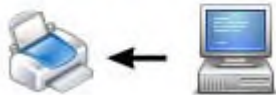


What is the difference between an input and output device?

Input Example



Output Example



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An [input device](#) sends information to a computer system for [processing](#), and an [output device](#) reproduces or displays the results of that processing. Input devices *only* allow for input of data to a computer and output devices *only* receive the output of data from another device.

Most devices are only input devices or output devices, as they can only accept data input from a user or output data generated by a computer. However, some devices can accept input and display output, and they are referred to as [I/O devices](#) (input/output devices).

For example, as shown in the top half of the image, a keyboard sends electrical signals, which are received as **input**. Those signals are then interpreted by the computer and displayed, or **output**, on the monitor as text or images. In the lower half of the image, the computer sends, or **outputs**, data to a printer. Then, that data is printed onto a piece of paper, which is also considered **output**.

Input devices

An **input** device can send data to another device, but it cannot receive data from another device. Examples of input devices include the following.

- **Keyboard** and **Mouse** - Accepts input from a user and sends that data (input) to the computer. They cannot accept or reproduce information (output) from the computer.
- **Microphone** - Receives sound generated by an input source, and sends that sound to a computer.
- **Webcam** - Receives images generated by whatever it is pointed at (input) and sends those images to a computer.

Output devices

An **output** device can receive data from another device and generate output with that data, but it cannot send data to another device. Examples of output devices include the following.

- **Monitor** - Receives data from a computer (output) and displays that information as text and images for users to view. It cannot accept data from a user and send that data to another device.
- **Projector** - Receives data from a computer (output) and displays, or projects, that information as text and images onto a surface, like a wall or screen. It cannot accept data from a user and send that data to another device.
- **Speakers** - Receives sound data from a computer and plays the sounds for users to hear. It cannot accept sound generated by users and send that sound to another device.

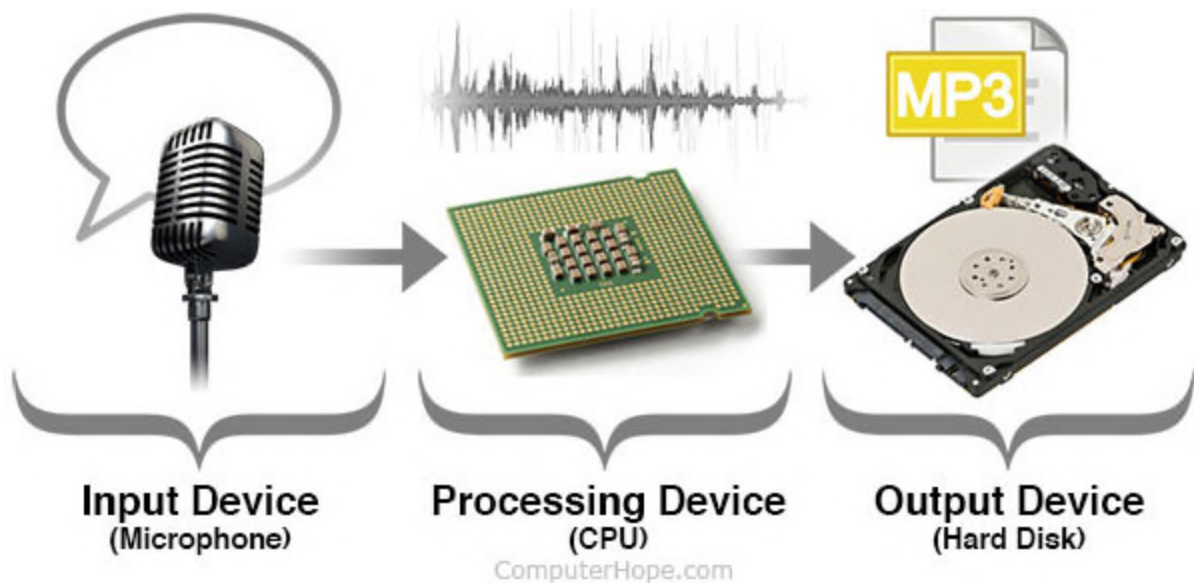
Input/output devices

An [input/output](#) device can *receive* data from users, or another device (input), and *send* data to another device (output). Examples of input/output devices include the following.

- [CD-RW drive](#) and [DVD-RW drive](#) - Receives data from a computer (input), to copy onto a writable CD or DVD. Also, the drive sends data contained on a CD or DVD (output) to a computer.
- [USB flash drive](#) - Receives, or saves, data from a computer (input). Also, the drive sends data to a computer or another device (output).
-

Processing device

When a computer receives data from an [input device](#) (e.g., [keyboard](#)), the data goes through an intermediate stage before it's sent to an [output device](#) (e.g., [monitor](#)). A **processing device** is any device in a computer that interprets and manipulates incoming data during this stage. For example, in the diagram below, the CPU is the processing device.



Processing device examples

Some of the most common processing devices in a computer include the following:

- [Central processing unit](#) (CPU)
- [Graphics processing unit](#) (GPU)
- [Motherboard](#)
- [Network card](#)
- [Sound card](#)
- [Video card](#)

What is a Computer



A **computer** is a [programmable](#) device that stores, retrieves, and processes [data](#). The term "computer" was originally given to humans (**human computers**) who performed numerical calculations using mechanical calculators, such as the [abacus](#) and [slide rule](#). The term was later given to a mechanical device as they began replacing the human computers. Today's computers are electronic devices that accept data ([input](#)), [process](#) that data, produce [output](#), and store ([storage](#)) the results.

- [Computer overview.](#)
- [History of the computer.](#)
- [How are computers used today?](#)
- [What components make up a desktop computer?](#)
- [What parts are needed for a computer to work?](#)
- [Computer connections](#)
- [Types of computers.](#)
- [Who makes computers?](#)
- [Related computer pages.](#)
- [All computer questions and answers.](#)

Computer overview

Below is a picture of a computer with each of the main components. In the picture below, you can see the [desktop computer](#), [flat-panel display](#), [speakers](#), [keyboard](#), and [mouse](#). We've also labeled each of the [input devices](#) and [output devices](#).

Computer



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History of the computer

The **first digital computer** and what most people think of as a computer was called the [ENIAC](#). It was built during World War II (1943-1946) and was designed to help automate the calculations being done by human computers. By doing these calculations on a computer, they could achieve results much faster and with fewer errors.

Early computers like the ENIAC used [vacuum tubes](#) and were large (sometimes room size) and only found in businesses, universities, or governments. Later, computers began utilizing [transistors](#) and smaller and cheaper parts that allowed the ordinary person to own a computer.

- [When was the first computer invented?](#)

How are computers used today?

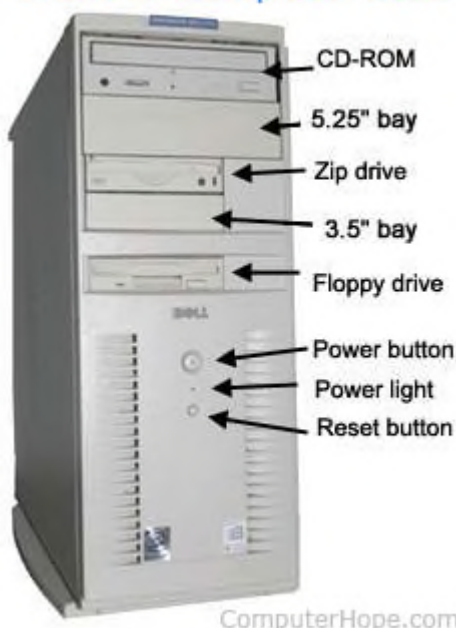
Today, computers make jobs that used to be complicated much simpler. For example, you can write a letter in a [word processor](#), edit it anytime, [spell check](#), print copies, and send it to someone across the world in seconds. All these activities would have taken someone days, if not months, to do before. Also, these examples are a small fraction of what computers can do.

- [How are computers used?](#)
- [How does a computer work?](#)
- [What are the advantages of using a computer?](#)

What components make up a desktop computer?

Today's desktop computers have some or all of the below components ([hardware](#)) and [peripherals](#). As technology advances, older technologies, such as a floppy disk drive and Zip drive (both shown below), are no longer required or included.

Front of Computer Case



- [Bay](#)
- [Case or Chassis](#)
- [Case Fan](#)
- Optical drive: [Blu-ray](#), [CD-ROM](#), [CD-R](#), [CD-RW](#), or [DVD](#).
- [CPU](#) (processor)
- [Floppy disk drive](#)
- [Hard drive](#)
- [Keyboard](#)
- [RAM](#) (random access [memory](#))
- [Microphone](#)
- [Monitor](#), [LCD](#), or another [display](#) device.
- [Motherboard](#)
- [Mouse](#)
- [Network card](#)
- [Power Supply](#)
- [Printer](#)
- [Sound card](#)
- [Speakers](#)
- [Video card](#)
- [Wearable](#)

What parts are needed for a computer to work?

A computer does not require all the components mentioned above. However, a computer cannot function without having at the very minimum the parts listed below.

- [Processor](#) - Component that executes [instructions](#) from the [software](#) and [hardware](#).
- [Memory](#) - Temporary [primary storage](#) for data traveling between the storage and CPU.
- [Motherboard](#) (with [onboard](#) video) - Component that connects all components.
- [Storage device](#) (e.g., [hard drive](#)) - Slower [secondary storage](#) that permanently stores data.

However, if you had a computer with only the minimum parts above, you would be unable to communicate with it until you connected at least one [input device](#) (e.g., [keyboard](#)). Also, for you to see what is happening, you would need at least one [output device](#) (e.g., [monitor](#)).

- [What does the inside of a computer look like?](#)

Computer connections

All computers have different types of connections. An example of the back of a personal computer and a brief description of each connection is found on our [computer connections](#) page.

- [How to set up a new computer.](#)

Types of computers

When talking about a computer or a "PC," you are usually referring to a desktop computer found in a home or office. Today, however, the lines of what makes a computer are blurring. Below are all the different examples of what is considered a computer today.

Examples and types of computers



The picture above shows several types of computers and computing devices, and is an example of their differences. Below is a complete list of computers of past and present.

- [Console](#) (e.g., [Xbox](#) and [PS3](#))
- [Custom-built PC](#)
- [Desktop computer](#)
- [Diskless workstation and Thin client](#)
- [Embedded computers](#) - The most common and used computer.

An embedded computer is a computer with a specific function, found in such things as [ATMs](#), cars, microwaves, [TVs](#), the VCR, and other home electronics.

- [Gaming computer](#)

- [Hybrid computer](#)
- [Laptop, portable, notebook computer](#)
- [Mainframe](#)
- [Microcomputer](#)
- [Nanocomputer](#)
- [Netbook](#)
- [PDA](#)
- [Personal computer](#) (aka [desktop](#) and home computer)
- [Prebuilt computer](#)
- [Server](#)
- [Set-top box](#)
- [Smartphone](#)
- [Stick computer](#)
- [Supercomputer](#)
- [Tablet](#)

Who makes computers?

Today, there are two types of computers the [PC](#) (IBM compatible) and [Apple](#) Mac. Several companies that make and build PCs, and if you get all the necessary parts for a computer, you can even build a custom PC. However, with Apple computers, only Apple designs and makes these computers. See our [computer companies](#) page for a listing of companies ([OEMs](#)) that make and build computers.

Storage device

Drobo



Alternatively referred to as **digital storage**, **storage**, **storage media**, or **storage medium**, a **storage device** is any [hardware](#) capable of holding information either temporarily or permanently. The picture shows an example of a [Drobo](#), an external secondary storage device.

There are two types of storage devices used with computers: a [primary storage](#) device, such as [RAM](#), and a [secondary storage](#) device, such as a [hard drive](#). Secondary storage can be [removable](#), [internal](#), or [external](#).

- [Examples of computer storage](#)
- [Why is storage needed in a computer?](#)
- [Why so many different storage devices?](#)
- [What is a storage location?](#)
- [Which storage devices are used today?](#)
- [What storage device has the largest capacity?](#)
- [Are storage devices input and output devices?](#)
- [How do you access storage devices?](#)
- [What is the latest storage device?](#)
- [Related pages.](#)
- [Hard drive help and support.](#)

Examples of computer storage



Magnetic storage devices

Today, [magnetic storage](#) is one of the most common types of storage used with computers. This technology is found mostly on extremely large HDDs or [hybrid hard drives](#).

- [Floppy diskette](#)
- [Hard drive](#)
- [Magnetic strip](#)
- [SuperDisk](#)
- [Tape cassette](#)
- [Zip diskette](#)

Compact Disc (CD)



Optical storage devices

Another common type of storage is [optical storage](#), which uses [lasers](#) and lights as its method of reading and writing data.

- [Blu-ray disc](#)
- [CD-ROM disc](#)
- [CD-R and CD-RW disc.](#)
- [DVD-R, DVD+R, DVD-RW, and DVD+RW disc.](#)

Flash memory devices

SanDisk Ultra Flair 128 GB USB Flash Drive



[Flash memory](#) has replaced most magnetic and optical media as it becomes cheaper because it is the more efficient and reliable solution.

- [USB flash drive, jump drive, or thumb drive.](#)
- [CF \(CompactFlash\)](#)
- [M.2](#)
- [Memory card](#)
- [MMC](#)
- [NVMe](#)
- [SDHC Card](#)
- [SmartMedia Card](#)
- [Sony Memory Stick](#)
- [SD card](#)
- [SSD](#)
- [xD-Picture Card](#)

Online and cloud

Storing data online and in cloud storage is becoming popular as people need to access their data from more than one device.

- [Cloud storage](#)
- [Network media](#)

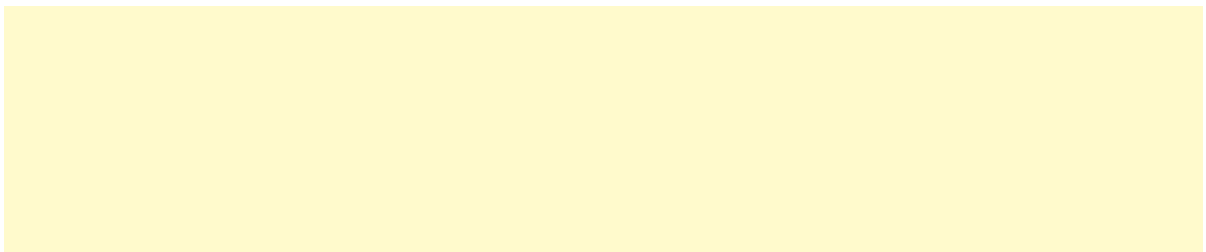
Paper storage

Punch Card in Punch Card Machine



Early computers had no method of using any of the technologies above for storing information and had to rely on paper. Today, these forms of storage are rarely used or found. In the picture is an example of a woman entering data to a punch card using a punch card machine.

- [OMR](#)
- [Punch card](#)



Note

A [hard copy](#) is considered a form of paper storage, although it cannot be easily used to input data back into a computer without the aid of [OCR](#).

Why is storage needed in a computer?

Without a storage device, a computer cannot [save](#) or remember any settings or information and would be considered a [dumb terminal](#).

Although a computer can run with no storage device, it would only be able to view information, unless it was connected to another computer that had storage capabilities. Even a task, such as browsing the Internet, requires information to be stored on your computer.

Why so many different storage devices?

As computers advance, the technologies used to store data do too, with higher requirements for storage space. Because people need more and more space, want it faster, cheaper, and want to take it with them, new technologies have to be invented. When new storage devices are designed, as people upgrade to those new devices, the older devices are no longer needed and stop being used.

For example, when punch cards were first used in early computers, the magnetic media used for floppy disks was not available. After floppy diskettes were released, they were replaced by CD-ROM drives, which were replaced by DVD drives, which were replaced by flash drives. The first [hard disk drive](#) from IBM cost \$50,000, was only 5 MB, big, and cumbersome. Today, we have [smartphones](#) that have hundreds of times the capacity at a much smaller price that we can carry in our pocket.

Each advancement of storage devices gives a computer the ability to store more data, and save and access data faster.

What is a storage location?

When [saving](#) anything on a computer, it may ask for a **storage location**, which is the location information is saved. By default, most information is saved to your computer hard drive. If you want to move the information to another computer, save it to a removable storage device, such as a [USB flash drive](#).

Which storage devices are used today?

Most of the storage devices [mentioned above](#) are no longer used with today's computers. Most computers today primarily use an SSD to store information, and the ability to use USB flash drives and access to cloud storage. Most desktop computers and some laptops include a disc drive that is capable of reading and writing CDs and DVDs.

What storage device has the largest capacity?

For most computers, the largest storage device is the [hard drive](#) or [SSD](#). However, networked computers may also have access to larger storage with large [tape drives](#), [cloud computing](#), or [NAS](#) devices. Below is a list of storage devices from the smallest capacity to the largest capacity.

Note

Many storage devices have been available in many different capacities. For example, over the evolution of the hard drive, their storage capacity has increased from 5 [MB](#) to several [terabytes](#) in size. Therefore, the list below is only meant to provide a general idea of the size difference between each storage device, from smallest to largest storage capacity. There are exceptions to the list.

1. [Punch card](#)
2. [Floppy diskette](#)
3. [Zip disk](#)
4. [CD](#)

5. [DVD](#)
6. [Blu-ray disc](#)
7. [Flash jump drive](#)
8. [Hard drive](#) / [SSD](#)
9. [Tape drive](#)
10. [NAS](#) / [Cloud Storage](#)

Are storage devices input and output devices?

No. Although these devices do send and receive information, they are not considered an [input device](#) or [output device](#). It is more proper to refer to any device capable of storing and reading information as a storage device, [disk](#), [disc](#), [drive](#), or [media](#).

How do you access storage devices?

Accessing a storage device on your computer depends on the [operating system](#) your computer uses and how it's being used. For example, with Microsoft Windows, you can use a [file manager](#) to access the files on any storage device. Microsoft Windows uses [Explorer](#) as its default file manager. With Apple computers, [Finder](#) is considered the default file manager.

- [How to see all drives available on the computer.](#)

What is the latest storage device?

One of the most recent storage device technologies to be introduced is [NVMe](#), with [SSDs](#) and [cloud storage](#) also being recently developed storage devices. Also, older technologies, like hard disk drives and tape drives, are always developing new techniques to allow for the devices to store more data.

Input/output processor

The **input/output processor** or **I/O processor** is a processor separate from the **CPU** designed to handle only input/output processes for a device or the computer.

The I/O processor is capable of performing actions without interruption or intervention from the CPU. The CPU only needs to initiate the I/O processor by telling it what activity to perform. Once the necessary actions are performed, the I/O processor then provides the results to the CPU. Doing these actions allow the I/O processor to act as a **bus** to the CPU, carrying out activities by directly interacting with memory and other devices in the computer. A more advanced I/O processor may also have memory built into it, allowing it to perform actions and activities more quickly.

For example, without an I/O processor, a computer would require the CPU to perform all actions and activities, reducing overall computer performance. However, a computer with an I/O processor would allow the CPU to send some activities to the I/O processor. While the I/O processor is performing the necessary actions for those activities, the CPU is free to carry out other activities, making the computer more efficient and increase performance.

Digital camera

Lumix Digital Camera



A **digital camera** is a hardware device that takes photographs and stores the image as data on a [memory card](#). Unlike an analog camera, which exposes film chemicals to light, a digital camera uses digital optical components to register the intensity and color of light, and converts it into [pixel](#) data. Many digital cameras are capable of recording video in addition to taking photos. The picture is of a Lumix digital camera from [Panasonic](#).

Note

A camera that is always connected to your computer with no [storage](#) could also be referred to as a digital camera. However, it is more appropriate to refer to this device as a [webcam](#).

Note

A digital camera may be considered both an [input](#) and [output device](#) ([I/O device](#)) as it can both take pictures (input) and send them to your computer (output).

- [What are the advantages of using a digital camera?](#)
- [Digital camera picture quality.](#)
- [History of the digital camera.](#)
- [Related pages.](#)
- [Camera help and support.](#)

What are the advantages of using a digital camera?

Below are key advantages that make digital cameras a popular choice compared to film cameras.

LCD screen

The rear-mounted [LCD](#) screen on a digital camera allows users to see their photos and videos immediately after they are taken. The LCD screen can also make it easier to frame your pictures.

Storage

A digital camera can store thousands of pictures, instead of only up to 36 pictures.

Picture development

Digital camera pictures can be developed like a standard film camera, but you can pick which pictures to develop instead of developing the whole roll of film.

Size

Because a digital camera does not need a place for film (not an SLR), it takes up far less space and can easily be carried in your pocket or purse.

Digital camera picture quality

The quality of pictures that a digital camera is capable of taking is primarily based on its megapixel rating. The higher the megapixels, the better the picture quality. For example, a 10 MP (megapixel) digital camera takes better pictures than a 7-megapixel digital camera.

Other factors that affect picture quality include the type of camera lens, size of the lens (measured in millimeters), and type of camera itself. Lower cost digital cameras often feature a lower quality and

standard size lens and provide minimal zoom capability. Higher priced, higher quality digital cameras include a better quality lens, possibly a larger size lens, and feature increased zoom capabilities.

Some digital cameras, like a digital SLR camera, allow users to adjust lighting, aperture, shutter speed, and other settings, providing improved control over picture quality. These digital cameras also allow for accessory attachments to increase or decrease the size of a lens and length of zoom.

History of the digital camera

Although the idea for a digital camera originated in 1961, the technology to create one didn't exist. The first digital camera was invented in [1975](#) by Steven Sasson, an engineer at [Eastman Kodak](#). It primarily used a [charge coupled device](#), a type of image sensor, but originally used a camera tube for image capture. That functionality was later digitized by Kodak. The first digital cameras were used by the military and for scientific purposes. Medical businesses and News reporting companies began to use digital cameras a few years later.

Digital cameras did not become common consumer electronic devices until the mid-1990s. By the mid-2000s, digital cameras mostly replaced film cameras as the camera of choice by consumers.

Output device



An **output device** is any [peripheral](#) that receives data from a computer, usually for display, projection, or physical reproduction. For example, the image shows an inkjet printer, an output device that make a [hard copy](#) of anything shown on the monitor. Monitors and printers are two of the most commonly used output devices used with a computer.

- [Types of output devices.](#)
- [What are the output devices of my computer?](#)
- [Why do computers need output devices?](#)
- [How does an output device work?](#)
- [Related output device pages.](#)

Types of output devices



The following list contains many different examples of output devices. For further information about the output device, select any of the listings with blue text.

- [3D Printer](#)
- Braille embosser
- [Braille reader](#)
- COM (Computer Output Microfilm)
- [Flat-panel](#)
- [GPS](#)
- [Headphones](#)
- [Monitor](#)
- [Plotter](#)
- [Printer](#) ([dot matrix printer](#), [inkjet printer](#), and [laser printer](#))
- [Projector](#)
- [Sound card](#)

- [Speakers](#)
- SGD ([Speech-generating device](#))
- [TV](#)
- [Video card](#)

Tip

Drives such as a [CD-ROM](#), [DVD](#), [floppy diskette drive](#), and [USB flash drive](#) are considered [storage devices](#).

What are the output devices of my computer?

Every computer has a monitor, an audio adapter, and a [GPU](#) (either [onboard](#) or discrete). Each of these is an output device. A printer is also very commonly used with computers. Depending on the type of computer and how the computer is used, other output devices may be used with a computer. The best method of determining all of the output devices your computer has is to go through the list above.

Why do computers need output devices?

A computer can still work without an output device. However, you'd have no way of determining what the computer is doing. By using an output device, you can view and get the results of input from a computer.

How does an output device work?

An output device works by receiving a [signal](#) from the computer and using that signal to perform a task to display the output. For example, below is a basic list of the steps of how an output device works.

1. On a computer [keyboard](#) ([input device](#)), if you type "H", it sends ([inputs](#)) a signal to the computer.
2. The computer processes the input and once completed, sends a signal to a monitor (output device).

3. The monitor receives the signal and displays (outputs) the "H" to the screen.
4. If supported, that "H" could also be printed (outputted) to a printer, which is another example of an output device.

If no output device was connected to the computer and it was functional, you could still type "H" on the keyboard, and it would still be processed. However, you'd be unable to see what happened or confirm the input with no output device.

Note

An output device does not send anything back to the computer. So, in the case of the monitor, a computer sends a signal without knowing if it was received. If an output device sends information back to the computer, it's considered an [input/output device](#).

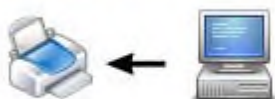
Input

Input may refer to any of the following:

Input Example



Output Example



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1. Any information or data sent to a [computer](#) for processing is considered **input**. Input or **user input** is sent to a computer using an [input device](#). The picture is an illustration of the difference between input and output. The input example (top) shows data being sent from a keyboard to a computer.

- [Input device examples](#)
- [Input technical information](#)
- [Related questions and answers](#)

Input device examples

Devices commonly used to provide input to a computer include:

- [Keyboard](#)
- [Mouse](#)
- [Microphone](#) for sound input
- [Webcam](#)
- [Touchpad](#)
- [Graphics Tablet](#)
- [Scanner](#)
- [Switch](#)

Tip

See our [input device](#) page for a full list of input devices used with a computer.

In addition to computers, input can be collected from any electronic device. For example, a water heater may receive input from a temperature sensor. The output would be a signal that turns on a pilot light or gas burner to heat the water to the desired temperature.

Input technical information

Computer [software](#) can receive data in the form of an input stream, which is a flowing sequence of data that can be directed to specific [functions](#). The directed channel that the data stream flows is known as a pipeline, and changing its direction is known as [piping](#).

In [Unix](#)-like operating systems such as [Linux](#) or [BSD](#), the input stream is one of the three standard data streams. It's known as the "standard input" stream, and often abbreviated as [stdin](#).

Related questions and answers

- [What is the difference between an input and output device?](#)
- [How does a computer process data into information?](#)

2. When referring to HTML, the `<input>` tag is used to create both input fields and interactive controls for web-based [forms](#).
3. With a [TV remote](#), the **input button** is a [button](#) that switches the [input device](#) shown on a [TV](#). For example, a TV may have a cable box, [DVR](#), [DVD player](#), and [game console](#) connected to a TV. To switch between these devices, press the input button one or more times. As you press the input button, most TVs display the name of the selected input device and if that device off or doesn't exist the TV shows nothing. Keep pressing the input button until the correct input device is selected.
4. In general, **input** can also refer to a contribution of [feedback](#), [information](#), or work. For example, someone may ask you for your input about a project they have undertaken at work or school.