

PC CONTROLLER DEVICES

Any device on a computer will have a "controller" device, whether it is on the motherboard, or inserted into an expansion slot in the form of a PC card. Many PCs have the controllers built into the mother board for devices such as IDE disk controller, printers, etc. An electrical cable (usually a parallel(ribbon) cable) attaches the hardware devices to the controller.

- Integrated Drive Electronics (IDE) Controllers
- Small Computer System Interface (SCSI) Controllers
- Enhanced IDE Controllers

The type of controllers listed above primarily control the interface of storage devices to the motherboard's bus such as an ISA, EISA, or even a PCI bus. There are other types of controllers on chips in the computer that you may not even know about or be able to see. For example 'memory controller', VL Bus controller, PCI bus controller. Some "expansion" cards even act in a 'controller' function and perform other functions as well.etc. An example is a video adapter card, or a video accelerator card.

Integrated Drive Electronics (IDE) DRIVE & INTERFACE:

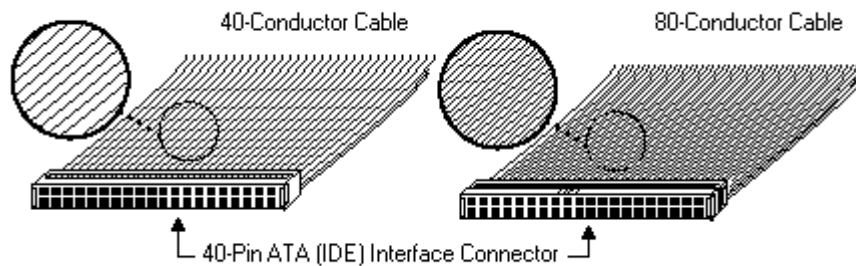
The term "Integrated Drive Electronics" (IDE) appeared in 1986, as Compac Corporation, Western Digital, and Magnetic Peripherals division of Control Data Corporation worked together to integrate a Western Digital controller chip onto a hard disk drive. In 1988, an industry group called Common Access Method (CAM) was formed and developed a standard that was submitted to the American National Standards Institute in November, 1990. The standard was approved in 1991 as the AT standard. Today we call it an "IDE" standard.

Integrated Drive Electronics (IDE) is the name for the AT Attachment (ATA) design, and IDE has the drive controller built into the drive itself. Still, an IDE can connect to the motherboard bus by connectors embedded in the motherboard, or by connecting to an expansion card in an ISA or PCI slot.

The cost of producing a motherboard with the embedded IDE connectors is less than having an additional controller board installed in an expansion slot. Consequently, most motherboards available today will have multiple embedded IDE connectors.

CONNECTORS

Most modern motherboards have two IDE connectors (a Primary and a Secondary IDE connector), as well as an "auto-detect" for IDE boards. An IDE connector is a 40-pin plug. You can only attach two devices to an IDE cable. Most motherboards have two 40 pin connectors, as does most IDE expansion cards.



So, if you have a motherboard with a built-in IDE interface, it will normally have 3 sets of connector pins. You can connect floppy drives, hard drives, CD-ROM drives, etc. However, you may want more drives, and if you elect to go IDE, you can purchase a "controller" card that you can place in an "expansion" slot on the motherboard. This will allow you to connect two additional cables for 4 more devices.

Some motherboards have the IDE connectors interfacing to a VESA Local Bus, with the labels "VESA IDE" and "VESA ISA", and have one set of pins without a label. We connect the hard drives to the "VESA IDE" connector, the floppy drives to the unlabeled connector, and the CD-ROM to the "VESA ISA" connector.

An IDE connector interfaces to a maximum of two devices. The cable to connect devices is a flat ribbon cable with 3, 40 pin, connectors. The end of the cable with the connectors close together connects to the devices, and the long end connects to the IDE connector on the motherboard. One side of the cable has a RED edge. The RED edge goes to pin 1 on the device and pin 1 on the motherboard connector.

IDE Drive Capacity

Original ATA limitations were that a maximum addressing of 528 MBytes was the limit. This is still a problem in many older PC's with a BIOS predating about 1991. With the newer capacity hard drive devices, a solution had to be reached. See "EIDE" discussion and the "SCSI" discussion.

SPEED

Pure IDE devices are somewhat slow, usually at a 8 MHz clock, an 8 bit AT interface connection can move data at 4 MBytes per second; in a 16 bit form, it can move up to 8 MBytes per second. Reference SCSI and EIDE discussions for higher data rates

CD-ROM interface to an IDE interface was achieved through development of the AT Attachment Packet Interface (ATAPI) introduced around 1993. This allowed attachment of CD-ROM drives to an IDE connector.

Enhanced Integrated Drive Electronics (EIDE)

When purchasing a PC today, you often see the specification of IDE or EIDE connectors for interfacing to storage devices. Pure IDE is the AT Attachment specification (ATA), and EIDE is the term used for AT Attachment 2 an effort to enhance the speed and capabilities of the original ATA.

Two vendors, Western Digital Corporation promotes a proposed standard called EIDE, and Seagate Technologies has proposed "Fast ATA" as alternatives to the ATA.

Some improvements over the ATA IDE proposed by Western Digital were:

- increasing the accessible storage capacity beyond 528MB.
- increasing the number of hard drives beyond 2.
- increasing throughput (speed).
- giving the ATA access to devices other than hard drives.

Before you get too excited, the EIDE proposal required a rewritten BIOS!

That is to increase the capacity up to a total capacity of 8.4GB by changing the logical block Address to a 28-bit address. BIOS, in the old days, had a 63 sector per track, 1024 tracks, and 255 r/w heads for a total capacity of 8.4GB; however, the ATA/IDE did not allow addressing of the total BIOS limitation.

There are other problems relating to EIDE, but as time passed, they seem to have been overcome, and EIDE drive interfaces are now available with some systems. Probably, if your BIOS is 1994 or later, it has EIDE.

In fact, an ATA-3 has been undertaken as early as 1994, but I have no information on the effort. It is envisioned as being able to reach 20MB/s transfer of data.

SCSI DRIVES

1. Small Computer System Interface (SCSI) is pronounced as "scuzzy".
2. It is a "system" level interface for multiple storage devices.
3. It is considered a "bus" that supports up to 7 devices plus a "host" adapter card.
4. Each SCSI host adapter card fits in an expansion slot on the motherboard. Each can handle up to 7 devices.
5. A SCSI hard drive usually comes with the drive, controller, and SCSI adapter in one circuit.
6. SCSI is a hardware standard - 1986.
7. Usually, the SCSI adapter requires a "driver" or software to tie it to your PC.
8. SCSI (1986), SCSI-2 (1994), and SCSI-3(still being defined- 1996).

Each SCSI controller can support up to 7 devices plus the controller card for each SCSI controller installed. A SCSI controller is installed in an expansion slot on the motherboard.

Standard SCSI has 8 and 16 bit data bus interface. The 8-bit interface can transfer data at 5 MB/s, and the 16 bit bus can transfer at 10 MB/s.

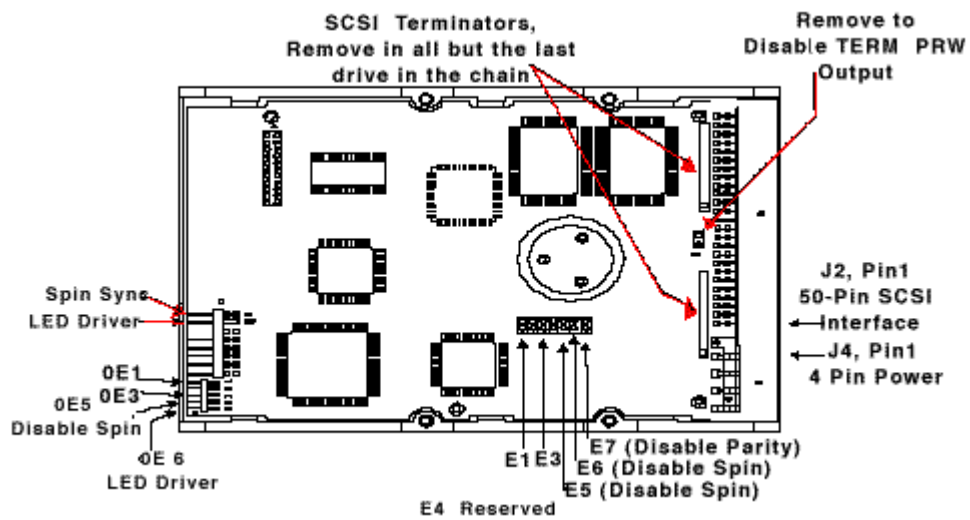
The SCSI-2 (known as FAST SCSI) at 10MB/s over an 8 bit bus, or 20MB/s over a 16 bit bus.

The SCSI-3 (known as "Ultra-SCSI" is already being sold, and can transfer data at 20MB/s over 8 bit buses, and at 40MB/s over 16 bit buses.

ADVANTAGES OF SCSI Devices

More devices can be attached to a single cable (7) than can be attached with IDE controllers (2).

Each SCSI drive has it's own embedded disk controller that can function independently of the system CPU.



An Example of SCSI Card