The Motherboard

IT Essentials Chapter 1

Motherboards

- Everything else in the system plugs into it, is controlled by it, and depends on it to communicate with other devices on the system.
- The system board is the largest of the printed circuit boards and every system has one.
- It houses the CPU, the controller circuitry, the bus, RAM, expansion slots for additional boards, and ports for external devices.
- Determine capabilities and limitations of the system.

The Motherboard Form Factors

Form factor	Dimensions (in.)	Notes
AT	12 x 13	Oldest type of motherboard.
Baby AT	8.5 X 10-13	Used by older PCs. Becoming outdated.
ATX	12 X 9.6	The most common form factor in use today.
Mini ATX	11.2 X 8.2	Used in newer, smaller PCs.
LPX	9 X 11-13	Found in older PCs. Uses a riser card to save space.
Mini LPX	8-9 X 10-11	Found in older PCs. Uses a riser card to save space.
NLX	8-9 X10-13.6	Found in newer PCs. Setup provides easier access to components.

- Most new systems come with the ATX motherboard form factor.
- Motherboards are usually described by their form factors. Form factors describe the physical dimensions of the motherboard. The two most common form factors currently in use are the Baby AT motherboard and the ATX motherboard.

Main Components on a Motherboard

- System clock
- CPU and its chip set
- System bus with expansion slots
- Jumpers and DIP switches
- ROM BIOS
- CMOS configuration chip and its battery
- RAM
- RAM cache (L2) (optional)
- Ports directly on the board
- Power supply connections

Considerations When Selecting a System Board

- Support the CPU you plan to use?
- Type of BIOS?
- Bus speeds and type of memory; memory capacity?
- Use many embedded devices?
- Fit the case?
- Support legacy cards?
- Warranty? How much manufacturer support?

The System Clock

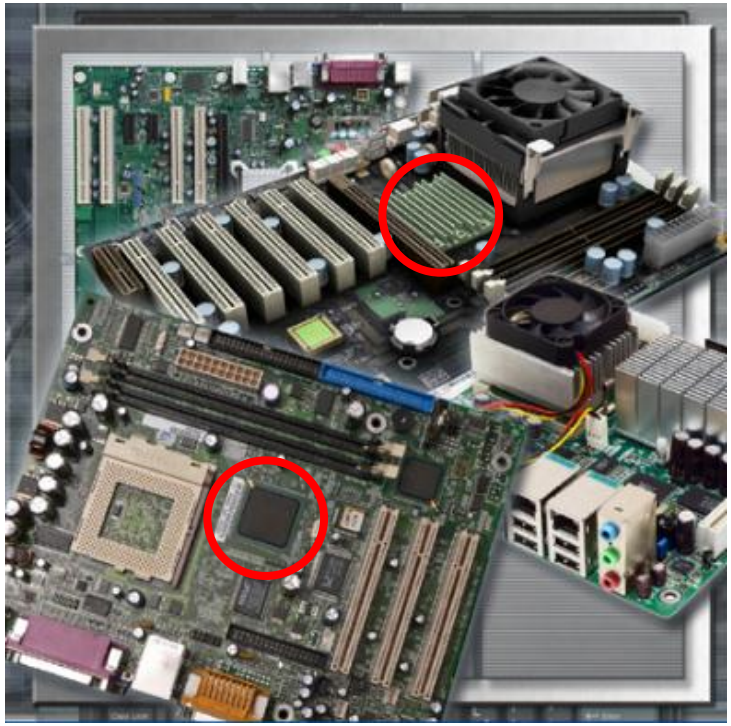
- Keeps the beat for motherboard activities
- Frequency is measured in Hertz (Hz)
- Determines the speed of the CPU

The Chip Set

- The motherboard chipset determines how system hardware interacts with the CPU and other various components, performance, and limitations.
  - The chip set establishes how much memory can be added to a motherboard.
  - The chip set also determines the type of connectors on the motherboard.

The Chip Set

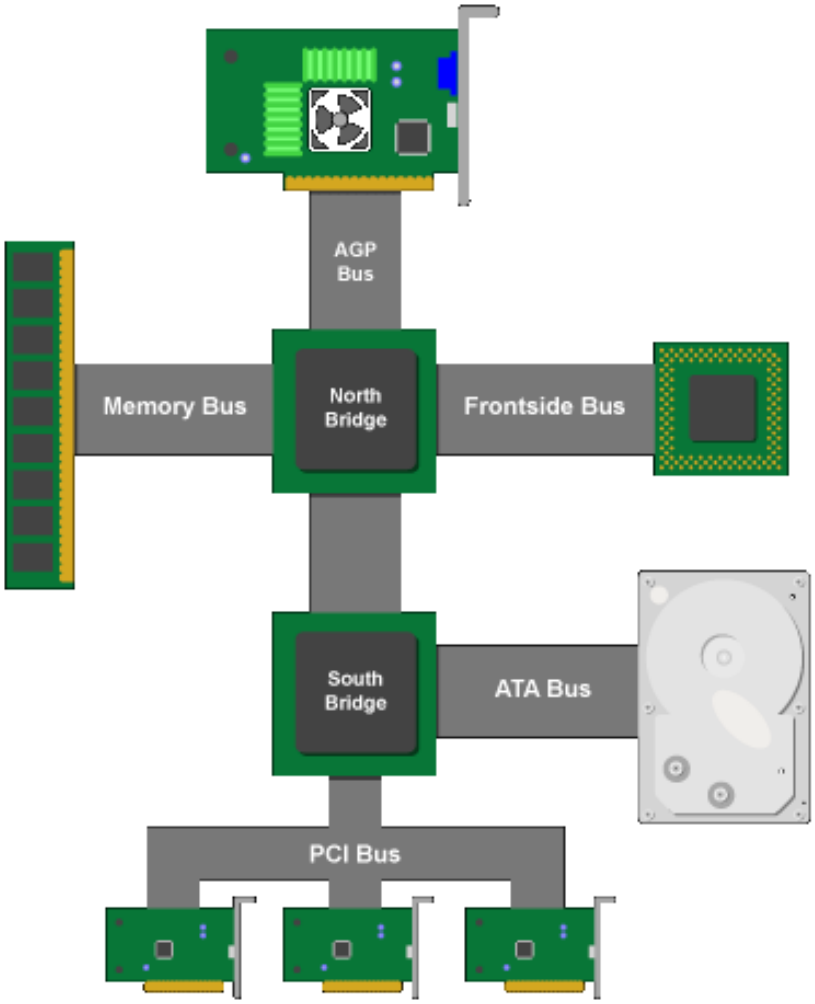
- Most chip sets are divided into two distinct components, **Northbridge** and **Southbridge**.



The Chip Set

- The Northbridge controls access to the RAM, video card, and the speeds at which the CPU can communicate with them.
- The Southbridge allows the CPU to communicate with the hard drives, sound card, USB ports, and other I/O ports.

Typical Bus Structures



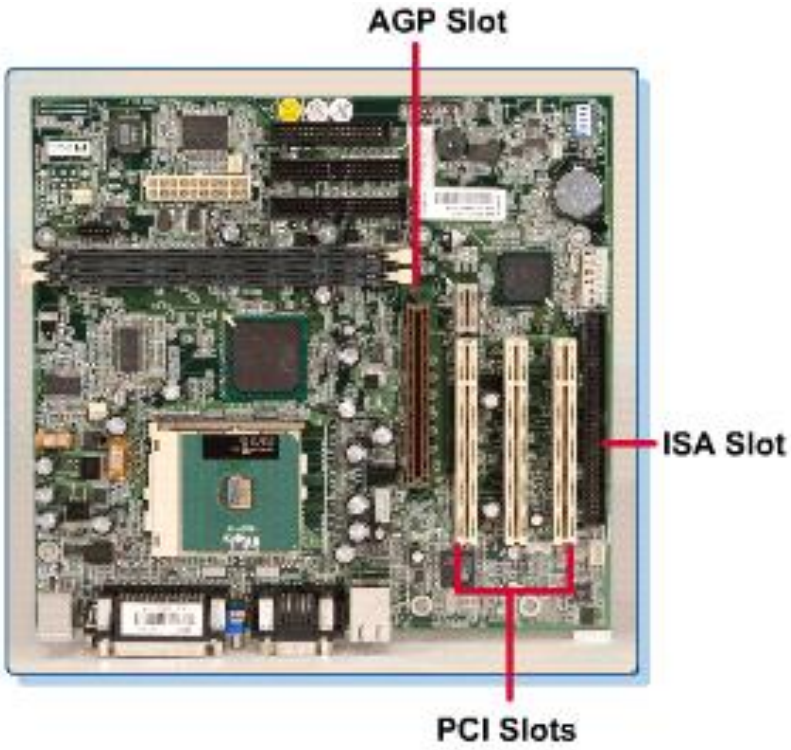
This illustration shows how the various buses connect to the CPU.

Buses Types

Every bus has three components:

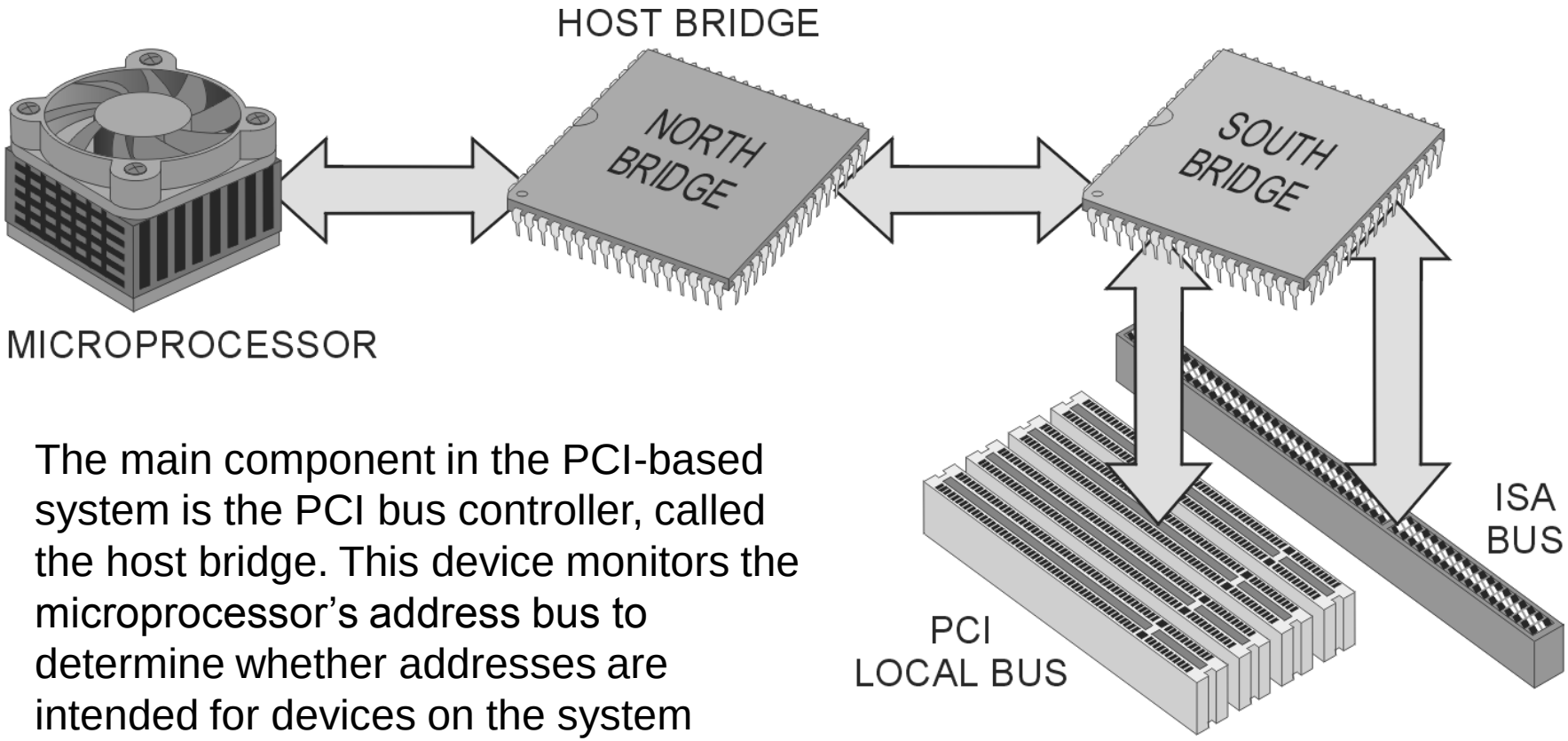
Bus Type	Description
Address bus	The address bus is a uni-directional pathway, which means that information can only flow one way.
Data bus	The data bus is a bi-directional pathway for data flow, which means that information can flow in two directions.
Control bus	The control bus carries the control and timing signals needed to coordinate the activities of the entire computer.

Expansion Slots



- Expansion slots (sockets) are receptacles on the computer motherboard that accept printed circuit boards.
- Common expansion slots likely to be encountered include the following:
  - Industry Standard Architecture (ISA)
  - Peripheral Component Interconnect (PCI)
  - Accelerated Graphics Port (AGP)

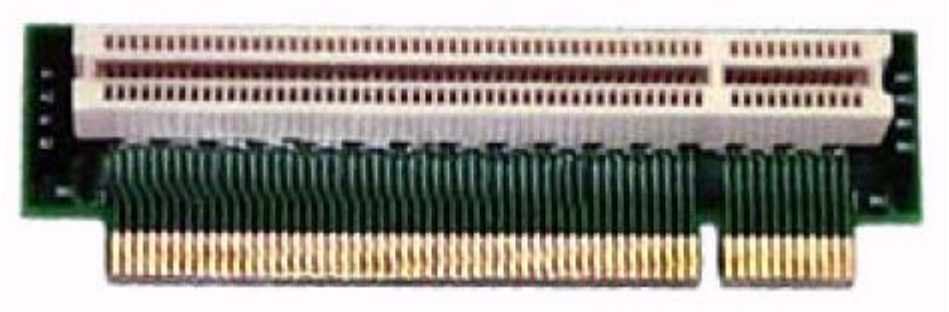
PCI Bus Structure



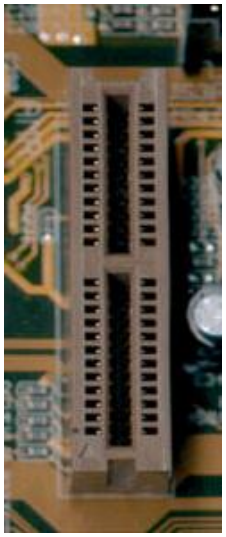
The main component in the PCI-based system is the PCI bus controller, called the host bridge. This device monitors the microprocessor's address bus to determine whether addresses are intended for devices on the system board, in a PCI slot, or in one of the system board's other expansion slots.

Riser Cards

- Riser card – used when a computer is fully loaded to physically extends a slot so a chip or card can be plugged in. In low-profile, space-saving cases, cards are plugged into riser cards that reside parallel with the motherboard.



Riser Cards

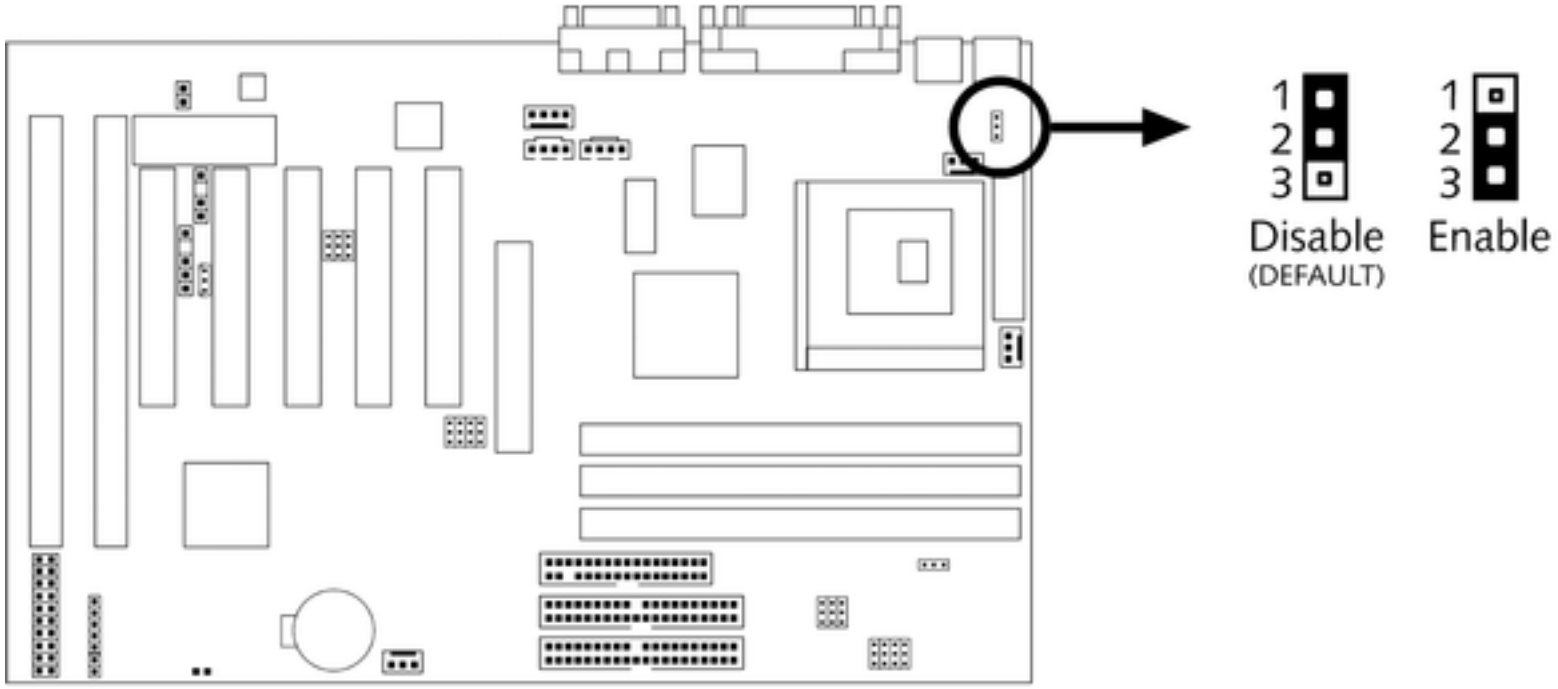


AMR

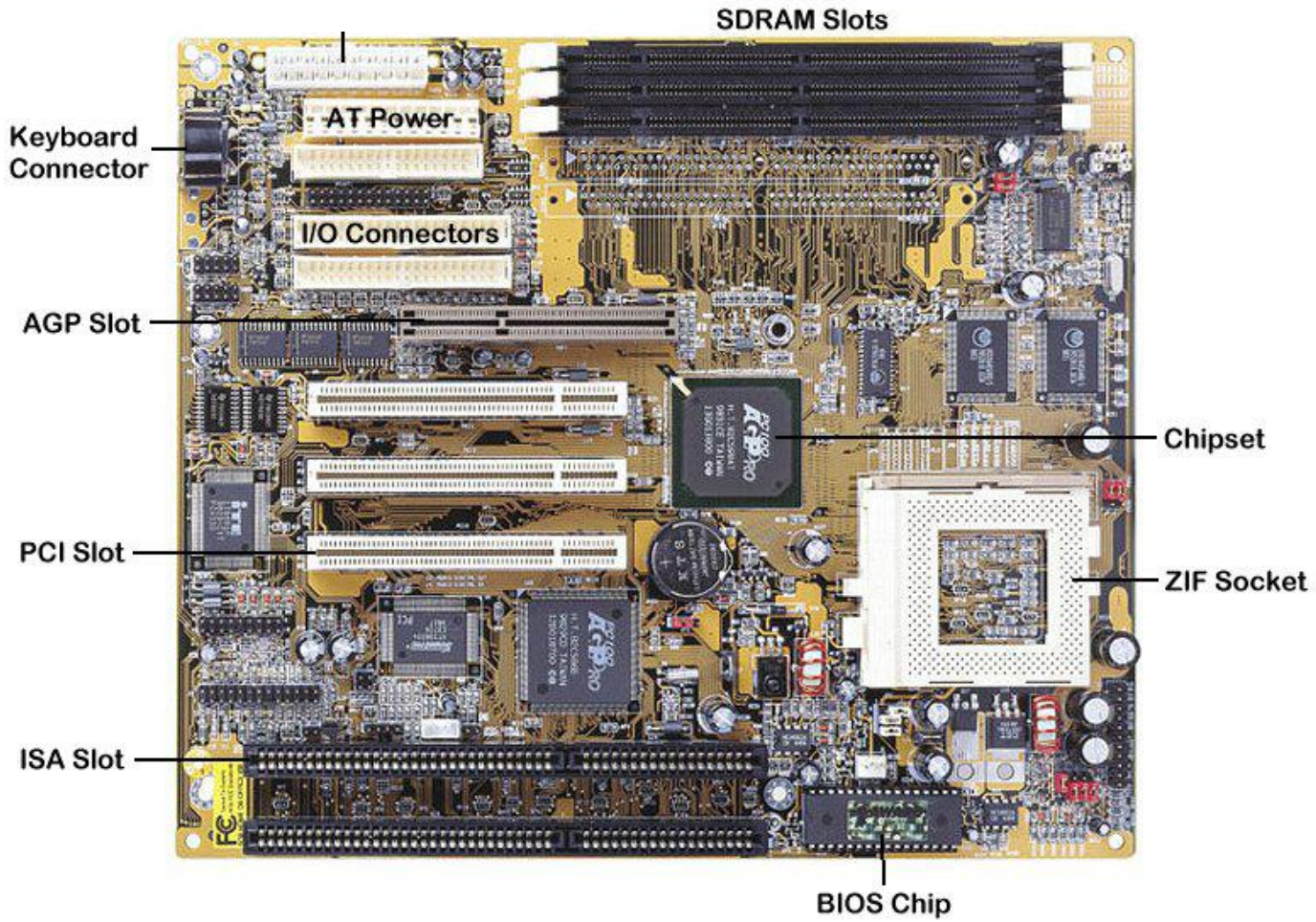
CNR

- Audio/Modem Riser (AMR)- a plug-in card for an Intel motherboard. The AMR evolved into the Communications and Networking Riser (CNR) card, which added LAN and home networking functions.
- The CNR is a 30-pin interface that accommodates two formats making various audio/modem and audio/network combinations possible.

Setup Data Stored by Jumpers



Full-size AT System Board



Full-size ATX System Board