ELLIOTT 900

Volume 1: FUNCTIONAL SPECIFICATION

Part 2: THE BASIC 903 COMPUTER UNIT

Section 1: REGISTERS AND BASIC STORE

Contents

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Chapter 1: REGISTER FACILITIES

1.1 Introduction

Registers are hardware facilities used to store counts, markers, etc. during the running of a program. Certain of the registers in the computer are accessible by program instruction. The functions of these are described below.

1.1.1 B-Register

Basic computer store locations 1, 3, 5 and 7 are allocated for use as modifiers or B-registers to each of the four program levels (see Section 1.2.4). Each B-register contains 18 bits. When bit 18 of an instruction word is zero, the instruction is obeyed as stored. When bit 18 of an instruction word is a one, the contents of the B-register are used to modify the address part of the instruction before the function is obeyed. The contents of the B-register will be a constant stored by program as and when required.

1.1.2 S-Register

Locations 0, 2, 4 and 6 of the basic core store are allocated for use as 16 bit Sequence Control or S-registers to each of the four program priority levels (see Section 1.2.4).

In the course of a program, instructions are extracted from the store under the control of the S-register which holds a number which is the address of the next instruction to be obeyed. Before an instruction is obeyed the number in the S-register is increased by 1, and in the case of a jump instruction, it is replaced by a new address.

1.1.3 A-Register

The A-register or accumulator, which contains 18 bits, holds the result of calculations prior to writing them to store or outputting them to peripheral channels. Most calculations have two operands, one of which is taken from the accumulator, and the results are normally held there.

When a larger register than A is required for a particular calculation, the least significant end of A is extended by linking to it the 17 most significant digits of the Q-register. Any information placed in or generated in the accumulator remains there until overwritten; program should arrange for the contents of the A-register to be stored before this occurs.

If a low priority program is interrupted by one of higher priority (see Section 1.2.4), the contents of the A and Q-registers (a, q) must be stored immediately on entry to the higher level. Immediately before its Program Terminate instruction, the higher priority program must replace a and q so that the original program may be continued from the point at which it was interrupted.

1.1.4 Q-Register

The Q-register has a capacity of 18 bits, and is primarily used as an auxiliary register to extend the A-register at the least significant end for double-length operations such as shifting, multiplication and division. The 17 most significant bits of Q are used for the extension of the A-register.

Chapter 2: BASIC STORE

2. 1 General Description

Basic core storage is supplied in a single module of 8192 words and this module is housed in the central processor cabinet. The central processor has direct access to the information in the core store. Access time and cycle time are 2μs and 6μs respectively.

The basic core storage may be supplemented by extra store modules each of 8192 or 16, 384 words, up to a maximum of 65, 536 words; extra store is described in Section 1. 3. 4.

The contents of either type of store module are not disturbed during normal shut down and start up.

2. 2 Allocated Locations

The basic core store of the 903 computer has locations reserved for special functions.

Store locations 0 to 7 inclusive are reserved for use as B-registers and S-registers for the four program levels (see Section 1. 2. 4).

Store locations 8180 to 8191 contain a set of Initial Instructions, which allow the reading of program tape into the computer. In the basic system these locations may under certain conditions be used as normal store locations. This is made possible as an additional effect of the Level Terminate instruction (15 7168) which disables the Initial Instructions until the Initial Instructions routine is entered again. This effect is not available on early systems.

Further information concerning Initial Instructions is detailed in Section 1. 2. 3.

Chapter 3: STORE ADDRESSING

3.1 Introduction

The addressing of basic and extra store is effected by the use of the S and B-registers.

The address of each extra store location is determined solely by the position of each extra store module in the desks attached to the computer and the position of the location within the module.

3.2 Mode of Address

The S-register contains 16 bits which are used directly to form the store address from which an instruction is obeyed. The three most significant bits (14-16) of the S-register are combined with the 13 address bits of the instruction to form the 16-bit operand address.

The effect of this is that when an instruction has been extracted from a particular store module, its operand will also be extracted from that module. In this way all instruction addresses are relative to the first location of the section of store in which a program is placed. The three bits (14-16) of the S-register specify the module of store in use, so switching between programs in different modules by the use of INTERRUPTS is possible.

Reference to data in a module other than the one in which the program is placed, or transfer of control to a program in another module, must utilise a modified instruction.

When an instruction is modified, the address is obtained by adding the 16 bit operand address as obtained above, to the 16 least significant bits of the B-register (carry into the 17th bit position being ignored). Thus, by the use of a suitable 16 bit number in the B-register any 16-bit address can be generated and reference made to or control transferred to any of the 65,536 store locations available.

In the particular case where an instruction stored in the highest location of a particular module is obeyed, the address part of the instruction is still interpreted relative to the first location of that module, although bits 14-16 of the S-register specify the next module of store at the time the instruction is obeyed.