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Choosing Power Distribution Units (PDUs) for Networking, Server and Telecom Applications

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Executive Summary

Faced with increasingly complex networks, managers are responsible for identifying reliable power sources for all of their equipment. This white paper establishes Power Distribution Units (PDUs) as a source for reliable network power by answering the following questions:

- What are PDUs?
- How has the PDU market evolved?
- How are PDUs mounted?
- How do I select the perfect PDU for my application?

Introduction

Power Distribution Units (PDUs) can provide network managers with reliable network power. While technically very simple (serving primarily as conduits for power), PDUs can dramatically increase a system's power availability and manageability when properly selected and deployed.

Network managers need to first understand the variety of power distribution options available. Then they need to match the correct PDU to their application.

What are PDUs?

Power Distribution Units (PDUs) are highly-reliable devices that distribute power to multiple pieces of networking, server or telecom equipment. PDUs typically feature multiple outlets to accommodate the growing power needs of today's densely-packed rack enclosures, some of which house devices with as many as 80 total input plugs to connect.

In addition to providing multiple outlets, PDUs serve as vital conduits that deliver conditioned power to rack equipment. PDUs, on their own, do not generate conditioned power. Instead, they deliver conditioned power supplied by a UPS system or a generator-supported wall outlet. A single PDU can be connected to a single UPS system (in smaller networks) or multiple PDUs can be connected to a single, large-capacity UPS system (in centralized data center applications).

Aside from delivering conditioned power, PDUs also serve as vital components that help maintain network power availability. To improve availability, PDUs are free of features found on standard power strips and surge suppressors (such as power switches, line filtering and surge suppression) that may serve as failure points, cutting off power to critical equipment. As an additional measure to improve availability, select PDUs include two input plugs (for redundancy) that can be connected to two separate input sources (either a UPS system or generator-supported wall outlet).

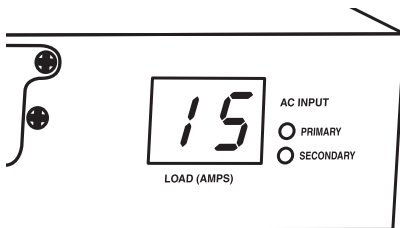
Three main PDU categories:

• **Basic PDUs**

Basic PDUs offer simple, but highly-reliable, power distribution to multiple pieces of equipment. Basic PDUs feature multiple outlets, a long input power cord and a housing with versatile mounting options.

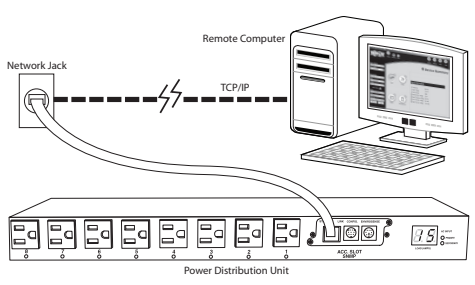
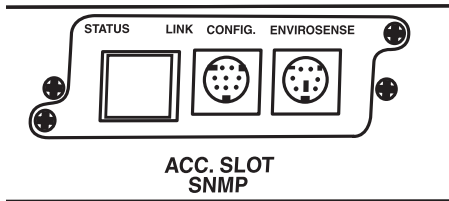
• **Metered PDUs**

Networks are always growing. As additional hardware is added, eventually the input power source, whether it is a UPS system or a generator-supported wall outlet, will become overloaded. Once overloaded, circuit breakers will trip, causing network downtime. Metered PDUs provide a practical way for managers to avoid network downtime. Metered PDUs offer the same features as Basic PDUs, with the addition of a digital load meter. The meter allows network managers to monitor the total power consumption (in amps) of equipment connected to the PDU. As equipment is added, managers can monitor the increased load and take proactive steps to increase input capacity (with the addition of more or larger UPS systems or additional utility circuits).



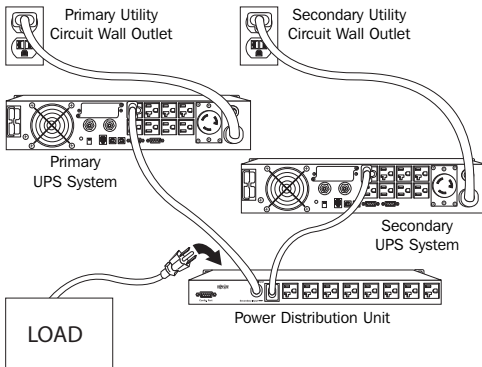
• **Switched PDUs**

Locked network devices can create service interruptions. The easiest way to reboot a locked device is to turn it off and back on again. However, when a network is spread over a wide geographical area, it becomes impractical for managers to travel to each site to perform manual reboots. Switched PDUs provide a practical way for managers to remotely reboot locked devices. Switched PDUs offer the same features as Metered PDUs, with the addition of a built-in network interface. The interface allows managers to remotely control power to individual PDU outlets via an ethernet network connection. This feature reduces costly service calls by allowing managers to remotely reboot locked-up devices that are connected to the PDU. This feature also extends runtime for critical equipment during a power failure. When power fails, managers can remotely shut down less critical devices (such as monitors) in order to divert finite backup power (either from a UPS system or generator) to run servers, switches and other critical devices.



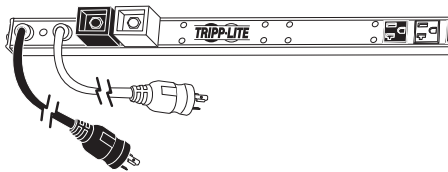
Managers can also use the remote interface to program outlets to start up in a predetermined sequence or to wait a predetermined length of time before starting up after a power outage (to safeguard against in-rush current and tripped circuit breakers). It is also possible to use the remote interface to set load alarms and thresholds and to disable power to unused outlets, ensuring that the PDU isn't inadvertently overloaded by unauthorized personnel.

Additional PDU features:



- **Dual AC Input Plugs with Automatic Transfer Switching (ATS)**

Select Metered and Switched PDUs feature two input power cords and an automatic switch that transfers between them. These features allow managers to increase network availability by providing a redundant, backup source of power—perfect for devices that feature only one power cord and need the support redundancy provides. When the primary input power source is normal, the PDU uses it to power connected equipment. If power fails or voltage drops below acceptable limits, a highly-reliable mechanism within the PDU automatically switches to the secondary input source to power connected equipment.



- **Dual AC Input Circuits**

Select Basic and Metered PDUs feature two separate input power circuits with corresponding, color-coded power cords, circuit breakers and outlets. These PDU models are designed to accommodate the two, redundant input power cords found on many networking devices. Using the PDU's two separate circuits, managers can build a fault-tolerant rack installation by sourcing power from two separate UPS systems or generator-supported building circuits. Since PDUs with dual input circuits consolidate the features of two models into one housing, they reduce clutter and allow for increased airflow in racks.

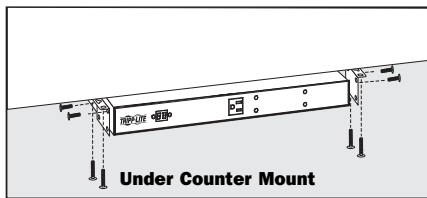
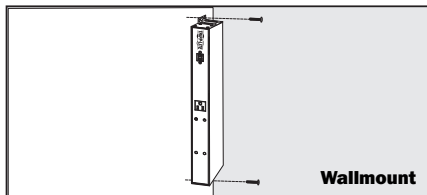
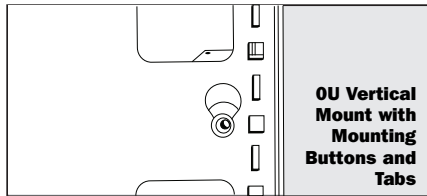
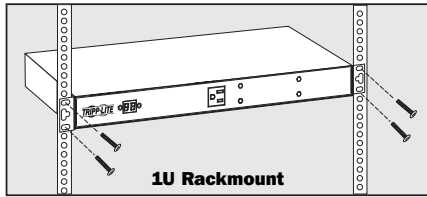
How has the PDU market evolved?

The PDU market has evolved incrementally, with each generation of PDUs featuring increasing levels of power management and control. Basic PDUs were introduced first, followed by Metered PDUs and then Switched PDUs.

The sheer number of devices in a typical network necessitated the development of Basic PDUs in order to get everything plugged in and powered. As availability became more critical to networking applications, Metered PDUs were developed to allow managers to monitor power usage. As networks grew to cover increasingly larger geographical areas (regional, national and global), Switched PDUs were developed to provide managers with a way to remotely control equipment.

How are PDUs mounted?

PDU Mounting Options



PDUs are commonly built for permanent mounting horizontally or vertically inside rack enclosures. Different designs allow for different mounting possibilities. When mounted horizontally, they commonly occupy one or two rack spaces (1U or 2U). When mounted vertically, they occupy no rack spaces (0U), because they are attached onto or behind one of a rack's vertical rails.

Since PDUs generally function as the entry point for power into a rack, most offer a 10- to 15-foot input cord. With long input cords, PDUs can be mounted anywhere within a rackmount enclosure, even at the top of a rack, and still be plugged into a distant power source.

How do I select the perfect PDU for my application?

Why buy a Basic PDU?

Basic PDUs provide enough outlets to reliably run the many networking, server and telecom loads that require continuous power.

Why buy a Metered PDU?

Metered PDUs allow managers to keep track of the amount of power their equipment is consuming, helping them determine when to apply more electrical capacity or larger UPS systems to support their growing network. Metered PDUs can prevent overloads by clearly displaying remaining capacity.

Why buy a Switched PDU?

Switched PDUs allow managers to remotely control locked devices by temporarily cycling power off and back on again, eliminating the need to travel to remote sites for a manual reboot.

PDU Feature/Benefit Guide

Choose a PDU by identifying the ideal features and benefits for your application.

Features	Benefits	Basic PDUs	Metered PDUs	Switched PDUs
Multiple Outlets	Increase the number of devices that can be powered by a UPS System, generator or utility source.	✓	✓	✓
High-Current Plug and Low-Current Outlets	Increase connection flexibility by converting a single high-amperage outlet into multiple low-amperage outlets.	✓	✓	✓
Long Input Power Cord	Increases installation flexibility by allowing devices to be located far from an input power source.	✓	✓	✓
Digital Current Meter	Avoid overloads and safely add loads as total equipment power consumption is displayed.		✓	✓
Remote Control of Individual Outlets (through SNMP, Web or Telnet)	Reduces costly service calls by rebooting locked devices. Extends runtime of critical devices by turning off non-critical loads during blackouts.			✓

Conclusion

Power Distribution Units (PDUs) are the ideal solution for increasing a system's power manageability and availability. Whether managers want basic features or more sophisticated options, including remote power monitoring and control, PDUs serve as cost-effective, reliable components of any network power distribution architecture.



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