**PC Maintenance and Repair - Chapter 3 Notes - Motherboards**

**Motherboard Features**

1. **Form Factor** - Size of the Motherboard
	1. ATX - Full Size
	2. MicroATX - Smaller version of ATX
	3. Mini-ITX
		1. Smaller than MicroATX
		2. Often used with low-end computers
	4. Make sure your case and power supply match the form factor of your motherboard!
2. **Processor Sockets**
	1. Socket controls which CPUs you can insert into the motherboard
	2. Choose between AMD or Intel
		1. Intel Sockets
			1. Current Intel processors begin with LGA
			2. LGA2011, LGA1155, LGA1156, LGA1366, LGA771, LGA775
		2. AMD Sockets
			1. FM2, FM1, AM3+, AM3, AM2+, AM2, Socket F
	3. Make sure the CPU you choose fits into the socket type on your motherboard!
3. **Chipset** - A set of chips on the motherboard that works with the CPU to control memory, buses and peripherals.
	* 1. Intel Chipsets
			1. North Bridge/South Bridge Chipset - 2006
				1. North Bridge

Raised chipset located near the CPU (Faster)

Handles memory (RAM) and graphics (Graphics Card)

* + - * 1. South Bridge

Flat, square chipset, further from CPU (Slower)

Handles Input/Output (I/O) - USB, Audio

* + - * 1. PCI Express v1.0
		1. AMD Chipsets
			1. AMD740G, AMD690 - Low-end computer systems
			2. AMD780V - Business computers
			3. AMD 9 series
				1. Designed for gamers
				2. Improved overclocking
				3. Supports faster CPUs
			4. Crossfire - Technology that allows multiple graphics cards (Radeon series) to be used to improve graphics potential
		2. NVIDIA Chipset
			1. Designed to allow improved communication between CPU and Graphics Card
			2. SLI
				1. Feature that connects multiple graphics(GeForce) cards to your motherboard.
				2. With 2 graphics cards, each card draws half the screen.
1. **Memory (DIMM Slots)**
	1. Number of DIMM Slots - how many different slots are there for you to add RAM?
	2. Number of pins - How long or how many data connectors are on each stick of RAM?
	3. Maximum Memory - What is the maximum RAM support by the motherboard? (GB)
	4. Memory Standard - What speed of RAM will the motherboard support?
		1. DDR1, DDR2, DDR3, DDR4 - Double Data Rate - Transfers data twice per clock cycle
2. **Buses** - Circuits that on the motherboard that connect different computer components
	1. Data path - The amount of data (in bits) that a motherboard can send simultaneously.
		1. Evolution - 8 bit, 16 bit, 32 bit, 64 bit, even 128 bit data paths
		2. 32 bit Windows vs 64 bit Windows
	2. Clock Speed
		1. How fast (frequently) the data is being push through the bus.
		2. Measured in hertz (Hz) - 1 Hz means 1 "tick" or cycle per second.
		3. Processors can operate up to 4.7 GHz (4.7 billion cycles per second)
	3. Overclocking
		* 1. Through BIOS, we can increase the Hz of the system clock.
			2. We can make our processor work faster than recommended.
			3. We have to supply more voltage if the processor is to work harder.
			4. When increasing voltage or speed (hertz) too much, you computer may not boot due to:
				1. Not enough power(voltage) to feed the processor at new faster speed.
				2. Too much voltage fries motherboard or BIOS shuts down to prevent damage
			5. Small increments are recommended.
			6. Test with your most processor intense programs to see if it is stable.
			7. If you computer fails to start after overclocking, reset the CMOS to defaults.
3. **BIOS** - Basic Input Output System
	1. Several different versions of BIOS, built into the motherboard firmware
	2. POST - Power-On Self-Test
		1. A check of your computer system's major hardware before operating system is loaded.
	3. BIOS appears after POST, but before the operating system (OS) is loaded (Windows)
	4. Usually accessed by pressing F10, F1, F2 or the Delete key
	5. Features - Varies based on motherboard manufacturer
		1. Overclocking
			1. You can control the timing/clock speed of CPU, RAM here
			2. You can add voltage to these components as well.
		2. Boot Sequence - You control the order in which your computer will attempt to load OS.
		3. Enable/Disable Onboard devices
			1. If you add a graphics or sound card, you should disable onboard video and/or sound.
		4. Monitor System
			1. Temperature
			2. Fan Speed - Sound vs. Heat
			3. Intrusion Detection
			4. Password - Don't make it easy for someone to access your BIOS
	6. Updating BIOS - AKA "Flashing BIOS"
		1. Updating BIOS is recommended as it helps your system work with new technologies.
		2. Since BIOS is contained on a firmware chip, we must be careful to match the BIOS update with the current BIOS installed.
		3. Never interrupt the flashing of BIOS.
4. **Other Motherboard Components**
	1. CMOS
		1. Small amount of memory stored on motherboard used to hold time and BIOS settings.
		2. Uses a lithium battery to remember these settings even if the power supply is unplugged.
		3. Resetting the CMOS is recommended for failed overclocking attempts.
	2. Jumper
		1. Used to turn on a motherboard setting
			1. Reset CMOS often uses a jumper
			2. Clear BIOS password jumper
			3. BIOS update undo jumper - If flashing fails
		2. Two small posts or metal pins that stick up off the motherboard
		3. Open jumper - No cover over the pins
		4. Closed jumper - Cover is over both pins
		5. Parked jumped - Covers 1 pin for safekeeping, but doesn't turn jumper setting on.
	3. Data Connectors -
		1. For Optical/Hard Drives
			1. IDE - 40 Pin connectors for older drives
			2. SATA - new connectors
				1. Variety of speeds - 3 Gbps, 6 Gbps
		2. Graphics Cards - Listed from oldest to newest
			1. PCI
			2. AGP
			3. PCI Express 1.0, 2.0, 3.0 x 16
5. **Motherboard Parts to Label**

|  |  |  |  |
| --- | --- | --- | --- |
| DIMM Slots | CPU Socket | IDE connector | SATA connector |
| CMOS Battery | North Bridge | South Bridge | 20 or 24 Pin P1 Power |
| All ports | Expansion Slots | CPU Power  | BIOS Chip |
| PCI | PCI Express 1, 2, 3 | AGP | Jumpers |
| Floppy Drive Connector |  |  |  |

.