

# **UNINTERRUPTIBLE POWER SUPPLY UPS 24 VDC**

## **User's Manual**

Version: **4.8 (November 2002)**

Mod. No.: **MAUSV1-E**

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# Chapter 1 • General Information

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## 1. Safety Guidelines

### 1.1 Introduction

Programmable logic controllers (e.g. PLCs, etc.), operating and monitoring devices (e.g. Industrial PCs, Power Panels, Mobile Panels, etc.) as well as the B&R uninterruptible power supplies have been designed, developed or manufactured for conventional use in industry. They were not designed, developed and manufactured for any use involving serious risks or hazards that without the implementation of exceptionally stringent safety precautions could lead to death, injury, serious physical damage or loss of any other kind. Such risks and hazards include in particular the use of these devices in the monitoring of nuclear reactions in nuclear power plants and of flight control systems, in flight safety, in the control of mass transportation systems, in medical life support systems, and in the control of weapons systems.

Both when using programmable logic controllers and when using operating and monitoring devices as control systems in conjunction with a Soft PLC (e.g. B&R Automation Runtime or comparable products) or a Slot PLC (e.g. B&R LS251 or comparable products), the safety precautions applying to industrial control systems (e.g. the provision of safety devices such as emergency stop circuits, etc.) in accordance with applicable national and international regulations must be observed.

All tasks such as installation, commissioning and service may only be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, mounting, installation, commissioning and operation of the product and have the appropriate qualifications (e.g. IEC 60364). National accident prevention guidelines must be followed.

The safety guidelines, connection descriptions (rating plate and documentation) and limit values listed in the technical data must be read carefully before installation and commissioning and must be observed.

### 1.2 Intended Use

Electronic devices are generally not fail-safe. In the event of a failure on the programmable control system, operating or monitoring device or uninterruptible power supply, the user is responsible for ensuring that other devices that may be connected, such as motors, are made safe.

## **1.3 Transport and Storage**

During transport and storage, the devices must be protected from excessive stress (mechanical load, temperature, humidity, aggressive atmosphere).

## **1.4 Installation**

- The installation must take place according to the documentation using suitable equipment.
- The devices may only be installed when isolated from the power supply and by qualified personnel.
- General safety regulations and nationally applicable accident prevention guidelines must be observed.
- Electrical installation must be carried out according to the relevant guidelines (e.g. line cross section, fuse, protective ground connection).

## **1.5 Operation**

### **1.5.1 Protection against Touching Electrical Parts**

To operate programmable logic controllers, operating and monitoring devices and uninterruptible power supplies, certain components must carry dangerous voltage levels of over 42 VDC. A life-threatening electrical shock could occur if you touch these parts. This could result in death, severe injury or material damage.

Before turning on the programmable logic controller, the operational and monitoring devices and the uninterruptible power supply, ensure that the housing is properly connected to protective ground (PE rail). The ground connection must be established even when testing the operating and monitoring devices and the uninterruptible power supply as well as when operating them for only a short time.

Before turning the device on, make sure that all voltage carrying parts are securely covered. During operation, all covers must remain closed.

## 2. Safety Notices

Safety notices are organized as follows:




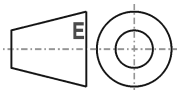
Safety Notice	Description
	Disregarding the safety regulations and guidelines can result in death or severe damage to the product.
	Disregarding the safety regulations and guidelines can result in severe injury or heavy damage to material or the product.
	Disregarding the safety regulations and guidelines can result in injury or damage to material and the product.

Table 1: Safety notices



All dimension diagrams (e.g. dimension diagrams, etc.) are drawn according to European dimension standards.

## 3. Manual History

Version	Date	Comments
4.8	23.09.2002	<p>Changes / New Features</p> <ul style="list-style-type: none"> <li>- Error in Figure 7 "Dimensions of UPS battery unit type B (24V 2.2 Ah)" - Dimensions for the distance between mounting holes corrected</li> <li>- Maximum cable length (15m) for self made RS232 connection cables added</li> <li>- 9A0100.16 UPS battery unit type C 24 V 4.5 Ah added</li> <li>- 9A0100.17 UPS batteries 2 pcs. 12 V 4.5 Ah added</li> <li>- Safety guidelines added</li> <li>- Description of new commands starting with UPS firmware version 2.0</li> <li>- B&amp;R UPS configuration software functions added starting with version 2.0</li> <li>- Section "Monitoring using Windows XP with Operating System UPS Service" on page 55 added</li> <li>- "UPS Command Sequences" on page 86 added</li> <li>- "UPS Overload Behavior" on page 70 added</li> <li>- Description of new UPS configuration software functions</li> <li>- Switching thresholds added</li> </ul>

Table 2: Manual history

## General Information • Manual History

Version	Date	Comments
4.7	03.10.2001	Changes / New Features <ul style="list-style-type: none"><li>- New manual structure</li><li>- B&amp;R UPS configuration software added</li><li>- Mistake regarding the possible storage/operating position for the lead gel rechargeable battery corrected</li><li>- New layout</li></ul>
4.6	19.04.2001	Changes / New Features <ul style="list-style-type: none"><li>- Mistake in the cable description corrected</li><li>- Mistake regarding the hand shake signal line corrected</li></ul>
4.5	29.09.2000	Changes / New Features
4.4	07.09.2000	Changes / New Features <ul style="list-style-type: none"><li>- New layout</li></ul>
4.3	18.08.2000	First Edition

Table 2: Manual history (cont.)



## Chapter 2 • B&R UPS 24 VDC

The UPS is used to supply power for systems which cannot be connected directly to the 24 V power mains for safety reasons because a power failure could cause data to be lost. The UPS allows the load (e.g. IPCs) to be shut down securely without losing data if a power failure occurs.



Figure 1: UPS device 9A0100.11

### Features:

- 24 VDC input voltage
- 24 VDC output voltage
- Industrial standard installation
- Communication via serial interface
- Status display
- Deep discharge protection
- Short circuit protection
- Maintenance free rechargeable batteries

## 1. Model Numbers

Model Number	Description	Remark
9A0017.01	<b>RS232 Null Modem Cable 0.6 m</b> To connect UPS and IPC (9 pin DSUB socket - 9 pin DSUB socket)	
9A0017.02	<b>RS232 Null Modem Cable 1.8 m</b> To connect UPS and IPC (9 pin DSUB socket - 9 pin DSUB socket)	
9A0100.11	<b>UPS 24 VDC</b> 24 VDC input, 24 VDC input, serial interface	
9A0100.12	<b>UPS Battery Unit Type A</b> 24 V; 7 Ah; including battery cage	
9A0100.13	<b>UPS Battery Unit Type A</b> 2 x 12 V; 7 Ah; for battery unit 9A0100.12	replacement part
9A0100.14	<b>UPS Battery Unit Type B</b> 24 V; 2.2 Ah; including battery cage	
9A0100.15	<b>UPS Battery Unit Type B</b> 2 x 12 V; 2.2 Ah; for battery unit 9A0100.14	replacement part
9A0100.16	<b>UPS Battery Unit, Type C 24V 4.5Ah</b> 24 V; 4.5 Ah; including battery cage	
9A0100.17	<b>UPS Battery Unit, Type C 24V 4.5Ah</b> 2 x 12 V; 4.5 Ah; for battery unit 9A0100.16	replacement part
MAUSV1-0	<b>UPS User Documentation, German</b>	
MAUSV1-E	<b>UPS User Documentation, English</b>	
MAUSV1-F	<b>UPS User Documentation, French</b>	

Table 3: Model numbers

## 2. Technical Data

### 2.1 USV 24 VDC 9A0100.11

Product ID	UPS 24 VDC
Model Number	9A0100.11
Input during Mains Operation Rated voltage value Voltage range	Regulated DC voltage 24 VDC 20 - 30 VDC at a switching threshold of 18 V <sup>1)</sup> 23.5 - 30 VDC at a switching threshold of 21.5 V <sup>1)</sup>
Output during Mains Operation Rated voltage value Voltage range Max. output current	24 VDC 20 - 30 VDC or 23.5 - 30 VDC according to the set switching threshold <sup>1)</sup> 8 A
Output during Battery Operation Switching threshold mains/battery operation <sup>1)</sup> Rated voltage value Voltage range Max. output current Mains failure bridging	18 V at 20 - 30 VDC input 21.5 V at 23.5 - 30 VDC input 24 VDC 21 - 26.8 VDC (40° C) or 28.2 VDC (0° C) 8 A (load) max. 20 minutes with 150 W load (with battery 9A0100.12, 24 V / 7.2 Ah)
Battery Charging Rating Charging clearing voltage Charging current	27.6 VDC From 0.88 A to 2.88 A depending on type adjustable in 0.01 A increments: using B&R UPS configuration software and HyperTerminal (0.5 - 2.88 A) or 0.25 A: using button (0.88 to 2.88 A)
Protection and Monitoring Deep discharge protection Short circuit protection Fuses Reverse polarity protection	Yes; depending on the set switching threshold: 21 V when 18 V <sup>1)</sup> or 21.5 V when 21.5 V <sup>1)</sup> Yes Yes; for mains supply, battery and battery charger Yes; for mains supply and battery
Status Display Operating mode Status Battery charging current Battery status Battery reverse polarity Fuses	LED green (mains operation, battery operation, etc.) LED yellow (overload, temperature alarm, etc.) LED yellow (charging current strength) LED yellow (battery change, age, etc.) LED red (battery reverse polarity, not connected) LED red (mains supply, battery, battery charger)
Interface CTS (Clear To Send) DCD (Data Carrier Detect) DTR (Data Terminal Ready)	Serial, RS232 Signals power failure Signals shutdown Signals remote shutdown of the UPS
Software Support	Microsoft Windows 95 / 98 / ME / NT4.0 / 2000 / XP
Standards	UL
Environmental Temperature	0 - 55 °C
Relative Humidity	5 - 95 %, (non-condensing)
Dimensions (W x H x D)	185 x 115 x 69 mm
Weight	Approx. 1.1 kg

Table 4: Technical data UPS 24VDC 9A0100.11

<sup>1)</sup> Can be set using B&R configuration software or HyperTerminal (18 or 21.5 VDC)

## 2.2 Battery Units and Accessories

Product ID	UPS Battery Unit Type A (24V 7.2 Ah)
Model Number	9A0100.12
Batteries	UPS batteries; 2 pcs., 12V; 7.2 Ah (9A0100.13)
Connection Cable For charger For temperature sensor	Length 3 m; cross section 2.5 mm <sup>2</sup> Length 3 m; cross section 0.75 mm <sup>2</sup>
Dimensions (W x H x D)	200 x 155 x 125 mm
Weight	Approx. 6.1 kg
Product ID	UPS batteries; 2 pcs., 12V; 7.2 Ah
Model Number	9A0100.13
Type	Panasonic 12V 7.2 Ah; two rechargeable batteries connected in series
Sort	Maintenance free lead acid battery
Installation	Mounting methods see "The Lead Acid Battery" on page 79
Environmental Temperature	0 - 40 °C
Lifespan	1.5 - 10 years (dependent on environmental temperature and the charging and discharging cycles)

Product ID	UPS Battery Unit Type B (24V 2.2 Ah)
Model Number	9A0100.14
Batteries	UPS batteries; 2 pcs., 12V; 2.2 Ah (9A0100.15)
Connection Cable For charger For temperature sensor	Length 3 m; cross section 2.5 mm <sup>2</sup> Length 3 m; cross section 0.75 mm <sup>2</sup>
Dimensions (W x H x D)	180 x 120 x 80 mm
Weight	Approx. 2.3 kg
Product ID	UPS batteries; 2 pcs., 12V; 2.2 Ah
Model Number	9A0100.15
Type	Panasonic 12V 2.2 Ah; two rechargeable batteries connected in series
Sort	Maintenance free lead acid battery
Installation	Mounting methods see "The Lead Acid Battery" on page 79
Environmental Temperature	0 - 40 °C
Lifespan	1.5 - 10 years (dependent on environmental temperature and the charging and discharging cycles)

Table 5: Technical data for battery units and accessories

<b>Product ID</b>	<b>UPS Battery Unit Type C (24V 4.5 Ah)</b>
Model Number	9A0100.16
Batteries	UPS batteries; 2 pcs., 12V; 4.5 Ah (9A0100.17)
Dimensions (W x H x D)	223.2 x 145 x 78.2 mm
Weight	Approx. 5 kg
<b>Product ID</b>	<b>UPS batteries; 2 pcs., 12V; 4.5 Ah</b>
Model Number	9A0100.17
Type	Hawker Cyclon 12V 4.5 Ah; two rechargeable batteries connected in series
Sort	Single cell
Installation	Mounting methods see "Hawker Cyclon Rechargeable Batteries" on page 79
Charging Environment Temperature	-40 °C to +80 °C
Storage Temperature	-65 °C to +80 °C
Lifespan	10 -15 years (dependent on environmental temperature and the charging and discharging cycles)

<b>Product ID</b>	<b>RS232 DB9 null modem cable 0.6 m</b>
Model Number	9A0017.01
Pin Assignment	See Table 12 "Pin assignment RS232 cable"
<b>Product ID</b>	<b>RS232 DB9 null modem cable 1.8 m</b>
Model Number	9A0017.02
Pin Assignment	See Table 12 "Pin assignment RS232 cable"

Table 5: Technical data for battery units and accessories (cont.)

### 3. Figures / Dimensions

#### 3.1 UPS 24 VDC

Product ID	UPS 24 VDC
Model Number	9A0100.11

Table 6: Order data for UPS 24 VDC

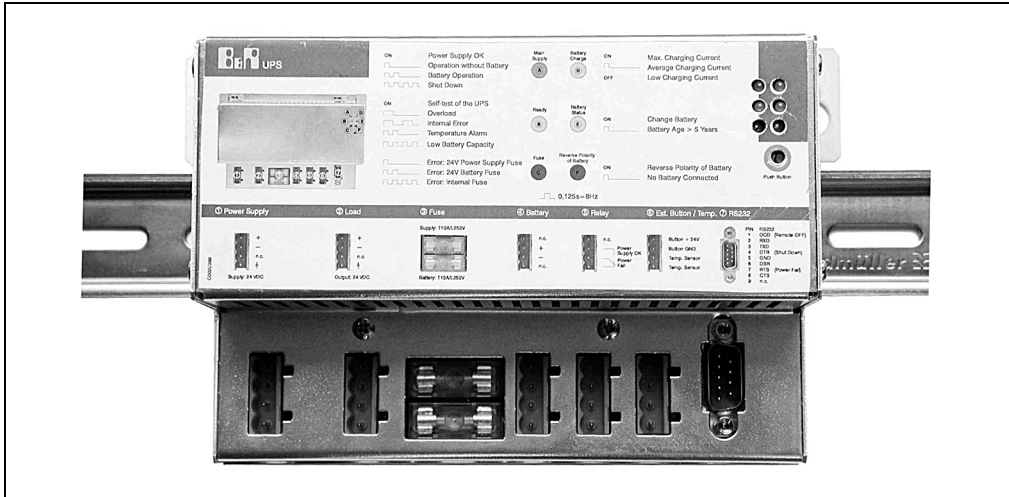


Figure 2: UPS on mounting rail

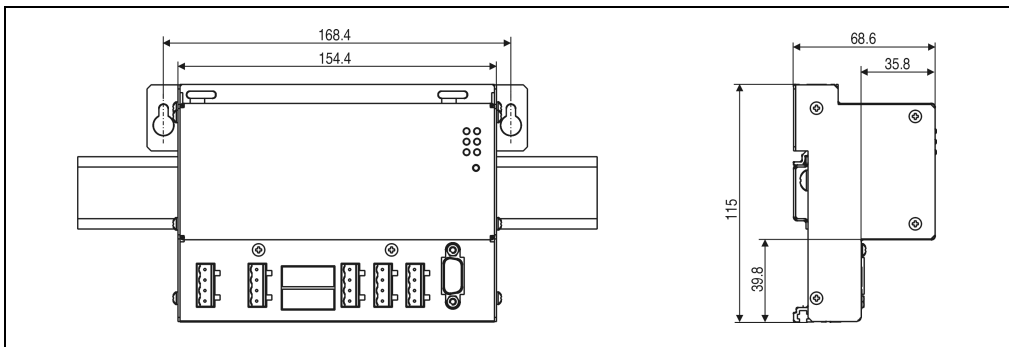


Figure 3: Dimensions of UPS 24 VDC

3.2 UPS Battery Unit Type A (24V 7.2 Ah)

Product ID	UPS Battery Unit Type A (24V 7.2 Ah)
Model Number	9A0100.12

Table 7: Order data for UPS battery unit type A (24V / 7.2 Ah)

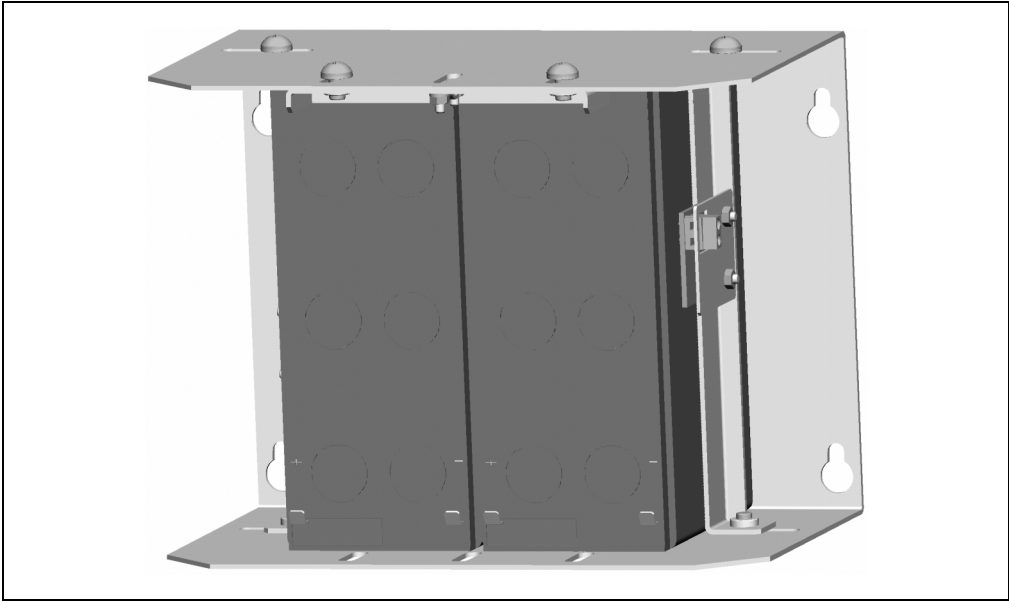


Figure 4: UPS battery unit type A (24V 7.2 Ah)

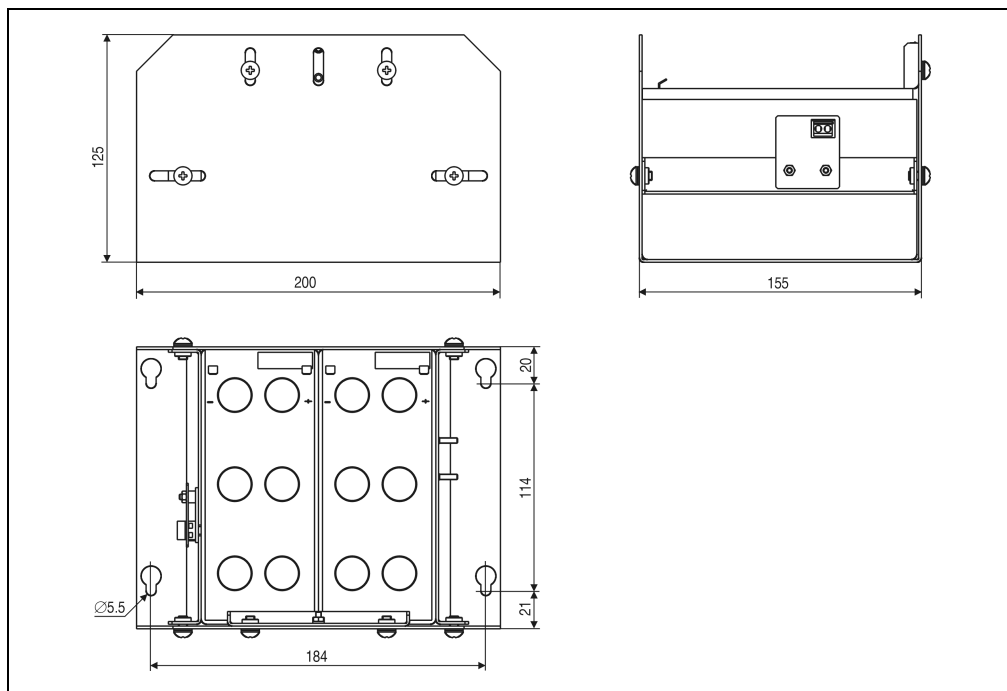


Figure 5: Dimensions of UPS battery unit type A (24V 7.2 Ah)



3.3 UPS Battery Unit Type B (24V 2.2 Ah)

Product ID	UPS Battery Unit Type B (24V 2.2 Ah)
Model Number	9A0100.14

Table 8: Order data for UPS battery unit type B (24V 2.2 Ah)

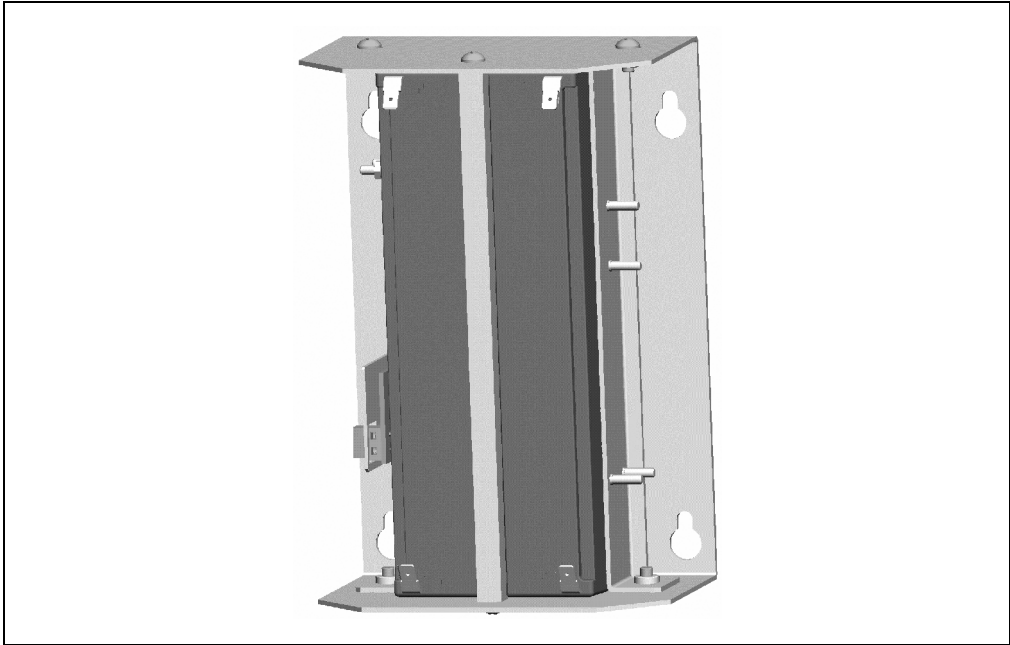


Figure 6: UPS battery unit type B (24V 2.2 Ah)

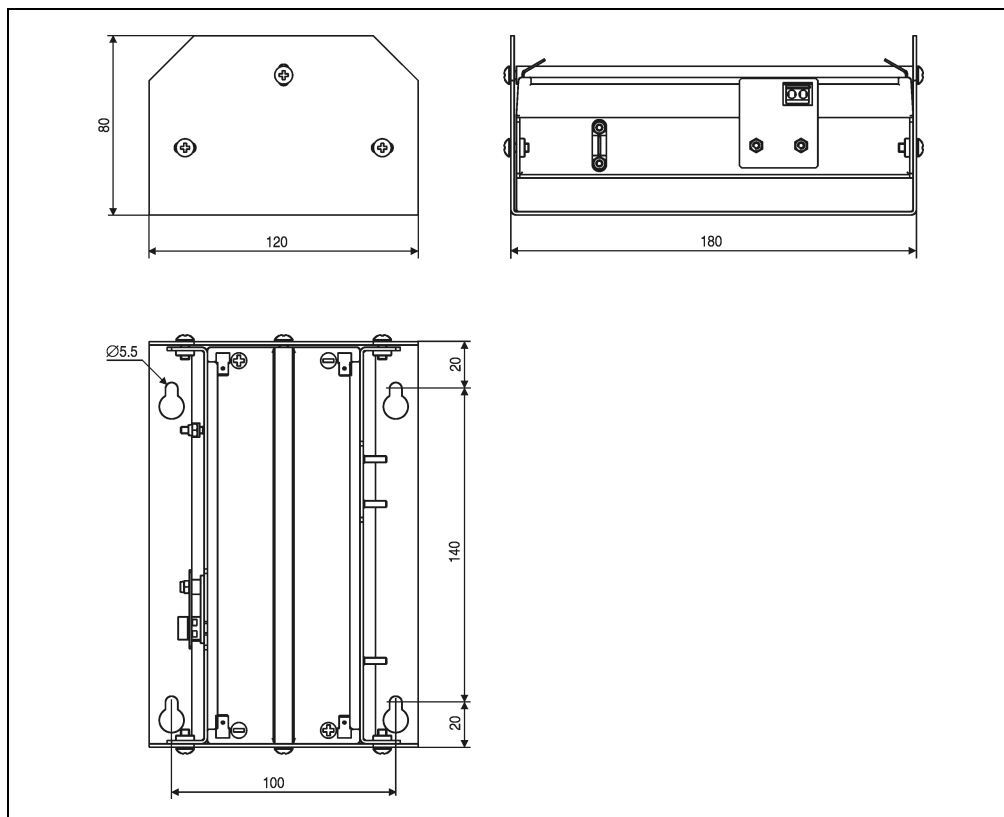


Figure 7: Dimensions of UPS battery unit type B (24V 2.2 Ah)

3.4 UPS Battery Unit Type C (24V 4.5 Ah)

Product ID	UPS Battery Unit Type C (24V 4.5 Ah)
Model Number	9A0100.16

Table 9: Order data for UPS battery unit type C (24V 4.5 Ah)

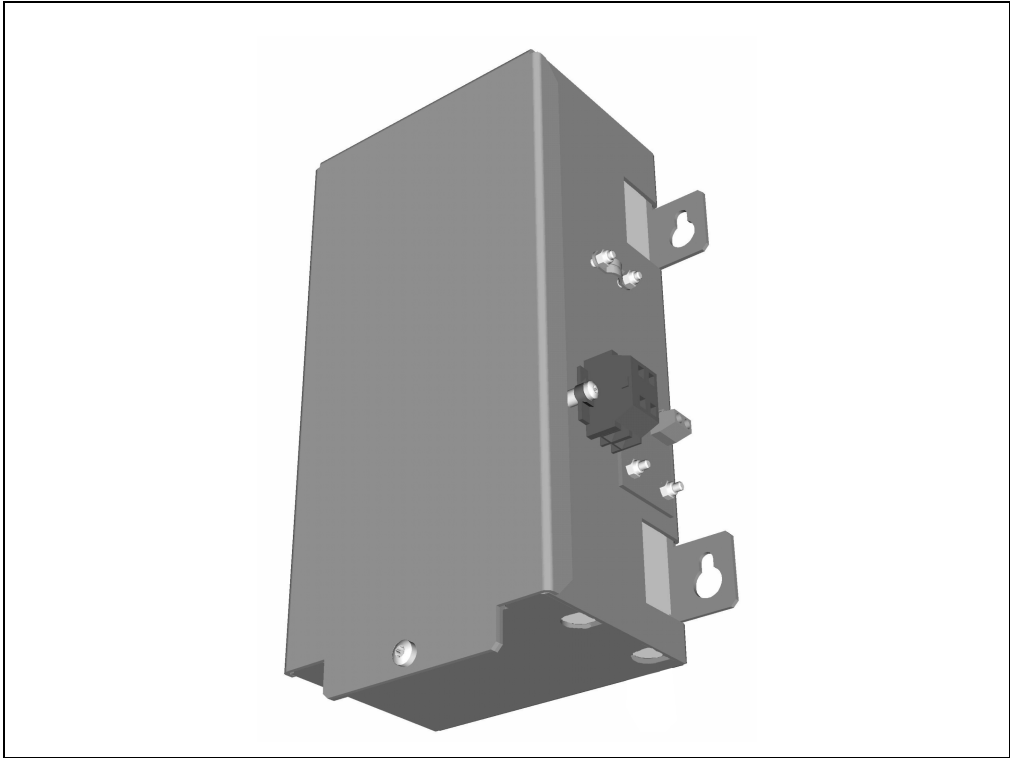


Figure 8: UPS battery unit type C (24V 4.5 Ah)

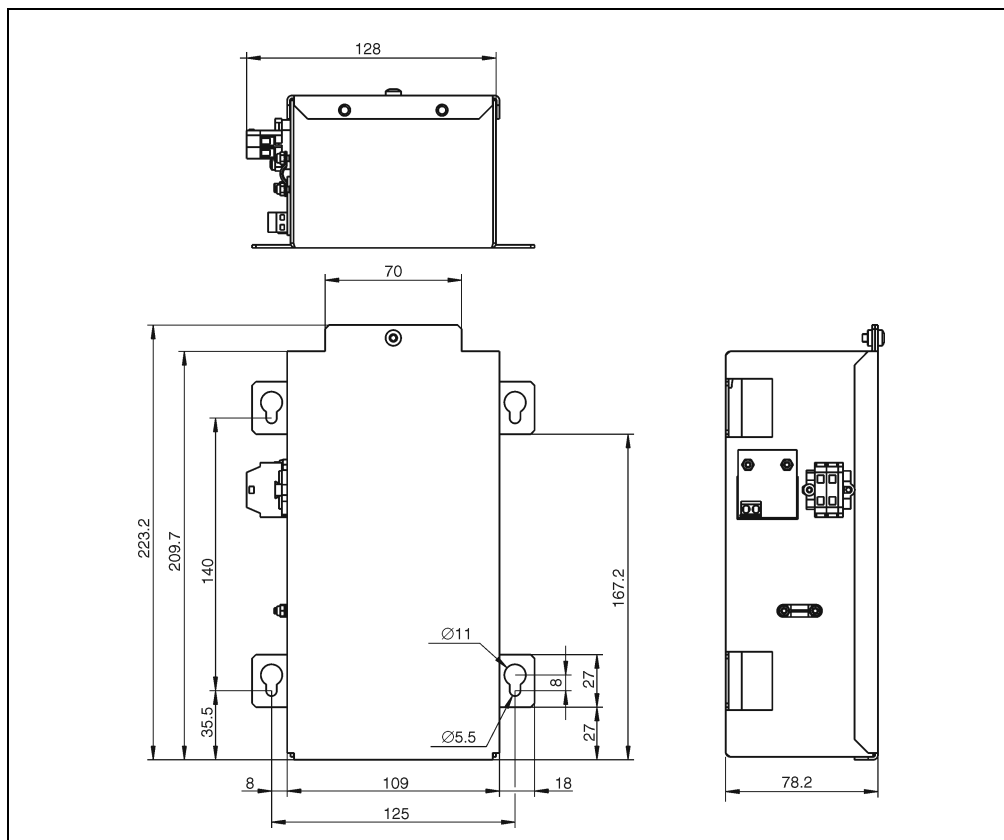


Figure 9: Dimensions of UPS battery unit type C (24V 4.5 Ah)

### 3.5 Mounting the UPS Device

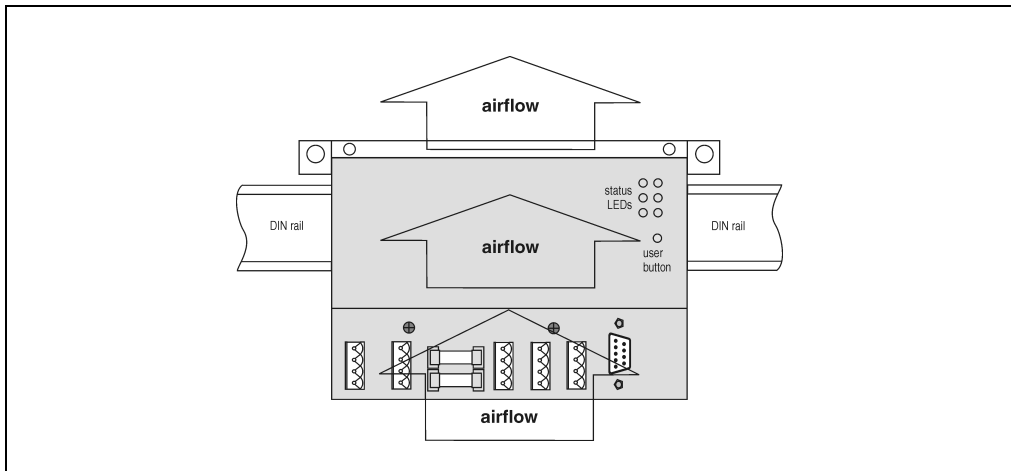
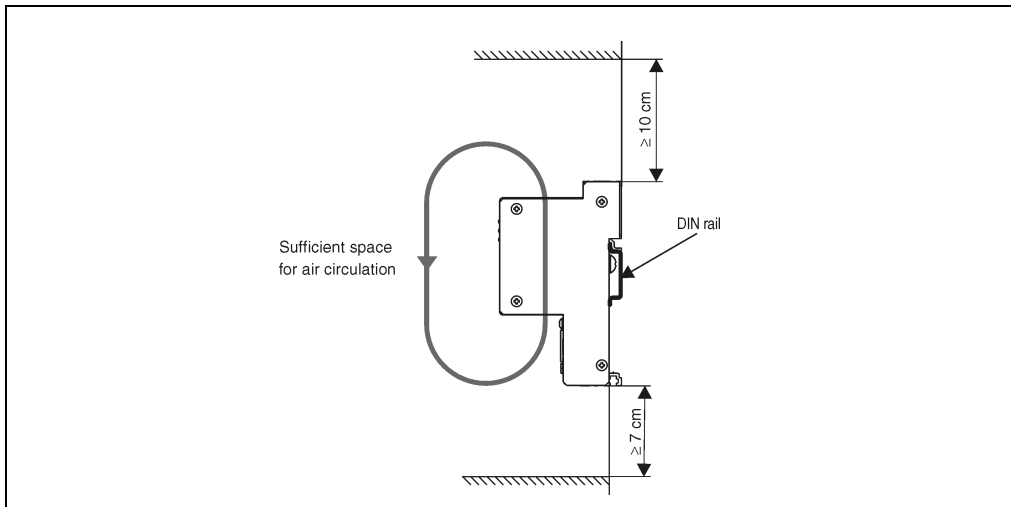


Figure 10: Mounting the UPS 24 VDC

The UPS can only be installed horizontally, e.g., on mounting rail (see Figure 2 "UPS on mounting rail").

There must be at least 10 cm free space above the UPS and at least 7 cm underneath. Do not cover the cooling slots. Air must flow naturally between the bottom (connections) and the top (vents).



Information for mounting the rechargeable batteries can be found in "Mounting Instructions for Rechargeable Batteries" on page 79.

## 4. Overview of Components

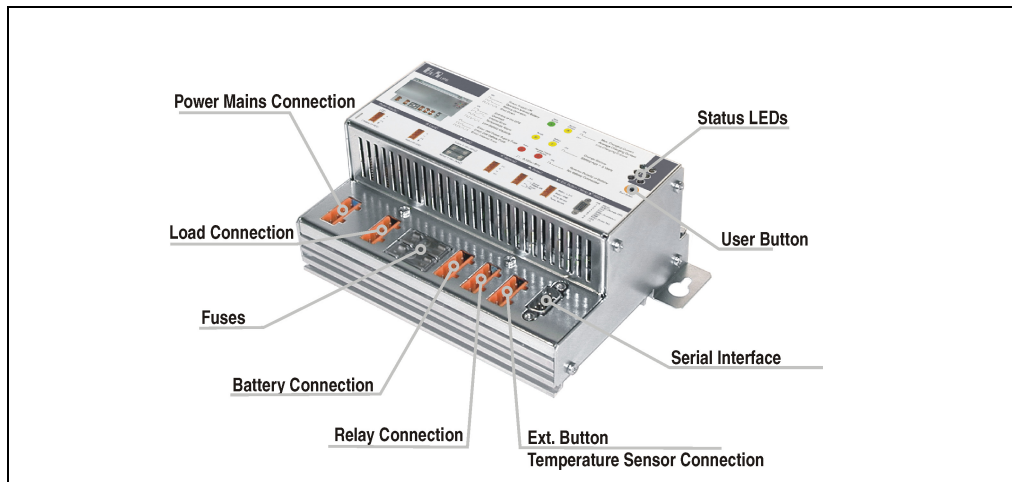


Figure 11: UPS connections

The mains supply, load, relay output, and temperature sensor are connected via Phoenix BL4 connectors. The connectors are included in delivery of the UPS.

### 4.1 Component Descriptions

#### 4.1.1 Power Mains Connection

24 V mains supply connection. Regulated DC voltage, rated voltage value 24 VDC, voltage range according to the set switching threshold when 18 V 20-30 VDC and when 21.5 V 23.5 - 30 VDC:

Power Mains Connection		
Pin	Assignment	
+	Input VDC +	
-	Input VDC -	
n.c.	Not connected	
↓	Ground connection	

Table 10: Power mains connection

Correct pin assignments are also indicated on the UPS.



Applying power over 30 VDC can damage the UPS! The UPS must be grounded using the ground connection provided.

### 4.1.2 Load Connection

Load connection (IPC with 24 VDC power supply).


Power Mains Connection		
Pin	Assignment	
+	Output VDC +	
-	Output VDC -	
n.c.	Not connected	
↓	Ground connection	

Table 11: Load connection

Correct pin assignments are also indicated on the UPS.



The UPS must be connected with the load ground connection, using the ground connection provided.

**For mains operation:** Rated voltage value 24 VDC, voltage range is dependent on the set switching threshold <sup>1)</sup> 18V: 20 - 30 VDC, 21.5V: 23.5 - 30 VDC; maximum output current: 8 A

**For battery operation:** Rated voltage value 24 VDC, voltage range 21 - 26.8 VDC (40 °C) or 28.2 VDC (0 °C); maximum output current: 8 A

### 4.1.3 Fuses

The two replaceable fuses on the front side of the device protect the power mains input and the battery connection from over-current, reverse polarity (using a diode which is controlled by the firmware to make a connection when the polarity is correct) and short circuits (using a fuse and firmware).

Type: Glass tube fuses 5 x 20 mm: T 10A / 250 V



Before changing a fuse, the power supply and battery must be disconnected.


Fuses		
Power Mains	10 A / 250 V	
Battery	10 A / 250 V	

Table 12: Fuses

<sup>1)</sup> Can be set using B&R configuration software or HyperTerminal (18 or 21.5 VDC)

#### 4.1.4 Battery Connection

The rechargeable batteries are connected using the cable included in delivery. The red and black leads are to be used for this.


Battery Connection		
Pin	Assignment	
n.c.	Not connected	
+	Battery +	
-	Battery -	
n.c.	Not connected	

Table 13: Battery connection

Correct pin assignments are also indicated on the UPS.



Only batteries provided by B&R are to be used!

Disconnecting the battery and reconnecting it with reversed polarity within one minute can damage the UPS!

#### 4.1.5 Relay Output

Setting a relay output, amongst other things, causes the UPS to signal a power failure. An external electrical circuit can be switched (closed or open) using the relay output.

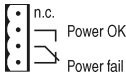


Relay Output		
Pin	Assignment	
n.c.	Not connected	
 Power OK  Power fail	Relay output	

Table 14: Relay output

For relay output contact data, see "Relay Output" on page 76.



#### 4.1.6 External Button, Temperature Sensor Connection

The temperature sensor for the rechargeable battery is connected using the cable supplied. Both of the white leads are to be used for this.


External Button, Temperature Sensor Connection		
Pin	Assignment	
Button +	Positive edge input	
Button -	Negative edge input	
Temp.	Temperature sensor	
Temp.	Temperature sensor	

Table 15: External button, temperature sensor connection

See "User Button and External Button (Digital Input)" on page 70 for connecting an external button.

#### 4.1.7 RS232 Interface

The UPS communicates with the load system (IPC) via the serial interface.

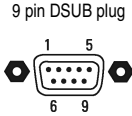
RS232 Interface		
Pin	Assignment	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	n.c.	

Table 16: RS232 interface

The 7 pin null modem cable required for this must have two 9 pin DSUB sockets (female). The appropriate cable can be ordered directly from B&R under the model number 9A0017.01 (length = 0.6m) and 9A0017.02 (length = 1.8m).

The cable can also be made. A self made cable can have a maximum length of 15 meters. The pins must be connected as follows:

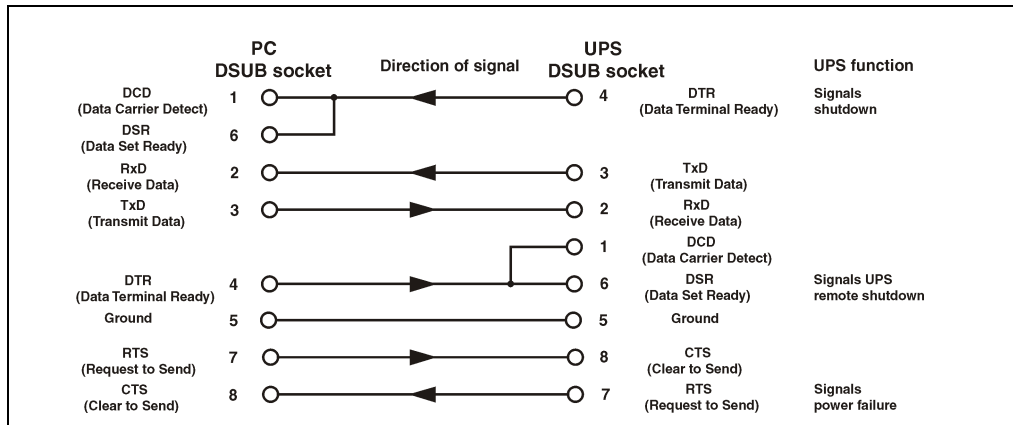


Figure 12: Pin assignment RS232 cable

### 4.1.8 User Button

For possible uses of the user button, see "User Button and External Button (Digital Input)" on page 70.

### 4.1.9 Status LEDs

The UPS has six status LEDs that show the operating state, indicate any faults or display information about the rechargeable batteries. The LEDs are also used to manually set the charging current for the rechargeable battery via the user button (see "Setting the Maximum Charging Current" on page 81). Each LED can display several different types of information based on flashing sequence:

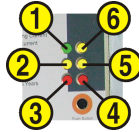


Figure 13: Status LEDs















Function	Color	LED Number	Flashing Sequence / Interval:  0.125 s = 8 Hz
Operating	Green	1	On Mains operation OK  Mains op. without battery  Battery operation  Shut down
Status	Yellow	2	On UPS self test  Overload  Internal error  Temperature alarm  Battery capacity too low
Fuses	Red	3	 Error: 24 V mains supply fuse or mains supply < 20 V or 23.5 V <sup>1)</sup> (dependent on the 18 V or 21.5 V switching threshold)  Error: 24 V battery fuse  Error: internal fuse
Battery reverse polarity	Red	4	On Reverse polarity  No battery connected
Battery status	Yellow	5	On Change battery (set battery lifespan exceeded)  Battery age > 5 or 10 years (depending on battery type)
Battery charging	Yellow	6	On Maximum charging current = Max. charging current  Mean charging current = 30 - 60 % of max. charging current Off Low charging current = 0 - 30 % of max. charging current

Table 17: LED status - flashing sequence and meaning

1) A reliable detection of a defective fuse is guaranteed only if the supply voltage is in the specified range according to the operating mode (switching threshold mains/battery).

## 5. UPS Installation

1. Unpack the UPS and the rechargeable battery pack.
2. Set up / install the B&R UPS 24 VDC (see "Mounting the UPS Device" on page 25). The UPS device should be mounted as close to the load system as possible to prevent voltage drops caused by long cables. It can be mounted on a mounting rail (TS35) using the profile on the back side.
3. Set up / install the B&R rechargeable battery unit (see "Mounting Instructions for Rechargeable Batteries" on page 79).
4. Connect the UPS to the load system using the null modem cable. A B&R null modem cable (Mod.No. 9A0017.01 and 9A0017.02) or a self made cable (see "RS232 Interface" on page 29) can be used.
5. Make the connection between the UPS load output and the load system input. This is done using the 4 pin plug included with the delivery and a cable provided by the customer with a  $2 \times 2.5 \text{ mm}^2$  cross section. Be sure to check the polarity when making the connection! The UPS must be connected with the load ground connection, using the ground connection provided.
6. The rechargeable battery must be connected to the UPS by connecting the cable to the 4 pin plug on the UPS: red and black leads (cable and plug are included with the delivery). Be sure to check the polarity when making the connection!
7. Connect the temperature sensor cable (white cable) to the 4 pin plug which is included with the delivery (external button / temp).
8. UPS connection to a 24 VDC power supply: The connection is made using the 4 pin plug included with the delivery and a cable provided by the customer with a  $2 \times 2.5 \text{ mm}^2$  cross section. Be sure to check the polarity when making the connection! The UPS must be grounded using the ground connection provided.
9. Install the B&R UPS configuration software on the load system (see Chapter 3 "Software").
10. Configure the UPS (see Chapter 3 "Software").
11. Enable monitoring (see Chapter 3 "Software").



The operating parameters should be checked and configured on the load system before the UPS is permanently connected to the load system. If this inspection is disregarded, Bernecker & Rainer shall not be liable for any loss of data even if the parameters have not been changed!

## Chapter 3 • Software

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### 1. Configuring the UPS using the B&R UPS Configuration Software

On operating systems Windows 95/98/ME/NT4.0/2000 and XP, the UPS parameters such as TWL, POT, LCS, SDT, etc., can be changed using this software. Proper shut down can also be guaranteed using these operating systems.

Before configuration can be started, the software must be installed and an operational UPS 24 VDC (9A0100.11) must be properly connected to the load system.

#### 1.1 Installation of the B&R UPS Configuration Software

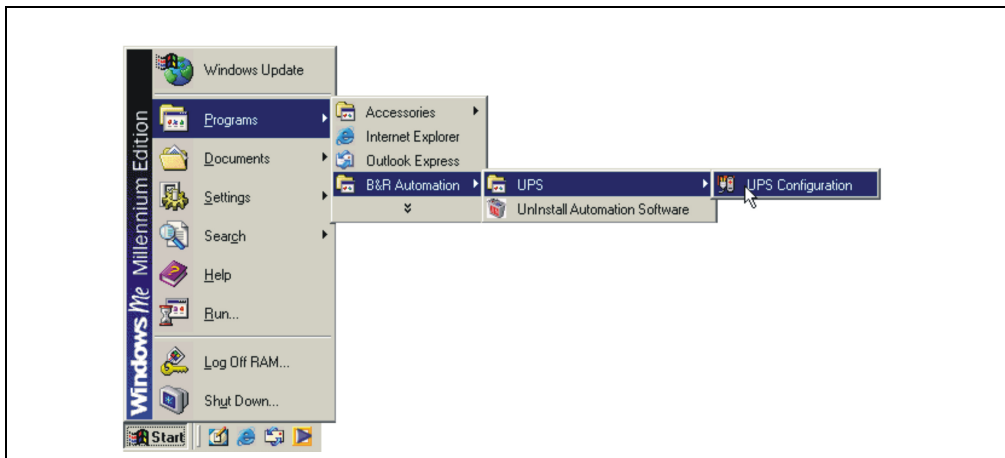
The B&R UPS Configuration Utility is found on the Provit Drivers & Utilities CD-ROM (Mod. No. 5S0000.01-090) starting with V1.40. Otherwise the software can be downloaded free of charge directly from the B&R homepage [www.br-automation.com](http://www.br-automation.com).

The B&R UPS Configuration Software setup consists of 3 diskette images packed in a ZIP file. After unzipping the files, "setup.exe" (in path Disk1) must be started and further instructions followed.

## 1.2 Starting the B&R UPS Configuration Software

After the **standard installation** (accepting the recommended menu entries and installation path) the B&R UPS Configuration Software is started as follows:

- Click on **Start**  and select **Programs**.
- Then select **B&R Automation / UPS** and click on the program **UPS Configuration**:



Once started, an icon is added to the system tray. The tray icon represents the operation mode as shown here below:




	09:20	Configuration Mode
	09:19	Monitoring Mode
	09:21	Connection Interrupted

Table 18: UPS - status indicator



If the monitoring mode is enabled, the UPS tool automatically starts with Windows.

The following menu is displayed by right clicking on the icon in the system tray.

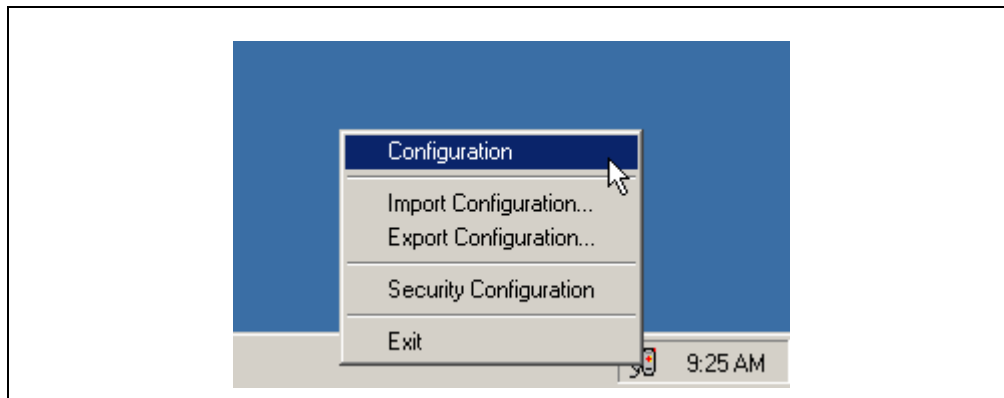


Figure 14: Tray menu selection

Selection	Meaning
Configuration	This selection opens the configuration screen, where the UPS parameters can be read / edited and transferred to the UPS.
Import Configuration...	A previously saved configuration file (containing all UPS parameters) can be selected here. The parameters saved in this file are entered and imported to the B&R UPS configuration tool, but not transferred to the UPS.
Export Configuration...	Using this selection, the current UPS configuration can be exported to a file.
Security Configuration	This function is first implemented in version 1.20 of the B&R UPS Configuration Software. For more information, see "Security Configuration / Menu Language" on page 49
Exit	This exits the B&R UPS Configuration Software. Exiting the software ends the service as well.

Table 19: Tray menu settings



Starting the configuration software (select "configuration") ends all previously enabled monitoring services (UPS services from Windows NT4.0 / 2000 / XP). The load system is not monitored during configuration. Monitoring is enabled again as soon as the configuration screen is closed ("OK" button).

### 1.3 Uninstalling the B&R UPS Configuration Software

The following procedure must be followed to remove the B&R UPS Configuration Software from the hard drive: Start the uninstall wizard.

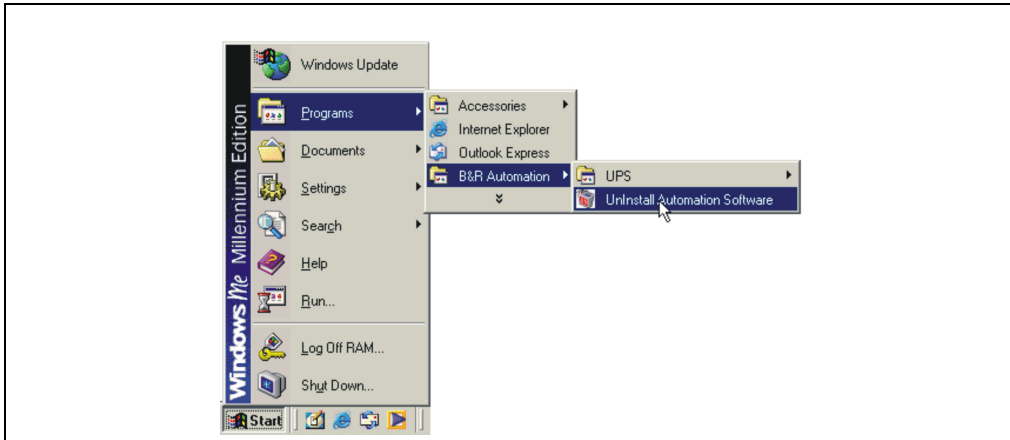


Figure 15: Uninstall

Once the uninstall wizard has been started, all installed B&R software is displayed: The programs to be removed can now be selected from the following dialog box. If the B&R UPS Configuration Software is the only program installed, then it is the only one which can be selected.

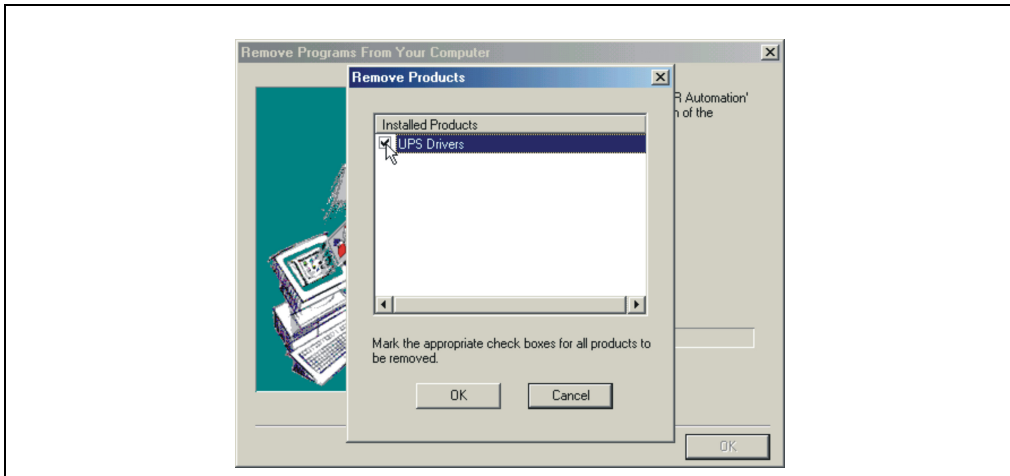


Figure 16: Uninstall wizard selection

The software is then removed by clicking "OK".



## 1.4 B&R UPS Configuration Software Structure

The B&R Configuration Software is divided into the following 5 tabs:

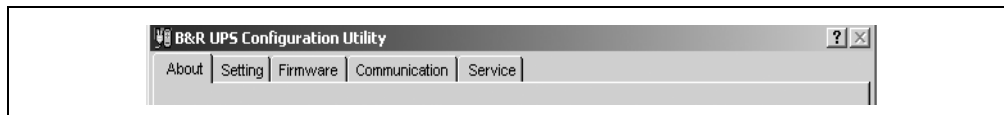


Figure 17: Overview of tabs

The individual tabs can be selected by either clicking on the name of the tab or setting the focus (using the TAB key) on "About" and using the arrow keys (right / left). Each tab is explained in detail in the following pages.

There are four buttons at the bottom of the window:

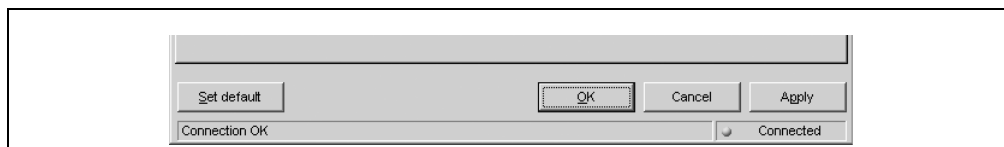


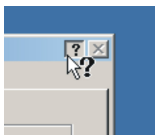
Figure 18: Standard buttons

These buttons are explained here below:

Selection	Meaning
Set default	Sets all UPS parameters to default values in the B&R UPS Configuration Software: TWL = 10 seconds, SDT = 5 min, POT = 2 min, LCS = 800mA, CTS = 5 seconds or 60 seconds, minutes with battery until shutdown = 2 min. The settings are not transferred to the UPS.
OK	Transfers all parameters to the UPS and closes the configuration screen in the system tray. In the event that a UPS service provided by the operating system (can be enabled on Win NT4.0, Win 2000 and WinXP) was enabled, then it is restarted and the UPS configuration program is closed.
Cancel	The configuration screen disappears from the system tray without transferring the parameters to the UPS. In the event that a UPS service provided by the operating system (can be enabled on Win NT4.0, Win 2000 and WinXP) was enabled, then it is restarted and the UPS configuration program is closed.
Apply	Updates all settings and transfers the parameters to the UPS.

Table 20: Standard button functions

## Software Help



"Tool Tips" can be enabled by first clicking on ? in the upper right part of the window then on an input area or information text. This is also used as a quick and easy way to display the value ranges for time settings. See Table 21 "Tool Tips example"

--	--

Table 21: Tool Tips example

## 1.5 Description of the Individual Tabs:

### 1.5.1 "About" Tab

Software version and copyright information are shown on this page.

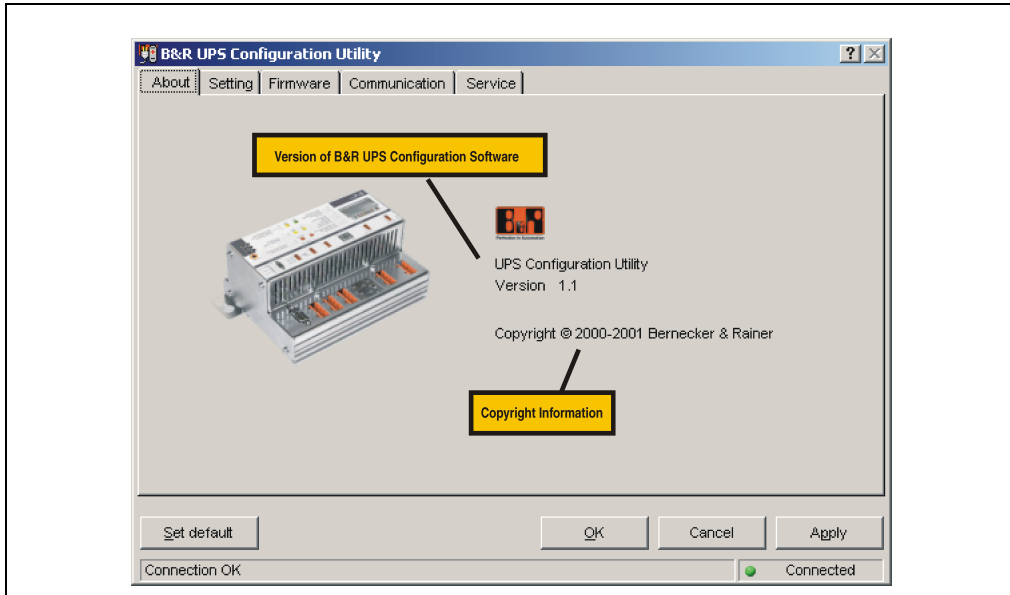


Figure 19: "About" tab description

### 1.5.2 "Settings" Tab

The main B&R UPS parameters can be configured on this page.

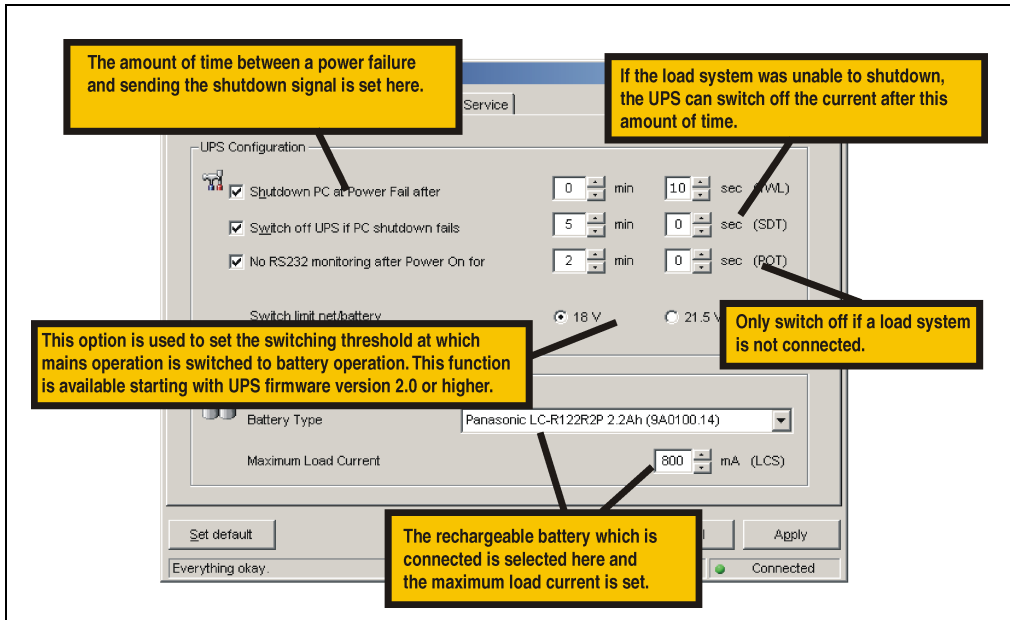


Figure 20: "Settings" tab description

### 1.5.3 "Firmware" Tab

This page offers information about the B&R UPS firmware. The creation date and firmware version are displayed here.

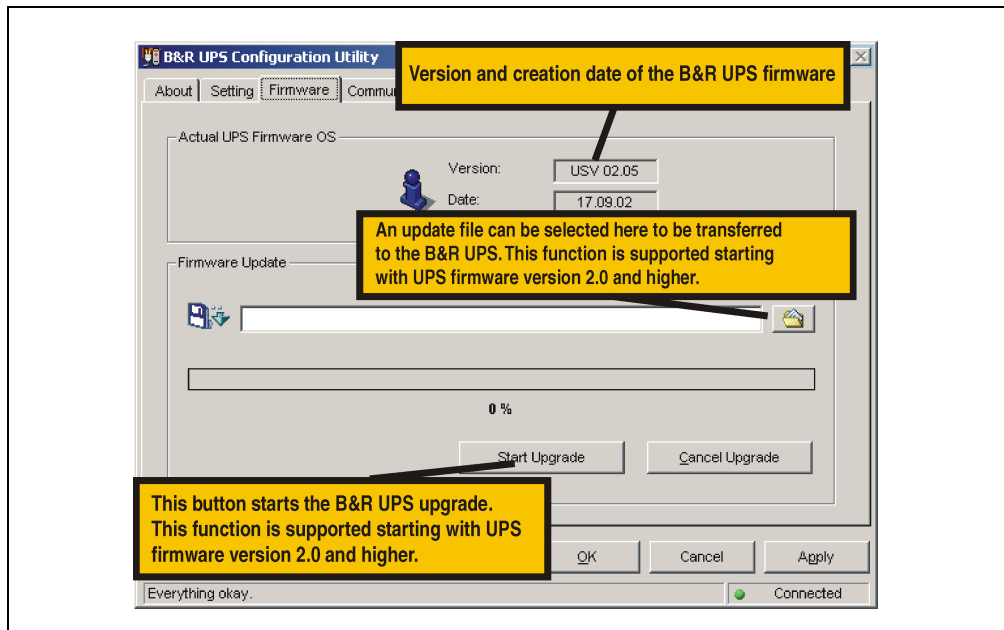


Figure 21: "Firmware" tab description

The B&R UPS operating system can be updated starting with UPS firmware version  $\geq 2.0$ . This B&R UPS Configuration Software function is not provided if a UPS firmware version  $< 2.0$  is detected.



**The UPS firmware cannot be upgraded with the load system (e.g. IPC). Instead, this must be done on a PC which is not supplied by the UPS!**

The following message appears after selecting an upgrade file and successfully completing the upgrade:

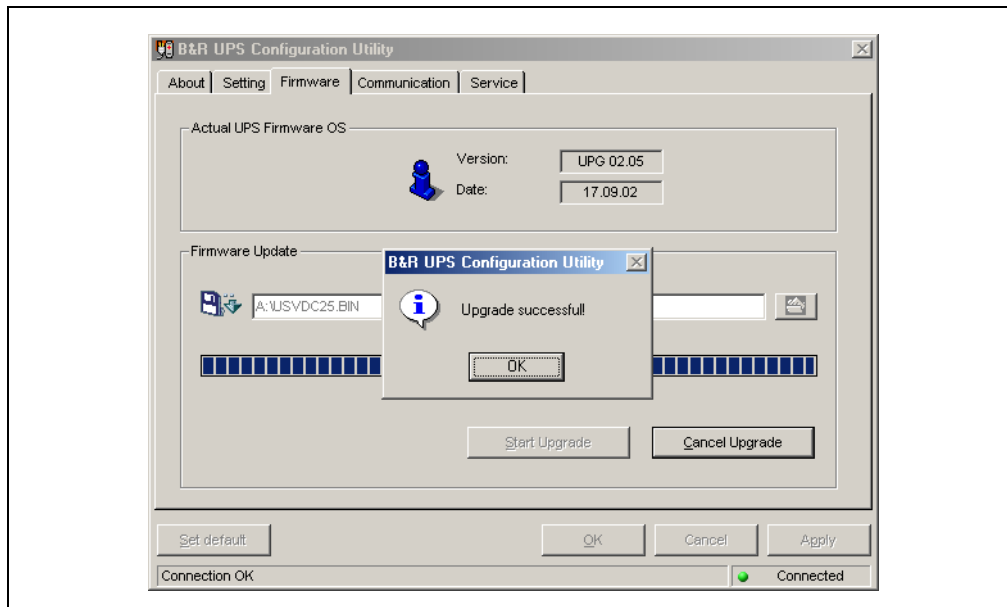


Figure 22: Upgrade successful

The UPS Configuration Software is restarted after clicking "OK" .

The UPS parameters set before the upgrade (e.g. TWL, SDT, POT, etc.) are the same after a firmware upgrade.

### 1.5.4 "Communication" Tab

The COM port used for the UPS is defined on this page.

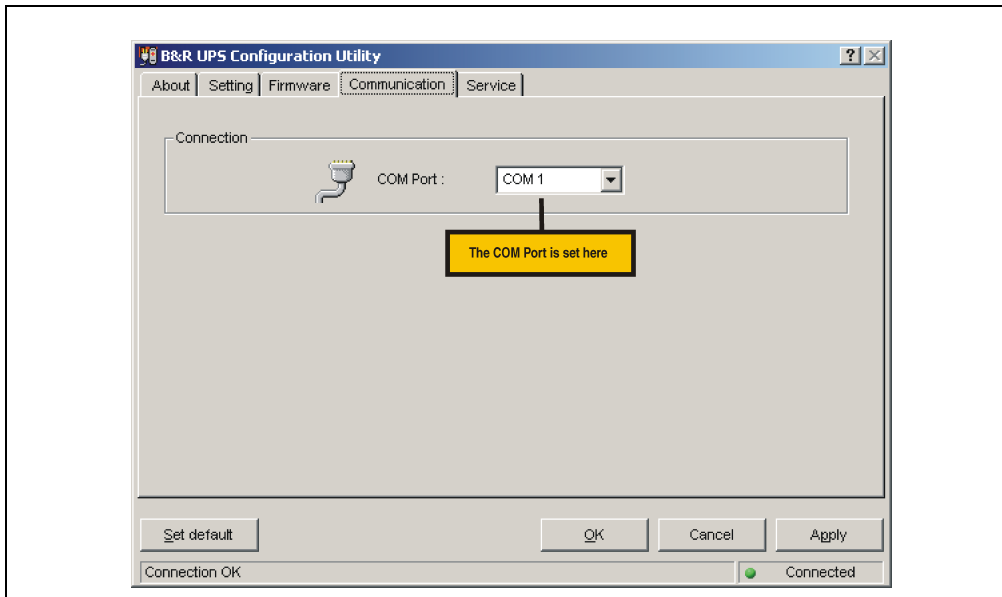


Figure 23: "Communication" Tab Description



Take note that operation of a B&R UPS 24 VDC using COM3 and COM4 on a B&R interface card (5A5000.01, 5A5000.02, 5A5000.05, 5A5000.06) is not possible because of the pin assignments. These interfaces are combined RS232/422 interfaces and do not have the handshake lines required by the UPS service.

### 1.5.5 "Service" Tab

The B&R UPS Configuration Software can also be set to monitor the load system and automatically shut it down. The settings are made under the "service" tab and are described in detail in the following pages. This is only visible or active, if there is no UPS service simultaneously enabled on the operating system (on Windows NT4.0/2000/XP).



On Windows NT4.0/2000/XP, the UPS services provided by the operating system can also be used for monitoring, see "Monitoring using Windows NT4.0 with Operating System UPS Service" on page 51, see "Monitoring using Windows 2000 with Operating System UPS Service" on page 52 and see "Monitoring using Windows XP with Operating System UPS Service" on page 55.

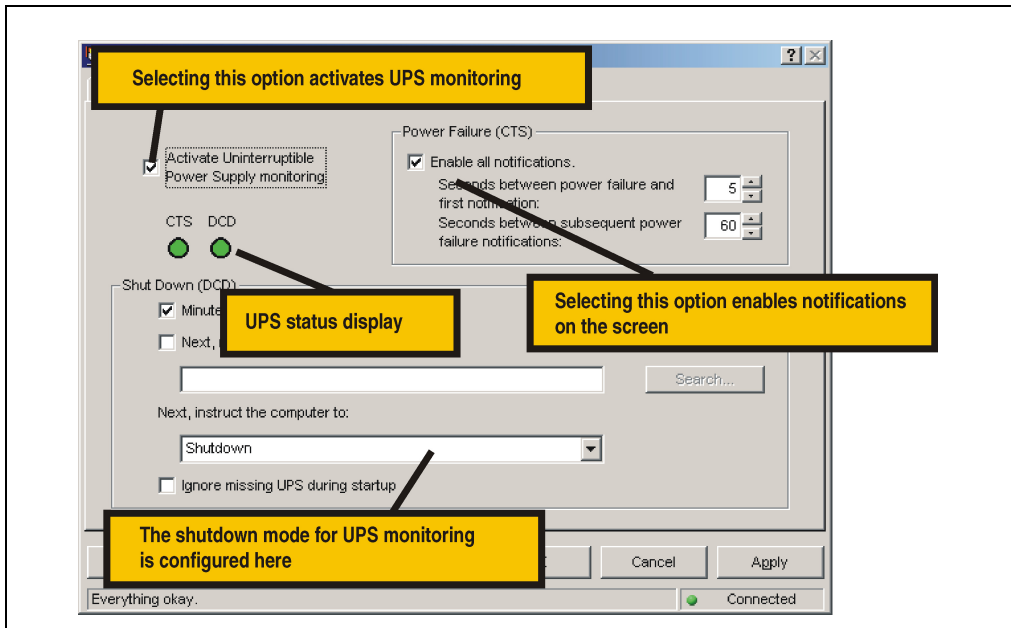


Figure 24: "Service" tab description

On Windows NT4.0, monitoring using the B&R UPS Configuration Software has a few limitations:



Remote shutdown of the UPS does not work (the UPS always switches itself off after the SDT time).

The new start button cannot be hidden. The load restarts when the Restart button is pressed before the SDT time has expired and the UPS has shut down, although the supply voltage is not yet available!



The limitations do not apply when using the UPS services provided by the operating system (see "Monitoring using Windows NT4.0 with Operating System UPS Service" on page 51).

## 1.6 Monitoring the Load System using the B&R UPS Configuration Software

This section applies to operating systems Windows 95/98/ME/NT4.0/2000/XP. On Windows NT4.0, Windows 2000 and Windows XP, the UPS services provided by the operating system can also be set for monitoring. For information on those settings: see "Monitoring using Windows NT4.0 with Operating System UPS Service" on page 51, see "Monitoring using Windows 2000 with Operating System UPS Service" on page 52 and see "Monitoring using Windows XP with Operating System UPS Service" on page 55. Otherwise it is assumed that an operational UPS is connected to the load system.

### 1.6.1 Monitoring on Windows 95/98/ME/NT4.0/2000/XP

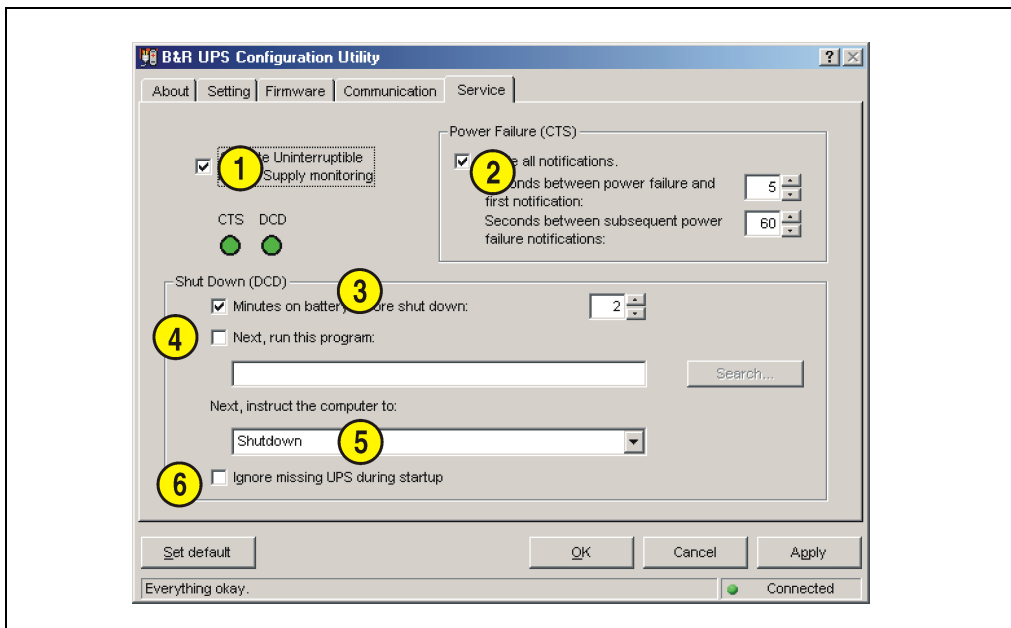


Figure 25: Monitoring settings

#### 1 Activate Uninterruptible Power Supply monitoring

Clicking on "Activate Uninterruptible Power Supply monitoring", selects the UPS monitoring on the interface which is defined under the "Communication" tab.



If this box is not selected, the remaining options on the "Service" tab cannot be selected or changed.

UPS monitoring is activated by clicking "OK" or "Apply". An error message appears if there is no UPS which is operational and correctly connected to the defined interface (in this case e.g., COM1).

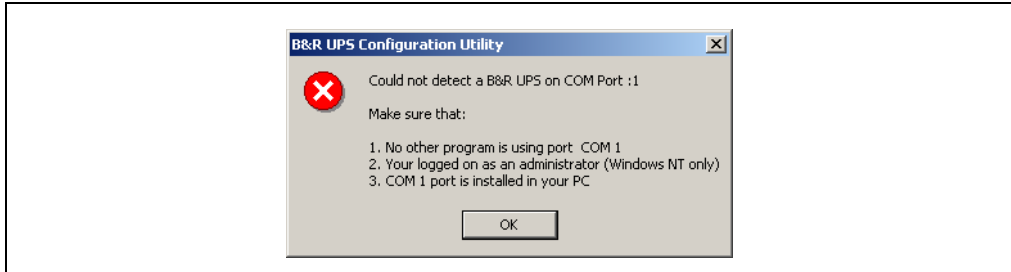


Figure 26: Error message "no UPS found"



## Power Failure (CTS)

If this option is selected, a warning message is given as soon as the computer is powered by the UPS.



Figure 27: Power failure message

The number of seconds which the load system is powered by the UPS until the warning message is displayed and/or how many seconds until another warning message is displayed can be set.

### 3 Shut Down (DCD)

Battery operation time in minutes until shutdown. This option must be selected for the function "Next, run this program", "Next, instruct the computer to" and "Ignore missing UPS during startup" to be selected. Otherwise, these functions are not available.

A message box appears if a shut down signal is received from the UPS:



Figure 28: Shut down signal message

If this option is selected, the program waits for a set amount of time for the next action in the shut down cycle to continue.

After this time has expired, the following error messages is given:

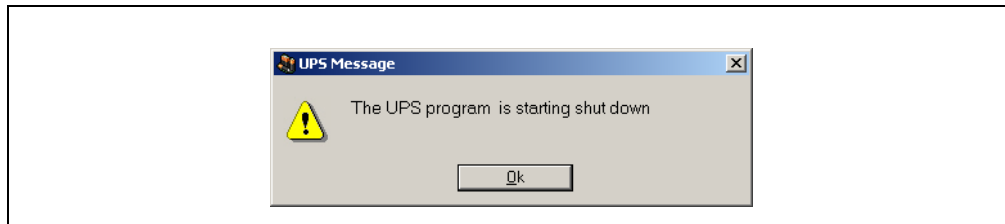


Figure 29: UPS start shut down message

This message is only given if the options "Enable all notifications" under "Power Failure (CTS)" and "Minutes on battery before shut down" are selected, the corresponding set time has expired and "shut down" has been selected as shut down option.

### 4 Next, run this program

A program can be specified here which is to be executed as soon as the set time for "Minutes on battery before shut down" expires.

Clicking the "Search..." button opens a dialog box where a program can be selected (\*.bat, \*.exe, \*.com, \*.cmd).

The command file must be executed in less than 30 seconds. If the execution of the command file is cancelled or if the 30 seconds have past, the load system is shut down.

This option is only available if "Minutes on battery before shut down" is selected.



It is recommended to only allow programs to be executed which change their process ID after starting. These are usually all batch files or notepad. **For example, Windows Explorer is not recommended!**

**5**

### Next, instruct the computer to

A shut down option is selected here. This option is only available if "Minutes on battery before shut down" is selected.

The following options are available:

- No action
- Shut down
- Force shut down



Selection	Meaning
No action	The B&R UPS Configuration Software will <b>not</b> initiate a shut down of the load system. Shutdown must be initiated by an application program.
Shutdown	<p>The B&amp;R Configuration Software initiates the shut down of the load system. An attempt is made to safely end all running programs. Using this option, an application program can react to the shut down command and save all unsaved data.</p>  <p>The shut down will <b>not</b> proceed if a program cannot be terminated.</p>
Force shut down	<p>Using this option, the B&amp;R UPS Configuration Software ends all programs and initiates shut down. An application program cannot react to the shut down when using this option. Therefore, any unsaved data will be lost.</p>  <p>This option guarantees that the operating system executes a complete shut down!</p>

Table 22: Shut down options

**6**

### Ignore missing UPS during startup

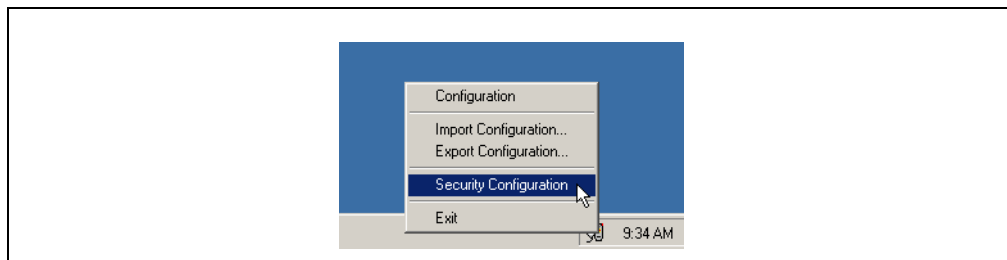
This function is first implemented in B&R UPS Configuration Software version 1.21. If this function is activated, a missing or defective UPS is ignored the first time the operating system is started and shutdown is not initiated.

**In this case the load system is not protected against a power failure.**

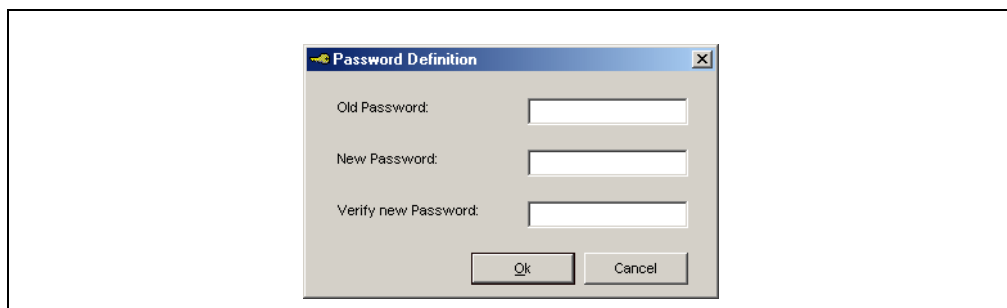
## 1.7 Security Configuration / Menu Language

The B&R Configuration Software function can be used to ensure that an undesired termination of the B&R UPS Configuration Software or undesired changes to the UPS parameters are prevented.

Right clicking on the icon in the system tray opens the following menu. Selecting "Security Configuration" from this menu enables you to change the safety settings for the B&R UPS Configuration Software or to change the language of the B&R Configuration Software (German - English).



The user is prompted to set a password the first time this function is used:



Configuration can be made once a password has been set:

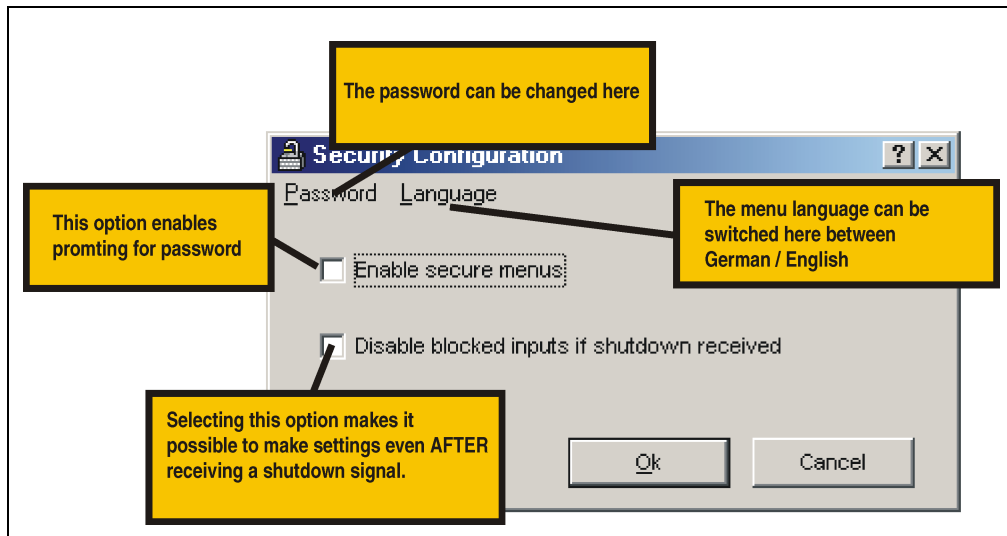


Figure 30: Description of security configuration

### 1.7.1 Menu Functions

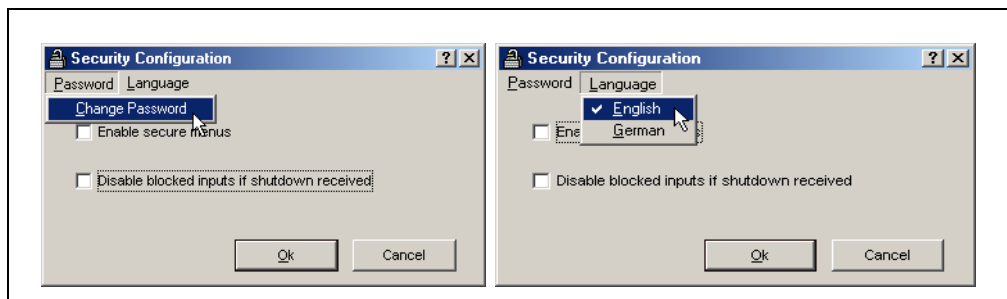


Figure 31: Safety menu functions



If the language is changed, the B&R UPS Configuration Software must be closed and restarted for the changes to become effective.

## 2. Monitoring using Windows NT4.0 with Operating System UPS Service

The UPS service provided by the operating system can also be used for monitoring when using Windows NT4.0.

Go to Start - Settings - Control Panel - UPS

The settings must match with those in the following figure (select the COM port on which the UPS is connected):

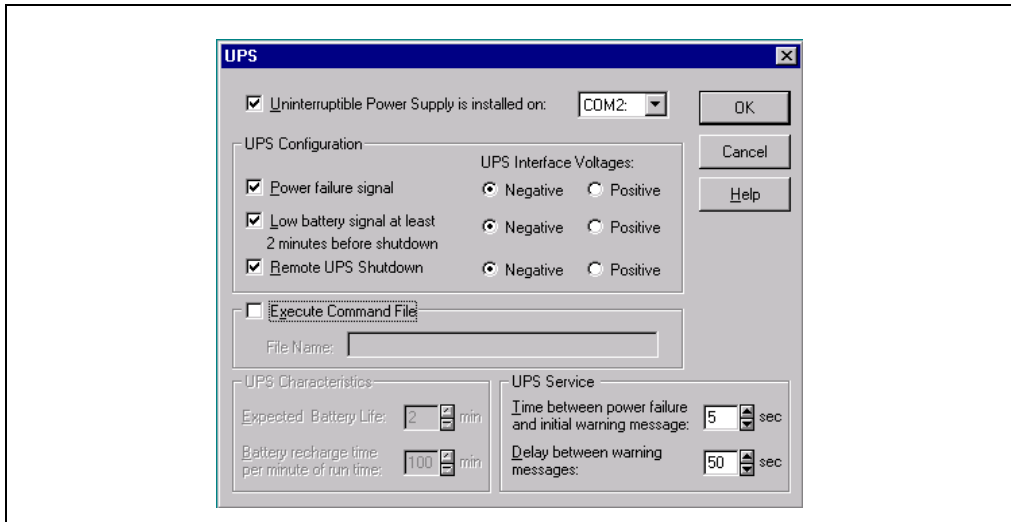


Figure 32: UPS Settings in Windows NT

A program which is to be executed immediately before the system is shut down can additionally be specified using the "Execute Command File" option.



The UPS service warning message which indicates that there is a power failure is only supported by Windows NT if a network card and driver are installed on the IPC, and a network service is running.



Take note that operation of a B&R UPS 24 VDC using COM3 and COM4 on a B&R interface card (5A5000.01, 5A5000.02, 5A5000.05, 5A5000.06) is not possible because of the pin assignments. These interfaces are combined RS232/422 interfaces and do not have the handshake lines required by the UPS service.

### 3. Monitoring using Windows 2000 with Operating System UPS Service

The UPS service provided by the operating system can also be used for monitoring when using Windows 2000.

Go to Start - Settings - Control Panel - Power Options - UPS

A manufacturer can be selected under the UPS tab.

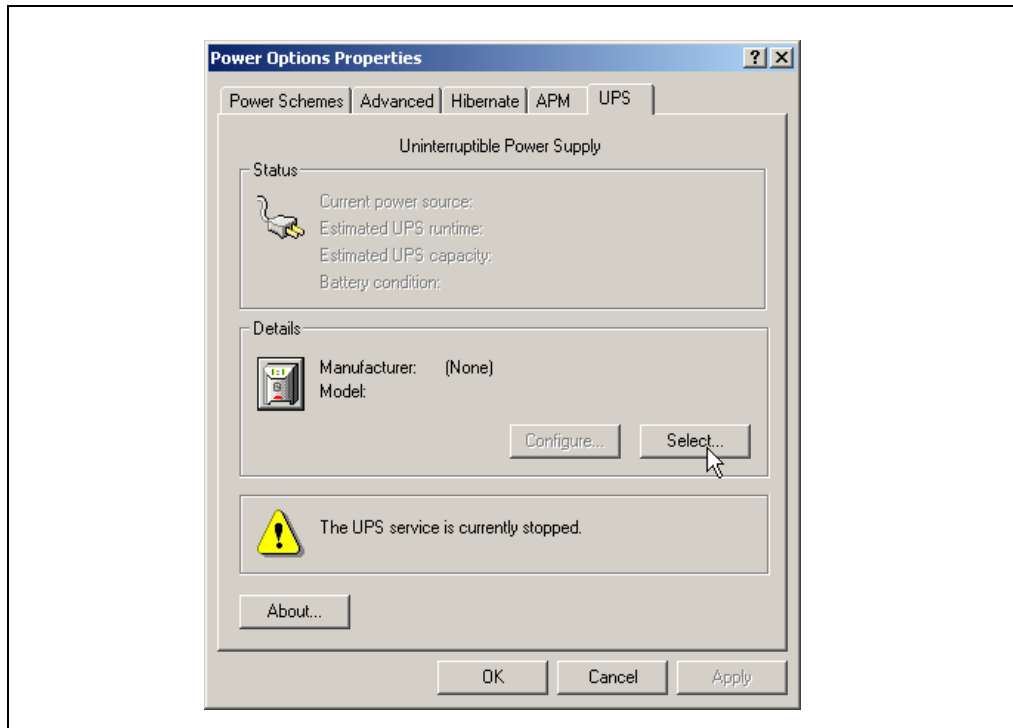


Figure 33: UPS - Windows 2000 settings - Manufacturer



A generic UPS must be selected as manufacturer and the model must be set to "Custom":

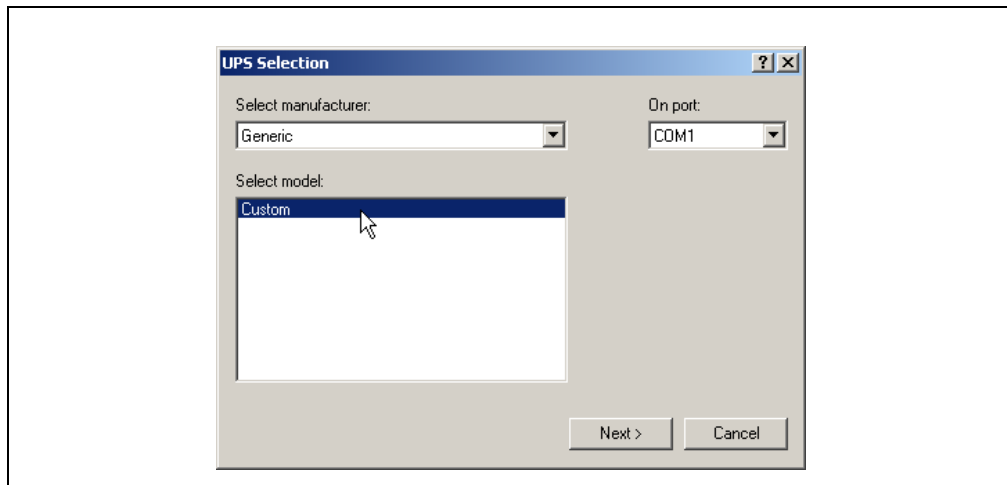


Figure 34: UPS - Windows 2000 settings - Type



Take note that operation of a B&R UPS 24 VDC using COM3 and COM4 on a B&R interface card (5A5000.01, 5A5000.02, 5A5000.05, 5A5000.06) is not possible because of the pin assignments. These interfaces are combined RS232/422 interfaces and do not have the handshake lines required by the UPS service.

After clicking the "Next >" button, a window is opened where signal lines for the UPS must be configured. The B&R UPS should be configured as follows:

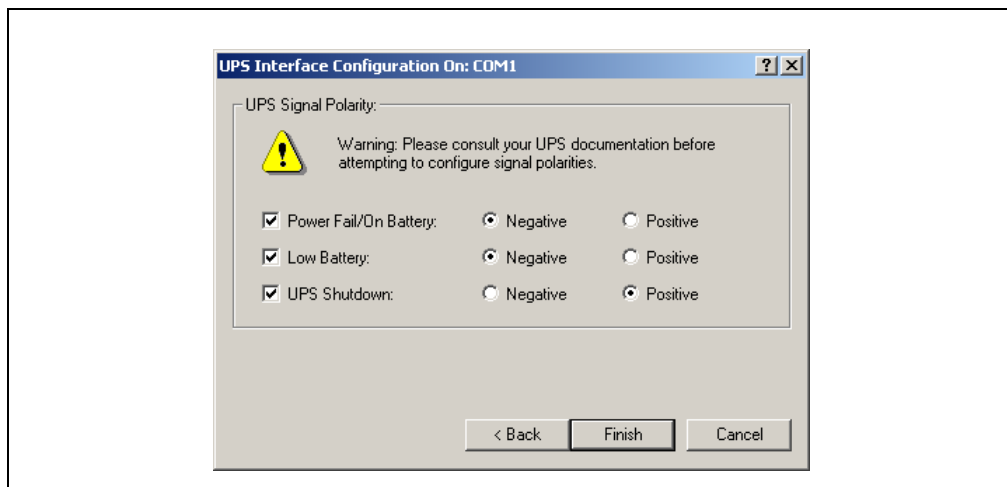


Figure 35: UPS - Windows 2000 settings - Signal Polarity



Remote shutdown of the UPS does not work (the UPS always switches itself off after the SDT time).

After the settings are confirmed by clicking the "Finish" button, the user is returned to the main configuration window. A few parameters can be changed there by clicking the "Configure..." button. A program which is to be executed immediately before shut down can also be specified by selecting the "When the alarm occurs, run this program:" option.

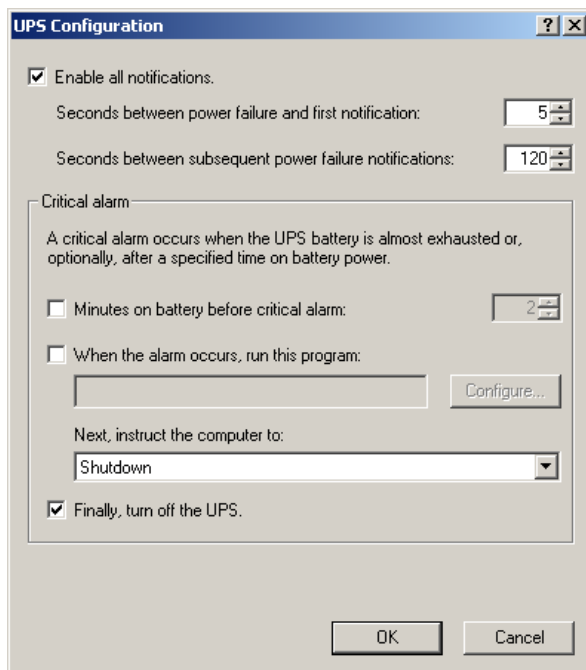


Figure 36: UPS - Configuration dialog box in Windows 2000

## 4. Monitoring using Windows XP with Operating System UPS Service

The UPS service provided by the operating system can also be used for monitoring with Windows XP.

Go to Start - Settings - Control Panel - Power Options - UPS

A manufacturer can be selected under the UPS tab.

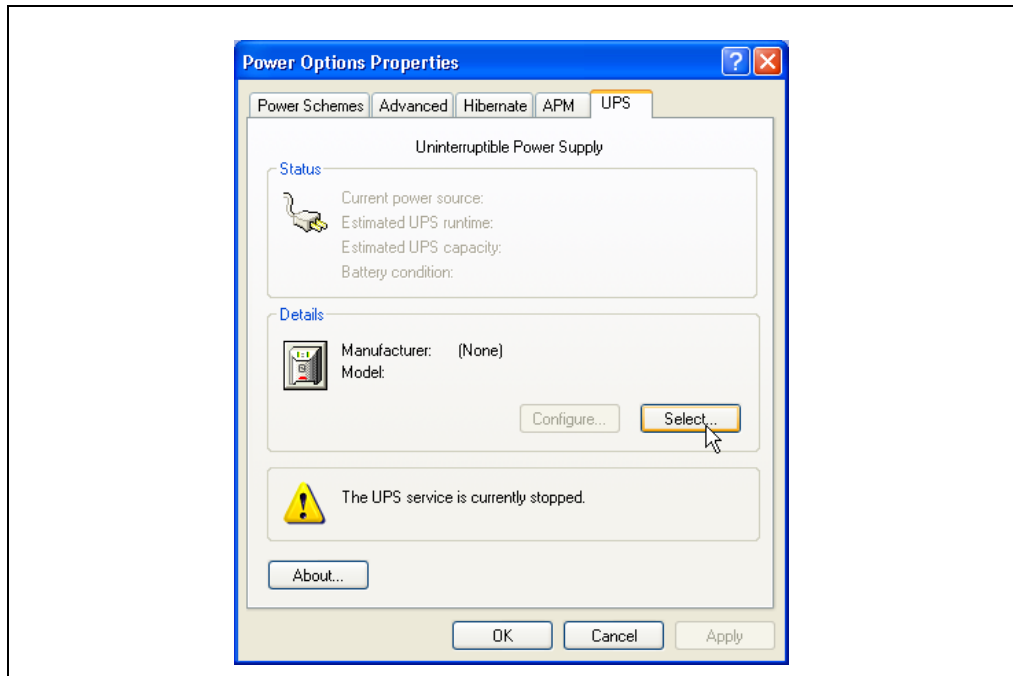


Figure 37: UPS - Windows XP settings - Manufacturer

A generic UPS must be selected as manufacturer and the model must be set to "Custom":

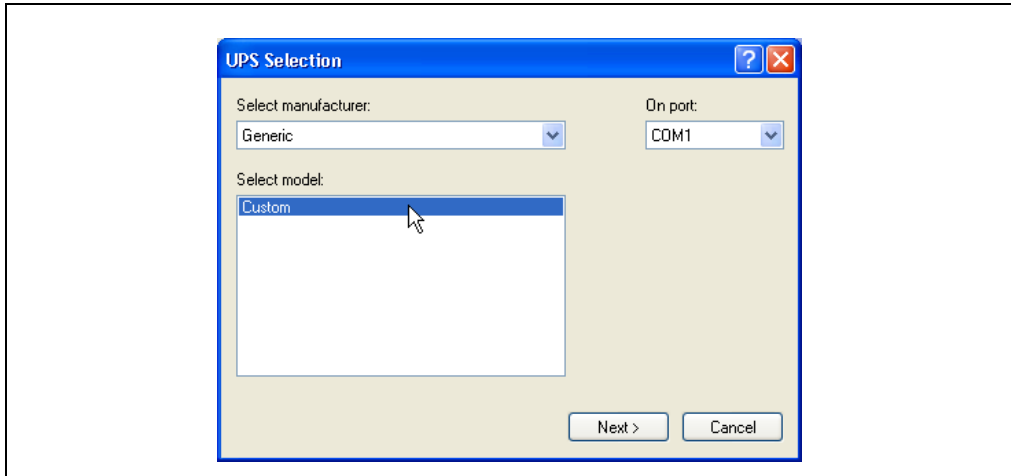


Figure 38: UPS - Windows XP settings - Type



Take note that operation of a B&R UPS 24 VDC using COM3 and COM4 on a B&R interface card (5A5000.01, 5A5000.02, 5A5000.05, 5A5000.06) is not possible because of the pin assignments. These interfaces are combined RS232/422 interfaces and do not have the handshake lines required by the UPS service.

After clicking the "Next >" button, a window is opened where signal lines for the UPS must be configured. The B&R UPS should be configured as follows:

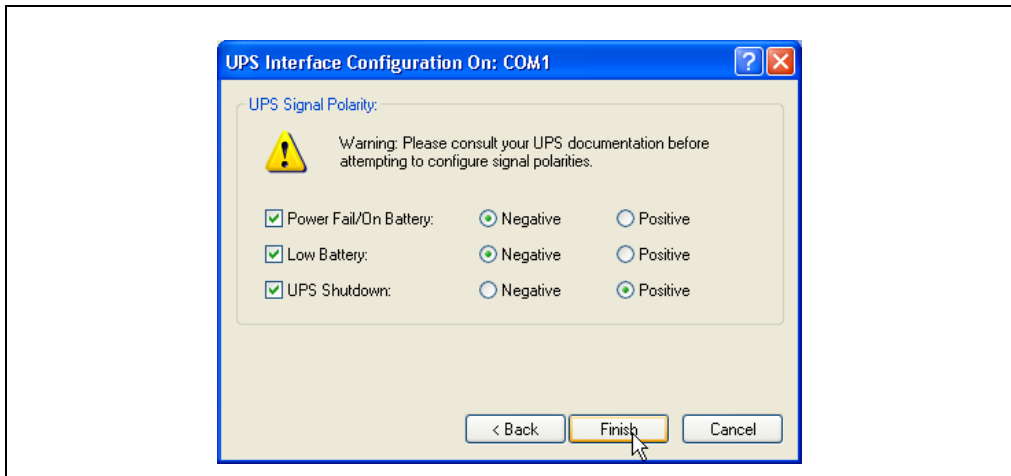


Figure 39: UPS - Windows XP settings - Signal Polarity



Remote shutdown of the UPS does not work (the UPS always switches itself off after the SDT time).

After the settings are confirmed by clicking the "Finish" button, the user is returned to the main configuration window. A few parameters can be changed there by clicking the "Configure..." button. A program which is to be executed immediately before shut down can also be specified by selecting the "When the alarm occurs, run this program:" option.

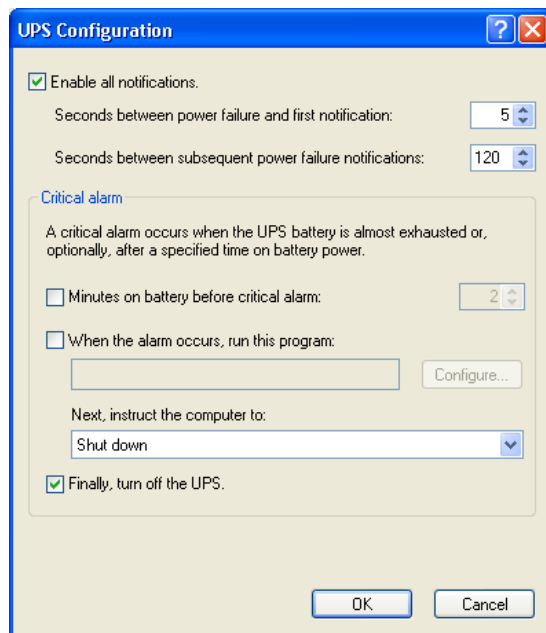


Figure 40: UPS - Configuration dialog box in Windows XP

## 5. Configuring the UPS using HyperTerminal

Different operating parameters can be manually set for the UPS via the serial interface. A standard terminal program is all that is needed (e.g. the "HyperTerminal" program included with Windows) which must be configured as follows:

Setting	Value
COM Port	The COM port where the UPS is installed
Baud Rate	19200 bps
Data Bits	8
Parity	None
Stop Bits	1
Protocol	Hardware

Table 23: Terminal program settings

If the connection is set up with these settings, the respective values can be changed using the following commands. It is not necessary to restart the UPS for the new settings to be accepted.



It is NOT possible to communicate with the UPS via the RS232 interface if a monitoring service is activated on the corresponding load system (using either B&R UPS Configuration Software or using Windows UPS service driver from Windows NT4.0/2000)! If you want to make the UPS settings via the serial interface while the UPS is in operation, the UPS service must be closed then activated again!

### 5.1 Setting TWL (Time Worst Low)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

TWL is the time that passes between a power failure and sending the signal to shut the PC down. This time can be set using the command "TWL" (Time Worst Low). The command can be entered and transmitted in either upper or lower case letters.

**#TWL=OFF** (Buffer operation)

After a power failure, the UPS immediately switches to battery operation. The UPS immediately switches back to mains operation when the supply voltage is available again. The DCD signal is not set until there is a battery power of 22.5 V and the load (e.g. the PC) is shut down. Remote or automatic shut down of the UPS takes place after 2 minutes when the battery supply is 21 V.

**Possible input value range #TWL=000...999**

This enables the time in seconds to be entered after which the load is to be shut down.

Default value: #TWL=010      TWL = 10 sec

Example:      #TWL=000      TWL = 0 sec (the load is immediately shut down after a power failure)

                 #TWL=010      TWL = 10 sec

                 #TWL=200      TWL = 200 sec

## 5.2 Setting SDT (Shut Down Time)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

The SDT time is necessary in case the system is not shut down correctly (i.e. the IPC crashes during shut down).

If SDT time passes after the DCD signal (load shutdown) was set without the signal for UPS remote shutdown (DTR signal) from the IPC, the UPS switches the output voltage off. This time can be set using the command "SDT" (Shut Down Time). The command can be entered and transmitted in either upper or lower case letters.



If the time selected is too low, data can be lost when the PC is shut down.

### #SDT=OFF

After the DTR is set, the UPS has until the battery is below 21V to shut down the PC.

### Possible input value range #SDT=0000...9999

This can be used to set the time in seconds, after which the UPS automatically disconnects the load from the mains supply.

Default value:      #SDT=0300      SDT = 300 sec

Example:      #SDT=0000      SDT = 0 sec (the load, e.g. IPC, is not given any time to shut down)

                 #SDT=0040      SDT = 40 sec

                 #SDT=2500      SDT = 2500 sec

## 5.3 Setting POT (Power On Time)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

If the load is an IPC, the software for communication with the UPS is not yet active when booting up (as long as the monitoring service is not yet completely loaded). If a power failure occurs within this time POT, the UPS changes into battery operation and only sends the respective signals to the IPC after the time POT has passed. The IPC then shuts down securely after the boot procedure is finished. This time can be set using the command "POT" (Power On Time). The command can be entered and transmitted in either upper or lower case letters.

### #POT=OFF

Means that the starting time for the load (IPC) can be unlimited and the signals RTS and DTR are set. This should only be set when no IPC is connected.

### Possible input value range #POT=000...999

Time in seconds from which the UPS communicates with the load (IPC) after switching on the UPS. If a power failure occurs within this time, the load system is supplied from the rechargeable batteries and a shut down is executed after POT has passed.

Default value: #POT=120 POT = 120 sec

Example: #POT=000 POT = 0 sec

#POT=300 POT = 300 sec



Ensure that POT is not shorter than the time Windows needs to fully boot (depends on processing power). Otherwise secure shut down is not guaranteed if a power failure occurs when booting.

## 5.4 Setting LCS (Load Current Set)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

The charging current can be set between 0.5 A and 2.88 A using the command "LCS" (Load Current Set). The command can be entered and transmitted in either upper or lower case letters.

### Possible input value range #LCS=0.5...2.88

Default value: #LCS=0.88 Charging current = 0.88 A

Example: #LCS=0.6 Charging current = 0.6 A  
#LCS=2.15 Charging current = 2.15 A

**Note:** The value entered is returned by the UPS in binary units.

Conversion factor: 2.88 A corresponds to 1015 units  
e.g.: Default value 0.8 A corresponds to 282 units



The charging current can also be set via the hardware (button). For details, see "Setting the Maximum Charging Current" on page 81.



0.88 A is the maximum charging current for the UPS battery set, 2 x 12V / 2.2Ah (Panasonic LC-R122R2P, Model no. 9A0100.14). The 0.88 A upper limit is to be observed when changing the charging current using this rechargeable battery!

## 5.5 Setting PFL (Power Fail Level)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

This command can be used to set the voltage value, at which the UPS is switched from mains to battery operation.

### possible input value range #PFL =180 or 215

Default value: #PFL=180 PFL = 18 Volt

Example: #PFL=215 POT = 21.5 volts

### Switching thresholds between rechargeable battery / mains operation

PFL = 18 volts

Switching thresholds for the UPS with no load	
Battery operation	18 Volt
Mains operation	19 Volt
Switching threshold for the UPS with load	
Battery operation	18 Volt
Mains operation	20 Volt

PFL = 21.5 volts

Switching thresholds for the UPS with no load	
Battery operation	21.5 Volt
Mains operation	22.5 Volt
Switching threshold for the UPS with load	
Battery operation	21.5 Volt
Mains operation	23.5 Volt

## 5.6 Setting CTL (Charge Temperature Low)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

This command can be used to set the minimum charging temperature for the rechargeable battery which is connected.

### Possible input value range #CTL = -068...0180

Default value: #CTL=0000 CTL = 0 °C

Example: #CTL=-040 CTL = -40 °C

#CTL=0010 CTL = 10 °C



If B&R battery units are used, the values listed in the following table must be used!

Model No.:	Battery type	Min. Charging Temperature
9A0100.12	Panasonic LC-R127R2P 7.2Ah	0 °C
9A0100.14	Panasonic LC-R122R2P 2.2Ah	0 °C
9A0100.16	Hawker Cyclon 4.5Ah	-40 °C

Table 24: Minimum rechargeable battery charging temperature

## 5.7 Setting CTH (Charge Temperature High)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

This command can be used to set the maximum charging temperature for the rechargeable battery which is connected. The rechargeable battery is charged until this temperature is reached.

### Possible input value range #CTH = -68...0180

Default value: #CTH=0040 CTH = 40 °C

Example: #CTH=0080 CTH = 80 °C

#CTH=0110 CTH = 110 °C



If B&R battery units are used, the values listed in the following table must be used!

Model No.:	Battery type	Max. Charging Temperature
9A0100.12	Panasonic LC-R127R2P 7.2Ah	40 °C
9A0100.14	Panasonic LC-R122R2P 2.2Ah	40 °C
9A0100.16	Hawker Cyclon 4.5Ah	80 °C

Table 25: Maximum charging temperature for the rechargeable battery

## 5.8 Setting AGE (Battery Lifespan)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

This command is used to set the maximum lifespan of the rechargeable battery which is connected.

### Possible input value range #AGE = 0...100

Default value: #AGE=005 AGE = 5 years

Example: #AGE=010 AGE = 10 years



If B&R battery units are used, the values listed in the following table must be used!

Model No.:	Battery type	Max. Battery Lifespan
9A0100.12	Panasonic LC-R127R2P 7.2Ah	5 years
9A0100.14	Panasonic LC-R122R2P 2.2Ah	5 years
9A0100.16	Hawker Cyclon 4.5Ah	10 years

Table 26: Maximum lifespan of the rechargeable battery

For information about resetting the battery lifespan stamp, see "Additional Function of the User Button starting with UPS Firmware V2.0" on page 70.

## 5.9 Checking and Reading the UPS Parameters

The following commands can be used to determine which parameters are set on the UPS using HyperTerminal, according to the firmware version.

Firmware	Command
Version < 2.0	#
Version ≥ 2.0	#READ

The UPS returns the following values (sample values) after confirming the command with "ENTER" according to the firmware version:

Firmware version < 2.0

TWL       = 10  
SDT       = 281  
LCS       = 300  
POT       = 120

Firmware version ≥ 2.0

TWL       = 0010  
LCS       = 0281  
SDT       = 00300  
POT       = 0120  
PFL       = 180  
CTL       = 0000  
CTH       = 0040  
TMP       = 00xx ... the current temperature of the rechargeable battery is returned  
AGE       = 0005

For additional functions and detailed information about the commands, see "UPS Command Sequences" on page 86.

# Chapter 4 • Technical Appendix

## 1. UPS Functions

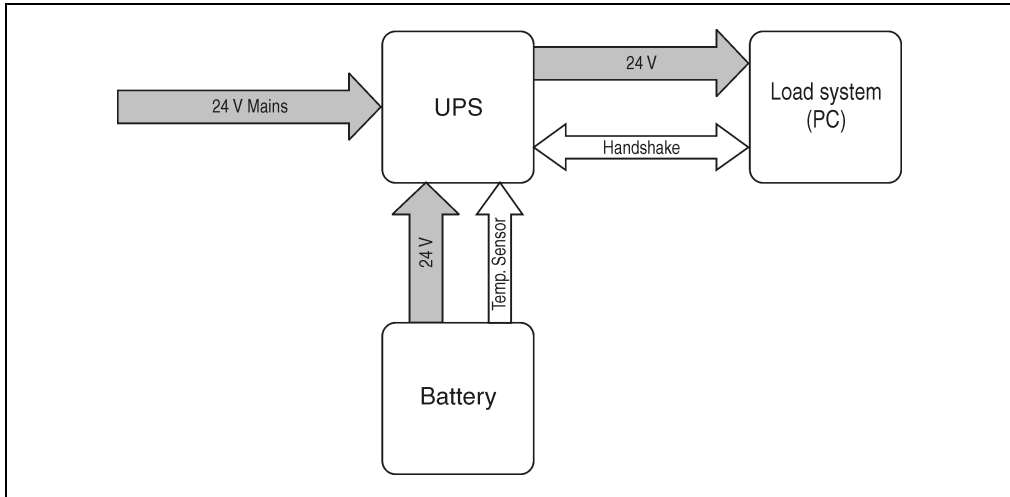


Figure 41: Block diagram of the entire system

In normal operation the 24 V supply voltage is switched through directly to the load system. If the supply voltage fails, the rechargeable UPS batteries power the PC to enable controlled shutdown without loss of data.

Data and commands are exchanged between the UPS and the PC via the handshake signals of a RS232 interface.



Independent shutdown of the load system in the case of a power failure is only possible on IPCs with Microsoft Windows 95/98/ME/NT4.0/2000/XP when B&R UPS Configuration Software is installed in monitor mode, the UPS and the IPC are properly connected and the settings described in Chapter 3 “Software” have been made!

Read 2.6.2 “Operation without the RS232 cable” if you want to operate the UPS without connecting it to the load system using an RS232 cable.



Using the UPS to protect the power supply for life support machines is not permitted!

## 2. UPS Behavior

There are two fundamental UPS operational modes:

- Mains operation
- Battery operation

The input voltage is switched directly through to the load during mains operation. The load is separated from the mains supply if the supply voltage falls below 18 V <sup>1)</sup> or 21.5V <sup>1)</sup>, and battery operation is started (the load is then powered completely by the rechargeable batteries). The UPS prevents the load voltage from dropping below 18V or 21.5V, i.e. when the mains supply voltage fails, the load system continues to operate without interruptions:

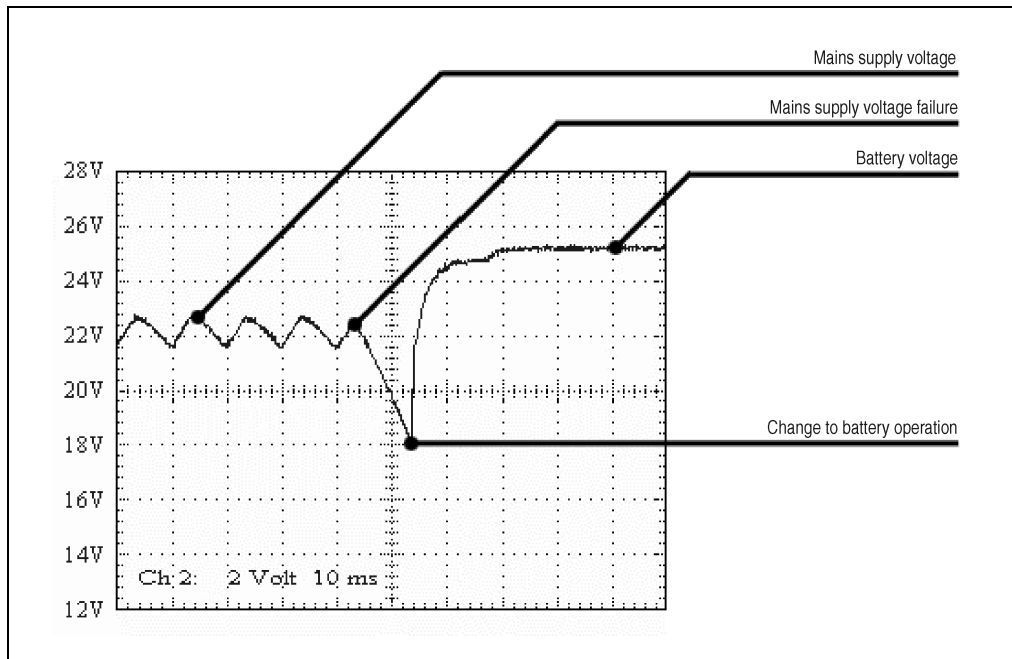


Figure 42: Behavior when the mains supply voltage fails

If the battery voltage drops below 22.5 V during battery operation, the system that is being supplied must be shutdown so that the rechargeable batteries are not damaged. The UPS switches off automatically at 21 V at the latest.

<sup>1)</sup> Depends on the switching threshold. Can be set using B&R Configuration Software or HyperTerminal (18 or 21.5 VDC)



When the mains supply voltage fails, the UPS starts to shut the IPC down after 10 seconds by default to guarantee maximum security. This time can also be set in the software via the serial interface (see Chapter 3 “Software”).

The intended use for the UPS is an important aspect. There are two possibilities:

## 2.1 Buffer Operation

In the case of a power failure, the load system is powered by the rechargeable batteries until the battery capacity is exhausted. If the supply voltage becomes available again during this time, the UPS switches over to mains operation.

## 2.2 Secure Shut Down

The UPS shuts down as quickly as possible during a power failure. This is determined by the time that is allowed to pass between a power failure and system shut down. If the supply voltage has not become available again once this time has passed, the UPS begins shut down. This time (TWL) can be set using the software (see section Chapter 3 “Software”). TWL is set to 10 seconds by default.



The software for communication with the UPS is not yet active when the PC is booting (as long as Windows NT is not yet completely loaded). If a power failure occurs in this time POT, the UPS changes to battery operation and only sends the respective signals to the load (e.g. IPC) after the time POT has passed. The IPC then shuts down securely after the boot procedure is finished (see also Chapter 3 “Software” and 2.6.1 “Power Failure”).

## 2.3 Switching on the UPS

After the supply voltage has been connected to the UPS, a check is made to see if the battery is available. This is determined by evaluating the no load voltage.

Battery voltage	Status
< 22.8 V	<b>Battery faulty</b> To be sure that the battery is faulty, a current test is performed for 1 minute. If the battery voltage rises substantially with full charging current, this is recognized as faulty. Otherwise the battery is charged until “Battery OK” is detected.
> 24.2 V	Battery OK
Between 22.8 V and 24.2 V	The battery must be charged. When approximately 26 V is reached (controlled internally and dependent on temperature) the supply voltage is switched through to the load.

Table 27: Testing the battery when switching on

The ambient temperature of the rechargeable battery is also checked:

- If the temperature is higher than the maximum specified charging temperature (see Table 25, “Maximum charging temperature for the rechargeable battery”, on page 63), the

battery cannot be charged anymore (important for empty batteries).

- If the ambient temperature exceeds or falls below the maximum or minimum temperature, the supply voltage is not switched through to the load, because discharging the rechargeable battery at this temperature could damage it (battery operation).
- If the temperature of the rechargeable battery is above or below the limit for 5 minutes, while in operation, the UPS starts the controlled shutdown of the load.

The no load voltage is evaluated to determine the capacity of the battery. The measurement is made while shutting down the UPS, then continuously every 24 hours. Due to the fact that this is a very rough evaluation method, it is possible that not every battery defect is 100% detected. The respective LED signals if no voltage can be measured (no battery, see "Status LEDs" on page 31) in which case the UPS does not switch the mains power supply through to the load. Power can be supplied to the load by pushing the user button, however the user takes full responsibility when doing this (see "User Button and External Button (Digital Input)" on page 70).



If supply voltage fails, the load is **immediately** shutdown without buffering.

The UPS carries out a brief self test (approx. 10 seconds =  $t_{ON}$ ) and checks if the battery is OK. The load is then supplied with voltage. If the first test reveals that the battery is deep discharged, a second test is started (approximately 1 minute), which determines the capacity of the connected battery. If this test reveals that the capacity of the battery which guarantees safe and proper UPS operation is too low, the user is informed via the "battery status" LED to change the battery.

If the UPS was just switched off, the load is supplied with power after approx. 2 seconds to prevent damage.

The following diagrams illustrate these states and procedures:

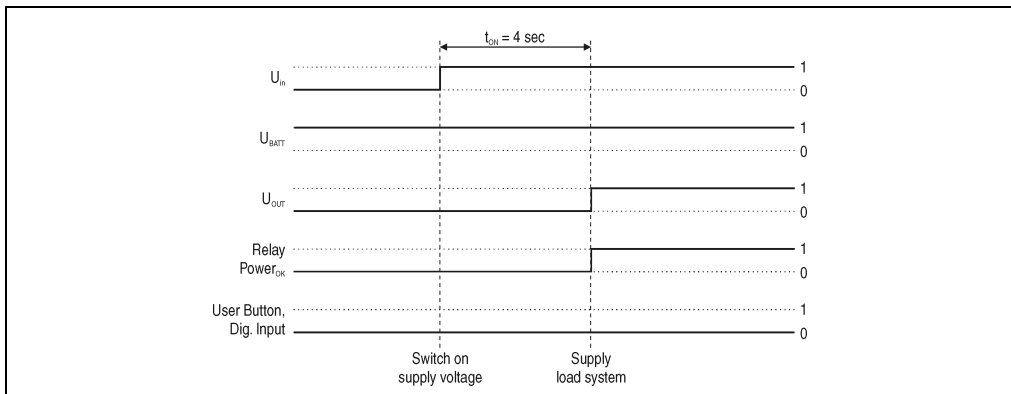


Figure 43: Switching on the UPS, Battery OK



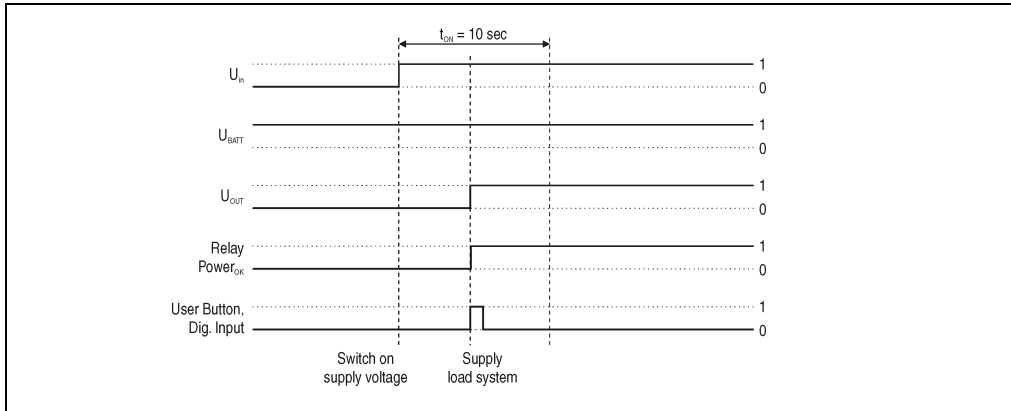


Figure 44: Switching on the UPS, Battery OK (with button)

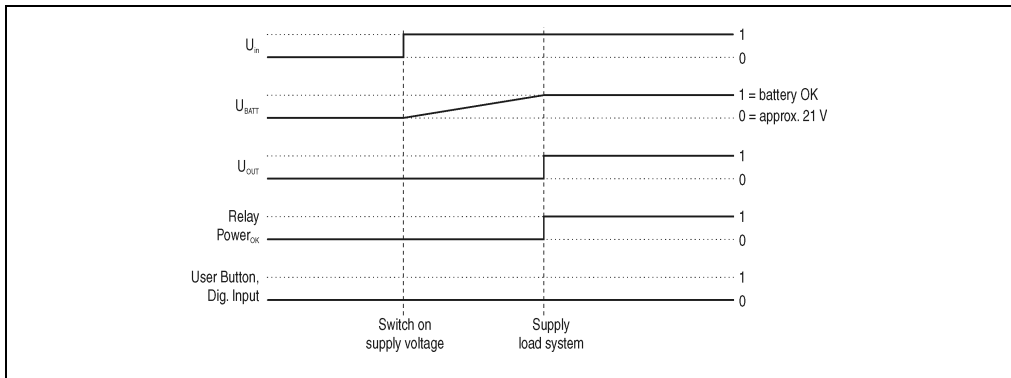


Figure 45: Switching on the UPS, Battery Empty

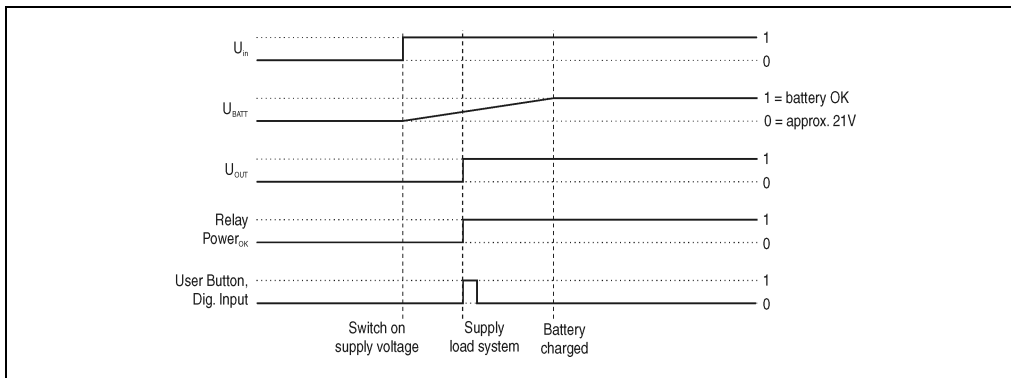


Figure 46: Switching on the UPS, Battery Empty (with button)

## 2.4 UPS Overload Behavior

If the maximum permitted output current of 8 A is exceeded, the following shutdown times apply: Between 8 - 14 A, the UPS shuts down after 10 seconds. Over 14 A output current, the UPS shuts down in one second.

UPS Overload is signalled via the "Status" LED (clock rate overload).

## 2.5 User Button and External Button (Digital Input)

The user button and external button (for location, see "Overview of Components" on page 26) have the same function. In order to guarantee maximum security, the UPS does NOT supply the load system with current if the battery is not connected or when the battery is not sufficiently charged.

To bypass this safety measure (such as temperature alarm, battery temperature too high/low, etc.), mains operation and the load system supply can still be activated via the user button or external button (digital input) when switching on the UPS.



Secure UPS operation is not guaranteed after pushing the user button or external button (digital input) - as long as the battery has not reached the minimum load!

The maximum charging current for the rechargeable battery can also be set with the user button. This is explained in "Setting the Maximum Charging Current" on page 81. The user button can be accessed using a pointed object.

### 2.5.1 Additional Function of the User Button starting with UPS Firmware V2.0

#### Resetting the Battery Lifespan Stamp

With a UPS firmware version 2.0 and higher, the time stamp which is required to calculate the battery lifespan, can be reset with the user button.

Procedure:

- The UPS must be switched on without a connected battery unit.
- Wait until "Error: 24V Battery Fuse" and "NO Battery Connected" are signaled via the respective LEDs.
- Press and hold the user button
- The "Change Battery" LED lights up after approximately 2 seconds
- Now hold the user button for approximately 30 more seconds until the "Change Battery" LED goes out

The UPS time stamp is now reset to 01.01.2000 00:00:00. This is then the basis for the rechargeable battery lifespan calculation.

For information about calculating the rechargeable battery lifespan see "Read the UPS time stamp (WHRD)" on page 91.

## Digital Input

Digital Input	Electrical Characteristics
Design	Sink
Rated Voltage	24 VDC
Maximum Input Voltage	30 VDC
Switching Threshold	
Low range	< 5 V
Switching range	5 V to 15 V
High range	> 15 V
Input Impedance	Approx. 5 kΩ
Input Current	Approx. 5 mA at 24 VDC
Input Delay	Max. 1 ms
Isolation	No electrical isolation

Table 28: Digital input electrical characteristics

## 2.6 Serial Interface

The UPS is connected to the IPC via the RS232 interface. The UPS provides the load system with information concerning the battery charge, the UPS operating mode, errors and the remaining rechargeable battery buffer time during battery operation, before the deep discharge protection disconnects its supply. However, its main task is to securely shut down and switch off the load system in the case of a power failure. This takes place using the handshake signals CTS, DTR and DCD (on the PC side):

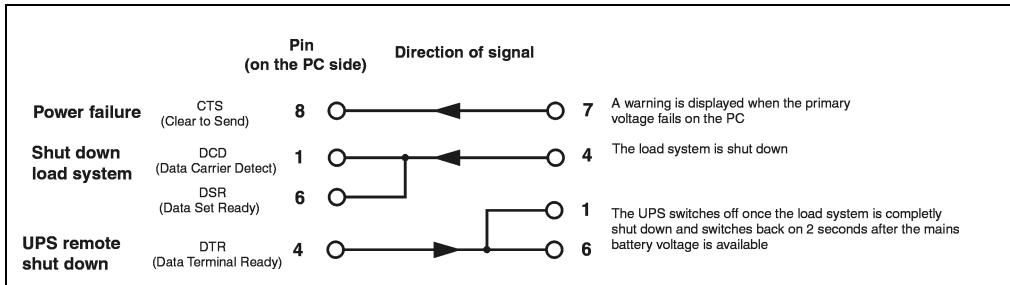


Figure 47: RS232 interface handshake signals

See Figure 12 "Pin assignment RS232 cable" for the complete pin assignment of the RS232 cable.

### 2.6.1 Power Failure

a) The voltage briefly sinks below the minimum level:

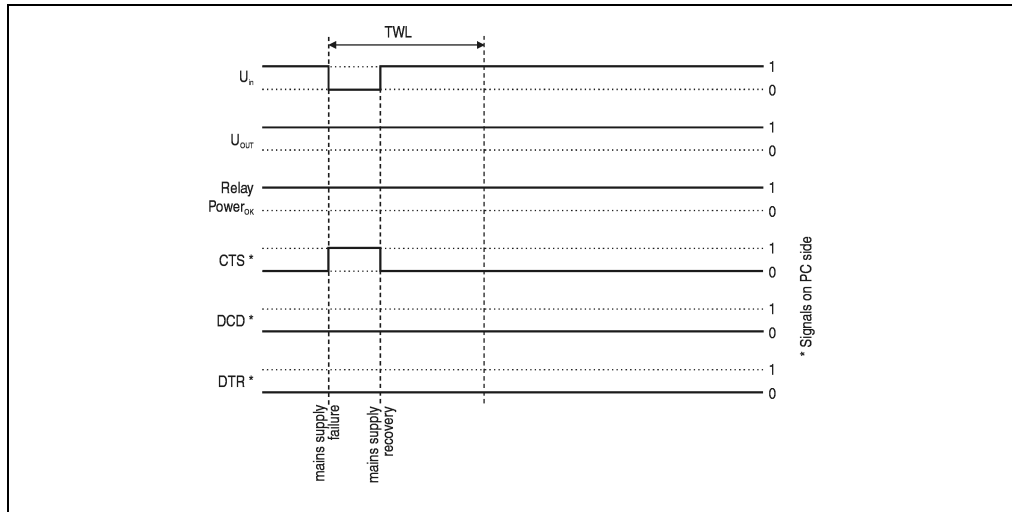


Figure 48: Handshake lines when a brief power failure occurs

If the supply voltage fails, the load system is immediately switched to battery operation. If the supply voltage becomes available again before the time TWL has passed (can be adjusted using software, see Chapter 3 “Software”), the load system is not effected.

b) The supply voltage fails for a longer period of time:

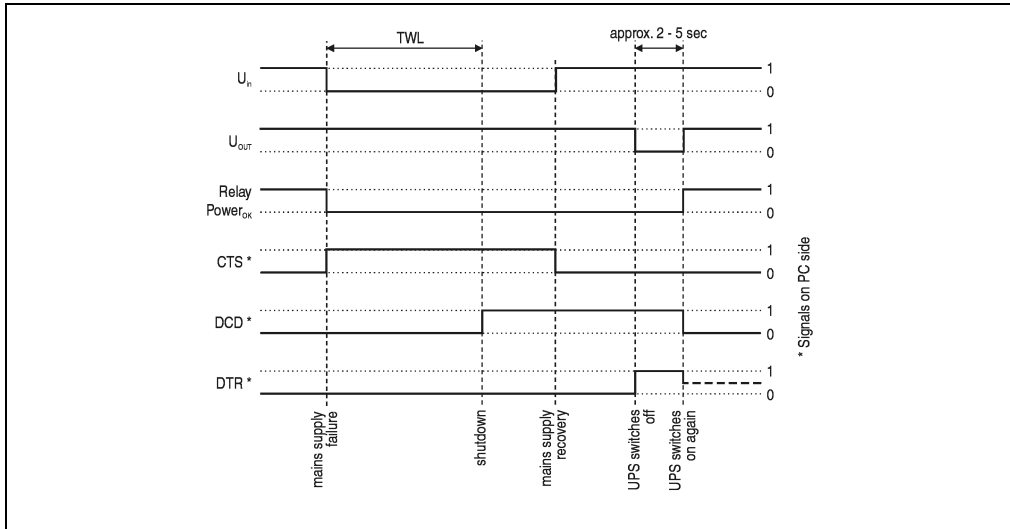


Figure 49: Handshake lines when a power failure occurs

If the supply voltage fails for a longer time than TWL, the UPS switches to battery operation. The CTS signal (signals power failure on the IPC) is set immediately after the supply voltage fails and the output relay is switched on. After the time TWL has passed, the DCD signal is set and the IPC shuts down.

If the UPS is supplied with power again, it restarts the load power supply after completing a positive self test.

### For Windows NT4.0 UPS Service:

If the operating system has completed the shut down sequence, Windows NT 4.0 UPS Service waits for an additional 2 minutes (can be set, see Chapter 3 “Software”) until the DTR signal is set by the IPC. The UPS stops supplying the load when this signal is set (remote shutdown). The SDT is necessary in case the system is not shut down correctly (i.e. crash occurs during shutdown). If time SDT passes after the DCD signal (load system shutdown) was set without the remote UPS shutdown signal (DTR signal) from the IPC, the UPS switches the output voltage off. The default value for SDT is 5 minutes; this time can be changed using software (see Chapter 3 “Software”).

## c) Power failure during POT

If a power failure occurs during POT, the respective handshake signals are set after this time has passed.

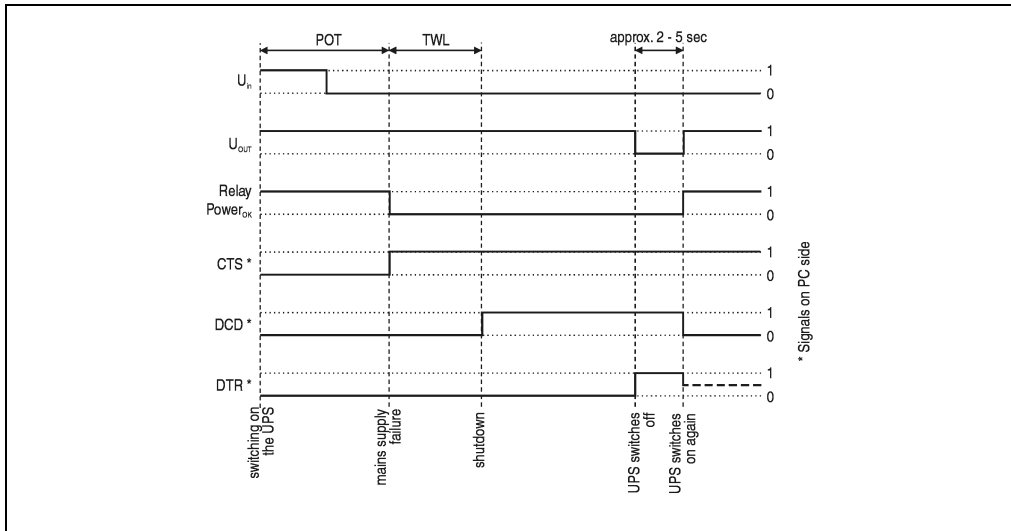


Figure 50: Handshake signals when a power failure occurs during POT

When shut down of the load system is complete, the UPS sets the DTR signal after an additional delay of 2 minutes (default POT time) and the UPS then disconnects the load system from the mains supply.

As soon as the supply voltage is available again, the load system is supplied with power after a successful self test.

## 2.6.2 Operation without the RS232 cable

If you want to run the UPS without connecting it to the load system (IPC) via an RS232 cable, the UPS behaves as follows during a power failure:

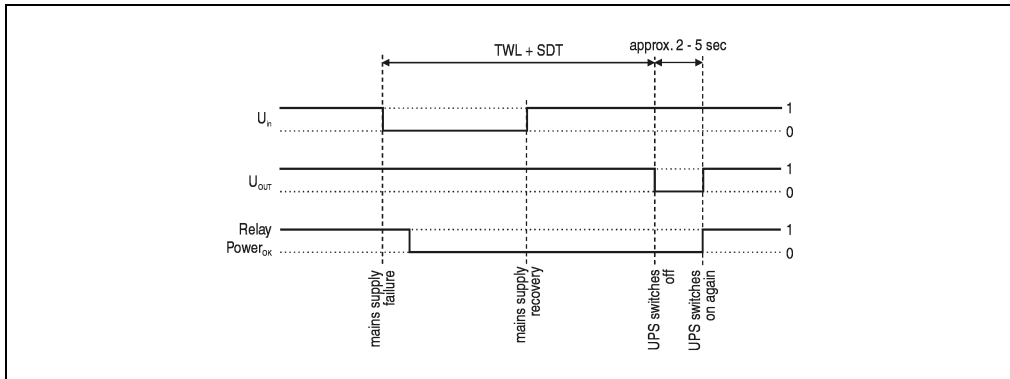


Figure 51: Handshake signals when a power failure occurs without an RS232 cable

As shown in the figure above, the times TWL and SDT (to change the values, see Chapter 3 “Software”) determine the behavior of the UPS when a power failure occurs. The UPS cannot send a DTR signal to the load because there is no connection between the UPS and the load. For this reason, the UPS switches itself off after the time TWL + SDT has passed, even if the load has not yet shut down. If the mains supply becomes available again after the time TWL has passed, the UPS switches off after the time TWL + SDT has passed and switches on again after approximately 2 to 5 seconds.



The load system (e.g. IPC) is not informed of a power failure and is shutdown depending on the UPS settings. This will most likely cause a loss of data.

## 2.7 Relay Output

An external electrical circuit can be switched (closed or open) using the relay output.

### 2.7.1 Contact Data

Relay Output	
Contact Class	III according to VDE 0435 part 120/10.81, Appendix B
Number and type of contacts	1 change-over contact
Contact design	Single contact
Contact material	AgCdO hard gold-plated
Continuous current limit (at maximum ambient temperature)	8 A
Starting current (max. 4 s at 10% ED)	15 A
Switching voltage	440 V~ / 30 V-
Switching capacity (max.)	Alternating current 2000 VA; direct current from the load limit cycle.
Contact resistance (starting value) / Measuring current / Driver current	$\leq 30 \text{ m}\Omega$ / 100 mA / 6 V
Reaction time at rated voltage and 20°C	Typical 6 ms
Release time with/without parallel diode	Typical 2.5 ms / 10 ms
Chatter time N.O. / N.C.	Typical 0.5 ms / 4 ms
Max. number of switching cycles without load / at rated load	1200 min <sup>-1</sup> / 30 min <sup>-1</sup>
Coil heating at continuous current limit	Approx. 7 K
Type of protection according to DIN 40050/IEC 529	Wash tight IP67 soldering machine compatible IP50

Table 29: Relay output contact data



## 2.8 Rechargeable Batteries

### 2.8.1 Characteristics of Lead Acid Battery 12 VDC 7.2 Ah

Panasonic LC-R127R2P 12 V / 7.2 Ah (UPS batteries; 2 pcs., 12V, 7.2Ah)		9A0100.13
Rated voltage		12 V
Rated capacity		7.2 Ah
Capacity dependent on discharging current (T = 25°C)	at 20 h discharging time (360 mA, T = 25°C)	7.2 Ah
	at 10 h discharging time (680 mA, T = 25 °C)	6.8 Ah
	at 5 h discharging time (1260 mA, T = 25 °C)	6.3 Ah
	at 1 h discharging time (4900 mA, T = 25 °C)	4.9 Ah
Capacity dependent on ambient temperature	at 20 h discharging time (T = 40 °C)	102 %
	at 20 h discharging time (T = 25 °C)	100 %
	at 20 h discharging time (T = 0 °C)	85 %
	at 20 h discharging time (T = -15 °C)	65 %
Self discharge (T = 25 °C)	Charge remaining after 3 months	91 %
	Charge remaining after 6 months	82 %
	Charge remaining after 12 months	64 %
Internal resistance at full charge (T = 25 °C)		Approx. 40 mΩ
Maximum charging current (T = 25 °C)		2.88 A
Maximum charging voltage (T = 25 °C)		13.6 V - 13.8 V
Dimensions in mm (L x W x H)		151 x 64.5 x 100
Weight		2.5 kg

Table 30: Panasonic LC-R127R2P characteristics



Batteries other than those obtained from B&R cannot be used because the UPS is specified for the charging and discharging characteristics of these battery types.

## 2.8.2 Characteristics of Lead Acid Battery 12 V, 2.2 Ah

Panasonic LC-R122R2P (UPS batteries; 2 pcs., 12V, 2.2 Ah)		9A0100.15
Rated voltage		12 V
Rated capacity		2.2 Ah
Capacity dependent on discharging current (T = 25 °C)	at 20 h discharging time (110 mA, T = 25 °C)	2.2 Ah
	at 10 h discharging time (200 mA, T = 25 °C)	2.0 Ah
	at 5 h discharging time (360 mA, T = 25 °C)	1.8 Ah
	at 1 h discharging time (1300 mA, T = 25 °C)	1.3 Ah
Capacity dependent on ambient temperature	at 20 h discharging time (T = 40 °C)	102 %
	at 20 h discharging time (T = 25 °C)	100 %
	at 20 h discharging time (T = 0 °C)	85 %
	at 20 h discharging time (T = -15 °C)	65 %
Self discharge (T = 25 °C)	Charge remaining after 3 months	91 %
	Charge remaining after 6 months	82 %
	Charge remaining after 12 months	64 %
Internal resistance at full charge (T = 25 °C)		Approx. 70 mΩ
Maximum charging current (T = 25 °C)		0.88 A
Maximum charging voltage (T = 25 °C)		13.6 V to 13.8 V
Dimensions in mm (L x W x H)		177 x 34 x 66
Weight		0.8 kg

Table 31: Panasonic LC-R122R2P characteristics



Batteries other than those obtained from B&R cannot be used because the UPS is specified for the charging and discharging characteristics of these battery types.

## 2.8.3 Characteristics of Hawker Cyclon Rechargeable Battery 12 V, 4.5 Ah

Hawker Cyclon (UPS batteries; 2 pcs., 12V, 4.5 Ah)		9A0100.17
Rated voltage		12 V
Rated capacity		4.5 Ah
Internal resistance at full charge (T = 25 °C)		Approx. 5 mΩ
Maximum charging current (T = 25 °C)		2.88 A
Maximum charging voltage (T = 25 °C)		14.7 V to 15 V
Dimensions in mm (L x W x H)		205 x 38 x 102
Weight		1.77 kg

Table 32: Hawker Cyclon Characteristics

## 2.8.4 Mounting Instructions for Rechargeable Batteries

### The Lead Acid Battery

The maintenance-free rechargeable batteries use a gel instead of liquid acid. This enables the batteries to be stored horizontally or vertically when not in use.

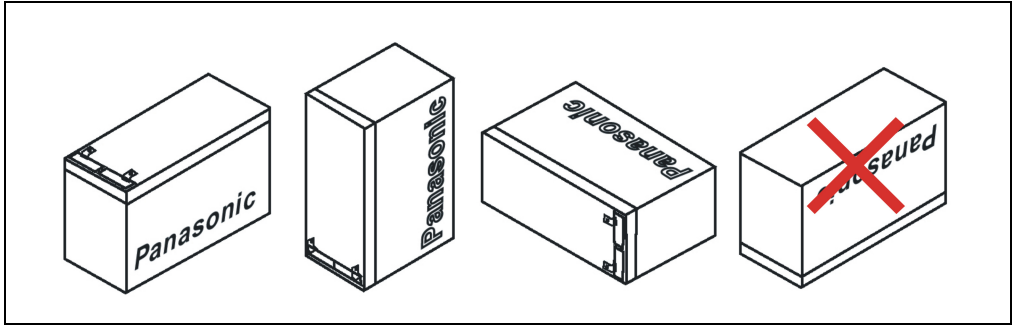


Figure 52: Battery during operation

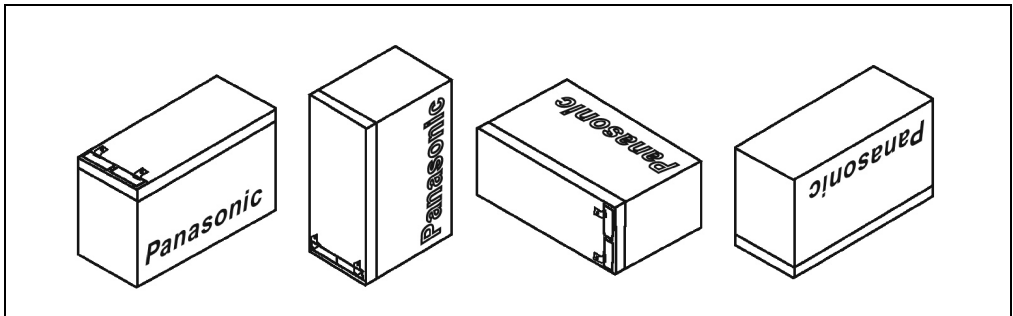


Figure 53: Battery storage when not in use

Care must be taken that the battery cage is assembled so that batteries are not installed upside down but only in a horizontal position or on its side and that they are not subjected to excessive mechanical stresses such as vibrations and jolts. This would cause the lead plates inside the rechargeable battery to touch and reduce the number of cells and rated voltage (additionally causing intensive heating due to internal short circuit currents).

The battery is not allowed to be exposed to direct sunlight and/or be stored in a damp environment.

### Hawker Cyclon Rechargeable Batteries

Due to the unique construction of these batteries, they can be stored and operated in any position.

**2.8.5 Parallel Connection of Batteries**

Several rechargeable batteries can be connected in parallel by observing the following points:

- Only use batteries which are available from B&R and designed for operation with a UPS (model numbers: 9A0100.12, 9A0100.13, 9A0100.14, 9A0100.15).
- Only connect batteries with the same capacity in parallel.  
Parallel connection of the rechargeable batteries with different capacities (e.g. 7.2 Ah parallel with 2.2 Ah) is not allowed.
- The temperature can only be monitored by the UPS for one battery, therefore the batteries must be placed so that the environmental conditions are the same (temperature).
- A defect which occurs in an individual battery unit cannot be detected when the batteries are connected in parallel.
- The maximum charging current of 0.88A cannot be exceeded for the 2.2Ah rechargeable battery.
- Dividing the charging current increases the charging time required to reach the necessary operating capacity of the rechargeable battery. The charging time depends on the following:
  - Number of rechargeable batteries connected in parallel
  - Charge of the rechargeable batteries
  - Charging Current
  - Temperature

Parallel operation of batteries does not increase the load current. This is set at 8A in battery operation. This only increases the buffer time and decreases charging and discharging current for the rechargeable battery.

## 2.8.6 Setting the Maximum Charging Current

The maximum charging current for the rechargeable battery is 0.88A by default. This can however be set between 0.88A and 2.88A using the button on the front (a lower charging current increases the life of the rechargeable battery, but also the charging time):

Push the button to start the electric current setting mode. The UPS then switches on. Release the button after approximately 5 seconds. Both red LEDs signal the electric current setting mode.

Each time the button is pushed again, the maximum charging current is increased one step (0.25A). Pushing the button once more when the maximum charging current (2.88A) is reached sets the default value.

The electric current which has been set is shown by the UPS status LEDs as a binary code:

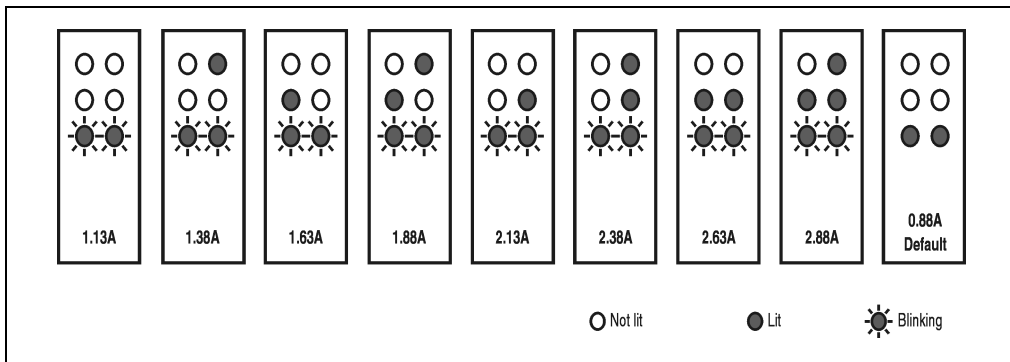


Figure 54: Setting the maximum charging current

If the button is not pushed for approximately 1 minute, the UPS accepts the changed settings and restarts the UPS.



0.88 A is the maximum charging current for the UPS battery set, 2 x 12V / 2.2Ah (Panasonic LC-R122R2P, Model no. 9A0100.14). The 0.88 A upper limit is to be observed when changing the charging current using this rechargeable battery!



When setting the charging current it is not recommended that a load system is connected to the UPS. When the UPS starts again, the load system is switched off without properly shutting down any program that are running!

The maximum charging current can also be set using the software, as described in Chapter 3 "Software". The lowest value that can be set when using the software is 0.5A (when using the button configuration it is 0.88A). Setting the current using the software first (see "Setting LCS (Load Current Set)" on page 60) and changing it using the button during the current setting mode overwrites the value. If this setting mode is changed without saving the current setting (by restarting the UPS), the value set using the LCS command remains.

### 2.8.7 Charging and Discharging Characteristics of the Lead Acid Battery

A special LED on the front of the UPS shows that the battery is charging. (for information on status LEDs, see "Status LEDs" on page 31)

The charging voltage and charging current are dependent on the ambient temperature and are controlled by the UPS microprocessor. If the battery ambient temperature is outside of the permissible values, this influences the operation of the UPS (see also 2.3 "Switching on the UPS").

The voltage limit value when discharging the batteries is 22.5 V (when the switching threshold is set to 18 V) or 22.8 V (when the switching threshold is set to 21.5 V). If the UPS is in battery operation and reaches the battery voltage 21 V, the load system shuts down and the UPS switches itself completely off.

The duration of battery operation is dependent on the discharging current, the rechargeable battery charge available and the ambient temperature.

#### Example:

With a fully charged UPS battery 12 V / 7.2 Ah (Mod.No. 9A0100.13) the available charge is 24 V 7.2 Ah. This is sufficient to supply a load of 150 W for 20 minutes (at ambient temperatures of -10 °C to 40 °C).

The battery capacity reduces over time, as shown in the following diagram:

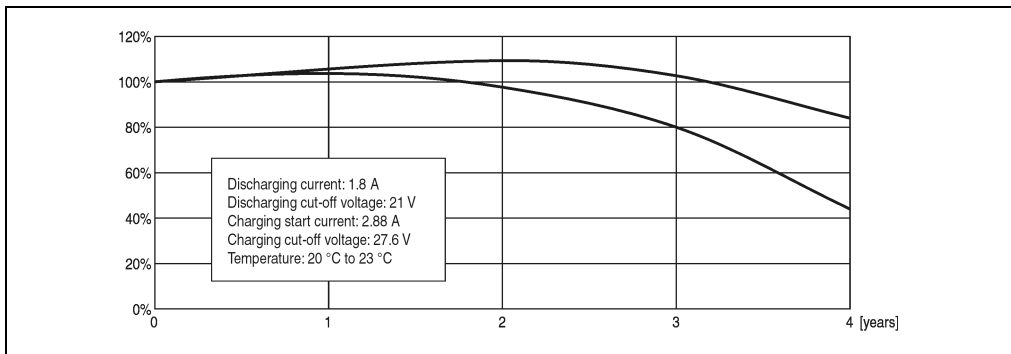


Figure 55: Reduction of rechargeable battery capacity over time

Additional factors include battery charging and discharging cycles as well as the ambient temperature.

## 2.8.8 Lead Acid Battery Lifespan

A battery life span depends on the number of charge / discharge cycles, the ambient temperature, the charging and discharging currents and the intensity of discharge. The battery capacity reduces during the lifetime of a battery. This means that an older battery cannot store as much energy as a new battery even when it has been completely charged. If the battery is discharged 100% with  $I = 1.8\text{ A}$  (up to  $V_{\text{batt}} = 21\text{ V}$ ) e.g. 200 times and then charged with  $I = 2.88\text{ A}$ , the rated capacity can only be 60% of the 7.2Ah. If it is only 30% discharge, then this procedure can be repeated up to 1200 times. For exact details, see the data sheets for Panasonic batteries (2.8.9 “LC-R122R2P Data Sheet” and 2.8.10 “LC-P127R2P Data Sheet”).

The effect of temperature on the battery life span forms the following characteristics.

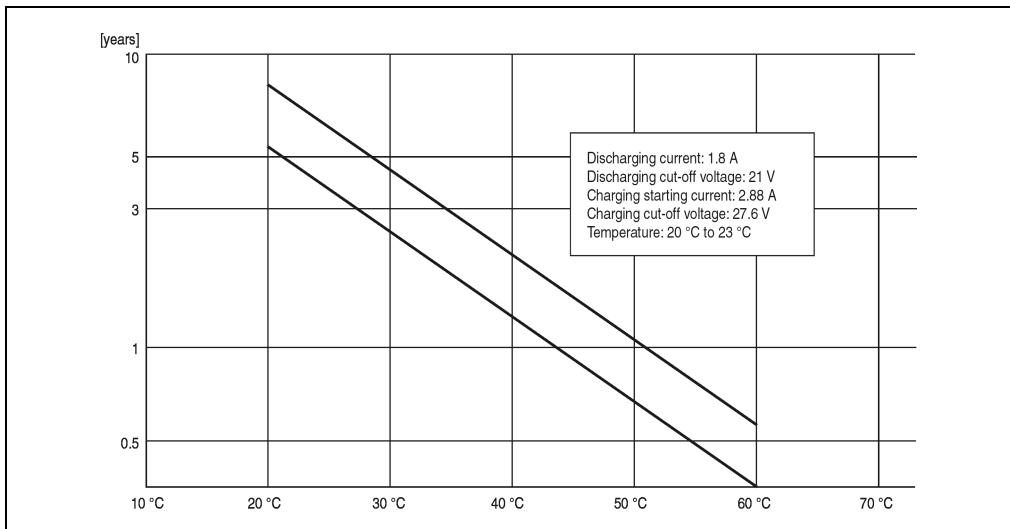


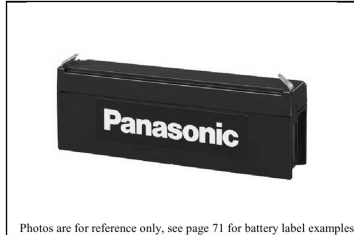
Figure 56: Effect of temperature on the battery life span

The no load voltage is evaluated to determine the capacity. The measurement is made while shutting down the UPS, then continuously every 24 hours. Due to the fact that this is a very rough evaluation method, it is possible that not every battery defect is 100% detected.

The UPS shows when the battery needs to be changed using the respective status LEDs (see "Status LEDs" on page 31).

## 2.8.9 LC-R122R2P Data Sheet

### LC-R122R2P(a)(LCR12V2.2P)



Photos are for reference only, see page 71 for battery label examples.

(a) Add applicable codes for terminal type, destination country, etc. (see page 21)

#### Specifications

Nominal voltage		12V
Nominal capacity (20 hour rate)		2.2Ah
Dimensions inch (mm)	Total height	2.598 inch (66mm)
	Height	2.362 inch (60mm)
	Length	6.968 inch (177mm)
	Width	1.339 inch (34mm)
Mass		Approx. 1.76 lbs. (0.8kg)

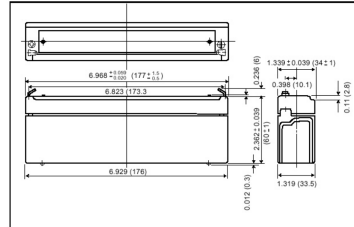
#### Characteristics

Capacity (note) (77°F (25°C))	20 hour rate (110mA)	2.2Ah
	10 hour rate (200mA)	2.0Ah
	5 hour rate (360mA)	1.8Ah
	1 hour rate (1300mA)	1.3Ah
	1.5 hour rate discharge Cut-off voltage: 10.5 V	0.95A
Internal resistance	Fully charged battery (77°F (25°C))	Approx. 70mΩ
Temperature dependency of capacity (20 hour rate)	104°F (40°C)	102 %
	77°F (25°C)	100 %
	32°F (0°C)	85 %
	5°F (-15°C)	65 %
Self discharge (77°F (25°C))	Residual capacity after standing 3 months	91%
	Residual capacity after standing 6 months	82%
	Residual capacity after standing 12 months	64%
Terminal AMP Faston tab (Type 187)		
Charge Method (Constant Voltage)	Cycle use (Repeating use)	Initial current Control voltage 0.88 A or smaller Constant voltage: 14.5 to 14.9 V (per 12V cell 77°F (25°C))
	Trickle use	Control voltage 13.6 to 13.8 V (per 12V cell 77°F (25°C))

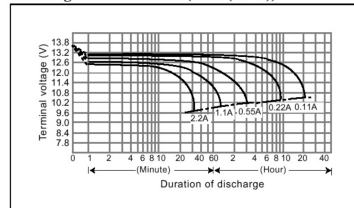
(Note) The above characteristics data are average values obtained within three charge/discharge Cycles not the minimum values.

\* This product adopts UL94HB-compliant resin as the material of the battery case. Product color is black. Optionally, type LC-V12R2P(a) which adopts flame-retardant resin complying with UL94V-0 is also available. Product color is gray.

#### Dimensions inch (mm)



#### Discharge characteristics (77°F (25°C)) (note)



#### Duration of discharge vs. Discharge current (note)

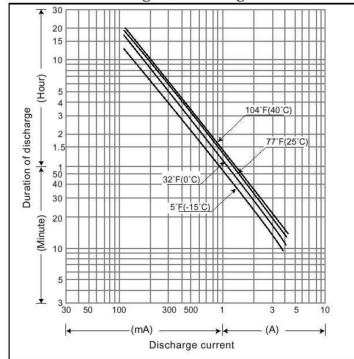
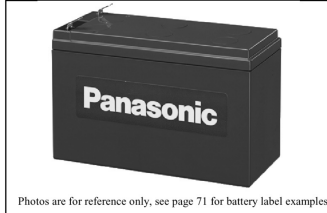


Figure 57: Panasonic battery LC-R122R2P data sheet



## 2.8.10 LC-P127R2P Data Sheet

### LC-P127R2P(a)



(a) Add applicable codes for terminal type, destination country, etc. (see page 21)

#### Specifications

Nominal voltage		12V
Nominal capacity (20 hour rate)		7.2Ah
Dimensions inch (mm)	Total height	3.937 inch (100mm)
	Height	3.701 inch (94mm)
	Length	5.945 inch (151mm)
	Width	2.539 inch (64.5mm)
Mass		Approx. 5.51 lbs. (2.5kg)

#### Characteristics

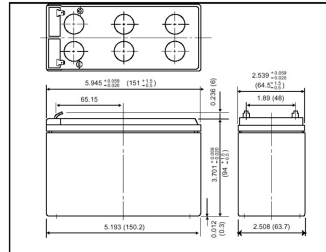
Capacity <sup>(note)</sup> (77°F (25°C))	20 hour rate (360mA)	7.2Ah
	10 hour rate (680mA)	6.8Ah
	5 hour rate (1260mA)	6.3Ah
	1 hour rate (4900mA)	4.9Ah
	1.5 hour rate discharge Cut-off voltage 10.5 V	3.5A
Internal resistance	Fully charged battery (77°F (25°C))	Approx. 40mΩ
Temperature dependency of capacity (20 hour rate)	104°F (40°C)	102 %
	77°F (25°C)	100 %
	32°F (0°C)	85 %
	5°F (-15°C)	65 %
Self discharge (77°F (25°C))	Residual capacity after standing 3 months	91%
	Residual capacity after standing 6 months	82%
	Residual capacity after standing 12 months	64%
	Terminal	AMP Faston tab (Type 187/250)
Charge Method (Constant Voltage)	Trickle use	Control voltage
		13.6 to 13.8 V (per 12V cell 77°F (25°C))

(Note) The above characteristics data are average values obtained within three charge/discharge Cycles not the minimum values.

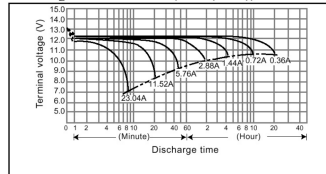
(Note) For cycle use of the battery, please contact us in advance.

\* This product adopts UL94V-0-compliant resin as the material of the battery case. Product color is gray. Optionally, type LC-N127R2P(a) which adopts less-flame-retardant resin complying with UL94HB is also available. Product color is black.

#### Dimensions inch (mm)



#### Discharge characteristics (77°F (25°C)) <sup>(note)</sup>



#### Duration of discharge vs. Discharge current <sup>(note)</sup>

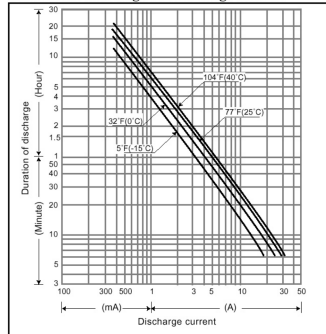


Figure 58: Panasonic battery LC-R127R2P data sheet

### 3. UPS Command Sequences

All possible commands for the UPS and the UPS return values are described in this section in detail.

Symbols	Meaning in English	Meaning in German	Hex value
<SP>	Space	Leerzeichen	20
<CR>	Carriage Return	Wagenrücklauf / Return	0D
<LF>	Line Feed	Zeilenvorschub	0A

Table 33: Definition of UPS symbols

#### 3.1 Detecting the UPS Operating Mode

This command sequence is used to detect the current UPS operating mode.

##### Sending from PC:

```
@#<CR><LF>
```

##### Response from UPS:

The following response is sent if the UPS is in monitoring mode:

```
err02<CR><LF>
```

The following response is sent if the UPS is in update mode:

```
err000<CR><LF>
```

If a response is not received, it is assumed that the UPS is not connected to the PC.

## 3.2 Requesting UPS Standard Parameters

### 3.2.1 UPS Firmware < 2.0

#### Sending from PC:

#

#### Response from UPS:

The values listed here are sample values.

```
invalid<SP>command<CR><LF>
TWL<SP>=<SP>10<CR><LF>
SDT<SP>=<SP>300<CR><LF>
LCS<SP>=<SP>310<CR><LF>
POT<SP>=<SP>120<CR><LF>
```

The length of the response frame is variable. The minimum frame length is 59 bytes.

### 3.2.2 UPS Firmware >= 2.0

#### Sending from PC:

#READ

#### Response from UPS:

The values listed here are sample values.

```
TWL<SP>=<SP>0010<CR><LF>
LCS<SP>=<SP>0281<CR><LF>
SDT<SP>=<SP>00300<CR><LF>
POT<SP>=<SP>0120<CR><LF>
PFL<SP>=<SP>180<CR><LF>
CTL<SP>=<SP>0000<CR><LF>
CTH<SP>=<SP>0040<CR><LF>
TMP<SP>=<SP>0025<CR><LF>
AGE<SP>=<SP>0005<CR><LF>
```

Starting with firmware version 2.0, the response frame has a fixed frame length of 104 bytes.

## 3.3 Writing UPS Parameters

### 3.3.1 TWL (Time Worst Low)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

Possible input value range #TWL = 000...999 or OFF

## Sending from PC:

```
#TWL=010<CR><LF>
```

## Response from UPS:

```
OK!___TWL<SP>=<SP>10<CR><LF>
```

### 3.3.2 SDT (Shut Down Time)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

Possible input value range #SDT = 0000...9999 or OFF

## Sending from PC:

```
#SDT=0100<CR><LF>
```

## Response from UPS:

```
OK!___SDT<SP>=<SP>100<CR><LF>
```

### 3.3.3 POT (Power On Time)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

Possible input value range #POT = 000...999 or OFF

## Sending from PC:

```
#POT=100<CR><LF>
```

## Response from UPS:

```
OK!___POT<SP>=<SP>100<CR><LF>
```

### 3.3.4 LCS (Load Current Set)

Firmware	Command Supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

Possible input value range #LCS = 0.5...2.88

### Sending from PC:

```
#LCS=2.28<CR><LF>
```

### Response from UPS:

```
OK!___LCS<SP>=<SP>802<CR><LF>
```

**Note:** The value entered is returned by the UPS in binary units.  
Binary value 1015 corresponds to 2.88 A  
Binary value 282 corresponds to 0.8 A

### 3.3.5 PFL (Power Fail Level)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

Possible input value range #PFL =180 or 215

### Sending from PC:

```
#PFL=180<CR><LF>
```

### Response from UPS:

```
OK!___PFL<SP>=<SP>180<CR><LF>
```

### 3.3.6 CTL (Charge Temperature Low)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

Possible input value range #CTL = -068...0180

### Sending from PC:

```
#CTL=0000<CR><LF>
```

### Response from UPS:

```
OK!___CTL<SP>=<SP>0<CR><LF>
```

### 3.3.7 CTH (Charge Temperature High)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

Possible input value range #CTH = -68...0180

## Sending from PC:

```
#CTH=0060<CR><LF>
```

## Response from UPS:

```
OK! ____CTH<SP>=<SP>60<CR><LF>
```

### 3.3.8 AGE (lifespan of rechargeable battery)

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

Possible input value range #AGE = 0...100

## Sending from PC:

```
#AGE=010<CR><LF>
```

## Response from UPS:

```
OK! ____AGE<SP>=<SP>10<CR><LF>
```

### 3.3.9 BCR (Battery Change Request)

The battery charging status can be requested using this command.

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

## Sending from PC:

```
#BCR?<CR><LF>
```

## Response from UPS:

```
STAT<SP>=<SP>x<CR><LF>
CMIN<SP>=<SP>068<CR><LF>
CMAX<SP>=<SP>085<CR><LF>
```

Possible values for x:

```
x=0    ...    Battery OK
x=1    ...    Battery faulty
x=2    ...    Battery temperature alarm
x=3    ...    User button pressed
```

The capacity of the battery connected is displayed by % using CMIN and CMAX.



If the status (STAT) is unequal to 0, there is no more UPS operation. In this case, the UPS switches off without buffering when a power failure occurs!

### 3.3.10 Read the UPS time stamp (WHRD)

The UPS time stamp is needed to calculate the battery lifespan.

Firmware	Command Supported
Version < 2.0	No
Version ≥ 2.0	Yes

#### Sending from PC:

```
@WHRD<CR><LF>
```

#### Response from UPS:

```
Time=00.02.21<CR><LF>
```

```
Date=01.01.2000<CR><LF>
```

Using the returned values, the current elapsed operating time of the UPS with the connected battery unit can be determined by subtracting the basis time stamp "01.01.2000 00:00:00".

### 3.4 Battery Operation Parameters

The minimum and maximum values listed here cannot be exceeded according to the battery type and must be transferred to the UPS when using B&R battery units.

Description	Command on the UPS
Load Current Low Load Current High	#LCS -> Value must be between Low and High
Charge Temperature Low	#CTL
Charge Temperature High	#CTH
Change Battery Age	#AGE

#### 3.4.1 Panasonic LC-R127R2P 7.2 Ah (9A0100.12)

Description	value	Remark
Load Current Low	500 mA	Minimum
Load Current High	2880 mA	Maximum
Charge Temperature Low	0 °C	Minimum
Charge Temperature High	40 °C	Maximum
Change Battery Age	5 years	Maximum

#### 3.4.2 Panasonic LC-R122R2P 2.2 Ah (9A0100.14)

Description	value	Remark
Load Current Low	500 mA	Minimum
Load Current High	880 mA	Maximum
Charge Temperature Low	0 °C	Minimum
Charge Temperature High	40 °C	Maximum
Change Battery Age	5 years	Maximum

#### 3.4.3 Hawker Cyclon 4.5 Ah (9A0100.16)

Description	value	Remark
Load Current Low	500 mA	Minimum
Load Current High	2880 mA	Maximum
Charge Temperature Low	-40 °C	Minimum
Charge Temperature High	80 °C	Maximum
Change Battery Age	10 years	Maximum



## 4. Glossary

### #AGE

This UPS parameter command is used to set the maximum lifespan of the rechargeable battery which is connected. Once this time has expired, a battery change is signalled by the lighting of the respective LEDs on the UPS.

### #BCR

Abbreviation for »**B**attery **C**hange **R**equest« This command is used to read the current charging status for the connected battery unit and the current status of the battery unit.

### COM

A device name used to access serial ports in MS-DOS. The first serial port can be accessed under COM1, the second under COM2 etc. Typically, a modem, mouse or serial printer is connected to a serial port.

### #CTH

An abbreviation for »**C**harge **T**emperature **H**igh« This command is used to set the maximum charging temperature for the connected rechargeable battery. The rechargeable battery is charged until this temperature is reached.

### #CTL

An abbreviation for »**C**harge **T**emperature **L**ow« This command is used to set the minimum charging temperature for the connected rechargeable battery. When the temperature falls below this value, the rechargeable battery is not charged anymore.

### CTS

An abbreviation for »**C**lear **T**o **S**end« A signal used when transferring serial data from modem to computer, indicating its readiness to send the data. CTS is a hardware signal which is transferred via line number 5 in compliance with the RS-232-C standard.

### DCD

An abbreviation for »**D**ata **C**arrier **D**etected« A signal used in serial communication which is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.

### DSR

An abbreviation for »**D**ata **S**et **R**eady« A signal used in serial data transfer, which is sent by the modem to the computer it is connected to, indicating its readiness for processing. DSR is a hardware signal which is sent via line number 6 in compliance with the RS-232-C standard.

### DTR

An abbreviation for »**Data Terminal Ready**« A signal used in serial data transfer, which is sent by the computer to the modem it is connected to, indicating the computer's readiness to accept incoming signals.

### #LCS

An abbreviation for »**Load Current Set**« The charging current for the rechargeable battery can be set using this signal.

### #PFL

An abbreviation for »**Power Fail Level**« This command is used to set the voltage value, at which the UPS reacts to a power failure and switches from mains to battery operation. Can be set between 18 and 21.5 VDC using software.

### #POT

An abbreviation for »**Power On Time**« The first signals from the UPS to the load system are sent once this time has passed.

### RTS

An abbreviation for »**Request To Send**« A signal used in serial data transfer for requesting send permission. For example, it is sent from a computer to the modem connected to it. The RTS signal is assigned to pin 4 according to hardware specifications of the RS-232-C standard.

### RXD

An abbreviation for »**Receive (RX) Data**« A line for the transfer of serial data received from one device to another - e.g. from a modem to a computer. For connections complying with the RS-232-C standard, the RXD is connected to pin 3 of the plug.

### #SDT

An abbreviation for »**Shut Down Time**« After SDT, the UPS shuts itself down once the DCD signals has been set.

### #TWL

An abbreviation for »**Time Worst Low**« TWL is the time that passes between a power failure and sending the signal to shut down the load system.

### TXD

An abbreviation for »**Transmit (TX) Data**« A line for the transfer of serial data sent from one device to another - e.g. from a computer to a modem. For connections complying with the RS-232-C standard, the TXD is connected to pin 2 of the plug.

### UPS

An abbreviation for »**Uninterruptible Power Supply**«





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