

1.6: Identify proper procedures for installing and configuring SCSI devices.

- Each SCSI device must have its own SCSI ID (0-7). ID 7 is usually in use by the adapter itself
- Termination:
 - The end of a SCSI chain must be terminated for the devices to function
 - If the chain is external only or internal only, the card and the device at the end of the chain must be terminated
 - If the chain is both external and internal, the card must be unterminated, and the devices on both ends terminated

1.48 CD-ROMS

- A cd-rom (compact disc, read-only memory) stores data in microscopic pits that are burned into the disc with a powerful laser.
- Normally hold 650MB
- red book, yellow book, orange book refer to standards
- can be parallel, IDE or SCSI
- type of connectors: molex; data cable; audio cable
- audio cable connects to sound card (or motherboard if on it)
- if BIOS allows it, can boot from CD ROM
- ATAPI refers to CD-ROMS
- Pits and lands
- By pass auto play: hold SHIFT key while inserting
- Data transfer rate: speed at which CD-ROM reads information into the PC
- External CD-ROM drive supported by SCSI

CD-ROM FORMATS:

1. CD-DA : compact disc digital audio; no error checking, like music CD
2. ISO 9660 : cd-rom
3. CD-I : compact disc interactive, can store sound & video, simult. Playback
4. CD-ROM/XA: specialized CD-I
5. PHOTO-CD: by kodak, many photos

SPEEDS:

- first CD-ROMS, had speed of 150 kbps, each speed increase is measured in a multiple of 150 kbps; maximum speeds are indicated
- Example: 1X à 150 kbps 2x à 300 kbps

CONNECTIONS:

1. proprietary : initially by some companies, dedicated drivers and connectors
2. ATAPI : allowed a CD-ROM drive to be treated exactly as though it were an EIDE drive. 40 pin connector, master/slave

jumpers

3. SCSI : small computer systems interface; allows many CD-ROMs; need a SCSI ID

DEVICE DRIVERS AND SOFTWARE

- Cd-rom need device drivers in order to operate

DOS: install the driver in config.sys

- MSCDEX : this program placed into autoexec.bat, assigns a letter to drive
- options : buffers; verbose; drive letter. Allows DOS to access CD-ROMs

W3.X

- designed to work with the DOS drivers and MSCDEX

- W95/98 MSCDEX replaced by CFDS (cd file system), protected mode and part of W95 IFS (installable file system)

1.49 MODEMS

- Modem initialization strings:

- ATA: Answer
- ATD: Dial Dial a #: ATD#####
- AT : modem plugged in and OK
- ATH: Hang up
- ATZ: Reset modem
- ATD: takes phone off the hook
- ATSO= : SO register set to answer at 0 rings so modem never answers
- ATDL: redial
- ATF1: half duplex off
- ATMN: speaker on/off
- ATSR: display register
- ATE1/0 : echo on/off
- CD: carrier detect
- RTS : request to send (before modem transmits)

- Modems use asynchronous transmission.

- Modulation: digital to analog

- Demodulation: analog to digital

- TAPI: manages communication between phone system and computer (MAPI is for messaging)

- Digital signals degrade faster on phone lines

- US law analog speed: 53 Kbps

- Digital modems use synchronous transmission. Digital modems are used to connect to ISDN lines.

- Modem : modulator/demodulator

- To accept data you need : carrier detect and receive data
- Allow computers to talk to each other via standard commercial phone lines
- Modem convert signals from analog, to digital and back to analog
- The UART16650 (universal asynchronous receiver transmitter) chip converts the serial bits of analog data into 8-bit bytes that the PC can understand.
(used by internal modem and serial port)
- New standard for modems is v.90
- Analog loopback test: test the connection between computer and modem (between transmitter and receiver of local modem)
- Local digital loopback: test transmitter and receiver of remote modem
- Remote digital loopback: test transmitter and receiver of both modems and phone line

Asynchronous organization:

- the way 2 serial ports communicate
- data chopped in 7 or 8 bits packets
- start bit at : 0, there is a stop bit as well
- possibility of parity bit for error detection
- no clock pulse

Synchronous organization

- when you want no errors in transmission
- many protocols : Xmodem, Ymodem; Zmodem
- they synchronize together
- regular time periods; no stop or start bits
- with clock pulse

File transfer protocols:

- ASCII : transmits each character as if comes from Keyboard, no error checking or compression
- XMODEM: 128 bytes transfer; error detection, checksum
- YMODEM: 1024 byte, error correction
- ZMODEM: includes features of X and Y; adds crash recovery, automatic downloading and streaming file
- KERMIT: first transfer protocol

BAUD RATE:

- The basic cycle of time that a modem uses as its carrier frequency. Ex: 300 baud means that frequency has 300 cycles per second. On a phone line, can go up to 2400 cycles. If each cycle is one bit, then would have 2400 bits per second. Modem speed is measured in bits per second (bps)
 - modem 14.4 should transmit 14400-15000 bits per second or 14.4 kbps

FLOW CONTROL (handshaking)

- Process by which 2 serial devices verify a conversation.
- The flow control between modems cannot be controlled. But we can control between modem and port à 2 types
- Hardware flow control: uses wires, let other modem know ready(request) to send and clear to send RTS/CTS

- Software flow control: uses special character XON data starts, XOFF
 - setting up modem: look at parity; speed, stop bits, data bits (not start bits)
 - null modem cable used : to exchange data between 2 DTE devices
 - modem pool : low users; low cost; for network to connect to Internet
- ISDN: integrated services digital network (changes outgoing data from analog to digital)

SOUND

- TYPES:
 1. WAV : defacto standard, plays human voice best
 2. MIDI: musical instrument digital interface; 2nd most popular
 3. 8 bit soundcards produce 256 tones

1.7: Identify proper procedures for installing and configuring peripheral devices.

- In Windows 95, System Resources are automatically configured by Plug and Play, or they can be manually configured by going to Control Panel > System > Device Manager, then highlight the device and go to Properties.
- In Windows 3.x, System resources are usually assigned by jumpers or DIP switches on the hardware, or using configuration software which accompanies the hardware.

1.8: Identify concepts and procedures relating to BIOS.

- The BIOS (Basic Input/Output System) contains low-level software for allowing the operating system to interact with the system hardware
- Most BIOS chips can be flash-updated using utilities from the manufacturer. Such chips are called Flash ROM or EEPROM (Electrically Erasable Programmable ROM)
- Upgrading a BIOS allows support for newer options and larger hard disks
- BIOS PnP reads legacy drives first

1.9: Identify hardware methods of system optimization and when to use them.

- Memory / cache:
 - Adding more RAM or cache will allow more programs to run simultaneously, and minimize disk swapping
- Hard drives:
 - Hard drives should be defragmented and backed up often, along with running system check utilities such as Scandisk
 - Software utilities are best for identifying and resolving problems
- CPU:
 - Upgrading the processor will increase overall system speed by accelerating the speed of individual applications

DOMAIN2

Diagnosing and Troubleshooting

2.1: Identify common symptoms and problems associated with each module and how to troubleshoot and isolate the problems.

- Processor: A faulty or overheating processor will cause system crashes, lockups, and sudden reboots.

- Memory: Bad memory can cause a 'Memory test failed' error during POST, a 'Himem.sys detected unreliable memory' error during bootup, or a 'Parity error' during normal use.
- Floppy drive: Floppy drive problems can be caused by incorrect BIOS settings, a bad drive, a bad/poorly connected controller cable, or a bad I/O card respectively. Reversing a floppy drive's cable will prevent reading, but should not harm the drive.
- Monitor/video: Monitor settings are the most likely cause of a blank screen when the PC boots normally otherwise. Other causes can be a problem with the cable connection, monitor, video card, motherboard, processor, or RAM.
- Power supply: The entire power supply must be replaced if its internal fan goes dead. When replacing a power supply, pay attention to physical dimensions-- the voltage and connectors are standardized.
- Fuses: Fuses are usually tested with a Volt/Ohmmeter (or Multimeter) set to Ohms. A good fuse will show 0 Ohms resistance.
- Multimeter use: If a multimeter is to be used on a circuit of unknown voltage, it should be set to the highest setting to avoid damaging the tool. Most good circuits will read 0 Ohms resistance.

2.2: Identify basic troubleshooting procedures and good practices for eliciting problem symptoms from customers.

- To determine the cause of a problem, ask specific questions about the PC, its users, and its environment
- When troubleshooting a problem, try only one thing at a time, so it will be clear what resolved the problem

DOMAIN3 : Safety and Preventive Maintenance

3.1: Identify the purpose of various types of preventive maintenance products and procedures and when to use

- Most parts are cleaned with a damp cloth and a mild all-purpose cleanser
- TMC solvent cleans smudged keys on a keyboard
- Compressed air is ideal for removing dust (due to reduced ESD risk)
- Use non-abrasive cleanser on Mylar-protected LCD notebook screens
- If you clean a dot matrix printhead, use denatured alcohol, because it leaves no residue after evaporation. Never lubricate this print head.

3.2: Identify procedures and devices for protecting against environmental hazards.

- A UPS (Uninterruptible Power Supply) protects against power sags and loss by providing battery backup power.
- A surge suppressor protects against normal line spikes and surges, but not against high-voltage hazards such as lightning. Only disconnecting all external cables will protect against lightning.
- Components should be stored in anti-static bags when not in use, and kept away from temperature extremes and strong magnetic fields.
- A line analyzer can detect line surges, sags and spikes.

3.3: Identify the potential hazards and proper safety procedures relating to lasers and high-voltage equipment.

- Scanners, laser printers, and CD-ROM drives all use concentrated light which can harm the eyes if exposed excessively.
- The capacitor in a CRT tube (the display tube in the monitor) can hold a potentially lethal charge for extended periods. Never wear an anti-static wrist strap when servicing, disconnect the power, and wait at least 60 minutes after power-down before servicing.
- Always turn a PC off and disconnect all cables before servicing internally.

3.4 Identify items that require special disposal procedures that comply with environmental guidelines.

- Batteries (such as UPS units and CMOS batteries) are harmful to the environment.
- Toner cartridges and ink cartridges can be refilled/reused.
- Chemical solvents should not be introduced to the regular water waste system.

3.5: Identify ESD (Electrostatic Discharge) precautions and procedures, including the use of ESD protection devices.

- ESD occurs when two objects have dissimilar electric potentials, and will degrade a component's integrity. Even if not immediately seen, the effects could be apparent months later.
- Any amount of friction may cause enough static to risk ESD.
- To avoid ESD when handling parts, wear an anti-static wrist strap. An anti-static wrist strap is a rubber strap with a resistor, and a wire to connect to a grounded metal object.
- An AC outlet is the best ground for a conductive work bench.
- Store PC parts in ESD safe bags.
- Nylon, plastic, wood, and vinyl are not ESD safe materials.
- Low humidity increases the chances of Electrostatic Discharge.

DOMAIN4

Motherboard/Processors/Memory

4.1: Distinguish between the popular CPU chips in terms of their basic characteristics.

- CPU PACKAGES
 - Replacing microprocessor: align the notch in the chip with the notch in the socket
 - Microprocessor hold and hold Acknowledge pins are used to coordinate operation of the system's buses with other bus masters
 - Memory buses are unidirectional
 - Data buses are bidirectional
 - DIP (dual in line pin package) → 8088-8086-80286
 - PGA (pin grid array) → 80286-386-486, into regular PGA or ZIF socket
 - SPGA (staggered pin grid array) → pentium, PRO, K5,6,7 6X86, Celeron; ZIF socket
 - PQFP/CQFP (plastic/ceramic quad flat pack) → 286-386-486 laptops
 - PLCC/CLCC (plastic/ceramic leadless chip carrier) → 286-386 no pins
 - SEC Cartridge (single edge contact) → PII; PIII; Athlon
- INTERNAL CACHE : level 1 (L1); start 486; with SRAM chips, built on chips (processor cache)
- EXTERNAL CACHE: level 2 (L2), with SRAM chips; built on m-board (motherboard cache)
- DRAM: dynamic RAM; cheap, small, problem : refresh of capacitor
- SRAM : static RAM; no capacitors, expensive, no refresh (uses flip-flop)
- EXTERNAL BUS: affects amount of RAM the CPU uses
- WRITE THROUGH: cache sends all data writes directly to RAM, even if hit wait state; cheap
- WRITE-BACK: cache stores the write data in the cache and write to RAM later; expensive
- DUAL PIPELINING: in pentiums; circuitry that allows more than 1 command to be processed at a time types: U → main, does all V → simple commands

- QUAD PIPELINING : P6

- Address bus determines maximum amount of RAM
- Internal is higher # Hz than external
- Processors all have the same number of pins to be soldered into computer

CPU	Comment	year	X clock MHZ	Int clock MHZ	Access Mem. Up 2	Int. Cache	Co-proc	Int bus (word size)	Ext. bus (data path)
8086	1st CPU	1978	5	5	1 meg	no	no	16 bit	16 bit
8088 (total of 640K of total memory) Add bus: 20Mhz	Used in the 1st IBM PC/XT, 29000 transistors	1979	8	8	1 meg	no	no	16 bit	8 bit
80286 (uses PLCC IC case; found in most AT; soldered to system board; Add bus 24 Mhz	Introduced idea of protected mode, 134000 tr.	1982	8 10 12	8 10 12	16 Meg	no	no	16 bit	16 bit
80386DX (first to have ability to multitask); Add bus: 32 Mhz for 386 and 486	Can switch between real & protected mode without rebooting; 1st true 32 bit CPU; 275000 tr.	1985	16 20 25 33	16 20 25 33	4 Gb	no	no	32 bit	32 bit
80386SX	Cheaper version of 386 known as derivative chip	1988	16 20 25 33	16 20 25 33	4 Gb	no	no	32 bit	16 bit
80486DX 5 VOLTS	Intro- duced L1 cache; twice as fast as 386; 1.2 million tr	1989	25 33 50	25 30 55	4 Gb	8K	Yes	32 bit	32 bit
80486SX	Same as 486 but with disabled co-proc	1991	25 33 50	25 30 50	4 Gb	8K	no	32 bit	32 bit
80486DX2	Can execute instru. In 1 cycle rather 2 cycles in DX	1992	25 33	50 66	4 Gb	8K	yes	32 bit	32 bit
80486DX4	Runs 3 X speed motherb.	1994	25 33 75 100		4 Gb	8K	yes	32 bit	32 bit

Pentium (considered fault tolerant) 3 VOLTS SLOT 7	64 bit data bus, can execute 2 instr. At the same time using super-scalar tech.; 2 int. 8K cache chips; cache controller built on board; 3.1 mill trans	1993	60 66	60 66 90 100 133 150 166 200	4 Gb	16 K	yes	64 bit	32 bit
Add bus is 64 Mhz									
Pentium MMX SLOT 7	57 add. Instruc. Better handle video / graphics; improves perf. Mult. By 50-100%, to use MMX programs need written in MMX	1996	Same Pentium	same	same	same	same	same	Same
Pentium PRO SLOT 8 L1, L2 cache	Specu- lative execution; dataflow analysis; 5.5 mil. Trans.	1996	66 180 200					64 bit	32 bit
Pentium II SLOT 1 L1: yes L2: 512 K	Use prop. Socket design 242 SEC; L2 cache built in, 7.5 mil trans	1997	66-100- 233-266- 300-333- 350-366- 400-450	4 Gb	16 K	yes		64 bit	64 bit
Pentium III		1999	100-500- 550						

- 80386:

- The 80386SX uses the 80387SX as its fastest coprocessor, and has a 32-bit word size and 16-bit data path.
- The 80386DX uses the 80387DX coprocessor, and has a 32-bit word size and data path.

- 80486:

- The 80486SX has a disabled coprocessor, and a 32-bit word size and data path.
- The 80486DX2 runs internally at twice the motherboard bus speed.
- The 80486DX4 runs internally at three times the motherboard bus speed.

- Pentium:
 - Processor speed determined by motherboard bus speed times bus multiplier.
 - Uses ZIF (Zero Insertion Force) Socket 7
- Pentium MMX:
 - 57 additional instructions for manipulating video, audio, and graphical data.
 - SIMD: Single Instruction Multiple Data
 - Increased built-in cache
 - Uses ZIF Socket 7
- Pentium Pro:
 - Multiple Branch Prediction - predicts when instructions are to be processed
 - Dataflow analysis
 - Speculative execution
 - Uses 387-pin ZIF Socket 8
- Pentium II:
 - System bus allows multiple simultaneous transactions.
 - Uses Single Edge Connector (SEC) design. L1 and L2 cache are contained in the cartridge.
 - Uses 242 SEC Slot 1

4.2: Identify the categories of RAM (Random Access Memory) terminology, their locations, and physical characteristics.

- DIPP: 1st generation DRAM chips (dual in line pin package)
- SIPP: (30 pin) : single in line pin package; had own sockets
- SIMM 30 or 72 pin: single in line memory modules; no pins; impossible to install improperly due to notch
- Access speed : a lower access speed means faster access; in nanoseconds
- Parity : error detection
- Wait state: tells the processor to wait 1 or more clock cycles for memory since processor is faster than memory
- 30 pin SIPP & SIMM: 3 widths : X8 non parity
 - X9 parity
 - X3 parity
 - 3 sizes: 256 K, 1MB; 4MB
 - Example: 4X8 (4MB X 8 non parity)
 - 4 rows to fill a 486 bank
 - minimum needed 386DX: 4
- 72 pin SIMM: 32 bit wide
 - X32 non parity
 - X36 parity

impossible to install improperly due to notch

Example: 1X32 à 4 Megs

2X32 à 8 Megs (multiply by 4)

Parity:

- true à parity chip for each 8 bits
- TTL à emulates parity, costs less

need 2 rows to fill a Pentium bank

- 168 pin DIMM: dual in line memory module

enables buffering, ECC and SDRAM

64 bits wide

1X64 à 8 Megs

2X64 à 16 Megs (multiply by 8)

SO-DIMM: in laptops, 32 bits wide; 72 pins

Can be installed 1 at a time in Pentium

- One bank : width external bus // width SIMM chip

- IMPROVEMENTS IN DRAM

- EDO à extended data output: minimizes the refresh rate in 72 pin SIMM or DIMM (168 or SO)

- SDRAM à synchronous dynamic RAM tied to system clock (system speed)

- ECC à error correction code : most common 168 DIMM

- ** RAM measured in width and depth

- ** bad RAM chips : parity errors/lock-ups and page faults

- Trick to calculate MB of RAM:

- How many MB in 2X32 SIMM : $2 \times 32 = 64 / 8 = 8$ MB (if odd numbered parity change 9 to 8 or 36 to 32)

- Memory terms:

- DIP : individual memory chip; pushed in

- RAM (Random Access Memory): used as the primary memory in PCs.

- SIMM (Single Inline Memory Module): RAM modules with a 32-bit bus to the individual chips. For modern Pentium microprocessors that have a 64-bit bus, you must use pairs of SIMMs. Has notch at the end of pin to install it. Place 45 degree to install, then vertical, pushdown. In 386,486 and Pentiums.

- DIMM (Dual Inline Memory Module): RAM modules with a 64-bit bus to the individual chips. Has notch in middle of pin. To install, push down over socket.

- Parity: Parity is an error-checking system where 1 bit is added to every 8 which move in and out of system memory. This bit is called the parity bit, and will change to be a 1 or 0 depending on the number of 1 or zeroes in the 8 bits it accompanies. The system compares this bit to what it expects, and any inconsistencies generate a parity error. Not all memory uses parity.

- Cache (L1 and L2): Cache is a faster type of RAM used to store information frequently used by the processor. L1 is built into the processor, and L2 is outside the processor. Uses SRAM.

- Memory structures:

- DRAM (Dynamic RAM-has 14 or 16 metal pins): Commonly used as primary memory in Pentium and older PCs. Usually found in 30- or 72-pin SIMM form, from 70 to 80 nanoseconds. Requires constant power to retain data, and the data must be refreshed, or re-written, to the memory at least once every 2 milliseconds (normally 16 milliseconds). Uses capacitors to store memory. Slower than SRAM.
- EDO RAM (Extended Data Output RAM): Also commonly used as primary memory in Pentium and older PCs. Usually found in 72-pin SIMM form, from 50 to 70 nanoseconds. Must be refreshed like DRAM.
- EEPROM (Electrically erasable PROM) Data can be erased by sending a special electric charge. Chip can then be reprogrammed. Modern computers use EEPROM to store BIOS.
- EPROM (Erasable PROM) Data can be erased by shining special ultraviolet light through a small window on the chip. The chip can then be reprogrammed.
- NVRAM (Non-volatile RAM): RAM which can maintain its data without the use of power.
- PROM (Programmable ROM) After the data is programmed into ROM, it can't be erased or changed
- ROM (Read only memory) Data in ROM can not be erased or changed
- SDRAM (Synchronized Dynamic RAM): DRAM which uses internal registers and clocks to organize data requests, freeing up the processor for other tasks. Must be refreshed.
- SRAM (Static RAM): RAM which can store its data indefinitely as long as the power is not interrupted. Older type of ram. Uses transistors to store information. Faster than DRAM. Uses clock to synchronize.
- VRAM (Video RAM): RAM specially made for video cards. Uses a dual port access data bus to accelerate transfer rates. Must be refreshed.
- WRAM (Windows accelerator card RAM): VRAM which transfers blocks of data at a time, making it 150% faster than VRAM. Must be refreshed.

4.3: Identify the most popular type of motherboards, their components, and their architecture

- Form factors:
 - AT/Baby AT: The form factor used by most PC motherboards prior to 1998. The original motherboard for the PC-AT measured 12"x13". Baby AT motherboards are a little smaller, usually 8.5"x13"
 - ATX: The modern-day shape and layout of PC motherboards. It improves on the previous standard, the Baby AT form factor, by rotating the orientation of the board 90 degrees. This allows for a more efficient design, with disk drive cable connectors nearer to the drive bays and the CPU closer to the power supply and cooling fan.
 - There are 2 basic types of motherboards: XT - extended technologies and AT - advance technology. ATX and baby AT are modifications of an AT format. All Pentium II motherboards are ATX format. A characteristic of an ATX format is that the computer can be shut down by software. Modern motherboards have 2 - 3 ISA, 3 - 4 PCI and 1 AGP expansion slots. Some motherboards have built in sound card, some have built in SCSI card. Motherboard configuration is stored in BIOS.
- Form factor: particular way components are positioned on a MB 2 types: AT and ATX AT invented by IBM early 80's, predominant problem : connectors (you need expansion slots) needed more connectors, then came...
- LBX: inflexible though, added devices for sound and video but became obsolete since they change often, then came
- ATX:
 - uses P1 power connector
 - better position of power supply
 - CPU and RAM have easier access
 - uses software to turn PC on and off (soft power switch)
 - Used keyed cables
 - By Intel
 - Different voltage than AT

- Bus architectures: (AT bus supports 8 and 16 bit slots)
- PC-Bus: Early 8-bit peripheral slot used in first IBM PCs, such as PC-XT.
- ISA (Industry Standard Architecture): 8- and 16-bit Industry standard for 80286 and above PCs. 16bit; 8MHz (10 for Turbo) slow running; have to manually configure DMA, I/O address and IRQ
- MCA (Micro Channel Architecture): IBM's original specification for 32-bit slots. This specification was not industry-accepted and was short-lived. 16bit or 32bit; 10MHz; self configures devices; slots different than ISA (non compatible); expensive, now dead. There is only 1 device in a MCA slot.
- EISA (Extended ISA): First industry-accepted 32-bit expansion slots, used in 80386-80486 PCs. The slots support 8-, 16-, and 32-bit cards. 32bit;8MHz. Competitor to MCA, enhanced ISA, compatible ; cheap, now dead. Had more I/O addresses.
- VL-Bus (VESA Local Bus): An early 16- and 32-bit expansion slot solutions which has been replaced by PCI. 32bit; CPU speed. Compatible, designed to run 486 only; now dead. Maximum speed 8Mhz.
- PCI (Peripheral Component Interconnect): Current industry standard for 32 and 64-bit expansion cards. 64bit; CPU speed. By Intel, stronger and flexible, independent of CPU, bus mastering system, has burst mode. IRQ configured by BIOS
- AGP (Advanced Graphics Port): New 32-bit standard expansion slot for video cards, providing a direct channel to main memory. AGP (Advanced Graphics Port): New 32-bit standard expansion slot for video cards, providing a direct channel to main memory.
- USB (Universal Serial Bus): A new external bus standard that supports data transfer rates of 12 Mbps, in 8, 16, 32, or 64 byte packets. A single USB port can be used to connect up to 127 peripheral devices. USB also supports hot-swapping.
- PCMCIA (Personal Computer Memory Card International Association): 16-bit expansion slots for portable PCs. The slots support hot-swapping. 16bit; 33MHz. Some are P&P.
- Bus Types:
 - SCSI
 - SCSI1; Original interface; centronics50 connector; 5MBps transfer rate; 8bit bus width.
 - SCSI2; SCSI2 WIDE had an 8bit and 16bit bus width.
 - SCSI2 FAST had 10MBps transfer rate.
 - SCSI FAST-WIDE was fast and wide and transferred up to 40MBps.
 - SCSI3; Standard not set yet.
 - Ultra SCSI is a faster SCSI2 operating at 20MBps.
 - 8bit- 8bit; 4.77MHz
- PC BUS : 8 bit card 8 bit 8 MHz on of the first expansion cards. Not used in modern computers .

- Cannot have EISA and MCA in same computer

BUS TYPE	DATA BUS WIDTH	SPEED	BUS MASTERING	COMMENTS
ISA (Can be plugged into ISA, EISA or VLBUS)	8 and 16 bits	8 MHZ	NO	Config done by setting jumpers
MCA	16 and 32 bits	10 MHZ	YES	Config by software; proprietary design IBM; not used in modern puters
EISA (Cannot put EISA in ISA)	8 and 16 & 32 bits	8 MHZ	YES	Backward compatible with ISA, config. By software or jumpers
VL-BUS (Faster than ISA, MCA, EISA (not PCI)	32 bits	Speed of processor; backward comaptible with ISA cards	NO	Confid done by jumpers; often used video cards

PCI (124 pins) (Good for NIC cards. PCI wider than ISA and EISA. PCI slots are white, most important of all buses PCI is the fastest bus Limited to 3 adapter cards) Mezzanine bus	32 and 64 bits	33 MHZ	YES	P&P cards; CMOS set up; installation utility from manufacturer, BIOS P&P
AGP	32 bit	Speed of processor	N/a	Used in video cards
PCMCIA	16 bit	33 MHZ	N/a	Laptop; some P&P, some software configured, 3 types : 1-2-3

4.4: Identify the purpose of CMOS (Complementary Metal-Oxide Semiconductor), what it contains and how to change its basic parameters.

- You cannot change the BIOS routines on the ROM, so you need another type of storage chip that can be modified to reflect these changes : CMOS (complementary metal-oxide semiconductor) chip. They do not store programs, only store data that is read by BIOS to complete the programs needed to talk to changeable hardware. Acts also as a clock to keep date and time. To restore a lost BIOS password: remove CMOS battery (or setting of special jumpers)
- CMOS does not contain POST code (the ROM BIOS has that)
- Types : American Megatrends : AMI
AWARD software (AWARD)
Phoenix Technologies
- FLASH ROM: permits you to upgrade, change BIOS
 - The CMOS chip contains the system BIOS. It uses a battery to maintain data while the PC is shut off.
 - The CMOS stores specific system settings, time/date, hard drive specs, and can retain and require a system password.
 - A CMOS chip cannot be infected by a virus. A CMOS virus only infects the memory where the BIOS is shadowed BIOS : software; hundreds of little programs designed talk basic parts of computer; stored on ROM chips. ROM is the hardware chips where BIOS is stored. ROM are non volatile; are firmware, sometimes updatable
 - start CMOS setup: CTRL+ALT+ENTER; CTRL+ALT+S; delete; F10

DOMAIN5 Printers

- Printers:
 - Toner- toner is a black, carbon substance mixed with polyester resins and iron oxide; Includes print drum. Has a negative charge.
 - Electric Stepper motor- an electric motor used in laser printers that can accurately move in small increments.
 - Transfer Corona Assembly- charges the paper, which pulls the toner from the photosensitive drum.
 - Static Charge Eliminator Strip- drains the charge from the paper so that it doesn't stick inside the printer.
 - Fuser- Applies pressure and heat (350 degrees) to ensure that the toner stays on the paper. If not well installed, thermal fuse would open.
 - Printer Controller Circuitry- Uses a process called rasterizing to convert PC signals into device signals.
 - Page description language- this is the language the printer uses to analyze how to print to the drum.
 - Paper made from cotton is called Rag Stock.
 - Basis weight or weight is how many pounds 500 sheets of 17"x22.5 weighs. (20lb paper is common).
 - Caliper is the thickness of paper.
 - ONLY use transparencies that are recommended for your printer; Otherwise the fuser will melt it.

- +600VDC is used to transfer the toner to the paper in an EP Laser Printer.
- Printer control circuitry forms the print job for the type of printer being used.
- Dot matrix: if light an uneven : worn ribbon
- If light and dark : paper not advancing properly
- Laser printers: error code 50 : problem with fuser assembly
- If trouble printing in W95 : disable EMF spooling
- Stalled print job : restart print job from File menu
- Garbled characters: print processor or driver is not correct
- How to change settings of printer port from SPP to ECP or EPP : Use Add New Hardware applet to update port settings
- Paper most susceptible to environment hazard : thermal paper
- What moving parts can cause paper jams: fuser roller ;drum; pressure roller (not sanner unit)
- For laser printers: the fastest throughput is in parallel
- An advantage of using Dot Matrix printers is their compatibility with Carbon Paper.
- The photo-sensitive drums and toner can be changed independently.
- Laser printer: error code 50 : fuser assembly
- Laser printers are called page printers because they print a page at a time.
- What part of a dot matrix printer may cause a burn to the tech - the print head
- Thermal fuse: prevent high voltage power supply from overheating OR guard against the fusing roller overheating
- Hex trace mode: diagnose communications problems
- Ozone filter: can be vacuumed or replaced during routine maintenance check
- Laser printers do not use switchboxes
- Prevent toner from sticking: oil
- Toner cartridge: corona wire; drum; developping roller
- In HPs, the laser discharges the paper to 0 volts. EP discharges to -100 volts.
- PRINTER LANGUAGES:
 - ASCII : characters and control codes for printers
 - POSTSCRIPT: by Adobe, print faster
 - PCL : Hewlett Packard
- PARALELL COMMUNICATION
 - IEEE1284 standard : attempts to deal with poor performance and lack of standardization) must support :
 1. 5 modes (compatibility mode; nibble;byte; EPP, ECP)
 2. standard method negotiation modes supported host PC & periph
 3. standard physical interface
 4. standard electrical interface

- MODES

- COMPATIBILITY/CENTRONICS MODE

- original IBM pc; female DB25pin

- adv: backward compatibility

- less: data passes in one direction only

- NIBBLE MODE

- transfer from periph. to the PC, can be used any parallel port, five status wires

- BYTE MODE/ENHANCED BIDIRECTIONAL PORT can have bidirectional transfers

- EPP (ENHANCED PARALLEL PORT) high speed, 2 way; does not use DMA

- ECP (EXTENDED CAPABILITY PORT) high performance for printers and scanners uses DMA and buffering to increase performance; 2 way

- Other printer types

- Daisy-wheel printer. A computer version of an electronic type writer. One of the first types of printers developed. Not used any more

- Dot matrix (impact printer) Combination of pins on the printhead hit the ribbon, causing it to leave the marks on the paper. Useful when you need to print carbon copies like receipts or shipping invoices. Typical printhead has 9, 18, or 24 pins. Printhead becomes very hot. Don't touch it. Never lubricate a printhead. If the ribbon is too tight, the image can become smudged. Broken pins on the printhead will cause incomplete characters. Image quality poorer than daisy-wheel.

- Prints too lightly on one side: platen misaligned

- Not even darker everywhere: worn print wires

- Uses printwires

- Ink Jet Ink is pumped from the reservoir through a nozzle by a special pump. Ink jet printers were messy and were replaced with bubble jet printers.

- Bubble Jet Ink cartridge contains ink, printhead and special piezoelectric crystal. When signal is send to the crystal, it expands, forcing the ink out. Do not refill bubble jet printer cartridges. They need to be replaced. To guide flow ink droplets à electrically charged metal plates Do not reuse inkjet cartridges, because with a new cartridge, we replace the jets