ONLINE UPS · SPLIT PHASE 120/240 V · RACK / TOWER

FERRUS SP RT

6–10 kVA

Online double-conversion UPS with output isolation transformer, 120/240 V split-phase output and the AEC color touchscreen, in a 4U / 5U chassis with BAT16192RT battery packs.



User Manual

Installation · Operation · Maintenance

FERRUS SP RT 6 kVA

FERRUS SP RT 10 kVA

BAT16192RT battery pack

COPYRIGHT AND NOTICES

Copyright © 2026 AEC UPS USA LLC. All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without the prior written consent of AEC UPS USA LLC.

Trademarks. AEC and FERRUS SP RT are trademarks of AEC UPS USA LLC. All other trademarks and trade names mentioned in this document are the property of their respective owners.

Notice. The products, services and features you purchase are defined by the contract between AEC and the customer; some of those described in this document may not be included in your purchase or use. Unless the contract says otherwise, all statements, information and recommendations in this document are provided “as is”, without warranties, guarantees or representations of any kind, express or implied. The information in this document may change without notice. Every effort has been made to ensure its accuracy, but nothing in it constitutes a warranty of any kind, express or implied. The illustrations are for reference: the actual product may differ slightly.

AEC UPS USA LLC
4872 SW 72nd Ave, Miami, FL 33155
Technical support, 24/7 · phone and WhatsApp: **+1 786 553 2100**
service.us@aecups.com · sales@aecups.com · aecups.com

AEC-UM-FSRT-US · Rev. C · November 2026. Rev. C states the 120/240 V input without neutral, restores the overload shutdown time, sizes breakers and conductors to the NEC 125 % rule, replaces the factory drawings that carried 110/220 V captions, corrects the parallel-wiring figure and adds call-out pictures for every panel, port, breaker state, battery pack connection and touchscreen page.

BEFORE YOU START

About this manual

Thank you for choosing an AEC FERRUS SP RT UPS. This manual describes the FERRUS SP RT 6–10 kVA: safety, the front and rear panels, planning, installation and the output configurations, the BAT16192RT battery packs, operation, the touchscreen, communication, batteries and runtime, maintenance, troubleshooting and the specifications. Read it before you start, and keep it near the UPS.

MODELS COVERED

FERRUS SP RT 6 kVA (FERSPRT6000-16X9, 4U) and FERRUS SP RT 10 kVA (FERSPRT10000-16X9, 5U), rack / tower, with one to four BAT16192RT battery packs. Ordering codes: Table 2-2.

WHO THIS MANUAL IS FOR

Qualified electricians install and wire the UPS to the National Electrical Code (NFPA 70) and local codes. Trained personnel operate and maintain it: they read the touchscreen and follow the procedures of the operation chapter.

Safety messages

Safety messages in this manual follow ANSI Z535.6. The signal word tells how serious the hazard is:

DANGER	A hazardous situation which, if not avoided, **will** result in death or serious injury.
WARNING	A hazardous situation which, if not avoided, **could** result in death or serious injury.
CAUTION	A hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Information about practices that could damage the equipment, lose data, reduce performance or give unexpected results — not related to injury.

Other conventions

i NOTE Additional information that stresses or completes the text.

✓ TIP A hint that helps you solve a problem or save time.

Keys are shown like [ON]; menus like **Settings › Battery**. Numbers in red circles on a picture are explained in the list under it. Cross-references in red are links in the PDF.

QUICK START

Up and running in six steps

The short version — each step points to the full instructions. Read the safety chapter first.

1. **Unpack and inspect** the UPS and the battery packs. Section 4.1, page 20.
2. **Mount** the packs low in the rack and the UPS on its rails above them, front and rear vents clear. Section 4.3, page 20.
3. **Wire — qualified electrician:** ground first, then the input (two line conductors of the 120/240 V or 120/208 V service, no neutral), the output and the battery packs, on a branch circuit sized to the NEC. Section 4.4, page 22.
4. **Set the output configuration** (01 to 04: 120 V, 240 V or both) with the jumpers. Section 4.6, page 25.
5. **Start:** pack breakers ON, then the input breaker. Line mode after about one minute — only INV lit. Section 5.3, page 29.
6. **Check and load:** number of packs in **Set › BATT Set**, then switch the loads on one at a time, the largest first. Section 6.4, page 36.

120/240 V	6–10 kVA	1–4 packs	Up to 3
split phase, isolated by the output transformer	kVA = kW, rack or tower, 4U / 5U	BAT16192RT, 3U, 192 V DC	units in parallel, N+1

CONTENTS

Contents

1 Safety 7
1.1 Battery safety 7
1.2 General safety 7
1.3 Handling and transport 8
1.4 Installation and EMC 8
1.5 Standards 8

2 Product description 10
2.1 Introduction 10
2.2 Models and ordering codes 10
2.3 What is in the box 11
2.4 Front panel 11
2.5 Rear panel 12
2.6 Touchscreen at a glance 14
2.7 The isolation transformer 15
2.8 How the UPS works 16
2.9 Operating modes 17
2.10 Protections 17

3 Planning the installation 18
3.1 Sizing the load 18
3.2 Estimating the runtime 18
3.3 Choosing the output configuration 18
3.4 The branch circuit 19
3.5 Running on a generator 19

4 Installation 20
4.1 Unpacking and inspection 20
4.2 Site and environment 20
4.3 Mounting in a rack or as a tower 20
4.4 Electrical connection 22
4.5 Terminal strip 23
4.6 Output configurations 25
4.7 Adding BAT16192RT battery packs 26
4.8 Parallel systems 27
4.9 Communication connections 28
4.10 Installation checklist 28

5 Operation 29
5.1 Breaker positions 29
5.2 Before the first start 29
5.3 Starting on utility power 29
5.4 Starting on battery (cold start) 29
5.5 Transferring to bypass and back 30
5.6 ECO mode 30
5.7 Battery test 30
5.8 Everyday use 30
5.9 What the panel tells you 31
5.10 Silencing the alarm 31

5.11 Shutting down 31
5.12 Maintenance bypass (option) 31
5.13 Emergency power off 32

6 Touchscreen 33
6.1 The touchscreen on the unit 33
6.2 Home page and main menu 33
6.3 Data (readings) 34
6.4 Set (settings) 36
6.5 Control 38

7 Communication and monitoring 40
7.1 Communication ports 40
7.2 SNMP-M network card 40
7.3 UPS View software 41
7.4 Dry-contact card 41
7.5 Intelligent slot 41
7.6 Emergency power off (EPO) 42
7.7 Parallel setting 43

8 Battery and runtime 44

9 Maintenance 46
9.1 Maintenance schedule 46
9.2 Battery care 46
9.3 Component life 46
9.4 Battery life and temperature 46
9.5 Replacing a battery pack 47
9.6 Battery handling and disposal 47
9.7 Storage and transport 47

10 Troubleshooting 48
10.1 Reading an alarm 48
10.2 Alarm list 48

11 Specifications 51

A Ordering codes and accessories 53

B Warranty 54

C Drawings 55

D Quick reference 56

E Frequently asked questions 57

F Acronyms and abbreviations 58

G Installation record 59

01

CHAPTER 1

Safety

Read this chapter before you install, operate or service the UPS. Safety messages also appear in the chapters where each task is described.

⚠ WARNING · IMPORTANT SAFETY INSTRUCTIONS — SAVE THESE INSTRUCTIONS

This manual contains important safety, installation and operating instructions for the FERRUS SP RT 6–10 kVA UPS and its BAT16192RT battery packs. Read the whole manual before you install or operate the unit, and keep it for future reference.

1.1 Battery safety

⚠ DANGER

The battery packs can cause electric shock and a high short-circuit current. Each BAT16192RT pack is a 192 V DC string. This voltage is lethal.

- Wear rubber gloves and rubber-soled boots.
- Remove rings, watches and other metal objects.
- Use tools with insulated handles only.
- Do not lay tools or other metal objects on the batteries or the packs.
- The battery circuit is not isolated from the utility input. Check that there is no voltage between the battery terminals and ground before you touch them.
- If a battery is damaged or shows signs of leakage, contact AEC service immediately.
- Do not dispose of batteries in fire: they can explode.
- Handle, transport and recycle batteries according to local regulations.

1.2 General safety

⚠ WARNING

Improper use can cause electric shock or fire.

- Switch the UPS off and disconnect it before you clean it.
- Clean the UPS with a dry cloth only. Do not use liquid or aerosol cleaners.
- Never block the ventilation openings or insert objects into them.
- Only qualified personnel may install the UPS, according to the National Electrical Code (NFPA 70) and local codes.
- In case of fire, use a dry-chemical (powder) extinguisher. A liquid extinguisher can cause electric shock.

⚠ DANGER

Before you move or rewire the UPS, open the input breaker and every pack breaker, and wait at least 10 minutes for the internal capacitors to discharge. Even with the input breaker open, the internal circuits stay connected to the batteries.

1.3 Handling and transport

> **⚠ WARNING**
>
> The UPS is heavy (128–143 lb) and each battery pack weighs 123.6 lb. Lift them with two or more people, using the handles, and support them on rails or a shelf in the rack.

- Move the UPS in its original packaging as far as the installation site.
- Do not tilt the UPS more than 10° while you move it.
- Transport and store the UPS and the packs upright, in their packaging.

1.4 Installation and EMC

- The UPS is hardwired. A qualified electrician must install it according to the National Electrical Code (NFPA 70) and local codes.
- Install an output circuit breaker between the UPS and the loads.
- Do not feed the UPS from a wall receptacle.
- This product is intended for commercial and industrial use. Installation restrictions or additional measures may be needed to prevent radio interference.

1.5 Standards

The UPS meets the UL 1778 standard. It is designed according to the following standards.

TABLE 1-1 Design standards

Standard	Subject
UL 1778	Uninterruptible power systems — safety (North America)
IEC 62040-1	UPS — general and safety requirements
IEC 62040-2	UPS — electromagnetic compatibility (EMC)
IEC 62040-3	UPS — performance and test requirements
IEC 61000-3-12	Harmonic currents, equipment above 16 A per phase
IEC 61000-3-11	Voltage fluctuations and flicker
IEC 61000-4-2	Immunity to electrostatic discharge
IEC 61000-4-3	Immunity to radiated electromagnetic fields
IEC 61000-4-4	Immunity to electrical fast transients / bursts
IEC 61000-4-5	Immunity to surges
IEC 61000-4-6	Immunity to conducted disturbances
IEC 61000-4-8	Immunity to power-frequency magnetic fields
IEC 63000	Restriction of hazardous substances (RoHS) — technical documentation
NFPA 70 (NEC)	Installation: branch circuits, conductors, overcurrent protection, working space

1.5.1 FCC statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio-frequency energy and, if not installed and used in accordance with this manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

02

CHAPTER 2

Product description

The FERRUS SP RT range and its codes, the front and rear panels, the touchscreen, the isolation transformer, how the UPS works, its operating modes and its protections.

2.1 Introduction

FERRUS SP RT is an online double-conversion UPS of 6 and 10 kVA with an output isolation transformer and a 120/240 V split-phase output. Its 19-inch chassis is 4U (6 kVA) or 5U (10 kVA) high and mounts in a rack or stands upright as a tower. The input takes the two line conductors of a 120/240 V or 120/208 V service (240 V or 208 V between them), with no neutral. The runtime comes from one to four BAT16192RT battery packs of 3U. Input, output and battery are hardwired on a terminal strip at the rear.



FIGURE 2-1 FERRUS SP RT with a BAT16192RT battery pack

TABLE 2-1 FERRUS SP RT at a glance

Feature	What it gives you
Isolation	No wire runs from the supply to the loads: noise and faults stay on the utility side.
120/240 V	Two 120 V legs, 240 V across them; jumpers set the output for the site.
kVA = kW	Output power factor 1; input power factor above 0.99.
Online, up to 93 %	Double conversion; ECO mode selectable.
Touchscreen	Readings, settings, alarms and tests; two access levels.
1–4 packs	BAT16192RT, 3U: 6 to 34 min at full load on the 6 kVA.

2.2 Models and ordering codes

TABLE 2-2 FERRUS SP RT models

Model	Rating	Code	Chassis	Battery
FERRUS SP RT 6	6,000 VA / 6,000 W	FERSPRT6000-16X9	4U	1–4 × BAT16192RT (16 × 12 V 9 Ah, 192 V DC)
FERRUS SP RT 10	10,000 VA / 10,000 W	FERSPRT10000-16X9	5U	1–4 × BAT16192RT (16 × 12 V 9 Ah, 192 V DC)

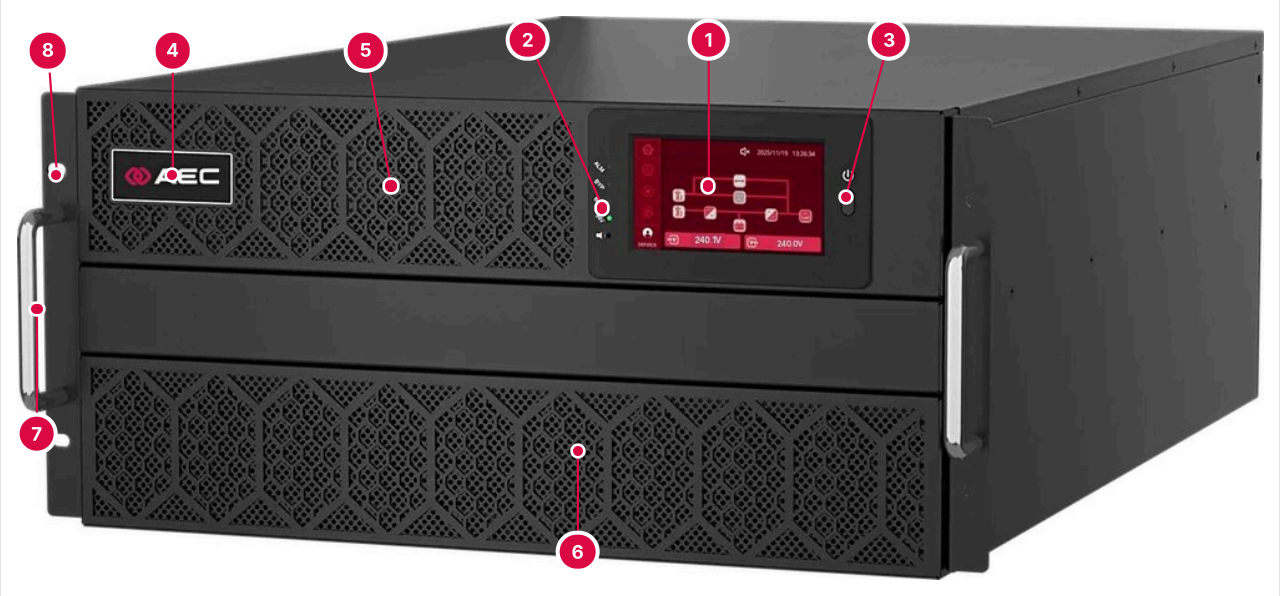
How to read the code. FERSPRT10000-16X9+BAT16192RTx2 means: series FERRUS SP RT · rating in VA (10000) · battery string the UPS is set for (16 × 12 V 9 Ah) · battery pack (BAT16192RT) · how many packs (x2; 1 to 4). All codes and accessories are in Appendix A.

2.3 What is in the box

- 1 × FERRUS SP RT UPS, with the rack ears and handles fitted
- Rail kit
- Accessory kit — check its contents against the packing list in the box
- 1 × user manual
- The BAT16192RT battery packs ordered, each in its own carton

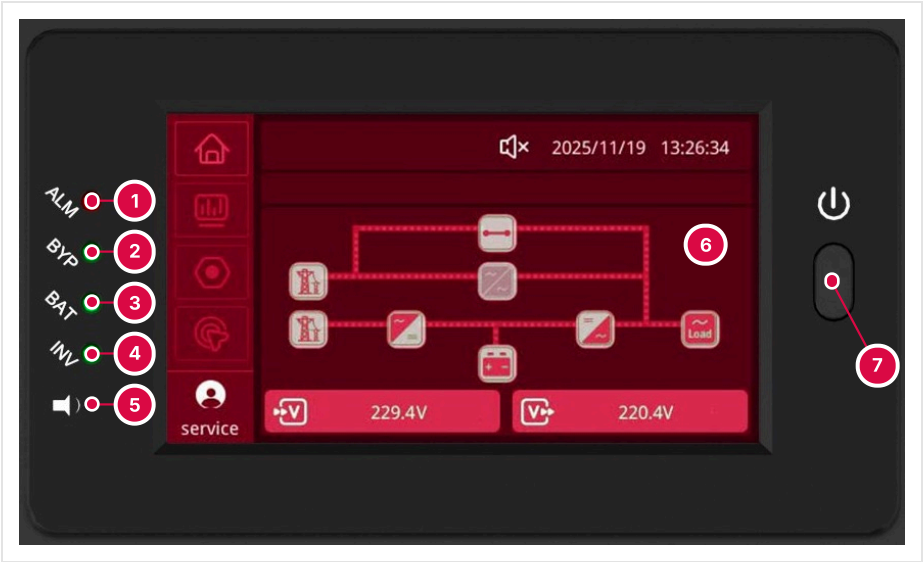
Inspect the contents on delivery. Report damage to the carrier and missing parts to AEC.

2.4 Front panel



1. Color touchscreen (Section 6.1)
2. Status LEDs: ALM, BYP, BAT, INV and buzzer mute (Table 2-3)
3. Power button
4. AEC badge
5. Upper front grille: air in
6. Lower front grille: air in
7. Handles, one on each side, for lifting into the rack
8. Rack ears, 19-inch: 4U (6 kVA) or 5U (10 kVA)

FIGURE 2-2 Front of the FERRUS SP RT (rack orientation)



1. ALM — alarm
2. BYP — bypass
3. BAT — battery
4. INV — inverter
5. Buzzer mute LED
6. Touchscreen (Section 6.2)
7. Power button

FIGURE 2-3 Display panel — LEDs, touchscreen and power button

TABLE 2-3 Status LEDs

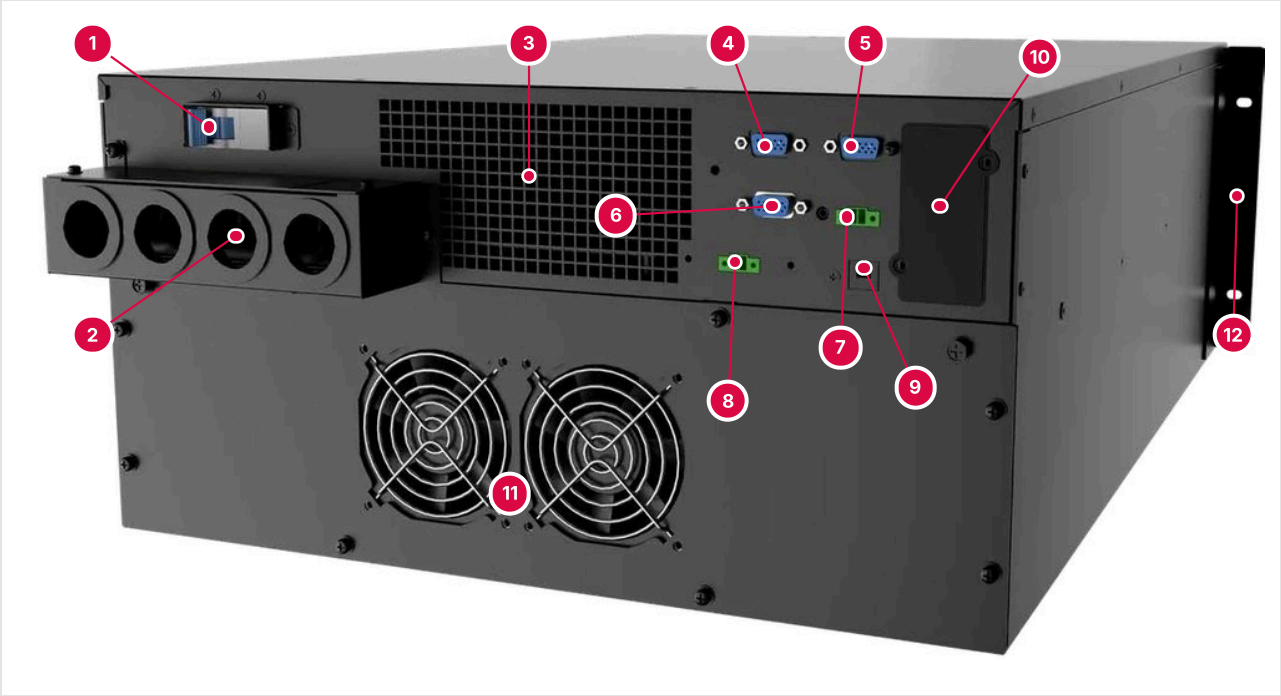
LED	Meaning
ALM	Alarm: lit on a fault or a warning.
BYP	Bypass: lit while the load is on the bypass.
BAT	Battery: lit while the battery supplies the load.
INV	Inverter: lit while the inverter supplies the load.
Mute	The buzzer is muted.

In normal operation only **INV** is lit.

The power button switches the UPS on and off, like the inverter command on the touchscreen (**Control › Function**, page 2, ON/OFF control). The procedures of Chapter 5 use the touchscreen command.

2.5 Rear panel

All connections are at the rear. The input breaker sits above the terminal strip; the cables enter through the cable-entry box that covers the strip.



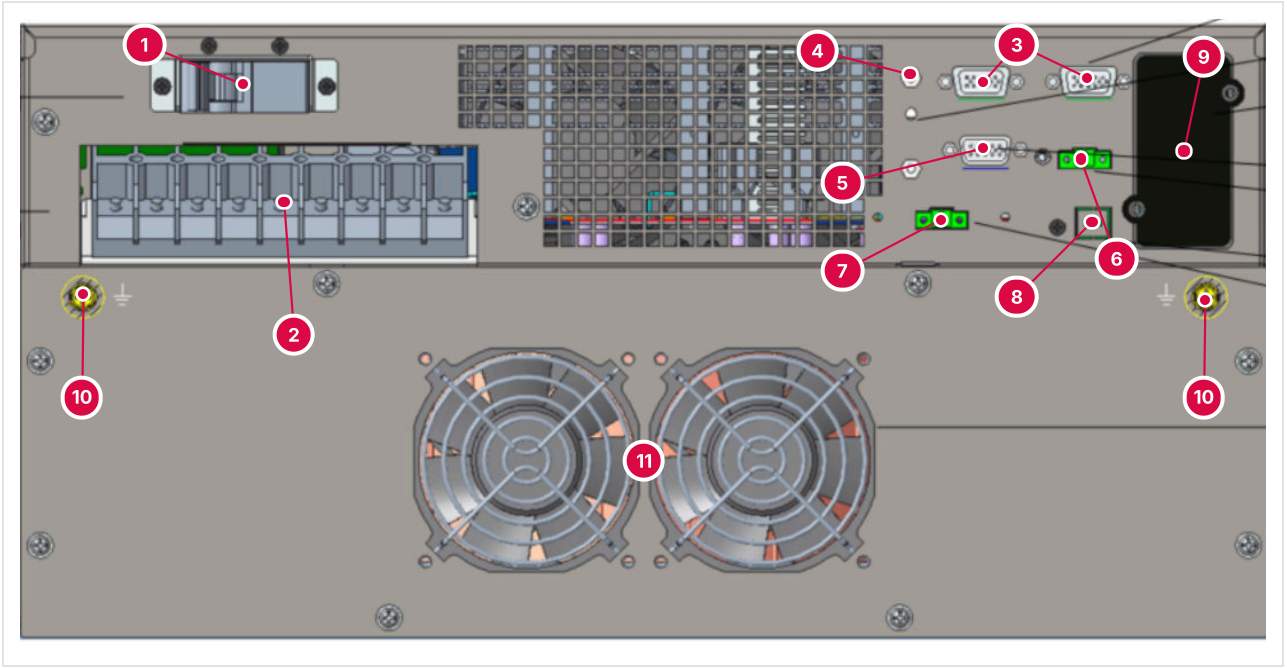
1. Input breaker
2. Cable-entry box: input, output and battery cables, terminal strip behind it (Section 4.5)
3. Ventilation grille
4. Parallel port 1 (Section 4.8)
5. Parallel port 2
6. RS-232, DB9 (Section 7.1)
7. EPO terminals, normally closed loop (Section 7.6)
8. RS-485 terminals (Modbus)
9. USB port
10. Intelligent slot, under its cover (Section 7.5)
11. Transformer fans: air out
12. Rack ear

FIGURE 2-4 Rear of the FERRUS SP RT

TABLE 2-4 Rear panel

Part	Description
Input breaker	Breaker of the 240 V or 208 V input (two line conductors).
Cable-entry box	Covers the terminal strip. Input, output and battery cables enter here: no wall plug, no receptacles.
Parallel ports	Two ports for the parallel cables (Section 4.8).
RS-232	DB9 for monitoring software (Section 7.3).
EPO	Normally closed loop: opening it stops the output (Section 7.6).
RS-485	Modbus link.
USB	Monitoring software.
Intelligent slot	SNMP-M card, or a dry-contact card on DB9 or terminal block (Section 7.5).
COLD START	Starts the UPS from the battery when there is no utility (Section 5.4).
Transformer fans	Cooling of the output transformer: air out at the rear.

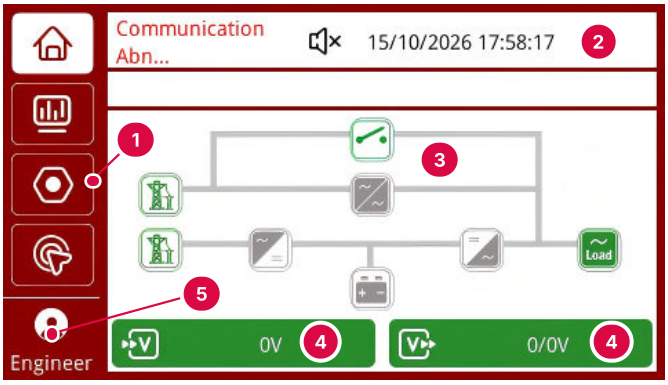
The drawing below shows the same panel with the cable-entry box removed. It also shows the two ground studs and the COLD START button.



1. Input breaker
2. Terminal strip, 9 terminals (Figure 4-3)
3. Parallel ports (2)
4. COLD START button (Section 5.4)
5. RS-232
6. EPO
7. RS-485
8. USB
9. Intelligent slot
10. Ground stud (one each side)
11. Transformer fans

FIGURE 2-5 Rear panel with the cable-entry box removed (FERRUS SP RT 10; the 6 kVA has the same parts)

2.6 Touchscreen at a glance



1. Side menu: Home, Data, Set, Control
2. Status bar: message, buzzer mute, date and time
3. Power flow
4. Input and output voltages
5. User level logged in

FIGURE 2-6 Home page

The full menu is described in Chapter 6. Two access levels: **User** reads the pages and mutes the buzzer; **Engineer** also changes the settings and runs the tests.

2.7 The isolation transformer

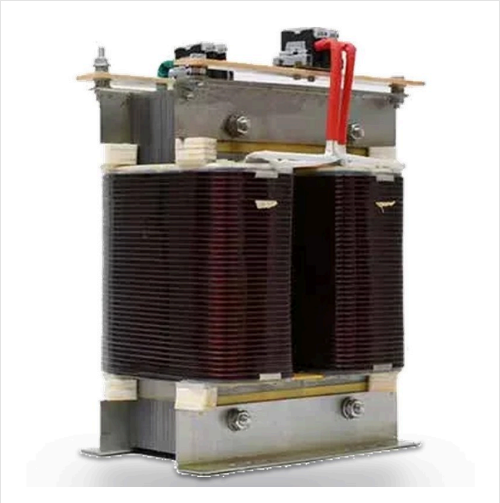


FIGURE 2-7 The output isolation transformer

Galvanic isolation. No wire runs from the supply to the loads. The power crosses the transformer as a magnetic field, so noise and faults on the utility stay on the utility side.

120 V and 240 V from one UPS. Two secondary windings make the two 120 V legs; in series, 240 V. Jumpers on the output terminals choose the wiring (Section 4.6).

Isolated on the bypass too. The bypass joins ahead of the transformer. In bypass mode the loads stay on its windings, but utility disturbances are not filtered.

For mixed and motor loads. 120 V equipment and 240 V machines run on the same UPS, as on a panel board.

TABLE 2-5 Split-phase output facts

Value	Meaning
180°	L1–N1 and L2–N2 in opposition, as in a North American split-phase service.
120 V · 240 V	120 V on each leg; 240 V from L1 to N2 with the jumper N1–L2.
100 %	One 120 V or one 240 V output carries the full rating; two separate 120 V outputs, 50 % each.
25 · 42 A	Output current of the 6 and 10 kVA on each 120 V leg.

2.8 How the UPS works

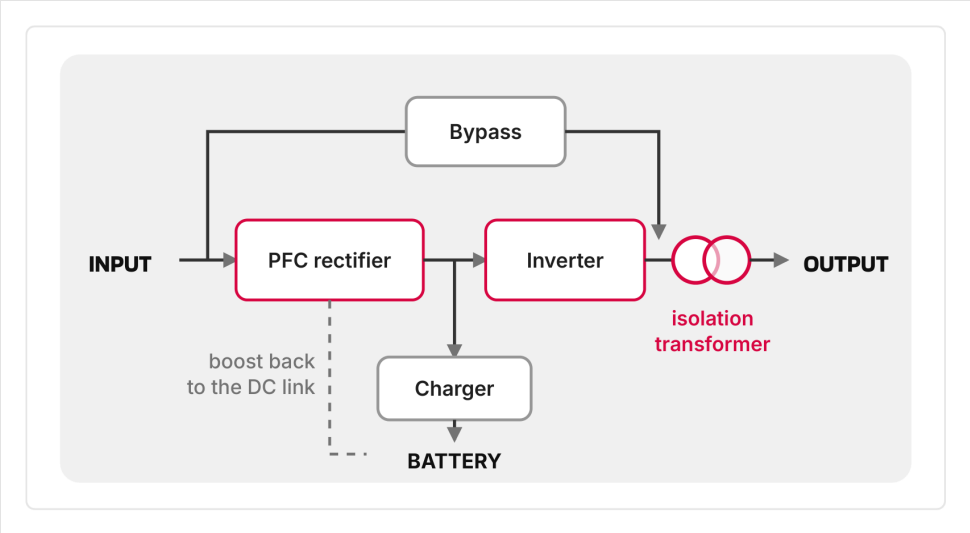


FIGURE 2-8 Working principle

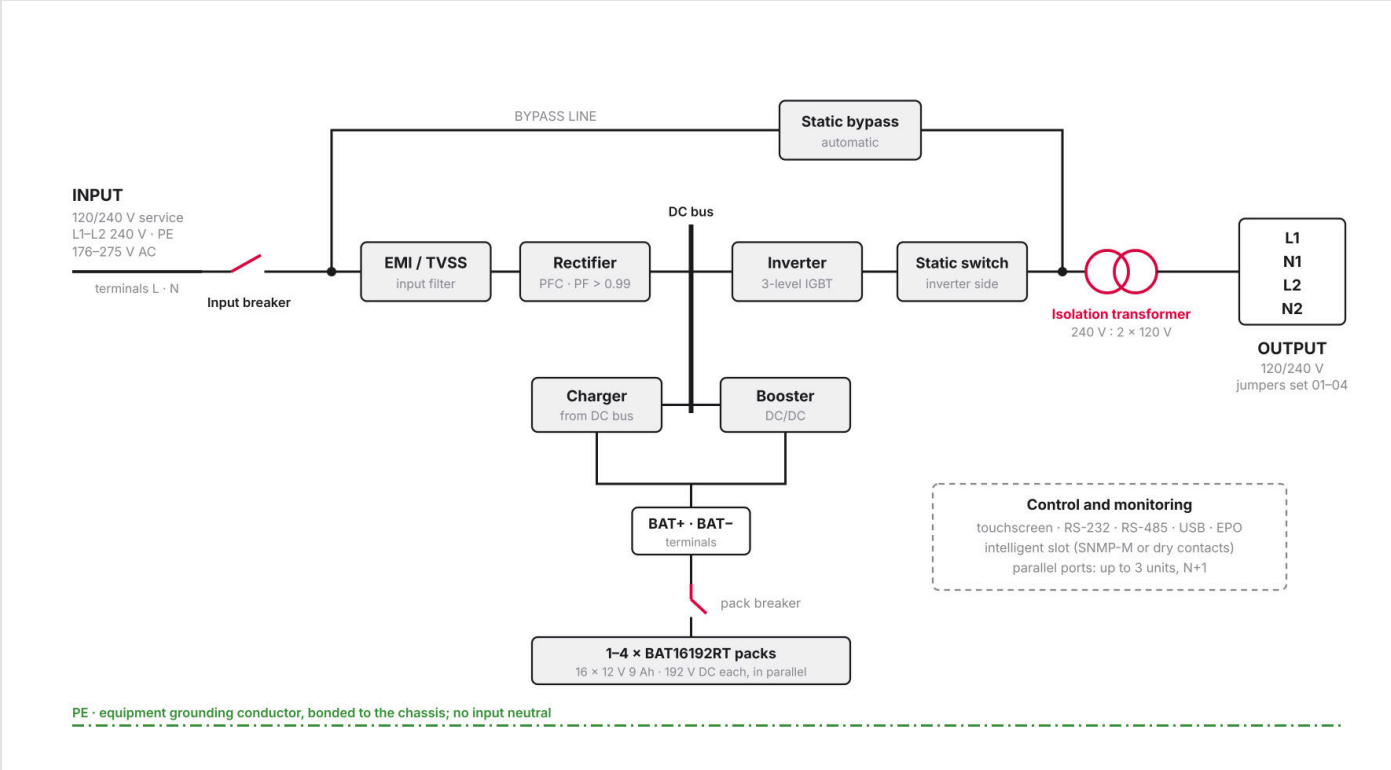


FIGURE 2-9 Single-line diagram of the FERRUS SP RT (AEC drawing)

Surge suppression (TVSS) and EMI/RFI filters. They protect against surges and filter electromagnetic and radio-frequency interference on the utility line.

Rectifier / power-factor correction (PFC). It converts the utility AC into a regulated DC bus while it draws a near-sinusoidal input current (power factor above 0.99).

Inverter. A 3-level IGBT inverter rebuilds a precise sine wave from the DC bus. On utility and on battery it runs online continuously.

Charger and DC-to-DC converter (booster). The charger float-charges the battery packs while the utility is present. On a utility failure the booster takes the battery energy back to the DC bus.

Output isolation transformer. It isolates the output and makes the two 120 V legs: 240 V primary, two 120 V secondaries (Section 2.7).

Bypass. On overload, over-temperature or a fault the load moves to the static bypass automatically, ahead of the transformer.

Input. Two line conductors of the 120/240 V or 120/208 V service (240 V or 208 V between them) and the equipment grounding conductor. There is no input neutral: the output neutrals come from the transformer.

2.9 Operating modes

TABLE 2-6 Operating modes

Mode	When	Panel
Line (normal)	Utility present: PFC and inverter feed the load; the charger float-charges the battery.	INV lit; power flow: utility → rectifier → inverter → load
Battery	Utility abnormal: the battery takes over without interrupting the output.	INV and BAT lit; buzzer; battery time in **Data › Battery**
Bypass	Overload, over-temperature, a fault, or a manual bypass: the load moves to the bypass.	BYP lit; the alarm in **Data › Current Alarm**
ECO	System mode ECO: the load stays on the bypass while it is good; the inverter takes over when it is not.	BYP lit while the bypass is good
Cold start	No utility: the UPS is started from the battery (Section 5.4).	As battery mode
Maintenance bypass	Where fitted (option): the load stays on the utility while the UPS is serviced.	Alarm 39 "Maintenance breaker closed"
Parallel	Up to three units of one rating share the load, or run N+1 (Section 4.8).	System settings, **Set** page 2

NOTICE

On bypass, on maintenance bypass and in ECO mode the load is not protected from utility disturbances.

2.10 Protections

- Input surge suppression (TVSS) and EMI/RFI filters.
- Overload: 110 % for 10 min, 130 % for 1 min, 150 % for 30 s, then transfer to bypass; at 150 % the output shuts down after 1 min.
- Output short circuit; bypass overload timeout.
- Rectifier, inverter and transformer over-temperature; fan failure.
- Battery low and end-of-discharge shutdown; battery reverse connection.
- EPO input (normally closed loop).

CHAPTER 3

03 Planning the installation

Sizing the load, estimating the runtime, choosing the output configuration, the branch circuit and running on a generator — before you install.

3.1 Sizing the load

The output power factor is 1: the UPS delivers its full rating in watts — 6,000 or 10,000 W. Size the UPS on the watts the loads draw.

1. List every device that will run on the UPS.
2. Read its power in watts on the label or in the data sheet. If only volts and amps are given, multiply them (V × A). That gives VA, which is equal to or higher than the watts, so the estimate is on the safe side.
3. Add the watts. Keep the total at or below 80 % of the UPS rating. The margin covers start-up currents, future equipment and battery ageing.
4. Check that no leg or circuit is overloaded (Table 4-3).

TABLE 3-1 Worked example — a server rack on a FERRUS SP RT 6 with two packs, configuration 01 (two 120 V outputs)

Load	Watts	Leg L1	Leg L2	Connected
Servers	2,400 W	20 A	—	L1–N1
Storage and network	2,100 W	—	17.5 A	L2–N2
Total	4,500 W (75 %)	20 A	17.5 A	limit 25 A per leg (50 % each)

Runtime. 20.6 minutes at 75 % with two BAT16192RT packs (Table 8-1).

✓ TIP Measure rather than guess. Once the UPS runs, **Data › Load** shows the real load in % and kW for each leg. Recheck after you add equipment.

3.2 Estimating the runtime

1. Work out the load as a percentage of the rating.
2. Find the two load columns either side of it in Table 8-1 and estimate between them.
3. Allow a margin: the runtime is shorter with batteries that are old, cold, hot or not fully charged.
4. If the runtime is too short, add BAT16192RT packs (up to four per UPS), or reduce the load: halving the load roughly doubles the runtime or more.

3.3 Choosing the output configuration

TABLE 3-2 Which configuration for which site

Your loads	Configuration	Remember
Only 120 V equipment, two groups	01	Each group up to 50 % of the rating. Balance the two groups.
Only 120 V equipment, one group	02	One output, full rating at 120 V.

Your loads	Configuration	Remember
Only 240 V equipment	03	One output, full rating at 240 V; no neutral needed by the load.
120 V and 240 V equipment, or a 120/240 V panel board	04	Keep each leg within its current limit.

Balancing the legs. In configurations 01 and 04 each 120 V leg carries its own current limit — 25 A (6 kVA) or 42 A (10 kVA). A 240 V load draws the same current from both legs; a 120 V load draws only from its own leg. Add up each leg separately (see Table 3-1). Move 120 V loads from the heavier leg to the lighter one until both are within the limit.

Motor loads. The starting current of a motor can be several times its running current. It must stay within the overload capability of the UPS (150 % for 30 s, Table 11-1). Start large motors first, with the other loads already running at low power — or ask AEC to check the application.

3.4 The branch circuit

The UPS is fed by a dedicated 2-pole branch circuit from the 120/240 V or 120/208 V service: two line conductors (240 V or 208 V between them) and the equipment grounding conductor. No neutral is connected at the input.

- Input breaker: the next standard rating (NEC 240.6) at or above both the maximum input current and 125 % of the rated input current at 240 V (rated power ÷ 93 % efficiency ÷ 240 V; NEC 215.2, 215.3). The maximum input current flows only at low input voltage, full load and full battery recharge. Conductors are rated for 75 °C terminations (NEC 110.14(C)). Table 4-5 gives the result for each rating; it is the same on a 208 V supply (125 % of 31.0 A and of 51.7 A rated).
- Keep the NEC working space (NEC 110.26) behind the rack: the terminals and the breaker are at the rear.
- Do not use an upstream breaker with ground-fault (residual-current) protection that trips on the normal leakage current of the UPS and its loads.

3.5 Running on a generator

The UPS accepts an input of 176–275 V (L1–L2, 240 V or 208 V nominal) and 40–70 Hz. So it rides through the voltage and frequency swings of a standby generator, and its PFC input (power factor above 0.99) loads the generator cleanly.

- As a general rule, choose a generator rated at least 1.5 times the UPS input power, so that it also covers the battery recharge.
- Let the generator reach stable voltage and frequency before the transfer switch connects it to the UPS. The UPS stays on battery until the input is within range.
- If the UPS keeps returning to battery while on the generator, the generator is too small or unstable: check its voltage and frequency.

CHAPTER 4

04 Installation

Unpacking, the site, mounting in a rack or as a tower, the electrical connection and terminal strip, the output configurations, the battery packs, parallel systems and communication.

⚠ WARNING

Only qualified electricians may install and wire the UPS, according to the National Electrical Code and local codes.

4.1 Unpacking and inspection

1. Open the package and check its contents (Section 2.3).
2. Inspect the unit and the packs for transport damage. If anything is damaged or missing, do not switch it on: notify the carrier and your AEC dealer immediately.
3. If the UPS was unpacked in a cold place, wait until it is completely dry inside and out before you install it: condensation can cause electric shock.

4.2 Site and environment

TABLE 4-1 Operating environment

Item	Requirement
Location	Indoors, ventilated; away from water, flammable gases and corrosive agents; no direct sunlight, no conductive dust
Temperature	32–104 °F (0–40 °C); battery life is best at 59–77 °F (15–25 °C)
Humidity	Below 95 %, non-condensing
Altitude	Full power up to 3,300 ft (1,000 m); derate above (Table 11-2)
Clearance	20 in (0.5 m) on each side; front and rear vents open

4.3 Mounting in a rack or as a tower

The UPS and its packs have the same 17.3 in width and mount in a standard 19-inch rack. In a rack the packs go below the UPS. As a tower the UPS stands upright on a flat floor, beside its packs.

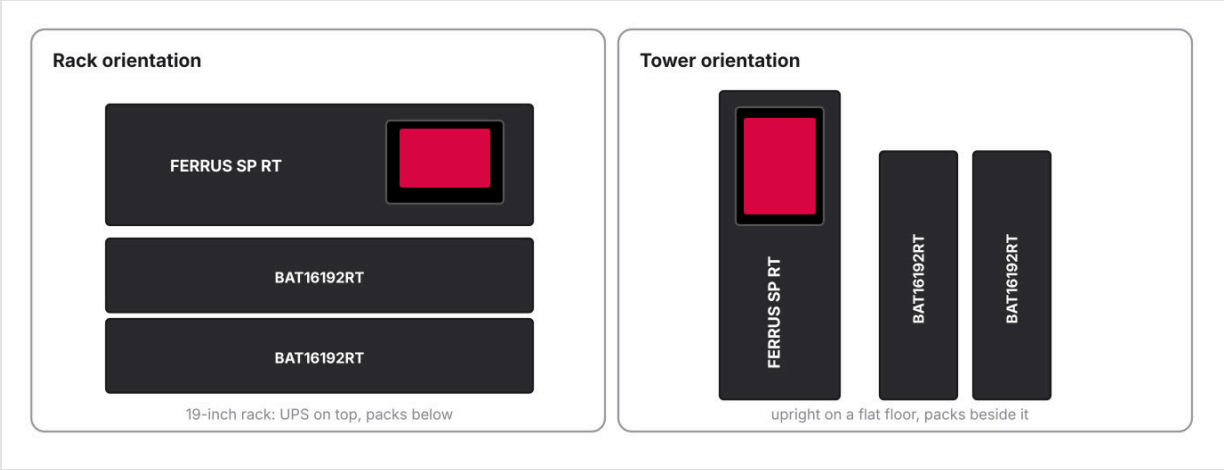


FIGURE 4-1 Rack and tower orientation (front views, not to scale)

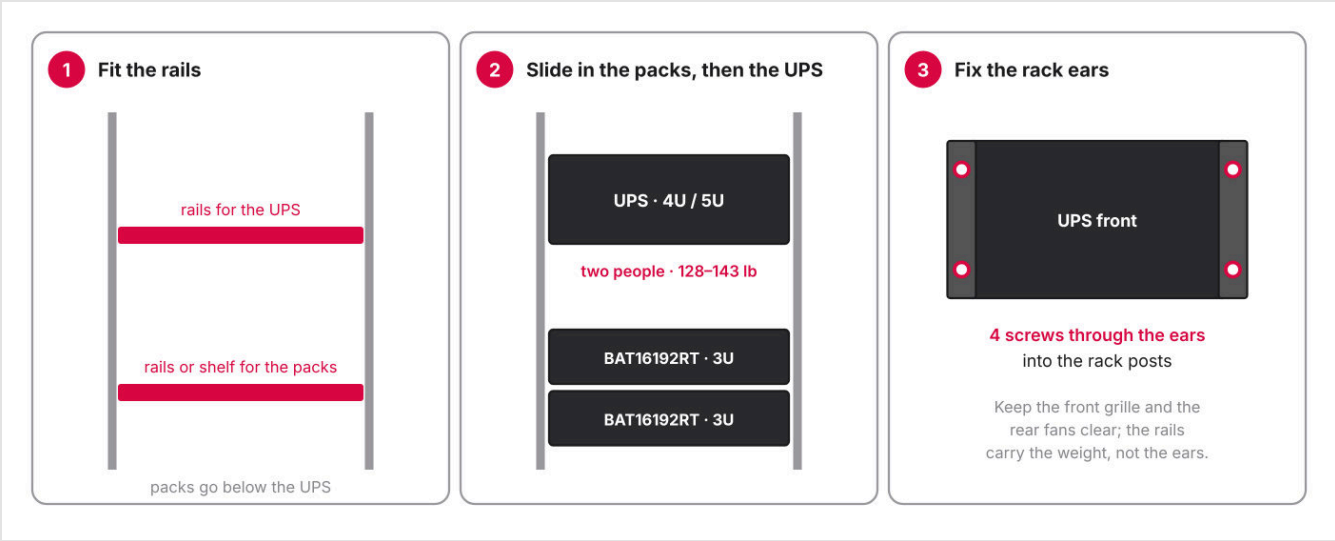


FIGURE 4-2 Mounting in a 19-inch rack

1. Fit the rail kit supplied with the UPS in the rack, at the height chosen for the UPS. Fit rails or a shelf rated for the weight of each pack below it (Figure 4-2, step 1).
2. Slide in the packs first, then the UPS, with two people (Figure 4-2, step 2).
3. Fix the rack ears (Figure 2-2, item 8) to the rack posts with four screws (Figure 4-2, step 3). The rails carry the weight, not the ears.
4. Keep the front grilles and the rear free: the transformer fans blow out at the rear.

For the tower orientation, set the screen orientation in **Set › Display Set** (Figure 6-10).

TABLE 4-2 Dimensions and weights

Unit	Height	W × D × H, in	W × D × H, mm	Weight
6 kVA UPS	4U	17.3 × 22.8 × 6.7	439 × 579 × 170	128 lb (58.1 kg)
10 kVA UPS	5U	17.3 × 22.8 × 8.5	439 × 579 × 216	143 lb (64.9 kg)
BAT16192RT pack	3U	17.3 × 25 × 5.2	439 × 635 × 132	123.6 lb (56.1 kg)

4.4 Electrical connection

⚠ WARNING

Switch off and lock out the utility supply before wiring. Open every pack breaker before you open any cover. Do not feed the UPS from a wall receptacle.

TABLE 4-3 Input and output currents

Rating	Input current, max.	Output current per 120 V leg	Battery current, max.
6 kVA	36 A	25 A	43 A
10 kVA	63 A	42 A	65 A

TABLE 4-4 Cable sizes recommended by the factory

Rating	AC input	AC output	Battery
6 kVA	10 AWG (6 mm²)	10 AWG (6 mm²)	8 AWG (10 mm²)
10 kVA	8 AWG (10 mm²)	8 AWG (10 mm²)	6 AWG (16 mm²)

TABLE 4-5 Recommended overcurrent protection and copper conductors

Circuit	Sizing current	Recommended breaker (NEC 240.6)	Copper conductor, 75 °C (NEC 310.16)
Input, 6 kVA (2-pole)	36 A max.; 125 % × 26.9 A rated = 33.6 A	40 A	8 AWG
Input, 10 kVA (2-pole)	63 A max.; 125 % × 44.8 A rated = 56 A	70 A	4 AWG
Output leg, 6 kVA (configurations 01, 03, 04)	31.25 A	35 A	10 AWG
Output leg, 10 kVA (configurations 01, 03, 04)	52.5 A	60 A	6 AWG
Battery cable, 6 kVA	53.75 A	—	6 AWG
Battery cable, 10 kVA	81.25 A	—	4 AWG

i NOTE The NEC example assumes copper THHN/THWN conductors at 75 °C, no more than three current-carrying conductors in the raceway and an ambient of 86 °F (30 °C). It is larger than the factory sizes of Table 4-4. In the US, conductors and overcurrent protection are sized to the National Electrical Code for the actual installation: the installer's calculation prevails. Check that the conductor fits the terminal; ask AEC for the terminal size when you plan the cables.

⚠ CAUTION

In configuration 02 (one 120 V output) the whole rating flows through one 120 V output: 50 A (6 kVA) or 83 A (10 kVA). Size the load conductors and the output breaker for that current, not for the leg current of Table 4-3.

1. Check that the input breaker (Figure 2-4, item 1) and every pack breaker are OFF (Figure 5-1, state A).
2. Remove the terminal cover behind the cable-entry box (Figure 4-4, step 1).

3. Size the conductors and the branch-circuit protection (Table 4-5).
4. Connect the cables to the terminals in the order of Section 4.5.
5. Fit the output jumpers for the configuration you chose (Section 4.6).
6. Check every connection, refit the terminal cover and close the cable-entry box (Figure 4-4, step 3).

4.5 Terminal strip

The FERRUS SP RT has one strip of nine terminals behind the terminal cover, below the input breaker. The markings in the figure are those printed on the unit. The two input terminals are marked **L** and **N**, but they take the two line conductors of the 120/240 V or 120/208 V service: there is no input neutral.

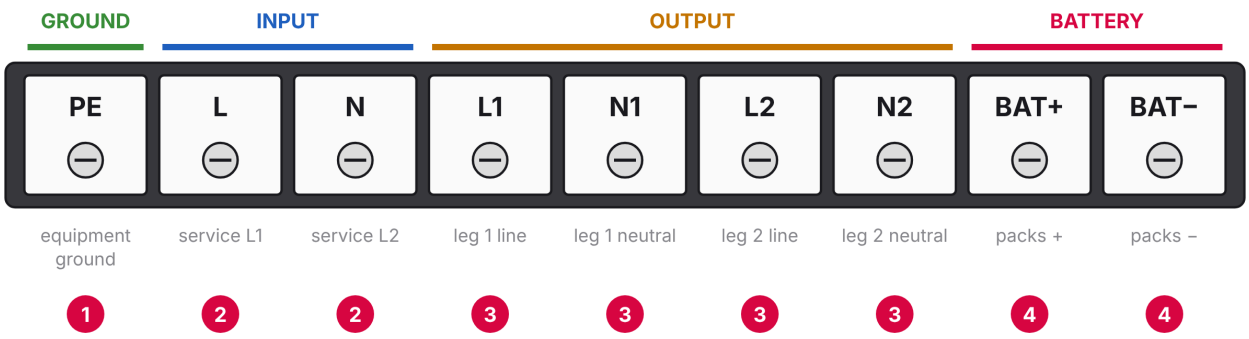
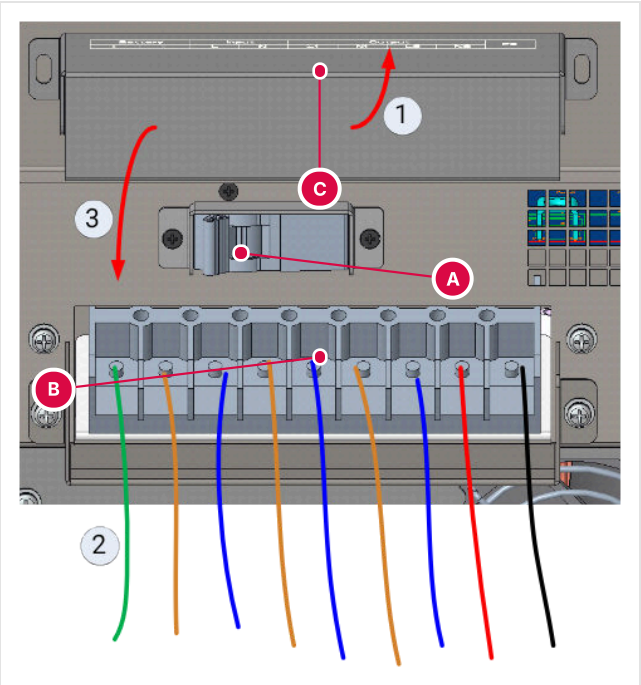


FIGURE 4-3 Terminal strip, seen from the rear with the cover removed, and the order of wiring



- **A** Input breaker
- **B** Terminal strip: PE, L, N, L1, N1, L2, N2, BAT+, BAT−
- **C** Terminal cover, markings of each terminal
- **1** Lift off the terminal cover.
- **2** Connect the conductors: PE (green) first, input, output, battery (red +, black −).
- **3** Refit the cover.

FIGURE 4-4 Terminal strip and input breaker with the cable-entry box removed

TABLE 4-6 What to connect to each terminal

Group	Terminal	Connect
PE	PE	Equipment grounding conductor of the supply and of the loads — connect it first.
INPUT	L · N	The two line conductors of the 120/240 V or 120/208 V service, 240 V or 208 V between them: one to L, the other to N. No neutral.
OUTPUT	L1 · N1	Load circuit 1, 120 V (L1 line, N1 neutral of leg 1).
OUTPUT	L2 · N2	Load circuit 2, 120 V (L2 line, N2 neutral of leg 2).
OUTPUT	L1 · N2	240 V loads, with the output jumper of configuration 03 or 04 (Section 4.6).
BATTERY	BAT+ · BAT−	BAT16192RT battery packs: positive to BAT+, negative to BAT−. Check the polarity with a voltmeter first (Section 4.7).

1. **Ground first.** Connect the grounding conductor (green or green/yellow) to PE before any other wire.
2. **Input.** Connect the two line conductors of the service to L and N.
3. **Output.** Connect L1, N1, L2 and N2 for the configuration you chose, with its jumpers (Section 4.6).
4. **Battery.** Connect the battery-pack cables to BAT+ and BAT−, polarity checked (Section 4.7).

⚠ WARNING

Reversed battery polarity damages the UPS. Always check the polarity with a voltmeter before you close the pack breakers.

After wiring.

- Check every connection and close the terminal cover.
- Install an output circuit breaker between the UPS output and the loads.
- To connect loads: switch them off, connect them, then switch them on one at a time.

4.6 Output configurations

The isolation transformer gives two 120 V legs. Jumpers on the output terminals set the output for the site. In a parallel system every unit uses the same configuration.

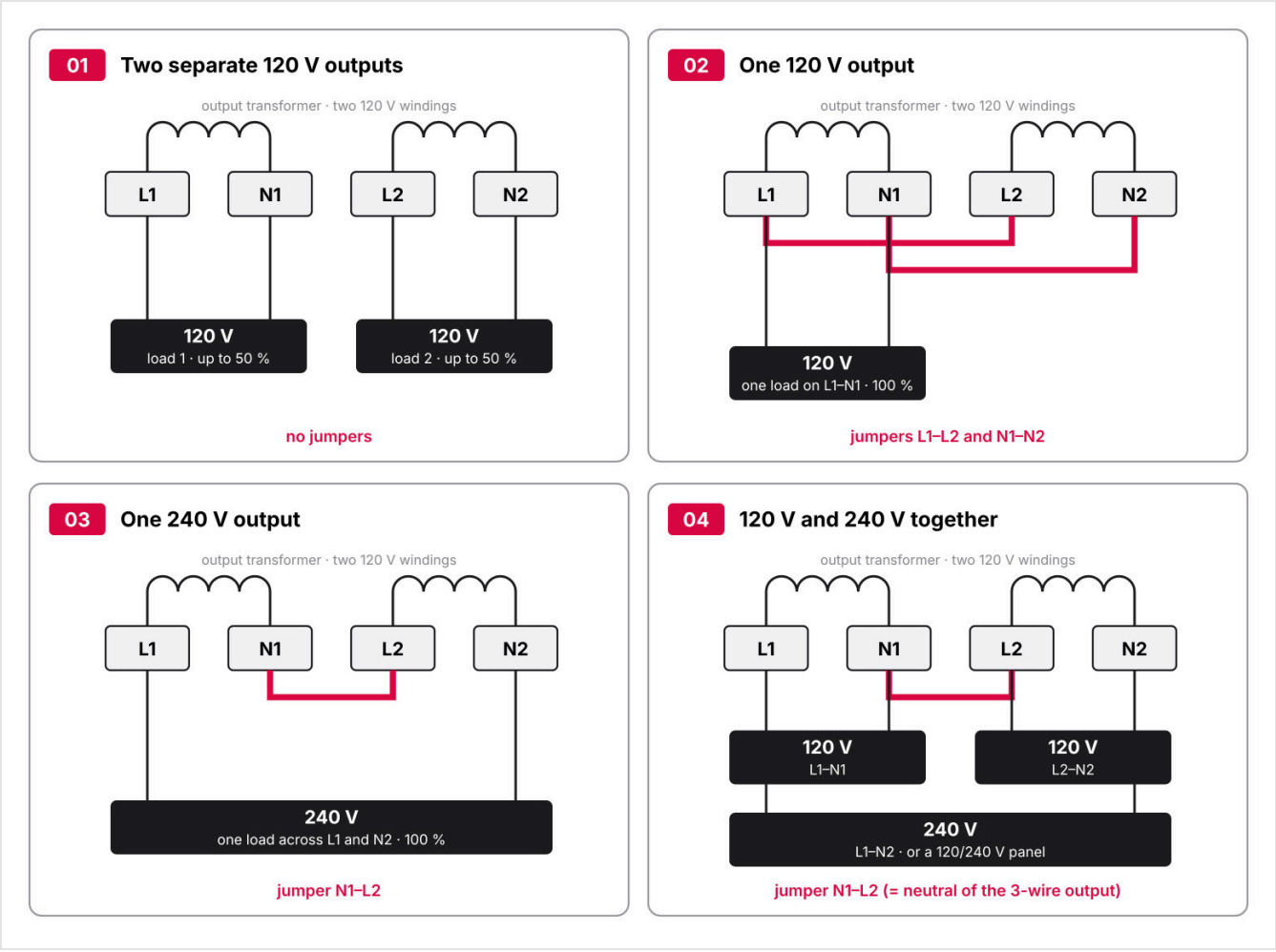


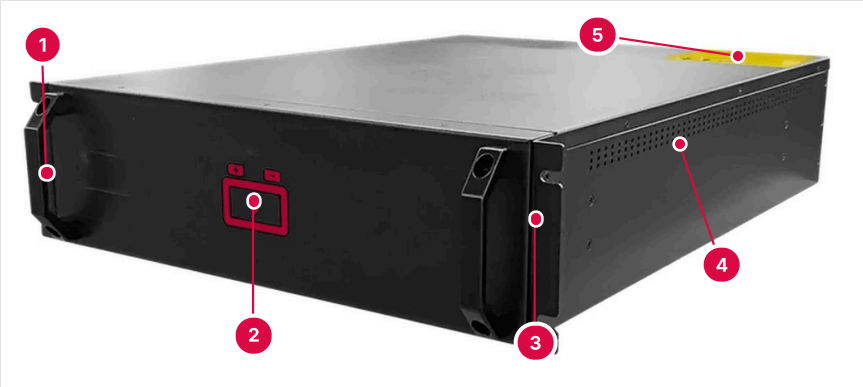
FIGURE 4-5 The four output configurations — red lines are the jumpers on the output terminals

TABLE 4-7 Output configurations

No.	Output	Jumpers	Loads
01	Two separate 120 V	none	Load 1 on L1–N1, load 2 on L2–N2: half the rating each.
02	One 120 V	L1–L2 and N1–N2	One load on L1–N1: the full rating at 120 V.
03	One 240 V	N1–L2	One load across L1–N2: the full rating at 240 V.
04	120 V and 240 V together	N1–L2	120 V on L1–N1 and L2–N2, 240 V on L1–N2. Split-phase 3-wire loads (180°): L1, N1 (= L2) and N2.

4.7 Adding BAT16192RT battery packs

Each BAT16192RT pack is a 3U, 17.3 in wide string of 16 × 12 V 9 Ah blocks at 192 V DC, the voltage of the UPS battery bus. Connect one to four packs per UPS, each wired in parallel to the battery terminals. Battery expansion is always with more BAT16192RT packs.



1. Handle (2)
2. Front panel with battery symbol
3. Rack ear, 19-inch
4. Side vents
5. Warning label

FIGURE 4-6 BAT16192RT battery pack, 3U

TABLE 4-8 BAT16192RT

Item	Value
Blocks	16 × 12 V 9 Ah VRLA, sealed
DC voltage	192 V DC
Size	3U · 17.3 × 25 × 5.2 in (439 × 635 × 132 mm)
Weight	123.6 lb (56.1 kg)
Per UPS	one to four packs, in parallel
Charger	1–8 A, set on the touchscreen

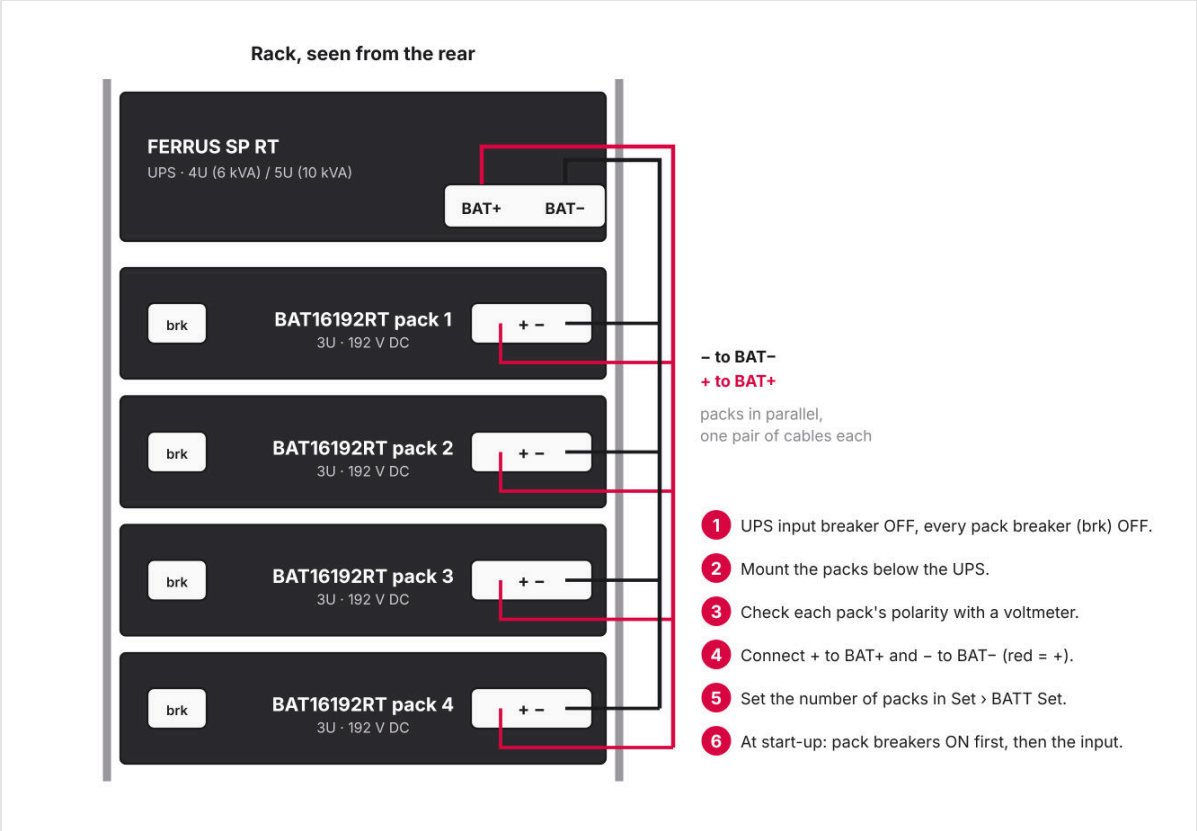


FIGURE 4-7 Connecting one to four BAT16192RT packs to the UPS battery terminals

> ⚠ ***CAUTION***
>
> Check the polarity of each pack with a voltmeter before you connect it. Reversed polarity damages the UPS.

1. Open the UPS input breaker and the pack breakers (Figure 5-1, state A).
2. Mount the packs below the UPS in the rack, or beside the tower (Section 4.3).
3. Check the polarity of each pack with a voltmeter.
4. Wire each pack's cables to BAT+ and BAT– behind the cable-entry box: red to BAT+, black to BAT– (Figure 4-7, Figure 4-3).
5. Enter the battery set-up, with the number of packs, on the touchscreen: **Set › BATT Set** (Section 6.4).
6. At start-up, close the pack breakers first, then the input breaker (Figure 5-1, state B).
7. Charge for at least 12 hours before you rely on the full runtime.

4.8 Parallel systems

With parallel cables, up to three units of one rating can work in parallel for power sharing and N+1 redundancy.

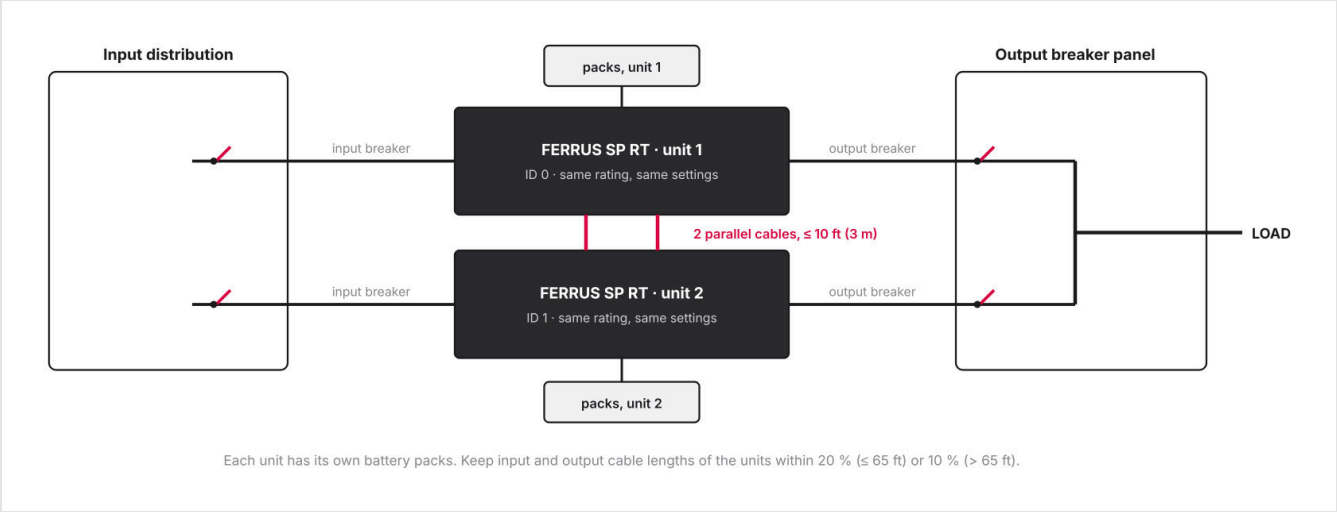


FIGURE 4-8 Parallel connection of two units (AEC drawing)

1. Use two standard 15-pin communication cables, no longer than 10 ft (3 m), on the parallel ports (Figure 2-4, items 4 and 5).
2. Wire the input of each UPS as for a single unit.
3. Connect the outputs of all units to a common output breaker panel.
4. Give each UPS its own battery packs.
5. Set each unit on the touchscreen (Section 7.7), then wire as in Figure 4-8, with breakers of suitable rating.

- Up to 65 ft (20 m) from the breaker panel, the input and output cable lengths of the units must not differ by more than 20 %. Beyond 65 ft, by more than 10 %.
- At start-up the units start one after the other in line mode, then transfer to inverter together. At shutdown the last unit to stop takes the system to bypass.

4.9 Communication connections

Connect the monitoring, EPO and signal cables before you start the UPS — see Section 7.1.

4.10 Installation checklist

- The UPS stands in the rack on rails (or upright as a tower), with free space and open vents.
- Ground connected first; input, output and battery tight, polarity checked.
- No neutral at the input; branch circuit sized to Table 4-5.
- Output jumpers set for the chosen configuration; output breaker installed.
- Pack breakers open until the first start.
- Communication, EPO and parallel cables connected.

05

CHAPTER 5

Operation

Starting, stopping and transferring the UPS, ECO mode, the battery test, the maintenance bypass and EPO — with the breaker positions for each step.

5.1 Breaker positions

The UPS has one input breaker at the rear (Figure 2-4, item 1). Each battery pack has its own breaker. The procedures refer to these states.

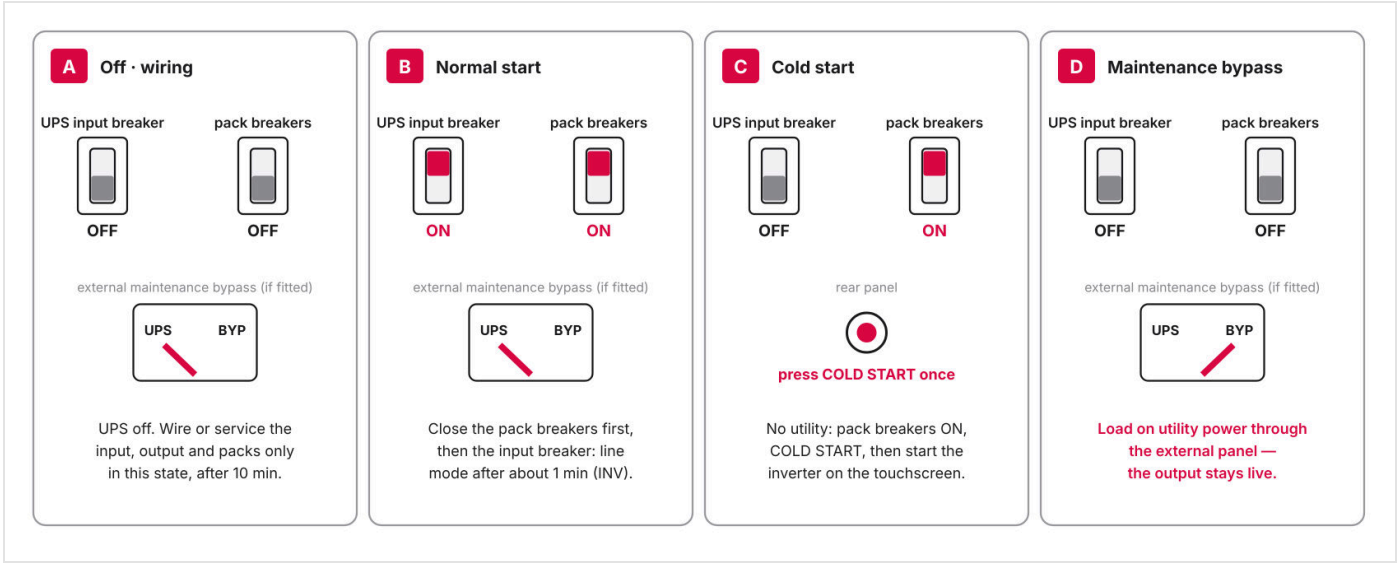


FIGURE 5-1 Breaker states A to D used in the procedures — red ON, gray OFF

5.2 Before the first start

- The installation checklist is complete (Section 4.10).
- The loads are switched off.
- The battery set-up on the touchscreen matches the packs installed (Section 6.4).

5.3 Starting on utility power

1. Close the pack breakers, then the input breaker (Figure 5-1, state B). You see: the fans start and the touchscreen lights.
2. Wait. The rectifier starts; after about one minute the UPS goes to line (normal) mode. You see: only INV lit (Figure 2-3, item 4).
3. Check the home page: power flow from the utility through rectifier and inverter to the load, no alarm (Figure 6-1).
4. Switch on the loads one at a time, the largest first.

5.4 Starting on battery (cold start)

1. Make sure the pack breakers are ON and the input breaker is OFF (Figure 5-1, state C).

2. Press the COLD START button on the rear panel once (Figure 2-5, item 4). You see: the display turns on and the buzzer sounds.
3. Start the inverter: **Control › Function**, page 2, ON/OFF control (Figure 6-12).
4. Wait a few seconds: the UPS runs in battery mode (INV and BAT lit).

5.5 Transferring to bypass and back

1. To bypass: **Control › Function › Manual Bypass** (Figure 6-12, item 2). The bypass must be normal. You see: BYP lit.
2. Back to the inverter: **Control › Function › Ecs Manual Bypass** (item 3), or **Manual Transfer to Inverter** (item 1).

5.6 ECO mode

Set the system mode to ECO in the system settings (**Set**, page 2, engineer level). With good utility power the load runs on the bypass: higher efficiency, no protection from disturbances. When the utility leaves its window the inverter takes over. Set the mode back to normal for full online protection.

5.7 Battery test

1. Check that the bypass is normal and the battery fully charged.
2. Open **Control › Test** and touch **Battery Test** (Figure 6-13, item 1). A short discharge tests the batteries. **Stop Test** (item 5) ends it.
3. If the test fails, alarm 13 "Battery self-test failed" appears (Table 10-2).
4. **Battery Maintain** runs a deeper maintenance discharge; **Manual Float** and **Manual Boost** force the charge stage.

5.8 Everyday use

During a power outage.

1. The UPS switches to battery with no break: the load keeps running, BAT lights and the buzzer beeps.
2. Silence the buzzer if you wish: touch the speaker icon on the screen.
3. Watch the battery: **Data › Battery** shows the capacity and the remaining time (Figure 6-6).
4. If the outage lasts, save work and shut the loads down in order, well before the battery is exhausted. With the SNMP-M card the servers can do this by themselves.
5. At the end of discharge the UPS switches its output off to protect the battery.

When the utility returns. The UPS restarts by itself and recharges the battery — unless "EOD restart inhibit" is set (alarm 26). A full recharge takes at least 12 hours: until then the runtime is shorter.

Good habits.

- Leave the UPS switched on all the time: it protects the load and keeps the battery charged.
- Switch new equipment on one at a time, and check the load reading afterwards.
- Look at the panel once a week: normal operation is INV alone lit, no alarm.
- Before a long shutdown (vacation, site closed) shut the UPS down completely (Section 5.11). Recharge it within 4 to 6 months.

5.9 What the panel tells you

TABLE 5-1 What you see, what it means, what to do

What you see	Meaning	What to do
INV lit; power flow green from utility through rectifier and inverter	Normal (line) mode	Nothing.
INV and BAT lit; battery block active; buzzer	Utility failure: on battery	See Section 5.8. Save work if the outage lasts.
BYP lit	Load on bypass — manual bypass, overload, over-temperature or a fault	Read **Data › Current Alarm**; remove the cause; return with **Manual Transfer to Inverter**.
BYP lit, ECO set	ECO mode, bypass good	Normal if ECO was chosen.
ALM lit	A fault or warning is present	Read **Data › Current Alarm** and Table 10-2; clear with **Fault Clear** once the cause is removed.
Mute lit	Buzzer silenced	A new alarm sounds again.
Screen dark, no LEDs	No input and no battery, or the UPS is off	Check the breakers; start from the battery with COLD START (Section 5.4).
"Communication Abnormal" in the status bar	The screen is not receiving data from the UPS controller	Restart the UPS; if it stays, contact AEC service.

5.10 Silencing the alarm

Touch the speaker icon in the status bar (Figure 6-1, item 3). The buzzer is muted and the Mute LED lights. A new alarm sounds again.

5.11 Shutting down

In normal mode.

1. Switch off the loads.
2. Switch the inverter off: **Control › Function**, page 2, ON/OFF control. The UPS transfers to bypass.
3. Open the input breaker, then the pack breakers, to switch the UPS off completely (Figure 5-1, state A).

In battery mode.

1. Switch the inverter off: **Control › Function**, page 2, ON/OFF control.
2. The UPS goes to no-output mode: the display goes off and there is no output voltage.
3. Open the pack breakers.

5.12 Maintenance bypass (option)

The FERRUS SP RT has no maintenance bypass switch on its rear panel. Where an external maintenance bypass panel is fitted (option — ask AEC for the panel and its wiring for your site), use this order:

1. Transfer the UPS to bypass: **Control › Function › Manual Bypass** (Figure 6-12, item 2).
2. Switch the external maintenance bypass to BYPASS (Figure 5-1, state D).
3. Open the UPS input breaker, then the pack breakers.

4. Alarm 39 shows while the maintenance breaker is closed.

To return, reverse the order: close the pack breakers and the input breaker, wait for the UPS to run on bypass, switch the external panel to UPS, then **Ecs Manual Bypass**.

> ⚠ ***WARNING***
>
> On maintenance bypass the output terminals and the load stay live, fed by the utility, and the load is not protected.

5.13 Emergency power off

Opening the EPO loop (Figure 2-4, item 7) stops the output at once. To restart:

1. Close the EPO loop again.
2. Clear the alarm: **Control › Function › Fault Clear** (Figure 6-12, item 4).
3. Start the inverter: **Control › Function**, page 2, ON/OFF control.

06

CHAPTER 6

Touchscreen

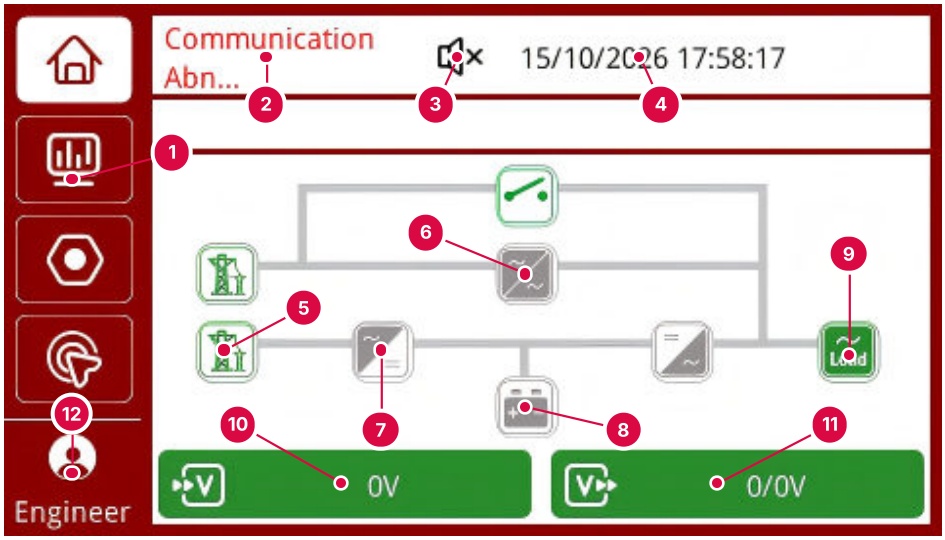
The AEC color touchscreen: home page, readings, settings and controls.

i NOTE The screen pictures were taken from a display not connected to a UPS, so the readings are zero and "Communication Abnormal" is shown. Your screens show the live values.

6.1 The touchscreen on the unit

The color touchscreen sits on the front of the UPS, with the status LEDs on its left and the power button on its right (Figure 2-3). Touch an icon to open a page. The arrows at the bottom of a page turn its sub-pages (1/2, 2/2); the curved arrow goes back.

6.2 Home page and main menu

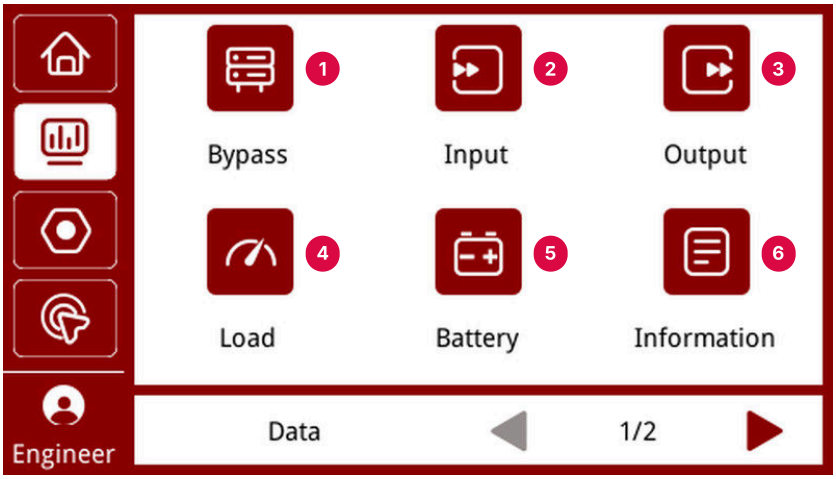


1. Side menu: Home, Data, Set, Control
2. Status message, for example an alarm
3. Speaker icon: mute or unmute the buzzer
4. Date and time
5. Utility input (lower) and bypass input (upper)
6. Static bypass and bypass path — green = active, gray = not active
7. Rectifier, then inverter on the right
8. Battery
9. Load
10. Input voltage
11. Output voltage of the two legs, L1/L2
12. User level logged in (User or Engineer)

FIGURE 6-1 Home page

Two access levels: **User** reads the pages and mutes the buzzer; **Engineer** also changes the settings and runs the commands of **Control**. AEC gives the login to the owner and the commissioning engineer.

6.3 Data (readings)



1. Bypass
2. Input
3. Output
4. Load
5. Battery
6. Information

FIGURE 6-2 Data, page 1

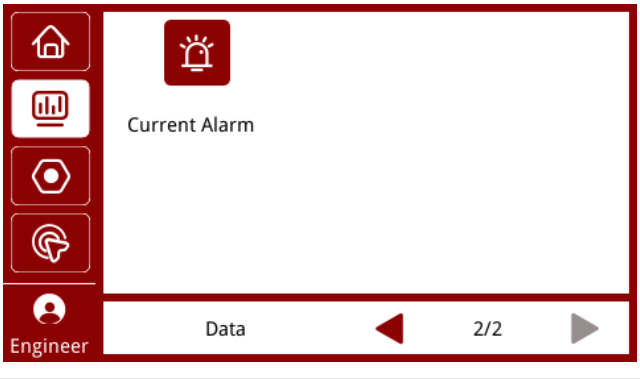


FIGURE 6-3 Data, page 2 — Current Alarm

TABLE 6-1 Data pages

Page	Shows
Bypass	Bypass voltage (V), current (A), frequency (Hz) and power factor.
Input	Input voltage (V), current (A), frequency (Hz) and power factor.
Output	Output voltage and current of the two legs (L1/L2), frequency (Hz) and power factor.
Load	Apparent power (kVA) and active power (kW) of L1 and L2, total load (%) and load of each leg (%).
Battery	Battery voltage (V), current (A), capacity (%), remaining time (min), temperature (°C) and the number of batteries set.
Information	DC bus voltage, charger voltage and current, transformer temperature, rectifier and inverter IGBT temperatures.
Current Alarm	The alarms present now, with number, date and time (Table 10-2).

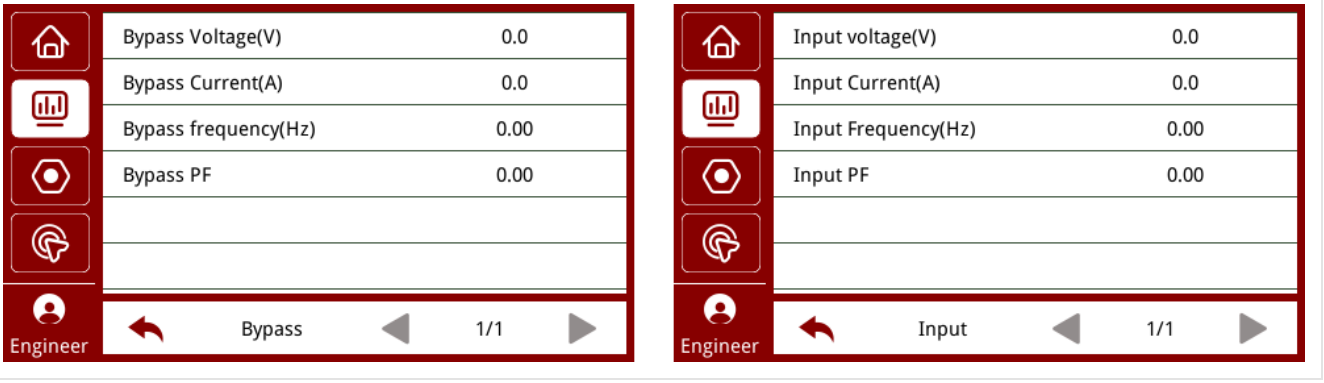


FIGURE 6-4 Data › Bypass (left) and Data › Input (right)

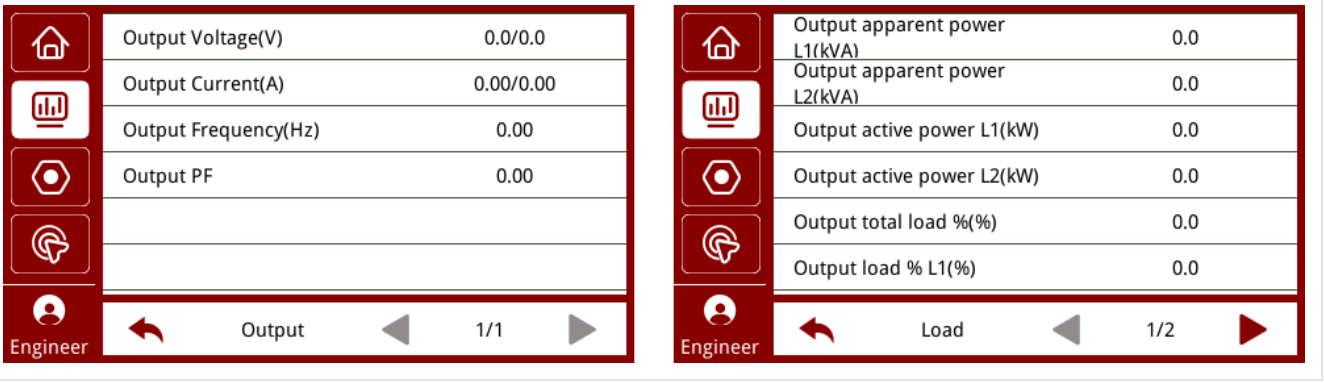


FIGURE 6-5 Data › Output (left) and Data › Load (right)

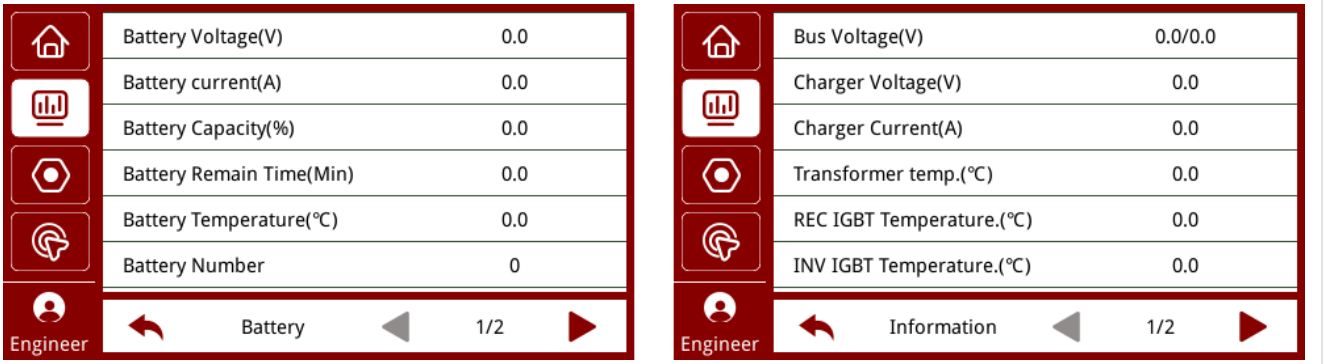
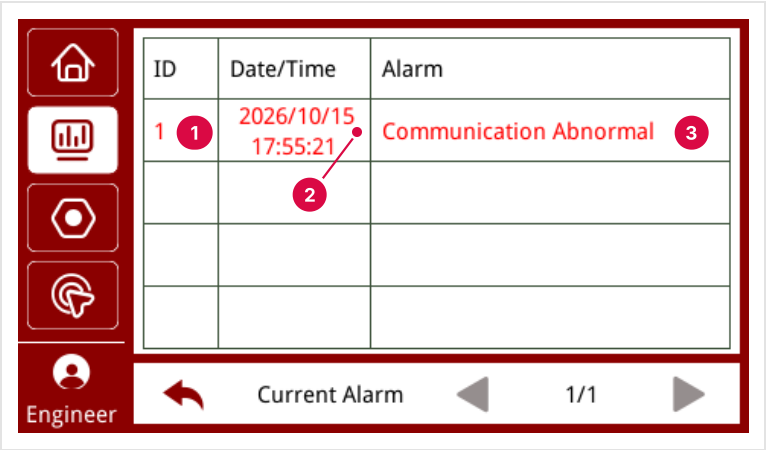


FIGURE 6-6 Data › Battery (left) and Data › Information (right)



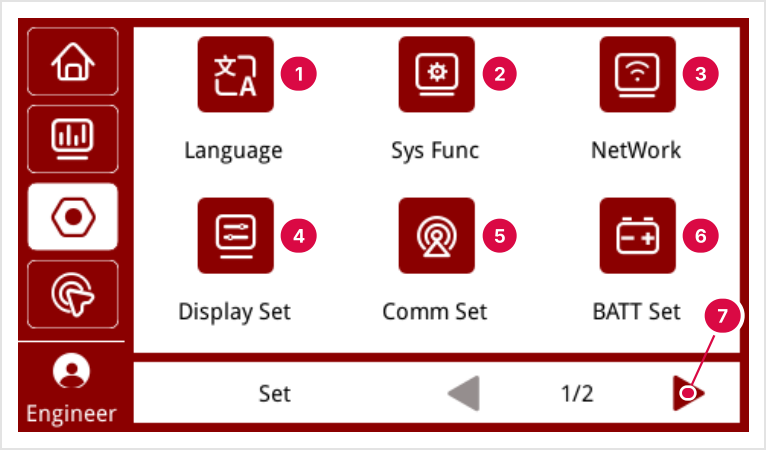
1. Alarm number
2. Date and time
3. Alarm text (Table 10-2)

FIGURE 6-7 Data › Current Alarm — the alarms present, with number, date and time

6.4 Set (settings)

⚠ CAUTION

Settings change how the UPS works. Only qualified personnel, logged in as Engineer, may change them. The battery set-up must match the packs installed, or the batteries and the UPS can be damaged.



1. Language
2. Sys Func
3. NetWork
4. Display Set
5. Comm Set
6. BATT Set
7. Page 2: system settings

FIGURE 6-8 Set, page 1

TABLE 6-2 Set pages

Page	Settings
Language	Display language: English, Español, Русский, Chinese (simplified and traditional) and more (three pages).
Sys Func	Screen saver on/off and wait time (minutes), date and time; software version and serial number.
NetWork	Static or DHCP; IP address (192.168.60.100 as shipped), subnet mask (255.255.255.0), default gateway (192.168.60.1).
Display Set	Protocol type, display orientation (horizontal for the rack), screen buttons.
Comm Set	RS-232 device address, mode (ASCII), baud rate (9600), protocol (MODBUS), RS-485 / USB address (three pages).
BATT Set	Battery type, number of blocks (16 per string), capacity (Ah) and number of packs, charge current (1–8 A) and charge voltages.
Page 2	The system settings: single, parallel or ECO mode, parallel ID, rated values, dry contacts — engineer level, at commissioning.

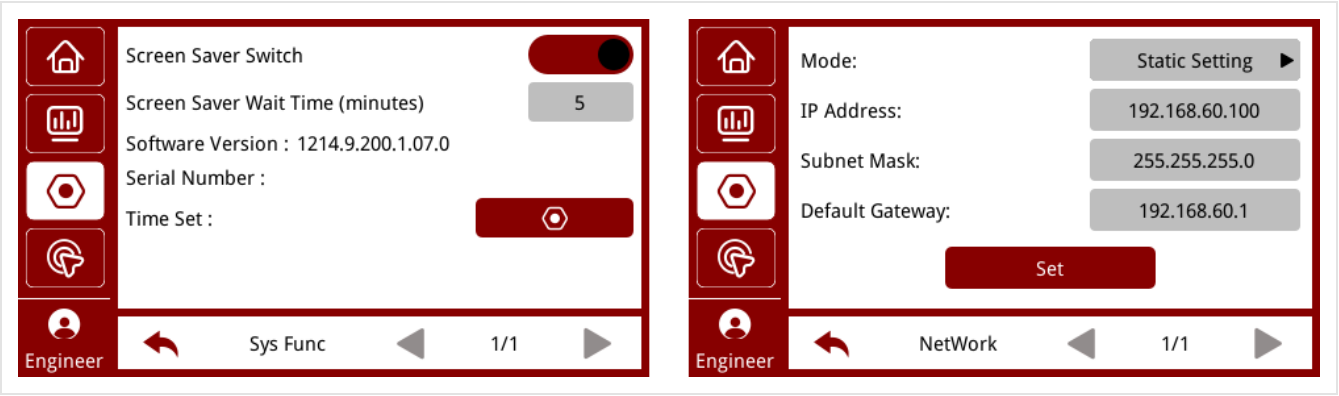


FIGURE 6-9 Set › Sys Func (left) and Set › NetWork (right)

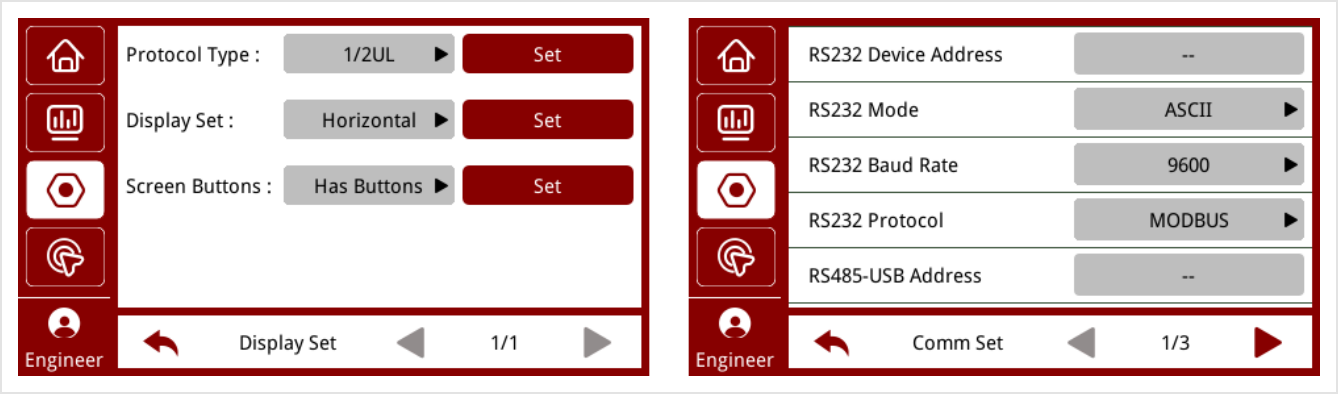
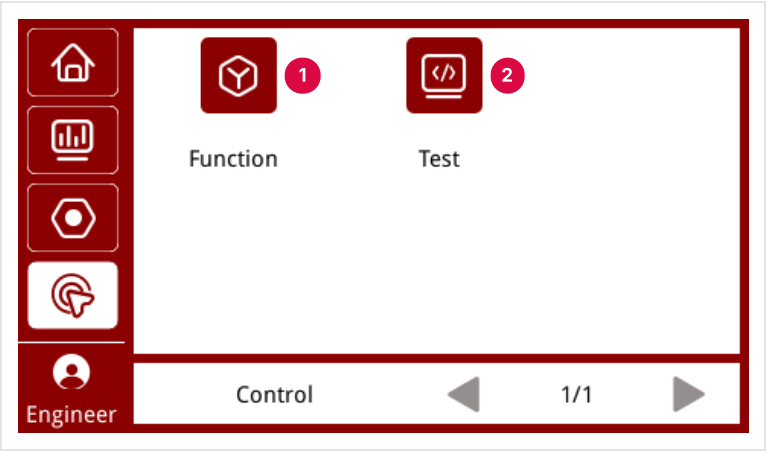


FIGURE 6-10 Set › Display Set (left) and Set › Comm Set, page 1 (right)

6.5 Control

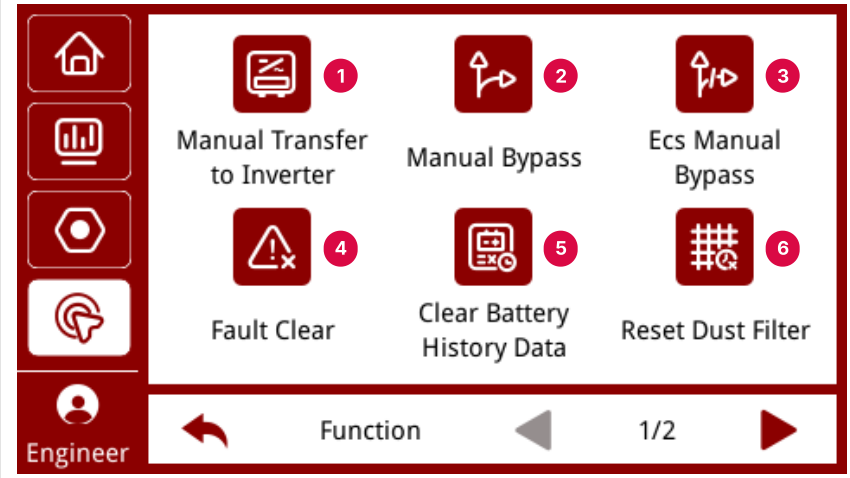


1. Function
2. Test

FIGURE 6-11 Control

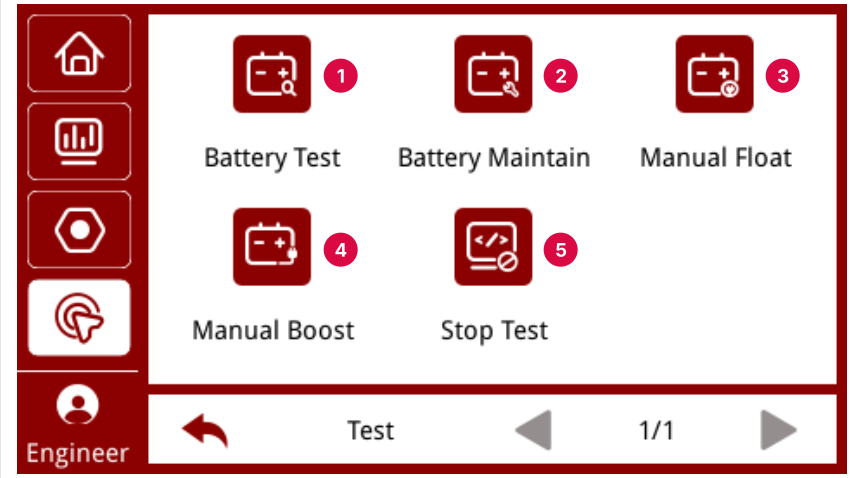
TABLE 6-3 Control pages

Page	Commands
Function	Manual Transfer to Inverter · Manual Bypass (the bypass must be normal) · Ecs Manual Bypass (cancels the manual bypass) · Fault Clear · Clear Battery History Data · Reset Dust Filter; the inverter ON/OFF control on page 2.
Test	Battery Test · Battery Maintain (bypass normal and battery charged) · Manual Float · Manual Boost · Stop Test.



1. Manual Transfer to Inverter
2. Manual Bypass
3. Ecs Manual Bypass
4. Fault Clear
5. Clear Battery History Data
6. Reset Dust Filter

FIGURE 6-12 Control › Function, page 1



1. Battery Test
2. Battery Maintain
3. Manual Float
4. Manual Boost
5. Stop Test

FIGURE 6-13 Control › Test

CHAPTER 7

07 Communication and monitoring

The ports, the intelligent slot cards, UPS View, EPO and the parallel setting.

7.1 Communication ports

TABLE 7-1 Communication ports

Port	Use
RS-232	DB9, for monitoring software (Figure 2-4, item 6).
RS-485	Modbus link (protocol, baud rate and address in **Set › Comm Set**; item 8).
USB	Monitoring software (item 9).
Intelligent slot	One: SNMP-M card, or a dry-contact card on DB9 or terminal block (item 10).
EPO	Normally closed loop: opening it stops the output (item 7).
Parallel ports	Two, for the parallel cables (items 4 and 5).
Network (touchscreen)	IP settings in **Set › NetWork** (192.168.60.100 as shipped).

7.2 SNMP-M network card

The SNMP-M card gives web pages, SNMP v1/v2c/v3, Modbus TCP/IP and MQTT: the UPS status and alarms on the network, and orderly shutdown of servers on a utility failure. Fit the card in the intelligent slot with the UPS off.

7.2.1 Setting up the SNMP-M card

1. Fit the card in the intelligent slot (Figure 2-4, item 10) and connect it to the network with an RJ45 cable. The green PWR LED lights.
2. On a PC in the same network, run IPSearch (AEC app › Support › Downloads › SNMP › SNMP-M). It lists the card with its IP and MAC address.
3. Select the card › NetWork set › Static IP. Enter a free IP address, the subnet mask and the gateway (ask your IT department), or choose Obtain IP for DHCP. Press Set.
4. Press Web page (or type the card's IP in a browser) and log in as admin.
5. In the card's UPS settings choose protocol Megtec, port Uart · Port A, baud rate 2400, address 1. The yellow DATA LED stops flashing when the card reads the UPS.
6. Set up e-mail alarms and, if used, SNMP traps (port 162) or Modbus TCP.

TABLE 7-2 SNMP-M card indicators

LED	State	Meaning
PWR (green)	On · Off	Card powered · not powered
SYS (red)	Off · Flashing · On	System normal · general alarm · serious alarm
DATA (yellow)	Off · Flashing	Communication with the UPS normal · abnormal

⚠ CAUTION

The card's default web accounts (admin, full rights; user, view only) and their passwords are given by AEC technical service. Change both passwords at the first login.

7.3 UPS View software

UPSView (version 2.0.7) monitors and sets up one UPS from a Windows PC through a direct cable, without the network card. Download UPSView_V2.0.7.rar from the AEC app (Support › Downloads › SNMP › SNMP-M), unpack it and run the program inside: no installation is needed.

TABLE 7-3 Connecting UPS View

Connection	How
RS-232	A serial cable from the UPS's RS-232 port to the PC's COM port (pin 2 TXD, pin 3 RXD, pin 5 GND); a USB-to-serial adapter on PCs without a COM port.
RS-485	Through a 485-232 adapter, with the special serial cable supplied with the UPS.
USB	A standard USB cable to the UPS's USB port; some PCs need a driver.

1. Connect the cable to the UPS's RS-232, RS-485 or USB port (Figure 2-4, items 6, 8, 9).
2. Start UPSView. Choose the Equip Type **1/1(6-20kVA)**, the Modbus mode (ASCII or RTU), the baud rate and address 1 — the same values as set on the UPS in **Set › Comm Set** (Figure 6-10, right).
3. Choose the PC's COM port (Windows Device Manager › Ports).
4. UPSView shows the live data, the status, the alarms and the settings of the UPS.

NOTICE

The RS-232 port and the intelligent slot share the same communication line. Use UPS View with the SNMP-M card removed, or monitor through the card — not both at the same time.

NOTICE

UPS View talks Modbus. The RS-232 port does not answer while the UPS communication protocol is set to Megatec (MEGA): check that **Set › Comm Set** shows MODBUS, as shipped. Megtec is the protocol setting of the SNMP-M card only (Section 7.2.1).

✓ TIP The AEC UPS View Monitor User Manual (AEC-UM-UPSV-US) describes every UPS View page; the SNMP-M User Manual describes the card's web interface. Both are in the AEC app, Support › Downloads › SNMP › SNMP-M.

7.4 Dry-contact card

The dry-contact card gives signals as voltage levels from the card's 12–24 V DC supply — UPS fault, warning, bypass, battery low, normal mode, utility fault — and a remote shutdown input. The pins are in Section 7.5.

7.5 Intelligent slot

The intelligent slot takes a DB9 or a terminal-block connector with the same pin assignment.

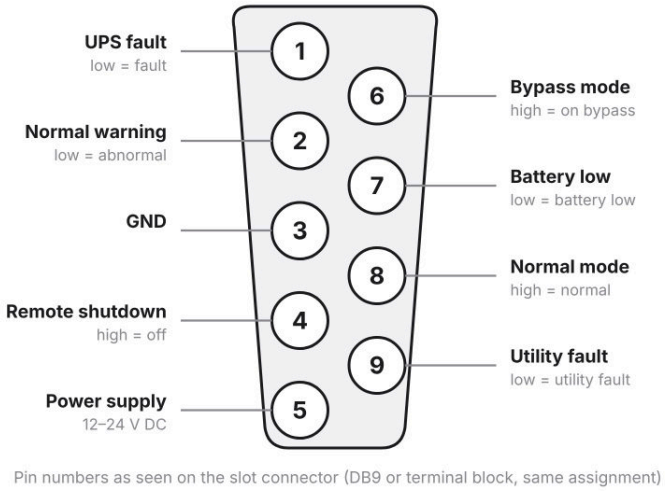


FIGURE 7-1 Intelligent slot — DB9 / terminal block pin layout

TABLE 7-4 Intelligent slot pins

Pin	Function	Description
1	UPS fault	Low level indicates a UPS fault.
2	Normal warning	Low level indicates an abnormal condition.
3	GND	—
4	Remote shutdown	With utility normal, cuts the rectifier and inverter output; in battery mode switches the whole system off. High level turns the unit off.
5	Power supply	12–24 V DC.
6	Bypass mode	High level: the UPS is on bypass.
7	Battery low	Low level: battery voltage low.
8	Normal mode	High level: the UPS is in normal mode.
9	Utility fault	Low level: utility failure.

7.6 Emergency power off (EPO)

EPO switches the UPS off quickly in an emergency through a customer contact. Opening the normally closed switch wired to the EPO terminals (Figure 2-4, item 7) activates it. To restart, see Section 5.13.

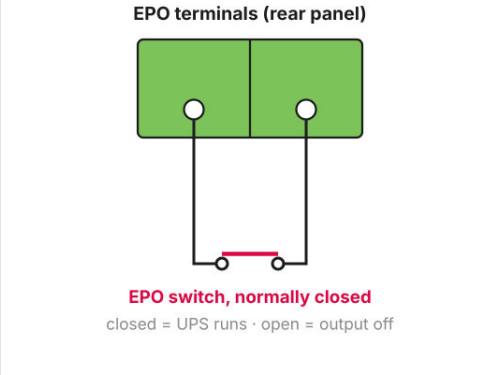
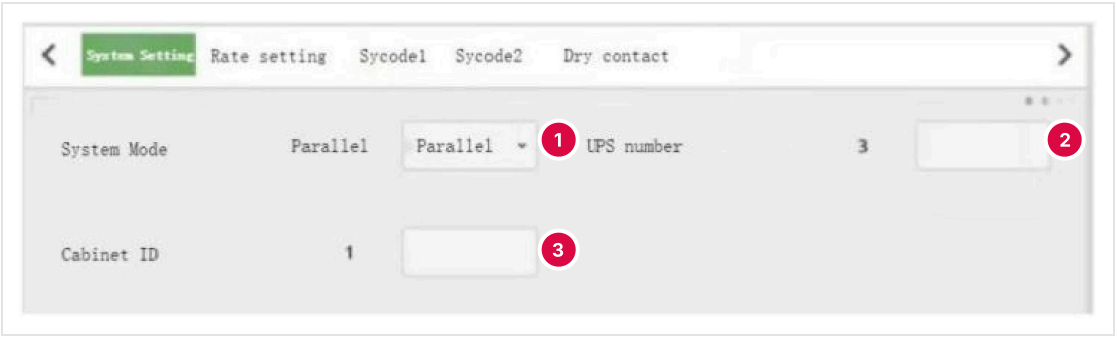


FIGURE 7-2 EPO switch wiring (normally closed)

7.7 Parallel setting

1. In the system settings set System Mode to *Parallel*. For two units set the UPS number to 2; for three, 3.
2. Give each unit its own cabinet ID, from 0 to n−1 (n = number of units). Each unit needs a unique ID.
3. Set every UPS of the parallel system with the same settings but its own ID.
4. After setting, power up the system (Section 5.3).



1. System Mode: Parallel
2. UPS number: 2 or 3
3. Cabinet ID: 0 to n−1, unique

FIGURE 7-3 Parallel setting in the configuration software — system mode, number of units and cabinet ID

08

CHAPTER 8

Battery and runtime

The battery packs, the runtime by load and the battery settings.

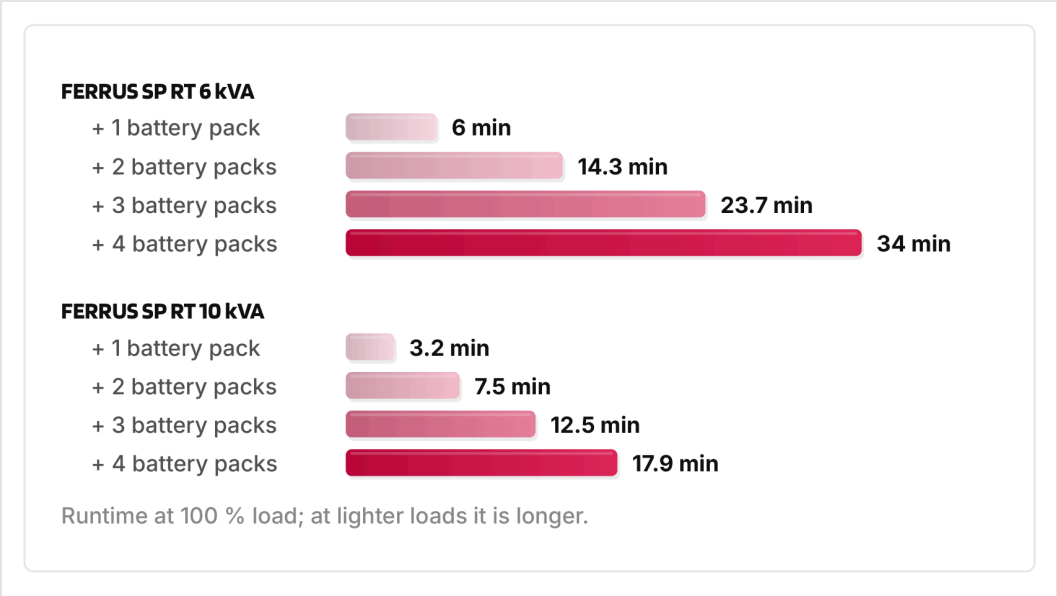


FIGURE 8-1 Backup time at full load

TABLE 8-1 Backup time by load (minutes; new batteries, 77 °F)

Set-up	100 %	75 %	50 %	25 %
6 kVA + 1 pack	6	8.7	14.3	36
6 kVA + 2 packs	14.3	20.6	34	85.5
6 kVA + 3 packs	23.7	34.1	56.4	142
6 kVA + 4 packs	34	49	80.8	204
10 kVA + 1 pack	3.2	4.6	7.5	19
10 kVA + 2 packs	7.5	10.9	17.9	45.2
10 kVA + 3 packs	12.5	18.1	29.8	75
10 kVA + 4 packs	17.9	25.9	42.7	107.5

Runtimes at 77 °F (25 °C) with new, fully charged batteries, from AEC published data.

TABLE 8-2 Battery system

Item	Value
DC voltage	192 V DC (strings of 16 blocks)
Blocks	12 V 9 Ah VRLA, sealed
Packs per UPS	1 to 4 BAT16192RT, in parallel
Blocks per string	set on the touchscreen (**Set › BATT Set**); 16 for the BAT16192RT
Charger	1–8 A, set on the touchscreen for the number of packs
Battery current, max.	43 A (6 kVA) · 65 A (10 kVA)

NOTICE

Enter the number of packs and the charge current in **Set › BATT Set** whenever you add or remove a pack. Ask AEC for the charge-current setting for your number of packs.

CHAPTER 9

09 Maintenance

Routine checks, battery care and replacement, component life, storage and transport.

9.1 Maintenance schedule

TABLE 9-1 Maintenance schedule

Interval	Task
Monthly	Check the home page: line mode, no alarm in **Data › Current Alarm**; the load below the rating.
Every 6 months	Check that the vents are clear and the fans run; clean the outside with a dry cloth. Run a battery test (Section 5.7).
Yearly	Qualified personnel: check the tightness of the terminals and the condition of the batteries; read the alarm list in **Data › Current Alarm**.
3–5 years	Replace the batteries as a full set, same type and number (Section 9.5).
After service	**Control › Function › Reset Dust Filter** resets the dust-filter timer.

9.2 Battery care

- Operate at 59–77 °F (15–25 °C) for rated battery life.
- Charge for at least 12 hours before first use and after a long discharge.
- Recharge a UPS that is not used every 4 to 6 months.
- Open the pack breakers before you open any cover.

9.3 Component life

Some components wear with time and heat. Planned replacement, before they fail, keeps the UPS available.

TABLE 9-2 Typical service life at 77 °F (25 °C)

Component	Typical life	Action
Cooling fans	5–7 years	Replace when worn or at the end of the period; a failed fan raises an alarm.
DC bus electrolytic capacitors	7–10 years	Replaced by AEC service.
AC filter capacitors	5–7 years	Replaced by AEC service.
VRLA batteries (5-year design life)	3–5 years	Replace as a full set (Section 9.5).

Life is shorter at higher temperature, in dusty rooms and under continuous heavy load. The figures are typical of the industry for online UPS; AEC service plans the replacement during preventive maintenance.

9.4 Battery life and temperature

VRLA batteries age faster in heat. As a rule of thumb, their service life roughly halves for every 18 °F (10 °C) above 77 °F (25 °C).

TABLE 9-3 Typical effect of temperature on VRLA battery life

Average room temperature	Relative life	Typical life
68–77 °F (20–25 °C)	100 %	3–5 years
86 °F (30 °C)	about 70 %	2–3.5 years
95 °F (35 °C)	about 50 %	1.5–2.5 years
104 °F (40 °C)	about 35 %	1–1.7 years

Signs that the batteries need replacing.

- The runtime is clearly shorter than in Table 8-1 with a fully charged battery.
- The battery test fails (alarm 13).
- A block is swollen, cracked or leaking — switch the UPS off and contact AEC service.
- The batteries are older than 3–5 years.

9.5 Replacing a battery pack

1. Transfer the UPS to bypass (**Control › Function › Manual Bypass**), or shut it down (Section 5.11).
2. Open the breaker of the pack and disconnect its cables from BAT+ and BAT−.
3. Remove the pack from the rack, with two people, and fit the new one.
4. Check the polarity, reconnect the cables and close the pack breaker (Figure 4-7).
5. Return the UPS to the inverter (**Ecs Manual Bypass**).

Blocks inside a pack are replaced by AEC service or qualified personnel, all 16 at once.

9.6 Battery handling and disposal

⚠ *WARNING*

Batteries carry hazardous voltage and current. Only qualified personnel who know batteries may replace them.

- Remove jewelry, watches and other metal objects. Wear rubber gloves and boots; use tools with insulated handles.
- Replace connection cables only with original parts from AEC.
- Do not dispose of batteries in fire: they can explode. Do not open or damage them: the electrolyte is toxic.
- Never short the battery terminals.
- The battery circuit is not isolated from the utility input: check that there is no voltage between the battery terminals and ground before you touch them.
- Even with the input breaker open, the internal circuits stay connected to the batteries: open the pack breakers.

Recycle used batteries according to local regulations. Lead-acid batteries must be recycled.

9.7 Storage and transport

- Store indoors, dry, at 32–158 °F (0–70 °C); the batteries last longest stored at 59–77 °F (15–25 °C).
- Recharge a stored UPS and its packs every 4 to 6 months.
- Transport upright, in the original packaging.

CHAPTER 10

10 Troubleshooting

What the UPS shows, the common symptoms, the alarm list and what to tell AEC service.

✓ TIP **AEC technical support — 24/7.** WhatsApp and phone +1 786 553 2100 · e-mail service.us@aecups.com. Send the model, the serial number and a photo of the display and of the alarm: it is the fastest way to a solution.

10.1 Reading an alarm

When the UPS sounds an alarm, ALM lights. Open **Data › Current Alarm** to see it (Figure 6-7). Use **Control › Function › Fault Clear** to clear a fault once the cause is removed. If the alarm persists, see Table 10-2.

TABLE 10-1 Common symptoms

Symptom	What to do
The screen stays dark	Check the input breaker and the utility supply; on battery, press COLD START (Section 5.4).
The UPS runs on battery with utility present	Check the input voltage (176–275 V, L1–L2) and the input breaker; see alarm 4.
The load is on bypass	Read the alarm: overload (reduce the load), over-temperature (check vents and fans) or a manual bypass.
Short runtime	Charge for 12 hours, run a battery test; replace old batteries.
No network access	Check **Set › NetWork** and the SNMP-M card.
The building breaker trips when the UPS starts	The breaker or the conductors are smaller than Table 4-5 requires; check the wiring.
Wrong output voltage (120 V instead of 240 V or the reverse)	Check the output jumpers (Section 4.6) and the rated values in the system settings (**Set**, page 2).
One leg overloaded, the other lightly loaded	Move 120 V loads to the lighter leg (Section 3.3).
Parallel units do not share the load	Check the parallel cables (alarm 35) and that each unit has its own ID and the same settings (Section 7.7).

10.2 Alarm list

TABLE 10-2 Alarms

No.	Alarm	Cause and action
1	Battery not connected	Check that the battery cables are connected correctly, the pack breakers are closed, and the batteries are not damaged.
2	Emergency power off (EPO)	Check that the EPO contact is closed correctly, or whether the EPO was operated.
3	Inverter under-rated	The hardware is not configured for the selected rated power.
4	Input fault	Check that the utility input voltage and frequency are in range and the input and external breakers are closed. Restore the utility supply, or the output stops when the battery reaches end of discharge.

No.	Alarm	Cause and action
5	Bypass phase sequence reversed	Check the input connection.
6	Bypass abnormal	Bypass voltage or frequency out of the set range: check the utility supply and the input breaker.
7	Bypass fault	Bypass SCR open or shorted: contact AEC service.
8	Bypass overload	Reduce the load below 95 % of the rating.
9	Bypass overload timeout	The bypass overload lasted too long: the output has been switched off.
10	Hourly transfer limit reached	5 transfers in 1 hour: check the utility supply and the load.
11	Output short circuit	Faulty load or output breaker. Find and switch off the faulty load, check the breaker, then clear the fault to restart.
12	Battery end of discharge	The battery is discharged after a utility failure.
13	Battery self-test failed	Check for active alarms; check that the battery can supply more than 20 s.
14	Rectifier fault	DC bus over/undervoltage, short circuit or IGBT open. Clear the fault; if it persists, contact AEC service.
15	Inverter fault	Inverter voltage abnormal or IGBT open. Clear the fault; if it persists, contact AEC service.
16	Rectifier over-temperature	Heatsink too hot or sensor disconnected: check fans, ventilation, sensor wiring and room temperature.
17	Fan failure	One or more fans faulty or blocked: check each fan.
18	Overload	Inverter overloaded: remove non-critical loads, or the UPS transfers to bypass.
19	Inverter overload timeout	The UPS has transferred to bypass; if the bypass is also overloaded the output stops. Reduce the load: the UPS returns to the inverter.
20	Inverter over-temperature	Heatsink too hot or sensor disconnected: check fans, ventilation, sensor wiring and room temperature.
21	Low battery voltage	Battery capacity low while on battery.
22	Input neutral disconnected	Not used on the FERRUS SP RT: the input has no neutral. If it appears, contact AEC service.
23	Bypass fan failure	One or more fans faulty or blocked: check each fan.
24	Manual shutdown	Inverter switched off or transferred to bypass by hand.
25	Battery or charger fault	No charger output: contact AEC service.
26	EOD restart inhibit	Automatic restart after end of discharge is inhibited.
27	Input overcurrent timeout	Input current above the limit for too long: the UPS goes to battery or bypass. Check the input voltage, the load and whether the source (transformer, generator) is too small; contact AEC service if needed.
31	System power supply disabled	No output available.
32	Relay open circuit	Inverter relay open.
33	Relay short circuit	Inverter relay shorted.
34	Inverter protection	Inverter output voltage out of range or DC bus overvoltage.

No.	Alarm	Cause and action
35	Parallel cable fault	One or more parallel cables disconnected.
36	Synchronization signal lost	Contact AEC service.
37	Current-sharing failure	Contact AEC service.
38	Input current imbalance	Contact AEC service.
39	Maintenance breaker closed	The maintenance breaker is closed: the UPS has transferred to bypass and the inverter cannot start.
40	Bypass over synchronization	Bypass outside the synchronization range.
41	Battery self-test in progress	The battery is being tested.
42	Battery maintenance in progress	The battery is being maintained.
43	Battery maintenance failed	Check for other alarms and that the battery capacity supports more than 20 s of discharge.
44	Manual bypass	The UPS was transferred to bypass by hand.
45	Battery reverse connection	Battery polarity reversed: open the pack breakers and correct the wiring.
46	Scheduled shutdown	Automatic shutdown at the set time.
47	BMS communication failure	Check the BMS communication wiring and that the BMS protocol matches the UPS.
48	Output transformer over-temperature	Check the room temperature and the load; contact AEC service.

i NOTE When you call AEC service, have ready the model and serial number (**Set › Sys Func**), the alarms shown in **Data › Current Alarm**, the load, the output configuration and the number of packs.

11

CHAPTER 11

Specifications

Electrical, mechanical and environmental data.

TABLE 11-1 FERRUS SP RT specifications

	6 kVA	10 kVA
Power (VA / W)	6,000 / 6,000	10,000 / 10,000
Input		
Connection	2 line conductors of the 120/240 V or 120/208 V service + PE, no neutral	same
Voltage · frequency	176–275 V AC (L1–L2, 240 V or 208 V nominal) at full load · 40–70 Hz	same
Power factor	> 0.99 at full load	> 0.99 at full load
Current, max.	36 A	63 A
Output		
Voltage	120/240 V split phase, isolated by the output transformer · 120 V or 240 V single output	same
Current per 120 V leg	25 A	42 A
Regulation · frequency	1 % · 60 Hz, 0.1 % of nominal	same
THD · crest factor	< 2.5 % at full linear load · 3 : 1	same
Overload	110 % 10 min · 130 % 1 min · 150 % 30 s, then bypass; at 150 % output off after 1 min	same
Efficiency, up to	93 %	93 %
Connection	terminal strip (hardwired)	terminal strip (hardwired)
Battery		
Configuration	BAT16192RT packs, 16 × 12 V 9 Ah each, 1 to 4 per UPS	same
DC voltage	192 V DC	192 V DC
Battery current, max.	43 A	65 A
Charger	1–8 A, settable	1–8 A, settable
Backup at 50 % · 100 %	1 pack: 14.3 · 6 min	1 pack: 7.5 · 3.2 min
General		
Communication	RS-232 · RS-485 · USB · intelligent slot (SNMP-M or dry contacts) · EPO · parallel ports	same
Parallel	up to 3 units, N+1	up to 3 units, N+1

	6 kVA	10 kVA
Environment	32–104 °F (0–40 °C) · RH < 95 % · 3,300 ft (1,000 m) at full power	same
Storage	32–158 °F (0–70 °C)	same
W × D × H	17.3 × 22.8 × 6.7 in (439 × 579 × 170 mm), 4U	17.3 × 22.8 × 8.5 in (439 × 579 × 216 mm), 5U
Weight	128 lb (58.1 kg)	143 lb (64.9 kg)
Standards	UL 1778 standard; FCC Part 15, Class A	same
Warranty	3 years on the UPS · 2 years on VRLA batteries	same

Specifications are subject to change without notice.

TABLE 11-2 Output derating with altitude

Altitude (ft)	3,280	4,920	6,560	8,200	9,840	11,480	13,120	14,760	16,400
Altitude (m)	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
Output power	100 %	95 %	91 %	86 %	82 %	78 %	74 %	70 %	67 %

APPENDIX A

A Ordering codes and accessories

TABLE A-1 FERRUS SP RT ordering codes

Code	Description
FERSPRT6000-16X9	FERRUS SP RT 6 kVA, rack / tower; packs added with +BAT16192RT
FERSPRT6000-16X9+BAT16192RT (x2, x3, x4)	FERRUS SP RT 6 kVA with 1 to 4 × BAT16192RT battery packs
FERSPRT10000-16X9	FERRUS SP RT 10 kVA, rack / tower; packs added with +BAT16192RT
FERSPRT10000-16X9+BAT16192RT (x2, x3, x4)	FERRUS SP RT 10 kVA with 1 to 4 × BAT16192RT battery packs
BAT16192RT	Battery pack, 3U rack, 192 V DC, 16 × 12 V 9 Ah
Rail kit	Rails matched to the unit: ask AEC (the 100 lb RLKT telescopic kit is not rated for the 128–143 lb FERRUS SP RT)
SNMP-M	SNMP-M network card: web pages, SNMP v1/v2c/v3, Modbus TCP/IP and MQTT
DRYCNT	Dry-contact card: status signals and a remote shutdown input

APPENDIX B

B Warranty

TABLE B-1 Warranty

Item	Coverage
FERRUS SP RT UPS	3 years
VRLA batteries (BAT16192RT)	2 years

During the warranty AEC repairs or replaces a faulty product. Keep the purchase invoice. Not covered: transport damage, incorrect installation or use, use outside the conditions of this manual, repairs by anyone not authorized by AEC, and natural events. The sales contract prevails.

C

APPENDIX C

Drawings

AEC drawings: the overall dimensions of the UPS and the pack (not to scale between units; details not shown) and the earlier drawings of the rear panels. The single-line diagram is in Figure 2-9.

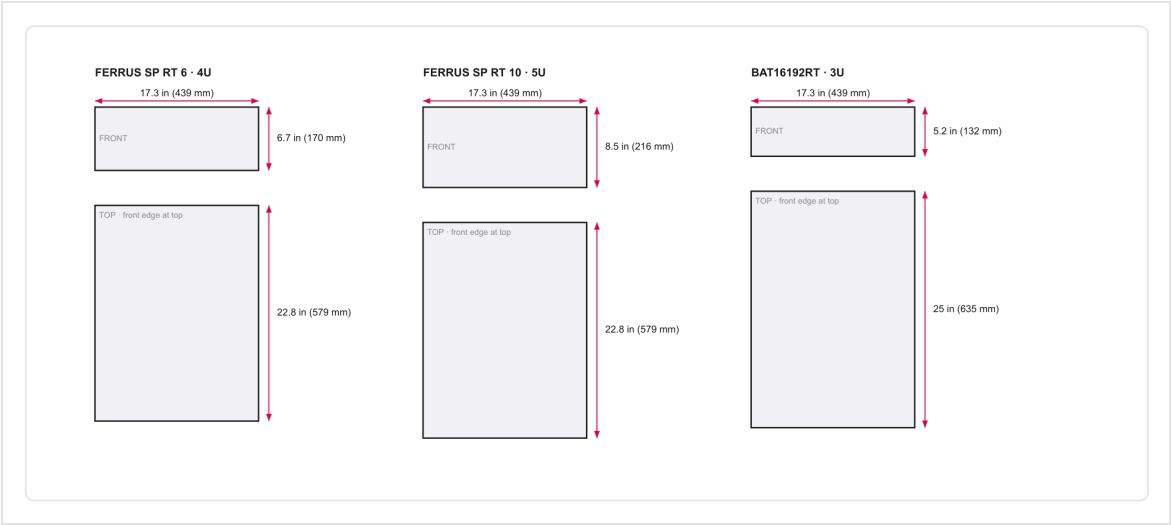
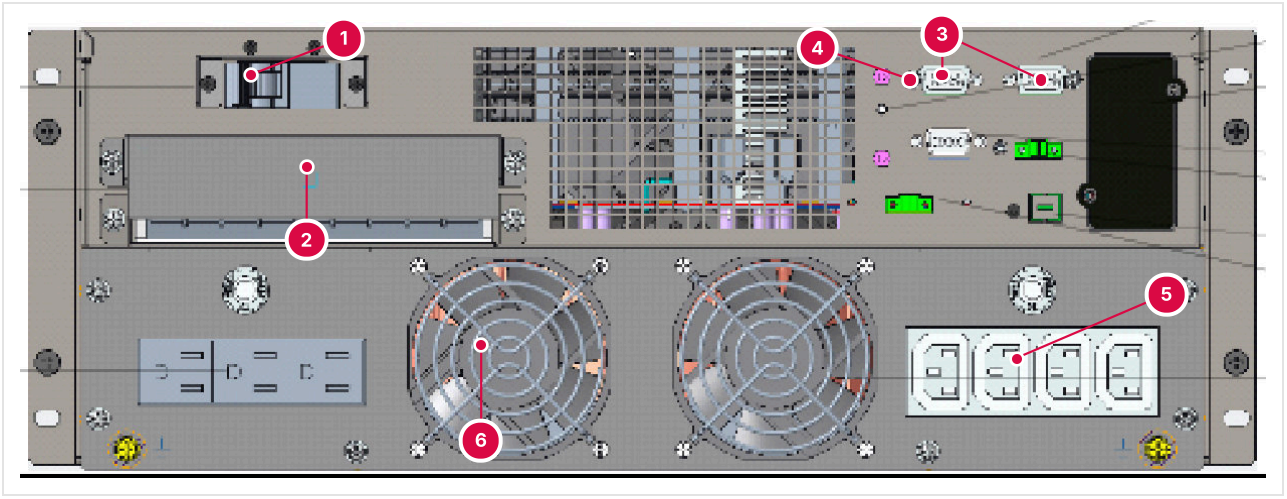


FIGURE C-1 FERRUS SP RT and BAT16192RT pack — overall dimensions (front and top views)

i NOTE The US FERRUS SP RT is hardwired on the terminal strip (Section 4.5). The receptacle positions on this earlier drawing are not part of the models in Table 2-2.



1. Input breaker
2. Cable-entry box
3. Parallel ports
4. COLD START
5. Receptacle fields shown on this drawing, left and right (see the note)
6. Transformer fans

FIGURE C-2 Rear panel of the FERRUS SP RT 6 — earlier drawing, cable-entry box fitted

D

APPENDIX D

Quick reference

TABLE D-1 Quick reference

Task	How
Start on utility	Pack breakers ON, then the input breaker (Section 5.3)
Start without utility (cold start)	COLD START button, then the inverter ON/OFF control (Section 5.4)
Start or stop the inverter	**Control › Function**, page 2, ON/OFF control
Transfer to bypass	**Control › Function › Manual Bypass**
Return to the inverter	**Control › Function › Ecs Manual Bypass** or **Manual Transfer to Inverter**
Silence the buzzer	Speaker icon in the status bar
See the alarms	**Data › Current Alarm**
Clear a fault	**Control › Function › Fault Clear**
Battery test	**Control › Test › Battery Test · Stop Test**
Battery status and remaining time	**Data › Battery**
Load per leg	**Data › Load**
Battery set-up, number of packs	**Set › BATT Set**
Rated values, single / parallel / ECO	System settings, **Set** page 2 (engineer)
Network address	**Set › NetWork**
Date, time, serial number	**Set › Sys Func**
Language	**Set › Language**

APPENDIX E

E Frequently asked questions

TABLE E-1 Frequently asked questions

Question	Answer
Should the UPS stay switched on?	Yes. Leave it on all the time: it protects the load and keeps the battery charged.
How long does the battery take to recharge?	At least 12 hours for a full charge after a long discharge.
Is the output a pure sine wave?	Yes. The UPS is online double conversion: the inverter builds a regulated sine wave at all times, on utility and on battery.
What happens when the battery runs out?	The UPS switches its output off at the end of discharge, then restarts by itself when the utility returns and recharges the battery.
Can I add batteries later?	Yes: more BAT16192RT packs, up to four per UPS. Enter the new number of packs in **Set › BATT Set**.
Does the input need a neutral?	No. The input takes the two line conductors of the 120/240 V or 120/208 V service and PE. The output neutrals come from the isolation transformer.
What is ECO mode, and should I use it?	In ECO mode the load runs on the bypass while the utility is good: efficiency is higher, but the load is not protected from utility disturbances. Use normal online mode for sensitive equipment.
Can I connect a power strip to the output?	Only through a branch circuit and breaker sized for it, on a receptacle installed by an electrician. Do not connect surge-protector strips, and never connect a UPS to the output of another UPS.
Which equipment should not be connected?	Laser printers, space heaters, vacuum cleaners, hair dryers and other loads with high start-up current or half-wave rectifiers.
Can I use the UPS with a generator?	Yes — see Section 3.5.
Can I move the UPS while it runs?	No. Shut it down and disconnect it first; move it upright.
Does a 240 V load need the neutral?	No. A 240 V load connects between L1 and N2 (configuration 03 or 04). A 120/240 V three-wire load uses L1, N2 and the jumpered N1–L2 as its neutral.
Why are there two access levels?	The User level reads the pages and silences the buzzer; the Engineer level changes settings and runs tests, so that nobody changes the UPS by mistake.

APPENDIX F

F Acronyms and abbreviations

TABLE F-1 Acronyms and abbreviations

Term	Meaning
BMS	Battery management system
DHCP	Dynamic Host Configuration Protocol
ECO	Economy (energy-saving) operating mode
EMI / RFI	Electromagnetic / radio-frequency interference
EOD	End of discharge
EPO	Emergency power off
IGBT	Insulated-gate bipolar transistor
NEC	National Electrical Code (NFPA 70)
PE	Protective earth: the equipment grounding conductor
PFC	Power-factor correction
SCR	Silicon-controlled rectifier
TVSS	Transient voltage surge suppression
UPS	Uninterruptible power supply
VRLA	Valve-regulated lead-acid (battery)

APPENDIX G

G Installation record

Fill this record in at installation and keep it with the UPS. It is the first thing AEC service will ask for.

TABLE G-1 Installation record

Item	Value
Model and ordering code	
Serial number	
Installation date	
Installed by (company, name)	
Site and room	
Input circuit (breaker rating, conductor size)	
Number of BAT16192RT packs	
Battery set-up entered (blocks, Ah) and charge current	
Output configuration (01, 02, 03 or 04)	
Output breakers (rating)	
Network address	
Parallel: unit ID / number of units	
Load at start-up (%)	
Battery test result and date	

Service and support

AEC technical support is available 24 hours a day, 7 days a week. For help with installation, start-up, alarms, settings, spare parts, warranty claims and service visits, contact us by WhatsApp, phone or e-mail.

TECHNICAL SUPPORT · 24/7	**+1 786 553 2100**	WhatsApp and phone — always available
SERVICE E-MAIL	**service.us@aecups.com**	Technical questions, service requests, warranty claims
SALES	**sales@aecups.com**	
ADDRESS	**AEC UPS USA LLC**	4872 SW 72nd Ave, Miami, FL 33155
WEB	**aecups.com**	

When you contact us, have ready: the model and ordering code, the serial number (on the rating label and in Set › Sys Func), the alarm shown in Data › Current Alarm, the load, the output configuration and the number of battery packs — a photo of the display and of the label speeds things up on WhatsApp.