



DIGITAL COMPUTER SYSTEM

COMPUTATION

Analyze, compute,
compare, decide

CONTROL

Send and receive control signals to and from
automatic devices under program control

A SOLID STATE, PARALLEL DIGITAL COMPUTER WITH UNUSUAL FLEXIBILITY AND CAPABILITY

This General Mills computer is a medium size, general purpose computer tailored to meet the needs of consumers who require high performance and reliability at moderate cost. In addition to an outstanding capability for computation, the computer possesses numerous special input and output features which adapt it to control applications and other applications where external automatic equipment must be integrated into a system.

The computer can converse with numerous external devices if the appropriate synchronizing circuits are provided. These include:

- **Typewriter**
- **Printer**
- **Tape Reader**
- **Card Punch**
- **Card Reader**
- **Magnetic Tape Units**
- **Analog Devices**
- **Control Systems**
- **Displays**

A "built-in" provision for real-time input and output permits the user to order the compilation of data from any of several *addressable* sources and send control or data signals to several addressable destinations.



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Kevam
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SPECIFICATIONS

SPEED —

Basic clock rate of 50 kilocycles. Execution times for common arithmetic operations (including memory access time) are:

Addition	80 microseconds
Subtract	100 microseconds
Multiply	820 microseconds
Divide	940 microseconds

All other arithmetic operations require 80 microseconds.

INPUT - OUTPUT FACILITIES —

Complete alphanumeric typewriter: 12 characters per second, automatic format control and variable codes.

Photoelectric tape reader: 100 and 150 characters per second, one-word or one-block entry.

Paper tape punch: 27 characters per second, 5-8 channels, one-word or one-block output.

Magnetic tape: 2,400 feet at 150 inches per second, 5,000,000 bits, read, write, search and rewind.

OUTSTANDING CHARACTERISTICS

- **OPTIUM INSTRUCTION LIST** — The computer is composed almost entirely of plug-in cards. Each of the 64 programmed orders contained in the machine is accomplished by a circuit contained on a *single card*. For example, the series of commands which accomplish the order "Add (m) to (A)" are generated by a single, pluggable instruction card. The order list of the computer can be changed simply by the substitution of additional cards.
- **AUTOMATIC PROGRAM MONITORING AND CONTROL** — The operator's console provides monitoring of computation by digital displays and indicators. A program in the computer can be varied automatically by setting sense switches during computation. This facility permits considerable variation in programming without resorting to complete program replacement or halting of machine operation.
- **BUFFERS AND RANDOM ACCESS** — In addition to a 4,096-word magnetic core memory, the computer contains two 64-word buffer memories and a 1-word buffer register for conversing with external devices. These buffers permit exchange of information and arithmetic operations to proceed simultaneously.
- **INDEXING** — The index counter and various indexed commands provide programming ease and flexibility.
- **BLOCK TRANSFERS** — 64-word block transfer of input, output and internal information can be accomplished with a single instruction.
- **ENVIRONMENT** — The computer is capable of operating efficiently under extremes of temperature and humidity.
- **MAGNETIC TAPE** — Magnetic tape units, operating at 30,000 alphanumeric characters per second, are available as optional equipment.

OPERATION —

Parallel.

NUMBER SYSTEM —

Binary, fixed point, fractional. Programmed translation to alphanumeric, octal and decimal systems is provided.

PRECISION —

36 bit (plus sign) word length.

INSTRUCTION SYSTEM —

Single address order structure with two orders per word. Each order consists of a 6-bit operation code and a 12-bit address code. The computer can contain a repertoire of 64 orders.

MEMORY CAPACITY —

4,096-word magnetic core memory with random access. Additionally, the computer contains two 64 word magnetic core buffer memories for external communication.

CONSOLE —

Simplified controls. Decimal or octal readout displays of principal registers. Sense switches. Four computational modes. Automatic initializing sequence into program control.

POWER REQUIREMENTS —

1,000 watts.

PHYSICAL CHARACTERISTICS —

Size: 6.5 ft. high, 3.5 ft. wide, 3 ft. deep.

Weight: 600 pounds.

No air conditioning required in ambient temperatures between 32 and 125 degrees F.

ORDER LIST

ARITHMETIC ORDERS

Add (m) to (A)
Subtract (m) from (A)
Bring (m) to register A
Bring the complement of (m) to register A
Bring the absolute value of (m) to register A
Clear (m)
Store (A) in location m
Store (R) in location M
Multiply (A) by (m)
Divide (A) by (m)
Sort
Merge

SHIFT ORDERS

Shift (A) and (R) m bits right
Shift (A) and (R) m bits left
Shift (A) and (R) m bits left (closed loop)
Normalize and Count—Shift (A) and (R) left until the sign bit of register A is not the same as the most significant bit of register A. Count number of shifts in the index counter.

BUFFER ORDERS

Block Transfer
Load Output Buffer
Read Input Buffer
Load One Word Buffer
Read One Word Buffer

CONTROL ORDERS

Jump
Jump if (A) < 0
Jump if (A) = 0
Jump to (M + IC)
Halt
Return
Ring Bell
Extract Ones
Extract Zeros
Set (IC)
Add one to (IC)
Test (IC)
Store (IC)

EXTERNAL MACHINE ORDERS

Typewriter:
Type out Alpha
Type out Alpha and Tab
Type out Alpha and Return
Type in Alpha
Type out Octal
Type out Octal and Tab
Type out Octal and Return
Type in Octal

Paper Tape:

Read one Word
Read one Block
Punch one Word
Punch one Block

Magnetic Tape:

Forward
Reverse
Read
Write
Rewind

The list above is representative of the more common orders. Because of the pluggable feature of the instruction cards which execute these orders, many more orders can be added to the list, and numerous substitutions can be made.

GENERAL MILLS' EXPERIENCE

Several years ago, a well equipped, competently staffed Digital Computer Laboratory was formally established in order to support increasing activity in the electronic digital computer field. Since that time, personnel of the Laboratory have effected development of highly advanced special and general purpose computers, as well as compilation of computer system components applicable to a wide range of scientific, industrial and military problems.

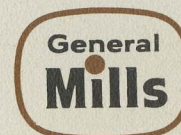
General Mills has demonstrated the ability to produce, at moderate cost, the *specific* computer system designed to satisfy requirements of the customer with a computation or control problem.

Your Inquiries Are Invited!

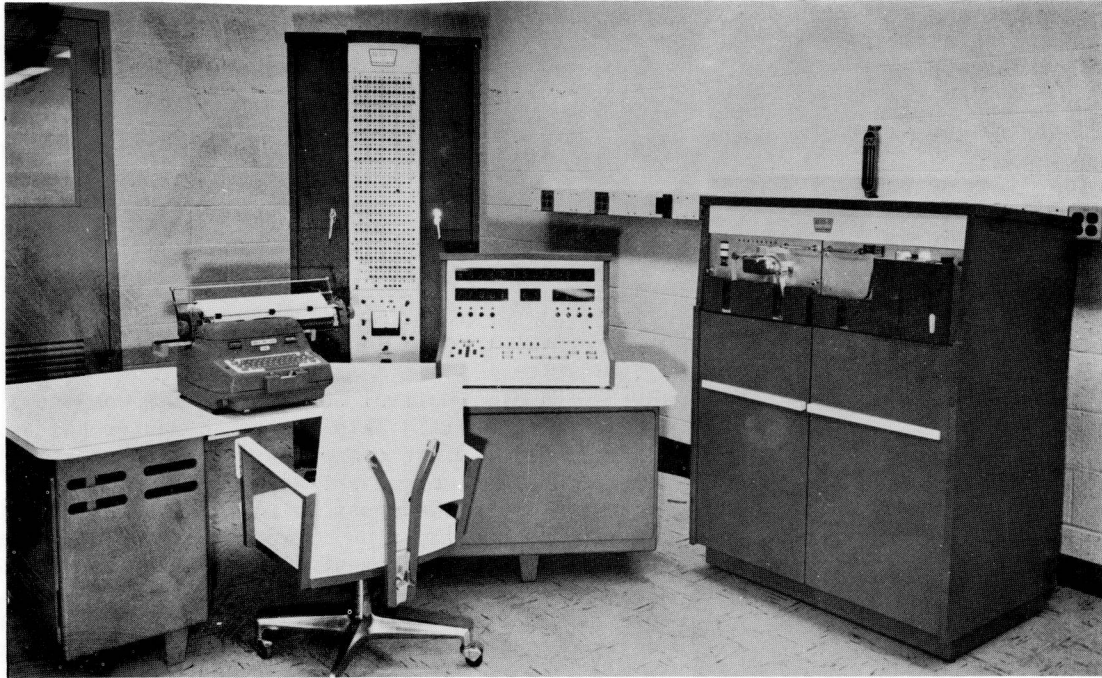
MECHANICAL DIVISION

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Intensive Research • Creative Engineering • Precision Manufacturing



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This is one of the five General Mills digital computer systems slated for use in the Orbiting Astronomical Observatory program of the National Aeronautics and Space Administration. This computer will be used by NASA for mathematical analysis of real time satellite control problems in addition to analysis of other data. The General Mills AD/ECS computer is a solid state, parallel, digital computer system. It utilizes plug-in printed circuit instruction cards for tying together various units of the computer system, such as the arithmetic unit, memory unit, control unit and input-output buffer. The Central Computer can be altered easily in storage capacity, operational registers, and even order structure.