Computer Hardware & Networking& Server Configurations (H7E3 04)

UNIT 01
Introduction to Computer Hardware, PC Components and Functionalities

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Classification of Computers

- Computers can be classified into three major classes based on the mode of data representation used.

1. Analog Computers
2. Digital Computers
3. Hybrid Computers

01. Analog Computers

- An analog computer is a form of computer that uses continuous physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved.

- It operates by measuring rather than counting.

- It uses continuous signals as input.

- Examples: Thermometer, Speedometer etc.

Digital Computers

- A computer that performs calculations and logical operations with quantities represented as digits, usually in the binary number system

- These are the systems that are computationally complete and capable of solving all of the problems that can be solved algorithmically.

- Examples: Desktop, laptop etc.

Hybrid Computers (Analog + Digital)

- A combination of computers those are capable of inputting and outputting in both digital and analog signals. A hybrid computer system setup offers a cost effective method of performing complex simulations.

- It uses both types of signals – analog as well as digital – as input.

- Mostly used with process control equipment's in continuous production plants e.g., oil refineries, Areas of application are nuclear power plants, mines, intensive care units of hospitals (ICUs), chemical process plants etc.

Oil Refineries

Nuclear Power Plants

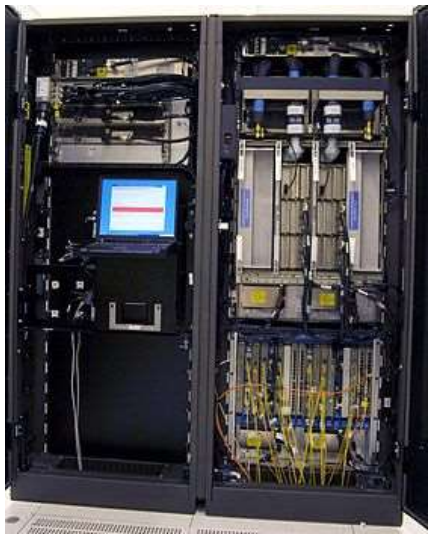
Hospitals (ECG Machine)

Classification of Digital Computers On the basis of Size

The digital computers that are available now a days vary in their sizes and types. The computers are broadly classified into four categories based on their size and type

1. Micro Computers

2. Mini Computers



3. Mainframe Computers

4. Super Computer

1. Micro Computers

- Microcomputers are small, low-cost and single-user digital computer.

- They consist of CPU, input unit, output unit, storage unit and the software.

- IBM PC based on Pentium microprocessor and Apple Macintosh are some examples of microcomputers.

- Microcomputers include desktop computers, notebook computers or laptop, tablet computer, handheld computer, smart phones and netbook

Desktop Computer or Personal Computer

- It is the most common type of microcomputer.

- It consists of three units—keyboard, monitor, and a system unit containing the CPU, memory, hard disk drive, etc.

- It is not very expensive and is suited to the needs of a single user at home, small business units, and organizations.

- Apple, Microsoft, HP, Dell and Lenovo are some of the PC manufacturers.

Notebook Computers or Laptop

- They are portable and have all the features of a desktop computer.

- The advantage of the laptop is that it is small in size, can be carried anywhere.

- Laptops can be placed on the lap while working.

- Laptops are costlier than the desktop machines.

Netbook/ Mini LAP

- These are smaller notebooks optimized for low weight and low cost, and are designed for accessing web-based applications.

- Netbooks deliver the performance needed to enjoy popular activities like streaming videos or music, emailing, Web surfing or instant messaging.

Tablet

- Tablet Computer has features of the notebook computer but it can accept input from a stylus or a pen instead of the keyboard or mouse.

- It is a portable computer.

- Tablet computer are the new kind of PCs.

Handheld Computer or Personal Digital Assistant (PDA)

- It is a small computer that can be held on the top of the palm.

- It is small in size.

- PDA uses a pen or a stylus for input, Instead of the keyboard.

- They have a limited memory and are less powerful.

- PDAs can be connected to the Internet via a wireless connection.

- Example Casio and Apple are some of the manufacturers of PDA.

Smart Phones

- These are cellular phones that function both as a phone and as a small PC.

- They may use a stylus or a pen, or may have a small keyboard.

- They can be connected to the Internet wirelessly.

- They are used to access the electronic-mail, download music, play games, etc.

- Blackberry, Apple, HTC, Nokia and LG are some of the manufacturers of smart phones.

Wearable computer

- The size of this computer is very small so that it can be worn on the body.
- It has smaller processing power.
- It is used in the field of medicine.

- For example,

  - ➢ To accurately calculate the heartbeat.

  - ➢ Insulin meter to find the levels of insulin in the blood.

2. Mini Computers

- Minicomputers are digital computers, generally used in multi-user systems.

- Minicomputers are mainly used as small or midrange servers operating business and scientific applications.

- They have high processing speed and high storage capacity than the microcomputers.

- Minicomputers can support 4–200 users simultaneously.

- The users can access the minicomputer through their PCs or terminal.

- Example
  - Digital Alpha
  - Sun Ultra
  - HP 3000 series

3. Mainframe Computers

- Mainframe computers are multi-user, multi-programming and high performance computers.

- They operate at a very high speed, have very large storage capacity and can handle the workload of many users.

- Mainframe computers are large and powerful systems generally used in centralized databases.

- Computers with large storage capacities and very high speed of processing (compared to mini- or microcomputers) are known as mainframe computers.

- They support a large number of terminals for simultaneous use by a number of users like ATM transactions.

- They are also used as central host computers in distributed data processing system.

- Mainframe computers are used in organizations like banks or companies, where many people require frequent access to the same data.

- Examples: -
  - IBM zSeries
  - IBM System z9
  - IBM System z10 servers

IBM zSeries

IBM System z9

IBM System z10 servers

4. Super Computers

- Supercomputers are the fastest and the most expensive machines.
- They have high processing speed compared to other computers.
- The speed of a supercomputer is generally measured in FLOPS (Floating point Operations per Second).

- Some of the faster supercomputers can perform trillions of calculations per second.

- Supercomputers are used for highly calculation-intensive tasks, such as, weather forecasting, climate research (global warming), molecular research, biological research, nuclear research and aircraft design. They are also used in major universities, military agencies and scientific research laboratories.

- Some examples of supercomputers are

IBM Roadrunner,
IBM Blue gene
Intel ASCI red.
Cray JAGUAR

Basic Personal Computer System

- A computer system consists of hardware and software components.

- Hardware is the physical equipment such as the case, storage drives, keyboards, monitors, cables, speakers, and printers.

- Software is the operating system and programs.
- The operating system instructs the computer how to operate.
- Programs or applications perform different functions.

External Components

Computer case

- Provides protection and support for internal components.
- Should be durable, easy to service, and have enough room for expansion.
- The size and layout of a case is called a **form factor.**

NOTE: Select a case that matches the physical dimensions of the power supply and motherboard.

Power supply

- Converts AC power from the wall socket into DC.
- Must provide enough power for the installed components and future additions.

Internal Components

Identify the names, purposes, and characteristics of:

- Motherboards
- CPUs
- Cooling systems
- ROM and RAM
- Adapter cards
- Storage drives
- Internal cables

Motherboards

- The motherboard is the main printed circuit board.
- Contains the buses, or electrical pathways found in a computer.
- Buses allow data to travel among the various components.

- Accommodates CPU, RAM, expansion slots, heat sink/fan assembly, BIOS chip, chip set, sockets, internal and external connectors, various ports, and the embedded wires that interconnect the motherboard components.

Pentium I Motherboard

Pentium II Motherboard

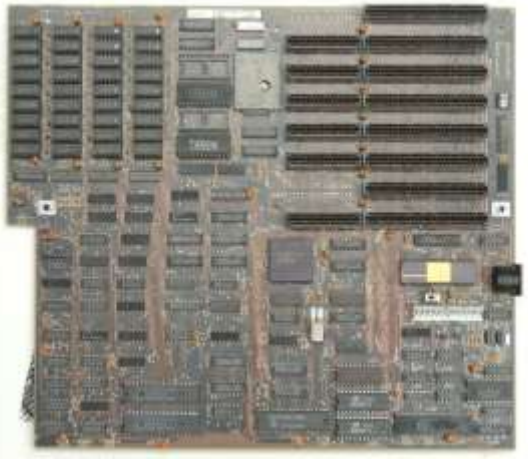
Pentium III Motherboard

Pentium IV Motherboard

Motherboard Form Factors

- The form factor of motherboards pertains to the size and shape of the board.
- It also describes the physical layout of the different components and devices on the motherboard.
- Various form factors exist for motherboards.

Form Factors	
AT	Advanced Technology
ATX	Advanced Technology Extended
Mini-ATX	Smaller Footprint of Advanced Technology Extended
Micro-ATX	Smaller Footprint of Advanced Technology Extended
LPX	Low-Profile Extended
NLX	New Low-Profile Extended
BTX	Balanced Technology Extended
Mini-ITX	Smaller than the Micro-ATX format
Nano-ITX	Smaller footprint of the Mini-ITX
Pico-ITX	Half the size of the Nano-ITX
Mobile-ITX	Smallest ITX motherboard



Advanced Technology

Advanced Technology Extended

Mini-ATX

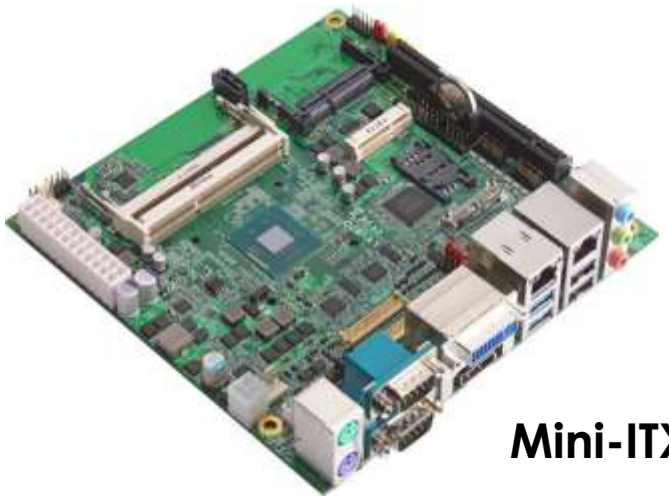
Micro-ATX

LPX

Pico-ITX

Nano-ITX

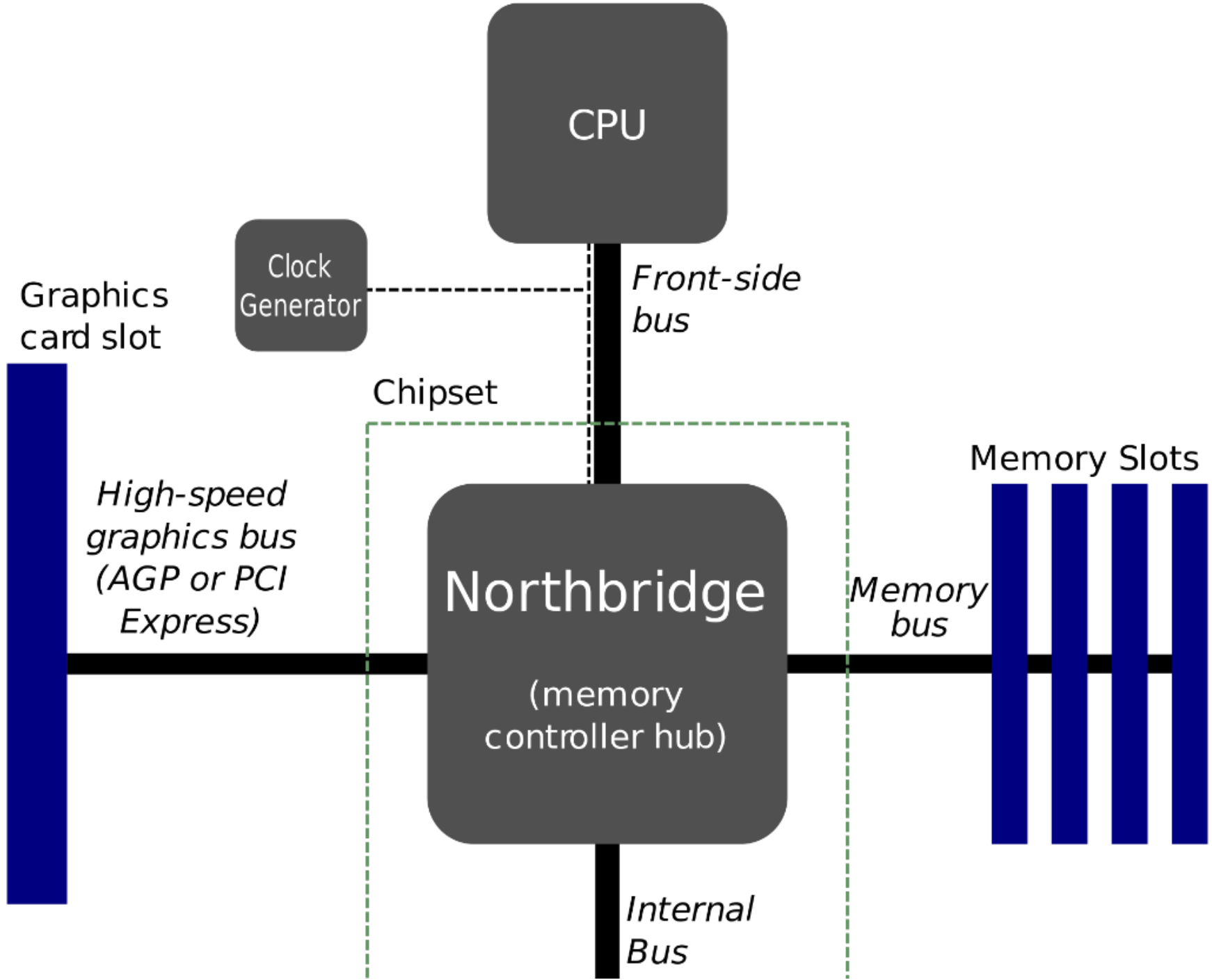
BTX

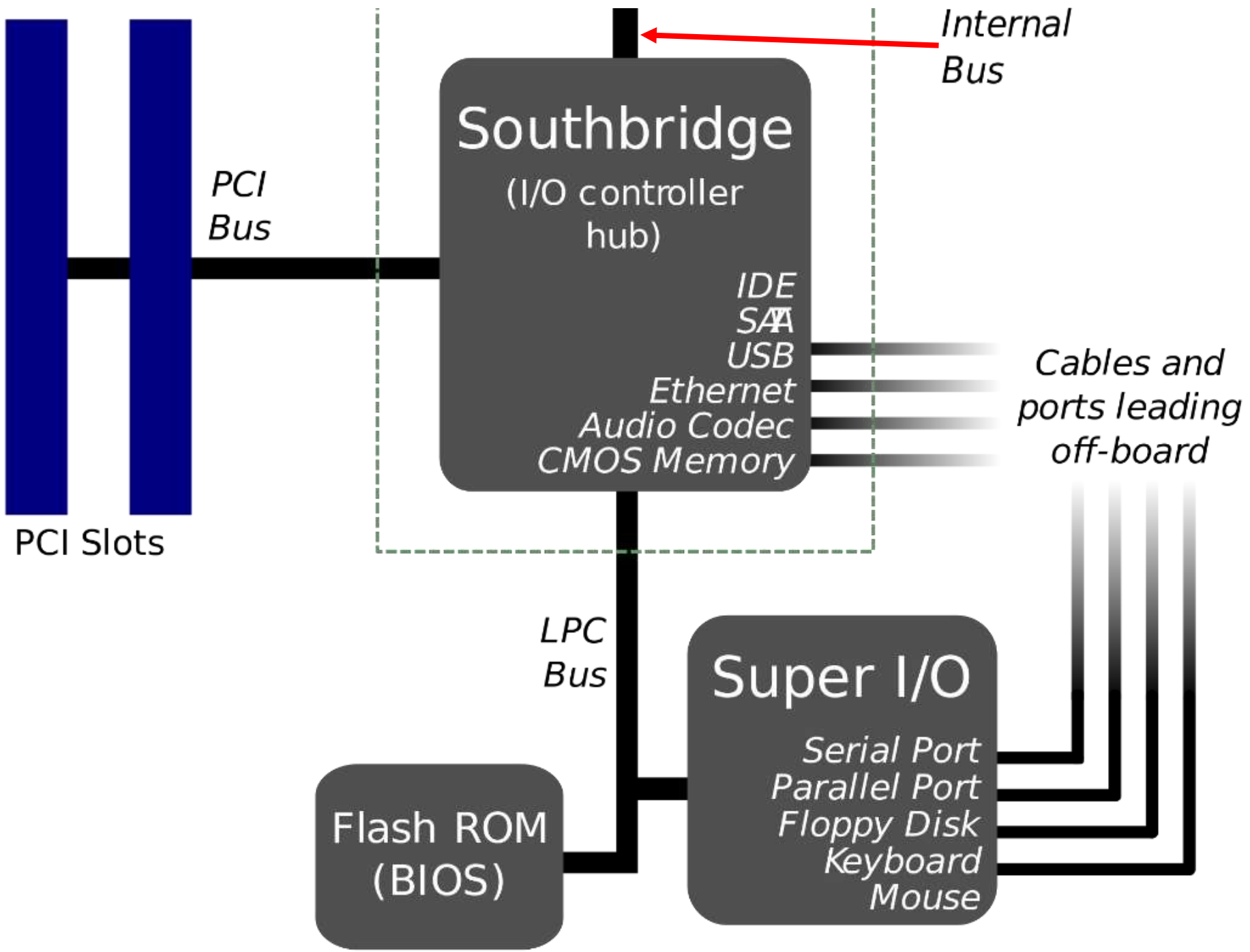


Mini-ITX

Mobile-ITX

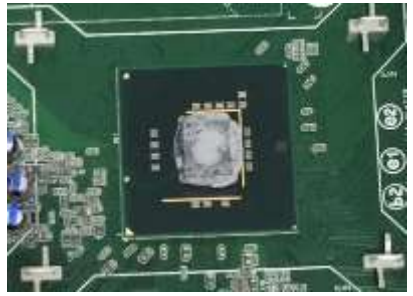
The Main Circuit Board has Major Components (CHIP SET)


CPU
Clock Generator
Front-side bus
Graphics card slot
Chipset
Memory Slots
High-speed graphics bus (AGP or PCI Express)
Northbridge
(memory controller hub)
Memory bus
Internal Bus


Internal
Bus
Southbridge
(I/O controller
hub)
PCI
Bus
IDE
SATA
USB
Ethernet
Audio Codec
CMOS Memory
Cables and
ports leading
off-board
PCI Slots
LPC
Bus
Super I/O
Serial Port
Parallel Port
Floppy Disk
Keyboard
Mouse
Flash ROM
(BIOS)

Northbridge

- The high-speed part of a common chipset architecture in a computer. The Northbridge is the controller that interconnects the CPU to memory via the frontside bus (FSB). It also connects peripherals via high-speed channels such as PCI Express. The Northbridge may include a display controller, obviating the need for a separate graphics card.



Southbridge

- The southbridge is an IC on the motherboard responsible for the hard drive controller, I/O controller and integrated hardware.

- Integrated hardware can include the sound card and video card if on the motherboard, USB, PCI, ISA, IDE, BIOS, and Ethernet.

- Although the southbridge handles most of the I/O devices, less prominent input/output devices, such as a serial port, keyboard, and non-USB mouse are handled by the super input/output (SIO).

Super IO (SIO)

Short for super input/output or Super I/O, SIO is an integrated circuit on a computer motherboard that handles the slower and less prominent input/output devices shown below.

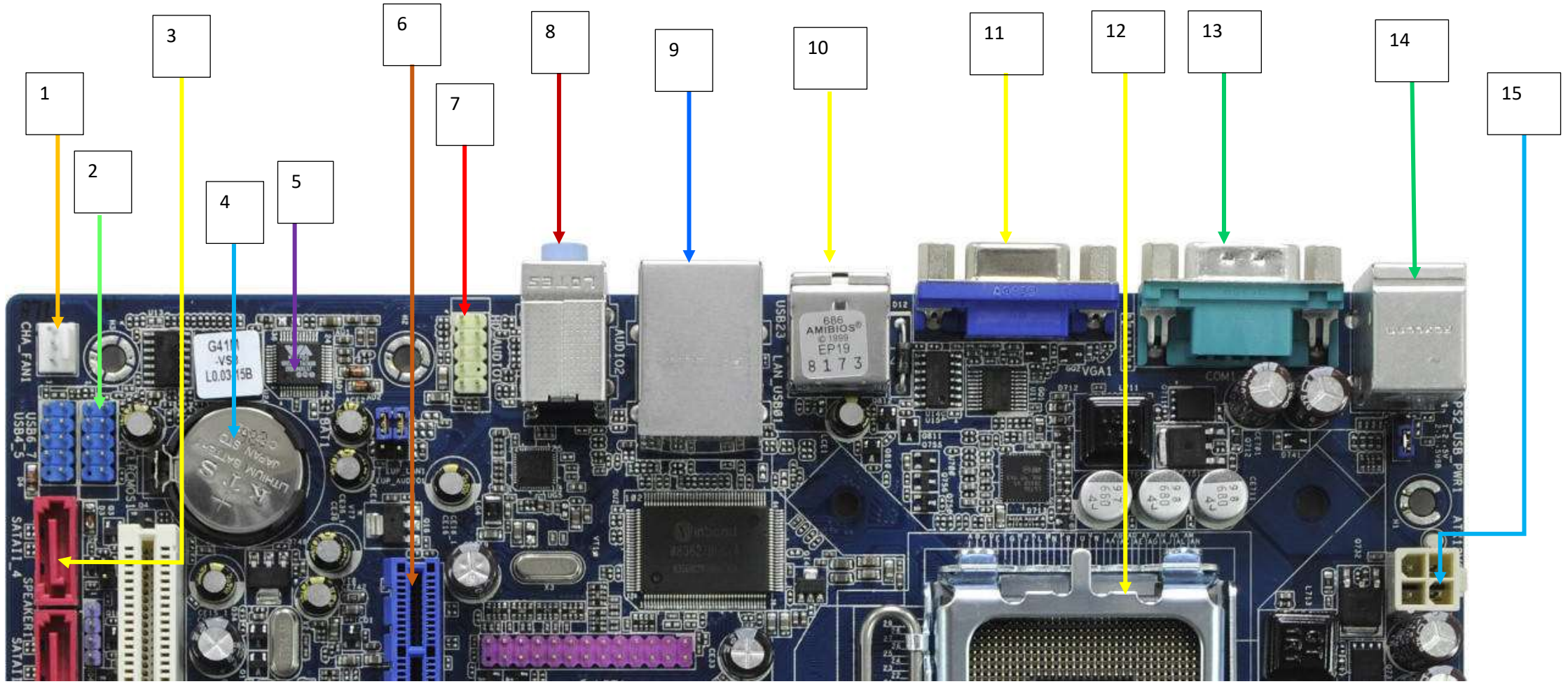
When the Super input/output was first introduced in the late 1980's it was found on an expansion card, later this chip was embedded into the motherboard and communicated over the ISA bus.

- As ISA began to no longer be used with computers SIO communicated over the PCI bus.

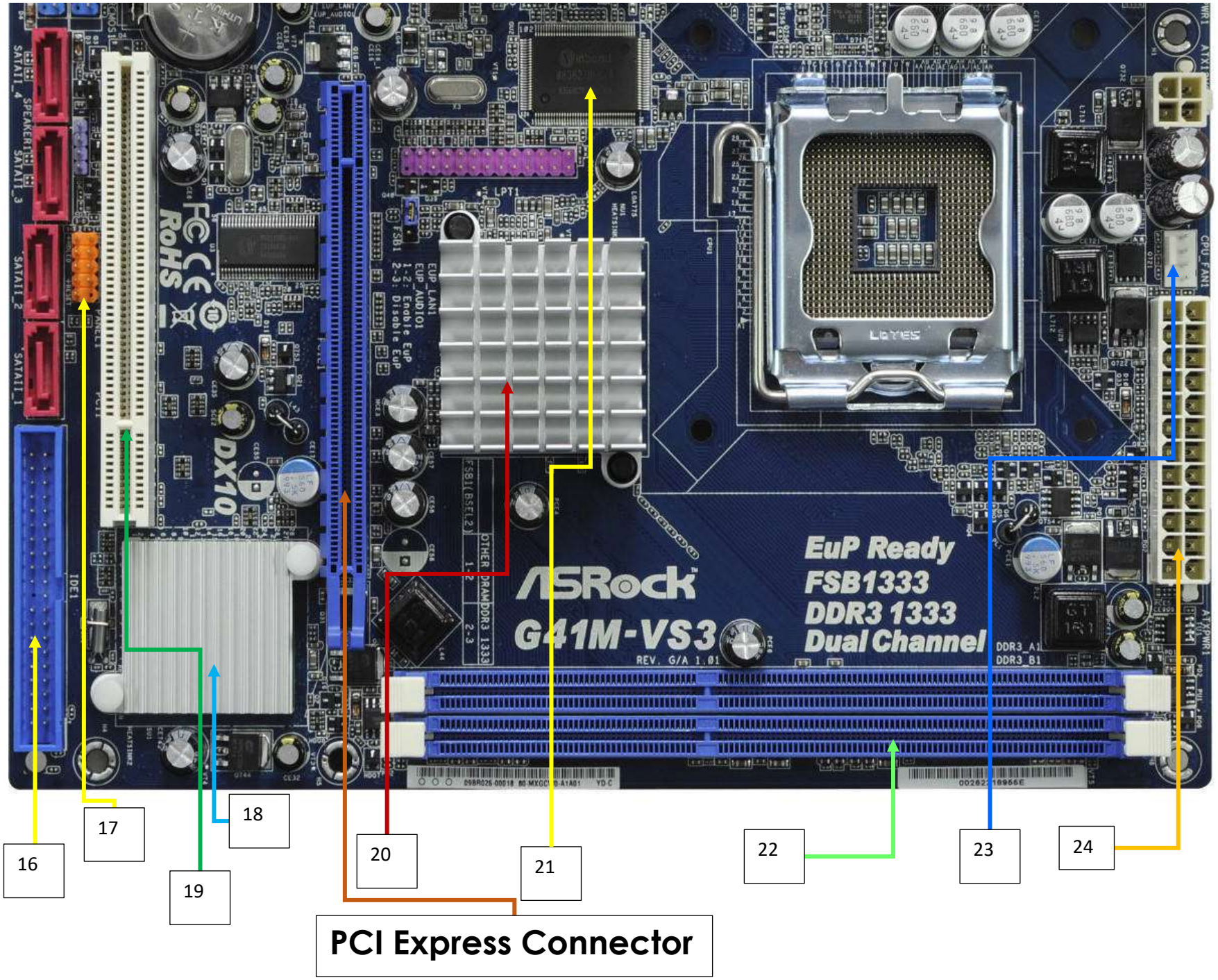
- Today, super I/O communicates through the Southbridge and is still used with computers to support older legacy devices.

Identifying the Super I/O on your motherboard is often easy if you look for an integrated circuit that is labeled with a company's name that manufacturers Super I/O chips. Some common Super I/O manufacturers are Fintek, ITE, National Semiconductor, Nuvoton, SMC, VIA, and Winbond.

Naming Motherboard Parts.



1). Chassi Fan Connector
2). Front Panel USB Connector
3). SATA Cable Connector
4). CMOS Battery
5). Super IO Chip
6). PCI Express Connector
7). Front Panel Audio Connector
8). Back Panel Audio Connector
9). RJ 45 and USB Connector
10). Back Panel USB Connector
11). VGA Port
12). Processor Socket
13). Serial Port
14). PS2 Keyboard and Mouse Connector
15). 12v 4 Pin Connector



16). IDE Cable Connector

17). Front Panel Cable Connector

18). South Bridge Chip

19). PCI Slot

20). North Bridge Chip

21). BIOS Chip

22). RAM Card Connector Slot

23). CPU Fan Connector

24). 24 Pin Power Connector

Note:

Some newer chipsets are combining the Southbridge and Super I/O chips into a single chip and referring to this chip as the Super Southbridge chip. Some manufacturers such as NVIDIA and SiS have even combined the Northbridge, Southbridge, and Super I/O into a single chip.

Note:

New motherboards are replacing the northbridge and the southbridge with PCH (Platform Controller Hub)

Contact Me ...

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THANK YOU