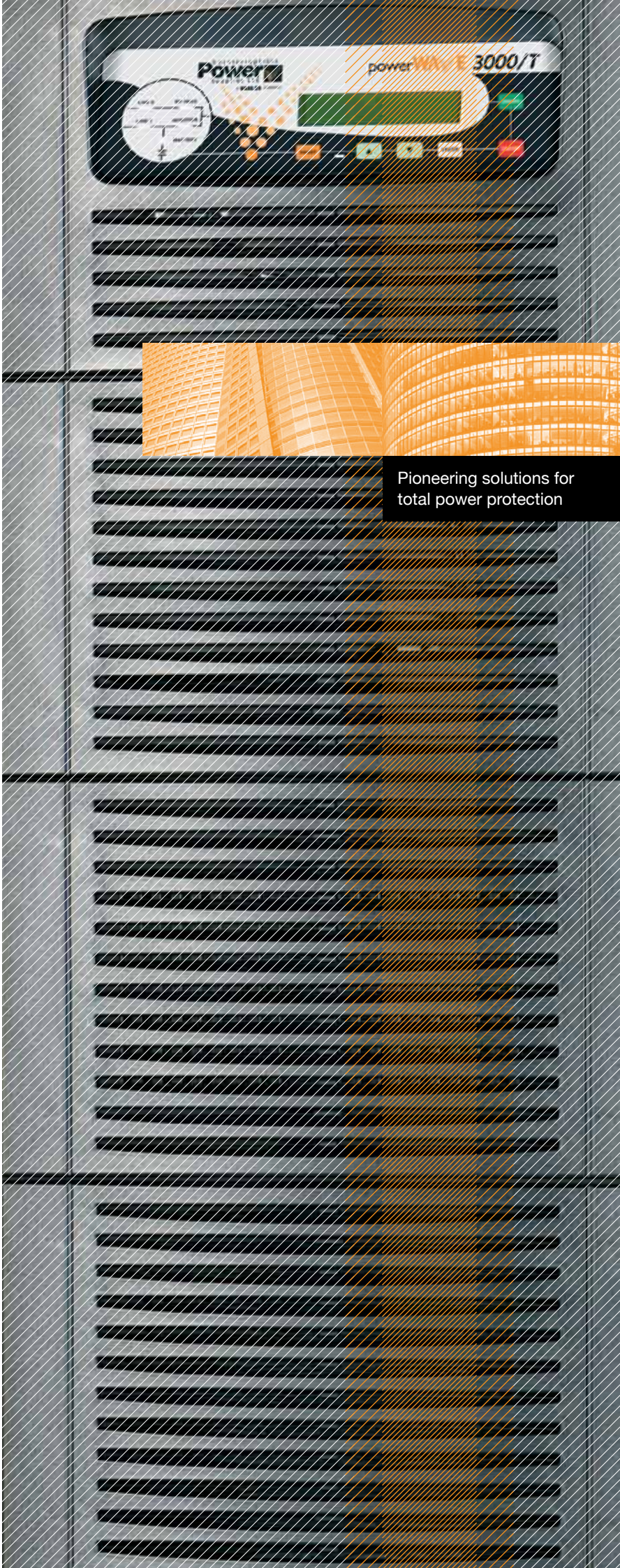
User Manual

PowerWave
PW 3000/T



Uninterruptible Power Supplies Ltd
A KOHLER COMPANY

Document Control

ISSUE	DATE	REVISION SUMMARY
469-02-00	06/08/14	Manual revised and issued as 469-02-00
469-02-01	01/12/14	Block diagram errors corrected.

Uninterruptible Power Supplies Ltd has taken every precaution to produce an accurate, complete and easy to understand manual and will therefore assume no responsibility nor liability for direct, indirect or accidental personal or material damage due to any misinterpretation of or accidental mistakes in this manual.

Table of Contents

1 Safety

1.1 Description of symbols used in this manual

WARNING: The warning symbol is used where there is danger of an electrical shock, equipment damage or personal-injury.

CAUTION: *The caution symbol is used to highlight important information to avoid possible equipment malfunction or damage.*

1.2 User precautions

WARNING: Keep this manual with the UPS for future reference.

WARNING: The UPS and peripheral equipment must be installed and commissioned by suitably qualified and trained personnel who are aware of the potential shock hazards.

WARNING: Do not attempt to install this UPS system until you are satisfied that ALL the safety instructions and hazard warnings contained in this manual are read and fully understood.

WARNING: High leakage current!
Ensure that the UPS has been correctly earthed before you connect the mains power supply!

WARNING: This UPS must not be started-up or put into use without having first been commissioned by a fully trained engineer authorised by the manufacturer.

WARNING: All servicing must be performed by an authorised electrician or other suitably qualified personnel. Do not attempt to service the UPS yourself.
You run risk of exposure to dangerous voltages by opening or removing the UPS-covers! Uninterruptible Power Supplies Ltd will assume no responsibility nor liability due to incorrect operation or manipulation of the UPS.

WARNING: The PowerWave 3000T is a Class A UPS product (according to EN 62040-2:2006). In a domestic environment the UPS may cause radio interference. In such an environment the user may be required to undertake additional measures.

2 General Description

2.1 Reliability and Quality Standards

Congratulations on your purchase of the PowerWave 3000T UPS.

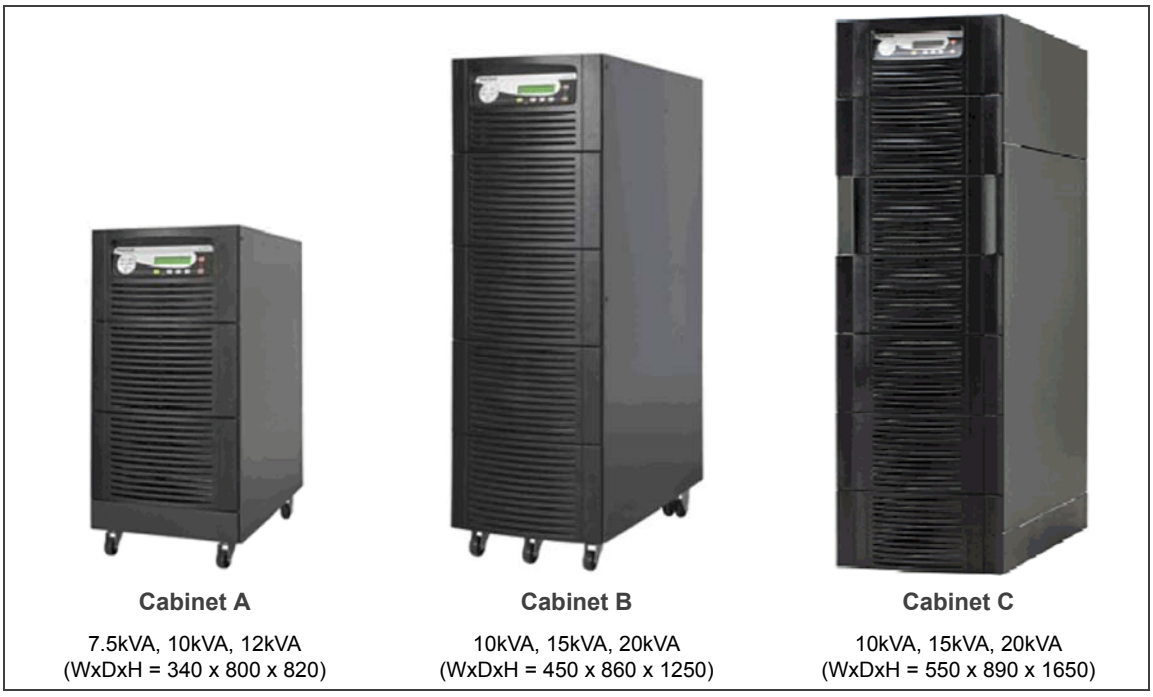
The PowerWave 3000T UPS represents a new generation of mid-range, single and three phase input / single phase output UPS-Systems, incorporating the latest technological developments in power engineering. High reliability, low operating costs and excellent electrical performance are only some of the highlights of this innovative UPS solution.

Uninterruptible Power Supplies Ltd. specialises in the design, building, installation and maintenance of Uninterruptible Power Systems. This compact and powerful UPS is just one example of our wide range of state-of-the-art power protection devices and will provide your critical equipment with a steady and reliable power supply for many years.

The criteria and methods which are used in the design, manufacture, and maintenance of Uninterruptible Power Supply systems are certified to International Standard ISO 9001/EN 29001 and ISO 14001. A full UPS Specification is given in Chapter 8 of this manual.

2.2 PowerWave 3000T Model Range

The PowerWave 3000T UPS model range provides a stand-alone UPS system offering a 7.5kVA, 10kVA, 12kVA, 15kVA and 20kVA single-phase output supply rating. The 7.5kVA and 10kVA models are available with either a single-phase or three-phase input; the 12kVA is available with single-phase input only and the 15kVA and 20kVA models are available with three-phase inputs only.



Cabinet A	Cabinet B	Cabinet C
7.5kVA, 10kVA, 12kVA (WxDxH = 340 x 800 x 820)	10kVA, 15kVA, 20kVA (WxDxH = 450 x 860 x 1250)	10kVA, 15kVA, 20kVA (WxDxH = 550 x 890 x 1650)

Figure 2.1 PowerWave 3000T Cabinet details

2.3 Advanced Design Features

2.3.1 Input booster technology

The UPS module's inbuilt advanced booster technology results in a perfect sinusoidal input power quality at 0.99 input power factor with a harmonic content of typically less than 7-9% THD(i) for the single-phase input machines and <25% for the 3-phase input models. This leads to a more reliable overall system operation and provides savings in generator and transformer sizing by minimising winding losses. It also means that traditional harmonic filters are no longer required.

The high power factor presented by the UPS on the incoming mains supply also minimises cabling and fusing costs due to the resulting lack of reactive power consumption. This, together with the accompanying low harmonic currents, provide the following benefits:

- No additional losses in wires and cables.
- No extra heating of transformers and generators.
- No over sizing of generators.
- No false circuit breaker tripping and malfunction.
- No erratic operation of computers, telecommunication, monitors, electronic test equipment etc.
- No resonance with power factor correction capacitors.

2.3.2 Flexible battery management

This equipment employs a flexible battery management which avoids premature deterioration of battery life by advanced management of battery charging and preventive failure diagnostics.

The major benefits are:

- AC-ripple free battery charging due to a dc-dc charger separated from the rectifier and inverter.
- Wide range of number of battery blocks (30-50 blocks of 12V; depending on autonomy times).
- UPS's wide input voltage operating window extends the battery life due to fewer discharge cycles.
- Battery discharge protection caused by load jumps.
- Proactive battery protection from false manipulations and inadequate charging voltages.
- Proactive battery failure detection thanks to Advanced Battery Diagnosis (ABD) - Algorithm.
- User selectable battery tests.

2.4 Warranty

The PowerWave 3000T UPS is supplied with a limited warranty that the UPS and its component parts are free from defects in materials and workmanship for a period of one year from the date of original commissioning or fifteen months from the date of original delivery, whichever is the sooner. This warranty is the only warranty given and no other warranty, express or implied, is provided.

This warranty is invalidated if the UPS is put into use without having been commissioned by a fully trained and authorised person. This warranty does not apply to any losses or damages caused by misuse, abuse, negligence, neglect, unauthorised repair or modification, incorrect installation, inappropriate environment, accident, act of God or inappropriate application.

If the UPS fails to conform to the above within the warranty period then Uninterruptible Power Supplies Ltd.. will, at its sole option, repair or replace the UPS. All repaired or replaced parts will remain the property of Uninterruptible Power Supplies Ltd.

As a general policy, Uninterruptible Power Supplies Ltd. does not recommend the use of any of its products in life support applications where failure or malfunction of the product can be reasonably expected to cause failure of the life support device or to significantly affect it's safety or effectiveness. Uninterruptible Power Supplies Ltd. does not recommend the use of any of its products in direct patient care. Uninterruptible Power Supplies Ltd. will not knowingly sell its products for use in such applications unless it receives in writing assurances satisfactory to Uninterruptible Power Supplies Ltd. that the risks of injury or damage have been minimized, the customer assumes all such risks and the liability of Uninterruptible Power Supplies Ltd. is adequately protected under the circumstances.

CAUTION: *The UPS may contain batteries which must be re-charged for a minimum of 24 hours every six months to prevent deep-discharging (at 20º). Batteries that have been, for whatever reason, deep-discharged are not covered by the warranty.*

2.5 Extended Warranty

The Standard Warranty may be enhanced by protecting the UPS with an Extended Warranty Agreement (maintenance contract).

An Extended Warranty Agreement enhances the standard warranty by providing the following:

- Regular preventative maintenance inspections.
- Guaranteed speed of response to operational problems.
- 24 hour telephone support.
- Fully comprehensive (excluding batteries and capacitors) cover.

Contact the Service Support Hotline on 0800 731 3269 for further details.

2.6 Additional Service/Maintenance Support

In addition to providing support for the PowerWave 3000T UPS, Uninterruptible Power Supplies Ltd. are able to provide maintenance and support on a wide range of different UPS products.

If you are interested in an extended warranty for your PowerWave 3000T UPS, or any other UPS you may have, please complete the enquiry form shown opposite and return or FAX to:

Uninterruptible Power Supplies Ltd.
Woodgate
Bartley Wood Business Park
Hook
Hampshire
RG27 9XA

Tel:	01256 386700 0800 731 3269 (24 Hr.)
Fax:	01256 386701
Email:	service@upspower.co.uk

Fax to: 01256 386701 **www.upspower.co.uk**

Uninterruptible Power Supplies Ltd.
Woodgate
Bartley Wood Business Park
Hook
Hampshire
RG27 9XA
Tel: 01256 386700

Name: .....

Job Title: .....

Company: .....

Address: .....

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.....

.....

Post Code .....

Tel. .....

Fax. .....

E-mail .....

Please contact me to discuss:

☐ Extended Warranty options for my PowerWave 3000T UPS

☐ Extended warranty options for my UPS System as below:

Manufacturer:.....

Model Nº:.....

Rating kVA:.....

☐ Replacement Batteries.....

☐ Other .....(please specify)

Thank you for your enquiry, which will receive our prompt attention.
If you need to contact us immediately call free on,

Freefone 0800 731 3269

or E-mail us on service@upspower.co.uk
www.upspower.co.uk

3 Installation

3.1 Introduction

This chapter contains all the information necessary to enable you to correctly install the PowerWave 3000T UPS, including unpacking, storage, positioning and cabling instructions.

WARNING: All the operations described in this chapter must be performed by an authorised electrician or other suitably qualified personnel.
Uninterruptible Power Supplies Ltd. will take no responsibility for any personal or material damage caused by incorrect cabling or operations, or activities that are not carried out in strict accordance with the instructions contained in this manual.

3.1.1 Receipt of the UPS

The UPS equipment, which includes the UPS cabinet, batteries and accessories, are delivered on pallets that can easily be moved with the aid of a forklift or a pallet jack. Before you accept receipt of the equipment, ensure that it is complete and matches the description indicated in the delivery note.

CAUTION: *When off loading the UPS equipment always keep it in an upright position. Do not drop the equipment or stack the pallets.*

The UPS cabinet is packed in a container that is intended to protect it from mechanical and environmental damage in transit. This protection is increased further by wrapping and sealing the container in a polythene sheet.

Upon receiving the UPS equipment carefully examine the packing container(s) for signs of physical damage. The 'Tip&Tel' (*FRAGILE* and *ARROW*) indicators attached to the exterior of the packaging should be intact if the equipment has been correctly transported in an upright position. If a 'Tip&Tel' indicator is ruptured or its integrity is suspect, you must inform both the carrier and Uninterruptible Power Supplies Ltd. immediately.

CAUTION: *Any visible transportation damages must be notified to the carrier immediately on receipt and claims for other shipping damage that is discovered when later unpacking the equipment must be filed immediately when found. All damage claims must be reported to the carrier within 7 days of receipt of the equipment. If any shipping damage is found you should store all affected packing materials for further investigation.*

WARNING: Do not attempt to install or power-up damaged equipment.

3.1.2 Site transportation

When locally transporting the UPS equipment after it has been off-loaded please observe the following precautions.

CAUTION: *Potential dangers:*
– Do not tilt the UPS or Battery Cabinet by more than 10° as it might damage the equipment.
– If the equipment is accidentally tilted do not connect it to the mains electricity supply.
– If dropped, the weight of the UPS and/or battery could cause serious injury to personnel or damage equipment in the surrounding area. Always handle with care.

3.1.3 Unpacking the UPS

Note: *Do not unpack the equipment if you intend to put it into storage prior to use (see paragraph 3.1.5).*

The UPS cabinet is fitted with castors to enable it to be wheeled into position once unpacked. Before you remove the cabinet from its shipping packaging you should ensure that the floor surface is level and suitable for wheeling the cabinet into its final position and that it is able to safely support the weight of the UPS equipment – UPS cabinet plus batteries.

1. Remove cardboard packing container by carefully cutting through the securing bands then pulling the container upwards.
2. Remove the protective polythene cover and any other packing from around the UPS.
3. Remove the fixings screws that are used to secure the UPS feet to the pallet base, then carefully remove the UPS from the pallet.
4. Retain the packaging materials for future shipment of the UPS.
5. Examine the UPS for signs of damage and notify your carrier or supplier immediately if any damage is apparent.

Checking the nameplate

Before proceeding further with the installation process, check that the technical specifications on the nameplate located on the rear of the UPS or behind the front internal door, corresponds to the purchased material detailed in the goods delivery note.

3.1.4 Batteries

The UPS normally uses sealed, maintenance-free batteries mounted on shelves within the UPS cabinet or, alternatively housed in an external battery cabinet.

The batteries are usually shipped separately and fitted by a manufacturer-approved engineer when the UPS is commissioned. Unless the batteries are to be stored *(see paragraph 3.1.5)*, leave them in their packaging until the UPS is commissioned

WARNING: If the UPS is purchased and supplied without batteries, Uninterruptible Power Supplies Ltd. will not accept responsibility for any damage or malfunctioning caused to the UPS by the incorrect supply, storage, installation or connection of batteries by third parties.

3.1.5 Storage

UPS Cabinet storage

If you plan to store the UPS cabinet prior to installation, it should be kept in a clean, dry environment with an ambient temperature between +5°C to +40°C and relative humidity <90%.

The UPS cabinet should preferably be stored in its original shipping packaging. If it is removed from its packing container you must take measures to ensure it is protected from dust.

Battery storage

Batteries should be stored in a dry, clean, cool environment and preferably in their original packaging. If the packaging is removed the batteries must be protected from dust and humidity.

When stored, all batteries will self-discharge at a rate that is greatly determined by the ambient temperature. Batteries should be fully charged before being put into storage and if stored for a long period they should be recharged periodically to prevent them from losing their original capacity. As a guide, the batteries should not be stored in a particular ambient temperature for longer than the periods shown below without being recharged:

- 6 months at 20°C
- 3 months at 30°C
- 2 months at 35°C

CAUTION: *Sealed batteries must never be stored in a discharged or partially discharged state. Extreme temperature, under-charge, overcharge or over-discharge will destroy the batteries!*

3.2 Planning the installation

A certain amount of pre-planning will help ensure smooth, trouble-free installation. The following *guidelines* should be considered when planning a suitable UPS location and environment.

Moving the UPS to is final location

1. The floor material where the UPS is to be located should be non-flammable and capable of safely supporting the weight of the UPS module and battery equipment.
2. The floor on the route between the off-loading point and the proposed installation location must be able to safely take the weight of the UPS and battery equipment plus any transit handling equipment.
3. The route between the off-loading point and the installation location must be suitable to allow the equipment to be transported in an upright position.

Environmental considerations

1. The UPS location should be subject to a humidity of less than 90% (non-condensing) and temperature between +15°C to +25°C. An ambient temperature of 20°C is recommended for optimum battery life.
2. The location should be free from dust or corrosive/explosive gases.
3. The location should not be subject to vibration.
4. The UPS cabinet requires space to the bottom, front and back to permit unrestricted cooling air flow. The air conditioning system must be able to provide a sufficient amount of cooling air to keep the room at, or below, the maximum permissible operating temperature.

Equipment accessibility

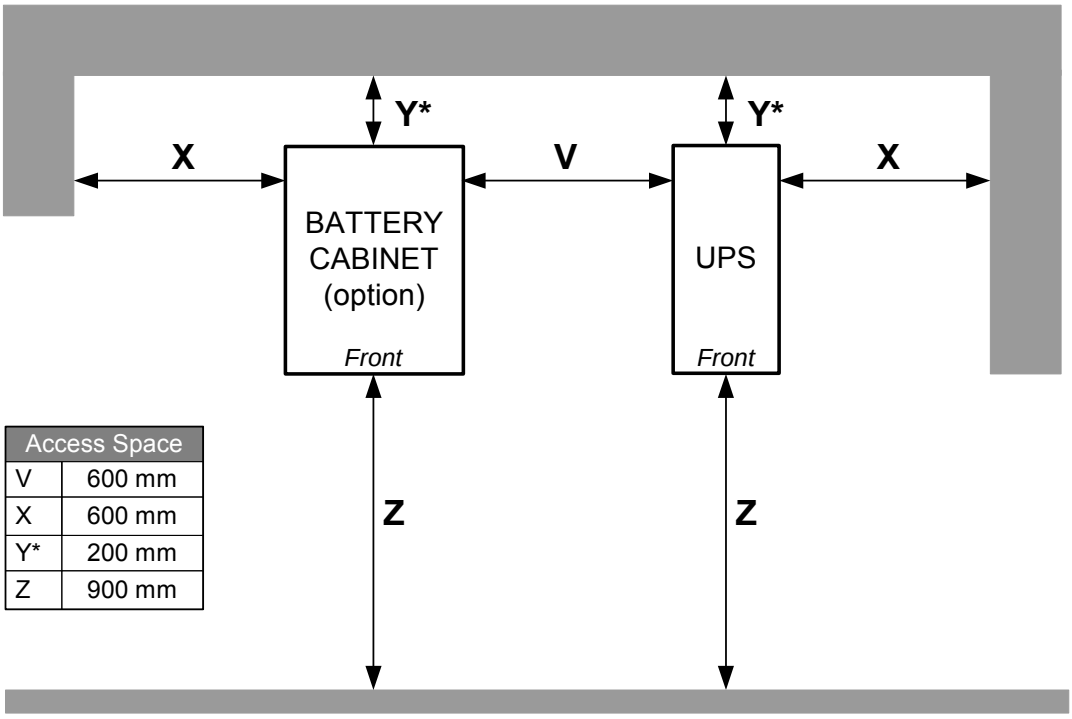
1. The available cable routing must be planned to enable the cables to be easily accessed when connecting the UPS (and optional battery cabinet where used) – also see *cable preparation and planning* in the paragraphs below.
2. A space of 200mm is required at the rear of the UPS for ventilation, however cabinets 'A' and 'B' should be cabled such the cabinet can be pulled forward to give service access.
3. A space of 600mm is required at both sides of the UPS cabinet to facilitate service and maintenance. A space of 900mm should be provided at the front of the cabinet to allow easy passage with the cabinet door open *(See Figure 3.1)*.

Cabinet Dimensions

	Cabinet A	Cabinet B	Cabinet C
Dimensions (WxDxH) mm	340x800x820	450x860x1250	550x890x1650
Accessibility for service and maintenance.	Front + left and right sides		
Input and Output Power Cabling	From the bottom rear	From the bottom front	

Heat Dissipation

		7.5kVA	10kVA	12kVA	15kVA	20kVA
Heat Dissipation with 100% Non-linear Load (EN 62040-3)	W	460	600	650	800	1120
	BTU/h	1638	2048	2218	2730	3822
Heat Dissipation with 100% Load (pf=0.8)	W	380	500	550	700	800
Heat Dissipation with 100% Load (pf = 1.0)	W	400	550	600	750	960
Airflow (25°C - 30°C) with 100% Non-linear Load per range (EN 62040-3)	m^3/h	110	110	110	150	200



Access Space	
V	600 mm
X	600 mm
Y*	200 mm
Z	900 mm

**Although the diagram shows 200mm is required at the rear of the cabinet, 'A' and 'B' cabinets should be cabled such that the cabinet can be pulled forward to give service access.*

Figure 3.1 UPS Space Recommendations

Notes

1. The minimum 200mm space shown at the rear of the UPS [Y] is required to allow adequate cooling air flow; however, the type 'A' UPS cabinet is cabled from the rear and the UPS power switches and fuses are located on the back panel. When installing a type 'A' UPS cabinet you should allow sufficient slack in the cabling to pull the UPS cabinet forward, or otherwise install the UPS with sufficient rear clearance to allow cable and switch access.
2. The above diagram shows 600mm clearance [V] between the UPS and optional Battery Cabinet. This is necessary to gain side access to the UPS for service repair.
   In the case of a type 'A' UPS cabinet, if the cabling is sufficient to allow the cabinet to be pulled forward clear of the Battery Cabinet (*see note 1 above*) then it is not necessary to observe clearance [V], and the UPS and Battery Cabinets can be located immediately adjacent to each other.

3.3 UPS Power Cabling (preparation and planning)

It is the customer's responsibility to provide all external fuses, isolators and cables used to connect the UPS to its input and output power supplies. The following information should help in the planning and preparation of the UPS power cabling.

The UPS input supply and bypass supply should be connected to the utility mains through a LV-Distribution board and protected by a circuit breaker or fuse. This provides overload protection and also a means of isolating the UPS from the mains supply when required. Similarly, the UPS output supply should be connected to the load equipment via a suitably fused output distribution panel.

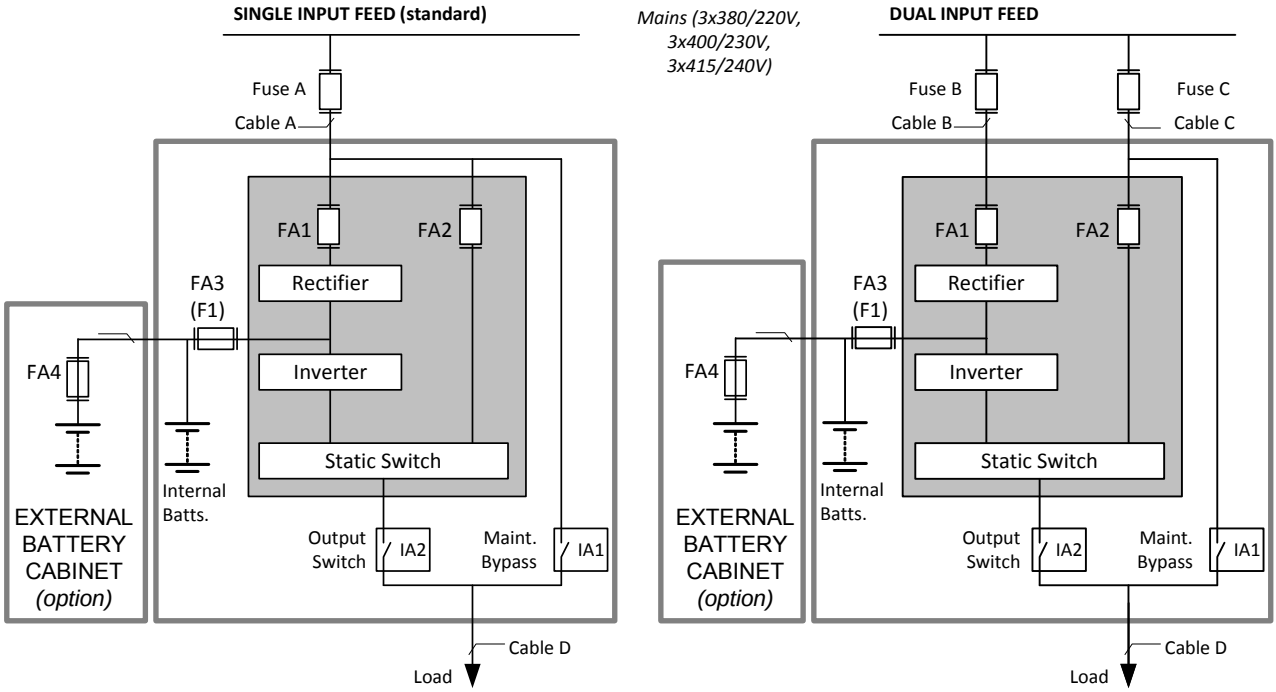
The UPS can be wired with a 'single input feed' (standard) whereby the UPS input supply terminals are internally linked to the UPS bypass supply terminals, or it can be wired with a 'dual input feed' where the UPS bypass circuit is connected to a dedicated 'bypass' mains supply *(See Figure 3.2)*.

Figure 3.2 summarises the UPS input/output cabling requirements and provides information regarding the external fuse rating and cable sizing.

Key Point: This information is given for guidance only. All fuses, isolators and power cables must be rated and installed in accordance with the prescribed IEC standards or local regulation – e.g. BS7671:2008.

Figure 3.3 and Figure 3.4 show the connection details for single and three phase input supply models respectively, configured for both 'single input feed' and 'dual input feed'. As mentioned above, the UPS is configured for 'single input feed' as standard and if a 'dual input feed' configuration is required the commissioning engineer will remove the links between the input supply and bypass supply terminals and carry out other configuration changes before turning on the equipment.

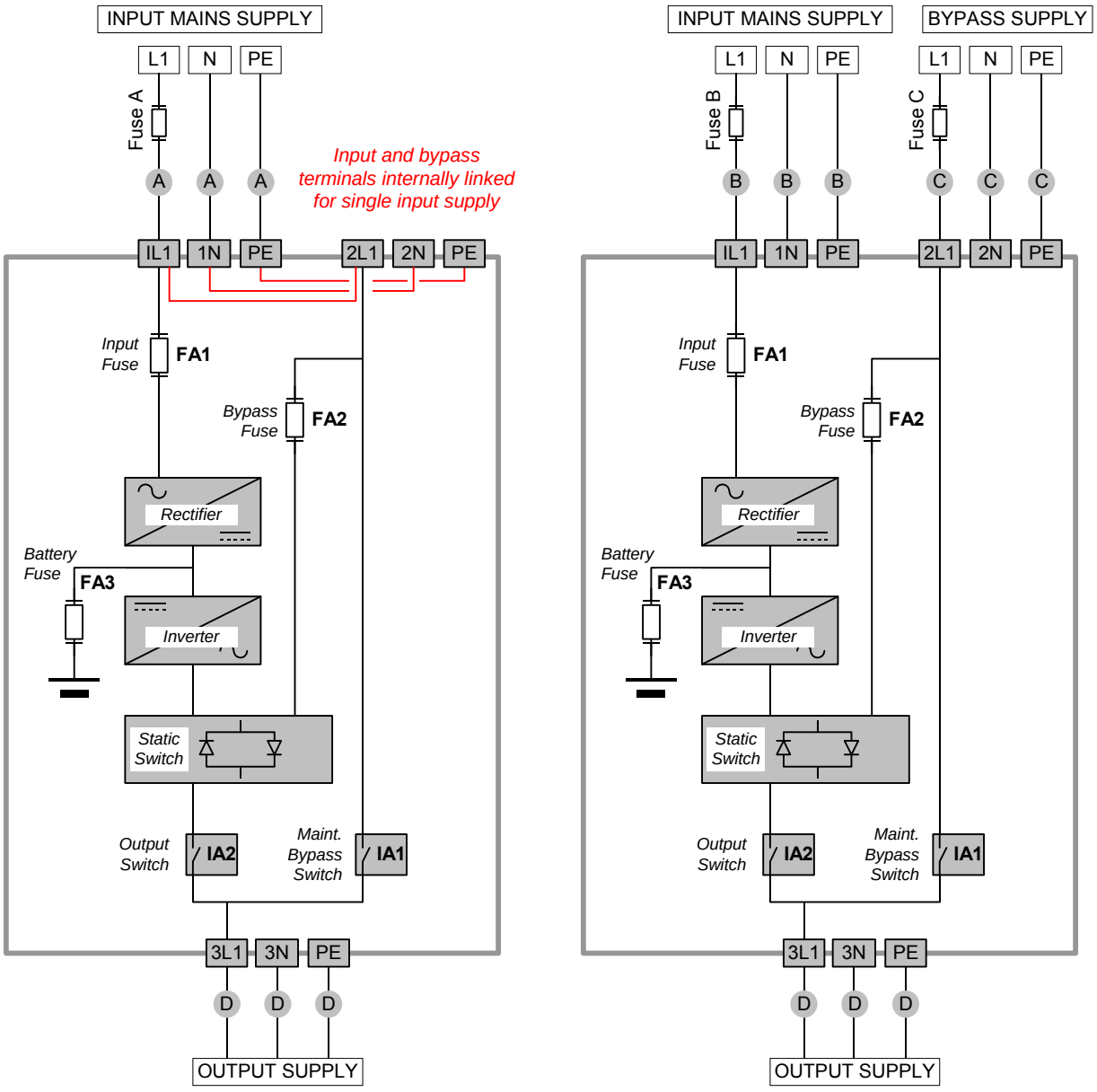
3.3.1 External supply fuse and cable rating



Power (kVA)	SINGLE INPUT FEED			DUAL INPUT FEED				
	Fuse A	Cable A	Cable D	Fuse B	Cable B	Fuse C	Cable C	Cable D
Single phase input								
7.5	1 x 40	3 x 6.0	3 x 6.0	1 x 40	3 x 6.0	1 x 40	3 x 6.0	3 x 6.0
10	1 x 63	3 x 10	3 x 10	1 x 63	3 x 10	1 x 63	3 x 10	3 x 10
12	1 x 63	3 x 10	3 x 10	1 x 63	3 x 10	1 x 80	3 x 16	3 x 16
3 Phase input								
7.5	3 x 40	5 x 6.0	3 x 6.0	3 x 25	5 x 2.5	1 x 40	3 x 6.0	3 x 6.0
10	3 x 63	5 x 10	3 x 10	3 x 25	5 x 2.5	1 x 63	3 x 10	3 x 10
15	3 x 80	5 x 16	3 x 16	3 x 40	5 x 6.0	1 x 80	3 x 16	3 x 16
20	3 x 100	5 x 25	3 x 25	3 x 40	5 x 6.0	1 x 100	3 x 25	3 x 25

1. Fuse and Cable recommendations to IEC 60950-1:2001
2. The fuse and cable rating details in the above tables are a recommendation only.
3. The UPS must be installed to prescribed IEC or local regulations (e.g. BS7671:2008).
4. External DC Cables and Battery fuses are bespoke to the installation.

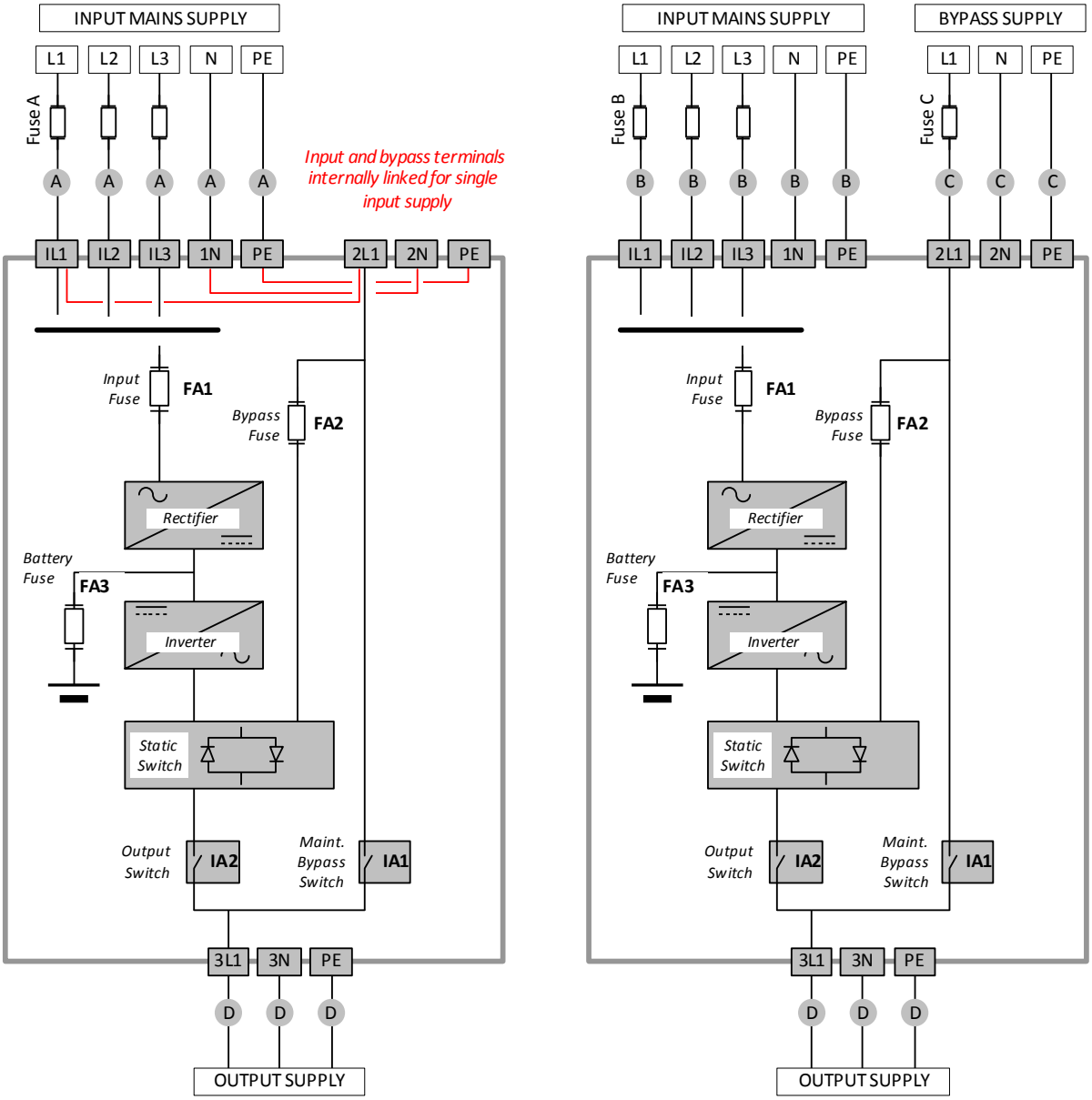
Figure 3.2 PowerWave 3000T External supply cable & fuse rating



Power (kVA)	SINGLE INPUT FEED			DUAL INPUT FEED				
	Fuse A	Cable A	Cable D	Fuse B	Cable B	Fuse C	Cable C	Cable D
7.5	1 x 40	3 x 6.0	3 x 6.0	1 x 40	3 x 6.0	1 x 40	3 x 6.0	3 x 6.0
10	1 x 63	3 x 10	3 x 10	1 x 63	3 x 10	1 x 63	3 x 10	3 x 10
12	1 x 63	3 x 10	3 x 10	1 x 63	3 x 10	1 x 80	3 x 16	3 x 16

1. Fuse and Cable recommendations to IEC 60950-1:2001
2. The fuse and cable rating details in the above tables are a recommendation only.
3. The UPS must be installed to prescribed IEC or local regulations (e.g. BS7671:2008).
4. External DC Cables and Battery fuses are bespoke to the installation.

Figure 3.3 Single phase input wiring details



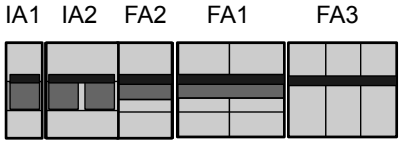
Power (kVA)	SINGLE INPUT FEED			DUAL INPUT FEED				
	Fuse A	Cable A	Cable D	Fuse B	Cable B	Fuse C	Cable C	Cable D
7.5	3 x 40	5 x 6.0	3 x 6.0	3 x 25	5 x 2.5	1 x 40	3 x 6.0	3 x 6.0
10	3 x 63	5 x 10	3 x 10	3 x 25	5 x 2.5	1 x 63	3 x 10	3 x 10
15	3 x 80	5 x 16	3 x 16	3 x 40	5 x 6.0	1 x 80	3 x 16	3 x 16
20	3 x 100	5 x 25	3 x 25	3 x 40	5 x 6.0	1 x 100	3 x 25	3 x 25

1. Fuse and Cable recommendations to IEC 60950-1:2001
2. The fuse and cable rating details in the above tables are a recommendation only.
3. The UPS must be installed to prescribed IEC or local regulations (e.g. BS7671:2008).
4. External DC Cables and Battery fuses are bespoke to the installation.

Figure 3.4 Three phase input wiring details

Customer Interface Connections

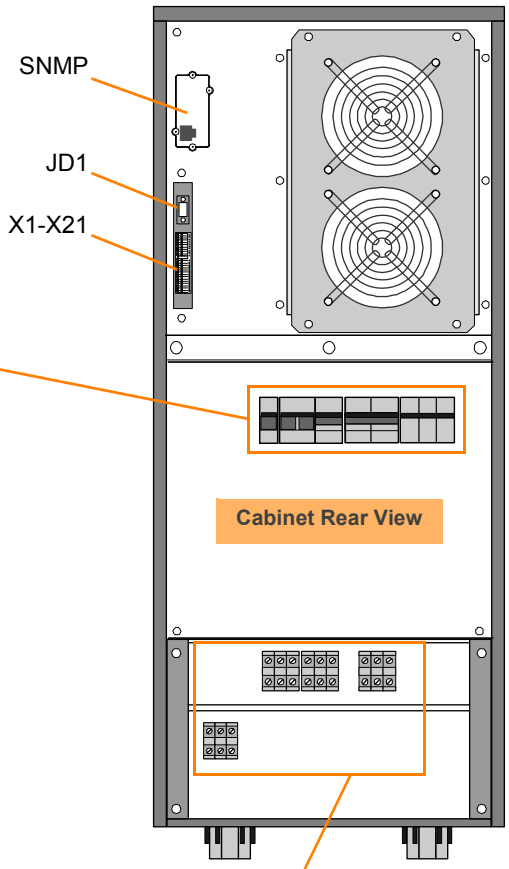
JD1 – Smart Port RS232 (Sub-D9P/F).
X1-X21 – Dry Port volt-free contacts on terminal block.



Power Switches & Fuses

IA1 – Maintenance Bypass Switch
IA2 – Output Switch
FA2 – Bypass Supply Line Fuse
FA1 – Input Supply line Fuse
FA3 – Battery Fuse

	FA1	FA2	FA3
7.5 kVA	50A (14x51) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*
10 kVA	50A (14x51) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*
12 kVA	50A (14x51) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*



Input/Output Power Connections

* In a 'single feed' (standard) installation terminals 2L1 and 1L1 are linked by cables fitted to the UPS side of the terminal blocks. Terminals 2N and 1N are similarly linked. When using a 'dual feed' supply these links should be removed and the bypass supply cable connected as shown in this diagram.

** The UPS internal battery is normally connected to the battery isolator switch (FA3). If an external battery cabinet option is used, the internal batteries are disconnected and the external battery cabinet is connected to the terminals shown in this diagram *(See Figure 3.9)*.

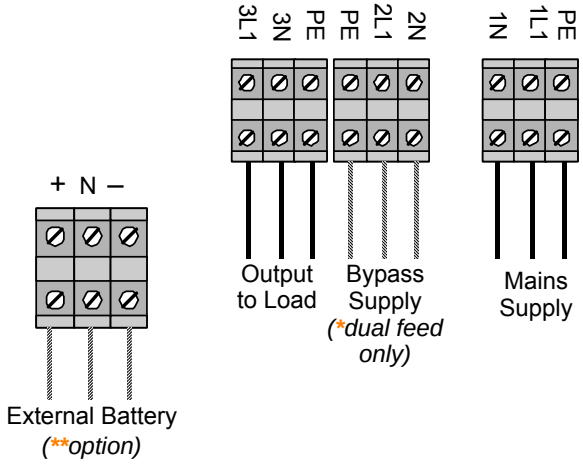
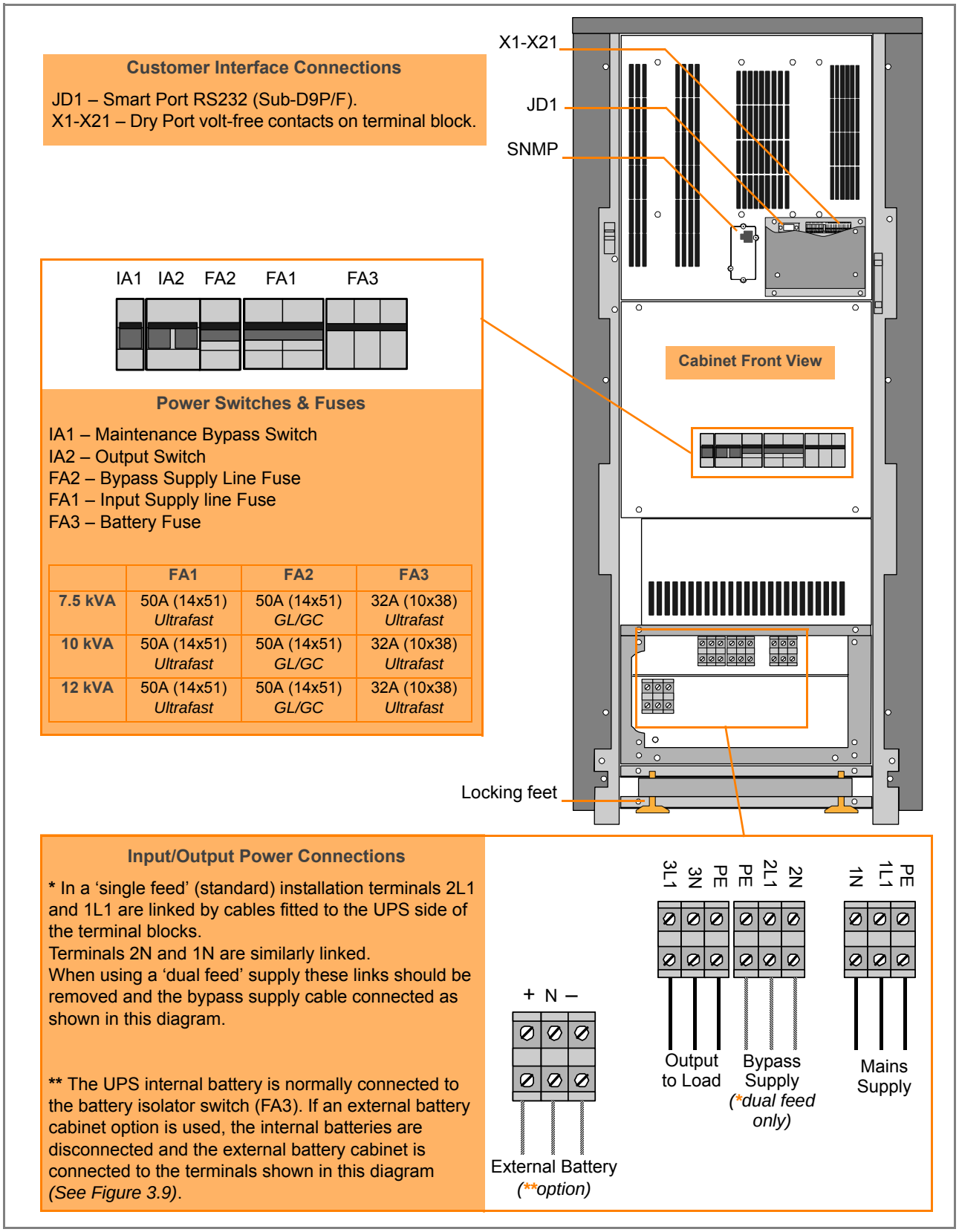


Figure 3.5 Cabinet A fuse and connection details (rear view) – single phase input



	FA1	FA2	FA3
7.5 kVA	50A (14x51) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*
10 kVA	50A (14x51) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*
12 kVA	50A (14x51) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*

Figure 3.6 Cabinet B & C fuse and connection details (front view) – single phase input

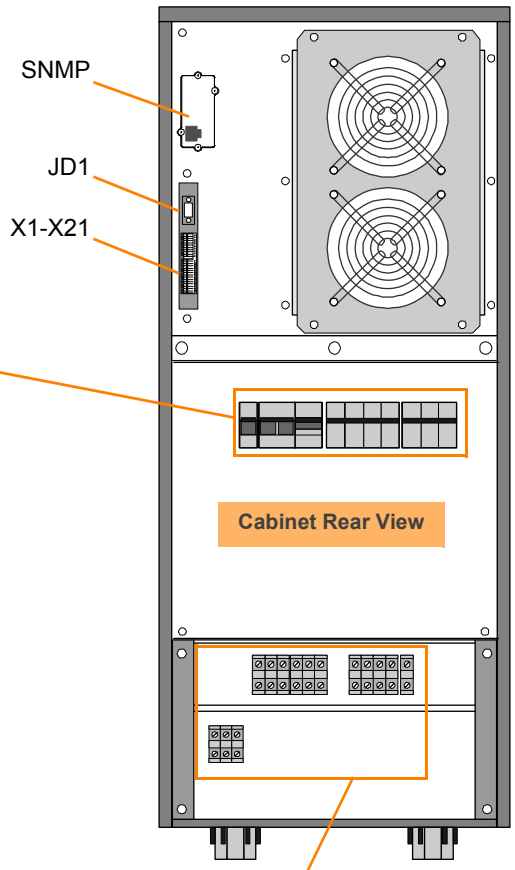
Customer Interface Connections

JD1 – Smart Port RS232 (Sub-D9P/F).
X1-X21 – Dry Port volt-free contacts on terminal block.

Power Switches & Fuses

IA1 – Maintenance Bypass Switch
IA2 – Output Switch
FA2 – Bypass Supply Line Fuse
FA1 – Input Supply line Fuse
FA3 – Battery Fuse

	FA1	FA2	FA3
7.5 kVA	32A (10x38) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*
10 kVA	32A (10x38) *Ultrafast*	50A (14x51) *GL/GC*	32A (10x38) *Ultrafast*
15 kVA	50A (14x51) *Ultrafast*	80A (22x58) *GL/GC*	50A (14x51) *Ultrafast*



Input/Output Power Connections

* In a 'single feed' (standard) installation terminals 2L1 and 1L1 are linked by cables fitted to the UPS side of the terminal blocks. Terminals 2N and 1N are similarly linked. When using a 'dual feed' supply these links should be removed and the bypass supply cable connected as shown in this diagram.

** The UPS internal battery is normally connected to the battery isolator switch (FA3). If an external battery cabinet option is used, the internal batteries are disconnected and the external battery cabinet is connected to the terminals shown in this diagram *(See Figure 3.9)*.

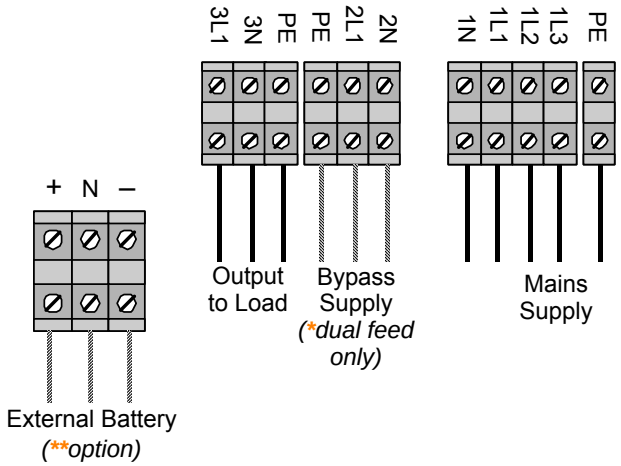


Figure 3.7 Cabinet A fuse and connection details (rear view) – three phase input

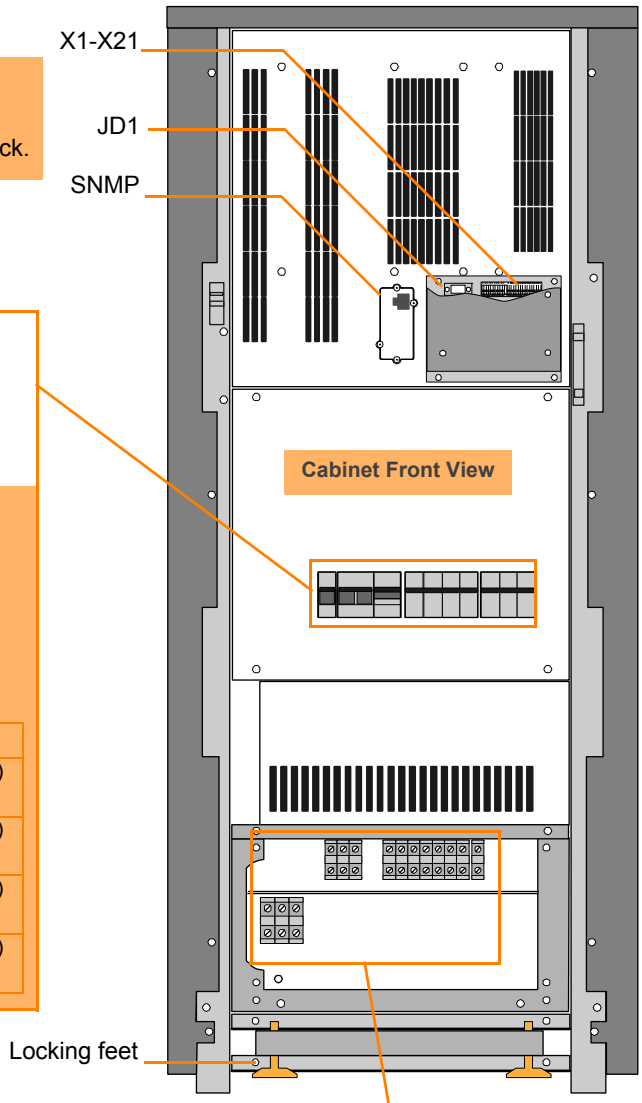
Customer Interface Connections

JD1 – Smart Port RS232 (Sub-D9P/F).
X1-X21 – Dry Port volt-free contacts on terminal block.

Power Switches & Fuses

IA1 – Maintenance Bypass Switch
IA2 – Output Switch
FA2 – Bypass Supply Line Fuse
FA1 – Input Supply line Fuse
FA3 – Battery Fuse

	FA1	FA2	FA3
7.5 kVA	32A (10x38) *Ultrafast*	50A (14x51) *GL/GC*	30A (10x38) *Ultrafast*
10 kVA	32A (10x38) *Ultrafast*	50A (14x51) *GL/GC*	30A (10x38) *Ultrafast*
15 kVA	32A (14x51) *Ultrafast*	80A (22x58) *GL/GC*	50A (14x51) *Ultrafast*
20 kVA	32A (14x51) *Ultrafast*	100A (22x58) *GL/GC*	50A (14x51) *Ultrafast*



Input/Output Power Connections

* In a 'single feed' (standard) installation terminals 2L1 and 1L1 are linked on the UPS side of the terminal blocks. Terminals 2N and 1N are similarly linked. When using a 'dual feed' supply these links should be removed and the bypass supply cable connected as shown in this diagram.

** The UPS internal battery is normally connected to the battery isolator switch (FA3). If an external battery cabinet option is used, the internal batteries are disconnected and the external battery cabinet is connected to the terminals shown in this diagram *(See Figure 3.9)*.

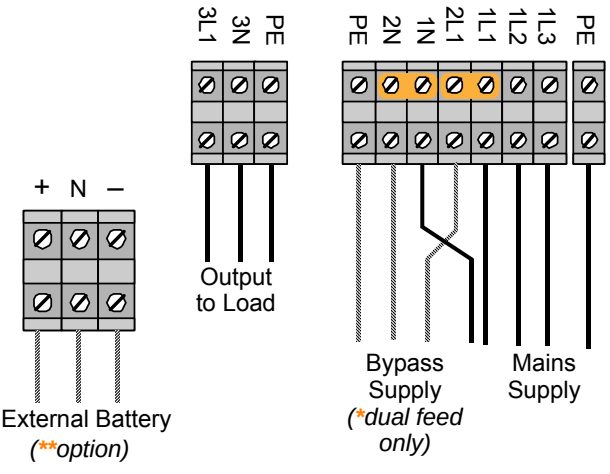


Figure 3.8 Cabinet B & C fuse and connection details (front view) – three phase input

3.3.2 Connecting an external battery cabinet

In a standard PowerWave 3000T the UPS batteries are mounted within the UPS module. If you require a longer battery autonomy time than is possible using the standard internal batteries, you can:

- Use one of the larger UPS cabinets – for example, use a Cabinet 'B' or 'C' cabinet which have more space for batteries than the Cabinet A.
- Install the batteries in an external battery cabinet.
  Note: *It is not permissible to connect an external battery cabinet in parallel with the UPS internal batteries. If an external battery cabinet is used no batteries are fitted within the UPS cabinet.*

Key Point: The UPS is delivered with an optional external batteries connection terminals only if it has been ordered without batteries.

CAUTION: *The following changes must be carried out by a qualified electrician or other suitably approved personnel before the UPS is powered up or commissioned.*

1. Disconnect the wires for internal battery at the bottom of FA3 (shown red in the illustration).
2. Connect the wires between FA3 and the External Battery TB at the bottom of the UPS cabinet (shown in green).
3. Connect the cables between from the external battery cabinet and the UPS External Battery TB.

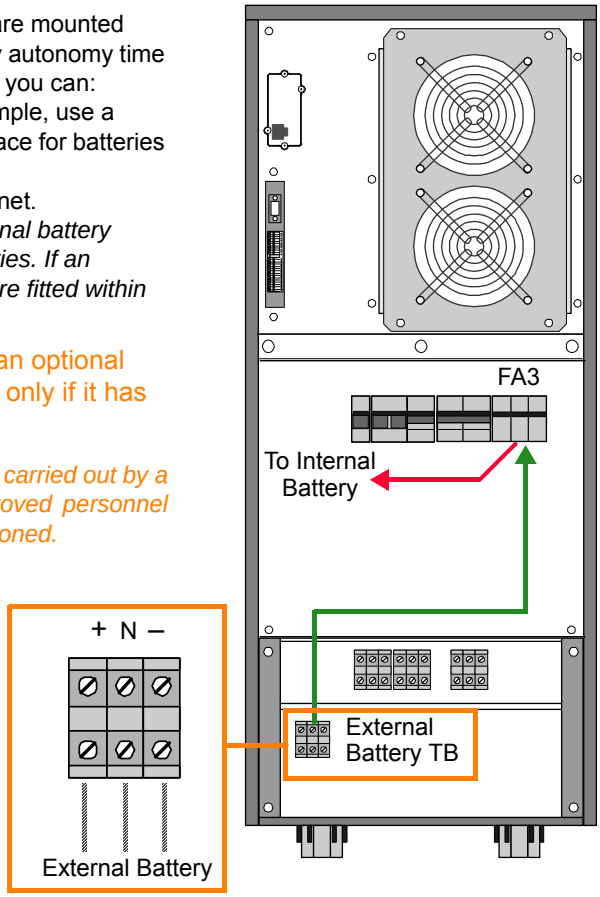


Figure 3.9 External battery connection

3.3.3 Input neutral grounding

Key Point: An input neutral is required for the UPS input rectifier to operate correctly. This neutral must be permanently connected and not switched by the input supply isolator.

During battery operation the neutral must always be grounded.

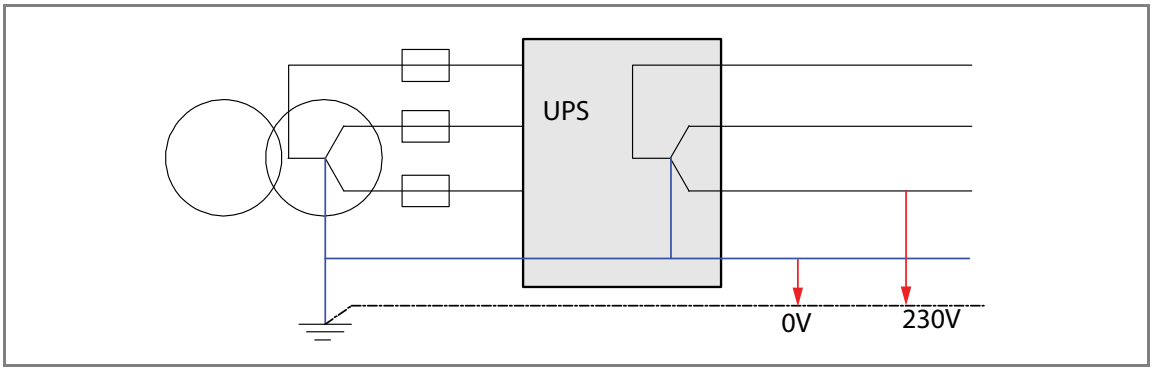


Figure 3.10 Input neutral grounding

3.4 Connecting the UPS power cables

WARNING: If the UPS covers are opened or removed there is a risk of exposure to dangerous voltages when power is connected to the UPS. All operations detailed in this section must be performed by an authorised electrician or other suitably qualified person.

3.4.1 Safety notes

Please ensure you read and understand these safety notes before you begin the UPS electrical installation.

1. All operations detailed in this section must be performed by a qualified electrician or other suitably approved person.
2. Once the electrical installation is completed do not turn on the UPS until it has first been commissioned by an authorised engineer who is trained by the manufacturer.
3. Do not operate the UPS if there is water or moisture present.
4. When carrying out any work on the UPS input power cables you must ensure that:
   - the UPS supplies are isolated and locked-out at the supply distribution panel.
   - the UPS output is isolated and locked-out at the load supply distribution panel.

   Place Warning notices where applicable to prevent inadvertent operation of the supply isolators.

3.4.2 Preliminary checks

1. Before you begin cabling the UPS:
   a) Ensure the potential (maximum) load does not exceed the UPS model output power rating (OUTPUT POWER) written on the nameplate.
   b) Ensure the intended UPS input supply circuit breaker at the input distribution board and UPS output (load) circuit breaker(s) at the load distribution board are correctly rated and comply with the prescribed IEC Standards (e.g. BS7671:2008).
   c) Where the load equipment is split and protected by individual circuit breakers, the maximum total load rating and maximum load rating of the individual load sockets should be indicated on the output distribution board.
   d) Ensure the provided fuses and cables satisfy the ratings shown in Figures 3.2 and 3.3/ 3.4, and are in accordance with the prescribed IEC Standards or local regulations (e.g. BS7671:2008).
2. Identify the operator controls and power connection details for the unit being installed from the following diagrams:
   - Figure 3.5 Cabinet A fuse and connection details (rear view) – single phase input
   - Figure 3.6 Cabinet B & C fuse and connection details (front view) – single phase input
   - Figure 3.7 Cabinet A fuse and connection details (rear view) – three phase input
   - Figure 3.8 Cabinet B & C fuse and connection details (front view) – three phase input

3.4.3 Connecting the input supply

1. For personal protection ensure that:
   a) The UPS is powered down and voltage-free.
   b) The UPS Maintenance Bypass Switch IA1 is OFF.
   c) The UPS Output Switch IA2 is OFF
2. Gain access to the UPS power terminals.
3. Connect the earth cable from the input mains LV-Distribution Board to the protective earth (PE) terminal on the UPS terminal block.
4. The PowerWave 3000T input supply can be wired for ‘single feed’ (standard) or ‘dual feed’ operation. Connect the input power cable coming from the input mains LV-Distribution Board to the UPS input terminals following the ‘single feed’ instructions or ‘dual feed’ instructions given below.

Single Input Feed

1. Refer to the appropriate illustration in Figure 3.5 to Figure 3.8 and connect the UPS input supply cables to terminals 1L1 and 1N [*1L1, 1L2, 1L3 and 1N in a 3-phase fed unit*] on the UPS mains supply terminal block. Ensure correct (clockwise) phase rotation in the case of a 3-phase unit.

CAUTION: *The input neutral cable to terminal 1N must be permanently connected and not switched by the input supply circuit breaker.*

2. Secure the cables to the fixing rail mounted below the terminal blocks.

Dual Input Feed

1. Refer to the appropriate illustration in Figure 3.5 to Figure 3.8.
2. Remove the links between 1L1-2L1 on the main terminal block.
3. Connect the UPS input supply cables to terminals 1L1 and 1N [*1L1, 1L2, 1L3 and 1N in a 3-phase fed unit*] on the UPS mains supply terminal block. Ensure correct (clockwise) phase rotation in the case of a 3-phase unit.

CAUTION: *The input neutral cable to terminal 1N must be permanently connected and not switched by the input supply circuit breaker.*

4. Connect the UPS bypass supply cables to terminals 2L1 and 2N on the UPS bypass supply terminal block.

CAUTION: *The bypass neutral cable to terminal 2N must be permanently connected and not switched through the bypass supply circuit breaker.*

5. Connect the earth cable from the bypass mains LV-Distribution Board to the protective earth (PE) terminal on the UPS bypass supply terminal block.
6. Secure the cables to the fixing rail mounted below the terminal blocks.

3.4.4 Connecting the UPS output cables

1. Refer to the appropriate illustration in Figure 3.5 to Figure 3.8. Connect the earth cable from the Output Load Distribution Board to the protective earth (PE) terminal on the UPS output supply terminal block.
2. Connect the UPS output cables to terminals 3L1, and 3N on the UPS output terminal block.

CAUTION: *The output neutral cable to terminal 3N must be permanently connected and not switched by the output (load) supply circuit breaker.*

3. Secure the cables to the fixing rail mounted below the UPS terminal blocks.

3.4.5 Final checks

1. On completion of the above cabling check that the earthing is complete and conforms to prescribed IEC standards or local regulations.
2. Ensure that all cables are securely fastened to the fixing rail mounted below the UPS terminal blocks.
3. Screw the terminal cover plate back on the UPS, making sure that the earthing wire is correctly attached on the terminal cover plate.
4. Move the UPS to its final position and lock it by applying the brake on the castors (cabinet A) or adjusting the locking feet (cabinet B/C).

3.5 Battery connections

WARNING: The final assembly and connection of the battery units must be carried out by the commissioning engineer. Do not attempt to complete the battery wiring or close the battery isolators before this system has been commissioned

The cabinets are designed to house a number of 12V batteries of various capacities to provide a flexible, self-contained UPS system. Cabinets A & B can accept 7Ah or 9Ah batteries, while cabinet C can accept batteries of up to 28-44Ah. The batteries are connected in up to 50x12V strings and it is possible to connect 2 or 3 strings in parallel in Cabinets B & C to enable a range of autonomy times to be achieved.

The final assembly and connection of the battery units will be carried out by the commissioning engineer.

3.5.1 External battery cabinets

Key Point: If an external battery system is used, the UPS internal batteries must be disconnected from the system. It is NOT possible to operate the internal and external batteries in parallel.

If the required autonomy time cannot be achieved using the UPS cabinet internal batteries, an external battery cabinet may be used to house a larger battery system. When used, the external battery enclosure must be fitted with a suitably rated fused isolator which is connected to the battery connection terminals inside the UPS (refer to the appropriate illustration in Figure 3.5 to Figure 3.8).

***Note:** DC fuses and cables are bespoke to the installation.*

3.6 Module interface facilities

The UPS contains a communication port and a communication card that can provide a range of system information to a remote computer or building facilities monitoring device.

Standard interface facilities

JD1 – Smart Port (Serial RS232) provides an interface between UPS system and a computer via a sub-D9/ female connector *(see paragraph 3.6.1)*.

X1-21 – Dry Port (volt-free contacts) provides a customer input/output interface via Phoenix terminals *(see paragraph 3.6.2)*.

Optional Facilities

The following interface facilities are described in the Options chapter of this manual.

USB – PC Interface for remote signalling and automatic computer shutdown.

SNMP – Slot for optional SNMP card ONLY. For monitoring and integration in network management.

3.6.1 JD1 Smart Port – serial RS 232 port

The JD1 Smart Port is an intelligent RS 232 serial port that allows the UPS to be connected to a computer via a standard D-Type, 9-pin, female connector.

When used with the optional *WAVEMON Smart Port* software, this allows a computer to continuously monitor the UPS input mains voltage and the UPS operational status and display a message in the event of any UPS system changes.

Figure 3.11 and show the connection to a PC from the UPS for PC's with a 9 pin serial port and 25 pin serial port respectively.

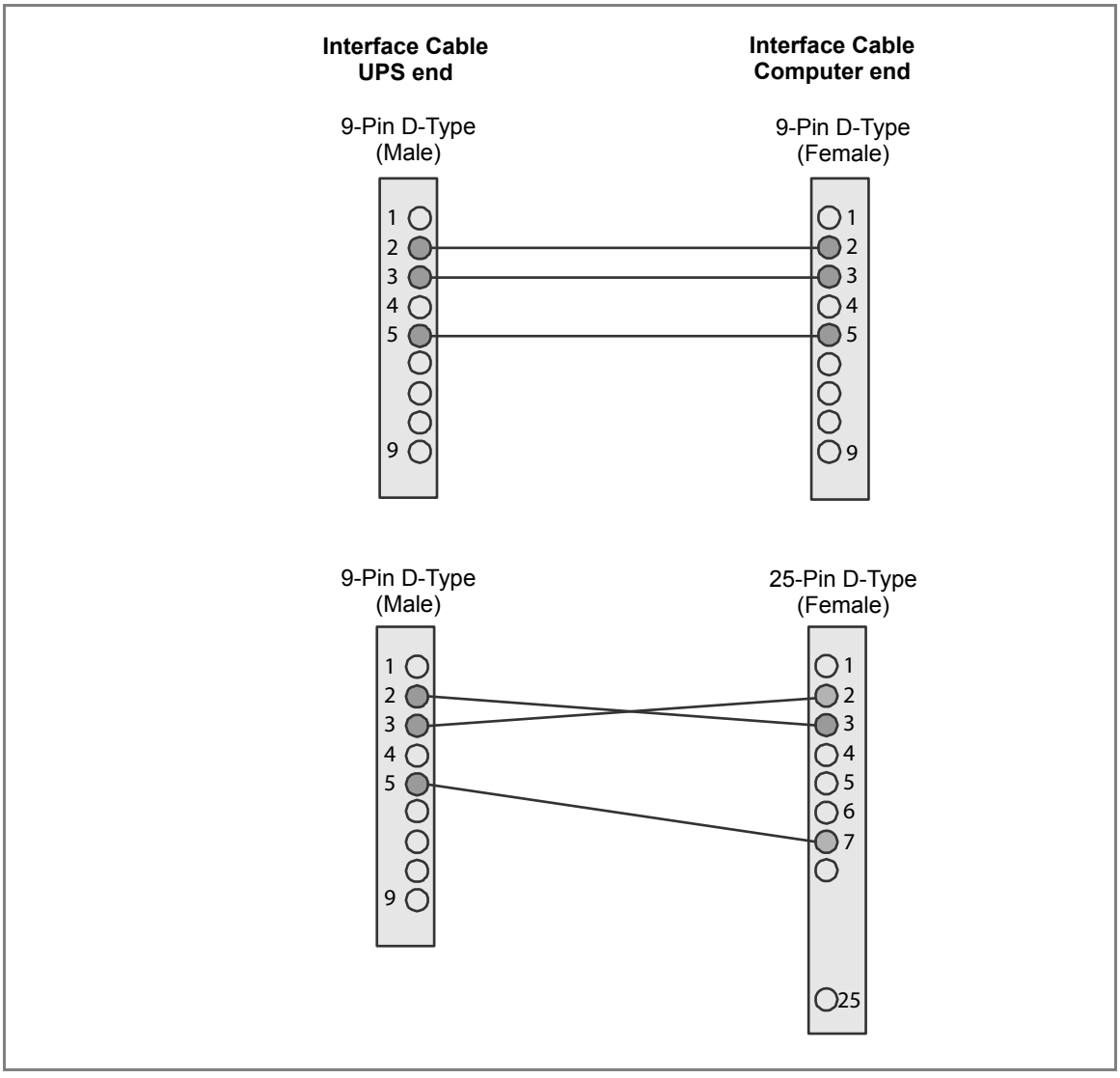


Figure 3.11 Connector Cable - PC Serial Port

3.6.2 X1-21 Dry Port (volt-free contacts)

All the Input and Output interfaces to X1 are connected to Phoenix terminals (cable 0.5 mm2). All voltage free contacts are rated 60 VAC max. and 500 mA max.

These output can be used to control an automatic and orderly shutdown of servers, AS400 or automated building facilities.

Term.	Contact	Signal		Function
1	NO	ALARM	MAINS FAILURE	Mains Failure
2	COM			Mains Present
3	NC			
4	NO	ALARM	COMMON ALARM	Common Alarm
5	COM			No Alarm Condition
6	NC			
7	NO	STATUS	LOAD ON INVERTER	Load on Inverter
8	COM			Load on Bypass
9	NC			
10	NO	ALARM	BATTERY LOW	Battery Low
11	COM			Battery OK
12	NC			
13	NO	STATUS	LOAD ON MAINS	Load on Bypass
14	COM			Load on Inverter
15	NC			
16	–	Control Input	ON GENERATOR	Terminals are linked when the standby generator is on-line.
17	–			
18	+12V (100mA)	Output supply		
19	0V			
20	–	Control Input	REMOTE SHUTDOWN	NC contact wired to a remote emergency stop circuit. Linked out when not used.
21	–			

Figure 3.12 Dry Port (X1-21)connections

4 Operation

4.1 Commissioning

The PowerWave 3000T UPS must be commissioned by a fully trained and authorised Uninterruptible Power Supplies Ltd. field service engineer before being put into use. Commissioning involves connecting the battery, checking the electrical installation and operating environment, performing a controlled start-up and testing of the UPS system, and customer basic training.

WARNING: Any PowerWave 3000T UPS system not commissioned by an Uninterruptible Power Supplies Ltd. approved service engineer must be considered an electrical hazard, and Uninterruptible Power Supplies Ltd. accepts no responsibility for its safe operation or the safety of its operator. Additionally, the manufacturer's warranty will be immediately invalidated if the UPS is put into use before it has been correctly commissioned.

4.2 Control Panel

The user-friendly control panel is composed of three parts:

- Power Management Display (PMD)
- Mimic LED Indicators
- Operating keys

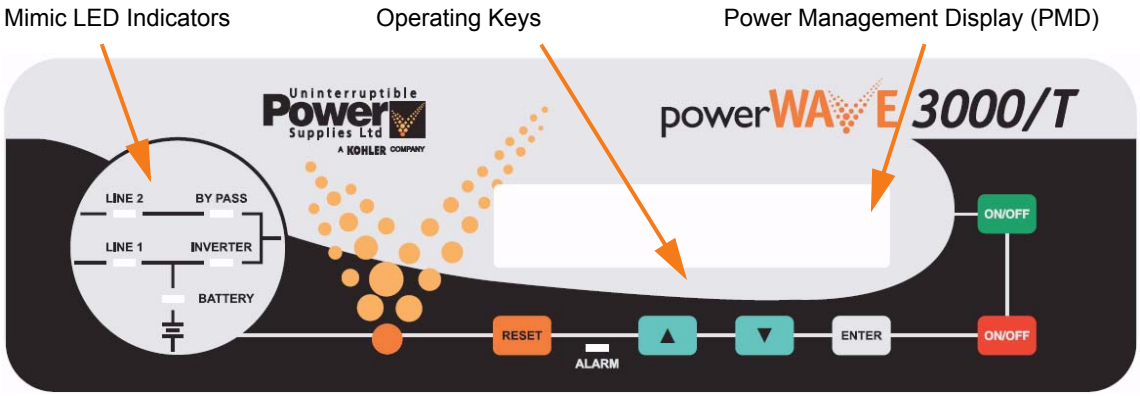


Figure 4.1 Control Panel

4.2.1 Power Management Display (PMD)

The 2 x 20 character LCD Power Management Display simplifies communication with the UPS and also provides UPS monitoring information *(See paragraph 4.3)*.

The menu driven LCD enables the access to:

- The 'Event register'
- Monitoring the input and output voltage, current, frequency & power
- Monitoring battery run time
- Perform commands such as UPS start-up and shut-down, Load transfer from INVERTER to BYPASS and vice-versa
- Diagnostic (service mode only)
- Adjustments and testing (service mode only)

4.2.2 Mimic LED indicators

The mimic diagram indicates the UPS power flow status and the led indicators change colour between Green, Red and OFF to indicate the UPS operating conditions.

LINE 1 (rectifier) and LINE 2 (bypass) indicate the availability of the mains and bypass power supply.

INVERTER and BYPASS, indicate which of the two power sources is supplying the critical load power.

The BATTERY LED indicator indicates the battery availability and flashes when the battery is supplying the load.

The ALARM LED indicates a detected internal or external alarm condition and when activated it is accompanied by an audible alarm.

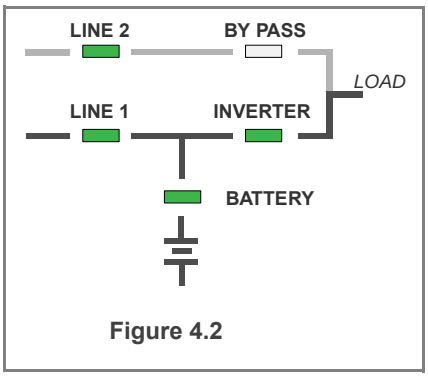


Figure 4.2

LED Indication summary

Indicator	Indicator Status	Interpretation
LINE 1	GREEN RED	Mains available Mains problem or unavailable
LINE 2	GREEN RED	Bypass mains available Bypass mains problem or unavailable
ALARM	OFF Flashing RED + buzzer RED	No alarm condition Alarm condition detected Alarm condition accepted (has been reset)
INVERTER	GREEN RED OFF	Load is on inverter (protected from mains disturbances) Inverter fault (load is not transferable to inverter) Inverter not operating
BY-PASS	GREEN OFF	Load is on bypass (unprotected from mains disturbances) Bypass not unavailable
BATTERY	GREEN RED Flashing GREEN	Battery OK Battery fault or discharged On Battery

4.2.3 Operator keys

The operator keys allow the user to:

- Make settings and adjustments via the menu driven LCD display
- Start-up and shut down the UPS and transfer the load between inverter and bypass
- Monitor and display the UPS operating voltages, currents, frequencies and other values on the LCD display

Key function summary

KEYS	FUNCTION
ON/OFF ON/OFF	Used to switch-on or switch-off the UPS (Both keys must be pressed simultaneously for either ON/OFF operation).
UP (▲)	Scroll upwards through a displayed menu.
DOWN (▼)	Scroll downwards through a displayed menu.
RESET	Cancels the audible alarm. If the alarm condition was transient the ALARM LED will also extinguish, otherwise it will remain ON (red).
ENTER	Confirms (selects) a chosen menu item.

ON/OFF Start-up and shutdown buttons

The UPS may be switched ON or OFF by simultaneously pressing both ON/OFF keys on the control panel. This is to prevent accidental UPS start-up or shutdown.

Note: *When the UPS is under normal operation, pressing the two ON/OFF buttons simultaneously will immediately shut down the UPS and disconnect the UPS from the load.*

CAUTION: *If the ON/OFF buttons are operated while the UPS is not in Maintenance Bypass it will interrupt the load power supply.*

4.3 Description of the LCD display

4.3.1 Status screens

	DESCRIPTION	LCD-DISPLAY
1.	Load is protected by UPS power supplied by inverter (normal operation).	LOAD PROTECTED
2.	Load is not protected by UPS power –supplied by mains power (load on bypass)	LOAD NOT PROTECTED
3.	Load supply interrupted. UPS has been switched off by "ON/OFF" buttons.	LOAD OFF SUPPLY FAILURE
4.	The UPS/module is not supplying load. The output switch is open.	LOAD DISCONNECTED OUTPUT SWITCH OPEN

4.3.2 Main menu screen

	DESCRIPTION	LCD-DISPLAY
1.	A log of the last 64 events is stored in the Power Management Display *(See paragraph 4.3.3)*.	→ EVENT LOG MEASUREMENTS
2.	Allows monitoring of voltages, power, frequencies, currents, autonomy etc *(See paragraph 4.3.4)*	→ MEASUREMENTS COMMANDS
3.	Enables the commands "Load to inverter", "Load to bypass" and battery test to be executed *(See paragraph 4.3.5)*.	→ COMMANDS SET-UP DATA
4.	Allows the UPS personalized information (such as serial number) to be entered *(See paragraph 4.3.6)*.	→ SET-UP DATA SET-UP USER
5.	Allows user to set up Date/Time, automatic battery test, etc. *(See paragraph 4.3.7)*	→ SET-UP USER SET-UP SERVICE
6.	Password-protected area for service engineer use only *(See paragraph 4.3.8)*.	→ SET-UP SERVICE

4.3.3 Event log menu screen

DESCRIPTION	LCD-DISPLAY
1. Logging Control; a log of the last 64 events is stored in the Power Management Display.	01 05-10-08 14-38-56 LOAD TO INV.
2. Every stored event is identified with a sequential number and time stamp.	02 05-10-08 14-38-59 LOAD TO BYP.
3. By pressing ENTER the code of the event will be displayed.	03 05-10-08 14-39-14 LOAD OFF

4.3.4 Measurements menu screen

DESCRIPTION	LCD-DISPLAY
1. Battery Runtime	BATT. RUN TIME (MIN) 00h 00mm
2. UPS-Output Frequency	OUTPUT FREQUENCY (HZ) 50.00
3. Bypass Frequency.	BYPASS FREQUENCY (HZ) 50.00
4. Battery Voltage	BATTERY VOLTAGE (V) +0.0 -0.0
5. Battery Charger Current	BATT. CHARGE CUR. (A) +0.0 -0.0
6. Battery Discharge Current.	DISCHARGE CURRENT (A) 00.00
7. Rectifier Input Voltage (1or 3 phases)	RECTIFIER VOLTAGE (V) 230 230 230
8. Bypass Input Voltage	BYPASS VOLTAGE (V) 230
9. Output Voltage	OUTPUT VOLTAGE (V)0 230
10. Output Current	OUTPUT CURRENT (A)0 00.00
11. Active Output Power	ACTIVE POWER (KW) 00
12. Reactive Output Power	REACTIVE POWER (kVAr) 00
13. Apparent Output Power	APPARENT POWER (KVA) 00
14. Output Power	OUTPUT POWER (%) 00
15. Battery Capacity	BATT. CAPACITY (%) 00.00

4.3.5 Commands menu screen

DESCRIPTION	LCD-DISPLAY
1. Transfer the load to inverter	→ LOAD TO INVERTER LOAD TO BYPASS
2. Transfer the load to bypass.	→ LOAD TO BYPASS PERFORM BATT.TEST
3. Battery test	→ PERFORM BATT.TEST

4.3.6 UPS Data menu screen

DESCRIPTION	LCD-DISPLAY
1. These general UPS Data are installed at the manufacturing plant.	UPS SERIAL NUMBER nn-nnnnn
2. Manufacturing date	DATE OF MANUFACTURE 15-03-11
3. EPROM Version	EPROM VERSION V-000
4. Dynamic Password	YES NO
5. Actual Date and Time	DATE TIME dd-mm-yyyy hh:mm:ss

4.3.7 Set-up User menu screen

DESCRIPTION	LCD-DISPLAY
1. Set-up language	→ SET LANGUAGE SET DATE AND TIME ENGLISH FRANCAIS DEUTCH DUTCH SPANISH POLISH PORTOGUESE
2. Set-up Date and Time	→ SET-UP DATE/TIME SET-UP BATT. TEST DD-MM-YY HH-MM-SS
3. Set-up battery test	→ SET-UP BATT. TEST SET-UP GEN-SET OPER. DAY OF MONTH (1-31) HOUR OF DAY (0-23) REPETITIVE (Y/N) YES/NO

4.	Set-up operation with Gen-Set	→ SET GENERATOR OP. BATT.CHARGE LOCK YES/NO BYPASS LOCK YES/NO

4.3.8 Set-Up Service menu screen

	DESCRIPTION	LCD-DISPLAY
1.	This password-protected menu is reserved for authorized service engineers. It is not to be used by End-Users.	→ SET-UP SERVICE PASSWORD
2.	Type in password	→ PASSWORD*

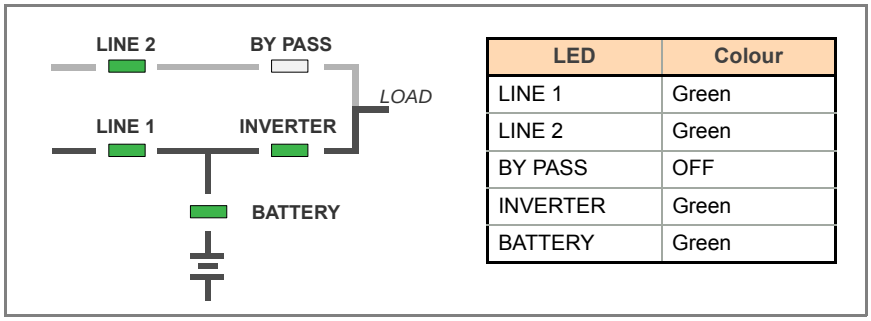
Key Point: It is essential to enter the password.

From within the Set-up Service menu a service engineer can adjust the UPS voltages, frequencies, currents, power and autonomies, together with setting up:

- UPS Rated Power
- Single (standard) or Dual input feed
- Frequency-converter, 50/60Hz and 60/50Hz
- Synchronisation window (2-4%)

4.4 Operating Modes

4.4.1 On-Line (Inverter) mode



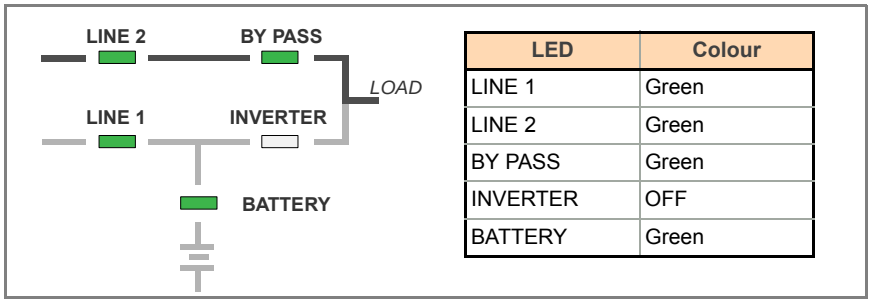
LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	OFF
INVERTER	Green
BATTERY	Green

Figure 4.3 On-Line Mode

When the UPS is operating in the On-Line mode the load is supplied through the LINE 1 (RECTIFIER) and INVERTER. This mode provides the highest degree of protection in the event of a mains disturbance or failure and is always recommended if the critical load, such as a computer system, will not tolerate even a very brief supply interruption.

When operating in this mode, in the unlikely event of an inverter fault or overload condition the UPS will transfer the load automatically to the static bypass supply without interruption (transfer time = 0).

4.4.2 Bypass (Off-line or ECO) mode



LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	Green
INVERTER	OFF
BATTERY	Green

Figure 4.4 Line-Interactive (Bypass Mode)

When operating in the Bypass (ECO) mode the load is supplied from the bypass mains (LINE 2) via the static BYPASS and in the event of a bypass mains failure the load is automatically transferred to the inverter (On-Line mode) within 3 to 5 msec. The battery charger remains active in this mode.

Although this mode of operation offers a greater efficiency than the On-Line mode, it is recommended only if the connected load can tolerate interruptions of 3 to 5 ms – which is the transfer time taken to change from Bypass mode to On-Line mode.

WARNING: The On-Line mode must always be used to provide maximum load protection.

4.4.3 Maintenance Bypass Mode

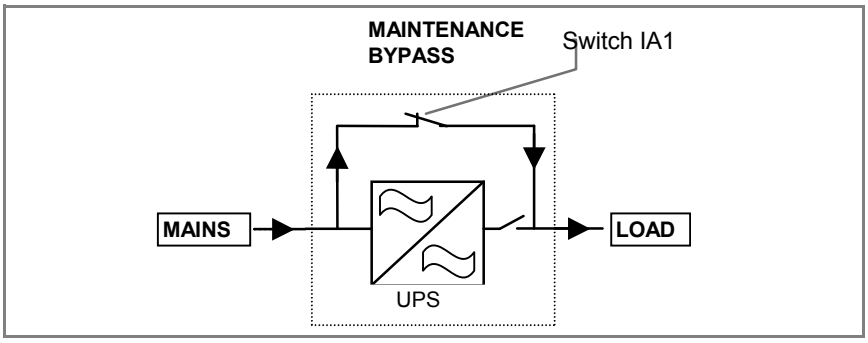


Figure 4.5 Maintenance Bypass Mode

Each module is fitted with a Maintenance Bypass switch (IA1) which, when closed, connects the UPS module output terminals directly to the UPS bypass Mains supply. This facility enables a UPS module to be shut down for maintenance or repair whilst maintaining the load on the raw (unprotected) bypass supply.

Maintenance Bypass switch (IA1)

The Maintenance Bypass mode is effected by means of the IA1 BYPASS SWITCH on the front/rear of the UPS:

Switch IA1	Effect
ON	Maintenance Bypass-Switch Closed (Load on bypass mains) LCD-indication: `MAINTENANCE BYP CLOSED` LED Indicators will indicate as shown in the table below
OFF	Bypass-Switch Open – Normal operating condition (Load on inverter) LCD-indication `MAINTENANCE BYP OPEN` LED Indicators will indicate as shown in the table below.

LED Indicator	ON	OFF
LINE 1	Green	Green
LINE 2	Green	Green
BYPASS	Green	OFF
INVERTER	RED	ON
BATTERY	Green	Green

CAUTION: *If the UPS is operating in the Maintenance Bypass mode the load will not be protected in the event of a mains failure. It is therefore strongly recommended to switch over to the on-line mode or bypass mode as soon as possible.*

4.5 Operating Instructions

Under normal conditions the UPS module is operating in the 'On Line' (On Inverter) mode.

The following procedures are provided in this section:

How to transfer the load to the Maintenance Bypass and shut down the UPS module for maintenance purposes – *(See paragraph 4.5.1)*.

How to start up the UPS module and transfer the load from the Maintenance Bypass to the inverter ('On Line' mode) *(See paragraph 4.5.2)*.

How to shut down the entire UPS *(See paragraph 4.5.3)*.

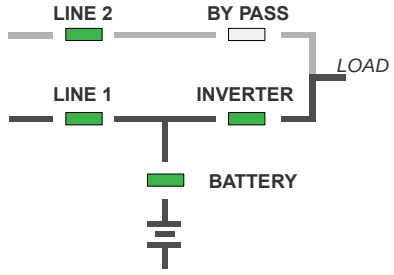
4.5.1 Transfer to Maintenance Bypass Mode

If needed, to perform service or maintenance, it is possible to transfer the load to Maintenance Bypass Mode and power down the UPS module whilst leaving the load connected to the raw bypass mains supply.

WARNING: Before you close the Maintenance Bypass isolator ensure that the UPS is operating in the Bypass Mode.
All the operations in this section must be performed by authorised and trained personnel.

Prior to commencing this procedure, check and confirm the following UPS status:

- The mimic panel LED indication should be as per the following table:

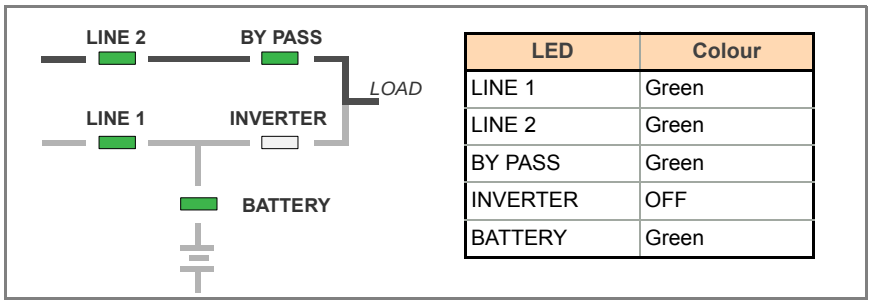


LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	OFF
INVERTER	Green
BATTERY	Green

- The LCD panel should display `LOAD PROTECTED`.
  If anything other than `LOAD PROTECTED` is displayed then press the `RESET` button, and if `LOAD PROTECTED` is still not displayed there is a problem with the UPS – seek assistance!

Transferring the UPS to 'Bypass' mode:

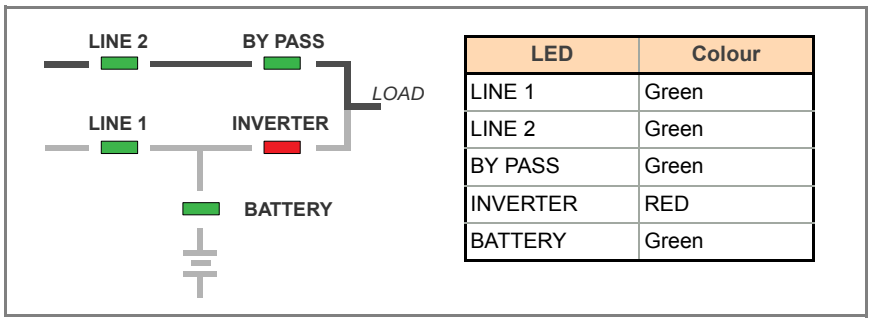
1. On the UPS module's mimic panel press the `ENTER` key once to access the menu system.
2. Using the `UP/DOWN` keys, move the cursor so that it is adjacent to `COMMANDS` and then press the `ENTER` key.
3. Using the `UP/DOWN` keys, move the cursor so that it is adjacent to `LOAD TO BYPASS` and then press the `ENTER` key.
   a) The UPS system will transfer the load to static bypass.
4. Confirm that:
   a) The `INVERTER` LED has extinguished.
   b) The `BYPASS` LED is green.
   c) The LCD displays `LOAD NOT PROTECTED`.



LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	Green
INVERTER	OFF
BATTERY	Green

Closing the Maintenance Bypass switch:

5. Close the Maintenance Bypass switch IA1.
6. Confirm that:
   a) The `INVERTER` LED has turned to red.
   b) The `BYPASS` LED is green.
   c) The LCD displays `MANUAL BYP IS CLOSED`.



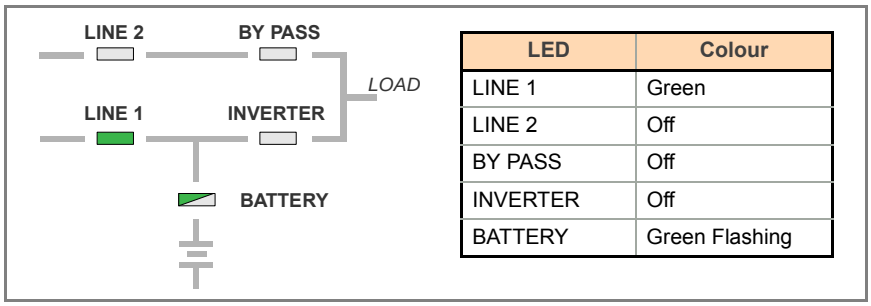
LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	Green
INVERTER	RED
BATTERY	Green

Powering down the UPS module:

When the load is connected to the Maintenance Bypass supply, as described above, the UPS module can be powered down (for example, if required for maintenance/testing) using the following procedure:

7. On the UPS control panel simultaneously press both `ON/OFF` buttons.
   a) The LCD panel will indicate: `LOAD OFF, SUPPLY FAILURE`.
8. Open the battery fuse/isolator F1.

   Note: *If using external batteries open the battery fuses/isolator on the associated battery cabinet/rack.*
9. On the UPS module open the module's Output Isolator (IA2).



LED	Colour
LINE 1	Green
LINE 2	Off
BY PASS	Off
INVERTER	Off
BATTERY	Green Flashing

10. Open the Bypass Line fuse holder FA2 and the Rectifier Line fuse holder FA1.

WARNING: The UPS module is still live at its input and output power terminals due to the activation of Maintenance Bypass circuit.
WARNING: Allow 10 minutes for the internal DC capacitors to discharge before touching any UPS internal components.
WARNING: The load is now supplied from the bypass mains and is not protected against power failure.

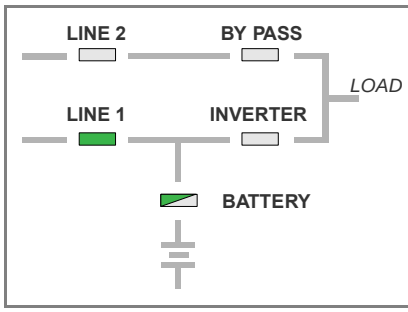
4.5.2 Starting the UPS system from the Maintenance Bypass mode

This procedure describes the sequence of operations necessary to power up the UPS module whilst the load is connected to the Maintenance Bypass supply, and then transfer the load to the UPS Inverter ('On-Line' mode).

WARNING: All the operations in this section must be performed by authorised and trained personnel.

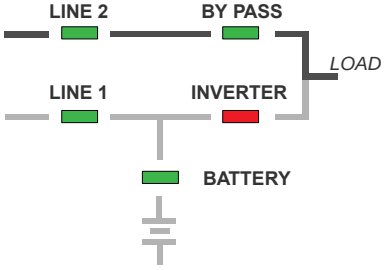
Powering up the UPS Module:

1. On the UPS module close the Bypass Line fuse holder FA2 and the Rectifier Line fuse holder FA1 if they are open.
2. Close the battery fuse F1 (and the battery fuse/isolator on the external battery cabinet/rack where used).
   a) The UPS mimic panel `LINE 1` LED will be permanent green.
   b) The `BATTERY` LED will be flashing green.
   c) The LCD display will indicate `LOAD OFF, SUPPLY FAILURE`.



LED	Colour
LINE 1	Green
LINE 2	Off
BY PASS	Off
INVERTER	Off
BATTERY	Green Flashing

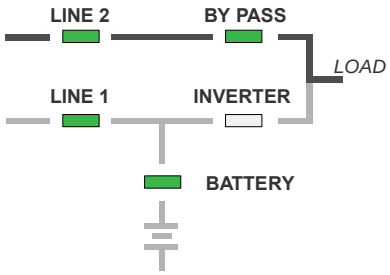
3. Close the Output Isolator switch (IA2).
4. On the UPS mimic panel simultaneously press both `ON/OFF` buttons then release them and wait for approximately 60 seconds.
   a) The UPS module will begin to power up.
   b) Initially `LINE 2` LED will be red, then change to green.
   c) At this stage the LCD display will indicate `LOAD NOT PROTECTED` and the module mimic LED indications should be as follows:



LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	Green
INVERTER	RED
BATTERY	Green

Transferring to the UPS bypass (Eco mode) from the Maintenance Bypass:

5. Ensure that the BYPASS LED is green.
6. Open the Maintenance Bypass switch (IA1).
   a) The LCD panels will display MANUAL BYPASS OPEN.
   b) The INVERTER LED will be extinguished.
   c) An audible alarm will sound.

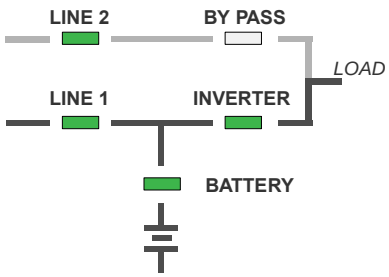


LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	Green
INVERTER	Off
BATTERY	Green

7. Press the RESET button to cancel the audible alarm.
   a) The LCD display(s) will now indicate LOAD NOT PROTECTED.

Transferring the load to the inverter:

8. On the Control Panel:
   a) Press the UP key once to access the menu system.
   b) Use the UP/DOWN keys to move the cursor so that it is adjacent to COMMANDS and then press the ENTER key.
   c) Use the UP/DOWN keys move the cursor so that it is adjacent to LOAD TO INVERTER and then press the ENTER key.
9. The UPS will transfer the load to Inverter ('On-line' mode).
   a) The LCD display will now indicate LOAD PROTECTED.
   b) Check and confirm that the LED display is as shown below:



LED	Colour
LINE 1	Green
LINE 2	Green
BY PASS	Off
INVERTER	Green
BATTERY	Green

10. The UPS is now operating in 'On-Line' mode. The load is protected and supplied by inverter power.

4.5.3 Complete system shutdown

The UPS system may be shutdown completely if the load does not need input power for an extended period of time. Use this procedure to turn off the load power and shutdown the entire UPS system.

WARNING: All the operations in this section must be performed by authorised and trained personnel.

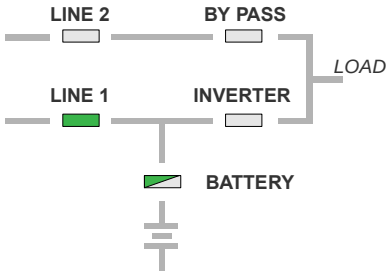
CAUTION: *This procedure will totally disconnect load power. Ensure that it is safe to lose power to all the loads connected to the UPS system before you begin this process.*

1. Isolate all load equipment connected to the output of the UPS system by opening the fused isolators or circuit breakers in the UPS output load distribution board.

WARNING: Perform the following steps only after the load has been fully isolated.

2. Verify that the loads are powered down.
3. On the UPS control panel simultaneously press both `ON/OFF` buttons.
   a) The LCD panel will indicate: `LOAD OFF, SUPPLY FAILURE.`
4. Open the battery fuse/isolator (F1).

   Note: *If using external batteries open the battery fuses/isolator in the associated battery cabinet.*
5. Open the module's Output Isolator switch (IA2).



LED	Colour
LINE 1	Green
LINE 2	Off
BY PASS	Off
INVERTER	Off
BATTERY	Green Flashing

6. Open the Bypass Line fuse holder FA2 and the Rectifier Line fuse holder FA1.
7. Open the UPS Input and Bypass supply fused isolators (or circuit breakers) in the power distribution panel.
8. The UPS is now voltage free.

WARNING: Allow 10 minutes for the internal DC capacitors to discharge before touching the UPS internal components.

5 Maintenance

5.1 Introduction

WARNING: All maintenance operations described in this chapter must be performed by an authorised electrician or other suitably qualified personnel.

As the UPS contains no user-serviceable parts the maintenance requirements to be carried out by the user are minimal, beyond ensuring that the UPS operating environment remains suitably cool and dust-free.

5.2 System calibration

To ensure optimum UPS operation and continuous, efficient protection of the connected load, it is recommended that the system's operating parameters are checked every six months and recalibrated where necessary. The batteries should also be checked every six months, depending on the ambient temperature.

5.3 User responsibilities

There are no user-serviceable parts contained within the UPS so the maintenance requirements of the user are minimal. To maximise the useful working life and reliability of the UPS and its batteries, the environment in which the UPS operates should be kept cool and dust free.

5.4 Routine maintenance

We recommend that the UPS operating parameters are checked and recalibrated every six months as part of a regular maintenance schedule to ensure optimum UPS operation efficient load protection. The batteries should also be checked every six months, depending on the ambient temperature.

When the UPS is commissioned, the commissioning engineer will attach a service record book to the front of the UPS which will be used to log the full service history of the UPS.

WARNING: Preventative maintenance inspections entail working inside the UPS with safety covers removed. This presents a risk of electric shock due to the unavoidable exposure to hazardous AC and DC voltages, and should be undertaken only by trained engineers authorised by Uninterruptible Power Supplies Ltd. who are fully aware of the hazardous areas.

During a preventative maintenance inspection the service engineer will carry out the following checks:

- Site environment conditions
- Integrity of the electrical installation
- Availability and quality of the cooling airflow
- UPS Rectifier operation and calibration
- UPS Inverter operation and calibration
- UPS Static switch operation
- Battery condition and status
- Load characteristics
- Integrity of the alarm and monitoring systems
- Operation of all installed options

Preventative maintenance inspections form an integral part of all Extended Warranty Agreements (maintenance contracts) offered by Uninterruptible Power Supplies Ltd.

For further details on Extended Warranty Agreements see Section 2 of this manual.

5.5 Battery Testing

The battery test takes approximately 3 minutes and should be performed only if:

- There are no alarm conditions
- The battery is fully charged
- The input mains supply is present

Battery testing can be carried out independently of the operating mode (Off-line or On-line) and whether or not the load is connected.

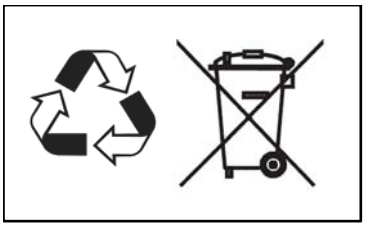
The battery test procedure can be performed from the UPS front panel (See paragraph 4.3.5).

5.6 Battery Maintenance

The battery maintenance shall be done by an authorized Uninterruptible Power Supplies Ltd. Service Partner.

5.7 Battery Disposal and Recycling

Batteries contain dangerous substances that will harm the environment if thrown away. If you change the batteries yourself, call qualified organizations for battery disposal and recycling.



6 Troubleshooting

6.1 Alarms

In the event of an alarm condition the red ALARM LED-indicator will illuminate on the operator control panel and the audible alarm will sound.

In this case proceed as follows:

1. Silence the audible alarm by pressing the RESET button.
2. Identify the cause of the alarm condition by viewing the events register in the main menu *(See paragraph 4.3.3)*.
3. In case of doubt please contact Uninterruptible Power Supplies Ltd. on 0800 731 3269.
4. Use information provided on the following pages to identify and rectify and apparent fault conditions.

6.2 Menu, Commands, Event Log, Measurements,

A detailed description of the Menu, Commands, Event Log and Measurements that can be operated and displayed on the LCD can be found in Section 4.

6.2.1 Event log screen

DESCRIPTION	LCD-DISPLAY
1. Logging Control	05-10-00 14-38-56 LOAD TO INV.
2. A log of the last 64 events is stored in the Power Management Display.	05-10-00 14-38-59 LOAD TO BYP.
3. All events and alarms are indicated with their date and time of occurrence.	05-10-00 14-39-14 LOAD OFF

As you step through the event memory, make a separate note of each alarm condition as this will assist in the identification of any problems.

6.2.2 Fault identification and rectification messages and alarms

The major alarm conditions that will be encountered are:

Alarm Condition	Meaning	Suggested Solution
UPS FAULT	There is a fault within the UPS and therefore normal operation cannot be guaranteed.	Call the authorised service centre for assistance.
MAINS BYP/RECT FAULT	Mains power supply is outside prescribed tolerance.	The input power to UPS is too low, too high, or missing. If site power appears to be OK, check the input circuit breakers etc. supplying the UPS.
OUTPUT SHORT	There is a short circuit at the output of UPS (on load side).	Check all output connections and repair as required.
OVERLOAD	Load exceeds the UPS rated power.	Identify which piece of equipment is causing the overload and remove it from the UPS. Do not connect laser printers, photocopiers, electric heaters, kettles etc. to the UPS.
OVERTEMPERATURE	UPS temperature has exceeded the allowed value.	Check the ambient temperature of the UPS is less than 30° C. If the ambient temperature is normal call the authorised service centre for assistance.
BATTERY CHARGER OFF	The attached battery and the battery charger set-up do not correspond or battery charger fault.	Call the authorised service centre for assistance.
INVERTER FAULT	Inverter is faulty.	Call the authorised service centre for assistance.
SYNCHRON FAULT	The inverter and mains are not synchronised.	The frequency of the UPS input voltage is outside operational limits and the UPS static bypass has been temporarily disabled.
BATTERY IN DISCHARGE	Battery is near end of autonomy.	Shutdown the load connected to UPS before the UPS switches itself off to protect its batteries.
MANUAL BYP IS CLOSED	Maintenance Bypass closed. Load supplied by mains.	This alarm is only displayed if the UPS is on Maintenance Bypass.

6.3 Contacting Service

Uninterruptible Power Supplies Limited has a service department dedicated to providing routine maintenance and emergency service cover for your UPS. If you have any queries regarding your UPS please contact us.

Uninterruptible Power Supplies Ltd.
Woodgate
Bartley Wood Business Park
Hook
Hampshire
RG27 9XA

Tel: 01256 386700
0800 731 3269 (24 Hr.)

Fax: 01256 386701

Email: service@upspower.co.uk

We recommend that your UPS is protected by an Extended Warranty Agreement (see Section 2 for details). These agreements assist us in caring for your UPS correctly, ensuring that it is well maintained and attended to promptly should any problems occur.

7 Options

7.1 Introduction

The PowerWave 3000T UPS has the following available options:

- Remote Emergency Stop facilities
- Generator On facilities
- Software for automatic shutdown and monitoring
- SNMP Card for network management and remote monitoring
- Modem/Ethernet interface for PowerREPORTER™ management software

7.2 Remote Emergency Stop facilities

The remote emergency stop facility comprises a normally-closed contact connected between terminal port X1/20 and X1/21 on the communications board which opens to operate the emergency stop function.

To allow removal, maintenance or testing of any remote emergency stop facility without disturbing the normal operation of the UPS, it is recommended that a terminal block, with linking facilities, is installed between the UPS and the remote emergency stop button.

1. Use a screened cable with 1 pair of wires (0.6mm^2) and maximum length of 100 m.
2. Connect the cable as shown in Figure 7.1.

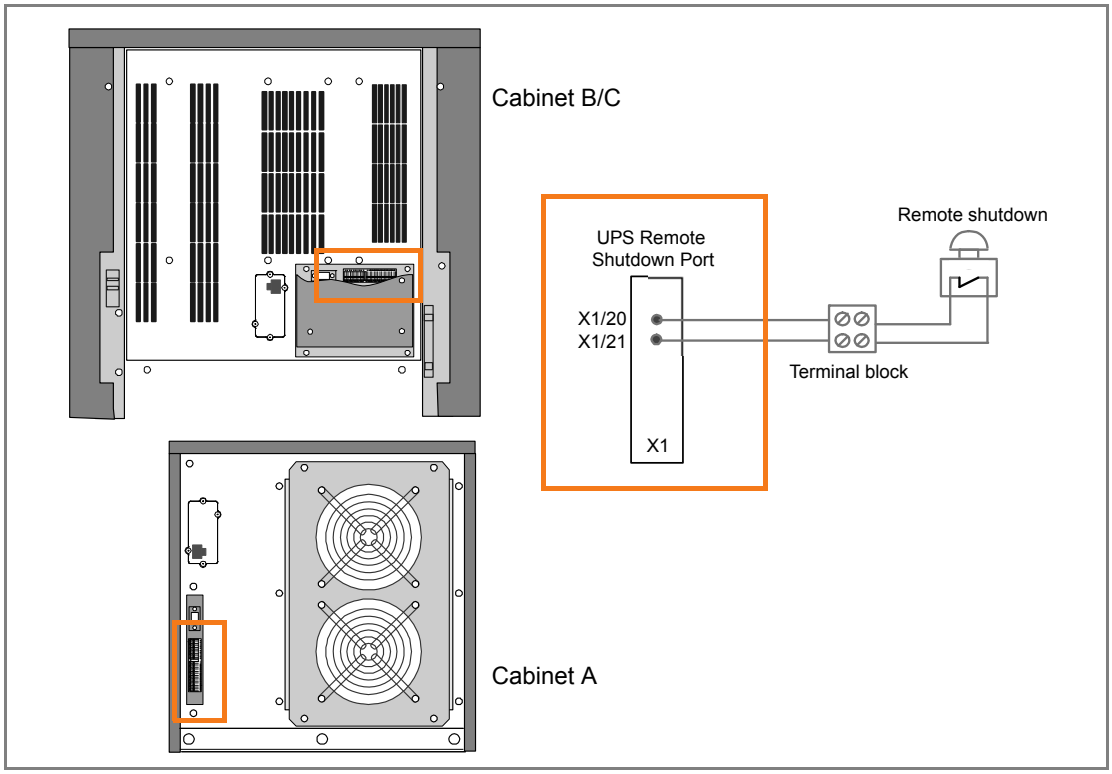


Figure 7.1 Remote Emergency Stop cabling

7.3 Generator ON facilities

The ON GENERATOR facility uses a normally-open contact which closes when a standby generator is running and supplying the UPS input power.

When used, this facility inhibits the operation of the battery charger and/or static bypass while the generator is on-line. See “Set-up User menu screen” in section 4.3.7.

1. Use a screened cable with 1 pair of wires (0.6mm^2) and maximum length of 100 m.
2. Connect the cable as shown in Figure 7.2.

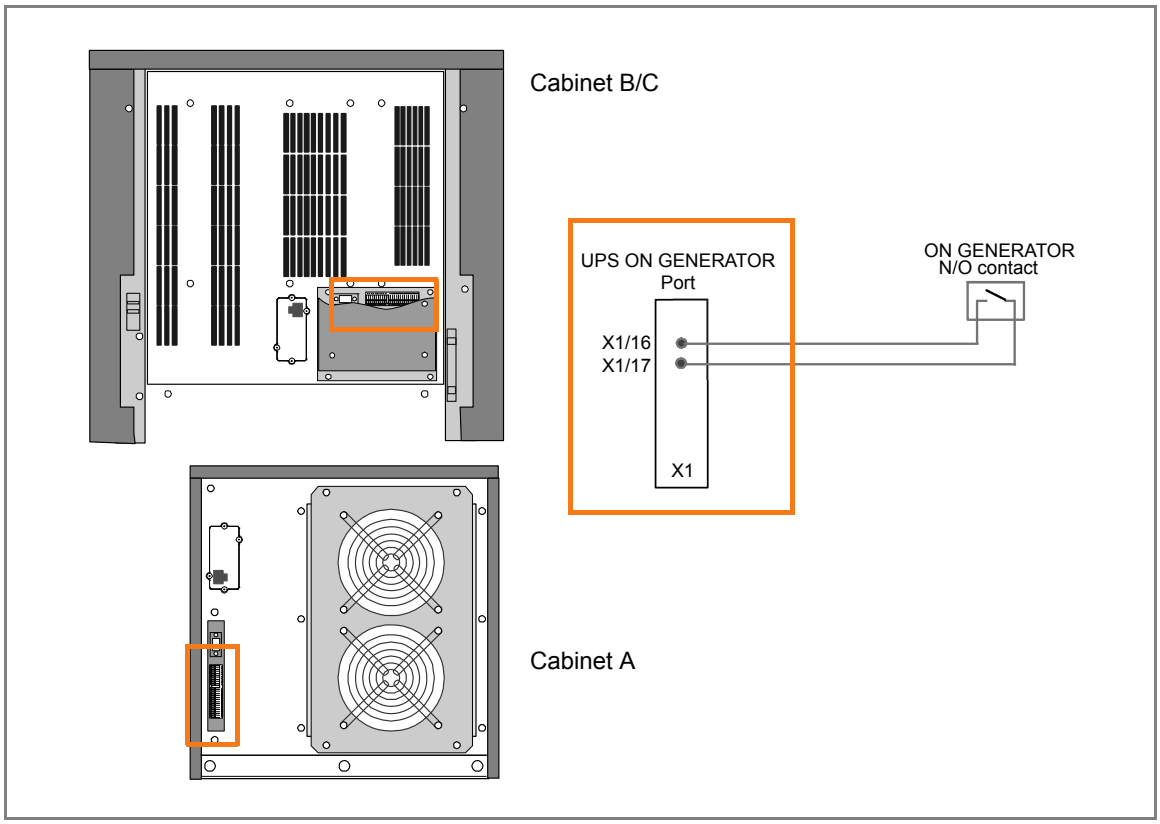
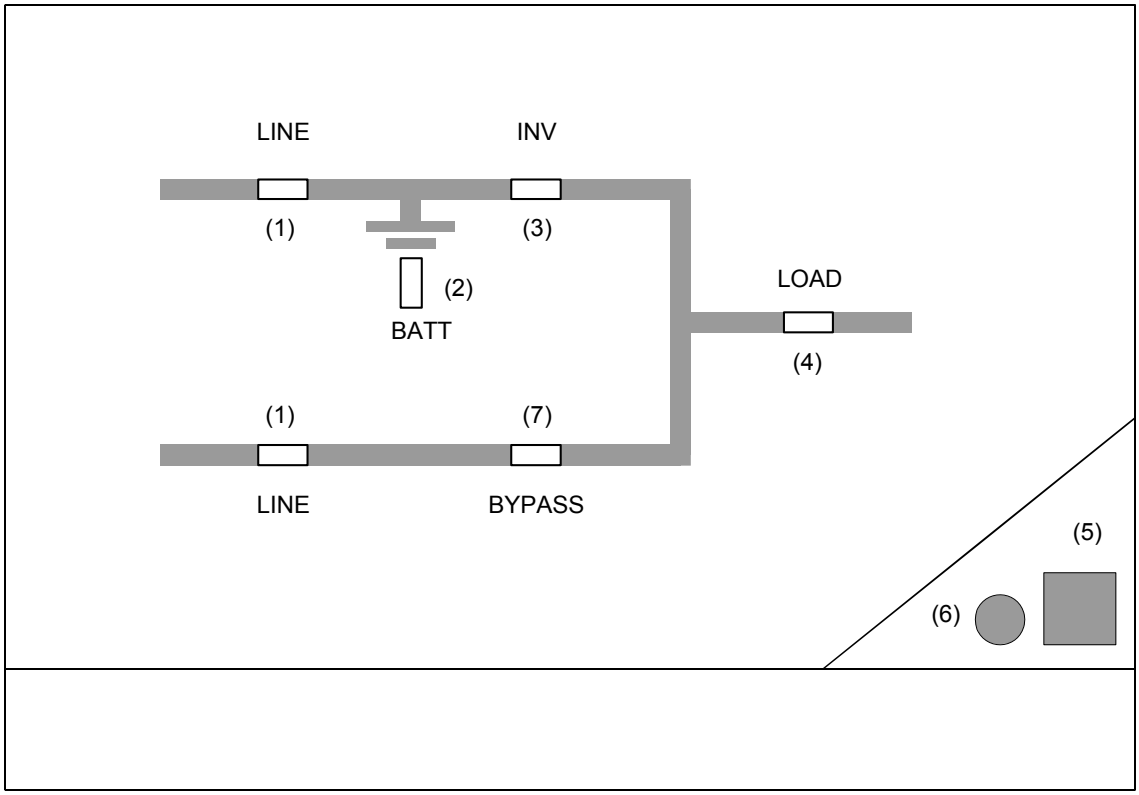


Figure 7.2 Generator ON Connection

7.4 Remote Signalling Panel

The optional Remote Signalling Panel (RSP) can be used to display UPS status information up to a distance of 100m.



No.	Item	Status	Meaning
1	LINE LED	GREEN	Mains available.
		RED	Mains not available.
2	BATTERY LED	GREEN	Battery OK.
		YELLOW	Battery near the end of capacity.
		OFF	No UPS supply or UPS on bypass.
3	INVERTER LED	GREEN	Load supplied by inverter.
		OFF	Inverter supply not available.
4	LOAD LED	GREEN	Load is supplied.
		RED FLASHING	Load is not supplied.
5	ALARM RESET	Push button	Silences the audible alarm.
6	ALARM LED	RED	Alarm condition; check other LEDs for indication of mains and/or UPS status.
		OFF	UPS is in normal operating condition.
7	BYPASS LED	RED	Load is being supplied from mains.
		OFF	Load is supplied by inverter.

Figure 7.3 Remote Signalling Panel

7.4.1 Remote Singalling Panel connections

- Provide a 0.75 mm2 minimum, shielded cable (max. 100 metre)
- Do not connect the shielding.
- Both ends of the cable are to be terminated in a terminal block connection at the Remote Status Panel and at the UPS in accordance with Figure 7.3.

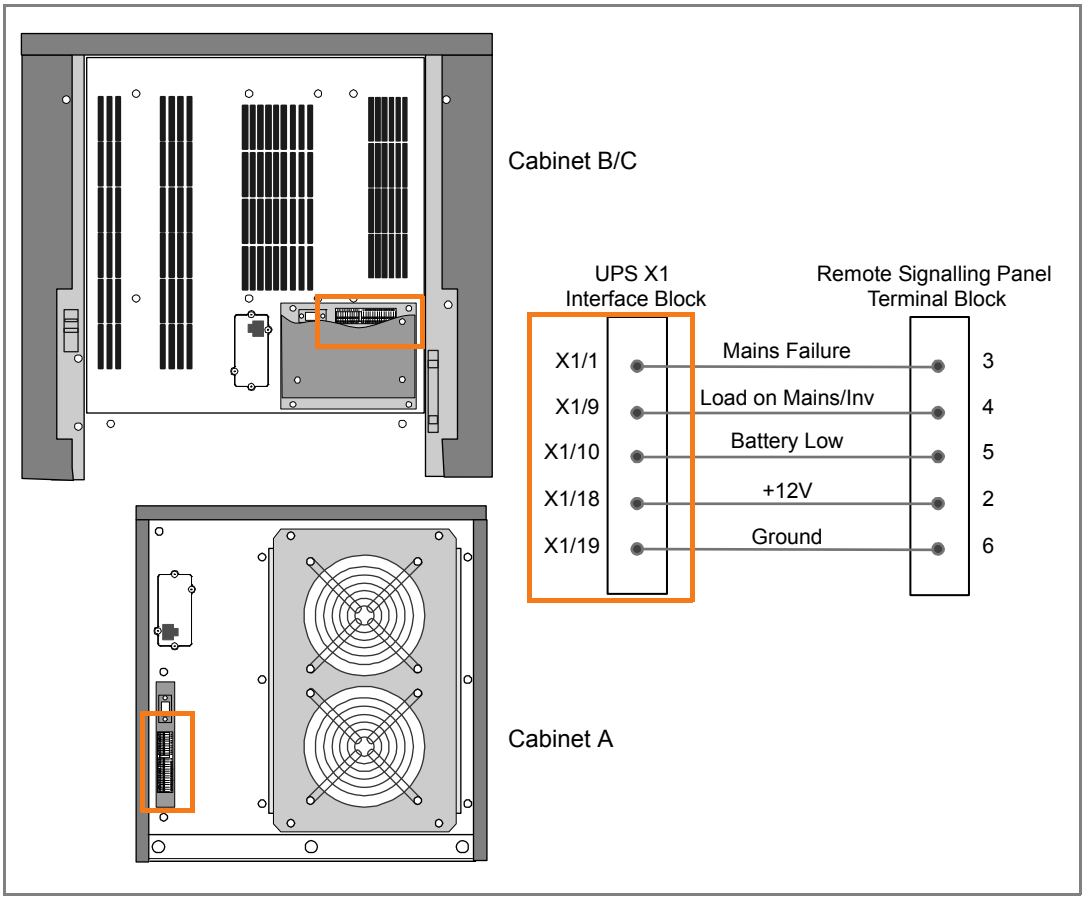


Figure 7.4 Connection of Remote Status Panel (RSP)

7.5 WAVEMON Shutdown and Management Software

7.5.1 Why is UPS Management important?

By combining a UPS with a variety of network management products, such as orderly shutdown software and SNMP adaptors, system-administrators can be assured that their electricity supplies are monitored for power disruptions and depleted battery conditions. Such conditions pose the greatest threat through power disturbance to valuable computer data by causing possible corruption or loss. By installing UPS/Mains monitoring software, administrators are able to monitor the utility power from a central location, allowing early warning of problems even across more complex systems like Wide Area Networks (WAN) and Enterprise Wide Networks of multinational companies.

A prolonged mains failure may outlast the battery autonomy of the UPS system. If this situation occurs the UPS management software will initiate an automatic, 'controlled' shutdown of the operating system, and so protect valuable data. Uninterruptible Power Supplies Ltd. offer a wide range of local and remote monitoring and control systems, affording maximum protection for computer systems.

7.5.2 WAVEMON Shutdown and Monitoring Software

WAVEMON is an external monitoring and shutdown software application that is designed to operate with many of Uninterruptible Power Supplies Ltd. UPS products. The package comprises a software installation CD suitable for most server operating systems, a standard cable set and a user manual

The WAVEMON system can monitor the dry port relay contacts available on terminal block X2, together with an RS232 port (JD1) – both located on the communications card.

When the WAVEMON system is used to monitor the X2 dry port contacts it is necessary to connect the X2 terminals of the UPS to the serial port of the server using a 0.5 mm^2 cable.

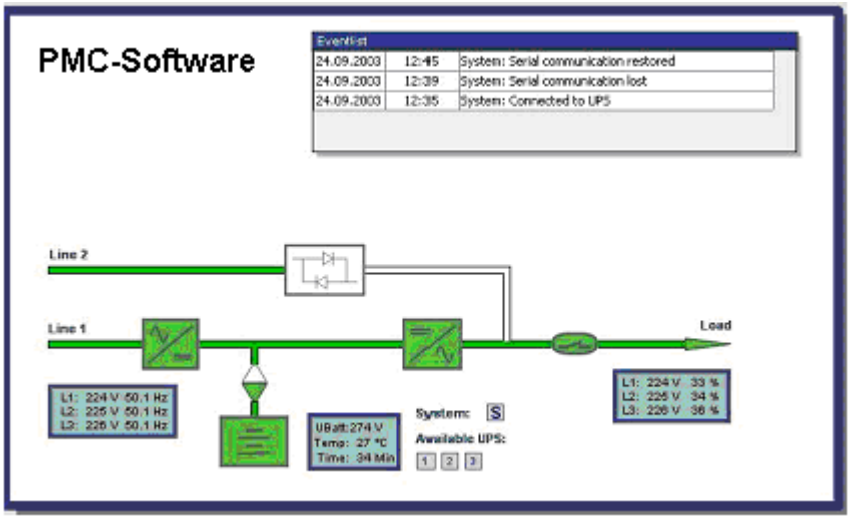


Figure 7.5 Monitoring screen image.

The main characteristics of WAVEMON software are (assuming RS232 port used):

- Automatic unattended master/slave shutdown in heterogeneous networks
- On-screen autonomy time/battery time countdown
- On-screen server log off and shutdown procedure
- Time and date stamp event log, extensive logging of all UPS activity and power quality data
- Scheduled UPS economy mode, service mode, other systems status
- Graphical user interface for Windows compatible platforms
- Automatic unattended local shutdown
- Special modules for the MS-Office software to close and save open documents
- Compatible with all optional modules like UPSDIALER, SNMP adaptors, temperature sensors, etc.

The UPS-Management software is a client-/server-application for networks and local workstations. Basically, the WAVEMON application consists of two parts: the server-module of the UPS-Management Software is *UPSServ*, which communicates via RS-232 cable with the UPS.

Working as a background process the *UPSServ* collects messages, received from the UPS, interprets the messages and then makes them available to the client-module *UPSCli* and to any SNMP-based management station.

When *UPSServ* detects voltage variations or a power failure it can execute various so called system 'event routines', which for example may shutdown the server or send a warning to connected users. These system event routines are a part of the UPS-Management Software can be adjusted to suit the customer's demands demands.

The UPS management software includes the licence for using the UPS service on one server with one UPS and an unlimited numbers of connected Windows workstations. When operating with two or more servers, a licence is required for every additional server, irrespective of whether the UPS service runs at that location, or if the server is halted by a UPS service via remote command.

The same regulations apply to the use of remote send/receive modules (RCCMD) and multi-server shutdown under NT, UNIX and other operating systems. The service programs are generally delivered as a single-licence. To use a single CD ROM to shutdown multiple servers you have to purchase additional CD license keys.

The PowerWave 3000T can be integrated in a network in two ways:

1. By means of the server which is being powered by the UPS and is integrated in the network. In most of the cases the server is used as sub-agent and you only need the PMC-Software without any SNMP Adapter. You need a standard serial connection between the RS232 JD1 port of the UPS and the RS232 port of the computer/server.
2. In some situations it is preferable to interface the network via an SNMP adapter. By this way up to 50 computers can be shut down in a RCCMD environment. RCCMD (Remote Console Command) is an additional software module, which can be triggered by the SNMP device to executes a command (typically a shutdown command) on a remote system.

7.6 SNMP CARD/ADAPTOR For Network Management/Remote Monitoring

The Simple Network Management Protocol (SNMP) is a world-wide standardised communication-protocol. It is used to monitor any device in the network via simple control language. The UPS-Management Software also provides its data in this SNMP format with its internal software agent. The operating system you are using must be SNMP compatible. We offer our software with SNMP functionality together with NetWare, OS/2, all Windows NT systems on INTEL and ALPHA.

There are two types of SNMP-Adaptors available: External SNMP-Adaptor and Internal SNMP-Card (both have the same functions).

The SNMP adaptor requires a PC with terminal connections. For normal operation at least one network connection (Ethernet) is also required.

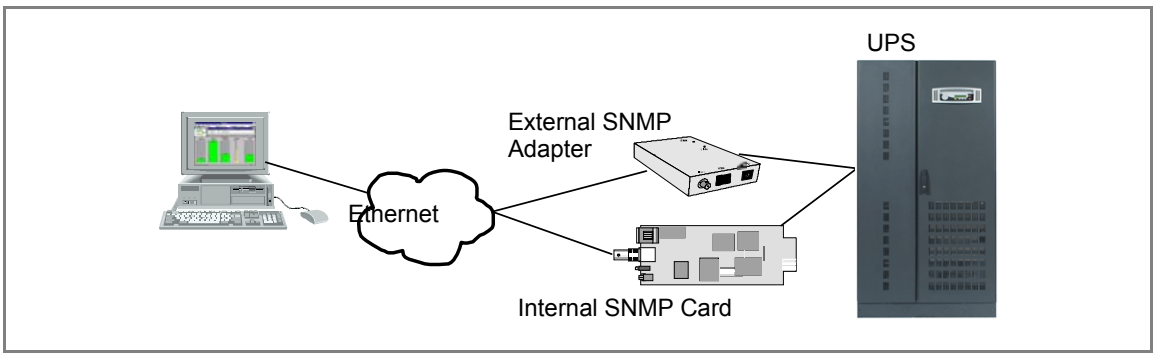
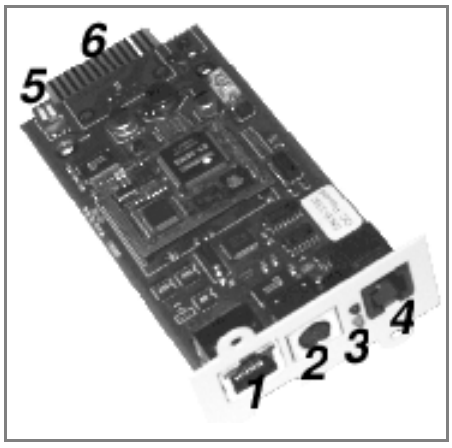


Figure 7.6 SNMP Adapter

External SNMP Adapter

1. The small (125x70 mm) External SNMP adapter comes with following interfaces:
   RJ-45 connector for 10/100 Base-T (auto switchable)
2. Serial Port for configuration (COM2) or optional ModBus interface.
3. Error/Link LED for UPS status
4. Aux. Port
5. DIP Switch
6. Serial Port to the UPS (COM1)
7. DC Supply (9 VDC or 9-36 VDC supply, depending on model), from a UPS-backed socket.

Internal SNMP Adapter



The Internal SNMP-Card can be inserted into an appropriate extension slot of the PMC. This adapter communicates via the serial port of the UPS and makes a direct multiple server shut down possible without additional SNMP management software.

The SNMP adaptor is used to monitor any device in the network and can be used, utilising the RCCMD send function, for an automatic network wide shut down or informing connected users. The shut down procedure can be initiated from the remaining time (downtime) or as countdown timer from the beginning of the alarm. A shut down is therefore possible without extra input from the operator, but fully software controlled.

For detailed information please refer to the Software Manual provided with the WAVEMON CD ROM. This adaptor communicates via the serial port of the UPS and makes a direct multiple server shut down possible without additional SNMP management software.

RCCMD - Remote Console Command module for a multi-server shutdown. The RCCMD modules are independent programs that may be activated on the computer that is running UPSMAN. This makes a shutdown call possible in any LAN and WAN, regardless of the network type or operating system.

8 Specifications

8.1 General Data

	kVA	7.5	10	12	15	20
Output Power Factor		0.7				
Topology		On-Line, Double Conversion, VFI, with static and maintenance bypass				
Technology		Third Generation, Transformerless				
Double Conversion AC-AC Efficiency						
100%/75%/50%25% Linear Load (cosφ=0.8ind)	%	93.5/93.5/92/89		94/94/92.5/90		94.5/94.5/93/91
100%/75%/50%/25% Linear Load (cosφ=1)	%	93/93/91.5/88.5		93.5/93.5/92/89.5		94/94/92/90
100%/75%/50%/25% non-Linear Load	%	92/92/91/88		93/93/91.5/89		93/93/91/90
Heat Dissipation 100% Load (cos φ =0.8ind)	W	380	500	550	700	800
Heat Dissipation 100% Resistive (cos φ =1)	W	400	550	600	750	960
Heat Dissipation 100% non-linear load	W	460	600	650	800	1120
Necessary Cooling Air (25° - 30°C)	m^3/h	110	110	110	150	200
Audible Noise with 100% Load	dBA	50	50	50	53	53
Audible Noise with 50% Load	dBA	47	47	47	49	49
Ambient Temperature for UPS	°C	0 - 40				
Ambient Temperature for Batteries (recommended)	°C	20				
Battery Storage Time at Ambient Temperature		Max. 6 months				
Relative Air-humidity		Max. 95% (non-condensing)				
Cooling		Fan-assisted				
Standards Safety Electromagnetic Compatibility Performance		EN 62040 - Part 1 (IEC 62040-1, IEC 60950) EN 62040 - Part 2 (IEC 62040 -2) EN 620040 - Part 3 (IEC 62040 -3)				
Transportation Pallet		Provided with UPS				
Accessibility		Rear/side access for Cabinet A, front/side access for Cabinet B-C				
Positioning		Min. 200cm rear space (required for ventilation)				
Input and Output Power Cabling		From bottom rear (Cabinet A) and bottom front (Cabinets B and C)				
Dry Port (Volt-free contacts)		For remote signalling and automatic computer shutdown				
Smart Port (RS 232)		For monitoring and integration in network management				

8.2 Rectifier Data

	kVA	7.5	10	12	15	20
Input Voltage 7.5 -12kVA (1 in 1 out)	V	1x220V+N, 1x230V+N, 1x240V+N			N/A	
Input Voltage 7.5, 10, 15 and 20kVA (3 in 1 out)	V	3x380/220V+N, 3x400V/230V+N, 3x415/240V+N				
Input Voltage Window ref 400V/230V	V (%) V (%) V (%)	< 100% load (-23%,+15%) < 80% load (-30%,+15%) < 60% load (-40%,+15%)				
Input Frequency	Hz	35 - 70				
Input Power Factor		Models with single-phase input: 0.98 (at 100% Load) Models with three-phase input: 0.95 (at 100% Load), 0.98 (optional)				
Input Current Form		Models with single-phase input THDi < 7-9% at 100% load Models with three-phase input THDi < 25% at 100% load; THDi < 7-9% (optional)				
Inrush Current		Limited by soft start				
Input Power with charged battery and rated output power	kW	5.6	7.4	9.4	11.1	14.8
Max. Input Power with battery charge and rated output power	kW	6.1	8.1	10.3	12.1	16.2

8.3 Battery Data

	kVA	7.5	10	12	15	20
Maximum Battery Charger Current (standard)		6A				
Battery Charging Curve		IU (DIN 41773)				
Temperature Controlled Battery Charger		No				
Battery Charger Ripple		<1%				
Battery Test		Automatic and periodic (adjustable)				
Battery Type		Lead-acid, Maintenance-free and NiCd				
Variable Number of 12V Battery Blocks		22-50	26-50	30-50	32-50	

8.4 Inverter Data

		7.5	10	12	15	20
Output Rated Power	KVA	7.5	10	12	15	20
Output Rated Voltage	V	1x220V, 1x230V, 1x240V				
Output Power Factor		0.7				
Output Voltage Stability						
Static Load Jump (0-100%, 100-0%)	%	< +/- 1 < +/- 4				
Output Voltage Distortion						
Distortion With Linear Load Distortion With Non-linear Load	%	+ / - 1 < +/- 3 (according to EN 50091-1)				
Output waveform		sinewave				
Output Frequency	Hz	50 or 60				
Output Frequency Tolerance						
Free-running, Quartz Oscillator Synchronized with mains (adjustable)	%	+ / - 0.1 + / - 4				
Overload Capability	%	125 during 10min. and 150 during 1 min.				
Crest Factor		3 : 1				

8.5 Communication Options

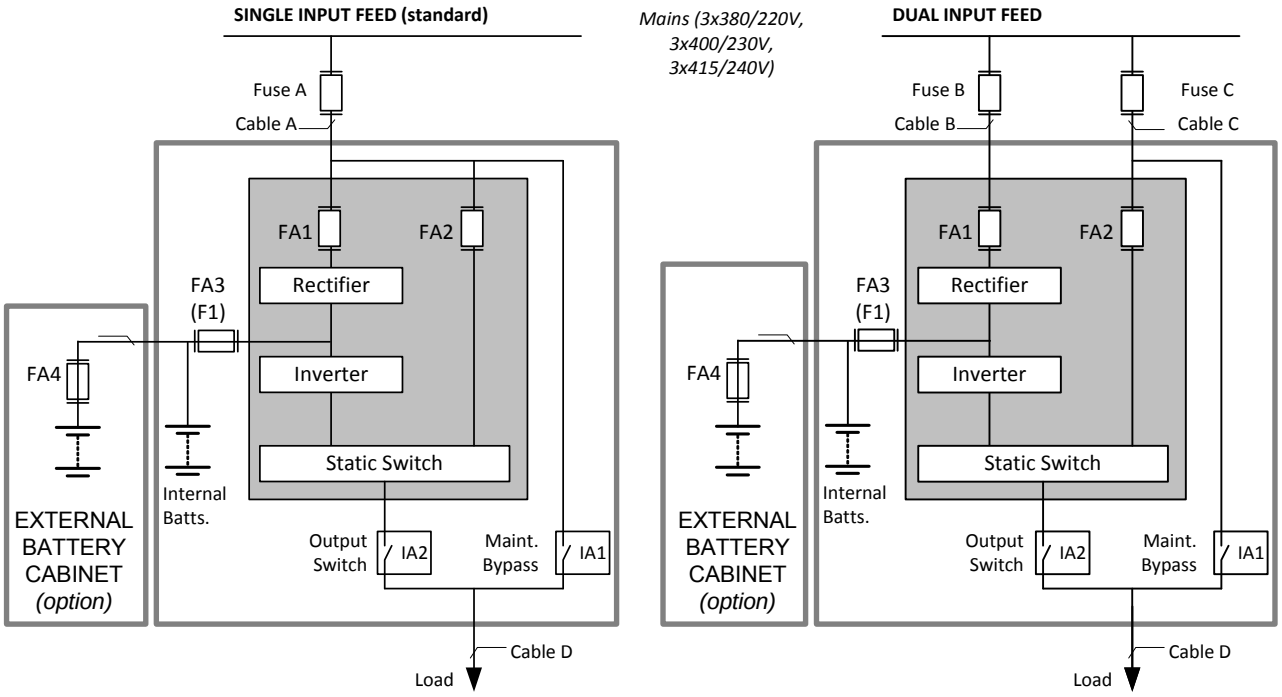
	All Modules
Power Management Display (PMD)	LCD display
RS232 on Sub-D9 port	For monitoring and integration in network management
Customer Interfaces: Inputs (DRY PORTS)	• 1 Remote Shut down [EMERGENCY OFF (Normally closed)] • 1 GEN-ON (Normally open) • 1 12Vdc source (max. 250mA)
RJ45 port	For multidrop purpose (optional)
Relay card +USB Including: Customer Interfaces: Outputs (DRY PORTS)	• Common Alarm • Load on Bypass • Battery Low • Load on Inverter • Mains Failure
RS232 on USB Port	For remote signalling and automatic computer shutdown
SNMP Card (slot already included)	For monitoring and integration in network management

8.6 Mechanical

	kVA	7.5	10	12	15	20
Dimensions (WxHxD)	mm	Cabinet A: 340x820x800 Footprint 0.27m^2				N/A
		Cabinet B: 450x1250x860 Footprint 0.39m^2				
		Cabinet C: 550x1650x890 Footprint 0.49m^2				
Protection Degree		IP20				
Ventilation		Fan Assisted				
Colour		RAL 9011				

8.7 Fuses & Cables Quick Reference

External supply fuse and cable rating



Power (kVA)	SINGLE INPUT FEED			DUAL INPUT FEED				
	Fuse A	Cable A	Cable D	Fuse B	Cable B	Fuse C	Cable C	Cable D
Single phase input								
7.5	1 x 40	3 x 6.0	3 x 6.0	1 x 40	3 x 6.0	1 x 40	3 x 6.0	3 x 6.0
10	1 x 63	3 x 10	3 x 10	1 x 63	3 x 10	1 x 63	3 x 10	3 x 10
12	1 x 63	3 x 10	3 x 10	1 x 63	3 x 10	1 x 80	3 x 16	3 x 16
3 Phase input								
7.5	3 x 40	5 x 6.0	3 x 6.0	3 x 25	5 x 2.5	1 x 40	3 x 6.0	3 x 6.0
10	3 x 63	5 x 10	3 x 10	3 x 25	5 x 2.5	1 x 63	3 x 10	3 x 10
15	3 x 80	5 x 16	3 x 16	3 x 40	5 x 6.0	1 x 80	3 x 16	3 x 16
20	3 x 100	5 x 25	3 x 25	3 x 40	5 x 6.0	1 x 100	3 x 25	3 x 25

1. Fuse and Cable recommendations to IEC 60950-1:2001
2. The fuse and cable rating details in the above tables are a recommendation only.
3. The UPS must be installed to prescribed IEC or local regulations (e.g. BS7671:2008).
4. External DC Cables and Battery fuses are bespoke to the installation.