

A+ Guide to Hardware, 9th Edition

Chapter 2

Working Inside Desktop Computers and Laptops

Objectives

- 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

How to Work Inside a Desktop Computer Case

- Every PC technician should know how to take a computer apart and put it back together again
- The following slides will cover this skill

Step 1: Plan and Organize Your Work

- Make notes for backtracking
- Remove loose jewelry that might get caught
- Stay organized by keeping small parts in one place
- Do not stack boards on top of each other
- Do not touch board chips
 - With hands, magnetized screwdriver
 - Fingerprints on edge connectors may later cause corrosion

Step 1: Plan and Organize Your Work

- Protect yourself and the equipment
 - Don't touch a microchip with a magnetized screwdriver
 - Never ever touch inside of a turned on computer
 - Consider monitor, power supply as “black boxes”
 - Never remove the cover or touch inside
 - Watch out for sharp edges that can cut

Step 2: Open the Computer Case and Examine the System

- Back up important data
- Power down the system and unplug it
 - Unplug other peripherals as well
- Press and hold the power button for 3 seconds
 - This will drain the power supply
- Have a plastic bag or cup handy to hold screws
- Open the case cover
 - Many cases require you to remove the faceplate first
 - Some older cases require you to remove a side panel

Step 2: Open the Computer Case and Examine the System

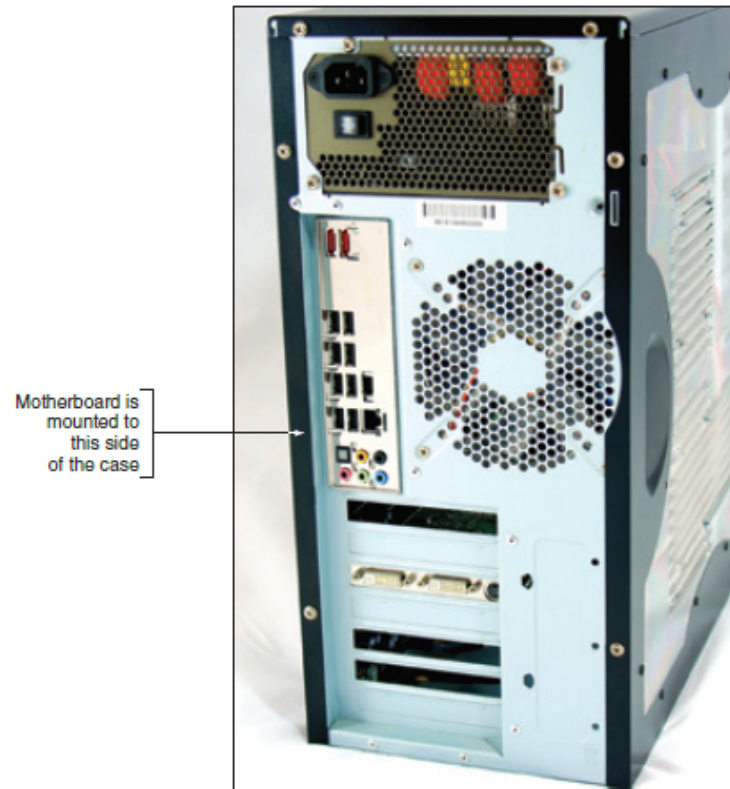


Figure 2-2 Decide which side panel to remove

Step 2: Open the Computer Case and Examine the System



Figure 2-3 Locate the screws that hold the side panel in place

Step 2: Open the Computer Case and Examine the System



Figure 2-4 On this system, clips hold the side panel in place

Step 2: Open the Computer Case and Examine the System



Figure 2-5 Slide the panel to the rear of the case

Step 2: Open the Computer Case and Examine the System

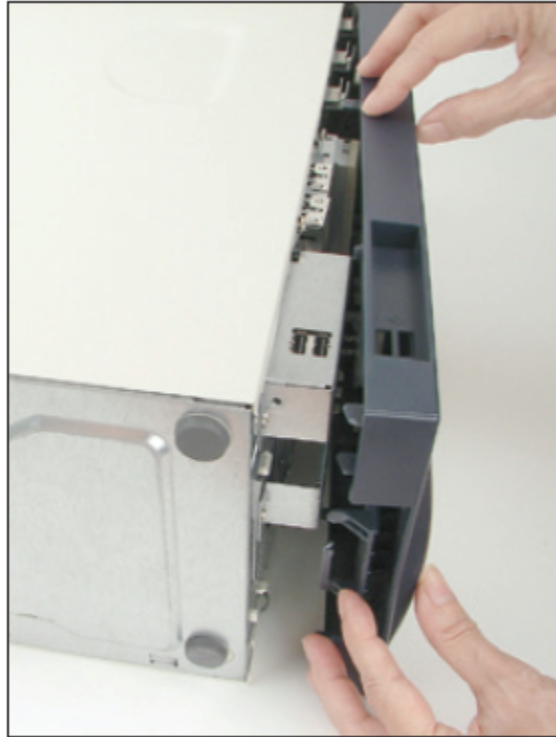


Figure 2-6 Some cases require you to remove the front panel before removing the side panel of a computer case

Step 2: Open the Computer Case and Examine the System

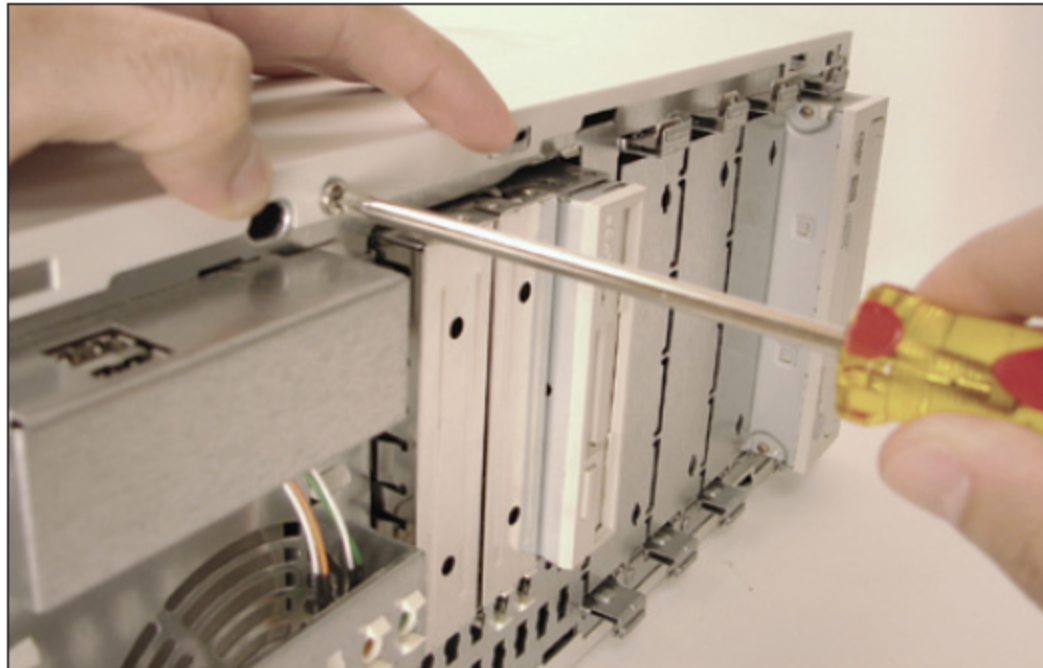


Figure 2-7 One screw holds the side panel in place

Step 2: Open the Computer Case and Examine the System

- Clip your ESD strap to the side of the computer case
- After opening you will see the main components:
 - Power supply
 - Motherboard
 - Drives
- Follow cables from motherboard to the component to know the purpose of each cable

Step 2: Open the Computer Case and Examine the System



Figure 2-8 Attach the alligator clip of your ground bracelet to the side of the computer case

Step 3: Remove Expansion Cards

- If removing components:
 - Draw a diagram of all cable connections to the motherboard, expansion cards, and drives
 - Use a felt-tip marker to mark components in order to indicate a cable connection, board placement, orientation, etc...

Step 3: Remove Expansion Cards

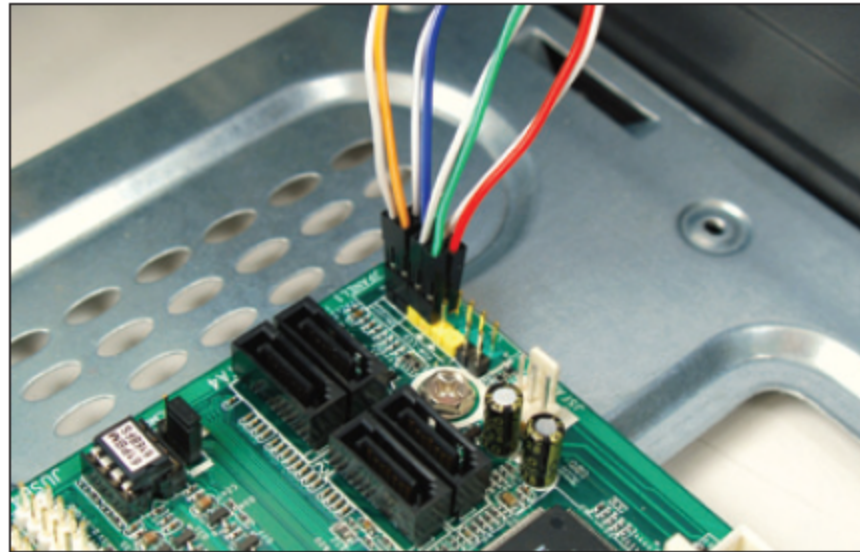


Figure 2-9 Diagram the pin locations of the color-coded wires that connect to the front of the case

Step 3: Remove Expansion Cards

- To remove expansion cards:
 - Remove any wire or cable connected to the card
 - Remove the screw holding the card to the case
 - Grasp the card with both hands and remove it by lifting straight up (can also rock the card from end to end)
 - Don't put your fingers on edge connectors or touch a chip
 - It is best to store cards in an antistatic bag

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

- Depending on the system, you may have to remove the drives and/or power supply to get to the motherboard
- To remove motherboard:
 - Unplug power supply lines
 - Unplug SATA cables connected to the motherboard
 - Disconnect wires leading from the front of the computer case to the motherboard (called front panel connectors)
 - Make a diagram before disconnecting

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

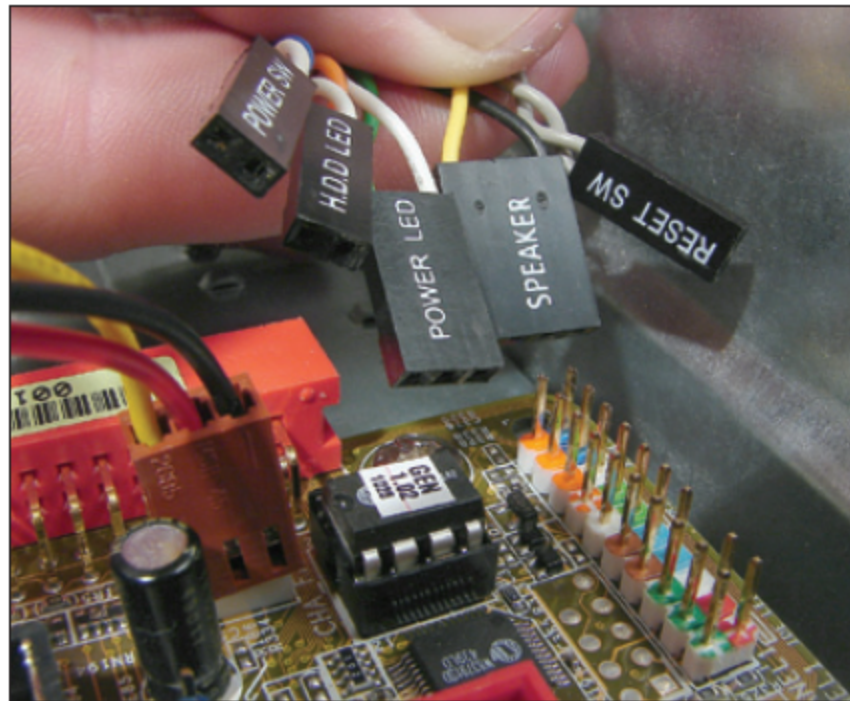


Figure 2-12 Five leads from the front panel connect to two rows of pins on the motherboard front panel header

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

- To remove motherboard (cont'd):
 - Disconnect any other cables or wires connected to the motherboard
 - Unscrew motherboard from spacers
 - Spacers (standoffs): round plastic or metal pegs that separate the board from the case
 - Spacers are necessary to keep motherboard from touching the metal case, which might cause a short
 - Motherboard should be free to remove from the case

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



Figure 2-15 Remove the motherboard from the case

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

- To remove the power supply from the case:
 - Look for screws that attach the power supply to the computer case
 - Do not remove screws that hold power supply housing together (do take housing apart)
 - Sometimes power supplies are also attached to the case on the underside by recessed slots
 - Turn case over and look for slots
 - If present, determine in which direction you need to slide the power supply to free it from the case

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



Figure 2-16 Removing the power supply mounting screws

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

- Tips to remove drives:
 - Look for screws on each side of the drive attaching the drive to the drive bay
 - There might be a catch underneath the drive
 - You must lift up as you slide the drive forward
 - Some drive bays have a clipping mechanism to hold the drive in the bay
 - Release the clip and then pull the drive forward
 - May have to remove the drive bay in order to remove the drives

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



Figure 2-17 To remove this CD drive, first pull the clip forward to release the drive from the bay

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



Figure 2-18 Push down on the clip and then slide the removable bay forward and out of the case

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

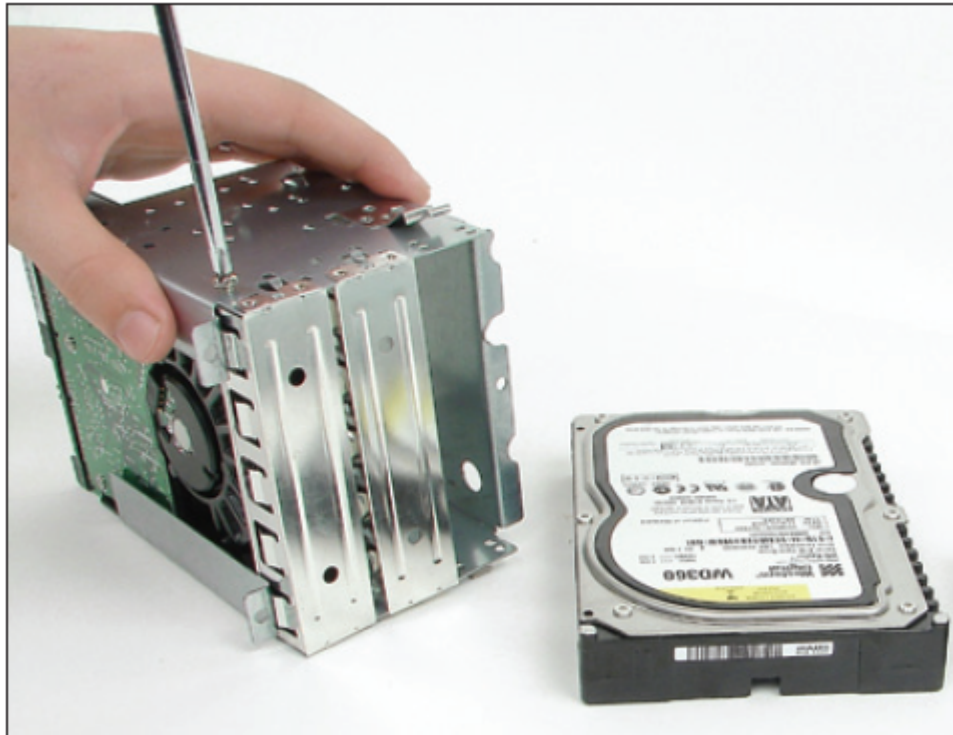


Figure 2-19 Drives in this removable bay are held in place with screws on each side of the bay

Steps to Put a Computer Back Together

- Refer to any diagrams created during the disassembling process
- Install components in this order: power supply, drives, motherboard, and cards
 - When installing drives, it may be easier to connect cables to the drives before sliding them into the bay
- Place motherboard inside the case
 - Make sure ports and screw holes are lined up

Steps to Put a Computer Back Together

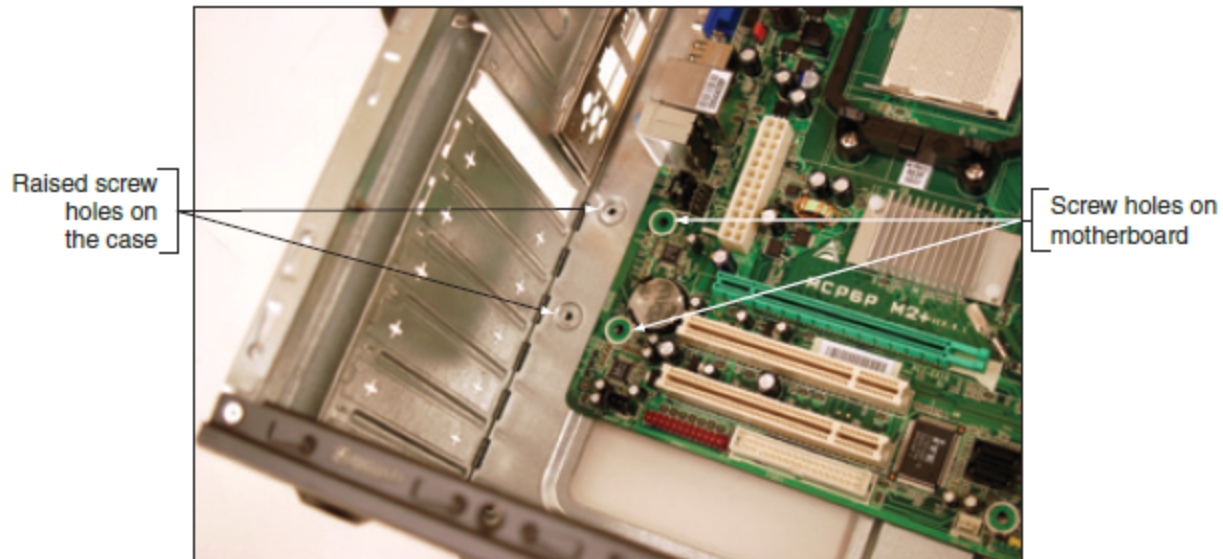


Figure 2-21 Align screw holes in the case with those on the motherboard

Steps to Put a Computer Back Together

- Connect the power cords from the power supply to the motherboard
 - Will always need the main P1 power connector and may likely need the 4-pin auxiliary connector for the processor
 - A board might have a 6-pin or 8-pin PCIe power connector
 - If power supply does not have this connector, use an adapter to convert two Molex connectors to a PCIe connector

Steps to Put a Computer Back Together

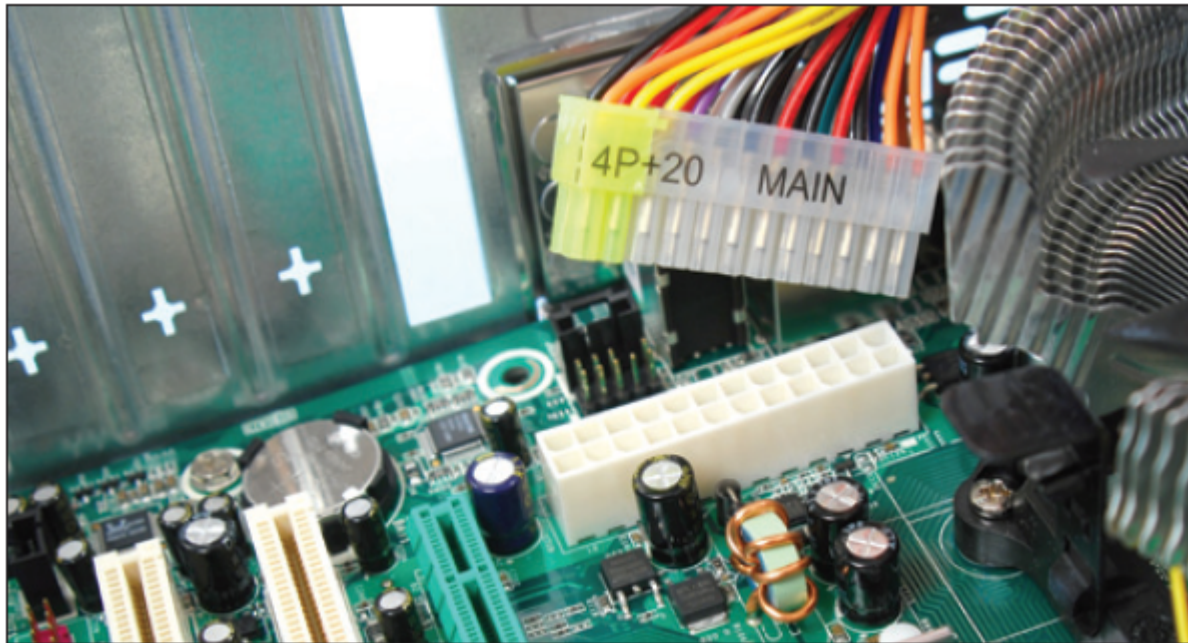


Figure 2-23 The 24-pin connector supplies power to the motherboard

Steps to Put a Computer Back Together

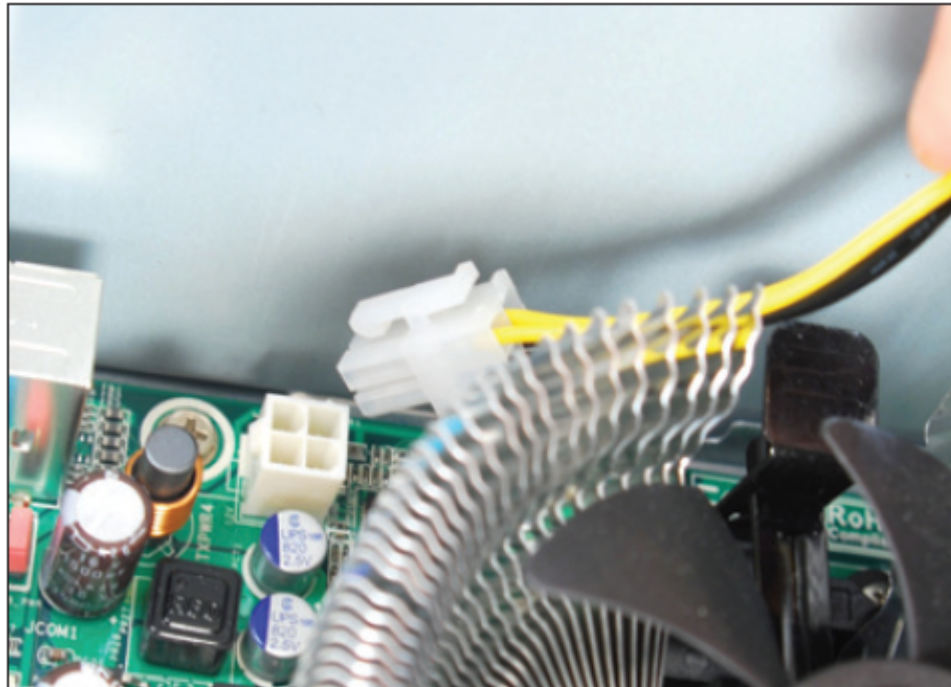


Figure 2-24 The auxiliary 4-pin power cord provides power to the processor

Steps to Put a Computer Back Together

- Connect the power cords from the power supply to the motherboard (cont'd):
 - If case fan is present, connect power cord from the fan to pins on motherboard labeled “Fan Header”
 - If a CPU and cooler are already installed on motherboard, connect power cord from CPU to pins on motherboard labeled “Fan Header”
- Connect wire leads from the front panel of the case to the front panel header on motherboard

Steps to Put a Computer Back Together

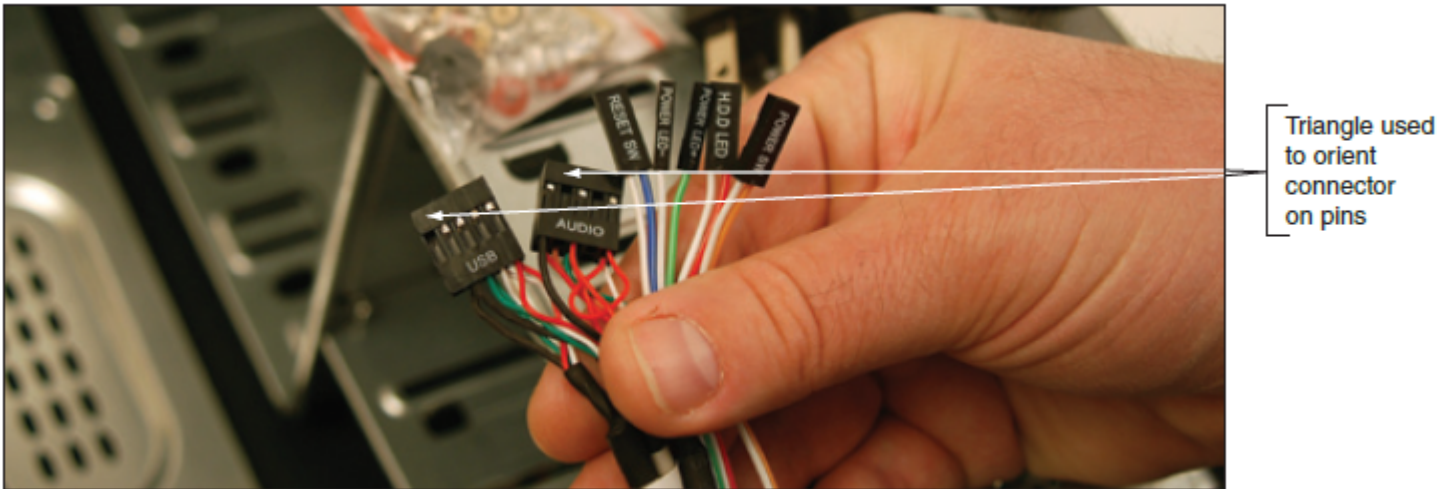


Figure 2-27 Seven connectors from the front panel connect to the motherboard

Steps to Put a Computer Back Together

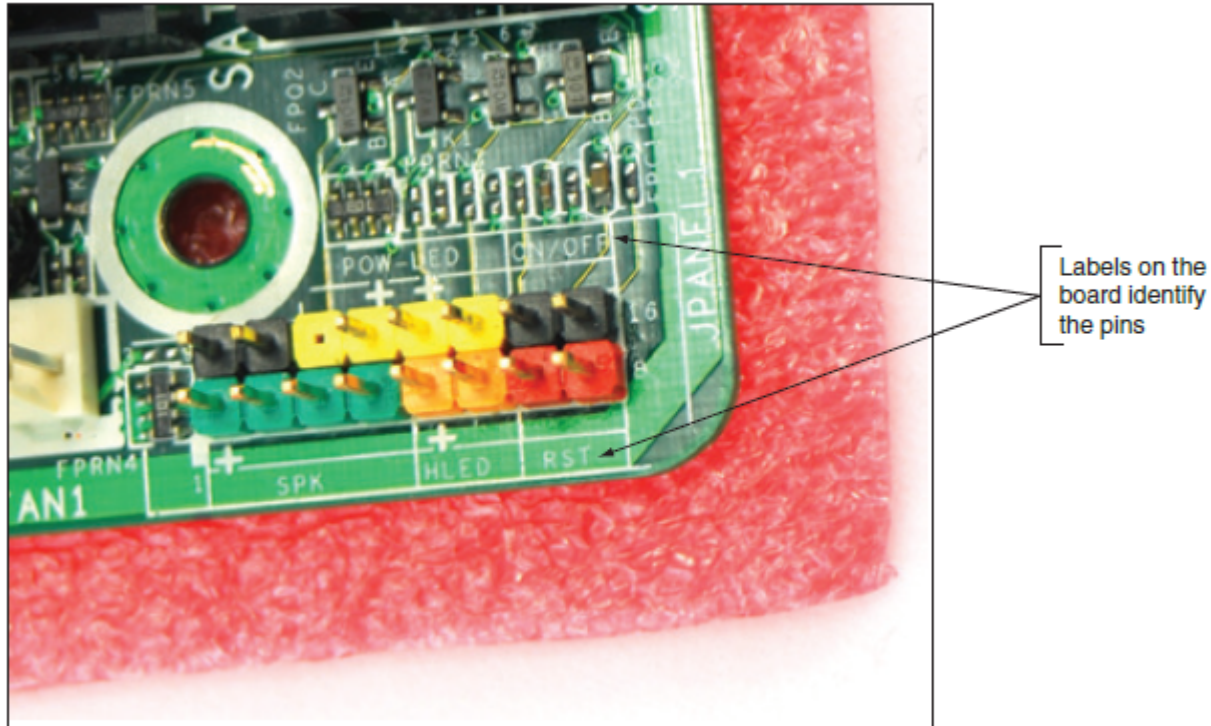


Figure 2-28 Front panel header uses color-coded pins and labels

Steps to Put a Computer Back Together

- Look for a small triangle embedded on the connector that marks one of the outside wires as pin 1
 - Line up pin 1 on connector with pin 1 marked on motherboard
 - If labels on motherboard are not clear, consult user guide for help

Steps to Put a Computer Back Together

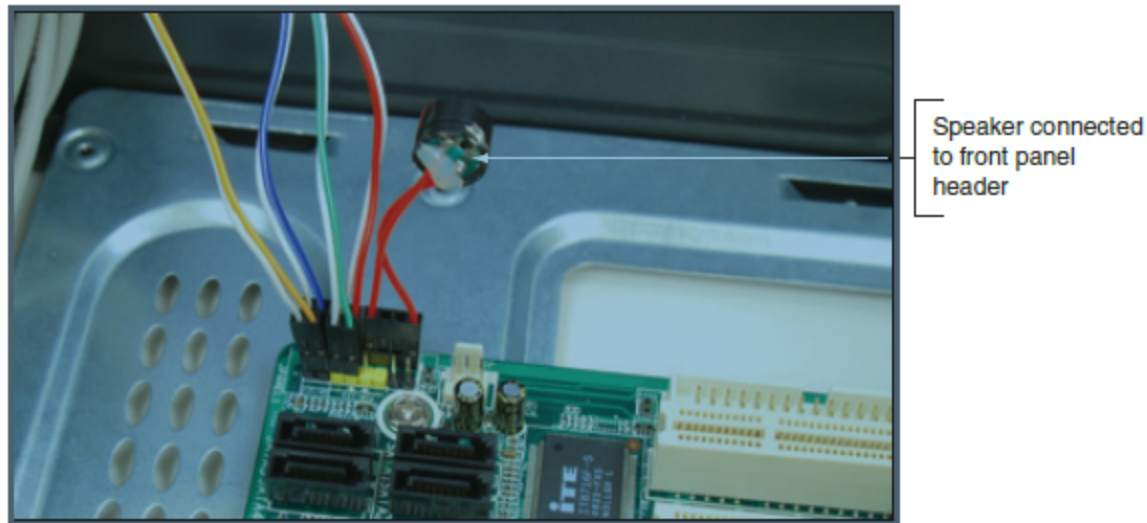


Figure 2-30 Front panel header with all connectors in place

Steps to Put a Computer Back Together

- Connect wires to ports on the front panel of the case
 - Audio ports or USB ports are examples
- Install the video card and other expansion cards
- Double-check each connection
- Plug in keyboard, monitor, and mouse
- In classroom environment, have instructor check work
- Turn on the power and check that the PC is working properly
 - If not, most likely a loose connection

Special Considerations when Supporting Laptops

- Laptops and their replacement parts cost more than desktop PCs
- Factors to consider that apply more to laptop than desktop computers:
 - Original equipment manufacturer's warranty
 - Service manuals and diagnostic software provided by the manufacturer
 - Customized installation of the OS unique to laptops
 - Advantage of order replacement parts directly from the laptop manufacturer or authorized source

Warranty Concerns

- Always check to see if laptop is under warranty before servicing
- Contacting technical support: information needed
 - Laptop model and serial number
 - Purchaser name, phone number, address
- Service options
 - On-site
 - Ship to authorized service center
 - Phone assistance or online chat

Service Manuals and Other Sources of Information

- Service manuals save time
 - Enables safe laptop disassembly
- Locating documentation – Service manual
 - Manufacturer's physical manual
 - Manufacturer's Web site
 - Support or FAQ pages
 - Third party websites
- User manual
 - Provides basic maintenance tasks

Diagnostic Tools Provided by Manufacturers

- To determine problem components use diagnostic software provided by manufacturer
 - Sources:
 - Manufacturer's Web site
 - CDs bundled with the notebook
 - Hard drive or floppy disk
 - Example: PC-Doctor
 - Included with Lenovo, Fujitsu, and HP notebooks
 - Can be purchased separately

How to Work Inside a Laptop Computer

- It may become necessary to open a laptop case to upgrade memory, exchange a hard drive, or replace a failed component
- Replacing a broken LCD panel or motherboard can be a complex process
- Screws and nuts on a laptop are smaller than a desktop
 - Require smaller tools

How to Work Inside a Laptop Computer

- Requires special tools and extra patience



Figure 2-38 Use a small screwdriver or dental pick to pry up the plastic cover hiding a screw

How to Work Inside a Laptop Computer

- Requires special tools and extra patience

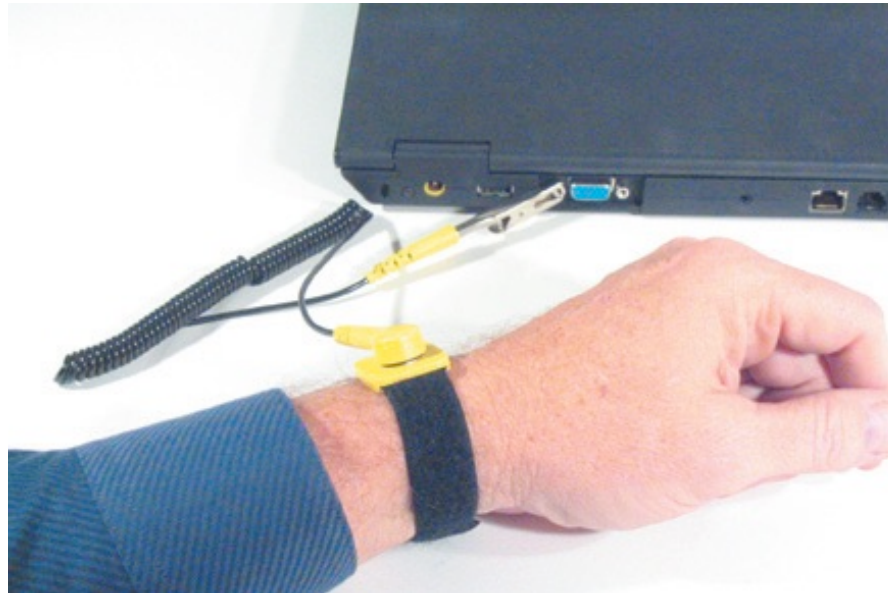


Figure 2-39 To protect the system against ESD, attach the alligator clip of a ground strap to an I/O port on the back of the laptop

How to Work Inside a Laptop Computer

- Many small screws require smaller tools
- Work methodically:
 - Keep screws and components organized
 - Place screws in a pillbox (label each compartment)
 - Place screws on soft padded work surface
 - Use white labeling tape
 - Place screws on notebook paper
 - Write where screw belongs
 - Tape screw beside manufacturer documentation
 - Keep notes to help with reassembly

How to Work Inside a Laptop Computer



Figure 2-41 Tape screws beside the step in the manufacturer documentation that told you to remove the screw

How to Work Inside a Laptop Computer

- Disassembly tips:
 - Find the hardware service manual
 - Consider the warranty might still apply
 - Opening the case might void the warranty
 - Take the time necessary, do not force anything
 - Protect against ESD
 - Understand ZIF connectors
 - Pry up plastic covers with dental pick or screwdriver
 - Plastic screws may be used only once
 - Disassemble components in order

How to Work Inside a Laptop Computer



Figure 2-43 Three ZIF connectors hold the three keyboard cables in place

How to Work Inside a Laptop Computer

- Reassembly tips:
 - Reassemble notebook in reverse order
 - Tighten, but do not over tighten, all screws
 - Before installing the battery or AC adapter verify there are no loose parts inside the notebook

Summary

- When working inside a computer, stay organized, keep careful notes, and follow all safety procedures
- Before opening a case, shut down the system, unplug it, disconnect all cables, and press the power button to drain residual power
- An expansion card fits in a slot on the motherboard and is anchored to the case by a single screw or clip
- Laptop computers are designed for travel, so smaller and more durable replacement parts cost more than they do for desktops

Summary

- The laptop manufacturer documentation are useful when disassembling, troubleshooting, and repairing a notebook
- When an internal component needs replacing, consider the possibility of disabling the component and using an external peripheral device in its place
- Replacing the laptop might be more cost effective than performing labor-intensive repairs
- When disassembling a laptop, the manufacturer's service manual is essential

Summary

- When upgrading components on a laptop, use components that are the same brand as the laptop
- Follow directions in a service manual to disassemble a laptop