WHITE PAPER

# Additional Considerations When Selecting Rack-Mount Power Distribution Units (PDUs) and Power Strips

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## Introduction

Rack-mount power distribution units (PDUs) and power strips (Figure 1) are a well-established solution for distributing power into Information and Communications Technologies (ICT) equipment racks. If you are responsible for selecting or advising selection of these critical components, be sure to review the impact of phase, level of redundancy, functionality on monitoring and reporting capabilities and the ability to integrate other rack-level monitoring hardware through the PDU in your overall consideration.

## **Definitions in this White Paper**

- Rack(s) refers to ICT equipment racks and cabinets—any 19" EIA rack-mount support structure for computer servers, data storage or network switches.
- Rack-mount is used to describe attachment of PDUs or power strips and ICT equipment into data center cabinets and racks.
- Rack level is used to describe the placement of PDUs or power strips in both cabinets (cabinet-level) and on racks (rack-level), and the monitoring of conditions inside and immediately around the cabinet or rack.

This white paper, by Chatsworth Products (CPI), presents additional considerations when selecting PDUs and power strips. It covers key concepts and features that enhance reliable power delivery and monitoring at the rack level. It concludes with resources that will help you select the right PDU or power strip for your application.

Fast Fact

If you are already familiar with selection of PDUs and power strips and just need to find a part number quickly, try the CPI Power Selector, <u>www.selectapdu.com</u>. If you would like help selecting a product or have a technical question, please contact our Technical Support department at <u>techsupport@chatsworth.com</u>.



If you are unfamiliar with electrical power distribution systems or first need a refresher on the basics, download the companion white paper: The Basics of Selecting Rack-Mount Power Distribution Units and Power Strips at www.chatsworth.com/white-papers

Figure 1: Rack-mount PDUs and power strips are used to distribute power into ICT racks and cabinets.



# A Quick Review: How Do You Select a Rack-Mount PDU or Power Strip?

Before addressing additional considerations when selecting PDUs and power strips, let's review the four basic steps for selecting a PDU or power strip (*Figure 2*):



Form Factor – use a vertical PDU in a full-height, free-standing rack to maximize possible equipment connections. Use a horizontal PDU in smaller wall-mount racks.

 Input Plug – must match the branch power circuit receptacle at the rack and determines the total amount of power available to equipment in the rack.

3. **Outlets** – match the plug(s) on equipment in the rack. There are two approaches: either select the model with the highest number of outlets used in region, or select the model with the highest number of mixed C13 and C19 outlets.

4. **Functionality** – match the level of monitoring required: no metering, local metering, remote monitoring of the input and breakers, remote monitoring including each outlet, remote control of outlets, or remote monitoring and control of outlets.

For a detailed explanation of these four key decisions, download the companion white paper: The Basics of Selecting Rack-Mount Power Distribution Units and Power Strips at <u>www.chatsworth.com/white-papers</u>.

# **Power Distribution and Conditioning**

Rack-mount PDUs and Power Strips primarily function to distribute power into racks. However, some models have optional surge protection and breakers. You should also consider the impact of the level of redundancy and how equipment is plugged to maintain load balance on three-phase models.

### **Optional Surge Protection**

Surge protection is circuitry within the PDU or power strip that protects against voltage spikes. This feature is not required in purpose-built facilities, data centers and computer equipment rooms that have power conditioning through a Transient Voltage Surge Suppressor (TVSS) and Uninterruptible Power Supply (UPS). In premise equipment rooms or at the network edge, where equipment is powered directly from utility power, advise surge protection.

Surge protection is typically specified by a voltage limit. If the amount of line in Voltage exceeds this amount, it is clipped. Surge protection may be limited to a certain number or strength of voltage spikes, after which the unit may continue to deliver power, but without surge protection. So, there may be an LED on the PDU or power strip to indicate surge suppression is active.

### **PDU Breakers**

The breakers on a PDU divide the input power between groups of outlets and limit the amount of current shared by those outlets to prevent overloading of the branch circuits on the PDU and the branch circuit supplying the PDU. If power draw from attached equipment exceeds the current limit, the breaker on the PDU opens, like a light switch, and power stops flowing to the equipment attached to the associated outlets. This prevents power loss for all equipment attached to the PDU and the branch circuit supplying power to the PDU. Basic power strips may have a simple thermal circuit breaker, but breakers on PDUs in highdensity racks and aisle containment that will be exposed to high temperatures should have hydraulic-magnetic breakers that are UL<sup>®</sup> Listed to the UL 489 standard<sup>1</sup> (Figure 3).

> Figure 3: Low profile, hydraulic-magnetic breakers that are UL Listed to the UL 489 standard are best suited for the high temperatures in contained aisles in purpose-built high-density data centers.

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### **Metering, Monitoring and Functionality**

Product functionality, or what can be monitored, is determined by the internal metering within the PDU or power strip. The unit may have metering for the input current, at the breakers and/or at the outlets (Figure 4). Be sure to check the product specifications to understand what it can measure, the level of accuracy of the measurement and the regularity of the measurement. Be sure the monitoring functionality that you select captures the data that you need.

One of the advantages of local metering and remote monitoring at the input and breakers on a PDU is the ability to see power draw and changes as new equipment is attached. The thresholds of the breakers are known, typically 15A, 16A or 20A, and if the measured value is close to the breaker value, it is best to plug no additional equipment to prevent an open circuit. Likewise, since power use by equipment varies with workload and utilization level, remote monitoring, logging of power values and trending with a Data Center Infrastructure Management (DCIM) software can help you locate and adjust available power capacity.

CPI Metered PDUs and power strips provide continuous input current monitoring.

CPI Monitored, Monitored Pro, Switched and Switched Pro eConnect® PDUs provide continuous input current monitoring and continuous voltage (V), current (A), power factor, power (kW) and energy (kWh) monitoring for each branch or phase breaker on the unit with ±1% accuracy power measurement.

CPI Monitored Pro and Switched Pro eConnect PDUs also provide continuous voltage, current, power and energy monitoring for each outlet on the unit.

Figure 4: Metered PDU with LED panel to show input current on each phase (L1, L2, L3).

### UL Listing – Independent, Third-Party Safety Testing and Review

Ensure the product has been tested by an independent, certified, third-party laboratory for safety and performance. Safety standards, like the Underwriters Laboratory ANSI/ UL 60950 Information Technology Equipment – Safety<sup>2</sup>, provide industry guidelines for testing and qualification. Individual test labs offer several categories of listing for power products. Listed products are identified in the test labs online database of listings and the product will include a label identifying the testing agency and listing (Figure 5). Third-party testing is especially important with electrical and electronic products.

Listing typically includes evaluation of components to be sure they support the product specification. Additionally, in commercial applications, some electrical codes require electrical distribution products to be tested and listed by a certified lab. Note that the CE marking (Conformite European)<sup>3</sup> does not require third-party testing.

CPI PDUs and power strips are UL Listed under the NWGO category, Information Technology Equipment Including Electrical Business Equipment, file E2120764.

### **Plugging Equipment for Redundant Power**

In the simplest configuration, equipment has a single power supply and cord, and is plugged through one power circuit and one PDU or power strip. However, most rackmount equipment has dual power supplies and dual cords to support redundant power. The idea in redundant power configuration is to feed the rack from two separate power circuits (sources) into two different PDUs or power strips and to plug equipment across both circuits, so that if one is interrupted, the other will continue to power all equipment (Figure 6).

Note that the equipment may be configured to draw all power from one cord and to switch to the alternate cord if power is lost, or to share power across both cords. Regardless, in a redundant power configuration, each PDU or power strip must be able to support the full power load of all equipment in the rack.



*Figure 6: Diagram of dual-cord equipment and redundant power* 

## **Monitoring Input Current on Three-phase PDUs**

Measure and monitor input current (each phase) on three-phase PDUs to ensure the power draw is balanced across phases. You can redistribute plugs onto different outlets to balance power. If using remote monitoring, be sure input current is one of the values presented (Figure 7). When combined with DCIM software, power trends can be compared with known capacities to estimate remaining capacity and to estimate if there is sufficient failover capacity in each rack.

CHATSWORTH P & D D U C T S	Syster Name: I Locatio Configu P5-1A10 IP Addr Firmwa	n Info Unit Name - n: Unit Des Irration ID: C3-C1B ess: 97.105 re: 4.4.211	Primary cription 5.189.146	Ses: User Last Uptir	sion Info : admin Login: 201 me: 24d 201	9-02-05 15:1 1 9m	07	No Alarm	
Status Outlet	Cabinet	Access	Loggi	ng	Notificatio	ons	Settings	Administration	
Overview Alarms									My Pro
SecureArray™ SortASC ▼	Overview of the outlet status.	erview he PDU's br ch Statu	anch status, IS	environme	ental probe s	itatus, input	line status, ca	binet lock status, and	
PDU 2	Branch	Voltage	Current		Power (kVA)	Energy (kVAh)	Current	Usage & Thresholds	
- PDU3	CB1	119.4V	0.00A	0.00	0.00	0.00	,	<b>.</b>	
-  PDU4 PDU5	TOTAL		0.00A		0.00	0.00	0% 20%		
	Sensor St	atus				PDU In	put Status	3	
PDU6									
PDU6     PDU7-Alternate     PDU8		1	iemp I	Humidity				Current	
PDU6 PDU7-Alternate PDU8 Primary PDU1	Probe1 Na	ime 70	iemp I	Humidity 67.56 %		L	ne1	Current 0.00A	



Figure 7: CPI Monitored Pro eConnect PDU has local and remote monitoring of power at the input, breakers and outlets. Note PDU Input Status, input line current is equal, indicating phases are balanced.

### Plugging equipment into three-phase PDUs

On three-phase PDUs, outlets are grouped with circuit breakers and each breaker feeds from two of the three phases. When plugging equipment, it is critical to plug across breakers and phases to balance power draw of equipment. CPI PDUs have alternating groups of outlets and clearly marked and color-coded breakers and outlets to assist in identifying phases and breakers (Figure 8). It is also recommended to have a local meter functionality to see metered values for input current and breaker current. You can balance current by plugging across phases evenly.



Figure 8: On three-phase PDUs, plug across breakers evenly to balance power draw from equipment.

## **Remote Monitoring**

When attaching any device to the network for remote monitoring, be sure to consider network security, administration, maintenance, the cost of networking the device and operating conditions at the device.

### Integrated network security, administration and maintenance

To ensure the intelligent PDU has the widest range of compatibility and security for the network, ensure that it supports the IPv4 and IPv6 protocols for TCP/IP addressing with static or dynamic address assignments, and SNMP v1, v2c and v3 protocols for connection to third-party DCIM software. The web interface should support HTTP or HTTPs sessions with definable ports (Figure 9).

CHATSWORTH Products	System Info Name: Unit Name - Location: Unit Des Configuration ID: P5-1A1C3-C1B IP Address: 97.105 Firmware: 4.4.211	S Primary U cription L U v.189.146	ession Info ser: admin ast Login: 2019-02-05 15:07 ptime: 24d 20h 12m		No Alarm	Help   Logout		
Status Outlet	Cabinet Access	Logging	Notifications Second	ettings	Administration			
DU Environmental I	Network SNMP Err	ails Clone				My Profile		
SecureArray™	Network Settings Edit network related confi	guration properties.				Î		
Sort ASC 🔻	TCP / IP Configurati	on						
Unit Name -Primary	Enable Protocols: IPv4 only							
PDU Z	Manually Configure IPv4							
PDU3	Link Local IPv6							
PDU4	🗌 Global IP 🕑 Manu	ally Configure IPv6						
PDU5	IPv4 Setup		IPv6 Setup					
PDU6	IP Address	97.105.189.146	IP Address	12				
DU7-Alternate	Subnet Mask	255.255.255.240	Prefix Length	0				
PDU8	Default Gateway	97.105.189.145	Default Gateway					
	IPv4 DNS Servers		IPv6 DNS Server	s				
rimary PDU	Primary DNS Server	0.0.0	Primary DNS Server					
Iternate Primary PDU	Secondary DNS Server	0.0.0.0	Secondary DNS Ser	ver				
	Time Servers							
	RFC Time Server							
	NTP Time Server time1.	google.com						
	Save Cancel							

Figure 9: Ensure secure network settings and the most current firmware.

Access should be password-protected with separate user rights levels for administrators and users. The PDU should support authentication from an internal database, LDAP database or RADIUS database. Network connections should support encryption and certificates. Email server connection should be outbound only with TLS protocol and definable ports for security.

For ease of maintenance, the PDU should support bulk configuration and firmware upgrades. The firmware should log every system change. For basic setup, you may want Telnet support and a serial connection. This allows configuration using a direct, off-network connection to a computer.

These features are standard on CPI Monitored, Switched, Monitored Pro and Switched Pro eConnect PDUs.



### **Integrated IP Consolidation**

IP Consolidation is sharing a single network connection and web interface for monitoring and control of a group of PDUs (Figure 10). This reduces the total number of network ports required to remotely monitor power, environmental and access control at the rack level in data center, computer room and telecommunications spaces, and can produce significant savings in larger, more concentrated sites.

Look for models that support large arrays, allow a primary and secondary network connection from different PDUs, allow site operators to designate which PDUs in the array are primary and secondary and maintain a connection if one or several PDUs in the array drop connection from the array. The firmware should monitor conditions of the network connection(s), log any array changes, automatically switch over to a secondary connection in the event the primary PDU fails, allow logging from a PDU that is under services to be suspended and support third-party DCIM software.

# Secure Array<sup>®</sup> IP Consolidation is standard on CPI Monitored, Switched, Monitored Pro and Switched Pro eConnect PDUs.

## Critical Firmware Capabilities with Remote Monitoring Functionality

Remote monitoring functionality implies a web interface with access through a network connection and may include monitoring of the inlet current, monitoring at the breakers and/or monitoring at the outlets depending on model functionality. The following list includes critical firmware capabilities for intelligent PDUs that have a remote monitoring functionality:

- Naming of the PDU and individual outlets to associate the PDU with cabinet and rack-mount equipment
- Automated measurement of critical values, including line input current; branch (phase/breaker) voltage, current, power factor, power and energy; and outlet voltage, current, power, energy
- On models that monitor outlet level, ability to group outlets for a combined measurement
- Ability to set and automatically monitor upper and lower thresholds on measured values, especially voltage and current
- Threshold alarms and automated notifications via email
- Logging of measured values on a user-defined interval and for any alarm, notification or event
- Integration with third-party DCIM software or hardware including the sharing of measured values and logged events

These capabilities are standard on CPI Monitored, Switched, Monitored Pro and Switched Pro eConnect PDUs.



Figure 10: CPI's Secure Array IP Consolidation technology links up to 32 PDUs under one IP address.

## Critical Firmware Capabilities with Remote Control Functionality

Remote control functionality implies a web interface with access through a network connection and includes the ability to turn individual outlets off, on and to cycle outlets. The following list includes critical firmware capabilities for intelligent PDUs that have a remote control functionality:

- Naming of the PDU and individual outlets to associate the PDU with cabinet and rack-mount equipment
- The ability to turn outlets on, off or cycle outlets
- The ability to set a cycle time to control the power on sequence and prevent inrush current
- The ability to group outlets and control the status for the entire group of outlets through a single click (on, off, cycle)
- · Logging of outlet status change
- Integration with third-party DCIM software or hardware including remote control function from the DCIM and sharing of the status of outlets and logged events

These capabilities are standard on CPI Switched and Switched Pro eConnect PDUs.

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### **High Operating Temperature Rating**

Intelligent PDUs have an operating temperature range that includes the operation of the monitoring and network components within the PDU. Because PDUs are typically placed at the rear of the rack where exhaust heat from equipment concentrates, and especially if using a hot aisle containment strategy when deploying high-density racks, a higher operating temperature is better.

High Operating Temperature Rating of 149°F (65°C) is standard on all CPI eConnect PDUs.

# Integrating Other Rack-Level Monitoring Hardware Through the PDU

To reduce the cost and complexity of a rack-level monitoring solution, consider the capability of combining a rack-level power monitoring and control system, environmental monitoring system and electronic locking and access control system into a single solution. Combining hardware reduces the number of network connections, the number of power connections and the amount of separate software packages required to fully monitor at the rack level.

## **Integrated Environmental Monitoring**

Environmental monitoring includes a network connection with a web interface for monitoring. A remote probe attaches to the PDU to share the PDU network connection (Figure 11). The probe measures temperature and humidity at the rack level. It is recommended to place a probe near the top of the rack at the front and rear of the rack to measure input temperature and outlet temperature (amount of change) and set threshold alarms for upper and lower limits.

Look for models that can measure temperature and humidity with a maximum range of (+/-) 3 percent accuracy. The firmware should support probe naming, selection of Fahrenheit or Celsius temperature unit of measure, upper and lower alarms, logging of measured values on user-defined interval and third-party DCIM software integration.

Environmental Monitoring is standard on CPI Monitored, Switched, Monitored Pro and Switched Pro eConnect PDUs.



Figure 11: Connect environmental probes to the PDU to add rack-level environmental monitoring. 13

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### **Integrated Electronic Access Control**

Electronic Access Control includes a network connection with a web interface for monitoring and control. Electronic locks and door open/closed sensors in each cabinet attach to the PDU to share the PDU network connection (Figure 12). The locks control access to all equipment within the rack. You can program employee badges with access permissions or can issue separate employee access badges strictly for access to racks.

Look for models that monitor both lock and door condition and that log every access attempt, including unauthorized or lock tamper attempts. The firmware should support secure login, assignment of individual access rights by cabinet, ability to quickly disable access rights by user, lock handle naming, tamper notification alarms, logging of attempts and door conditions on each attempt and third-party DCIM software integration.

Electronic Access Control is standard on CPI Monitored, Switched, Monitored Pro and Switched Pro eConnect PDUs.



Figure 12: Connect electronic locks to the PDU to add rack-level access conrol.

### **Retrofit Upgrades to Increase Physical Security**

There are three types of keys with electronic access control systems: something you have, something you know and something you are. These are currently an access card (something you have), an access code (something you know) or a fingerprint (something you are). One way to increase physical security is to use a dual-factor or multi-factor system. You require more than one key type: an access card and key code, an access card and fingerprint, or all three.

One of the challenges in upgrading existing systems is that if you add an additional key type, then you may need to upgrade the locks to include the reader for the new type of key. Electronic access control systems include locks with single-factor or multi-factor support. Locks with an integrated access card reader, fingerprint reader, integrated keypad or a mix of those inputs. If you need to upgrade to a dual-factor or multi-factor system, you may be able to upgrade the lock, if the system can support a different lock with no additional changes to firmware.

As an alternative, you can use Zwipe® Biometric Access Card to upgrade an existing single-factor system to a dual-factor system that includes biometrics. Zwipe is an access card with an integrated fingerprint reader (Figure 13). The authorized user's fingerprint is encoded on the card. The fingerprint is required to activate the card. You issue Zwipe cards only to authorized users that should have cabinet access. No changes to hardware or additional software or data management is required. Zwipe offers a cost-effective alternative for upgrading keys in systems that would require significant hardware upgrade.

CPI eConnect PDU with Electronic Access Control and Networked Access Control systems are fully compatible with Zwipe Biometric Access Card.

Figure 13: Zwipe Biometric Access Card upgrades an existing access card reader system into a dual-factor system with biometric access without the need to upgrade electronic lock hardware or software.

## **Reduced Networking Cost with Integrated Secure Array IP Consolidation**

Combining the rack-level power monitoring and control system, environmental monitoring system and electronic locking and access control system into a single hardware solution reduces the number of network ports required to monitor a rack from three to one. Integrating Secure Array IP Consolidation technology extends this further by allowing up to 32 PDUs and all attached environmental probes and electronic locks to connect through a single network connection. This greatly reduces the number of network ports, network addresses and network operating cost required to monitor a group of cabinets. The Table below (Table 1) compares estimated cost of a traditional system with separate intelligent PDU, environmental monitoring and access control systems to CPI's integrated ecosystem with Secure Array IP Consolidation technology.

Secure Array IP Consolidation technology is standard on CPI Monitored, Switched, Monitored Pro and Switched Pro eConnect PDUs.

	Estimated Cost Comparison of a NEW Monitoring System for 16 Cabinets						
	Traditional System Seperate PDU, Environmental, and Electronic Access Control (EAC)			CPI ecosystem Integrated PDU, Environmental, and Electronic Access Control (EAC)			Savings with CPI
Component (estimates)	Qty	Each	Total	Qty	Each	Total	
Cabinet Handle Kit	16	\$1,000.00	\$16,000.00	16	\$300.00	\$4,800.00	\$11,200.00
Power Supply for Handle Kit	16	\$25.00	\$400.00	0	-	-	\$400.00
Access Card	5	\$5.00	\$25.00	5	\$5.00	\$25.00	-
Access Control Software	1	\$1,000.00	\$1,000.00	0	-	-	\$1,000.00
Environmental Monitoring Appliance	16	\$750.00	\$12,000.00	0	-	-	\$12,000.00
Power Supply for Appliance	16	\$25.00	\$400.00	0	-	-	\$400.00
Environmental Sensors	32	\$5.00	\$160.00	32	\$5.00	\$160.00	-
Environmental Monitoring Software	1	\$1,000.00	\$1,000.00	0	-	-	\$1,000.00
Intelligent PDU	1	\$1,000.00	\$32,000.00	32	\$1,000.00	\$32,000.00	-
PDU Monitoring Software	1	\$1,000.00	\$1,000.00	0	-	-	\$1,000.00
DCIM Software	1	\$5,000.00	\$5,000.00	1	\$5,000.00	\$5,000.00	-
Subtotals			\$68,985.00			\$41,985.00	\$27,000.00
Service (estimates)	Qty	Each	Total	Qty	Each	Total	
Handle Installation	16	\$25.00	\$400.00	16	\$25.00	\$400.00	-
Environmental Installation	16	\$25.00	\$400.00	16	\$25.00	\$400.00	-
Intelligent PDU Installation	32	\$25.00	\$800.00	32	\$25.00	\$800.00	-
New Network Connection	64	\$250.00	\$16,000.00	1	\$250.00	\$250.00	\$15,750.00
New Power Connection	64	\$250.00	\$16,000.00	32	\$250.00	\$8,000.00	\$8,000.00
IT Administration, System Setup	4	\$500.00	\$2,000.00	1	\$500.00	\$500.00	\$1,500.00
Software Maintenance Contract	4	\$100.00	\$400.00	1	\$100.00	\$100.00	\$300.00
Subtotals			\$36,000.00			\$10,450.00	\$25,550.00
Totals			\$104,985.00			\$52,435.00	\$52,550.00
Estimated Savings with CPI EAC						\$(52,550.00)	

Note: Pricing is strictly an estimate. Comparison shows the relative differences in component and service quantities for the given systems, but actual unit prices will vary depending on systems selected.

Table 1: Comparison of estimated costs for components and installation of a complete cabinet-level monitoring solution including intelligent PDUs, environmental monitoring and electronic locks and access control. The traditional system uses separate hardware systems, network connections and monitoring software. The CPI ecosystem uses integrated hardware and firmware and Secure Array IP Consolidation technology.



To see how much CPI eConnect PDU with EAC and integrated Secure Array IP Consolidation technology could save you, try the CPI eConnect Secure Array Savings Estimator www.chatsworth.com/support-and-downloads/design-tools/econnect-secure-array-savings-estimator/.

## Integration with DCIM Software

DCIM software provides the "single pane of glass" for monitoring all intelligent PDUs, environmental monitoring sensors and other facility sensors in the data center. DCIM software presents measurements in a visual dashboard, which lets you quickly identify issues (Figure 14). It trends measurements, so you can monitor available rack, power and cooling capacity and identify areas for improvement. Depending on the functionality of the PDU, it can report at the device, rack, row, room or site level. Some DCIM software also include network mapping, power line mapping, asset management and/or predictive analytics capabilities.

It is important to understand the differences between PDU levels of functionality and the impact on available reporting through a DCIM software. Think of the PDU as the sensor array and the DCIM as the aggregation and reporting tool. The (Table 2) below compares PDU level of functionality with DCIM report capability.



Figure 14: Screen shot of Powerl $\Omega^{\otimes}$  for eConnect DCIM software showing current conditions of racks

PDU Functionality	DCIM Report Capability
<b>Monitored – Cabinet-level measurement</b> Measures input current and power at the PDU, breaker level.	Reports power utilization by cabinet against known limit Estimates failover capacity for the cabinet
Monitored Pro – Device level measurement Measures power at the outlet level	Reports power utilization by device Identifies underutilized equipment Identifies overutilized equipment Identifies available U-space by cabinet
Switched – Device-level control Control power at the outlet level.	Identifies conditions of outlets Turn equipment off, on or cycle remotely
Switched Pro – Combines above	All of above
Integrated Environmental Monitoring	Reports temperature and humidity by cabinet Reports conditions within or outside of agreed environmental operating range
Integrated Electronic Access Control	Reports cabinet access by user or cabinet Open locks remotely

Table 2: Comparison of PDU functionality and DCIM software report capabilities. With outlet/device-level measurement (Monitored Pro), DCIM software can provide reporting at the device, cabinet (rack), row, room or site levels, including available rack space, power and cooling.

# **Conclusion: Finding the Right Product**

This is a companion white paper to **The Basics of Selecting A Rack-Mount PDU or Power Strip** and provides details on each of the four key decisions: form factor, input plug, outlets and functionality. The three key takeaways are to be sure that you understand what monitoring capabilities you are getting for your selected level of functionality (these may vary between vendors); to consider the integration of environmental monitoring, electronic access control and IP consolidation with any intelligent PDU (this will reduce the cost of networking while enhancing rack-level monitoring capability); and to plan to include a DCIM software as part of your overall monitoring solution (to consolidate data and automate reporting).

### Why Select a CPI PDU or Power Strip?

Monitoring at the rack level provides the data you need to optimize space, power and cooling utilization at your site. CPI designs and manufactures a complete solution for the rack space. CPI has knowledgeable power sales and application engineering to help you identify the best solution for your application.

The CPI cabinet ecosystem includes PDU, rack, cable management, airflow management, environmental monitoring, electronic access control and DCIM software. CPI can be your single source for a complete solution. You can order a cabinet with PDUs and all accessories preinstalled or kitted to match your site requirements. The systems are fully compatible, easy to configure and operate.

CPI has more than 300 standard PDU and power strip models encompassing all functionality levels, form factors and electrical configurations. CPI also provides custom configurations in case standard configurations do not meet all your needs.



If you would like help selecting a product or have a technical question, contact our Technical Support department <u>techsupport@chatsworth.com</u>.



# References

<sup>1</sup>Underwriters Laboratory. UL489 Standard – Molded-Case Circuit Breakers, Molded-Case Switches, And Circuit-Breaker Enclosures. Edition 13. Published 10/24/2016. *standardscatalog.ul.com/standards/en/standard\_489\_13* 

<sup>2</sup>Underwriters Laboratory. ANSI/UL60950-1 Standard -- Information Technology Equipment – Safety – Part 1: General Requirements. Edition 2. Published 03/27/2007. ANSI Approved 10/14/2014. *standardscatalog.ul.com/standards/en/standard\_60950-1\_2.* 

<sup>3</sup>European Commission. CE marking. ec.europa.eu/growth/single-market/ce-marking/

<sup>4</sup>Underwriters Laboratory. UL Product iQ Certifications Database. Chatsworth Products. Listing NWGO.E212076 – Information Technology Equipment Including Electrical Business Equipment. Updated 08-23-2018. *iq.ulprospector.com/info/* 

## Contributor



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