External Anatomy Guide

Exercise 1 – Central Processing Unit (CPU)

Exercise Objective:
In this exercise, you'll identify component parts of the CPU and demonstrate your knowledge of their basic operation.

Discussion of Fundamentals:
All desktop computers have the same major parts:

- Power Supply
- Microprocessor
- Operating System
- Solid-State Memory
- Disk Drives
- Input/Output Ports
- Sound Cards and Speakers

You'll learn more detailed information about these devices in Gross Anatomy. For now... This is just an overview.

Power Supply
The power supply is designed to convert 120/230-volt 60/50-Hz alternating current (AC) into something the computer can use... 5 and 12 volts direct current (DC). Digital electronic components inside the computer typically use 5-volts DC where as the computer's motors (drives and fans) use 12-volt power. The power supply is a self-contained unit containing a power switch, cooling fan, power selector switch, and several electrical connectors. These connectors provide power to the motherboard and disk drives. An indicator lamp on the front panel signals the power supply is on.

Microprocessors
Standard desktops are powered by microprocessors. The microprocessor is the brain of the computer and coordinates all of the computer's functions according to the operating system software. Microprocessor architecture and processing speeds improve periodically. Typical microprocessors include Motorola's PowerPC family (used in Apple Macintosh computers), Intel's Pentium and Celeron families (used in PCs) and AMD's K5 and K6 families (used in PCs).

Operating Systems
The operating system is the set of pre-programmed instructions that tell the microprocessor what to do. Operating systems on computers include Windows 95/98/2000/NT (Microsoft) and Mac OS, depending upon the type of computer (PC vs. Mac), and Linux (Linux is not an option for most consumers, but some third-party developers are writing applications for this operating system).

Memory
Desktop computers have both RAM (Random Access Memory) and ROM (Read Only Memory) memory. The computer's ROM chip contains the Basic Input/Output System (BIOS) that allows the microprocessor to use peripheral devices such as the RAM. RAM stores the application software and data files while the computer is on. Most computers should have at least 64 MB of RAM to have sufficient memory to run operating systems and applications software. Also, most computers allow you to upgrade the memory of your computer and come equipped with convenient access panels to plug in additional memory chips.

Disk Drives
Desktop computers have various disk drive storage devices. All computers have an internal hard disk drive, usually 6 to 20 gigabytes (GB). The hard disk drive stores operating systems, application programs and data files.

In addition to hard drives, most computers have some type of removable disk storage system, such as floppy disks, Zip disks, compact discs (CD) and DVDs. Removable media drives typically incorporate a disk eject button and activity indicator light. The CD-ROM drive sometimes includes a stereo headphone jack with a separate volume control.

Some computers have more than one bay built into the case for disk drives (such as floppy drive and CD-ROM drive). This feature allows the computer to be upgraded to include features that are not yet available. Computers also allow external drives and are connected to the computer by cables connected to ports or computer interface cards.

Input/Output Ports
Computers need to talk to other devices (such as printers, modems and networks). Computers send and receive information through various input/output ports, which can include serial ports, parallel ports and Universal Serial Bus (USB) ports.

In addition to ports, some computers have expansion slots for PCMCIA standard adapter cards (Type I and Type II) or "PC " cards. These cards can be used to upgrade your computer by adding memory, a modem, a network connection or a peripheral device.

Sound Cards and Speakers
Most desktops are equipped with sound cards and speakers so they can play sound files, sound effects, and music from CDs. There is also a speaker located inside the computer referred to as the PC speaker. However, the quality of the PC speaker is no match for the multimedia speaker system that accompanies the sound card. Sound cards also have jacks so you could hook up a microphone, line-in, or headphones. Most PC manufacturers have integrated the sound card into the motherboard. The features are still the same, but there's no need for an extra interface card.

Front Panel
The front panel is part of the computer chassis and acts as a bezel plate for the floppy and CD-ROM drives. It also holds the power and reset switches as well as the indicator LEDs for power-on and disk drive activity. This particular front panel snaps into place and holds plastic inserts that can be punched out to accommodate new drives.

Research Resources:

Company	Web Site	Description
How Stuff Works	http://www.howstuffworks.com/pc.htm	Comprehensive website depicting information on a variety of technical devices.
Webopedia	http:// www.webopedia.com/	On-Line Technical Glossary

Required Materials:
CSS Curriculum Software

External Anatomy Guide

Exercise 1 – Central Processing Unit (CPU)

Questions

Name:	
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Date:	

Procedure: Review the material presented in this exercise and the information found in the module lessons to answer the following questions. You may also need use other resources while you search for the answers to these questions. Print out only this page, fill out the ID information box, and answer the questions. Return the completed assignment to you supervisor for approval to continue with the next assignment.

1. Research and develop a detailed definition for each of the following terms. Be sure to develop your definition within the context of this exercise. Refer to the list of Research Resources and Required Materials as well as other materials you feel are appropriate. Write your definitions on the reverse side or a separate piece of paper with each definition being two sentences or more.

   - Power Supply
   - Input / Output Port
   - Memory
   - Microprocessor
   - Disk Drive
   - Sound Card and Speakers

2. The main chip on the motherboard that executes instructions is called the _____ .

3. The _____ chip on the motherboard is an example of a Read Only Memory (ROM).

4. What type of memory stores data only when the computer's power is on?

5. List three types of removable data storage.

6. List three type of input/output ports.

7. The PC power supply converts _____ power to _____ power.

8. What port does the printer connect to?

9. Where are the power and reset switches normally found on the computer?

10. What company manufactures the Pentium processor? …The Celeron? …The K4 or K6?

External Anatomy Guide

Exercise 2 – Monitor

Exercise Objective:

In this exercise, you'll identify component parts of the computer monitor and demonstrate your knowledge of its basic features and operation.

Discussion of Fundamentals:

Displays have come a long way since the blinking green monitors in text-based computer systems of the 1970s. In 1981, IBM introduced the Color Graphics Adapter (CGA), which was capable of rendering four colors, and had a maximum resolution of 320 pixels horizontally by 200 pixels vertically. IBM introduced the Enhanced Graphics Adapter (EGA) display in 1984. EGA allowed up to 16 different colors and increased the resolution to 640 pixels horizontally by 350 pixels vertically, improving the appearance of the display and making it easier to read text. In 1987, IBM introduced the Video Graphics Array (VGA) display system. Most computers today support the VGA standard (640 x 480) and many VGA monitors are still in use. IBM introduced the Extended Graphics Array (XGA) display in 1990, offering 800 by 600 pixel resolution in true color (16.8 million colors) and 1,024 by 768 resolution in 65,536 colors.

In the late 1980's, NEC announced the MultiSync monitor. Up to that point, most monitors only understood one frequency, which meant that the monitor operated at a single fixed resolution and refresh rate. You had to match your monitor with a graphics adapter that provided that exact signal or it wouldn't work. The introduction of NEC MultiSync technology started a trend towards multi-scanning monitors. This technology allows a monitor to understand any frequency sent to it within a certain bandwidth. The benefit of a multi-scanning monitor is that you can change resolutions and refresh rates without having to purchase and install a new graphics adapter or monitor each time. Because of the obvious advantage of this approach, nearly every monitor you buy today is a multi-scanning monitor. Most displays sold today support the Ultra Extended Graphics Array (UXGA) standard. UXGA can support a palette of up to 16.8 million colors and resolutions of up to 1600 x 1200 pixels, depending on the video memory of the graphics card in your computer. The maximum resolution normally depends on the number of colors displayed. For example, your card might require that you choose between 16.8 million colors at 800 x 600, or 65,536 colors at 1600 x 1200. A typical UXGA adapter takes the digital data sent by application programs, stores it in video random access memory (VRAM) or some equivalent, and uses a digital-to-analog converter (DAC) to convert it to analog data for the display scanning mechanism. Once it is in analog form, the information is sent to the monitor through a VGA cable.

You can see that a VGA connector like this has three separate lines for the red, green and blue color signals, and two lines for horizontal and vertical sync signals. In a normal television, all of these signals are combined into a single composite video signal. The separation of the signals is one reason why a computer monitor can have so many more pixels than a TV set. Since today's VGA adapters do not fully support the use of digital monitors, a new standard, DVI (Digital Video Interface) has been designed for this purpose. Because VGA technology requires that the signal be converted from digital to analog for transmission to the monitor, a certain amount of degradation occurs. The use of DVI will keep data in digital form from the computer to the monitor, virtually eliminating signal loss. The DVI specification is based on Silicon Image's Transition Minimized Differential Signaling (TMDS) and provides a high-speed digital interface. TMDS takes the signal from the graphics adapter, determines the resolution and refresh rate that the monitor is using and spreads the signal out over the available bandwidth to optimize the data transfer from computer to monitor. DVI is technology independent. Essentially, this means that DVI is going to perform properly with any display and graphics card that is DVI compliant. If you buy a DVI monitor, make sure that you have a video adapter card that can connect to it.

Cable Pin-Out	
Pin	**Signal**
1	Red out
2	Green out
3	Blue out
4	Monitor ID 2 in
5	Ground
6	Red return
7	Green return
8	Blue return
9	Optional +5V output from graphics adapter
10	Sync return
11	Monitor ID 0 in
12	Monitor ID 1 in or data from display
13	Horizontal Sync out
14	Vertical Sync out (sometimes used as data clock too)
15	Monitor ID 3 in or data clock

Viewable Area of the Display

Two measures describe the size of your display: the aspect ratio and the screen size. Most computer displays, like most televisions, have an aspect ratio of 4:3 right now. This means that the ratio of the width of the display screen to the height is 4 to 3. The other aspect ratio in common use is 16:9. Used in cinematic film, 16:9 was not adopted when the television was developed due to the difficulty of creating a CRT that could accommodate the format. CRT manufacturing processes have greatly improved, and the aspect ratio has never been a problem with the manufacture of alternative display technologies such as LCD. In fact, with wide screen DVD movies increasing in popularity, most manufacturers now offer 16:9 displays or plan to in the near future. The display includes a projection surface, commonly referred to as the screen. Screen sizes are normally measured in inches from one corner to the corner diagonally across from it. This diagonal measuring system actually came about because the early television manufacturers wanted to make the screen size of their TVs sound more impressive. Because the listed size is measured from the inside beveled edges of the display casing, make sure you ask what the viewable screen size is. This will usually be somewhat less than the stated screen size. Popular screen sizes are 15, 17, 19 and 21 inches. Notebook screen sizes are usually somewhat smaller, normally ranging from 12 to 15 inches. Obviously the size of the display will directly affect resolution.

Display Resolution

The same pixel resolution will be sharper on a smaller monitor and lose sharpness in larger monitors because the same number of pixels is being spread out over a larger number of inches. An image on a 21-inch monitor with a 640x480 resolution will not appear nearly as sharp as it would on a 15-inch display at 640x480. Display's Maximum Resolution refers to the number of individual dots of color, known as pixels, contained on a display. Resolution is typically expressed by identifying the number of pixels on the horizontal axis (rows) and the number on the vertical axis (columns), such as 640x480.

Dot Pitch

The monitor's dot pitch, viewable area and refresh rate all directly affect the maximum resolution a monitor can display. Dot Pitch Briefly, the dot pitch is the measure of how much space there is between a display's pixels. When considering dot pitch, remember that smaller is better. Packing the pixels closer together is fundamental to achieving higher resolutions. A display normally can support resolutions that match the physical dot (pixel) size as well as several lesser resolutions. For example, a display with a physical grid of 1280 rows by 1024 columns can obviously support a maximum resolution of 1280 by 1024 pixels. It usually also supports lower resolutions such as 1024 by 768, 800 by 600, and 640 by 480.

Refresh Rate

In monitors based on CRT technology, the refresh rate is the number of times that the image on the display is drawn each second. If your CRT monitor has a refresh rate of 72 Hz, then it cycles through all the pixels from top to bottom 72 times a second. Refresh rates are very important because they control flicker, and you want the refresh rate as high as possible. Too few cycles per second and you will notice a flickering, which can lead to headaches and eye strain. Televisions have a lower refresh rate than most computer monitors. To help adjust for the lower rate, they use a method called interlacing. This means that the electron gun in the television's CRT will scan through all the odd rows from top to bottom and then start again with the even rows. This means that interlaced computer monitors have to go through 2 sweeps for the CRT to be fully refreshed. Non-interlaced monitors require only one sweep of the electron beam to fully refresh the CRT.

The phosphors hold the light long enough that your eyes are tricked into thinking that all the lines are being drawn together. Because the speed of your monitor's refresh rate depends on the number of rows it has to scan, it limits the maximum possible resolution. A lot of monitors support multiple refresh rates, usually dependent on the level of resolution you have chosen. Keep in mind that there is a tradeoff between flicker and resolution and then pick what works best for you. Color Depth The combination of the display modes supported by your graphics adapter and the color capability of your monitor determine how many colors can be displayed. For example, a display that can operate in SuperVGA (SVGA) mode can display up to 16,777,216 (usually rounded to 16.8 million) colors because it can process a 24-bit long description of a pixel.

Color Depth

The number of bits used to describe a pixel is known as its bit depth. With 24-bit bit depth, eight bits are dedicated to each of the three additive primary colors -- red, green and blue. This bit depth is also called true color because it can produce the 10,000,000 colors discernible to the human eye, while a 16-bit display is only capable of producing 65,536 colors. Displays jumped from 16-bit color to 24-bit color because working in 8-bit increments makes things a whole lot easier for developers and programmers. Simply put, color bit depth refers to the number of bits used to describe the color of a single pixel. The bit depth determines the number of colors that can be displayed at one time.

Video RAM

Although video RAM isn't actually part of the monitor, it's an important consideration when matching a monitor to the computer's video card. It's important to realize that every pixel on the CRT screen corresponds to a bit of video RAM. Furthermore, for every color each pixel can display… that's a bit of video RAM. You can calculate the amount of video RAM you'll need for any specific monitor using the following calculation: VRAM = HorRes x VerRes x ColorDepth (In Bytes). The amount of video RAM required for a 640 x 480 monitor with an 8-bit (1 Byte) color depth would be 307 kilobytes… That's 640 x 480 x 1. Since 307 KB is not a typical size for video RAM, the next standard size is used. In this case, that would be 512 KB of video RAM.

Power Consumption

Power consumption varies greatly with different technologies. CRTs are somewhat power-hungry, at about 110 watts for a typical display, especially when compared to LCDs, which average between 30 and 40 watts. In a typical home computer setup, with a CRT-based display, the monitor accounts for over 80% of the electricity used! Because most users don't interact with the computer much of the time it is on, the U.S. government initiated the Energy Star program in 1992. Energy Star compliant equipment monitors user activity and suspends non-critical processes, such as maintaining a visual display, until you move the mouse or tap the keyboard. An Energy Star compliant monitor will reduce its power consumption by 99% when it switches into suspend or sleep mode. According to the EPA, if you use a computer system that is Energy Star compliant, it could save you approximately $400 a year on your electric bill! Similarly, because of the difference in power usage, an LCD monitor might cost more up front but end up saving you money in the long run. CRT technology is still the most prevalent system in desktop displays. Because standard CRT technology requires a certain distance between the beam projection device and the screen, monitors employing this type of display technology tend to be very bulky. Other technologies make it possible to have much thinner displays, commonly known as flat-panel displays. Liquid Crystal Display (LCD) technology works by blocking light rather than creating it, while Light Emitting Diode (LED) and gas plasma work by lighting up display screen positions based on the voltages at different grid intersections. LCDs require far less energy than LED and gas plasma technologies and are currently the primary technology for notebook and other mobile computers. As flat panel displays continue to grow in screen size and improve in resolution and affordability, expect them to gradually replace CRT-based displays.

Research Resources:

Company	Web Site	Description
How Stuff Works	http://www.howstuffworks.com/monitor.htm	Comprehensive website depicting information on a variety of technical devices.
Webopedia	http://www.webopedia.com/	On-Line Technical Glossary

Required Materials:

CSS Curriculum Software

External Anatomy Guide

Exercise 2 – The Monitor

Questions

Procedure: Review the material presented in this exercise and the information found in the module lessons to answer the following questions. You may also need use other resources while you search for the answers to these questions. Print out only this page, fill out the ID information box, and answer the questions. Return the completed assignment to you supervisor for approval to continue with the next assignment.

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1. Research and develop a detailed definition for each of the following terms. Be sure to develop your definition within the context of this exercise. Refer to the list of Research Resources and Required Materials as well as other materials you feel are appropriate. Write your definitions on the reverse side or a separate piece of paper with each definition being two sentences or more.

   - Aspect Ratio
   - Display Resolution
   - Dot Pitch
   - Refresh Rate
   - Color Depth
   - Power Consumption

2. What is the standard resolution for a VGA monitor?

3. What is a pixel?

4. How many times does the electron beam sweep from top to bottom to fully refresh an interlaced monitor's screen?

5. How much video RAM is needed to support a monitor with a resolution of 1,024 x 768 pixels with a 16 bit (2 Bytes) color depth (65,000 colors)?

6. A monitor conforming to the Energy Star standard reduces its power consumption by _____ % when it's in sleep or suspended mode.

7. Besides VGA… List three types of video adapter standards.

8. What type of monitor uses a singe pass to draw the entire screen, drawing every line of the raster on each pass?

9. A common problem with monitors is bent pins on the cable connector. When the pins are bent, they don't make contact with the signals coming from the video graphics adapter. Which pin(s) on the connector would be bent if the screen image constantly rolled vertically on the monitor?

10. Which pin(s) on the connector would be bent if the screen image had a bluish color shift? (You'll have to think on this one… It's tricky.)

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External Anatomy Guide

Exercise 3 – Keyboard

Exercise Objective:

In this exercise, you'll identify component parts of a keyboard and demonstrate your knowledge of its basic operation.

Discussion of Fundamentals:

Keyboards are the most common of all input devices. Functionally, they provide a convenient method of encoding data. In their simplest form, the might resemble a panel of one or more push-button switches; and yet they often look like a complex switch console. Styles and function change frequently. The placement of keys on the keyboard usually categorize the keyboard as one of these three model types. They are the PC/XT 83-key, AT 84-key, and the 101-key layout for XT, AT, and PS/2 keyboards. The keyboard pictured above is the 101-key PS/2 model as determined by the number of keys, key layout, and type of the keyboard connector. This style is sometimes known as an enhanced keyboard and is the most common PC keyboard format in the field. There are newer versions of the enhanced keyboard that are easier to use and ergonomically sound.

The only other advancement keyboard manufacturer's toy around with is altering the order in which the keys are placed on the keyboard. American keyboards are sometimes called QWERTY keyboards because that's the word the first row of letters on the keyboard spells. The QWERTY keyboard came onto the scene when mechanical typewriters were first invented. Early typewriters had a significant flaw. The typists typed so fast that the keys often jammed. The designer had to experiment with the position of the letters on the keyboard to slow the typist down. Commonly used letters were placed farther away from the home-keys to keep the typist from jamming-up the typewriter. Now that we no longer have to worry about jammed keys, many manufacturer's have developed keyboards with the commonly used letters close to the home-keys so typist can maximize their typing speed. They haven't caught on though. It seems many typists have problems learning the new layout of the keys.

Opening the keyboard, reveals how the keyboard works. The keyboard is comprised of four component parts: The keypad assembly which holds the keycaps and switch circuit matrix; the encoder circuit board which converts the key tap to an ASCII code; the keyboard cable that carries the ASCII code to the computer; and the keyboard cover which houses everything. Although you may be able to troubleshoot simple problems with the keyboard they're typically considered throwaway technology. They're just cheaper to replace than repair.

As each keycap is depressed it closes an electronic switch. The type of switch could be mechanical or capacitive. Mechanical keyboards feature switches that electrically close circuits. The mechanism that closes the circuit could be a foam element, membrane sheet, or rubber dome. Capacitive keyboards are better and therefore more expensive than mechanicals. The circuitry in the keyboard senses a change in the key's capacitance when the keycap is depressed. The encoder circuitry determines the key pressed and transmits the appropriate ASCII code to the computer through the keyboard cable. The keypad assembly is connected to the encoder circuit board through a detachable flexible circuit. Most keyboards are snapped together and feature fully removable keycaps, keypad assembly, encoder circuit, and keyboard cable.

Research Resources:

Company	Web Site	Description
How Stuff Works	http://www.howstuffworks.com/keyboard.htm	Comprehensive website depicting information on a variety of technical devices.
Webopedia	http:// www.webopedia.com/	On-Line Technical Glossary

External Anatomy Guide

Exercise 3 – The Keyboard

Questions

Name:	
Period:	
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   - ASCII Code
   - Encoder Circuit
   - PS/2 Keyboard
   - PC/XT Keyboard
   - Key Pad

2. What kinds of keyboards are considered mechanical?

3. The most commonly used PC keyboard format is the _____ keyboard?

4. Because of the layout of the keys, American keyboards are sometimes called _____ keyboards.

5. The _____ keyboard uses a capacitive membrane module instead of switch contacts to complete the keypad circuit.

6. For the most part… Keyboards are considered _____ technology and are not usually repaired.

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External Anatomy Guide

Exercise 4 – Mouse

Exercise Objective:

In this exercise, you'll identify component parts of a mouse and demonstrate your knowledge of its basic operation.

Discussion of Fundamentals:

The computer mouse is an alternate computer input device. The computer mouse broke onto the scene in 1984 with the introduction of the Apple Macintosh. It's used to position the computer cursor and select objects using a Graphic User Interface (GUI). It's connected to the computer through a serial interface. The mouse pictured above uses a PS2 (Mini-DIN-6) style connector, but there are also D9, D25, USB, and wireless varieties available. Some mice, called bus mice, require their own adapter or expansion card installed in the computer to operate. Newer optical mouse designs have eliminated the mouse ball/rollers and replaced them with electro-optical devices.

Opening the "Wheeled" (mechanical) mouse, reveals how it works. As the rubber mouse ball rolls, it turns two rotors that are connected to encoding disks called optoisolator disks. The tension roller presses the mouse ball against the rotors. These disks interrupt the light being transmitted within the optocouplers. Each optocoupler contains a light source and a photo transistor. Each time the light is interrupted by the vanes in the opto isolator disk the cursor moves correspondingly. One rotor moves the cursor vertically while the other moves horizontally.

The switches at the top of the mouse are simple microswitches used to activate functions that are programmed in your GUI. The mouse wheel in the center activates a microswitch when it's rotated and when it's depressed. It can be programmed for useful functions like zoom or scroll.

The Optical Mouse

With the invention of the optical mouse, it would seem that the days of the wheeled mouse are numbered. Most versions available on store shelves these days are the optical variety. Developed by Agilent Technologies and introduced to the world in late 1999, the optical mouse actually uses a tiny camera to take 1,500 pictures every second to keep track of where the mouse is on the mousing surface.

Optical mice can work on a variety of surfaces except for clear glass, plastic, or skin (for some strange reason). The mouse has a small, red light-emitting diode (LED) that bounces light off that surface onto a complimentary metal-oxide semiconductor (CMOS) sensor. The CMOS sensor sends each image to a digital signal processor (DSP) for analysis. The DSP, operating at 18 MIPS (million instructions per second), is able to detect patterns in the images and see how those patterns have moved since the previous image. Based on the change in patterns over a sequence of images, the DSP determines how far the mouse has moved and sends the corresponding coordinates to the computer. The computer moves the cursor on the screen based on the coordinates received from the mouse. This happens hundreds of times each second, making the cursor appear to move very smoothly.

Optical mice have several benefits over wheeled mice:

- No moving parts mean less wear and a lower chance of failure.
- There's no way for dirt to get inside the mouse and interfere with the tracking sensors.
- Increased tracking resolution means smoother response.
- They don't require a special surface, such as a mouse pad.

Regardless of weather it's a wheeled or optical mouse, mice usually considered a throwaway technology. Outside of very simple maintenance and repair, mice are cheaper to replace than they are to repair.

Research Resources:

Company	Web Site	Description
How Stuff Works	http://www.howstuffworks.com/keyboard.htm	Comprehensive website depicting information on a variety of technical devices.
Webopedia	http://www.webopedia.com/	On-Line Technical Glossary

Required Materials:

CSS Curriculum Software

External Anatomy Guide

Exercise 4 – The Mouse

Questions

Name:	
Period:	
Date:	

Procedure: Review the material presented in this exercise and the information found in the module lessons to answer the following questions. You may also need use other resources while you search for the answers to these questions. Print out only this page, fill out the ID information box, and answer the questions. Return the completed assignment to you supervisor for approval to continue with the next assignment.

1. Research and develop a detailed definition for each of the following terms. Be sure to develop your definition within the context of this exercise. Refer to the list of Research Resources and Required Materials as well as other materials you feel are appropriate. Write your definitions on the reverse side or a separate piece of paper with each definition being two sentences or more.

   - Optoisolator Disc
   - Optocoupler
   - Microswitch
   - Wheeled (Mechanical) Mouse
   - Optical Mouse

2. The mouse is considered a _____ technology meaning that it is usually more economical to replace than it is to repair.

3. Describe the device that's used to detect the movement of an optical mouse.

4. Which mouse type is the most commonly used?

5. List the types of connectors used by mice?

6. A _____ mouse uses a ball and sensor mechanism to detect movement.

7. The bus mouse attaches to its own _____ .

8. What are the advantages of an optical mouse over a mechanical mouse?

9. What surfaces would an optical mouse have trouble operating on?

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External Anatomy Guide

Exercise 5 – Speakers

Exercise Objective:

In this exercise, you'll identify component parts of the speakers and demonstrate your knowledge of their basic operation.

Discussion of Fundamentals:

The multimedia speaker system augments the computer's PC speaker. These high fidelity speakers provide stereo sound required for multimedia software applications and games. Stereo means that each speaker can produce sound completely independent from one another. Speakers connect to the computer's speaker output using a mini stereo phono plug. This output jack is most often found at the back of the CPU. This type of speaker system also requires an external power supply such as the black power cube pictured here. The power cube drops the AC voltage found at the wall outlet and converts it to a low DC voltage typically around 6 VDC. Some speakers provide volume, balance, and tone controls right on the speaker cabinet. However, these functions can also be controlled using computer software. There is a power switch located somewhere on the speaker cabinet and there may even be a headphone jack available for private listening.

Opening the speaker, reveals how the speaker works. Low voltage DC power is delivered from the power cube to the Power Jack. Wiring carries the voltage to the Amplifier Board to power it. Low level audio is delivered to the speaker system through the Audio Input Jack. The wiring routes these signals the Control Board where the signal volume, balance, and tone controls alter them. The resulting audio signals are then sent to the Amplifier Board where it is amplified to drive the speaker. Only one of the two speaker cabinets usually contain the Amplifier and Control circuits.

Research Resources:

Company	Web Site	Description
How Stuff Works	http://www.howstuffworks.com/keyboard.htm	Comprehensive website depicting information on a variety of technical devices.
Webopedia	http:// www.webopedia.com/	On-Line Technical Glossary

Required Materials:

CSS Curriculum Software

External Anatomy Guide

Exercise 5 – The Speakers

Questions

Name:	
Period:	
Date:	

Procedure: Review the material presented in this exercise and the information found in the module lessons to answer the following questions. You may also need use other resources while you search for the answers to these questions. Print out only this page, fill out the ID information box, and answer the questions. Return the completed assignment to you supervisor for approval to continue with the next assignment.

1. Research and develop a detailed definition for each of the following terms. Be sure to develop your definition within the context of this exercise. Refer to the list of Research Resources and Required Materials as well as other materials you feel are appropriate. Write your definitions on the reverse side or a separate piece of paper with each definition being two sentences or more.

   - Stereo Audio
   - Phono Plug
   - Balance
   - Power Cube
   - Jack

2. What kind of plug is used to connect the speaker to the audio output jack on the computer?

3. What voltage do external speaker systems usually operate at?

4. What controls are typically found on an external speaker system?

5. List the internal components found inside the external speaker system.

6. What type of voltage does and external speaker system operate on?

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