MODULAR ONLINE UPS · THREE-PHASE 480/277 V

CIRRO

60–1,600 kVA

Modular three-phase online double-conversion UPS on five frames, CIRRO 360 to CIRRO 1600, with hot-swappable 60 and 100 kVA power modules, N+X redundancy and the AEC color touchscreen.



User Manual

Installation · Operation · Maintenance

CIRRO 360 | CIRRO 600 | CIRRO 800 | CIRRO 1200 | CIRRO 1600 | 60 · 100 kVA modules

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AEC-UM-CIR-US · Rev. F · November 2026. Rev. F fills the installation data from the manufacturer's data for the 100 kVA module platform (clearances, bolts and torque, cable entry, input and battery currents), sizes every breaker and conductor to NEC 125 %, settles the CIRRO 800 breaker section, adds call-out pictures for every frame, panel, breaker state and screen, and removes the factory references.

BEFORE YOU START

About this manual

Thank you for choosing an AEC CIRRO UPS. This manual describes the CIRRO modular UPS on the 360, 600, 800, 1200 and 1600 frames: safety, the frames and modules, planning, installation, operation, the AEC touchscreen, communication, the battery, maintenance, troubleshooting and the specifications. Read it before you start, and keep it near the UPS.

MODELS COVERED

CIRRO 360 (6 × 60 kVA, one breaker in the frame), CIRRO 600 (6 × 100 kVA, four breakers in the frame), CIRRO 800 (8 × 100 kVA, four breakers in the breaker section beside the cabinet), CIRRO 1200 and 1600 (12 or 16 × 100 kVA, switchgear by others); 480/277 V, three-phase, 4-wire, external battery. Ordering codes: Table 2-3.

WHO THIS MANUAL IS FOR

Qualified electricians install and wire the UPS. An engineer approved by AEC commissions it. Trained operators use it every day: they read the touchscreen and follow the procedures of the operation chapter.

Safety messages

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

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

Other conventions

i NOTE Additional information that stresses or completes the text.

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

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

QUICK START

From delivery to normal mode in six steps

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

1. **Inspect the delivery and the frame.** Report damage to the carrier and to AEC. Section 4.1, page 30.
2. **Place the frame** with its clearances and fit the power modules from the bottom slot up. Section 4.3, page 32, Section 4.5, page 33.
3. **Size the breakers and cables for your frame** and wire PE first, then input, bypass, battery and output. Table 4-3, page 34, Section 4.7, page 35.
4. **Connect EPO, the network card and (parallel systems) the parallel kit.** Section 4.9, page 43.
5. **Commission with the AEC engineer:** close the breakers in order and let the UPS go to inverter. Section 5.2, page 46.
6. **Set the battery and the system mode** on the touchscreen. Section 6.6, page 57.

60 · 100 kVA	Up to 1,600 kVA	480/277 V	Touch
hot-swappable power modules	per frame, up to 8 frames in parallel	three-phase, 4-wire, 60 Hz	AEC color touchscreen, 7 or 10 inch

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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 instructions for the installation and operation of the CIRRO modular UPS. Read it before installation. Do not put the UPS into operation until an engineer approved by AEC has commissioned it: otherwise there is a risk to people, the equipment may malfunction and the warranty is void.

Commissioning engineer: the engineer who installs or operates the equipment must be trained in electricity and safety, and familiar with the operation, commissioning and maintenance of the equipment.

1.1 General

⚠ DANGER

- Only commissioning engineers may install, commission and service the UPS.
- This UPS is designed for commercial and industrial applications only. It is not intended for life-support devices or systems.

⚠ WARNING

- Read all warning labels before operation and follow their instructions.
- The UPS contains electrostatic-sensitive components. Take ESD precautions before you handle them.

1.2 Moving and installation

⚠ DANGER

- Keep the equipment away from heat sources and air outlets.
- In case of fire, use a dry-chemical (powder) extinguisher only. A liquid extinguisher can cause electric shock.

⚠ WARNING

- Do not start the system if you find any damage or abnormal part.
- Touching the UPS with wet materials or wet hands can cause electric shock.
- The frames weigh up to 3,796 lb (1,722 kg) with modules. Move them only with lifting equipment rated for the weight, keep them upright (tilt 15° at most) and never lift them by hand.

⚠ CAUTION

- Use suitable equipment to handle and install the UPS. Wear safety shoes, protective clothing and other protective equipment.
- Protect the UPS from shock and vibration while you position it.
- Install the UPS in a suitable environment, as described in Section 4.2.

1.3 Commissioning and operation

⚠ DANGER

- Connect the grounding conductor before the power cables. Grounding and neutral conductors must comply with the National Electrical Code (NFPA 70) and local codes.
- Before you move or reconnect cables, switch off all input power sources and the battery breaker, and wait at least 15 minutes for the internal capacitors to discharge. Check with a multimeter that the voltage on the terminals is below 36 V before you work.

⚠ WARNING

- Any upstream ground-fault (residual-current) device carries the earth leakage current of the load.
- After long storage, inspect and check the UPS before you start it.
- The voltage between neutral and ground at the UPS input must not exceed 5 V.

1.4 Maintenance and replacement

⚠ DANGER

Maintenance and service that need internal access require special tools and trained personnel. Parts reached by opening a protective cover with a tool are not user-serviceable. Hazardous voltage is present inside the frame and the battery cabinet. In normal operation, following this manual, there is no risk to the operator.

1.5 Battery safety

⚠ DANGER

- Battery maintenance and service that need internal access require special tools or keys and trained personnel.
- Connected in series, the standard 40-block string is 480 V DC nominal (±240 V to the center tap), up to 600 V DC with 50 blocks, and more while charging. This voltage is lethal.
- Follow the battery maker's precautions for work on or near a large battery bank at all times, in particular for the environment, protective clothing, first aid and fire fighting.
- Replace batteries only with the same type and number. Otherwise there is a risk of explosion or poor performance.
- Inspect the batteries before you connect them. If the package is damaged, the terminals are dirty, corroded or rusty, or the case is broken, deformed or leaking, replace the battery. Otherwise capacity can drop, current can leak or fire can result.
- Remove rings, watches, necklaces, bracelets and other metal jewelry. Wear rubber gloves and eye protection against arc flash. Use only tools with insulated handles.
- Batteries are heavy. Lift and handle them correctly to prevent injury and damage to the terminals.
- Do not disassemble, modify or damage a battery: risk of short circuit, leakage or injury.
- Check that the battery is not grounded by mistake. If it is, remove the ground: touching a grounded battery can cause electric shock.

⚠ WARNING · Sulfuric acid

- The VRLA batteries contain sulfuric acid. If a case breaks, acid can leak. Wear safety glasses, rubber gloves and an apron. Acid in the eyes can cause blindness; it burns the skin.
- At the end of its life a battery can short internally, lose electrolyte and corrode its plates, then overheat, swell or leak. Replace batteries before this happens.
- Replace a leaking or damaged battery, store it in an acid-resistant container and dispose of it according to local regulations.
- If electrolyte touches the skin, wash the area immediately with water.

Ambient temperature is a major factor in battery capacity and life. The nominal battery temperature is 68 °F (20 °C); higher temperatures shorten battery life, lower temperatures reduce capacity. Replace the batteries as their maker requires, to keep the rated runtime.

1.6 Disposal

⚠ WARNING

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

1.7 Standards

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

TABLE 1-1 Design standards

Standard	Subject
UL 1778	Uninterruptible power systems — safety (North America)
IEC 62040-1	UPS — general and safety requirements
IEC 62040-2	UPS — electromagnetic compatibility (EMC)
IEC 62040-3	UPS — performance and test requirements
IEC 61000-3-12	Harmonic currents, equipment of 16 A to 75 A per phase
IEC 61000-3-11	Voltage fluctuations and flicker
IEC 61000-4-2	Immunity to electrostatic discharge
IEC 61000-4-3	Immunity to radiated electromagnetic fields
IEC 61000-4-4	Immunity to electrical fast transients / bursts
IEC 61000-4-5	Immunity to surges
IEC 61000-4-6	Immunity to conducted disturbances
IEC 61000-4-8	Immunity to power-frequency magnetic fields
IEC 63000	Restriction of hazardous substances (RoHS) — technical documentation
NFPA 70 (NEC)	Installation: feeders, conductors, working space, battery systems (Article 480)

1.7.1 FCC statement

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

02

CHAPTER 2

Product description

The CIRRO frames and their 60 and 100 kVA power modules, the front of each frame, the breakers, the control strip, how the UPS works, its operating modes and its protections.

2.1 Introduction

CIRRO is a modular online double-conversion UPS for 480/277 V three-phase, 4-wire loads. Five frames take hot-swappable power modules with a three-level IGBT inverter. The compact CIRRO 360 holds six 60 kVA modules (60–360 kVA). The CIRRO 600, 800, 1200 and 1600 hold 6, 8, 12 and 16 modules of 100 kVA (100–1,600 kVA), for N+X redundancy. Up to eight units run in parallel with the parallel kit. The battery bank is external. A color touchscreen with three access levels runs the system: 7-inch on the 360, 10-inch on the 600 to 1600.



FIGURE 2-1 The CIRRO frames

TABLE 2-1 CIRRO at a glance

Feature	What it gives you
60 · 100 kVA modules	60 kVA in the 360, 100 kVA in the 600 to 1600. Each module is a complete rectifier, inverter and charger, hot-swappable from the front.
N+X	One spare module for N+1, or more for the most critical loads.
97 %	AC/AC efficiency (96 % on the 360); input power factor 0.99 or better; output power factor 1 (kVA = kW).
Three-level IGBT	+Vdc · 0 · −Vdc switching: lower THD, lower switching stress and EMI.
Touchscreen	7-inch (360) or 10-inch (600–1600) AEC color touchscreen; three access levels; 10,000 events, downloaded through USB.
× 8	Up to eight units in parallel with the parallel kit PAR-KIT-CIR.

2.2 Frames

TABLE 2-2 CIRRO frames

Item	CIRRO 360	CIRRO 600	CIRRO 800	CIRRO 1200	CIRRO 1600
Ratings	60–360 kVA	100–600 kVA	700–800 kVA	900–1,200 kVA	1,300–1,600 kVA
Power modules	6 × 60 kVA (CIR-PWR-60)	6 × 100 kVA	8 × 100 kVA	12 × 100 kVA	16 × 100 kVA
Breakers	1 in the frame	4 in the frame	4 in the breaker section beside the cabinet	none: switchgear by others	none: switchgear by others
Touchscreen	7-inch	10-inch	10-inch	10-inch	10-inch
W × D × H	23.6 × 39.4 × 78.7 in (600 × 1,000 × 2,000 mm)	31.5 × 39.4 × 78.7 in (800 × 1,000 × 2,000 mm)	Cabinet 31.5 × 39.4 × 78.7 in; 55.1 in (1,400 mm) wide with the breaker section	47.2 × 43.3 × 78.7 in (1,200 × 1,100 × 2,000 mm)	63.0 × 39.4 × 78.7 in (1,600 × 1,000 × 2,000 mm)
Frame weight, no modules	559 lb (253.6 kg)	893 lb (405.1 kg)	1,074 lb (487.2 kg)	1,376 lb (624.1 kg)	2,139 lb (970.2 kg)
Doors	one	one	one, and the breaker section door	two	two
Battery, external	30–44 blocks, ±180 to ±264 V DC	30–50 blocks, ±180 to ±300 V DC	30–50 blocks	30–50 blocks	30–50 blocks
Charger	80 A, settable	15 % of the output power	15 %	15 %	15 %
Output current at full load	433 A	722 A	962 A	1,443 A	1,925 A

The output currents are calculated at full kVA, 480 V, power factor 1.

2.3 Models and ordering codes

TABLE 2-3 CIRRO ordering codes

Code	Configuration	Weight
CIR360-1X60 · -2X60 · -3X60	CIRRO 360 frame, 60 · 120 · 180 kVA	636.4 · 726.8 · 817.2 lb
CIR360-4X60 · -5X60 · -6X60	CIRRO 360 frame, 240 · 300 · 360 kVA	907.6 · 998 · 1,088.4 lb
CIR600-1X100 · -2X100 · -3X100	CIRRO 600 frame, 100 · 200 · 300 kVA	996.5 · 1,100.1 · 1,203.7 lb
CIR600-4X100 · -5X100 · -6X100	CIRRO 600 frame, 400 · 500 · 600 kVA	1,307.3 · 1,410.9 · 1,514.5 lb
CIR800-7X100 · -8X100	CIRRO 800 frame, 700 · 800 kVA	1,798.8 · 1,902.4 lb
CIR1200-9X100 · -10X100	CIRRO 1200 frame, 900 · 1,000 kVA	2,308.1 · 2,411.7 lb
CIR1200-11X100 · -12X100	CIRRO 1200 frame, 1,100 · 1,200 kVA	2,515.3 · 2,618.9 lb
CIR1600-13X100 · -14X100	CIRRO 1600 frame, 1,300 · 1,400 kVA	3,485.3 · 3,588.9 lb
CIR1600-15X100 · -16X100	CIRRO 1600 frame, 1,500 · 1,600 kVA	3,692.5 · 3,796.1 lb
CIR360-FRAME	Frame 360: 6 slots × 60 kVA, 1 breaker	559 lb

Code	Configuration	Weight
CIR600-FRAME	Frame 600: 6 slots × 100 kVA, 4 breakers in the frame	893 lb
CIR800-FRAME	Frame 800: 8 slots × 100 kVA, cabinet and breaker section with 4 breakers	1,074 lb
CIR1200-FRAME	Frame 1200: 12 slots, switchgear by others	1,376 lb
CIR1600-FRAME	Frame 1600: 16 slots, switchgear by others	2,139 lb
CIR-PWR-60	Power module 60 kVA, CIRRO 360 only	77 lb (35 kg)
CIR-PWR-100	Power module 100 kVA, hot-swappable	104 lb (47 kg)
PAR-KIT-CIR	Parallel kit, up to 8 units	—
BATT-COMP-CIR	Battery compensation kit (long battery cable runs)	—
SPD-3PH-CIR	Three-phase surge protection	—
SNMP-M · DRYCNT	SNMP network card · dry-contact (relay) card	—

How to read the code. CIR600-4X100 means the 600 frame, then the number and size of the modules (4 × 100 = 400 kVA installed; CIR360-3X60 = three 60 kVA modules). Order one module for every module's worth of load and one more for N+1. AEC sizes the external battery bank.

2.4 What is in the box

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

- 1 × CIRRO frame with the bypass module and the touchscreen (CIRRO 360 with its breaker, CIRRO 600 with its four breakers, CIRRO 800 with its breaker section)
- The power modules ordered (fitted, or packed separately — see the packing list)
- 1 × user manual; the options ordered (parallel kit, surge protection, battery compensation, cards)

2.5 Front of the frames

2.5.1 CIRRO 360



1	Touchscreen, 7-inch color (Section 6.1)
2	EPO button
3	Control strip: cold start, ports and card slots
4	Power modules, 60 kVA (CIR-PWR-60), six slots
5	Door handle
6	Base

FIGURE 2-2 CIRRO 360, one door 23.6 in (600 mm) wide

The CIRRO 360 has one breaker in the frame. Provide the other switching the installation needs upstream (Section 4.6).

2.5.2 CIRRO 600 and CIRRO 800



1	Touchscreen, 10-inch color (Section 6.1)	7	Bypass Input breaker
2	EPO button (Section 5.8)	8	Maintenance Bypass breaker
3	Door handle	9	Main Input breaker
4	Perforated door: air in; a dust filter is standard	10	Output breaker
5	Power modules, 100 kVA: six in the 600, eight in the 800	11	Control strip (Figure 2-14)
6	Base, the full width	12	Bypass module: static switch and its fans

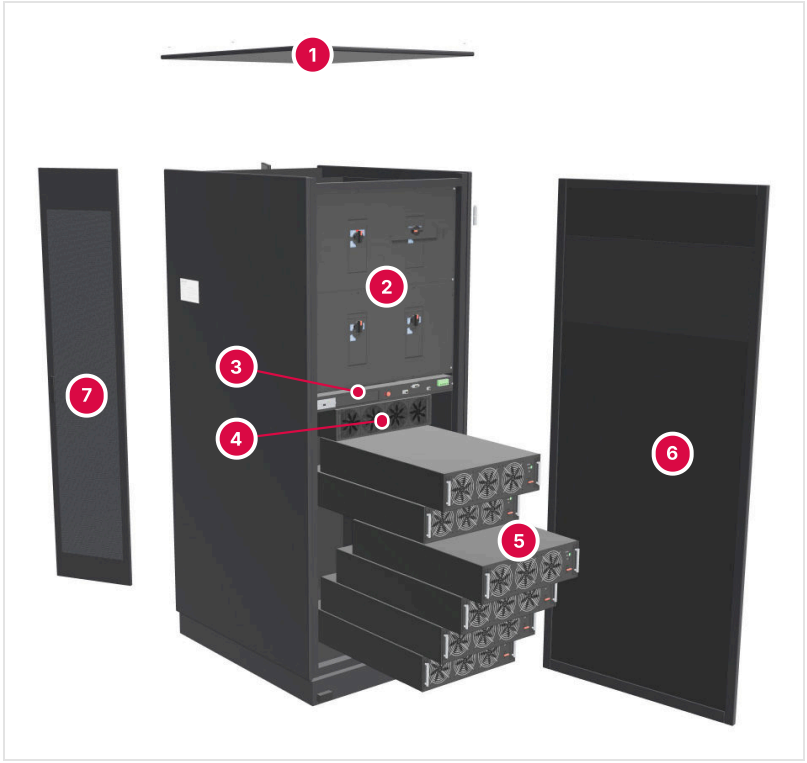
FIGURE 2-3 CIRRO 800 door closed (left) and CIRRO 600 door open (right)

How the CIRRO 600 is built. Figure 2-4 and Figure 2-5 show the frame closed and pulled apart: the touchscreen and the EPO button on the front door, the four breakers at the top behind the door, the control strip and the bypass module under them, and the power modules below, slot 1 at the bottom. The power terminals are at the rear, behind the two rear doors (Section 4.7.1).



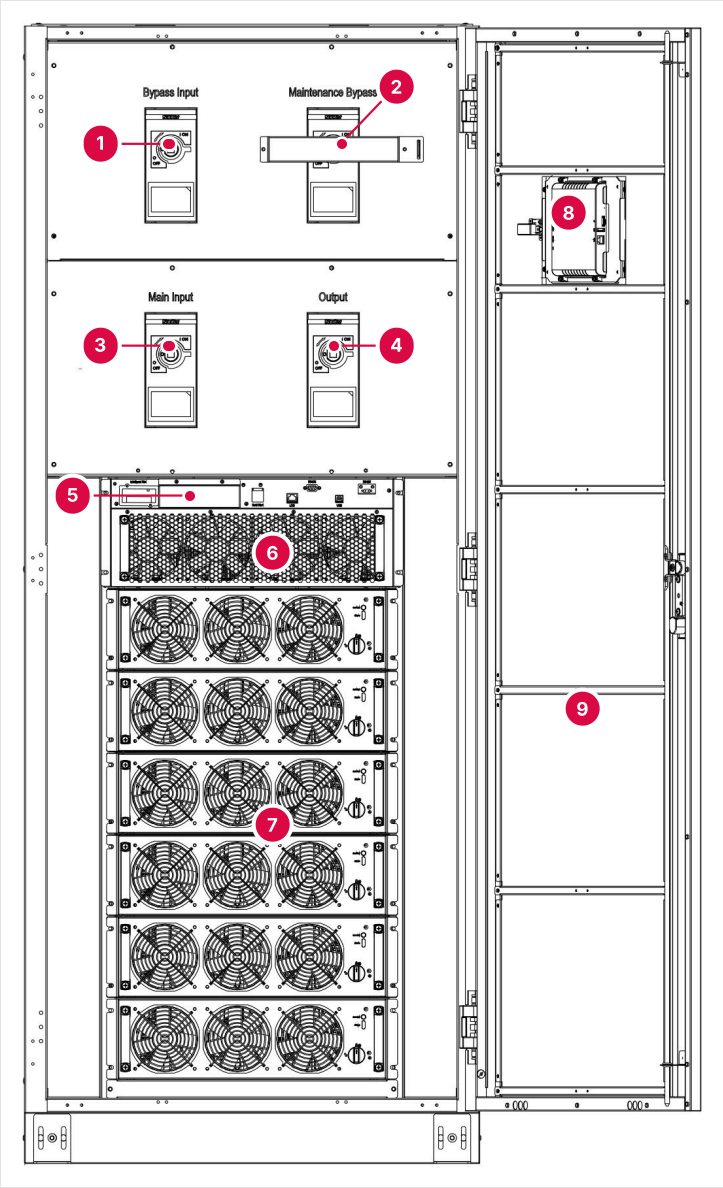
1. Touchscreen, 10-inch color
2. EPO button
3. Door handle and lock
4. Perforated door: air in
5. Base

FIGURE 2-4 CIRRO 600, door closed (3D render)



1. Top cover
2. Breakers: Bypass Input, Maintenance Bypass, Main Input, Output (Figure 2-12)
3. Control strip: ports, card slots, cold start (Figure 2-14)
4. Bypass module: static switch and its fans
5. Power modules, 100 kVA, slot 1 at the bottom
6. Front door, seen from inside
7. Rear door (one of two)

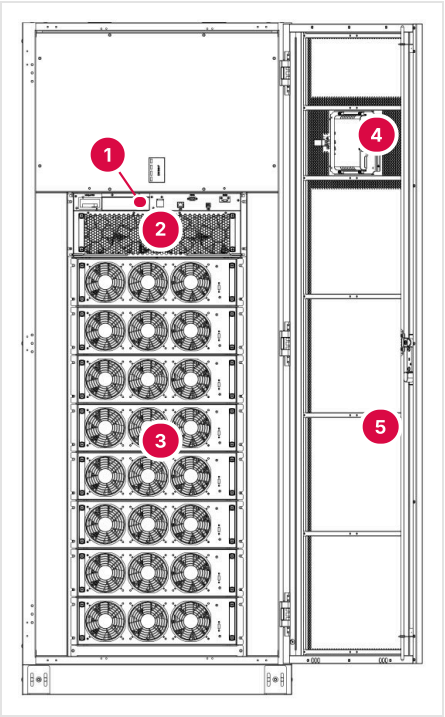
FIGURE 2-5 CIRRO 600 pulled apart (3D render) — illustration, internal layout simplified



1. Bypass Input breaker
2. Maintenance Bypass breaker, behind its locking bar
3. Main Input breaker
4. Output breaker
5. Control strip (Figure 2-14)
6. Bypass module
7. Power modules: slot 1 at the bottom, slot 6 at the top
8. Back of the touchscreen, inside the door
9. Door

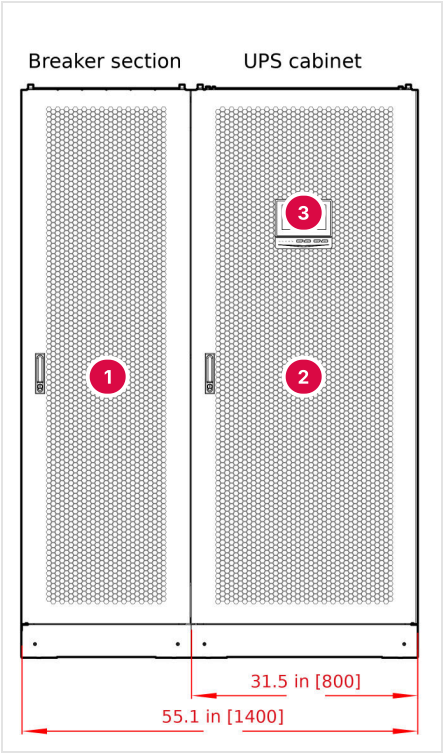
FIGURE 2-6 CIRRO 600, door open (AEC drawing)

CIRRO 800. The UPS cabinet of the CIRRO 800 has no breakers. Its four breakers — Main Input, Bypass Input, Output and Maintenance Bypass — are in the breaker section of CIR800-FRAME, beside the cabinet (Figure 2-8). The AEC drawing of the 800 cabinet and the single-line diagram both say so (Figure 2-17).



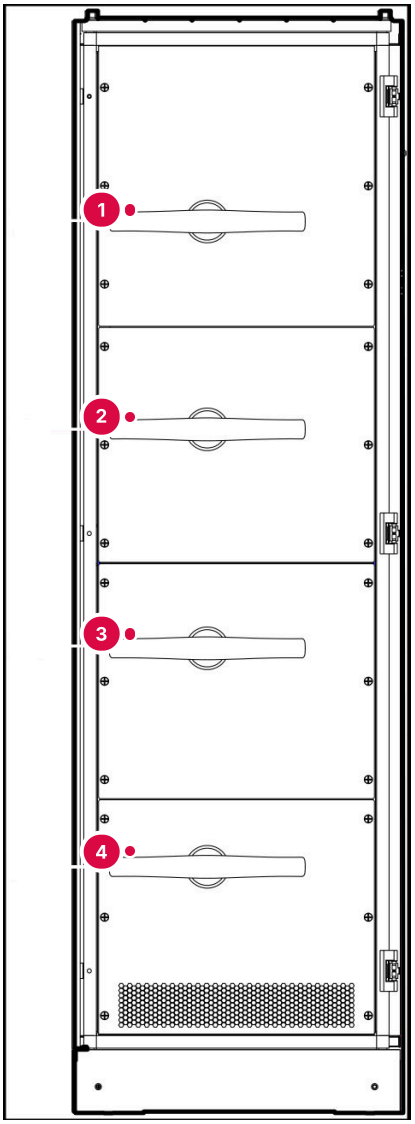
1. Control strip
2. Bypass module
3. Power modules, 8 slots
4. Back of the touchscreen
5. Door

FIGURE 2-7 CIRRO 800 cabinet, door open (AEC drawing)



1. Breaker section: Main Input, Bypass Input, Output and Maintenance Bypass breakers
2. UPS cabinet
3. Touchscreen

FIGURE 2-8 CIRRO 800 with its breaker section, doors closed



1. Main Input breaker
2. Bypass Input breaker
3. Maintenance Bypass breaker
4. Output breaker

FIGURE 2-9 Breakers in the CIRRO 800 breaker section, door open

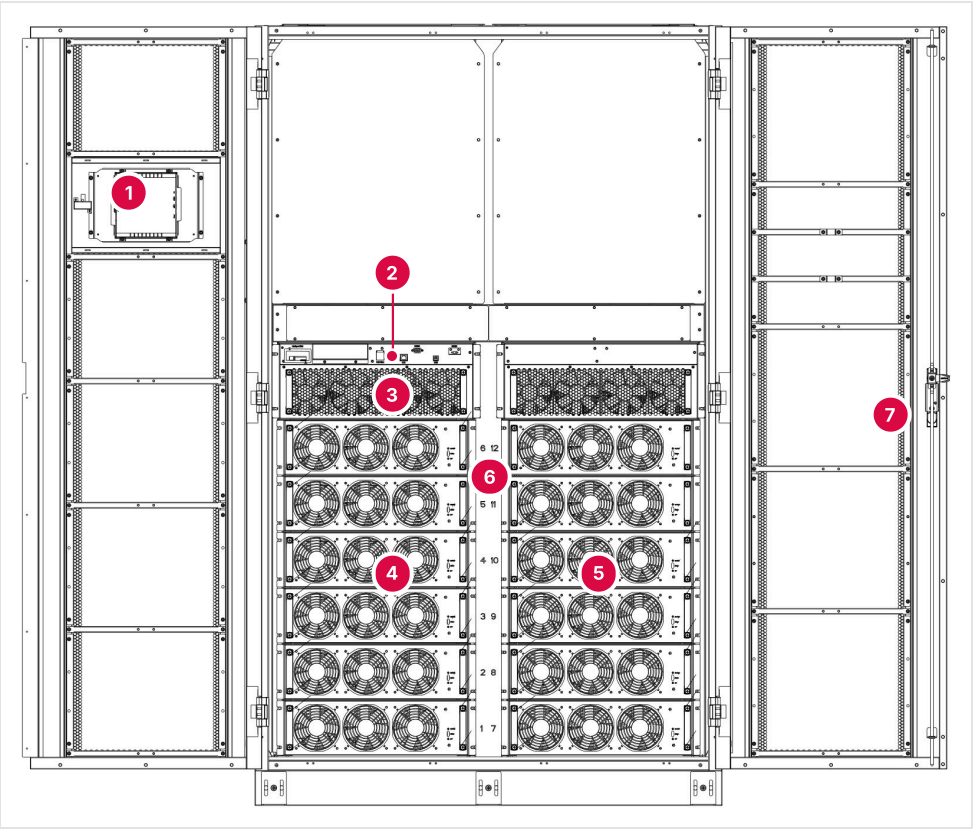
Each breaker carries its name on its label. Check the labels on your unit before you operate a breaker.

2.5.3 CIRRO 1200 and CIRRO 1600



1. Touchscreen, 10-inch color, on the left door
2. Control strip and bypass module, above the bays
3. Left bay: 100 kVA power modules
4. Right bay: the same modules — 12 slots in the 1200, 16 in the 1600
5. Two perforated doors: air in at the front; a dust filter is standard
6. Door handle

FIGURE 2-10 CIRRO 1200 (left) and CIRRO 1600 doors closed (right)

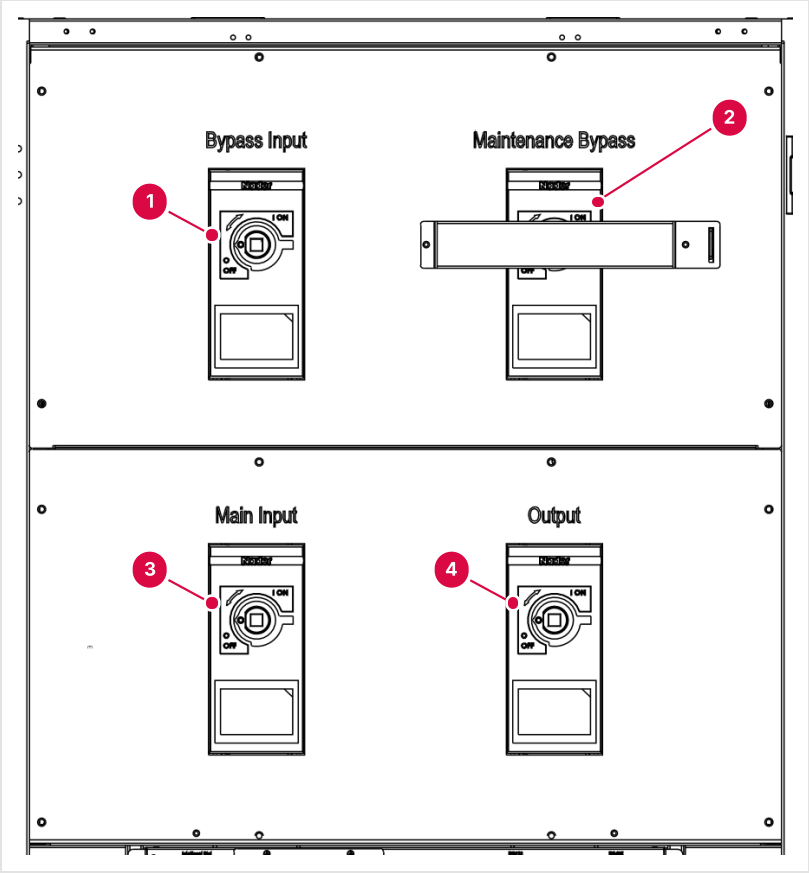


1 Back of the touchscreen, left door	4 Left bay, slots 1 to 6
2 Control strip	5 Right bay, slots 7 to 12
3 Bypass module, two sections above the bays	6 Slot numbers
	7 Right door

FIGURE 2-11 CIRRO 1200, doors open (AEC drawing)

The CIRRO 1200 and 1600 have no breakers. Main input, bypass input, output and maintenance bypass switching is in switchgear by others (Section 4.6).

2.6 Breakers



1. **Bypass Input** — feeds the static bypass in the bypass module from the bypass input terminals.
2. **Maintenance Bypass** — connects the bypass input straight to the output, around the whole UPS, for service. Normally OFF. A locking bar covers its handle.
3. **Main Input** — feeds the rectifiers of the power modules from the main input terminals.
4. **Output** — connects the inverters and the static bypass to the output terminals and the load.

FIGURE 2-12 The breaker panel of the CIRRO 600 — each breaker is labeled on the panel

The same four breakers are in the breaker section of the CIRRO 800 (Figure 2-9) and in the switchgear of the CIRRO 1200 and 1600. The procedures of Chapter 5 name them as on these labels and show one picture per breaker state (Figure 5-1).

NOTICE

The battery breaker is never in the frame: it is an external DC breaker in or near the battery cabinet (Section 4.8). The breakers are 3-pole; the neutral is not switched.

2.7 Power modules and bypass module



1. Fans (three): front-to-back cooling
2. Cold Start button: starts the module from the battery
3. Status lamp
4. OFF / lock knob: switches the module off and unlocks it from its slot
5. Left handle
6. Right handle

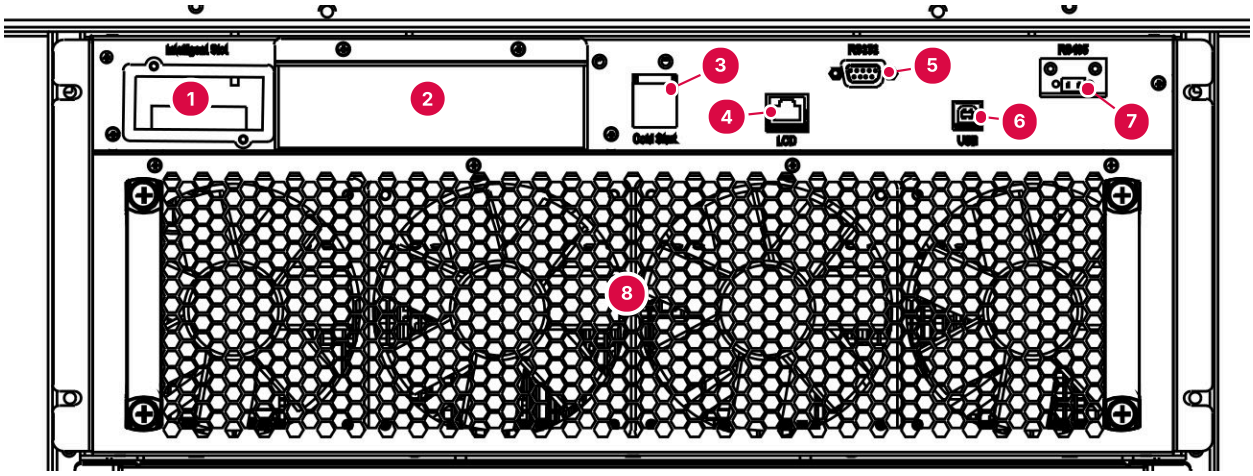
FIGURE 2-13 Front of a 100 kVA power module (CIR-PWR-100)

TABLE 2-4 Power modules

Item	CIR-PWR-100	CIR-PWR-60
Frames	600 · 800 · 1200 · 1600	360 only
Rating	100 kVA = 100 kW	60 kVA = 60 kW
Inside	Rectifier, three-level IGBT inverter, charger	Rectifier, three-level IGBT inverter, charger
Size	18.7 × 27.8 × 5.5 in (475 × 705 × 140 mm)	ask AEC
Weight	104 lb (47 kg)	77 lb (35 kg)
Front	Fans, Cold Start button, status lamp, OFF / lock knob, two handles	as the 100 kVA module
Access	From the front; hot swap	From the front; hot swap

The **bypass module** holds the static bypass switch and its fans. There is one per frame, under the control strip. Its service is reserved to AEC service.

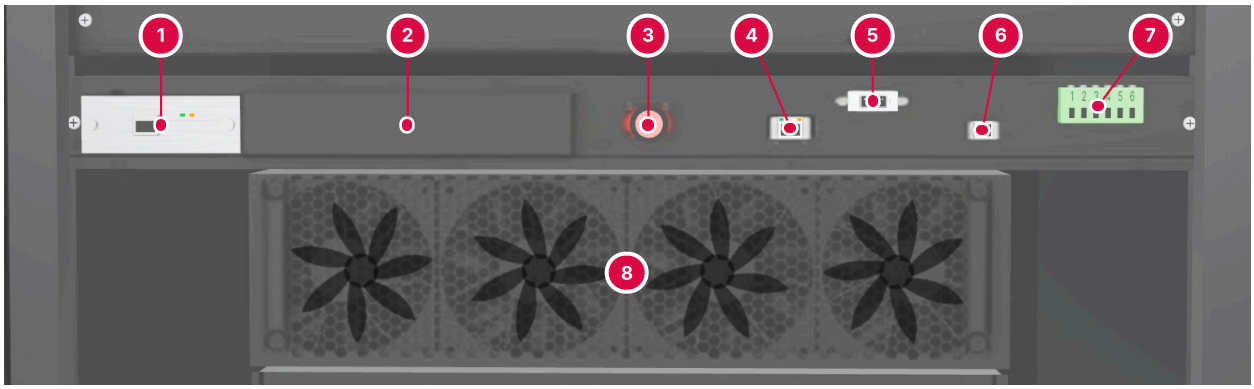
2.7.1 Control strip



1	Intelligent slot: dry-contact card DRYCNT	5	RS-232 port (DB9)
2	SNMP slot: SNMP-M network card (behind the cover plate)	6	USB port
3	Cold Start button: starts the UPS from the battery	7	RS-485 port (terminal)
4	LCD: cable to the touchscreen (RJ45) — not a network port	8	Bypass module: fans of the static bypass

FIGURE 2-14 Control strip above the bypass module (AEC drawing, CIRRO 600)

The strip runs across the full width of the bay, directly above the fans of the bypass module (Figure 2-15). Open the front door to reach it.



1	Intelligent slot	5	RS-232 port (DB9)
2	SNMP slot (behind the cover plate)	6	USB port
3	Cold Start button	7	RS-485 port (terminal)
4	LCD: cable to the touchscreen (RJ45)	8	Bypass module: fans of the static bypass

FIGURE 2-15 Control strip in the CIRRO 600, door open (3D render, card fitted in the intelligent slot) — items as in the drawing above

2.8 How the UPS works

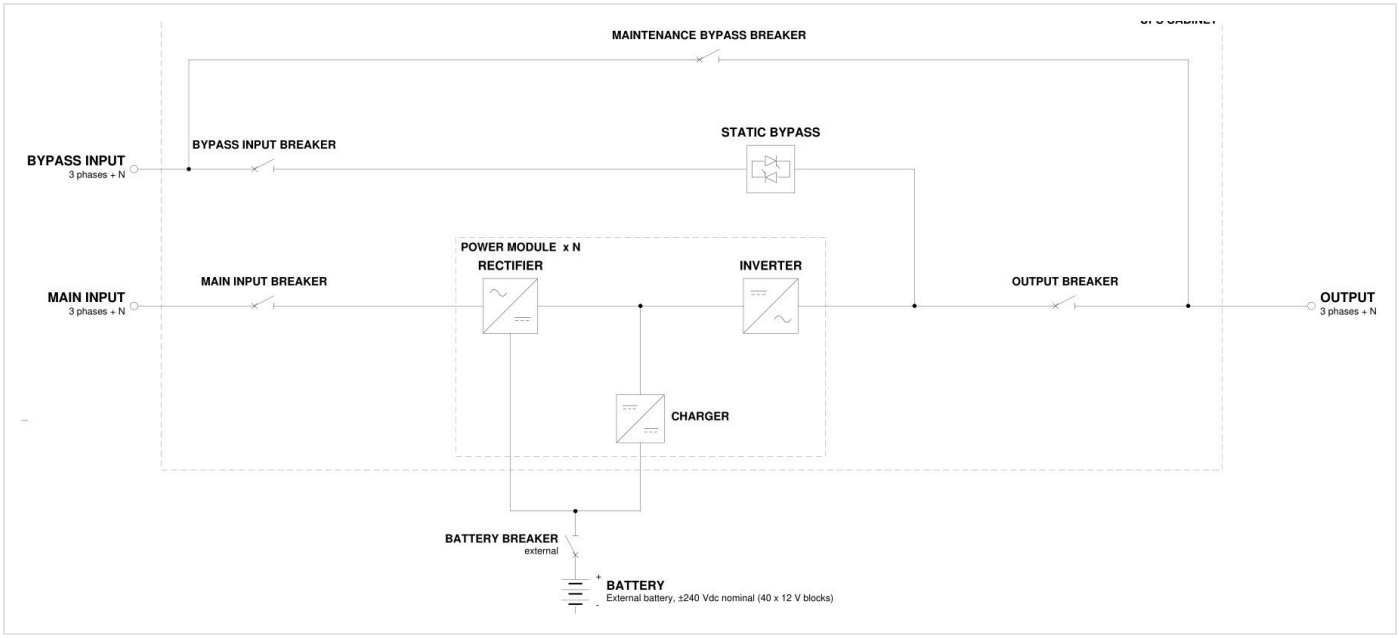


FIGURE 2-16 Single-line diagram, CIRRO 600 — four breakers in the frame; one line stands for the three phases and the neutral; PE not shown

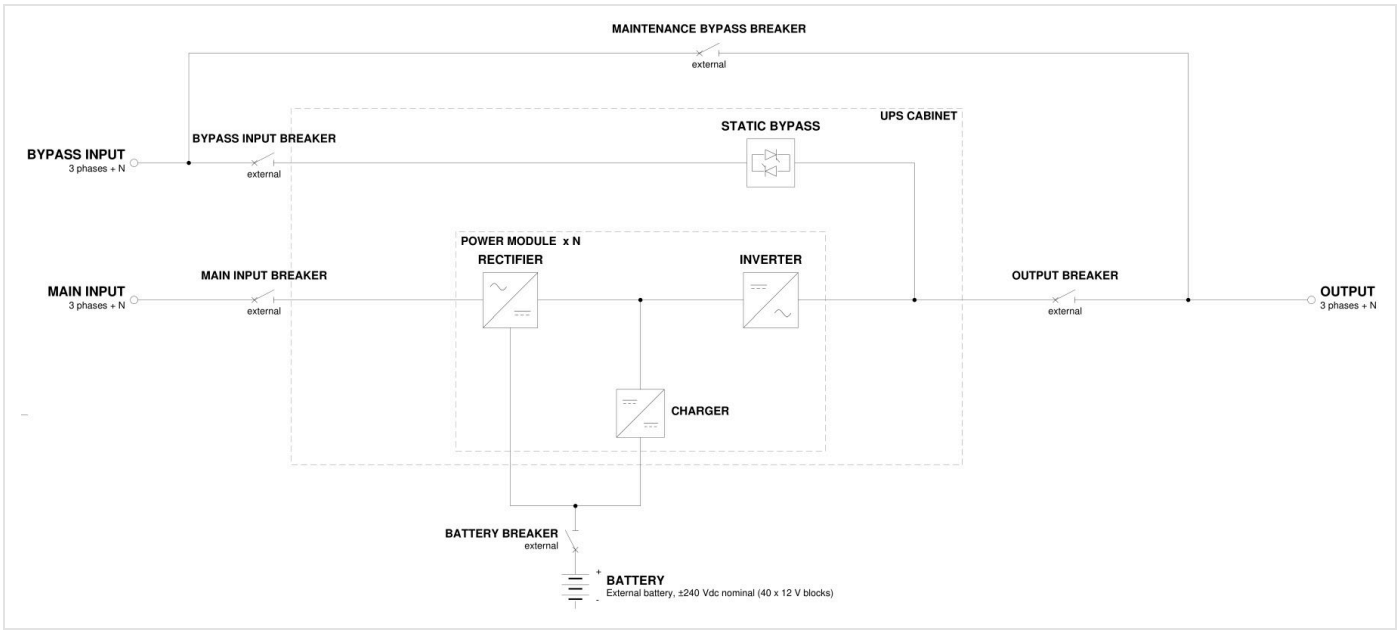


FIGURE 2-17 Single-line diagram, CIRRO 800 and 1200 (1600 alike) — the cabinet has no breakers: CIRRO 800 breaker section, CIRRO 1200 and 1600 switchgear by others

TABLE 2-5 The parts of the power path

Part	What it does
Rectifier	In each power module: turns the utility into a regulated DC bus (input power factor 0.99 or better, current THD 2 % or less on the 600 to 1600).
Inverter	In each power module: three-level IGBT inverter that rebuilds the sine wave. The modules share the load.

Part	What it does
Charger	In each power module: keeps the external battery charged (80 A settable on the 360, up to 15 % of the output power on the 600 to 1600). On a utility failure the battery feeds the DC bus with no break.
Static bypass	In the bypass module: feeds the load from the bypass input when the inverters are off, overloaded or faulty.
Breakers	CIRRO 360: one in the frame. CIRRO 600: main input, bypass input, output and maintenance bypass in the frame. CIRRO 800: the same four in the breaker section beside the cabinet. CIRRO 1200 and 1600: switchgear by others. The battery breaker is always external. Main and bypass inputs have separate terminals: a split bypass is possible.

2.9 Operating modes

TABLE 2-6 Operating modes

Mode	What happens
Normal	The rectifiers turn the utility into DC and the inverters turn it back into regulated AC for the load. The chargers keep the battery charged.
Battery	On a utility failure the inverters run from the battery with no break. When the utility returns the UPS goes back to normal mode by itself. The UPS can also start from the battery alone (cold start, Section 5.3).
Source sharing	When the utility voltage is too low to carry the load, the modules draw from the utility and the battery together; the load stays on the inverter.
Bypass	With the inverters off, overloaded, too hot or faulty, the static bypass feeds the load from the bypass input: the load is not protected. A transfer out of synchronism interrupts the load for less than 3/4 of a cycle (12.5 ms at 60 Hz).
Maintenance bypass	With the Maintenance Bypass breaker closed the load is fed from the bypass input, so the UPS and the battery can be serviced without stopping the load. Dangerous voltage stays on the input, output and neutral terminals.
ECO	The load runs on the static bypass while the inverters stand by; if the bypass fails the inverters take the load.
Auto restart	After end of discharge the UPS restarts by itself when the utility returns (if enabled).
Frequency converter	Output frequency different from the input; static bypass disabled.

The thick line in each diagram shows the power path in that mode.

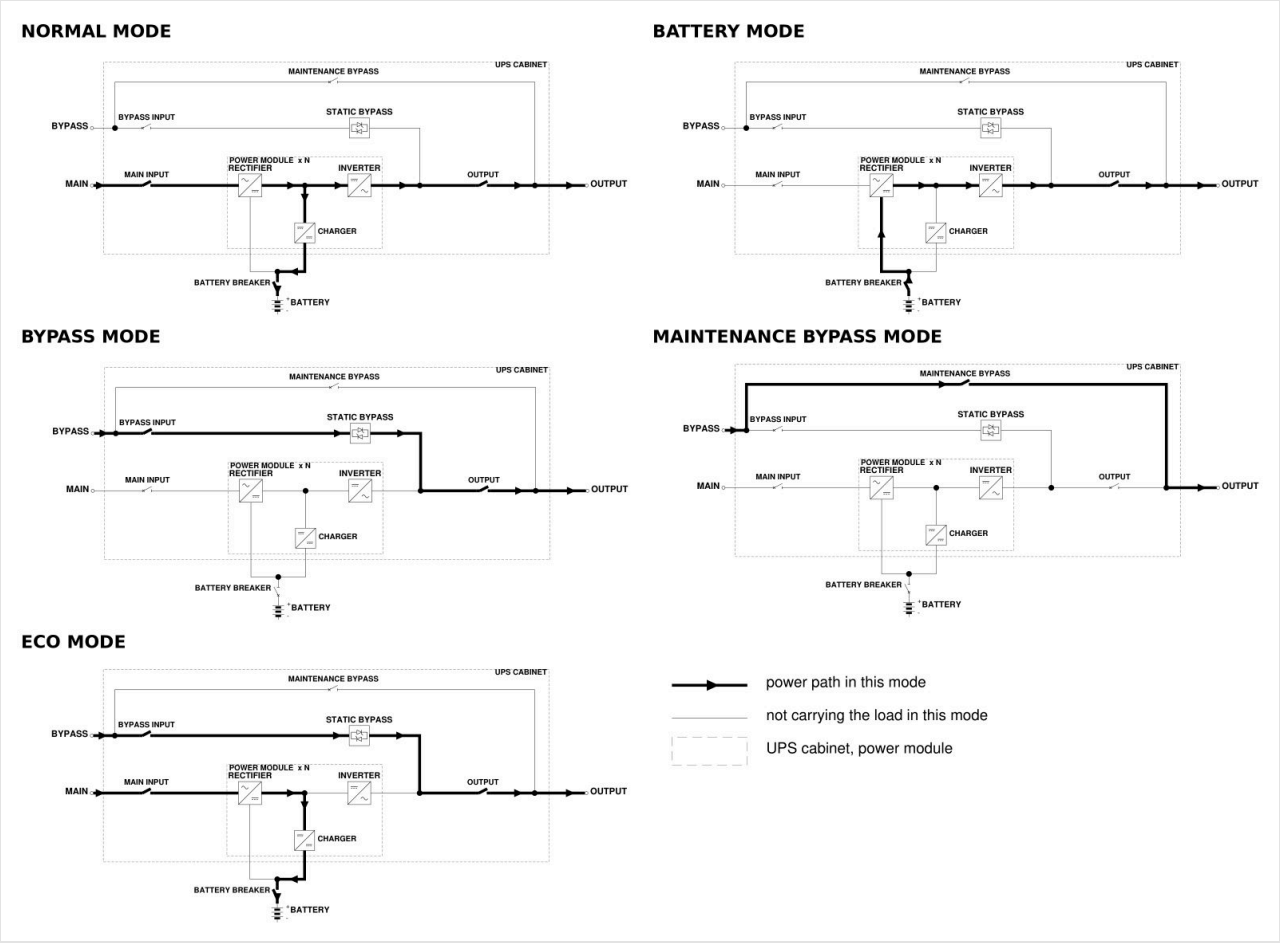


FIGURE 2-18 The power path in each operating mode — thick line: power path; thin line: not carrying the load

NOTICE

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

2.10 Functions

TABLE 2-7 Functions

Function	What it does
Event log	10,000 events, downloaded through the USB port.
Generator ready	Settings for stable operation with diesel generators; generator signal on a dry-contact input.
Custom alarms	The dry-contact alarms are set and managed from the touchscreen.
Self-cleaning fan cycles	Automatic fan cycles remove the dust; a dust filter is standard.
Waveform recording	Inverter, rectifier and control waveforms are recorded for diagnostics.
Three access levels	User, technician and AEC service: each level sees and sets only its own pages.
Battery cell by cell	Battery status shown cell by cell on the touchscreen.
Cold start	The UPS starts from the battery with no utility.

2.11 Protections

- **Overload, inverter:** 110 % for 1 h · 125 % for 10 min · 150 % for 1 min · above 150 % for 200 ms, then transfer to bypass.
- **Overload, bypass (600–1600):** up to 135 % continuous · 135–150 % for 5 min · 150–200 % for 1 s · 200–300 % for 100 ms.
- **Output short circuit**, module and inlet over-temperature, fan failure and service timers.
- **Battery:** battery low warning, end-of-discharge shutdown, reverse polarity.
- **System:** lost N+X redundancy, input neutral lost, bypass phase sequence.
- **EPO** button on every frame; SPD surge protection as an option (SPD-3PH-CIR).

CHAPTER 3

03 Planning the installation

Sizing the power modules for capacity and redundancy, the battery, and running on a generator.

3.1 Sizing the power modules

CIRRO uses hot-swappable power modules of 100 kVA / 100 kW (output power factor 1: kVA = kW). The CIRRO 600, 800, 1200 and 1600 hold 6, 8, 12 and 16 modules. The CIRRO 360 takes six 60 kVA modules: size it the same way with 60 kW per module. Size the system on the kW the loads draw.

1. Add up the active power (kW) of all the loads, from their data sheets or from measurements on the existing installation.
2. Divide by the module rating (100 kW) and round up: that is N, the number of modules that carry the load.
3. For redundancy add one module (N+1) or more (N+X). If a module fails or is removed for service, the others carry the load with no interruption.
4. Keep the load at or below about 80 % of the capacity that remains with one module out, for start-up currents and growth.
5. Set the number of redundant modules in **Set › Sys Set** (Figure 6-10), so that the UPS alarms when redundancy is lost.

TABLE 3-1 Worked example — 430 kW of load

Step	Result
Load	430 kW
Modules for the load (N)	430 ÷ 100 = 4.30 → 5 modules
With 80 % margin	430 ÷ (100 × 0.8) = 5.38 → 6 modules
For N+1 redundancy	7 modules (700 kVA installed, CIR800-7X100)

✓ TIP Leave the free slots closed with their covers: you can add modules later, hot-swapped, as the load grows. Size the breakers and cables for the full frame from the start.

3.2 Planning the battery

CIRRO uses an external VRLA battery bank. The runtime depends on the load, the battery and the number of blocks. AEC sizes the battery for the runtime you need, from the makers' discharge data.

- The standard string is **40 blocks of 12 V**: 480 V DC, used with a center tap (±240 V: +, N, –) or without one. The number of blocks is settable from 30 to 50 (±180 to ±300 V DC); 30 to 44 on the CIRRO 360 (±180 to ±264 V DC).
- On the CIRRO 600 to 1600 the output power is derated with fewer than 40 blocks: 36–39 blocks to 90 %, 32–35 blocks to 80 %, 30–31 blocks to 75 %. With 40 to 50 blocks there is no derating (float at 50 blocks: 300 cells × 2.27 V/cell ≈ 681 V DC).
- The number of blocks per string and the capacity entered in **Set › BATT Set** must match the installed battery exactly.
- Battery life is best at 68–77 °F (20–25 °C). Plan the battery location for it.
- Allow space and floor loading for the battery: lead-acid batteries are heavy.
- Mount the battery breaker as close to the battery as possible, and keep the battery cables short.

3.3 Running on a generator

The PFC rectifier (input power factor 0.99) and the wide input window let the UPS run from a standby generator.

- As a general rule, choose a generator rated at least 1.5 times the UPS input power, to cover the battery recharge as well.
- A dry-contact input can tell the UPS that the generator runs (**Set › Dry Contact**, Figure 6-12), for example to limit the battery charge on the generator.
- Let the generator reach stable voltage and frequency before it feeds the UPS. The UPS stays on battery until the input is within range.

CHAPTER 4

04 Installation

Unpacking, the site and its clearances, placing the frame, the modules, protective devices and cables for every frame, the terminals, the battery, communication and parallel systems.

DANGER

Only authorized engineers may install and commission the UPS. Do not apply power to the UPS before the commissioning engineer arrives at the site.

WARNING · Battery hazards

The battery string is 480 V DC nominal and lethal. Wear eye protection, remove rings, watches and metal objects, use tools with insulated handles and rubber gloves. Replace a leaking battery and dispose of it according to local regulations.

4.1 Unpacking and inspection

1. While the frame is still on the truck, inspect it and the packing for damage. If damage is apparent, do not install it: file a claim with the carrier and notify AEC.
2. Unpack the frame as close to its final place as possible. Move it with a forklift or pallet truck rated for its weight (Table 2-3): from 636 lb for the smallest 360 to 3,796 lb for the full 1600. Insert the forks from the side, or use two forklifts from the front, and keep the frame upright.
3. Check the product label: the UPS model, capacity and main parameters must match the order.
4. Check the contents against the packing list (Section 2.4) and report any missing item.

4.2 Site and environment

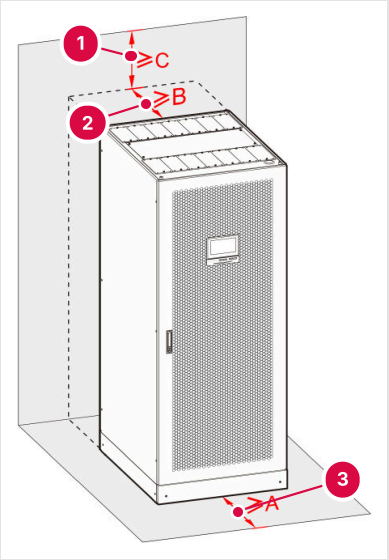
TABLE 4-1 Operating and storage environment

Item	Requirement
Location	Indoors; cool, dry, clean and ventilated; on a level concrete or other non-combustible floor, inclination 5° at most, no vibration
Operating temperature	32–104 °F (0–40 °C); 68–77 °F (20–25 °C) for the battery room
Humidity	0–95 % RH, non-condensing
Altitude	Full power up to 3,300 ft (1,000 m)
Protection · noise	IP20 · 72 dB (600–1600), below 65 dB (360)
Cooling air (minimum)	CIRRO 600: 3,676 cfm (6,246 m³/h) · CIRRO 800: 4,202 cfm (7,140 m³/h) · CIRRO 1200: 5,171 cfm (8,785 m³/h)
Floor	Rated for the frame with its modules (Table 2-3), plus the battery
UPS storage	−13 to 131 °F (−25 to 55 °C), 0–95 % RH, in the original packing, off the floor; inspect again after 6 months of storage
Battery storage	Recharge stored VRLA batteries every 3 months

NOTICE

- VRLA batteries give off small amounts of hydrogen and oxygen while charging. The battery room needs ventilation according to NFPA 70 Article 480 and IEEE 1635. Do not install batteries in a sealed room or cabinet.
- Battery life halves for each 18 °F (10 °C) above 77 °F (25 °C).
- Keep the UPS away from water, heat sources, dust, corrosive gases and conductive dust.

4.3 Working space and clearances



1. C — top
2. B — rear
3. A — front

FIGURE 4-1 Clearances around the frame — C top, B rear, A front

TABLE 4-2 Minimum clearances

Frame	A — front	B — rear	C — top
CIRRO 600	36 in (914 mm)	31.5 in (800 mm): the terminals are reached from the rear	19.7 in (500 mm); 25.6 in (650 mm) with the top air outlet kit
CIRRO 800 · 1200	36 in (914 mm)	31.5 in (800 mm)	19.7 in (500 mm)
CIRRO 360 · 1600	36 in (914 mm)	ask AEC	ask AEC

- **Front:** the manufacturer asks for 31.5 in (800 mm). NEC 110.26(A) asks for a working space at least 36 in (914 mm) deep, 30 in (762 mm) wide or the width of the equipment, and 6.5 ft (1.98 m) high. Use 36 in. The doors must open fully.
- **Rear:** where anyone works behind the UPS, keep at least 31.5 in (800 mm). In a hot room keep more.
- For frames in parallel, keep these clearances around the whole line-up.
- Do not block the air inlets and outlets.

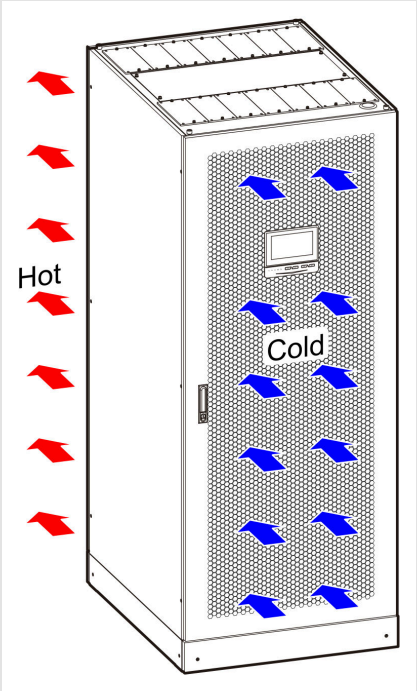


FIGURE 4-2 Air in at the front, out at the rear (standard); a top air outlet kit is an option

4.4 Placing the frame

⚠ WARNING

Lifting equipment must be rated for the weight (Table 2-3). Install the power modules only after the frame is in its final place: they raise the weight and the center of gravity.

1. Mark the anchor holes on the floor with the base of the frame as a template.
2. Drill 0.55 in (14 mm) holes and set M12 expansion anchors (provided by the installer).
3. Take the frame off its pallet, set it over the anchors and bolt it down with the washers and nuts.
4. Fit the bottom cover plates supplied with the UPS.
5. On a raised floor, set the frame on a pedestal or channel steel designed for its point loading.

The dimensions of each frame are on the AEC drawings in Appendix B.

4.5 Installing the power modules

1. Remove the slot covers for the number of modules ordered.
2. Insert the modules from the bottom slot upward (slot 1 at the bottom, Figure 2-6), to keep the center of gravity low. Use three people or a lift truck: a module weighs 104 lb (47 kg).
3. Push each module in slowly and evenly until it meets the connector, then fully in. Turn its lock knob to lock it (Figure 2-13, item 4) and fit its fixing screws.
4. Leave the empty slots closed with their covers.

4.6 External protective devices

Install breakers upstream of the UPS and a DC breaker in the battery circuit. Size them for your frame with Table 4-3 and Table 4-4.

- **CIRRO 600:** the four breakers are in the frame. Install the feeder breakers for the main input and the bypass input in the distribution panel.
- **CIRRO 800:** the four breakers are in the breaker section beside the cabinet. Install the feeder breakers upstream.
- **CIRRO 1200 and 1600:** provide main input, bypass input, output and maintenance bypass breakers in switchgear by others (Figure 2-17).
- **CIRRO 360:** one breaker is in the frame. Provide the other switching upstream.
- The UPS is a continuous load. Size every overcurrent device at **125 % of the continuous current** (NEC 215.2, 215.3) and use the next standard rating (NEC 240.6).
- With a split bypass, the main input and the bypass input each need their own breaker, fed from sources with the same neutral.
- Use 3-pole breakers; the neutral is not switched. Connect no load between the UPS and its breakers, and do not share one breaker between two UPS.
- Breakers with ground-fault (RCD) protection are not recommended on the UPS feeds.
- The breaker ratings below hold where the available short-circuit current at the UPS is 65 kA or less.
- The battery breaker is a DC breaker in or near the battery cabinet, rated for the string voltage.

TABLE 4-3 Currents for each frame at full load — 480 V

Frame	Rated output and bypass current	Rated input current, charging excluded	Maximum input current, recharge included	Maximum battery current (40 blocks, end of discharge)
CIRRO 360	433 A	456 A	ask AEC	893 A
CIRRO 600	722 A	752 A	784 A	1,487 A
CIRRO 800	962 A	1,002 A	1,046 A	1,983 A
CIRRO 1200	1,443 A	1,503 A	1,569 A	2,975 A
CIRRO 1600	1,925 A	2,004 A	2,092 A	3,967 A

Rated input current at 480 V, efficiency 97 % (96 % on the 360) and input power factor 0.99. The maximum input current is the manufacturer's value for the 100 kVA module platform, recalculated for 480 V (130.7 A per module). The battery current is the manufacturer's value at 1.75 V/cell (10.5 V per block); with 30 blocks it rises to 1,587 A (600), 2,117 A (800) and 3,174 A (1200). For a smaller build in the same frame, scale by the number of modules — but size the breakers and cables for the full frame if modules will be added.

TABLE 4-4 External breakers for each frame — sized at 125 %

Frame	Main input	Bypass input	Output	Maintenance bypass	Battery (DC)
CIRRO 360	ask AEC	600 A, 3-pole	600 A, 3-pole	600 A, 3-pole	1,200 A
CIRRO 600	1,000 A, 3-pole	1,000 A, 3-pole	1,000 A, 3-pole	1,000 A, 3-pole	2,000 A
CIRRO 800	1,600 A, 3-pole	1,600 A, 3-pole	1,600 A, 3-pole	1,600 A, 3-pole	2,500 A
CIRRO 1200	2,000 A, 3-pole	2,000 A, 3-pole	2,000 A, 3-pole	2,000 A, 3-pole	4,000 A
CIRRO 1600	3,000 A, 3-pole	2,500 A, 3-pole	2,500 A, 3-pole	2,500 A, 3-pole	5,000 A

Each rating is at least 125 % of the current in Table 4-3 (maximum input current for the main input), rounded up to a standard rating. On the CIRRO 600 and 800 the output and maintenance bypass breakers are part of the UPS; the values show the rating an external maintenance bypass for a single unit needs. In a parallel system, size the system maintenance bypass for the total current.

4.7 Power cables

⚠ DANGER

Failure to follow adequate grounding procedures can result in electric shock or fire. Connect the protective earth (PE) first.

TABLE 4-5 Minimum copper conductors for each frame — 75 °C, NEC Table 310.16

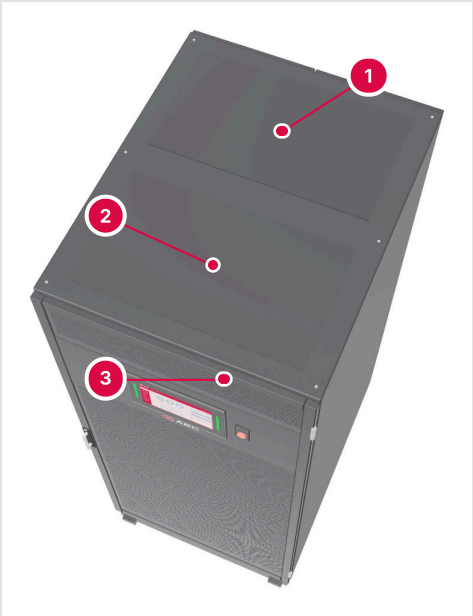
Frame	Main input A, B, C, N	Bypass input and output A, B, C, N	Battery +, (N), –	Equipment grounding (PE)
CIRRO 360	ask AEC	2 × 350 kcmil [2 × 177 mm²]	3 × 600 kcmil [3 × 304 mm²]	ask AEC
CIRRO 600	3 × 400 kcmil [3 × 203 mm²]	3 × 400 kcmil [3 × 203 mm²]	4 × 1,000 kcmil [4 × 507 mm²]	2/0 AWG [67.4 mm²]
CIRRO 800	4 × 600 kcmil [4 × 304 mm²]	4 × 600 kcmil [4 × 304 mm²]	6 × 600 kcmil [6 × 304 mm²]	4/0 AWG [107 mm²]
CIRRO 1200	6 × 400 kcmil [6 × 203 mm²]	6 × 400 kcmil [6 × 203 mm²]	8 × 1,000 kcmil [8 × 507 mm²]	250 kcmil [127 mm²]
CIRRO 1600	8 × 500 kcmil [8 × 253 mm²]	6 × 600 kcmil [6 × 304 mm²]	10 × 1,000 kcmil [10 × 507 mm²]	400 kcmil [203 mm²]

- "3 × 400 kcmil" means three conductors in parallel per phase (or per pole), each set in its own raceway. The combined ampacity at 75 °C (NEC 110.14(C)) is at least the rating of the breaker in Table 4-4. Parallel conductors follow NEC 310.10(G).
- The sets fit the number of cable lugs per terminal that the manufacturer gives: AC terminals 3 lugs (600), 4 (800), 6 (1200); battery terminals 4, 6 and 8; PE 2, 2 and 3.
- The grounding conductor follows NEC 250.122 for the main input breaker; run one in each parallel raceway.
- The sizes are for copper, up to three current-carrying conductors in a raceway and 86 °F (30 °C) ambient. Correct them for other conditions (NEC 310.15). The electrical engineer of record confirms them for the site.
- Keep the voltage drop below 3 % on AC runs and 1 % on the battery run. Keep AC runs below about 100 ft (30 m) and battery runs below about 164 ft (50 m), or increase the conductors.
- Size the output neutral 1.5 to 1.7 times the phase conductor for mainly non-linear loads.
- In a parallel system, give every frame bypass and output cables of the same length and size.
- Use crimped ring lugs for the bolt size of Table 4-6. Use flexible copper cable; with aluminum cable use copper-aluminum transition plates, aluminum side to the lug.

TABLE 4-6 Terminals, bolts and cable entry

Frame	Where the terminals are	Bolts · torque	Cable entry
CIRRO 600	Rear, both rear doors open, 53 to 77 in (1,350 to 1,960 mm) above the floor (Figure 4-6)	M12 × 35 · 420 lb-in (47.5 N·m)	Top, through the cable entry plate
CIRRO 800	Under the top cover (Figure 4-8); the breaker section connects to them	M16 × 30 · ask AEC	Top
CIRRO 1200	Under the top cover (Figure 4-9)	M16 × 60 · ask AEC	Top
CIRRO 360 · 1600	ask AEC	ask AEC	ask AEC

Bottom cable entry needs a side wiring cabinet beside the UPS. Ask AEC for it when you plan the room.

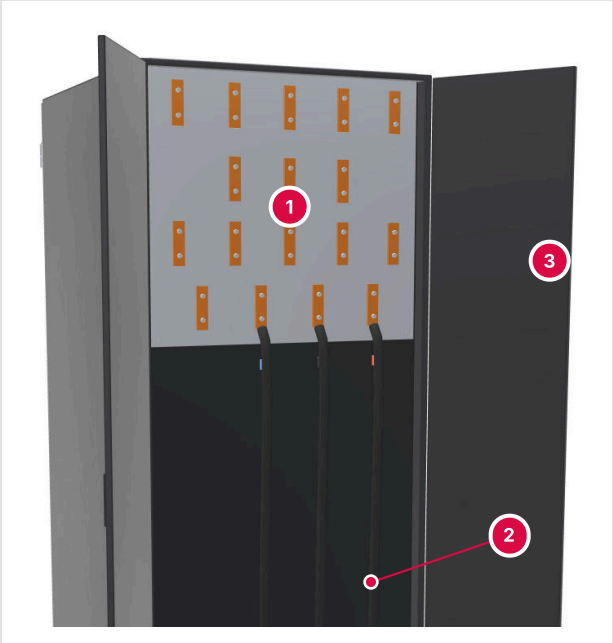


1. Cable entry plate, rear: to the terminals behind the rear doors
2. Cable entry plate, front
3. Front door

FIGURE 4-3 CIRRO 600 from above (3D render) — two cable entry plates in the top cover

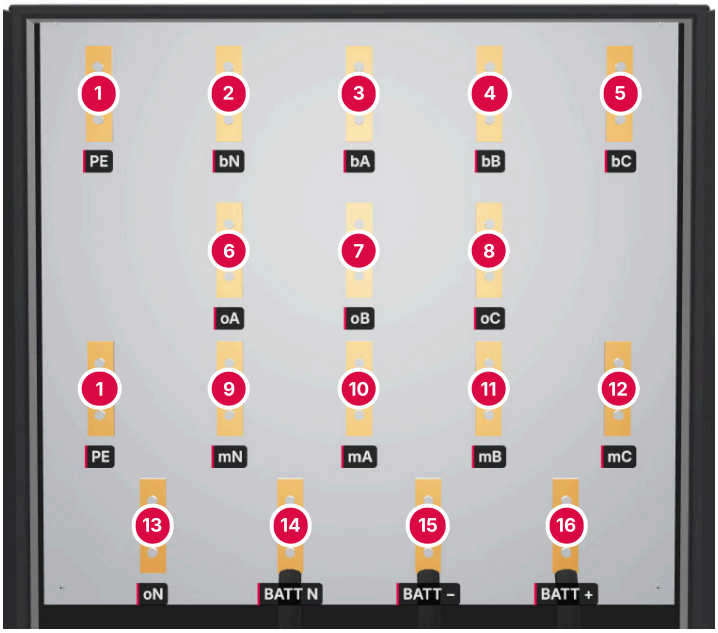
4.7.1 Terminals and wire order

CIRRO 600. The terminals are at the rear of the frame, behind both rear doors, in the upper part of the cabinet (Figure 4-4). Figure 4-5 numbers every terminal; Table 4-7 gives the bolt, torque and conductor data for each frame.



1. Power terminals
2. Battery cables from BATT N, BATT –, BATT + (illustration)
3. Rear doors (two)

FIGURE 4-4 CIRRO 600 rear, both rear doors open (3D render)



1. **PE**, two places: connect first
2. **bN** — bypass input neutral
3. **bA** — bypass input L1
4. **bB** — bypass input L2
5. **bC** — bypass input L3
6. **oA** — output L1
7. **oB** — output L2
8. **oC** — output L3
9. **mN** — main input neutral
10. **mA** — main input L1
11. **mB** — main input L2
12. **mC** — main input L3
13. **oN** — output neutral
14. **BATT N** — battery center tap
15. **BATT –** — battery negative
16. **BATT +** — battery positive

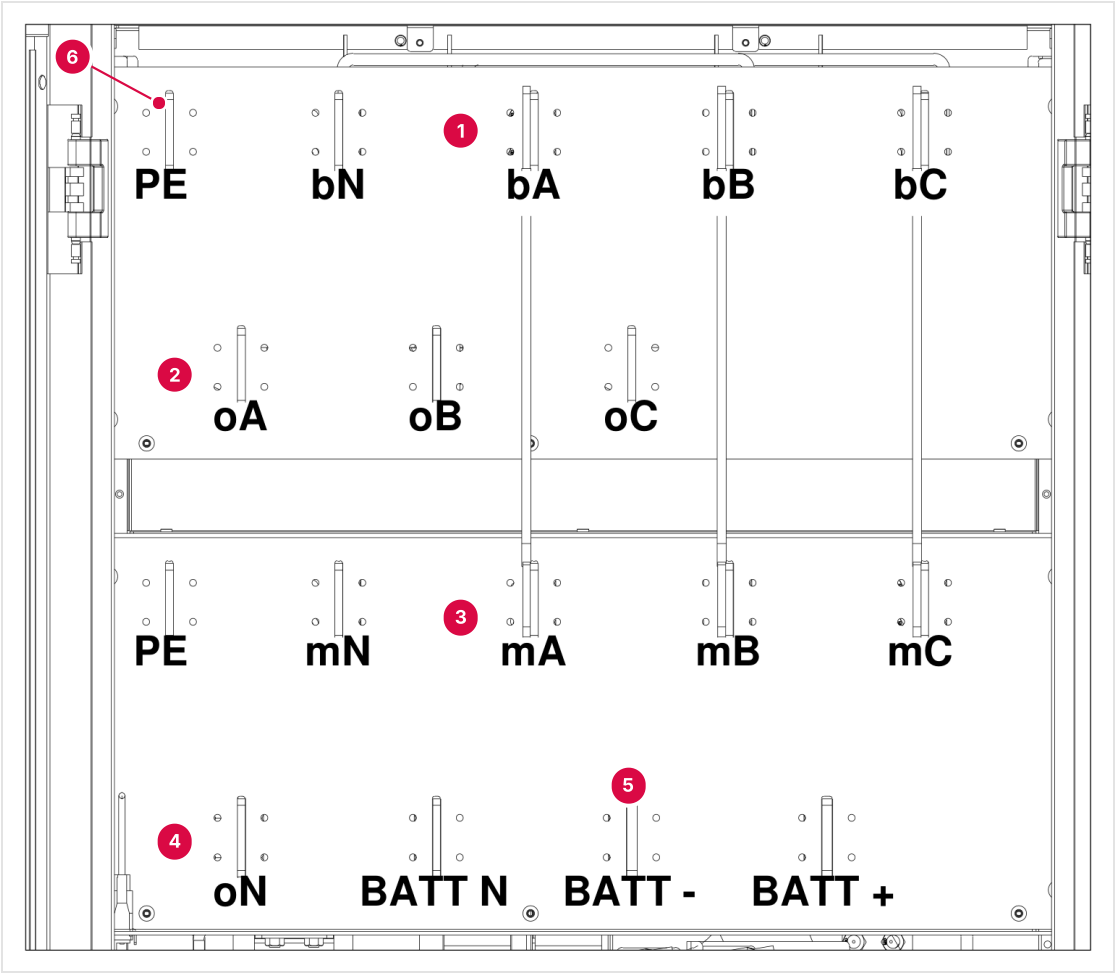
FIGURE 4-5 CIRRO 600 terminals, rear view (3D render) — markings as on the AEC drawing

TABLE 4-7 Terminal data for each frame

Frame	Terminals (items in Figure 4-5)	Bolt · torque	Wire, min. (Table 4-5)	Wire, max.	Lug
CIRRO 600	Main input mA, mB, mC, mN (9–12)	M12 × 35 · 420 lb-in (47.5 N·m)	3 × 400 kcmil [3 × 203 mm²]	ask AEC	Crimped ring, M12; 3 per terminal
CIRRO 600	Bypass input bA, bB, bC, bN (2–5); output oA, oB, oC, oN (6–8, 13)	M12 × 35 · 420 lb-in (47.5 N·m)	3 × 400 kcmil [3 × 203 mm²]	ask AEC	Crimped ring, M12; 3 per terminal
CIRRO 600	Battery BATT +, BATT N, BATT – (14–16)	M12 × 35 · 420 lb-in (47.5 N·m)	4 × 1,000 kcmil [4 × 507 mm²]	ask AEC	Crimped ring, M12; 4 per terminal
CIRRO 600	PE (1)	M12 × 35 · 420 lb-in (47.5 N·m)	2/0 AWG [67.4 mm²]	ask AEC	Crimped ring, M12; 2 per terminal
CIRRO 800	Main input A, B, C (Figure 4-8)	M16 × 30 · ask AEC	4 × 600 kcmil [4 × 304 mm²]	ask AEC	Crimped ring, M16; 4 per terminal
CIRRO 800	Bypass input A, B, C; output A, B, C; N	M16 × 30 · ask AEC	4 × 600 kcmil [4 × 304 mm²]	ask AEC	Crimped ring, M16; 4 per terminal

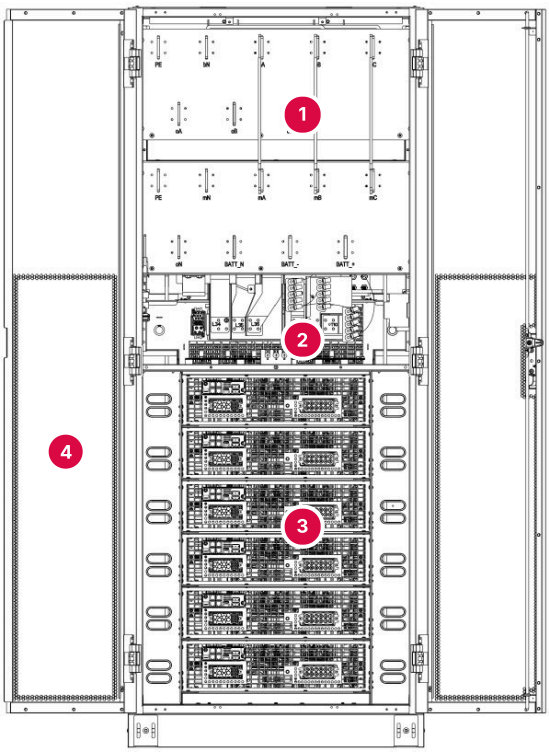
Frame	Terminals (items in Figure 4-5)	Bolt · torque	Wire, min. (Table 4-5)	Wire, max.	Lug
CIRRO 800	Battery BAT+, BAT−	M16 × 30 · ask AEC	6 × 600 kcmil [6 × 304 mm²]	ask AEC	Crimped ring, M16; 6 per terminal
CIRRO 800	PE	M16 × 30 · ask AEC	4/0 AWG [107 mm²]	ask AEC	Crimped ring, M16; 2 per terminal
CIRRO 1200	Main input A, B, C (Figure 4-9)	M16 × 60 · ask AEC	6 × 400 kcmil [6 × 203 mm²]	ask AEC	Crimped ring, M16; 6 per terminal
CIRRO 1200	Bypass input A, B, C; output A, B, C; N	M16 × 60 · ask AEC	6 × 400 kcmil [6 × 203 mm²]	ask AEC	Crimped ring, M16; 6 per terminal
CIRRO 1200	Battery +, −	M16 × 60 · ask AEC	8 × 1,000 kcmil [8 × 507 mm²]	ask AEC	Crimped ring, M16; 8 per terminal
CIRRO 1200	PE	M16 × 60 · ask AEC	250 kcmil [127 mm²]	ask AEC	Crimped ring, M16; 3 per terminal
CIRRO 360 · 1600	All terminals	ask AEC	as Table 4-5	ask AEC	ask AEC

The minimum conductors are the NEC sizes of Table 4-5 for the full frame; the number of lugs per terminal is the manufacturer's. The largest conductor and lug each terminal accepts is not published: ask AEC before you plan conductors larger than the minimum. The 3D render of the CIRRO 600 shows the order of the terminals; their exact spacing is on the AEC drawing (Figure 4-6).



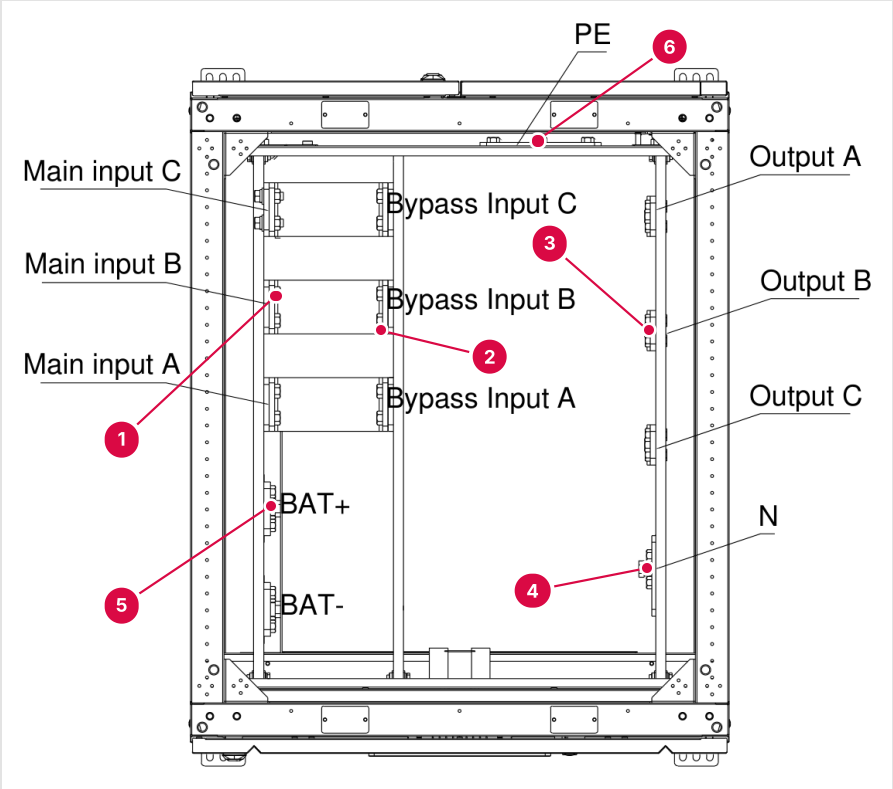
1. **Bypass input** bA, bB, bC, bN
2. **Output** oA, oB, oC
3. **Main input** mA, mB, mC, mN
4. **Output neutral** oN
5. **Battery** BATT N, BATT –, BATT +
6. **PE**, two places: connect first

FIGURE 4-6 CIRRO 600 power terminals, rear view with both rear doors open (AEC drawing) — m main input, b bypass input, o output



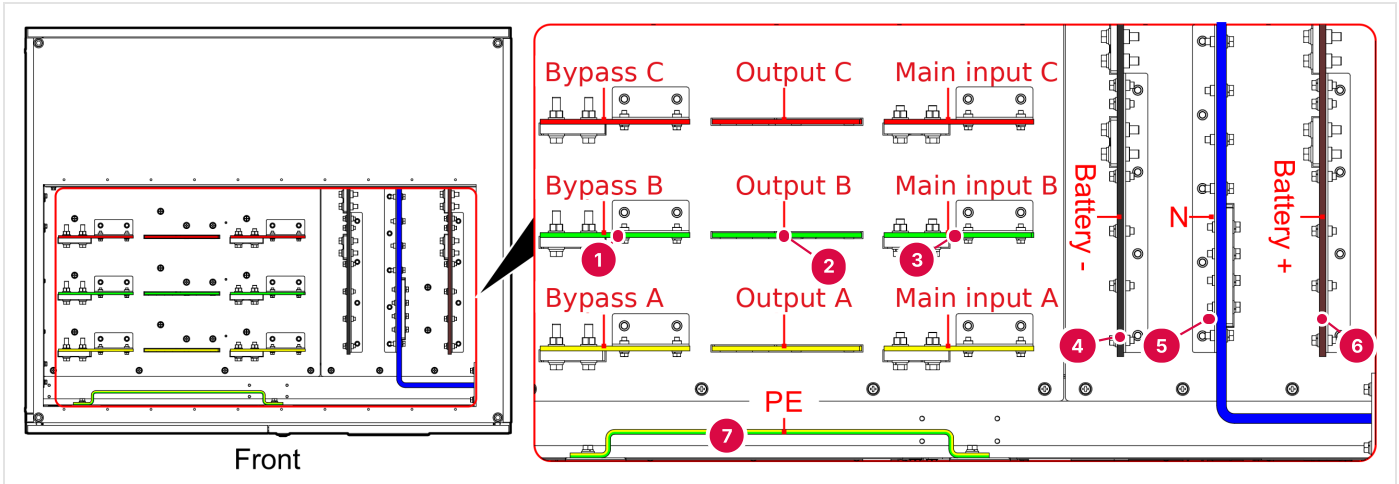
1. Power terminals (Figure 4-6)
2. Internal wiring and protection: do not touch
3. Rear of the power modules
4. Rear doors (two)

FIGURE 4-7 CIRRO 600 rear, both rear doors open (AEC drawing)



1	**Main input** A, B, C (left)	4	**N** — neutral busbar
2	**Bypass input** A, B, C	5	**Battery** BAT+, BAT–
3	**Output** A, B, C (right)	6	**PE**

FIGURE 4-8 CIRRO 800 cabinet terminals, top cover removed, seen from above, front at the bottom (AEC drawing)



1	**Bypass input** A, B, C	5	**N** — neutral busbar
2	**Output** A, B, C	6	**Battery +**
3	**Main input** A, B, C	7	**PE**
4	**Battery –**		

FIGURE 4-9 CIRRO 1200 terminals, top cover removed, seen from above, front at the bottom (manufacturer's layout of the 100 kVA platform)

TABLE 4-8 Wire order

Terminal group	Order	Notes
Main input	A (L1) · B (L2) · C (L3) · N	Clockwise phase rotation A-B-C.
Bypass input	A (L1) · B (L2) · C (L3) · N	Same phase rotation as the main input, or the UPS alarms Bypass Sequence Error. Same neutral as the main input. With a single supply, feed both inputs from it.
Output	A (L1) · B (L2) · C (L3) · N	480 V line to line, 277 V line to neutral.
Battery	+ · N · –	+ to the positive end of the string, N to the center tap (BATT N on the 600; the N busbar on the 800 and 1200), – to the negative end. Without a center tap, connect + and – only (Figure 4-10).
PE	PE	Protective earth, first on and last off.

i NOTE On the manufacturer's busbars the phases may be marked U, V, W: U = A, V = B, W = C.

Connection sequence

1. Open every upstream breaker, every breaker of the UPS and the battery breaker (Figure 5-1, state A). Lock them out and hang warning signs on them.
2. Remove the covers over the terminals: the rear doors and terminal cover on the CIRRO 600, the top cover on the CIRRO 800 and 1200.
3. Pull each cable outside the cabinet to strip and crimp it, so that no strands or insulation fall inside.
4. Connect the protective earth (PE) conductor first.
5. Connect the main input cables, then the bypass input cables. Keep phases A, B, C of each set on the same side of the copper bar.
6. Connect the battery cables (+, N, –) through the external DC breaker; leave the breaker open.
7. Connect the neutrals, then the output cables to the load.
8. Tighten every lug to the torque of Table 4-6, check the phase rotation and the wiring, then fix the cables to the entry plate and refit all covers.
9. Seal the cable entry with flame-retardant sealing putty against dust and rodents.

4.8 Battery

The battery bank is external: VRLA, 40 blocks of 12 V as standard (480 V DC; ±240 V DC with a center tap), settable from 30 to 50 blocks — 30 to 44 blocks on the CIRRO 360. The charger gives up to 15 % of the output power (80 A, settable, on the 360). Recharge time is less than 6 hours. The battery compensation kit BATT-COMP-CIR compensates the string voltage on long cable runs.

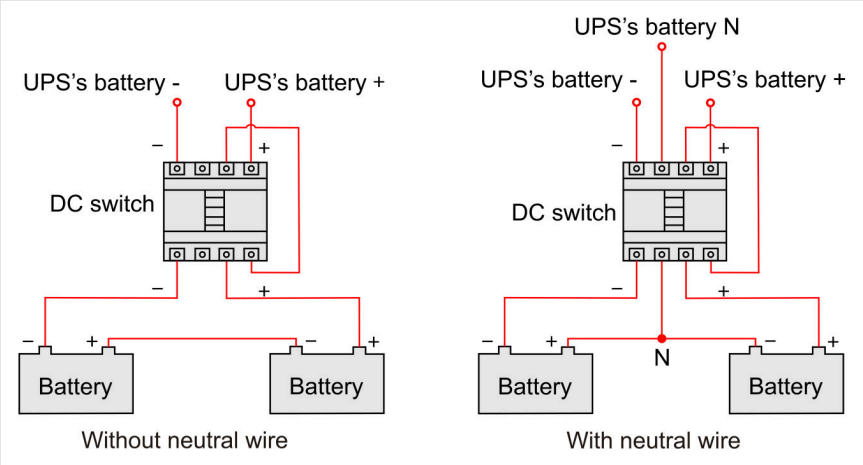


FIGURE 4-10 Battery connection through the external DC breaker: without center tap (left, + and –) and with center tap (right, +, N and –)

⚠ WARNING

- Do not connect the battery cables to the UPS and do not close the battery breaker before the commissioning engineer allows it.
- Check the polarity of every connection and the string voltage with a voltmeter before you close the breaker. Each half of a center-tapped string must read at least 11.5 V per block (230 V for a 40-block string).
- Use the same type, capacity and age of block throughout. The number of blocks set in **Set › BATT Set** must equal the number installed.
- Do not connect any conductor across the positive and negative terminals of a battery. Keep the battery terminals free from cable tension or twist.

- Install the battery in a locked cabinet or a battery room open only to qualified service personnel.
- Use a DC breaker with a pole for each conductor (+, N and – where there is a center tap) in the battery circuit.
- Tighten the block terminals to the battery maker's torque and insulate each terminal once connected.
- Wire the auxiliary contact of the battery breaker to a dry-contact input, and set that input in **Set › Dry Contact**, so that the UPS sees when the breaker is open.

4.9 Communication

Standard on every frame: USB, RS-232, RS-485, the touchscreen port, the cold start button, the intelligent slot and the SNMP slot (Figure 2-14). The SNMP-M network card and the DRYCNT dry-contact card are options. The dry-contact functions (generator input, battery breaker status and trip, alarm outputs) are set on the touchscreen in **Set › Dry Contact** (Figure 6-12).

- **RS-232** (Figure 2-14, item 5): to a PC with UPS View, or to a building system (Modbus). Pin 2 TXD, pin 3 RXD, pin 5 GND.
- **RS-485** (item 7) and **USB** (item 6): Modbus or UPS View; they share one setting in **Set › Comm Set** (Figure 6-13).
- **SNMP slot** (item 2): the SNMP-M network card (Section 8.1). **Intelligent slot** (item 1): the DRYCNT dry-contact card.
- **Remote EPO:** wire the remote EPO switch as a normally-closed loop. The EPO and dry-contact terminals are listed on the label inside the frame.
- Run the communication cables away from the power cables, in shielded cable (two-core 18 AWG [0.75 mm²] for dry contacts, Cat 5e for RJ45 ports).

4.10 Parallel system

Up to eight CIRRO units run in parallel, for more power or for redundancy. The parallel kit PAR-KIT-CIR is required for two or more frames. N+1 works inside a frame and between frames. AEC sets up and commissions the parallel system.

- All units must have the same rating and be fed from the same bypass source, with the same phase rotation. The bypass and main inputs must share the same neutral.
- Connect the outputs of all units to a common output bus. Keep the input and output cables of all units of the same length and size, so that the load shares equally in bypass mode.
- Connect the parallel cables in a closed ring: N units need N cables, so that each unit has two. The standard cable is 23 ft (7 m) long; ask AEC for longer cables.
- Wire the EPO of all units to the same remote switch.
- Provide a system maintenance bypass, sized for the total current.
- Set the system mode and the IDs on each unit as in Appendix A.

4.11 Installation checklist

- ☐ The frame stands level and anchored, with the clearances of Section 4.3.
- ☐ The power modules are fitted from the bottom slot up and locked; empty slots are closed.
- ☐ Breakers and conductors match Table 4-4 and Table 4-5 for the full frame; PE connected first; torque as in Table 4-6.
- ☐ CIRRO 1200 · 1600: switchgear for main input, bypass input, output and maintenance bypass installed.
- ☐ No short circuit between phases, neutral and PE on the input and the output; neutral-to-ground voltage 5 V or less.
- ☐ Phase rotation of main and bypass input checked.
- ☐ Battery polarity and string voltage checked; the battery breaker stays open until commissioning.
- ☐ EPO, dry contacts, cards and parallel cables connected; cable entries sealed; no tools or debris left in the cabinet.
- ☐ The commissioning engineer is booked: power is applied only in his presence.

05

CHAPTER 5

Operation

Starting, stopping and transferring the UPS, the maintenance bypass, EPO, replacing a power module, and the battery test — with the breaker positions for each step.

DANGER

Hazardous utility and battery voltage is present behind the protective covers. Only qualified service personnel may remove them.

5.1 Operation at a glance

TABLE 5-1 Operation at a glance

To	Do this
Start from fully off	Close Bypass Input, Output and Main Input; the inverters start by themselves; close the battery breaker (Section 5.2)
Start without utility (cold start)	Cold Start button on the control strip, then the Cold Start button of each power module (Section 5.3)
Load to bypass and back	**Control › Function › Manual Bypass**, then **Ecs Manual Bypass** (Section 5.4)
Service the modules with the load on	Maintenance bypass (Section 5.5)
Service the whole frame with the load on	Isolate the frame on the maintenance bypass (Section 5.6)
Switch everything off	EPO, then open the battery and all breakers (Section 5.7)
Emergency	EPO button (Section 5.8)

5.1.1 Breaker positions

The procedures refer to these breaker states. The pictures show the panel of the CIRRO 600. On the CIRRO 800 use the breakers of the breaker section (Figure 2-9); on the CIRRO 1200 and 1600 use the breakers with the same names in the switchgear; on the CIRRO 360 use the frame breaker and the upstream breakers.

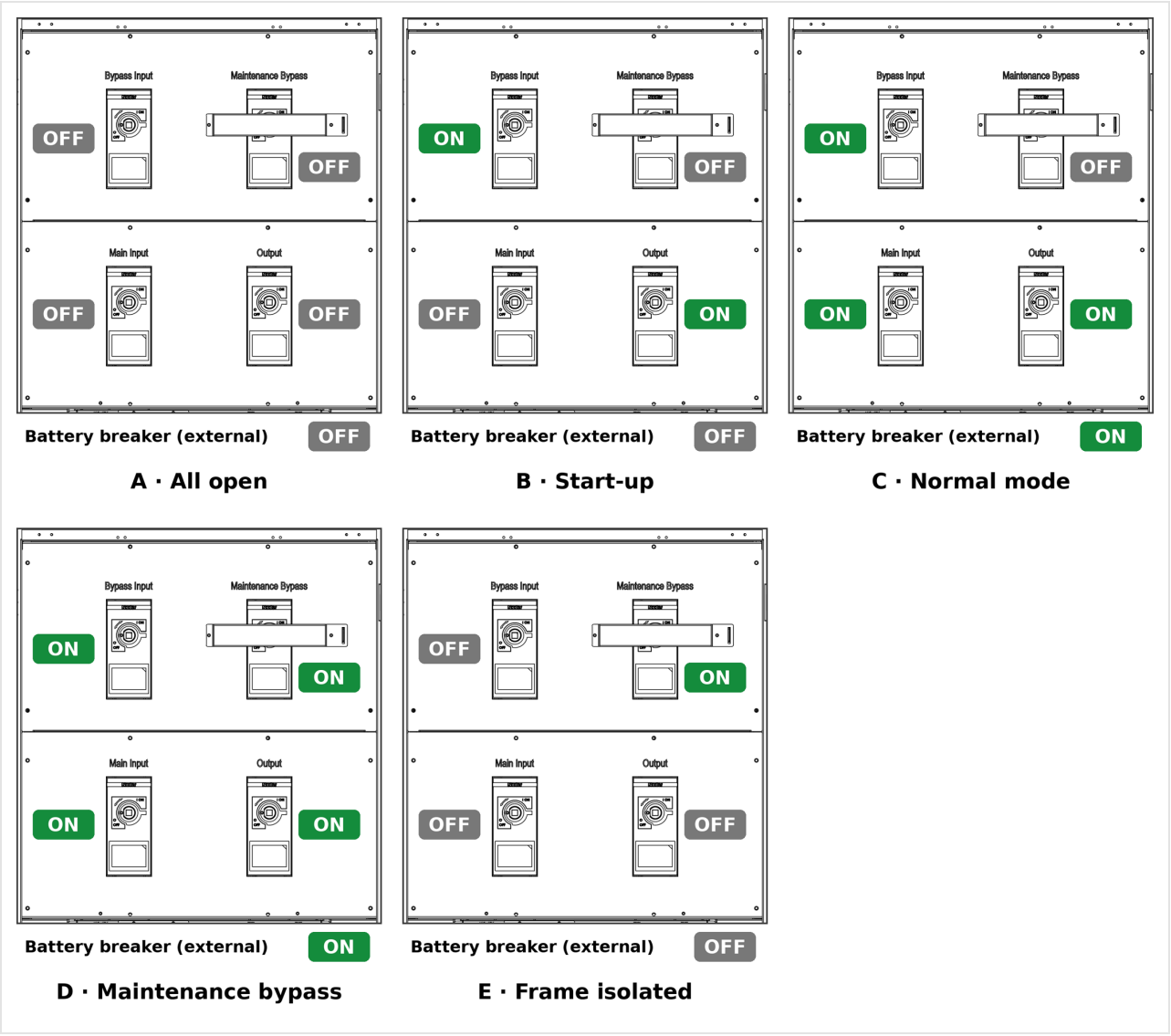


FIGURE 5-1 Breaker states A to E used in the procedures — green ON, gray OFF

5.2 Starting the UPS from fully off

> ⚠ ***WARNING***
>
> During this procedure the output terminals become live. If loads are connected, check with their users that it is safe to apply power; otherwise isolate them from the UPS output.

1. Check that all breakers are open (Figure 5-1, state A), that the cables are connected with the correct phase rotation and that every power module is locked in its slot.
2. Close the upstream feeder breakers. Close the **Bypass Input** and **Output** breakers (Figure 5-1, state B).
3. Close the **Main Input** breaker (Figure 5-1, state C). You see: the touchscreen starts; the rectifiers start and, after initialization, the static bypass feeds the load.
4. Open **Log** and check that there is no fault. If there is, stop and call AEC service.

5. Wait: the inverters start by themselves. After about one minute the UPS transfers from bypass to inverter. If they do not start, select **Control › Function › ON/OFF Control** (Figure 6-20, item 1). You see: green indicator; on the home page the energy flow runs from the main input through rectifier and inverter to the output (Figure 6-2, item 5).
6. Close the external battery breaker. A few minutes later the battery starts charging. You see: **Cabinet › Battery** shows the battery connected and charging (Figure 6-4).
7. Measure the output: 480 V ± 2 V line to line, 60 Hz ± 0.1 Hz. Then switch on the loads, the largest first.

5.3 Starting on battery (cold start)

Use the cold start when there is no utility and the load must run from the battery.

1. Make sure the battery string is connected and its breaker is closed, and that the **Output** breaker is closed.
2. Press the **Cold Start** button on the control strip (Figure 2-14, item 3) for about 1 s. You see: the touchscreen turns on.
3. Press the **Cold Start** button on the front of a power module (Figure 2-13, item 2). You see: after about 2 minutes the module runs in battery mode (Figure 2-18).
4. Start the other power modules one by one in the same way.

5.4 Transferring to bypass and back

1. To bypass: **Control › Function › Manual Bypass** (Figure 6-20, item 3). The load is fed directly from the bypass input, not from the inverters.
2. Back to normal: **Control › Function › Ecs Manual Bypass** (item 4). When the inverters are ready the UPS transfers to normal mode.
3. If the bypass frequency is out of tracking range, use **Manual Transfer to Inverter** (item 2) instead. The output can be interrupted for up to 20 ms.

> ⚠ ***WARNING***
>
> In bypass mode the load is fed directly by the utility, not by the inverter, and is not protected.

5.5 Maintenance bypass

Use this procedure to service the power modules or the battery while the load stays on.

5.5.1 From normal mode to maintenance bypass

> ⚠ ***WARNING***
>
> Before you start, check on the touchscreen that the bypass is normal and the inverters are synchronized with it, so as not to interrupt the load.

1. Transfer the UPS to bypass: **Control › Function › Manual Bypass** (Figure 6-20, item 3). Silence the alarm with the speaker icon (Figure 6-2, item 7); the message stays until the condition ends.
2. Remove the locking bar and close the **Maintenance Bypass** breaker (Figure 5-1, state D). The maintenance bypass and the static bypass now feed the load together. You see: the event Maintenance CB Closed.
3. Enable the module keys (**Control › Function › Module Button Power Enable**, item 6), then turn each power module OFF with its knob (Figure 2-13, item 4).

4. Open the external battery breaker. The power modules can now be serviced.
5. To service the whole frame, continue with Section 5.6.

5.5.2 From maintenance bypass to normal mode

1. Check that the **Bypass Input**, **Main Input** and **Output** breakers are closed and the external battery breaker is still open: as state D of Figure 5-1, but with the battery breaker OFF (you close it in step 4). Lock the power modules in their slots. You see: the touchscreen starts; after about 20 s the rectifiers run and the static bypass feeds the load.
2. Check on the touchscreen that the static bypass feeds the load (energy flow on the home page), then open the **Maintenance Bypass** breaker and refit its locking bar. The breakers are now as state C of Figure 5-1, except the battery breaker, which is still open.
3. If the load stays on bypass, select **Control › Function › Ecs Manual Bypass**. After about 60 s the UPS transfers to inverter.
4. Close the external battery breaker.

⚠ *WARNING*

Before you open the Maintenance Bypass breaker, make sure on the touchscreen that the static bypass is feeding the load. Otherwise the load drops.

⚠ *DANGER*

With the Maintenance Bypass breaker closed, parts of the UPS are still live, among them the input and output busbars. Before you remove a power module wait 15 minutes for its DC bus capacitors to discharge.

5.6 Isolating the frame on the maintenance bypass

Use this procedure to service the whole frame — bypass module and power modules — while the load runs on the maintenance bypass.

5.6.1 From normal mode to the isolated frame

1. Select **Control › Function › Manual Bypass**. The load transfers to the static bypass with an audible alarm, and the inverters stand by.
2. Close the **Maintenance Bypass** breaker (Figure 5-1, state D).
3. Enable the module keys, then turn each power module OFF.
4. Open the external battery breaker.
5. Open the **Bypass Input**, **Main Input** and **Output** breakers (Figure 5-1, state E). The load is on the maintenance bypass (Figure 2-18); the touchscreen goes dark. Wait 15 minutes before you work inside the frame.

⚠ *WARNING*

Do not open the upstream breaker that feeds the bypass input: the maintenance bypass is fed from it, and the output would be interrupted. Do not close the Output breaker while the frame is isolated. With an external maintenance bypass you can isolate the frame completely: close the external maintenance bypass breaker, then open the external input and output breakers.

5.6.2 From the isolated frame back to normal mode

1. Close the **Output** and **Bypass Input** breakers. The static bypass turns on.

2. On the touchscreen, clear the alarms: **Control › Function › Fault Clear** (Figure 6-20, item 5).
3. Check that the static bypass feeds the load, then open the **Maintenance Bypass** breaker and refit its locking bar.
4. Lock the power modules in their slots and close the **Main Input** breaker (Figure 5-1, state C). Select **Ecs Manual Bypass**: the UPS transfers to inverter after about 60 s.
5. Close the external battery breaker.

5.7 Shutting the UPS down completely

1. Shut down or transfer the loads.
2. Stop the output: press EPO on the front of the UPS (Figure 6-1, item 2). The rectifiers, inverters and bypass stop; nothing is fed to the load. To stop only the inverters and keep the load on the bypass, use **Control › Function › ON/OFF Control** instead.
3. Open the external battery breaker.
4. Open the **Bypass Input**, **Main Input** and **Output** breakers (Figure 5-1, state A), and the external breakers (with a split bypass, both input breakers).
5. Wait until the touchscreen is dark: the UPS is off.

5.8 Emergency power off (EPO)

Pressing EPO switches off the rectifiers, inverters and the bypass and stops the output at once; the battery stops charging and discharging. With utility present the controls stay powered but the output is off. To isolate the UPS completely, open the main input and battery breakers.

Restart after EPO. Release the EPO button or the remote EPO switch. Shut the UPS down completely (Section 5.7), then start it as in Section 5.2. If the utility input was disconnected after the EPO, the EPO condition clears when the utility returns and the UPS restores the output on the static bypass.

> ⚠ ***WARNING***
>
> If the Maintenance Bypass breaker is closed and the utility is present, the output stays energized after EPO.

5.9 Automatic restart

On a utility failure the UPS runs from the battery until end of discharge (EOD), then shuts down. If auto recovery after EOD is enabled, it restarts by itself when the utility returns and recharges the battery. After an over-temperature, overload or too many transfers, the UPS clears the fault by itself when the cause is gone.

5.10 Replacing a power module

Only trained operators may replace a power module. A module weighs 104 lb (47 kg): use three people or a lift truck with locked wheels.

With a redundant module (N+X) and the bypass normal

1. Select **Control › Function › Module Button Power Enable** (Figure 6-20, item 6): the modules' OFF knob works.
2. Turn the module's knob to OFF (Figure 2-13, item 4). It leaves the system and the others carry the load.
3. Remove the fixing screws, unlock the module and pull it out slowly by its handles.

4. Insert the new module slowly and evenly; do not force it onto the connector. Insert modules one at a time, at least 10 s apart. Lock the module and fit the screws: it joins the system by itself.

Without a redundant module

1. Transfer to bypass: **Control › Function › Manual Bypass**.
2. Turn the module OFF, unlock it and pull it out.
3. Insert the new module, lock it, fit the screws, and return to normal mode with **Ecs Manual Bypass**.

> ⚠ ***WARNING***
>
> A removed module stays charged inside and on its rear connector. Do not open it, and do not touch its connector pins for 15 minutes; check that the DC bus is below 36 V before you handle it. The bypass module cannot be serviced in battery mode; its service is reserved to AEC service.

5.11 Battery test and maintenance

1. **Control › Test › Battery Test** (Figure 6-21, item 1): the UPS runs on battery for 20 seconds. A weak battery raises an alarm and the UPS returns to normal or bypass mode. Before the test, check that there is no alarm and that the battery voltage is above 90 % of the float voltage.
2. **Battery Maintain** (item 2): the battery is discharged down to 1.1 × the end-of-discharge voltage, then the UPS returns to normal mode. Conditions: battery in float for at least 5 hours, load 25–100 % of the rating.
3. **Stop Test** (item 3) ends a test or a maintenance discharge.
4. The commissioning engineer can set an automatic self-test every 720 to 3,000 hours.

5.12 Language, date and time

- **Language: Set › Language** (Figure 6-14). Choose English, Spanish, French, German, Italian, Portuguese, Russian, Polish, Czech, Catalan, Turkish, Korean or Chinese (simplified or traditional).
- **Date and time: Set › Sys Func** (Figure 6-14). Tap the date and time, enter the new values and press Set. Every log entry carries them.

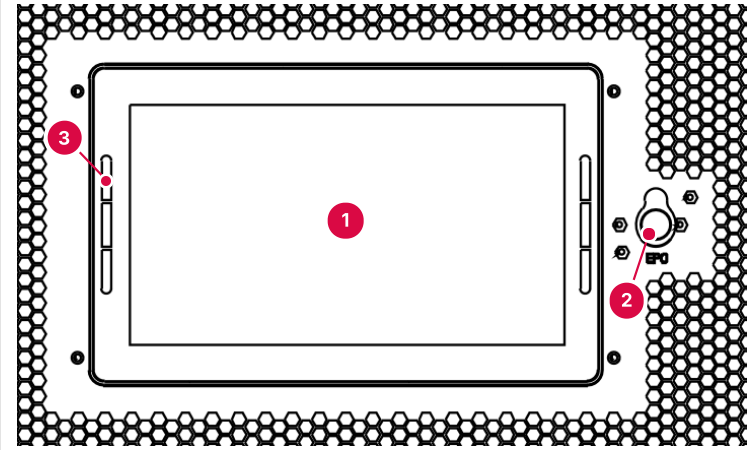
CHAPTER 6

06 Touchscreen

The AEC color touchscreen: home page, cabinet and module readings, logs, settings, controls and waveforms.

i NOTE The CIRRO 360 has a 7-inch touchscreen, the CIRRO 600 to 1600 a 10-inch one; the pages are the same. The screen pictures in this chapter were taken from a display not connected to a UPS: the readings are zero and "Communication Abnormal" is shown. Your screens show the live values.

6.1 Operator panel



1. Touchscreen, color
2. EPO button
3. Status indicator bars, both sides of the screen

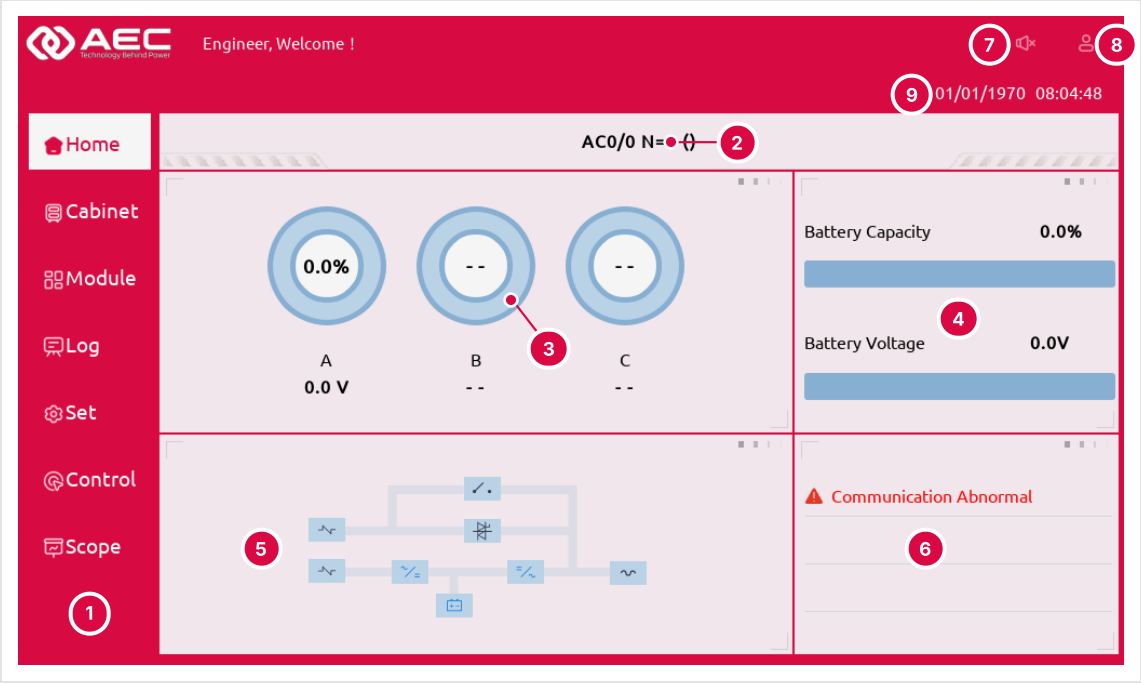
FIGURE 6-1 Operator panel on the front door (AEC drawing)

The status indicators show the system status. The buzzer tells the kind of alarm. Press EPO to shut down the rectifier, inverter, charger and bypass in an emergency.

TABLE 6-1 Indicators and buzzer

Signal	Meaning
Green	System working normally
Yellow	System warning (utility failure, overload, etc.)
Red	System failure or fault
Two short beeps and one long beep	General alarm (for example utility input abnormal)
Continuous tone	Serious fault (for example a fuse or hardware fault)

6.2 Home page and main menu



1. Main menu: Home, Cabinet, Module, Log, Set, Control, Scope
2. Status bar: cabinet capacity / module capacity, number of modules (N = ...), single (S) or parallel (P) mode
3. Output voltage gauges, phases A, B, C
4. Battery capacity and battery voltage bars
5. Energy flow: bypass, maintenance bypass, main input, rectifier, inverter, battery, output
6. Warning information: red = serious alarm, orange = general alarm
7. Speaker icon: mute or unmute the alarm
8. User icon: log in or out
9. Date and time

FIGURE 6-2 Home page

The home page comes up after the welcome window. A dash instead of a value means that phase is not wired or not read.

⚠ CAUTION

Settings and controls are protected by login. AEC gives the login accounts to the owner and the commissioning engineer. Only authorized, trained personnel may change settings or use the Control menu.

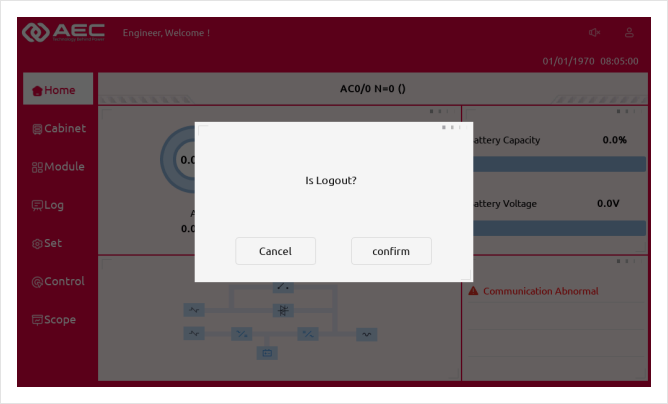
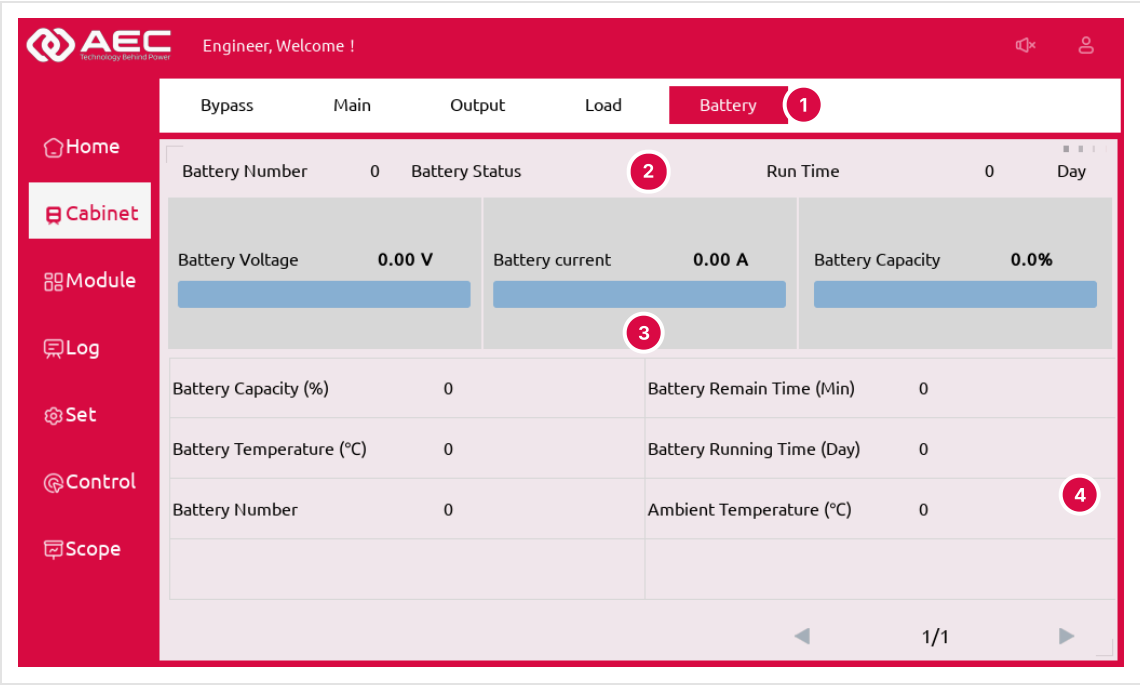


FIGURE 6-3 The user icon asks before it logs out

6.3 Cabinet (system readings)

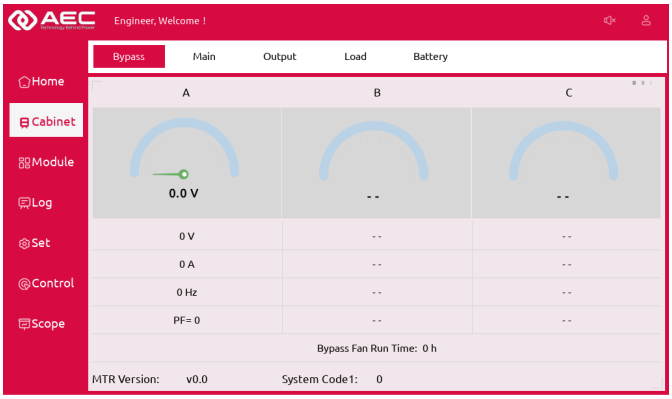
TABLE 6-2 Cabinet pages

Page	Shows
Bypass	Phase voltage (V), current (A), frequency (Hz) and power factor of the bypass; bypass fan running time.
Main	Phase voltage, current, frequency and power factor of the main input; rated input.
Output	Phase voltage, current, frequency and power factor of the output; rated output.
Load	Apparent power (kVA), active power (kW), reactive power (kVAr) and load (%) per phase.
Battery	Number of batteries per string, status (boost / float charge), run time, total voltage and current, capacity compared with a new battery (%), remaining time (min), battery and ambient temperature.

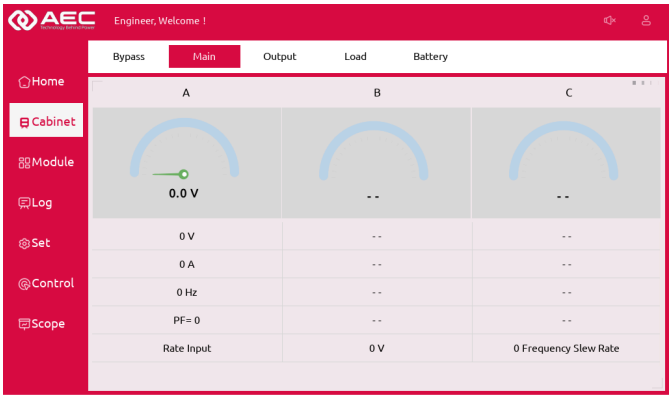


1. Cabinet tabs: Bypass, Main, Output, Load, Battery
2. Battery number per string, status (boost / float), run time
3. Battery voltage, current and capacity, positive and negative half
4. Capacity compared with a new battery, remaining time, battery and ambient temperature

FIGURE 6-4 Cabinet — Battery, the page to check after start-up and during an outage

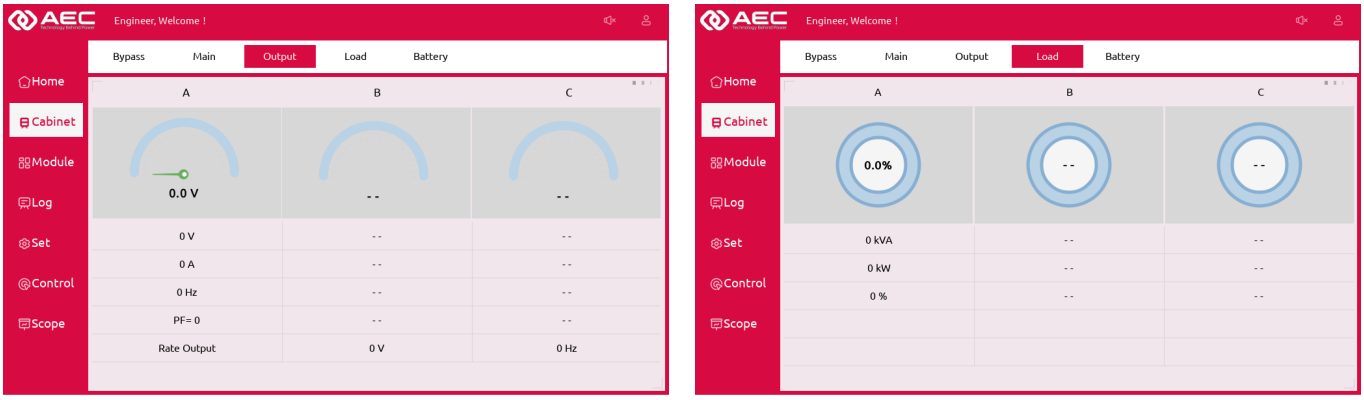


Cabinet — Bypass



Cabinet — Main

FIGURE 6-5 Cabinet — Bypass and Main



Cabinet — Output

Cabinet — Load

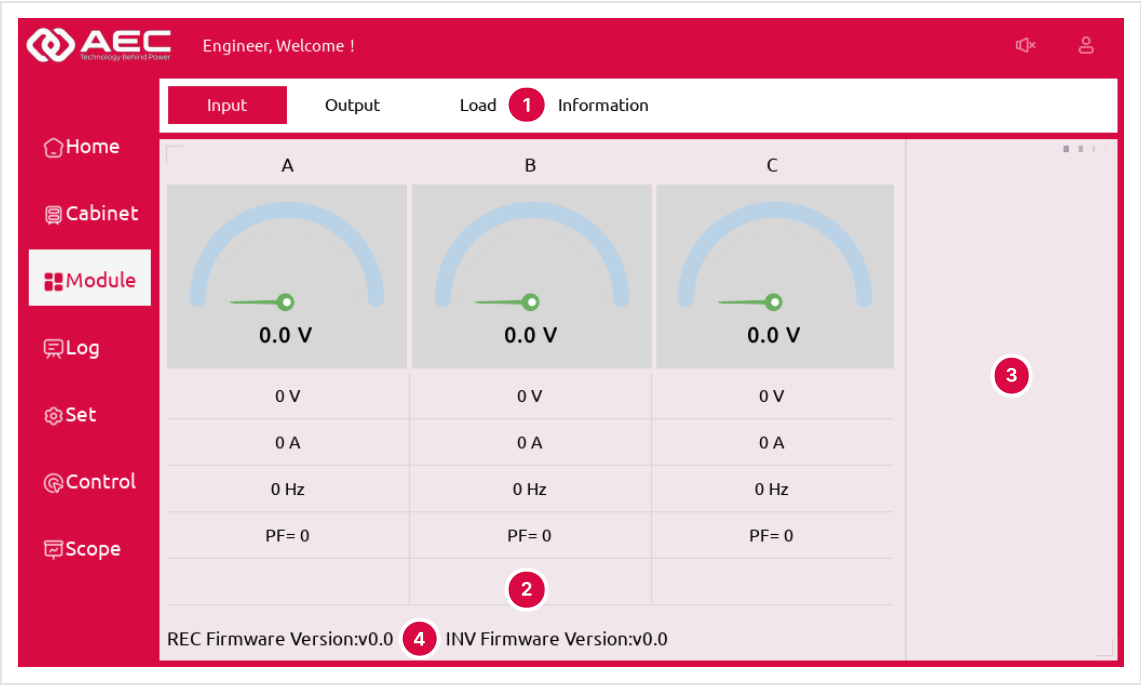
FIGURE 6-6 Cabinet — Output and Load

6.4 Module (power module readings)

Select a power module in the list on the right to see its values.

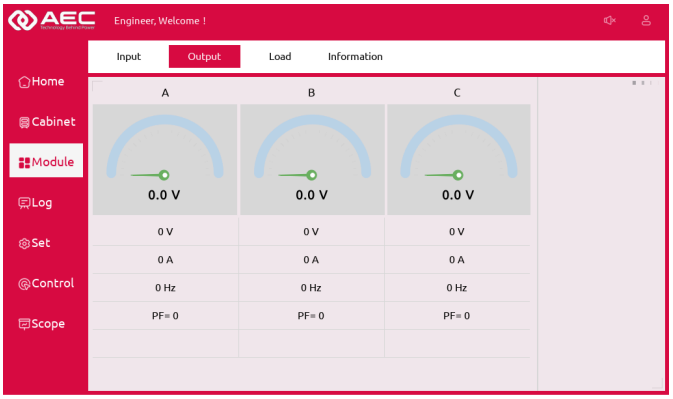
TABLE 6-3 Module pages

Page	Shows
Input	Input phase voltage, current, frequency and power factor of the selected module.
Output	Output phase voltage, current, frequency and power factor of the selected module.
Load	Apparent, active and reactive power and load (%) of the selected module.
Information	DC bus voltage (+/–), battery voltage, charger voltage and current, discharge current, inverter voltage per phase, fan and capacitor running hours, temperatures.



1. Module tabs: Input, Output, Load, Information
2. Readings of the selected module, phases A, B, C
3. Module list: green = module shown, black = module connected, empty = no module in that slot
4. Rectifier and inverter firmware versions of the module

FIGURE 6-7 Module — Input



Module — Output



Module — Load

FIGURE 6-8 Module — Output and Load

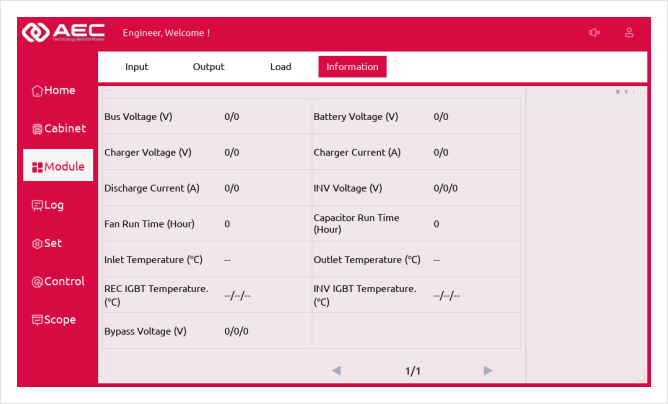


FIGURE 6-9 Module — Information

6.5 Log

Log lists the current alarms and the history of alarms and events by date and time. The meaning of every event is in Section 11.3.

6.6 Set (settings)

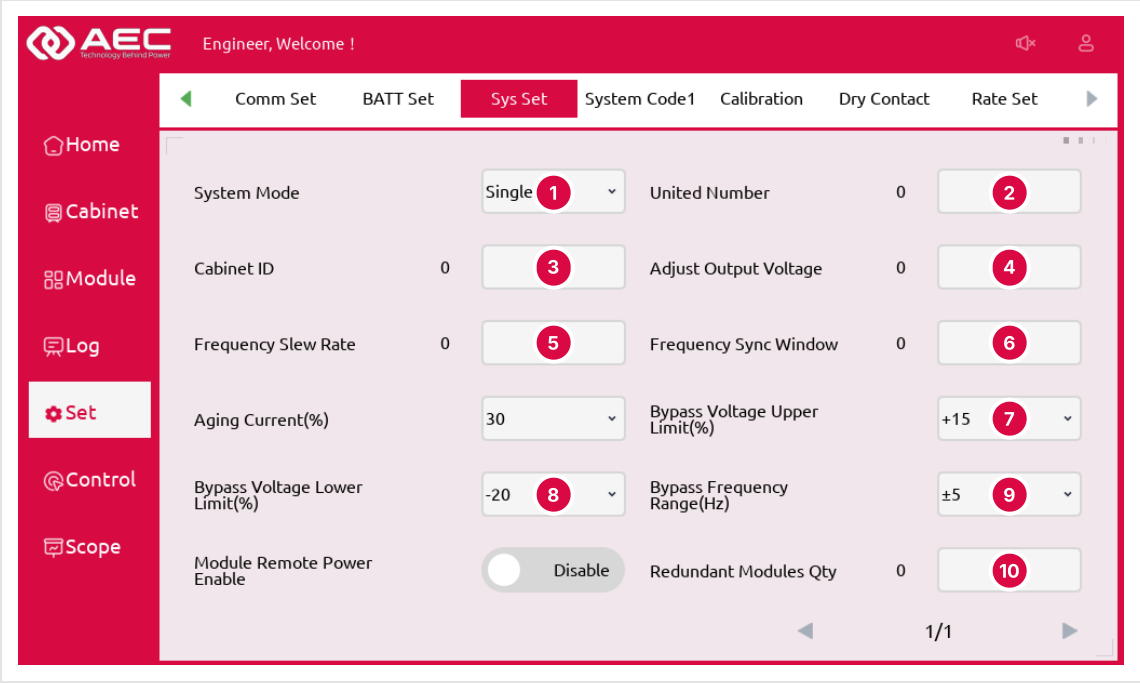
> ⚠ ***CAUTION***
>
> Settings change how the UPS works. Battery, calibration, communication and dry-contact settings are for service engineers. The number of batteries set must equal the number installed, or the batteries and the UPS can be seriously damaged.

The Set menu has two rows of tabs; the green arrows at the ends switch between them.

TABLE 6-4 Set pages

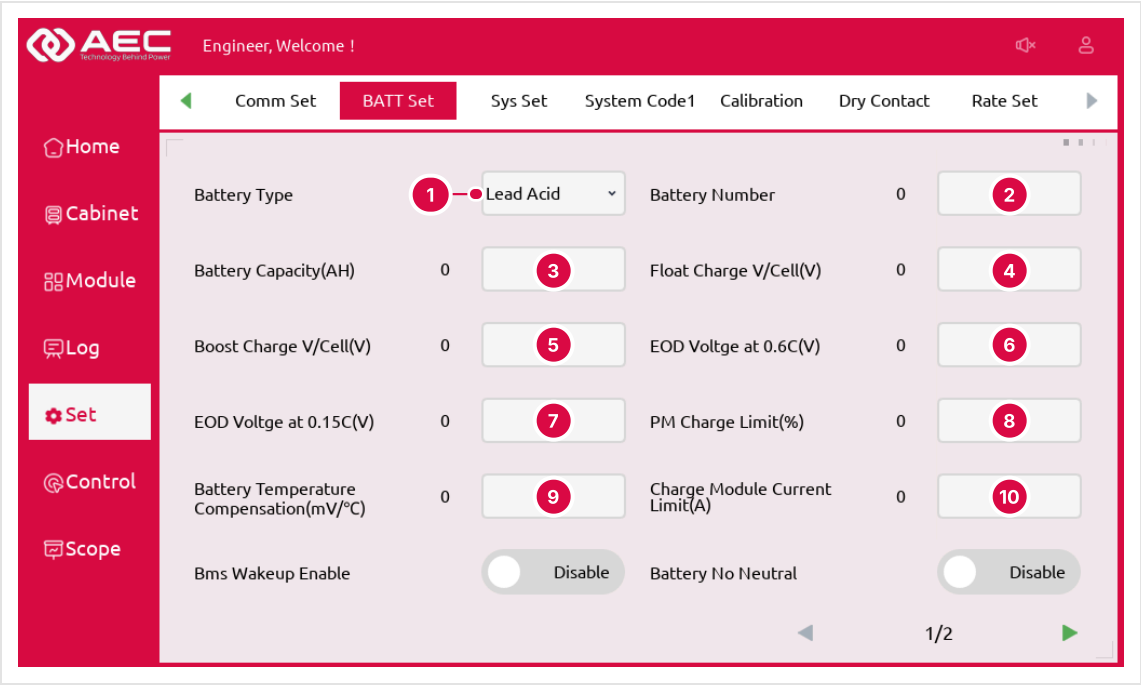
Page	Settings
Language	Display language (Section 5.12).
Sys Func	Screen saver and wait time, system date and time; software version and serial number.
NetWork	Static or DHCP, IP address, subnet mask, gateway and DNS servers of the display and its web monitor.
Uart	Serial port, baud rate, Modbus RTU enable.
Display Set	Display protocol and phase labels.
Alarm Set	Level of each UPS event — green: event, yellow: warning, red: fault.
BMS	Add and apply a battery management system device (lithium battery cabinet).
Comm Set	Protocol (MEGA, Modbus ASCII, Modbus RTU), baud rate and address of the RS-232 and RS-485 / USB ports.
BATT Set	Battery type (VRLA or lithium), number, capacity (Ah), float and boost voltage per cell, end-of-discharge voltage at 0.6 C and 0.15 C, charge current limit, temperature compensation; BMS communication control.
Sys Set	System mode (single, parallel, ECO, LBS), number of units and cabinet ID, output voltage adjustment, bypass voltage and frequency window, redundant modules.
System Code1	Parallel delayed start; line-voltage display.
Calibration	Output, bypass, inverter DC, input AC and battery voltages against a meter (maintenance only).

Page	Settings
Dry Contact	Function of the dry-contact inputs (e.g. generator input) and outputs (e.g. battery breaker trip).
Rate Set	Rated input and output voltage and frequency.



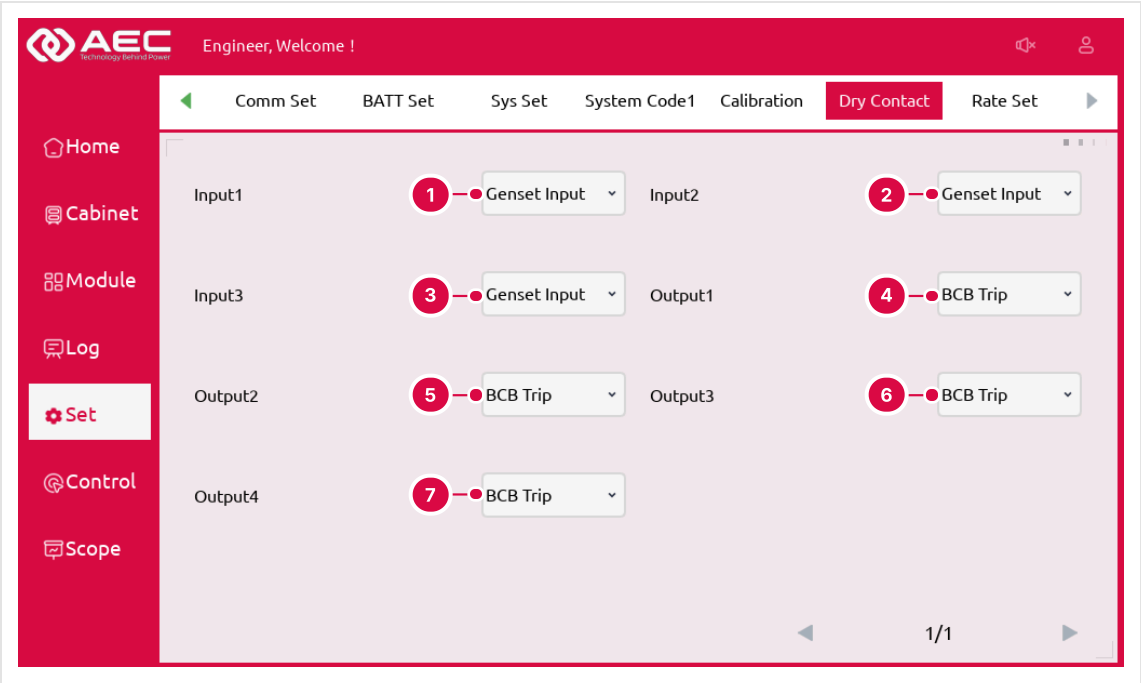
1. System Mode: Single, Parallel, Single ECO, Parallel ECO, LBS, Parallel LBS
2. United Number: number of units in parallel
3. Cabinet ID: 0, 1, 2 ... one per unit
4. Adjust Output Voltage
5. Frequency Slew Rate
6. Frequency Sync Window
7. Bypass Voltage Upper Limit
8. Bypass Voltage Lower Limit
9. Bypass Frequency Range
10. Redundant Modules Qty (N+X)

FIGURE 6-10 Set — Sys Set



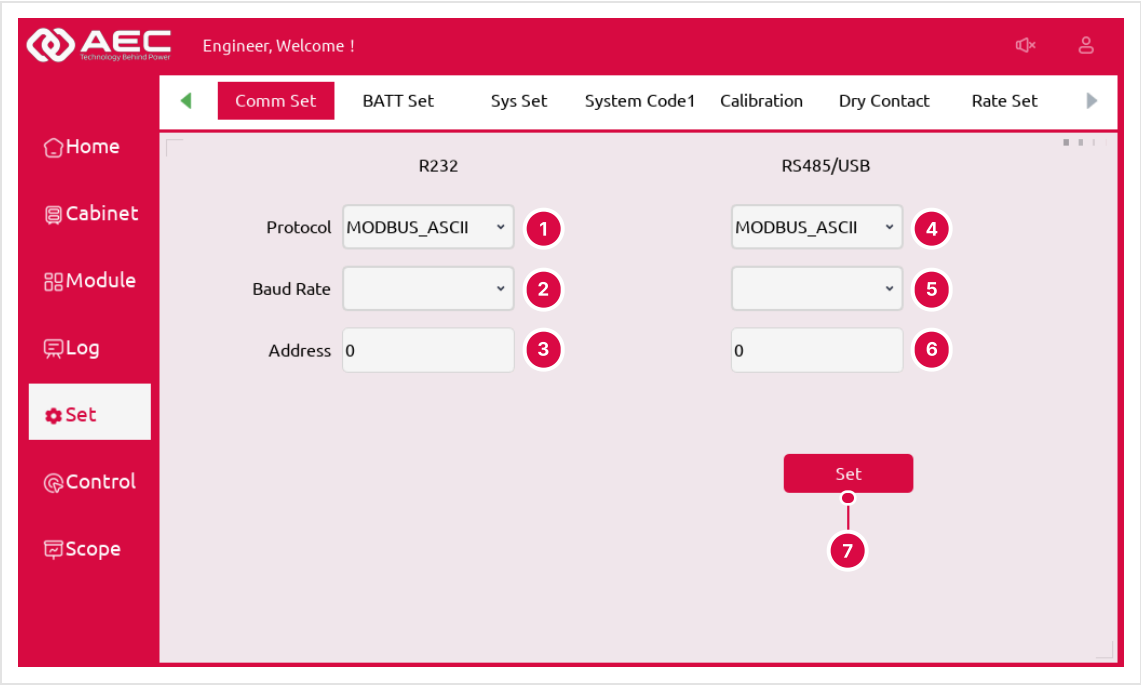
1. Battery Type
2. Battery Number: 30 to 50 blocks (30 to 44 on the 360)
3. Battery Capacity (Ah)
4. Float Charge V/Cell
5. Boost Charge V/Cell
6. EOD Voltage at 0.6 C
7. EOD Voltage at 0.15 C
8. PM Charge Limit (%)
9. Battery Temperature Compensation (mV/°C)
10. Charge Module Current Limit (A)

FIGURE 6-11 Set — BATT Set, page 1



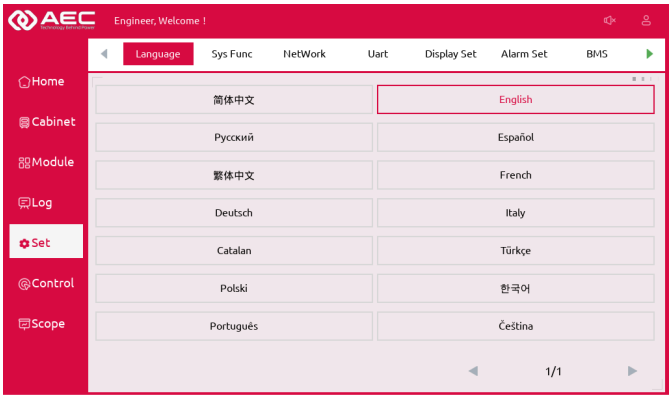
1. Input1
2. Input2
3. Input3, e.g. Genset Input
4. Output1
5. Output2
6. Output3
7. Output4, e.g. BCB Trip

FIGURE 6-12 Set — Dry Contact

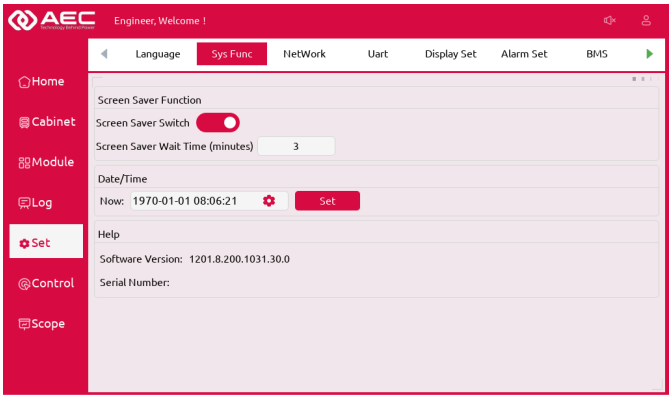


1. RS-232 protocol
2. RS-232 baud rate
3. RS-232 address
4. RS-485 / USB protocol
5. RS-485 / USB baud rate
6. RS-485 / USB address
7. Set: apply

FIGURE 6-13 Set — Comm Set

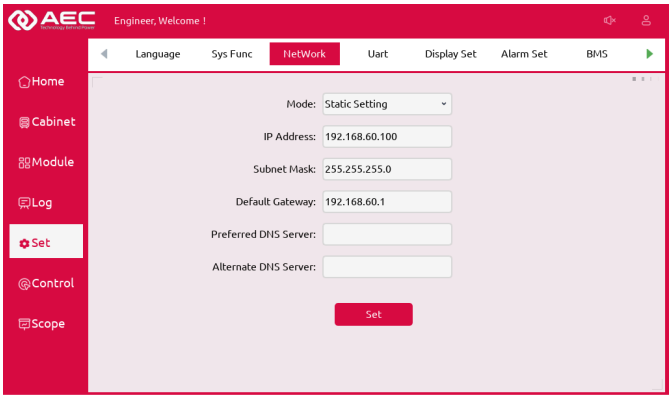


Language

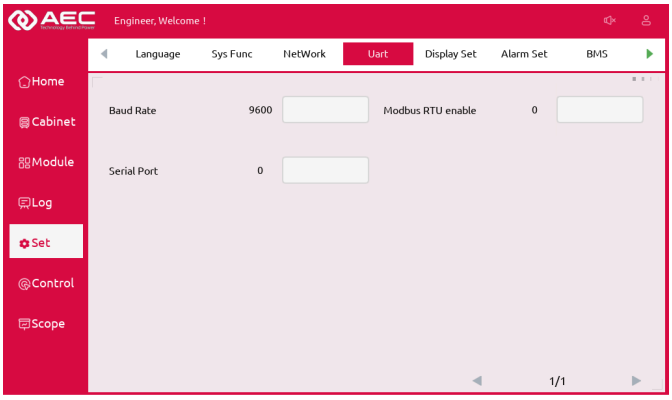


Sys Func

FIGURE 6-14 Set — Language and Sys Func

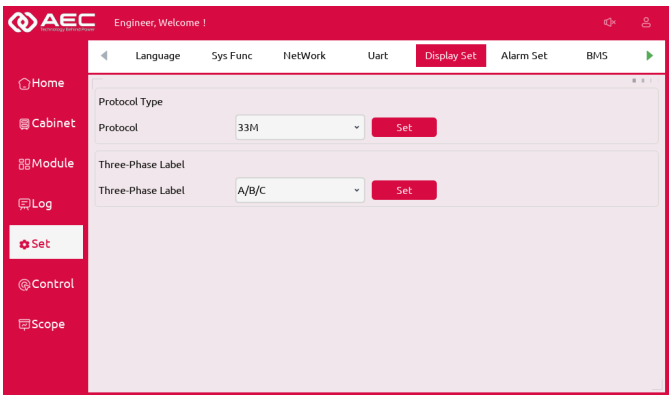


NetWork

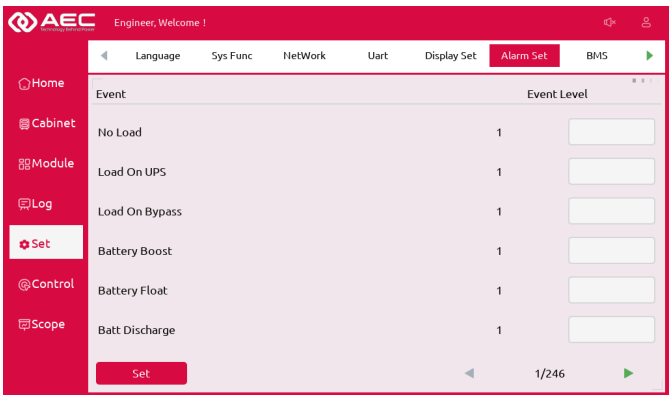


Uart

FIGURE 6-15 Set — NetWork and Uart

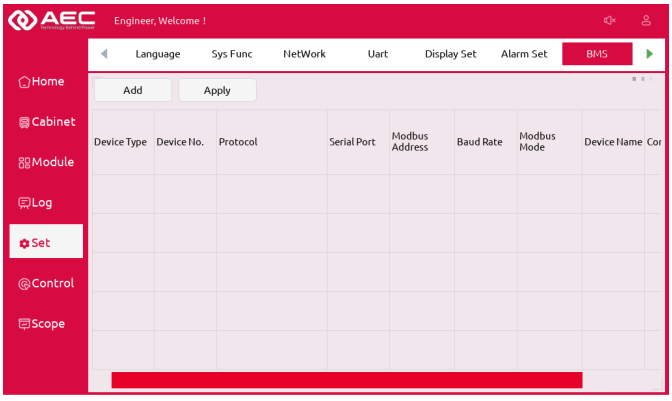


Display Set

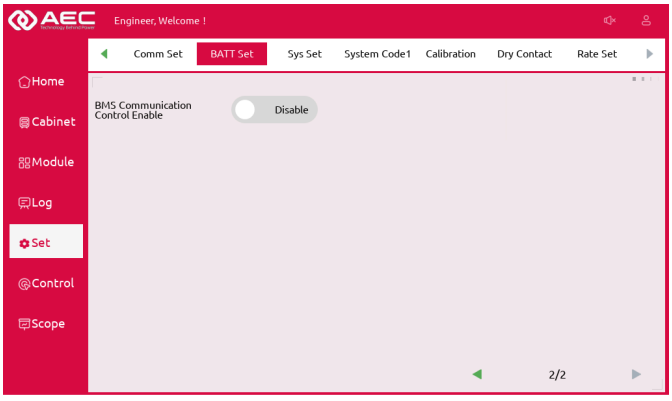


Alarm Set

FIGURE 6-16 Set — Display Set and Alarm Set

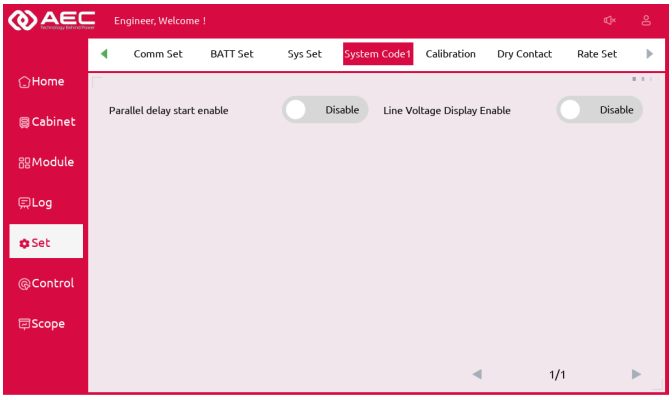


BMS



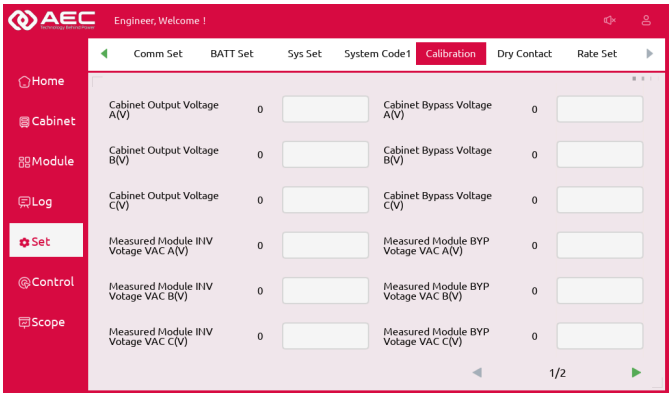
BATT Set, page 2

FIGURE 6-17 Set — BMS and BATT Set page 2



System Code1 | Rate Set

FIGURE 6-18 Set — System Code1 and Rate Set



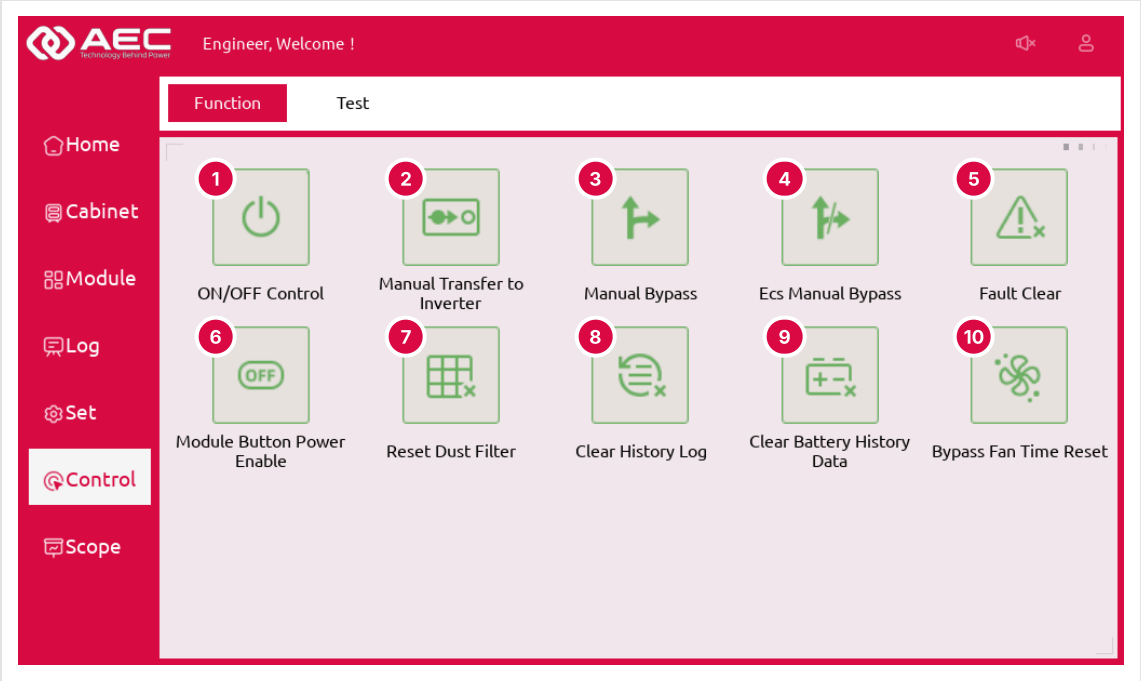
Calibration, page 1 | Calibration, page 2

FIGURE 6-19 Set — Calibration, pages 1 and 2

6.7 Control

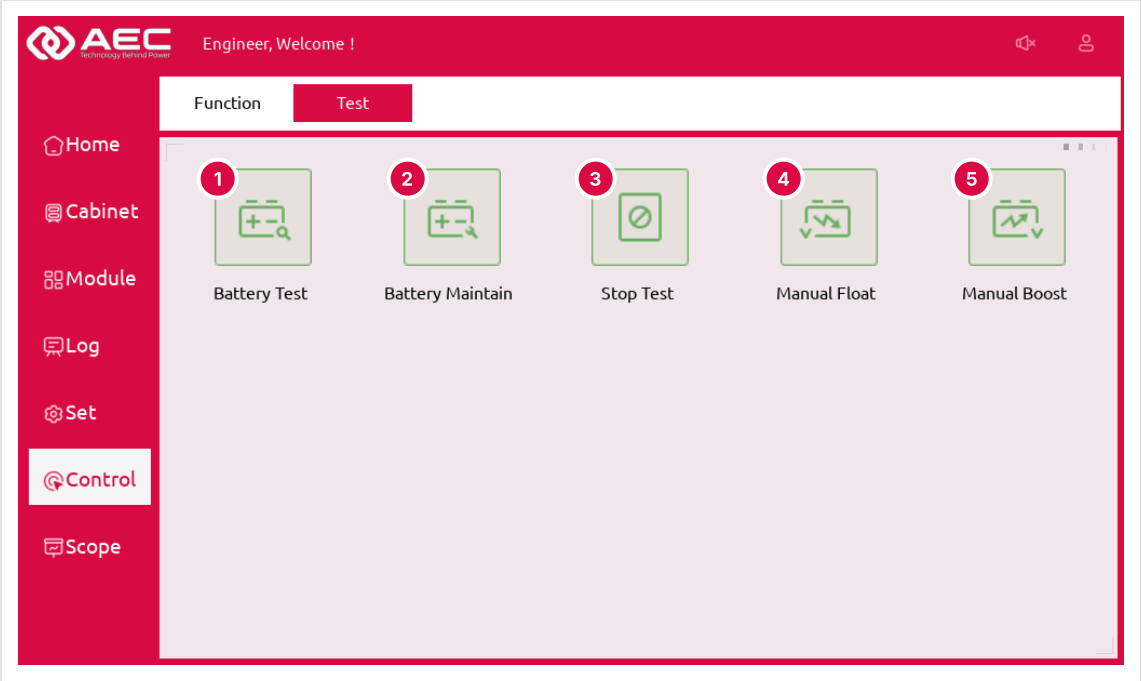
TABLE 6-5 Control pages

Page	Commands
Function	ON/OFF Control (inverter on/off, with confirmation) · Manual Transfer to Inverter (the output can be interrupted) · Manual Bypass and Ecs Manual Bypass (its cancel) · Fault Clear · Module Button Power Enable (enables the OFF knob on the power modules) · Reset Dust Filter · Clear History Log · Clear Battery History Data (after new batteries) · Bypass Fan Time Reset.
Test	Battery Test · Battery Maintain · Stop Test · Manual Float · Manual Boost charge.



1. ON/OFF Control: inverter on or off
2. Manual Transfer to Inverter
3. Manual Bypass: load to the static bypass
4. Ecs Manual Bypass: cancel the manual bypass
5. Fault Clear
6. Module Button Power Enable: enables the modules' OFF knob
7. Reset Dust Filter
8. Clear History Log
9. Clear Battery History Data
10. Bypass Fan Time Reset

FIGURE 6-20 Control — Function: the commands used in the operating procedures



1. Battery Test (20 s on battery)
2. Battery Maintain (discharge to 1.1 × EOD)
3. Stop Test
4. Manual Float charge
5. Manual Boost charge

FIGURE 6-21 Control — Test

6.8 Scope (waveforms)

Scope shows the waveforms of the output voltage, the output current and the bypass voltage of the three phases: yellow = phase A, green = phase B, red = phase C.



FIGURE 6-22 Scope — output voltage, output current and bypass voltage

CHAPTER 7

07 Everyday use

Power outages, what the panel tells you, and good habits.

7.1 During a power outage

1. The UPS switches to battery with no break. The load keeps running, the energy flow on the home page shows the battery feeding the inverter, and the buzzer sounds.
2. Silence the buzzer with the speaker icon at the top right of the screen (Figure 6-2, item 7).
3. Watch **Cabinet › Battery**: capacity and remaining time (Figure 6-4).
4. If the outage lasts, shut the loads down in order before the battery is exhausted — automatically through the SNMP-M card if installed.
5. At the end of discharge the UPS switches its output off to protect the battery. When the utility returns it restarts and recharges the battery (auto restart). If the utility stays off for a long time, open the battery breaker to protect the battery, and recharge it fully when the utility returns.

7.2 What the panel tells you

TABLE 7-1 What you see, what it means, what to do

What you see	Meaning	What to do
Green indicator; energy flow from the main input through rectifier and inverter	Normal mode	Nothing.
Battery feeding the inverter; buzzer	Utility failure: on battery	See Section 7.1.
Yellow indicator; two short beeps and one long beep	General alarm (for example utility input abnormal)	Read **Log**; look the event up in Section 11.3.
Red indicator; continuous tone	Serious fault (for example a fuse or hardware fault)	Read **Log**, note the event, call AEC service. Do not restart repeatedly.
Load on bypass in the energy flow	Manual bypass, overload or a fault	Read **Log**; remove the cause; return with **Ecs Manual Bypass** or **Manual Transfer to Inverter**.
Orange warning text on the home page	General alarm	Read the text and **Log**.
Red warning text on the home page	Serious alarm	Call AEC service.
Redundancy alarm (Lost N+X Redundant)	Fewer modules than the redundancy set	Check the modules in **Module**; replace or reinsert the failed one.

7.3 Good habits

- Leave the UPS running all the time. Check the home page and **Log** once a week.
- Keep the room clean, cool and within 32–104 °F (0–40 °C). Keep the front and rear of the frame clear.
- Before adding load, check **Cabinet › Load**: stay within the capacity with one module out.
- Run a battery test every six months (**Control › Test › Battery Test**).
- Only trained personnel use the Set and Control menus.

CHAPTER 8

08 Communication and monitoring

The SNMP-M network card and the UPS View software.

The communication ports — RS-232, RS-485, USB, the SNMP slot, the intelligent slot and EPO — are described in Section 4.9. Set the protocol, baud rate and address of the serial ports in **Set › Comm Set** (Figure 6-13).

8.1 Setting up the SNMP-M card

1. Fit the card in the SNMP slot of the control strip (Figure 2-14, item 2) — not in the intelligent slot, which is for the dry-contact card. Connect it to the network with an RJ45 cable. The green PWR LED lights.
2. On a PC in the same network, run IPSearch (AEC app › Support › Downloads › SNMP › SNMP-M). It lists the card with its IP and MAC address.
3. Select the card › NetWork set › Static IP: enter a free IP address, the subnet mask and the gateway (ask your IT department), or choose Obtain IP for DHCP. Press Set.
4. Press Web page (or type the card's IP in a browser) and log in as admin.
5. In the card's UPS settings choose protocol **ACM(10-600KVA)** (the card's own label for the CIRRO protocol, for every CIRRO frame; it is set only on the card), port Uart · Port A, the same baud rate as the UPS (for example 9600) and address 1 — the same values as set on the UPS. 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 8-1 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.

8.2 UPS View software

UPS View (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 8-2 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.

Connection	How
USB	A standard USB cable; some PCs need a driver.

1. Connect the cable to the RS-232, RS-485 or USB port of the UPS (Figure 2-14).
2. Start UPS View. Choose **Equip Type M(10-600kVA)**, the Modbus mode (RTU or ASCII), the baud rate and address 1 — the same values as set on the UPS in **Set › Comm Set**. The RS-232 port does not answer while the UPS protocol is set to MEGA: set it to Modbus.
3. Choose the PC's COM port (Windows Device Manager › Ports).
4. UPS View shows the live data, the status, the alarms and the settings of the UPS.

NOTICE

The RS-232 port and the SNMP 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 UPS View page; the SNMP-M User Manual describes the card's web interface. Both are in the AEC app, Support › Downloads › SNMP › SNMP-M.

09

CHAPTER 9

Battery management

The battery settings made at commissioning and the battery protections.

> **⚠ CAUTION**
>
> The commissioning engineer makes the battery settings in **Set › BATT Set** (Figure 6-11), following the battery maker's values. Wrong values damage the batteries.

TABLE 9-1 Battery settings

Setting	Value
Number of blocks	30–50 × 12 V per string, 30–44 on the 360 (standard 40: 480 V DC, ±240 V DC with a center tap); must equal the blocks installed
Boost charge current	0–20 % (default 10 %)
Boost charge voltage (VRLA)	not above 2.40 V/cell
Float charge voltage (VRLA)	2.20–2.30 V/cell (default 2.25 V/cell)
Temperature compensation	−1.7 mV/°F/cell (−3.0 mV/°C/cell), with the battery sensor
End of discharge (VRLA)	1.60–1.75 V/cell
Charging power	Up to 15 % of the output power (80 A settable on the 360); recharge in less than 6 h
Self-test interval	720–3,000 h; discharges 25 % of the capacity; needs 25–100 % load

Battery protections

- **Battery low pre-warning:** before end of discharge, with about 3 minutes left at full load.
- **End-of-discharge protection:** below the EOD voltage the battery converter shuts down and the battery is isolated.
- **Battery breaker alarm:** when the battery breaker opens. The UPS can trip the external battery breaker (BCB) at EOD or EPO through a dry-contact output.

Battery maintenance. Follow IEEE 1188 and the battery maker's manual. Check that all safety devices are in place, the battery settings are right and the battery room temperature is recorded. Check the terminals for damage or heating and the cases for damage. One to two months after installation, check the torque of every battery terminal bolt again.

CHAPTER 10

10 Preventive maintenance

The maintenance schedule, component life and battery life.

10.1 Maintenance schedule

TABLE 10-1 Maintenance schedule

Interval	Task
Weekly	Check the home page and **Log**: normal mode, no alarm; load within the capacity with one module out.
Monthly	Check that the front and rear of the frame are clear and the fans run; check the room temperature.
Every 3–6 months	Clean or replace the dust filter in the door (more often in dusty rooms); reset the filter timer: **Control › Function › Reset Dust Filter**.
Every 6 months	Battery test: **Control › Test › Battery Test**. Read the battery data in **Cabinet › Battery**.
Yearly	AEC service: inspection of the power connections (tightness, signs of heating), the modules, fans and capacitors; battery measurement; firmware check.
3–5 years	Replace VRLA batteries as a full set.

10.2 Component life

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

TABLE 10-2 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 (Chapter 9).
Dust filter	3–6 months	Check and clean or replace; more often in dusty rooms.

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

10.3 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 10-3 Typical effect of temperature on VRLA battery life

Average 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

CHAPTER 11

11 Troubleshooting

The indicators and buzzer, what to do first, and the list of UPS events.

✓ **TIP** 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.

11.1 Indicators and buzzer

The indicator bars and the buzzer are described in Table 6-1 (Figure 6-1): green is normal, yellow a warning with two short beeps and one long, red a fault with a continuous tone.

11.2 What to do first

1. Silence the buzzer with the speaker icon.
2. Open **Log**: note the events with their date and time (download the log through USB if AEC service asks for it).
3. Look each event up in Section 11.3 and do what it says.
4. After the cause is removed, clear a fault with **Control › Function › Fault Clear**.
5. If the fault remains, call AEC service with the model, serial number, the events and the load.

11.3 UPS event log

TABLE 11-1 UPS events

Event	Meaning and action
Fault Clear	A fault was cleared by hand.
Log Clear	The history log was cleared by hand.
Load On UPS	The inverter feeds the load.
Load On Bypass	The bypass feeds the load.
No Load	No load on the output.
Battery Boost	The charger is in boost charge.
Battery Float	The charger is in float charge.
Battery Discharge	The battery is discharging.
Battery Connected	The battery is connected.
Battery Not Connected	The battery is not connected: check the battery breaker and cables.
Maintenance CB Closed	The Maintenance Bypass breaker is closed.
Maintenance CB Open	The Maintenance Bypass breaker is open.

Event	Meaning and action
EPO	Emergency power off.
Module On Less	The capacity of the running power modules is less than the load: reduce the load or add modules so that the UPS has enough capacity.
Generator Input	A generator is connected: the signal reaches the UPS on the dry-contact input.
Utility Abnormal	Utility voltage or frequency outside the limits, so the rectifier shuts down: check the input voltage.
Bypass Sequence Error	Bypass phase sequence reversed: check that the input power cables are connected correctly.
Bypass Volt Abnormal	Bypass voltage or frequency outside the limits; it resets when the bypass returns to normal. Check the bypass breaker and supply; if it recurs, AEC service can widen the bypass window.
Bypass Module Fail	Bypass module fault, or bypass fans failed; latched until power-off. Call AEC service.
Bypass Module Over Load	Bypass current above the limit (below 125 % of rating the UPS alarms only).
Bypass Over Load Tout	The bypass overload lasted too long: the output is switched off.
Byp Freq Over Track	Bypass frequency outside the tracking limit; the inverter does not synchronize. Check the bypass supply.
Exceed Tx Times Lmt	Too many transfers in one hour: the load stays on bypass. It returns to the inverter after one hour, or clear the fault by hand. Check the load.
Output Short Circuit	Output short circuit: check the loads, the output cables and the output terminals; then clear the fault.
Battery EOD	Inverter off at end of discharge: restore the utility.
Battery Test	The UPS runs on battery for 20 s to check the battery.
Battery Test OK	Battery test passed.
Battery Maintenance	The UPS runs on battery down to 1.1 × end-of-discharge voltage to maintain the battery.
Battery Maintenance OK	Battery maintenance completed.
Module Inserted	A power module was inserted.
Module Exit	A power module was pulled out.
Rectifier Fail	Rectifier of module N# failed: the rectifier and the battery charger of that module shut down. Call AEC service.
Inverter Fail	Inverter of module N# failed: the load moves to bypass or to the other modules. Call AEC service.
Rectifier Over Temp.	Rectifier of module N# too hot: the rectifier shuts down and restarts when it cools. Check the room temperature, the ventilation and the fans.
Fan Fail	At least one fan of module N# failed.
Output Over Load	Module N# above 100 % of its rating; resets when the load is reduced. Check the load per phase.
Inverter Overload Tout	The overload of module N# lasted too long: the load moves to bypass, and back to the inverter when the load falls below 95 %.
Inverter Over Temp.	Inverter of module N# too hot: the load moves to bypass. Check the room temperature, the ventilation and the fans.
On UPS Inhibited	Transfer from bypass to inverter blocked: module capacity too small for the load, or the rectifier is not ready.
Manual Transfer Byp	Transferred to bypass by hand.

Event	Meaning and action
Esc Manual Bypass	The manual transfer to bypass was cancelled.
Battery Volt Low	Battery voltage low: about 3 minutes of full-load runtime remain.
Battery Reverse	Battery cables connected the wrong way.
Inverter Protect	Inverter of module N# protected: inverter voltage abnormal or out of step with the other modules.
Input Neutral Lost	Input neutral lost or not detected. A 3-pole breaker is recommended between the supply and the UPS.
Bypass Fan Fail	At least one fan of the bypass module failed.
Manual Shutdown	Module N# switched off by hand: rectifier and inverter off, no output from it.
Manual Boost Charge	The charger was forced into boost charge.
Manual Float Charge	The charger was forced into float charge.
UPS Locked	Manual shutdown of power modules is not allowed.
Parallel Cable Error	Parallel cable missing, loose or not in a ring: check the parallel cables.
Lost N+X Redundant	No redundant module left: the load needs every running module.
EOD Sys Inhibited	Output inhibited after end of discharge, until the utility returns.
Battery Test Fail	Battery test failed: check that the UPS has no alarm, that the battery is above 90 % of float voltage and that the load is above 25 %.
Battery Maintenance Fail	Battery maintenance failed: same checks as the battery test.
Ambient Over Temp	Room temperature above the UPS limit: air conditioning is needed.
REC CAN Fail	Rectifier communication bus abnormal: check the communication cables.
INV IO CAN Fail	Inverter signal bus abnormal: check the communication cables.
INV DATA CAN Fail	Inverter data bus abnormal: check the communication cables.
Power Share Fail	Output current of the modules out of balance: AEC service checks the module settings.
Sync Pulse Fail	Synchronization signal between modules abnormal: check the communication cables.
Input Volt Detect Fail	Input voltage of module N# abnormal: check the input cables, fuses and utility.
Battery Volt Detect Fail	Battery voltage abnormal: check the batteries and battery fuses.
Output Volt Fail	Output voltage abnormal.
Bypass Volt Detect Fail	Bypass voltage abnormal: check that the bypass breaker is closed and good, and the bypass cables.
INV Bridge Fail	Inverter IGBTs broken or open. Call AEC service.
Outlet Temp Error	Outlet temperature of a module above the limit: check the fans, the air path and the room temperature. Call AEC service.
Input Curr Unbalance	Input currents differ by more than 40 % of rating between phases: check the input voltage. Call AEC service.
DC Bus Over Volt	DC bus capacitor voltage too high: rectifier and inverter shut down.

Event	Meaning and action
REC Soft Start Fail	DC bus voltage too low after soft start. Call AEC service.
Relay Connect Fail	Inverter relays open or fuses broken.
Relay Short Circuit	Inverter relays shorted.
PWM Sync Fail	PWM synchronizing signal abnormal.
Intelligent Sleep	Module sleep active: modules stand by in turn at part load and wake when the load grows.
Manual Transfer to INV	Transferred to the inverter by hand (used when the bypass frequency is out of tracking range; the transfer interrupts the output for up to 20 ms).
Input Over Curr Tout	Input over current for too long: the UPS moves to battery. Check whether the input voltage is low and the load high.
No Inlet Temp. Sensor	Inlet temperature sensor not connected correctly.
No Outlet Temp. Sensor	Outlet temperature sensor not connected correctly.
Inlet Over Temp.	Inlet air too hot: keep the room within 32–104 °F (0–40 °C).
Capacitor Time Reset	The DC bus capacitor timer was reset.
Fan Time Reset	The fan timer was reset.
Battery History Reset	The battery history was reset.
Byp Fan Time Reset	The bypass fan timer was reset.
Battery Over Temp.	Battery too hot (with the optional battery sensor).
Bypass Fan Expired	Service life of the bypass fans reached: replace them, then reset the timer.
Capacitor Expired	Service life of the capacitors reached: replace them, then reset the timer.
Fan Expired	Service life of the module fans reached: replace them, then reset the timer.
INV IGBT Driver Block	Inverter IGBTs stopped: check that the power modules are fully inserted and locked. Call AEC service.
Battery Expired	Service life of the batteries reached: replace them, then reset the timer.
Bypass CAN Fail	Communication bus between the bypass module and the frame abnormal: check the connector and signal cable.
Dust Filter Expired	The dust filter must be cleaned or replaced; then reset the timer.
Stop Test	Battery test or maintenance stopped by hand: the UPS returns to normal mode.
Wave Trigger	A waveform was saved when the UPS failed.
Firmware Error	Reserved to AEC service. Call AEC service.
System Setting Error	Reserved to AEC service. Call AEC service.
Bypass Over Temp.	Bypass module too hot: check the bypass load, the room temperature (below 104 °F / 40 °C) and the bypass fans.
Module ID Duplicate	Two modules have the same ID: call AEC service to set the IDs in sequence.

CHAPTER 12

12 Specifications

Electrical, mechanical and environmental data of the CIRRO 60–1,600 kVA. Subject to change without notice.

TABLE 12-1 CIRRO specifications

Item	CIRRO 360	CIRRO 600 · 800 · 1200 · 1600
Ratings	60–360 kVA	100–1,600 kVA
Power module	60 kVA (CIR-PWR-60), 77 lb (35 kg)	100 kVA (CIR-PWR-100), 104 lb (47 kg), 18.7 × 27.8 × 5.5 in (475 × 705 × 140 mm)
Modules per frame	6	6 · 8 · 12 · 16
Input		
Connection · voltage	3 phases + N + PE · 480 V L-L (277 V L-N)	3 phases + N + PE · 480 V L-L (277 V L-N)
Voltage range	384–528 V full load; 288–384 V derated to 75 %	384–528 V full load; 288–384 V derated to 50 %
Frequency · power factor	40–70 Hz · 0.99 or better	40–70 Hz · 0.99 or better
Current THD	3 % or less	2 % or less (100 % linear load)
Currents	Table 4-3	Table 4-3
Output		
Voltage · frequency	480 V L-L · 60 Hz ± 0.1 Hz · pure sine wave	480 V L-L · 60 Hz ± 0.1 Hz · pure sine wave
Power factor	1 (kVA = kW)	1 (kVA = kW)
THD	1 % or less linear, 5 % or less non-linear	1 % or less linear, 3 % or less non-linear
Inverter overload	110 % 1 h · 125 % 10 min · 150 % 1 min · > 150 % 200 ms	110 % 1 h · 125 % 10 min · 150 % 1 min · > 150 % 200 ms
Bypass overload	ask AEC	135 % continuous · 150 % 5 min · 200 % 1 s · 300 % 100 ms
Transfer time	0 ms utility to battery; < 3/4 cycle (12.5 ms) bypass, not synchronized	0 ms utility to battery; < 3/4 cycle (12.5 ms) bypass, not synchronized
Efficiency AC/AC	96 %	up to 97 %
Battery		
Type · standard	external VRLA · 40 blocks, 480 V DC (±240 V DC)	external VRLA · 40 blocks, 480 V DC (±240 V DC)
Range	30–44 blocks, ±180 to ±264 V DC	30–50 blocks, ±180 to ±300 V DC; derated below 40 blocks (Section 3.2)
Charger · recharge	80 A settable · < 6 h	15 % of output power · < 6 h
System		
Display	7-inch color touchscreen	10-inch color touchscreen

Item	CIRRO 360	CIRRO 600 · 800 · 1200 · 1600
Communication	USB, RS-232, RS-485, dry contacts, EPO, cold start, SNMP slot and intelligent slot; SNMP-M and DRYCNT cards optional	USB, RS-232, RS-485, dry contacts, EPO, cold start, SNMP slot and intelligent slot; SNMP-M and DRYCNT cards optional
Parallel	up to 8 units, with the parallel kit	up to 8 units, with the parallel kit
Breakers	1 in the frame	600: 4 in the frame · 800: 4 in the breaker section · 1200 · 1600: switchgear by others
Environment	32–104 °F (0–40 °C) · 0–95 % RH · < 65 dB	32–104 °F (0–40 °C) · 0–95 % RH · IP20 · full power to 3,300 ft (1,000 m) · 72 dB
Storage	−13 to 131 °F (−25 to 55 °C)	−13 to 131 °F (−25 to 55 °C)
W × D × H	23.6 × 39.4 × 78.7 in	600 · 800: 31.5 × 39.4 × 78.7 in (800 with breaker section 55.1 in wide) · 1200: 47.2 × 43.3 × 78.7 in · 1600: 63.0 × 39.4 × 78.7 in
Weight	Table 2-3	Table 2-3
Standards	UL 1778 standard; FCC Part 15, Class A	UL 1778 standard; FCC Part 15, Class A
Warranty	3 years on the UPS	3 years on the UPS

APPENDIX A

A Parallel setting

Setting the units of a parallel system on the touchscreen.

1. AEC sets up and commissions the parallel system. When the parallel kit and all cables are connected, set each unit on the touchscreen: **Set › Sys Set** (Figure 6-10) — **System Mode** Parallel (or Parallel ECO / Parallel LBS).
2. Set **United Number** to the number of units in the system (up to 8).
3. Give each unit its own **Cabinet ID**, starting from 0. Two units must never have the same ID.
4. Every other setting must be the same on all units.
5. Before the outputs are paralleled, AEC compares the output voltage of the units (within 5 V of each other) and checks the bypass phase sequence of each unit. Keep the output breakers open until then.

APPENDIX B

B Drawings

AEC drawings of the CIRRO 600, 800 and 1200, revision 001, and the single-line diagrams. Dimensions in inches [mm]. The CIRRO 360 and 1600 drawings are not issued yet.

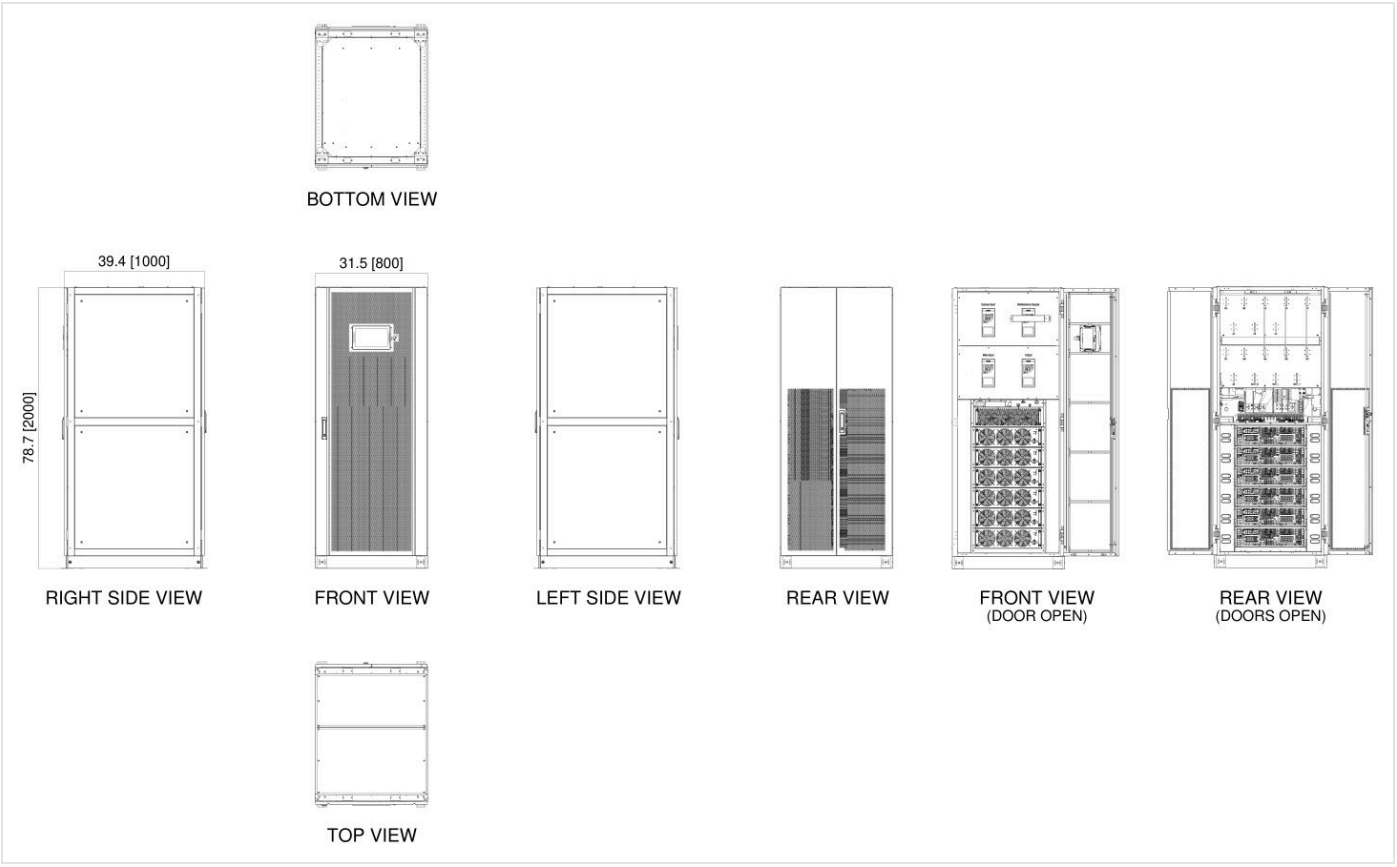


FIGURE B-1 CIRRO 600 appearance: side, front, rear, front door open, rear doors open, top and bottom views

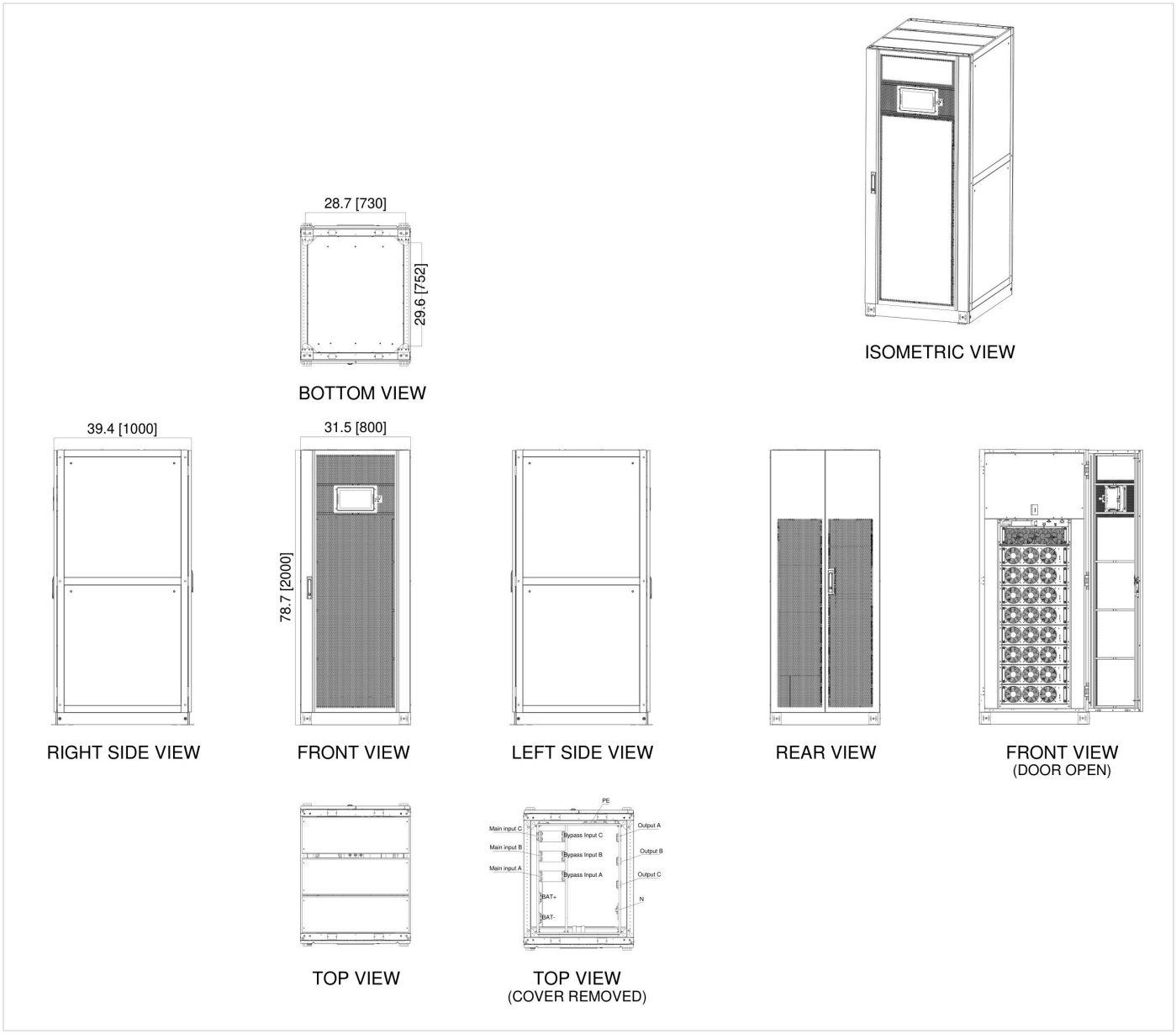


FIGURE B-2 CIRRO 800 cabinet appearance (breaker section not shown): isometric, side, front, rear, front door open, top and bottom views, top with the cover removed

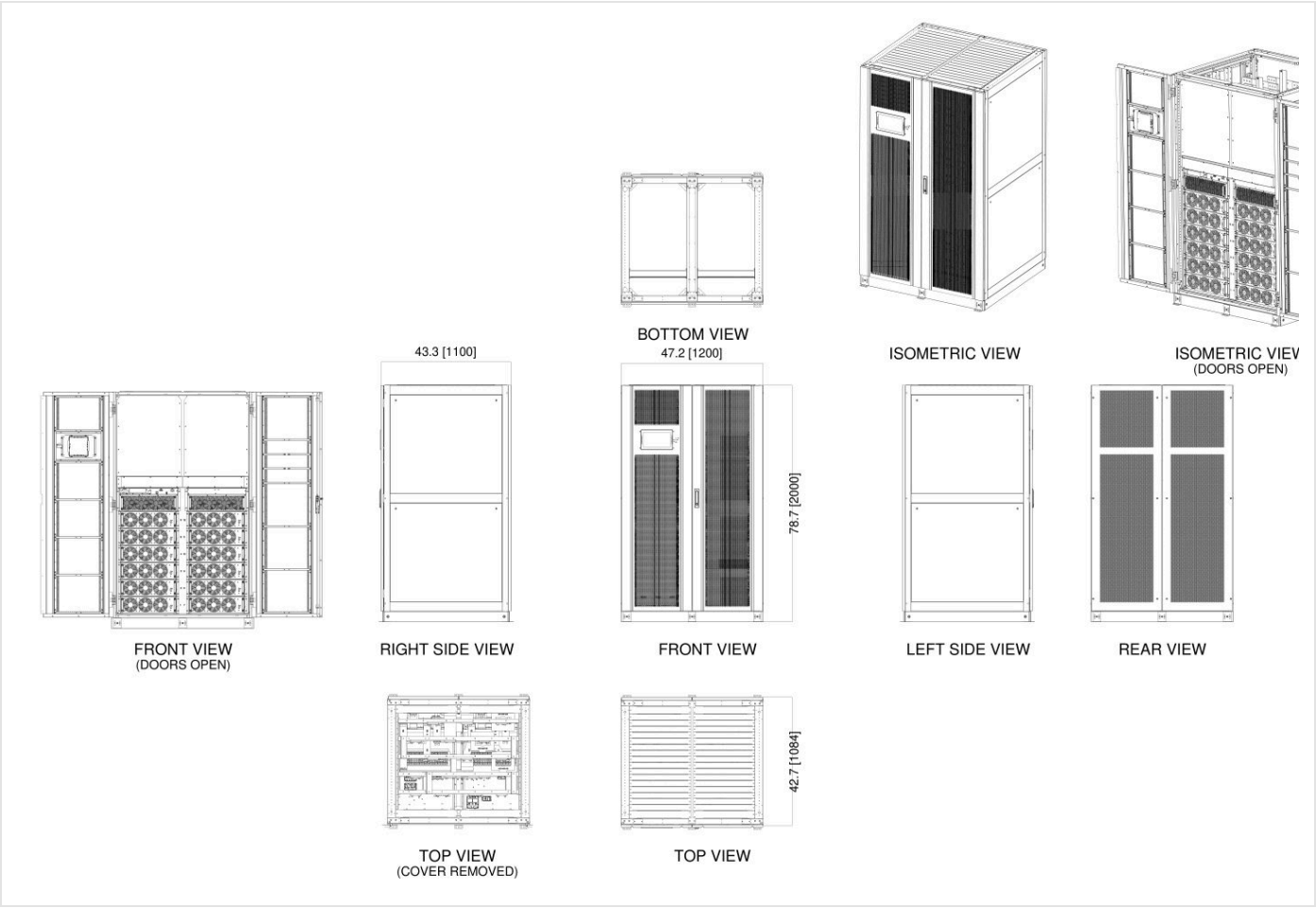


FIGURE B-3 CIRRO 1200 appearance: isometric, side, front, rear, front doors open, top and bottom views, top with the cover removed

C

APPENDIX C

Quick reference

The touchscreen paths for everyday tasks.

TABLE C-1 Quick reference — touchscreen

Task	How
Start or stop the inverter	**Control › Function › ON/OFF Control**
Transfer to bypass	**Control › Function › Manual Bypass**
Return to the inverter	**Control › Function › Ecs Manual Bypass** (or **Manual Transfer to Inverter**)
Enable the module OFF knobs	**Control › Function › Module Button Power Enable**
Silence the buzzer	Speaker icon, top right
Alarms and events	**Log**
Clear a fault	**Control › Function › Fault Clear**
Battery test	**Control › Test › Battery Test** · **Stop Test**
Battery status and remaining time	**Cabinet › Battery**
Load per phase	**Cabinet › Load**
One power module	**Module** — select it in the list
Battery set-up	**Set › BATT Set**
Single / parallel / ECO / redundancy	**Set › Sys Set**
Network address of the display	**Set › NetWork**
Serial ports	**Set › Comm Set**
Date, time, serial number	**Set › Sys Func**
Waveforms	**Scope**
Emergency stop	EPO button on the front

APPENDIX D

D Frequently asked questions

Short answers to the questions AEC support hears most.

TABLE D-1 Frequently asked questions

Question	Answer
Can I add power modules later?	Yes. The modules are hot-swappable: insert them in free slots with the UPS running, then set the system in **Set › Sys Set** (AEC service recommended). Size the breakers and cables for the full frame from the start (Table 4-4).
Where are the breakers of my CIRRO?	CIRRO 600: in the frame. CIRRO 800: in the breaker section beside the cabinet. CIRRO 1200 and 1600: in your switchgear. CIRRO 360: one in the frame (Section 2.6).
What does N+1 mean?	One module more than the load needs: if any module fails, the others carry the load with no interruption.
Can I remove a module while the UPS runs?	Yes, if the remaining modules can carry the load. Follow Section 5.10.
Is the output a pure sine wave?	Yes. The UPS is online double conversion: the inverter builds a regulated sine wave at all times.
What happens when the battery runs out?	The UPS switches its output off at the end of discharge, and restarts and recharges when the utility returns (auto restart).
What is ECO mode?	The load runs on the bypass while the utility is good: efficiency is higher, but the load is not protected from disturbances. Use normal online mode for critical loads.
Can the UPS run from a generator?	Yes — see Section 3.3.
Who may change the settings?	Only trained personnel: settings and controls are protected by login.
How do I monitor the UPS on the network?	With the SNMP-M card — see Section 8.1.

APPENDIX E

Installation record

Fill this record in at commissioning and keep it with the UPS.

TABLE E-1 Installation record

Item	Value
Model and ordering code	
Serial number	
Installation and commissioning date	
Commissioned by (company, engineer)	
Site and room	
Number of power modules · redundancy (N+X)	
Main input, bypass, output and maintenance bypass breakers, conductor sizes	
Battery: type, blocks per string, strings, capacity (Ah), battery breaker	
Battery settings (BATT Set) checked	
System mode (single, parallel, ECO) · Cabinet ID	
Display network address · SNMP-M address	
Load at commissioning (kW, %)	
Battery test result and date	

F

APPENDIX F

Warranty

What the CIRRO warranty covers.

TABLE F-1 Warranty

Item	Coverage
CIRRO UPS	3 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.

APPENDIX G

Acronyms and abbreviations

The abbreviations used in this manual and on the touchscreen.

TABLE G-1 Acronyms and abbreviations

Term	Meaning
BCB	Battery circuit breaker
ECO	Economy mode: the load on the static bypass
EGC	Equipment grounding conductor
EOD	End of discharge
EPO	Emergency power off
IGBT	Insulated-gate bipolar transistor
LBS	Load bus synchronization (two systems kept in step)
N+X	X redundant modules beyond the N that carry the load
NEC	National Electrical Code (NFPA 70)
PE	Protective earth
RCD	Residual-current (ground-fault) device
SPD	Surge protective device
THD	Total harmonic distortion
VRLA	Valve-regulated lead-acid (battery)

Service and support

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

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

When you contact us, have ready: the model and ordering code, the serial number (on the rating label and in Set › Sys Func), the alarm or event shown, the load and the battery set-up — a photo of the display and of the label speeds things up on WhatsApp.