Chapter 9 - Installing and Supporting I/O Devices

- Basic Principles to Support I/O Devices
- I/O devices may be internal or external
- Fundamental principles and concepts:
  - Every I/O device controlled by software
  - Best guide for installation and support: manufacturer
  - Some devices need application software
  - Problems are sometimes solved by updating drivers or firmware
  - Learning about I/O devices is a moving target
  - Device Manager manages devices and device drivers
  - Some devices follow Energy Star standards

- Types and Features of I/O Devices
- Topics covered:
  - Motherboard and display devices I/O ports
    - Including monitor, projector, video card, other expansion cards
  - I/O Ports on the Motherboard
    - Ports directly off motherboard
      - Parallel, USB, FireWire
    - Ports provided by expansion card
  - USB Ports
    Becoming popular ports for slower I/O devices
    - Easier to configure
    - Faster than serial or parallel ports
    - Use higher-quality cabling
    - Power drawn from USB port
    - Ports available on case front or rear
    - Can daisy chain 127 USB devices
  - USB cable wiring
    - Four wires: two for power, two for communication
  - USB cable length
    - Original USB: up to 3 meters
    - Hi-Speed USB: up to 5 meters
    - Hub is used for greater distances
    - FireWire (IEEE 1394) ports
    - Also called FireWire (Apple) or i.Link (Sony), Lynx (Texas inst.)
    - Similar to USB
      - Use serial data transmission, are hot-pluggable, and supports up to 63 FireWire devices daisy chained
      - FireWire versions
        - 1394a, 1394b, 1394c, 1394d
      - Use isochronous data transfer
        - Data transferred continuously without breaks such as digital audio, video ....
  - Serial Ports
    - Transmit data in single bits
    - Originally intended for I/O devices (e.g., mouse or modem)
    - Sometimes called DB9 and DB25
– Conform to RS-232c interface standard
  • Sometimes called an RS-232 port
  • Also called COM1 or COM2 port
– Universal Asynchronous Receiver-Transmitter (UART) or UART 16550
  • Motherboard controller logic

• Parallel ports
  – Simultaneously transmit 8 bits of data
  – Primarily designed for printers
  – Being replaced by USB
  – Parallel port types
    • Standard parallel port (SPP)
    • Enhanced Parallel Port (EPP)
    • Extended Capabilities Port (ECP)

• Infrared transceivers
  – Alternative terminology:
    • IrDA (Infrared Data Association) or IR transceiver
  – Provide infrared port for wireless communication
  – Uses
    • Television remote controls, wireless keyboards, mice, cell phones, PDAs, and printers
    • Communication between notebook and PDA
    • Connecting PC to a network
  – Motherboard uses IR headers
  – Obsolete technology due to line of sight issue
  – Display Devices

• Two necessary components for video output are: Video card and the monitor

• Two categories of monitor:
  – CRT (cathode-ray tube)
  – LCD (liquid crystal display)
    • Also called flat panel
    • Video card can be onboard or a separated card.

• LCD and CRT
  – Refresh rate measures number of times screen built in a second
  – Response time measures time needed for LCD monitor to build one screen
  – Interlaced CRT monitors draws screen in two passes
  – Noninterlaced monitor draws screen in one pass
  – Resolution measures number of addressable pixels
  – Native resolution (LCD) represents actual (and fixed) number of pixels built into the monitor

• Changing monitor settings
  – Monitor buttons
    • Degauss CRT monitor to eliminate accumulated or stray magnetic fields
  – Manufacturer’s video card utility
    • Best performance with manufacturer’s drivers
  – Windows utilities
    • Adjusts resolution and refresh rate
    • Supports a standard group of resolutions
    • Native resolution can be obtained if not displayed

• Projectors
– Display images for a large group
– Extra video port required
  • Desktops may need a second video card
  • Most notebooks provide a 15-pin video port
– Function key activates projector on notebooks

• Video cards
  • Graphic adapters, graphics cards, display cards
  • Motherboard may have integrated video controller
  • Can use AGP, PCI, PCI Express motherboard slot
  • Ports provided by video cards
    • 15-pin VGA: red, green, blue video using VGA port
    • DVI (Digital Visual Interface): used by LCD monitors
    • Composite out port: RGB mixed in the same signal
    • S-Video (Super-Video): sends two signals over cable
    • HDMI (High-Definition Multimedia Interface)
  • Processor and RAM may be supported

• Video memory and Windows Vista
  • Aero (3D interface in Vista) requirements
    • 128 MB video memory, DirectX 9 or higher, Windows Display Driver Model (WDDM)
  • DirectX diagnostics program: dxdiag.exe
    • Displays information about hardware
    • Helps diagnose problems with DirectX
  • 128 MB video memory
    • Graphics memory embedded on video card, system memory, or a combination of both

• Dual video cards
  • Work in tandem using one of two technologies
    • SLI by NVIDIA
    • CrossFire by ATI Technologies

• Expansion Cards
• Many types of expansion cards
• Selection considerations
  • Card features
  • Bus slot required
  • Operating system compatibility
  • Hardware resources required
    • Processor, RAM, free hard drive space
  • Application software compatibility

• Installing Input Devices
• Devices require device drivers or BIOS
  • Control
  • Interface with the operating system
• Devices covered
  • Keyboard
  • Mouse
  • Touch screen
  • Barcode reader
  • Fingerprint reader
• How to Install a Keyboard and Mouse
  • Plug in and turn on the PC
  • Four connections methods
    – 5-pin round DIN connector (mostly outdated)
    – 6-pin PS/2 connector (mini-DIN)
    – USB port
    – Wireless connection
      • Example: for a mouse, plug receiver into USB port
  • Adapters are available for PS/2 device and USB
• How to Install a Keyboard and Mouse (cont’d.)
  • Drivers may be necessary for special features
  • Most installed devices appear in Device Manager
    – USB devices are managed through Control Panel
• How to Install a Keyboard and Mouse (cont’d.)
  • Installing keyboard and mouse requiring driver for features
    – Insert the CD and run setup.exe program
      • Respond to Vista UAC box
    – Accept end-user license agreement (EULA)
      • Select keyboard and mouse from a list the CD supports
      • Drivers install
    – Restart the computer
      • Plug in the keyboard and mouse to USB ports
    – Use utilities to configure mouse and keyboard buttons
• How to Install a Touch Screen
  • Touch screen input device
    – Uses a monitor or LCD panel as the backdrop for input options
  • Installation
    – Run setup.exe program to install device drivers and software to manage the device
    – Restart the computer
    – Run the management software
    – Connect USB or serial cable to the touch screen and computer
    – Use management software to calibrate
• How to Install a Barcode Reader
  • Barcode reader
    – Scans barcodes on products
      • Used to maintain inventory or at point of sale (POS)
    – Variety of shapes, sizes, features
    – Several interface methods
      • Wireless connection, serial port, USB port, keyboard port
  • Installation
    – Install device drivers, plug device into keyboard, USB, or serial port
    – For Bluetooth connection follow documentation
• How to Install a Fingerprint Reader
  • Biometric device inputs a persons biological data
    – Additional authentication to control access to sensitive data
  • Fingerprint reader types may:
    – Look like a mouse
• Use wireless or USB connection
• Be embedded on side of keyboard, flash drive
• Installation for most USB devices
  – Install software before plugging in device
• How to Install a KVM Switch
• Keyboard, Video, and Mouse (KVM) switch
  – Allows use of one keyboard, mouse, and monitor for multiple computers
• Characteristics
  – Extra USB ports, sound port, support for two to sixteen computers, inexpensive
• Considerations
  – Ensure it will support the specific keyboard, mice, monitor, and devices with special features
• Installation: plug in devices
• Troubleshooting I/O Devices
• Steps:
  – For a new installation suspect the device and drivers or application software
  – Verify adapter card securely seated in the slot
  – For problems after an installation verify nothing changed
  – Try to isolate the problem
  – Check simple things first
  – Exchange the device for a good one
  – Access resources
  – Document after the problem resolved
• Troubleshooting Keyboards
• A few keys do not work
  – Dislodge debris
• Keyboard does not work at all
  – Check the cabling, swap with a known good keyboard
• PS/2 keyboard does not work
  – Try a USB keyboard
• Coffee, sugary drinks spilled on the keyboard
  – Replace keyboard
  – Try rinsing keyboard in water and reinstall after it dries
• Troubleshooting Monitors and Video Cards
• Power light (LED) does not go on; no picture
  – Verify monitor and cord plugged in and tight connection
  – Look at fuse, volt switch selection, and video card
• Power light (LED) is on, no picture on power-up
  – Check contrast, brightness, and backlight adjustments
  – Check cables, reseat card, inspect for chip creep, disable video ROM shadowing, test RAM, and look for Windows issues
  – Test with good monitor, video card, and motherboard
  – For notebooks try connecting a second monitor
• Troubleshooting Monitors and Video Cards (cont’d.)
• Power is on, but monitor displays the wrong characters
  – Exchange the video card
  – Exchange the motherboard
• Monitor flickers, has wavy lines, or both
– Check the cabling and refresh rate
– Press degauss button
– Check for items with high electric noise

• Troubleshooting Monitors and Video Cards (cont’d.)
• No graphics display or screen goes blank
  – Replace video card
  – Update drivers
  – Add video RAM

• Screen goes blank 30 seconds or one minute after the keyboard is left untouched
  – Check for standby or sleep modes
  – Enter BIOS setup and look for an Power Management option

• Troubleshooting Monitors and Video Cards (cont’d.)
• Poor color display
  – Fine-tune the color
  – Exchange video cards
  – Install additional video RAM
  – Check for interference
  – Replace CRT monitor

• Troubleshooting Other Adapter Cards
• Steps:
  – Make sure device connected to the card works
  – Update drivers for the card
  – Uninstall the card
  – Reboot and install the drivers again
  – Reseat card or move it to a different slot
  – Search for diagnostic software
    • Driver CD or manufacturer Web site
  – Use technical resources available
  – Search the Internet
  – Replace the card with a known good card

• Installing and Configuring I/O Devices and Ports
• Topics covered
  – Learn how to configure and use ports on the motherboard
  – Learn how to install expansion cards

• Authority required
  – Windows XP
    • Log on as administrator
  – Vista
    • Use the User Account Control (UAC) box

• Device Manager
  – Monitors and manages most devices

• Using Device Manager
• Device Manager (devmgmt.msc)
  – Primary Windows tool for managing hardware

• Vista access
  – Click Start, right-click Computer, select Properties on the shortcut menu, Click Device Manager on the System window and respond to UAC box
• Windows XP access
  – Click Start, right-click My Computer, select Properties from the shortcut menu, select Hardware tab from the System Properties window, click Device Manager

• Using Device Manager (cont’d.)

• Vista or XP access
  – Enter devmgmt.msc in Vista Start Search box or XP Run box and press Enter

• Tasks available
  – Uninstall a device
  – Obtain more device information
  – Run diagnostics to test a device or report problems
  – Drivers
    • View details about installed drivers, update drivers, undo a driver update, disable, or enable a device

• Using Ports on the Motherboard

• Verify device is enabled in BIOS setup first

• For ports and expansion slots:
  – BIOS setup recognizes the port or slot
    • Not the device or expansion card using that slot

• Any device showing up in BIOS setup
  – Should also be listed in Device Manager
  – The opposite is not always true

• For port problems
  – Verify port enabled in BIOS setup
  – Check Device Manager to verify the port is recognized without error

• Using Ports on the Motherboard (cont’d.)

• Using USB and FireWire ports
  – Read documentation to determine driver and device installation order
  – Verify drivers are valid for the operating system

• Configuring parallel ports
  – Easy on today’s motherboard with BIOS setup
    • Keep ECP default setting (DMA3)
    • BIOS manages interrupt request (IRQ) lines

• Device Manager Line Printer Terminal (LPT) assignments (LPT1, LPT2)
  – Parallel port system resources to manage print job

• Using Ports on the Motherboard (cont’d.)

• Configuring serial ports
  – Examples: 3F8/IRQ4 and 2F8/IRQ3
    • 3F8 and 2F8 indicate I/O addresses used by the ports
    • IRQ4 and IRQ5 are lines the port uses to hail the CPU
  – COM ports in Device Manager
  – Serial port settings available in the properties box for the port on the Port Settings tab
    • Used by modem cards
    • Installing and Configuring Adapter Cards

• Initial tasks
  – Verify card fits an empty expansion slot
  – Verify correct device drivers for the OS
  – Back up important data not already backed up
Know your starting point

- Installing and Configuring Adapter Cards (cont’d.)
- General directions to install an adapter card
  - Read the documentation
  - Replace onboard port and disable port in BIOS setup
  - Wear ground bracelet, shut down system, unplug power cords and cables, and drain power
  - Locate slot and prepare for installation
  - Insert card into expansion slot
  - Anchor card to top of the slot
  - Replace case cover, power cord, and peripherals
  - Start the system

- Installing and Configuring Adapter Cards (cont’d.)
- How to install a FireWire controller card
  - Follow general directions to install the card
  - Connect power cord to card and to a 4-pin power connector
  - Start Windows
    - Automatically detects card
    - Installs its own embedded Windows IEEE 1394 drivers
  - Verify installation with Device Manager
  - Plug up FireWire devices to ports on the card
  - Resolve problems with driver CD software

- Installing and Configuring Adapter Cards (cont’d.)
- How to install a video card
  - If replacing onboard video port:
    - Disable onboard in port BIOS setup
  - Follow general steps given earlier to install card
    - Use retention mechanism for stability if necessary
  - Connect power cord to video card 6-pin or 8-pin PCIe power connector
  - Found New Hardware Wizard appears
    - For best performance, cancel wizard
    - Insert driver CD, launch Setup.exe, and install drivers
  - Verify resolution and refresh rate properties

- Installing and Configuring Adapter Cards (cont’d.)
- Possible problems
  - Whining sound at power up: inadequate power supply
  - Black screen at power up: disable onboard port
  - Series of beeps at power up: reseat card and check slot
  - Error messages about video when Windows starts: conflict in onboard video and video card
  - Games crash or lock up: update motherboard, video card, sound card drivers, update DirectX, and apply game patches

- Installing and Configuring Adapter Cards (cont’d.)
- Requirements for installing two video cards
  - Motherboard supporting SLI or CrossFire with two PCIe x16 slots and two matching video cards

- Steps
  - Install first video card in first PCIe x16 slot
  - Power down system and install second video card
  - Leave monitor cable connected to first card
• Reboot, install second video card drivers, and verify video cards installed using Device Manager
  – Configure video cards to work in tandem
  – Test graphics performance using optional SLI bridge
• Installing and Configuring Adapter Cards (cont’d.)
• How to install a SATA, eSATA, and RAID storage controller card
  – More complex than other adapter card installations
    • Install drivers controlling SATA and eSATA connectors
    • Install utility program to manage RAID array
  – Follow manufacturer’s specific instructions
• Installing and Configuring Adapter Cards (cont’d.)
• General steps
  – Install controller card and attach one or more drives
  – Boot computer
    • Found New Hardware wizard appears
    • Select Locate and install driver software
    • Windows: insert card’s driver CD and click Next
    • Manufacturer: insert driver CD and locate Setup.exe
    • Click Install the driver software anyway message
  – Restart system
  – Install RAID utility to manage the array