

How things Work

Thursday, February 11, 2010

Working of Xbox 360

How Xbox 360 Works

Microsoft's first video game console, the Xbox, has sold more than 20 million units worldwide since its introduction in 2001. Despite the Xbox's impressive power, the list of big-name video game titles to support it and the success of the Xbox's online component, Xbox LIVE, Sony's PlayStation 2 still outsold it.

As the game industry moved into the next generation of video game technology, Microsoft was determined to dethrone Sony's PlayStation. Enter the Xbox 360.



Photo courtesy Microsoft Corp.

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Xbox 360.

Microsoft rebuilt the Xbox from the ground up. From the name to the look to hardware and features, the Xbox 360 is a radically different and more powerful machine than its predecessor. Far more than a video game console, the Xbox 360 is a total media center that allows users to play, network, rip, stream and download all types of media, including high-definition movies, music, digital pictures and game content.

In this article, we will learn about the hardware and features that make the Xbox 360 a leap forward into the next generation of gaming consoles.

The Xbox 360, like all video game consoles, is just a computer with hardware and software dedicated to the function of running video game software. The original Xbox was essentially a Windows PC with a modified Pentium III processor, some relatively powerful graphics and audio hardware and a modified version of the Microsoft operating system Windows 2000, all packaged in that distinctive black box. The Xbox 360 is also a specially packaged computer, but once you look inside, you realize that this console has quite a bit under the hood:

- Custom IBM Power PC-based CPU with three 3.2 GHz cores
- Custom ATI graphics processor with 10 MB embedded DRAM
- 512 MB 700 MHz GDDR3 RAM
- Detachable and upgradeable hard drive -- all models except the Core system
- 12x dual-layer DVD-ROM
- Support for up to four wireless game controllers
- Three USB 2.0 ports
- Two memory unit slots

As you can see, Microsoft intends the Xbox 360 to be a serious game machine. The company is also serious about reaching more audiences with the Xbox 360. On the next , we'll look at variations of the Xbox 360 that are marketed to different kinds of gamers.

Xbox 360 Consoles

Microsoft released two versions of the Xbox 360 in November 2005: the **Xbox 360 Premium Package** and **Xbox 360 Core System**. Since then, the lineup has undergone some changes. The Premium Package is now known simply as the Xbox 360 console. A new Elite system hit store shelves in April 2007. Microsoft announced another new system, the Xbox 360 Arcade, in October 2007.



The Xbox 360 debuted at the
2005 E3 Expo Microsoft booth.

The Core System is "plug and play" -- in addition to the console, it includes a wired controller and an AV cable. The Xbox 360 comes with a wireless controller, an HD AV cable, an Ethernet connectivity cable, a headset and a removable 20-GB hard drive. Initially, it also included a DVD remote, but this is no longer available as part of the package.

The Xbox 360 Elite is similar to the main Xbox 360, with a black case, matching wireless controller and headset. It also includes a larger 120-GB hard drive and an HDMI cable.

To combat Nintendo's surprise powerhouse, the Wii, Microsoft announced the Xbox 360 Arcade in October 2007. Aimed at casual gamers, the console will come with between three and five Xbox LIVE Arcade games and will probably include "Pac-Man," "Uno" and "Luxor 2." Microsoft has also prepared subtle variations of the console for marketing tie-ins. To commemorate the release of "The Simpsons Movie," Microsoft created a run of 100 limited-edition Simpsons Xbox 360s, which were given away in promotions. Fans of Bungie's "Halo" game series can purchase the "Halo 3" limited edition Xbox 360, which comes in "Spartan green and gold" and features a matching controller.

On the next page we will see what makes the Xbox 360 tick -- the central processing unit, or CPU.

Xbox Sales

Because of delays in manufacturing, there were not enough Xbox 360s to meet the demand of the 2005 holiday season. As a result, Xbox 360s were selling for as much as \$2,000 on Web sites like eBay, and initial sales figures were poor. However, Microsoft still got a jump on its competitors, as the PlayStation 3 and the Nintendo Wii did not release until 2006. According to industry analyst the NPD Group, as of August 2007, the Xbox 360 sold 6.3 million Xbox 360s in the United States, to 4 million of Nintendo's Wii and 1.75 million Sony Playstation 3s.

CPU: The Heart of the 360

As with any computer, the CPU is the heart of the Xbox 360. Microsoft has outfitted the 360 with a 165-million transistor, multi-core processor running three 3.2-GHz PowerPC cores.

Each core on the chip functions as a separate processor.

Recently,

hardware manufacturers have started combining several

cores, or processors, onto one chip. This is a **multi-core processor**. Multi-core processors offer a combination of tremendous computing capabilities and efficient power consumption.

They split

heavy work loads over multiple powerful processors rather than giving all the work to one super-powerful processor.



The Xbox 360 on display at the 2005 E3 Expo.

The other interesting thing to note about the Xbox 360 CPU is that each core is capable of processing two threads simultaneously. Think of a thread as a set of instructions for a program's job. The core processes these instructions and does the heavy lifting to get the job done. A conventional processor can run a single execution thread. Because the Xbox 360 cores can each handle two threads at a time, the 360 CPU is the equivalent of having six conventional processors in one machine.

What this means when you are playing video games is that the Xbox 360 can dedicate one core entirely to producing sound, while another may run the game's collision and physics engine. The system may allocate an entire processor just to rendering hi-def graphics. It's really up to the game developers how the system's considerable resources are used. With a multi-core processor, the system is powerful enough to pull off the computational demands needed for an amazing gaming experience without even breaking a sweat.

360 Degrees

According to J. Allard, Microsoft Corporate Vice President and chief XNA architect, in an interview with Gamespot, "If we were building another console in the 3D era, we'd just call it Xbox 2 ... So, we eliminated Xbox 2 from the list. So, the name that we came up with was Xbox 360, because we are putting the gamer at the center of the experience."

The graphics processor unit, or GPU, is responsible for the heavy-lifting for the console's beautiful, high-resolution images.

The GPU

Another powerful asset in the Xbox 360 is the Graphics Processor Unit (GPU). The Xbox 360 boasts the new, custom-built 500-MHz ATI Graphics Processor card with 10 MB of embedded DRAM. While the 500-MHz graphics processor is powerful, and 10 MB of DRAM provides ample memory for the GPU to do its job, the most innovative thing about this card is that it is built on **unified shader architecture**.

Shaders are computer programs that determine the final look of what you see on the screen when you're looking at computer animation. Shaders take rendered 3-D objects built on polygons (the building blocks of 3-D animation) and make them look more realistic. There are two types of shaders: pixel shaders and vertex shaders.

Pixel shaders alter the lighting, color and surface of each pixel. This in turn affects the

overall color, texture and shape of 3-D objects built from these pixels. Pixel shaders help "smooth out" 3-D objects, giving them a more organic texture.



The Xbox 360 with a custom, wood-grain faceplate.

Vertex shaders work by manipulating an object's position in 3-D space. "Vertex" refers to the intersection of two coordinates in space. The machine maps the position of an animated object in 3-D space by giving it a value. These values are the x, y and z coordinates. By manipulating these variables, a vertex shader creates realistic animation and special effects such as "morphing."

In real-time graphics, like the kind you see in video games, shaders work with the graphics processor. The shaders make billions of computations every second to perform their specific tasks. These computations are performed in steps through a series of computational components. Think of an assembly line. In the world of hardware, these assembly lines are called **pipelines**.

Traditionally, pixel shaders and vertex shaders have dedicated pipelines because each one has very specific and differing needs. As we learned before, the new ATI graphics card in the Xbox 360 has **unified shader architecture**. What that means is that now, both shader types share the same pipelines. ATI figured out a way at the hardware level to address the needs of both types of shaders using the same pipeline.

The apparent advantage of sharing pipelines is to add more assembly lines, making computation that much faster. ATI claims that this **unified shader architecture** allows for 48 billion shader operations per second. The Xbox 360 is the first device to use this type of architecture.

On the next , we'll learn about how the Xbox 360 fits in with your home entertainment system.

Jacks, Tracks and Other 360 Features

Input/Output The Xbox 360 supports up to four wireless controllers at once. It also has three USB 2.0 jacks, two in the front and one in the back that can be used to plug in wired controllers for play or wireless controllers when they need to be charged. The USB jacks can also be used to connect devices like digital cameras, MP3 players and computer keyboards to the 360 (but the keyboard can only be used for text entry, not game play).

Online The Xbox 360 has an Ethernet port to hook up to a broadband connection, as well as a slot for a WiFi card. The 360 is WiFi-ready "out of the box" and the bundle includes a connectivity Ethernet cable.

TV Connections The Xbox 360 comes standard with both composite and component video connections to hook up to a TV. There are also optional connections for S-Video and VGA, and the console supports some SCART-type adapters used in Europe. The Xbox 360 Core System includes a standard-definition AV cable, while the other Xbox 360 bundles come with an AV HD cable and a media remote.

Audio The Xbox 360 has multi-channel surrounding sound that supports 256 channels of 48

KHz, 16-bit digital audio. The 32-bit audio processing is handled by the CPU. One of the most talked about new audio features of the Xbox 360 is **customizable soundtracks**. No matter what video game you are playing, you can play or stream your music during game play.

Removable Hard Drive and Storage The original Xbox was quite innovative in that it had an 8-GB hard drive built into the console. The 360 takes the hard-drive concept one step further: The Xbox 360 includes a removable 20-GB hard drive, and the Xbox 360 Elite has a removable 120-GB hard drive. The Xbox 360 also supports up to two 64-MB memory cards at one time.

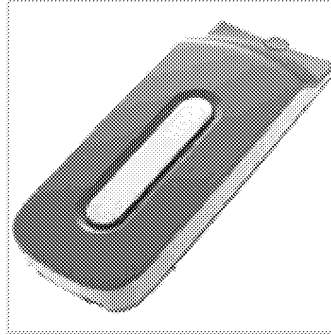
The Disc Drive In keeping with the idea that the Xbox 360 is a full media center, it sports a 12x dual-layer DVD-ROM that can read DVD-Video, DVD-ROM, DVD-R/RW, DVD+R/RW, CD-DA, CD-ROM, CD-R, CD-RW, WMA CD, MP3 CD and JPEG Photo CD. You can buy an external HD-DVD player for the Xbox 360. The 360 does not, however, support Blu-ray.

Cooling The original Xbox took a lot of criticism for how large it was. The cooling system that kept the Xbox's rather hefty processor cool was the single greatest factor that contributed to the console's robust size. Microsoft changed all this for the Xbox 360.

In order to fit all that hardware into the stylish and slim form factor of the Xbox 360, Microsoft devised a cooling system that combines a small, vacuum-sealed, liquid-cooled system with fans to maintain a comfortable temperature inside the 360. The system regulates the temperature of the cores and adjusts the flow of liquid and fan speed accordingly. Additionally, the cooling system monitors the core's workload: If one or more cores are not needed for the job at hand (for instance, if you are using the Xbox 360 to watch a DVD), then the unused cores are automatically turned off.

Other Accessories There are dozens of accessories on the market for the Xbox 360, including headsets, wireless controllers, cooling systems, rechargeable batteries and more. You can play compatible Xbox 360 games on your Windows computer with the Wireless Gaming Receiver for Windows. The Live Vision Camera allows players to create an in-game version of themselves in select games. The Xbox 360 Wireless Racing Wheel is a force-feedback steering wheel controller with standard gamepad buttons and floor-mounted accelerator and brake pedals. The Messenger Kit attaches to Xbox 360 controllers and features a keyboard to message other players.

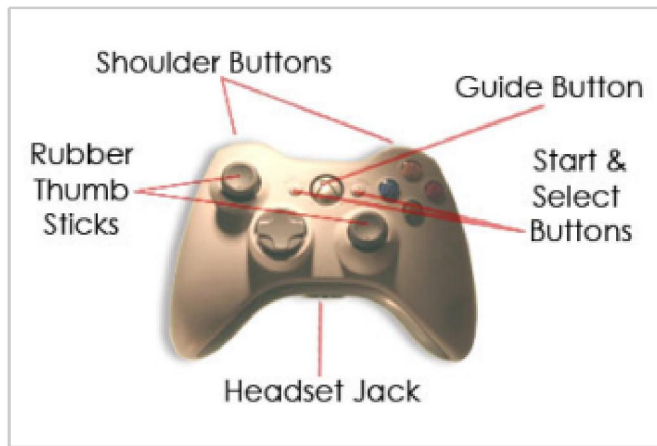
In the next , we'll take a look at the Xbox 360 controller and how it has evolved from the original Xbox controller.



An Xbox 360's external
hard drive

Xbox Controller

The design for the Xbox 360 controller is based largely on the one used for the original Xbox - the **Controller S**.



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The new Xbox 360 controller is a familiar design with several new features.

The most noticeable difference in the Xbox 360 controllers from those for the original Xbox is that most of them are **wireless**. Microsoft created a proprietary technology to deal with some of the latency and bandwidth issues that can be a problem for some wireless controllers. The Xbox 360 can support up to four wireless controllers at one time.

The wireless controller comes with all Xbox 360 bundles except for the Core system, which includes a wired controller with a nine-foot cable. Everything else about the design is the same. Of course, wireless controllers are available separately if you choose to upgrade.

Control Issues

When the original Xbox was released in 2001, one of the most common complaints about the new console was the controller. Gamers worldwide criticized it for being too large and having poor button spacing. In Japan, where the Xbox sales were already suffering, Japanese gamers all but refused to use the large Xbox controllers, opting instead for smaller, third-party ones. This compelled Microsoft to create a smaller, redesigned controller for Asian markets that was released in winter 2002.

Shortly after that, Microsoft released a slightly improved version of the Japanese controller in the west called the Controller S. The Controller S is now the standard Xbox controller that is shipped with all Xbox consoles.

The new Xbox 360 wireless controllers can be powered by either a pair of traditional AA batteries or a rechargeable battery pack. The battery pack can be "flash charged" in a charger or "trickle charged" via a USB connection to the console, and it alerts the user when its charge is running low.

The Xbox 360 controller has a **Guide** button in the center of its face that provides a new functionality. This button is divided into four quadrants that light up to provide gamers with different types of information during game play. (Incidentally, the "ring of light" power button on the console also provides this function.) For instance, during a split screen multiplayer match, a particular quadrant will light up to indicate to a player which part of the screen he or she is playing on at that time. The Guide button can also light up to let a player know he has received a message from another gamer. In this case, when the user pushes the button, he or she visits the Xbox **dashboard** (the equivalent of a PC's desktop). The dashboard provides access to features like messaging friends, downloading content, voice chat and

customizing soundtracks, all while staying in the game. The controller has a standard headphone jack on the back so that the user can plug in a headset for voice communication during game play. Some wireless headsets will also work with the Xbox 360.

The new Xbox 360 controller has the same basic familiar button layout as the Controller S except that a few of the auxiliary buttons have been moved. The "back" and "start" buttons have been moved to a more central position on the face of the controller, and the "white" and "black" buttons have been removed and replaced with two new shoulder buttons that are positioned over the analog triggers on the back of the controller.

One of the great features of Xbox 360 is its ability to let players compete against one another online.

Xbox LIVE

Xbox LIVE is an online subscription service that allows Xbox gamers to play video games together and download additional game content using the Internet. Once online, gamers can play one another over the Internet and talk to each other in real-time using the headset (included in the bundle). Xbox LIVE has created a huge online community of gamers challenging one another worldwide. The Xbox 360 will also usher in the next generation of online game play and online community with the new, revamped Xbox LIVE.



The Xbox 360 is WIFI-ready so that gamers can jump on Xbox LIVE wirelessly.

The new Xbox LIVE has enhanced matchmaking and feedback systems as well as voice chat and video conferencing. It has a new, more seamless interface and is a generally more robust system for communicating during online gaming. Xbox LIVE on the 360 is divided into two services: Xbox LIVE Silver and Xbox LIVE Gold.

Xbox LIVE Silver is a free service that ships with all Xbox 360s and allows any Xbox 360 user with a broadband connection to get online and create a gamer tag as well as a new ID type called a **gamer card**. The gamer card is a profile that displays a gamer's interests, skill level, competitiveness and gaming accomplishments. In addition, gamers can use Xbox LIVE Silver to chat, download content and play certain games. Xbox LIVE Silver allows gamers to access most of the features of Xbox LIVE. The one key feature missing from the free service is the ability to play multiplayer games online.

In order to play in multiplayer matches online, you must upgrade to the subscription service known as **Xbox LIVE Gold**. The Gold service has all the functionality of Silver plus the ability to play **multiplayer games**. Additionally, Xbox LIVE Gold has exclusive content, tournaments and events.

Serious gamers know the Xbox 360 has a great slate of games available for it.

Xbox Games

As history has shown time and again, the latest and greatest console is nothing without great games. Microsoft has set out to create a series of blockbuster titles in-house for the Xbox 360 as well as make deals with as many third-party developers as possible. Game developers are attracted to the prospect of creating games on such a powerful canvas, and in the years to come they will find new ways to build games that push the potential of the Xbox 360.

One game franchise more than any other has defined the success of the Xbox and Xbox 360: "Halo." Microsoft acquired game developer Bungie Studios in 2000 to bring the game to the original Xbox. The game took off and spawned a sequel. Then, on September 25, 2007, came "Halo 3." In 12 days, it had already surpassed the biggest-selling game in 2007, "Wii Play," selling 3.3 million copies and pushing the Xbox 360 ahead of the Wii in numbers of consoles sold for the month [source: Casamassina]. Microsoft even released a special "Halo"-themed Xbox 360 console for hard-core fans.

The game even seems to have affected the motion picture industry. Ticket sales for the October 5, 2007, weekend only totaled \$80 million, a 27 percent decrease from the same weekend the year before [source: Brodesser-Akner, Claude]. Some movie executives blame Bungie and Microsoft for stealing their sales.

Below is a list of games that released with the Xbox 360. For a complete list of current and upcoming games, check out Xboc.com Games.

- "Kameo: Elements of Power"
- "Perfect Dark Zero"
- "Project Gotham Racing 3"
- "Call of Duty 2"
- "Need for Speed Most Wanted"
- "Peter Jackson's King Kong"
- "Madden NFL 06"
- "GUN"
- "Condemned: Criminal Origins"
- "NBA 2K6"
- "Ridge Racer 6"
- "Tony Hawk's American Wasteland"
- "QUAKE 4"
- "Tiger Woods PGA TOUR 06"
- "Amped 3"
- "FIFA 06: Road to FIFA World Cup"
- "NHL 2K6"
- "NBA Live 06"



Halo 3 is one of the most successful video games in history by earning over 300 million dollars in first week sales. Read about some of the Halo 3 features.

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