

Digital Systems: Digital I/O

Session 9e for
“Digital Systems: Computers and Communications”
A Fairfield University E-Course
Powered by LearnLinc

Module: Digital Systems (in two parts)

- Texts:
 - “Computers,” Capron, Benjamin Cummings, 1996, ISBN 0-8053-0662-5
 - “Telecommunications,” Blyth, McGraw-Hill, 1990, ISBN 0-02-680841-2
 - “Understanding Telephone Electronics,” Bigelow, Newnes, 1997, ISBN 0-7506-9944
- References:
 - [Electronics Tutorial](#) (Thanks to Alex Pounds)
 - [Electronics Tutorial](#) (Thanks to Mark Sokos)
- Part 9 – Computers
 - 5 on-line sessions plus one lab
- Part 10 – Digital Communications
 - 5 on-line sessions plus one lab
- Mastery Test part 5 follows this Module

Digital Systems: Topics

- Computer Architecture
 - Memory: ROM, RAM, Cache, Error Checking
 - CPU and Program Control **Part 9**
 - Secondary Storage: Floppy, Hard Drive, CD / DVD
 - I/O (Human: Video, Keyboard, & Pointer)
 - Digital I/O: Serial, Parallel, IDE, USB, FireWire, SCSI
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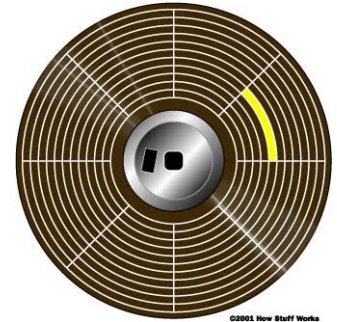
- Serial I/O: RS232
- Modems **Part 10**
 - Telephone: Modulation and Data compression
 - Cable and DSL
- Telephony Digital Transmission
- Packet Transmission
- Fiber Optics: SONET

Section 9 Schedule

Session 9a (5/26 – Holiday)	05/21	Introduction: Computer Overview	Capron: Ch 1; Notes
Session 9b	06/02	The CPU (Central Processing Unit)	Capron: Ch 2;
Session 9c	06/04	I/O	Capron: Ch 3;
Session 9d	06/09	Data Storage	Capron: Ch 4;
Session 9e (Lab-06/14, Sat. McAuliffe 113)	06/11	Digital I/O: Serial, Parallel, IDE, SCSI, USB, and Firewire	Bigelow: pp. 285-288, 301-305; Notes
Session 9f Quiz 9 due 06/22)	06/16	Review for Quiz 9	
Session 9g (6/18 – no class)	06/23	Quiz Results	

Data Storage Review

- Disk Storage: FAT, Sectors, Tracks and Heads
- Magnetic Disks: Fast, Dense storage
 - Floppies
 - Hard Disks
- Optical Disks: Dense, Inexpensive, Archival
 - CD, DVD
 - Magneto-Optical
- Flash Memory Modules: USB
- Tape: Sequential, Extreme density, Inconvenient storage
 - Reels
 - Cartridge
- Data Compression: Lossless, Lossy



Serial vs. Parallel IO

	Serial	Parallel
Bit Paths	1	4, 8, 16, ...
Timing	asynchronous	strobe signal
Speed	1*clock speed	N*clock speed

Note: Serial and Parallel ports will soon not be supplied in new PCs (USB)

Serial Port: RS232 Intro

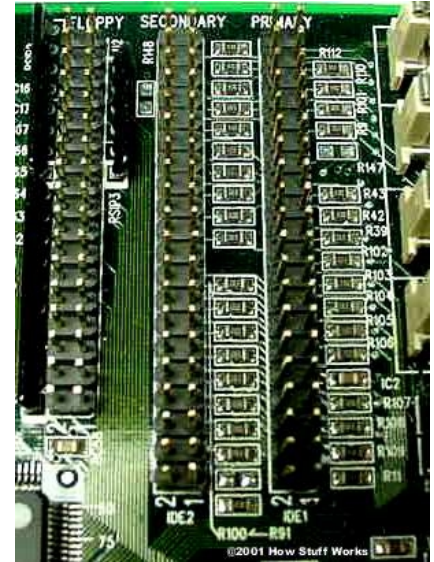
- One bit at a time, bi-directional (pins 2 & 3)
- Two different ends
 - DTE: data terminal equipment
 - E.G. Your PC
 - Male connector
 - DCE: data communications equipment
 - E.G. Modem
 - Female connector
 - “Null Modem” Cable
 - Same sex at both ends
 - Reversed pins so two DTEs can communicate
- Several control signals (RS, CS, DSR, CD, DTR, etc.)
- Up to 115 Kbits/sec usually supported
- 16550A UART (universal asynchronous receiver/transmitter)

Parallel Port (Printer Port)

- Female DB25 connector on PC
- Male “Centronix” connector at printer
- “Standards” – Newer PCs can handle all three (Bios)
 - SPP: standard parallel port (up to 500 kbit/sec)
 - EPP: enhanced parallel port (up to 2 Mbit/sec)
 - ECP: extended capabilities port (up to 2 Mbit/sec)
- A Parallel port “Null Modem” equivalent cable can be used to allow two PC’s to communicate at up to 2 Mbit/sec

Peripheral Busses

- Floppy Disk cable: low speed parallel
- Hard Drive cables
 - IDE (ATA): high speed parallel (internal only)
 - Serial ATA: Very high speed serial (NEW)
- SCSI (small computer system interface)
 - Extremely fast parallel (40 to 160 Mbytes/sec)
 - Many variants, needs to be terminated correctly
- USB (universal serial bus): Host-based, Hubs
 - 12 or 480 (New) Mbit/sec, PC peripherals
- Firewire (IEEE1384): peer-to-peer
 - 400 Mbit/sec, consumer electronics



10.2 mm



12 mm
1394 Connector

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