Chapter 2 Solutions

Reviewing the Basics

1. When taking a computer apart, why is it important to not stack boards on top of each other?

Answer: You could accidentally dislodge a chip.

2. Why is it important to remove loose jewelry before working inside a computer case?

Answer: Because the jewelry might get caught in cables and components as you work.

3. When assembling a desktop computer, which do you install first, the drives or the motherboard?

Answer: Drives

4. What is the purpose of raised screw holes or standoffs installed between the motherboard and desktop case?

Answer: To prevent a short that might happen if lines or circuits on the bottom of the motherboard touch the case when the system is running.

5. When installing the front panel wires to the motherboard front panel header, how do you know which pins to use for each wire if the pins on the header are not labeled?

Answer: You can find this information in the motherboard user guide.

6. How many pins does the CPU auxiliary power connector on a motherboard have?

Answer: 4 pins

7. Why are laptops usually more expensive than desktop computers with comparable power and features?

Answer: Laptops use compact hard drives that can withstand movement even during operation, and small memory modules and CPUs that require less voltage than regular components. In general, it costs more to make similar components that take up less space and require less power.

8. Why is the service manual so important to have when you disassemble a laptop?

Answer: The service manual for the laptop model explains how to open the case and remove components without damaging the case or components. Each laptop model is proprietary in design and the ways to disassemble a laptop vary widely.

9. When a laptop internal device fails, what three options can you use to deal with the problem?

Answer: Return the laptop to a service center for repair

Substitute an external component for the internal component

Replace the internal component

10. After you have removed the AC adapter and all peripherals, what is the next component you should always remove before servicing any internal laptop components?

Answer: The battery pack

Thinking Critically

1. You disassemble and reassemble a desktop computer. When you first turn it on, you see no lights and hear no sounds. Nothing appears on the monitor screen. What is the most likely cause of the problem? Explain your answer.

a. A memory module is not seated properly in a memory slot.

b. You forgot to plug up the monitor's external power cord.

c. A wire in the case is obstructing a fan.

d. Power cords to the motherboard are not connected.

Answer: d. Power cords to the motherboard are not connected. All the other answers would still cause the system to start the boot even though it might fail. If the motherboard is not getting power, it will not start the boot.

2. You are looking to buy a laptop on a budget and want to save money by not purchasing an extended service agreement with the manufacturer beyond the first year. What should you consider when choosing manufacturers to limit your search? Which manufacturers would you choose and why?

Answer: You want to be able to maintain and repair the laptop on your own after the warranty expires. You will need access to documentation and new parts. Consider that two manufacturers, Lenovo and Dell, provide their service manuals online free of charge. They also provide documentation about how their laptops are disassembled and options to purchase proprietary parts without first being an authorized service center.

3. A four-year old laptop will not boot and presents error messages on screen. You have verified with the laptop technical support that these error messages indicate the motherboard has failed and needs replacing. What is the first question you should ask yourself before performing the repair?

a. Will replacing the motherboard be more costly than purchasing a new laptop?

b. Can you find a replacement motherboard?

c. Can you find the service manual to show you how to replace the motherboard?

d. Is the laptop still under warranty?

Answers:

All questions are good questions to ask before attempting the repair. The first question to ask is d. Is the laptop still under warranty?

Lab 2.1 Take a Computer Apart and Put It Back Together

Review Questions

1. When removing the cover, why should you take care to remove only the screws that hold the cover on?

Answer: The power supply retention screws are often accessible from the outside of the case; if they are removed from the power supply, they could damage other components by falling on them.

2. How should you rock a card to remove it from its slot? Why is it important to know how to rock a card correctly?

Answer: Rock the card lengthwise. If you rock the wrong way, you could damage the card or slot.

3. What should you do to help you remember which components connect to which cables?

Answer: Take notes, make a sketch, take a photo, attach labels, and so forth.

4. What marking on a ribbon cable identifies pin 1?

Answer: A colored stripe on one side of the cable identifies pin 1.

5. What component(s) defines the system's form factor?

Answer: Answers may vary and might include the power supply, the backplate, the spacing of the mounts for the motherboard, and the position of the expansion slots in relation to the CPU.

6. What form factor does your computer use?

Answer: The answer is based on the actual system being used.

7. Why would an IT technician ever have to change out a computer's motherboard?

Answer: The motherboard might need replacing if it becomes damaged, such as when a trace on the board or a chip is damaged. Also the board might need replacing when the CPU is upgraded or additional features are needed. For example, the motherboard could be upgraded to support DDR4 memory.

Lab 2.2 Examine Laptop Documentation

Review Questions

1. Other than documentation, what resources are available on a manufacturer's website to help you support a laptop?

Answer: Answers may vary and might include software downloads, online chat with support personnel, or parts for sale.

2. Which manufacturer's site did you think was the most user friendly and, in general, offered the best support?

Answer: This answer is dependent on student's opinion; answers may vary.

3. Besides the questions you researched in the lab, what other type of information is available in the manuals you reviewed?

Answer: This answer is dependent on student's choice, but some possibilities include battery information, LCD screen information, and how to replace a motherboard.

4. Of the laptops you researched, which one would you purchase? Explain your answer, listing the features that you liked best.

Answer: This answer is dependent on student's opinion; answers may vary.

Lab 2.3 Compare Laptops and Desktops

Review Questions

1. What are the two most important criteria when deciding which computer to buy?

Answer: How the computer will be used and the price

2. Why do laptop computers cost more than desktop computers?

Answer: Laptop components must be small and weigh less, yet they must have the same power as desktop components. Laptop components must also be durable enough to withstand movement and jostling while the computer is in use.

3. List three reasons why it is easier to upgrade a desktop computer than a laptop computer.

Answer: Answers may vary and might include:

- Because the desktop has more room in the case for expansion
- Because desktop components are not proprietary as are many laptop components
- Because disassembling a laptop is more difficult than disassembling a desktop computer

4. Other than price, what factors might someone consider when deciding whether to buy a Windows laptop or a Mac OS X laptop?

Answer: Answers may vary and might include:

- Applications software availability
- User experience
- Ease of sharing data files with users of other computers

5. In this lab, was it easier comparing a desktop computer to a laptop, or comparing a Windows laptop to a Mac OS X laptop? Explain your answer.

Answer: Answers will vary depending on student experience.

Lab 2.4 Use Laptop Diagnostic Software

Review Questions

1. What kinds of information can be found in a technical service manual?

Answer: Answers may vary. Generally, a service manual contains troubleshooting procedures, specifications, directions for replacing parts, and parts lists.

2. Why would you want to run diagnostic software after you have repaired a laptop and verified that the repaired component works?

Answer: Diagnostic software can also determine if hardware is being optimized.

3. Before you purchase an internal laptop part to replace a broken one, what should you verify?

Answer: Confirm that you have enough information and directions to open the laptop, access the part, and reassemble the laptop.

4. List three troubleshooting situations in which diagnostic software might be useful:

Answer: This answer is dependent on student's opinion. Some possible examples are:

- Audio does not work.
- Windows stop errors occur.
- The battery does not charge.
- The optical drive does not work.

Lab 2.5 Investigate Computer Teardown Procedures

Review Questions

1. What are three notable characteristics of the system shown in the first video you selected? For example, was this an older or newer system? How can you tell? Who is the manufacturer of the system, the case, and/or the components? What drives or other optional components were included in the system?

Answer: Answers will vary, depending on student experience.

2. What tools did the technician use in each video? What additional tools would you recommend having on hand to take apart and reassemble a computer?

Answer: Answers will vary, depending on student experience. Possible tools include: screwdriver, ESD strap, tweezers, pliers, multimeter, zip ties, and flashlight.

3. Which two components of a computer should be treated as "black boxes" and not opened without specialized training?

Answer: The power supply and the monitor

4. What are two methods for keeping track of screws during disassembly so that reassembly goes more smoothly?

Answer: Answers may vary. Two possible answers include:

- Keep screws and spacers in small cups or a tray.
- Tape screws to a piece of paper and label them on the paper.

Chapter 2

Working Inside Desktop Computers and Laptops

At a Glance

Instructor's Manual Table of Contents

- Overview
- Objectives
- Teaching Tips
- Quick Quizzes
- Class Discussion Topics
- Additional Projects
- Additional Resources
- Key Terms

Lecture Notes

Overview

In this chapter, students will learn how to work inside of a desktop computer and how different components are removed or replaced in a case. They will also learn about the differences between supporting laptop computers and supporting desktop computers. Lastly, they will take see how to take apart a laptop computer and put it back together again.

Chapter Objectives

After reading this chapter and completing the exercises, the student will be able to:

- Take apart a desktop computer and put it back together
- Explain the special considerations when supporting laptop computers that are different than supporting desktop computers
- Take apart a laptop computer and put it back together

Teaching Tips

How to Work Inside a Desktop Computer Case

1. Encourage students that as they work through this chapter, they should follow all the safety precautions found in Appendix A, "Safety Procedures and Environmental Concerns."

Step 1: Plan and Organize your Work

1. Discuss basic tips and best practices in planning and ensuring that work inside a case is performed safely.

Step 2: Open the Computer Case and Examine the System

1. Stress the importance of performing backups of critical data on a system prior to working on its components.

2. Give students information on how to properly prepare a computer for maintenance, and provide information on how cases are typically opened.

3. Provide instruction on additional pieces of the case that may need to be removed in order to gain access to internal components.

4. Note that students can clip a ground bracelet onto the side of a metal case to ensure safe handling of components.

Teaching Tip	In really complex systems, taking a picture of the internal parts prior to working inside a case can be helpful in troubleshooting connections later. Smartphone cameras allow for a bit more maneuverability inside of a computer case for this purpose.

Step 3: Remove Expansion Cards

1. Discuss techniques for keeping track of cable connections and placement of parts within a computer case, such as using diagrams.

2. Cover steps required to remove expansion cards from a computer, such as removing screws that hold the card in place.

Step 4: Remove the Motherboard, Power Supply, and Drives

1. List the steps required to remove a hard drive from a case, mainly the removal of power cables and data cables.

2. Detail how to remove a motherboard from a case, and note what cables must be removed, such as the front panel connectors. Explain the role of spacers or standoffs in keeping the motherboard from contacting the metal case and shorting circuits.

3. Show how to remove the power supply from a case, noting where screws that hold the power supply in place are typically located.

4. Demonstrate how to remove drives from the case, and show the removal of screws that keep drives in place.

Steps to put a Computer Back Together

1. Explain the optimal order in which components should be installed into the case, starting with power supply, drives, motherboard, and cards. Note that this order may differ depending on the case involved.

2. Show how a motherboard should line up with the IO shield on the back of the case.

3. Discuss what power cables should be connected to the motherboard. Students should be aware that a system will always need the main P1 power connector and most likely will need the 4-pin auxiliary connector for the processor.

4. Elaborate on what additional power requirements a motherboard might have, such as on-board 6-pin or 8-pin PCIe power connectors, or Molex and SATA power connectors.

5. The front panel connectors and their respective contact points on the motherboard can usually be identified by markings around the pins on the motherboard. List some of the common connectors:
    a. Power SW
    b. HDD LED
    c. Power LED+
    d. Power LED-
    e. Reset SW

6. Motherboard documentation should be discussed as a way of identifying pins and ports on the motherboard.

7. Explain how to connect ports that exist on the front of the PC (such as USB or sound) to the motherboard.

8. Discuss the installation of a video card or other expansion cards, and demonstrate how to ensure that a card is seated correctly.

9. List other devices that need to be connected to a computer, such as the monitor, keyboard, and mouse. Show where these devices plug in.

10. Cover some additional troubleshooting steps to take in the event the computer does not power on or work properly.

Quick Quiz 1

1. When working with a computer that is operational and still in use, what is the first step that should be taken before working inside the computer?
    A. Press and hold down the power button for a moment
    B. Back up important data
    C. Power down the system and unplug it
    D. Touch something metal to discharge ESD
    Answer: B.

2. True or False: An anti-static wrist strap can be clipped to the metal portion of a computer case to discharge static.
    Answer: True

3. Which of the following is used to keep the motherboard from contacting the case, preventing a short?
    A. Standoffs
    B. Headers

C. Retention screws
D. Case screws

Answer: A

4. Some motherboards require an extra power connector for PCIe devices. How many pins is this connector?
   A. 4 or 8 pins
   B. 6 or 12 pins
   C. 6 or 8 pins
   D. 4 or 12 pins

   Answer: C

5. Which of the following is not a typical header for the front panel connectors?
   A. Power SW
   B. Power LED-
   C. Reset SW
   D. Power SW-

   Answer: D

Special Consideration when Supporting Laptops

1. Explain the differences between a laptop a desktop. Note what kind of features one might have over the other, and what hardware is typically included.

2. Discuss the costs of repair for laptops to desktop PCs, and note that components such as memory and processors are smaller and differ from their desktop counterparts.

Warranty Concerns

1. Discuss what options for extended warranties on laptops typically exist, and give information on how to determine if equipment is currently under a warranty.

2. List some support websites for various hardware manufacturers. Students should be shown how to access warranty information via some of these websites. Use Table 2-1 in your discussion.

Service Manuals and other Sources of Information

1. Elaborate on how to use service manuals to aid in disassembly and repair of a laptop, and discuss ways of obtaining service manuals.

2. Explain that some laptops may have additional information in the form of videos or user manuals that may aid in disassembly.

3. Encourage students to always check the Support or FAQ pages of the manufacturer's website for help.

Diagnostic Tools Provided by Manufacturers

1. Provide information on what tools might be provided by the manufacturer for troubleshooting an issue or replaced part, such as PC-Doctor.

How to Work Inside a Laptop Computer

1. List some common tools necessary for disassembly of a laptop computer, such as screwdrivers and torx screwdrivers.

2. Review steps to take to discharge static electricity prior to working on the internal components of a laptop. Discuss methods of documenting the areas at which screws are removed or components are unattached from the system, either by note pad or digital camera.

3. Emphasize that the service manual is the best piece of documentation to have for a laptop, and will show where various screws are installed.

4. Note that any applied warranties to laptop equipment could be voided if opened.

5. Remind students not to use force when working with laptop components.

6. Point out that some laptops use ZIF connectors. Demonstrate how to disconnect a cable from a ZIF connector or use Figure 2-43 in your discussion.

7. Disassemble the laptop by removing each FRU in the order gen by the service manual for the laptop. Stress the importance of following the steps to remove each component in the right order.

8. Discuss the general tips students should follow when reassembling a laptop:
    - Reassemble the laptop in the reverse order of the way it was disassembled.
    - Tighten, but do not over tighten, all screws.
    - Verify there are no loose parts inside the laptop before installing the battery or AC adapter.

Teaching Tip	Many popular laptops will have disassembly videos on YouTube. Always check online resources first if you can't find a service manual for working on the laptop.

Quick Quiz 2

1. What can be used to provide detailed instructions for performing work internally on a specific model of laptop computer?
   Answer: service manual

1. True or False: Because they are smaller and easier to produce, laptop replacement parts cost less than replacement parts for desktop computers.
   Answer: False

2. True or False: Opening the case of a laptop under warranty most likely will void the warranty.
   Answer: True

3. What type of connector requires very little force for insertion?
   A. FRU
   B. ZIF
   C. PCI
   D. IDE
   Answer: B

4. True or False: Because laptop components are installed in unique ways and opening the case for each laptop model is done differently, servicing laptops can be very complicated and time consuming.
   Answer: True

Class Discussion Topics

1. Do students have previous experience with PC Repair and Maintenance? If so, ask them to briefly discuss their experiences.

2. Encourage students to discuss what models of laptops they've had good experiences with. Some may note that specific manufacturers of laptops are not as reliable as others.

Additional Projects

1. Have students review the specifications for their motherboard and determine the maximum amount of RAM that can be installed on the motherboard. Have them list the types and sizes of RAM modules that can be installed.

2. Based on the students' examination of the motherboard disk controller ports and power supply connectors, have students determine the maximum number of disk drives that can be installed on their system. Have them research disk drives to determine the maximum amount of storage they can install on the system.

Additional Resources

1. How to Disassemble a Computer:
   http://www.instructables.com/id/Disassemble-a-Computer/

2. Laptop Disassembly Tips:
   http://www.fonerbooks.com/laptop13.htm
3. Blog containing links to a number of service manuals for different laptops:
   http://www.tim.id.au/blog/tims-laptop-service-manuals/

4. Laptop Maintenance and Assembly
   http://www.quepublishing.com/articles/article.aspx?p=435192&seqNum=2

Key Terms

For explanations of key terms, see the Glossary for this text.

front panel connector

front panel header

spacer

standoff

ZIF connector