8080 MICROPROCESSOR

1. INTRODUCTION

The 8080 is a complete 8-bit parallel central processing unit (CPU) for use in general purpose digital computer systems. It is fabricated on a single LSI chip using Intel's n-channel silicon gate MOS process, thus offering much higher performance than conventional microprocessors (2μs instruction cycle). A complete micro computer system is formed when the 8080 CPU is interfaced with I/O ports (up to 256 input and 256 output ports) and any type or speed of semi-conductor memory.

Although significantly higher in performance than existing microprocessors, the 8080 has been designed to be software compatible at the source code level with Intel's 8008 microprocessor. Like the 8008, the 8080 contains six 8-bit data registers, an 8-bit accumulator, four 8-bit temporary registers, four testable flag bits, and an 8-bit parallel binary arithmetic unit. The 8080 also provides decimal arithmetic capability, and it includes sixteen bit arithmetic and immediate operators which greatly simplify memory address calculations, and high speed arithmetic operations.

The 8080 has a stack architecture wherein any portion of the external memory can be used as a last in/first out stack to store/retrieve the contents of the accumulator, the flags, or any of the data registers.

The 8080 also contains a 16-bit stack pointer to control the addressing of this external stack. One of the major advantages of the stack is that multiple level interrupts can easily be handled since complete system status can easily be saved when an interrupt occurs and then be restored after the interrupt. Another major advantage is that almost unlimited subroutine nesting is possible.

This processor has been designed to greatly simplify system design. Separate 16-line address and 8-line bidirectional data busses are used to allow direct interface to memories and I/O ports. Control signals, which require no decoding, are provided directly by the processor. All busses, including control, are TTL compatible.

Communication on the address lines and the data lines can be interlocked by using the HOLD input. When the HLDA (Hold Acknowledge) signal is issued by the CPU, CPU operation is suspended and the address and data lines are forced to be in the FLOATING state. This permits "OR-tying" the address and data busses with other devices such as direct memory access channels (DMA).

The 8080 has many instructions which are extremely useful and extend the range of applicability of the CPU. The instruction groups are as follows:

- Data register and memory transfers
- Conditional or unconditional branches and subroutine calls
- I/O operations
- Direct Load/Store Accumulator
- Save, Restore Data Registers, Accumulator and Flags
- Double Length Operation in Data Registers
  - Increment/Decrement/Addition
  - Direct Load/Store (H and L)
  - Load Immediate
  - Index Register Modification
- Indirect Jump
- Stack Pointer Modification
- Logical Operations
- Binary Arithmetic
- Decimal Arithmetic
- Set and reset interrupt enable flip-flop
- Increment/Decrement Memory of data registers

8080 ADDRESSING MODES:
DIRECT
REGISTER
REGISTER INDIRECT
IMMEDIATE

Figure 1. 8080 CPU Functional Block Diagram