Computer Hardware

The birth of Personal Computer

Personal computer PC By IBM

Microcomputer with OS CP/M and upto 64 dump Terminals

Why not a system for single user like microcomputer at the cost of Home computer ???

Home computer HC TV as monitor & Tape recorder as storage device

For this PC the IBM needs

- **A 8 bit processor**
  which can support above **256KB Memory**

- **Single user OS**
  which can work with **Floppy Disk**

Intel

The Microprocessor Company released **8086**
a **16 bit** Processor with **1MB** memory support.
….failure in the market

8086 was modified into **8 bit** processor as **8088**
used by **IBM for PC**

Microsoft

A small company of those days developed a OS as Disk Operating System **DOS** for IBM

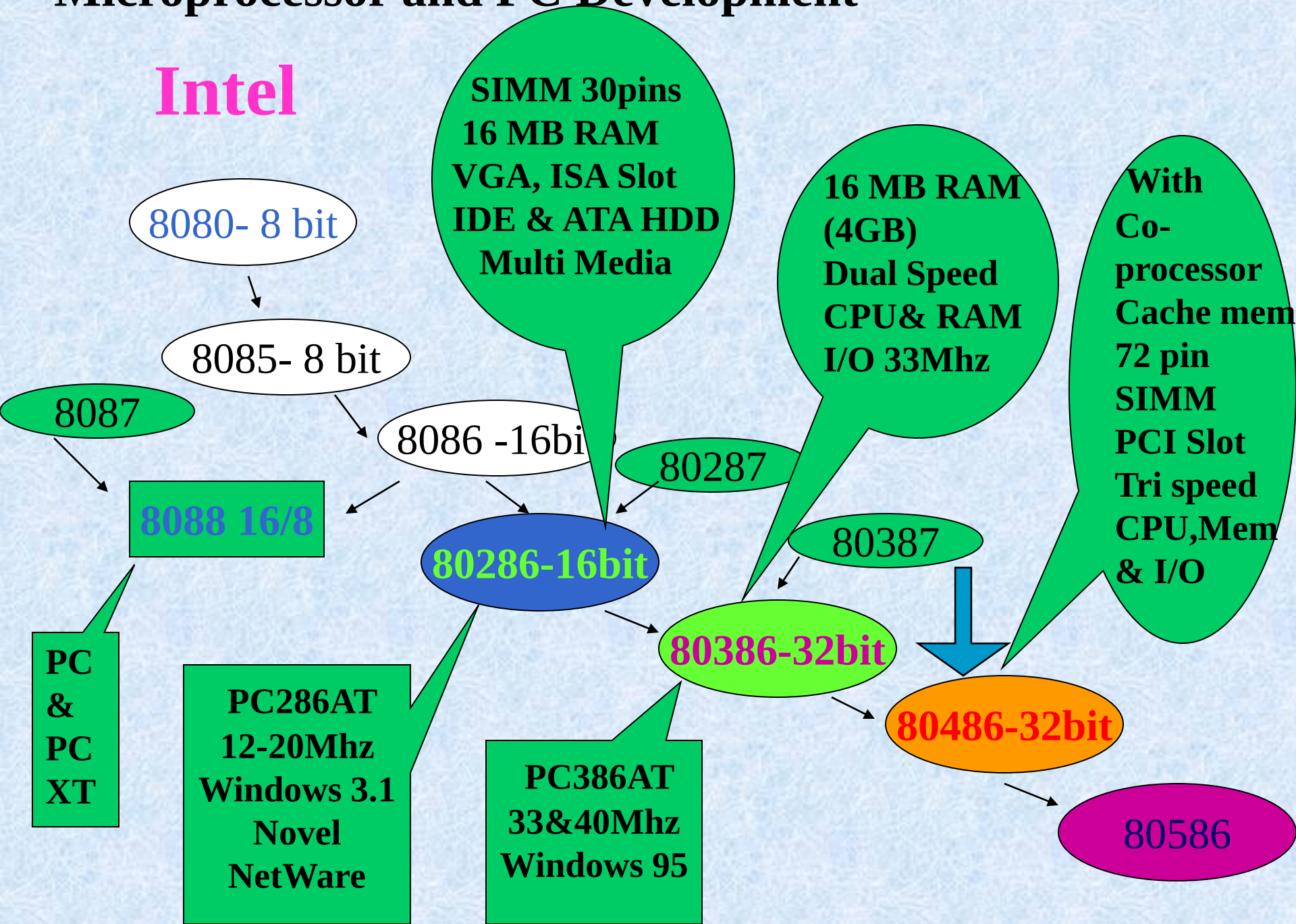
…later renamed as **MSDOS**

The First IBM PC configuration

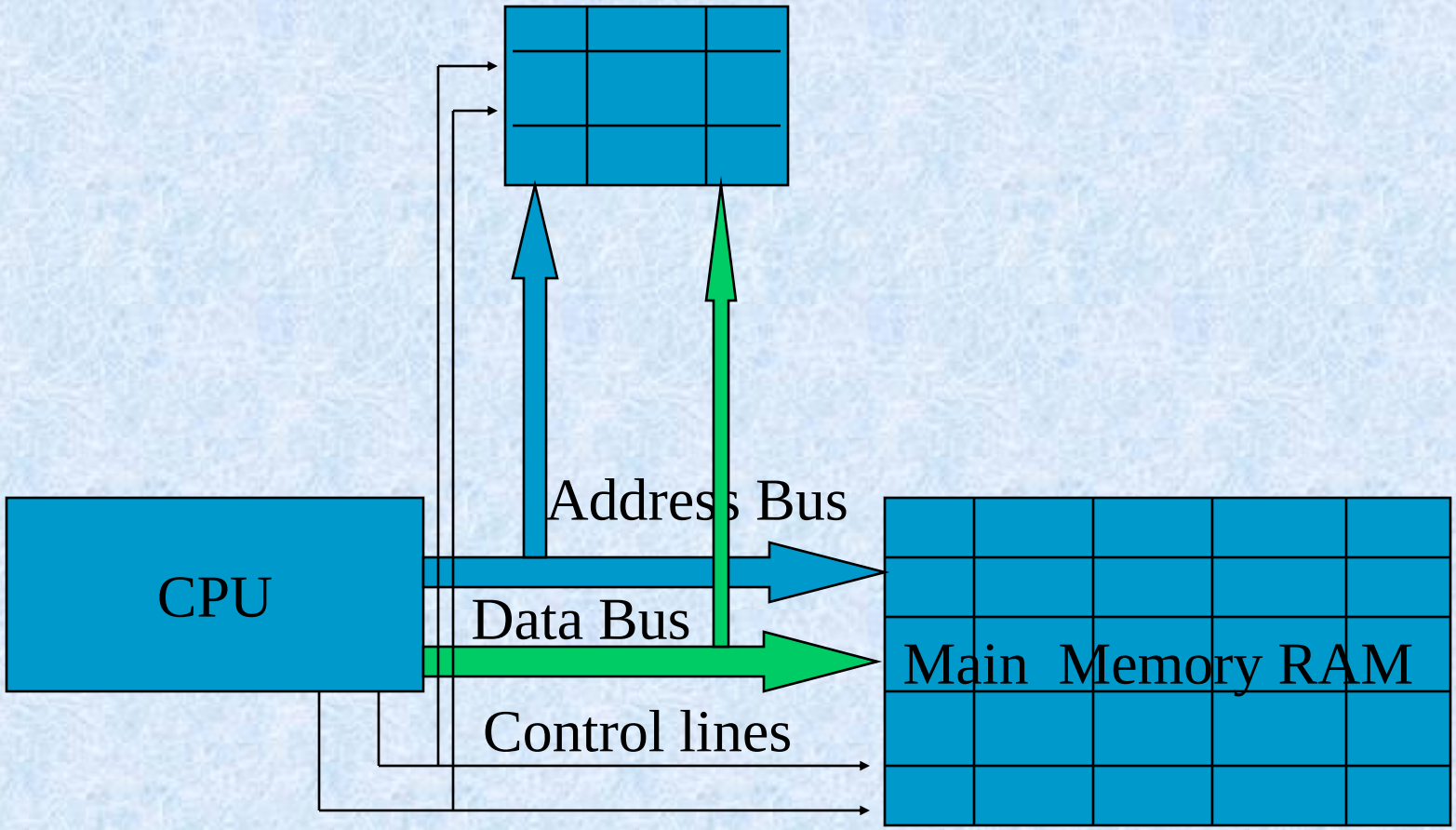
Processor 8088 - 4.77Mhz
256 KB RAM (640kb)
2x360 KB Floppy disk drive
2 Parallel port
2 Serial port
Mono Graphics display card
Mono chromatic monitor
84 keys keyboard

Operating system DOS (8 bit)

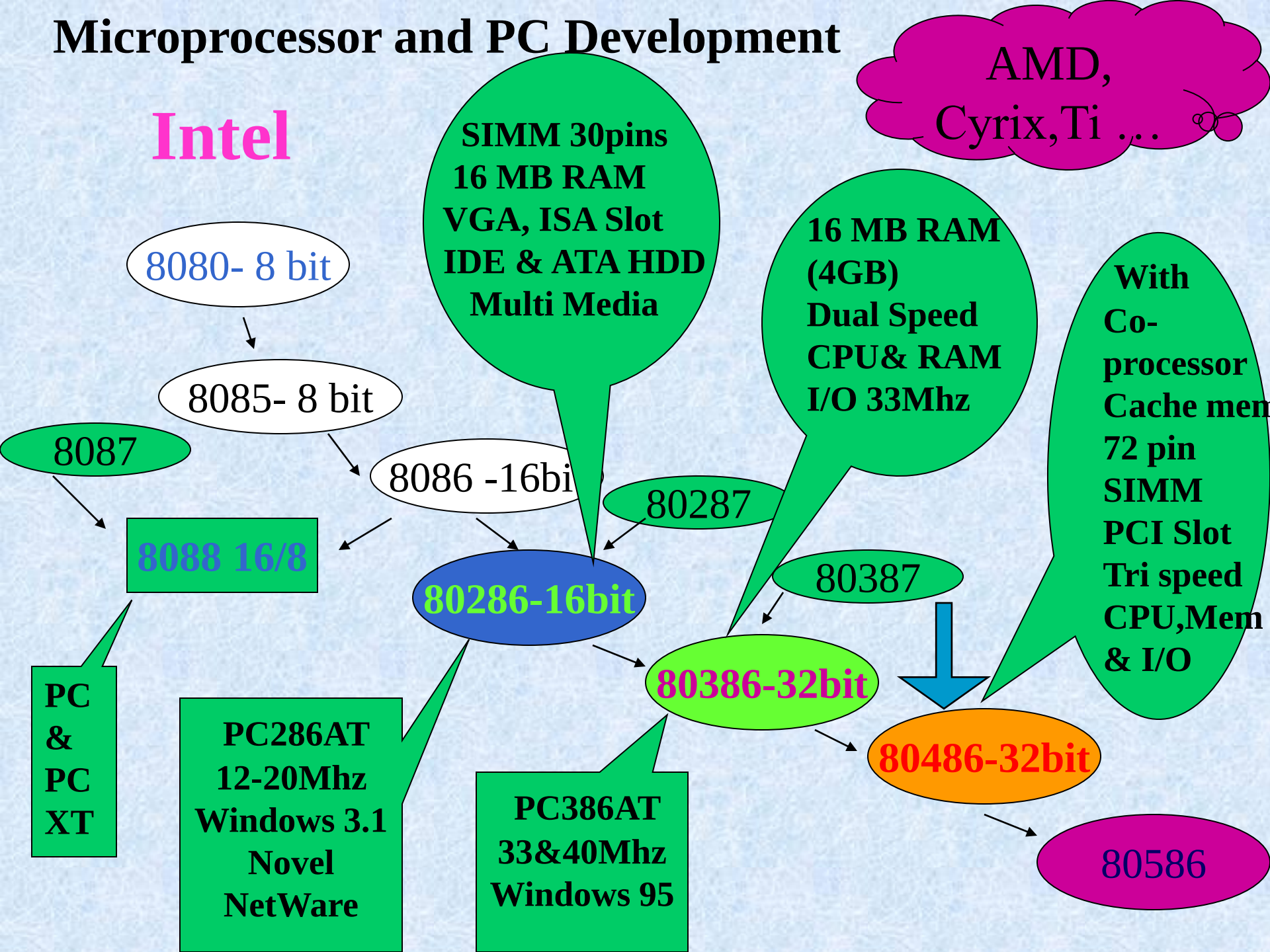
Microprocessor and PC Development

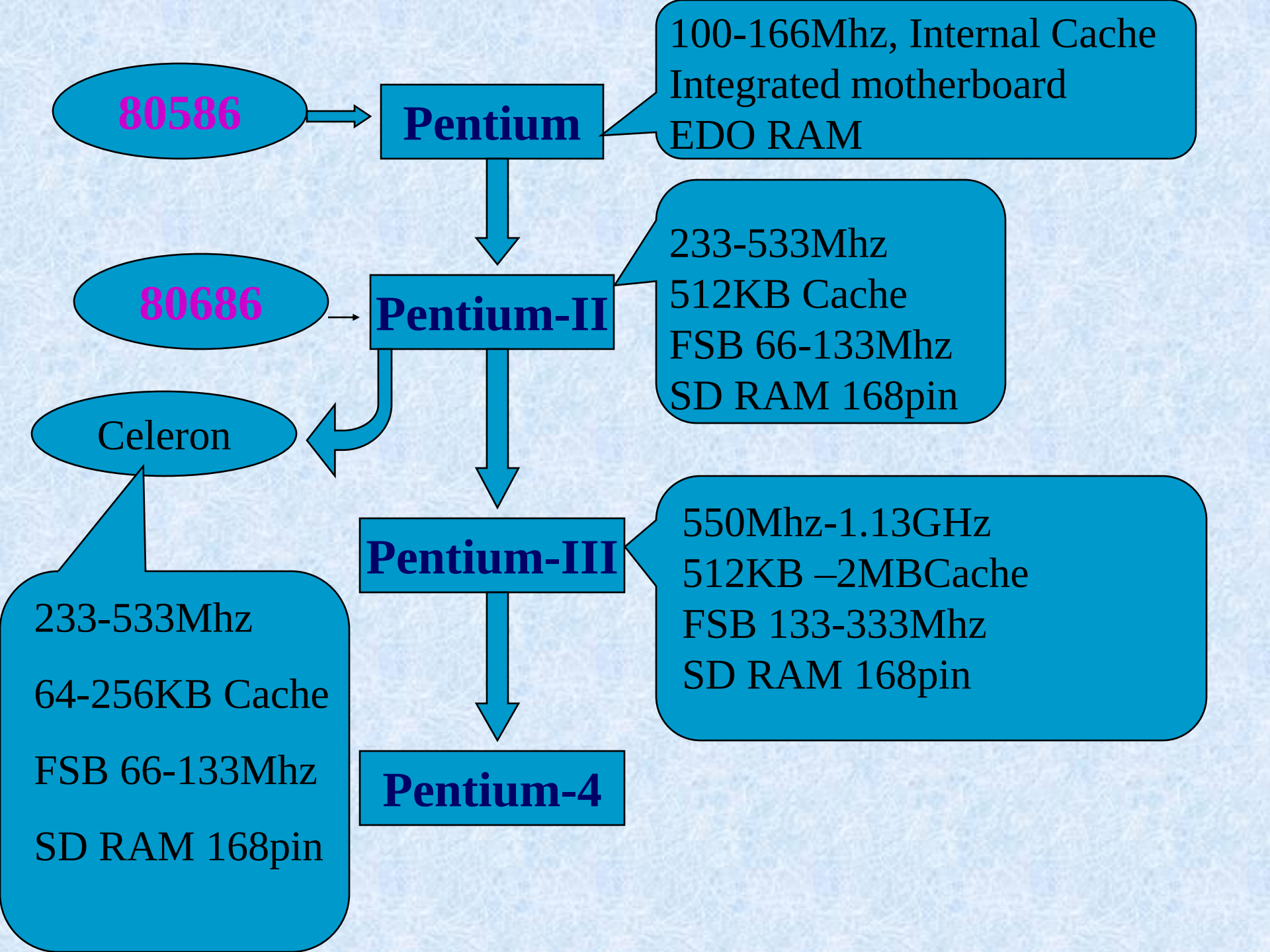


Cache Memory

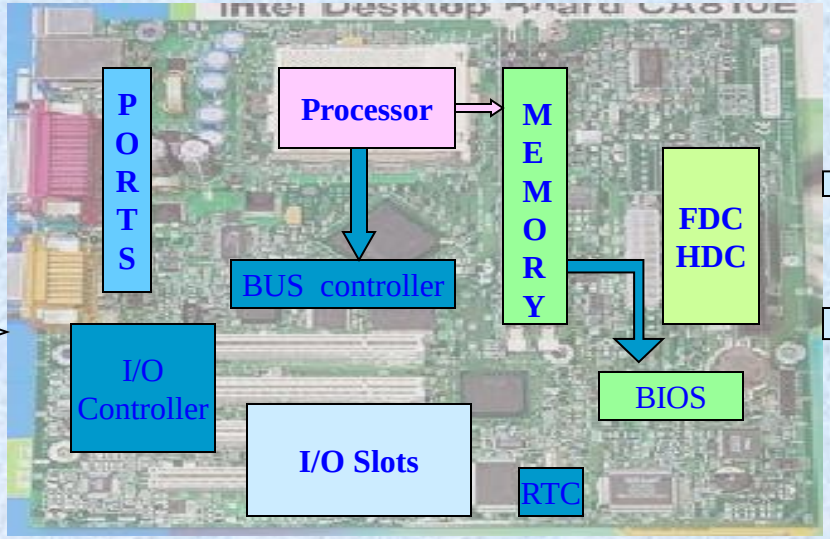


Microprocessor and PC Development




80586
Pentium
100-166Mhz, Internal Cache
Integrated motherboard
EDO RAM
80686
Pentium-II
233-533Mhz
512KB Cache
FSB 66-133Mhz
SD RAM 168pin
Celeron
233-533Mhz
64-256KB Cache
FSB 66-133Mhz
SD RAM 168pin
Pentium-III
550Mhz-1.13GHz
512KB –2MBCache
FSB 133-333Mhz
SD RAM 168pin
Pentium-4

Personal Computer Architechture

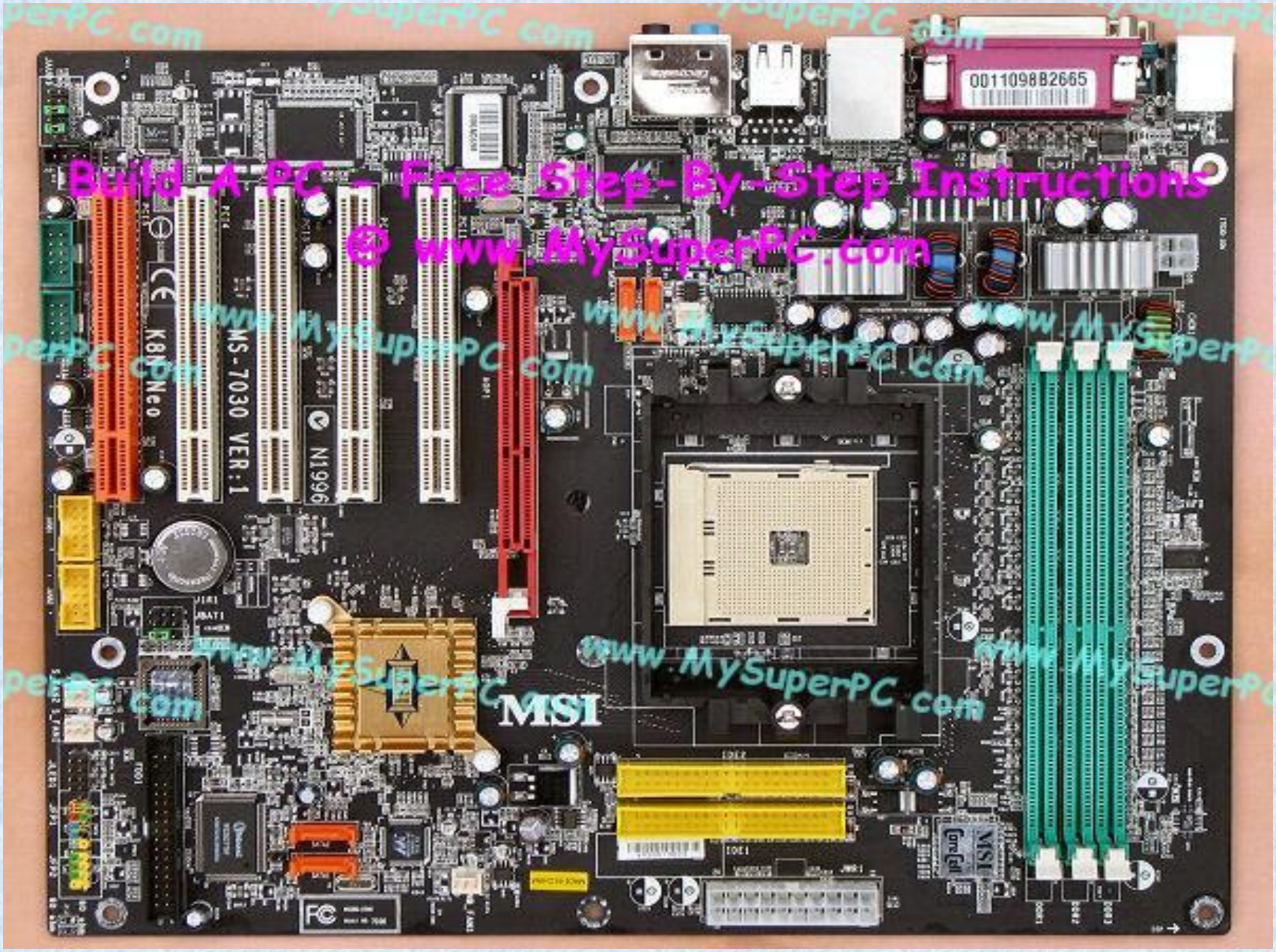


Motherboard

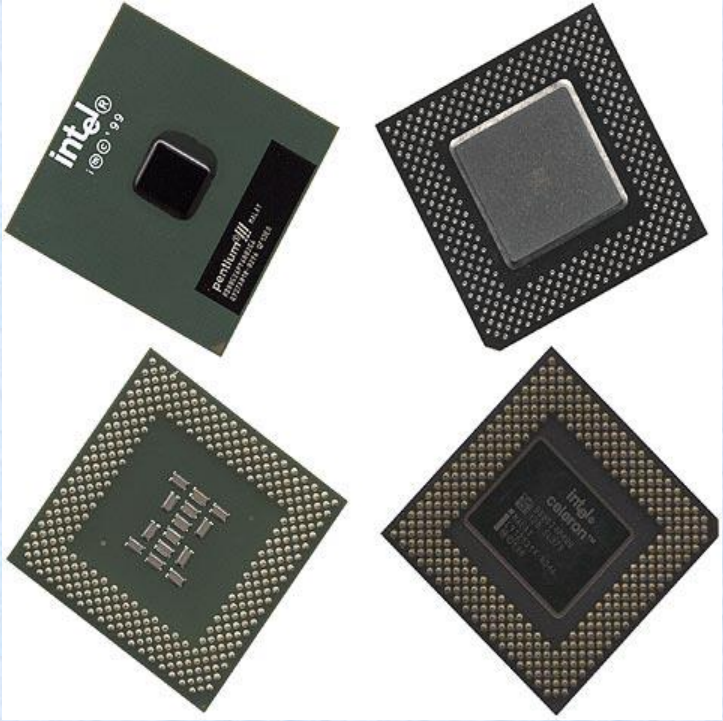
Motherboard

Normally a motherboard consists of

- CPU Socket & CPU
- Core voltage converter~1.7V
- Core Frequency generator e.g. 2.8Ghz
- Chip set
  - Memory bus controller (FSB)
  - I/O controllers
- RAM Slot & RAM
- Keyboard interface
- I/O Slots
- **Integrated or All In One Motherboard**
- Floppy Disk Controller
- Hard Disk Controller
  - parallel ATA (PATA)
  - Serial ATA (SATA)
- Parallel port, Serial port, USB ports
- Ethernet
- AGP display controller
- Sound Controller


Build A PC - Free Step-By-Step Instructions
@ www.MySuperPC.com
MS-7030 VER:1
MSI
0011098B2665

Pentium-4



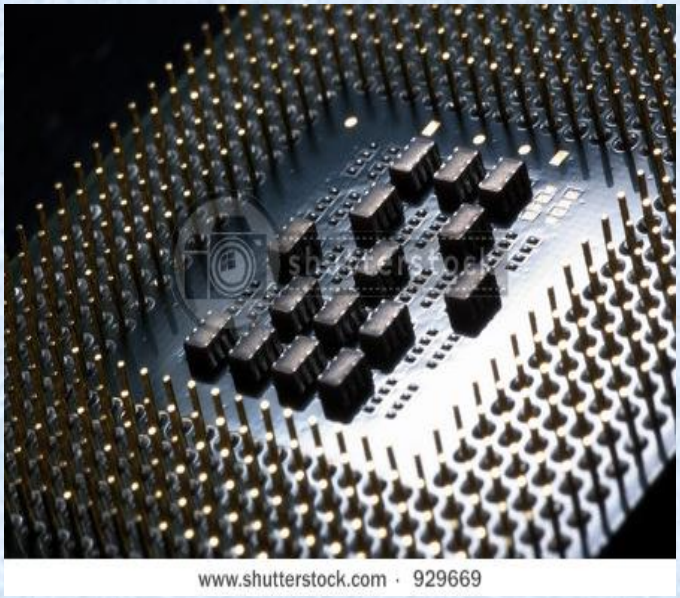
Some Important points in selecting the Processor

Speed: 1 Ghz – 3.4 Ghz ….

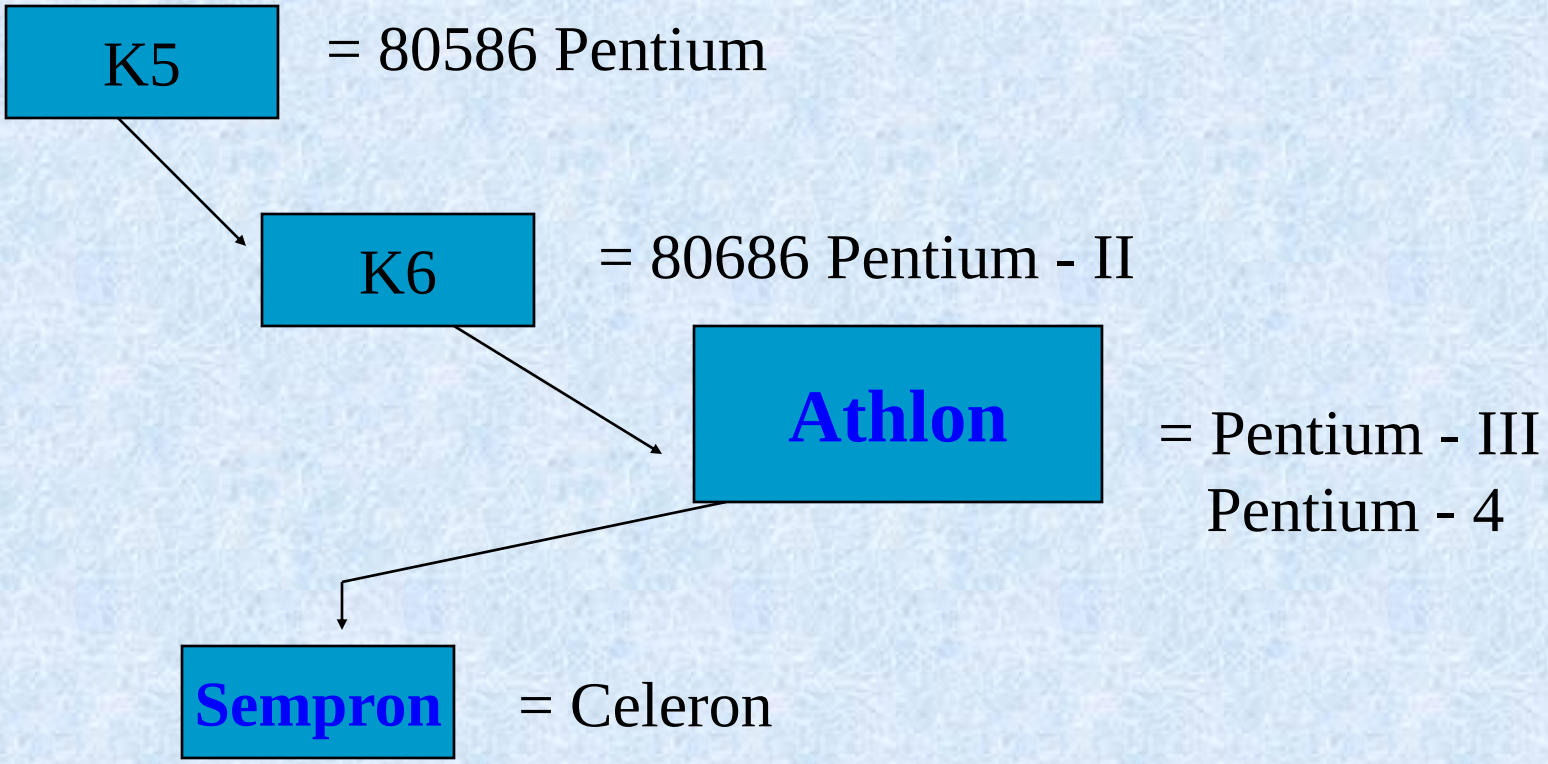
FSB : 333Mhz – 833Mhz

Three
Level Cache: 256Kb-4Gb

Models: Single core
HT
Dual Core



Advance Micro Devices **AMD**



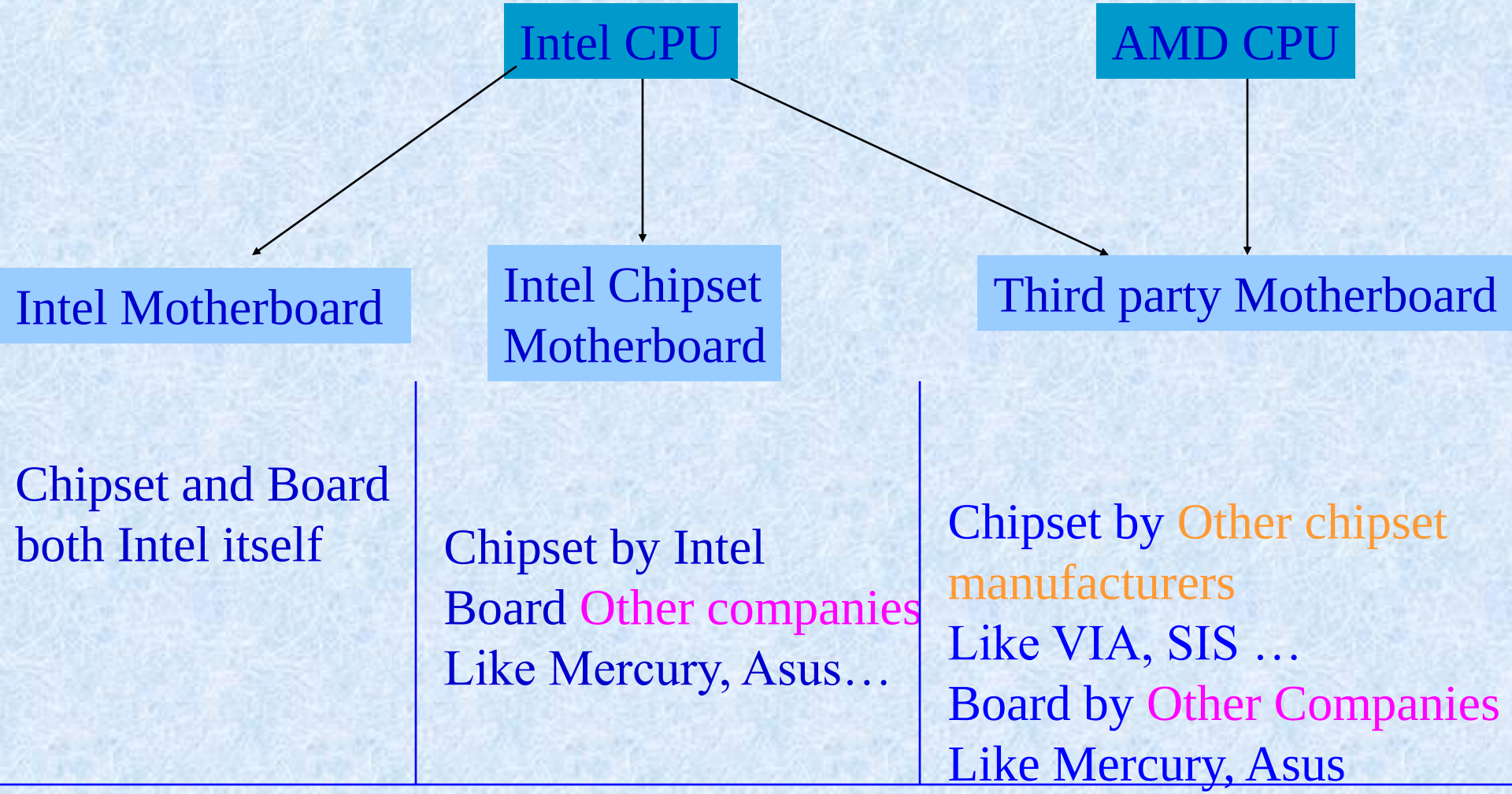
Today's Computer Configuration

Pentium-4 3.0Ghz Dual 2Mb Cache 833 FSB
Intel Motherboard 102 FSB 533Mhz
512 MB DDR2
160GB HDD SATA
DVD drive
Serial & Parallel ports
USB port
Monitor CRT or TFT
Keyboard & mouse

AMD Athlon 4800+
Chipset Motherboard

As same as other side

Motherboard



Motherboard With **higher FSB**, **AGP Slot**, **SATA** interface and at least **three PCI I/O** Slots

Chipset

There are two major sections in motherboard namely

- Memory Section
- I/O Section

Memory Section

Memory decoders
Bus controller
FSB manager
Etc
For these things
One SMD

Chipset

I/O Section

I/O Decoder
DMA & PIC
PCI I/O slot manager
Power manager
AGP onboard & AGP Slot
Etc
One SMD

Memory RAM

SIMM 30 pin	**286 & 386 AT**
SIMM 72 pin	486 & Pentium K5 from AMD
EDO RAM (Enhance Data Out)	486 & Pentium K5 from AMD
SD RAM (Synchronous Data)	Pentium, Pentium-II & III Athalon
RD RAM (Ram Data bus)	Pentium – 4
DDR (Double Data Rate)	Pentium – 4 Single core & HT **FSB: 400Mhz**
DDR2	Pentium – 4 Dual core FSB: 533Mhz

Hard Disk Drive (HDD)

SCSI Small Computer System Interface
Normally used in Servers.

IDE Integrated Drive Electronics
(ATA) Advance Technology Attachment

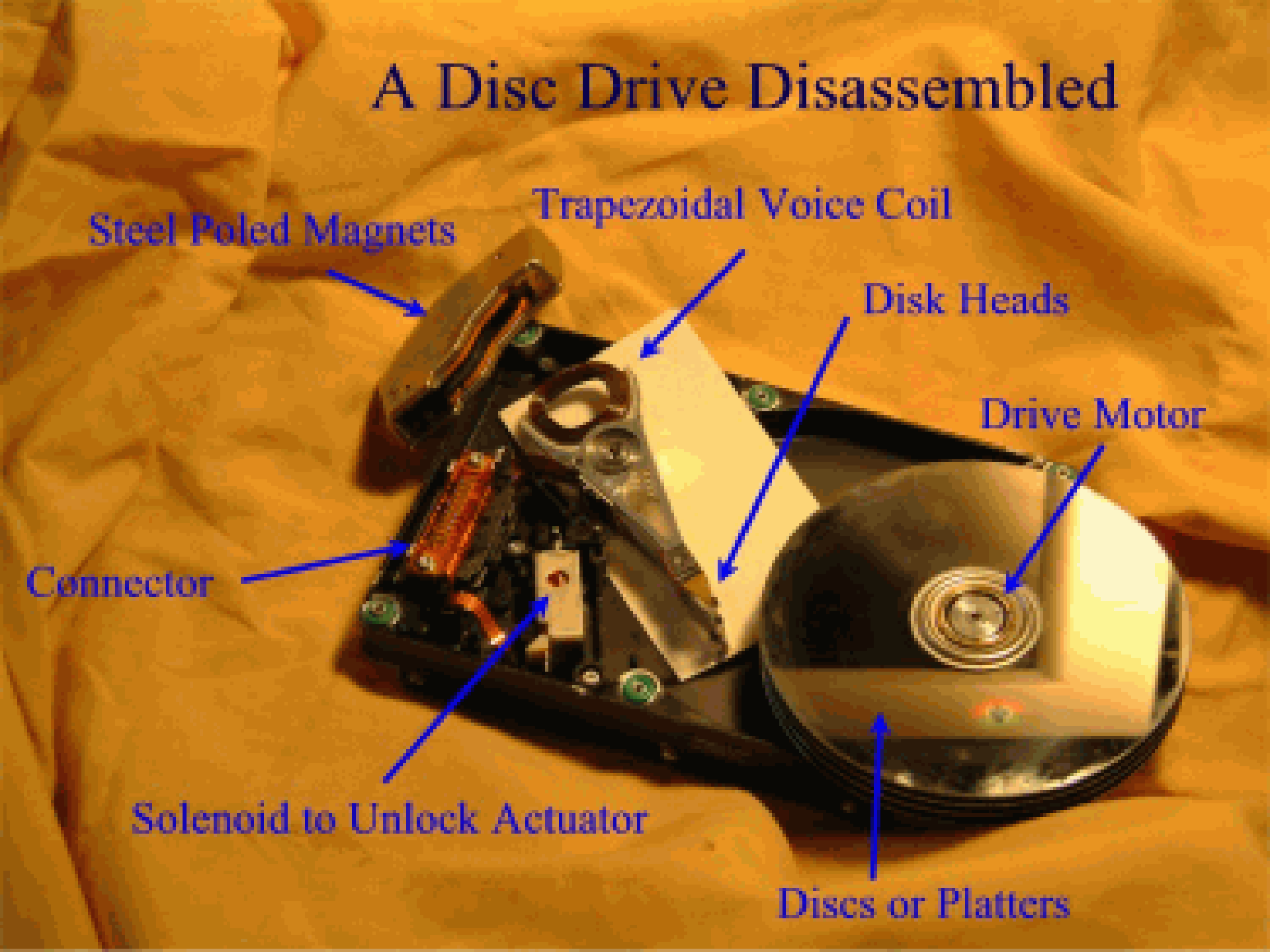
PATA Parallel ATA

SATA Serial ATA (7200 RPM &
Ultra DMA 133Mhz)


FOTOSEARCH


FOTOSEARCH.com

A Disc Drive Disassembled



Voice Coil Actuator

A Voice Coil Actuator is a very simple positioning device that utilizes a coil of wire in a permanent magnetic field. In speakers, the magnet is cylindrical North-South Pole in-out (or top-bottom of the cylinder) and the coil goes North-to-South Pole (or top-bottom of an inner cylinder). Changing the amplitude and polarity of the current in the coil causes an in-out force that 'plays' the diaphragm on the speaker. The spring tension on the diaphragm keeps the voice coil actuator centered when no current is applied. You know the voice coil and speaker ... here's Alexander Graham Bell's original invention drawing from 1876 (courtesy U.S. Library of Congress):

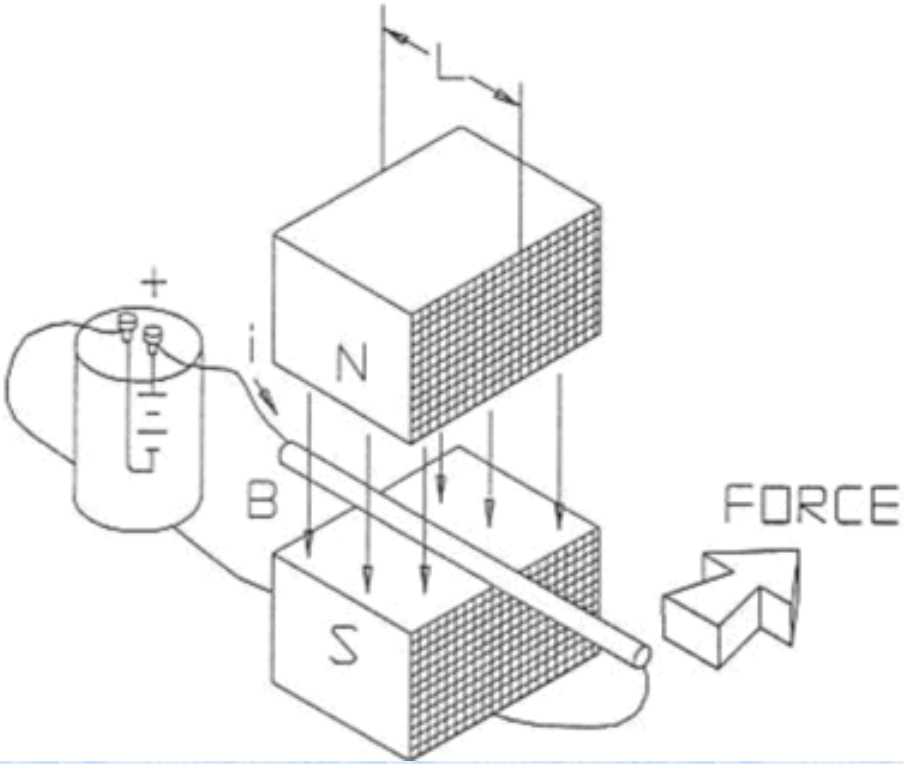
$$F = \int i\,(d\bar{\ell} \times \bar{B}) \qquad (11.1)$$

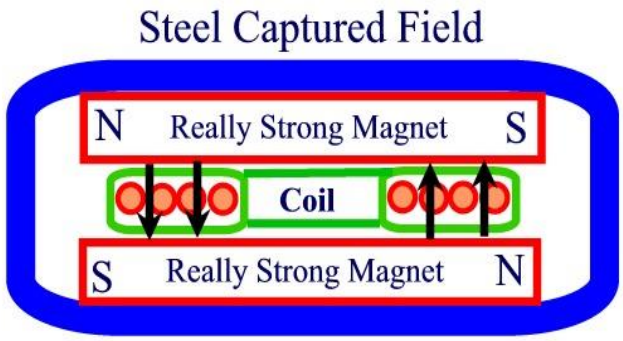
where F = force on the conductor

$d\ell$ = a differential length of conductor

i = electric current

B = magnetic flux-density vector





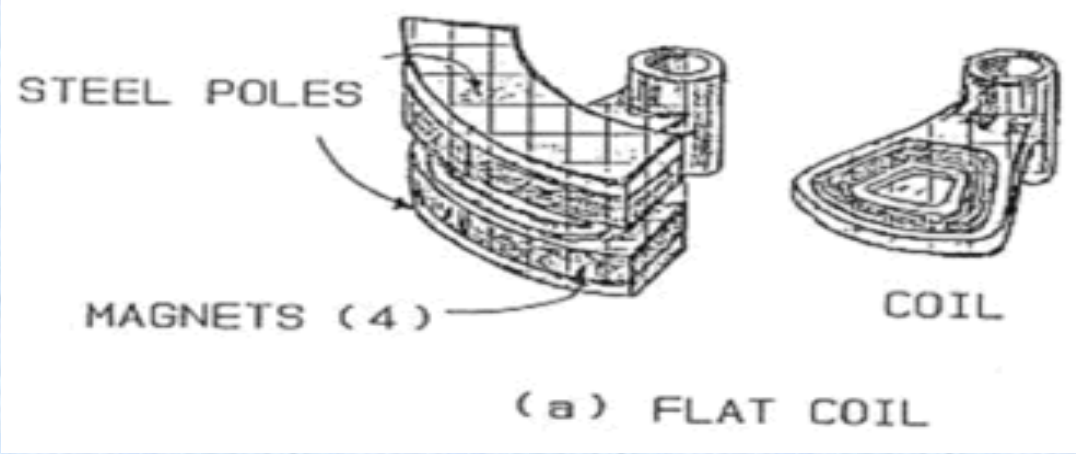
Current Comes Out on Left and In on Right Side of Flat Coil
Force Goes Right in Both Cases, Causing Coil to Move Right

Reverse the Current and Coil Moves Left

The hard disk voice coil actuator

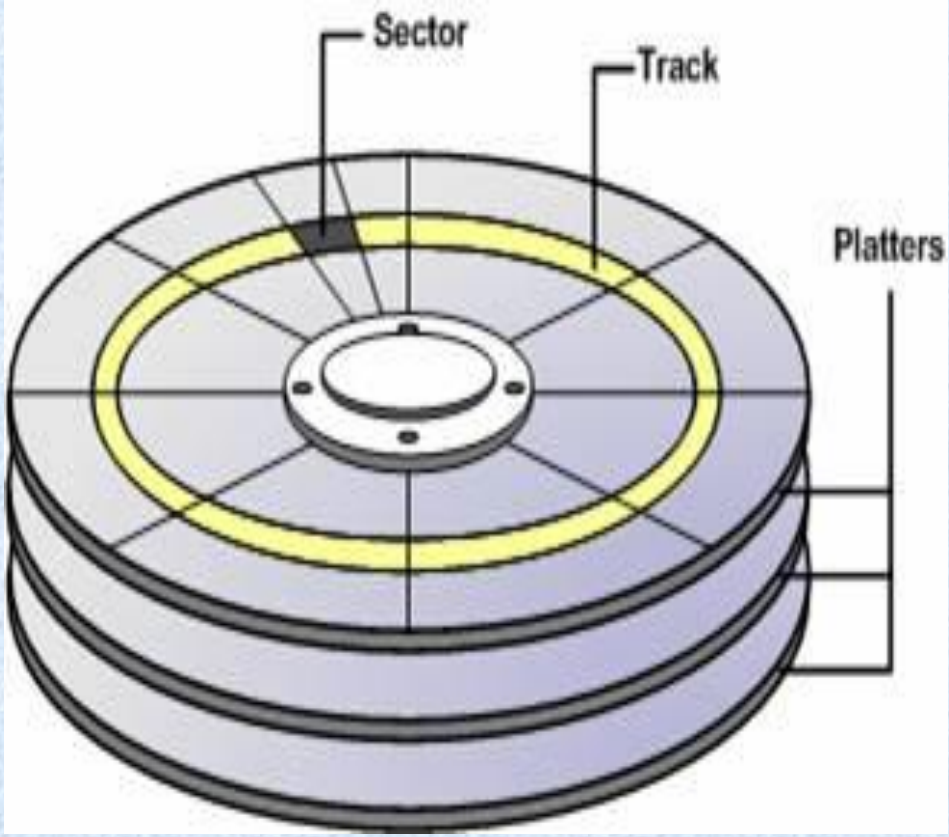
The hard disk voice coil actuator is used to position disk heads across the platter of the disk. It is a 'voice coil actuator' in that it only uses a coil and a permanent magnet in a simple push-pull fashion, but doesn't work like a speaker voice coil actuator. The geometries are completely different.

The voice coil actuator looks like this:



Hard Disk Basics

Hard disks are organized as a concentric stack of platters. The data is stored on concentric circles on the surfaces known as tracks. Sections within each track are called sectors. A sector is the smallest physical storage unit on a disk and typically it will hold 512 bytes of data.

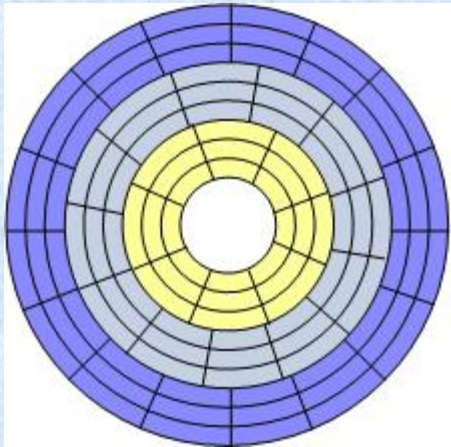


Zoned Bit Recording (ZBR)

Now that you know what's inside your hard disk and how the data is stored, it's time to add some complexity.

If you imagine the surface of a disk platter, considering a constant number of sectors per track and knowing that track lengths increase the farther a track resides from the center of the disk (they are concentric circles), it's not hard to conclude that the outer data sectors are longer than the inner data sectors.

This means that the outer tracks are greatly underutilized, because in theory they can hold many more sectors given the same linear bit density. In order to increase capacity and eliminate this wasted space, a technique called zone bit recording (ZBR) is employed on modern hard disks. With this technique, tracks are grouped into zones based on their distance from the center of the disk, and each zone is assigned a number of sectors per track. As you move from the innermost part of the disk to the outer edge, you move through different zones, each containing more sectors per track than the one before. This allows for more efficient use of the larger tracks on the outside of the disk.

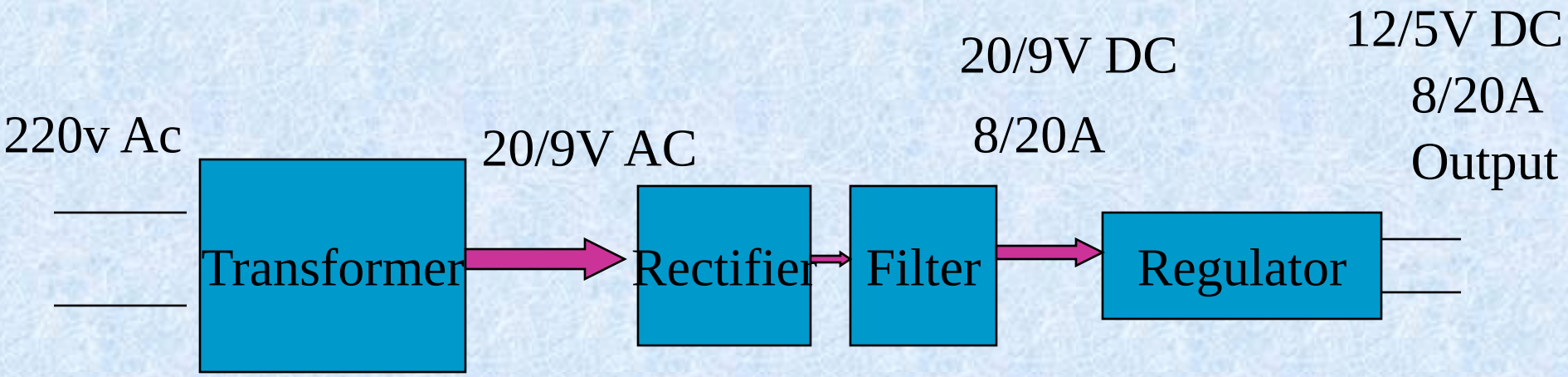


Input output Ports in Computer

To communicate with other devices and for interfacing there some ports in computer

Parallel port	for printer and 8 bit interfacing
Serial port	for mouse, modem and serial interfacing
USB ports	Universal Serial Bus port for serial communication with devices at closer distances Speed 12Mbps & 127 devices
Ether net	for LAN
VGA	Monitor

Power Supply

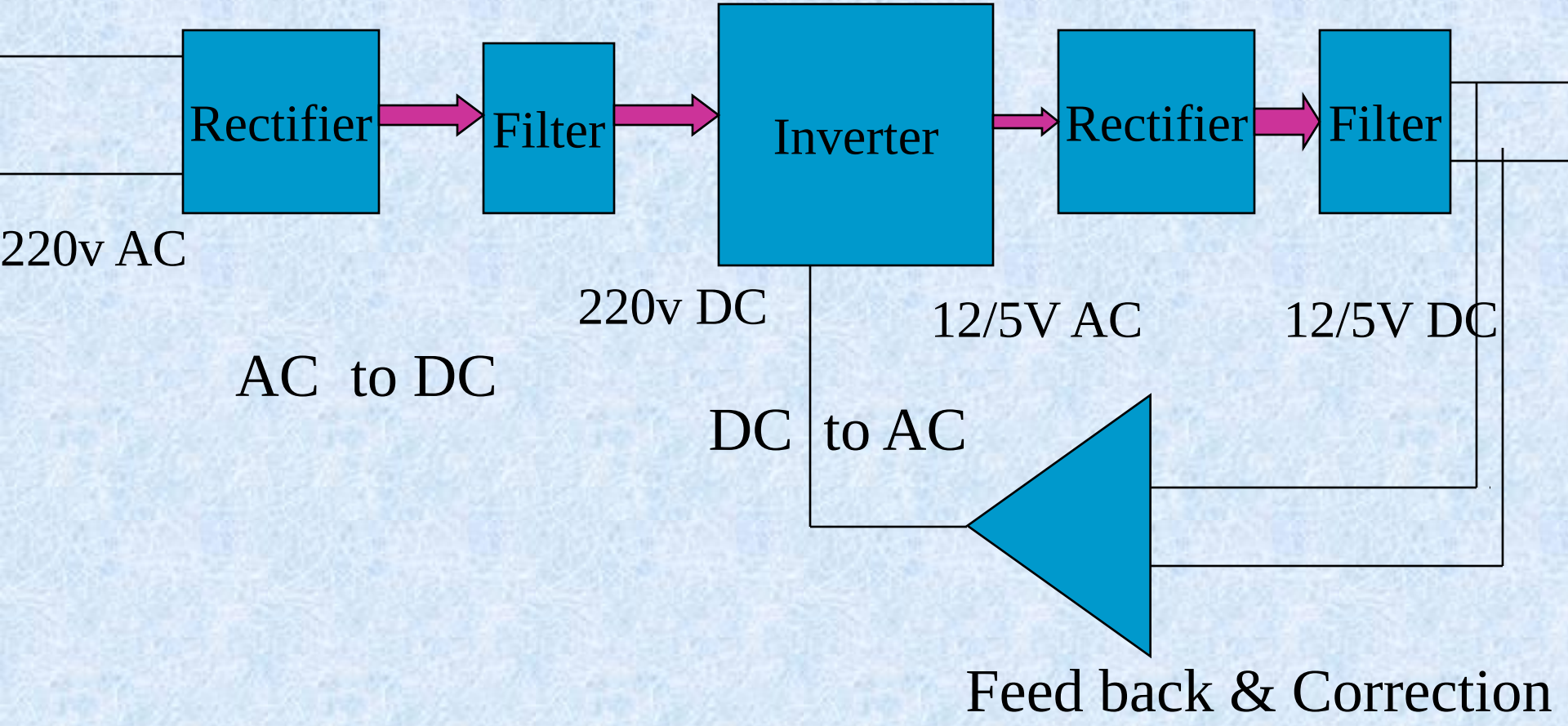


180W **100W**

80W ?~100w

1 computer 1h r = 100W
1 computer 10hrs = 1000W
100 computer 10hrs = 10000W
10 colleges like this = 100000W
100 Cites/towns = 10000000W=10MW
20 States = 200MW
Taking TV into account
= 2000MW

Switching Mode Power Supply (SMPS)



Keyboard & Mouse

Keyboard Interface	AT (Din connector)
	PS/2 (Small Din connector)
Mouse Interface	Serial (9 Pin D type Connector)
	PS/2 (Small Din connector)

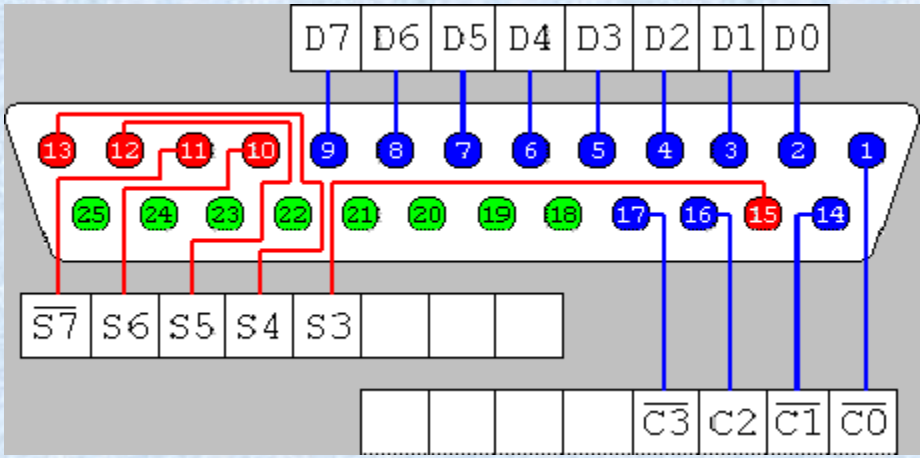
Monitor

- Display Card — PCI /AGP I/o Card or On board
  (15 Pin D type Connector)
- Monitor — CRT
  TFT(LCD)

Interfacing Techniques

Parallel Port Anatomy:

Following are the pin outs:



- 8 Output pins [**D0 to D7**]
- 5 Status pins [**S4 to S7 and S3**]
- 4 Control pins [**C0 to C3**]
- 8 ground pins [**18 to 25**]

The Pins having a bar over them ,means that the signal is inverted by the parallel port's hardware.
if a 1 were to appear on the 11 pin [S7],
the PC would see a 0.

The Status pins are mainly used by the PC to know the status of the printer ,like if there is paper in the printer, end of paper etc.

Data Port

In this address the CPU writes the data to be sent to the printer. It is an OUTPUT port.
The eight data bits (D0-D7) are latched to appear in the output connector.

Data Bits Table		
BIT	FUNCTION	PIN
D0	data 0	2
D1	data 1	3
D2	data 2	4
D3	data 3	5
D4	data 4	6
D5	data 5	7
D6	data 6	8
D7	data 7	9

Status Port

This is an INPUT port. These signals are used by the CPU to know the state of the printer.

Status Bits Table		
BIT	FUNCTION	PIN
D0	not used	
D1	not used	
D2	not used	
D3	ERROR/	15
D4	SLCT/	17
D5	PE	12
D6	ACK/	10
D7	BUSY/	11

Control Port

In this port the computer writes the signals that control the printer. Therefore, it is an OUTPUT port,

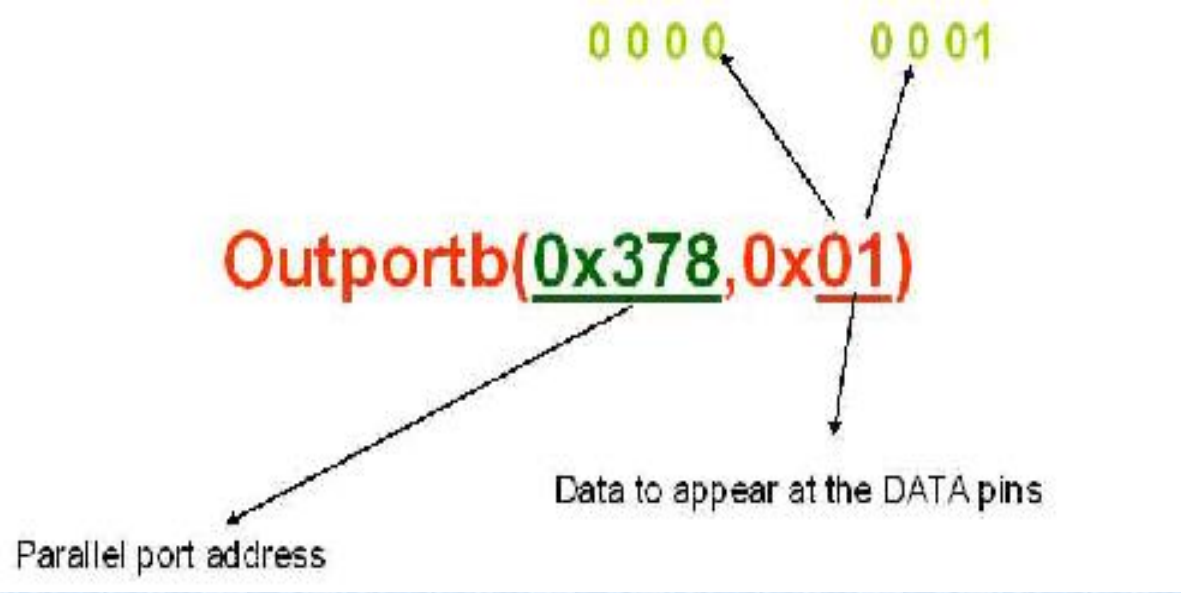
Control Bits Table		
BIT	FUNCTION	PIN
D0	STROBE	1
D1	AUTO FD	14
D2	INIT/	16
D3	SLCT IN/	17
D4	IRQ7	
D5	not used	
D6	not used	
D7	not used	

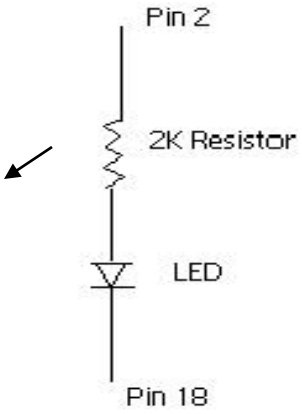
The computer has three LPTn ports. The addresses of the Data, Status and Control signals for each LPTn port are listed below. Each port works in the same way that LPT1 does.

Addresses of LPTn			
PORT	DATA	STATUS	CONTROL
LPT1	378H	379H	37AH
LPT2	278H	279H	27AH
LPT3	3BCH	2BDH	3BEH

LED flash

```
#include <studio.h>
#include <dos.h>
void main(void)
  {
outportb(0x378,0xFF) ;
outportb(0x378,0x00)
}
```





Stepper Motor control

```
#include<studio.h>
 #include<conio.h>
#include<dos.h>
main() {
outportb(0x378,0x01);
outportb(0x378,0x02);
outportb(0x378,0x04);
outportb(0x378,0x08)
 }
```

RS232 Serial Port

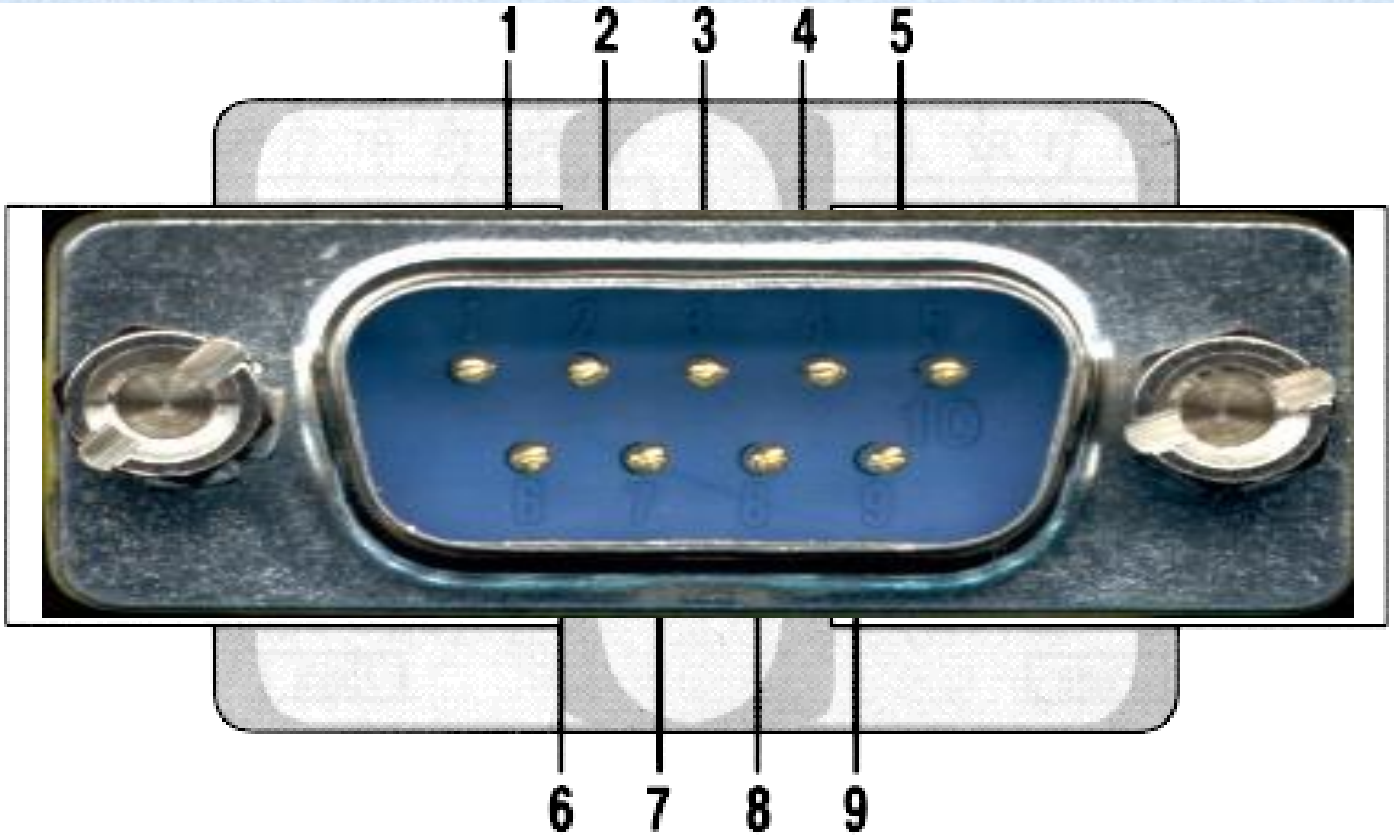
Electronic data communications between elements will generally fall into two broad categories: single-ended and differential. RS232 (single-ended) was introduced in 1962, rumors for its early It is widely used through the industry.

Independent channels are established for two-way (full-duplex) communications. The RS232 signals are represented by voltage levels with respect to a system common (power / logic ground). The "idle" state (MARK) has the signal level negative with respect to common, and the "active" state (SPACE) has the signal level positive with respect to common. RS232 has numerous handshaking lines (primarily used with modems), and also specifies a communications protocol.

The RS-232 interface presupposes a common ground between the DTE and DCE. RS232 data is bi-polar.... +3 TO +12 volts indicates an "ON or 0-state (SPACE) condition" while A -3 to -12 volts indicates an "OFF" 1-state (MARK) condition.... Modern computer equipment ignores the negative level and accepts a zero voltage level as the "OFF" state. In fact, the "ON" state may be achieved with lesser positive potential.

This means circuits powered by 5 VDC are capable of driving RS232 circuits directly, however, the overall range that the RS232 signal may be transmitted/received may be dramatically reduced.

Description	Signal	9-pin DTE	25-pin DCE	Source DTE or DCE
Carrier Detect	CD	1	8	from Modem
Receive Data	RD	2	3	from Modem
Transmit Data	TD	3	2	from Terminal/Computer
Data Terminal Ready	DTR	4	20	from Terminal/Computer
Signal Ground	SG	5	7	from Modem
Data Set Ready	DSR	6	6	from Modem
Request to Send	RTS	7	4	from Terminal/Computer
Clear to Send	CTS	8	5	from Modem
Ring Indicator	RI	9	22	from Modem



Pin	Signal	Pin	Signal
1	Data Carrier Detect	6	Data Set Ready
2	Received Data	7	Request to Send
3	Transmitted Data	8	Clear to Send
4	Data Terminal Ready	9	Ring Indicator
5	Signal Ground		

Microcontrollers and Embedded System

Embedded Systems are a combination of Hardware (microcontrollers) and Software (developed in assembler, c, c++…) designed to perform a specific function

An embedded product uses microcontrollers to do one task and one task only.

What is a Microcontroller?

A microcontroller (often abbreviated MCU) is a single computer chip (integrated circuit) that executes a user program, normally for the purpose of controlling some device, hence the name microcontroller.

The program is normally contained either in a second chip, called an EPROM, or within the same chip as the microcontroller itself.

A microcontroller is normally found in devices such as microwave ovens, automobiles, keyboards, CD players, cell phones, VCRs, security systems, time & attendance clocks, etc.

Microprocessor Vs Microcontroller

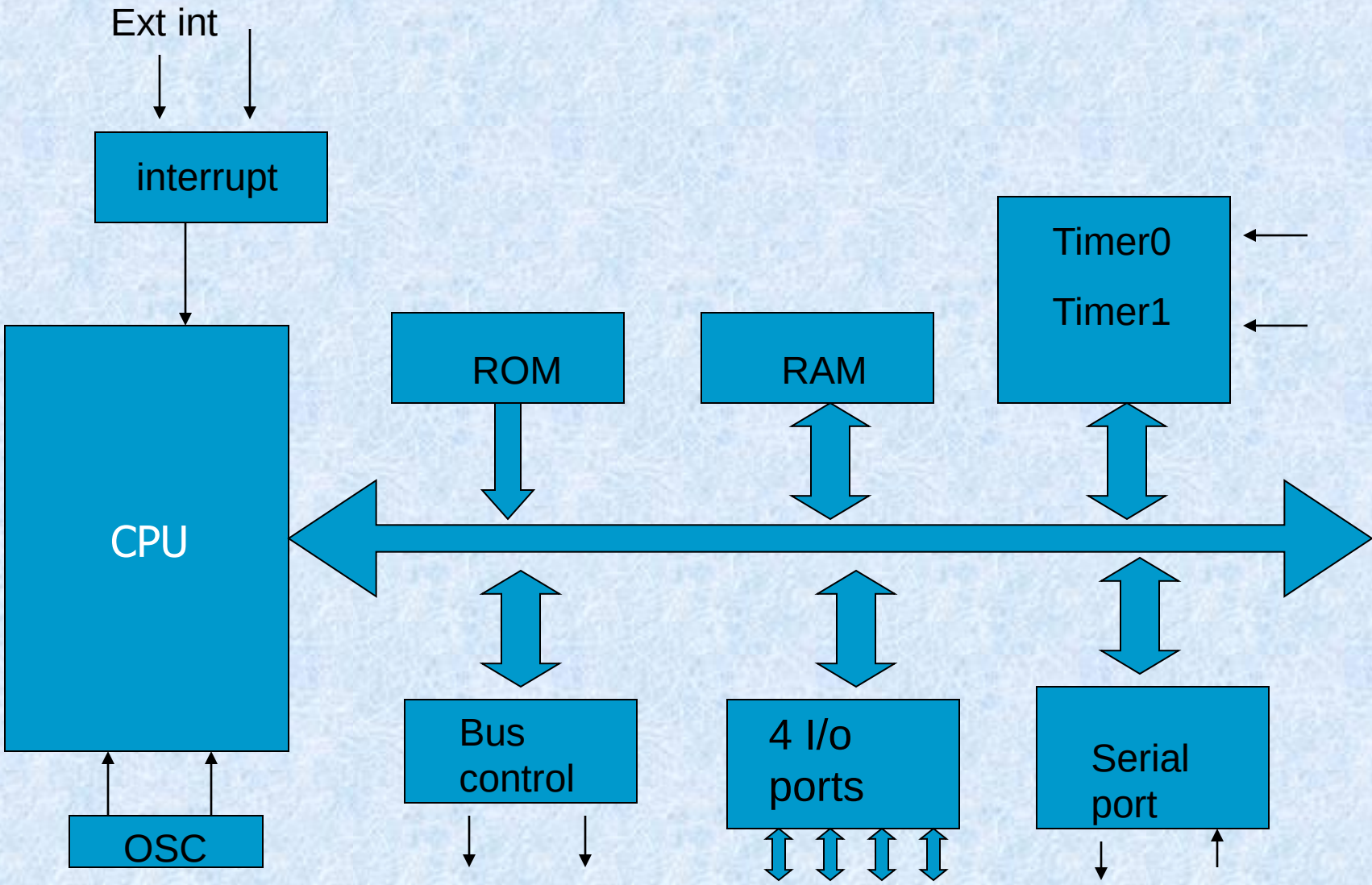
Microcontrollers are used in devices that require some amount of computing power but donot require as much computing power as that provided by a complex (and expensive) 486 or Pentium system which generally requires a large amount of supporting circuitry (large motherboards, hundreds of megabytes of RAM, hard drives, hard drive controllers, video cards, etc).

A microwave oven just does not need that much computing power. Microcontroller-based systems are generally smaller, more reliable, and cheaper. They are ideal for the types of applications described above where cost and unit size are very important considerations. In such applications it is almost always desirable to produce circuits that require the smallest number of integrated circuits, that require the smallest amount of physical space, require the least amount of energy, and cost as little as possible.

Simple comparison: Pentium vs. 8051

FEATURE	8051	PENTIUM	COMMENT
Clock Speed	12Mhz. typical but 60MHz. ICs available	1,000 MHz. (1GHz.)	8051 internally divides clock by 12 so for 12MHz. clock effective clock rate is just 1MHz.
Address bus	16 bits	32 bits	8051 can address 2^{16}, or 64Kbytes of memory. Pentium can address 2^{32}, or 4 GigaBytes of memory.
Data bus	8 bits	64 bits	Pentium's wide bus allows very fast data transfers.
ALU width	8 bits	32 bits	But - Pentium has multiple 32 bit ALUs – along with floating-point units.
Applications	Domestic appliances, Peripherals,	Personal Computers And other high	

Microcontroller



Microcontroller Manufacturing Companies

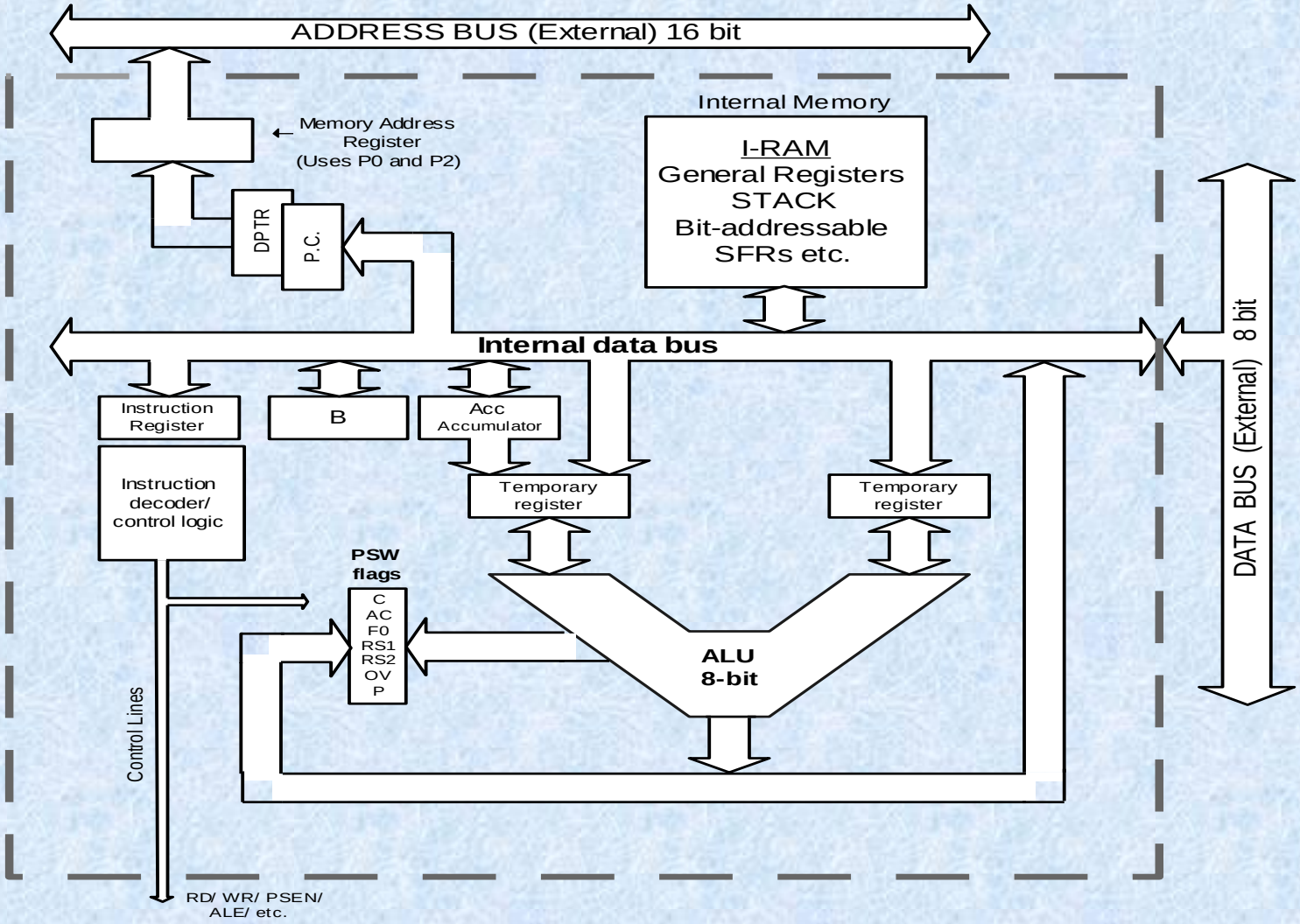
There are FOUR major companies manufacturing

8 bit controllers

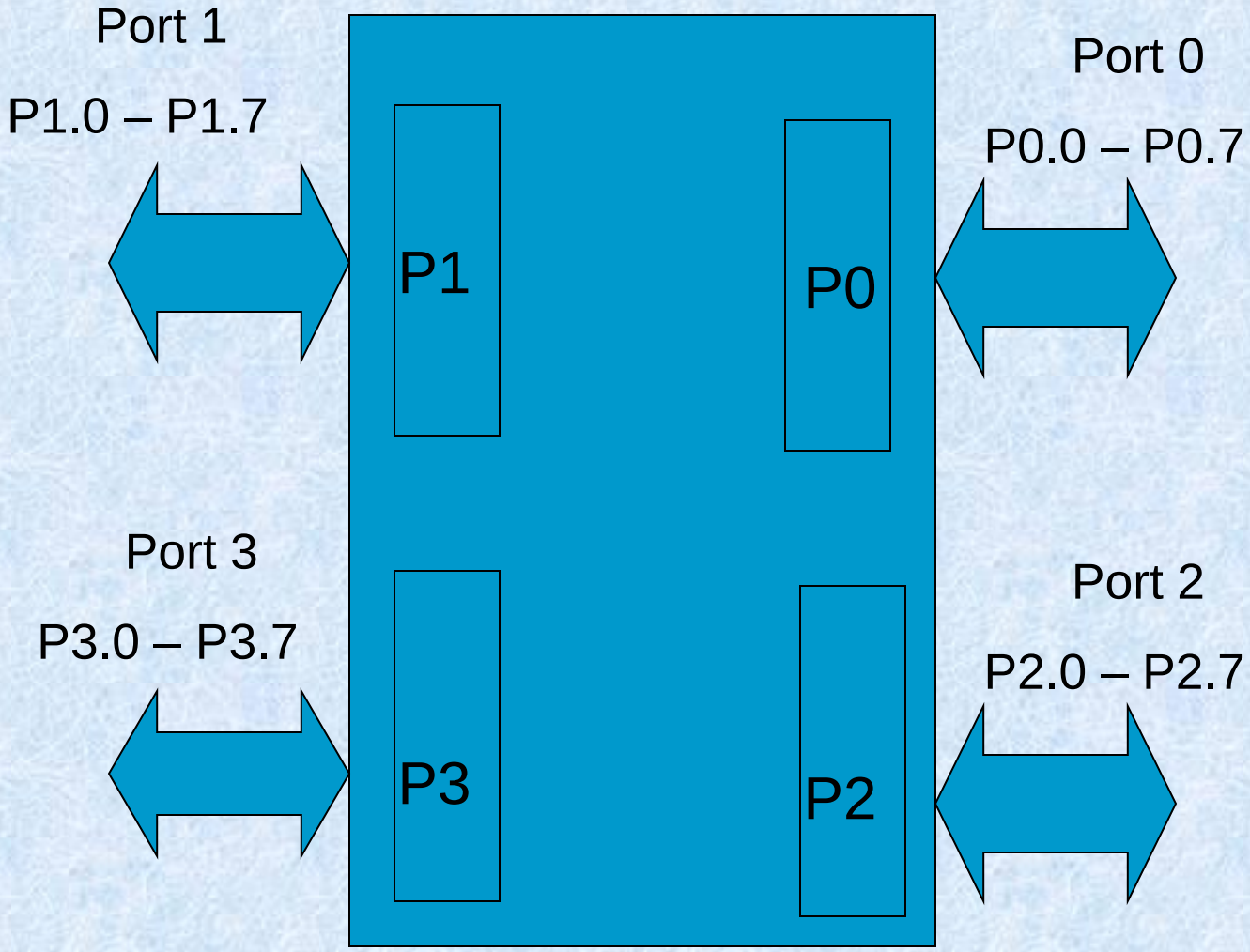
1. Motorola (6811)
2. Intel (8051 MCS51)
3. Zilog (Z8)
4. PIC (16X____) Microchip

8051 Microcontroller Overview

Functional block of the internal operation of an 8051



Port Organization of MCS51



Port Assignments

Port 0 : Input/Output Port & AD0-AD7 for ext memory

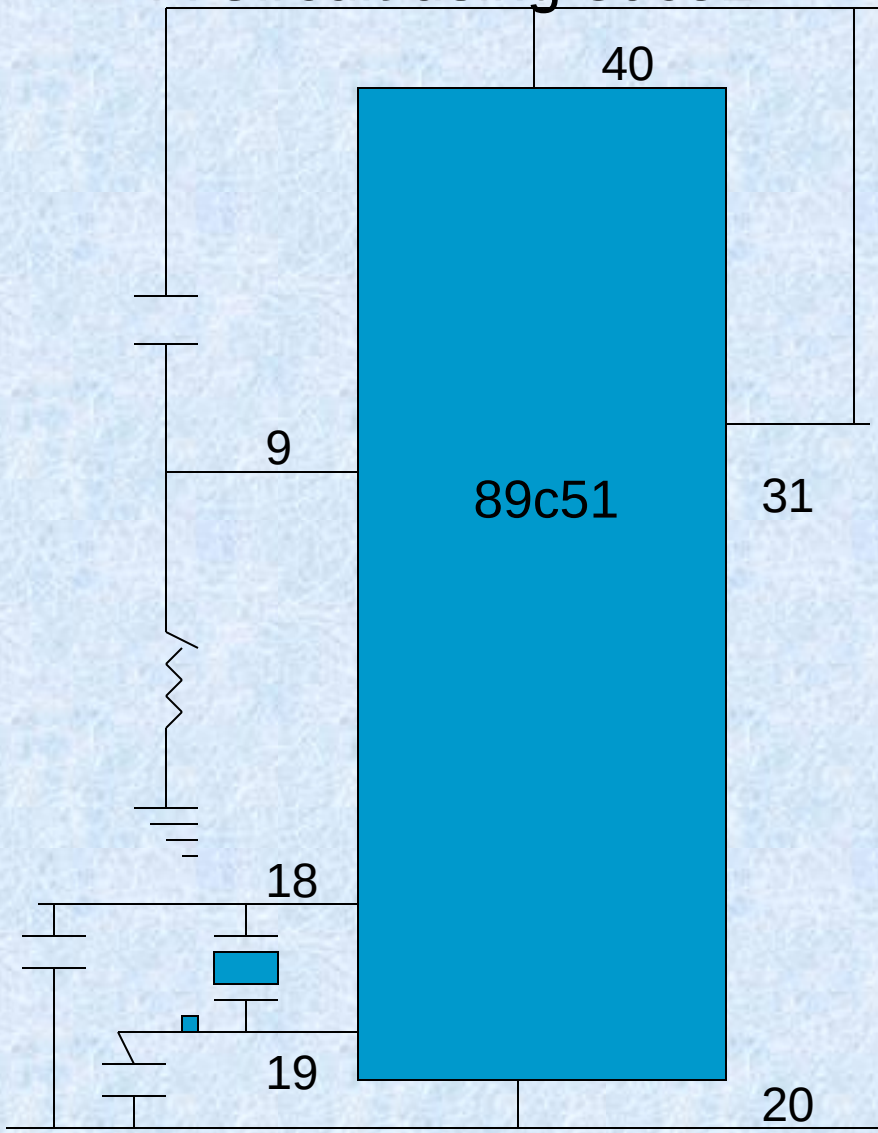
Port 1 : Input/Output Port

Port 2 : Input/Output Port & A8-A15 for ext Memory

Port 3 : Input/Output Port

- P3.0 : RxD
- P3.1 : TxD
- P3.2 : INTO’
- P3.3 : INT1’
- P3.4 : T0
- P3.5 : T1
- P3.6 : WR’
- P3.7 : RD’

A Circuit using 89c51



Pin 40 +vcc

20 Gnd

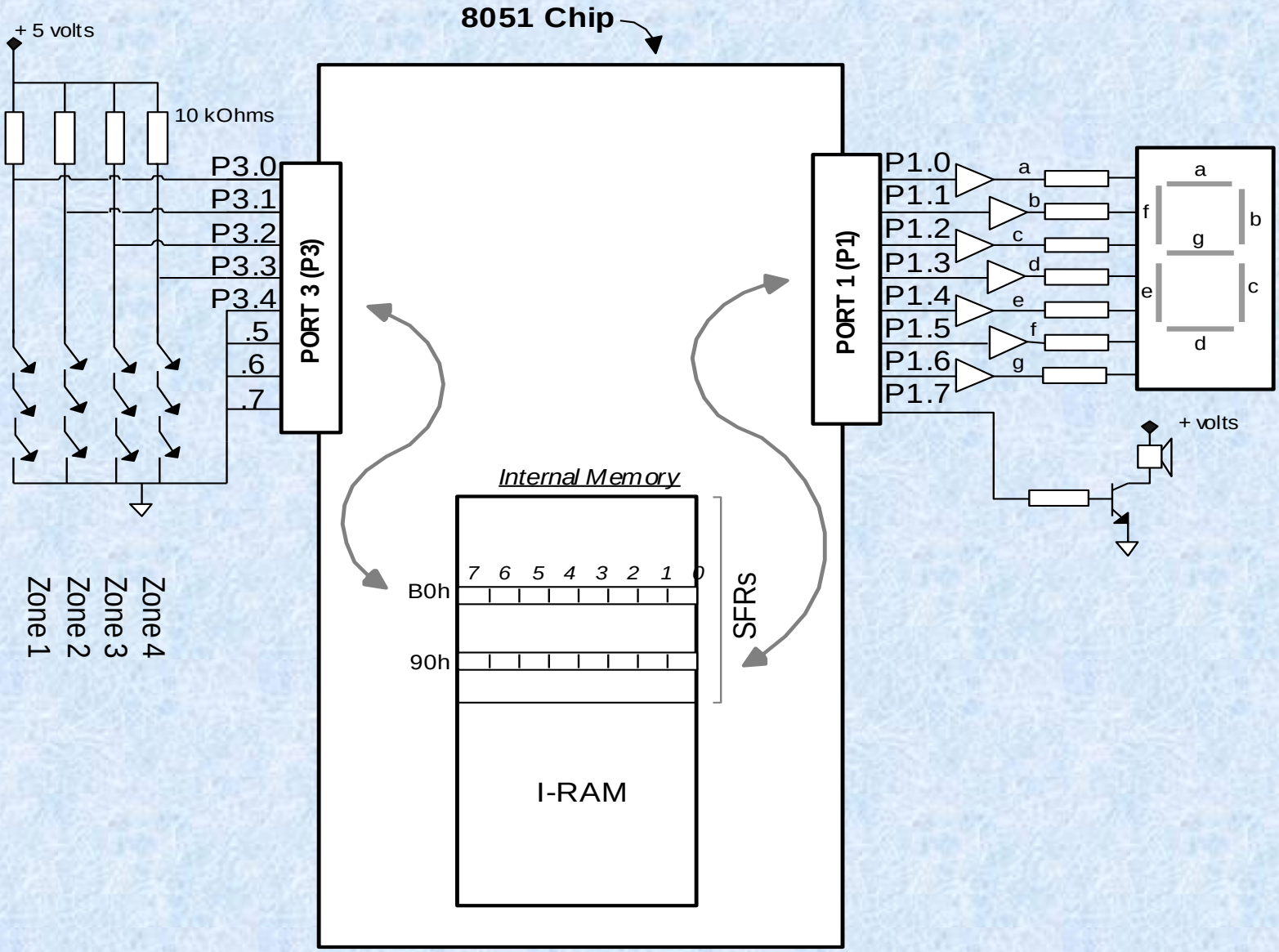
9 Reset

18 OSC1

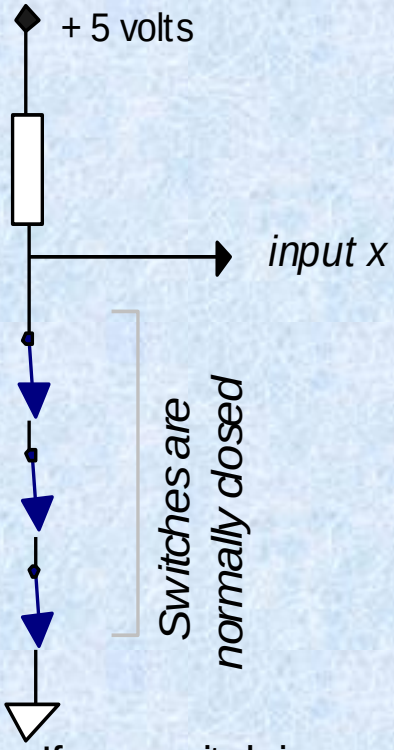
19 OSC2

31 Ext Acces

Burglar alarm system hardware

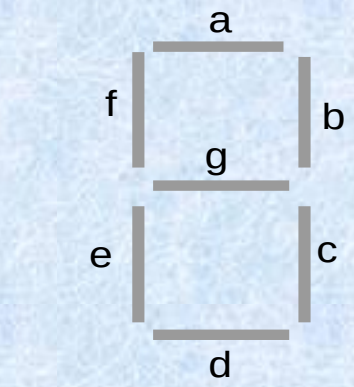


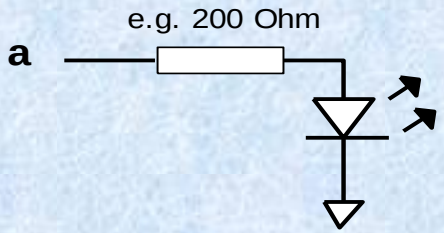
Input circuit



If any switch is opened
Input x goes high to indicate an alarm condition

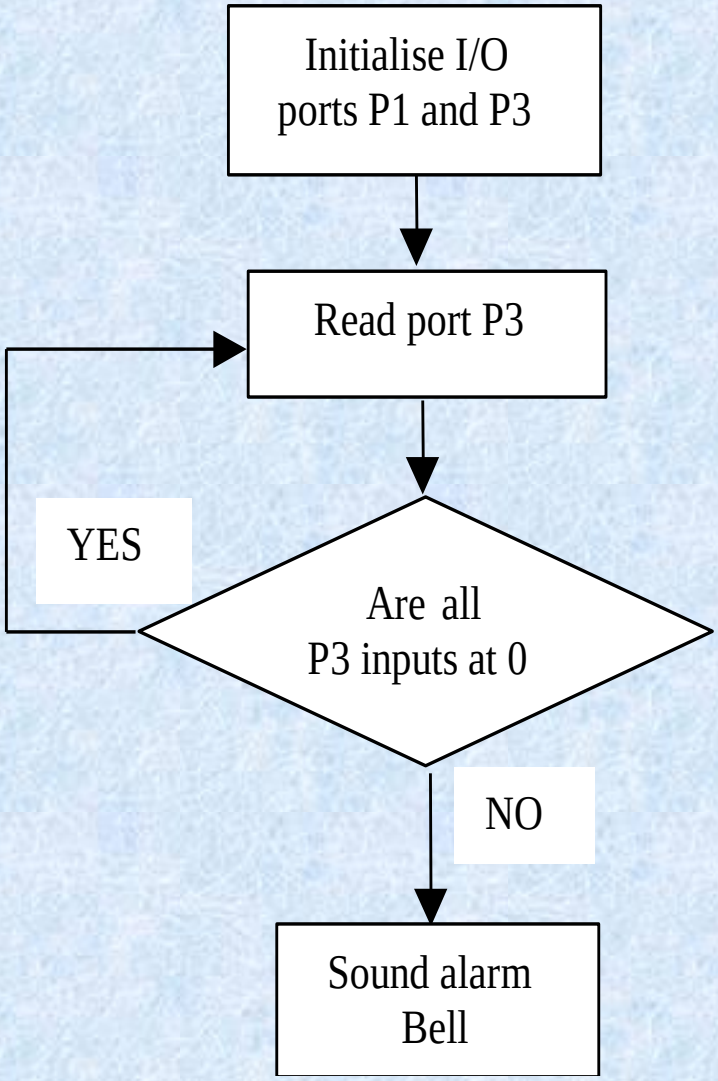
Output circuit





Internal circuit within 7-segment display device. (Common cathode i.e. +5v input causes LED to light)

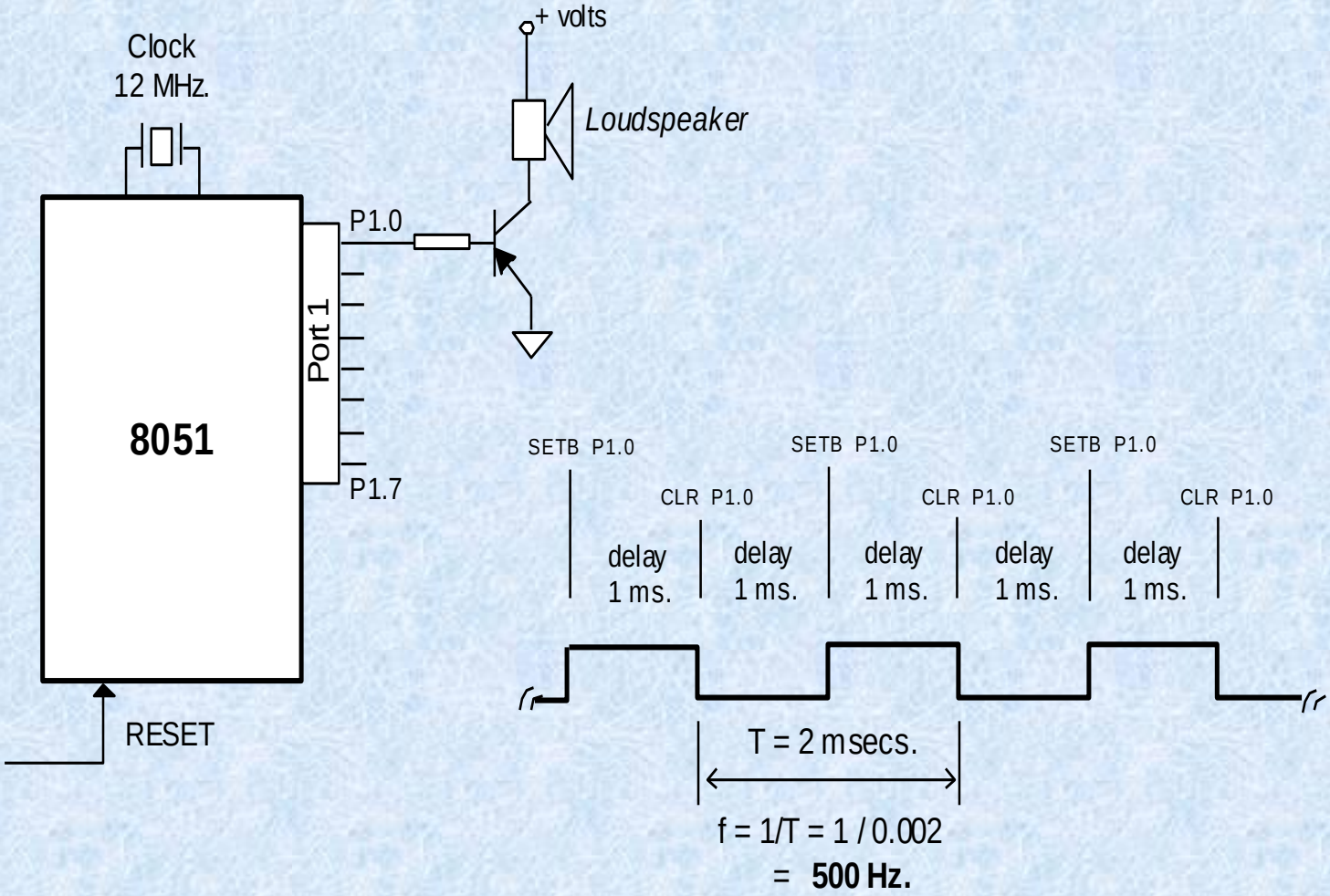
ALARM_1 Program flow chart



ALARM_1 Program source code

```
ORG 0000h                       ; define memory start address 000
; Initialise the I/O ports
        MOV P3, #0ffh           ; write all ones to P3 to use as an input port
        MOV P1, #00             ; all zeros to put P1 in a known output state
POLL:
        MOV A, P3                       ; read P3 to accumulator
        CJNE A, #00h, ALARM             ; if not all zeros then jump to ALARM
        LJMP POLL                       ; else loop back to POLL
ALARM:
        SETB P1.7                       ; enable the BELL by setting P1.7 high
END_LOOP:
        LJMP END_LOOP                   ; program just loops around here
END                                     ; end of program
```

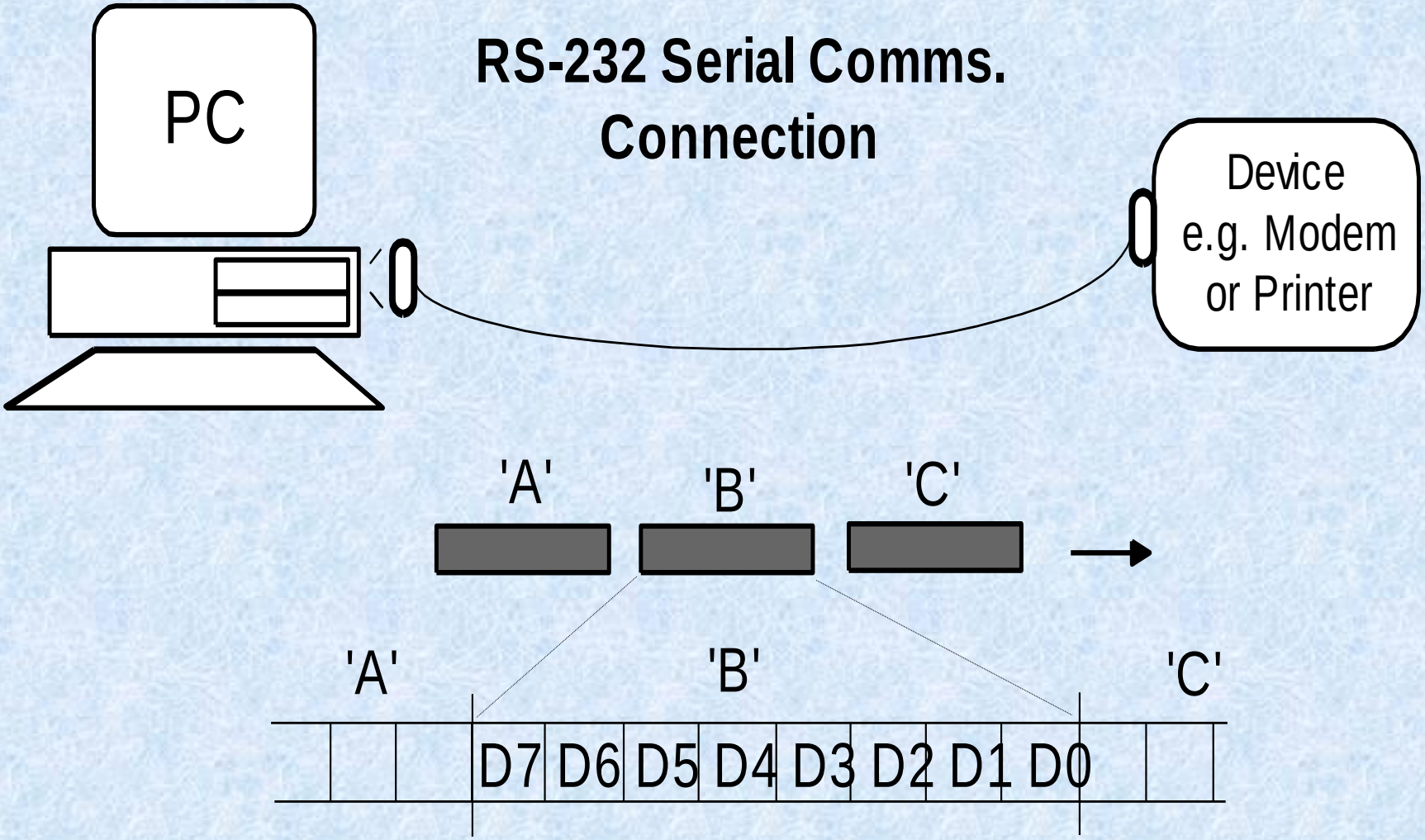
Hardware circuit with timing diagram for sound



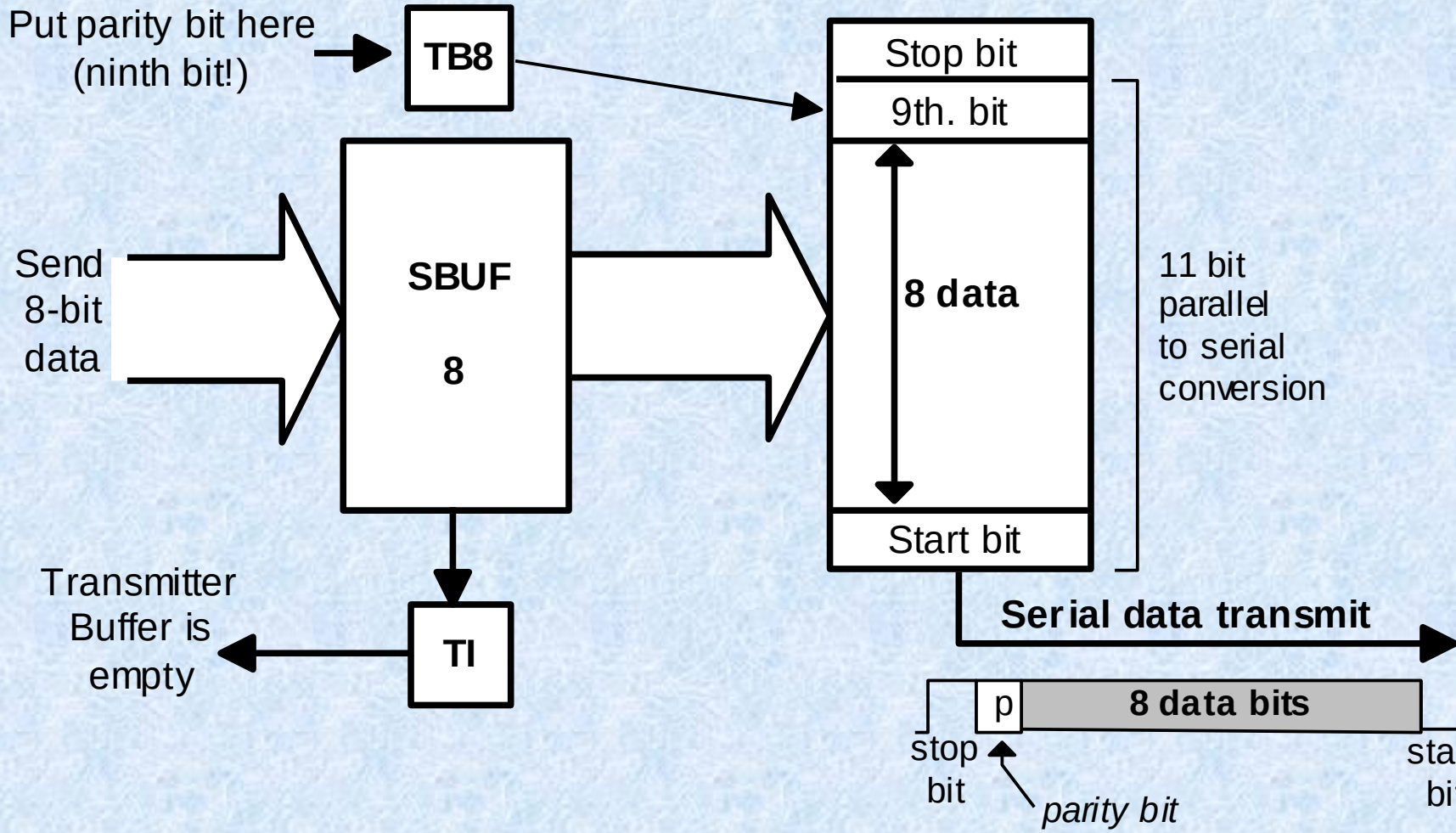
Source code for example program to sound 500Hz

```
ORG 0000h                    ; start address is 0000h
MOV P1, #00                  ; clear all bits on P1
LOOP:
SETB  P1.0                   ; set P1.0 high
LCALL  ONE_MILLI_SUB         ; delay one millisecond
CLR  P1.0                    ; set P1.0 low
LCALL  ONE_MILLI_SUB         ; delay one millisecond
LJMP  LOOP                   ; loop around!
ONE_MILLI_SUB
PUSH 07h                     ; save R7 to stack
MOV R7, #250d                ; 250 decimal to R7 to count 250 loops
LOOP_1_MILLI:                ; loops  250 times
NOP                          ; inserted NOPs to cause delay
NOP
DJNZ R7, LOOP_1_MILLI        ; decrement R7, if not zero loop back
POP 07h                      ; restore R7 to original value
RET                          ; return from subroutine
END                          ; end of program
```

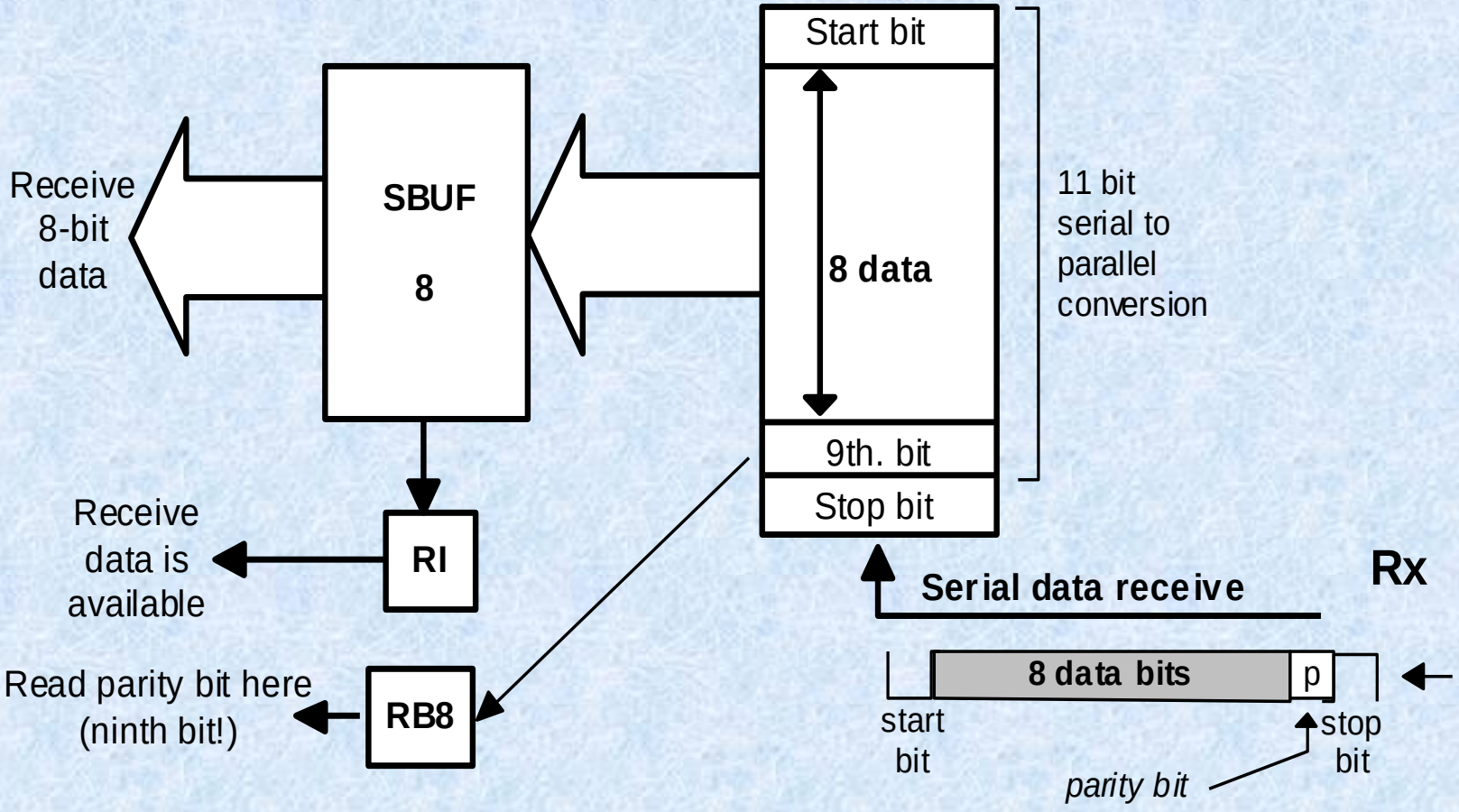
Serial Communication



Block diagram of UART transmitter



Block diagram of UART receiver



System Assembling

1. Collect all The materials
2. Test the SMPS for its various voltages
   +12V,-12V,+5V,-5V,3.3V

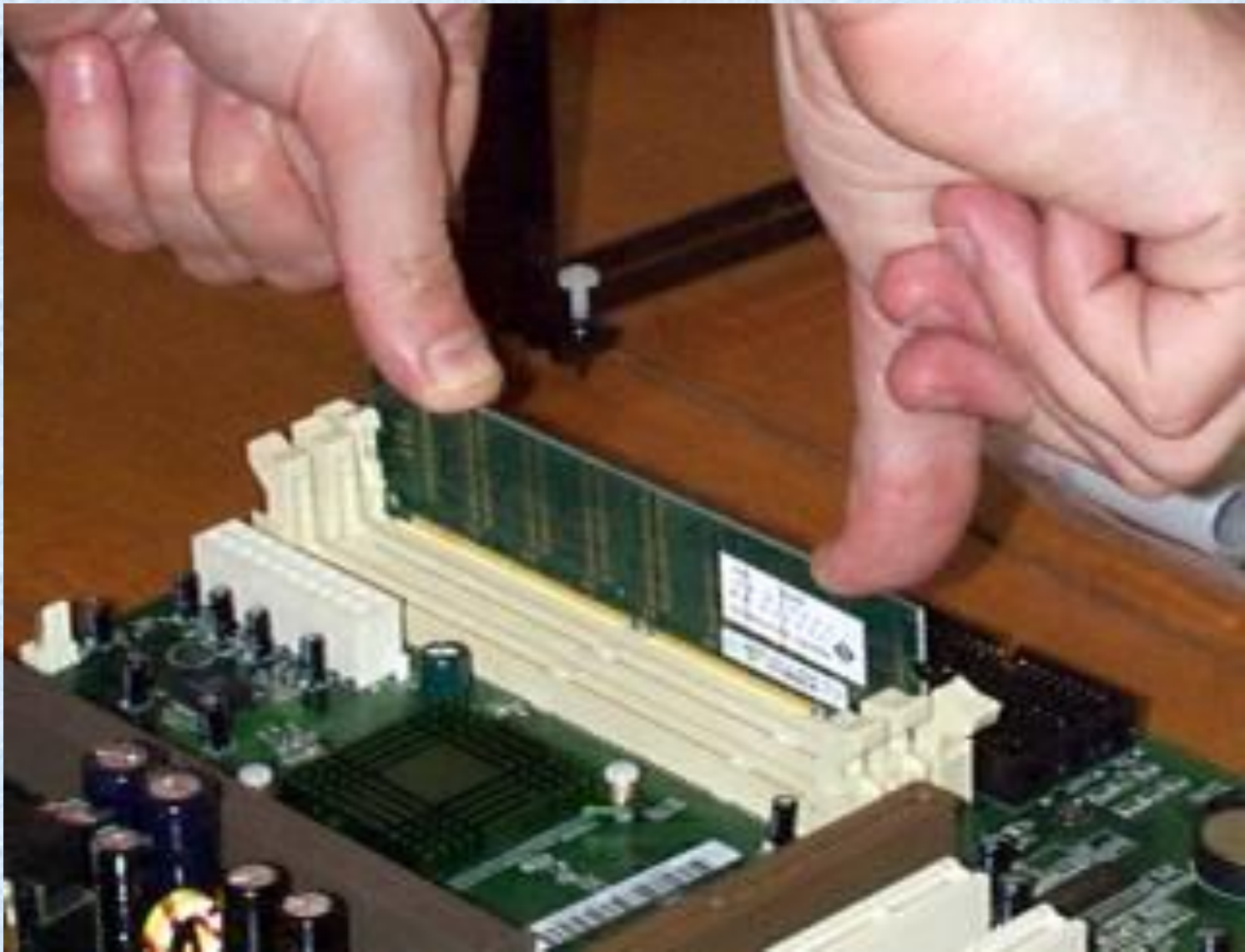
Take the motherboard check for physical damages

Insert the CPU

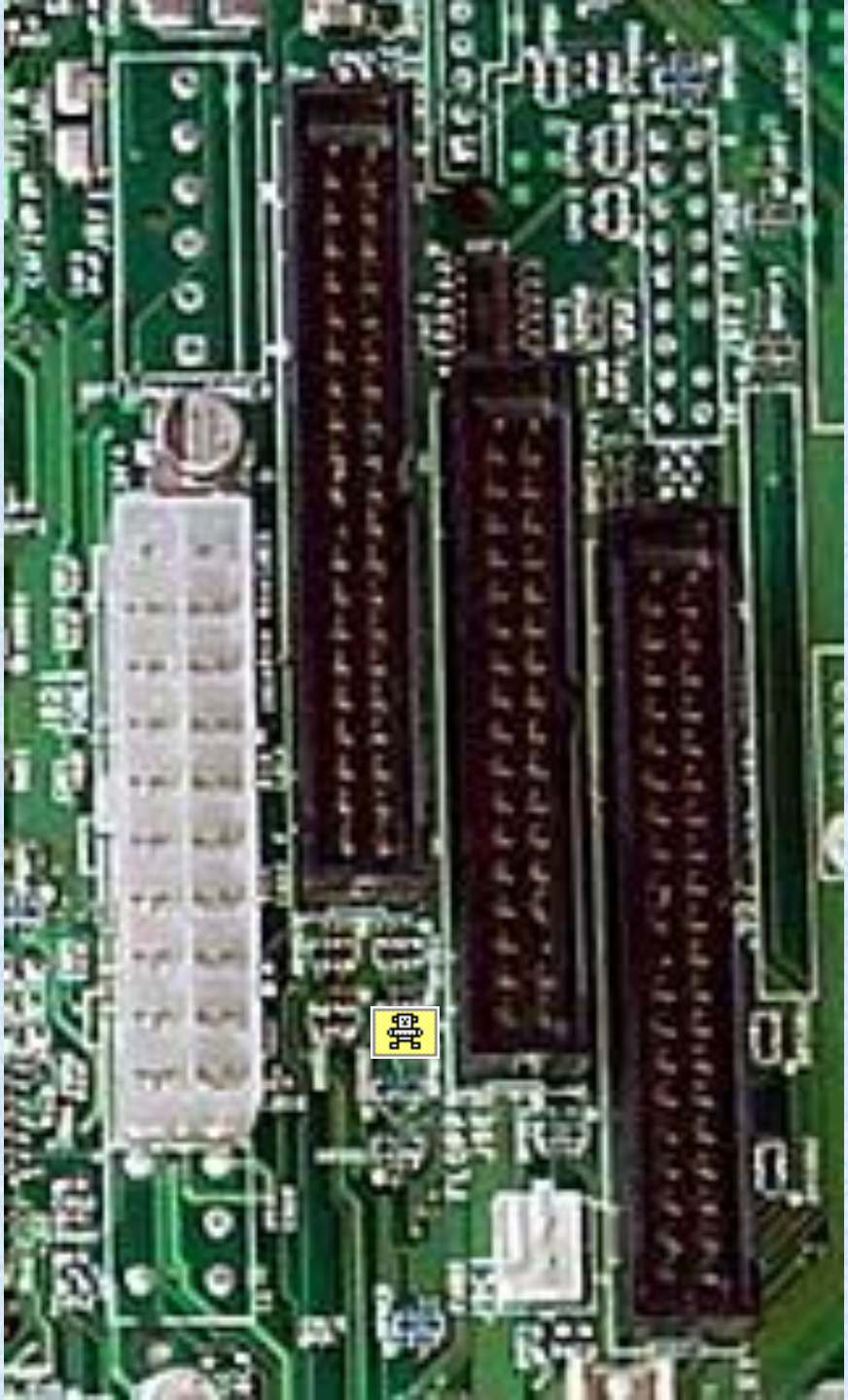
Mount the cooling FAN

Power connection for FAN

Fix the RAM in its Slot



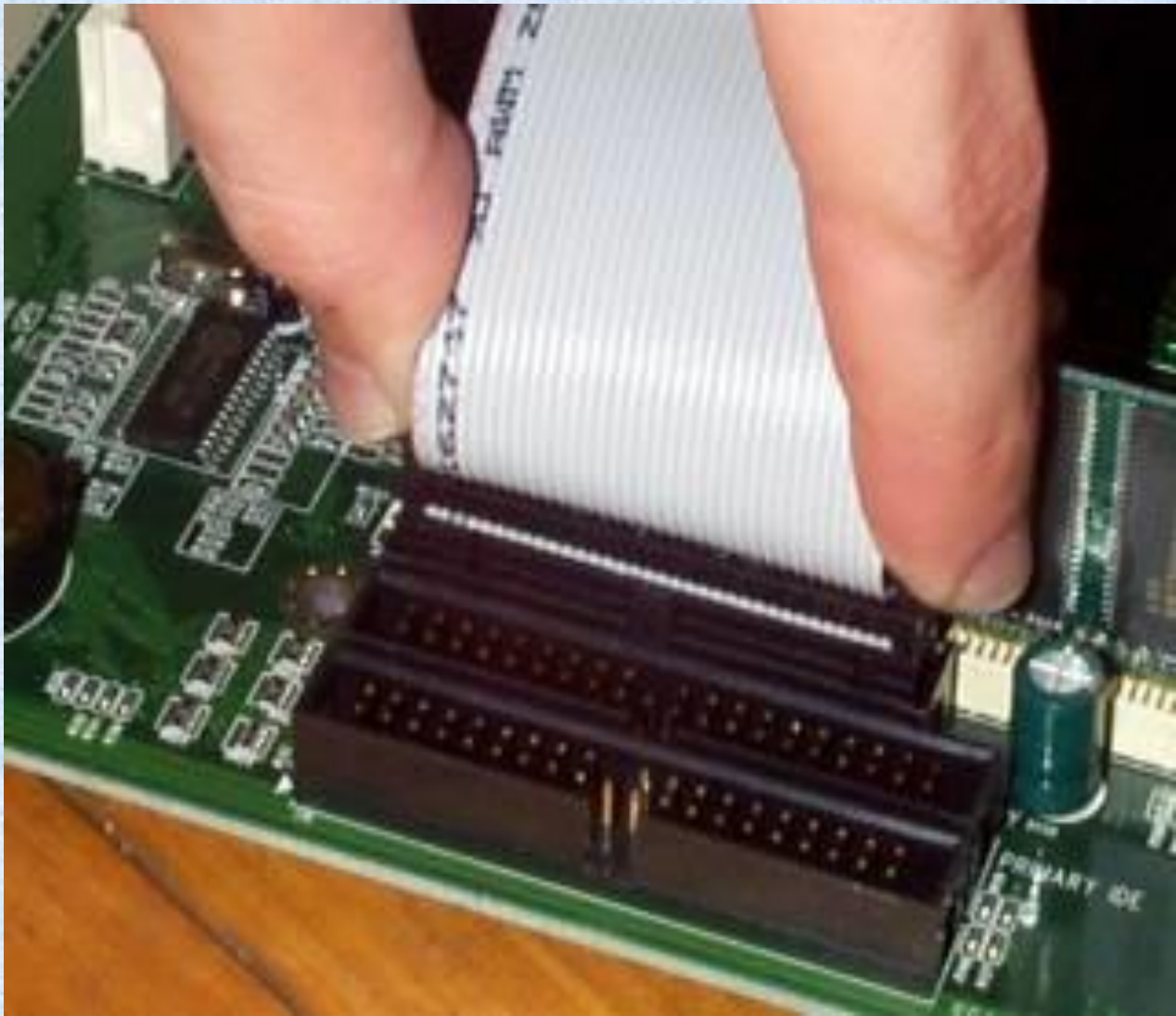
Power Connection for motherboard



Fix the Storage device like
Floppy Disk Drive ,
Hard Disk Drive,
CD/DVD drive
and
Connect Data cable
and
Power cable

Hard Disk Drive Connections

Connect the data cable in motherboard



Hard Disk Data cable to Motherboard

Trouble Shooting a System

Troubles in the system can be put in two main Categories

Before Boot Problem	After Boot Problem
Before Display After display	Software & OS Based Virus Hardware Problems

Trouble Shooting a System Before boot and Display

1.A System Reports **Nothing** on the screen

Check the power cable and switch On

No response

Check monitor Power LED

OFF Check the Power cable the monitor

ON Check the Panel controls

Blinking Check the Data Cable the monitor

Data cable OK

Problem in the system

May be the SMPS or the motherboard side

To check SMPS – Watch your keyboard LEDS during Switch ON

If Flashing once or twice on problem in SMPS

other conformation is SMPS FAN

Trouble Shooting a System Before boot and Display Contd

The problem may in the motherboard, CPU, Reset Switch

Check the Reset Switch

Check Hard Disk Data Cable

2.A System Reports **Nothing** on the screen But **Long Beep**

RAM Or RAM Slot Problem.

After Display Problems

The BIOS give proper information by its POST

After Boot Problems

The BIOS and OS give the information

Asymmetric Digital Subscriber Line (ADSL)

Definition

Asymmetric digital subscriber line (ADSL) is a new modem technology that converts existing twisted-pair telephone lines into access paths for high-speed communications of various sorts.

Overview

ADSL can transmit more than 6 Mbps to a subscriber—enough to provide Internet access, video-on-demand, and LAN access. In interactive mode it can transmit more than 640 kbps in both directions. This increases the existing access capacity by more than fifty-fold enabling the transformation of the existing public network. No longer is it limited to voice, text, and low-resolution graphics. It promises to be nothing less than an ubiquitous system that can provide multimedia (including full-motion video) to the entire country.

Data Rate (Mbps)	Wire Gauge (AWG)	Distance (ft)	Wire Size (mm)	Distance (km)
1.5–2.0	24	18,000	0.5	5.5
1.5–2.0	26	15,000	0.4	4.6
6.1	24	12,000	0.5	3.7
6.1	26	9,000	0.4	2.7

Be Informative….

Be A Hard worker….

Be A successful Person

Thank you