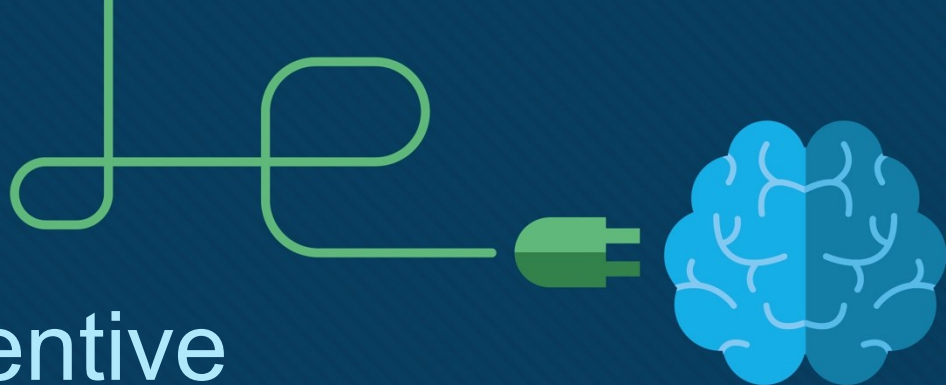




# Chapter 4: Preventive Maintenance and Troubleshooting

Instructor Materials

IT Essentials v7.0



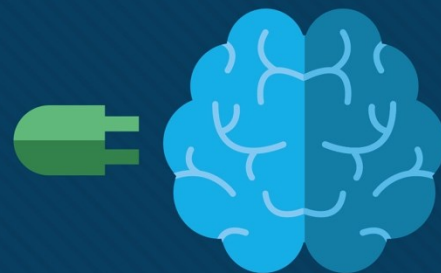
# Chapter 4: Preventive Maintenance and Troubleshooting

## IT Essentials 7.0 Planning Guide



# Chapter 4: Preventive Maintenance and Troubleshooting

IT Essentials v7.0



# Chapter 4 - Sections & Objectives

- 4.1 Preventive Maintenance
  - Explain why preventive maintenance must be performed on personal computers.
  - Describe PC preventive maintenance.
- 4.2 Troubleshooting Process
  - Troubleshoot problems with PC and Peripheral devices
    - Describe each step of the troubleshooting process.
    - Identify common problems and solutions for PCs.
    - Troubleshoot computer components and peripherals using the six-step troubleshooting process.

# 4.1 Preventive Maintenance

# Benefits to Preventive Maintenance

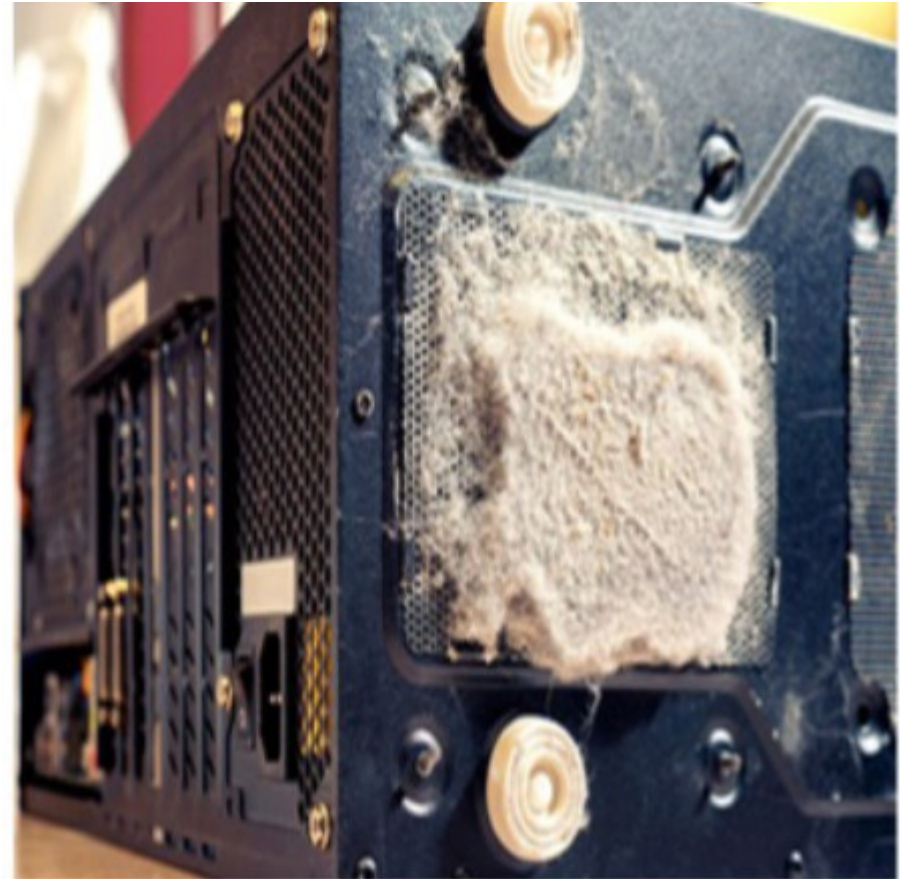
Preventive maintenance plans are developed based on at least two factors:

**Computer location or environment** - Dusty environments, such as construction sites, requires more attention than an office environment.

**Computer use** - High-traffic networks, such as a school network, might require additional scanning and removal of malicious software and unwanted files.

# Preventive Maintenance - Dust

- Use a cloth or a duster to clean the outside of the computer case. If using a cleaning product, put a small amount onto a cleaning cloth and then wipe the outside of the case.
- Dust on the outside of a computer can travel through cooling fans to the inside.
- Accumulated dust prevents the flow of air and reduces the cooling of components.
- Hot computer components are more likely to break down.
- Remove dust from the inside of a computer using a combination of compressed air, a low-air-flow ESD vacuum cleaner, and a small lint-free cloth.





# Preventive Maintenance – Internal Components

A basic checklist of components to inspect for dust and damage includes:

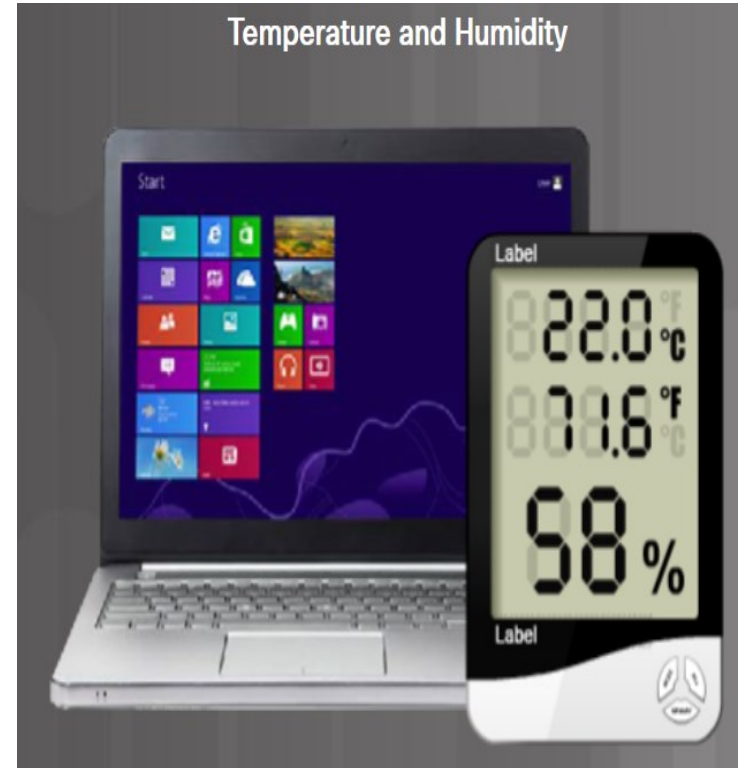
- **CPU heat sink and fan assembly**
- **RAM modules**
- **Storage devices**
- **Adapter cards**
- **Cables**
- **Power devices**
- **Keyboard and mouse**





# Preventive Maintenance – Environmental Concerns

- An optimal operating environment for a computer is clean, free of potential contaminants, and within the temperature and humidity range specified by the manufacturer.



# Preventive Maintenance – Software

Verify that installed software is current.

- Follow the policies of the organization when installing security updates, operating system, and program updates.

Create a software maintenance schedule to:

- Review and install the appropriate security, software, and driver updates.
- Update the virus definition files and scan for viruses and spyware.
- Remove unwanted or unused programs.
- Scan hard drives for errors and defragment hard drives.

## 4.2 Troubleshooting Process

# Introduction to Troubleshooting

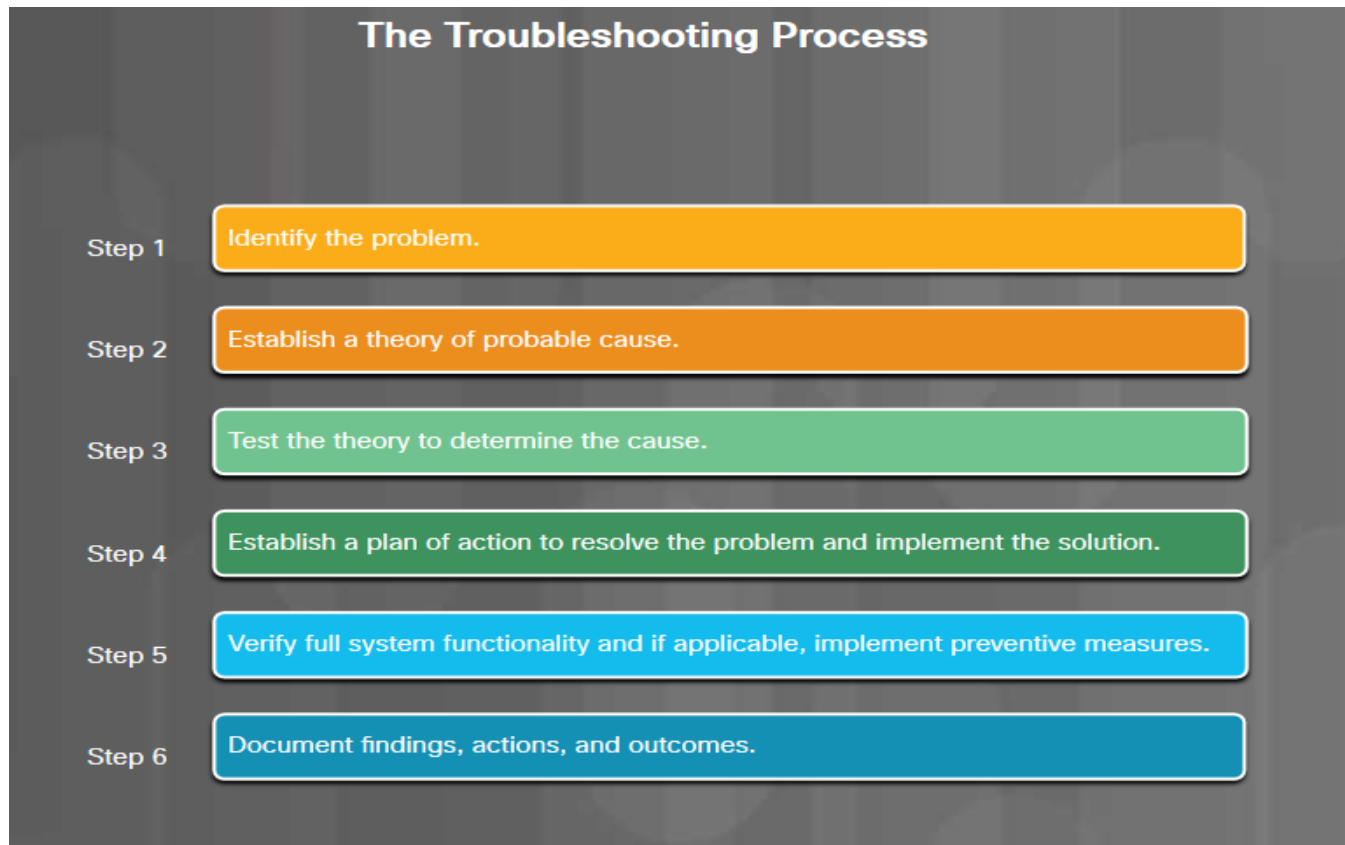
Troubleshooting requires an organized and logical approach to problems with computers and other components.

Troubleshooting is a skill refined over time.

Before you begin troubleshooting problems, always follow the necessary precautions to protect data on a computer.



# Troubleshooting Process Steps



# Troubleshooting Process Steps

## Identify the Problem

Step 1: Identify the Problem.	
Customer Information	<ul style="list-style-type: none"><li>• Company Name</li><li>• Contact Name</li><li>• Address</li><li>• Phone Number</li></ul>
Computer Configuration	<ul style="list-style-type: none"><li>• Manufacturer and Model</li><li>• Operating System</li><li>• Network Environment</li><li>• Connection Type</li></ul>
Problem Description	<ul style="list-style-type: none"><li>• Open-ended Questions</li><li>• Closed-ended Questions</li></ul>
Error Messages	
Beep Sequences	
LEDs	
POST	

# Establish a Theory of Probable Cause

## Step 2. Establish a Theory of Probable Cause.

- Device is powered off.
- Power switch for an outlet is turned off.
- Surge protector is turned off.
- Loose external cable connections.
- Non-bootable disk in designated boot drive.
- Incorrect boot order in BIOS setup.



# Test the Theory to Determine the Cause

## Step 3. Test the Theory to Determine the Cause.

Common steps to determine cause

- Ensure the device is powered on.
- Ensure the power switch for an outlet is turned on.
- Ensure the surge protector is turned on.
- Ensure external cable connections are secure.
- Ensure that the designated boot drive is bootable.
- Verify the boot order in BIOS setup.

# Establish a Plan of Action to Resolve the Problem and Implement the Solution

Step 4: Establish a Plan of Action to Resolve the Problem and Implement the Solution.	
If no solution is achieved in the previous step, further research is needed to implement the solution.	<ul style="list-style-type: none"><li>• Helpdesk repair logs</li><li>• Other technicians</li><li>• Manufacturer FAQ websites</li><li>• Technical websites</li><li>• News groups</li><li>• Computer manuals</li><li>• Device manuals</li><li>• Online forums</li><li>• Internet search</li></ul>

# Verify Full Functionality and, If Applicable, Implement Preventive Measures

### Step 5: Verify Full System Functionality and if Applicable Implement Preventive Measures.

- Reboot the computer.
- Ensure multiple applications work properly.
- Verify network and Internet connections.
- Print a document from one application.
- Ensure all attached devices work properly.
- Ensure no error messages are received.

# Document Findings, Actions, and Outcomes

## Step 6: Document Findings, Actions, and Outcomes

- Discuss the solution implemented with the customer.
- Have the customer verify that the problem has been solved.
- Provide the customer with all paperwork.
- Document the steps taken to solve the problem in the work order and in the technician's journal.
- Document any components used in the repair.
- Document the amount of time spent to resolve the problem.

# PC Common Problems and Solutions

- Computer problems can be attributed to hardware, software, networks, or some combination of the three. These are some common hardware problems:
- **Storage Device** - Storage device problems are often related to loose, or incorrect cable connections, incorrect drive and media formats, and incorrect jumper and BIOS settings.
- **Motherboard and Internal Components** - These problems are often caused by incorrect or loose cables, failed components, incorrect drivers, and corrupted updates.
- **Power Supply** - Power problems are often caused by a faulty power supply, loose connections, and inadequate wattage.
- **CPU and Memory** - Processor and memory problems are often caused by faulty installations, incorrect BIOS settings, inadequate cooling and ventilation, and compatibility issues.
- **Displays** – Display problems are often caused by incorrect settings, loose connections, and incorrect or corrupted drivers.

# Common Problems and Solutions for PCs

## Common Problems and Solutions for Storage Devices

Select each problem

The computer does not recognize a storage device.

The computer does not recognize an optical disc.

The computer will not eject the optical disc.

The computer does not recognize a removable, external drive.

A media reader cannot read a memory card that works properly.

Retrieving or saving data from the USB flash drive is slow.

The computer does not recognize a storage device

Probable Causes	Possible Solutions
The power cable is loose.	Secure the power cable.
The data cable is loose.	Secure the data cable.
The jumpers are set incorrectly.	Reset the jumpers.
A storage device failed	Replace the storage device.
The storage device setting in BIOS are incorrect.	Reset the storage device settings in BIOS.

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# Common Problems and Solutions for Motherboards and Internal Components

Identify the Problem

The clock on the computer is no longer keeping the correct time or the BIOS settings are changing when the computer is rebooted.

After updating the BIOS firmware, the computer will not start.

The computer displays the incorrect CPU information when the computer boots.

The hard drive LED on the front of the computer does not light.

The built-in NIC has stopped working.

The computer does not display any video after installing a new PCIe video card.

The new sound card does not work.

The clock on the computer is no longer keeping the correct time or the BIOS settings are changing when the computer is rebooted

Probable Causes	Possible Solutions
The CMOS battery may be loose.	Secure the battery.
The CMOS battery may be drained.	Replace the battery.

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# Common Problems and Solutions for Power Supplies

Identify the Problem

The computer will not turn on.

The computer reboots, turns off unexpectedly; or there is smoke or the smell of burning electronics.

The computer will not turn on

Probable Causes	Possible Solutions
The computer is not plugged in to the AC outlet.	Plug the computer into a known good AC outlet.
The AC outlet is faulty.	Plug the computer into a known good AC outlet.
The power cord is faulty.	Use a known good power cord.
The power supply switch is not turned on.	Turn on the power supply switch.
The power supply switch is set to the incorrect voltage.	Set the power supply switch to the correct voltage setting.
The power button is not connected correctly to the front panel connector.	Correctly orient the power button to the front case panel connector and reconnect.
The power supply has failed.	Install a known good power supply.

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# Common Problems and Solutions for CPUs and Memory

### Identify the Problem

The computer will not boot or it locks up.

The CPU fan is making an unusual noise.

The computer reboots without warning, locks up, or displays error messages.

After upgrading from a single core CPU to a dual core CPU, the computer runs more slowly and only shows one CPU graph in the Task Manager.

A CPU will not install onto the motherboard.

The computer does not recognize the RAM that was added.

After upgrading Windows, the computer runs very slowly.

### The computer will not boot or it locks up

Probable Causes	Possible Solutions
The CPU has overheated.	Reinstall the CPU. <ul style="list-style-type: none"><li>• Replace the CPU fan.</li><li>• Add fan(s) to the case.</li></ul>
The CPU fan is failing.	Replace the CPU fan.
The CPU has failed.	Replace the CPU.

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# Common Problems and Solutions for PCs

## Common Problems and Solutions for Displays

Identify the Problem

Display has power but no image on the screen.

The images on the display have distorted geometry.

The display is flickering.

The display has a "ghost" image.

The image on the display looks dim.

Images on a display screen are distorted.

Pixels on the screen are dead, or not generating color.

The monitor has oversized images and icons.

The image on the screen appears to flash lines or patterns of different color and size (artifacts).

In a multiple monitor setup, the displays are not aligned or are incorrectly oriented.

Color patterns on a screen are incorrect.

The projector overheats and shuts down.

The display is in VGA mode.

Display has power but no image on the screen

Probable Causes	Possible Solutions
Video cable is loose or damaged.	Reconnect or replace video cable.
The computer is not sending a video signal to the external display.	Use the Fn key along with the multi-purpose key to toggle to the external display.

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# Personal Reference Tools

- Personal reference tools include troubleshooting guides, manufacturer manuals, quick reference guides, and repair journals. In addition to an invoice, a technician keeps a journal of upgrades and repairs:
- **Notes** - Make notes as you go through the troubleshooting and repair process. Refer to these notes to avoid repeating steps and to determine what needs to be done next.
- **Journal** - Include descriptions of the problem, possible solutions that have been tried to correct the problem, and the steps taken to repair the problem. Note any configuration changes made to the equipment and any replacement parts used in the repair. Your journal, along with your notes, can be valuable when you encounter similar situations in the future.
- **History of repairs** - Make a detailed list of problems and repairs, including the date, replacement parts, and customer information. The history allows a technician to determine what work has been performed on a specific computer in the past.

# Internet Reference Tools

The Internet is an excellent source of information about specific hardware problems and possible solutions:

- Internet search engines
- News groups
- Manufacturer FAQs
- Online computer manuals
- Online forums and chat
- Technical websites

# Apply Troubleshooting Process to Computer Components and Peripherals

## Advanced Problems and Solutions for Hardware

### Instructions

Click a problem on the left side of the screen to see probable causes and possible solutions. At any time, click another problem on the left side of the screen. To see a PDF of the entire table, click the Show PDF button on the lower right corner of the screen.

#### Identify the Problem

RAID cannot be found.

RAID stops working.

The computer exhibits slow performance.

The computer does not recognize a removable external drive.

After updating the CMOS firmware, the computer will not start.

The computer reboots without warning, locks up, or displays error messages or the BSOD.

After upgrading from a single core CPU to a multi-core CPU, the computer runs slower and only shows one CPU graph in Task Manager.

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# Lab – Using a Multimeter and a Power Supply Tester

In this lab, you will learn how to use and handle a multimeter and a power supply tester.



## Lab – Troubleshoot Hardware Problems

In this lab, you will diagnose the cause of various hardware problems and solve them.

# 4.3 Chapter Summary

# Chapter 4: Preventive Maintenance and Troubleshooting

## 4.1 Preventive Maintenance

- Explain why preventive maintenance must be performed on personal computers.
- Describe PC preventive maintenance.

## 4.2 Troubleshooting Process

Troubleshoot problems with PC and Peripheral devices

- Describe each step of the troubleshooting process.
- Identify common problems and solutions for PCs.
- Troubleshoot computer components and peripherals using the six-step troubleshooting process.

