



# Alternating Phase

## A New Look at 3-Phase Power Distribution

WHITE PAPER

July 2019

### Executive Summary

Three phase power is used in data centers to support high density IT applications and minimize the cost of the cables delivering that power. This paper discusses the importance of load balancing across phases and how using PDUs having alternating phase outlets simplifies the load balancing process.

### 3-Phase Power Principles and Challenges

The principles of 3-Phase power are not always well understood by the installer, whose only task is to power up the equipment being installed in the computer rack. Load balancing (matching current draw on each phase) is critical in these applications for multiple reasons:

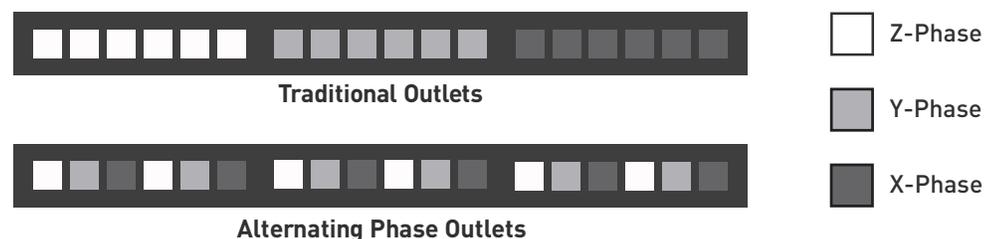
- If the three phases are not balanced, heat is generated resulting in higher cooling costs.
- Unbalanced loads lead to inefficiency and higher power bills.
- High loads on a single phase means greater chance of tripping either a PDU or upstream breaker, and losing power at the rack

Good practice in the data center is to install rack mounted equipment so that the current draw is similar on each branch. This is relatively easy if the rack is filled with only one type of device. Unfortunately, this is often not the case. Mixed devices such as switches, storage devices, blade servers and different brands and types of 1U/2U/3U servers can create a crazy mesh of power cables in the back of the rack. This can potentially inhibit airflow and add to the heat problems mentioned above.

The issues above are compounded by the move to higher density racks that demand more kilowatts of power. Higher power distribution at 60A and 100A force even more complex PDUs with six, nine, and twelve branches. The power draw still must be evenly distributed across these branches.

### Solution

A solution to these issues is to use an alternating phase PDU. These specially designed PDUs alternate the phased power on a per-outlet basis instead of a per-branch basis. An example of these products can be seen below.



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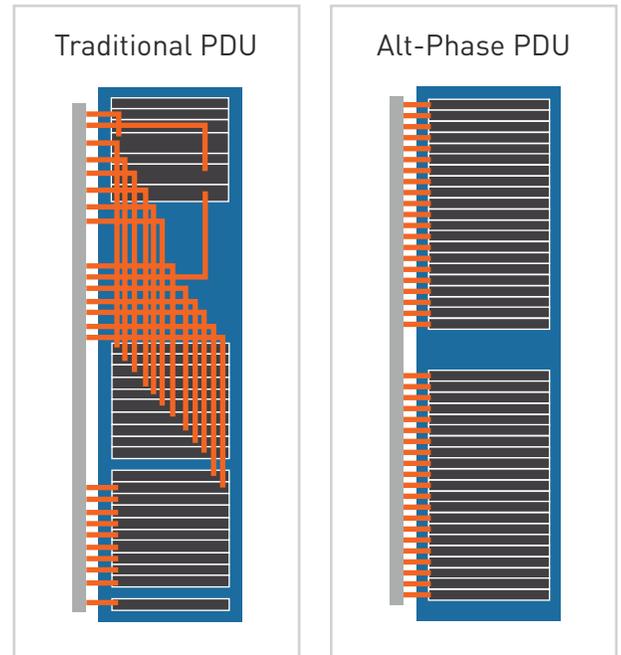
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### Solution (continued)

Power wiring becomes much more simplified with this type of PDU since power cords do not need to be stretched across the length of the vertical PDU to reach separate branches. Plugging into a different phase only means moving the cord several inches to the next available receptacle. Shorter power cords from the server to the PDU can now be used thus cleaning up the back of the rack cabling.

Alternating phase outlets are also a great choice for Basic PDUs where there is no current measurement or display on the unit to assist with load balancing. Installers can plug in servers from the bottom to the top of the rack with less risk of blowing a breaker since there are no dedicated branches across the length of the PDU.

Server Technology has a patent pending for this unique method of distributing the alternating phase power to each outlet. Instead of using wires, our products use a multi-layer circuit board to separate the phases. Each outlet contacts a different trace within the board to distribute the proper phased voltage. This helps to reduce heat build-up in the PDU, lessens the human error during manufacturing and finally creates a cleaner design to reduce the physical size of the product.



### Conclusion

Three-Phase power distribution at the rack level traditionally meant that power was divided into separate branches. Load balancing and cabling can be difficult. Alternating phased power on a per-receptacle basis provides tangible benefits in the form of simplified cabling, better airflow, better load balancing and greater efficiencies.

# About Server Technology®

Server Technology, a brand of Legrand, is leading the engineering and manufacturing of customer-driven, innovative and exceptionally reliable power, access and control solutions for monitoring and managing critical IT assets for continual availability.

Server Technology's power strategy experts are trusted to provide Rack PDU solutions for data centers worldwide ranging from small technology startups to Fortune 100 powerhouses. Because power is all we do, Server Technology can be found in the best cloud and colocation providers, forward thinking labs, and telecommunications operations.

Server Technology customers consistently rank us as providing the highest quality PDUs, the best customer support, and most valuable innovation. We have over 12,000 PDU configurations to fit every data center need and most of our PDUs are shipped within 10 days.



## Rack PDU Buying Guide

Find the best PDU for your data center

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Tools to simplify the PDU buying process

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