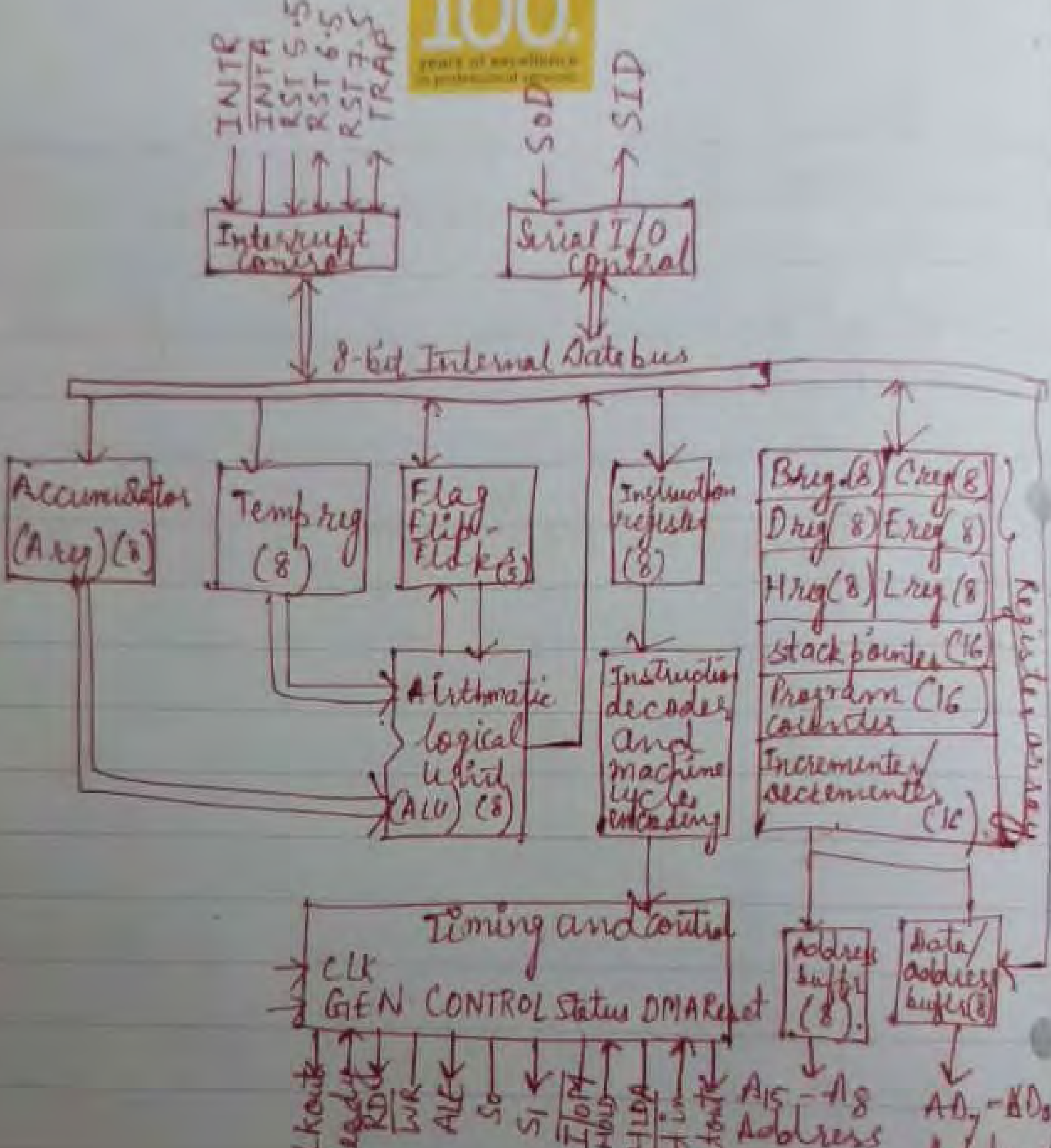

Internal Architecture of 8085 Microprocessor

Control unit

Generates signals within up to carry out the Instruction, which has been decoded. In reality causes certain connections between blocks of the up to be opened or closed, so the data goes where it is required, and so that ALU operation occurs.

Arithmetic logic unit :-

The ALU performs the actual numerical and logic operations such as 'add', 'subtract', 'AND', 'OR', etc. Uses data from memory and from Accumulator to perform arithmetic. Always stores result of operation in Accumulator.

Registers

The 8085/8080A - programming model includes six registers, one accumulator and one flag register, as shown in figure. ~~They can be combined as register pair~~. In addition, it has two 16- bit registers; the stack pointer and the Program counter. They are described breifly

as follows
The 8085/8080A has six general-purpose registers to store 8-bit data; these are identified as B, C, D, E, H and L, as shown in the figure. They can be combined as register pairs - BC, DE, and HL - to perform some 16-bit operations. The programmer can use these registers to store or copy data into the registers by using data copy instruction

Accumulator

The accumulator is an 8-bit register that is a part of arithmetic/logic unit (ALU). This register is used to store 8-bit data and to perform arithmetic and logical operations. The result of an operation is stored in the accumulator. The accumulator is also identified as register A.

Flags

The ALU includes five flip flops, which are set or reset after an operation according data conditions of the result in the accumulator and other registers. They are called Zero(Z), carry (CY), Sign(S), Parity (P), and Auxiliary Carry (AC) flags; they are listed in the Table and their bit positions in the flag register are shown in the figure below. The most commonly used flags are zero, carry, and sign. The microprocessor uses these flags to test data conditions.

For example, after an addition of two numbers, if the sum in the accumulator is larger than eight bits, the flip flops uses to indicate a carry - called the carry flag (CY) - is set to one. When an arithmetic operation results in zero, the flip flop called the Zero (Z) flag is set to one. The first figure shows an 8-bit register called the flag register, adjacent to the accumulator. However it is not used as a register; five bit positions out of eight are used to store the outputs of the five flip-flops. The flags are stored in the 8-bit register so that the programmer can examine these flags (data conditions) by accessing the register through an instruction

These flags have critical importance in the decision making process of the microprocessor. The conditions (set or reset) of the flags are tested through the software instructions: For example, the instruction JC (Jump on Carry) is implemented to change the sequence of a program when CY flag is set. The thorough understanding of flag is essential in writing assembly language programs.

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CY flag is set. The Thorough understanding of a flag is essential in writting assembly language programs.

Program Counter (PC)

This 16-bit register deals with sequencing the execution of instructions. This register is a memory pointer. Memory locations have 16-bit addresses, and that is why this is a 16-bit register.

The microprocessor uses this register to sequence the execution of the instructions. The Function of the program counter is to point to the memory address from which the next byte is to be fetched. When a byte (machine code) is being fetched, the program counter is incremented by one to point to the next memory location.

stack Painter (SP).

The stack Painter is also a 16-bit register used as a memory pointer. It points to a memory location in R/W memory, called the stack. The beginning of the stack is defined by loading 16-bit address in the stack pointer. The stack concept is explained in the chapter. "stack and subroutines".

Instruction register / Decoder

Temporary store for the current instruction of a program. Latest instruction sent here from memory prior to execution. Decoder then takes instruction and decodes or interprets the instruction. Decoded instruction then passed to next stage.

· Memory Address Register

Holds address, received from PC of next program instruction. Feeds the address

Scanned with CamScanner

bus with addresses of location of the program under execution

control generator
generates signals within up to carryout the instruction which has been decoded.
In reality causes certain connections between blocks of the up to be opened or closed, so that data goes where it is required, and so that ALU operations occur.

Register selector

This block controls the use of the register stack in the example. Just a logic circuit which switches between different registers in the set will receive instructions from control unit.

general purpose Registers

up requires extra registers for versatility. Can be used to store additional data during a program. More complex processors may have a variety of differently named registers

Microprogramming

How does the up knows what an instruction means, especially when it is only a binary number? The microprogram in a up/uC is written by the chip designer and tells the up/uC the meaning of each instruction up/uC can then carry out operation.

2. 8085 system Bus.

Typical system uses a number of busses, collection of wires, which transmit binary numbers, one bit per wire. A typical microprocessor communicates with memory and other devices (input and output) using three busses: Address Bus, Data bus and Control bus.

Address Bus

one wire for each bit, therefore 16 bits = 16 wires. Binary number carried alerts memory to 'open' the designated box. Data (binary) can then be put in or taken out. The Address Bus consists of 16 wires therefore 16 bits. Its "width" is 16 bits. A 16 bit binary number allows 2^{16} different numbers, or 32 000 different numbers. ie 0000 0000 0000 0000 up to 1111 1111 1111 1111.

Because memory consists of boxes, each with a unique address, the size of the address bus determines the size of memory which can be used. To communicate with memory the up sends an address on the address bus, eg 0000000000000 11. Because memory consists of boxes, each with a unique address, the size of the address bus determines the size of the memory!

Data Bus

Data bus carries 'data' in binary form, between µp and other external units, such as memory. Typical size is 8 or 16 bits. Size determined by size of boxes in memory and µp size helps determine performance of µp.

- ⇒ Data bus consists of 8 wires. Therefore 2^8 combinations of binary digits.
- ⇒ Bus is Bi-directional.
- ⇒ Largest no is 11111111 (255 in decimal)
- ⇒ Size of the bus therefore limits the number of possible Instruction to 256.

Control Bus

⇒ control bus are various lines which have specific functions for coordinating and controlling µp operations.

example Read/ Write ie
Read/ Not write

This means, control whether memory is being 'written to' (data stored in mem) or 'read from' (data taken out of mem) 1= Read , 0= write.

⇒ µp has 10 control lines.
⇒ Control bus carries control signals partly unidirectional, party bi-directional

⇒ Control signals are things like "read or write". This tells memory that we are either reading from a location, specified on the address bus or writing to a location specified.