Liebert® APS™

5 – 20 kVA Modular UPS

Installer/User Guide

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. For additional assistance, visit https://www.VertivCo.com/en-us/support/

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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 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.

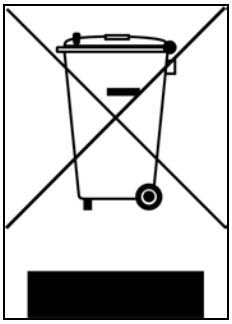
Storing magnetic media on top of the Liebert APS may result in data loss or corruption.

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.VertivCo.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.vertivco.com/en-emea/ ("Products session" or "Contact us" session) 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.

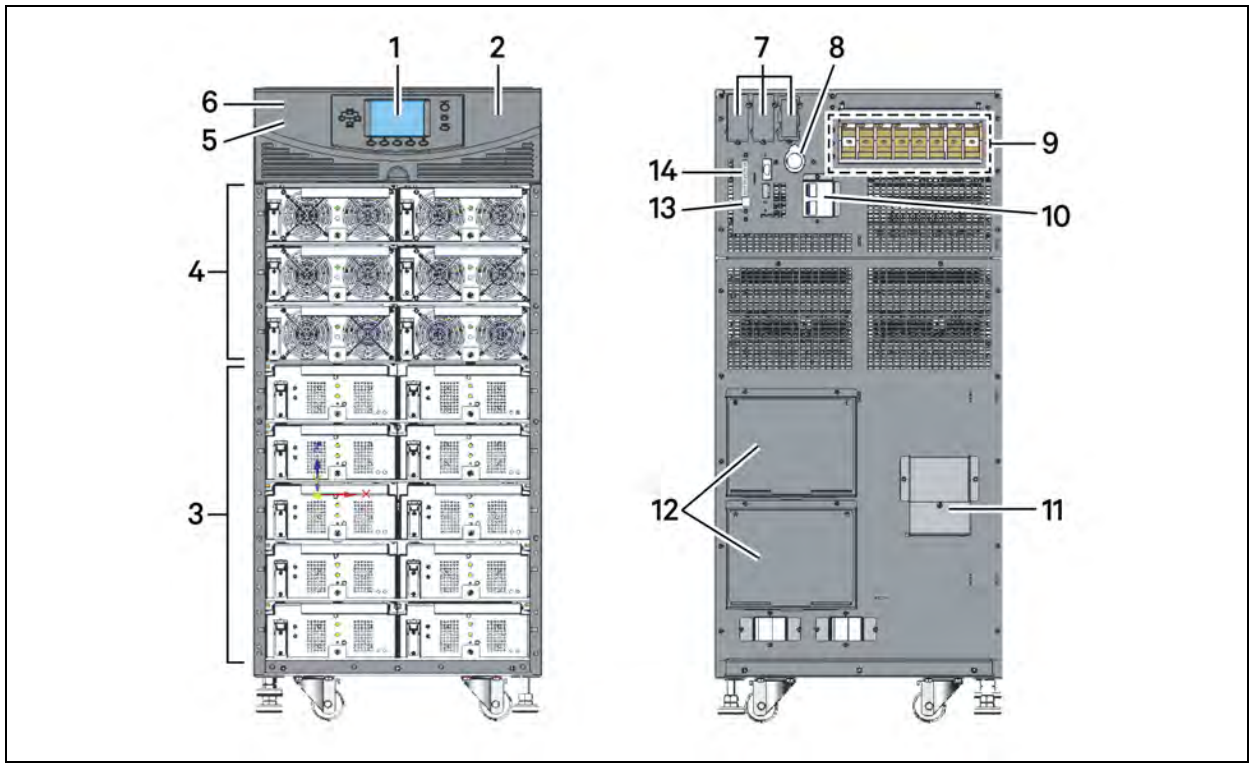
The Liebert APS UPS is an easily adaptable UPS system. By installing additional power or battery modules, you can expand your current system capacity, extend your back-up runtime, or provide redundancy. The user interface lets you configure the operation according to application requirements. It also 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 Figure 2.1 on the next page through Figure 2.4 on page 15.

Table 2.1 Frame designation

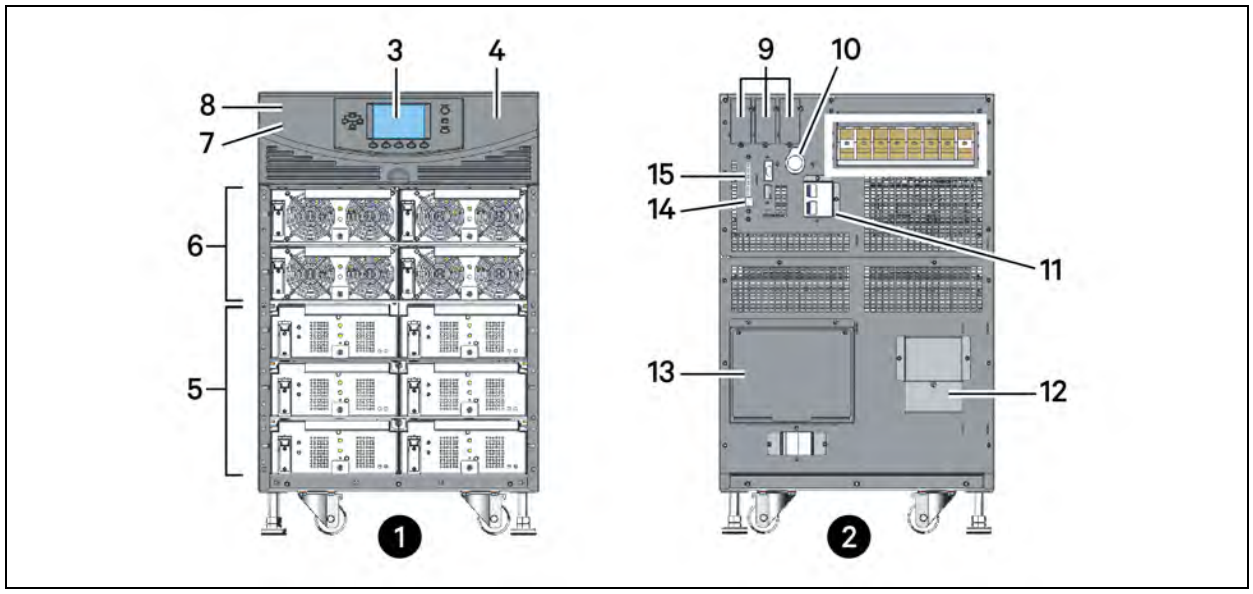
UPS MODEL NUMBER DIGITS 1-3	FRAME TYPE	FRAME RATING
AS1 or ASA or AS5 or ASE	10 Bay Transformer-free	15 kVA redundant
AS2 or ASB or AS6 or ASF	16 Bay Transformer-free	20 kVA redundant
AS3 or ASC	12 Bay Transformer-based	15 kVA redundant
AS4 or ASD	16 Bay Transformer-based	20 kVA redundant

Figure 2.1 16-bay transformer-free UPS



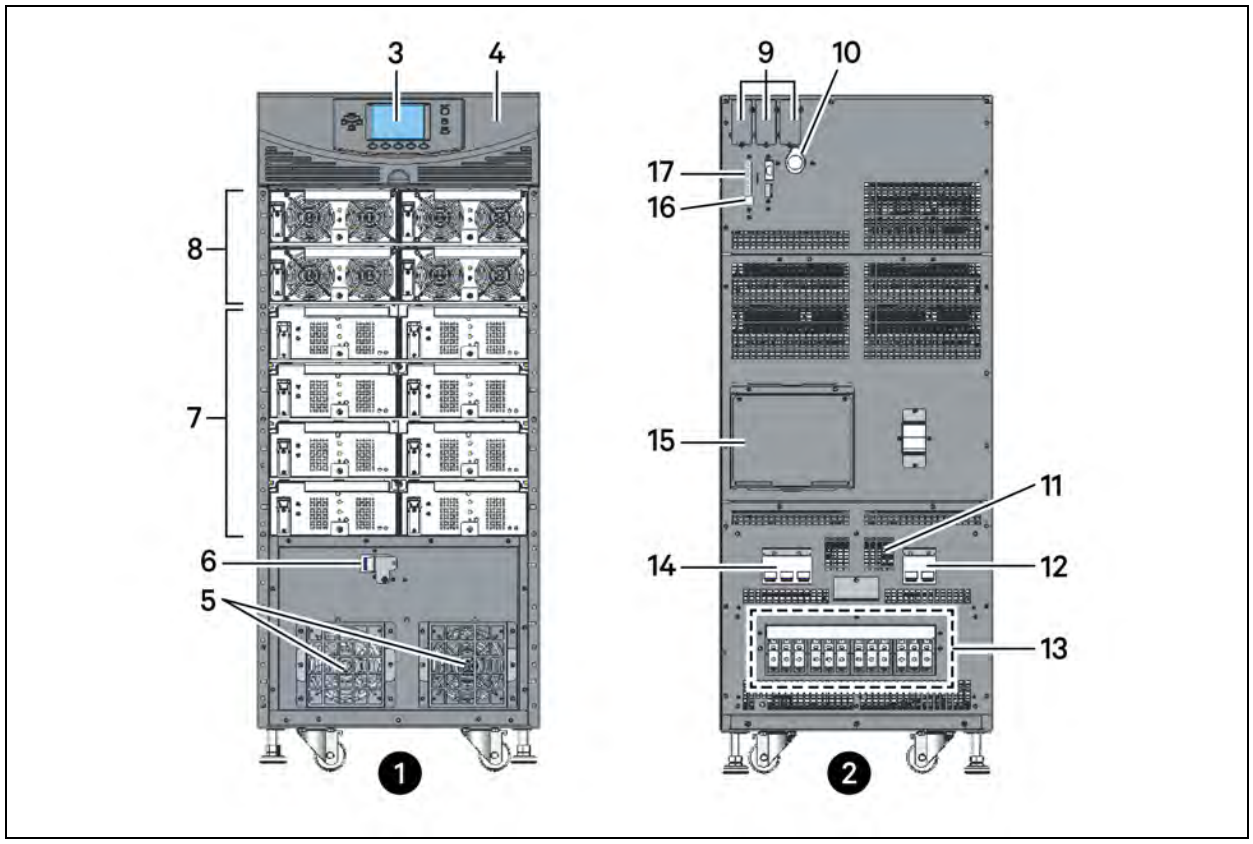
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	User-interface module	8	System-enable switch
2	System-control module (under cover)	9	Power input and output terminals
3	Bays for battery modules	10	Output breaker
4	Bays for power, charger, or battery modules	11	External-batter-cabinet connector
5	Input breaker (under 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



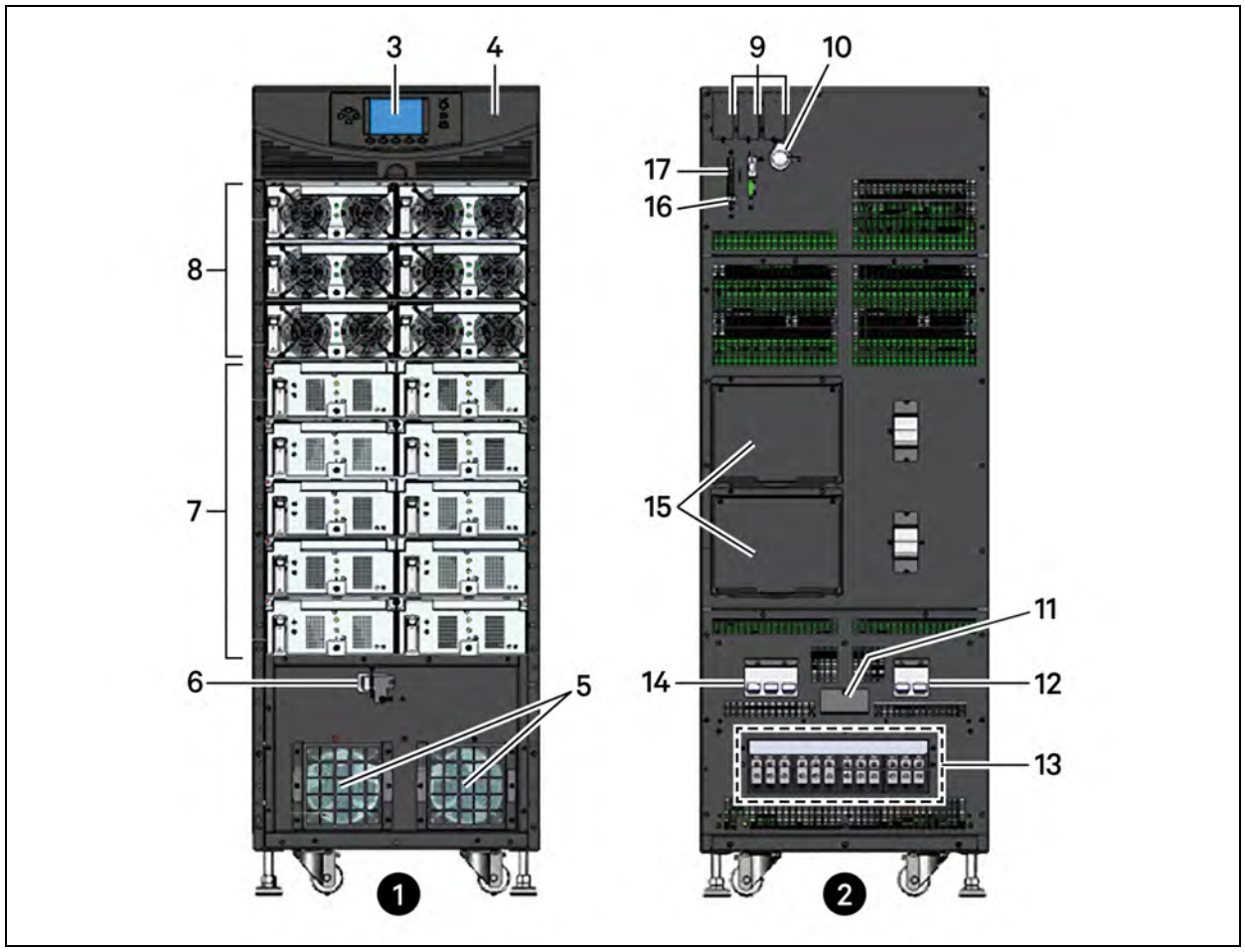
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Front view with bezels removed	9	Liebert IntelliSlot ports
2	Rear view	10	System-enable switch
3	User-interface module	11	Output breaker
4	System-control module (under cover)	12	External-batter-cabinet connector
5	Bays for battery modules	13	POD ports
6	Bays for power, 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

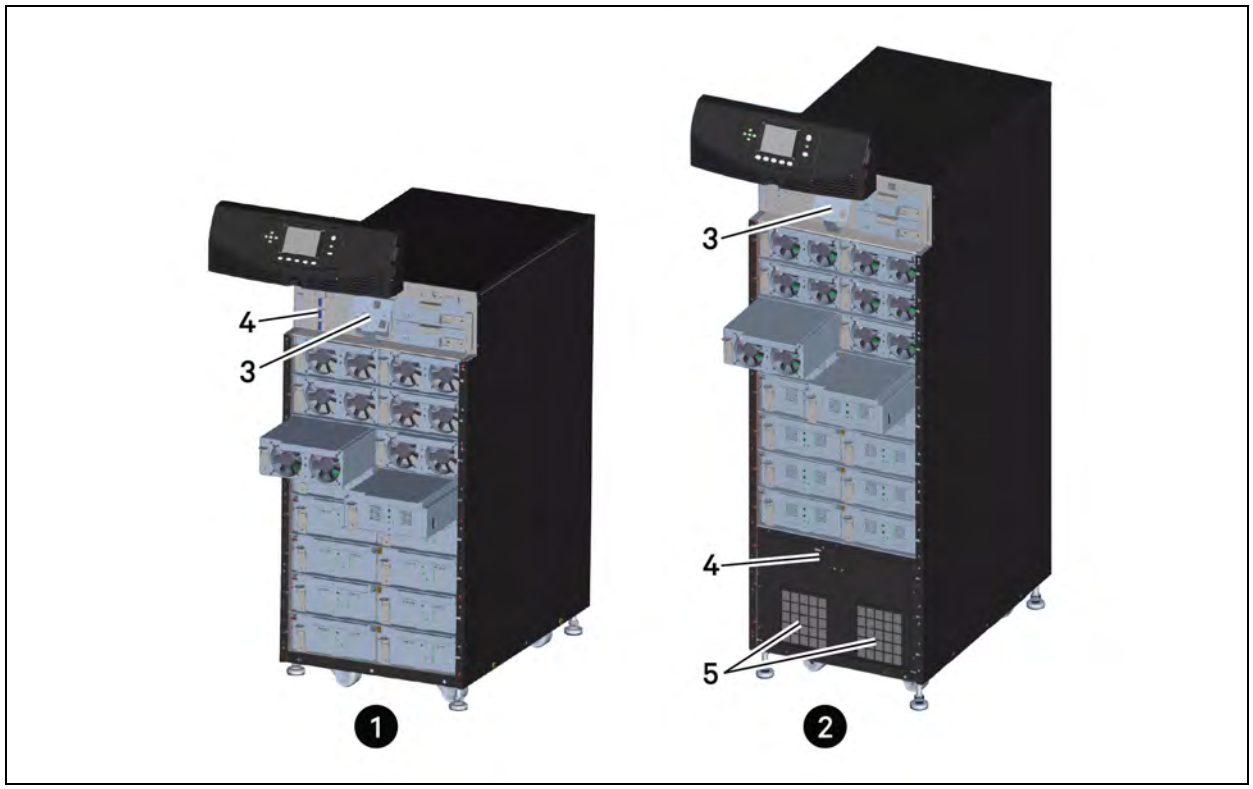
This section provides a general description of each component and its functions. Please review this section carefully, as it will give you a better understanding of how the UPS operates.

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 Figure 2.5 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 Figure 2.6 on the next page,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 57 for details on operating the user interface module.

Figure 2.6 User-interface module

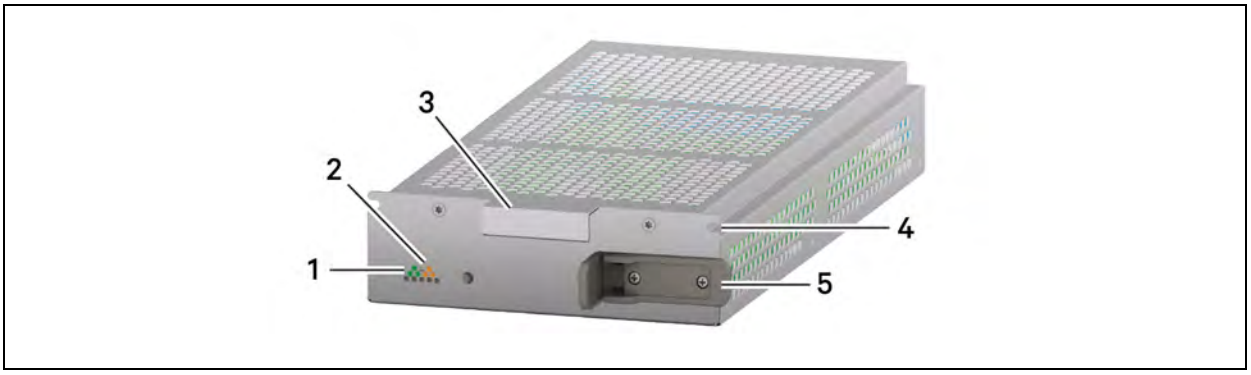


2.3.3 System-Control Module and System-Monitor Module

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 Figure 2.7 below.

Under normal operation, the green status LED blinks and the yellow fault LED is Off. For any other condition, refer to Troubleshooting on page 69.

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 Figure 2.8 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.

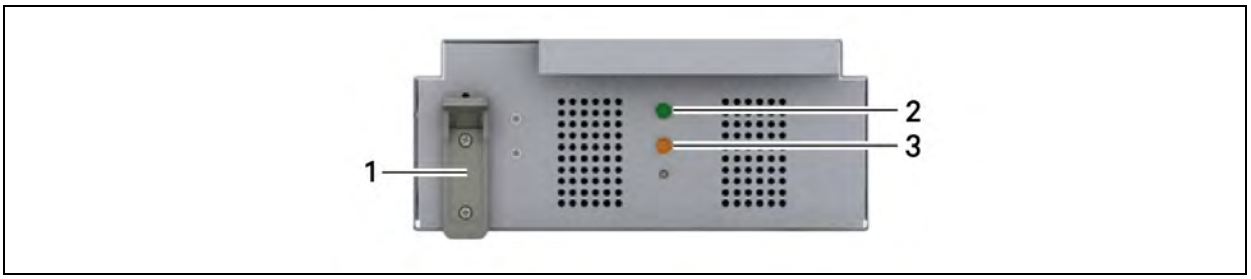
Each battery module, shown in Figure 2.9 on the next page,has monitoring and controls that isolate the battery module in the event of a battery failure. The battery strings are connected in parallel to provide back-up time and/or redundancy.

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 69.

Figure 2.9 Battery module



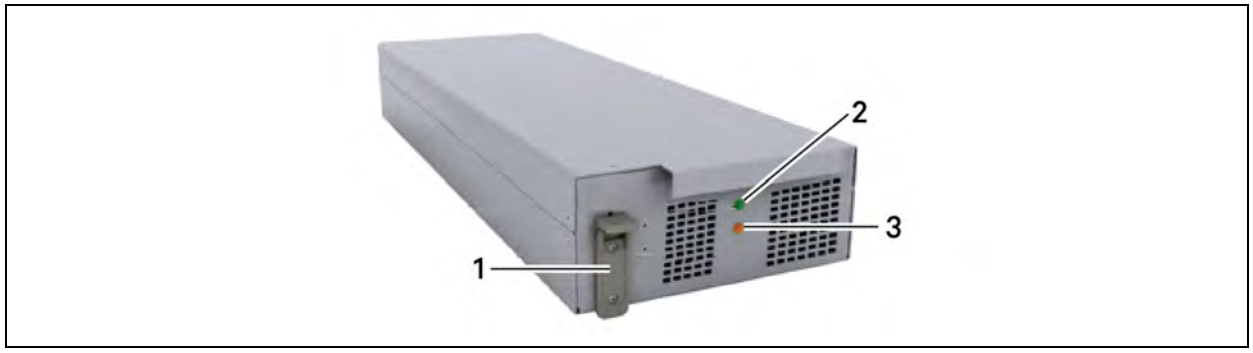
ITEM	DESCRIPTION
1	Locking Lever
2	Status LED (green)
3	Fault LED (yellow)

2.3.6 Charger Module

In AC mains mode, the charger module, shown in Figure 2.10 below, 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 Figure 2.11 on the facing page, 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

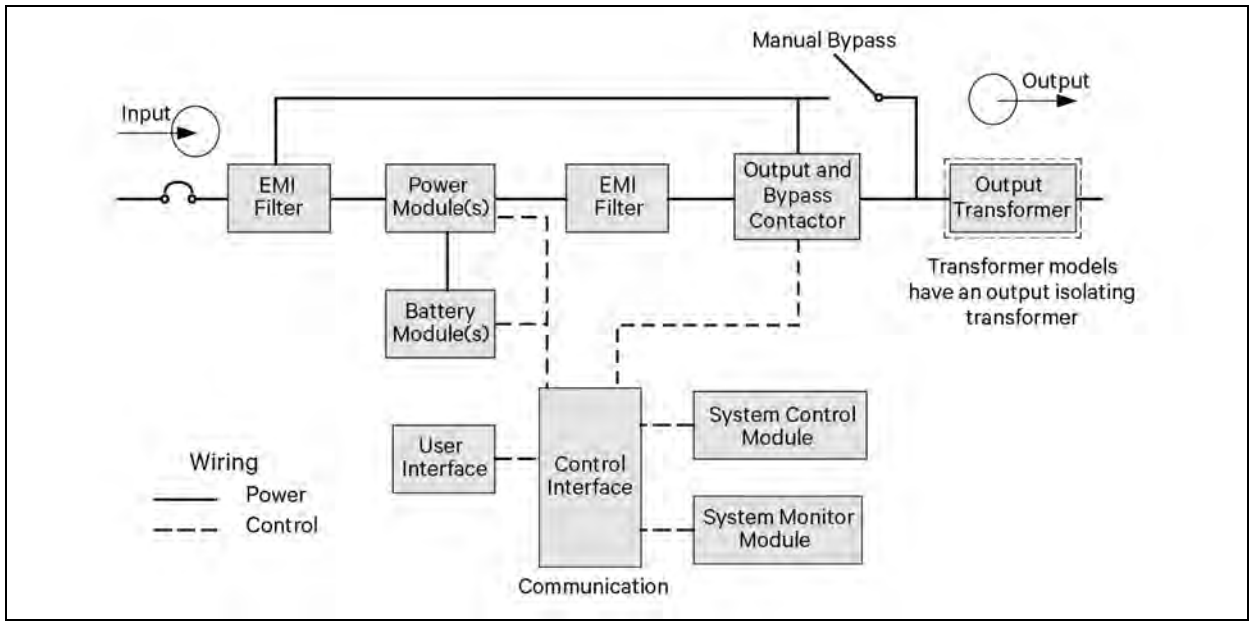


2.4 Operating Principle

The operating principle of the Liebert APS UPS is shown in Figure 2.12 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.

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

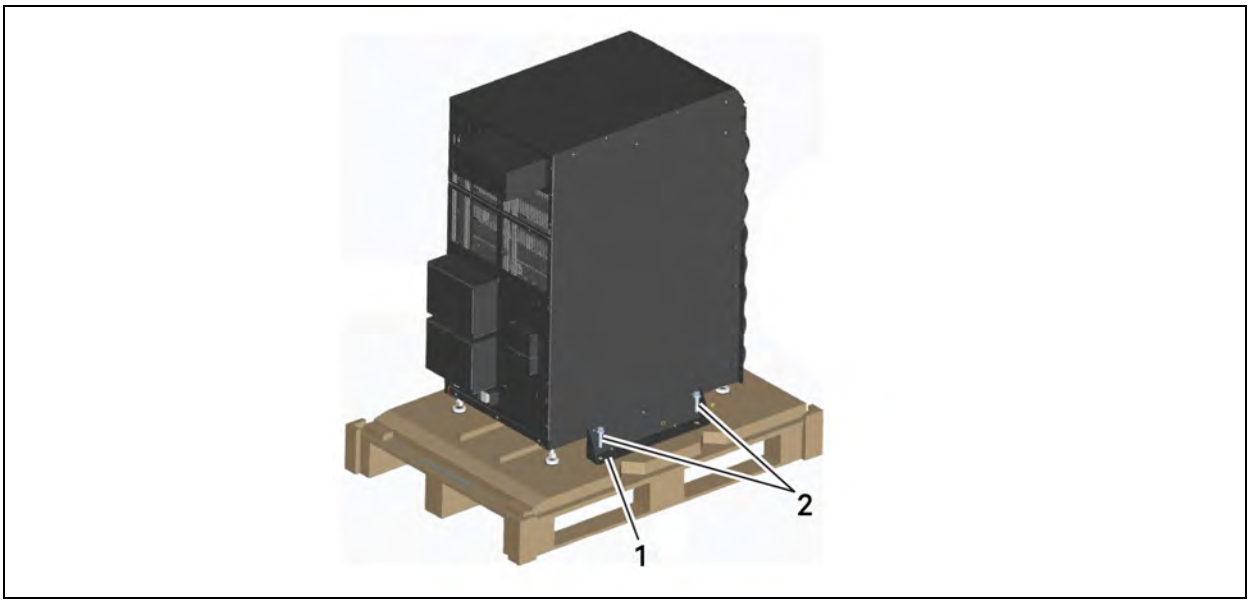
The unit frame is bolted to the shipping pallet for safety during shipping. We recommend keeping the unit bolted to the pallet and using a pallet jack to transport the unit to the installation location.

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 Figure 3.1 on the next page.
3. Remove the mounting brackets from the UPS with a 10mm wrench or socket or a #3 Phillips screwdriver.

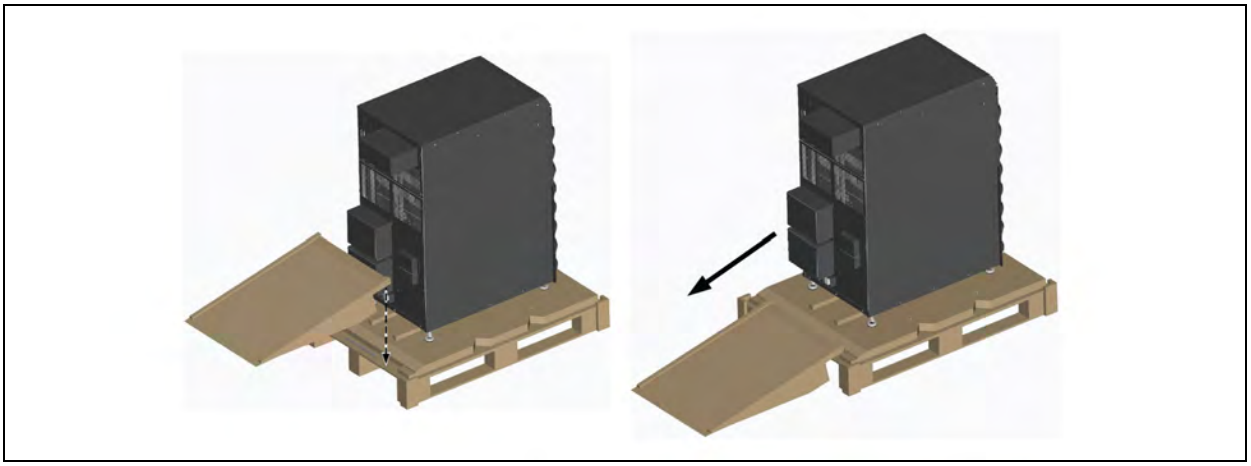
Figure 3.1 Remove the mounting brackets



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 Figure 3.2 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



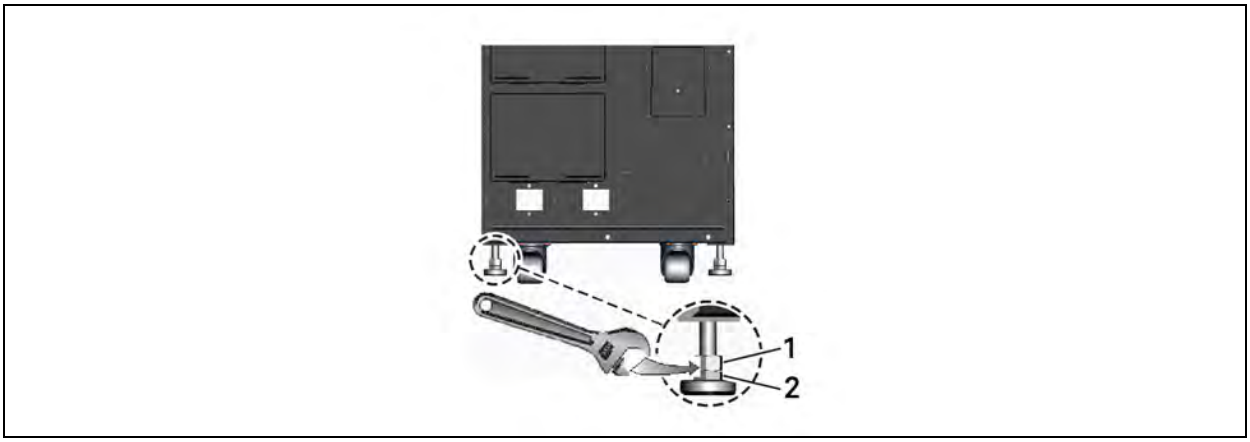
3.5 Installing the UPS

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 on page 25 or Rack Installation on page 26.

3.5.1 Tower Installation

1. With the UPS in the installation location, adjust the leveling feet to secure its position, as shown in Figure 3.3 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.

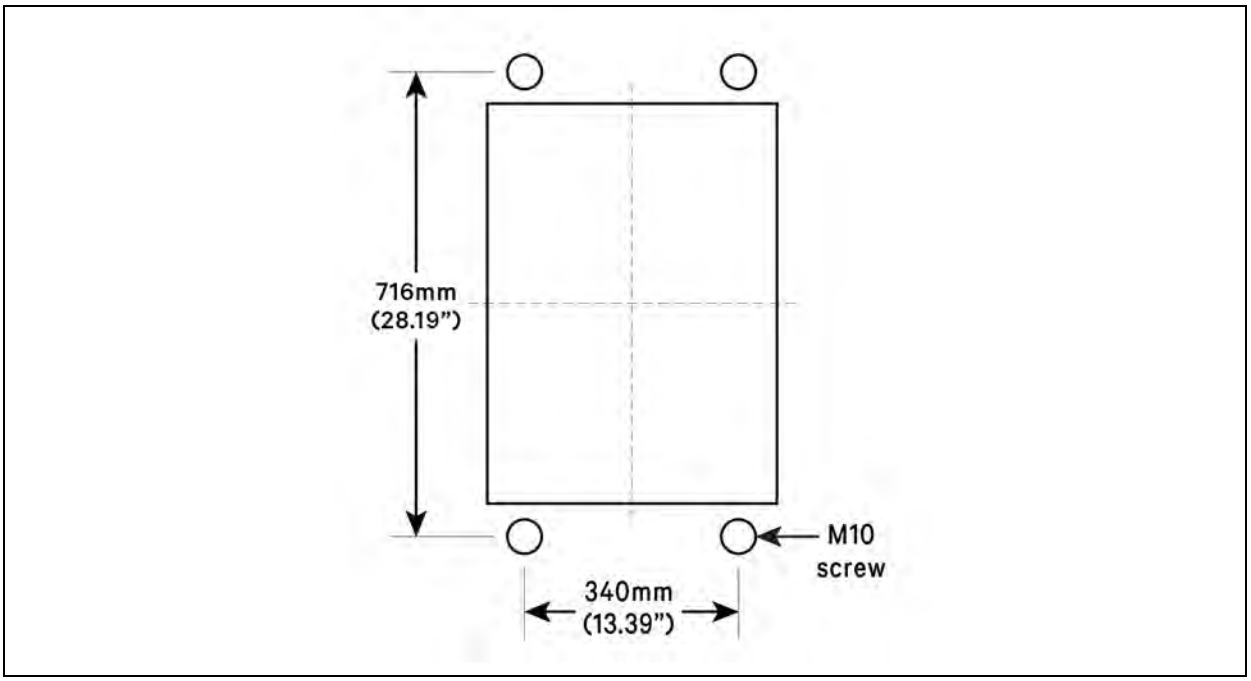
Figure 3.3 Adjust the leveling feet



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 Figure 3.4 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 24).
    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

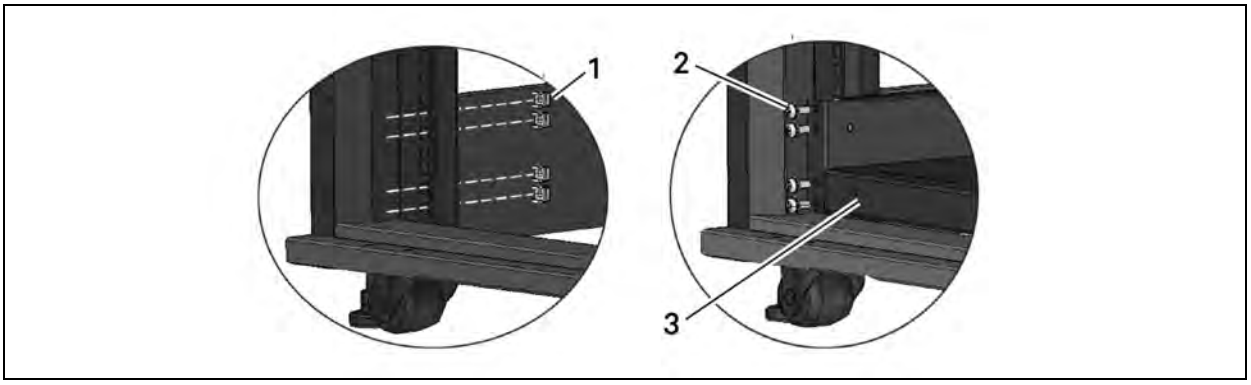


3.5.2 Rack Installation

1. Install the cage nuts on the corresponding positions in the rack, see Figure 3.5 on the facing page.
    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 Figure 3.5 below.

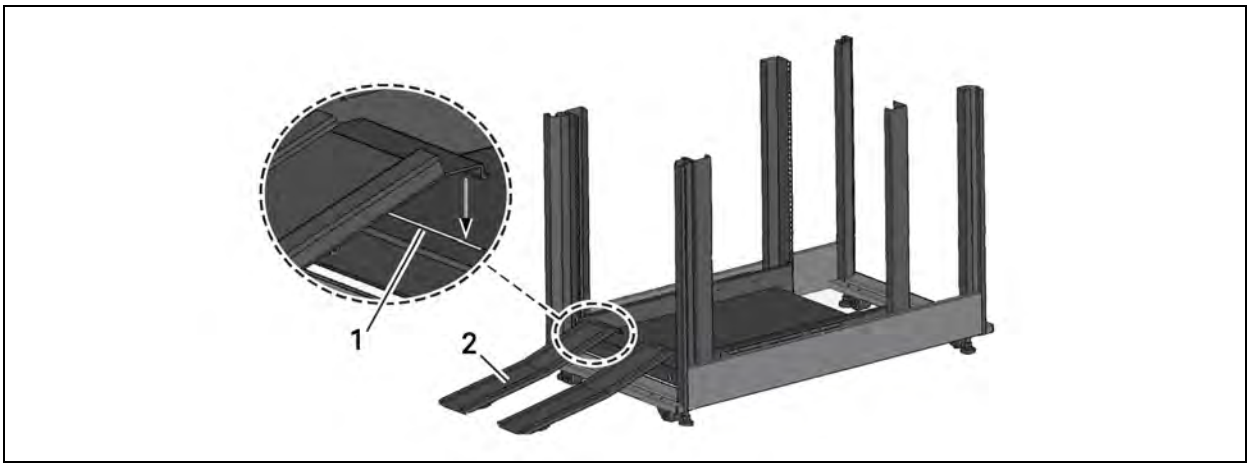
Figure 3.5 Install cage nuts and tray



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 Figure 3.6 below.

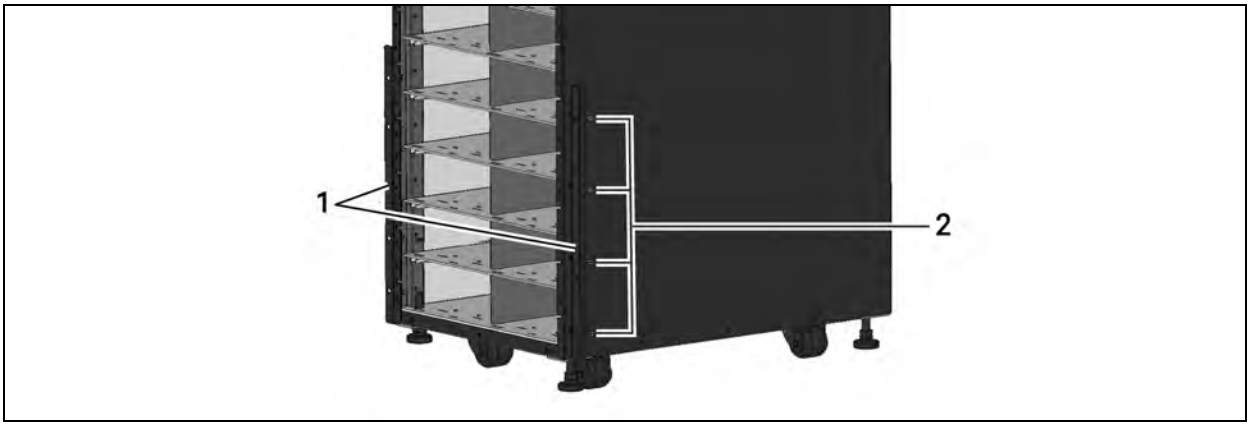
Figure 3.6 Install the guide rails



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 Figure 3.7 below.

Figure 3.7 Install the brackets



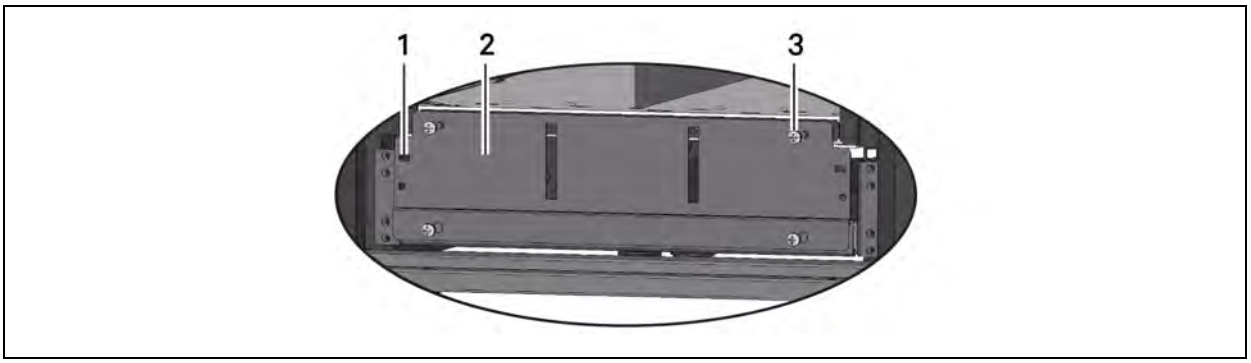
ITEM	DESCRIPTION
1	Brackets (1 each side)
2	Screws (8 places)

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 Figure 3.8 below.
8. Insert the plastic bezel into the square holes of the metal plate, see Figure 3.8 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

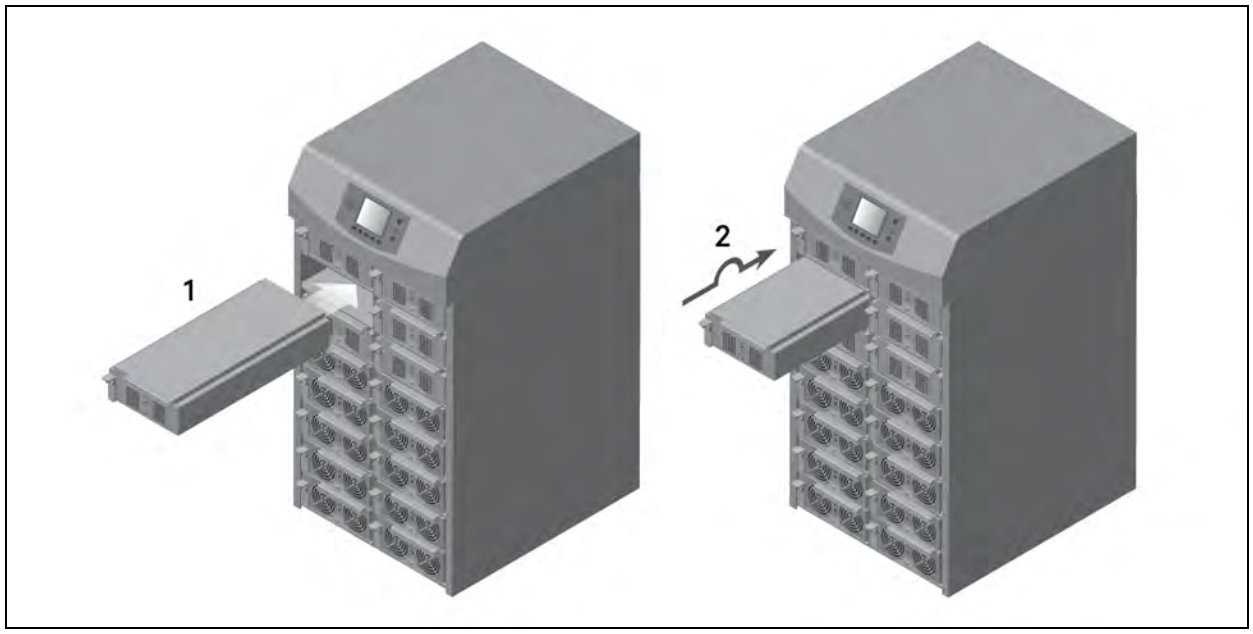
1. With the plastic bezel removed, lift module to appropriate bay, resting end of module on bay shelf.

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 Figure 3.9 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



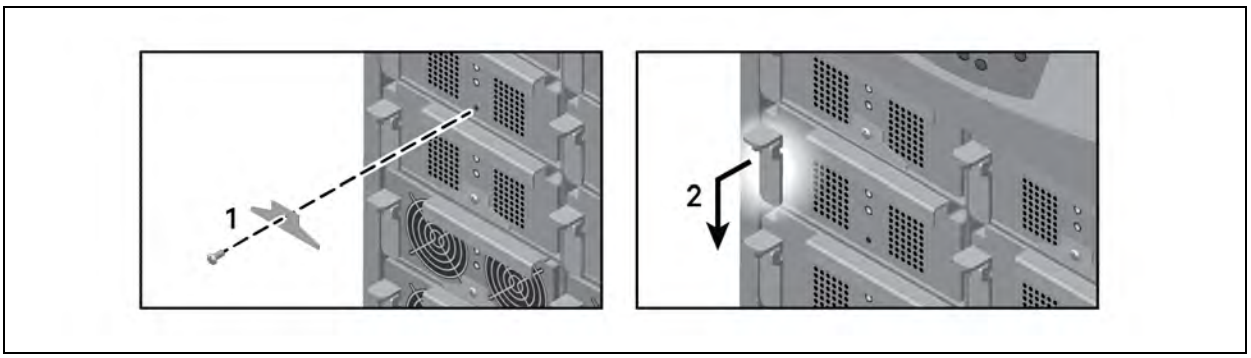
ITEM	DESCRIPTION
1	Push in slowly about 1/3 of the module.
2	Lift and push smoothly and firmly until fully inserted.

4. Pull out the lock lever slightly, and press the lever down slightly, see Lock lever and module-securing bracket on page 30.

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 on page 30.
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

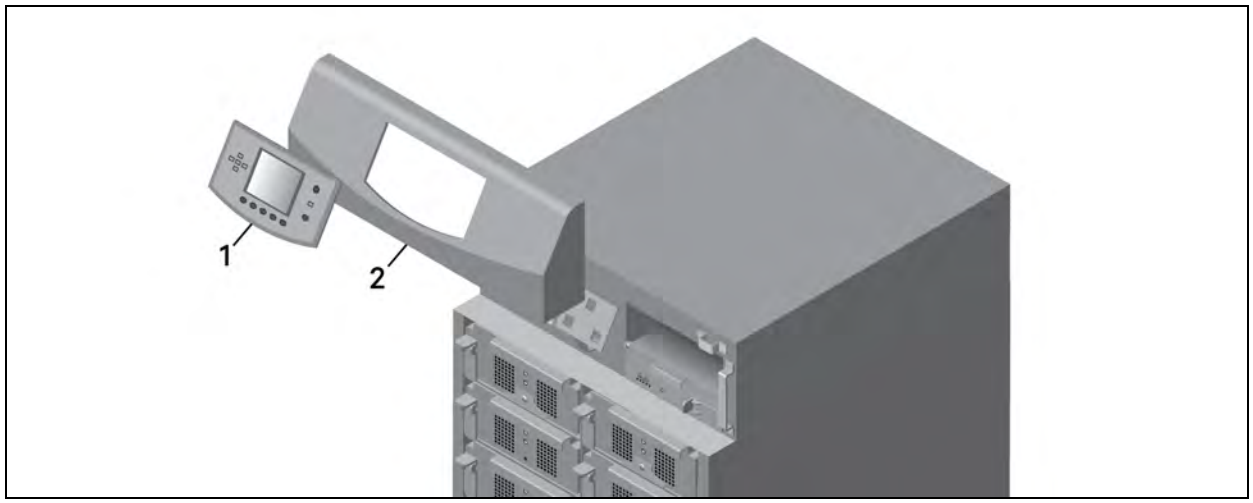
NOTICE

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 Figure 3.11 below, then lay the user-interface module on top of the UPS.

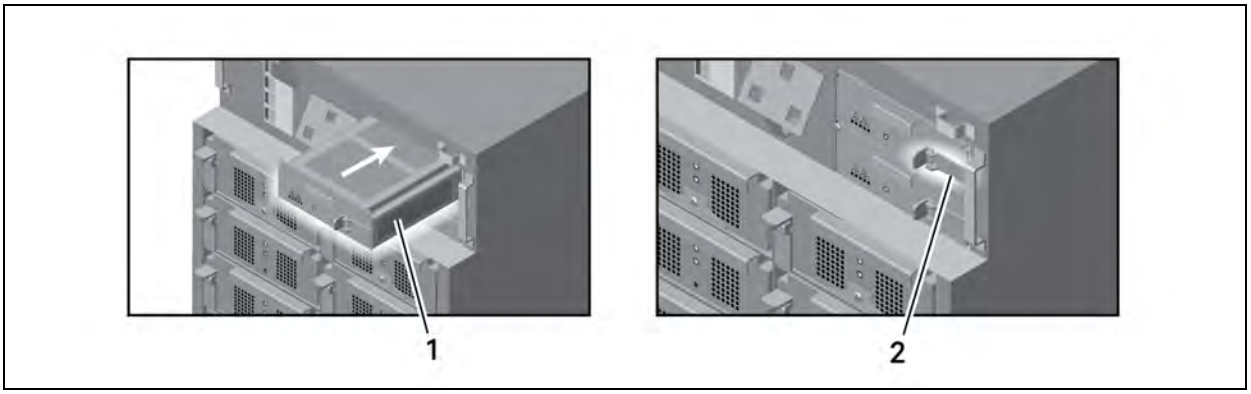
Figure 3.11 Remove display bezel and user-interface module



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 Figure 3.12 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 Table 3.1 below 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 on page 32
AS2 or ASB	16 Bay Transformer-free	Connecting Cables on a Transformer-free UPS on page 32
AS3 or ASC	12 Bay Transformer-based	Connecting Cables on a Transformer-Based UPS on page 36
AS4 or ASD	16 Bay Transformer-based	Connecting Cables on a Transformer-Based UPS on page 36
AS5 or ASE	10 Bay Transformer-free	Connecting Cables on a Transformer-free UPS with Dual Inverter Frames on page 41
AS6 or ASF	16 Bay Transformer-free	Connecting Cables on a Transformer-free UPS with Dual Inverter Frames on page 41

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 Table 3.2 below and Table 3.3 below 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).

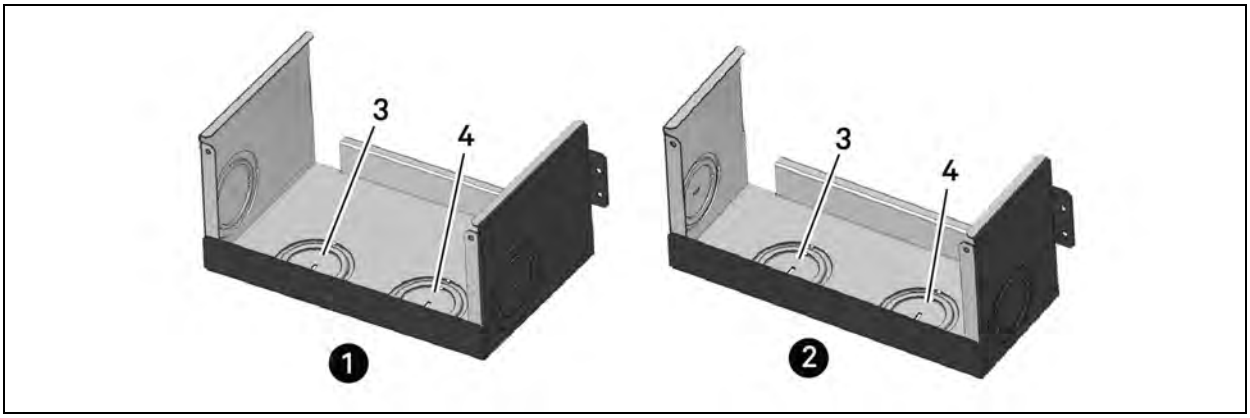
90°C copper wire recommended

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 Figure 3.13 on the next page, 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 Figure 3.14 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 Figure 3.15 on the facing page and Figure 3.16 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

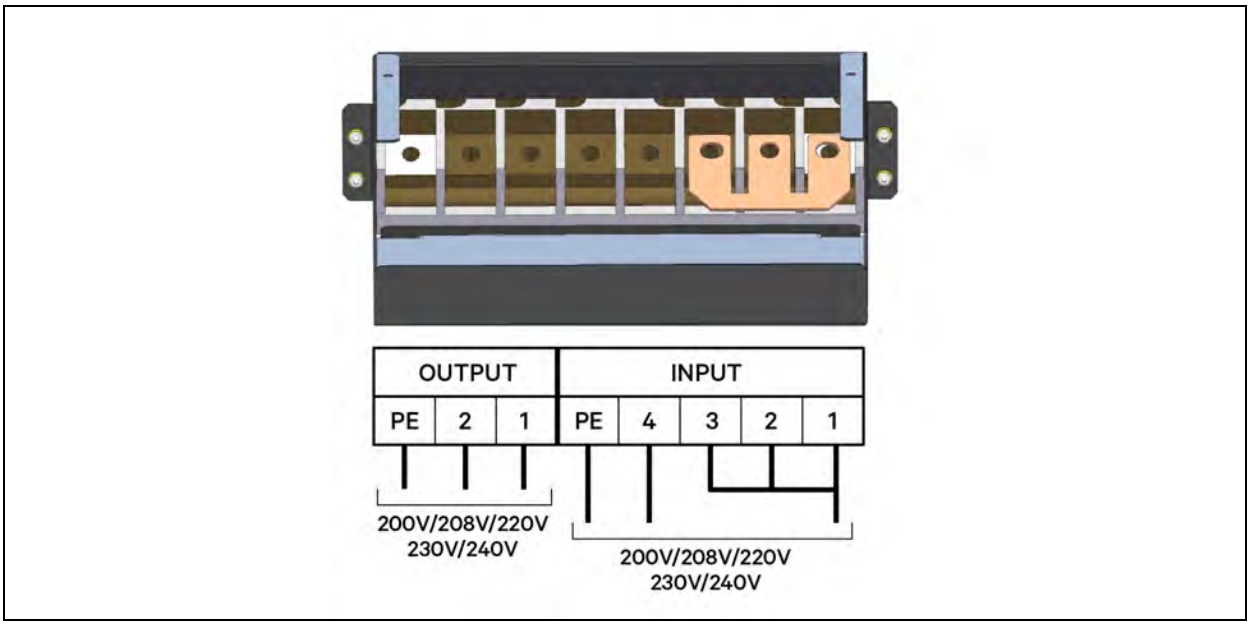


Figure 3.16 Connection in 3-phase input

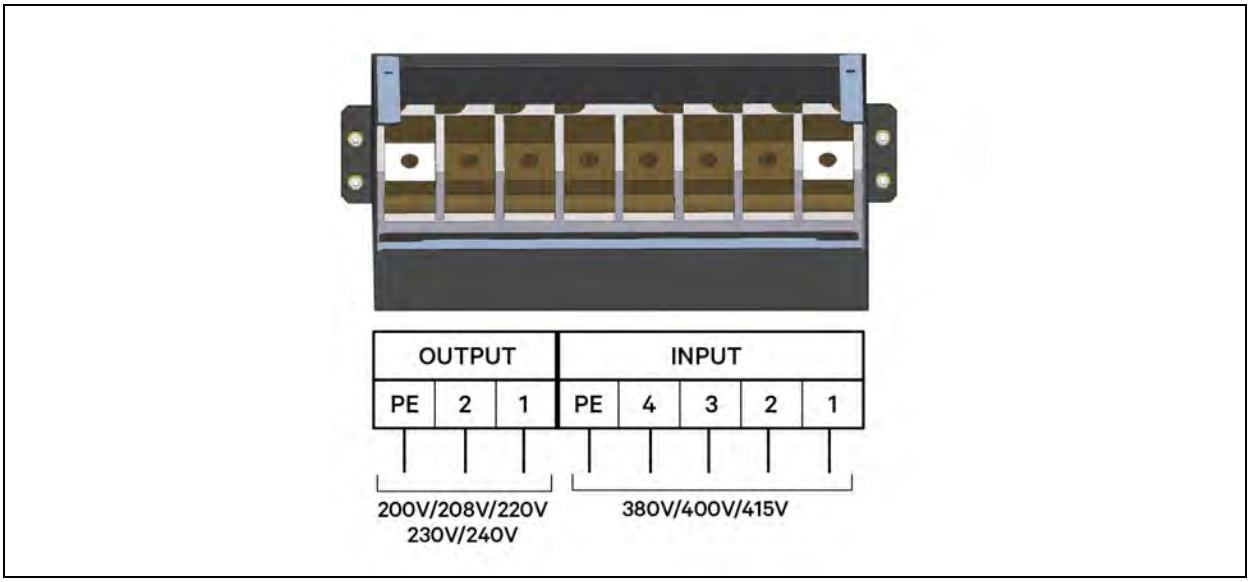


Table 3.4 Key to Figure 3.15 above and Connection in 3-phase input on page 35 UPS wiring

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

Table 3.4 Key to Figure 3.15 above and Connection in 3-phase input on page 35 UPS wiring (continued)

SYSTEM VOLTAGE	SYSTEM NOMINAL FREQUENCY	INPUT TERMINAL BLOCK					OUTPUT TERMINAL BLOCK		
		1	2	3	4	PE		2	PE
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 Table 3.5 on the facing page and Table 3.6 on the facing page based upon the UPS rating and mains frequency. Emerson 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 Figure 3.17 on the next page and Figure 3.18 on the next page. Refer to Table 3.8 on page 41 for the proper setting according to the AC mains voltage configuration.

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

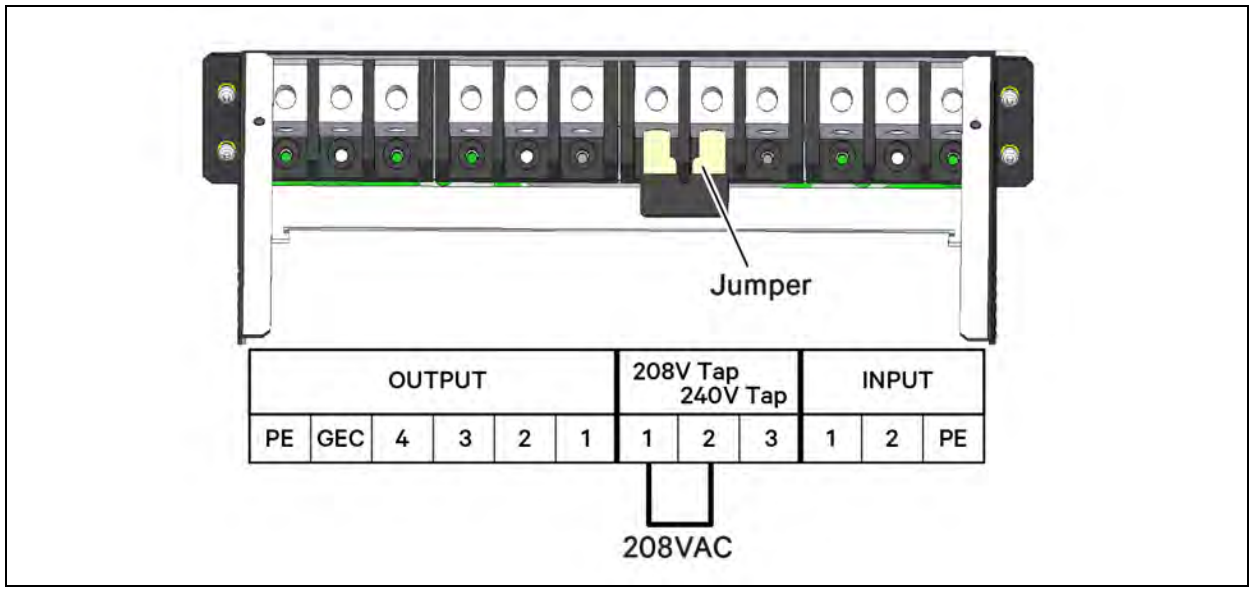
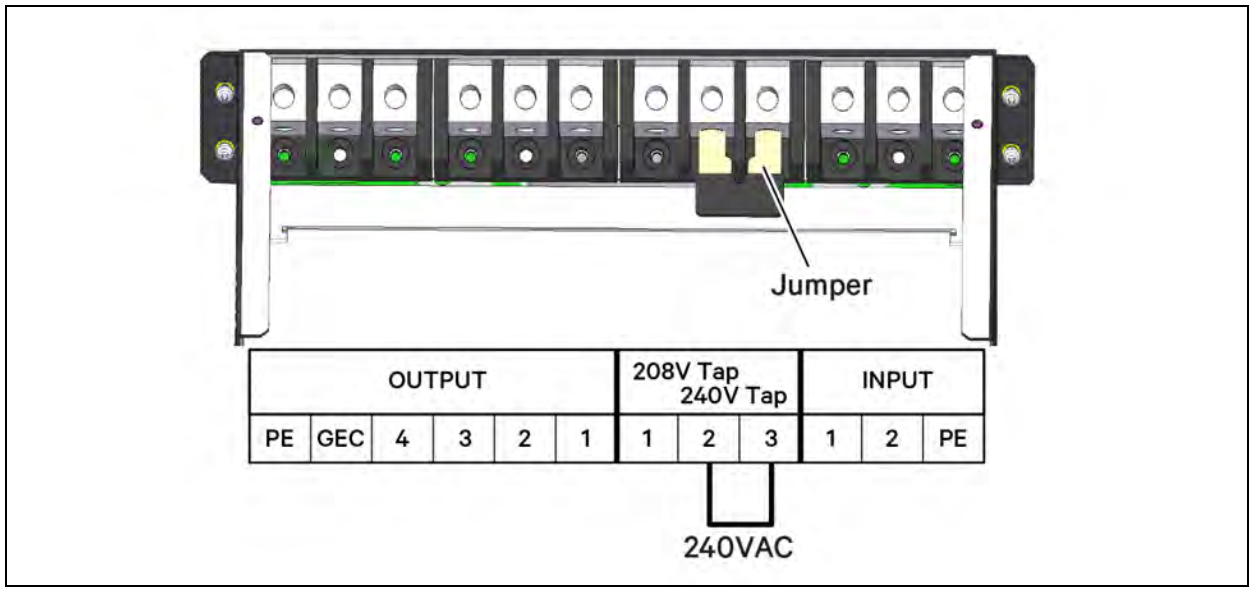


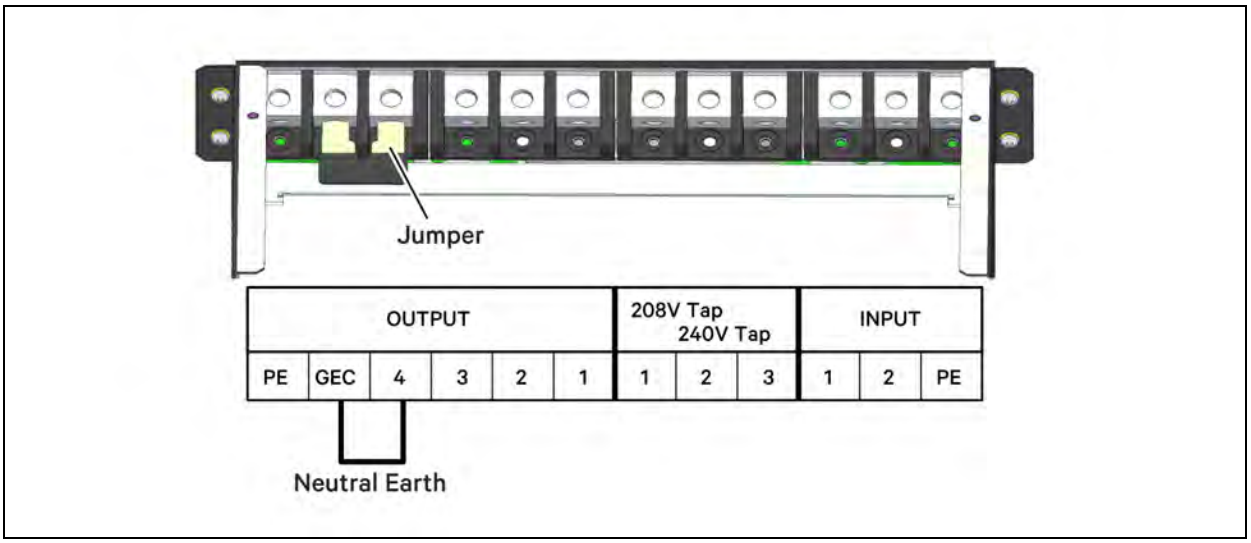
Figure 3.18 Setting bypass voltage jumper (200/220/230/240VAC)



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

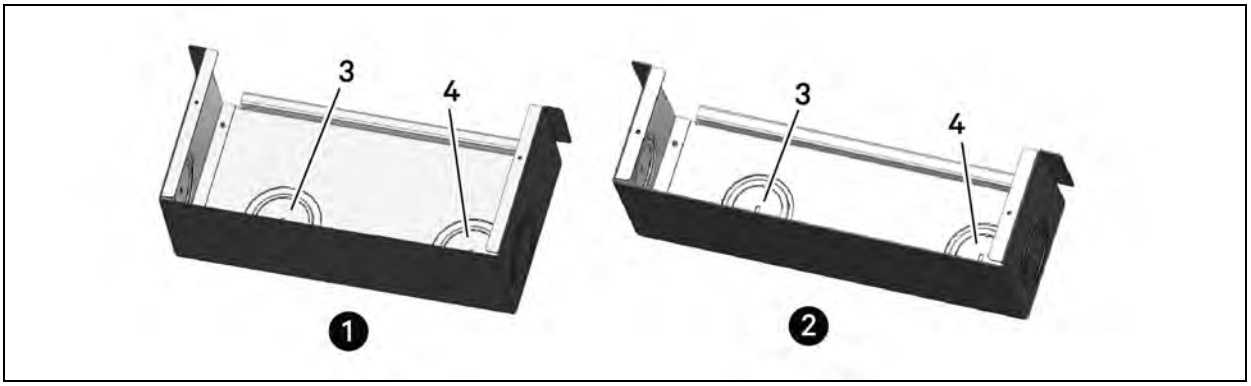


Connecting the Cables

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

1. Remove the knockouts at the junction box, see Figure 3.20 below and pull the cables through them, leaving some slack for installation.

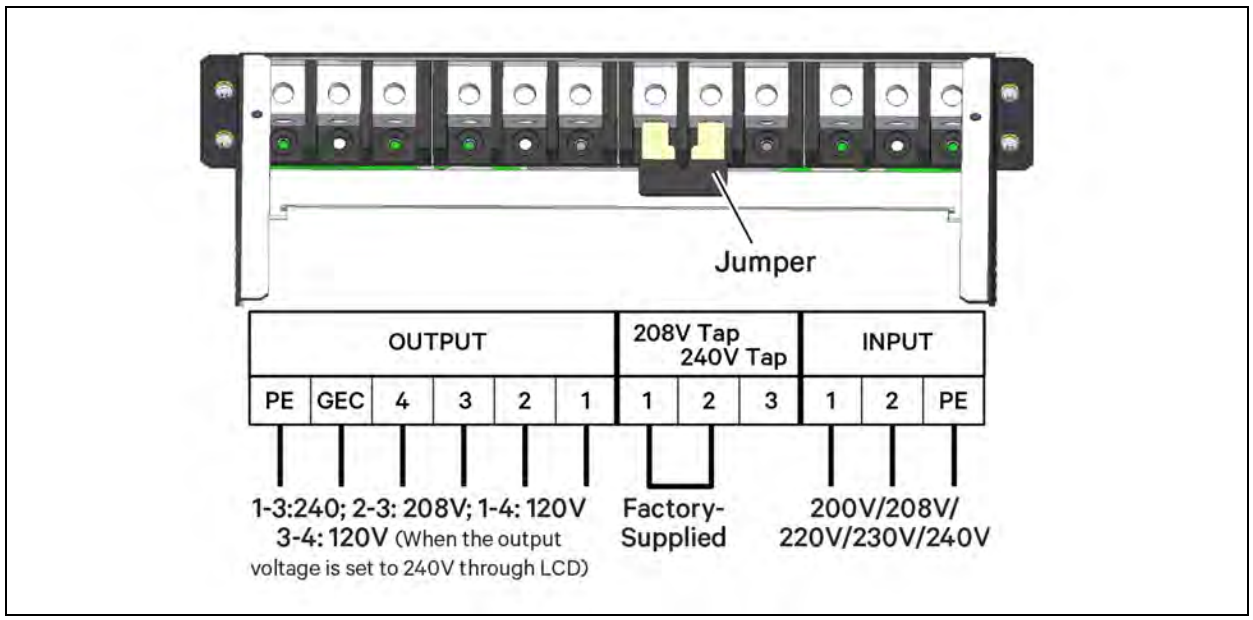
Figure 3.20 Knockouts in units without a transformer



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 Figure 3.21 below.
3. Using a torque wrench, tighten the screws to 12.43 Nm (110 in-lb).

Figure 3.21 Connection method



Refer to Table 3.6 on page 37 for configuring the output cable. For standard voltages, make the connections shown in Table 3.8 on the facing page.

Table 3.7 Key to Figure 3.21 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 Figure 3.21 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.

Table 3.9 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 Table 3.10 below and Table 3.11 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

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

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
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).

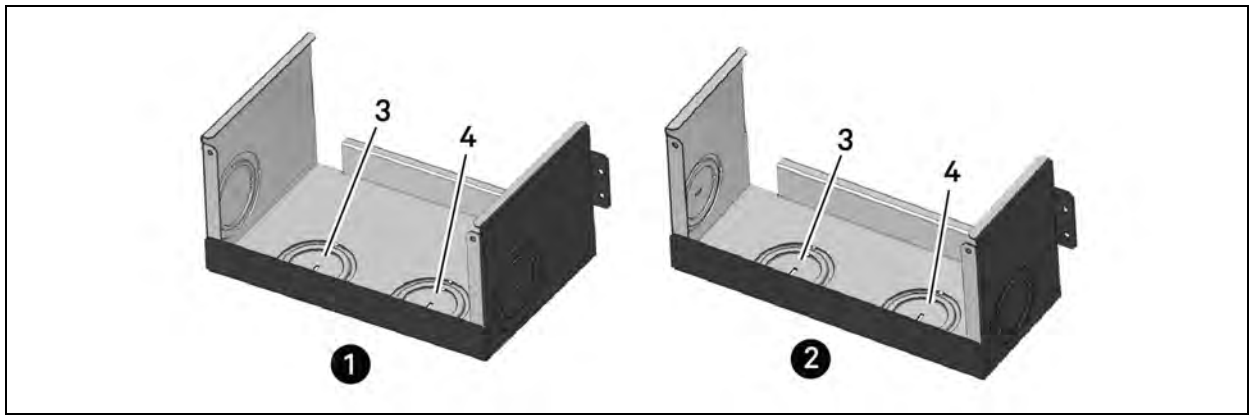
90°C copper wire is recommended.

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 Figure 3.22 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 Figure 3.23 below.

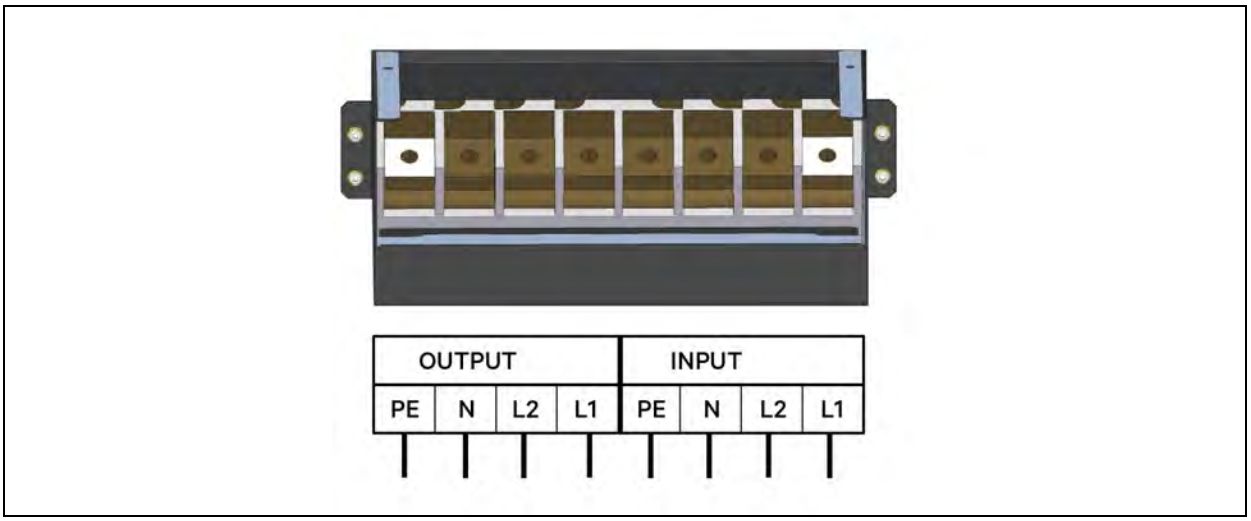
Figure 3.23 Secure cables on cable bridges



ITEM	DESCRIPTION
1	Cable bridge

The connection methods for single-phase and the 3-phase input modes are shown in 3.7.3 on page 41 and 3.7.3 on page 41, 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 Figure 3.25 on the facing page or Figure 3.26 on page 46 (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.

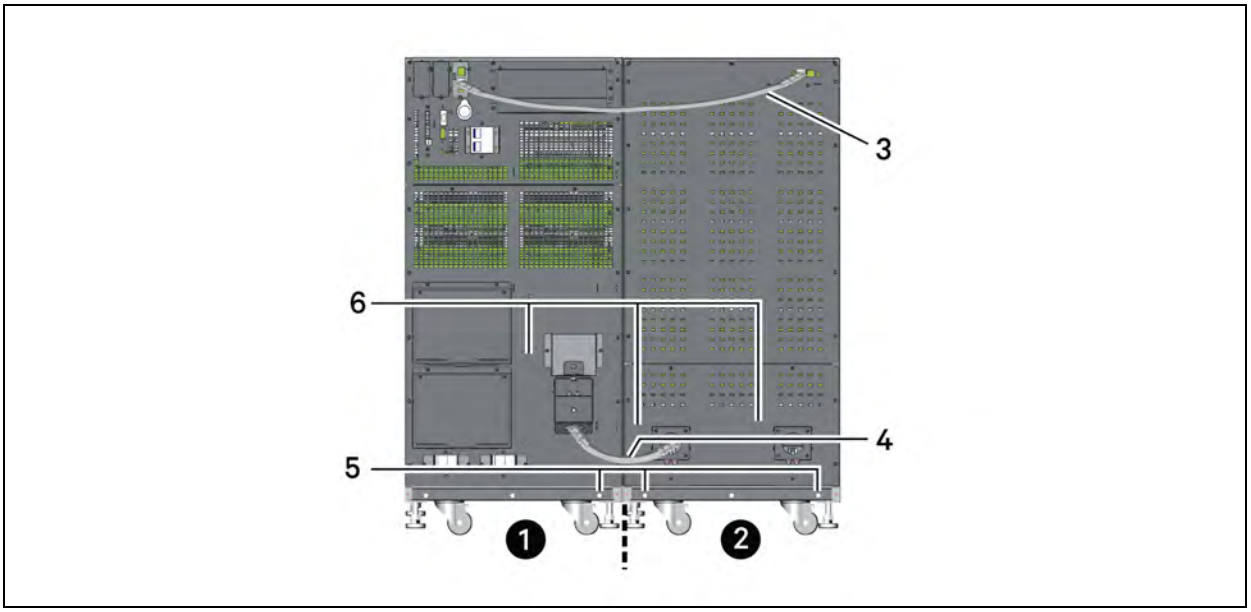
3. After the frame grounds are properly bonded together, connect one end of the battery power connector to the external battery connector on the rear of the UPS frame as shown in Figure 3.25 on the facing page or Figure 3.26 on page 46, depending on your system.
4. Connect the other end to the closest 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 Figure 3.25 below or Figure 3.26 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 Table 3.12 on page 47.

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

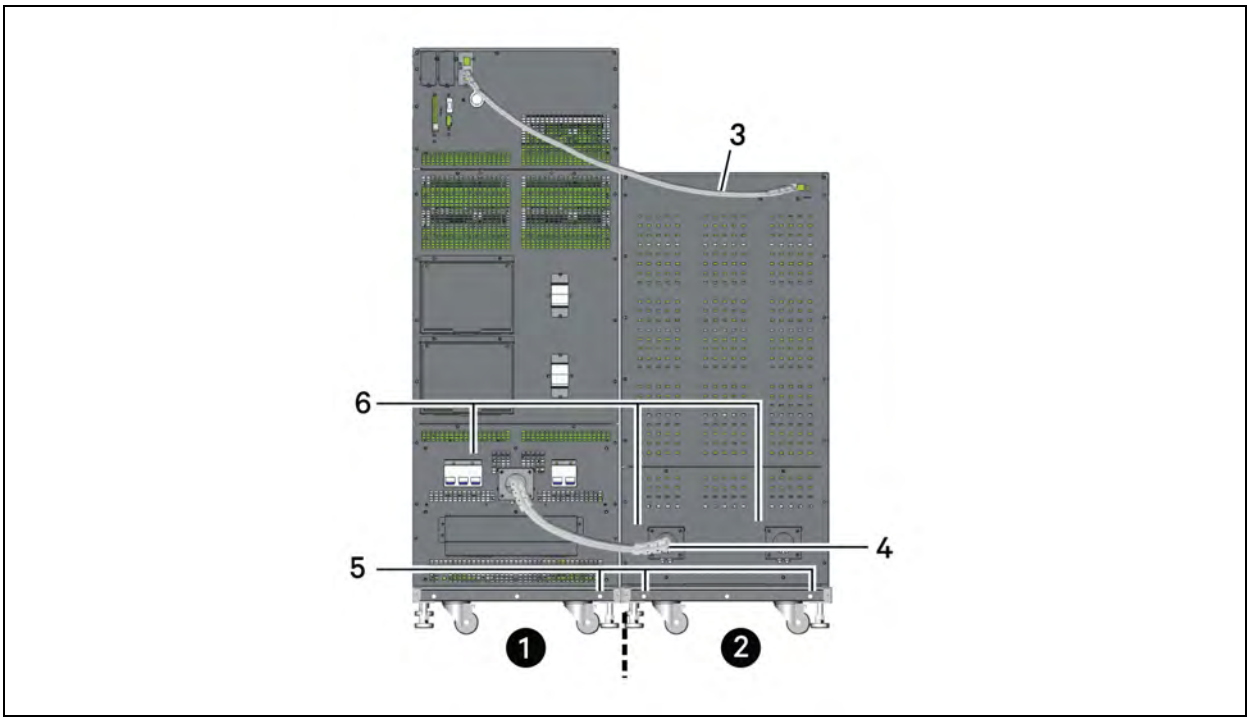
WARNING! Risk of hazardous voltage between UPS frames. Can cause damage to equipment, injury and death. Failure to open the EBC DC circuit breaker before connecting or disconnecting the battery cable between the UPS and EBC frames can result in hazardous voltages being present between the frames.

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



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Liebert 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 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 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 Table 3.12 below.

Figure 3.27 Battery screen

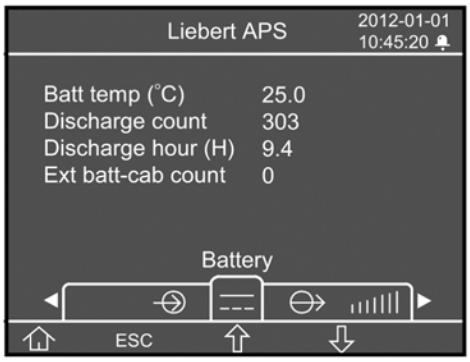


Table 3.12 EBC DIP switch settings

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 2.
6. Repeat steps 1 through 5 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 on page 48.

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 53 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 52.
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.

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4 COMMUNICATION

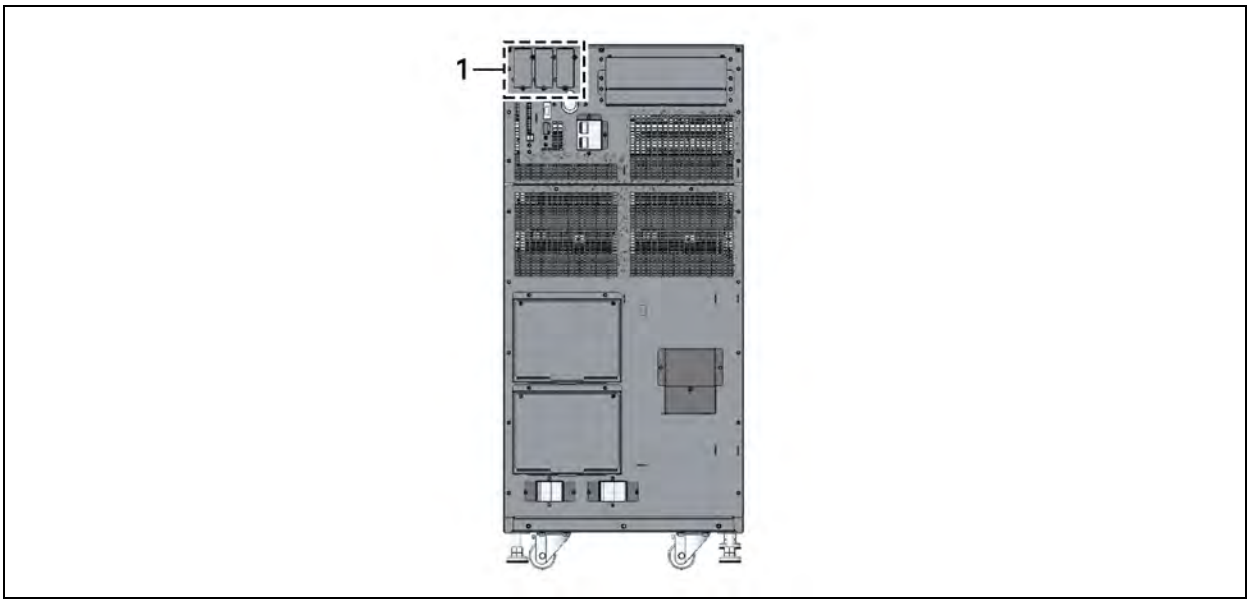
The rear panel of the Liebert APS includes the following communication ports:

- 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 Liebert IntelliSlot communication ports (see Figure 4.1 below) are for communication options, including the Liebert IntelliSlot Unity card, dry-contact card, Liebert MultiPort and Liebert IntelliSlot EBC card. 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 or for use with Liebert MultiLink® software. The card also acceps input signals to shut down the UPS during any mode of operation.

4.1.3 Liebert IntelliSlot MultiPort Card (IS-MULTIPORT)

The IS-MULTIPORT card provides dry-contact alarm information, including: On Battery, Low Battery signals for communication to 4 servers for use with Liebert MultiLink software.

4.1.4 Liebert IntelliSlot EBC Card

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

4.2 Dry-contact Ports

Figure 2.1 on page 12 shows the location of the dry-contact ports.

Figure 4.2 Pin layout of the dry contacts

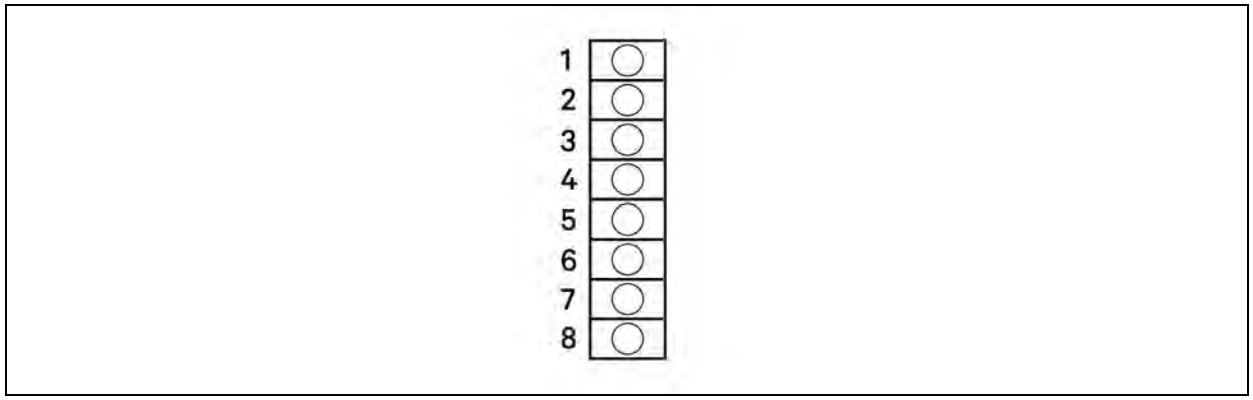


Table 4.1 Pin definition for dry-contact port

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. Figure 4.4 on the next page shows the schematic diagram of REPO switch connections.

Figure 4.3 REPO connector pin layout

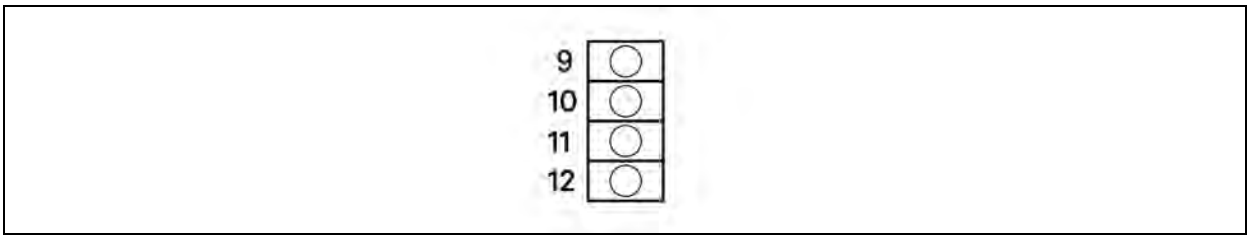
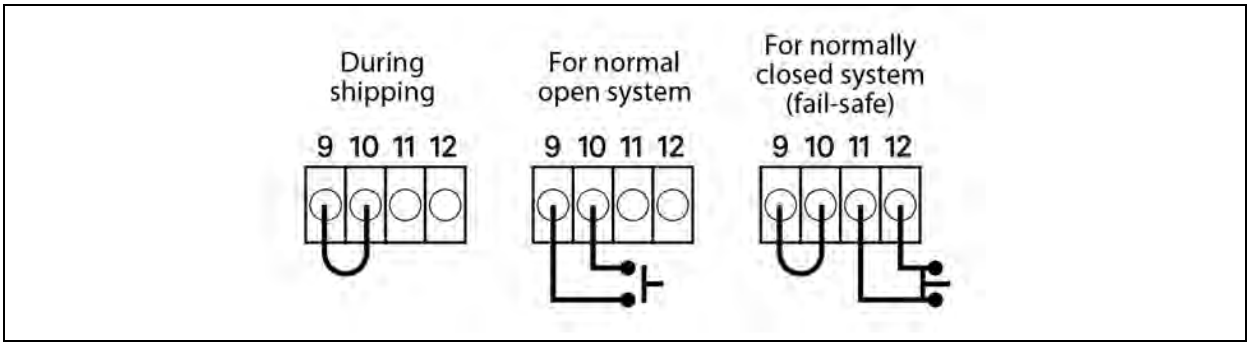


Table 4.2 Pin definition of the REPO dry contact

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

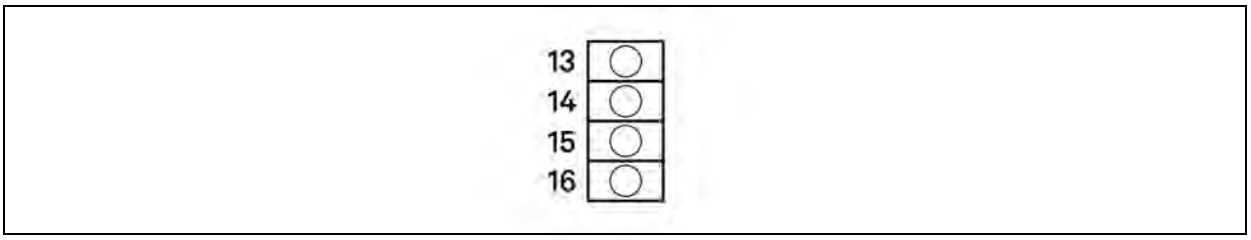


Table 4.3 Pin definition of the temperature sensor terminal

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, built-in UPS support or in conjunction with Liebert MultiLink® software.

4.6 Liebert MultiLink®

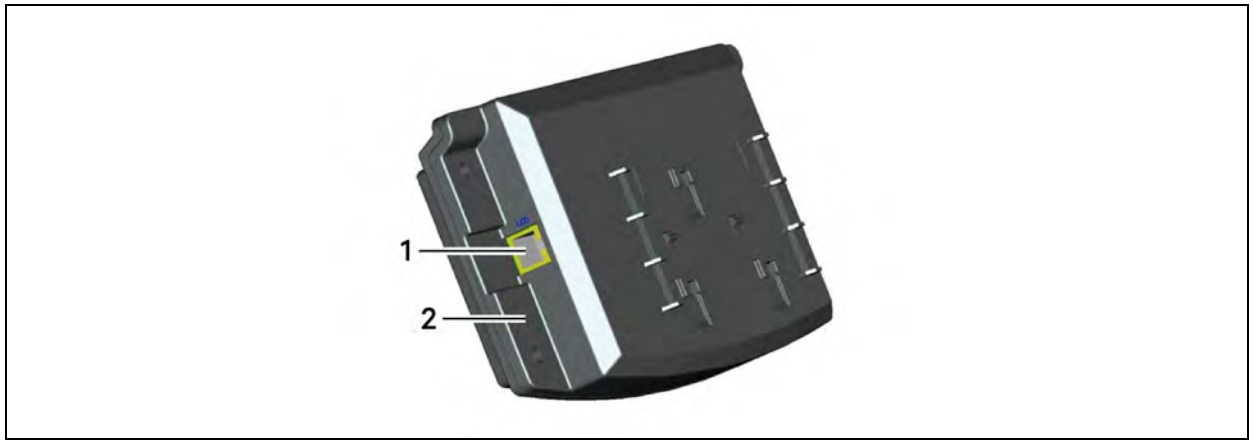
Liebert MultiLink monitors the UPS continuously and can shut down configured computers in the event of an extended power failure. Liebert MultiLink can configured to shut down the UPS and can also be used without the USB cable when the Liebert IntelliSlot UNITY-DP SNMP Card is installed in the UPS. An optional Liebert MultiLink License Kit permits shutting down the UPS over a network. For more information about the Liebert IntelliSlot SNMP Card, Liebert IntelliSlot Web Card, and Liebert MultiLink license kits, visit www.VertivCo.com or contact your local Vertiv™ representative.

4.7 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

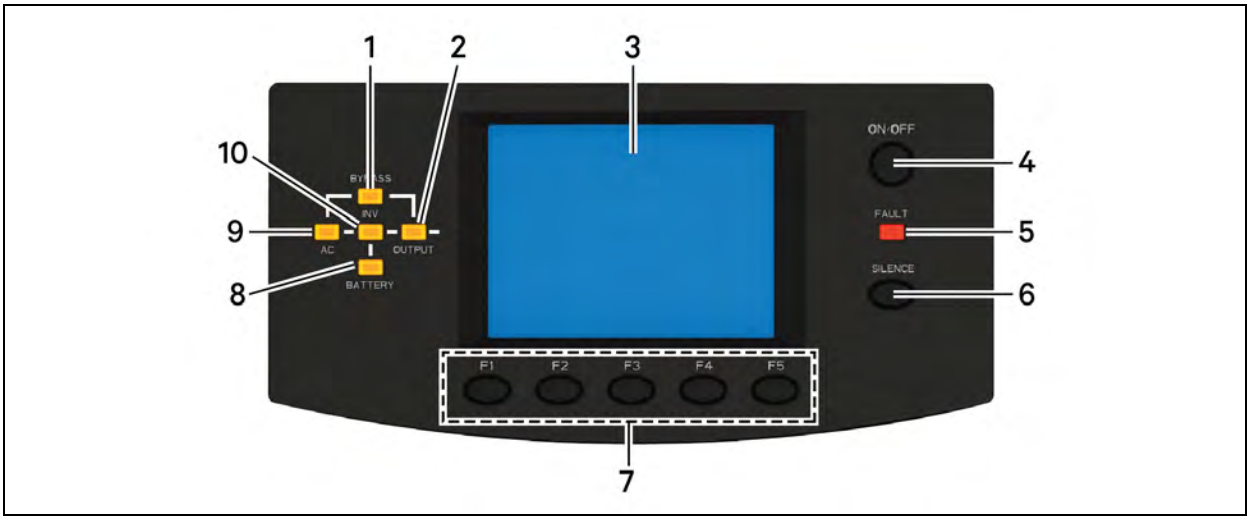


ITEM	DESCRIPTION
1	LCD port
2	User-interface module

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. Table 5.1 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 Table 5.2 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 Table 5.3 on the facing page.

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 Table 5.4 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	–	ESC Exit			–

5.3.1 Start-up Screen

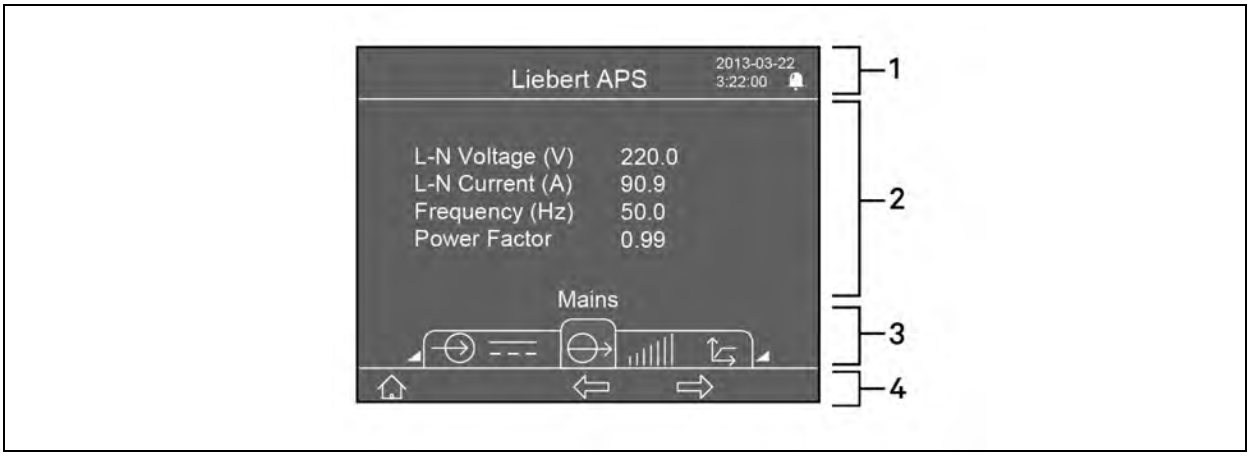
When the UPS starts up, it conducts a self-test, and the LCD displays the startup screen, which lasts for 15 seconds.

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 Figure 5.2 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 on page 60.
2	Data window, see Menu Window and Data Window on page 60.
3	Menu window, see Menu Window and Data Window on page 60.
4	Keyboard window, see LCD Screen and Menu Buttons on page 59.

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. Table 5.5 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
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.

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

MENU NAME	DATA ITEM	DATA DESCRIPTION
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
	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.
	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.

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

MENU NAME	DATA ITEM	DATA DESCRIPTION
	Redundant Alarm Mode	Allows alarm to be generated when the system loses redundant power module
Settings (continued)	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
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 69 for the UPS alarm list
Records	Historical Alarms	Displays all historical alarms. See Active Alarms on page 69 for the UPS alarm list

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

MENU NAME	DATA ITEM	DATA DESCRIPTION
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
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 Table 5.4 on page 59.

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 Table 5.4 on page 59.

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 Table 5.4 on page 59. To adjust the settings, see Entering a Password to Edit Settings on page 67, and Editing Parameter Settings on page 67.

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 Table 5.4 on page 59. To adjust the settings, see Entering a Password to Edit Settings on page 67, and Editing Parameter Settings on page 67.

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. Table 5.6 below 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.

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

PROMPT WINDOW	EXPLANATION
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.
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

6 TROUBLESHOOTING

This is the basic troubleshooting guide and required actions for maintaining the 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 Table 6.1 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.
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.

Table 6.1 Alarm message list (continued)

ALARM MESSAGE	POSSIBLE CAUSE	CORRECTIVE ACTION
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.
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.

Table 6.1 Alarm message list (continued)

ALARM MESSAGE	POSSIBLE CAUSE	CORRECTIVE ACTION
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.
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 16, and Table 6.2 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
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.

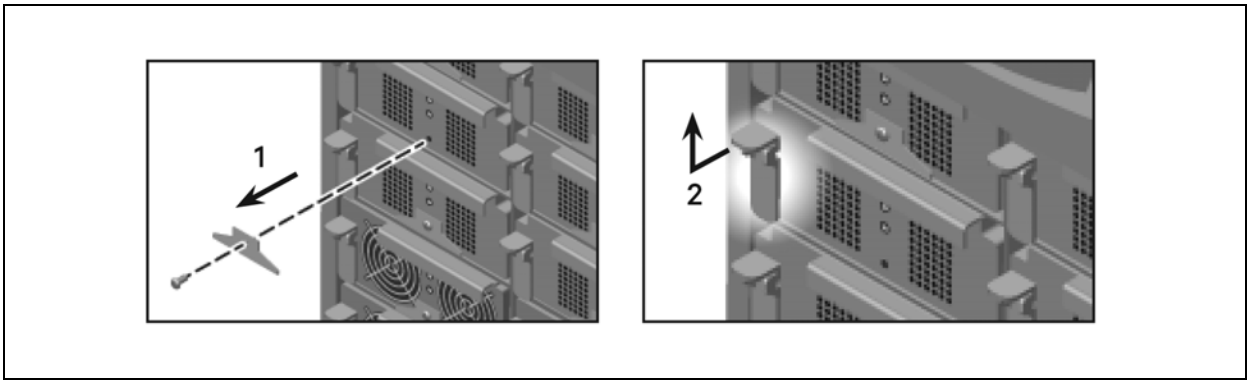
1. Remove bezel cover to locate the faulty module. The yellow fault LED is illuminated on the faulty module.

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.

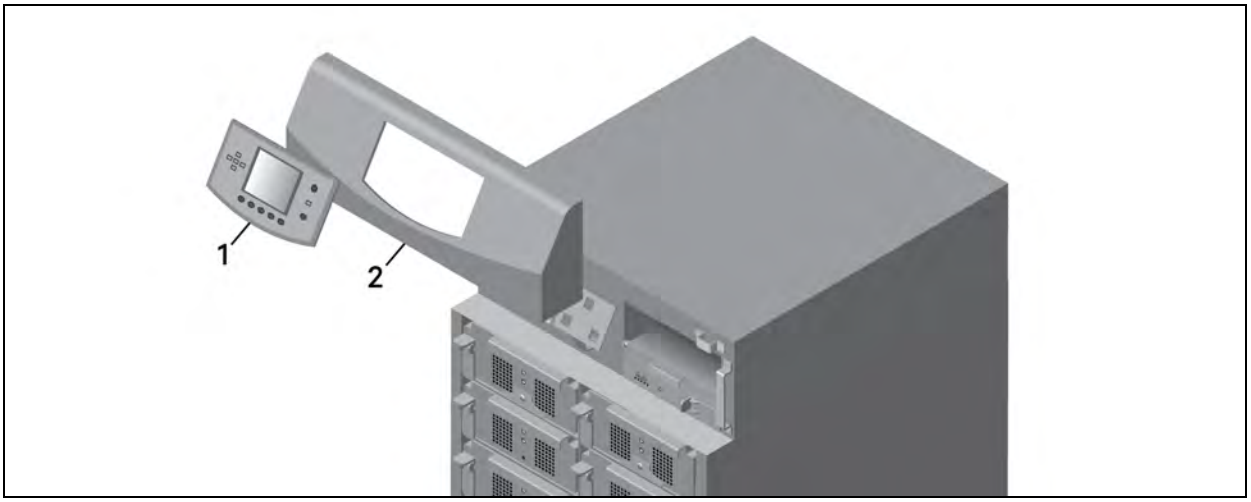
Do not remove both the control and the monitor modules at the same time. Removing both the control module and monitor module at the same time will cause the UPS to shut down and remove power from the load. Replace these modules one at a time.

1. Remove the display bezel and the user interface (LCD) module from the frame, as shown in Figure 6.2 on the next 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.

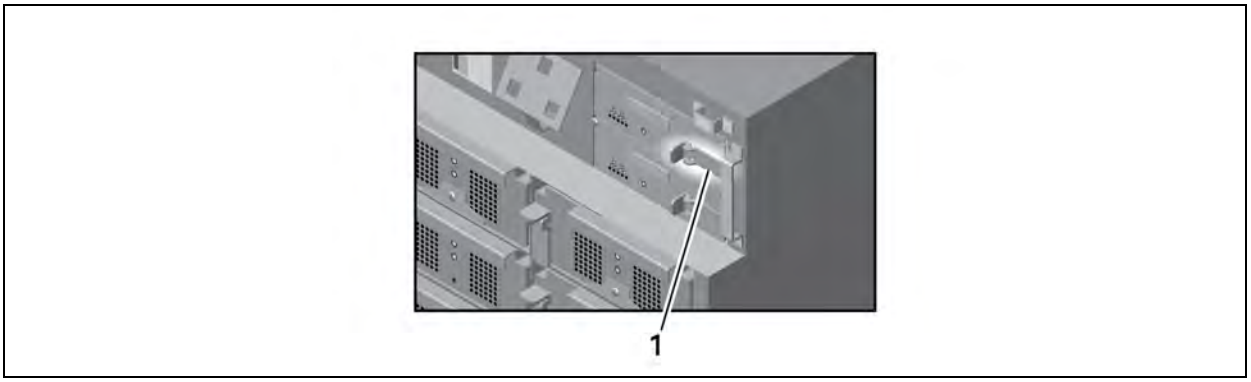
Figure 6.2 Remove display bezel and user-interface module



ITEM	DESCRIPTION
1	User-interface module
2	Display bezel

4. Pull out the lock lever slightly and pull to the left (see Figure 6.3 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



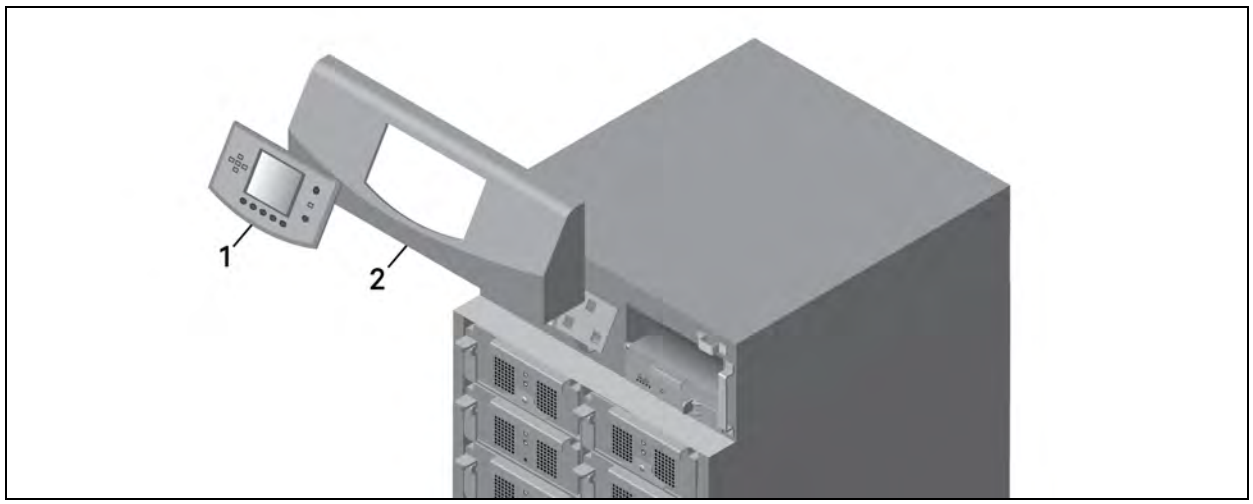
ITEM	DESCRIPTION
1	Lock lever

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 Figure 6.4 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

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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.

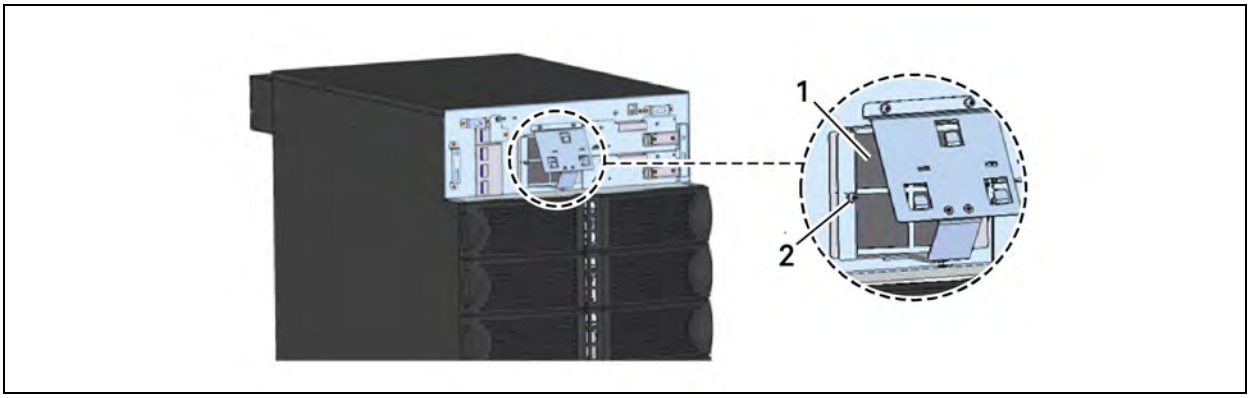
To remove dirt and dust from a filter:

Use a vacuum or rinse out the filter under running water (with the dirt side down). If you cleand 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 Figure 7.1 on the next page, and clean the filters as described in Cleaning Fan Filters on page 77.
5. Replace the filter, mounting plate, user interface module and display bezel.

Figure 7.1 Replacing/Cleaning the top filter

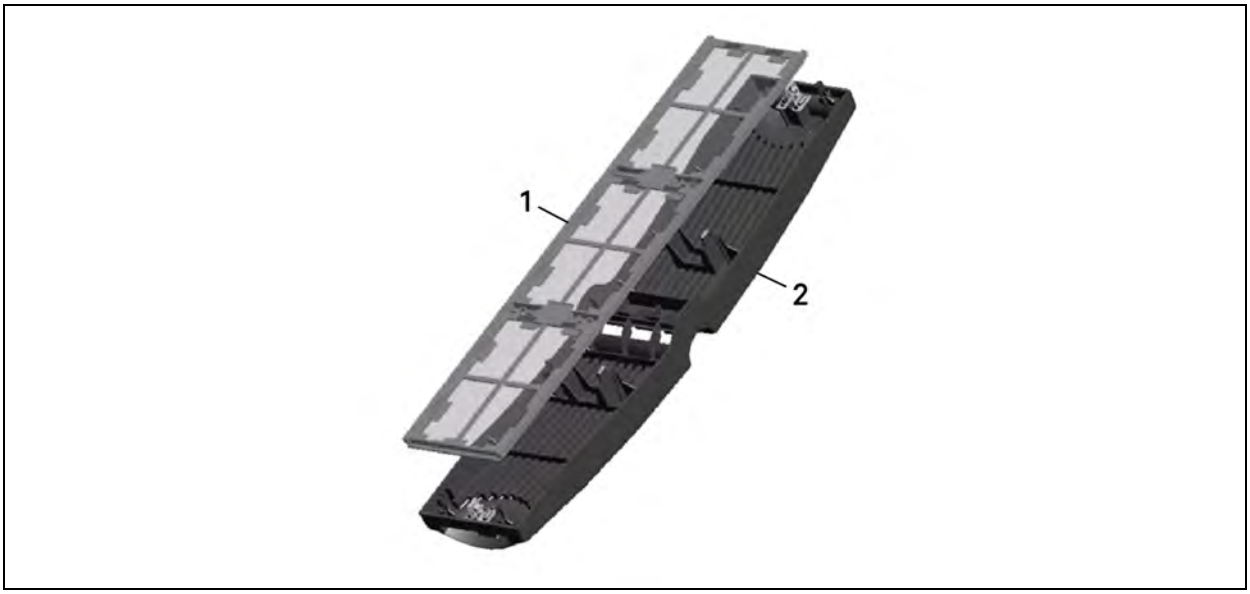


ITEM	DESCRIPTION
1	Filter
2	Screw (1 place)

7.3.2 Accessing the Bezel Filter

1. Remove the bezel from the frame.
2. Remove the filter assembly from the bezel, see Figure 7.2 below, and clean the filters as described in Cleaning Fan Filters on page 77.
3. Replace the filter in the bezel and and place the bezel on the frame.

Figure 7.2 Replacing/Cleaning the bezel filter



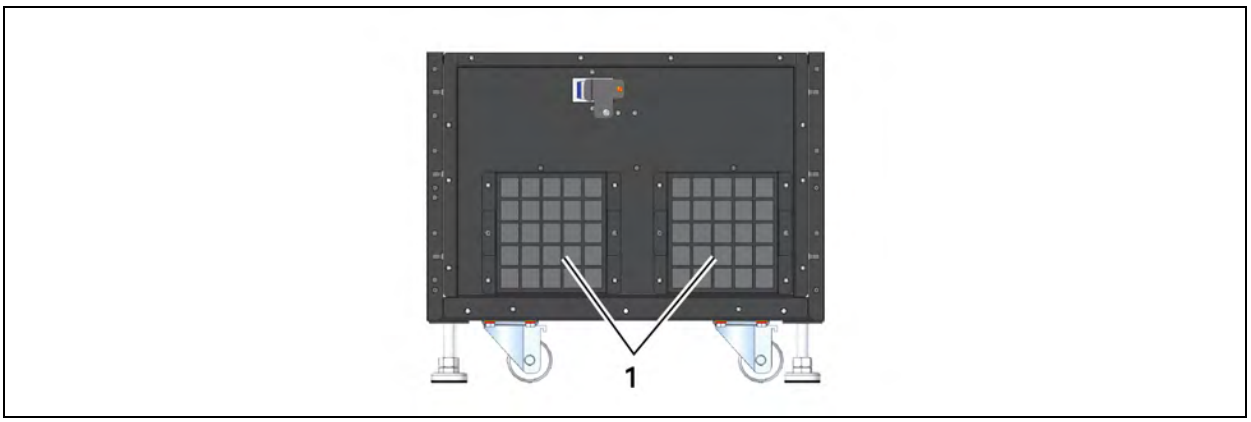
ITEM	DESCRIPTION
1	Filter
2	Bezel

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 Figure 7.3 below, and clean the filters as described in Cleaning Fan Filters on page 77.
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						
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					

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
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 Table 8.2 on the facing page					
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)					
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					

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
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

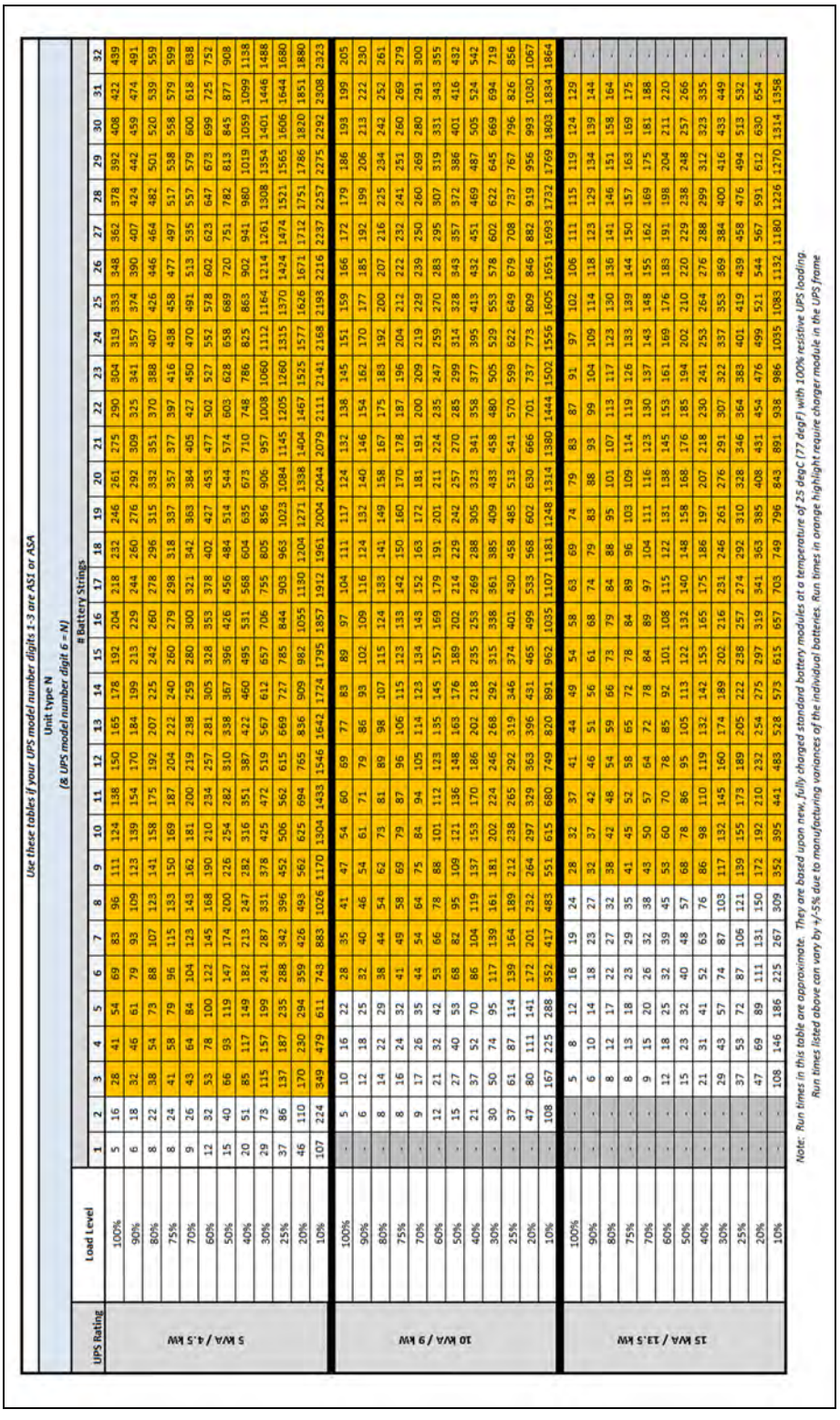
Table 8.3 Liebert APS external battery cabinet specifications (continued)

PARAMETERS	AS7EBCNCC1BX000
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)
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 page 85 through* *Estimated Battery Run Times: Model-number Digits 1-3 = AS6 or ASF* *on page 105*

*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

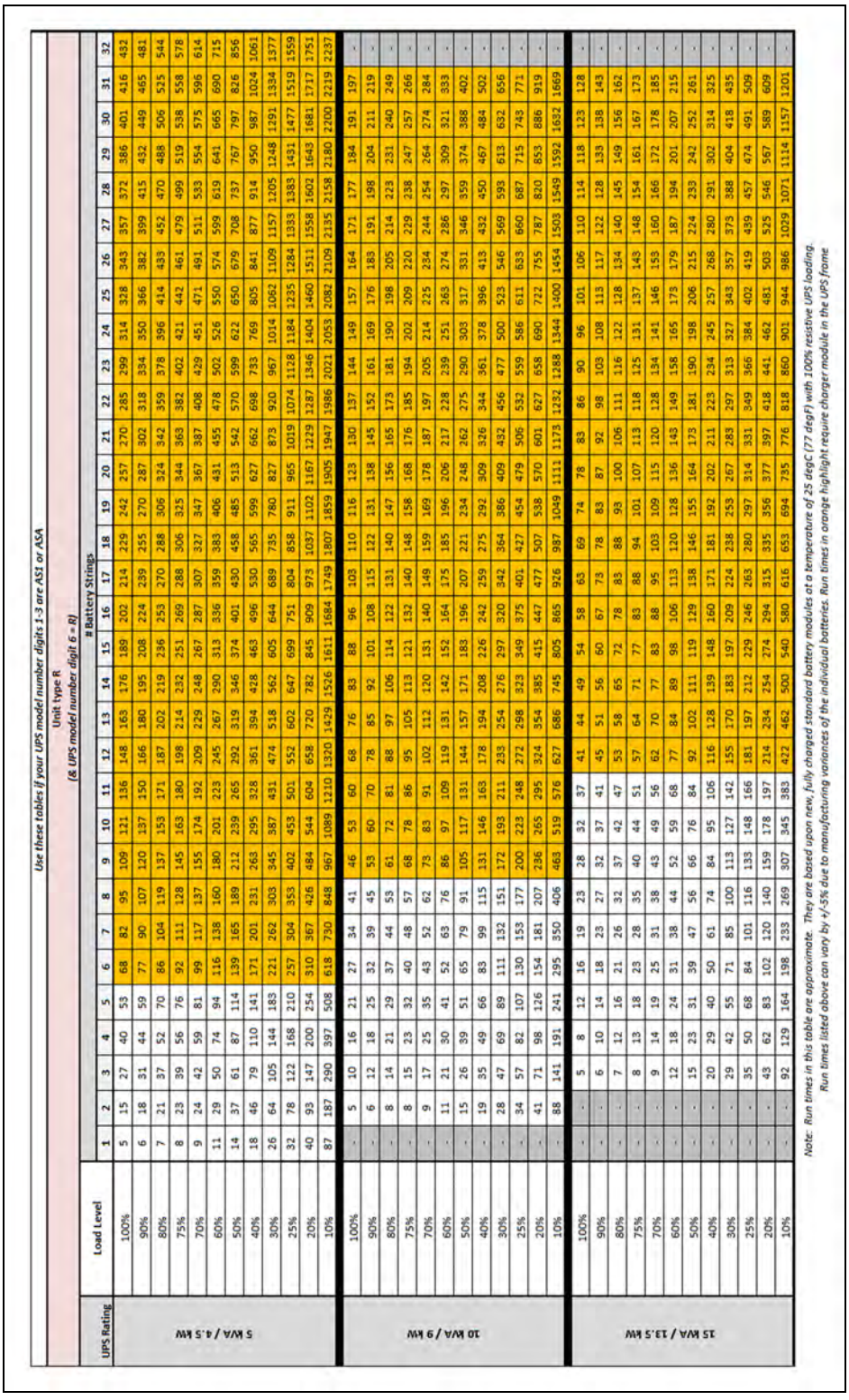
Unit type N

(& 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	142	150	160	170	178	187	196	204	212	222	232	241	251	260	269	279
	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	300
	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

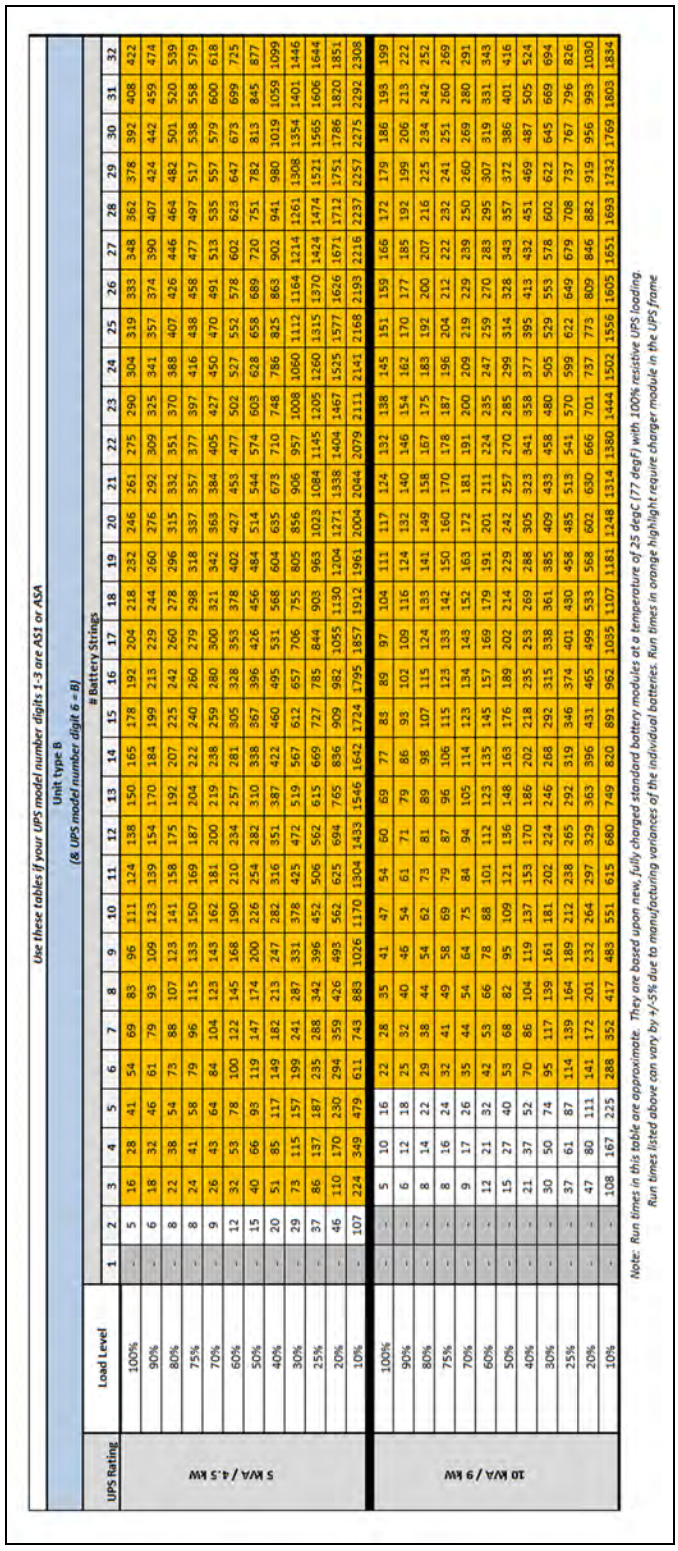
Unit type R

(& 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%	5	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
	90%	6	18	31	44	59	77	90	107	120	137	150	166	180	195	208	224	239	255	270	287	302	318	334	350	366	382	399	415	432	449	465	481
	80%	7	21	37	52	70	86	104	119	137	153	171	187	202	219	236	253	270	288	306	324	342	359	378	396	414	433	452	470	488	506	525	544
	75%	8	23	39	56	76	92	111	128	145	163	180	198	214	232	251	269	288	306	325	344	363	382	402	421	442	461	479	499	519	538	558	578
	70%	9	24	42	59	81	99	117	137	155	174	192	209	229	248	267	287	307	327	347	367	387	408	429	451	471	491	511	533	554	575	596	614
	60%	11	29	50	74	94	116	138	160	180	201	223	245	267	290	313	336	359	383	406	431	455	478	502	526	550	574	599	619	641	665	690	715
	50%	14	37	61	87	114	139	165	189	212	239	265	292	319	346	374	401	430	458	485	513	542	570	599	622	650	679	708	737	767	797	826	856
	40%	18	46	79	110	141	171	201	231	268	295	328	361	394	428	463	496	530	565	599	627	662	698	733	769	805	841	877	914	950	987	1024	1061
	30%	26	64	105	144	183	221	262	303	345	387	431	474	518	562	605	644	689	735	780	827	873	920	967	1014	1062	1109	1157	1205	1248	1291	1334	1377
	25%	32	78	122	168	210	257	304	353	402	453	501	552	602	647	699	751	804	858	911	965	1019	1074	1128	1184	1235	1284	1333	1383	1431	1477	1519	1559
	20%	40	93	147	200	254	310	367	426	484	544	604	658	720	782	845	909	973	1037	1102	1167	1229	1287	1346	1404	1460	1511	1558	1602	1643	1681	1717	1751
	10%	87	187	290	397	508	618	730	848	967	1089	1210	1320	1429	1526	1611	1684	1749	1807	1859	1905	1947	1986	2021	2053	2082	2109	2135	2158	2180	2200	2219	2237
10 kVA / 9 kW	100%	-	5	10	16	21	27	34	41	46	53	60	68	76	83	88	96	103	110	116	123	130	137	144	149	157	164	171	177	184	191	197	-
	90%	-	6	12	18	25	32	39	45	53	60	70	78	85	92	101	108	115	122	131	138	145	152	161	169	176	183	191	198	204	211	219	-
	80%	-	8	14	21	29	37	44	53	61	72	81	88	97	106	114	122	131	140	147	156	165	173	181	190	198	205	214	223	231	240	249	-
	75%	-	8	15	23	32	40	48	57	68	78	86	95	105	113	121	132	140	148	158	168	176	185	194	202	209	220	229	238	247	257	266	-
	70%	-	9	17	25	35	43	52	62	73	83	91	102	112	120	131	140	149	159	169	178	187	197	205	214	225	234	244	254	264	274	284	-
	60%	-	11	21	30	41	52	63	76	86	97	109	119	131	142	152	164	175	185	196	206	217	228	239	251	263	274	286	297	309	321	333	-
	50%	-	15	26	39	51	65	79	91	105	117	131	144	157	171	183	196	207	221	234	248	262	275	290	303	317	331	346	359	374	388	402	-
	40%	-	19	35	49	66	83	99	115	131	146	163	178	194	208	226	242	259	275	292	309	326	344	361	378	396	413	432	450	467	484	502	-
	30%	-	28	47	69	89	111	132	151	172	193	211	233	254	276	297	320	342	364	386	409	432	456	477	500	523	546	569	593	613	632	656	-
	25%	-	34	57	82	107	130	153	177	200	223	248	272	298	323	349	375	401	427	454	479	506	532	559	586	611	633	660	687	715	743	771	-
	20%	-	41	71	98	126	154	181	207	236	265	295	324	354	385	415	447	477	507	538	570	601	627	658	690	722	755	787	820	853	886	919	-
	10%	-	88	141	191	241	295	350	406	463	519	576	627	686	745	805	865	926	987	1049	1111	1173	1232	1288	1344	1400	1454	1503	1549	1592	1632	1669	-
15 kVA / 13.5 kW	100%	-	-	5	8	12	16	19	23	28	32	37	41	44	49	54	58	63	69	74	78	83	86	90	96	101	106	110	114	118	123	128	-
	90%	-	-	6	10	14	18	23	27	32	37	41	45	51	56	60	67	73	78	83	87	92	98	103	108	113	117	122	128	133	138	143	-
	80%	-	-	7	12	16	21	26	32	37	42	47	53	58	65	72	78	83	88	93	100	106	111	116	122	128	134	140	145	149	156	162	-
	75%	-	-	8	13	18	23	28	35	40	44	51	57	64	71	77	83	88	94	101	107	113	118	125	131	137	143	148	154	161	167	173	-
	70%	-	-	9	14	19	25	31	38	43	49	56	62	70	77	83	88	95	103	109	115	120	128	134	141	146	153	160	166	172	178	185	-
	60%	-	-	12	18	24	31	38	44	52	59	68	77	84	89	98	106	113	120	128	136	143	149	158	165	173	179	187	194	201	207	215	-
	50%	-	-	15	23	31	39	47	56	66	76	84	92	102	111	119	129	138	146	155	164	173	181	190	198	206	215	224	233	242	252	261	-
	40%	-	-	20	29	40	50	61	74	84	95	106	116	128	139	148	160	171	181	192	202	211	223	234	245	257	268	280	291	302	314	325	-
	30%	-	-	29	42	55	71	85	100	113	127	142	155	170	183	197	209	224	238	253	267	283	297	313	327	343	357	373	388	404	418	435	-
	25%	-	-	35	50	68	84	101	116	133	148	166	181	197	212	229	246	263	280	297	314	331	349	366	384	402	419	439	457	474	491	509	-
	20%	-	-	43	62	83	102	120	140	159	178	197	214	234	254	274	294	315	335	356	377	397	418	441	462	481	503	525	546	567	589	609	-
	10%	-	-	92	129	164	198	233	269	307	345	383	422	462	500	540	580	616	653	694	735	776	818	860	901	944	986	1029	1071	1114	1157	1201	-

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

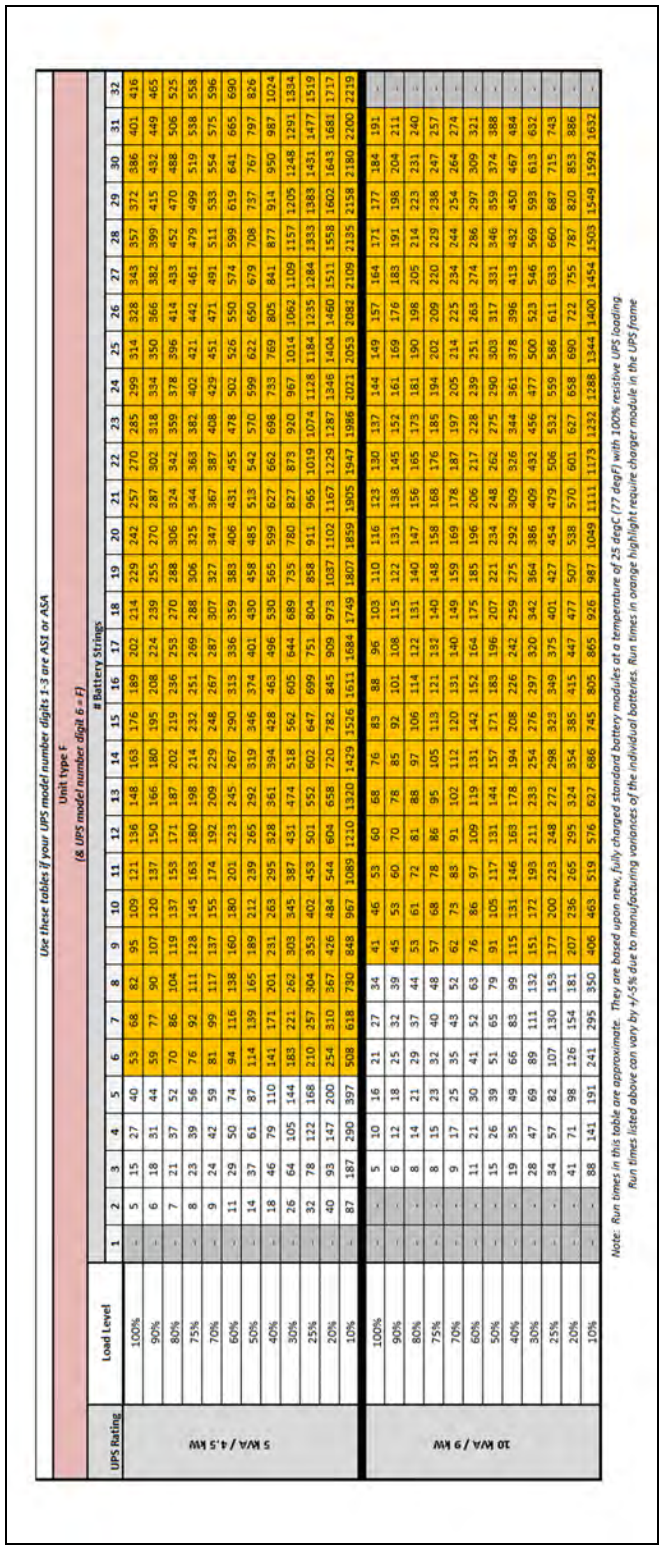
Unit type B

(& 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%	-	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
	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
	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
	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
	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
	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
	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
	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
	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
	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
	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
	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
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
	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
	80%	-	-	8	14	22	29	38	44	54	62	73	81	89	98	107	115	124	133	141	149	158	167	175	183	192	200	207	216	225	234	242	252
	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
	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
	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
	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
	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
	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
	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
	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
	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

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 ASI or ASA

Unit type F

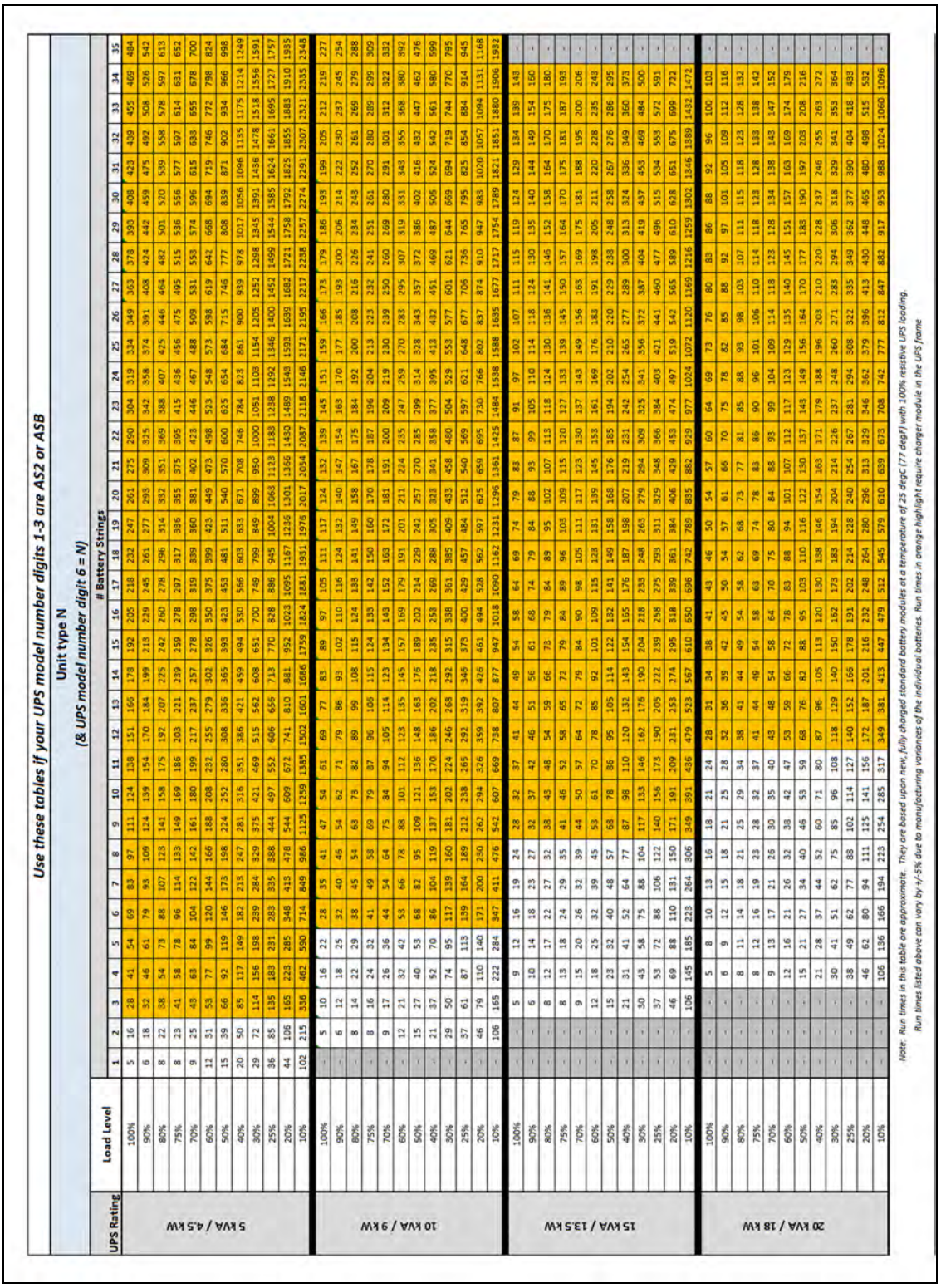
(& UPS model number digit 6 = F)

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%	-	5	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
	90%	-	6	18	31	44	59	77	90	107	120	137	150	166	180	195	208	224	239	255	270	287	302	318	334	350	366	382	399	415	432	449	465
	80%	-	7	21	37	52	70	86	104	119	137	158	171	187	202	219	236	253	270	288	306	324	342	359	378	396	414	433	452	470	488	506	525
	75%	-	8	23	39	56	76	92	111	128	145	163	180	198	214	232	251	269	288	306	325	344	363	382	402	421	442	461	479	499	519	538	558
	70%	-	9	24	42	59	81	99	117	137	155	174	192	209	229	248	267	287	307	327	347	367	387	408	429	451	471	491	511	533	554	575	596
	60%	-	11	29	50	74	94	116	138	160	180	201	223	245	267	290	315	336	359	383	406	431	455	478	502	526	550	574	599	619	641	665	690
	50%	-	14	37	61	87	114	139	165	189	212	239	265	292	319	346	374	401	430	458	485	513	542	570	599	622	650	679	708	737	767	797	826
	40%	-	18	46	79	110	141	171	201	231	263	295	328	361	394	428	463	496	530	565	599	627	662	698	733	769	805	841	877	914	950	987	1024
	30%	-	26	64	105	144	183	221	262	303	345	387	431	474	518	562	605	644	689	735	780	827	873	920	967	1014	1062	1109	1157	1205	1248	1291	1334
	25%	-	32	78	122	168	210	257	304	353	402	453	501	552	602	647	699	751	804	858	911	965	1019	1074	1128	1184	1235	1284	1333	1383	1431	1477	1519
	20%	-	40	93	147	200	254	310	367	426	484	544	604	658	720	782	845	909	973	1037	1102	1167	1229	1287	1346	1404	1460	1511	1558	1602	1643	1681	1717
	10%	-	87	187	290	397	508	618	730	848	967	1089	1210	1320	1429	1526	1611	1684	1749	1807	1859	1905	1947	1986	2021	2053	2083	2109	2135	2158	2180	2200	2219
10 kVA / 9 kW	100%	-	-	5	10	16	21	27	34	41	46	53	60	68	76	83	88	96	103	110	116	123	130	137	144	149	157	164	171	177	184	191	-
	90%	-	-	6	12	18	25	32	39	45	53	60	70	78	85	92	101	108	115	122	131	138	145	152	161	169	176	183	191	198	204	211	-
	80%	-	-	8	14	21	29	37	44	53	61	72	81	88	97	106	114	122	131	140	147	156	165	173	181	190	198	205	214	223	231	240	-
	75%	-	-	8	15	23	32	40	48	57	68	78	86	95	105	113	121	133	140	148	158	168	176	185	194	202	209	220	229	238	247	257	-
	70%	-	-	9	17	25	35	43	52	62	73	83	91	102	112	120	131	140	149	159	169	178	187	197	205	214	225	234	244	254	264	274	-
	60%	-	-	11	21	30	41	52	63	76	86	97	109	119	131	142	152	164	175	185	196	206	217	228	239	251	263	274	286	297	309	321	-
	50%	-	-	15	26	39	51	65	79	91	105	117	131	144	157	171	183	196	207	221	234	248	262	275	290	303	317	331	346	359	374	388	-
	40%	-	-	19	35	49	66	83	99	115	131	146	163	178	194	208	226	242	259	275	292	309	326	344	361	378	396	413	432	450	467	484	-
	30%	-	-	28	47	69	89	111	132	151	172	193	211	233	254	276	297	320	342	364	386	409	432	456	477	500	523	546	569	593	613	632	-
	25%	-	-	34	57	82	107	130	153	177	200	223	248	272	298	323	349	375	401	427	454	479	506	532	559	586	611	633	660	687	715	743	-
	20%	-	-	41	71	98	126	154	181	207	236	265	295	324	354	385	415	447	477	507	538	570	601	627	658	690	722	755	787	820	853	886	-
	10%	-	-	88	141	191	241	295	350	406	463	519	576	627	686	745	805	865	926	987	1049	1111	1173	1232	1288	1344	1400	1454	1503	1549	1592	1632	-

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)



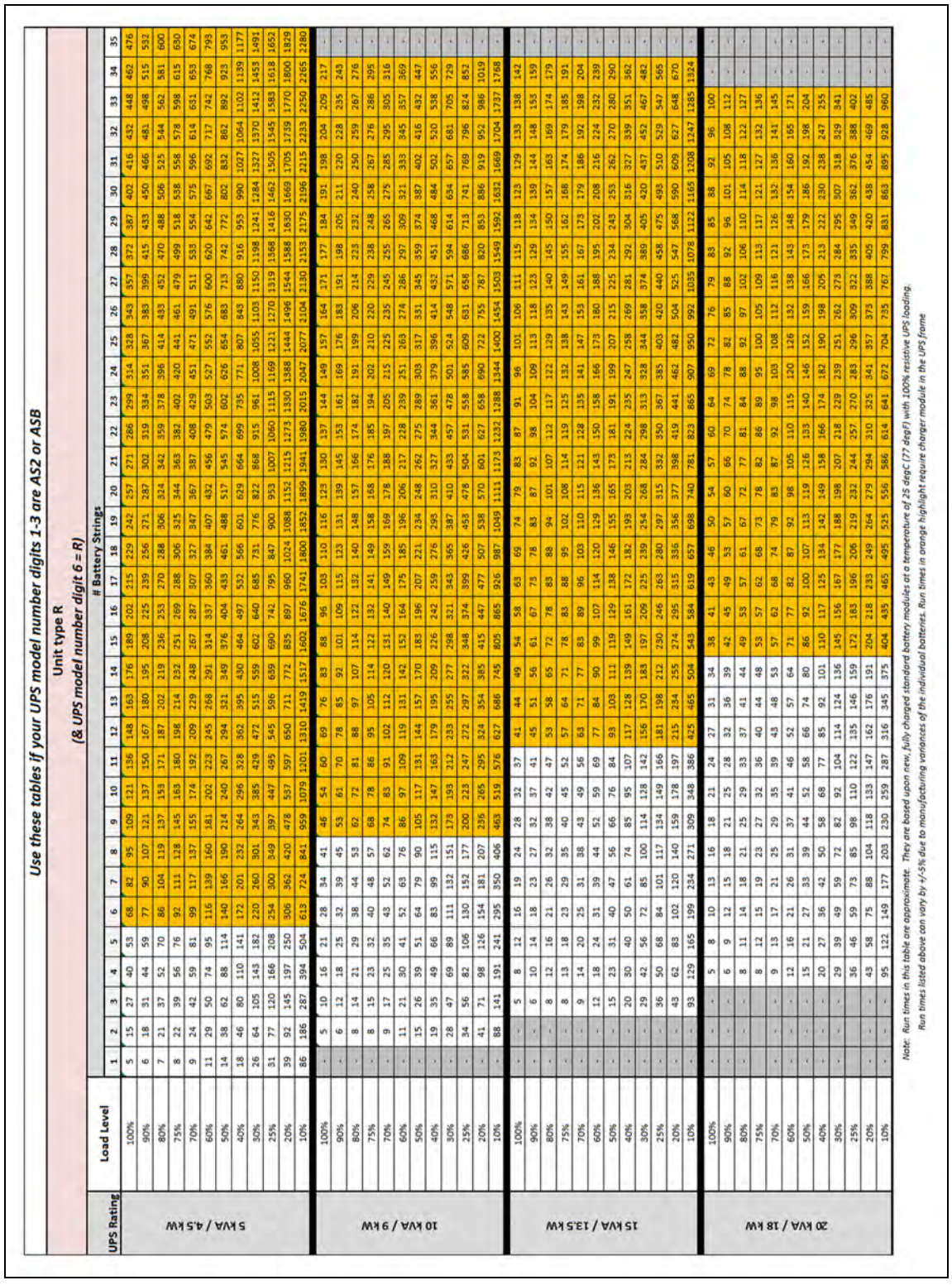
Use these tables if your UPS model number digits 1-3 are AS2 or ASB

Unit type N

(& UPS model number digit 6 = N)

| UPS Rating | Load Level | # Battery Strings | | |

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%	5	15	27	40	53	68	82	95	109	121	136	148	163	176	189	202	215	229	242	257	271	286	299	314	328	343	357	372	387	402	416	432	448	462	476
	90%	6	18	31	44	59	77	90	107	121	137	150	167	180	195	208	225	239	256	271	287	302	319	334	351	367	383	399	415	433	450	466	481	498	515	532
	80%	7	21	37	52	70	86	104	119	137	153	171	187	202	219	236	253	270	288	306	324	342	359	378	396	414	433	452	470	488	506	525	544	562	581	600
	75%	8	22	39	56	76	92	111	128	145	163	180	198	214	232	251	269	288	306	325	344	363	382	402	420	441	461	479	499	518	538	558	578	598	615	630
	70%	9	24	42	59	81	99	117	137	155	174	192	209	229	248	267	287	307	327	347	367	387	408	429	451	471	491	511	533	554	575	596	614	631	653	674
	60%	11	29	50	74	95	116	139	160	181	202	223	245	268	291	314	337	360	384	407	432	456	479	503	527	552	576	600	620	642	667	692	717	742	768	798
	50%	14	38	62	88	114	140	166	190	214	240	267	294	321	349	376	404	439	461	488	517	545	574	602	626	654	683	713	742	772	802	832	862	892	923	953
	40%	18	46	80	110	141	172	201	232	264	296	328	362	395	430	464	497	532	566	601	629	664	699	735	771	807	843	880	916	953	990	1027	1064	1102	1139	1177
	30%	26	64	105	143	182	220	260	301	343	385	429	472	515	559	602	640	685	731	776	822	868	915	961	1008	1055	1103	1150	1198	1241	1284	1327	1370	1412	1453	1491
	25%	31	77	120	166	208	254	300	349	397	447	495	545	596	639	690	742	795	847	900	953	1007	1060	1115	1169	1221	1270	1319	1368	1416	1462	1505	1545	1583	1618	1652
	20%	39	92	145	197	250	306	362	420	478	537	597	650	711	772	835	897	960	1024	1088	1152	1215	1273	1330	1388	1444	1496	1544	1588	1630	1669	1705	1739	1770	1800	1829
	10%	86	186	287	394	504	613	724	841	959	1079	1201	1310	1419	1517	1602	1676	1741	1800	1852	1899	1941	1980	2015	2047	2077	2104	2130	2153	2175	2196	2215	2233	2250	2265	2280
10 kVA / 9 kW	100%	-	5	10	16	21	28	34	41	46	54	60	69	76	83	88	96	105	110	116	123	130	137	144	149	157	164	171	177	184	191	198	204	209	217	-
	90%	-	6	12	18	25	32	39	45	53	61	70	78	85	92	101	109	115	123	131	139	145	153	161	169	176	183	191	198	205	211	220	228	235	243	-
	80%	-	8	14	21	29	38	44	53	62	72	81	88	97	107	114	122	132	140	148	157	166	174	182	191	199	206	214	223	232	240	250	259	267	276	-
	75%	-	8	15	23	32	40	48	57	68	78	86	95	105	114	122	132	141	149	158	168	176	185	194	202	210	220	229	238	248	258	267	276	286	295	-
	70%	-	9	17	25	35	43	52	62	74	83	91	102	112	120	131	140	149	159	169	178	188	197	205	215	225	235	245	255	265	275	285	295	305	316	-
	60%	-	11	21	30	41	52	63	76	86	97	109	119	131	142	152	164	175	185	196	206	217	228	239	251	263	274	286	297	309	321	333	345	357	369	-
	50%	-	15	26	39	51	64	79	90	105	117	131	144	157	170	183	196	207	221	234	248	262	275	289	303	317	331	345	359	374	387	402	416	432	447	-
	40%	-	19	35	49	66	83	99	115	132	147	163	179	195	209	226	242	259	276	293	310	327	344	361	379	396	414	432	451	468	484	502	520	538	556	-
	30%	-	28	47	69	89	111	132	151	173	193	212	233	255	277	298	321	343	365	387	410	433	457	478	501	524	548	571	594	614	634	657	681	705	729	-
	25%	-	34	56	82	106	130	152	177	200	223	247	272	297	322	348	374	399	426	453	478	504	531	558	585	609	631	658	686	713	741	769	796	824	853	-
	20%	-	41	71	98	126	154	181	207	236	265	295	324	354	385	415	447	477	507	538	570	601	627	658	690	722	755	787	820	853	886	919	952	986	1019	-
	10%	-	88	141	191	241	295	350	406	463	519	576	627	686	745	805	865	926	987	1049	1111	1173	1232	1288	1344	1400	1454	1503	1549	1592	1632	1669	1704	1737	1768	-
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	96	101	106	111	115	118	123	129	133	138	142	-
	90%	-	-	6	10	14	18	23	27	32	37	41	45	51	56	61	67	73	78	83	87	92	98	104	109	113	118	123	129	134	139	144	148	153	159	-
	80%	-	-	8	12	16	21	26	32	38	42	47	53	58	65	72	78	83	88	94	101	107	112	117	122	129	135	140	145	150	157	163	169	174	179	-
	75%	-	-	8	13	18	23	29	35	40	45	52	57	64	71	78	83	88	95	102	108	114	119	125	132	138	143	149	155	162	168	174	179	185	191	-
	70%	-	-	9	14	20	25	31	38	43	49	56	63	71	77	83	89	96	103	110	115	121	128	135	141	147	153	161	167	173	179	186	192	198	204	-
	60%	-	-	12	18	24	31	39	44	52	59	69	77	84	90	99	107	114	120	129	136	143	150	158	166	173	180	188	195	202	208	216	224	232	239	-
	50%	-	-	15	23	31	40	47	56	66	76	84	93	103	111	119	129	138	146	155	165	173	181	191	199	207	215	225	234	243	253	262	270	280	290	-
	40%	-	-	20	30	40	50	61	74	85	95	107	117	128	139	149	161	172	182	193	203	213	224	235	247	258	269	281	292	304	316	327	339	351	362	-
	30%	-	-	29	42	56	72	85	100	114	128	142	156	170	183	197	209	225	239	254	268	284	298	313	328	344	358	374	389	405	420	437	452	467	482	-
	25%	-	-	36	50	68	84	101	117	134	149	166	181	198	212	230	246	263	280	297	315	332	350	367	385	403	420	440	458	475	493	510	529	547	565	-
	20%	-	-	43	62	83	102	120	140	159	178	197	215	234	255	274	295	315	336	356	377	398	419	441	462	482	504	525	547	568	590	609	627	648	670	-
	10%	-	-	93	129	165	199	234	271	309	348	386	425	465	504	543	584	619	657	698	740	781	823	865	907	950	992	1035	1078	1122	1165	1208	1247	1285	1324	-
20 kVA / 18 kW	100%	-	-	-	5	8	10	13	16	18	21	24	27	31	34	38	41	43	46	50	54	57	60	64	69	72	76	79	83	85	88	92	96	100	-	-
	90%	-	-	-	6	9	12	15	18	21	25	28	32	36	39	42	45	49	53	57	60	66	70	74	78	82	85	88	92	96	101	105	108	112	-	-
	80%	-	-	-	8	11	14	18	21	25	29	33	37	41	44	49	53	57	61	67	72	77	81	84	88	92	97	102	106	110	114	118	122	127	-	-
	75%	-	-	-	8	12	15	19	23	27	32	36	40	44	48	53	57	62	68	73	78	82	86	89	95	100	105	109	113	117	121	127	132	136	-	-
	70%	-	-	-	9	13	17	21	25	29	35	39	43	48	53	57	62	68	74	79	83	87	92	98	103	108	112	116	121	126	132	136	141	145	-	-
	60%	-	-	-	12	16	21	26	31	37	41	46	52	57	64	71	77	82	87	92	98	105	110	115	120	126	132	138	143	148	154	160	165	171	-	-
	50%	-	-	-	15	21	27	33	39	44	52	58	66	74	80	86	92	100	107	113	119	126	133	140	146	152	159	166	173	179	186	192	198	204	-	-
	40%	-	-	-	20	27	36	42	50	58	68	77	85	92	101	110	117	125	134	142	149	158	166	174	182	190	198	205	213	222	230	238	247	255	-	-
	30%	-	-	-	29	39	49	59	72	82	92	104	114	124	136	145	156	167	177	188	198	207	218	229	239	251	262	273	284	295	307	318	329	341	-	-
	25%	-	-	-	36	46	59	73	85	98	110	122	135	146	159	172	183	196	206	219	232	244	257	270	283	296	309	322	335	349	362	376	388	402	-	-
	20%	-	-	-	43	58	75	88	104	118	133	147	162	176	191	204	218	233	249	264	279	294	310	325	341	357	373	388	405	420	438	454	469	485	-	-
	10%	-	-	-	95	122	149	177	203	230	259	287	316	345	375	404	435	465	495	525	556	586	614	641	672	704	735	767	799	831	863	895	928	960	-	-

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)

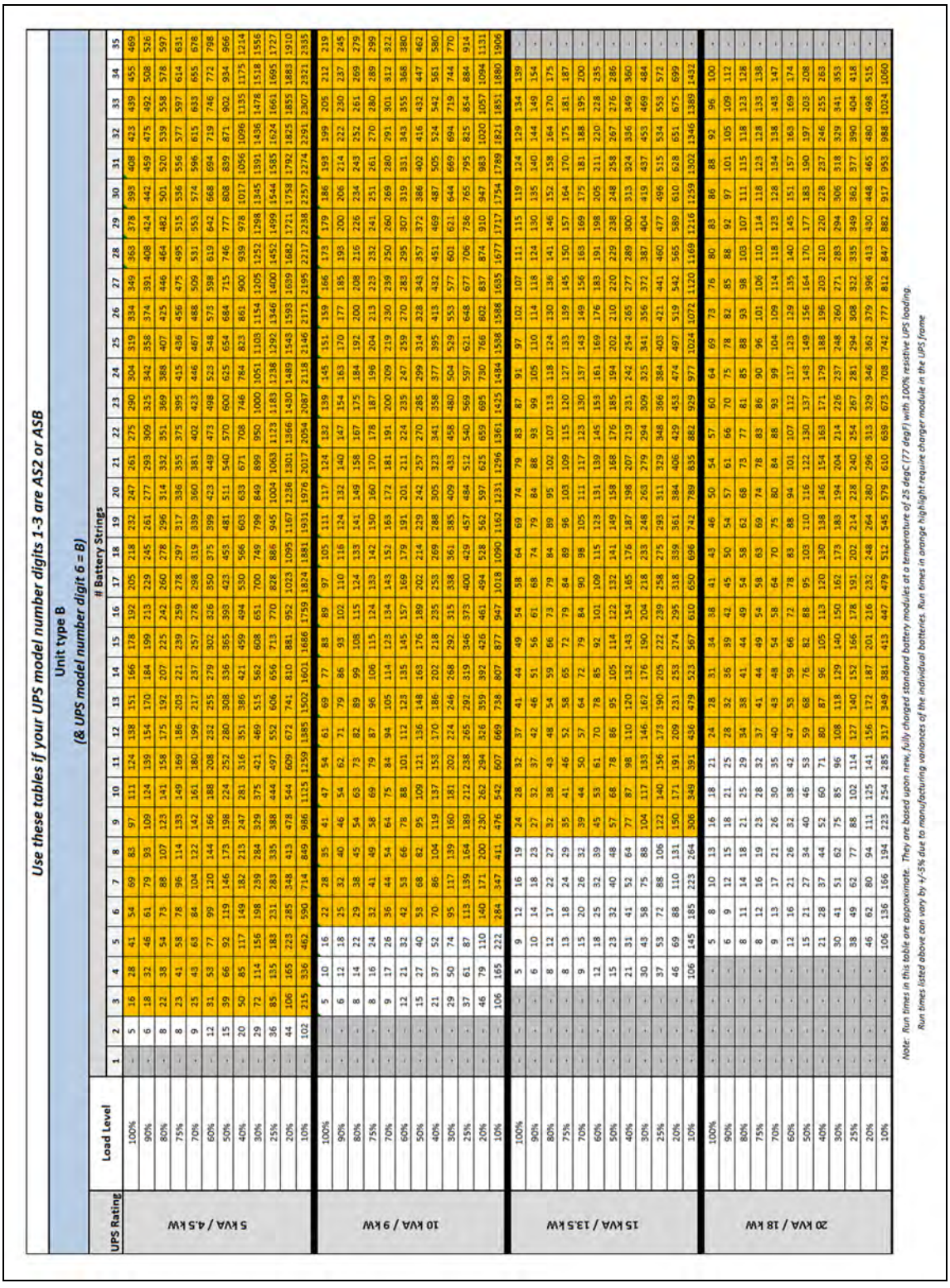
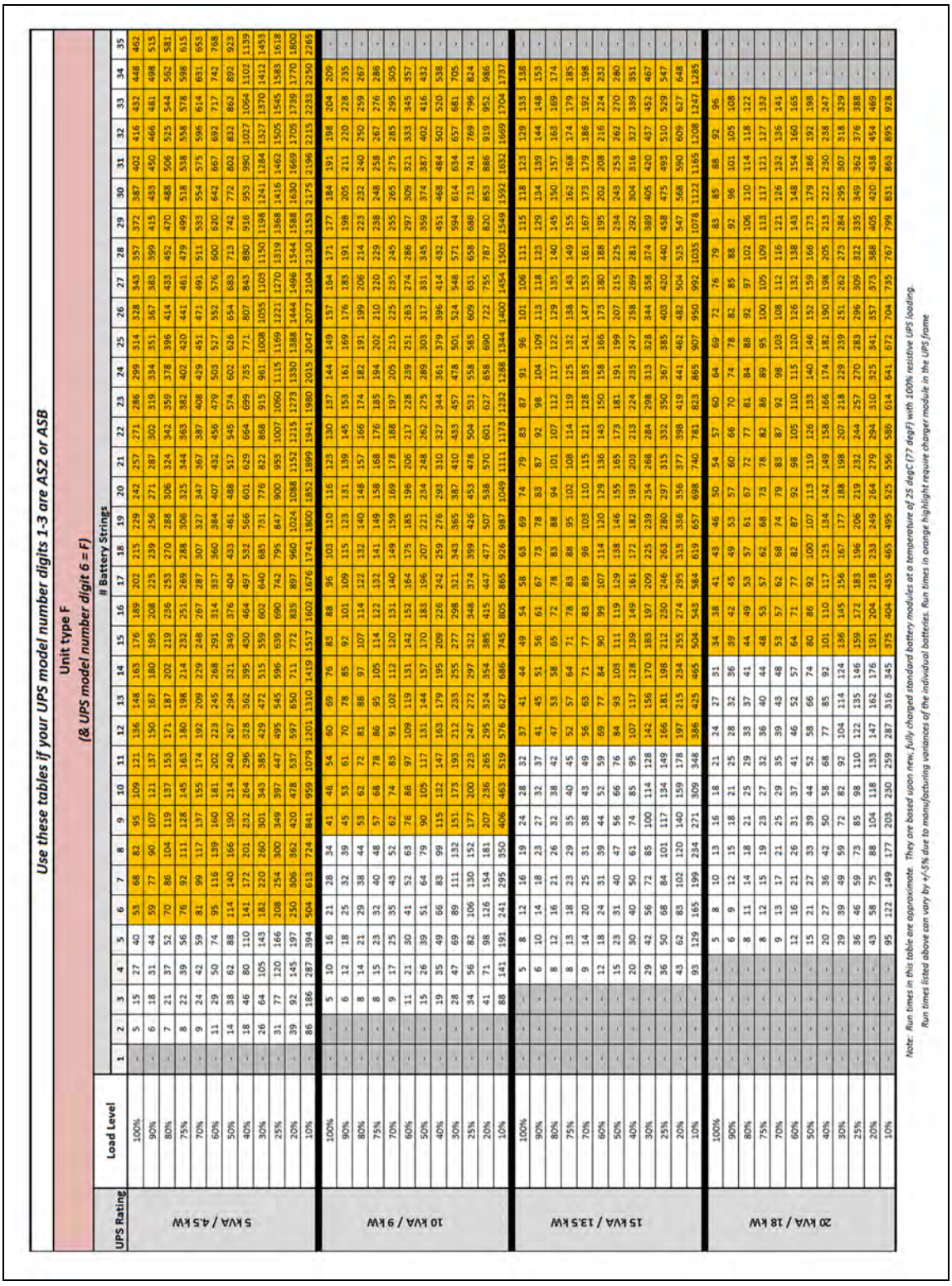


Figure 8.8 16-bay, single-phase, no transformer unit Type F (UPS model-number digit 6 = F)



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

Unit type F

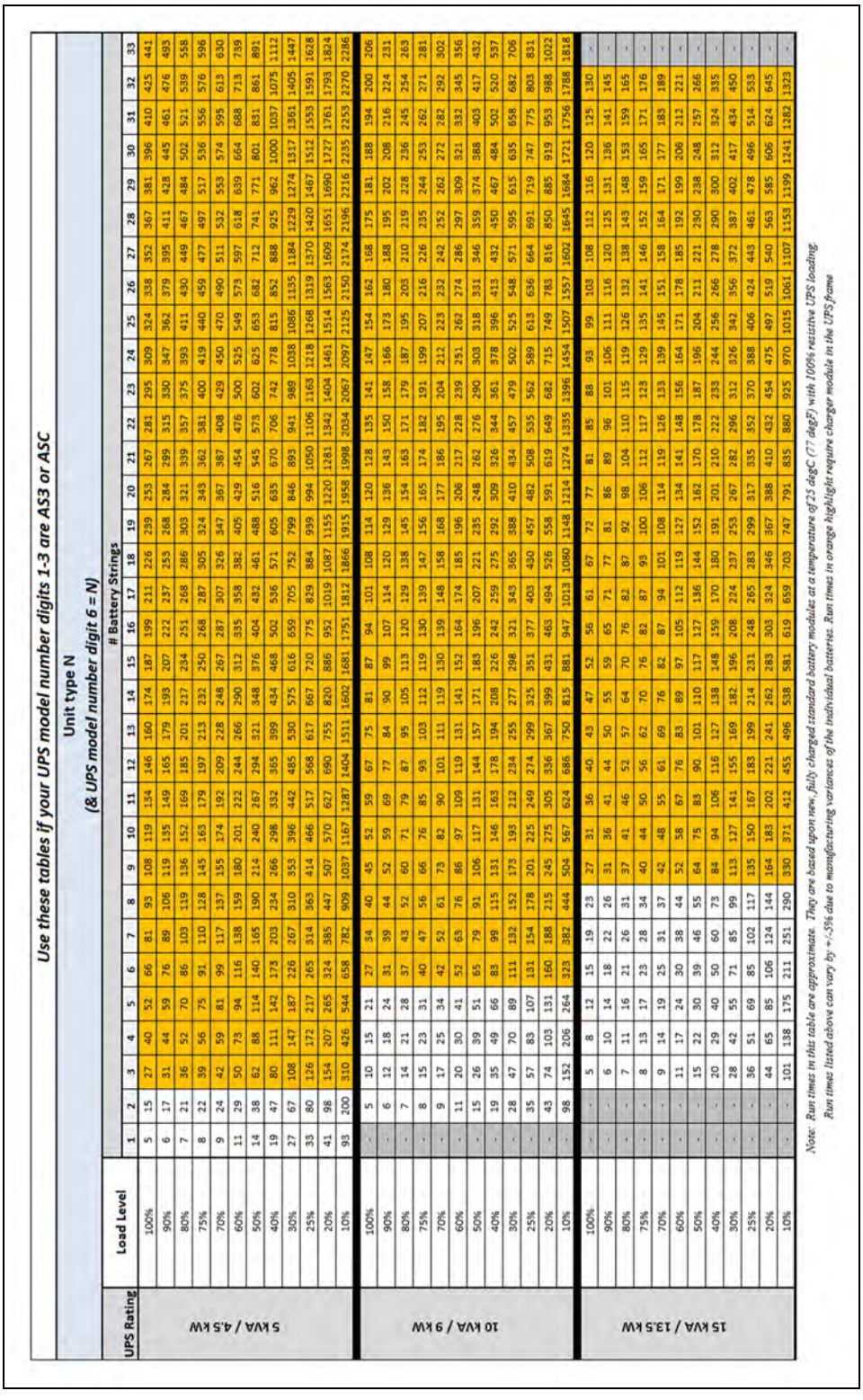
(& UPS model number digit 6 = F)

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%	-	5	15	27	40	53	68	82	95	109	121	136	148	163	176	189	202	215	229	242	257	271	286	299	314	328	343	357	372	387	402	416	432	448	462
	90%	-	6	18	31	44	59	77	90	107	121	137	150	167	180	195	208	225	239	256	271	287	302	319	334	351	367	383	399	415	433	450	466	481	498	515
	80%	-	7	21	37	52	70	86	104	119	137	153	171	187	202	219	236	253	270	288	306	324	342	359	378	396	414	433	452	470	488	506	525	544	562	581
	75%	-	8	22	39	56	76	92	111	128	145	163	180	198	214	232	251	269	288	306	325	344	363	382	402	420	441	461	479	499	518	538	558	578	598	615
	70%	-	9	24	42	59	81	99	117	137	155	174	192	209	229	248	267	287	307	327	347	367	387	408	429	451	471	491	511	533	554	575	596	614	631	653
	60%	-	11	29	50	74	95	116	139	160	181	202	223	245	268	291	314	337	360	384	407	432	456	479	503	527	552	576	600	620	642	667	692	717	742	768
	50%	-	14	38	62	88	114	140	166	190	214	240	267	294	321	349	376	404	433	461	488	517	545	574	602	626	654	683	713	742	772	802	832	862	892	923
	40%	-	18	46	80	110	141	172	201	232	264	296	328	362	395	430	464	497	532	566	601	629	664	699	735	771	807	843	880	916	953	990	1027	1064	1102	1139
	30%	-	26	64	105	143	182	220	260	301	343	385	429	472	515	559	602	640	685	731	776	822	868	915	961	1008	1055	1103	1150	1196	1241	1284	1327	1370	1412	1453
	25%	-	31	77	120	166	208	254	300	349	397	447	495	545	596	639	690	742	795	847	900	953	1007	1060	1115	1169	1221	1270	1319	1368	1416	1462	1505	1545	1583	1618
	20%	-	39	92	145	197	250	306	362	420	478	537	597	650	711	772	835	897	960	1024	1088	1152	1215	1273	1330	1388	1444	1496	1544	1588	1630	1669	1705	1739	1770	1800
	10%	-	86	186	287	394	504	613	724	841	959	1079	1201	1310	1419	1517	1602	1676	1741	1800	1852	1899	1941	1980	2015	2047	2077	2104	2130	2153	2175	2196	2215	2233	2250	2265
10 kVA / 9 kW	100%	-	-	5	10	16	21	28	34	41	46	54	60	69	76	83	88	96	103	110	116	123	130	137	144	149	157	164	171	177	184	191	198	204	209	-
	90%	-	-	6	12	18	25	32	39	45	53	61	70	78	85	92	101	109	115	123	131	139	145	153	161	169	176	183	191	198	205	211	220	228	235	-
	80%	-	-	8	14	21	29	38	44	53	62	72	81	88	97	107	114	122	132	140	148	157	166	174	182	191	199	206	214	223	232	240	250	259	267	-
	75%	-	-	8	15	23	32	40	48	57	68	78	86	95	105	114	122	132	141	149	158	168	176	185	194	202	210	220	229	238	248	258	267	276	286	-
	70%	-	-	9	17	25	35	43	52	62	74	83	91	102	112	120	131	140	149	159	169	178	188	197	205	215	225	235	245	255	265	275	285	295	305	-
	60%	-	-	11	21	30	41	52	63	76	86	97	109	119	131	142	152	164	175	185	196	206	217	228	239	251	263	274	286	297	309	321	333	345	357	-
	50%	-	-	15	26	39	51	64	79	90	105	117	131	144	157	170	183	196	207	221	234	248	262	275	289	303	317	331	345	359	374	387	402	416	432	-
	40%	-	-	19	35	49	66	83	99	115	132	147	163	179	195	209	226	242	259	276	293	310	327	344	361	379	396	414	432	451	468	484	502	520	538	-
	30%	-	-	28	47	69	89	111	132	151	173	193	212	233	255	277	298	321	343	365	387	410	433	457	478	501	524	548	571	594	614	634	657	681	705	-
	25%	-	-	34	56	82	106	130	152	177	200	223	247	272	297	322	348	374	399	426	453	478	504	531	558	585	609	631	658	686	713	741	769	796	824	-
	20%	-	-	41	71	98	126	154	181	207	236	265	295	324	354	385	415	447	477	507	538	570	601	627	658	690	722	755	787	820	853	886	919	952	986	-
	10%	-	-	88	141	191	241	295	350	406	463	519	576	627	686	745	805	865	926	987	1049	1111	1173	1232	1288	1344	1400	1454	1503	1549	1592	1632	1669	1704	1737	-
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	96	101	106	111	115	118	123	129	133	138	-
	90%	-	-	-	6	10	14	18	23	27	32	37	41	45	51	56	61	67	73	78	83	87	92	98	104	109	113	118	123	129	134	139	144	148	153	-
	80%	-	-	-	8	12	16	21	26	32	38	42	47	53	58	65	72	78	83	88	94	101	107	112	117	122	129	135	140	145	150	157	163	169	174	-
	75%	-	-	-	8	13	18	23	29	35	40	45	52	57	64	71	78	83	88	95	102	108	114	119	125	132	138	143	149	155	162	168	174	179	185	-
	70%	-	-	-	9	14	20	25	31	38	43	49	56	63	71	77	83	89	96	103	110	115	121	128	135	141	147	153	161	167	173	179	186	192	198	-
	60%	-	-	-	12	18	24	31	39	44	52	59	69	77	84	90	99	107	114	120	129	136	143	150	158	166	173	180	188	195	202	208	216	224	232	-
	50%	-	-	-	15	23	31	40	47	56	66	76	84	93	103	111	119	129	138	146	155	165	173	181	191	199	207	215	225	234	243	253	262	270	280	-
	40%	-	-	-	20	30	40	50	61	74	85	95	107	117	128	139	149	161	172	182	193	203	213	224	235	247	258	269	281	292	304	316	327	339	351	-
	30%	-	-	-	29	42	56	72	85	100	114	128	142	156	170	183	197	209	225	239	254	268	284	298	313	328	344	358	374	389	405	420	437	452	467	-
	25%	-	-	-	36	50	68	84	101	117	134	149	166	181	198	212	230	246	263	280	297	315	332	350	367	385	403	420	440	458	475	493	510	529	547	-
	20%	-	-	-	43	62	83	102	120	140	159	178	197	215	234	255	274	295	315	336	356	377	398	419	441	462	482	504	525	547	568	590	609	627	648	-
	10%	-	-	-	93	129	165	199	234	271	309	348	386	425	465	504	543	584	619	657	698	740	781	823	865	907	950	992	1035	1078	1122	1165	1208	1247	1285	-
20 kVA / 18 kW	100%	-	-	-	-	5	8	10	13	16	18	21	24	27	31	34	38	41	43	46	50	54	57	60	64	69	72	76	79	83	85	88	92	96	-	-
	90%	-	-	-	-	6	9	12	15	18	21	25	28	32	36	39	42	45	49	53	57	60	66	70	74	78	82	85	88	92	96	101	105	108	-	-
	80%	-	-	-	-	8	11	14	18	21	25	29	33	37	41	44	49	53	57	61	67	72	77	81	84	88	92	97	102	106	110	114	118	122	-	-
	75%	-	-	-	-	8	12	15	19	23	27	32	36	40	44	48	53	57	62	68	73	78	82	86	89	95	100	105	109	113	117	121	127	132	-	-
	70%	-	-	-	-	9	13	17	21	25	29	35	39	43	48	53	57	62	68	74	79	83	87	92	98	103	108	112	116	121	126	132	136	141	-	-
	60%	-	-	-	-	12	16	21	26	31	37	41	46	52	57	64	71	77	82	87	92	98	105	110	115	120	126	132	138	143	148	154	160	165	-	-
	50%	-	-	-	-	15	21	27	33	39	44	52	58	66	74	80	86	92	100	107	113	119	126	133	140	146	152	159	166	173	179	186	192	198	-	-
	40%	-	-	-	-	20	27	36	42	50	58	68	77	85	92	101	110	117	125	134	142	149	158	166	174	182	190	198	205	213	222	230	238	247	-	-
	30%	-	-	-	-	29	39	49	59	72	82	92	104	114	124	136	145	156	167	177	188	198	207	218	229	239	251	262	273	284	295	307	318	329	-	-
	25%	-	-	-	-	36	46	59	73	85	98	110	122	135	146	159	172	183	196	206	219	232	244	257	270	283	296	309	322	335	349	362	376	388	-	-
	20%	-	-	-	-	43	58	75	88	104	118	133	147	162	176	191	204	218	233	249	264	279	294	310	325	341	357	373	388	405	420	438	454	469	-	-
	10%	-	-	-	-	95	122	149	177	203	230	259	287	316	345	375	404	435	465	495	525	556	586	614	641	672	704	735	767	799	831	863	895	928	-	-

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

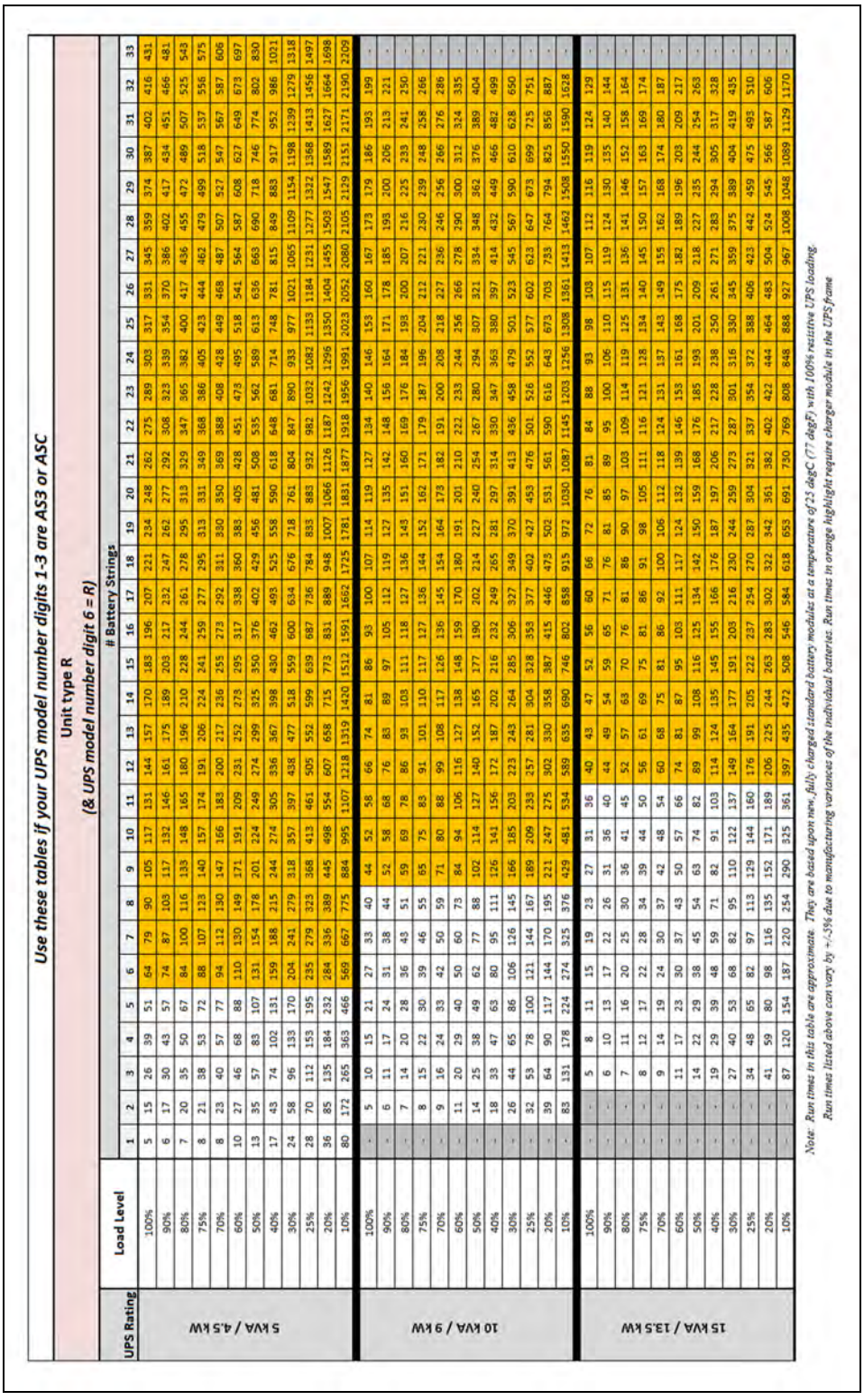
(& UPS model number digit 6 = N)

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%	5	15	27	40	52	66	81	93	108	119	134	146	160	174	187	199	211	226	239	253	267	281	295	309	324	338	352	367	381	396	410	425	441
	90%	6	17	31	44	59	76	89	106	119	135	149	165	179	193	207	222	237	253	268	284	299	315	330	347	362	379	395	411	428	445	461	476	493
	80%	7	21	36	52	70	86	103	119	136	152	169	185	201	217	234	251	268	286	303	321	339	357	375	393	411	430	449	467	484	502	521	539	558
	75%	8	22	39	56	75	91	110	128	145	163	179	197	213	232	250	268	287	305	324	343	362	381	400	419	440	459	477	497	517	536	556	576	596
	70%	9	24	42	59	81	99	117	137	155	174	192	209	228	248	267	287	307	326	347	367	387	408	429	450	470	490	511	532	553	574	595	613	630
	60%	11	29	50	73	94	116	138	159	180	201	222	244	266	290	312	335	358	382	405	429	454	476	500	525	549	573	597	618	639	664	688	713	739
	50%	14	38	62	88	114	140	165	190	214	240	267	294	321	348	376	404	432	461	488	516	545	573	602	625	653	682	712	741	771	801	831	861	891
	40%	19	47	80	111	142	173	203	234	266	298	332	365	399	434	468	502	536	571	605	635	670	706	742	778	815	852	888	925	962	1000	1037	1075	1112
	30%	27	67	108	147	187	226	267	310	353	396	442	485	530	575	616	659	705	752	799	846	893	941	989	1038	1086	1135	1184	1229	1274	1317	1361	1405	1447
	25%	33	80	126	172	217	265	314	363	414	466	517	568	617	667	720	775	829	884	939	994	1050	1106	1163	1218	1268	1319	1370	1420	1467	1512	1553	1591	1628
	20%	41	98	154	207	265	324	385	447	507	570	627	690	755	820	886	952	1019	1087	1155	1220	1281	1342	1404	1461	1514	1563	1609	1651	1690	1727	1761	1793	1824
	10%	93	200	310	426	544	658	782	909	1037	1167	1287	1404	1511	1602	1681	1751	1812	1866	1915	1958	1998	2034	2067	2097	2125	2150	2174	2196	2216	2235	2253	2270	2286
10 kVA / 9 kW	100%	-	5	10	15	21	27	34	40	45	52	59	67	75	81	87	94	101	108	114	120	128	135	141	147	154	162	168	175	181	188	194	200	206
	90%	-	6	12	18	24	31	39	44	52	59	69	77	84	90	99	107	114	120	129	136	143	150	158	166	173	180	188	195	202	208	216	224	231
	80%	-	7	14	21	28	37	43	52	60	71	79	87	95	105	113	120	129	138	145	154	163	171	179	187	195	203	210	219	228	236	245	254	263
	75%	-	8	15	23	31	40	47	56	66	76	85	93	103	112	119	130	139	147	156	165	174	182	191	199	207	216	226	235	244	253	262	271	281
	70%	-	9	17	25	34	42	52	61	73	82	90	101	111	119	130	139	148	158	168	177	186	195	204	212	223	232	242	252	262	272	282	292	302
	60%	-	11	20	30	41	52	63	76	86	97	109	119	131	141	152	164	174	185	196	206	217	228	239	251	262	274	286	297	309	321	332	345	356
	50%	-	15	26	39	51	65	79	91	106	117	131	144	157	171	183	196	207	221	235	248	262	276	290	303	318	331	346	359	374	388	403	417	432
	40%	-	19	35	49	66	83	99	115	131	146	163	178	194	208	226	242	259	275	292	309	326	344	361	378	396	413	432	450	467	484	502	520	537
	30%	-	28	47	70	89	111	132	152	173	193	212	234	255	277	298	321	343	365	388	410	434	457	479	502	525	548	571	595	615	635	658	682	706
	25%	-	35	57	83	107	131	154	178	201	225	249	274	299	325	351	377	403	430	457	482	508	535	562	589	613	636	664	691	719	747	775	803	831
	20%	-	43	74	103	131	160	188	215	245	275	305	336	367	399	431	463	494	526	558	591	619	649	682	715	749	783	816	850	885	919	953	988	1022
	10%	-	98	152	206	264	323	382	444	504	567	624	686	750	815	881	947	1013	1080	1148	1214	1274	1335	1396	1454	1507	1557	1602	1645	1684	1721	1756	1788	1818
15 kVA / 13.5 kW	100%	-	-	5	8	12	15	19	23	27	31	36	40	43	47	52	56	61	67	72	77	81	85	88	93	99	103	108	112	116	120	125	130	-
	90%	-	-	6	10	14	18	22	26	31	36	41	44	50	55	59	65	71	77	81	86	89	96	101	106	111	116	120	125	131	136	141	145	-
	80%	-	-	7	11	16	21	26	31	37	41	46	52	57	64	70	76	82	87	92	98	104	110	115	119	126	132	138	143	148	153	159	165	-
	75%	-	-	8	13	17	23	28	34	40	44	50	56	62	70	76	82	87	93	100	106	112	117	123	129	135	141	146	152	159	165	171	176	-
	70%	-	-	9	14	19	25	31	37	42	48	55	61	69	76	82	87	94	101	108	114	119	126	133	139	145	151	158	164	171	177	183	189	-
	60%	-	-	11	17	24	30	38	44	52	58	67	76	83	89	97	105	112	119	127	134	141	148	156	164	171	178	185	192	199	206	212	221	-
	50%	-	-	15	22	30	39	46	55	64	75	83	90	101	110	117	127	136	144	152	162	170	178	187	196	204	211	221	230	238	248	257	266	-
	40%	-	-	20	29	40	50	60	73	84	94	106	116	127	138	148	159	170	180	191	201	210	222	233	244	256	266	278	290	300	312	324	335	-
	30%	-	-	28	42	55	71	85	99	113	127	141	155	169	182	196	208	224	237	253	267	282	296	312	326	342	356	372	387	402	417	434	450	-
	25%	-	-	36	51	69	85	102	117	135	150	167	183	199	214	231	248	265	283	299	317	335	352	370	388	406	424	443	461	478	496	514	533	-
	20%	-	-	44	65	85	106	124	144	164	183	202	221	241	262	283	303	324	346	367	388	410	432	454	475	497	519	540	563	585	606	624	645	-
	10%	-	-	101	138	175	211	251	290	330	371	412	455	496	538	581	619	659	703	747	791	835	880	925	970	1015	1061	1107	1153	1199	1241	1282	1323	-

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

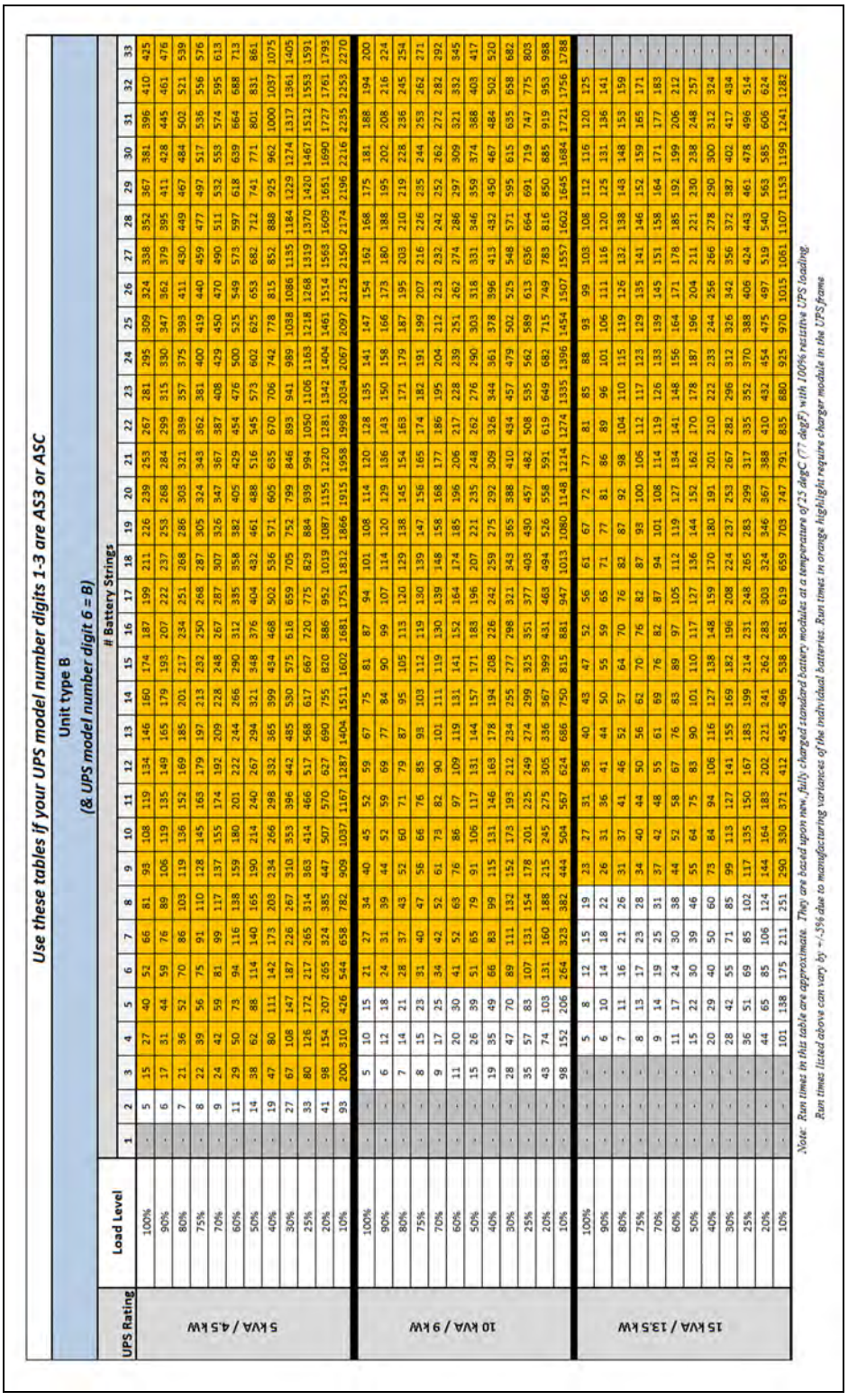
(& UPS model number digit 6 = R)

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%	5	15	26	39	51	64	79	90	105	117	131	144	157	170	183	196	207	221	234	248	262	275	289	303	317	331	345	359	374	387	402	416	431
	90%	6	17	30	43	57	74	87	103	117	132	146	161	175	189	203	217	232	247	262	277	292	308	323	339	354	370	386	402	417	434	451	466	481
	80%	7	20	35	50	67	84	100	116	133	148	165	180	196	210	228	244	261	278	295	313	329	347	365	382	400	417	436	455	472	489	507	525	543
	75%	8	21	38	53	72	88	107	123	140	157	174	191	206	224	241	259	277	295	313	331	349	368	386	405	423	444	462	479	499	518	537	556	575
	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
	60%	10	27	46	68	88	110	130	149	171	191	209	231	252	273	295	317	338	360	383	405	428	451	473	495	518	541	564	587	608	627	649	673	697
	50%	13	35	57	83	107	131	154	178	201	224	249	274	299	325	350	376	402	429	456	481	508	535	562	589	613	636	663	690	718	746	774	802	830
	40%	17	43	74	102	131	159	188	215	244	274	305	336	367	398	430	462	493	525	558	590	618	648	681	714	748	781	815	849	883	917	952	986	1021
	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
	25%	28	70	112	153	195	235	279	323	368	413	461	505	552	599	639	687	736	784	833	883	932	982	1032	1082	1133	1184	1231	1277	1322	1368	1413	1456	1497
	20%	36	85	135	184	232	284	336	389	445	498	554	607	658	715	773	831	889	948	1007	1066	1126	1187	1242	1296	1350	1404	1455	1503	1547	1589	1637	1664	1698
	10%	80	172	265	363	466	569	667	775	884	995	1107	1218	1319	1420	1512	1591	1662	1725	1781	1831	1877	1918	1956	1991	2023	2052	2080	2105	2129	2151	2171	2190	2209
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	-
	90%	-	6	11	17	24	31	38	44	52	58	68	76	83	89	97	105	112	119	127	135	142	148	156	164	171	178	185	193	200	206	213	221	-
	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	-
	75%	-	8	15	22	30	39	46	55	65	75	83	91	101	110	117	127	136	144	152	162	171	179	187	196	204	212	221	230	239	248	258	266	-
	70%	-	9	16	24	33	42	50	59	71	80	88	99	108	117	126	136	145	154	164	173	182	191	200	208	218	227	236	246	256	266	276	286	-
	60%	-	11	20	29	40	50	60	73	84	94	106	116	127	138	148	159	170	180	191	201	210	222	233	244	256	266	278	290	300	312	324	335	-
	50%	-	14	25	38	49	62	77	88	102	114	127	140	152	165	177	190	202	214	227	240	254	267	280	294	307	321	334	348	362	376	389	404	-
	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	-
	30%	-	26	44	65	86	106	126	145	166	185	203	223	243	264	285	306	327	349	370	391	413	436	458	479	501	523	545	567	590	610	628	650	-
	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	633	647	673	699	715	751	-
	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	-
	10%	-	83	131	178	224	274	325	376	429	481	534	589	635	680	746	802	858	915	972	1030	1087	1145	1203	1256	1308	1361	1413	1462	1508	1550	1590	1628	-
15 kVA / 13.5 kW	100%	-	-	5	8	11	15	19	23	27	31	36	40	43	47	52	56	60	66	72	76	81	84	88	93	98	103	107	112	116	119	124	129	-
	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	-
	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	-
	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	-
	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	-
	60%	-	-	11	17	23	30	37	43	50	57	66	74	81	87	95	103	111	117	124	132	139	146	153	161	168	175	182	189	196	203	209	217	-
	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	235	244	254	263	-
	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	-
	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	-
	25%	-	-	34	48	65	82	97	113	129	144	160	176	191	205	222	237	254	270	287	304	321	337	354	372	388	406	423	442	459	475	493	510	-
	20%	-	-	41	59	80	98	116	135	152	171	189	206	225	244	263	283	302	322	342	361	382	402	422	444	464	483	504	524	545	566	587	606	-
	10%	-	-	87	120	154	187	220	254	290	325	361	397	435	472	508	546	584	618	653	691	730	769	808	848	888	927	967	1008	1048	1089	1129	1170	-

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

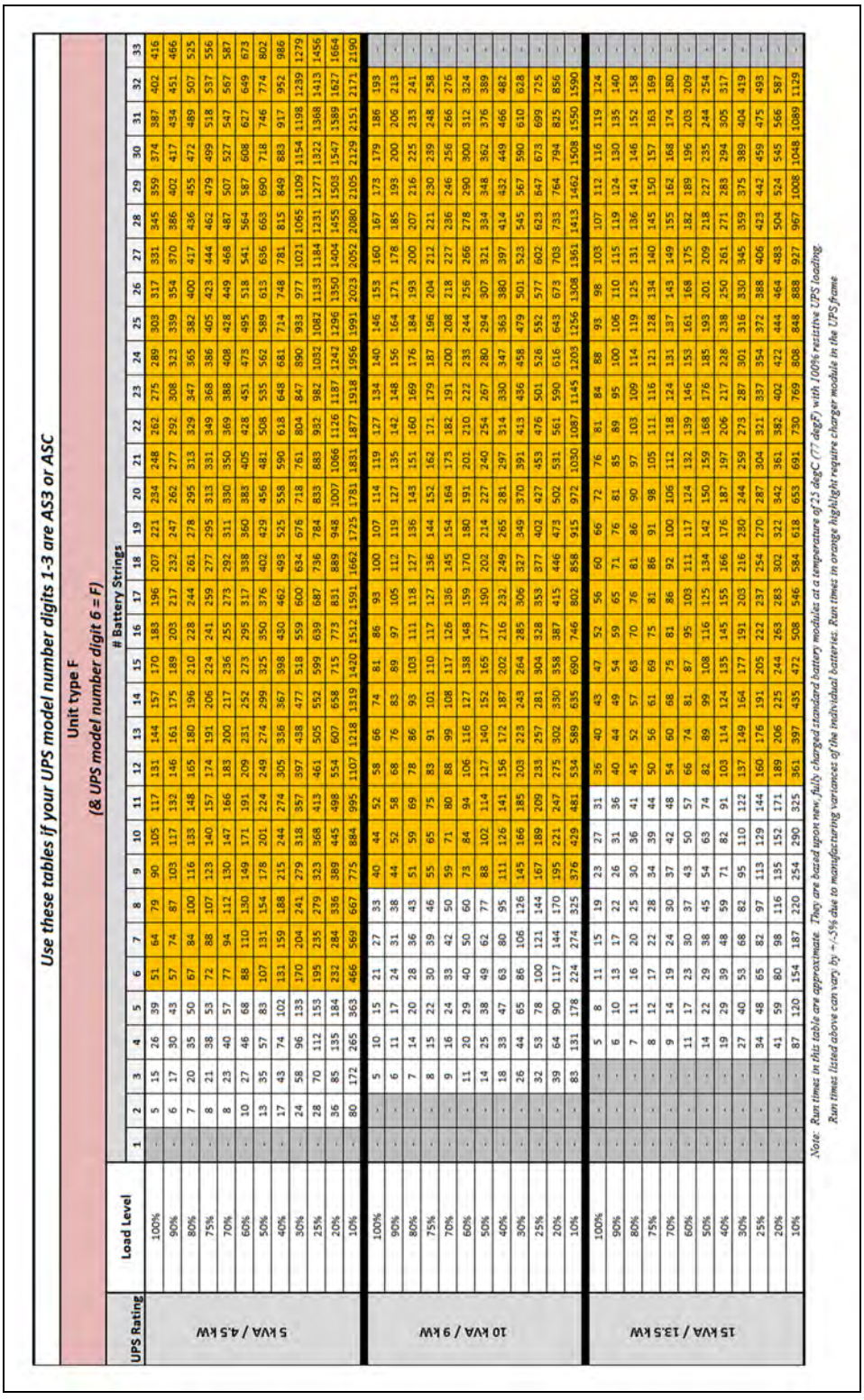
(& UPS model number digit 6 = B)

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%	-	5	15	27	40	52	66	81	93	108	119	134	146	160	174	187	199	211	226	239	253	267	281	295	309	324	338	352	367	381	396	410	425
	90%	-	6	17	31	44	59	76	89	106	119	135	149	165	179	193	207	222	237	253	268	284	299	315	330	347	362	379	395	411	428	445	461	476
	80%	-	7	21	36	52	70	86	103	119	136	152	169	185	201	217	234	251	268	286	303	321	339	357	375	393	411	430	449	467	484	502	521	539
	75%	-	8	22	39	56	75	91	110	128	145	163	179	197	213	232	250	268	287	305	324	343	362	381	400	419	440	459	477	497	517	536	556	576
	70%	-	9	24	42	59	81	99	117	137	155	174	192	209	228	248	267	287	307	326	347	367	387	408	429	450	470	490	511	532	553	574	595	613
	60%	-	11	29	50	73	94	116	138	159	180	201	222	244	266	290	312	335	358	382	405	429	454	476	500	525	549	573	597	618	639	664	688	713
	50%	-	14	38	62	88	114	140	165	190	214	240	267	294	321	348	376	404	432	461	488	516	545	573	602	625	653	682	712	741	771	801	831	861
	40%	-	19	47	80	111	142	173	203	234	266	298	332	365	399	434	468	502	536	571	605	635	670	706	742	778	815	852	888	925	962	1000	1037	1075
	30%	-	27	67	108	147	187	226	267	310	353	396	442	485	530	575	616	659	705	752	799	846	893	941	989	1038	1086	1135	1184	1229	1274	1317	1361	1405
	25%	-	33	80	126	172	217	265	314	363	414	466	517	568	617	667	720	775	829	884	939	994	1050	1106	1163	1218	1268	1319	1370	1420	1467	1512	1553	1591
	20%	-	41	98	154	207	265	324	385	447	507	570	627	690	755	820	886	952	1019	1087	1155	1220	1281	1342	1404	1461	1514	1563	1609	1651	1690	1727	1761	1793
	10%	-	93	200	310	426	544	658	782	909	1037	1167	1287	1404	1511	1602	1681	1751	1812	1866	1915	1958	1998	2034	2067	2097	2125	2150	2174	2196	2216	2235	2253	2270
10 kVA / 9 kW	100%	-	-	5	10	15	21	27	34	40	45	52	59	67	75	81	87	94	101	108	114	120	128	135	141	147	154	162	168	175	181	188	194	200
	90%	-	-	6	12	18	24	31	39	44	52	59	69	77	84	90	99	107	114	120	129	136	143	150	158	166	173	180	188	195	202	208	216	224
	80%	-	-	7	14	21	28	37	43	52	60	71	79	87	95	105	113	120	129	138	145	154	163	171	179	187	195	203	210	219	228	236	245	254
	75%	-	-	8	15	23	31	40	47	56	66	76	85	93	103	112	119	130	139	147	156	165	174	182	191	199	207	216	226	235	244	253	262	271
	70%	-	-	9	17	25	34	42	52	61	73	82	90	101	111	119	130	139	148	158	168	177	186	195	204	212	223	232	242	252	262	272	282	292
	60%	-	-	11	20	30	41	52	63	76	86	97	109	119	131	141	152	164	174	185	196	206	217	228	239	251	262	274	286	297	309	321	332	345
	50%	-	-	15	26	39	51	65	79	91	106	117	131	144	157	171	183	196	207	221	235	248	262	276	290	303	318	331	346	359	374	388	403	417
	40%	-	-	19	35	49	66	83	99	115	131	146	163	178	194	208	226	243	259	275	292	309	326	344	361	378	396	413	432	450	467	484	502	520
	30%	-	-	28	47	70	89	111	132	152	173	193	212	234	255	277	298	321	343	365	388	410	434	457	479	502	525	548	571	595	615	635	658	682
	25%	-	-	35	57	83	107	131	154	178	201	225	249	274	299	325	351	377	403	430	457	482	508	535	562	589	613	636	664	691	719	747	775	803
	20%	-	-	43	74	103	131	160	188	215	245	275	305	336	367	399	431	463	494	526	558	591	619	649	682	715	749	783	816	850	885	919	953	988
	10%	-	-	98	152	206	264	323	382	444	504	567	624	686	750	815	881	947	1013	1080	1148	1214	1274	1335	1396	1454	1507	1557	1602	1645	1684	1721	1756	1788
15 kVA / 13.5 kW	100%	-	-	-	5	8	12	15	19	23	27	31	36	40	43	47	52	56	61	67	72	77	81	85	88	93	99	103	108	112	116	120	125	-
	90%	-	-	-	6	10	14	18	22	26	31	36	41	44	50	55	59	65	71	77	81	86	89	96	101	106	111	116	120	125	131	136	141	-
	80%	-	-	-	7	11	16	21	26	31	37	41	46	52	57	64	70	76	82	87	92	98	104	110	115	119	126	132	138	143	148	153	159	-
	75%	-	-	-	8	13	17	23	28	34	40	44	50	56	62	70	76	82	87	93	100	106	112	117	123	129	135	141	146	152	159	165	171	-
	70%	-	-	-	9	14	19	25	31	37	42	48	55	61	69	76	82	87	94	101	108	114	119	126	133	139	145	151	158	164	171	177	183	-
	60%	-	-	-	11	17	24	30	38	44	52	58	67	76	83	89	97	105	112	119	127	134	141	148	156	164	171	178	185	192	199	206	212	-
	50%	-	-	-	15	22	30	39	46	55	64	75	83	90	101	110	117	127	136	144	152	162	170	178	187	196	204	211	221	230	238	248	257	-
	40%	-	-	-	20	29	40	50	60	73	84	94	106	116	127	138	148	159	170	180	191	201	210	222	233	244	256	266	278	290	300	312	324	-
	30%	-	-	-	28	42	55	71	85	99	113	127	141	155	169	182	196	208	224	237	253	267	282	296	312	326	342	356	372	387	402	417	434	-
	25%	-	-	-	36	51	69	85	102	117	135	150	167	183	199	214	231	248	265	283	299	317	335	352	370	388	406	424	443	461	478	496	514	-
	20%	-	-	-	44	65	85	106	124	144	164	183	202	221	241	262	283	303	324	346	367	388	410	432	454	475	497	519	540	563	585	606	624	-
	10%	-	-	-	101	138	175	211	251	290	330	371	412	455	496	538	581	619	659	703	747	791	835	880	925	970	1015	1061	1107	1153	1199	1241	1282	-

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)

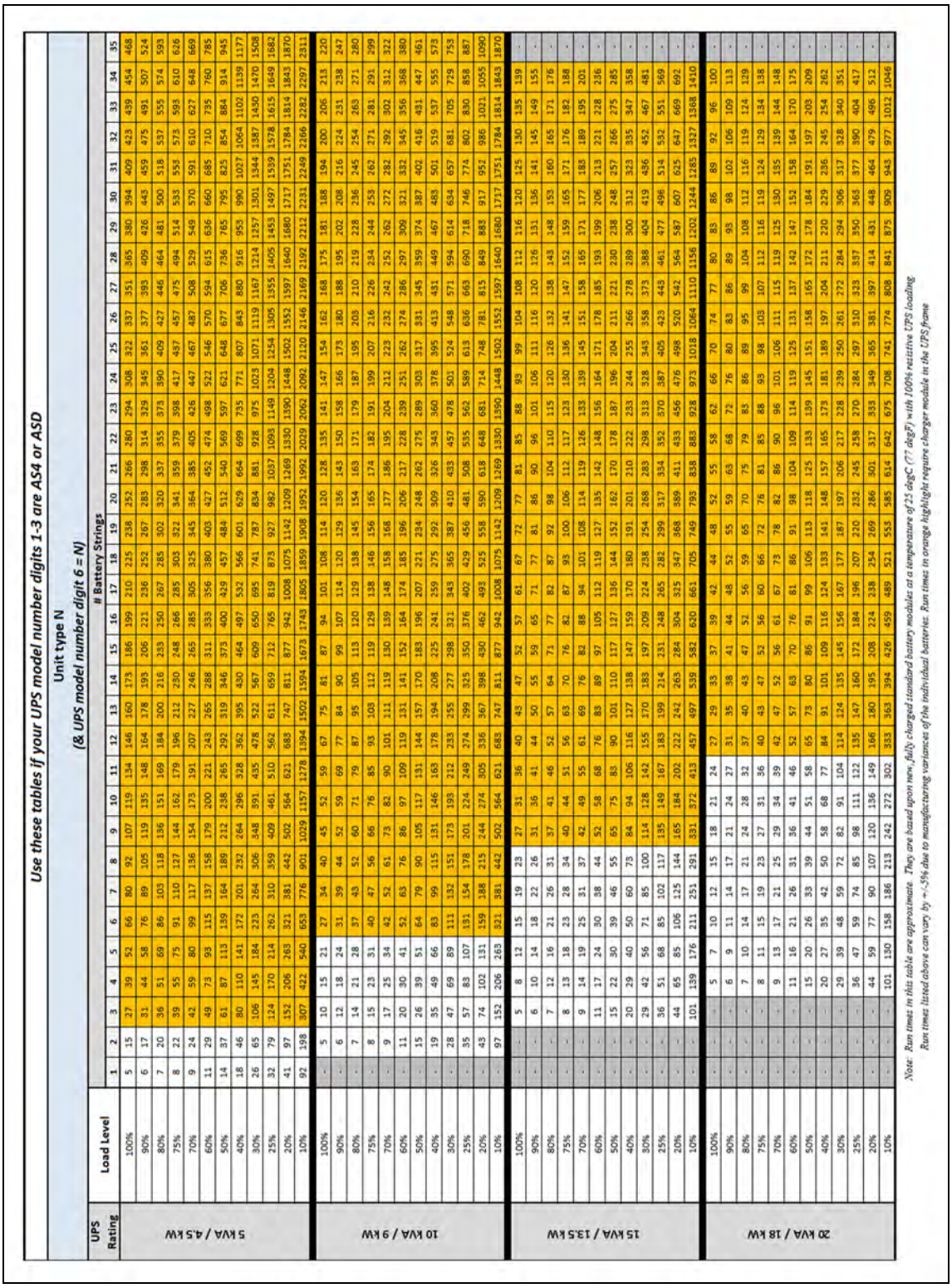
UPS Rating	Load Level	# Battery Strings																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
5 kVA / 4.5 kW	100%	-	5	15	26	39	51	64	79	90	105	117	131	144	157	170	183	196	207	221	234	248	262	275	289	303	317	331	345	359	374	387	402	416
	90%	-	6	17	30	43	57	74	87	103	117	132	146	161	175	189	203	217	232	247	262	277	292	308	323	339	354	370	386	402	417	434	451	466
	80%	-	7	20	35	50	67	84	100	116	133	148	165	180	196	210	228	244	261	278	295	313	329	347	365	382	400	417	436	455	472	489	507	525
	75%	-	8	21	38	53	72	88	107	123	140	157	174	191	206	224	241	259	277	295	313	331	349	368	386	405	423	444	462	479	499	518	537	556
	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
	60%	-	10	27	46	68	88	110	130	149	171	191	209	231	252	273	295	317	338	360	383	405	428	451	473	495	518	541	564	587	608	627	649	673
	50%	-	13	35	57	83	107	131	154	178	201	224	249	274	299	325	350	376	402	429	456	481	508	535	562	589	613	636	663	690	718	746	774	802
	40%	-	17	43	74	102	131	159	188	215	244	274	305	336	367	398	430	462	493	525	558	590	618	648	681	714	748	781	815	849	883	917	952	986
	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
	25%	-	28	70	112	153	195	235	279	323	368	413	461	505	552	599	639	687	736	784	839	883	932	982	1032	1082	1133	1184	1231	1277	1322	1368	1413	1456
	20%	-	36	85	135	184	232	284	336	389	445	498	554	607	658	715	773	831	889	948	1007	1066	1126	1187	1242	1296	1350	1404	1455	1503	1547	1589	1627	1664
	10%	-	80	172	265	363	466	569	667	775	884	995	1107	1218	1319	1420	1512	1591	1662	1725	1781	1831	1877	1918	1956	1991	2023	2052	2080	2105	2129	2151	2171	2190
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	-
	90%	-	-	6	11	17	24	31	38	44	52	58	68	76	83	89	97	105	112	119	127	135	142	148	156	164	171	178	185	193	200	206	213	-
	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	-
	75%	-	-	8	15	22	30	39	46	55	65	75	83	91	101	110	117	127	136	144	152	162	171	179	187	196	204	212	221	230	239	248	258	-
	70%	-	-	9	16	24	33	42	50	59	71	80	88	99	108	117	126	136	145	154	164	173	182	191	200	208	218	227	236	246	256	266	276	-
	60%	-	-	11	20	29	40	50	60	73	84	94	106	116	127	138	148	159	170	180	191	201	210	222	233	244	256	266	278	290	300	312	324	-
	50%	-	-	14	25	38	49	62	77	88	102	114	127	140	152	165	177	190	202	214	227	240	254	267	280	294	307	321	334	348	362	376	389	-
	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	-
	30%	-	-	26	44	65	86	106	126	145	166	185	203	223	243	264	285	306	327	349	370	391	413	436	458	479	501	523	545	567	590	610	628	-
	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	699	725	-
	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	-
	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	-
15 kVA / 13.5 kW	100%	-	-	-	5	8	11	15	19	23	27	31	36	40	43	47	52	56	60	66	72	76	81	84	88	93	98	103	107	112	116	119	124	-
	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	-
	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	-
	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	-
	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	-
	60%	-	-	-	11	17	23	30	37	43	50	57	66	74	81	87	95	103	111	117	124	132	139	146	153	161	168	175	182	189	196	203	209	-
	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	235	244	254	-
	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	-
	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	-
	25%	-	-	-	34	48	65	82	97	113	129	144	160	176	191	205	222	237	254	270	287	304	321	337	354	372	388	406	423	442	459	475	493	-
	20%	-	-	-	41	59	80	98	116	135	152	171	189	206	225	244	263	283	302	322	342	361	382	402	422	444	464	483	504	524	545	566	587	-
	10%	-	-	-	87	120	154	187	220	254	290	325	361	397	435	472	508	546	584	618	653	691	730	769	808	848	888	927	967	1008	1048	1089	1129	-

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

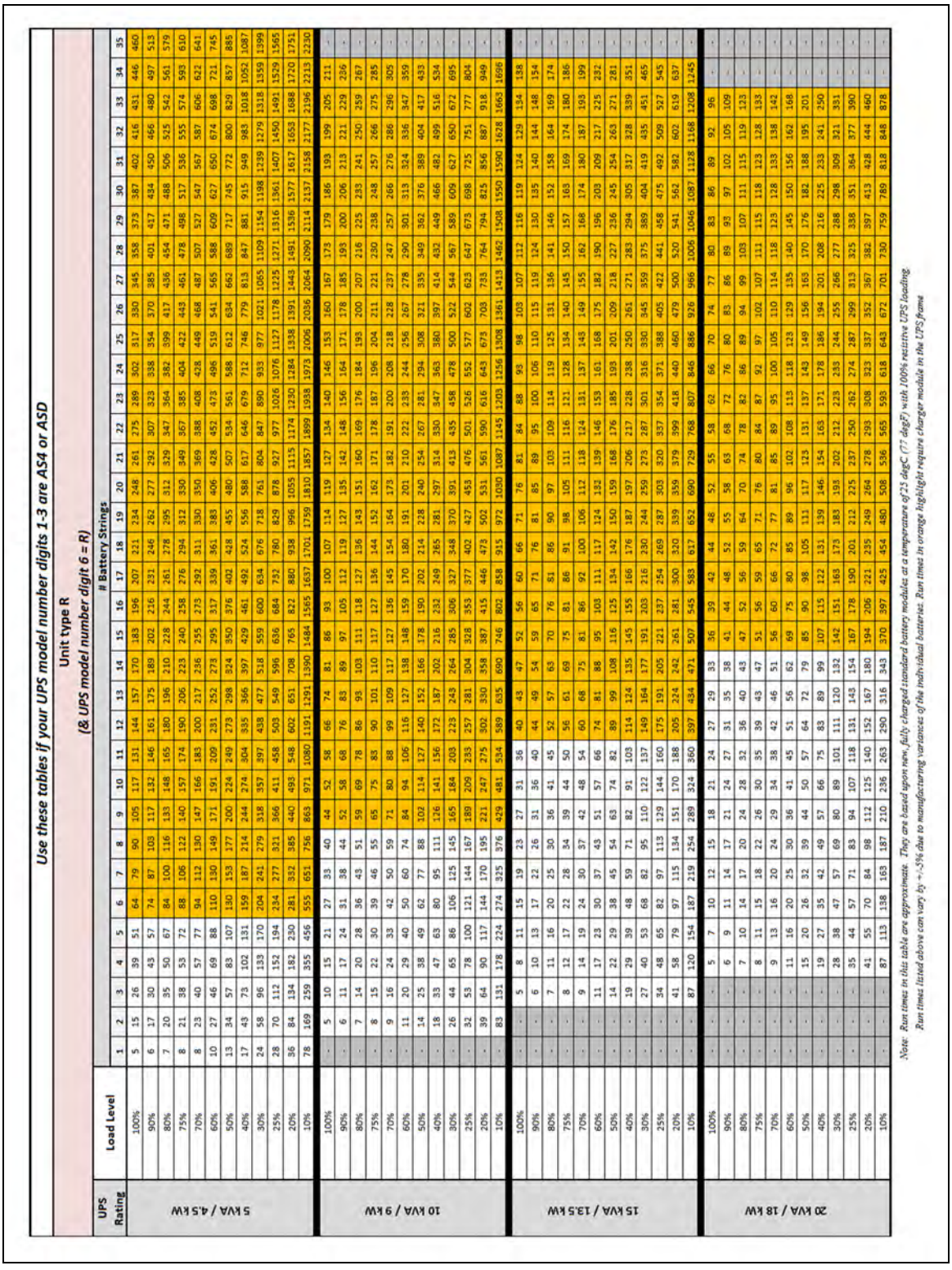
Unit type N

(& 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%	5	15	27	39	52	66	80	92	107	119	134	146	160	173	186	199	210	225	238	252	266	280	294	308	322	337	351	365	380	394	409	423	439	454	468
	90%	6	17	31	44	58	76	89	105	119	135	148	164	178	193	206	221	236	252	267	283	298	314	329	345	361	377	393	409	426	443	459	475	491	507	524
	80%	7	20	36	51	69	86	103	118	136	151	169	184	200	216	233	250	267	285	302	320	337	355	373	390	409	427	446	464	481	500	518	537	555	574	593
	75%	8	22	39	55	75	91	110	127	144	162	179	196	212	230	248	266	285	303	322	341	359	379	398	417	437	457	475	494	514	533	553	573	593	610	626
	70%	9	24	42	59	80	99	117	136	154	173	191	207	227	246	265	285	305	325	345	364	385	405	426	447	467	487	508	529	549	570	591	610	627	648	669
	60%	11	29	49	73	93	115	137	158	179	200	221	243	265	288	311	333	356	380	403	427	452	474	498	522	546	570	594	615	636	660	685	710	735	760	785
	50%	14	37	61	87	113	139	164	189	212	238	265	292	319	346	373	400	429	457	484	512	540	569	597	621	648	677	706	736	765	795	825	854	884	914	945
	40%	18	46	80	110	141	172	201	232	264	296	328	362	395	430	464	497	532	566	601	629	664	699	735	771	807	843	880	916	953	990	1027	1064	1102	1139	1177
	30%	26	65	106	145	184	223	264	306	348	391	435	478	522	567	609	650	695	741	787	834	881	928	975	1023	1071	1119	1167	1214	1257	1301	1344	1387	1430	1470	1508
	25%	32	79	124	170	214	262	310	359	409	461	510	562	611	659	712	765	819	873	927	982	1037	1093	1149	1204	1254	1305	1355	1405	1453	1497	1539	1578	1615	1649	1682
	20%	41	97	152	206	263	321	381	442	502	564	621	683	747	811	877	942	1008	1075	1142	1209	1269	1330	1390	1448	1502	1552	1597	1640	1680	1717	1751	1784	1814	1843	1870
	10%	92	198	307	422	540	653	776	901	1029	1157	1278	1394	1502	1594	1673	1743	1805	1859	1908	1952	1992	2029	2062	2092	2120	2146	2169	2192	2212	2231	2249	2266	2282	2297	2311
10 kVA / 9 kW	100%	-	5	10	15	21	27	34	40	45	52	59	67	75	81	87	94	101	108	114	120	128	135	141	147	154	162	168	175	181	188	194	200	206	213	220
	90%	-	6	12	18	24	31	39	44	52	59	69	77	84	90	99	107	114	120	129	136	143	150	158	166	173	180	188	195	202	208	216	224	231	238	247
	80%	-	7	14	21	28	37	43	52	60	71	79	87	95	105	113	120	129	138	145	154	163	171	179	187	195	203	210	219	228	236	245	254	263	271	280
	75%	-	8	15	23	31	40	47	56	66	76	85	93	103	112	119	129	138	146	156	165	174	182	191	199	207	216	226	234	244	253	262	271	281	291	299
	70%	-	9	17	25	34	42	52	61	73	82	90	101	111	119	130	139	148	158	168	177	186	195	204	212	223	232	242	252	262	272	282	292	302	312	322
	60%	-	11	20	30	41	52	63	76	86	97	109	119	131	141	152	164	174	185	196	206	217	228	239	251	262	274	286	297	309	321	332	345	356	368	380
	50%	-	15	26	39	51	64	79	90	105	117	131	144	157	170	183	196	207	221	234	248	262	275	289	303	317	331	345	359	374	387	402	416	431	447	461
	40%	-	19	35	49	66	83	99	115	131	146	163	178	194	208	225	241	259	275	292	309	326	343	360	378	395	413	431	449	467	483	501	519	537	555	573
	30%	-	28	47	69	89	111	132	151	173	193	212	233	255	277	298	321	343	365	387	410	433	457	478	501	524	548	571	594	614	634	657	681	705	729	753
	25%	-	35	57	83	107	131	154	178	201	224	249	274	299	325	350	376	402	429	456	481	508	535	562	589	613	636	663	690	718	746	774	802	830	858	887
	20%	-	43	74	102	131	159	188	215	244	274	305	336	367	398	430	462	493	525	558	590	618	648	681	714	748	781	815	849	883	917	952	986	1021	1055	1090
	10%	-	97	152	206	263	321	381	442	502	564	621	683	747	811	877	942	1008	1075	1142	1209	1269	1330	1390	1448	1502	1552	1597	1640	1680	1717	1751	1784	1814	1843	1870
15 kVA / 13.5 kW	100%	-	-	5	8	12	15	19	23	27	31	36	40	43	47	52	57	61	67	72	77	81	85	88	93	99	104	108	112	116	120	125	130	135	139	-
	90%	-	-	6	10	14	18	22	26	31	36	41	44	50	55	59	65	71	77	81	86	90	96	101	106	111	116	120	126	131	136	141	145	149	155	-
	80%	-	-	7	12	16	21	26	31	37	41	46	52	57	64	71	77	82	87	92	98	104	110	115	120	126	132	138	143	148	153	160	165	171	176	-
	75%	-	-	8	13	18	23	28	34	40	44	51	56	63	70	76	82	87	93	100	106	112	117	123	130	136	141	147	152	159	165	171	176	182	188	-
	70%	-	-	9	14	19	25	31	37	42	49	55	61	69	76	82	88	94	101	108	114	119	126	133	139	145	151	158	165	171	177	183	189	195	201	-
	60%	-	-	11	17	24	30	38	44	52	58	68	76	83	89	97	105	112	119	127	135	142	148	156	164	171	178	185	193	199	206	213	221	228	236	-
	50%	-	-	15	22	30	39	46	55	65	75	83	90	101	110	117	127	136	144	152	162	170	178	187	196	204	211	221	230	238	248	257	266	275	285	-
	40%	-	-	20	29	40	50	60	73	84	94	106	116	127	138	147	159	170	180	191	201	210	222	233	244	255	266	278	289	300	312	323	335	347	358	-
	30%	-	-	29	42	56	71	85	100	114	128	142	155	170	183	197	209	224	238	254	268	283	298	313	328	343	358	373	388	404	419	436	452	467	481	-
	25%	-	-	36	51	68	85	102	117	135	149	167	183	199	214	231	248	265	282	299	317	334	352	370	387	405	423	443	461	477	496	514	532	551	569	-
	20%	-	-	44	65	85	106	125	144	165	184	202	222	242	263	284	304	325	347	368	389	411	433	456	476	498	520	542	564	587	607	625	647	669	692	-
	10%	-	-	101	139	176	211	251	291	331	372	413	457	497	539	582	620	661	705	749	793	838	883	928	973	1018	1064	1110	1156	1202	1244	1285	1327	1368	1410	-
20 kVA / 18 kW	100%	-	-	-	5	7	10	12	15	18	21	24	27	29	33	37	39	42	44	48	52	55	58	62	66	70	74	77	80	83	86	89	92	96	100	-
	90%	-	-	-	6	9	11	14	17	21	24	27	31	35	38	41	44	48	52	55	59	63	68	72	76	80	83	86	89	93	98	102	106	109	113	-
	80%	-	-	-	7	10	14	17	21	24	28	32	37	40	43	47	52	56	59	65	70	75	79	83	86	89	95	99	104	108	112	116	119	124	129	-
	75%	-	-	-	8	11	15	19	23	27	31	36	40	43	47	52	56	60	66	72	76	81	85	88	93	98	103	107	112	116	119	124	129	134	138	-
	70%	-	-	-	9	13	17	21	25	29	34	39	42	47	52	56	61	67	73	78	82	86	90	96	101	106	111	115	119	125	130	135	139	144	148	-
	60%	-	-	-	11	16	21	26	31	36	41	46	52	57	63	70	76	81	86	91	98	104	109	114	119	125	131	137	142	147	152	158	164	170	175	-
	50%	-	-	-	15	20	26	33	39	44	51	58	65	73	80	86	91	99	106	113	118	125	133	139	145	151	158	165	172	178	184	191	197	203	209	-
	40%	-	-	-	20	27	35	42	50	58	68	77	84	91	101	109	116	124	133	141	148	157	165	173	181	189	197	204	211	220	229	236	245	254	262	-
	30%	-	-	-	29	39	48	59	72	82	91	104	114	124	135	145	156	167	177	187	197	206	217	228	239	250	261	272	284	294	306	317	328	340	351	-
	25%	-	-	-	36	47	59	74	85	98	111	122	135	147	160	172	184	196	207	220	232	245	258	270	284	297	310	323	337	350	363	377	390	404	417	-
	20%	-	-	-	44	59	77	90	107	120	136	149	166	180	195	208	224	238	254	269	286	301	317	333	349	365	381	397	414	431	448	464	479	496	512	-
	10%	-	-	-	101	130	158	186	213	242	272	302	333	363	394	426	459	489	521	553	585	614	642	675	708	741	774	808	841	875	909	943	977	1012	1046	-

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

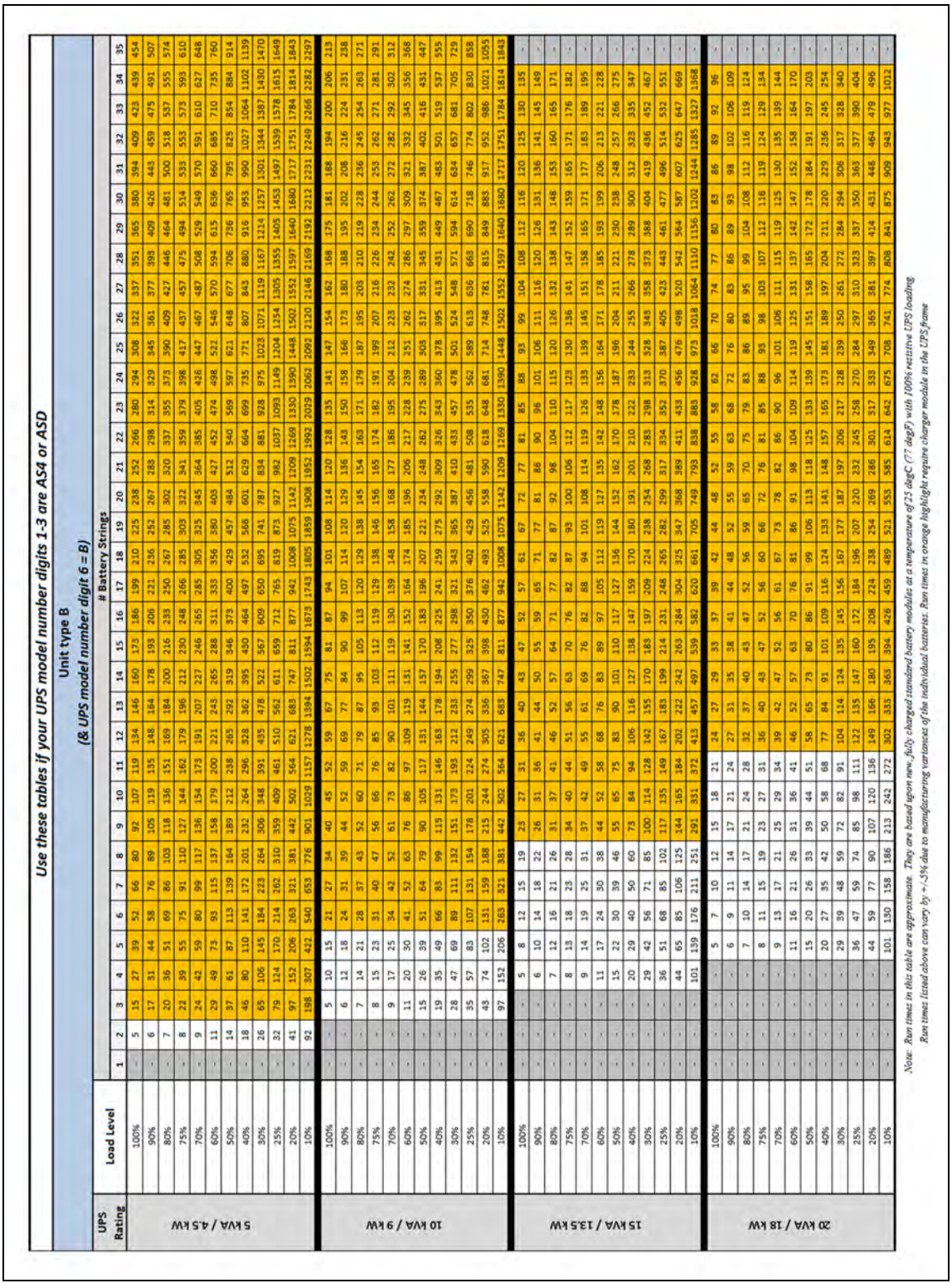
Unit type R

(& 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	689	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	68	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

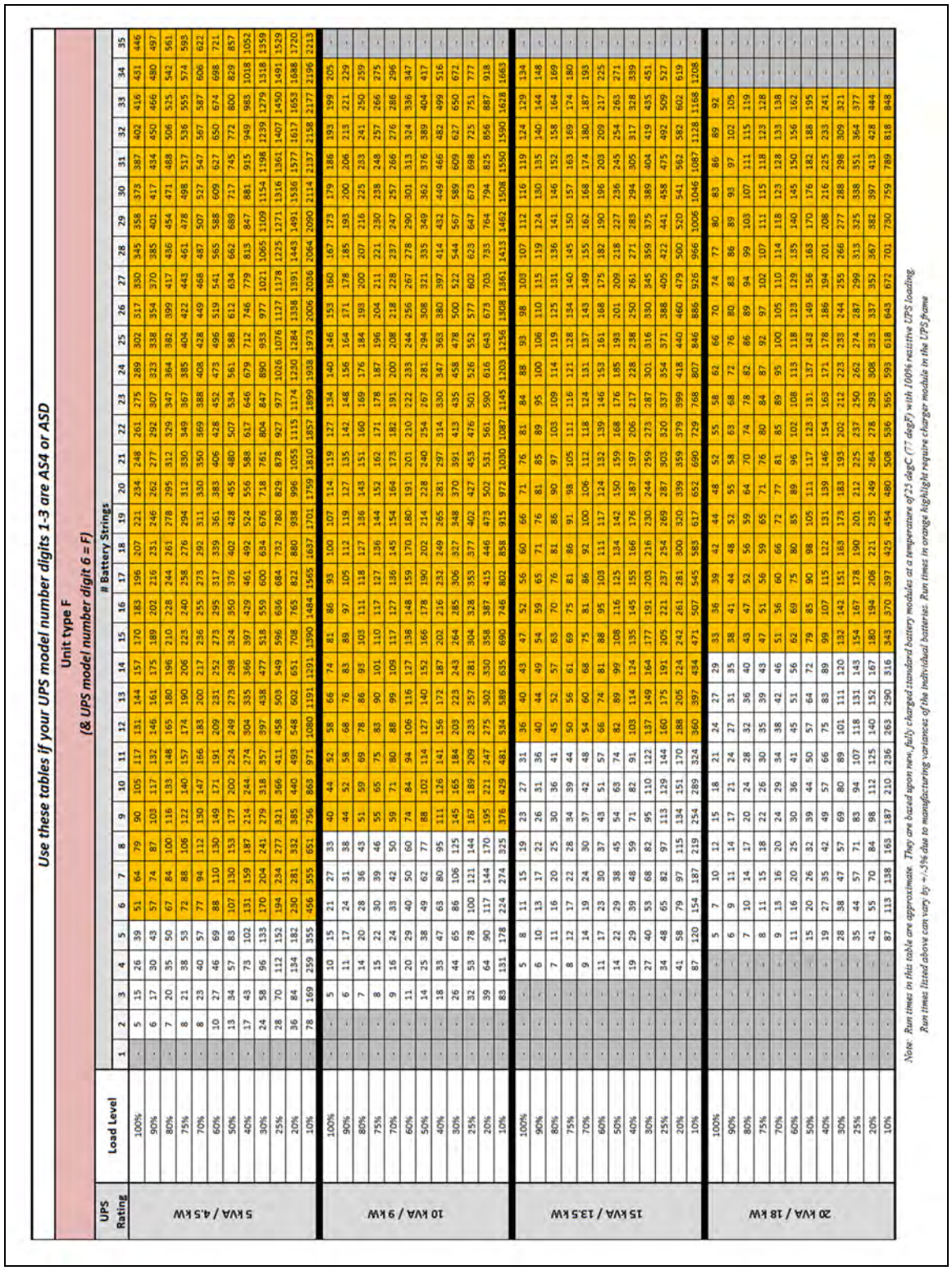
Unit type B

(& 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%	-	5	15	27	39	52	66	80	92	107	119	134	146	160	173	186	199	210	225	238	252	266	280	294	308	322	337	351	365	380	394	409	423	439	454
	90%	-	6	17	31	44	58	76	89	105	119	135	148	164	178	193	206	221	236	252	267	283	298	314	329	345	361	377	393	409	426	443	459	475	491	507
	80%	-	7	20	36	51	69	86	103	118	136	151	169	184	200	216	233	250	267	285	302	320	337	355	373	390	409	427	446	464	481	500	518	537	555	574
	75%	-	8	22	39	55	75	91	110	127	144	162	179	196	212	230	248	266	285	303	322	341	359	379	398	417	437	457	475	494	514	533	553	573	593	610
	70%	-	9	24	42	59	80	99	117	136	154	173	191	207	227	246	265	285	305	325	345	364	385	405	426	447	467	487	508	529	549	570	591	610	627	648
	60%	-	11	29	49	73	93	115	137	158	179	200	221	243	265	288	311	333	356	380	403	427	452	474	498	522	546	570	594	615	636	660	685	710	735	760
	50%	-	14	37	61	87	113	139	164	189	212	238	265	292	319	346	373	400	429	457	484	512	540	569	597	621	648	677	706	736	765	795	825	854	884	914
	40%	-	18	46	80	110	141	172	201	232	264	296	328	362	395	430	464	497	532	566	601	629	664	699	735	771	807	843	880	916	953	990	1027	1064	1102	1139
	30%	-	26	65	106	145	184	223	264	306	348	391	435	478	522	567	609	650	695	741	787	834	881	928	975	1023	1071	1119	1167	1214	1257	1301	1344	1387	1430	1470
	25%	-	32	79	124	170	214	262	310	359	409	461	510	562	611	659	712	765	819	873	927	982	1037	1093	1149	1204	1254	1305	1355	1405	1453	1497	1539	1578	1615	1649
	20%	-	41	97	152	206	263	321	381	442	502	564	621	683	747	811	877	942	1008	1075	1142	1209	1269	1330	1390	1448	1502	1552	1597	1640	1680	1717	1751	1784	1814	1843
	10%	-	92	198	307	422	540	653	776	901	1029	1157	1278	1394	1502	1594	1673	1743	1805	1859	1908	1952	1992	2029	2062	2092	2120	2146	2169	2192	2212	2231	2249	2266	2282	2297
10 kVA / 9 kW	100%	-	-	5	10	15	21	27	34	40	45	52	59	67	75	81	87	94	101	108	114	120	128	135	141	147	154	162	168	175	181	188	194	200	206	213
	90%	-	-	6	12	18	24	31	39	44	52	59	69	77	84	90	99	107	114	120	129	136	143	150	158	166	173	180	188	195	202	208	216	224	231	238
	80%	-	-	7	14	21	28	37	43	52	60	71	79	87	95	105	113	120	129	138	145	154	163	171	179	187	195	203	210	219	228	236	245	254	263	271
	75%	-	-	8	15	23	31	40	47	56	66	76	85	93	103	112	119	129	138	146	156	165	174	182	191	199	207	216	226	234	244	253	262	271	281	291
	70%	-	-	9	17	25	34	42	52	61	73	82	90	101	111	119	130	139	148	158	168	177	186	195	204	212	223	232	242	252	262	272	282	292	302	312
	60%	-	-	11	20	30	41	52	63	76	86	97	109	119	131	141	152	164	174	185	196	206	217	228	239	251	262	274	286	297	309	321	332	345	356	368
	50%	-	-	15	26	39	51	64	79	90	105	117	131	144	157	170	183	196	207	221	234	248	262	275	289	303	317	331	345	359	374	387	402	416	431	447
	40%	-	-	19	35	49	66	83	99	115	131	146	163	178	194	208	225	241	259	275	292	309	326	343	360	378	395	413	431	449	467	483	501	519	537	555
	30%	-	-	28	47	69	89	111	132	151	173	193	212	233	255	277	298	321	343	365	387	410	433	457	478	501	524	548	571	594	614	634	657	681	705	729
	25%	-	-	35	57	83	107	131	154	178	201	224	249	274	299	325	350	376	402	429	456	481	508	535	562	589	613	636	663	690	718	746	774	802	830	858
	20%	-	-	43	74	102	131	159	188	215	244	274	305	336	367	398	430	462	493	525	558	590	618	648	681	714	748	781	815	849	883	917	952	986	1021	1055
	10%	-	-	97	152	206	263	321	381	442	502	564	621	683	747	811	877	942	1008	1075	1142	1209	1269	1330	1390	1448	1502	1552	1597	1640	1680	1717	1751	1784	1814	1843
15 kVA / 13.5 kW	100%	-	-	-	5	8	12	15	19	23	27	31	36	40	43	47	52	57	61	67	72	77	81	85	88	93	99	104	108	112	116	120	125	130	135	-
	90%	-	-	-	6	10	14	18	22	26	31	36	41	44	50	55	59	65	71	77	81	86	90	96	101	106	111	116	120	126	131	136	141	145	149	-
	80%	-	-	-	7	12	16	21	26	31	37	41	46	52	57	64	71	77	82	87	92	98	104	110	115	120	126	132	138	143	148	153	160	165	171	-
	75%	-	-	-	8	13	18	23	28	34	40	44	51	56	63	70	76	82	87	93	100	106	112	117	123	130	136	141	147	152	159	165	171	176	182	-
	70%	-	-	-	9	14	19	25	31	37	42	49	55	61	69	76	82	88	94	101	108	114	119	126	133	139	145	151	158	165	171	177	183	189	195	-
	60%	-	-	-	11	17	24	30	38	44	52	58	68	76	83	89	97	105	112	119	127	135	142	148	156	164	171	178	185	193	199	206	213	221	228	-
	50%	-	-	-	15	22	30	39	46	55	65	75	83	90	101	110	117	127	136	144	152	162	170	178	187	196	204	211	221	230	238	248	257	266	275	-
	40%	-	-	-	20	29	40	50	60	73	84	94	106	116	127	138	147	159	170	180	191	201	210	222	233	244	255	266	278	289	300	312	323	335	347	-
	30%	-	-	-	29	42	56	71	85	100	114	128	142	155	170	183	197	209	224	238	254	268	283	298	313	328	343	358	373	388	404	419	436	452	467	-
	25%	-	-	-	36	51	68	85	102	117	135	149	167	183	199	214	231	248	265	282	299	317	334	352	370	387	405	423	443	461	477	496	514	532	551	-
	20%	-	-	-	44	65	85	106	125	144	165	184	202	222	242	263	284	304	325	347	368	389	411	433	456	476	498	520	542	564	587	607	625	647	669	-
	10%	-	-	-	101	139	176	211	251	291	331	372	413	457	497	539	582	620	661	705	749	793	838	883	928	973	1018	1064	1110	1156	1202	1244	1285	1327	1368	-
20 kVA / 18 kW	100%	-	-	-	-	5	7	10	12	15	18	21	24	27	29	33	37	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	59	63	68	72	76	80	83	86	89	93	98	102	106	109	-
	80%	-	-	-	-	7	10	14	17	21	24	28	32	37	40	43	47	52	56	59	65	70	75	79	83	86	89	95	99	104	108	112	116	119	124	-
	75%	-	-	-	-	8	11	15	19	23	27	31	36	40	43	47	52	56	60	66	72	76	81	85	88	93	98	103	107	112	116	119	124	129	134	-
	70%	-	-	-	-	9	13	17	21	25	29	34	39	42	47	52	56	61	67	73	78	82	86	90	96	101	106	111	115	119	125	130	135	139	144	-
	60%	-	-	-	-	11	16	21	26	31	36	41	46	52	57	63	70	76	81	86	91	98	104	109	114	119	125	131	137	142	147	152	158	164	170	-
	50%	-	-	-	-	15	20	26	33	39	44	51	58	65	73	80	86	91	99	106	113	118	125	133	139	145	151	158	165	172	178	184	191	197	203	-
	40%	-	-	-	-	20	27	35	42	50	58	68	77	84	91	101	109	116	124	133	141	148	157	165	173	181	189	197	204	211	220	229	236	245	254	-
	30%	-	-	-	-	29	39	48	59	72	82	91	104	114	124	135	145	156	167	177	187	197	206	217	228	239	250	261	272	284	294	306	317	328	340	-
	25%	-	-	-	-	36	47	59	74	85	98	111	122	135	147	160	172	184	196	207	220	232	245	258	270	284	297	310	323	337	350	363	377	390	404	-
	20%	-	-	-	-	44	59	77	90	107	120	136	149	166	180	195	208	224	238	254	269	286	301	317	333	349	365	381	397	414	431	448	464	479	496	-
	10%	-	-	-	-	101	130	158	186	213	242	272	302	333	363	394	426	459	489	521	553	585	614	642	675	708	741	774	808	841	875	909	943	977	1012	-

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

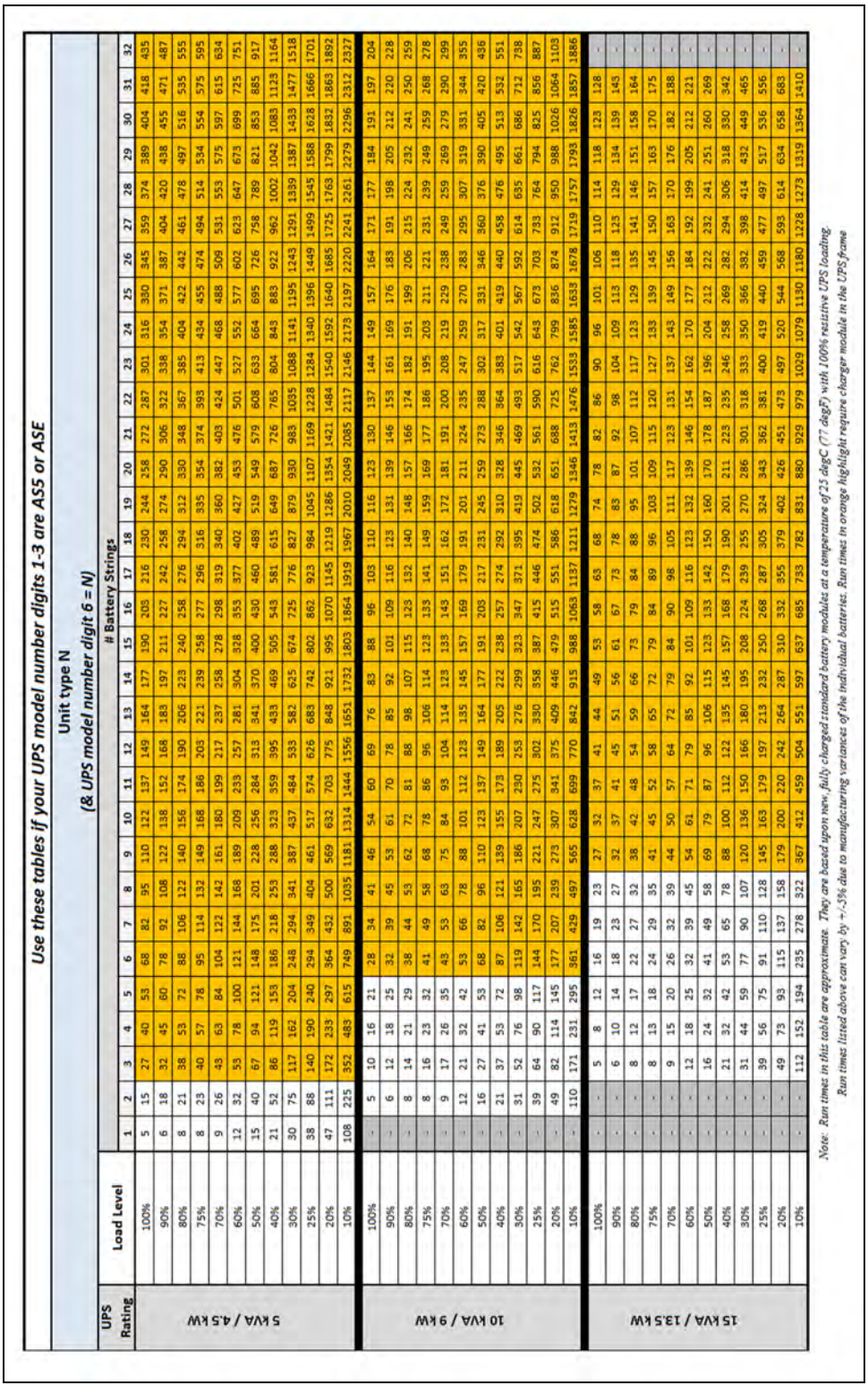
(& UPS model number digit 6 = F)

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%	-	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
	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
	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
	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
	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
	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
	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	689	717	745	772	800	829	857
	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
	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
	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
	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
	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
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	-
	90%	-	-	6	11	17	24	31	38	44	52	58	68	76	83	89	97	105	112	119	127	135	142	148	156	164	171	178	185	193	200	206	213	221	229	-
	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	-
	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	-
	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	-
	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	-
	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	-
	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	-
	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	-
	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	-
	20%	-	-	39	64	90	117	144	170	195	221	247	275	302	330	358	387	415	446	479	502	531	561	590	616	643	673	703	733	764	794	825	856	887	918	-
	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	-
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	-
	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	-
	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	-
	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	-
	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	-
	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	-
	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	-
	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	-
	30%	-	-	-	27	40	53	68	82	95	110	122	137	149	164	177	191	205	216	230	244	259	273	287	301	316	330	345	359	375	389	404	419	435	451	-
	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	-
	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	-
	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	-
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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-
	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	-	-

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

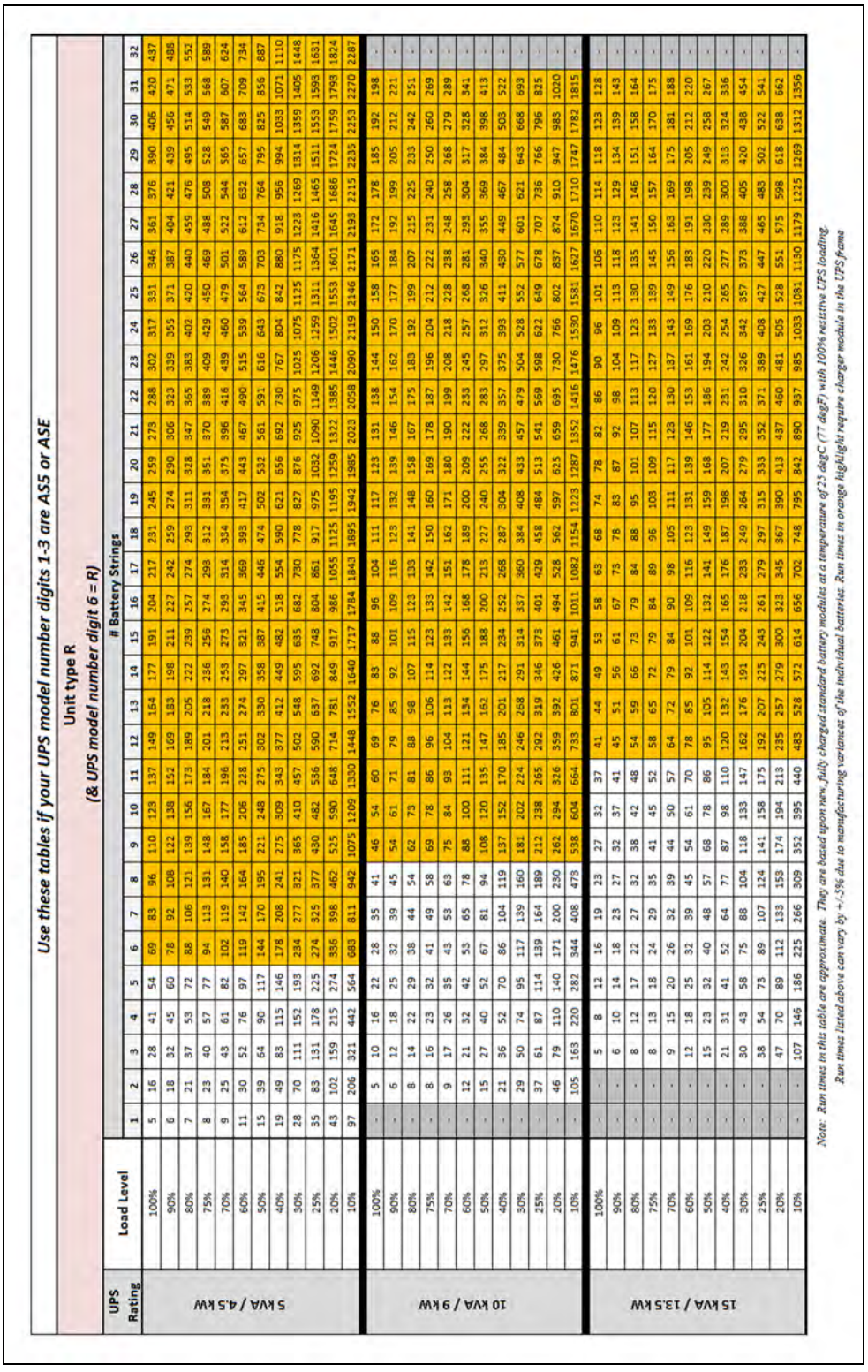
Unit type N

(& 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%	5	15	27	40	53	68	82	95	110	122	137	149	164	177	190	205	216	230	244	258	272	287	301	316	330	345	359	374	389	404	418	435
	90%	6	18	32	45	60	78	92	108	122	138	152	168	183	197	211	227	242	258	274	290	306	322	338	354	371	387	404	420	438	455	471	487
	80%	8	21	38	53	72	88	106	122	140	156	174	190	206	223	240	258	276	294	312	330	348	367	385	404	422	442	461	478	497	516	535	555
	75%	8	23	40	57	78	95	114	132	149	168	186	203	221	239	258	277	296	316	335	354	374	393	413	434	455	474	494	514	534	554	575	595
	70%	9	26	43	63	84	104	122	142	161	180	199	217	237	258	278	298	319	340	360	382	403	424	447	468	488	509	531	553	575	597	615	634
	60%	12	32	53	78	100	121	144	168	189	209	233	257	281	304	328	353	377	402	427	453	476	501	527	552	577	602	623	647	673	699	725	751
	50%	15	40	67	94	121	148	175	201	228	256	284	313	341	370	400	430	460	489	519	549	579	608	633	664	695	726	758	789	821	853	885	917
	40%	21	52	86	119	153	186	218	253	288	323	359	395	433	469	505	543	581	615	649	687	726	765	804	843	883	922	962	1002	1042	1083	1123	1164
	30%	30	75	117	162	204	248	294	341	387	437	484	533	582	625	674	725	776	827	879	930	983	1035	1088	1141	1195	1243	1291	1339	1387	1433	1477	1518
	25%	38	88	140	190	240	294	349	404	461	517	574	626	683	742	802	862	923	984	1045	1107	1169	1228	1284	1340	1396	1449	1499	1545	1588	1628	1666	1701
	20%	47	111	172	233	297	364	432	500	569	632	703	775	848	921	995	1070	1145	1219	1286	1354	1421	1484	1540	1592	1640	1685	1725	1763	1799	1832	1863	1892
	10%	108	225	352	483	615	749	891	1035	1181	1314	1444	1556	1651	1732	1803	1864	1919	1967	2010	2049	2085	2117	2146	2173	2197	2220	2241	2261	2279	2296	2312	2327
10 kVA / 9 kW	100%	-	5	10	16	21	28	34	41	46	54	60	69	76	83	88	96	103	110	116	123	130	137	144	149	157	164	171	177	184	191	197	204
	90%	-	6	12	18	25	32	39	45	53	61	70	78	85	92	101	109	116	123	131	139	146	153	161	169	176	183	191	198	205	212	220	228
	80%	-	8	14	21	29	38	44	53	62	72	81	88	98	107	115	123	132	140	148	157	166	174	182	191	199	206	215	224	232	241	250	259
	75%	-	8	16	23	32	41	49	58	68	78	86	96	106	114	123	133	141	149	159	169	177	186	195	203	211	221	231	239	249	259	268	278
	70%	-	9	17	26	35	43	53	63	75	84	93	104	114	123	133	143	151	162	172	181	191	200	208	219	229	238	249	259	269	279	290	299
	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	344	355
	50%	-	16	27	41	53	68	82	96	110	123	137	149	164	177	191	205	217	231	245	259	273	288	302	317	331	346	360	376	390	405	420	436
	40%	-	21	37	53	72	87	106	121	139	155	173	189	205	222	238	257	274	292	310	328	346	364	383	401	419	440	458	476	495	513	532	551
	30%	-	31	52	76	98	119	142	165	186	207	230	253	276	299	323	347	371	395	419	445	469	493	517	542	567	592	614	635	661	686	712	738
	25%	-	39	64	90	117	144	170	195	221	247	275	302	330	358	387	415	446	474	502	532	561	590	616	643	673	703	733	764	794	825	856	887
	20%	-	49	82	114	145	177	207	239	273	307	341	375	409	446	479	515	551	586	618	651	688	725	762	799	836	874	912	950	988	1026	1064	1103
	10%	-	110	171	231	295	361	429	497	565	628	699	770	842	915	988	1063	1137	1211	1279	1346	1413	1476	1533	1585	1633	1678	1719	1757	1793	1826	1857	1886
15 kVA / 13.5 kW	100%	-	-	5	8	12	16	19	23	27	32	37	41	44	49	53	58	63	68	74	78	82	86	90	96	101	106	110	114	118	123	128	-
	90%	-	-	6	10	14	18	23	27	32	37	41	45	51	56	61	67	73	78	83	87	92	98	104	109	113	118	123	129	134	139	145	-
	80%	-	-	8	12	17	22	27	32	38	42	48	54	59	66	73	79	84	88	95	101	107	112	117	123	129	135	141	146	151	158	164	-
	75%	-	-	8	13	18	24	29	35	41	45	52	58	65	72	79	84	90	96	103	109	115	120	127	133	139	145	150	157	163	170	175	-
	70%	-	-	9	15	20	26	32	39	44	50	57	64	72	79	84	90	98	105	111	117	123	131	137	143	149	156	163	170	176	182	188	-
	60%	-	-	12	18	25	32	39	45	54	61	71	79	85	92	101	109	116	123	132	139	146	154	162	170	177	184	192	199	205	212	221	-
	50%	-	-	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	-
	40%	-	-	21	32	42	53	65	78	88	100	112	122	135	145	157	168	179	190	201	211	223	235	246	258	269	282	294	306	318	330	342	-
	30%	-	-	31	44	59	77	90	107	120	136	150	166	180	195	208	224	239	255	270	286	301	318	333	350	366	382	398	414	432	449	465	-
	25%	-	-	39	56	75	91	110	128	145	163	179	197	213	232	250	268	287	305	324	343	362	381	400	419	440	459	477	497	517	536	556	-
	20%	-	-	49	73	93	115	137	158	179	200	220	242	264	287	310	332	355	379	402	426	451	473	497	520	544	568	593	614	634	658	683	-
	10%	-	-	112	152	194	235	278	322	367	412	459	504	551	597	637	685	733	782	831	880	929	979	1029	1079	1130	1180	1228	1273	1319	1364	1410	-

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 A55 or ASE

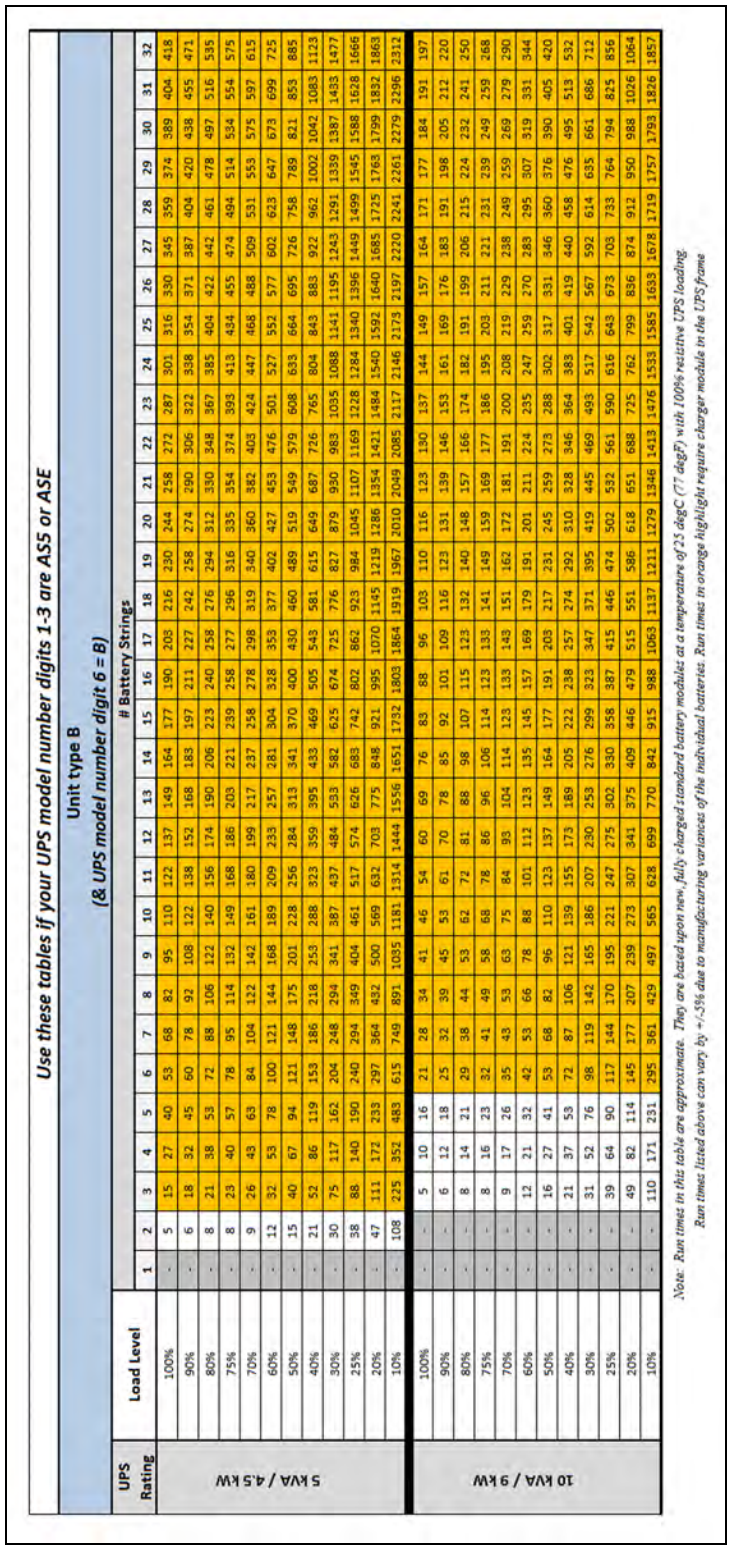
Unit type R

(& 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%	5	16	28	41	54	69	83	96	110	123	137	149	164	177	191	204	217	231	245	259	273	288	302	317	331	346	361	376	390	406	420	437
	90%	6	18	32	45	60	78	92	108	122	138	152	169	183	198	211	227	242	259	274	290	306	323	339	355	371	387	404	421	439	456	471	488
	80%	7	21	37	53	72	88	106	121	139	156	173	189	205	222	239	257	274	293	312	331	347	365	383	402	420	440	459	476	495	514	533	552
	75%	8	23	40	57	77	94	113	131	148	167	184	201	218	236	256	274	293	312	331	351	370	389	409	429	450	469	488	508	528	549	568	589
	70%	9	25	43	61	82	102	119	140	158	177	196	213	233	253	273	293	314	334	354	375	396	416	439	460	479	501	522	544	565	587	607	624
	60%	11	30	52	76	97	119	142	164	185	206	228	251	274	297	321	345	369	393	417	443	467	490	515	539	564	589	612	632	657	683	709	734
	50%	15	39	64	90	117	144	170	195	221	248	275	302	330	358	387	415	446	474	502	532	561	591	616	643	673	703	734	764	795	825	856	887
	40%	19	49	83	115	146	178	208	241	275	309	343	377	412	449	482	518	554	590	621	656	692	730	767	804	842	880	918	956	994	1033	1071	1110
	30%	28	70	111	152	193	234	277	321	365	410	457	502	548	595	635	682	730	778	827	876	925	975	1025	1075	1125	1175	1223	1269	1314	1359	1405	1448
	25%	35	83	131	178	225	274	325	377	430	482	536	590	637	692	748	804	861	917	975	1032	1090	1149	1206	1259	1311	1364	1416	1465	1511	1553	1593	1631
	20%	43	102	159	215	274	336	398	462	525	590	648	714	781	849	917	986	1055	1125	1195	1259	1322	1385	1446	1502	1553	1601	1645	1686	1724	1759	1793	1824
	10%	97	206	321	442	564	683	811	942	1075	1209	1330	1448	1552	1640	1717	1784	1843	1895	1942	1985	2023	2058	2090	2119	2146	2171	2193	2215	2235	2253	2270	2287
10 kVA / 9 kW	100%	-	5	10	16	22	28	35	41	46	54	60	69	76	83	88	96	104	111	117	123	131	138	144	150	158	165	172	178	185	192	198	-
	90%	-	6	12	18	25	32	39	45	54	61	71	79	85	92	101	109	116	123	132	139	146	154	162	170	177	184	192	199	205	212	221	-
	80%	-	8	14	22	29	38	44	54	62	73	81	88	98	107	115	123	133	142	148	158	167	175	183	192	199	207	215	225	233	242	251	-
	75%	-	8	16	23	32	41	49	58	69	78	86	96	106	114	123	133	142	150	160	169	178	187	196	204	212	222	231	240	250	260	269	-
	70%	-	9	17	26	35	43	53	63	75	84	93	104	113	122	133	142	151	162	171	180	190	199	208	218	228	238	248	258	268	279	289	-
	60%	-	12	21	32	42	53	65	78	88	100	111	121	134	144	156	168	178	189	200	209	222	233	245	257	268	281	293	304	317	328	341	-
	50%	-	15	27	40	52	67	81	94	108	120	135	147	162	175	188	200	213	227	240	255	268	283	297	312	326	340	355	369	384	398	413	-
	40%	-	21	36	52	70	86	104	119	137	152	170	185	201	217	234	252	268	287	304	322	339	357	375	393	411	430	449	467	484	503	522	-
	30%	-	29	50	74	95	117	139	160	181	202	224	246	268	291	314	337	360	384	408	433	457	479	504	528	552	577	601	621	643	668	693	-
	25%	-	37	61	87	114	139	164	189	212	238	265	292	319	346	373	401	429	458	484	513	541	569	598	622	649	678	707	736	766	796	825	-
	20%	-	46	79	110	140	171	200	230	262	294	326	359	392	426	461	494	528	562	597	625	659	695	730	766	802	837	874	910	947	983	1020	-
	10%	-	105	163	220	282	344	408	473	538	604	664	733	801	871	941	1011	1082	1154	1223	1287	1352	1416	1476	1530	1581	1627	1670	1710	1747	1782	1815	-
15 kVA / 13.5 kW	100%	-	-	5	8	12	16	19	23	27	32	37	41	44	49	53	58	63	68	74	78	82	86	90	96	101	106	110	114	118	123	128	-
	90%	-	-	6	10	14	18	23	27	32	37	41	45	51	56	61	67	73	78	83	87	92	98	104	109	113	118	123	129	134	139	143	-
	80%	-	-	8	12	17	22	27	32	38	42	48	54	59	66	73	79	84	88	95	101	107	113	117	123	130	135	141	146	151	158	164	-
	75%	-	-	8	13	18	24	29	35	41	45	52	58	65	72	79	84	89	96	103	109	115	120	127	133	139	145	150	157	164	170	175	-
	70%	-	-	9	15	20	26	32	39	44	50	57	64	72	79	84	90	98	105	111	117	123	130	137	143	149	156	163	169	175	181	188	-
	60%	-	-	12	18	25	32	39	45	54	61	70	78	85	92	101	109	116	123	131	139	146	153	161	169	176	183	191	198	205	212	220	-
	50%	-	-	15	23	32	40	48	57	68	78	86	95	105	114	122	132	141	149	159	168	177	186	194	203	210	220	230	239	249	258	267	-
	40%	-	-	21	31	41	52	64	77	87	98	110	120	132	143	154	165	176	187	198	207	219	231	242	254	265	277	289	300	313	324	336	-
	30%	-	-	30	43	58	75	88	104	118	133	147	162	176	191	204	218	233	249	264	279	295	310	326	342	357	373	388	405	420	438	454	-
	25%	-	-	38	54	73	89	107	124	141	158	175	192	207	225	243	261	279	297	315	333	352	371	389	408	427	447	465	483	502	522	541	-
	20%	-	-	47	70	89	112	133	153	174	194	213	235	257	279	300	323	345	367	390	413	437	460	481	505	528	551	575	598	618	638	662	-
	10%	-	-	107	146	186	225	266	309	352	395	440	483	528	572	614	656	702	748	795	842	890	937	985	1033	1081	1130	1179	1225	1269	1312	1356	-

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

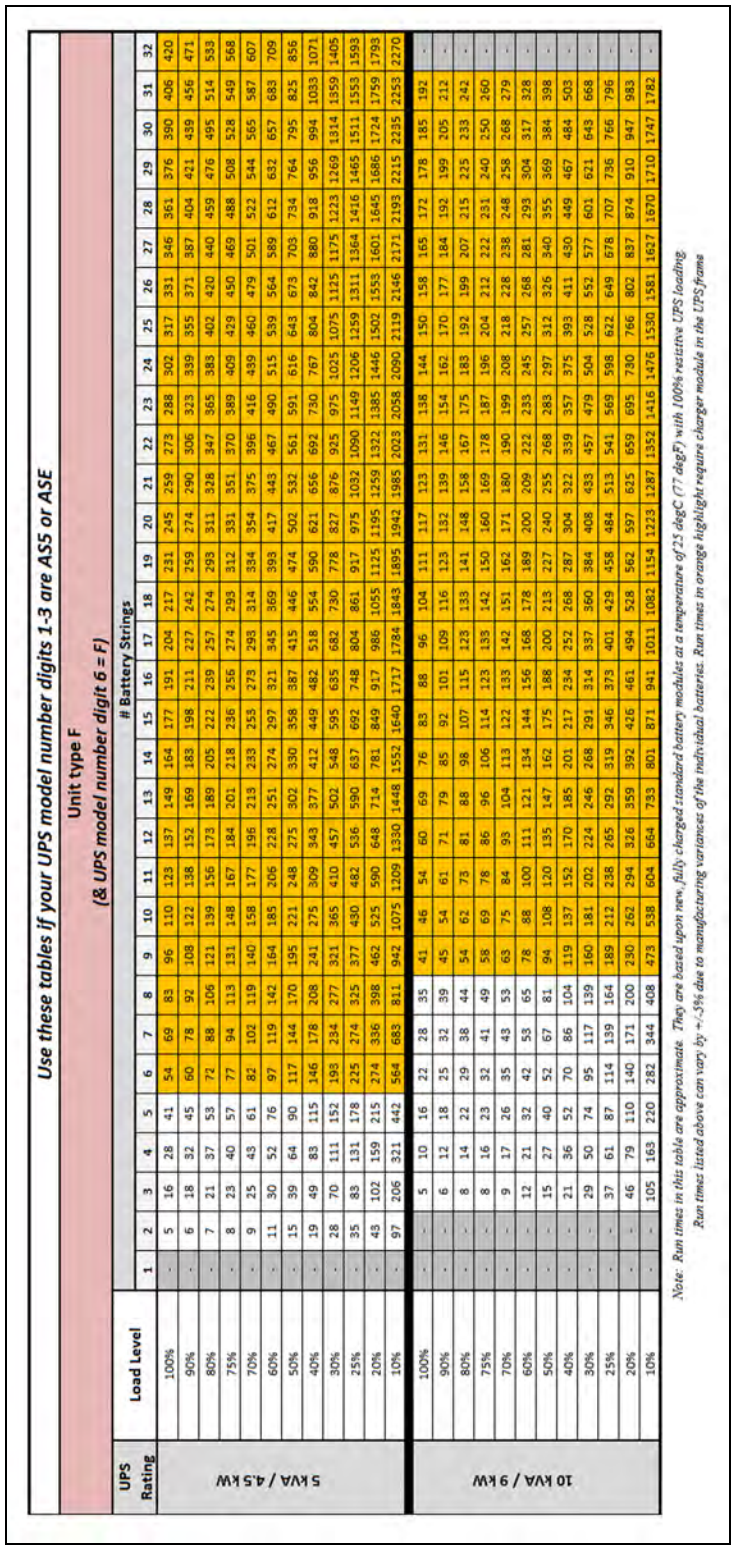
Unit type B

(& 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%	-	5	15	27	40	53	68	82	95	110	122	137	149	164	177	190	203	216	230	244	258	272	287	301	316	330	345	359	374	389	404	418
	90%	-	6	18	32	45	60	78	92	108	122	138	152	168	183	197	211	227	242	258	274	290	306	322	338	354	371	387	404	420	438	455	471
	80%	-	8	21	38	53	72	88	106	122	140	156	174	190	206	223	240	258	276	294	312	330	348	367	385	404	422	442	461	478	497	516	535
	75%	-	8	23	40	57	78	95	114	132	149	168	186	203	221	239	258	277	296	316	335	354	374	393	413	434	455	474	494	514	534	554	575
	70%	-	9	26	43	63	84	104	122	142	161	180	199	217	237	258	278	298	319	340	360	382	403	424	447	468	488	509	531	553	575	597	615
	60%	-	12	32	53	78	100	121	144	168	189	209	233	257	281	304	328	353	377	402	427	453	476	501	527	552	577	602	623	647	673	699	725
	50%	-	15	40	67	94	121	148	175	201	228	256	284	313	341	370	400	430	460	489	519	549	579	608	633	664	695	726	758	789	821	853	885
	40%	-	21	52	86	119	153	186	218	253	288	323	359	395	433	469	505	543	581	615	649	687	726	765	804	843	883	922	962	1002	1042	1083	1123
	30%	-	30	75	117	162	204	248	294	341	387	437	484	533	582	625	674	725	776	827	879	930	983	1035	1088	1141	1195	1243	1291	1339	1387	1433	1477
	25%	-	38	88	140	190	240	294	349	404	461	517	574	626	683	742	802	862	923	984	1045	1107	1169	1228	1284	1340	1396	1449	1499	1545	1588	1628	1666
	20%	-	47	111	172	233	297	364	432	500	569	632	703	775	848	921	995	1070	1145	1219	1286	1354	1421	1484	1540	1592	1640	1685	1725	1763	1799	1832	1863
	10%	-	108	225	352	483	615	749	891	1035	1181	1314	1444	1556	1651	1732	1803	1864	1919	1967	2010	2049	2085	2117	2146	2173	2197	2220	2241	2261	2279	2296	2312
10 kVA / 9 kW	100%	-	-	5	10	16	21	28	34	41	46	54	60	69	76	83	88	96	103	110	116	123	130	137	144	149	157	164	171	177	184	191	197
	90%	-	-	6	12	18	25	32	39	45	53	61	70	78	85	92	101	109	116	123	131	139	146	153	161	169	176	183	191	198	205	212	220
	80%	-	-	8	14	21	29	38	44	53	62	72	81	88	98	107	115	123	132	140	148	157	166	174	182	191	199	206	215	224	232	241	250
	75%	-	-	8	16	23	32	41	49	58	68	78	86	96	106	114	123	133	141	149	159	169	177	186	195	203	211	221	231	239	249	259	268
	70%	-	-	9	17	26	35	43	53	63	75	84	93	104	114	123	133	143	151	162	172	181	191	200	208	219	229	238	249	259	269	279	290
	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	344
	50%	-	-	16	27	41	53	68	82	96	110	123	137	149	164	177	191	203	217	231	245	259	273	288	302	317	331	346	360	376	390	405	420
	40%	-	-	21	37	53	72	87	106	121	139	155	173	189	205	222	238	257	274	292	310	328	346	364	383	401	419	440	458	476	495	513	532
	30%	-	-	31	52	76	98	119	142	165	186	207	230	253	276	299	323	347	371	395	419	445	469	493	517	542	567	592	614	635	661	686	712
	25%	-	-	39	64	90	117	144	170	195	221	247	275	302	330	358	387	415	446	474	502	532	561	590	616	643	673	703	733	764	794	825	856
	20%	-	-	49	82	114	145	177	207	239	273	307	341	375	409	446	479	515	551	586	618	651	688	725	762	799	836	874	912	950	988	1026	1064
	10%	-	-	110	171	231	295	361	429	497	565	628	699	770	842	915	988	1063	1137	1211	1279	1346	1413	1476	1533	1585	1633	1678	1719	1757	1793	1826	1857

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

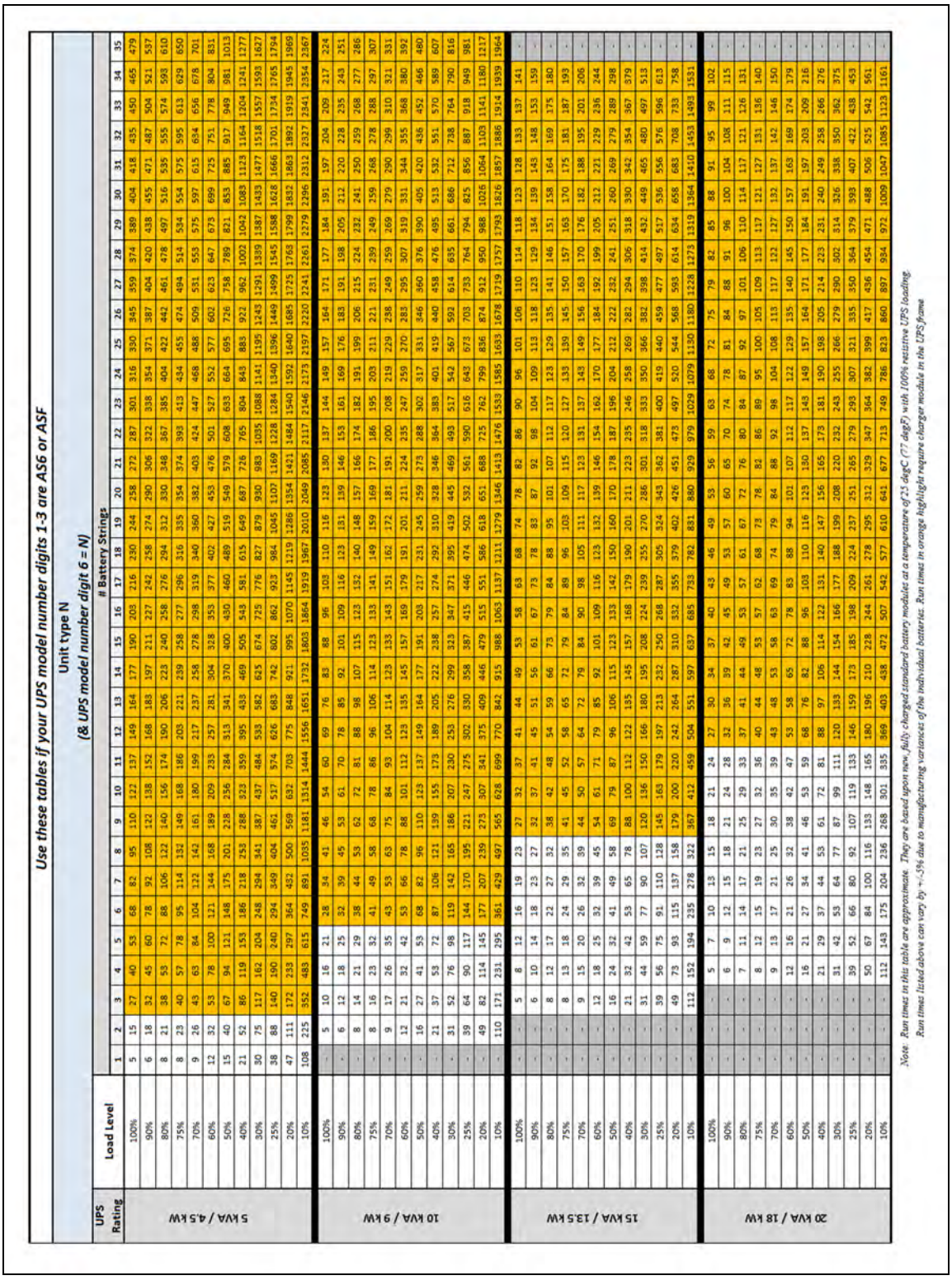
(& UPS model number digit 6 = F)

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%	-	5	16	28	41	54	69	83	96	110	123	137	149	164	177	191	204	217	231	245	259	273	288	302	317	331	346	361	376	390	406	420
	90%	-	6	18	32	45	60	78	92	108	122	138	152	169	183	198	211	227	242	259	274	290	306	323	339	355	371	387	404	421	439	456	471
	80%	-	7	21	37	53	72	88	106	121	139	156	173	189	205	222	239	257	274	293	311	328	347	365	383	402	420	440	459	476	495	514	533
	75%	-	8	23	40	57	77	94	113	131	148	167	184	201	218	236	256	274	293	312	331	351	370	389	409	429	450	469	488	508	528	549	568
	70%	-	9	25	43	61	82	102	119	140	158	177	196	213	233	253	273	293	314	334	354	375	396	416	439	460	479	501	522	544	565	587	607
	60%	-	11	30	52	76	97	119	142	164	185	206	228	251	274	297	321	345	369	393	417	443	467	490	515	539	564	589	612	632	657	683	709
	50%	-	15	39	64	90	117	144	170	195	221	248	275	302	330	358	387	415	446	474	502	532	561	591	616	643	673	703	734	764	795	825	856
	40%	-	19	49	83	115	146	178	208	241	275	309	343	377	412	449	482	518	554	590	621	656	692	730	767	804	842	880	918	956	994	1033	1071
	30%	-	28	70	111	152	193	234	277	321	365	410	457	502	548	595	635	682	730	778	827	876	925	975	1025	1075	1125	1175	1223	1269	1314	1359	1405
	25%	-	35	83	131	178	225	274	325	377	430	482	536	590	637	692	748	804	861	917	975	1032	1090	1149	1206	1259	1311	1364	1416	1465	1511	1553	1593
	20%	-	43	102	159	215	274	336	398	462	525	590	648	714	781	849	917	986	1055	1125	1195	1259	1322	1385	1446	1502	1553	1601	1645	1686	1724	1759	1793
	10%	-	97	206	321	442	564	683	811	942	1075	1209	1330	1448	1552	1640	1717	1784	1843	1895	1942	1985	2023	2058	2090	2119	2146	2171	2193	2215	2235	2253	2270
10 kVA / 9 kW	100%	-	-	5	10	16	22	28	35	41	46	54	60	69	76	83	88	96	104	111	117	123	131	138	144	150	158	165	172	178	185	192	-
	90%	-	-	6	12	18	25	32	39	45	54	61	71	79	85	92	101	109	116	123	132	139	146	154	162	170	177	184	192	199	205	212	-
	80%	-	-	8	14	22	29	38	44	54	62	73	81	88	98	107	115	123	133	141	148	158	167	175	183	192	199	207	215	225	233	242	-
	75%	-	-	8	16	23	32	41	49	58	69	78	86	96	106	114	123	133	142	150	160	169	178	187	196	204	212	222	231	240	250	260	-
	70%	-	-	9	17	26	35	43	53	63	75	84	93	104	113	122	133	142	151	162	171	180	190	199	208	218	228	238	248	258	268	279	-
	60%	-	-	12	21	32	42	53	65	78	88	100	111	121	134	144	156	168	178	189	200	209	222	233	245	257	268	281	293	304	317	328	-
	50%	-	-	15	27	40	52	67	81	94	108	120	135	147	162	175	188	200	213	227	240	255	268	283	297	312	326	340	355	369	384	398	-
	40%	-	-	21	36	52	70	86	104	119	137	152	170	185	201	217	234	252	268	287	304	322	339	357	375	393	411	430	449	467	484	503	-
	30%	-	-	29	50	74	95	117	139	160	181	202	224	246	268	291	314	337	360	384	408	433	457	479	504	528	552	577	601	621	643	668	-
	25%	-	-	37	61	87	114	139	164	189	212	238	265	292	319	346	373	401	429	458	484	513	541	569	598	622	649	678	707	736	766	796	-
	20%	-	-	46	79	110	140	171	200	230	262	294	326	359	392	426	461	494	528	562	597	625	659	695	730	766	802	837	874	910	947	983	-
	10%	-	-	105	163	220	282	344	408	473	538	604	664	733	801	871	941	1011	1082	1154	1223	1287	1352	1416	1476	1530	1581	1627	1670	1710	1747	1782	-

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

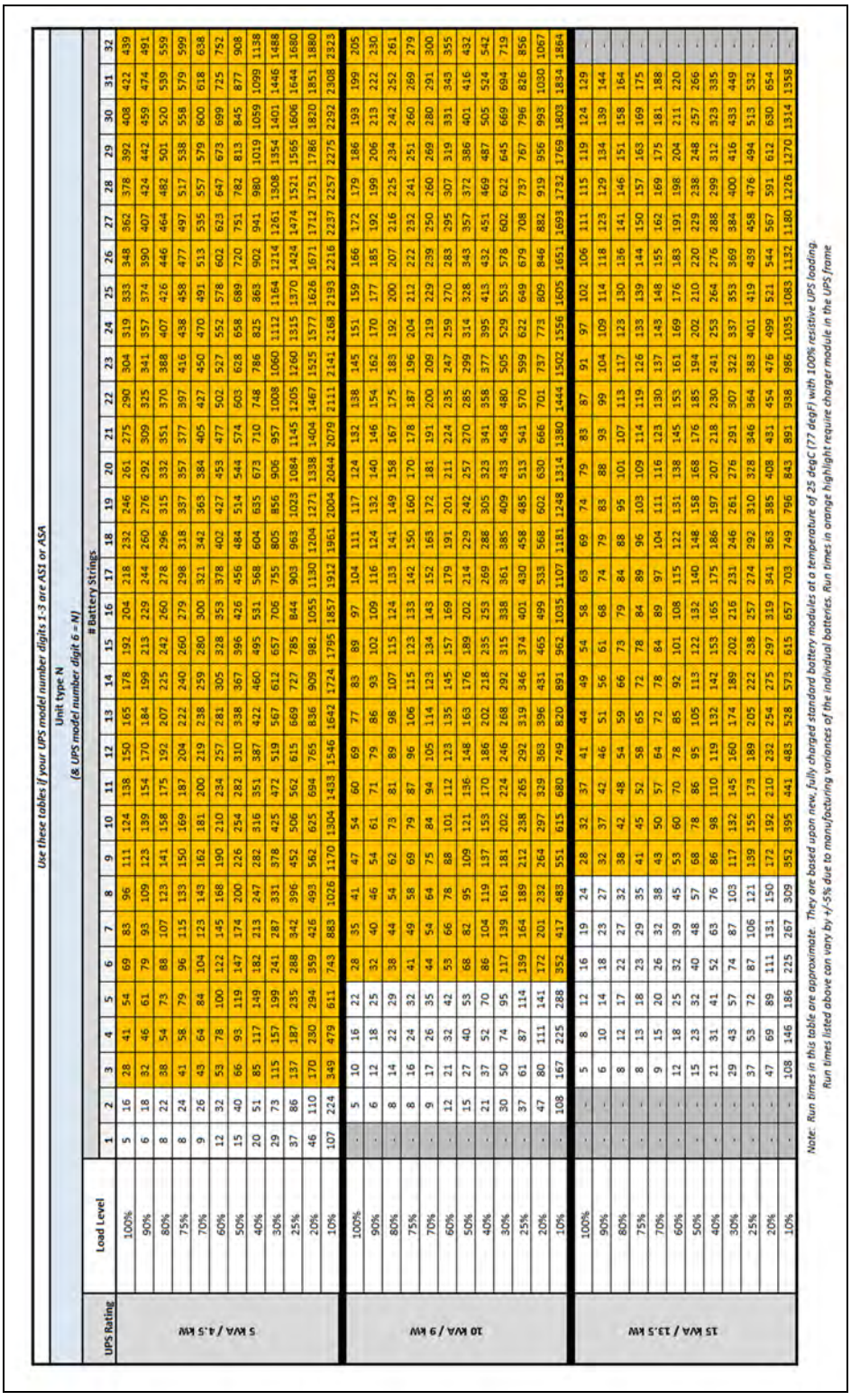
Unit type N

(& 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%	5	15	27	40	53	68	82	95	110	122	137	149	164	177	190	203	216	230	244	258	272	287	301	316	330	345	359	374	389	404	418	435	450	465	479
	90%	6	18	32	45	60	78	92	108	122	138	152	168	183	197	211	227	242	258	274	290	306	322	338	354	371	387	404	420	438	455	471	487	504	521	537
	80%	8	21	38	53	72	88	106	122	140	156	174	190	206	223	240	258	276	294	312	330	348	367	385	404	422	442	461	478	497	516	535	555	574	593	610
	75%	8	23	40	57	78	95	114	134	149	168	186	203	221	239	258	277	296	316	335	354	374	393	413	434	455	474	494	514	534	554	575	595	613	629	650
	70%	9	26	43	63	84	104	122	142	161	180	199	217	237	258	278	298	319	340	360	382	403	424	447	468	488	509	531	553	575	597	615	634	656	678	701
	60%	12	32	53	78	100	121	144	168	189	209	235	257	281	304	328	353	377	402	427	453	476	501	527	552	577	602	623	647	673	699	725	751	778	804	831
	50%	15	40	67	94	121	148	175	201	228	256	284	313	341	370	400	430	460	489	519	549	579	608	633	664	695	726	758	789	821	853	885	917	949	981	1013
	40%	21	52	86	119	153	186	218	253	288	323	359	395	438	469	505	543	581	615	649	687	726	765	804	843	883	922	962	1002	1042	1083	1123	1164	1204	1241	1277
	30%	30	75	117	162	204	248	294	341	387	437	484	533	582	635	674	725	776	827	879	930	983	1035	1088	1141	1195	1243	1291	1339	1387	1433	1477	1518	1557	1593	1627
	25%	38	88	140	190	240	294	349	404	461	517	574	626	683	742	802	862	923	984	1045	1107	1169	1228	1284	1340	1396	1449	1499	1545	1588	1628	1666	1701	1734	1765	1794
	20%	47	111	172	233	297	364	432	500	569	632	703	775	848	921	995	1070	1145	1219	1286	1354	1421	1484	1540	1592	1640	1685	1725	1768	1799	1832	1863	1892	1919	1945	1969
	10%	108	225	352	483	615	749	891	1035	1181	1314	1444	1556	1651	1732	1803	1864	1919	1967	2010	2049	2085	2117	2146	2173	2197	2220	2241	2261	2279	2296	2312	2327	2341	2354	2367
10 kVA / 9 kW	100%	-	5	10	16	21	28	34	41	46	54	60	69	76	83	88	96	103	110	116	123	130	137	144	149	157	164	171	177	184	191	197	204	209	217	224
	90%	-	6	12	18	25	32	39	45	53	61	70	78	85	92	101	109	116	123	131	139	146	153	161	169	176	183	191	198	205	212	220	228	235	243	251
	80%	-	8	14	21	29	38	44	53	62	72	81	88	98	107	115	123	132	140	148	157	166	174	182	191	199	206	215	224	232	241	250	259	268	277	286
	75%	-	8	16	23	32	41	49	58	68	78	86	96	106	114	123	133	141	149	159	169	177	186	195	203	211	221	231	239	249	259	268	278	288	297	307
	70%	-	9	17	26	35	43	53	63	75	84	93	104	114	123	133	143	151	162	172	181	191	200	208	219	229	238	249	259	269	279	290	299	310	321	331
	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	344	355	368	380	392
	50%	-	16	27	41	53	68	82	96	110	123	137	149	164	177	191	203	217	231	245	259	273	288	302	317	331	346	360	376	390	405	420	436	452	466	480
	40%	-	21	37	53	72	87	106	121	139	155	173	189	205	222	238	257	274	292	310	328	346	364	383	401	419	440	458	476	495	513	532	551	570	589	607
	30%	-	31	52	76	98	119	142	165	186	207	230	253	276	299	323	347	371	395	419	445	469	493	517	542	567	592	614	635	661	686	712	738	764	790	816
	25%	-	39	64	90	117	144	170	195	221	247	275	302	330	358	387	415	446	474	502	532	561	590	616	643	673	703	733	764	794	825	856	887	918	949	981
	20%	-	49	82	114	145	177	207	239	273	307	341	375	409	446	479	515	551	586	618	651	688	725	762	799	836	874	912	950	988	1026	1064	1103	1141	1180	1217
	10%	-	110	171	231	295	361	429	497	565	628	699	770	842	915	988	1063	1137	1211	1279	1346	1413	1476	1533	1585	1633	1678	1719	1757	1793	1826	1857	1886	1914	1939	1964
15 kVA / 13.5 kW	100%	-	-	5	8	12	16	19	23	27	32	37	41	44	49	53	58	63	68	74	78	82	86	90	96	101	106	110	114	118	123	128	133	137	141	-
	90%	-	-	6	10	14	18	23	27	32	37	41	45	51	56	61	67	73	78	83	87	92	98	104	109	113	118	123	129	134	139	143	148	153	159	-
	80%	-	-	8	12	17	22	27	32	38	42	48	54	59	66	73	79	84	88	95	101	107	112	117	123	129	135	141	146	151	158	164	169	175	180	-
	75%	-	-	8	13	18	24	29	35	41	45	52	58	65	72	79	84	89	96	103	109	115	120	127	133	139	145	150	157	163	170	175	181	187	193	-
	70%	-	-	9	15	20	26	32	39	44	50	57	64	72	79	84	90	98	105	111	117	123	131	137	143	149	156	163	170	176	182	188	195	201	206	-
	60%	-	-	12	18	25	32	39	45	54	61	71	79	85	92	101	109	116	123	132	139	146	154	162	170	177	184	192	199	205	212	221	229	236	244	-
	50%	-	-	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	289	298	-
	40%	-	-	21	32	42	53	65	78	88	100	112	122	135	145	157	168	179	190	201	211	223	235	246	258	269	282	294	306	318	330	342	354	367	379	-
	30%	-	-	31	44	59	77	90	107	120	136	150	166	180	195	208	224	239	255	270	286	301	318	333	350	366	382	398	414	432	449	465	480	497	513	-
	25%	-	-	39	56	75	91	110	128	145	163	179	197	213	232	250	268	287	305	324	343	362	381	400	419	440	459	477	497	517	536	556	576	596	613	-
	20%	-	-	49	73	93	115	137	158	179	200	220	242	264	287	310	332	355	379	402	426	451	473	497	520	544	568	593	614	634	658	683	708	733	758	-
	10%	-	-	112	152	194	235	278	322	367	412	459	504	551	597	637	685	733	782	831	880	929	979	1029	1079	1130	1180	1228	1275	1319	1364	1410	1453	1493	1531	-
20 kVA / 18 kW	100%	-	-	-	5	7	10	13	15	18	21	24	27	30	34	37	40	43	46	49	53	56	59	63	68	72	75	79	82	85	88	91	95	99	102	-
	90%	-	-	-	6	9	12	15	18	21	24	28	32	36	39	42	45	49	53	57	60	65	70	74	78	81	84	88	91	96	100	104	108	111	115	-
	80%	-	-	-	7	11	14	17	21	25	29	33	37	41	44	49	53	57	61	67	72	76	80	84	87	92	97	101	106	110	114	117	121	126	131	-
	75%	-	-	-	8	12	15	19	23	27	32	36	40	44	48	53	57	62	68	73	78	82	86	89	95	100	105	109	113	117	121	127	131	136	140	-
	70%	-	-	-	9	13	17	21	25	30	35	39	43	48	53	58	63	69	74	79	84	88	92	98	104	108	113	117	122	127	132	137	142	146	150	-
	60%	-	-	-	12	16	21	26	32	38	42	47	53	58	65	72	78	83	88	94	101	107	112	117	122	129	135	140	145	150	157	163	169	174	179	-
	50%	-	-	-	16	21	27	34	41	46	53	59	68	76	82	88	96	103	110	116	123	130	137	143	149	157	164	171	177	184	191	197	203	209	216	-
	40%	-	-	-	21	29	37	44	53	61	72	81	88	97	106	114	122	131	140	147	156	165	173	181	190	198	205	214	223	231	240	249	258	266	276	-
	30%	-	-	-	31	42	53	64	77	87	99	111	120	133	144	154	166	177	188	199	208	220	232	243	255	266	279	290	302	314	326	338	350	362	375	-
	25%	-	-	-	39	52	66	80	92	107	119	133	146	159	173	185	198	209	224	237	251	265	279	293	307	321	335	350	364	379	393	407	422	438	453	-
	20%	-	-	-	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	-
	10%	-	-	-	112	143	175	204	236	268	301	335	369	403	438	472	507	542	577	610	641	677	713	749	786	823	860	897	934	972	1009	1047	1085	1123	1161	-

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

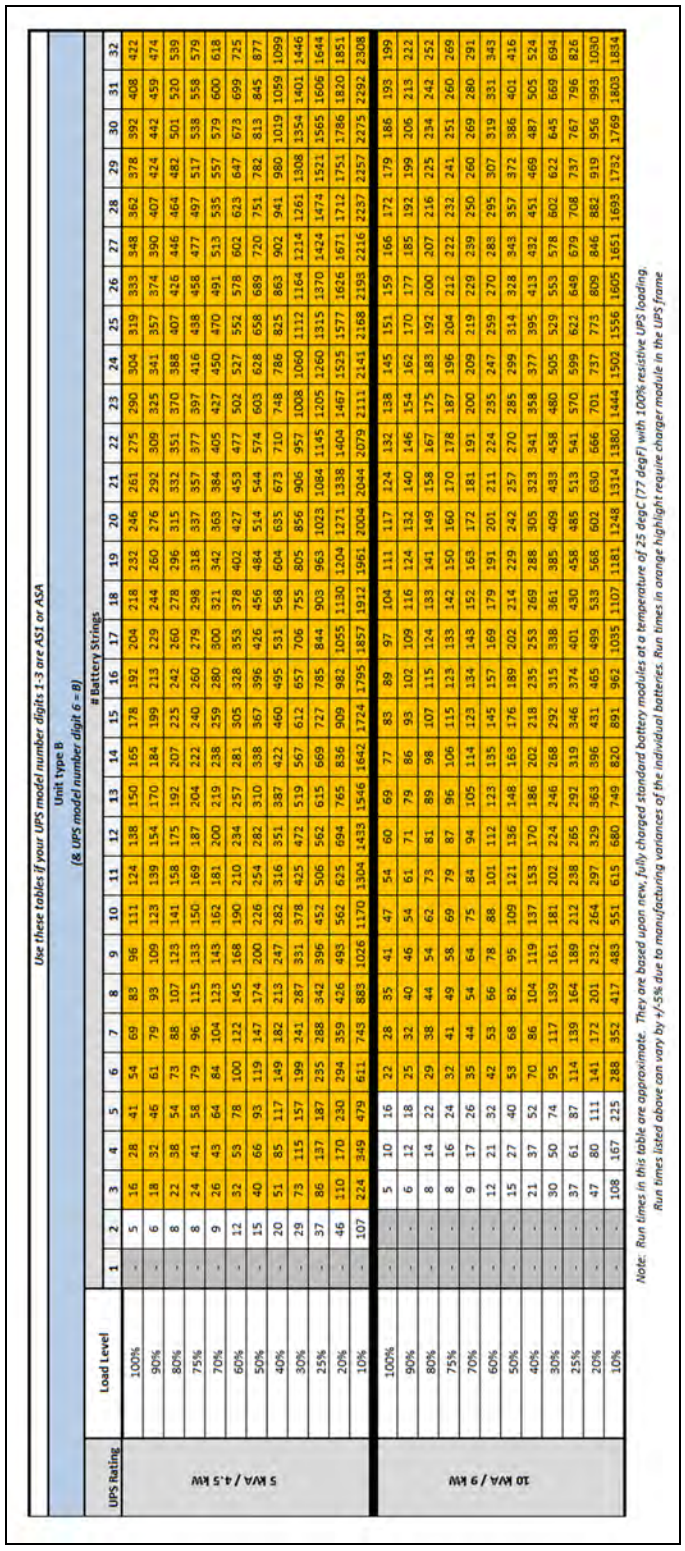


Use these tables if your UPS model number digits 1-3 are AS1 or ASA
Unit type N
(& UPS model number digit 6 = N)

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	124	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	225	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 8.23 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 AS1 or ASA

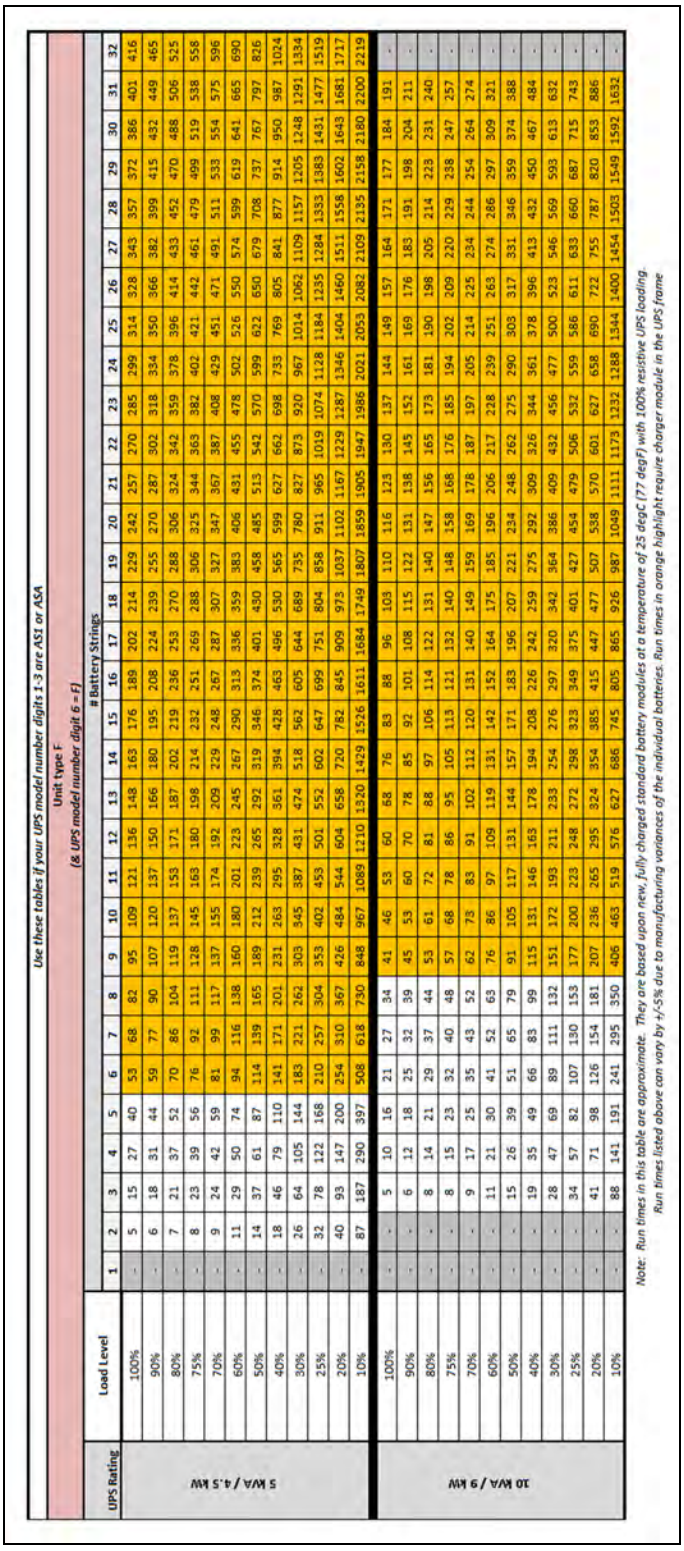
Unit type B

(& 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%	-	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
	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
	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
	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
	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
	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
	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
	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
	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
	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
	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
	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
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
	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
	80%	-	-	8	14	22	29	38	44	54	62	73	81	89	98	107	115	124	133	141	149	158	167	175	183	192	200	207	216	225	234	242	252
	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	212	232	241	251	260	269
	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
	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
	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
	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
	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
	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	786	826
	20%	-	-	47	80	111	141	172	201	232	264	297	329	363	396	431	465	499	538	568	602	630	666	701	737	773	809	846	882	919	956	993	1030
	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

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 AS1 or AS4

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%	-	5	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
	90%	-	6	18	31	44	59	77	90	107	120	137	150	166	180	195	208	224	239	255	270	287	302	318	334	350	366	382	399	415	432	449	465
	80%	-	7	21	37	52	70	86	104	119	137	153	171	187	202	219	236	253	270	288	306	324	342	359	378	396	414	433	452	470	488	506	525
	75%	-	8	23	39	56	76	92	111	128	145	163	180	198	214	232	251	269	288	306	325	344	363	382	402	421	442	461	479	499	519	538	558
	70%	-	9	24	42	59	81	99	117	137	155	174	192	209	229	248	267	287	307	327	347	367	387	408	429	451	471	491	511	533	554	575	596
	60%	-	11	29	50	74	94	116	138	160	180	201	223	245	267	290	313	336	359	383	406	431	455	478	502	526	550	574	599	619	641	665	690
	50%	-	14	37	61	87	114	139	165	189	212	239	265	292	319	346	374	401	430	458	485	513	542	570	599	622	650	679	708	737	767	797	826
	40%	-	18	46	79	110	141	171	201	231	263	295	328	361	394	428	463	496	530	565	599	627	662	698	733	769	805	841	877	914	950	987	1024
	30%	-	26	64	105	144	183	221	262	303	345	387	431	474	518	562	605	644	689	735	780	827	873	920	967	1014	1062	1109	1157	1205	1248	1291	1334
	25%	-	32	78	122	168	210	257	304	353	402	453	501	552	602	647	699	751	804	858	911	965	1019	1074	1128	1184	1235	1284	1333	1383	1431	1477	1519
	20%	-	40	93	147	200	254	310	367	426	484	544	604	658	720	782	845	909	973	1037	1102	1167	1229	1287	1346	1404	1460	1511	1558	1602	1643	1681	1717
	10%	-	87	187	290	397	508	618	730	848	967	1089	1210	1320	1429	1526	1611	1684	1749	1807	1859	1905	1947	1986	2021	2053	2082	2109	2135	2158	2180	2200	2219
10 kVA / 9 kW	100%	-	-	5	10	16	21	27	34	41	46	53	60	68	76	83	88	96	103	110	116	123	130	137	144	149	157	164	171	177	184	191	-
	90%	-	-	6	12	18	25	32	39	45	53	60	70	78	85	92	101	108	115	122	131	138	145	152	161	169	176	183	191	198	204	211	-
	80%	-	-	8	14	21	29	37	44	53	61	72	81	88	97	106	114	122	131	140	147	156	165	173	181	190	198	205	214	223	231	240	-
	75%	-	-	8	15	23	32	40	48	57	68	78	86	95	105	113	121	132	140	148	158	168	176	185	194	202	209	220	229	238	247	257	-
	70%	-	-	9	17	25	35	43	52	62	73	83	91	102	112	120	131	140	149	159	169	178	187	197	205	214	225	234	244	254	264	274	-
	60%	-	-	11	21	30	41	52	63	76	86	97	109	119	131	142	152	164	175	185	196	206	217	228	239	251	263	274	286	297	309	321	-
	50%	-	-	15	26	39	51	65	79	91	105	117	131	144	157	171	183	196	207	221	234	248	262	275	290	303	317	331	346	359	374	388	-
	40%	-	-	19	35	49	66	83	99	115	131	146	163	178	194	208	226	242	259	275	292	309	326	344	361	378	396	413	432	450	467	484	-
	30%	-	-	28	47	69	89	111	132	151	172	193	211	233	254	276	297	320	342	364	386	409	432	456	477	500	523	546	569	593	613	632	-
	25%	-	-	34	57	82	107	130	153	177	200	223	248	272	298	323	349	375	401	427	454	479	506	532	559	586	611	633	660	687	715	743	-
	20%	-	-	41	71	98	126	154	181	207	236	265	295	324	354	385	415	447	477	507	538	570	601	627	658	690	722	755	787	820	853	886	-
	10%	-	-	88	141	191	241	295	350	406	463	519	576	627	686	745	805	865	926	987	1049	1111	1173	1232	1288	1344	1400	1454	1503	1549	1592	1632	-

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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