13.1 – Troubleshooting Basics

13.2 – Troubleshooting the Hardware Box
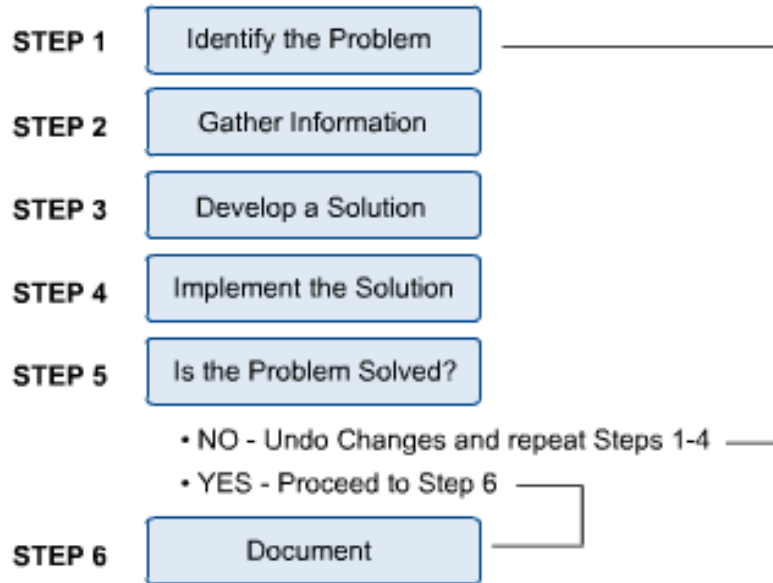
13.3 – Troubleshooting Peripheral Devices

BY

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Troubleshooting Basics

What is Troubleshooting?

STEP 1 — Identify the Problem

STEP 2 — Gather Information

STEP 3 — Develop a Solution

STEP 4 — Implement the Solution

STEP 5 — Is the Problem Solved?

- NO - Undo Changes and repeat Steps 1-4
- YES - Proceed to Step 6

STEP 6 — Document

- Effective troubleshooting uses techniques to diagnose and then fix computer problems.
- A series of logical steps speeds up the troubleshooting process.
- Rarely will simply guessing potential solutions for a problem work.
- Troubleshooting is a cycle.

Identify the Problem

- This step should provide a clear problem statement that defines the problem as a set of symptoms and associated causes.

- This is done by identifying the general symptoms and then determining the possible causes that could result in these symptoms.

- The outcome of this step should be a written set of ideas and possibilities.

Identify the Problem

- Identify symptoms and associated causes

- List ideas and possibilities (brainstorm)

- Create a clear and concise problem statement

Gathering Information

- The information gathered here will be used to develop a solution to the problem.

- A technician will be able to make better decisions when the problem has been accurately described.

Gathering Information

- Gather information from customer

- Gather information using diagnostic tools and software

- Reproduce problem (if possible)

- Determine if the problem is hardware or software related

- Document your observations and results

Developing a Solution

- The technician will assess the gathered data and its definition.

- The technician will use experience, logic, reasoning, and common sense to develop a solution.

Develop a Solution

- Compile gathered information

- Assess the information

- Consider the most likely cause

- Develop a solution based on your experience, and the information you gathered.

Implementing the Solution

- This step involves the technician working on the computer.

- The technician attempts their solution through hands-on manipulation of the computer components, which might be hardware and software.

Implement the Solution

- Backup critical data

- Start with the simple things first

- Make changes one at a time

- Reverse any changes that caused any adverse effects

Is the Problem Resolved?

- The technician is responsible for verifying that the system is operating correctly.
- If the system is operating properly, then the troubleshooting cycle ends successfully.
- If the system is not running correctly, the troubleshooting cycle will continue.
- If the technician needs more information, go back to identifying the problem (step one).

Is the Problem Solved?

- Perform test, visually, audibly inspect the computer

- Verify the computer problem is resolved

  - If the problem has been resolved
    - Show the user the problem is fixed
    - Document results

  - If the problem is still existing
    - Undo changes
    - Return to step one

Documenting the Solution

- It is important to always document all the changes that were introduced to the system as a result of solving one problem.

- This record can be the starting point for troubleshooting any future problems.

Document

- Document all changes made to system
- Document the initial problem and subsequent resolution
- Document when the problem was resolved

Troubleshooting Tools

- Every technician should have a good toolset.

- To correctly troubleshoot hardware problems, technicians will need to be equipped with the right tools.

- The average computer problem is not going to require sophisticated tools.

Diagnostic Software

Some of the more popular diagnostic programs:

- SpinRite
- Chekit
- PC Technician
- AMI Diags
- SiSoft Sandra

- There are many commercial software products available to assist in troubleshooting computer problems.

- Some of the more popular programs are:
  - SpinRite
  - Checkit
  - PC Technician
  - AMI Diags
  - SiSoft Sandra (freeware)

Disposal Actions

- Proper disposal practices should be undertaken when disposing of hazards materials.

- Technicians should be informed of the local regulations for the disposal of computer components.

- Chemicals, batteries, CRTs, and printer cartridges all need to be disposed of properly.

The following items should be disposed of properly:

- Chemicals

- Batteries

- CRTs

- Printer Cartridges

# Troubleshooting the Hardware Box

Overview of Field Replaceable Units (FRUs)

- Devices that can be replaced or added in the field are called field replacement units (FRU).

- These are common FRUs:
  - Monitors
  - Keyboard/mouse
  - Modular expansion cards
  - Most microprocessors
  - Power supply
  - RAM (such as DIMMs, SIMMs, RIMMs, and so on)
  - Floppy and fixed disk drives
  - Motherboard
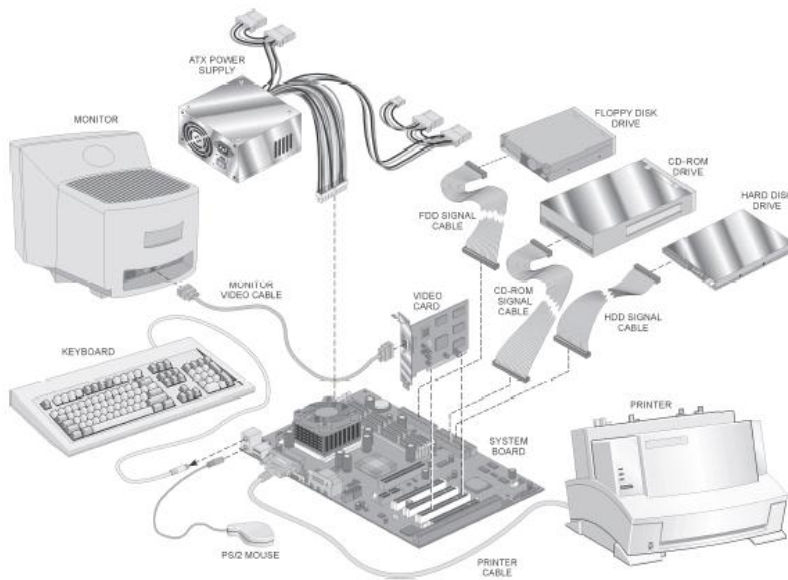
POST Errors

- Every time the computer is turned on, it runs through a Power-On Self-Test (POST).

- The POST is a series of self-diagnostic tests that the computer runs through to test the major hardware.

- The POST performs basic test routines on the motherboard and major hardware devices.

- It does not perform in-depth testing on the computer system.

- It can only detect major failures that will prohibit the bootup process.
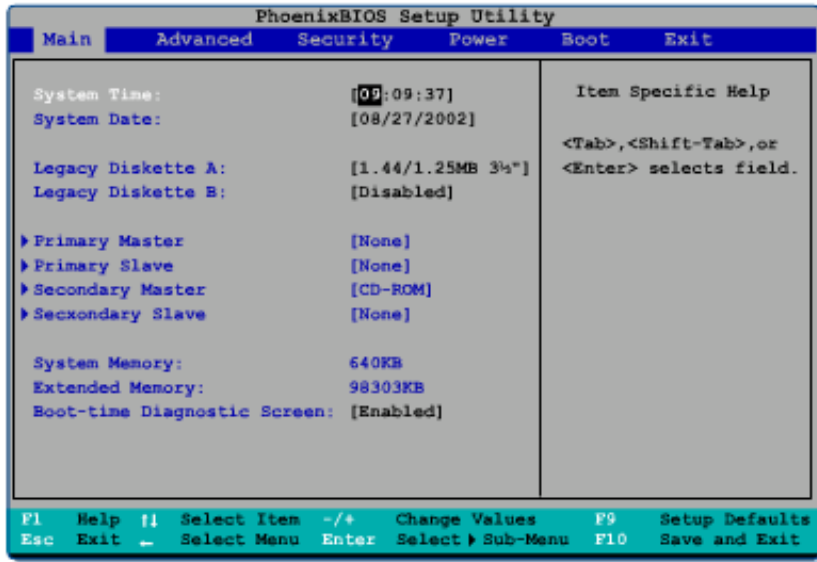
POST Errors
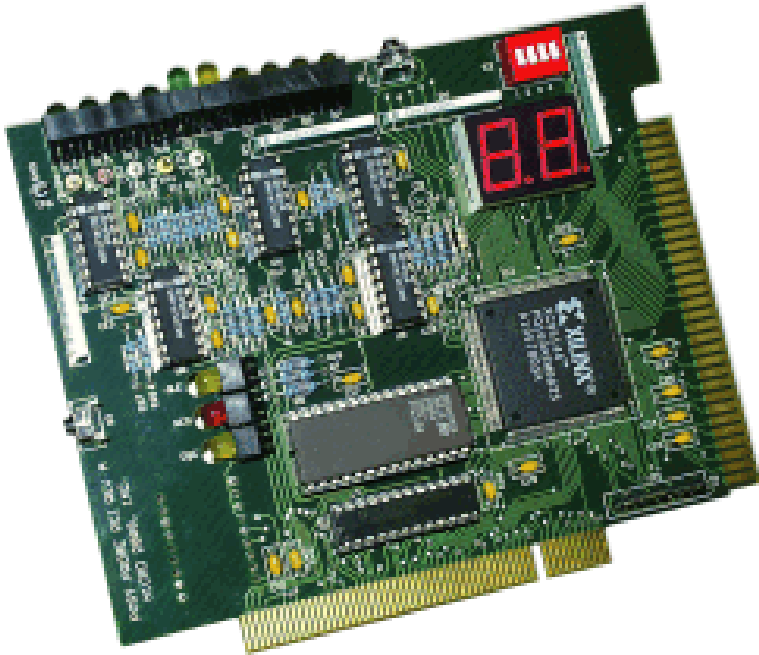
- A POST card is a device that helps troubleshoot computer problems that occur before the BIOS can report an error.
- There will be times when a computer fails before a BIOS error can be reported.
- A POST card is useful because it provides the technician with a digital readout of any POST errors.

CMOS/BIOS Errors

```
                PhoenixBIOS Setup Utility
 Main     Advanced    Security    Power    Boot    Exit

 System Time:              [09:09:37]          Item Specific Help
 System Date:              [08/27/2002]
                                               <Tab>,<Shift-Tab>,or
 Legacy Diskette A:        [1.44/1.25MB 3½"]   <Enter> selects field.
 Legacy Diskette B:        [Disabled]

▶Primary Master           [None]
▶Primary Slave            [None]
▶Secondary Master         [CD-ROM]
▶Secxondary Slave         [None]

 System Memory:           640KB
 Extended Memory:         98303KB
 Boot-time Diagnostic Screen: [Enabled]


 F1   Help   ↑↓  Select Item  -/+   Change Values   F9   Setup Defaults
 Esc  Exit   ←→  Select Menu   Enter Select ▶ Sub-Menu F10  Save and Exit
```

- The complementary metal oxide semiconductor (CMOS) or non-volatile random access memory (NVRAM) stores the systems startup configurations and parameters.

- To access the CMOS setup utility, press the setup key during the boot process.

- The setup key must be pressed early in the boot process, or the system will load the installed OS.

- The CMOS setup key is usually F1, F2, or Delete.

CMOS/BIOS Errors

CMOS Battery

- Clearing the CMOS memory is useful when the computer will not boot at all.
- The easiest way is to clear memory is to remove the CMOS battery.

1. Turn off the power on the computer.
2. Remove the CMOS battery from the motherboard.
3. Short the negative and positive connections (terminals) of the battery location on the motherboard
4. Replace the CMOS battery in its original position on the motherboard.
5. Turn the power on (reboot) the system.

CMOS/BIOS Errors

- A BIOS upgrade can include patches, fixes, additional features, and additional support for the latest devices that should resolve any problems.

- Special consideration must be taken before upgrading the BIOS.

- The motherboard is required to have flash BIOS and it must support the upgraded version.

- The BIOS chip also needs to support the upgrade version number.

- Only when these criteria are met can the BIOS be successfully updated.

Motherboard-Related Errors

- The motherboard coordinates the proper functioning of the system components.
- Troubleshooting a "dead" computer system is a process of elimination.
  - Scenario 1 - the computer will not boot and appears "dead"
  - Scenario 2 - while troubleshooting, DIP switches and jumpers were configured
  - Scenario 3 - an end user receives a "BIOS ROM checksum error"

CPUs
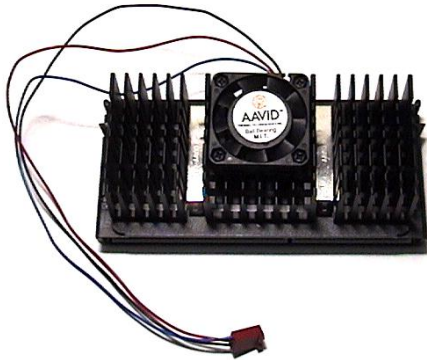
- Symptoms of a processor error can include slow performance, POST beep errors, or a system that is not operating properly.

- These errors usually indicate an internal error has occurred.

- Most CPUs will have an onboard fan.

- This provides cooling directly to the CPU.

CPUs

Socket 4 — PGA
Socket 5 — SPGA
Socket 6 — PGA
Socket 7 — SPGA
Socket 8 — SPGA
Socket 370 — SPGA
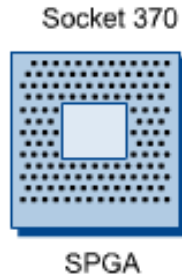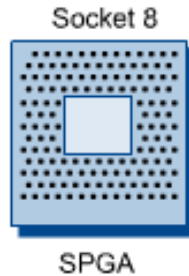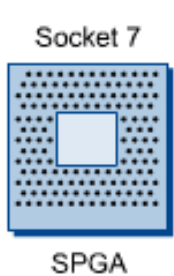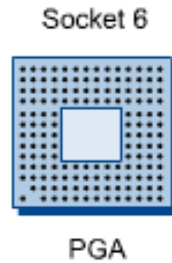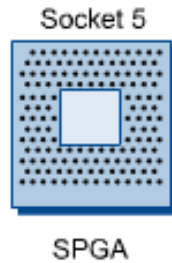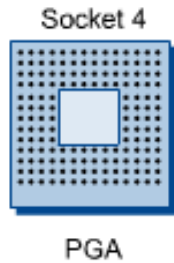
- CPUs must be set to receive the correct voltages to run properly. Motherboards that use Socket 5, Socket 7 or Super Socket 7 chips need to use voltage regulators.

- Typically, the voltage regulators are built into the board.

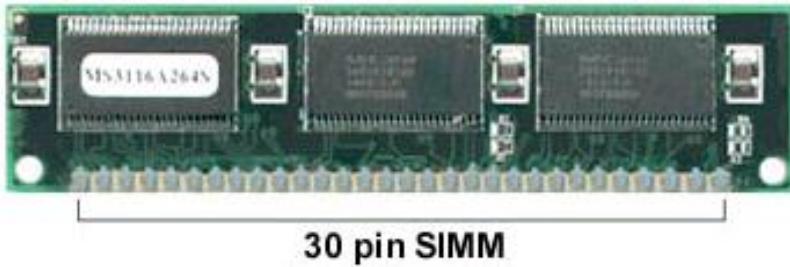- They must be set at the proper voltage, or the CPU can be damaged.
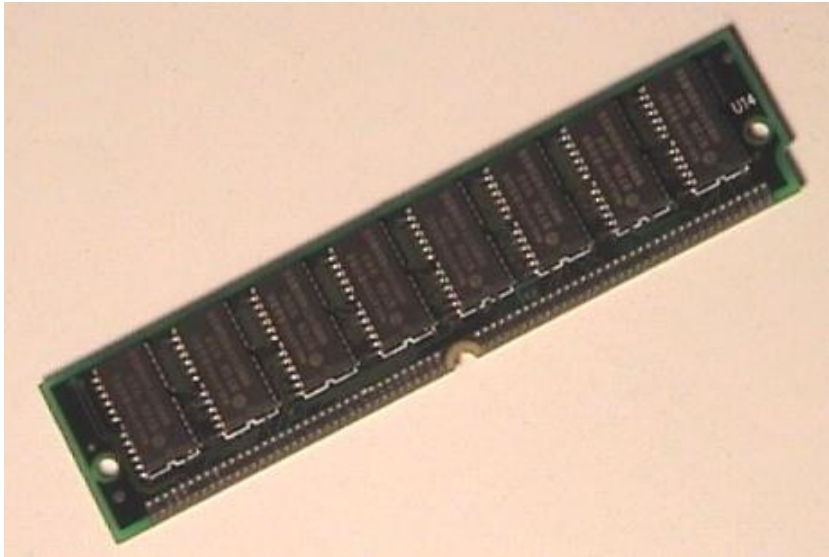
RAM

- SDRAM replaced DRAM, FPM, and EDO.

- SDRAM was an improvement because it synchronized data transfer between the CPU and memory.

- SDRAM allowed the CPU to process data while another process is being queued.
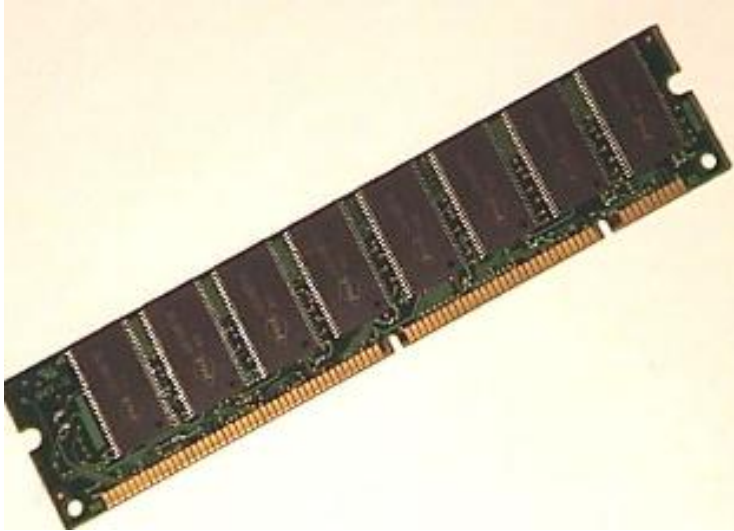
RAM

30 pin SIMM

- SIMM is a memory module with 72 or 30.
- SIMMs are considered legacy components and can be found in older machines.
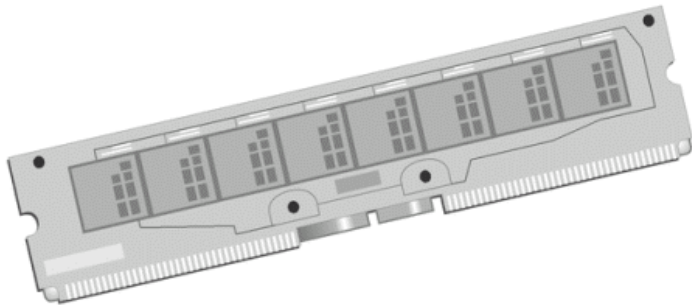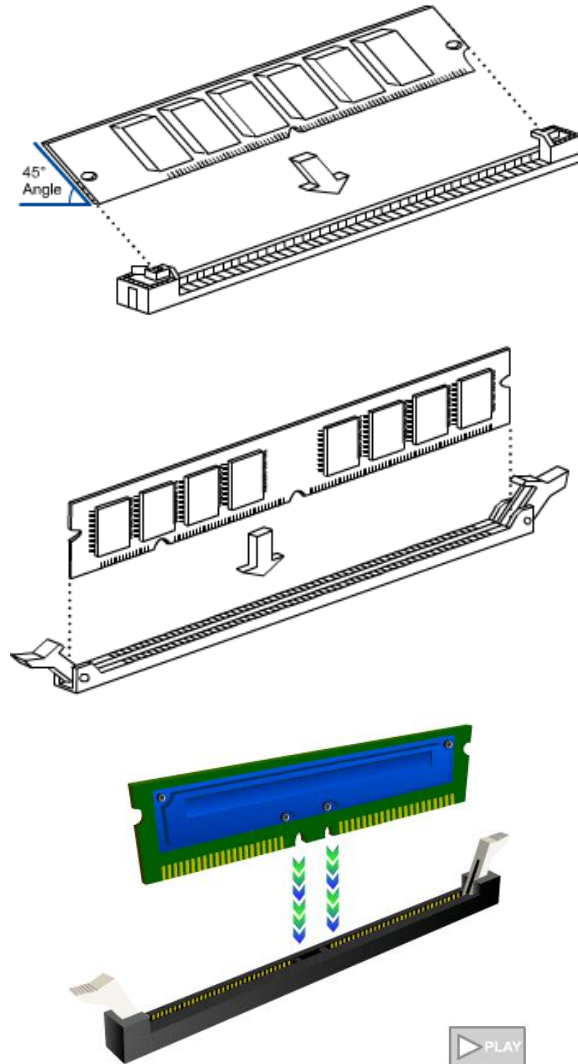
RAM

- **Dual Inline Memory Module (DIMM)** – DIMM is a memory module with 168 pins.
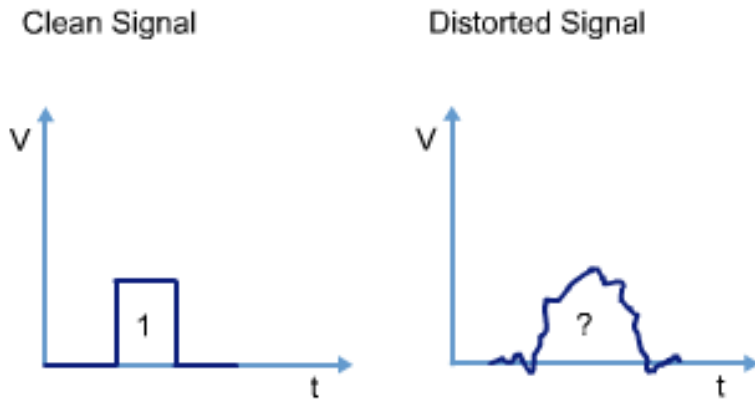- DIMMs are widely used today and support 64-bit transfer.

- **Rambus Inline Memory Module (RIMM)** – RIMM is a 184-pin memory module that uses only the (RDRAM).

RAM

- Some motherboards require memory modules to be installed in a particular slot order, or jumpers to be set (SIMMs, DIMMs, and RIMMs).

Cable Issues

Clean Signal

Distorted Signal

- Many cabling issues can be obvious to determine because they are usually due to faulty physical connections.
- Reconnecting cables can resolve many of these problems.
- Another common cable issue is mismatched interfaces.
- Always verify that the proper cable is being used with the proper interface.
- The best way to verify that the proper cabling is being used is to check the writing on the cable.

Ports

Serial Parallel USB AGP
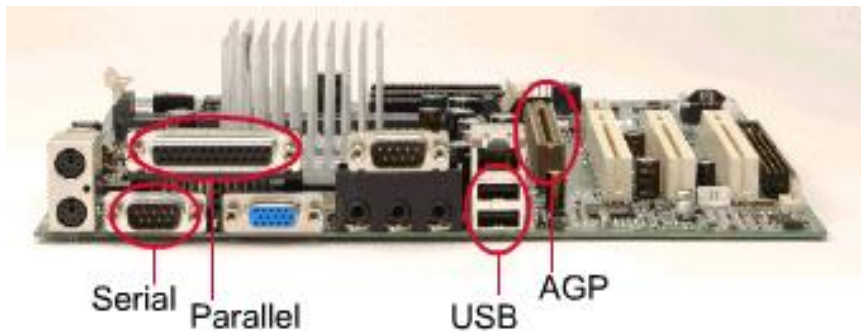
- Port problems are typically diagnosed with a slow performing or inoperative peripheral device.
- Common symptoms include the following:
  - Completely inoperative port
  - "Device not found error" error message
  - Peripheral device is slow, or performance is bad

The Video System


Female DB-15 Connections
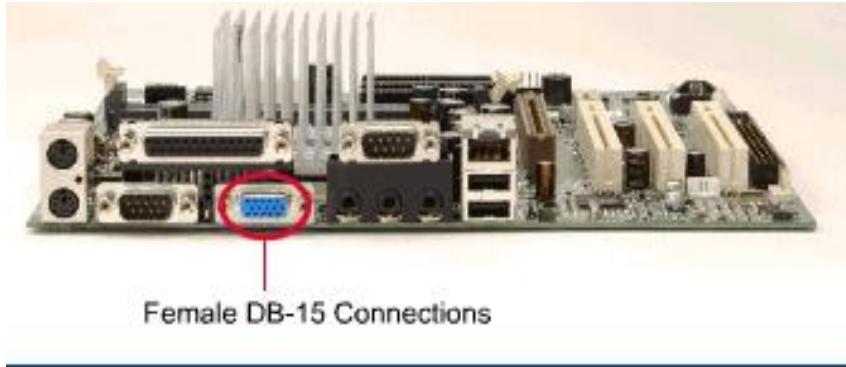
- Troubleshooting the video display should start outside the computer case.
- Begin by verifying that the monitor is turned-on and plugged into a functional wall outlet or socket.
- Test the wall socket by plugging in a known good device.
- The female DB-15 located on the back of computer case is the most common monitor connection.

Secondary Storage Devices

- Some computers will be configured with two different hard drives.
- If two hard drives are configured on the same ribbon cable, they must have a master slave relationship.
- Cable Select (CSEL) is an option that decides master/slave hard drive relationships based on the position of the drive on the IDE cable.
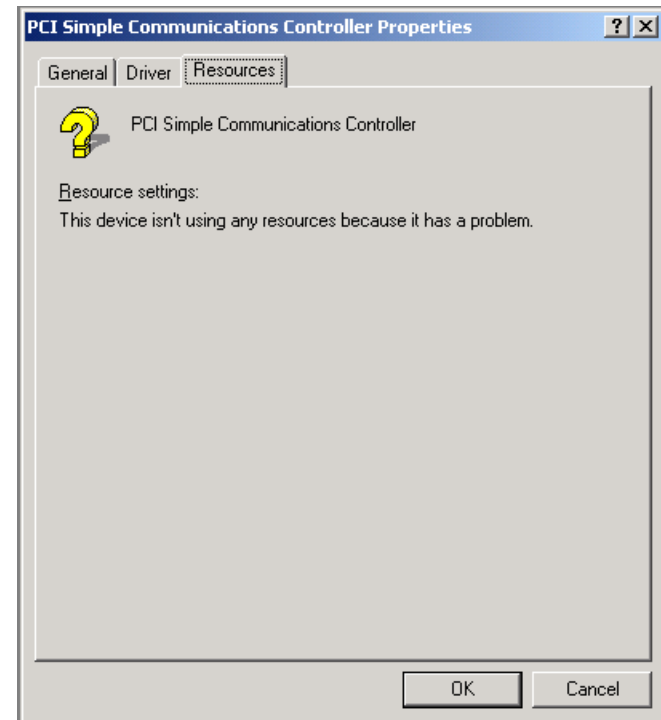
Sound Cards

Creative Sound Blaster PCI
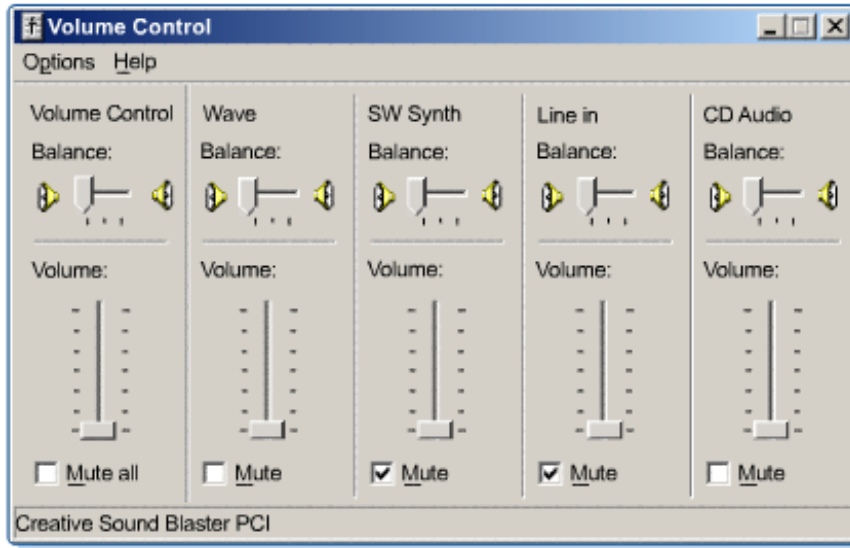
- Legacy sound cards had well documented interrupt conflicts with other devices, typically peripheral devices.

- Hardware errors can be caused by a physically damaged sound card and improperly set jumpers.
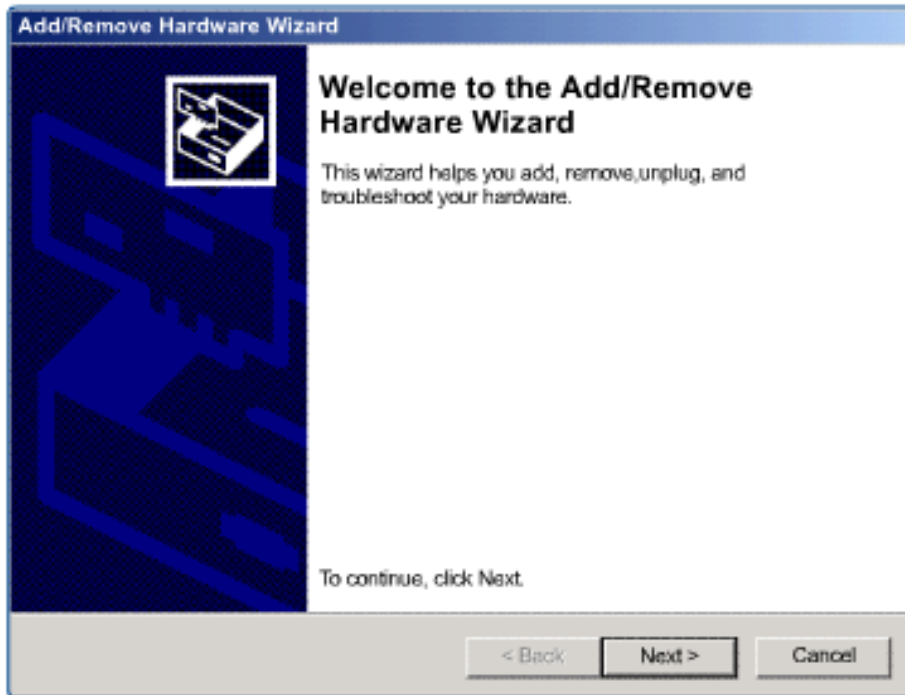
- Today, most sound cards are plug-and-play (PnP).

Sound Cards

- From the Device Manager, select the **Sound, video and game controllers** list.

- If the system detects a conflict, it will place a yellow question mark next to the device.

Sound Cards

Add/Remove Hardware Wizard

Welcome to the Add/Remove Hardware Wizard

This wizard helps you add, remove, unplug, and troubleshoot your hardware.

To continue, click Next.

< Back   Next >   Cancel
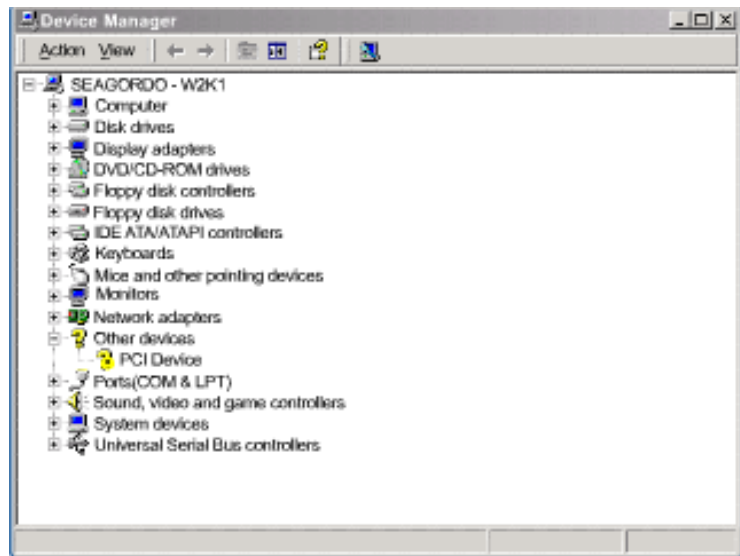
- Check the Control Panel Device Manager to see that the correct audio driver is installed, and that the settings match those recommended by the sound card manufacturer.

- If the drivers are missing or wrong then they must be added to the system through the Control Panel Add/Remove Hardware wizard.

Power Supply Issues
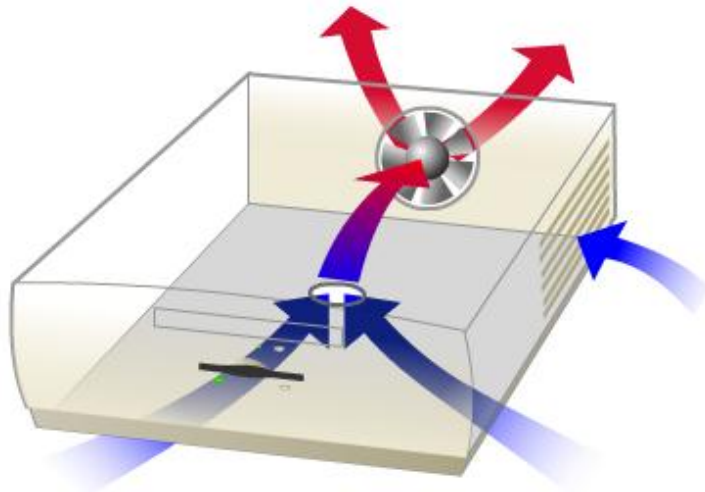
- The power supply converts the current coming from the wall jack from alternating current (AC) into direct current (DC).

- An onboard fan attached to most power supplies cools the power supply and internal components.

Box Cooling Issues
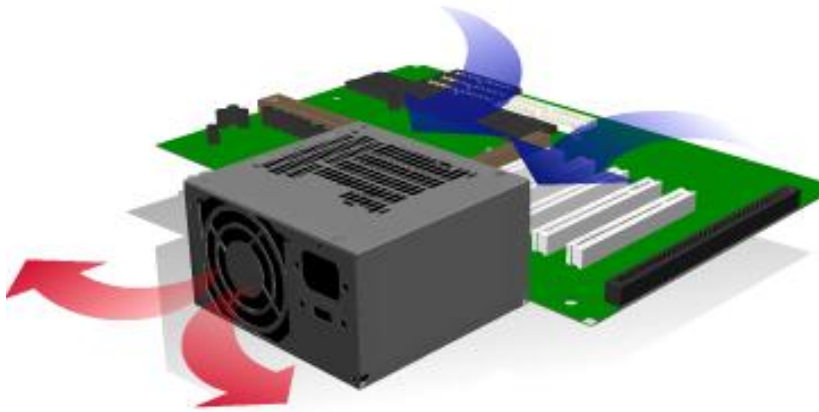
- Computer components are susceptible to heat.
- The components operate at high speeds and in tight spaces.
- The computer case plays an important role in cooling the internal components and is designed with cooling features.
- Computer cases have air intake vents, which are usually cut into the sides or front of the cases.

Troubleshooting Peripheral Devices

Input Devices

Problem/ Error	Solution
Keyboard is running on legacy equipment and isn't supported.	Keyboards are either AT or XT compliant. However, an AT keyboard will not work with an XT compliant keyboard, and vise-versa. An AT compliant keyboard is a 286 or higher system, for this discussion. However, some can work with both using a configuration Dipswitch or a normal slider switch located on the bottom of the keyboard. Check to see if these switches are set properly when troubleshooting keyboards.
Gate A20 Failure	Indicates a 286 or higher system must switch to protected mode to use more than 1MB of RAM. Solution - verifying configuration XT or AT. Replace with keyboard verified in good working condition. Finally, replace the motherboard.
Voltage Issue	Troubleshooting the keyboard connections to the motherboard. Checking the voltage. Clock pin measure between +2.0 V and +5.5 V. Power Pin should be between +2.0 V and +5.5 V. Data Pin between +4.8 V and +5.5 V.

- Most input devices are detected at startup.
- Due to the heavy workload and numerous movable components, keyboard failures are frequent.
- The best protection against keyboard errors is proactive maintenance.

Input Devices

- Mice are prone to bad performance mainly because of dust and dirt corroding the components.

- Maintain a clean environment and clean the mouse frequently for optimal performance.

Problem/ Error	Solution
Unrecognized or malfunctioning mouse	Install or outdated device driver. Also, check to make sure the mouse is properly connected.
Erratic movement of the cursor	Clean the ball located on the bottom of the mouse. Also, the technician might be required to reconfigure the mouse settings. In a Windows environment this is done through the Control Panel. If the problem still exists, replace the mouse.

Input Devices

Problem/ Error	Solution
Bad software installation; device isn't recognized.	Incomplete software installation. Re-install software and necessary drivers.
Quality of image is low on monitor.	Scanners use 24-bit color (with 16 million color variations) and monitor resolution might be set too low. Change monitor settings to display true color (24 bit).
Slow or bad performance	Problem might be that two devices are daisy chained (chaining several devices, e.g. printer and scanner, on one cable). To access more than one peripheral on a parallel port, use a switchbox, which is a device that switches between the two peripherals, using each device independent of each other.
Vertical streak on image	Scanners will pick up dust or smudge on glass. Use a damp cloth to clean glass. Make sure it is free of dust, dirt and other particles.

Problem/ Error	Solution
Cable can't supply the necessary data transfer rates.	Troubleshoot with a cable that has been verified to work.
Legacy equipment doesn't support new product requirements or there is a hardware defect.	Upgrade the ports.
Outdated or bad drivers	Update drivers or reload driver.
IRQ conflict; two devices sharing same device.	Remove a conflicting device (ISA cards are often the problem -- IRQ5 conflicts with LPT 2 or IRQ 7 conflicts with LPT1).
Wrong mode selected (EPP, ECP, or EPP/ECP modes)	Use an IEEE-1284 compatible cable, which supports all parallel port modes.

- Most scanner errors are either a direct result of a bad software install or an improperly connected device.

- Parallel ports will rarely fail. However, a more common problem is slow performance from a parallel device.

Output Devices

- An output device displays or prints data processed by the computer.

- To efficiently troubleshoot laser printers, technicians must be knowledgeable of the components of a laser printer.

| Common Laser Printer Problems	
Printer is online and properly connected but does not print.	Toner cartridge might be empty. If it is empty, replace it.
Printing vertical lines.	Toner cartridge is most likely broke and needs to be replaced.
Pages are dirty.	Toner cartridge is most likely broke and needs to be replaced.
Paper is not feeding correctly.	Could be caused by a paper jam. Manually feed the paper or change the software configurations.

SCSI Interface Issues

SCSI Type	Maximum Cable Length (Meters)	Maximum Speed(MBps)	Maximum Number of Devices
SCSI-1	6	5	8
SCSI-2	6	5-10	8 or 16
Ultra SCSI-3, 8-/16-bit	1.5	20/40	8/16
Ultra-2 SCSI	12	40	8
Wide Ultra-2 SCSI	12	80	16
Ultra-3 (Ultra160/m) SCSI	12	160	16

- SCSI drives require a separate controller from the IDE controller.
- SCSI devices must have unique SCSI Ids.
- A common source of malfunction of SCSI devices is when specifications are ignored when installing and configuring these devices.

Internet/Network Access Devices
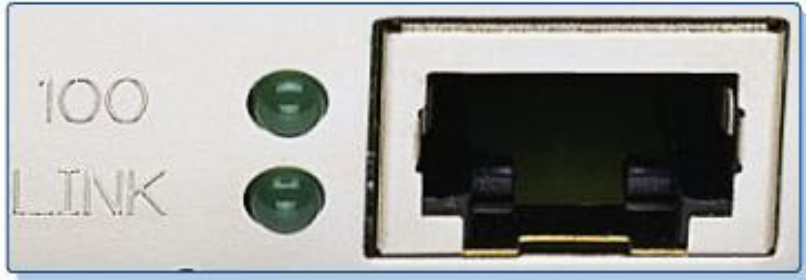
- The NIC and modem provide basic troubleshooting information by using onboard lights.

- Most NICs have a green blinking light that signifies data is being processed.

- The blinking green light tells the technician that the NIC is recognized and properly set in its slot.

CISCO SYSTEMS

EMPOWERING THE
INTERNET GENERATION