KOMPUTER KORNER

DAVID LARSEN, PETER RONY, and JOHN TITUS*

THIS MONTH WE WILL DISCUSS THE 8080 microprocessor. Will cover the 8080's hardware architecture and in a future column we will discuss its instruction set and programming characteristics. This should provide us with enough information to begin discussing various programming techniques illustrated with examples using the 8080.

Background

The 8080 microprocessor was introduced by Intel Corporation in late 1973. It is a direct descendant of the Intel 8008 and it was developed to provide additional features and corrections to limitations imposed on the 8008 by process and packaging constraints. The 8080 is an 8-bit parallel microcomputer central processing unit, fabricated on a single integrated circuit using an n-channel MOS process. It has a basic machine cycle time of 500 ns, with instruction execution times ranging from 4 to 18 machine cycles (2 μs to 9 μs). The 8080 requires an external two-phase clock and power supplies of +5, +12, and −12, all referenced to ground.

The 8080 must be supported by various peripheral circuits if it is to be made into a useful system. This interface is accomplished using an 8-bit data bus, a 16-bit address bus, and ten timing and control signals (six outputs and four inputs). The bus structure and control signals allow the 8080 to be interfaced to a wide variety of memory and I/O devices. All outputs and inputs (except for the clocks) are capable of directly interfacing one TTL load. In addition, the address and data busses are both three-state. This provides for bi-directional data transfers using the normal high or low states. The third is a high impedance "floating" state that permits multiple devices to be wired in parallel to the bus.

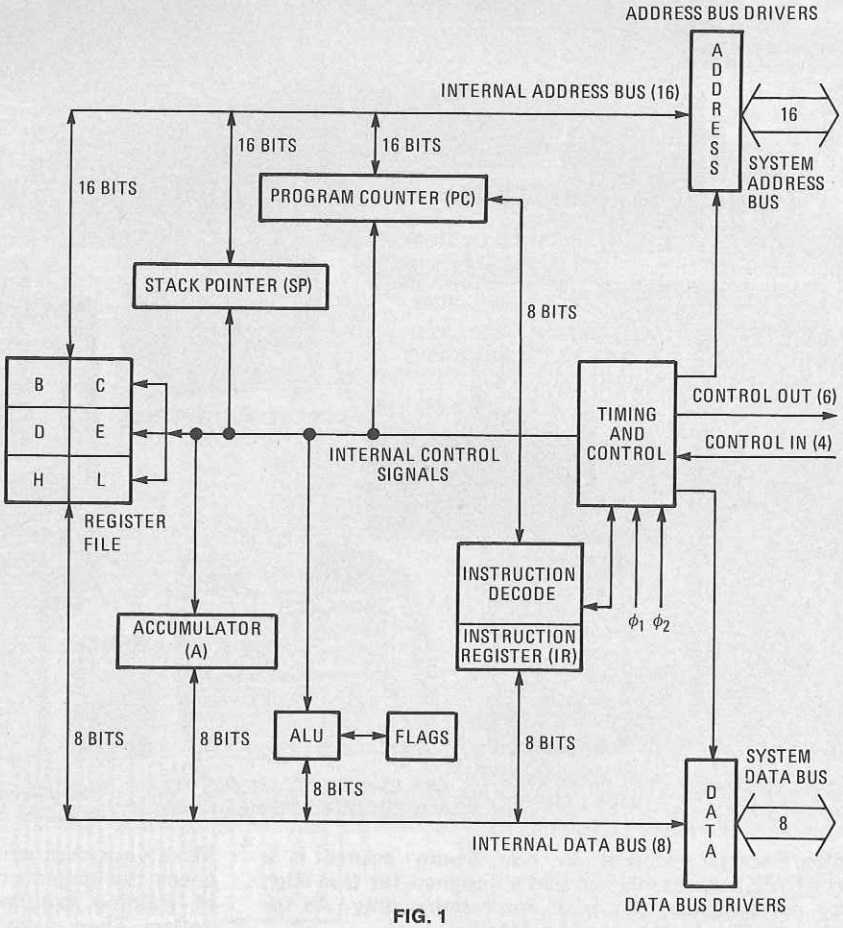

FIG. 1

Architecture

A block diagram of the 8080's basic architecture is shown in Fig. 1. With the

(continued on page 24)

*This article is reprinted courtesy of American Laboratories.

(continued from page 22)

exception of its internal register file and separate address and data buses, the architecture is fairly conventional. From a user standpoint, the areas that are of most interest to us are the registers, memory addressing modes, instruction set and basic timing and control sequences. These are the features that have the most effect on how we will be able to use the processor in practical systems.

Registers

The 8080 provides an interesting internal register structure. The user accessible registers are organized into three 16-bit general-purpose registers (BC, DE, and HL), a 16-bit stack pointer (SP), a 16-bit program counter (PC), and an eight-bit accumulator. There are also five processor flags that are treated together as a register by certain instructions.

The three 16-bit general-purpose registers are designed so that they can also be used as six independent 8-bit registers for a number of operations. The internal organization of the 8080 makes this feature significant. The 8080 uses an 8-bit word (byte) as its basic memory data elements. However, it addresses memory with a 16-bit memory address. To do this, the 8080 is effectively divided internally into an eight-bit "data side" and a 16-bit "address side". Now, one of the most important measure of any computer's flexibility is

(continued on page 87)

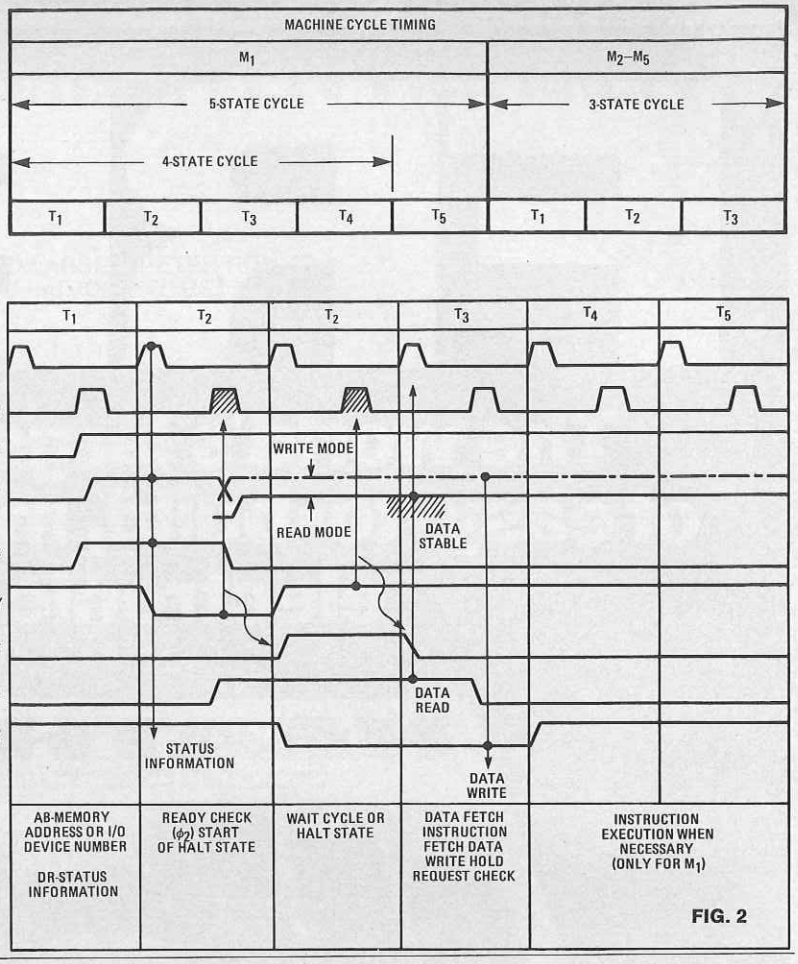

FIG. 2