# **Chapter 2**

# **Working Inside Desktop Computers and Laptops**

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| At a Glance |

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## 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.

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| *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:
   1. Power SW
   2. HDD LED
   3. Power LED+
   4. Power LED-
   5. 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?
2. Press and hold down the power button for a moment
3. Back up important data
4. Power down the system and unplug it
5. Touch something metal to discharge ESD

Answer: B.

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

Answer: True

1. Which of the following is used to keep the motherboard from contacting the case, preventing a short?
   1. Standoffs
   2. Headers
   3. Retention screws
   4. Case screws

Answer: A

1. Some motherboards require an extra power connector for PCIe devices. How many pins is this connector?
   1. 4 or 8 pins
   2. 6 or 12 pins
   3. 6 or 8 pins
   4. 4 or 12 pins

Answer: C

1. Which of the following is not a typical header for the front panel connectors?
   1. Power SW
   2. Power LED-
   3. Reset SW
   4. 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.

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| ***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

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

Answer: True

1. What type of connector requires very little force for insertion?
   1. FRU
   2. ZIF
   3. PCI
   4. IDE

Answer: B

1. 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/>

1. Laptop Disassembly Tips:

<http://www.fonerbooks.com/laptop13.htm>

1. Blog containing links to a number of service manuals for different laptops:

<http://www.tim.id.au/blog/tims-laptop-service-manuals/>

1. 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**