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Uninterruptible Power Supplies — Powerware

Uninterruptible Power Supplies — Powerware

See Eaton's Cutler-Hammer Product Specification Guide on enclosed CD-ROM: 1995 CSI Format Sections 16264A, 16264B, 16264C, 16264D, 16264E, 16264F, 16265A, 16265B, 16265C

2004 CSI Format...... Sections 26 33 53.11, 26 33 53.12, 26 33 53.13, 26 33 53.14, 26 33 53.21, 26 33 53.23, 26 33 53.31, 26 33 53.33, 26 33 53.35



Uninterruptible Power Supplies — Powerware

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General Information

According to data released by the U.S. Department of Energy in 2004, it is estimated that power interruptions cost U.S. business 80 billion dollars annually. When people think of these power problems, they envision the outages similar to the one the North East experienced in 2003, but the vast majority of disturbances last just a few cycles. In this age of ever-increasing dependence on electronic tools, these disturbances can wreak havoc in certain types of facilities.

To properly protect the investments made in equipment, processes and personnel, it is important to understand exactly what we are trying to protect against. IEEE publication E-050R defines nine of the most common power problems that can occur in any work environment.

Power Problem	Definition*	Cause*
1 Power Failure	A total loss of utility power	Can be caused by a number of events: lightning strikes, downed power lines, grid over-demands, accidents and natural disasters.
2 Power Sag	Short-term low voltage	Triggered by the startup of large loads, utility switching, utility equipment failure, lightning and power service that's too small for the demand. In addition to crashes, sags can damage hardware.
3 Power Surge (Spike)	Short-term high voltage above 110% of nominal	Can be caused by a lightning strike and can senc line voltages to levels in excess of 6,000 volts. A spike almost always results in data loss or hardware damage.
4 Under-voltage (Brownout)	Reduced line voltage for extended periods of a few minutes to a few days	Can be caused by an intentional utility voltage reduction to conserve power during peak deman periods or other heavy loads that exceed supply capacity.
5 Over-voltage	Increased line voltage for extended periods of a few minutes to a few days	Triggered by a rapid reduction in power loads, heavy equipment being turned off, or by utility switching. The results can potentially damage hardware.
6 Electrical Line Noise	High frequency waveform caused by EMI interference	Can be caused by either RH or EMI interference generated by transmitters, welding devices, SCR driven printers, lightning, etc.
7 Frequency Variation	A change in frequency stability	Resulting from generator or small co-generation sites being loaded and unloaded. Frequency variation can cause erratic operation, data loss, system crashes and equipment damage.
8 Switching Transient	Instantaneous undervoltage (notch) in the range of nanoseconds	Normal duration is shorter than a spike and generally falls in the range of nanoseconds.
9 Harmonic Distortion	Distortion of the normal line waveform, generally transmitted by nonlinear loads	Switch mode power supplies, variable speed motors and drives, copiers and fax machines are examples of non-linear loads. Can cause communication errors, over heating and hardwar damage.

Figure 41.1-1. Common Power Problems

These nine problems can occur not only from problems with utility but also, as is the case with some switching transients and harmonics, can be generated from the electrical system within a facility. Overall, the national power grid in the United States has 99.9% reliability which at first glance might seem pretty good. This three nine's of reliability however, translates to almost 9 hours of downtime per year. The digital industries of today require much higher levels of reliability; these high-tech industries would like nine, nine's of reliability which corresponds to a single, 1-cycle outage per year. Facility managers and engineers can't do much on the utility side to increase reliability, but much can be done on the customer side of the meter.

What is a UPS

A UPS is a backup power system used to insure uninterrupted power to various electronic devices. This backup is accomplished by using stored energy from batteries or the kinetic energy of a rotating flywheel, or a combination of both.

In the industry today, there are three basic types or topologies for static UPS systems:

A standby or "off-line" design (refer to Figure 41.1-2) is used as a low price solution for power failures, power sags and power surges. Utility power is provided during normal operation and passed through the equipment without being regulated by the UPS. When a voltage or frequency change becomes too severe, the UPS inverter converts dc battery power to ac power to run the equipment.



Figure 41.1-2. Standby UPS Power Flow

A line-interactive UPS (refer to Figure 41.1-3) provides basic power at midrange prices. In addition to protection against power failures, power sags and power surges, the line-interactive UPS protects against brownouts and electrical line noise. This design offers low-grade voltage regulation by "bumping" the utility voltage up or down before passing it through to the connected load. Although lineinteractive UPS provides more voltage regulation than the standby units, battery life is often sacrificed. The number of transfers to and from batteries exceeds that of the double conversion units by as much as 10 to 1 during brownouts and power surges.



Figure 41.1-3. Line Interactive UPS Power Flow

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An **on-line or "double conversion"** (refer to **Figure 41.1-4**) UPS is designed to provide complete power protection against all nine of the common power problems and use an inverter to create 100% new, clean regulated ac power for your systems. These units are in the high cost range and are typically used for missioncritical applications such as data centers and server farms.



Figure 41.1-4. On-Line UPS Power Flow

Batteries

Batteries are a critical component in the reliability of any UPS, but they face a few fundamental challenges. First, all batteries need charging but extended charging significantly shortens battery life. Most batteries are charged with a trickle-charging process (a constant voltage feeding a low current to the battery). This method dries the electrolyte and corrodes the plates, reducing potential life by up to 50%.

During prolonged power outages, the UPS batteries will discharge and will not be recharged until the power returns. When there is a subsequent power failure prior to the batteries being recharged, the computers will not have full backup time. Excessive rapid charging can cause premature battery failure. To combat these problems, UPSs can be equipped with an "intelligent battery-charger." Powerware developed and utilizes Advanced Battery Management (ABM) which increases battery life by close to double while optimizing charge time. The ABM system works using a three-phase charging system:

- The battery is quickly charged to 90% to make sure the UPS is prepared for the next power outage.
- 2. The ABM finishes charging the battery with a more moderate flow charge.

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3. The ABM turns charger off which prevents batteries from being over charged.



Figure 41.1-5. Battery Life Using ABM vs Trickle Charge

Design Considerations

When incoming utility power fails, a UPS is often used as a stop gap to supply power to sensitive loads while a generator is coming on line. Although the generator usually steps in fairly quickly to provide substitute power, the UPS batteries will still be partially discharged during this transition period. Is it important to re-charge batteries while running on generator power? If so, the generator must be sized to handle the normal load plus the UPS battery charging load which can be as high as 120% of the UPS kVA rating.

An option to increasing generator size, or possible even having a generator at all, might be extended battery modules. If the application requires several minutes or even hours of backup time, this can be accomplished by paralleling batteries to increase capacity. Certain models of UPS may also allow hot-swapping of battery modules to allow expanded run-time while keeping critical loads up and running.

Redundancy

A parallel system is considered redundant when there is at least one more module connected to the common bus than is required to support the load. The configuration is sometimes referred to as n+1 redundant. In a redundant configuration, any one of the connected modules may fail and the remaining modules will support the load. In a properly designed system, the failed module will shut itself down and remove itself from the critical bus without disturbing the overall system operation. The process is called selective shutdown.

A simple configuration whereby one UPS module is used as the bypass, source for a second UPS module is used by some designers to achieve redundancy. The system is quite simple and does not require any control wiring. In fact the modules do not have to be the same size or even the same vendor. However, there is some guestion if true redundancy is achieved because the system must successfully transfer to bypass if the load-bearing module fails and the standby module must gracefully accept the entire load going from no load to near full load in a single step. If the transfer is successful then power to the load is passing through the crippled module which could hinder prompt repair. The configuration is called isolated redundant or standby redundant.



Figure 41.1-6. Isolated or Standby Redundant Configuration

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Redundant Distribution

For the highest level of protected power to be made available at the load, dual but separate protected power sources feeding dual but separate distribution paths to loads that have dual power supplies built into them have become common. Systems configured in this manner are expensive and are usually found only at the most critical sites. In the configuration, there will be two separate UPSs, each capable of carrying the entire load but not connected to a common bus during normal operation. Each UPS may be a single module or some variance of a parallel system as previously described. In general, the two UPSs will be identical in design. The intent of the configuration is to have a path for protected power to reach the load under any condition of site operation eliminating Mean Time To Repair or Mean Time To Recover (MTTR) from consideration.

Dual Power Cord Load
_

Figure 41.1-7. UPS Schematic

Quite often a site will consist of a combination of dual power cord loads and older single power cord loads. With the addition of a Static Transfer Switch (STS) the dual path system can serve both types of loads although the single power cord loads can not reach the five and six nine availability numbers because of the necessity to shut the load down when service to the single path portion of the distribution is required.



Figure 41.1-8. UPS Schematic with Static Transfer Switch

The STS will provide power to the load from whichever distribution path is designated primary. If that path fails the STS will automatically switch to the other distribution path continuing power to the load.

Sizing

Sizing a UPS really is a fairly straightforward exercise. Just keep in mind a few simple guidelines.

Output power rating: The load cannot be greater than the output rating of the UPS. Obvious enough. Not quite so obvious is the fact that the load cannot exceed either the apparent power rating (VA, kVA) or the real power (W, kW) of the UPS. Leave a comfortable margin (10 to 20%) between the load requirement and the UPS output rating for growth. Powerware systems will run quite happily at full load continuously, but computer sites tend to expand rapidly, due to required increases in computing power so it would be very poor planning indeed to size the initial UPS application at full rated load unless the UPS had field upgradeable capability to at least the next power rating.

Voltage/frequency: Match the output voltage and frequency capability of the UPS to the load requirements.

Support time/battery size: Battery sizing is technical enough that it should be left to the vendor's application engineers. To properly size a UPS battery, one needs to know the inverter efficiency (NOT UPS efficiency), upper and lower DC input limits of the inverter, characteristics curves of batteries at difference temperatures and the customer's required support time. Fortunately the catalog cut sheets have already taken these elements into account and list a matrix of support times versus load power requirements. The customer should determine the support time requirements by adding up how long is required to finish or protect the work in progress, how long to shut down or go into standby, and how much operator reaction time is required. The support time is matched to the load requirements in the matrix and the battery is defined by the chart. However, if an auxiliary generator will be available, then a comfortable margin to start the generator, switch to it, and have the UPS recognize the generator as a valid source is all the battery that is required. As a rule, the battery should never be sized for less than five minutes. In larger UPS systems, the battery is almost always designed to suit the particular application. The UPS vendor's application engineer or inside sales engineer will have all the information necessary to size a battery once they know the load requirements and the support time.

Connectivity

To provide maximum efficiency and reliability for your UPS systems, it is important to either install a communication network or tie into existing communication networks. As with all Eaton products, different systems have different requirements that the communication system needs to fill.

Maintenance

UPS systems provide backup protection for mission-critical systems. To provide the highest level of reliability available, it is important to monitor and proactively replace degrading components.

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UPS Products

Small UPS Products

Powerware 3105 350 – 1500 VA



Powerware 3105 350 – 700 VA

The compact Powerware 3105 UPS makes it affordable for the smallest offices and home offices to have surge suppression and backup power to protect PCs, peripherals, fax machines, and telephone equipment.

Powerware 5110 350 – 1500 VA



Powerware 5110 350 – 1500 VA

The space-saving Powerware 5110 UPS provides surge suppression, voltage regulation and backup power to protect PCs, networking, and telephone equipment from the five most common power problems.

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Powerware 5115 500 – 1400 VA



Powerware 5115 500 – 1400 VA

The Powerware 5115 UPS offers excellent backup power protection and power quality management for PCs, small-office-home-office (SOHO) equipment, NT workstations, and small Internet-working devices.

Powerware 5115RM 500 - 1500 VA



Powerware 5115RM 500 – 1500 VA

The Powerware 5115 rack-mount UPS is a high-density power quality and backup power protection solution ideal for servers, storage systems, network equipment and other critical devices. Powerware 5125 1000 - 2200 VA



Powerware 5125 1000 - 2200 VA

The Powerware 5125 Tower UPS provides advanced backup power and power quality management for PCs, workstations and servers.

Powerware 5125RM 1000 - 6000 VA



Powerware 5125 1000 - 6000 VA

The Powerware 5125 rack-mount UPS provides advanced backup power and power quality management for PCs, workstations and servers.

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Powerware 9120 700 – 3000 VA



Powerware 9120 700 – 3000 VA

The Powerware 9120 UPS provides maximum power quality and backup power protection in the 700 – 3000 VA range and is the ideal power management solution for networks, Web servers and telecommunications equipment.

Powerware 9125 700 - 2000 VA



Powerware 9125 700 - 2000 VA

Combining superior backup power management and performance with innovative features, the Powerware 9125 UPS delivers the ultimate in power quality, available as a rackmount or stand-alone unit.

Powerware 9125RM 700 - 6000 VA



Powerware 9125RM 700 - 6000 VA

Combining superior backup power management and performance with innovative features, the Powerware 9125 UPS delivers the ultimate in power quality.

Powerware 9155 8 - 15 kVA



Powerware 9155 8 - 15 kVA

Delivering superior power quality and backup power management, the double conversion, online Powerware 9155 UPS power supply provides essential power protection for IT and electrical engineering infrastructures in corporate, telecom, healthcare, banking, industrial and marine applications.

Powerware 9170+ 3 - 18 kVA



Powerware 9170+ 3 - 18 kVA

The Powerware 9170+ UPS, with its scalable, modular and redundant design, offers the highest level of backup power protection, power quality and reliability, and lowest cost of ownership, of any UPS power supply in the 3 – 18 kVA range.

Powerware FERRUPS UPS 500 VA - 18 kVA



Powerware FERRUPS UPS 500 VA - 18 kVA

The Powerware FERRUPS UPS power supply delivers the best power quality and unmatched reliability in configurable backup power management.

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Large UPS Products

Powerware 9315 200 - 500 kVA



Powerware 9315 200 – 500 kVA

As the power quality industry's most reliable and comprehensive option in backup power protection and power management, the Powerware 9315 UPS is essential for mission-critical applications such as data centers, server farms and transportation facilities.



Powerware 9315 500 - 750 kVA

Powerware 9315 500 - 750 kVA

As the power quality industry's most reliable and comprehensive option in backup power protection and power management, the Powerware 9315 UPS is essential for mission-critical applications such as data centers, server farms and transportation facilities.

Powerware 9330 10 - 40 kVA



Powerware 9330 10 – 40 kVA

Eaton has once again set the standard in backup power protection and power management higher than any other power quality company with the Powerware 9330 UPS.

Powerware 9390 40 - 160 kVA



Powerware 9390 40 - 160 kVA

Designed to meet the current and future power protection requirements of data centers, manufacturing operations, medical facilities and other large-system applications, the Powerware 9390 provides the most robust combination of power performance, battery management, scalable architecture, flexibility, power density, and warranty and service.

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PF2 Flywheel



PF2 Flywheel

Wherever maximum productivity and system availability is critical, the Powerware PF2 battery-free energy flywheel storage system bridges the power gap, acting as a backup power or battery backup source during power quality or utility disturbances.



Powerware Power Distribution Units

Powerware Power Distribution Units

Delivering flexibility and simplifying power quality and backup power management, our power distribution solutions enable you to easily deliver power from your UPS power supply wherever you need it.

Powerware Static Transfer Switches



Powerware Static Transfer Switches

Powerware static transfer switches are designed to enhance our line of advanced backup power management solutions, adding an increased level of power quality, flexibility, availability and reliability to create the best UPS power protection infrastructure.

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General Information/Features

Single-Phase Features

Eaton offers an extensive and innovative line of Powerware single-phase UPS solutions. The following are just a few features that enable us to provide you with the best power protection available.



Single-Phase UPS

Extended Battery Run Times

Your application may require several hours of backup time, and Powerware solutions can deliver it with extended battery modules and other battery solutions. Featured on the following models: Powerware 5125, 9120, 9125, 9155, 9170+ and FERRUPS.

Load Segments

Using Powerware LanSafe[™] power management software, you can independently control load segments, which are groups of receptacles on the rear panel of the Powerware UPS. This feature, available on Powerware 5115RM, 5125, 9120 and 9125 models, enables you to manage scheduled shutdowns and sequential startups of protected loads. During a power outage, you can shut down power to non-critical devices, thereby extending battery backup time available for critical devices. Additionally, when the load segments of the Powerware 9125 are used in combination with Powerware ConnectUPS connectivity cards, users can remotely reboot locked-up network equipment. Simply link to the ConnectUPS connectivity card via the network and toggle the passwordprotected Load Segment Controller to get your network back online.



5125RM Load Segment Outlets

Load Segments

To preserve battery power for selected equipment connected to Load Segment 1, you can schedule Load Segment 2 supporting less critical equipment to shut down. As a result, less critical devices do not drain battery power.

Triple Power Warranty

Not only does Eaton offer outstanding Powerware UPS products, we stand behind their performance with the Triple Power Warranty. Most singlephase UPSs include a standard twoyear warranty and a load protection guarantee. In addition, by returning your warranty registration card, you'll receive our exclusive prorated warranty, the longest in the industry. Featured on the following models: Powerware 3105, 5110, 5115RM, 5125, 9120, 9125, 9155, 9170+ and FERRUPS.

Power Density

Powerware rackmount UPSs provide optimal, high-density power protection for critical loads — delivering more performance in smaller packages. Our space-saving models allow valuable rack space to be freed up for other essential equipment.

ABM Technology

Most UPS manufacturers on the market today offer constant trickle-charge batteries. This process degrades the battery's internal chemical composition, reducing potential battery service life by as much as 50 percent. In contrast, Powerware ABM Technology uses sophisticated sensing circuitry and an innovative three-stage charging technique that extends the useful service life of UPS batteries while optimizing the battery recharge time. It also provides advanced notice of the end of useful battery service life to allow you ample time to hot-swap batteries without ever having to shut down connected equipment. ABM Technology is available on Powerware 5115, 5125, 9120, 9125, 9155, 9170+ and 9390.

41.2-2 Uninterruptible Power Supplies — Powerware Single-Phase Units

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Rack-Mount Selection Guide

Table 41.2-1. Powerware Rack-Mount Products

Specification 1	5115	5125	5125	9125	9170	Ferrups
Topology	I	_ine-Interactive		Double-Co	nversion Online	Ferroresonant
Output VA Rating	500/750/1050/ 1500	1000 / 1440 / 2400 / 2880	5000 / 6000	700 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000 / 5000 / 6000	3000 / 6000 / 9000 / 12,000 / 15,000 / 18,000	850 / 1150 / 1400 / 1800 / 2100 / 3100 / 4300 / 7000
Output Wattage Rating	320 / 520 / 670 / 1000	900 / 1340 / 2250 / 2700	4500 / 54,000	490 / 700 / 875 / 1050 / 1400 / 1750 / 2100 / 3500 / 4200	2500 / 5000 / 7500 / 10,000 12,500 / 15,000	600 / 800 / 1000 / 1250 / 1500 / 2200 / 3000 / 5000"
Rack Height	1U	2U	3U	2U and 5U	10U – 34U	6U – 11U
Electrical Input						
Nominal Voltage	120 and	230 Vac	200/208, 220,230 and 240 Vac	120, 208, 230 and 240 Vac	208 – 240 Vac or 200/ 100, 208/120, 220/110, 240/120 Vac	120, 208 or 240 Vac (60 Hz) 220, 230 or 240 Vac (50 Hz)
Nominal Voltage Range	96 – 144 V	120 V: 77 – 152 V; 230 V: 154 – 288 V	160 – 288 V	120 V: 80 –144 V; 208/230 V: 160 – 288 V	176 – 276 V	240 V: 192 – 276 V
Operating Frequency			50/60 Hz, Aut	o-sensing		50 Hz or 60 Hz
Electrical Output						
On Utility Voltage Regulation	-10%	to +6% of Nomin	nal		±3% of Nomina	al
On Battery Voltage Regulation		±5% rms			±3% of Nomina	al
Voltage Wave Shape (on Battery)				True Sine Wave	9	
Frequency Regulation		_			±3 Hz Online; ±0.1 Hz o	n Battery
Load Crest Factor				3 to 1 Ratio		
Load Segments (Receptacle Groups)	2	2 – 3	2	Up to 3	—	—
Battery						
Internal Battery Type	Maintenance-fre	e, Sealed, Valve-F	Regulated Lead	d-Acid (VRLA)		
Recharge Time	<3 Hours to 90%	Usable Capacity		1		Battery Dependant
Transfer Time	2 – 4 ms Typical		4 ms Typical	N/A		0 ms
Communications					1	
Network Transient Protector	Ye	es	No	Yes		No
REPO Port	No			1	Yes	
X-Slot Interface	1 50 000	Yes			Yes	Non X-Slot Adapter
Standard Communications	1 x RS-232 Serial Port and 1 x USB Port	1 x RS-232 Serial Port	1 x RS-232 Serial Port and 1 x USB port		1 x RS-232 Serial	Port
General	1		1	г		
Weight (lb)	35.2/41.4/41.4 /48.6	61.0/61.0/89.0 /89.0	169	34.0 / 34.0 / 50.0 / 50.0 / 50.0 / 81.5 / 81.5 / 206 / 206	66 / 103 / 158 / 196 / 158 / 196	105 / 135 / 150 / 209 / 220 / 238 / 495 / 580
Dimensions (H x W x D) Inches	500 – 1500 VA: 1.75 x 17.3 x 22.8	1000 – 1440 VA: 3.5 x 19.0 x 19.4; 2400 – 3000 VA: 3.5 x 19.0 x 24.5	5000/6000 VA: 5.25 x 17.50 x 24.75	700 – 2000 VA: 3.5 x 19.0 x 19.4: 2500/ 3000 VA: 3.5 x 19.0 x 23.9 5000/6000 VA: 8.63 x 17.37 x 24.94	3-Slot:17.8 x 17.0 x 25.4; 6-Slot: 31.5 x 17.0 x 25.4; 9-Slot: 45.0 x 17.0 x 25.4; 12- Slot: 58.0 x 17.0 x 25.4	850 – 1400 VA: 9.75 × 16.0 × 21.25; 1800 – 3100 VA: 9.75 × 16.0 × 26.25; 4300 –7000 VA: 19.0 × 16.0 × 26.25
Available Colors	Gray	Gray or Black	Gray and Black	Gray	or Black	Gray
Rail Kit	Included	Optional	Included	O	otional	Included
Additional Mounting Capability	Zero-4 Wall	Tower Stand-alone	N/A		Tower Stand-alo	ne
Environmental	1			1		
Safety Markings	UL, cUL, C-Tick, CE, TUV	UL, cUL, NOM, C-Tick, CE	UL, cUL, NOM, C- Tick, CE	UL, cUL, NYCE, CSA, NOM, VDE, CE, S, D, N, FI, B, NOM, R	UL, cUL, TUV, CE, C- Tick, BCIQ	UL, CSA (cUL), CE, TUV
EMC Compliance	FCC Part 15 Subpart J Class A, ICES-003; EN 50091-2	FCC Part 15, EN50091-2, Class A and B	FCC Part 15, EN50091-2, Class A and B	FCC Class B and VCCI Class II, 3000 FCC Class A, BSMI-A, C-Tick, CE Compliance	FCC Class A	FCC Part 15: Class A and B

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Uninterruptible Power Supplies — Powerware Single-Phase Units

41.2-3

Stand-Alone Selection Guide

Table 41.2-1. Powerware Rack-Mount Product (Continued)

Specification 1	5115	5125	5125	9125	9170	FERRUPS				
Environmental (Continued)										
Internal Fans for Cooling		Yes								
Operating Temperature		0 to 40°C (32 to 104°F)								
Relative Humidity				0% to 95% Non-Cond	densing					
Surge Suppression		ANSI C62.41 Category A (Formerly IEEE 587)								
Audible Noise	Less th	Less than 40 dBA Typical Less than 55 dBA Typical								
Altitude	Up to 3000 m (10,000 ft) Without Derating									

① Specifications typical and subject to change without notice. Please review each individual product specs for more details.

Table 41.2-2. Powerware Stand-Alone Tower Products

Specification 2	3105	5115	5125	9120	9125	9155	9170	FERRUPS
Topology	Stand-By	Line-Interactive		Doubl	e-Conversion	Online	•	Ferroresonant
Output VA Rating	350 /500 / 750	500 / 750 / 1000 / 1400	1000 / 1440 / 1920 / 2080	700 / 1000 / 1500 / 2000 / 3000	700 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000 / 5000 / 6000	8/10/12/15 kVA	3000 / 6000 / 9000 / 12000 / 15000 / 18000	500 / 700 / 10,000 / 12,500 / 18,000
Output Wattage Rating	210 / 300 / 420	320 / 520 / 670 / 950	700 / 1050 / 1600	490 / 700 / 1050 / 1400 / 2100	490 / 700 / 875 / 1050 / 1400 / 1750 / 2100 / 3500 / 4200	7.2 / 9.0 / 10.8 / 13.5 kW	2500 / 5000 / 7500 / 10000 12500 / 15000	350 / 500
Electrical Input								
Nominal Voltage	120	120 or 230 Vac	120, 208 or 230 Vac	120, 208 (3000 VA only) and 230 Vac	120, 208, 230 and 240 Vac	200 – 240 V with Neutral or With Optional Input Transformer	208 – 240 Vac or 200/ 100, 208/ 120, 220/ 110, 240/ 120 Vac	220, 230, or 240 Vac (50 Hz) or 240 Vac (60 Hz)
Nominal Voltage Range	96 – 138	96 – 144 V	120 V: 77 – 152 V; 230 V: 154 – 288 V	120 Vac, 80 – 144 Vac, 230 Vac, 160 – 276 Vac	120 V: 80 – 144 V; 208/ 230 V: 160 – 288 V	-15%, +10% from Nominal at 100% Load Without Depleting Battery	176 – 276 V	240 V: 192 – 276 V
Operating Frequency	60 Hz			50/60 Hz, Aut	o-sensing			50 Hz or 60 Hz
Electrical Output								
On Utility Voltage Regulation	-20% to +15%	-10% to +6%	6 of Nominal	±2% of Nominal		±3% of N	lominal	
On Battery Voltage Regulation	115 V ±10%	±5%	rms	±3% of Nominal		±3% of N	lominal	
Voltage Wave Shape (on Battery)	Modified Sinewave			٦	True Sine Wave	e		
Frequency Regulation	—		_			±3 Hz Onl	ine; ±0.1 Hz o	on Battery
Load Crest Factor	—				3 to 1 Ratio			
Load Segments (Receptacle Groups)	—	None	2	Up to 3	—	—	—	—
Battery								
Internal Battery Type		Mainten	ance-Free, Sealed	, Valve-Regula	ted Lead-Acid	(VRLA)		
Recharge Time			3 Hours to 9	90% Usable Ca	pacity			Battery Dependant

[®] Specifications typical and subject to change without notice. Please review each individual product specs for more details.

Uninterruptible Power Supplies — Powerware Single-Phase Units 41.2-4

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Stand-Alone Selection Guide

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Table 41.2-2. Powerware	Stand-Alone	Products (Contin	ued)							
Specification 1	3105	5115	5125	5125	9120	9125	9155	9170	FERRUPS	
Transfer Time	2 – 6 ms	2 – 4 ms Typical	4–6 ms	4 ms Typical			0 ms			
Communications										
Network Transient Protector	Yes	Y	es	No		Y	′es	Ν	10	
REPO Port	No	No	Yes	—	—	—	—	—	—	
X-Slot Interface	No	No	Y	és		Ye	S		Non X- Slot adapter	
Standard Communications	1-USB	1 x RS-232 Serial Port and 1 x USB Port	1 x RS-232 Serial Port	1 x RS-232 Serial Port and 1 x USB port	_	1 x RS-232	Serial Port			
General										
Weight (Ib)	9.5 / 11.2 / 14.3	17.2/27.3/ 27.8/37	61.0 / 61.0 / 89.0 / 89.0	169	_	34.0/34.0 /50.0/ 50.0/50.0 /81.5/ 81.5/206/ 206	_	66 / 103 / 158 / 196 / 158 / 196	105 / 135 / 150 / 209 / 220 / 238 / 495 / 580	
Dimensions (H x W x D) Inches	4.4 x 11 x 7	500 - 1400 VA: 7.6 x 5.9 x 10.6; 750 & 1000 VA: 7.6 x 5.9 x 13.2; 1400 VA: 7.6 x 5.9 x 15.4	1000 – 1440 VA: 3.5 x 19.0 x 19.4; 2400 – 3000 VA: 3.5 x 19.0 x 24.5	5000/6000 VA: 5.25 x 17.50 x 24.75	_	700 - 2000 VA: 3.5 x 19.0 x 2500/3000 VA: 3.5 x 19.0 x 23.9 5000/6000 VA: 8.63 x 17.37 x 24.94	_	3-Slot: 17.8 x 17.0 x 25.4; 6- Slot: 31.5 x 17.0 x 25.4; 9- Slot: 45.0 x 17.0 x 25.4; 12- Slot: 58.0 x 17.0 x 25.4	Rack- mount Sizes	
Available Colors	Black	Gray	Gray or Black	Gray or Black		Gray or Bla	ack		Gray	
Environmental			-		1					
Safety Markings	UL & CSA	UL, cUL, CE, TUV & CSA	UL, cUL, NOM, C-Tick, CE	UL, cUL, NOM, C-Tick, CE	_	UL, cUL, NYCE, CSA, NOM, VDE, CE, S, D, N, FI, B, NOM, R	_	UL, cUL, TUV, CE, C-Tick, BCIQ	UL, CSA (cUL), CE, TUV	
EMC Compliance	FCC Part 15 Subpart J Class B	FCC Part 15 Subpart J Class B; EN 50091-2, C-Tick	FCC Part 15, EN50091-2, Class A and B	FCC Part 15, EN50091-2, Class A and B		FCC Class B and VCCI Class II, 3000 FCC Class A, BSMI-A, C-Tick, CE Compli- ance	_	A FCC Class	FCC Part 15: Class A & B	
Internal Fans for Cooling		I	1	Yes	1	1	1	1		
Operating Temperature				0 to 40°C (32	to 104°F)					
Relative Humidity				0% to 95% Non	condensing					
, Surge Suppression			ANSI	C62.41 Category A	(Formerly IEE	E 587)				
Audible Noise	<40 dBA	45	dBA		,	< 55 dBA Ty	pical			
Altitude			Up t	o 3000 m (10,000 f	t) Without Der	ating				

^① Specifications typical and subject to change without notice. Please review each individual product specs for more details.

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Uninterruptible Power Supplies — Powerware Single-Phase Units

Options Chart

Table 41.2-3. Product (VA Modules)

Standard Features	PW3110 (300 – 700 VA) 3105	PW3115 (300 – 650 VA) 5110	PW5115 Tower (500 – 1400 VA)	PW5115 RM (500 – 1500 VA)	PW5125 Tower (1000 – 2200 VA)	PW5125 Rack & Tower (1000 – 1500 VA)	PW5125 Rack & Tower (2400 – 3000 VA)	PW5125 RM (5000 – 6000 VA)
Double-Conversion Online								
Line-Interactive			X	Х	X	Х	Х	Х
Standby	Х	Х						
Multiple Mounting Capabilities				Х		Х	Х	
ABM® Technology			X	Х	X	Х	Х	Х
Load Segments			X	Х	X	Х	Х	Х
LCD Display								
User-Replaceable Batteries	X	X	X	Х	X	Х	Х	Х
Hot-Swappable Batteries			Х	Х	Х	Х	Х	Х
Hot-Swappable Power Modules						х	х	×
Cold-start Capable	Х	Х	Х	Х	Х	Х	Х	Х
Ideal for Power Factor- Corrected Loads				x	x	Х	х	X
Automatic Bypass							Х	Х
Automatic Voltage Regulation (AVR)			X	X	X	Х	Х	×
Network Transient Protector	x		x	X	x	Х		
REPO Port			Х	Х	X	Х	Χ	Х
Site Wire Fault Indicator	Х	Х	Х	Х	X	Х	Х	Х
Galvanic Isolation								
True Sine Wave Output			Х	Х	Х	Х	Х	Х
Connections								
N+X Parallel Redundant								
Extended Battery Module (EBM)					X	Х	Х	×
Power Distribution Unit (PDU)						х	Х	×
Serial Connectivity	Х	Х	Х	Х	Х	Х	Х	Х
USB Connectivity	Х		Х					Х
Communications Bay				Х	Х	Х	Х	Х
Web/SNMP Enabled								Х
3-Port Switching Hub								Х
Software Suite CD Bundle		X	X	×	X	х	х	×
2-Year Warranty	X	Х	Х	Х	Х	X	X	Х
5-Year Pro-Rated Warranty	X	X						
10-Year Pro-Rated Warranty			x	х	x	x	x	Х
Gold Plan Service	х	х	х	Х	х	x	x	X

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41.2-6 Uninterruptible Power Supplies — Powerware Single-Phase Units

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Options Chart

Table 41.2-3. Product (VA Modules) (Continued)

Standard Features	PW9120 (700 – 300 VA)	PW9125 Rack & Tower (1000 – 3000 VA)	PW9125 Rack & Tower (5000 – 6000 VA)	PW9155 (8 – 15 kVA)	PW9170+ Rack & Tower (3000 – 18,000 VA)	PW FERRUPS (500 VA – 18 kVA)	PW FERRUPS Rack- mount (850 VA – 7 kVA)
Double-Conversion Online	X	Х	Х	Х	х		
Line-Interactive						Х	Х
Standby							
Multiple Mounting Capabilities		Х	Х		х		
ABM® Technology	Х	Х	Х	х	Х		
Load Segments	Х	Х	Х				
LCD Display	Х			Х	Х	Х	Х
User-Replaceable Batteries	Х	Х	Х	Х	Х	Х	Х
Hot-Swappable Batteries	х	Х	Х		х		
Hot-Swappable Power Modules					Х		
Cold-start Capable	Х	Х	Х	Х	Х	Х	Х
Ideal for Power Factor- Corrected Loads	х	Х	Х	Х	х	Х	Х
Automatic Bypass		Х	Х	Х	Х		
Automatic Voltage Regulation (AVR)	х	Х	Х	Х	х	Х	Х
Network Transient Protector	Х	Х	Х				
REPO Port	Х	Х	Х	Х	Х	Х	Х
Site Wire Fault Indicator	х	Х	Х	Х			
Galvanic Isolation				х		Х	Х
True Sine Wave Output	х	х	Х	х	х	Х	Х
Connections			Х	Х	Х	Х	Х
N+X Parallel Redundant				Х	Х		
Extended Battery Module (EBM)	х	Х	Х	Х	х	Х	Х
Power Distribution Unit (PDU)		Х	Х	Х	Х	Х	Х
Serial Connectivity	Х	Х	Х	Х	Х	Х	Х
USB Connectivity	Х		Х	х			
Communications Bay	Х	Х	Х	Х	Х		
Web/SNMP Enabled		Х	Х	Х			
3-Port Switching Hub		Х	Х	х			
Software Suite CD Bundle	Х	Х	Х	Х	Х	Х	Х
2-Year Warranty	х	Х	Х	х	Х	Х	Х
5-Year Pro-Rated Warranty							
10-Year Pro-Rated Warranty	х	х	Х	х	х	Х	Х
Gold Plan Service	Х	Х	Х	Х	Х	Х	Х

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Receptacle Chart



Figure 41.2-1. Input Plug and Output Receptacle Chart

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Uninterruptible Power Supplies — Powerware 3-Phase Units

Powerware 9330

Powerware[®] 9355 **Uninterruptible Power System**



10 – 15 kVA

20 – 30 kVA

9355 10 - 15 kVA

The double-conversion, online Powerware 9355 10 - 15 kVA UPS provides full-featured, efficient power protection in a compact tower about half the size of most competitor units on the market today - and is exceptionally easy to install and manage.

9355 20 - 30 kVA

The Powerware 9355 20 - 30 kVA UPS provides full-featured, efficient power protection in a compact tower. The product is exceptionally easy to install and manage, and the paralleling capability is unmatched in the industry.

Reliability by Design

The Powerware 9330 provides IT managers with a state-of-the-art UPS designed for optimal efficiency and the highest reliability. This double conversion online UPS integrates Powerware's awarding-winning technology, software and service capabilities into a single module capable of supporting critical applications, including:

- Server farms.
- Networking.
- Telecommunications.
- Medical/medical imaging.
- Branch offices.
- Data centers.
- Process control.

By incorporating many features previously found only in power solutions at much higher kVA ratings, such as Powerware Hot Sync® paralleling for redundancy and capacity, redundant fans, DC Expert Plus Built-in Battery Monitoring, and advanced communications, the Powerware 9330 offers the highest reliability for critical systems in this power range. Further, the Powerware 9330 provides the lowest overall cost of ownership for a double conversion online UPS in this kVA range because of its high efficiency design.

The Powerware 9330 is available in the following system configurations:

- Single Module Reverse Transfer.
- Powerware Hot Svnc:
 - Parallel Redundant
 - Parallel Capacity
 - Parallel Capacity/Redundant

Benefits

Maximum Availability

With true double conversion online design, the proven technology is used for the most mission-critical applications in the world. It's unusual to find line interactive, pseudo-online or any other kind of UPS, other than double conversion online, supporting 24/365 data centers, facilities, ISPs and major telecommunications installations.

Maximum Reliability

With Powerware Hot Sync, the awardwinning, patented technology that achieves paralleling for redundancy and capacity (up to four modules) with no system-level single-point-of-failure. The preferred paralleling technology installed around the world with such major customers as E*Trade, NASA, MBNA and Citibank, Powerware Hot Sync is available for Powerware 9330 models.

Maximum Efficiency

The Powerware 9330's advanced design features efficiency of up to 93%, among the highest for a double conversion online UPS in this kVA range. No need to compromise reliability for efficiency with the Powerware 9330.

Maximum Performance

The Powerware 9330 delivers the highest performance by using digital signal processing, true pulse-width modulation and maximum IGBT responsiveness. This provides easy setup, drift-free operation and a pristine output.

Powerware Global Services

Service professionals provide aroundthe-clock monitoring, remote diagnostics, and on-site maintenance programs. More than just a material warranty, this is the most comprehensive service coverage available in the industry.

Advanced Ergonomically Designed **User Interface Panel**

- Easily accessed from a standing position, panel is tilted 15 degrees for optimum viewing.
- Large LCD panel for graphic displays (4 line by 40 characters).
- LED status indicators.
- Soft keys provide easy navigation through info screens.
- Smart Load Off button prevents unintentional load losses.
- Current status, history, events and alarms and an active mimic bus can be viewed.

Superior Cooling Design

- Air filters prevent contaminants from entering the UPS.
- Redundant fans provide continuous operation without derating if a fan fails.
- Fan failure detection and notification.
- Load-based fan speed control maximizes fan life and efficiency while minimizing audible noise and heat dissipation.
- Fans easily replaced while online.

Easy Installation

- Casters provide for easy placement of unit.
- Multiple wire entry locations.
- Simple installation of communication option cards.
- Terminal blocks for input/output wiring.
- Front covers designed with magnetic latches for effortless removal and replacement.

Exceptional Design for Service

- Front and top access for service.
- Dedicated service port prevents any disturbance to the customer's communication setup.
- Battery circuit breaker.
- Internal maintenance bypass switch provides isolation for safe servicing.
- Input circuit breaker.
- Slide out battery trays with quick disconnects.

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Powerware 9330

Other Standard Features Include:

- UL[®] 1778.
- cUL[®] CAN/CSA[®] C22.2 No. 107.1.
- Exceeds IEC 62040-3, UPS definition.
- Double conversion online technology.
- Cold start capability from battery.
- Wide input voltage and frequency window.
- kVA/kW field upgradeable.
- Supports up to four different communications options.
- Dual source input to rectifier and bypass.
- Quiet operation, less than 60 dBA.
- ProActive 1 year service plan.
- RS-232 port.
- Four Building alarm inputs.
- Two Summary contacts.

DC Expert Plus™ Built-in Battery Monitoring

Real-world business applications require a complete range of battery management and testing features, including battery run time remaining, lifetime remaining, battery health, and notification, to help make critical decisions, from scheduling preventive maintenance to load shedding. Advances in firmware, digital technology and battery monitoring techniques enable the Powerware 9330 to offer sophisticated battery management features, previously available only in expensive add-on systems. By ensuring optimal battery health and availability, DC Expert Plus raises the reliability of the Powerware 9330 far beyond any other UPS in this kVA range.

DC Expert Plus advanced features include:

Powerware Battery Lifetime Monitor

Uses measures of chronological time, number of battery discharges, battery temperature, and system loading to determine battery lifetime remaining.

Battery Run Time Remaining Monitor

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Uses system loading plus internal sensing points for voltage and current data to calculate run time remaining.

Advanced Battery Management™ (ABM) Technology

Uses patented three-stage charging technique that not only increases battery service life, but also optimizes recharge time.

Battery Circuit Test (BCT)

Performs a periodic test of the battery string to ensure that there are no open circuits that would jeopardize battery performance and system availability.

Temperature Compensated Charging (TCC)

Monitors the battery temperature and through sophisticated algorithms, adjusts the rate of charge, compensating for the ambient temperature to prolong the life of the battery.

Intelligent Battery Protection (IBP)

Automatically adjusts the shutdown voltage of the batteries based on the length of the ac outage. This prevents severe battery discharge if the system is lightly loaded.

Extended Battery Cabinets

Powerware offers a full line of battery cabinets for the Powerware 9330.

- Battery cabinets may be daisychained together for extended battery run times. (Up to 2 on model 20 and up to 3 on model 40.)
- Integral configurations, which line up and match, are standard.
- Front-access-only enhances servicing and installation.
- Slide trays and modular battery packaging makes periodic servicing easy.
- Cabinets are UL 1778 listed.
- Flame-retardant batteries meet UL 94V2 for computer room installations.



Note: Battery cabinets can be configured as lineup and match, or remotely located. Customer must provide wiring for remotely located cabinets.

Table 41.3-1. UPS Battery Run Times

Description	Run Time At:			Installed			
	10 kVA	15 kVA	20 kVA	25 kVA	30 kVA	35 kVA	40 kVA
	7 kW	10.5 kW	14 kW	17.5 kW	21 kW	24.5 kW	28 kW
Internal Battery	45	26	17	32	25	21	17
One External Battony Cabinat	00	65	10	E0	10	40	20
One External Battery Cabinet	90	00	40	90	40	40	30
Two External Battery Cabinets	155	90	75	77	65	55	48
Three External Battery Cabinets	N/A	N/A	N/A	90	80	71	61

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Uninterruptible Power Supplies — Powerware 3-Phase Units

41.3-3

Powerware 9330

Options for a Total Solution

A complete Powerware 9330 solution will be ideally suited to your needs. This comes from the Powerware 9330's wide range of system options that lets you tailor your power solution to your exact specifications, taking into account your unique uptime requirements.

- Voltage matching transformers.
- Power distribution panel.
- External maintenance bypass.
- Input/output galvanic isolation.
- Input THD filter.
- Remote status panel.
- Remote EPO button.



Figure 41.3-1. One-Line Diagrams

Table 41.3-2. Powerware 9330 UPS Accessories/Ancillary Products

Accessory	Description
System	
Powerware Battery Cabinets	Battery cabinets feature a common battery type, optimized to meet application run time needs. Multiple cabinets may be daisy-chained together for extended battery run times.
9330 Option Cabinet	This line and match cabinet can enclose up to 2 transformers. Cabinet includes maintenance bypass and input breakers. Optional 42-pole distribution panel also available.
Remote Emergency Power Off (REPO)	In an emergency, use this switch to turn off the UPS output. The REPO switch de-energizes the critical load and powers down the UPS immediately, without asking for verification. The UPS, including Bypass, remains off until manually restarted.
External Battery Disconnect	For customers with installations that require locating the battery system remotely from the UPS.
Power Distribution	
Powerware Type I Static Transfer Switch (STS) by Cyberex	Powerware Type I STS are high-speed open-transaction switches that can transfer electrical loads from one ac power source to another in a fraction of a single electrical cycle. The Powerware Type I STS uses modular, cost-effective SCRs, and is fused for protection during a fault. When a downstream fault occurs, the fast-acting semiconductor fuse will open, protecting the SCRs from rupture.
Powerware Type II Static Transfer Switch (STS) by Cyberex	The Powerware Type II STS eliminates the chance of a loss of power to critical loads by properly coordinating with the electrical distribution system. During a fault condition, the Type II STS will continue to conduct current, allowing downstream circuit breakers to work selectively.
Powerware Zero Footprint Integrated STS/PDU by Cyberex	The Powerware Zero Footprint Integrated STS/PDU System combines the power protection of a static transfer switch with a power distribution unit into one space-saving unit to minimize floor space requirements without compromising system availability. In fact, the Powerware Zero Footprint STS/PDU is the size of just the PDUs in a typical STS/PDU configuration — a savings of more than 40%.
Communications	
PowerVision [®]	PowerVision is Windows®-based client/server software application that provides monitoring, alarm notification and data analysis for multiple Powerware UPSs within an enterprise network.
FORESEER®	FORESEER is the ultimate solution to proactively monitor and manage foundation equipment from any manufacturer. This is a custom solution tailored specifically to each customer's needs and installed by highly trained integration team.
Remote Monitor Panel (RMP)	Allows a customer to monitor the operational status of the UPS system from virtually any location within a facility. The RMP utilizes simple backlit status indicators and an alarm horn that notifies customers of changes in the operational status of the UPS system. This option can be installed in multiple locations throughout a customer's facility.
Expansion Chassis	Three-slot peripheral device that expands communication capability for a UPS through its support for X-slot cards.
Modbus Card	Interface your UPS with your building maintenance monitoring system.
ConnectUPS SNMP/Web Card	Monitor your UPS over the network using the web or SNMP.
Industrial Relay Card	The Industrial Relay Card allows customers to monitor UPS status remotely with dry contacts.

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Powerware 9330

Options Cabinet

Input Isolation Transformer

An optional 208/208, 480/208 or 600/ 208 Vac input isolation transformer provides an isolated input to the UPS rectifier for applications that require a dc link that is not ground referenced, or for applications requiring an input of 480 or 600 Vac. The transformer is contained in the separate options cabinet.

Bypass Input Isolation Transformer (Dual Input)

An optional 208/208, 480/208 or 600/208 Vac bypass input isolation transformer provides an isolated input to the UPS bypass for applications that require an isolated bypass and an independently derived neutral, or for applications requiring an input of 480 or 600 Vac. The transformer is contained in the separate options cabinet.

Output Isolation Transformer

An optional 208/208 or 208/480 Vac output isolation transformer provides an isolated output to the critical load or for applications that require 480 Vac. The transformer is contained in the separate options cabinet.

Input Auto Transformer

An optional 480/208 or 600/208 Vac input auto transformer provides an input to the UPS rectifier for applications requiring an input of 480 or 600 Vac. The transformer is contained in the separate options cabinet.

Bypass Input Auto Transformer (Dual Input)

An optional 480/208 or 600/208 Vac bypass input auto transformer provides an input to the UPS bypass for applications requiring an input of 480 or 600 Vac. The transformer is contained in the separate options cabinet.

Output Auto Transformer

An optional 208/480 Vac output auto transformer provides an output to the critical load for applications that require 480 Vac. The transformer is contained in the separate options cabinet.

Maintenance Bypass Switch

An internal Maintenance Bypass switch is provided to completely isolate the UPS during service. The Maintenance Bypass Switch is described in detail in Chapter 10, "UPS Operating Instructions."

Power Distribution Module

An optional output Power Distribution Module (PDM) is available to distribute the output power from the UPS to your critical load. The PDM contains up to 42 circuit breaker switches (Square D[®] Type QO or QOB) that can be assigned with flexibility to meet facility needs. The PDM is enclosed below the hinged top of the Options Cabinet.

Parallel Cabinet

The Parallel Cabinet extends the normal operation of Powerware 9330 UPS units by offering parallel capacity/ redundant capability. The Parallel system continues to maintain power to the critical loads during commercial electrical power brownout, blackout, overvoltage, undervoltage, and out-of-tolerance frequency conditions.

The output of the system is normally supplied by several Uninterruptible Power Modules (UPMs). Multiple UPMs are connected with their outputs in parallel to provide a load level greater than the rating of one UPM and/or for redundancy. The paralleled UPMs supply the output load with protected power as long as the load does not exceed the combined rating of the paralleled UPMs.

The power system is redundant as long as one of the UPMs can be disconnected from the output bus and the remaining UPMs can continue to supply power to the load without exceeding their ratings.

The Parallel Cabinet contains components that allow the UPMs to be paralleled and the source of system output power to be transferred between Bypass and the paralleled UPMs. When the load is being supplied by the UPMs, the system output bus is continuously monitored for an overor undervoltage condition. If an out of limits condition is detected, the Parallel Cabinet will transfer the load to bypass using the UPM static switches and the bypass contactor in the Parallel Cabinet.

During manual transfers to bypass or maintenance, the critical load can be supplied power through the bypass contactor in the Parallel Cabinet. The upstream bypass input and breaker must be rated for the total system load since it must supply all of the system load when on bypass.

Communication is required between the Parallel Cabinet and UPMs for full system operation. System level communications and control are accomplished using a CAN network. A single building alarm in each UPM, tied to the bypass contactor auxiliary contacts in the Parallel Cabinet, will be used for a secondary signaling path.

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Uninterruptible Power Supplies — Powerware 3-Phase Units

Powerware 9330

Table 41.3-3. Powerware 9330 Dimensions — Inches (mm)

Description	Height	Width	Depth						
UPS Cabinets									
10 – 20 kVA	44.89 (1140.2)	21.93 (557.0)	31.00 (787.4)						
25 – 40 kVA	44.89 (1140.2)	38.83 (986.3)	31.00 (787.4)						
Options Cabinet									
10 – 20 kVA	44.89 (1140.2)	16.90 (429.3)	31.00 (787.4)						
25 – 40 kVA	44.89 (1140.2)	—	31.00 (787.4)						
Option Cabinet with Optional Distribution Housing									
10 – 20 kVA	44.89 (1140.2)	21.93 (557.0)	38.08 (967.2)						
Battery Cabinet	44.89 (1140.2)	16.93 (430.0)	31.00 (787.4)						



Figure 41.3-3. Powerware 9330 Dimensions



Figure 41.3-2. 9330 Electrical One-Line With Parallel Cabinet

41.3-6 Uninterruptible Power Supplies — Powerware 3-Phase Units

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Powerware 9355

Powerware 9355 Uninterruptible Power System



Powerware 9355

Features and Benefits

- Protects connected equipment from all nine of the most common power anomalies.
- Provides more real wattage in less space with a 0.9 power factor — protecting more equipment and leaving more room for expansion.
- System efficiency up to 91% minimizes cost of ownership.
- Supports Powerware Hot Sync paralleling of multiple modules for redundancy or extra capacity.
- Increases battery life through proven ABM[®], a microprocessorcontrolled advanced battery management technology.
- Provides 0.99 power factor and generator friendly <5% total harmonic distortion using an active IGBT rectifier to control the input power factor.</p>
- Ensures data and system integrity with complete power management software for remote monitoring, management and shutdown — over the network and the Internet.
- Provides investment protection and peace of mind with a two-year limited warranty, 10-year pro-rated warranty, \$250,000 load protection guarantee (U.S. and Canada), and optional service plans.

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With advances in miniaturization and processing power, a single rack of equipment demands more power than ever — and more equipment will be served by dual cord power supplies. It's a challenge to provide power protection for expanding loads in shrinking spaces.

Fortunately, technology advancements have also raised the density per square foot of power protection systems. The Powerware 9155 and new Powerware 9355 uninterruptible power systems (UPSs) deliver premium levels of efficiency, reliability and flexibility — all in a sleek tower half the size of most competitor units on the market today.

This double-conversion, online UPSs resolve all nine common utility power problems and supply clean, continuous power to all connected equipment. Even when presented with the most severe power problems, power output remains stable. And if the utility power goes out altogether, there is no delay transferring to backup power.

These capabilities make the Powerware 9155 and Powerware 9355 ideal for protecting essential data center, communications and electrical engineering infrastructures in corporate, telecom, healthcare, banking, public sector and industrial applications even marine environments, with special engineering.

Premium power protection is now easier than ever.

With raised-floor real estate at a premium, you will appreciate that these UPSs are only 12 inches wide and 33 inches deep, including internal batteries. With such a small footprint, you have more location options, and more space is available for future expansion. Equipment installation is easy, essentially plug-and-play. You can order either UPS with your choice of output receptacles with more than 17 types. To change or move data center equipment, you simply unplug from the old receptacle, plug into a new one, and go. No need for an electrician to run new conduit and wiring.

kVA UPS, for example, can grow to support loads of up to 45 kVA. There's no dependence on communications wiring among those UPS modules.

Battery Innovations Optimize Battery Performance and Service Life.

Standard internal batteries provide power until auxiliary power takes over or systems are gracefully shut down. Battery run time can be extended to hours by adding matching Extended Battery Modules.

Powerware 9155 and Powerware 9355 UPSs also use sophisticated technologies that maximize the health and service life of batteries:

- ABM technology uses a unique three-stage charging technique that significantly extends battery service life and optimizes recharge time, compared to traditional trickle charging.
- Temperature-compensated charging monitors battery temperature and adjusts the charge rate accordingly, which properly charges the battery and greatly extends battery life.
- An integrated battery management system tests and monitors battery health and remaining lifetime, and provides advance notification to guide preventive maintenance.

Unlike heavy, old-style batteries, Eaton's are easily field-replaceable. One person, working alone, can replace a battery without disrupting data center operations or power to protected equipment.

Advanced design delivers unequaled power performance.

The innovative design of these UPSs deliver the industry's best performance combination of efficiency, input current distortion, input power factor, and output power factor.

Lower costs, lower temperatures. High efficiency (greater than 90 percent across all load ranges) reduces utility costs, extends battery run times, and produces cooler operating conditions.

Generator-friendly design. Total input harmonic distortion (THD) remains below five percent without compromising overall efficiency. The result is maximum transfer of power between source and protected load, and exceptional compatibility with auxiliary generators.

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Uninterruptible Power Supplies — Powerware 3-Phase Units

Powerware 9355

Table 41.3-4. Powerware 9355 Backup Times (In Minutes)

VA	Watt	UPS	(1)	(2)	(3)	(4)	UPS	(1)	(2)	(3)
		+Internal	EBM	EBM	EBM	EBM	+Internal	EBM	EBM	EBM
		32 Battery	64	64	64	64	64 Battery	96	96	96
15,000	13,500	4.6	23.0	43.0	65.1	88.6	13.3	43.0	76.7	113
14,500	13,050	4.9	24.1	45.2	68.3	93.0	14.1	45.2	80.5	119
14,000	12,600	5.2	25.2	47.3	71.5	97.4	14.9	47.3	84.2	125
13,500	12,150	5.5	26.4	49.4	74.7	102	15.8	49.4	88.1	130
13,000	11,700	5.8	27.6	51.6	78.1	106	16.7	51.6	92.0	136
12,500	11,250	6.1	28.8	54.0	81.6	111	17.6	54.0	96.2	142
12,000	10,800	6.5	30.2	56.5	85.5	116	18.6	56.5	101	149
11,500	10,350	6.9	31.6	59.3	89.7	122	19.2	59.3	106	156
11,000	9,900	7.3	33.3	62.4	94.4	129	20.2	62.4	111	164
10,500	9,450	7.8	35.1	65.9	99.6	136	21.4	65.9	117	174
10,000	9,000	8.4	37.2	69.8	106	144	22.6	69.8	124	184
9,500	8,550	9.1	39.6	74.2	112	153	24.1	74.2	132	196
9,000	8,100	9.9	42.3	79.4	120	163	25.7	79.4	141	209
8,500	7,650	10.8	45.5	85.2	129	175	27.6	79.4	152	225
8,000	7,200	11.9	49.1	91.9	139	189	29.8	91.9	164	242
7,500	6,750	13.1	53.2	99.7	151	205	32.3	99.7	178	263
7,000	6,300	14.6	58.0	109	164	224	35.2	109	194	286
6,500	5,850	16.3	63.5	119	180	245	38.6	119	212	314
6,000	5,400	18.4	70.0	131	198	270	42.5	131	234	346
5,500	4,950	20.1	77.6	145	220	300	47.2	145	259	383
5,000	4,500	22.4	86.6	162	245	334	52.6	162	289	428
4,500	4,050	25.2	97.4	182	276	376	59.2	182	325	
4,000	3,600	28.6	110	207	313	426	67.1	207	369	
3,500	3,150	32.8	127	238	359	—	77.0	238	423	
3,000 2,500	2,700 2,250	38.3 45.6	148 176	277 329	418 —	_	89.7 107	277 329	_	=

While protecting critical systems, the UPS itself is protected in several ways:

Self-diagnosis

The UPS constantly monitors its own operation, such as voltage, temperature or function of internal elements — and sends alarms or takes action if it detects a potential problem. You'll know your UPS is always performing up to specifications to protect your equipment.

Self-correction

If the UPS senses an issue — planned or unplanned — it instantly transfers the power path to a bypass source, with zero interruption in power. When the alarm condition passes, the UPS automatically reverts from bypass to normal operation.

Remote Monitoring

You can have Eaton specialists securely monitor your Powerware 9155 and Powerware 9355 UPSs around the clock with eNotify service, or you can monitor your own UPSs over your LAN or the Internet. Either way, you'll always be informed about conditions in your power protection infrastructure.

Redundancy

 Using Powerware Hot Sync technology, you can configure up to N+3 redundancy. Any module can serve as backup for any other, with no interruption or downtime. For instance, you could perform full maintenance on any UPS without having to remove any loads from conditioned power.

Most other paralleling systems on the market use a top-down configuration; if the master fails, the subsidiary units fail. With Eaton's patented approach, each UPS module is independent yet synchronized with the others. There is no single point of failure.

The following options for the Powerware 9355 are available.

Remote Monitor Panel (RMP)

The optional RMP provides monitoring of the operational status and alarm condition of the UPS from virtually any location within the facility. You can install multiple RMPs at remote locations to increase your monitoring capabilities.

Power Distribution Module (PDM)

The optional PDM comes equipped with several different types of output receptacles.

Parallel Tie Cabinet

A parallel system with up to four UPSs can be installed to provide a parallel capacity and/or redundant system. This load sharing system provides more capacity than a single UPS and can provide backup, depending on the load and configuration. In addition, when one UPS is taken out of service for maintenance or is not operating properly, a redundant UPS continues to supply uninterrupted power to the critical load. A parallel Powerware Hot Sync Computer Area Network (CAN) Bridge Card provides connectivity for system metering and operational mode control. The parallel system consists of two to four UPSs, each with a parallel CAN Bridge Card and a parallel tie cabinet.

Wall-Mounted Bypass Switch

The optional wall-mounted bypass switch is used to bypass the UPS during maintenance or servicing providing wrap-around bypass for UPS service without shutting down the load.

Input Isolation Transformer

The optional input isolation transformer is located at the bottom of a 3-high UPS model. The isolation transformer allows operation from a 480 V or 600 V 60 Hz source.

Seismic Kit

The seimic kit secures the UPS and optional EBMs for Zone-4 seismic installations. 41

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Table 41.3-5. Dimensions and Weights

Description	Dimensions in Inches (mm)	Weight		
	Height	Width	Depth	lbs. (kg)
2-High UPS	32.20 (817.9)	12.00 (304.8)	33.50 (850.9)	381 (173)
3-High UPS-32	47.80 (1214.1)	12.00 (304.8)	33.50 (850.9)	587 (266)
3-High UPS-64	47.80 (1214.1)	12.00 (304.8)	33.50 (850.9)	619 (281)
2-High EBM	32.20 (817.9)	12.00 (304.8)	30.30 (769.6)	480 (218)
3-High EBM	47.80 (1214.1)	12.00 (304.8)	30.30 (769.6)	710 (322)

Table 41.3-6. Accessories

Description	Dimensions in Inches	(mm)	Weight	Order Number	
	Height	Width	Depth	lbs. (kg)	
Extended Battery Modules	•		•	•	•
Powerware 9155 EBM 64 (2-High)	32.20 (817.9)	12.00 (304.8)	30.20 (767.1)	484 (220)	103004192 1
Powerware 9155 EBM 96 (3-High)	47.80 (1214.1)	12.00 (304.8)	30.20 (767.1)	720 (327)	103004193 1
Maintenance Bypass Module	·		•	•	·
Rear UPS-Mount, Maintenance Bypass Module	16.50 (419.1)	12.00 (304.8)	7.00 (177.8)	15 (7)	103004184
Spare Parts	•		•	•	•
Powerware 9355 Spare Parts Kit "A"	—	—	—	—	106711169
Connectivity Options	•		•	•	•
ConnectUPS-X Web/SNMP/xHub Card ConnectUPS-MX SNMP/Modem Card Modbus Card	_	_	_	—	103002974-5501 05146288-5501 103002510-5501
USB Card Multi-Server Card Relay Interface Card (IBM eServer iSeries Compatible)	_	_	_	_	05146508-5501 05146447-5501 1018460
Industrial Relay Card Environmental Monitoring Probe (Requires ConnectUPS Web/SNMP Device)	_	_	_	_	103003055 103003637-5501

① Up to four EBM 64 cabinets or three EBM 96 cabinets can be added to each UPS for extended run time.

Table 41.3-7. Power Distribution Module (PDM) with Mechanical Bypass Switch

Optional Receptacle Panels 2	Breaker Ampere Rating	Voltage	Phase
(2) 5-15R	15	120	Single
(2) 5-20R UL	20	120	Single
(2) 5-20R CSA	20	120	Single
(2) 6-15R	15	208	Dual
(2) 6-20R	20	208	Dual
(2) L5-15R	15	120	Single
(1) L5-20R ③	20	120	Single
(1) L5-30R ③	30	120	Single
(2) L6-15R	15	208	Dual
(1) L6-20R ③	20	208	Dual
(1) L6-30R ③	30	208	Dual
(1) L14-20R ③	20	120/208	Dual
(1) L14-30R Blank Plate	30	120/208	Dual —

⁽²⁾ Maximum of eight panels per PDM.

^③ The combined quantities of single-locking receptacle panels must not exceed five per PDM.

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Powerware 9355

Table 41.3-8. 9355 Options

Description	Part Number
Remote Emergency Power Off (REPO)	103002939
Remote Monitor	103002687-001 + 103003055
Wall Mount MBS	124100020-001
Parallel Tie Cabinet	124100020-001
External Battery (2-High)	103004192-5501
External Battery (3-High)	103004193-5501
kVA Upgrade 10 to 15	103004657
Parallel Upgrade Kit	103004656
Seismic Kit	103004194-5501

Table 41.3-9. X-Slot Communication Options (Order Separate, Field Install)

Description	Part Number
Parallel (CAN Bridge)	103004336
Connect UPS-X Web/ SNMP	103002974-5501
Modbus Card	103002510-5501
Relay Card	1018460
Industrial Relay Card	103003055
Modem Card	109017

Floor Loading

When planning the installation, consider the UPS weight for floor loading. The strength of the installation surface must be adequate for point and distributed loadings. The approximate weights are shown in the following table.

Table 41.3-10. Standard Model Floor Loadings (2-High/3-High Cabinets)

Powerware 9355	Maximum Weight in Ibs. (kg)	Point Loading Ib/in ² (kg/ mm ²)
2-High UPS	381 (173)	95 (43)
3-High UPS-32	587 (266)	147 (67)
3-High UPS-64	619 (281)	155 (70)
2-High EBM	480 (218)	120 (54)
3-High EBM	710 (322)	178 (81)

Clearances

Table 41.3-11. Clearances Recommended for the Powerware 9355 UPS

Location	Dimensions in Inches (mm)
From Front of Cabinet	36 (914.4) Working Space
From Back of Cabinet	6 (152.4) Without MBM/PDM Installed; With PDM Installed, Clearance Determined by Consumer-Supplied Mating Plug

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Table 41 3-12	Model Sn	ecitications

Output Voltage (Line–Line)	Output Voltage (Line– Neutral)	Input Voltage	Input Current	Output Current	Output kVA	Output kW	Efficiency (Minimum)	Heat Rejection BTU/hr. (kg-mm/hr)
Model 15 kVA		•						
208 V	120 V	208 V	48 A	41.6 A	15	13.5	90%	5122 (1290)
208 V	120 V	480 V (with Input Isolation Trans- former)	20.9 A	41.6 A	15	13.5	85%	8134 (2048)
208 V	120 V	600 V (with Input Isolation Trans- former)	16.8 A	41.6 A	15	13.5	35%	8134 (2048)
220 V	127 V	220 V	45.7 A	33.5 A	14	13.5	90%	5122 (1290)
Model 10 kVA								
208 V	120 V	208 V	32.2 A	27.8 A	10	9	89%	3798 (956)
208 V	120 V	480 V (with Input Isolation Trans- former)	14 A	27.8 A	10	9	83%	6294 (1585)
208 V	120 V	600 V (with Input Isolation Trans- former)	11.2 A	27.8 A	10	9	83%	6294 (1585)
220 V	127 V	220	30.5 A	26.2 A	10	9	89%	3798 (956)

Table 41.3-13. 15 kVA Input/Output Specifications

Output Voltage (Line–Line)	Output Voltage (Line–Neutral)	Input Voltage	Input Current	Input Circuit Breaker (Customer Supplied)	Output Current
208 V	120 V	208 V	48 A	60 A	41.6 A
208 V	120 V	480 V with Input Isolation Transformer	24 A	40 A	41.6 A
208 V	120 V	600 V with Input Isolation Transformer	20 A	40 A	41.6 A
220 V	127 V	220 V	45.7 A	60 A	39.4 A

Table 41.3-14. 10 kVA Input/Output Specifications

Output Voltage (Line–Line)	Output Voltage (Line–Neutral)	Input Voltage	Input Current	Input Circuit Breaker (Customer Supplied)	Output Current
208 V	120 V	208 V	32.2 A	45A	27.8 A
208 V	120 V	480 V with Input Isolation Transformer	16 A	40 A	27.8 A
208 V	120 V	600 V with Input Isolation Transformer	13.3 A	40 A	27.8 A
220 V	127 V	220 V	30.5 A	40 A	26.2 A

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Table 41.3-15. UPS Terminal Block Wiring

10 or 15 kVA Wire Function	Minimum Wire Size ①	Wire Size of Pressure Termination	Tighening Torque in Ibs. (kg)	Screw Type in Inches (mm)	Conduit Size in Inches (mm) (Number of Conduits) ^②
nput					-
L1	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
L2	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
L3	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
Neutral	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
Dutput					
L1	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
L2	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
L3	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
Neutral	4 AWG	2/0-14 AWG	120 (54)	3/16 (4.76) Hex	1.25 (32) Conduit (1)
iround	•				•
_	4 AWG	1/0-14 AWG	50 (23)	Slotted	_

^① Use only 90°C-rated copper wire. Minimum wire size is based on 120/208 full load ratings applied to NEC Code Table 310-16. Code may require larger AWG size than shown in this table because of temperature, number of conductors in the conduit or long service runs. Follow local requirements.

② Conduit is sized to accommodate one neutral conductor the same size as the phase conductor and one #8 AWG ground conductor. If two neutral conductors or an oversized neutral conductor are to be installed, check the size of the conduit needed to accommodate the extra wire or size and use that conduit size in place of the conduit size listed. Conduit sizes were chosen from NEC Table C1, type letters RHH, RHW, RHW-2, TW, THW, THW-2. Note: Per NEC article 300-2-(a), all three-phase conductors must be run in the same conduit. Neutral and ground must be run in the same

conduit as the phase conductors.

Uninterruptible Power Supplies — Powerware 3-Phase Units

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Figure 41.3-4. UPS with Extended Battery Modules Wiring Diagram



Figure 41.3-5. UPS with Input Isolation Transformer Wiring Diagram

41.3-12 Uninterruptible Power Supplies — Powerware 3-Phase Units

F·T•**N** Cutler-Hammer

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Figure 41.3-6. 208 V or 220 V Input 208 V or 220 V Output, Single-Feed UPS



Figure 41.3-7. 480 V or 600 V Input 208 V Output, Single-Feed UPS

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Figure 41.3-8. 208 V or 220 V Input or 220 V Output, Single-Feed UPS



Figure 41.3-9. 208 V or 220 V Input or 220 V Output, Single-Feed UPS

41.3-14 Uninterruptible Power Supplies — Powerware 3-Phase Units

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Powerware 9355





Main Components:

4 - 80 A, 3 pole, circuit breaker (UPS)

ACCEPTS 14-1/0 AWG WIRE

AWG	TORQUE LB-IN
14-10	20
8	25
4-8	27
1/0-4	54

1 – 225 A, 3 pole, circuit breaker with aux contacts (Bypass)

ACCEPTS 14AWG -300MCM WIRE				
AWG	TORQUE LB-IN			
14-1/0	50			
4-4/0	120			
6-300MCM	275			

NEUTRAL BUS/GROUND BUS

	CONNECTING WIRE TORQUES								
	SMALL OPENING				LARGE OPENING				
		NEUT	RAL			NEUT	RAL		
WIRE	TORQUE			WIRE	TORQUE				
AWG	LB-IN	NEUTRAL	GND	AWG	LB-IN	NEUTRAL	GND		
14-12	35	1	2	14-10	35**	1	3		
10	35	1	1	8	45	1	1		
8	45	1	1	4-6	45	1	1		
6	45	1	1	3-1/0	50	1	1		

**When Using Three #10 Cu Conductors per opening apply 50 Lb-In Torque

WIRE LUGS

ACCEPTS	TO 300MCM	WIRE

Connecting Wire Torques					
Screw Driver			Socket Head		
WIRE	TORQUE	Γ	ACROSS	TORQUE	
AWG	AWG LB-IN		FLATS	LB-IN	
18-10	35		5/16"	275	
8	40	Γ	3/8"	375	
6-4	6-4 45		1/2"	500	
2-2/0 50					

Figure 41.3-11. Wire Specifications

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Uninterruptible Power Supplies — Powerware 3-Phase Units

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Figure 41.3-12. 9355 Parallel Tie Cabinet with Bypass — Dimensions in Inches (mm)



Parallel Tie Cabinet



Parallel Tie Cabinet (Cover Removed)



Parallel Tie Cabinet (Internal View)

41.3-16 Uninterruptible Power Supplies — Powerware 3-Phase Units

E·T•**N** Cutler-Hammer

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Powerware 9390

Powerware 9390 Uninterruptible Power System



Powerware 9390

Description

The Powerware 9390 Uninterruptible Power System (UPS) is a double-conversion UPS that resolves all utility power problems and supplies clean, continuous, uninterruptible power to connected equipment. Whether you're selecting a UPS for a branch office, manufacturing floor, medical facility, or a large data center, there's a Powerware 9390 model that delivers just the right combination of performance and price for your needs.

Features and Benefits

- Provides unmatched power performance for efficiency, input current harmonic distortion (THD), and power factor.
- Scalable for capacity and redundancy to meet present and future power needs.
- Provides peace-of-mind that your batteries will be ready when you need them with innovative three-stage charging, battery health-checks, optional temperature-compensated charging, and remote monitoring.
- Lowers installation time and costs with small footprint and the flexibility to install against walls, using topor bottom-entry cabling.
- Provides a one-year, limited factory warranty* on parts and labor, Start-up service, one year of remote monitoring, on-site preventive maintenance, and optional service plans.

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Advanced Design Delivers Unequaled Power Performance

The innovative design of the Powerware 9390 delivers the industry's best performance combination of efficiency, input current distortion and power factor. The Powerware 9390 operates at a high efficiency of up to 94 percent, reducing utility costs and extending battery run times. Higher system efficiency produces cooler operating conditions, which reduces facility air conditioning cost, extends the life of UPS components, and increases overall reliability, availability and performance.

A new input circuit design keeps input current THD low and input power factor near unity without compromising overall efficiency. As a result, the Powerware 9390 allows maximum transfer of power between power source and protected load and is exceptionally compatible with multiple power sources, especially auxiliary generators.

On the output side, the ultra high speed switching Pulse Width Modulation (PWM) inverter enables the Powerware 9390 to provide its full rated power capability to the load whether the load power factor is 0.9 lagging, unity or 0.9 leading.

Double-Conversion Design Offers the Highest Protection Possible

Unlike some other commercially available UPS technologies, the doubleconversion design completely isolates output power from all input power anomalies and delivers 100-percent conditioned, perfect sine-wave output — regulating both voltage and frequency.



Powerware 9390 View Panel

Even when presented with the most severe power problems, power output remains stable. Output voltage THD is held within two percent of nominal specification for linear loads, within five percent for non-linear loads — making the Powerware 9390 ideal for supporting equipment that is sensitive to a distorted voltage input as a result of harmonic loads. In the event of a utility power failure, there is no delay transferring to backup power.

UPS Control Innovations Optimize Battery Performance and Service Life

Eaton's ABM (Advanced Battery Management) technology uses a unique three-stage charging technique that significantly extends battery service life and optimizes recharge time, compared to traditional trickle charging. An integrated battery management system tests and monitors battery health and remaining lifetime, and provides advance notification to guide preventive maintenance. The temperature-compensated charger monitors temperature changes and adjusts the charge rate accordingly to properly charge the battery and greatly extend battery life.

A variable battery bus accommodates 384 V to 480 V configurations, so the battery capacity can be matched to your exact run time requirements either a specific run time, an extension to existing battery run time, or legacy battery installations.

With remote monitoring of the UPS and battery system, Eaton is there with you — able to respond to alarms and real-time battery data to avert potential battery problems.

Scalable Architecture Meets Your Current and Future Load Requirements

The Powerware 9390 UPS supports loads from 40 kVA to 160 kVA to deliver power protection for small branch offices to large corporate data centers and communication networks.

Up to four equivalent UPS modules can be paralleled for additional capacity or redundancy, without having to utilize a central paralleling cabinet. Up to eight UPS modules can be paralleled by utilizing a module tie cabinet. In all paralleling configurations, each UPS module operates independently yet is completely synchronized with the others. Parallel UPS modules can provide N+1, N+2, or greater redundancy.

Flexible Installation Options Expedite Deployment and Save Valuable Space

The Powerware 9390 UPS offers the smallest footprint of any UPS in its class - 35 to 50 percent smaller than competitive units. Cabling can enter the UPS from either the top or bottom of the cabinet to provide easier and flexible installation. The Powerware 9390 provides front panel access for all services and operation, increasing serviceability and reducing Mean Time to Repair (MTTR). And since the compact Powerware 9390 cabinet can be installed against back and side walls, you have more location options, installation is fast and easy, deployment cost is lower, and you save valuable data center space for future expansion.

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Uninterruptible Power Supplies — Powerware 3-Phase Units

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Powerware 9390







Figure 41.3-14. Powerware 9390 40/50/60/80 kVA UPS with Battery Cabinet

Table 41.3-16	. Powerware	9390 (40 -	- 80 kVA) UPS	S Weights
---------------	-------------	------------	---------------	-----------

Voltage		Weight — kg (lb.)				
Input	Output	Shipping	Installed	Point Loading		
40/40			•			
208/220 480	208/220 480	263 (580) 231 (508)	241 (530) 208 (458)	4 at 60.3 (133) 4 at 52.2 (115)		
80/40		•	•	•		
208/220 480	208/220 480	313 (690) 271 (618)	290 (640) 258 (568)	4 at 72.5 (160) 4 at 64.5 (142)		
80/50						
208/220 480	208/220 480	313 (690) 271 (618)	290 (640) 258 (568)	4 at 72.5 (160) 4 at 64.5 (142)		
80/60		•				
208/220 480	208/220 480	313 (690) 271 (618)	290 (640) 258 (568)	4 at 72.5 (160) 4 at 64.5 (142)		
80/80	80/80					
208/220 480	208/220 480	313 (690) 271 (618)	290 (640) 258 (568)	4 at 72.5 (160) 4 at 64.5 (142)		

Table 41.3-17. Powerware 9390 (100 - 160 kVA) UPS Cabinet Weights

Voltage		Weight— kg (lb.)			
Input Output		Shipping	Installed	Point Loading	
120/100			•		
208/220 480	208/220 480	531 (1170) 467 (1030)	504 (1110) 440 (970)	6 at 84 (185) 6 at 73 (162)	
120/120					
208/220 480	208/220 480	531 (1170) 467 (1030)	504 (1110) 440 (970)	6 at 84 (185) 6 at 73 (162)	
160/100					
208/220 480	208/220 480	581 (1280) 517 (1140)	553 (1220) 490 (1080)	6 at 92 (204) 6 at 82 (180)	
160/120				•	
208/220 480	208/220 480	581 (1280) 517 (1140)	553 (1220) 490 (1080)	6 at 92 (204) 6 at 82 (180)	
160/160					
208/220 480	208/220 480	581 (1280) 517 (1140)	553 (1220) 490 (1080)	6 at 92 (204) 6 at 82 (180)	

Table 41.3-18. Powerware 9390 Air Conditioning or Ventilation Requirements During Full Load Operation

Ratings	Voltage		Heat Rejection				
	Input Output		BTU/hr ¥ 1000/hr (kg–cal/hr)				
40 – 80 kVA (1)	40 – 80 kVA 🛈						
40 kVA	208/220	208/220	11.8 (2.98)				
	480	480	10.9 (2.76)				
50 kVA	208/220	208/220	14.8 (3.73)				
	480	480	13.7 (3.45)				
60 kVA	208/220	208/220	17.7 (4.47)				
	480	480	16.4 (4.14)				
80 kVA	208/220	208/220	23.6 (5.96)				
	480	480	21.9 (5.52)				
100 – 160 kVA	2		•				
100 kVA	208/220	208/220	29.6 (7.45)				
	480	480	27.4 (6.90)				
120 kVA	208/220	208/220	35.5 (8.94)				
	480	480	32.8 (8.28)				
160 kVA	208/220	208/220	47.3 (11.9)				
	480	480	43.8 (11.0)				

O Ventilation required for cooling air exhaust: approximately 4.72 liter/sec (1000 cfm).

⁽²⁾ Ventilation required for cooling air exhaust: approximately 9.44 liter/sec (2000 cfm).

41.3-18 Uninterruptible Power Supplies — Powerware 3-Phase Units

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Figure 41.3-15. 9390 UPS with Battery — Single or Dual Feed



Figure 41.3-16. 9390 UPS with External Maintenance Bypass



Figure 41.3-17. 9390 UPS Four-Module Parallel System with Remote Tie Cabinet
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Uninterruptible Power Supplies — Powerware 3-Phase Units

Powerware 9390

Read and understand the following notes while planning and performing the installation:

- 1. Refer to national and local electrical codes for acceptable external wiring practices.
- 2. Material and labor for external wiring requirements are to be provided by designated personnel.
- 3. For external wiring, use 90° C copper wire. See the appropriate information in the tables. Wire sizes are based on using the specified breakers.
- 4. Wire ampacities are chosen from Table 310–16 of the NEC. Wire is 90°C specification.
- 5. If installing, as part of the UPS system, a maintenance bypass without a rectifier input breaker, a minimum of two separate feeds with upstream feeder breakers, or one feed with two upstream feeder breakers, must be provided: one for the UPS and one for the maintenance bypass input. DO NOT use one feed or a single feeder breaker to supply both the UPS and the maintenance bypass.
- 6. The bypass feed into this equipment uses three or four wires. The rectifier feed into this equipment uses three wires. The phases must be symmetrical about ground (from a Wye source) for proper equipment operation.
- 7. If the load requires a neutral, a bypass source neutral must be provided. If the load does not require a neutral and there is no neutral conductor connected at the bypass input, a neutral to ground bonding jumper must be installed. DO NOT install both a source neutral and a bonding jumper. See tables for neutral bonding jumper wire sizes. Bonding jumper must be copper wire.
- The UPS cabinet is shipped with a debris shield covering the ventilation grill on top of the unit. Do not remove the debris shield until installation is complete. However, remove the shield before operating the UPS. Once the debris shield is removed, do not place objects on the ventilation grill.
- 9. Refer to the UPS manual for installation instructions.
- 10. Terminals are UL and CSA rated at 90°C. Refer to the tables for power cable terminations and conduit requirements.

Note: Callout letters A, B, C and D map to (9390-7).

Table 41.3-19. Input/Output Ratings and External Wiring Requirements for the Powerware 9390-40/40 and 9390-80/40

Description	Units	Rating 50/	'60 Hz
Basic Unit Rating at 0.9 lagging pF load	kVA kW	40 36	40 36
Input and Bypass Input Output	Volts Volts	208/220 208/220	480 480
A — AC Input to UPS Rectifier (0.98 mi	n. pF)		
Full Load Current plus Battery Recharge Current (3) Phases, (1) Ground	Amps	125	55
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (1)	4 (1)
B — AC Input to UPS Bypass			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	111/105	48
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (1)	4 (1)
C — DC Input from Battery to UPS			
(1) Positive, (1) Negative	Vdc Amps at (2.0 V/cell)	384 – 480 101	432 – 480 101
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	1/0 (1)	1/0 (1)
D — AC Output to Critical Load			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	111/105	48
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (1)	4 (1)
Neutral Bonding Jumper	•		,
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	4 (1)	6 (1)

Table 41.3-20. Input/Output Ratings and External Wiring Requirements for the Powerware 9390-80/50

Description	Units	Rating 50	/60 Hz
Basic Unit Rating at 0.9 lagging pF load	kVA kW	50 45	50 45
Input and Bypass Input Output	Volts Volts	208/220 208/220	480 480
A — AC Input to UPS Rectifier (0.98 mi	n. pF)	•	
Full Load Current plus Battery Recharge Current (3) Phases, (1) Ground	Amps	155	67
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	4/0 (1)	2 (1)
B — AC Input to UPS Bypass		•	*
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	139/131	60
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	4/0 (1)	2 (1)
C — DC Input from Battery to UPS			
(1) Positive, (1) Negative	Vdc Amps at (2.0 V/cell)	384 – 480 126	432 – 480 126
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	1/0 (1)	1/0 (1)
D — AC Output to Critical Load		•	
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	139/131	60
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	4/0 (1)	2 (1)
Neutral Bonding Jumper	•	•	
Minimum Conductor Sizo	AVA/C or komil	2	6

(each)

(1)

(1)

Number per Phase

2

(1)

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Table 41.3-21. Input/Output Ratings and External Wiring Requirements for the Powerware 9390-80/60

Description	Units	Rating 50	/60 Hz
Basic Unit Rating at 0.9 lagging pF load	kVA kW	60 54	60 54
Input and Bypass Input Output	Volts Volts	208/220 208/220	480 480
A — AC Input to UPS Rectifier (0.98 mi	n. pF)		
Full Load Current plus Battery Recharge Current (3) Phases, (1) Ground	Amps	185	80
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	250 (1)	1 (1)
B — AC Input to UPS Bypass			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	167/158	72
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	250 (1)	1 (1)
C — DC Input from Battery to UPS			
(1) Positive, (1) Negative	Vdc Amps at (2.0 V/cell)	384 – 480 151	432 – 480 151
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	2/0 (1)	2/0 (1)
D — AC Output to Critical Load			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	167/158	72
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	250 (1)	1 (1)
Neutral Bonding Jumper			
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2 (1)	6 (1)

Table 41.3-22. Input/Output Ratings and External Wiring Requirements for the Powerware 9390-80/80

Description	Units	Rating 50/60 Hz	
Basic Unit Rating at 0.9 lagging pF load	kVA kW	80 72	80 72
Input and Bypass Input Output	Volts Volts	208/220 208/220	480 480
A — AC Input to UPS Rectifier (0.98 mi	n. pF)		
Full Load Current plus Battery Recharge Current (3) Phases, (1) Ground	Amps	240	105
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (1)	1/0 (1)
B — AC Input to UPS Bypass			•
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	222/210	96
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (2)	1/0 (1)
C — DC Input from Battery to UPS			•
(1) Positive, (1) Negative	Vdc Amps at (2.0 V/cell)	384 - 480 203	432 – 480 203
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	3/0 (2)	3/0 (1)
D — AC Output to Critical Load			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	222/210	96
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (2)	1/0 (1)
Neutral Bonding Jumper			
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	1/0 (1)	6 (1)

Table 41.3-23. Input/Output Ratings and External Wiring Requirements for the Powerware 9390-120/100 and 9390-160/100				
Description	Units	Rating 50	/60 Hz	
Basic Unit Rating at 0.9 lagging pF load	kVA kW	100 90	100 90	
Input and Bypass Input Output	Volts Volts	208/220 208/220	480 480	
A — AC Input to UPS Rectifier (0.98 mi	n. pF)	•		
Full Load Current plus Battery Recharge Current (3) Phases, (1) Ground	Amps	300	130	
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	3/0 (2)	4/0 (1)	
B — AC Input to UPS Bypass	•		•	
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	278/262	120	
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	3/0 (2)	4/0 (1)	
C — DC Input from Battery to UPS	•		•	
(1) Positive, (1) Negative	Vdc Amps at (2.0 V/cell)	384 – 480 252	432 – 480 252	
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	2/0 (2)	2/0 (2)	
D — AC Output to Critical Load	•			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	278/262	120	
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	3/0 (2)	4/0 (1)	
Neutral Bonding Jumper				

	(eacii)	(2)
Neutral Bonding Jumper		
Minimum Conductor Size	AWG or kcmil	1/0
Number per Phase	(each)	(1)

Table 41.3-24. Input/Output Ratings and External Wiring Requirements for the Powerware 9390-120/120 and 9390-160/120

Description	Units	Rating 50	/60 Hz
Basic Unit Rating at 0.9 lagging pF load	kVA kW	120 108	120 108
Input and Bypass Input Output	Volts Volts	208/220 208/220	480 480
A — AC Input to UPS Rectifier (0.98 mi	n. pF)		
Full Load Current plus Battery Recharge Current (3) Phases, (1) Ground	Amps	360	160
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	4/0 (2)	4/0 (1)
B — AC Input to UPS Bypass	•	•	
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	333/315	120
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	4/0 (2)	4/0 (1)
C — DC Input from Battery to UPS			
(1) Positive, (1) Negative	Vdc Amps at (2.0 V/cell)	384 – 480 302	432 – 480 302
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	3/0 (2)	3/0 (2)
D — AC Output to Critical Load			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	333/315	120
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	4/0 (2)	4/0 (1)
Neutral Bonding Jumper			
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	1/0 (1)	2 (1)

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Table 41.3-25. Input/Output Ratings and External Wiring Requirements for the Powerware 9390-160/160

Description	Units	Rating 50	/60 Hz
Basic Unit Rating at 0.9 lagging pF load	kVA kW	160 144	160 144
Input and Bypass Input Output	Volts Volts	208/220 208/220	480 480
A — AC Input to UPS Rectifier (0.98 mi	n. pF)		
Full Load Current plus Battery Recharge Current (3) Phases, (1) Ground	Amps	480	210
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	400 (2)	1/0 (2)
B — AC Input to UPS Bypass			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	444/420	192
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	400 (2)	1/0 (2)
C — DC Input from Battery to UPS	_		_
(1) Positive, (1) Negative	Vdc Amps at (2.0 V/cell)	384 - 480 403	432 – 480 403
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	250 (2)	250 (2)
D — AC Output to Critical Load			
Full Load Current — (3) Phases, (1) Neutral-if required, (1) Ground	Amps	444/420	192
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	400 (2)	1/0 (2)
Neutral Bonding Jumper			
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	1/0 (2)	2 (2)

Powerware 9390-40/40, 9390-80/40, 9390-80/50, 9390-80/60, and 9390-80/80 (208 V/220 V Input and 208 V/220 V Output)					
Terminal	Function	Size of Pressure Termination	Tightening Torque Nm (lb. in)	Screw Type	
AC Input to	UPS Rectifi	er and Bypass (Sing	jle Input)		
E6 E7	Phase A Phase B	2 - #6-250 kcmil 2 - #6-250 kcmil	42.4 (375) 42.4 (375) 42.4 (375)	5/16 in. Hex 5/16 in. Hex	
AC Input to	UPS Rectifi	er (Dual Innut)	42.4 (375)	5/10 III. Hex	
E1 E2 E3	Phase A Phase B Phase C	2 - #6-250 kcmil 2 - #6-250 kcmil 2 - #6-250 kcmil 2 - #6-250 kcmil	42.4 (375) 42.4 (375) 42.4 (375)	5/16 in. Hex 5/16 in. Hex 5/16 in. Hex	
AC Input to	Bypass (Du	al Input)			
E6 E7 E8	Phase A Phase B Phase C	2 - #6-250 kcmil 2 - #6-250 kcmil 2 - #6-250 kcmil	42.4 (375) 42.4 (375) 42.4 (375)	5/16 in. Hex 5/16 in. Hex 5/16 in. Hex	
Single-Fee	d Jumper fro	om Rectifier Input Te	erminals to Bypass Inp	out Terminals	
	Phase A Phase B Phase C	N/A N/A N/A	22.6 (200) 22.6 (200) 22.6 (200)	M10 Hex Bolt M10 Hex Bolt M10 Hex Bolt	
AC Output t	o Critical Lo	oad			
E9 E10 E11	Phase A Phase B Phase C	2 - #6-250 kcmil 2 - #6-250 kcmil 2 - #6-250 kcmil	42.4 (375) 42.4 (375) 42.4 (375)	5/16 in. Hex 5/16 in. Hex 5/16 in. Hex	
DC Input fro	om Battery t	o UPS			
E4 E5	Positive Negative	1 - #6-350 kcmil 1 - #6-350 kcmil	31.1 (275) 31.1 (275)	5/16 in. Hex 5/16 in. Hex	
Input and O	utput Neutr	al			
E12	Neutral	8 - #6-250 kcmil	42.4 (375)	5/16 in. Hex	
Customer G	round				
Ground	Ground	8 - #14-1/0	5.6 (50)	Slotted	

Table 41.3-26. UPS Cabinet Power Cable Terminations for the

Powerware 9390

Table 41.3-27. UPS Cabinet Power Cable Terminations for the Powerware 9390-120/100, 9390-120/120, 9390-160/100, 9390-160/ 120 and 9390-160/160 (208 V/220 V Input and 208 V/220 V Output)

Terminal	Function	Size of Pressure Termination	Tightening Torque Nm (lb. in)	Screw Type	
AC Input to	UPS Rectifi	er and Bypass (Sing	le Input)		
E1	Phase A	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
E2	Phase B	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
E3	Phase C	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
AC Input to	UPS Rectifi	er (Dual Input)			
E1	Phase A	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
E2	Phase B	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
E3	Phase C	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
AC Input to	Bypass (Du	al Input)			
E6	Phase A	2 - #2-600 kcmil	56.5 (500)	1/2 in. Hex	
E7	Phase B	2 - #2-600 kcmil	56.5 (500)	1/2 in. Hex	
E8	Phase C	2 - #2-600 kcmil	56.5 (500)	1/2 in. Hex	
Single-Feed	l to Dual-Fe	ed Wire Transfer fro	m		
Reculler III		is to bypass input re			
Rectifier	Phase A	N/A	12.5 (110)	M8 Hex Bolt	
Bypass	Phase A	N/A	12.5 (110)	M8 Hex Bolt	
Rectifier	Phase B	N/A	12.5 (110)	IVI8 Hex Bolt	
Bypass	Phase B	N/A	12.5 (110)	M8 Hex Bolt	
Rectifier	Phase C	N/A	12.5 (110)	M8 Hex Bolt	
Bypass	Phase C	N/A	12.5 (110)	M8 Hex Bolt	
AC Output t	o Critical Lo	ad			
E9	Phase A	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
E10	Phase B	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
E11	Phase C	2 - 2/0-500 kcmil	31.1 (275)	4 mm Hex	
DC Input fro	DC Input from Battery to UPS				
E4	Positive	2 - #2-600 kcmil	56.5 (500)	1/2 in. Hex	
E5	Negative	2 - #2-600 kcmil	56.5 (500)	1/2 in. Hex	
Input and O	Input and Output Neutral				
E12	Neutral	8 - #2-600 kcmil	56.5 (500)	1/2 in. Hex	
Customer G	round			,	
Ground	Ground	8 - #14-1/0	5.6 (50)	Slotted	

Table 41.3-28. UPS Cabinet Power Cable Terminations for the Powerware 9390-40/40, 9390-80/40, 9390-80/50, 9390-80/60, and 9390-80/80 (480 V Input and 480 V Output)

Terminal	Function	Size of Pressure Termination	Tightening Torque Nm (lb. in)	Screw Type
AC Input to	UPS Rectif	ier and Bypass (Sin	gle Input)	
E6	Phase A	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E7	Phase B	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E8	Phase C	1 - #14-2/0	13.5 (120)	3/16 in. Hex
AC Input to	UPS Rectif	ier (Dual Input)		
E1	Phase A	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E2	Phase B	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E3	Phase C	1 - #14-2/0	13.5 (120)	3/16 in. Hex
AC Input to	Bypass (Du	ial Input)		
E6	Phase A	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E7	Phase B	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E8	Phase C	1 - #14-2/0	13.5 (120)	3/16 in. Hex
Single-Fee Rectifier In	d to Dual-Fe put Termina	ed Wire Transfer f Ils to Bypass Input	rom Terminals	
-	Phase A	N/A	5.6 (50)	1/4–20 Hex Nut
-	Phase B	N/A	5.6 (50)	1/4–20 Hex Nut
—	Phase C	N/A	5.6 (50)	1/4–20 Hex Nut
AC Output t	to Critical L	oad		
E9	Phase A	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E10	Phase B	1 - #14-2/0	13.5 (120)	3/16 in. Hex
E11	Phase C	1 - #14-2/0	13.5 (120)	3/16 in. Hex
DC Input fro	om Battery t	to UPS		
E4	Positive	1 - #6-350 kcmil	31.1 (275)	5/16 in. Hex
E5	Negative	1 - #6-350 kcmil	31.1 (275)	5/16 in. Hex
Input and O	utput Neuti	ral		
E12	Neutral	4 - #14-1/0	5.6 (50)	Slotted
Customer G	round			
Ground	Ground	8 - #14-1/0	5.6 (50)	Slotted

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Powerware 9390

Table 41.3-29. UPS Cabinet Power Cable Terminations for the Powerware 9390-120/100, 9390-120/120, 9390-160/100, 9390-160/120 and 9390-160/160 (480 V Input and 480 V Output)

Terminal	Function	Size of Pressure Termination	Tightening Torque Nm (lb. in)	Screw Type
AC Input to	UPS Rectifi	er and Bypass (Sing	jle Input)	•
E6	Phase A	2 - #6-250	42.4 (375)	5/16 in. Hex
E7	Phase B	2 - #6-250	42.4 (375)	5/16 in. Hex
E8	Phase C	2 - #6-250	42.4 (375)	5/16 in. Hex
AC Input to	UPS Rectifi	er (Dual Input)		
E1	Phase A	2 - #6-250	42.4 (375)	5/16 in. Hex
E2	Phase B	2 - #6-250	42.4 (375)	5/16 in. Hex
E3	Phase C	2 - #6-250	42.4 (375)	5/16 in. Hex
AC Input to	Bypass (Du	al Input)		
E6	Phase A	2 - #6-250	42.4 (375)	5/16 in. Hex
E7	Phase B	2 - #6-250	42.4 (375)	5/16 in. Hex
E8	Phase C	2 - #6-250	42.4 (375)	5/16 in. Hex
Single-Fee	d to Jumper	Bus from Rectifier	Input Terminals	
to Bypass I	nput Termin	als		
Rectifier	Phase A	N/A	12.5 (110)	M8 Hex Bolt
Bypass	Phase A	N/A	22.6 (200)	M10 Hex Bolt
Rectifier	Phase B	N/A	12.5 (110)	M8 Hex Bolt
Bypass	Phase B	N/A	22.6 (200)	M10 Hex Bolt
Rectifier	Phase C	N/A	12.5 (110)	M8 Hex Bolt
Bypass	Phase C	N/A	22.6 (200)	M10 Hex Bolt
AC Output t	to Critical Lo	oad		
E9	Phase A	2 - #6-250	42.4 (375)	5/16 in. Hex
E10	Phase B	2 - #6-250	42.4 (375)	5/16 in. Hex
E11	Phase C	2 - #6-250	42.4 (375)	5/16 in. Hex
DC Input fro	om Battery t	o UPS		
E4	Positive	2 - #2-600 kcmil	56.5 (500)	1/2 in. Hex
E5	Negative	2 - #2-600 kcmil	56.5 (500)	1/2 in. Hex
Input and O	utput Neutr	al		-
E12	Neutral	8 - #6-250 kcmil	42.4 (375)	1/2 in. Hex
Customer G	round			
Ground	Ground	8 - #14-1/0	5.6 (50)	Slotted

41.3-24 Uninterruptible Power Supplies — Powerware 3-Phase Units

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Figure 41.3-18. 9390 (40 to 80 kVA) UPS Dimensions



Figure 41.3-19. 9390 (40 to 80 kVA) UPS Dimensions



Figure 41.3-20. 9390 (100 to 160 kVA) UPS Dimensions



Figure 41.3-21. 9390 (100 to 160 kVA) UPS Dimensions

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Figure 41.3-22. 9390 (40 to 80 kVA) UPS Floor Mounting Dimensions



Figure 41.3-23. 9390 (100 to 160 kVA) UPS Floor Mounting Dimensions

41.3-26 Uninterruptible Power Supplies — Powerware 3-Phase Units

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Powerware 9390

Powerware 9390 UPS Integrated Battery Cabinets



IBC-L and IBC-S

Description

Eaton offers two models of Powerware battery cabinets, the IBC-S and IBC-L, for its Powerware 9390 UPS series. These cabinets line-up and match with the 9390 UPS and offer a wide range of run times.

Features and Benefits

- ABM (Advanced Battery Management) technology extends battery life and optimizes recharge time.
- Top and bottom cabling entry provides installation flexibility.
- CD-rated circuit breaker within each cabinet provides protection and servicing isolation.
- Each circuit breaker includes:
 - Auxiliary switch for UPS sensing of circuit breaker closure
 - 48 Vdc UVR to interface with UPS for remote EPO function
- Variable battery bus enables battery capacity to be matched to exact run time requirements.
- Optional remote configurations available.
- Casters provided to enhance portability.
- Quick disconnects between battery tray assemblies reduce battery maintenance time.
- Manufacturer-supplied wiring provides plug and play capability for line-up-and-match configurations.

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- Removable battery tray assemblies reduce battery maintenance time.
- DC-rated circuit breaker in each battery cabinet allows multiple battery strings to be serviced independently of each other, assuring backup power is always available to the UPS.

- Circuit breaker features UVR trip auxiliaries for system EPO and UPS sensing of battery breaker.
- Located adjacent to the internal wireway, mechanical lugs reduce installation time for remote configurations.

Flexibility

- A variable battery bus accommodates 384 V to 480 V configurations, so the battery capacity can be matched to your exact run time requirements either a specific run time, an extension to an existing battery run time, or legacy battery installations.
- Daisy chain up to four (4) cabinets together for extended battery run times.
- Integral, line-up-and-match configurations are standard.
- Remote configurations available.

Serviceability

- Front access only design enhances servicing and installation.
- Modular battery tray design optimizes periodic servicing.

Dimensions

- IBC-S: 22.4"W x 31.6"D x 74.4"H.
- IBC-L: 42.7"W x 31.6"D x 74.4"H.

Reliability

- Battery cabinets are UL 1778 listed.
- Flame retardant batteries meet UL94V2 for computer room installations.



IBC-S with Door Opened — IBC-S is Compatible with Battery Types B12, B17 and E20



IBC-L with Doors Opened — IBC-L is Compatible with Battery Types E28, E33, E39, E50, B27, B31, B37 and B47

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Powerware 9390

Table 41.3-30.	Powerware	9390 40 to	80 kVA Rui	n Times: 480	Vac Systems,	60 Hz

kVA			40	50	60	80	Weight	40	50	60	80	Weight
kW			36	45	54	72	lb. (kg) ②	36	45	54	72	lb. (kg) ②
Nominal DC Link	Voltage		480	480	480	480	-	432	432	432	432	1
Battery Type	Width in Inches (mm) 1	No. of Strings	Minutes	1	•	•		Minute	S	1		
B12	22.40 (569.0)	1	9	5	_	_	1665 (756)	—	—	—	—	1560 (708)
B17	22.40 (569.0)	1	16	10	7	-	2445 (1110)	8	5	—	—	2270 (1031)
B27	42.70 (1084.6)	1	33	25	19	13	3150 (1430)	24	17	12	6	2897 (1315)
E28	42.70 (1084.6)	1	35	27	22	15	3250 (1476)	24	18	13	5	2987 (1356)
B31	42.70 (1084.6)	1	39	30	24	16	3495 (1587)	28	21	16	8	3202 (1454)
E33	42.70 (1084.6)	1	42	33	27	19	3595 (1632)	30	23	18	11	3292 (1495)
B37	42.70 (1084.6)	1	48	36	29	20	3765 (1709)	34	26	21	13	3444 (1564)
E39	42.70 (1084.6)	1	48	38	31	23	3925 (1782)	36	27	22	16	3588 (1629)
B47	42.70 (1084.6)	1	66	51	40	26	4800 (2179)	53	38	29	18	4375 (1986)
E50	42.70 (1084.6)	1	65	51	41	30	4840 (2197)	54	41	34	25	4411 (2003)
B12	44.80 (2169.2)	2	26	19	16	10	3330 (1512)	19	14	11	5	3120 (1416)
B17	44.80 (2169.2)	2	43	31	25	17	4890 (2220)	32	24	17	9	4540 (2061)
B27	85.40 (1137.9)	2	78	60	50	34	6300 (2860)	61	47	36	25	5804 (2635)
E28	85.40 (1137.9)	2	79	61	49	35	6500 (2951)	57	43	34	24	5984 (2717)
B31	85.40 (2169.2)	2	90	68	57	40	6990 (3173)	71	54	43	29	6414 (2912)
E33	85.40 (2169.2)	2	92	72	58	42	7190 (3264)	69	52	42	30	6594 (2994)
B37	85.40 (2169.2)	2	100	80	65	50	7530 (3418)	82	62	51	35	6898 (3132)
E39	85.40 (2169.2)	2	105	82	67	49	7850 (3564)	80	61	50	36	7186 (3262)
B47	85.40 (2169.2)	2	149	114	92	67	9600 (4358)	125	94	76	54	8760 (3977)
E50	85.40 (2169.2)	2	144	111	91	66	9680 (4395)	121	93	76	54	8832 (4010)
B12	67.20 (1706.9)	3	45	32	26	18	4995 (2268)	36	26	20	13	4680 (2125)
B17	67.20 (1706.9)	3	72	55	43	29	7335 (3330)	58	44	33	22	6810 (3092)
B27	128.10 (3253.7)	3	125	95	78	57	9450 (4290)	102	77	61	44	8706 (3953)
E28	128.10 (3253.7)	3	125	96	78	56	9750 (4427)	96	72	58	40	8976 (4075)
B31	128.10 (3253.7)	3	141	110	91	65	10485 (4760)	118	90	71	51	9621 (4368)
E33	128.10 (3253.7)	3	147	113	92	66	10785 (4896)	113	86	69	49	9891 (4491)
B37	128.10 (3253.7)	3	157	122	100	75	11295 (5128)	130	100	83	58	10347 (4698)
E39	128.10 (3253.7)	3	164	128	105	76	11775 (5346)	130	99	80	58	10779 (4894)
B47	128.10 (3253.7)	3	251	188	150	107	14400 (6538)	210	153	127	89	13140 (5966)
E50	128.10 (3253.7)	3	230	177	144	104	14520 (6592)	196	150	121	86	13248 (6015)
B12	89.60 (2275.8)	4	63	50	39	27	6660 (3024)	54	40	30	20	6240 (2833)
B17	89.60 (2275.8)	4	104	79	63	44	9780 (4440)	86	63	52	33	9080 (4122)
B27	170.80 (4338.3)	4	175	135	110	80	12600 (5720)	144	113	89	62	11608 (5270)
E28	170.80 (4338.3)	4	176	135	110	78	13000 (5902)	138	104	83	58	11968 (5433)
B31	170.80 (4338.3)	4	200	153	125	92	13980 (6347)	162	128	104	73	12828 (5824)
E33	170.80 (4338.3)	4	206	158	128	92	14380 (6529)	163	123	98	69	13188 (5987)
B37	170.80 (4338.3)	4	222	170	140	101	15060 (6837)	187	140	115	84	13796 (6263)
E39	170.80 (4338.3)	4	228	178	145	105	15700 (7128)	184	141	113	81	14372 (6525)
B47	170.80 (4338.3)	4	360	280	212	152	19200 (8717)	309	230	185	128	17520 (7954)
E50	170.80 (4338.3)	4	322	248	201	144	19360 (8789)	278	209	172	123	17664 (8019)

^① All battery cabinets are 74.4 inches (1889.8 mm) height x 31.6 inches (802.6 mm) depth.

 $\ensuremath{\textcircled{}^\circ}$ Maximum installed weight with largest breaker.

Powerware 9390

Table 41.3-31. Powerware 9390 100 to 160 kVA Run Times: 480 Vac Systems, 60 Hz

kVA			100	120	160	Weight	100	120	160	Weight
kW			90	108	144	lb. (kg) ②	90	108	144	lb. (kg) ②
Nominal DC Link Vo	Itage		480	480	480	-	432	432	432	
Battery Type	Width in Inches (mm) 1	No. of Strings	Minutes	1	1		Minutes	<u> </u>	<u> </u>	
B27	42.70 (1084.6)	1	9	7	—	3150 (1430)	_	—	_	2897 (1315)
E28	42.70 (1084.6)	1	10	6	—	3250 (1476)	—	—	—	2987 (1356)
B31	42.70 (1084.6)	1	11	8	—	3495 (1587)	_	—	—	3202 (1454)
E33	42.70 (1084.6)	1	14	10	-	3595 (1632)	_	—	—	3292 (1495)
B37	42.70 (1084.6)	1	15	11	7	3765 (1709)	_	_	_	3444 (1564)
E39	42.70 (1084.6)	1	11	13	7	3925 (1782)	_	—	—	3588 (1629)
B47	42.70 (1084.6)	1	18	13	8	4800 (2179)	_	—	—	4375 (1986)
E50	42.70 (1084.6)	1	22	17	10	4840 (2197)	—	—	—	4411 (2003)
B27	85.40 (2169.2)	2	25	19	13	6300 (2860)	17	12	6	5804 (2635)
E28	85.40 (2169.2)	2	27	22	15	6500 (2951)	18	13	5	5984 (2717)
B31	85.40 (2169.2)	2	30	24	16	6990 (3173)	21	16	8	6414 (2912)
E33	85.40 (2169.2)	2	33	27	19	7190 (3264)	23	18	11	6594 (2994)
B37	85.40 (2169.2)	2	36	29	20	7530 (3418)	27	21	13	6898 (3132)
E39	85.40 (2169.2)	2	38	31	23	7850 (3564)	28	22	16	7186 (3262)
B47	85.40 (2169.2)	2	51	40	27	9600 (4358)	38	29	18	8760 (3977)
E50	85.40 (2169.2)	2	51	41	30	9680 (4395)	42	34	25	8832 (4010)
B27	128.10 (3253.7)	3	43	34	23	9450 (4290)	32	25	16	8706 (3953)
E28	128.10 (3253.7)	3	43	35	26	9750 (4427)	30	24	16	8976 (4075)
B31	128.10 (3253.7)	3	52	40	28	10485 (4760)	36	29	19	9621 (4368)
E33	128.10 (3253.7)	3	51	42	31	10785 (4896)	37	30	21	9891 (4491)
B37	128.10 (3253.7)	3	59	49	34	11295 (5128)	45	35	25	10347 (4698)
E39	128.10 (3253.7)	3	59	48	35	11775 (5346)	44	36	26	10779 (4894)
B47	128.10 (3253.7)	3	83	67	48	14400 (6538)	66	54	35	13140 (5966)
E50	128.10 (3253.7)	3	80	65	47	14520 (6592)	67	54	39	13248 (6015)
B27	170.80 (4338.3)	4	60	50	34	12600 (5720)	47	36	25	11608 (5270)
E28	170.80 (4338.3)	4	60	49	35	13000 (5902)	43	34	24	11968 (5433)
B31	170.80 (4338.3)	4	69	58	40	13980 (6347)	54	43	29	12828 (5824)
E33	170.80 (4338.3)	4	71	57	42	14380 (6529)	52	42	30	13188 (5987)
B37	170.80 (4338.3)	4	80	65	50	15060 (6837)	62	52	35	13796 (6263)
E39	170.80 (4338.3)	4	81	66	49	15700 (7128)	62	50	36	14372 (6525)
B47	170.80 (4338.3)	4	115	92	66	19200 (8717)	94	77	54	17520 (7954)
E50	170.80 (4338.3)	4	110	90	65	19360 (8789)	94	76	54	17664 (8019)

① All battery cabinets are 74.4 (1889.8 mm) inches height x 31.6 (802.6 mm) inches depth.

⁽²⁾ Maximum installed weight with largest breaker.

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F-T-N

Uninterruptible Power Supplies — Powerware 3-Phase Units

Powerware 9390

icxi icxi <th< th=""><th>Table 41</th><th>.3-32. Powerwai</th><th>re 9390 4</th><th>0 to 80</th><th>) kVA</th><th>Run T</th><th>imes:</th><th>208 Vac System</th><th>ns, 60 l</th><th>Hz</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>	Table 41	.3-32. Powerwai	re 9390 4	0 to 80) kVA	Run T	imes:	208 Vac System	ns, 60 l	Hz								
imat	kVA			40	50	60	80	Weight	40	50	60	80	Weight	40	50	60	80	Weight
International De Link Voltage Vertice	kW			36	45	54	72	lb. (kg)	36	45	54	72	lb. (kg) ②	36	45	54	72	lb. (kg) ②
Battery Immi Windth Immi No. of Immi No. of Single Mini-L Immi Mini-L Immi Immi <thimmi< th=""> Immi Immi</thimmi<>	Nomina	I DC Link Voltage	e	480	480	480	480	1	432	432	432	432	1	384	384	384	384	
B12 22.40 (59.9.0) 1 9 1 166 (76) 7 - - - 156 (661) B17 22.40 (59.9.0) 1 16 10 7 - - - 156 (661) 10 5 - - - 2095 (951) E28 42.70 (1084.6) 1 35 27 22 15 320 (147.6) 31 24.6 2021 (147.6) 31 24.20 (147.6) 32.2 25 21 14 2997 (135.6) 23 22 17 110 22.2 11 210 (271.2) 21 17 101 22.17 11 210 (271.2) 211 (211.2) 211	Battery Type	Width in Inches (mm) 1	No. of Strings	Minu	utes				Minu	utes								
B17 22.40 (680.0) 1 16 10 7 - 24.61 (110) 13 8.6 - 227 (113) 10 15 - - - - 2009 (951) B27 42.70 (1084.6) 1 35 27 22 16 3250 (147.6) 31 24 10 2297 (1366) 27 21 17 10 272 (123) B31 42.70 (1084.6) 1 48 36 29 17 3282 (1456) 32 25 21 14 3292 (1456) 32 25 24 18 3256 (147.6) B33 42.70 (1084.6) 1 48 36 29 33 32 20 3588 (1569) 38 29 24 375 (147.6) 37 29 41 32 335 (147.6) 38 32 23 3358 (159.1) 38 29 24 375 (147.6) 37 24 375 (147.6) 37 24 375 (147.6) 37 24 375 (147.6) 37 24 335 (34.7) 33 32 431 (35.0) (35.1) 356	B12	22.40 (569.0)	1	9	5	—	—	1665 (756)	7	—	—	—	1560 (708)	5.5	—	—	—	1455 (661)
B27 42.70 (108.46) 1 35 25 16 14 35 264 10 35 27 22 15 3206 (1476) 31 24 10 3296 (1356) 27 11 11 2946 (1233) E31 42.70 (108.46) 1 42 33 27 19 3956 (1652) 37 28 24 14 3202 (1454) 30 25 21 14 294 (1323) E33 42.70 (108.46) 1 48 38 31 23 3956 (1760) 43 33 28 20 3558 (1629) 38 29 24 18 242 91 3956 (1760) B37 42.70 (108.46) 1 65 14 30 395 (2102) 33 32 33 24 43 33 44 31 344 (0117) 31 44 30 340 (2180) 30 35 34 33 34 33 34 33 344 34	B17	22.40 (569.0)	1	16	10	7	—	2445 (1110)	13	8	5	—	2270 (1031)	10	5	—	—	2095 (951)
E28 42.70 (108.4) 1 35 27 27 17 10 2729 (128) B31 42.70 (108.4) 1 42 30 24 16 3956 (152) 37 28 21 14 2921 (128) 30 23 17 3292 (148) 30 23 17 3292 (148) 30 23	B27	42.70 (1084.6)	1	33	25	19	13	3150 (1430)	30	22	17	11	2897 (1315)	25	18	14	9	2649 (1203)
B31 42.70 (1084.6) 1 39 30 24 16 3496 (1857) 35 26 21 14 2022 (1464) 30 23 17 11 2914 (1323) E33 42.70 (1084.6) 1 48 38 29 20 3765 (1709) 42 32 20 15 342 22 15 3128 (1420) E39 42.70 (1084.6) 1 48 38 23 332 325 (1720) 43 33 28 20 238 48 (1829) 38 29 24 18 295 5(176) E50 42.70 (1084.6) 1 65 51 41 30 4840 (2197) 57 45 37 27 4411 (200) 50 39 32 24 30 30 31 10 4990 (190) 100 330 (1512) 23 47 18 10 4990 (190) 100 23 23 4540 (2011) 20 10 490 (190) 100 100 23 43 30 5744 (230) 60 40 30 550 (53) 31	E28	42.70 (1084.6)	1	35	27	22	15	3250 (1476)	31	24	20	13	2987 (1356)	27	21	17	10	2729 (1239)
E33 42.70 (1084.6) 1 48 36 Z9 20 376 (709) 42 32 26 17 322 (1485) 32 28 21 14 294 (1369) B37 42.70 (1084.6) 1 48 36 21 23 326 (1778) 43 33 28 21 14 236 (1778) B47 42.70 (1084.6) 1 65 51 40 26 4800 (2179) 57 45 37 27 4411 (200) 50 39 22 24 38 20 235 (178) B12 44.80 (1137.9) 2 48 31 25 17 4890 (220) 37 28 21 14 71 302 (1410) B12 44.80 (1137.9) 2 48 31 25 17 4890 (220) 37 43 30 674 (280) 60 47 38 29 44 30 84 B13 85.40 (2169.2) 2 79	B31	42.70 (1084.6)	1	39	30	24	16	3495 (1587)	35	26	21	14	3202 (1454)	30	23	17	11	2914 (1323)
B37 42.70 (1084.6) 1 48 36 29 20 3766 (1709) 42 32 26 17 344 (1564) 36 28 22 15 3128 (1420) E39 42.70 (1084.6) 1 66 51 40 23 3926 (1729) 57 45 37 27 411 (2003) 50 39 32 24 3936 (137) B12 44.80 (137.9) 2 28 19 61 10 3330 (1512) 23 17 14 7 411 (2003) 50 39 32 24 3936 (1310) B17 44.80 (137.9) 2 83 30 25 17 4890 (2200) 7 443 30 5794 (2630) 60 47 37 26 5308 (2410) B2 85.40 (2169.2) 2 90 68 7 40 690 (373) 81 61 53 42 31 450 (4262) 43 36 624 (236) 35 640 (2162) 63 646 (236) 63 64 33 553 (421) 63	E33	42.70 (1084.6)	1	42	33	27	19	3595 (1632)	37	29	24	17	3292 (1495)	32	25	21	14	2994 (1359)
E39 42.70 (1084.6) 1 48 38 31 23 392 (172) 43 33 28 20 20 18 226 18 3256 (1478) B47 42.70 (1084.6) 1 65 51 40 26 4800 (2179) 57 45 37 27 4411 (2003) 50 37 28 19 3255 (1796) B12 44.80 (1137.9) 2 28 19 16 10 3330 (1512) 23 17 14 7 320 (1416) 22 23 18 01 2330 (1512) 23 13 4540 (2061) 20 15 11 5 290 (1321) B27 85.40 (2169.2) 2 78 64 33 6500 (2551) 69 53 42 31 5594 (2712) 60 44 30 5584 (242) B31 85.40 (2169.2) 2 90 68 64 30 558 (42 31 568 (3127) 80 62 53 36 6262 (284) B33 85.40 (2169.2) 2 114 <td>B37</td> <td>42.70 (1084.6)</td> <td>1</td> <td>48</td> <td>36</td> <td>29</td> <td>20</td> <td>3765 (1709)</td> <td>42</td> <td>32</td> <td>26</td> <td>17</td> <td>3444 (1564)</td> <td>36</td> <td>28</td> <td>22</td> <td>15</td> <td>3128 (1420)</td>	B37	42.70 (1084.6)	1	48	36	29	20	3765 (1709)	42	32	26	17	3444 (1564)	36	28	22	15	3128 (1420)
B47 42.70 (1084.6) 1 66 51 40 26 4800 (2179) 57 45 37 27 4411 (2003) 50 39 32 24 3985 (1796) E50 44.80 (1137.9) 2 28 19 16 10 3330 (1512) 23 17 14 7 3120 (1416) 20 15 11 5 210 (1321) B17 44.80 (1137.9) 2 48 31 25 17 4890 (2220) 37 28 22 13 4540 (2061) 32 23 17 564 (242) B27 85.40 (2169.2) 2 78 61 49 55600 (2351) 69 54 43 30 5794 (2712) 60 47 33 6998 (272) B31 85.40 (2169.2) 2 90 68 57 40 6590 (3173) 81 61 52 45 45 33 6998 (273) B37 85.40 (2169.2) 2 100 80 65 50 45 45 6560 (4356) 10 52	E39	42.70 (1084.6)	1	48	38	31	23	3925 (1782)	43	33	28	20	3588 (1629)	38	29	24	18	3256 (1478)
E50 42.70 (108.40) 1 65 51 41 30 4840 (2197) 57 45 37 27 4111 (2003) 50 39 32 24 3987 (1810) B12 44.80 (1137.9) 2 43 31 25 17 4890 (2200) 7 28 21 3 4540 (2061) 32 23 18 10 4190 (1902) B27 85.40 (2169.2) 2 78 60 50 34 6300 (2860) 69 54 43 30 5794 (2800) 60 47 38 20 56848 (242) B31 85.40 (2169.2) 2 90 68 50 7530 (3264) 81 62 51 37 6584 (2980) 70 55 45 33 5998 (272) B37 85.40 (2169.2) 2 100 80 65 50 7530 (3564) 91 71 59 42 6888 (377) 80 62 52 38 626 (2845) 66 60 876 (397) 117 89 71 50 29	B47	42.70 (1084.6)	1	66	51	40	26	4800 (2179)	59	45	34	23	4375 (1986)	51	37	29	19	3955 (1796)
B12 44.80 (137.9) 2 26 19 16 10 3330 (1512) 23 17 14 7 3120 (1416) 20 15 11 15 210 (132) B17 44.80 (1137.9) 2 78 60 50 34 6300 (2260) 69 54 43 30 5794 (250) 60 47 38 22 5486 (2429) B28 85.40 (2169.2) 2 79 61 49 35 6500 (2951) 69 53 42 31 5974 (2712) 60 47 38 22 5486 (2429) B31 85.40 (2169.2) 2 90 68 50 7530 (3418) 91 71 59 42 6584 (299) 70 55 43 652 (236) 36 652 (236) 36 652 (236) 36 652 (236) 36 652 (236) 36 652 (236) 36 652 (2264) 14 14 14 14 14 14 14 14 14 14 14 14 14 140 (345) 14 1716 (3258) <td>E50</td> <td>42.70 (1084.6)</td> <td>1</td> <td>65</td> <td>51</td> <td>41</td> <td>30</td> <td>4840 (2197)</td> <td>57</td> <td>45</td> <td>37</td> <td>27</td> <td>4411 (2003)</td> <td>50</td> <td>39</td> <td>32</td> <td>24</td> <td>3987 (1810)</td>	E50	42.70 (1084.6)	1	65	51	41	30	4840 (2197)	57	45	37	27	4411 (2003)	50	39	32	24	3987 (1810)
B17 44.80 (137.9) 2 43 31 25 17 4890 (220) 37 28 22 22 28 10 4190 (1902) B27 85.40 (2169.2) 2 79 61 49 35 6500 (2860) 69 54 42 31 5974 (2712) 60 47 38 27 5468 (2422) B31 85.40 (2169.2) 2 90 68 57 40 6990 (3173) 81 61 52 35 6404 (2907) 69 56 44 30 5838 (260) B37 85.40 (2169.2) 2 100 86 50 7530 (31418) 91 71 59 42 6884 (3127) 80 62 53 36 6526 (2845) B37 85.40 (2169.2) 2 144 114 92 67 9600 (4358) 134 100 84 60 8750 (3373) 117 88 71 52 7920 (3596) B12 67.20 (1706.9) 3 72 55 43 29 735 (330) 65	B12	44.80 (1137.9)	2	26	19	16	10	3330 (1512)	23	17	14	7	3120 (1416)	20	15	11	5	2910 (1321)
B27 85.40 (2169.2) 2 78 60 50 34 6300 (2860) 69 54 43 30 5794 (2630) 60 47 38 27 5468 (2482) E28 85.40 (2169.2) 2 90 68 57 40 6990 (3173) 81 61 52 35 6644 (2907) 69 56 44 30 538 (226) E33 85.40 (2169.2) 2 100 80 65 67 49 7850 (3564) 91 71 59 42 6888 (3127) 80 62 53 86 626 (2245) E39 85.40 (2169.2) 2 149 114 92 79 7850 (3564) 91 72 58 48 626 (2245) 52 38 6522 (291) E47 85.40 (2169.2) 2 144 111 91 66 9680 (4355) 126 96 80 58 8822 (4005) 110 86 70 51 7984 (3625) 78 798 71 52 7972 (3596) 78 50 450<	B17	44.80 (1137.9)	2	43	31	25	17	4890 (2220)	37	28	22	13	4540 (2061)	32	23	18	10	4190 (1902)
E28 85.40 (2169.2) 2 79 61 49 35 6500 (251) 69 53 42 31 5974 (2712) 60 47 38 27 5468 (2422) B31 85.40 (2169.2) 2 92 72 58 42 7190 (3264) 81 62 51 37 658 (4293) 70 55 45 33 5998 (2723) B37 85.40 (2169.2) 2 100 82 67 49 7850 (364) 91 72 59 43 7176 (3258) 81 63 52 38 6522 (2961) B47 85.40 (2169.2) 2 144 111 91 66 9600 (4358) 126 60 8802 (4005) 110 88 71 52 7920 (3556) B12 67.20 (1706.9) 3 72 55 43 29 7335 (330) 65 48 37 26 6810 (392) 56 41 32 2 622 (2525) </td <td>B27</td> <td>85.40 (2169.2)</td> <td>2</td> <td>78</td> <td>60</td> <td>50</td> <td>34</td> <td>6300 (2860)</td> <td>69</td> <td>54</td> <td>43</td> <td>30</td> <td>5794 (2630)</td> <td>60</td> <td>47</td> <td>37</td> <td>26</td> <td>5308 (2410)</td>	B27	85.40 (2169.2)	2	78	60	50	34	6300 (2860)	69	54	43	30	5794 (2630)	60	47	37	26	5308 (2410)
B31 B5.40 (2169.2) 2 90 68 57 40 6990 (3173) B1 61 52 35 6404 (2907) 68 56 44 30 5533 (250) E33 85.40 (2169.2) 2 100 80 65 7530 (3418) 91 71 59 42 6588 (3273) 81 63 52 38 6626 (2245) E39 85.40 (2169.2) 2 149 114 92 67 9600 (4358) 134 100 84 60 8750 (3973) 117 89 71 52 7920 (3596) E50 85.40 (2169.2) 2 144 11 91 66 9680 (4395) 126 69 88 822 (4005) 110 88 652 (245) B12 67.20 (1706.9) 3 45 32 65 9750 (427) 109 85 69 50 8961 (4068) 97 75 60 44 796 (236) B17 67.20 (1706.9) 3 125 95 78 57 9450 (4290) 113 87	E28	85.40 (2169.2)	2	79	61	49	35	6500 (2951)	69	53	42	31	5974 (2712)	60	47	38	27	5468 (2482)
E33 85.40 (2169.2) 2 92 72 58 42 7190 (3264) 81 62 51 37 6584 (2989) 70 55 45 33 5998 (2723) B37 85.40 (2169.2) 2 100 80 65 50 7530 (3418) 91 71 59 43 7176 (3258) 81 62 53 36 626 (2845) B37 85.40 (2169.2) 2 144 11 91 66 9680 (4358) 124 90 85 8822 (4005) 110 86 70 51 7984 (3625) B17 67.20 (1706.9) 3 45 32 26 18 4995 (2624) 10 85 69 50 8861 (3092) 56 41 32 22 7920 (3564) B17 67.20 (1706.9) 3 45 78 57 9450 (4290) 113 87 69 51 8691 (3946) 97 74 61 44 8262 (372) B17 67.20 (3253.7) 3 147 113 92 66 <t< td=""><td>B31</td><td>85.40 (2169.2)</td><td>2</td><td>90</td><td>68</td><td>57</td><td>40</td><td>6990 (3173)</td><td>81</td><td>61</td><td>52</td><td>35</td><td>6404 (2907)</td><td>69</td><td>56</td><td>44</td><td>30</td><td>5838 (2650)</td></t<>	B31	85.40 (2169.2)	2	90	68	57	40	6990 (3173)	81	61	52	35	6404 (2907)	69	56	44	30	5838 (2650)
B3.40 B3.40 C169.20 2 100 80 65 50 7.50 (3418) 91 71 59 42 6858 (3127) 80 62 53 36 6266 (2648) E39 85.40 (2169.2) 2 105 82 67 9600 (3356) 134 100 84 60 875 (3973) 117 89 71 52 732 52 732 (538) 81 63 52 732 (532) 53 34 52 732 (533) 55 43 29 733 (333) 55 48 37 26 6810 (302) 55 41 32 22 628 (2853) B17 67.20 (1706.9) 3 125 95 78 57 9450 (4220) 113 87 69 51 8691 (3094) 97 74 61 44 7920 (3596) B27 128.10 (3253.7) 3 147 113 97 69 51 8691 (4068) 97 74	E33	85.40 (2169.2)	2	92	72	58	42	7190 (3264)	81	62	51	37	6584 (2989)	70	55	45	33	5998 (2723)
B3.40 B3.40 <th< td=""><td>B37</td><td>85.40 (2169.2)</td><td>2</td><td>100</td><td>80</td><td>65</td><td>50</td><td>7530 (3418)</td><td>91</td><td>71</td><td>59</td><td>42</td><td>6888 (3127)</td><td>80</td><td>62</td><td>53</td><td>36</td><td>6266 (2845)</td></th<>	B37	85.40 (2169.2)	2	100	80	65	50	7530 (3418)	91	71	59	42	6888 (3127)	80	62	53	36	6266 (2845)
B47 B5.40 (2169.2) 2 144 114 92 67 9600 (4393) 126 90 84 60 8760 (3973) 117 88 7 52 7920 (3596) E50 85.40 (2169.2) 2 144 111 91 66 9680 (4395) 126 90 80 822 (4005) 110 86 70 51 7984 (3625) B12 67.20 (1706.9) 3 45 32 25 43 29 7335 (330) 65 48 37 26 6810 (3092) 56 41 32 22 6285 (2853) B27 128.10 (3253.7) 3 125 95 78 57 9450 (427) 109 85 69 50 8961 (4068) 97 74 61 44 820 (3254) 3 147 113 92 66 10785 (4896) 128 99 81 59 9606 (4361) 113 87 69 51 8597 (0484) 112 87 69 50 8971 (4854) 126 97 81 597 (977) 5	E39	85.40 (2169.2)	2	105	82	6/	49	/850 (3564)	91	/2	59	43	/1/6 (3258)	81	63	52	38	6522 (2961)
E50 85.40 (2165.2) 2 144 111 91 66 9680 (4395) 126 96 80 58 8822 (4005) 110 86 70 51 7984 (3525) B12 67.20 (1706.9) 3 72 55 43 29 7335 (3330) 65 48 37 26 6810 (3092) 56 41 32 22 62685 (2853) B27 128.10 (3253.7) 3 125 96 78 56 9750 (4427) 109 85 69 50 8961 (4068) 97 74 61 44 8202 (3724) B31 128.10 (3253.7) 3 141 110 91 65 10485 (4760) 130 98 80 59 9606 (4361) 113 87 69 53 8777 (3776) E33 128.10 (3253.7) 3 157 122 100 75 11295 (5128) 143 111 90 66 10332 (4691) 126 97 81 59 9399 (4267) E39 128.10 (3253.7) 3 164	B47	85.40 (2169.2)	2	149	114	92	6/	9600 (4358)	134	100	84	60	8/50 (39/3)	11/	89	/1	52	7920 (3596)
B12 67.20 (1706.9) 3 43 32 26 18 499 (226) 40 29 123 16 4880 (212) 33 25 20 14 4365 (192) B17 67.20 (1706.9) 3 72 55 43 29 7335 (3330) 65 48 37 26 6810 (302) 56 41 32 22 6285 (2263) B27 128.10 (3253.7) 3 125 95 78 57 9450 (427) 109 85 69 50 8961 (4068) 97 74 61 44 8202 (3724) B31 128.10 (3253.7) 3 141 10 91 65 10485 (4760) 130 98 80 59 9606 (4361) 113 87 69 53 877 (376) B37 128.10 (3253.7) 3 157 122 100 75 11295 (5128) 143 111 90 66 10332 (4691) 126 97 81 59 9399 (4267) E39 128.10 (3253.7) 3 251 188	E50	85.40 (2169.2)	2	144	111	91	66	9680 (4395)	126	96	80	58	8822 (4005)	110	86	70	51	/984 (3625)
B17 67.20 (1706.9) 3 72 55 43 29 7335 (330) 65 48 37 26 6810 (3022) 56 41 32 22 6285 (2833) B27 128.10 (3253.7) 3 125 96 78 57 9450 (4290) 113 87 69 50 8961 (4068) 97 75 60 44 8202 (3724) B31 128.10 (3253.7) 3 141 10 91 65 10485 (4760) 130 98 80 59 9606 (4361) 113 87 69 53 8757 (3976) E33 128.10 (3253.7) 3 147 113 92 66 10785 (4896) 128 99 81 59 9876 (4484) 112 87 71 52 8997 (4085) E33 128.10 (3253.7) 3 157 122 100 75 11775 (5346) 145 113 91 68 10764 (4887) 126 100 81 60 9783 (4441) B47 128.10 (3253.7) 3 23 <	BIZ D17	67.20 (1706.9)	3	45	32	20	18	4995 (2268)	40	29	23	16	4680 (2125)	33	25	20	14	4365 (1982)
B27 128.10 (3253.7) 3 125 95 78 56 9750 (429) 113 67 69 51 3691 (396) 97 74 61 44 7962 (3613) E28 128.10 (3253.7) 3 111 10 91 65 10485 (4760) 130 98 80 59 9606 (4361) 113 87 69 53 8757 (3976) E33 128.10 (3253.7) 3 147 113 92 66 10785 (4896) 128 99 81 59 9876 (4484) 112 87 71 52 8997 (4085) E37 128.10 (3253.7) 3 157 122 100 75 11295 (5128) 143 111 90 66 10332 (4691) 126 97 81 59 9399 (4267) E39 128.10 (3253.7) 3 164 128 105 1775 (5346) 145 113 91 68 10764 (4887) 126 100 81 60 9783 (4441) B47 128.10 (3253.7) 3 230 177 <td>BI/</td> <td>67.20 (1706.9)</td> <td>3</td> <td>105</td> <td>55</td> <td>43</td> <td>29</td> <td>7335 (3330)</td> <td>112</td> <td>48</td> <td>3/</td> <td>20</td> <td>6810 (3092)</td> <td>50</td> <td>41</td> <td>32</td> <td>22</td> <td>6285 (2853)</td>	BI/	67.20 (1706.9)	3	105	55	43	29	7335 (3330)	112	48	3/	20	6810 (3092)	50	41	32	22	6285 (2853)
128. 128.	DZ/	128.10 (3253.7)	3	125	95	70	57	9450 (4290)	100	8/ 0E	69	51	8091 (3940)	97	75	61	44	7962 (3015)
Instruction	E20	120.10 (3253.7)	3	125	110	70	50	9750 (4427)	109	00	09	50	0606 (4261)	37	74 07	60	52 E2	0202 (3724)
123.10 123.10 123 147 113 132 107 1125 133 137 135 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 132 137 144 117 140 132 143 111 90 66 10332 (4691) 126 100 81 60 978 (4441) B47 128.10 (3253.7) 3 251 188 150 107 14400 (6538) 220 164 132 95 13125 (5959) 193 144 117 84 1180 (5394) 1197 (5437) B12 89.60 (2275.8) 4 63 50 39 27 6660 (3024) 58 43 33 23 6240 (2833) 50 35 28 20 5820 (2642) 137	E22	120.10 (3253.7)	2	141	112	91	66	10465 (4760)	130	90	00	59	9000 (4301)	113	07	71	53	8757 (3976) 9007 (4095)
Instruction Instruction <thinstruction< th=""> <thinstruction< th=""></thinstruction<></thinstruction<>	E33 B37	128.10 (3253.7)	3	147	122	100	75	11295 (5128)	1/13	111	91	66	10332 (4691)	12	97	81	52	9399 (4085)
Basic Table (1000000000000000000000000000000000000	E39	128.10 (3253.7)	3	164	122	105	76	11235 (5126)	145	113	91	68	10764 (4887)	120	100	81	60	9783 (4441)
Initial Sector InitiSector Initial	B47	128.10 (3253.7)	3	251	120	150	107	14400 (6538)	220	164	132	95	13125 (5959)	193	144	117	84	11880 (5394)
Bit in the information in the informati	E50	128.10 (3253.7)	3	230	177	144	104	14520 (6992)	200	155	126	91	13233 (6008)	174	137	110	81	11976 (5437)
B17 89.60 (2275.8) 4 104 79 63 44 9780 (4440) 92 69 56 37 9080 (4122) 80 60 48 32 8380 (3805) B27 170.80 (4338.3) 4 175 135 110 80 12600 (5720) 156 121 95 69 11588 (5261) 137 105 86 61 10616 (4820) E28 170.80 (4338.3) 4 176 135 110 78 13000 (5902) 154 119 96 70 11948 (5424) 135 103 85 61 10936 (4965) B31 170.80 (4338.3) 4 200 153 125 92 13980 (6347) 181 139 111 81 12808 (5815) 155 122 98 70 11676 (5301) E33 170.80 (4338.3) 4 206 158 128 92 14380 (6527) 180 136 113 82 13168 (5978) 157 121 98 71 11996 (5446) B37 170.80 (4338.3) 4	B12	89.60 (2275.8)	4	63	50	39	27	6660 (3024)	58	43	33	23	6240 (2833)	50	35	28	20	5820 (2642)
B27 170.80 (4338.3) 4 175 135 110 80 12600 (5720) 156 121 95 69 11588 (5261) 137 105 86 61 10616 (4820) E28 170.80 (4338.3) 4 176 135 110 78 13000 (5902) 154 119 96 70 11948 (5424) 135 103 85 61 10936 (4965) B31 170.80 (4338.3) 4 200 153 125 92 13980 (6347) 181 139 111 81 12808 (5815) 155 122 98 70 11676 (5301) E33 170.80 (4338.3) 4 206 158 128 92 14380 (6527) 180 136 113 82 13168 (5978) 157 121 98 71 11996 (5446) B37 170.80 (4338.3) 4 222 170 140 101 15060 (6837) 200 151 125 92 13776 (6254) 174 134 110 81 12532 (5690) E39 170.80 (4338.3) <t< td=""><td>B17</td><td>89.60 (2275.8)</td><td>4</td><td>104</td><td>79</td><td>63</td><td>44</td><td>9780 (4440)</td><td>92</td><td>69</td><td>56</td><td>37</td><td>9080 (4122)</td><td>80</td><td>60</td><td>48</td><td>32</td><td>8380 (3805)</td></t<>	B17	89.60 (2275.8)	4	104	79	63	44	9780 (4440)	92	69	56	37	9080 (4122)	80	60	48	32	8380 (3805)
E28 170.80 (4338.3) 4 176 135 110 78 13000 (5902) 154 119 96 70 11948 (5424) 135 103 85 61 10936 (4965) B31 170.80 (4338.3) 4 200 153 125 92 13980 (6347) 181 139 111 81 12808 (5815) 155 122 98 70 11676 (5301) E33 170.80 (4338.3) 4 206 158 128 92 14380 (6527) 180 136 113 82 13168 (5978) 157 121 98 71 11996 (5446) B37 170.80 (4338.3) 4 222 170 140 101 15060 (6837) 200 151 125 92 13776 (6254) 174 134 110 81 12532 (5690) E39 170.80 (4338.3) 4 228 178 145 105 15700 (7128) 202 157 128 93 14352 (6516) 175 137 112 82 13044 (5922) 1374 170.80 (4338.3) 4	B27	170.80 (4338.3)	4	175	135	110	80	12600 (5720)	156	121	95	69	11588 (5261)	137	105	86	61	10616 (4820)
B31 170.80 (4338.3) 4 200 153 125 92 13980 (6347) 181 139 111 81 12808 (5815) 155 122 98 70 11676 (5301) E33 170.80 (4338.3) 4 206 158 128 92 14380 (6527) 180 136 113 82 13168 (5978) 157 121 98 71 11996 (5446) B37 170.80 (4338.3) 4 222 170 140 101 15060 (6837) 200 151 125 92 13776 (6254) 174 134 110 81 12532 (5690) E39 170.80 (4338.3) 4 228 178 145 105 15700 (7128) 202 157 128 93 14352 (6516) 175 137 112 82 13044 (5922) B47 170.80 (4338.3) 4 360 280 212 152 19200 (8717) 328 238 191 134 17500 (7945) 284 206 166 118 15840 (7191) E50 170.80 (4338.3) <td>E28</td> <td>170.80 (4338.3)</td> <td>4</td> <td>176</td> <td>135</td> <td>110</td> <td>78</td> <td>13000 (5902)</td> <td>154</td> <td>119</td> <td>96</td> <td>70</td> <td>11948 (5424)</td> <td>135</td> <td>103</td> <td>85</td> <td>61</td> <td>10936 (4965)</td>	E28	170.80 (4338.3)	4	176	135	110	78	13000 (5902)	154	119	96	70	11948 (5424)	135	103	85	61	10936 (4965)
E33 170.80 (4338.3) 4 206 158 128 92 14380 (6527) 180 136 113 82 13168 (5978) 157 121 98 71 11996 (5446) B37 170.80 (4338.3) 4 222 170 140 101 15060 (6837) 200 151 125 92 13776 (6254) 174 134 110 81 12532 (5690) E39 170.80 (4338.3) 4 228 178 145 105 15700 (7128) 202 157 128 93 14352 (6516) 175 137 112 82 13044 (5922) B47 170.80 (4338.3) 4 360 280 212 152 19200 (8717) 328 238 191 134 17500 (7945) 284 206 166 118 15840 (7191) E50 170.80 (4338.3) 4 322 248 201 144 19360 (8789) 280 217 177 127 17644 (8019) 243 190 153 111 15968 (7249)	B31	170.80 (4338.3)	4	200	153	125	92	13980 (6347)	181	139	111	81	12808 (5815)	155	122	98	70	11676 (5301)
B37 170.80 (4338.3) 4 222 170 140 101 15060 (6837) 200 151 125 92 13776 (6254) 174 134 110 81 12532 (5690) E39 170.80 (4338.3) 4 228 178 145 105 15700 (7128) 202 157 128 93 14352 (6516) 175 137 112 82 13044 (5922) B47 170.80 (4338.3) 4 360 280 212 152 19200 (8717) 328 238 191 134 17500 (7945) 284 206 166 118 15840 (7191) E50 170.80 (4338.3) 4 322 248 201 144 19360 (8789) 280 217 177 127 17644 (8019) 243 190 153 111 15968 (7249)	E33	170.80 (4338.3)	4	206	158	128	92	14380 (6527)	180	136	113	82	13168 (5978)	157	121	98	71	11996 (5446)
E39 170.80 (4338.3) 4 228 178 145 105 15700 (7128) 202 157 128 93 14352 (6516) 175 137 112 82 13044 (5922) B47 170.80 (4338.3) 4 360 280 212 152 19200 (8717) 328 238 191 134 17500 (7945) 284 206 166 118 15840 (7191) E50 170.80 (4338.3) 4 322 248 201 144 19360 (8789) 280 217 177 127 17644 (8019) 243 190 153 111 15968 (7249)	B37	170.80 (4338.3)	4	222	170	140	101	15060 (6837)	200	151	125	92	13776 (6254)	174	134	110	81	12532 (5690)
B47 170.80 (4338.3) 4 360 280 212 152 19200 (8717) 328 238 191 134 17500 (7945) 284 206 166 118 15840 (7191) E50 170.80 (4338.3) 4 322 248 201 144 19360 (8789) 280 217 177 127 17644 (8019) 243 190 153 111 15968 (7249)	E39	170.80 (4338.3)	4	228	178	145	105	15700 (7128)	202	157	128	93	14352 (6516)	175	137	112	82	13044 (5922)
E50 170.80 (4338.3) 4 322 248 201 144 19360 (8789) 280 217 177 127 17644 (8019) 243 190 153 111 15968 (7249)	B47	170.80 (4338.3)	4	360	280	212	152	19200 (8717)	328	238	191	134	17500 (7945)	284	206	166	118	15840 (7191)
	E50	170.80 (4338.3)	4	322	248	201	144	19360 (8789)	280	217	177	127	17644 (8019)	243	190	153	111	15968 (7249)

① All battery cabinets are 74.4 (1889.8 mm) inches height x 31.6 (802.6 mm) inches depth.

2 Maximum installed weight with largest breaker.

Powerware 9390

Table 41.3-33. Powerware 9390 100 to 160 kVA Run Times: 208 Vac Systems, 60 Hz $\,$

kVA			100	120	160	Weight	100	120	160	Weight	100	120	160	Weight
kW			90	108	144	lb. (kg) ②	90	108	144	lb. (kg) ②	90	108	144	lb. (kg) ②
Nominal DC Link Vol	tage		480	480	480		432	432	432		384	384	384	
Battery Type	Width in Inches (mm) ^①	No. of Strings	Min	utes			Min	utes						
B27	42.70 (1084.6)	1	9	7	—	3150 (1430)	—	—	—	2897 (1315)	—	—	—	2649 (1203)
E28	42.70 (1084.6)	1	10	6		3250 (1476)	—	—	—	2987 (1356)	—	—	—	2729 (1239)
B31	42.70 (1084.6)	1	11	8	—	3495 (1587)	—	—	—	3202 (1454)	—	—	—	2914 (1323)
E33	42.70 (1084.6)	1	14	10	—	3595 (1632)	—	—	—	3292 (1495)	—	—	—	2994 (1359)
B37	42.70 (1084.6)	1	15	11	7	3765 (1709)	—	—	—	3444 (1564)		—	—	3128 (1420)
E39	42.70 (1084.6)	1	11	13	7	3925 (1782)	—	—	—	3588 (1629)	—	—	—	3256 (1478)
B47	42.70 (1084.6)	1	18	13	8	4800 (2179)	—	—	—	4375 (1986)	—	—	—	3955 (1796)
E50	42.70 (1084.6)	1	22	17	10	4840 (2197)	—	—	—	4411 (2003)	—	—	—	3987 (1810)
B27	85.40 (2169.2)	2	25	19	13	6300 (2860)	22	17	11	5794 (2630)	18	14	9	5308 (2410)
E28	85.40 (2169.2)	2	27	22	15	6500 (2951)	24	20	13	5974 (2712)	21	17	10	5468 (2482)
B31	85.40 (2169.2)	2	30	24	16	6990 (3173)	27	21	13	6404 (2907)	23	17	11	5838 (2650)
E33	85.40 (2169.2)	2	33	27	19	7190 (3264)	29	24	17	6584 (2989)	25	21	14	5998 (2723)
B37	85.40 (2169.2)	2	36	29	20	7530 (3418)	32	26	17	6888 (3127)	28	22	15	6266 (2845)
E39	85.40 (2169.2)	2	38	31	23	7850 (3564)	34	28	20	7176 (3258)	29	24	18	6522 (2961)
B47	85.40 (2169.2)	2	51	40	27	9600 (4358)	46	34	22	8750 (3973)	37	29	18	7920 (3596)
E50	85.40 (2169.2)	2	51	41	30	9680 (4395)	45	37	27	8822 (4005)	39	32	24	7984 (3625)
B27	128.10 (3253.7)	3	43	34	23	9450 (4290)	37	30	20	8691 (3946)	32	25	17	7962 (3615)
E28	128.10 (3253.7)	3	43	35	26	9750 (4427)	38	31	23	8961 (4068)	33	27	20	8202 (3724)
B31	128.10 (3253.7)	3	52	40	28	10485 (4760)	45	35	24	9606 (4361)	38	30	21	8757 (3976)
E33	128.10 (3253.7)	3	51	42	31	10785 (4896)	46	37	27	9876 (4484)	40	33	24	8997 (4085)
B37	128.10 (3253.7)	3	59	49	34	11295 (5128)	54	42	29	10332 (4691)	47	36	25	9399 (4267)
E39	128.10 (3253.7)	3	59	48	35	11775 (5346)	53	43	31	10764 (4887)	46	38	28	9783 (4441)
B47	128.10 (3253.7)	3	83	67	48	14400 (6538)	74	60	41	13125 (5959)	64	51	34	11880 (5394)
E50	128.10 (3253.7)	3	80	65	47	14520 (6592)	71	58	42	13233 (6008)	62	51	37	11976 (5437)
B27	170.80 (4338.3)	4	60	50	34	12600 (5720)	55	43	30	11588 (5261)	47	37	25	10616 (4820)
E28	170.80 (4338.3)	4	60	49	35	13000 (5902)	52	43	31	11948 (5424)	47	38	27	10936 (4965)
B31	170.80 (4338.3)	4	69	58	40	13980 (6347)	61	52	35	12808 (5815)	55	44	30	11676 (5301)
E33	170.80 (4338.3)	4	71	57	42	14380 (6529)	63	51	37	13168 (5978)	55	45	33	11996 (5446)
B37	170.80 (4338.3)	4	80	65	50	15060 (6837)	71	59	41	13776 (6254)	62	53	36	12532 (5690)
E39	170.80 (4338.3)	4	81	66	49	15700 (7128)	72	59	43	14352 (6516)	63	52	38	13044 (5922)
B47	170.80 (4338.3)	4	115	92	66	19200 (8717)	100	84	59	17500 (7945)	90	72	51	15840 (7191)
E50	170.80 (4338.3)	4	110	90	65	19360 (8789)	98	80	58	17644 (8019)	86	70	51	15968 (7249)

^① All battery cabinets are 74.4 (1889.8 mm) inches height x 31.6 (802.6 mm) inches depth.

^② Maximum installed weight with largest breaker.

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41.3-31

Powerware 9390



Figure 41.3-24. 9390 Battery Cabinet Internal Wiring (2-Pole)



Figure 41.3-25. 9390 Battery Cabinet Internal Wiring (3-Pole)



Figure 41.3-26. 9390 Multiple Battery Cabinet Interconnect Wiring

Powerware 9390

UPS Model	Battery	No. of	Cabinet	Wire Size		Terminations	Torque	Screw Size
kVA	Туре	Cabinets	Position	UPS to Battery	Battery to Battery	-	Nm (lb. in)	and Type
Powerware 93	390 Model IBC-S		4	•		1	1	
40 and 50	B12, B17, B20	1, 2, 3 or 4	Line-up-and-Match	Supplied 1 per Pole	Supplied 1 per Pole	1 - #6-500 kcmil 2 - 1 Bolt Mounting	56.5 (500) 22.6 (200)	1/2" Allen 3/8" Hex nu
	B12, B17, B20	1, 2, 3 or 4	Stand-alone	1/0 1 per Pole	1/0 1 per Pole	1 - #6-500 kcmil 2 - 1 Bolt Mounting	56.5 (500) 22.6 (200)	1/2" Allen 3/8" Hex nu
60	B12, B17, B20	1, 2, 3 or 4	Line-up-and-Match	Supplied 1 per Pole	Supplied 1 per Pole	1 - #6-500 kcmil 2 - 1 Bolt Mounting	56.5 (500) 22.6 (200)	1/2" Allen 3/8" Hex nu
	B12, B17, B20	1, 2, 3 or 4	Stand-alone	2/0 1 per Pole	2/0 1 per Pole	1 - #6-500 kcmil 2 - 1 Bolt Mounting	56.5 (500) 22.6 (200)	1/2" Allen 3/8" Hex nu
80	B12, B17, B20	1, 2, 3 or 4	Line-up-and-Match	Supplied 1 per Pole	Supplied 1 per Pole	1 - #6-500 kcmil 2 - 1 Bolt Mounting	56.5 (500) 22.6 (200)	1/2" Allen 3/8" Hex nu
	B12, B17, B20	1, 2, 3 or 4	Stand-alone	3/0 1 per Pole	3/0 1 per Pole	1 - #6-500 kcmil 2 - 1 Bolt Mounting	56.5 (500) 22.6 (200)	1/2" Allen 3/8" Hex nu
Powerware 93	390 Model IBC-L	•						
40 and 50	B27, B31, B37, B47	1, 2, 3 or 4	Line-up-and-Match	Supplied 1 per Pole	Supplied 1 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
	B27, B31, B37, B47	1, 2, 3 or 4	Stand-alone	1/0 1 per Pole	1/0 1 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
60	B27, B31, B37, B47	1, 2, 3 or 4	Line-up-and-Match	Supplied 1 per Pole	Supplied 1 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
	B27, B31, B37, B47	1, 2, 3 or 4	Stand-alone	2/0 1 per Pole	2/0 1 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
80	B27, B31, B37, B47	1, 2, 3 or 4	Line-up-and-Match	Supplied 1 per Pole	Supplied 1 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
	B27, B31, B37, B47	1, 2, 3 or 4	Stand-alone	3/0 1 per Pole	3/0 1 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
100	B27, B31, B37, B47	1, 2, 3 or 4	Line-up-and-Match	Supplied 2 per Pole	Supplied 2 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
	B27, B31, B37, B47	1, 2, 3 or 4	Stand-alone	2/0 2 per Pole	2/0 2 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
120	B27, B31, B37, B47	1, 2, 3 or 4	Line-up-and-Match	Supplied 2 per Pole	Supplied 2 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
	B27, B31, B37, B47	1, 2, 3 or 4	Stand-alone	2/0 2 per Pole	3/0 2 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
160	B27, B31, B37, B47	1, 2, 3 or 4	Line-up-and-Match	Supplied 2 per Pole	Supplied 2 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375) 22.6 (200)	3/8" Hex M10 Hex
	B27, B31, B37, B47	1, 2, 3 or 4	Stand-alone	250 kcmil 2 per Pole	250 kcmil 2 per Pole	2 - #2-600 kcmil 2 - 1 Bolt Mounting	42.4 (375)	3/8" Hex M10 Hex

Note: All specified wire sizes are 90°C rated copper minimum.

Uninterruptible Power Supplies — Powerware 3-Phase Units

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Figure 41.3-29. 9390 Multiple Battery Cabinet Interconnect Wiring





Powerware 9390

Integrated Distribution Cabinet[™] for the Powerware 9390 UPS

Power Protection and Distribution for Data Centers

Powerware's Integrated Distribution Cabinet is specifically designed to complement the new Powerware 9390 family of three-phase Uninterruptible Power Systems (UPSs). This cabinet integrates with the 9390 UPS models and is designed for the specific power rating of the 9390 UPS models from 40 kVA to 160 kVA.

With this optional cabinet, Powerware offers a complete, one-stop shop for power protection and distribution solutions that is easy to design, install, customize and manage, while delivering "pay-as-you-grow" scalability for future expansion.



Figure 41.3-31. Typical Application of Powerware 9390 Integrated Distribution Cabinet Distributing Power to IT Racks

Preconfigured for ease-of-use, mix-and-match for flexibility

The Integrated Distribution Cabinet is preconfigured with the most popular power distribution options for ease of design and installation.

In addition, it offers the flexibility to mix and match power distribution, voltage transformation, and maintenance bypass options to select the right combination of functions for your data center requirements.

Power Distribution

 Options enable you to distribute power to servers or racks via distribution panelboards, or distribute power to larger loads via distribution circuit breakers.

Voltage Transformation

Allows you to change output voltage levels. For instance, you could convert 480 Vac output from the UPS into 208/ 120 Vac output to serve single-phase loads. You can also add an isolation transformer if required.

Maintenance Bypass

Enables power to completely bypass the UPS power module. You can then service or replace the UPS module in complete safety, without interrupting power to critical systems.

Customized for Today's Needs, Scalable for Tomorrow's Growth

In today's economy, "pay as you grow" is more than a catch phrase; it's a way of life. So is the need to balance the often-conflicting requirements of budgets, operational demands, and future growth.

Powerware addresses these realities with a flexible architecture that lets you configure just the right combination of functions to complement your UPS. You save money by only specifying what your system currently needs — while keeping your options open for future expansion.

Simplified Installation and Clean Appearance

The Integrated Distribution Cabinet has the same look and finish as the Powerware 9390 UPS system it complements. The cabinet is shipped with interconnecting cables for fast and easy installation with the Powerware 9390 UPS. The result is a clean look that enhances the appearance of your data center.

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Integrated Management and Support for Enhanced Confidence

The 9390 UPS models can be monitored and managed by Powerware software such as LanSafe[™], PowerVision[®], and FORESEER[®]. This close integration provides greater visibility to your complete power protection infrastructure.

Powerware also backs up the Integrated Distribution Cabinet with the standard one-year limited factory warranty we offer on the 9390 UPS models. You can have the confidence that both your power protection and distribution are supported by Powerware's best-in-class Global Services organization and strong customer service commitments.

To find out more about the Integrated Distribution Cabinet option or the new Powerware 9390 UPS, visit our website at www.powerware.com/9390, or contact us at 1-800-356-5794.

Table 41.3-35. 9390 40 to 80 kVA Integrated Distribution Cabinet Technical Specifications

Description	Specification
General Characteristics	
Installation	Line Up and Match to UPS
	Front Access Only
Color	Same as UPS
Construction	NEMA [®] 1 Ventilated
Input Voltage	208, 480
Output Voltage Isolation Distribution	208, 208/120 V 208/120 V
Dimensions Inches (mm) 40 – 80 kVA	35.60 W X 31.60 D X 74.40 H (904.2 W X 802.6 D X 1890.0 H)
Weight	1200 lbs (545 kg) (Maximum)
Certification	
Safety	UL 1778
Markings	UL, cUL
User Interface	
Cable Entry	Top or Bottom
EPO Switch	Optional
Transformer Option	
Electrostatic Shield	Standard
Insulation	150°C Rise, Class H
Impedance	5% (Maximum)
K-factor	K1; K13; K20
Compensation Taps:	2-FCAN, 4-FCBN Standard
Overload Protection:	Input Breaker Standard
Power Distribution Option	
Panelboard Distribution Quantity Voltage Main Breaker Circuits	2 (Maximum) 208/120 V 225 A, 65 kAIC 84 (Maximum)
Distribution Breakers (in Lieu of Panelboards) Quantity Voltage Size Maintenance Bypass Option	6 (Maximum) ^① 208/120 V 225 A, 65 kAIC

Optional

Maintenance Bypass

 $\ensuremath{\textcircled{}}$ Three in combination with one panelboard.

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Uninterruptible Power Supplies — Powerware 3-Phase Units

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Powerware 9390



Figure 41.3-32. 9390 UPS, IBC-L and IDC Lineup

Table 41.3-36. Powerware 9390 40 - 80 kVA IDC Equipment Weight

Component/Model	Weight kg	Weight kg (lb.)					
	Shipping	Installed	Point Loading				
Powerware 9390 80 kVA IDC with Maintenance Bypass Switch and Input Breaker	236 (520)	213 (470)	6 at 35.5 (78.3)				

Note: For IDC with Transformer, add 331 kg (730 lb.).

For IDC with Distribution Panels, add 11.3 kg (25 lb.) for each panel. For IDC with Distribution Breakers, add 6.8 kg (15 lb.) for each breaker. For IDC with Output Lugs, add 2.3 kg (5 lb.).

Table 41.3-37. Table B. Powerware 9390 40 – 80 kVA IDC Air Conditioning or Ventilation Requirements During Full Load Operation

Component/Model	Input/Output Voltage	Heat Rejection BTU/hr X 1000/hr (kg-cal/hr)
IDC-80 without Transformer	N/A	N/A
IDC-80 with Transformer	208/208	7.4 (1.8)
IDC-80 with Transformer	480/208	7.4 (1.8)



Figure 41.3-33. 9390 (40 – 80 kVA) UPS, IBC-L and IDC One-line

Table 41.3-38. Input/Output Ratings and External Wiring Requirements for Powerware 9390 80 kVA IDC

Description	Units	Rating 60 Hz							
Basic Unit Rating	UPS kVA	40/50/6080	40/50/60/80						
IDC Input and Bypass Input IDC Output	Volts Volts	208 208	480 208						
A — AC Input from UPS — Sta	nd-alone Installa	tion	·,						
(3) Phases, (1) Neutral- if required, (1) Ground	Amps	111/155/185/222	48/67/80/96						
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	1	1						
B — AC Input to Maintenance	Bypass — Stand	-alone Installation	,,						
(3) Phases, (1) Neutral- if required, (1) Ground	Amps	111/155/185/222	48/67/80/96						
Minimum Conductor Size Number per PhaseAWG or kcmil (each)2/01/0(2)(1)									
C — AC Output from 225 A Dist	ribution Breaker	to Critical Load							
(3) Phases, (1) Neutral, (1) Ground	Wire branch ci circuit breaker national and lo	rcuits according to manufacturer's ra ocal electrical code) the branch tings, and es.						
C — AC Output from Output Ter	minal Block to C	ritical Load	,						
(3) Phases, (1) Neutral, (1) GroundWire output according to national and local electrical codes. Refer to the Powerware 9390 UPS (40 – 80 kVA) Installation and Operation Manual for output current rating and wire size.									
C — AC Output from Distribution Panel Breakers to Critical Load									
Wire branch circuits according to the branch circuit breaker manufacturer's ratings and instructions, and national and local electrical codes (output is prewired to the panelboard).									
 For contractor-supplied wiring, refer to the Powerware 9390 UPS (40 – 80 kVA) Installation and Operation Manual for wire size. Wiring for Line-up-and-Match cabinet installation is factory supplied. 									

Powerware 9390

Table 41.3-39. IDC-80 Pov	ver Cable Termi	nations 208 V/208 V			
Terminal	Function	Size of Pressure Termination	Tightening Torq	ue Nm (Ib. in)	Screw Type
AC Input from UPS (with Ma	intenance Bypass	5)			
S1–3 S1–7 S1–11	Phase A Phase B Phase C	2 - #14-2/0 2 - #14-2/0 2 - #14-2/0	2/0-#3: #4-#6: #8: #10-#14:	5.6 (50) 5.0 (45) 4.5 (40) 4.0 (35)	Slotted Slotted Slotted
AC Input to Maintenance By	pass (with Mainte	enance Bypass)			
S1–1 S1–5 S1–9	Phase A Phase B Phase C	2 - #14-2/0 2 - #14-2/0 2 - #14-2/0 2 - #14-2/0	2/0-#3: #4-#6: #8: #10-#14:	5.6 (50) 5.0 (45) 4.5 (40) 4.0 (35)	Slotted Slotted Slotted
AC Input from UPS (without	Maintenance Byp	ass)			
CB1-2 CB1-4 CB1-6	Phase A Phase B Phase C	2 - #14-2/0 2 - #14-2/0 2 - #14-2/0	2/0-#3: #4-#6: #8: #10-#14:	5.6 (50) 5.0 (45) 4.5 (40) 4.0 (35)	1/4 in. Hex 1/4 in. Hex 1/4 in. Hex
Input Neutral from UPS (Mo	dels without a Tra	nsformer) — if Required			
E4	Neutral	4 - #4-300 kcmil	31 (275)		5/16 in. Hex
Input Neutral from Bypass (I	Nodels without a	Transformer) — if Required			
E4	Neutral	4 - #4-300 kcmil	31 (275)		5/16 in. Hex
Input Ground					
E9	Ground	2 - #14-1/0	5.6 (50)		Slotted
AC Output from 225 A Distrib	oution Breaker to	Critical Load			
CBxx-1 CBxx-3 CBxx-5	Phase A Phase B Phase C	1 - #4-300 kcmil 1 - #4-300 kcmil 1 - #4-300 kcmil	22.6 (200) 22.6 (200) 22.6 (200)		1/4 Hex 1/4 Hex 1/4 Hex
E10, E20 E18, E19, E28, E29	Neutral Ground	4 ea #4-300 kcmil 2 ea #14-1/0	31 (275) 5.6 (50)		5/16 Hex Slotted
AC Output from Output Term	inal Block to Criti	cal Load			
E11 E12 E13	Phase A Phase B Phase C	2 - #6-250 kcmil 2 - #6-250 kcmil 2 - #6-250 kcmil	42.4 (375) 42.4 (375) 42.4 (375)		5/16 in. Hex 5/16 in. Hex 5/16 in. Hex
E10 E19	Neutral Ground	4 - #4-300 kcmil 2 - #14-1/0	31 (275) 5.6 (50)		5/16 in. Hex Slotted
AC Output from Distribution	Panel Breakers to	o Critical Load 1			
PB1–N PB2–N	Neutral	45 – #4-#14	#4-#6: #8: #10-#14:	4.0 (35) 2.8 (25) 2.3 (20)	Slotted
E18, E19, E28, E29	Ground	46 – #4-#14 or 2 each #12–#14	#4-#6: #8: #10-#14: #12-#14:	4.0 (35) 2.8 (25) 2.3 (20) 2.8 (25)	Slotted

① Wire branch circuits according to the branch circuit breaker manufacturer's ratings and instructions (output is prewired to the panelboard).

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Table 41.3-40. IDC-80 Pc	ower Cable Termi	nations 480 V/208 V			
Terminal	Function	Size of Pressure Termination	Tightening Torqu	ue Nm (lb. in)	Screw Type
AC Input from UPS (with N	laintenance Bypas	5)			
S1–3 S1–7 S1–11	Phase A Phase B Phase C	1 - #14-2/0 1 - #14-2/0 1 - #14-2/0	2/0-#3: #4-#6: #8: #10-#14:	5.6 (50) 5.0 (45) 4.5 (40) 4.0 (35)	Slotted Slotted Slotted
AC Input to Maintenance E	Bypass (with Maint	enance Bypass)			
S1–1 S1–5 S1–9	Phase A Phase B Phase C	1 - #14-2/0 1 - #14-2/0 1 - #14-2/0	2/0-#3: #4-#6: #8: #10-#14:	5.6 (50) 5.0 (45) 4.5 (40) 4.0 (35)	Slotted Slotted Slotted
AC Input from UPS (withou	ıt Maintenance Byr	ass)			
CB1-2 CB1-4 CB1-6	Phase A Phase B Phase C	1 - #14-2/0 1 - #14-2/0 1 - #14-2/0	2/0-#3: #4-#6: #8: #10-#14:	5.6 (50) 5.0 (45) 4.5 (40) 4.0 (35)	1/4 in. Hex 1/4 in. Hex 1/4 in. Hex
Input Neutral from UPS (M	odels without a Tra	nsformer) — if Required			
E4	Neutral	4 - #4-300 kcmil	31 (275)		5/16 in. Hex
Input Neutral from Bypass	(Models without a	Transformer) — if Required			
E4	Neutral	4 - #4-300 kcmil	31 (275)		5/16 in. Hex
Input Ground					
E9	Ground	2 - #14-1/0	5.6 (50)		Slotted
AC Output from 225 A Distr	ibution Breaker to	Critical Load			
CBxx-1 CBxx-3 CBxx-5 E10, E20	Phase A Phase B Phase C Neutral	1 - #4-300 kcmil 1 - #4-300 kcmil 1 - #4-300 kcmil 4 ea #4-300 kcmil	22.6 (200) 22.6 (200) 22.6 (200) 31 (275)		1/4 Hex 1/4 Hex 1/4 Hex 5/16 Hex
E18, E19, E28, E29	Ground	2 ea #14-1/0	5.6 (50)		Slotted
AC Output from Output Ter	minal Block to Criti	cal Load			
E11 E12 E13	Phase A Phase B Phase C	2 - #6-250 kcmil 2 - #6-250 kcmil 2 - #6-250 kcmil	42.4 (375) 42.4 (375) 42.4 (375)		5/16 in. Hex 5/16 in. Hex 5/16 in. Hex
E10 E19	Neutral Ground	4 - #4-300 kcmil 2 - #14-1/0	31 (275) 5.6 (50)		5/16 in. Hex Slotted
AC Output from Distributio	n Panel Breakers t	o Critical Load 1			
PB1-N PB2-N	Neutral	45 – #4-#14	#4-#6: #8: #10-#14:	4.0 (35) 2.8 (25) 2.3 (20)	Slotted
E18, E19, E28, E29	Ground	46 – #4-#14 or 2 each #12–#14	#4-#6: #8: #10-#14: #12-#14:	4.0 (35) 2.8 (25) 2.3 (20) 2.8 (25)	Slotted

① Wire branch circuits according to the branch circuit breaker manufacturer's ratings and instructions (output is prewired to the panelboard).

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Figure 41.3-34. 9390 (40 to 80 kVA) IDC Top and Bottom View



Figure 41.3-35. 9390 (40 to 80 kVA) IDC Front and Side View



Figure 41.3-36. 9390 (40 to 80 kVA) IDC Top and Bottom View

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Uninterruptible Power Supplies — Powerware **3-Phase Units**

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Figure 41.3-37. 9390 (100 to 160 kVA) IDC-L and IDC Line-up Table 41.3-41. Powerware 9390 40 - 80 kVA IDC Equipment Weight

Component/Model	Weight Lb. (kg)		
	Shipping	Installed	Point Loading
Powerware 9390 160 kVA IDC Cabinet with Transformer and Maintenance Bypass Breakers	2250 (1021)	2185 (991)	4 at 546.3 (247.8)

Note: For IDC with Distribution Panels, add 25 lb. (11.3 kg) for each panel. For IDC with Distribution Breakers, add 15 lb. f6.8 kg) for each breaker. For IDC with Output Lugs, add 5 lb. (2.3 kg). For IDC with a BIB, add 15 lb. (6.8 kg).

For IDC with a BIB and RIB, add 30 lb. (13.6 kg).

Table 41.3-42. Powerware 9390 40-80 kVA IDC Air Conditioning or Ventilation Requirements During Full Load Operation

Component/Model	Input/Output Voltage	Heat Rejection BTU/hr X 1000/hr (kg-cal/hr)
IDC-160 with Transformer	480/208	14.8 (3.6)



Figure 41.3-38. 9390 (100 to 160 kVA) IDC with 2 Breaker Bypass



Figure 41.3-39. 9390 (100 to 160 kVA) IDC with 3 Breaker Bypass



Figure 41.3-40. 9390 (100 to 160 kVA) IDC with 4 Breaker Bypass

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Description	Units	Rating 60 Hz		
Basic Unit Rating	UPS kVA	100/120/160		
IDC Input and IDC Bypass Input	Volts	480		
A — AC Input from UPS — Stand-a	lone Installation	200		
(3) Phases, (1) Ground	Amps	120/144/192		
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	0		
B — AC Input to Maintenance Bypa Line-up-and-Match or Stand-alone	ass e Installation)	1		
(3) Phases, (1) Ground	Amps	120/144/192		
Minimum Conductor Size	AWG or kcmil	1/0		
Number per Phase	(each)	(2)		
Line-up-and-Match or Stand-alone	e Installation)			
(3) Phases, (1) Ground	Amps	130/160/210		
Minimum Conductor Size	AWG or kcmil	1/0		
Number per Phase	(each)	(2)		
D — AC Output from Optional RIB t	o UPS (Stand-alo	ne Installation)		
(3) Phases, (1) Ground	Amps	130/160/210		
Minimum Conductor Size	AWG or kcmil	1		
F — AC Output from Ontional BIB to	UPS (Stand-alo	ne Installation)		
(3) Phases, (1) Ground	Amps	120/144/192		
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	1		
F — AC Output from Distribution Br	eaker to Critical	Load		
(3) Phases, (1) Neutral, (1) Ground	Wire branch cir with branch cir ers ratings, and electrical codes	rcuits in accordance cuit breaker manufactur- d national and local s.		
F — AC Output from Output Termina	al Block to Critica	al Load		
(3) Phases, (1) Neutral, (1) Ground	Wire output in accordance with national and local electrical codes. Refer to Powerware 9390 UPS manual for output current rating and wire size.			
F — AC Output from Distribution Pa	anel Breakers to	Critical Load		
Wire branch circuits in accordan manufacturers ratings and instru-	ce with branch o uctions, and nati	circuit breaker onal and local electrical		

manual for wire size. Wiring for Line-up-and-Match installation is factory-supplied.

Read and understand the following notes while planning and performing the installation:

- 1. Refer to national and local electrical codes for acceptable external wiring practices.
- 2. Material and labor for external wiring requirements are to be provided by designated personnel.
- For external input wiring, use 90°C copper wire. Wire sizes are based on using the specified breakers.
- 4. Wire ampacities are chosen from Table 310-16 of the NEC. Input wire is 90°C specification.
- If a BIB is not installed, a minimum of two separate feeds with upstream feeder breakers must be provided. One for the for the UPS and one for the IDC bypass input. Do not use one feed for both UPS and IDC.
- 6. The IDC cabinet is shipped with a debris shield covering the ventilation grill on top of the unit. Do not remove the debris shield until installation is complete. However, remove the shield before operating the IDC. Once the debris shield is removed, do not place objects on the ventilation grill.
- 7. Optional 225A Distribution Panel uses Cutler-Hammer type CH breakers to be provided by the customer.
- 8. Refer to Section I of the manual for installation instructions.
- Refer to the Powerware 9390 UPS (100 160 kVA) Installation and Operation Manual for UPS cabinet conduit and terminal locations.
- 10. Terminals are UL and CSA rated at 90°C. Refer to the table for power cable terminations.
- 11. Per NEC article 300-20(a), all three-phase conductors must be run in the same conduit. Neutral and ground must be run in the same conduit as the phase conductors.

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Table 41.3-44. IDC-160	Power Cable Ter	minations 480 V/208 V			
Terminal	Function	Size of Pressure Termination	Tightening Torque Nm (lb. in)	Screw Type
AC Input from UPS					
E54	Phase A	2 - #6-250 kcmil	42.4 (375)		5/16 in. Hex
E55	Phase B	2 - #6-250 kcmil	42.4 (375)		5/16 in. Hex
E56	Phase C	2 - #6-250 kcmil	42.4 (375)		5/16 in. Hex
C Input to Maintenance	Bypass				1
F51	Phase A	2 - #6-250 kcmil	42 4 (375)		5/16 in Hex
F52	Phase B	2 - #6-250 kcmil	42 4 (375)		5/16 in Hex
E53	Phase C	2 - #6-250 kcmil	42.4 (375)		5/16 in. Hex
C Input to Optional RIB					
F57	Phase A	2 - #6-250 kcmil	42,4 (375)		5/16 in. Hex
E59	Phase B	2 - #6-250 kcmil	12.4 (375)		5/16 in Hey
E50	Phase C	2 - #6-250 kcmil	42.4 (375)		5/16 in Hex
C Output from Ontional F	RIR (CR4) to LIPS	2 10 200 Komm	42.4 (676)		0, 10 III. 110X
	Phone A	1 #4 250 komil	20.2 (190)		2/16 in Hay
	Phase P	1 #4.250 komil	20.3 (100)		2/16 in Hov
	Phone C	1 #4.250 komil	20.3 (100)		2/16 in Llas
	Phase C	1 - #4-350 KCMII	20.3 (180)		3/ 16 In. Hex
C Output from Optional E	BIB to UPS (without	t RIB)			I
E57	Phase A	2 - #6-250 kcmil	42.4 (375)		5/16 in. Hex
E58	Phase B	2 - #6-250 kcmil	42.4 (375)		5/16 in. Hex
E59	Phase C	2 - #6-250 kcmil	42.4 (375)		5/16 in. Hex
AC Output from Optional E	BIB (CB3) to UPS (w	rithout RIB)			
BIB-1	Phase A	1 - #4-350 kcmil	20.3 (180)		3/16 in. Hex
BIB-3	Phase B	1 - #4-350 kcmil	20.3 (180)		3/16 in. Hex
BIB-5	Phase C	1 - #4-350 kcmil	20.3 (180)		3/16 in. Hex
Ground					
F8	Ground	2 - #14-1/0	5.6 (50)		Slotted
E9	Ground	2 - #14-1/0	5.6 (50)		Slotted
AC Output from Distributio	on Breaker to Critic	al Load			
CBxx-2	Phase A	1 - #4-350 kcmil	20.3 (180)		3/16 in Hex
CBxx_4	Phase R	1 - #4-350 kcmil	20.3 (180)		3/16 in Hev
CBxx-6	Phase C	1 - #4-350 kcmil	20.3 (180)		3/16 in Hey
E10 E20	Noutral	4 oo #4 200 komit	21 (275)		E/16 Llass
E IU, EZU	Neutral	4 ea #4-300 kcmll	31 (2/5)		D/ ID HEX
E 10, E 19, E28, E29	Ground	2 ea #14-1/0	5.6 (50)		Slotted
to output from output lei	rminal Block to Crit				
E11	Phase A	2 - #6-500 kcmil	56.5 (500)		1/2 in. Hex
E12	Phase B	2 - #6-500 kcmil	56.5 (500)		1/2 in. Hex
E13	Phase C	2 - #6-500 kcmil	56.5 (500)		1/2 in. Hex
E10	Neutral	4 - #6-500 kcmil	56.5 (500)		1/2 in. Hex
E19	Ground	2 - #14-1/0	5.6 (50)		Slotted
\C Output from Distribution	on Panel Breakers	to Critical Load 1			
PB1–N	Neutral	42 – #4-#14	#4-#6:	4.0 (35)	Slotted
PB2–N			#8:	2.8 (25)	
			#10-#14:	2.3 (20)	
E18, E19, E28, E29	Ground	42 – #4-#14	#4-#6:	4.0 (35)	Slotted
, ,,			#8:	2.8 (25)	
			#10-#14:	2.3 (20)	

① Wire branch circuits according to the branch circuit breaker manufacturer's ratings and instructions (output is prewired to the panelboard).

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Figure 41.3-42. 9390 (100 to 160 kVA) IDC with 2 Breaker Bypass

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[128,8 [44,44] 987,425 [38.88] 1 377,825 TOP VIEW OP VENTILATION TRY OPTION tana tang ata atau 1128,8 987,425 377,825 TOP VIEW VENTILATION (WITH TOP ENTRY OPTION) 250 TOP CONDUIT LANDING - INPUT TOP COND OUTPUT

Figure 41.3-43. 9390 (100 to 160 kVA) IDC with 3 Breaker Bypass



Figure 41.3-44. 9390 (100 to 160 kVA) IDC with 4 Breaker Bypass



Figure 41.3-45. 9390 (100 to 160 kVA) IDC with 4 Breaker Bypass

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The Powerware 9390 Integrated Accessory Cabinets

The IAC is designed for use with the Powerware 9390 40 kVA to 160 kVA three-phase Uninterruptible Power Systems. The IAC provides maintenance bypass, parallel tie cabinet, or parallel tie cabinet with maintenance bypass functions with the following custom configurable features, enabling adaptation and expansion without costly electrical rework.

The IAC comes in two physical sizes, a small cabinet mounted on the side of the UPS and a larger freestanding cabinet. The cabinet function UPS sized voltage determines which size cabinet is used. The IAC-SB and IAC-ST are slim-line cabinets which are shipped attached to the side of the UPS system. These cabinets give the UPS system the smallest footprint possible.

Maintenance Bypass Configuration

Maintenance Bypass (MBP) and Maintenance Isolation (MIS) breakers enable power to completely bypass the UPS power module. The UPS module can then be safely serviced or replaced, without interrupting power to critical systems. An optional Bypass Input Breaker (BIB) and Rectifier Input Breaker (RIB) provide a single wiring point input to the UPS and a convenient method for removing power from the UPS, when using the maintenance bypass to supply the load.

Parallel Redundant Configuration

Module Output Breakers (MOB) 1 and 2 enable two UPS modules to be paralleled together for redundancy. An optional System Load Breaker (SLB) provides output control to the critical load for the whole system.

Parallel Redundant Configuration with Maintenance Bypass

Module Output Breakers (MOB) 1 and 2 enable two UPS modules to be paralleled together for redundancy. Optional Maintenance Bypass (MBP) and Maintenance Isolation (MIS) breakers enable power to completely bypass the UPS power module.

The IAC-B and IAC-T are housed in a single, freestanding cabinet, with safety shields behind the doors for hazardous voltage protection. The cabinet matches the UPS cabinet in style and color, and can be installed in line-up-and-match or stand-alone configurations.

IAC Standard Features

The IAC has many standard features that provide a cost-effective and reliable power system. The descriptions provide a brief overview of the IAC controls, and standard and optional features.

Maintenance Bypass Configuration

A Maintenance Bypass switch (MBP), in combination with the Maintenance Isolation switch (MIS), can be used to completely isolate the UPS during service. The UPS can be serviced or replaced without interrupting power to critical systems.

Parallel Redundant Configuration

Module Output Breakers (MOBs) 1 and 2 enable two UPS modules to be paralleled together for redundancy. An optional System Level Breaker provides output control to the critical load for the whole system.

Parallel Redundant Configuration with Maintenance Bypass

MOBs 1 and 2 enable two UPS modules to be paralleled together for redundancy. The MBP, in combination with the MIS, can be used to completely isolate the UPS during service without interrupting power to critical systems.

Control Interface

The IAC uses one UPS building alarm input for Maintenance Bypass switch monitoring. This alarm input will detect when the Maintenance Bypass switch is closed and the system is on bypass.

Installation Features

The IAC-B and IAC-T can be installed in line-up-and-match or stand-alone configurations. The cabinet can be permanently bolted to the floor or left standing on leveling feet. Power and control wiring can be routed through the top or bottom of the cabinet with connections made to easily accessible terminals. Line-up-and-match cabinets are wired through knockouts in the side panels of the units.

Expansion

The IAC supports custom configurations and scalability to adapt to changing and future power and distribution needs.

Options

Contact your sales representative for information about any of these available options:

Bypass Input Breaker

Maintenance bypass configurations have an optional Bypass Input Breaker for single-feed and dualfeed systems. The BIB provides a single point of input power control to the UPS and easily removes power from the UPS for servicing.

Rectifier Input Breaker

Maintenance bypass configurations have an optional Rectifier Input Breaker for dual-feed systems. The RIB provides a single point of rectifier input power control to the UPS and easily removes power from the UPS for servicing.

System Load Breaker

A parallel redundant configuration with an optional System Load Breaker is available to control the output to the critical load for the whole system.

Powerware 9390

The Powerware 9390 Integrated Accessory Cabinet-Distribution (IAC-D)

The IAC-D is designed for use with the Powerware 9390 three-phase Uninterruptible Power Systems. The IAC-D provides power distribution options for servers, racks and other equipment via distribution panelboards, or distributes power to larger loads via distribution circuit breakers. The distribution options are custom configurable, enabling adaptation and expansion without costly electrical rework.

The IAC-D is housed in a single, free-standing cabinet, with safety shields behind the doors for hazardous voltage protection. The cabinet matches the UPS cabinet in style and color, and can be installed in line-up-and-match or stand-alone configurations. **Figure 41.3-46** shows the Powerware 9390 IAC-D.

Configurations

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The following IAC-D configurations are possible:

- One or two 225 A distribution panels (208 V only).
- One to six 40 100 A adjustable distribution breakers (208 V or 480 V).
- One to six 100 250 A adjustable distribution breakers (208 V or 480 V).
- One 225 A distribution panel and one to three 100 – 250 A adjustable distribution breakers (208 V only).
- One 225 A distribution panel and one to three 40 – 100 A adjustable distribution breakers (208 V only).

- 1. The IAC-D equipment operating environment must meet the weight requirements shown in Table A and size requirements shown in **Figure 41.3-46**.
- 2. The IAC-D cabinet is palleted separately for shipping.
- 3. Do not tilt cabinets more than $\pm 10^{\circ}$ during handling.
- 4. Dimensions are in millimeters (inches).

Table 41.3-45. Equipment Weight

Component/Model	Weight lbs. (kg) 123				
	Shipping	Installed	Point Loading		
Powerware 9390 IAC–D (cabinet only)	465 (210.9)	415 (188.2)	103.8 (4 at 47.1)		

© For IAC–D with Distribution Panels, add 25 lbs (11.3 kgs) for each panel.

⁽²⁾ For IAC-D with Distribution Breakers, add 15 lbs (6.8 kgs) for each breaker.

 $\ensuremath{^{\textcircled{3}}}$ For IAC–D with Cosmetic Covers, add 60 lbs (27.2 kgs).

5. The clearances required around the IAC-D cabinet are shown in Table 41.3-47

Table 41.3-46. IAC-D Cabinet Clearances

Area	Dimensions in Inches (mm)
From Top of Cabinet	Minimum Clearance Over the IAC–D Cabinet is 18 inches (457.2 mm) for Ventilation
From Front of Cabinet	36 inches (914.4 mm) Working Space
From Back of Cabinet	None Required
From Right Side of Cabinet	None Required
From Left Side of Cabinet	None Required

6. The basic environmental requirements for operation of the IAC-D are:

- g. Ambient Temperature Range: 0 40°C (32 104°F).
- h. Recommended Operating Range: 20 25°C (68 77°F).
- i. Maximum Relative Humidity: 95%, noncondensing.
- 7. The IAC-D ventilation requirements are shown in **Table 41.3-47**.

Table 41.3-47. Air Conditioning or Ventilation Requirements During Full Load Operation

Component/Model	Input/Output Voltage	Heat Rejection BTU/hr x 1000/hr (kg – cal/hr)
Powerware 9390 IAC-D	N/A	N/A

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Table 41.3-48. Input/Output Ratings & External Wiring Requirements for Powerware 9390 IAC-D

Description	Units	Rating 50/60 Hz		
ac Input from UPS (Standalone Installation) (3) Phases, (1) Ground	Amps	Maximum input ratings are to be in accordance with the rating label on the IAC-D and not to exceed 500 A. The total combined load is not to exceed the UPS output ratings.		
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	For contractor-supplied wiring, refer to the applicable Powerware 9390 UPS Installation and Operation man- ual, listed in paragraph 1.5. Wiring should be sized in accordance with the rating label on the IAC-D. Factory supplied wiring for line-up-and-match installation is available as an option.		
ac Output from Distribution Breaker to Critical Load (3) Phases, (1) Neutral, (1) Ground	Wire brar codes. Ma total com	nch circuits in accordance with branch circuit breaker manufacturer's ratings, and national and local electrical aximum output ratings are to be in accordance with the rating label on the IAC-D and not to exceed 500A. The abined load is not to exceed the UPS output rating.		
ac Output from Distribution Panel Breakers	Wire bran local elect rating lab	ranch circuits in accordance with branch circuit breaker manufacturer's ratings and instructions, and national and lectrical codes (output is prewired to the panelboard). Maximum output ratings are to be in accordance with the label on the IAC-D and not to exceed 500 A. The total combined load is not to exceed the UPS output rating.		

Read and understand the following notes while planning and performing the installation:

- 1. Refer to national and local electrical codes for acceptable external wiring practices.
- 2. Material and labor for external wiring requirements are to be provided by designated personnel.
- 3. For external input wiring, use 90°C copper wire. See the appropriate column in **Table 41.3-48**. Wire sizes are based on using the specified breakers.
- 4. Wire ampacities are chosen from Table 310–16 of the NEC. Input wire is 90°C specification.
- 5. Optional 225A Distribution Panels use Cutler-Hammer bolt-on type BAB or ΩBHW breakers for bolt-on panels, or plug-on type HQP or ΩPHW breakers for plug-on panels. Breakers to be provided by the customer.
- 6. Refer to Section I of this manual for installation instructions.
- 7. Refer to the applicable Powerware 9390 UPS Installation and Operation manual, listed in paragraph 1.5, for UPS cabinet wiring requirements, and conduit and terminal locations.
- When Distribution Panelboards or a combination of Panelboard and Distribution Breakers are installed, input and output to the IAC-D must be 208 V. If only Distribution Breakers are installed, input and output to the IAC-D can be either 208 V or 480 V.
- 9. Per NEC article 300-20(a), all three-phase conductors must be run in the same conduit. Neutral and ground must be run in the same conduit as the phase conductors.
- 10. Conduit is to be sized to accommodate one neutral conductor the same size as the phase conductor and one ground conductor. If two neutral conductors or an oversized neutral conductor are to be installed, size the conduit to accommodate the extra wire or size. All Powerware 9390 products can accommodate a double-sized neutral.
- 11. Terminals are UL and CSA rated at 90°C. Refer to Table 41.3-49 for power cable terminations.

Terminal Function	Terminal	Function	Size of Pressure Termination	Tightening Torque Nm (Ib in) (mm)	Screw Type
ac Input	E54	Phase A	2 – #2–600 kcmil	56.5 (500)	1/2 in. Hex
from UPS	E55	Phase B	2 – #2–600 kcmil	56.5 (500)	1/2 in. Hex
	E56	Phase C	2 – #2–600 kcmil	56.5 (500)	1/2 in. Hex
	E4	Neutral	4 – #2–600 kcmil	56.5 (500)	1/2 in. Hex
	E9	Ground	2 - #14-1/0	5.6 (50)	Slotted
ac Output	CBxx-2	Phase A	1 – #4–350 kcmil	20.3 (180)	3/16 in. Hex
from	CBxx-4	Phase B	1 – #4–350 kcmil	20.3 (180)	3/16 in. Hex
Breaker to	CBxx-6	Phase C	1 – #4–350 kcmil	20.3 (180)	3/16 in. Hex
Critical Load	E10, E20	Neutral	6 ea. – #4–300 kcmil	31 (275)	5/16 Hex
	E18, E19, E28, E29	Ground	2 ea #14-1/0	5.6 (50)	Slotted
ac Output	Wire branch circuits in ac	cordance with branch circui	t breaker manufacturers ra	tings and instructions (outp	ut is prewired to the panelboard)
from Distribution Panel Breakers to Critical Load	PB1–N, PB2–N	Neutral	42 – #4–#14 or 3 x #10–#14	#4–#6: 4.0 (35) #8: 2.8 (25) #10–#14: 2.3 (20)	Slotted
	E18, E19, E28, E29	Ground	42 – #4–#14 or 2 x #12–#14	#4–#6: 4.0 (35) #8: 2.8 (25) #10 – #14: 2.3 (20)	Slotted

Table 41.3-49. IAC-D Power Cable Terminations

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12. The continuous current (I_r) values for the corresponding lettered adjustment setting marked on the Distribution Panel Input breakers (CB10 and CB20) are listed in Table G. The continuous current (I_r) values for the corresponding lettered adjustment setting marked on the Distribution breakers (CB11, CB12, CB13, CB21, CB22 and CB23), are listed in **Table 41.3-50** and **Table 41.3-51**.

Table 41.3-50.	Breaker	Continuous	Current (Ir)	Settings (Low (Current
Breaker)				-		

Breaker Setting	Continuous Current (I _r)	Breaker Setting	Continuous Current (I _r) 40 E 70
A	40	E	70
В	45	F	80
С	50	G	90
D	63	Н	100

Table 41.3-51. Breaker Continuous Current (I_r) Settings (High Current Breaker)

Breaker Setting	Continuous Current (I _r)	Breaker Setting	Continuous Current (I _r)
A	100	E	175
В	125	F	200
С	150	G	225
D	160	Н	250

- If installed, verify the Distribution Panel Input breakers (CB10 and CB20) are set to 225 A (Letter G on the breakers). Use the dial on each breaker to adjust as necessary.
- 14. If installed, use the dial on each breaker to adjust Distribution breaker (CB11, CB12, CB13, CB21, CB22 and CB23) current ratings as required to protect the wiring to the load. See **Table 41.3-51** for the correct breaker continuous current adjustment letter.



Figure 41.3-46. IAC-D Dimensions Front and Right Side Views

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Figure 41.3-47. IAC-D Dimensions Top and Bottom Views

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Figure 41.3-48. IAC-D Dimensions Top View (Optional Floor Mounting)

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Powerware 9390

Powerware 9390 Integrated Accessory Cabinet (IAC-B and IAC-T)

The Powerware 9390 Integrated Accessory Cabinet is designed for use with the Powerware 9390 40 kVA through 160 kVA three-phase Uninterruptible Power Systems. The IAC provides maintenance bypass, parallel tie cabinet, or parallel tie cabinet with maintenance bypass functions with the following custom configurable features, enabling adaptation and expansion without costly electrical rework.

Maintenance Bypass Configuration

Maintenance Bypass (MBP) and Maintenance Isolation (MIS) breakers enable power to completely bypass the UPS power module. The UPS module can then be safely serviced or replaced, without interrupting power to critical systems. An optional Bypass Input Breaker (BIB) and Rectifier Input Breaker (RIB) provide a single wiring point input to the UPS and a convenient method for removing power from the UPS, when using the maintenance bypass to supply the load.

Parallel Redundant Configuration — Module Output Breakers (MOB) 1 and 2 Enable Two

UPS modules to be paralleled together for redundancy. An optional System Load Breaker (SLB) provides output control to the critical load for the whole system.

Parallel Redundant Configuration with Maintenance Bypass — Module Output Breakers

(MOB) 1 and 2 enable two UPS modules to be paralleled together for redundancy. Optional Maintenance Bypass (MBP) and Maintenance Isolation (MIS) breakers enable power to completely bypass the UPS power module.

The IAC is housed in a single, freestanding cabinet, with safety shields behind the doors for hazardous voltage protection. The cabinet matches the UPS cabinet in style and color, and can be installed in line-up-and-match or standalone configurations.

Powerware 9390 IAC-SB or IAC-ST

The Powerware 9390 IAC-SB or IAC-ST is designed for use with the Powerware 9390 80 kVA 208/208 V and 480/ 480 V and 160 kVA 480/480 V threephase Uninterruptible Power Systems. The IAC provides maintenance bypass or tie cabinet functions with the following custom configurable features, enabling adaptation and expansion without costly electrical rework:

Maintenance Bypass Configuration

Maintenance Bypass (MBP) and Maintenance Isolation (MIS) breakers enable power to completely bypass the UPS power module. The UPS module can then be serviced or replaced in complete safety, without interrupting power to critical systems. An optional Bypass Input Breaker (BIB) and Rectifier Input Breaker (RIB) provide a single wiring point input to the UPS and a convenient method for removing power from the UPS, when using the maintenance bypass to supply the load.

Parallel Redundant Configuration

Module Output Breakers (MOB) 1 and 2 enable two UPS modules to be paralleled together for redundancy. An optional System Level Breaker (SLB) provides output control to the critical load for the whole system.

The IAC is attached to and directly integrated with the UPS cabinet, with safety shields behind the removable panel for hazardous voltage protection. The UPS Sidecar matches the UPS cabinet in style and color. **Figure 41.3-49** shows the Powerware 9390 UPS (40 – 80 kVA) Cabinet with the UPS Sidecar and **Figure 41.3-50** shows the Powerware 9390 UPS (100 – 160 kVA) Cabinet with the UPS Sidecar.

Configurations

The following UPS IAC-SB or IAC-ST configurations are possible:

- UPS Sidecar with MBP and MIS.
- UPS Sidecar with MBP, MIS and BIB.
- UPS Sidecar with MBP, MIS, BIB and RIB.
- UPS Sidecar with MOB1 and MOB2.
- UPS Sidecar with MOB1, MOB2 and SLB.



Figure 41.3-49. Powerware 9390 UPS (40 – 80 kVA) Cabinet with IAC-SB or IAC-ST



Figure 41.3-50. Powerware 9390 UPS (100 – 160 kVA) Cabinet with IAC-SB or IAC-ST

Options IAC-SB or IAC-ST

Contact your Eaton sales representative for information about any of these available options:

Bypass Input Breaker

Maintenance bypass configurations have an optional Bypass Input Breaker for single-feed and dualfeed systems. The BIB provides a single point of input power control to the UPS and easily removes power from the UPS for servicing.

Rectifier Input Breaker

Maintenance bypass configurations have an optional Rectifier Input Breaker for dual-feed systems. The RIB provides a single point of rectifier input power control to the UPS and easily removes power from the UPS for servicing.

System Load Breaker

A parallel redundant configuration with an optional System Load Breaker is available to control the output to the critical load for the whole system.

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Description	Units	Rating 50/60 Hz		
Basic Unit Rating	UPS kVA	80	80	160
Input and Bypass Input Output	Volts Volts	208 208	480 480	480 480
ac Input to Maintenance Bypass (without BIB or RIB, or dual	Amps	222	96	192
Feed with BIB and RIB) (3) Phases, (1) Neutral – if Required, (1) Ground Minimum Conductor Size Number per Phase	AWG or kcmil (Each)	2/0 (2)	1/0 (1)	1/0 (2)
ac Input to Maintenance Bypass (Single Feed with BIB, or Sin-	Amps	240	105	210
gle Feed with BIB and RIB) (3) Phases, (1) Neutral – if required, (1) Ground Minimum Conductor Size Number per Phase	AWG or kcmil (Each)	2/0 (2)	1/0 (1)	1/0 (2)
ac Input to Optional RIB)3) Phases, (1) Ground Minimum	Amps	240	105	210
Conductor Size Number per Phase	AWG or kcmil (Each)	2/0 (2)	1/0 (1)	1/0 (2)
ac Output to Critical Load Full Load Current (3) Phases,	Amps	222	96	192
(1) Neutral – if Required, (1) Ground Minimum Conductor Size Number per Phase	AWG or kcmil (Each)	2/0 (2)	1/0 (1)	1/0 (2)

Table 41.3-53. Input/Output Ratings & External Wiring Requirements for Powerware 9390 IAC-SB or IAC-ST (1 + 1 Parallel Redundant)

Description	Units	Rating 50/60 Hz		
Basic Unit Rating	UPS kVA	160		
Input and Bypass Input Output	Volts Volts	208 208	480 480	480 480
ac Input from UPM Full Load Current for each Module	Amps	222	96	192
(3) Phases, (1) Neutral – if required, (1) Ground Minimum Conductor Size for each Module Number per Phase for each Module	For contractor-supplied wiring in a stand-alone installation, refer to the applicable Powerware 9390 UPS Installation and Operation manual, listed in paragraph 1.5, for wire size. Wiring for Line-up-and-match installation is factory supplied.			
ac Output to Critical Load Full Load Current (3) Phases,	Amps	222	96	192
(1) Neutral – if required, (1) Ground Minimum Conductor Size Number per Phase	AWG or kcmil (Each)	2/0 (2)	1/0 (1)	1/0 (2)

Read and understand the following notes while planning and performing the installation:

- 1. Refer to national and local electrical codes for acceptable external wiring practices.
- 2. Material and labor for external wiring requirements are to be provided by designated personnel.
- 3. For external input wiring, use 90°C copper wire. See the appropriate column in **Table 41.3-52**. Wire sizes are based on using the specified breakers.
- 4. Wire ampacities are chosen from Table 310 16 of the NEC. Input wire is 90°C specification.
- 5. If a BIB is not installed, a minimum of two separate feeds with upstream feeder breakers, or one feed with two upstream feeder breakers, must be provided. One for the UPS and one for the UPS Sidecar bypass input. DO NOT use one feed or a single feeder breaker to supply both the UPS and Sidecar.
- 6. Refer to Section 1 of this manual for installation instruction.

- 7. Refer to the applicable Powerware 9390 UPS Installation and Operation manual, listed in paragraph 1.5, for UPS cabinet wiring requirements, and conduit and terminal locations.
- 8. Refer to the applicable Powerware 9390 UPS Installation and Operation manual, listed in paragraph 1.5, for parallel system power and control wiring requirements.
- 9. Terminals are UL and CSA rated at 90°C. Refer to Table 41.3-54 for power cable termination.
- 10. Per NEC Article 300-2-(a), all three-phase conductors must be run in the same conduit. Neutral and ground must be run in the same conduit as the phase conductors.
- 11. Conduit is to be sized to accommodate one neutral conductor the same size as the phase conductor and one #8 AWG ground conductor. If two neutral conductors or an oversized neutral conductor are to be installed, size the conduit to accommodate the extra wire or size. All Powerware 9390 products can accommodate a double size neutral.

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Table 41.3-54. IAC-SB or IAC-ST Maintenance Bypass Power Cable Terminations 80 kVA 480 V/480 V

Terminal Function	Function	Size of Pressure Termination	Tightening Torque NM lbs/inch (mm)	Screw Type
ac Input to Maintenance Bypass	Phase A	1 – #14-2/0	120 (13.5)	3/16 inch Hex
	Phase B	1-#14-2/0	120 (13.5)	3/16 inch Hex
	Phase C	1-#14-2/0	120 (13.5)	3/16 inch Hex
ac Input to Optional RIB	Phase A	1 – #4–350 kcmil	177 (20.0)	M4 Hex
	Phase B	1 – #4–350 kcmil	177 (20.0)	M4 Hex
	Phase C	1 – #4–350 kcmil	177 (20.0)	M4 Hex
ac Output to Critical Load	Phase A	1-#14-2/0	120 (13.5)	3/16 inch Hex
	Phase B	1-#14-2/0	120 (13.5)	3/16 inch Hex
	Phase C	1-#14-2/0	120 (13.5)	3/16 inch Hex

Table 41.3-55. IAC-SB or IAC-ST Maintenance Bypass Power Cable Terminations 80 kVA 208 V/208 V and kVA 480 V/480 V

Terminal Function	Function	Size of Pressure Termination	Tightening Torque NM lbs/inch (mm)	Screw Type
ac Input to Maintenance Bypass	Phase A	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
	Phase B	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
	Phase C	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
ac Input to Optional RIB	Phase A	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
	Phase B	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
	Phase C	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
ac Output to Critical Load	Phase A	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
	Phase B	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex
	Phase C	1 – 2/0-250 kcmil 1 – 2/0-500 kcmil	275 (31.1) 275 (31.1)	5/16 inch Hex 3/8 inch Hex

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Figure 41.3-51. UPS with IAC-SB Sidecar Bypass



Figure 41.3-52. UPS with IAC-SB Sidecar Bypass with BIB



Figure 41.3-53. 9390 (100 to 160 kVA) IDC with 3 Breaker Bypass

Table 41.3-56. Input/Output Ratings & External Wiring Requirements
for Powerware 9390 UPS Sidecar (Maintenance Bypass)

Description	Units	Rating 50/60 Hz				
Basic Unit Rating	UPS kVA	80	80	160		
Input and Bypass Input Output	Volts Volts	208 208	480 480	480 480		
B — AC Input to Maintenance Bypass (without BIB or RIB, or Dual Feed with BIB and RIB)						

(3) Phases, (1) Neutral-if required, (1) Ground	Amps	222	96	192	
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (2)	1/0 (1)	1/0 (2)	

B — AC Input to Maintenance Bypass (Single Feed with BIB, or Single Feed with BIB and RIB)

. J		'		
(3) Phases, (1) Neutral-if required, (1) Ground	Amps	240	105	210
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (2)	1/0 (1)	1/0 (2)

A — AC Input to Optional RIB

(3) Phases, (1) Ground	Amps	240	105	210
Minimum Conductor Size Number per Pole	AWG or kcmil (each)	2/0 (2)	1/0 (1)	1/0 (2)
	11.1			

— AC Output to Chitcai Loau (Fun Loau Current)				
(3) Phases, (1) Neutral-if required, (1) Ground	Amps	222	96	192
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (2)	1/0 (1)	1/0 (2)

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Uninterruptible Power Supplies — Powerware 3-Phase Units

Powerware 9390

Table 41.3-57. Input/Output Ratings and External Wiring Requirements for Powerware 9390 UPS Sidecar (1+1 Parallel Redundant)

Description	Units	Rating 50/60 Hz		
Basic Unit Rating	UPS kVA	80	80	160
Input and Bypass Input Output	Volts Volts	208 208	480 480	480 480
B — AC Input from UPM				
Full Load Current for each Module (3) Phases, (1) Neutral- if required, (1) Ground	Amps	222	96	192
Minimum Conductor Size Number per Phase	For contractor-supplied wiring in a stand-alone installation, refer to the applicable Powerware 9390 UPS manual for wire size. Wiring for Line-up-and- Match installation is factory-supplied.			a ne manual nd- lied.
D — AC Output to Critical Load				
Full Load Current for each Module (3) Phases, (1) Neutral- if required, (1) Ground	Amps 222 96			192
Minimum Conductor Size Number per Phase	AWG or kcmil (each)	2/0 (2)	1/0 (1)	1/0 (2)

Table 41.3-58. UPS Sidecar Maintenance Bypass Power Cable Terminations 80 kVA 480 V/480 V

Function	Size of Pressure	Tightening Torque	Screw	
	Termination	Nm (lb. in)	Type	
AC Input to Maintenance Bypass				
Phase A	1 - #14-2/0	13.5 (120)	3/16 in. Hex	
Phase B	1 - #14-2/0	13.5 (120)	3/16 in. Hex	
Phase C	1 - #14-2/0	13.5 (120)	3/16 in. Hex	
AC Input to Optional RIB				
Phase A	1 - #4-350 kcmil	20.0 (177)	M4 Hex	
Phase B	1 - #4-350 kcmil	20.0 (177)	M4 Hex	
Phase C	1 - #4-350 kcmil	20.0 (177)	M4 Hex	
AC Output to Critical Load				
Phase A	1 - #14-2/0	13.5 (120)	3/16 in. Hex	
Phase B	1 - #14-2/0	13.5 (120)	3/16 in. Hex	
Phase C	1 - #14-2/0	13.5 (120)	3/16 in. Hex	

Table 41.3-59. UPS Sidecar Maintenance Bypass Power Cable Terminations 80 kVA 208 V/208 V and 160 kVA 480 V/480 V

Function	Size of Pressure	Tightening Torque	Screw	
	Termination	Nm (Ib. in)	Type	
AC Input to Maintenance Bypass				
Phase A	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
Phase B	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
Phase C	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
AC Input to (Dptional RIB	•		
Phase A	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
Phase B	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
Phase C	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
AC Output to	Critical Load			
Phase A	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
Phase B	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	
Phase C	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex	
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex	

Table 41.3-60. UPS Sidecar 1+1 Parallel Redundant Power Cable
Terminations 80 kVA 480 V/480 V

Function	Size of Pressure Termination	Tightening Torque Nm (lb. in)	Screw Type			
AC Input from	AC Input from UPM to MOB 2 (Stand-alone Installation)					
Phase A Phase B Phase C	1 - #14-3/0 1 - #14-3/0 1 - #14-3/0	5.6 (50) 5.6 (50) 5.6 (50)	3/16 in. Hex 3/16 in. Hex 3/16 in. Hex			
AC Output to (AC Output to Critical Load (without SLB)					
Phase A Phase B Phase C	1 - #14-2/0 1 - #14-2/0 1 - #14-2/0	13.5 (120) 13.5 (120) 13.5 (120)	3/16 in. Hex 3/16 in. Hex 3/16 in. Hex			
AC Output to (Critical Load (with SLB)					
Phase A Phase B Phase C	1 - #14-3/0 1 - #14-3/0 1 - #14-3/0	5.6 (50) 5.6 (50) 5.6 (50)	3/16 in. Hex 3/16 in. Hex 3/16 in. Hex			
Neutral						
Neutral Ground	4 - #14-1/0	5.6 (50)	Slotted			
Ground	2 - #14-1/0	5.6 (50)	Slotted			

Table 41.3-61. UPS Sidecar 1+1 Parallel Redundant Power Cable Terminations 80 kVA 208 V/208 V and 160 kVA 480 V/480 V

Function	Size of Pressure	Tightening Torque	Screw			
	Termination	Nm (lb. in)	Type			
AC Input from	AC Input from UPM to MOB 2 (Stand-alone Installation)					
Phase A	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex			
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex			
Phase B	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex			
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex			
Phase C	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex			
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex			
AC Output to Critical Load (with and without SLB)						
Phase A	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex			
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex			
Phase B	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex			
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex			
Phase C	1 - 2/0-250 kcmil	31.1 (275)	5/16 in. Hex			
	1 - 2/0-500 kcmil	31.1 (275)	3/8 in. Hex			
Neutral						
Neutral	8 - #6-250 kcmil	42.4 (375)	5/16 in. Hex			
Ground						
Ground	4 - #14-1/0	5.6 (50)	Slotted			

41.3-54 Uninterruptible Power Supplies — Powerware 3-Phase Units

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Powerware 9390











Figure 41.3-56. 9390 (100 - 160 kVA) UPS with IAC-SX Sidecar



Figure 41.3-57. 9390 (100 – 160 kVA) UPS with IAC-SX Sidecar Top and Bottom View

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Powerware® 9315 (225 – 750 kVA)



Powerware 9315

General Description

More than the power standard for data centers, facilities and network solutions, the Powerware 9315 is the industry's most reliable and flexible three-phase UPS. The Powerware 9315 uses intelligent communications and parallel configurations to provide maximum uptime and high 9s availability. And, the Powerware 9315 can be paralleled for both redundancy and capacity using patented Powerware HotSync technology.

The Powerware 9315 UPS series gives you maximum flexibility, reliability and system availability for your entire enterprise, whether it's a single building or multiple locations spread throughout the world. With the most reliable hardware, sophisticated power management software, and a multitude of accessories and options, combined with world-class service, the Powerware 9315 offers the power solution and system availability that let's you get down to the business of your business.

Typical Applications

- Data centers.
- Facilities.
- Security operations.
- Enterprise networks.
- Server farms.
- Telecommunications installations.
- Internet service providers.
- Diagnostic imaging equipment.
- Positron Emission Tomagraphy (PET).
- HDTV station applications.
- Production lines water treatment facilities.

Features and Benefits

Provides flexible run-time options for your application.

General Information/Features

- Delivers maximum uptime for mission-critical systems by including ProActive Service Plan for the first year following installation, including:
 - One year of 7 x 24 corrective maintenance
 - One year of 7 x 24 remote monitoring service (ProActive service plan is required to obtain "no charge" monitoring)
 - Annual performance check and Power Protection Audit
 - □ 7 x 24 technical support
- Isolates connected equipment from all incoming power problems to provide the highest degree of protection with online, doubleconversion technology.
- Maintains and monitors battery health continuously, dynamically updating information on battery time remaining.
- Integrates seamlessly with generators by using an intelligent input filter.
- Increases system reliability by minimizing points-of-failure through innovative design and reduced component count.
- Starts up with the push of a button and displays UPS status information on its monitor panel.
- Incorporates connectivity products to fit various environments and applications.
- Keeps you informed by sending notification for power and UPS events that you select.

Monitor Panel

The Monitor Panel on the front of the UPS contains an LCD screen to display the current status of the UPS. You can view a statistical history and log of UPS events and display a real-time graphic representation of power flowing through the UPS components. Backlit status indicators show the operating mode of the UPS and alert you to system events. The emergency LOAD OFF button is also located on the monitor panel.

Control Panel

The Control Panel inside the right door of the UPS contains the operator controls to start and stop the UPS, change the operating mode, and reset the LOAD OFF button.

Communication Bays

- X-Slot [™] Communication Bay Allows internal, UPS powered communication with optional X-Slot cards. The X-Slot cards support several protocols such as SNMP, HTTP and Modbus.
- Computer Interface Serial communication ports are standard on all units, and are electrically isolated from the UPS. You can use these ports to link the UPS to the features.
- Summary Alarm Contacts Alarm contacts are provided for connection to equipment at your facility such as a light, an audible alarm, or a computer terminal. The equipment you connect to these contacts alerts you to a UPS alarm.
- Building Alarm Monitoring You can connect your facility's alarm system contacts to six inputs in the UPS. The UPS uses these inputs to monitor your building alarms in addition to the UPS status.

Input Filter

Your UPS may be equipped with an input filter. An input filter yields power factor correction that allows you to save on your initial installation and operating costs. The filter also reduces input harmonic current distortion and minimizes upstream interference that can damage sensitive hardware components.

Emergency Load Off

A LOAD OFF button is provided for situations where you must immediately remove all power to your critical load. The button is located on the front of the UPS for quick access and is covered with a clear plastic shield to prevent inadvertent operation. The shield must be raised before pressing the button.

Automatic Battery Charge Current Limit

A preset limit restricts battery charging current to protect batteries from damage due to high current charging. Charging at high currents can overheat and damage batteries.

Installation Features

Power wiring can be routed through the top or bottom of each UPS cabinet. External sensing and monitoring control wire must be installed in accordance with Class 2 wiring methods. Bottom entry is provided for Class 2 wiring.

General Information/Features

Options and Accessories

Battery

You can enhance the protection provided by your UPS with one or more backup battery supplies equipped with sealed lead-acid, maintenance-free batteries in a matching cabinet. Each battery cabinet contains individual modular battery trays and a battery circuit breaker. Several battery capacities are available.

The UPS battery cabinets can be paralleled; you can increase your battery backup time by adding battery cabinets to your UPS system. The Powerware 9315 can support up to four battery cabinets.

External Battery Disconnect

An optional dc circuit breaker, enclosed in a wall-mounted box adjacent to the UPS, provides a manual means of disconnecting a battery that is located remotely from the UPS.

Power Distribution Module (LV Models Only)

An optional output Power Distribution Module (PDM) is available to distribute the output power of the UPS to your critical load. The PDM cabinet has one or two panels, each containing up to 42 poles for breaker switches, provides flexibility for the needs of your facility. Each panel is controlled by one 225 ampere feeder breaker. The PDM is enclosed in a separated cabinet that matches the UPS. This option requires a 480 to 208 V transformer on some models.

Upgrade Capability

The UPS is available in various output power ratings in both 50 and 60 Hz models. If your power requirements increase, you can upgrade the UPS system to provide more output power with minimum impact on your facility.

Remote Monitor Panel

An optional Remote Monitor Panel (RMP) contains backlit status indicators and a local horn, allowing you to monitor the operational status and alarm condition of the UPS from virtually any location within your facility. You can install multiple RMPs at remote locations to increase your monitoring capabilities.

Relay Interface Module

An optional Relay Interface Module (RIM) uses relay contact closures to indicate the operating status and alarm condition of the UPS system. The module uses a serial interface line and may support up to eight critical loads.

Input Isolation Transformer

Optional 480/480, 208/480 or 600/480 Vac input isolation transformers provide an isolated input to the rectifier for applications that require a DC link that is not ground referenced or for applications requiring an input of 208 or 600 Vac. The transformers are contained in separate cabinets.

5% Input Filter

Optional 480/480 Vac input filters can reduce input harmonic current distortion as low as 5% and minimize upstream interference that can damage sensitive hardware components. The filter is contained in a separate cabinet.

Output Transformer

An optional 480/208 Vac output auto transformer provides a 208 Vac output for applications that require 208 Vac. The transformer is contained in a separate cabinet.

Modem

An optional modem is available for use with the UPS Remote Notification feature. Refer to the manual supplied with the modem for operating instructions.

Customer Convenience Outlet

An uninterruptedly 120 Vac, 0.2 A, fuse-protected convenience outlet is provided to supply power to the optional modem. It is located adjacent to the Communication Panel.

Hot-Tie

The Powerware 9315 Hot-Tie Control system is designed to operate with two Powerware 9315 Hot-Sync Capacity/Redundant Systems. Each system will include two or more Powerware 9315 UPM (modules) and a System Bypass Module (SBM). The primary function of the Powerware 9315 Hot-Tie Control is to provide increased maintainability of the two Powerware Hot-Sync Capacity/Redundant systems by controlling a momentary, uninterrupted transfer of one system's load to the other system and isolating the off-line system. After completion of the transfer, preventive maintenance can be performed on the complete off-line system (SBM, modules, cabling, etc.) without disturbing the critical power paths to the load. A scheduled shutdown of the off-line system's critical load is never required or is a transfer to bypass power needed. After preventive maintenance is finished, the Powerware Hot-Tie Control can be used to return the loads to the individual systems and reconfigure the two systems to dual path operation.

The Powerware 9315 Hot-Tie Control performs the following actions:

- Monitoring UPS system status.
- Monitoring switchboard breaker status.
- Synchronization of the two critical load buses.
- Control of SIS-A, SIS-B, and the TIE breaker.
- Control of MBP-A, MBP-B, MIS-A, and MIS-B breakers (with optional MBP only).

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Uninterruptible Power Supplies — Powerware Large 3-Phase Units — Powerware 9315

System Layout



Figure 41.4-1. Typical Single Unit Layout

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41.4-4 Uninterruptible Power Supplies — Powerware Large 3-Phase Units — Powerware 9315

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System Layout



Figure 41.4-2. Typical Parallel Capacity/Redundant System Layout Note: Accommodates one to eight UPMs. Four UPM system shown.

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Uninterruptible Power Supplies — Powerware Large 3-Phase Units — Powerware 9315

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System Layout



Figure 41.4-3. Typical Single Module UPS System

Note: A bypass neutral feeder must be supplied when the output neutral is used.

If no bypass neutral feeder is supplied, the output neutral of the UPS is to be connected to ground.

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System Layout



Figure 41.4-4. Typical Single Module UPS System with Input Transformer

Note: A bypass neutral feeder must be supplied when the output neutral is used. If no bypass neutral is supplied, the output neutral is to be bonded to ground through a minimum 3/0 copper conductor.

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Uninterruptible Power Supplies — Powerware Large 3-Phase Units — Powerware 9315



Figure 41.4-5. Typical Multi-Module UPS with System and Maintenance Bypass

Note: A bypass neutral feeder must be supplied when the output neutral is used. If no bypass neutral feeder is supplied, the output neutral of the UPMs are to be connected to chassis ground.

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Automatic Hot-Tie System

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Automatic Hot-Tie System

With this industry first automatic hot-tie system, Eaton does not limit the availability of dual power paths to scheduled maintenance. Instead, this incredible level of reliability is continuously available. The automatic hot tie consists of a conventional three-breaker hot-tie system with a static switch paralleling the actual tiebreaker. When system level monitoring detects a reason why the protected load in a dual power path system should be transferred to one UPS or the other, the static switch is fired. The tie-breaker is signaled to close in much the same way a UPS transfers the load to its internal bypass. The two systems are tied together momentarily until the appropriate isolation breaker opens, leaving one UPS isolated with no load and the other UPS supporting both power paths. Since both power paths to the load remain active, no transfer devices are activated, and dual power supply loads are not challenged by shutting down one power supply. In fact, in the Eaton automatic hot-tie system, distribution transfer devices can be eliminated. A sample automatic hot-tie system is shown in Figure 41.4-6.



Figure 41.4-6. Momentary Hot-Tie System

Note: This system eliminates the static switch as shown above and is designed for manual transfer applications.

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Uninterruptible Power Supplies — Powerware Large 3-Phase Units — Powerware 9315

Battery Information

Table 41.4-1. Maximum Input Breaker Ratings at 100%

Powerware	9315			208 Filter		400 Filter		480 Filter		600 Filter	
Model/ kVA	PF	kW	dc Volt	Yes	No	Yes	No	Yes	No	Yes	No
200	0.0	160	420			450	450				
200	0.0	100	420			400	400				
200	0.9	180	420			500	500				
225	0.8	180	480	1000	1000			450	450		
225	0.9	203	480	1200	1200			500	500		
250	0.8	200	420				600				
250	0.9	225	420 or 480				700				
300	0.8	240	420 or 480	1600	1600	600	800	600	600	500	500
300	0.9	270	420	1600	1600	700	800	700	700	600	600
400	0.8	320	420			700	1000				
400	0.9	360	420			900	1000				
400	0.8	320	480	1600				700	800	600	700
400	0.9	360	480	1800				800	900	600	700
500	0.8	400	480					800	1000	700	800
500	0.9	450	480					900	1200	800	900
625	0.8	400				1000	1000				
625	0.9	450				1000	1000				
625	0.8	500				1200	1200				
625	0.9	562				1200	1200				
750	0.8	500						1000	1000	800	800
750	0.9	562						1000	1000	800	800
750	0.8	600						1200	1200	1000	1000
750	0.9	675						1200	1200	1000	1000

Table 41.4-2. Maximum Remote Battery Disconnect Circuit Breaker Ratings

Powerware 9315	/erware 9315					
Model/kVA	PF	kW	dc Volt	Breaker Rating		
	1	1	1	1		
225	0.8	180	480	600		
225	0.9	203	480	700		
300	0.8	240	480	800		
300	0.9	270	480	1000		
400	0.8	320	480	1100		
400	0.9	360	480	1200		
500	0.8	400	480	1200		
500	0.9	450	480	1200		
625	0.8	500	384	2000		
625	0.9	562	384	2000		
750	0.8	600	384	2000		
750	0.9	675	384	2500		

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Battery Information

Cutler-Hammer

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Table 41.4-3. Remote Battery Strings Sized by Run Time Requirements

Sizing	Battery	Model	9315-22	5	9315-300 9315-500 9315-750											
Letter	ithe	kVA	225.0	225.0	225.0	225.0	300.0	300.0	400.0	400.0	500.0	500.0	625.0	625.0	750.0	750.0
		kW	180.0	202.0	180.0	202.0	240.0	270.0	320.0	360.0	400.0	450.0	500.0	562.0	600.0	675.0
		Number of Parallel Strings	Time in	Minutes	at Full L	oad Outp	out									
A	J27	2	9	7	9	7										
A	E28	2	9	7	9	7										
в	J31	2	12	9	12	9	7	5								
В	E33	2	13	10	13	10	7	5								
С	J37	2	15	12	15	12	9	7								
С	E39	2	17	15	17	15	10	7								
D	J47	2	20	16	20	16	11	8	5							
D	E50	2	22	18	22	18	13	10	6							
Α	J27	3	17	14	17	14	11	9	6							
А	E28	3	19	16	19	16	12	9	6							
в	J31	3	22	18	22	18	14	10	8	6	5					
в	E33	3	24	20	24	20	15	13	9	6	5					
С	J37	3	28	22	28	22	18	14	12	9	7	6				
С	E39	3	29	24	29	24	19	16	13	10	7	6				
D	J47	3	38	31	38	31	25	19	15	10	9	7				
D	E50	3	38	32	38	32	26	21	17	13	10	7				
Α	J27	4	28	22	28	22	17	14	11	9	7	5				
А	E28	4	28	23	28	23	18	15	12	9	7	5				
в	J31	4	32	27	32	27	22	18	14	10	9	7				
В	E33	4	33	28	33	28	23	19	15	12	10	7				
С	J37	4	40	33	40	33	28	22	18	14	13	10				
С	E39	4	40	34	40	34	28	23	19	16	14	11				
D	J47	4	55	48	55	48	38	31	25	19	17	13				
D	E50	4	54	47	54	47	35	29	23	19	18	14				
E	SLF12205	3											8			
F	SLF12205	4											13			
G	SLF12205	5											18			
E	SLF12205	3												6		
F	SLF12205	4												11		
G	SLF12205	5												15		
E	SLF12205	3														
F	SLF12205	4													5	
G	SLF12205	5													9	
F	SLF12205	4													14	8
G	SLF12205	5														11
		Nominal DC Link Voltage		480	480	480	480	480	480	480	480	480	384	384	384	384

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Key Factors that Affect Battery Life

Ambient Temperature

The rated output capacity of a battery is based on an ambient temperature of $25^{\circ}C$ (77°F). It is important to realize that any variation from this operating temperature can alter the performance of the battery and shorten its expected life. A good rule of thumb when determining battery life in relation to temperature is that for every $8.3^{\circ}C$ (15°F) average annual temperature about $25^{\circ}C$ (77°F), the life of the battery is reduced by 50 percent.

Cycling

During a utility power failure (severe brownout or blackout conditions), the UPS operates on battery power. Once utility power is restored, the battery is recharged for future use. This entire "loop" is considered a discharge cycle. When installed, the battery is at 100 percent of rated capacity. Each discharge and subsequent recharge reduces the relative capacity of the battery by a small percentage. The length of the discharge cycle will determine the reduction in battery capacity.

Battery Information

The Basic Environmental Requirements for Operation of the UPS System are:

- Ambient temperature range: 0 40°C (32 104°F).
- Recommended operating range: 20 25°C (68 77°F).
- Maximum relative humidity: 95%.

Table 41.4-4. Air conditioning or Ventilation Requirements During Full Load Operation

kVA Ratings	Input/Output Voltage	Heat Rejection BTU/hr x 1000/hr (Kg — cal/hr)
Powerware 9315 22	25		
225	480/208, 480/480	53.7 (13.5)	62.8 (15.8)
Powerware 9315 30	0		T
225	480/480	53.7 (13.5)	62.8 (15.8)
225	600/600	61.7 (15.5)	72.2 (18.2)
300	208/208	82.4 (20.8)	96.5 (24.3)
300	480/480	71.7 (18.1)	83.9 (21.1)
300	600/600	82.4 (20.8)	96.5 (24.3)
Powerware 9315 50	10 - 750		
400	208/208	119.0 (30.0)	133.9 (33.7)
400	480/208	107.6 (27.1)	119.7 (30.2)
400	480/480	95.6 (24.1)	107.9 (27.2)
500	480/480	119.5 (30.1)	134.9 (34.0)
500	600/600	122.9 (31.0)	138.3 (34.9)
625	480/480, 600/600	109 (27.5)	145 (36.6)
750	480/480, 600/600	130.8 (33)	174 (43.9)

 Worst case scenario heat rejection data to ensure cooling capacity (includes losses from filters and transformers).

Note: If perforated floor tiles are required for ventilation, you should place them in front of the UPS.

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Table 41.4-5. Dimens	tions for 9315 UPS Sys	tem Cabinets				
Standard Units Desi	gned for 480 V Input a	nd Output Size for kW	/ Required			
For Voltage Inputs a	nd Outputs at 208 V or	600 V Add Below Lis	ted Transformer Cabin	iets		
Model/kVA	PF	kW	Height	Width	Depth	Weight Ibs. (kg)
225 Unit	0.8/0.9	180/203	73.60 (1869.4)	65.00 (1651.0) 1	31.50 (800.1)	1,800 (817)
300 Unit	0.8/0.9	240/270	73.60 (1869.4)	65.00 (1651.0)	31.50 (800.1)	4,200 (1907)
400 Unit	0.8/0.9	320/360	73.60 (1869.4)	74.00 (1879.6)	31.50 (800.1)	6,100 (2769)
500 Unit	0.8/0.9	400/450	73.60 (1869.4)	74.00 (1879.6)	31.50 (800.1)	6,100 (2769)
625 Unit	0.8/0.9	500/562	82.00 (2082.8)	126.70 (3218.2) 2	39.60 (1005.8)	12,600 (5720)
750 Unit	0.8/0.9	600/675	82.00 (2082.8)	126.70 (3218.2) 2	39.60 (1005.8)	12,600 (5720)
225 Transformer Cabine	ets					
Input Transformer 20	08/480 480/480 600/480		73.60 (1869.4)	33.60 (853.4)	31.50 (800.1)	2,500 (1135)
Output Transformer	480/208 480/480 480/60	0	73.60 (1869.4)	33.60 (853.4)	31.50 (800.1)	2,500 (1135)
300 – 500 kVA Transform	mer Cabinets					
Input Transformer 20	8/480 480/480 600/480		73.60 (1869.4)	49.40 (1254.8)	31.50 (800.1)	4,000 (1816)
Output Transformer	480/208 480/480 480/60	0	73.60 (1869.4)	49.40 (1254.8)	31.50 (800.1)	4,000 (1816)
225 – 500 Batteries, Sir	ıgle Unit Bypass, Filters,	PDM				
Battery Cabinets Size	e A (Each Unit)		73.60 (1869.4)	44.70 (1135.4)	31.50 (800.1)	3,150 (1430)
Battery Cabinets Size	e B (Each Unit)		73.60 (1869.4)	44.70 (1135.4)	31.50 (800.1)	3,500 (1589)
Battery Cabinets Size	e C (Each Unit)		73.60 (1869.4)	44.70 (1135.4)	31.50 (800.1)	3,800 (1725)
Battery Cabinets Size	e D (Each Unit)		73.60 (1869.4)	44.70 (1135.4)	31.50 (800.1)	5,000 (2270)
Single Unit Maintena	ance Bypass Module		73.60 (1869.4)	34.00 (863.6)	31.50 (800.1)	850 (386)
Input Filter 5% Packa	ged with Input Transfo	rmer (Choose Above)	Additional Weight Only	,		
Power Distribution N	lodule		73.60 (1869.4)	34.00 (863.6)	31.50 (800.1)	500 (227)
625 – 750 kVA Batteries	s, Single Unit Bypass					
Maintenance Bypass	Modules for Single Un	its	82.00 (2082.8)	22.00 (558.8)	39.60 (1005.8)	600 (272)
Input Schroud (Botto	om Entry or Exit Pull Sec	ction)/Output	82.00 (2082.8)	16.00 (406.4)/ 12.00 (304.8)	39.60 (1005.8)	400 (182)
Battery Cabinets Size	e E (Each Unit)		82.00 (2082.8)	62.00 (1574.8)	39.60 (1005.8)	7,000 (3178)
Battery Cabinets Size	e F (Each Unit)		82.00 (2082.8)	62.00 (1574.8)	39.60 (1005.8)	9,000 (4086)
Battery Cabinets Size	e G (Each Unit)		82.00 (2082.8)	62.00 (1574.8)	39.60 (1005.8)	12,000 (5448)
System Bypass Units fo	or Parallel Module 9315 (Jnits				
System Bypass Only		1200 A	74.00 (1879.6)	34.00 (863.6)	40.00 (1016.0)	1,170 (531)
System Bypass with	Maint. Bypass	1200 A	74.00 (1879.6)	52.00 (1320.8)	40.00 (1016.0)	1,650 (749)
System Bypass Only		2000 A	82.00 (2082.8)	68.00 (1727.2)	41.00 (1041.4)	2,700 (1226)
System Bypass with	Maint. Bypass	2000 A	82.00 (2082.8)	91.00 (2311.4)	41.00 (1041.4)	3,700 (1680)

1 225 kV unit will output 208 V or 480 V without output transformers.

 $^{\scriptsize (2)}$ Width for single unit with reverse transfer module is 149 wide and 13,000 lb.

Note: Longest shipping section is 63.00 inches (1600.2 mm).

Note: Modules may require an external DC Battery Disconnect Circuit Breaker (see previous sizing chart).

Note: One remote Battery Circuit Breaker per UPS Module is recommended for multiple battery systems required for rack-mounted battery configurations.

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Uninterruptible Power Supplies — Powerware Large 3-Phase Units — Powerware 9315

System Cabinets

Table 41.4-6. 9315 Standard Cabinet Power Cable Terminations

Unit Size and Location	Phase	Number Available	Size of Pressure Termination
225 – 300 kVA Units			
225 kVA Input at Rectifier	ABC	2	#3/0 – 250 kcmil
300 kVA Input at Rectifier	ABC	2	250 – 500 kcmil
Input to Single unit Bypass	ABC	4	#2 – 600 kcmil
Output to Transformer or Load	ABC	4	#2 – 600 kcmil
DC Battery Inputs	Pos Neg	4	#2 – 600 kcmil
Neutral Outputs	N	12	#2 – 600 kcmil
Customer Ground	G	8	#2 – 600 kcmil
225 – 300 kVA Transformers as Applicable			
Input 208 – 480 All Connections	ABCN	4	#2 – 600 kcmil
Ouput 480 – 208 All Connections	ABCN 1	4	#2 – 600 kcmil
Isolation 480 – 480 All Connections	ABC	3	#2 – 600 kcmil
Input 600 – 480 All Connections	ABC	3	#2 – 600 kcmil
Ouput 480 – 600 All Connections	ABC	3	#2 – 600 kcmil
400 – 500 kVA Units			
400 kVA Input at Rectifier	ABC	4	#4/0 – 500 kcmil
500 kVA Input at Rectifier	ABC	4	#4/0 – 500 kcmil
Input to Single unit Bypass (opt)	ABC	4	#2 – 600 kcmil
Output to Transformer or Load	ABC	4	#2 – 600 kcmil
DC Battery Inputs	Pos Neg	4	#2 – 600 kcmil
Neutral Output	N	12	#2 – 600 kcmil
Customer Ground	G	8	#2 – 600 kcmil
Isolated Ground (Option)	Electrode	10	#14 – 1/0 AWG
400 – 500 kVA Transformers as Applicable			
Input 208 – 480 All Connections	ABCN	4	#2 – 600 kcmil
Output 480 – 208 All Connections	ABCN 1	4 ②	#2 – 600 kcmil
Isolation 480 – 208 All Connections	ABC	4	#2 – 600 kcmil
Input 600 – 480 All Connections	ABC	4	#2 – 600 kcmil
Output 480 480 – 600 All Connections	ABC	4	#2 – 600 kcmil
5% Input Harmonic Transformer Same Connections as 480/480 Isolation (opt)			

① Neutral connection on output side only.

 $\ensuremath{\textcircled{}^{2}}$ Eight terminations provided.

Note: 625 kVA and 750 kVA Units are hard bus internal. Units provide NEMA 2 Hole lug landing provisions to receive all necessary connections per NEC requirements.

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Provision

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Bypass Connections

Table 41.4-7. 200 – 500 kVA Maintenance Bypass Module MBM (Optional)

Description		Phase	Number Available	Size of Pressure Termination
Unit Without Optional Single-Unit Bypa	ss BIB			
Input to MBM	225 kVA 48/20	ABC	3	#3/0 – 400 kcmil
	225 kVA 20/20 & 40 – 50 kVA 48/48	ABC	2	#3/0 – 250 kcmil
	225 – 300 kVA 48/48 60/60 60/20	ABC	4	#2 – 600 kcmil
UPS to MBM	225 – 300 kVA 48/48 60/60 60/20	ABC	3	#3/0 – 400 kcmil
	225 kVA 20/20 48/20 & 400 – 500 kVA 48/48	ABC	2	#3/0 – 250 kcmil
MBM to Load	225 – 300 kVA 48/48 60/60	ABC	2	#6 – 350 kcmil
	225 – 300 kVA 20/20 48/20 60/20 & 400 – 500 kVA 48/48	ABC	3	#3/0 – 400 kcmil
Neutral	-	N	12	#2 – 500 kcmil
Ground Lug	225 – 300 kVA 20/20 48/48 60/60 & 400 – 500 kVA 48/48	G	2	#6 – 350 kcmil
	225 – 300 kVA 48/20 60/20	G	4	#2 – 600 kcmil
Unit With Optional Single-Unit Bypass	BIB			
Input to MBM	225 kVA 48/20	ABC	4	#2 – 600 kcmil
	225 kVA 20/20 & 40 – 50 kVA 48/48	ABC	4	#2 – 600 kcmil
	225 – 300 kVA 48/48 60/60 60/20	ABC	2	#6 – 350 kcmil
Input to BIB	225 – 300 kVA 48/48 60/60 60/20	ABC	3	#3/0 – 400 kcmil
	225 kVA 20/20 48/20 & 400 – 500 kVA 48/48	ABC	2	#3/0 – 250 kcmil
UPS to MBM	225 – 300 kVA 48/48 60/60 60/20	ABC	3	#3/0 – 400 kcmil
	225 kVA 20/20 48/20 & 400 – 500 kVA 48/48	ABC	2	#3/0 – 250 kcmil
MBM to Load	225 – 300 kVA 48/48 60/60	ABC	2	#6 – 350 kcmil
	225 – 300 kVA 20/20 48/20 60/20 & 400 – 500 kVA 48/48	ABC	4	#2 – 600 kcmil
Neutral	-	N	12	#2 – 500 kcmil
Ground Lug	225 - 300 kVA 20/20 48/48 60/60 & 400 - 500 kVA 48/48	G	2	#6 – 350 kcmil
	225 – 300 kVA 48/20 60/20	G	4	#2 – 600 kcmil

Table 41.4-8. Parallel System Bypass Connections

		-		-	
D	e	scri	ptio	on	

Without Optional Maintenance Bypas	3		
1200 Amperes ①	Input	ABC	Two-Hole
	Output	ABC	Two-Hole
	Neutral	N	Two-Hole
	Ground	G	Two-Hole
2000 Amperes ①	Input	ABC	Two-Hole
	Output	ABC	Two-Hole
	Neutral	N	Two-Hole
	Ground	G	Two-Hole

Phase

With Optional Maintenance Bypass

1200 Amperes 1	Input	ABC	Two-Hole
	Output	ABC	Two-Hole
	Neutral	N	Two-Hole
	Ground	G	Two-Hole
2000 Amperes 1	Input	ABC	Two-Hole
	Output	ABC	Two-Hole
	Neutral	N	Two-Hole
	Ground	G	Two-Hole

^(†) Provisions provided for two-hole NEMA lugs.

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Powerware[®] PF2 Flywheel Maxim

Energy Storage System



Powerware PF2 Flywheel Energy Storage System

Features

Maximum Availability

- Powerware PF2 can parallel up to eight flywheels to increase ride-through time or provide redundancy.
- N+1 configurable.
- Fast recharge time (under 150 seconds).

Powerware PF2 Flywheel Energy Storage System

Maximum Reliability

- Long, useful life.
- Self-diagnostics.
- Remote notification (e-mail and/or paging).
- Remote monitoring (network and/or modem).
- LCD monitor/control panel.
- Microprocessor-based monitoring system.
- Alarm status contacts.
- Log file stores up to 2000 events.

Maximum Performance

- Soft-start UPS integration.
- High power density (very small footprint).
- 99% efficient.
- Quiet operation.
- No special facility requirements.
- Low maintenance cost.
- Adjustable voltage setting.
- Battery hardening capability.
- On-board DC disconnect.
- Simple plug and play installation.

Table 41.4-9. Specifications

Description	Specification		
Input			
Float voltage range	40 – 600 Vdc		
Minimum charging current required	15 adc (250 kW) 30 adc (500 kW)		
Output			
Adjustable nominal discharge voltage range	360 – 550 Vdc		
Maximum rated power	480 – 550 Vdc		
dc voltage regulation	±1% steady rate		
dc ripple	<2%		

As systems availability becomes increasingly fundamental to survival in today's worldwide economy, Eaton, a leader in technology introduces Powerware PF2. From data centers to industrial plants, wherever maximum productivity and system availability is critical, the Powerware PF2 bridges the power gap during utility disturbances and acts as an effective enhancement or replacement for traditional battery systems.

The Powerware PF2, a dc battery-free energy storage technology, is an integrated motor-generator-flywheel that stores kinetic energy in a constantly spinning, quiet, low friction steel disc. Compared to traditional battery systems, the Powerware PF2 dramatically reduces space requirements, temperature restrictions, replacement cycles and maintenance costs while improving UPS system reliability and operational integrity.

The Powerware PF2 offers a number of benefits over traditional energy storage systems:

- Flexible siting.
- Reduced maintenance cost.
- Over 20 years of useful life.
- High power density in a small footprint.
- Non-toxic and non-corrosive.
- Real-time monitoring of over 25 system parameters.
- Simple connections.

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Powerware PF2 Flywheel Energy Storage System

Powerware	UPS	Percent	Output	Powerware Fly	wheel Models		
UPS Models	Output	kW	kW	PF2-250	PF2-500	PF2-750 (PF2-250+PF2-500) ①	PF2-1000 (2x PF2-500)
9315-160	100 kVA	50% 75% 100%	40 60 80	76 51 38	120 101 76	120 120 114	120 120 120
	130 kVA	50% 75% 100%	52 78 104	58 39 29	117 78 58	120 117 88	120 120 120
	160 kVA	50% 75% 100%	64 96 128	47 32 24	95 63 48	120 95 71	120 120 96
9315-225	225 kVA	50% 75% 100%	90 135 180	34 23 17	68 45 34	101 68 51	120 91 69
9315-300	300 kVA	50% 75% 100%	120 180 240	25 17 13	51 34 25	76 51 38	103 69 51
9315-500	400 kVA	50% 75% 100%	160 240 320	19 13 —	38 25 19	57 38 29	77 51 39
	500 kVA	50% 75% 100%	200 300 400	15 	30 20 15	46 31 23	62 41 31
9315-750 ^②	625 kVA	50% 75% 100%	250 375 500		24 16 —	36 25 18	50 33 25
	750 kVA	50% 75% 100%	300 450 600		20	32 21 16	43 27 21

Table 41.4-10. Powerware PF2 Ride-through Times

^① Ride-through to the Load in Seconds.

 $^{\scriptsize (2)}$.8 output power factor. Consult factory for ride-through times for .9 output power factor.

Table 41.4-11. Environmental Specifications

Description	Specification
Operating temperature	-20°C to 40°C
Non-operating temperature	0°C to 70°C
Relative humidity	<95% non-condensing
Altitude	Up to 4,000 ft. (1220 meters) with no derating
Audible noise	72 dBA at 1 meter; in accordance with ISO 7779
Typical heat dissipation	<3 kW or 10,250 BTU (250 kW) or <5 kW or 17,050 BTU (500 kW)
System dimensions	42.00 inches W x 34.00 inches D x 78.00 inches H (1066.8 mm W x 863.6 mm D x 1981.2 mm H)
Cabinet footprint	10 sq. ft. (.93 sq. m.) (No rear or side access required)
Weight	250 kW - 3,800 lbs. (1724 kgs) 500 kW - 6,000 lbs. (2727 kgs)



Figure 41.4-7. PF2 Flywheel Operating Sequence

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Uninterruptible Power Supplies — Powerware Powerware Software & Connectivity

Connectivity Selection Chart

Table 41.5-1. Powerware Software and Connectivity Selection Chart

Features	Soft	ware	Produ	icts					Con	nectiv	ity Pr	oduc	ts				
	LanSafe III v. 4.x.x	LanSafe v. 5.1	IBM Director Snap-In v. 5.1 ①	MultiView	NetWatch	PowerVision v. 4.1 Network Edition	PowerVision v. 4.1 Facility Edition	PV Emergency Computer Shutdown	Summary Alarms	Relay Products	Remote Panels	Modem Services	Serial Cards	SNMP Products	SNMP/Modem Products	Web/SNMP Products	Modbus/ Expansion Chassis
General																	
Free-of-Charge and/or Bundled Solution																	
Sold as an Option																	
Single UPS Application																	
Multi-UPS Application																	
Parallel Redundant UPS Application																	
Parallel Capacity/Redundant UPS Application																	
Complete Power and Environmental Equipment Application																	
Input/Output Connectivity		1	1		1	1	1	1		1		1	1	1		L	L
Contact Closure Communications (Solid-State/Form-C Relays)																	
Serial Communications (RS-232)																	
Serial Communications (USB)	-																
Telephone Dial-up Communications (Modem Services)	-																
Network Communications (Ethernet)																	
Monitoring	_		-						-						-		L
Basic Monitoring of Alarm Status Only																	
Basic Monitoring of Primary Meters and Alarm Information	•																
Basic monitoring of Environmental Conditions (Temp/Humidity)																	
Advanced Monitoring of All Available Meters and Alarms																	
Basic Logging & Display (Only Primary Info)			1									1					<u> </u>
Advanced Logging & Display (All Available Info)	1																<u> </u>
Direct Access to UPS History Logs																	
Basic Graphing Capabilities (Simple Line Graphs)																	
Advanced Graphing Capability (Bar, Scattered, Line, Custom Legends, Gridlines)						•	-										
Statistical Analysis for All Monitored Channels (Average, Trend, Median, Min, Max)						•											
Adhoc Reporting																	
Custom Threshold Setting for Meters																	
Custom Alert Definitions (Cautionary, Critical, Acknowledged)																	
Email Notification			1									1					
Pager Notification		1	1														
Network Broadcast Notification																	
SNMP Trap Notification																	

① IBM Director Snap-In provides functionality based upon LanSafe and ConnectUPS Web/SNMP card capabilities.

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Connectivity Selection Chart

Table 41.5-1. Powerware Software and Connectivity Selection Chart (Continued)

Features	Soft	ware	Produ	icts					Con	nectiv	ity Pr	oduct	s				
	LanSafe III v. 4.x.x	LanSafe v. 5.1	IBM Director Snap-In v. 5.1 ⁽¹⁾	MultiView	NetWatch	PowerVision v. 4.1 Network Edition	PowerVision v. 4.1 Facility Edition	PV Emergency Computer Shutdown	Summary Alarms	Relay Products	Remote Panels	Modem Services	Serial Cards	SNMP Products	SNMP/Modem Products	Web/SNMP Products	Modbus/ Expansion Chassis
Shutdown		_						_			_						
Automatic/Unattended/Graceful Computer Shutdown																	
Basic Computer Shutdown Control (Broadcast)																	
Advanced Computer Shutdown Control (Sequential)																	
Scheduled Computer Shutdown (Calendar)																	
UPS is Turned off After all Computers are Down (Mandatory)																	
User-Definable UPS Turn-off (Yes/No)																	
Management																	
Automatic/Manual Control UPS Shutdown and Reboot																	
Automatic/Manual Control UPS Load Segments																	
Configure Scheduled UPS Shutdown and Reboot																	
Configure UPS Self Diagnostics Schedule																	
Initiate UPS Diagnostics																	
Configure UPS Host Shutdown Timings																	
Configure UPS Client Shutdown Settings																	
User Access Management (Security) Multiple Levels																	
Alarm Management (Remote Administration, Acknowledge and Rearm)																	
Integration & Common Protocols																	
Basic SNMP Agent (MIB II Info Only and Traps)																	
Advanced SNMP Agent (GETs, SETs and Traps)																	
Modbus (Single Node)																	
Modbus Gateway (Multi-Node)																	
ODBC Compliant Database																	
Web Enabled (HTTP)																	
Telnet Enabled																	

 \odot IBM Director Snap-In provides functionality based upon LanSafe and ConnectUPS Web/SNMP card capabilities.

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Description

Operating Systems

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Uninterruptible Power Supplies — Powerware **Powerware Software & Connectivity**

Powerware Software Products UPS Compatibility

ConnectUPS-X Web/

SNMP Card

Table 41.5-2. Powerware Software Products UPS Compatibility

Software Products De 5.1 Snap-In v. PV Emergency Computer Shutdown LanSafe III v. 4.x.x PowerVision v. 4.1 Facility Edition PowerVision v. 4.1 Network Edition LanSafe v. 5.1 **IBM Director** MultiView NetWatch UPS Microsoft Windows 95 932 Microsoft Windows 98 933 Microsoft Windows Me 933 Microsoft Windows 2000 934 Lar Ροι

Microsoft Windows XP				
Microsoft Windows NT (Intel)				
Microsoft Windows NT (Alpha)				
Apple Macintosh (MacOS X)				
Novell NetWare				
AT&T SVR4 (Unisys)				
Digital UNIX (alpha)				
HP Tru64				
HP-UX				
IBM AIX (RISC + Power PC)				
Linux (Redhat)				
Linux (SuSe)				
SCO Unix OpenServer				
Solaris (SPARC and Intel)				
UNIXWare				
SGI IRIX				
UPS				
3110				
3115				
5115				
5125				
Prestige				
Plus 6 & 12				
FERRUPS				
9110				
9120				
9125				
9140				
9150				
9170 (CheckUPS)				
9170+				
9305				
Plus 18 & 36				
Powerware 80, 125, 225 & 375				
9315 (Powerware Plus)				
IPM BP Plus				
IPM BP – II				
IPM BP – III				
IPM BP – IV				

Table 41.5-2. Powerware Software Products UPS Compatibility (Continued)

scription	Sof	twar	e Pro	oduc	ts				
	LanSafe III v. 4.x.x	LanSafe v. 5.1	IBM Director Snap-In v. 5.1	MultiView	NetWatch	PowerVision v. 4.1 Network Edition	PowerVision v. 4.1 Facility Edition	PV Emergency Computer Shutdown	
20									
30									
35									
10									
Safe Software									
werVision Software									

Table 41 5-3 Powerware IIPS Compatibility Selection Chart

	_		- F	-			-	· ·	-	-	-	-	-
UPS	Summary Alarms Contacts	Relay Card (X-Slot)	Relay Card (BD)	Industrial Relay Card	Supervisory Contact Module	Relay Interface Module	USB Card	Multi-Server Card	ConnectUPS-X	ConnectUPS-BD	BestLink	Modbus Card	Expansion Chassis
3110													
3115													
5115													
5115 Rackmount													
5125													
Prestige													
Plus 6 & 12													
FERRUPS													
9120													
9125													
9140													
9150													
9170+													
9305													
Plus 18 & 36													
System 80, 125, 225 & 375													
9315 (Powerware Plus)													
9315 Hot Sync Parallel													
IPM BP Plus													
IPM BP – II													
IPM BP – III													
IPM BP – IV													
9320													
9330													
9335													
9340													
Expansion Chassis													

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PowerVision Software

PowerVision Software



PowerVision Software

General Description

PowerVision power management software is the solution for the progressive system administrator or facility engineer who needs local or enterprise-wide monitoring of multiple UPSs and/or other power components supporting missioncritical applications.

PowerVision is available in two different packages, each tailored to meet the requirements of its unique application:

- PowerVision Network Edition provides remote monitoring and computer operating system shutdown for multiple single-phase UPSs and small-to-midrange threephase UPSs, including Powerware and other products — using industrystandard SNMP communications and integration with popular network management systems.
- PowerVision Facility Edition provides one-line detailed UPS information, monitors system status of other elements in the critical power distribution system such as generators, static switches, power distribution units (PDUs), and air conditioners through alarm contacts — and supports in-depth reporting, analysis, and graphics.

PowerVision Enterprise Manager serves a unique role as an optional enhancement to either edition providing an enterprise-wide view that spans multiple PowerVision programs across your organization.

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Application Focus

Multiple distributed single and three phase UPS installations.



Figure 41.5-1. Network Edition

Large parallel Hot Sync three-phase UPS systems and other mission critical power components using the PowerVision DAT.



Figure 41.5-2. Facility Edition

Monitor multiple locations from a single desktop.



Figure 41.5-3. Enterprise Manager

Windows Minimum Requirements

- Installed TCP/IP networking.
- 200 MHz processor.
- 4 MB RAM (Recommended: 128 MB).
- 250 MB of available hard disk space (Recommended: 1.5 GB; depending on the number of devices being monitored).
- 30 MB of available hard disk space.
- For optimum viewing, set the monitor resolution to 1024 by 768 pixels and 16-bit color (thousands of colors) with the system task bar hidden.
- Sound card for assigning sounds to specific alarm conditions.
- Local printer for hard copy outputs.
- Modem for remote alarm notification.

Required Connectivity Items

 ConnectUPS Web/SNMP Card for UPS network connectivity.

Product Feature Comparison

	PowerVision		
Features		Edition	
	PowerVision Network Edition	PowerVision Enterprise Manager	PowerVision Facility Edition
Monitoring of multiple UPSs via SNMP with auto-discovery	✓		✓
Monitoring of other equipment relay contacts over network			~
Alarm notification via email, alphanumeric pagers, and SNMP traps	√	✓	√
Integration with building management systems via optional modbus gateway			\checkmark
Built-in intelligent shutdown of computer operating systems powered by multiple UPSs	✓		\checkmark
Standard and customizable equipment graphics and system one-line diagrams		✓	\checkmark
Standard and customizable event logs and data reports	✓	✓	\checkmark
Historical database of all monitored data for 3 years	✓	<u>✓</u>	✓
Advanced statistical analysis and graphing of multiple parameters simultaneously		✓	\checkmark
Centralized monitoring of multiple PowerVision installations from a single desktop		✓	

PowerVision Features Comparison

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PowerVision DAT



Figure 41.5-4. PowerVision DAT

Description

The PowerVision Data Acquisition Terminal (DAT) reads the alarm/status information from any connected equipment that provides a contact closure (relay) and sends the information over an Ethernet network connection to PowerVision Facility Edition software.

Specifications

- 16 digital inputs.
- Compatible with PowerVision Facility Edition software.
- Programmable device names and alarm contact information from front keypad and LCD display.

PowerVision DAT

Optional Powerware EMP

Figure 41.5-5. Optional Powerware EMP

Combination temperature and

Connects to EMP connector on

Specifications

humidity sensor.

PowerVision DAT.

Ordering Information

Table 41.5-4. Ordering Information

Optional Wall-Mount Kit



Figure 41.5-6. Optional Wall-Mount Kit

Description	Part Number
PowerVision Network Edition License: (including unlimited built-in multiple server OS shutdown ^①) Option 1: Environmental Monitoring Probe Option 2: Secure Web Server options License	165200132 103003637-5501 165200140
PowerVision Enterprise Manager License (requires either PowerVision Network or Facility Edition License)	165200138
PowerVision Facilities Edition License: (including unlimited built-in multiple server OS shutdown) Option 1: PowerVision Data Acquisition Terminal (DAT) Option 2: Wall Kit Option for PowerVision DAT Option 3: Environmental Monitoring Probe (EMP) Option 4: Secure Web Server option Option 5: Modbus Gateway option	165200134 103003780 103003916 103003637-5501 165200140 165200142
Upgrade License from PowerVision v.3.x to PowerVision Facility Edition	165200136

Install PowerVision Shutdown Agents on each computer server that needs to be protected. PowerVision shutdown software is included free of charge on the Software Suite CD-ROM, as well as on the software download site.

② Multiple PowerVision DATs may be installed on the same network and monitored by PowerVision Facility Edition Simultaneously.

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Powerware LanSafe

Powerware LanSafe



Powerware LanSafe

General Description

LanSafe Power Management Software provides automatic, unattended and graceful shutdown of computer systems throughout the network during an extended power outage. It continuously monitors the UPSs status and automatically notifies defined users locally and remotely about UPS events.

LanSafe can be setup to shutdown a large group of computers running multiple Operating Systems (e.g. Linux, UNIX, Windows, Novell). It's exclusive SafetyNet[™] technology enables network administrators to establish a user-defined sequential shutdown so that the most critical equipment (such as database or file servers) is shut down last, after work in progress is saved from client workstations through hubs, switches, routers and communication servers.

With event notification, one can specify unique text messages associated with each alarm, and to which users the alarms are broadcasted over the network. For remote alarms, the software can initiate an e-mail message to immediately notify users about a power problem.

In addition, LanSafe provides as standard the ability to send SNMP Traps to any SNMP compliant Network Management System (NMS) like e.g. HP-OpenView or CiscoWorks 2000. LanSafe also supports the 'GET' and 'SET' SNMP commands, which allows the NMS administrator to periodically enquire all metering information such as input voltage, output voltage, battery health and runtime among others.

LanSafe software is bundled freeof-charge with all Powerware UPSs on the Software Suite CD-ROM.

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Application Focus

- Advanced computer shutdown capabilities.
- Basic UPS monitoring and management.
- Local and networked single- or three-phase Powerware UPSs.
- Third-party UPS support via USB HID and SNMP (RFC1628) standards.

Key Product Features

- Automatically performs a graceful shutdown of the computer system and saves work-in-progress during an extended power outage.
- Displays vital UPS information with an intuitive, graphic format for non-technical personnel.
- Broad OS support:
- Compiles a full year of UPS events with a graphical calendar view
- Communicates UPS status change messages via email, pager or cell phone to keep you informed at all times.
- Notifies you in advance that it is time to hot-swap your batteries so that your UPS is ready for the next power outage.
- Saves electricity and adds security with automatic power-on and power-off scheduling capability.
- Helps you determine how much money the UPS and LanSafe is saving you during every power failure due to prevented downtime with a cost savings calculator.
- Runs invisibly with Stealth Mode Operation, which is particularly useful when integrating LanSafe into a POS, ATM or other environment where discretion is necessary.
- Remotely recycles power of hung-up hubs, routers and computer systems with UPS power on/off capability.

Requirements

- Powerware UPS with contact closure, serial, USB or Connect UPS network communications.
- Third-party UPS support via USB HID and SNMP (RFC1628) standards.
- Supported computer Operating System, current list available at http://www.powerware.com/ Software/Lansafe5.asp.
- Configured SMTP server for email notifications.
- Computer system supporting minimum system requirements: 200 MHz CPU, 32MB RAM, 30MB HD, SVGA monitor.

Monitoring

			-		
ι.	input Status			Output Status	
٨. ١	Data Jupa	Yahas		Data Data	Value
10	Vallage (VAC):		0	Voluge (VAE)	120
9	frequency [%]:	0	0	Current (Ampril:	1
191			0	Propancy (He)	80
(P)			0	*	100
[P]			0	Load person:	14%
101			0		
	Battery Status			Bypass/Miscellaneous	Status
11	Data Symm	Value		Data from	Value
0	Veltage:	23	0	WPS on bypass:	No
0	Bun time:	8 h, 38 min	0		
0	SPR on haitery:	Yes	0		
Þ	Battey failure:	80	0		
[P]	AEM Hann	Discharging	0		
(p)	Rent replacement sinte	4/23/2007	0		
0	Total time on battery:	O br 3 min	0		
0	Total number of pores failures.	1	0		
0			0		
			_		

Monitoring

LanSafe can monitor a single UPS at a time via the ControlRoom (screenshot above) or PowerScope Views. Other LanSafe installations on the network can be selected for monitoring and management via the File-Open Controller option.

Communication — Input/Output

- RS-232.
- USB.
- ConnectUPS Web/SNMP Ethernet network connection.
- SNMP via RFC1628 standard.

Notification



- Personalized UPS Alarm notifications.
- Local event message notification.
- Network broadcasts.
- Email.
- Command execution.
- SNMP traps.
- SNMP proxy agent (GET and SET capability).

Computer Shutdown

Sequential SafetyNet Shutdown ensures that all network transactions are completed prior to shutdown. Workstations are shut down first, internet working equipment is shut down next and Servers are shut down last.

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Load Segment Control

Select the load segment to	be shut down:		
	Load segment	1	•
Select a power-on option:			
Power-on immedia	tely after shutdo	wn	
C Power-on after a d	elay of	5	minutes
C Remain off			

Load Segment Control

Doubles the run time for mission critical loads. Turns separate load segments (receptacle groups) on and off at predefined times, or automatically during power outage events. In addition load segments can be turned off and back on again manually over the network or locally.

Diagnostics

iontzoller localhost		Tining chart scale: 30 Minutes
Scale: Minutes	line	
Unassigned		
By boshest:127.0.0.1		
Canad Segment 2		→
Load segment information		Powes of delay
Load segment information	2	Poses of doly
Load segment internation — Load segment Preser Members environment	2	Poses of delay
Load segment internation Load segment Power Manitars assigned	2 0	Power of data C success C 12 data hours F data ninches
Load segment internation Load segment Power Monitors essigned Guernt bettery survive	2 0 0 h 52 min	Power of delay C Automatic C Power in the second
Load segment internation Load segment Power Monitors assigned Gueent battery surrise	2 0 0 h 52 min	Power of duly C intervent C Fit hours Fit minutes C Reposition - Prove on duly
Load segment internation Load segment Power Monitors assigned Durrent battery numline	2 0 0h 12 min	Power of delay C Subserver C ST - Starter Power on delay - Power on delay
Load segment information Load segment Power Monitors accigned Durrent bettery survive	2 0 0 h 52 min	Power of data C Intervent C Intervent C Intervent C Intervent C Intervent C Intervent Power on data Image: State of the state

Diagnostics

LanSafe reminds the user ahead of time when the UPS batteries need to be replaced.

The Test Hardware option performs a diagnostic test to verify your UPS is functioning properly. The tests provide information about the UPS battery and internal circuitry and can be initiated either locally or remotely.

Powerware LanSafe

Data Archiving/Analysis

Data collected since 4/20/2004 Oracle Control Street Tube? 1/20/2004 Oracle Control Street Tube? 1/20/2004 Oracle Control Street Tube? 0/20/2004 Utilis on builtery 1 Oracle Control Tube? 1/20/2004 Oracle Control Tube? 1/20/2004 Oracle Control Tube? 0/20/2004 Oracle Control Tube? 0 Statistical Tube? 0 Statistical Tube? 0 Oracle Control Tube? 0 Statistical Tube? 0 Table Control Tube? 0 Oracle Contube? 0<	ummary Savings Calculator	Daily Event Log		
Cincid Event Name Total Event Description Consider State Studies Total Center Total	Data collected since: 4	/28/2004		
Priver Falares Judden 0 UIS Shu Skon Skon Skon Skon Skon Skon Skon Skon	Critical Event Name	Total Events	Desception	_
Uti Sin bittery due to power failure Total critical centre Total centre Tota	Power failure shutdown	0	UPS shut down due to power failure	
Total arXista Full Server Session Qi Warring Servert Sawa Total Servert Description Nor on hottry- rest 0 Chabtery- less than notification delay. Graners All Servert 0 Chabtery- less than notification delay. Graners All Servert 0 Chabtery- less than notification delay. Soldwald of Horus and Less 1 Loss of carenarciston belows consider and LPS Soldwald of Horus and Less 0 Loss of carenarciston belows consider and LPS Soldwald of Horus and Less Bettery replacement working. Eastery replacement working. Query List Less of Lesson below song Description Description Query List Less formand 0 Adagraphic task were gorfmed	UP5 on battery	1	UPS on battery due to power failure	
Varing Event Name Total Events Descelation Prior on bittery event Constant, event Constan	Total critical events	1		
Nor on bitter event 0 Chalters less than collocities delay. reverter UPS events fractions and UPS 0 Monolenseus UPS events. UPS conservations line in the intervent fractional and UPS Loss of conservations belowers Chalters and UPS Scholder (Houring delays) Event initial of dublicans. Event initial of dublicans. Replace balanty events 15 Event initial of dublicans. O Hond Event Name Total Events Description Quegositic trial performed 0 A disguid/c tot was performed.	Warring Event Name	Total Events	Description	
General EPS events 0 Photodeneous UPS events VEX.communitation HS Iss Iss of communitation between Controller and UPS Schedule J (Houruh shudown 0 User shudown is between Controller and UPS Total adversing events 15 Subschedultry very charament www.migs Charad Event Name: Total Events Description Quarket List performed 0 Adjustation task spectramed	Minor on battery event	0	On battery less than notification delay	
UPS communication between Controller and UPS Scholad / Hinus Middown Can of communication between Controller and UPS Scholad / Hinus Middown Replace between year in the second scholar second scholar second scholar second scholar second scholar scholar second scholar second scholar second scholar scholar second scholar second scholar second scholar second scholar second scholar scholar second scholar second scholar scholar second scholar second scholar second scholar second scholar second scholar second scholar second scholar scholar second scholar second scholar second scholar scholar second scho	General UPS event	0	Miscellaneous UPS events	
Scheduk (F) Howal Bulcolom User related a Bulcover Backa bulletry verginacement wernings Distant registrament wernings Total austring events 15 O Homal Event Name Total Events Dagrant Ent Japerformst 0	LPS communication lost	15	Loss of communication between Controller and UPS	
Replace balances O Balances Balances Total warning events 15 S S O Hond Event Name Total Events Description Quagnatic track performed 0 A dagradic track was performed	Scheduled / Manual shutdown	0	User initiated shutdowns	
Total warring events 15 O Nomul Event Name Total Events Description Diagnositic test performed 0 A diagnositic test was performed	Replace battery warning	0	Battery replacement warnings	
Norsai Event Name Total Events Description Diagnostic test was performed A dagnostic test was performed	Total warning events	15		
Diagnostic test performed 0 A diagnostic test was performed	O Normal Event Name	TotalEvents	Description	_
	Diagnostic test performed	0	A diagnostic test was performed	
Controller offline 0 The Lansafe Controller was not running	Controller offline	0	The Lansafe Controller was not running	
Total normal events 0	Total normal events	0		

Data Archiving/Analysis

The History Data Summary displays a cumulative tally of system events that have occurred since LanSafe was installed.

View input, output voltage, output load and battery voltage measurement changes over a period of time in a crisp clear graphic diagram format.

Integration

a second a s		
Date	LopEntry	
8/15/2005 816:34 AM	UPS communications established	1
8/12/2006 7:44:25 PM	Power Monitor loaded	
8/12/2005 5:32:35 PM	Power Monitor unloaded	
8/12/2005 8:07:07 AM	UPS communications established	
8/11/2005 8:22:19 PM	UPS communications lost	
8/11/2005 11:01:00 AM	UPS consurications established	
8/11/2005 11:00:59 AM	Power Manitar loaded	
8/11/2005 10:5B 44 AM	Power Monitor unloaded	
8/5/2005 8:40:16 AM	UPS communications lost	
8/4/2005 812 26 AM	UPS communications lost	
8/3/2005 2:27:11 PM	UPS communications established	
8/3/2005 8:18:45 AM	UPS communications lost	
8/3/2005 6:59 15 AM	UPS communications established	
8/3/2005 6 18:24 AM	UPS communications lost	
8/2/2005 9:59:10 PM	UPS communications established	
8/2/2005 3:58:54 PM	UPS communications lost	
8/2/200511:21:15.AM	Power Manitar loaded	
8/2/2005 8:59:44 AM	Power Monitor unloaded	
8/2/2005 8:25 58 AM	UPS communications established	
 International Contraction 		

Integration

- NMS (Network Management Systems e.g., HP-OpenView, IBM Tivoli, CA-Unicenter, Cisco 2000) via SNMP.
- PowerVision Network Edition for viewing all LanSafe installations on the network.
- Other systems via command execution.

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Powerware CoreLogic



Powerware CoreLogic

General Description

Software Development Toolkit designed to facilitate custom software development and integration activities for Powerware UPS devices. A suite of software utilities and components with an API-based driver library enables the embedding of UPS management capabilities into customer or third-party software applications.

Application Focus

Advanced, customizable monitoring and control of single or multiple Powerware single- and three-phase UPSs.

Key Product Features

- API-based.
- Highly targeted power protection tasks, including status monitoring, control, discovery, and operating system shutdown.
- Broad OS support.
- Designed for easy integration with small code footprints.
- Includes documentation, technical support and maintenance releases.

Requirements

- Powerware UPS.
- Computer or server running an operating system supported by CoreLogic.
- UPS-native or Powerware X-Slot communications supporting Serial, USB or SNMP.

41 Monitoring

Local monitoring can be achieved by installing CoreLogic utilities or CoreLogic-powered customer software on the primary computer directly connected to the UPS.

Connectivity between the primary computer running CoreLogic and the UPS can also be accomplished over existing SNMP networks.

Powerware MultiView



Powerware MultiView

General Description

Windows-based web browser for monitoring multiple Powerware UPSs via ConnectUPS Web cards and LanSafe v. 5 instances.

Application Focus

- Basic network device monitoring
- Multiple single- or three-phase Powerware UPSs

Key Product Features

- Simple monitoring for multiple UPSs connected via ConnectUPS Web/SNMP Card and/or LanSafe v. 5.
- Status@aGlance[™] monitoring capability.
- Drill down access to web page details (ConnectUPS Web/SNMP Card only).
- Allows user to view multiple web sites simultaneously within a single browser window.
- Searches for and automatically adds browser pages of connected ConnectUPS Web/SNMP Cards as well as the Status@aGlance monitoring feature from the Powerware LanSafe v. 5 software.

Requirements

- Powerware UPS.
- Windows operating system.
- Powerware connectivity device, e.g., serial card or ConnectUPS Web/SNMP.

Powerware Extensions for IBM Director



Powerware Extensions for IBM Director

General Description

Plug-in software for IBM Director Network Management System that allows network system administrators to monitor, diagnose, configure, set alarms, schedule self-tests, check battery, gather inventory information, and control Powerware UPSs networkwide from a single console within IBM Director.

Application Focus

- Network Management System integration.
- Multiple single- or three-phase Powerware UPSs.

Key Product Features

- Network monitoring and control software for all UPSs in the network.
- UPS control and power management for IBM Director system administrators.
- Seamless integration of UPSs into the IBM Director Management Console.
- UPS Inventory management.
- Central log for UPS events.

Requirements

Primary computer running IBM Director version 5.1.

Integration

Installing the Powerware Extensions for IBM Director enables the user to easily and automatically integrate Powerware UPSs into the IBM Director environment.

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Powerware NetWatch

General Description

NetWatch Client UPS software enables users to shutdown a server or workstation and acts as a networkmonitoring tool through the Powerware ConnectUPS-X, ConnectUPS-BD or BestLink SNMP/WEB Adapter connectivity devices. During an extended power outage, the SNMP/WEB adapter informs all registered NetWatch Clients to shut down their respective operating systems, thus preparing them for the removal of ac power.

Application Focus

- Basic network device monitoring.
- Multiple single- or three-phase Powerware UPSs.
- Key Product Features
- Shutdown up to 255 computers dependent upon power from a Powerware UPS.
- Popup messaging on Windows to notify UPS on Battery conditions.

Requirements

- Powerware UPS.
- Computer or server running an operating system supported by CoreLogic.
- UPS-native or Powerware X-Slot communications supporting Serial, USB or SNMP.

Shutdown

Computer shutdown is achieved through the use of NetWatch software. The shutdown message is sent in the form of a network broadcast from the ConnectUPS or BestLink connectivity card to all available NetWatch clients on the network. In the event of a power failure all clients are notified to shutdown based upon their local settings.

Powerware Modbus Profiler

General Description

Profiler is a power management and UPS software tool that creates a Modbus register map for a particular Powerware UPS. It reads the available parameters in a UPS and compares them with a list of universally supported Modbus parameters. If the parameter in the UPS and parameter in the master list both exist, then the Profiler program reports the supported parameter.

Powerware Software Suite



Powerware Software Suite

General Description

The Powerware Software Suite CD ships with every Powerware UPS and incorporates the latest power technology with management and control software needed for effective network monitoring and analysis, power management, SNMP and UPS system remote shutdown.

Along with product documentation and links to online support resources, the Software Suite includes a broad range of Powerware software including LanSafe power management software, MultiView, and a 30-day trial version of PowerVision software.

F·T•**N** Cutler-Hammer

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ConnectUPS Web/SNMP Products

ConnectUPS Web/SNMP Products





ConnectUPS Web/SNMP Products

General Description

The Powerware ConnectUPS Web/ SNMP product family provides seamless Powerware UPS integration into the Ethernet network and the Internet. The built-in Web Server allows the users to monitor and manage the UPSs through the ConnectUPS via a standard Web Browser.

HTTP, SNMP, SMTP, WAP, Telnet compatibility and a console port enable dynamic and versatile support for a large variety of system configurations.

When used in conjunction with NetWatch Client software, the ConnectUPS products also provide graceful shutdown of operating systems of up to 255 computers powered by a single UPS.

Application Focus

- Ethernet, Internet connectivity device.
- Graceful shutdown functionality when used in conjunction with Net-Watch power management software.
- Integration to standard SNMP, HTTP, WAP, SMTP compliant applications.

Key Product Features

41

- Supports real-time monitoring and control of UPSs across the network.
- Enables monitoring and control via Web browsers, SNMP-compliant network management systems or power management software.
- Delivers alarm notifications through email, to mobile phones, pagers, or SNMP traps.
- Enables rapid identification and analysis of critical power conditions.

- Logs and graphs detailed historical data to analyze trends.
- Uses standard communication protocols on 10 Mb and 100 Mb Ethernet networks.
- Performs as a switching hub for three 10/100Mbps connections (ConnectUPS-X).
- Enables orderly shutdown and restart of remote UPSs.
- Supports optional Powerware Environmental Monitoring Probe (EMP) for temperature, humidity and other contact sensor monitoring, management.
- User Interface support for local languages (English, Chinese, Spanish, French, German, Italian, other.
- Interworks with optional Powerware probe to monitor environmental conditions: temperature and humidity at remote sites.
- Supports in-service installation and upgrades without interrupting critical loads (most UPS models).

Event Notification

ConnectUPS products send real-time alert notifications to four designated recipients via email, PCS mobile phone, or pager, and via SNMP traps to an NMS or network messaging to Powerware NetWatch software. Each recipient has the option of receiving real-time event messages, daily status reports based on criticality, containing data and event log files, or a combination of routine reports and event notifications.

Monitoring

CorrectUPS History Log (10.111 A1 79)					
a Input Voltage (V)		UPS H	listory	Log	
· Output Voltage (V)	130.0	600	120	10	1906
a Output Load (%)	120.0			-	
Input Frequency (Hertz)	100.0				
- Battery Voltage (VDC)	10.0				
· UPS Internal Temperature (Celsius)	70.0				
EMP Temperature (Celsius)	50.0				
EMP Humidity (%)	40.0			1	
- Display Point	20.0			in quality	The second s
Thin Line	10.0			MAN	
· Medium Line	100700	18-57-03	05:00	100	10 51-00
Thick Line	04/07/2005	04/07/200	5 04/08/	2005	04/08/200
0 1907		1907 Re	fresh F	beoles	Exit

Monitoring

Gain up-to-the-minute assurance that computing and communication.

systems are receiving the continuous, clean power they demand. Through easily navigable Web pages, network administrators can check system status and view critical meter information, such as input and output voltage, UPS load, battery voltage and condition, at any time. ConnectUPS-X, ConnectUPS-BD, and ConnectUPS-E products have built-in data and event logs that track and record specific power-related occurrences over time, at user-defined increments as fine as one-minute intervals.

Communication — Input/Output

- 10/100 Ethernet.
- 3-port switching hub (ConnectUPS-X model only).
- HTTP
- SNMP
- SMTP
- WAP
- Telnet

Management

From a Web browser or NMS, which may be hundreds or thousands of miles away, a system administrator can shut down or reboot a remote UPS, perform remote UPS battery tests, and set up scheduled shutdowns of UPSs and associated servers.

The ability to shut down or restart systems without a site visit dramatically reduces field service expense and response time. Scheduled shutdowns can be devised to conserve power or tighten security during specific time periods, such as evenings or weekends.

Integration

- Network Management Systems (NMS) via SNMP.
- Mobile phones via WAP.
- Optional EMP (Environmental Monitoring Probe) for temperature and humidity monitoring.

Load Segment Control

Turns separate load segments (receptacle groups) on and off at predefined times, or automatically during power outage events. In addition load segments can be turned off and back on again manually over the network or locally.

June 2006 Sheet 1803

E-T-N

Uninterruptible Power Supplies — Powerware Powerware Software & Connectivity

ConnectUPS Web/SNMP & Relay Products

Information Tables

Table 41.5-5. Technical Specifications

Model	ConnectUPS-X	ConnectUPS-BD	ConnectUPS-E	BestLink		
Description	Card Providing Remote Monitoring and Control of Powerware UPSs					
Protocol Support	http, SNMP, TFTP, Te	ttp, SNMP, TFTP, Telnet, BootP, DHCP, WAP, ARP, RARP				
PS Slot Type	X-Slot	BestDock	External	External		
Network Support	Ethernet 10/100Base-	-T	•	•		
Switching Hub	Yes (Three 10/100Bas	se-T Connections)	No			
Temperature and Humidity Monitoring	Yes	les				
UPS Compatibility	See Chart Below	See Chart Below				
Supported MIB	UPS Standard MIB R	UPS Standard MIB RFC-1628, Powerware MIB, MIB II, 2003 BestLink MIB				
?/S Supported or Shutdown	Microsoft Windows 9X, ME, 2000/NT and XP, Various UNIX (Including Linux) Versions, Novell NetWare, Macintosh					
Operating Temperature	0 - 40°C					
Operating Humidity	10 – 80%, Non-condensing					
Power Input	9 Vdc Unregulated 12 V Unregulated					
Power Consumption	3.5 Watts					
Dimensions in Inches (mm)	4.70 x 4.50 x 1.50 (119.4 x 114.3 x 38.1)	5.30 x 3.20 x 1.30 (134.6 x 81.3 x 33.0)	5.30 x 3.40 x 1.10 (134.6 x 86.4 x 28.00)	5.30 x 3.40 x 1.10 (134.6 x 86.4 x 28.0)		
Weight	6 oz.	4 oz.	6 oz.	6 oz.		
Regulatory	FCC Class B					

Table 41.5-6. ConnectUPS/Power ware UPS Compatibility

Model	Part Number	Powerware UPSs	Environmental Monitoring Probe	
X-Slot ConnectUPS-X Kit	116750221-001	5115 RM, 5125, 9125, 9320, 9330, 9335, 9340, and 9390 via Expansion Chassis: 9120, 9170+, 9315	Yes	
Best Dock ConnectUPS-BD Kit	116750222-001	9120 and 9170+	Yes	
ConnectUPS-E Kit	116750223-001	9150 and 9305	Yes	
Best Link Web/SNMP Kit	116750225-001	FERRUPS	—	

Relay Products



Relay Products

General Description

Powerware Relay Interface Cards enable automatic shutdown and network monitoring of Powerware UPS system status through a connected computer.

The relay interface cards are available in two models, the X-slot version and BestDock version. Both are dedicated adapters that provide the essential dry-contact interface between a Powerware UPS and any relay-connected computer, including the IBM AS/400, as well as a variety of industrial applications.

Application Focus

- Basic network device monitoring.
- Multiple single- or three-phase Powerware UPSs.
- Single UPS and parallel systems (Single/Three Phase UPS).

Key Product Features

- Simple integration with building and security alarm systems.
- Compatibility with simple shutdown methods i.e., IBM AS/400 and Windows UPS Service.
- Option available for all UPS models excluding 3110,3115, 5115 (tower) models.
- Isolated Form-C relay contacts.
- Compatibility with simple shutdown methods i.e., IBM AS/400 and Windows UPS Service.

Requirements

- Compatible Powerware UPS.
- IBM AS/400 cable to connect between DB-15 port on card to computer.

Relay & Serial Protocol Products

Monitoring

Monitoring is accomplished though the use Powerware relay products that provide alarm information via Form-C dry contacts that are connected the customer alarm panel.

Management/Shutdown

IBM AS/400 computer shutdown is achieved by using the computer port on the Powerware relay cards for use with all X-slot compatible UPS models along with the appropriate cable. For information on AS/400 cables available for all relay products please refer to either the Powerware Single Phase or Three Phase UPS price lists.

Integration

Simple integration with Building Management Systems or Building Alarm Systems can be achieved by connecting the Form-C dry contact outputs from the relay product to the digital inputs on the I/O controller provided by the BMS or Security Alarm vendor.

Ordering Information

Table 41.5-7. Ordering Information

Product Name	Part Number
Relay Card (X-Slot)	1018460
Relay Card (BD)	1014018
Relay Interface Adapter	103001185-002
Industrial Relay Card	103003055

Serial Protocol Products

Multi-Server Card



Multi-Server Card

General Description

The Multi-Server card is a power quality connectivity product designed to enable multiple devices connected to a single UPS system to be managed and controlled independently.

This Multi-Server card is designed to function with any Powerware UPS that has an X-slot communication device, and is also compatible with Powerware Expansion Chassis. The Multi-Server card has six serial ports, three of which correspond with the multiple load segments of your Powerware UPS. By utilizing multiple serial cables and LanSafe software, you can perform simultaneously yet independent monitoring and control of up to six servers with a mixture of operating systems.

Application Focus

Single UPS Module and Parallel Systems (Single/Three Phase UPS)

Key Product Features

- Multiple serial ports provide greater power management control and flexible monitoring.
- LanSafe compatibility provides simultaneous monitoring of computer loads.
- Allows user to configure each server to provide a graceful shutdown at the optimum time desired.
- Works with multiple operating systems.
- Independent control of serial ports gives load shedding capability for maximum runtime of critical loads.
- Simultaneously provides RS-232 monitoring and relay output monitoring.
- Plug and Play (PnP) protocol for easy configuration.

Monitoring

Monitoring is achieved through RS-232 serial communications between the connectivity device and the host computer running LanSafe.

Table 41.5-8. Technical Specifications — Dimensions in Inches (mm)

Part Number	05146447-5502
Description	X-slot card with multiple Serial connections for serial Communications with Powerware UPS s
UPS Compatibility	PW 5125, PW 9125, PW 9330, PW 9340, Expansion Chassis
Serial cable	PN 124102022-002
O/S supported For shutdown	All O/S supported by Powerware Lan Safe Operating temperature $0 - 40^{\circ}$ C
Operating humidity	10 – 80% non-condensing
Power input	9 Vdc unregulated
Power consumption	1.5 Walls
L×W×H	4.7 x 4.5 x 1.5 (120 x 114 x .39)
Weight	7 oz.
Regulatory	FCC Class A.



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F:T.N

Serial Protocol Products

Powerware Modbus Card



Powerware Modbus Card

General Description

The Powerware Modbus Card is an X-slot[™] Powerware UPS connectivity device that provides continuous, reliable and accurate remote monitoring of a Powerware UPS system through a Building Management System (BMS) or Industrial Automation System (IAS).

The card provides the means to integrate data from the Powerware UPS into the user-provided management system using Modicon[®], Modbus RTU Protocol. Key power quality and UPS status information may be monitored in real-time to aid in the management of the UPS and notification of potential power problems.

Application Focus

- Single UPS Module and Parallel Systems (Single/Three Phase UPS).
- BMS / IAS integration.

Key Product Features

- Real-time monitoring of power conditions through building management systems (BMS).
- Supports Modbus RTU/Jbus protocol.
- Seamless data integration via included Profiler software package.
- Flexible input/output communication methods: RS-232 and RS-485 multi-drop (network).
- Optically isolated communication ports.
- User-selectable communication topologies.
- Supports wide range of UPSs via native Powerware X-Slot UPSs or via Powerware Expansion Chassis.
- Powerware Modbus Profiler utility provides exact UPS parameter list (Register Map) for BMS data integration.
- Supports both commands 02 (Read Input Status) and 04 (Read Input Register) from a BMS query.
- Compatible with common BMS platforms such as: Siemens Apogee, JCI Metasys, Honeywell EBI, Liebert SiteScan, and Invensys Climate Controls.

Requirements

Powerware Expansion Chassis required for UPS models without communication slots.

Note: Modbus Card is included with the expansion chassis as standard.

Integration

UPS data is easily integrated into the building management system by con-

necting the UPS into the RS-485 power and environmental device network which in turn gets converted to ethernet for easy access by the BMS host computer running the management software.

Table 41.5-9. Ordering Information

Product Name	Part Number		
Modbus Card	103002510-5501		





Table 41.5-10. Technical Data and Specifications

Part Number	103002510-5501				
Description	X-Slot Card Providing Integration with Modbus Network and Monitoring of Associated UPS through Building Management System (BMS)				
Modbus Command Support	Read Input Status (Alarms and Status Points, Function 02) Read Input Register (Meters, Function 04)				
Profiler	Automatically Generates Modbus Register Map for Each UPS (Windows 32 Application)				
Configuration	Via VT-100 Terminal Emulat	ion through Dl	3-9 Port		
Baud Rate	Selectable 1200 to 19.2 k				
Slave Address	Selectable 1 to 247				
Network Connections	RS-485 through Isolated Terminal Block or DB-9 Port RS-232 through DB-9 Port				
Communications Topology	Selectable 2-Wire or 4-Wire				
Additional Hardware Features	Selectable Termination Resistance Selectable Polarity Resistance				
UPS Compatibility via Native X-Slot	Powerware 5125, 9125, 9170+, 9330, 9340, 9390				
UPS Compatibility via Expansion Chassis	Powerware Prestige 9	Powerware 5115	Powerware 9315 Hot Sync Parallel Redundant Module		
	Powerware Plus 12, 18, 36	Powerware 9120	Powerware 9315 Hot Sync Parallel Capacity UPM;		
	Powerware 9315 Reverse Transfer Module	Powerware 9170+	Powerware 9315 Hot Sync Parallel Capacity SBM		
Operating Temperature	10°C to 40°C				
Operating Humidity	20 – 80% Relative Humidity (Non-condensing)				
Power Input	9 Vdc Unregulated				
Power Consumption	1.5 Watts				
Dimensions in Inches (mm)	4.70 L x 4.50 W x 1.50 H (11	9.4 L x 114.3 W	′ x 38.1 H)		
Weight	7 oz.				
Regulatory	FCC Class B				

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Serial Protocol Products

Expansion Chassis



Expansion Chassis

General Description

The Expansion Chassis is a three-slot power quality peripheral device that expands communication methods for a UPS through its support for X-slot[™] cards. It comes pre-configured with a card that conforms to the Modicon[®] Modbus[®], protocol.

Application Focus

 Single UPS Module and Parallel Systems (Single/Three Phase UPS).

Key Product Features

- Creates wide array of communication options for UPSs.
- Primary focus on Powerware 9315 UPS models to enable use of new X-Slot communication cards.
- Acts as the framework for protocol conversion via compatible X-Slot. cards to: Modbus; SNMP; HTTP
- Built-in Modbus Card provides integration of UPS information into building management systems.
- Compatible with X-Slot cards: Modbus Card (one included); ConnectUPS-X SNMP/Web Adapter; ConnectUPS-M SNMP Module; Single Port Serial Card; Multiserver Card.
- Flexible mounting options.
- Redundant power inputs.

Integration

The Expansion Chassis and associated cards effectively act as a protocol converter easily integrating the Powerware UPS into open architecture management systems. This device may be placed on or close to the associated UPS system using the included mounting feet. The kit includes brackets for rack and wall mounting. Two additional slots are available for use with any of the following cards:

- A ConnectUPSTM-X SNMP/Web Adapter — monitor via SNMP or the Web.
- A ConnectUPS-M SNMP Module monitor via Simple Network Management Protocol (SNMP).
- A Single Port Serial Card connect an additional server for monitoring and graceful shutdown.
- A Multi-Server Card connect up to three servers for monitoring and graceful shutdown, supports load segment control and RS-232 signals for low battery and AC Fail.
- A Modbus Card connect to another Modbus Network, monitor via BMS.



Figure 41.5-8. Typical Configuration

Table 41.5-11. Technical Data

Part Number	05147063
Description	Adds Modbus Card Plus 2 Additional Slots for X-Slot Communication Cards to Supported UPSs
Included Card	Modbus Card
Optional Cards	ConnectUPS-Web/SNMP-X xHub Card
	ConnectUPS-M SNMP Module
	Single Port Serial Card
	Multi-server Card
	Additional Modbus Card
Communication with UPS	DB-9 via Included Serial Cable
UPS Compatibility	Powerware 5115; Powerware 5125; Powerware 9120; Powerware 9125; Powerware 9155; Powerware 9170+; Powerware Prestige 9; Powerware Plus 12, 18, 36; Powerware 9315 Reverse Transfer Module; Powerware 9315 Hot Sync Parallel Redundant Module; Powerware 9315 Hot Sync Parallel Capacity UPM; Powerware 9315 Hot Sync Parallel Capacity SBM; Powerware 9320; Powerware 9335; Powerware 9390
Mounting	Stand-alone (Feet), Rack (19 Inches, 483 mm), or Wall Mount
Operating Temperature	10° to 40°C
Operating Humidity	20 to 80% Relative Humidity (Non-condensing)
Power Input	Switchable 230/120 Vac, 50/60 Hz (via Included Transformer)
Power Consumption	6 Watts Maximum
Dimensions in Inches (mm)	18.00 x 1.75 x 6.00 (457.2 x 44.4 x 152.4)
Weight	6 lbs. (Including 1 lb. for Power Supply)
Regulatory	FCC Class B

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Power Distribution Unit



Power Distribution Unit

Product Description

The Powerware Power Distribution Unit (PDU) provides reliable data center power distribution for both raised and non-raised floor applications.

The Eaton designed and manufactured PDU provides isolation, voltage transformation, electrical distribution, equipment protection and computer grade grounding in an integrated factory-tested package to ensure the high performance required for data centers. Compared to hard wiring methods, the Powerware PDU also greatly reduces the installation time and allows for easy relocation of equipment during consolidation, upgrade or relocation of the data center.

The Powerware PDU offers a broad range of options providing tailor-made power distribution solutions for each customer's datacenter. The state of the art metering system provides monitoring, alarming, and provisions for remote communications to aid the user in proactive management of power distribution in the datacenter. A world class service organization supports the Powerware PDU through the entire life-cycle of your data center to increase reliability and provide you the peace of mind.

Features

- UL and CSA approved.
- 30 kVA to 300 kVA.
- Top and bottom cable entry standard.
- Maximum of eight (8) 225 ampere subfeed breakers per PDU.

Note: Subfeed circuit breakers are bolt-on for ease of field installation and removal.

- Factory-installed branch circuit breakers.
- PDU can be customized to specific applications.
- Front and side mounted sidecars
- available Dual input mains.
- TVSS.
- Floor stands.
- Dual electrostatic shield K13 transformer standard, K1 and K20 optional.
- Junction box.

Monitoring and Connectivity

Microprocessor-based monitor with 8 x 40 character LCD display and soft key driven menu for monitoring and alarming. Monitored parameters are as follows:

- Input voltage (L-L).
- Input kW.
- Input and output kVA.
- Input and output power factor.
- Input and output frequency.
- Output voltage (L-L, L-N).
- Output current (A, B, C, G, N).
- Output THD (V & I).
- Output kWh.
- Date.
- Time.
- Communication platform common with other Powerware products: Webcard/SNMP.
 - eNotify
 - □ Modbus
 - Modem
- Two (2) X-slots standard.

Load profiler records monthly maximum and minimum deviations for several of the parameters listed above. Meter stores the past 24 months worth of readings in non-volatile memory.

Alarms

All PDU alarms are displayed on the screen with the last 128 alarms stored in memory.

Alarms can be programmed to make outgoing calls for service and can be monitored remotely. Services are available for reporting of monthly alarms and system health.

Two user-programmable alarms are standard. A twenty (20) character customized message can be programmed for each alarm.

Alarm thresholds (factory set points shown in brackets) are adjustable by way of the service port to match site requirements. The system detects the following alarm conditions:

- Input ac undervoltage (90% of nominal).
- Input ac overvoltage (110% of nominal).
- Input under/overfrequency (+/- 0.5 Hz of nominal).
- Input phase sequence error.
- Input breaker open.
- Input breaker tripped.
- Emergency power off.
- Transformer over-temperature warning.
- Transformer over-temperature shutdown.
- Output ac undervoltage (90% of nominal).
- Output ac overvoltage (110% of nominal).
- Three alarm levels of output current per phase (80%, 100%, 120%).
- Neutral overcurrent.
- Ground overcurrent.
- Phase loss.
- Output under/overfrequency (+/- 0.5 Hz of nominal).
- Incoming modem call started.
- Outgoing modem call started.
- Modem call successfully completed.
- Modem call failure.

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Startup and Commissioning

Powerware's service organization provides startup, warranty and post-warranty support for all Eaton products. Several packages are available for startup, commissioning, preventative maintenance and extended service. Consult your Powerware rep for further detail.

Table 41.6-1. PDU Technical Data

kVA	Width		Depth		Height		Weight		
	Inches	mm	Inches	mm	Inches	mm	lb.	kg	
PDU									
30	36.00	914.4	32.00	812.8	75.00	1905.0	980	445	
50	36.00	914.4	32.00	812.8	75.00	1905.0	1130	514	
75	36.00	914.4	32.00	812.8	75.00	1905.0	1300	591	
100	36.00	914.4	32.00	812.8	75.00	1905.0	1625	739	
125	36.00	914.4	32.00	812.8	75.00	1905.0	1705	775	
150	36.00	914.4	32.00	812.8	/5.00	1905.0	1825	830	
200	36.00	914.4	32.00	812.8	75.00	1905.0	2250	1023	
225	36.00	914.4	32.00	812.8	75.00	1905.0	2450	1114	
300	45.00	1143.0	37.00	939.8	/5.00	1905.0	2700	1227	
PDU with S	Single Front	Mounted Sid	lecar Attacl	nment					
30	57.00	1447.8	32.00	812.8	75.00	1905.0	1255	570	
50	57.00	1447.8	32.00	812.8	75.00	1905.0	1405	639	
75	57.00	1447.8	32.00	812.8	75.00	1905.0	1575	716	
100	57.00	1447.8	32.00	812.8	75.00	1905.0	1900	864	
125	57.00	1447.8	32.00	812.8	75.00	1905.0	1980	900	
150	57.00	1447.8	32.00	812.8	75.00	1905.0	2100	955	
200	57.00	1447.8	32.00	812.8	75.00	1905.0	2525	1148	
225	57.00	1447.8	32.00	812.8	75.00	1905.0	2725	1239	
300	66.00	1676.4	32.00	812.8	75.00	1905.0	2975	1352	
PDU with S	Single Side-	Mounted Sid	ecar Attach	ment					
30	47.00	1193.8	32.00	812.8	75.00	1905.0	1230	559	
50	47.00	1193.8	32.00	812.8	75.00	1905.0	1380	627	
75	47.00	1193.8	32.00	812.8	75.00	1905.0	1550	705	
100	47.00	1193.8	32.00	812.8	75.00	1905.0	1875	852	
125	47.00	1193.8	32.00	812.8	75.00	1905.0	1955	889	
150	47.00	1193.8	32.00	812.8	75.00	1905.0	2075	943	
200	47.00	1193.8	32.00	812.8	75.00	1905.0	2500	1136	
225	47.00	1193.8	32.00	812.8	75.00	1905.0	2700	1227	
300	56.00	1422.4	32.00	812.8	75.00	1905.0	2950	1341	

1 PDU dimensions shown with two 42-circuit panelboards installed.

Additional panelboards require sidecar attachments.

⁽²⁾ Subfeed breakers cannot be installed in the Front-Mounted Sidecar and can house maximum of two 42-circuit panelboards only.

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Uninterruptible Power Supplies — Powerware Power Distribution Unit



Figure 41.6-1. PDU General Layout



Figure 41.6-2. PDU General Layout — Door Swing and Cable KO Plates

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41.6-4 Uninterruptible Power Supplies — Powerware Power Distribution Unit

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Figure 41.6-3. PDU with Front-Mounted Sidecar



Figure 41.6-4. PDU with Front-Mounted Sidecar — Door Swing and Cable KO Plates

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Figure 41.6-5. PDU with Side-Mounted Sidecar



Figure 41.6-6. PDU with Side-Mounted Sidecar — Door Swing and Cable KO Plates



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PDU with Side-Mounted Sidecar



PDU with Front-Mounted Sidecar



RPP Door Trim Opened

Remote Power Panel

Product Description

The remote power panel (RPP) expands distribution capacity by up to 168 pole spaces (4 x 42 circuit panelboards) in a 24.00 x 24.00 x 78.00-inch (609.6 mm x 609.6 mm x 1981.2 mm) stand-alone cabinet. Incoming cables can be connected to main lugs, main breakers or panelboard main breakers.

The Powerware RPP comes standard with top and bottom cable access. Panelboards can be installed in the front or rear of the RPP, two per side. A variety of monitoring options are also available.

Branch circuit breakers can be factory-mounted or installed at the customer site.

Electrical Parameters

- 208/120 volt.
- 168 pole spaces.

Dimensions and Weights

- 24.00 x 24.00 x 78.00 inches (609.6 mm x 609.6 mm x 1981.2 mm).
- 650 lbs (295 kg).

RPP Options

- Two front panelboards.
- Two front & two rear panelboards.
- With or without panelboard main breaker.
- RPP main breaker on front and/or rear.
- RPP main lugs.
- Metering.
- 4-wire plus ground.



Figure 41.6-7. RPP Layout
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Glossary of Power Terms

Commonly Used Terms

ampere (A or Amp): The unit of measure for the "rate of flow" of electricity, analogous to "gallons per minute." VA x .7 (power factor) = Watts

alternating current (ac): An electric current that reverses its direction at regularly recurring intervals.

blackout: A zero-voltage condition lasting for more than two cycles.

brownout: A steady state of low voltage, but not zero voltage.

direct current (dc): An electric current in which the flow of electrons is in one direction, such as supplied by a battery.

double conversion: A UPS design in which the primary power path consists of a rectifier and inverter. Double conversion isolates the output power from all input anomalies such as low voltage surges and frequency variations.

downtime: The time during which a functional unit cannot be used because of a fault within the functional unit or within the environment.

electrical line noise: Radio frequency interference (RFI), electromagnetic interference (EMI) and other voltage or frequency disturbances.

electromagnetic interference (EMI): Electrical interference that can cause equipment to work improperly. EMI can be separated into conducted EMI (interference conducted through cables out of the UPS) and radiated EMI (interference conducted through the air).

hertz (Hz): A unit of frequency equal to one cycle per second.

high voltage spike: Rapid voltage peak up to 6,000 volts.

hot-swappable: The ability to change a module without taking the critical load off the UPS.

input voltage range: The voltage range within which a UPS operates in "normal" mode and does not require battery power.

inverter: UPS assembly that converts internal DC power to output AC power to run user's equipment. When the inverter is supporting 100% of the load at all times, as with an online UPS, there is no break from utility power to battery power. **kilovolt ampere (kVA)**: An approximation of available power in an AC system that does not take the power factor into account.

line-interactive: An offline UPS topology in which the system interacts with the utility line in order to regulate the power to the load.

load: The equipment connected to and protected by a UPS.

maintenance bypass: An external wiring path to which the load can be transferred in order to upgrade or perform service on the UPS without powering down the load.

noise: (1) A disturbance that affects a signal; it can distort the information carried by the signal. (2) Random variations of one or more characteristics of any entity such as voltage, current or data. (3) Loosely, any disturbance tending to interfere with normal operation of a device.

offline: Any UPS that does not fit the definition of online. Line-interactive and standby topologies are offline.

online: (1) A UPS that provides power to the load from its inverter 100% of the time, regulating BOTH voltage and frequency, usually double conversion topology.

plug and play: An electrical device that does not require extensive setup to operate.

power factor (PF): The ratio of real power to apparent power. Watts divided by VA. Most power supplies used in communication and computer equipment have a power factor of .7. (PF = .7)

 $VA \times PF = W$

W/PF = VA

power sag: Low voltage (below nominal 120 volts).

power surge: High voltage (above nominal 120 volts).

rack-mount: Ability to mount an electrical assembly into a standardized rack.

rectifier: UPS component that converts incoming AC power to DC power for feeding the inverter and for charging the battery.

redundancy: Duplication or repetition of elements in electronic equipment to provide alternative functional channels in case of failure. The Avaya 9 and 12 kVA features N+X redundancy. Visit avayaups.com for details. **relay communication**: Communication between a UPS and a computer through the opening and closing of solid state relays which are pre-defined to indicate UPS status.

RS-232: The standard for serial interfaces (serial refers to the eight bits of each character successively sent down one wire) used by most computers, modems and printers; a 25-pin physical interface.

run time: The amount of time the battery in a UPS is designed to support the load.

sine wave: A waveform that represents periodic oscillations of a pure frequency.

single-phase: Power system with one primary waveform.

standby: UPS technology where power is applied to the load directly from the utility under normal operation, but switched to the inverter and battery for emergency support (offline topology).

three-phase: A power system with three primary voltage waveforms spaced equally (in time) out of phase with each other.

Total Harmonic Distortion (THD): Describes how much the circuit voltage deviates from a perfect sine wave. A poor voltage THD is most often manifested in a "flat topped" waveform that comes from the inability of a power source to respond to the demands of highly non-linear loads.

uninterruptible power system (UPS):

An electrical system designed to provide instant, transient-free back up power during power failure or fault. Some UPSs also filter and/or regulate utility power (line conditioning).

volt/voltage (V): Electrical pressure that pushes current through a circuit. High voltage in a computer circuit is represented by 1; low (or zero) voltage is represented by 0.

VoltAmps (VA): Voltage x amps.

volts direct current (Vdc)

volts alternating current (Vac)

watts (W): The rate of doing electrical work.

W x 1.4 = VA.

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