

# ELLIOTT

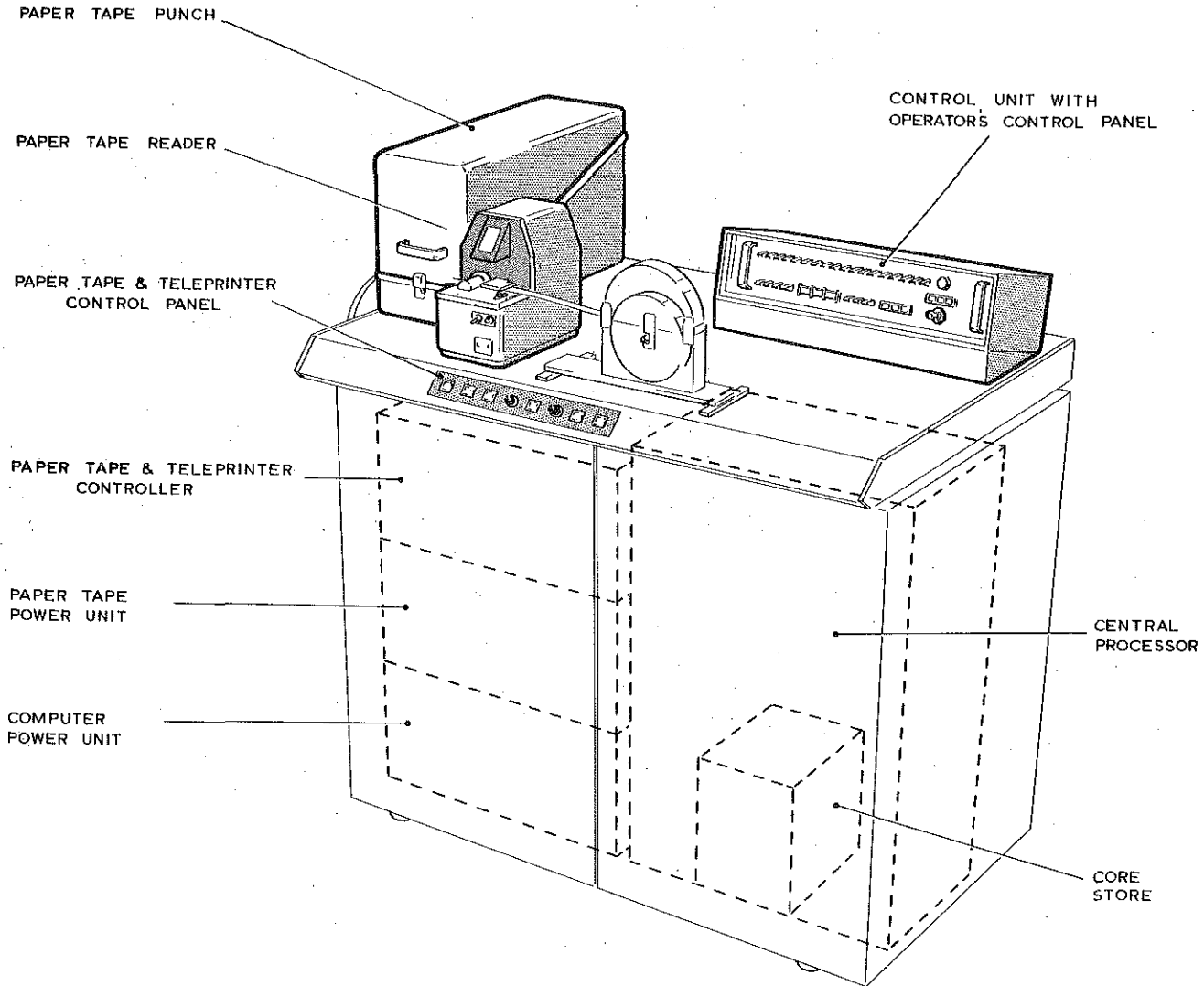
# 903

Volume 1: FUNCTIONAL SPECIFICATION

Part 1: THE ELLIOTT 903 COMPUTER-INTRODUCTION

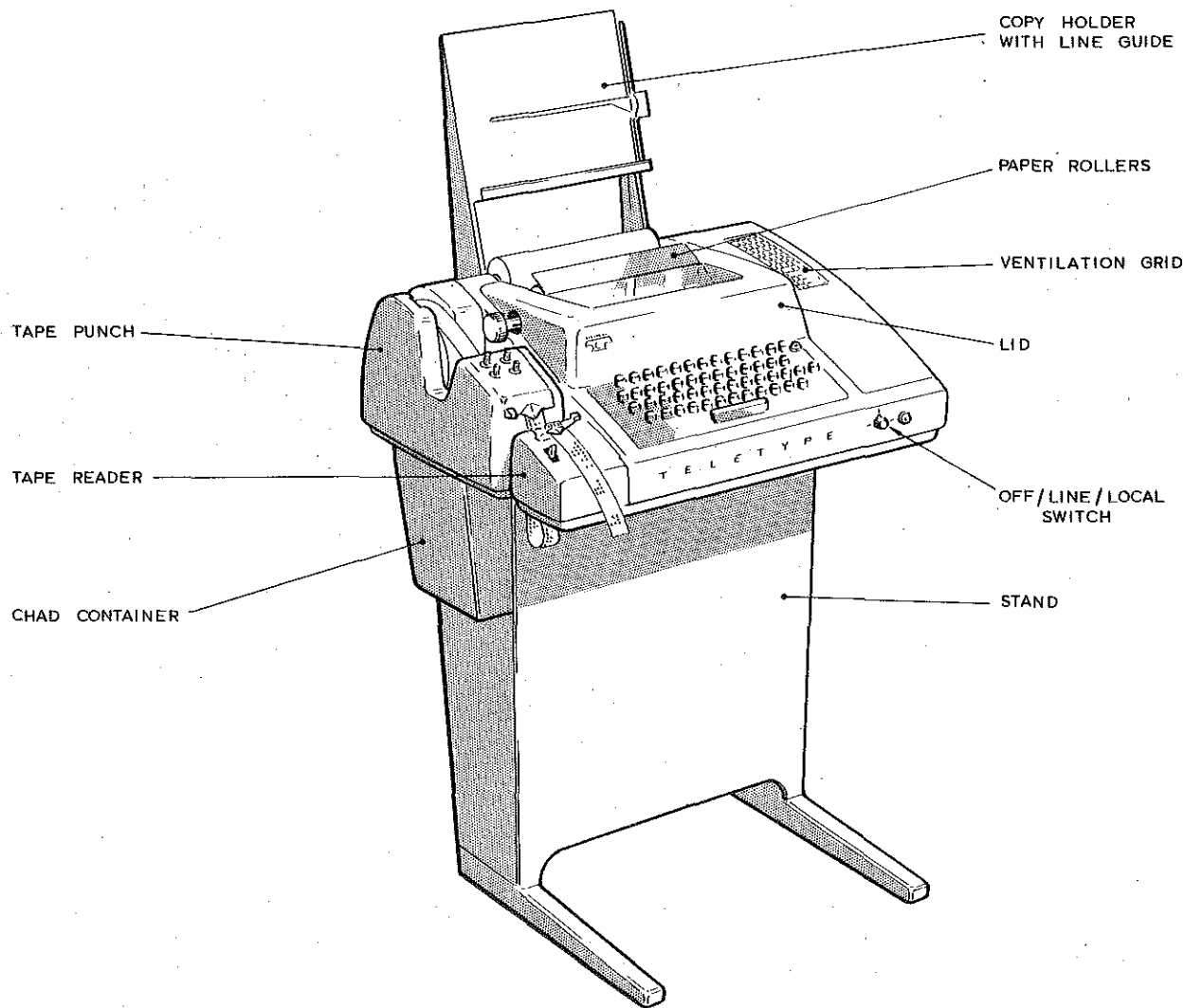
## Contents

	Page
1. General Information .....	1
2. Basic Computer Units Available .....	1
3. Core Store .....	2
4. Information Storage and Retrieval .....	3
5. Instruction Code .....	3
6. Software Available .....	3
7. Program Interrupt System .....	4
8. Input/Output Facilities .....	4
9. Peripheral Devices .....	4



THIS IS THE DESK UNIT FROM THE FRONT & SHOWS THE INTERNAL STORAGE OF EQUIPMENT AS WELL AS THE LAYOUT OF EQUIPMENT BUILT INTO DESK TOP.

Figure 1. (ISSUE 2)



THE TELEPRINTER, THOUGH MOUNTED ON A SEPARATE STAND, OPERATES AS PART OF THE BASIC 903 COMPUTER UNIT.

## 1. General Information

The Elliott 903 is a small, general-purpose digital computer suitable for a wide variety of scientific and research applications, and designed especially for those organisations which do not require a large, expensive system. It is therefore of particular interest to educational establishments and departments of large organisations which require a small autonomous computing system. The 903 is suitable for on-line and off-line applications.

The compact basic computer unit and other features of the system are described briefly in this introduction, and more fully in the rest of the 903 Technical Manual.

## 2. Basic Computer Units Available.

A Basic 903 Computer Unit is supplied with every system. It is the minimum unit of equipment necessary for computation to be controlled and carried out, and for basic input and output, and thus constitutes a small, complete computer system which may be supplemented by other facilities and peripherals for more efficient and higher-speed operation.

Most of the basic 903 unit is mounted in a desk, the lower part of which has been designed as a cabinet containing the electronics and the basic core store module; the Teletype 33 teleprinter, although it is operationally part of the basic unit, is free-standing on a separate mounting. The desk is cream and brown metal and the teleprinter is cream and grey plastic, mounted on a grey metal stand.

Three variations of the basic unit are available as described below; (c), the largest system, is illustrated in Figures 1 and 2 of this introduction.

- (a) central processor  
8192-word core store module  
10 c. p. s. (characters per second) on-line Teletype 33 teleprinter  
control unit
- (b) central processor  
8192-word core store module  
250 c. p. s. tape reader  
110 c. p. s. tape punch  
control unit

## 1. I. Intro.

- (c) central processor
- 8192-word core store module
- 250 c. p. s. tape reader
- 110 c. p. s. tape punch
- 10 c. p. s. on-line Teletype 33 teleprinter
- control unit

The largest system illustrates the full facilities of the basic unit. The paper tape reader allows high-speed input of both program and data tapes, and the paper tape punch provides for output of program results for printing via a tape reproducer. The teleprinter provides for messages to the operator, which would otherwise be directed to the tape punch for subsequent printing, to be displayed at once, and this facilitates immediate action. In the same way, operating instructions (e. g. SIR options) can be typed on the teleprinter. The control unit carries a set of switches and lamps which allow the operator to initiate and control the running of the program manually (including the operation of the Program Interrupt System), and provide him with visible indication of what is happening; audible evidence of program running is provided by a loudspeaker on the control panel. The control unit also carries a Word Generator, which provides a method whereby the operator may input information to the computer directly from the control unit.

## 3. Core Store

Core storage in the 903 is supplied and fitted in units, or modules. The basic module and its power supply are always fitted inside the computer desk unit as shown in Figure 1; the module has a capacity of 8192 words. The basic core store is directly addressable.

The basic core store capacity may be supplemented, as the system expands, by the addition of extra store units. These are supplied in two capacities - 8,192 or 16,384 words - up to a maximum of 57,344 words of extra store; the maximum total store is therefore 65,536 words. Extra store units are not housed inside the main desk; they are housed in other desk cabinets, the number of which will vary according to the amount of extra store fitted. Direct addressing is possible within any 8192-word block of locations, and addressing within blocks is possible by use of the Modifier register.

The access times of the basic and extra core store units are 2  $\mu$ s and 2.2  $\mu$ s respectively. The cycle time when either kind of store is being addressed is 6  $\mu$ s.

#### 4. Information Storage and Retrieval

Information is stored within the 903 in binary form, as a fixed length 18-bit computer word. Each core store location is capable of holding one such word, and information is input from and output to peripheral devices in the same form. The central processor operates in the parallel mode.

Information may be held within the computer word as data or as an instruction. If it is held as data, a word can hold a fraction in the range  $-1 \leq \text{fraction} \leq 1 - 2^{-17}$ . Both positive and negative numbers may be stored; bit 18 of the word is the sign bit, and is zero if the number is positive and 1 if it is negative.

903 instructions are of the single address type. Each instruction occupies an 18-bit word, and is stored as follows:-

Bit	18	17 - 14	13-1
	B-Modifier marker	Function bits	Address bits

The modifier facility adds to the flexibility of the 903 instruction code, and extends the addressing range.

A number of hardware registers assist in the implementation of instructions, and some of them may also be used by the programmer.

#### 5. Instruction Code

There are 16 function codes in the 903 order code; some of them lead to more than one kind of operation, as further specified by the address bits. The time taken to obey instructions varies according to the complexity of the function; in general modified instructions take 6.5  $\mu$ s longer than unmodified instructions.

#### 6. Software Available

Programs run on the 903 may be written in the symbolic assembly language specified for use with SIR (Symbolic Input Routine). SIR may be supplied as a software package. As alternatives, several automatic programming languages are available.

Library routines and standard mathematical routines are also available for a variety of widely-needed operations.

Software is described in Volume 2 of this manual.

## 1. 1. Intro.

## 7. Program Interrupt System

The processor provides four levels of operation, each with a different priority, and these are known as program levels. The processor changes from one level to another as a result of receiving an external stimulus, and such stimuli will usually come from peripheral devices associated with the different program levels.

## 8. Input/Output Facilities

Transfer of information between the 903 central processor and any specified peripheral device is effected across the 903 standard interface. The interface specifies the lines along which transfer signals pass, and so provides the connection between the processor and the peripherals.

The 903 provides the following range of transfer facilities:-

- (a) the 903 Standard Interface allows one standard peripheral to be fitted.
- (b) the Multiplexer extends the facilities of the interface, allowing more than one 903 peripheral to be fitted.
- (c) interface matching units (described fully elsewhere in this Manual) allow peripherals built for connection to other types of interfaces, to be attached and used with the 903.

Four input/output functions are available to the programmer. Where extra store is used, an Autonomous Transfer Unit may be fitted; this allows information to be transferred between the extra store and peripheral devices without going through the computer registers, and thus without interrupting the work of the central processor.

## 9. Peripheral Devices

A range of peripheral devices is being developed for use with the 903 computer. The following devices are at present available, and may be attached by standard connections; the maximum speed of operation is given beside the name of the device. Other devices will be added to the range as they become available:-

Magnetic Quarter Tapes	4,000 characters per sec.
Lineprinter	300 lines per min.
Digital plotter	300 steps per sec.

4100 peripherals may also be attached to the 903 via the 4100 Interface, as explained earlier in this introduction. These devices include IBM compatible magnetic tape units.

The NPL Interface is also available for attachment to the system.