BASIC INPUT/OUTPUT OPERATIONS

We now examine the means by which data are transferred between the memory of a computer and the outside world. Input/Output (I/O) operations are essential, and the way they are performed can have a significant effect on the performance of the computer.

Consider a task that reads in character input from a keyboard and produces character output on a display screen. A simple way of performing such I/O tasks is to use a method known as program-controlled I/O. The rate of data transfer from the keyboard to a computer is limited by the typing speed of the user, which is unlikely to exceed a few characters per second. The rate of output transfers from the computer to the display is much higher. It is determined by the rate at which characters can be transmitted over the link between the computer and the display device, typically several thousand characters per second. However, this is still much slower than the speed of a processor that can execute many millions of instructions per second. The difference in speed between the processor and I/O devices creates the need for mechanisms to synchronize the transfer of data between them.

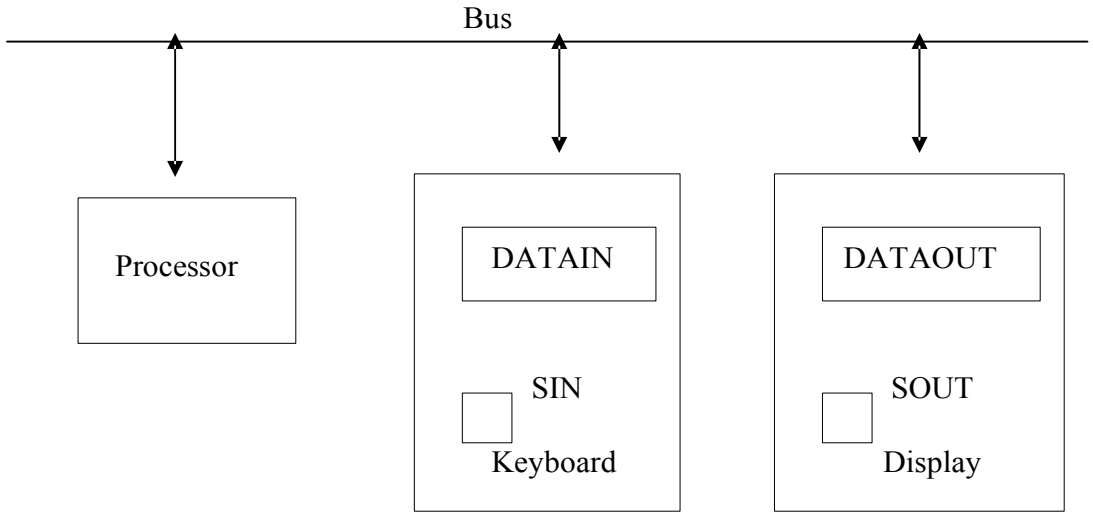

Fig a Bus connection for processor, keyboard, and display

The keyboard and the display are separate device as shown in fig a. the action of striking a key on the keyboard does not automatically cause the corresponding character to be displayed on the screen. One block of instructions in the I/O program transfers the character into the processor, and another associated block of instructions causes the character to be displayed.

Striking a key stores the corresponding character code in an 8-bit buffer register associated with the keyboard. Let us call this register DATAIN, as shown in fig a. To

inform the processor that a valid character is in DATAIN, a status control flag, SIN, is set to 1. A program monitors SIN, and when SIN is set to 1, the processor reads the contents of DATAIN. When the character is transferred to the processor, SIN is automatically cleared to 0. If a second character is entered at the keyboard, SIN is again set to 1, and the processor repeats.

An analogous process takes place when characters are transferred from the processor to the display. A buffer register, DATAOUT, and a status control flag, SOUT, are used for this transfer. When SOUT equals 1, the display is ready to receive a character.

In order to perform I/O transfers, we need machine instructions that can check the state of the status flags and transfer data between the processor and the I/O device. These instructions are similar in format to those used for moving data between the processor and the memory. For example, the processor can monitor the keyboard status flag SIN and transfer a character from DATAIN to register R1 by the following sequence of operations.

Source : http://elearningatria.files.wordpress.com/2013/10/cse-iv-computer-organization-10cs46-notes.pdf