

Understanding and Installing Hard Drives - Chapter #8

Amy Hissom

Key Terms

80 conductor IDE cable — An IDE cable that has 40 pins but uses 80 wires, 40 of which are ground wires designed to reduce crosstalk on the cable. The cable is used by ATA/66, ATA/100, and ATA/133 IDE drives.

active partition — The primary partition on the hard drive that boots the OS. Windows NT/2000/XP calls the active partition the system partition.

ANSI (American National Standards Institute) — A nonprofit organization dedicated to creating trade and communications standards.

autodetection — A feature on newer system BIOS and hard drives that automatically identifies and configures a new drive in the CMOS setup.

block mode — A method of data transfer between hard drive and memory that allows multiple data transfers on a single software interrupt.

boot sector virus — An infectious program that can replace the boot program with a modified, infected version of the boot command utilities, often causing boot and data retrieval problems.

CHS (cylinder, head, sector) mode — The traditional method by which BIOS reads from and writes to hard drives by addressing the correct cylinder, head, and sector. Also called normal mode.

DMA transfer mode — A transfer mode used by devices, including the hard drive, to transfer data to memory without involving the CPU.

ECHS (extended CHS) mode — *See* large mode.

EIDE (Enhanced IDE) — A standard for managing the interface between secondary storage devices and a computer system. A system can support up to six serial ATA and parallel ATA IDE devices or up to four parallel ATA IDE devices such as hard drives, CD-ROM drives, and Zip drives.

enhanced BIOS — A system BIOS that has been written to accommodate large-capacity drives (over 504 MB, usually in the gigabyte range).

extended partition — The only partition on a hard drive that can contain more than one logical drive.

hard drive controller — The firmware that controls access to a hard drive contained on a circuit board mounted on or inside the hard drive housing. Older hard drives used firmware on a controller card that connected to the drive by way of two cables, one for data and one for control.

head — The top or bottom surface of one platter on a hard drive. Each platter has two heads.

high-level formatting — Formatting performed by means of the DOS or Windows Format program (for example, `FORMAT C:/S` creates the boot record, FAT, and root directory on drive C and makes the drive bootable). Also called OS formatting.

IDE (Integrated Drive Electronics or Integrated Device Electronics) — A hard drive whose disk controller is integrated into the drive, eliminating the need for a controller cable and thus increasing speed, as well as reducing price. *See also* EIDE.

large mode — A mode of addressing information on hard drives that range from 504 MB to 8.4 GB, addressing information on a hard drive by translating cylinder, head, and sector information in order to break the 528-MB hard drive barrier. Also called ECHS mode.

large-capacity drive — A hard drive larger than 504 MB.

LBA (logical block addressing) mode — A mode of addressing information on hard drives in which the BIOS and operating system view the drive as one long linear list of LBAs or addressable sectors, permitting drives to be larger than 8.4 GB (LBA 0 is cylinder 0, head 0, and sector 1).

logical geometry — The number of heads, tracks, and sectors that the BIOS on the hard drive controller presents to the system BIOS and the OS. The logical geometry does not consist of the same values as the physical geometry, although calculations of drive capacity yield the same results.

low-level formatting — A process (usually performed at the factory) that electronically creates the hard drive tracks and sectors and tests for bad spots on the disk surface.

master file table (MFT) — The database used by the NTFS file system to track the contents of a logical drive.

normal mode — *See* CHS mode.

NTFS (NT file system) — The file system for the Windows NT/2000/XP operating systems. NTFS cannot be accessed by other operating systems such as DOS. It provides increased reliability and security in comparison to other methods of organizing and accessing files. There are several versions of NTFS that might or might not be compatible.

operating system (OS) — Software that controls a computer. An OS controls how system resources are used and provides a user interface, a way of managing hardware and software, and ways to work with files.

parallel ATA (PATA) — An older IDE cabling method that uses a 40-pin flat data cable or an 80-conductor cable and a 40-pin IDE connector. *See also* serial ATA.

physical geometry — The actual layout of heads, tracks, and sectors on a hard drive. Refer also to logical geometry.

PIO (Programmed I/O) transfer mode — A transfer mode that uses the CPU to transfer data from the hard drive to memory. PIO mode is slower than DMA mode.

primary partition — A hard disk partition that can contain only one logical drive.

serial ATA (SATA) — An ATAPI cabling method that uses a narrower and more reliable cable than the 80-conductor cable. *See also* parallel ATA.

serial ATA cable — An IDE cable that is narrower and has fewer pins than the parallel IDE 80-conductor cable.

slack — Wasted space on a hard drive caused by not using all available space at the end of clusters.

translation — A technique used by system BIOS and hard drive controller BIOS to break the 504-MB hard drive barrier, whereby a different set of drive parameters are communicated to the OS and other software than that used by the hard drive controller BIOS.

VFAT (virtual file allocation table) — A variation of the original DOS 16-bit FAT that allows for long filenames and 32-bit disk access.

zone bit recording — A method of storing data on a hard drive whereby the drive can have more sectors per track near the outside of the platter.

Review Questions

- 1) **Name four ANSI standards for interfacing with hard drives.**
ATA, ATA-2, ATA-3, ATA/ATAPI-4
- 2) **What are the two data transfer modes used by hard drives?**
DMA (direct memory access) transfer mode or PIO (Programmed Input/Output) transfer mode
- 3) **What are the two types of IDE data cables currently used with hard drives?**
Parallel ATA (PATA) or serial ATA cable and conductor IDE cable
- 4) **What is the most popular ATAPI standard currently used for hard drives in desktop systems?**
ATAPI-6 and also USB
- 5) **If a hard drive has three platters, how many heads does it have?**
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- 6) **Given that there are 512 bytes per sector, calculate the hard drive storage for the following:
heads= 32, tracks (cylinders) = 1024, sectors/track= 63.**
1008 MB
- 7) **For older drives, why does the logical geometry sometimes differ from the physical geometry of a hard drive?**
Physical geometry is the actual organization of heads, tracks, sectors on the hard drive where logical geometry is the head, track, and sector information that the hard drive controller presents to system BIOS and the OS.
- 8) **What are three modes that system BIOS can use to relate to hard drives?**
FAT16, FAT32, NTFS
- 9) **Which mode must be used for a 10 GB hard drive?**
FAT16
- 10) **What is the ATA standard that changes the number of bits used to address data on a hard drive?**
The ATA/ATAPI-6 also called ATA/133
- 11) **How does block mode give faster access to a hard drive? How can you disable block mode?**
It allows multiple data transfers each time the software requests it. Block mode can be disabled in the CMOS setup.
- 12) **What is the purpose of the Master Boot Record (MBR) on a hard drive?**
Executes and checks the integrity of the partition table and contains partition information.
- 13) **When installing a hard drive and a CD-ROM drive on the same IDE channel, which do you configure as the master and which as the slave?**
Hard drive as the master because it's faster. CD-ROM as the slave because it is slower.
- 14) **Under Windows 98, when would it be appropriate to use FAT16 rather than FAT32 on a new hard drive?**
FAT16 would be used for anything up to 2 GB and anything over that would use FAT32.

- 15) **What is the largest FAT32 partition allowed by Windows XP?**
32 GB
- 16) **What are three ANSI hard drive interface standards that do not use a traditional hard drive?**
USB, IEEE1394, or Fibre Channel
- 17) **When two drives are connected to the same data cable, how does BIOS know which is the master and which is the slave drive?**
By the settings of the jumper
- 18) **If a motherboard has two EIDE connections, how many IDE devices can the system support?**
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- 19) **If a hard drive is too small to physically fit snugly into the drive bay, what can you do?**
Slide the drive into the bay and secure it with 4 screws, 2 on each side and use a universal bay kit.
- 20) **How can you tell which side of a hard drive's data cable connects to pin 1 on the drive?**
Pin 1 and the edge color on the cable align correctly at both ends of the cable. Normally, pin 1 is closest to the power connection.
- 21) **If your BIOS does not support a large-capacity drive that you want to install, what five choices do you have?**
Let the BIOS see the drive as a smaller device, upgrade the BIOS, Upgrade the entire motherboard, use software that interfaces between the older BIOS and the newer drive, or use an adaptor card that provides the BIOS to substitute for motherboard BIOS.
- 22) **How can you tell if your motherboard chip set supports Ultra DMA mode?**
Look in the CMOS setup for chip set features
- 23) **Which Windows 9x and DOS utility is used to partition a hard drive?**
Fdisk
- 24) **How can you tell how many partitions a hard drive has been set up to have?**
Disk Management Utility
- 25) **What question does the Windows 9x partition utility ask in order to use FAT32 instead of the FAT16 file system?**
Do you wish to enable large disk support (Y/N)?
- 26) **How many sectors are in one cluster for a 1.5-GB partition using FAT16? Using FAT32?**
Fat16 contains 64 sectors and FAT32 contains 8 sectors