Module 5

Input/Output Ports

Objectives

1. PC Hardware
   A. 1.7 Compare and contrast various connection interfaces and explain their purpose

INPUT/OUTPUT PORTS

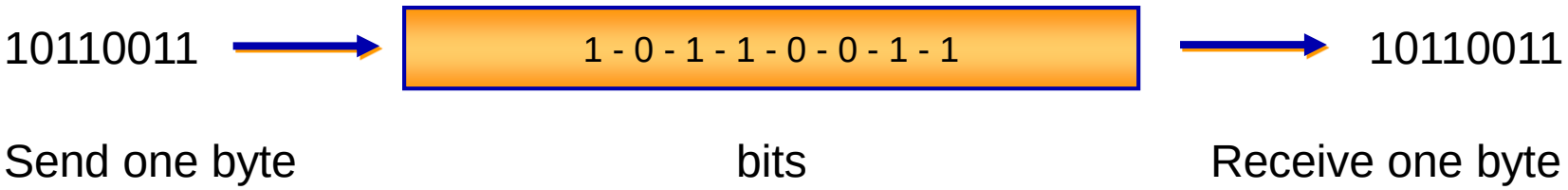
Device Connection

I/O ports (Input/Output)

1. All devices that connect outside of the computer must use a n I/O port
2. Bits can travel in serial or in parallel
3. Most setting are found in the BIOS

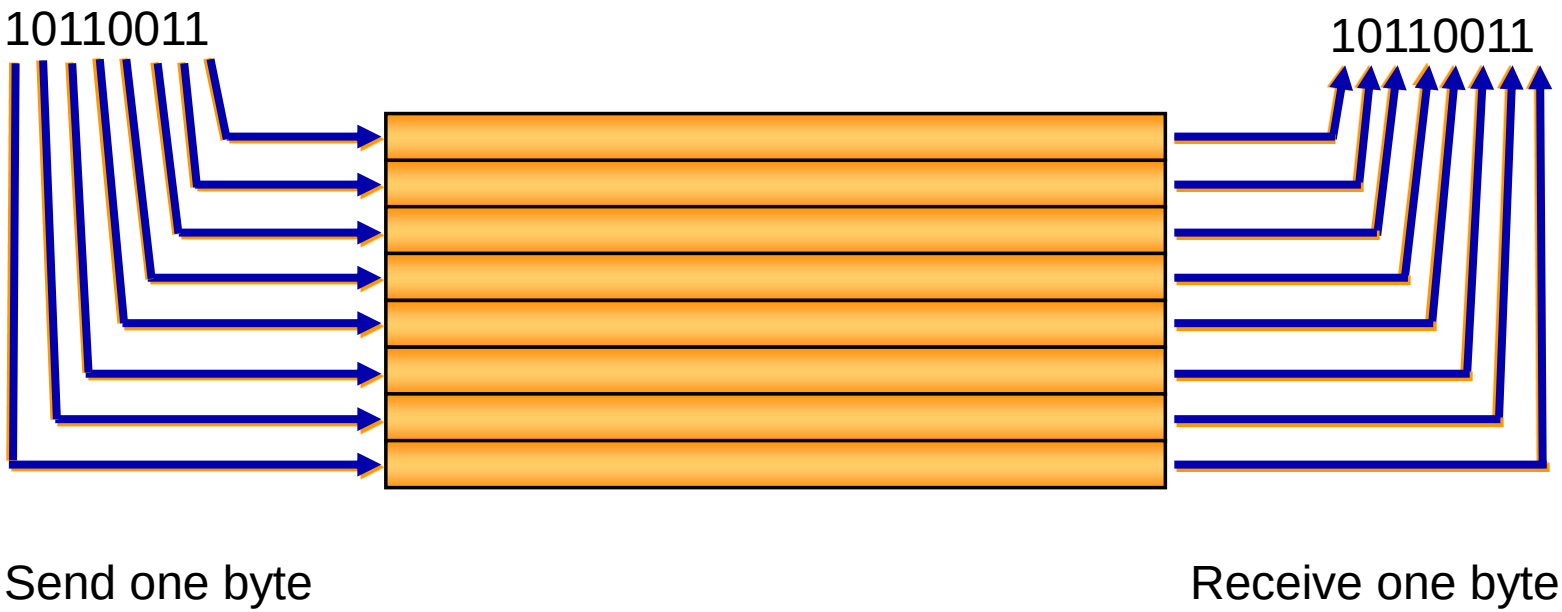
Serial Transmission

Sent one **bit** at a time



Parallel Transmission

Sent one **Byte** at a time



Types of Ports

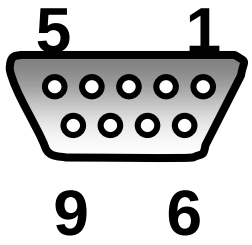
1. Serial
2. Parallel
3. PS/2
4. USB
5. FireWire
6. Bluetooth
7. Video (discussed later)
8. Inferred IR (not covered on exam)
9. SCSI (discussed later)
10. PCMCIA (discussed with laptops)

Serial Connectors

1. Can use a DB-9 or DB-25 pin male connector
2. Slowest ports
3. Used for:
    A. Mice
    B. Modems

Serial Ports

1. Also called **communication (COM) ports**
2. **Bi-directional**
3. Allows each device to receive data as well as transmit it
4. Use different pins to receive and transmit data
5. Allows for full-duplex communication
6. Also called COM1, COM2, COM3, and COM4
7. Can be referred to as a **RS-232 port**

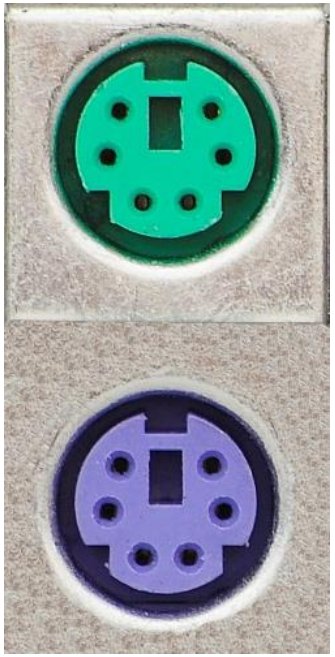


DIN-5 Keyboard Connector

1. Used by older AT motherboards for the keyboard connection
2. DB9 serial connection for the mouse

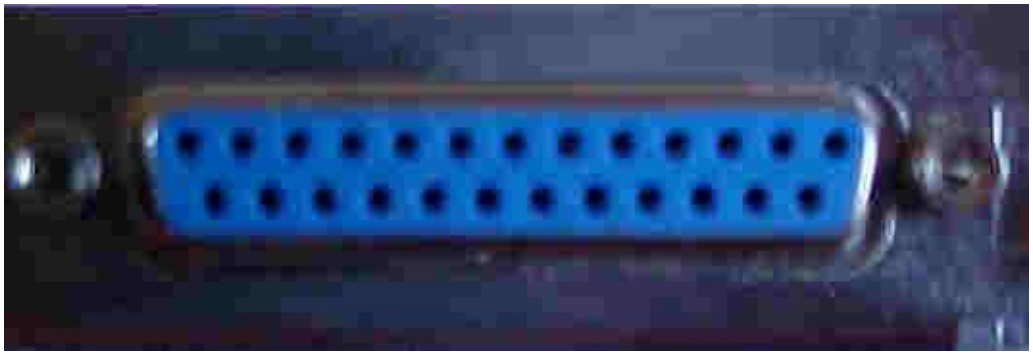
PS/2 and Keyboard Connectors

1. Used for both mice and keyboard
2. Also called **6-pin mini DIN**
3. Green for mouse
4. Purple for keyboard
5. Not interchangeable
6. Standard for ATX boards



Parallel Ports

1. Uses a DB-25 pin female connector
2. Data flows over 16 lines
3. Others for control signals
4. Used for:
    A. Printers
    B. Scanners



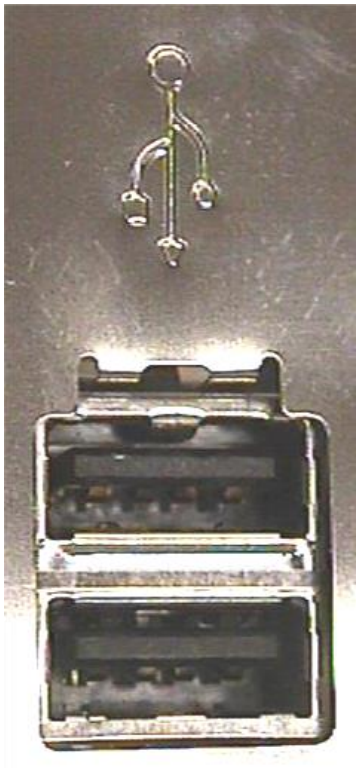
Parallel Ports

1. Also called LPT1, LPT2, LPT3
2. Bi-directional communication
3. Transmission mode can be set in the BIOS
4. Maximum cable length is 15 feet or 4.5 meters
5. Referred to as a **IEEE-1284**

Parallel Ports

1. Used to connect to a printer
2. 36-pin Centronics connector at the printer end
3. DB-25 connector on the computer end

Universal Serial Bus (USB)

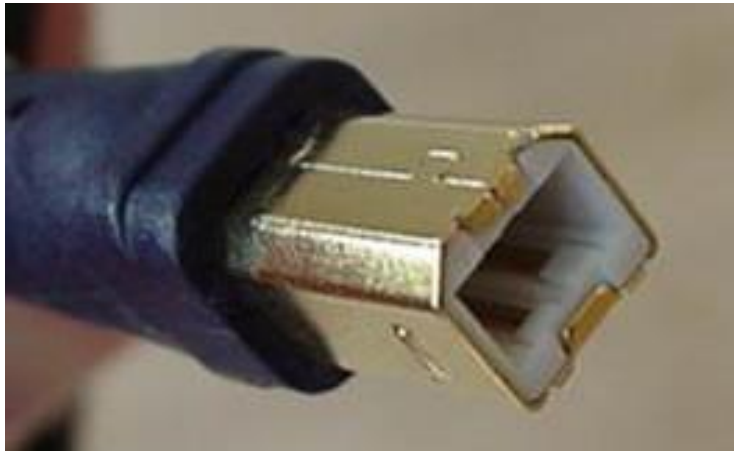


1. **Host-based** – devices must connect to a computer in order to communicate
2. **Up to 127 devices** can connect to the host
3. Cables up to **5 meters**
4. With hubs up to 30 meters
5. Two wires for power (+5 volts up to 500 milliamps and ground) and a twisted pair for data

Universal Serial Bus (USB)

1. Low-power devices (such as mice) can draw their power directly from the bus
2. High-power devices (such as printers) have their own power supplies and draw minimal power from the bus
3. Hubs can have their own power supplies to provide power to devices connected to the hub
4. Hot-swappable
5. Can be put to sleep by the host computer
6. Available for Windows 98, 2000, XP, Vista, Windows 7, or 8
7. Not supported in Windows 95 or NT 4.0

Universal Serial Bus (USB)



Uses "A" and "B" connectors to avoid confusion:

1. **"A"** connectors transmit **"upstream"** away from the computer
2. **"B"** connectors receive **"downstream"** toward the device

USB Standards

1. USB 1.0 – maximum bandwidth of 1.5 Mbps
2. USB 1.1 (**Low-speed USB**) – maximum bandwidth to 12Mbps
3. USB 2.0 (**High-speed USB**) – maximum bandwidth of 480 Mbps
4. Backward compatibility
5. USB 3.0 – maximum bandwidth to 4,800 mbps

USB Cable Lengths

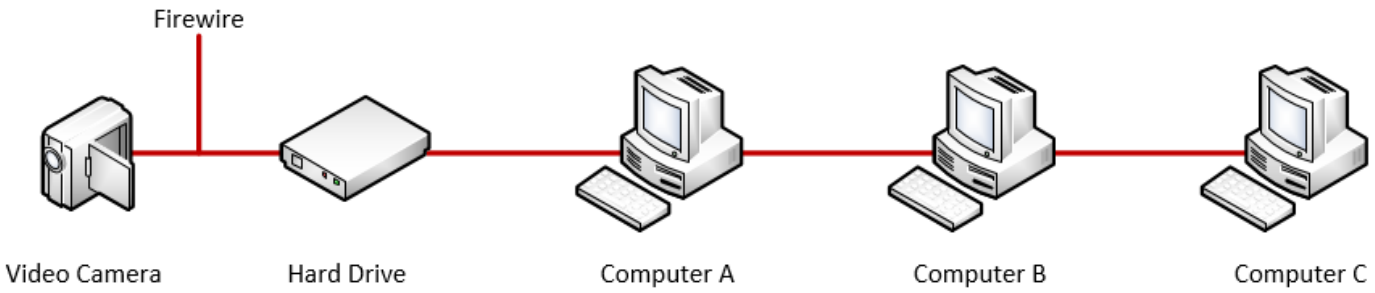
1. Hi powered (hi-speed) devices – 5 meters max
2. Low powered (low-speed) devices – 3 meters max
    A. Can be extended if you use a powered hub
3. Uses:
    A. Cameras
    B. Scanners
    C. Bar Code Readers

FireWire

1. Developed by Apple Computers in 1995
2. Used for digital cameras, camcorders, and scanners
3. Bi-directional communication
4. Requires a special adapter card
5. Common on new motherboards
6. **Peer-to-peer**
7. Also called **IEEE-1394**
8. Bandwidth of 400Mbps

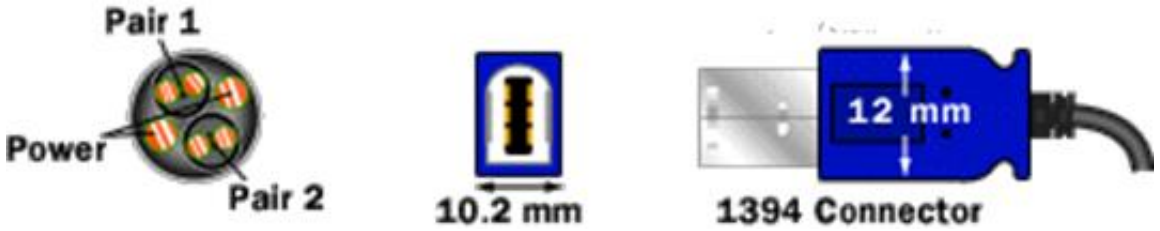
FireWire

1. 63 devices on a single port
2. Cables maximum of 4.5 meters
3. Up to 16 **hops**
4. For a maximum distance of 72 meters
5. Can be **daisy-chained**



FireWire

1. Can be **powered or unpowered**
2. Draws power from connection
3. Two power conductors (8 to 40 volts, 1.5 amps maximum)
4. Two or three twisted pair sets carry the data
5. Either 4-pins or 6-pin connectors



FireWire

1. IEEE 1394b maximum transfer speed to 800 Mbps
2. New Firewire 3200 up to 393 Gbps
3. Copper cable replaced with fiber optics

Bluetooth

1. Industrial specification for wireless
2. Developed and licensed by the Bluetooth Special Interest Group
3. Personal Area Networks (PANs)
4. Can connect and exchange information between devices
5. Supported OS:
   A. Windows XP Service Pack 2 and up
   B. Mac OS X v10.2 and up

Bluetooth

1. Designed for low power consumption
2. Short range

Class 1	100 mW (20 dBm)	~100 meters
Class 2	2.5 mW (4 dBm)	~22 meters
Class 3	1 mW (0 dBm)	~6 meter

3. Transmission speeds:
   A. 1.1 - up to 721 Kbps in 1.1
   B. 2.0 - up to 2.1 Mbps in 2.0
   C. 3.0 - up to 480 Mbps in 3.0

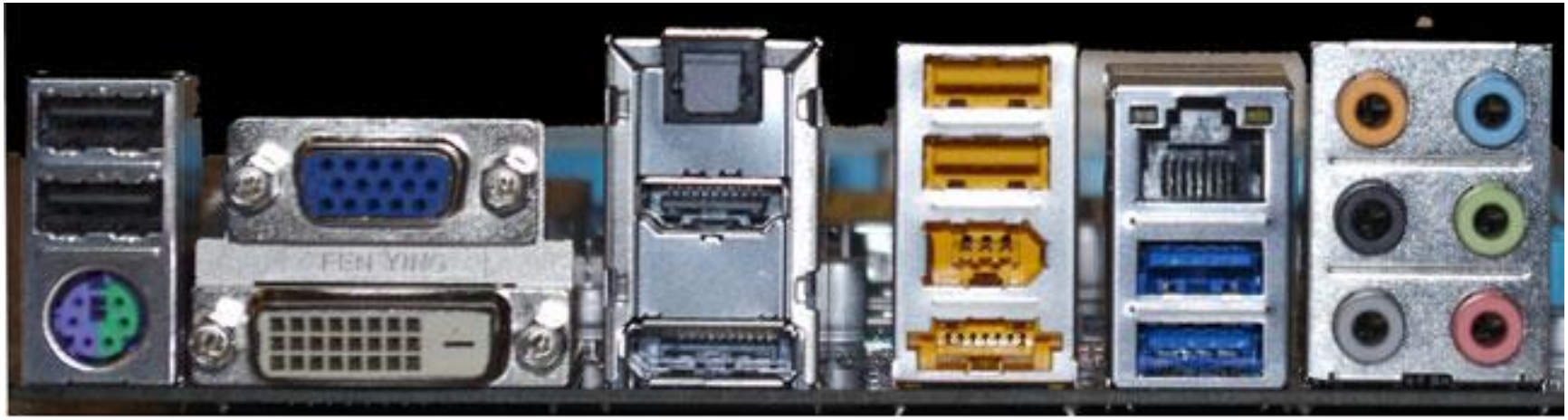
eSATA

1. Newest interface type
2. Cable length of 2 meters (6.6ft)
3. Transfer speeds up to 6 Gbps
4. Hot swappable

I/O Port Comparison

Name	Standard	Bus	Max Length	Transfer Speed	Power Provided	Devices per Channel
Serial	RS-232 DB9 male DB25 male	Serial	2 m	460 Kbps	No	1
Parallel	IEEE 1284 DB25 female	Parallel	4.5 m	2000 Mbps	No	1
USB	USB 1.1 USB 2.0	Serial	3-5 m	12 Mbps 480 Mbps	Yes	127
Firewire	IEEE1394 IEEE1394b	Serial	4.5 m	400 Mbps 800 Mbps	Yes	63
SATA	SATA	Serial	2 m	6 Gbps	No	1
Bluetooth	IEEE 802.15	Wireless	6 m	480 Mbps	No	7

ATX System Board I/O Connections



USB 2.0
USB 2.0
PS/2

VGA
DVI

Optical S/PDIF
HDMI
DisplayPort

USB 2.0
USB 2.0
1394a
eSATA

RJ45
USB 3.0
USB 3.0

Audio Jacks
Sub Line In
Read Out
Side Mic In

Summary

In this module we discussed:

1. Serial vs. Parallel transmissions
2. Types of I/O ports and specifications
3. I/O port comparison
4. I/O motherboard connectors