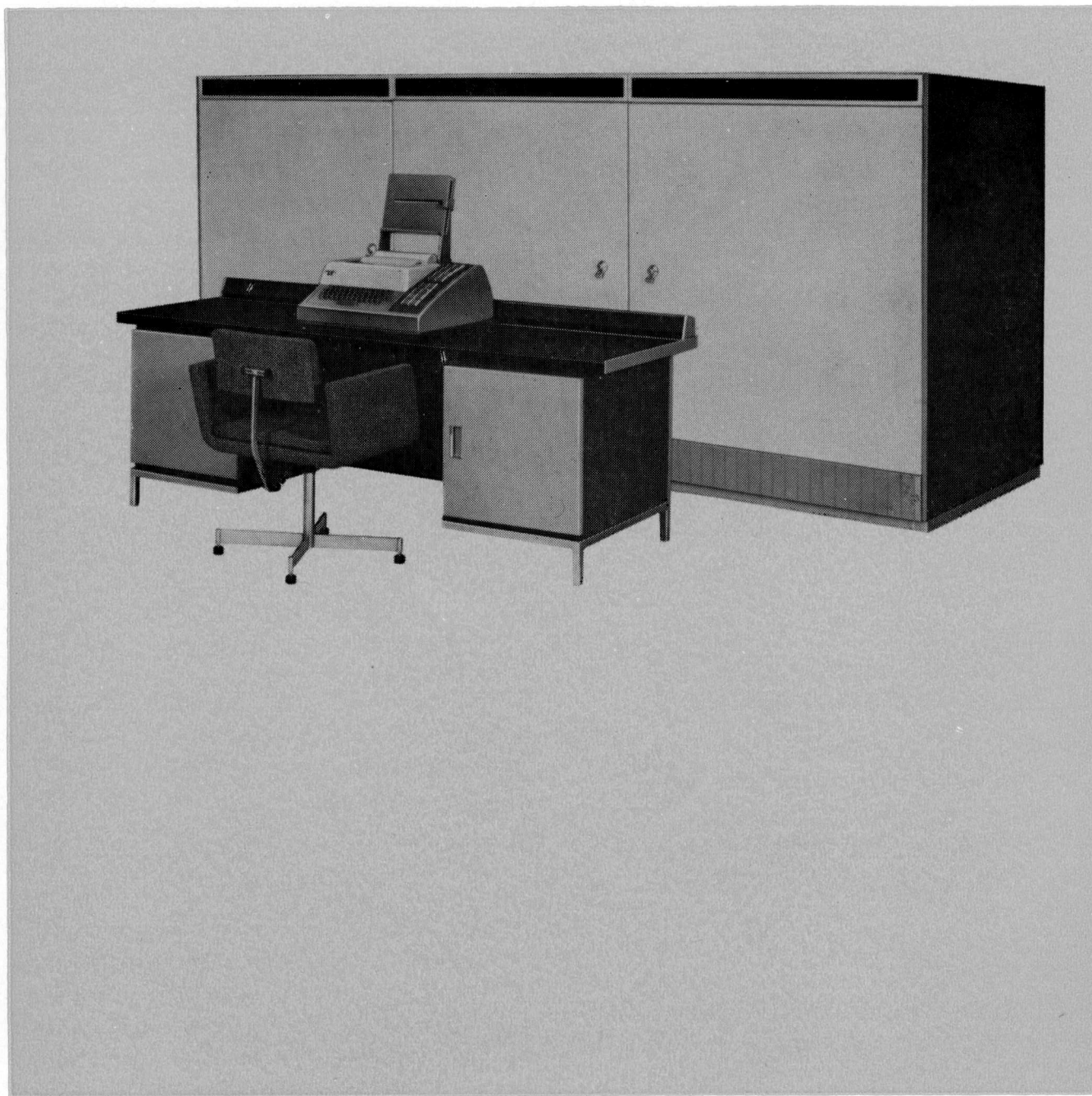




I.C.T 1900 SERIES

CENTRAL PROCESSOR 1909



DESCRIPTION

The 1909 is a multi-programming central processor designed especially for scientific computing. It contains units for both fixed and floating point arithmetic, the two units being capable of simultaneous operation. The basic 1909 includes two paper tape readers, two paper tape punches, a console typewriter and space for further input/output channels to which other 1900 peripheral devices can be connected. Peripheral devices to Standard Interface are interchangeable with all systems in the 1900 range of computers.

Programs written for any other processor in the 1900 series can be run on the 1909 and vice versa, provided storage and peripheral devices are available.

- Low cost system with large system scientific performance
- Fixed and floating point arithmetic units
- Multi-Programming under automatic control of Executive
- Programming compatibility throughout the 1900 series

CENTRAL PROCESSOR 1909

Multi-programming

The processor incorporates facilities for multi-programming whereby a number of programs may be run concurrently. Up to four main programs may be run at once with no risk of mutual interference. This multi-programming system is entirely automatic, and the programmer does not have to consider it when writing his programs. If he so desires, the programmer may incorporate into a main program up to two sub-programs which will then participate independently in the automatic multi-programming system, concurrently with the other programs in the system.

Executive

Executive is the program which when the computer is in normal use, is always present in the core store, and which controls all the user programs that are in the system at any time. The main functions performed by Executive are:

1. Interpretation and execution of the operator's commands to the system, and provision of information for the operator concerning normal program running incidents, and peripheral devices that need attention.
2. Allocation of the time of the central processor among the programs in the system according to given priorities so as to achieve maximum utilization of the central processor and of the peripheral devices.
3. Allocation of peripheral devices to programs that are entered into the system, and the control of data transfer to and from peripheral devices.
4. Monitoring of program and peripheral device performance.

Operation

Systems utilizing the 1909 processor are controlled by means of messages

entered by the operator on a typewriter directly connected to the processor. In addition, pre-punched messages may be entered via a card reader or a paper-tape reader.

Executive takes the actions requested and when necessary will type out messages for the information or action of the operator. This provides a permanent printed record of the sequence of operational events. Facilities for automatic sequencing of jobs are also available.

High Speed Store

A 1909 Processor may be supplied with a core store of 16,384 or 32,768 words. The store in an initial installation may be later expanded on site up to the maximum when required. The cycle time is 6 microseconds. All store operations are subjected to a parity check.

Store Reservation

Each program is allotted an appropriate area within the core store. While obeying program instructions the central processor is allowed to use only those parts of the store which are reserved for that program. Whenever the Executive causes the central processor to start obeying a different program the reservation settings are changed to those appropriate for that program. Thus each program including those under test, is prevented from interfering with any others that may be running in the machine.

Peripheral Transfers

All transfers of data to or from peripheral devices are carried out by program entries to Executive, which has direct control of all devices. Before initiating the transfer Executive checks that the store locations requested are within the area reserved for the program that issued the request. Once initiated the transfers proceed autonomously so that an

number of transfers may be in progress simultaneously.

The central processor is caused to 'hesitate' when necessary to allow a single character or word to be transferred between the core store and the peripheral units.

Completion of a transfer causes a signal to the Executive and any program held waiting for that transfer is allowed to proceed. Transfers which fail accuracy controls are automatically repeated a pre-determined number of times before operator intervention is requested, if the peripheral devices permit automatic re-positioning of the medium e.g. magnetic tape decks. On other devices a failure is notified to the operator immediately.

Word Length

The processor normally operates with words of 24 binary digits. Such a word can be used to represent:—

one instruction

four alpha-numeric characters

a decimal integer in the range
—8,388,608 to +8,388,607

a decimal fraction in the range
—1.0 to +0.9999999 with accuracy approximately equivalent to seven decimal digits.

Two words together may represent a double precision number having an accuracy equivalent to over thirteen decimal digits or a floating-point number.

A number of separate data items may be packed into a word or group of words, and instructions are available to address single characters in the store.

CENTRAL PROCESSOR 1909

Instruction Code

The first eight core store locations assigned to each program are used as accumulators, and can be used for fixed point arithmetic and counting. Three of these accumulators may be further used for indexing. Most instructions carry a reference to a core store location and an accumulator. The comprehensive instruction repertoire contains arithmetic, transfer, logical and shifting operations, including multiplication, division and literal operand facilities. There are special provisions for multiple-length arithmetic, conversions between decimal and binary forms of numbers, and character handling.

Floating Point

In addition to the fixed point arithmetic unit there is also a floating point unit, which is autonomous. The Central Processor can continue obeying other instructions 18 micro-seconds after a floating point instruction has been initiated or 24 micro-seconds after the initiation of a modified floating point instruction. The floating point unit includes a 47-bit accumulator, and an exponent overflow indicator.

The number representation is:

Argument 37 bits plus sign

Exponent 8 bits plus sign

The arithmetic functions may be rounded or unrounded and standardized or unstandardized at the discretion of the user.

Typical times in micro-seconds for the floating-point instructions are shown in the Specification Summary. These times take account of the overlap only with the fetching from store of the following instruction. If the following instruction is modified, or if it is not a floating point instruction, these times can be effectively reduced to 18 micro-seconds per instruction.

Input/Output Devices

The I.C.T 1909 includes two paper tape readers mounted on a desk together with the console typewriter, and one or two paper tape punches on individual pedestals. There is a choice of paper tape readers; either 1,000 or 300 characters per second can be specified. The paper tape punches operate at 110 characters per second. The paper tape devices are described more fully in catalogue sheets 1915, 1916 and 1925.

In addition to the basic input/output units, further slow peripheral devices may be attached to an overall maximum of eighteen. The system may also be specified with fast peripheral devices including drums.

SPECIFICATION SUMMARY

	Words of core store	Paper tape input— two readers at:	Paper tape output— two punches at:
1909/1	16,384	300	110
1909/2	16,384	1,000	110
1909/3	32,768	300	110
1909/4	32,768	1,000	110

characters per second

Data unit 24-bit word

Store cycle time Six micro-seconds

Store checking One parity bit per word

Multi-Programming Up to four programs may operate concurrently

Accumulators Eight per program

Index Registers Three per program (uses three of the eight accumulators)

Arithmetic Binary; order code includes decimal conversion

Times:

Fixed point

Add/subtract —18 micro-seconds

Multiply —67 micro-seconds

Divide —71 micro-seconds

Floating point

Add/subtract —21 micro-seconds

Multiply —37 micro-seconds

Divide —59 micro-seconds

(minimum of 18 μ s with full overlap)

Load/store —18 micro-seconds

Peripheral simultaneity Full simultaneity on all peripherals.

Processor hesitation time 12 micro-seconds for each word (or character for slow devices) transferred between peripheral device and store.

CENTRAL PROCESSOR 1909

PHYSICAL CHARACTERISTICS

Central processor

Height 61 inches

Depth 34 inches

Length 146 inches

Weight 3,250 pounds

Console desk holding two paper tape readers and console typewriter

Height 36 inches

Depth 26 inches

Length 72 inches

Weight 310 pounds

Maximum distance from
Central Processor—50 feet

Paper tape punch—each

Height 49 inches

Depth 22 inches

Length 35 inches

Weight 150 pounds

Maximum distance from
Central Processor—50 feet

Paper tape bins

Height 36 inches

Depth 22 inches

Length 36 inches

This specification is subject to modification

INTERNATIONAL COMPUTERS AND TABULATORS LIMITED

Head Office I.C.T House Putney London SW15

Sales Office Bridge House Putney Bridge London SW6 Renown 3322
and local offices throughout the United Kingdom
