INFORMATION TECHNOLOGY

SUPPORT SERVICE

Level II

Learning Guide #27

Unit of Competence: -	**Care for Network and Computer Hardware**
Module Title: -	**Caring for Network and Computer Hardware**
LG Code:	EIS ITS2 M07 1019 LO1-LG27
TTLM Code:	**EIS ITS2 TTLM 1019 V1**

LO1: Identify computer hardware components

Instruction Sheet	Learning Guide #27

This learning guide is developed to provide you the necessary information regarding the Following content coverage and topics –

- Identifying external hardware components and peripherals
- Identifying internal hardware components.
- Reviewing ,recording and applying Requirements specifying by hardware manufacturers
- Determining and recording quality standard of hardware and peripherals
- Determining and establishing relationship of hardware and software components
- Determining, recording and applying Safe work practices

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to –

- External hardware components and peripherals are identified based on business requirement
- Internal hardware components are identified as needed
- Requirements specified by hardware manufacturers are reviewed, recorded and applied where appropriate.
- Quality standards of hardware components and associated peripherals are determined and recorded
- Relationship of computer hardware and software is determined and established for proper functioning of the system
- Safe work practices are determined, recorded and applied, taking into account legal and manufacturer requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 5.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3,Sheet 4,Sheet 5 and Sheet 6” **in page 1 ,4,9,19, 22,and 44** respectively.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 , Self-check 4, Self-check 5 and Self-check 6” **in page 2, 7, 16,20,42 and 46** respectively

Information Sheet – 1	Identifying external hardware components and peripherals

1.1. Hardware

Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mice, printers, and scanners etc.

Basic Components

- **Case or Tower** - This is the plastic box that contains the computer. Housed in the case, you will find the floppy drive, CD R OM drive, and the main components of the computer. Some of these are the hard drive, motherboard and the processor chip (CPU). The case keeps them neatly and safely together.
- **Monitor or Screen** - This is the TV-type screen on which you see the work you're doing on your computer.
- **Mouse** - The mouse allows you to move, select and click on objects.
- **Keyboard** - The keyboard is used to type in information and operate the computer.
- **Speakers** - Sometimes speakers are connected to the computer so that you can hear music and sound.
- **Microphone** - A microphone can provide a way to talk through or to the computer.
- **Printer** - A device that makes a printed copy of your work on a sheet of paper.
- **A scanner** is a device that captures text or illustrations on paper and converts the information into a form the computer can use. One of the most common kinds of scanners is called a flatbed scanner. It has a glass surface on which you lay paper, magazines, or other documents that you want to scan. Sometimes scanners can be manufactured so that they are combined with a printer thus can also be used as a photocopier and fax machine.

- **Digital cameras** store images digitally onto a storage device, either a memory card or a floppy disk, rather than recording them on film. Once a picture has been taken, it can be downloaded to a computer system, and then manipulated or printed.

- **USB flash drive**:-A small, portable device that plugs into a computer's USB port and operates as a portable hard drive. USB flash drives are considered to be an ideal method to transport data, as they are small enough to be carried in a pocket and can plug into any computer with a USB drive. Other names for flash drives are thumb drives, pen drives or USB drives.

Self Check 1	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

Match the most appropriate peripheral device to A column from B column.

Column A	**Column B**
_____1.Mouse	A. The TV-type screen on which you see the work you're doing on your computer.
_____2.Speakers	B. Select and click on objects
_____3.Keyboard	C. The plastic box that contains the computer
_____4.Jostic	D. Used to type in information and operate the computer.
_____5.Monitor	E. Store images digitally onto a storage device
_____6. Microphones	F. That used for hear music and sound.
_____7.Digital Camera	G. A device that captures text or illustrations on paper and converts the information into a form the computer can use.
_____8.Printers	H. A device that makes a printed copy of your work on a sheet of paper.
_____9.scanner	I. can provide a way to talk through or to the computer
_____ 10. Case	J. Game port

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. **BOOKS**
2. **https://training.gov.au/Training/Details/ICTSAS506**
3. **web1.keira-h.schools.nsw.edu.au/faculties/IT**

Information Sheet – 2	Identifying internal hardware components

1.1. Introduction

The internal hardware parts of a computer are often referred to as components, while external hardware devices are usually called peripherals. Together, they all fall under the category of computer hardware. Software, on the other hand, consists of the programs and applications that run on computers. Because software runs on computer hardware, software programs often have system requirements that list the minimum hardware required for the software to run.

Note: *Peripheral devices are the devices that are attached to the computer's system unit*

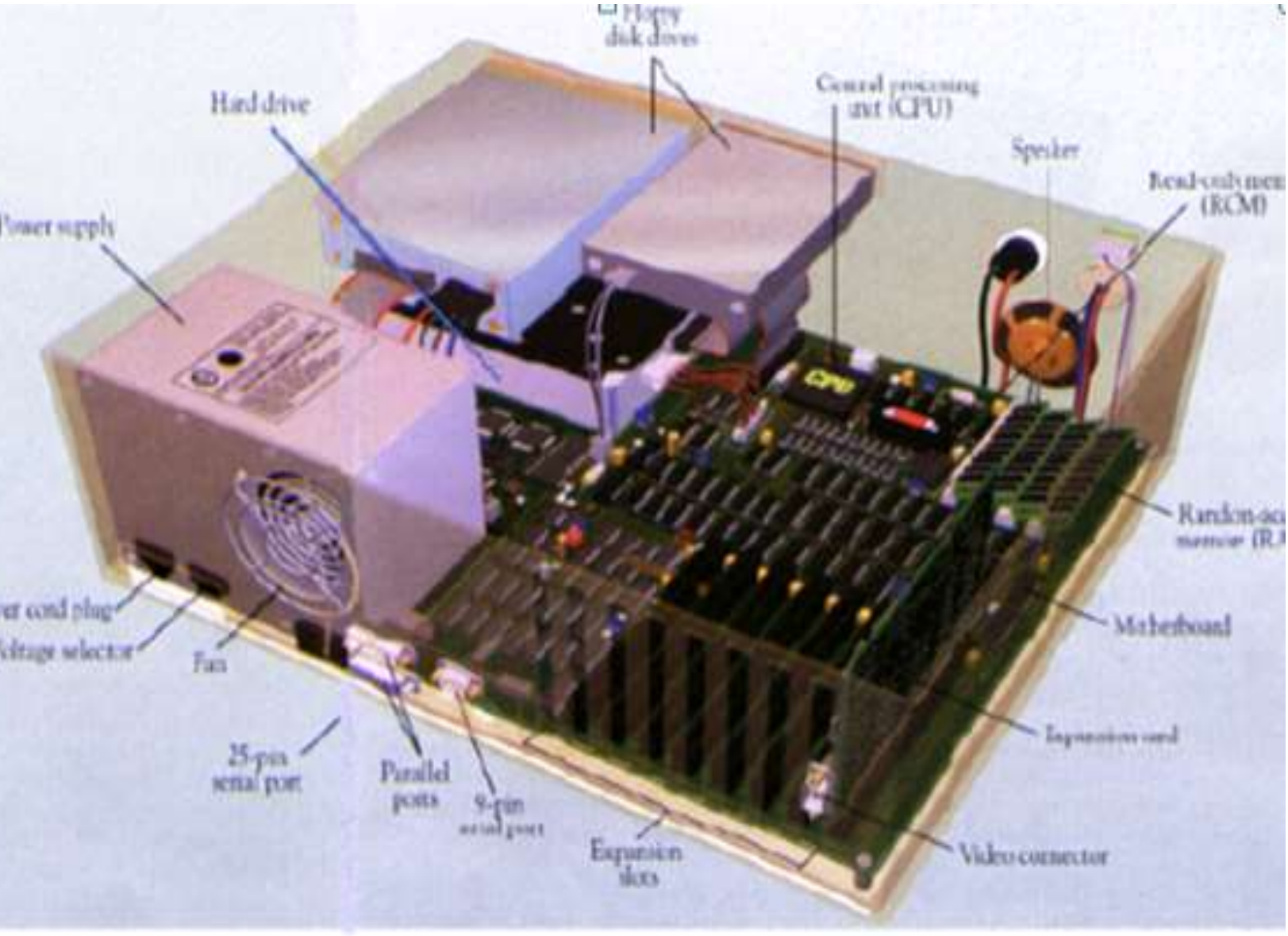


Figure 1.1:-Hardware component

INTERNAL COMPONENTS

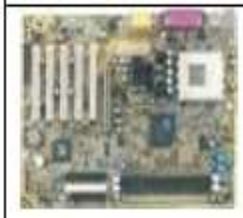
	**Power Supply** A power supply changes normal household electricity into electricity that a computer can use.		**Hard Drive** A hard drive is the primary device that a computer uses to store information
	**Expansion Card** An expansion card lets you add new features to a computer.		**Expansion Slot** An expansion slot is a socket on the motherboard that expansion cards plugs into.
	**Motherboard** The motherboard is the main circuit board of a computer. All computer components attached to the motherboard.		**Central Processing Unit (CPU)** The CPU processes instructions, performs calculations and manages the flow of information through a computer.
	**Random Access Memory (RAM)** RAM temporarily stores information inside a computer. The Information is lost when computer is turned off.		**CD-ROM** A CD-ROM drive reads information stored in compact discs (CDs).
	**Drive Bay** A drive bay is the space inside the computer case where a hard drive, floppy drive or CD-ROM drive sits.		**Floppy Drive** A floppy drive stores and retrieves information on floppy disks.

Figure 1.2:- Internal component

COMPONENT F UNCTIONS

- **CPU**: The CPU is the brains of the computer. All information goes through the CPU to be processed. The latest CPUs execute many millions of instructions per second.
- **MEMORY**: Memory is where the information is stored.
- **RAM**: Random Access Memory stores programs and data as it is used. The information in RAM is lost when the power is turned off.
- **ROM**: Read Only Memory stores start up and basic operating information.
- **DISKS**: Disks are where large amounts of information are stored, even when the power is off.
- **Floppy Disks** - Information can be written to and read from floppy disks. The advantage of floppy disks is that they can be removed from the computer and the data taken to another machine.
- **Hard disks** - Hard disks are not removable like floppy disks, but hold more information.
- **CD ROMs** - Compact Disk Read Only Memory. They are useful for storing large amounts of data. A CD ROM holds about 650 MB of data and is removable.
- **Input/Output Components** : Allow a computer to communicate with the outside world. Following are some examples of Input/ Output devic es.
- **Keyboard** is used to enter information from the user to the computer.
- **Monitors** are used to display information.
- **Video controller** is a board in the computer that controls the monitor. It translates the data in the video memory into symbols on the monitor .
- **Parallel/Serial ports** allow the computer to send data to and receive data from printers, modems, etc.
- **Mouse and Joystick** are used to input positional information to the computer.
- **Network Interface Card** – A NIC connects the computer to a network. Networks are a high - speed method of transferring data from one computer to another.

Self Check 2	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications-feel free to ask your teacher.

Match the most appropriate peripheral device to A column from B column.

Column A	**Column B**
_____1.Memory	A. The brains of the computer
_____2.CPU	B. Connects the computer to a network
_____3.Video controller	C. Are not removable like floppy disks, but hold more information
_____3.DISKS	D. Where the information is stored
_____1Network Interface	E. A board in the computer that controls the monitor

Note: **Satisfactory rating – 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. **BOOKS**
2. **https://training.gov.au/Training/Details/ICTSAS506**
3. **web1.keira-h.schools.nsw.edu.au/faculties/IT**

Information Sheet – 3	Reviewing ,recording and applying Requirements specifying by hardware manufacturers

3.1. Access point

Internet Access

- There are several ways to obtain Internet access.
- The type chosen often depends on the cost as well as what technologies are available in the area you are located.
    - XDSL Internet Access
    - Cable Internet Access
    - Satellite Internet Access
    - Wireless Internet Access
    - POTS(Plain Old Telephone Service) Internet Access

XDSL Internet Access

- DSL is an Internet access method that uses a standard phone line to provide high-speed Internet access.
- DSL offers phone and data transmissions over a standard phone connection.
- High-speed Internet access;
- Less expensive than technologies such as ISDN

  With DSL a different frequency can be used for digital and analog signals, which means that you can talk to a friend on the phone while you're uploading data.

DSL's staggering number of flavors

- **Asymmetric DSL (ADSL)** The word asymmetric describes different channels on the line: One channel is responsible for analog traffic, the second channel is used to provide upload access, and the third channel is used for downloads. With ADSL, downloads are faster than uploads.
- **Symmetric DSL (SDSL)** - offers the same speeds for uploads and for downloads, making it most suitable for web hosting, intranets, and ecommerce. It is not widely implemented in the home/small business environment and cannot share a phone line.
- **ISDN DSL (IDSL)** - a symmetric type of DSL commonly used in environments where SDSL and ADSL are unavailable. IDSL does not support analog phones.

- **Rate Adaptive DSL (RADSL)** - a variation on ADSL that can modify its transmission speeds based on the signal quality. RADSL supports line sharing.
- **Very High Bit Rate DSL (VHDSL) -** VHDSL is an asymmetric version of DSL and can share a telephone line.
- **High Bit Rate DSL (HDSL)** - HDSL is a symmetric technology that offers identical transmission rates in both directions. HDSL does not allow line sharing with analog phones.
- Why are there are so many DSL variations?
    - Each flavor of DSL is aimed at a different user, business, or application.
- What is the major differences?
    - DSL options can be a **shared** or **dedicated** link. ADSL for instance is a shared DSL connection while SDSL is not (or dedicated link).
    - A dedicated DSL line is not used for regular voice transmissions.

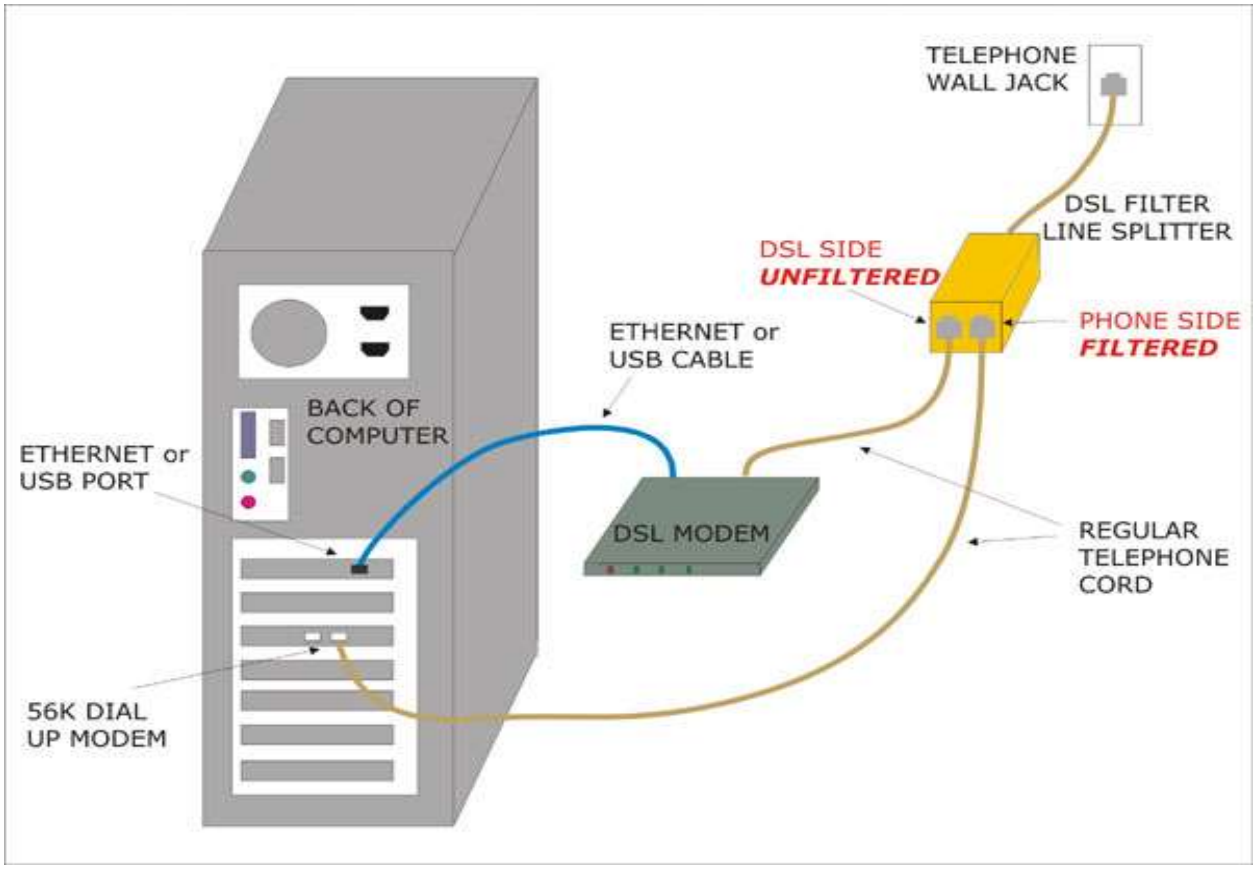


Figure 1.3:- DSL Internet Access

Cable Internet Access

- Cable Internet access is an always-on Internet access method available in areas that have digital cable television.
- Cable Internet access is attractive to many small businesses and home office users because it is both inexpensive and reliable.
- Connectivity is achieved by using a device called a ***cable modem***; it has a coaxial connection for connecting to the provider's outlet and an unshielded twisted-pair (UTP) connection for connection directly to a system or to a hub or switch.
- Most cable modems supply a 10Mbps Ethernet connection for the home LAN, although the actual Internet connection ranges from 1.5Mbps to 3Mbps.
- One of the biggest disadvantages of cable access is the fact that you share the available bandwidth with everyone else in your cable area.
- As a result, during peak times, performance of a cable link might be poorer than in low-use periods.

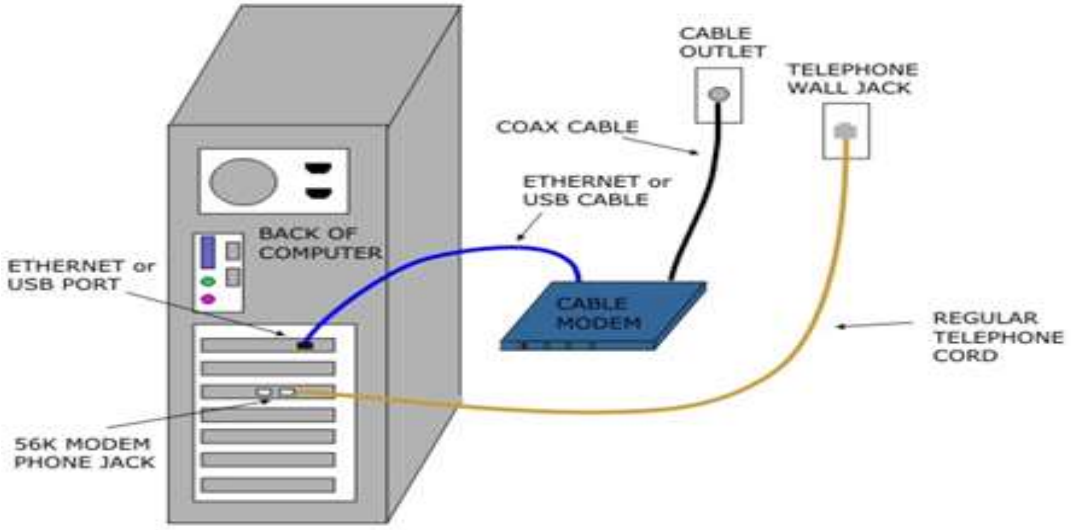


Figure 1.4:- Cable Internet Access

Feature	Cable Internet	DSL Internet
Bandwidth/ Speed	The theoretical maximum cable speed of 30Mbps downstream, aside, in practical use the rate is somewhere between 300 and 700Kbps downstream and a 128 connection.	DSL lists speeds from to 384Kbps to 6.0Mbps depending on the type of DSL used and whom you ask. DSL offers 128Kbps upstream transfers.
Connection type	Cable Internet uses a shared connection. You share the connection with others in your area. This can affect bandwidth performance during peak usage times.	DSL bandwidth is dedicated and not shared.
Distance factors	With cable Internet distance is not a concern. Subscribers maintain the same speeds regardless of the distance from the Internet provider.	DSL speeds degrade as the distance from the ISP increases. The farther you are, the more overall speed deteriorates.
Security	The shared nature of cable Internet make it an increased security risk. Security risks include eavesdropping, tampering, service theft and more.	DSL is more secure because it offers a dedicated link to the ISP. The dedicated link helps protect against attacks associated with a shared connection.

Table 1.1. Cable Internet and DSL Internet

Satellite Internet Access

- DSL and cable Internet access are not offered everywhere.
- Satellite Internet offers an **always-on** connection with theoretical speeds advertised anywhere from 512Kbps upload speeds to 2048Kbps download speeds, considerably faster than a 56K dial-up connection.
- One primary drawback to satellite Internet is the cost, and even with the high price tag, it is not as fast as DSL or cable modem.
- As with other wireless technologies, ***atmospheric conditions*** can significantly affect the performance of satellite Internet access.
- Greatest advantage is its ***portability***.

Types of Satellite Internet

- Two different types of Internet satellite services are deployed: **one-way** and **two-way** systems.
- A one-way satellite system requires a satellite card and a satellite dish installed at the end user's site; this system works by sending outgoing requests on one link using a phone line, with inbound traffic returning on the satellite link.
- A two-way satellite system, on the other hand, provides data paths for both upstream and downstream data. Like a one-way system, a two-way system also uses a satellite card and a satellite dish installed at the end user's site; bidirectional communication occurs directly between the end user's node and the satellite.

Figure 1.5 **Satellite Internet Access**

Wireless Internet Access

- Nowadays it is becoming increasingly common to see people surfing the Web in many different public places.
- This is made possible by subscribing to a wireless Internet service provider (WISP) or connecting to a company's local wireless router.
- A WISP provides public wireless Internet access known as *hotspots*.
- A hotspot is created using one or many wireless access points near the hotspot location.
- Airports, hotels, and coffee shops will advertise that they offer Internet access for customers or clients.

POTS(Plain Old Telephone Service) Internet Access

- The most popular means of connecting to the Internet or a remote network may still be the good old telephone line and modem.
- Because the same line used for a household phone is used for dial-up access, it is referred to as the **POTS** (Plain Old Telephone Service) method of access.
- Although many parts of the world are served by broadband providers, many people still connect with a modem.
- Internet access through a phone system requires two things: a ***modem*** and a ***dial-up access account*** through an ISP.
- A big consideration for dial-up Internet access is how many lines the ISP has. ISPs never have the same number of lines as subscribers; instead, they work on a first-come, first-served basis for dial-up clients.
- This means that on occasion, users get busy signals when they try to connect.

Self Check 3	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

Match the most appropriate peripheral device to A column from B column.

Column A	**Column B**
_____1.XDSL Internet Access	A. It is becoming increasingly common to see people surfing the Web in many different public places.
_____2.Cable Internet Access	B. The most popular means of connecting to the Internet or a remote network may still be the good old telephone line and modem.
_____3.Satellite Internet Access	C. offers an always-on connection with theoretical speeds advertised anywhere from 512Kbps upload speeds to 2048Kbps download speeds, considerably faster than a 56K dial-up connection.
_____4.Wireless Internet Access	D. An always-on Internet access method available in areas that have digital cable television.
_____5.(Plain Old Telephone Service) Internet Access	E. An Internet access method that uses a standard phone line to provide high-speed Internet access.

Note: **Satisfactory rating – 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. **BOOKS**
2. **https://training.gov.au/Training/Details/ICTSAS506**
3. **web1.keira-h.schools.nsw.edu.au/faculties/IT**

Information Sheet – 4	Determining and recording quality standard of hardware and peripherals

4.1. System specifications

It is important to find out the specifications of the computer system you are planning to connect the peripheral device to. Many newer types of peripheral devices require a specific amount of memory, CPU speed, hard disk space, and may only be compatible with certain operating systems.

You also need to be aware of the peripheral's system requirements. The manual for the peripheral device as well as the manufacturer's website will help you determine the minimum system specifications.

Compatibility

Compatibility is the ability of a system or a product to work with other systems or products without special effort on the part of the customer. One way products achieve interoperability is to comply with industry interface standards. For example, a memory module is compatible with a motherboard because the manufacturer of the memory module and the motherboard both work to the same industry standard.

Technical specifications

Once the business requirements have been considered, the technical specifications of the hardware device need to be evaluated. Areas for evaluation include the following:

- processing speed of the CPU
- storage capacity of the hard drive
- size of memory (RAM)
- software capabilities
- compatibility with existing systems
- upgradeability

The technical specifications to be considered will depend on the computer hardware device to be purchased. For example, technical specifications to be considered for a printer include:

- interface – USB or network
- resolution – measured in dots per inch
- printing speed – measured in pages per minute
- memory
- paper capacity

Self Check 4	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

Match the most appropriate peripheral device to A column from B column.

Column A	**Column B**
_____1.Interface	A. measured in pages per minute
_____2. Resolution	B. USB or network
_____3. printing speed	C. measured in dots per inch
_____4. storage capacity	D. CPU
_____5.processing speed	E. Hard drive

Note: **Satisfactory rating – 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. **BOOKS**
2. **https://training.gov.au/Training/Details/ICTSAS506**
3. **web1.keira-h.schools.nsw.edu.au/faculties/IT**

Information Sheet – 5	Determining and establishing relationship of hardware and software components

4.1. Introduction

When caring for computer equipment you will inevitably be faced with a computer, or peripheral, that is not operating as it should. You will be looked upon to provide the answer to 'What's wrong with it?'. In order for you to answer that question, you will need to know a basic diagnostic approach to fault finding.

In this section we will examine what a system usually does when nothing is wrong, list some of the typical faults encountered and what to do about it, and what to do if you can't fix it. If you are not able to effect repairs then you should be able to give the user some indication on how long their system will be down.

Firstly, let's look at what normally happens, before looking at what can go wrong.

Booting up

The POST

When first turning the computer on, you will notice that there are certain lights flashing, beeping sounds and text displayed on the screen. When power is applied to a computer system, the first thing that happens is that the computer performs a Power On Self Test, commonly called a POST. After performing this self-check, the system will try to load an operating system. Loading the operating system was traditionally known as loading the bootstrap loader, or pulling the system up by the boot-straps. While the terminology has been dropped, we still use the term 'Booting Up' to refer to starting the system.

The BIOS (Basic Input Output System) is responsible to perform the POST. The BIOS is a program that is built-in to the motherboard and is responsible for the low level operations of the hardware, such as placing data from a hard disk and writing it into RAM (Random Access Memory), or sending video output to the video card, or handling a mouse movement, or event like a click. Without the BIOS, nothing would happen when you turn the power on.

After the initial POST, assuming that the BIOS is able to boot the system far enough to gain access to the video subsystem, it will display information about the computer system as it boots. It will also use the video system to communicate error messages. In fact, most non-critical boot problems are displayed via video error messages, as opposed to audio beep codes.

Some errors in the POST may simply generate an error message on the screen and continue, while others will halt the system until the error is dealt with. If the POST is passed successfully, then the system is ready to load an operating system.

Loading an operating system

To load an operating system, the BIOS will seek out a boot device in a set order. A boot device is usually a hard disk drive, but may be a floppy disk, CD-ROM drive, network interface card (NIC) or USB flash disk etc. That is where the terms 'Boot Disk' and 'Disk Operating System' (DOS) are derived.

There are a number of hardware level settings that are stored on a special chip called a CMOS chip. CMOS stands for Complimentary Metal Oxide Semiconductor and is usually identified as one of the chips, with a sticker with the BIOS maker's name, on the motherboard. CMOS technology is just one type used to make semiconductors (integrated circuits) such as processors, chipset chips, DRAM, etc. CMOS has the advantage of requiring very little power, compared to some other semiconductor technologies. This is why it was chosen for this use, so that the amount of power required from the battery would be minimal, and the battery would be able to last a long time.

It is common for the terms BIOS and CMOS to be used interchangeably, even though it is not technically correct. The BIOS is the program and the CMOS is the memory that stores the BIOS settings. When a program is written to a chip it is known as firmware ie software put into hardware.

To gain access to the CMOS settings, you should see some sort of message on the screen that tells you which key to press. For example 'Press <Delete> to run Setup'. Most systems use the **Delete** key, some use **F1** or **F10** and even **Escape**. If the screen does not show any message (there is sometimes an option in CMOS to turn this off) then try each key in turn. If all else fails, then read the manufacturer's instructions.

Boot device options

You can change the boot device order from the standard:

- Floppy disk
- Hard disk drive 0 (master hard disk)
- CD-ROM.

For instance, if you had to install an operating system from new, like *Microsoft Windows XP*, you should change the boot device order to make the CD-ROM the first boot device. This is because the operating system is usually supplied on a bootable CD-ROM disk. In fact many other operating systems are originally installed from CD-ROM disk.

When the operating system loads, it too may generate error messages and either continue or halt. If the error messages flash by too quickly, or the system hangs at a certain point, you can try a step-by-step boot process by pressing F8 key just after the POST.

The system boot sequence

The following are the steps in a boot sequence. Of course this will vary by the manufacturer of your hardware, BIOS, etc, and especially due to the peripherals you have connected. Here is what generally happens when you turn on your system power:

1 The internal power supply turns on and initialises. The power supply takes some time until it can generate reliable power for the rest of the computer, and having it turn on prematurely could potentially lead to damage. Therefore, the chipset will generate a reset signal to the processor (the same as if you held the reset button down for a while on your case) until it receives the Power Good signal from the power supply.

2 When the reset button is released, the processor will be ready to start executing. When the processor first starts up there is nothing at all in the memory to execute. Of course processor makers know this will happen, so they pre-program the processor to always look at the same place in the system BIOS ROM for the start of the BIOS boot program.

3 The BIOS performs the POST. If there are any fatal errors, the boot process stops.

4 The BIOS looks for the video card. In particular, it looks for the video card's built in BIOS program and runs it. The system BIOS executes the video card BIOS, which initialises the video card. Most modern cards will display information on the screen about the video card. This is why on most systems you usually see something on the screen about the video card before you see the messages from the system BIOS itself.

5 The BIOS then looks for other devices' ROMs to see if any of them have BIOSes. Normally, the IDE/ATA hard disk BIOS will be found and executed. If any other device BIOSes are found, they are executed as well.

6 The BIOS displays its start-up screen.

7 The BIOS does more tests on the system, including the memory count-up test which you see on the screen. The BIOS will generally display a text error message on the screen if it encounters an error at this point.

8 The BIOS performs a 'system inventory' of sorts, doing more tests to determine what sort of hardware is in the system. Modern BIOSes have many automatic settings and can dynamically set hard drive parameters and access modes, and will determine these at roughly this time. Some will display a message on the screen for each drive they detect and configure this way. The BIOS will also now search for and label logical devices (COM and LPT ports).

9 The BIOS will detect and configure Plug and Play devices at this time and display a message on the screen for each one it finds.

10 The BIOS will display a summary screen about your system's configuration. Checking this screen of information can be helpful in diagnosing setup problems, although it can be hard to see

because sometimes it flashes on the screen very quickly before scrolling off the top or behind an operating systems splash screen. Try being quick to press the <Pause> key.

11 The BIOS begins the search for a device to boot from.

12 Having identified its target boot device, the BIOS looks for boot information to start the operating system boot process. If it is searching a hard disk, it looks for a master boot record (MBR) at cylinder 0, head 0, sector 1 (the first sector on the disk); if it is searching a floppy disk, it looks at the same address on the floppy disk for a volume boot sector.

13 If it finds what it is looking for, the BIOS starts the process of booting the operating system, using the information in the boot sector. At this point, the code in the boot sector takes over from the BIOS. If the first device that the system tries (floppy, hard disk, etc.) is not found, the BIOS will then try the next device in the boot sequence, and continue until it finds a bootable device.

14 If no boot device at all can be found, the system will normally display an error message and then freeze up the system. What the error message is depends entirely on the BIOS, and can be anything from ‘No boot device available’ to ‘No ROM BASIC—System Halted’.

When diagnosing hardware problems you will need to keep in mind the steps above, particularly for errors that halt the system from starting up.

Error messages

An error message can be produced by different parts of the system, depending on how far into the boot process the system gets before it is produced. Most error messages are produced by the system BIOS, as it is responsible for most of the functions of starting the boot process. However, other error messages are operating system specific.

Error messages that crop up while the system is operational can be generated by different sources, including the system BIOS, the operating system, hardware driver routines, or application software. It is usually possible to determine roughly what is causing the error, since application-specific messages usually mention the application that is generating them. However, error messages that crash a specific application can sometimes be caused by hardware or system problems, especially if the problem occurs in many different applications. This can make diagnosis very difficult.

Even sticking to hardware, there are many thousands of individual error messages; some are more common than others because there are only a few different BIOS companies that are used by the majority of systems in use. However, since the exact wording of an error message can be changed by the manufacturer of each system or motherboard, there are a lot of variations.

In most cases, the messages are pretty similar to each other; you may see a slightly different wording in your error message than the ones listed here, but if the messages meaning will be substantially the same. For example, ‘Disk drive failure’ and ‘Diskette drive failure’ are virtually identical messages.

You may want to consult with your owner's manual regarding some unusual messages, or to ensure that your manufacturer means the same thing with their messages compared to others.

BIOS beep codes

There usually is a single quick beep sound when a system is turned on, and that often is an audible acknowledgement of a good power supply ie the Power Good signal. However, when diagnosing fatal errors in a system, knowledge of the beep codes, and their meaning, can be the key to quick repair or replacement. Unfortunately not all manufacturers use the same set of codes to mean the same error, so we will have a look at some of the most common.

AMI BIOS beep codes

The American Megatrends Inc. (AMI) BIOS is one of the most popular in the personal computing world and is quite consistent in its use of beep codes, across its many different versions.

Beep Code	**Meaning**
1 beep	There is a problem in the system memory or the motherboard.
2 beeps	Memory parity error. The parity circuit is not working properly.
3 beeps	Base 64K RAM failure
4 beeps	System timer not operational. There is problem with the timer(s) that control functions on the motherboard.
5 beeps	The system CPU has failed.
6 beeps	Keyboard controller failure.
7 beeps	Virtual mode exception error.
8 beeps	Video memory error. The BIOS cannot write to the frame buffer memory on the video card.
9 beeps	ROM checksum error. The BIOS ROM chip on the motherboard is likely faulty.
10 beeps	CMOS checksum error. Something on the motherboard is causing an error when trying to interact with the CMOS.
Continuous beeping	A problem with the memory or video.

Table 1.2. AMI BIOS beep codes

Phoenix BIOS beep codes

Phoenix uses sequences of beeps to indicate problems. The '-' between each number below indicates a pause between each beep sequence. For example, 1-2-3 indicates one beep, followed by a pause and two beeps, followed by a pause and three beeps. Phoenix version before 4.x use 3-beep codes, while Phoenix versions starting with 4.x use 4-beep codes. This list is by no means comprehensive.

4- Beep Code	**Meaning**
1-1-1-3	Faulty CPU/motherboard.
1-1-2-1	Faulty CPU/motherboard.
1-1-2-3 1-1-3-2 1-1-3-3 1-2-1-2	Faulty motherboard or one of its components.
1-1-3-2	Failure in the first 64K of memory.
1-1-4-1	Level 2 cache error.
1-1-4-3	I/O port error.
1-2-1-1	Power management error.
1-2-2-1	Keyboard controller failure.
1-2-2-3	BIOS ROM error.
1-2-3-1	System timer error.
1-2-3-3	DMA error.
1-2-4-1	IRQ controller error.
1-3-1-1	DRAM refresh error.
1-3-3-1 2-3-1-1 2-3-3-3	Extended memory error.
1-3-3-3 1-3-4-1	Error in first 1MB of system memory.

4- Beep Code	Meaning
1-3-4-3 2-2-4-1	
1-4-1-3 1-4-2-4	CPU error.
2-1-2-3	BIOS ROM error.
2-1-3-1 2-1-3-3	Video system failure.
2-1-1-3 2-1-2-1 2-2-3-1	IRQ failure.
2-1-2-3	BIOS ROM error.
2-1-2-4	I/O port failure.
2-1-4-3 2-2-1-1	Video card failure.
2-3-4-1 2-3-4-3 2-3-4-1 2-3-4-3 2-4-1-1	Motherboard or video card failure.
3-1-4-1 3-2-1-1 3-2-1-2	Floppy drive or hard drive failure.
3-3-1-1	Real Time Clock error.

Table 1.3 Phoenix BIOS beep codes

Award BIOS beep codes

Award BIOSes do not have many error beep codes, instead most errors are reported on the screen.

Typical hardware level errors

While the range of possibilities is enormous when it comes to errors and computing problems, there are a few typical errors. For each of the errors, there may be a simple solution, or at least a way of determining the actual cause of the problem. Let's look at some of them:

System appears dead

Listen to the power supply and determine if the internal fan starts up. If the fan does not start up then the cause of the problem could be:

- The system is not plugged into a power outlet, or the outlet has no power.
- The power supply unit is faulty.
- There is an internal short circuit and the fan does not start as a protective measure.
- The computer is dead!

No video

No video appears on the screen when the system is performing its POST. Often an audible beep is heard if the BIOS detects the video error, but other likely causes are:

- Video card is faulty — swap it out with a known good card.
- There is a fault in the motherboard.
- The video card is not inserted correctly.
- The monitor is turned off or has no power.

No boot device or unable to boot

The system could not find a bootable device; the most likely cause is the hard disk drive. The system summary screen is the first place to check. If the hard disk is listed as a detected device, then the problem may be a logical and not physical problem. Things to consider are:

- Missing boot files — they may have been deleted by the user.
- A virus has caused damage to the boot files or has corrupted the file system or Master Boot Record (MBR).
- A common mistake is a floppy disk being left in the drive.
- Cables not connected to hard disk drive properly.

Failure to read hard disk drive

This usually means that there is a serious problem with the drive which may be physical or logical. A physical problem would mean the drive was unserviceable, whereas a logical problem may mean the drive and its contents could be recovered by:

- Running a disk checking program like scandisk, fsck, Norton's Disk Doctor or some other program appropriate to the operating system.
- Reinstalling the operating system making sure the drive is formatted. If the option allows it, perform a full format and not a quick format. A full format will make a thorough check of the drive for faulty sectors.
- The cable may be faulty or not connected to the hard disk drive properly.

CD-ROM or DVD-ROM drive not reading disks

It is common for copied disks to be difficult to be read in standard CD/DVD-ROM drives. Often the drive (CD/DVD Read Write drive, a.k.a. burner) that was used to copy the disk will be able to read the contents, unless the disk is totally unserviceable. Other possibilities are:

- The copying process was never complete and the disk session not closed off. Check the setting on the software in use.
- General poor quality disks or CD/DVD burner.
- Disk dirty or in need of cleaning.
- Faulty drive — when CD-ROM dives first came onto the market, the quality was poor and it seemed as though they were a disposable item. These days the quality and reliability seems much improved.

Floppy drive errors

Floppy disks are notable for their unreliability. This is one reason why it is important to have more than one copy of a disk, or its contents. Things to consider:

- Try the disk in another drive or two, if it can be read then the problem is likely the floppy disk drive (FDD) and not the disk.
- The cable to the drive has not been connected properly. Most cables to floppy disk drives can be connected to two drives. To distinguish between the first (A) and second (B) drive there is a twist in the wires of the cable. If there is only a single drive (most common) and the cable is not connected at the end of the cable (past the twist) then a drive error message is typical.
- The floppy disk has not been formatted to this operating system.

Unable to print

Most current printers come with a high degree of intelligence built in and can detect errors like cable not connected, printer offline, out of paper, out of toner/ink etc. Things to consider:

- Read the LCD display (if the printer has one) or check the status lights are displaying what they should for normal operation.
- Check the print manager software of the operating system to see if the printer is being shown as connected and on-line. If it is not on-line or shown as connected, then it may be a hardware problem.
- Change the cable.
- Perform a self test on the printer using the LCD display or options on the printer panel. If it performs the test properly then try the options available in the printer control of your operating system.

No network connectivity

The likely cause of networking problems can be many and varied. Without delving into the finer details of networking, the easiest option to try is to change the network cable and check the status lights that are on both the network interface card (NIC) and the hub/switch/router at the other end. If there is activity then the likely cause is not hardware. You can also try switching off, or resetting, the hub/switch/router.

System hangs (locks up)

One of the most difficult to problems with personal computers occurs when it appears as though a system is not responding to any user input (key press, mouse movement etc.). The likely causes are many and varied but a few possibilities are:

- Faulty memory (RAM) — you could turn memory testing on in CMOS settings which may confirm the problem, or perform a rigorous test using third-party diagnostic software.
- Conflict with devices — you should check the systems properties information available on you operating system platform, for any messages or indications of conflict.
- Device driver is faulty — try to isolate the problem occurrence to when a particular device is in use, such as a scanner or printer. A driver update may be a solution.

Some poorly designed programs do not behave in a civilised fashion

In other words, programs may take control and not yield to other programs when they need processor time. On some operating systems it is possible to view the activity of applications or processes. In *Microsoft Windows XP/2000* you can press the Ctrl + Alt + Delete keys and access the Task

Manager. From there you can attempt to kill any process that is consuming more that its fair share of processor time.

The operating system has generally become unstable

The most reliable solution is to reinstall the operating system. Alternatively you may be able to restore to a backup of the system, where performance levels were known to be good.

Typical faultfinding procedures

Flowcharts

Fault finding procedures can be presented in several ways. For instance you could produce sets of flowcharts that consider various options based on Yes/No responses. This technique is useful for training, or use of, first line helpdesk staff in responding to caller's difficulties. The downside to using flowcharts is that a different flowchart would be needed for every possible problem, which would be very time-consuming to produce and not something that a field technician is likely to carry around. Nevertheless they can be a useful tool.

Communicate

For more experience technical support staff, sometimes a few pointed questions, to the user of the system, may be able to isolate the cause of a problem quickly. The approach when talking to the user may be to establish a history. Establish a history means to find out what worked before, what changed, and what works now. The solution might be simple – change it back.

Read and respond

Make sure you read carefully any error messages. When programmers write programs they usually assign some error code to each possible error that they may expect the program to encounter. If an error message quotes a number, then write it down and check it with the manufacturer or developer. If they know the specific error code then they will be in a position to offer specific and more reliable advice.

Try a workaround. For instance if you read an error message stating that there was 'No boot device found', then provide a different boot device. This could be as simple as using another bootable floppy disk, hard disk or even CD-ROM disk. If the system starts up, then you will be in a position to effect repairs.

KISS principle

Keep It Simple Stupid (KISS), while sounding strange, is an approach that can be surprisingly effective. Look for the simple things first. For instance:

- If a system does not power up as you expect then consider if there is in fact power connected and turn on.

- If nothing appears on a monitor, then try a different monitor. Then you will know if the problem is the monitor or within the system unit. Another possibility is that little fingers have turned the brightness control down so that the screen simply appears black, when in fact nothing is wrong.
- If you suspect that a video card is faulty, then swap it with a known good card – if the fault continues then you know that the card is not at fault. If another card is not available then, remove the card, power the system and you should hear an appropriate audible error – no beeps and the motherboard is the likely faulty component.
- If the mouse-pointer movement seems erratic, then turn the mouse over and clean the rollers, if it still is not working properly then replace it with a new mouse. The cost of some devices is so low, in comparison to the time wasted, that it is just not worth the bother.

Diagnostic tools

The most useful diagnostic tool that can be used is your brain. The tool should be used in conjunction with the KISS principle. While that is suitable for some obvious problems, there are times when more specific information is needed in order to take the appropriate corrective measures. To get good information about a systems condition, good diagnostic tools are required.

A POST card

Where a system does not boot, or appears to be dead, there are some specialist interface cards that can be used to diagnose the problem. A set of LEDs (light emitting diodes) display a code that can be referenced from the manual. Example of this type of card would be:

- *Post-Probe* by Micro2000 (www.micro2000.com).
- *ISA/PCI PC Analyzer Diagnostic Card* by Pro Tech Diagnostics (www.protechdiagnostics.com).

Diagnostic software

Where a computer is capable of starting to the boot level, you can use diagnostic software in an attempt to isolate the cause of a problem. While there is software that runs on your existing operating system (like Norton's Utilities), the better software will have its own operating system.

When a program requests access to any hardware device, it should be accessing it through the operating system and any drivers. The problem with this approach is that the operating system shields the higher-level programs from the lower-level hardware functions. If a program were to access the hardware directly, then it is highly likely that the operating system will not respond well and the system could easily crash.

If diagnostic software is operated on its own specially designed operating system, then direct access (via the BIOS) to the hardware will likely yield accurate and thorough details. Having unimpeded access to the low-level functions of the hardware means the diagnostic software is able to run

rigorous testing and reporting. After all, it's unlikely that rigorous memory testing could be performed while there are several other programs currently running in memory.

Examples of good diagnostic software are:

- *Micro-Scope Diagnostic Suite* from Micro2000 (www.micro2000.com)
- *PC Certify Lite* from Pro Tech Diagnostics (www.protechdiagnostics.com)

Use built-in tools

All operating systems come with utilities that are used for general checking, repair and reporting of faults. Each operating system is different but they do have some tools in common. Tools such as hard disk scanning, such as *Scandisk* from Microsoft, *fsck* (file system check) on Unix clones like Linux, and Apple's *Disk First Aid*.

If your operating system supports it, then checking the device interrupts and input/output addresses can locate problems associated with hardware conflicts, or apparent inoperative hardware. For instance you may have a sound card installed in a system but have difficulty in getting the device to produce any sound, when you know the device is not faulty.

An example of a Device Manager can be seen using Microsoft Windows XP/2000. Right-click the *My Computer* icon, select *Properties*, then click the *Hardware* tab, then click the *Device Manager* button. If any items listed have some problem, a yellow symbol with an exclamation (!) is displayed.

Check for conflicting devices

When a device (a sound card, mouse, NIC etc.) requires attention from the processor (CPU), it generates an Interrupt Request commonly known as an IRQ. It is the equivalent to a child putting their hand in the air in a classroom, because the teacher's attention is required for some reason.

There are a set number of interrupts that are available (traditionally just 0-15), for use in the typical personal computer, so it is possible for two or more devices to generate an interrupt using the same IRQ number. This is fine, provided only one device uses that request at any given time. But if a request, say IRQ 7, is generated by two devices simultaneously, then the processor will not be able to distinguish which device is in need of attention. Therefore a conflict occurs.

Each hardware device also has a base address (or IO address) where data is sent or retrieved (input or output). It's the equivalent of Post Office Boxes, all numbered and where each relates to only one person's mail. Two people can use the same PO Box, so if two devices share the same address then a conflict occurs.

Fortunately, many of the hardware conflicts of the past are significantly reduced through the use of USB connections. The USB (Universal Serial Bus) controls which device is generating an interrupt and the address of each device.

Swap devices

In troubleshooting hardware problems with a personal computer, you will need to swap devices ie you replace a suspect component with a known good component. While different devices may be fitted in different ways, the basic steps remain the same. For example, while different types of RAM may be inserted differently — same may have to be inserted at an angle, others pushed directly down — the steps in removing the covers and replacing the component remain the same.

Here is a set of steps for the removal and replacement of the system unit covers:

Warnings

If the case is on a retail or brand-name system that is under warranty, be very sure that opening the case will not void your warranty. Some vendors have this policy, and you may see stickers on the case that say that if they are removed or broken the warranty is void. Some have the policy without the stickers.

Case and system manufacturers are quite creative, so not every imaginable case design is covered here. If you read all of the different choices you are likely to find one that is close to what you have.

Be careful not to touch any of the internal components when removing the cover.

Cover removal procedure

Disconnect cables

Make sure the system itself is off. Detach all the cables from the back of the system case. Make a note of what went where so that you will know how to reconnect them later on.

Remove monitor and other devices

If you have a desktop case, you of course need to move the monitor so that you can open the case. Also remove any other devices from the top of the case.

Loosen and remove cover

The instructions for removing the cover depend on what sort of case you have. Find the one that best describes your system:

Conventional tower: This is the classic design that has been around for years and is still being sold. Locate the screws along the edge of the back of the case, and remove them using a screwdriver. There are usually four to six. Gently pull back on the U-shaped top cover about a half-inch.; you may have to rock it slightly. Lift the cover up off the frame of the case. Be careful, as these covers are large and unwieldy.

Conventional desktop: The conventional desktop case has been around since the original IBM PC in 1982, and is still sometimes seen in new systems. Locate the screws along the edge of the back of the case, and remove them with a screwdriver. There are usually five but may be fewer. Gently push the cover forward. Watch out for drive faceplates that may become caught on the cover as you try to slide it forward. On some cases, the front cover slides all the way off the front of the case. On others it will slide forward a couple of inches and stop, and then you lift it up off the case.

Slimline Desktop: An odd design found on some proprietary systems, the low-profile case has the screws that hold the cover on the front or rear of the case. Others may in fact be screwdriver-less, using finger tight screws. Look at the front of the case near the bottom, or the centre top at the rear. Loosen the screw(s), and slide the cover forward off the case. Watch out for drive faceplates that may become caught on the cover as you slide it.

Store screws in safe place

If you forget this step you might regret it later on.

Remember to wear an anti-static wrist strap before touching any internal components.

Post change, re-assembly procedure

After changing any component, you should take the following basic reassembly procedure.

Power inspection

Verify the following key items related to the system power:

- If the system case has a dual voltage switch, make sure it is set to the correct voltage eg 230/240V.
- Make sure the power switch is off. You don't want the system booting up as soon as you connect the power cord.
- If you are working in an ATX system, double-check that you have connected the power switch to the motherboard properly.
- Make sure all your drives have a power connector attached to them correctly.
- Make sure that the CPU fan and any additional case fans have their power connectors attached.

Cable inspection

- Check the cable connections to make sure they are correct.
- Check for loose connections or cables that are misaligned. Make sure the red edge of the cable is lined up to pin 1 of each device
- Check the IDE cable(s) going to the hard disk drive and CD-ROM drive.
- Check the floppy cable going to the floppy disk drive.
- Check the cables that attach the I/O port connectors and PS/2 mouse port connector to the motherboard. Most new motherboards have all these connections integrated on the motherboard, so this is not an issue.
- Make sure the cables running to the case switches and LEDs are correct. For instance, if the speaker is not connected you will not be able to hear any audible error beeps, or power good signal.

Motherboard inspection

Double-check these configuration and installation aspects relevant to the motherboard:

- Make sure the memory is inserted into the correct socket(s) and is fully seated.
- Make sure the processor is inserted correctly and is all the way into its socket.
- Ensure that the heat sink is secured properly to the processor.
- Make sure the video card is seated properly in its slot. Some motherboards, particularly proprietary ones, will also have the video fully integrated on the motherboard, so this is not necessary.

Physical interference inspection

Check the following physical issues:

- Ensure that all the drives are properly secured in their bays.
- Make sure there are no loose wires in the case that may interfere with any moving objects like the CPU fan. Some video cards can also have a fan attached and some cases can have more than one fan.

Experience shows that it is quicker, and less frustrating, to test the operation of the system before putting the covers back on.

Update drivers

A driver is a program that is designed to operate a particular device at its lowest hardware level. The benefit of having device drivers is that any application need not know the finer details of how a device works, simply know how to ask it to do whatever it does. For example, to print a graphic on a page, a word processor need only provide the graphic to the driver and issue some command .

Drivers are usually supplied by the manufacturer of the device. While many drivers (for a wide range of devices) are included with an operating system, they are originally provided by the manufacturer. As problems are identified by manufacturers (possibly as a result of customer complaints), they will update their drivers to fix the problem. It stands to reason then, that if you have device that is experiencing some problem, that obtaining the updated driver from the manufacturer might rectify the problem. Further, it’s not necessary to wait for a known problem to manifest itself before you choose to update the driver – it’s called a preventative measure.

Not all drivers are simply software added or updated on the operating system. Some devices (including motherboards, modems etc.) can have their ROM BIOS updated through using Flash Memory technology. The term flash memory is applied to special EEPROM (Electronically Erasable Programmable Read Only Memory) hardware chips. By running a program provided be the manufacturer the latest bug fixes or new protocols etc. can be applied.

However, there is a word of warning in flashing a BIOS. Some manufacturers take little care in checking if the existing BIOS to be updated is of a suitable type and/or model, and possibly provide

no option to undo what is done. Flashing a BIOS is not for the faint-hearted as some errors could lead to the device being totally unusable. So it is important to make sure you get the right update!

Warranties

After you have identified a faulty device, you will then have to make the decision to repair, or replace. Realistically, most electronic components are rarely repaired. The cost of finding faulty transistors, diodes, fuses, etc. is a specialist task and is high enough to make it cheaper and faster simply to replace the component. This would be true for items such as video cards, network cards, floppy disk drives, motherboards, etc.

However, there are some peripherals that are likely candidates for repair. For example, a CRT monitor that displays a blurred or dull image can be easily adjusted, as there are brightness and focus adjustments inside the cover. Refocusing a monitor is a 10 minute job for a suitably trained person. Some printers may simply need a print-head or roller replaced, so once again there no need to discard the device as unserviceable. These types of repairs should be carried out by qualified technicians and usually at a specialist repair/service centre.

If a piece of hardware is to be repaired or replaced, then the question of warranty arises. If there is no warranty exists (unlikely), or warranty has expired then perhaps the hardware can be considered as having reached its useful life, and be replaced or upgraded with one that is covered by warranty. The cost of repairs not performed under warranty can often easily justify taking this view.

Even if repairs are to be done under some warranty system then, you might want to consider some of these factors:

Turnaround time

There will be a turn around time for the repairs from the time you make the call.

Costs

You may be required to pay extra costs such as freight to and from the repair centre.

Location

The equipment may have to be sent quite some distance to the nearest repair centre.

Loaners

If a repair will take days or weeks, determine if it is possible to provide an alternative device as a stopgap measure. The last thing you want is significant downtime.

Ideally you want an arrangement where you simply make a phone call, the support people come to your premises and replace any faulty components. What you really need in a productive and busy environment is a good **Service Level Agreement**.

Getting support to work for you

In business you often can’t afford to be unproductive. Imagine a retail outlet with a line of customers and the ‘computer is down and won’t be working for two days’. How much would be lost through lost sales and disgruntled customers? It could be very expensive indeed. When you view the situation

from an economical point of view, the seemingly expensive option of on-site 24/7 support services may not seem quite so expensive.

In a less system-critical environment you would still become reliant on good support services, but your needs may only extend from 9-5pm, five days a week. So choosing the support level you need is one aim of a good Service Level Agreement.

A Service Level Agreement (SLA) is a contract between a service provider and the end-user which stipulates and commits the provider to a required level of service. An SLA should contain:

- a specified level of service
- the support options
- the enforcement or penalty provisions for services not provided
- a guaranteed level of system performance in terms of downtime or uptime
- a specified level of customer support
- what software and/or hardware will be supported
- the fees and charges involved.

A poorly chosen SLA might find that you have on-site support in principle only. For instance, your agreement might be for a technician to go on-site. But after making a call the technician arrives, and the equipment is taken and sent away for repairs. The repairs or replacement might take weeks, with no other equipment acting as a temporary workaround. You may be unproductive during that time; clearly not a satisfactory situation.

Even with a well-chosen SLA you can still assist the support processes when you log a call by:

- Performing some initial troubleshooting on the equipment in an attempt to pinpoint the device at fault. In the process you will likely also determine what the cause IS NOT.
- Explaining clearly to the first-line support person (whether by phone or email), that you have isolated the cause of the problem, and what the cause is (or is not).
- Trying a few options or suggestions provided to further narrow down or solve the problem.
- Making sure you get a Call, Job or Request Number or Reference. This number will be vital in being able to track the progress of any work or equipment related to the fault.
- Being polite! Think about what it must be like being the person at the other end of the phone that clients constantly complain too.

Escalating is the term applied to passing the problem onto the next level of support. If the fault cannot be initially corrected, then it is passed to a more experienced and technically savvy person or team. Once again if you have the *request number*, you will be able to track progress more quickly.

Self Check 5	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Write the answer briefly

1. List type of boot device option ?

2. Write solution Failure to read hard disk drive?

3. Write solution CD-ROM or DVD-ROM drive not reading disks?

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. **BOOKS**
2. **https://training.gov.au/Training/Details/ICTSAS506**
3. **web1.keira-h.schools.nsw.edu.au/faculties/IT**

Information Sheet – 6	Determining, recording and applying Safe work practices

6.1. SYSTEM RESOURCES (IRQ, DMA and I/O ADDRESSES)

System resources are what allocate and setup your hardware components helping preventing hardware to work without causing issues with other hardware within your computer. System resources are setup by one or more of the following:

- Interrupt Request (IRQ)
- Input/output (I/O)
- Direct memory access (DMA)

6.1. WHAT IS IRQ?

An IRQ or Interrupt request line allows a hardware device inside of the computer a direct line to the Microprocessor and tells the Microprocessor to stop what it is doing and wait until it has further instructions. Every PC computer has a maximum of 16 IRQs and is prioritized in the computer according to the importance of the device.

6.2. WHAT IS DMA?

A DMA or **Direct Memory Access** is a pathway provided by the hardware to allow the hardware direct access to the computer's memory. This feature allows devices to bypass the CPU and write their information directly to the main memory.

6.3. WHAT IS I/O?

An Input Output (I/O) represents the location in memory that is designated by use of various devices to exchange information amongst themselves and the rest of the PC.

Warranties and support

Before acquiring hardware peripheral devices, it is vital to assess what kind of warranties, service and support, prospective suppliers will provide.

Warranties

A warranty is an agreed upon term which covers a computer or computer component. Generally, most computers have a 1 or 3 year warranty. This warranty may or may not cover the service, repair and replacement of computer parts.

An extended warranty is an available option provided by manufacturers or third-party companies that provides additional support and/or repair of a computer or other hardware devices beyond its standard warranty.

Warranty

When computer hardware devices are purchased, the supplier provides a guarantee that if a fault develops in the equipment within a certain time, they will repair or replace it free of charge. Organizations need to consider the warranty conditions before purchasing to ensure their business needs will be met. Common warranty conditions include:

- The length of the warranty – typically one or more years.
- The actions needed to have the repairs undertaken. Either the repairs will be done on-site or the equipment will need to be returned to the supplier, known as return-to-base.
- How long the supplier has to make good any required repairs
- Any exclusions to the warranty, such as damage caused to hardware by accidental damage.

Many computer hardware suppliers offer extended warranties at additional cost. For example, the extended warranty may extend the period of cover from one year to three years. The level of service purchased by an organization will depend on how critical the device is to the IT system.

A Service Level Agreement (SLA) is an agreement which sets out the level of service and maintenance to be provided.

Service and support

It is important to know what kind of support services are offered by the prospective supplier. There are many questions to consider such as:

- If a device requires repairs does it have to be sent back to the supplier (called ‘Return to base’) or will they provide on-site visits?
- What is the average response time if service is required?
- What kinds of maintenance and repair costs could be incurred during the duration of use of the device?
- Will the device require regular servicing? If so, how many services will be necessary over a one-year period?

Self Check 6	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

II. Fill the blank space.

1. _____line allows a hardware device inside of the computer a direct line to the Microprocessor and tells the Microprocessor to stop what it is doing and wait until it has further instructions.
2. _____is a pathway provided by the hardware to allow the hardware direct access to the computer's memory.
3. _____is an agreement which sets out the level of service and maintenance to be provided.
4. _____an agreed upon term which covers a computer or computer component.
5. _____represents the location in memory that is designated by use of various devices to exchange information amongst themselves and the rest of the PC.

Note: **Satisfactory rating – 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. **BOOKS**
2. **https://training.gov.au/Training/Details/ICTSAS506**
3. **web1.keira-h.schools.nsw.edu.au/faculties/IT**