IO

IO Modules

- The third key element of a computer system is a set of I/O modules.
- Each module interfaces to the system bus or central switch and controls one or more peripheral devices.
- An I/O module is not simply a set of mechanical connectors that wire a device into the system bus. Rather, the I/O module contains logic for performing a communication function between the peripheral and the bus.

Issues with Peripherals

- There are a wide variety of peripherals with various methods of operation. It would be impractical to incorporate the necessary logic within the processor to control a range of devices.
- The data transfer rate of peripherals is often much slower than that of the memory or processor. Thus, it is impractical to use the high- speed system bus to communicate directly with a peripheral.
- On the other hand, the data transfer rate of some peripherals is faster than that of the memory or processor. Again, the mismatch would lead to inefficiencies if not managed properly.
- Peripherals often use different data formats and word lengths than the computer to which they are attached.

IO Modules

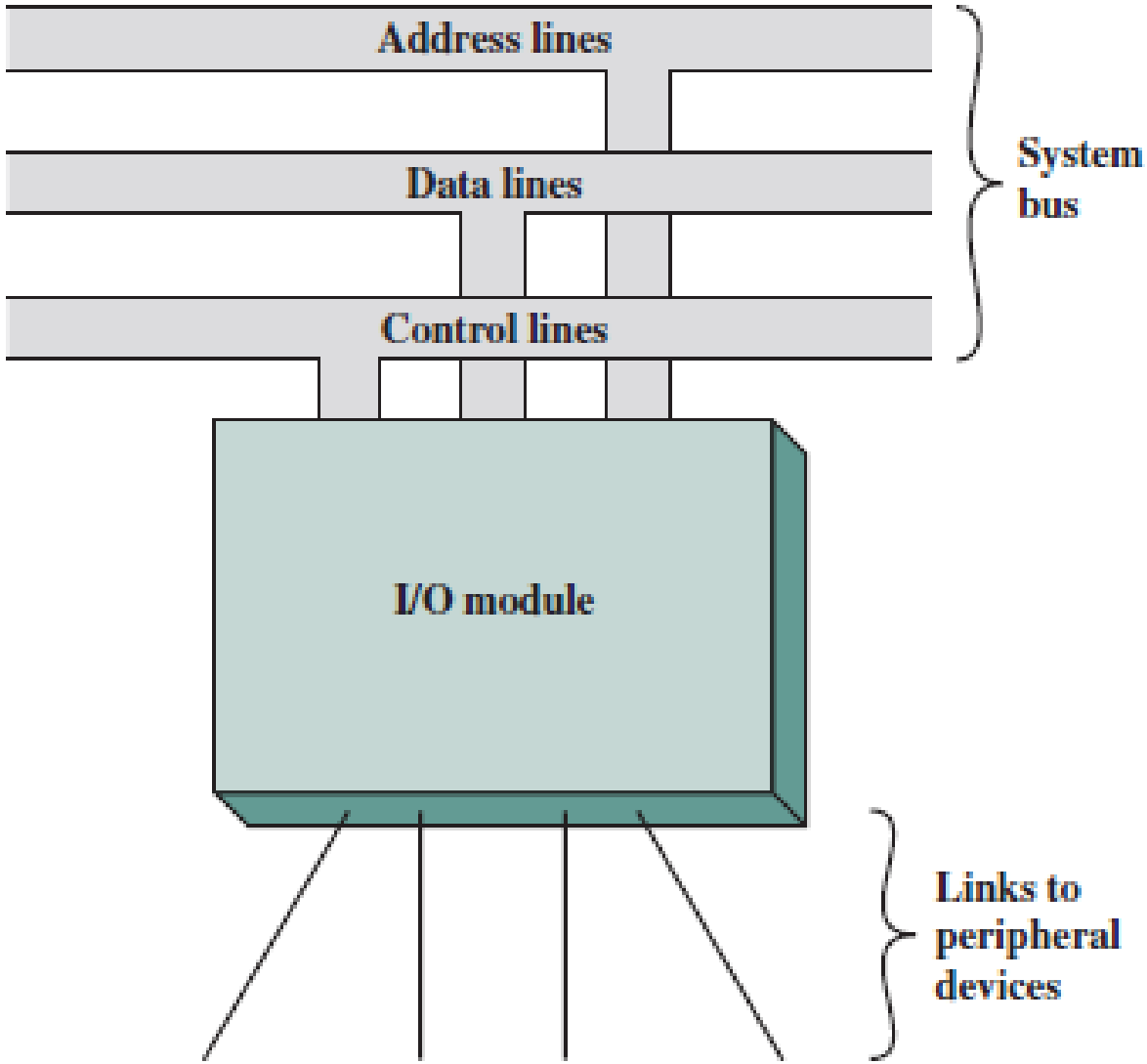
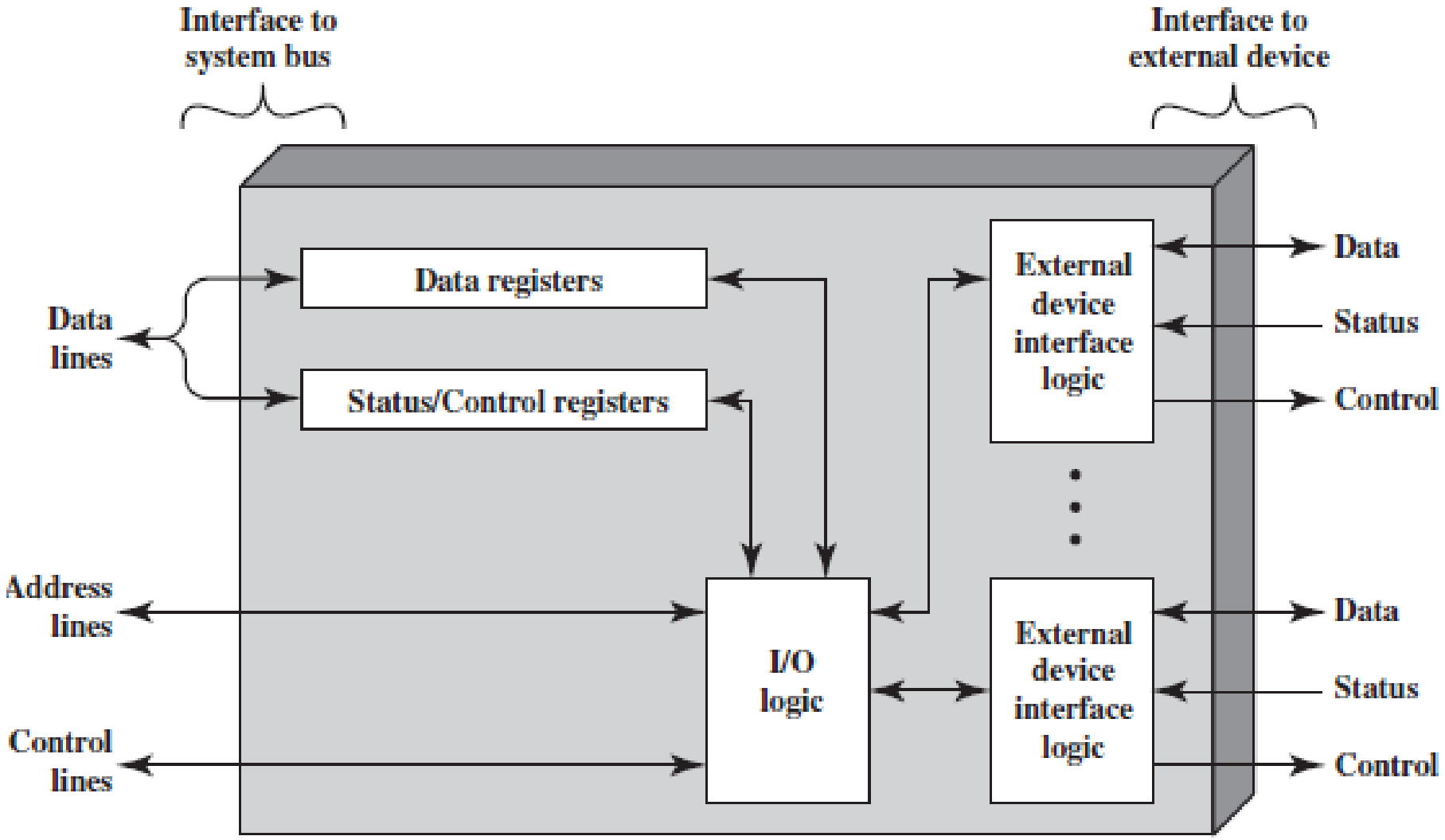


Figure 7.1 Generic Model of an I/O Module

IO Modules - Functions

- The major functions or requirements for an I/O module fall into the following categories:
  - Control and timing
  - Processor communication
  - Device communication
  - Data buffering
  - Error detection

I/O Module Structure



DMA

- DMA involves an additional module on the system bus. The DMA module is capable of mimicking the processor and, indeed, of ta
- The processor wishes to read or write a block of data, it issues a command to the DMA module.
- The processor then continues with other work. It has delegated this I/O operation to the DMA module. The DMA module transfers the entire block of data, one word at a time, directly to or from memory, without going through the processor.
- When the transfer is complete, the DMA module sends an interrupt signal to the processor. Thus, the processor is involved only at the beginning and end of the transfer

Operating System

- The OS is a program that manages the computer's resources, provides services for programmers, and schedules the execution of other programs.
- OS Objectives: **Convenience, Efficiency**
- OS Aspects: ***user/computer interface, resource manager***

Types of Operating Systems

- *simple batch systems*
- *multiprogrammed batch systems*
- *time- sharing systems*