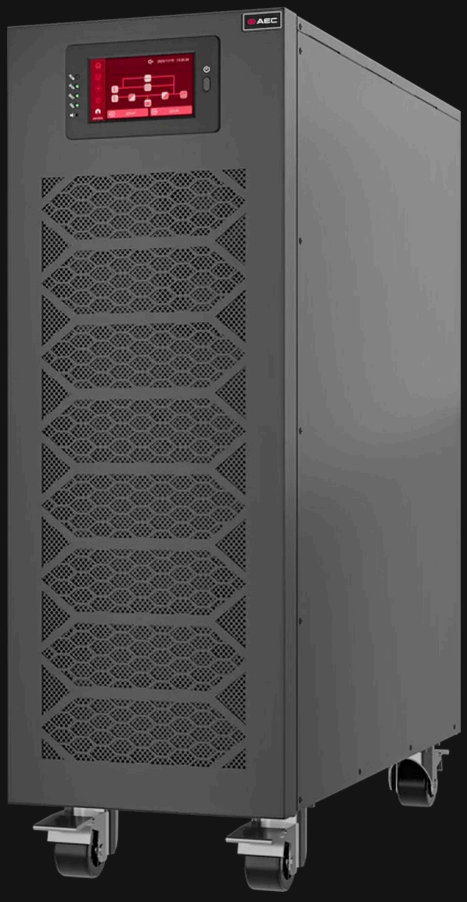
ONLINE UPS · SPLIT PHASE 120/240 V · TOWER

FERRUS SP

6–10 kVA

Online double-conversion UPS with output isolation transformer, 120/240 V split-phase output, AEC color touchscreen, 16 batteries inside and BB4US battery cabinets.



User Manual

Installation · Operation · Maintenance

FERRUS SP 6 kVA | FERRUS SP 10 kVA | BB4US battery cabinet

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AEC-UM-FSP-US · Rev. C · November 2026. Rev. C takes the dimensions, rear panel, power terminals, separate battery connector, installation and cooling data from the AEC drawings AEC-FSP-0610-01…07, removes the wrong nine-terminal strip and the factory terminal pictures, restores the overload behavior, sizes the input to the NEC and adds labeled pictures of every panel, terminal and procedure.

Rev. C1 · 13 November 2026 corrects the output configurations: configurations 01 and 02 are not allowed on the FERRUS SP 6/10 kVA tower, whose O/P-N1 is linked to O/P-L2 inside (factory manual V3.2). Sections 3.3, 3.4, 4.8 and the installation record.

BEFORE YOU START

About this manual

Thank you for choosing an AEC FERRUS SP 6–10 kVA UPS. This manual describes the product and its panels, the touchscreen, installation and output configurations, the BB4US battery cabinet, operation, communication, batteries and runtime, maintenance, troubleshooting and specifications. Dimensions, terminals and panel parts follow the AEC drawings AEC-FSP-0610-01…07. Read it before you start, and keep it near the UPS.

MODELS COVERED

FERRUS SP 6 kVA (FERSP6000-16X9) and FERRUS SP 10 kVA (FERSP10000-16X9), tower, with 16 × 12 V 9 Ah batteries inside, and the BB4US battery cabinet for longer runtime. Ordering codes: Table 2-2. The FERRUS SP 20 kVA and the FERRUS SP RT 6–10 kVA have their own manuals.

WHO THIS MANUAL IS FOR

Qualified electricians and trained personnel who install, operate and maintain the UPS. The UPS is hardwired: the branch circuit, the output circuits and the battery cabinet must be installed by qualified personnel to the National Electrical Code (NFPA 70) and local codes.

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.** Report damage to the carrier before you install. Section 4.1, page 28.
2. **Place the tower** on a level floor with 20 in (500 mm) free on all four sides; lock the caster brakes. Section 4.3, page 30.
3. **Wire — qualified electrician.** Ground first, then input I/P-L1 · I/P-L2, then the output on the 7-terminal strip; the BB4US cable goes to the separate BAT+ · BAT– connector, last. Output breaker downstream. Section 4.7, page 32.
4. **Choose the output configuration** (120 V, 240 V or both) with the jumpers. Section 4.8, page 33.
5. **Start.** Close the BB4US battery breaker (if fitted), then Byp-L1, Mains-L1 and I/P-L2: line mode after about a minute, only INV lit. Section 5.2, page 39.
6. **Check and load.** Battery blocks and Ah in **Set › BATT Set**, then switch the loads on one at a time, the largest first. Section 6.4, page 46.

120/240 V	6–10 kVA	Touch	Up to 3
split phase, isolated by the output transformer	tower, kVA = kW	AEC color touchscreen	units in parallel

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CHAPTER 1

01 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 6–10 kVA UPS and the BB4US battery cabinet. Read the whole manual before installing or operating the unit, and keep it for future reference.

1.1 Battery safety

⚠ DANGER

The internal battery and the BB4US cabinet can cause electric shock and high short-circuit current.

- 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.
- 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.

⚠ WARNING

The battery circuit is not isolated from the utility input. Hazardous voltage can exist between the battery terminals and ground. The internal battery stays connected inside the UPS when every breaker on the rear panel is open. Check that there is no voltage before you touch any battery part.

1.2 General safety

⚠ WARNING

Improper use can cause electric shock or fire.

- Switch the UPS off and disconnect it before cleaning 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.
- Installation must be done only by qualified personnel, according to the National Electrical Code (NFPA 70) and local codes.

1.3 Handling and transport

> ⚠ ***WARNING***
>
> **The UPS is heavy: 196.2 lb (89 kg) for the 6 kVA, 235.9 lb (107 kg) for the 10 kVA.** Move it on its casters on a flat floor only, with two or more people. Lock the caster brakes once it is in place.

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

1.4 Installation and EMC

- The UPS is hardwired. It must be installed by a qualified electrician according to the National Electrical Code (NFPA 70) and local codes.
- Never feed the UPS from a wall receptacle: its rating is below the maximum input current of the UPS, and the receptacle can be damaged.
- Install an output circuit breaker between the UPS and the loads. If the installation requires it, use a breaker with ground-fault (residual-current) protection.
- 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 61000-3-11	Voltage changes, fluctuations and flicker, equipment up to 75 A
IEC 61000-3-12	Harmonic currents, equipment above 16 A per phase
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

i NOTE **FCC Part 15 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 6–10 kVA, its codes, the front and rear panels, the power terminals and battery connector, the touchscreen, the isolation transformer, how it works and its operating modes.

2.1 Introduction

FERRUS SP is an online double-conversion UPS of 6 and 10 kVA with an **output isolation transformer** and a **120/240 V split-phase output**. The tower carries 16 × 12 V 9 Ah batteries inside and rolls on four casters. A BB4US battery cabinet extends the runtime to about an hour.

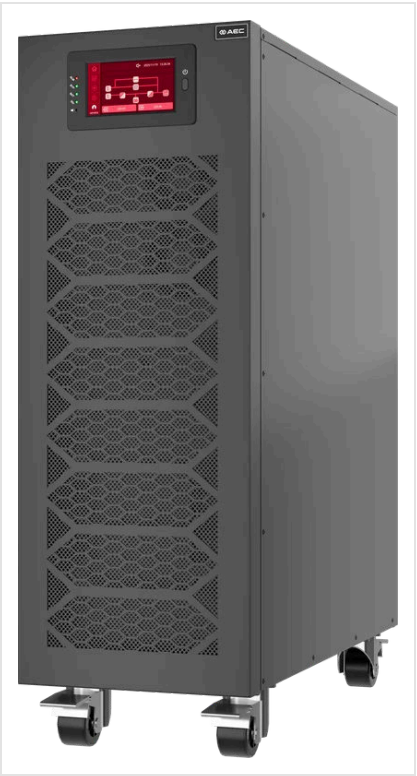


FIGURE 2-1 FERRUS SP 6 · 10 kVA



FIGURE 2-2 Rear, breakers and outlets

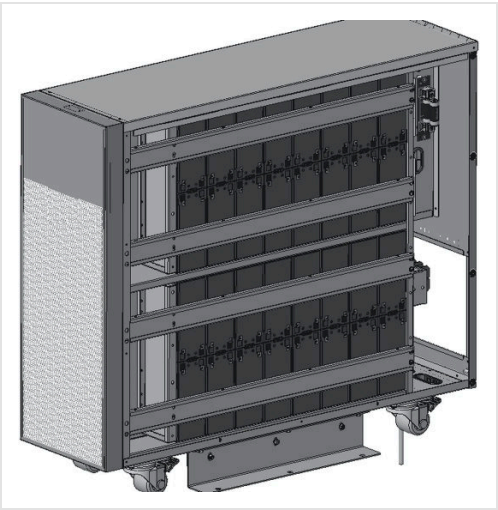


FIGURE 2-3 BB4US battery cabinet (option), side panel removed

TABLE 2-1 What the FERRUS SP offers

Feature	What it means
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, tests; two access levels.
16 blocks inside	6 min at full load on the 6 kVA; up to 57 min with a BB4US-80X9.

2.2 Models and ordering codes

TABLE 2-2 FERRUS SP 6–10 kVA models

Model	Rating	Code	Battery inside	Outlets
FERRUS SP 6 kVA	6,000 VA / 6,000 W	FERSP6000-16X9	16 × 12 V 9 Ah · 192 V DC	2 × NEMA L5-30R · 2 × NEMA L6-30R + terminal strip
FERRUS SP 10 kVA	10,000 VA / 10,000 W	FERSP10000-16X9	16 × 12 V 9 Ah · 192 V DC	2 × NEMA L5-30R · 2 × NEMA L6-30R + terminal strip

How to read the code. FERSP 10000 -16X9 +BB4US-64X9 — series FERRUS SP · rating in VA · 16 × 12 V 9 Ah inside · BB4US cabinet with 32, 64 or 80 blocks.

The FERRUS SP 20 kVA tower and the FERRUS SP RT 6–10 kVA rack/tower have their own user manuals.

2.3 What is in the box

- 1 × FERRUS SP UPS with its internal batteries
- 1 × user manual
- Accessory kit — check its contents against the packing list in the box

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

2.4 Front panel



1. Color touchscreen — power flow, readings, settings and commands (Section 6.1)
2. Status LEDs ALM, BYP, BAT, INV and buzzer mute, beside the screen (Table 2-6)
3. Power button — on and off, as on the screen's Control page
4. AEC badge
5. Front grille — cool air in (Section 4.5)
6. Casters, four, two with brakes — lock them once the tower is in position

FIGURE 2-4 FERRUS SP front view

The touchscreen center is 25.8 in (655 mm) above the floor (Figure 4-1).

2.5 Rear panel

The rear panel carries the communication ports, the maintenance bypass switch, the input breakers, the power terminals behind their cover, the separate battery connector, the output receptacles and the transformer fan. The numbers are those of AEC drawing AEC-FSP-0610-04 (sheet 4).

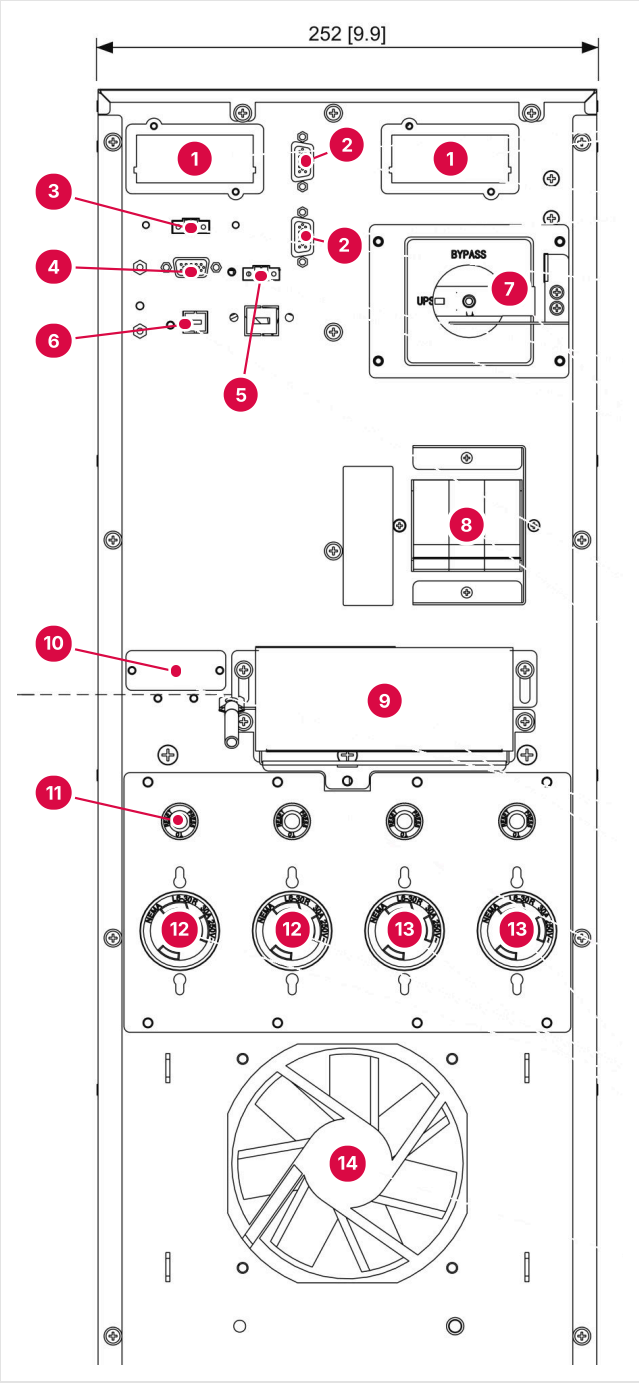


FIGURE 2-5 Rear panel, AEC drawing sheet 4 (scale reduced), terminal cover fitted — the numbers are explained in Table 2-3

TABLE 2-3 Rear panel parts (AEC drawing sheet 4)

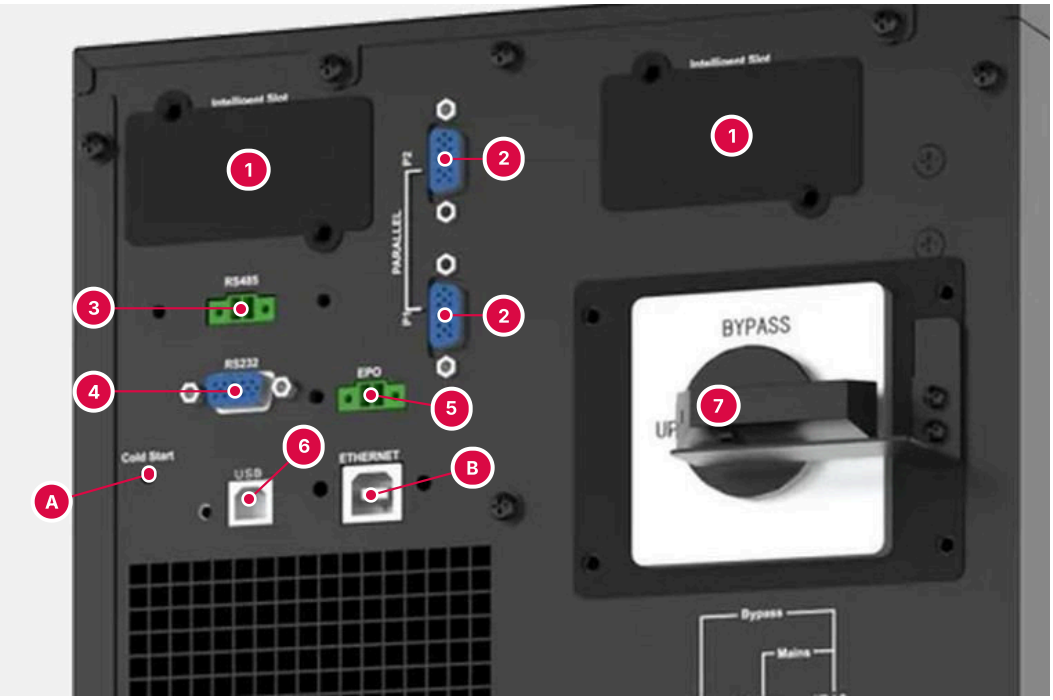
No.	Part	Function
1	Intelligent slots × 2	SNMP-M card and dry-contact card at once (Section 7.6)
2	Parallel ports × 2	DB9, for the parallel cables, up to 3 units (Section 4.10)
3	RS485	Modbus link
4	RS232	DB9, monitoring software
5	EPO	Normally closed loop (Section 7.7)
6	USB	Monitoring software
7	Maintenance bypass switch	UPS or BYPASS: the load stays on utility power for service (Section 5.11)
8	Input breakers	3 × 63 A 1-pole: **Byp-L1** (bypass line) · **Mains-L1** and **I/P-L2** (rectifier input)
9	Terminal strip, behind the cover	PE · I/P-L1 · I/P-L2 · O/P-L1 · O/P-N1 · O/P-L2 · O/P-N2 (Section 4.7)
10	Battery terminals	BAT+ · BAT−, on their own connector to the left of the strip, for the BB4US cable (Section 4.9.1)
11	Output surge protection	Resettable, above the receptacles
12	NEMA L5-30R × 2	30 A twist-lock, 120 V
13	NEMA L6-30R × 2	30 A twist-lock, 240 V
14	Transformer fan	Cooling of the output transformer

Figure 2-6 shows the same parts on the unit, with the numbers of Table 2-3. The terminal cover (9) sits in the middle of the rear panel, above the receptacles; the battery connector (10) is the plate to its left.



1	Intelligent slots × 2
2	Parallel ports × 2
7	Maintenance bypass switch UPS / BYPASS
8	Input breakers Byp-L1 · Mains-L1 · I/P-L2
9	Terminal cover — the 7-terminal strip is behind it
10	Battery connector BAT+ · BAT−, left of the terminal cover
11	Output surge protection, resettable
12	NEMA L5-30R × 2, 120 V
13	NEMA L6-30R × 2, 240 V
14	Transformer fan

FIGURE 2-6 Rear of the FERRUS SP 10 kVA, terminal cover fitted (rendering from the factory 3D model; the 6 kVA is the same)



1	Intelligent slots	6	USB
2	Parallel ports P1 · P2	7	Maintenance bypass switch
3	RS485	A	COLD START button — start from the battery (Section 5.3)
4	RS232	B	ETHERNET — marked on the panel; not numbered on sheet 4
5	EPO		

FIGURE 2-7 Communication area and maintenance bypass switch (rendering, labels as printed on the unit)

2.6 Power terminals and battery connector

The power terminals sit behind the terminal cover, at the middle of the rear panel. **The 7-terminal strip carries ground, input and output only. The external battery has its own connector, BAT+ · BAT−, on a separate block to the left of the strip.** The values below are measured on the factory 3D model (AEC drawing sheet 5).

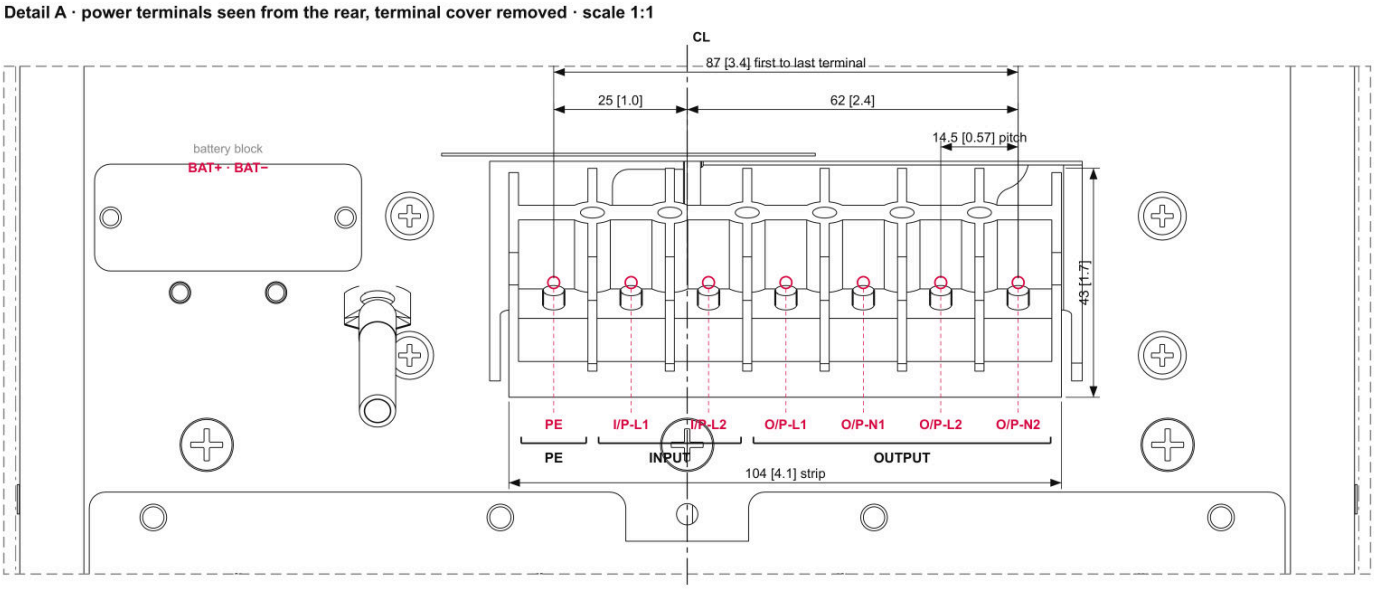


FIGURE 2-8 Detail A — power terminals seen from the rear, terminal cover removed (AEC drawing sheet 5, dimensions in mm [in])

TABLE 2-4 Terminal data (AEC drawing sheet 5)

Item	Value
Strip	7 terminals, from left to right seen from the rear: PE · I/P-L1 · I/P-L2 · O/P-L1 · O/P-N1 · O/P-L2 · O/P-N2
Terminals	M4 screw clamps (Ø 4 mm)
Pitch	0.57 in (14.5 mm)
First to last terminal	3.4 in (87 mm); strip 4.1 in (104 mm) long; terminal height 1.7 in (43 mm)
Terminal center line	**17.0 in (433 mm) above the floor**, casters included; 14.0 in (354 mm) above the cabinet base
Stand-off	Terminals 0.7 in (17 mm) off the rear panel; the terminal cover projects 1.4 in (36 mm)
Cable entry	From below, through the terminal cover
Battery connector	BAT+ · BAT−, separate block left of the strip, for the BB4US cable
Input	Two line conductors of a 120/240 V or 120/208 V service (I/P-L1, I/P-L2, 240 V or 208 V between them) and PE — **no input neutral**

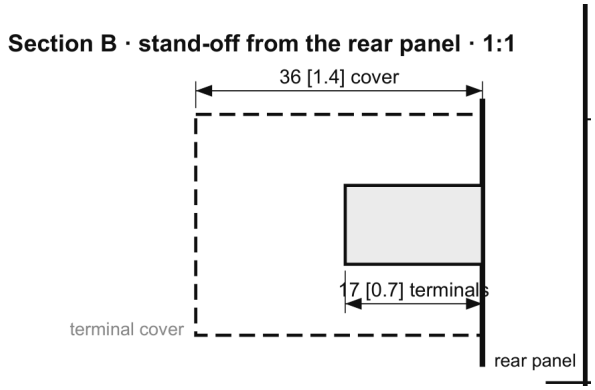
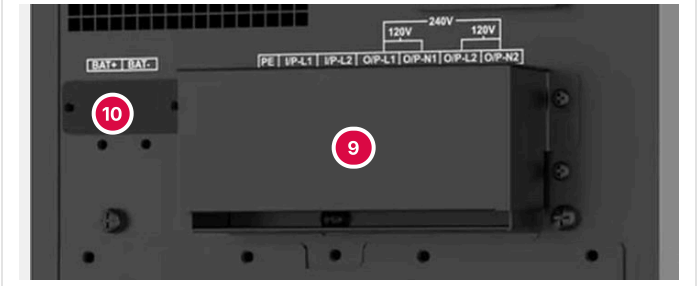


FIGURE 2-9 Section B — stand-off from the rear panel (sheet 5)

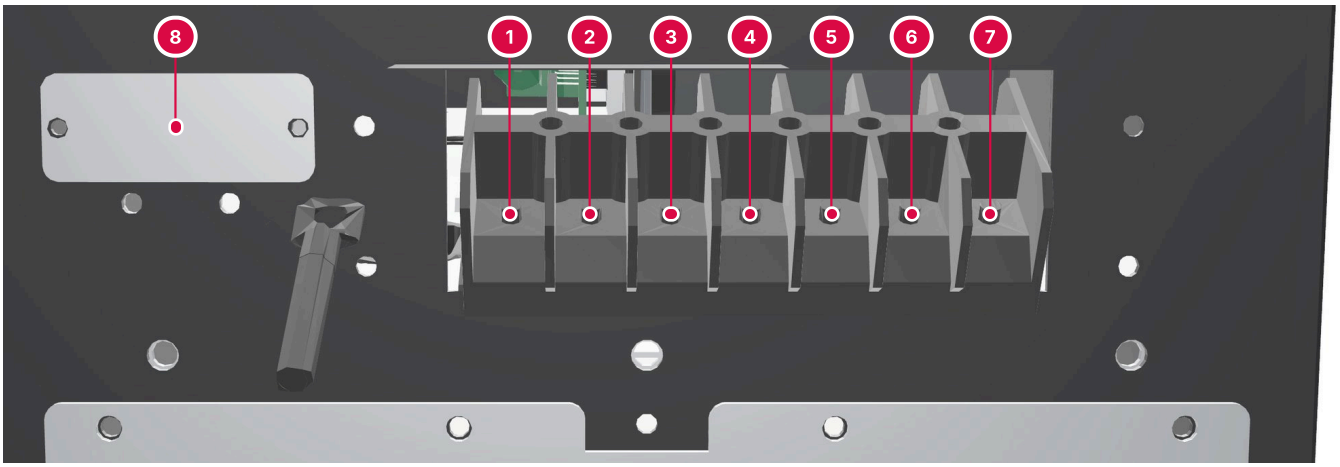


9 Terminal cover (9)

10 BAT+ · BAT– connector (10)

FIGURE 2-10 Terminal cover fitted (rendering): its labels follow the strip

Figure 2-11 shows the strip and the battery connector on the unit, with the cover removed, and Table 2-5 gives the clamp, the torque and the wire sizes of each terminal.



1 PE

2 I/P-L1

3 I/P-L2

4 O/P-L1

5 O/P-N1

6 O/P-L2

7 O/P-N2

8 Battery connector BAT+ · BAT– (separate block)

FIGURE 2-11 Power terminals and battery connector, seen from the rear with the terminal cover removed (rendering from the factory 3D model, FERRUS SP 10 kVA; the 6 kVA is the same)

TABLE 2-5 Power terminals, torque and wire sizes, FERRUS SP 6 · 10 kVA

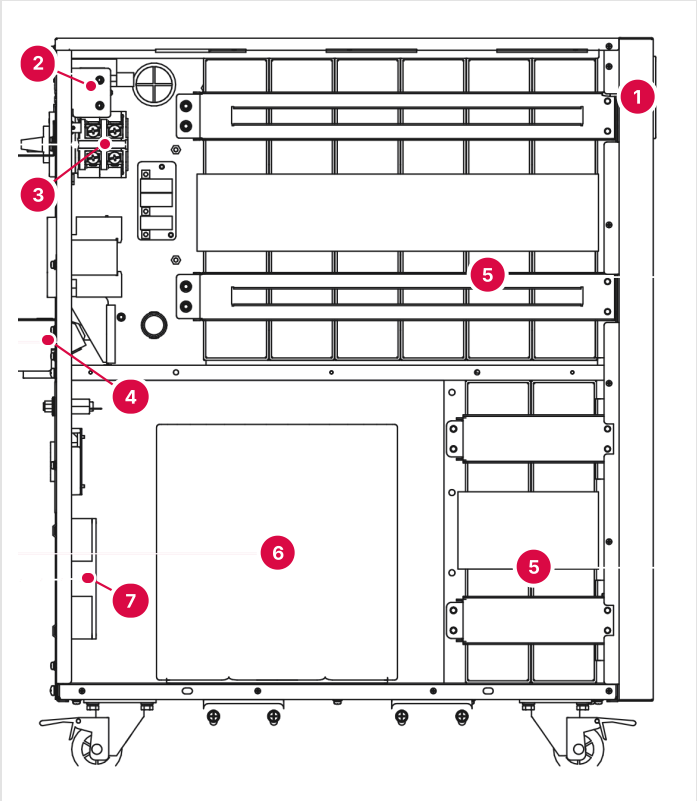
No.	Terminal	Clamp	Torque	Wire, min. (factory) 6 / 10 kVA	Wire, max. (NEC size) 6 / 10 kVA	Lug
1	PE	M4 screw clamp	ask AEC	As the largest phase conductor	As the largest phase conductor; largest the clamp accepts: ask AEC	ask AEC
2 · 3	I/P-L1 · I/P-L2	M4 screw clamp	ask AEC	10 AWG (6 mm²) / 8 AWG (10 mm²)	8 AWG / 4 AWG — 4 AWG may not fit the M4 clamp: ask AEC	ask AEC

No.	Terminal	Clamp	Torque	Wire, min. (factory) 6 / 10 kVA	Wire, max. (NEC size) 6 / 10 kVA	Lug
4–7	O/P-L1 · O/P-N1 · O/P-L2 · O/P-N2	M4 screw clamp	ask AEC	10 AWG (6 mm²) / 8 AWG (10 mm²)	10 AWG / 6 AWG	ask AEC
8	BAT+ · BAT–	Battery connector, type: ask AEC	ask AEC	8 AWG (10 mm²) / 6 AWG (16 mm²)	6 AWG / 4 AWG — ask AEC	ask AEC

Factory sizes from Table 3-4; NEC sizes from Table 3-5, for the conditions stated under it. Until AEC confirms the torque, tighten to the torque on the terminal label.

2.7 Inside the cabinet

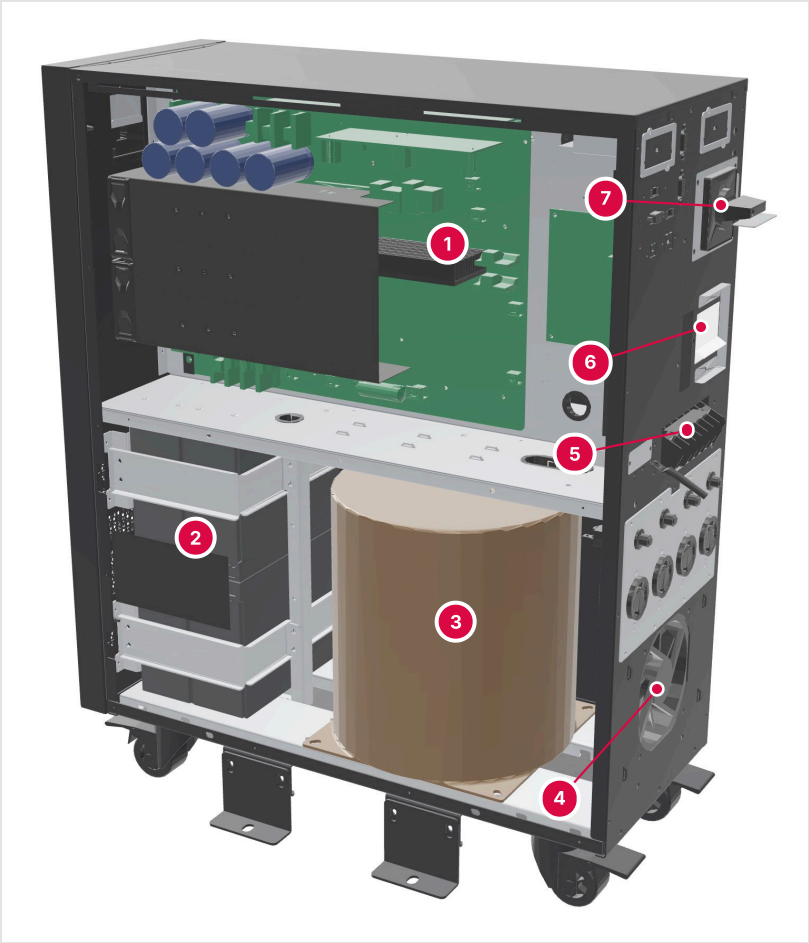
How the FERRUS SP 6 · 10 kVA is built, seen from the right with the side panel removed (front on the right).



1. Touchscreen — on the front, at the top
2. Intelligent slots — reached from the rear
3. Maintenance bypass switch — at the rear
4. Terminal strip — rear connection area, behind the terminal cover
5. Internal batteries — 16 × 12 V 9 Ah on two shelves; the compartment takes up to 20 blocks. The power and control boards are behind the upper shelf
6. Isolation transformer — at the bottom (Section 2.10)
7. Transformer fan — at the bottom of the rear panel

FIGURE 2-12 FERRUS SP 6 · 10 kVA, right side with the side panel removed (AEC drawing from the factory 3D model)

Figure 2-13 shows the same cabinet in a rendering, from the rear right with the side panel and the terminal cover removed.



1. Power and control boards
2. Internal batteries, 12 V 9 Ah blocks
3. Isolation transformer, at the bottom
4. Transformer fan, rear panel
5. Terminal strip, rear panel
6. Input breakers
7. Maintenance bypass switch

FIGURE 2-13 Illustration — internal layout simplified. FERRUS SP 10 kVA, side panel removed, seen from the rear right (front on the left)

2.8 Status LEDs

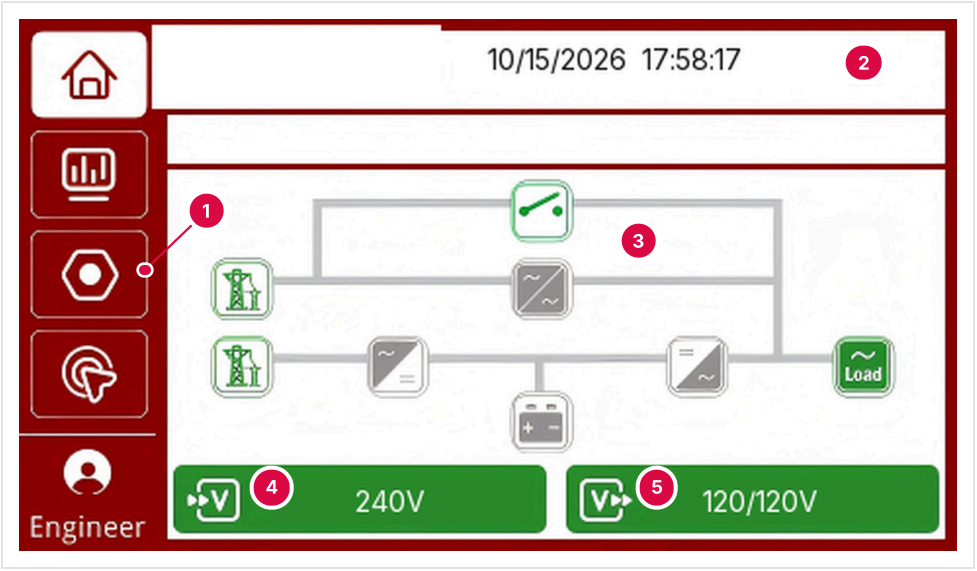
TABLE 2-6 Status LEDs

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.

LED	Meaning
INV	Inverter: lit while the inverter supplies the load.
Mute	The buzzer is muted.

In normal operation only INV is lit.

2.9 Touchscreen at a glance



1. Side menu — Home, Data, Set and Control; the user level logged in below (Engineer)
2. Status bar — the current message, buzzer mute, date and time
3. Power flow — input, bypass switch, rectifier, inverter, battery and load, each shown green (active) or grey
4. Input voltage
5. Output voltage of the two legs

FIGURE 2-14 Home page

Two access levels: **User** — home, data, alarms, mute; **Engineer** — settings and tests. The full menu is described in Chapter 6.

2.10 The isolation transformer

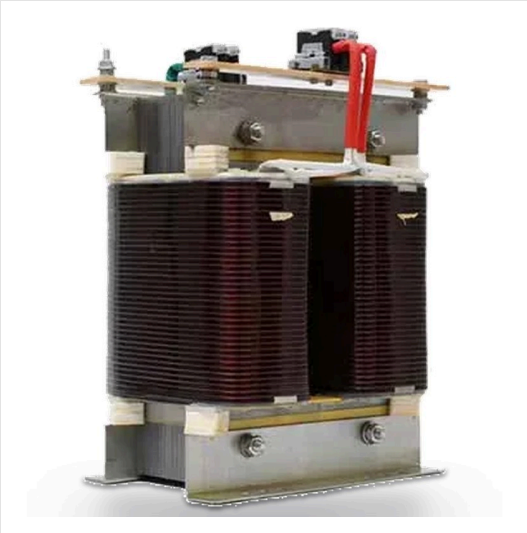


FIGURE 2-15 The output isolation transformer

- **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 4.8).
- **On the bypass.** The automatic bypass joins ahead of the transformer: the loads stay on its windings in bypass mode, but utility disturbances are not filtered there. The AEC single-line diagram also shows the maintenance bypass feeding the transformer primary, so the 120 V legs stay on in BYPASS — this is marked "to confirm" on the drawing.
- **For mixed and motor loads.** 120 V equipment and 240 V machines on the same UPS, as on a panel board.

TABLE 2-7 Split-phase output facts

Value	Meaning
180°	O/P-L1–N1 and O/P-L2–N2 in opposition, as in a North American split-phase service.
120 / 240 V	120 V on each leg, 240 V from O/P-L1 to O/P-N2 (configurations 03 and 04). Other rated voltages per leg (110, 115 or 127 V) are a setting made at commissioning (Table 11-1).
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.

2.11 How the UPS works

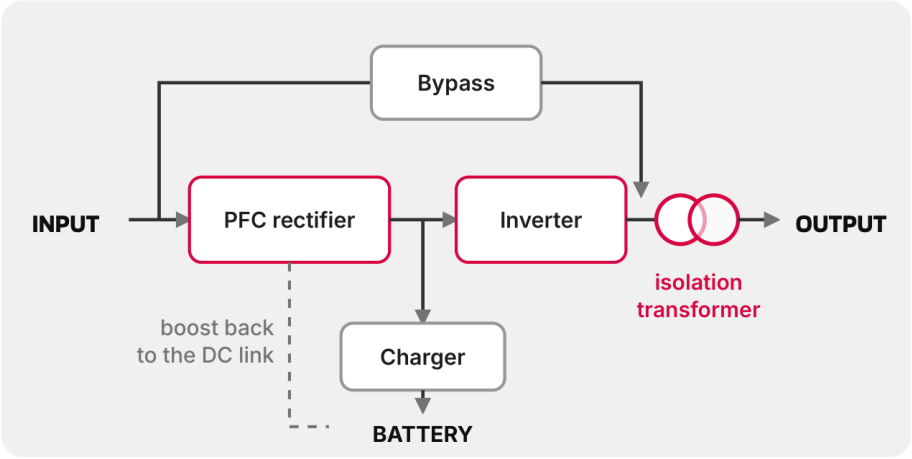


FIGURE 2-16 Working principle

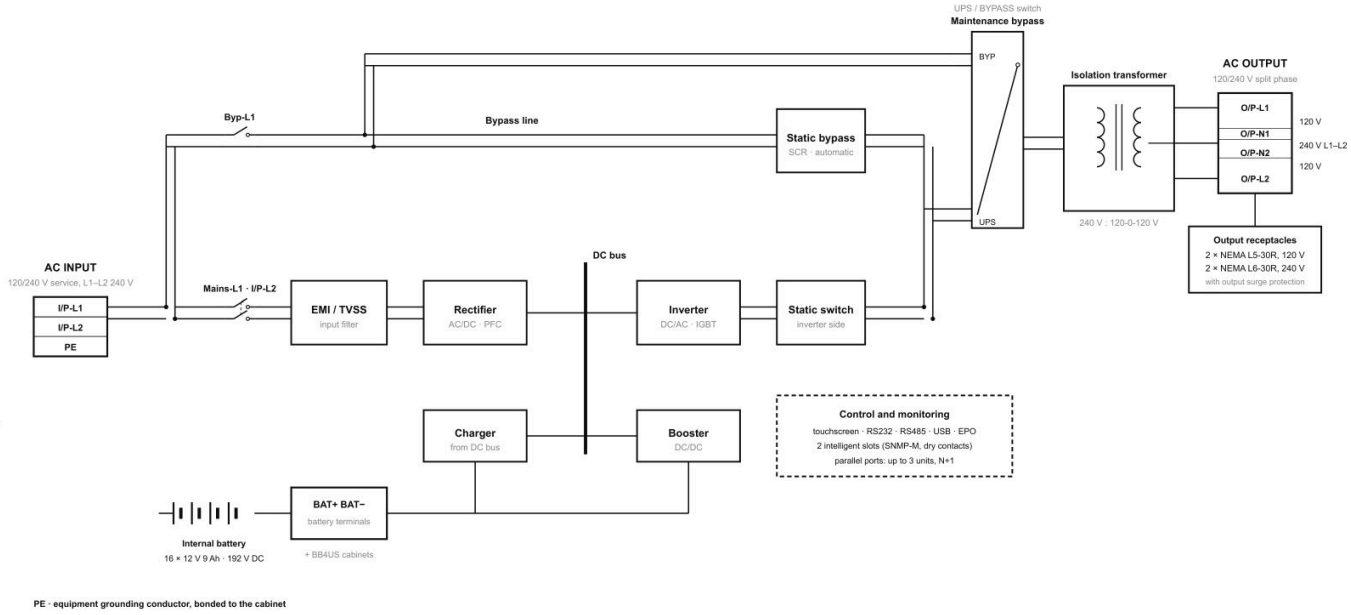


FIGURE 2-17 Single-line diagram (AEC drawing sheet 2)

- **Surge suppression (TVSS) and EMI/RFI filters.** Protect against surges and filter electromagnetic and radio-frequency interference on the utility line.
- **Rectifier / power-factor correction (PFC).** Converts the utility AC, fed through **Mains-L1 · I/P-L2**, into a regulated DC bus while drawing a near-sinusoidal input current (power factor above 0.99). Drawing a sinusoidal current uses the utility power efficiently and reflects less distortion onto the supply that other equipment shares.
- **Inverter.** A 3-level IGBT inverter rebuilds a precise sine wave from the DC bus. In utility and battery operation it runs online continuously.
- **Charger and DC-to-DC converter.** The charger float-charges the battery while the utility is present. On a utility failure the boost converter takes the battery energy (BAT+ · BAT–) back to the DC bus.
- **Output isolation transformer.** 240 V : 120-0-120 V. Isolates the output and makes the two 120 V legs (Section 2.10). The output neutrals come from the transformer center tap; the jumpers on O/P-N1 · N2 set the configuration.

- **Static bypass.** Fed through **Byp-L1**. On overload, over-temperature or a fault, the load moves to the bypass automatically, ahead of the transformer.
- **Maintenance bypass.** The UPS / BYPASS switch keeps the load on utility power while the UPS is serviced (Section 5.11).

2.12 Operating modes

TABLE 2-8 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 shown in **Data › Battery**
Bypass	Overload, over-temperature or a fault, or a manual bypass: the load moves to the bypass.	BYP lit; the alarm shown 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 5.3).	As battery mode
Maintenance bypass	Switch at the rear on BYPASS: the load stays on utility power 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 4.10).	Set, page 2 (system mode)

NOTICE

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

2.13 Protections

- Input surge suppression (TVSS) and EMI/RFI filters; output surge protection on the receptacles (resettable).
- 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.
- Bypass phase sequence; EPO input (normally closed loop).

CHAPTER 3

03 Planning the installation

Sizing the load, estimating the runtime, choosing the output configuration, sizing the input 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 single receptacle or leg is overloaded (Table 3-3).

TABLE 3-1 Worked example — a workshop on a FERRUS SP 10 kVA, configuration 04 (120 V and 240 V)

Load	Watts	Leg L1	Leg L2	Connected
240 V well pump	3,000 W	12.5 A	12.5 A	O/P-L1–N2
PCs and monitors	1,200 W	10 A	—	O/P-L1–N1
Network and lighting	900 W	—	7.5 A	O/P-L2–N2
Total	**5,100 W (51 %)**	**22.5 A**	**20 A**	limit 42 A per leg

Runtime. About 7.5 minutes at 50 % with the internal batteries; with a BB4US-64X9 about 57 minutes (Table 8-1).

✓ TIP Measure rather than guess: once the UPS runs, **Data › Load** shows the real load in % and kW of each leg. Recheck after adding 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 a BB4US battery cabinet — or reduce the load on the UPS: 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	04	120 V on O/P-L1–N1 and O/P-L2–N2, up to 50 % each. Balance the two groups.

Your loads	Configuration	Remember
Only 120 V equipment, one group	04	No single full-rating 120 V output: share the loads between the two legs.
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 configuration 04 each 120 V leg has 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 Sizing the input circuit

TABLE 3-3 Input and output currents

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

TABLE 3-4 Cable sizes recommended by the factory

Rating	AC input	AC output	Battery (BB4US)	PE
6 kVA	10 AWG (6 mm²)	10 AWG (6 mm²)	8 AWG (10 mm²)	as the largest phase conductor
10 kVA	8 AWG (10 mm²)	8 AWG (10 mm²)	6 AWG (16 mm²)	as the largest phase conductor

The UPS input is the two line conductors of a 120/240 V or 120/208 V service (L1 and L2, 240 V or 208 V between them) and the equipment grounding conductor. **No input neutral is connected.** The input voltage window is 176–275 V AC measured from L1 to L2.

In the US, the installer sizes the conductors and the overcurrent protection to the National Electrical Code for the actual installation:

- 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. Result: 40 A for the 6 kVA and 70 A for the 10 kVA (Table 3-5). The result is the same on a 208 V supply (125 % of 31.0 A and of 51.7 A rated).
- Size the conductors for that device, with the 75 °C column for the terminations (NEC 110.14(C)). Check that the conductor fits the M4 clamp of the strip; if the NEC size is larger than the factory size in Table 3-4, ask AEC before you install.
- Keep the working space in front of the rear panel required by NEC 110.26.
- Install an output overcurrent device for every output circuit, sized for the conductors and the load.

TABLE 3-5 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

Circuit	Sizing current	Recommended breaker (NEC 240.6)	Copper conductor, 75 °C (NEC 310.16)
Input, 10 kVA (2-pole)	63 A max.; 125 % × 44.8 A rated = 56 A	70 A	4 AWG
Output leg, 6 kVA (configurations 03, 04)	31.25 A	35 A	10 AWG
Output leg, 10 kVA (configurations 03, 04)	52.5 A	60 A	6 AWG
Battery cable, 6 kVA (BB4US)	53.75 A	—	6 AWG
Battery cable, 10 kVA (BB4US)	81.25 A	—	4 AWG

The 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). The 10 kVA input and battery sizes (4 AWG) are larger than the factory sizes and may not fit the M4 clamps of the strip: ask AEC before you plan the cables.

i NOTE The installer's calculation prevails over the factory sizes. The factory sizes are the minimum the UPS terminals are designed for.

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. 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 can also cover 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.

04

CHAPTER 4

Installation

Unpacking, the site, clearances and anchoring, the power terminals, the output configurations, the BB4US battery cabinet, parallel systems and communication.

⚠ WARNING

The UPS must be installed and wired only by qualified electricians, 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 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 installing it. Condensation can cause electric shock.

4.2 Dimensions

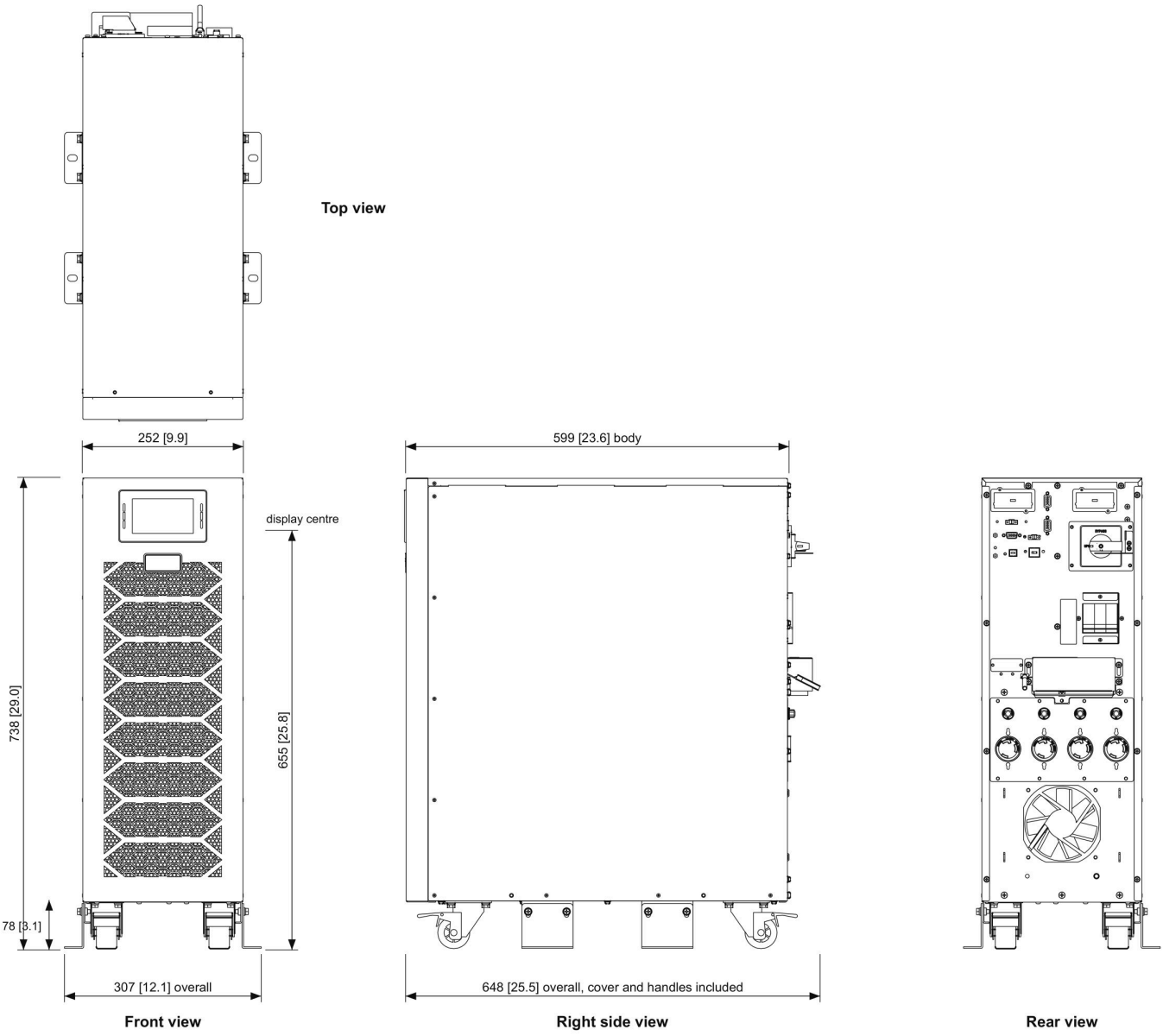


FIGURE 4-1 Top, front, right side and rear views (AEC drawing sheet 3), dimensions in mm [in]

TABLE 4-1 Dimensions and weight (AEC drawing sheet 3)

Item	Value
Body W × D × H	9.9 × 23.6 × 29.0 in (252 × 599 × 738 mm) — without casters' brackets, terminal cover and handles; height with casters
Overall width	12.1 in (307 mm), anchor brackets included
Overall depth	25.5 in (648 mm), terminal cover and handles included
Casters	4, two with brakes; height 3.1 in (78 mm)

Item	Value
Touchscreen center	25.8 in (655 mm) above the floor
Weight	6 kVA 196.2 lb (89 kg) · 10 kVA 235.9 lb (107 kg)

4.3 Site and environment

TABLE 4-2 Operating environment

Item	Requirement
Location	Indoors, ventilated, on a level floor rated for the weight; away from water, heat sources, flammable gases and corrosive agents
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	At least 19.7 in (500 mm) on all four sides — front, rear, left and right; front and rear vents open
Service access	From the rear (terminals, breakers) and the front (touchscreen)

TABLE 4-3 Floor plan and anchoring (AEC drawing sheet 6)

Item	Value
Floor area with clearances	49.3 × 63.0 in (1,252 × 1,599 mm)
Caster centers	6.9 in (176 mm) wide × 18.8 in (478 mm) deep
Anchor brackets	4, for fixed or seismic installation
Anchor slots	10 × 17 mm, 11.0 in (280 mm) apart across the cabinet, 7.4 in (188 mm) apart front to back
Anchors	M8, supplied by the installer

4.4 Placing the tower

1. Roll the tower into place on its casters.
2. Check the clearances: 19.7 in (500 mm) free on all four sides (Figure 4-2).
3. Lock the caster brakes.
4. For a fixed or seismic installation, anchor the 4 brackets to the floor with M8 anchors (Table 4-3).
5. If a BB4US cabinet is used, place it beside the UPS, within reach of its battery cable, with its own clearances.

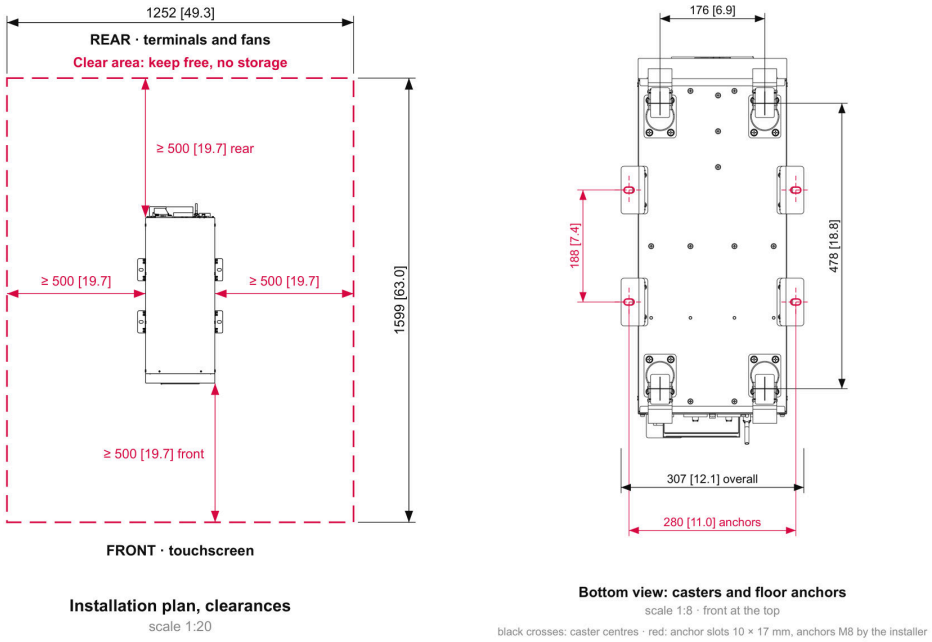


FIGURE 4-2 Installation plan and clearances (left, the red area stays free, no storage) and bottom view with the caster centers and the anchor slots 10 × 17 mm, front at the top (right) — AEC drawing sheet 6, scale reduced

4.5 Cooling

The UPS is cooled by forced air, **from front to rear**. The output-transformer fan exhausts at the rear.

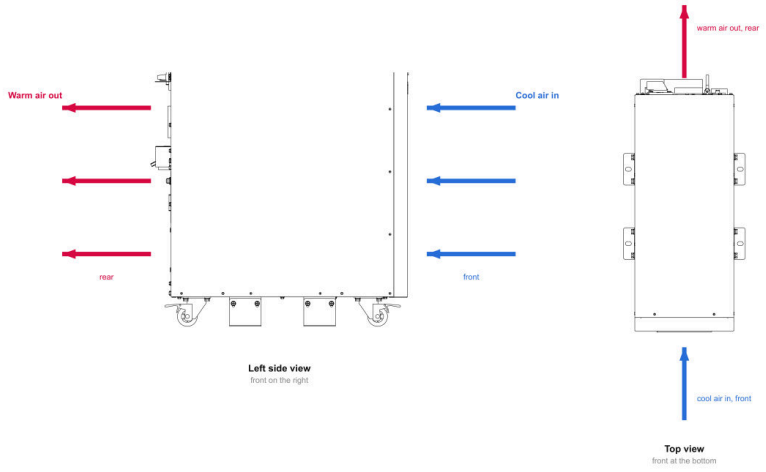


FIGURE 4-3 Air flow from front to rear: left side view, front on the right, and top view, front at the bottom (AEC drawing sheet 7)

- Keep 20 in (500 mm) free in front and behind the tower; do not block any vent.
- Do not install the UPS with the rear against a wall, or with its exhaust into another unit's intake.
- Size the room cooling for the UPS losses at full load (efficiency up to 93 %).

4.6 Electrical connection

> **⚠ WARNING**
>
> Switch off and lock out the utility supply before wiring. Open the BB4US battery breaker before opening any cover. Do not feed the UPS from a wall receptacle.

1. Check that the three input breakers Byp-L1, Mains-L1 and I/P-L2 (8 in Figure 2-5) are open.
2. Remove the terminal cover (9 in Figure 2-5).
3. Size the conductors and the branch-circuit protection as in Section 3.4.
4. Bring the cables in from below, through the terminal cover.
5. Connect the cables as shown in Section 4.7.

4.7 Terminal strip and wire order

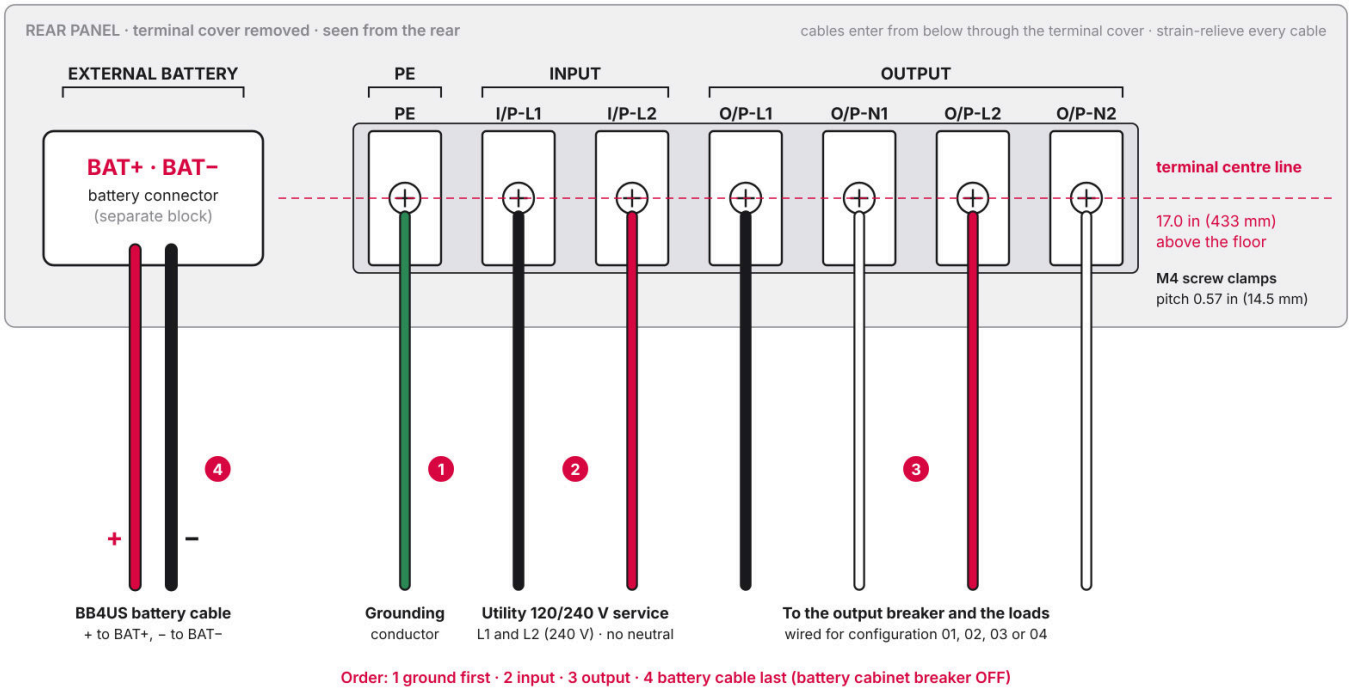


FIGURE 4-4 Power terminals and battery connector, seen from the rear with the terminal cover removed: wire order 1–4

The terminals on the unit: Figure 2-11; clamp, torque and wire sizes: Table 2-5.

TABLE 4-4 What to connect to each terminal

Marking	Connect	Cable (factory) 6 kVA / 10 kVA
PE	Equipment grounding conductor of the supply and of the loads — connect it first	As the largest phase conductor
I/P-L1	Service line L1 (240 V or 208 V to L2)	10 AWG (6 mm²) / 8 AWG (10 mm²)
I/P-L2	Service line L2	10 AWG (6 mm²) / 8 AWG (10 mm²)

Marking	Connect	Cable (factory) 6 kVA / 10 kVA
O/P-L1	Output leg 1, line	10 AWG (6 mm²) / 8 AWG (10 mm²)
O/P-N1	Output leg 1, neutral	10 AWG (6 mm²) / 8 AWG (10 mm²)
O/P-L2	Output leg 2, line	10 AWG (6 mm²) / 8 AWG (10 mm²)
O/P-N2	Output leg 2, neutral	10 AWG (6 mm²) / 8 AWG (10 mm²)
BAT+ (battery connector)	BB4US cable, positive	8 AWG (10 mm²) / 6 AWG (16 mm²)
BAT− (battery connector)	BB4US cable, negative	8 AWG (10 mm²) / 6 AWG (16 mm²)

1. **Ground first.** Connect the grounding conductor (green or green/yellow) to PE before any other wire.
2. **Input.** Connect service line L1 to I/P-L1 and service line L2 to I/P-L2. Do not connect a neutral to the input.
3. **Output.** Connect O/P-L1, O/P-N1, O/P-L2 and O/P-N2 for the configuration you chose, with its jumpers (Section 4.8).
4. **Battery, last.** If a BB4US cabinet is used, connect its cable to the battery connector BAT+ · BAT−, to the left of the strip (Section 4.9.1).
5. Tighten every screw to the torque on the terminal label.
6. Pull each wire gently to check it is held. Strain-relieve every cable.

> ⚠ ***WARNING***
>
> Reversed battery polarity damages the UPS. Always check the polarity with a voltmeter before closing the battery breaker.

After wiring

- Check every connection and refit 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.
- Re-check the tightness of the terminals after 24 hours of operation.

4.8 Output configurations

The isolation transformer makes 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.

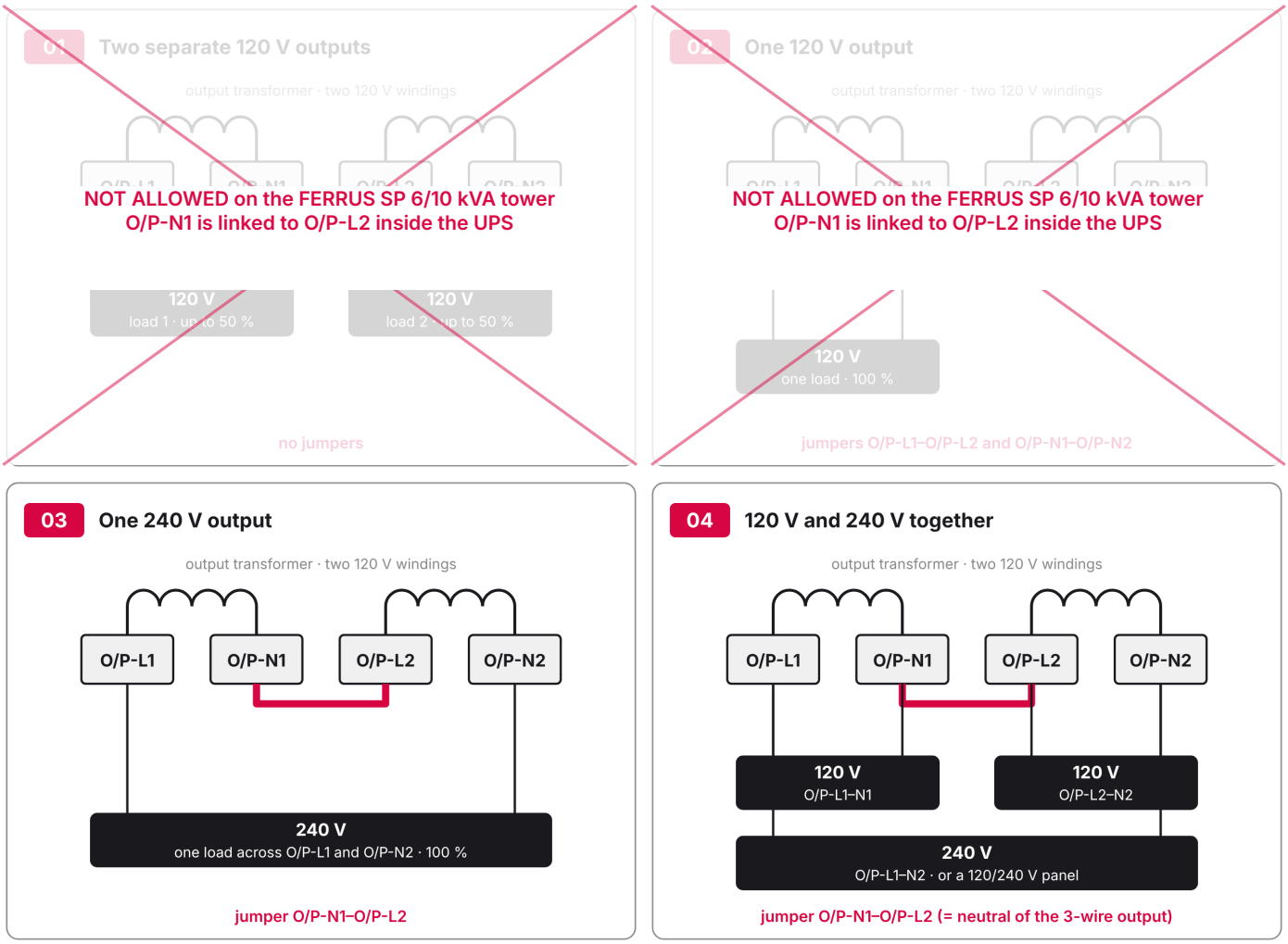


FIGURE 4-5 The four output configurations — jumpers in red, on the output terminals of the strip

TABLE 4-5 Output configurations

No.	Output	Jumpers	Loads
01	Two separate 120 V	none	**Not allowed on the FERRUS SP 6/10 kVA tower: see the warning below.**
02	One 120 V	O/P-L1–O/P-L2 and O/P-N1–O/P-N2	**Not allowed on the FERRUS SP 6/10 kVA tower: see the warning below.**
03	One 240 V	O/P-N1–O/P-L2	One load across O/P-L1–N2: the full rating at 240 V.
04	120 V and 240 V together	O/P-N1–O/P-L2	120 V on O/P-L1–N1 and O/P-L2–N2, 240 V on O/P-L1–N2. Split-phase 3-wire loads (180°): O/P-L1, O/P-N1 (= O/P-L2) as the neutral, and O/P-N2.

⚠ WARNING

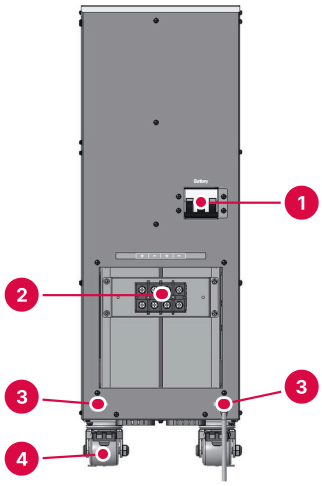
Use configuration 03 or 04 only. The FERRUS SP 6/10 kVA tower has two NEMA L6-30R (240 V) receptacles, so O/P-N1 is linked to O/P-L2 inside the UPS (factory). The jumpers of configuration 01 or 02 would short the transformer windings and damage the UPS. Configuration 04 feeds both receptacle types: the two NEMA L5-30R (120 V, 30 A) take the two legs, the two NEMA L6-30R (240 V, 30 A) the output across them. For 120 V loads only, use 04 and share the loads between the two legs (up to 50 % of the rating each). Keep the total load of the terminals and receptacles within the UPS rating.

4.9 Adding a BB4US battery cabinet

The BB4US is a steel cabinet 9.84 in (250 mm) wide on four casters. It is delivered empty or with 32, 64 or 80 blocks of 12 V 9 Ah already wired in strings of 16 on the 192 V DC bus of the FERRUS SP. The 16 blocks inside the UPS work together with the cabinet.



FIGURE 4-6 BB4US battery cabinet



1	Battery breaker (MCB)
2	DC terminal block, two strings (+ − + −)
3	Ground stud, one at each lower corner
4	Casters

FIGURE 4-7 BB4US, rear

TABLE 4-6 BB4US versions

Code	Blocks	Strings at 192 V	Weight	Set code
BB4US	empty: blocks to order	up to 5 strings of 16	110 lb	—
BB4US-32X9	32 × 12 V 9 Ah	2 strings of 16	297.2 lb	FERSP...-16X9+BB4US-32X9
BB4US-64X9	64 × 12 V 9 Ah	4 strings of 16	484.4 lb	FERSP...-16X9+BB4US-64X9
BB4US-80X9	80 × 12 V 9 Ah	5 strings of 16	578 lb	FERSP...-16X9+BB4US-80X9

4.9.1 The battery connector

The BB4US cable connects to the **battery connector BAT+ · BAT−**, a separate block on the rear panel to the **left** of the 7-terminal strip (10 in Figure 2-5, and Detail A in Figure 2-8). It is not on the terminal strip. Cable: 8 AWG (10 mm²) for the 6 kVA, 6 AWG (16 mm²) for the 10 kVA.

4.9.2 Connecting the cabinet, step by step

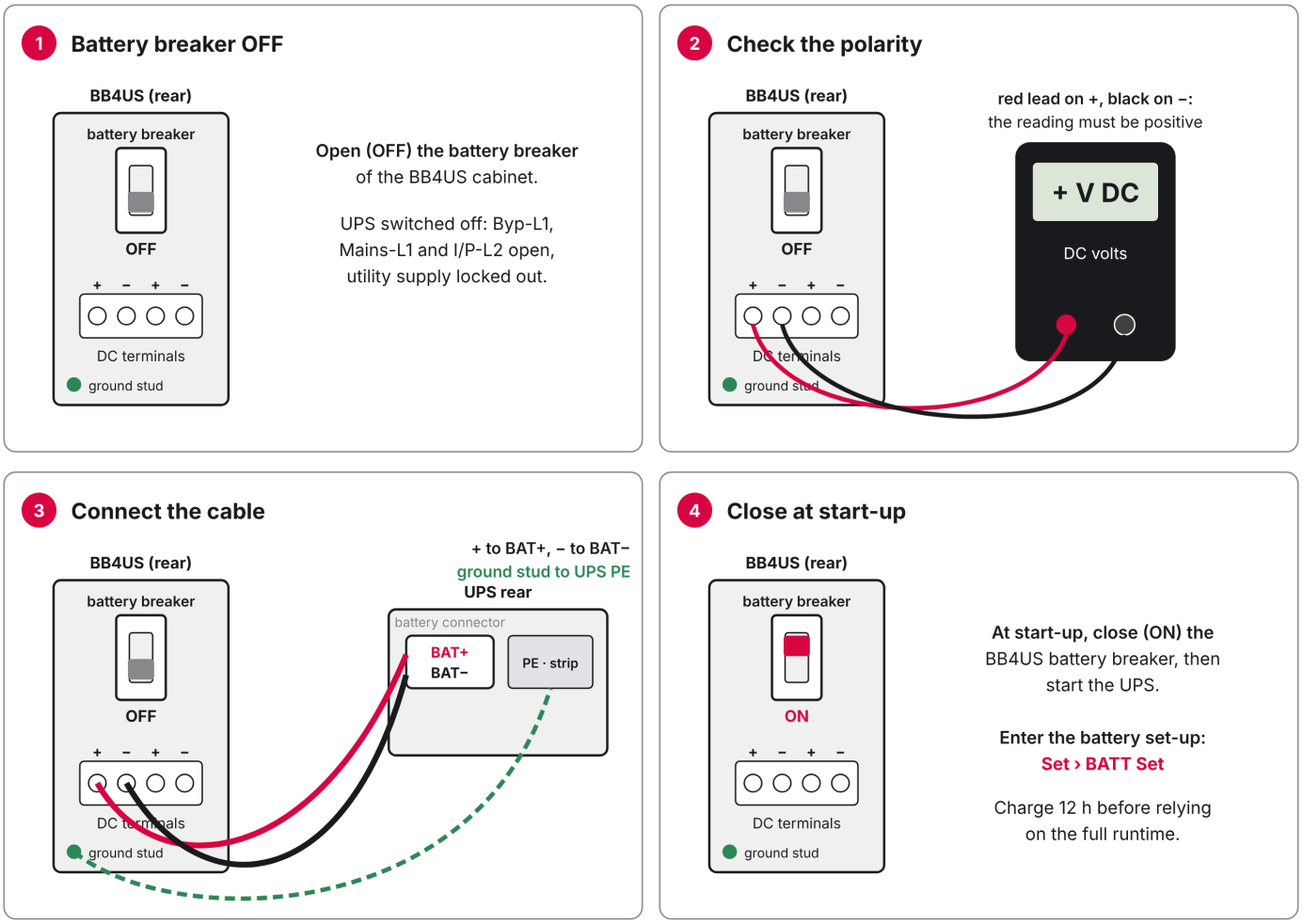


FIGURE 4-8 Connecting the BB4US battery cabinet: breaker off, polarity, cable, breaker on at start-up

> ⚠ ***CAUTION***
>
> Check the polarity of the battery cabinet with a voltmeter before connecting. Reversed polarity damages the UPS.

1. Switch the UPS off. Open Byp-L1, Mains-L1 and I/P-L2 and lock out the utility supply.
2. **Open the battery breaker of the BB4US cabinet** (OFF).
3. Connect the ground stud of the cabinet to PE of the UPS.
4. **Check the polarity with a voltmeter** (DC volts): red lead on +, black lead on −. The reading must be positive (192 V DC nominal for a string of 16 blocks). If the cabinet terminals are dead with the breaker open, check at the UPS end of the cable with the breaker closed for the measurement only, then open it again.
5. **Connect the BB4US cable to the UPS battery connector**: + to BAT+, − to BAT−.
6. Refit the covers. Leave the cabinet breaker open until start-up.
7. **At start-up, close the cabinet breaker** (ON) before the UPS input breakers (Section 5.2).
8. Enter the battery set-up on the touchscreen: **Set › BATT Set** — number of blocks per string (16), capacity in Ah, charger current (Section 6.4).

9. Charge for at least 12 hours before relying on the full runtime.

4.10 Parallel systems

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

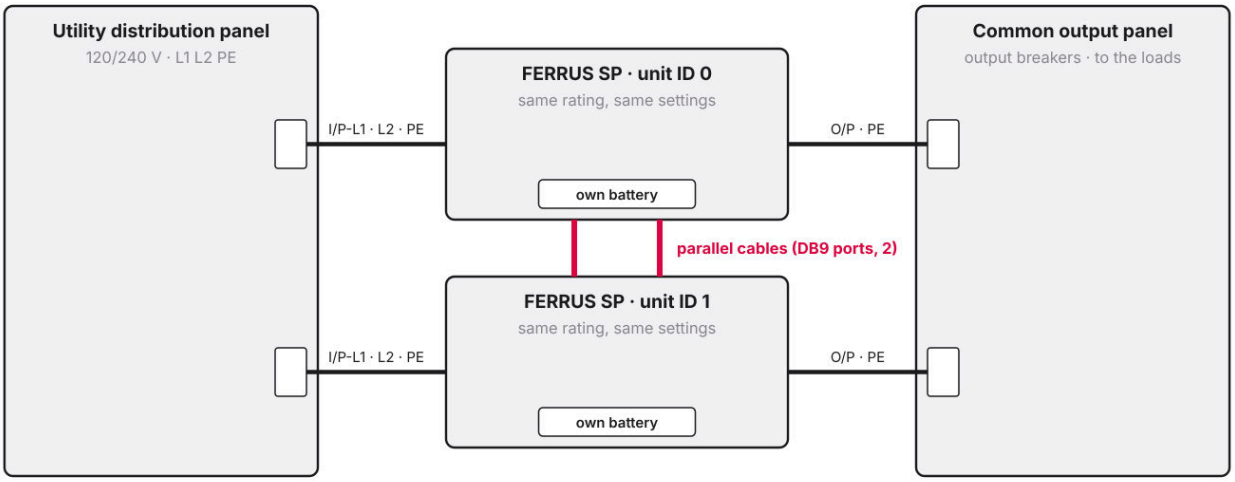


FIGURE 4-9 Parallel connection, two units

1. Use the parallel cables on the two DB9 parallel ports (2 in Figure 2-5), no longer than 10 ft (3 m).
2. Wire the input of each UPS as for a single unit.
3. Connect the outputs of all UPS to a common output breaker panel, with breakers of suitable rating.
4. Give each UPS its own battery.
5. Set each unit on the touchscreen (Section 7.8).
6. Use the same output configuration on every unit.

- 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.

4.11 Communication connections

Connect the monitoring and signal cables before starting the UPS — see Section 7.1. Keep communication cables (RS232, USB, EPO, parallel) away from power cables.

4.12 Installation checklist

- The UPS stands on its locked casters, with 19.7 in (500 mm) free on all four sides and open vents.
- Ground connected first; input and output tight; no neutral on the input.
- Battery cabinet cable on the battery connector BAT+ · BAT−, polarity checked.
- Output jumpers set for the chosen configuration; output breaker installed.

- Terminal cover refitted.
- BB4US battery breaker 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 the emergency power off.

The breakers and the maintenance bypass switch have three typical states. The procedures of this chapter refer to them.

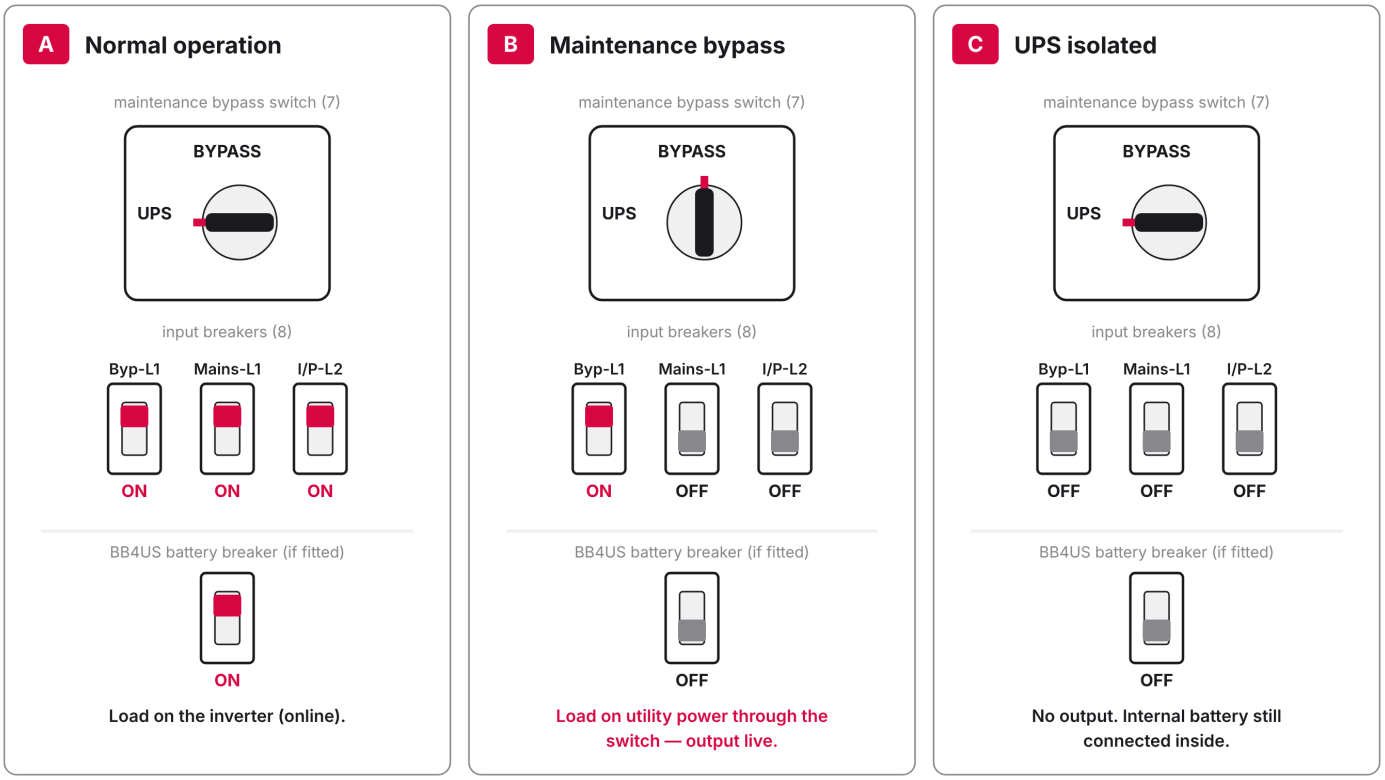


FIGURE 5-1 Breaker and maintenance bypass positions: A normal operation, B maintenance bypass, C UPS isolated. Numbers as in Figure 2-5

5.1 Before the first start

- The installation checklist is complete (Section 4.12).
- The loads are switched off.
- The battery set-up on the touchscreen matches the blocks installed (Section 6.4).

5.2 Starting on utility power

1. Check that the maintenance bypass switch is on **UPS** (Figure 5-1, A).
2. If a BB4US is connected, close its battery breaker.
3. Close the input breakers **Byp-L1**, **Mains-L1** and **I/P-L2**. The fans start and the touchscreen lights.
4. The rectifier starts. After about one minute the UPS goes to line (normal) mode and INV lights.
5. Check the home page: power flow from utility through rectifier and inverter to the load, no alarm.

6. Switch on the loads one at a time, the largest first.

5.3 Starting on battery (cold start)

1. If a BB4US is connected, make sure its battery breaker is ON.
2. Press the **COLD START** button on the rear panel once (A in Figure 2-7) to power the display.
3. After the buzzer sounds, start the inverter: **Control › Function › ON/OFF Control**.
4. After a few seconds the UPS runs in battery mode.

5.4 Transferring to bypass and back

- **To bypass: Control › Function › Manual Bypass** (the bypass must be normal). BYP lights.
- **Back to the inverter: Control › Function › Manual Transfer to Inverter**, or **Esc Manual Bypass**.

5.5 ECO mode

Set the system mode to ECO (engineer level, Set, page 2). 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.

5.6 Battery test

1. Check that the bypass is normal and the battery fully charged.
2. Open **Control › Test** and select **Battery Test**: a short discharge tests the batteries. **Stop Test** 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.

5.7 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.
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 available 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 5.10). Recharge it within 4 to 6 months.

5.8 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 5.7. 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 5.3).
"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.

5.9 Silencing the alarm

Touch the speaker icon at the top of the screen: the buzzer is muted and the Mute LED lights. A new alarm sounds again.

5.10 Shutting down

In normal mode

1. Switch off the loads.
2. Switch the inverter off: **Control › Function › ON/OFF Control**. The UPS transfers to bypass.
3. Open **Mains-L1**, **I/P-L2** and **Byp-L1**.
4. If a BB4US is connected, open its battery breaker (Figure 5-1, C).
5. The UPS still has its internal battery. Switch it off completely with the power button on the front panel, so that it does not discharge the battery.

In battery mode

1. Switch the inverter off with **Control › Function › ON/OFF Control**.
2. The UPS goes to no-output mode: the display goes off and there is no output voltage.

5.11 Maintenance bypass

Use the maintenance bypass to keep the load on utility power while the UPS is serviced.

1. Transfer the UPS to bypass: **Control › Function › Manual Bypass**. BYP lights.

2. If a BB4US is connected, open its battery breaker.
3. Turn the maintenance bypass switch (7 in Figure 2-5) to **BYPASS**: the load stays on utility power.
4. Open **Mains-L1** and **I/P-L2**. Leave **Byp-L1** closed: on the AEC single-line diagram the maintenance bypass is fed through it (Figure 5-1, B).
5. Switch the UPS off with the power button on the front panel, so that it does not run from its internal battery. The UPS can now be serviced.

To return to normal operation

1. Close **Mains-L1** and **I/P-L2**; wait until the rectifier has started.
2. Turn the maintenance bypass switch to **UPS**.
3. If a BB4US is connected, close its battery breaker.
4. Select **Control › Function › Manual Transfer to Inverter**. INV lights (Figure 5-1, A).

> ⚠ ***WARNING***
>
> With the maintenance bypass on, the output terminals and receptacles stay live from the utility. The input terminals, Byp-L1 and the bypass circuit are live too. The internal battery stays connected inside the UPS.

5.12 Emergency power off

Opening the EPO loop stops the output at once (Section 7.7). To restart:

1. Close the loop again.
2. Clear the alarm: **Control › Function › Fault Clear**.
3. Start the inverter: **Control › Function › ON/OFF Control**.

06

CHAPTER 6

Touchscreen

The AEC color touchscreen: the panel, the home page, readings, alarms, 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.

6.1 The touchscreen on the unit

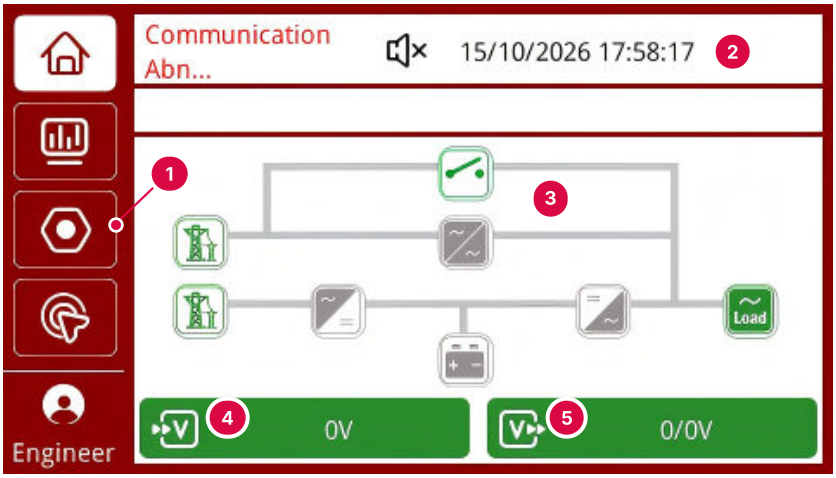


1. Color touchscreen
2. ALM — alarm
3. BYP — bypass
4. BAT — battery
5. INV — inverter
6. Mute — buzzer silenced
7. Power button

FIGURE 6-1 The display panel on the front of the UPS

The color touchscreen sits on the front of the UPS, with the status LEDs on its left and the power button on its right. 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 and Control; the user level logged in at the bottom (User or Engineer)
2. Status bar — the current message (for example an alarm), the buzzer mute icon, date and time
3. Power flow — input, bypass, rectifier, inverter, battery and load: green = active, grey = not active
4. Input voltage
5. Output voltage of the two legs, L1/L2

FIGURE 6-2 Home page

Two access levels: **User** reads the pages and mutes the buzzer; **Engineer** also changes the settings and runs the commands of Control. Touch the speaker icon in the status bar to mute the alarm.

6.3 Data (readings)

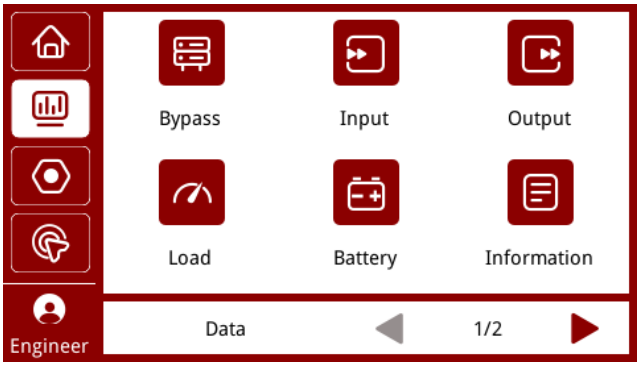


FIGURE 6-3 Data, page 1

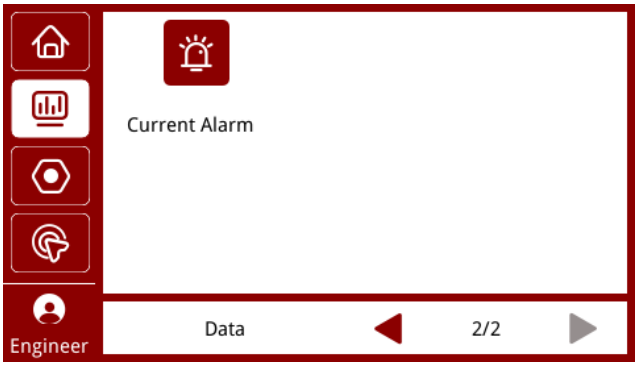


FIGURE 6-4 Data, page 2 — Current Alarm

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.

Page	Shows
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 (page 1 of 2).
Current Alarm	The alarms present now, with number, date and time (Table 10-2).

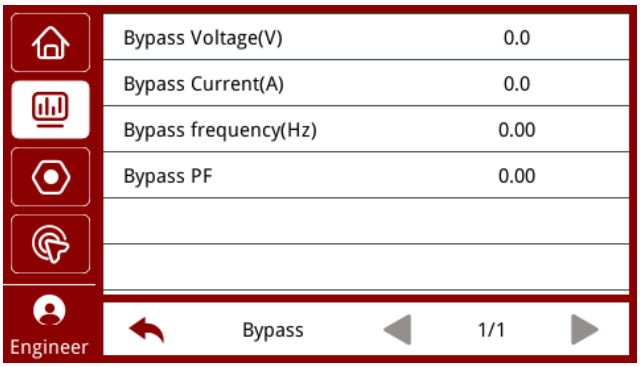


FIGURE 6-5 Data — Bypass

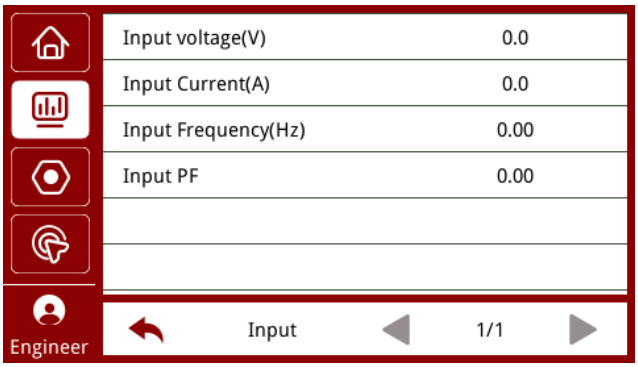


FIGURE 6-6 Data — Input

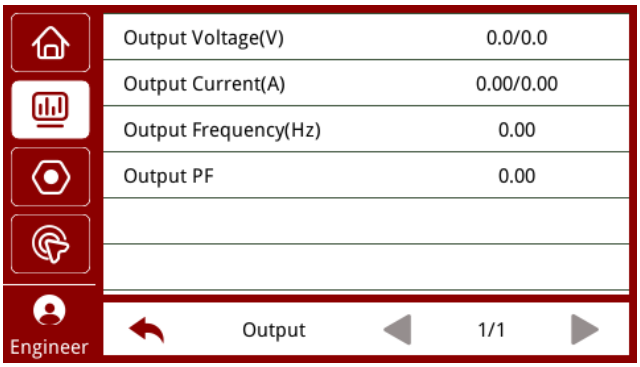


FIGURE 6-7 Data — Output

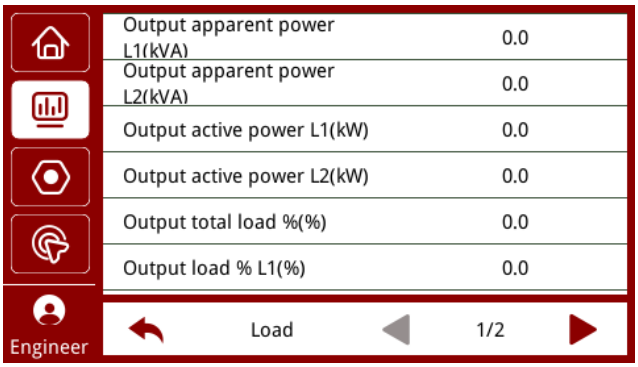


FIGURE 6-8 Data — Load

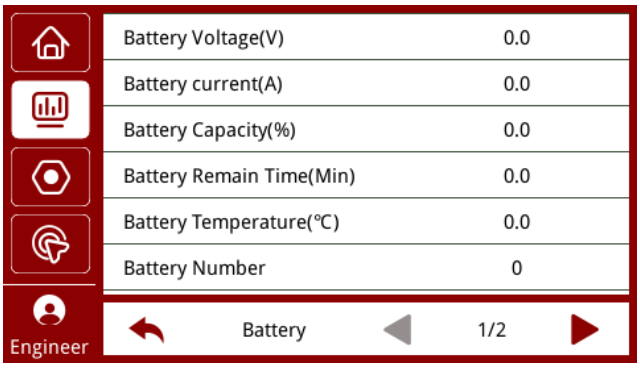


FIGURE 6-9 Data — Battery

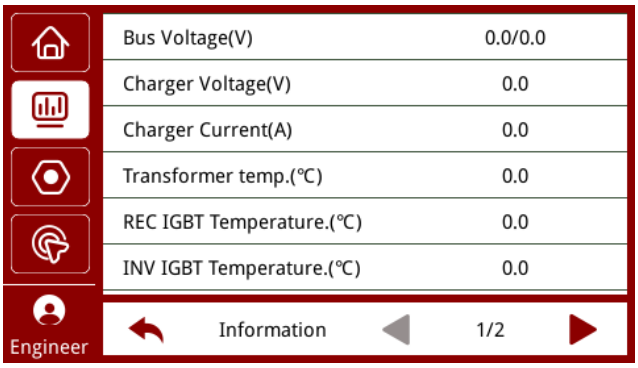


FIGURE 6-10 Data — Information

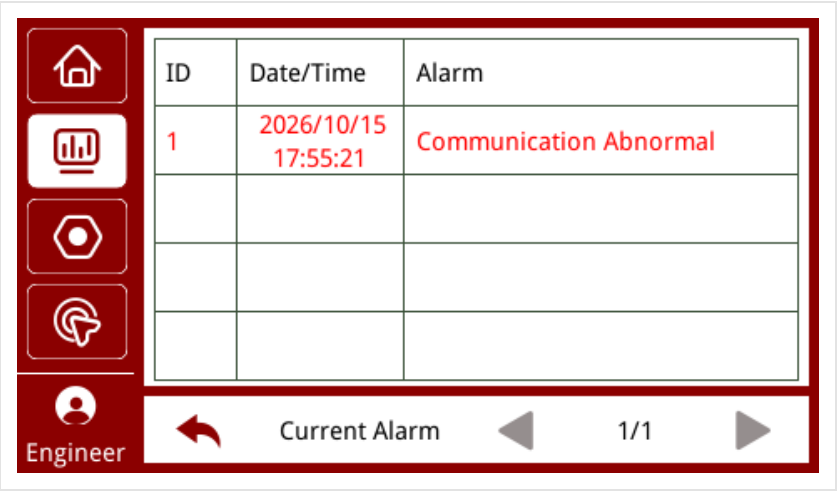
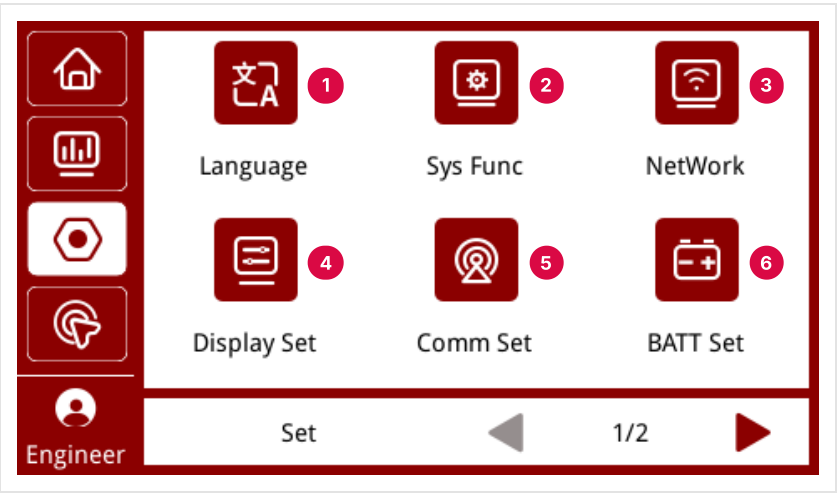


FIGURE 6-11 Data › Current Alarm: the alarms present, with date and time

6.4 Set (settings)

⚠ CAUTION

Settings change how the UPS works. Only qualified personnel, logged in as Engineer, may change them. The number of batteries set must equal the number 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

FIGURE 6-12 Set, page 1

TABLE 6-2 Set pages

Page	Settings
Language	Display language: English, Español, Русский, 简体中文, 繁體中文 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).

Page	Settings
Display Set	Protocol type, display orientation (horizontal), 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, capacity (Ah), charge current and charge voltages (Table 8-2).
Set, page 2	The system settings — system mode (single, parallel or ECO), parallel number and ID, rated values (Rate Set), dry contacts — engineer level, at commissioning.



FIGURE 6-13 Language

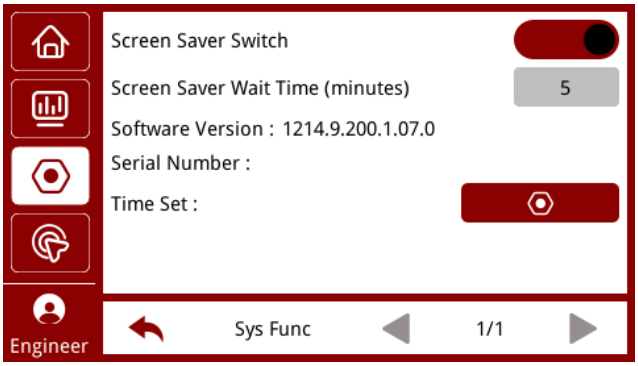


FIGURE 6-14 Sys Func

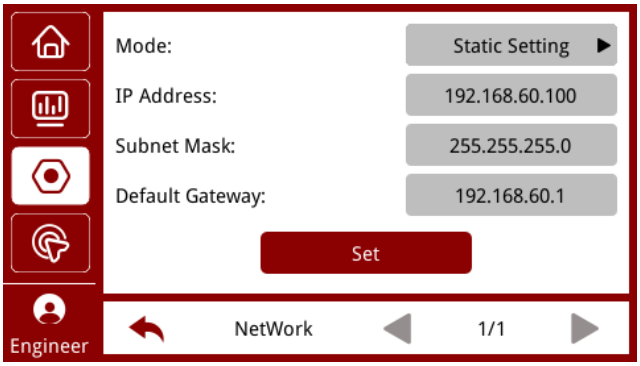


FIGURE 6-15 NetWork

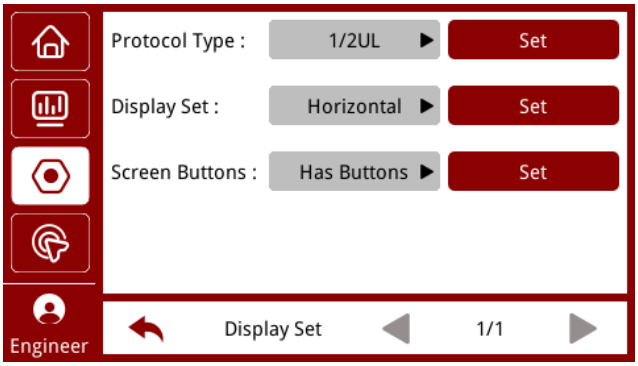


FIGURE 6-16 Display Set

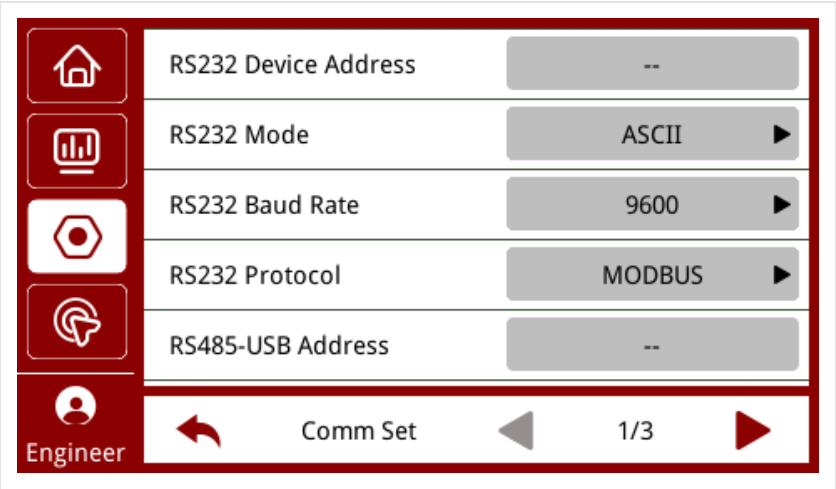


FIGURE 6-17 Comm Set, page 1

6.5 Control

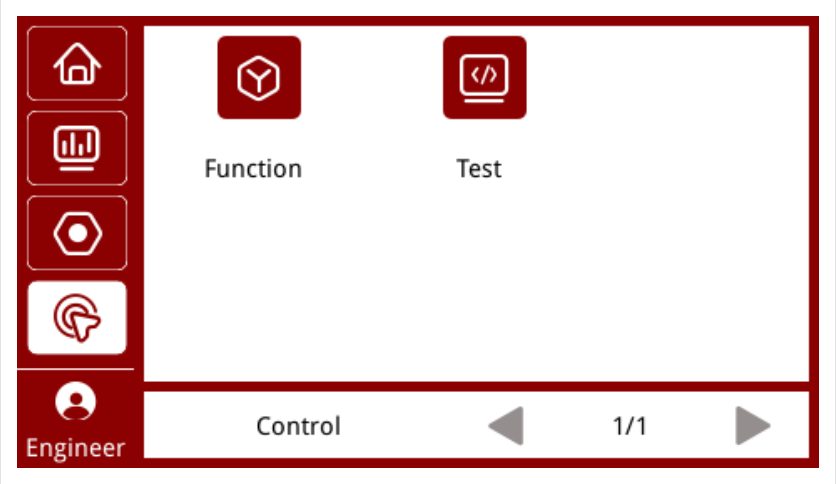


FIGURE 6-18 Control

TABLE 6-3 Control pages

Page	Commands
Function	Manual Transfer to Inverter · Manual Bypass (the bypass must be normal) · Esc 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.

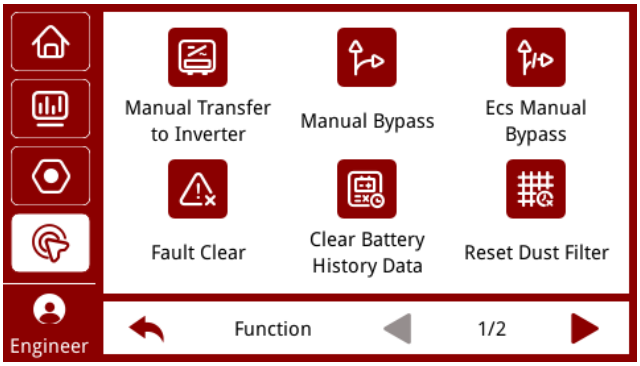


FIGURE 6-19 Control — Function

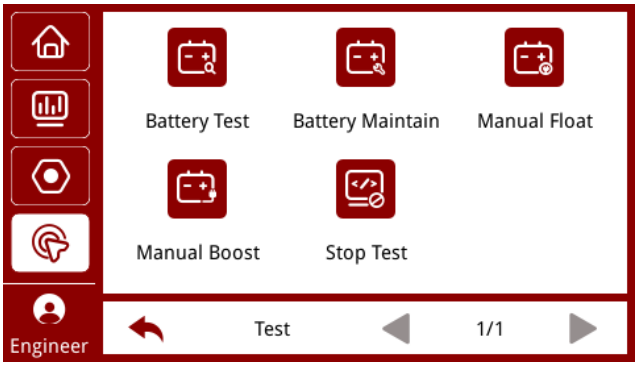


FIGURE 6-20 Control — Test

CHAPTER 7

07 Communication and monitoring

The ports, the SNMP-M network card, UPS View, the intelligent slot, Modbus, EPO and the parallel setting.

7.1 Communication ports

The ports are on the upper part of the rear panel (Figure 2-7).

TABLE 7-1 Communication ports

No.	Port	Use
4	RS-232	DB9, for monitoring software.
3	RS-485	Modbus link (protocol, baud rate and address in **Set › Comm Set**).
6	USB	Monitoring software.
1	Intelligent slots	Two: SNMP-M card and dry-contact card at once.
5	EPO	Normally closed loop: opening it stops the output.
2	Parallel ports	Two, DB9, for the parallel cables.
B	Network (touchscreen)	ETHERNET port; IP settings in **Set › NetWork** (192.168.60.100 as shipped).

7.2 SNMP-M network card

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 an intelligent slot with the UPS off.

7.3 Setting up the SNMP-M card

1. Fit the card in the intelligent slot 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 (card web page › Sys Set › Device) 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.

7.4 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.
2. Start UPSView. Set **Equip Type** to **1/1(6-20kVA)**, the Modbus mode (ASCII or RTU), the baud rate and address 1 as set on the UPS in **Set › Comm Set**.
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.

UPS View talks Modbus only. The RS-232 port does not answer while the UPS protocol is set to Megatec; "Megtec" is a protocol setting of the SNMP-M card only (Section 7.3).

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.

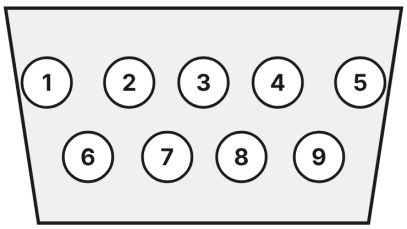
✓ TIP The AEC UPS View Monitor User Manual (AEC-UM-UPSV-US) describes every UPSView page; the SNMP-M User Manual describes the card's web interface. Both are in the AEC app, Support › Downloads › SNMP › SNMP-M.

7.5 Dry-contact card

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 (Table 7-4).

7.6 Intelligent slot

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



DB9 or terminal block (same pin numbers)

1	**UPS fault**	low = fault
2	**Normal warning**	low = abnormal
3	**GND**	signal ground
4	**Remote shutdown**	input · high = off
5	**Power supply**	12–24 V DC
6	**Bypass mode**	high = on bypass
7	**Battery low**	low = battery low
8	**Normal mode**	high = normal
9	**Utility fault**	low = utility fail

FIGURE 7-1 Intelligent slot — DB9 connector / 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.

7.7 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 (5 in Figure 2-5) activates it. To restart, see Section 5.12.

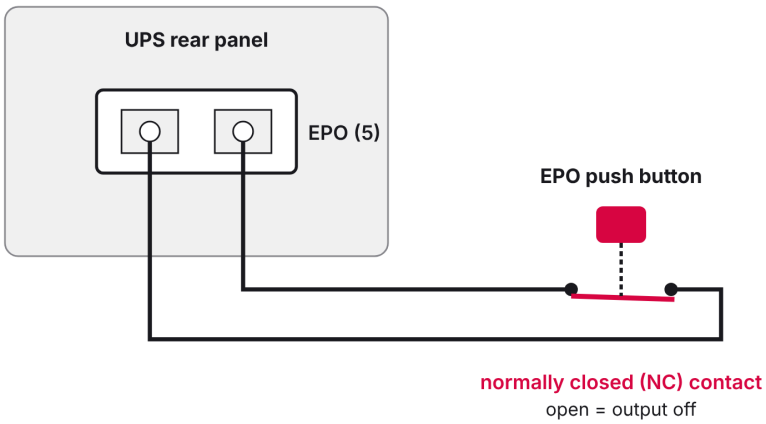


FIGURE 7-2 EPO switch wiring (normally closed)

7.8 Parallel setting

1. In the system settings (Set, page 2) 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 4.10).

08

CHAPTER 8

Battery and runtime

The internal battery, the BB4US cabinet, the battery settings and the runtime by load.

8.1 Runtime

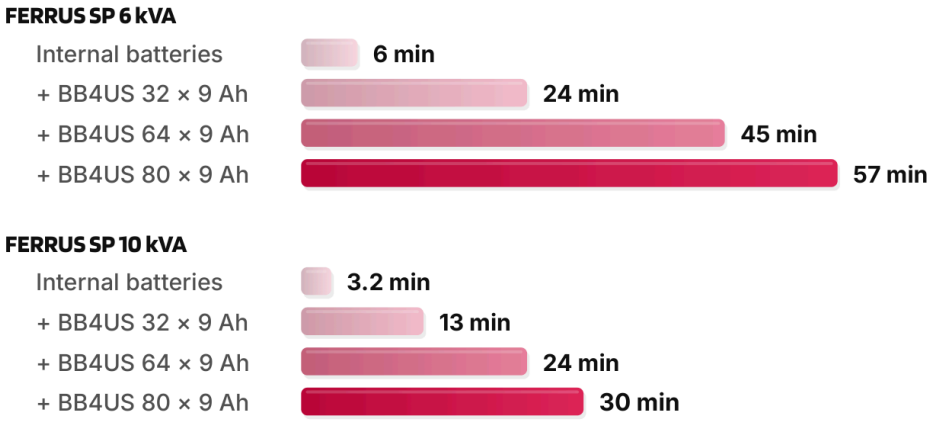


FIGURE 8-1 Backup time at full load. At lighter loads it is longer

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

Set-up	100 %	75 %	50 %	25 %
6 kVA, internal batteries	6	8.7	14	36
6 kVA + BB4US-32X9	24	31	56	107
6 kVA + BB4US-64X9	45	59	107	202
6 kVA + BB4US-80X9	57	74	135	254
10 kVA, internal batteries	3.2	4.6	7.5	19
10 kVA + BB4US-32X9	13	17	30	56
10 kVA + BB4US-64X9	24	32	57	107
10 kVA + BB4US-80X9	30	40	72	135

With a BB4US the 16 blocks inside the UPS work together with the cabinet (48, 80 or 96 blocks in all). Runtimes at 77 °F (25 °C) with new, fully charged batteries, from AEC published data.

8.2 Battery system

TABLE 8-2 Battery system

Item	Value
Internal battery	16 × 12 V 9 Ah VRLA, sealed, one string; the compartment takes up to 20 blocks

Item	Value
DC bus	192 V DC (strings of 16 blocks)
Blocks per string	10, 12, 16, 18 or 20, set on the touchscreen (120–240 V DC)
External battery	BB4US cabinet on the battery connector BAT+ · BAT− (Section 4.9.1)
Battery current, max.	43 A (6 kVA) · 65 A (10 kVA)
Charger current	1 A as standard; 1 to 8 A for long-backup set-ups, set in **Set › BATT Set**

Charger current and capacity. Raise the charger current above 1 A only for a long-backup set-up whose total capacity is above 24 Ah, to avoid overcharging. The capacity is 9 Ah per string of 16 blocks: internal only, 9 Ah; with a BB4US-32X9, 27 Ah (3 strings); BB4US-64X9, 45 Ah (5 strings); BB4US-80X9, 54 Ah (6 strings).

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 5.6).
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).
As in Table 9-2	Replace the fans and capacitors; 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 BB4US battery breaker before opening 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 the internal batteries

> ⚠ ***WARNING***
>
> Only qualified personnel who know batteries may replace them. Read Section 9.6 first.

1. Put the UPS on maintenance bypass (Section 5.11). Open the BB4US battery breaker, if fitted.
2. Remove both side covers.
3. Disconnect the battery wires one at a time.
4. Remove the metal bars that hold the batteries.
5. Replace the batteries one at a time, all with blocks of the same type and age.
6. Refit the metal bars and reconnect the wires one at a time. Take care when connecting the last wire: the string is live.
7. Refit the covers, close the BB4US battery breaker and return the UPS to the inverter.

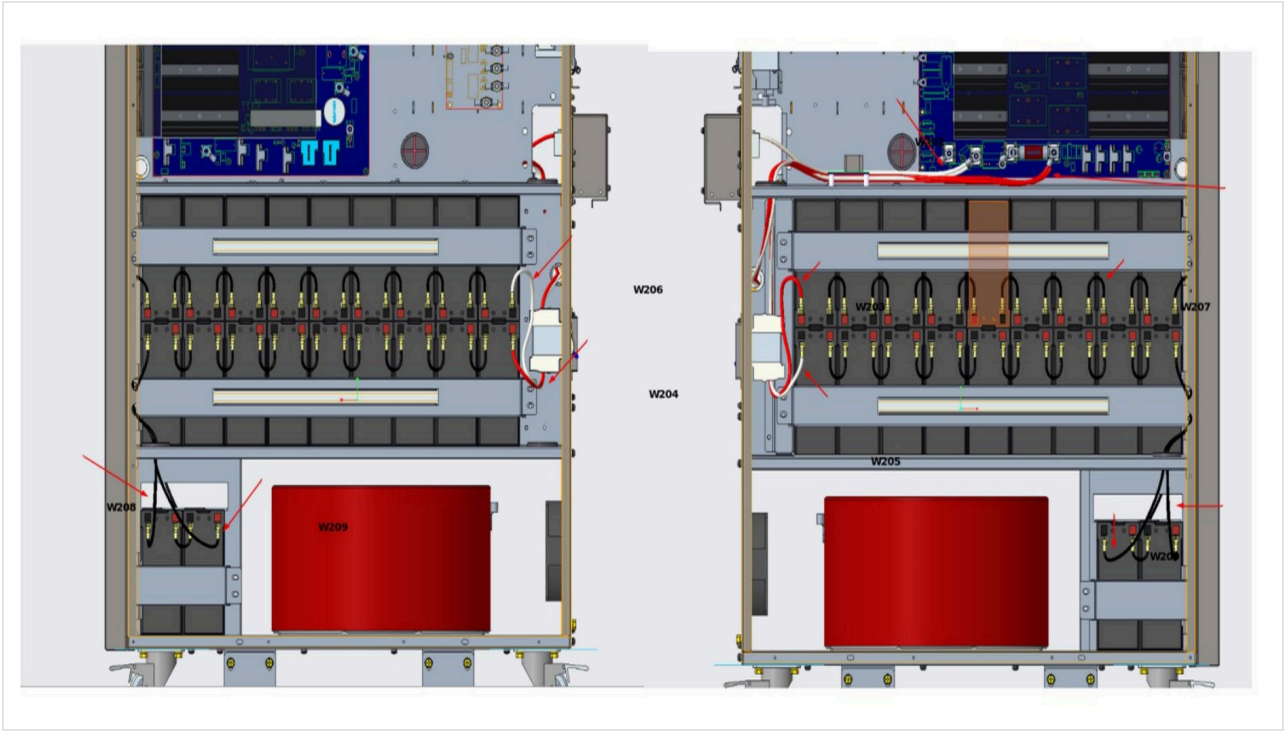


FIGURE 9-1 Battery cable connection inside the 6 / 10 kVA tower, side panels removed

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: under-rated cables can overheat and cause fire.
- 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 touching them.
- Even with the input breakers open, the internal circuits stay connected to the batteries. Before any maintenance, open the BB4US battery breaker or disconnect the link wire between battery blocks.
- Recycle used batteries according to local regulations.

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 every 4 to 6 months.
- Transport upright, in the original packaging.

CHAPTER 10

10 Troubleshooting

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

✓ TIP **AEC technical support — 24/7.** WhatsApp and phone +1 786 553 2100, always available · 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, and **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 breakers and the utility supply; on battery, press COLD START (Section 5.3).
The UPS runs on battery with utility present	Check the input voltage (176–275 V, L1–L2) and Mains-L1 · I/P-L2; 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 (Section 9.5).
No network access	Check **Set › NetWork** and the SNMP-M card.
The building breaker trips when the UPS starts	The breaker or conductors are smaller than Section 3.4 requires; check the wiring.
Wrong output voltage (120 V instead of 240 V or the reverse)	Check the output jumpers (Section 4.8) and the rated values (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 7.8).
A receptacle has no output	Press its output surge protection reset button (11 in Figure 2-5); if it trips again, check the load.

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 BB4US battery breaker is 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.

No.	Alarm	Cause and action
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.
5	Bypass phase sequence reversed	Check whether the bypass input is phase-reversed.
6	Bypass abnormal	Bypass voltage or frequency out of the set range: check the bypass supply and Byp-L1.
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 6–10 kVA, which has no input 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 bypass switch is on BYPASS: 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 BB4US breaker and check the cable on BAT+ · BAT−.
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, the transformer fan 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 and the battery set-up.

11

CHAPTER 11

Specifications

Electrical, mechanical and environmental data.

TABLE 11-1 FERRUS SP 6–10 kVA specifications

	6 kVA	10 kVA
Power (VA / W)	6,000 / 6,000	10,000 / 10,000
Input		
Connection	I/P-L1, I/P-L2 (120/240 V or 120/208 V service, L1–L2) and PE; no neutral	same
Voltage · frequency	240 V or 208 V nominal; 176–275 V AC (L1–L2) at full load · 40–70 Hz	same
Power factor	> 0.99 at full load	same
Current, max.	36 A	63 A
Input breakers	3 × 63 A 1-pole: Byp-L1 · Mains-L1 · I/P-L2	same
Output		
Voltage	120/240 V split phase, 60 Hz (rated voltage per leg 110 / 115 / 120 / 127 V and 50 Hz are settings)	same
Current per 120 V leg	25 A (27 / 26 / 25 / 24 A at 110 / 115 / 120 / 127 V)	42 A (45 / 43 / 42 / 40 A)
Regulation · frequency	1 % · 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 %	same
Outlets	terminal strip · 2 × NEMA L5-30R · 2 × NEMA L6-30R, with resettable output surge protection	same
Battery		
Configuration	16 × 12 V 9 Ah inside (the compartment takes up to 20 blocks); BB4US cabinets on BAT+ · BAT–	same
DC voltage	192 V DC	same
Battery current, max.	43 A	65 A
Backup at 50 % · 100 %	14 · 6 min	7.5 · 3.2 min
General		
Communication	RS-232 · RS-485 · USB · 2 intelligent slots (SNMP-M and dry contacts) · EPO · 2 parallel ports	same
Parallel	up to 3 units, N+1	same
Cooling	Forced air, front to rear	same

	6 kVA	10 kVA
Environment	32–104 °F (0–40 °C) · RH < 95 % · 3,300 ft (1,000 m) at full power	same
Body W × D × H	9.9 × 23.6 × 29.0 in (252 × 599 × 738 mm)	same
Overall W × D	12.1 × 25.5 in (307 × 648 mm)	same
Weight	196.2 lb (89 kg)	235.9 lb (107 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. Dimensions and terminals: AEC drawings AEC-FSP-0610-01…07.

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 %

A

APPENDIX A

Ordering codes and accessories

The FERRUS SP 6–10 kVA codes, the BB4US cabinets and the cards.

TABLE A-1 FERRUS SP ordering codes

Code	Description
FERSP6000-16X9	FERRUS SP 6 kVA split-phase online UPS, tower, internal batteries
FERSP6000-16X9+BB4US-32X9 · -64X9 · -80X9	FERRUS SP 6 kVA with BB4US cabinet, 32 / 64 / 80 × 12 V 9 Ah
FERSP10000-16X9	FERRUS SP 10 kVA split-phase online UPS, tower, internal batteries
FERSP10000-16X9+BB4US-32X9 · -64X9 · -80X9	FERRUS SP 10 kVA with BB4US cabinet, 32 / 64 / 80 × 12 V 9 Ah
BB4US	Battery cabinet, tower, 192 V DC, empty
BB4US-32X9 · -64X9 · -80X9	Battery cabinet, tower, 192 V DC, 32 / 64 / 80 × 12 V 9 Ah
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 BB4US battery cabinet drawings

Dimensions, rear view and DC terminals of the BB4US battery cabinet. Dimensions in mm [in].

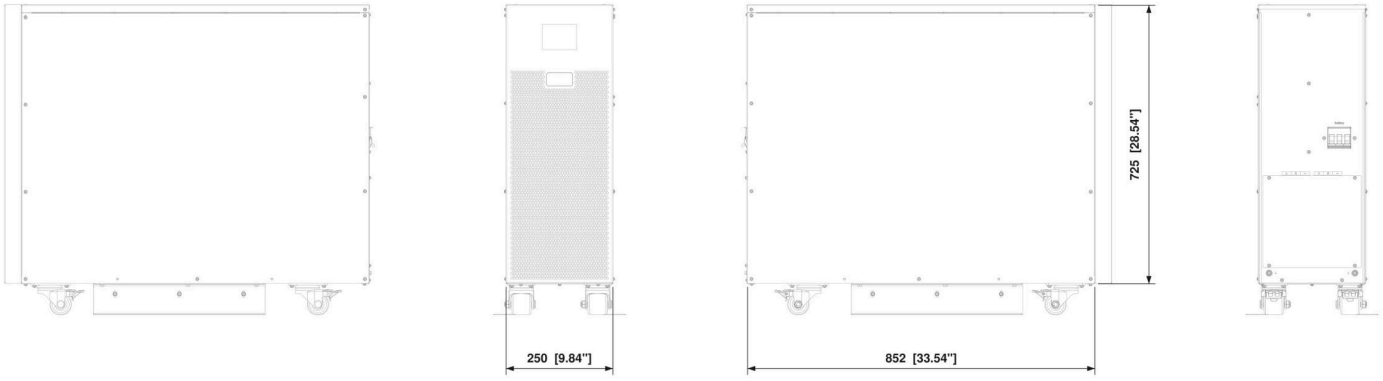
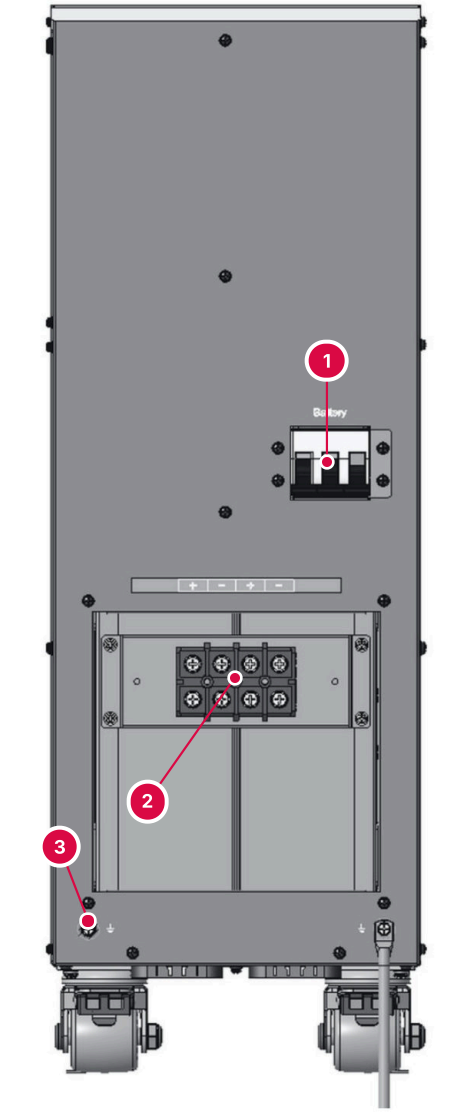


FIGURE B-1 BB4US — side, front, side and rear views: 250 mm [9.84 in] wide, 852 mm [33.54 in] deep, 725 mm [28.54 in] high (cabinet body, without casters and side rails)



1. Battery breaker (MCB)
2. DC terminal block
3. Ground stud

FIGURE B-2 BB4US — rear view

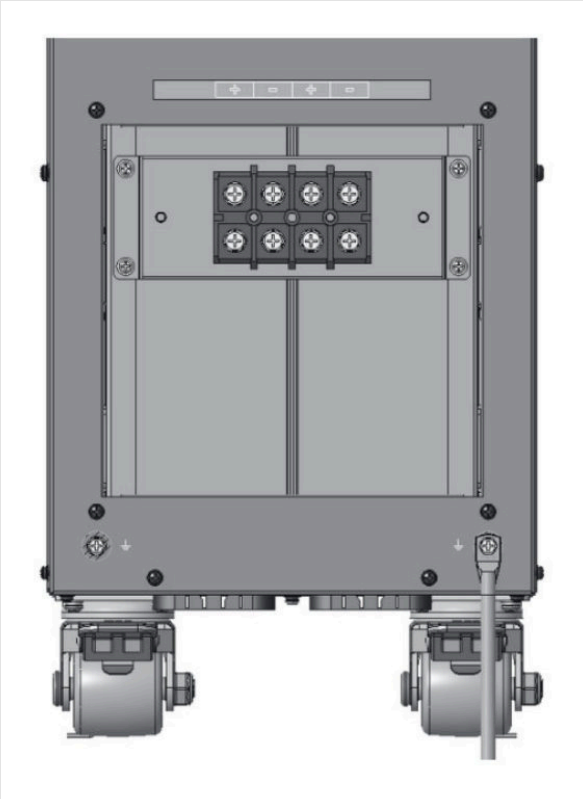


FIGURE B-3 BB4US — DC terminal block for two strings (+ − + −), as marked on the rear identification strip

TABLE B-1 BB4US data

Item	Value
Cabinet body W × D × H	9.84 × 33.54 × 28.54 in (250 × 852 × 725 mm)
Block	12 V 9 Ah VRLA
Blocks installed	32, 64 or 80 (or empty, blocks to order)
DC bus	192 V DC (16 blocks per string)
Breaker, terminals	Battery MCB and DC terminals at the rear; two ground studs
Casters	4

APPENDIX C

C AEC drawings

The AEC drawing set of the FERRUS SP 6 · 10 kVA, AEC-FSP-0610-01…07, Rev. A, drawn from the factory 3D model.

TABLE C-1 AEC drawing set FERRUS SP 6 · 10 kVA

Drawing no.	Sheet	Drawing name	In this manual
AEC-FSP-0610-01	1	Drawing list	this table
AEC-FSP-0610-02	2	Single-line diagram and ratings	Figure 2-17, Table 3-3
AEC-FSP-0610-03	3	Appearance diagram	Figure 4-1, Table 4-1
AEC-FSP-0610-04	4	Rear panel and connections	Figure 2-5, Table 2-3
AEC-FSP-0610-05	5	Power terminals, dimensions	Figure 2-8, Table 2-4
AEC-FSP-0610-06	6	Installation and clearances	Figure 4-2, Table 4-3
AEC-FSP-0610-07	7	Cooling diagram	Figure 4-3

General notes of the drawing set:

- All views are hidden-line projections of the factory 3D model.
- Dimensions in millimeters, inches in brackets. Heights are from the floor, casters included.
- Installation to the National Electrical Code (NFPA 70) and local codes, by qualified personnel only.
- Subject to change without notice. Do not scale the drawings.

D

APPENDIX D

Warranty

What the warranty covers.

TABLE D-1 Warranty

Item	Coverage
FERRUS SP UPS	3 years
VRLA batteries	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.

E

APPENDIX E

Acronyms and abbreviations

The terms used in this manual.

TABLE E-1 Acronyms and abbreviations

Term	Meaning
AWG	American Wire Gauge
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
I/P · O/P	Input · output (terminal markings)
MCB	Miniature circuit breaker
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 F

Quick reference

The touchscreen paths and panel parts used most often.

TABLE F-1 Quick reference

Task	How
Start the inverter	**Control › Function › ON/OFF Control**
Start without utility (cold start)	COLD START button on the rear panel, then ON/OFF Control
Transfer to bypass	**Control › Function › Manual Bypass**
Return to the inverter	**Control › Function › Manual Transfer to Inverter**
Maintenance bypass	Manual Bypass → BB4US breaker off → switch to BYPASS → Mains-L1 and I/P-L2 off (Section 5.11)
Silence the buzzer	Speaker icon, top of the screen
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	**Set › BATT Set**
Rated voltage and frequency	Set, page 2 (Rate Set) — engineer, at commissioning
Single / parallel / ECO	Set, page 2 (system mode) — engineer, at commissioning
Network address	**Set › NetWork**
Date, time, serial number	**Set › Sys Func**
Language	**Set › Language**

APPENDIX G

Frequently asked questions

Short answers to the questions users ask most.

TABLE G-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: a BB4US cabinet on the battery connector BAT+ · BAT− (Section 4.9). Enter the new battery set-up in **Set › BATT Set**.
Where does the battery cabinet cable go?	To the separate battery connector BAT+ · BAT−, left of the terminal strip — not to the strip.
Does the input need a neutral?	No. The input is I/P-L1 and I/P-L2 of the 120/240 V or 120/208 V service (240 V or 208 V between them) plus PE.
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 plug a power strip into the UPS?	Only a plain power strip within the rating of the receptacle. 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 O/P-L1 and O/P-N2 (configuration 03 or 04). A 120/240 V three-wire load uses O/P-L1, O/P-N2 and the jumpered O/P-N1–O/P-L2 as its neutral.
Why are there two access levels?	The User level reads data and alarms and silences the buzzer; the Engineer level changes settings and runs tests, so that nobody changes the UPS by mistake.

APPENDIX H

H 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 H-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)	
Anchored (yes / no) and clearances checked	
Battery set-up (internal, BB4US model)	
BB4US polarity checked (voltage read)	
Battery capacity set (Ah) and charger current	
Output configuration (03 or 04)	
Rated output voltage per leg	
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), the alarm or event shown, the load and the battery set-up — a photo of the display and of the label speeds things up on WhatsApp.