Objectives

- In this session, you will learn to:
  - Identify common hardware and software tools used by professional personal computer technicians.
  - Identify the best practices for PC technicians to follow to promote electrical safety.
  - Identify the best practices for PC technicians to follow to promote environmental safety and proper handling of materials.
  - Identify and apply the general preventative maintenance best practices that PC technicians should employ.
  - Identify the general diagnostics and troubleshooting best practices that PC technicians should employ.
  - Identify best practices for PC technicians to use to communicate appropriately with clients and colleagues and conduct business in a professional manner.

Tools of the Trade

- The common hardware and software tools used by professional personal computer technicians are:
  - Multimeters
  - Loopback plugs
  - Hardware toolkit
  - Software diagnostic tools

Multimeters

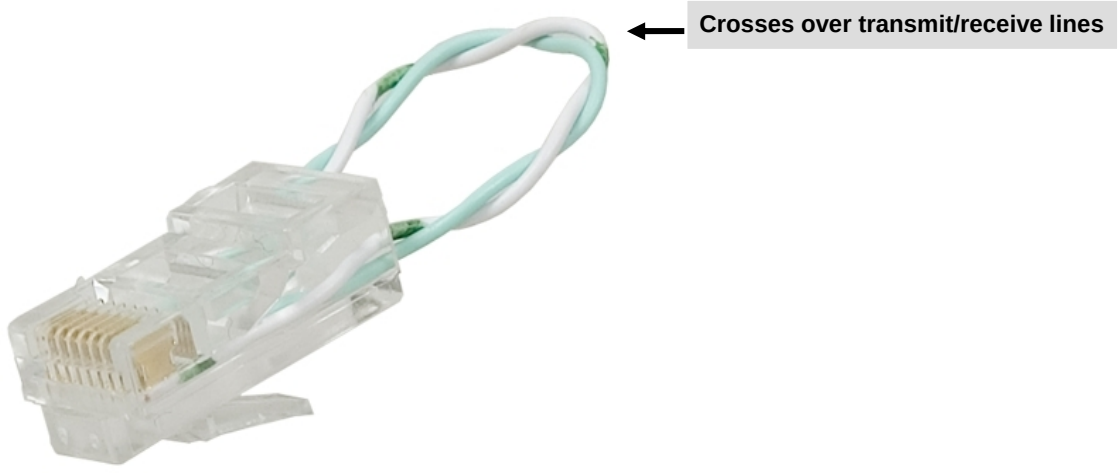
- A ***multimeter*** is an electronic instrument used to measure voltage, current, and resistance.

Digital multimeter

Analog multimeter

Loopback Plugs

- A ***loopback plug*** is a special connector used for diagnosing transmission problems that redirects electrical signals back to the transmitting system.

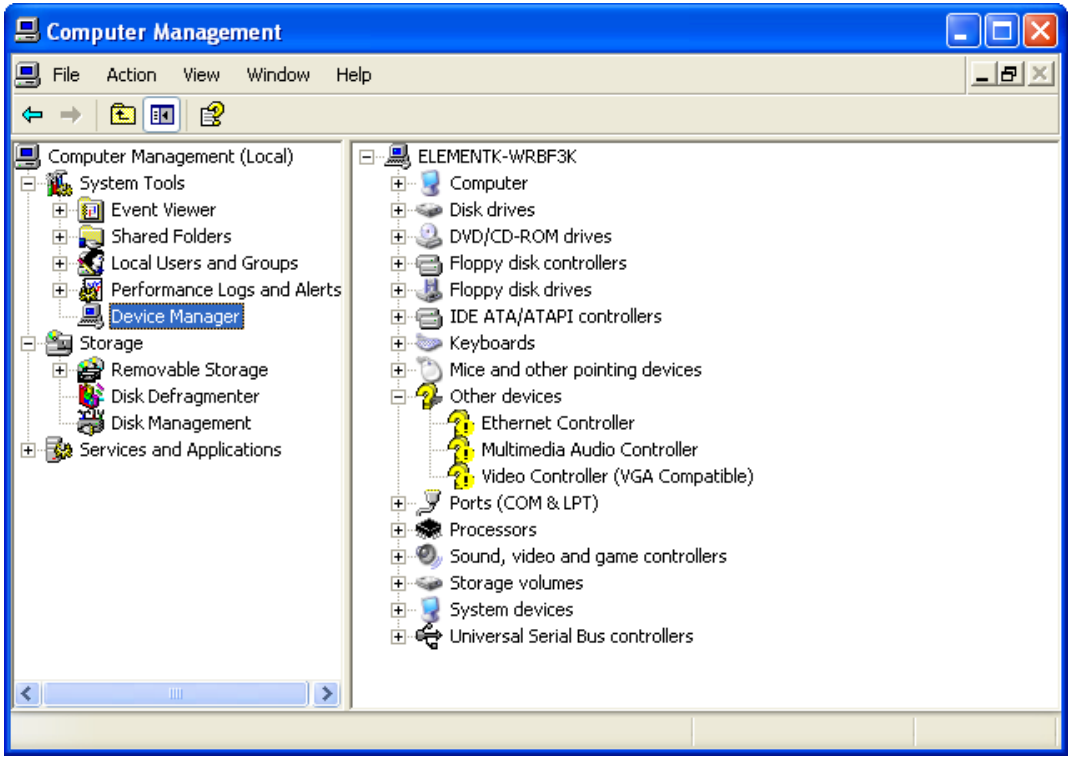


Types of Hardware Toolkits

- The different types of hardware toolkits that are commonly used in PC maintenance and repair are:
  - Basic
  - Network
  - Circuit board

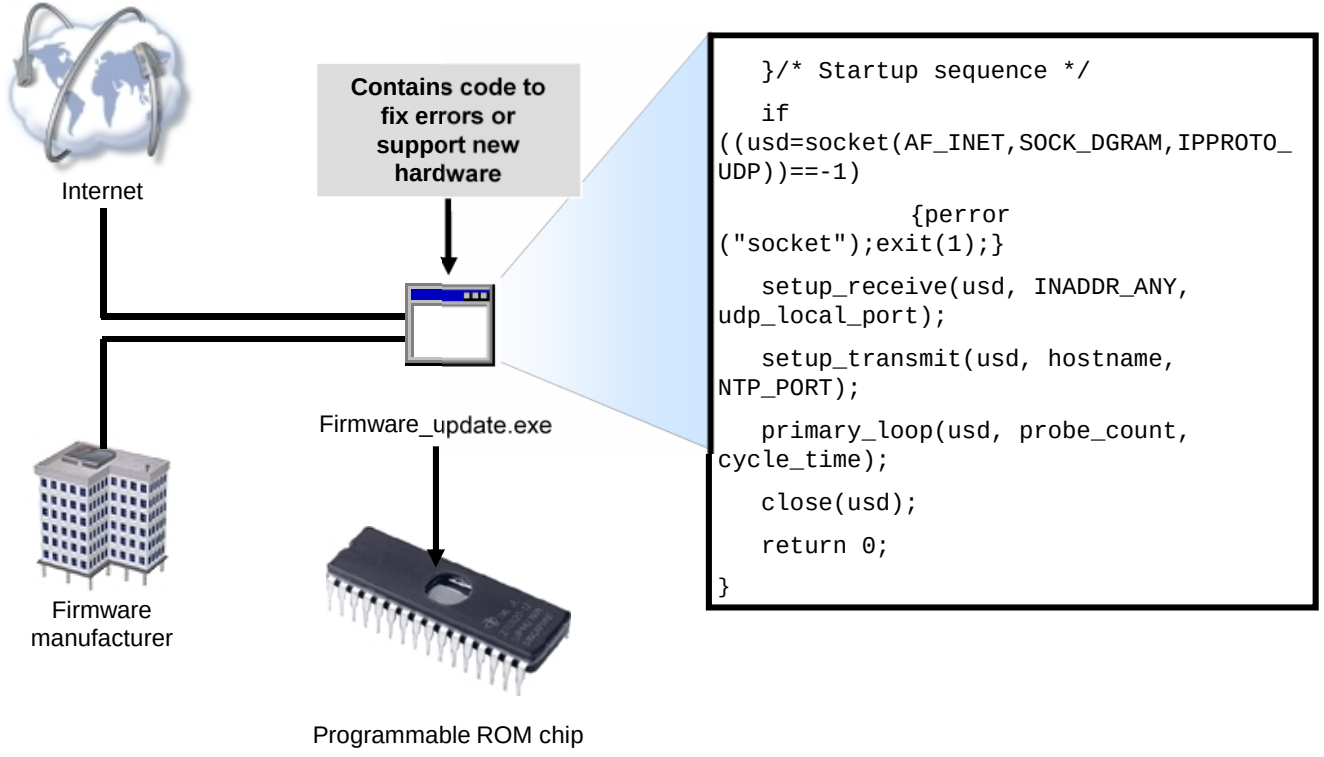
Software Diagnostic Tools

- A ***software diagnostic tool*** or ***utility*** is a computer repair tool that contains software routines that test hardware and software components for problems.



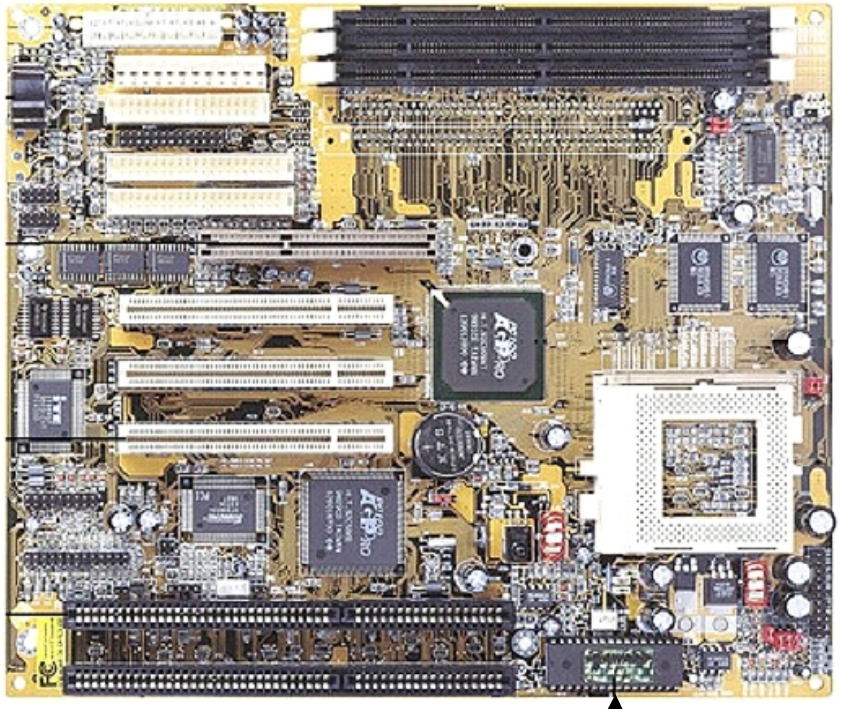
Firmware

- ***Firmware*** is software stored in memory chips that retains data whether or not power to the computer is on.



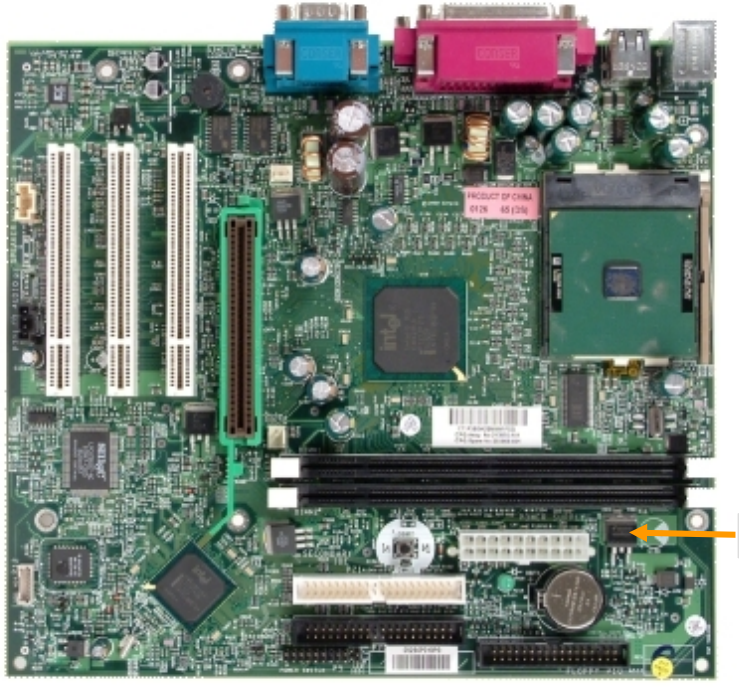
The System BIOS

- A ***Basic Input/Output System*** ***(BIOS)*** is a set of instructions that is stored in Read Only Memory and that is used to start the most basic services of a computer system.



CMOS RAM

- ***Complementary Metal Oxide Semiconductor RAM*** ***(CMOS RAM)*** is special memory that has its own battery to help it keep track of its data even when the power is turned off.



The Power-On Self Test (POST)

- ***POST*** is a built-in diagnostic program that is run every time a personal computer starts up.
- The following hardware components are checked during POST:
  - Power supply
  - CPU
  - BIOS
  - CMOS RAM
  - Memory
  - I/O bus or I/O controller

Hard Drive Self Tests

- HDD manufacturers provide a diagnostic tool that enables a hard disk drive to test itself when the computer starts.
- HDD self test can be:
  - Built into drive's firmware
  - Separate utility available for download from the drive manufacturer's website

Software Diagnostic Tests

- Software diagnostics tests assist you in detecting, repairing, and preventing hardware and software problems.

Electrical Safety

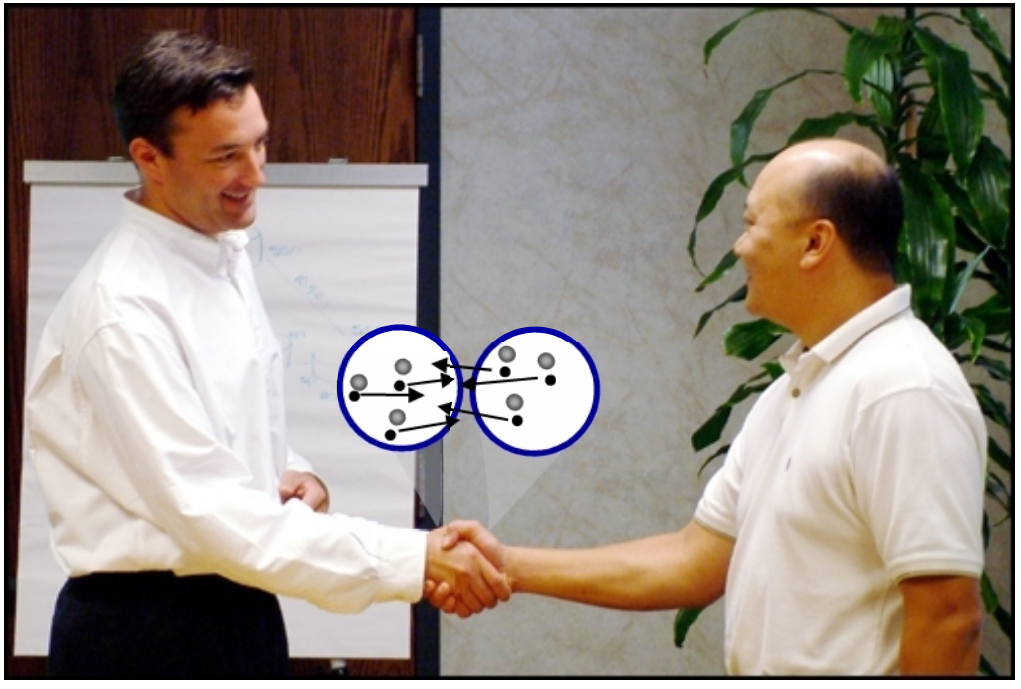
- The most common electrical states and electrical hazards which PC technicians face are:
  - Static Electricity
  - Electrostatic Discharge (ESD)
  - Electrical Hazards
    - Electrocution
    - Electric shock
    - Burns
    - Collateral injuries

Static Electricity

- Static electricity is a build-up of a stationary electrical charge on an object.

Electrostatic Discharge

- Electrostatic discharge (ESD) occurs when electrons rush from one body with a static electrical charge to another with an unequal charge.



ESD Prevention Techniques

- You can protect against ESD in your work environment by:
  - Eliminating unnecessary activities that create static charges.
  - Removing unnecessary materials that are known charge generators.
  - Using anti-static vacuums for cleaning computer components.
  - Using anti-static materials.
  - Grounding conductive materials.
  - Using anti-static bags to store computer components.
  - Using an air ionizer, which releases negative ions into the air.
  - Humidifying the air to speed up static discharge from insulators.
  - Grounding yourself before touching electronic equipment.

An ESD Toolkit

- An ESD-protection equipment includes:
  - Wrist or ankle strap
  - Grounded floor mat or grounded work-surface mat
  - Anti-static bags
  - ESD smock

Electrical Hazards

- The following are some potential electrical hazards you should be aware of when servicing a PC:
  - Electrocution (fatal)
  - Electric shock
  - Burns
  - Collateral injuries

Environmental Safety and Materials Handling

- Some potential environmental hazards you might face as a PC technician are:
  - Atmospheric Hazards
  - Situational Hazards
  - Physical Hazards
  - Chemical Hazards
  - Liquid Hazards

Safety Precautions for Physical Hazards

- To minimize the physical hazards associated with computing environments, you should understand the following recommendations:
  - Use cord protectors to prevent tripping
  - Laser
    - Never point a laser beam in someone's eyes.
    - Never look directly at a laser beam.
    - Never disable safety mechanisms when servicing a device with an embedded lasers.

Safety Precautions for Physical Hazards (Contd..)

- Eyestrain
  - Special glasses
  - Artificial tears
- Noise
  - Keep printers separate
  - Noise reduction hoods

Chemical Hazards

- To minimize the chemical hazards associated with computing environments, you should understand the following recommendations:
  - If you spill laser printer toner avoid cleaning it up with regular vacuum cleaner. Do not use warm water to wash toner off from hands.
  - Thoroughly wash your hands after handling capacitors.
  - Handle batteries carefully as they contains dangerous chemicals.

Liquid Hazards

- Hazardous liquids are used sometimes to clean or condition computing equipments. Always read the labels carefully and follow instructions of using hazardous liquids.

The Materials Safety Data Sheet (MSDS)

- ***MSDS*** give users and emergency personnel information about the proper procedures of storage and handling of a hazardous substance.
- MSDS includes the information about the following items:
  - The name of the material
  - The physical properties of the material
  - Any hazardous ingredients contained in the material
  - Reactivity data, such as fire and explosion data
  - Procedures for spills or leaks
  - Special precautions
  - Health hazards
  - Special protection requirements

Incident Reports

- An ***incident report*** is a record of any instance where a person is injured or computer equipment is damaged due to environmental issues.

Hazardous Material Disposal Procedures

- Proper disposal of hazardous materials is an essential part of maintaining a safe work environment.
  - Display devices, Liquid cleaners and empty containers
    - Follow your company's guidelines for disposing of CRT tubes and liquid cleaning materials & containers.
  - Toner
    - Empty toner cartridges should not be tossed into the trash because of the damage the residual chemicals can do to the environment.
  - Ozone filter
    - Follow the manufacturer's recommendations for replacement and disposal of a laser printer's ozone filter.
  - Batteries
    - Used batteries should not be tossed into the trash, but should be disposed of following your company's guidelines.

Perform Preventative Maintenance

- Some general considerations for preventive maintenance that apply to virtually all components are:
  - Visual/audio inspection
  - Driver/firmware updates
  - Scheduling preventative maintenance
  - Using appropriate repair tools and cleaning materials
  - Ensuring proper environment

Computer Component Maintenance Techniques

- The following are some preventative maintenance techniques you can use to maintain personal computer components:
  - Use a power strip, surge protector, or Uninterruptible Power Supply (UPS)
  - Clean peripheral components
  - Clean internal system components

Cleaning Compounds and Materials

- The following are the cleaning materials for computers:
  - Monitor and keyboard wipes
  - Lint-free cloths
  - Rubbing alcohol
  - Household cleaners
  - Cotton swabs
  - Window cleaners
  - Toothpicks
  - Artist's paint brush
  - Compressed air
  - Computer vacuum
  - Toner cloth
  - Latex gloves

Activity 3-4

Activity on Performing Preventative Maintenance

Activity 3-5

Activity on Using a UPS

Troubleshooting Theory

- The following are the general factors that will apply in any troubleshooting situation:
  - Backups
  - Assessment
  - Simple solutions
  - Research
  - Documentation

The Troubleshooting Process

- The troubleshooting process moves through the following logical stages:
  - Identify the problem.
  - Analyze the problem, including potential causes (hardware, software, or both).
  - Test related components to solve the problem or identify a likely solution.
  - Implement the identified solution.
  - Evaluate results.
  - Document activities and outcomes.
  - Verify user satisfaction.

Communication Skills

- Using the proper communication skills when dealing with clients and colleagues provides professional environment that is conducive to solving the problem at hand.
  - Verbal communication includes:
    - Use test and discretion in communication
    - Use clear, concise, and direct statements
    - Avoid using jargons
    - Use timing to set the pace of conversation
  - Non-verbal communication includes:
    - Use proper body language
    - Use the proper level of eye contact
    - Use facial expressions to reinforce the spoken message
    - Be aware of physical positioning and gesture
    - Be aware of the effect of tone and voice

Communication Skills (Contd.)

- Listening skill includes:
  - Listen to the user
  - Allow the user to complete statments
  - Employ passive listening techniques
  - Employ active listening techniques

Professional Conduct

- Acting in a professional manner when dealing with colleagues and clients provides a work environment where problems can be solved efficiently. The following
  - Appearance
  - Respect
  - Accountability
  - Confidentiality
  - Ethics
  - Honesty
  - Prioritizing
  - Verbal communication

Summary

- In this lesson, you learned that:
  - The common hardware and software tools used by professional personal computer technicians are:
    - Multimeters
    - A loopback plug
    - Hardware toolkit
    - Software diagnostic tools
  - The most common electrical states and electrical hazards which PC technicians face are:
    - Static Electricity
    - Electrostatic Discharge (ESD)
    - Electrical Hazards
      - Electrocution
      - Electric shock
      - Burns
      - Collateral injuries

Summary (Contd.)

- Some potential environmental hazards you might face as a PC technician are:
  - Atmospheric Hazards
  - Situational Hazards
  - Physical Hazards
  - Chemical and Liquid Hazards
- Using the proper communication skills when dealing with clients and colleagues.
- Acting in a professional manner when dealing with colleagues and clients.