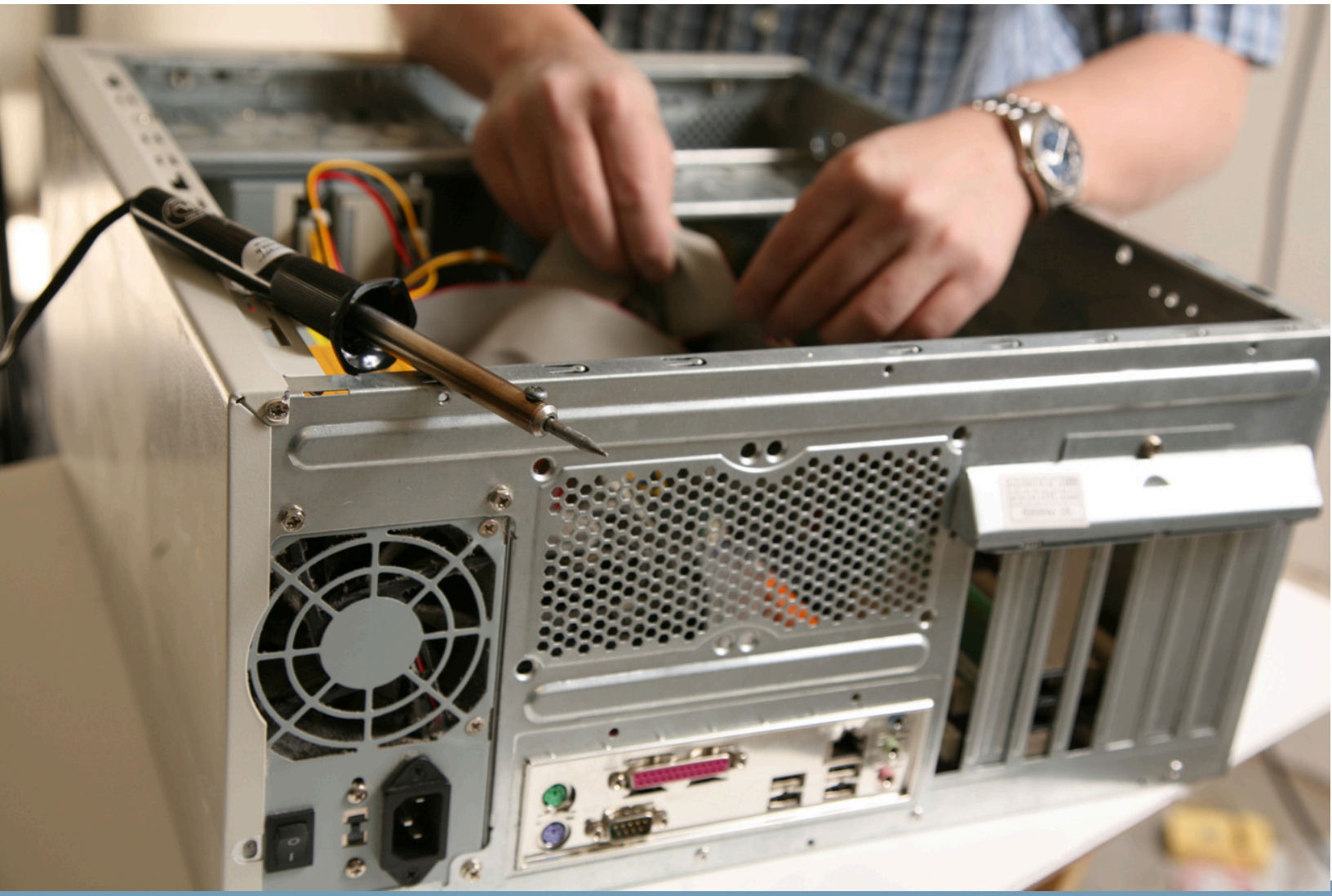
Demystifying Your Device:

A Short Lesson on What's Inside Your Computer



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OVERVIEW

Computers are an essential tool for living in our interconnected world. Knowledge of how computers operate is a key part of digital literacy.

This allows for a greater understanding of the devices we have come to rely on and how they exist in the world.

This guide describes a computer's individual components and their functions, in clear, accessible language.

MOTHERBOARD

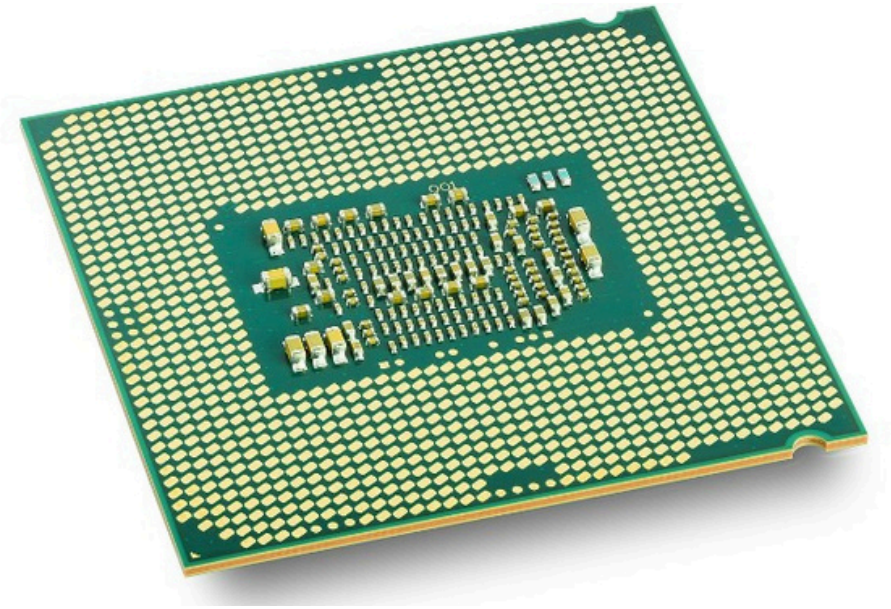
A motherboard is, as its name suggests, the "mother" of all other components in a computer. It is a large circuit board that all other components are connected to. They use it to talk to one another. All other components mentioned after this point fit cleanly into this board via the range of connectors shown in the image below.

The motherboard is typically located under the keyboard of a laptop computer. On a desktop computer, it is mounted on the left or right interior side of its case. They are not universal. Often, they are designed with specific types of devices and components in mind.

The average user will not interface with their motherboard often. However, if you plan on replacing a hard drive or adding RAM to your computer, make sure to confirm your motherboard is compatible with your desired components.

CPU (CENTRAL PROCESSING UNIT)

A CPU is essentially the brain of your device. It is responsible for processing and performing instructions. They are made up of billions of tiny transistors. These mini-switches can be turned on or off via an electric current. These on and off states are interpreted as ones or zeros. In turn, these are translated into the functions we use our computers for, from checking email to posting on social media.



CPUs are square chips that plug directly into the motherboard via a specially designed socket. Specification wise, there are two things to be aware of. Processor speed is measured by how many instructions a CPU can manage per second, expressed in gigahertz (GHz, or billions of instructions per second).

Your CPU will come pre-installed in any machine you purchase. However, if you are given the choice, take a look at your options. An Intel Core i3 or AMD equivalent multi-core processor capable of 2.3 GHz, should be a good minimum starting point.

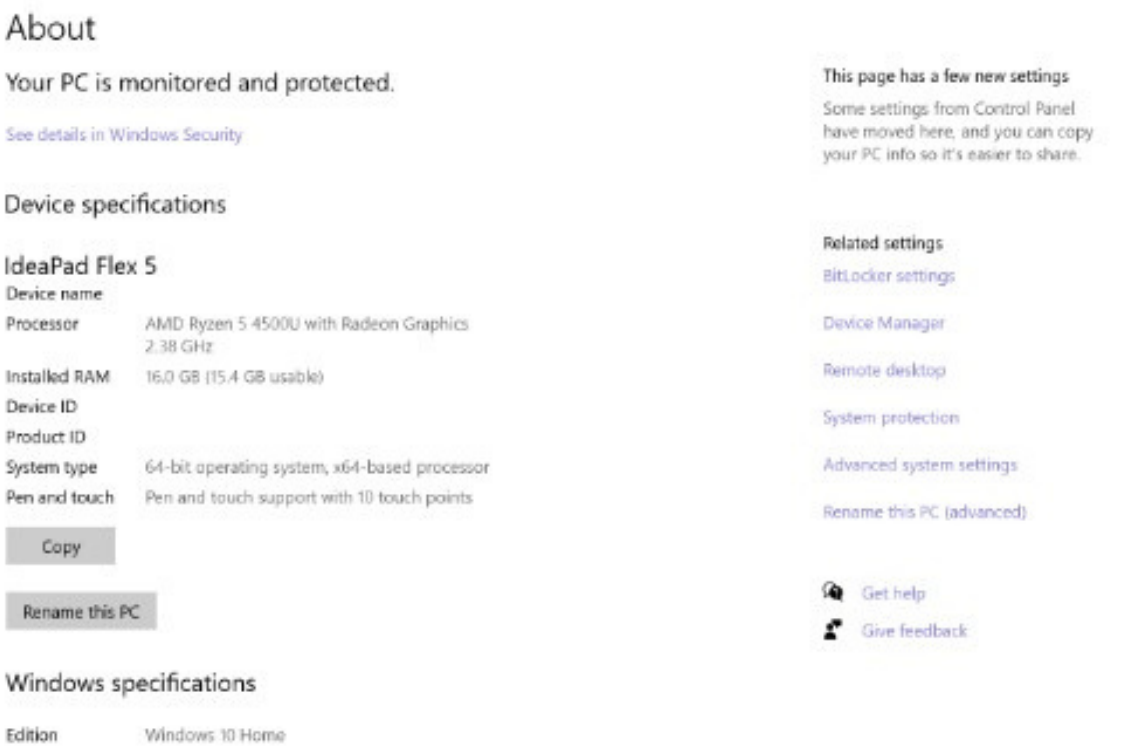
Additionally, modern CPUs are made of multiple cores that allow for more sets of instructions to be processed. Two, four, or six cores are commonplace with higher end computers going above that. These two pieces of information can be viewed on your computer's specifications page.

HOW DO I IDENTIFY MY COMPUTER'S SPECIFICATIONS?

WINDOWS 10

If your computer's operating system is Windows 10, please use the steps below.

1. Click on the Windows Start button on the bottom left corner of your screen.
2. Then, click on Settings (the gear icon).
3. In the Settings menu, click on System.
4. Scroll down.
5. Then, click on "About." This is where you can find your computer's specifications.



MAC OS

If your computer's operating system is MacOS, please use the steps below:

1. Click on the Apple menu on the top left corner of your screen.
2. Select About This Mac.
3. This page is where you can find your computer's specifications.

HARD DRIVE

Hard drives are the storage component of your computer, where everything from your operating system to programs and individual files (documents, photos, music, etc.) are held. There are two kinds of hard drives, hard disc drives (HDDs) and solid state drives (SSDs).

HDDs (pictured below on the left) incorporate a physical spinning disc into their design where data is stored magnetically. They are generally cheaper and slower than SSDs. They are great for storing files that don't need to be accessed frequently and backing up data.

SSDs (pictured below on the right) are a newer technology. They are designed to store data entirely within integrated circuits. This makes them smaller, faster, and generally, more expensive. SSDs are quickly becoming the norm because of their performance benefits. If given the choice, an SSD will greatly increase the operating speeds of your computer.

Your hard drive's capacity is measured in units called bytes. A single byte is large enough to store one character of text. These days we use gigabytes, which are one billion bytes. Hard drives range in size, but newer computers typically offer 128-512 gigabytes of storage. We suggest at least 250 gigabytes of HDD storage, or 128 gigabytes of SSD storage.

WHAT IS AN OPERATING SYSTEM?

An operating system is the most important program on your computer. It manages all other applications. It also acts as a bridge between the user and the machine's physical components. Common operating systems include Windows, MacOS, and Linux.

RAM (RANDOM ACCESS MEMORY)

RAM, often referred to as “memory,” is a component that gives programs on your computer a place to access and store data for a short period of time. Specifically, until the machine is turned off. It’s the component that allows your computer to multitask.

It keeps track of the programs currently running. That way, users can quickly switch between tabs in their browsers or keep music playing in the background while they check their email or perform other tasks on their computer.

HOW MUCH RAM DO I NEED?

Similar to hard drives, RAM is measured in gigabytes. The more RAM you have, the more simultaneous tasks your computer can handle. About 8-16 gigabytes of RAM is the norm for newer computers. This is ideal for the average user.

Our suggested minimum for RAM is 4 gigabytes. However, upgrading to 8 gigabytes, if given the choice, is encouraged. It is possible to add more after the fact, but the process for doing so depends on the type of computer you have and your motherboard’s available RAM slots.

Keep in mind that manufacturers are increasingly soldering RAM and hard drives directly into computer motherboards. With that in mind, take a moment to investigate your specific computer model before upgrading or making a purchase.

GPU (GRAPHICS PROCESSING UNIT)

A GPU is the cousin of the CPU. It's another chip used by your computer to process and perform instructions. The difference here is that a GPU's instructions are specific. All of them are related to computer graphics.

They are responsible for visually representing your computer's operations, from the icons that open your files to the windows your programs run in. They are also essential for graphically intensive tasks like photo or video editing, 3D rendering, and gaming.

GPU's are often built into a computer's motherboard or integrated into its CPU. For those with a need for extra power, graphics cards (pictured above) are an option. They are a separate component that fits into your motherboard via an expansion slot.

Most users should be fine with the GPU preinstalled in their computer. If you plan on using your computer for graphically intensive tasks, consider one with a separate graphics card. As with other components mentioned, it is essential to confirm your graphics card and motherboard are compatible.

POWER SUPPLY

A computer's power supply takes in electricity via a wall outlet and converts that into the power needed by the machine. A desktop power supply is pictured below. It is a square component mounted inside of the computer's case.

Laptop power supplies are typically smaller. Commonly called chargers, they serve to charge the computer's internal battery.

SAFETY TIP

If it ever becomes necessary to open up your computer, make sure to turn it off and unplug it before you do. Additionally, touch a piece of grounded metal or wear an anti-static wrist strap before you touch its interior as built up static electricity can damage your computer.

About Digitunity

Digitunity is a 501(c)(3) public charity whose work advances digital inclusion by connecting donors of technology with organizations serving people in need.

Our mission is to ensure everyone who needs a computer has one, along with robust internet connectivity and digital literacy skills.

You can reach us by phone at (203) 863-9100, by email at info@digitunity.org, or by mail at:

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INTERESTED IN A DEEPER DIVE?

If you'd like additional information about the inner workings of your computer, take a look at these resources:

- GCF Learn Free has a number of useful computer-centric guides located on their website (https://edu.gcfglobal.org/en/topics/computers)
- Crash Course has an excellent video series on the history of computer science, hosted on YouTube (https://thecrashcourse.com/topic/computerscience)