

Unit

4

Computer Assembly and Disassembly



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INTRODUCTION

Computer assembly is a process in which all the internal components of the computer system are fitted to make the computer functional. The main component involves CPU, motherboard, memory, disk drives, etc. There is a proper process of attachment and installation of each and every component. An installation technician should be competent to disassemble and reassemble the computer system. In this Unit, we will understand the step by step process of computer assembly and disassembly as a whole. The assembly and disassembly of the desktop as well as of a laptop computer is demonstrated.

Tools are an essential part of computer assembly and maintenance. It is also important to handle the tools carefully and safely. While installing a computer and its peripherals, you should follow the basic safety guidelines to prevent cuts, burns, electrical shock, and damage to eyesight. The technician has to take care of the tools as well as personal safety. Safe working practice helps to prevent injury to people and damage to computer equipment. In this Unit, we will learn to use various tools required for installation of a computer and peripherals. We will also understand and follow the basic safety precautions while handling tools and equipment during the installation process.

INTRODUCTION

Tools are an essential part of computer assembly and maintenance. It is important to handle the tools carefully and safely. The technician has to take care of the tools as well as personal safety. Safe working practice helps to prevent injury to people and damage to computer equipment. A safe workspace is clean, organised, and properly lit. It is necessary to understand and follow safety procedures. In this Chapter, we will understand the safety precautions while handling tools as well as various tools required for installation of the computer.

USING HARDWARE TOOLS

For every job, there is a right tool. Use the correct tool for a task. Skilled use of tools and software makes the job less difficult and ensures that tasks are performed properly and safely. A tool kit should contain all the tools necessary to complete hardware repairs. Hardware tools are grouped into four categories—

- (i) ESD tools
- (ii) Hand tools
- (iii) Cleaning tools
- (iv) Diagnostic tools

ESD Tools

There are two ESD tools—the anti-static wrist strap and the anti-static mat.

The anti-static wrist strap protects computer equipment when grounded to a computer chassis. It is used to prevent ESD damage to computer equipment.

The anti-static mat protects computer equipment by preventing static electricity from accumulating on the hardware or on the technician. It is used to stand or place onto the hardware to prevent static electricity from building up.



Fig. 11.1: Different types of electronic cutters

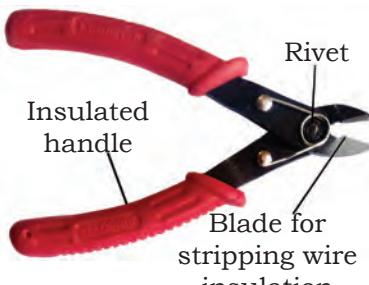


Fig. 11.2: Parts of electronic cutter



Fig. 11.3: Precise screwdriver



Fig. 11.4: Different bits of screwdriver



Fig. 11.5: Parts of precision screwdriver

Hand Tools

Most tools used in the computer assembly process are small hand tools. They are available individually or as part of a computer repair tool kit. Tool kits range widely in size, quality, and price.

Electronic cutter

This belongs to the family of pliers and cutter. It is used in printed circuit board and to cut fine wire. It is sharp enough and hence cannot damage the other nearby wires.

Precise screwdriver

Screwdriver is a hand held tool, commonly used for inserting and removing of screw. Screwdriver is made up of a bit and handle. Bits are detachable according to the use and are made up of metal, whereas handle is made up of insulating material.

Different types of precise screw drivers

Screwdrivers are available in different shapes of bit and size. The various bits can be attached to the screwdriver to work in different fashions. Some of the bits are mentioned below.

A Phillips head screwdriver

It is used to tighten or loosen cross-head screws.

A torx screwdriver

It is used to tighten or loosen screws that have a star-like depression on the top, a feature that is mainly found on laptops.

Hex Driver

A hex driver sometimes called a nut driver is used to tighten or loosen nuts in the same way that a screwdriver tightens screws.

Combination pliers

Combination pliers, as the name suggests, perform various operations. It enables the user to perform the

combined operation, that is, cutting and gripping. Some combination pliers have other additions, especially if they are designed for use in particular industries or for specific tasks.

Wire stripper

It is a portable handheld tool used by workers, especially electricians, for removing the protective coating of an electric wire in order to replace or repair the wire. It is also capable of stripping the end portions of an electric wire in order to connect them to other wires or to terminals. A wire stripper is often considered an important tool for professional electricians and other related personnel.

Crimper

This is used for the joining of stripped wire and special connector. Stripped wire is inserted through the correctly sized opening of the connector. And then crimper is used to tightly squeeze the opening against the wire.

Tweezers

These are used to manipulate small parts.

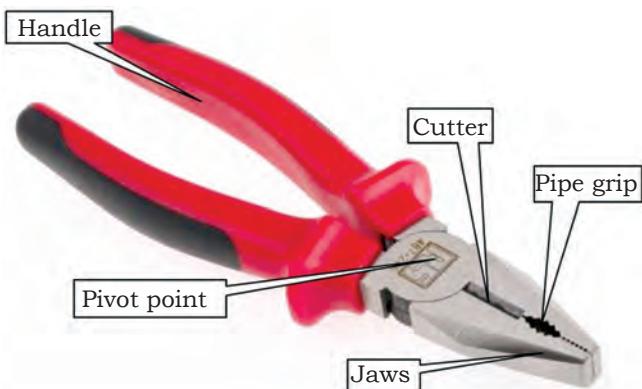


Fig. 11.6: Combination pliers



Fig. 11.7: Wire stripper and its different parts



Fig. 11.8: Crimping tool for RJ 45 connector

Punch down tool

It is used to terminate a wire into termination blocks. Some cable connectors must be connected to cables using a punch down tool.

Cleaning Tools

Soft lint-free cloth

It used to clean different computer components without scratching or leaving debris.

Compressed air

It used to blow away dust and debris from different computer parts without touching the components.

Cable ties

They are used to bundle cables neatly inside and outside of a computer.



Fig. 11.10: Punch down tool

Parts organiser

It used to hold screws, jumpers, fasteners, and other small parts and prevent them from getting mixed up together.

Diagnostic Tools

Digital multimeter

It is used to test the integrity of circuits and the quality of electricity in computer components. A digital multimeter displays the information on an LCD or LED.

Loopback adapter

It is also known as a loopback plug and is used to test the basic functionality of computer ports. The adapter is specific to the port that you want to test.

Toner probe

It is a two-part tool. The toner part is connected to a cable at one end using specific adapters such as an RJ-45, coaxial, or metal clips. The toner generates a tone that travels the length of the cable. The probe part



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traces the cable. When the probe is in near proximity to the cable to which the toner is attached, the tone can be heard through a speaker in the probe.

Safety

While installing computer and peripherals, you should follow the basic safety guidelines to prevent cuts, burns, electrical shock, and damage to eyesight. As a best practice, make sure that a fire extinguisher and first aid kits are available in case of fire or injury. Place the cables in conduit or cable trays to prevent hazards. Some basic safety precautions to be followed when working on a computer are as below:

Basic safety guidelines

- Remove your watch and jewellery.
- Turn off the power and unplug equipment before installation.
- Never open a power supply or a CRT monitor.
- Do not touch the computer and the printer's part that use high voltage.
- Know about the location of fire extinguisher and its use.
- Take necessary precautions when lifting heavy objects to avoid injury.
- Keep food and drinks out of your workspace.

Electrical safety

Follow electrical safety guidelines to prevent electrical fires and injuries. Power supplies and CRT monitors contain high voltage.

Precautions

Do not wear the anti-static wrist strap when repairing power supplies or CRT monitors. Some components retain a high voltage even after the printer is turned off. Check the printer manual for the location of high-voltage components.

Fire safety

Follow fire safety guidelines to protect yourself and equipment. To avoid an electrical shock and to prevent



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damage to the computer, turn off and unplug the computer before beginning installation.

Fire can spread rapidly. Proper use of a fire extinguisher can prevent a small fire from getting out of control. When working with computer components, be aware of the possibility of an accidental fire and know how to react. Be alert for odours emitting from computers and electronic devices. When electronic components overheat or short out, they emit a burning odour. In case of fire, follow the following safety procedures—

- Never fight a fire that is out of control.
- Keep a planned fire escape route before beginning any work.
- Get out of the building quickly.
- Contact emergency services for help.
- Read the instructions on the fire extinguishers in workplace before you have to use them.

Be familiar with the types of fire extinguishers. Each type of fire extinguisher has specific chemicals to fight different types of fires (causes)—paper, wood, plastics, cardboard, gasoline, kerosene, organic solvents, electrical equipment, or combustible metals.

It is important to know how to use a fire extinguisher. Use the memory aid P-A-S-S to remember the basic rules of fire extinguisher operation:

P — pull the pin.

A — aim at the base of the fire, not at the flames.

S — squeeze the lever.

S — sweep the nozzle from side to side.

Protecting Equipment

Electrostatic discharge (ESD)

Electrostatic discharge (ESD) and poor-quality sources of electricity can cause damage to computer equipment. Follow proper handling guidelines, be aware of environmental issues, and use equipment that stabilises power to prevent equipment damage and data loss.

Static electricity is an electric charge resting on a surface. ESD occurs when this build-up charge jumps



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to a component and causes damage. ESD can be destructive to the electronics in a computer system.

At least 3,000 volts of static electricity must build up before a person can feel ESD. For example, static electricity can build up on you as you walk across a carpeted floor. When you touch another person, you both receive a shock. If the discharge causes pain or makes a noise, the charge was probably above 10,000 volts. By comparison, less than 30 volts of static electricity can damage a computer component.

ESD can cause permanent damage to electrical components. Follow these recommendations to help prevent ESD damage:

- Keep all components in anti-static bags until you install them.
- Use grounded mats on workbenches.
- Use grounded floor mats in work areas.
- Use anti-static wrist straps when working on computers.

Electromagnetic interference

It is the intrusion of outside electromagnetic signals in a transmission media, such as copper cabling. In a network environment, EMI distorts the signals so that the receiving devices have difficulty interpreting them.

EMI does not always come from expected sources, such as cellular phones. Other types of electric equipment can emit a silent, invisible electromagnetic field. There are many sources of EMI:

- Any source designed to generate electromagnetic energy.
- Man-made sources like power lines or motors.
- Natural events such as electrical storms, or solar and interstellar radiations.

Wireless networks are affected by radio frequency interference (RFI). RFI is caused by radio transmitters and other devices transmitting in the same frequency. For example, a cordless telephone can cause problems with a wireless network when both devices use the same frequency. Microwaves can also cause interference when positioned in close proximity to wireless networking devices.

Climate

This affects the computer equipment in variety of ways:

- If the environment temperature is too high, equipment can overheat.
- If the humidity level is too low, the chance of ESD increases.
- If the humidity level is too high, equipment can suffer from moisture damage.

Power fluctuations

Voltage is a measure of work required to move a charge from one location to another. The movement of electrons is called current. Computer circuits need voltage and current to operate electronic components. When the voltage in a computer is not accurate or steady, computer components might not operate correctly. Unsteady voltages are called power fluctuations.

The following types of AC power fluctuations can cause data loss or hardware failure:

- Blackout — complete loss of AC power. A fuse, damaged transformer, or downed power line can cause a blackout.
- Noise — interference from generators and lightning. Noise results in poor quality power, which can cause errors in a computer system.
- Spike — sudden increase in voltage that lasts for a short period and exceeds 100 per cent of the normal voltage on a line. Spikes can be caused by lightning strikes, but can also occur when the electrical system comes back on after a blackout.
- Power surge — dramatic increase in voltage above the normal flow of electrical current. A power surge lasts for a few nanoseconds, or one-billionth of a second.

Power protection devices

To help shield against power fluctuation problems, use devices to protect the data and computer equipment:

- surge suppressor — It diverts extra electrical voltage that is on the line to the ground. It helps to protect against damage from surges and spikes.



- Uninterruptible power supply (UPS) — It provides a consistent quality of power when power supply goes off. It helps to protect against potential electrical power problems by supplying a consistent level of electrical power to a computer or other device. The battery is constantly recharging while the UPS is in use. Never plug in a laser printer into a UPS because the printer could overload the UPS.

Proper Disposal to Protect Environment

To protect the environment it is essential to properly dispose or recycle the hazardous computer components.

Batteries

They contain rare earth metals that can be harmful to the environment. Batteries from portable computer systems contain lead, cadmium, lithium, alkaline manganese, and mercury. These metals do not decay and they remain in the environment for many years. Mercury is commonly used in the manufacturing of batteries and is extremely toxic and harmful for human beings. Hence, recycling of batteries should be adopted as a standard practice.

Monitors

They contain glass, metal, plastics, lead, barium, and rare earth metals. They must be disposed off in compliance with environmental regulations. CRT monitors must be handled with care. Extremely high voltage can be stored in these monitors, even after being disconnected from a power source.

Toner kits, cartridges, and developers

Used printer toner kits and printer cartridges must be disposed of properly or recycled. Some toner cartridge suppliers and manufacturers take empty cartridges for refilling. Some companies specialise in refilling empty cartridges. Kits to refill inkjet printer cartridges are available but are not recommended, because the ink might leak into the printer causing irreparable damage.



Chemical solvents and aerosol cans

Contact the local sanitation company to learn how and where to dispose of the chemicals and solvents used to clean computers. Never dump chemicals or solvents down a sink or dispose them in a drain that connects to public sewers.

The cans or bottles that contain solvents and other cleaning supplies must be handled carefully. Make sure that they are identified and treated as special hazardous waste. For example, some aerosol cans explode when exposed to heat if the contents are not completely used.

CHECK YOUR PROGRESS

A. Fill in the blanks

1. The anti-static wrist strap _____ the computer equipment when grounded to a computer chassis.
2. Electronic cutter belongs to the family of pliers and _____.
3. Screwdriver is a hand held tool, commonly used for inserting and removing of _____.
4. Crimping tools is used for the joining of stripped wire and special _____.
5. Tweezers are used to manipulate _____ parts.
6. A punch down tool is used to terminate wire into termination _____.
7. Do not wear the anti-static wrist strap when repairing power supplies or _____ monitors.
8. Electrostatic discharge (ESD) and poor-quality sources of electricity can cause damage to the _____ equipment.
9. Keep all components in anti-static bags until you _____ them.
10. Voltage is a measure of work required to move a charge from one location to _____.
11. A surge suppressor diverts extra electrical voltage that is on the line to the _____.
12. UPS provides a consistent quality of power when power supply goes _____.



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13. Batteries contains rare earth metals that can be harmful to the _____.
14. Used printer toner kits and printer cartridges must be disposed of properly or _____.
15. The cans or bottles that contain solvents and other _____ supplies must be handled carefully.

B. Short answer questions

1. What do you understand by a tool?
2. What are hardware tools?
3. What are the categories of hardware tools?
4. Define—
 - (a) ESD tools
 - (b) Hand tools
 - (c) Cleaning tools
 - (d) Diagnostic tools
5. What are the basic safety guidelines for installation of computer and peripherals ?
6. What is protecting equipment?

INTRODUCTION

Computer assembly is an essential job of a computer installation technician. The technician has to work in a logical, methodical manner while handling various computer components and peripherals. The technician can improve the computer assembly skills with practice. Computer assembly is a process in which all the internal components required for the computer system are fitted so as to make the computer functional. There is a proper sequence of attachment of each and every component into the computer system. To establish proper connectivity, one has to use the tools. Proper handling of tools is also required by the technician. It is required that students learn the steps of installation of each component. The main component involves installing CPU, motherboard, drives, video, graphics card, sound card, modem and adapter, and connectors, and system panel connector. In this Chapter, we will understand the step by step process of assembling a computer. It also covers the need for adequate system resources to efficiently run the customer's hardware and software.

COMPUTER ASSEMBLY

As we know, computer assembly is a systematic process. First, arrange the computer parts. The sequence for assembly and working of the computer listed below is as:

- Open the case.
- Install the power supply.
- Attach the components to the motherboard.
- Install the motherboard.
- Install internal drives.
- Connect all internal cables.
- Install motherboard power connections
- Connect external cables to the computer.
- Boot the computer for the first time.

Prepare the workspace before starting installation of the computer. There should be adequate lighting, good ventilation, and a comfortable room temperature. The workbench or table should be accessible from all sides. Avoid cluttering the surface of the workbench or table with tools and computer components. An anti-static mat on the table will help to prevent physical and electrostatic discharge (ESD) damage to equipment. Small containers can be used to hold small screws and other parts as they are being removed.



Fig. 12.1: Unscrew cabinet

Material Required

- Computer case, with power supply installed
- Motherboard
- CPU
- Heat sink/fan assembly
- Thermal compound
- RAM module(s)
- Motherboard standoffs and screws
- Anti-static wrist strap and anti-static mat
- Tool kit



Fig. 12.2: Pull cabinet side cover

Procedure

Step 1: Open the case

- The first step in assembling a computer is to open the computer case (see Figure 12.1). There are different methods for opening cases.
- The computer comes with various types of cabinets. The method for opening the case is different based on the manufacturer.
- To open the case, first remove the screws of the left side cover and slide the side cover (see Figure 12.3).



Fig. 12.3: Unscrew bolts

Step 2 : Install the power supply

The next step is to install a power supply (see Figure 12.4). There are usually four screws that attach the power supply to the case. Power supplies have fans that can vibrate and loosen screws that are not secured. When installing a power supply, make sure that all of the screws are used and that they are properly tightened.



Fig. 12.4: Insert power supply

- Insert the power supply into the case.
- Align the holes in the power supply with the holes in the case.
- Secure the power supply to the case using the proper screws.

Step 3: Attach the components to motherboard

The motherboard has to be prepared before its installation. To prepare the motherboard, you first need to install the CPU, then the heat sink on the CPU and CPU fan.

CPU

The CPU and motherboard are sensitive to electrostatic discharge. So place them on a grounded anti-static mat and wear an anti-static wrist strap while handling the CPU. When handling a CPU, do not touch the CPU contacts at any point. The CPU is secured to the socket on the motherboard with a locking assembly.

Thermal compound which is used to conduct heat away from the CPU is applied on the top of CPU. In case of an old CPU, first clean the top of the CPU, and then apply the thermal compound. Clean the top of the CPU and the base of the heat sink with isopropyl alcohol and a lint-free cloth. This removes the old thermal compound. Then apply a new layer of thermal compound (see Figure 12.6).

Heat sink and fan assembly

Heat sink and fan assembly is a two-part cooling device. The heat sink draws heat away from the CPU. The fan moves the heat away from the heat sink. The assembly has a 3-pin power connector.

To install a CPU and heat sink and fan assembly, follow these steps:

- First, open the CPU load plate. Align the CPU orientation so that the notches on the CPU are aligned with the orientation keys on CPU socket.
- Place the CPU gently into the socket.
- Close the CPU load plate.
- Close the load lever.
- Apply a small amount of thermal compound to top of the CPU (see Figure 12.6).



Fig. 12.5: Installing CPU on the motherboard



Fig. 12.6: Applying thermal compound on CPU



Fig. 12.7: Screw the heat sink



Fig. 12.8: Screw the heat sink fan assembly

- Screw the CPU fan on the heat sink.
- Align the heat sink and fan assembly with the holes on the motherboard.
- Place the assembly onto the CPU socket carefully.
- Screw the assembly on the motherboard (see Figure 12.8).
- Connect the assembly power cable to the CPU fan connector on the motherboard.

Installation of RAM

It is better to install the RAM first on the motherboard and then fix the motherboard in the case. To install RAM, first ensure its compatibility with the motherboard. If DDR3 is mentioned on the motherboard, then DDR3 RAM may be fixed in the memory slot. To install RAM, follow these steps.

- Press down the side locks of the memory slot (see Figure 12.9). Align the notches on the RAM module to the keys in the slot and press down on both ends of RAM module until the side lock gets locked.
- Make sure that the side tabs have locked the RAM module.
- Repeat the above steps to install additional RAM modules.

Step 4: Install motherboard

After preparing the motherboard, you can install the computer case, as shown in Figure 12.10. Plastic and metal standoffs are used to mount the motherboard and to prevent it from touching the metal portions of the case. To install the motherboard, follow these steps:

- Lay the motherboard over the standoffs to mount it on the holes.
- Align the screw holes of the motherboard with the standoffs.
- Then screw the board using a standard screwdriver.
- Tighten all the motherboard screws.
- Connect the 4-pin ATX power connector from the power supply to the motherboard.



Fig. 12.9: Memory slot



Fig. 12.10: Lay the motherboard over the standoffs



Fig. 12.11: Tighten all the motherboard screws



Fig. 12.12: Insert hard disk



Fig. 12.13: Tighten screws of HDD



Fig. 12.14: Insert optical drive



Fig. 12.15: Tighten screws of optical drive



Fig. 12.16: Connect cable IN to HDD

Step 5: Install internal drives

Hard drive

The hard drive is the device which stores all the data. It is 3.5 inch wide and needs to be mounted so that access to the cable connections on the back is gained. Drives that are installed in internal bays are called internal drives. A hard disk drive (HDD) is an example of an internal drive. To install HDD, follow these steps:

- Position the HDD so that it aligns with the 3.5 inch drive bay.
- Insert the HDD into the drive bay so that the screw holes in the drive line up with the screw holes in the case (see Figure 12.12).
- Secure the HDD to the case using proper screws (see Figure 12.13).

Optical drive

- Position the optical drive so that it aligns with the 5.25 inch drive bay.
- Insert the optical drive into the drive bay so that the optical drive screw holes align with the screw holes in the case (see Figure 12.14).
- Secure the optical drive to the case using the proper screws (see Figure 12.15).
- Connect the power cable coming from the SMPS to the power socket of optical drive.
- Connect SATA data cable from optical drive socket to the motherboard socket.

Step 6: Connect all internal cables

Power cables are used to distribute electricity from the power supply to the motherboard and other components. Data cables transmit data between the motherboard and storage devices, such as hard drives.

Step 7: Install motherboard power connections

Just like other components, motherboards require power to operate. The Advanced Technology eXtended (ATX) main power connector will have either 20 or

24 pins. The power supply may also have a 4-pin or 6-pin auxiliary (AUX) power connector that connects to the motherboard. A 20-pin connector will work in a motherboard with a 24-pin socket. Follow these steps for motherboard power cable installation:

- Align the 20-pin ATX power connector with the socket on the motherboard.
- Gently press down on the connector until the clip clicks into place (see Figure 12.18).
- Align the 4-pin AUX power connector with the socket on the motherboard.
- Gently press down on the connector until the clip clicks into place (see Figure 12.19).

SATA power connectors

SATA power connectors use a 15-pin connector (see Figure 12.20). Serial advanced technology attachment (SATA) power connectors are used to connect to hard disk drives, optical drives, or any devices that have a SATA power socket.

Step 8: Connect external cables to the computer

Setting up the computer system involves the complete process of establishing the proper connectivity of various parts of the computer system—input and output devices, connectivity of computer with the surge power supply. Reattach the side panels to the case. The process of connecting the external cables given below:

Locate the monitor cable

Locate the two power cable and one VGA cable or monitor cable (see Figure 12.21). The VGA cable is used to connect to monitor and another point on to the back side of the cabinet. If you are having trouble finding these, refer to the instruction manual of or the computer. You can skip to ‘Step 3’, in case of all-in-one computer that is built into the monitor.



Fig. 12.21: Display cable and ports



Fig. 12.17: Press cable socket for proper connection



Fig. 12.18: Plug-in 20-pin ATX power connector to motherboard

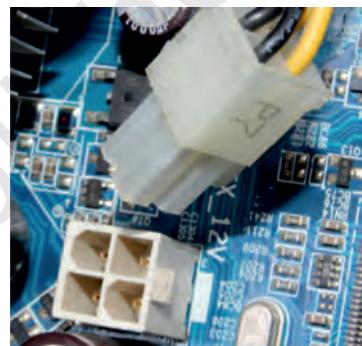


Fig. 12.19: Plug-in 4-pin AUX power connector to motherboard



Fig. 12.20: Plug-in 15-pin connector to HDD



Fig. 12.22: Connecting VGA or monitor cable to the port on back panel of computer

Connecting monitor

Connect one end of the cable to the monitor port on the back of the computer case and the other end to the monitor. In case of VGA cable as shown in Figure 12.22 tighten the screws on the monitor cable to secure it.

The cables will only fit in a specific way. If the cable does not fit, do not force it, otherwise the connectors might get damaged. Make sure the plug aligns with the port, then connect it. So, first identify all the cables, ports, and connectors.

Connecting keyboard

Unpack the keyboard and determine whether it uses a USB (rectangular) connector or a PS/2 (round) connector. If they have colour coded plugs that are light green and lavender, plug them into the corresponding colour-coded ports, it is more likely if they use round PS/2 connectors. If it uses a USB connector, plug it into any of the USB ports on the back of the computer. The following Figures 12.23 and 12.24 shows connecting keyboard in PS/2 connector and USB connector.



Fig. 12.23: Connecting keyboard in PS/2 port



Fig. 12.24: Connecting keyboard in USB port

Connecting mouse

Unpack the mouse and determine whether it uses a USB or PS/2 connector. If it uses a USB connector, plug it into any of the USB ports on the back of the computer. If it uses a PS/2 connector, plug it into the green mouse port on the back of the computer. In case of wireless mouse or keyboard, connect a Bluetooth dongle (USB adapter) in one of the USB ports of the computer. However, it is not necessary to connect an adapter for the modern computers which have built-in Bluetooth.



*Fig. 12.25: Connecting mouse (a) in PS/2 port
(b) in USB port*

Connecting headphones or speakers, and microphone

Connect the external speakers or headphones, to computer's audio port (either on the front or back of the computer case). The modern computers have colour-coded ports. Speakers or headphones connect to the green port, and microphones connect to the pink port. The blue port is the line-in, which can be used with other types of devices. They can be also connected to the USB port. Some speakers, headphones, and microphones have USB connectors instead of the usual audio plug. Connect them to any USB port. Some computers have speakers or microphones built into the monitor.

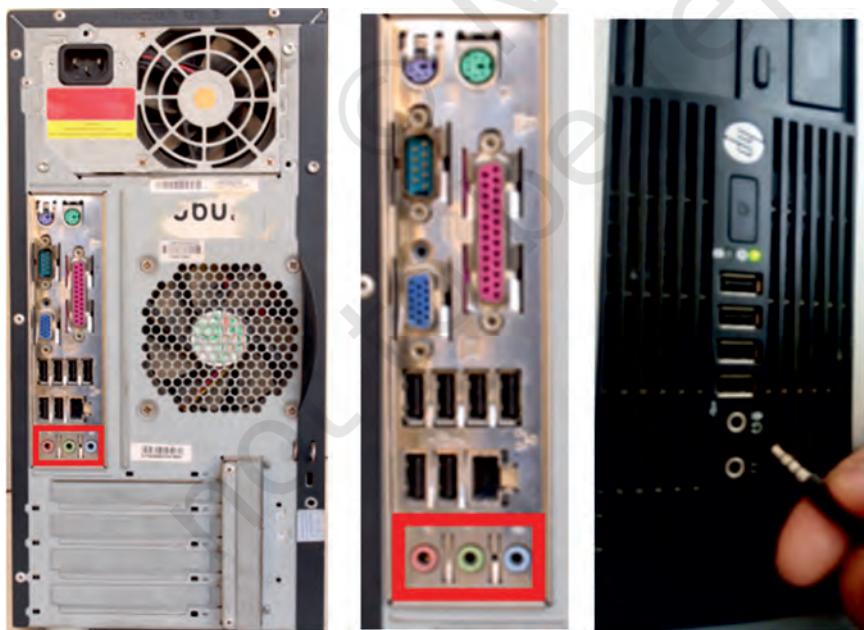


Fig. 12.26: Connecting speakers or headphones, and microphone



Fig. 12.27: Plug the surge protector into a wall outlet

Connect the computer to a power supply

Locate the two power supply cables that came with the computer. Plug the first power supply cable into the back of the computer case and then into a surge protector. Then, using the other cable, connect the monitor to the surge protector. It is better to use an uninterruptable power supply (UPS), which acts as a surge protector and provides the back up when the power goes off.

Ups (uninterruptible power supply)

While working on computer, its power supply should not be interrupted. UPS is like a power bank which gives power to the computer system. So make sure to plug power cable of monitor and cabinet into the UPS power output socket. Ensure the connection is proper.



Fig. 12.28: UPS

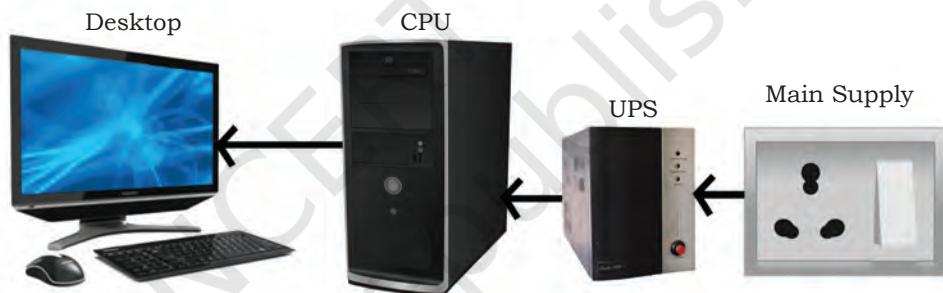


Fig. 12.29: Power connection (CPU through UPS)

Plug the surge protector

Plug the surge protector into a wall outlet after finishing the connectivity of all the parts and peripherals, plug the surge protector into the main power supply. You may also need to turn on the surge protector if it has a power switch.

Connecting printer, scanner, webcam

To connect the peripherals such as printer, scanner, webcam, identify the respective connectors of the cable and port on the cabinet. Plug in the connectors of these peripherals in respective ports. Correctly plugging in will recognise the peripherals as they are plug and play devices.



It may be required to install their software drivers for them to function properly. Use the instructions included with the device to install them if necessary. Installation of peripherals is optional, and it can be added at any time; it may not be required during the initial setup of your computer.

Checklist the following before starting the computer:

- VGA cable of monitor is connected to the cabinet or not.
- Power cable of monitor and cabinet has been plugged into the UPS power output socket. Make sure monitor is connected to the power supply or not.
- Keyboard and mouse both are connected to their proper ports.

Step 9: Starting the computer

To start the computer, it is necessary to follow the correct sequence to start up. Now push the power button on the CPU to start the computer. Practically when we start our vehicle, we always check that the light or air conditioner (AC) is off. Otherwise it will consume more power compared to normal start up.

Always remember that the first step is to push power button of the CPU than the monitor's. Because the monitor consumes more electricity when powered. An operating system or system software like Windows or Linux will start loading as shown in Figure 12.31, 12.32, and 12.33 and the home window will appear as shown in Figure 12.34, 12.35, and 12.36. Now your computer is ready to use.



Fig. 12.31: Starting window of Windows 10



Fig. 12.32: Starting window of Windows 7



Fig. 12.33: Starting window of Ubuntu



Fig. 12.30: Proper connectivity of parts of computer system

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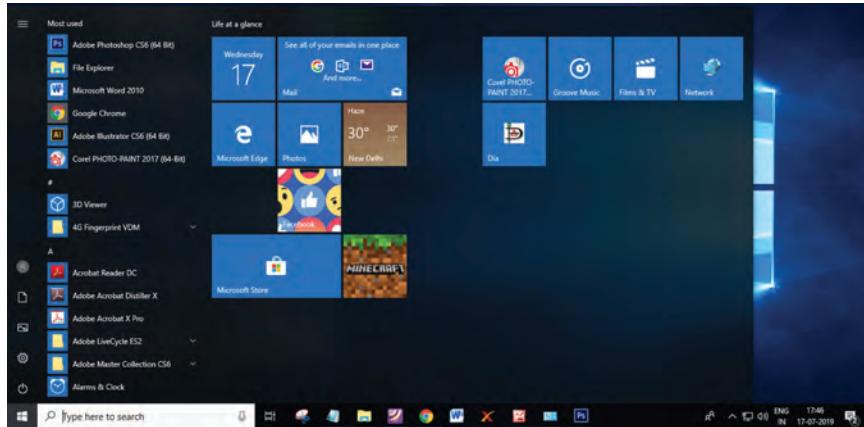


Fig. 12.34: Home window of Windows 10



Fig. 12.35: Home window of Windows 7

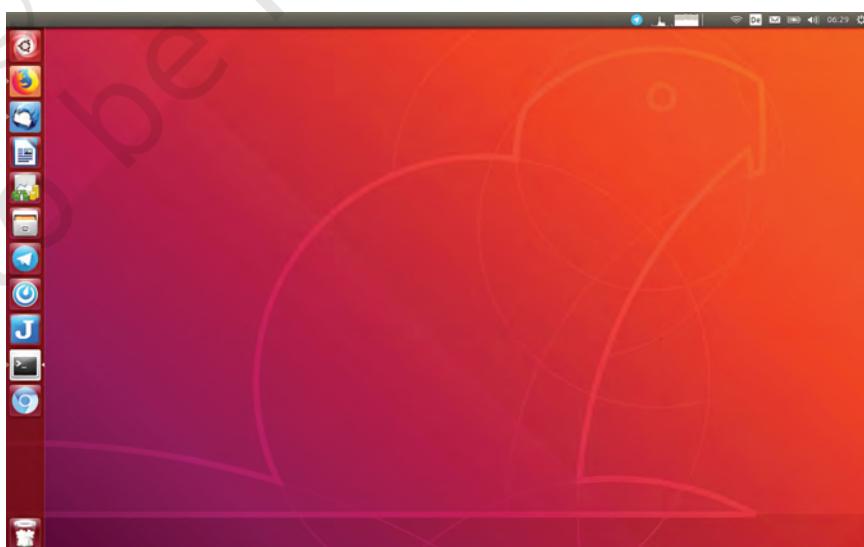


Fig. 12.36: Home window of Ubuntu

COMPUTER DISASSEMBLY

Disassembly is the process of breaking down a device into separate parts. Disassembly of any device is required to determine a problem, to replace a part, or take the parts and use them in another device. A computer is also an electronic device which requires disassembly for such issues. For example, if a RAM gets dysfunctional in a computer, then it requires disassembling the computer to take out the dysfunctional RAM and replace it with new RAM chips. As we know, computers have standard internal components, but the way of placement may vary as per the PC tower case and different brands of computer. The best way is to refer to the manufacturer instructions manual. But in general there is a standard process of computer disassembly, which is demonstrated in this session. Just like computer assembly, the disassembly is a standard process. The process involves unplugging of all the cords and cables connecting a component to other components, then removing the part from the case or frame. Components can be attached to the case with special clips, screws, or by insertion into a holder. A small amount of force is required to remove each part of the computer system.

Material Required

- One working PC
- An anti-static wrist strap
- An anti-static mat
- Anti-static bags of various sizes
- Technician's toolkit
- A plastic cup or box to organise screws, nuts, and bolts

Procedure

The disassembly procedure of computer is demonstrated as below.

Step 1: Unplugging

- Unplug the power cord from the PC and from the wall socket to prevent any injuries and damage of the PC from electrostatic discharge (ESD).



Fig. 12.37: CPU

- Unplug all the peripherals attached to the computer, such as the keyboard, mouse, monitor, headphones, and any external drives.
- Wear a grounding strap to discharge any static electricity.

Step 2: Open the case

The computer comes with various types of cabinets. The methods of opening the case are different based on the manufacturer.

- To open the case, first remove the screws of the left side cover and slide the side cover.
- Pull the latch to release the side panel. Then lift the side cover out from the chassis.

To remember connectivity of internal cables, take the photographs of internal circuitry. It will help to assemble back the system.



Fig. 12.38: Unscrew cabinet



Fig. 12.39: Pull cabinet side cover

Step 3: Disconnect all the connectors

Disconnect all the connectors connected to the motherboard. These include SATA power cable and data cable of HDD as well as SATA cable of optical drive.



Fig. 12.40: Unplug 15-pin connector from HDD



Fig. 12.41: Unplug 7-pin connector from HDD

Step 4: Remove the fan

Remove the fan now. Most computers have two fans—the system fan and CPU fan. The system fan is located at the back side of the computer to blow air into the computer. The CPU fan is located on top of the CPU heat sink. The fans and its connectors are labelled with their names.

To remove the system fan, first, disconnect its connector from the motherboard. Then, unscrew it from the outside of the back of the case and lift the fan out of the system (see Figure 12.43).

To remove the CPU fan from the heat sink, first, disconnect its connector from the motherboard. Then remove the four screws securing it (see Figure 12.44).



Fig. 12.42: Unscrew fan



Fig. 12.43: Remove the system fan



Fig. 12.44: Unscrew heat sink

Step 5: Remove the power supply

The power supply is connected to the motherboard by a 20-pin connector and 4-pin connector. It is also connected to hard disk drive and the optical drive. Firstly, disconnect hard disk drive and the optical drive connectors from the motherboard (see Figure 12.47).



Fig. 12.45: Unplug 20-pin ATX



Fig. 12.46: Unplug 4-pin AUX power connector from power connector from motherboard



Fig. 12.47: Unplug SATA cables from motherboard

- Disconnect the power cable of the hard disk and optical drive which connects to the SMPS (see Figure 12.48).
- Remove the screws that secure the power supply unit to the chassis (see Figure 12.49).
- Carefully lift the power supply out of the chassis (see Figure 12.50).

Step 6: Removing HDD and optical drive

- Remove the SATA cable connecting to the HDD and motherboard.



Fig. 12.48: Unplug power cable from optical drive and HDD



Fig. 12.49: Remove the screws



Fig. 12.50: Unscrew the SMPS and remove it from cabinet

- Then unscrew the four screws securing it in place and pull out the HDD (see Figure 12.52).



Fig. 12.51: Unscrewing of HDD



Fig. 12.52: Remove HDD

Step 7: Remove RAM (random access memory) modules

RAM allows for the transfer of information to and from the CPU. Computer runs fast with more RAM. Most computers have four RAM slots, and two RAM chips.

To remove the RAM, push down on both tabs holding the RAM in place, which are located at both ends of



Fig. 12.53: Unplug the RAM from slot

the RAM. It will cause the module to pop up for easy removal.

Step 8: Remove expansion cards

The modern motherboards are integrated with the audio, video and network cards. However, if your computer has the expansion card as shown in Figure 12.54, insert into the expansions slot to increase the functionality. The expansion card is screwed with a single screw on top of expansion card slot.

- To remove the expansion cards, disconnect the cables attached to it.
- Remove the screws securing the card in the slot.
- Carefully take out the card from the slot.

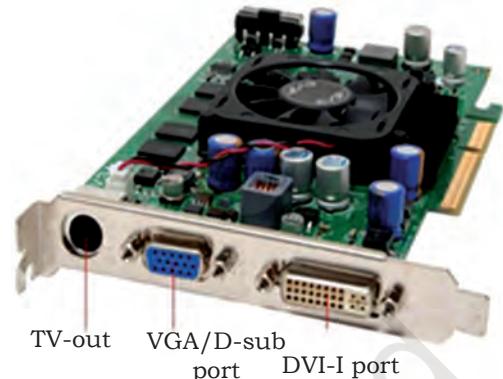


Fig. 12.54: Expansion card

Step 9: Remove motherboard

Every part of the computer is attached to the motherboard. The CPU, RAM, and expansion cards are directly attached to the motherboard.

To remove the motherboard, disconnect all the cables from the motherboard. It has seven screws holding it to the frame. Remove these screws and then lift the motherboard out of the frame.

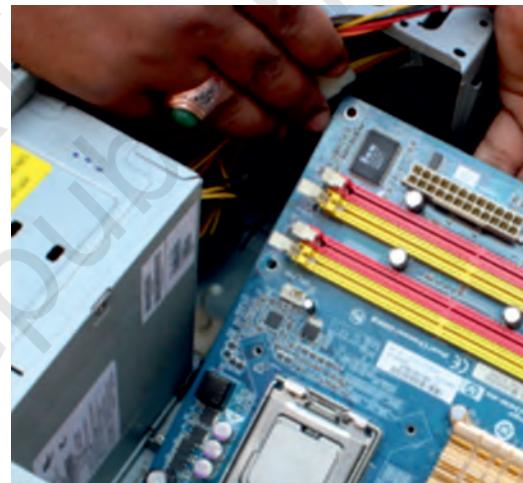


Fig. 12.55: Removing the motherboard

Step 10: Reassemble the components

- Identify every component and take its photograph.
- After identification of each component, put all the components back in their place and ensure that all cables and wires are connected at the right place to avoid further troubleshooting.
- Close the case and put the screws back in their place.
- Lastly, connect every external device such as the keyboard, mouse, monitor, etc., and turn on the computer to see everything is working fine after assembled.

Practical Exercise

Identify and list the various internal components of the computer system:

- Form a group of 35 students.
- Take any old computer system.
- Disable the computer system as per the procedure.
- Identify and name the various internal components of the computer system.
- Identify their brands and list the specifications.
- Test the compatibility of the components with the motherboard.

ASSEMBLING OF LAPTOP

Material Required

- Laptop
- Mini screwdriver
- Anti-static wrist strap
- Magnifying glass

Procedure

Step 1: Keep track of screws

There are several types of small screws that are used throughout the laptop. Place these in small envelopes and write the component name on the envelope. Be organised and keep track of all the screws. We have to figure out how to remove the back panel.



Fig. 12.56: Back panel of a laptop



Step 2: Installation of processor

NOTES

First component to be installed is the processor. Take extreme care not to touch the pins in the socket during the process (see Figure 12.57 and 12.58).

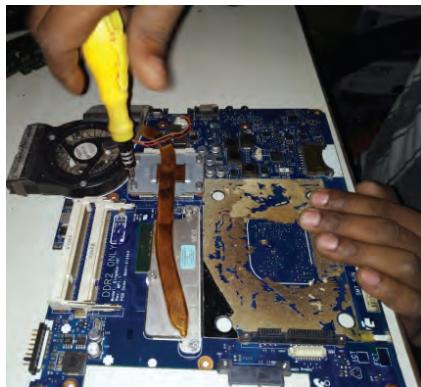


Fig. 12.57: Unscrew the socket

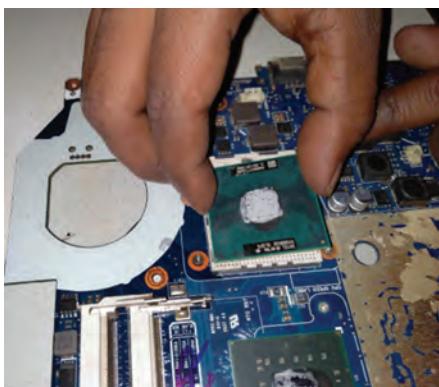


Fig. 12.58: Fit processor in the socket

Step 3: Pop in the video card

First, find the baggie with three larger silver screws and two small black screws to install the graphics card. Hold the card at about a 30-degree angle as you insert its edge connector into the video-card slot near the center of the motherboard. Press the card in and downward, and then use the two small black screws to secure it in place.

Step 4: Set up the drive

The motherboard SATA connectors are along the front, right edge, and under the lip of the laptop's shell. Drop the drive into place and then carefully use your thumb to push the drive into the SATA connectors. Now use the remaining two screws to secure the drive in place.

Step 5: Add memory

To install memory, locate the memory slots on the motherboard. Align the notches on the memory module with the ridge in the slot. Firmly push the module until the clips on the side of the slot snap into place.

Step 6: Final assembly

Now that all the hardware components are installed, find the four screws you removed from the ACE door,

slide the door back into place, and replace the screws. To prepare for power up, pop in the notebook's battery pack, connect the power brick and plug it into a wall outlet. Finally, open the laptop's cover with one hand, use your other hand to press the power button.

DISASSEMBLY OF LAPTOP

Procedure

Step 1: Removal of battery

Start the disassembly process by removing the battery (see Figure 12.59). Remove one screw securing the optical CD/DVD drive. Pull out the optical drive and remove it. Remove all the screws securing the bottom case. There are two screws hidden under the two laptop bottom feet. Remove the bottom screws. Peel off the bottom from the case to access the hidden screws. Remove the hidden screws from both sides of the notebook.



Fig. 12.59: Remove battery and optical drive



Fig. 12.60: Separate palm rest from bottom case

Step 2: Separation of palm rest

Using a plastic case opener, separate the palm rest from the bottom case as shown in Figure 12.60.

Step 3: Removal of bottom case

Turn the notebook upside down and remove the bottom case.

Step 4: Disconnecting the hard drive cable from the motherboard

Remove the three screws fixing the hard drive bracket to the case. Disconnect the hard drive cable from the motherboard.



Fig. 12.61: Remove screws from the hard drive and disconnect it



Fig. 12.62: Open the connector and release hard drive cable



Step 5: Remove the hard drive

Remove the hard drive assembly from the notebook. If you are going to replace it with another hard drive or SSD, you will have to transfer the mounting bracket and the SATA cable.



Fig. 12.63: Remove hard drive assembly



Fig. 12.64: Disconnect SATA cable

Step 6: Removal of RAM

A notebook PC motherboard has two memory slots. Remove both RAM modules if necessary.



Fig. 12.65: Remove RAM memory modules

Step 7: Disconnection of cable

Remove the one screw fixing the USB LED status board. Disconnect the cable from the motherboard.

Step 8: Removal of USB LED status board

Remove the USB LED status board.

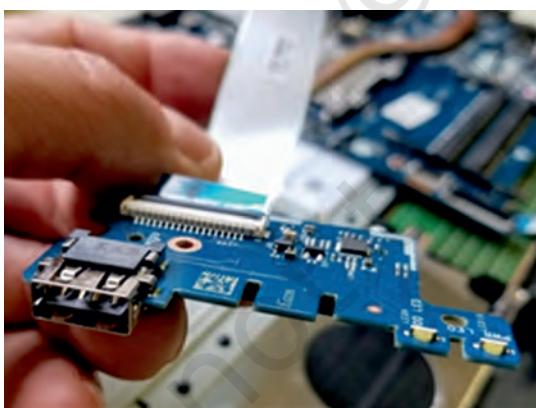


Fig. 12.66: Remove USB LED status board



Fig. 12.67: Remove optical CD DVD drive connector board

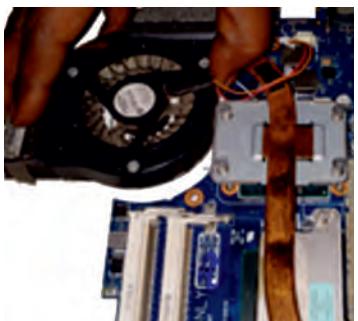


Fig. 12.68: Remove cooling fan

Step 9: Removal of screw fixing the optical CD/DVD drive connector board

Remove the one screw fixing the optical CD/DVD drive connector board. Disconnect the cable from the motherboard.

Step 10: Removal of the cooling fan

Remove the two screws fastening the cooling fan to the case. Unplug the fan cable from the motherboard and remove the cooling fan (see Figure 12.68).

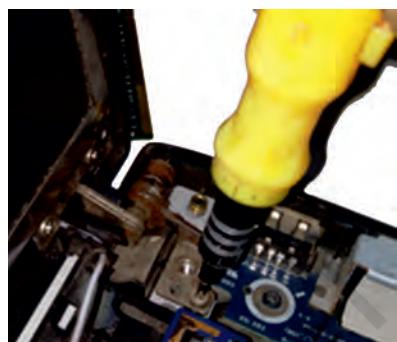


Fig. 12.69: Remove screws fastening display hinge



Fig. 12.70: Open the hinge and remove DC power jack

Step 11: Removal of DC power jack

In a notebook PC, the DC power jack is mounted under the hinge. Remove it. Disconnect the Wi-Fi antenna cable from the wireless card. Disconnect the DC power jack harness from the motherboard. Move all cables aside and remove the two screws from the display hinge. Open up the hinge and remove the DC power jack.



Fig. 12.71: DC power jack mounted under display hinge



Fig. 12.72: Disconnect Wi-Fi Module

Step 15: Removal of screw securing the board

The power button board is also mounted under the same hinge. Remove the one screw securing the board and unplug the cable from the motherboard.



Step 12: Removal of motherboard

Separate the motherboard from the top case and remove it. The other side of the motherboard is shown in Figure 12.74.

In a notebook PCs, the keyboard is permanently attached to the top case with rivets. When the keyboard fails, it is necessary to replace the top case. The touchpad is glued to the top case but the touchpad button board can be removed.



Fig. 12.73: Disconnect cables from motherboard and remove screws

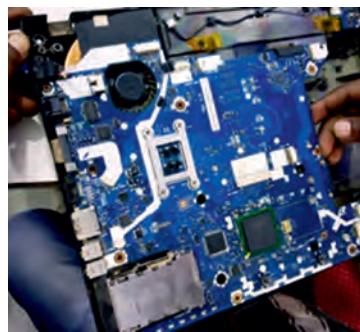


Fig. 12.74: Remove the motherboard from notebook case



Fig. 12.75: Keyboard permanently attached to top case

Laptop LCD Screen Removal

Procedure

It is possible to disassemble the LCD screen of a laptop independently. Previous steps are not required for disassembling the display, you only need to disconnect the battery before you start.

Step 1: Separate the display bezel from the back cover. You will have to wiggle the bezel to unfasten it from the cover. Start on the top and move to the sides for the display assembly.

Step 2: On the bottom, the bezel is attached to the LCD screen with adhesive tape. Carefully separate it from the screen.

Step 3: Remove the bezel completely.

Step 4: Remove the four screws securing the LCD screen to the side brackets (see Figure 12.77).



Fig. 12.76: Notebook PC LCD screen removal



Fig. 12.77: Remove the four screws securing LCD screen

Step 5: Separate LCD screen from the back cover and place it the front side down on the keyboard.



Fig. 12.78: Remove screen bezel



Fig. 12.79: Separate LCD screen from back cover

Step 6: Now you can access the video cable connector (see Figure 12.80).

Step 7: Peel off the grounding tape from the screen.

Step 8: Peel off the clear tape securing the connection and unplug the video cable from the screen.



Fig. 12.80: Disconnect video cable from screen



Fig. 12.81: Remove and replace LCD screen

Step 9: Remove the LCD screen completely and replace if necessary (see Figure 12.81).

Step 10: You can find a new LCD screen using the model number from the original one.



Practical Exercise

NOTES

Visit the different manufacturer's websites for assembly and disassembly of various models of laptops from different brands.

Check Your Progress

A. Multiple choice questions



NOTES

B. Fill in the blanks

1. Disassembling is the process of breaking down a device into _____ parts.
 2. The tools and equipments required for computer disassembly are the same as that of computer _____.
 3. Power cables are used to distribute electricity from the _____ supply to the motherboard and other components.
 4. The cable of monitor port on the back side of the _____ case.
 5. USB cable connector can plug it into any of the _____ ports.
 6. UPS is like a power bank which gives power to the _____ system.
 7. Every part of the computer is attached to the _____.
 8. To remove the CPU fan from the heat sink, first disconnect its connector from the _____.
 9. The CPU, RAM, and expansion cards are directly attached to the _____.
 10. The modern motherboards are integrated with the audio, video, and _____ cards.
 11. The power supply is connected to the motherboard by a 20 pin connector and _____ pin connector.
 12. The _____ is the first component to be installed on the motherboard of laptop.
 13. The _____ case opener is used to open the case of laptop.
 14. In a notebook, the _____ power jack is mounted under the hinge.
 15. A notebook motherboard has _____ memory slots.
 16. It is possible to _____ the LCD screen of a laptop independently.



NOTES

C. Short answer questions

1. What does somebody need to know before setting out to assemble or disassemble a computer?
2. What are the necessary tools and accessories required for assembly or disassembly?
3. Describe different computer cables for building a computer.
4. What is the role of anti-static wrist wrap?
5. What is the necessity of applying thermal solution on the processor?
6. What are the necessary precautions to assemble or disassemble a computer?
7. How will you protect your computer's motherboard?
8. List the steps for installing a new processor.
9. How is it tested that a computer is ready for use?
10. What is ESD?