INFORMATION TECHNOLOGY

SUPPORT SERVICE

Level II

Learning Guide #30

Unit of Competence: -	**Care for Network and Computer Hardware**
Module Title: -	**Caring for Network and Computer Hardware**
LG Code:	EIS ITS2 M07 1019 LO4-LG30
TTLM Code:	**EIS ITS2 TTLM 1019 V1**

LO4. Establish maintenance practices

Instruction Sheet	Learning Guide#30

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

- Determining maintenance requirements specified by the equipment manufacturer.
- Producing maintenance schedules
- Performing diagnostic function
- Configuring software security settings
- Determining unserviceable components
- Using the operating system and third-party diagnostic tools

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 –

- Maintenance requirements specified by the equipment manufacturer are determined.
- Maintenance schedules including removal of dust and grease build -up are produced
- Diagnostic functions including replacing suspect components with other serviceable components and reloading of associated software are performed
- Software security settings to prevent destructive software from infecting the computer are configured
- Unserviceable components are determined whether replaceable through warranty, replacement or upgrade
- Diagnostic functions are performed using the operating system and third-party diagnostic tools

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3
4. , Sheet 4 , Sheet 5 and Sheet 6” **in page 1,4,12, 18, 22 and 57** respectively.
5. Accomplish the “Self-check 1, Self-check 2, Self-check 3 Self-check 4, Self-check 5 and Self-check 6” , **in page , 3,11,17,21,56,and 64** respectively

Information Sheet – 1	Determining maintenance requirements specified by the equipment manufacturer.

1.1 **Maintenance requirement**

Maintenance requirement is the materials or tools that are important to maintain specific equipment. Maintenance requirement may include but not limited to: -

- Caution
- Attention

Attention is more than just noticing incoming stimuli. It involves a number of processes including filtering out perceptions, balancing multiple perceptions and attaching emotional significance to these perceptions.

There are two major forms of attention: *passive* and *active*. *Passive* attention refers to the involuntary process directed by external events that stand out from their environment, such as a bright flash, a strong odor, or a sudden loud noise. We might say that because passive attention is involuntary, it is easy. *Active* attention is voluntary and is guided by alertness, concentration, interest and needs such as curiosity and hunger.

Personal computers (PCs), also called microcomputers, are the most popular type of computer in use today. The PC is a small-sized, relatively inexpensive computer designed for an individual user. Today, the world of PCs is basically divided between IBM-compatible and Macintosh-compatible machines, named after the two computer manufacturers. Computers may be called 'desktop' computers, which stay on the desk, or 'laptop' computers, which are lightweight and portable. Organisations and individuals use PCs for a wide range of tasks, including word processing, accounting, desktop publishing, preparation and delivery of presentations, organisation of spreadsheets and database management. Entry-level PCs are much more powerful than a few years ago, and today there is little distinction between PCs and workstations.

Switches

- On the surface, a *switch* looks much like a hub. Despite their similar appearance, switches are far more efficient than hubs and are far more desirable for today's network environments.

- As with a hub, computers connect to a switch via a length of twisted-pair cable. Multiple switches are often interconnected to create larger networks.

Fig:-4.1. Switch

- Rather than forwarding data to all the connected ports, a switch forwards data only to the port on which the destination system is connected.
- It looks at the *Media Access Control (MAC)* addresses of the devices connected to it to determine the correct port. A MAC address is a unique number that is stamped into every NIC. By forwarding data only to the system to which the data is addressed, the switch decreases the amount of traffic on each network link dramatically.

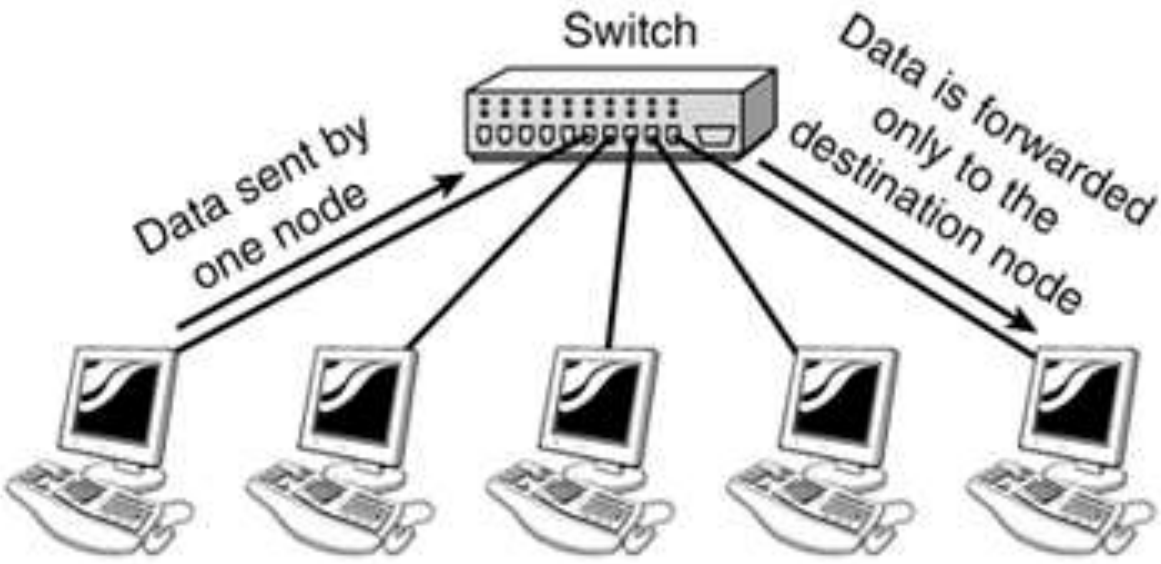


Fig:-4.2. Media Access Control(MAC)

Self Check 1	Write 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. Define Maintenance requirement ?

2. Define Personal computer?

3. Define Switch?

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: _____

Information Sheet – 2	Producing maintenance schedules

2.1. Maintenance Schedule

Maintenance Schedule is a plan or procedures that are used to maintain equipment and it must be programmed with time of intervals. Maintenance schedules including removal of dust, grease build-up and etc.

Maintenance scheduling can be planed or prepared as:-

- Onsite response
- Remote diagnostic

Onsite response is one of maintenance schedule that display the plan or procedures from the internet.

Remote diagnostics refers to the ability to evaluate the current status of electronic equipment from a remote location. The process involves the establishment of some type of wired or wireless communication between the two points in order for the remote analysis to take place.

Remote diagnostics is the act of diagnosing a given symptom, issue or problem from a distance

2.2. MAINTENANCE PLANNING AND SCHEDULING

Effective planning and scheduling contribute significantly to the following:

- Reduced maintenance cost.
- Improved utilization of the maintenance workforce by reducing delays and interruptions.
- Improved quality of maintenance work by adopting the best methods and procedures and assigning the most qualified workers for the job.

2.2.1. Planning and Scheduling Objectives

- Minimizing the idle time of maintenance workers.
- Maximizing the efficient use of work time, material, and equipment.
- Maintaining the operating equipment at a responsive level to the need of production in terms of delivery schedule and quality.

2.2.2. Classification of Maintenance Work According to Planning and Scheduling Purposes

- **Routine maintenance**: are maintenance operations of a periodic nature. They are planned and scheduled and in advance. They are covered by blanket orders.
- **Emergency or breakdown maintenance**: interrupt maintenance schedules in order to be performed. They are planned and scheduled as they happened.
- **Design modifications**: are planned and scheduled and they depend on eliminating the cause of repeated breakdowns.
- **Scheduled overhaul and shutdowns of the plant**: planned and scheduled in advanced.
- **Overhaul, general repairs, and replacement**: planned and scheduled in advanced.
- **Preventive maintenance**: planned and scheduled in advanced.
- An essential part of planning and scheduling is to forecast future work and to balance the workload between these categories.
- The maintenance management system should aim to have over 90% of the maintenance work planned and scheduled.

2.2.3. Planning

Planning is the process by which the elements required to perform a task are determined in advance of the job start.

- It comprises all the functions related to the preparation of:
    - The work order
    - Bill of material
    - Purchase requisition
    - Necessary drawings
    - Labor planning sheet including standard times
    - All data needed prior to scheduling and releasing the work order.
- Good planning is a prerequisite for sound scheduling.

2.2.3.1. <u>Planning Procedures</u>

- Determine the job content.

- Develop work plan. This entails the sequence of the activities in the job and establishing the best methods and procedures to accomplish the job.
- Establish crew size for the job.
- Plan and order parts and material.
- Check if special tools and equipment are needed and obtain them.
- Assign workers with appropriate skills.
- Review safety procedures.
- Set priorities for all maintenance work.
- Assign cost accounts.
- Complete the work order.
- Review the backlog and develop plans for controlling it.
- Predict the maintenance load using effective forecasting technique.

2.2.3.2. Basic Levels of Planning Process (Depend on The Planning Horizon)

- Long-rang planning: it covers a period of 3 to 5 years and sets plans for future activities and long-range improvement.
- Medium-range planning: it covers a period of 1 month to 1 year.
- Short-rang planning: it covers a period of 1 day to 1 week. It focuses on the determination of all the elements required to perform maintenance tasks in advance.
- **Long and Medium-Range Planning**

Needs to utilize the following:

- Sound forecasting techniques to estimate the maintenance load.
- Reliable job standards times to estimate staffing requirements.
- Aggregate planning tools such as linear programming to determine resource requirements.
- **Long-Range Planning**
    - sets plans for future activities and long-range improvement.
- **Medium-Range Planning**
- Specify how the maintenance workers will operate.
- Provide details of major overhauls, construction jobs, preventive maintenance plans, and plant shutdowns.
- Balances the need for staffing over the period covered.
- Estimates required spare parts and material acquisition.

- **Short-Range Planning**

  It focuses on the determination of all the elements required to perform maintenance tasks in advance.

2.2.4. Scheduling

- Is the process by which jobs are matched with resources and sequenced to be executed at a certain points in time.
- Scheduling deals with the specific time and phasing of planned jobs together with the orders to perform the work, monitoring the work, controlling it, and reporting on job progress.

- Successful planning needs a feedback from scheduling.

  Reliable Schedule Must Take Into Consideration

  - A job priority ranking reflecting the criticality of the job.
  - The availability of all materials needed for the work order in the plant.
  - The production master schedule.
  - Realistic estimates and what is likely to happen.
  - Flexibility in the schedule.

  Elements of Sound Scheduling

  Requirements for effective scheduling:

- Written work orders that are derived from a well-conceived planning process. (Work to be done, methods to be followed, crafts needed, spare parts needed, and priority).
- Time standards.
- Information about craft availability for each shift.
- Stocks of spare parts and information on restocking.
- Information on the availability of special equipment and tools necessary for maintenance work.
- Access to the plant production schedule and knowledge about when the facilities will be available for service without interrupting production schedule.
- Well-define priorities for maintenance work.
- Information about jobs already scheduled that are behind the schedule (backlog).

  Maintenance Schedule Can be Prepared at Three Levels (Depend on The Time Horizon)

  - Long-range (master) schedule
  - Weekly schedule

- Daily schedule

Long-Range (master) Schedule

- Covering a period of 3 months to 1 year.
- Based on existing maintenance work orders (blanket work order, backlog, PM, anticipated EM).
- Balancing long-term demand for maintenance work with available resources.
- Spare parts and material could be identified and ordered in advance.
- Subject to revision and updating to reflect changes in the plans and maintenance work.

Weekly Schedule

- Covering 1 week.
- Generated from the master schedule.
- Takes into account current operations schedules and economic considerations.
- Allow 10% to 15% of the workforce to be available for emergency work.
- The schedule prepared for the current week and the following one in order to consider the available backlog.
- The work orders scheduled in this week are sequenced based in priority.
- CPM and integer programming techniques can be used to generate a schedule.

Daily Schedule

- Covering 1 day.
- Generated from weekly schedule.
- Prepared the day before.
- Interrupted to perform EM.
- Priorities are used to schedule the jobs.

Scheduling Procedures (Steps)

- Sort backlog work orders by crafts.
- Arrange orders by priority.
- Compile a list of completed and carry over jobs.

- Consider job duration, location, travel distance, and the possibility of combining jobs in the same area.
- Schedule multi-craft jobs to start at the beginning of every shift.
- Issue a daily schedule (not for shutdown maintenance).
- Authorize a supervisor to make work assignments (dispatching).

Maintenance Job Priority System

- Priorities are established to ensure that the most critical work is scheduled first.
- It is developed under coordination with operations staff.
- It should be dynamic.
- It must be updated periodically to reflect changes in operation and maintenance strategies.
- It typically includes three to ten levels of priority.

Priorities of Maintenance Work

Code	Name	Time frame work should start	Type of work
1	Emergency	Work should start immediately	Work that has an immediate effect on safety, environment, quality, or will shut down the operation
2	Urgent	Work should start within 24 h	Work that is likely to have an impact on safety, environment, quality, or shut down the operation
3	Normal	Work should start within 48 h	Work that is likely to impact the production within a week.
4	Scheduled	As scheduled	Preventive maintenance and routine. All programmed work
5	Postponable	Work should start when resources are available or at shutdown period	Work that does not have an immediate impact on safety, health, environment, or the production operations

Table 4.1. Priorities of Maintenance Work

Scheduling Techniques

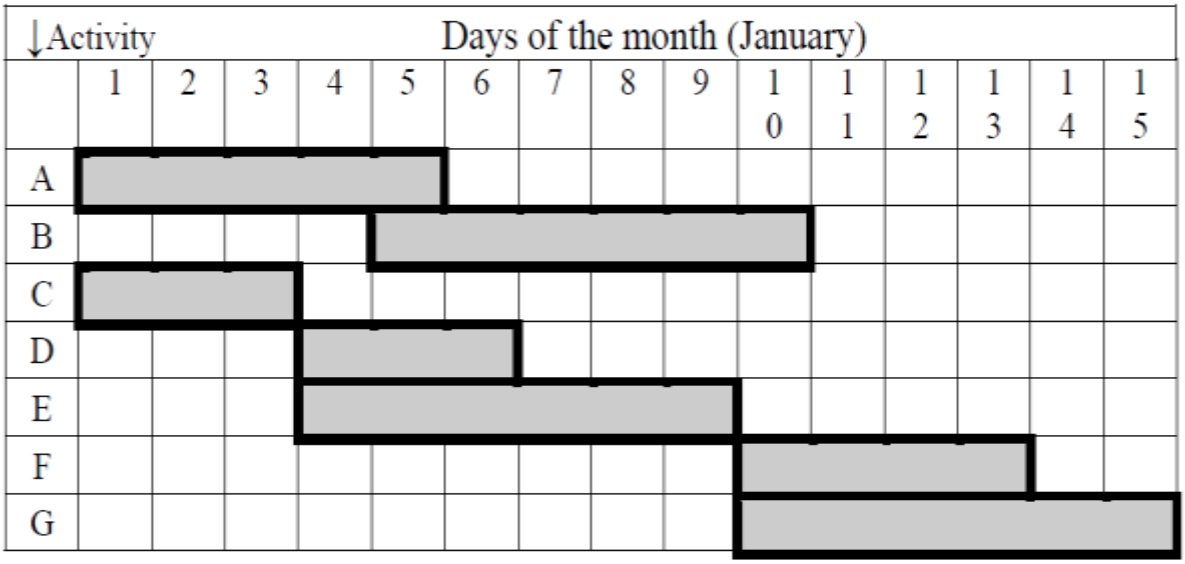
The objective of the scheduling techniques is to construct a time chart showing:

- The start and finish for each job.

- The interdependencies among jobs.
- The critical jobs that require special attention and effective monitoring.

  Such techniques are:
- Modified Gantt chart
- CPM
- PERT
- Integer and stochastic programming.

Example



4.1:- Gantt Chart

Self Check 2	Write Test

Name:_____ Date:_____

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

I. If statement is correct say True if statement is incorrect Say False

1. Maintenance Schedule is a plan or procedures that are used to maintain equipment and it must be programmed with time of intervals.
2. Planning is the process by which the elements required to perform a task are determined in advance of the job start.
3. Medium-rang planning: it covers a period of 3 to 5 years and sets plans for future activities and long-range improvement.

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: _____

Information Sheet – 3	Performing diagnostic function

3.1. **Diagnostic functions**

It includes but not limited

- Replacing suspected components
- Upgrade components
- Reloading software's

3.1. Replacing suspected components

Computer hardware or components that can be replaced are: -

- Motherboards
- CMOS battery
- Central processing Unit (CPU)
- Drives (floppy, hard disk, CD-ROM)
- Interface cards
- Fax, modem cards
- RAM

3.2. Upgrade components

Computer hardware or components that can be upgrade are: -

- Central processing Unit (CPU)
- RAM

How to Replace a Motherboard

Replacing a motherboard takes a moderate understanding of how the components in your computer are assembled. Before replacing the motherboard, back up all your information to ensure it won't get lost, and go to your motherboard's manufacturer to download any updated drivers that may need to be installed after you install the new motherboard. This will help ensure that changing your motherboard is a success.

Instructions

1. Unplug all power sources to your computer, and remove the casing from your computer. Set aside all screws and small pieces in a bowl so nothing will get lost.

2. Remove all the connectors to the motherboard. This may be your video card, data cables from the hard drives and adapters. Label each one before removing so you can remember exactly where they will attach on your new motherboard.
3. Take out the old motherboard carefully by removing the screws and sliding it out. There is generally little clearance on the sides of the motherboard, so use caution when removing it so nothing gets broken.
4. Compare the new and old motherboards to ensure they're the same. If the new motherboard has cut-outs for integrated sound or game ports, punch out the holes so the wires can fit through them. Do this carefully with a Phillips-head screwdriver or pliers.
5. Place the new motherboard in the case. Double-check to make sure it lines up properly in the computer case before connecting it. Use the seven screws that are included to install the motherboard.
6. Attach the adapters, drives and power connectors to the new motherboard. Locate where you labeled everything before, and install them in the exact same places.
7. Put the computer case back on and turn the power supply back on. If the computer doesn't start up properly, remove the case and double-check to ensure that all the adapters, drives and power supply cords are in the correct position and are tightened securely.

Tips & Warnings

- Avoid creating static electricity charges while you're installing the new motherboard by wearing a static-free wristband or grounding yourself often by touching the metal case.

How to Replace a CPU

A computer's central processing unit, or CPU, can be thought of as the computer's brain, which carries out the majority of the calculations and processes needed to make the computer run. As computers age, processors may run more slowly due to power surges, overheating and other stress-induced damage. Replacing a used CPU with a new one can often increase performance, but it is usually more common to install a CPU upgrade rather than a straight replacement.

Instructions

Things you'll need

- Screwdriver(s)
- Replacement CPU
- Thermal grease or other thermal interface material

1. Turn off the computer and unplug all plugs.
2. Open the computer's case and set it on its side.
3. Take off the CPU fan and heat sink. The CPU fan and heat sink will be easy to locate: look for a large fan on top of a fin-like network of metal attached to the motherboard. Depending on your heat sink, you may either have to unscrew it, or undo some plastic clipping mechanisms holding it in place. Sometimes removing the fan first can make removing the heat sink easier. You will likely have to unplug the fan from the motherboard.
4. Undo the securing lever on the processor mount to release the old CPU. The CPU will be held in by a mounting system that is closed when a small lever is pressed down. Left the lever up and release the CPU.
5. Remove the old CPU.
6. Put the new CPU in place, hold it down with a finger, and close the lever to lock it in. Do not exert much force on the CPU; you don't have to press hard, but you may have to wiggle it around a little bit to get it to line up properly before closing the lever.
7. Apply thermal grease liberally to the CPU. The CPU needs a thermal interface material between it and the heat sink to transfer heat effectively.
8. Reinstall the heat sink and fan, making sure the thermal grease is touching both the CPU and the heat sink. Plug the fan back into the motherboard.
9. Close the computer case.

Tips & Warnings

- If you are planning on installing replacement CPU that is different than the original CPU, make sure your motherboard can use it first.
- The interior of a computer is susceptible to electric shock. Guard against carrying a dangerous charge. Touch the metal case of the computer at least every couple of minutes to make sure you don't shock the computer's components

How to Upgrade a Processor

Upgrading the processor in a computer can be one of the easiest ways to give new life to an older, slower machine. While the upgrade itself will take little time or effort, there is significant work that must be done beforehand to ensure that the upgrade is completed successfully.

Instructions

1. Research the computer that is to receive the new processor. There are many different processors on the market, and they are not all compatible with a particular machine. Visit the website of the computer manufacturer. If the computer was assembled from after-market components, check the website of the company that manufactured the motherboard, or main circuit board, of the computer. Find out the processor brand, the processor family, the processor and bus speeds that the machine supports, the type of processor socket on the board and the processor cores or revisions that are compatible with the machine.
2. Shop for a compatible processor from either a local retailer or an online store. The processor must meet all the requirements that your research uncovered, otherwise it will likely be incompatible with the machine. As soon as the processor is received, check it against your original order.
3. Install the processor. Disconnect the computer cables and unplug the machine. Move it to a good work area. Open the side of the machine to obtain access to the interior. Before going any further, discharge any static electricity from your body by using a grounding wrist strap or by touching the bare metal of the computer case.
4. Find the processor. It will be one of the largest objects on the motherboard, near the center, and it will be covered by a large heat sink and fan. On each side of the heat sink, there should be a clip or some other fastener securing it to the processor socket. Gently

unhook the clips, taking extreme care not to damage the processor socket, and then disconnect the power lead that runs from the fan to the motherboard. The heat sink then can be pulled away from the processor. It may take some force to separate the heat sink from the processor, depending on the type of thermal transfer compound used.

5. Examine the processor. On one side of the processor socket, there will be a metal or plastic arm that is used to secure the processor in the socket. Slide the end of this arm out from the retaining clip, and lift the arm until it is perpendicular to the motherboard. The old processor can then be gently pulled out.
6. Look at the processor socket. There should be one corner that has a small, 45-degree notch, or another distinguishing mark, cut into it. The processor should have a similar mark. Rotate the processor until the mark is in the same corner as the mark on the socket. Once the processor is orientated correctly, line up the pins and slide the processor into the socket. This should require no force at all. If force is used, the processor pins may be bent and the processor permanently damaged. With the processor seated in the socket, the retaining arm may be lowered and clipped into position.
7. Install the heat sink and fan assembly with a thin layer of thermal compound or a thermal pad between it and the processor. This step transfers heat away from the processor to the heat sink, preventing the processor from overheating. With the heat sink in place, plug the power lead from the fan back into the motherboard.
8. Close the computer. Reconnect the components and test the new upgrade. When everything is done, the computer should be noticeably faster, and it will be able to handle more robust applications and games than it could previously.

Self Check 3	Write 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. Write instruction Replace a Motherboard?

2. Write instruction Replace a CPU?

Note: **Satisfactory rating –1 points** **Unsatisfactory - below 1 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 4	Configuring software security settings

4.1. Firewall

In computing, a firewall is software or firmware that enforces a set of rules about what data packets will be allowed to enter or leave a network. Firewalls are incorporated into a wide variety of networked devices to filter traffic and lower the risk that malicious packets traveling over the public internet can impact the security of a private network. Firewalls may also be purchased as stand-alone software applications.

The term *firewall* is a metaphor that compares a type of physical barrier that's put in place to limit the damage a fire can cause, with a virtual barrier that's put in place to limit damage from an external or internal cyberattack. When located at the perimeter of a network, firewalls provide low-level network protection, as well as important logging and auditing functions.

While the two main types of firewalls are host-based and network-based, there are many different types that can be found in different places and controlling different activities. A host-based firewall is installed on individual servers and monitors incoming and outgoing signals. A network-based firewall can be built into the cloud's infrastructure, or it can be a virtual firewall service.

Types of firewalls

Other types of firewalls include packet-filteringfirewalls, stateful inspection firewalls, proxy firewalls and next-generation firewalls (NGFW).

- A packet-filtering firewall examines packets in isolation and does not know the packet's context.
- A stateful inspection firewall examines network traffic to determine whether one packet is related to another packet.
- A proxy firewall inspects packets at the application layer of the Open Systems Interconnection (OSI) reference model.

An NGFW uses a multilayered approach to integrate enterprise firewall capabilities with an intrusion prevention system (IPS) and application control.

When organizations began moving from mainframe computers and dumb clients to the client-server model, the ability to control access to the server became a priority. Before the first firewalls emerged based on work done in the late 1980s, the only real form of network security was enforced through access control lists (ACL) residing on routers. ACLs specified which Internet Protocol (IP) addresses were granted or denied access to the network.

The exponential growth of the internet and the resulting increase in connectivity of networks, however, meant that filtering network traffic by IP address alone was no longer enough. Static packet-filtering firewalls, which examine packet headers and use rules to make decisions about what traffic to let through, arguably became the most important part of every network security initiative by the end of the last century.

How packet-filtering firewalls work

When a packet passes through a packet-filtering firewall, its source and destination address, protocol and destination port number are checked. The packet is dropped -- it's not forwarded to its destination -- if it does not comply with the firewall's rule set. For example, if a firewall is configured with a rule to block Telnet access, then the firewall will drop packets destined for Transmission Control Protocol (TCP) port number 23, the port where a Telnetserver application would be listening.

There are mechanisms that are used to configure security. Some of them are: -

- Install firewall
- Install antivirus
- Install anti-malware
- Install anti-spyware

4.1. How to Install Windows XP Firewall

Instruction

- To get started first click start and open the control panels network connection icon. Click network and Internet Connections. Click the windows firewall icon which should be clearly visible.
- This brings up the windows firewall dialog box. Click the "On" button. This button will stop all intruders from gaining access to your computer. Now click the exceptions tab

on top. Put a check mark
next to anything there that you wish to use. For example checking file and print share will allow other computers to gain access to your computer and share files and the printer.

- Once you've checked off what you wish to allow click OK and the firewall is set!
- Windows firewall inadequate? Some computer users like a second line of defense while on the Internet. Click on over to Cnets downloads.com to check out their top free personal computer firewalls. Popular firewalls include Zone Alarm and PC Tools Firewalls. Both are free to download.

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.

I. Write the answer briefly

1. Define Firwall?

2. Write mechanisms that are used to configure security?

Note: **Satisfactory rating –1 points** **Unsatisfactory - below 1 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 5	Determining unserviceable components

5.1. Troubleshooting Power Sources and Power Protection Devices

This section lists some typical problems related to the system power. This includes external power problems, power protection devices (surge suppressors, UPSes, etc.) and also the internal power supply.

A couple of general caveats that you should consider whenever you believe you are looking at a power-related problem:

- I strongly recommend the use of a power protection device, especially if you live in an area with bad power or a lot of electrical storms.
- If this is a new system, read this section describing common problems in newly assembled PCs.
- Read these care instructions related to power.

Please choose the problem description best describing the problem you are having.

The power supply appears to not be functioning

- **Explanation:** The PC's internal power supply appears not to work at all. The system will not turn on and the power supply itself appears to be dead.
- **Diagnosis:** There is a possibility that the internal power supply has failed; this does happen, especially on older or cheaper PCs. The power supply can be damaged due to electrical storms, overheating or other causes.

Recommendation:

- If you have not done so already, you should first verify that it really is the internal power supply causing the PC not to have power, as opposed to an external electrical cause. Follow this part of the boot process troubleshooting walkthrough to verify the cause of the lack of power.
- If you have an ATX system, double-check the connections from the case power switch to the motherboard. On an ATX system the power switch does not physically turn on the power supply, it just sends a signal to the motherboard to turn on the PC.
- Check *very* carefully for something inside the PC that may have accidentally short-circuited the power supply. One way this can happen is by incorrectly attaching a power connector to a storage drive. Another possibility is incorrect motherboard installation, or something else loose inside the case. If the power supply has been short-circuited, it will

detect this immediately and "play dead"; when you resolve the short, the supply should come back up.

- Replace the power supply. On most machines this is not that difficult of a task, and the power supplies themselves are reasonably standardized. However, make sure you get the right form factor when ordering a replacement.
- Take the PC in for repair.

I've noticed that the lights flicker occasionally in my office and sometimes when they do, the PC will hang or reboot

- **Explanation:** The PC is exhibiting instability or strange behavior at the same time that other symptoms of power fluctuation are apparent.
- **Diagnosis:** Low quality input power to the PC is causing it to behave erratically. Flickering lights means either power grid problems (brownouts, electrical storms), poor wiring in the building, or draw from large electricity-using devices, especially air conditioners.

Recommendation:

- If you are not using any sort of power protection device, get one and see if it fixes the problem. Even a $20 surge protector is better than nothing since it will provide some line filtering. If possible, try using a UPS and see if that solves the problem--it probably will.
- Try the PC in a different location and see if the problem resolves. This will clearly implicate the power coming from the wall.
- If you are in a home with central air conditioning, see if you can tie the light flickering to when the unit comes on. If so, you may want to see if the PC works better on a different circuit. You may want to consult a qualified electrician if the air conditioner is causing this much draw, or simply get a UPS.
- Look here for more ideas on system instability.

I need to run my PC on a different voltage, but there is no switch to change the line voltage

- **Explanation:** The PC is currently set to 110 volt input, but needs to be able to run at 220 volts (or vice-versa) and there is no voltage switch on the back of the power supply.

- **Diagnosis:** Sometimes there actually *is* a voltage switch, but it is hidden, either intentionally or unintentionally, under labels or covers on the back of the PC. Otherwise, you will need to use a voltage converter.

Recommendation:

- Check carefully on the back of the power supply for a switch, looking under any labels there (on a new PC, do not remove any labels that warn you about voiding your warranty).
- Use a voltage conversion device. These are sold in electronics shops; Radio Shack is a good place to start. Make sure you ask for something that will work with a PC.
- Replace the power supply with a unit that has selectable voltage. This is a bit of a pain but will certainly solve the problem.

There's a squealing or whining sound coming from the power supply when I turn it on

- **Explanation:** The PC is making a squealing or whining sound, coming from the back of the power supply unit. The sound may be louder when the PC is first started up, and then diminish, or it may get worse as the PC is left on for a period of time.
- **Diagnosis:** Usually, the cause of this problem is the fan on the back of the power supply. It will tend to accumulate dirt over time, and cheaper ones will fail readily. If the fan is making noise now, it will probably fail soon. This usually takes years, but with cheaper power supplies that can be a surprisingly small number of years. Rarely, the problem can be with the internals of the power supply itself.

Recommendation:

- Look and listen closely at the back of the PC to see if the fan is what is causing the problem. If it appears that the fan is making the noise, troubleshoot it here.
- If you hear a high-pitched whistling sound, this could be coming from components within the power supply. This will require you to either replace the power supply or take the system in for service.

My UPS is supposed to provide {N} minutes of backup power, but mine cuts out after much less time than that

- **Explanation:** You purchased a UPS that claimed that it would provide a certain amount of time running on the batteries when the power went down, but the batteries last much less time than what the advertisements claim.

- **Diagnosis:** The advertisements often exaggerate. Unfortunately, just like everything in the industry, claims that have numbers in them tend to be based on best-case ideal world conditions that don't always hold up in the real world. In addition, claims of battery life are based on a particular configuration. Every PC is different and has a different power demand.

Recommendation:

- Take all numeric advertising claims with a grain of salt.
- Follow the manufacturer's instructions for maximizing battery life. This may include routine maintenance for the device.
- Consult the manufacturer's technical support line for feedback on whether the battery life you are experiencing is normal. It is possible that your device may be defective. If battery life was at one point higher and now has decreased, this could be a defect as well.
- Consider removing devices from your PC that you don't need

My UPS doesn't provide proper backup power when the line power goes out

- **Explanation:** A UPS is being used on the PC, but when the power goes out the UPS doesn't keep the PC running.
- **Diagnosis:** There is either something wrong internally with the device, or it has been connected or configured incorrectly.

Recommendation:

- If the unit is making any noises or has LEDs flashing in strange configurations, consult the manufacturer's technical support.
- The unit may be overloaded. If a 400 kVA unit will support your system for 5 minutes on battery backup, this does not mean that a 200 kVA unit will necessarily support it for 2.5 minutes. Once a unit gets too much load on it, it may not work *at all* when the power goes out. You will need a more powerful unit in this case.
- Check the unit physically to make sure that everything is connected properly, there are no tripped circuit breakers, etc.
- Try plugging the PC into a different socket in the device and see if that solves the problem. If it does, the device has a failure with that particular socket and it needs to be repaired or replaced.

- The batteries could be damaged, defective, or discharged. Follow the manufacturer's instructions for ensuring that the batteries are fully charged and see if the problem works properly.
- Consult with the manufacturer of the device for technical support.

Windows automatically turns off the PC when I tell it to shut down, and I don't want it to (or vice-versa)

- **Explanation:** When you select "Shut down the computer" from the Windows "Shut Down" menu, the PC is completely powered down automatically instead of your being given the chance to do this manually, or, the opposite, you want this to happen and it isn't happening.
- **Diagnosis:** This is a power management feature that is built into Windows. In order to make use of it, you must have an ATX form factor motherboard, because ATX boards support the ability to have the PC turned off under software control. You must also have a board that supports advanced power management (APM) features. If the feature is not working then one of these conditions has been violated; if you want it to stop then you must disable the power management feature.

Recommendation:

- If the system automatically powers down when you shut down Windows and you don't want this to happen, the easiest way to stop it is to disable all power management features in the system BIOS.
- If you want automatic power-down to occur, make sure that you have an ATX system and that power management is not totally disabled in the system BIOS. You can tell the system BIOS to not activate its power-saving "standby" or "suspend" modes, if you wish; just don't totally disable all power management functions.

If you have power management enabled and an ATX system and power-off still does not work, try runnin an "Add new hardware" session in Windows (from the Control Panel) and have Windows search for new devices. It should find and enable the power management feature.

The power doesn’t come on

1. **No power from the wall socket:** Use a live power outlet. In rare cases, the power cable may be defective and may require replacement. Check the power cable on another working PC. Plug in a lamp or any other electric device to see if you have a live outlet.
2. **Incorrect voltage setting on the PSU:** Select the proper voltage setting (220-240V) on the back of the PSU. WARNING: If you have switched on the PC with the voltage set to 110-120V and with a mains supply of 240V you may have blown your PSU beyond repair at worst or blown a fuse at best. Be careful!

3. **The front panel power switch's connector to the motherboard is not fixed correctly or has come off or is defective:** Check the motherboard manual and fix the lead (wires) from the front panel switch to the motherboard correctly. If there is still no power, try a different lead.
4. **The front panel power switch is defective:** Replace the switch. In case you do not want to get a replacement, one option is to use the reset button. The only problem with this is that to cut the A PSU with all its connectors power to the system in case of system hangs etc., you will have to switch off the power from the mains wall outlet rather than from the front panel.
5. **The power supply connections to the motherboard are not correct:** Check the power connections from the PSU to the motherboard. Refer to the motherboard manual and identify the correct connection points.
6. **Not identified; non-PSU related problem:** After attempting all the above, if the system still doesn't power up, it is time to look elsewhere. Disconnect all the drives and see if it is powering up. (*Note:* Pull out the power cord when removing or disconnecting something.) If the system is powering up, then start reconnecting the drives one by one to identify which is defective drive. If the system is not powering with all drives disconnected, remove the other adaptors one at a time and checking to see if it is powering up. Leave the video adaptor for the last. If you are able to isolate the problem to one of the adaptor cards, verify that the slot and the adaptor cards are compatible. Then try plugging it into a different slot and see if the system powers

If the system is still not powering up, then you either have a defective PSU or a defective motherboard. If there is a burnt smell, then most probably either one of them has been fried. Look for burn marks on the motherboard. Sometimes the PSU and motherboard may be incompatible. If the motherboard looks fine, replace the PSU, since it's cheaper! Check the relevant sections of this guide for troubleshooting hints for the other components.

The PC powers on after the second or third try

The mostly likely problem is that the power_ok (or power_good) signal is sent before the power supply has stabilised. Get a better quality PSU. In modern PCs, the power switch is a logic device that tells the PSU to supply full power to the motherboard. The power_ok signal tells the motherboard that the power supply is available and stable. If the signal is sent too soon the motherboard does not recognize it and stays off to protect itself. This can happen in lower quality PSUs. Booting more than once is not recommended, and you will be better off getting a better PSU.

The PC powers on but nothing happens after that (no beep)

1. This may be due to the addition of new hardware that is overtaxing the power supply. Remove the last hardware component installed and check again.
2. A defective hard disk or one that is not plugged in correctly: Check the power cable to the hard disk. Sometimes it may not be fully plugged in. Check the hard disk on another system.

The PC powers on, beeps and stops. No Power On Self Test (POST) messages.

This may be a motherboard problem and not related to the PSU. Check the motherboard section of this guide.

The PC powers on and runs POST but there is no display

This may be a display card problem and not related to the PSU. Check the display section of this guide.

There is a squealing/whistling/whining noise when the PC starts

This could indicate either a problem with the fan, which has accumulated dirt over time, or one of the internal components of the PSU. Switch on the PC and listen carefully to confirm that it's the PSU fan and not the CPU fan or the hard disk. Usually, the noise will stop once the fan picks up speed, and you can ignore it temporarily. It's a good idea, however, to clean out the dirt around the PSU fan using a PC vacuum. This will increase the working life of the PSU fan as well as the PSU itself. If the fan stops working, the PSU will generate heat and cause more trouble. So a little prevention will save you a lot of headaches later. If the sound is not from the fan but from within the PSU itself, then you may be able to service it. A PSU has no 'user-serviceable' parts, and it's best left to a competent technician, although in most cases of component failure, you will have to replace the PSU.

The PC freezes or reboots suddenly

1. This could indicate a failing PSU that is not supplying power correctly to the motherboard. You may be able to get the PSU serviced but in most cases you will be better off getting a new power supply.
2. This could be due to overheating of the PSU or CPU: If the PSU is overheating, the metal cabinet may be hot to touch or you might get a shock. Shut off immediately. Check if the PSU fan is working, clean or replace the fan if not working or spinning very slowly. If it's a faulty PSU you may be able to service it. If the PSU seems normal it might be due to an overheating CPU.

5.1. Common Motherboard and BIOS Problems

There is an apparent failure of the motherboard or a system device on the motherboard

- **Explanation:** There is suspicion of a possible failure related to the motherboard. This can be a result of a specific message strongly implicating the motherboard in some sort of erratic system behaviour. It may also be the case that the motherboard probably isn't the problem, but that we want to rule it out as a possible cause. Since the motherboard is where all the other components meet and connect, a bad motherboard can affect virtually any other part of the PC. For this reason the motherboard must often be checked to ensure it is working properly, even if it is unlikely to be the cause of whatever is happening.
- **Diagnosis:** Outright motherboard failure is fairly rare in a new system, and extremely rare in a system that is already up and running. Usually, the problem is that the motherboard has been misconfigured or there is a failure with one or more of the components that connect to it. Getting a system in the mail that has a loose component or disconnected cable is very common. In fact, though, there are surprisingly large possible causes for what may appear to be a motherboard failure.

Recommendation: Follow the suggestions below to diagnose the possible failure of the motherboard. You will find a lot of possible causes listed below, since there are so many problems that can make it look like the motherboard is at fault. This part of the Troubleshooting Expert is referenced by a large number of other sections. For this reason, you may want to skip some of the steps below if you have already tried them elsewhere. Also, try to avoid the very difficult diagnostic steps--especially replacing the motherboard--until you have exhausted the other possibilities both here and elsewhere on the site:

- First of all, if you have just recently installed this motherboard, or performed upgrades or additions to the PC of any sort, read this section, which contains items to check that may cause problems after working on the system unit.
- If the PC isn't booting at all, make sure you have at least the minimums in the machine required to make it work: processor, a full bank of memory, video card, and a drive. Make sure that all of these are inserted correctly into the motherboard, especially the memory. Partially inserted memory modules can cause all sorts of bizarre behavior.
- Remove all optional devices from the motherboard, including expansion cards, external peripherals, etc. and see if the problem can be resolved.

- Double-check all the motherboard jumper settings, carefully. Make sure they are all correct. In particular, check the processor type, bus speed, clock multiplier and voltage jumpers. Also make sure the CMOS clear and flash BIOS jumpers are in their normal, default operating positions.
- Reset all BIOS settings to default, conservative values to make sure an overly aggressive BIOS setting isn't causing the problem. Set all cache, memory and hard disk timing as slow as possible. Turn off BIOS shadowing and see if the problem goes away.
- Double-check all connections to the motherboard.
- Check the inside of the case to see if any components seem to be overheating.
- Inspect the motherboard physically. Check to make sure the board itself isn't cracked; if it is look here. Make sure there are no broken pins or components on the board; if there are, you will have problems with whatever component of the PC uses that connection. Check for any socketed components that may be loose in their sockets, and push them gently but firmly back into the socket if this has happened.
- Make sure the keyboard is inserted correctly into the motherboard.
- A failed cache module or using the wrong type can cause motherboard problems. If you suspect it, troubleshoot the secondary cache.
- An overheated processor can cause system problems. Try troubleshooting the processor.
- Troubleshoot the system memory. Memory problems are often mistaken for motherboard faults, especially on systems that don't have the protection of using memory error detection.
- Try troubleshooting the video card or replacing it with another one, preferably a simple straight VGA card that is known to work from being in another system that functioned properly.
- If the power supply is older, or this is a cheap case, or you have added many new drives to a system with a weaker power supply (especially one that is less than 200W) then you may have a power supply problem. You may want to try replacing it.
- You may have a BIOS bug or other problem. Check your manufacturer's technical support resources for any known problems with your motherboard. Check on USEnet as well.
- Contact the technical support department of your system or motherboard manufacturer for additional troubleshooting information. If this is a new motherboard, you may want to consider returning it for an exchange if you have exhausted all other troubleshooting avenues.

- Some newer viruses, when activated, overwrite part of the BIOS code in systems that employ a flash BIOS. If the BIOS is corrupted, the system won't boot. See here for ideas on recovering from this.
- Try swapping the motherboard with another one and see if the problem resolves itself. If it does then the original motherboard is probably faulty, but it could just have been misconfigured or installed incorrectly.

2. There appears to be a failure related to the keyboard controller

Explanation: An error message or keyboard failure is implicating a possible failure of the keyboard controller chip on the motherboard.

Diagnosis: The keyboard controller chip can indeed develop a problem, although this is unusual. Using the wrong kind of keyboard, or a defective or incorrectly connected keyboard can also cause an apparent problem with the controller.

Recommendation:

- Troubleshoot the keyboard itself first.
- Find the keyboard controller chip on the motherboard, and examine it. See if it looks damaged in any way. If it is, then it needs to be replaced (either that or the whole motherboard). You may be able to get a new controller chip, but you will have to contact your motherboard's technical support department.
- If the controller chip is socketed, check to see if it is fully in the socket. Gently but firmly push down on the chip. You may hear a "crackling" sound when you do this, which is fairly normal. This may resolve the problem.
- Troubleshoot the motherboard.

3.I have lost my BIOS password so I cannot start the system and/or get into the BIOS setup program

Explanation: You entered a password into the BIOS setup program to control access to the system, and then forgot the password. If this a setup password, you will be unable to enter the BIOS setup program. If this is a startup or boot password, you will be unable to boot the system at all.

Diagnosis: For most people, using the BIOS passwords isn't a great idea, and this is the main reason why. If you do use a password, you should always record it in writing somewhere in case you need it later on. It can be hard to get around this sort of a problem, precisely because if there were an easy way to get around the password, it would have no value. In most cases you will have to clear the CMOS memory to erase the password.

Recommendation:

- If you haven't already, and if you can live without the machine for a day or so, wait and try to remember the password. This is the best solution, if you can remember it. :^)
- If your system has an AMI BIOS, try the default password, which is either "AMI" or "ami". This will not usually work, but is worth a try.
- If you cannot get into the BIOS program, your only remaining option is to try to clear the CMOS memory that holds BIOS settings. Included in this memory is the password, so this will let you get back into the PC. See here for instructions on erasing the CMOS memory.
- If it is a setup password that you are trying to get around, then you can at least boot the PC. It is possible in some systems that performing a flash BIOS upgrade will clear the CMOS memory and eliminate the password. I would not recommend trying this without getting confirmation from your motherboard vendor first, as doing flash BIOS upgrades in strange situations can theoretically be dangerous.

4. I need to clear the CMOS memory (due to a corrupted BIOS, lost password or other problem) but do not know how to do this

Explanation: You need to clear the CMOS memory but aren't sure how to do this. It is sometimes necessary to clear the CMOS due to a lost BIOS password, corruption of the CMOS memory, or because you set the BIOS settings to values incompatible with your hardware and now you cannot boot the PC far enough to get into the settings and reset them (this rarely happens, fortunately).

Diagnosis: How easily you can clear the memory depends on the design of your motherboard. In some cases it can be easy to do but in other cases very difficult.

Warning: Erasing the CMOS memory will cause you to lose all settings in the BIOS. Make sure that you only do this if it is absolutely necessary. Basically, you should only do this if you can't get

into the BIOS setup program due to hardware problems or a lost password.

Recommendation:

- Turn off the PC. Hold down the {Insert} key and then turn the PC on and wait for it to boot. On some PCs, this will clear and reset the CMOS memory for you. (On most PCs it will not work, so don't be discouraged.)
- Try the same thing with the {Delete} key. Again, it usually won't work.
- Look in your motherboard or system documentation for any evidence of a CMOS clear jumper. This is a jumper on the motherboard that can be used to clear the CMOS memory; many newer motherboards have them. Follow the instructions for its use as described in the documentation; usually this means opening the PC, changing the jumper to a special setting, and then booting the PC. The CMOS memory will be cleared. Then you power the PC down and put the jumper back to its previous position. If it doesn't work properly when you try it, look here.
- If you do not have a CMOS clear jumper, your next option is to try disconnecting the CMOS battery. This is easy to do if the battery on the motherboard is removable or user-replaceable. If you see on the motherboard what looks like a flat round wristwatch or calculator battery in a holder, that's it. Some older motherboards use batteries that sit off the motherboard and connect with a wire. If the battery can be disconnected, then disconnect or remove it. Wait for about two hours (you may need to vary the amount of time; if two hours isn't enough, try leaving it overnight) and then plug it back in, and the CMOS should be cleared and reset.
- On some systems, the CMOS battery is integrated within the BIOS chip. You *may* have success with removing the chip for a few minutes and then replacing it. Just be very careful to take anti-static precautions.
- Your motherboard may have a battery that is soldered to the motherboard. You may not see a battery on the motherboard at all; if this is the case then your motherboard probably uses a battery that is integrated into the real-time clock chip (or else, you weren't looking closely enough :^)). Unfortunately, on a motherboard without a removable battery and with no CMOS clear jumper, clearing the CMOS memory is difficult to do. At this point you should contact your manufacturer for technical support.

Warning: Some people will recommend shorting the leads of the battery to clear the CMOS memory. I do not recommend this procedure, because shorting things on the motherboard is just generally a dangerous thing to do. Even removing the CMOS chip has the potential for problems. It really is best to contact the manufacturer of the motherboard or PC you are using in this situation.

5. My system has a CMOS clear jumper but when I use it, it doesn't seem to do anything

Explanation: You are following the directions to use the CMOS clear jumper on your motherboard, but the CMOS memory is not being cleared.

Diagnosis: The usual cause of this problem is neglecting to unplug the PC before attempting the procedure, or accidentally changing the wrong jumper. Some motherboards, particularly those using the ATX form factors, are supplying voltage to the motherboard even when it is off, and this is used as a "backup" for the CMOS memory when the battery is not working. (You're not supposed to be working inside the box with the power plugged in anyway, remember?)

Recommendation:

- Unplug the PC, if it is plugged in.
- Make sure you are actually using the CMOS clear jumper and not a different one by mistake.
- Troubleshoot the motherboard.

6. The CMOS battery is dead or dying

Explanation: The system is exhibiting behavior that implies that the CMOS battery is dead. This can include lost CMOS settings, the real-time clock losing time, or of course dead battery warnings at boot time.

Diagnosis: On an older PC, it is normal for the CMOS battery to fail at some point in time. They usually last for many years, with over five years being the norm, at least on older machines. Nobody knows for sure how newer machines will fare. On a new motherboard, this sort of message is a sign of a defect, although you shouldn't worry about it if it appears only the very first time the board is powered up. The solution is replacing the battery, and this can be an either

easy or impossible task, depending on how much thought the motherboard manufacturer put into the design.

Recommendation:

- If this is a new motherboard and you are getting an error saying that the CMOS memory was cleared, or that the battery is dead, try rebooting the machine and seeing if the message goes away. If it does, then the problem is probably resolved as long as it does not return.
- If this is a new installation and you are getting the error continuously, I would double-check any jumpers associated with the battery. Some motherboards have a jumper to select between using an internal and external battery. Also, check out these common problems with new installations.
- Replace the CMOS battery. Note that on some motherboards it is not possible to replace the battery because it is integrated into the motherboard or a component such as the real-time clock. This is a bad design by engineers who lack vision, but is unfortunately all too common these days.
- If the battery cannot be replaced, or replacing it does not solve the problem, troubleshoot the motherboard.

1. The CMOS battery is failing intermittently, indicating that it is losing power, or losing settings once in a while

Explanation: The CMOS battery is working sometimes, but is occasionally failing, causing loss of BIOS settings or error messages.

Diagnosis: This situation can be very annoying, and in some PCs can last for a very long time. It usually means that the CMOS battery voltage is getting low and that it needs to be replaced, especially if the problem is occurring with increasing frequency. It can also result from a bad connection to the motherboard.

Recommendation:

- Double-check the battery connection to the motherboard. If the battery is removable, remove and reinsert it.
- Replace the CMOS battery, if this is possible with your motherboard.

- Troubleshoot the motherboard.

2. The system clock is losing time or not keeping time accurately

Explanation: The system clock is not accurate; it loses a number of minutes each day, or stops incrementing the time when the system is turned off.

Diagnosis: The most common cause of this problem is the CMOS battery, which also backs up the date and time so it isn't lost when the machine is turned off. A weak CMOS battery can lead to problems with the real-time clock even if the battery isn't weak enough to cause the loss of BIOS settings. Some motherboards apparently disable the clock as a power-saving measure when the battery voltage gets low. Of course, sometimes the problem with the clock is simply that it is inaccurate. As motherboards get cheaper and cheaper in both price and construction, the quality of some of these components gets very questionable.

Recommendation:

- Troubleshoot the battery to make sure that it is not causing the problem.
- Troubleshoot the motherboard to ensure that some other strange situation is not causing the problem.
- If the battery is not at fault, and you cannot find any problem with the motherboard, your remaining solutions are to replace the motherboard or to use software methods to compensate for the clock. There are utilities that will resynchronize the system clock with Internet time servers, and others that allow you to program them to adjust the system clock forward or backward a number of minutes each day, to keep the clock roughly accurate.

3.The BIOS settings in the CMOS memory have become corrupted or damaged

Explanation: The data stored in CMOS memory that controls the BIOS settings has become corrupted. This is usually seen in a warning or error message when the PC is booted, since the CMOS has a checksum value that is used to allow the BIOS to detect when the settings have become corrupted.

Diagnosis: The most common cause of this problem is the CMOS battery, which can cause erratic behavior if it is poorly connected or weak. It is also possible for other hardware or software problems to corrupt the CMOS memory, but this is unusual.

Recommendation: If you have created a backup copy of your CMOS settings then use them to restore the settings to the correct values. To find the problem itself:

- Troubleshoot the battery to make sure that it is not causing the problem.
- Make sure that you scan the system for viruses. Viruses can corrupt the CMOS memory (although they cannot reside in it).
- Troubleshoot the motherboard. Motherboard problems can sometimes (rarely) result in CMOS corruption.
- Troubleshoot your power supply. A failing supply can lead to problems with the whole system, and especially motherboard components.

4. can't figure out how to get into the BIOS setup program

Explanation: You need to get into the BIOS setup program to change some parameters, but don't know what key or keys must be pressed.

Diagnosis: On most modern systems, the key or key combination to press to enter the BIOS program is displayed on the screen when the system boots up, at the time when the BIOS is ready to enter Setup. Older systems often didn't specify the key(s) on the screen at boot time. Very old systems don't have a built-in setup program and one must be run from the floppy disk. Note that if your PC says to try a specific key combination and you try it, and it doesn't work, this could be due to a keyboard problem as well. Look for a keyboard error to come up on the screen.

Recommendation: Assuming that your PC is from about 1985 or later, it should have an integrated setup program (original XT computers used switches on the motherboard instead of a setup program.) Try the following key combinations, which I have listed approximately in order of popularity in today's system (there may be others as well):

- {Delete} (modern Award and AMI BIOSes)
- {F2} (modern Phoenix BIOSes)
- {Ctrl}+{Alt}+{Esc}
- {Ctrl}+{Esc}
- {Alt}+{Esc}
- {Ctrl}+{Alt}+{S}
- {Insert}
- {F1}
- Consult your system manufacturer for the key combination.

5. I changed my BIOS settings but when I rebooted, they reappeared with the old values!

Explanation: You went into the BIOS setup program to make changes to the settings, and then rebooted the PC, but the changes were reversed to the old values when you rebooted the machine.

Diagnosis: You probably forgot to save the changes to the BIOS settings, or you selected the "Exit without saving" option instead of the "Save and exit" option in the setup program (which are, unfortunately, usually located right next to each other on the BIOS setup menu).

Recommendation:

- Make the changes again, and be sure to save them using the correct option in the setup program.
- If the changes again do not stick, you might have a problem with your CMOS battery.
- Troubleshoot the motherboard.

6. I am having problems trying to flash my BIOS

Explanation: "Flashing" the BIOS refers to upgrading the BIOS program through software. This can allow you to quickly and easily increase the capabilities of your system, but if performed incorrectly

Diagnosis: It is extremely important to follow the manufacturer's instructions in detail when performing a flash BIOS upgrade. These upgrades are highly vendor-specific.

Recommendation:

- Read the instructions for performing the flash BIOS carefully. Some motherboards require a special jumper to be set on the motherboard in order to perform a flash BIOS upgrade. If this jumper is not set, the flash will not work.
- Perform the upgrade on a clean-booted system, from DOS (not any form of Windows) and with no drivers or special programs of any sort loaded.
- Do not be afraid to consult with the motherboard manufacturer's technical support.
- If you improperly flash the BIOS, if the flashing is interrupted (by a power failure) or if you flash the wrong BIOS image, you may corrupt the BIOS chip to the point where the system will no longer boot.

1. I flashed my BIOS, and now the system is dead!

Explanation: The system BIOS is the key piece of software responsible for booting your PC. Incorrectly flashing it will often cause the PC to fail to boot.

Diagnosis: The cause is usually flashing the wrong BIOS image file into the BIOS chip. This happens more often than you'd think, since most flash programs are not intelligent and will allow you to program the wrong BIOS code into the chip. The BIOS corruption can also result from an error or interruption during any BIOS flashing procedure. Finally, some new viruses can corrupt the system BIOS.

Recommendation:

- Some newer PCs come with a boot block feature that enables them to recover from a corrupted BIOS situation. If the BIOS code is whacked, a tiny built-in program will look on the floppy drive for the appropriate files to reload the BIOS. You should contact the manufacturer for instructions.
- You can usually purchase a replacement BIOS chip from the motherboard (not BIOS) manufacturer. Physically replacing the chip with another that has the right code will solve the problem.
- for other ideas on how to recover from this situation. **Warning:** Some of the procedures described on Wim's page are not for the faint of heart, especially hot-swapping BIOS chips, which has the (low, but non-zero) potential to cause injury or damage.

2. My hard disk spins down after a period of inactivity even though I disabled power management in the BIOS

Explanation: You have turned off power management, but the hard disk still spins down after a period of inactivity.

Diagnosis: Sometimes the power management isn't really turned off; it's possible that more than one BIOS setting needs to be changed and they weren't all changed. There could be a BIOS bug as well.

Recommendation:

- Go into the BIOS setup and double-check that power management really is turned off at a global level.
- If you are running Windows 95 OEM SR2, look in the Control Panel for an applet called "Power". Go into it, and uncheck the box that controls spinning down the hard disk.

- If the problem persists, it is possible that your BIOS has a bug. Contact your motherboard manufacturer for more information. There was definitely a bug in some Award BIOSes in late 1996 (a motherboard of mine had one). This sort of problem can normally be fixed with a flash BIOS upgrade, if available.
- There could be a problem related to the hard disk, such as a loose cable, or a defect with the hard disk itself; double-check the hard disk connection.
- Troubleshoot the motherboard.

3. I can't seem to enable ROM shadowing, or the system isn't working with ROM shadowing enabled

Explanation: You are trying to enable ROM shadowing in the system BIOS but the system is refusing to boot or behaving unstably when shadowing is turned on.

Diagnosis: Shadowing of the system BIOS works properly in *almost* every system. Shadowing of the video card usually works. Shadowing of adapter ROMs only works sometimes, depending on the system and on the peripheral. Turning on shadowing may reveal a general problem with the hardware, but usually if shadowing is the only thing causing the problem, the device you are trying to shadow simply isn't designed to work with it. For example, many adapters use both ROM and RAM in their address spaces, and shadowing will cause these to stop functioning altogether.

Recommendation:

- If the device you are trying to shadow is an expansion card, then the card may not allow shadowing. Consult your system documentation. If the device (as well as the system overall) works with shadowing disabled, it is generally better to just not worry about it, as the performance improvement is slight in this case anyway.
- If the video card will not allow shadowing, this may be a limitation of the video card, though this is uncommon. You may want to diagnose the video card.
- A failure to shadow the system BIOS ROM can mean a motherboard problem. Troubleshoot it.
- Any type of problem with shadowing can implicate a memory problem. You may want to troubleshoot the system memory.

4. The motherboard appears to be cracked

Explanation: The motherboard appears to have a crack in the board itself.

Diagnosis: Eek. This is not good. It's very rare for this to happen, actually. This most likely would have been caused by abuse, especially by being too forceful when inserting components. It may be caused by pressing too hard when inserting expansion cards, especially into a poorly-mounted motherboard. If the motherboard is new, it may have been a manufacturing defect. As for the board itself, if it is working OK, don't worry about the crack. Otherwise, it will need to be replaced; there is no practical way to repair damage of this sort.

Recommendation:

- If the board is new, and you suspect it may have been shipped with the crack, return it for exchange.
- Examine the motherboard to determine if it is mounted into the case correctly. Consider adding additional plastic supports to brace the motherboard if it is flexing when pressure is applied to it.
- Be careful when inserting expansion cards and components into the motherboard.
- If the motherboard is not working, troubleshoot it to eliminate all other possible causes of the problem. If the motherboard is still causing problems, you should replace it and see if the problem goes away. If it does, the motherboard with the damage should be discarded.

5. There is a component or pin broken on the motherboard

Explanation: A component is broken on the motherboard, or a pin that makes up one of the connectors or headers on the motherboard is broken.

Diagnosis: Depending on what the part is that is broken, this may or may not be a big problem. The only causes of broken components on a motherboard are manufacturing defect, abuse, or accidental damage. If the board itself is working OK, you may not need to do anything, but you may have difficulty upgrading or expanding the motherboard later on.

Recommendation:

- If the board is new, and you suspect it may have been shipped with the damage, return it for exchange.

- If the motherboard is working OK, and if the component or pin damaged is a part of the system not currently being used, for example a second processor socket, or a SIMM socket not in use, or a second serial port you are not using, ignore the damage. Get a new motherboard when you are ready to upgrade the machine.
- If the motherboard (or the system as a whole) is not working, troubleshoot it to eliminate all other possible causes of the problem. If the motherboard is still causing problems, you should replace it and see if the problem goes away. If it does, the motherboard with the damage should be discarded.

6. One of the pins on the motherboard is bent

Explanation: One of the pins that makes up one of the connectors or headers on the motherboard is bent.

Diagnosis: This is usually a manufacturing defect, or is caused by rough handling or abuse of the motherboard. The pins are malleable and it is usually possible to correct the problem.

Recommendation: With the power to the motherboard disconnected, examine the bent pin carefully. Using a pair of needle-nose pliers, grasp the end of the pin firmly. Slowly, slowly, bend the pin back into the correct position.

1. I cannot get the ZIF socket to loosen so I can remove the processor that is in it

Explanation: The ZIF socket holding the processor seems to be "stuck" and cannot be loosened.

Diagnosis: This occurs quite frequently, especially with older motherboards. These boards have had the same processor sitting in them often for years and they can become rather "comfortable" in their present position. It is usually possible to extricate the processor, but you must be careful not to break the socket, or you can basically toss the motherboard (and maybe the CPU as well.)

Recommendation:

- First, realize that many sockets require you to pull the ZIF socket lever *out* slightly from the socket before trying to lift it up.
- Make sure nothing is physically obstructing the lever.

- The problem is usually that the lever gets stuck and won't push all the way up to loosen the processor. Try applying gentle but firm pressure. Try rocking the lever back and forth, gradually increasing the pressure against the resistance in the socket. Eventually the lever should move and the socket should pop open. Do not try to "push as hard as you can".
- If you cannot get the socket open, you will need to have the motherboard serviced.

2. There is a suspected failure of the secondary (level 2) cache, or the system locks up or crashes after adding cache to the system

Explanation: The secondary cache is suspected of failing. This may or may not have occurred after adding more cache to the system.

Diagnosis: Outright failure of the cache is unusual, especially on an existing system. The most common problem when adding cache to a system is using the wrong kind of cache, or adding it and not setting jumpers that the motherboard requires. You may also have accidentally jarred something else inside the PC.

Recommendation:

- Try disabling the secondary cache in the BIOS setup. If the problem goes away, then the problem is most likely the cache or the motherboard.
- If you added more cache, make sure that you used the right sort of cache for your motherboard. Cache "COASt" modules may all look similar, but they are *not* universal. Consult your manufacturer.
- Ensure that the cache is inserted correctly into the board and is all the way into the socket or slot.
- Check the motherboard manual for any jumpers that you may be required to set or change when adding cache. Check in the BIOS setup for a BIOS setting that you may need to change (though this would be unusual).
- If you added cache, or recently worked inside the machine on something else, check out this section that describes possible causes of problems after working inside the PC, some of which may be unrelated to what you were doing.
- If the system is acting unstable, diagnose this here. It is possible that the problem is unrelated to the cache, even if it showed up after adding more cache to the system.

- After the PC has been on for a few minutes, touch the chips on the cache module. If they are very hot, this is a signal that the cache module itself may be bad. If you can't keep your finger on the chip for more than a couple of seconds without pain, the chips are hot! If you replace the module and the chips on the new module get hot also, the motherboard is implicated.
- Try to replace the cache module with another one. If the problem goes away, then the module was bad. Otherwise, you should treat this as a motherboard problem.

3. I added more secondary cache to the system but I didn't see any improvement in performance

Explanation: You were told that adding more secondary (level 2) cache to the system would improve performance, but don't see it. The system seems the same as it did before.

Diagnosis: The truth is that especially if you already have 256 KB of cache, adding another 256 KB does not significantly impact on performance. The reason is that the original cache is already probably catching over 90% of memory requests, so there just isn't that much room for improvement. A 5% improvement in overall performance is typical for a desktop user, and increases in speed of less than 10% are hard for most people to notice. Of course, this all assumes that your upgrade was performed correctly, and actually "took".

Recommendation:

- Make sure that the extra cache was recognized and is being used. When the system boots up, check to see how much cache it is reporting, and make sure it is the right amount.
- Double-check in your system manual to see if adding more cache requires any jumpers to be changed on the motherboard. Some do require this. Check in the BIOS setup for a BIOS setting that you may need to change (though this would be unusual).
- Run some benchmark programs and compare their results to before the upgrade. Some sort of improvement, even if minor, should be apparent.

4. I put in a Pentium MMX OverDrive processor, and it works, but when I boot the system it disables the cache

Explanation: When booting the motherboard with a Pentium with MMX OverDrive processor, the secondary cache is disabled or not functioning.

Diagnosis: This is often caused by a BIOS that is unable to recognize the OverDrive processor properly.

Recommendation:

- Ensure that the processor has been inserted correctly into the socket; see this section for more troubleshooting of processors.
- Contact your motherboard manufacturer about a BIOS upgrade.

5. I have a motherboard that uses an Intel Triton II 430HX motherboard, which is supposed to support caching over 64 MB of RAM, but my PC still slows down with more than 64 MB

Explanation: The system uses the Intel Triton II 430HX chipset in its motherboard, which is designed to allow caching of over 64 MB of memory. However, the system exhibits a slowdown when using more than 64 MB of RAM, similar to how a board that only caches a maximum of 64 MB would slow down in this situation.

Diagnosis: Unfortunately, once again, "el cheapo motherboard syndrome" is probably to blame. While the 430HX chipset supports caching up to 512 MB of RAM, it only does this if an *optional* second tag RAM chip is added to the motherboard, or if a larger single RAM chip is used in the first place. Some vendors do not add this chip, in order to save a buck or two. It is sometimes possible to correct this situation.

Note: How much actual cache you have doesn't affect directly how much memory you can cache. Even if you have 512 KB of cache, this doesn't mean you can cache more RAM than if you only had 256 KB. See here for more on this little-known limitation.

Recommendation:

- Check the motherboard and manual to figure out whether your board has the 11-bit tag RAM that is required for 512 MB of cached RAM. If it doesn't then continue here for possible solutions.
- If you do have the tag RAM, then there is either a problem with the components, or something is misconfigured. Troubleshoot the system memory and troubleshoot the cache to make sure that there isn't some sort of problem that is responsible for the slowdown.

- Troubleshoot the motherboard.

6. My Triton II 430HX motherboard doesn't have enough tag RAM to support caching over 64 MB of RAM; is there anything that can be done to solve this?

Explanation: The motherboard requires a second tag RAM chip to allow caching of over 64 MB of RAM with the Intel 430HX chipset, and the motherboard doesn't have it.

Diagnosis: In some cases the tag RAM can be increased, but in others it cannot. It depends entirely on the design of the motherboard.

Recommendation: Consult your motherboard documentation or technical support options to see what your choices are. Your PC will probably fall into one of these categories:

- Some motherboards don't have the second tag RAM chip needed to cache over 64 MB of RAM, but they have a *socket* where the second chip can be added. If you have the socket, consult your manufacturer for the exact specifications of the chip required. Then purchase and install it, making sure to follow the manufacturer's instructions, and you should be all set. You may need to change a jumper on the motherboard. Cost is probably only a few dollars.
- Some motherboards accept a COASt module to expand the size of the cache that contains an extra tag RAM chip on it as well. If your motherboard is like this, then adding an extra 256 KB of cache to the motherboard will also add the extra tag RAM and will let you cache over 64 MB. This situation is what sometimes makes people think that it is the adding of extra cache that enables more memory to be cached. In fact, it is the extra tag RAM chip on the module, not the cache chips themselves.

Note: Not all cache modules have tag RAM on them, and not all cache modules work with all motherboards. Make sure you find out exactly what you are buying, and if it will work with your board.

- If you don't have a socket and you can't add tag RAM via a cache module, you are basically out of luck. You will have to either accept slower performance when going over 64 MB of RAM, use less memory, or replace your motherboard. If the motherboard was just bought you may be able to return it for exchange or refund.

1.Updating ESCD...

Explanation: ESCD stands for "extended system configuration data", and is where resource information is stored on a system that uses Plug and Play. This message is displayed when the system detects a change in the hardware configuration and therefore updates the Plug and Play information that it has stored. In some systems it may appear every time the PC is booted, however, even if the hardware configuration has not changed.

Diagnosis: Depending on the circumstances, this message may indicate an error or a normal operating condition.

Recommendation:

- If the system displays "Updating ESCD... Success" after adding or removing hardware on the next boot-up only, then this is normal for many BIOSes, and no action is required.
- If the system displays the message every time the PC boots, then there may be a conflict between the BIOS and the operating system. The ESCD information is managed by both the BIOS and by Windows 95 (or other Plug and Play operating system) to allow for Plug and Play resource allocation. However, some BIOSes record hardware configuration information in a way that is different from how Windows 95 does it. When this happens, each time Windows 95 is started it will change the ESCD area back to the way it expects it to be. When you reboot your system, the BIOS will see this change made by Windows 95 and change the data back to the way *it* likes it. This back-and-forth will continue to happen each time the system is booted. It doesn't generally cause any problems other than displaying the "Updating ESCD" message every time the system is started up. You can contact your system or motherboard manufacturer about a possible BIOS upgrade to correct this situation. Other than it being annoying to some to see this message every time the PC boots, the system should continue to work without any problems.
- If the system displays "Updating ESCD..." and then hangs up the boot process, either with or without displaying "Success", then there is a problem with updating the extended system configuration data. This is probably a problem with an expansion card, especially if you just added one to the machine. It could also be a problem with the motherboard. You should troubleshoot this as an expansion card problem, and if this fails, troubleshoot the motherboard.

2. I have a PCI expansion card or video card that is supposed to support bus mastering, but I can't get bus mastering to work

Explanation: PCI bus mastering is supposed to be supported by a video or expansion card, but is not working properly. (Note that problems with IDE hard disk bus mastering is discussed in this section, not here.)

Diagnosis: Bus mastering problems are generally hard to diagnose, and often depend a great deal on the specific card. General problems with bus mastering can be related to the motherboard or BIOS settings.

Recommendation:

- Consult the documentation for the peripheral card *carefully*. Usually the answer to the problem will be there somewhere.
- Search your motherboard documentation for any hints as to whether all of your PCI slots support bus mastering, or only some of them. Some early and/or cheaper motherboards only supported bus mastering in some of their PCI slots, but not all of them.
- Double-check all BIOS settings that are in the PCI / PnP settings group. Make sure that you are not disabling bus mastering, or assigning resources incorrectly to only ISA legacy cards.
- You may have a resource conflict associated with the card..
- Troubleshoot the expansion card.
- Troubleshoot the motherboard.

3. I have a suspected system failure related generally to expansion cards in the system

Explanation: A problem condition with the system overall is arising that implies a possible problem related to one or more of the expansion cards in the system. (This means a problem with the system caused by expansion cards, not a problem with a specific card in a system that otherwise works; look here for that.) This typically means an error message or a failure of the system to boot.

Diagnosis: The wide availability of many different types of expansion cards means that the chances of a conflict between two of them, or between them and the system, are significant. Resource conflicts are the most likely problem.

Recommendation:

- Make sure all the cards are securely inserted into the system. Very long cards, especially those that use the VESA local bus, can sometimes come partially loose, causing strange results.
- Make sure that there are no physical problems with the motherboard or internal connections.
- Disable all shadowing of expansion adapter ROMs and see if that fixes the problem.
- Remove all unnecessary expansion cards (basically, everything but the video card) and see if the problem goes away. If it does, the problem is probably one of the expansion cards you removed. If not, your problem lies elsewhere. Try to isolate the problem by inserting one expansion card at a time back into the system and seeing which one triggers the problem.
- Since the most likely cause of the problem is a resource conflict, look here for ideas on resolving the conflict.
- Troubleshoot the motherboard.

4. I have a specific expansion card that appears to be problematic

Explanation: A problem is suspected with a particular expansion card. (This means a problem with the card itself, not a problem with the overall system caused by one or more expansion cards; look here for that.) This is typically manifested through an error message, such as a ROM checksum error or I/O parity error.

Diagnosis: Most of the problems with specific expansion cards depend entirely on the nature of the card. I can only provide some general pointers here.

Recommendation:

- Make sure all the cards are securely inserted into the system. Very long cards, especially those that use the VESA local bus, can sometimes come partially loose, causing strange results.
- Make sure that there are no physical problems with the motherboard or internal connections.

- Make sure that the connections, jumpers and any software drivers associated with this card are correct.
- If this card has its own BIOS ROM, make sure that the shadowing of that segment of ROM address space is not enabled, as this can cause problems. (Shadowing will work with many cards, but won't work with some of them.)
- Remove any other expansion cards in the system and see if that affects the problem. If it does, then either the other card was causing the difficulty, or there is some sort of a resource conflict.
- Check for resource conflicts in general.
- Try the card in a different slot and see if it works. This is especially true of PCI cards, which will try to use different IRQ lines depending on which slot they are placed into. By changing the slot you may as a side-effect eliminate a resource conflict that was actually causing the problem.
- If the card is a video card, troubleshoot it here.

5. I think I have a resource conflict in my system; what can I do about this?

Explanation: It is suspected that the system may have a resource conflict. This means that two different devices are both trying to use a system resource like an interrupt request line, DMA channel or I/O address. The two devices will conflict and cause either one or both to malfunction. A list of typical symptoms of resource conflicts can be found here.

Diagnosis: Resource conflicts are one of the most common problems with PCs, especially with those who upgrade or add equipment to their PCs. Since the ancient architecture of the PC has resulted in a great variety of internal devices and expansion cards having to share a limited amount of resources, devices will often "step on each others' toes". The problem is almost always misconfiguration; in rare cases you will not be able to use two devices in the same system if they cannot find a way to cooperate by configuring themselves to use available resources.

Recommendation:

- Read this section of the Reference Guide, which contains much more information on resource conflicts.

- Do not try to "share" resources. Some people will say that this is possible to do, and technically it is, but it is a headache that is not worth dealing with in my opinion. Windows 95 is particularly unforgiving about trying to share resources.
- If you suspect a conflict with a specific device, and you are running Windows 95, go into the Device Manager. Click on the device with the problem (which may show with a yellow exclamation-mark-in-a-circle next to it) and select "Properties". Click on the "Resources" tab and the system will often tell you what the conflict is.
- Sometimes, folks think they have a resource conflict because the Windows 95 Device Manager shows a PCI device on the same IRQ as another device called "IRQ Holder for PCI Steering". This is in fact not a resource conflict; IRQ steering is a feature of Windows 95 that is designed to help *avoid* resource conflicts. If you think you have a resource conflict you may indeed have one, but this isn't it.
- Use a diagnostic tool such as Norton Diagnostics. There is a test in this package that looks for the IRQ usage of various devices and will sometimes highlight conflicts (though it is not perfect by any means).
- Catalog the resource usage of all of the devices in your PC. This is the best way to determine what resources are being used by what. You may find the device resource summary sheet I have included here to be helpful with this. If you find any devices that are trying to use the same resources, try to change the configuration of one of them.
- Check resource-related BIOS settings to ensure that they are correct.
- Watch out for PCI devices using IRQs. The PCI bus uses its own interrupt scheme but PCI devices also "map" to regular IRQs when needed. Many PCI video cards, for example, use an IRQ, typically 9, 10, 11 or 12. Make sure that this does not cause any conflicts with other devices.
- If you are using IRQ9 for any device, make sure you are not using IRQ2 on any other device. They are the same interrupt line.
- If you are trying to use the COM1 port and the COM3 port at the same time, or the COM2 port and the COM4 at the same time, you will run into a conflict if you leave these ports at their default IRQ settings. Each of these two pairs uses the same IRQ number. To use COM1 with COM3, or COM2 with COM4, you must change the IRQ number that one of the pair is using so that it does not conflict with the other.
- If you add a modem to your system, and you have a built in COM2 port (which most do) you will see a conflict unless you change the modem's settings, because most of them default to use COM2. If you just change the modem from COM2 to COM4, then the

problem above will result unless you also change the IRQ of the modem to another number.

- If you are using a sound card and a second parallel port, you will probably have a conflict, because both devices try to use IRQ5 by default. One or the other must be changed. (Also watch out for the *first* parallel port accidentally being set to IRQ5).
- If you are using a secondary IDE controller, then IRQ number 15 is normally used by that controller and cannot be used by other devices.
- DMA conflicts are commonly caused when enabling ECP parallel ports. They use a DMA channel while other modes of operation of the parallel port do not.
- If you are using a network card, beware of I/O address conflicts. Many network cards use a full 32 bytes of I/O address space, and can conflict with other devices. They also sometimes try to use IRQs that are commonly used by other system devices such as video cards or hard disk controllers.

6. My system is reporting that it has a "static resource conflict"

Explanation: On rare occasions, some motherboards may produce an error at boot time saying that they have detected a "static resource conflict". This is a result of the Plug and Play feature of the BIOS and is saying that more than one device is trying to use the same Plug and Play system resource. Usually this will not occur because the BIOS will adjust resource allocations to prevent a conflict.

Diagnosis: The most usual cause of this problem is certain cards that designate their resource usage in a strange way. Without getting into too many details, some peripherals such as the Pro Audio Spectrum will allocate an I/O address in two different ways. It is the same resource, but the BIOS becomes confused and thinks that there is a conflict. In other cases, the BIOS thinks there is another kind of conflict when there isn't. The BIOS usually needs to be reset to avoid this situation recurring.

Recommendation:

- Attempt to discern, if possible, whether or not you really have a resource conflict. If you do, then resolve this situation.
- Try to reboot the system to see if this makes the problem go away.

- Remove all expansion cards from the system and reboot the PC. This may make the problem go away so you can boot the machine. Then re-insert the cards and see if the message goes away.
- If you cannot get the message to clear, you will have to clear the CMOS memory.

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. The PC's internal power supply appears not to work at all. The system will not turn on and the power supply itself appears to be dead. Write Diagnosis?

2. "Flashing" the BIOS refers to upgrading the BIOS program through software. This can allow you to quickly and easily increase the capabilities of your system, but if performed incorrectly . Write Diagnosis?

Note: **Satisfactory rating –1 points** **Unsatisfactory - below 1 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 6	Using the operating system and third-party diagnostic tools

6.1. Using diagnostic tools

Each computer system has built into it a range of tools to help the user determine its ‘status’. By ‘status’ we mean that they help determine if the system is working correctly or not. If a system is not working correctly, diagnostic tools can provide information vital to solving the problem. The most common types of computer problems will be found during these processes:

- booting the computer
- loading the operating system
- manually checking the system.

Diagnostic tools are available at each of these stages and are outlined in the following sections. These tools provide the foundation of any troubleshooting that involves the malfunctioning of a computer.

IMPORTANT: You will be directed to use a number of diagnostic and configuration tools to gather information about your system. Changing **any** of the settings using these tools may cause your computer to malfunction. If you are in any doubt about the use of a particular tool, contact your supervising teacher.

You may also be required to make system changes to solve problems identified by the diagnostics. Again, the types of changes required, if incorrectly applied, may cause your computer to malfunction. If you are in doubt about how to proceed with system modifications, consult your supervisor.

Booting the computer

Booting a computer system involves turning the machine on, checking that power LEDs come on and that the screen reflects the expected activity of the system start up procedure. In a PC system, part of this procedure is the Power On Self Test or POST diagnostic tool. The POST diagnostic tool is built in to the system and starts automatically when the system is turned on.

Any failure related to a major component, such as motherboard, video, keyboard or drive failures, will be detected during the POST phase of a computer system. The total failure of a major

hardware component is easily detected. Less crucial devices that fail will normally be detected by the operating system as it loads and are dealt with in the next section.

Most hardware systems such as computers and printers have a POST tool to check that their major components are working properly.

Power On Self Test (POST) diagnostic tool

During the PC computer system's loading phase, each of the main components are tested. The failure of any one of these systems would impair the computer's ability to operate. Such critical devices include the graphics card, motherboard resources, drives and Input/Output (I/O) interfaces such as keyboard and graphics (video cards).

Figure 1: Power On Self Test (POST) diagnostic tool

On a PC based system, this provides feedback on the screen about the type of video card detected, the type and speed of the processor detected, the type and number of drives detected, as well as the amount of Random Access Memory (RAM) detected. It checks the presence of peripheral devices such as keyboard and mouse devices. It also internally tests the correct performance of many motherboard components.

Any failures at this level may result in an error message on the screen, or may be heard as a series of coded 'beeps'. The beep codes are often unique to a motherboard model and should be interpreted by information found on the motherboard manufacturer's website.

The POST screen will only briefly appear at the start of the booting process. The CPU's type and speed will be listed here with other device information. On many systems, pressing the **Pause** key during this process will freeze the screen, and the **space bar** key releases it. If you cannot pause the screen, check with your supervisor or teacher as it may take several restarts to view

the information fully. If you must reset the computer, be careful to do so by pressing the reset button before the operating system begins to load, as this will prevent it from recording failed loading attempts.

To view the systems detected configuration more fully, examine the system Setup or **CMOS** tool. Some references may prefer to use the term **BIOS** in place of the term CMOS. They refer to the same tool. To enter this tool, users are normally required to press a key or key combination such as the **DEL** (Delete) key or **Shift** + **F10** during the POST sequence. Because these settings effect the operation of the PC, many companies password protect this tool so unauthorised users cannot access this area.

The Setup or CMOS tool for your PC holds the configuration of your computer. It lists how much memory the system has, how many drives are detected and which drive it should load the operating system from. It will also have configuration options for a range of other items such as power management and I/O interfaces, just to name a few.

The motherboard manual that came with the PC holds information about the CMOS tool and its use.

At this level, the tool is simply used to determine that the system has detected its elementary components such as RAM, HDDs, FDD, etc. The CMOS settings should reflect the known configuration of the PC. Normally the IDE drives should be set to ‘AUTO’ which stands for Automatic Detection. Any errors such as RAM or drives not being recognised by the system should be recorded and reported to a supervising technical support person.

The default or factory settings can normally be restored by choosing the relevant menu option. **When you exit the CMOS, exit without saving your changes, unless you have deliberately changed a setting**. This prevents accidental changes from occurring.

For a MacIntosh system, when you boot the PC will either show a happy face and load, or show a sad face and refuse to load.

Fixing faults detected here, on either a PC or Mac system, may require the case to be opened and can effect the warranty of the computer. It must be authorised by your manager who will refer it to an appropriate technical person.

Loading the operating system

Once the POST sequence has been completed, the system then looks for a boot device as the CMOS configuration dictates. From here the computer begins to load the series of services or

programs that together form what is called the operating system (OS). Normally the operating system's name and version (or service pack number) will be displayed during this process.

Log files and OS booting tools

Common failures at this point may relate to the failure of minor hardware devices or incorrect configuration of devices that are physically OK. Any services or devices that fail to load are usually noted in a log file by the operating system. This file can then be examined at a later time to help determine what went wrong. Most Windows and Unix systems create log files during the loading process. These log files provide details that will alert you to errors. Many of the system log entries are fully explained in the operating system's documentation or the support section of their Internet site.

Exercise

The following screen is from the system log of a Windows XP system.

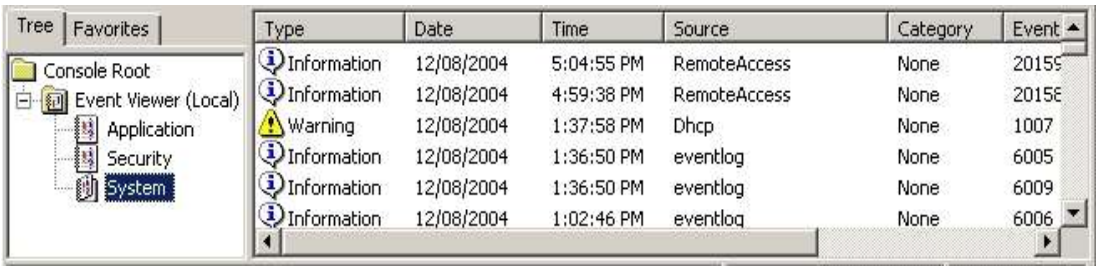


Figure 2: System Log of a Windows XP system

Examine entries in the log to determine which (if any) represent possible errors in the booting process. Each entry has an Event ID number that can be searched for in the Microsoft Knowledge Base. Search the Knowledge Base at http://support.microsoft.com for Event ID 1007 and determine the nature of the event warning.

If the system failure is so bad that the operating system fails before it loading process is complete, most systems provide tools that allow the computer to boot in restricted or 'Safe' modes, or alternatively provide emergency recovery disks. Using these options, the system then boots with a reduced set of services, allowing you to examine boot logs or device management tools to help detect problems.

Entries in the system log may require further research to explain their full meaning. Most operating system companies provide documentation on their website to assist in the interpretation of log file messages. For Windows 2000/XP, Microsoft's Knowledge Base website has many articles about different Event Viewer messages.

Manually checking the system

Device management tools

Most operating systems now work with the concept of ‘Plug and Play’ devices. This simply means that when a new device is installed, the system will automatically detect it and install the most appropriate software drivers for it.

A driver is a small piece of software written for a specific device. To make life simpler, many standard drivers are built into operating systems so they automatically work when installed. However, special features of that particular device model may only be available if the manufacturer’s device driver is installed.

All current PC and Mac operating systems provide you with tools to look at the devices installed on your computer. In this context, a ‘tool’ is a small program that is designed to perform a limited, specialised role — such as providing information about a hardware device.

In a graphical user interface (GUI), which Windows, MacIntosh and most Unix-based operating systems have, the tool may be represented by an icon. It may also form the properties of an object represented on the desktop, such as ‘My Computer’.

In a text-based system, which Unix and Windows based systems also have, the tool may be in the form of a specific command related to a specific device.

Examples of tools are shown in the following screen shot.

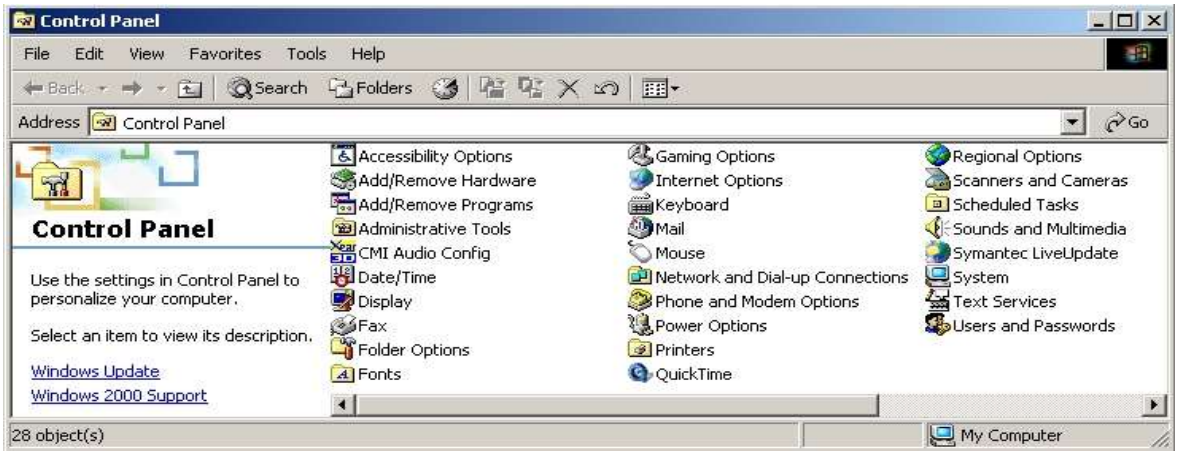


Figure 3: Configuration tools

Device Management tools provide you with information and configuration options for devices attached to your system. They should provide you with a list of devices attached to your system and information about their status.

In a PC system these tools should also list the resources that devices use, such as an Interrupt (IRQ), Input/Output (I/O) memory range and Direct Memory Access (DMA) channel, etc. In a Mac system, the resource allocation for devices is automatic. Device Management tools may provide information about the software driver that was installed to manage the device.

In some operating systems, many different tools may be required to find this information. In other operating systems, this information may all be available from one tool.

Management of hard disk drives

Hard disk drives are a vital part of any computer system. They retain data saved as files and can have a directory or folder system to organise files into a logical system. The constant writing, modifying and deleting files may cause errors from time to time. These errors often relate to file processes, such as saving a file that has been interrupted before it could be completed. This interruption could be caused by a power outage, application crash or shutting down a system incorrectly.

Checking the file system

Each operating system provides you with standard tools to check the integrity of the file system. While different operating systems may support a range of different file systems, the basics remain the same. There is some master record of what files are on a drive and where those files can be found. This is called the **File Allocation Table** (FAT). The FAT holds the list of files contained on the drive and the address of the first block where that file is stored. It is effectively a ‘table of contents’ to the disk drive.

Checking the integrity of the file system involves matching the FAT against the drive’s contents. Should this become damaged, or incorrect, the results for your data could be devastating.

Checking the drive

Your operating system may also provide you with an option, or separate tool, to check the actual integrity of the drive. By this we are referring to a process where the actual data blocks on the drive are checked to ensure that they store data correctly. Originally this is also done when you format the drive, which is why it can take so long to format large hard disk drives.

Defragging the drive

It is also possible that your drive becomes ‘messy’ which is known as **fragmentation**.

Imagine your drive as a book, where information (or data) saved as files is written on the first available page (or block). When saving is complete, the file name and the page it starts on are entered into the ‘Contents’ page (or File allocation Table) of the book. The next file saved will take the next available page and so on.

However, when we wish to add more data to the first file we may require more than one page to hold the additional information. It can’t be stored on the next page as it is already used by another file. So the next available blank page is used and we must link the first page of the file to the page number that is the second page of the file.

Having a file spread over a series of ‘non-contiguous’ blocks slows the reading and writing processes. The term ‘non-contiguous blocks’ simply means a series of blocks which are not stored next to one another. This is called fragmentation.

The process of **de-fragmentation** refers to a tool which tries to rearrange files into contiguous blocks to improve the performance of the file system. It can be dangerous as any interruption to this process may result in data loss and corruption. Always ensure that a backup exists for a drive before running a tool to de-fragment your disk.

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.

I. Fill the blank

1. _____ involves turning the machine on, checking that power LEDs come on and that the screen reflects the expected activity of the system start up procedure.
2. _____ is built in to the system and starts automatically when the system is turned on.

Note: **Satisfactory rating –1 points** **Unsatisfactory - below 1 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**