

Figure 2: Architecture of the Z80 microprocessor showing the internal registers.

Sixteen bits are not enough to address a megabyte of memory. The 8086 manages to do so, however, by dividing the megabyte of memory into a number of segments of 64K bytes each. Each segment begins at an address that yields an even result when divided by 16.

All calculations of memory addresses in the 8086 involve four special registers called segment registers. The 8080 family has a 16-bit address bus that allows addressing of 65,536 bytes of memory. While the internal registers of the 8088/8086 family also have 16 bits, the external address bus has 20 bits. To get the 20-bit address, the 8086 extends a segment register with 4 low-order bits of 0, and adds the segment register to a 16-bit address from another register, as shown in figure 4.

Each segment register defines what is known as its own "current" segment. Each instruction specifies an offset into a segment. The segment registers, which *cannot* be used interchangeably, are as follows:

CS—The Code Segment register defines the 64K-byte current code segment. When an instruction is fetched, the contents of the program counter are added to the CS register contents to calculate the address of the instruction to be fetched.

DS—The Data Segment register defines the current data segment. With three exceptions, all data memory references are understood in relation to the DS register. (The exceptions are that the stack pointer is used to calculate stack addresses, any data memory addresses calculated using the BP register are taken in relation to the stack segment, and any string operations involving the destination are taken in relation to the extra segment. See SS and ES immediately below.)

SS—The Stack Segment register identifies the current stack segment. References to data memory that use the BP or SP register in calculating the address are understood in relation to the SS register. For example, the PUSH, POP, CALL, INT, and RET instructions use the SS register.

ES—The Extra Segment register plays

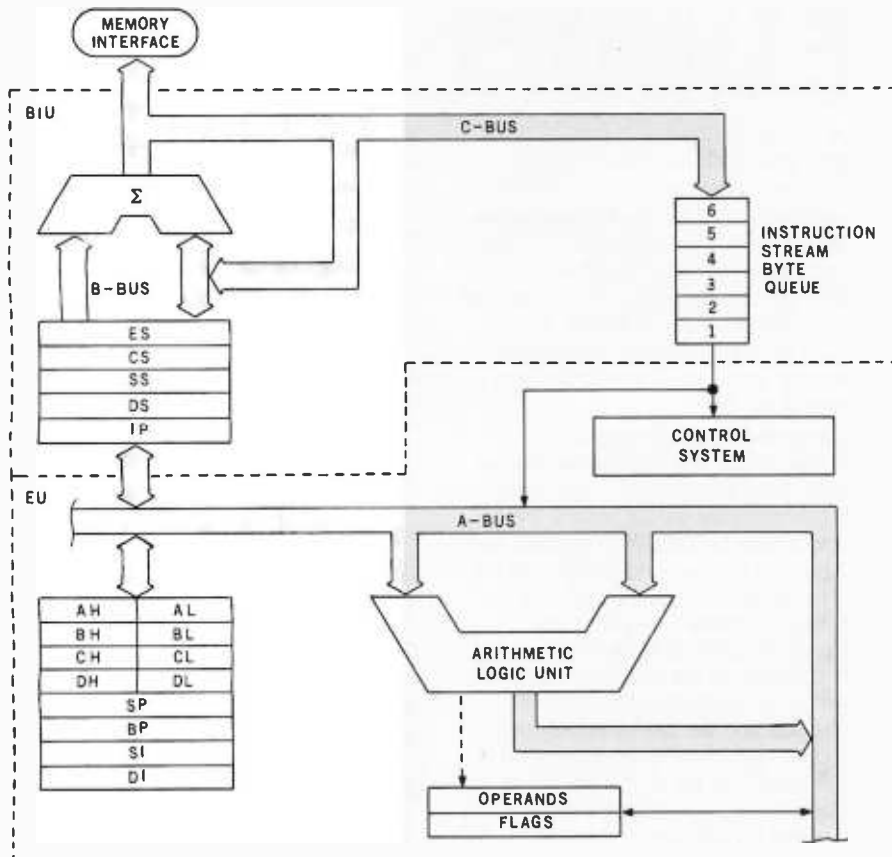


Figure 3: Architecture of the 8086/8088 microprocessor showing the internal registers.