Single Rail PSUs are better!

Myth 1: Only Single Rail Power Supplies Can Power up High-end Graphics Cards!

NO!

Some forums users and even some major companies are spreading the idea that single +12V rail power supplies power up the latest graphics cards in a better way, in order to market their products or to scare other users. This is of course total nonsense. To understand this matter better, let's examine some different scenarios and how the actual power is being distributed to the graphics cards.

There are different kinds of graphics cards in the market today, and depending on the performance of the chip they come with, they have different levels of power consumption as well. The total amount of power that a graphics card consumes is called its *thermal design power*, or TDP. Graphics cards are usually connected to power supplies by PCI-Express connectors. The number and type of connectors that a card has, however, can vary wildly. Some cards have one 6-pin PCI-E connector, some have two; some others come with one 6-pin and one 8-pin PCI-E connector (sometimes referred to as a 6+2-pin PCI-E connector) and again others have none at all. In general you can say that the higher the performance of the graphics card, the more power the graphics card will consume and the higher its TDP will be. All of today's high-end cards come with a 6-pin *and* an 8-pin PCI-E jack.

Note: Not many people know that some power is also delivered through the PCI-E *slot* itself – that is, the slot on the motherboard right where you plug the card in. The PCI-E slot is powered by the 24-pin ATX connector attached to the motherboard.

The maximum power distribution for all of the connectors and slots that are able to connect to a graphics card is as follows:

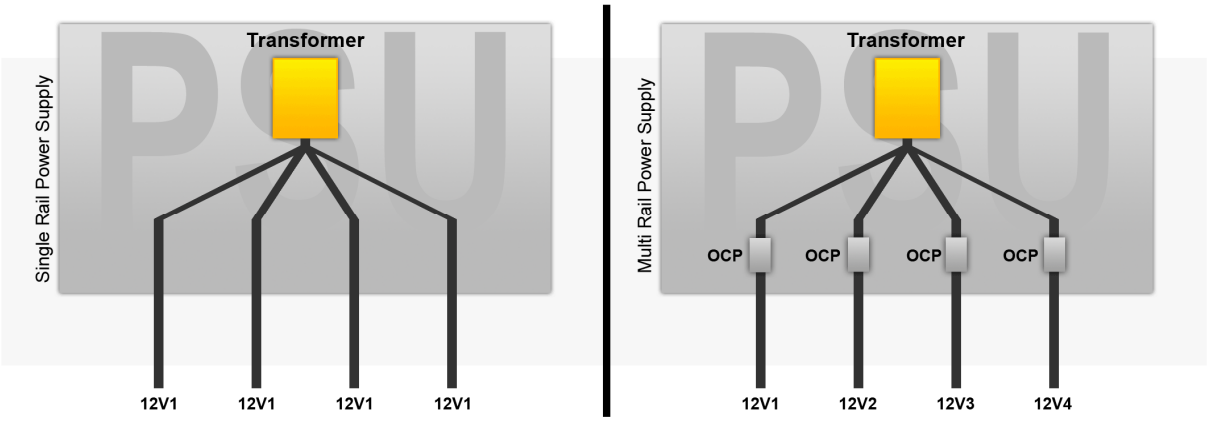
PCI-E slot on the motherboard (powered by the 24-pin ATX Connector)	Up to 75 Watts (6.25A) x2 with SLI and x3 with Triple-SLI
6-pin PCI-E (PEG) Connector	Up to 200 Watts (~17A)
6+2-pin PCI-E (PEG) Connector	Up to 200 Watts (~17A)

Note: The additional pins of the 6+2-pin PCI-E connector are both ground, and not additional +12V cables as is commonly thought.

All together, a graphics card could theoretically have a power consumption of up to 300 Watts. And, as you can see, regardless of which graphics card you use, there is more than one way for power to be distributed to it: 75W at 6.25A, just from the PCI-E slot, and up to another 200W (at around 17A) from each PCI-E Graphics (PEG) connector. As we'll see, because of the way this power is being distributed,

there is no way that you could possibly overload one of the different +12V rails on an Antec power supply (provided it has the right maximum output wattage).

Antec power supplies have separate +12V rails, which means that each rail is limited by a safety function called Over Current Protection, or OCP. Depending on the power supply and its highest rated output, the OCP is set differently for each model to kick in whenever output climbs above a certain level. The point at which OCP kicks in is called the *OCP set point*. The latest Antec models have higher OCP set points – up to 40A per +12V rail, better than twice the ATX standard of 20A and enough, individually, to power even a high-end modern graphics card by itself! But with all that high power comes high safety: Every high-power, multi-rail Antec power supply comes with OCP on all +12V rails, providing the comfort of knowing you have secure rails that won't destroy your PC components in the event of a short circuit.

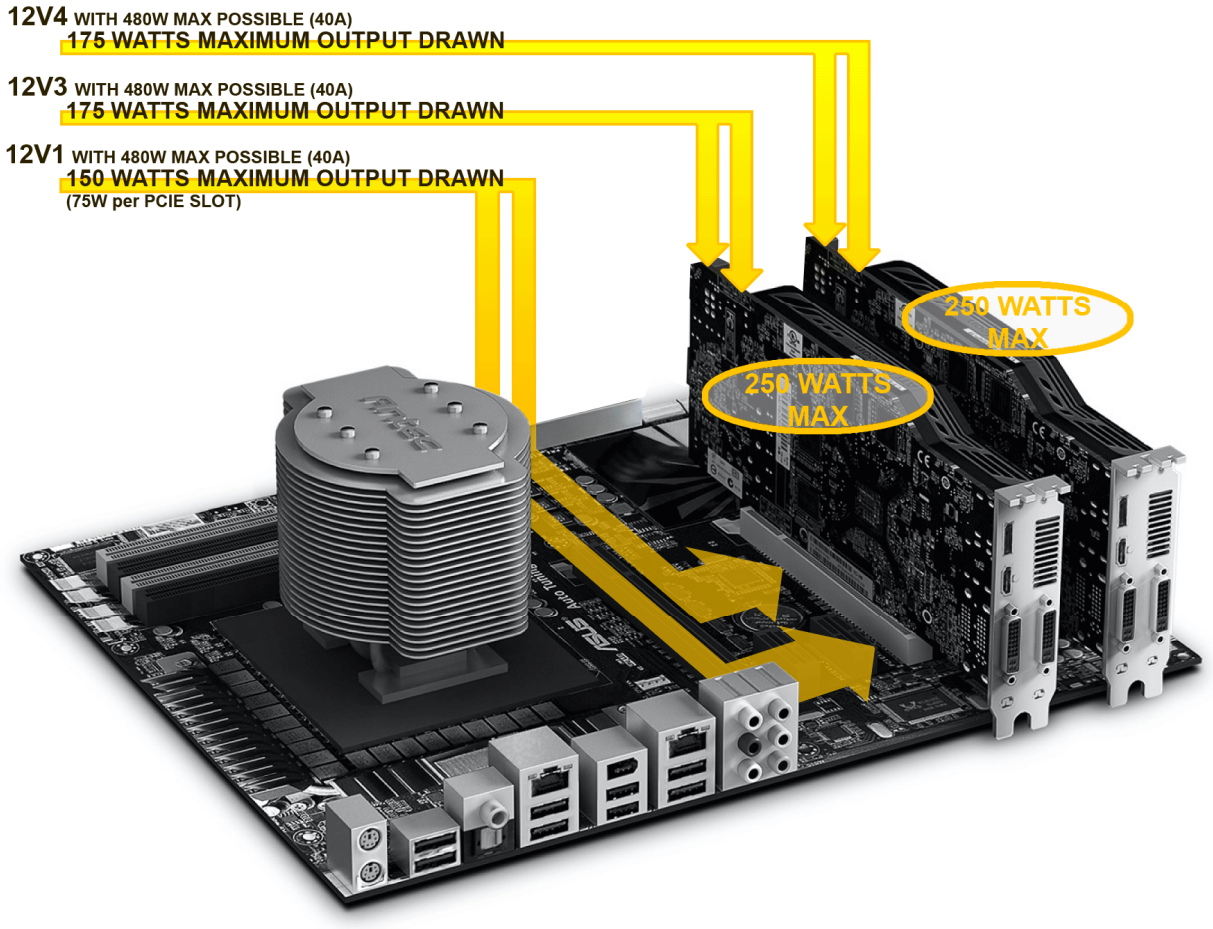


Here's an example just with the +12V rail(s) in a power supply; there are, of course, additional lower voltage rails as well in most power supplies which are not shown here. As you can see in the diagram on the right, in an Antec multi-rail PSU, every +12V line comes OCP-protected for maximum safety.

The basis of this myth states that graphics cards will use too much power from one rail in a multi-rail PSU, causing OCP to kick in and shut down the power supply in order to protect components from dangerous levels of inrushing current. But is this really true in modern setups? Well, we have learned now that each of the +12V rails (and all other voltage rails as well of course) *should be* secured with OCP. Let us check the different cable setups and voltage distributions again. On high-end graphics cards we have up to three power inputs requiring a total of two to three +12V rails. The PCI-E slot can support 75 watts, but its +12V rail is limited to up to 480 watts. The remainder of the graphics card's TDP thus needs to come from its 6-pin or 8-pin PCI-E connectors. On a typical Antec multi-rail PSU with a 40A OCP set point, the total power available on each +12V rail through the 6- or 8-pin connector is 40A times +12V = 480 watts each. That's more than sufficient to power the graphics card with power left over, and certainly enough for any multi-graphics card setup available in the market once an additional +12V rail is used.

An Antec multi-rail PSU has all the PCI-E connectors needed to deliver all the rest of the power that the graphics cards are asking for, and the current delivered by these connectors is also limited by the OCP

safety function at up to 40A. Depending on the power supply and on its highest rated output the OCP set point is set differently for each model. But the vast majority of the latest Antec models have higher OCP set points at up to 40A per +12V rail – twice the 20A specified by the ATX standard, and far higher than OCP set points were back when this myth started. This means that you've got all the power you need for your graphics card and then some with a multi-rail PSU. So much for this myth!



Here's an example of power supply distribution in a typical 2-way SLI setup. The +12V1 rail supplies 150 watts maximum to the cards through the PCI-E slot itself. 6-pin or 6+2-pin PCI-E Graphics power connectors (PEG connectors) on the cards are used to supply the remainder of the graphics card's power requirement. A 40A OCP set point on each of the +12V lines used to power the graphics cards means that up to 480W (40A times +12V = 480W) of power can be transmitted on each +12V rail. Using one rail for each card supplies each card with its TDP with 230W to spare, even when graphics cards are at full load.

We've seen that there is no difference in the ability to power graphics cards. There is, however, one big advantage of multi-rail versus single-rail power supplies: *Safety*. Modern multi-rail power supplies, like the ones that Antec makes, are engineered so that there is no way that you can possibly overload a +12V rail (provided it has the right maximum output wattage). Antec power supplies have separate +12V rails, which means that each rail is limited by OCP. This provides high power that still comes with the assurance of having secure rails that won't destroy PC components.

Note: To make things more interesting, many single-rail designs include OCP on the +3.3V and +5V rail but NOT on the +12V rail which is carrying the most current. Why would they think this safety is important on a rail carrying maybe 20 amps of current but not one carrying 60 or 70 amps? If it 's not an Antec power supply, check to make sure that your power supply has OCP on the +12V rails.

To summarize: The only reason why any power supply is limited to certain graphics cards is simply the total power output of the power supply, something that's true with any power supply vendor and not a feature of any particular single- or multi-rail design. And there is no way Antec's multi-rail power supplies could overload from today's graphics card setups. If there's no difference between the capabilities of single- and multi-rail power supplies, and you can gain an important safety advantage by choosing a multi-rail power supply, why wouldn't you?

Myth Busted.