

PATA

In this corner, coming in at a maximum data throughput of 133 MB/s is PATA (Parallel ATA). This was the traditional hard drive and the standard for many years but has been all but phased out by SATA hard drives on most new computers; however, it is still on the CompTIA A+ objectives. PATA hard drives are often referred to as Ultra ATA drives and sometimes as IDE drives. They transfer data in parallel, for example 16 bits (2 bytes) at a time.

Internal PATA hard drives use the Integrated Drive Electronics (IDE) interface to transmit data to and from the motherboard. Every IDE port on a motherboard can have up to two drives connected to it. For a long time, motherboards would be equipped with two IDE ports, enabling for a maximum of four IDE devices. However newer motherboards often come with only one, limiting you to two IDE devices. The IDE ports on the motherboard and the hard drive manifest themselves as 40-pin connectors to which you can connect either a 40 or 80-wire ribbon cable. Newer IDE cables are all 80-wire; however, they look identical to the older 40-wire versions, except for the blue connector on one end that you find on many 80-wire cables. The cable has three connectors, one for the controller (often blue), one for the master drive (often black), and a connector in the middle of the cable for the slave drive (often gray). We talk more about master/slave configurations in a little bit. The IDE port on the hard drive is keyed for easy orientation. External PATA drives usually transfer data to the computer by way of USB or FireWire.

PATA hard drives accept a 4-pin Molex power connector from the computer's power supply. The Molex connector is keyed so that it is easier to orient when connecting to the hard drive. This power cable has four wires: Red (5 V), Black (ground), Black (ground), and Yellow (12 V).

There is a jumper block in between the power and data connectors. This enables you to select the configuration of the hard drive. There are usually four options, which are often labeled on the drive:

Single: In a single drive configuration, no jumper shunt is needed. If you want, you can connect the jumper horizontally across two pins. Although this does not configure the drive in any way, it keeps the jumper handy for future use.

Master: Each of the motherboard's IDE connections enables for two drives. In a two-drive configuration on a single IDE cable, one must be set to drive 0 (master), and one must be set to drive 1 (slave). To set a drive to master, connect the jumper vertically to the correct pair of pins (for example, Western Digital drives use the center location), and connect the black end connector of the IDE ribbon cable to the hard drive. The master hard drive is normally where the operating system would go.

Slave: To set a drive to slave, connect the jumper vertically to the correct pair of pins (for example, Western Digital drives use the second position from the right), and connect the gray, middle connector of the IDE cable to the hard drive. The slave hard drive is where the bulk of the data would usually be stored.

Cable Select: This drive mode automatically configures the drive as master or slave according to where you connect it to the IDE cable. This might be marked on the drive as CS.

After the drive is screwed in or attached to the case chassis, connect the data and power connectors. For Ultra ATA drives, the data connector is keyed. There is a tab on each end of the cable (in the middle), which corresponds to a notch on the hard drive's port and on the motherboard's port. In addition, these types of cables indicate the first pin (known as Pin 1) with a colored stripe on one side of the cable. Pin 1 is normally on the upper-right corner of the hard drive's IDE port, so just match the colored stripe up to it. Or remember that the colored stripe of the IDE cable should be oriented next to the power connector. The power connector (Molex) is also keyed; it has two diagonal corners that should be oriented at the top of the connector when plugging it into the drive. Try not to force these connections; it can damage an individual pin. It should take a bit of pressure, but if it doesn't seem right, pull the connector away, and make sure it is oriented correctly. For SATA drives, attach the data connector with the exposed metal or Serial ATA label facing up. Orient the power connector according to the tab on the right side of the hard drive's port. Verify that both the data and power connectors are firmly secured to the drive and to the motherboard. A loose connector can cause a boot failure in the operating system. However, don't force the connection, especially the data connection. If SATA data cable is upside down and forced into the port, it could cause damage to the port.

(e)SCSI

Small Computer System Interface (SCSI) hard drives are often used in servers and power workstations that need high data throughput. You can identify a SCSI drive by the different (and usually louder) sound it makes compared to ATA drives; it's kind of like the difference between a diesel engine and a standard car engine. SCSI standards describe the devices, controllers, cables, and protocols used to send data. Part of the beauty of SCSI is that you can have up to 16 devices including the controller. They can be internal, external, or both. For the longest time SCSI was a parallel technology, but of late serial versions such as Serial Attached SCSI (SAS) have emerged. When installing SCSI devices, it is important to remember that each end of the SCSI chain must be terminated and that each device gets its own ID, between 0 and 15 (0[nd]7 on older SCSI chains). The controller normally gets ID 7 and has its own BIOS, known as Option ROM, in which you can configure the controller, drives, and drive arrays. This SCSI

BIOS often loads up and appears on the display before the PC BIOS. Because the card has a BIOS, its firmware might need to be updated from time to time, just like a motherboard's BIOS. Also, a software driver might need to be installed to the operating system for the SCSI controller. This is done during the Windows installation process. Table 6.2 shows a few of the current SCSI technologies you might see in the field.

Table 6.2[em]Comparison of SCSI Standards

SCSI Standard	Maximum Data Transfer Rate	Connector Type	Transmission Type
Ultra3 SCSI	160 MB/s	68-pin; 80-pin	Parallel
Ultra-320 SCSI	320 MB/s	68-pin; 80-pin	Parallel
Ultra-640 SCSI	640 MB/s	68-pin; 80-pin	Parallel
SAS (Serial Attached SCSI)	300 MB/s	SFF 8482, 8484, and 8470	Serial

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Note: Older, deprecated SCSI connections use 50 pins. An example of a 50-pin SCSI connection is Ultra2 SCSI (Fast-40) which can transmit 40 MB/s. It only allows for a maximum of 8 devices.

****begin exam alert*

For the exam, know that the SCSI controller normally uses ID 7, and memorize the data transfer rates for the various SCSI Ultra versions.

****end exam alert*

(d) Floppy Disk Drives

As mentioned before, floppy disk drives (FDD) are not nearly as common as they were 10 years ago; in fact, most computers don't come with a floppy drive. However, some businesses might need them to access older data or programs, and technicians use them to start up a computer with special boot disks. Due to this, there is a chance you might see a question on them on the exam.

(e) Floppy Drive Basics

The standard floppy drive is a 3.5-inch 1.44 MB floppy drive. Historically, this has been the A: drive and possibly the B: drive in a computer. These drive letters are reserved for floppy drives and other devices; now you know why operating systems use C: by default! The floppy drive uses a "mini" floppy power connector (shown in Chapter 5), also known as Berg, and a 34-pin

keyed data cable that connects to the motherboard, *if* your motherboard supports it.

The floppy drive is known as removable media because the floppy disks are inserted into the drive. The most common of these disks has a 1.44 MB capacity. You can store only 1.38 MB of data to these disks due to formatting and because the boot sector takes up a small amount of space on the disk. Floppy disks are normally formatted using the FAT12 file system.

Floppy drives are installed much the same way as hard drives: They are screwed into the chassis of the case, and data and power cables connect to the floppy ports; these ports are shown in Figure 6.4. The mini power cable has a linear plastic tab that needs to face up when you connect the cable to the drive.

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Figure 6.4[em]Floppy data and power connectors

(e)Floppy Drive Troubleshooting and Boot Disks

As always, make sure that the data and power cables firmly connect to the floppy drive and to the motherboard. A floppy drive fails if the data connector is connected upside down, which is possible because many floppy drive's data ports are not keyed. You will know if the data cable is upside down because the floppy drive's activity light will remain on. If a disk is placed in the drive in this state, it will be erased and/or damaged. By the way, if there is a nonbootable disk in the floppy drive, and the floppy drive is set to first in the BIOS boot order, the system will probably give a Nonsystem Disk error when booted. If the floppy drive doesn't work, ensure that the BIOS has the floppy drive enabled. Otherwise, floppy drives are quite resilient and last a long time.

Examples of boot disks that a technician might use include Windows startup disks, to boot/repair or install a Windows computer; antivirus boot disks, to scan the boot sector of a hard drive; BIOS Flash boot disks, to update the BIOS on a computer; and specialized third-party boot disks, to repair a computer, recover data, and so on. If you plan to boot from a floppy disk, verify that the floppy drive is first in the BIOS boot order. If your computer doesn't have internal connectivity for a floppy drive, go external! USB floppy drives are available, and the BIOS boot order on some motherboards can be changed to allow USB devices to boot first, allowing you to start the computer from that bootable floppy disk.

A derivative of SD is the Secure Digital Input Output (SDIO) card. This takes the capabilities of an SD card and merges them with the functionality of an

I/O device. Some smartphones use this technology to integrate GPS, WLAN, Bluetooth, and many other types of radio technologies. SDIO cards do not work in standard SD card slots, but standard SD cards can be read in SDIO slots.

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Don't confuse an SDIO card with a SIM (Subscriber Identity Module) card. A SIM card identifies the user/subscriber of a mobile device and allows the telecommunications company to lock the phone to that SIM card. The SIM is a slightly different size than the SD and SDIO cards.

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