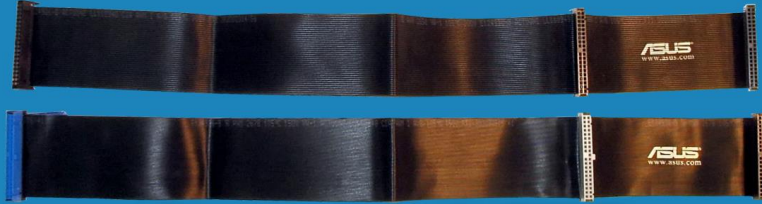


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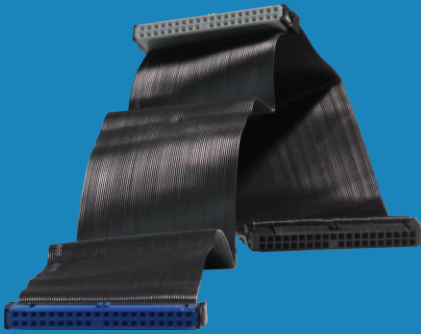
Parallel ATA (PATA/IDE/EIDE)

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In this video from ITFreeTraining I will look at Parallel ATA, also known as IDE and EIDE. This is an old technology used to connect storage devices. Nowadays obsolete, it is something you need to have a basic understanding of for the exam.

Parallel ATA (PATA)

- ATA “AT Bus Attachment”
- First version developed by Western Digital
 - Called Integrated Device Electronics (IDE)



40 pin ribbon cable

Transfers 16 bits of data at once

Supports two drives

Cables/MB refer to it as IDE

0:15 Nowadays, all the technologies that I am going to look at come under what is called Parallel ATA otherwise known as PATA. You may sometimes see it referred to as other names, so it helps to have a very basic understanding of where the names came from. Since the technology is obsolete nowadays, you don't really need to understand what the differences are, just be able to understand what the terms mean.

To start with, the ATA part in the name stands for AT Bus Attachment. AT stands for Advanced Technology which was used with the first IBM PC back in 1984. It is essentially a standard for cables which are used to connect devices to the computer.

The first version was created by Western Digital. Western Digital called this version Integrated Device Electronics or IDE. IDE refers to any hard disk with a built-in controller. Thus, technically all hard disks are IDE drives; however, the term IDE only gets used for old hard disks that use the 40-pin cable – more on that in a moment.

The technical name later changed to PATA, but you will often see it still referred to as IDE. For example, the exam will most likely refer to the cable as an IDE cable.

The cable itself is a 40-pin ribbon cable. The ribbon cable is bulky. Due to the width of the cable, this can block air flow in the computer. Given that it works in parallel, 16 bits of data are transferred at once. The important thing to remember is not how many bits can be transferred, but rather that it transfers data in parallel rather than serial as modern connections do.

The standard supports two drives. This is why there are three connections on the cable. One end is plugged directly into the motherboard; the other two connections are plugged into the storage devices. It does not matter which connector gets plugged into the motherboard, but you will generally find that there is a larger gap between the middle connector and the end connectors on one side. Generally, you would plug this end in the motherboard to give you more cable length to attach your devices to.

The name IDE was quite popular at the time, so you will often hear the cable referred to as an IDE cable or the plugs on the motherboard referred to as IDE. Originally the standard was designed to be used with hard disks; however, the standard was later changed to include other devices.

ATA Packet Interface (ATAPI)

- Protocol added to Parallel ATA
- Allows more types of devices to be connected



Parallel ATA
designed for hard disks

CD-ROM



ATAPI allows other device
type features to be used

Tape Drive



2:42 To add additional devices, the ATA Packet Interface protocol was added. This protocol allows different types of devices to be connected. The original Parallel ATA design was made only to be used with hard disks or devices that emulated a hard disk. Some devices have additional features that are not found in hard disks. For example, devices like CD-ROMs and tape drives have the ability to eject media whereas a hard disk does not.

The ATAPI protocol allows other types of devices to be connected and any additional features that they have to be used. The protocol is designed to be open ended so that new features can be added - where before you were limited to the features the protocol originally had.

The original Parallel ATA design was very limited in this respect. You may sometimes see a device referred to as ATAPI or ATAPI compatible. This is referring to this protocol and is still in use with newer devices like SATA devices. So, don't get confused when you see ATAPI, it is only referring to the protocol used to transfer data and commands from the computer to the device.

Improvements

- Enhanced IDE (EIDE)
- Ultra ATA
- 80 wire/40 pin cable
 - Each pin has its own ground wire
- Different versions may either be
 - ATA-(Version) e.g. ATA-1 ATA-2 ATA-3 ATA-4
 - ATA/(Speed) e.g. ATA/66 ATA/100 ATA/133



3:53 There have been a number of improvements to Parallel ATA since it was released. The technology is now quite old and obsolete, so if you purchase a motherboard there is a very good chance it will support the newest standard. Nowadays you generally just hear it referred to as IDE or PATA.

One of the first improvements was Enhanced IDE. You will not hear this term anymore as it is assumed that any Parallel ATA connection supports this standard. Later on, Ultra-ATA was introduced which was a revision of the standard that increased the speed. Once again, you probably won't hear this term used, but may see it on a product packaging.

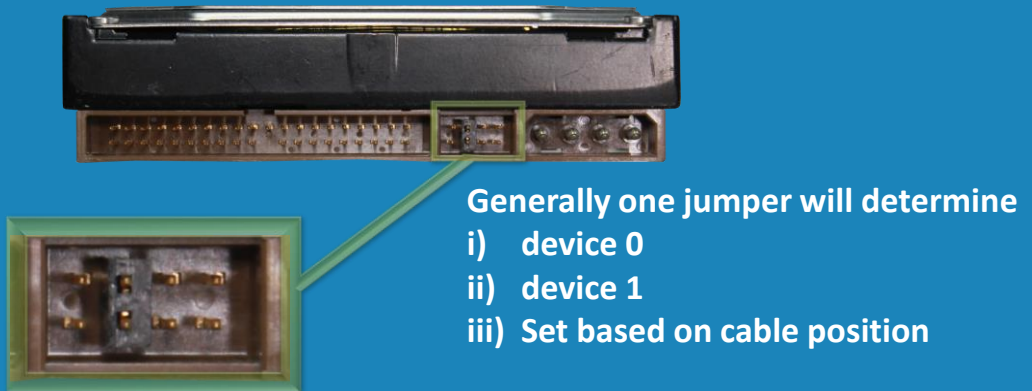
When the speed started increasing, the cable increased to 80 wires, but still retained 40 pins. What happened was each pin had a ground wire added. This increased the reliability of the cable when the speed started increasing. In this example, the top cable is 40 wires and the bottom 80 wires. You can see the cables are very similar and difficult to tell apart. If you use the 40-wire cable, the performance may be a little slower, but it will work.

There have been a lot of different versions of ATA. You may see ATA followed by the version number or you may see ATA followed by the speed. Essentially the newer versions increased the speed and added new features, however, all versions are backwards compatible.

Parallel ATA supports two drives per cable. Let's have a look at how that works.

Two Devices

- Device 0/Device 1 or Master/Slave
- Jumpers determine if device 0 or 1



5:28 In order for two storage devices to be supported on the one cable, one is designated as device zero and the other as device one. Originally, they were referred to as master and slave, so you may see these terms used. The master and slave terms were misleading as they tend to imply that one has priority over the other or that it requires the other to operate. This is generally not true. On some very old equipment, like some of the first optical drives, you may find that they only work as device zero or device one with a hard disk installed as device zero. This was in the very early days, so should not be a problem nowadays.

On the storage device, you will generally find (on the back near the connection) some jumpers. Although the jumpers may be different on each device, generally one jumper will configure the storage device to be device zero, another jumper for device one and a third jumper will be called cable select. If cable select is used, the drive will configure itself as device zero or one based on which plug it is connected to on the cable.

On the device, there will generally be a sticker to tell you what jumper does what. If you are not sure, generally the default will be for cable select. No jumpers present will generally default to cable select.

Demonstration

- Generally end plugs will be device 0/master
- Middle plug will be device 1/slave
- Power-uses Molex connector

6:49 If your motherboard supports PATA drives, you will be able to plug the cable directly into the motherboard. It was very common for the motherboard to have two of these connections in the old days. As time went on, this was reduced to the one connector. Most motherboards nowadays will not have this connector. We had to go through our collection of old motherboards to find one that had these connectors. All our new motherboards do not have the connector.

You will notice on this motherboard there are two connectors. Most motherboards will label these as IDE. One of these connectors may be called primary and the other secondary. You should use the primary one first as any device connected to this will be listed first in the BIOS. The order will be primary device zero follow by device one, and then the secondary controller in the same order.

If I now have a look at the cable, you will notice the amount of cable between the middle connector is different. Generally, either connector on the end of the cable will be device zero (or the master, if you are using cable select to determine which storage device is which). This, of course, means the middle connector is device one or the slave. Although, if you wish to overwrite this, you can configure the storage device manually to be either device zero or device one.

To install a new storage device, all you need to do is first plug the cable into the motherboard. Once it is plugged in, the other end of the plug is plugged into your storage device; in this case, the storage device is a hard disk. Once the cable is plugged in, the last step is to plug in a Molex

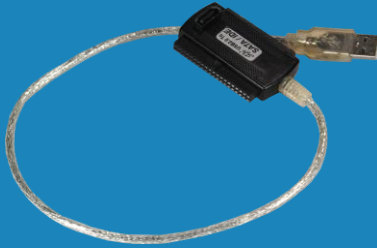
power connection, which will power the hard disk. If you want to install a second storage device, you would plug it in using the middle connector.

Nowadays, not too many motherboards will have this connector.

Compatibility Options



Expansion card



USB to PATA



IDE to SATA

8:39 If your motherboard does not have the connector, you can always add one. You can do this with an expansion card or by using a USB adapter. Both will add the functionality to the computer. The USB adapter is generally the easier choice.

Manufacturing of PATA drives stopped a long time ago. If you have an old computer that does not support SATA, you can always purchase an IDE to SATA adapter. This will plug into the motherboard and allow a SATA hard disk to be used with the computer. So, if you come across some old hardware you still have some options.

In the Real World



- PATA and IDE terms are interchangeable
- PATA/IDE long obsolete
 - About ten years ago HDD stopped being made
- Upgrade old hardware where possible
- Technology still being used S.M.A.R.T
 - Self-Monitoring, Analysis and Reporting Technology

9:14 In the real world, you will find the terms PATA and IDE used interchangeably, so you won't get criticized for using either. In product documentation and on motherboards, you may find either term used.

Whatever you decide to call them, PATA and IDE are long obsolete. Hard disk manufacturers stopped making them about ten years ago. You won't be able to purchase a new one nowadays, only a used hard disk. I would suggest if you're fixing an old computer, consider upgrading the computer if possible, otherwise consider using a SATA drive and using an adapter to install it.

The technology then went through a number of different versions, too many features to mention and some disappeared, as they are not required for solid-state drives. One feature that is unlikely to go away is the S.M.A.R.T technology. This stands for Self-Monitoring, Analysis and Reporting Technology. This technology uses non-volatile memory on the hard disk to store performance information. This can be read through diagnostic software or externally using a S.M.A.R.T reader. The technology tracks the performance of the drive, and can be useful for predicting potential drive failures and troubleshooting.

This concludes this video on PATA and IDE. I hope you have found this video informative. Until the next video from us, I would like to thank you for watching.

References

"The Official CompTIA A+ Core Study Guide (Exam 220-1001)" Chapter 3 position 7999-8197

“CompTIA A+ Certification exam guide. Tenth edition” Pages 296-298

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