

Power Supplies

Purpose

Provides power for the computer.

Convert the 120VAC coming from the wall outlet to **DC voltage** that the devices inside and outside the computer need.

Come in different shapes, sizes, bolt patterns (**mounting standards**)

ATX-most common form factor



Connectors

Have connectors that 'connect' to different devices and parts of the motherboard.



P1 Connector

This is the main power connector.

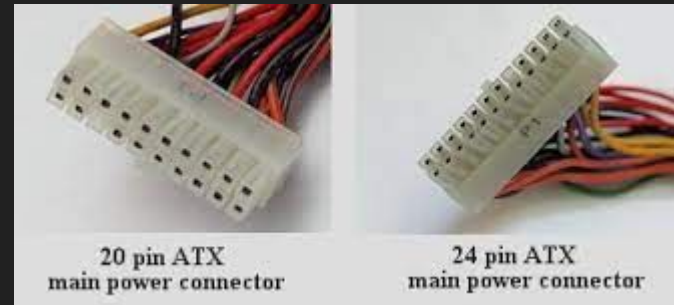
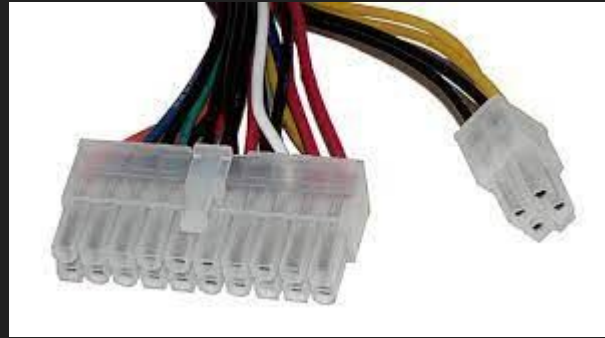
Connect to the motherboard.

Has 20 or 24 pins.

20-older MB

24-newer MB

Modern connector are 20+4 pin i.e. they have both to accommodate older and newer MB

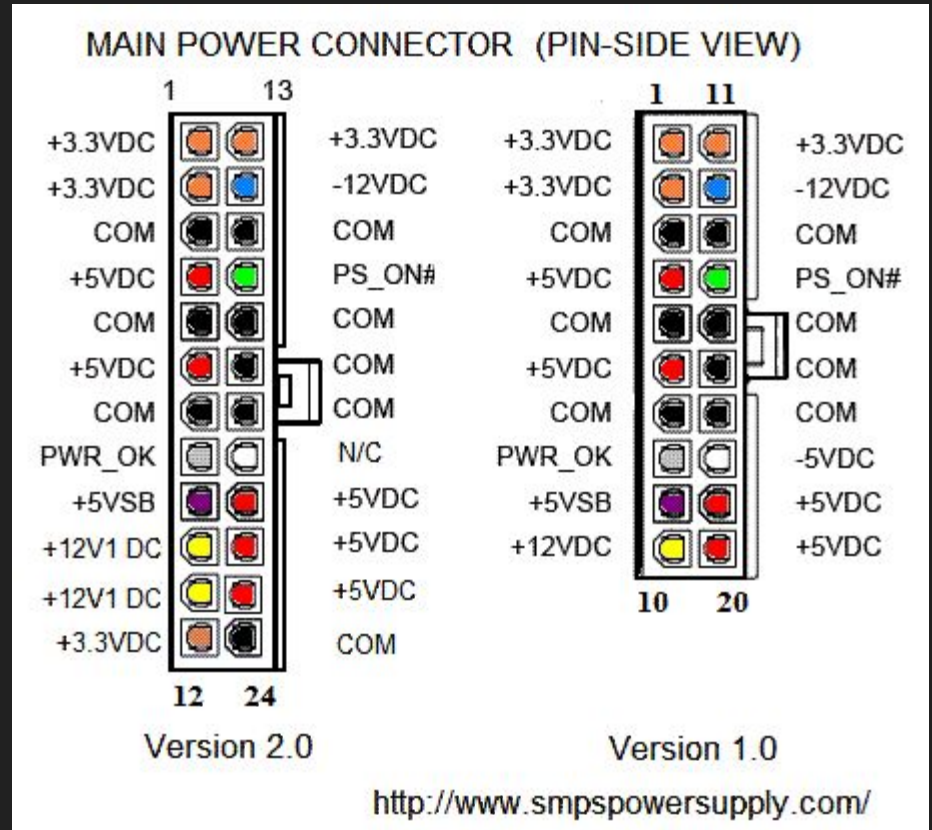


20 pin ATX
main power connector

24 pin ATX
main power connector

Pinout

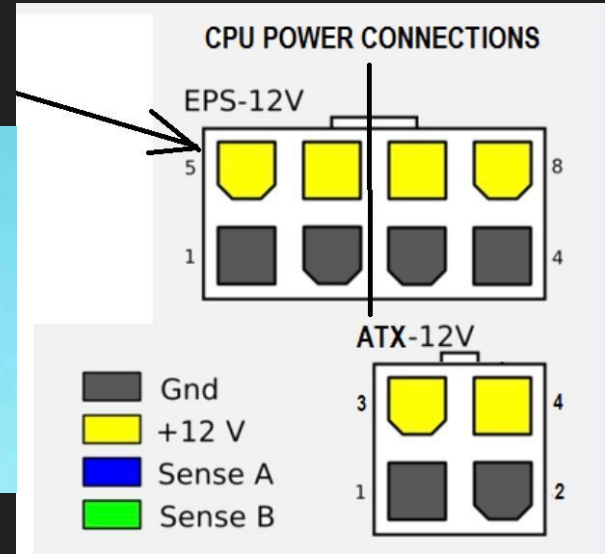
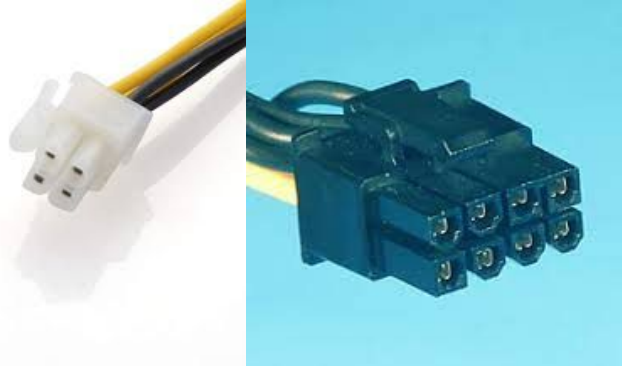
- pinout give you information about each of the pins/wires coming from an electrical device
- another name for the COM pins are **ground(GND)**
- note that the PSU supplies through these pins voltages of **3.3V, 5V** and **12V**
- pin numbering normally occurs **from left to right/sequentially**
- PWR_OK is used to indicate if voltages are within range
- PS_ON if **pulled low(connected to ground)** turns on the power supply



P4/ATX 12-V and EPS-12V Connectors

Additional power connector to supply even more power, specifically to the **CPU**:

Located near the **CPU socket**.

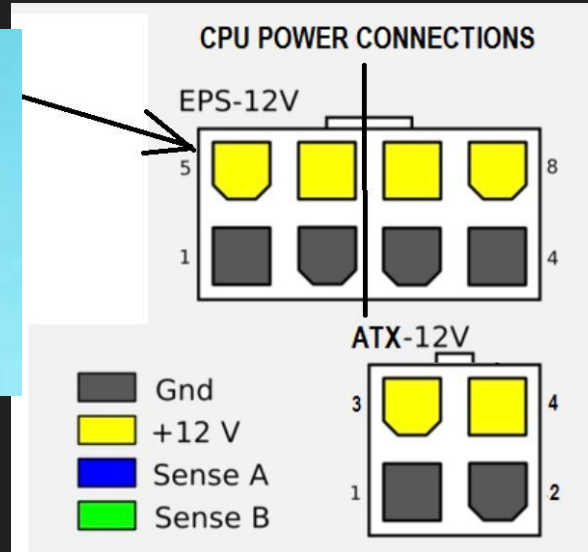


P8 EPS-12V Connector

Developed later on to supply even more power:

Also referred to as the **8 pin** connector.

8 pins.

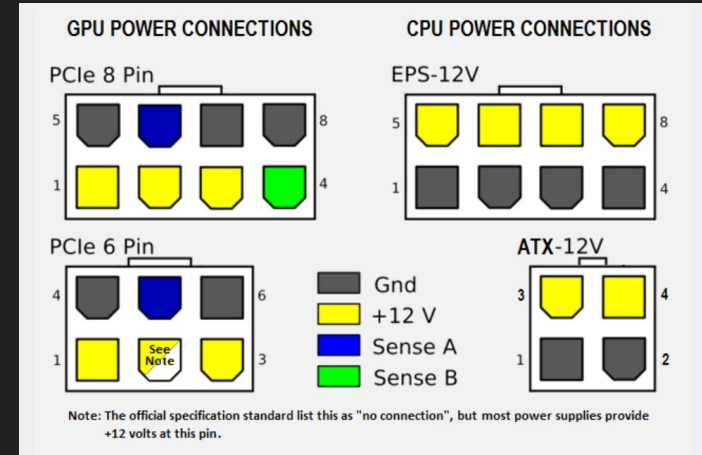
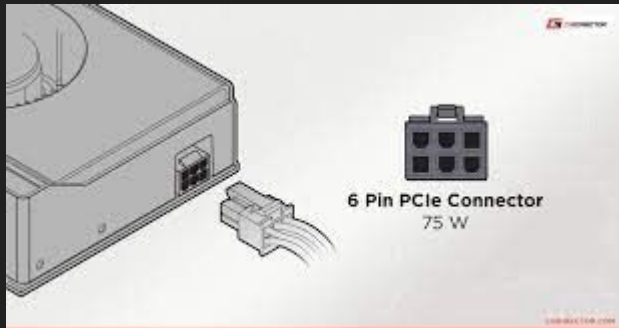


6 and 8 Pin PCE-Express Connectors

Used to power high end **graphics** cards.

Note the slight differences in the two pin connectors.

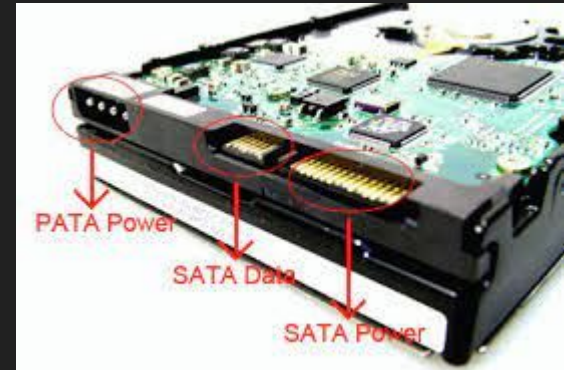
Some cards require multiple connectors



SATA Connector

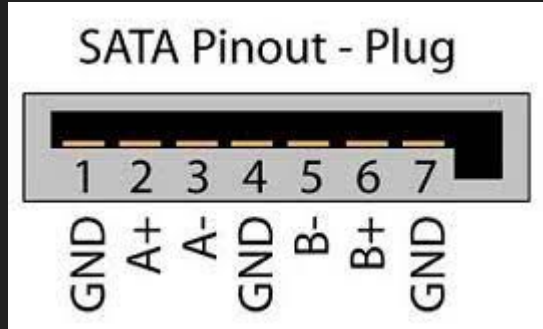
SATA Pins

Power HDD,SDD,SSHD,CD Drives, case fans etc.

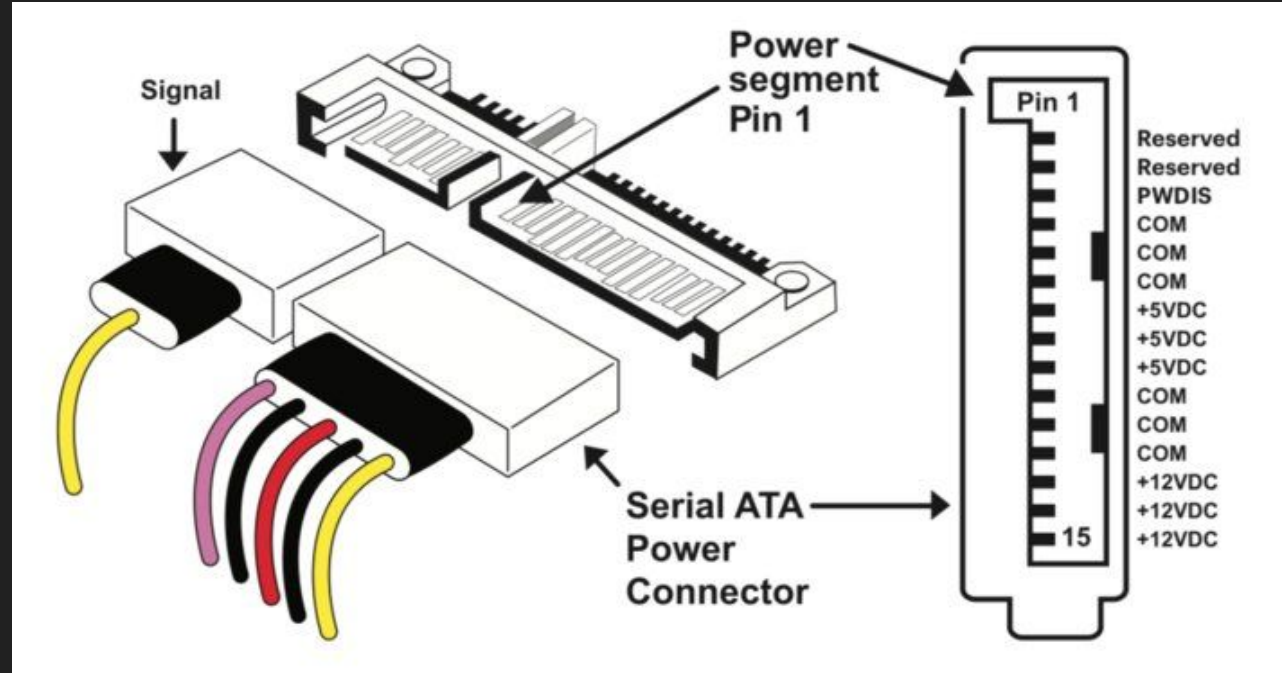


SATA Pinouts

SATA Signal



SATA POWER

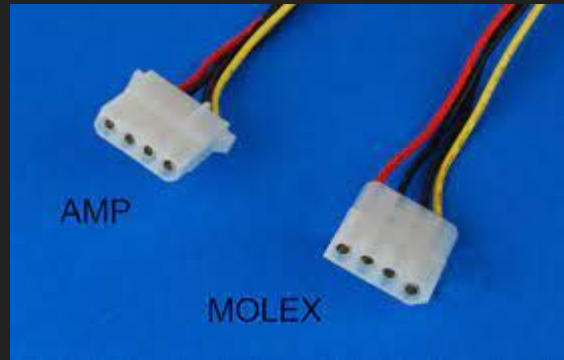
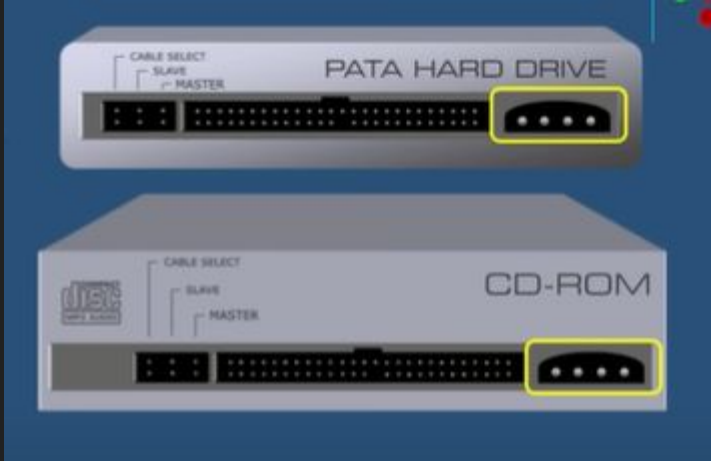
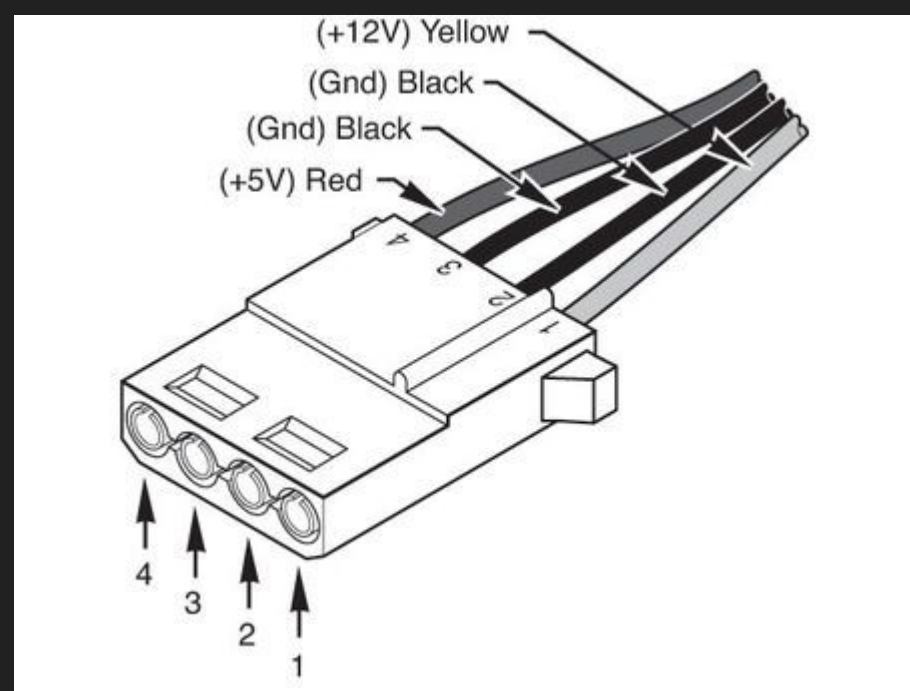


Molex Connector

4 pin

Old connector for HDD and CD drives

Still used for case fans



Wattages

Range from 200 to 2000W

More watts=more power=more devices or more power hungry devices

Most computers need approx. 500-600W

High end ones may need 1000W+

More is always better!

Watts is really an indication of how much current a PSU can supply.

$\text{POWER(Watts)} = \text{Voltage} \times \text{CURRENT(ampères)} = VI$

Since voltage is always 120V then wattage determines current.

240W PSU can provide 2(ampères) of current.

Types

Modular-use cables you need



Non-modular -limited preset number of already attached cables

Semi-modular -has some preset and some you can add



Energy Efficiency

80% rated PSU means for every 80W the computer needs the PSU will need to draw 100W. $80/100=80\%$.

Higher the rating the less wasteful the PSU is (converting AC to DC and from one voltage to another lower one results in loss/heat energy).

Formula for wattage draw is :

Wattage needed = rating

X wattage drawn 100

QnE

1. What are some benefits of a modular PSU?

Reduced cable clutter, improved airflow, customizable cable setup.

2. What is a benefit of a non-modular PSU?

Lower cost, simple installation with all cables included.

3. Go to <https://www.coolermaster.com/power-supply-calculator/>. Using the tool on this site determine what wattage PSU you will need to power a computer that has the following components: AMD CPU Phenom II X4 830, ATX MB, AMD Radeon R7 260X video card, 4 sticks of 16GB DD4 RAM, 2 1TB SSDs, 1 7200RPM 3.5" HDD and 1 Blu Ray Drive.

369 WATTS

4. Based on your last question do some research and provide the link to an appropriate PSU.

Corsair CV450

5. Use the same calculator and list the computer components that would need a 1000W+ PSU.

CPU-> AMD Ryzen 9 5900X, Motherboard-> SSI EEB, GPU-> 3x AMD Raedon RX 6800, RAM-> 5x 32GB DDR4, SSD-> 2x 1TB+, HDD-> 2x 10,000RPM3.5", CD-RW

6. If a PSU draws 800W from the outlet but only supplies the computer with 600W what is its efficiency?

75%

7. Your computer needs 500W of pure power. Its rated for 90% efficiency. How much power will it actually draw from the wall?

approximately 555.56W

8. A PSU draws 750W from the wall. It outputs 600W. What is its efficiency?

80%

9. Do some research and list the efficiency a PSU needs to have at 100% load to get a 80Plus, 80PlusBronze, 80PlusSilver, 80PlusGold, 80PlusPlatinum and 80PlusTitanium ratings?

80 Plus: 80% efficiency 80 Plus Bronze: 82% efficiency (at 100% load)

80 Plus Silver: 85% efficiency (at 100% load) 80 Plus Gold: 87% efficiency (at 100% load)

80 Plus Platinum: 90% efficiency (at 100% load) 80 Plus Titanium: 92% efficiency (at 100% load)

10. Provide a link to a 1000W 80Plus PSU and one to a 80PlusTitanium. Do you think the price difference is worth it? Why might it be worth it to some people?

Corsair AX1000: 80 Plus Titanium, energy savings, lower heat, longer lifespan.

Corsair RM1000x: 80 Plus Gold, good balance, lower upfront cost.

Price difference: Worth it for high-end, energy-conscious users, overclockers.

11. What is a danger in buying a cheap, no name brand of PSU?

Risk of failure, poor voltage regulation, overheating, lack of safety features, reduced lifespan, potential damage to components

12. Typically, computers use 3-5 amps. What power PSU would that require?

3-5 amps at 120V would require a 360W to 600W PSU.

13. On average how many watts of electricity do most laptops use?

30W to 90W

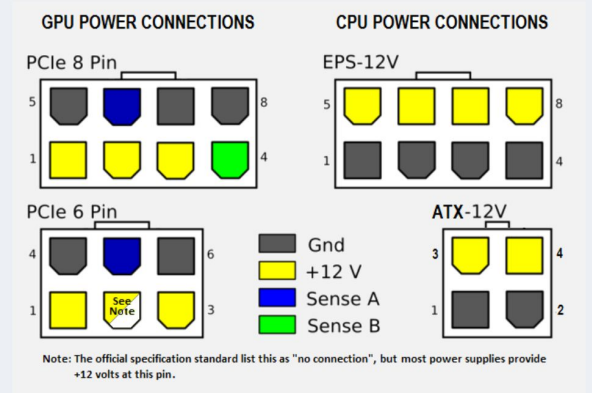
14. How many watts do most high end video cards use? What does this tell you about the PSU needed in computers with these installed?

Most high-end video cards use 200W to 350W.

Indicates higher wattage PSUs (750W+ recommended) for stability and performance.

15. Find and embed here the pinout diagrams for a 6 and 8 pin PCIe graphics power connectors.

X



16. Find and embed a picture of a fan power connector and its pinout.

X

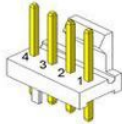
3 pin fans

Pin	Name	Color
1	GND	black
2	+12VDC or +5VDC	red
3	Tachometric Signal	yellow

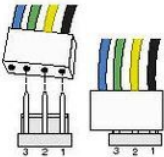


4 pin fans

Pin	Name	Color
1	GND	black
2	+12VDC	yellow
3	Sense	green
4	Control	blue



4 pin on 3 pin header



3 pin on 4 pin header

