

# UNIT 2: COMPUTER SYSTEMS

Week02  
Lesson 01

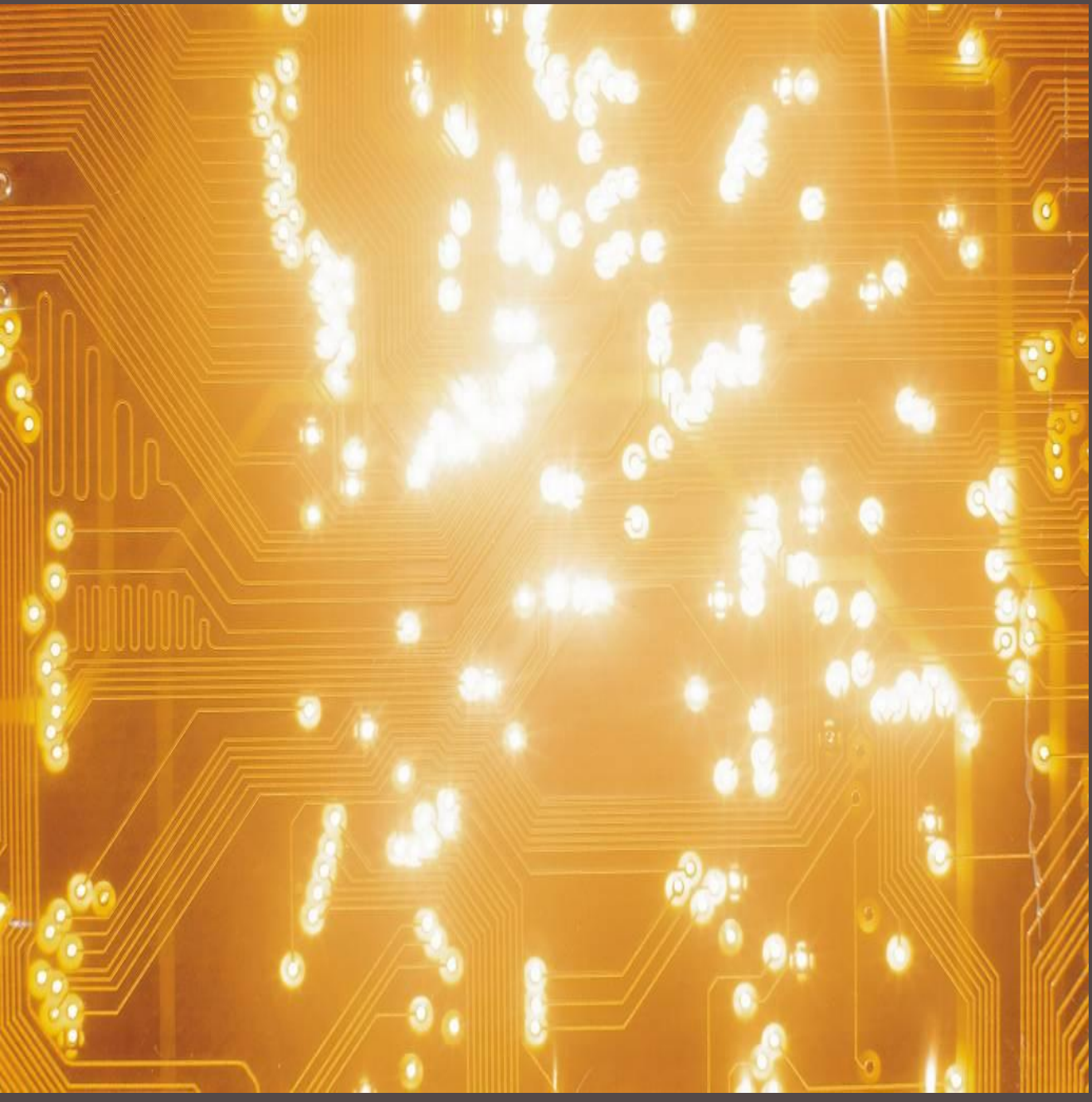
# THINK ABOUT IT...

Two Antennas got married - the wedding was lousy, but the reception was outstanding

# OBJECTIVES (P1)

- Define computer bridges
- Explain the function of BIOS
- Distinguish among various CMOS setup utility options
- Troubleshoot the power-on self test (POST)
- State the need and operational requirements of a PSU
- Test a PSU for its operational functionality

# BIOS AND CMOS

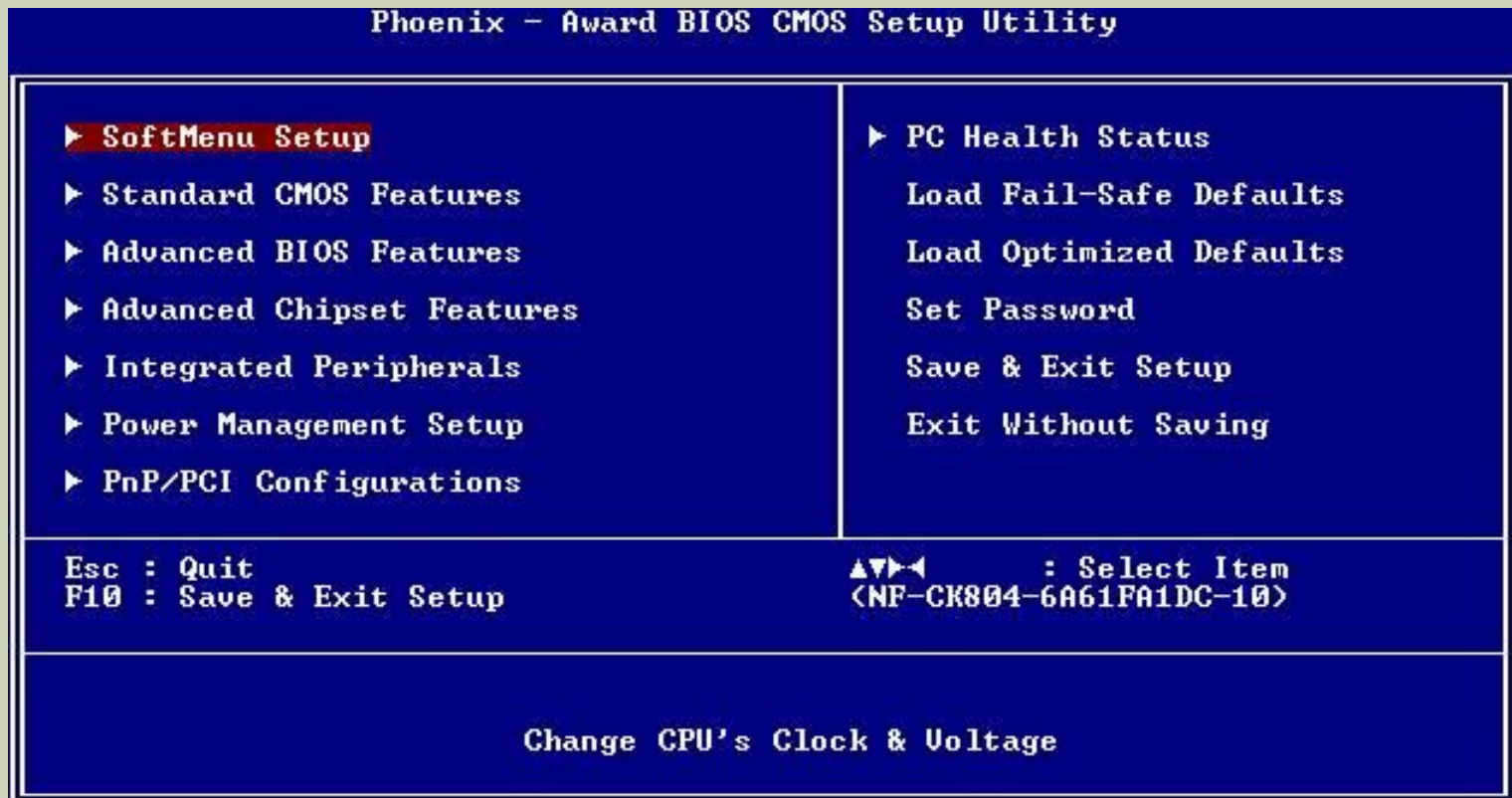


# BIOS (BASIC INPUT OUTPUT SYSTEM)

- The **BIOS** contains instructions and setup for how your system should boot and how it operates
- The BIOS has 4 main functions:
  - **POST** - Test computer hardware, ensuring hardware is properly functioning before starting process of loading operating system
  - **Bootstrap Loader** - Process of locating the operating system, once found the BIOS will pass the control to it
  - **BIOS Software and drivers** - interface between the operating system and your hardware
  - **BIOS / CMOS Setup** - Configuration program that allows you to configure hardware settings including system settings such as computer passwords, time, and date

# CMOS SETUP

- **Main menu**
  - Access to all submenus



# STANDARD CMOS FEATURES

- Clock, hard drives, floppy drives

```
Phoenix - Award BIOS CMOS Setup Utility
Standard CMOS Features

Date (mm:dd:yy)      Wed, Jun 7 2006
Time (hh:mm:ss)     13 : 19 : 35

IDE Channel 1 Master  WDC WD1200JB-75CRA0
IDE Channel 1 Slave   None
IDE Channel 2 Master  SONY CD-CW CRX17
IDE Channel 2 Slave   TOSHIBA CD/DVDW SDR5
IDE Channel 3 Master  None
IDE Channel 4 Master  None
IDE Channel 5 Master  WDC WD2000JS-00MHB0
IDE Channel 6 Master  None

Drive A              1.44, 3.5 in.
Drive B              None
Floppy 3 Mode Support Disabled
Halt On              All , But Keyboard

Base Memory          640K
Extended Memory     1047552K

Item Help
Menu Level
Change the day, month,
year and century

▲▼◀▶:Move Enter:Select +/-/PU/PD:Value F10:Save ESC:Exit F1:General He
F5:Previous Values F6:Fail-Safe Defaults F7:Optimized Defaults
```

# SOFTMENU SETUP

- Normally set to Default or Auto for all

```
Phoenix - Award BIOS CMOS Setup Utility
                SoftMenu Setup

AMD Athlon(tm) 64 Processor 3200+
Frequency : 2000MHz

CPU Operating Speed      Default
x - CPU FSB Clock(MHz)  200
x - Multiplier Factor    10x
x - PCIe Clock           100Mhz

Voltages Control        Default
x - CPU Core Voltage     1.400 V
x - DDR RAM Voltage      2.60 V
x - DDR Ref Voltage      - 60 mV
x - nForce4 Voltage      1.50 V
x - Hypertransport Voltage Default

Item Help
Menu Level ▶
Select User Define,AMD
K8 Cool 'n' Quite
Function will Disable

▲▼▶◀:Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help
F5:Previous Values  F6:Fail-Safe Defaults  F7:Optimized Defaults
```



# ADVANCED FEATURES

## ■ POST, boot order

```
Phoenix - Award BIOS CMOS Setup Utility
Advanced BIOS Features

Quick Power On Self Test      Enabled
▶ Hard Disk Boot Priority      Press Enter
First Boot Device             Floppy
Second Boot Device            Hard Disk
Third Boot Device             CDROM
Boot Other Device             Enabled
Boot Up Floppy Seek           Disabled
Boot up NumLock Status        On
Security Option                Setup
MPS Version Control For OS    1.4
Delay For HDD (Secs)          0
Full Screen LOGO Show         Disabled

Item Help
Menu Level ▶
Select User Define,AMD
K8 Cool 'n' Quite
Function will Disable

▲▼▶◀:Move  Enter:Select  +/-/PU/PD:Uvalue  F10:Save  ESC:Exit  F1:General Help
F5:Previous Values  F6:Fail-Safe Defaults  F7:Optimized Defaults
```

# POWER MANAGEMENT

- Use to enable/disable power-saving features

```
Phoenix - Award BIOS CMOS Setup Utility
Power Management Setup

ACPI Suspend Type          S3 (Suspend-ToRAM)
-USB Resume from S3       Enabled
Power Button Function      Delay 4 Sec
Wakeup by PME# of PCI     Disabled
Wakeup by Ring             Disabled
Wakeup by OnChip LAN      Enabled
Wakeup by Alarm           Disabled
x - Day of Month Alarm    0
x - Time (hh:mm:ss) Alarm 0 : 0 : 0
AMD K8 Cool'n'Quite control Auto
Power On Function         Button Only
x - KB Power On Password  Enter
x - Hot Key Power On      Ctrl-F1
Restore on AC Power Loss  Power Off

Item Help
Menu Level ▶

▲▼▶◀:Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help
F5:Previous Values  F6:Fail-Safe Defaults  F7:Optimized Defaults
```

# PNP/PCI

- Rarely need to manipulate on today's PCs

```
Phoenix - Award BIOS CMOS Setup Utility
PnP/PCI Conigurations

Resources Controlled By      Auto<ESCD>
x IRQ Resources             Press Enter

PCI/UGA Palette Snoop      Disabled
PIRQ_0 Use IRQ No.         Auto
PIRQ_1 Use IRQ No.         Auto
PIRQ_2 Use IRQ No.         Auto
PIRQ_3 Use IRQ No.         Auto

** PCI Express relative items **
Maximum Payload Size        4096

Item Help
Menu Level  ▶
BIOS can automatically
configure all the
boot and Plug and Play
compatible devices.
If you choose Auto,
you cannot select IRQ
DMA and memory base
address fields, since
BIOS automatically
assigns them

▲▼▶◀:Move  Enter:Select  +/-/PU/PD:Ualue  F10:Save  ESC:Exit  F1:General Help
F5:Previous Values  F6:Fail-Safe Defaults  F7:Optimized Defaults
```

# POWER-ON SELF TEST (POST)

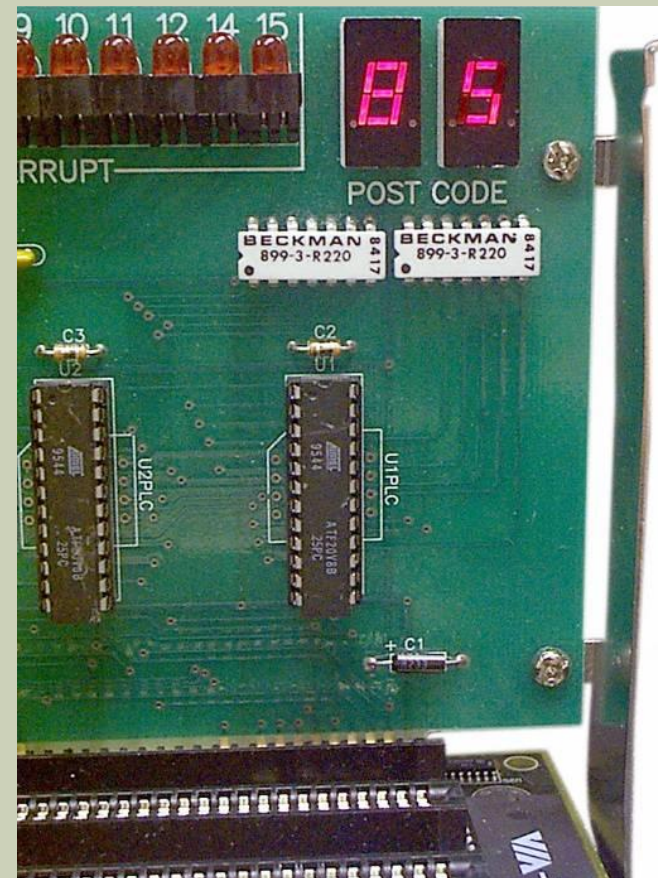
- The **power-on self test (POST)** is a special program stored on the ROM chip
  - Initiated when the computer is turned on or is reset
  - Checks out the system every time the computer boots
- Communicates errors
  - Beep codes
  - Text errors

# BEEP CODES

- If video is determined to be missing or faulty
  - One long beep followed by three short beeps
- If everything checks out
  - One or two short beeps
- If RAM is missing or faulty
  - Buzzing noise that repeats until power turned off
- More complicated beep codes may be found in legacy computers
  - Check motherboard manual for meaning

# POST CARDS

- **POST cards** are devices that monitor POSTs and report on the hardware that may be causing problems
  - Turn the PC off, plug in the card, and reboot
  - POST error codes do not fix the computer – they just tell you where to look
  - If all else fails, replace the motherboard

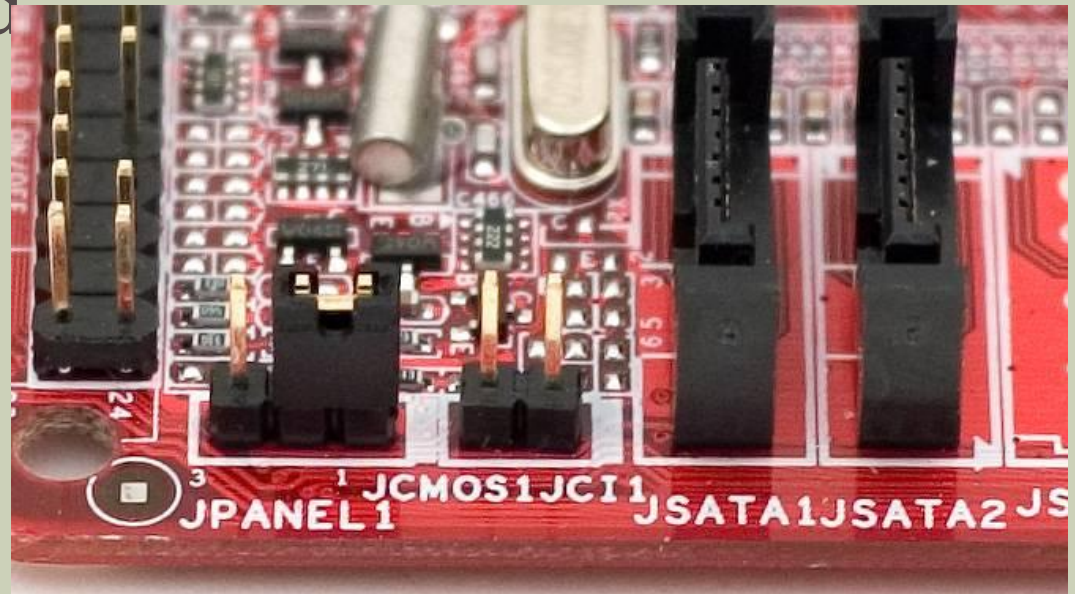


# UPDATING/FLASHING THE BIOS

- Flashing your BIOS to the latest release is crucial because it enhances your system's capabilities
  - It helps it to detect newer devices and components
  - Bigger hard drivers
  - Newer processors
  - Support for updated USB/Firewire
  - PCE-E / PCI-X ports
- Improves stability (very often in the latest BIOS flashes manufacturers apply a series of bug fixes)
- There is always a "change-log" included with every newer BIOS release that should help you decide whether or not it's worth it to flash that specific version
- Dangers of 'flashing'
- How to protect against failed flashes...?!?!?

# CLEARING THE CMOS

- To clear the CMOS settings, place the shunt on the CMOS jumper
  - Resets to factory settings
  - Resets password





# BRIDGE INTRODUCTION

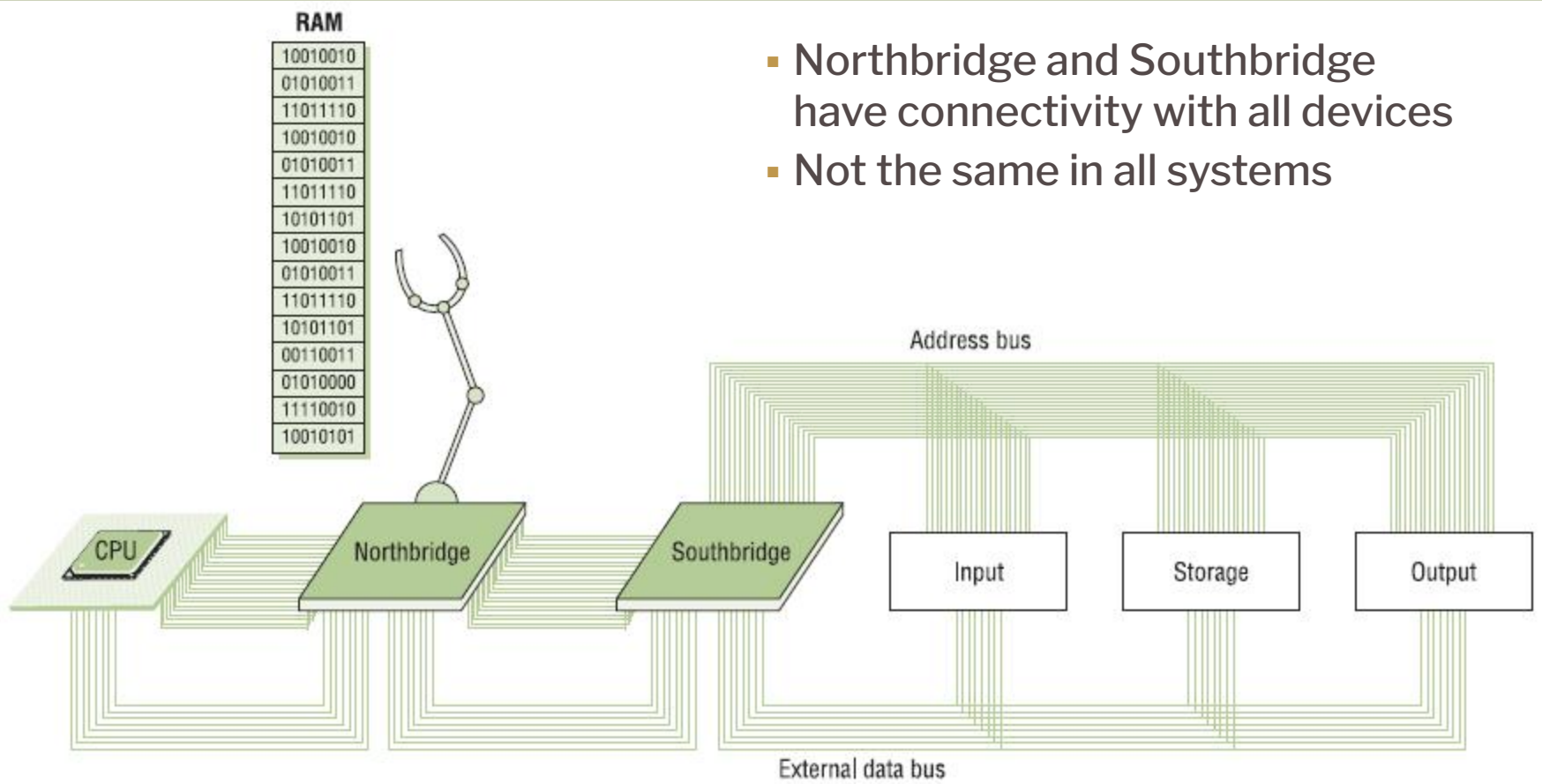
- Data flows through the computer
  - Between CPU and RAM
  - Between CPU and video
  - Between CPU and other devices
- Bridges are used to connect the pieces
  - Northbridge
    - Bridge closest to the CPU
  - Southbridge
    - The farther bridge



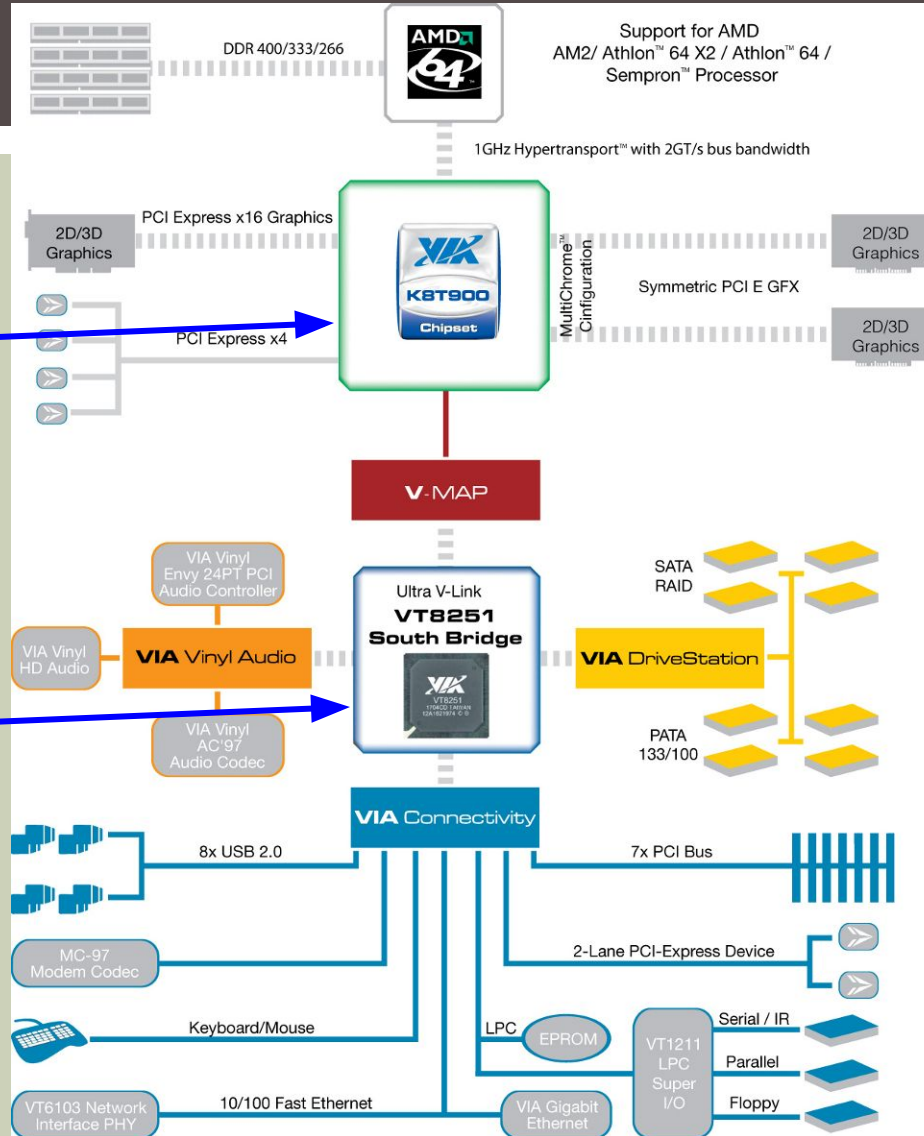
# NORTHBRIDGE & SOUTHBRIDGE

- A **chipset** is a set of Northbridge and Southbridge chips that work together
  - **Northbridge**
    - Chip or chips that connect the CPU to video and/or memory
  - **Southbridge**
    - Handles all of the inputs and outputs to the many devices in the PC

# DATA FLOW



# EXAMPLE AMD CHIPSET

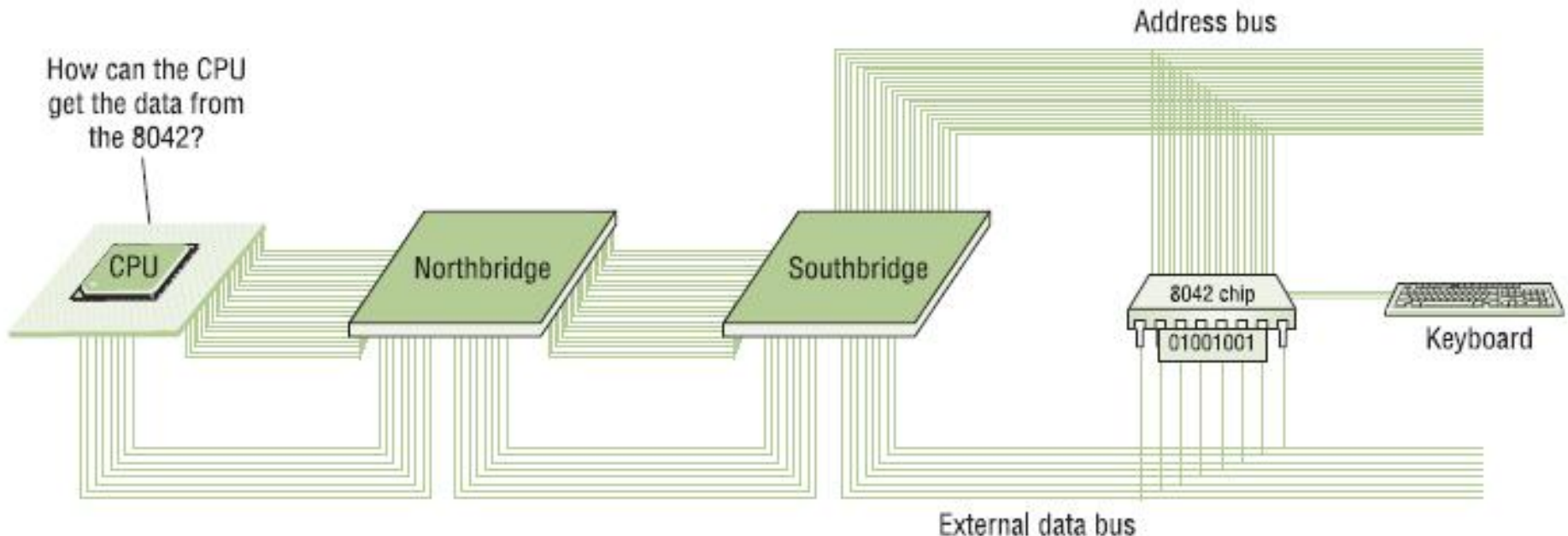


Northbridge

Southbridge

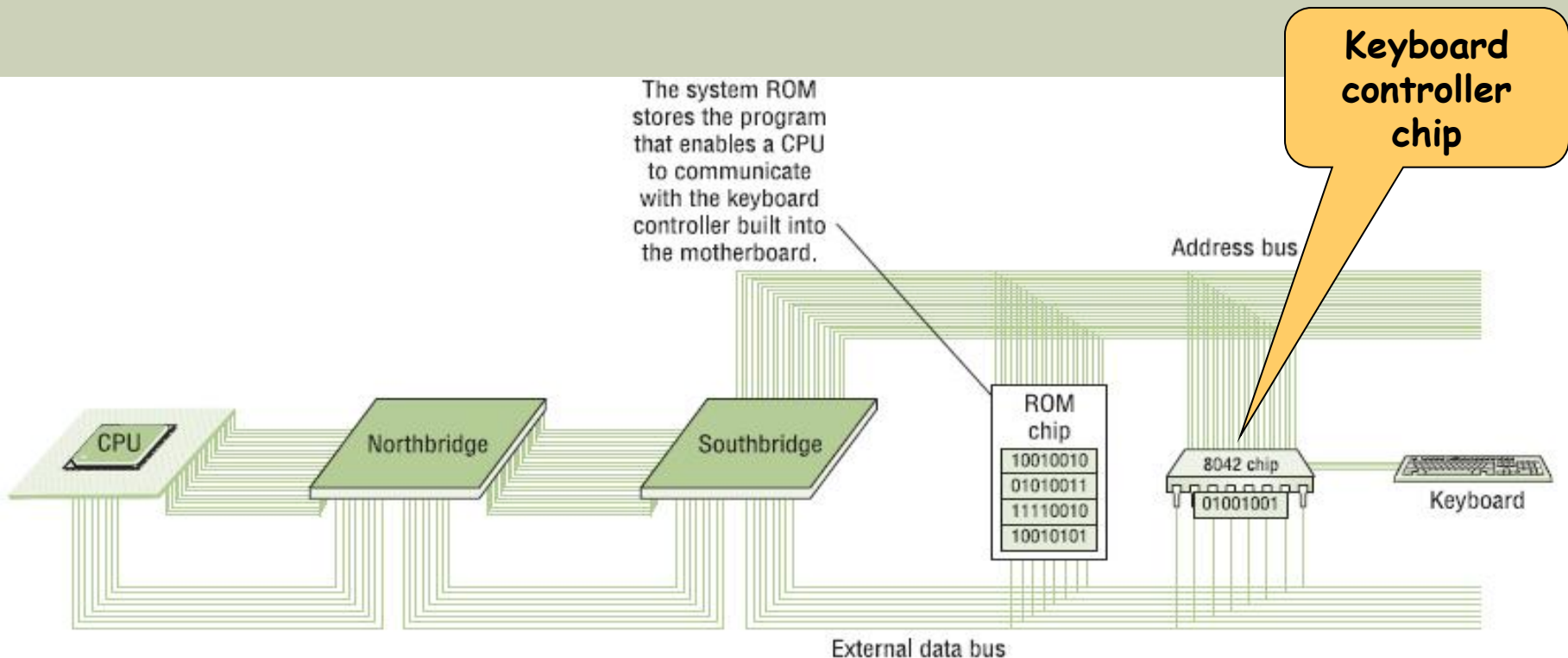
# TALKING TO THE KEYBOARD

- The keyboard talks to the external data bus
  - Uses the keyboard controller chip (8042)
  - The Southbridge chip handles the keyboard interface, acting as the keyboard controller chip among its many other functions. Manufacturers today choose a specific chipset, rather than an individual keyboard controller



# BIOS

- Each program is called a **service**
- Programs that typically reside in RAM or on other erasable media are called “**software**,” while programs that reside in ROM are called “**firmware**.”



# BIOS VS. CMOS

## ■ BIOS

- Programs
- Non-volatile after power
- Can be changed "flashing"
- Typically (though Flash is bigger)
- Often a separate

## ■ CMOS

- Not alive with
- CMOS setup
- 32 K of data
- Size is typically
- Southbridge

Motherboard  
Schematic & Chipset  
research Activity

# Updated via BIOS program

- **Three primary BIOS brands**
  - American Megatrends (AMI), Award, Phoenix
  - To enter setup, press key combination (may be Del, ESC, F1, F2, CTRL-ALT-ESC, CTRL-ALT-INS, CTRL-ALT-Enter, or CTRL-S)

Updating CMOS

```
● Award Modular BIOS v6.00PG, An Energy Star Ally
★ Copyright (C) 1984-2003 Phoenix Technologies, LTD

Main Processor : AMD Athlon(tm) 64 Processor 3200+
Memory Testing : 1048576K OK
CPU0 Memory Information: DDR 400 CL:3 .1T Dual Channel, 128-bit

IDE Channel 1 Master : WDC WD1200JB-75CRA0 16.06U16
IDE Channel 1 Slave  : None
IDE Channel 2 Master : SONY      CD-RW  CRX175E2 S002
IDE Channel 2 Slave  : TOSHIBA   CD=DUDW  SDR5372U TU11

IDE Channel 3 Master : None
IDE Channel 4 Master : None

Detecting IDE drives ...
```

Press DEL to enter SETUP, ESC to Enter Boot Menu  
07/01/2005-MF-CK804-6A61FA1DC-10





# CMOS (COMPLEMENTARY METAL OXIDE SEMICONDUCTOR)

- The CMOS is powered by a CMOS battery and contains your system settings and is modified and changed by entering the CMOS Setup
- CMOS is an on-board semiconductor chip powered by a CMOS battery inside computers that stores information such as the system time and date and the system hardware settings for your computer
- The standard lifetime of a CMOS battery is around 10 Years
- Volatile (kept alive by battery)
- Stores only changeable data, Not programs
- Often on Southbridge

# LOSING CMOS SETTINGS

## ■ Common errors

- CMOS configuration mismatch
- CMOS date/time not set
- No boot device available
- CMOS battery state low

## ■ Common reasons for losing CMOS data

- Jiggling the battery while doing other work
- Dirt on the motherboard
- Electrical surges
- Faulty power supplies
- Chip creep

# POWER SUPPLY UNIT (PSU)

- A PSU converts the 115-volt alternating current (AC) supplied by an electrical outlet into direct current that the PC can use
- The PSU converts the AC into a 12-volt, 5-volt, or 3.3-volt direct current
  - 12-volt DC is used to power such as hard drives and CD
  - The 5-volt and 3.3-volt output various electronics on the
- Although unlikely over 25% of all PSU's  
<http://www.helpwithpcs.com/courses>

Power Supply  
Calculator:

[www.outervision.com](http://www.outervision.com)

# AT & ATX PSU'S

- Every PSU in use today is either an AT or an ATX
- The main difference is the number of connectors attached to the wires
- But regardless of which type there are some basic components that apply to all PSU's
- The first is the power connection, which is where the power supply connects to the electrical outlet
- Next is the motherboard power, which is delivered via a set of cables running from the power supply
- Power supplies also have a fan (which you can troubleshoot easily by just looking at it to see if it's working)

# PSU CONNECTORS



- **4 Pin Berg Connector**

Used to connect the PSU to small form factor devices, such as 3.5" floppy drives. *available in: AT, ATX & ATX-2*



- **4 Pin Molex Connector**

This is used to power various components, including hard drives and optical drives.

*available in: AT, ATX & ATX-2*



- **20 Pin Molex ATX Power Connector**

This is used to power the motherboard in ATX systems.

*available in: ATX( ATX-2 have four extra pins)*



- **4 Pin Molex P4 12V Power Connector**

Used specifically for Pentium 4 Processor Motherboards.

*available in: ATX (integrated into the power connector in ATX-2)*



- **6 Pin AUX Connector**

Provides +5V DC, and two connections of +3.3V.

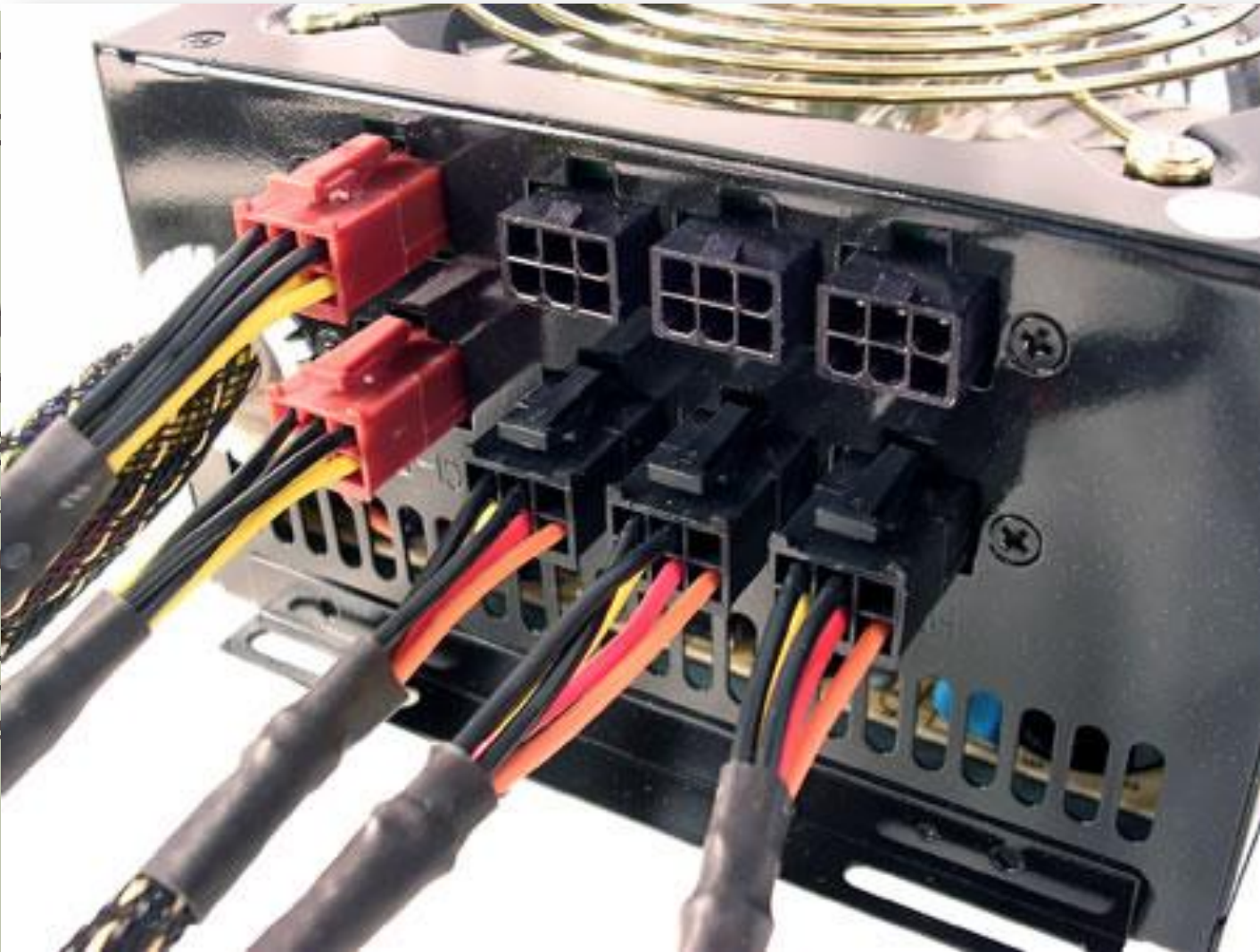
*available in: ATX/ATX-2*



- **A 15-pin SATA power connector**, the shape prevents accidental mis-identification and forced insertion of the wrong connector type,

# MODULAR PSU

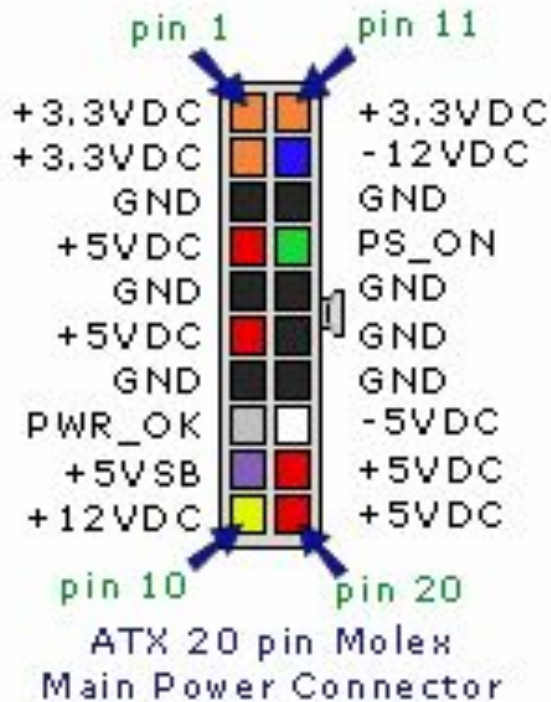
- A modular PSU is a type of power supply unit (PSU) that is designed to be connected to a computer system by using modular cables. It is a type of PSU that is designed to be connected to a computer system by using modular cables.
- With a modular PSU, you can connect only the cables that you need, which can help to reduce clutter and improve airflow in your computer case.
- Benefits of a modular PSU include:
  - A cleaner and more organized power supply area.
  - Improved airflow and cooling.
  - Easier cable management.



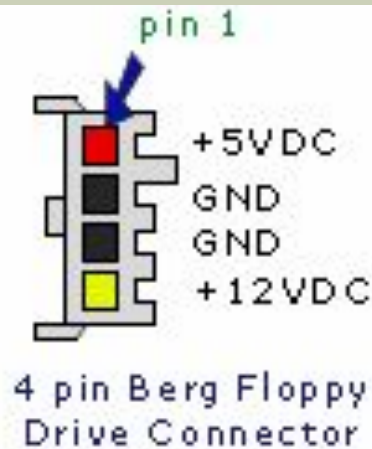
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# ATX POWER SUPPLY PIN OUTS

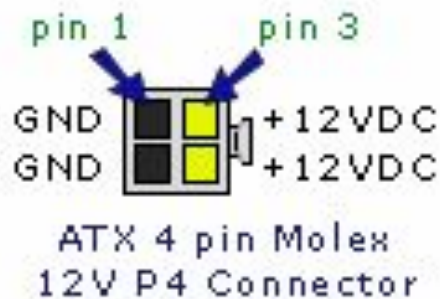
diagrams with pins facing forward



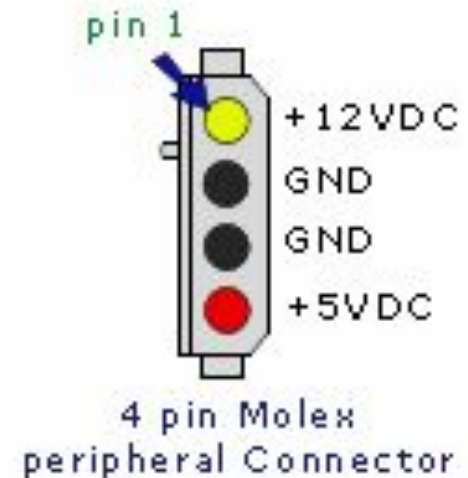
(c) helpwithpcs.com



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# WHAT IS A MULTI-METER?

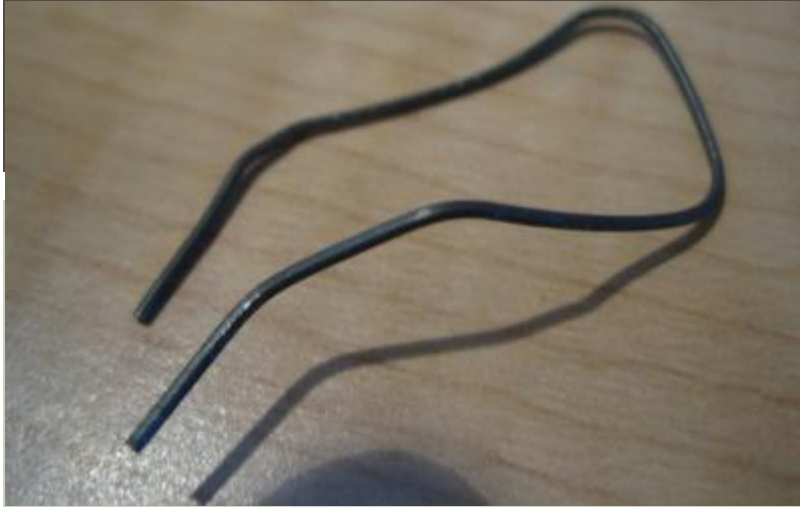
- A multimeter measures electrical properties such as AC or DC voltage, current, and resistance
- Electricians and the general public might use a multimeter on batteries, components, switches, power sources, and motors to diagnose electrical malfunctions and narrow down their cause
- The two main kinds of a multimeter are analogue and digital



# MULTIMETERS CONT.

- A digital multimeter has an LCD screen that gives a straight forward decimal read out, while an analogue display moves a bar through a scale of numbers and must be interpreted.
- Any multimeter will work over a specific range for each measurement. Select one that's compatible with what you meter most, from low-voltage power sources to high-voltage car batteries.
- Multimeters are specified with a sensitivity range, so make sure you get the appropriate one.

# THE PSU POWER ON TRICK



First of all, find a paperclip and bend it to something like in the picture



Find the green wire and one of the black wires



Next, put your paperclip into the pin with the green wire and the other end into one of the two black ground wires beside the green wire. With your teachers permission power on the PSU unit

# PSU PIN-OUT TESTING

- In groups (chosen by your teacher)
- Collect the equipment required to complete this weeks activity
  - Power Supply Unit
  - Paperclip
  - Multimeter
  - Power cable(if not available)
- Under the careful watch of your teacher, perform the test on the PSU using the correct wiring trick
- Measure the pin-out of the PSU and determine the correct output standards

PSU Worksheet  
Task: