Unit 14 PC Assembly

Structure:

14.1 Introduction

In the previous units you studied the concept of CPU, memory, motherboard, Buses, CMOS, BIOS, power supply and power management, storage devices, parallel port, serial port, input-output devices, video adapters and accelerators, and SCSI and USB systems. These concepts you have studied individually in detail. You have studied the basic concepts of all these devices and components. But any computer device is useful only when it works well when connected to the computer and interact with all the other devices of the computer. This unit will tell you how to accommodate all the devices in one block and the working of the computer. In this unit we shall discuss about assembling the PC with all the different components discussed so far. Before you begin the process of assembling, first you need to identify various devices and components need for a PC. In this unit, you will study to identify necessary devices and components that make up a PC. Also you will identify various cables in the computer, as a lot of devices need to be connected to the computer. Operating systems such as Windows OS, Windows Vista and Windows 7 support Plug and Play devices. In these OS, you need not configure your devices; just plug your device into the respective port, your system will work.

The essential parts of a computer are generally packed in a case; a desktop computer will have a case or the tower (the box with most of the components that actually make it work), and various input and display devices (monitor, mouse, keyboard, printer, etc.). The case consists of several basic physical parts such as motherboard (or Mainboard), CPU, memory, hard disk drive, any additional drives, network or modem card and any additional cards. Generally computer cases come with power supply. However, if your case does not have it, then you should buy one. You should take care that the case you have is able to accommodate the motherboard that you buy otherwise you will face problem of securing the two together if the holes in both do not correspond with each other. Afteryou have taken these precautionary measures, you can start assembling a PC.

Objectives:

After studying this unit, you should be able to:

- Use plug and play devices under Windows OS and Linux
- Identify various components and cables in the computer
- Assemble various components in the computer cabinet
- Mount the mother board into the cabinet

14.2 Plug and Play Devices

Plug and Play (PnP) is a combination of hardware and software support that enables a computer system to recognize and adapt to hardware configuration changes with little or no involvement by a user. This feature enables you to add devices to a computer or even remove devices from, it even without any understanding about the hardware or even performing any manual configuration. For example, you can add and remove plug and play devices such as keyboard, mouse, monitor, pen drive, external hard disk etc.

PnP is supported by the device hardware, device drivers and system software. The hardware industry standards, PnP ISA definition and the PC Card standard are provided for easy identification of add-in boards and basic system components. The system software support for PnP, together with PnP drivers provides the following:

- ***Automatic and dynamic recognition of installed hardware***
  In this, the system software recognizes hardware during initial system installation. It also recognizes PnP hardware changes that occur between system boots, and responds to run-time hardware events such as docking or undocking and device insertion or removal.
- ***Hardware resource allocation and reallocation***
  The PnP Manager determines the request made by .devices hardware resources such as input/output ports, for interrupt request, direct memory access channels, memory locations etc., when a new device is added to the system that requires resources already in use; the PnP Manager reconfigures resource assignments. PnP device drivers do not assign resources directly but only identify the requested source. The PnP Manager retrieves the requirements for each device during resource allocation.
- ***Loading of appropriate drivers***
  The PnP Manager determines which drivers are required to support each device and loads those drivers accordingly.

As a PnP driver is an important part of PnP support it is important for it fulfill certain criteria to qualify as PnP, namely, it shouldprovide the required PnP entry points, handle the required PnP IRPs, and follow PnP guidelines.

14.2.1 PnP under Windows OS

Since the time the first Plug and Play (PnP) support was provided in the Windows 95 operating system, the technology has evolved dramatically due to OnNow design initiative. OnNow outlines a comprehensive, system-wide approach to controlling system and device configuration and power management with the help of Advanced Configuration and Power Interface Specification (ACPI) which provides these services for all versions of Windows later than Windows 95. The main purpose of the Plug and Play design creation is to simplify PCs for end users.

The Windows 2000 Plug and Play implementation does not rely on an APM BIOS or a Plug and Play BIOS. It is actually designed to extend the existing Windows NT I/O infrastructure to support Plug and Play and Power Management. In Windows 2000, Plug and Play support is optimized for laptop, workstation, and server computers that include ACPI system boards.

Moreover, the Plug and Play device driver support for many device classes is provided by the Microsoft Windows Driver Model (WDM), which also supports power management and other new capabilities that can be configured and controlled by the operating system.

Plug and Play Architecture in Windows 2000

Figure 14.1 shows the architecture of Plug and Play in Windows 2000.It contains two modes of functionalities: user-mode functionality and kernel-mode functionality. The user-mode functionality cooperates with kernel-mode components to provide dynamic configuration and interfaces with other components that need to participate in Plug and Play, such as Setup and Control Panel. Boot-time Plug and Play activity and interfaces with the HAL (Hardware Abstraction Layer), Executive, and device drivers are supported by the kernel-mode functionality. Let's see the functions of various components in this architecture.

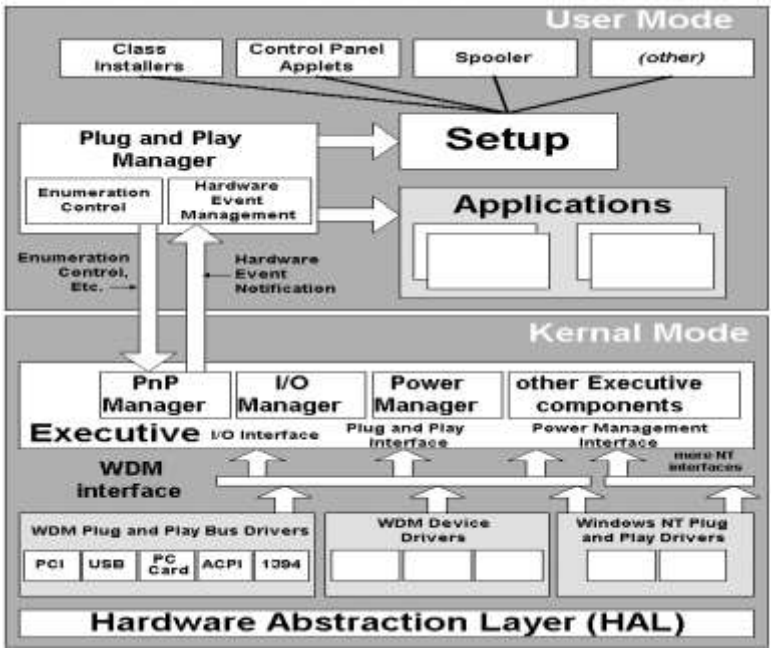

Figure 14.1: Plug and Play Architecture in Windows 2000

- **Plug and Play Manager in Kernel-mode**

There are a number of activities performed by the kernel-mode Plug and Play Manager in Windows 2000 like maintaining central control, directingbus drivers to perform enumeration and configuration, directing the device drivers to add a device, start a device, and so on. Apart from these the Plug

and Play Manager can send requests to determine whether a device can be safely kept in pause mode or removed; give the device driver an opportunity to synchronize outstanding I/O requests to the incoming request; coordinate with the user mode Plug and Play counterpart to pause or remove devices that are available for such actions.

- **Power Manager and Policy Manager in the Kernel-mode**

All power management APIs are handled by the Power Manager component in the kernel-mode in combination with the Policy Manager. It also coordinates matching power events, and generates power management IRPs. It is the Power Manager which gathers the requests made by several devices to be turned off, When several devices request to be turned off, the Power Manager collects those requests, decideswhich requests must be serialized, and then generates appropriate power management IRPs. The Policy Manager component in the kernel-mode monitors activity in the system and integrates user status, application status, and device driver status into power policy. It is only under specified circumstances or upon request that the Policy Manager generates IRPs to change device power states.

- **I/O Manager in the Kernel-mode**

There are a number of services provided by the I/O Manager in the kernel-mode for device drivers like translating user-mode read and write commands into read or write IRPs, andmanaging all the other main operating system IRPs. As the functions of these interfaces are same as in Windows NT 4.0 and both Windows NT 4.0 and Windows 2000 include the I/O Manager, a Windows 2000 Plug and Play driver can be manually installed on Windows NT 4.0 to serve as a Windows NT 4.0 driver, but it will not support Plug and Play or other features specific only to Windows 2000.

- **WDM (Windows Device Manager) Interface for Plug and Play**

The I/O system provides a layered architecture for drivers. The following sections discusstypes of WDM drivers, driver layers, and device objects:

- **WDM Driver Types**

The WDM Bus drivers are the standard WDM drivers that describe bus capabilities and control the bus power management and Plug and Play. The bus is referred by any drive from which other devices are listed. A bus driver not only responds to new Plug and Play and power management IRPs but

can also be extended using filter drivers. Moreover, it enumerates the device on its bus, reports dynamic events on its bus to the operating system, responds to Plug and Play and Power Management IRPs, provides several accesses to the bus, and generally administers the devices on its bus.

There are three kinds of drivers in the context of Plug and Play. They are bus drivers, function drivers and filter drivers.

***Bus Driver*:** It services a bus controller, adapter, bridge, or any device that has child devices. A Bus driveris an essential driver and is generally provided by Microsoft.Every type of bus on a system has a bus driver each.

***Function Driver*:** This is a main device driver toprovide the operational interface for its deviceFunction driver is needed unless the device is used raw in which case the I/O is done by the bus drivers and filter drivers. The function driver for a device is typically implemented as a pair of class driver/mini-driver. In such driver pairs, a *class driver* (usually written by Microsoft) provides the functionality required by all devices of that type, and a *mini-driver* (usually written by the device vendor) provides device-specific functionality. The Plug and Play Manager loads one function driver for each device.

***Filter Driver*:** A filter driver which sorts I/O requests for a bus, a device, or a class of devices is optional and can be present in any number, placed above or below a function driver and above a bus driver. Usually, a filter driver is supplied by system's original equipment manufacturer (OEM) or independent hardware vendor (IHV). In most cases, lower-level filter drivers modify the behavior of device hardware. For example, a lower-level class filter driver for mouse devices could provide acceleration, performing a non-linear conversion of mouse movement data while Upper-level filter drivers usually provide added-value features for a device. For example, an upper-level device filter driver for a keyboard could enforce additional security checks.

- **Driver Layers**

Every device will have two (one each for bus driver and function driver) or three (including the optional filter driver) driver layers.

- **Device Objects**

The device objects which are the device to the driver created by the corresponding driver are generally of three kinds: *physical device objects (PDOs)*, *functional device objects (FDOs)*, and *filter device objects*. Physical Device Objects (PDOs) represent a device on a bus. Every Plug and Play API that refers to a device refers to the PDO. The Functional Device Objects (FDOs) represent the functionality of a device to a function driver. The filter device objects represent a filter driver as a hook to add value. These three kinds of device objects are all of the type DEVICE_OBJECT, but are used differently and can have different device extensions.

- **Additional Windows NT (New Technology) Interfaces**

The Plug and Play drivers in Windows 2000 are not limited to using the WDM (Windows Device Manager) interfaces. These drivers can call other interfaces to support legacy Windows NT drivers, detection, or other Windows 2000-specific capabilities that are not provided under WDM. You should keep in mind that a driver that supports features specific to Windows 2000 is no longer compatible with Windows 98. However if you want to use the same drivers in Windows 2000 and Windows 98, then you should opt for WDM drivers only.

- **User-Mode Plug and Play Components**

The User-Mode APIs in Windows 2000 are 32-bit extended versions of Windows 95 based Configuration Manager APIs and expose functionality from the user-mode Plug and Play. The Windows 2000 Setup program installs the drivers and so forth. The 32-bit device installer installation APIs that Setup uses to install drivers are functionally a superset of the Windows 95 SetupxDi (Windows 95 setup files) routines. Windows 2000 provides APIs that applications can use for customized hardware event management and to create new hardware events.

- **Plug and Play Device Tree**

The Plug and Play Manager maintains a device tree for the devices which can be viewed through the Device Manager, which keeps track of the active devices in the system and information about those devices. The Plug and Play Manager updates the device tree as devices are added and removed or as resources are reallocated. Depicted like a family tree, the device tree is hierarchical in nature with devices on a bus represented as children of the

bus adapter or controller. The registry is the central storehouse for static hardware information. Plug and Play system components and drivers build, maintain, and access new and existing sub-trees in the registry.

14.2.2 Enabling PnP under Linux

It is from mid-2004 that serious problems of Plug and Play technology in Linux have been resolved. Although initially Linux did not support PnP devices nowhowever if you require it to support PnP devices then all you need to do is select certain options while compiling the kernel. The BIOS may assign IRQs but Linux may also assign some of them or even reassign what the BIOS did. The configuration part of ACPI (Advance Configuration and Power Interface) is designed to make it easy for operating systems to do their own configuring. Linux can use ACPI if it's selected when the kernel is compiled.

In Linux, each device driver does its own low level configuration which function was difficult to perform until Linux supplied software in the kernel that the drivers could use to make it easier forthem. Today, in Linux, driver simply calls the kernel function: pci_enable_device () and the device gets configured by being enabled and having both an IRQ and addresses assigned to the device. This assignment could be what was previously assigned by the BIOS or what the kernel had previously reserved for it when the PCI or isa PnP device was detected by the kernel. There is even an ACPI option for Linux to assign all devices IRQs at boot-time.This is done through a program called '*setserial'* which allows you to tell the device driver software the I/O address of the serial port, which IRQ is set in the port's hardware, etc. Although the drivers are still doing the configuring they just have to request Linux to do it. In effect it is the non-device-driver part of the Linux kernel that does most of the configuring. Linux then could be considered a PnP operating system, at least for common computer architectures.

In Linux, when a device driver finds its device, it sees the addresses and IRQs assigned by BIOS and/or Linux and normally accepts them. However the driver is at liberty to change the addresses using the functions supplied by the kernel. But the kernel will not accept addresses that conflict with other devices or ones that the hardware can't support. When the PC starts up, you may see messages on the screen mentioningthat some Linux

device drivers have found their hardware devices and what the IRQ and address ranges are. Thus, the kernel provides the drivers with functions (program code) that the drivers may use to find out if their device exists, how it's been configured, and functions to modify the configuration if needed. You can refer to the word document “kernel-doc” in the directory /usr/src/linux/Documentation. In this directory, you can also see pci.txt (“How to Write Linux PCI Drivers”). Also you can refer to the file ‘pci.h’ in the location: /usr/include/linux/pci.h for more information about PCI drivers.

14.2.3 Troubleshooting

This section discusses troubleshooting techniques for some common PnP devicesunder Windows OS.

Plug and Play USB Not Working

In spite of Windows OS being loaded with a lot of drivers to support Plug and Play devices these devices may not function for various reasons. The most common reason may be that Windows OS may not have the device driver for that particular USB. An example of such a device would be your USB wireless broadband stick or a locally manufactured cell phone. Such devices need related drivers to be installed prior to their functioning on any computer.

The other common reasons as to why sometimes Windows OS plug and play devices do not work may include faulty devices, incorrectly configured hardware, mismatched USB cables, outdated firmware and problems with USB root hubs. If you find a plug and play device that should be detected automatically but is not being recognized by Windows OS, you can troubleshoot Windows OS, keeping in mind the above possibilities.

Sometimes the USB device may work in another computer having Windows OS but not in your computer. If this is the case first download the latest updates of Windows OS, including latest Service Pack. Use the Windows Update option under Tools Menu of the Internet Explorer to get the latest updates. If you are using another browser, you can use the Automatic Updates icon in the Control Panel to get the Windows OS Updates.

Before you download and install any updates you may be missing, or before installing the latest Service Pack, which is not on your computer, create a system restore point. You can do this by using the System Restore option.

Click on Start → All Programs → Accessories → System Tools → System Restore. Once you get the System Restore Window, select “Create a Restore Point” and click on Next. The next page will ask you for a name to identify the system restore point. Once you enter a unique name that you can remember, click on “Create” button and finally on “Close”. All the current settings of your computer will be saved so that if anything goes wrong, you can use the system restore to undo the changes done to your computer.

Using System Restore to Fix the USB Plug and Play Issue

Sometimes a USB device which may have been working well previously suddenly stops working. This may due to some fault in the settings of the USB hub or with any system file associated with your device. You can resolve this issue by resorting to system restore. Open the System Restore Dialog Box and select “Restore my computer to an earlier time”. This will present you with a list of restore points in a calendar format. You need to recall the restore point prior to which the USB plug and play device was working. Once you find it, click the restore point and then again click on the “Next” button. This will restore the previous settings so that you can use the USB plug and play device again. There is a possibility of losing any custom settings software installed after the creation of the restore point you selected to restore your computer.

Troubleshooting using Power Cycle and Cables Power Reset

In order to do this first, detach the USB device from the computer and turn off the computer. Then unplug the power supply, wait for a minute and plug the power cord back and turn on the computer. When Windows OS is loaded fully insert the plug and play into the USB port. The power cycle will make the data bus to reset which might help Windows OS to identify the plug and play device. Generally, the problem is fixed at this stage however, if Windows is still unable to detect the USB plug and play, go to the next Windows OS troubleshooting steps.

Problems with Malfunctioning Cables

As some extension cables that come along with USB devices may have a problem, it is advisable to connect the USB directly into the computer without using cables and see whether the USB is working. You should keep in mind that sometimes the problem may arise due to the use of incompatible cables. Not every cable will work with all USB plug and play

devices as the USB cables are categorized based on the data transfer speeds, which vary from cable to cable. You should checkif the cable is compatible with your plug and play USB device. If you find that the cables are ok and the problem persists then you should go in for advanced Windows OS troubleshooting method for USB plug and play devices.

Advanced Windows Troubleshooting for Plug and Play Devices

As Windows OS has a certain power limit for each of its ports if any of the ports attempts or starts consuming more power than the specified limit, the operating system suspends the port temporarily. If this happens to the USB ports, then the Windows OS plug and play device may not be recognized.

Updating the BIOS and USB Firmware to Restore the Settings of Windows Ports:

Though the power settings are restored when you give a power cycle as explained above, sometimes the problem lies with the firmware, meaning the hardware itself. There could be several reasons why a port would draw more power than allocated. If you found that the power cycle did not fix the USB port, then now you may need to update the firmware. Moreover, you can also update the system BIOS so that you can start afresh.For this you could search the website of the manufacturer of your computer for the latest version of USB firmware and any BIOS update for downloading them.

Reinstallation of USB Controllers:

Even after undertaking all checks for troubleshooting, your Windows OS plug and play device does not work, and then you have to consider two possibilities for this: either the USB controllers are corrupt or the USB ports are bad. In the latter case, you will have to replace the USB ports. But before that, check if the reinstallation of the USB controllers can solve your problem with the Windows OS plug and play device not working.

To reinstall the USB controllers, you need to uninstall them first. To uninstall the controllers, open the Device Manager by holding down the Windows key and hitting the Break key. In the System Properties Dialog box that appears, select the Hardware tab. Then click on the Device Manager Button (first one from the top). In the dialog box, expand the Universal Serial Bus Controllers. You will find it at the bottom of the window.

Once expanded, right click on each of the USB Controller and select uninstall from the context menu. You may be presented with a message saying something about system instability. Ignore the message and uninstall all of them.

Self Assessment Questions

1. In Linux, the 'pci.h' header file is available in _____ directory.
2. ACPI stands for _____.
3. Every USB cable will work with all kinds USB plug and play devices. (True / False)

14.3 Identification of Cables in Computers

Before you start assembling a PC, you should first know and identify various cables that came packaged with your computer. This section provides a visual guide for identifying various cables, starting with USB cables and connectors.

USB Cables and Connectors

USB cables are not only used to connect most new devices to your computer including flash memory sticks, portable media players, internet modems and digital cameras but also computer accessories like mice, keyboards, webcams, portable hard-drives, microphones, printers, scanners and speakers through USB ports. USB cables can alsobe used for charging a variety of gadgets including mobile phones or for transferring data from one computer to another. Figure 14.2 shows a model of USB connector.

Figure 14.2: The USB connector

Although there are different types of USB cables a standard USB connector, USB-A, is a rectangular connector. The USB-A end is present on every USB cable as it is the end that connects to your computer. The other end of the USB cable may have different connectors including USB-B (a square connector commonly used with printers, external hard drives, and larger

devices) or smaller connectors such as the Mini-USB and Micro-USB that are commonly used with portable devices such as media players and phones. Figure 14.3 shows different types of USB cables.

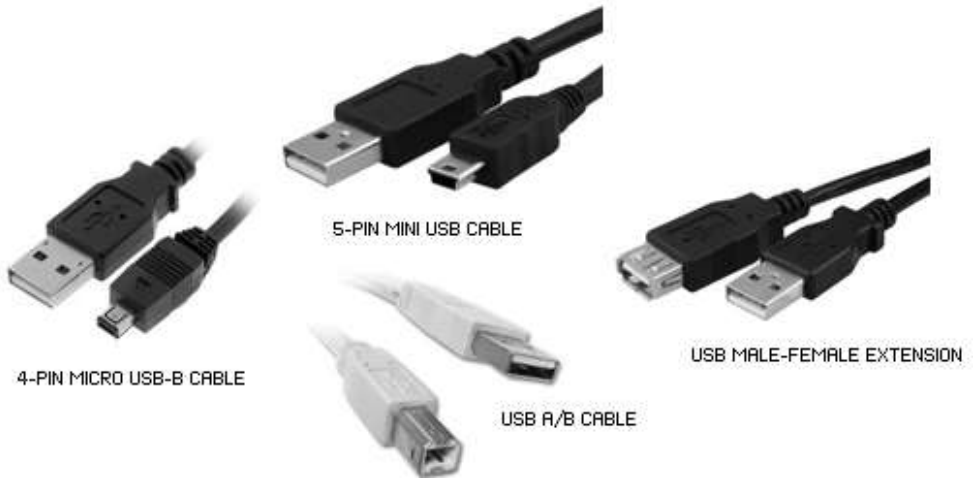

Figure 14.3: The USB connector

There are also connectors that have USB-A connectors at the end that connect to the computer, and a device-specific connector at the other end (e.g. the iPod). USB Male to Female connectors is also available for extending the length of a USB cable. Many other non-USB cables can also connect to your computer via a USB converter; these cables have the standard USB-A connector on one end while the other end could have connections for other ports such as Ethernet or audio.

Audio Cables and Connectors

The most common audio cable is the standard headphone jack which is also referred to as TRS connector.Such connectors are available in several sizes, but the most common ones used with computers are the 3.5 mm or 1/8" mini audio jack. Figure 14.4 shows the standard audio jack.

Figure 14.4: The standard audio jack

This standard audio jack can be used to connect most speakers and microphones to the computer. The microphone port on your computer is usually pink in color. The speaker port will be usually green. Some computers have additional TSR audio ports colored black, grey, and gold; these are for rear, front, and center/subwoofer output, respectively.

There is a bigger variety of the TSR connector which is called 1/4″ TRS. This is commonly used in professional audio recording equipment and it can be connected to a computer using a 1/4" to 1/8" converter as shown in Figure 14.5.

Figure 14.5: The ¼″ TRS

Video Cables

The VGA (Video Graphics Array) cable is one of the most common video connectors for computer monitors and high-definition TVs. A standard VGA connector has 15-pins. This is used to connect a monitor to a computer, laptop to a TV screen or a projector. Figure 14.6 shows different types of VGA cables and connectors.

Figure 14.6: Varieties of VGA cables

DVI (Digital Visual Interface) Monitor Port

While modern computers have DVI instead of VGA the new class of 'slim' laptops uses smaller variants of DVI like the Mini-DVI and Micro-DVI. A DVI cable has 29 pins, though some connectors may have fewer pins depending on their configuration. DVI's video signal is compatible with HDMI (High-Definition Multimedia Interface), so a simple converter can allow a DVI

monitor to receive input from an HDMI cable. Additionally, DVI to VGA converters is also available for connecting your new graphics card to the old monitor that supports only VGA mode. Figure 14.7 shows the DVI cable.

Figure 14.7: The DVI cables

S-Video

S-Video cables are also known as Separate Video or Super Video cables carry analog video signals. They are commonly used for connecting DVD players, camcorders, and older video consoles to the television. Standard S-Video connectors are round in shape and usually have 4 to 9 pins. Figure 14.8 shows the S-Video cable.

Figure 14.7: The S-Video cables

Data Cables

A data cable is any media that allows baseband transmissions (binary 1s, 0s) from a transmitter to a receiver. Some of the examples include: Ethernet cables, token ring cables, USB cables etc. Firewire is a faster alternate to USB. They are used for connecting digital camcorders and external hard drives to a computer. Firewire typically has 6 pins in its connector, though a 4 pin variety is common as well. Figure 14.9 shows the Firewire.

Figure 14.8: The Firewire

eSATA(External Serial Advanced Technology Attachment) Cables

eSATA cable is used internally for connecting the hard drive to the computer's motherboard. The eSATA cable is designed to connect portable hard drives to the computerand can transfer data faster than USB or FireWire. However, the eSATA cable cannot transmit power, so unlike USB, you cannot power an external hard drive with eSATA. The eSATA cable has more shielding, and contains a larger connector. Figure 14.9 shows the eSATA cable.

Figure 14.9: The eSATA cable

Networking Related Cables

Phone RJ11 Cable

The telephone cable is also known as RJ11. It is used to connect the Internet through DSL/ADSL modems. A standard phone cable has 4 wires and the connector has four pins.The connector has a clip at the top to help maintain a tight connection. Figure 14.10 shows the standard RJ11 cable.

Figure 14.10: The standard RJ11 cable

Ethernet Cable

The Ethernet cable, also known as RJ45 is based on Cat5 (Category 5) twisted pair cable and is made from 8 individual wires.The Ethernet connector, has 8 pins and looks similar to a phone plug, but is actually thicker and wider. It too has a clip to help maintain a tight connection like a phone connector. Figure 14.11 shows the Ethernet cable.

Figure 14.11: The standard Ethernet cable

Self Assessment Questions

4. The standard audio jack is _____ in size.
5. S-Video cable generally contains _____ pins.
6. The Ethernet cable is also known as _____.

14.4 Fitting of Cabinet

This section discuss how to fit various components such as switch mode power supply (SMPS), floppy disk drive, hard disk drive, CD-ROM drive etc. in the cabinet. The popular ATX cabinet is considered here as the model.

Attaching the Power Supply

Generally the computer cabinets come with SMPS (switch mode power supply) but if your case does not have it you may have to buy one taking care to see that you get a 250W power supply to support your monitor and other devices. Mount the power supply into the cabinet with the help of screws that come along with it. The power supply contains the power supply connectors for other components such as floppy disk drive, hard disk drive, CD-ROM drive, mother board etc.

Installing the Hard Disk

First you have to set the jumper on the drive (next to the connector at the rear end) to select “Master”. If you use only one hard disk, it should be set to Master. In future if you want to add one more hard disk, its jumper should be

set for Slave. Place the hard disk in the case and fasten with 4 screws.Connect one of the power supply cables to the hard drive.

Installing the CD-ROM Drive

First you need to set the jumper on the CD-ROM drive. You can configure CD-ROM as either ‘Slave’ or ‘Master’. Here are the options:

- Attach the CD-ROM to IDE (Integrated Drive Electronics) connector 1 and make the CD-ROM a slave. In this case, you will set the jumper on the CD-ROM to "Slave" then attach the CD-ROM drive to the same IDE cable as the hard drive. Or,
- Attach the CD-ROM to IDE connector (Integrated Drive Electronics) 2 and make the CD-ROM a master. In this case you will set the jumper on the CD-ROM to "Master" and attach the CD-ROM drive with a separate IDE cable. In order to use this method, you will need a second IDE cable.

Connect one of the power supply cables to the CD-ROM drive.

Once you have mounted the above devices in the cabinet, your next step is to fix the motherboard in the cabinet and connecting the above devices to the motherboard.

14.5 Mounting Motherboard in Cabinet

The following are the guideline for installing memory before mounting the motherboard in the cabinet:

Installing the Memory

There is a designated slot for inserting the memory in the motherboard.Before inserting the memory, which can be done inonly one way, make sure that the two latches are apart. As the memory is very static sensitive, the usual precautions of earthing etc. should be taken. Start with the lowest numbered slot on the motherboard (usually slot 0),as you push the memory into the slot. While inserting the memory, the levers should start to close. If the levers haven't fully closed then squeeze them both together and they should latch the memory into place. To remove the memory, just pull the levers apart and they will automatically eject the memory. Figure 14.12 shows the sockets for inserting the memory and figure 14.13 shows the memory.

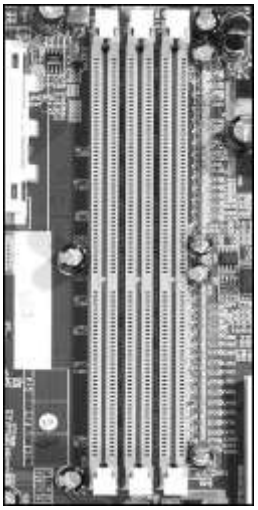

Figure 14.12: The sockets for inserting the memory

Figure 14.13: The memory chip

Once you install the memory, the next step is to mount the motherboard in the case.

Installing the motherboard

It is essential to ensure that the motherboard you have purchased matches your cabinet. Spacers, which come with the case, help you to mount the motherboard on one side of the casewhere there is a metal plate that is slightly bigger than the motherboard. You will find a number of plated screw holes that you can match the spacers to and there should be at least a couple of mounts on the case that you can fixa screw into. When you plug cards into the PCI slots, they will point out through the slots at the back of the PC cabinet. Also the ports (LAN, USB, PS/2, parallel etc.) will all have to fit through the slot for the back-panel. It is recommended that you go through the instruction manual that comes along with the case. It is important to ensure that the motherboard does not touch the case at any point otherwise it will result in short circuiting something making the motherboard useless. Another vital point to consider is that no screws are

dropped or placed at the back of the motherboard as it might mean the same thing as the motherboard touching the case directly which is to be avoided at any cost. Next connect the 20 pin standard ATX power cable in the SMPS to the motherboard as shown in figure 14.14.

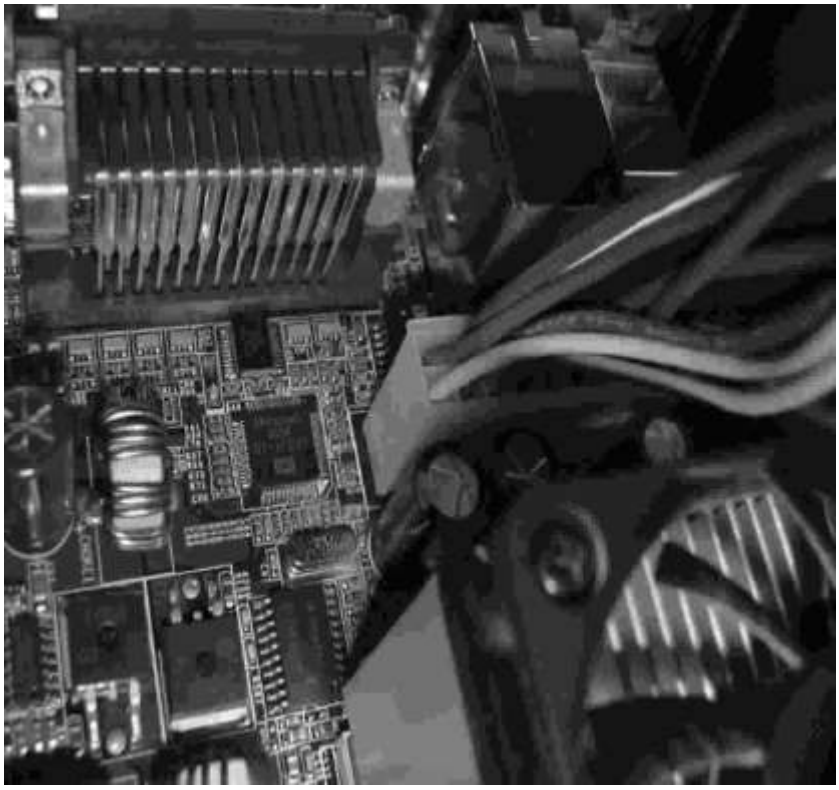

Figure 14.14: The 20 pin standard ATX power cable connected to motherboard

Next you have to connect various data cables from the devices such as floppy drive, hard disk drive, CD-ROM drive into the motherboard. Figure 14.15 shows a schematic diagram of a motherboard. The diagram clearly shows the respective slots to insert power cable, IDE cables, FDD (Floppy Disk Drive) cable etc.

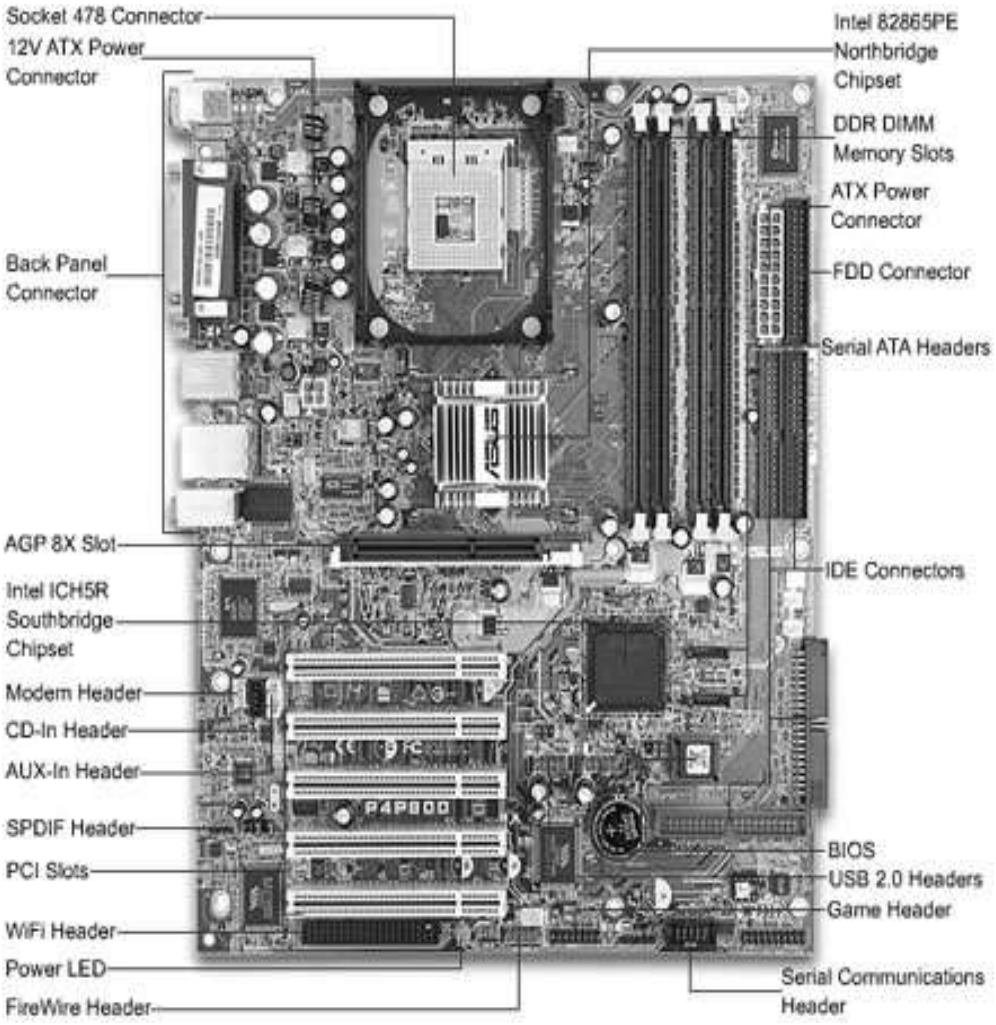

Figure 14.15: The schematic diagram of a motherboard

The modern motherboard / processor combinations, unlike the older ones, require anauxiliary power connection in addition to the standard ATX power supply. In the above figure you will observe that there is an ATX power connector and a 12V ATX (Advanced Technology eXtended) connector. Both should be plugged in using the corresponding leads from the power supply.

After connecting all the cables, your next task is to insert various cards such as AGP card, sound card, network card etc.

Fitting Cards

Fitting the sound and video cards is very easyas the PCI and AGP slots like the memory slots are keyed meaning that the cards can only be inserted one way. As usual you should take all the antistatic precautions. Next take the graphics card from the antistatic bag and push it down into the AGP slot. Look along the length of the slot to ensure that the card is not sitting up at either end. Your motherboard may have a lot of PCI slots so try to place the cards in those slots, such that enough space is available between them. Sometimes your AGP card may develop heat; in that case try to avoid the PCI slot next to it, just to ensurea cooling airflow around your case. Modern AGP cards have cooling fans fitted in them.

Once you complete the above tasks, you can close the cabinet and then connect the monitor, keyboard, mouse, speakers and microphone to the computer. Now your computer is ready for installing the operating system.

Self Assessment Questions

7. SMPS stands for _____.
8. Hard disk can be used as either Master or Slave. (True / False)
9. Before you start assembling a PC, you should ensure proper earthing. (True / False).

14.6 Summary

This unit has provided you with some important concepts like:

- Plug and Play (PnP) which is a combination of hardware and software support that enables a computer system to recognize and adapt to hardware configuration changes with little or no intervention by a user.
- The kernel-mode functionality in Windows 2000 Plug and Play whichsupports boot-time Plug and Play activity and interfaces with the HAL (Hardware Abstraction Layer), Executive, and device drivers.
- In Linux, each device driver does its own low level configuration.
- Before start assembling a PC, you should identify various cables such as power cables, data cables etc. in the computer.
- USB cables are used to connect most new devices to your computer including flash memory sticks, portable media players, internet modems and digital cameras.

- Enough antistatic precautions to be taken before you start assembling a PC.
- You can configure CD-ROM as either a Master or Slave depending upon the IDE connectors and jumper settings.
- You need to plug sound and video cards into their respective PCI or AGP slots.

14.7 Glossary

Term	Description
PnP	Plug and Play (PnP) is a combination of hardware and software support that enables a computer system to recognize and adapt to hardware configuration changes with little or no intervention by a user.
ACPI	Advanced Configuration and Power Interface Specification (ACPI) defines a comprehensive, system-wide approach to controlling system and device configuration and power management. ACPI provides these services for all versions of Windows later than Windows 95.
Device object	The device object represents the device to the driver which will be created by the corresponding driver. Generally there will be three kinds of device objects.
USB	Universal Serial Bus (USB) cables are used to connect most new devices to your computer including flash memory sticks, portable media players, internet modems and digital cameras.
RJ11	RJ11 is the standard telephone cable. It is used to connect the Internet through DSL/ADSL modems.
RJ45	RJ45 is the standard Ethernet cable. It is based on Cat5 twisted pair cable and is made from 8 individual wires.
APM	APM stands for Advanced Power Management, which is an Application Programming Interface developed by Intel and Microsoft and released in 1992 which enables an operating system running an IBM-compatible personal computer to work with the BIOS (part of the computer's firmware) to achieve power management.
TRS Connector	A TRS connector (Tip-Ring-Sleeve) also called an audio jack, phone jack, phone plug, jack plug, stereo plug, mini-jack, mini-stereo, or headphone jack, is a common analog audio connector. It is cylindrical in shape, typically with three contacts, although sometimes with two (a TS connector) or four (a TRRS connector).

14.8 Terminal Questions

1. Explain the term PnP.
2. How will you identify different cables in the computer?
3. How will you fit various peripherals into the computer cabinet?
4. Explain the steps to install the motherboard into the cabinet.

14.9 Answers

Self Assessment questions

1. /usr/include/linux
2. Advanced Configuration and Power Interface Specification
3. False
4. 3.5 mm
5. 4 to 9
6. RJ45
7. Switch Mode Power Supply
8. True
9. True

Terminal questions

1. Refer section 14.2: Plug and Play Devices
2. Refer section 14.3: Identification of Cables in Computers
3. Refer section 14.4: Fitting of Cabinet
4. Refer section 14.5: Mounting Motherboard in Cabinet

References:

- Troubleshooting, Maintaining and Repairing PC's by Stephen J. Bigelow, TMH
- Inside the IBM PC by Peter Norton, PHI

E-References:

- http://www.build-your-own-computer.org/pc-assembly.html