



Hardware

3.1 HARDWARE

3.1.1 Understand what is computer hardware

To learn what hardware is, first we need to know what is computer. A **computer** is an electronic device, operating under the control of instructions stored in its own memory that can accept data (input), process the data according to specified rules, produce information (output), and store the information for future use. Every computer has two parts, the hardware and software. Hardware cannot be used without software.

Abbreviated as HW, **hardware** is best described as any physical component of a computer system that contains a circuit board, integrated circuits, or other electronics. Hardware is so-termed because it is "hard" or rigid with respect to changes or modifications; whereas software is "soft" because it can be easily updated or changed. A perfect example of hardware is the screen on which you are viewing this page. Whether it be a computer monitor, tablet or smart phone; it is hardware. Without any hardware, your computer would not exist, and software could not be used.

Hardware is directly controlled by firmware, the part that is embedded into computer. Software of the computer is on top of the hardware, and it makes use of the firmware to interface with the hardware. Firmware is software program that is programmed to give permanent instructions to communicate with other devices and perform input/output tasks. Firmware is stored in ROM (read only memory) of the hardware device. Without firmware, hardware is non-functional.

Software is computer program that is giving instructions to a computer in order to do specific tasks. There are three categories of software: system software (serves as a base for application software), programming software (set of tools to aid developers in writing programs) and application software (intended to perform certain tasks).

3.1.2 Understand what is internal and external hardware

Hardware is the collection of all the physical parts that you can see and touch. There are internal and external parts of hardware. External hardware consists of parts that are installed outside of the computer, while the internal hardware are parts inside the computer. Keyboard, mouse, printer etc. are external hardware parts, and RAM, motherboard etc. are considered parts of internal hardware. The internal hardware parts are called **components**, and external hardware are called **peripherals**.

- COMPONENTS (INTERNAL)

Every computer is made from different parts, like hard drives, motherboards and RAM, and every one of those parts is made from smaller parts that are called components.

Example: Motherboard parts are transformers, capacitors, resistors, PCP (printed circuit board). They all need to function in order for motherboard to work with other parts of the computer.

Components that perform calculations and process information are circuits, transistors and switches. Even bigger parts of a computer like hard drive are called components, even though they themselves are made of small components.

- PERIPHERAL (EXTERNAL)

Any external device that can be plugged and/or unplugged can be called peripheral. There are input (mice, keyboard) and output (monitor) peripherals. You can also call them "I/O devices" because they provide input and output for the computer. There are also some devices that provide both input and output for the computer, like external hard drives.

There are many different peripheral devices, but generally, they are divided into three general categories:

- Input devices, such as a mouse and a keyboard
- Output devices, such as a monitor, projector, interactive whiteboard, printer
- Storage devices, such as a hard drive or flash drive

Input are any data or instructions entered into the memory of a computer. Output is data that has been processed into a useful form. Output is basically how you get the processed information "out" of the computer.

Some devices fall into more than one category. Consider a CD-ROM drive; you can use it to read data or music (input), and you can use it to write data to a CD (output).

3.1.3 Hardware problem fixing

When it comes to hardware, some technical issues can occur from time to time; nevertheless not all of them require a professional intervention from IT specialist and some of the problems can be handled by yourself. The first and basic rule if the application or computer is not working is to restart the computer.

3.1.3.1 Know how to use and plug/unplug external devices

External devices along with internal devices are essential part of every PC. In order to use external devices (like USB flash drive), you need to plug them in the PC. When you want to unplug them, you need to remember, that they must be **safely removed**. In the additional reading, you can find a step-by-step guide how to do it.



Figure 1 USB port and cable

If your USB port stops working, it's not necessary that it's broken. Here, you can find some solutions that can help you to fix this issue:

<https://www.hongkiat.com/blog/pc-hardware-problems-solutions/>

3.1.3.2 Know how to solve internet connection problems

Every once in a while, you will experience problems with your internet connection. Some of the problems are very common and easy to resolve, and some are more complicated. Most of them you can solve on your own, but if you cannot, always call your internet operators or school technician, who will fix the problem. In order to find the solution for internet and Wi-Fi problems, you need to understand the issue. First of all try turning off the Wi-Fi on your device, then re-enabling it. If that doesn't work, do the same with your router by unplugging it and then plugging it back in 30 seconds later. Following link will give you most common Wi-Fi and Internet problems along with solutions:

<https://www.digitaltrends.com/computing/wi-fi-problems-and-solutions/>

3.1.3.3 Be able to use projector

“A projector is an optical device that projects an image (or moving images) onto a surface, commonly a projection screen. Most projectors create an image by shining a light through a small transparent lens, but some newer types of projectors can project the image directly, by using lasers.”¹

In order to use a projector, first you have to set it up, from finding the right location for the projector to selecting the right picture mode. In this link you can find step by step instructions:

<https://www.cnet.com/how-to/how-to-set-up-a-projector/>

¹ <https://en.wikipedia.org/wiki/Projector>

If you have problems with connecting your projector to a PC or a laptop, here is the link with instructions how to do that:

<https://www.lifewire.com/how-to-set-up-a-projector-and-laptop-for-presentations-2378137>

As with all technology, you will have some problems at some point of time with your projector, like bad quality of image, or no image at all. On this link you can find the most common problems that you can have with your projector, backed up with solutions:

<https://jprojectors.wordpress.com/2011/08/08/projector-troubleshooting/>

How to switch screens from the monitor to projector

Plug the projector to your computer, if the screen is not switched automatically, you need to do these steps:

1. While holding down the Windows key, press and release the P key.



Figure 2 Keyboard shortcut

2. A window with display options will appear. You can choose from 4 options:

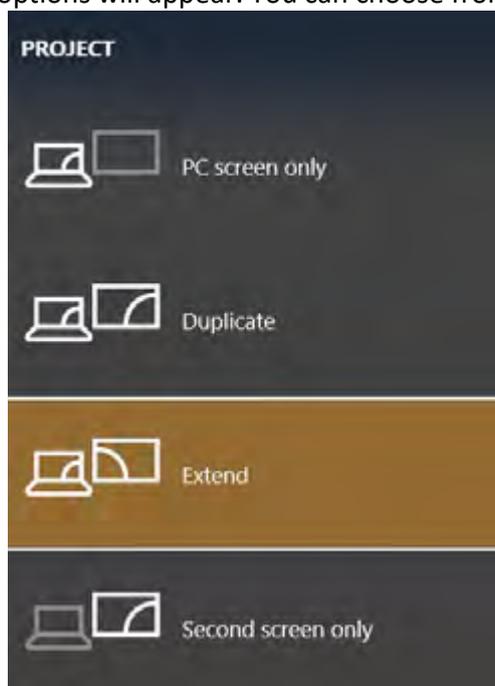


Figure 3 Display mode options



- a. **PC screen only** – the user see only the screen of the computer
- b. **Duplicate** – this option shows the same image from the computer on the projection screen
- c. **Extend** - gives the user the ability to expand their desktop viewing to more than one monitor. This feature works well when a user needs multiple programs open, it displays different content on your laptop monitor and on the data projector screen.
- d. **Second screen only** - disables the user's monitor and displays only on the user's projector screen.