Dale Power Solutions Ltd

User Manual

E600

3 phase to 3 phase

10 – 200 kVA

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S5264FU18 Rev 1

Contents

Safety

WARNING!

THIS EQUIPMENT MUST BE INSTALLED, COMMISSIONED AND MAINTAINED BY A QUALIFIED ELECTRICIAN.

There are dangerous voltages and high temperatures inside the UPS. During installation, operation and maintenance please abide by local safety instructions, regulations and laws. Failure to do so may result in injury to personnel or damage to equipment. Safety instructions in this manual are supplementary to local safety instructions. Dale Power Solutions Ltd does not accept any liability caused as a result of failure to follow safety instructions. Please note the following:

- Do not use the UPS for any other purpose than the one for which it was designed.
- Do not exceed the rated load of the UPS.
- Under no circumstances open the UPS. There are high voltages inside that can cause electric shock. If the UPS requires internal maintenance or battery replacement, contact Dale Power Solutions Ltd.
- Keep the UPS in a dry well ventilated location away from any area or situation in which there is a risk of fire, such as direct sunlight or other sources of heat.
- If the UPS emits smoke, turn off immediately the input circuit breaker and battery circuit breaker, and contact Dale Power Solutions Ltd.

WARNING!

THIS IS A PRODUCT FOR COMMERCIAL AND INDUSTRIAL APPLICATION IN THE SECOND ENVIRONMENT. INSTALLATION RESTRICTIONS OR ADDITIONAL MEASURES MAY BE NEEDED TO PREVENT DISTURBANCES (AS STATED IN EN62040-2:2006).

Warning symbols

The safety symbols used in this manual are shown in table below. They alert you to important safety information that you need to be aware of when installing, operating and maintaining the UPS.

Safety Symbol	Indication
	Attention
	Static discharge sensitive
	Electric shock

Caution: A caution describes a situation in which there is a risk of damage to equipment.

WARNING!

A WARNING DESCRIBES A SITUATION IN WHICH THERE IS A RISK OF INJURY OR DEATH TO PERSONNEL.

Conformity and standards

This equipment complies with CE directives 73/23 & 93/68 (LV Safety) and 89/336 (EMC), and the following product standards for Uninterruptible Power System (UPS):

- IEC 62040-1-1 General and safety requirements for use in operator access area
- IEC 62040-2 EMC requirements; Class C3 compliant
- IEC 62040-3 Performance requirements and test methods

Caution: Continued compliance requires installation in accordance with the instructions this manual and the use of manufacturer approved accessories only.

According to IEC62040, this is a low emission class C3 Uninterruptible Power System (UPS) product. In a residential environment, this product may nevertheless cause radio interference, in which case, you may be required to take additional measures.

Energy conservation and environmental protection

With an efficiency of greater than 97% in ECO mode the UPS meets the technical specifications for energy conservation. An input power factor of 0.99 results in minimum current contamination of the power grid. All the material and components comply with the ROSH standards, ensuring that no hazardous waste is produced.

Product description

Applications

This UPS series provides reliable 3 phase backup power, from a 3 phase source, to various types of equipment, for example computer centres, network management centres, auto control systems, and telecommunication systems.

The UPS can be installed and operated as a single unit or it can be operated with other units of the same type in parallel N+1 redundant mode for additional reliability or in parallel capacity mode for increased output rating.

Product range

The following table lists the models available in the E63300 series. All models are designed to operate with either an internal or external battery.

Capacity	100 kVA	200 kVA
Model	E633100	E633200
Battery location	Internal or external	

E633100 – 100 KVA **E633200 – 200 KVA**

System block diagram

The UPS is connected between the mains a.c. input source and the critical load to provide uninterruptible power free from disturbances on the mains supply such as voltage and frequency variations. This is achieved using high-frequency double-conversion pulse width modulation (PWM) and full digital signal processing (DSP) control.

As shown in Figure 1, input mains is converted to d.c., which in turn feeds a d.c./d.c. battery charger and an inverter. The inverter then converts the battery voltage to a clean a.c. source, output-independent of the input. The battery powers the load through the inverter in case of an input mains power failure.

If the inverter is unable to supply power for any reason the load is supplied via the bypass circuit, which includes the bypass input breaker and the static transfer switch (STS).

If maintenance or repair is necessary the UPS can supply the load via the internal and manually controlled maintenance bypass breaker. With the exception of the maintenance bypass breakers (internal and external) all the breakers shown are closed during normal UPS operation.

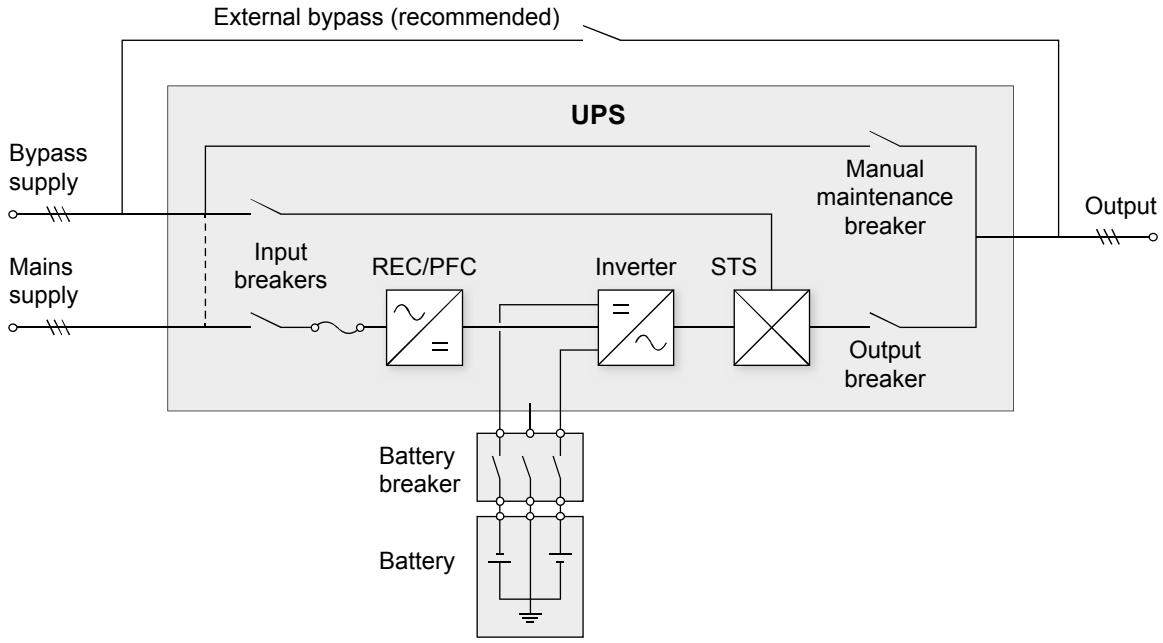


Figure 1 Single unit block diagram

An external bypass breaker enables a UPS to be replaced without interrupting the load and is recommended in most installations.

Split bypass input

Figure 1 shows the UPS in what is known as the 'split bypass' configuration (E633200 only), in which a separate input supply (the bypass supply) feeds the internal bypass circuits instead of the mains supply. In this configuration the link (dotted line) between mains and bypass supply is removed.

Static transfer switch

The static transfer switch (STS) is an electronic power switch. During normal operation the load is supplied via the inverter, however in the event of a UPS overload or inverter failure, the STS transfers the load automatically to the bypass circuit. To provide a clean (no-break) load transfer between the inverter output and bypass line, the inverter output is synchronized to the bypass supply during normal operating conditions.

Battery temperature compensation

Using optional external battery temperature sensors the UPS is capable of optimising the battery charger output to enhance battery life and performance. This is a non-standard feature that must be purchased separately. Contact your distributor for details.

Redundant control power supply board

The UPS is equipped with two identical and fully redundant control power supply boards. Each board is powered by the input a.c. and battery d.c. Therefore, if one of these sources or even if a board fails the UPS continues to operate normally. This feature further enhances the reliability of the system.

Multi-unit operation

Up to four E63300 series units can be operated in N+X parallel mode to provide additional power or higher reliability. In this configuration the load is shared equally between the cabinets.

Multi-unit operation is enabled by:

- Hardware and firmware built into each UPS, controlled by software settings.
- Parallel control cables, connected in a ring to enhance reliability. Dual-bus control cables are connected between any two UPS modules of each bus. The intelligent paralleling logic provides the user with maximum flexibility. For example, shutting down or starting up UPS units in a parallel system can be done in any sequence. Transfers between **Normal** and **Bypass** modes of operation are synchronised and self-recovering.

The total load of a multi-unit system can be queried from each unit's LCD display.

Parallel redundant operation

Each UPS in the E63300 series is fitted with a number of UPS modules that work in parallel to provide the total load. You can choose to load your UPS such that one of more UPS modules operates in redundant mode thus providing increased resilience.

Installation

Siting considerations

Before unpacking and installing the unit, consider the following:

- DO NOT expose the UPS to high temperatures, water ingress, flammable or corrosive gas, dust, direct sunlight or explosives. Optional air filters are available for operation in dusty environments.
- Ensure the room in which the UPS is located is maintained at a temperature of between 0 and 40°C for full load operation. Above 40°C derate the load by 2.4% for each 1°C rise in temperature up to a maximum of 50°C.
- Locate the UPS indoors on a level surface as close as possible to the equipment it will be powering to minimise cable voltage drops. If required, allow enough spare cable to move the UPS after installation.
- Maintain a gap from walls or other equipment of at least 100 cm at the front of the cabinet and 80 cm at the rear. Ensure you can open the cabinet's front and rear doors to access the inside of the cabinet. If operating 2 m cabinets in parallel see Wiring units in parallel on page 25 before siting the cabinets because you will need to access a pcb behind the right-hand side panel (viewed from the front of the cabinet).
- Ensure the ventilation holes/slots at the front and rear of the units are not obstructed.
- For improved product reliability ensure cool air is available at the front of the unit.
- Battery location. We recommend you site batteries in a separate room to maintain the optimum working temperature of between 15°C and 25°C. As an approximation, battery life is halved for every 10K (10°C) rise in temperature.
- If siting the UPS above 1,500 m altitude, derate the load as shown in Operating Environment on page 63.

Temporary storage

If you are not installing the equipment immediately, ensure it is protected against excessive humidity and/or heat sources.

Caution: Unused batteries must be recharged every 6 months. Temporarily connect the UPS to a suitable mains supply and turn it on for the time required to recharge the batteries.

Wiring considerations

To ensure a safe installation please follow these instructions and the local electrical code of the area or country in which you are installing the equipment:

- If the UPS is to be supplied from a local transformer, ensure the transformer kVA rating is at least 50% greater than the UPS output kVA rating and the output is a 4-wire star configuration.
- Use circuit breakers and cables with the correct rating (see the next section).
- Always fit an MCB between the mains supply live lines only and the UPS input (see Figure 2).

Caution: Do not fit an MCB in the neutral line.

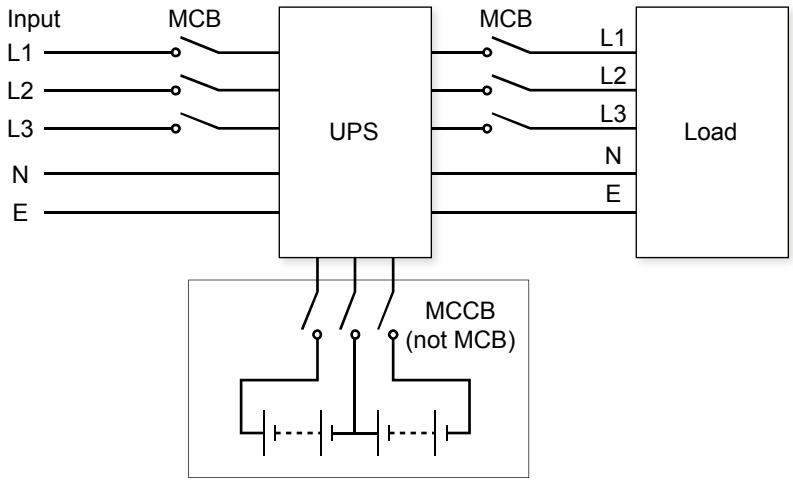


Figure 2 Power cable wiring configuration for a single UPS

- Because of the high leakage current (see Earth leakage current below), permanently hard wire all the a.c. cables.
- Fit ring terminal crimps on the ends of all cables (see Cable sizes on page 13).
- Fit a 3 pole MCCB, with a suitable d.c. voltage rating and breaking capacity, between the battery and the UPS (see Figure 2).

Caution: The UPS is designed to work with a centre-tap battery only.

- Although it may not be absolutely necessary, we recommend you fit an MCB between the UPS and the load to protect the output load and cables in the event of a fault (see Figure 2). You may also wish to connect the UPS output to your load via a power distribution unit (PDU).
- Ensure correct phase rotation in the 3-phase wiring.

Units in parallel

A group of paralleled units behaves as if it was one large UPS. To ensure units share the load equally and the system complies with the relevant wiring regulations, follow these requirements:

- Use units of the same rating only and connect them to the same bypass source.
- Reference the bypass and the main input sources to the same neutral potential.
- Ensure that any RCDs (residual current devices) are appropriately set and located (see Earth leakage current below).
- Connect the outputs of all units to a common output bus.
- Ensure the length and specification of power cables including the bypass input cables and UPS output cables of each unit is the same. This ensures load sharing when operating in bypass mode.

Note: Optional isolation transformers are available for applications where sources do not share the same neutral reference or where the neutral is not available.

Earth leakage current

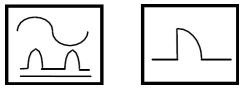
The residual earth current introduced by the RFI suppression filter inside the UPS is between 3.5 mA and 1000 mA. We recommend that you verify the selectivity of the residual current detector (RCD) with all other differential devices both upstream of the input distribution board and downstream (towards the load).

Caution: To avoid false alarms, locate earth leakage monitoring devices upstream of the common neutral point when used in systems with split bypass input or when used in paralleled UPS configurations. Alternatively use the device to monitor the combined 4-wire rectifier and split bypass input currents.

Ensure that an RCD upstream of the UPS has these characteristics:

- Sensitive to d.c. unidirectional (class A) pulses.
- Insensitive to transient current pulses.
- Average sensitivity adjustable between 0.3 and 1A.

Such residual current circuit breakers (RCCB) are identified by the symbols:



Operation from a generator

As a guide we recommend that the load capacity should be less than 30% of the generator capacity, and the generator rating should be 1.5 to 2 times the rating of the UPS, depending on the type of generator used.

Caution: Ensure that the neutral line from the generator is permanently connected to the mains neutral line. Do not use an MCB or any other type of switch in this line.

Cable sizes

Use the following sizes of cables to connect the UPS between mains power, batteries and the load.

UPS rating (kVA)	AC input / output (mm^2)	DC input (mm^2)	Ground (mm^2)	Busbar bolt sizes[1]	Torque (Nm)
100	50	70	35	Power connections: M12 Earth connections: M5, M6 and M8	10
200	95	240	75		

[1] All power and earth connections are made to bolts.

Caution: Size the ground (earth) conductor for the a.c. supply fault rating, cable lengths and type of protection.

External bypass and battery breakers are specified at the time of purchase.

WARNING!

FAILURE TO ADEQUATELY EARTH THE EQUIPMENT MAY RESULT IN ELECTRIC SHOCK AND FIRE.

Unpacking the UPS

To unpack the UPS:

1. Cut off the shrink wrapping carefully from around the unit.
2. Cut the straps securing the unit to the pallet, and remove the corner protection strips, disposing of them correctly.
3. Remove and retain the documentation, CD and leads from inside the door of the UPS.
4. Dispose of packets of desiccant correctly.
5. Using a forklift truck or similar, move the UPS off the pallet.

WARNING!

TAKE CARE WHEN MOVING THE UPS OFF THE PALLET. IT WEIGHTS IN EXCESS OF 145 KG AND COULD FALL.

6. Check the appearance of the UPS to see if it is damaged. If any damage is found, do not switch on the UPS and contact your distributor.
7. Check the packing list. Contact your distributor if any of the accessories are missing.

E633100 (1.4 m cabinet)

Front, side and rear views

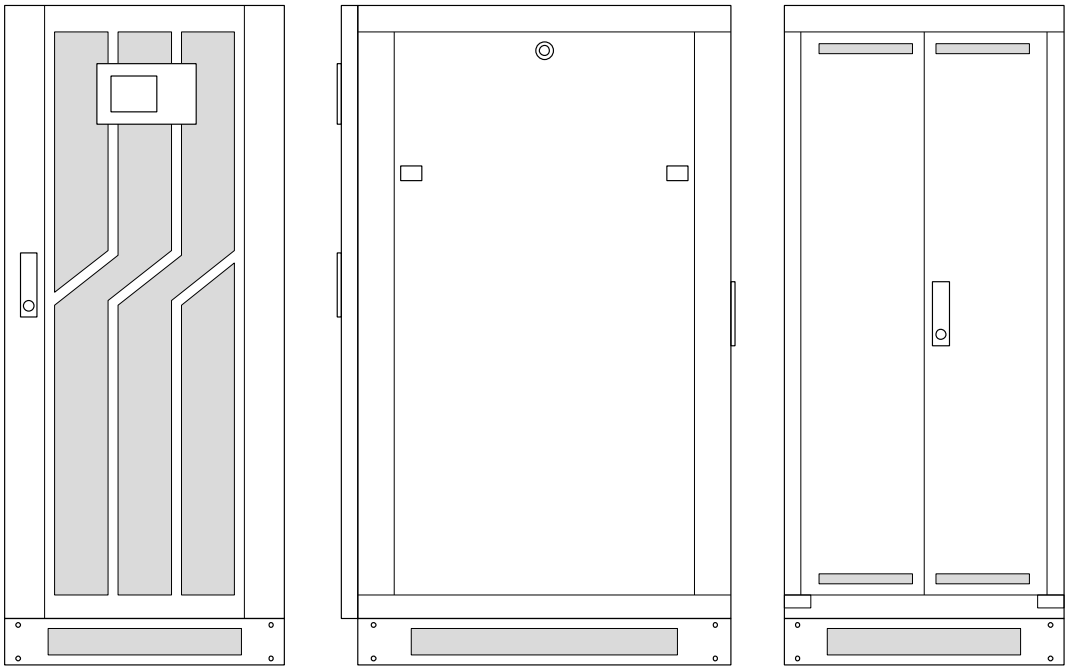


Figure 3 E633100 front, side and rear views

Internal layout (front door open)

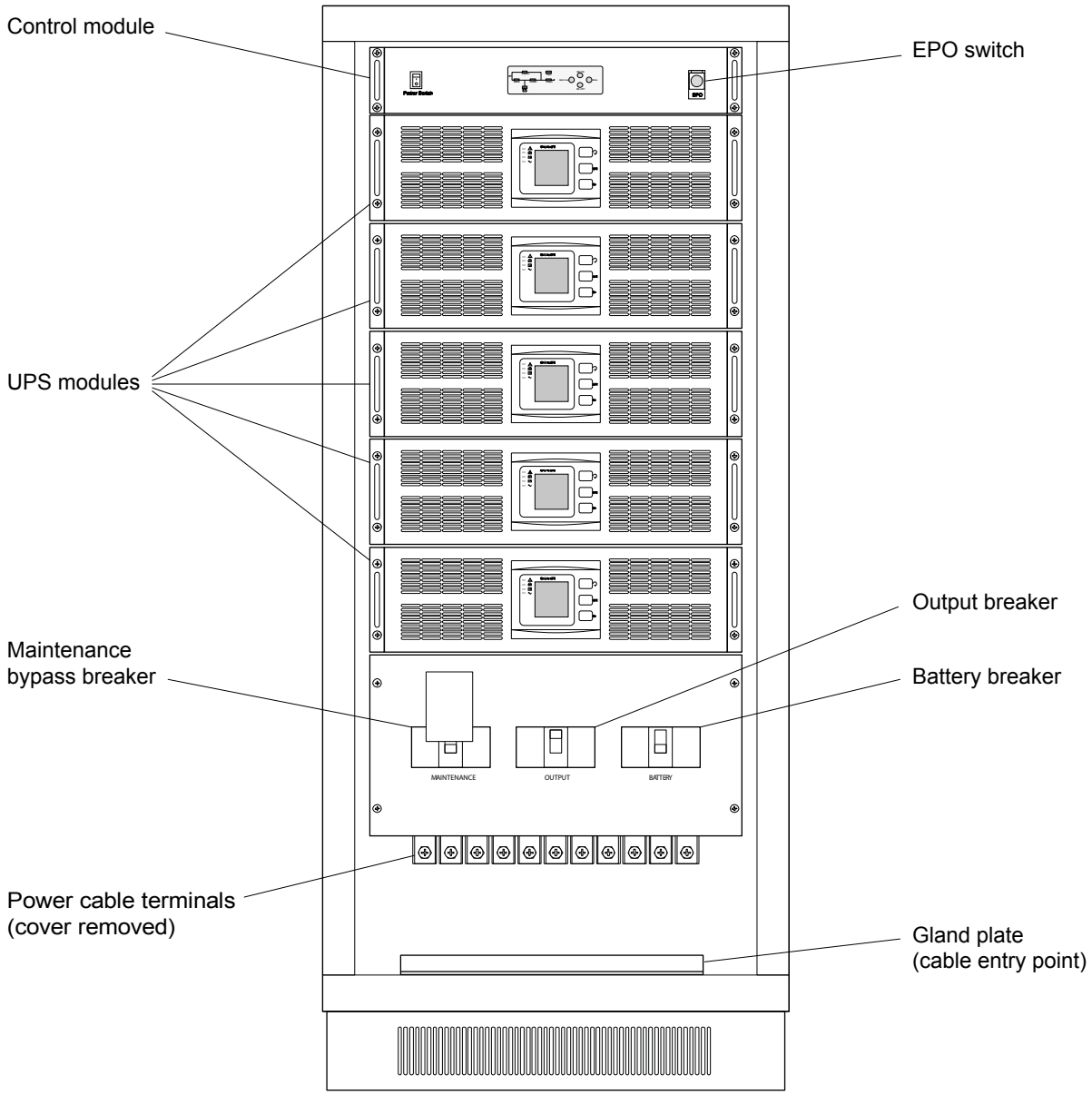


Figure 4 E633100 internal layout (front)

Internal layout (rear doors open)

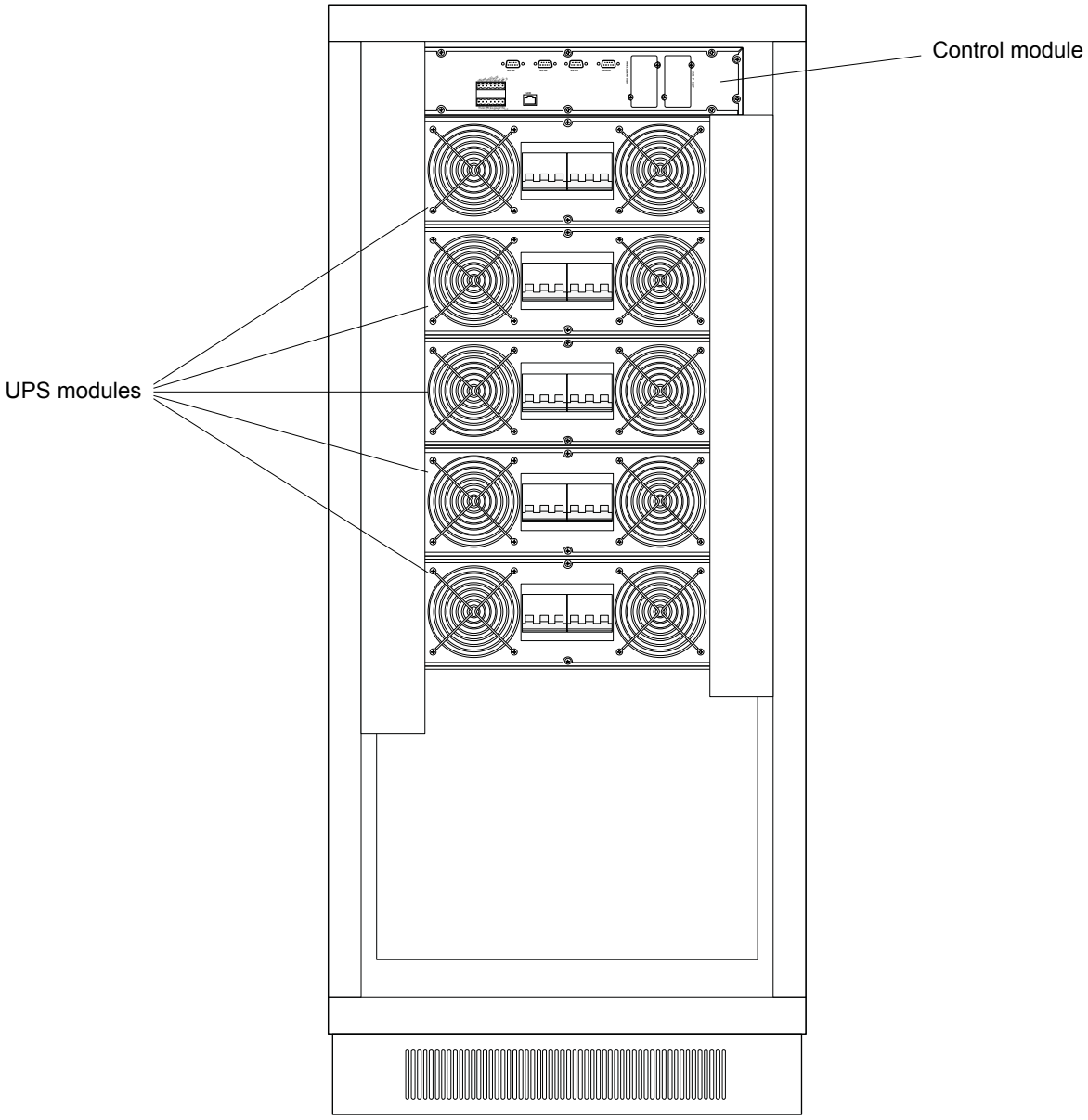


Figure 5 E633100 internal layout (rear)

E633200 (2 m cabinet)

Front, side and rear views

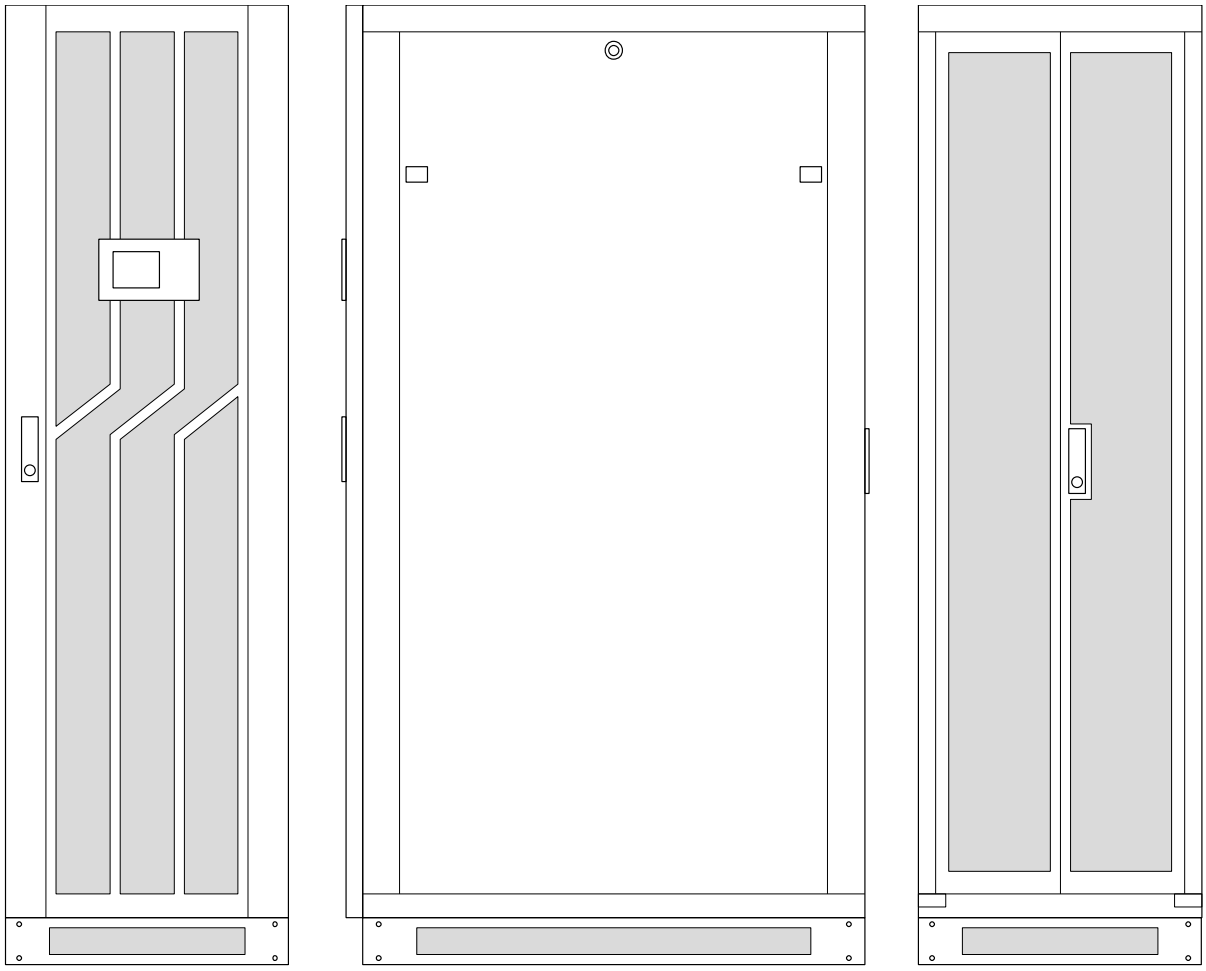


Figure 6 E633200 front, side and rear views

Internal layout (front door open)

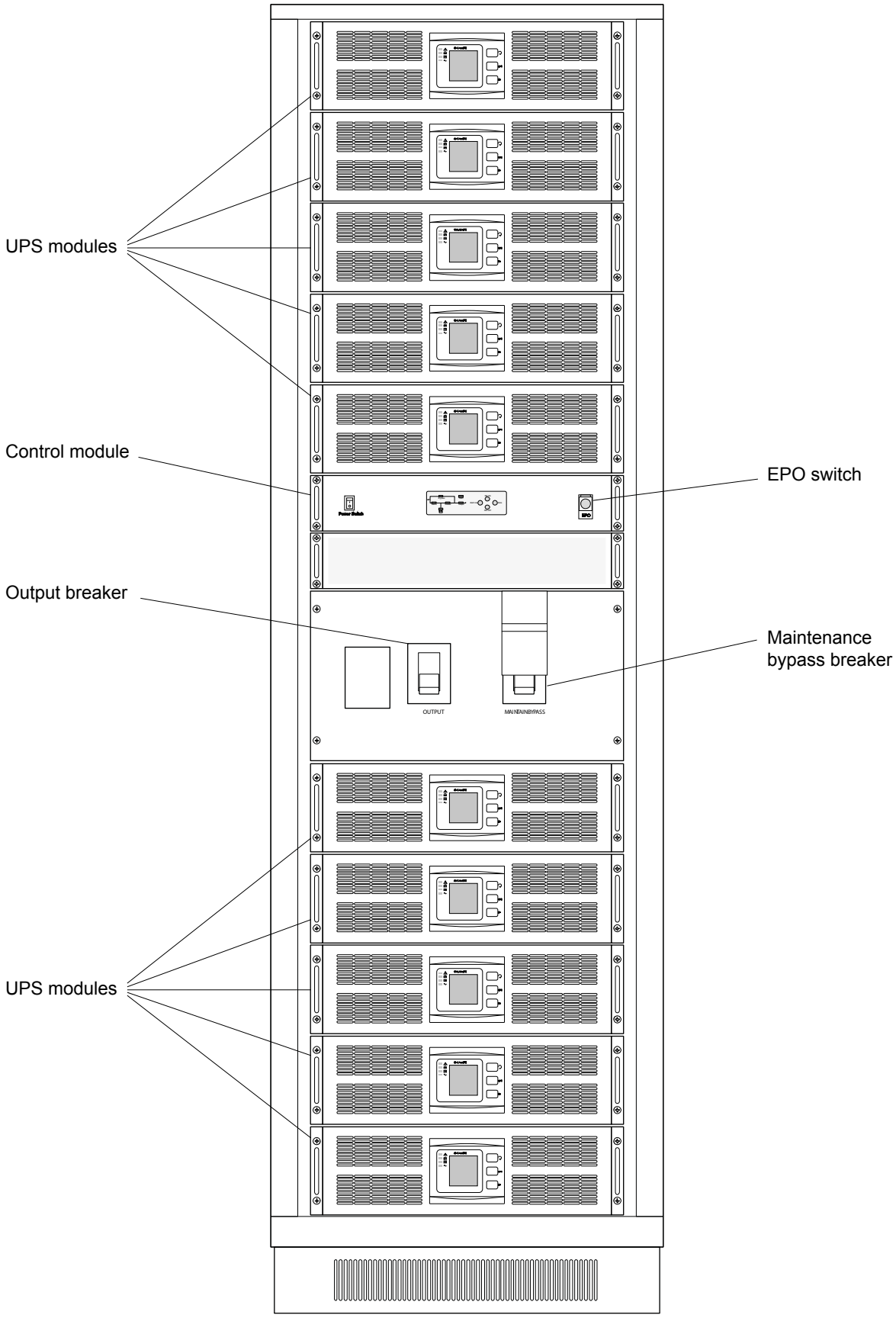


Figure 7 E633200 internal layout (front)

Internal layout (rear doors open)

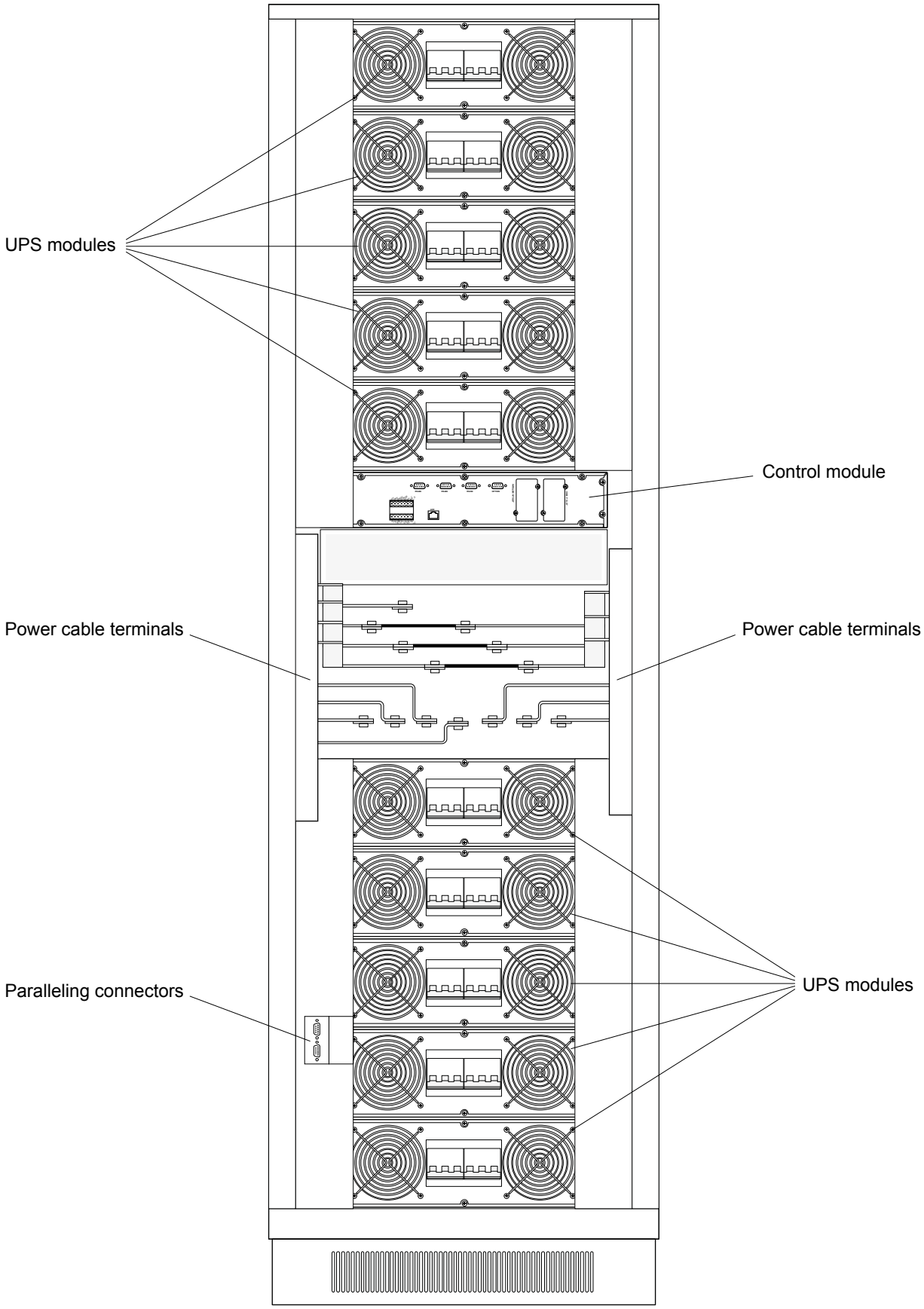


Figure 8 E633200 internal layout (rear)

UPS module layout

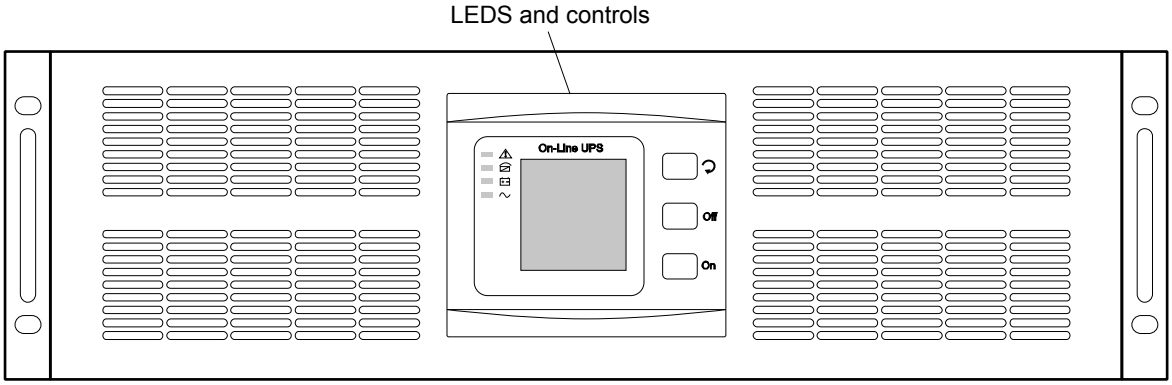


Figure 9 UPS module front panel

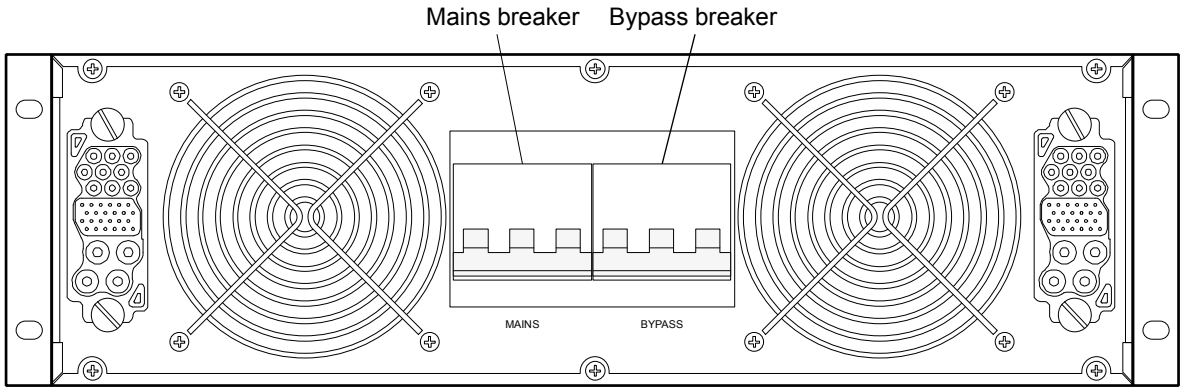


Figure 10 UPS module rear panel

Control module layout

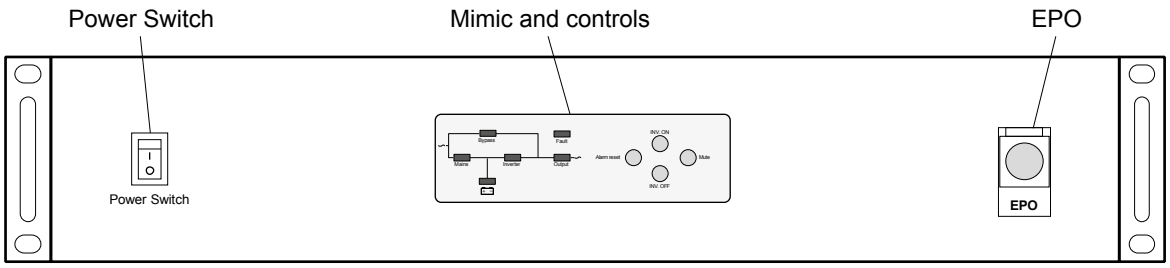


Figure 11 Control module front panel

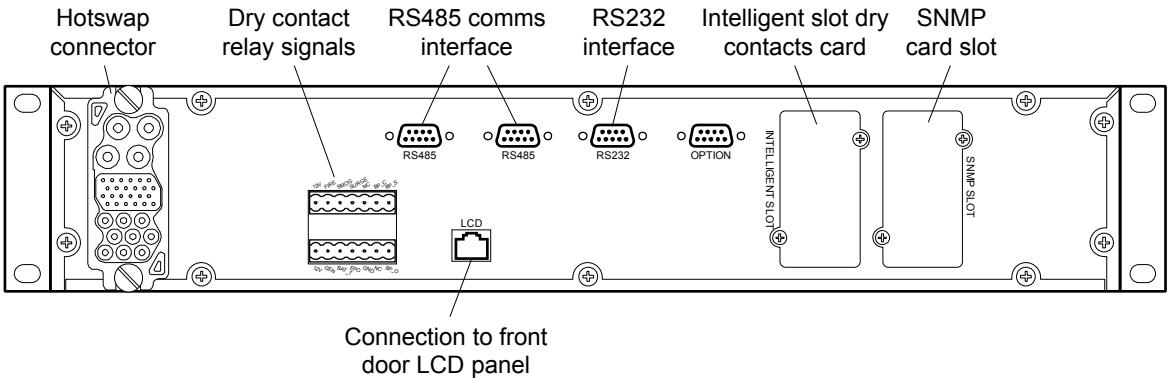


Figure 12 Control module rear panel

Wiring the UPS

Before connecting the UPS, read the siting considerations above and check you have selected breakers and cables with the correct ratings.

WARNING!

BEFORE ATTEMPTING TO WIRE THE UPS ENSURE ALL BREAKERS ARE IN THE OFF POSITION AND WHERE POSSIBLE LOCKED OFF. VERIFY THAT THE UPS IS TOTALLY ISOLATED FROM ITS EXTERNAL POWER SOURCE.

Caution: DO NOT mix batteries from different manufacturers or mix different types of batteries. DO NOT use old and new batteries together.

Caution: Ensure correct phase rotation in the 3-phase wiring.

To connect the UPS to your system:

1. Check the external battery as follows:
   a. Ensure that the number of 12 V blocks in each string (positive and negative) is equal and matches the number specified in your order.
   b. Measure the battery voltage in each string, which should be approximately:

Number of batteries	Voltage (Vd.c.)
16	192
17	204
18	216
19	228
20	240

2. Open the front door of the UPS cabinet and ensure that all output breakers are switched off.
3. Open the rear doors of the UPS cabinet and ensure that all module breakers are off.
4. Remove the protective cover of the input, output and battery terminals, and remove the cable gland plate at the bottom of the cabinet.
5. If the unit is part of a parallel system, fit the parallel cables before the main power cables

> **Note:** There isn't room through the gland plate opening for the parallel cable D-type connectors once the power cables are in place.

6. Feed all cables through the gland plate up to the terminal blocks.
7. Fit ring crimps to the ends of all power cables.

8. Wire the input and output earth cables to the PE (protective earth) terminal. Ensure that both connections are made (see Figure 13 for the E633100 and Figure 14 for the E633200).

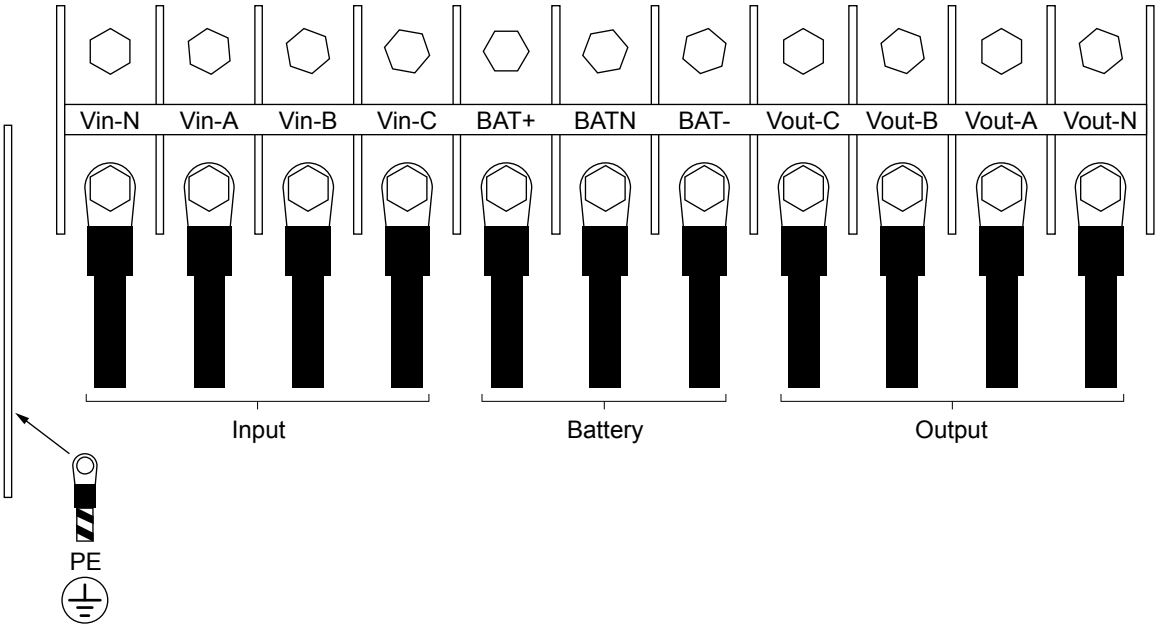


Figure 13 E633100 cable connections

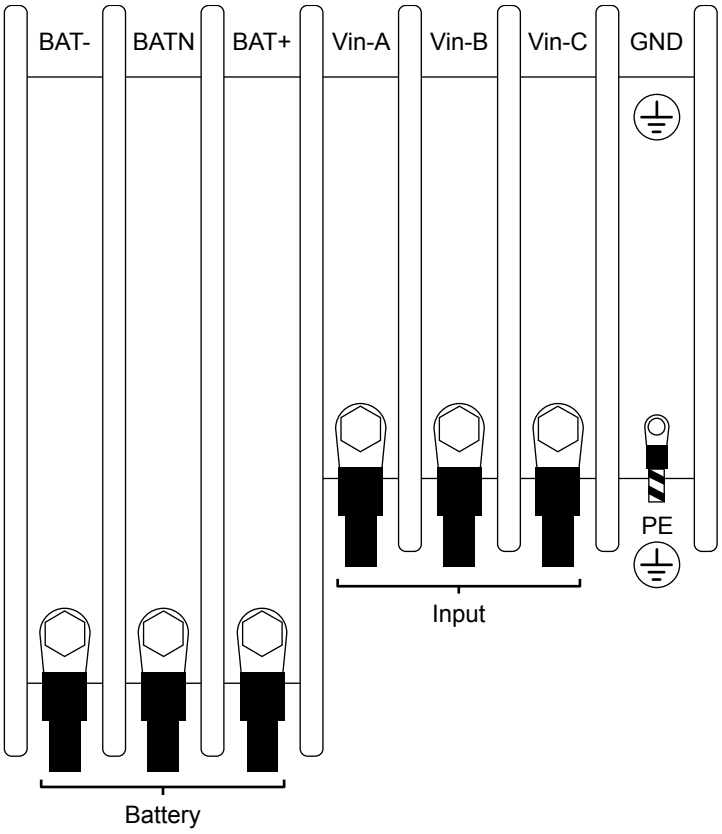


Figure 14 E633200 right-hand side cable connections

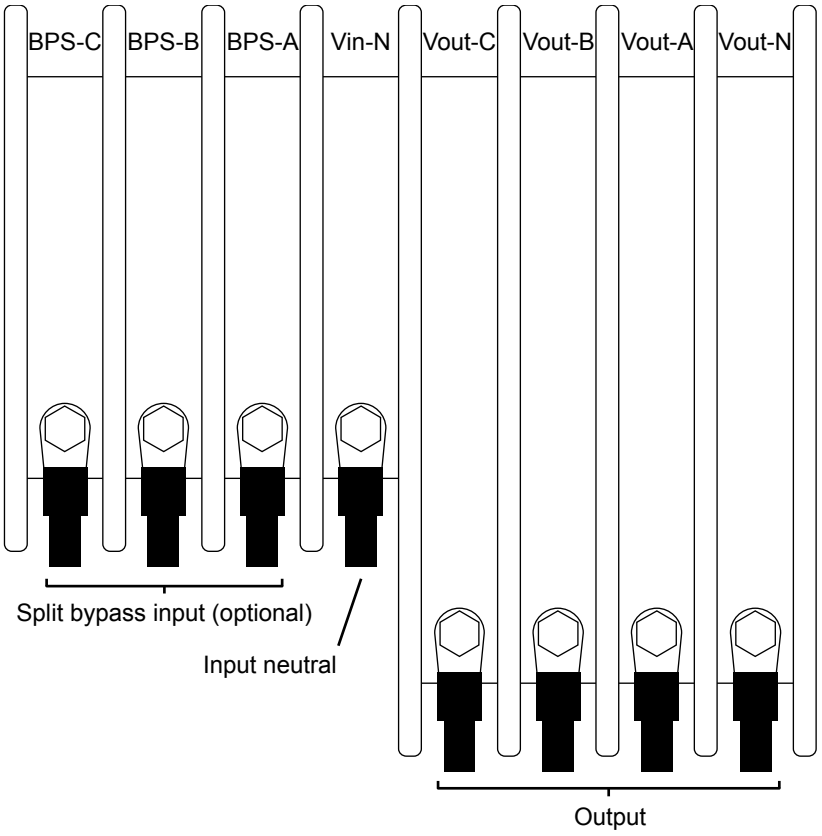


Figure 15 E663300 left-hand side cable connections

9. Wire input, output and battery cables to the terminals (see Figure 13 for the E633100, and Figure 14 and Figure 15 for the E633200.
10. E633200 only. If your UPS is configured for split bypass operation:
    a. Check that the split bypass links have been removed (Figure 16).

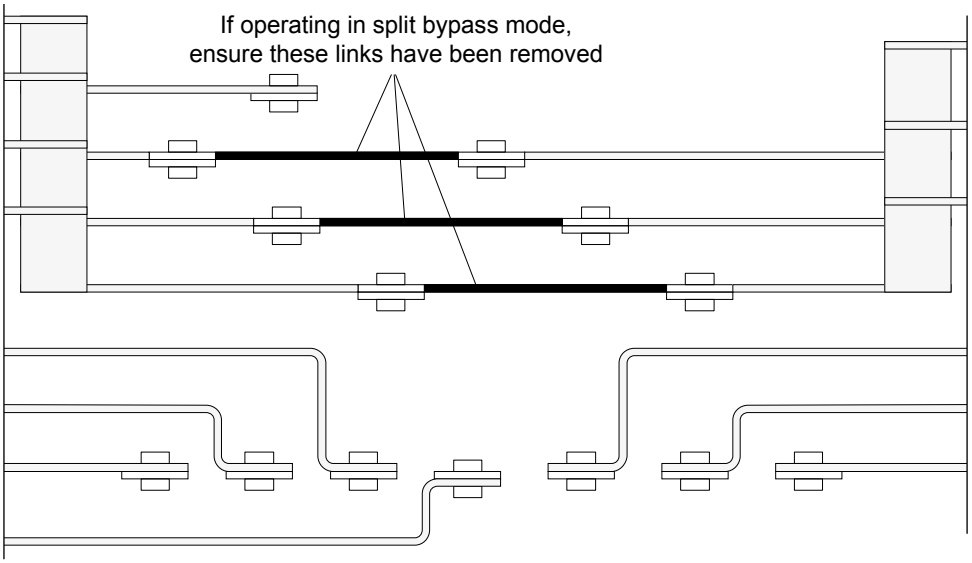


Figure 16 Split bypass links

b. Wire the split bypass input to BPS-A, BPS-B and BPS-C inputs shown in Figure 15.

WARNING!

CHECK THAT ALL CABLES ARE WIRED TO THE CORRECT TERMINALS. DO NOT REVERSE THE INPUT LIVE AND NEUTRAL CONNECTIONS OR THE POLARITY OF ANY OF THE BATTERY CABLES.

11. Route cables to ensure they do not impede UPS module airflow, and secure all cables with cable ties where tie points are provided.
12. Replace the cable gland plate at the bottom of the cabinet.
13. If your unit has an SNMP card fitted or you plan to use the RS232 port or other standard signals, see Appendix 1 Signals options on page 54.
14. Close and lock the rear doors.
15. At the front of the cabinet, slide in and secure each module using the screws provided. The number of available slots should match the number of modules provided with your order.

Note: The top right-hand fastening screw is part of an interlock and must be fitted before the UPS module will power on.

Caution: Modules are heavy. Always use two people to lift them.

Note: On the E633200, before fitting the top module, unplug the cable to the door display panel. Remember to refit the cable once the module is in place.

16. Close and lock the front door.

Wiring units in parallel

You can operate 2, 3 or 4 units in parallel.

WARNING!

BEFORE ATTEMPTING TO WIRE THE UNITS, ENSURE ALL BREAKERS ARE IN THE OFF POSITION.

Caution: Each unit requires its own battery bank. You cannot use a common battery bank for more than one unit working in parallel mode.

When operating units in parallel you must not use the built-in bypass as it is rated for one unit only. If you need a bypass for the parallel system it must be wired as an external item.

To connect two or more units in parallel:

1. Wire the power cables and optional signals as described above.
2. If a system bypass is required, wire in a separate MCB capable of carrying the total system load current as shown below. This is not required if you have only two units working in N+1 mode and the load never exceeds the rating of a single unit.

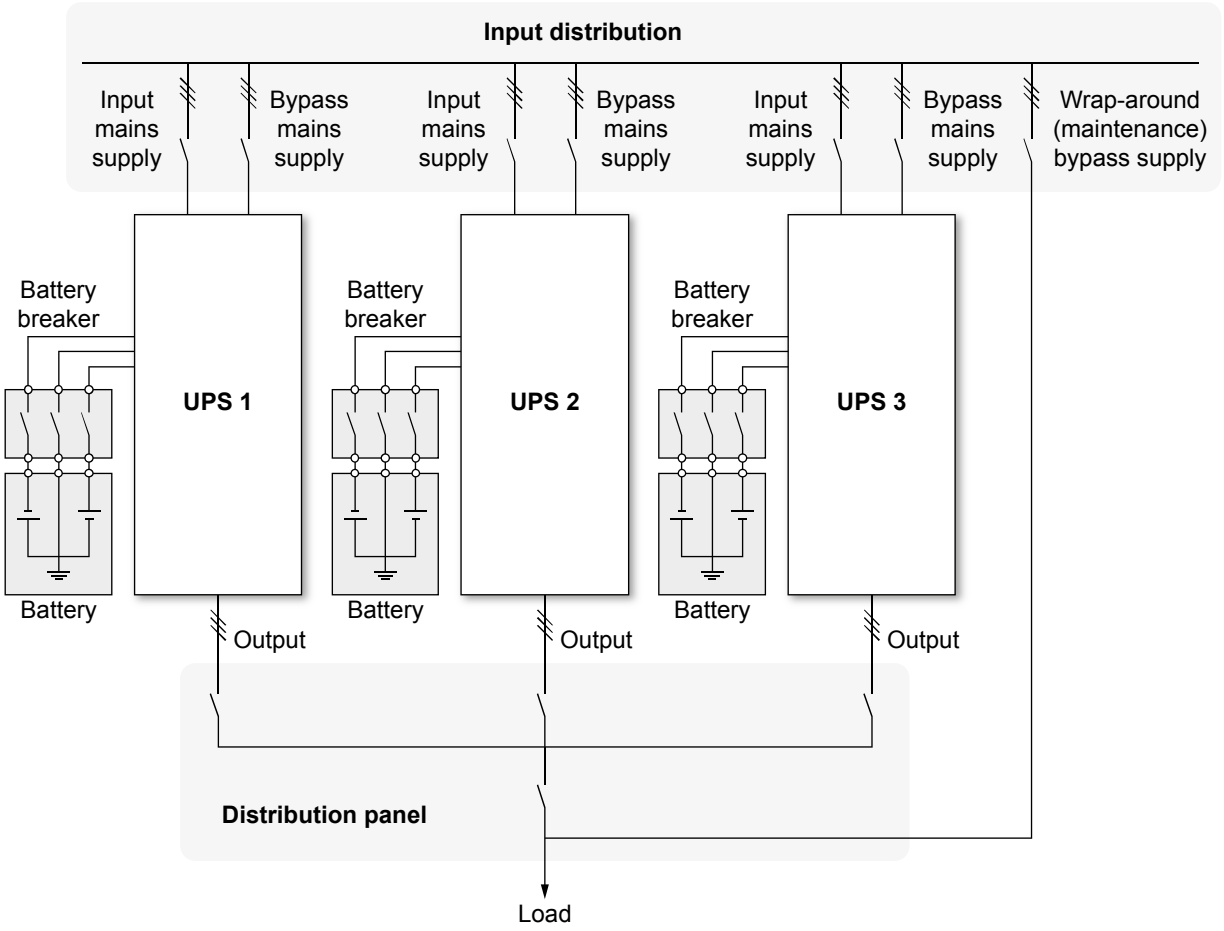
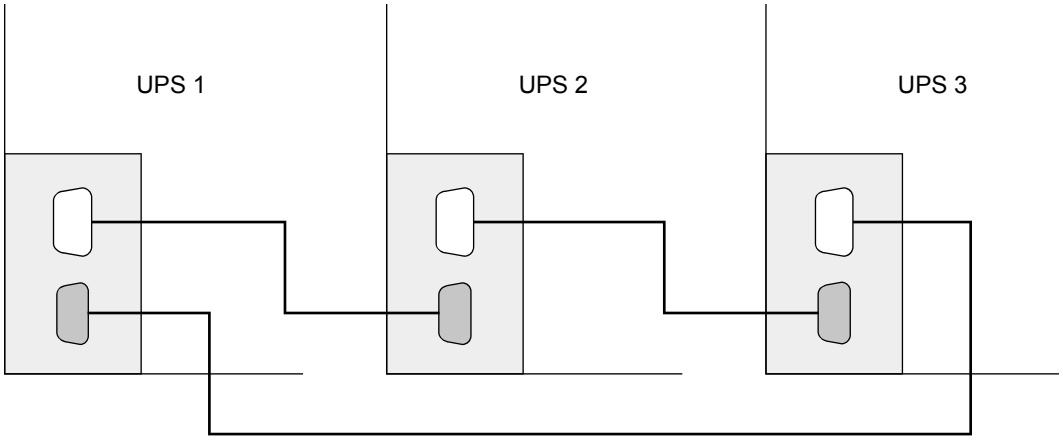
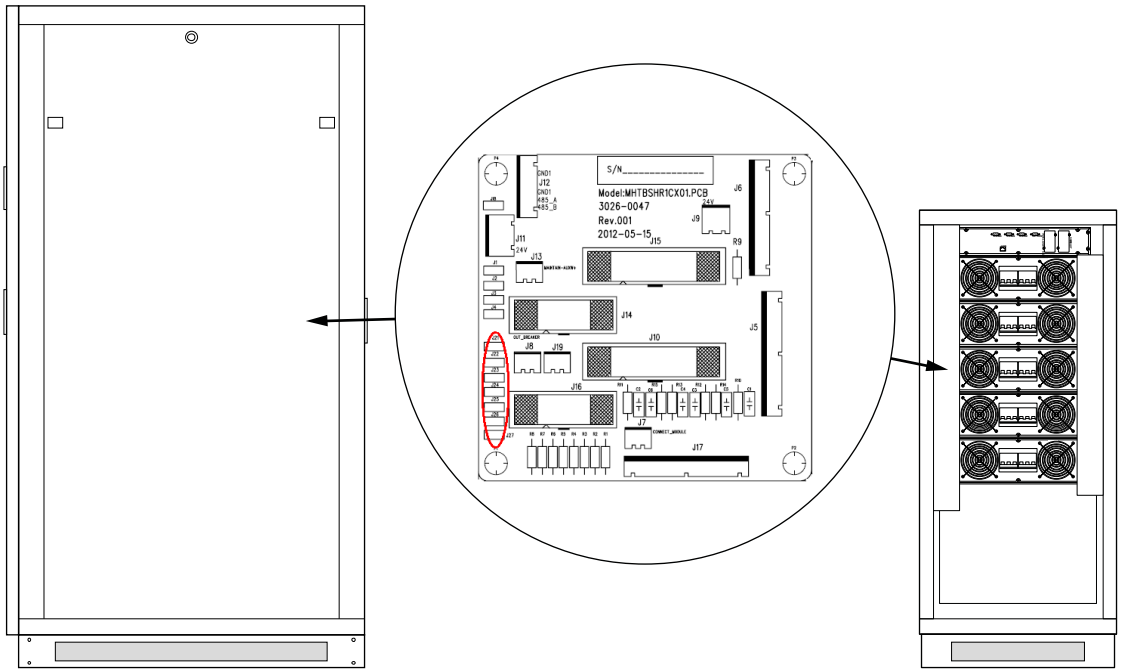


Figure 17 Units connected in parallel

3. In the rear of the cabinet on the left-hand side connect the CAN bus, labelled **Parallel 1** and **Parallel 2**, in a ring arrangement using the supplied cables as shown below. Make sure you wire all CAN bus connectors and secure them in place using their captive screw locks.



4. Access the parallel board of each cabinet as shown below.



2 m cabinet
Remove the right-hand side panel
(as viewed from the front of the cabinet)

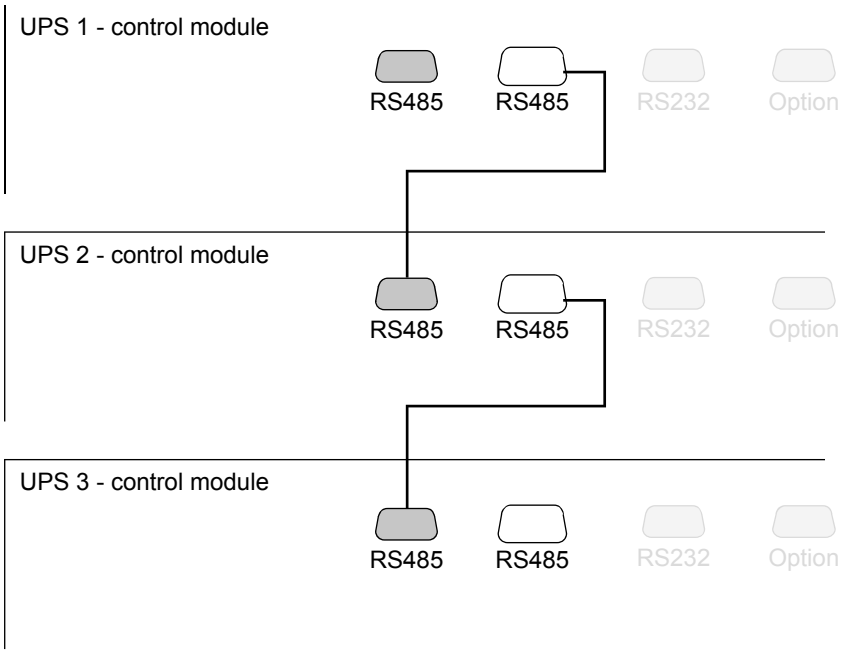
1.4 m cabinet
Remove the PDU
baffle

5. On each parallel board remove the appropriate jumpers to suit you configuration, using the information in the following table:

Cabinet size	2 units in parallel	3 or 4 units in parallel
1.4 m	J21, J22, J23, J24	J21, J22, J23, J24, J25, J26
2 m	J25, J26	J25, J26, J27

6. Replace the parallel board access cover (either side panel or PDU baffle).
7. Optional connection. You can control and monitor all units using the RS232 port on one UPS. To do this, connect the RS485 socket of one unit to the RS485 socket of the next unit and so on until all units are connected in a daisy-chain as shown below.

> **Note:** Do not connect the units in a loop.



8. If required, wire a remote emergency power off (EPO) switch as described on page 59.

Operation

Working modes

The UPS has the following modes of operation:

- Online mode
- Battery mode
- Auto-restart mode
- Bypass and split bypass modes
- ECO mode
- Frequency converter mode

Each operating mode is described below.

Online mode

This is the default mode of operation in which the load is supplied via the inverter when the a.c. input and load are within their normal ranges. The battery is trickle charged in this mode.

During fault conditions the UPS automatically switches to either bypass mode or battery mode without interruption of power to the load.

Battery mode

In battery mode the load is supplied from the battery via the inverter, the UPS beeps every 3 s, and the rectifier and charger are turned off. The UPS switches to battery mode when there is no a.c. input or the a.c. input is outside its normal range. On the front panel the Mains LED if off and the Battery LED is on.

When the battery reaches a pre-set low limit, the system gives a low battery voltage alarm signal, the LCD provides a low battery alarm, and the UPS beeps every second. Eventually the UPS shuts down to prevent damage to the batteries.

When the a.c. mains is restored the inverter starts automatically and the UPS reverts to online mode. If you turn off the UPS in battery mode it restarts in bypass mode and you must press the INV. ON button to start the inverter.

Auto-restart mode

Following an extended a.c. mains failure the battery will become exhausted. When the battery reaches the end of discharge (EOD) voltage the inverter shuts down and no more power is supplied to the load.

By default the UPS remains shut down after EOD. However it can be programmed to automatically restart after a time delay. This is normally done by the commissioning engineer.

Bypass mode

In bypass mode the load is supplied directly from the a.c. mains input and the battery is charged. The UPS switches to bypass mode when any of the following conditions occur:

- An output overload – the unit beeps twice every second, indicating that the load must be reduced to within its normal range as soon as possible. Once the overload is removed the inverter re-starts after a 5 minute delay. If the UPS is overloaded too many times in any one hour it will eventually remain in bypass mode.

- The UPS is too hot – the UPS reverts to online mode as soon as the unit temperature returns to normal.
- The UPS fails – a serious fault has occurred within the UPS that must be repaired.
- The UPS inverter is turned off.

In bypass mode the Inverter LED is off and the Bypass LED is on.

Split bypass mode (E633200 only)

Split bypass mode operates as described above except that the bypass input is connected to a completely separate a.c. source.

ECO mode

If specified, your UPS may be set to operate in ECO mode instead of online mode. In ECO mode the load is supplied via the bypass circuit and not the inverter, allowing the UPS to work at higher efficiency. The battery is trickle charged in this mode. If the a.c. input is lost or goes beyond its normal range the UPS automatically switches to battery mode, however, the transfer speed is slower than online mode and may not be suitable for all applications.

Note: Do not use ECO mode for sensitive loads.

Frequency converter mode

The UPS can be programmed to work as a frequency converter to provide either a 50 or 60 HZ a.c. output voltage. In this mode static bypass operation is disabled and the UPS may operate in battery mode.

Before switch on

Before turning on the unit for the first time or after any wiring or battery changes:

1. Read the section above on working modes.
2. Check all the wiring.
3. Check that the rated load does not exceed the rated output of the UPS.
4. If the UPS is supplied by a generator, check that the generator is correctly rated and wired (see Operation from a generator on page 13).

Switching on the UPS

Note: It is important to switch on your UPS as described below as damage may occur when supplying certain load types.

Caution: When using the UPS for the first time, charge the batteries for at least 8 hours as they may have lost charge during the time between production and installation.

Caution: If the UPS input power is provided by a generator it is important to apply the load gradually.

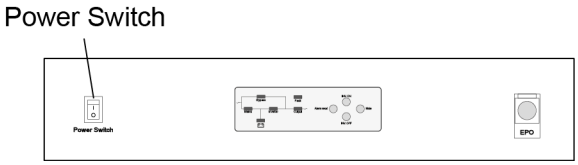
To switch on the UPS:

1. Open the cabinet's front and rear doors.
2. Ensure all UPS breakers are switched off.
3. Switch on the battery breaker.

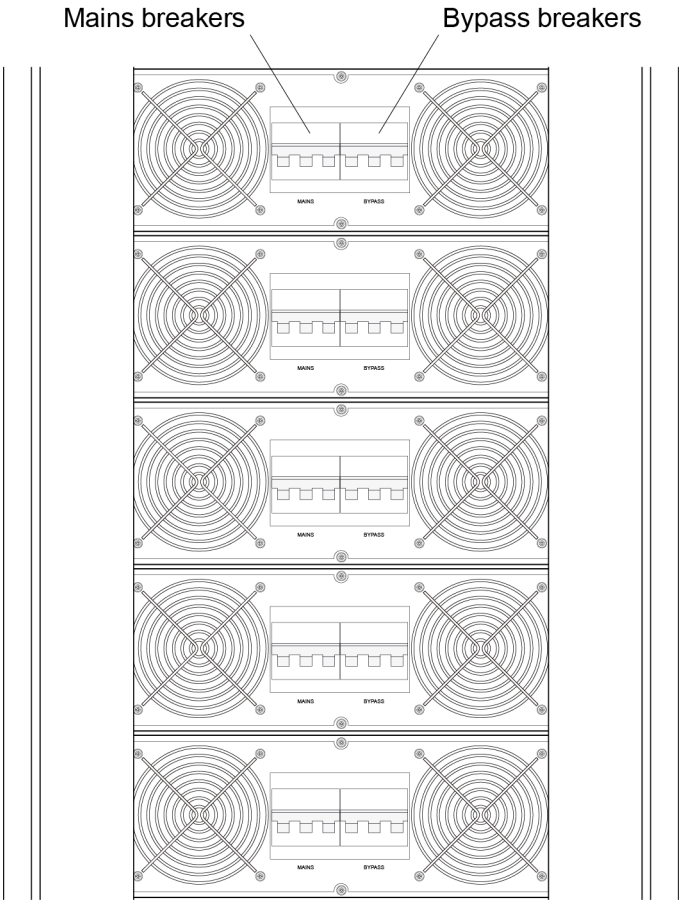
WARNING!

BE VERY CAREFUL TO AVOID ELECTRIC SHOCK. THE OUTPUT TERMINALS IN THE REAR OF THE CABINET ARE LIVE ONCE THE BATTERY BREAKER IS ON.

4. At the front of the cabinet, ensure the control module is switched on.

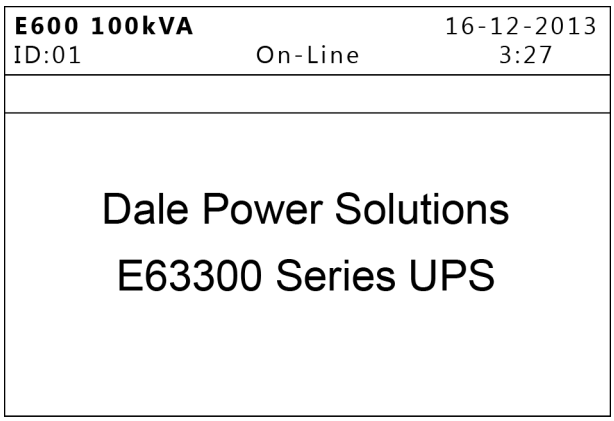


5. Switch on the mains supply to the UPS.
6. At the rear of the cabinet, switch on the input and bypass breakers of all the UPS modules. You should hear the fans start up immediately.



Note: It can take up to 30 seconds before the inverters become fully operational.

The LCD panel on the front door should begin to work. The model number and working mode is initially displayed. After a few seconds this changes to system information.



7. At the front of the cabinet, switch on all output breakers.

   After a few seconds the Mains and Inverter LEDs are illuminated and the Bypass LED goes out (see Figure 18 on page 34) on the control module.

   Note: If switching on into a transformer load, ensure the UPS is initially working in bypass mode before switching to online mode.

In this state your unit is working correctly and is capable of delivering power to the load. There is no need to alter any settings.

Commissioning test procedure

Perform this test once the unit is operating normally:

1. Switch off the mains to simulate a utility failure. The rectifier should turn off and the battery should feed the inverter without interruption. The battery, inverter and output indictors should be on.
2. Switch on the mains to simulate utility recovery, the rectifier should restart automatically after 10 s and supply the load.

Switching off the UPS

Caution: All power to the load will be removed when you follow this procedure.

To switch off the UPS:

1. Switch off the battery breaker according to the manufacturer's instructions.
2. Switch off the mains and bypass breakers (located on the rear of each module).
3. Switch off the mains supply to the UPS and lock it out.
4. If the UPS has a separate bypass mains supply, switch it off and lock it out.

Transferring the load to an EMBS

Transferring to an emergency backup supply (EMBS) is only possible if an external maintenance bypass breaker has been wired into the system.

To transfer to an EMBS while maintaining the load:

1. Unlock and open the front door of the UPS cabinet.
2. On the control module, press the **INV. OFF** button (see Figure 18 below) to put the unit into static bypass.
3. Switch on the external maintenance bypass breaker.
4. Switch off the UPS and battery as described above. The UPS is now off.
5. Perform the required maintenance work on the UPS.
6. After the maintenance work is complete, switch on the UPS as described above.
7. Switch off the external maintenance bypass breaker. The inverter should start automatically.

Control panels and indicators

Your UPS has the following control panels:

- Control module panel
- Door mounted control panel
- Individual UPS module controls

Control module panel

The following control panel is mounted on the control module. To access this panel, open the front door. The controls (Figure 18) allow you to change and/or view the status of the UPS.

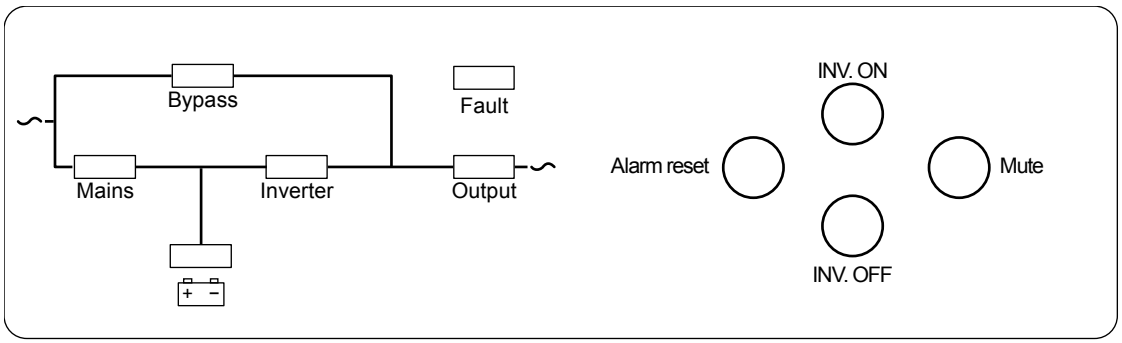


Figure 18 LED indicators and inverter operator keys

The following table describes the operation of the LED indicators:

LED	Colour	Description
Output	green	On when the load is being supplied
Inverter	green	On when the UPS is supplying power. Flashes when the inverter is overloaded or it is faulty
Battery	amber	On when power is supplied from the battery. Flashes if the battery is low, disconnected, reversed polarity, not charging or if the voltage is abnormally high
Mains	green	On when mains is present and within limits. Flashes if the mains is outside its normal range
Bypass	green	On when power is supplied via the bypass. Flashes when the bypass is not available, out of limits, overcurrent or the switch or wiring are faulty
Fault	red	On when there is any type of fault

Button	Definition
EPO (see Figure 4)	Emergency Power Off. Press to disconnect power from the load. The rectifier, inverter, static bypass and battery operation are disabled
INV. ON	Press to enable inverter operation
INV. OFF	Press to inhibit inverter operation
Alarm reset	Press to reset UPS functions once the fault is cleared
Mute	Press to toggle the buzzer on and off. After a fault the buzzer is re-enabled

Door mounted control panel

Using the buttons and the menu structure displayed on the LCD panel (Figure 19) you can:

- Check the status of the UPS
- Check and make changes to the settings

> **Note:** Your UPS is setup to your requirements by the distributor prior to delivery. There is normally no reason to change any of the settings.

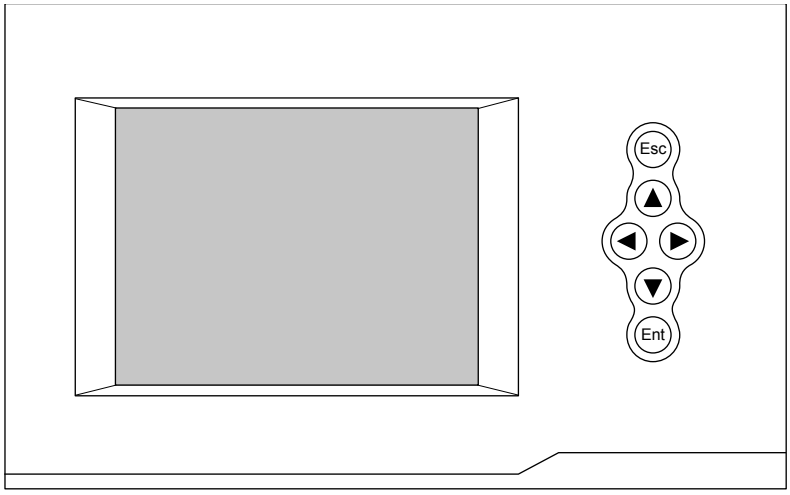


Figure 19 Door panel controls

The LCD screen is touch-sensitive and allows you to monitor:

- All parameters
- UPS and battery status
- Event and alarm logs

The following table describes the button functions:

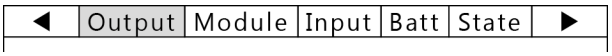
Button	Definition
Esc	Press to cancel an operation or return to the previous menu level
◄	Press to go left or scroll up one row
►	Press to go right or scroll down one row
▲	Press to scroll up one page
▼	Press to scroll down one page
Ent	Press to confirm an operation or enter a lower menu level

Navigating the system menu

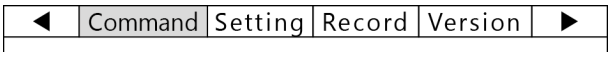
The system menu consists of a series of pages you access via a set of tabs and the front panel keys.

To display a menu page:

1. Press ◄ or ► to display the tabs. The Output tab is highlighted and the output information is displayed on the screen below the tab (as shown in the following sections).



2. Press ◄ or ► (either the buttons or the onscreen arrows) repeatedly to scroll along the tabs. Eventually the following set of additional tabs is displayed:



Note: The values shown below are examples only. The values in your system are likely to be different.

Output information

◄ | Output | Module | Input | Batt | State | ►

	A(AB)	B(BC)	C(CA)
Phase Voltage (V)	229.2	230.7	231.6
Phase Current (A)	0.0	0.0	0.0
Frequency	50.0		
Active Power (kW)	0.0	0.0	0.0
Apparent Power (kVA)	0.0	0.0	0.0
Load Percent (%)	0.0	0.0	0.0
Load Crest Factor	0.0	0.0	0.0

Module information

All modules listed

◄ | Output | Module | Input | Batt | State | ►

Module01	Non-Output
Module02	Non-Output
Module03	Non-Output
Module04	Non-Output
Module05	Non-Output
Module06	Non-Output
Module07	Non-Output
Module08	Non-Output
Module09	Non-Output
Module10	Non-Output

Module01 details

◄ | Output | Module | Input | Batt | State | ►

Module01	A(AB)	B(BC)	C(CA)
Invert Voltage (V)	220	220	220
Invert Current (A)	0	0	0
Frequency (Hz)	50		
Pos. Bus Voltage (V)	390		
Neg. Bus Voltage (V)	390		
Code	8000-8000	D800-8000	
	0000-0000	0000-0000	

Back

Battery information

◄ | Output | Module | Input | Batt | State | ►

Positive Battery Voltage	(V)	240.0
Negative Battery Voltage	(V)	240.0
Positive Battery Current	(A)	10.0
Negative Battery Current	(A)	10.0
Battery State		Charge
Battery Temperature (°C)		28
Lasting (min)		90

State information

◄ | Output | Module | Input | Batt | State | ►

Input Switch	ON
Output Switch	ON
ByPass Switch	Invalid
Manu-ByPass Switch	OFF
Inside Temperature (°C)	30

Command information

◄ | Command | Setting | Record | Version | ►

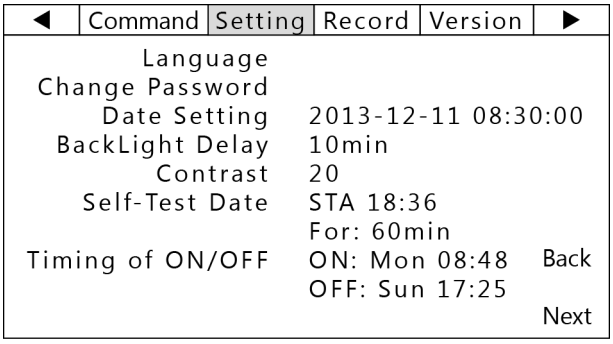
Battery Test

Buzzer Set Mute

Default Set

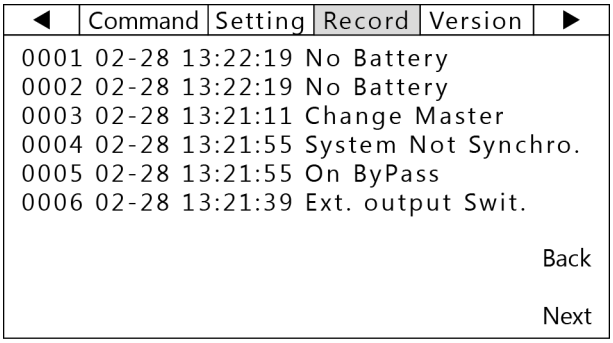
Setting information

This tab comprises several pages of settings that can be altered (see Change settings below for a list of all the settings and their ranges).

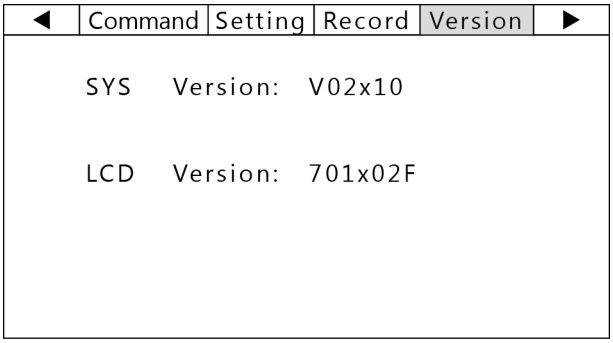


Recorded events list

This page shows up to 120 of the most recently recorded events (normal operation and fault information). For detailed information about a record, scroll to it and press **Ent**.



Version information

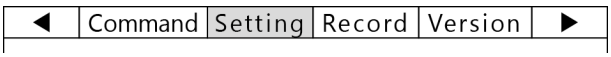


Change settings

At the time of installation your installer will alter the settings to meet your order requirements, however if you need to make a change, use the following procedure.

To change a system setting:

1. Press ◄ or ► (either the buttons or the onscreen arrows) to highlight the **Setting** tab.



2. Press **Ent**. The first item on the **Setting** page is highlighted (this is usually **Language**).

3. Either press **Ent** to change the language settings, or press ◄ or ► to highlight another parameter and then press **Ent**. To scroll to other pages of settings either press the ▼ or ▲ buttons, or in the bottom right corner of the screen, press **Back** or **Next**.
4. Depending on the parameter, either press ◄ or ►, or use the onscreen arrows or onscreen number keys to change the setting.
5. Press **Ent** to save the new setting (or press **Esc** to cancel the change).

The changeable parameters and their values are shown in the following table:

Setting Parameter	Description
Language	Change the display language
Change Password	Set if required. _ _ _ _ _ _ (range 0 to 9, 6 digits)
Data setting	YYYY-MM-DD hh:mm
Backlight Delay	Adjust how long the backlight stays on for in minutes
Contrast	Adjust the display contrast
Self-Test Date	Disable (default) Monthly Day of month: _ _ Time: _ _ : _ _ Duration: _ _ (range 1 to 99 minutes) Weekly Day: Mon, Tues, Wed, Thurs, Fri, Sat, Sun Time: _ _ : _ _ Duration: _ _ (range 1 to 99 minutes)
Timing of ON/OFF	Disable (default) Everyday Turn ON time _ _ : _ _ Turn OFF time _ _ : _ _ (hh:mm) Weekly Turn ON day: Mon, Tues, Wed, Thurs, Fri, Sat, Sun Turn ON time _ _ : _ _ Turn ON day: Mon, Tues, Wed, Thurs, Fri, Sat, Sun Turn ON time _ _ : _ _
Work Mode	Single (default, stand-alone UPS in online mode) ECO (single UPS only, UPS in off-line high efficiency mode) Master (sets UPS as master in a master/slave system) Slave (sets UPS as a slave in a master/slave system) Parallel
System Voltage Level	220 V 230 V 240 V (default)
System Frequency Level	50 Hz (default) 60 Hz
Auto Turn-on	Allows the UPS to auto-restart when the mains is re-applied after a 100% battery discharge following a mains failure. Enable (default) Disable
Bypass frequency range	1% 2% 3% 4% 5% (default)
Bypass Volt Upper Limit	5% 10% 15% (default)
Bypass Volt Lower Limit	-20% -30% -45% (default)

O/P Volt Regulation	Allows you to fine adjust the inverter output -5% -4.5% -4% -3.5% -3% -2.5% -2% -1.5% -1% -0.5% 0% 0.5% 1% 1.5% 2% 2.5% 3% 3.5% 4% 4.5% 5%
Parallel ID	Set the UPS identity in a parallel configuration 1 (default) 2 3 4
UPS Output	Switches off the output from the UPS
Float Volt Revise	Float voltage adjustment based on temperature probe
Parallel Amount	Set the number of units in a parallel configuration 1 (default) 2 3 4
Internal Module Amount	Set the number of modules fitted into the cabinet
Single Battery Voltage (V)	Set the voltage of the battery blocks 2 4 6 12 (default)
Battery Number	Set the number of batteries on a string 2x16 2x17 2x18 2x19 2x20
Battery Group	Set the number of battery strings in a group 1 2 3 4 5 6 7 8
Single Battery Capability	Battery capacity: _ _ _ _ Ah (range 7 to 2000)
Boost upper limit Volt.	Set the upper limit voltage in boost mode 2.27 V/cell (default, range 2.20 to 2.40)
Float base Volt.	Set the float mode voltage 2.27 V/cell (default, range 2.20 to 2.29)
Battery Protect Volt.	Set the end of discharge voltage 1.65 V/cell (default, range 1.20 to 1.90)
Boost Charge	Boost charges the batteries at the end of a recharge Enable (default) Disable (use for VRLA batteries)
Boost Last Time	Set the boost charge time
Max charge current	Set to 10% of the battery Ah capacity rating in amperes. _ _ A (1 to 30 A in 1 A steps)

UPS module LCD panel

You can display information about each UPS module using its LCD panel and you can also switch each UPS module on and off.

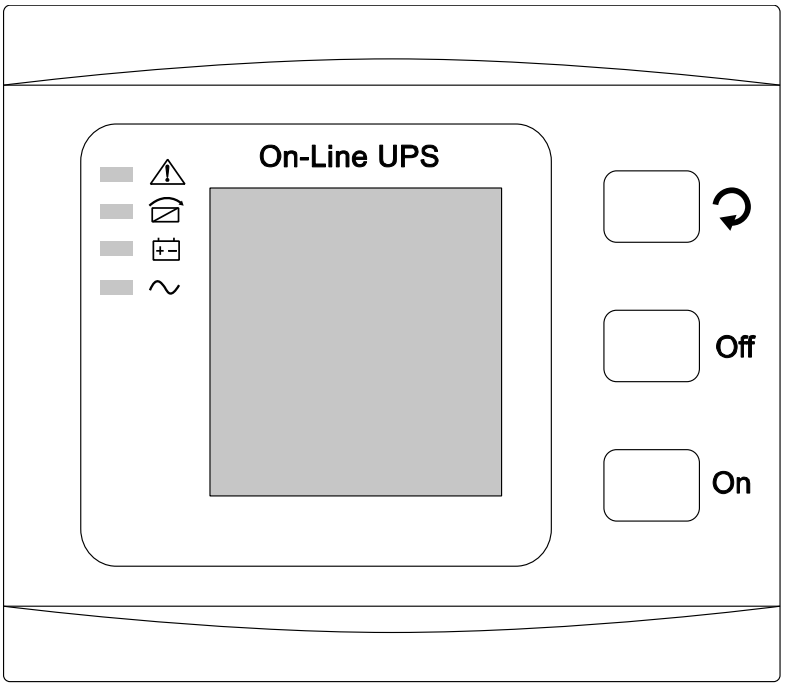


Figure 20 UPS module LCD panel

The following table describes the operation of the LEDs:

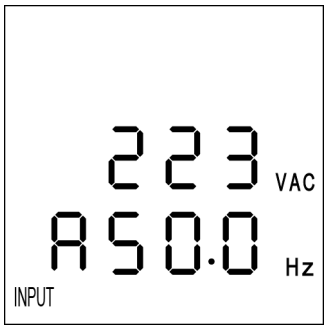
LED	Description
⚠	Indicates a fault. Maybe lit or flashing depending on the fault.
	When on alone, indicates that the UPS is working in bypass mode. The buzzer beeps every 2 minutes. When on with the green inverter LED, indicates that the UPS working in ECO mode.
	Indicates that the UPS is in battery mode. Flashes under fault conditions.
∿	Indicates that the UPS is turned on and the following conditions apply: the a.c. input, if present, is within limits; no overload; battery connected.

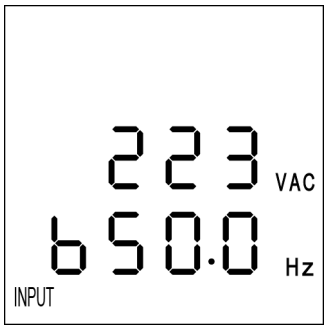
The following table describes the buttons functions:

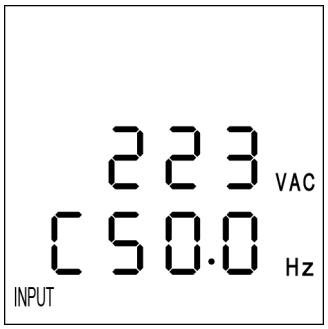
Button	Definition
↻	Press repeatedly to cycle between each screen of information.
Off	Press and hold for more than 0.5 s to switch off the UPS module.
On	Press and hold for more than 0.5 s to switch on the UPS module.

The following pictures are examples of the information you will see when you press the button repeatedly.

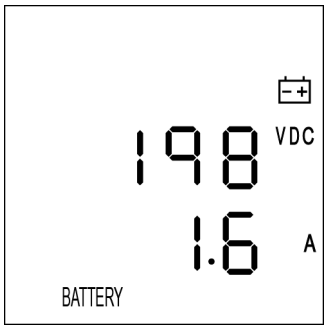
Input voltage per phase and the input frequency:

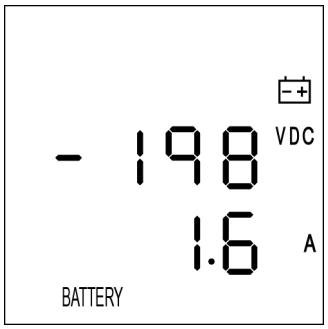




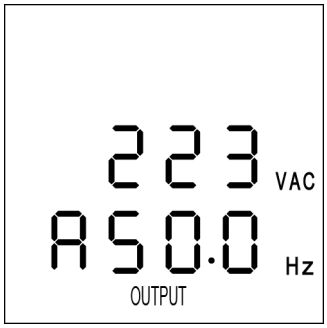


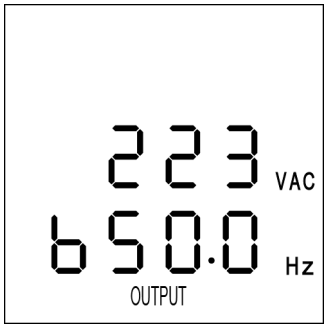
Battery voltage:

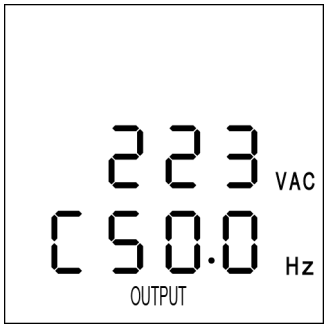




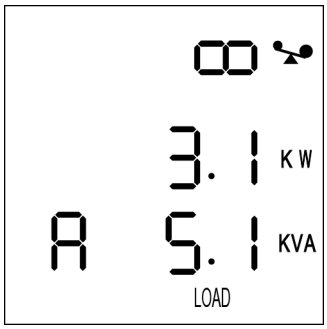
Output voltage per phase and output frequency:

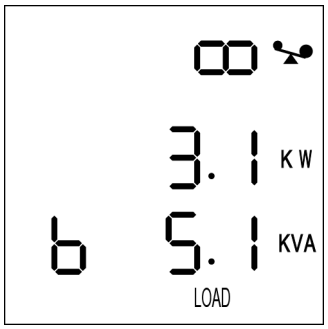


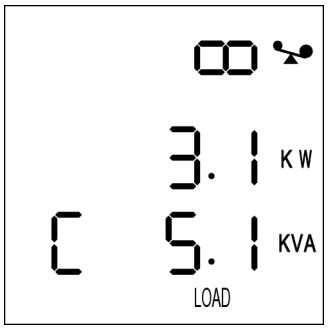




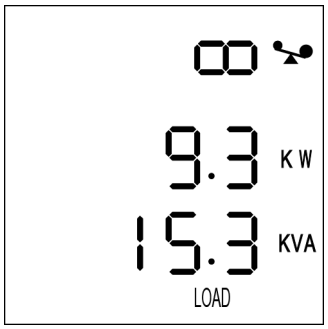
Loading per phase:



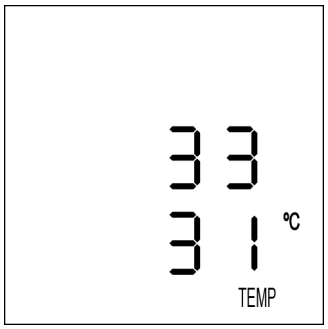




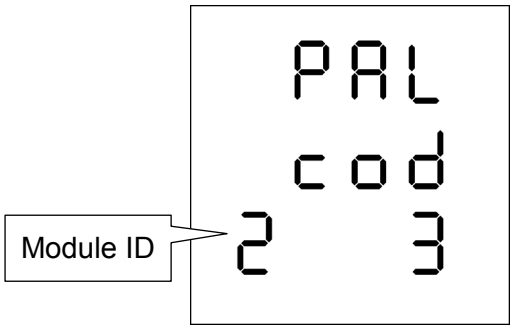
Total loading:



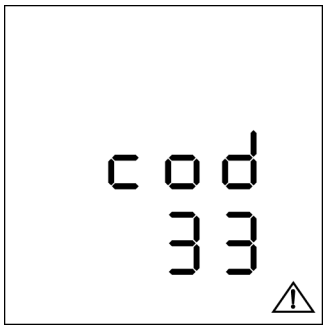
Internal and ambient temperature:



Module ID and status code:

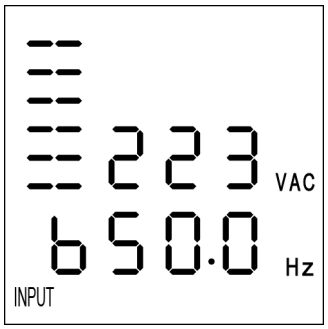


Alarm code:

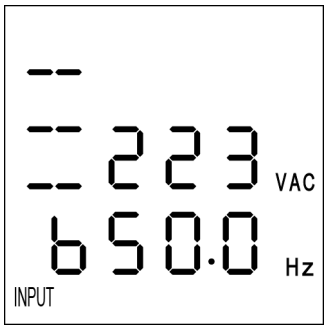


When the UPS module charger is on its status is show on the input screens, for example:

Equalised:



Floating



Maintenance

Module replacement with UPS online

Modules can be replaced on a UPS that is operating online. The control system detects the removal and insertion of modules automatically.

Caution: Modules are heavy. Always use two people to lift them.

To replace a module with the UPS online:

1. Open the cabinet front door.
2. On the module to be replaced, remove the four screws that hold it in place. The top right-hand screw operates an interlock that turns off the module.
3. Wait until the module displays cod 44 and then remove the module.
4. On the replacement module ensure the output and bypass breakers on its rear are in the ON position.
5. Slide in the replacement module and refit the four screws that hold it in place. The module will start operating soon after fitting the top right-hand screw. Ensure that its fans are running and that it is providing power.

Fan

At normal room ambient temperature the fans will operate continuously for 20,000 to 40,000 hours. Increased ambient temperatures will shorten this lifetime.

Periodically ensure that air is blowing out of the rear of the unit.

Battery

We recommend the use of sealed lead acid, maintenance free batteries. Battery life depends on the ambient temperature and the number of discharge/charge cycles. Battery life is shortened with high ambient temperature and deep discharges.

To maximise the life of your batteries, maintain them as follows:

- Maintain the ambient temperature in the range 15 to 25°C.
- Avoid discharge currents of less than 10% of full load current.
- Do not operate the UPS in battery mode continuously for more than the specified autonomy (hold-up time).
- Charge the battery for at least 12 hours every 3 months if it has not been used. If the ambient temperature is higher than 25°C, charge the battery every 2 months.
- Maintain external batteries at least once a year.

If the backup time has significantly reduced, or a battery fault is displayed on the LCD screen contact your distributor to find out if the batteries need replacing.

WARNING

DON'T SHORT CIRCUIT THE BATTERY AS IT CAN CAUSE A FIRE.

DON’T OPEN THE BATTERY AS THE ELECTROLYTE INSIDE IS HARMFUL TO SKIN AND EYES.

Battery change

Caution: We strongly recommend you switch off the whole UPS when you need to change a battery group.

Visual check

Ensure there is adequate ventilation to maintain the UPS at the correct temperature.

UPS status check

Check the following:

- Ensure there are no faults or alarms indicated.
- If the UPS is working in bypass mode, investigate the cause.
- If the UPS is working in battery mode, make sure it is normal, if not, investigate.

Function check

Perform the following function checking every 6 months:

1. On the control module, press the **INV. OFF** button to ensure the buzzer, indicators and LCD are operating normally.
2. On the control module, press the **INV. ON** button. Check the indicators, LCD and UPS inverter, and ensure they are working normally.
3. When the UPS is working in online mode, perform a battery test.

Display messages

UPS module code numbers and messages

Code	Content displayed	LED			
		Alarm	Bypass	Battery	Inverter
1	Initialized	unlit	unlit	unlit	unlit
2	Standby mode	unlit	unlit	x	unlit
3	No output	unlit	unlit	x	unlit
4	Bypass mode	unlit	lit	x	unlit
5	Utility mode	unlit	unlit	x	lit
6	Battery mode	unlit	unlit	lit	unlit
7	Battery self-diagnostics	unlit	unlit	lit	unlit
8	Inverter is starting up	unlit	x	x	unlit
9	ECO mode	unlit	x	x	x
10	EPO mode	lit	unlit	x	unlit
11	Maintenance bypass mode	unlit	unlit	unlit	unlit
12	Fault mode	lit	x	x	x

Note: x indicates that the LED state is determined by other conditions.

UPS module alarm information

No.	UPS alarm warning	Buzzer	LED
1	Rectifier fault	Continuous beep	Fault LED lit
2	Inverter fault (including inverter bridge is shorted)	Continuous beep	Fault LED lit
3	Inverter thyristor short	Continuous beep	Fault LED lit
4	Inverter thyristor broken	Continuous beep	Fault LED lit
5	Bypass thyristor short	Continuous beep	Fault LED lit
6	Bypass thyristor broken	Continuous beep	Fault LED lit
7	Fuse broken	Continuous beep	Fault LED lit
8	Parallel relay fault	Continuous beep	Fault LED lit
9	Fan fault	Continuous beep	Fault LED lit
10	Fan power fault	Continuous beep	Fault LED lit
11	Auxiliary power fault	Continuous beep	Fault LED lit
12	Initialization fault	Continuous beep	Fault LED lit
13	P-battery charger fault	Continuous beep	Fault LED lit
14	N-battery charger fault	Continuous beep	Fault LED lit
15	DC bus over voltage	Continuous beep	Fault LED lit
16	DC bus below voltage	Continuous beep	Fault LED lit

No.	UPS alarm warning	Buzzer	LED
17	DC bus unbalance	Continuous beep	Fault LED lit
18	Soft start failed	Continuous beep	Fault LED lit
19	Rectifier over temperature	Twice per second	Fault LED lit
20	Inverter over temperature	Twice per second	Fault LED lit
21	Input neutral line missing	Twice per second	Fault LED lit
22	Battery reverse	Twice per second	Fault LED lit
23	Cable connection error	Twice per second	Fault LED lit
24	CAN comm. fault	Twice per second	Fault LED lit
25	Parallel load sharing fault	Twice per second	Fault LED lit
26	Battery over voltage	Once per second	Fault LED flashing
27	Mains site wiring fault	Once per second	Fault LED flashing
28	Bypass site wiring fault	Once per second	Fault LED flashing
29	Output short-circuit	Once per second	Fault LED flashing
30	Rectifier over current	Once per second	Fault LED flashing
31	Bypass over current	Once per second	Bypass LED flashing
32	Overload	Once per second	Inverter or Bypass LED flashing
33	No battery	Once per second	Battery LED flashing
34	Battery under voltage	Once per second	Battery LED flashing
35	Battery low pre-warning	Once per second	Battery LED flashing
36	Internal communication error	Once per 2 seconds	Fault LED flashing
37	DC component over limit	Once per 2 seconds	Inverter LED flashing
38	Parallel overload	Once per 2 seconds	Inverter LED flashing
39	Mains volt. abnormal	Once per 2 seconds	Battery LED lit
40	Mains freq. abnormal	Once per 2 seconds	Battery LED lit
41	Bypass not available		Bypass LED flashing
42	Bypass unable to trace		Bypass LED flashing
43	Inverter on invalid		
44	Module Screws Unlocked		

Cabinet display messages

No.	Display message	Description
1	Initializing	The DSP and MCU are in Initializing
2	Standby	
3	Non-output	The UPS does not provide power to the load equipment
4	On bypass	Inverter output is turned off and the load connected at the inverter output receives power from utility line via STS
5	On line	Inverter output power is the primary energy source to load

No.	Display message	Description
6	EPO activated	Emergency power off switch has been activated
7	Automatic self-test	The UPS has started pre-programmed battery test
8	Inverter soft starting	
9	System fault detected	The system has detected an internal error
10	MBS status	Status of maintenance bypass
11	EPO status	Status of EPO (emergency power off)
12	Int. input switch closed	The internal input breaker is closed manually
13	Int. input switch opened	The internal input breaker is opened manually
14	Rectifier deactivated	The rectifier has been deactivated
15	Rectifier activated	The rectifier has been activated
16	Rectifier current limit	When the input voltage is between 208 V and 305 V, the output of the UPS will not be interrupted, but it will be current limited, for example, to reduce charge current. When the load exceeds its limit, there is a warming
17	Battery charge deactivated	The charger has been deactivated
18	Positive battery boost charging	Either constant voltage boost charge mode or constant current boost charge mode
19	Positive battery float charging	
20	Negative battery boost charging	
21	Negative battery float charging	
22	Int. bypass switch opened	The internal bypass breaker is opened manually
23	Int. bypass switch closed	The internal bypass breaker is closed manually
24	Int. output switch opened	The internal output breaker is opened manually
25	Int. output switch closed	The internal output breaker is closed manually
26	Ext. bypass switch opened	The external bypass breaker (parallel system) is opened
27	Ext. bypass switch closed	The external bypass breaker (parallel system) is closed
28	Ext. output switch opened	The external output breaker (parallel system) is opened
29	Ext. output switch closed	The external output breaker (parallel system) is closed
30	Coming to interval transfer	Allows transfer to bypass or inverter with 3/4 cycle break. Use of this command will drop load.
31	Coming to over load due to inverter off	When the inverter is turned off manually, the load will exceed the power capacity.
32	Coming to interval transfer due to inverter off	When the inverter is turned off manually, the load will exceed the power capacity.
33	Inverter invalid due to over load	The load exceeds the capability of the single or parallel modules.
34	Inverter master	It indicates the master inverter.

No.	Display message	Description
35	Transfer Times-out	Latched load transfer to bypass as a result of too many successive transfers within the current hour. Automatic reset attempt within the next hour.
36	UPS in shutdown due to overload	The load exceeded the power capacity. The UPS has been shutdown
37	UPS in bypass due to overload	The load exceeded the power capacity. The UPS has switched to Bypass Mode
38	Parallel in bypass	The parallel system has switched to bypass mode
39	LBS activated	LBS has been activated
40	Lightning protection	Lightning protector has been activated
41	Battery low to UPS off	Battery voltage lower than protection point
42	UPS timing on	UPS on at certain time
43	UPS timing off	UPS off at certain time
44	Timing self-test start	Start to self-test at certain time
45	Stop self-test	Self-test stops
46	Manual off	Turn off UPS manually
47	Remote off	Turn off UPS remotely
48	Module connected	Module is connected
49	Module removed	Module is removed

Cabinet alarm messages

No.	Display message	Description
1	Rectifier fault	Rectifier detected faulty. Rectifier and inverter and charger shut down.
2	Rectifier over temperature	The temperature of heat sink is too high to keep the rectifier running. Charger and inverter shut down.
3	Inverter over temperature	The temperature of the inverter heat sink is too high to keep inverter running.
4	Rectifier over-current	Rectifier failure due to over-current
5	Input thyristor failure	Failure of input thyristor
6	Battery discharge thyristor failure	Failure of battery discharge thyristor
7	Battery charge thyristor failure	Failure of battery charge thyristor
8	Fan fault	At least one of the cooling fans fails. Rectifier and inverter and charger shut down.
9	DC Bus over-voltage	Rectifier, inverter and battery converter are shut down due to high DC bus voltage.
10	DC Bus under-voltage	Rectifier, inverter and battery converter are shut down due to low DC bus voltage.
11	DC bus unbalance	If the difference between positive DC bus and negative DC bus exceeds 30V, this warning shall occur.

No.	Display message	Description
12	Soft start fault	Rectifier could not be started due to low DC bus voltage
13	Input neutral line missing	If Input Neutral line is missing or disconnected while the UPS is in operation, the UPS will generate Neutral line failure alarm and go into Battery mode.
14	Battery reverse	The polarity of the battery is reversed.
15	No battery	Battery is disconnected
16	Positive battery charger fault	The positive battery Charger is fault. The charger will be shut down.
17	Negative battery charger fault	The negative battery charger is fault. The charger will be shut down.
18	Battery under-voltage	The battery voltage is too low and the charger has been deactivated.
19	Battery over-voltage	The battery voltage is too high and the charger has been deactivated.
20	Battery under-voltage pre-warning	The UPS is in battery operation and the battery voltage is low. Note: Runtime is limited in duration.
21	Mains freq. abnormal	Mains frequency is out of limit range and results in rectifier shutdown.
22	Mains volt. abnormal	Mains Voltage exceeds the upper or lower limit and results in rectifier shutdown.
23	Inverter fault	When inverter has been turned on for a certain time, but the output voltage of inverter is still out of the range of Rating voltage +12.5% and –25%, inverter fault will occur, and the inverter will be shut down and UPS will transfer to bypass. This fault cannot be cleared until this unit is completely powered off.
24	Inverter IGBT bridge direct conduct protection	If the two IGBTs in the same bridge of inverter are on simultaneously, inverter should be shut down
25	Inverter thyristor short fault	SCR at the inverter side is short-circuited
26	Inverter thyristor broken fault	SCR at the inverter side is open-circuited
27	Bypass thyristor short fault	SCR at the bypass side is short-circuited
28	Bypass thyristor broken fault	SCR at the bypass side is open-circuited
29	CAN comm. fault	The CAN bus communication fails
30	Parallel system load sharing fault	If any unit in a parallel system has an unbalance load share that exceeds 30%, this warning will occur.
31	Bypass site wiring fault	Wrong phase rotation on the bypass side.
32	System not synchronized to bypass	System cannot synchronize to bypass. Bypass Mode may not be available.
33	Bypass unable to trace	Bypass is unable to trace
34	Bypass not available	The frequency or voltage is out of acceptable range for bypass. This message occurs when the UPS is online, and indicates that the bypass mode may not be available if required.
35	IGBT over current	IGBT current is over limit.

No.	Display message	Description
36	Parallel cable connection error	If a unit is set as parallel mode, but parallel cable is not connected correctly, this warning will occur
37	Parallel relay fault	Relay of parallel circuit must be turned on when the system are in parallel and the inverter is on. If the relay of parallel circuit cannot be turned on correctly, this unit should be shut down (include inverter and bypass). This fault cannot be cleared until this unit is completely powered off.
38	LBS not sync.	Two parallel systems are not in synchronization.
39	Initialization fault	When the procedure of initialization is wrong, this warning will occur.
40	Inverter is invalid	The inverter on button has been activated.
41	Overload	The load exceeds the system power capacity.
42	Parallel overload	The UPS parallel system is confirmed to be overloaded according to the set number.
43	DC component over limitation	If the DC component of the UPS output rating power is larger than the limitation, this warning should occur
44	Bypass over current	When the bypass current exceeds the limitation, this alarm will occur.
45	Feedback protection	This UPS is fitted with a voltage free contact closure signal for use with an external automatic disconnect device (by others) to protect against back-feeding voltage into the incoming bypass supply
46	Ext. fire alarm	External fire detector has been activated.
47	Ext. smoke alarm	External smoke detector has been activated.
48	Battery damaged	Battery has been damaged, this warning shall occur.
49	Battery over-temperature	Battery over-temperature, this warning shall occur.
50	Model set wrong	Model setting of the UPS is incorrect.

Troubleshooting

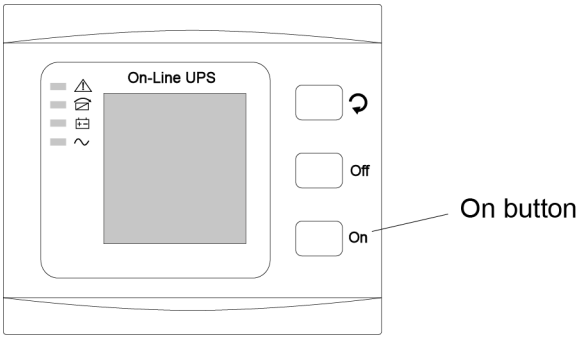
Before contacting your distributor, try to solve your problem using the following information. If you need to contact your distributor make sure you have the model number and serial number of your UPS.

Black Start procedure

Use this procedure to start the UPS from the battery only when the mains supply is absent, or to check the system as part of the commissioning process.

To start the UPS using the black start switch:

1. Unlock and open the front door.
2. Turn on the battery breaker. The battery will supply the auxiliary power board.
3. Press and hold the **On** button of each UPS module for more than 0.5 s. After about 30 seconds the UPS will be ready to supply load current.



4. Turn on the output breaker.

Frequently asked questions

No	Problem	Causes	Solution
1	No LCD display	Display cable not plugged in correctly	Unplug the cable to LCD panel and then plug it in again
2	Blue screen LCD	LCD not connected	
3	UPS won't start	Input breaker is open	Close the input breaker
		UPS module breaker is open	Close the mains breaker
		AC input is out of specification	Check that the voltage and frequency are within limits
4	Mains normal but mains LED off and UPS operating in battery mode	UPS input breakers not on	Switch on the mains input breaker
		Mains input cable not connected correctly	Check the mains input wiring
5	No output from UPS	Output breaker is open	Close the output breaker
		UPS disabled at the LCD control panel	Enable the UPS using the LCD control panel
		Output wiring fault	Check the output wiring

No	Problem	Causes	Solution
6	Inverter not working	Inverter not started	Press Inverter ON for 2 seconds
7	UPS module can't transfer to bypass or inverter	UPS module incorrectly inserted	Pull out the module and re-insert
		The top right-hand interlock screw in not tight	Tighten the screw
		UPS module output breaker off	Switch on the breaker
8	UPS module fault LED remains on	UPS module damaged	Replace the module
9	Mains LED flashes	Mains voltage our of limits	If UPS working in battery mode. Check remaining backup time and then rectify mains supply
10	Battery LED flashes but no charging power	Battery breaker off	Switch on battery breaker
		Batteries damaged	Replace the whole battery group
		Batteries connection reversed	Connect the battery correctly
		Battery number and capacity set incorrectly	Set the correct data
11	Buzzer sounds at 0.5 s intervals, LCD displays 'output overload'	Output overloaded	Reduce the load within rating
12	Long sounds from buzzer, LCD displays 'output short circuit'	Short circuit on output	Remove the short circuit and restart the UPS
13	Red LED on module lit	Module not plugged in correctly	Pull out the module and then push back in
14	UPS works on bypass only	Mains breaker is open	Close the mains breaker
		UPS working in ECO mode	Set the UPS to work in online mode
		Switch Bypass times out (if the UPS has repeatedly switched to bypass due to over current/temp more than the 'bypass switch times')	Increase the time or restart the UPS
15	Can't 'black start' the UPS	Battery breaker is open	Close the battery breaker
		A battery fuse is open	Change the fuse
		Battery low	Recharge the battery
16	Buzzer sounds continuously and LCD indicates rectifier or output fault	UPS faulty	Consult Dale Power Solutions for repair

Appendix 1 Signals options

RS232 serial port

E63300 series units are fitted with a standard RS232 serial port, which can be used to:

- Monitor the UPS power status
- Monitor the UPS alarm information
- Monitor the UPS running parameters
- Perform a battery test

To enable RS232 control:

1. Connect the UPS to your computer using the supplied RS232 cable.
2. Load the supplied software onto your computer.

Connections between computer and UPS RS232 ports

Computer		UPS
RDX 2	←	TX 3
TDX 3	→	RX 2
GND 5		GND 5

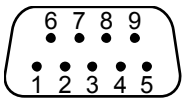


Figure 21 RS232 serial port pin-outs looking at the socket on the UPS

RS232 communication data format

Parameter	Value
Baud rate	2400 bps
Byte length	8bit
End bit	1bit
Parity check	Null

SNMP card with environmental monitor

If your unit is fitted with the optional SNMP card (located in the SNMP Slot on the control module rear panel, Figure 12 on page 21), connect it to your computer with a network cable. You can also connect a modem and environment controls as shown in Figure 22.

For instructions on how to operate the SNMP card, refer to the documentation on the supplied CD.

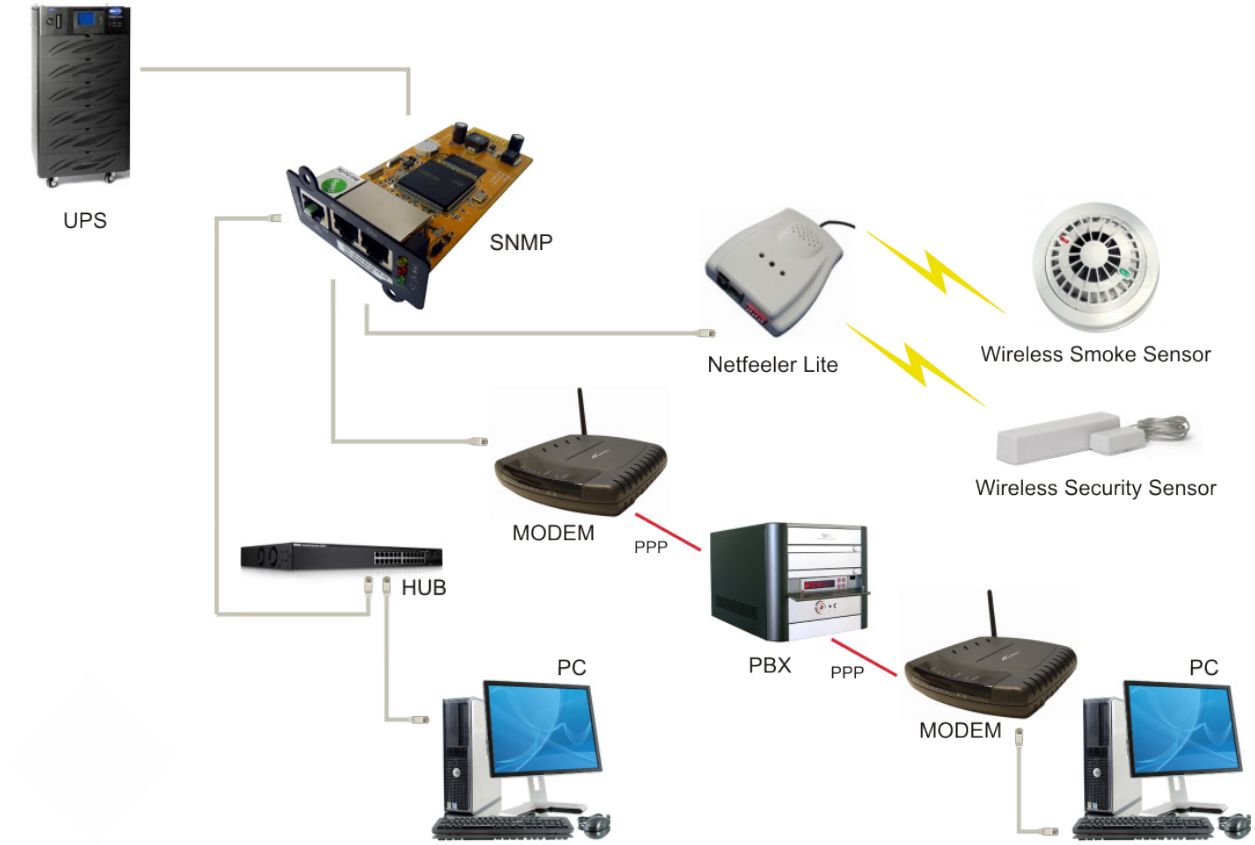


Figure 22 A topology using network, modem and environmental functions

The SNMP card supports the MEGAtec protocol, allowing you to remotely monitor and manage your UPS system.

NetAgent II-3 Ports supports the Modem Dial-in (PPP) function to enable remote control via the Internet when your network is unavailable.

In addition to the features of a standard NetAgent Mini, NetAgent II has the option to add NetFeelerLite to detect temperature, humidity, smoke and security sensors, thus making NetAgent II a versatile management tool. NetAgent II also supports multiple languages and is setup for web-based auto-detection of language.

Relay card (monitoring and control)

E63300 series units are fitted with a relay card (located in the Intelligent Slot, see Figure 4 on page 15) you have access to monitoring and control functionality via a set of dry contacts and a single opto-coupled input.

Connections:

Pin no.	Description	Contact status	Additional fault information
1	Mains out of limits	closed (on)	
2	Battery low	open (off)	
3	Battery low	closed (on)	
4	Bypass output	closed (on)	
5	Internal failure	closed (on)	• Rectifier fault • Inverter fault and shutdown • Over temperature and shutdown • Short circuit and shutdown
6	Inverter output	closed (on)	
7	System alarm	closed (on)	• Rectifier fault • Inverter fault and shutdown • Over temperature and shutdown • Short circuit and shutdown
8	Relay common GND		
9	Remote shutdown	+V (see opto specification below)	+5 V to +12 Vd.c. input
10	Remote shutdown	0 V (not the same as relay common)	

Relay contact specifications:

Parameter	Value
Maximum switched voltage	277 Va.c. or 30 Vd.c.
Typical switched voltage	5 to 12 Vd.c.
Maximum switched current	NO: 10 A NC: 3 A
Maximum switched power	NO: 1400 VA, 150 W NC: 850 VA, 90 W

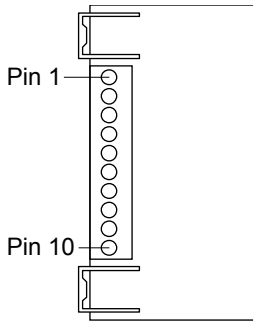


Figure 23 Relay card connector (viewed from connector side)

Opto-coupler input specifications (used for remote shutdown):

Parameter	Value
Reverse voltage (V_R)	5 Vd.c.
Forward input voltage	30 Vd.c. max., 5 to 12 Vd.c. typ.
Forward current	25 mA max., 16 mA typical
Pulse forward current (I_{FP})	1 A (100 µs pulse, 100 pps)

To connect to the relay card:

1. Unlock and open the rear doors.
2. On the control module rear panel, unscrew the card in the Intelligent Slot and slide it out completely or sufficiently to access the terminal block.
3. Using the information in the tables above, wire your signal cables to the terminal block (Figure 23).
4. Refit the card and secure it in place with the cover plate.

Dry contact relay signals

The dry contact relay signals are located on the control module rear panel (see Figure 12 on page 21), which is accessible via the cabinet rear doors.

To wire to the sockets you will need:

- Wieland Electric plugs, part number 25.340.0753.0

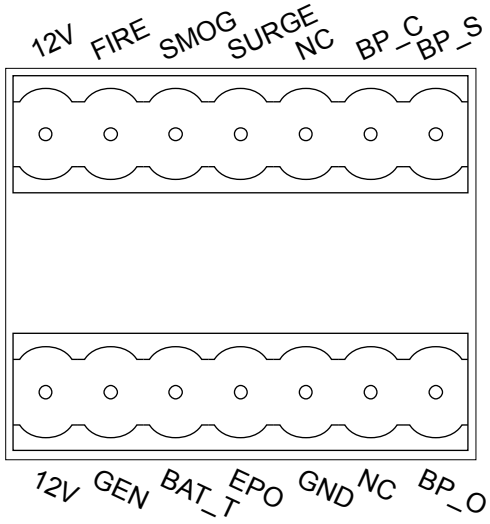


Figure 24 Dry contact relay sockets

Connections:

Signal name	Description
12V	Provides a +12 V 100 mA isolated supply on each connector row
FIRE	Fire alarm input signal
SMOG	Smog alarm input signal
SURGE	Surge alarm output signal
NC	No connection
BP_C	Anti-backfeed relay common
BP_S	Anti-backfeed relay normally open To prevent the input being energised by backfeeding in the event of an internal failure, connect this signal to an external circuit breaker trip
GEN	Generator signal input
BAT_T	Over temperature switch on battery. Feed +12 V via the switch when the battery temperature is exceeded
EPO	Emergency power off connect to +12V for complete power off (pulse contact)
GND	Common return (0 V) for the +12 V supply and relays. This is not connected to the chassis
BP_O	Anti-backfeed relay normally closed To prevent the input being energised by backfeeding in the event of an internal failure, connect this signal to an external circuit breaker trip

Battery temperature sensor

A battery temperature sensor is available as an option for E63300 series units. When connected the sensor monitors and displays battery cabinet temperature, and it controls the UPS to compensate the battery charging voltage. The sensor is connected to the MODBUS connector on the UPS (see Figure 4 on page 15).

For further details ask you distributor for the sensor user manual.

Appendix 2 Parallel operation

The following signals are available on each UPS for parallel operation:

- 15-way D-type connectors, connected as described in Wiring units in parallel on page 25.
- Remote emergency power off (EPO) as described below.

Remote emergency power off (EPO)

In a parallel system the EPO switch on the control module of any unit will turn off the whole system. It is also possible to add a remote EPO switch in addition to the front panel switch.

Wire the switch as shown in Figure 25. Only one 12V connection is required and it can be made to any unit in the system.

Switch type: normally open

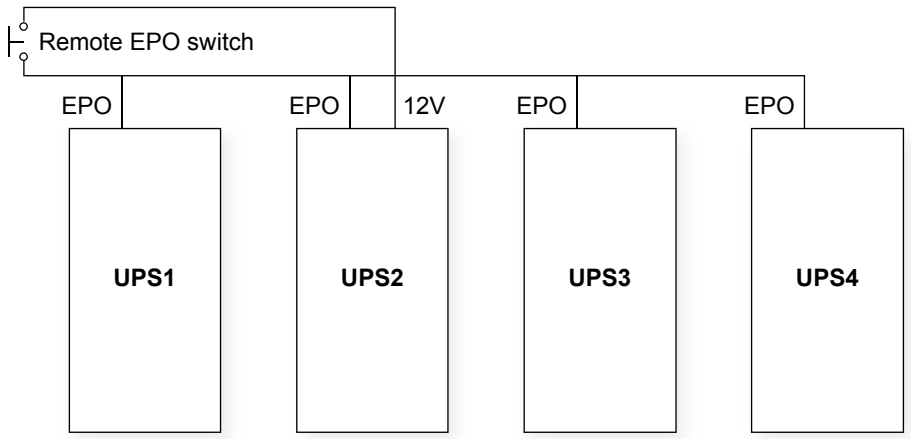


Figure 25 An N+1 parallel system with remote EPO switch

Appendix 3 Specifications

Electrical

Model	E633100	E633200
Capacity (cabinet)	10 to 100 kVA	10 to 200 kVA
Capacity (modules)	E63310H: 10 kVA / 9 kW E63315H: 15 kVA / 13.5 kW E63320H: 20 kVA / 18 kW	

Input	
Input type	3 phase 4 wire (L1, L2, L3, N and E)
Rated voltage	380 / 400 / 415 V a.c.
Voltage range	208 to 478 V a.c.
Frequency range	40 ± 0.5 Hz to 70 ± 0.5 Hz
Power factor	≥ 0.99
THDI	≤ 3%, 100% non-linear load
Bypass voltage range	V_{max}: +15%(optional +5%, +10%, +25%) V_{min}: −45% (optional −20%, −30%) Frequency protection range: ±10%

Battery			
Number of 12 V batteries		32, 34, 36, 38 or 40 in series	
Battery type		VRLA	
Charge current (A)[1]	Cabinet	30	60
	Modules	6	

Output			
Output current (A) (full load)	@ 380 V @ 400 V @ 415 V	145 139 133	194 186 178
Breaker / fuse (A)		250	
Output type		3 phase 4 wire (L1, L2, L3, N and E)	
Rated voltage		380 / 400 / 415 V a.c.	
Power factor		0.9	
Voltage regulation		± 2%	
Frequency	Utility mode	± 1%, ± 2%, ± 4%, ± 4% and 10% of rated frequency	
	Battery mode	50 Hz / 60 Hz ± 0.2%	
Crest factor		≥ 3:1	

[1] Charging current can be set according to the installed battery capacity.

Voltage distortion (THD)		≤ 2% with 100% linear load ≤ 5% with 100% non-linear load
Waveform		Sine wave
DC component		≤ 500 mV d.c.
Voltage precision		Output balanceable: ± 1.0% Output non-balanceable: ± 3.0%
Overload	AC mode	110%, 60 min 125%, 10 min 150%, 1 min
	Battery mode	110%, 10 min 125%, 1 min 150%, 1 s
	Bypass mode	Breaker (10 kVA: 20 A; 15 kVA: 32 A; 20 kVA: 40 A)
Bypass and ECO voltage range		Adjustable via the LCD panel using 'bypass volt upper limit' and 'bypass volt lower limit'
Efficiency: online mode		10 kVA and 15 kVA module ≥ 92%, 20 kVA module ≥ 95%
Power loss: online mode		≤ 3%
Power loss: ECO mode		≤ 2%
Dynamic respond		5.0%, 20ms

Bypass	
Voltage range 380 V 400 V 415 V	208/266/304 ± 5 V a.c. to 399/418/437/475 ± 5 V a.c. 220/280/320 ± 5 V a.c. to 420/440/460 ± 5 V a.c. 228/290/332 ± 5 V a.c. to 436/457/477 ± 5 V a.c.
Frequency range	50 Hz / 60 Hz ± 10%
Overload capability	125% to 170% for 10 min

Eco	
Voltage range 380 V 400 V 415 V	304 ± 5 V a.c. to 399/418 ± 5 V a.c. 320 ± 5 V a.c. to 420/440 ± 5 V a.c. 332 ± 5 V a.c. to 436/457 ± 5 V a.c.
Frequency range	50 Hz / 60 Hz ± 10%

Switch time	
Between normal mode and battery mode	0 ms
Between inverter and bypass	0 ms

Parallel operation	
Parallel equal current	1+1 ≤ 8%，N+1 ≤ 10%

Safety and EMC	
Safety	CE, EN/IEC 62040-2, EN/IEC 62040-1-1
Isolation resistance	> 2 MΩ (500 V d.c.)
Isolation voltage	2,820 V d.c., < 3.5 mA 1 min
EMI	IEC 62040-2 C3 (>16A)
EMS	IEC61000-4-2 (ESD) IEC61000-4-3 (RS) IEC61000-4-4 (EFT) IEC61000-4-5 (Surge)
Surge	IEC60664-1 level IV

Reliability	
MTBF	Inverter: 50,000 hrs Single module: 250,000 hrs 1+1 expandable modules: 400,000 hrs
MTTR	Single module: < 30 min

Signals	
Remote signalling	Dry contact
Communication	RS232 / RS485 / 2 x Intelligent slots

Mechanical

Safety and EMC			
Dimensions (mm) (w x d x h)	Cabinet	600 x 840 x 1400	600 x 1100 x 2000
	Modules	443 x 580 x 131	
Weight (kg)	Cabinet	170	270
	Modules	26 (10 kVA), 30 (15 kVA), 31 (20 kVA)	
Relative humidity		0% RH to 95% RH (non-condensing)	
Colour		Black	
Display		LCD and LED	
Ingress protection		IP20	
Vibration		ISTA (International Safe Transmission Association) 1B	
Transport		ISTA 1B	

Operating Environment	
Temperature	0 to 40°C
Storage temperature	−25°C to 55°C
Relative humidity	0% RH to 95% RH (non-condensing)
Altitude	≤ 1,500 m (full power output). Decrease the load by 5% for every 500 m increase in altitude up to 5,000 m

Appendix 4 Optional equipment

The following items are available as options for the UPS:

- SNMP card
- Battery temperature compensation (special order)
- Paralleling cables
- RS485 cable (serial data cable to connect between paralleled units)

Appendix 5 UPS message tables

1. The Inner Code is applied to this series. The following format block is Inner Code display on LCD:

   AAAA–AAAA BBBB-BBBB EEFF

   CCCC-CCCC DDDD-DDDD

2. The part of Inner Code means

   AAAA-AAAA (Rectifier state):

Axxx-xxxx

							8	9	A	B	C	D	E	F	Internal input switch closed
			4	5	6	7					C	D	E	F	Rectifier on
	2	3			6	7			A	B	C		E	F	Emergency power off
1		3		5		7		9		B		D		F	Rectifier current limit

xAxxx-xxxx

							8	9	A	B	C	D	E	F	Input power work on
			4	5	6	7					C	D	E	F	Power from input
	2	3			6	7			A	B			E	F	Battery test
1		3		5		7		9		B		D		F	Battery charge

xxAx-xxxx

							8	9	A	B	C	D	E	F	P-battery boost charge
			4	5	6	7					C	D	E	F	N-battery boost charge
	2	3			6	7			A	B	C		E	F	
1		3		5		7		9		B		D		F	

xxxA-xxxx

							8	9	A	B	C	D	E	F	
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B	C		E	F	
1		3		5		7		9		B		D		F	

xxxx-Axxx

							8	9	A	B	C	D	E	F	Communication connected
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B	C		E	F	
1		3		5		7		9		B		D		F	

xxxx-xAxx

							8	9	A	B	C	D	E	F	
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

xxxx-xxAx

							8	9	A	B	C	D	E	F	
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

xxxx-xxxA

							8	9	A	B	C	D	E	F	
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

BBBB-BBBB (Inverter state):

Bxxx-xxxx

							8	9	A	B	C	D	E	F	Internal bypass switch closed
			4	5	6	7					C	D	E	F	Internal output switch closed
	2	3			6	7			A	B			E	F	Manual bypass switch closed
1		3		5		7		9		B		D		F	External bypass switch closed

xBxx-xxxx

							8	9	A	B	C	D	E	F	External output switch closed
			4	5	6	7					C	D	E	F	00: shutdown 01: Inverter starting
	2	3			6	7			A	B			E	F	10: Inverter on but no output 11: Normal output
1		3		5		7		9		B		D		F	Output from inverter

xxBx-xxxx

							8	9	A	B	C	D	E	F	Output via bypass
			4	5	6	7					C	D	E	F	Cue: Interval transfer
	2	3			6	7			A	B			E	F	Cue: turn-off, system failure
1		3		5		7		9		B		D		F	Cue: turn-off, parallel overloaded

xxxB-xxxx

							8	9	A	B	C	D	E	F	Emergency power off
			4	5	6	7					C	D	E	F	Inverter overloaded
	2	3			6	7			A	B			E	F	Change master
1		3		5		7		9		B		D		F	Transfer times-out

xxxx-Bxxx

							8	9	A	B	C	D	E	F	Shutdown due to overload
			4	5	6	7					C	D	E	F	On bypass due to overload
	2	3			6	7			A	B			E	F	Parallel in bypass
1		3		5		7		9		B		D		F	LBS activated

xxxx-xBxx

							8	9	A	B	C	D	E	F	Inverter on standby
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

xxxx-xxBx

							8	9	A	B	C	D	E	F	Shutdown due to overload
			4	5	6	7					C	D	E	F	On bypass due to overload
	2	3			6	7			A	B			E	F	Parallel in bypass
1		3		5		7		9		B		D		F	LBS activated

xxxx-xxxB

							8	9	A	B	C	D	E	F	Inverter on standby
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

CCCC-CCCC (Rectifier alarm):

Cxxx-xxxx

							8	9	A	B	C	D	E	F	Rectifier fault
			4	5	6	7					C	D	E	F	Rectifier over temperature
	2	3			6	7			A	B			E	F	Inverter over temperature
1		3		5		7		9		B		D		F	Rectifier over current

xCxx-xxxx

							8	9	A	B	C	D	E	F	Auxiliary power 1 fault
			4	5	6	7					C	D	E	F	Auxiliary power 2 fault
	2	3			6	7			A	B			E	F	Input thyristor failure
1		3		5		7		9		B		D		F	Discharge thyristor failure

xxCx-xxxx

							8	9	A	B	C	D	E	F	Charge thyristor failure
			4	5	6	7					C	D	E	F	Fan fault
	2	3			6	7			A	B			E	F	Fan power fault
1		3		5		7		9		B		D		F	DC bus overvoltage

xxxC-xxxx

							8	9	A	B	C	D	E	F	DC bus undervoltage
			4	5	6	7					C	D	E	F	DC bus imbalance
	2	3			6	7			A	B			E	F	Mains wiring fault
1		3		5		7		9		B		D		F	Soft start failure

xxxx-Cxxx

							8	9	A	B	C	D	E	F	Input neutral line missing
			4	5	6	7					C	D	E	F	Battery reversed
	2	3			6	7			A	B			E	F	No battery
1		3		5		7		9		B		D		F	P-battery charger fault

xxxx-xCxx

							8	9	A	B	C	D	E	F	N-battery charger fault
			4	5	6	7					C	D	E	F	Battery undervoltage
	2	3			6	7			A	B			E	F	Battery overvoltage
1		3		5		7		9		B		D		F	Battery low pre-warning

xxxx-xxCx

							8	9	A	B	C	D	E	F	Mains frequency abnormal
			4	5	6	7					C	D	E	F	Mains voltage abnormal
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

xxxx-xxxC

							8	9	A	B	C	D	E	F	
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

DDDD-DDDD (Inverter alarm):

Dxxx-xxxx

							8	9	A	B	C	D	E	F	Inverter fault
			4	5	6	7					C	D	E	F	Inverter IGBT bridge shorted
	2	3			6	7			A	B			E	F	Inverter thyristor short
1		3		5		7		9		B		D		F	Inverter thyristor failure

xDxx-xxxx

							8	9	A	B	C	D	E	F	Bypass thyristor short
			4	5	6	7					C	D	E	F	Bypass Thyristor failure
	2	3			6	7			A	B			E	F	CAN comm. fault
1		3		5		7		9		B		D		F	Parallel load sharing fault

xxDx-xxxx

							8	9	A	B	C	D	E	F	Bypass wiring fault
			4	5	6	7					C	D	E	F	System not in sync with bypass
	2	3			6	7			A	B			E	F	Bypass unable to trace
1		3		5		7		9		B		D		F	Bypass not available

xxxD-xxxx

							8	9	A	B	C	D	E	F	IGBT over current
			4	5	6	7					C	D	E	F	Fuse failure
	2	3			6	7			A	B			E	F	Cable connection error
1		3		5		7		9		B		D		F	Parallel relay fault

xxxx-Dxxx

							8	9	A	B	C	D	E	F	LBS not synchronised
			4	5	6	7					C	D	E	F	Initialization fault
	2	3			6	7			A	B			E	F	Inverter on invalid
1		3		5		7		9		B		D		F	Overload

xxxx-xDxx

							8	9	A	B	C	D	E	F	Parallel overload
			4	5	6	7					C	D	E	F	DC component over limit
	2	3			6	7			A	B			E	F	Bypass over current
1		3		5		7		9		B		D		F	Feedback protection

xxxx-xxDx

							8	9	A	B	C	D	E	F	Bus voltage abnormal
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

xxxx-xxxD

							8	9	A	B	C	D	E	F	
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B			E	F	
1		3		5		7		9		B		D		F	

EE (Internal monitor):

Ex

							8	9	A	B	C	D	E	F	Generator connected
			4	5	6	7					C	D	E	F	Shutdown due to low battery
	2	3			6	7			A	B			E	F	Time to turn on
1		3		5		7		9		B		D		F	Time to turn off

xE

							8	9	A	B	C	D	E	F	Timing self-test start
			4	5	6	7					C	D	E	F	Anti-lightning active signal, from monitoring board IO
	2	3			6	7			A	B			E	F	Battery monitoring system connected
1		3		5		7		9		B		D		F	System unregistered

FF (Monitoring):

Fx

							8	9	A	B	C	D	E	F	Battery fault
			4	5	6	7					C	D	E	F	Battery over temperature
	2	3			6	7			A	B			E	F	Battery overvoltage
1		3		5		7		9		B		D		F	Battery undervoltage

xF

							8	9	A	B	C	D	E	F	External fire alarm (from monitoring board IO)
			4	5	6	7					C	D	E	F	External smog alarm (from monitoring board IO)
	2	3			6	7			A	B			E	F	UPS model wrong
1		3		5		7		9		B		D		F	Time for preventive maintenance

Notes

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