**How BIOS Works**

https://computer.howstuffworks.com/bios.htm

One of the most common uses of Flash memory is for the basic input/output system of your computer, commonly known as the BIOS. On virtually every computer available, the BIOS makes sure all the other chips, hard drives, ports and CPU function together.

Every desktop and laptop computer in common use today contains a microprocessor as its central processing unit. The microprocessor is the hardware component. To get its work done, the microprocessor executes a set of instructions known as software.

You are probably very familiar with two different types of software: the operating system and the applications. The BIOS is the third type of software your computer needs to operate successfully.

The BIOS software has a number of different roles, but its most important role is to load the operating system. When you turn on your computer and the microprocessor tries to execute its first instruction, it has to get that instruction from somewhere. It cannot get it from the operating system because the operating system is located on a hard disk, and the microprocessor cannot get to it without some instructions that tell it how. The BIOS provides those instructions. Some of the other common tasks that the BIOS performs include:

* A power-on self-test (POST) for all of the different hardware components in the system to make sure everything is working properly
* Activating other BIOS chips on different cards installed in the computer - For example, SCSI and graphics cards often have their own BIOS chips.
* Providing a set of low-level routines that the operating system uses to interface to different hardware devices - It is these routines that give the BIOS its name. They manage things like the keyboard, the screen, and the serial and parallel ports, especially when the computer is booting.
* Managing a collection of settings for the hard disks, clock, etc.

The BIOS is special software that interfaces the major hardware components of your computer with the operating system. It is usually stored on a Flash memory chip on the motherboard, but sometimes the chip is another type of ROM.

When you turn on your computer, the BIOS does several things. This is its usual sequence:

* Check the CMOS Setup for custom settings
* Load the interrupt handlers and device drivers
* Initialize registers and power management
* Perform the power-on self-test (POST)
* Display system settings
* Determine which devices are bootable
* Initiate the bootstrap sequence

The first thing the BIOS does is check the information stored in a tiny (64 bytes) amount of RAM located on a complementary metal oxide semiconductor (CMOS) chip. The CMOS Setup provides detailed information particular to your system and can be altered as your system changes. The BIOS uses this information to modify or supplement its default programming as needed. We will talk more about these settings later.

Interrupt handlers are small pieces of software that act as translators between the hardware components and the operating system. For example, when you press a key on your keyboard, the signal is sent to the keyboard interrupt handler, which tells the CPU what it is and passes it on to the operating system. The device drivers are other pieces of software that identify the base hardware components such as keyboard, mouse, hard drive and floppy drive. Since the BIOS is constantly intercepting signals to and from the hardware, it is usually copied, or shadowed, into RAM to run faster.

Whenever you turn on your computer, the first thing you see is the BIOS software doing its thing. On many machines, the BIOS displays text describing things like the amount of memory installed in your computer, the type of hard disk and so on. It turns out that, during this boot sequence, the BIOS is doing a remarkable amount of work to get your computer ready to run. This section briefly describes some of those activities for a typical PC.

After checking the CMOS Setup and loading the interrupt handlers, the BIOS determines whether the video card is operational. Most video cards have a miniature BIOS of their own that initializes the memory and graphics processor on the card. If they do not, there is usually video driver information on another ROM on the motherboard that the BIOS can load.

Next, the BIOS checks to see if this is a cold boot or a reboot. It does this by checking the value at memory address 0000:0472. A value of 1234h indicates a reboot, and the BIOS skips the rest of POST. Anything else is considered a cold boot.

If it is a cold boot, the BIOS verifies RAM by performing a read/write test of each memory address. It checks the PS/2 ports or USB ports for a keyboard and a mouse. It looks for a peripheral component interconnect (PCI) bus and, if it finds one, checks all the PCI cards. If the BIOS finds any errors during the POST, it will notify you by a series of beeps or a text message displayed on the screen. An error at this point is almost always a hardware problem.

The BIOS then displays some details about your system. This typically includes information about:

* The processor
* The floppy drive and hard drive
* Memory
* BIOS revision and date
* Display

**Configuring BIOS**

To enter the CMOS Setup, you must press a certain key or combination of keys during the initial startup sequence. Most systems use "Esc," "Del," "F1," "F2," "Ctrl-Esc" or "Ctrl-Alt-Esc" to enter setup. There is usually a line of text at the bottom of the display that tells you "Press \_\_\_ to Enter Setup."

Once you have entered setup, you will see a set of text screens with a number of options. Some of these are standard, while others vary according to the BIOS manufacturer. Common options include:

• System Time/Date - Set the system time and date

• Boot Sequence - The order that BIOS will try to load the operating system

• Mouse/Keyboard - "Enable Num Lock," "Enable the Keyboard," "Auto-Detect Mouse"...

• Drive Configuration - Configure hard drives, CD-ROM and floppy drives

• Memory - Direct the BIOS to shadow to a specific memory address

• Security - Set a password for accessing the computer

• Power Management - Select whether to use power management, as well as set the amount of time for standby and suspend

• Exit - Save your changes, discard your changes or restore default settings

The BIOS uses CMOS technology to save any changes made to the computer's settings. With this technology, a small lithium or Ni-Cad battery can supply enough power to keep the data for years. In fact, some of the newer chips have a 10-year, tiny lithium battery built right into the CMOS chip!

bootstrap – начальная загрузка

interrupt handler – программа обработки прерываний; обработчик прерываний

cold boot – холодная загрузка (после выключения системы)