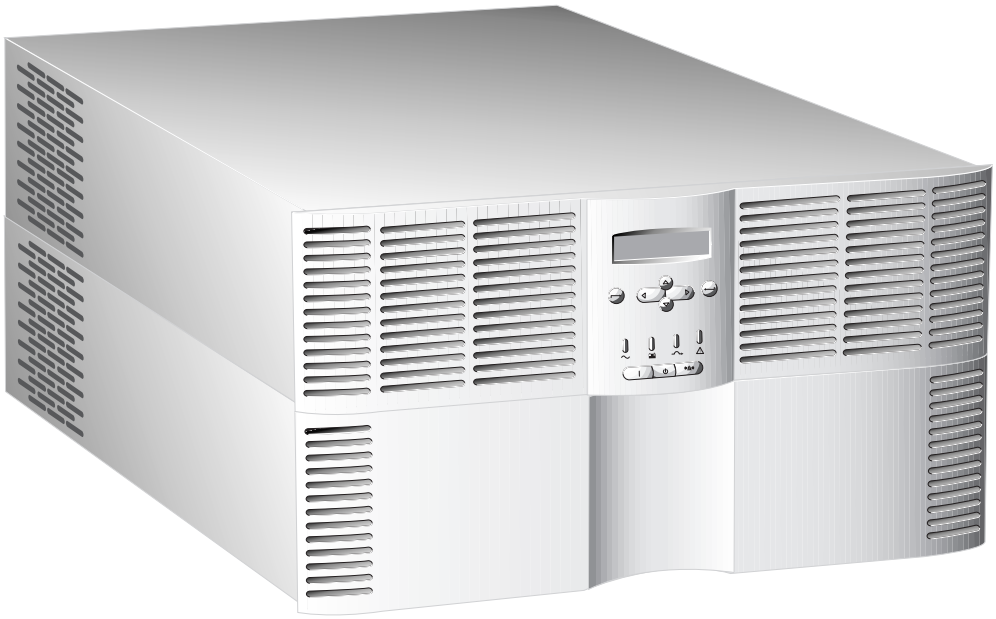
Powerware 5140

Power Factor Correction (PFC)

Application Note



POWERWARE®

General Description

The Powerware 5140 uninterruptible power system (UPS) was specifically designed with input from leading information technology professionals to meet the evolving needs of the Enterprise computing environment. The unique power processing system design of the Powerware 5140 achieves an industry-leading power density of 1 kW per 1U of rack space. This innovative power system design enables space-saving power protection for a wide range of equipment and direct compatibility with Enterprise computing Power Factor Corrected (PFC) power supplies.

The Powerware 5140 power system design meets the requirements of two key trends in Enterprise computing.

- Increased computing power density in a rack-mount environment where rack space has become critical.
- An industry move toward larger PFC power supplies for Enterprise level servers.

Unity Rated UPS

Rated at 6000 VA/6000 W, the Powerware 5140 can protect up to twice as many servers with PFC power supplies in a typical configuration when compared to competitive UPSs. PFC power supplies have a power factor close to unity, typically greater than .95. Switch mode power supplies that are not PFC have a power factor typically between .6 and .8.

VA vs. Watt Rating for PFC and Non-PFC Rated Power Supplies*

Power Supply	Power Supply Watt Rating		
VA Rating	PFC Power Supply with .95 PF	Non-PFC Power Supply at .6 PF	Non-PFC Power Supplyat .8 PF
1000 VA	950W	600W	800W
2000 VA	1900W	1200W	1600W
3000 VA	2850W	1800W	2400W

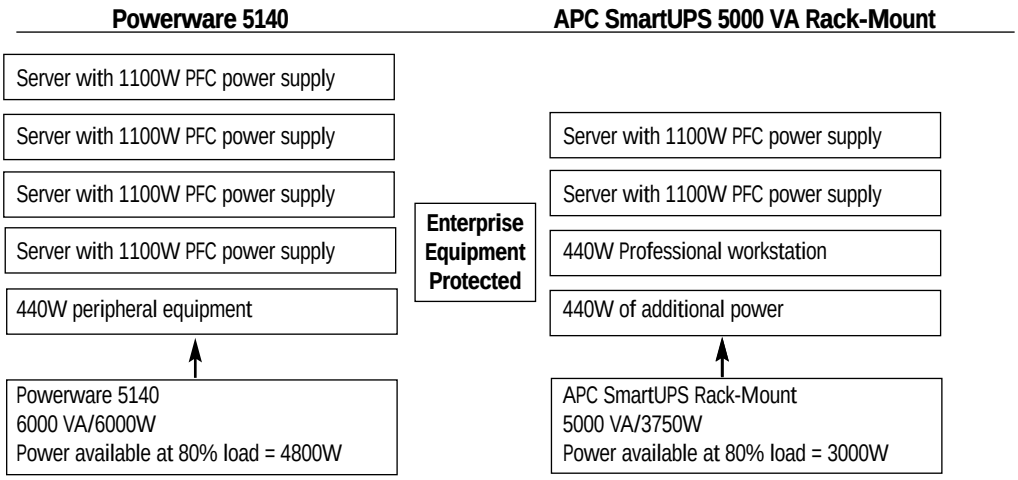
*PF = Power Factor; W = watts

A UPS rated at 1000 VA/1000 W supports a 1000 VA PFC power supply. However, a UPS rated at 1000 VA/750 W will not support a 1000 VA PFC power supply. One of the key advantages of the Powerware 5140 is the unity rated power processing stage, which means the UPS can support a greater number of PFC loads.

The following example shows the Powerware 5140 protection advantage for an Enterprise server configuration with PFC power supplies.

Enterprise load requirement:

- Enterprise servers with PFC power supplies rated at 1122 VA/1100W each.
- 540W peripheral equipment (such as workstations, monitors, and storage).



Powerware 5140 Protects More PFC Loads

The primary technical difference between a Powerware 5140 and a non-unity rated UPS is the ability of the Powerware 5140 to deliver more true power (energy), which is measured in watts. In order to understand the true power requirement of a load, three elements must be defined:

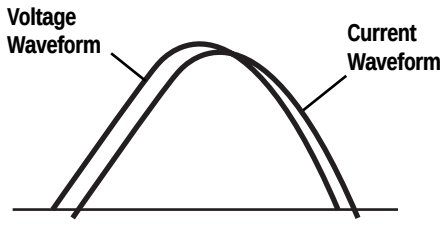
Voltage required = V (volts)

Current required = A (amps)

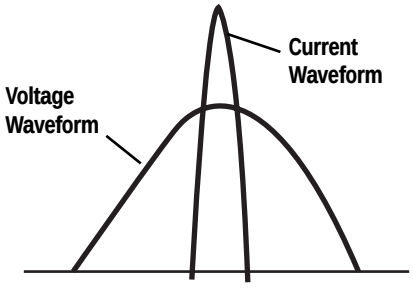
Power Factor = PF

(Watts = V x A x PF)

The primary difference between a PFC power supply and non-PFC power supply is how it draws current from its power source. A PFC power supply with a unity power factor draws current in a linear fashion throughout the entire voltage waveform. A non-PFC power supply with a .6 to .8 power factor draws current for a short duration of the voltage waveform, which is normally during the peak of the voltage waveform. This causes distortion, a form of nonwork-producing energy.



PFC Power Supply Current Draw



Non-PFC Power Supply Current Draw

A PFC supply requires a power (energy) source that can produce more true power. During a utility failure or a very low voltage condition (voltage sag), the UPS becomes the power (energy) source for the equipment it is protecting. UPSs rated at unity have several distinct competitive design differences over non-unity rated UPSs:

- A greater source of energy to supply more true power, meaning it has more battery capacity (energy source).
- A more robust DC to AC inverter power stage in order to produce more true power.
- Greater cooling capacity to handle the additional heat created by converting more true power.

These distinct design advantages give the Powerware 5140 a significant edge in protecting the newest PFC power supplies and also provide several key competitive advantages when used to protect non-PFC loads:

- The Powerware 5140 rated at 6000 VA/6000W provides a full load backup time of 6 minutes using its standard internal batteries while APC's SU5000RM UPS at 5000 VA/3750W provides a full load backup time of 6 minutes.
- Enterprise load protected equals 6000 VA/4000W of non-PFC power supplies with a .66 power factor.

Powerware 5140 Protection Advantage with Non-PFC Power Supplies

Competitive Advantage	Powerware 5140	APC's SU5000RM
% of True Power Capacity	66%	100%
Backup Time on Standard Battery	12 minutes	6 minutes
Heat stress (Reliability)	Only 66% of designed full load heat stress; increased reliability	100% of designed full load heat stress; reduced reliability
Extended Run Capability	Supports extended battery modules for longer back-up times with more robust DC to AC inverter power stage	Cannot support extended battery modules for additional battery backup time

The Powerware 5140 delivers more true power with an advanced power processing system that leads the industry in power density with 1 kW per 1U of rack space. Combining this new power processing system with a proven and reliable line-interactive topology, the Powerware 5140 takes Enterprise network power protection to a new level.