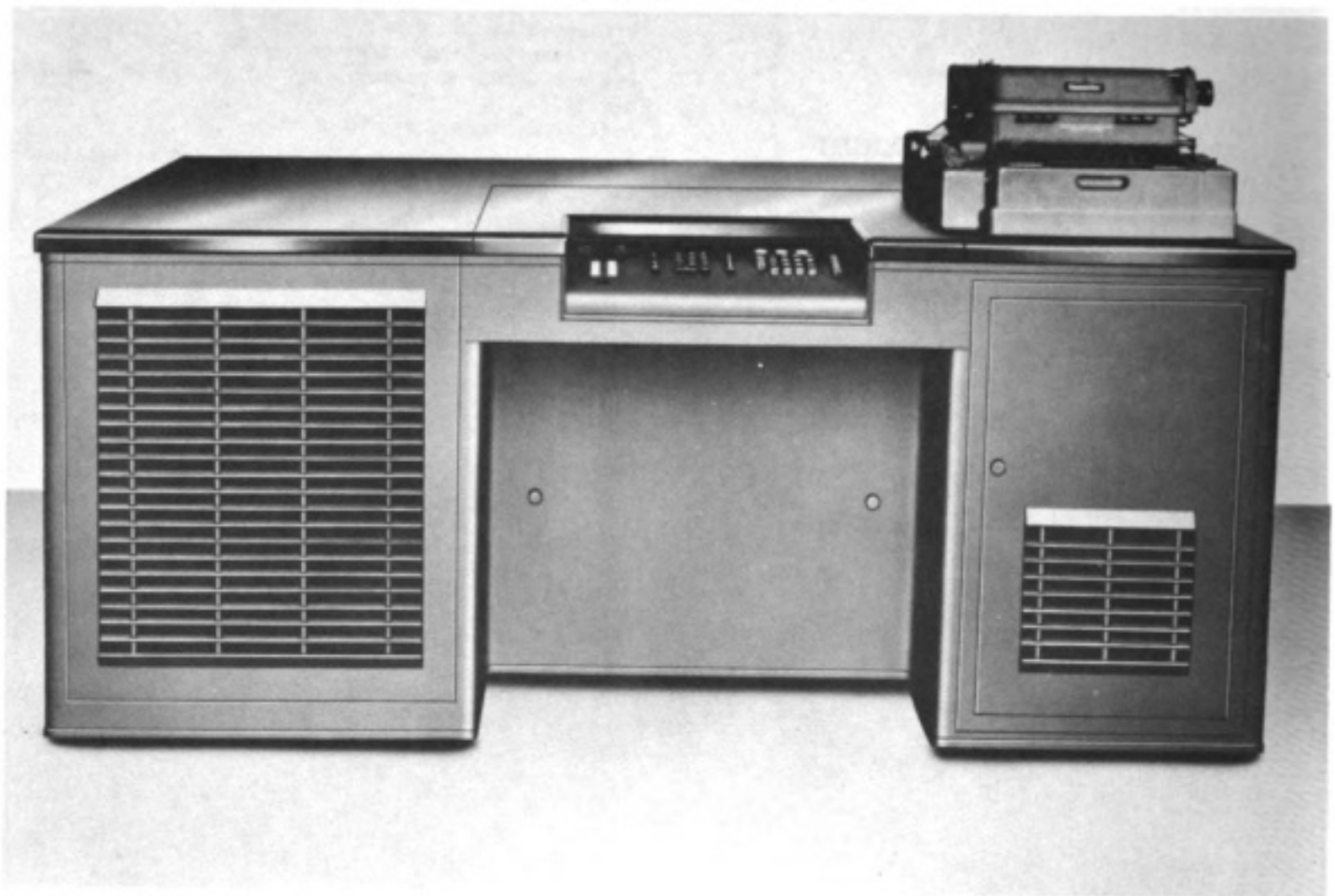
INSTALLATIONS

Air Force Cambridge Research Center
Computing Laboratory
Cambridge 39, Massachusetts

MONROBOT T

MONROBOT V

Monroe Computer Model V

MANUFACTURER

Monroe Calculating Machine Company
Electronics Division

Picture by Monroe Calculating Machine Company, Electronics Division

APPLICATIONS

Computing problems normally encountered by Topographic Troops in surveying operations.

NUMERICAL SYSTEM

Internal number system	Binary coded decimal
Decimal digits per word	20
Decimal digits per instruction	10
Arithmetic system	Fixed point
Instruction type	Four address

ARITHMETIC UNIT

	Microsec
Add time (includ. stor. access)	120 (approx)
Mult time (includ. stor. access)	540 (approx)
Div time (includ. stor. access)	540 (approx)
Construction	Vacuum tubes
Basic pulse repetition rate	10 Kc/sec

Timing	Synchronous
Operation	Sequential

STORAGE

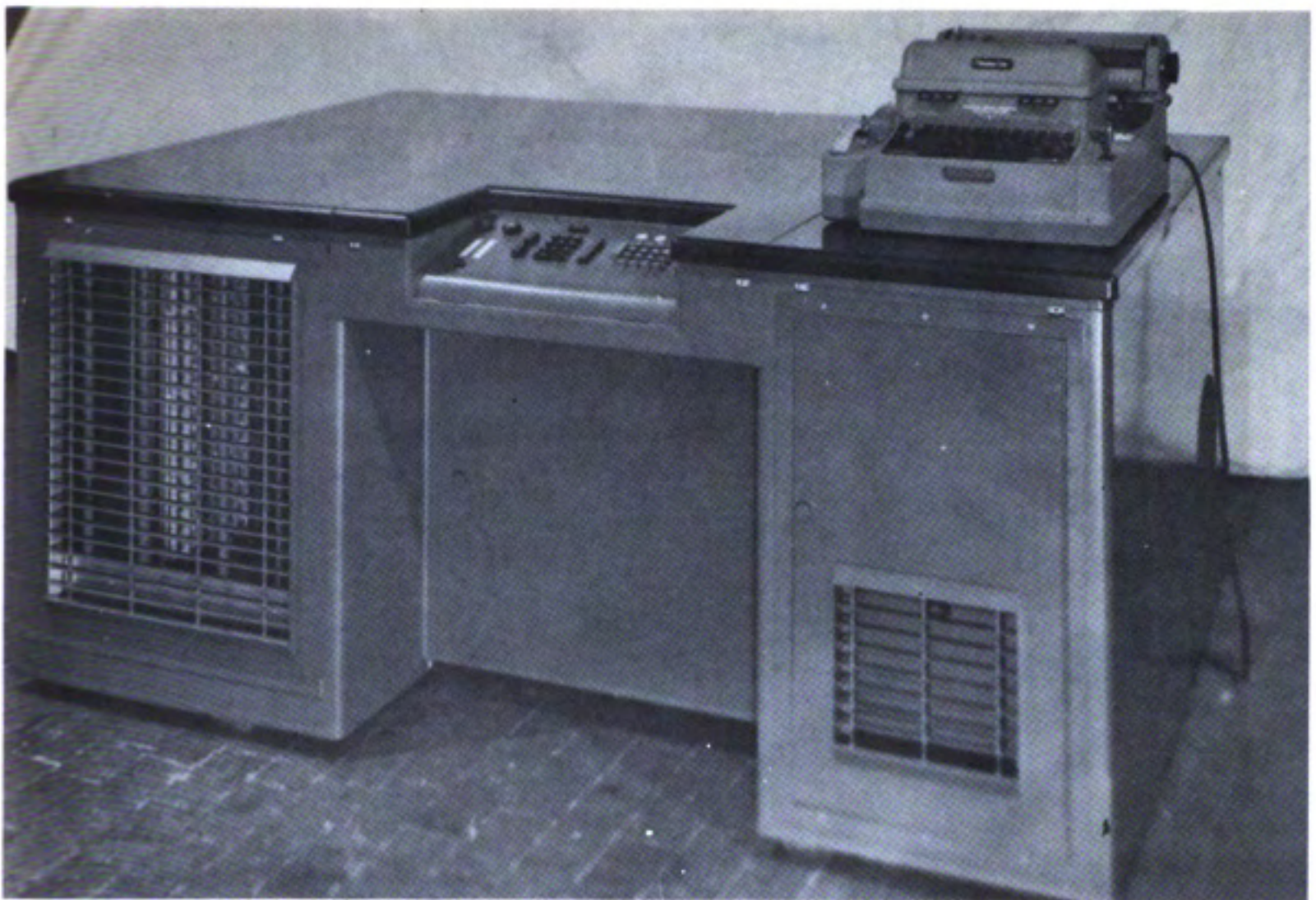| Media	Words	Microsec Access
Magnetic Drum	300	18,000
Paper Tape		

Access time on drum is for 100 twenty digit numbers. Drum is 6 inches in diameter, 20 inches long and rotates at a speed of 3,550 rev/min.

INPUT

Media	Speed
Keyboard	Manual
Paper Tape (Reader)	570 char/min

OUTPUT

Media	
Typewriter (Flexowriter)	Reader 570 char/min
	Printer 400 char/min

Picture by U. S. Army Corps of Engineers, Engineer Research and Development Laboratories

CIRCUIT ELEMENTS ENTIRE SYSTEM

Tubes	800 (approx)
Crystal diodes	1
Tube types	5814A, 5726, 5751, 5844, 6005, and 5725

CHECKING FEATURES

Storage selection indicators.

POWER, SPACE AND WEIGHT

Power, computer	5 KW
Space, computer	44-1/2 in x 72 in x 31 in Desk
Weight	1,686 lbs, including Flexowriter

PRODUCTION RECORD

Produced	1
Operating	1

COST, PRICE AND RENTAL RATE

Engineer Research and Development Laboratories
Approximate cost of basic system $86,074.

PERSONNEL REQUIREMENTS

Engineer Research and Development Laboratories
One person required for operation and one person
required for servicing unless one person is trained
to perform both operation and servicing.

RELIABILITY AND OPERATING EXPERIENCE

Operating ratio (Good/Attempted to run time) 0.85
Date unit passed acceptance test March 1955.

Computer has operated for several days without any
down time; however, the only actual figure is the
2,069 hours taken from the running time meter.

INSTALLATIONS

U. S. Army Corps of Engineers
Topographic Engineering Department
Engineer Research and Development Laboratories
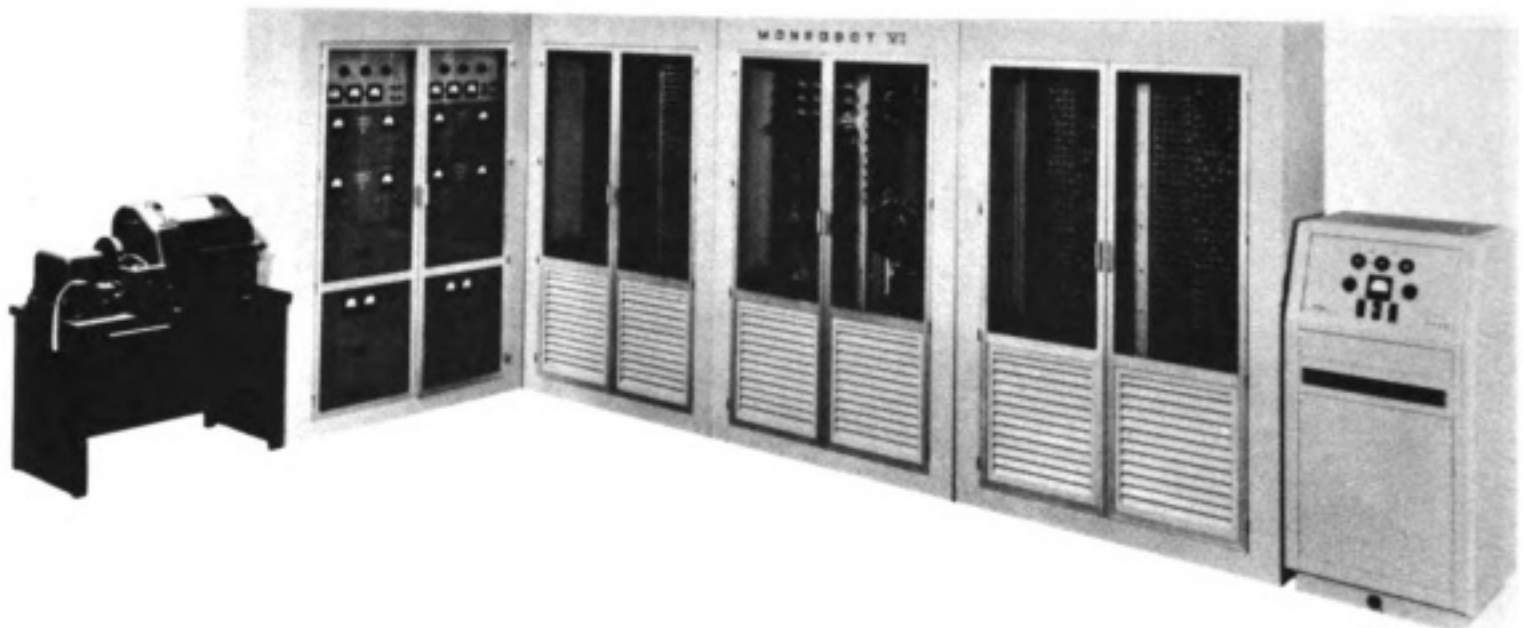Fort Belvoir, Virginia

ADDITIONAL FEATURES AND REMARKS

Pre-addressed tapes
Single cycle operation where program is checked line
for line.
Pre-determined automatic sequencing.
Shock-mounted for van installation; mobile.

MONROBOT

MONROBOT VI

Monroe General Purpose Computer Model VI

MANUFACTURER

Monroe Calculating Machine Company
Electronics Division

Picture by Monroe Calculating Machine Company, Electronics Division

APPLICATIONS

Scientific calculation.

NUMERICAL SYSTEM

Internal number system	Binary coded decimal
Decimal digits per word	20
Decimal digits per instruction	10
Instructions per word	2
Instructions used	200
Arithmetic system	Fixed point
Instruction type	Four address
Number range	+XXXXX XXXXX . XXXXX XXXXX

Fixed point is centrally located.

ARITHMETIC UNIT

	Microsec
Add time (includ. stor. access)	135,000
Mult time (includ. stor. access)	600,000

Div time (includ. stor. access)	600,000
Construction	Vacuum tubes and crystal diodes
Basic pulse repetition rate	10 Kc/sec
Arithmetic mode	Serial
Timing	Synchronous
Operation	Sequential

Automatic positioning of numerical results about the decimal point.

STORAGE

Media	Words	Microsec Access
Magnetic Drum	200	16,670 max

4,000 digits of magnetic drum storage.

INPUT

Media	Speed
Keyboard	Manual
Punched Tape	10/sec

ROBOT VI

Picture by Monroe Calculating Machine Company, Electronics Division

Punched Card   17/sec

Punched Tape is optional to 60/sec.
Standard Teletype or Kleinschmidt units for tape
processing.

OUTPUT

Media	Speed
Printed Copy	10 char/sec
Punched Tape	10 char/sec
Punched Card	17 char/sec

Standard Teletype or Kleinschmidt units. 60 char/sec
Punched tape and punched card is optional.
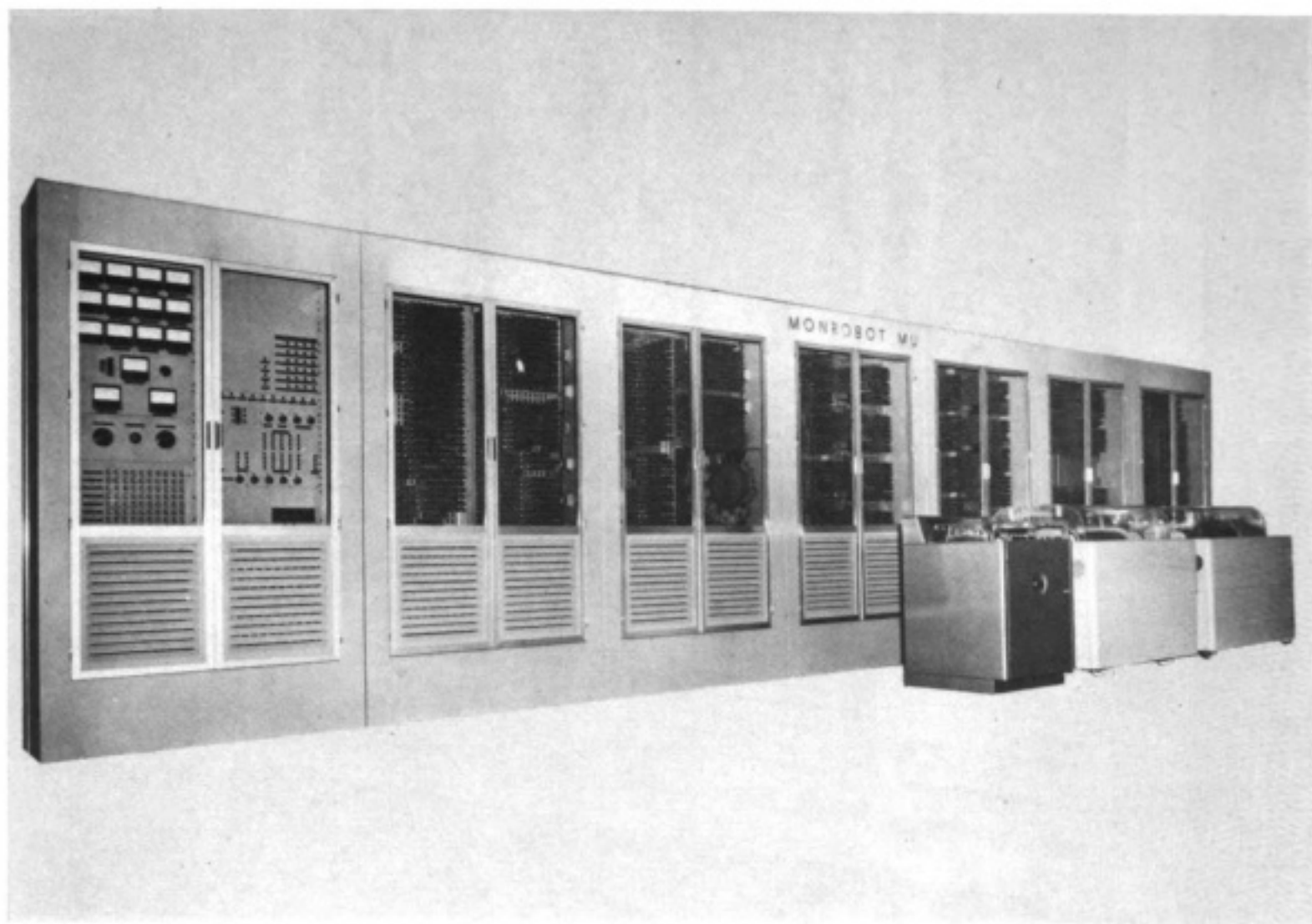
CHECKING FEATURES

Fixed
Parity checks
   Optional
MAID (Monrobot Automatic Internal Diagnosis) and
dual arithmetic and control units.

MONROBOT MU

Monroe Multiple-Unit General Purpose Computer

Picture by Monroe Calculating Machine Company, Electronics Division

APPLICATIONS

Item inventory and monetary accounting.

NUMERICAL SYSTEM

Internal number system	Binary coded decimal and sexadecimal
Binary digits per word	96
Decimal digits per instruction	12
Instructions per word	2
Instructions decoded	36
Instructions used	36
Arithmetic system	Fixed point (arbitrarily located)
Instruction type	Three address (modified)
Number range	Variable

Words may be made up of either numeric or alpha-numeric characters.

ARITHMETIC UNIT

Time	Microsec
Add (includ. stor. access)	8,000
Mult (includ. stor. access)	68,000
Div (includ. stor. access)	77,000
Construction	Vacuum tubes and crystal diodes
Basic pulse repetition rate	60 Kc/sec (rapid access)
	104 Kc/sec (general storage)
Arithmetic mode	Serial
Timing	Synchronous
Operation	Sequential

STORAGE

Media	Words	Microsec Access
Magnetic Drums	20,000/drum (general storage)	25,000(avg)
Magnetic Drum	10 (rapid access)	1,600
Magnetic Tape (2)	12,000/unit	

The large capacity drums are for general storage and utilize saturable core reactors for track selection. The number of drums utilized is based upon application requirements.

INPUT

Media	Speed
Keyboard (Flexowriter)	10 char/sec
Keyboard (Model 28 Teletype 12 Units)	6 char/sec
Paper Tape (Ferranti)	200 char/sec
Magnetic Tape	400 char/sec

OUTPUT

Media	Speed
Paper Tape (Flexowriter)	10 char/sec
Printed Page (Flexowriter and Model 28 Teletype)	10 char/sec
Magnetic Tape	400 char/sec

CHECKING FEATURES

Fixed
Parity checks
  Optional
MAID (Monroe Automatic Internal Diagnosis) System used for malfunction detection and location.

PRODUCTION RECORD

Currently being installed for the U. S. Air Force under Contract No. AF33(616)-2158.