Vertiv™ Liebert® APS

Installer/User Guide

5 kVA to 20 kVA Modular UPS

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit https://www.vertiv.com/en-us/support/ for additional assistance.

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1 Important Safety Precautions

Save These Instructions

This manual contains important safety instructions. Read all safety, installation and operating instructions before operating the Vertiv™ Liebert® APS modular UPS system. Adhere to all warnings on the unit and in this manual. Follow all operating and user instructions. Individuals must fully understand this equipment to install and operate it.

The Liebert® APS is designed for commercial/industrial use only. It is not intended for use with life-support or other designated critical devices. Maximum load must not exceed that shown on the rating label. Install and operate the unit only in a clean indoor environment, free of conductive contaminants, moisture, flammable liquids, gases and corrosive substances. The Liebert® APS contains no user-serviceable parts. Refer all faults to your local dealer, local Vertiv™ representative or Vertiv™ Technical Support.

The Liebert® APS UPS system is designed for use on a properly earthed (grounded) "TN" electrical supply. The system must be installed by qualified personnel. A qualified electrician must review and approve customer supplied wiring, circuit breakers, and intended loads and verify correct input, output, and earth connections to ensure compliance with the technical standards and local electrical codes of practice.

WARNING! Risk of electric shock. Can cause equipment damage, injury and death. A battery can present a risk of electrical shock and high short-circuit current.

The following precautions must be observed before replacing the battery pack:

- Wear rubber gloves and boots
- Remove rings, watches and other metal objects.
- Use tools with insulated handles.
- Do not lay tools or other metal objects on the batteries.
- If the battery kit is damaged in any way or shows signs of leakage, contact your local Vertiv representative immediately.
- Do not dispose of batteries in a fire. The batteries may explode.
- Handle, transport and recycle batteries in accordance with local regulations.

The Liebert® APS is designed and manufactured to ensure personal safety, but improper use can result in electrical shock or fire. To ensure safety, observe the following precautions:

- Turn Off and unplug the Liebert® APS before cleaning it.
- Clean the unit with a dry cloth. Do not use liquid or aerosol cleaners.
- Never block or insert any objects into the ventilation holes or other openings of the Liebert® APS.
- Do not place the Liebert® APS power cord where it might be damaged.

This UPS contains no user-serviceable parts except for the user-replaceable module assemblies. The UPS On/Off push button does not electrically isolate internal parts.

All service and maintenance operations must be performed by properly trained and qualified personnel. Under no circumstances should unqualified or unauthorized personnel attempt to gain access to the internal portions of the Liebert® APS.

ELECTROMAGNETIC COMPATIBILITY—The Liebert® APS complies with the limits of Category C2, pursuant to IEC/EN/AS 62040-2, and for a Class A digital device, pursuant to Part 15 of FCC rules. Operation is subject to the following conditions:

- The output cables must be no longer than 10 m (32 ft).
- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation. Operating this device in a residential area is likely to cause harmful interference that users must correct at their own expense.

The Liebert® APS complies with the requirements of EMC Directive 2004/108/EC and the published technical standards. Continued compliance requires installation in accordance with these instructions and use of accessories approved by Vertiv..

Operate the unit in an indoor environment only in an ambient temperature range of 0-40°C (32-104°F). Install it in a clean environment, free from moisture, flammable liquids, gases and corrosive substances.

Do not continue to use the Liebert® APS if the front panel indications are not in accordance with these operating instructions or the performance alters in use. Refer all faults to your Vertiv representative or Technical Support.

Servicing of batteries must be performed or supervised by properly-trained and qualified personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from the batteries. Proper disposal of batteries is required. Refer to your local laws and regulations for disposal requirements.

Never block or insert any object into the ventilation holes or other openings.

DO NOT CONNECT equipment that could overload the UPS or demand DC current from the Liebert® APS, for example: electric drills, vacuum cleaners, laser printers, hair dryers or any appliance using half-wave rectification.

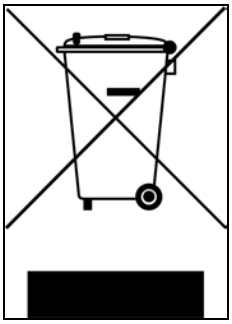
Storing magnetic media on top of the Liebert® APS may result in data loss or corruption.

Turn Off and isolate the Liebert® APS before cleaning it. Use only a soft cloth, never liquid or aerosol cleaners.

Information for the Protection of the Environment

UPS SERVICING—This unit makes use of components dangerous for the environment (electronic cards, electronic components). The components removed must be taken to specialized collection and disposal centers.

NOTICE TO EUROPEAN UNION CUSTOMERS: DISPOSAL OF OLD APPLIANCES—This product has been supplied from an environmentally aware manufacturer that complies with the Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/CE.



The symbol at right is placed on this product to encourage recycling wherever possible. Recycle this product through a recycling facility at the end of its service life. Do not dispose of this product as unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provisions to reduce the environmental impact of waste electrical and electronic equipment (WEEE).

For information regarding the disposing of this equipment, visit www.vertiv.com or contact Vertiv technical support. Refer to the inside front cover of this manual for contact information.

For information regarding the scrapping of this equipment, please browse *https://www.vertiv.com/en-emea/* or call our worldwide technical support.

- Toll Free: 00 80011554499
- Toll Number Based in Italy: +39 0298250222

Table 1.1 Glossary of Symbols

Symbol	Description	Symbol	Description
	Risk of electrical shock		Recycle
	Indicates caution followed by important instructions		Equipment grounding conductor
	AC input		Bonded to ground
	AC output		Requests the user to consult the manual
	Indicates the unit contains a valve-regulated lead acid battery		DC voltage
	Toggle between On and Off		Stand-by

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2 Product Introduction

To ensure proper installation and operation of this unit, please read this manual thoroughly.

The installation must be completed by trained professionals and follow all local codes. General operation of the units can be conducted without any specialized training.

2.1 System Description

The Liebert® APS power system is a modular UPS that provides high reliability. It is intended for use with workstations, servers, networks, telecoms and other sensitive electronic equipment. It provides continuous, high-quality AC power to your equipment, protecting it from any power disturbance due to blackouts, brownouts, surges or noise interference.

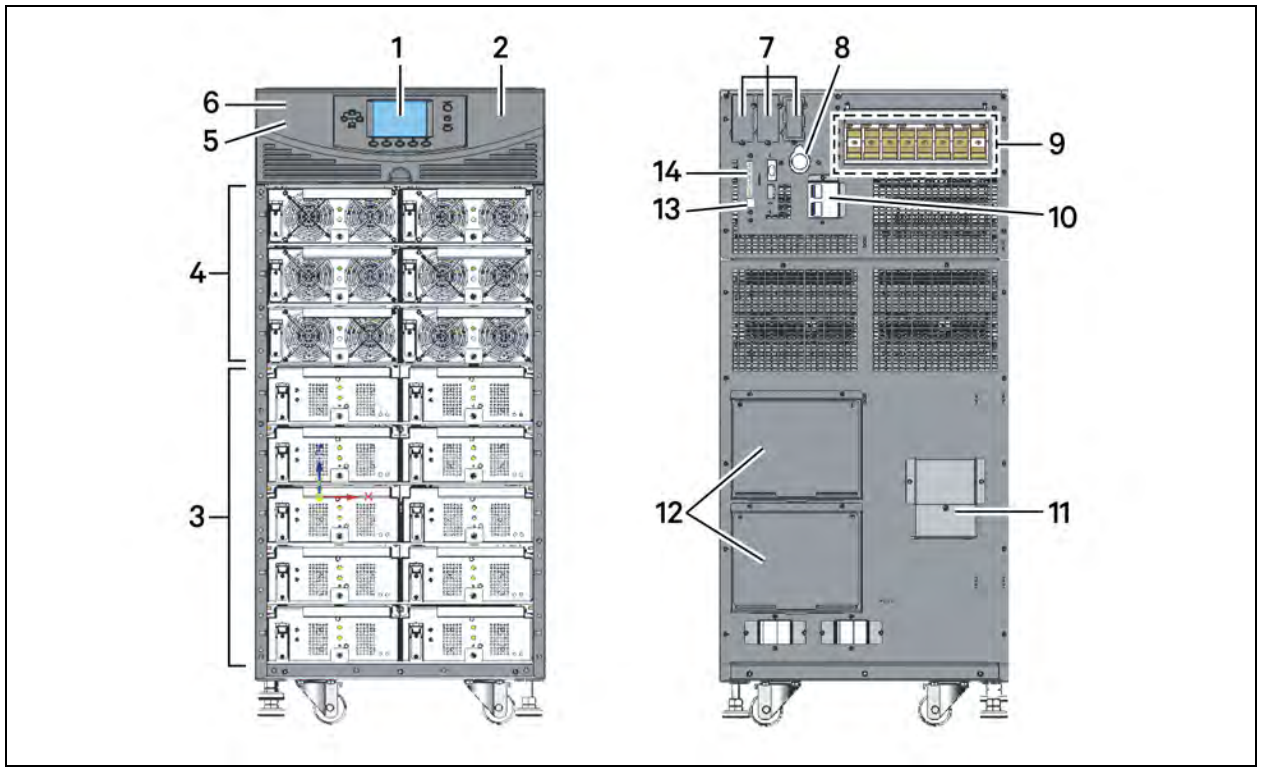
The Liebert® APS UPS is an easily adaptable UPS system. By installing additional power or battery modules, you can expand your current system capacity, extend your back-up runtime, or provide redundancy. The user interface lets you configure the operation according to application requirements. It also informs you of the status of the UPS and keeps a log of events.

The Liebert® APS series UPS contains both transformer-free and transformer-based UPS frames. The use of the transformer-free or transformer-based frames depends on the specific application requirements. The appearance of the different frames is shown in 16-bay transformer-free UPS on the next page through 16-bay transformer-based UPS on page 9 .

Table 2.1 Frame designation

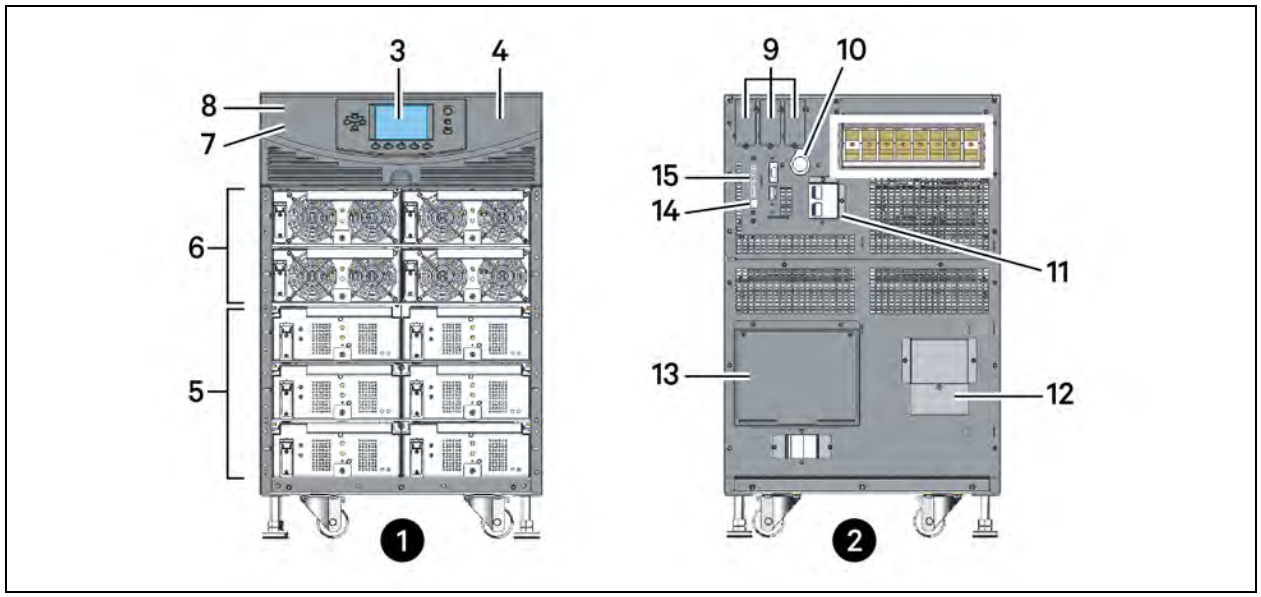
UPS Model Number Digits 1-3	Frame Type	Frame Rating
AS1 or ASA or AS5 or ASE	10 Bay Transformer-free	15 kVA redundant
AS2 or ASB or AS6 or ASF	16 Bay Transformer-free	20 kVA redundant
AS3 or ASC	12 Bay Transformer-based	15 kVA redundant
AS4 or ASD	16 Bay Transformer-based	20 kVA redundant

Figure 2.1 16-bay transformer-free UPS



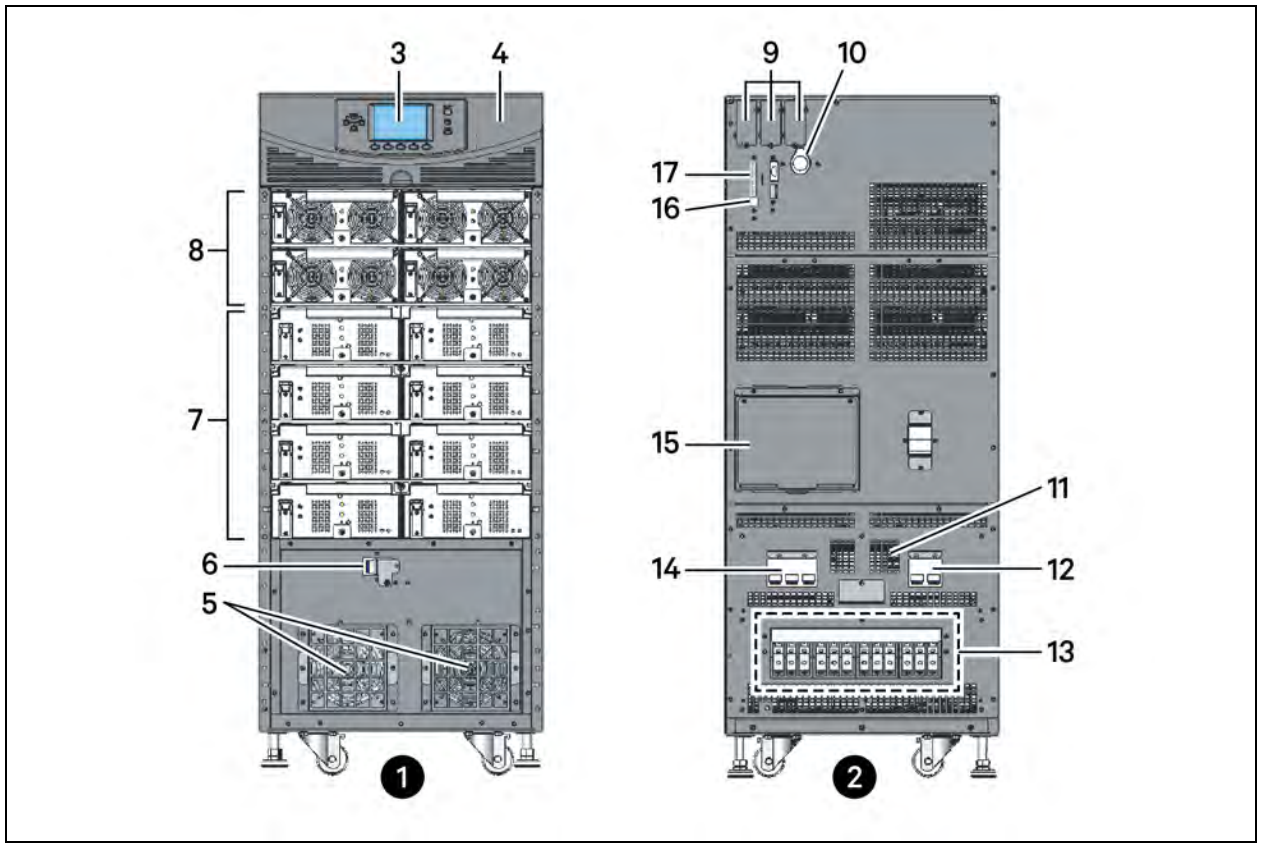
Item	Description	Item	Description
1	User-interface module	8	System-enable switch
2	System-control module (under cover)	9	Power input and output terminals
3	Bays for battery modules	10	Output breaker
4	Bays for power, charger, or battery modules	11	External-batter-cabinet connector
5	Input breaker (under cover)	12	POD ports
6	Manual bypass breaker (under cover)	13	USB port
7	Liebert IntelliSlot ports	14	Dry contacts and REPO connections

Figure 2.2 10-bay transformer-free UPS



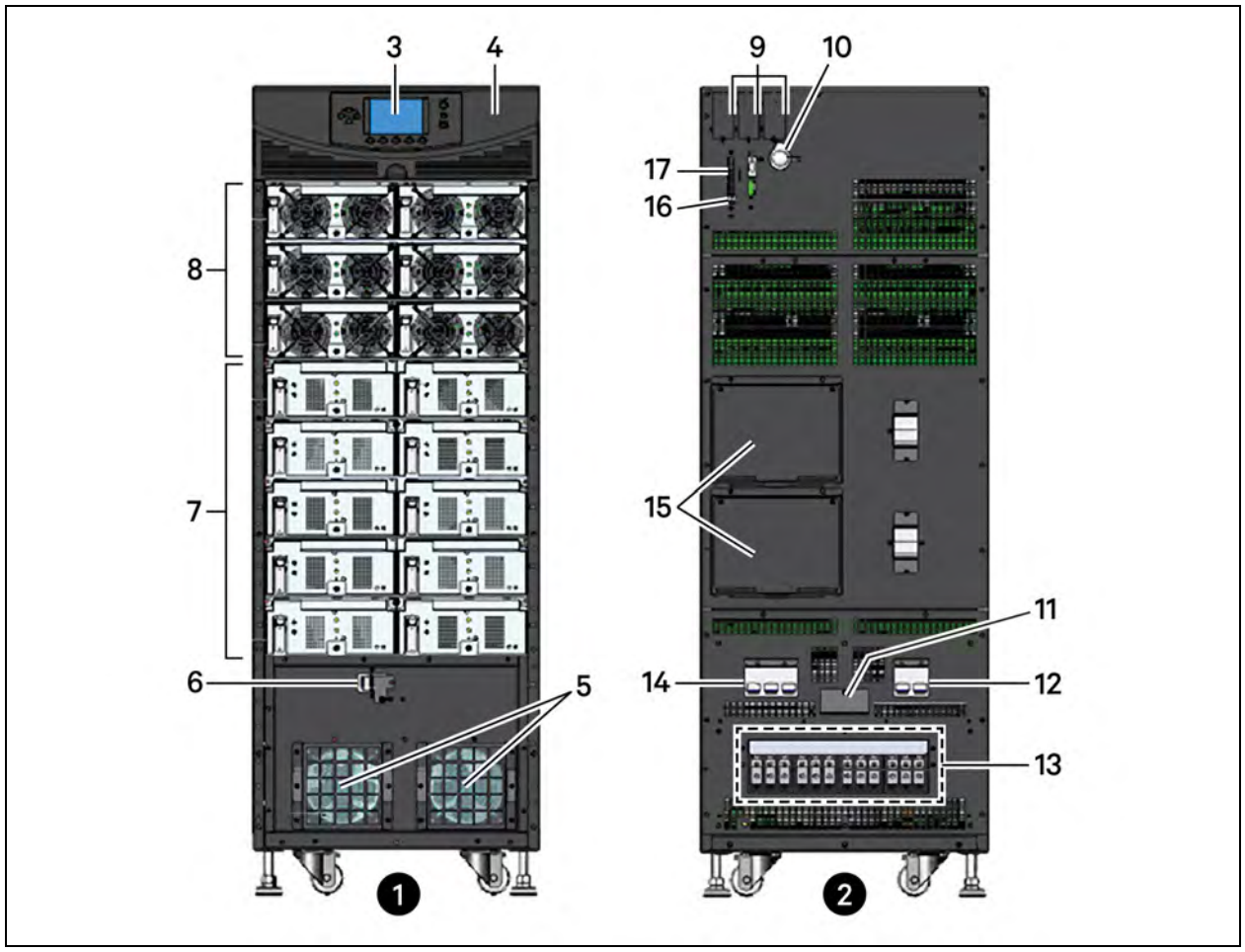
Item	Description	Item	Description
1	Front view with bezels removed	9	Liebert IntelliSlot ports
2	Rear view	10	System-enable switch
3	User-interface module	11	Output breaker
4	System-control module (under cover)	12	External-batter-cabinet connector
5	Bays for battery modules	13	POD ports
6	Bays for power, charger, or battery modules	14	USB port
7	Input breaker (under cover)	15	Dry contacts and REPO connections
8	Manual bypass breaker (under cover)		

Figure 2.3 12-bay transformer-based UPS



Item	Description	Item	Description
1	Front view with bezels removed	10	System-enable switch
2	Rear view	11	External-batter-cabinet connector
3	User-interface module	12	Input breaker
4	System-control module (under cover)	13	Power input and output terminals
5	Fans	14	Output breaker
6	Manual bypass breaker	15	POD ports
7	Bays for battery modules	16	USB port
8	Bays for power, charger, or battery modules	17	Dry contacts and REPO connections
9	LiebertIntelliSlot ports		

Figure 2.4 16-bay transformer-based UPS



Item	Description	Item	Description
1	Front view with bezels removed	10	System-enable switch
2	Rear view	11	External-batter-cabinet connector
3	User-interface module	12	Input breaker
4	System-control module (under cover)	13	Power input and output terminals
5	Fans	14	Output breaker
6	Manual bypass breaker	15	POD ports
7	Bays for battery modules	16	USB port
8	Bays for power, charger, or battery modules	17	Dry contacts and REPO connections
9	Liebert IntelliSlot ports		

2.2 Features

- Flexible extension of capacity, up to 15 or 20 kVA modular power, depending upon frame rating
- N + 1 redundancy, improving availability
- Modular design, modules hot-swappable by user
- Intelligent battery management
- External large batteries can be connected
- Internal automatic and manual bypass
- Transformer-based UPS frames provide output isolation transformer
- Optional 10-A battery charger module
- Continuous system monitoring
- User-friendly interface with audible alarms and event logs
- Supporting hot-pluggable and online update
- Compatible with backup generators

Standard Components

- UPS frame
- User-interface module for comprehensive user indications and programmable controls
- System-control modules and system-monitor module for system monitoring and communications
- Power modules for power conditioning
- Battery modules for back-up power
- Charger module option for charging batteries and long run-time applications
- External battery cabinet prolongs system run time

Communications

- Dry contacts
- Liebert IntelliSlot communication ports
- USB port

2.3 Major Components

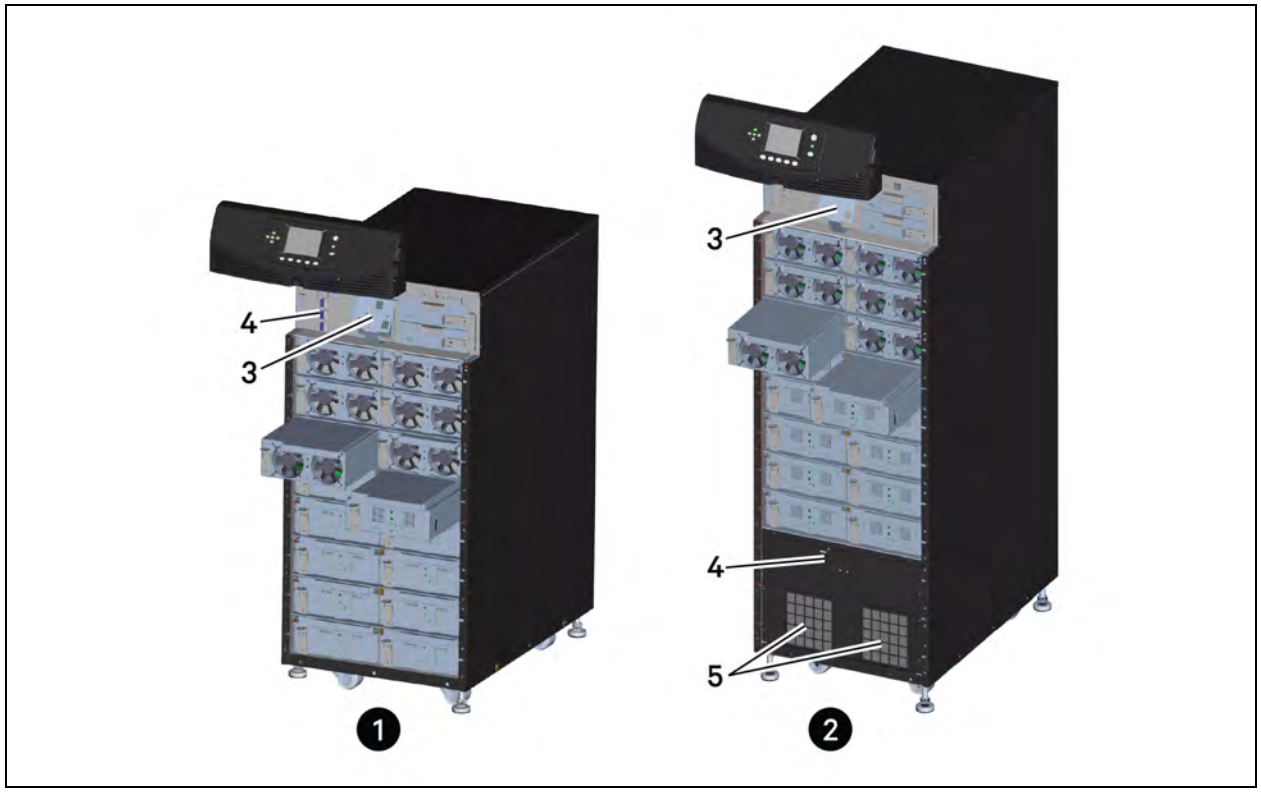
This section provides a general description of each component and its functions. Please review this section carefully, as it will give you a better understanding of how the UPS operates.

2.3.1 UPS Frame

All UPS components are located in the Liebert® APS frame. The front of the UPS consists of a series of plastic bezels. Grasp the bezels from the sides and pull straight out to remove the bezel and reveal the battery/power-module bays. The standard-model frame provides cooling fans and a manual-bypass breaker on the top. The transformer-model frame provides a manual-bypass breaker on its bottom and fans on both top and bottom. The user-interface module is located above the power/battery-module bays for easy access, operation and for viewing UPS operating information. On the lower-right of the user-interface module are the system-control module bays.The UPS frames are shown in Example UPS frames with bezels removed below .

NOTE: In the figure, the power module and battery module are extended for illustration purposes only. Extending more than one module at a time could cause the unit to tip over.

Figure 2.5 Example UPS frames with bezels removed



Item	Description	Item	Description
1	16-bay, transformer-free UPS	4	Manual bypass breaker
2	16-bay, transformer-based UPS	5	Fans
3	Fan, behind display bracket		

2.3.2 User-Interface Module

The user-interface module, shown in User-interface module below ,is the primary source of communication between the UPS and the user. The user interface module lets you:

- View the UPS status
- Configure the system
- Review the event log
- Silence the audible alarm

Refer to Operation and Display Panel on page 55 for details on operating the user interface module.

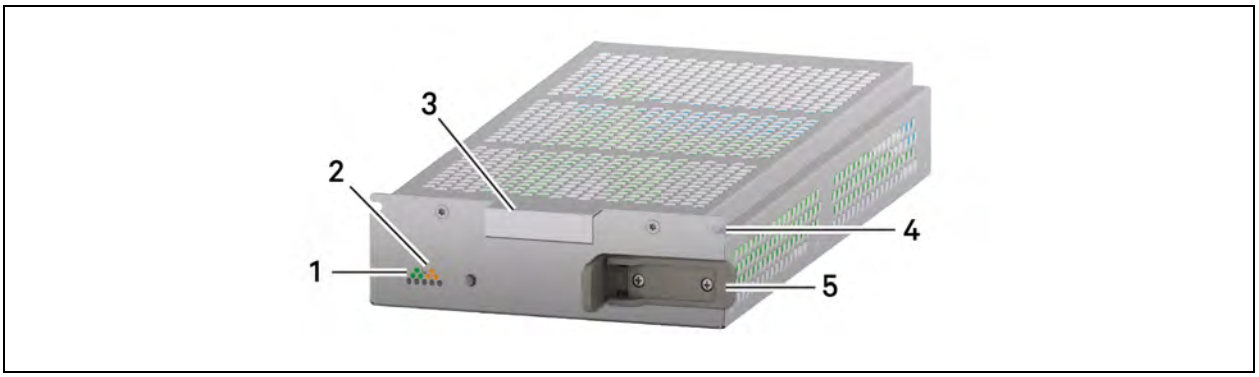
Figure 2.6 User-interface module

2.3.3 System-Control Module and System-Monitor Module

The system-control module and the system-monitor module are the communication backbone of the UPS. They gather input from all modules and process the data to control system operation and monitor the condition of each module. Except for the silkscreen, the appearance of the system-control module and the system-monitor module appear as shown in Example of system-control and system-monitor module on the facing page .

Under normal operation, the green status LED blinks and the yellow fault LED is Off. For any other condition, refer to Troubleshooting on page 71 .

Figure 2.7 Example of system-control and system-monitor module



Item	Description	Item	Description
1	Status LED (green)	4	Securing hole
2	Fault LED (yellow)	5	Locking lever
3	Handle		

2.3.4 Power Module

Each power module, shown in Power module below , is an independent 5-kVA unit, consisting of a power-factor-corrected rectifier, battery charger, and inverter with associated monitoring and control circuitry. The modules are connected in parallel for greater capacity and/or redundancy.

The power modules may be added or replaced on-line with no interruption or danger to the connected equipment or user.

Figure 2.8 Power module

Item	Description	Item	Description
1	Locking Lever	3	Status LED (green)
2	Fan	4	Fault LED (yellow)

2.3.5 Battery Module

When AC utility fails, the battery module supplies power to the load. Each battery module contains 6 individual 12-V, valve-regulated lead-acid (VRLA) battery blocks. Two battery modules are connected in series to form a battery string.

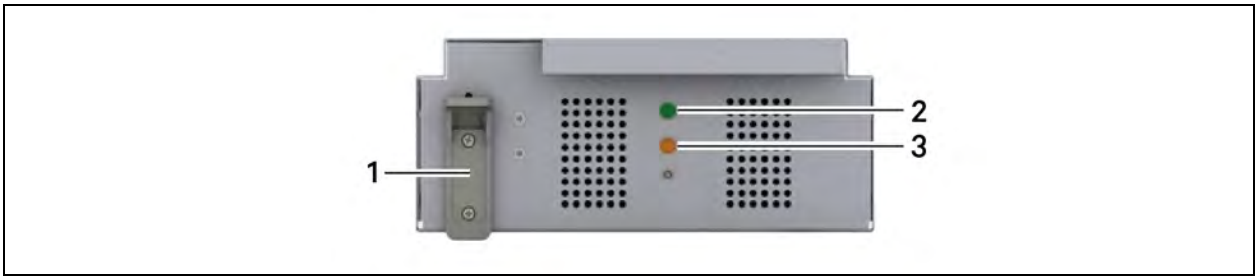
Each battery module, shown in Battery module below ,has monitoring and controls that isolate the battery module in the event of a battery failure. The battery strings are connected in parallel to provide back-up time and/or redundancy.

NOTE: Two battery modules must be installed in the same row to make a complete battery string.

The battery modules may be added or replaced on-line with no interruption or danger to the connected equipment if the UPS is not operating on battery.

Under normal operation, the green status LED blinks continuously and the yellow fault LED is Off. For any other condition, refer to Troubleshooting on page 71 .

Figure 2.9 Battery module



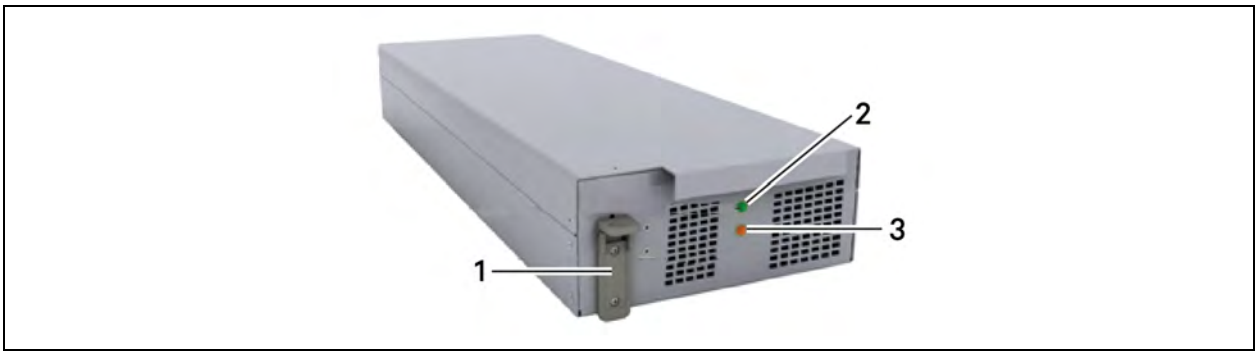
Item	Description
1	Locking Lever
2	Status LED (green)
3	Fault LED (yellow)

2.3.6 Charger Module

In AC mains mode, the charger module, shown in Charger module on the facing page , charges the system battery modules or external battery cabinet. Each charger module is rated to deliver 10-A charging current. The charger module has an independent control function and maintains real-time communication with the system and the battery modules to ensure stable charging and fault protection.

The charger module may be added or replaced on-line with no interruption or danger to the user, connected battery system or connected equipment.

Figure 2.10 Charger module



Item	Description
1	Locking Lever
2	Status LED (green)
3	Fault LED (yellow)

2.3.7 External Battery Cabinet (EBC)

The external battery cabinet, shown in External battery cabinet below , is divided into 9 rows: the upper 7 rows are used for the intelligent battery modules, and the lower 2 rows are used for overcurrent protection for each battery cabinet. For normal operation, 2 battery modules must be inserted in the same row of the frame to create a complete string. The battery module strings work in parallel to provide longer back-up time for the UPS. The Liebert® APS can be configured with up to 4 external battery cabinets.

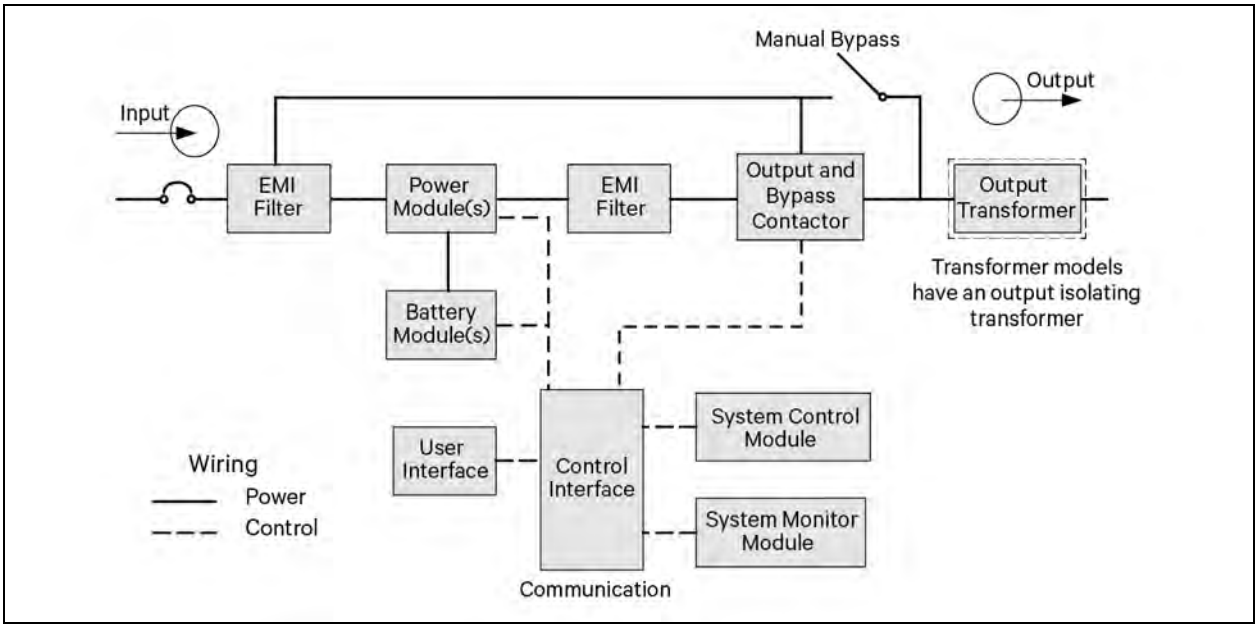
Figure 2.11 External battery cabinet

2.4 Operating Principle

The operating principle of the Liebert® APS UPS is shown in Operating principle diagram below .

The UPS is composed of AC input, EMI filter, power module(s), battery module(s), user interface, control interface, system control module, output and bypass contactor, manual bypass, output transformer (certain frames only) and AC output.

Figure 2.12 Operating principle diagram



2.5 Operating Modes

The Liebert® APS is a true online double-conversion system, with the following operating modes:

- Normal Mode
- Backup Mode
- Auto Restart Mode
- Bypass Mode

2.5.1 Normal Mode

The power-module rectifiers derive power from a utility AC source and supply regulated DC power to the inverter. The module's inverter regenerates precise AC power to supply the connected equipment. The battery charger is in the power module and maintains a float-charge on the batteries of the UPS. The optional charger module can also charge the batteries to maintain a quicker recharge time for long back-up time applications.

2.5.2 Backup Mode

When AC utility fails, the connected equipment is supplied power by the inverter, which obtains energy from the battery modules. The output power will not be interrupted during the failure or restoration of the AC utility/mains source.

2.5.3 Auto Restart Mode

After a power outage and complete battery discharge, and once AC utility is restored, the UPS automatically restarts and resumes supplying power to connected equipment. This feature is enabled at the factory, but can be disabled by you. You can also program two auto-restart delay settings from the LCD:

- Battery capacity level (%)
- Countdown timer

2.5.4 Bypass Mode

The bypass provides an alternate path for power to the connected equipment and operates as follows:

- Automatic: In the event of an internal fault or the inverter overload capacity be exceeded, the UPS performs an automatic transfer of the connected equipment from the inverter to the bypass source.
- Manual: If the UPS needs taken out of service for limited maintenance or repair, manual activation of the bypass causes an immediate transfer of the equipment from the inverter to the bypass source.

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3 Installation

3.1 Unpacking Inspection

Upon receipt, unpack the Liebert® APS and conduct the following checks:

- Inspect the unit for shipping damage. If any shipping damage is founded, report it to the carrier.
- Check against the delivery list to verify that the types of the accessories are complete and correct. If there is any discrepancy, contact the carrier and your Vertiv representative immediately.

3.2 Installation Environment

NOTE: Operating the UPS in temperatures above 77°F (25°) will reduce battery life.

The environment must be free of conductive contaminants and excessive moisture (water and condensation), flammable vapors, chemical fumes, corrosive gases and liquids.

3.3 Installation Tools

The following tools are required to properly set up your UPS:

- Pallet jack
- 17-mm (11/16-in.) wrench or socket
- 13-mm (1/2-in.) wrench or socket
- 10-mm wrench or socket
- #1 and #3 Phillips-head screwdrivers
- Torque wrench

3.3.1 Installation Site Considerations and Clearances

Consider the weight and size of the Liebert® APS when deciding where to install the unit. Verify that the floor can support the weight of a fully-loaded unit, with any accessories and external cabinets.

The UPS is air-cooled by internal fans. Air is drawn into the front of the UPS and exhausted through ventilation grilles in the back. Verify that the UPS will be in a well-ventilated area with at least 6-in. (153-mm) clearance behind for ventilation and at least 39-in. (1-m) clearance in front for service and to meet local and national building codes.

3.4 Removing the UPS from the Pallet

The unit frame is bolted to the shipping pallet for safety during shipping. We recommend keeping the unit bolted to the pallet and using a pallet jack to transport the unit to the installation location.

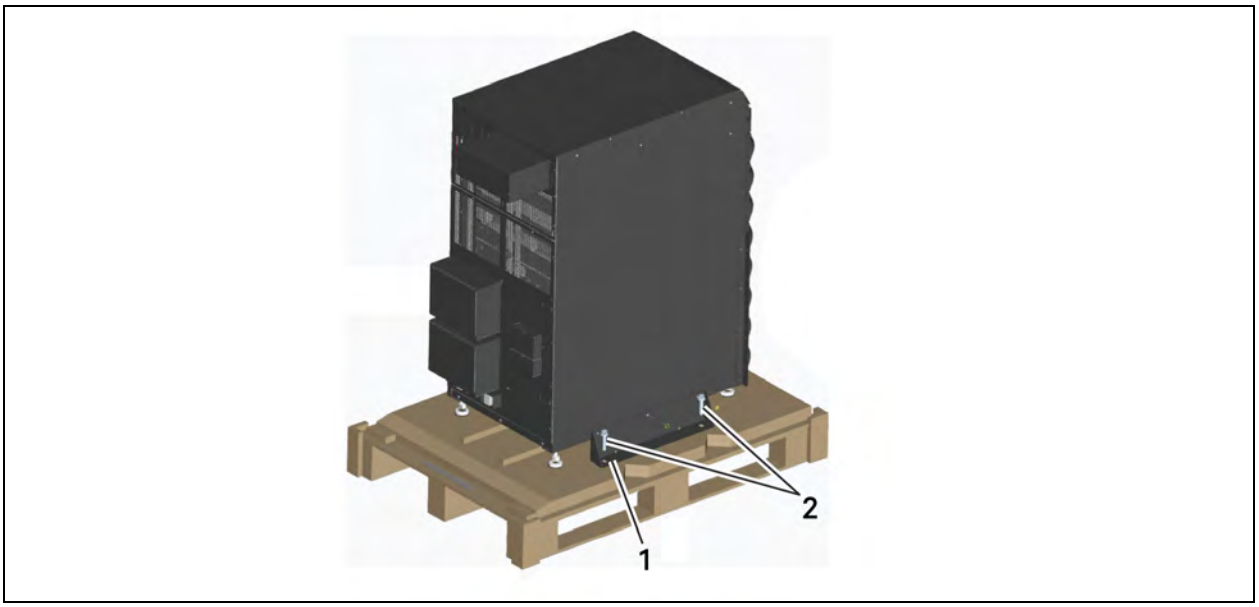
NOTE: The UPS is very heavy. At least two people should unload it from the pallet.

To unload the UPS:

1. Move the UPS to its installation location and remove the package paper.

2. Use a 17-mm (11/16-in.) wrench, to remove the 4 mounting bolts from the pallet brackets, see Remove the mounting brackets below .
3. Remove the mounting brackets from the UPS with a 10mm wrench or socket or a #3 Phillips screwdriver.

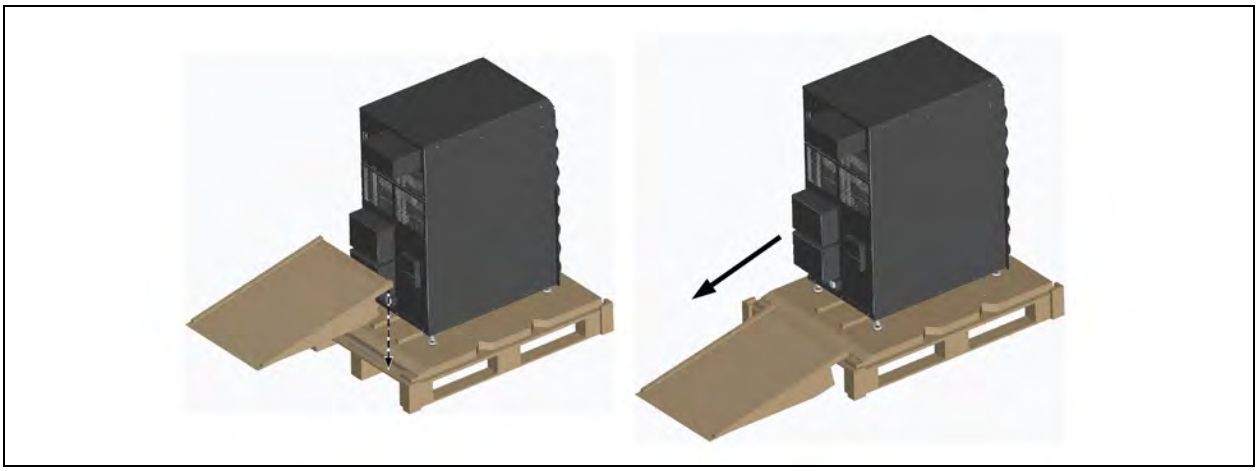
Figure 3.1 Remove the mounting brackets



Item	Description
1	Mounting bracket (one on each side)
2	Mounting bolts (4 places, 2 each side)

4. Raise the 4 leveling feet to provide clearance between the pallet and the UPS frame.
5. Connect the ramp to the UPS pallet as shown in Connect the ramp and roll UPS off the pallet below , and roll the UPS slowly down the ramp until it is on a level surface.

Figure 3.2 Connect the ramp and roll UPS off the pallet



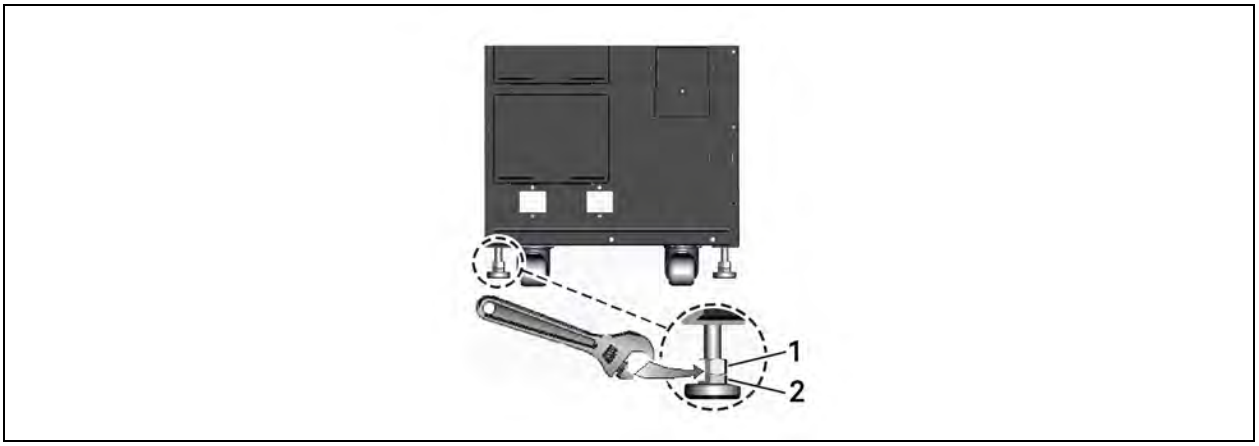
3.5 Installing the UPS

The Liebert® APS may be installed as a tower or in a rack, depending on available space and use considerations. Determine the type of installation and follow the appropriate instructions. See Tower Installation below or Rack Installation on page 23 .

3.5.1 Tower Installation

1. With the UPS in the installation location, adjust the leveling feet to secure its position, as shown in Adjust the leveling feet below .
   a. Use an open end wrench to turn the lower nut to raise or lower the leveling foot.
   b. After the unit is level, tighten the upper nut against the frame to prevent the height from changing.

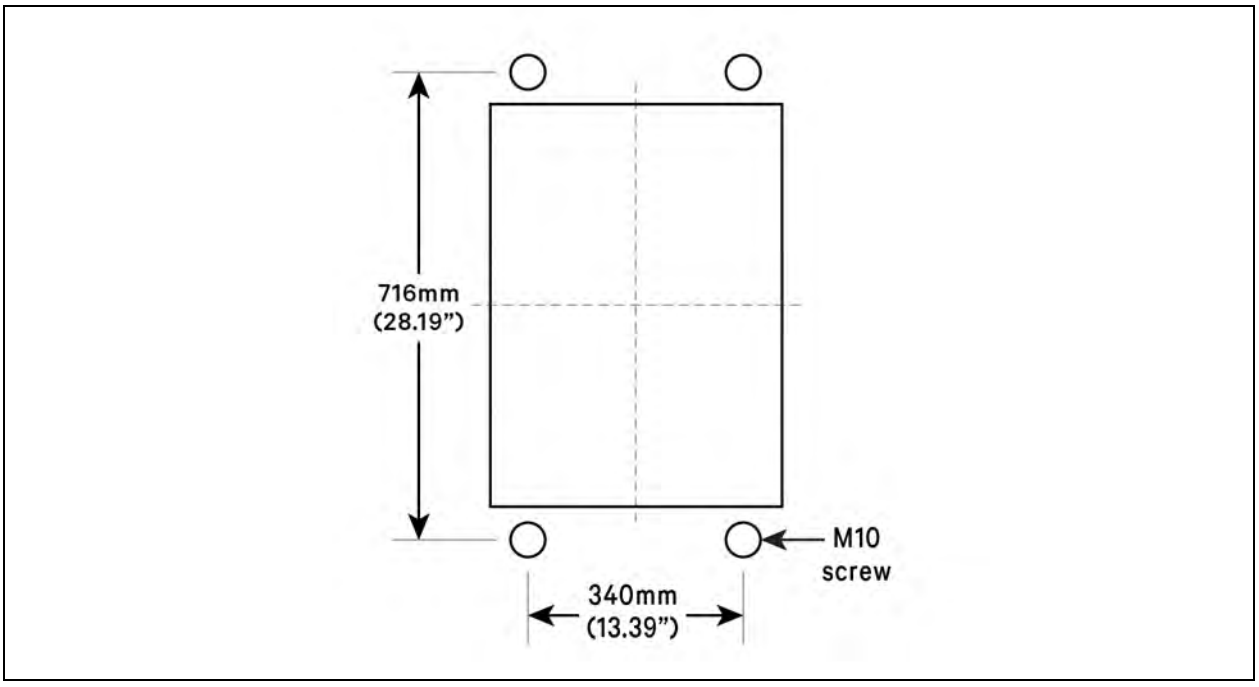
Figure 3.3 Adjust the leveling feet



Item	Description
1	Upper nut
2	Lower nut

2. For added stability or earthquake-resistant installations, the shipping brackets can be used to secure the unit to the floor.
   a. Refering to Dimension-location of drilled holes for stationary mounting below , drill 10.3-mm (13/32-in.) holes in the floor to accommodate the mounting bolts removed from the pallet.
   b. Use the mounting screws to install the mounting brackets on the front and rear of the UPS (the brackets were removed from the sides of the unit when removing it from the pallet, see Remove the mounting brackets on page 20).
   c. Secure the mounting brackets to the floor with the mounting bolts in the drilled holes. For greater stability, use a higher-grade bolt.

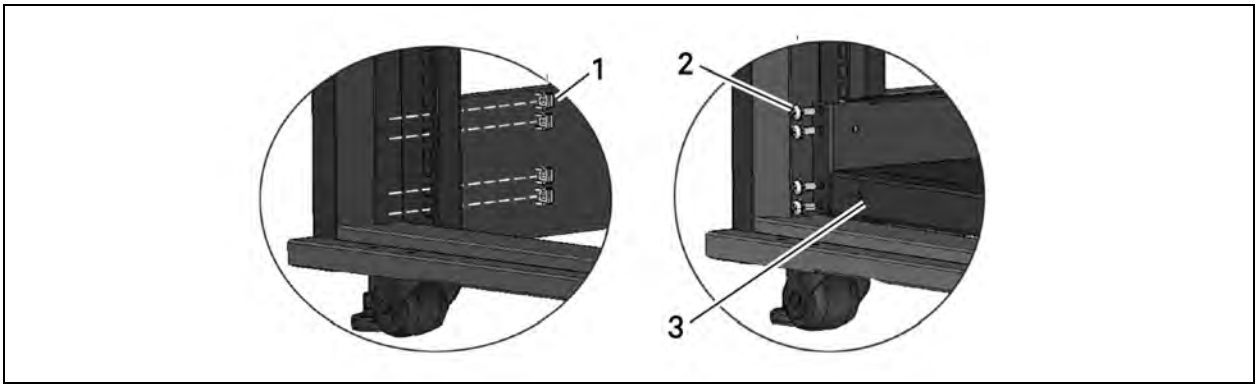
Figure 3.4 Dimension-location of drilled holes for stationary mounting



3.5.2 Rack Installation

1. Install the cage nuts on the corresponding positions in the rack, see Install cage nuts and tray below .
   a. Install cage nuts in the 2 lower square holes of 1U space and in the 2 upper square holes of 2U space on all 4 rack posts. These cage nuts secure the optional shelf that will support the weight of the Liebert® APS.
   b. Install a cage nut in the middle square hole of 4U, 6U, 10U, 12U spaces, respectively in all 4 posts. These cage nuts help secure the UPS in the rack.
2. Install the rack-mount shelf on the corresponding position between 1U space and 2U space on the bottom of the rack, as shown in Install cage nuts and tray below .

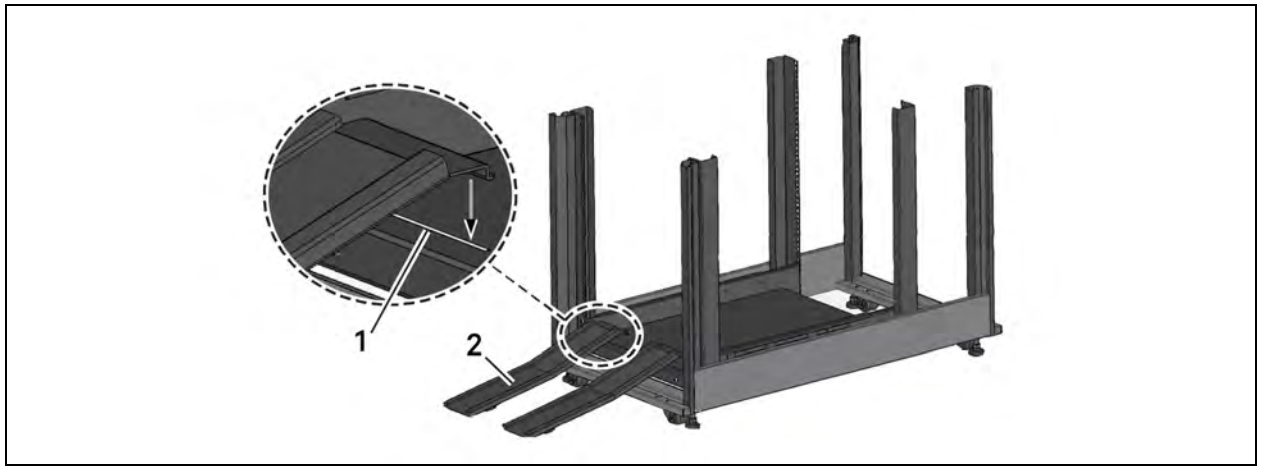
Figure 3.5 Install cage nuts and tray



Item	Description
1	Cage nut
2	Screw (16 places)
3	Tray

3. Install the guide rails (ramp) in the mounting slot at the front of the tray, as shown in Install the guide rails below .

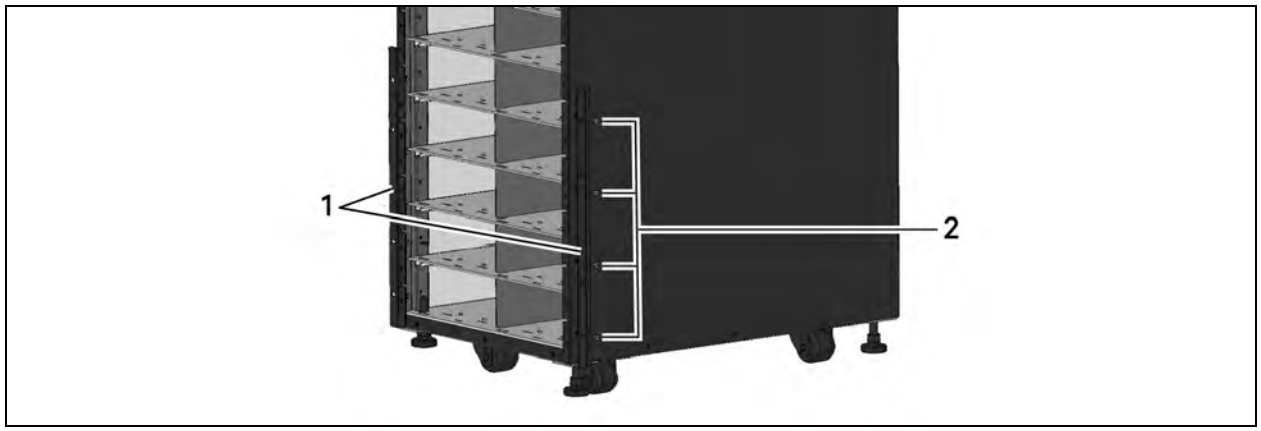
Figure 3.6 Install the guide rails



Item	Description
1	Mounting slot
2	Guide rail

4. Unscrew the 10 screws, 5 each side, on the front of the side panels of the UPS frame, and use the screws to attach the brackets to each side of the UPS frame, as shown in Install the brackets below .

Figure 3.7 Install the brackets



Item	Description
1	Brackets (1 each side)
2	Screws (8 places)

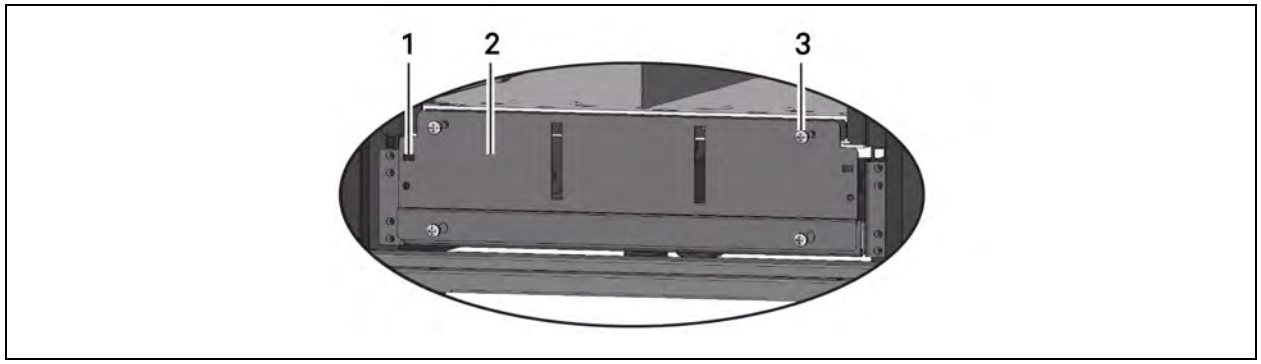
5. Push the Liebert® APS frame slowly, up the guide rails into the enclosure from the front. The rear of the UPS goes into the rack first when installing through the front of the rack.

6. Using 8 panel screws, 4 in each bracket, secure the UPS frame to the rack posts.

NOTE: You may need to adjust the leveling feet to align the holes.

7. Use 4 screws to install the metal plate (accessory in the rack-mount kit) on the corresponding position on the lower-front part of the UPS frame as shown in Metal plate and Square holes for bezel below .
8. Insert the plastic bezel into the square holes of the metal plate, see Metal plate and Square holes for bezel below .

Figure 3.8 Metal plate and Square holes for bezel



Item	Description
1	Square hole (4 places)
2	Metal plate
3	Screw (4 places)

3.6 Installing Modules

The Liebert® APS ships configured from the factory (modules pre-populated) and tested as a system to your requirements. If you removed any modules to facilitate installation, refer to the following steps to re-insert them properly.

3.6.1 Installing Power, Battery and Charger Modules

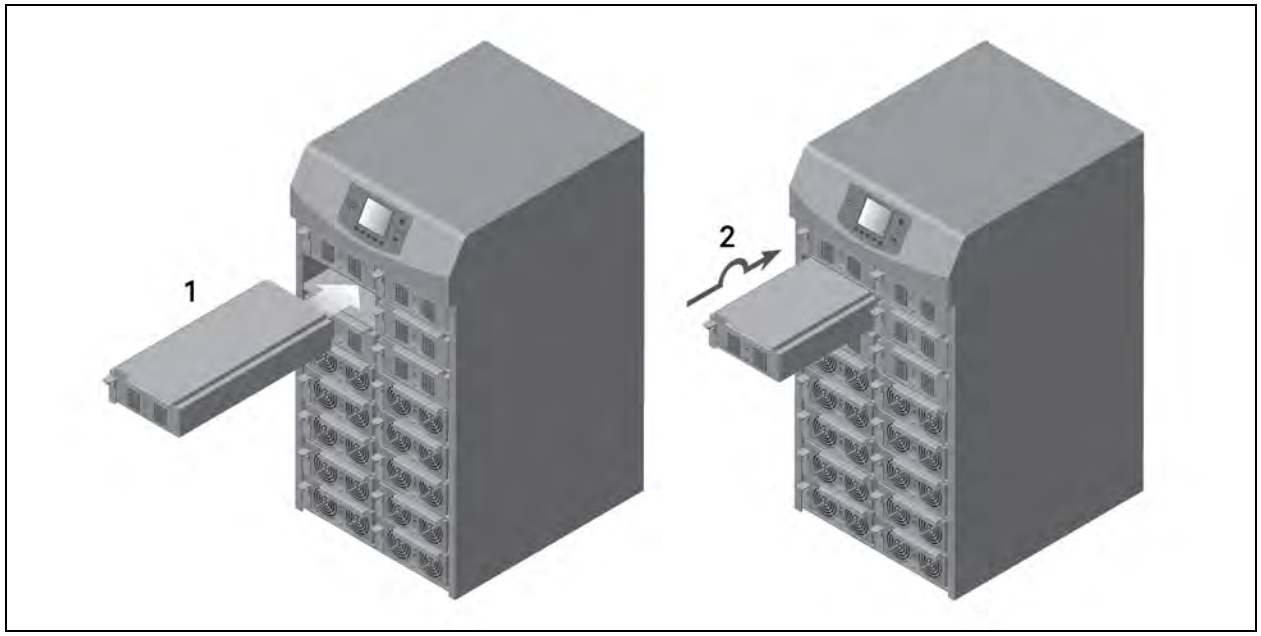
1. With the plastic bezel removed, lift module to appropriate bay, resting end of module on bay shelf.

NOTE: Do not rest the module on any plastic bezels. It could damage the bezel.

NOTE: Two battery modules must be installed in the same row to complete the battery string.

2. Refering to Inserting power, battery and charger modules below , slowly push the module until about 1/3 of the module is in the bay.
3. Lift the module up, then continue pushing until about 5 cm (2 in.) of the module remains outside the bay, then push it firmly and smoothly to insure that it is fully inserted.

Figure 3.9 Inserting power, battery and charger modules



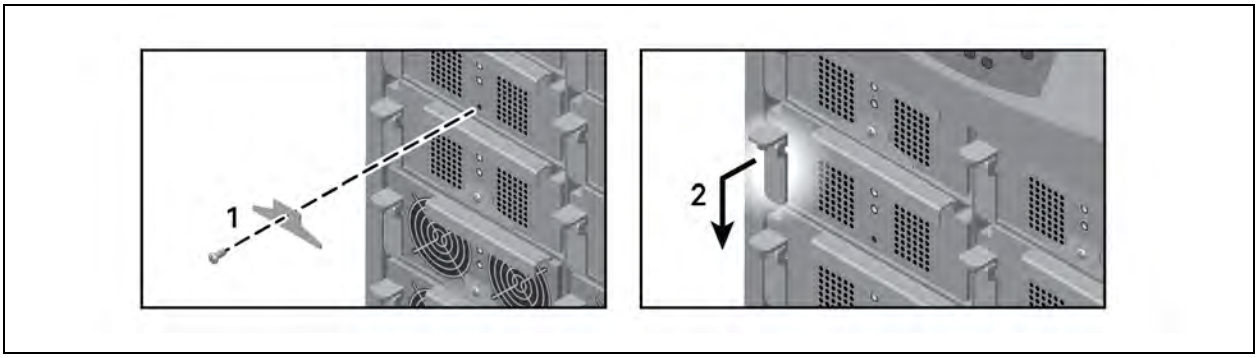
Item	Description
1	Push in slowly about 1/3 of the module.
2	Lift and push smoothly and firmly until fully inserted.

4. Pull out the lock lever slightly, and press the lever down slightly, see Lock lever and module-securing bracket on the facing page .

NOTE: If the lever does not press down smoothly, remove and reinstall the module.

5. Use a #2 Phillips screwdriver to install the module-securing bracket as shown in Lock lever and module-securing bracket below .
6. Replace the plastic bezels.

Figure 3.10 Lock lever and module-securing bracket



Item	Description
1	Install module-securing bracket.
2	Pull out and down to secure lock lever.

3.6.2 Installing System-Control and System-Monitor Modules

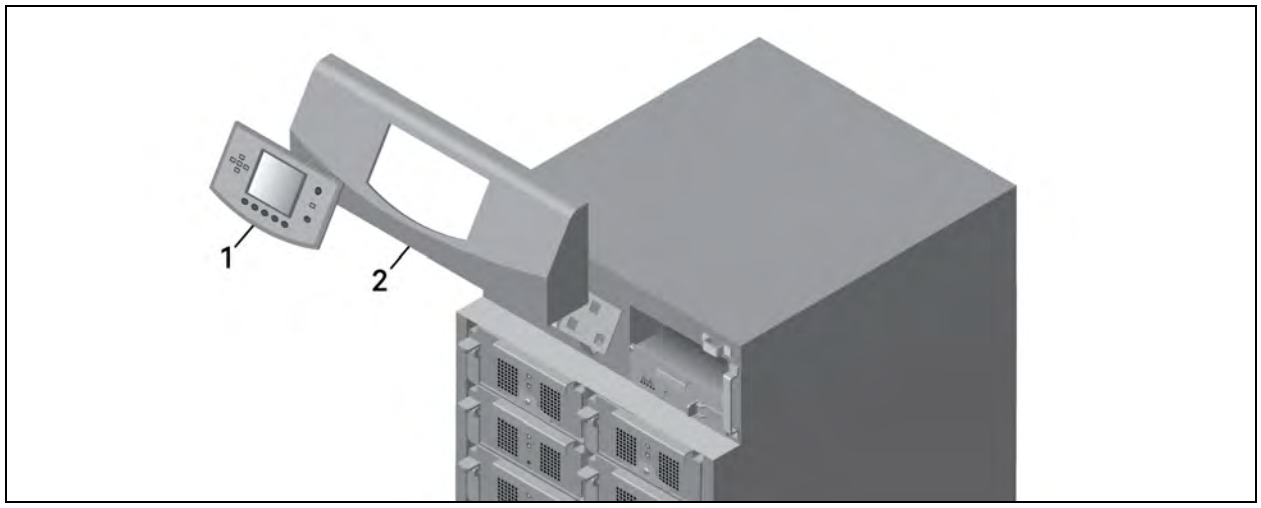
NOTICE

Risk of unintended shutdown. Can cause equipment damage.

Do not remove both the control and the monitor modules at the same time. Removing both the control module and monitor module at the same time will cause the UPS to shut down and remove power from the load. Replace these modules one at a time.

1. Remove the display bezel and the user interface (LCD) module from the frame, as shown in Remove display bezel and user-interface module below , then lay the user-interface module on top of the UPS.

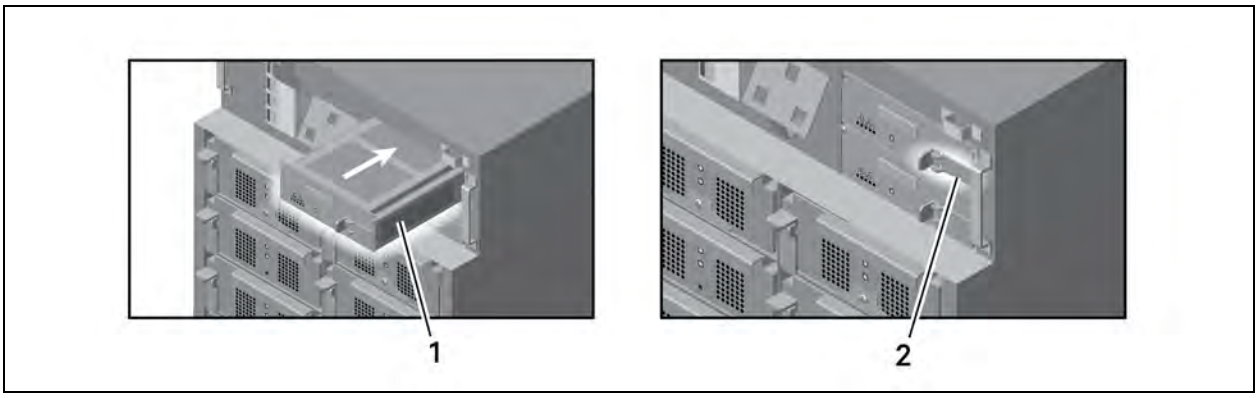
Figure 3.11 Remove display bezel and user-interface module



Item	Description
1	User-interface module
2	Display bezel

2. Push the module in slowly until about 1 cm (1/2 in) of the module remains outside the bay, as shown in Insert the module and engage the lock lever below , then press it firmly and smoothly to ensure that it is fully inserted.
3. Pull out the lock lever slightly, then press the lever to the right into the bracket.

Figure 3.12 Insert the module and engage the lock lever



Item	Description
1	Push in smoothly and firmly until fully inserted.
2	Pull out slightly and slide lock lever to the right.

4. Use a #2 Phillips screwdriver to install the screws into the holes on each end of the inserted module.
5. Replace the user-interface module and display bezel.

3.7 Cable Connections

WARNING! Risk of electric shock. Can cause injury or death. Disconnect local and remote power supplies before working within. Read this section thoroughly before attempting to install wiring to this unit. Ensure that all the UPS input sources are disconnected off before attempting to install wiring to this unit. This UPS cables should be connected by a properly trained and qualified electrician.

Refer to the unit model number in Cable connection method reference on the next page to determine the instructions to use for installation.

Table 3.1 Cable connection method reference

UPS Model # Digits 1-3	Frame Type	Manual Section
AS1 or ASA	10 Bay Transformer-free	Connecting Cables on a Transformer-free UPS below
AS2 or ASB	16 Bay Transformer-free	Connecting Cables on a Transformer-free UPS below
AS3 or ASC	12 Bay Transformer-based	Connecting Cables on a Transformer-Based UPS on page 34
AS4 or ASD	16 Bay Transformer-based	Connecting Cables on a Transformer-Based UPS on page 34
AS5 or ASE	10 Bay Transformer-free	Connecting Cables on a Transformer-free UPS with Dual Inverter Frames on page 39
AS6 or ASF	16 Bay Transformer-free	Connecting Cables on a Transformer-free UPS with Dual Inverter Frames on page 39

3.7.1 Connecting Cables on a Transformer-free UPS

A junction box is factory-installed on each model of the Liebert APS to ease cable connection.

Select the appropriate input cables according to Input cable selection list—60Hz below and Input cable selection list—50Hz on the facing page based on the UPS rating and mains frequency; however, it is recommended that you size the over current protection and wiring for the frame rating to easily allow upgrades to the UPS system.

Table 3.2 Input cable selection list—60Hz

Maximum System Rated Load	Input voltage - 200VAC		Input voltage - 208VAC		Input voltage - 240VAC	
	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker
5kVA	27A	50A	26A	50A	23A	50A
10kVA	53A	63A	51A	63A	45A	63A
15kVA	80A	100A	77A	100A	67A	100A
20kVA	106A	125A	102A	125A	90A	125A
The power input and output terminals accept a maximum cable cross-sectional area of 35 mm^2 (2 AWG); the minimum cable cross-sectional area is 16 mm^2 (6 AWG); the rated torque is 4.52 Nm (40 in-lb). Use of 90°C copper wire is recommended						

Table 3.3 Input cable selection list—50Hz

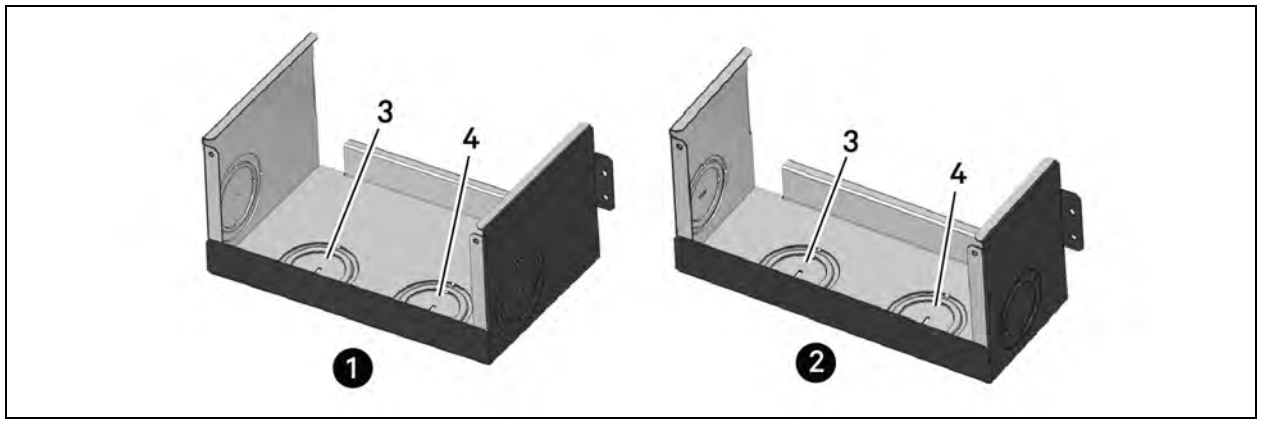
Maximum System Rated Load	Input Voltage - 220VAC		Input Voltage - 230VAC		Input Voltage - 240VAC	
	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker
5kVA	25A	50A	24A	50A	23A	50A
10kVA	49A	63A	47A	63A	45A	63A
15kVA	73A	100A	70A	100A	67A	100A
20kVA	97A	125A	93A	125A	90A	125A
The power input and output terminals accept a maximum cable cross-sectional area of 35 mm^2 (2 AWG); the minimum cable cross-sectional area is 16 mm^2 (6 AWG); the rated torque is 4.52 Nm (40 in-lb). 90°C copper wire recommended						

To connect the cable:

NOTE: Input and output cables must be run in separate conduit before cable connection. If your input power grid is L-L line voltage, the input N of the power input and output terminals will connect live wire, so the output N of the power input and output terminals is also live wire.

1. Remove the knockouts at the junction box, see Knockouts in Units without Transformer below , and pull the cables through them, leaving some slack for installation.

Figure 3.13 Knockouts in Units without Transformer



Item	Description	Item	Description
1	16-bay, no transformer	3	Output-cable knockout
2	10-bay, no transformer	4	Input-cable knockout

2. Connect the cables to the corresponding terminal of the power input and output terminals.
3. Using a 13-mm (1/2-in.) torque wrench, tighten the screws to 4.52 Nm (40 in-lb).
4. Respectively, secure the conduit of the input/output cables through the cable bridges on the rear panel of the UPS, see Secure cables on cable bridges below .

Figure 3.14 Secure cables on cable bridges

Item	Description
1	Cable bridge

The connection methods for single-phase and the 3-phase input modes are shown in Connection in single-phase input on the facing page and Connection in 3-phase input on the facing page , respectively. Installation of the factory-provided copper bar is essential in the single-phase input mode. The copper busbar is in the accessory bag included with the UPS.

Figure 3.15 Connection in single-phase input

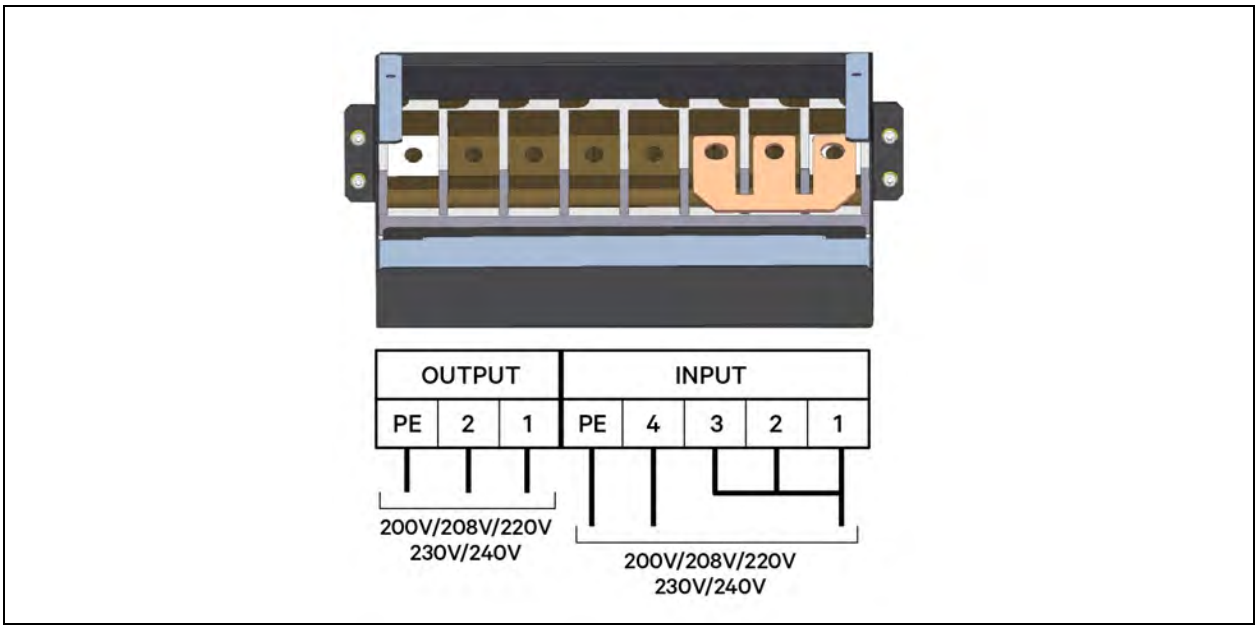


Figure 3.16 Connection in 3-phase input

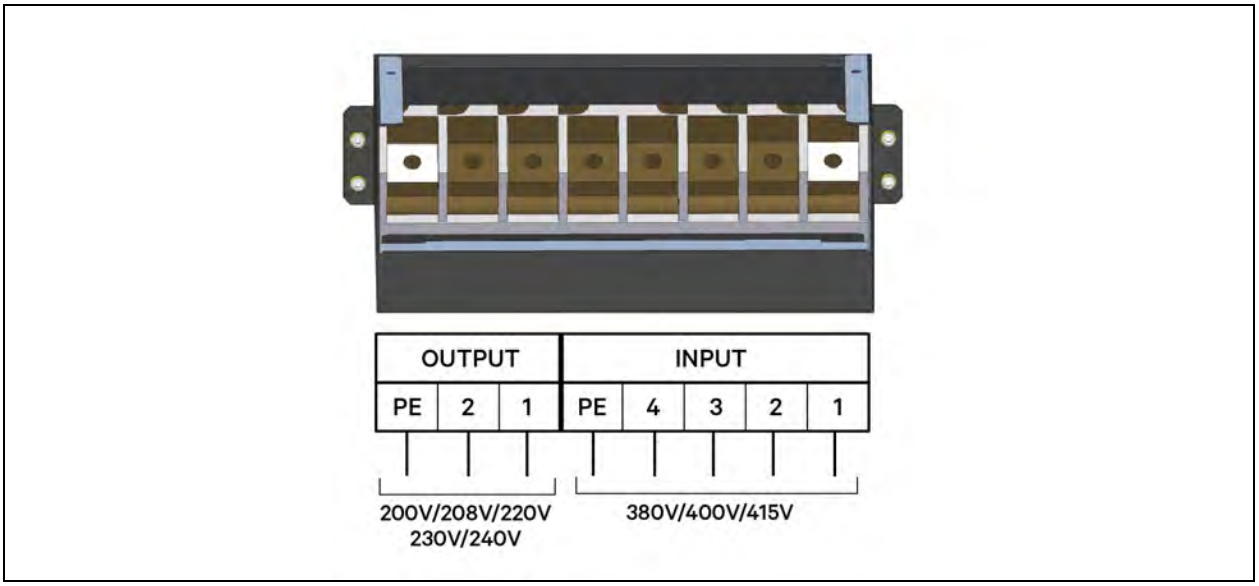


Table 3.4 Key to Connection in single-phase input on the previous page and Connection in 3-phase input on the previous page UPS wiring

System Voltage	System Nominal Frequency	Input Terminal Block					Output Terminal Block		
		1	2	3	4	PE		2	PE
200	60	L1*	L1*	L1*	L2	GND	L1	L2	GND
208	60	L1*	L1*	L1*	L2	GND	L1	L2	GND
220	60	L1*	L1*	L1*	L2	GND	L1	L2	GND
230	60	L1*	L1*	L1*	L2	GND	L1	L2	GND
240	60	L1*	L1*	L1*	L2	GND	L1	L2	GND
200	50	L*	L*	L*	N	PE	L	N	PE
220	50	L*	L*	L*	N	PE	L	N	PE
230	50	L*	L*	L*	N	PE	L	N	PE
240	50	L*	L*	L*	N	PE	L	N	PE
380	50	L1	L2	L3	N	PE	L	N	PE
400	50	L1	L2	L3	N	PE	L	N	PE
415	50	L1	L2	L3	N	PE	L	N	PE

* This connection requires the factory-provided three-position busbar to connect the three terminal block positions.

3.7.2 Connecting Cables on a Transformer-Based UPS

NOTE: After the output transformer is installed, if the start-up is on bypass, the UPS has a 6-cycle inrush current that is up to 20 times the rated output current. This must be taken into account when selecting the input-overload protection device at the AC-input supply-distribution point.

To avoid random tripping on startup, we recommend that the AC-input supply be protected with a circuit breaker capable of withstanding this initial inrush (the MCB is derated according to the D curve or TYPE 4).

This UPS is fitted with EMI filters. Earth leakage current is less than 40 mA. Transient and steady-state earth leakage currents may occur when starting the UPS. This should be taken into account when selecting transient RCCB or RCCD (leakage-current devices of the UPS and load).

The MCB of the AC power supply connected to the UPS input must bear this warning:

"Disconnect the connection with UPS before maintaining this circuit"

The warning is required because the UPS has no auto-feeding protection device.

The UPS grounding should be in accordance with local regulations.

A junction box is factory-installed on all models of the Liebert® APS to ease cable connection.

Select the appropriate input cables according to Input cable selection for transformer-based frames (60 Hz) below and Input cable selection for transformer-based frames (50 Hz) below based upon the UPS rating and mains frequency. Vertiv recommends sizing the frame's overcurrent protection and wiring to permit easier UPS system upgrades.

Table 3.5 Input cable selection for transformer-based frames (60 Hz)

Maximum System Rated Load	Input Voltage - 200VAC		Input Voltage - 208VAC		Input Voltage - 240VAC	
	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker
5kVA	27A	50A	26A	50A	23A	50A
10kVA	53A	63A	51A	63A	45A	63A
15kVA	80A	100A	77A	100A	67A	100A
20kVA	106A	125A	102A	125A	90A	125A

The power input and output terminals accept a maximum cable cross-sectional area of 70 mm^2 (2/0 AWG); the minimum cable cross-sectional area is 16 mm^2 (6 AWG). The rated torque is 12.43 Nm (110 in-lb).

90°C copper wire recommended.

Table 3.6 Input cable selection for transformer-based frames (50 Hz)

Maximum System Rated Load	Input Voltage - 220VAC		Input Voltage - 230VAC		Input Voltage - 240VAC	
	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker
5kVA	25A	50A	24A	50A	23A	50A
10kVA	49A	63A	47A	63A	45A	63A
15kVA	73A	100A	70A	100A	67A	100A
20kVA	97A	125A	93A	125A	90A	125A

The power input and output terminals accept a maximum cable cross-sectional area of is 70 mm^2 (2/0 AWG); the minimum cable cross-sectional area is 16 mm^2 (6 AWG). The rated torque is 12.43 Nm (110 in-lb).

90°C copper wire recommended.

Configuring the Bypass Voltage

The UPS bypass voltage is factory-set to 208 V (the jumper copper bar is installed). If you have a utility supply of 200 V/220 V/230 V/240 V, you must change the bypass-voltage jumper to ensure correct output voltages when in bypass mode. The bypass voltage jumper settings are shown in Setting bypass voltage jumper (default: 208VAC) on the next page and Setting bypass voltage jumper (200/220/230/240VAC) on the next page . Refer to Key to Connection method on the previous page UPS output wiring on page 39 for the proper setting according to the AC mains voltage configuration.

Figure 3.17 Setting bypass voltage jumper (default: 208VAC)

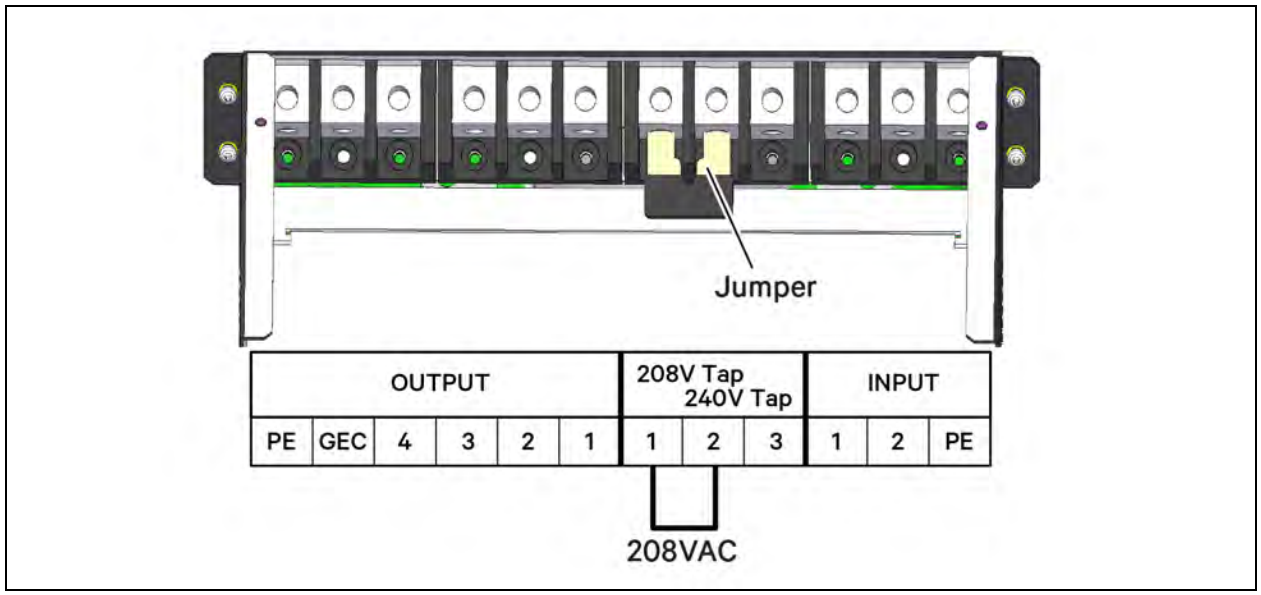
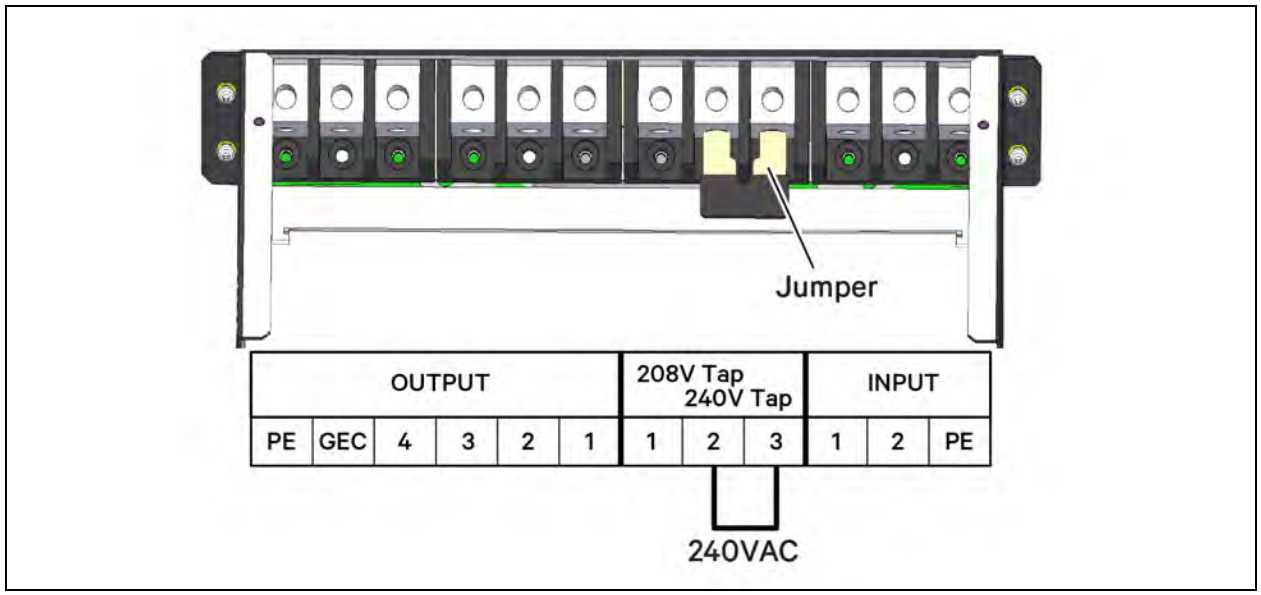


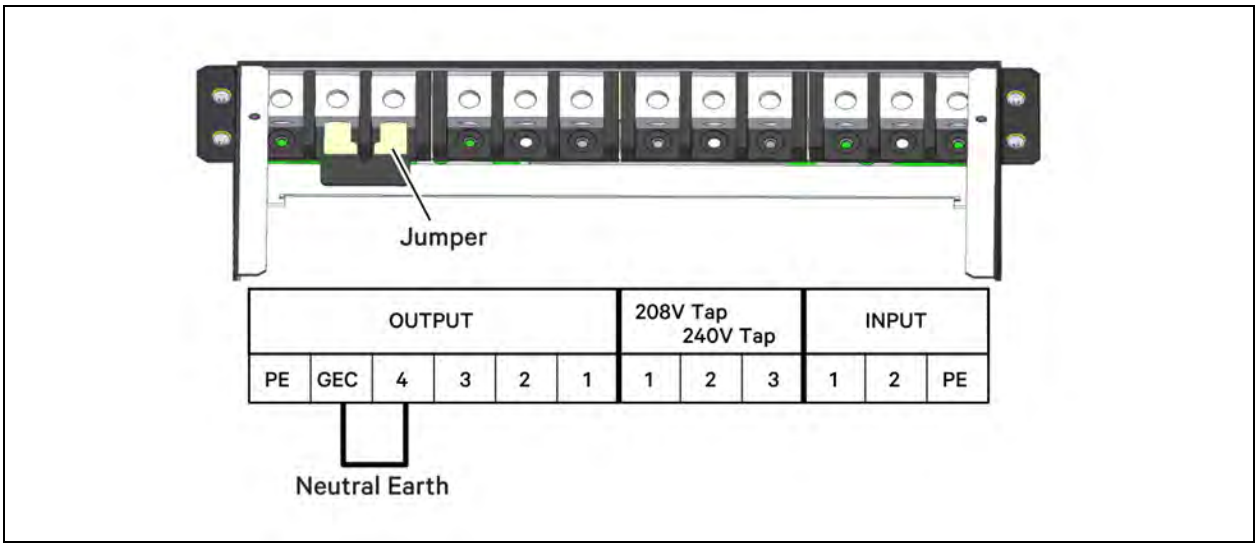
Figure 3.18 Setting bypass voltage jumper (200/220/230/240VAC)



Configuring the Neutral/Earth Jumper

The UPS contains an isolation transformer that generates a neutral conductor for the connected load. The UPS is a separately-derived source and contains a neutral/earth jumper. You may need to remove a factory-installed neutral/earth-jumper copper bar to comply with local codes and regulations.

Figure 3.19 Configuring the neutral/earth jumper

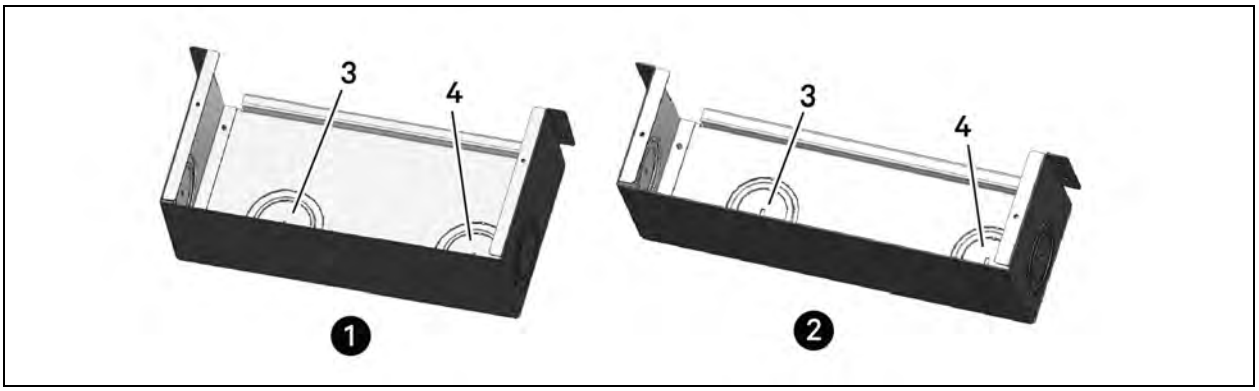


Connecting the Cables

NOTE: Input and output cables must be run in separate conduit before cable connection.

1. Remove the knockouts at the junction box, see Knockouts in units without a transformer below and pull the cables through them, leaving some slack for installation.

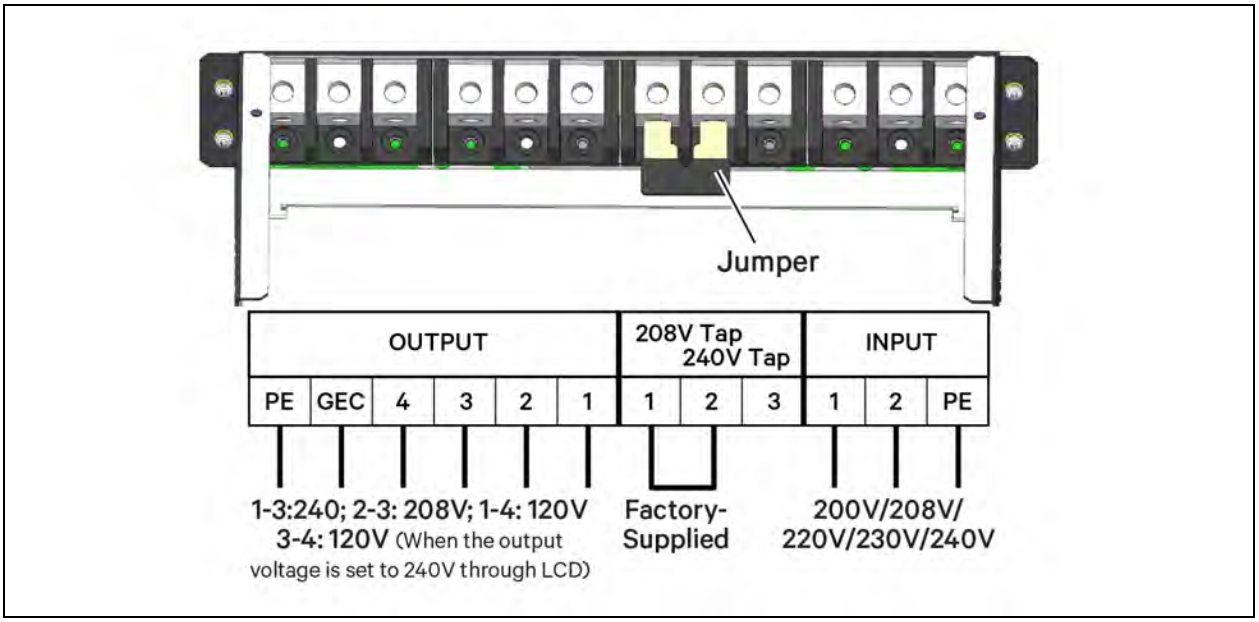
Figure 3.20 Knockouts in units without a transformer



Item	Description	Item	Description
1	16-bay, with transformer	3	Output-cable knockout
2	12-bay, with transformer	4	Input-cable knockout

2. Connect the cable to the corresponding terminal of the power input and output terminals as shown in Connection method below .
3. Using a torque wrench, tighten the screws to 12.43 Nm (110 in-lb).

Figure 3.21 Connection method



Refer to Input cable selection for transformer-based frames (50 Hz) on page 35 for configuring the output cable. For standard voltages, make the connections shown in Key to Connection method on the previous page UPS output wiring on the facing page .

Table 3.7 Key to Connection method above UPS input wiring

System Voltage	System Nominal Frequency	Input Terminal Block		
		1	2	PE
200	60	L1	L2	GND
208	60	L1	L2	GND
220	60	L1	L2	GND
230	60	L1	L2	GND
240	60	L1	L2	GND
200	50	L	N	PE
220	50	L	N	PE
230	50	L	N	PE
240	50	L	N	PE

Table 3.8 Key to Connection method on the previous page UPS output wiring

Output Voltage	Set Output Voltage by LCD	Bypass Voltage Jumper		Output Voltage (Between Terminals)			
		208V TAP (1-2)	240V TAP (2-3)	1-4	3-4	2-3	1-3
200/100	200	—	OK	100	100	173 (Do Not Use)	200
220/110	220	—	OK	110	110	190 (Do Not Use)	220
230/115	230	—	OK	115	115	199 (Do Not Use)	230
220/127	220	OK	—	127	127	220	254 (Do Not Use)
240/120	240	—	OK	120	120	208	240
208/120	208	OK	—	120	120	208	240

If the bypass voltage jumper copper bar is connected incorrectly, the system will report a fault alarm.

When wiring to single-phase panels, connect to output terminals 1, 3, 4 and PE (GND) only.

Maximum load capacity of the output winding below shows the maximum load capacity of the output winding of the transformer-based UPS.

Table 3.9 Maximum load capacity of the output winding

UPS Model	Maximum Output Capacity, kVA (Between Terminals)			
	1-4	3-4	2-3	1-3
16-bay Transformer-based UPS	10	10	20	20
10-bay Transformer-based UPS	7.5	7.5	15	15

3.7.3 Connecting Cables on a Transformer-free UPS with Dual Inverter Frames

A junction box is factory-installed on all models of the Liebert® APS to ease cable connection.

Select the appropriate input cables according to Input cable selection for Transformer-free Dual Inverter frames(50/60 Hz) on the next page and Input cable selection for Transformer-free Dual Inverter frames (50/60 Hz) on the next page based on the UPS rating and mains frequency. We recommend sizing the overcurrent protection and wiring for the frame rating to easily upgrade the UPS system.

Table 3.10 Input cable selection for Transformer-free Dual Inverter frames(50/60 Hz)

Maximum System Rated Load	Input Voltage – 200/100VAC		Input Voltage – 208/120VAC		Input Voltage – 240/120VAC	
	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker
5kVA	23A	50A	21A	50A	21A	50A
10kVA	46A	63A	42A	63A	42A	63A
15kVA	68A	100A	62A	100A	62A	100A
20kVA	91A	125A	83A	125A	83A	125A
The power input and output terminals accept a maximum cable cross-sectional area of 35 mm^2 (2 AWG); the minimum cable cross-sectional area is 16 mm^2 (6 AWG); and the rated torque is 4.52 Nm (40 in-lb). 90°C copper wire is recommended.						

Table 3.11 Input cable selection for Transformer-free Dual Inverter frames (50/60 Hz)

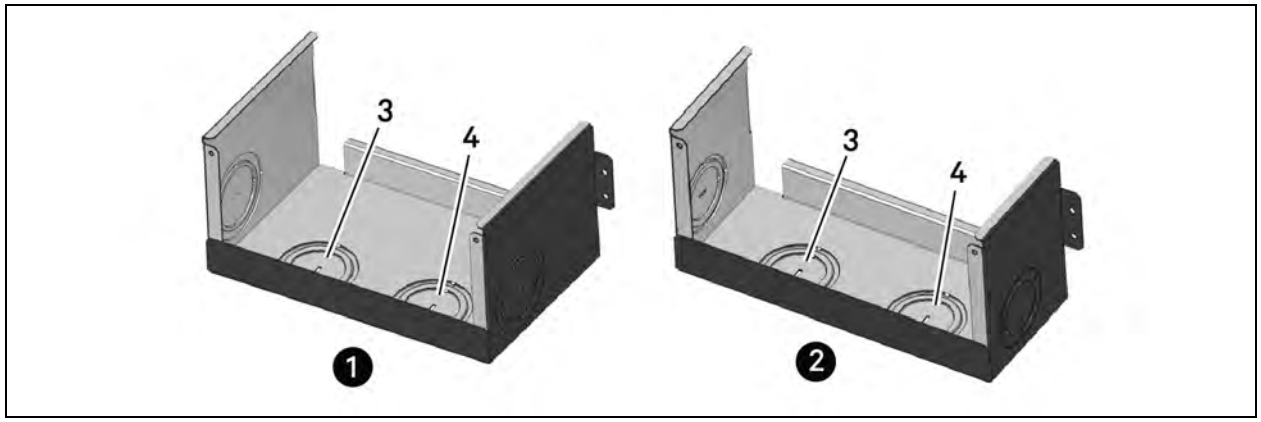
Maximum System Rated Load	Input Voltage – 220/110VAC		Input Voltage – 230/115VAC		Input Voltage – 220/127VAC	
	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker	Maximum Current in UPS Mode	Recommended Input Protection Circuit Breaker
5kVA	21A	50A	20A	50A	20A	50A
10kVA	41A	63A	39A	63A	39A	63A
15kVA	62A	100A	59A	100A	59A	100A
20kVA	82A	125A	78A	125A	78A	125A
The power input and output terminals accept a maximum cable cross-sectional area of 35 mm^2 (2 AWG); the minimum cable cross-sectional area is 16 mm^2 (6 AWG); and the rated torque is 4.52 Nm (40 in-lb). 90°C copper wire is recommended.						

To connect the cable:

NOTE: Input and output cables must be run in separate conduit before cable connection.

1. Remove the knockouts at the junction box, see Knockouts in Units without Transformer below , and pull the cables through them, leaving some slack for installation.

Figure 3.22 Knockouts in Units without Transformer



Item	Description	Item	Description
1	16-bay, no transformer	3	Output-cable knockout
2	10-bay, no transformer	4	Input-cable knockout

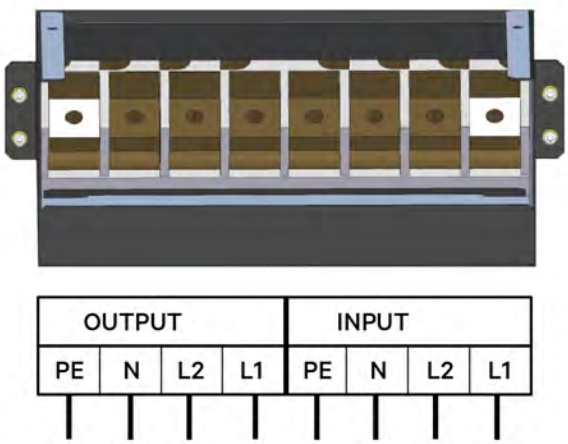
2. Connect the cables to the corresponding terminal of the power input and output terminals.
3. Using a 13-mm (1/2-in.) torque wrench, tighten the screws to 4.52 Nm (40 in-lb).
4. Respectively, secure the conduit of the input/output cables through the cable bridges on the rear panel of the UPS, see Secure cables on cable bridges below .

Figure 3.23 Secure cables on cable bridges

Item	Description
1	Cable bridge

The connection methods for single-phase and the 3-phase input modes are shown in Connecting Cables on a Transformer-free UPS with Dual Inverter Frames on page 39 and Connecting Cables on a Transformer-free UPS with Dual Inverter Frames on page 39, respectively. Installation of the factory-provided copper bar is essential in the single-phase input mode. The copper busbar is in the accessory bag included with the UPS.

Figure 3.24 Wiring connections



3.8 Connecting an External Battery Cabinet

Up to 4 external battery cabinets may be connected to the Liebert® APS to provide longer battery run times.

The external battery cabinet (EBC) requires the optional EBC cable kit to connect to the UPS. The optional cable kits contain the power and communication cables required to operate and monitor the battery modules. The standard cable-kit lengths are 3.2 ft, 9.8 ft and 16.4 ft (1 m, 3 m, and 5 m) to accommodate varying site requirements.

To connect an external battery cabinet:

1. Locate the DC circuit breaker on the front bottom of the EBC frame behind the bottom two bezels, and verify that the circuit breaker is open.
2. Attach the EBC cable ground wire to either the ground-wire connection points labeled "5" or "6" in Connecting external battery cabinet to a transformer-free UPS on the facing page or Connecting external battery cabinet (transformer-based UPS) on page 44 (Depending on whether or not the UPS has a transformer).
   - Choose the connection point with the easiest access and that applies the least amount of stress to the ground wire after the DC connector is installed.
   - Connect one ground wire to the UPS and the other to the EBC.

IMPORTANT! Do not continue with installation until the ground wires are firmly installed.

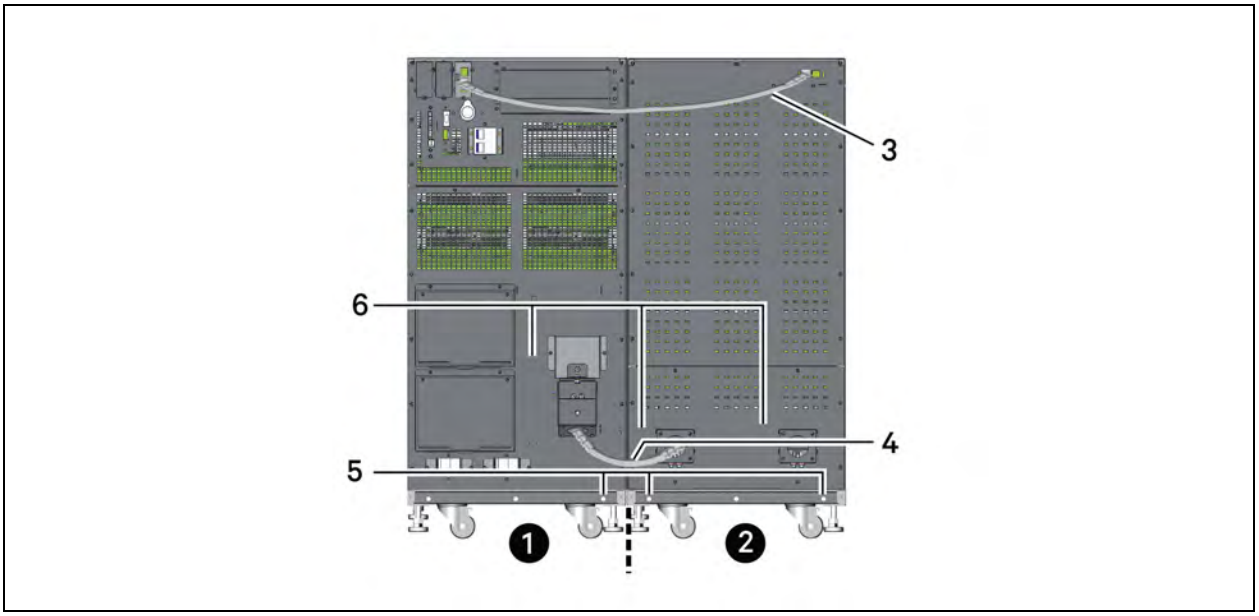
3. After the frame grounds are properly bonded together, connect one end of the battery power connector to the external battery connector on the rear of the UPS frame as shown in Connecting external battery cabinet to a transformer-free UPS on the facing page or Connecting external battery cabinet (transformer-based UPS) on page 44, depending on your system.

4. Connect the other end to the closest corresponding port on the rear of the EBC frame.
5. Install and tighten the grounding screw on the battery cable assembly, on both the UPS and EBC ends.
   This screw also secures the cable assembly to the frames to prevent accidental disconnection.
6. For new systems that included an EBC, the EBC communication card should already be installed in the UPS frame (IntelliSlot Port #3, typically).
   - If it is not installed, obtain the EBC communication card and insert it into any open IntelliSlot port (preferably Port #3).
   - Connect the provided EBC communication cable to the UPS and EBC as shown in Connecting external battery cabinet to a transformer-free UPS below or Connecting external battery cabinet (transformer-based UPS) on the next page , depending on your system.
7. Check the EBC DIP-switch settings on the top rear of each EBC frame, and verify that they are set correctly according to EBC DIP switch settings on page 45 .

7. Close the EBC DC circuit breaker and replace the bezels back onto the EBC.

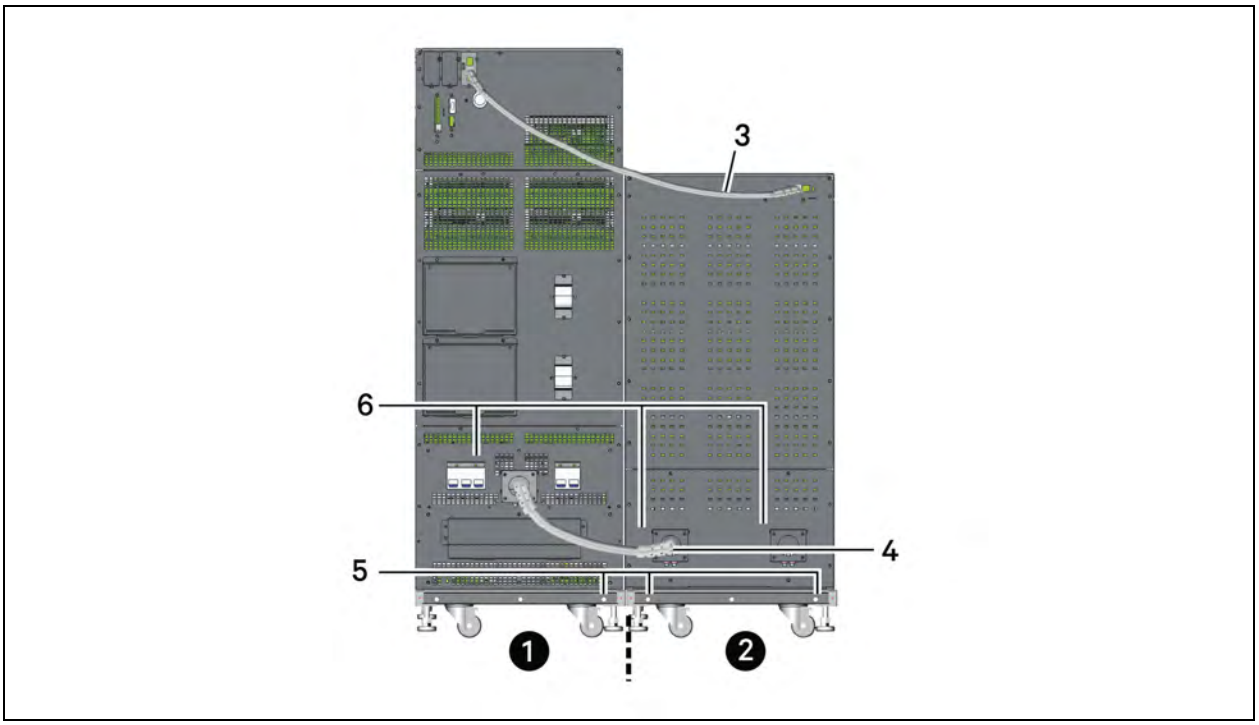
WARNING! Risk of hazardous voltage between UPS frames. Can cause damage to equipment, injury and death. Failure to open the EBC DC circuit breaker before connecting or disconnecting the battery cable between the UPS and EBC frames can result in hazardous voltages being present between the frames.

Figure 3.25 Connecting external battery cabinet to a transformer-free UPS



Item	Description	Item	Description
1	Liebert Liebert® APS	4	Battery cable
2	Battery cabinet	5	Ground-wire connection points
3	Communication cable	6	Ground-wire connection points

Figure 3.26 Connecting external battery cabinet (transformer-based UPS)



Item	Description	Item	Description
1	Liebert Liebert® APS	3	Communication cable
2	Battery cabinet	4	Battery cable

8. After connecting the external battery cabinet, use the user interface to determine the number of external battery cabinets, see If the number displayed is not consistent with the actual number of installed external battery cabinets: below .

   If the number displayed is not consistent with the actual number of installed external battery cabinets:

   - Make sure that each external battery cabinet contains two battery modules installed on the same row and the locking levers on both are in the locked position.
   - Make sure that the Liebert IntelliSlot EBC card is installed properly and the communication cables are fully inserted in the connectors.
   - Make sure that the DIP-switch setting of each battery cabinet is correct using EBC DIP switch settings below .

Figure 3.27 Battery screen

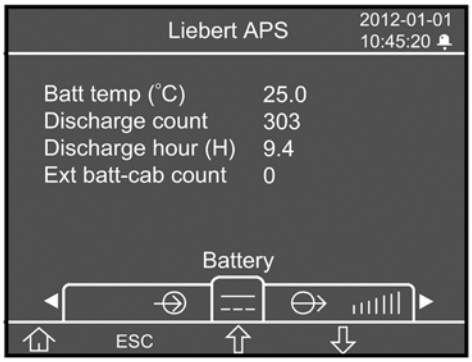


Table 3.12 EBC DIP switch settings

External Battery Cabinet Number	DIP Switch Setting	
	1	2
EBC #1	Down	Down
EBC #2	UP	Down
EBC #3	Down	UP
EBC #4	UP	UP
On the DIP switch: Down is On and Up is Off.		

3.9 Connecting Integrated Power Output Distribution (POD)

The rear panel of the Liebert® APS let you add integrated distribution outlets (PODs) as an option for direct, AC-power connection of equipment to the UPS. PODs let you install and change distribution, if necessary, as equipment changes and while the UPS is still providing power.

To add or change the optional PODs:

1. Locate the POD breaker near the POD port, and make sure that it is in the Off position.
2. Using a Phillips-head screwdriver, remove the two screws at the top of the POD cover plate and retain for later reattachment.
3. Remove the POD cover plate to expose the POD connectors.
4. Insert the bottom of the POD into the slot provided, and then connect the POD connectors.

NOTE: The connector should connect only one way, matching the color of the pins.

NOTE: Distribution PODs PD2-101, PD2-102, PD2-103, PD2-104, PD2-105, PD2-106 and PD2-107 should not be used if the UPS output voltage is set to 220/127 V.

NOTE: When connecting distribution POD's to an AS3 or AS4 frame, the L-L output receptacles connect to the 240-V taps of the output transformer, not to the 208-V tap. Verify receptacle voltage and load ratings before energizing the load.

5. Secure the POD by using the two screws removed in step Using a Phillips-head screwdriver, remove the two screws at the top of the POD cover plate and retain for later reattachment. above .
6. Repeat steps Locate the POD breaker near the POD port, and make sure that it is in the Off position. above through Secure the POD by using the two screws removed in step Using a Phillips-head screwdriver, remove the two screws at the top of the POD cover plate and retain for later reattachment. above . above to install a second POD on the UPS, only the 16-bay frame has two POD ports.
7. Connect the equipment to the appropriate outlets.
8. Close the POD breaker(s) to connect AC power to the outlets.
9. After commissioning the UPS, power-on the connected equipment per the manufacturer's instructions. See Commissioning/Startup Procedures below .

3.10 Commissioning/Startup Procedures

The Liebert APS can be commissioned with or without AC power being connected.

3.10.1 Checks before Commissioning/Start-up

1. Verify that the AC-power connections are wired properly and that all connections are tight.
2. If using external battery cabinets or 3-party battery systems, verify that the DC-power and communication cables are connected properly and that all connections are tight.
3. Measure and record the AC-input voltage and frequency. These are required to properly configure the output voltage of the Liebert® APS system.
4. If any modules were removed from the Liebert® APS during installation, verify that all modules are fully-inserted and that the module locking levers are in the locked position.

5. For Remote Emergency Power Off (REPO) circuit:
   - If connecting the UPS to a REPO circuit, see REPO (Remote Emergency Power Off) on page 51 for the connection details and instructions.
   - If a REPO circuit is required or used, the factory-installed jumper must be removed from the terminal-block Pins 9-10 as described in Dry-contact Ports on page 50 .
6. Verify that the internal bypass breaker in the UPS is in the open position with the guard in place and secure.

3.10.2 Commissioning/Start-up with AC Power Available (Normal-mode Operation)

1. Verify that the up-stream mains AC breaker is closed.
2. Locate the UPS Enable switch on the rear of the unit protected by a clear plastic cover, and turn it On.
3. Locate the UPS input breaker on the front of transformer-free frame systems and on the rear of transformer-based frame systems, and turn it off.
   The initial system checks begin and power begins charging the battery.
4. Press the ON/OFF button on the LCD panel.
5. When asked to confirm, press Enter (F5 button) to turn On the UPS.
6. Close the UPS output breaker on the rear of the unit.
7. If supplying power to an external distribution panel, close all breakers to provide power to the equipment. If using the integral distribution PODs on the UPS or MBC, make sure that the individual POD breakers are closed.

3.10.3 Commissioning/Startup without AC Power Available (Battery-mode Operation)

NOTE: Starting the UPS system without AC power will discharge the batteries. If AC-mains power is not restored before the batteries discharge, the USP will shutdown and power will be lost to the connected equipment. If the UPS reaches the battery EOD level and shuts down, AC-mains power must be present to restart the UPS system.

1. Verify that the up-stream mains AC breaker is closed.
2. Locate the UPS Enable switch on the rear of the unit protected by a clear plastic cover, and turn it On.
3. Locate the “Battery Start” push button on either of the two control modules, then press and hold this button for 5 seconds.
   The initial system checks begin, and output power is automatically enabled.
4. Press the On/Off button on the LCD panel.
5. When asked to confirm, press Enter (F5 button) to turn On the UPS.
6. Close the output breaker on the rear of the unit.

7. If supplying power to an external distribution panel, close all breakers to provide power to the equipment. If using the integral distribution PODs on the UPS or MBC, make sure that the individual POD breakers are closed.
8. We recommend closing the UPS input breaker that is on the front of transformer-free frame systems and on the rear of transformer-based frame systems. If AC mains becomes available, the UPS will revert to AC power mode and begin recharging the battery.

4 Communication

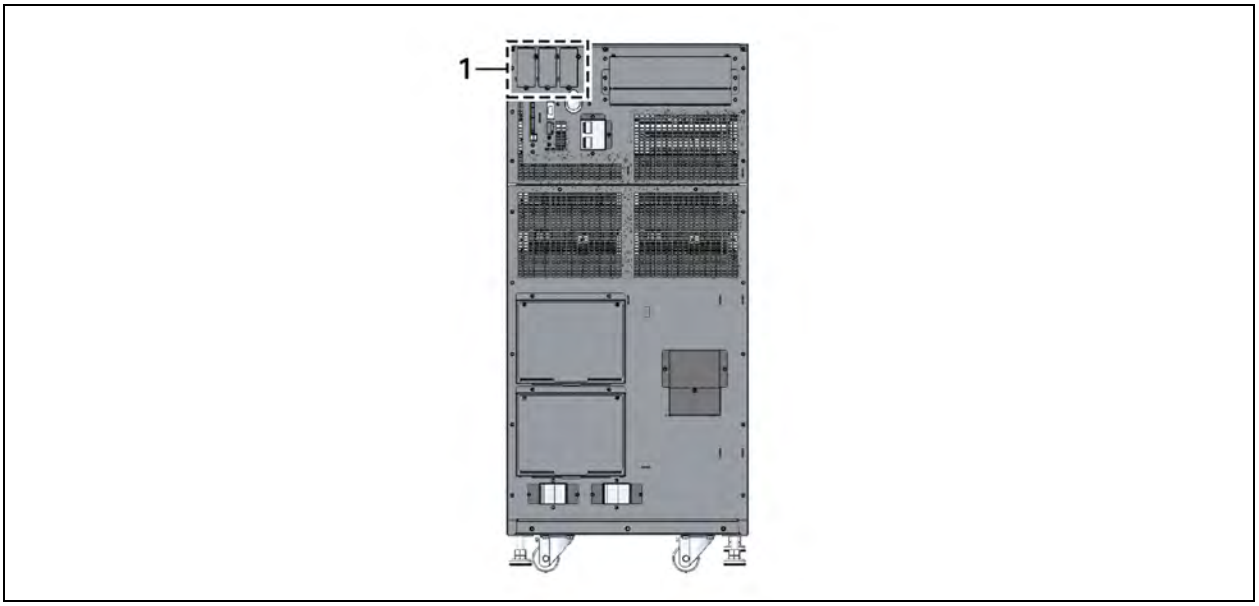
The rear panel of the Liebert® APS includes the following communication ports:

- Liebert IntelliSlot™ port—3
- Dry-contact port—1
- REPO (Remote Emergency Power Off)—1
- Long Run Time (LRT) Battery-temperature Probe Terminal—1
- USB port—1

4.1 Liebert IntelliSlot Ports

The 3 IntelliSlot communication ports (see Liebert IntelliSlot communication port location below) are for communication options. The IntelliSlot ports and the USB port may be used at the same time.

Figure 4.1 Liebert IntelliSlot communication port location



Item	Description
1	IntelliSlot ports

4.1.1 Liebert IntelliSlot Unity Cards

- IS-UNITY-LIFE is standard in every Liebert® APS. It is used for communication between the Liebert® APS and Vertiv™ Trellis® NMS and LIFE Services.
- IS-UNITY-DP: is optional in place of the standard card if communication to two third-party platforms is required. Third-party platforms include SNMP and 485 (Modbus/Bacnet) protocols. When used, this card also provides communication between the Liebert® APS and Vertiv™ Trellis NMS and LIFE Services. All communication protocols are active simultaneously.

4.1.2 Liebert IntelliSlot Dry-contact Card (IS-RELAY)

The IS-RELAY card provides dry-contact alarm information, including: On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault and On UPS signals to a remote monitoring system. The card also acceps input signals to shut down the UPS during any mode of operation.

4.1.3 Liebert IntelliSlot EBC Card

The EBC card monitors and manages the intelligent battery modules in external, matching battery cabinets.

4.2 Dry-contact Ports

16-bay transformer-free UPS on page 6 shows the location of the dry-contact ports.

Figure 4.2 Pin layout of the dry contacts

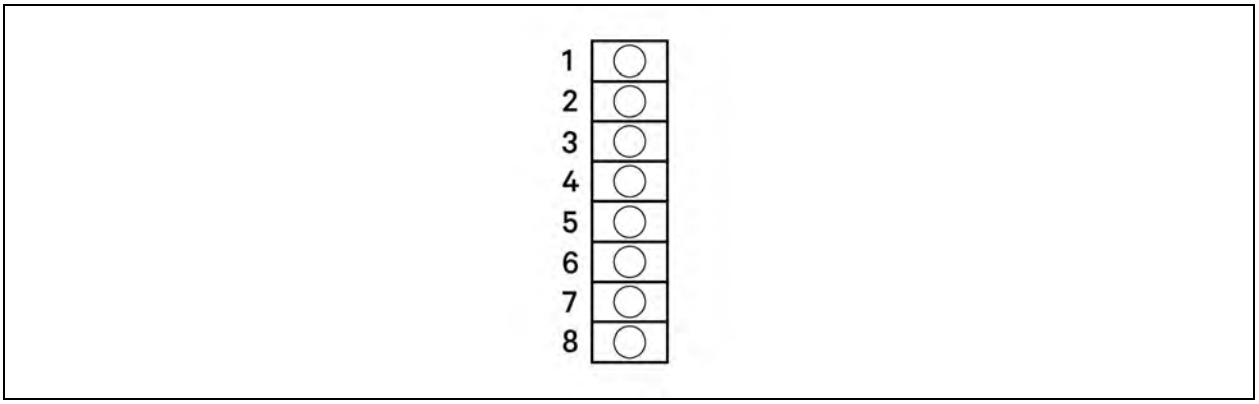


Table 4.1 Pin definition for dry-contact port

Position	Name	Description
1	Battery Mode	Output dry contact of battery mode operation
2	Battery Mode	Output dry contact of battery mode operation
3	Low Battery	Output dry contact of low battery operation
4	Low Battery	Output dry contact of low battery operation
5	Any Mode Shut Down	Input dry contact of any mode shut down
6	GND	Any mode shutdown GND
7	Battery Mode Shut Down	Input dry contact of battery mode shut down
8	GND	Battery mode shutdown GND

4.2.1 Battery-mode Dry Contact

Pins 1 and 2: Output dry contact, normally open. The dry contact is closed when the UPS is operating on battery. The maximum voltage and current are 24 VDC and 0.3 A, respectively.

4.2.2 Low Battery Dry Contact

Pins 3 and 4: Output dry contact, normally open. When the UPS is operating on battery, the dry contact is closed upon battery low-voltage alarm. The maximum voltage and current are 24 VDC and 0.3 A, respectively.

4.2.3 Any Mode Shut Down

Pins 5 and 6: Input dry contact, normally open. After the external dry contact is closed (shorted), the UPS output will be shut down during any mode of operation (mains, battery, bypass).

4.2.4 Battery Mode Shut Down

Pins 7 and 8: Input dry contact, normally open. After the external dry contact is closed (shorted), the UPS output will be shut down only during battery mode operation.

NOTE: The default for the any-mode and battery-mode Shutdown features is "disabled." Using this function requires setting Remote Comms shutdown to "Enabled" in the Settings on the LCD user interface. You can also use the user-interface Settings to set the delay time for the UPS shutdown after the dry contact is closed. Enabling the feature on the LCD enables both shutdown methods.

4.3 REPO (Remote Emergency Power Off)

WARNING! Risk of electrical shock. Can cause property damage, injury and death. Operating the REPO circuit WILL NOT trip the manual bypass breaker. If the REPO must shut off UPS output under all circumstances, you must tie the REPO into the breaker that feeds the UPS source. Otherwise, voltage may be present on the output connections if the unit is in manual bypass.

NOTICE

Risk of improper installation. Can cause unintended UPS shutdown and loss of power to the load.

Run signal cables separately from power cables. Running cables in the same conduit can cause signal noise, possibly causing the system to shut down.

The Liebert® APS is equipped with a REPO connection. Only the SELV (Safety Extra Low Voltage) circuit can be connected to the REPO terminal block. REPO switch connections on the next page shows the schematic diagram of REPO switch connections.

Figure 4.3 REPO connector pin layout

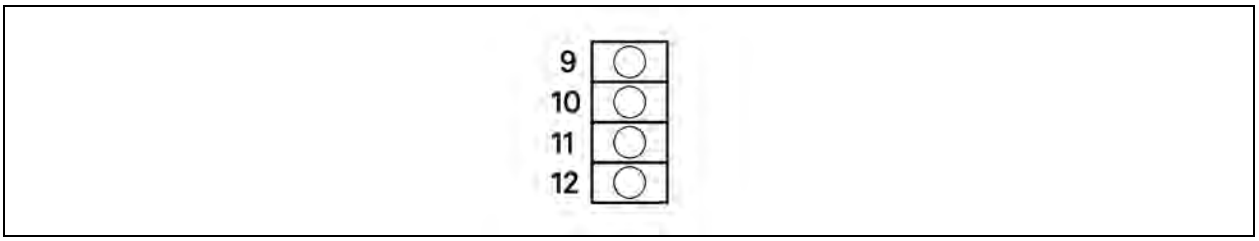
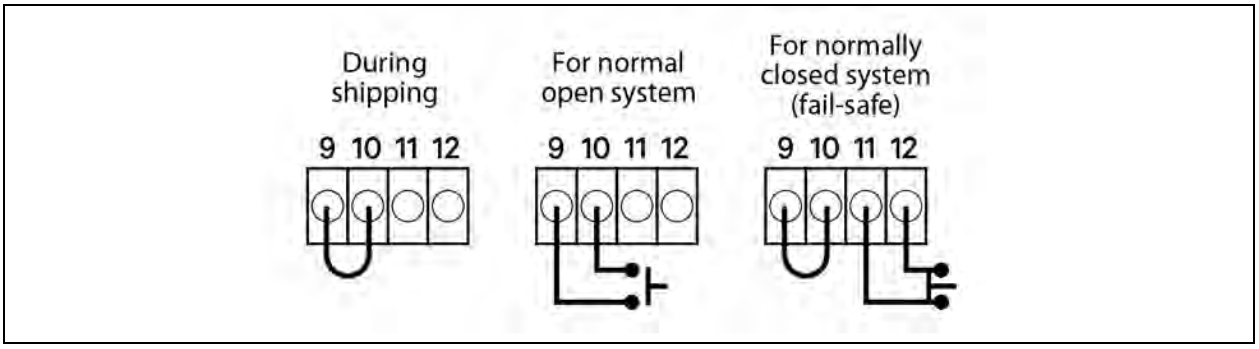


Table 4.2 Pin definition of the REPO dry contact

Position	Name	Description
9	REPO +12V	REPO power, 12VDC 100mA
10	REPO Coil - NO	REPO normally-open nodes, shorting pins 9 and 10, REPO is triggered
11	REPO Coil - NC	REPO normally-closed nodes (fail-safe), shorting pins 9, 10, 11, 12, and opening pins 11 and 12, REPO is triggered
12	GND	GND

Figure 4.4 REPO switch connections



NOTE: A jumper is factory-installed between Pins 9 and 10 to disable the Main Control Switch, which prevents the UPS from being started accidentally during shipment and installation. This jumper must be removed before the unit can be started. If the installation does not require connection to a REPO system, the factory-installed jumper must be removed.

4.4 Long-run-time (LRT) Battery-temperature-probe Terminals

The Liebert® APS contains a temperature-compensated battery-charging system. To use this feature with external LRT battery systems, connect Pins 13-16 of the contact terminal strip to a temperature sensor.

Figure 4.5 Pin layout of the temperature sensor terminal

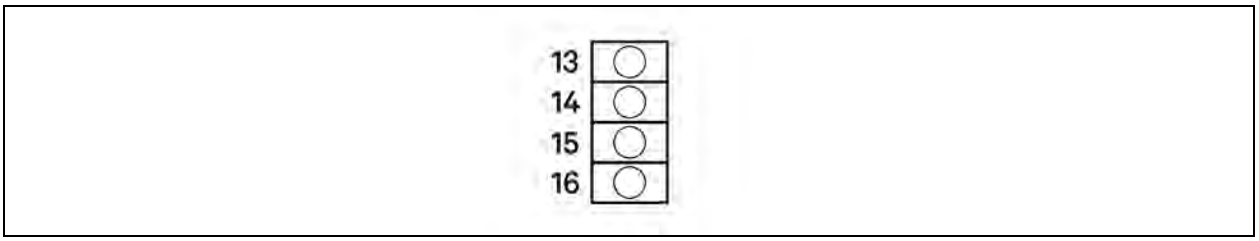


Table 4.3 Pin definition of the temperature sensor terminal

Position	Name	Description
13	Inside Battery Temperature	Locate battery temperature signal close to the UPS
14	Battery Temperature +12V	Battery temperature signal power supply
15	Outside Battery Temperature	Locate battery temperature signal at UPS remote end
16	GND	GND

4.5 USB Port

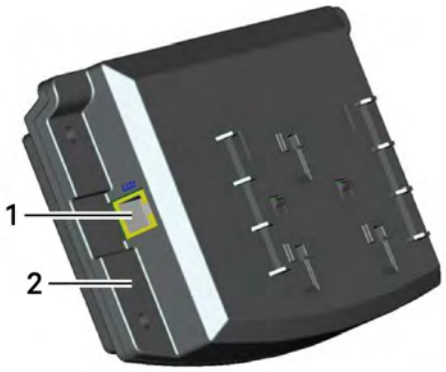
The Liebert® APS contains a standard B type USB port on the rear of the unit to connect the UPS to a network server or other computer for monitoring with any operating system or built-in UPS support.

4.6 LCD Port

The LCD module contains the LCD port for power and data communication between the UPS monitor module and display module. The LCD module can be removed from the Liebert® APS and remotely located. A longer Ethernet cable must be used when installing the LCD module remotely. A standard Ethernet type cable (Category 5, with RJ-45 connectors, both ends meet T568B standard) can be used. Maximum cable length is 14 meters to ensure proper communication signals between the UPS and the LCD module.

The user-interface module provides three network ports and one USB port. Of those, one network port (LCD port) is used for power supply and communication of the user interface module. Other network ports and the USB port are reserved for use only by customer-service personnel.

Figure 4.6 LCD port

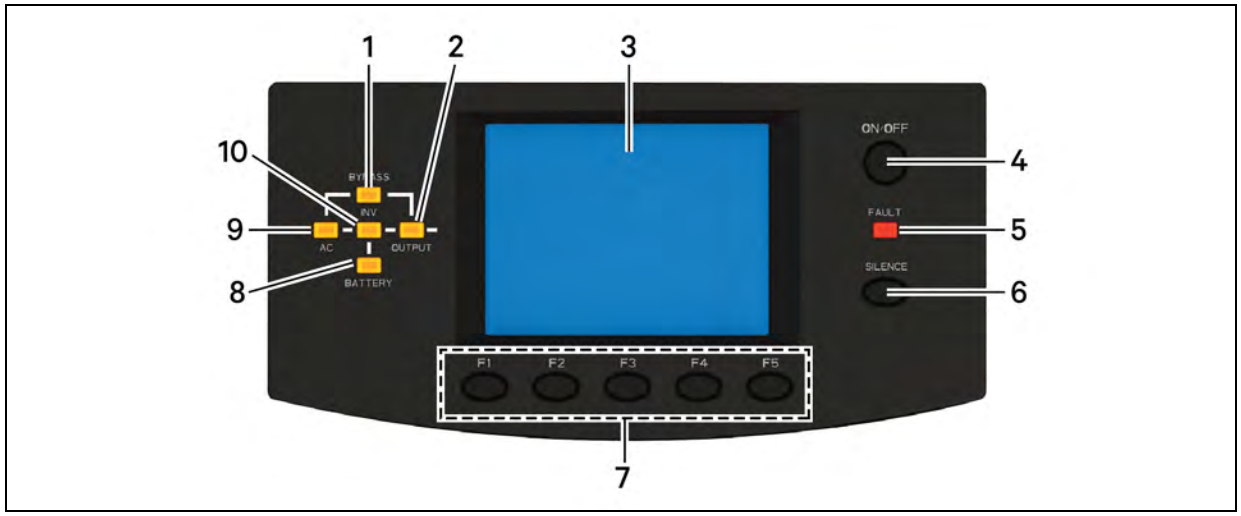


Item	Description
1	LCD port
2	User-interface module

5 Operation and Display Panel

The user-interface module is the operation and display panel composed of an LED mimic power flow diagram, fault LED indicator and LCD screen to show detailed operational information and UPS alarm list using the menu buttons.

Figure 5.1 Operation and display on the user-interface module



Item	Description	Item	Description
1	Bypass LED	6	Alarm silence button
2	Output LED	7	Menu buttons
3	LCD screen	8	Battery LED
4	On/Off button	9	AC LED
5	Fault LED	10	Inverter LED

5.1 Mimic LEDs

The mimic power-flow LEDs indicate current operating state of the UPS. LED descriptions below . describes the LED states.

Table 5.1 LED descriptions

LED	State	Description
AC LED	On (Green)	The rectifier is functioning normally
	Flashing (Green)	The AC mains is normal, but the rectifier is not functioning properly
	On (Red)	The rectifier is faulty
	Off	The AC mains is abnormal, and the rectifier is not functioning

Table 5.1 LED descriptions (continued)

LED	State	Description
Battery LED	On (Green)	The battery is discharging
	Flashing (Green)	The battery has a pre-alarm of low voltage
	On (Red)	The DC-DC converter is faulty
	Off	The battery is charging, and the DC-DC converter is not functioning
Bypass LED	On (Green)	The bypass is supplying power
	On (Red)	The bypass is abnormal and not available
	Off	The bypass is normal, but not supplying output power
Inverter LED	On (green)	The inverter is supplying output power
	Flashing (green)	The inverter is starting up, in soft start or phase locked, and is not supplying output power
	On (red)	The inverter is faulty
	Off	The inverter is off
Output LED	On (green)	The UPS output is supplying power
	Flashing (green)	The UPS internal manual bypass is supplying output power
	On (red)	The UPS has output overload
	Off	The UPS does not have output power
Fault LED	On (yellow)	The UPS has an alarm or alarms
	On (red)	The UPS has one or more faults
	Off	UPS operating normally with no alarm or fault conditions

5.2 Audible Alarms

Three different audible alarms may occur during the UPS operation, described in Audible alarm descriptions below .

Table 5.2 Audible alarm descriptions

Alarm sound	Meaning
One beep per second	When the UPS has an alarm, for example, AC fault (mains failure)
One beep every 0.5 second	Upon UPS output overload or low battery voltage alarm during discharge
Continuous beep	When the UPS has a fault

5.2.1 Control Buttons

The operation and display panel provides two control buttons described in Control buttons functions below .

Table 5.3 Control buttons functions

Control Button	Function
ON/OFF Button	Used to turn the UPS On and Off.
Alarm Silence Button	When an audible alarm sounds, pressing this button can silence the alarm. Pressing this button again can restart the audible alarm.

5.3 LCD Screen and Menu Buttons

The operation and display panel provides an LCD screen and menu buttons (F1, F2, F3, F4, F5) described in Function descriptions of menu button below .

The LCD is a 320 × 240 dot-matrix graphic display. You can browse the UPS input, output, load and battery parameters and obtain the current state and alarm information of the UPS. You also can perform relevant function/parameter settings and control operations.

Table 5.4 Function descriptions of menu button

Button	F1	F2	F3	F4	F5
Function 1		—			
Function 2	—				—

5.3.1 Start-up Screen

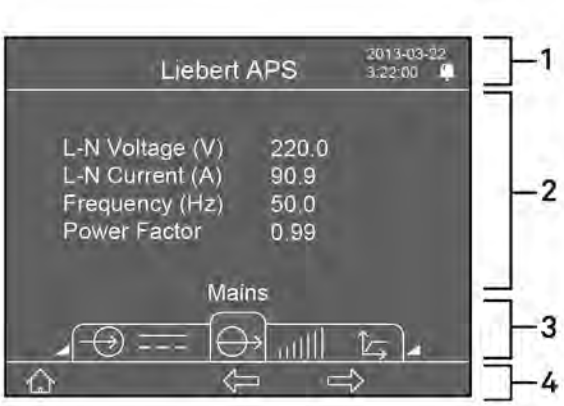
When the UPS starts up, it conducts a self-test, and the LCD displays the startup screen, which lasts for 15 seconds.

5.3.2 Main Screen

The main screen is divided into four parts: system information window, data window, menu window and keyboard window as shown in Main screen on the next page .

The functions of F1 ~ F5 buttons change automatically according to the currently-displayed screen. On any screen, press the F1 button to return to the Output screen. The window parts are described in the following sections

Figure 5.2 Main screen



Item	Description
1	Information window, see System Information Window below .
2	Data window, see Menu Window and Data Window below .
3	Menu window, see Menu Window and Data Window below .
4	Keyboard window, see LCD Screen and Menu Buttons on the previous page .

System Information Window

The system information window displays the current date and time and the UPS name without the need to select an option or press a button.

Menu Window and Data Window

The menu window shows the menu name and navigates to menu items. Each menu item displays a set of data in the data window. You can browse the relevant parameters of the UPS and can adjust/set some operational parameters. Item description of menu window and data window below describes the menu items and data displayed.

Table 5.5 Item description of menu window and data window

Menu Name	Data Item	Data Description
Mains	L-N Voltage (V)	L-N input voltage
	L-N Current (A)	L-N input current
	Frequency (Hz)	Input frequency
	L-L Voltage (V)	L-L input voltage
	kVA	Input apparent power
	Power Factor	Input power factor

Table 5.5 Item description of menu window and data window (continued)

Menu Name	Data Item	Data Description
Battery	Batt Voltage (V)	Battery bus voltage
	Batt Current (A)	Battery bus current
	Runtime (Min.)	Battery backup time remaining
	Batt Capacity (%)	Percentage of battery capacity
	Batt State	Charging, discharging or fully charged
	Batt String Count	Online battery string count
	Batt Temp (°C)	Battery temperature
	Discharge Count	Maximum historical discharge count within current battery modules
	Discharge Time (H)	Maximum historical discharge time within current battery modules
	EBC Count	Number of connected External Battery Cabinets
Output	L-N Voltage (V)	L-N Output Voltage
	L-N Current (A)	L-N Output Current
	Frequency (Hz)	Output Frequency
	Power Factor	Output Power Factor
	Line Voltage (V)	L-L Output Voltage (not displayed for single-phase output model)
Load	kVA	Output apparent power
	kW	Output active power
	Load Level (%)	Output loading, indicated in percentage of the UPS system rated load
	Crest Factor	Output current peak value factor

Table 5.5 Item description of menu window and data window (continued)

Menu Name	Data Item	Data Description
UPS Info	UPS ID	UPS ID
	LCD Module	If the module is online, the serial number and software version will be displayed
	Bypass Monitor Module	If the module is online, the serial number and software version will be displayed
	Bypass Control Module	If the module is online, the serial number and software version will be displayed
	Charger Module	If the module is online, the serial number and software version will be displayed
	Power Module	If the module is online, the serial number and software version will be displayed
	Battery Module	If the module is online, the serial number and software version will be displayed
Redundant State	PM Installed	The number of installed power modules
	PM	Whether there are redundant power modules supplying power.
Settings	Set Redundancy Mode	Disabled/ Enabled. If 'Enabled,' the system operational parameters will assume there is a redundant power module in the frame; if 'Disabled', the system operational parameters will assume that all power modules in the frame are not redundant. Note: This item is closely related to the 'Redundant alarm' setting
	Remote Comms Shutdown	Disabled/ Enabled. If 'Enabled,' this allows the UPS output power to be shutdown through remote communication, including the dry contacts and Liebert IntelliSlot communication cards. Note: This item is closely related to 'Remote shutdown delay'
	Bypass Setting	Enables the bypass to supply power or not
	Output Frequency	Sets the output frequency to allow frequency conversion operation
	Output Voltage	Sets the output voltage level to match the mains input voltage
	Inverter Sync Range	Sets the range of inverter synchronization for bypass frequency operation and availability
	Remote Shutdown Delay	Sets the shutdown delay time for the remote signal operation

Table 5.5 Item description of menu window and data window (continued)

Menu Name	Data Item	Data Description
Settings (continued)	Bypass Upper Limit	Sets the upper limit of bypass voltage operation and availability
	Bypass Lower Limit	Sets the lower limit of bypass voltage operation and availability
	Guaranteed Shutdown	Disabled/ Enabled. If 'Enabled,' once a low battery alarm is generated during a battery discharge, the UPS will continue battery mode operation until it reaches the end of discharge (EOD) setpoint, then will shutdown output power, whether the AC mains recovers or not.
	Bypass Alarm Mode	Allows an alarm to be generated when the bypass is abnormal
	Set RS232 Protocol	Because the slot 2 and the serial port on the rear panel cannot work at the same time, you must select one of them to work. If 'INTERFACE2' is selected, the slot 2 can communicate; if 'RS232' is selected, the serial port can communicate.
	Auto-Restart Mode	Allows auto restart after a EOD shutdown and AC mains returns
	Auto-Restart Capacity	Sets the battery capacity limit of auto restart feature. When AC mains power returns, the UPS will charge the battery to the specified battery capacity before enabling output power.
	Auto-Restart Delay	Sets the delay time of auto restart feature. When AC mains power returns, the UPS will start a countdown timer based upon the setting before enabling output power.

Table 5.5 Item description of menu window and data window (continued)

Menu Name	Data Item	Data Description
Settings (continued)	Display Contrast	Adjusts the contrast of LCD backlighting
	Date and Time	Sets date and time
	Command Password	Users can change the command password to prevent unauthorized user from changing any user configurable settings. The default password is 1234567. Once the password is changed, the default password is no longer operational and users are then required to enter the new password to enter/change any 'Settings' or 'Battery settings'. If the new password is forgotten, contact your local customer service center for steps to reset the password back to the factory default.
	Max Load Alarm	Sets a maximum load alarm. This item is closely related to 'Max load threshold.'
	Max Load Threshold	Sets the threshold of maximum load alarm. When the UPS loads exceed the threshold, and the maximum load alarm is enabled, an alarm will be generated.This item is closely related to 'Max load alarm,' for example, set this item to 5.0kVA, when the UPS loads exceed 5.0kVA, an alarm will be generated.
	Redundant Alarm Mode	Allows alarm to be generated when the system loses redundant power module
	Communication Address	Sets the UPS device address. This setting is only for the network card communication of newly emerging market.
	Air Filter Reminder	Set the reminder period of checking dust-proof filter
	Air Filter Type	Standard: Use this setting if air filter is not installed. Fine Dust: Use this setting if air filter is installed.
	IT System Compatibility	Enabled - Neutral back-feed relay will open on battery mode Disabled (Default) - Neutral back-feed relay is always closed
	UPS ID	Users can set the UPS name to facilitate managing the UPS through remote communications
	Company Name	Set the local service company name of the UPS
	Contact Number	Set the local service telephone number of the UPS
	Load factory defaults	Restores the setting items in 'Settings' menu to factory values

Table 5.5 Item description of menu window and data window (continued)

Menu Name	Data Item	Data Description
Battery settings	Low battery Warning	Sets the battery low voltage alarm time
	Automatic Battery Test Interval	Sets the interval for the automatic battery test. Intervals of 8, 12, 16, 20, 26 weeks or Disable are available for selection. Factory default is 8 weeks.
	Auto Batt Test Start Day	Sets the day of the week for the automatic battery test
	Auto Batt Test Start Time	Sets the time of the day for the automatic battery test
	External Battery AH	Sets the AH capacity of external third party battery system to calculate the battery capacity and estimate the battery time remaining
	Load Factory Defaults	Restores the setting items in 'Battery set' menu to factory values
Language	Language Options	Provides a selection of seven languages: Chinese, English, French, Spanish, Italian, Russian and German
Alarms	Current Alarms	Displays the current alarms. See Active Alarms on page 71 for the UPS alarm list
Records	Historical Alarms	Displays all historical alarms. See Active Alarms on page 71 for the UPS alarm list
Module replacement	LCD Module	Displays the procedures for replacing LCD module
	Bypass Monitor Module	Displays the procedures for replacing system monitor module
	Bypass Control Module	Displays the procedures for replacing system control module
	Power Module	Displays the procedures for replacing power module
	Battery Module	Displays the procedures for replacing battery module
	Charger Module	Displays the procedures for replacing charger module

Table 5.5 Item description of menu window and data window (continued)

Menu Name	Data Item	Data Description
Service	Battery Maintenance Test	Battery maintenance test allows battery to discharge some voltage to obtain the battery activity. The loads must be within 0% ~ 90%, the battery capacity must be larger than 70%, and there is no battery fault and alarm in the system.
	Stop Battery Test	Stops battery maintenance test
	System Test	A UPS self-test, used to test whether the LEDs are normal. When you start this function, 5 seconds later, the screen will prompt a window to display the system self-test result.
	Stop Testing	Stops system test manually
	Freshening Charge	Boost charges the battery by force, manually
	Stop Freshening Charge	Stops freshening charge manually
	UPS ID	Allows customer service personnel to set the UPS ID, to facilitate maintenance
	Site ID	Allows customer service personnel to set the UPS address, to facilitate maintenance
	Tag Number	Allows customer service personnel to set the UPS tag, to facilitate maintenance
	Company Name	Allows customer service personnel to set the UPS company name, to facilitate maintenance
	Contact Number	Allows customer service personnel to set the UPS company contact number, to facilitate maintenance
	Frame S/N	Reset this when replacing the LCD board. The frame S/N is labeled on the frame.
	Normal Mode	Allows customer service personnel to set the UPS operating mode to normal online mode
	ECO Mode	Allows customer service personnel to set the UPS operating mode to ECO mode
	Enable Max Discharge Protection	By default, the UPS has a maximum discharge time to protect the batteries from a deep, slow discharge. After this time, the UPS will turn Off its output.
	Disable Max Discharge Protection	If this variable is set, there will be no time limit and the UPS will stay on battery until the EOD setpoint is reached. This may cause damage to some battery types and should only be used for DC sources that do not have slow discharge issues.
The Service screen is only for customer service personnel. It is not open to the user.		

Keyboard Window

The keyboard window displays the functions of the menu buttons, F1 ~ F5, and the function icons are described in Function descriptions of menu button on page 57 .

5.3.3 Default Screen/Screen Saver

While the UPS is operating, if there are no active alarms, the LCD enters screen-saver mode after 2 minutes of no activity. After a brief delay, the LCD back-light also turns off. Pressing any button will return to the original screen.

5.3.4 Screen Views

This section gives a detailed description of each display screen and its contents. The default “main screen” is the Output menu and its data. The navigation indicated for each screen is in reference to the Output screen.

Navigating to Screens and Screen Descriptions

AC Mains screen

From the main screen, press the F3 button twice.

The AC mains screen displays the input L-N voltage, L-N current, input frequency, L-L voltage, apparent power and power factor of three phases (L1, L2, L3).

Battery screen

From the main screen, press the F3 button once.

On the first battery screen, press F5 to change the function of the F2, F3, and F4 buttons from the primary functions to the secondary functions, described in Function descriptions of menu button on page 57 .

The battery screen displays Battery voltage, Battery current, Battery time remaining, Battery capacity, Battery state, Battery string count, Battery temperature, cumulative discharge count (highest of all installed battery modules), cumulative discharge time (in hours) and External battery cabinet count.

Output screen

Output is the default main screen.

The output screen displays L-N or L-L voltage, L-N or L-L current, Frequency and Power factor.

Load screen

From the main screen, press the F4 button once.

The load screen displays output kVA (Sout/apparent power), output kW (Pout/active power), load level and crest factor.

UPS Information Screen

From the main screen, press the F4 button twice.

The UPS information screen displays UPS ID (name set by user), serial number and software version of LCD module, system monitor module, system control module, charger module, power module and battery module (if the modules are installed and are online).

Redundancy Screen

From the main screen, press the F4 button three times.

The redundancy screen displays the number of installed power modules in the frame, and whether the system contains a redundant module or not.

Settings Screen

From the main screen, press the F4 button four times.
The settings screen is displayed in a total of nine screens as you scroll down.

On the first settings screen, press F5 to prompt a password window to pop up. After you enter the correct password, the function of the F2, F3, and F4 buttons switch from the primary functions to the secondary functions, described in Function descriptions of menu button on page 57 . To adjust the settings, see Entering a Password to Edit Settings on the facing page , and Editing Parameter Settings on the facing page .

Battery Setting Screen

From the main screen, press the F4 button five times.

On the first settings screen, press F5 button to prompt a password window to pop up. After you enter the correct password, the function of the F2, F3, and F4 buttons switch from the primary functions to the secondary functions, described in Function descriptions of menu button on page 57 . To adjust the settings, see Entering a Password to Edit Settings on the facing page , and Editing Parameter Settings on the facing page .

Language Selection Screen

From the main screen, press the F4 button six times.

The language selection screen displays a choice of seven languages: Chinese, English, German, Russian, French, Italian and Spanish.

NOTE: The languages are displayed in their alphabet.

To set the language:

1. Press F5.
   The language option is highlighted.
2. Press F3 or F4 to navigate to the language to select.
3. Press F5 to confirm the selection.
4. Once the screen language changes, press F2 to exit language-setting mode.

Alarms Screen

From the main screen, press the F4 button seven.

The alarms screen displays any current alarms of the UPS, including the alarm name, alarm ID code and alarm date/time stamp.

Records Screen

From the main screen, press the F4 button eight times.

The records screen displays all historical alarms of the UPS, including the alarm name, alarm ID code, alarm date/time stamp and record number/total record count.

Module Replacement Screen

From the main screen, press the F4 button nine times.

The module-replacement screen displays the procedures for replacing all user-replaceable module assemblies in the UPS frame.

To view the module-replacement procedure:

1. press F5 to enter the module replacement.
   One module option is highlighted.
2. Press F3 or F4 to navigate to the procedure for the specific model, then press F5 to view the procedures.
3. Once completed, press F2 to exit.

5.3.5 Entering a Password to Edit Settings

1. On the password prompt window, press F5, the first digit becomes editable, press F3 to enter the correct number.
2. Press F4, the second digit becomes editable, press F3 to enter the correct number.
3. Enter the remaining password digits this method, then press F5 when complete.

5.3.6 Editing Parameter Settings

1. Press F4 to navigate to the parameter, and press F5 to enter edit mode.
2. Press F3 or F4 to select the item or change value, then press F5 to confirm the setting.
3. Press F2 to exit the edit setting mode.

5.3.7 Prompt Window

During system operation, alerts, reminders, and notifications pop up in a prompt window. Information and actions required for the prompt window on the next page descibes the prompts and the action to take if needed.

Table 5.6 Information and actions required for the prompt window

Prompt Window	Explanation
Turn On/Off: Turn On UPS Cancel	When you press the ON/OFF-button while UPS is Off.
Turn On/Off: Turn On INV Turn Off UPS	When you press the ON/OFF-button while UPS is operating on bypass mode.
Turn On/Off: Transfer to Bypass Cancel	When you press the ON/OFF-button while UPS is operating on inverter mode and bypass is qualified.
Turn On/Off: Turn Off UPS Cancel	When you press the ON/OFF-button while UPS is operating on inverter mode and bypass is not qualified.
Enter password *******	After the control password is changed, you are required to enter the password when you want to enter "Settings," "Battery set" and "Service" screens.
Output must be Off	While the UPS output is supplying power, this prompt appears when you want to set some key system parameters. You need to close the output before setting key parameters.
On manual bypass can't turn Off the load	This prompt appears when UPS operates on manual bypass and the ON/OFF button is pressed.
Please verify output settings before starting the UPS Escape: Ignore this message Enter: Go to Settings Screen	After the UPS is powered on, When you press the ON/OFF button for the first time, this prompt appears to remind you of viewing relevant setting.
Short Circuit Recovery	After the UPS output short circuits, wait 30 seconds before turning On the UPS again.
System is not ready	When the power modules in the frame is initializing or there are no power modules, this prompt appears when you press the ON/OFF button.
AC input not qualified, cannot start UPS	When the input voltage cannot meet the startup condition of the inverter, this prompt appears when you press the ON/OFF button.
Please check air filter	When you set "Enabled" for "Air filter reminder," this prompt appears after the reminder time is up.

Table 5.6 Information and actions required for the prompt window (continued)

Prompt Window	Explanation
Removal of module will result in loss of output power	When only one of the system monitor module OR system control module is installed and active, when the locking level is moved to the unlock position, this prompt appears to remind user of loss of output power will occur if the module is removed from the system.
New Alarms Present Escape: Ignore this message Enter: Go to Alarms Screen	This prompt appears when a new alarm occurs.
Warning! Frame Fan Fault Reduce load or replace fan to avoid damage to bypass	This prompt appears when frame fan is in fault and load is heavy, user should reduce load or replace fan
Bypass source not qualified Can not switch to bypass	This prompt appears when bypass source is not qualified and inverter can't power on the load for transformer based frame

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6 Troubleshooting

This is the basic troubleshooting guide and required actions for maintaining the Liebert Liebert® APS system.

6.1 Active Alarms

In the event of an alarm, the user-interface display displays the latest alarm message. A list of possible alarm messages are described in Alarm message list below . If an alarm occurs and you are uncertain of the corrective action to take, contact your local Vertiv representative.

Table 6.1 Alarm message list

Alarm Message	Possible Cause	Corrective Action
Power Module Warning	One or more power modules is not operating correctly.	View the corresponding module serial number in the fault logs or event logs and contact your local Liebert Services representative.
Power Module Fail	One or more power modules has a fault.	View the corresponding module serial number in the fault logs or event logs and either replace the module or contact your local Liebert Services representative.
Power Module Over Temp Warning	One or more power modules is operating at an internal high temperature.	Check the air filters located behind the bezels and clean if necessary, or check to see if the ambient temperature is too high. If these conditions do not exist, contact your local Liebert Services personnel.
Power Module Over Temp Shutdown	One or more power modules has stopped operating due to an internal over temperature.	Check the air filters located behind the bezels and clean if necessary, or check to see if the ambient temperature is too high. If these conditions do not exist, contact your local Liebert Services representative.
Power Module Fan Failure	One or more of the power module fans has failed.	Check to see if the fan is blocked. If not, contact your local Liebert Services representative.
Insufficient Capacity To Start Inverter	The load value exceeds the maximum load capacity of all operating modules.	Ensure all power modules are inserted and the locking lever is fully inserted. If all modules are active, add power modules to increase capacity or contact your local Liebert Services representative.
PM Locking Lever In Remove Position	The power module locking lever is not in the locked position.	Check the locking lever to ensure it is fully inserted. If so, contact your local Liebert Services representative.
Input Phase A Not Qualified	A-phase voltage is too high or too low.	Check the upstream feeder breaker or the UPS input breaker and reset if necessary, or contact your local Liebert Services representative.
Input Phase B Not Qualified	B-phase voltage is too high or too low.	Check the upstream feeder breaker or the UPS input breaker and reset if necessary, or contact your local Liebert Services representative.

Table 6.1 Alarm message list (continued)

Alarm Message	Possible Cause	Corrective Action
Input Phase C Not Qualified	C-phase voltage is too high or too low.	Check the upstream feeder breaker or the UPS input breaker and reset if necessary or contact your local Liebert Services representative.
L1L2 Phase Reversed	Two phases are reversely connected.	Have a qualified electrician check the phase rotation at the distribution panel and/or at the UPS input terminal block. If this is not the problem, contact your local Liebert Services representative.
Battery Reversed	The battery is reversely connected.	Have a qualified electrician check the wiring rotation at the external battery cabinet. If this is not the problem, contact your local Liebert Services representative.
No Battery Modules Are Ready	The battery module is not ready, and the yellow fault LED flashes.	Ensure that the battery module is fully inserted and locking levers are in the locked position. If this is not the problem, contact your local Liebert Services representative.
All PM's Are Not Ready	The power module is not ready, and the yellow fault LED flashes.	Ensure that the power module is fully inserted in the upper frame bays and locking levers are in the locked position. If this is not the problem, contact your local Liebert Services representative.
Power Module Redundancy Alarm	The UPS has no redundant power module	Add power modules or replace the faulty power module to obtain redundancy, or contact your local Liebert Services representative.
Output Exceeds Max Load Setting	The maximum load alarm is effective, the actual load is larger than the setting	Either decrease load on the UPS or readjust the user programmable alarm set point from the LCD. It might also require another power module to increase capacity. If this is not the problem, contact your local Liebert Services representative.
Turn Rocker Switch Off Before Removing	The bypass power is unqualified or the system output is disconnected. There is only one system monitor module or one system control module in the system, and the control lever is removed. The alarm reminds you to open the startup switch before pulling out the control module.	Open the startup switch.
Time to Check the Fan Filters for Excessive Dirt	When the air filter reminder is 'Enabled,' this message appears to remind users to check the air filters.	Check the air filters and clean them if necessary, or contact your local Liebert Services representative.
No Matching Module	Only one battery module is inserted into one row of bays in the system.	Ensure that there are a pair of battery modules in the same row of the frame, or contact your local Liebert Services representative.
Load Exceeds Battery Module Capacity	The system has determined the load exceeds the capacity of the battery.	Check to ensure that all battery modules are fully inserted and the locking lever is in the locked position. It is possible that more battery modules are required to increase battery run time. If this is not the problem, contact your local Liebert Services representative.
Battery Cabinet Not Connected	The power cable of the external battery cabinet is not connected or fully inserted.	Connect the cable or contact your local Liebert Services representative.

Table 6.1 Alarm message list (continued)

Alarm Message	Possible Cause	Corrective Action
BM Lock Lever in Remove Position	The locking lever is not in the locked position.	Check the locking lever to ensure it is fully inserted. If so, contact your local Liebert Services representative.
BM Over Temperature Warning	The internal battery module temperature is at an elevated level.	Check the air filters located behind the bezels and clean if necessary, or check to see if the ambient temperature is too high. If this is not the problem, contact your local Liebert Services representative.
Low Battery Warning	The battery capacity has reached the user programmable set point.	Check upstream feeder breaker or the UPS input breaker and reset if necessary.If this is not the problem, begin the orderly shutdown of all connected equipment as UPS shutdown is imminent.
Battery Module Warning	One or more battery modules is abnormal.	View the corresponding module serial number in the fault logs or event logs and contact your local Liebert Services representative.
Battery Module Fail	One or more battery modules has a fault.	View the corresponding module serial number in the fault logs or event logs and either replace the module or contact your local Liebert Services representative.
Battery Test Warning Weak Battery	One or more battery modules has detected batteries that are no longer in specification due to age or operating conditions.	Replace the battery string or contact your local Liebert Services representative.
BM Temp Unbalance	The temperature difference between all the battery modules exceeds 10°C.	Check the air filters located behind the bezels and clean if necessary, or check to see if the ambient temperature is too high. If this is not the problem, contact your local Liebert representative.
Frame Fan Failure	The fan located behind the display panel has failed.	Contact your local Liebert Services representative for fan replacement.
Transformer Fan Failure	There is a transformer on the UPS frame and at least one transformer fan has failed.	Contact your local Liebert Services representative for fan replacement.
Transformer Temperature Warning	A high temperature condition has occurred in the output transformer area.	Check the air filters located behind the bezels and clean if necessary, or check to see if the ambient temperature is too high. If this is not the problem, contact your local Liebert Services representative.
Bypass Source Not Qualified	The UPS bypass functionality is not available because the input source is out of tolerance to the bypass voltage and/or frequency window.	No action necessary unless the AC input has been verified within bypass settings. If this is not the problem, contact your local Liebert Services representative.
Output Is Off Abnormal Output Volt	The cable connection is wrong.	Check the power distribution.
System Control Module Lock Lever in Remove Position	The locking lever is not in the locked position.	Check the locking lever to ensure it is fully inserted. If so, contact your local Liebert Services representative.

Table 6.1 Alarm message list (continued)

Alarm Message	Possible Cause	Corrective Action
System Monitor Module Lock Lever in Remove Position	The locking lever is not in the locked position.	Check the locking lever to ensure it is fully inserted. If so, contact your local Liebert Services representative.
Charger Module Warning	The charger module is not operating correctly.	View the corresponding module serial number in the fault logs or event logs, and contact your local Liebert Services representative.
Charger Module Fail	The charger module has a fault.	View the corresponding module serial number in the fault logs or event logs, and either replace the module or contact your local Liebert Services representative.
CM Power source Is Not Qualified	Check the power distribution.	Check upstream feeder breaker or the UPS input breaker and reset if necessary, or contact your local Liebert Services representative
Charger Module LOCK Lever in Remove Position	The locking lever is not in the locked position.	Check the locking lever to ensure it is fully inserted. If so, contact your local Liebert Services representative.
Charger Module Fan Failure	One or more of the charger module fans has failed.	Check to see if the fan is blocked. If not, contact your local Liebert Services representative.
Charger Module Temperature Warning	One or more charger modules is operating at an internal high temperature.	Check the air filters located behind the bezels and clean if necessary, or check to see if the ambient temperature is too high. If this is not the problem, contact your local Liebert Services representative.

6.2 Module Troubleshooting

The power, battery, charger, system-control and system-monitor module have two LEDs each to indicate the module operating state. The location of the LED is shown in the description of each module in Major Components on page 10 , and Descriptions of module LEDs below describes the meaning the LED indicators.

Table 6.2 Descriptions of module LEDs

Green Status LED	Yellow Fault LED	Descriptions of Module State
Off	Off	The module is not inserted into the frame, lock lever is in unlocked position or the system is off
Off	On	The module is initializing (maximum 30 seconds[1])
Flashing	Off	The module is operating normally
Flashing	Flashing	The module is in startup mode or the module has an alarm[2]
Flashing	On	The module is faulty and off-line, and the control module is operating

Table 6.2 Descriptions of module LEDs (continued)

Green Status LED	Yellow Fault LED	Descriptions of Module State
Off	Flashing	The module is not operating correctly, re-insert the module. If this persists, contact technical support personnel.
On	Off	
On	On	
On	Flashing	

1. If this condition persists for more than 30 seconds, verify that the lock lever is in the locked position. If it is not, the module is faulty.
2. If both green and yellow LEDs are flashing for more than 30 seconds, reinsert module.

6.3 Module Replacement

Follow these instructions when replacing or adding a system-control, system-monitor, power, battery, or charger module. Contact your Vertiv representative to purchase additional modules to expand your system or for replacement modules.

6.3.1 Removing Power, Battery and Charger Modules

WARNING! Risk of heavy unit falling over. Can cause equipment damage, injury or death. Read all of the instructions before attempting to move the unit, lift it, remove packaging or prepare the unit for installation. The UPS presents a tipping hazard. Do not remove more than one module at a time. Failure to do so may cause unit to tip over and cause serious injury.

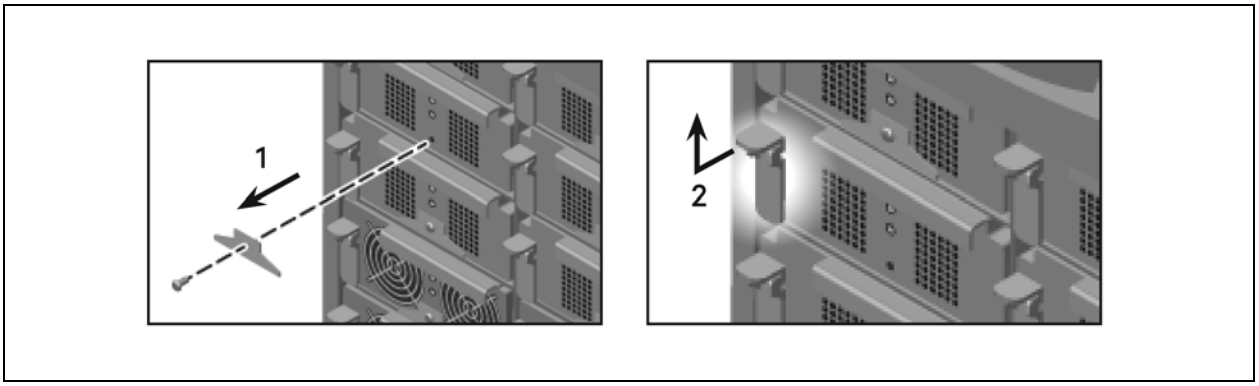
1. Remove bezel cover to locate the faulty module. The yellow fault LED is illuminated on the faulty module.

NOTE: When removing bezels from a transformer-based UPS, note which have filters and replace them accordingly. Bezels from the modules have air filters. There are no filters on the bottom three transformer bezels. The transformer has a separate air filter.

NOTE: If your system does not contain a redundant module, you may need to manually place the UPS into manual bypass before removing modules to avoid accidental loss of output power for the connected equipment.

2. Use a Phillips screwdriver to remove the fastener (if installed).
3. Pull out the lock lever slightly and lift up, then wait a few seconds before continuing.
4. Slide the module out about two-thirds of the way until it is stopped by the safety catch, then lift the module slightly and, while supporting the module, slide it completely out.

Figure 6.1 Removing a module



Item	Description
1	Remove module-securing bracket if installed.
2	Pull up lock lever and wait a few seconds.

6.3.2 Removing System-Control and System-Monitor Modules

NOTICE

Risk of unintended shutdown. Can cause equipment damage.

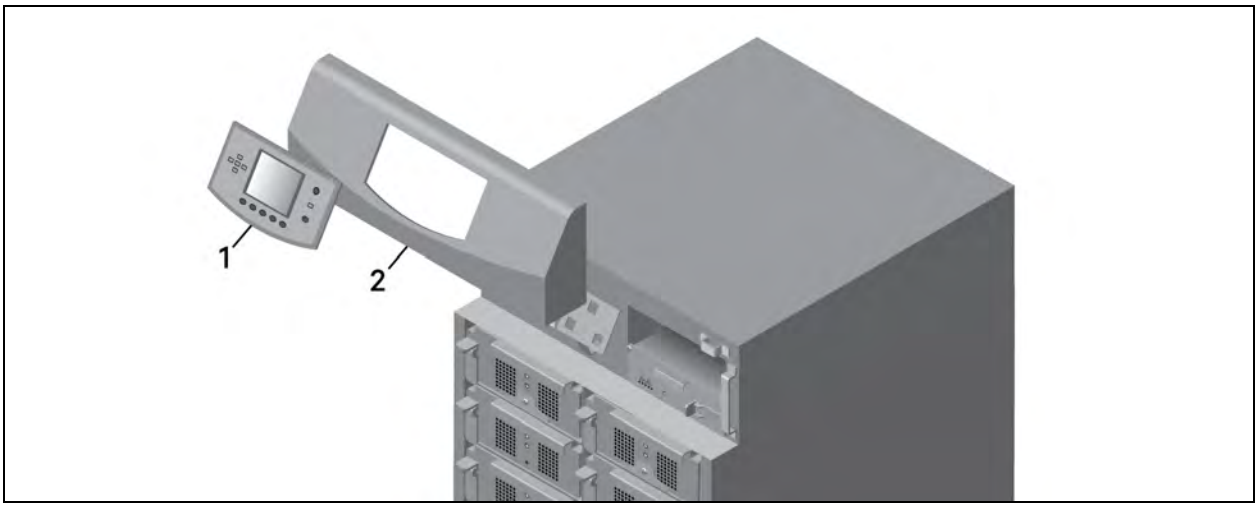
Do not remove both the control and the monitor modules at the same time. Removing both the control module and monitor module at the same time will cause the UPS to shut down and remove power from the load. Replace these modules one at a time.

1. Remove the display bezel and the user interface (LCD) module from the frame, as shown in Remove display bezel and user-interface module on the facing page , then lay the user-interface module on top of the UPS.
2. Locate the faulty module. The yellow fault LED is illuminated on the faulty module.

NOTE: If your system does not contain a redundant module, you may need to manually place the UPS into manual bypass before removing modules to avoid accidental loss of output power for the connected equipment.

3. Use a Phillips-head screwdriver to remove the screws from the 2 securing holes.

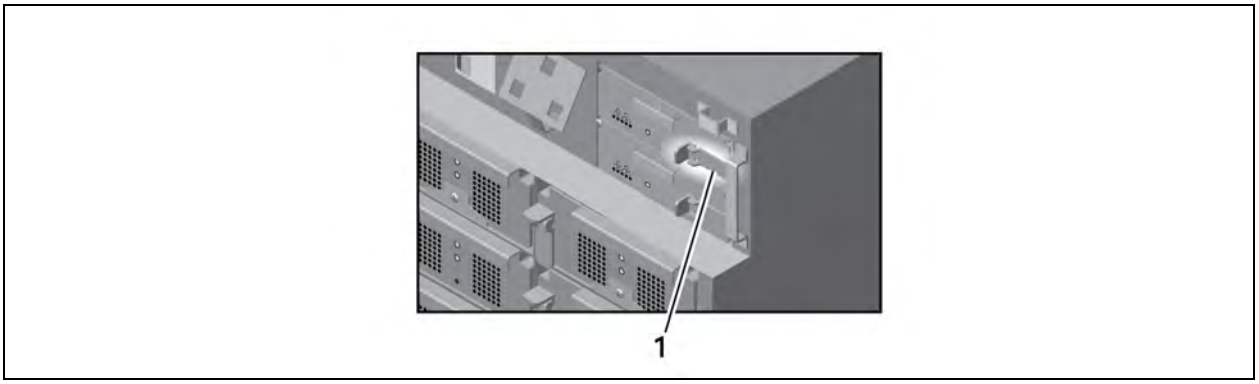
Figure 6.2 Remove display bezel and user-interface module



Item	Description
1	User-interface module
2	Display bezel

4. Pull out the lock lever slightly and pull to the left (see Releasing the lock lever below), then wait a view seconds before continuing.
5. Making sure to support the module, slide it completely out of its control bay.

Figure 6.3 Releasing the lock lever



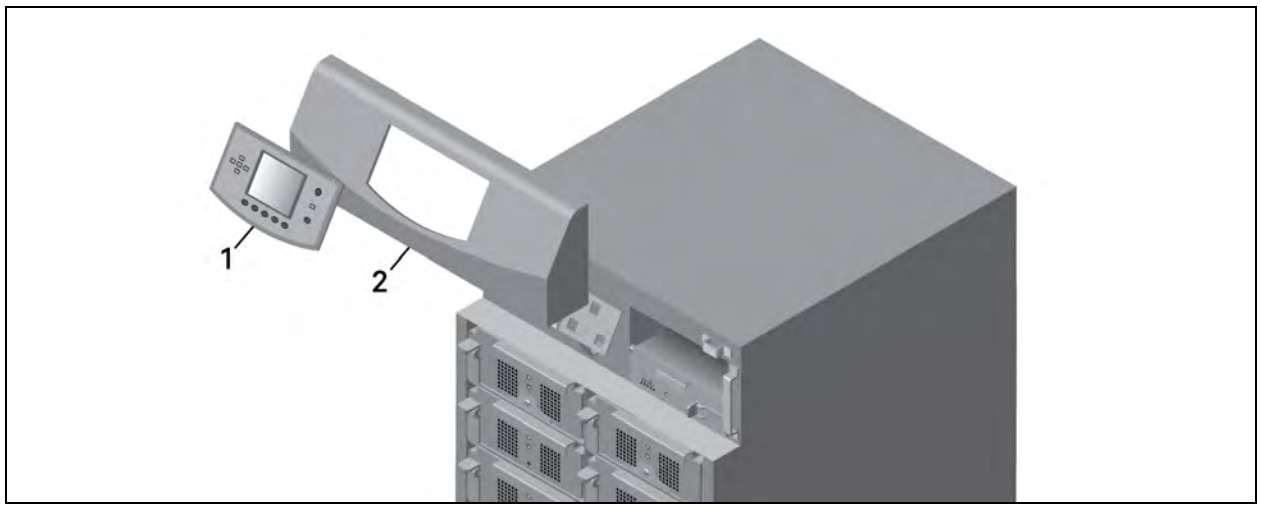
Item	Description
1	Lock lever

6.3.3 Replacing the User Interface Module

Replace the User Interface Module only while the Liebert® APS is turned On (System Enable switch On and input power available). If this module is replaced while the UPS is Off, the UPS settings will be reset to factory defaults when the UPS is powered On with the new User Interface Module installed.

1. Remove the display bezel on top of the frame, see Remove display bezel and user-interface module below .
2. Lift up the user interface module, and put it on top of the UPS frame.
3. Disconnect the network cable from the user interface module.
4. Connect the network cable to the new user interface module.
5. Insert the new user interface module into the clips and replace the display bezel.

Figure 6.4 Remove display bezel and user-interface module



Item	Description
1	User-interface module
2	Display bezel

7 Maintenance

Routine maintenance for the Liebert® APS, includes proper care, scheduled maintenance and cleaning fan filters.

7.1 Proper Care

Proper maintenance of the UPS is imperative to optimal performance and life of the unit. We recommend that a certified technician perform preventive and corrective maintenance. Vertiv is dedicated to ensuring the highest level of performance and unmatched support for your Liebert UPS. Contact your local Vertiv representative for service.

7.2 Scheduled Maintenance

We recommend performing the following maintenance at least monthly:

- Clean unit.
- Clean or replace filters.
- Verify proper airflow.

We recommend performing the following maintenance annually:

- Verify that all power modules are operating properly.
- Verify that all battery modules are operating properly.
- Verify redundancy (if applicable).

7.3 Cleaning Fan Filters

The intake fans contain filters that must be replaced or cleaned periodically, depending on the surrounding environment. Check filters and replace them if they are very dirty or damaged.

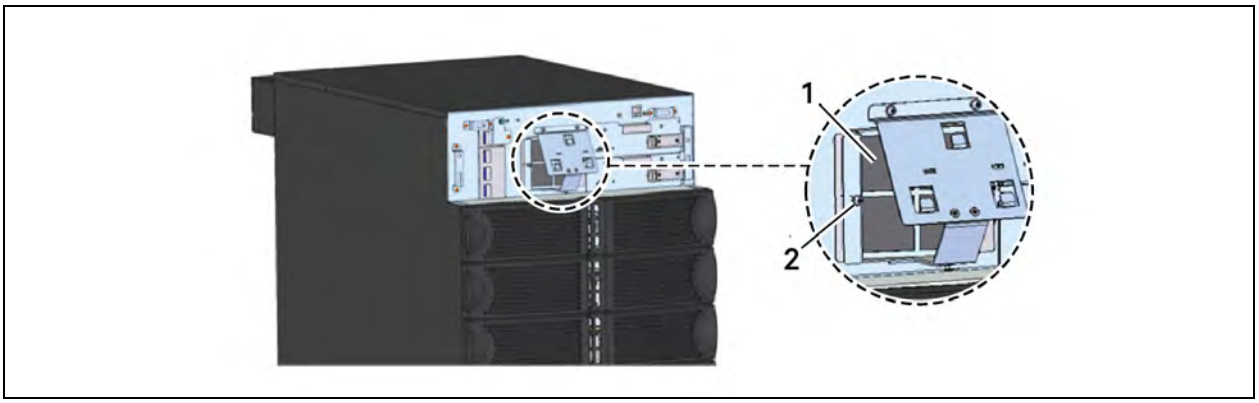
To remove dirt and dust from a filter:

Use a vacuum or rinse out the filter under running water (with the dirt side down). If you cleaned with water, blot the filters dry with a towel and allow to air-dry before reinstalling.

7.3.1 Accessing the Top Filter

1. Remove the display bezel.
2. Remove the user interface module, and lay it on top of the UPS frame.
3. Remove the two screws on the LCD mounting plate
4. Remove the screw in the middle of the filter assembly, remove the filter as shown in Replacing/Cleaning the top filter on the next page , and clean the filters as described in Cleaning Fan Filters above .
5. Replace the filter, mounting plate, user interface module and display bezel.

Figure 7.1 Replacing/Cleaning the top filter

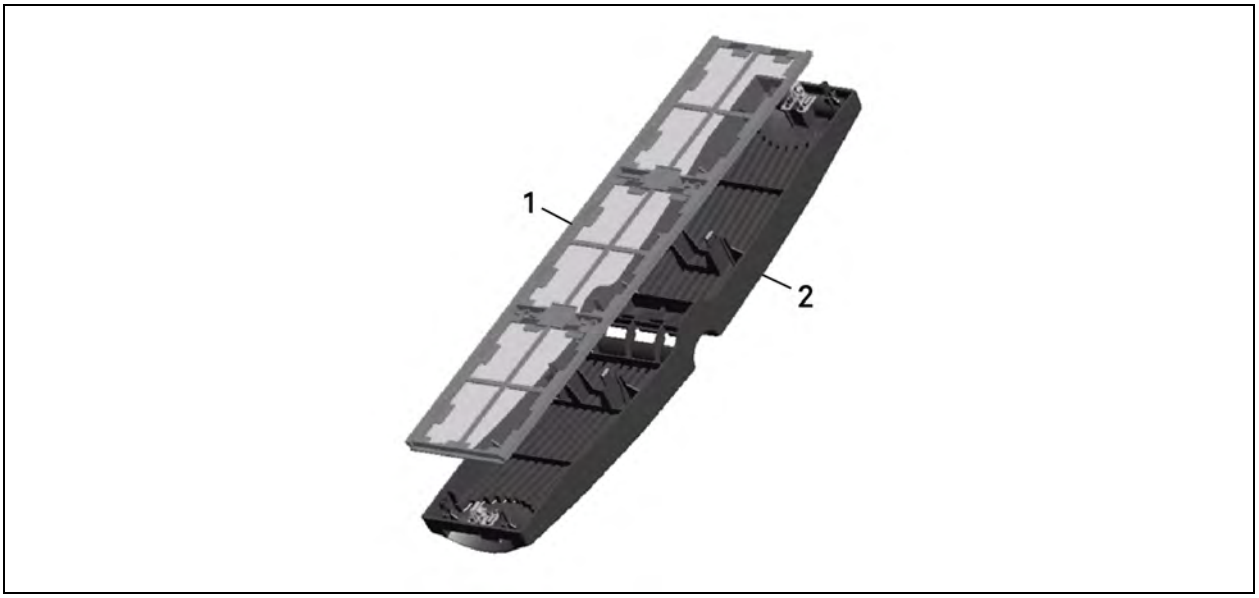


Item	Description
1	Filter
2	Screw (1 place)

7.3.2 Accessing the Bezel Filter

1. Remove the bezel from the frame.
2. Remove the filter assembly from the bezel, see Replacing/Cleaning the bezel filter below , and clean the filters as described in Cleaning Fan Filters on the previous page .
3. Replace the filter in the bezel and and place the bezel on the frame.

Figure 7.2 Replacing/Cleaning the bezel filter



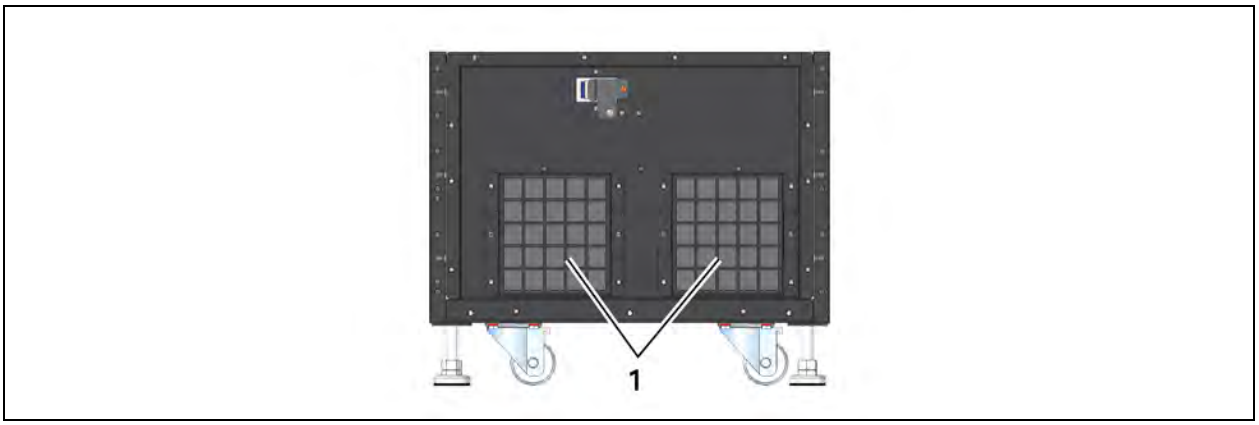
Item	Description
1	Filter
2	Bezel

7.3.3 Accessing the Bottom Fan Filter

NOTE: Only transformer-based frames have bottom fans.

1. Remove the three lower bezels at the bottom of the frame.
2. Remove the screws and take out the filter, shown in Replacing/Cleaning the bottom fan filter below , and clean the filters as described in Cleaning Fan Filters on page 79 .
3. Replace the filter and bezels.

Figure 7.3 Replacing/Cleaning the bottom fan filter



Item	Description
1	Filters

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8 Specifications

Table 8.1 Liebert APS specifications

Unit Size, Type	10 Bay	16 Bay	12 Bay	16 Bay	10 Bay	16 Bay
	No Transformer		Transformer-based		No Transformer Dual Inverter	
Frame Rating, kVA/kW	15/13.5	20/18	15/13.5	20/18	15/13.5	20/18
General & Environmental						
Conducted and Radiated EMC Levels	IEC/EN/AS 62040-2 Cat 2, CISPR22 Class A, FCC Part 15 Class A					
Compliant Safety Standards	IEC/EN/AS 62040-1:2008, UL 1778 5th Ed and CSA 22.2 No. 107.3				UL 1778 5th Ed and CSA 22.2 No. 107.3	
Compliant Immunity Standards	IEC/EN/AS 61000-4-2, 3, 4, 5, 6					
Transportation	Individual packaged modules meet ISTA-1A / 1B; the complete system meets ISTA-1E					
Environmental	WEEE and ROHS2 (6 by 6), REACH Compliant					
Protection Degree IEC60529	IP 20					
Color	RAL 7021					
Dimensions, W x D x H, in (mm)						
	17x32x27 (440x800x695)	17x34x38 (440x850x970)	17x32x42 (440x800x1060)	17x34x49 (440x850x1240)	17x32x27 (440x800x695)	17x34x38 (440x850x970)
Weight, lb. (kg)						
Unit Weight (empty frame)	280 (127)	320 (145.1)	510 (231.3)	540 244.9)	280 (127)	320 (145.1)
Shipping Weight (empty frame)	320 (145.1)	360 (163.3)	550 (249.5)	580 (263.1)	320 (145.1)	360 (163.3)
Unit Weight (frame rating populated)	565 (256.3)	700 (317.5)	795 (360.6)	920 (417.3)	565 (256.3)	700 (317.5)
Shipping Weight (frame rating populated)	605 (274.4)	740 (335.7)	835 (378.7)	960 (435.4)	605 (274.4)	740 (335.7)
Environmental						

Table 8.1 Liebert APS specifications (continued)

Unit Size, Type	10 Bay	16 Bay	12 Bay	16 Bay	10 Bay	16 Bay
	No Transformer		Transformer-based		No Transformer Dual Inverter	
Frame Rating, kVA/kW	15/13.5	20/18	15/13.5	20/18	15/13.5	20/18
Operating Temperature	0 - 40°C (32 - 104°F)					
Relative Humidity	0 - 95%, non-condensing					
Altitude	3000m (10000 ft.) @ 25°C (77°F)					
Efficiency (AC-AC)	91.8-92.0%	91.6-92.0%	88.5-89.9%	88.6-89.7%	90.4-91.0%	90.0-91.0%
Nominal Heat Dissipation (maximum)	4208 BTU/Hr	5747 BTU/Hr	5528 BTU/Hr	7965 BTU/Hr	4904 BTU/Hr	6768 BTU/Hr
Acoustic Noise Level, dBA	< 55dB (≤ 50% load), < 65dB (51-100% load) @ 1 meter					
Input Data						
Nominal Input Voltage, VAC	200/208/220/230/240; Single-Phase				200/100, 220/110, 230/115, 240/120, 254/127, 208/120, 173/100, 190/110, 200/115, 220/127; Two-Phase	
	380/400/415; Three-Phase		—	—		
Input Voltage Range	The input voltage range based on the output loading, refer to Rated input voltage range (Unit: VAC) on page 86					
Power Factor, Cos	Single-Phase Input, ≥ 0.99; Three-phase Input, ≥ 0.95		Single-Phase Input, ≥ 0.99			
Input Frequency, Nominal	50/60Hz					
Input Current Distortion, THDi	≤ 5%					
Input Frequency Range	40 to 70Hz, auto-sensing					
Battery Module						
Lead-Acid Batteries Per String	12					
Battery Cells Per String	72					
Battery Capacity	36W @ 15min-rate to 1.67V per cell @25°C (77°F)					

Table 8.1 Liebert APS specifications (continued)

Unit Size, Type	10 Bay	16 Bay	12 Bay	16 Bay	10 Bay	16 Bay
	No Transformer		Transformer-based		No Transformer Dual Inverter	
Frame Rating, kVA/kW	15/13.5	20/18	15/13.5	20/18	15/13.5	20/18
Backup Time, Full Load	5 (for non-redundant system which has equal number of battery strings and power modules)					
Maximum Charge Current (Full, Load)	Power module internal charger: 1.8A Charger module: 10A					
Nominal Voltage	144 VDC					
Recharge Timer	< 5 Hr. to 90% capacity (PM internal charger with 1:1 ratio of PM to Battery Strings)					
Output Data						
Output Voltage, VAC	200/208/220/230/240 Single-Phase		100/100/173/200 110/110/190/220 115/115/199/230 120/120/208/240 Single-Phase		200/100, 220/110, 230/115, 240/120, 254/127, 208/120, 173/100, 190/110, 200/115, 220/127; Two-Phase	
Voltage Regulation	±3%					
Voltage Stability (100% Step Load)	±7%					
Voltage Recovery Time	≤ 60 ms					
Voltage Distortion	≤ 3%, linear load					
	≤ 5%, non-linear load		≤ 7%, non-linear load		≤ 5%, non-linear load	
Output Frequency	50/60 Hz					
Output Overload Capability	< 104% continuous					
	105% - 130% for 1 min					
	131% - 150% for 10 sec					
	151% - 200% for 1 sec					
	> 201% for 250 msec					

Table 8.2 Rated input voltage range (Unit: VAC)

System Configuration	% UPS Load	Low Limit Value	High Limit Value
Dual-Inverter Configured to 120 or 127 VAC per Phase	>100%	98 ±3.1	139.5 ±3.1
	90% ~ 100%	89 ±3.1 ~ 98 ±3.1	
	70% ~ 90%	74 ±3.1 ~ 89 ±3.1	
	30% ~ 70%	60.5 ±3.1 ~ 74 ±3.1	
	<30%	60.5 ±3.1	
Dual-Inverter Configured to 100, 110 or 115 VAC per Phase	>100%	84 ±3.1	
	90% ~ 100%	80 ±3.1 ~ 84 ±3.1	
	70%~90%	72 ±3.1 ~ 80 ±3.1	
	40%~70%	60 ±3.1 ~ 72 ±3.1	
	<40%	60 ±3.1	
Single-Inverter Transformer-Based and Transformer-Free	>100%	170 ±5	280 ±5
	90% ~ 100%	160 ±5 ~ 170 ±5	
	70%~90%	140 ±5 ~ 160 ±5	
	50%~70%	120 ±5 ~ 140 ±5	
	<50%	120 ±5	

Table 8.3 Liebert APS external battery cabinet specifications

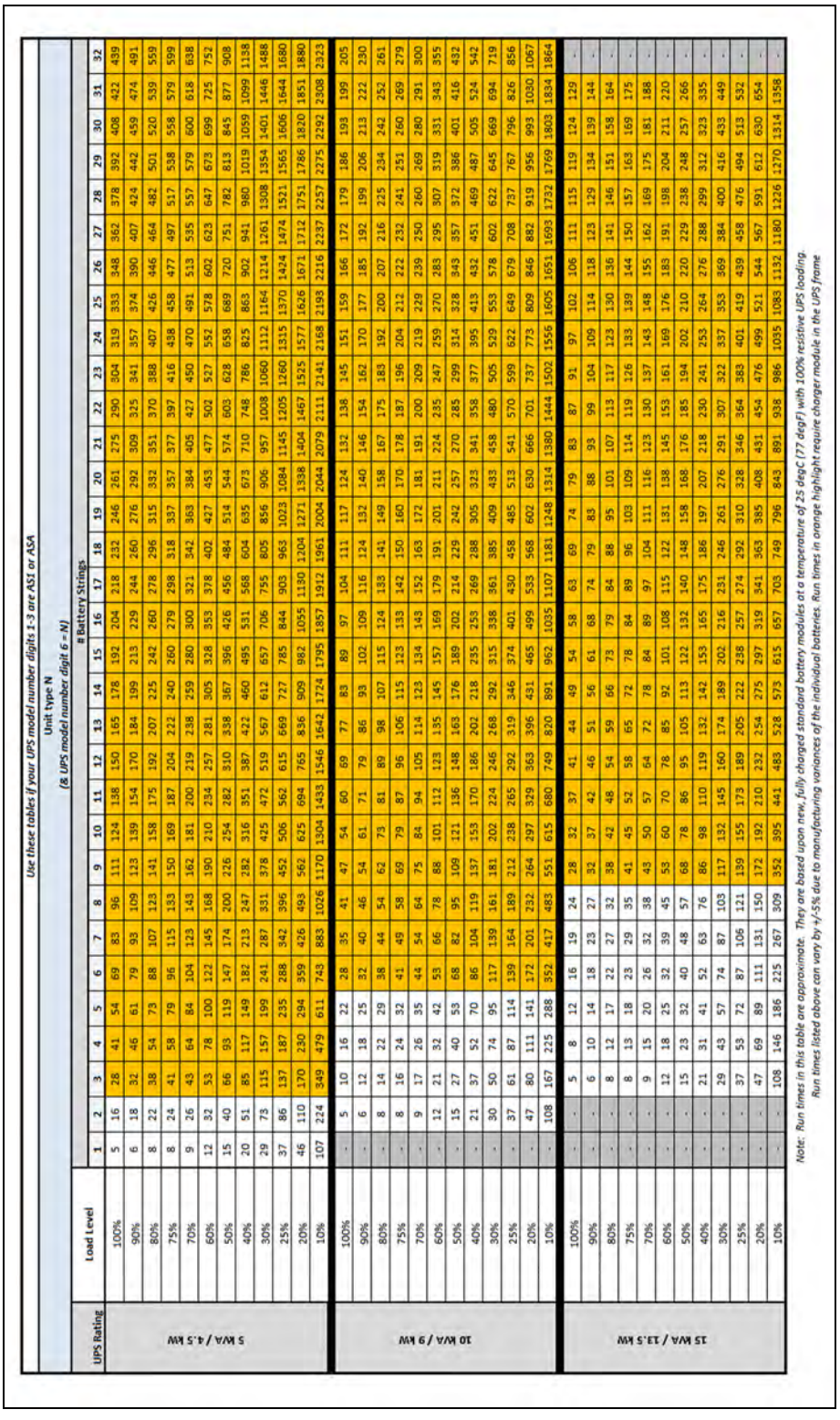
Parameters	AS7EBCNCC1BX000
General and Environmental	
Conducted and Radiated EMC Levels	IEC/EN/AS 62040-2—Class A, FCC Part 15 (Class A)
Safety Standards	IEC/EN/AS 62040-1:2008, UL 1778 5th Ed and CSA 22.2 No. 107.3
Immunity Standards	IEC/EN/AS 61000-4-2, 3, 4, 5, 6
Transportation	ISTA-1E
Dimensions, WxDxH	17x28x38 in. (440x712x970mm)
Unit Weight	147.7 lb.(67kg)
Shipping Weight	209.4 lb. (95kg)
Environmental	
Operating Temperature	32 to 104°F (0 to 40°C)
Storage Temperature	Without battery: -4 to 140°F (-20 to 60°C) With battery: 5 to 104°F (-15 to 40°C)
Relative Humidity	0 - 95%, non-condensing
Altitude	10,000 ft. (3000m)

Table 8.3 Liebert APS external battery cabinet specifications (continued)

Parameters	AS7EBCNCC1BX000
Battery Module *	
Lead-Acid Batteries (Per String)	12
Backup Time (Full Load), Minutes	See ,*Estimated Battery Run Times: Model-number Digits 1-3 = AS1 or ASA* on the next page *through Estimated Battery Run Times: Model-number Digits 1-3 = AS6 or ASF* on page 170
*Up to four external battery cabinets can be connected to each UPS frame and each external battery cabinet can be configured with up to seven strings of batteries.	

8.1 Estimated Battery Run Times: Model-number Digits 1-3 = AS1 or ASA

Figure 8.1 10-bay, single-phase, no transformer unit Type N (UPS model-number digit 6 = N)



Use these tables if your UPS model number digits 1-3 are AS1 or ASA

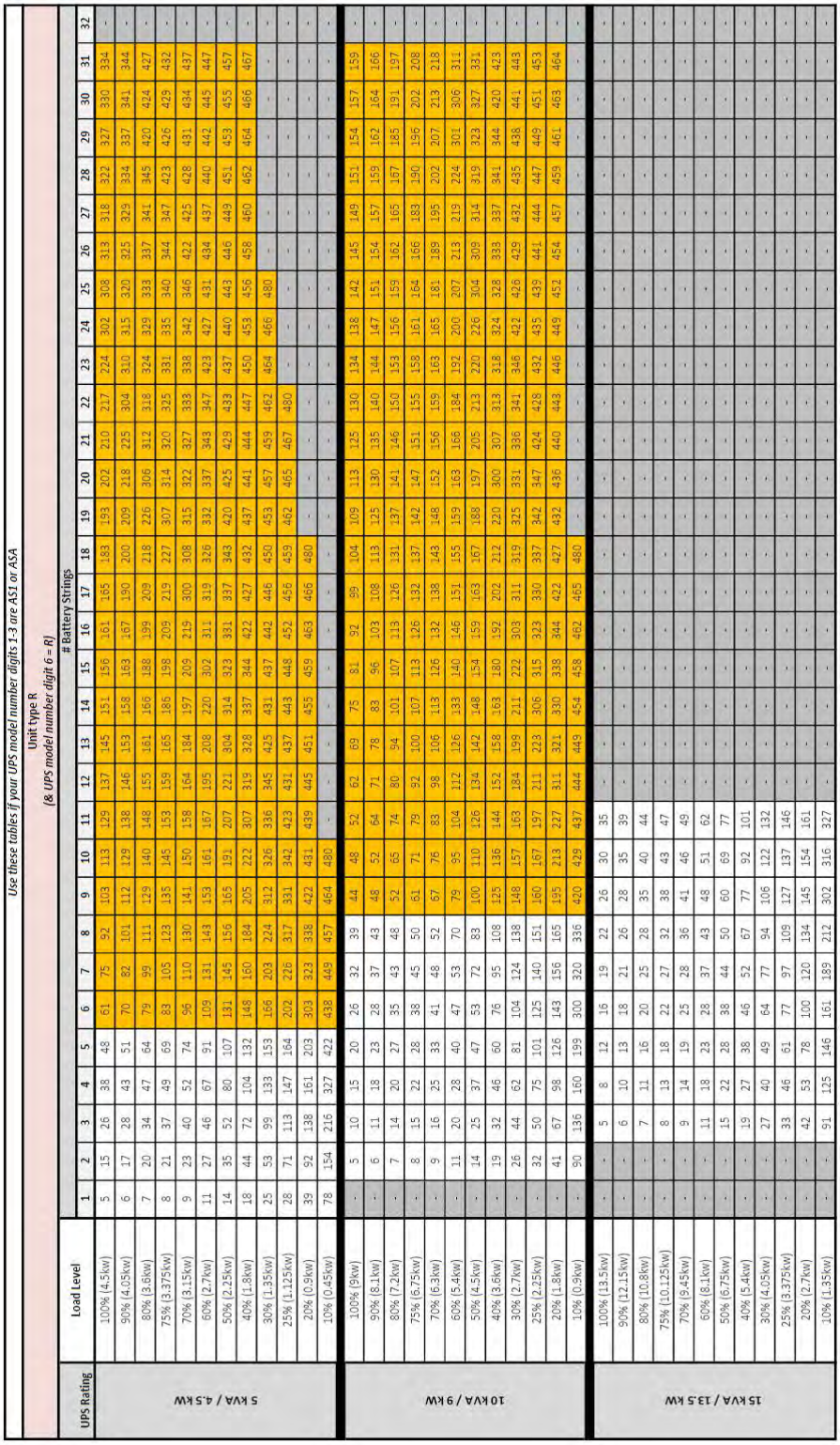
Unit Type N

(& UPS model number digit 6 = N)

UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100%	5	16	28	41	54	69	83	96	111	124	138	150	165	178	192	204	218	232	246	261	275	290	304	319	333	348	362	378	392	408	422	439
	90%	6	18	32	46	61	79	93	109	123	139	154	170	184	199	213	229	244	260	276	292	309	325	341	357	374	390	407	424	442	459	474	491
	80%	8	22	38	54	73	88	107	123	141	158	175	192	207	225	242	260	278	296	315	332	351	370	388	407	426	446	464	482	501	520	539	559
	75%	8	24	41	58	79	96	115	133	150	169	187	204	222	240	260	279	298	318	337	357	377	397	416	438	458	477	497	517	538	558	579	599
	70%	9	26	43	64	84	104	123	143	162	181	200	219	238	259	280	300	321	342	363	384	405	427	450	470	491	513	535	557	579	600	618	638
	60%	12	32	53	78	100	122	145	168	190	210	234	257	281	305	328	353	378	402	427	453	477	502	527	552	578	602	623	647	673	699	725	752
	50%	15	40	66	93	119	147	174	200	226	254	282	310	338	367	396	426	456	484	514	544	574	603	628	658	689	720	751	782	813	845	877	908
	40%	20	51	85	117	149	182	213	247	282	316	351	387	422	460	495	531	568	604	635	673	710	748	786	825	863	902	941	980	1019	1059	1099	1138
	30%	29	73	115	157	199	241	287	331	378	425	472	519	567	612	657	706	755	805	856	906	957	1008	1060	1112	1164	1214	1261	1308	1354	1401	1446	1488
	25%	37	86	137	187	235	288	342	396	452	506	562	615	669	727	785	844	903	963	1023	1084	1145	1205	1260	1315	1370	1424	1474	1521	1565	1606	1644	1680
	20%	46	110	170	230	294	359	426	493	562	625	694	765	836	909	982	1055	1130	1204	1271	1338	1404	1467	1525	1577	1626	1671	1712	1751	1786	1820	1851	1880
	10%	107	224	349	479	611	743	883	1026	1170	1304	1433	1546	1642	1724	1795	1857	1912	1961	2004	2044	2079	2111	2141	2168	2193	2216	2237	2257	2275	2292	2308	2323
10 kVA / 9 kW	100%	-	5	10	16	22	28	35	41	47	54	60	69	77	83	89	97	104	111	117	124	132	138	145	151	159	166	172	179	186	193	199	205
	90%	-	6	12	18	25	32	40	46	54	61	71	79	86	93	102	109	116	124	132	140	146	154	162	170	177	185	192	199	206	213	222	230
	80%	-	8	14	22	29	38	44	54	62	73	81	89	98	107	115	123	133	141	149	158	167	175	183	192	200	207	216	225	234	242	252	261
	75%	-	8	16	24	32	41	49	58	69	79	87	96	106	115	123	133	142	150	160	170	178	187	196	204	212	222	232	241	251	260	269	279
	70%	-	9	17	26	35	44	54	64	75	84	94	105	114	123	134	143	152	163	172	181	191	200	209	219	229	239	250	260	269	280	291	300
	60%	-	12	21	32	42	53	66	78	88	101	112	123	135	145	157	169	179	191	201	211	224	235	247	259	270	283	295	307	319	331	343	355
	50%	-	15	27	40	53	68	82	95	109	121	136	148	163	176	189	202	214	229	242	257	270	285	299	314	328	343	357	372	386	401	416	432
	40%	-	21	37	52	70	86	104	119	137	153	170	186	202	218	235	253	269	288	305	323	341	358	377	395	413	432	451	469	487	505	524	542
	30%	-	30	50	74	95	117	139	161	181	202	224	246	268	292	315	338	361	385	409	433	458	480	505	529	553	578	602	622	645	669	694	719
	25%	-	37	61	87	114	139	164	189	212	238	265	292	319	346	374	401	430	458	485	513	541	570	599	622	649	679	708	737	767	796	826	856
	20%	-	47	80	111	141	172	201	232	264	297	329	363	396	431	465	499	533	568	602	630	666	701	737	773	809	846	882	919	956	993	1030	1067
	10%	-	108	167	225	288	352	417	483	551	615	680	749	820	891	962	1035	1107	1181	1248	1314	1380	1444	1502	1556	1605	1651	1693	1732	1769	1803	1834	1864
15 kVA / 13.5 kW	100%	-	-	5	8	12	16	19	24	28	32	37	41	44	49	54	58	63	69	74	79	83	87	91	97	102	106	111	115	119	124	129	-
	90%	-	-	6	10	14	18	23	27	32	37	42	46	51	56	61	68	74	79	83	88	93	99	104	109	114	118	123	129	134	139	144	-
	80%	-	-	8	12	17	22	27	32	38	42	48	54	59	66	73	79	84	88	95	101	107	113	117	123	130	136	141	146	151	158	164	-
	75%	-	-	8	13	18	23	29	35	41	45	52	58	65	72	78	84	89	96	103	109	114	119	126	133	139	144	150	157	163	169	175	-
	70%	-	-	9	15	20	26	32	38	43	50	57	64	72	78	84	89	97	104	111	116	123	130	137	143	148	155	162	169	175	181	188	-
	60%	-	-	12	18	25	32	39	45	53	60	70	78	85	92	101	108	115	122	131	138	145	153	161	169	176	183	191	198	204	211	220	-
	50%	-	-	15	23	32	40	48	57	68	78	86	95	105	113	122	132	140	148	158	168	176	185	194	202	210	220	229	238	248	257	266	-
	40%	-	-	21	31	41	52	63	76	86	98	110	119	132	142	153	165	175	186	197	207	218	230	241	253	264	276	288	299	312	323	335	-
	30%	-	-	29	43	57	74	87	103	117	132	145	160	174	189	202	216	231	246	261	276	291	307	322	337	353	369	384	400	416	433	449	-
	25%	-	-	37	53	72	87	106	121	139	155	173	189	205	222	238	257	274	292	310	328	346	364	383	401	419	439	458	476	494	513	532	-
	20%	-	-	47	69	89	111	131	150	172	192	210	232	254	275	297	319	341	363	385	408	431	454	476	499	521	544	567	591	612	630	654	-
	10%	-	-	108	146	186	215	267	309	352	395	441	483	528	573	615	657	703	749	796	843	891	938	986	1035	1083	1132	1180	1226	1270	1314	1358	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.2 10-bay, single-phase, no transformer unit Type R (UPS model-number digit 6 = R)



Use these tables if your UPS model number digits 1-3 are AS1 or ASA

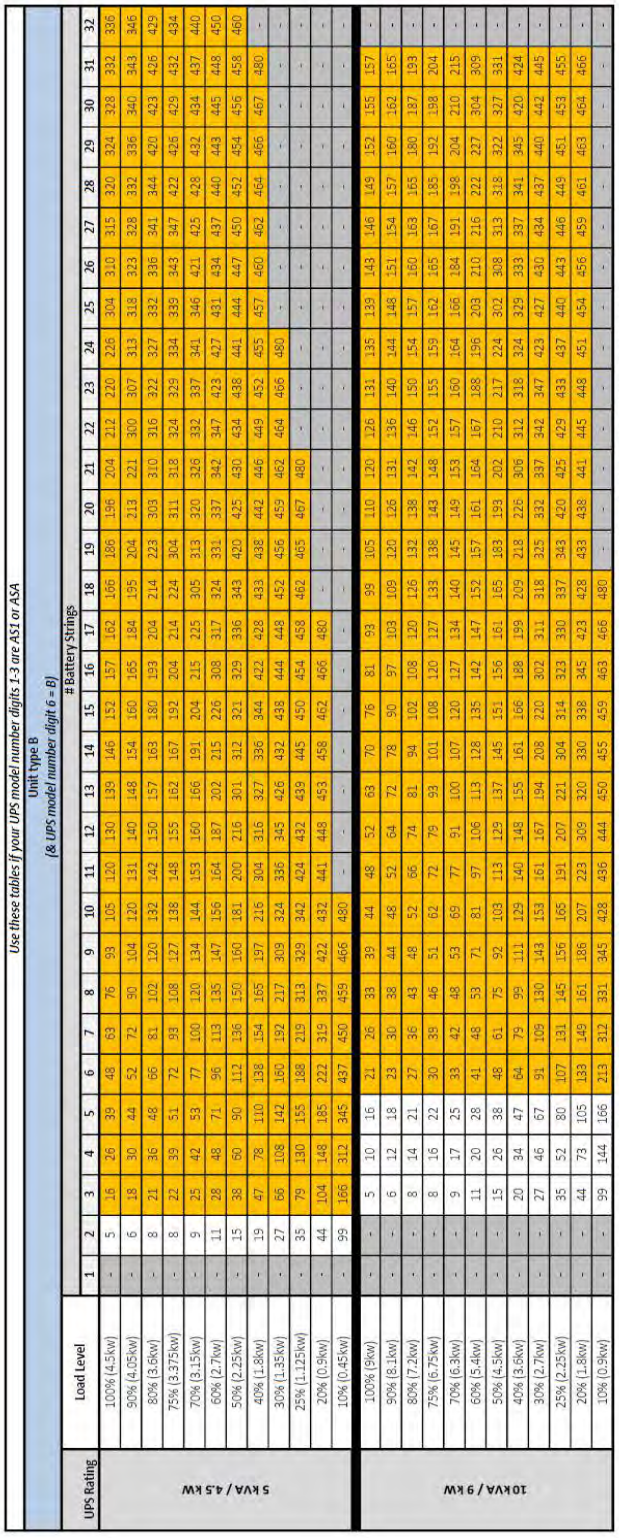
Unit type R

(& UPS model number digit 6 = R)

UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100% (4.5kw)	5	15	26	38	48	61	75	92	103	113	129	137	145	151	156	161	165	183	193	202	210	217	224	302	308	313	318	322	327	330	334	-
	90% (4.05kw)	6	17	28	43	51	70	82	101	112	129	138	146	153	158	163	167	190	200	209	218	225	304	310	315	320	325	329	334	337	341	344	-
	80% (3.6kw)	7	20	34	47	64	79	99	111	129	140	148	155	161	166	188	199	209	218	226	306	312	318	324	329	333	337	341	345	420	424	427	-
	75% (3.375kw)	8	21	37	49	69	83	105	123	135	145	153	159	165	186	198	209	219	227	307	314	320	325	331	335	340	344	347	423	426	429	432	-
	70% (3.15kw)	9	23	40	52	74	96	110	130	141	150	158	164	184	197	209	219	300	308	315	322	327	333	338	342	346	422	425	428	431	434	437	-
	60% (2.7kw)	11	27	46	67	91	109	131	143	153	161	167	195	208	220	302	311	319	326	332	337	343	347	423	427	431	434	437	440	442	445	447	-
	50% (2.25kw)	14	35	52	80	107	131	145	156	165	191	207	221	304	314	323	331	337	343	420	425	429	433	437	440	443	446	449	451	453	455	457	-
	40% (1.8kw)	18	44	72	104	132	148	160	184	205	222	307	319	328	337	344	422	427	432	437	441	444	447	450	453	456	458	460	462	464	466	467	-
	30% (1.35kw)	25	53	99	133	153	166	203	224	312	326	336	345	425	431	437	442	446	450	453	457	459	462	464	466	480	-	-	-	-	-	-	-
	25% (1.125kw)	28	71	113	147	164	202	226	317	331	342	423	431	437	443	448	452	456	459	462	465	467	480	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	39	92	138	161	203	303	323	338	422	431	439	445	451	455	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	78	154	216	327	422	438	449	457	464	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	15	20	26	32	39	44	48	52	62	69	75	81	92	99	104	109	113	125	130	134	138	142	145	149	151	154	157	159	-
	90% (8.1kw)	-	6	11	18	23	28	37	43	48	52	64	71	78	83	96	103	108	113	125	130	135	140	144	147	151	154	157	159	162	164	166	-
	80% (7.2kw)	-	7	14	20	27	35	43	48	52	65	74	80	92	101	107	113	126	131	137	141	146	150	153	156	159	162	165	167	185	191	197	-
	75% (6.75kw)	-	8	15	22	28	38	45	50	61	71	79	92	100	107	113	126	132	137	142	147	151	155	158	161	164	166	183	190	196	202	208	-
	70% (6.3kw)	-	9	16	25	33	41	48	52	67	76	83	98	106	113	126	132	138	143	148	152	156	159	163	165	181	189	195	202	207	213	218	-
	60% (5.4kw)	-	11	20	28	40	47	53	70	79	95	104	112	126	133	140	146	151	155	159	163	166	184	192	200	207	213	213	224	301	306	311	-
	50% (4.5kw)	-	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	188	197	205	213	220	226	304	309	314	319	323	327	331	-
	40% (3.6kw)	-	19	32	46	60	76	95	108	125	136	144	152	158	163	180	192	202	212	220	300	307	313	318	324	328	333	337	341	344	420	423	-
	30% (2.7kw)	-	26	44	62	81	104	124	138	148	157	163	184	199	211	222	303	311	319	325	331	336	341	346	422	426	429	432	435	438	441	443	-
	25% (2.25kw)	-	32	50	75	101	125	140	151	160	167	197	211	223	306	315	323	330	337	342	347	424	428	432	435	439	441	444	447	449	451	453	-
	20% (1.8kw)	-	41	67	98	126	143	156	165	185	213	227	311	321	330	338	344	422	427	432	436	440	443	446	449	452	454	457	459	461	463	464	-
	10% (0.9kw)	-	90	136	160	199	300	320	336	420	429	437	444	449	454	458	462	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	12	16	19	22	26	30	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	90% (12.15kw)	-	-	6	10	13	18	21	26	28	35	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	80% (10.8kw)	-	-	7	11	16	20	25	28	35	40	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	75% (10.125kw)	-	-	8	13	18	22	27	32	38	43	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	70% (9.45kw)	-	-	9	14	19	25	28	36	41	46	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60% (8.1kw)	-	-	11	18	23	28	37	43	48	51	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50% (6.75kw)	-	-	15	22	28	38	44	50	60	69	77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40% (5.4kw)	-	-	19	27	38	46	52	67	77	92	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30% (4.05kw)	-	-	27	40	49	64	77	94	106	122	132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25% (3.375kw)	-	-	33	46	61	77	97	109	127	137	146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (2.7kw)	-	-	42	53	78	100	120	134	145	154	161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (1.35kw)	-	-	91	125	146	161	189	212	302	316	327	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.3 10-bay, single-phase, no transformer unit Type B (UPS model-number digit 6 = B)



Use these tables if your UPS model number digits 1-3 are AS1 or ASA

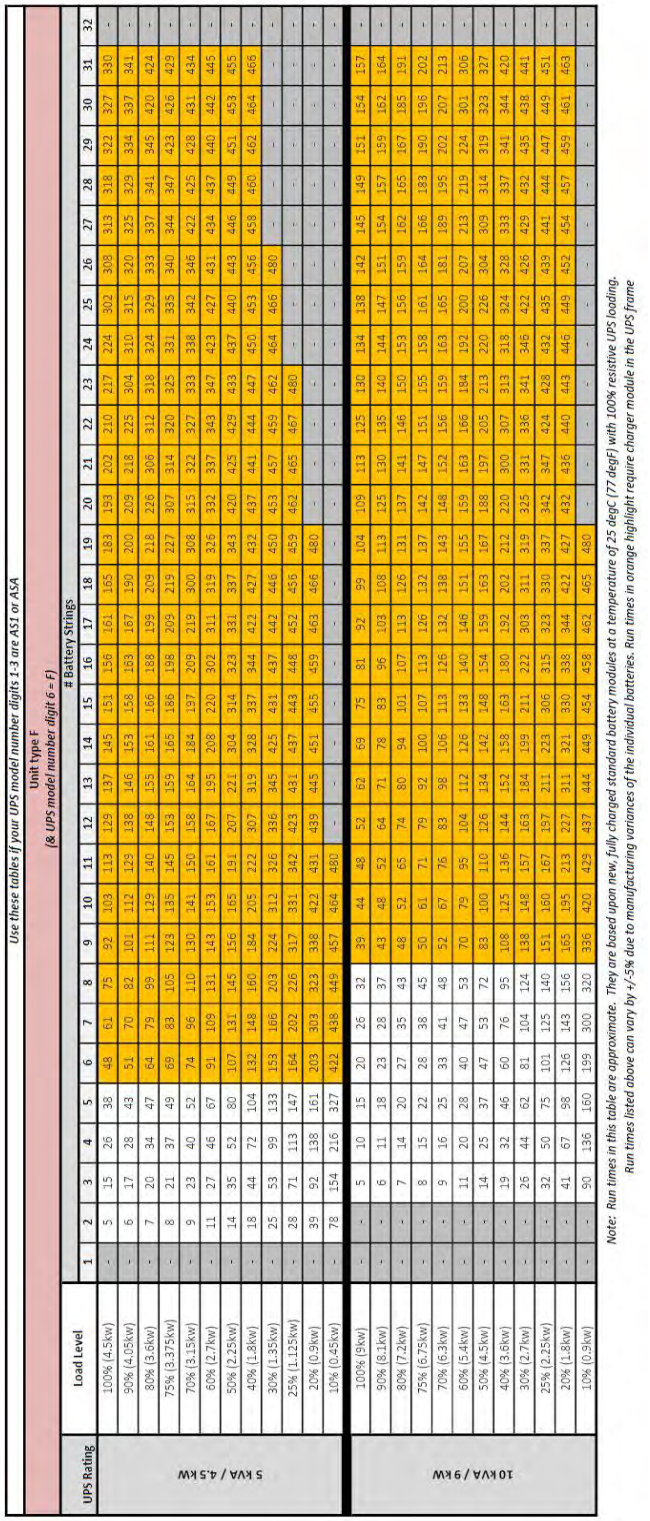
Unit type B

(& UPS model number digit 6 = B)

UPS Rating	Load Level	# Battery Strings: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100% (4.5kw)	-	5	16	26	39	48	63	76	93	105	120	130	139	146	152	157	162	166	186	196	204	212	220	226	304	310	315	320	324	328	332	336
	90% (4.05kw)	-	6	18	30	44	52	72	90	104	120	131	140	148	154	160	165	184	195	204	213	221	300	307	313	318	323	328	332	336	340	343	346
	80% (3.6kw)	-	8	21	36	48	66	81	102	120	132	142	150	157	163	180	193	204	214	223	303	310	316	322	327	332	336	341	344	420	423	426	429
	75% (3.375kw)	-	8	22	39	51	72	93	108	127	138	148	155	162	167	192	204	214	224	304	311	318	324	329	334	339	343	347	422	426	429	432	434
	70% (3.15kw)	-	9	25	42	53	77	100	120	134	144	153	160	166	191	204	215	225	305	313	320	326	332	337	341	346	421	425	428	432	434	437	440
	60% (2.7kw)	-	11	28	48	71	96	113	135	147	156	164	187	202	215	226	308	317	324	331	337	342	347	423	427	431	434	437	440	443	445	448	450
	50% (2.25kw)	-	15	38	60	90	112	136	150	160	181	200	216	301	312	321	329	336	343	420	435	430	434	438	441	444	447	450	452	454	456	458	460
	40% (1.8kw)	-	19	47	78	110	138	154	165	197	216	304	316	327	396	344	422	428	433	438	442	446	449	452	455	457	460	462	464	466	467	480	-
	30% (1.35kw)	-	27	66	108	142	160	192	217	309	324	336	345	426	432	438	444	448	452	456	459	462	464	466	480	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	35	79	130	155	188	219	313	329	342	424	432	439	445	450	454	458	462	465	467	480	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	44	104	148	185	222	319	337	422	432	441	448	453	458	462	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	99	166	312	345	437	450	459	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10kVA / 9 kW	100% (9kw)	-	-	5	10	16	21	26	33	39	44	48	52	63	70	76	81	93	99	105	110	120	126	131	135	139	143	146	149	152	155	157	-
	90% (8.1kw)	-	-	6	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	165	-
	80% (7.2kw)	-	-	8	14	21	27	36	43	48	52	66	74	81	94	102	108	120	126	132	138	142	146	150	154	157	160	163	165	180	187	193	-
	75% (6.75kw)	-	-	8	16	22	30	38	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	165	167	185	192	198	204	-
	70% (6.3kw)	-	-	9	17	25	33	42	48	53	69	77	91	100	107	120	127	134	140	145	149	153	157	160	164	166	184	191	198	204	210	215	-
	60% (5.4kw)	-	-	11	20	28	41	48	53	71	81	97	106	113	128	135	142	147	152	157	161	164	167	188	196	203	210	216	223	227	304	309	-
	50% (4.5kw)	-	-	15	26	38	48	61	75	92	103	113	129	137	145	151	156	161	165	183	193	202	210	217	224	302	308	313	318	322	327	331	-
	40% (3.6kw)	-	-	20	34	47	64	79	99	111	129	140	148	155	161	166	188	199	209	218	226	306	312	318	324	329	333	337	341	345	420	424	-
	30% (2.7kw)	-	-	27	46	67	91	109	130	143	153	161	167	194	208	220	302	311	318	325	332	337	342	347	423	427	430	434	437	440	442	445	-
	25% (2.25kw)	-	-	35	52	80	107	131	145	156	165	191	207	221	304	314	323	330	337	343	420	425	429	433	437	440	443	446	449	451	453	455	-
	20% (1.8kw)	-	-	44	73	105	133	149	161	186	207	223	309	320	330	338	345	423	428	433	438	441	445	448	451	454	456	459	461	463	464	466	-
	10% (0.9kw)	-	-	99	144	166	213	312	331	345	428	436	444	450	455	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.4 10-bay, single-phase, no transformer unit Type F (UPS model-number digit 6 = F)



Use these tables if your UPS model number digits 1-3 are AS1 or ASA

Unit Type F

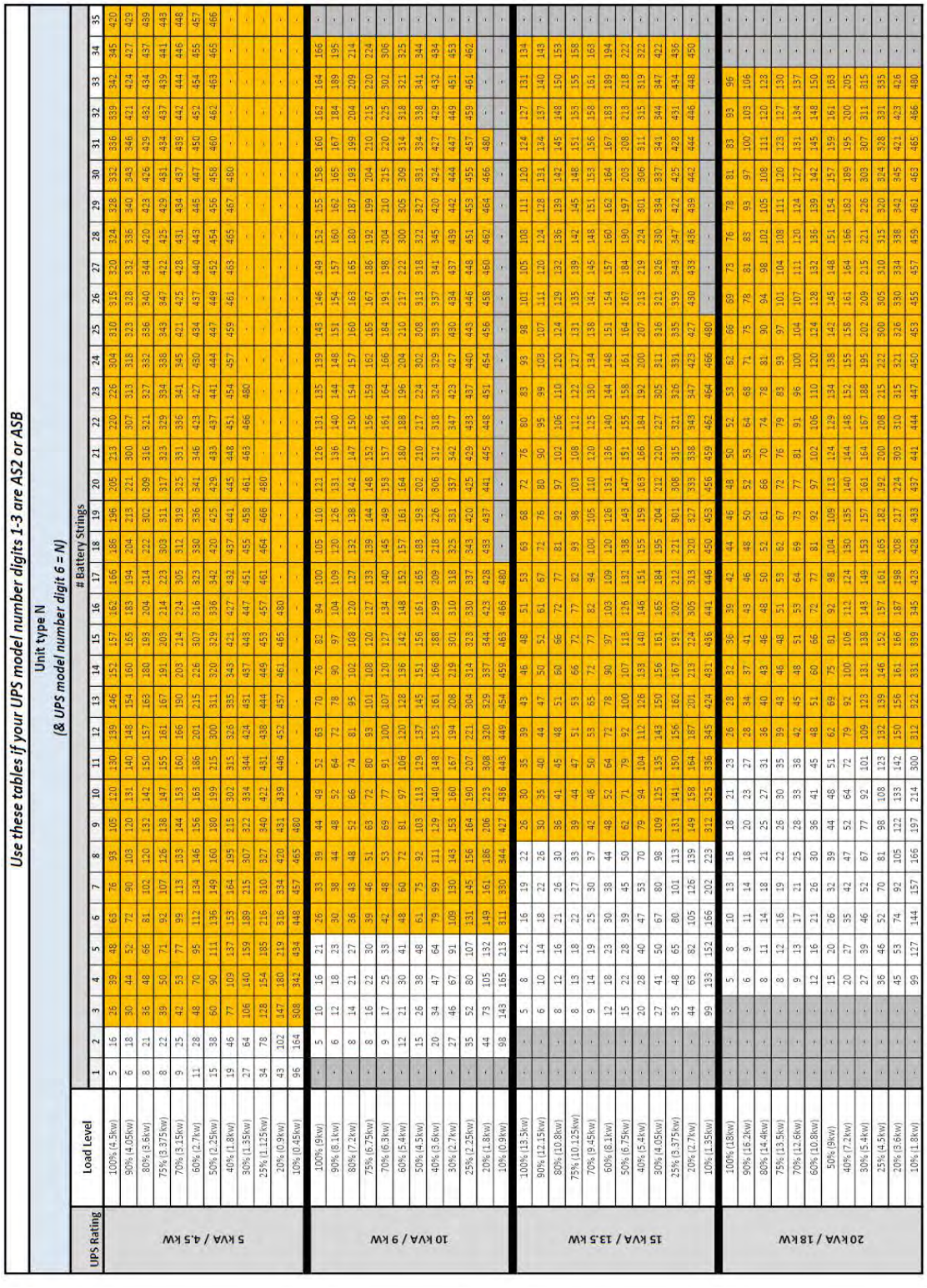
(& UPS model number digit 6 = F)

UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100% (4.5kw)	-	5	15	26	38	48	61	75	92	103	113	129	137	145	151	156	161	165	183	193	202	210	217	224	302	308	313	318	322	327	330	-
	90% (4.05kw)	-	6	17	28	43	51	70	82	101	112	129	138	146	153	158	163	167	190	200	209	218	225	304	310	315	320	325	329	334	337	341	-
	80% (3.6kw)	-	7	20	34	47	64	79	99	111	129	140	148	155	161	166	188	199	209	218	226	306	312	318	324	329	333	337	341	345	420	424	-
	75% (3.375kw)	-	8	21	37	49	69	83	105	123	135	145	153	159	165	186	198	209	219	227	307	314	320	325	331	335	340	344	347	423	426	429	-
	70% (3.15kw)	-	9	23	40	52	74	96	110	130	141	150	158	164	184	197	209	219	300	308	315	322	327	333	338	342	346	422	425	428	431	434	-
	60% (2.7kw)	-	11	27	46	67	91	109	131	143	153	161	167	195	208	220	302	311	319	326	332	337	343	347	423	427	431	434	437	440	442	445	-
	50% (2.25kw)	-	14	35	52	80	107	131	145	156	165	191	207	221	304	314	323	331	337	343	420	425	429	433	437	440	443	446	449	451	453	455	-
	40% (1.8kw)	-	18	44	72	104	132	148	160	184	205	222	307	319	328	337	344	423	427	432	437	441	444	447	450	453	456	458	460	462	464	466	-
	30% (1.35kw)	-	25	53	99	133	153	166	203	224	312	326	336	345	425	431	437	442	446	450	453	457	459	462	464	466	480	-	-	-	-	-	-
	25% (1.125kw)	-	28	71	113	147	164	202	226	317	331	342	423	431	437	443	448	452	456	459	462	465	467	480	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	39	92	138	161	203	303	323	338	422	431	439	445	451	455	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	78	154	216	327	422	438	449	457	464	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	15	20	26	32	39	44	48	52	62	69	75	81	92	99	104	109	113	125	130	134	138	142	145	149	151	154	157	-
	90% (8.1kw)	-	-	6	11	18	23	28	37	43	48	52	64	71	78	83	96	103	108	113	125	130	135	140	144	147	151	154	157	159	162	164	-
	80% (7.2kw)	-	-	7	14	20	27	35	43	48	52	65	74	80	94	101	107	113	126	131	137	141	146	150	153	156	159	162	165	167	185	191	-
	75% (6.75kw)	-	-	8	15	22	28	38	45	50	61	71	79	92	100	107	113	126	132	137	142	147	151	155	158	161	164	166	183	190	196	202	-
	70% (6.3kw)	-	-	9	16	25	33	41	48	52	67	76	83	98	106	113	126	132	138	143	148	152	156	159	163	165	181	189	195	202	207	213	-
	60% (5.4kw)	-	-	11	20	28	40	47	53	70	79	95	104	112	126	133	140	146	151	155	159	163	166	184	192	200	207	213	219	224	301	306	-
	50% (4.5kw)	-	-	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	188	197	205	213	220	226	304	309	314	319	323	327	-
	40% (3.6kw)	-	-	19	32	46	60	76	95	108	125	136	144	152	158	163	180	192	202	212	220	300	307	313	318	324	328	333	337	341	344	420	-
	30% (2.7kw)	-	-	26	44	62	81	104	124	138	148	157	163	184	199	211	222	303	311	319	325	331	336	341	346	422	426	429	432	435	438	441	-
	25% (2.25kw)	-	-	32	50	75	101	125	140	151	160	167	197	211	223	306	315	323	330	337	342	347	424	428	432	435	439	441	444	447	449	451	-
	20% (1.8kw)	-	-	41	67	98	126	143	156	165	195	213	227	311	321	330	338	344	422	427	432	436	440	443	446	449	452	454	457	459	461	463	-
	10% (0.9kw)	-	-	90	136	160	199	300	320	336	420	439	437	444	449	454	458	462	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

8.2 Estimated Battery Run Times: Model-number Digits 1 to 3 = AS2 or ASB

Figure 8.5 16-bay, single-phase, no transformer unit Type N (UPS model-number digit 6 = N)



Use these tables if your UPS model number digits 1-3 are AS2 or ASB

Unit type N

(& UPS model number digit 6 = N)

UPS Rating	Load Level	# Battery Strings																																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	5	16	26	39	48	63	76	93	105	120	130	139	146	152	157	162	166	186	196	205	213	220	226	304	310	315	320	324	328	332	336	339	342	345	420
	90% (4.05kw)	6	18	30	44	52	72	90	103	120	131	140	148	154	160	165	183	194	204	213	221	300	307	313	318	323	328	332	336	340	343	346	421	424	427	429
	80% (3.6kw)	8	21	36	48	66	81	102	120	132	142	150	157	163	169	180	193	204	214	222	302	309	316	321	327	332	336	340	344	420	423	426	429	432	434	437
	75% (3.375kw)	8	22	39	50	71	92	107	126	138	147	155	161	167	191	203	214	223	303	311	317	323	329	334	338	343	347	422	425	429	431	434	437	439	441	443
	70% (3.15kw)	9	25	42	53	77	99	113	133	144	153	160	166	330	203	214	224	305	312	319	325	331	336	341	345	421	425	428	431	434	437	439	442	444	446	448
	60% (2.7kw)	11	28	48	70	95	112	134	146	156	163	186	201	215	226	307	316	323	330	336	341	346	423	427	430	434	437	440	443	445	447	450	452	454	455	457
	50% (2.25kw)	15	38	60	90	111	136	149	160	180	199	215	300	311	320	329	336	342	420	425	429	433	437	441	444	447	449	452	454	456	458	460	462	463	465	466
	40% (1.8kw)	19	46	77	109	137	153	164	195	215	302	315	326	335	343	421	427	432	437	441	445	448	451	454	457	459	461	463	465	467	480	-	-	-	-	-
	30% (1.35kw)	27	64	106	140	159	189	215	307	322	334	344	424	431	437	443	447	451	455	458	461	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-
	25% (1.25kw)	34	78	128	154	185	216	310	327	340	422	431	438	444	449	453	457	461	464	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	43	102	147	180	219	316	334	420	431	439	446	452	457	461	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	96	164	308	342	434	448	457	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	16	21	26	33	39	44	49	52	65	70	76	82	94	100	105	110	121	126	131	135	139	143	146	149	152	355	158	160	162	164	166	-
	90% (8.1kw)	-	6	12	18	23	30	38	44	48	52	64	72	78	90	97	104	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	184	189	195	-
	80% (7.2kw)	-	8	14	21	27	36	43	48	52	66	74	81	95	102	108	120	127	132	138	142	147	150	154	157	160	163	165	180	187	193	193	204	209	214	-
	75% (6.75kw)	-	8	16	22	30	39	46	51	63	72	80	93	101	108	120	127	133	139	144	148	152	156	159	162	165	167	186	192	199	204	210	215	220	224	-
	70% (6.3kw)	-	9	17	25	33	42	48	53	69	77	91	100	107	120	127	134	140	145	149	153	157	161	164	166	184	191	198	204	210	215	220	225	302	306	-
	60% (5.4kw)	-	12	21	30	41	48	60	72	81	97	106	220	128	136	142	148	152	157	161	164	180	188	196	204	210	217	222	300	305	309	314	318	321	325	-
	50% (4.5kw)	-	15	26	38	48	61	75	92	103	113	129	137	145	151	156	161	165	183	193	202	210	217	224	302	308	313	318	322	327	331	334	338	341	344	-
	40% (3.6kw)	-	20	34	47	64	79	99	111	129	140	148	155	161	166	188	199	209	218	226	306	312	318	324	329	333	337	341	345	420	424	427	429	432	434	-
	30% (2.7kw)	-	27	46	67	91	109	130	143	153	160	167	194	208	219	301	310	318	325	331	337	342	347	423	427	430	434	437	439	442	444	447	449	451	453	-
	25% (2.25kw)	-	35	52	80	107	131	145	156	164	190	207	221	304	314	323	330	337	343	420	425	429	433	437	440	443	446	448	451	453	455	457	459	461	462	-
	20% (1.8kw)	-	44	73	105	132	149	161	186	206	219	308	320	329	337	344	423	428	433	437	441	445	448	451	454	456	458	460	462	464	466	480	-	-	-	-
	10% (0.9kw)	-	98	143	165	213	311	330	344	427	436	443	449	454	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	12	16	19	22	26	30	35	39	43	46	48	51	53	63	68	72	76	80	83	93	98	101	105	108	111	120	124	127	131	134	-
	90% (12.15kw)	-	-	6	10	14	18	22	26	30	35	40	44	47	50	52	61	67	72	76	80	90	95	99	103	107	111	120	124	128	131	134	137	140	143	-
	80% (10.8kw)	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	129	132	136	139	142	145	148	150	153	-
	75% (10.125kw)	-	-	8	13	18	22	27	33	39	44	47	51	53	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	153	155	158	-
	70% (9.45kw)	-	-	9	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	158	161	163	-
	60% (8.1kw)	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	164	167	183	189	194	-
	50% (6.75kw)	-	-	15	22	28	39	45	50	62	71	79	92	100	107	113	126	132	138	143	147	151	155	158	161	164	167	184	190	197	203	208	213	218	222	-
	40% (5.4kw)	-	-	20	28	40	47	53	70	79	94	104	112	126	133	140	146	151	155	159	163	166	184	192	200	207	213	219	224	301	306	311	315	319	322	-
	30% (4.05kw)	-	-	27	41	50	67	80	98	109	125	135	143	150	156	161	165	184	195	204	212	220	227	305	311	316	321	326	330	334	337	341	344	347	422	-
	25% (3.375kw)	-	-	35	48	65	80	101	113	131	141	150	156	162	167	191	202	212	221	301	308	315	321	326	331	335	339	343	347	422	425	428	431	434	436	-
	20% (2.7kw)	-	-	44	63	82	105	126	139	149	158	164	187	201	213	224	305	313	320	327	333	338	343	347	423	427	430	433	436	439	442	444	446	448	450	-
	10% (1.35kw)	-	-	99	133	152	166	202	223	312	325	336	345	424	431	436	441	446	450	453	456	459	462	464	466	480	-	-	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	5	8	10	13	16	18	21	23	26	28	32	36	39	42	44	46	48	50	52	53	62	66	69	73	76	78	81	83	93	96	-	-
	90% (16.2kw)	-	-	-	6	9	11	14	18	20	23	27	28	34	37	41	43	46	48	50	52	53	64	68	71	75	78	81	83	93	97	100	103	106	-	-
	80% (14.4kw)	-	-	-	8	11	14	18	21	25	27	31	36	40	43	46	48	50	52	61	66	70	74	78	81	90	94	98	102	105	108	111	120	123	-	-
	75% (13.5kw)	-	-	-	8	12	16	19	22	26	30	35	39	43	46	48	51	53	62	67	72	76	79	83	93	97	101	104	108	111	120	123	127	130	-	-
	70% (12.6kw)	-	-	-	9	13	17	21	25	28	33	38	42	45	48	51	53	64	69	73	77	81	91	96	100	104	107	111	120	124	127	131	134	137	-	-
	60% (10.8kw)	-	-	-	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	148	150	-	-
	50% (9kw)	-	-	-	15	20	26	32	39	44	48	51	62	69	75	81	92	98	104	109	113	124	129	134	138	142	145	148	151	154	157	159	161	163	-	-
	40% (7.2kw)	-	-	-	20	27	35	42	47	52	64	72	79	92	100	106	112	124	130	135	140	144	148	152	155	158	161	164	166	182	189	195	200	205	-	-
	30% (5.4kw)	-	-	-	27	39	46	52	67	77	92	101	109	123	131	138	143	149	153	157	161	164	167	188	195	202	209	215	221	226	303	307	311	315	-	-
	25% (4.5kw)	-	-	-	36	46	52	70	81	98	108	123	132	139	146	152	157	161	165	182	192	200	208	215	232	300	305	310	315	320	324	328	331	335	-	-
	20% (3.6kw)	-	-	-	45	53	74	92	105	122	133	142	150	156	161	166	187	198	208	217	224	303	310	315	321	326	330	334	338	342	345	421	423	426	-	-
	10% (1.8kw)	-	-	-	99	127	144	157	166	197	214	300	312	322	331	339	345	423	428	433	437	441	444	447	450	453	455	457	459	461	463	465	466	468	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.

Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.6 16-bay, single-phase, no transformer unit Type R (UPS model-number digit 6 = R)

Use these tables if your UPS model number digits 1-3 are AS2 or ASB

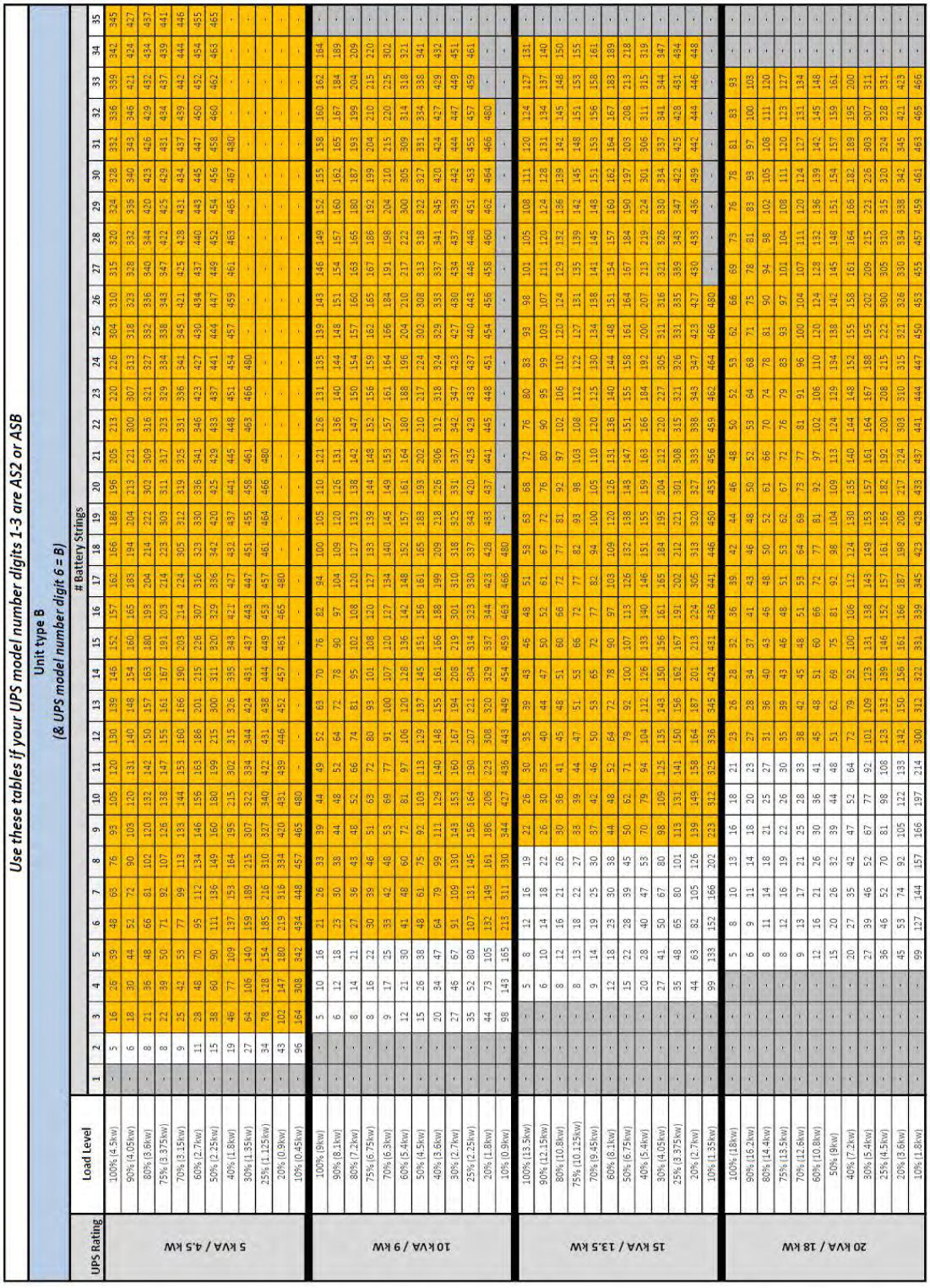
Unit type R

(& UPS model number digit 6 = R)

UPS Rating	Load Level	# Battery Strings																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	5	15	26	38	48	61	75	92	103	113	129	137	145	151	156	161	165	183	193	202	210	218	224	302	308	313	318	323	327	331	334	338	341	344	-
	90% (4.05kw)	6	17	28	43	51	70	82	101	112	129	138	146	152	158	163	167	190	200	209	217	225	303	309	315	320	325	329	333	337	341	344	347	422	425	-
	80% (3.6kw)	7	20	34	47	63	79	99	111	129	139	148	155	161	166	187	199	209	218	226	305	312	318	323	328	335	337	341	345	420	423	426	429	432	434	-
	75% (3.375kw)	8	21	37	49	69	83	105	123	135	145	153	159	165	186	196	209	219	227	307	314	320	325	331	335	340	344	347	423	426	429	432	434	437	439	-
	70% (3.15kw)	9	23	40	52	74	96	111	130	141	150	158	164	184	198	209	219	300	308	315	322	328	333	338	342	346	422	425	429	432	434	437	439	442	444	-
	60% (2.7kw)	11	28	46	68	92	110	131	144	153	161	180	196	209	221	303	312	319	326	332	338	343	420	424	428	431	434	437	440	443	445	447	450	452	453	-
	50% (2.25kw)	14	36	52	81	108	132	146	157	165	192	208	222	305	315	324	331	338	344	421	426	430	434	437	441	444	446	449	451	454	456	458	459	461	463	-
	40% (1.8kw)	18	44	73	104	132	149	161	185	206	222	308	319	329	337	344	422	428	433	437	441	445	448	451	453	456	458	460	462	464	466	467	480	-	-	-
	30% (1.35kw)	25	53	99	133	153	166	202	223	312	325	336	345	424	431	437	441	446	450	453	456	459	462	464	466	480	-	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	28	70	112	146	163	200	225	315	329	341	422	430	437	442	447	451	455	458	461	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	38	90	136	160	199	300	320	336	420	429	437	444	449	454	458	462	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	73	149	207	320	345	433	445	454	461	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	16	21	26	32	39	44	48	52	62	69	76	81	93	99	104	109	120	125	130	134	138	142	145	149	152	154	157	159	162	164	166	-
	90% (8.1kw)	-	6	11	18	23	28	37	43	48	52	64	71	78	83	97	103	108	113	125	131	135	140	144	147	151	154	157	159	162	164	166	182	188	193	-
	80% (7.2kw)	-	7	14	20	27	36	43	48	52	66	74	81	94	101	108	113	126	132	137	142	146	150	153	157	160	162	165	167	185	192	197	203	208	213	-
	75% (6.75kw)	-	8	15	22	28	39	45	50	62	71	79	92	100	107	113	126	132	138	143	147	151	155	158	161	164	166	184	190	197	202	208	213	218	222	-
	70% (6.3kw)	-	9	17	25	33	42	48	53	68	76	90	99	106	113	126	133	138	144	148	152	156	160	163	166	182	189	196	202	208	213	218	223	300	304	-
	60% (5.4kw)	-	11	20	28	40	47	53	70	79	95	104	112	126	133	140	146	151	155	159	163	166	184	192	200	207	213	219	224	302	306	311	315	319	322	-
	50% (4.5kw)	-	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	187	197	205	213	219	226	304	309	314	319	323	327	331	334	338	341	-
	40% (3.6kw)	-	19	32	46	60	76	95	108	125	136	144	152	158	163	180	192	202	212	220	300	306	313	318	324	328	333	337	341	344	420	423	426	428	431	-
	30% (2.7kw)	-	26	44	62	80	104	124	138	148	156	163	184	198	211	221	303	311	318	325	331	336	341	346	422	425	429	432	435	438	440	443	445	447	449	-
	25% (2.25kw)	-	32	50	75	101	124	140	151	160	167	196	211	223	306	315	323	330	336	342	347	424	428	432	435	438	441	444	447	449	451	453	455	457	459	-
	20% (1.8kw)	-	41	67	98	125	143	156	165	194	212	227	311	321	330	337	344	422	427	432	436	440	443	446	449	452	454	456	459	461	462	464	466	467	480	-
	10% (0.9kw)	-	83	135	159	199	227	320	335	347	429	437	443	449	454	458	461	465	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	12	16	19	22	26	30	35	39	43	46	48	51	53	63	67	72	76	79	83	93	97	101	105	108	111	120	124	127	130	-	-
	90% (12.15kw)	-	-	6	10	14	18	21	26	28	35	40	43	47	49	52	61	66	71	76	80	83	94	99	103	107	110	113	123	127	130	134	137	140	-	-
	80% (10.8kw)	-	-	7	11	16	20	25	28	35	40	45	48	51	53	65	71	76	80	91	96	101	105	109	113	123	128	131	135	138	141	144	147	150	-	-
	75% (10.125kw)	-	-	8	13	18	22	27	33	39	43	47	50	53	65	71	76	81	92	97	102	107	111	121	126	130	134	138	141	144	147	150	152	155	-	-
	70% (9.45kw)	-	-	9	14	19	25	28	36	42	46	50	53	64	71	77	81	93	99	104	109	113	124	129	133	137	140	144	147	150	153	155	157	160	-	-
	60% (8.1kw)	-	-	11	18	23	28	37	43	48	51	63	70	77	83	95	102	107	112	124	129	134	139	143	146	150	153	156	159	161	163	166	180	186	-	-
	50% (6.75kw)	-	-	15	22	28	38	45	50	60	69	77	90	98	105	111	124	130	136	141	145	150	153	157	160	163	165	180	187	193	199	205	210	215	-	-
	40% (5.4kw)	-	-	19	27	39	46	52	67	77	92	101	109	123	131	138	143	149	153	157	161	164	167	188	195	203	209	215	221	226	303	307	311	315	-	-
	30% (4.05kw)	-	-	27	40	49	64	77	95	106	122	132	140	147	153	158	163	167	189	198	207	215	222	300	306	312	317	322	326	330	334	337	341	344	-	-
	25% (3.375kw)	-	-	33	46	62	77	97	110	127	138	146	153	159	164	184	196	206	215	223	303	309	316	321	326	331	335	339	343	346	422	425	428	430	-	-
	20% (2.7kw)	-	-	42	53	78	101	121	135	145	154	161	167	193	205	216	226	307	314	321	327	333	338	342	347	422	426	429	432	435	438	440	443	445	-	-
	10% (1.35kw)	-	-	92	126	147	161	190	213	302	316	328	338	346	425	431	436	441	445	449	452	455	458	460	463	465	467	480	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	5	8	10	13	16	18	21	23	26	28	32	36	39	42	44	46	48	50	52	53	62	66	69	73	76	78	81	83	93	96	-	-
	90% (16.2kw)	-	-	-	6	9	11	14	18	20	23	26	28	34	37	41	43	46	48	50	52	53	63	67	71	75	78	81	83	93	96	100	103	105	-	-
	80% (14.4kw)	-	-	-	7	10	14	17	20	23	27	31	35	39	43	45	48	50	52	61	65	70	74	77	80	83	93	97	101	104	107	110	113	122	-	-
	75% (13.5kw)	-	-	-	8	11	15	18	22	26	28	34	38	42	45	48	50	52	61	66	71	75	79	82	92	96	100	103	107	110	113	122	126	129	-	-
	70% (12.6kw)	-	-	-	9	13	17	20	25	28	33	38	42	45	48	50	53	62	68	72	76	80	90	94	99	103	106	110	113	122	126	129	133	136	-	-
	60% (10.8kw)	-	-	-	11	16	20	25	28	35	40	44	48	51	53	65	70	75	80	90	95	100	104	109	112	122	127	130	134	137	141	143	146	149	-	-
	50% (9kw)	-	-	-	15	20	26	31	38	43	47	51	60	67	73	79	90	96	102	107	111	122	127	131	136	139	143	146	149	152	155	157	160	162	-	-
	40% (7.2kw)	-	-	-	19	26	33	41	46	51	62	70	77	83	97	104	109	121	127	133	138	142	146	150	153	156	159	162	164	167	184	190	195	201	-	-
	30% (5.4kw)	-	-	-	27	37	45	51	65	75	83	98	107	120	128	134	141	146	151	155	159	162	165	182	190	197	204	210	216	221	226	303	307	311	-	-
	25% (4.5kw)	-	-	-	34	44	51	67	78	94	104	113	128	136	143	149	154	159	163	166	185	194	202	210	216	223	300	306	311	315	319	323	327	331	-	-
	20% (3.6kw)	-	-	-	43	52	71	83	102	113	130	139	147	153	159	164	180	192	202	211	219	226	305	311	316	321	326	330	334	338	342	345	420	423	-	-
	10% (1.8kw)	-	-	-	95	122	140	153	163	189	207	222	307	317	326	334	341	347	424	429	433	437	441	444	447	450	452	455	457	459	461	463	464	466	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.
Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.7 16-bay, single-phase, no transformer unit Type B (UPS model-number digit 6 = B)



Use these tables if your UPS model number digits 1-3 are AS2 or ASB

Unit type B

(& UPS model number digit 6 = B)

UPS Rating	Load Level	# Battery Strings																																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	-	5	16	26	39	48	65	76	93	105	120	130	139	146	152	157	162	166	186	196	205	213	220	226	304	310	315	320	324	328	333	336	339	342	345
	90% (4.05kw)	-	6	18	30	44	52	72	90	103	120	131	140	148	154	160	165	169	194	204	213	221	300	307	313	318	323	328	332	336	340	343	346	421	424	427
	80% (3.6kw)	-	8	21	36	48	66	81	102	120	132	142	150	157	163	180	193	204	214	222	302	309	316	321	327	332	336	340	344	420	423	426	429	432	434	437
	75% (3.375kw)	-	8	22	39	50	71	92	107	126	138	147	155	161	167	191	203	214	223	303	311	317	323	329	334	338	343	347	422	425	429	431	434	437	439	441
	70% (3.15kw)	-	9	25	42	59	77	99	113	133	144	153	160	166	190	203	214	224	305	312	319	325	331	336	341	345	421	425	428	431	434	437	439	442	444	446
	60% (2.7kw)	-	11	28	48	70	95	112	134	146	156	163	166	201	215	226	307	316	323	330	336	341	346	423	427	430	434	437	440	443	445	447	450	452	454	455
	50% (2.25kw)	-	15	38	60	90	111	136	149	160	180	199	215	300	311	320	329	336	342	420	425	429	433	437	441	444	447	449	452	454	456	458	460	462	463	465
	40% (1.8kw)	-	19	46	77	109	137	153	164	195	215	302	315	326	335	343	421	427	432	437	441	445	448	451	454	457	459	461	463	465	467	480	-	-	-	-
	30% (1.35kw)	-	27	64	106	140	159	189	215	307	322	394	344	424	431	437	443	447	451	455	458	461	463	466	480	-	-	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	34	78	118	154	185	216	310	327	340	422	431	438	444	449	453	457	461	464	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	43	102	147	180	219	316	334	420	491	439	446	452	457	461	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	96	164	308	342	434	448	457	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	16	21	26	33	39	44	49	52	63	70	76	82	94	100	105	110	121	126	131	135	139	143	146	149	152	155	158	160	162	164	-
	90% (8.1kw)	-	-	6	12	18	23	30	38	44	48	52	64	72	78	90	97	104	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	184	189	-
	80% (7.2kw)	-	-	8	14	21	27	36	43	48	52	66	74	81	95	102	108	120	127	132	138	142	147	150	154	157	160	163	165	180	187	193	199	204	209	-
	75% (6.75kw)	-	-	8	16	22	30	39	46	51	63	72	80	93	101	108	120	127	133	139	144	148	152	156	159	162	165	167	186	192	199	204	210	215	220	-
	70% (6.3kw)	-	-	9	17	25	33	42	48	55	69	77	91	100	107	110	127	134	140	145	149	153	157	161	164	166	184	191	198	204	210	215	220	225	302	-
	60% (5.4kw)	-	-	12	21	30	41	48	60	72	81	97	106	120	128	136	142	148	152	157	161	164	180	188	196	204	210	217	222	300	305	309	314	318	321	-
	50% (4.5kw)	-	-	15	26	38	48	61	75	92	103	113	129	137	145	151	156	161	165	183	193	202	210	217	224	302	308	313	318	322	327	331	334	338	341	-
	40% (3.6kw)	-	-	20	34	47	64	79	99	111	129	140	148	155	161	166	188	199	209	218	226	306	312	318	324	329	333	337	341	345	420	424	427	429	432	-
	30% (2.7kw)	-	-	27	46	67	91	109	130	143	153	160	167	194	208	219	301	310	318	325	331	337	342	347	423	427	430	434	437	439	442	444	447	449	451	-
	25% (2.25kw)	-	-	35	52	80	107	131	145	156	164	190	207	221	304	314	323	330	337	343	420	425	429	433	437	440	443	446	448	451	453	455	457	459	461	-
	20% (1.8kw)	-	-	44	73	105	132	149	161	186	206	223	308	320	329	337	344	423	428	433	437	441	445	448	451	454	456	458	460	462	464	466	480	-	-	-
	10% (0.9kw)	-	-	98	143	165	213	311	330	344	427	436	443	449	454	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	12	16	19	22	26	30	35	39	43	45	48	51	53	63	68	72	76	80	83	93	98	101	105	108	111	120	124	127	131	-
	90% (12.15kw)	-	-	-	6	10	14	18	22	26	30	35	40	44	47	50	52	61	67	72	76	80	90	95	99	103	107	111	120	124	128	131	134	137	140	-
	80% (10.8kw)	-	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	129	132	136	139	142	145	148	150	-
	75% (10.125kw)	-	-	-	8	13	18	22	27	36	39	44	47	51	53	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	153	155	-
	70% (9.45kw)	-	-	-	9	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	158	161	-
	60% (8.1kw)	-	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	164	167	183	189	-
	50% (6.75kw)	-	-	-	15	22	28	39	45	50	62	71	79	92	100	107	113	126	132	138	143	147	151	155	158	161	164	167	184	190	197	203	208	213	218	-
	40% (5.4kw)	-	-	-	20	28	40	47	53	70	79	94	104	112	126	133	140	146	151	155	159	163	166	184	192	200	207	213	219	224	301	306	311	315	319	-
	30% (4.05kw)	-	-	-	27	41	50	67	80	98	109	125	135	143	150	156	161	165	884	195	204	212	220	227	305	311	316	321	326	330	334	337	341	344	347	-
	25% (3.375kw)	-	-	-	35	48	65	80	101	113	131	141	150	156	162	167	191	202	212	221	301	308	315	321	326	331	335	339	343	347	422	425	428	431	434	-
	20% (2.7kw)	-	-	-	44	63	82	105	126	139	149	158	164	187	201	213	224	305	313	320	327	333	338	343	347	423	427	430	433	436	439	442	444	446	448	-
	10% (1.35kw)	-	-	-	99	133	152	166	202	223	312	325	336	345	424	431	436	441	446	450	453	456	459	462	464	466	480	-	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	-	5	8	10	13	16	18	21	23	26	28	32	36	39	42	44	46	48	50	52	53	62	66	69	73	76	78	81	83	93	-	-
	90% (16.2kw)	-	-	-	-	6	9	11	14	18	20	23	27	28	34	37	41	43	46	48	50	52	53	64	68	71	75	78	81	83	93	97	100	103	-	-
	80% (14.4kw)	-	-	-	-	8	11	14	18	21	25	27	31	36	40	43	46	48	50	52	61	66	70	74	78	81	90	94	98	103	105	108	111	120	-	-
	75% (13.5kw)	-	-	-	-	8	12	16	19	22	26	30	35	39	43	46	48	51	53	62	67	72	76	79	83	93	97	101	104	108	111	120	123	127	-	-
	70% (12.6kw)	-	-	-	-	9	13	17	21	25	28	33	38	42	45	48	51	53	64	69	73	77	81	91	96	100	106	107	111	120	124	127	131	134	-	-
	60% (10.8kw)	-	-	-	-	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	148	-	-
	50% (9kw)	-	-	-	-	15	20	26	32	39	44	48	51	62	69	75	81	92	98	104	109	113	124	129	134	138	142	145	148	151	154	157	159	161	-	-
	40% (7.2kw)	-	-	-	-	20	27	35	42	47	52	64	72	79	92	100	106	112	124	130	135	140	144	148	152	155	158	161	164	166	182	189	195	200	-	-
	30% (5.4kw)	-	-	-	-	27	39	46	52	67	77	92	101	109	123	131	138	143	149	153	157	161	164	167	188	195	202	209	215	221	226	303	307	311	-	-
	25% (4.5kw)	-	-	-	-	36	46	52	70	81	98	108	125	132	139	146	152	157	161	165	182	192	200	206	215	222	300	305	310	315	320	324	328	331	-	-
	20% (3.6kw)	-	-	-	-	45	53	74	92	105	122	133	142	150	156	161	166	187	198	208	217	224	303	310	315	321	306	330	334	338	342	345	421	423	-	-
	10% (1.8kw)	-	-	-	-	99	127	144	157	166	197	214	300	312	323	331	339	345	423	428	433	437	441	444	447	450	453	455	457	459	461	463	465	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.

Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.8 16-bay, single-phase, no transformer unit Type F (UPS model-number digit 6 = F)

Use these tables if your UPS model number digits 1-3 are AS2 or ASB

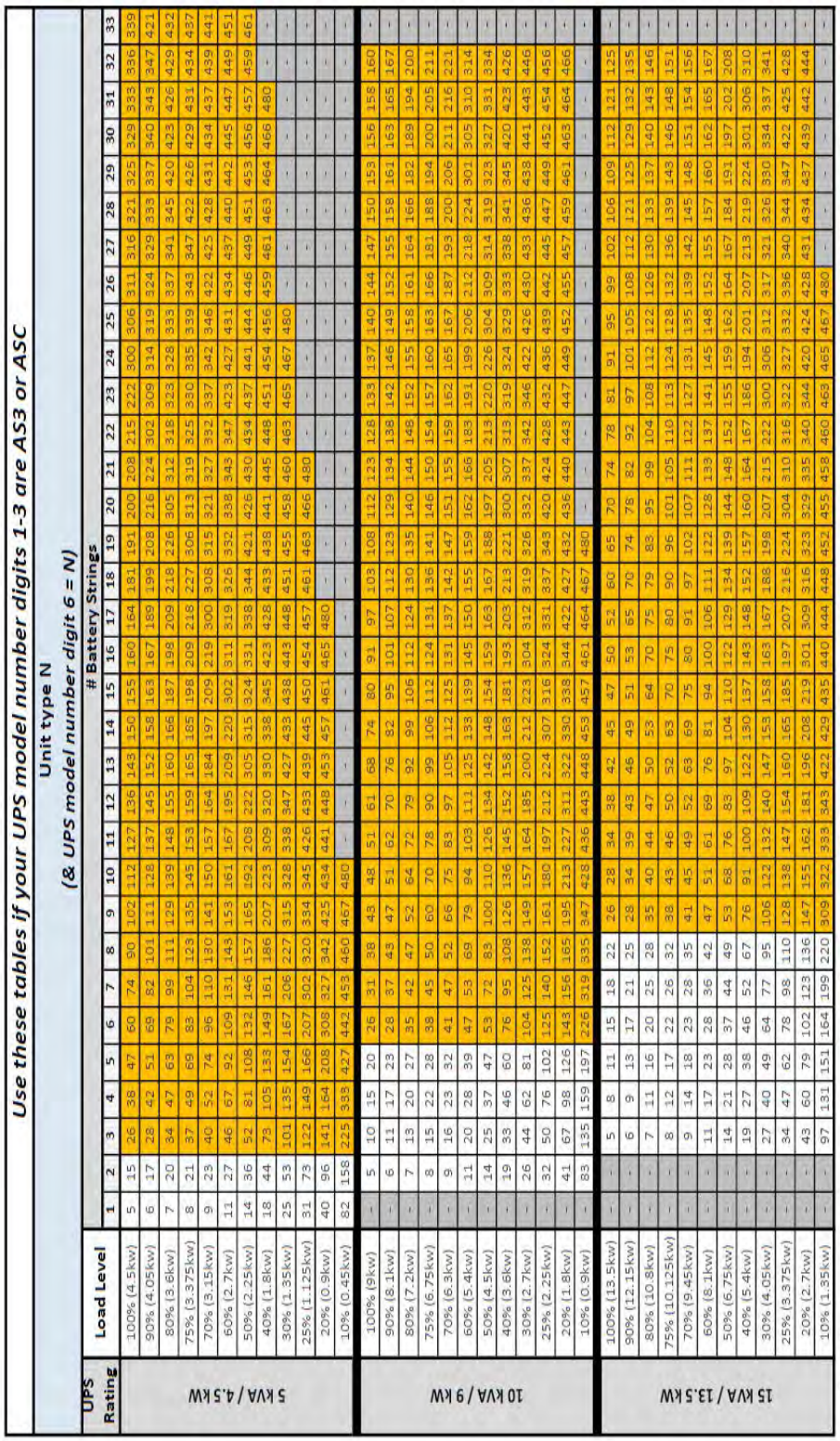
Unit type F
(& UPS model number digit 6 = F)

UPS Rating	Load Level	# Battery Strings																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	-	5	15	26	38	48	61	75	92	103	113	129	137	145	151	156	161	165	183	193	202	210	218	224	302	308	313	318	323	327	331	334	338	341	-
	90% (4.05kw)	-	6	17	28	43	51	70	82	101	112	129	138	146	152	158	163	167	190	200	209	217	225	303	309	315	320	325	329	333	337	341	344	347	422	-
	80% (3.6kw)	-	7	20	34	47	63	79	99	111	129	139	148	155	161	166	187	199	209	218	226	305	312	318	323	328	333	337	341	345	420	423	426	429	432	-
	75% (3.375kw)	-	8	21	37	49	69	83	105	123	135	145	153	159	165	186	198	209	219	227	307	314	320	325	331	335	340	344	347	423	426	429	432	434	437	-
	70% (3.15kw)	-	9	23	40	52	74	96	111	130	141	150	158	164	184	198	209	219	300	308	315	322	328	333	338	342	346	422	425	429	432	434	437	439	442	-
	60% (2.7kw)	-	11	28	46	68	92	110	131	144	153	161	180	196	209	221	303	312	319	326	332	338	343	420	424	428	431	434	437	440	443	445	447	450	452	-
	50% (2.25kw)	-	14	36	52	81	108	132	146	157	165	192	208	222	305	315	324	331	338	344	421	426	430	434	437	441	444	446	449	451	454	456	458	459	461	-
	40% (1.8kw)	-	18	44	73	104	132	149	161	185	206	222	308	319	329	337	344	422	428	433	437	441	445	448	451	453	456	458	460	462	464	466	467	480	-	-
	30% (1.35kw)	-	25	53	99	133	153	166	202	223	312	325	336	345	424	431	437	441	446	450	453	456	459	462	464	466	480	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	28	70	112	146	163	200	225	315	329	341	422	430	437	442	447	451	455	458	461	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	38	90	136	160	199	300	320	336	420	429	437	444	449	454	458	462	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	73	149	207	320	345	433	445	454	461	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	16	21	26	32	39	44	48	52	62	69	76	81	93	99	104	109	120	125	130	134	138	142	145	149	152	154	157	159	162	164	-
	90% (8.1kw)	-	-	6	11	18	23	28	37	43	48	52	64	71	78	83	97	103	108	113	125	131	135	140	144	147	151	154	157	159	162	164	166	182	188	-
	80% (7.2kw)	-	-	7	14	20	27	36	43	48	52	66	74	81	94	101	108	113	126	132	137	142	146	150	153	157	160	162	165	167	185	192	197	203	208	-
	75% (6.75kw)	-	-	8	15	22	28	39	45	50	62	71	79	92	100	107	113	126	132	138	143	147	151	155	158	161	164	166	184	190	197	202	208	213	218	-
	70% (6.3kw)	-	-	9	17	25	33	42	48	53	68	76	90	99	106	113	126	133	138	144	148	152	156	160	163	166	182	189	196	202	208	213	218	223	300	-
	60% (5.4kw)	-	-	11	20	28	40	47	53	70	79	95	104	112	126	133	140	146	151	155	159	163	166	184	192	200	207	213	219	224	302	306	311	315	319	-
	50% (4.5kw)	-	-	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	187	197	205	213	219	226	304	309	314	319	323	327	331	334	338	-
	40% (3.6kw)	-	-	19	32	46	60	76	95	108	125	136	144	152	158	163	180	192	202	212	220	300	306	313	318	324	328	333	337	341	344	420	423	426	428	-
	30% (2.7kw)	-	-	26	44	62	80	104	124	138	148	156	163	184	198	211	221	303	311	318	325	331	336	341	346	422	425	429	432	435	438	440	443	445	447	-
	25% (2.25kw)	-	-	32	50	75	101	124	140	151	160	167	196	211	223	306	315	323	330	336	342	347	424	428	432	435	438	441	444	447	449	451	453	455	457	-
	20% (1.8kw)	-	-	41	67	98	125	143	156	165	194	212	227	311	321	330	337	344	422	427	432	436	440	443	446	449	452	454	456	459	461	462	464	466	467	-
	10% (0.9kw)	-	-	83	135	159	199	227	320	335	347	429	437	443	449	454	458	461	465	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	12	16	19	22	26	30	35	39	43	46	48	51	53	63	67	72	76	79	83	93	97	101	105	108	111	120	124	127	-	-
	90% (12.15kw)	-	-	-	6	10	14	18	21	26	28	35	40	43	47	49	52	61	66	71	76	80	83	94	99	103	107	110	113	123	127	130	134	137	-	-
	80% (10.8kw)	-	-	-	7	11	16	20	25	28	35	40	45	48	51	53	65	71	76	80	91	96	101	105	109	113	123	128	131	135	138	141	144	147	-	-
	75% (10.125kw)	-	-	-	8	13	18	22	27	33	39	43	47	50	53	65	71	76	81	92	97	102	107	111	121	126	130	134	138	141	144	147	150	152	-	-
	70% (9.45kw)	-	-	-	9	14	19	25	28	36	42	46	50	53	64	71	77	81	93	99	104	109	113	124	129	133	137	140	144	147	150	153	155	157	-	-
	60% (8.1kw)	-	-	-	11	18	23	28	37	43	48	51	63	70	77	83	95	102	107	112	124	129	134	139	143	146	150	153	156	159	161	163	166	180	-	-
	50% (6.75kw)	-	-	-	15	22	28	38	45	50	60	69	77	90	98	105	111	124	130	136	141	145	150	153	157	160	163	165	180	187	193	199	205	210	-	-
	40% (5.4kw)	-	-	-	19	27	39	46	52	67	77	92	101	109	123	131	138	143	149	153	157	161	164	167	188	195	203	209	215	221	226	303	307	311	-	-
	30% (4.05kw)	-	-	-	27	40	49	64	77	95	106	122	132	140	147	153	158	163	167	189	198	207	215	222	300	306	312	317	322	326	330	334	337	341	-	-
	25% (3.375kw)	-	-	-	33	46	62	77	97	110	127	138	146	153	159	164	184	196	206	215	223	303	309	316	321	326	331	335	339	343	346	422	425	428	-	-
	20% (2.7kw)	-	-	-	42	53	78	101	121	135	145	154	161	167	193	205	216	226	307	314	321	327	333	338	342	347	422	426	429	432	435	438	440	443	-	-
	10% (1.35kw)	-	-	-	92	126	147	161	190	213	302	316	328	338	346	425	431	436	441	445	449	452	455	458	460	463	465	467	480	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	-	5	8	10	13	16	18	21	23	26	28	32	36	39	42	44	46	48	50	52	53	62	66	69	73	76	78	81	83	93	-	-
	90% (16.2kw)	-	-	-	-	6	9	11	14	18	20	23	26	28	34	37	41	43	46	48	50	52	53	63	67	71	75	78	81	83	93	96	100	103	-	-
	80% (14.4kw)	-	-	-	-	7	10	14	17	20	23	27	31	35	39	43	45	48	50	52	61	65	70	74	77	80	83	93	97	101	104	107	110	113	-	-
	75% (13.5kw)	-	-	-	-	8	11	15	18	22	26	28	34	38	42	45	48	50	52	61	66	71	75	79	82	92	96	100	103	107	110	113	122	126	-	-
	70% (12.6kw)	-	-	-	-	9	13	17	20	25	28	33	38	42	45	48	50	53	62	68	72	76	80	90	94	99	103	106	110	113	122	126	129	133	-	-
	60% (10.8kw)	-	-	-	-	11	16	20	25	28	35	40	44	48	51	53	65	70	75	80	90	95	100	104	109	112	122	127	130	134	137	141	143	146	-	-
	50% (9kw)	-	-	-	-	15	20	26	31	38	43	47	51	60	67	73	79	90	96	102	107	111	122	127	131	136	139	143	146	149	152	155	157	160	-	-
	40% (7.2kw)	-	-	-	-	19	26	33	41	46	51	62	70	77	83	97	104	109	121	127	133	138	142	146	150	153	156	159	162	164	167	184	190	195	-	-
	30% (5.4kw)	-	-	-	-	27	37	45	51	65	75	83	98	107	120	128	134	141	146	151	155	159	162	165	182	190	197	204	210	216	221	226	303	307	-	-
	25% (4.5kw)	-	-	-	-	34	44	51	67	78	94	104	113	128	136	143	149	154	159	163	166	185	194	202	210	216	223	300	306	311	315	319	323	327	-	-
	20% (3.6kw)	-	-	-	-	43	52	71	83	102	113	130	139	147	153	159	164	180	192	202	211	219	226	305	311	316	321	326	330	334	338	342	345	420	-	-
	10% (1.8kw)	-	-	-	-	95	122	140	153	163	189	207	222	307	317	326	334	341	347	424	429	433	437	441	444	447	450	452	455	457	459	461	463	464	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.
Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

8.3 Estimated Battery Run Times: Model-number Digits 1 to 3 = AS3 or ASC

Figure 8.9 12-bay, single-phase, transformer-based unit Type N (UPS model-number digit 6 = N)



Use these tables if your UPS model number digits 1-3 are AS3 or ASC

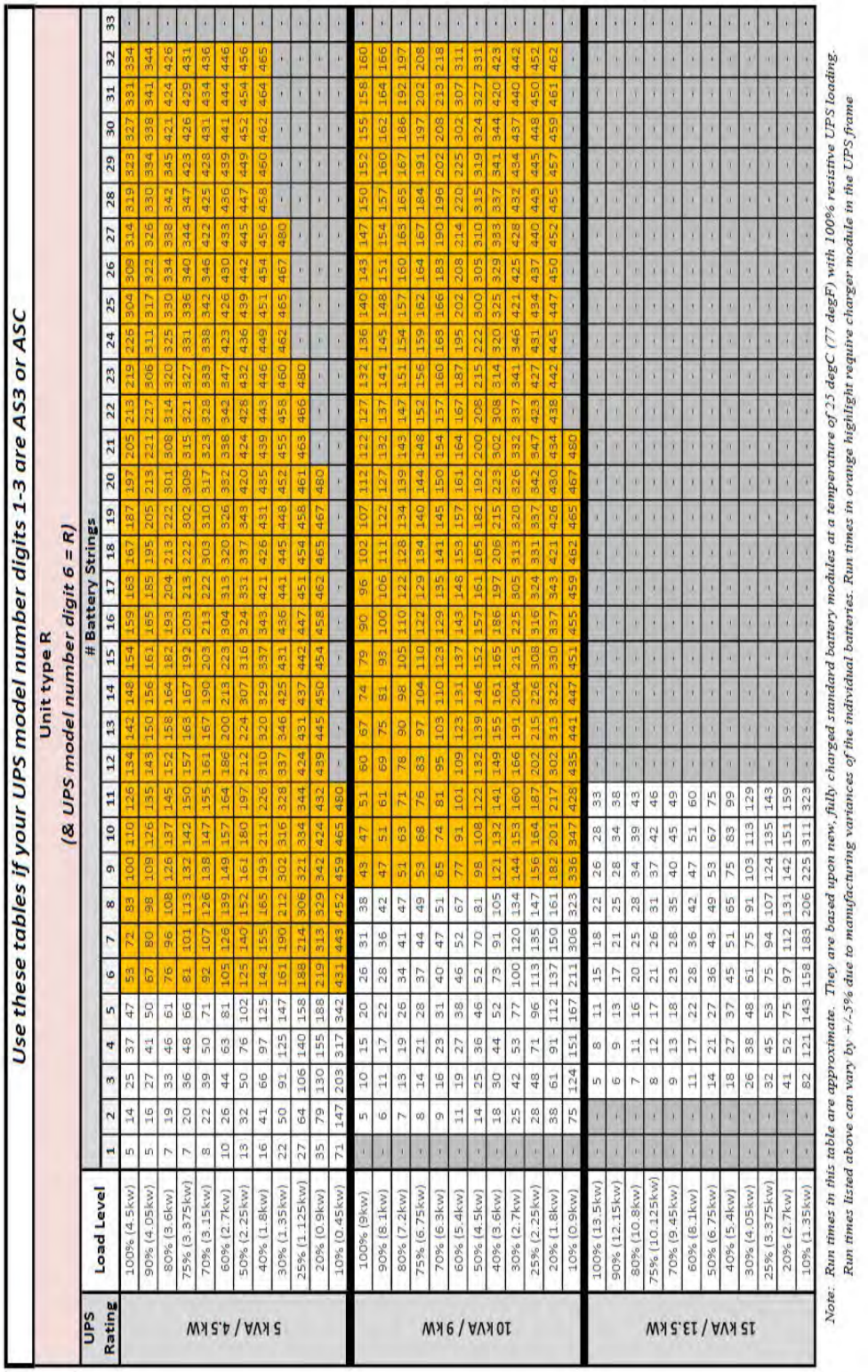
Unit type N

(& UPS model number digit 6 = N)

UPS Rating	Load Level	# Battery Strings																														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
5 kVA / 4.5 kW	100% (4.5kw)	5	15	26	38	47	60	74	90	102	112	127	136	143	150	155	160	164	181	191	200	208	215	222	300	306	311	316	321	325	329	333	336	339
	90% (4.05kw)	6	17	28	42	51	69	82	101	111	128	137	145	152	158	163	167	189	199	208	216	224	302	309	314	319	324	329	333	337	340	343	347	421
	80% (3.6kw)	7	20	34	47	63	79	99	111	129	139	148	155	160	166	187	198	209	218	226	305	312	318	323	328	333	337	341	345	420	423	426	429	432
	75% (3.375kw)	8	21	37	49	69	83	104	123	135	145	153	159	165	185	198	209	218	227	306	313	319	325	330	335	339	343	347	422	426	429	431	434	437
	70% (3.15kw)	9	23	40	52	74	96	110	130	141	150	157	164	184	197	209	219	300	308	315	321	327	332	337	342	346	422	425	428	431	434	437	439	441
	60% (2.7kw)	11	27	46	67	92	109	131	143	153	161	167	195	209	220	302	311	319	326	332	338	343	347	423	427	431	434	437	440	442	445	447	449	451
	50% (2.25kw)	14	36	52	81	108	132	146	157	165	192	208	222	305	315	324	331	338	344	421	426	430	434	437	441	444	446	449	451	453	456	457	459	461
	40% (1.8kw)	18	44	73	105	133	149	161	186	207	223	309	320	330	338	345	423	428	433	438	441	445	448	451	454	456	459	461	463	464	466	480	-	-
	30% (1.35kw)	25	53	101	135	154	167	206	227	315	328	338	347	427	433	438	443	448	451	455	458	460	463	465	467	480	-	-	-	-	-	-	-	-
	25% (1.125kw)	31	73	122	149	166	207	302	320	334	345	426	433	439	445	450	454	457	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	40	96	141	164	208	308	327	342	425	434	441	448	453	457	461	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	82	158	225	338	427	442	453	460	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	15	20	26	31	38	43	48	51	61	68	74	80	91	97	108	108	112	123	128	133	137	140	144	147	150	153	156	158	160	-
	90% (8.1kw)	-	6	11	17	23	28	37	43	47	51	62	70	76	82	95	101	107	112	123	129	134	138	142	146	149	152	155	158	161	163	165	167	-
	80% (7.2kw)	-	7	13	20	27	35	42	47	52	64	72	79	92	99	106	112	124	130	135	140	144	148	152	155	158	161	164	166	182	189	194	200	-
	75% (6.75kw)	-	8	15	22	28	38	45	50	60	70	78	90	99	106	112	124	131	136	141	146	150	154	157	160	163	166	181	188	194	200	205	211	-
	70% (6.3kw)	-	9	16	23	32	41	47	52	66	75	83	97	105	112	125	131	137	142	147	151	155	159	162	165	167	187	193	200	206	211	216	221	-
	60% (5.4kw)	-	11	20	28	39	47	53	69	79	94	108	111	125	133	139	145	150	155	159	162	166	183	191	199	206	212	218	224	301	305	310	314	-
	50% (4.5kw)	-	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	188	197	205	213	220	226	304	309	314	319	323	327	331	334	-
	40% (3.6kw)	-	19	33	46	60	76	95	108	126	136	145	152	158	163	181	193	203	213	221	300	307	313	319	324	329	333	338	341	345	420	423	426	-
	30% (2.7kw)	-	26	44	62	81	104	125	138	149	157	164	185	200	212	223	304	312	319	326	332	337	342	346	422	430	433	436	438	441	443	445	-	-
	25% (2.25kw)	-	32	50	76	102	125	140	152	161	180	197	212	224	307	316	324	331	337	343	420	424	428	432	436	439	442	445	447	449	452	454	456	-
	20% (1.8kw)	-	41	67	98	126	143	156	165	195	213	227	311	322	330	338	344	422	427	432	436	440	443	447	449	452	455	457	459	461	463	464	466	-
	10% (0.9kw)	-	83	135	159	197	226	319	335	347	428	436	443	448	453	457	461	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	11	15	18	22	26	28	34	38	42	45	47	50	52	60	65	70	74	78	81	91	95	99	102	106	109	112	121	125	-
	90% (12.15kw)	-	-	6	9	13	17	21	25	28	34	39	43	46	49	51	53	65	70	74	78	82	92	97	101	105	108	112	121	125	129	132	135	-
	80% (10.8kw)	-	-	7	11	16	20	25	28	35	40	44	47	50	53	64	70	75	79	83	95	99	104	108	112	122	126	130	133	137	140	143	146	-
	75% (10.125kw)	-	-	8	12	17	22	26	32	38	43	46	50	52	63	70	75	80	90	96	101	105	110	113	124	128	132	136	139	143	146	148	151	-
	70% (9.45kw)	-	-	9	14	18	23	28	35	41	45	49	52	63	69	75	80	91	97	102	107	111	122	127	131	135	139	142	145	148	151	154	156	-
	60% (8.1kw)	-	-	11	17	23	28	36	42	47	51	61	69	76	81	94	100	106	111	122	128	133	137	141	145	148	152	155	157	160	162	165	167	-
	50% (6.75kw)	-	-	14	21	28	37	44	49	53	68	76	83	97	104	110	122	129	134	139	144	148	152	155	159	162	164	167	184	191	197	202	208	-
	40% (5.4kw)	-	-	19	27	38	46	52	67	76	91	100	109	122	130	137	143	148	152	157	160	164	167	186	194	201	207	213	219	224	301	306	310	-
	30% (4.05kw)	-	-	27	40	49	64	77	95	106	122	132	140	147	153	158	163	167	188	198	207	215	222	300	306	312	317	321	326	330	334	337	341	-
	25% (3.375kw)	-	-	34	47	62	78	98	110	128	138	147	154	160	165	185	197	207	216	224	304	310	316	322	327	332	336	340	344	347	422	425	428	-
	20% (2.7kw)	-	-	43	60	79	102	123	136	147	155	162	181	196	208	219	301	309	316	323	329	335	340	344	420	424	428	431	434	437	439	442	444	-
	10% (1.35kw)	-	-	97	131	151	164	199	220	309	322	333	343	422	429	435	440	444	448	452	455	458	460	463	465	467	480	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.10 12-bay, single-phase, transformer-based unit Type R (UPS model-number digit 6 = R)



Use these tables if your UPS model number digits 1-3 are AS3 or ASC

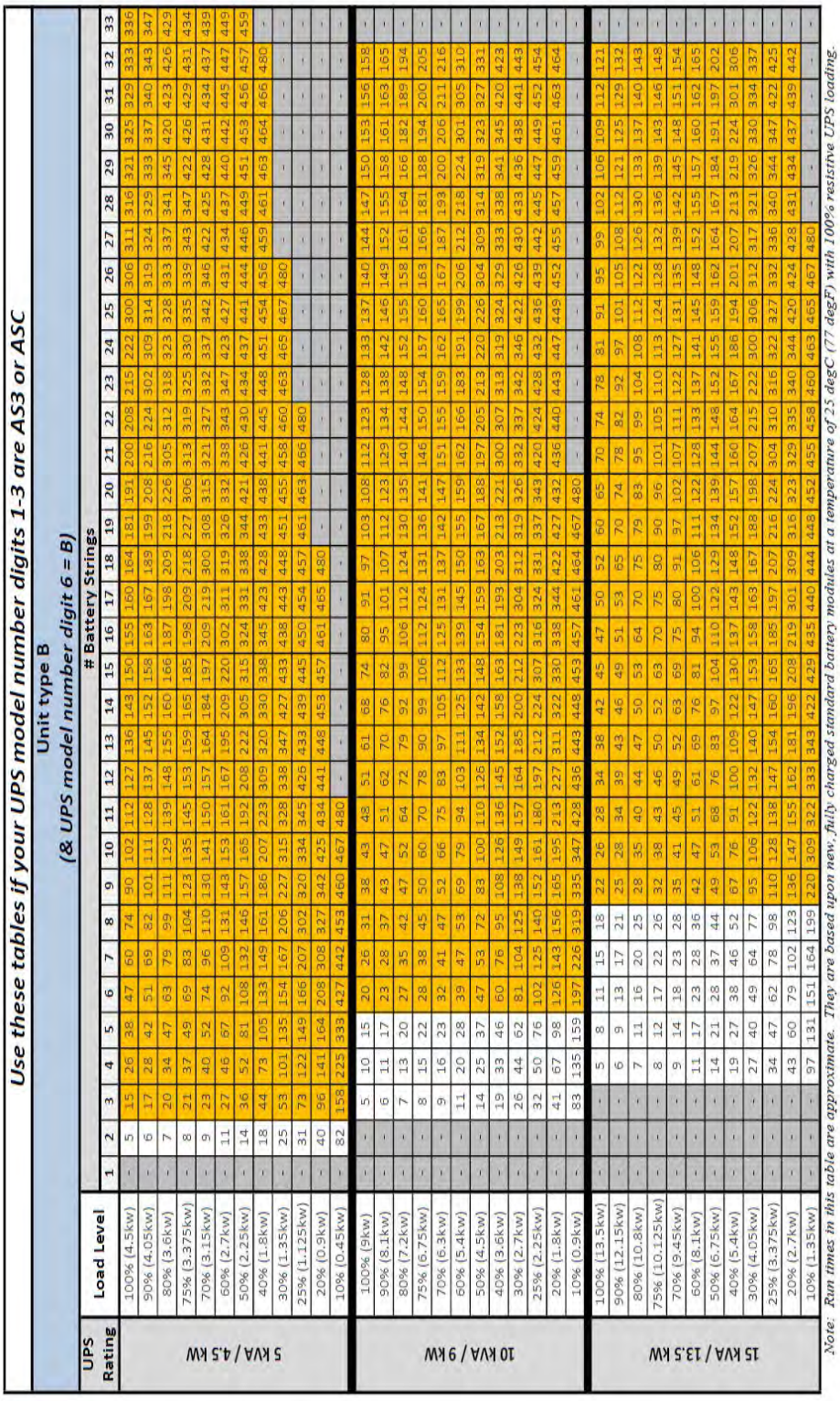
Unit type R

(& UPS model number digit 6 = R)

UPS Rating	Load Level	# Battery Strings																														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
5 kVA / 4.5 kW	100% (4.5kw)	5	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	187	197	205	213	219	226	304	309	314	319	323	327	331	334	-
	90% (4.05kw)	5	16	27	41	50	67	80	98	109	126	135	143	150	156	161	165	185	195	205	213	221	227	306	311	317	322	326	330	334	338	341	344	-
	80% (3.6kw)	7	19	33	46	61	76	96	108	126	137	145	152	158	164	182	193	204	213	222	301	308	314	320	325	330	334	338	342	345	421	424	426	-
	75% (3.375kw)	7	20	36	48	66	81	101	115	132	142	150	157	163	167	192	203	213	222	302	309	315	321	327	331	336	340	344	347	423	426	429	431	-
	70% (3.15kw)	8	22	39	50	71	92	107	126	138	147	155	161	167	190	203	213	222	303	310	317	323	328	333	338	342	346	422	425	428	431	434	436	-
	60% (2.7kw)	10	26	44	63	81	105	126	139	149	157	164	186	200	213	223	304	313	320	326	332	338	342	347	423	426	430	433	436	439	441	444	446	-
	50% (2.25kw)	13	32	50	76	102	125	140	152	161	180	197	212	224	307	316	324	331	337	343	420	424	428	432	436	439	442	445	447	449	452	454	456	-
	40% (1.8kw)	16	41	66	97	125	142	155	165	193	211	226	310	320	329	337	343	421	426	431	435	439	443	446	449	451	454	456	458	460	462	464	465	-
	30% (1.35kw)	22	50	91	125	147	161	190	212	302	316	328	337	346	425	431	436	441	445	448	452	455	459	460	462	465	467	480	-	-	-	-	-	-
	25% (1.125kw)	27	64	106	140	158	188	214	306	321	334	344	424	431	437	442	447	451	454	458	461	463	466	480	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	35	79	130	155	188	219	313	329	342	424	432	439	445	450	454	458	462	465	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	71	147	203	317	342	431	443	452	459	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	15	20	26	31	38	43	47	51	60	67	74	79	90	96	102	107	112	122	127	132	136	140	143	147	150	152	155	158	160	-
	90% (8.1kw)	-	6	11	17	22	28	36	42	47	51	61	69	75	81	93	100	106	111	122	127	132	137	141	145	148	151	154	157	160	162	164	166	-
	80% (7.2kw)	-	7	13	19	26	34	41	47	51	63	71	78	90	98	105	110	122	128	134	139	143	147	151	154	157	160	163	165	167	186	192	197	-
	75% (6.75kw)	-	8	14	21	28	37	44	49	53	68	76	83	97	104	110	122	129	134	140	144	148	152	156	159	162	164	167	184	191	197	202	206	-
	70% (6.3kw)	-	9	16	23	31	40	47	51	65	74	81	95	103	110	123	129	135	141	145	150	154	157	160	163	166	183	190	196	202	208	213	218	-
	60% (5.4kw)	-	11	19	27	38	46	52	67	77	91	101	109	123	131	137	143	148	153	157	161	164	167	187	195	202	208	214	220	225	302	307	311	-
	50% (4.5kw)	-	14	25	36	46	52	70	81	98	108	122	132	139	146	152	157	161	165	182	192	200	208	215	222	300	305	310	315	319	324	327	331	-
	40% (3.6kw)	-	18	30	44	52	73	91	105	121	132	141	149	155	161	165	186	197	206	215	223	302	308	314	320	325	329	333	337	341	344	420	423	-
	30% (2.7kw)	-	25	42	53	77	100	120	134	144	153	160	166	191	204	215	225	305	313	320	326	332	337	341	346	421	425	428	432	434	437	440	442	-
	25% (2.25kw)	-	28	48	71	96	113	135	147	156	164	187	202	215	226	308	316	324	331	337	342	347	423	427	431	434	437	440	443	445	448	450	452	-
	20% (1.8kw)	-	38	61	91	112	137	150	161	182	201	217	302	313	322	330	337	343	421	426	430	434	438	442	445	447	450	452	455	457	459	461	462	-
	10% (0.9kw)	-	75	124	151	167	211	306	323	336	347	428	435	441	447	451	455	459	462	465	467	480	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	11	15	18	22	26	28	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	90% (12.15kw)	-	-	6	9	13	17	21	25	28	34	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	80% (10.8kw)	-	-	7	11	16	20	25	28	34	39	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	75% (10.125kw)	-	-	8	12	17	21	26	31	37	42	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	70% (9.45kw)	-	-	9	13	18	23	28	35	40	45	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60% (8.1kw)	-	-	11	17	22	28	36	42	47	51	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50% (6.75kw)	-	-	14	21	27	36	43	49	53	67	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40% (5.4kw)	-	-	18	27	37	45	51	65	75	83	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30% (4.05kw)	-	-	26	38	48	61	75	91	103	113	129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25% (3.375kw)	-	-	32	45	53	75	94	107	124	135	143	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (2.7kw)	-	-	41	52	75	97	112	131	142	151	159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (1.35kw)	-	-	82	121	143	158	183	206	225	311	323	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.11 12-bay, single-phase, transformer-based unit Type B (UPS model-number digit 6 = B)



Use these tables if your UPS model number digits 1-3 are AS3 or ASC

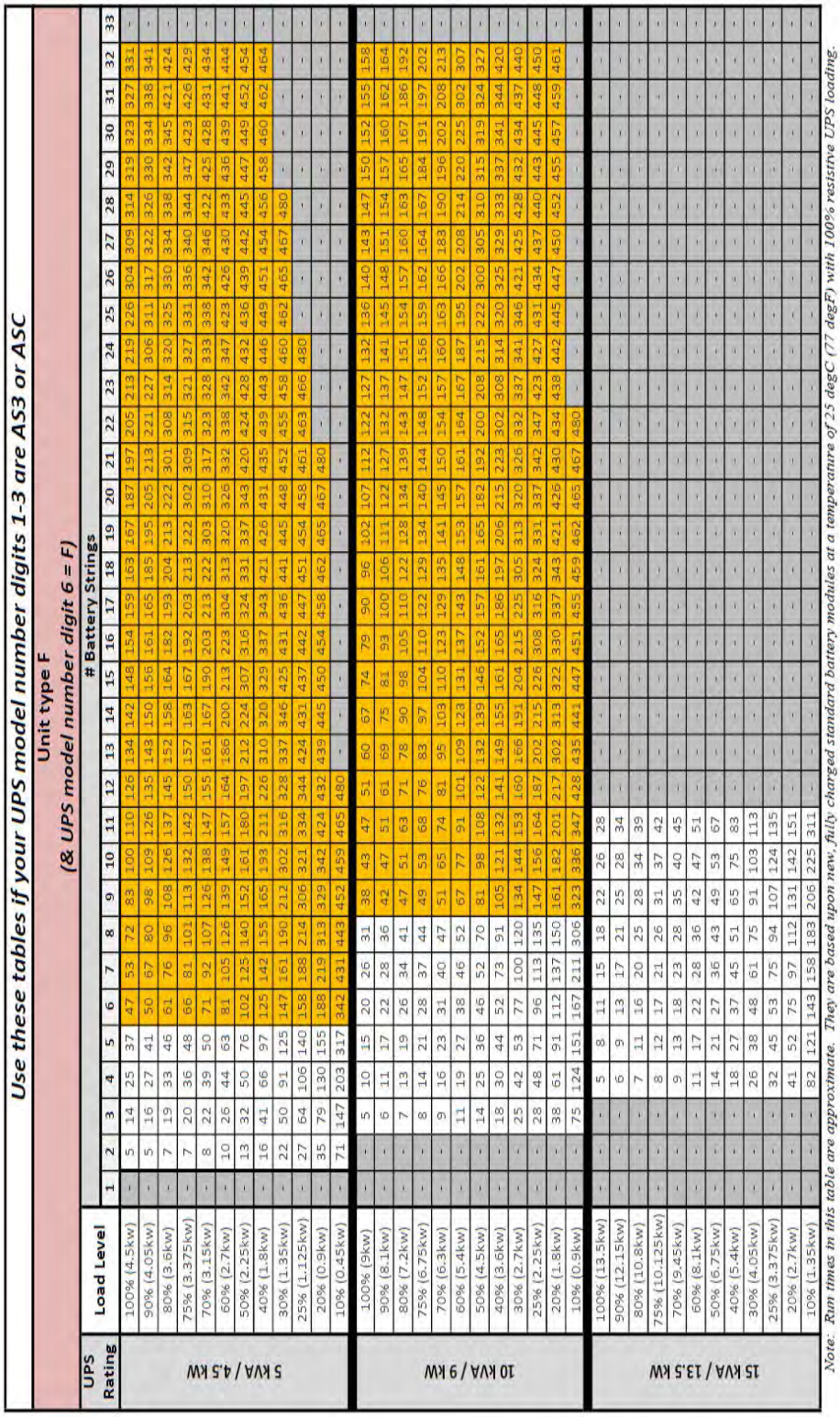
Unit type B

(& UPS model number digit 6 = B)

UPS Rating	Load Level	# Battery Strings																														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
5 kVA / 4.5 kW	100% (4.5kw)	-	5	15	26	38	47	60	74	90	102	112	127	136	143	150	155	160	164	181	191	200	208	215	222	300	306	311	316	321	325	329	333	336
	90% (4.05kw)	-	6	17	28	42	51	69	82	101	111	128	137	145	152	158	163	167	189	199	208	216	224	302	309	314	319	324	329	333	337	340	343	347
	80% (3.6kw)	-	7	20	34	47	63	79	99	111	129	139	148	155	160	166	187	198	209	218	226	305	312	318	323	328	333	337	341	345	420	423	426	429
	75% (3.375kw)	-	8	21	37	49	69	83	104	123	135	145	153	159	165	185	198	209	218	227	306	313	319	325	330	335	339	343	347	422	426	429	431	434
	70% (3.15kw)	-	9	23	40	52	74	96	110	130	141	150	157	164	184	197	209	219	300	308	315	321	327	332	337	342	346	422	425	428	431	434	437	439
	60% (2.7kw)	-	11	27	46	67	92	109	131	143	153	161	167	195	209	220	302	311	319	326	332	338	343	347	423	427	431	434	437	440	442	445	447	449
	50% (2.25kw)	-	14	36	52	81	108	132	146	157	165	192	208	222	305	315	324	331	338	344	421	426	430	434	437	441	444	446	449	451	453	456	457	459
	40% (1.8kw)	-	18	44	73	105	133	149	161	186	207	223	309	320	330	338	345	423	428	433	438	441	445	448	451	454	456	459	461	463	464	466	480	-
	30% (1.35kw)	-	25	53	101	135	154	167	206	227	315	328	338	347	427	433	438	443	448	451	455	458	460	463	465	467	480	-	-	-	-	-	-	-
	25% (1.125kw)	-	31	73	122	149	166	207	302	320	334	345	426	433	439	445	450	454	457	461	463	466	480	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	40	96	141	164	208	308	327	342	425	434	441	448	453	457	461	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	82	158	225	333	427	442	453	460	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	15	20	26	31	38	43	48	51	61	68	74	80	91	97	103	108	112	123	128	133	137	140	144	147	150	153	156	158	-
	90% (8.1kw)	-	-	6	11	17	23	28	37	43	47	51	62	70	76	82	95	101	107	112	123	129	134	138	142	146	149	152	155	158	161	163	165	-
	80% (7.2kw)	-	-	7	13	20	27	35	42	47	52	64	72	79	92	99	106	112	124	130	135	140	144	148	152	155	158	161	164	166	182	189	194	-
	75% (6.75kw)	-	-	8	15	22	28	38	45	50	60	70	78	90	99	106	112	124	131	136	141	146	150	154	157	160	163	166	181	188	194	200	205	-
	70% (6.3kw)	-	-	9	16	23	32	41	47	52	66	75	83	97	105	112	125	131	137	142	147	151	155	159	162	165	167	187	193	200	206	211	216	-
	60% (5.4kw)	-	-	11	20	28	39	47	53	69	79	94	103	111	125	133	139	145	150	155	159	162	166	183	191	199	206	212	218	224	301	305	310	-
	50% (4.5kw)	-	-	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	188	197	205	213	220	226	304	309	314	319	323	327	331	-
	40% (3.6kw)	-	-	19	33	46	60	76	95	108	126	136	145	152	158	163	181	193	203	213	221	300	307	313	319	324	329	333	338	341	345	420	423	-
	30% (2.7kw)	-	-	26	44	62	81	104	125	138	149	157	164	185	200	212	223	304	312	319	326	332	337	342	345	422	426	430	433	436	438	441	443	-
	25% (2.25kw)	-	-	32	50	76	102	125	140	152	161	180	197	212	224	307	316	324	331	337	343	420	424	428	432	436	439	442	445	447	449	452	454	-
	20% (1.8kw)	-	-	41	67	98	126	143	156	165	195	213	227	311	322	330	338	344	422	427	432	436	440	443	447	449	452	455	457	459	461	463	464	-
	10% (0.9kw)	-	-	83	135	159	197	226	319	335	347	428	436	443	448	453	457	461	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	11	15	18	22	26	28	34	38	42	45	47	50	52	60	65	70	74	78	81	91	95	99	102	106	109	112	121	-
	90% (12.15kw)	-	-	-	6	9	13	17	21	25	28	34	39	43	46	49	51	53	65	70	74	78	82	92	97	101	105	108	112	121	125	129	132	-
	80% (10.8kw)	-	-	-	7	11	16	20	25	28	35	40	44	47	50	53	64	70	75	79	83	95	99	104	108	112	122	126	130	133	137	140	143	-
	75% (10.125kw)	-	-	-	8	12	17	22	26	32	38	43	46	50	52	63	70	75	80	90	96	101	105	110	113	124	128	132	136	139	143	146	148	-
	70% (9.45kw)	-	-	-	9	14	18	23	28	35	41	45	49	52	63	69	75	80	91	97	102	107	111	122	127	131	135	139	142	145	148	151	154	-
	60% (8.1kw)	-	-	-	11	17	23	28	36	42	47	51	61	69	76	81	94	100	106	111	122	128	133	137	141	145	148	152	155	157	160	162	165	-
	50% (6.75kw)	-	-	-	14	21	28	37	44	49	53	68	76	83	97	104	110	122	129	134	139	144	148	152	155	159	162	164	167	184	191	197	202	-
	40% (5.4kw)	-	-	-	19	27	38	46	52	67	76	91	100	109	122	130	137	143	148	152	157	160	164	167	186	194	201	207	213	219	224	301	306	-
	30% (4.05kw)	-	-	-	27	40	49	64	77	95	106	122	132	140	147	153	158	163	167	188	198	207	215	222	300	306	312	317	321	326	330	334	337	-
	25% (3.375kw)	-	-	-	34	47	62	78	98	110	128	138	147	154	160	165	185	197	207	216	224	304	310	316	322	327	332	336	340	344	347	422	425	-
	20% (2.7kw)	-	-	-	43	60	79	102	123	136	147	155	162	181	166	208	219	301	309	316	323	329	335	340	344	420	424	428	431	434	437	439	442	-
	10% (1.35kw)	-	-	-	97	131	151	164	199	220	309	322	333	343	422	429	435	440	444	448	452	455	458	460	463	465	467	480	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.12 12-bay, single-phase, transformer-based unit Type F (UPS model-number digit 6 = F)



Use these tables if your UPS model number digits 1-3 are AS3 or ASC

Unit type F

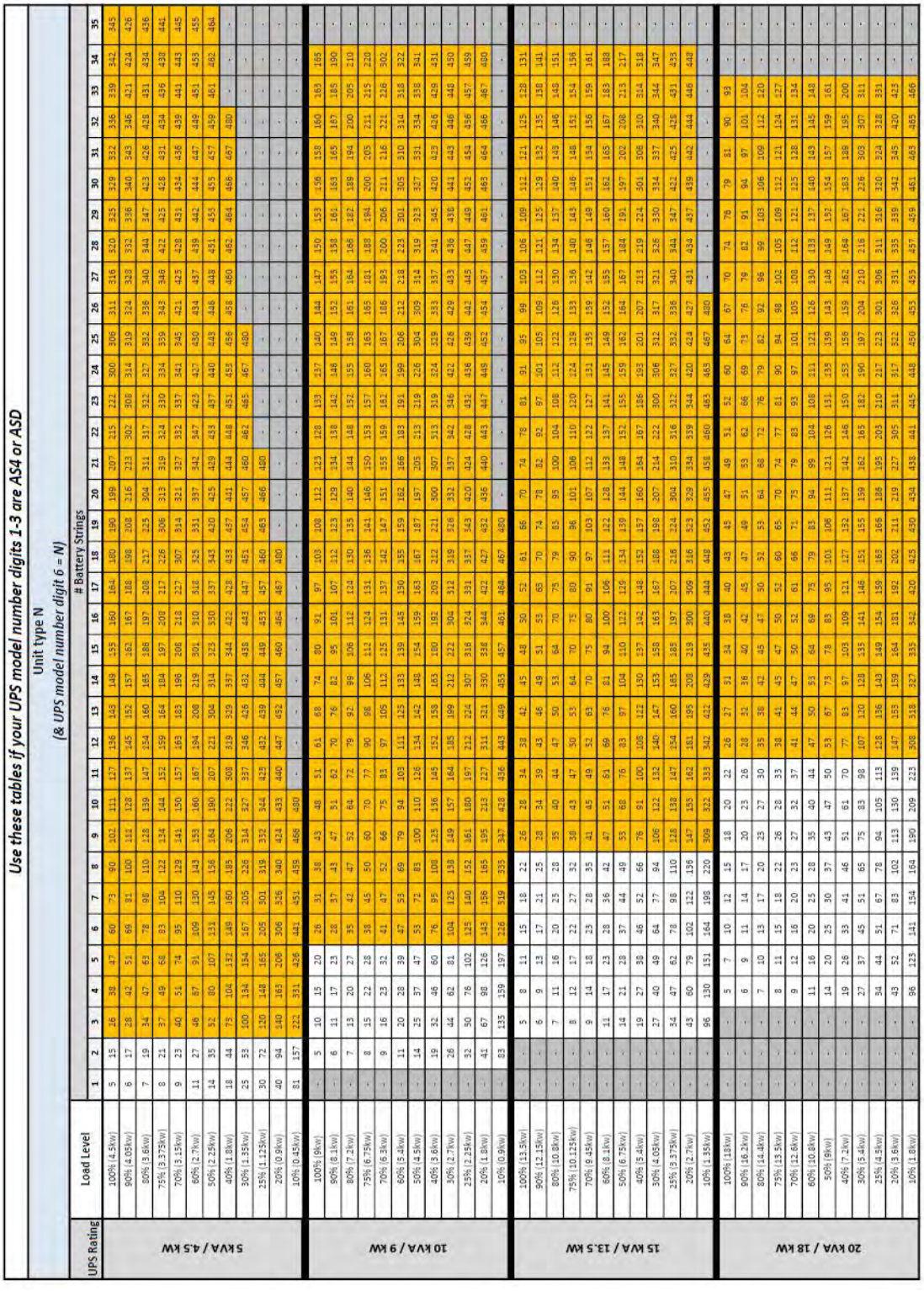
(& UPS model number digit 6 = F)

UPS Rating	Load Level	# Battery Strings																															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
5 kVA / 4.5 kW	100% (4.5kw)	-	5	14	25	37	47	53	72	83	100	110	126	134	142	148	154	159	163	167	187	197	205	213	219	226	304	309	314	319	323	327	331	-
	90% (4.05kw)	-	5	16	27	41	50	67	80	98	109	126	135	143	150	156	161	165	185	195	205	213	221	227	306	311	317	322	326	330	334	338	341	-
	80% (3.6kw)	-	7	19	33	46	61	76	96	108	126	137	145	152	158	164	182	193	204	213	222	301	308	314	320	325	330	334	338	342	345	421	424	-
	75% (3.375kw)	-	7	20	36	48	66	81	101	113	132	142	150	157	163	167	192	203	213	222	302	309	315	321	327	331	336	340	344	347	423	426	429	-
	70% (3.15kw)	-	8	22	39	50	71	92	107	126	138	147	155	161	167	190	203	213	222	303	310	317	323	328	333	338	342	346	422	425	428	431	434	-
	60% (2.7kw)	-	10	26	44	63	81	105	126	139	149	157	164	186	200	213	223	304	313	320	326	332	338	342	347	423	426	430	433	436	439	441	444	-
	50% (2.25kw)	-	13	32	50	76	102	125	140	152	161	180	197	212	224	307	316	324	331	337	343	420	424	428	432	436	439	442	445	447	449	452	454	-
	40% (1.8kw)	-	16	41	66	97	125	142	155	165	193	211	226	310	320	329	337	343	421	426	431	435	439	443	446	449	451	454	456	458	460	462	464	-
	30% (1.35kw)	-	22	50	91	125	147	161	190	212	302	316	328	337	346	425	431	436	441	445	448	452	455	458	460	462	465	467	480	-	-	-	-	-
	25% (1.125kw)	-	27	64	106	140	158	188	214	306	321	334	344	424	431	437	442	447	451	454	458	461	463	466	480	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	35	79	130	155	188	219	313	329	342	424	432	439	445	450	454	458	462	465	467	480	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	71	147	203	317	342	431	443	452	459	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	15	20	26	31	38	43	47	51	60	67	74	79	90	96	102	107	112	122	127	132	136	140	143	147	150	152	155	158	-
	90% (8.1kw)	-	-	6	11	17	22	28	36	42	47	51	61	69	75	81	93	100	106	111	122	127	132	137	141	145	148	151	154	157	160	162	164	-
	80% (7.2kw)	-	-	7	13	19	26	34	41	47	51	63	71	78	90	98	105	110	122	128	134	139	143	147	151	154	157	160	163	165	167	186	192	-
	75% (6.75kw)	-	-	8	14	21	28	37	44	49	53	68	76	83	97	104	110	122	129	134	140	144	148	152	156	159	162	164	167	184	191	197	202	-
	70% (6.3kw)	-	-	9	16	23	31	40	47	51	65	74	81	95	109	110	123	129	135	141	145	150	154	157	160	163	166	168	190	196	202	208	213	-
	60% (5.4kw)	-	-	11	19	27	38	46	52	67	77	91	101	109	123	131	137	143	148	153	157	161	164	167	187	195	202	208	214	220	225	302	307	-
	50% (4.5kw)	-	-	14	25	36	46	52	70	81	98	108	122	132	139	146	152	157	161	165	182	192	200	208	215	222	300	305	310	315	319	324	327	-
	40% (3.6kw)	-	-	18	30	44	52	73	91	105	121	132	141	149	155	161	165	186	197	206	215	223	302	308	314	320	325	329	333	337	341	344	420	-
	30% (2.7kw)	-	-	25	42	53	77	100	120	134	144	153	160	166	191	204	215	225	305	313	320	326	332	337	341	346	421	425	428	432	434	437	440	-
	25% (2.25kw)	-	-	28	48	71	96	113	135	147	156	164	187	202	215	226	308	316	324	331	337	342	347	423	427	431	434	437	440	443	445	448	450	-
	20% (1.8kw)	-	-	38	61	91	112	137	150	161	182	201	217	302	313	322	330	337	343	421	426	430	434	438	442	445	447	450	452	455	457	459	461	-
	10% (0.9kw)	-	-	75	124	151	167	211	306	323	336	347	428	435	441	447	451	455	459	462	465	467	480	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	11	15	18	22	26	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	90% (12.15kw)	-	-	-	6	9	13	17	21	25	28	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	80% (10.8kw)	-	-	-	7	11	16	20	25	28	34	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	75% (10.125kw)	-	-	-	8	12	17	21	26	31	37	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	70% (9.45kw)	-	-	-	9	13	18	23	28	35	40	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60% (8.1kw)	-	-	-	11	17	22	28	36	42	47	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50% (6.75kw)	-	-	-	14	21	27	36	43	49	53	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40% (5.4kw)	-	-	-	18	27	37	45	51	65	75	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30% (4.05kw)	-	-	-	26	38	48	61	75	91	103	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25% (3.375kw)	-	-	-	32	45	53	75	94	107	124	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (2.7kw)	-	-	-	41	52	75	97	112	131	142	151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (1.35kw)	-	-	-	82	121	143	158	183	206	225	311	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

8.4 Estimated Battery Run Times: Model-number Digits 1 to 3 = AS4 or ASD

Figure 8.13 16-bay, single-phase, transformer-based unit Type N (UPS model-number digit 6 = N)



Use these tables if your UPS model number digits 1-3 are AS4 or ASD

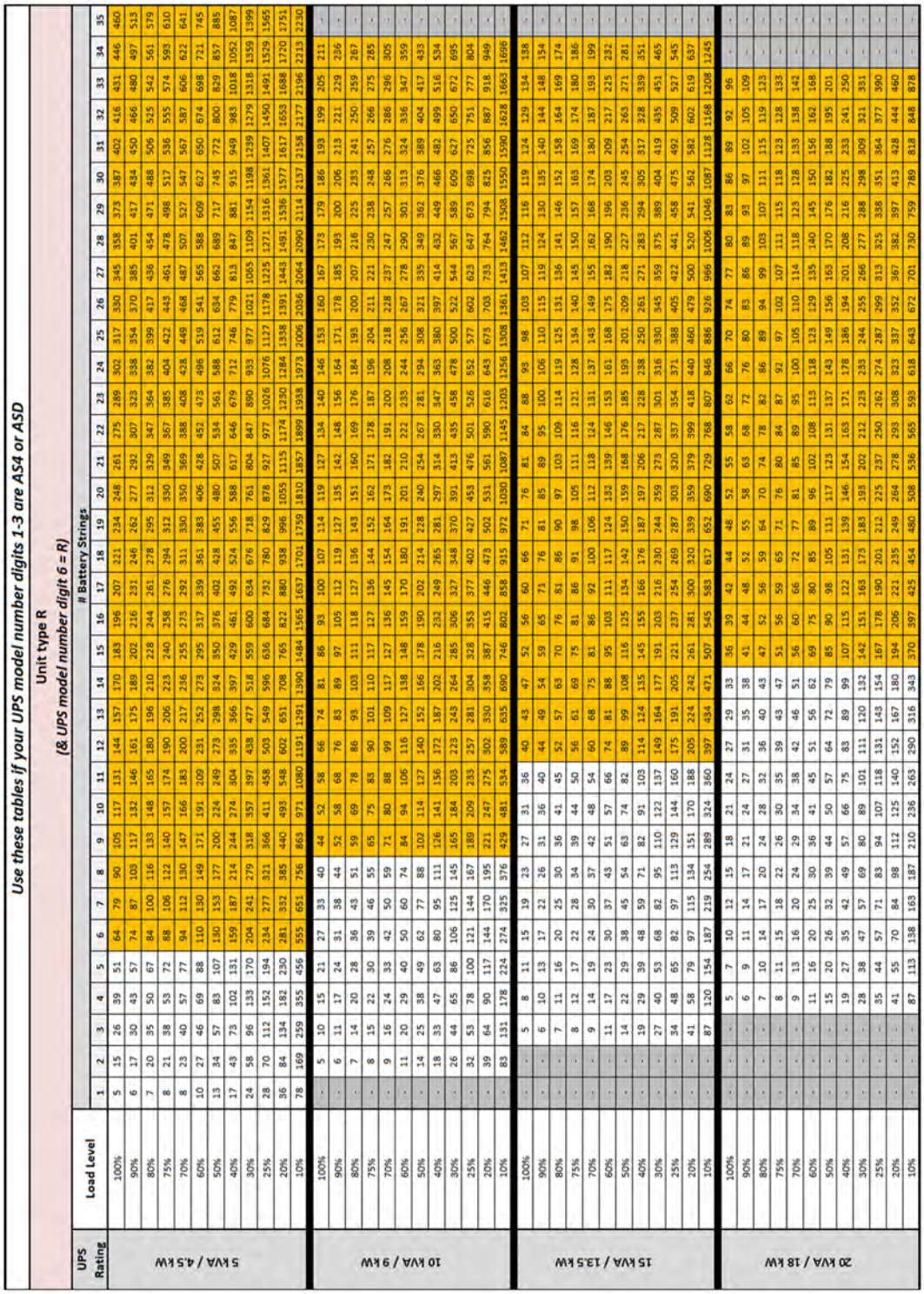
Unit type N

(& UPS model number digit 6 = N)

UPS Rating	Load Level	# Battery Strings																																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	5	15	26	38	47	60	73	90	102	111	127	136	143	149	155	160	164	169	190	199	207	215	222	300	306	311	316	320	325	329	332	336	339	342	345
	90% (4.05kw)	6	17	28	42	51	69	81	100	114	128	137	145	152	157	162	167	188	198	208	216	213	302	308	314	319	324	328	332	336	340	343	346	421	424	426
	80% (3.6kw)	7	19	34	47	63	78	98	110	128	139	147	154	160	165	186	197	208	217	235	304	311	317	322	327	332	336	340	344	347	423	426	428	431	434	436
	75% (3.375kw)	8	21	37	49	68	83	104	122	144	152	159	164	184	197	208	217	226	306	313	319	324	330	334	339	343	346	422	425	428	431	434	436	438	441	442
	70% (3.15kw)	9	23	40	54	74	95	110	129	141	150	157	163	183	196	206	210	227	307	314	321	327	332	337	423	427	430	434	437	431	434	436	439	441	443	445
	60% (2.7kw)	11	27	46	67	91	109	130	143	153	160	167	194	208	219	301	310	318	325	331	337	342	347	423	427	430	434	437	439	442	444	447	449	451	453	455
	50% (2.25kw)	14	35	52	80	107	131	145	156	164	190	207	221	304	314	323	330	337	343	420	425	439	433	437	440	443	446	448	451	453	455	457	459	461	462	464
	40% (1.8kw)	18	44	73	106	132	148	160	185	206	222	303	319	329	337	344	422	428	433	437	441	444	448	451	453	456	458	460	-	-	-	-	-	-	-	-
	30% (1.35kw)	25	53	100	134	154	167	205	226	314	327	337	346	426	432	438	443	447	451	454	457	460	462	465	467	480	-	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	30	72	130	148	165	205	901	319	332	344	428	432	439	444	449	453	457	460	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	40	94	140	165	206	306	326	340	424	433	440	447	452	457	460	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	81	157	222	331	426	441	451	459	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	15	20	26	31	38	43	48	51	61	68	74	80	91	97	103	108	112	123	128	133	137	140	144	147	150	153	156	158	160	163	165	-
	90% (8.1kw)	-	6	11	17	23	28	37	43	47	51	62	70	76	81	95	101	107	112	123	129	134	138	142	145	148	149	152	155	158	161	163	165	167	185	190
	80% (7.2kw)	-	7	13	20	27	35	42	47	52	64	72	79	92	99	206	112	124	130	135	140	144	148	152	155	158	161	164	166	168	189	194	200	205	210	-
	75% (6.75kw)	-	8	15	22	28	33	45	50	60	70	77	90	98	106	112	124	131	136	141	146	150	153	157	160	163	165	101	188	194	200	205	211	215	220	-
	70% (6.3kw)	-	9	16	23	32	41	47	52	66	75	83	97	105	112	125	131	137	142	147	151	155	159	162	166	183	191	193	200	206	211	216	221	226	302	-
	60% (5.4kw)	-	11	20	28	39	47	53	69	79	94	103	111	125	133	139	145	150	155	159	162	166	183	191	199	206	212	218	223	301	305	310	314	318	322	-
	50% (4.5kw)	-	14	25	37	47	53	72	83	100	110	128	134	142	148	154	159	163	167	187	197	205	213	219	226	304	309	314	319	323	327	331	334	338	341	-
	40% (3.6kw)	-	19	32	46	60	76	95	108	125	136	145	152	158	163	180	192	208	212	221	300	307	313	319	324	329	333	337	341	345	420	425	426	431	431	-
	30% (2.7kw)	-	26	44	62	81	104	125	138	149	157	164	185	199	212	222	304	312	319	326	332	337	342	346	422	426	428	433	436	438	441	443	446	448	450	-
	25% (2.25kw)	-	32	50	76	102	125	140	152	161	180	197	212	224	307	318	324	331	337	343	420	424	428	432	436	439	442	445	447	449	452	454	456	457	459	-
	20% (1.8kw)	-	41	67	98	126	143	166	165	195	213	227	311	321	330	338	344	422	427	432	436	440	443	447	448	452	454	457	459	461	463	464	466	467	480	-
	10% (0.9kw)	-	83	135	159	197	216	319	335	347	428	436	443	449	453	457	461	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	11	15	18	22	26	28	34	38	42	45	48	50	52	61	66	70	74	78	81	91	95	99	103	106	109	112	121	125	128	131	-
	90% (12.15kw)	-	-	6	9	13	17	21	25	28	34	39	43	46	49	51	53	65	70	74	78	82	92	97	301	105	109	112	121	125	129	132	135	138	141	-
	80% (10.8kw)	-	-	7	11	16	20	25	28	35	40	44	47	50	53	64	70	75	79	83	95	100	104	108	112	122	126	130	134	137	140	143	146	148	151	-
	75% (10.125kw)	-	-	8	12	17	22	27	32	38	43	47	50	53	64	70	75	80	90	96	101	106	110	120	124	129	133	136	140	143	146	148	151	154	156	-
	70% (9.45kw)	-	-	9	14	18	23	28	35	41	45	49	52	83	70	75	80	91	97	103	107	112	112	127	131	135	139	142	146	148	151	154	156	159	161	-
	60% (8.1kw)	-	-	11	17	23	28	36	42	47	51	61	69	76	81	94	100	106	111	122	128	133	137	141	145	149	152	155	157	160	162	165	167	169	183	-
	50% (6.75kw)	-	-	14	21	28	37	44	49	55	68	76	83	97	104	110	122	129	134	139	144	148	152	155	159	162	164	167	184	191	197	202	208	213	217	-
	40% (5.4kw)	-	-	19	27	38	46	52	66	76	91	100	108	122	130	137	142	148	152	157	160	164	167	186	183	201	207	213	219	224	301	306	310	314	318	-
	30% (4.05kw)	-	-	27	40	49	64	77	94	106	122	132	140	147	153	158	163	167	188	198	207	214	222	300	306	312	317	321	326	330	334	337	340	344	347	-
	25% (3.375kw)	-	-	34	47	62	78	98	110	128	138	147	154	160	165	185	197	207	216	224	304	310	316	322	327	332	336	340	344	347	422	425	428	431	433	-
	20% (2.7kw)	-	-	43	60	79	102	122	136	147	155	162	181	195	208	219	300	309	316	323	329	334	339	344	420	424	427	431	434	437	439	442	444	446	448	-
	10% (1.35kw)	-	-	96	130	151	164	198	220	309	322	333	342	422	429	435	440	444	448	452	455	458	460	463	465	467	480	-	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	5	7	10	12	15	18	20	22	26	27	31	34	38	40	43	45	47	49	51	52	60	64	67	70	74	78	79	81	90	93	-	-
	90% (16.2kw)	-	-	-	6	9	11	14	17	20	23	26	28	31	36	40	42	45	47	49	51	53	62	66	69	73	76	79	82	91	94	97	101	104	-	-
	80% (14.4kw)	-	-	-	7	10	13	17	20	25	27	30	35	38	42	45	47	50	53	64	68	72	76	79	82	92	96	99	103	106	106	112	120	-	-	-
	75% (13.5kw)	-	-	-	8	11	15	18	22	26	28	33	38	41	45	47	50	52	60	65	70	74	77	81	90	94	98	102	105	109	112	121	124	127	-	-
	70% (12.6kw)	-	-	-	9	12	16	20	23	27	32	37	41	44	47	50	52	61	66	71	75	79	83	93	97	101	105	108	112	121	125	128	131	134	-	-
	60% (10.8kw)	-	-	-	11	16	20	25	28	35	40	44	47	50	53	64	69	75	79	83	94	99	104	108	111	121	126	130	133	137	140	143	145	-	-	-
	50% (9kw)	-	-	-	14	20	25	30	37	43	47	50	53	67	73	78	83	95	101	106	111	121	126	131	135	139	143	146	149	152	154	157	159	161	-	-
	40% (7.2kw)	-	-	-	19	26	33	41	46	51	61	70	77	83	97	203	109	121	127	132	137	142	146	150	153	156	159	162	164	167	183	188	195	200	-	-
	30% (5.4kw)	-	-	-	27	37	45	51	65	75	83	98	107	120	128	135	141	146	151	155	159	162	165	182	190	197	204	210	216	221	226	303	307	311	-	-
	25% (4.5kw)	-	-	-	34	44	51	67	78	94	105	113	126	136	143	149	154	159	164	181	192	202	211	219	227	305	311	317	322	326	331	335	339	342	345	420
	20% (3.6kw)	-	-	-	43	52	71	83	102	113	130	139	147	153	159	164	181	192	202	211	219	227	305	311	317	322	326	331	335	339	342	345	420	423	-	-
	10% (1.8kw)	-	-	-	96	123	141	154	164	190	209	223	308	318	327	335	342	420	425	430	434	438	441	445	448	450	453	455	457	459	461	463	465	466	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.
Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.14 16-bay, single-phase, transformer-based unit Type R (UPS model-number digit 6 = R)



Use these tables if your UPS model number digits 1-3 are AS4 or ASD

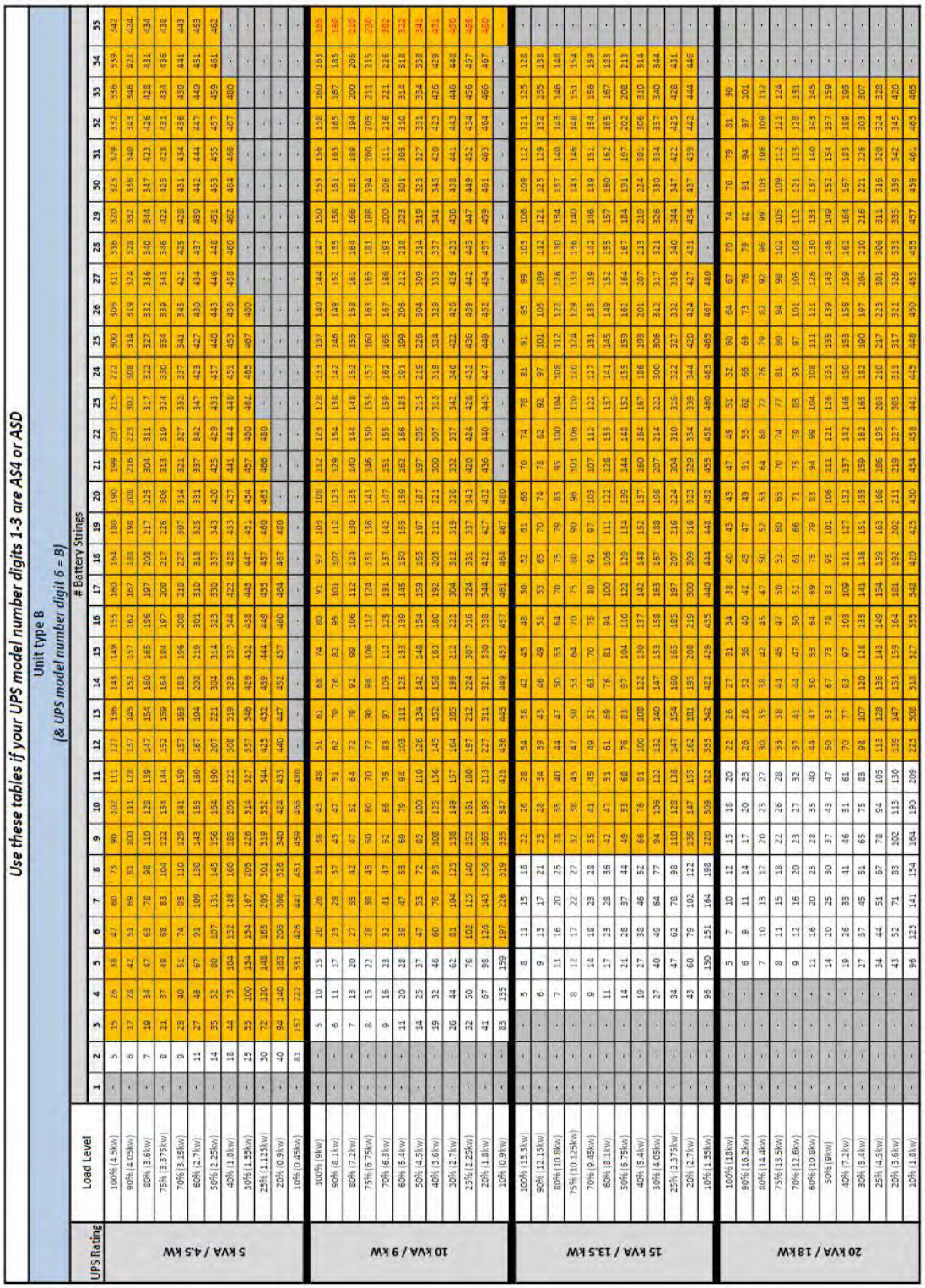
Unit type R

(& UPS model number digit 6 = R)

UPS Rating	Load Level	# Battery Strings																																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100%	5	15	26	39	51	64	79	90	105	117	131	144	157	170	183	196	207	221	234	248	261	275	289	302	317	330	345	358	373	387	402	416	431	446	460
	90%	6	17	30	43	57	74	87	103	117	132	146	161	175	189	202	216	231	246	262	277	292	307	323	338	354	370	385	401	417	434	450	466	480	497	513
	80%	7	20	35	50	67	84	100	116	133	148	165	180	196	210	228	244	261	278	295	312	329	347	364	382	399	417	436	454	471	488	506	525	542	561	579
	75%	8	21	38	53	72	88	106	122	140	157	174	190	206	223	240	258	276	294	312	330	349	367	385	404	422	443	461	478	498	517	536	555	574	593	610
	70%	8	23	40	57	77	94	112	130	147	166	183	200	217	236	255	273	292	311	330	350	369	388	408	428	449	468	487	507	527	547	567	587	606	622	641
	60%	10	27	46	69	88	110	130	149	171	191	209	231	252	273	295	317	339	361	383	406	428	452	473	496	519	541	565	588	609	627	650	674	698	721	745
	50%	13	34	57	83	107	130	153	177	200	224	249	273	298	324	350	376	402	428	455	480	507	534	561	588	612	634	662	688	717	745	772	800	829	857	885
	40%	17	43	73	102	131	159	187	214	244	274	304	335	366	397	429	461	492	524	556	588	617	646	679	712	746	779	813	847	881	915	949	983	1018	1052	1087
	30%	24	58	96	133	170	204	241	279	318	357	397	438	477	518	559	600	634	676	718	761	804	847	890	933	977	1021	1065	1109	1154	1198	1239	1279	1318	1359	1399
	25%	28	70	112	152	194	234	277	321	366	411	458	503	549	596	636	684	732	780	829	878	927	977	1026	1076	1127	1178	1225	1271	1316	1361	1407	1450	1491	1529	1565
	20%	36	84	134	182	230	281	332	385	440	493	548	602	651	708	765	822	880	938	996	1055	1115	1174	1230	1284	1338	1391	1443	1491	1536	1577	1617	1653	1688	1720	1751
	10%	78	169	259	355	456	555	651	756	863	971	1080	1191	1291	1390	1484	1565	1637	1701	1759	1810	1857	1899	1938	1973	2006	2036	2064	2090	2114	2137	2158	2177	2196	2213	2230
10 kVA / 9 kW	100%	-	5	10	15	21	27	33	40	44	52	58	66	74	81	86	93	100	107	114	119	127	134	140	146	153	160	167	173	179	186	193	199	205	211	-
	90%	-	6	11	17	24	31	38	44	52	58	66	76	83	89	97	105	112	119	127	135	142	148	156	164	171	178	185	193	200	206	213	221	229	236	-
	80%	-	7	14	20	28	36	43	51	59	69	78	86	93	103	111	118	127	136	143	151	160	169	176	184	193	200	207	216	225	233	241	250	259	267	-
	75%	-	8	15	22	30	39	46	55	65	75	83	90	101	110	117	127	136	144	152	162	171	178	187	196	204	211	221	230	238	248	257	266	275	285	-
	70%	-	9	16	24	33	42	50	59	71	80	88	99	109	117	127	136	145	154	164	173	182	191	200	208	218	228	237	247	257	266	276	286	296	305	-
	60%	-	11	20	29	40	50	60	74	84	94	106	116	127	138	148	159	170	180	191	201	210	222	233	244	256	267	278	290	301	313	324	336	347	359	-
	50%	-	14	25	38	49	62	77	88	102	114	127	140	152	166	178	190	202	214	228	240	254	267	281	294	308	321	335	349	362	376	389	404	417	433	-
	40%	-	18	33	47	63	80	95	111	126	141	156	172	187	202	216	232	249	265	281	297	314	330	347	363	380	397	414	432	449	466	482	499	516	534	-
	30%	-	26	44	65	86	106	125	145	165	184	203	223	243	264	285	306	327	348	370	391	413	435	458	478	500	522	544	567	589	609	627	650	672	695	-
	25%	-	32	53	78	100	121	144	167	189	209	233	257	281	304	328	353	377	402	427	453	476	501	526	552	577	602	623	647	673	698	725	751	777	804	-
	20%	-	39	64	90	117	144	170	195	221	247	275	302	330	358	387	415	446	473	502	531	561	590	616	643	673	703	733	764	794	825	856	887	918	949	-
	10%	-	83	131	178	224	274	325	376	429	481	534	589	635	690	746	802	858	915	972	1030	1087	1145	1203	1256	1308	1361	1413	1462	1508	1550	1590	1628	1663	1696	-
15 kVA / 13.5 kW	100%	-	-	5	8	11	15	19	23	27	31	36	40	43	47	52	56	60	66	71	76	81	84	88	93	98	103	107	112	116	119	124	129	134	138	-
	90%	-	-	6	10	13	17	22	26	31	36	40	44	49	54	59	65	71	76	81	85	89	95	100	106	110	115	119	124	130	135	140	144	148	154	-
	80%	-	-	7	11	16	20	25	30	36	41	45	52	57	63	70	76	81	86	90	97	103	109	114	119	125	131	136	141	146	152	158	164	169	174	-
	75%	-	-	8	12	17	22	28	34	39	44	50	56	61	69	75	81	86	91	98	105	111	116	121	128	134	140	145	150	157	163	169	174	180	186	-
	70%	-	-	9	14	19	24	30	37	42	48	54	60	68	75	81	86	92	100	106	112	118	124	131	137	143	149	155	162	168	174	180	187	193	199	-
	60%	-	-	11	17	23	30	37	43	51	57	66	74	81	88	95	103	111	117	124	132	139	146	153	161	168	175	182	190	196	203	209	217	225	232	-
	50%	-	-	14	22	29	38	45	54	63	74	82	89	99	108	116	125	134	142	150	159	168	176	185	193	201	209	218	227	236	245	254	263	271	281	-
	40%	-	-	19	29	39	48	59	71	82	91	103	114	124	135	145	155	166	176	187	197	206	217	228	238	250	261	271	283	294	305	317	328	339	351	-
	30%	-	-	27	40	53	68	82	95	110	122	137	149	164	177	191	203	216	230	244	259	273	287	301	316	330	345	359	375	389	404	419	435	451	465	-
	25%	-	-	34	48	65	82	97	113	129	144	160	175	191	205	221	237	254	269	287	303	320	337	354	371	388	405	422	441	458	475	492	509	527	545	-
	20%	-	-	41	58	79	97	115	134	151	170	188	205	224	242	261	281	300	320	339	359	379	399	418	440	460	479	500	520	541	562	582	602	619	637	-
	10%	-	-	87	120	154	187	219	254	289	324	360	397	434	471	507	545	583	617	652	690	729	768	807	846	886	926	966	1006	1046	1087	1128	1168	1208	1245	-
20 kVA / 18 kW	100%	-	-	-	5	7	10	12	15	18	21	24	27	29	33	36	39	42	44	48	52	55	58	62	66	70	74	77	80	83	86	89	92	96	-	-
	90%	-	-	-	6	9	11	14	17	21	24	27	31	35	38	41	44	48	52	55	58	63	68	72	76	80	83	86	89	93	97	102	105	109	-	-
	80%	-	-	-	7	10	14	17	20	24	28	32	36	40	43	47	52	56	59	64	70	74	78	82	86	89	94	99	103	107	111	115	119	123	-	-
	75%	-	-	-	8	11	15	18	22	26	30	35	39	43	47	51	56	59	65	71	76	80	84	87	92	97	102	107	111	115	118	123	128	133	-	-
	70%	-	-	-	9	13	16	20	24	29	34	38	42	46	51	56	60	66	72	77	81	85	89	95	100	105	110	114	118	123	128	133	138	142	-	-
	60%	-	-	-	11	16	20	25	30	36	41	45	51	56	62	69	75	80	85	89	96	102	108	113	118	123	129	135	140	145	150	156	162	168	-	-
	50%	-	-	-	15	20	26	32	39	44	50	57	64	72	79	85	90	98	105	111	117	123	131	137	143	149	156	163	170	176	182	188	195	201	-	-
	40%	-	-	-	19	27	35	42	49	57	66	75	83	89	99	107	115	122	131	139	146	154	163	171	178	186	194	201	208	216	225	233	241	250	-	-
	30%	-	-	-	28	38	47	57	69	80	89	101	111	120	132	142	151	163	173	183	193	202	212	223	233	244	255	266	277	288	298	309	321	331	-	-
	25%	-	-	-	35	44	57	71	83	94	107	118	131	143	154	167	178	190	201	212	225	237	250	262	274	287	299	313	325	338	351	364	377	390	-	-
	20%	-	-	-	41	55	70	84	98	112	125	140	152	167	180	194	206	221	235	249	264	278	293	308	323	337	352	367	382	397	413	428	444	460	-	-
	10%	-	-	-	87	113	138	163	187	210	236	263	290	316	343	370	397	425	454	480	508	536	565	593	618	643	672	701	730	759	789	818	848	878	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.15 16-bay, single-phase, transformer-based unit Type B (UPS model-number digit 6 = B)



Use these tables if your UPS model number digits 1-3 are AS4 or ASD

Unit type B

(& UPS model number digit 6 = B)

UPS Rating	Load Level	# Battery Strings																																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	-	5	15	26	38	47	60	73	90	102	111	127	136	143	149	155	160	164	180	190	199	207	215	222	300	306	311	316	320	325	329	332	336	338	342
	90% (4.05kw)	-	6	17	28	42	51	69	81	100	111	128	137	145	152	157	162	167	188	198	208	216	223	302	308	314	319	324	328	331	336	340	343	346	421	424
	80% (3.6kw)	-	7	19	34	47	63	78	98	110	128	139	147	154	160	165	166	197	208	217	325	304	311	317	322	327	332	336	340	344	347	423	426	428	431	434
	75% (3.375kw)	-	8	21	37	48	68	83	104	122	134	144	152	159	164	184	197	208	217	226	306	313	319	324	330	334	339	343	346	422	425	428	431	434	436	438
	70% (3.15kw)	-	9	23	40	51	74	85	110	129	141	150	157	163	183	196	208	218	227	307	314	321	327	332	337	341	345	421	425	428	431	434	436	439	441	443
	60% (2.7kw)	-	11	27	46	67	91	109	130	143	153	160	167	184	208	219	301	310	318	325	331	337	342	347	423	427	430	434	437	439	442	444	447	449	451	453
	50% (2.25kw)	-	14	35	52	80	107	131	145	156	164	190	207	221	304	314	323	330	337	343	420	425	429	433	437	440	443	446	448	451	453	455	457	459	461	462
	40% (1.8kw)	-	18	44	73	104	132	149	160	185	206	222	308	319	329	337	344	322	428	433	437	441	444	446	448	451	453	456	458	460	464	466	467	480	-	-
	30% (1.35kw)	-	25	53	100	134	154	167	205	226	314	327	337	346	426	432	438	443	447	451	454	457	460	462	465	467	480	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	30	72	120	148	165	205	301	319	332	344	425	432	439	444	449	453	457	460	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	40	94	140	163	206	306	326	340	424	433	440	447	452	457	460	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	81	157	222	331	426	441	451	459	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	15	20	26	31	38	43	48	51	61	68	74	80	91	97	103	108	112	123	128	133	137	140	144	147	150	153	156	158	160	163	165
	90% (8.1kw)	-	-	6	11	17	25	28	37	45	47	51	62	70	76	82	95	101	107	112	123	139	134	136	142	146	149	152	155	158	161	163	165	167	183	180
	80% (7.2kw)	-	-	7	13	20	27	35	42	47	52	64	72	78	92	99	106	112	124	131	135	140	144	148	152	155	158	161	164	166	168	189	194	200	205	210
	75% (6.75kw)	-	-	8	15	22	28	38	45	50	60	70	77	90	98	106	112	125	131	136	141	146	150	153	157	160	163	165	181	188	194	200	205	211	215	220
	70% (6.3kw)	-	-	9	16	23	32	41	47	52	66	75	83	97	105	112	125	131	137	142	147	151	155	158	162	165	167	186	193	200	206	211	216	221	226	302
	60% (5.4kw)	-	-	11	20	28	39	47	53	69	79	94	103	111	125	133	139	145	150	155	159	162	166	183	191	199	206	212	218	223	301	305	310	314	318	322
	50% (4.5kw)	-	-	14	25	37	47	53	72	85	100	110	126	134	142	148	154	159	165	187	197	205	213	219	226	304	309	314	319	323	327	331	334	338	341	345
	40% (3.6kw)	-	-	19	32	46	60	76	95	108	125	136	145	152	158	163	180	192	203	212	221	300	307	313	318	324	329	333	337	341	345	420	423	426	429	431
	30% (2.7kw)	-	-	26	44	62	81	104	125	138	149	157	164	185	199	211	222	304	312	319	326	332	337	342	346	422	426	429	433	436	438	441	443	446	448	450
	25% (2.25kw)	-	-	32	50	76	102	125	140	152	161	180	197	212	224	307	316	324	331	337	343	420	424	428	431	436	439	442	445	447	449	452	454	456	457	459
	20% (1.8kw)	-	-	41	67	98	126	143	156	165	195	213	227	311	321	330	338	344	422	427	432	436	440	443	447	449	452	454	457	459	461	463	464	466	467	480
	10% (0.9kw)	-	-	83	135	159	197	226	319	335	347	428	436	443	448	453	457	461	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	11	15	18	22	26	28	34	38	42	45	48	50	52	61	66	70	74	78	81	91	95	99	103	106	109	112	121	125	128	-
	90% (12.15kw)	-	-	-	6	9	13	17	21	25	28	34	39	43	46	49	51	53	65	70	74	78	82	97	101	105	109	112	121	125	129	132	135	138	-	
	80% (10.8kw)	-	-	-	7	11	16	20	25	28	35	40	44	47	50	53	64	70	75	79	83	85	100	104	108	112	122	126	130	134	137	140	143	146	148	-
	75% (10.125kw)	-	-	-	8	12	17	22	27	32	38	43	47	50	53	64	70	75	80	90	96	101	106	110	120	124	129	133	136	140	143	146	148	151	154	-
	70% (9.45kw)	-	-	-	9	14	18	23	28	35	41	45	49	52	63	70	75	80	91	97	103	107	112	122	127	131	135	139	142	146	149	151	154	156	159	-
	60% (8.1kw)	-	-	-	11	17	23	28	36	42	47	51	61	69	76	81	94	100	106	111	122	118	133	137	141	145	149	152	155	157	160	162	165	167	183	-
	50% (6.75kw)	-	-	-	14	21	28	37	44	49	53	68	76	83	97	104	110	122	129	134	139	144	148	152	155	159	162	164	167	184	191	197	202	208	213	-
	40% (5.4kw)	-	-	-	19	27	38	46	52	66	76	91	100	108	122	130	137	142	148	152	157	160	164	167	186	193	201	207	213	219	224	301	306	310	314	-
	30% (4.05kw)	-	-	-	27	40	49	64	77	94	106	122	132	140	147	153	158	163	167	188	198	207	214	222	300	306	312	317	321	326	330	334	337	340	344	-
	25% (3.375kw)	-	-	-	34	47	62	78	98	110	128	138	147	154	160	165	185	197	207	216	224	304	310	316	322	327	332	336	340	344	347	422	425	428	431	-
	20% (2.7kw)	-	-	-	43	60	79	101	122	136	147	155	162	181	195	208	219	300	309	316	323	329	334	338	344	420	424	427	431	434	437	439	442	444	446	-
	10% (1.35kw)	-	-	-	96	130	151	164	198	220	309	322	333	342	422	429	435	440	444	448	452	455	458	460	463	465	467	480	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	-	5	7	10	12	15	18	20	22	26	27	31	34	38	40	43	45	47	49	51	52	60	64	67	70	74	76	79	81	90	-	-
	90% (16.2kw)	-	-	-	-	6	9	11	14	17	20	23	26	26	32	36	40	42	45	47	49	51	53	62	68	69	73	76	79	82	91	94	97	101	-	-
	80% (14.4kw)	-	-	-	-	7	10	13	17	20	23	27	30	35	38	42	45	47	50	52	53	64	68	72	76	79	82	92	96	99	103	106	109	112	-	-
	75% (13.5kw)	-	-	-	-	8	11	15	18	22	26	28	33	38	41	45	47	50	52	60	65	70	74	77	81	90	94	98	102	105	109	112	121	124	-	-
	70% (12.6kw)	-	-	-	-	9	12	16	20	23	27	32	37	41	44	47	50	52	61	66	71	75	79	83	93	97	101	105	108	112	121	125	128	131	-	-
	60% (10.8kw)	-	-	-	-	11	16	20	25	28	35	40	44	47	50	53	64	69	75	79	83	94	99	104	108	111	121	126	130	133	137	140	143	145	-	-
	50% (9kw)	-	-	-	-	14	20	25	30	37	43	47	50	53	67	73	78	83	95	101	106	111	121	126	131	135	139	143	146	149	152	154	157	159	-	-
	40% (7.2kw)	-	-	-	-	19	26	33	41	46	51	61	70	77	83	97	103	109	121	127	132	137	142	146	150	153	156	159	162	164	167	183	189	195	-	-
	30% (5.4kw)	-	-	-	-	27	37	45	51	65	75	83	98	107	120	126	135	141	148	151	155	159	162	165	182	190	197	204	210	216	221	226	303	307	-	-
	25% (4.5kw)	-	-	-	-	34	44	51	67	78	94	105	113	128	136	143	149	154	159	163	166	186	195	203	210	217	225	301	306	311	316	320	324	328	-	-
	20% (3.6kw)	-	-	-	-	43	52	71	83	102	113	130	139	147	153	159	164	181	192	202	211	219	227	305	311	317	322	326	331	335	339	342	345	420	-	-
	10% (1.8kw)	-	-	-	-	96	123	141	154	164	190	209	223	308	318	327	335	343	420	425	430	434	438	441	445	448	450	453	455	457	459	461	463	465	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.

Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.16 16-bay, single-phase, transformer-based unit Type F (UPS model-number digit 6 = F)

Use these tables if your UPS model number digits 1-3 are AS4 or ASD

Unit type F

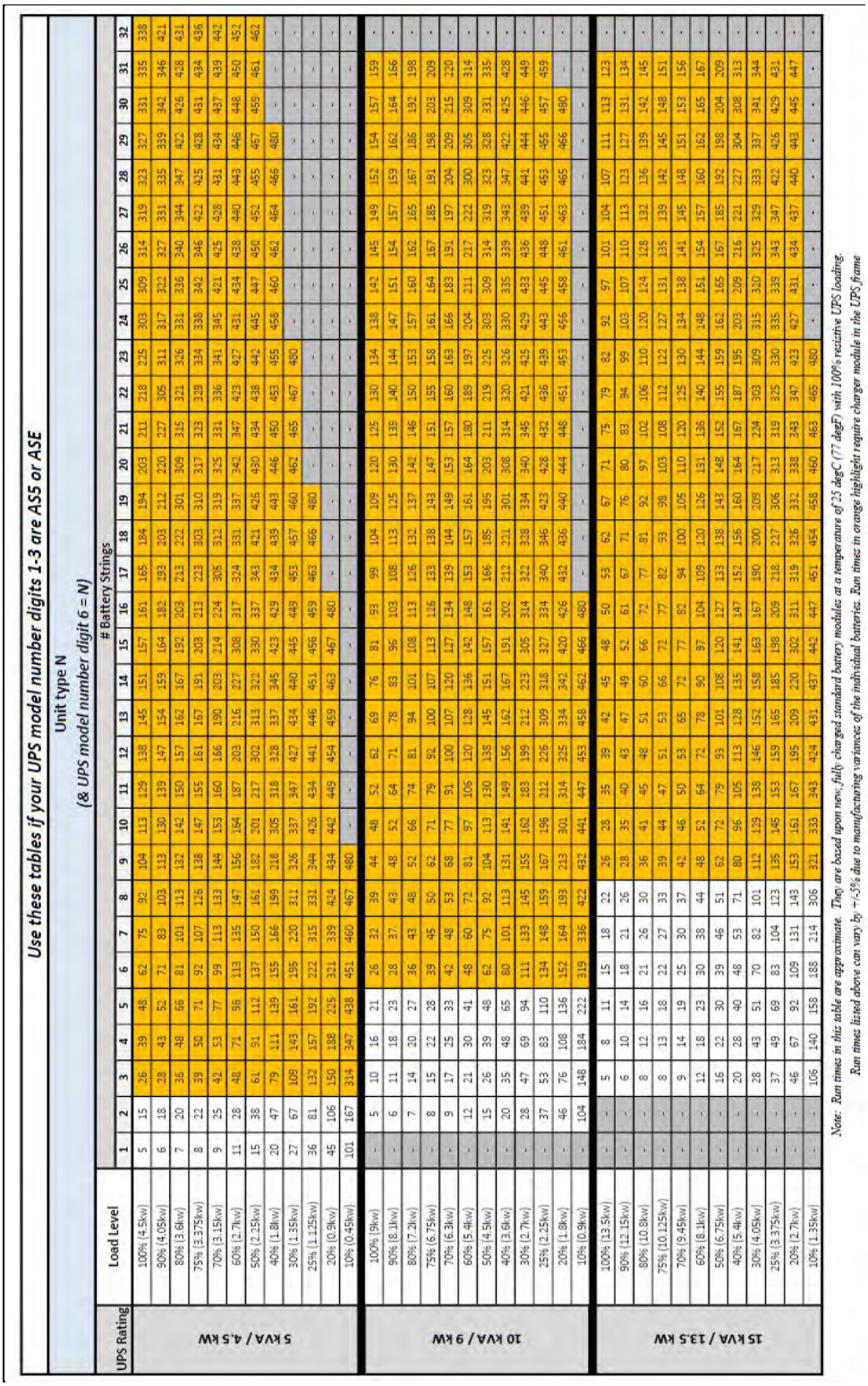
(& UPS model number digit 6 = F)

UPS Rating	Load Level	# Battery Strings																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	-	5	14	25	37	47	53	72	83	100	110	125	134	142	148	154	159	163	167	187	196	205	212	219	226	303	309	514	318	323	327	331	334	537	-
	90% (4.05kw)	-	5	16	27	41	50	67	80	98	109	126	135	143	150	156	161	165	185	195	204	213	220	227	305	311	317	321	326	330	334	338	341	344	547	-
	80% (3.6kw)	-	7	19	33	46	60	76	96	106	126	136	145	152	158	164	181	193	204	213	221	301	308	314	319	325	329	334	338	342	345	420	423	426	429	-
	75% (3.375kw)	-	7	20	36	48	66	81	101	113	132	142	150	157	162	167	192	203	213	222	302	309	315	321	326	331	336	340	344	347	423	426	429	431	434	-
	70% (3.15kw)	-	8	22	38	50	71	92	107	126	137	147	155	161	166	190	202	213	222	302	310	317	323	328	333	338	342	346	421	425	428	431	434	436	439	-
	60% (2.7kw)	-	10	26	44	63	81	105	125	139	149	157	164	186	200	212	225	304	312	320	326	332	337	342	347	423	426	430	433	436	439	441	444	446	448	-
	50% (2.25kw)	-	13	32	50	76	102	125	140	152	160	180	197	212	224	306	316	324	331	337	342	420	424	428	432	436	439	442	444	447	449	452	454	456	457	-
	40% (1.8kw)	-	16	41	66	97	124	142	155	165	193	211	226	310	320	329	336	343	421	426	431	435	439	443	446	449	451	454	456	458	460	462	464	465	467	-
	30% (1.35kw)	-	22	50	91	125	146	160	189	212	301	316	327	337	345	424	430	436	440	444	448	452	455	457	460	462	464	466	480	-	-	-	-	-	-	-
	25% (1.125kw)	-	26	63	105	139	158	187	214	305	321	333	343	423	430	437	442	446	450	454	457	460	463	465	467	480	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	34	79	129	155	187	218	312	328	341	423	432	439	445	450	454	458	461	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	70	146	201	315	341	430	442	451	459	464	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	15	20	26	31	38	43	47	51	60	67	74	79	90	96	102	107	112	122	127	132	136	140	143	147	150	152	155	158	160	162	-
	90% (8.1kw)	-	-	6	11	17	22	28	36	42	47	51	61	69	75	81	93	100	106	111	122	127	132	137	141	145	148	151	154	157	160	162	164	166	182	-
	80% (7.2kw)	-	-	7	13	19	26	34	41	47	51	62	71	78	90	98	104	110	122	128	134	138	143	147	151	154	157	160	163	165	167	185	191	197	202	-
	75% (6.75kw)	-	-	8	14	21	28	37	44	49	53	68	76	83	97	104	110	122	129	134	140	144	148	152	156	159	162	164	167	184	191	197	202	208	213	-
	70% (6.3kw)	-	-	9	16	23	31	40	47	51	65	74	81	95	103	110	122	129	135	141	145	150	154	157	160	163	166	183	190	196	202	208	213	218	223	-
	60% (5.4kw)	-	-	11	19	27	38	46	52	67	77	92	101	109	123	131	137	143	148	153	157	161	164	167	187	195	202	208	214	220	225	302	307	311	315	-
	50% (4.5kw)	-	-	14	25	36	46	52	70	81	98	108	123	132	139	146	152	157	161	165	182	192	200	208	215	222	300	305	310	315	320	324	328	331	335	-
	40% (3.6kw)	-	-	18	30	44	52	73	91	105	121	132	141	149	155	161	165	186	197	206	215	223	302	308	314	320	325	329	333	337	341	344	420	423	425	-
	30% (2.7kw)	-	-	25	42	53	77	100	120	134	144	153	160	166	191	204	215	225	305	313	320	326	332	337	341	346	422	425	428	432	434	437	440	442	444	-
	25% (2.25kw)	-	-	28	48	71	96	113	135	147	156	164	187	202	215	226	308	316	324	331	337	342	347	423	427	431	434	437	440	443	445	448	450	452	454	-
	20% (1.8kw)	-	-	38	61	91	112	137	150	161	182	201	217	302	312	322	330	337	343	421	426	430	434	438	441	445	447	450	452	455	457	459	461	462	464	-
	10% (0.9kw)	-	-	75	124	151	167	210	305	322	336	347	427	435	441	446	451	455	458	462	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	11	15	18	22	26	28	33	38	41	45	47	50	52	60	65	70	74	77	81	90	94	98	102	105	109	112	121	124	-	-
	90% (12.15kw)	-	-	-	6	9	13	17	21	25	28	34	38	42	46	48	51	53	64	69	74	78	81	91	96	100	104	108	111	120	124	128	131	134	-	-
	80% (10.8kw)	-	-	-	7	11	16	20	25	28	34	39	43	47	50	52	63	69	74	78	82	93	98	103	107	111	121	125	129	132	136	139	142	145	-	-
	75% (10.125kw)	-	-	-	8	12	17	21	26	31	37	42	46	49	52	63	69	74	79	83	95	100	105	109	113	123	127	131	135	139	142	145	148	150	-	-
	70% (9.45kw)	-	-	-	9	13	18	23	28	35	40	45	49	52	62	69	74	79	90	96	101	106	111	121	126	130	134	138	141	145	148	150	153	155	-	-
	60% (8.1kw)	-	-	-	11	17	22	28	36	42	47	51	60	68	75	81	93	99	105	110	121	127	132	136	140	144	148	151	154	157	159	162	164	166	-	-
	50% (6.75kw)	-	-	-	14	21	27	36	43	49	53	67	75	82	95	103	109	121	127	133	138	143	147	151	155	158	161	163	166	182	188	195	200	206	-	-
	40% (5.4kw)	-	-	-	18	27	37	45	51	65	75	83	99	107	120	128	135	141	146	151	153	159	162	166	182	190	197	204	210	216	221	226	303	308	-	-
	30% (4.05kw)	-	-	-	26	38	48	61	75	91	103	113	129	137	144	151	156	161	165	183	193	202	210	217	224	302	308	313	318	322	326	330	334	337	-	-
	25% (3.375kw)	-	-	-	32	45	53	75	93	106	124	134	143	151	157	162	167	189	200	210	218	226	305	311	317	322	327	331	336	339	343	346	422	424	-	-
	20% (2.7kw)	-	-	-	41	52	75	97	111	131	142	151	158	164	186	199	211	221	302	309	317	323	329	334	339	343	347	423	426	429	432	435	438	440	-	-
	10% (1.35kw)	-	-	-	82	121	143	158	182	206	224	311	323	333	341	421	427	433	437	442	446	449	452	455	458	460	462	464	466	480	-	-	-	-	-	-
20 kVA / 18 kW	100%	-	-	-	-	5	7	10	12	15	18	20	22	26	27	31	34	38	40	43	45	47	49	51	52	60	64	67	70	73	76	79	81	90	-	-
	90%	-	-	-	-	6	9	11	14	17	20	23	26	28	32	36	39	42	45	47	49	51	53	61	65	69	72	76	79	81	90	94	97	100	-	-
	80%	-	-	-	-	7	10	13	17	20	23	26	30	34	38	42	44	47	49	51	53	63	68	72	75	79	82	91	95	99	102	105	108	111	-	-
	75%	-	-	-	-	8	11	14	18	21	25	28	33	37	41	44	47	49	52	53	64	69	73	77	80	83	94	98	101	105	108	111	120	123	-	-
	70%	-	-	-	-	9	12	16	20	23	27	32	36	41	44	47	50	52	60	66	70	75	78	82	92	96	100	104	108	111	120	124	127	130	-	-
	60%	-	-	-	-	11	16	20	25	28	34	39	43	47	50	52	63	69	74	78	82	93	98	103	107	111	120	124	128	132	136	139	142	145	-	-
	50%	-	-	-	-	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	158	-	-
	40%	-	-	-	-	19	26	32	40	46	50	60	68	76	82	95	102	108	113	125	131	136	140	144	148	152	155	158	161	163	165	180	186	192	-	-
	30%	-	-	-	-	26	36	44	50	62	73	81	96	104	111	125	132	138	144	149	153	157	161	164	167	185	193	199	206	212	217	222	227	304	-	-
	25%	-	-	-	-	32	43	50	64	76	91	102	111	125	133	140	146	152	156	161	164	180	189	198	205	212	218	224	302	307	312	316	320	324	-	-
	20%	-	-	-	-	42	50	68	80	99	110	126	136	144	150	156	161	166	186	196	205	213	221	300	306	312	317	322	326	331	334	338	342	345	-	-
	10%	-	-	-	-	90	111	136	149	160	180	199	215	300	311	320	328	336	342	420	425	429	433	437	440	444	446	449	452	454	456	458	460	462	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.
Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

8.5 Estimated Battery Run Times: Model-number Digits 1-3 = AS5 or ASE

Figure 8.17 10-bay, 2-phase, no transformer unit Type N (UPS model-number digit 6 = N)



Use these tables if your UPS model number digits 1-3 are AS5 or ASE

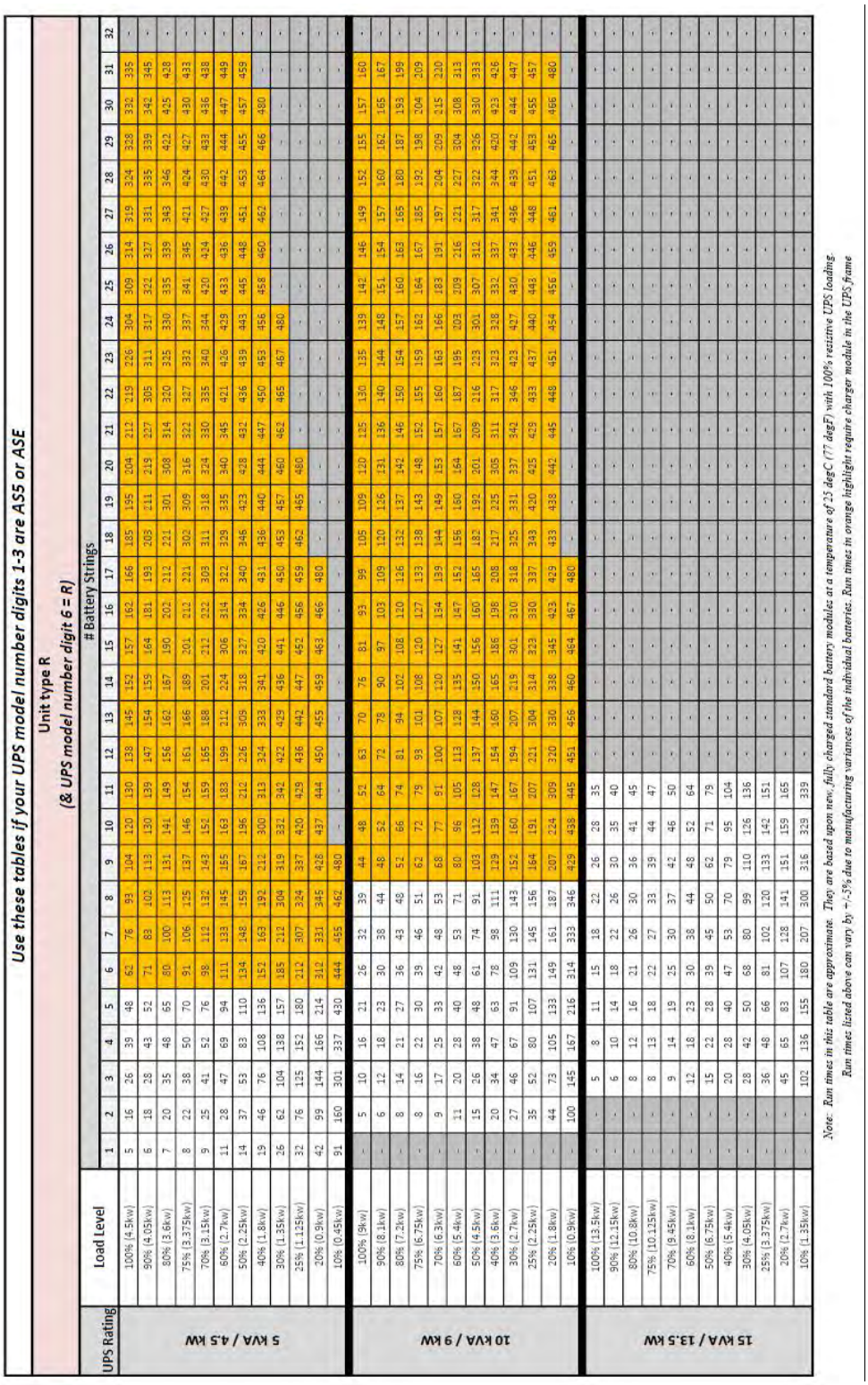
Unit type N

(& UPS model number digit 6 = N)

UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100% (4.5kw)	5	15	26	39	48	62	75	92	104	113	129	138	145	151	157	161	165	184	194	203	211	218	225	303	309	314	319	323	327	331	335	338
	90% (4.05kw)	6	18	28	43	52	71	83	103	113	130	139	147	154	159	164	182	193	203	212	220	227	305	311	317	323	327	331	335	339	342	346	421
	80% (3.6kw)	7	20	36	48	66	81	101	113	132	142	150	157	162	167	192	203	213	222	301	309	315	321	326	331	336	340	344	347	422	426	428	431
	75% (3.375kw)	8	22	39	50	71	92	107	126	138	147	155	161	167	191	203	213	223	303	310	317	323	329	334	338	342	346	422	425	428	431	434	436
	70% (3.15kw)	9	25	42	53	77	99	113	133	144	153	160	166	190	203	214	224	305	312	319	325	331	336	341	345	421	425	428	431	434	437	439	442
	60% (2.7kw)	11	28	48	71	96	113	135	147	156	164	187	203	216	227	308	317	324	331	337	342	347	423	427	431	434	438	440	443	446	448	450	452
	50% (2.25kw)	15	38	61	91	112	137	150	161	182	201	217	302	313	322	330	337	343	421	426	430	434	438	442	445	447	450	452	455	457	459	461	462
	40% (1.8kw)	20	47	79	111	139	155	166	199	216	305	318	328	337	345	423	429	434	439	443	446	450	453	455	456	460	462	464	466	480	-	-	-
	30% (1.35kw)	27	67	109	143	161	195	220	311	326	337	347	427	434	440	445	449	453	457	460	462	465	467	480	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	36	81	132	157	192	222	315	331	344	426	434	441	446	451	456	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	45	106	150	188	225	321	339	424	434	442	449	454	459	463	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	101	167	314	347	428	451	460	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	16	21	26	32	39	44	48	52	61	69	76	81	93	99	104	109	120	125	130	134	138	142	145	149	152	154	157	159	-
	90% (8.1kw)	-	6	11	18	23	28	37	43	48	52	64	71	78	83	96	103	108	113	125	130	139	140	144	147	151	154	157	159	162	164	166	-
	80% (7.2kw)	-	7	14	20	27	36	43	48	52	66	74	81	94	101	108	113	126	132	137	142	146	150	153	157	160	162	165	167	186	192	198	-
	75% (6.75kw)	-	8	15	22	28	39	45	50	62	71	79	92	100	107	113	126	133	138	143	147	151	155	158	161	164	167	185	191	158	203	209	-
	70% (6.3kw)	-	9	17	25	33	42	48	53	68	77	91	100	107	120	127	134	139	144	149	153	157	160	163	166	183	191	197	204	209	215	220	-
	60% (5.4kw)	-	12	21	30	41	48	60	72	81	97	106	120	128	136	140	148	153	157	161	164	180	189	197	204	211	217	222	300	305	309	314	-
	50% (4.5kw)	-	15	26	39	48	62	75	92	104	113	130	138	145	151	157	161	166	185	195	203	211	219	225	303	209	314	319	323	328	331	335	-
	40% (3.6kw)	-	20	35	48	65	80	101	113	131	141	149	156	162	167	191	202	212	211	301	308	314	320	326	330	335	339	343	347	422	425	428	-
	30% (2.7kw)	-	28	47	69	94	111	133	145	155	162	183	199	212	223	305	314	322	328	334	340	345	421	425	429	433	436	439	441	444	446	449	-
	25% (2.25kw)	-	37	53	83	110	134	148	159	167	196	212	226	309	318	327	334	340	346	423	428	432	436	439	443	445	448	451	453	455	457	459	-
	20% (1.8kw)	-	46	76	108	136	152	164	193	213	301	314	325	334	342	420	426	432	436	440	444	448	451	453	456	458	461	463	465	466	480	-	-
	10% (0.9kw)	-	104	148	184	222	319	336	422	432	441	447	453	458	462	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	11	15	18	22	26	28	35	39	42	45	48	50	53	62	67	71	75	79	82	92	92	97	101	104	107	111	113	123
	90% (12.15kw)	-	-	6	10	14	18	21	26	28	35	40	43	47	49	52	61	67	71	76	80	83	94	99	103	107	110	113	123	127	131	134	-
	80% (10.8kw)	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	-
	75% (10.125kw)	-	-	8	13	18	22	27	33	39	44	47	51	53	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	-
	70% (9.45kw)	-	-	9	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	-
	60% (8.1kw)	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	104	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	-
	50% (6.75kw)	-	-	16	22	30	39	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	165	167	185	192	198	204	209	-
	40% (5.4kw)	-	-	20	28	40	48	53	71	80	96	105	113	128	135	141	147	153	156	160	164	167	187	195	203	209	216	221	227	304	308	313	-
	30% (4.05kw)	-	-	28	43	51	70	82	101	112	129	138	146	152	158	163	167	190	200	209	217	224	303	309	315	320	325	329	333	337	341	344	-
	25% (3.375kw)	-	-	37	49	69	83	104	123	135	145	153	159	165	185	198	209	218	227	306	313	319	325	330	335	338	343	347	422	426	429	431	-
	20% (2.7kw)	-	-	46	67	92	109	131	143	153	161	167	195	209	220	302	311	319	326	332	338	343	347	423	427	431	434	437	440	443	445	447	-
	10% (1.35kw)	-	-	106	140	158	188	214	306	321	333	343	424	431	437	442	447	451	454	458	460	463	465	480	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.18 10-bay, 2-phase, no transformer unit Type R (UPS model-number digit 6 = R)



Use these tables if your UPS model number digits 1-3 are AS5 or ASE

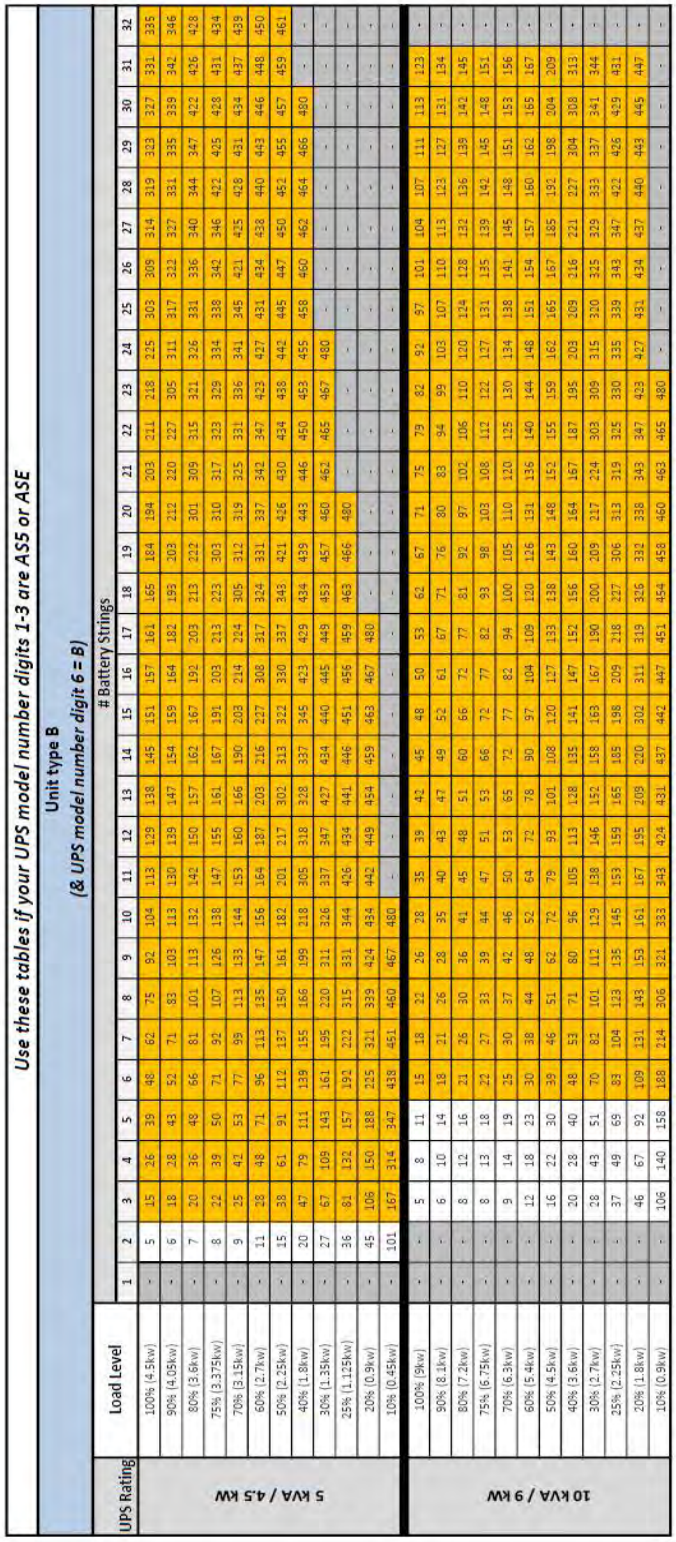
Unit type R

(& UPS model number digit 6 = R)

UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100% (4.5kw)	5	16	26	39	48	62	76	93	104	120	130	138	145	152	157	162	166	185	195	204	212	219	226	304	309	314	319	324	328	332	335	-
	90% (4.05kw)	6	18	28	43	52	71	83	102	113	130	139	147	154	159	164	181	193	203	211	219	227	305	311	317	322	327	331	335	339	342	345	-
	80% (3.6kw)	7	20	35	48	65	80	100	113	131	141	149	156	162	167	190	202	212	221	301	308	314	320	325	330	335	339	343	346	422	425	428	-
	75% (3.375kw)	8	22	38	50	70	91	106	125	137	146	154	161	166	188	189	201	212	221	302	309	316	321	327	332	337	341	345	424	427	430	433	-
	70% (3.15kw)	9	25	41	52	76	98	112	132	143	152	159	165	188	199	201	212	222	303	311	318	324	330	335	340	344	420	424	430	433	436	438	-
	60% (2.7kw)	11	28	47	69	94	111	133	145	155	163	183	199	212	224	306	314	322	329	335	340	345	421	426	429	433	436	439	442	444	447	449	-
	50% (2.25kw)	14	37	53	83	110	134	148	159	167	196	212	226	309	318	327	334	340	346	423	428	432	436	439	443	445	448	451	453	455	457	459	-
	40% (1.8kw)	19	46	76	108	136	152	163	192	212	300	313	324	333	341	420	426	431	436	440	444	447	450	453	456	458	460	462	464	466	480	-	-
	30% (1.35kw)	26	62	104	138	157	185	212	304	319	332	342	422	429	436	441	446	450	453	457	460	462	465	467	480	-	-	-	-	-	-	-	-
	25% (1.125kw)	32	76	125	152	180	212	307	324	337	430	429	436	442	447	452	456	459	462	465	480	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	42	99	144	166	214	312	331	345	428	437	444	450	455	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	91	160	301	337	430	444	455	462	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	5	10	16	21	26	32	39	44	48	52	63	70	76	81	93	99	105	109	120	125	130	135	139	142	146	149	152	155	157	160	-
	90% (8.1kw)	-	6	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	-
	80% (7.2kw)	-	8	14	21	27	36	43	48	52	66	74	81	94	102	108	120	126	132	137	142	146	150	154	157	160	163	165	180	187	193	199	-
	75% (6.75kw)	-	8	16	22	30	39	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	164	167	185	192	198	204	209	-
	70% (6.3kw)	-	9	17	25	33	42	48	53	68	77	81	100	107	120	127	134	139	144	149	153	157	160	163	166	183	191	197	204	209	215	220	-
	60% (5.4kw)	-	11	20	28	40	48	53	71	80	96	105	113	128	135	141	147	152	156	160	164	167	187	195	203	209	216	221	227	304	308	313	-
	50% (4.5kw)	-	15	26	38	48	61	74	91	103	112	128	137	144	150	156	160	165	182	193	201	209	216	223	301	307	312	317	322	326	330	333	-
	40% (3.6kw)	-	20	34	47	63	78	98	111	129	139	147	154	160	165	186	198	208	217	225	305	311	317	323	328	332	337	341	344	420	423	426	-
	30% (2.7kw)	-	27	46	67	91	109	130	143	152	160	167	194	207	219	301	310	318	325	331	337	342	346	423	427	430	433	436	439	442	444	447	-
	25% (2.25kw)	-	35	52	80	107	131	145	156	164	191	207	221	304	314	323	330	337	343	420	425	428	433	437	440	443	446	448	451	453	455	457	-
	20% (1.8kw)	-	44	73	105	133	149	161	187	207	224	309	320	330	338	345	423	429	433	438	442	445	448	451	454	456	459	461	463	465	466	480	-
	10% (0.9kw)	-	100	145	167	216	314	333	346	429	438	445	451	456	460	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	5	8	11	15	18	22	26	28	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	90% (12.15kw)	-	-	6	10	14	18	22	26	30	35	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	80% (10.8kw)	-	-	8	12	16	21	26	30	36	41	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	75% (10.125kw)	-	-	8	13	18	22	27	33	39	44	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	70% (9.45kw)	-	-	9	14	19	25	30	37	42	46	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60% (8.1kw)	-	-	12	18	23	30	38	44	48	52	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50% (6.75kw)	-	-	15	22	28	39	45	50	62	71	79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40% (5.4kw)	-	-	20	28	40	47	53	70	79	95	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30% (4.05kw)	-	-	28	42	50	68	80	99	110	126	136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25% (3.375kw)	-	-	36	48	66	81	102	120	133	142	151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (2.7kw)	-	-	45	65	83	107	128	141	151	159	165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (1.35kw)	-	-	102	136	155	180	207	300	316	329	339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.19 10-bay, 2-phase, no transformer unit Type B (UPS model-number digit 6 = B)



Use these tables if your UPS model number digits 1-3 are AS5 or ASE

Unit type B

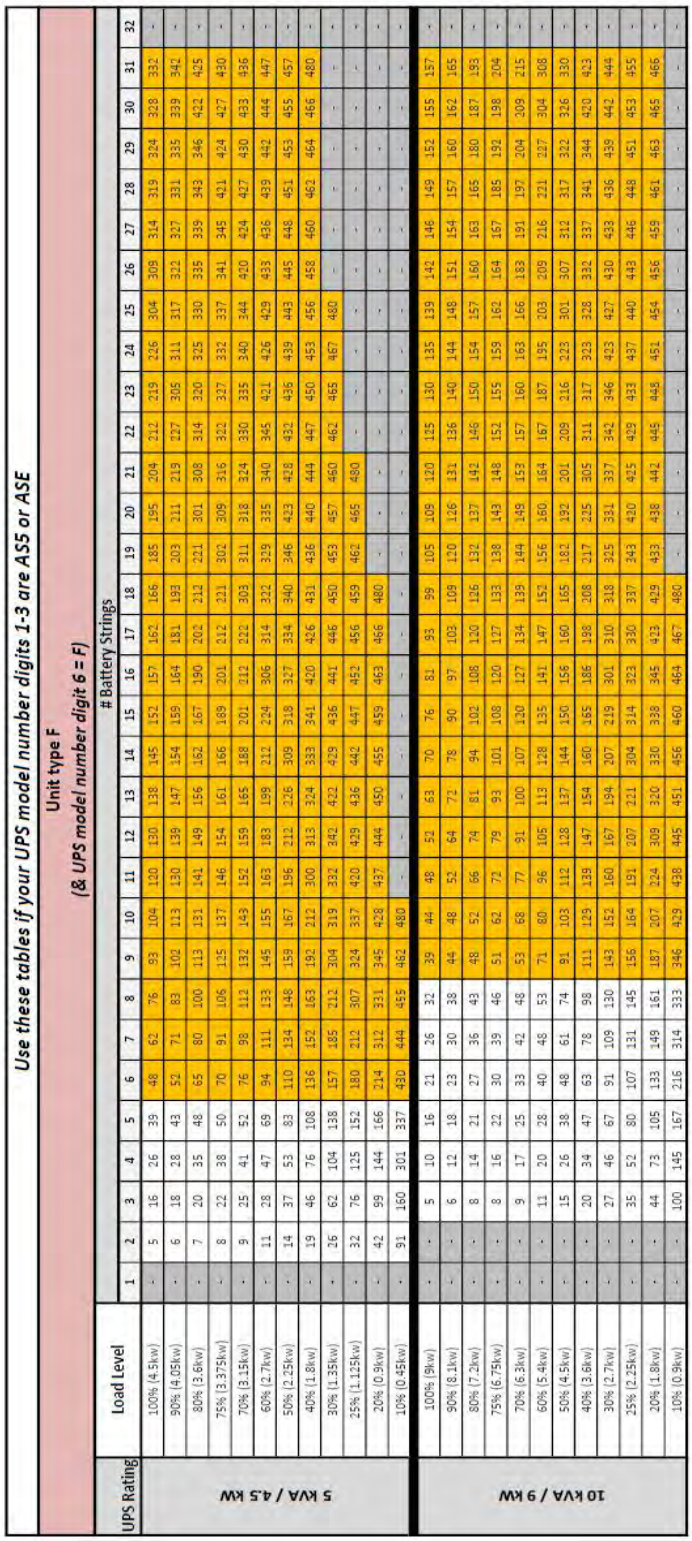
(& UPS model number digit 6 = B)

UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100% (4.5kw)	-	5	15	26	39	48	62	75	92	104	113	129	138	145	151	157	161	165	184	194	203	211	218	225	303	309	314	319	323	327	331	335
	90% (4.05kw)	-	6	18	28	43	52	71	83	103	113	130	139	147	154	159	164	182	193	203	212	220	227	305	311	317	322	327	331	335	339	342	346
	80% (3.6kw)	-	7	20	36	48	66	81	101	113	132	142	150	157	162	167	192	203	213	222	301	309	315	321	326	331	336	340	344	347	422	426	428
	75% (3.375kw)	-	8	22	39	50	71	92	107	126	138	147	155	161	167	191	203	213	223	303	310	317	323	329	334	338	342	346	422	425	428	431	434
	70% (3.15kw)	-	9	25	42	53	77	99	113	133	144	153	160	166	190	203	214	224	305	312	319	325	331	336	341	345	421	425	428	431	434	437	439
	60% (2.7kw)	-	11	28	48	71	96	113	135	147	156	164	187	203	216	227	308	317	324	331	337	342	347	423	427	431	434	438	440	443	446	448	450
	50% (2.25kw)	-	15	38	61	91	112	137	150	161	182	201	217	302	313	322	330	337	343	421	436	430	434	438	442	445	447	450	452	455	457	459	461
	40% (1.8kw)	-	20	47	79	111	139	155	166	199	218	305	318	328	337	345	423	429	434	439	443	446	450	453	455	458	460	462	464	466	480	-	-
	30% (1.35kw)	-	27	67	109	143	161	195	220	311	326	337	347	427	434	440	445	449	453	457	460	462	465	467	480	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	36	81	132	157	192	222	315	331	344	426	434	441	446	451	456	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	45	106	150	188	225	321	339	424	434	442	449	454	459	463	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	101	167	314	347	438	451	460	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	8	11	15	18	22	26	28	35	39	42	45	48	50	53	62	67	71	75	79	82	92	97	101	104	107	111	113	123	-
	90% (8.1kw)	-	-	6	10	14	18	21	26	28	35	40	43	47	49	52	61	67	71	76	80	83	94	99	103	107	110	113	123	127	131	134	-
	80% (7.2kw)	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	-
	75% (6.75kw)	-	-	8	13	18	22	27	33	39	44	47	51	53	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	-
	70% (6.3kw)	-	-	9	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	-
	60% (5.4kw)	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	104	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	-
	50% (4.5kw)	-	-	16	22	30	39	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	165	167	185	192	198	204	209	-
	40% (3.6kw)	-	-	20	28	40	48	53	71	80	96	105	113	128	135	141	147	152	156	160	164	167	187	195	203	209	216	221	227	304	308	313	-
	30% (2.7kw)	-	-	28	43	51	70	82	101	112	129	138	146	152	158	163	167	190	200	209	217	224	303	309	315	320	325	329	333	337	341	344	-
	25% (2.25kw)	-	-	37	49	69	83	104	123	135	145	153	159	165	185	198	209	218	227	306	313	319	325	330	335	339	343	347	422	426	429	431	-
	20% (1.8kw)	-	-	46	67	92	109	131	143	153	161	167	195	209	220	302	311	319	326	332	338	343	347	423	427	431	434	437	440	443	445	447	-
	10% (0.9kw)	-	-	106	140	158	188	214	306	321	333	343	424	431	437	442	447	451	454	458	460	463	465	480	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.

Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.20 10-bay, 2-phase, no transformer unit Type F (UPS model-number digit 6 = F)



Use these tables if your UPS model number digits 1-3 are AS5 or ASE

Unit type F

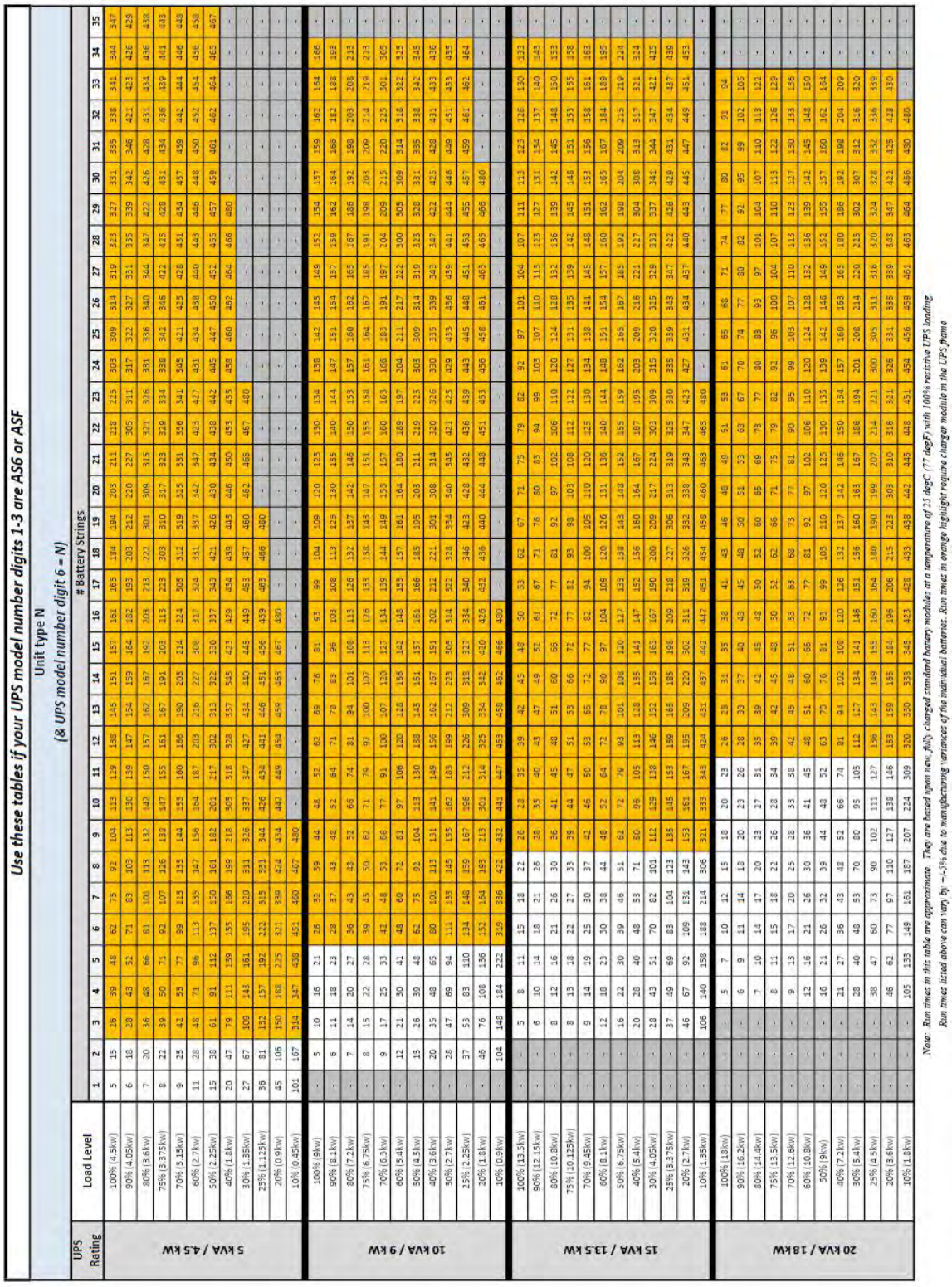
(& UPS model number digit 6 = F)

UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
5 kVA / 4.5 kW	100% (4.5kw)	-	5	16	26	39	48	62	76	93	104	120	130	138	145	152	157	162	166	185	195	204	212	219	226	304	309	314	319	324	328	332	-
	90% (4.05kw)	-	6	18	28	43	52	71	83	102	113	130	139	147	154	159	164	181	193	203	211	219	227	305	311	317	322	327	331	335	339	342	-
	80% (3.6kw)	-	7	20	35	48	65	80	100	113	131	141	149	156	162	167	190	202	212	221	301	308	314	320	325	330	335	339	343	346	422	425	-
	75% (3.375kw)	-	8	22	38	50	70	91	106	125	137	146	154	161	166	169	201	212	221	302	309	316	322	327	332	337	341	345	421	424	427	430	-
	70% (3.15kw)	-	9	25	41	52	76	98	112	132	143	152	159	165	168	201	212	222	303	311	318	324	330	335	340	344	420	424	427	430	433	436	-
	60% (2.7kw)	-	11	28	47	69	94	111	133	145	155	163	183	199	212	224	306	314	322	329	335	340	345	421	426	429	433	436	439	442	444	447	-
	50% (2.25kw)	-	14	37	53	83	110	134	148	159	167	196	212	226	309	318	327	334	340	346	433	428	432	436	439	443	445	448	451	453	455	457	-
	40% (1.8kw)	-	19	46	76	108	136	152	163	192	212	300	313	324	333	341	420	426	431	436	440	444	447	450	453	456	458	460	462	464	466	480	-
	30% (1.35kw)	-	26	62	104	138	157	185	212	304	319	332	342	422	429	436	441	446	450	463	457	460	462	465	467	480	-	-	-	-	-	-	-
	25% (1.125kw)	-	32	76	125	152	180	212	307	324	337	420	429	436	442	447	452	456	459	462	465	480	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	42	99	144	166	214	312	331	345	428	437	444	450	455	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	91	160	301	337	430	444	455	462	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	16	21	26	32	39	44	48	52	63	70	76	81	93	99	105	108	120	125	130	135	139	142	146	149	152	155	157	-
	90% (8.1kw)	-	-	6	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	165	-
	80% (7.2kw)	-	-	8	14	21	27	36	43	48	52	66	74	81	94	102	108	120	126	132	137	142	146	150	154	157	160	163	165	180	187	193	-
	75% (6.75kw)	-	-	8	16	22	30	39	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	164	167	185	192	198	204	-
	70% (6.3kw)	-	-	9	17	25	33	42	48	53	68	77	91	100	107	120	127	134	139	144	148	153	157	160	163	166	183	191	197	204	209	215	-
	60% (5.4kw)	-	-	11	20	28	40	48	53	71	80	96	105	113	128	135	141	147	152	156	160	164	167	187	195	203	209	216	221	227	304	308	-
	50% (4.5kw)	-	-	15	26	38	48	61	74	91	103	112	128	137	144	150	156	160	165	182	192	201	209	216	223	301	307	312	317	322	326	330	-
	40% (3.6kw)	-	-	20	34	47	63	78	98	111	129	139	147	154	160	165	186	198	208	217	225	305	311	317	323	328	332	337	341	344	420	423	-
	30% (2.7kw)	-	-	27	46	67	91	109	130	143	152	160	167	194	207	219	301	310	318	325	331	337	342	346	423	427	430	433	436	439	442	444	-
	25% (2.25kw)	-	-	35	52	80	107	131	145	156	164	191	207	211	304	314	323	330	337	343	430	425	429	433	437	440	443	446	448	451	453	455	-
	20% (1.8kw)	-	-	44	73	105	133	149	161	187	207	224	309	320	330	338	345	423	429	433	438	442	445	448	451	454	456	459	461	463	465	466	-
	10% (0.9kw)	-	-	100	145	167	216	314	333	346	429	438	445	451	456	460	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

8.6 Estimated Battery Run Times: Model-number Digits 1-3 = AS6 or ASF

Figure 8.21 16-bay, 2-phase, no transformer unit Type N (UPS model-number digit 6 = N)



Use these tables if your UPS model number digits 1-3 are AS6 or ASF

Unit type N

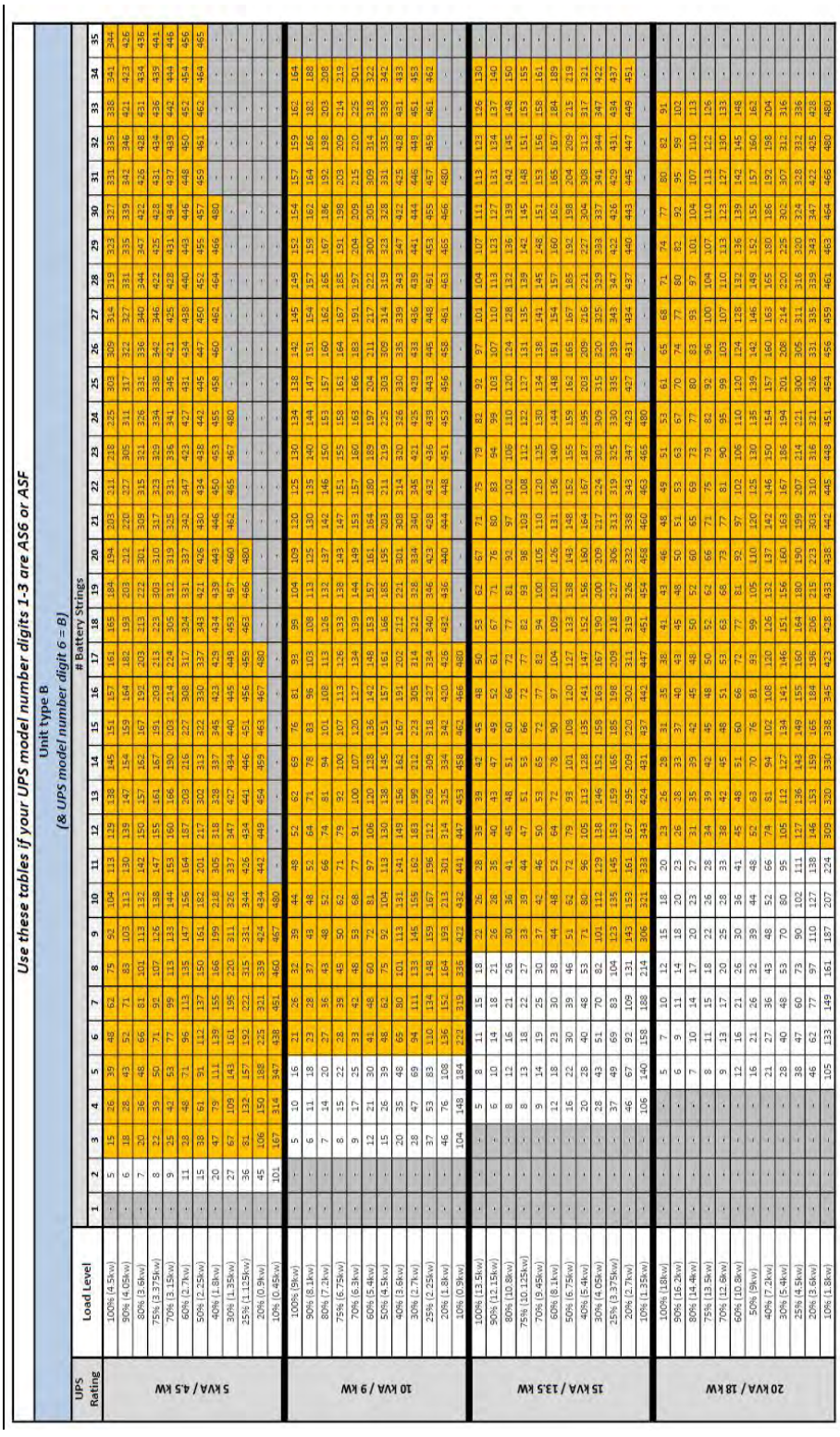
(& UPS model number digit 6 = N)

UPS Rating	Load Level	# Battery Strings																																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kW)	5	15	26	39	48	62	75	92	104	113	129	138	145	151	157	161	165	194	194	203	211	218	225	303	309	314	319	323	327	331	335	338	341	344	347
	90% (4.05kW)	6	18	28	43	52	71	83	103	113	130	139	147	154	159	164	167	182	193	203	212	220	227	305	311	317	322	331	335	339	342	346	421	423	426	429
	80% (3.6kW)	7	30	36	48	66	81	101	115	132	142	150	157	162	167	192	203	213	222	301	309	315	321	326	331	336	340	344	347	422	426	428	431	434	436	438
	75% (3.375kW)	8	22	39	50	71	92	107	126	130	147	155	161	167	191	203	213	223	303	310	317	323	329	334	338	342	346	422	425	428	491	434	436	439	441	445
	70% (3.15kW)	9	25	42	53	77	99	113	133	144	153	160	166	180	203	214	224	305	312	319	325	331	336	341	345	421	428	431	434	437	439	442	444	446	448	
	60% (2.7kW)	11	28	48	71	96	113	135	147	156	164	187	203	216	227	300	317	324	331	337	342	347	423	427	431	434	438	440	443	446	448	450	452	454	456	458
	50% (2.25kW)	15	38	61	91	112	137	150	161	182	201	217	302	313	322	330	337	343	421	426	430	434	438	442	445	447	450	452	455	457	459	461	462	464	465	467
	40% (1.8kW)	20	47	79	111	139	155	166	199	218	305	318	328	337	345	423	429	434	439	443	446	450	453	455	458	460	462	464	466	480	-	-	-	-	-	-
	30% (1.35kW)	27	67	109	148	161	195	220	311	326	337	347	427	434	440	445	449	453	457	460	462	465	467	480	-	-	-	-	-	-	-	-	-	-	-	-
	25% (1.125kW)	36	81	132	157	192	222	315	331	344	426	438	441	446	451	456	459	465	486	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kW)	45	106	150	168	225	321	339	424	454	442	449	454	459	463	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kW)	101	167	314	347	428	451	460	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kW)	-	5	10	16	21	26	32	39	44	48	52	62	69	76	81	93	99	104	109	120	125	130	134	138	142	145	149	152	154	157	159	162	164	166	-
	90% (8.1kW)	-	6	11	18	23	28	37	43	48	52	64	71	78	83	96	103	108	113	125	130	135	140	144	147	151	154	157	159	162	164	166	182	188	193	-
	80% (7.2kW)	-	7	14	20	27	36	43	48	52	66	74	81	94	101	100	113	126	132	137	142	146	150	153	157	160	162	165	167	186	192	198	203	208	213	-
	75% (6.75kW)	-	8	15	22	28	39	45	50	62	71	92	100	107	113	126	135	138	143	147	151	155	158	161	164	167	185	191	198	203	209	214	219	-		
	70% (6.3kW)	-	9	17	25	33	42	48	53	68	77	91	100	107	120	127	134	139	144	149	153	157	161	164	180	189	197	204	211	217	222	300	305	309	314	305
	60% (5.4kW)	-	12	21	30	41	48	60	72	81	97	106	120	128	136	142	148	153	157	161	166	185	195	203	211	219	225	303	309	314	319	325	328	331	335	322
	50% (4.5kW)	-	15	26	39	48	62	75	92	104	113	130	138	145	151	157	161	166	185	195	203	211	219	225	303	309	314	319	325	328	331	335	338	342	345	-
	40% (3.6kW)	-	20	35	48	65	80	101	113	131	141	149	156	162	167	191	202	212	221	301	308	314	320	326	330	335	339	343	347	422	425	428	431	433	436	-
	30% (2.7kW)	-	28	47	69	94	111	133	145	155	182	183	199	212	223	305	314	322	328	334	340	345	421	425	429	433	436	439	441	444	446	448	451	453	455	-
	25% (2.25kW)	-	37	53	83	110	134	148	159	167	196	212	226	309	318	327	334	340	346	423	428	432	436	439	443	445	448	451	453	455	457	459	461	462	464	-
	20% (1.8kW)	-	46	76	108	136	152	164	193	213	303	314	325	334	342	410	426	432	436	440	444	448	451	453	456	458	461	463	465	466	480	-	-	-	-	-
	10% (0.9kW)	-	104	148	184	222	319	336	422	432	441	447	451	458	462	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kW)	-	-	5	8	11	15	18	22	26	28	35	39	42	45	48	50	53	62	67	71	75	79	82	92	97	101	104	107	111	113	123	126	130	133	-
	90% (12.15kW)	-	-	6	10	14	18	21	26	28	35	40	43	47	49	52	61	67	71	76	80	83	94	99	103	107	110	113	123	127	131	134	137	140	143	-
	80% (10.8kW)	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	114	118	132	136	139	142	145	148	150	153	-	
	75% (10.125kW)	-	-	8	13	18	22	27	33	39	44	47	51	53	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	153	155	158	-
	70% (9.45kW)	-	-	9	14	19	25	30	37	42	46	50	55	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	158	161	163	-
	60% (8.1kW)	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	104	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	184	189	195	-
	50% (6.75kW)	-	-	16	22	30	39	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	165	167	185	192	193	204	209	215	219	224	-
	40% (5.4kW)	-	-	20	28	40	48	59	71	80	96	105	113	128	135	141	147	152	156	160	164	167	187	195	203	209	216	221	227	304	306	313	317	321	324	-
	30% (4.05kW)	-	-	28	43	51	70	82	101	112	129	138	146	152	158	163	167	190	200	209	217	224	303	309	315	320	315	329	333	337	341	344	347	421	425	-
	25% (3.375kW)	-	-	37	49	69	85	104	123	135	145	153	159	165	185	198	209	218	227	306	313	319	325	330	335	339	343	347	422	426	429	431	434	437	439	-
	20% (2.7kW)	-	-	46	67	92	109	134	143	153	161	167	195	209	220	302	311	319	326	332	338	343	347	413	427	431	434	437	440	443	445	447	449	451	453	-
	10% (1.35kW)	-	-	106	140	158	188	214	306	321	333	343	424	431	437	442	447	451	454	458	460	463	465	480	-	-	-	-	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kW)	-	-	-	5	7	10	12	15	18	20	23	26	28	31	35	38	41	43	46	48	49	51	53	61	65	68	71	74	77	80	82	83	84	-	-
	90% (16.2kW)	-	-	-	6	9	11	14	18	20	23	26	28	33	37	40	43	45	48	50	51	53	63	67	70	74	77	80	82	92	95	99	102	105	-	-
	80% (14.4kW)	-	-	-	7	10	14	17	20	23	27	31	35	39	42	45	48	50	52	60	65	69	73	77	80	83	93	97	101	104	107	110	113	122	-	-
	75% (13.5kW)	-	-	-	8	11	15	18	22	26	28	34	39	42	45	48	50	52	62	66	71	75	79	82	92	96	100	104	107	110	113	122	126	129	-	-
	70% (12.6kW)	-	-	-	9	13	17	20	25	28	33	38	42	45	48	51	53	63	68	73	77	81	90	95	99	103	107	110	113	123	127	130	133	136	-	-
	60% (10.8kW)	-	-	-	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	148	150	-	-
	50% (9kW)	-	-	-	16	21	26	32	39	44	48	52	63	70	76	81	93	99	105	110	110	135	130	135	139	142	146	149	152	155	157	160	162	164	-	-
	40% (7.2kW)	-	-	-	21	27	36	43	48	52	66	74	81	84	102	108	120	126	133	137	142	146	150	157	160	163	165	180	186	192	198	204	209	-	-	-
	30% (5.4kW)	-	-	-	28	40	48	53	70	80	95	105	112	127	134	141	148	151	156	160	163	167	168	194	201	208	214	230	235	302	307	312	316	320	-	-
	25% (4.5kW)	-	-	-	38	47	60	73	90	102	111	127	136	143	149	155	160	164	180	190	199	207	214	221	300	305	311	316	320	324	328	332	336	339	-	-
	20% (3.6kW)	-	-	-	46	62	77	97	110	127	138	146	153	159	165	184	196	206	215	223	305	310	316	321	326	331	335	339	343	347	422	425	428	430	-	-
	10% (1.8kW)	-	-	-	105	133	149	161	187	207	214	309	320	330	338	345	423	428	433	438	442	445	448	451	454	456	459	461	463	464	466	480	480	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.

Run times listed above can vary by +-15% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.22 16-bay, 2-phase, no transformer unit Type R (UPS model-number digit 6 = R)



Use these tables if your UPS model number digits 1-3 are AS6 or ASF

Unit type B

(& UPS model number digit 6 = B)

UPS Rating	Load Level	# Battery Strings																																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	-	5	15	26	39	48	62	75	92	104	113	129	138	145	151	157	161	165	184	194	203	211	218	225	303	309	314	319	323	327	331	335	338	341	344
	90% (4.05kw)	-	6	18	28	43	52	71	83	103	113	130	139	147	154	159	164	182	193	203	212	220	227	305	311	317	322	327	331	335	339	342	346	421	423	426
	80% (3.6kw)	-	7	20	36	48	66	81	101	113	133	142	150	157	162	167	171	203	213	222	301	309	315	321	326	331	336	340	344	247	422	426	428	431	434	436
	75% (3.375kw)	-	8	22	39	50	71	92	107	126	138	147	155	161	167	171	203	213	223	303	310	317	323	329	334	338	342	346	422	425	428	431	434	436	439	441
	70% (3.15kw)	-	9	25	42	53	77	99	113	133	144	153	160	166	190	203	214	224	305	312	319	325	331	336	341	345	421	425	428	431	434	437	439	442	444	446
	60% (2.7kw)	-	11	28	48	71	96	113	135	147	156	164	167	203	216	227	308	317	324	331	337	342	347	423	427	431	434	438	440	443	446	448	450	452	454	456
	50% (2.25kw)	-	15	38	61	91	112	137	150	161	182	201	217	302	313	322	330	337	343	421	426	430	434	438	442	445	447	450	452	455	457	459	461	462	464	465
	40% (1.8kw)	-	20	47	79	111	139	155	166	199	218	305	318	328	337	345	423	429	434	439	443	446	450	453	455	458	460	462	464	466	480	-	-	-	-	-
	30% (1.35kw)	-	27	67	109	143	161	195	220	311	326	344	427	434	440	445	449	453	457	460	462	465	467	469	480	-	-	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	36	81	132	157	192	222	315	331	344	426	434	441	446	451	456	458	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	45	106	150	188	225	321	339	424	434	442	449	454	459	463	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	101	167	314	347	438	461	460	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	16	21	26	32	39	44	48	52	62	69	76	81	93	99	104	109	120	125	130	134	138	142	145	149	153	154	157	159	162	164	-
	90% (8.1kw)	-	-	6	11	18	29	28	37	49	48	52	64	71	78	83	96	103	108	113	125	130	135	140	144	147	151	154	157	155	162	164	166	182	188	-
	80% (7.2kw)	-	-	7	14	20	27	36	43	48	52	66	74	81	94	101	108	113	126	132	137	142	146	150	153	157	160	162	165	167	196	192	198	203	208	-
	75% (6.75kw)	-	-	8	15	22	28	39	45	50	62	71	79	92	100	107	113	126	133	138	143	147	151	155	158	161	164	167	185	191	198	203	209	214	219	-
	70% (6.3kw)	-	-	9	17	25	33	42	46	53	68	77	91	100	107	120	127	134	139	144	149	153	157	160	163	166	183	191	197	204	209	215	220	225	301	-
	60% (5.4kw)	-	-	12	21	30	41	48	60	72	81	97	106	120	128	136	142	148	153	157	161	164	180	189	197	204	211	217	222	300	305	309	314	318	322	-
	50% (4.5kw)	-	-	15	26	39	48	62	75	92	104	113	130	138	145	151	157	161	166	185	195	203	211	219	225	303	305	314	319	323	328	331	335	338	342	-
	40% (3.6kw)	-	-	20	35	48	65	80	101	113	131	141	149	156	162	167	191	202	212	221	301	308	314	320	326	330	335	339	343	347	422	425	428	431	433	-
	30% (2.7kw)	-	-	28	47	69	94	111	133	146	155	162	183	190	212	223	305	314	322	328	334	340	345	421	425	429	433	436	439	441	444	446	449	461	453	-
	25% (2.25kw)	-	-	37	53	83	110	134	148	159	167	196	212	226	309	318	327	334	340	346	423	428	432	436	439	443	445	448	451	453	455	457	459	461	462	-
	20% (1.8kw)	-	-	46	76	108	136	152	164	193	213	301	314	325	334	342	420	426	432	436	440	444	448	451	453	456	458	461	463	465	466	480	-	-	-	-
	10% (0.9kw)	-	-	104	148	184	222	319	336	422	432	441	447	453	458	462	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	11	15	18	22	25	28	35	39	42	45	48	50	53	62	67	71	75	79	82	92	97	101	104	107	111	113	123	126	130	-
	90% (12.15kw)	-	-	-	6	10	14	18	21	26	28	35	40	43	47	49	52	61	67	71	76	80	83	94	99	103	107	110	113	123	127	131	134	137	140	-
	80% (10.8kw)	-	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	148	150	-
	75% (10.125kw)	-	-	-	8	13	18	22	27	33	39	44	47	51	55	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	153	155	-
	70% (9.45kw)	-	-	-	9	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	158	161	-
	60% (8.1kw)	-	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	104	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	184	189	-
	50% (6.75kw)	-	-	-	16	22	30	39	46	51	62	72	79	93	101	109	120	127	133	138	143	148	152	155	159	162	165	167	185	192	198	204	209	215	219	-
	40% (5.4kw)	-	-	-	20	28	40	48	53	71	80	96	105	113	128	135	141	147	152	156	160	164	167	187	195	203	206	216	221	227	304	308	313	317	321	-
	30% (4.05kw)	-	-	-	28	43	51	70	82	101	112	129	138	146	152	158	163	167	190	200	209	217	224	303	309	315	320	325	329	333	337	341	344	347	422	-
	25% (3.375kw)	-	-	-	37	49	69	83	104	123	135	145	153	159	165	185	198	209	218	227	306	313	319	325	330	335	339	343	347	422	426	429	431	434	437	-
	20% (2.7kw)	-	-	-	46	67	92	109	131	143	153	161	167	195	209	220	302	311	319	326	332	338	343	347	423	427	431	434	437	440	443	445	447	449	451	-
	10% (1.35kw)	-	-	-	106	140	158	188	214	206	311	333	343	424	431	437	442	447	451	454	458	460	463	465	480	-	-	-	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	-	5	7	10	12	15	18	20	23	26	28	31	35	38	41	43	46	48	49	51	53	61	65	68	71	74	77	80	82	91	-	-
	90% (16.2kw)	-	-	-	-	6	9	11	14	18	20	23	26	28	33	37	40	43	45	48	50	51	53	63	67	70	74	77	80	82	92	95	99	102	-	-
	80% (14.4kw)	-	-	-	-	7	10	14	17	20	23	27	31	35	39	42	45	48	50	52	60	65	69	73	77	80	83	93	97	101	104	107	110	113	-	-
	75% (13.5kw)	-	-	-	-	8	11	15	18	22	26	28	34	39	42	45	48	50	52	62	66	71	75	79	82	92	96	100	104	107	110	113	122	126	-	-
	70% (12.6kw)	-	-	-	-	9	13	17	20	25	28	33	38	42	45	48	51	53	63	68	73	77	81	90	95	99	103	107	110	113	123	127	130	133	-	-
	60% (10.8kw)	-	-	-	-	12	16	21	26	30	36	41	45	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	148	-	-	-
	50% (9kw)	-	-	-	-	16	21	26	32	39	44	48	52	63	70	76	81	93	99	105	110	120	125	130	135	139	141	146	149	152	155	157	160	162	-	-	-
	40% (7.2kw)	-	-	-	-	21	27	36	43	48	52	66	74	81	94	102	108	120	126	132	137	142	146	150	154	157	160	163	165	180	186	192	198	204	-	-	-
	30% (5.4kw)	-	-	-	-	28	40	48	53	70	80	95	105	112	127	134	141	146	151	156	160	163	167	186	194	201	208	214	220	225	302	307	312	316	-	-	-
	25% (4.5kw)	-	-	-	-	38	47	60	73	90	102	111	127	136	143	149	155	160	164	180	190	199	207	214	221	300	305	311	316	320	324	328	332	336	-	-	-
	20% (3.6kw)	-	-	-	-	46	62	77	97	110	127	138	146	153	159	165	184	196	206	215	223	303	310	316	321	326	331	335	339	343	347	422	425	428	-	-	-
	10% (1.8kw)	-	-	-	-	105	133	149	161	187	207	224	269	320	330	338	345	423	428	433	438	442	445	448	851	454	456	459	461	464	466	468	480	-	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading.
Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.23 16-bay, 2-phase, no transformer unit Type B (UPS model-number digit 6 = B)

Use these tables if your UPS model number digits 1-3 are AS6 or ASF

Unit type F
(& UPS model number digit 6 = F)

UPS Rating	Load Level	# Battery Strings																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	-	5	16	26	39	48	62	76	93	104	120	130	138	145	152	157	162	166	185	195	204	212	219	226	304	309	314	319	324	328	332	335	339	342	-
	90% (4.05kw)	-	6	18	28	43	52	71	83	102	113	130	139	147	154	159	164	181	193	203	211	219	227	305	311	317	322	327	331	335	339	342	345	420	423	-
	80% (3.6kw)	-	7	20	35	48	65	80	100	113	131	141	149	156	162	167	190	202	212	221	301	308	314	320	325	330	335	339	343	346	422	425	428	431	433	-
	75% (3.375kw)	-	8	22	38	50	70	91	106	125	137	146	154	161	166	189	201	212	221	302	309	316	322	327	332	337	341	345	421	424	427	430	433	436	438	-
	70% (3.15kw)	-	9	25	41	52	76	98	112	132	143	152	159	165	188	201	212	222	303	311	318	324	330	335	340	344	420	424	427	430	433	436	438	441	443	-
	60% (2.7kw)	-	11	28	47	69	94	111	133	145	155	163	183	199	212	224	306	314	322	329	335	340	345	421	426	429	433	436	439	442	444	447	449	451	453	-
	50% (2.25kw)	-	14	37	53	83	110	134	148	159	167	196	212	226	309	318	327	334	340	346	423	428	432	436	439	443	445	448	451	453	455	457	459	461	462	-
	40% (1.8kw)	-	19	46	76	108	136	152	163	192	212	300	313	324	333	341	420	426	431	436	440	444	447	450	453	456	458	460	462	464	466	480	-	-	-	-
	30% (1.35kw)	-	26	62	104	138	157	185	212	304	319	332	342	422	429	436	441	446	450	453	457	460	462	465	467	480	-	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	32	76	125	152	180	212	307	324	337	420	429	436	442	447	452	456	459	462	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	42	99	144	166	214	312	331	345	428	437	444	450	455	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	91	160	301	337	430	444	455	462	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	16	21	26	32	39	44	48	52	63	70	76	81	93	99	105	109	120	125	130	135	139	142	146	149	152	155	157	160	162	164	-
	90% (8.1kw)	-	-	6	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	183	189	-
	80% (7.2kw)	-	-	8	14	21	27	36	43	48	52	66	74	81	94	102	108	120	126	132	137	142	146	150	154	157	160	163	165	180	187	193	199	204	209	-
	75% (6.75kw)	-	-	8	16	22	30	39	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	164	167	185	192	198	204	209	214	219	-
	70% (6.3kw)	-	-	9	17	25	33	42	48	53	68	77	91	100	107	120	127	134	139	144	149	153	157	160	163	166	183	191	197	204	209	215	220	225	301	-
	60% (5.4kw)	-	-	11	20	28	40	48	53	71	80	96	105	113	128	135	141	147	152	156	160	164	167	187	195	203	209	216	221	227	304	308	313	317	321	-
	50% (4.5kw)	-	-	15	26	38	48	61	74	91	103	112	128	137	144	150	156	160	165	182	192	201	209	216	223	301	307	312	317	322	326	330	333	337	340	-
	40% (3.6kw)	-	-	20	34	47	63	78	98	111	129	139	147	154	160	165	186	198	208	217	225	305	311	317	323	328	332	337	341	344	420	423	426	429	431	-
	30% (2.7kw)	-	-	27	46	67	91	109	130	143	152	160	167	194	207	219	301	310	318	325	331	337	342	346	423	427	430	433	436	439	442	444	447	449	451	-
	25% (2.25kw)	-	-	35	52	80	107	131	145	156	164	191	207	221	304	314	323	330	337	343	420	425	429	433	437	440	443	446	448	451	453	455	457	459	461	-
	20% (1.8kw)	-	-	44	73	105	133	149	161	187	207	224	309	320	330	338	345	423	429	433	438	442	445	448	451	454	456	459	461	463	465	466	480	-	-	-
	10% (0.9kw)	-	-	100	145	167	216	314	333	346	429	438	445	451	456	460	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	11	15	18	22	26	28	35	39	42	45	48	50	53	62	67	71	75	79	82	92	97	100	104	107	111	113	123	126	-	-
	90% (12.15kw)	-	-	-	6	10	14	18	22	26	30	35	40	44	47	50	52	61	67	72	76	80	90	94	99	103	107	110	120	124	127	131	134	137	-	-
	80% (10.8kw)	-	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	148	-	-
	75% (10.125kw)	-	-	-	8	13	18	22	27	33	39	44	47	51	53	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	153	-	-
	70% (9.45kw)	-	-	-	9	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	158	-	-
	60% (8.1kw)	-	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	164	167	183	-	-
	50% (6.75kw)	-	-	-	15	22	28	39	45	50	62	71	79	92	100	107	113	126	132	138	143	147	151	155	158	161	164	167	184	191	197	203	208	213	-	-
	40% (5.4kw)	-	-	-	20	28	40	47	53	70	79	95	104	112	126	134	140	146	151	155	159	163	166	185	193	200	207	214	219	225	302	307	311	315	-	-
	30% (4.05kw)	-	-	-	28	42	50	68	80	99	110	126	136	144	151	156	161	166	186	196	205	214	221	300	306	312	317	322	327	331	335	338	342	345	-	-
	25% (3.375kw)	-	-	-	36	48	66	81	102	120	133	142	151	157	163	181	193	204	214	223	303	310	316	322	327	332	337	341	345	420	423	426	429	432	-	-
	20% (2.7kw)	-	-	-	45	65	83	107	128	141	151	159	165	190	204	216	226	307	315	322	329	334	340	344	421	425	428	432	435	438	440	443	445	447	-	-
	10% (1.35kw)	-	-	-	102	136	155	180	207	300	316	329	339	420	427	433	439	444	448	452	455	458	461	463	466	480	-	-	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	-	5	7	10	12	15	18	20	23	26	28	32	35	38	41	44	46	48	50	51	53	61	65	69	72	75	78	80	83	92	-	-
	90% (16.2kw)	-	-	-	-	6	9	11	14	18	20	23	26	28	33	37	40	43	45	48	50	51	53	63	67	70	74	77	80	83	92	95	99	102	-	-
	80% (14.4kw)	-	-	-	-	7	10	14	17	20	23	27	31	35	39	42	45	48	50	52	60	65	69	73	77	80	83	93	97	100	104	107	110	113	-	-
	75% (13.5kw)	-	-	-	-	8	11	15	18	22	26	28	34	38	42	45	48	50	52	61	66	71	75	79	82	92	96	100	103	107	110	113	122	126	-	-
	70% (12.6kw)	-	-	-	-	9	13	17	20	25	28	33	38	42	45	48	50	53	63	68	73	77	80	90	95	99	103	107	110	113	123	126	130	133	-	-
	60% (10.8kw)	-	-	-	-	11	16	20	25	28	36	41	45	48	51	53	66	71	76	81	91	97	101	106	110	113	124	128	132	135	139	142	145	147	-	-
	50% (9kw)	-	-	-	-	15	20	26	32	39	44	48	52	62	69	75	81	92	99	104	109	113	125	130	134	138	142	145	148	151	154	157	159	161	-	-
	40% (7.2kw)	-	-	-	-	20	27	35	42	48	52	65	73	80	93	101	107	113	125	131	136	141	145	149	153	156	159	162	165	167	184	191	197	202	-	-
	30% (5.4kw)	-	-	-	-	28	39	47	53	69	79	94	103	111	125	133	139	145	150	155	159	162	166	183	191	198	205	212	218	223	300	305	310	314	-	-
	25% (4.5kw)	-	-	-	-	37	46	53	72	82	100	110	125	134	141	148	153	158	162	166	186	196	204	212	218	225	303	308	313	318	322	326	330	334	-	-
	20% (3.6kw)	-	-	-	-	46	60	76	95	108	125	136	144	152	158	163	180	192	202	212	220	300	306	313	318	324	328	333	337	341	344	420	423	426	-	-
	10% (1.8kw)	-	-	-	-	102	129	146	159	180	201	218	304	316	326	334	341	420	425	430	435	439	443	446	449	452	454	457	459	461	463	464	466	480	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

Figure 8.24 16-bay, 2-phase, no transformer unit Type F (UPS model-number digit 6 = F)

Use these tables if your UPS model number digits 1-3 are AS6 or ASF

Unit type F
(& UPS model number digit 6 = F)

UPS Rating	Load Level	# Battery Strings 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5 kVA / 4.5 kW	100% (4.5kw)	-	5	16	26	39	48	62	76	93	104	120	130	138	145	152	157	162	166	185	195	204	212	219	226	304	309	314	319	324	328	332	335	339	342	-
	90% (4.05kw)	-	6	18	28	43	52	71	83	102	113	130	139	147	154	159	164	181	193	203	211	219	227	305	311	317	322	327	331	335	339	342	345	420	423	-
	80% (3.6kw)	-	7	20	35	48	65	80	100	113	131	141	149	156	162	167	190	202	212	221	301	308	314	320	325	330	335	339	343	346	422	425	428	431	433	-
	75% (3.375kw)	-	8	22	38	50	70	91	106	125	137	146	154	161	166	189	201	212	221	302	309	316	322	327	332	337	341	345	421	424	427	430	433	436	438	-
	70% (3.15kw)	-	9	25	41	52	76	98	112	132	143	152	159	165	188	201	212	222	303	311	318	324	330	335	340	344	420	424	427	430	433	436	438	441	443	-
	60% (2.7kw)	-	11	28	47	69	94	111	133	145	155	163	183	199	212	224	306	314	322	329	335	340	345	421	426	429	433	436	439	442	444	447	449	451	453	-
	50% (2.25kw)	-	14	37	53	83	110	134	148	159	167	196	212	226	309	318	327	334	340	346	423	428	432	436	439	443	445	448	451	453	455	457	459	461	462	-
	40% (1.8kw)	-	19	46	76	108	136	152	163	192	212	300	313	324	333	341	420	426	431	436	440	444	447	450	453	456	458	460	462	464	466	480	-	-	-	-
	30% (1.35kw)	-	26	62	104	138	157	185	212	304	319	332	342	422	429	436	441	446	450	453	457	460	462	465	467	480	-	-	-	-	-	-	-	-	-	-
	25% (1.125kw)	-	32	76	125	152	180	212	307	324	337	420	429	436	442	447	452	456	459	462	465	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20% (0.9kw)	-	42	99	144	166	214	312	331	345	428	437	444	450	455	459	463	466	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10% (0.45kw)	-	91	160	301	337	430	444	455	462	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 kVA / 9 kW	100% (9kw)	-	-	5	10	16	21	26	32	39	44	48	52	63	70	76	81	93	99	105	109	120	125	130	135	139	142	146	149	152	155	157	160	162	164	-
	90% (8.1kw)	-	-	6	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	165	167	183	189	-
	80% (7.2kw)	-	-	8	14	21	27	36	43	48	52	66	74	81	94	102	108	120	126	132	137	142	146	150	154	157	160	163	165	180	187	193	199	204	209	-
	75% (6.75kw)	-	-	8	16	22	30	39	46	51	62	72	79	93	101	108	120	127	133	138	143	148	152	155	159	162	164	167	185	192	198	204	209	214	219	-
	70% (6.3kw)	-	-	9	17	25	33	42	48	53	68	77	91	100	107	120	127	134	139	144	149	153	157	160	163	166	183	191	197	204	209	215	220	225	301	-
	60% (5.4kw)	-	-	11	20	28	40	48	53	71	80	96	105	113	128	135	141	147	152	156	160	164	167	187	195	203	209	216	221	227	304	308	313	317	321	-
	50% (4.5kw)	-	-	15	26	38	48	61	74	91	103	112	128	137	144	150	156	160	165	182	192	201	209	216	223	301	307	312	317	322	326	330	333	337	340	-
	40% (3.6kw)	-	-	20	34	47	63	78	98	111	129	139	147	154	160	165	186	198	208	217	225	305	311	317	323	328	332	337	341	344	420	423	426	429	431	-
	30% (2.7kw)	-	-	27	46	67	91	109	130	143	152	160	167	194	207	219	301	310	318	325	331	337	342	346	423	427	430	433	436	439	442	444	447	449	451	-
	25% (2.25kw)	-	-	35	52	80	107	131	145	156	164	191	207	221	304	314	323	330	337	343	420	425	429	433	437	440	443	446	448	451	453	455	457	459	461	-
	20% (1.8kw)	-	-	44	73	105	133	149	161	187	207	224	309	320	330	338	345	423	429	433	438	442	445	448	451	454	456	459	461	463	465	466	480	-	-	-
	10% (0.9kw)	-	-	100	145	167	216	314	333	346	429	438	445	451	456	460	464	467	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 kVA / 13.5 kW	100% (13.5kw)	-	-	-	5	8	11	15	18	22	26	28	35	39	42	45	48	50	53	62	67	71	75	79	82	92	97	100	104	107	111	113	123	126	-	-
	90% (12.15kw)	-	-	-	6	10	14	18	22	26	30	35	40	44	47	50	52	61	67	72	76	80	90	94	99	103	107	110	120	124	127	131	134	137	-	-
	80% (10.8kw)	-	-	-	8	12	16	21	26	30	36	41	45	48	51	60	66	72	77	81	92	97	102	106	110	120	124	128	132	136	139	142	145	148	-	-
	75% (10.125kw)	-	-	-	8	13	18	22	27	33	39	44	47	51	53	66	72	77	82	93	98	103	108	112	122	127	131	135	139	142	145	148	151	153	-	-
	70% (9.45kw)	-	-	-	9	14	19	25	30	37	42	46	50	53	65	72	77	82	94	100	105	110	120	125	130	134	138	141	145	148	151	153	156	158	-	-
	60% (8.1kw)	-	-	-	12	18	23	30	38	44	48	52	64	72	78	90	97	103	109	120	126	131	136	140	144	148	151	154	157	160	162	164	167	183	-	-
	50% (6.75kw)	-	-	-	15	22	28	39	45	50	62	71	79	92	100	107	113	126	132	138	143	147	151	155	158	161	164	167	184	191	197	203	208	213	-	-
	40% (5.4kw)	-	-	-	20	28	40	47	53	70	79	95	104	112	126	134	140	146	151	155	159	163	166	185	193	200	207	214	219	225	302	307	311	315	-	-
	30% (4.05kw)	-	-	-	28	42	50	68	80	99	110	126	136	144	151	156	161	166	186	196	205	214	221	300	306	312	317	322	327	331	335	338	342	345	-	-
	25% (3.375kw)	-	-	-	36	48	66	81	102	120	133	142	151	157	163	181	193	204	214	223	303	310	316	322	327	332	337	341	345	420	423	426	429	432	-	-
	20% (2.7kw)	-	-	-	45	65	83	107	128	141	151	159	165	190	204	216	226	307	315	322	329	334	340	344	421	425	428	432	435	438	440	443	445	447	-	-
	10% (1.35kw)	-	-	-	102	136	155	180	207	300	316	329	339	420	427	433	439	444	448	452	455	458	461	463	466	480	-	-	-	-	-	-	-	-	-	-
20 kVA / 18 kW	100% (18kw)	-	-	-	-	5	7	10	12	15	18	20	23	26	28	32	35	38	41	44	46	48	50	51	53	61	65	69	72	75	78	80	83	92	-	-
	90% (16.2kw)	-	-	-	-	6	9	11	14	18	20	23	26	28	33	37	40	43	45	48	50	51	53	63	67	70	74	77	80	83	92	95	99	102	-	-
	80% (14.4kw)	-	-	-	-	7	10	14	17	20	23	27	31	35	39	42	45	48	50	52	60	65	69	73	77	80	83	93	97	100	104	107	110	113	-	-
	75% (13.5kw)	-	-	-	-	8	11	15	18	22	26	28	34	38	42	45	48	50	52	61	66	71	75	79	82	92	96	100	103	107	110	113	122	126	-	-
	70% (12.6kw)	-	-	-	-	9	13	17	20	25	28	33	38	42	45	48	50	53	63	68	73	77	80	90	95	99	103	107	110	113	123	126	130	133	-	-
	60% (10.8kw)	-	-	-	-	11	16	20	25	28	36	41	45	48	51	53	66	71	76	81	91	97	101	106	110	113	124	128	132	135	139	142	145	147	-	-
	50% (9kw)	-	-	-	-	15	20	26	32	39	44	48	52	62	69	75	81	92	99	104	109	113	125	130	134	138	142	145	148	151	154	157	159	161	-	-
	40% (7.2kw)	-	-	-	-	20	27	35	42	48	52	65	73	80	93	101	107	113	125	131	136	141	145	149	153	156	159	162	165	167	184	191	197	202	-	-
	30% (5.4kw)	-	-	-	-	28	39	47	53	69	79	94	103	111	125	133	139	145	150	155	159	162	166	183	191	198	205	212	218	223	300	305	310	314	-	-
	25% (4.5kw)	-	-	-	-	37	46	53	72	82	100	110	125	134	141	148	153	158	162	166	186	196	204	212	218	225	303	308	313	318	322	326	330	334	-	-
	20% (3.6kw)	-	-	-	-	46	60	76	95	108	125	136	144	152	158	163	180	192	202	212	220	300	306	313	318	324	328	333	337	341	344	420	423	426	-	-
	10% (1.8kw)	-	-	-	-	102	129	146	159	180	201	218	304	316	326	334	341	420	425	430	435	439	443	446	449	452	454	457	459	461	463	464	466	480	-	-

Note: Run times in this table are approximate. They are based upon new, fully charged standard battery modules at a temperature of 25 degC (77 degF) with 100% resistive UPS loading. Run times listed above can vary by +/-5% due to manufacturing variances of the individual batteries. Run times in orange highlight require charger module in the UPS frame

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