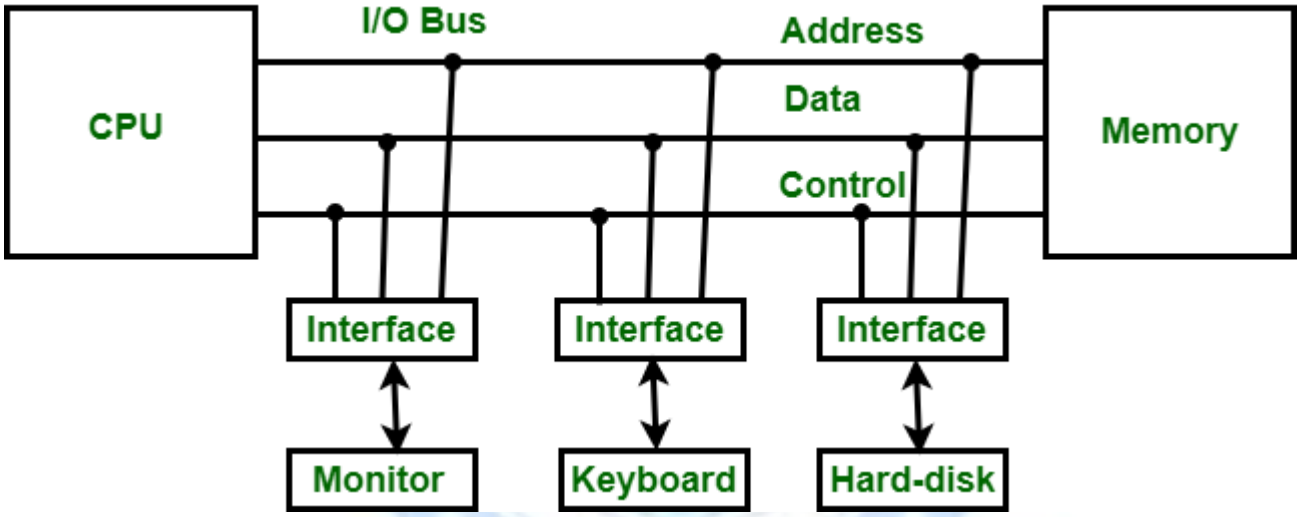
Introduction to Input-Output Interface

Input-Output Interface is used as a method which helps in transferring of information between the internal storage devices i.e. memory and the external peripheral device . A peripheral device is that which provide input and output for the computer, it is also called Input-Output devices. For Example: A keyboard and mouse provide Input to the computer are called input devices while a monitor and printer that provide output to the computer are called output devices. Just like the external hard-drives, there is also availability of some peripheral devices which are able to provide both input and output.



Input-Output Interface

In micro-computer base system, the only purpose of peripheral devices is just to provide **special communication links** for the interfacing them with the CPU. To resolve the differences between peripheral devices and CPU, there is a special need for communication links.

The major differences are as follows:

1. The nature of peripheral devices is electromagnetic and electro-mechanical. The nature of the CPU is electronic. There is a lot of difference in the mode of operation of both peripheral devices and CPU.
2. There is also a synchronization mechanism because the data transfer rate of peripheral devices are slow than CPU.
3. In peripheral devices, data code and formats are differ from the format in the CPU and memory.

4. The operating mode of peripheral devices are different and each may be controlled so as not to disturb the operation of other peripheral devices connected to CPU.

There is a special need of the additional hardware to resolve the differences between CPU and peripheral devices to supervise and synchronize all input and output devices.

Functions of Input-Output Interface:

1. It is used to synchronize the operating speed of CPU with respect to input-output devices.
2. It selects the input-output device which is appropriate for the interpretation of the input-output signal.
3. It is capable of providing signals like control and timing signals.
4. In this data buffering can be possible through data bus.
5. There are various error detectors.
6. It converts serial data into parallel data and vice-versa.
7. It also convert digital data into analog signal and vice-versa.

An I/O interface consists of circuits which connect an, I/O device to a computer bus.The interface can be classified as serial interface or parallel interface.

Parallel and Serial Interface

• An I/O interface consists of circuits which connect an, I/O device to a computer bus.

• As shown in Fig. 8.9.1 on one side of the interface we have the bus signals for address, data and control. On the other side we have a data path with its associated controls to transfer data between the interface and the I/O device.

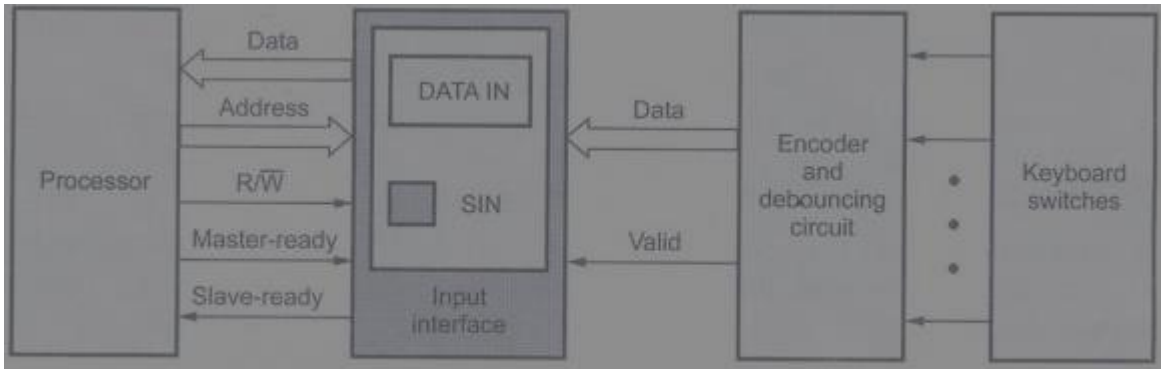


Fig. 8.9.1 Hardware components for connecting a keyboard to a processor

• The interface can be classified as serial interface or parallel interface.

Parallel Interface

• Parallel interface is used to send or receive data having group of bits (8-bits or 16-bits) simultaneously.

• According to usage, hardware and control signal requirements parallel interfaces are classified as input interface and output interface.

• Input interfaces are used to receive the data whereas output interfaces are used to send the data.

Input Interface

• Commonly used input device is a keyboard. Fig. 8.9.1 shows the hardware components needed for connecting a keyboard to a processor.

• A typical keyboard consists of mechanical switches that are normally open. When key is pressed, corresponding signal alters and encoder circuit generates ASCII code for the corresponding key.

Output Interface

• The Fig. 8.9.5 shows typical example of output interface which is used to interface parallel printer.

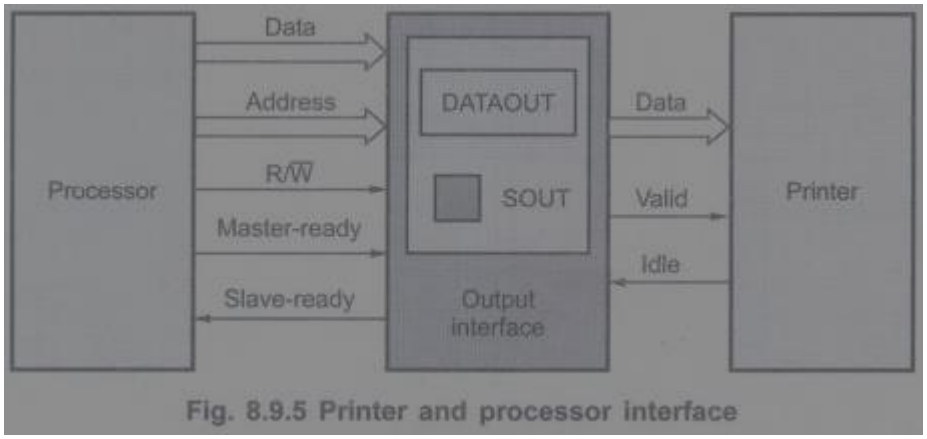


Fig. 8.9.5 Printer and processor interface

• The output interface contains a data register, DATAOUT, and a status flag, SOUT.

• The SOUT flag is set to 1 when the printer is ready to accept another character, and it is cleared to 0 when a new character is loaded into DATAOUT by the processor.

Serial Interface

• A serial interface is used to transmit / receive data serially, i.e,, one bit at a time.

• A key feature of an interface circuit for a serial port is that it is capable of communicating in a bit serial fashion on the device side and in a bit parallel fashion on the processor side.

• A shift register is used to transform information between the parallel and serial formats. The Fig. 8.9.9 shows the block diagram of typical internal circuit for serial interface.

• As shown in the Fig. 8.9.9, the input shift register accepts serial data bit by bit and converts it into the parallel data. The converted parallel data is loaded in the data register and it is then read by the processor using data bus.

• When it is necessary to send data serially, the data is loaded into DATAOUT register. It is then loaded into output shift register. Output shift register converts this parallel data into serial data.

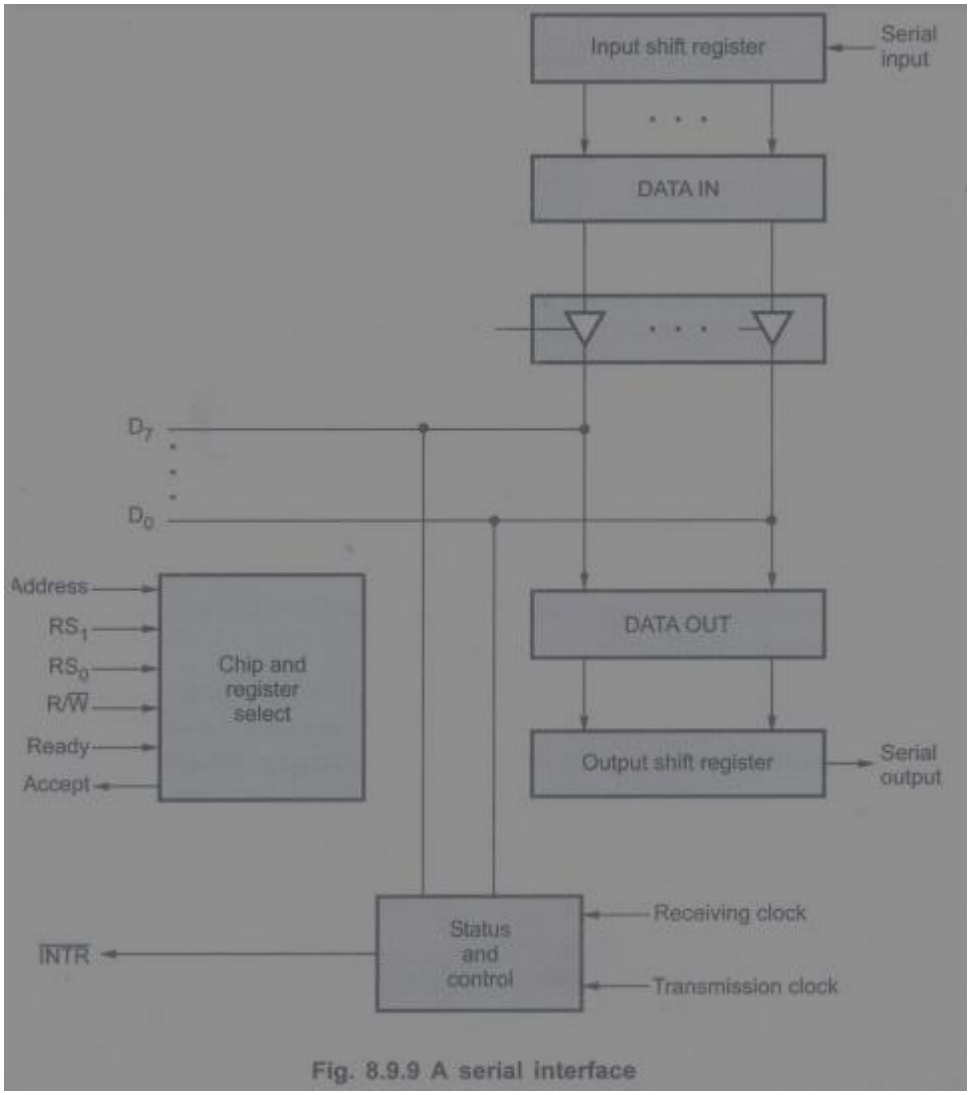


Fig. 8.9.9 A serial interface

Comparison between Serial and Parallel Interface

• In parallel interface number of lines required to transfer data depend on the number of bits to be transferred.

• For transmitting data over a long distance, using parallel interface is impractical due to the increase in cost of cabling.

• Parallel interface is also not practical for devices such as cassette tapes or a CRT terminal. In such situations, serial interface is used.

• In serial interface one bit is transferred at a time over a single line.

Sr. No.	Serial interface	Parallel interface
1.	It transfer data one bit at a time.	It can transmit more than one data bit at a time.
2.	Lower data transfer rate.	Faster data transfer rate.
3.	Needs less number of wires to connect devices in the system.	Needs more number of wires to connect devices in the system.
4.	Well suited for long distances, because fewer wires are used as compared to a parallel bus.	The interconnection penalty increases as distances increase. Thus not suitable for long distance interface.

Table 8.9.2 Comparison between serial and parallel interface

Modes of Transfer

The primary modes of data transfer in computer architecture between the CPU and I/O devices are:

1. Programmed I/O
2. Interrupt-initiated I/O
3. Direct Memory Access (DMA).