# Uninterruptible power supply

# **User's Manual**

Version: 5.20 (February 2010) Model no.: MAUSV1-0

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## **Chapter 1: General information**

**Chapter 2: Technical data** 

**Chapter 3: Commissioning** 

**Chapter 4: Software** 

**Chapter 5: Accessories** 

Anhang A

## Figure index

Table index

Model number index

Index

Chapter 1: General information	11
1. Manual history	. 11
2. Safety notices	13
2.1 Introduction	13
2.2 Intended use	13
2.3 Transport and storage	. 13
2.4 Installation	14
2.5 Operation	14
2.5.1 Protection against touching electrical parts	14
2.5.2 Environmental conditions - dust, humidity, aggressive gases	. 14
2.5.3 Programs, viruses and dangerous programs	15
2.6 Environmentally-friendly disposal	15
2.6.1 Separation of materials	. 15
3. Safety notices	16
4. Guidelines	16
5. Model numbers	. 17

Chapter 2: Technical data	19
1. General information	19
1.1 UPS Functions	20
2. Charging Unit	21
2.1 9A0100.11 UPS 24 VDC	21
2.1.1 Technical data	21
2.1.2 Dimensions	23
2.1.3 Contents of delivery	23
2.1.4 Device interfaces	24
3. Battery Units	31
3.1 9A0100.12 Type A Battery Unit (24 V / 7.2 Ah)	31
3.1.1 Technical data	31
3.1.2 Dimensions <= Revision E0	32
3.1.3 Dimensions > Revision E0	33
3.1.4 Contents of delivery	33
3.2 9A0100.14 Typ B Battery Unit (24 V / 2.2 Ah)	34
3.2.1 Technical data	34
3.2.2 Dimensions <= Revision D0	35
3.2.3 Dimensions > Revision D0	36
3.2.4 Contents of delivery	36
3.3 9A0100.16 Type C Battery Unit (24 V / 4.5 Ah)	37
3.3.1 Technical data	37
3.3.2 Dimensions	38
3.3.3 Contents of delivery	38
4. Replacement Batteries	39
4.1 9A0100.13 Batteries; 2 pcs., 12V 7.2 Ah	39
4.1.1 Technical data	39
4.2 9A0100.15 Batteries; 2 pcs., 12V 2.2 Ah	40
4.2.1 Technical data	40

#### Table of contents

4.3 9A0100.17 Batteries; 2 pcs., 12 V 4.5 Ah	41
4.3.1 Technical data	41
5. Null modem cable	42
5.1 9A0017.0x RS232 Null Modem Cable	42

# Chapter 3: Commissioning 43 1. Getting started 43 2. Mounting the UPS Charging Unit 44

	44
2.1 Cable connection	46
2.2 Mounting orientation	46
3. Mounting Guidelines for Battery Units	47
3.1 Cable connection	48
3.1.1 Procedure	48
3.2 Mounting orientation	49
3.2.1 9A0100.12, 9A0100.13, 9A0100.14, 9A0100.15	49
3.2.2 9A0100.16, 9A0100.17	50

Chapter 4: Software	51
1. B&R UPS Configuration Software	51
1.1 Installation	51
1.2 Start	52
1.3 Uninstall	54
1.4 Construction	55
1.5 Tab Descriptions	57
1.5.1 "About" Tab	57
1.5.2 "Settings" tab description	58
1.5.3 "Firmware" Tab	59
1.5.4 "Communication" Tab	61
1.5.5 "Service" Tab	62
1.6 Load System Monitoring	63
1.6.1 Monitoring on Windows 95/98/ME/NT4.0/2000/XP	64
1.7 Security configuration / Menu language	68
1.7.1 Menu Functions	70
1.8 Warnings	70
2. Monitoring using Windows NT4.0 with Operating System UPS Service	73
3. Monitoring using Windows 2000 with Operating System UPS Service	74
4. Monitoring using Windows XP with Operating System UPS Service	78
5. Configuring the UPS using HyperTerminal	82
5.1 Detecting the UPS operating mode	83
5.1.1 Command sequence	83
5.2 Read UPS parameters	84
5.2.1 UPS Firmware < 2.0	84
5.2.2 UPS Firmware $\geq$ 2.0	85
5.2.3 UPS Firmware $\geq$ 2.10	86
5.2.4 BCR (Battery Change Request)	87
5.2.5 whrd (UPS Time Stamp)	88

5.2.6 RBS (Reset Battery Status)	88
5.3 Set UPS Parameters	
5.3.1 TWL (Time Worst Low)	
5.3.2 SDT (Shut Down Time)	
5.3.3 POT (Power On Time)	
5.3.4 LCS (Load Current Set)	
5.3.5 PFL (Power Fail Level)	
5.3.6 CTL (Charge Temperature Low)	95
5.3.7 CTH (Charge Temperature High)	
5.3.8 AGE (Lifespan of the Battery)	
5.3.9 DIT (Digital Input Button)	
5.3.10 LTL (Life Time LED)	
5.4 Measurement of charging current maintenance	100
5.4.1 Setting CCD (Charge Count Down)	101
5.4.2 Setting RCL (Remain Current Low)	102
5.4.3 Setting RCH (Remain Current High)	103
6. Battery operation parameters	104
6.1 Panasonic LC-R127R2P 7.2 Ah (9A0100.12)	104
6.2 Panasonic LC-R122R2P 2.2 Ah (9A0100.14)	104
6.3 Hawker Cyclon 4.5 Ah (9A0100.16)	105
7. UPS Firmware Differences	105
Chapter 5: Accessories	107
1. HMI Drivers & Utilities DVD 5SWHMI.0000-00	107
Annondix A	111
1. UPS behavior	
1.1 Deep discharge protection	
1.0. Shutting the lead system down acfely	
1.2 Shutting the load system down safely	
1.3 Switching on the UPS	
1.4 UPS overload benavior	

1.	UPS behavior	111
	1.1 Buffer operation	112
	1.1.1 Deep discharge protection	112
	1.2 Shutting the load system down safely	112
	1.3 Switching on the UPS	113
	1.4 UPS overload behavior	116
	1.5 User button, external button (digital input) and DIT (digital input button)	116
	1.5.1 Additional function of the user button starting with UPS Firmware version 2.0	117
	1.6 Serial interface	118
	1.6.1 Power failure	119
	1.6.2 Operation without the RS232 cable	122
	1.7 Relay output	123
	1.7.1 Contact data	123
2.	Rechargeable batteries	124
	2.1 Characteristics of lead acid battery 12 VDC 7.2 Ah	124
	2.2 Characteristics of lead acid battery 12 V 2.2 Ah	125
	2.3 Characteristics of Hawker Cyclon rechargeable battery 12 V, 4.5 Ah	125
	2.4 Parallel connection of battery units	126
	2.5 Setting the maximum charging current	126
	2.6 Charging and discharging characteristics of the lead acid battery	128

#### Table of contents

2.7 Life-span of the lead acid battery	129
2.8 LC-R122R2P data sheet	130
2.9 LC-P127R2P data sheet	131
2.10 Hawker Cyclon data sheet	132
3. Overview of UPS parameters	133
4. Glossary	134

## **Chapter 1 • General information**

## Information:

B&R does its best to keep the printed versions of its user's manuals as current as possible. However, any newer versions of the User's Manual can always be downloaded in electronic form (pdf) from the B&R homepage <u>www.br-automation.com</u>.

#### 1. Manual history

Version	Date	Comment
4.3	18.08.2000	First edition
4.4	07.09.2000	Changes / new features - New layout
4.5	29.09.2000	Changes / new features
4.6	19.04.2001	Changes / new features - Mistake in the cable description corrected - Mistake regarding the hand shake signal line corrected
4.7	03.10.2001	Changes / new features - New manual structure - B&R UPS configuration software added - Mistake regarding the possible storage/operating position for the lead gel rechargeable battery corrected - New layout
4.8	23.09.2002	Changes / new features - Error in Figure "Dimensions 9A0100.14 <= Revision D0" on page 35 - Dimensions for the distance between mounting holes corrected - Maximum cable length (15m) for self made RS232 connection cables added - 9A0100.16 UPS type C battery unit 24 V / 4.5 Ah added - 9A0100.17 UPS batteries 2 pcs. 12 V / 4.5 Ah added - Safety guidelines added - Description of new commands starting with UPS firmware version 2.0 - B&R UPS configuration software functions added starting with version 2.0 - Section "Monitoring using Windows XP with Operating System UPS Service" on page 78 added - Section "Configuring the UPS using HyperTerminal" on page 82 added - Section "UPS overload behavior" on page 116 added - Description of new UPS configuration software functions - Switching thresholds added

Table 1: Manual history

#### General information • Manual history

Version	Date	Comment
4.9	05.05.2003	Changes / new features - New symbols for safety notices - Signal display of "Status LEDs" on page 29 updated Communications settings of the HyperTerminal connection updated. (see table "Terminal program settings" on page 82) (no HW handshakel) - New commands added for UPS firmware versions 2.10 and up DIT (Digital Input Button) command - LTL (Life Time LED) command - CCD (Charge Count Down) command - RCL (Remain Current High) command - RCL (Remain Current High) command - RPS (Reset Battery Status) command - UPS read command RHDM - Description of the function of the measurement of charging current maintenance expanded Additions to the "Glossary" due to the new UPS commands (firmware version 2.10 and up) Section "Warnings" on page 70 added - Changeover to a new A5 book template (B&R HB template V32_07_2003) - HMI Drivers & Utilities CD (order number 5S0000.01-090) added - Section "UPS Firmware Differences" on page 105 added
5.0	23.02.2004	Changes / new features - Mounting of battery units revised (see Chapter 3 "Commissioning", Section 3 "Mounting Guidelines for Battery Units" on page 47) - Mounting of UPS charging unit revised (see Chapter 3 "Commissioning", Section 2 "Mounting the UPS Charging Unit" on page 44) - Data sheet for the Hawker Cyclon batteries added - Correction and revision of the state diagrams and signal lines (see "Appendix A" on page 111) - "UPS Command Sequences" section is now described in more detail in Chapter 4 "Software" Section 5 "Configuring the UPS using HyperTerminal". - New images of the battery units and the null modem cable.
5.10	23.11.2009	<ul> <li>Changes / new features <ul> <li>Chapter 3 Installation renamed to Chapter 3 Commissioning.</li> <li>Chapter 5 Technical Appendix renamed to Appendix A.</li> <li>Wording in technical data revised.</li> <li>Section 2.5.2 "Environmentally-friendly disposal" on page 15 added</li> <li>Section 2.5.2 "Environmental conditions - dust, humidity, aggressive gases" on page 14 and section 2.5.3 "Programs, viruses and dangerous programs" on page 15 added.</li> <li>Section about UPS functionality from Appendix A moved to Chapter 2 Technical Data.</li> <li>Maintenance interval for UPS battery units and replacement batteries added.</li> <li>Glossary revised.</li> <li>Table note formatting revised (page 67).</li> <li>Information text on cover page replace with updated text.</li> <li>Altitude information for replacement batteries updated, Information about altitude added throughout document (footnote).</li> <li>Headings for safety notices changed (e.g.: Important! -&gt; Warning!)</li> <li>Table formatting revised date to the manual.</li> <li>Rechargeable battery added to table "Environmentally-friendly separation of materials" on page 15.</li> <li>Lifespan specifications corrected for battery units and replacement batteries.</li> </ul> </li> </ul>
5.20	16.02.2010	Changes / new features - Marking lines, dimension lines and arrows of the graphics recolored in orange. - Table name changed at page 107.

Table 1: Manual history (Forts.)

## 2. Safety notices

#### 2.1 Introduction

Programmable logic controllers (PLCs), operating and monitoring devices (industrial PCs, Power Panels, Mobile Panels, etc.), and B&R uninterruptible power supplies have been designed, developed, and manufactured for conventional use in industry. They were not designed, developed, and manufactured for any use involving serious risks or hazards that could lead to death, injury, serious physical damage, or loss of any kind without the implementation of exceptionally stringent safety precautions. In particular, such risks and hazards include the use of these devices to monitor nuclear reactions in nuclear power plants, as well as flight control systems, flight safety, the control of mass transit systems, medical life support systems and 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.) must be observed in accordance with applicable national and international regulations. The same applies for all other devices connected to the system, such as drives.

All tasks such as installation, commissioning, and maintenance are only permitted to 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 who 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 and must be observed before installation and commissioning.

#### 2.2 Intended use

Electronic devices are generally not failsafe. 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, e.g. motors, are in a secure state.

#### 2.3 Transport and storage

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

#### 2.4 Installation

- Installation must take place according to the documentation, using suitable equipment and tools.
- Devices must be installed without voltage applied 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).

#### 2.5 Operation

#### 2.5.1 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 come into contact with these parts. This could result in death, severe injury or material damage.

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

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

#### 2.5.2 Environmental conditions - dust, humidity, aggressive gases

Use of operating and monitoring devices (e.g. industrial PCs, power panels, mobile panels, etc.) and uninterruptible power supplies in very dusty environments should be avoided. Dust collection on the devices influences their function and, especially in systems with active cooling (fans), sufficient cooling cannot be guaranteed.

The presence of aggressive gases in the environment can also lead to malfunctions. When combined with high temperature and humidity, aggressive gases - e.g. with sulfur, nitrogen and chlorine components - start chemical processes that can damage electronic components very quickly. Signs of the presence of aggressive gases are blackened copper surfaces and cable ends on existing installations.

For operation in dusty or humid conditions, correctly installed (cutout installation) operating and monitoring devices like Automation Panel or Power Panel are protected on the front side. The rear side of all devices must be protected from dust and humidity and must be cleaned at suitable intervals.

#### 2.5.3 Programs, viruses and dangerous programs

The system is subject to potential danger each time data is exchanged or software is installed from a data medium (e.g. diskette, CD-ROM, USB flash drive, etc.), a network connection, or the Internet. The user is responsible for assessing these dangers, implementing preventative measures such as virus protection programs, firewalls, etc. and obtaining software from reliable sources.

#### 2.6 Environmentally-friendly disposal

All B&R programmable controllers, operating and monitoring devices, and uninterruptible power supplies are designed to inflict as little harm on the environment as possible.

#### 2.6.1 Separation of materials

It is necessary to separate different materials so the device can undergo an environmentallyfriendly recycling process.

Component	Disposal
Programmable logic controllers Operating and monitoring devices Uninterruptible power supply Cables Accu	Electronics recycling
Cardboard box / paper packaging	Paper / cardboard recycling
Plastic packaging	Plastic recycling

Table 2: Environmentally-friendly separation of materials

Disposal must comply with the respective legal regulations.

General information • Safety notices

### 3. Safety notices

The safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Caution!	Disregarding the safety regulations and guidelines can result in severe injury or major damage to material.
Warning!	Disregarding the safety regulations and guidelines can result in injury or damage to material.
Information:	Important information for preventing errors.

Table 3: Organization of safety notices

## 4. Guidelines



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

#### General information • Model numbers

## 5. Model numbers

Model number	Description	Note
5SWHMI.0000-00	HMI Drivers & Utilities CD Include, among other things, the B&R UPS configuration software or current UPS firmware update files.	
9A0017.01	RS232 Null Modem Cable 0.6 m To connect UPS and load system (9-pin DSUB socket - 9-pin DSUB socket)	
9A0017.02	RS232 Null Modem Cable 1.8 m To connect UPS and load system (9-pin DSUB socket - 9-pin DSUB socket)	
9A0100.11	UPS 24 VDC 24 VDC input, 24 VDC output, serial interface	
9A0100.12	UPS battery unit type A 24 V; 7 Ah; including battery cage	
9A0100.13	UPS battery unit type A (replacement part) 2 x 12 V; 7 Ah; for battery unit 9A0100.12	
9A0100.14	UPS battery unit type B 24 V; 2.2 Ah; including battery cage	
9A0100.15	UPS battery unit type B (replacement part) 2 x 12 V; 2.2 Ah; for battery unit 9A0100.14	
9A0100.16	UPS battery unit, type C 24V 4.5Ah 24 V; 4.5 Ah; including battery cage	
9A0100.17	UPS battery unit, type C 24V 4.5Ah (replacement part) 2 x 12 V; 4.5 Ah; for battery unit 9A0100.16	
MAUSV1-0	UPS User's Manual, German	
MAUSV1-E	UPS User's Manual, English	
MAUSV1-F	UPS User's Manual, French	

Table 4: Model numbers

## Chapter 2 • Technical data

#### **1. General information**

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



Figure 1: UPS - Charging Unit

Features:

- 24 VDC Input voltage
- 24 VDC Output voltage
- Industrial standard installation
- · Communication via serial interface
- Status indicators
- Deep discharge protection
- Short circuit protection
- Maintenance free battery units

#### 1.1 UPS Functions



Figure 2: Block diagram of the entire system

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

Data and commands are exchanged between the UPS and the load system via the handshake signals for an RS232 interface. See Section 1.6.2 "Operation without the RS232 cable" on page 122 if you want to operate the UPS without connecting it to the load system using an RS232 cable.

## Danger!

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

## 2. Charging Unit

### 2.1 9A0100.11 UPS 24 VDC



Figure 3: UPS Charging Unit 9A0100.11

#### 2.1.1 Technical data

Features	9A0100.11
Software Support	Microsoft Windows 95 / 98 / ME / NT4.0 / 2000 / XP
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
Status indicators 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.) Red LED (battery reverse polarity, not connected) Red LED (mains supply, battery, battery charger)
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>2)</sup> or 21.5 V when 21.5 V <sup>2)</sup> Yes Yes; for mains supply, battery and battery charger <sup>1)</sup> Yes; for mains supply and battery

Table 5: Technical Data 9A0100.11

#### Technical data • Charging Unit

Electrical characteristics	9A01	00.11
Input during mains operation Rated voltage value Voltage range	Regulated 24 20 - 30 VDC at a switch 23.5 - 30 VDC at a switch	DC voltage VDC ning threshold of 18 V $^{2)}$ ning threshold of 21.5 V $^{2)}$
Output during mains operation Rated voltage value Voltage range Max. output current	24 20 - 30 VDC or 23.5 - 30 VDC depen 8	VDC ding on the set switching threshold <sup>2)</sup> A
Output during battery operation Switching threshold mains / battery operation <sup>2)</sup> Rated voltage value Voltage range Max. output current Mains failure bridging	18 V at 20 - 21.5 V at 23.5 24 21 - 26.8 VDC (+40° 8 A (loa max. 20 minutes with 150 W load (w	30 VDC input - 30 VDC input VDC C) or 28.2 VDC (0°C) ad-side) ith battery 9A0100.12, 24 V / 7.2 Ah)
Battery charging rating Charging clearing voltage Charging current	27.6 Depending on the type, adju in 0.01 A increments: using B&R HyperTerminal (0.5 - 2.88 A) or 0.	VDC Istable from 0.88 A to 2.88 A I UPS configuration software and 25 A: using button (0.88 to 2.88 A)
Mechanical characteristics		
Dimensions (W x H x D)	185 x 115 x 69 mm (see also figure 4	"Dimensions 9A0100.11" on page 23)
Weight	Approx. 1.2 kg	
Environmental characteristics		
Ambient temperature Operation Bearings Transport	0 to - 20 to - 20 to	+55°C +60°C +60°C
Relative humidity Operation Bearings Transport	5 to 95%, non-condensing 5 to 95%, non-condensing 5 to 95%, non-condensing	
Vibration Operation Bearings Transport	max. 9 - 200 Hz and max. 2 - 500 Hz and max. 2 - 500 Hz and 4	1 G (9.8 m/s² 0-peak) 4 G (39.2 m/s² 0-peak) 4 G (39.2 m/s² 0-peak)
Shock Operation Bearings Transport	max. 15 G (147 m/s <sup>2</sup> 0-peak) and 11 ms length max. 100 G (980 m/s <sup>2</sup> 0-peak) and 6 ms length max. 100 G (980 m/s <sup>2</sup> 0-peak) and 6 ms length	
Altitude	Max. 30	000 m <sup>3)</sup>
Standards	USA and Canada	Europe

Table 5: Technical Data 9A0100.11 (Forts.)

1) The charging unit fuse is not necessary with Revision L0 and higher.

2) Can be set using B&R UPS Configuration Software or HyperTerminal (18 or 21.5 VDC).

3) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

#### 2.1.2 Dimensions



Figure 4: Dimensions 9A0100.11

#### 2.1.3 Contents of delivery

The following components are included in the delivery of the B&R UPS 24 VDC :

Amount	Component
1	UPS Charging Unit
5	orange connection plug (plugged in)

Table 6: Delivery 9A0100.11

#### 2.1.4 Device interfaces



Figure 5: Device Interfaces 9A0100.11

#### **Power mains connection**

24 V mains supply connection. Regulated DC voltage, rated voltage value 24 VDC, voltage range according to the set switching threshold  $^{1)}$  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.
n.c.	Not connected	L ÷
Ť	Ground connection	

Table 7: Power mains connectio
--------------------------------

Correct pin assignments are also indicated on the UPS.

## Warning!

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

<sup>1)</sup> Can be set using B&R UPS Configuration Software or HyperTerminal (18 or 21.5 VDC).

#### Load Connection

Load connection (e.g. B&R IPC with 24 VDC bus unit).

Power mains connection		
Pin	Assignment	
+	Output VDC +	+
-	Output VDC -	- n.c.
n.c.	Not connected	L_1 ÷
Ť	Ground connection	

Table 8: Load Connection

Correct pin assignments are also indicated on the UPS.

## Caution!

The UPS must be connected with the load system 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> 18 V: 20-30 VDC, 21.5 V: 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

1) Can be set using B&R UPS Configuration Software or HyperTerminal (18 or 21.5 VDC).

Chapter 2 Technical data

#### **Technical data • Charging Unit**

#### **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 10 A / 250 V

l l l l l l l l l l l l l l l l l l l		Fuses
Network	10 A / 250 V	Mains
Battery	10 A / 250 V	Battery

Table 9: Fuses

#### **Battery Connection**

The battery units are connected using the cable included in delivery. The red (+) and black (-) leads of the battery cable are to be used for this.

Battery connection		
Pin	Assignment	
n.c.	Not connected	n.c.
+	Battery + Pin	
-	Battery - Pin	- not
n.c.	Not connected	

Table 10: Battery connection

Correct pin assignments are also indicated on the UPS.

## Warning!

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

#### **Relay Output**

A power failure is also signalled immediately by the UPS by setting a relay output. An external electrical circuit can be switched (closed or open) using the relay output.

Relay output		
Pin	Assignment	
n.c.	Not connected	n.c.
Power OK	Relay output	Power oK

Table 11: Relay output

For relay output contact data, see Section "Relay output" on page 123.

#### Buff. Button, Temperature Sensor Connection

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

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

Table 12: Ext. Button, Temperature Sensor Connection

See Section "User button, external button (digital input) and DIT (digital input button)" on page 116 for connecting an external button.

Chapter 2 Technical data

#### **Technical data • Charging Unit**

#### **RS232 interface**

The UPS communicates with the load system (e.g. B&R IPC) via the serial interface.

RS232 interface		
Pin	Assignment	
1	DCD	
2	RxD	
3	TxD	9-pin DSUB plug
4	DTR	1 5
5	GND	0
6	DSR	6 9
7	RTS	
8	CTS	
9	n.c.	

Table 13: 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 = 0.6 m) and 9A0017.02 (length = 1.8 m).

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 6: Pin assignment - RS232 cable

#### **User Button**

See Section "User button, external button (digital input) and DIT (digital input button)" on page 116 for possible uses of the user button.

#### Status LEDs

The UPS has six status LEDs that show the operating state, indicate any faults or display information about the battery units. The LEDs are also used to manually set the charging current for the battery unit via the user button (see Section "Setting the maximum charging current" on page 126). Each LED can display several different types of information based on flashing sequence:



Chapter 2 Technical data

Figure 7: Status LEDs

Function	Color	LED Number	Flashing sequences / 0.125 s = 8 Hz Interval:
Operation	Green	1	ON        Mains operation OK         OFF        Mains operation with no battery         OFF           OFF           OFF           OFF           Shut Down           OFF           Shut Down
Status	Yellow	2	UPS self test Overload Derivation of the self test Overload Derivation of the self test Derivation of test
Fuses	Red	3	1) Error: 24 V fuse mains or mains voltage < 20 V or 23.5 V (depending on the switching threshold 18 or 21.5V) Error: 24 V fuse battery Seconds
Battery Reverse Polarity	Red	4	On  Battery polarity reversed    On  Image: Construction of the second

Table 14: LED Status - Flashing Sequences and their Meaning

#### Technical data • Charging Unit

Function	Color	LED Number	Flashing sequences / D.125 s = 8 Hz Interval:
Battery Status	Yellow	5	Change battery malfunctioned or did not pass capacity test) Battery lifespan exceeded (dependant on type) or low battery capacity
Battery Charging	Yellow	6	On       Max charge current       = Max charge current         On       Mid charge current       = 30 - 60% of max charge current         On       Low charge current       = 0 - 30% of max charge current

Table 14: LED Status - Flashing Sequences and their 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).

## 3. Battery Units

## Warning!

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 units.

#### 3.1 9A0100.12 Type A Battery Unit (24 V / 7.2 Ah)



Figure 8: Type A Battery Unit 9A0100.12 Revision Comparison

#### 3.1.1 Technical data

Features	9A0100.12
Battery Type Method	Panasonic 12 V 7.2 Ah; two rechargeable batteries connected in series Maintenance free lead acid battery
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>
Lifespan	Up to 5 years (dependent on ambient temperature and the charging and discharging cycles)
Maintenance interval during storage	6 month interval between charges
Mechanical characteristics	
Dimensions (W x H x D)	See figure 9 "Dimensions 9A0100.12 <= Revision E0" on page 32 or Figure 10 "Dimensions 9A0100.12 > Revision E0" on page 33
Weight	Approx. 6.1 kg
Environmental characteristics	9A0100.12

Table 15: Technical Data 9A0100.12

#### Technical data • Battery Units

Ambient temperature Operation Bearings Transport	0 to +40°C -15 to +40°C -15 to +40°C
Relative humidity Operation Bearings Transport	25 to 85%, non-condensing 25 to 85%, non-condensing 25 to 85% (non-condensing)
Altitude	Max. 3000 m <sup>1)</sup>

Table 15: Technical Data 9A0100.12 (Forts.)

1) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

#### 3.1.2 Dimensions <= Revision E0



Figure 9: Dimensions 9A0100.12 <= Revision E0

#### 3.1.3 Dimensions > Revision E0



Figure 10: Dimensions 9A0100.12 > Revision E0

#### 3.1.4 Contents of delivery

The following components are included in the delivery of the battery unit 9A0100.12:

Amount	Component
1	Battery unit type A 24 V; 7.2 Ah; incl. battery cage
1	Pre-assembled 3 meter long attachment cable for connecting the battery unit and temperature sensor to the UPS charging unit.

Table 16: Delivery 9A0100.12

#### 3.2 9A0100.14 Typ B Battery Unit (24 V / 2.2 Ah)



Figure 11: Type B Battery Unit 9A0100.14 Revision Comparison

#### 3.2.1 Technical data

Features	9A0100.14
Battery Type Method	Panasonic 12V 2.2 Ah; two rechargeable batteries connected in series Maintenance free lead acid battery
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>
Lifespan	Up to 5 years (dependent on ambient temperature and the charging and discharging cycles)
Maintenance interval during storage	6 month interval between charges
Mechanical characteristics	
Dimensions (W x H x D)	See figure 12 "Dimensions 9A0100.14 <= Revision D0" on page 35 or Figure 13 "Dimensions 9A0100.14 > Revision D0" on page 36
Weight	Approx. 2.3 kg
Environmental characteristics	
Ambient temperature Operation Bearings Transport	0 to +40°C -15 to +40°C -15 to +40°C
Relative humidity Operation Bearings Transport	25 to 85%, non-condensing 25 to 85%, non-condensing 25 to 85% (non-condensing)
Altitude	Max. 3000 m <sup>1)</sup>

Table 17: Technical Data 9A0100.14

1) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

#### 3.2.2 Dimensions <= Revision D0



Figure 12: Dimensions 9A0100.14 <= Revision D0

#### 3.2.3 Dimensions > Revision D0



Figure 13: Dimensions 9A0100.14 > Revision D0

#### 3.2.4 Contents of delivery

The following components are included in the delivery of the battery unit 9A0100.14:

Amount	Component
1	Battery unit type B 24 V; 2.2 Ah; incl. battery cage
1	Pre-assembled 3 meter long attachment cable for connecting the battery unit and temperature sensor to the UPS charging unit.

Table 18: Delivery 9A0100.14
### 3.3 9A0100.16 Type C Battery Unit (24 V / 4.5 Ah)



Figure 14: Type C Battery Unit 9A0100.16

#### 3.3.1 Technical data

Features	9A0100.16
Battery Type Method	Hawker Cyclon 12 V 4.5 Ah; two rechargeable batteries connected in series Single cell
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>
Lifespan	Up to 10 years (dependent on ambient temperature and the charging and discharging cycles)
Maintenance interval during storage	6 month interval between charges
Mechanical characteristics	
Dimensions (W x H x D)	223.2 x 145 x 78.2 mm
Weight	Approx. 5 kg
Environmental characteristics	
Ambient temperature Operation Bearings Transport	-40 to +80°C -65 to +80°C -65 to +80°C
Relative humidity Operation Bearings Transport	5 to 95%, non-condensing 5 to 95%, non-condensing 5 to 95%, non-condensing
Altitude	Max. 3000 m <sup>1)</sup>

Table 19: Technical Data 9A0100.16

1) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Chapter 2 Technical data

#### 3.3.2 Dimensions



Figure 15: Dimensions 9A0100.16

#### 3.3.3 Contents of delivery

The following components are included in the delivery of the battery unit 9A0100.16:

Amount	Component
1	Battery unit type C 24 V; 4.5 Ah; incl. battery cage
1	Pre-assembled 3 meter long attachment cable for connecting the battery unit and temperature sensor to the UPS charging unit.

Table 20: Delivery 9A0100.16

### 4. Replacement Batteries

#### 4.1 9A0100.13 Batteries; 2 pcs., 12V 7.2 Ah

These are the replacements for the batteries in battery unit 9A0100.12.



Figure 16: Battery Unit 9A0100.13

#### 4.1.1 Technical data

Features	9A0100.13
Battery Type Method	Panasonic 12 V 7.2 Ah Maintenance free lead acid battery
Lifespan	Up to 5 years (dependent on ambient temperature and the charging and discharging cycles)
Maintenance interval during storage	6 month interval between charges
Mechanical characteristics	9A0100.13
Weight	Approx. 5.2 kg
Environmental characteristics	9A0100.13
Ambient temperature Operation Bearings Transport	0 to +40°C -15 to +40°C -15 to +40°C
Relative humidity Operation Bearings Transport	25 to 85%, non-condensing 25 to 85%, non-condensing 25 to 85% (non-condensing)
Altitude	Max. 3000 m <sup>1)</sup>

Table 21: Technical Data 9A0100.13

1) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

#### 4.2 9A0100.15 Batteries; 2 pcs., 12V 2.2 Ah

These are the replacements for the batteries in battery unit 9A0100.14.



Figure 17: Battery Unit 9A0100.15

#### 4.2.1 Technical data

UPS batteries; 2 pcs., 12V; 2.2 Ah	9A0100.15
Battery Type Method	Panasonic 12 V 2.2 Ah Maintenance free lead acid battery
Lifespan	Up to 5 years (dependent on ambient temperature and the charging and discharging cycles)
Maintenance interval during storage	6 month interval between charges
Mechanical characteristics	9A0100.13
Weight	Approx. 1.9 kg
Environmental characteristics	9A0100.13
Ambient temperature Operation Bearings Transport	0 to +40°C -15 to +40°C -15 to +40°C
Relative humidity Operation Bearings Transport	25 to 85%, non-condensing 25 to 85%, non-condensing 25 to 85% (non-condensing)
Altitude	Max. 3000 m <sup>1)</sup>

Table 22: Technical Data 9A0100.15

1) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

### 4.3 9A0100.17 Batteries; 2 pcs., 12 V 4.5 Ah

These are the replacements for the batteries in battery unit 9A0100.16.



Figure 18: Battery Unit 9A0100.17

#### 4.3.1 Technical data

UPS batteries; 2 pcs., 12V; 4.5 Ah	9A0100.17
Battery Type Method	Hawker Cyclon 12 V 4.5 Ah; Single cell
Lifespan	Up to 10 years (dependent on ambient temperature and the charging and discharging cycles)
Maintenance interval during storage	6 month interval between charges
Mechanical characteristics	9A0100.13
Dimensions (W x H x D)	223.2 x 145 x 78.2 mm
Weight	Approx. 3.6 kg
Environmental characteristics	9A0100.13
Ambient temperature Operation Bearings Transport	-40 to +80°C -65 to +80°C -65 to +80°C
Relative humidity Operation Bearings Transport	5 to 95%, non-condensing 5 to 95%, non-condensing 5 to 95%, non-condensing
Altitude	Max. 3000 m <sup>1)</sup>

Table 23: Technical Data 9A0100.17

1) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

### 5. Null modem cable

This cable is needed for the connection between the UPS and the load system (e.g. B&R IPC) The cable has 2 DSUB sockets. It is available in lengths of 0.6 m and 1.8 m.

#### 5.1 9A0017.0x RS232 Null Modem Cable



Figure 19: Null modem cable 9A0017.0x

RS232 DB9 null modem cable	9A0017.01	9A0017.02
Length	0.6 m	1.8 m
Pin assignments	See table "Pin assignment	- RS232 cable" on page 28

Table 24: Null Modem Cable 9A0017.01 and 9A0017.02

# **Chapter 3 • Commissioning**

### 1. Getting started

- 1) Unpack the UPS and the battery unit.
- 2) Set up and install the UPS charging unit (see Section 2 "Mounting the UPS Charging Unit" on page 44). The UPS 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.
- Set up and install the battery unit (see Section "Mounting Guidelines for Battery Units" on page 47).
- 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 null modem cable (see Section "RS232 interface" on page 28) can be used.
- 5) Connect the UPS load output to the load system that should be supplied. For the connection, use the 4 pin plug included in the delivery and a user-provided cable with a cross section of  $2 \times 2.5 \text{ mm}^2$ . Be sure to check the polarity when making the connection! The UPS must also be connected with the load system ground connection, using the ground connection provided.
- 6) Attaching the connection cable (delivered with the battery unit) to the battery unit according to wiring guidelines (see Section 3.1 "Cable connection" on page 48).
- 7) Attaching the battery unit connection cable (red and black leads) to the battery input of the UPS with the 4 pin plug included in the delivery. Be sure to check the polarity when making the connection!
- 8) Connecting the temperature sensor cable (two white leads) to the 4 pin plug extension included in delivery. Button / Temp.
- 9) UPS connection to a 24 VDC power supply: The connection of the 24 VDC supply voltage is made using the 4 pin plug included with the delivery and a user-provided cable with a 2 x 2.5 mm<sup>2</sup> cross section. Be sure to check the polarity when making the connection! The UPS must be grounded using the ground connection provided.
- 10) Install the B&R UPS configuration software on the load system (see Chapter 4 "Software" on page 51).
- 11) Configure the UPS (see Chapter 4 "Software" on page 51).

#### Commissioning • Mounting the UPS Charging Unit

12) Enable monitoring (see Chapter 4 "Software" on page 51).

# Warning!

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

# 2. Mounting the UPS Charging Unit

# Warning!

If the UPS device will be subject to vibration and shock, it should be mounted on a mounting rail, and the mounting plates should additionally be fastened with M4 safety screws.

It can be mounted on a mounting rail (TS35), which must conform to the EN50022 standard, using the profile on the back side.



Figure 20: Mounting rail

The USP can also be mounted with the two mounting plates located on the device. The plates are designed for M4 screws, and therefore suitable for mounting.

#### **Commissioning • Mounting the UPS Charging Unit**



Figure 21: Mounting Plates UPS Charging Unit

The exact positioning of the mounting holes can be taken from the dimension diagram for the UPS device (see diagram 4 "Dimensions 9A0100.11" on page 23).

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



Figure 22: Mounting the UPS 24 VDC

Chapter 3 Commissioning

#### 2.1 Cable connection



The following images show two examples of proper cable connections to the UPS.

Table 25: Cable Connection Examples

#### 2.2 Mounting orientation

The UPS can only be installed horizontally, e.g., on mounting rail.



Figure 23: UPS Device Mounting Orientation 9A0100.11

### 3. Mounting Guidelines for Battery Units

The battery units can also be mounted with the four mounting plates located on the battery cage. The plates are designed for M5 screws, and therefore suitable for mounting.



Figure 24: Mounting Plates UPS Charging Unit

The exact positioning of the mounting holes can be taken from the dimension diagram for each battery unit (see dimension diagram for the battery unit).

Chapter 3 Commissioning

#### **Commissioning • Mounting Guidelines for Battery Units**

#### 3.1 Cable connection

The battery unit must be connected to the UPS with the attachment cable included in the delivery. It is important to install the connection cable according to the guidelines shown in the following images.



Figure 25: Cable Connection for Battery Units

#### 3.1.1 Procedure

- 1) Fasten the attachment cable to the clamps on the battery unit (the two self-locking nuts require a 5.5 mm hex wrench).
- 2) Loop the battery cable (red and black leads) to terminal block (3) as shown in the above picture.
- 3) Connect the red lead of the battery cable to the position on the terminal block marked "+" and the black lead to the position marked "-" (you will need a small screwdriver).
- 4) Loop the temperature sensor cable (white leads) to the temperature sensor plate (5) as shown in the above picture.
- 5) Attach the temperature sensor cable to the temperature sensor plate on the terminal block (with a small screwdriver).

#### 3.2 Mounting orientation

The mounting orientations of the various battery units and replacement batteries will now be explained in more detail.

#### 3.2.1 9A0100.12, 9A0100.13, 9A0100.14, 9A0100.15

#### Operation

Care must be taken that the battery cage is assembled so that rechargable 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 nominal voltage (additionally causing intensive heating due to internal short circuit currents).



Figure 26: Mounting Methods for Lead-Acid Battery Units During Operation

#### **Bearings**

The maintenance free battery units use a gel instead of liquid acid. This enables the batteries to be stored horizontally or vertically when not in use. The battery units should not be exposed to direct sunlight and/or be stored in a damp environment.



Figure 27: Mounting Methods for Lead-Acid Battery Units in Storage

#### 3.2.2 9A0100.16, 9A0100.17

#### **Operation and Storage**

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

# **Chapter 4 • Software**

### 1. 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

The B&R UPS configuration utility is provided on the HMI Drivers & Utilities DVD (Mod. No. 5SWHMI.0000-00). Additionally, the software can be downloaded for free directly from the B&R homepage <u>www.br-automation.com</u>.

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 Start

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

*	Windows Update					
	Programs		Accessories	·		
🖆 🔁	Documents	ŝ	Outlook Express			
🛃 🛃	<u>S</u> ettings +	Ē	B&R Automation		UPS	UPS Configuration
	Sear <u>c</u> h	1		~		
200	Help					
× 2	<u>R</u> un					
<b>§</b> 🙇	Log Off RAM					
	Shut Down					
R Start	🖸 🥔 🛱 🕨					

Figure 28: Start B&R UPS Configuration Software

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

<b>9</b> 3	09:20	Configuration mode
<b>\$</b>	09:19	Monitoring Mode
X	09:21	Connection Interrupted

Table 26: UPS - status indicator

# Information:

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 29: Tray menu selection

Selection	Meaning
Settings	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 B&R UPS Configuration Software version 1.20. More detailed information on this topic in Section "Security configuration / Menu language" on page 68
Close	This exits the B&R UPS Configuration Software. Exiting the software ends monitoring as well.

Table 27: Tray menu settings

# **Caution!**

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 Uninstall

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

	Windows Update	
iti o	<u>P</u> rograms •	Accessories   Accessories Accessories  Accessories Accessories Accessories Accessor
🗋 🖸	Documents	Guttook Express
enniu ***	Search	VnInstall Automation Software
Mille 🤌	Help	
2 Juli 2	<u>R</u> un	
	Log Off RAM	
<u> </u>	Shut Down	
Start	j 🗹 🥭 🗘 ▶ j	

Figure 30: Uninstall

Once the uninstall wizard has been started, all installed B&R software (e.g. B&R Automation Studio<sup>TM</sup>) 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.

		Ave. down 11- down							
5	<b>**</b>	Programs		Accessories	+				
n Editio		Documents		Internet Explorer Outlook Express B&B Automation	Þ	2	LIPS	•	
enniur	(1) (1)	Seatings		¥			UnInstall Automation Software		
e Mill	2	<u>H</u> elp							
() SMO	<u>2</u>	<u>B</u> un	-						
Wind	چي ا	Log Off RAM Shut Down							
	Start	🗹 🧔 🛱 📘							

Figure 31: Uninstall wizard selection

The software is then removed by clicking "OK".

#### **1.4 Construction**

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

99 B&R UPS Configuration Utility	? 🔀
About Setting Firmware Communication Service	

Figure 32: 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 buttons at the bottom of the window:

<u>S</u> et default	Reset Battery Status	OK	Cancel	Apply
Connection OK			•	Connected

Figure 33: Standard buttons

These buttons are explained here below:

Selection	Meaning
Default values	Sets all UPS parameters to default values: TWL = 10 seconds, SDT = 5 min, POT = 2 min, LCS = 800 mA, CTS = notification at first or cyclic = 5 seconds or 60 seconds, minutes with battery until shutdown = 2 min. The settings are not transferred to the UPS.
Reset Battery Status	This button is first integrated in UPS Configuration Software version 1.22. Additionally, the UPS firmware version in use must be $\geq$ 2.10. This button only appears if the connected battary unit failed the measurement of charging current maintenance (more detailed information in Section "Measurement of charging current maintenance" on page 100). Pushing this button sets the results of the measurement of charging current maintenance for BCR and RBS to "Battery OK" status, and the button disappears. <b>Caution!</b> Pushing this button does not guarantee secure operation of the UPS. The battery unit could be defective.
ок	Transfers all parameters to the UPS and the parameter window is minimized into 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 parameter window is minimized in 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 set parameters to the UPS.

Table 28: Standard button functions

#### Software • B&R UPS Configuration Software

#### **Software Help**



"Tool Tips" can be enabled by first clicking on the "?" 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 Table29 "Tool Tips example".

Defines the time between the power Fail after Defines the time between the power failure and sending the command to shutdown Windows. Do not mark this check box to disable this feature.	0 - 59 sek.

Table 29: Tool Tips example

### 1.5 Tab Descriptions

#### 1.5.1 "About" Tab

Ē

Software version and copyright information are shown on this page.

UPS Configuration Version 1.1	Utility 2001 Bernecker & Rainer
Copyright Informati	ion

Figure 34: "About" tab description

#### Software • B&R UPS Configuration Software

#### 1.5.2 "Settings" tab description

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

Set the length of time after a the shutdown signal is sent	power failure before	lf t will ler	the load system could not s Il automatically shut off the ngth of time.	shut down, the e power after th
- UPS Configuratio	n vn PC at Power Fail after	0 + min	10 + sec (ML)	
	off UPS if PC shutdown fails	5 min	0 + sec (SDT)	
Vo RS23	12 monitoring after Power On for	2 × min	0 * sec (PQT)	
Switch I	mit net/battery	• 18 V	C 21.5 V Delay after po	owering on
Switch I e switching threshold at whi to battery operation. This fu ns 2.0 and up.	init net/battery ch the system will switch from nction is supported by UPS	© 18 V	O 21.5 V Delay after po before the first signals are so system.	owering on st power failure ent to the load
Switch I switching threshold at whi to battery operation. This fu ns 2.0 and up.	init net/battery ch the system will switch from nction is supported by UPS ype Panason	18 V	C 21.5 V Delay after po before the first signals are se system. (9A0100.14)	owering on st power failure ent to the load
Switch a switching threshold at whi to battery operation. This fu ns 2.0 and up. Battery 1 Maximum	init net/battery ch the system will switch from notion is supported by UPS ype Panason Load Current	ic LC-R122R2P 2.2Ah	(3A0100.14) BOD MARK (LCS)	owering on st power failure ent to the load

Figure 35: "Settings" tab description

#### 1.5.3 "Firmware" Tab

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

	3) Commune
Actual UPS Firmware OS	5
	Version: USV 02.05
	Date: 17.09.02
Eirmuiara Lindata	Choose an update file to transfer to the B&R UPS. This function
-Firmware opdate	is only supported by UPS firmware versions 2.0 and higher.
	0 %
	0 % Start Upgrade <u>C</u> ancel Upgrade
Start the upgrade of	0 %           Start         Upgrade         Cancel Upgrade           f the B&R UPS. This function

Figure 36: "Firmware" tab description

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

# **Caution!**

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

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

B&R UPS Configuration Utility About Setting Firmware Commun	nication Service	X
Actual UPS Firmware OS	Version: UPG 02.05 Date: 17.09.02	
Firmware Update Bt	R UPS Configuration Utility 🔀	
	Start Upgrade	<u>Cancel Upgrade</u>
Set default	<u>o</u> k	Cancel Agply

Figure 37: 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

B&R UPS Configuration	Utility		? 🗙
About Setting Firmware	Communication Service		
Connection	COM Port: COM 1		
	Choose the COM port		
Set default	<u>o</u> k	Cancel	Apply

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

Figure 38: "Communication" tab description

# Information:

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.

#### Software • B&R UPS Configuration Software

#### 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).

# Information:

On Windows NT4.0/2000/XP, the UPS services provided by the operating system can also be used for monitoring, see Section "Monitoring using Windows NT4.0 with Operating System UPS Service" on page 73, Section "Monitoring using Windows 2000 with Operating System UPS Service" on page 74 and Section "Monitoring using Windows XP with Operating System UPS Service" on page 78.

CTS DCD	Power Failure (CTS) ✓ Enable all notifications. Seconds between power failure and first notification: Seconds between subsequent power failure notifications:
Shut Down (DCD)	check box to activate the messages that appear on the screen.
Next, instruct the computer to:	Search

Figure 39: "Service" tab description

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

# Information:

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

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

The limitations do not apply when using the UPS services provided by the operating system (see Section "Monitoring using Windows NT4.0 with Operating System UPS Service" on page 73).

#### 1.6 Load System Monitoring

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 sections "Monitoring using Windows NT4.0 with Operating System UPS Service" on page 73, "Monitoring using Windows 2000 with Operating System UPS Service" on page 74, and "Monitoring using Windows XP with Operating System UPS Service" on page 78.

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

Power Failure (CTS) T Dupply monitoring CTS DCD Mathematical CTS DCD Mathematical CT	About Setting Firmware Commun	ication Service
Minutes on batter 3 re shut down: 2 +     Minutes on batter 3 re shut down: 2 +     Next, run this program:     Next, instruct the computer to:     Shutdown 5     for Ignore missing UPS during startup	CTS DCD	Power Failure (CTS) Power Failure all notifications. Inst notification: Seconds between subsequent power failure notifications: Failure notifications:
6 Ignore missing UPS during startup	Minutes on batter	shut down: 2 👻

Figure 40: 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.

# Information:

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 41: Error message "no UPS found"



#### **Power Failure (CTS)**

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



Figure 42: 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.



### Shutdown (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 command is received from the UPS:



Figure 43: 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 message shown:

🛃 UPS Message	X
The UPS program is starting	g shut down
<u>k</u>	]

Figure 44: 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.

# 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.

Δ

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

# Warning!

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!

### 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

5

- Shutdown
- 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	The B&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.
	The shut down will not proceed if a program cannot be terminated.
Force shut down	Using this option, the B&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.
	Information:
	This option guarantees that the operating system executes a complete shut down!

Table 30: Shut down options



#### 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.

# **Caution!**

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).



Figure 45: Open security configuration

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

		X
Old Password:		
New Password:		
Verify new Password:		j
	Ok Cancel	

Figure 46: Set password

Configurations can be made once a password has been set:



Figure 47: Description of security configuration

#### 1.7.1 Menu Functions

🚔 Security Configuration	? ×	a Security Configuration	? ×
Password Language		Password Language	
Change Password		✓ English	
Enable secure hSnus		EnsGerman 12 s	
Disable blocked inputs if shutdown received		Disable blocked inputs if shutdown received	
<u>Ok</u> Cano	el		ncel

Figure 48: Safety menu functions

# Information:

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

#### **1.8 Warnings**

If the system is being monitored by B&R UPS Configuration Software, warnings are displayed on the monitor that correspond to errors that occur.

Warning displayed	Explanation	Repair / Remedy
B&R UPS Configuration Utility       Image: Could not detect a B&R UPS on COM Port :1         Make sure that:       1. No other program is using port COM 1         2. Your logged on as an administrator (Windows NT only)       3. COM 1 port is installed in your PC	No operable, correctly connected UPS was found on the selected COM interface. The warning is only displayed at startup or when transferring the set parameters to or from the B&R Configuration Software.	Check COM Settings Checking the UPS Connections
The UPS message	The UPS starts when the load system is shut down. This warning is only displayed in UPS monitoring mode.	Check UPS power supply.

Table 31: UPS Configuration Software Warnings

#### Software • B&R UPS Configuration Software

Warning displayed	Explanation	Repair / Remedy
Comparison of the UPS Message     A shut down command was received from the UPS.	A shutdown signal was sent from the UPS to the B&R UPS Configuration Software. This warning is only displayed in UPS monitoring mode.	Check UPS power supply.
USV Nachricht Stromausfall Beenden Sie ihre Aktivitäten. Bestätigen	A power failure occured. The load system is now supplied by the battery unit connected to the UPS. This warning is only displayed in UPS monitoring mode.	Check UPS power supply.
UPS Message	The measurement of charging current maintenance determined that the quality of the connected battery unit is insufficient for proper UPS operation. This warning is only displayed in when starting the B&R Configuration Software.	Check battery unit.
Battery Status Warning (RBS)!	The measurement of charging current maintenance determined that the quality of the connected battery unit will soon be insufficient for proper UPS operation. This warning is only displayed in when starting or while operating the B&R Configuration Software.	Check battery unit.
UPS Message Exchange your UPS Battery (RBS)I A shut down command was received from the UPS.	The measurement of charging current maintenance determined that the quality of the connected battery unit is no longer sufficient for proper UPS operation. This warning is only displayed in UPS monitoring mode.	Check battery unit.
UPS Message	A short power interruption has occured, and power was restored before the TWL had elapsed. This warning is only displayed in UPS monitoring mode.	Check UPS power supply.



#### Software • B&R UPS Configuration Software

Warning displayed	Explanation	Repair / Remedy	
Image: UPS Message       Image: Second	No operable, correctly connected UPS was found on the selected COM interface. This warning is only displayed in when starting the B&R Configuration Software.	Check COM Settings Checking the UPS Connections	
Image: UPS Message         Image: Exchange your UPS Battery (BCR)! A shut down command was received from the UPS.         Image: Dk	The idle voltage measurement determined that the quality of the connected battery unit is no longer sufficient for proper UPS operation. This warning is only displayed in UPS monitoring mode.	Check battery unit.	
UPS Message	The temperature measurement has determined that the temperature of the connected battery unit is outside the specified range. If the temperature of the battery unit is above or below the limit for 5 minutes, while in operation, the UPS starts the controlled shutdown of the load system to prevent damage to the battery unit. This warning is only displayed in when starting the B&R Configuration Software.	Check temperature of battery unit.	
UPS Message	This notice appears when the user button or a butten connected to the UPS externally has been pressed. This warning is only displayed in when starting the B&R Configuration Software.	-	
Image: State of the state	The temperature measurement has determined that the temperature of the connected battery unit is outside the specified range. If the temperature of the battery unit is above or below the limit for 5 minutes, while in operation, the UPS starts the controlled shutdown of the load system to prevent damage to the battery unit. This warning is only displayed in UPS monitoring mode.	Check temperature of battery unit.	
UPS Message     Exchange your UPS Battery (BCR)! UPS     observation is not active!     Dk	The idle voltage measurement determined that the quality of the connected battery unit is no longer sufficient for proper UPS operation. This warning is only displayed in when starting the B&R Configuration Software.	Check battery unit.	

Table 31: UPS Configuration Software Warnings (Forts.)
# 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 with 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):

Uninterruptible Power Supply is	s installed on: COM2:	OK
UPS Configuration	UPS Interface Voltages:	Cancel
Power failure signal	Negative C Positive	<u>H</u> elp
☑ Low battery signal at least 2 minutes before shutdown	Negative C Positive	
<u>Remote UPS Shutdown</u>	Negative C Positive	
Execute Command File		
File Name:		
UPS Characteristics	UPS Service	
Expected Battery Life: 2	min <u>T</u> ime between power failure and initial warning message	e 5 💂 sec
Battery recharge time	min Delay between warning	50 🖨 sec

Figure 49: UPS Settings in Windows NT

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

# Information:

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 load system (e.g. B&R IPC), and a network service is running.

### Information:

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 with Windows 2000.

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

A manufacturer can be selected under the UPS tab.

Uninterruptible Power Supply         Status       Current power source: Estimated UPS runtime: Estimated UPS capacity: Battery condition:         Details       Manufacture: (None) Model:         Image: Configure       Select         State: Configure       Select         Image: Configure       Select         Image: Configure       Select         Image: Configure       Select         Image: Configure       Select	Power Schen	nes Advanced Hibernate APM UPS	
Current power source: Estimated UPS runtime: Estimated UPS capacity: Battery condition: Details Manufacturer: (None) Model: Configure Select	– Status –	Uninterruptible Power Supply	
Details         Manufacturer:       (None)         Model:         Configure         Select         The UPS service is currently stopped.		Current power source: Estimated UPS runtime: Estimated UPS capacity: Battery condition:	
The UPS service is currently stopped.	Details	Manufacturer: (None) Model: Configure Se	elect
		The UPS service is currently stopped.	
About	About		

Figure 50: UPS - Windows 2000 settings - Manufacturer

### Software • Monitoring using Windows 2000 with Operating System UPS Service

UPS Selection	<u>? ×</u>
Select manufacturer:	On port:
Select model:	
J	Next > Cancel

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

Figure 51: UPS - Windows 2000 settings - Type

### Information:

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:

S Signal Polarity:			
Warning: Please ( attempting to con	consult your UPS doo igure signal polarities	cumentation before	
Power Fail/On Battery:	Negative	C Positive	
Low Battery:	Negative	C Positive	
UPS Shutdown:	C Negative	Positive	

Figure 52: UPS - Windows 2000 settings - Signal Polarity

# Information:

Remote shutdown of the UPS with the default Windows 2000 UPS service does not work (the UPS always switches itself off after the SDT time).

### Software • Monitoring using Windows 2000 with Operating System UPS Service

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.

UP5 Configuration	' ×
Enable all notifications.	
Seconds between power failure and first notification:	÷
Seconds between subsequent power failure notifications:	÷
Critical alarm	
A critical alarm occurs when the UPS battery is almost exhausted or, optionally, after a specified time on battery power.	
Minutes on battery before critical alarm:	E
When the alarm occurs, run this program:	
Configure	
Next, instruct the computer to:	
Shutdown	]
Finally, turn off the UPS.	
OK Cancel	

Figure 53: 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.

	nemes Advanced Hibernate APM 0F5
Chathar	Uninterruptible Power Supply
J.	Current power source: Estimated UPS runtime: Estimated UPS capacity: Battery condition:
Details	Manufacturer: (None) Model: Configure
1	The UPS service is currently stopped.
Abou	t

Figure 54: UPS - Windows XP settings - Manufacturer

### Software • Monitoring using Windows XP with Operating System UPS Service

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

Select manufacturer:	On port:
Generic	COM1 V
Select model:	
Custom	-
	Next > Cancel

Figure 55: UPS - Windows XP settings - Type

### Information:

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:

Warning: Please attempting to co	consult your UPS doo nfigure signal polarities	cumentation before
Power Fail/On Battery:	<ul> <li>Negative</li> </ul>	O Positive
V Low Battery:	<ul> <li>Negative</li> </ul>	O Positive
UPS Shutdown:	🔘 Negative	<ul> <li>Positive</li> </ul>

Figure 56: UPS - Windows XP settings - Signal Polarity

### Information:

Remote shutdown of the UPS with the default Windows XP UPS service does not work (the UPS always switches itself off after the SDT time).

### Software • Monitoring using Windows XP with Operating System UPS Service

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.

Seconds between subsequent power failure notifications: 120 <table-cell-columns> Critical alarm A critical alarm occurs when the UPS battery is almost exhausted or, optionally, after a specified time on battery power. Minutes on battery before critical alarm: 2 🗘 When the alarm occurs, run this program: Configure Next, instruct the computer to: Shut down</table-cell-columns>	econds between power failure and first notification:	5 🗘
Critical alarm A critical alarm occurs when the UPS battery is almost exhausted or, optionally, after a specified time on battery power. Minutes on battery before critical alarm:	econds between subsequent power failure notifications:	) 🜲
A critical alarm occurs when the UPS battery is almost exhausted or, optionally, after a specified time on battery power.  Minutes on battery before critical alarm:  When the alarm occurs, run this program:  Configure Next, instruct the computer to: Shut down	ical alarm	
<ul> <li>Minutes on battery before critical alarm:</li> <li>When the alarm occurs, run this program:</li> <li>Configure</li> <li>Next, instruct the computer to:</li> <li>Shut down</li> </ul>	critical alarm occurs when the UPS battery is almost exhausted or, tionally, after a specified time on battery power.	
When the alarm occurs, run this program: Configure Next, instruct the computer to: Shut down	Minutes on battery before critical alarm:	*
Configure Next, instruct the computer to: Shut down	When the alarm occurs, run this program:	
Next, instruct the computer to:	Configure.	
Shut down	Next, instruct the computer to:	
	Shut down	~

Figure 57: UPS - Configuration dialog box in Windows XP

### 5. Configuring the UPS using HyperTerminal

Various operating parameters can be manually set on 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
Bits per Second	19,200 bps
Data bits	8
Parity	None
Stop bits	1
Flow control	None

Table 32: Terminal program settings

The setting could look like the following examples for Windows 2000 and Windows XP:

Windows 2000 Windows XP	
COM1 Properties	COM1 Properties
Port Settings	Port Settings
Bits per second: 19600	Bits per second: 19600
Data bits: 8	Data bits: 8
Parity: None	Parity: None
Stop bits: 1	Stop bits: 1
Flow control: None	Elow control: None
Restore Defaults	<u>R</u> estore Defaults
OK Cancel Apply	OK Cancel Apply

Table 33: Example - HyperTerminal Configuration in Windows 2000 / XP for COM1

If the connection is made 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 effective.

# Information:

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/XP)! 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!

All possible commands for the UPS and the UPS return values are described in detail on the following pages. When programming a monitoring program, the additional detailed description important. Therefore, the special characters (space, carriage return, and line feed) are shown as follows:

Character	Meaning in English	Meaning in German	Hex value
<sp></sp>	Space	Space	20
<cr></cr>	Carriage return	Carriage return	0D
<lf></lf>	Line feed	Line feed	0A

Table 34: Definition of UPS symbols

### 5.1 Detecting the UPS operating mode

Firmware	Command supported
Version < 2.0	Yes
Version $\ge$ 2.0	Yes

Table 35: Detecting the UPS operating mode

The command sequence "@#" is used to read the current operating mode of the UPS. If it returns "err02", the UPS is currently in monitoring mode. If it returns "err000", the UPS is currently in update mode (firmware update). If a response is not received, it is assumed that the UPS is not connected to the load system.

### 5.1.1 Command sequence

### Sending from the load system:

@#<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>

### 5.2 Read 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 $\geq$ 2.0	#READ
Version $\ge$ 2.10	#RHDM (Read High-grade Discharge Measurement Status)

Table 36: Read UPS parameters

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

### 5.2.1 UPS Firmware < 2.0

Firmware version < 2.0 with command "#"

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

### **Command sequence**

### Sending from the load system:

#<CR><LF>

### **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 answer frame length is 59 bytes.

### 5.2.2 UPS Firmware ≥ 2.0

Firmware version  $\ge$  2.0 with command "**#READ**" The command can be entered and transmitted in either upper or lower case letters.

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

### **Command sequence**

### Sending from the load system:

#READ<CR><LF>

### **Response from UPS:**

The values listed here are sample values.

```
\label{eq:twister} \begin{split} TWL &< SP >= < SP > 0010 < CR > < LF > \\ LCS &< SP >= < SP > 0281 < CR > < LF > \\ SDT &< SP >= < SP > 0120 < 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 > \end{split}
```

The response frame has a fixed frame length of 104 bytes. It is also possible to read the UPS parameters TWL, SDT, LCS, and POT with the command "#".

### **5.2.3 UPS Firmware** ≥ **2.10**

Firmware version  $\geq$  2.10 with command "**#RHDM**" The command can be entered and transmitted in either upper or lower case letters.

DIT	=0000
LTL	=0001
CCD	=10000
RCL	=1000
RCH	=1000
RBS	=0000

### **Command sequence**

### Sending from the load system:

#RHDM<CR><LF>

### **Response from UPS:**

The values listed here are sample values.

```
DIT<SP>=<SP>0000<CR><LF>
LTL<SP>=<SP>0001<CR><LF>
CCD<SP>=<SP>10000<CR><LF>
RCL<SP>=<SP>1000<CR><LF>
RCH<SP>=<SP>1000<CR><LF>
RSS<SP>=<SP>1000<CR><LF>
```

The response frame has a fixed frame length of 104 bytes. It is also possible to read the UPS parameters TWL, SDT, LCS and POT with the command "#", and the UPS parameters TWL, LCS, SDT, POT, PFL, CTL, CTH, TMP, AGE with the command "#READ".

### 5.2.4 BCR (Battery Change Request)

The battery charging status, which is provided from the idle voltage measurement, can be requested using this command.

Firmware	Command supported
Version < 2.0	No
Version $\ge$ 2.0	Yes

Table 37: BCR (Battery Change Request)

### **Command sequence**

### Sending from the load system:

The command can be entered and transmitted in either upper or lower case letters.

#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:

- Battery OK x=0 ... Battery faulty x=1 ... x=2 Battery temperature alarm
- ...
- Button pressed x=3 ...

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

### Caution!

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!

### 5.2.5 whrd (UPS Time Stamp)

Firmware	Command supported
Version < 2.0	No
Version $\ge$ 2.0	Yes

Table 38: whrd (UPS time stamp)

The UPS time stamp is needed to calculate the battery lifespan. The command can only be entered and transmitted in lower case letters.

#### **Command sequence**

#### Sending from the load system:

@whrd<CR><LF>

#### **Response from UPS:**

Time=12.58.21<CR><LF> Date=09.01.2000<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".

### 5.2.6 RBS (Reset Battery Status)

Firmware	Command supported
Version < 2.10	No
Version≥2.10	Yes

Table 39: RBS (Reset Battery Status)

One function of #RHDM is to call up the results of the measurement of charging current maintenance (see Section "Measurement of charging current maintenance" on page 100). The command can be entered and transmitted in either upper or lower case letters.

### **Command sequence**

### Sending from the load system:

#RHDM<CR><LF>

#### **Response from UPS:**

```
DIT<SP>=<SP>0000<CR><LF>
LTL<SP>=<SP>0001<CR><LF>
CCD<SP>=<SP>10000<CR><LF>
RCL<SP>=<SP>1000<CR><LF>
```

```
RCH<SP>=<SP>1000<CR><LF>
RBS<SP>=<SP>x<CR><LF>
```

Possible values for x:

x=0000...Batterie OKx=0001...Change batteriesx=0002...Battery faulty

### **Resetting the RBS**

It is also possible to reset the RBS (Reset Battery Status). Upon the next measurement of charging current maintenance, it is chosen and entered again. The command can be entered and transmitted in either upper or lower case letters.

# Information:

If the RBS command is reset to (=OFF), the time stamp is automatically reset as well (see Section "Resetting the battery life-span stamp" on page 117).

**Command sequence** 

Sending from the load system:

#RBS=OFF

# Information:

After setting the parameter "RBS=OFF" no other command can be made to the UPS for at least one second.

### **Response from UPS:**

OK!\_\_\_\_RBS<SP>=<SP>0<CR><LF>

### 5.3 Set UPS Parameters

### 5.3.1 TWL (Time Worst Low)

Firmware	Command supported
Version < 2.0	Yes
Version $\ge$ 2.0	Yes

Table 40: TWL (Time Worst Low)

TWL is the time that passes between a power failure and sending the signal to shut the load system 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 system is shut down. After 2 minutes (= default time for minutes with battery until shutdown. This time can be set in the B&R UPS Configuration Software, see section 1.5.2 ""Settings" tab description" on page 58) the system is shut down remotely by the load system. Otherwise, the UPS shuts down automatically when the battery voltage reaches 21 V.

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

Enter the time, in seconds, after which the load system is to be shut down.

Default value:	#TWL=010	TWL = 10 sec
Example:	#TWL=000	TWL = 0 sec (the load system is immediately shut down after a power failure)
	#TWL=010 #TWL=200	TWL = 10 sec TWL = 200 sec

### **Command sequence**

### Sending from the load system:

#TWL=010<CR><LF>

### Response from UPS:

OK!\_\_\_TWL<SP>=<SP>10<CR><LF>

### 5.3.2 SDT (Shut Down Time)

Firmware	Command supported
Version < 2.0	Yes
Version $\ge$ 2.0	Yes

Table 41: SDT (Shut Down Time)

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

If time SDT passes after the DCD signal (load system shutdown) was set without the remote UPS shutdown signal (DTR signal) from the load system, 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.

# Warning!

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

### #SDT=OFF

The UPS buffers the load system until either the the battery is empties (deep discharge protection 22.5 V or 21 V), or until the system is remotely shut down from the DTR.

#### 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 system from the mains supply.

Default value: #SDT=0300 SDT = 300 sec Example: #SDT=0000 SDT = 0 sec (the load system is not given any time to shut down)

> #SDT=0040 SDT = 40 sec #SDT=2500 SDT = 2500 sec

### **Command sequence**

### Sending from the load system:

#SDT=0100<CR><LF>

### **Response from UPS:**

OK!\_\_\_SDT<SP>=<SP>100<CR><LF>

### 5.3.3 POT (Power On Time)

Firmware	Command supported
Version < 2.0	Yes
Version $\ge$ 2.0	Yes

Table 42: POT (Power On Time)

If the load system is a B&R 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 load system after the time POT has passed. The load system 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 system can be unlimited and the signals RTS and DTR are set. This should only be set when no load system is connected.

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

Time in seconds from which the UPS communicates with the load system after switching on the UPS. If a power failure occurs within this time, the load system is supplied from the battery unit 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

### Warning!

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.

### **Command sequence**

### Sending from the load system:

#POT=100<CR><LF>

### **Response from UPS:**

OK!\_\_\_POT<SP>=<SP>100<CR><LF>

### 5.3.4 LCS (Load Current Set)

Firmware	Command supported
Version < 2.0	Yes
Version $\ge$ 2.0	Yes

Table 43: LCS (Load Current Set)

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. The decimal point can be entered with either "." or ","

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

Default value:	#LCS=0.88	Charging current = 0.88 A
Example:	#LCS=0.6 #LCS=2.15	Charging current = 0.60 A Charging current = 2.15 A

### Information:

The charging current must always be entered to two decimal places.

### Information:

The value entered is returned by the UPS in binary units. Binary value 1015 corresponds to 2.88 A and an entry of #LCS=2.88 Binary value 282 corresponds to 0.8 A and an entry of #LCS=0.80

# **Caution!**

The maximum allowable charging current for UPS battery unit 9A0100.14 and replacement batteries (2 pcs. 12 V / 2.2 Ah Panasonic LC-R122R2P, order.nr. 9A0100.14) is 0.88 A. The 0.88 A upper limit is to be observed when changing the charging current using this battery unit!

The charging current can also be set using the hardware (button). See Section "Setting the maximum charging current" on page 126.

### **Command sequence**

### Sending from the load system:

#LCS=2.28<CR><LF>

### Response from UPS:

OK!\_\_\_LCS<SP>=<SP>802<CR><LF>

### 5.3.5 PFL (Power Fail Level)

Firmware	Command supported	
Version < 2.0	No	
Version $\ge$ 2.0	Yes	

Table 44: PFL (Power Fail Level)

This command can be used to set the voltage value, at which the UPS is switched from mains to battery operation. The command can be entered and transmitted in either upper or lower case letters. The PFL is displayed in volts and entered in steps of 1/10 Volts (0.1 Volts).

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

Default value:	#PFL=180	PFL = 18 V
Default value:	#PFL=180	PFL = 21.5 V

### Switching thresholds between battery / mains operation

PFL = 18 V

Switching thresholds for the UPS with no load			
Mains operation> Battery operation	when supply voltage falls to 18 V, at the latest		
Battery operation> Mains operation	when supply voltage rises to 19 V, at the latest		
Switching threshold for the UPS with load			
Mains operation> Battery operation	when supply voltage falls to 18 V, at the latest		
Battery operation> Mains operation	when supply voltage rises to 20 V, at the latest		

Table 45: Switching thresholds between battery / mains operation (18 V)

#### PFL = 21.5 V

Switching thresholds for the UPS with no load		
Mains operation> Battery operation	when supply voltage falls to 21.5 V, at the latest	
Battery operation> Mains operation	when supply voltage rises to 22.5 V, at the latest	
Switching threshold for the UPS with load		
Mains operation> Battery operation	when supply voltage falls to 21.5 V, at the latest	
Battery operation> Mains operation	when supply voltage rises to 23.5 V, at the latest	

Table 46: Switching thresholds between battery / mains operation (21.5 V)

### Information:

Even when the switching threshold (PFL) is configured to 21.5 V, it is ok if the voltage drops to 18 V during the first 4 seconds after reconnecting the supply voltage.

### **Command sequence**

### Sending from the load system:

#PFL=180<CR><LF>

### **Response from UPS:**

OK!\_\_\_\_PFL<SP>=<SP>180<CR><LF>

### 5.3.6 CTL (Charge Temperature Low)

Firmware	Command supported
Version < 2.0	No
Version $\ge$ 2.0	Yes

Table 47: CTL (Charge Temperature Low)

This command can be used to set the minimum charging temperature for the battery unit that is connected. The command can be entered and transmitted in either upper or lower case letters. CTL is measured in degrees celcius.

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

Default value:	#CTL=0000	$CTL = 0^{\circ}C$
Example:	#CTL=-040	$CTL = -40^{\circ}C$
	#CTL=0010	CTL = +10°C

# Warning!

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 48: Minimum Charging Temperature for Battery Units

### **Command sequence**

### Sending from the load system:

#CTL=0000<CR><LF>

### **Response from UPS:**

OK!\_\_\_CTL<SP>=<SP>0<CR><LF>

### 5.3.7 CTH (Charge Temperature High)

Firmware	Command supported
Version < 2.0	No
Version $\ge$ 2.0	Yes

Table 49: CTH (Charge Temperature High)

This command can be used to set the maximum charging temperature for the battery unit that is connected. The battery unit is charged until this temperature (battery unit temperature) is reached. The command can be entered and transmitted in either upper or lower case letters. CTH is measured in degrees celcius.

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

Default value: #CTL=0040 CTH =  $+40^{\circ}C$ 

Example: #CTL=0080 CTH = +80°C

### Warning!

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 50: Maximum Charging Temperature for Battery Units

### **Command sequence**

### Sending from the load system:

#CTH=0040<CR><LF>

### **Response from UPS:**

OK!\_\_\_CTH<SP>=<SP>40<CR><LF>

### 5.3.8 AGE (Lifespan of the Battery)

Firmware	Command supported	
Version < 2.0	No	
Version $\ge$ 2.0	Yes	

Table 51: AGE (Lifespan of the Battery)

This command is used to set the maximum lifespan of the battery which is connected. The command can be entered and transmitted in either upper or lower case letters. AGE is measured in years.

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

Default value: #AGE=005 AGE = 5 years Example: #AGE=010 AGE = 10 years

### Warning!

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

Model No.:	Battery type	Max. Battery Lifespan <sup>1)</sup>
9A0100.12	Panasonic LC-R127R2P 7.2Ah	Up to 5 years
9A0100.14	Panasonic LC-R122R2P 2.2Ah	Up to 5 years
9A0100.16	Hawker Cyclon 4.5Ah	Up to 10 years

Table 52: Maximum Life-span for Battery Units

1) Dependent on ambient temperature and the charging and discharging cycles.

For information about resetting the battery lifespan stamp, see Section "Additional function of the user button starting with UPS Firmware version 2.0" on page 117.

Possible input value range #AGE = 0...100The command can be entered and transmitted in either upper or lower case letters.

### **Command sequence**

### Sending from the load system:

#AGE=010<CR><LF>

### **Response from UPS:**

OK!\_\_\_AGE<SP>=<SP>10<CR><LF>

### 5.3.9 DIT (Digital Input Button)

Firmware	Command supported	
Version < 2.10	No	
Version≥2.10	Yes	

Table 53: DIT (Digital Input Button)

This command is used to operate the button on the UPS and the external input button via software. This makes it possible to supply the load system even when no battery unit is attached or when the attached battery unit is not charged. The command can be entered and transmitted in either upper or lower case letters.

# **Caution!**

Secure UPS operation is not guaranteed after activating this function (DIT=ON\_) - until the battery has not reached the minimum load!

Unlike with the user button and external button, no current test is performed on the connected battery unit.

After it reaches the minimum load the UPS automatically switches to normal operation. At this point, UPS operation is again secure.

### Possible input value range #DIT = OFF or ON\_

Default value: #DIT=OFF function deactivated Example: #DIT=ON function activated

### Information:

If the UPS parameter DIT is activated or deactivated, the last setting is made permanent (even when the UPS device is turned on or off).

### **Command sequence**

### Sending from the load system:

#DIT=ON\_<CR><LF> or #DIT=OFF<CR><LF>

### **Response from UPS:**

OK!\_\_\_DIT<SP>=<SP>1<CR><LF> or OK!\_\_\_DIT<SP>=<SP>0<CR><LF>

### 5.3.10 LTL (Life Time LED)

Firmware	Command supported	
Version < 2.10	No	
Version≥2.10	Yes	

Table 54: LTL (Life Time LED)

When the battery's life span (AGE) is exceeded, the "battery status" LED on the UPS device begins to blink. This command is used to turn this blinking (of the battery status LED) on or off. The command can be entered and transferred in either upper or lowercase.

### Possible input value range #LTL = OFF or ON\_

Default value:#LTL=OFFfunction deactivatedExample:#LTL=OFFfunction deactivated

### **Command sequence**

#### Sending from the load system:

#LTL=ON\_<CR><LF> or #LTL=OFF<CR><LF>

#### **Response from UPS:**

OK!\_\_\_LTL<SP>=<SP>1<CR><LF> or OK!\_\_\_LTL<SP>=<SP>0<CR><LF>

### 5.4 Measurement of charging current maintenance

Firmware	Command supported	
Version < 2.10	No	
Version≥2.10	Yes	

Table 55: Measurement of charging current maintenance

The measurement of charging current maintenance determines the quality of the connected battery unit. This enables a precise statement about the current condition of the battery unit.

### Information:

This function is meant for use with B&R battery units, and will therefore ONLY deliver accurate measurements about the condition of these units.

The measurement of charging current maintenance is configured through three parameters: CCD, RCH, and RCL.

These are explained later in more detail.

### Information:

If one of the three parameters is not activated (e.g. is set to "OFF"), the other two are automatically not activated, and the measurement of charging current maintenance is turned off.

### 5.4.1 Setting CCD (Charge Count Down)

Firmware	Command supported	
Version < 2.10	No	
Version≥2.10	Yes	

Table 56: Setting CCD (Charge Count Down)

This command is used to set the length of time after which the UPS should check the charging current for the connected battery unit, in order to produce a quality report about the battery unit. The frequency of the testing is determined by the setting of the CCD (in minutes). The result of the test can be called up using the UPS parameter RBS (Reset Battery Status), which displays the status of the battery (see Section "RBS (Reset Battery Status)" on page 88). The command can be entered and transmitted in either upper or lower case letters.

### Possible input value range #CCD = 0..0.9999

Default value: #CCD=OFF measurement of charging current maintenance deactivated

Example: #CCD=1260 CCD = 1260 minutes

#CCD=3043 CCD = 3043 minutes

### Information:

The condition of the battery unit is <u>only</u> displayed after every uninterrupted completion of the CCD time.

In order to guarantee the battery status measurement, this value should always be set to 1260 minutes (this is the maximum time needed to recharge <u>one</u> empty battery unit to full capacity).

The maximum charging current for the measurement LCS should be higher than the battery capacity/5, or else the charge retention current will not be reached, and the battery cannot be completely loaded. To preserve the battery, however, the charging current should not exceed the battery capacity/2.5.

### **Command sequence**

Sending from the load system:

#CCD=1260<CR><LF>

### **Response from UPS:**

OK!\_\_\_CCD<SP>=<SP>1260<CR><LF>

### 5.4.2 Setting RCL (Remain Current Low)

Firmware	Command supported	
Version < 2.10	No	
Version≥2.10	Yes	

Table 57: Setting RCL (Remain Current Low)

This command is used to set the lower threshold for the measurement of charging current maintenance. The lower threshold for the charge retention current should be higher than the battery capacity/500 and lower than the battery capacity/50 or RCH. The command can be entered and transmitted in either upper or lower case letters. RCL is measured and displayed in Milliampere.

### Possible input value range #RCL = 000.999

Default value: #RCL=OFF measurement of charging current maintenance deactivated Example: #RCL=020 RCL = 20 mA #RCL=123 RCL = 123 mA

### Warning!

If B&R battery units are used, the values used cannot be lower than those listed in the following table!

Model No.:	Battery type	RCL (lower threshold)
9A0100.12	Panasonic LC-R127R2P 7.2Ah	27 mA
9A0100.14	Panasonic LC-R122R2P 2.2Ah	8 mA
9A0100.16	Hawker Cyclon 4.5Ah	20 mA

Table 58: RCL of Battery Units

### **Command sequence**

### Sending from the load system:

#RCL=020<CR><LF>

### **Response from UPS:**

OK!\_\_\_\_RCL<SP>=<SP>20<CR><LF>

### 5.4.3 Setting RCH (Remain Current High)

Firmware	Command supported	
Version < 2.10	No	
Version≥2.10	Yes	

Table 59: Setting RCH (Remain Current High)

This command is used to set the upper threshold for the measurement of charging current maintenance. The upper threshold for the charge retention current should be lower than the battery capacity/50 and higher than the battery capacity/500 or RCL. The command can be entered and transmitted in either upper or lower case letters. RCH is measured and displayed in Milliampere.

### Possible input value range #RCH = 000.999

Default value: #RCH=OFF measurement of charging current maintenance deactivated

Example: #RCH=080 RCH = 80 mA

#RCH=234 RCH = 234 mA

# Warning!

If B&R battery units are used, the values used cannot be higher than those listed in the following table!

Model No.:	Battery type	RCH (upper threshold)
9A0100.12	Panasonic LC-R127R2P 7.2 Ah	110 mA
9A0100.14	Panasonic LC-R122R2P 2.2 Ah	30 mA
9A0100.16	Hawker Cyclon 4.5 Ah	80 mA

Table 60: RCH of Battery Units

### **Command sequence**

### Sending from the load system:

#RCH=080<CR><LF>

### **Response from UPS:**

OK!\_\_\_\_RCH<SP>=<SP>80<CR><LF>

### 6. 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	
Remain Current Low	#RCL	
Remain Current High	#RCH	

Table 61: Battery operation parameters

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

Description	Value	Note
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
Remain Current Low	27 mA	Minimum
Remain Current High	110 mA	Maximum

Table 62: Battery operating parameters - Panasonic LC-R127R2P 7.2 Ah (9A0100.12)

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

Description	Value	Note
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
Remain Current Low	8 mA	Minimum
Remain Current High	30 mA	Maximum

Table 63: Battery operation parameters - Panasonic LC-R122R2P 2.2 Ah (9A0100.14)

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

Description	Value	Note
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
Remain Current Low	20 mA	Minimum
Remain Current High	80 mA	Maximum

Table 64: Battery operation parameters - Hawker Cyclon 4.5 Ah (9A0100.16)

### 7. UPS Firmware Differences

Revision	Date	Firmware version (Firmware file)	Changes from earlier versions
C0	15.11.2000	1.05 (UPSDC15.BIN)	First version
D0	03.09.2001		
E0	26.03.2002		
HO	28.10.2002	2.01 (UPSDC21.BIN)	<ul> <li>Establishment of battery lifespan re-worked due to a Real Time Clock (RTC) read error.</li> <li>The UPS parameter read command (#READ), which is used to read the UPS paramaters: TWL, LCS, SDT, POT, PFL, CTL, CTH, TMP and AGE, has been added.</li> <li>The command for reading the battery charge condition (BCR) has been added (see Section "BCR (Battery Change Request)" on page 87 for more info).</li> <li>It is now possible to upgrade the UPS firmware using the B&amp;R USP Configuration Software.</li> <li>New UPS battery unit 9A0100.16 Typ C 24 V 4.5 Ah has been implemented.</li> </ul>
10	29.10.2002	2.05 (UPSDC25.BIN)	<ul> <li>UPS switching thresholds 18 and 21.5 Volts added. If the switching threshold is set to 21.5 volts, the input current can be around the 18 volt switching threshold for a period of 4 seconds without triggering the UPS to switch to battery operation (see Section "Switching thresholds between battery / mains operation" on page 94 for more info).</li> </ul>
JO	30.10.2002	2.06	<ul> <li>A flickering overload LED was removed due to high frequency over-current load</li> </ul>
К0	27.01.2003	(UPSDC26.BIN)	ivau.

Table 65: UPS Firmware Versions

### Software • UPS Firmware Differences

Revision	Date	Firmware version (Firmware file)	Changes from earlier versions
К5	14.02.2003	2.10 (UPSDC210.BIN)	<ul> <li>Error correction: LED status displays synchronized due to blinking irregularities.</li> <li>Measurement of charging current maintenance added for further battery quality testing. Additionally, the new UPS commands (CCD, RCL, RCH, and RBS) have been added (see Section 5.4 "Measurement of charging current maintenance" on page 100 for more info).</li> </ul>
			<ul> <li>It is now possible to turn the blinking of the battery status LED on or off after expiration of the set battery life-span using the software command LTL (see Section 5.3.10 "LTL (Life Time LED)" on page 99 for more info). As a default setting, the blinking is activated.</li> </ul>
			<ul> <li>It is now possible to operate the buttons found on the UPS (user button and input button) with the software command DIT (see Section 5.3.9 "DIT (Digital Input Button)" on page 98 for more info).</li> </ul>
			<ul> <li>The UPS parameter read command "#RHDM", which is used to read the parameters DIT, LTL, CCD, RCL, RCH and RBS, has been added.</li> </ul>
			<ul> <li>The UPS parameter "WHRD" had been added to read the UPS time stamp for the calculation of the battery life-span.</li> </ul>
LO	28.08.2003	2.11 (UPSDC211.BIN)	<ul> <li>The length of time that the highest allowable output current (8 A) may be exceeded, in the range from 8 to 14 A, has been raised from 10 to 30 seconds (see Section 1.4 "UPS overload behavior" on page 116 for more info).</li> </ul>

Table 65: UPS Firmware Versions

# **Chapter 5 • Accessories**

### 1. HMI Drivers & Utilities DVD 5SWHMI.0000-00



#### Figure 58: HMI Drivers & Utilities DVD 5SWHMI.0000-00

Model number	Short description	Note
5SWHMI.0000-00	HMI Drivers & Utilities DVD Contains drivers, utilities, software upgrades and user's manuals for B&R panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).	

Table 66: 5SWHMI.0000-00 - HMI Drivers & Utilities DVD

This DVD contains drivers, utilities, software upgrades and user's manuals for B&R Panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).

Information in detail:

### **BIOS upgrades for the products**

- Automation PC 620
- Panel PC 700
- Automation PC 680
- Provit 2000 product family IPC2000/2001/2002

### Accessories • HMI Drivers & Utilities DVD 5SWHMI.0000-00

- Provit 5000 product family IPC5000/5600/5000C/5600C
- Power Panel 100 BIOS devices
- Mobile Panel 100 BIOS devices
- Power Panel 100 / Mobile Panel 100 user boot logo
- Power Panel 100 / Mobile Panel 100 REMHOST utility

### **Drivers for the devices**

- Automation Device Interface (ADI)
- Audio
- Chipset
- CD-ROM
- LS120
- Graphics
- Network
- PCI RAID controller
- Touch screen
- Touchpad
- Interface board

### **Updates**

• Firmware upgrades (e.g. MTCX, SMXC)

### **Utilities/Tools**

- Automation Device Interface (ADI)
- Miscellaneous
- MTC utilities
- Key editor
- MTC & Mkey utilities
- Mkey utilities
- UPS configuration software
- ICU ISA configuration
- Intel PCI NIC boot ROM
- Diagnostics
- CompactFlash lifespan calculation for Silicon Systems CompactFlash cards 5CFCRD.xxxx-03
#### Windows and embedded operating systems

- Thin client
- Windows CE
- Windows NT Embedded
- Windows XP Embedded

#### **MCAD** templates for

- Industrial PCs
- Visualization and operating devices
- Legend strip templates

#### **Documentation for**

- B&R Windows CE
- Automation PC 620
- Automation PC 680
- Automation Panel 900
- Panel PC 700
- Power Panel 15/21/35/41
- Power Panel 100/200
- Provit 2000
- Provit 3030
- Provit 4000
- Provit 5000
- Provit Benchmark
- Provit Mkey
- Windows NT Embedded application guide
- Windows XP Embedded application guide
- Uninterruptible power supply

#### Service tools

- Acrobat Reader 5.0.5 (freeware in German, English, and French)
- Power Archiver 6.0 (freeware in German, English, and French)
- Internet Explorer 5.0 (German and English)
- Internet Explorer 6.0 (German and English)

Chapter 5 Accessories

# **Appendix A**

# 1. UPS behavior

There are two fundamental UPS operating modes:

- · Mains operation
- Battery operation

The input voltage is switched directly through to the load system during mains operation. The load system is separated from the mains supply if the load voltage (power voltage at output) falls below 18 V <sup>1)</sup> or 21.5 V <sup>1)</sup>, and battery operation is started (the load system is then powered completely by the batteries). The UPS prevents the load voltage from dropping below 18 V or  $21.5 V^{2}$ , i.e. when the mains supply voltage fails, the load system continues to operate without interruptions:



Figure 59: Behavior when the mains supply voltage fails

- 1) Depends on the switching threshold. Can be set using B&R configuration software or HyperTerminal (18 or 21.5 VDC)
- 2) Even when the switching threshold (PFL) is configured to 21.5 VDC, it is ok if the voltage drops to 18 VDC during the first 4 seconds after reconnecting the supply voltage.

# **1.1 Buffer operation**

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

# Information:

When the mains supply voltage fails, the UPS starts to shut down the load system after 10 seconds (= default TWL time) to guarantee maximum security. This time (TWL) can also be set in the software via the serial interface (see Chapter 4 "Software" on page 51).

# 1.1.1 Deep discharge protection

If the battery voltage drops below 22.5 V (PFL=18 V) or 22.8 V (PFL=21.5 V) during battery operation, the system that is being supplied is automatically shutdown so that the battery units are not damaged. The UPS switches off automatically at 21 V (PFL=18 V) or 21.5V (PFL=21.5 V) at the latest.

# 1.2 Shutting the load system down safely

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 4 "Software" on page 51). TWL is set to 10 seconds by default.

# **Caution!**

The software for communication with the UPS is not yet active when the PC is booting (as long as Windows is not yet completely loaded). If a power failure occurs in this time POT, the UPS changes into battery operation and only sends the respective signals to the load system after the time POT has passed. The load system then shuts down securely after the boot procedure is finished (see also Chapter 4 "Software" on page 51 and Section "Power failure" on page 119).

# Information:

Independent shutdown of the load system in the case of a power failure is only possible on load systems 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 load system are properly connected and the settings described in Chapter 4 "Software" on page 51 ff. have been made!

# 1.3 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	State
<22.8 V	Battery faulty 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 system.

Table 67: Testing the battery when switching on

The ambient temperature of the battery unit is also checked:

- If the temperature is higher than the maximum specified charging temperature (see table "Maximum Charging Temperature for Battery Units" on page 96), 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 system, because discharging the battery unit at this temperature could damage it (battery operation).
- If the temperature of the battery unit is above or below the limit for 5 minutes, while in operation, the UPS starts the controlled shutdown of the load system.

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 Section "Status LEDs" on page 29) and the UPS does not switch the mains power supply through to the load system. Power can be supplied to the load system by pushing the user button, however the user takes full responsibility when doing this (see Section "User button, external button (digital input) and DIT (digital input button)" on page 116).

# Information:

# If supply voltage fails, the load system 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 system 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 system is supplied with power after approx. 2 seconds to prevent damage.

The following diagrams illustrate these states and procedures:



Figure 60: Switching on the UPS, Battery OK



Figure 61: Switching on the UPS, Battery OK (with button)



Figure 62: Switching on the UPS, Battery Empty

#### Appendix A • UPS behavior



Figure 63: Switching on the UPS, Battery Empty (with button)

## 1.4 UPS overload behavior

If the maximum permitted output current of 8 A is exceeded, the following turn-off times apply: Between 8 - 14 A, the UPS shuts down after 30  $^{1)}$  seconds. Over 14 A output current, the UPS shuts down in one second.

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

## 1.5 User button, external button (digital input) and DIT (digital input button)

The user button, the external button (see Section for "Device interfaces" on page 24 location), and the software UPS command DIT (firmware version 2.10 and up) all 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), or through the software by setting DIT = ON (firmware version 2.10 and up), when switching on the UPS. Pushing the user button or external button (digital input) initiates an additional current-test that does not occur when the DIT is changed in the software.

<sup>1)</sup> Depends on revision. For a 9A0100.11 UPS 24 VDC < revision L0 10 Sekunden

# **Caution!**

Until the battery has reached the minimum load, secure UPS operation after pushing the user button or external button (digital input), or after setting the DIT = ON in the software (firmware version 2.10 and up), is not guaranteed.

After it reaches the minimum load the UPS automatically switches to normal operation. At this point, UPS operation is again secure.

The maximum charging current for the battery unit can also be set with the user button. This is explained in "Setting the maximum charging current" on page 126. The user button can be accessed using a pointed object.

#### 1.5.1 Additional function of the user button starting with UPS Firmware version 2.0

#### Resetting the battery life-span stamp

With a UPS firmware version 2.0 and higher, the time stamp which is required to calculate the battery life-span, 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 battery unit life-span calculation.

When reseting the time stamp on a UPS with firmware version 2.10 and higher, the UPS parameter RBS is also reset to "0."

For calculating the battery unit life-span, see the Section "whrd (UPS Time Stamp)" on page 88.

#### **Digital input**

Digital input	Electrical characteristics
Design	Sink
Rated voltage	24 VDC
Maximum input voltage	30 VDC

Table 68: Digital input electrical characteristics

Digital input	Electrical characteristics
Switching threshold Low range Switching range High range	<5 V 5 V to 15 V >15 V
Input impedance	about 5 kΩ
Input current	about 5 mA at 24 VDC
Input delay	Max. 1 ms
Separator	No electrical isolation

Table 68: Digital input electrical characteristics

# 1.6 Serial interface

The UPS is connected to the load system (e.g. B&R IPC via the RS232 interface. The UPS informs the load system of the battery's condition, the operating condition of the UPS, as well as defects and temperature alarms. 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 load system side):



Figure 64: RS232 Interface Handshake Signal

See the figure "Pin assignment - RS232 cable" on page 28 for the complete pin assignment of the RS232 cable.

# 1.6.1 Power failure





Figure 65: 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 4 "Software" on page 51), the load system is not effected.

#### Appendix A • UPS behavior

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



Figure 66: 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 load system) is set immediately after the supply voltage fails. After the time TWL has passed, the DCD signal is set and the load system shuts down.

If the UPS is supplied with power again, it restarts the supply for the load system 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 (default time - can be set, see Chapter "Software" on page 51) until the DTR signal is set by the load system. The UPS stops supplying the load system when this signal is set (remote shutdown). If the power comes back on during shutdown, the load system completes the shutdown process and restarts after completing a self test.

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 load system, the UPS switches the output voltage off. The default value for SDT is 5 minutes; this time can be changed using software (see Chapter 4 "Software" on page 51).

c) Power failure during POT

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



Figure 67: Handshake Lines During POT

A power failure signal is sent to the load system upon completion of POT by setting CTS. After 2 minutes (= default TWL time) DCD is set, which begins to shut down the load system. When shut down of the load system is complete, the UPS sets the DTR signal, and the UPS then disconnects the load system from the mains supply (or, at the latest, after the SDT is expired). As soon as the supply voltage is available again, the load system is supplied with power after a successful self test (about 10 seconds).

### 1.6.2 Operation without the RS232 cable

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



Figure 68: Handshake lines during power failure without RS232 cable

As shown in the figure above, the times TWL and SDT (to change the values, see Chapter "Software" on page 51) determine the behavior of the UPS when a power failure occurs. The load system cannot send a DTR signal to the UPS because there is no connection between the UPS and the load system. For this reason, the UPS switches itself off after the time TWL + SDT has passed, even if the load system 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 10 seconds (self test).

# Danger!

The load system (e.g. B&R 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.

# 1.7 Relay output

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

# 1.7.1 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 sec at 10% ED)	15 A
Switching voltage	440 V~ / 30 V-
Switching capacity (max.)	AC 2000 VA; DC from the load limit curve
Contact resistance (starting value) / Measuring current / Driver current	$\leq$ 30 m $\Omega$ / 100 mA / 6 V
Response time at rated voltage and +20°C	Typ. 6 ms
Release time with/without parallel diode	Typically 2.5 ms / 10 ms
Chatter time N.O./ N.C.	Typically 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 69: Relay output contact data

# 2. Rechargeable batteries

# Warning!

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.

# 2.1 Characteristics of lead acid battery 12 VDC 7.2 Ah

Panasonic LC-R127R2P 12 V / 7.2 Ah (	nic LC-R127R2P 12 V / 7.2 Ah (UPS batteries; 2 pcs., 12 V 7.2 Ah) 9A0100.12, 9A0100.13	
Rated voltage		12 V
Rated capacity		7.2 Ah
Capacity dependent on discharging	at 20 h discharging time (360 mA / T = +25°C)	7.2 Ah
current $(1 = +25^{\circ}C)$	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	at 20 h discharging time (T = $+40^{\circ}$ C)	102%
temperature	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 70: Panasonic LC-R127R2P characteristics

Panasonic LC-R122R2P (UPS batteries; 2 pcs., 12 V, 2.2 Ah)		9A0100.14, 9A0100.15
Rated voltage		12 V
Rated capacity		2.2 Ah
Capacity dependent on discharging	at 20 h discharging time (360 mA / T = +25°C)	2.2 Ah
current $(1 = +25^{\circ}C)$	at 10 h discharging time (680 mA / T = +25°C)	2.0 Ah
	at 5 h discharging time (1260 mA / T = +25°C)	1.8 Ah
	at 1 h discharging time (4900 mA / T = +25°C)	1.3 Ah
Capacity dependent on ambient	at 20 h discharging time (T = $+40^{\circ}$ C)	102%
temperature	at 20 h discharging time (T = $+25^{\circ}C$ )	100%
	at 20 h discharging time (T = $0^{\circ}$ C)	85%
	at 20 h discharging time (T = $-15^{\circ}$ 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 = $+25^{\circ}C$ )		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

# 2.2 Characteristics of lead acid battery 12 V 2.2 Ah

Table 71: Panasonic LC-R122R2P characteristics

# 2.3 Characteristics of Hawker Cyclon rechargeable battery 12 V, 4.5 Ah

Hawker Cyclon (UPS batteries; 2 pcs., 12 V 4.5 Ah)	9A0100.16, 9A0100.17
Rated voltage	12
Rated capacity	4.5 Ah
Storage time (T = $+25^{\circ}$ C)	2 Years (without recharging)
Internal resistance at full charge (T = +25°C)	Approx. 5 mΩ
Maximum charging current (T = $+25^{\circ}$ C)	2.88 A
Maximum charging voltage (T = $+25^{\circ}$ 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 72: Hawker Cyclon characteristics

# 2.4 Parallel connection of battery units

Several battery units 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, 9A0100.16, 9A0100.17).
- Only connect batteries with the same capacity in parallel. Parallel connection of battery units 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 0.88 A cannot be exceeded for the 2.2 Ah battery unit.
- Dividing the charging current increases the charging time required to reach the necessary operating capacity of the battery unit. The charging time depends on the following:
  - Number of batteries connected in parallel
  - Charge of the batteries
  - Charging current
  - Temperature

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

# 2.5 Setting the maximum charging current

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

With the UPS turned off, 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 (fuse and battery reverse polarity) signal the electric current setting mode.

Each time the button is pushed again, the maximum charging current is increased one step (0.25 A). Pushing the button once more when the maximum charging current (2.88 A) is reached sets the default value of 0.88 A.

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



Figure 69: 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.

# **Caution!**

The maximum allowable charging current for UPS battery unit 9A0100.14 and replacement batteries (2 pcs. 12 V/2.2 Ah Panasonic LC-R122R2P, order.nr. 9A0100.14) is 0.88 A. The 0.88 A upper limit is to be observed when changing the charging current using this battery unit!

# Danger!

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 "Software" on page 51. The lowest value that can be set when using the software is 0.5 A (when using the button configuration it is 0.88 A). Setting the current using the software first (see Section "LCS (Load Current Set)" on page 93) 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.

#### Appendix A • Rechargeable batteries

#### 2.6 Charging and discharging characteristics of the lead acid battery

A special LED on the front of the UPS shows that the battery is charging (see Section "Status LEDs" on page 29 for info regarding the status LEDs).

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 Section "Switching on the UPS" on page 113).

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). Should the battery's voltage fall below this limit, the UPS will automatically begin to shut down the load system. Should the battery's voltage reach the limit of 21 V, the UPS will shut down immediately.

The duration of battery operation is dependent on the discharging current, the 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 to 40°C).

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



Figure 70: Reduction of rechargeable battery capacity over time

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

## 2.7 Life-span of the lead acid battery

A battery lifespan 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 A (up to  $V_{batt} = 21 \text{ V}$ ) e.g. 200 times and then charged with I = 2.88 A, the rated capacity can only be 60% of the 7.2 Ah. 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 (see "LC-R122R2P data sheet" on page 130 and "LC-P127R2P data sheet" on page 131).

Temperature influences have the following effect on the the life-span of the battery.



Figure 71: 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 Section "Status LEDs" on page 29).

## 2.8 LC-R122R2P data sheet

The following data sheet contains a section of the battery manufacturer's 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
	Total height	2.598 inch (66mm)
Dimensions inch (mm)	Height	2.362 inch (60mm)
	Length	6.968 inch (177mm)
	Width	1.339 inch (34mm)
Mass		Approx. 1.76 lbs. (0.8kg)

#### Characteristics

Capacity <sup>(note)</sup> (77°F (25°C))		20 hour rate (110mA) 10 hour rate (200mA) 5 hour rate (360mA) 1 hour rate (1300mA)		2.2Ah 2.0Ah 1.8Ah 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 stra)		104°F (40°C) 77°F (25°C) 32°F (0°C)		102 % 100 % 85 % 65 %
Self discharge (77°F (25°C))		Residual capacity after standing 3 months Residual capacity after standing 6 months Residual capacity		91% 82% 64%
Ter	minal	AMP Faston tab (Type 187)		Type 187)
Charge Method (Constant	Cycle use (Repeating use)	Initial current Control voltage	0.8 Constar (per 12)	8 A or smaller nt voltage; 14.5 to 14.9 V / cell 77°F (25°C))
Voltage)	Trickle use	Control voltage	13 (per 12V	8.6 to 13.8 V 7 cell 77°F (25°C))
(Note) The above characteristics data are average values obtained within three charge/discharge Cycles not the minimum values.				

<sup>9</sup> This product adopts UL94HB-compliant resin as the material of the battery case. Product color is black. Optionally, type LC-V122R2P(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 72: Panasonic battery LC-R122R2P data sheet

### 2.9 LC-P127R2P data sheet

The following data sheet contains a section of the battery manufacturer's data sheet.



Figure 73: Panasonic battery LC-R127R2P data sheet

Appendix A

# 2.10 Hawker Cyclon data sheet

The following data sheet contains a section of the battery manufacturer's data sheet.



Figure 74: Hawker Cyclon data sheet

# 3. Overview of UPS parameters

Term	Meaning
#AGE	This UPS parameter command is used to set the maximum lifespan of the 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	Stands for "Battery Change Request". This command is used to read the current charging status for the connected battery unit and the current status of the battery unit.
#CCD	An abbreviation for "Battery Change Down". This command is used to set the length of time after which the UPS should check the charging current for the connected battery unit, in order to produce a quality report.
#CTH	An abbreviation for "Charge Temperature High". This command is used to set the maximum allowable charging temperature of the connected battey unit. The battery unit is charged until this temperature is reached.
#CTL	An abbreviation for "Charge Temperature Low". This command is used to set the lowest allowable charging temperature of the connected battey unit. When the temperature falls below this value, the battery unit is not charged anymore.
#DIT	Abbreviation for "Digital Input Button". This command is used to operate the button found on the UPS and the external input button via the software.
#LCS	An abbreviation for "Load Current Set". The charging current for the battery unit can be set using this signal.
#LTL	An abbreviation for "Life Time LED". This command is used to turn on or off the blinking of the battery status LED that signals that the battery life-span has expired.
#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.
#RCH	Abbreviation for "Remain Current High". This command is used to set the upper threshold for the measurement of charging current maintenance. The upper threshold for the charge retention current should be lower than the battery capacity/50 and higher than the battery capacity/500 or RCL. The command can be entered and transmitted in either upper or lower case letters.
#RCL	Abbreviation for "Remain Current Low". This command is used to set the lower threshold for the measurement of charging current maintenance. The lower threshold for the charge retention current should be higher than the battery capacity/500 and lower than the battery capacity/50 or RCH. The command can be entered and transmitted in either upper or lower case letters.
#READ	This command is used (in UPS firmware versions 2.0 and up) to read the UPS paramaters: TWL, LCS, SDT, POT, PFL, CTL, CTH, TMP and AGE.
#RHDM	An abbreviation for "Read High-grade Discharge Measurement Status". This command is used (in UPS firmware versions 2.10 and up) to read the UPS parameters: DIT, LTL, CCD, RCL, RCH and RBS.
#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.
@ whrd	This command is needed to read the time stamp, which is needed for the battery life-span calculation.

Table 73: Overview of UPS parameters

# 4. Glossary

A

### ADI

Abbreviation for »Automation Device Interface« The ADI interface allows access to specific functions (e.g. brightness control, firmware updates, static value read) of B&R devices. The settings can be read or changed in the Control Panel with the B&R Control Center Applet (already included in the B&R embedded operating system).

Automation Runtime

A uniform runtime system for all B&R automation components.

В

#### BIOS

An abbreviation for "Basic Input/Output System". Core software for computer systems with essential routines for controlling input and output processes on hardware components, for performing tests after system start, and for loading the operating system. Although BIOS is used to configure a system's performance, the user does not usually come into contact with it.

Bit

Binary digit > binary position, binary character, smallest discrete unit of information. A bit can have the value 0 or 1.

Bus unit

Provit bus units consist of the housing, interface board slots and the power supply for the system units.

#### Byte

Data format [1 byte = 8 bits] and a unit for characterizing information amounts and memory capacity. The following units are the commonly used units of progression: KB, MB, GB.

#### **B&R** Automation Runtime

Windows-based program for creating installation disks to install B&R Automation Runtime<sup>™</sup> on the target system.

С

#### CD-ROM

Abbreviation for "Compact Disc Read-Only Memory". A removable data medium with a capacity of ~700 MB. CD-ROMs are optically scanned.

#### CE mark

A CE mark for a product. It consists of the letters "CE" and indicates conformity to all EU guidelines for the labeled product. It indicates that the individual or corporate body who has performed or attached the label assures that the product conforms to all EU guidelines for complete harmonization. It also indicates that all mandatory conformity evaluation procedures have taken place.

#### 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. A modem, mouse, or serial printer is typically connected to a serial port.

#### COM1

Device name for the first serial port in a PC system. The input/output area for COM1 is usually found at address 03F8H. Generally, the COM1 port is assigned to IRQ 4. In many systems, an RS232 serial mouse is connected to COM1.

#### COM2

Device name for the second serial port in a PC system. The input/output area for COM2 is usually found at address 02F8H. Generally, the COM2 port is assigned to IRQ 3. In many systems, a modem is connected to COM2.

#### COM3

Device name for a serial port in a PC system. The input/output area for COM3 is usually found at address 03E8H. Generally, the COM3 port is assigned to IRQ 4. In many systems, COM3 is used as an alternative for COM1 or COM2 if peripheral devices are already connected to COM1 and COM2.

#### CompactFlash®

CompactFlash memory cards [CF cards] are exchangeable nonvolatile mass memory systems with very small dimensions [43 x 36 x 3.3 mm, approximately half the size of a credit card]. In addition to the flash memory chips, the controller is also present on the cards. CF cards provide complete PC card / ATA functionality and compatibility. A 50-pin CF card can be simply inserted in a passive 68-pin type II adapter card. It conforms to all electrical and mechanical PC card interface specifications. CF cards were launched by SanDisk back in 1994. Currently, memory capacities reach up to 64 GB per unit. Since 1995, CompactFlash Association [CFA] has been looking after standardization and the worldwide distribution of CF technology

#### Compact IPC

The B&R Compact IPC is a very cost effective industrial PC with an integrated 10.4" TFT touch display. It is also known as the IPC2002.

#### Appendix A • Glossary

#### Controller

A device component which allows access to other devices on a computer subsystem. A disk controller, for example, allows access to hard disks and disk drives and is responsible both for physical and logic drive access.

#### CTS

An abbreviation for "Clear To Send". 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.

#### D

## DCD

An abbreviation for " Data Carrier Detected". A signal used in serial communication that is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.

#### DVD

An abbreviation for "Digital Versatile Disc". The next generation of optical data carrier technology. Using this technology it is possible to encode video, audio and computer data on CD. DVDs can store a higher volume of data than conventional CDs. Standard DVDs, which have a single layer, can hold 4.7 GB. Dual-layer DVDs can hold 8.5 GB. Double-sided DVDs can therefore hold up to 17 GB. A special drive is needed for DVDs. Conventional CDs can also be played on DVD drives.

#### DSR

An abbreviation for "Data Set Ready". 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 that is sent by the computer to the modem it is connected to, indicating the computer's readiness to accept incoming signals.

#### F

#### Firmware

Programs stored permanently in read-only memory. Firmware is software used to operate computer-controlled devices that generally stays in the device throughout its lifespan or over a long period of time. Such software includes operating systems for CPUs and application programs for industrial PCs as well as programmable logic controllers (e.g. the software in a washing machine controller). This software is written in read-only memory (ROM, PROM, EPROM) and cannot be easily replaced.

# Η

Т

#### Handshake

Method of synchronization for data transfer when data is sent at irregular intervals. The sender signals that data can be sent, and the receiver signals when new data can be received.

#### Interface

From the hardware point of view, an interface is the connection point between two modules/devices/systems. The units on both sides of the interface are connected by the interface lines so that data, addresses, and control signals can be exchanged. The term interface includes all functional, electrical and constructive conditions [encoding, signal level, pin assignments] that characterize the connection point between the modules, devices, or systems. Depending on the type of data transfer, a differentiation is made between parallel [e.g. Centronics, IEEE 488] and serial interfaces [e.g. V.24, TTY, RS232, RS422, RS485], which are set up for different transfer speeds and transfer distances. From the point of view of software, the term "interface" describes the transfer point between program modules using specified rules for transferring the program data.

IPC

An abbreviation for "Industrial PC".

IPC2000

Product from the B&R industrial PC family.

IPC2001

Product from the B&R industrial PC family. A further development on the IPC2000

IPC2002

see Compact IPC

IPC5000

Product from the B&R industrial PC family. Pentium processors (100 MHz - 200 MHz) and AMD K6 (166 MHz or 266 MHz) can be used.

#### IPC5600

Product from the B&R industrial PC family. Pentium processors (100 MHz - 200 MHz) and AMD K6 (166 MHz or 266 MHz) can be used.

#### IPC5000C

Product from the B&R industrial PC family. Celeron (300, 366, 433, 566 MHz) and Pentium III (600 and 850 MHz) processors can be used.

#### Appendix A • Glossary

#### IPC5600C

Product from the B&R industrial PC family. Celeron (300, 366, 433, 566 MHz) and Pentium III (600 and 850 MHz) processors can be used.

#### ISA

An abbreviation for "Industry Standard Architecture". A term given for the bus design which allows expansion of the system with plug-in cards that can be inserted in PC expansion slots.

#### L

#### LED

An abbreviation for "Light Emitting Diode". A semiconductor diode which converts electrical energy into light. LEDs work on the principle of electroluminescence. They are highly efficient because they do not produce much heat in spite of the amount of light they emit. For example, "operational status indicators" on floppy disk drives are LEDs.

#### М

#### Microprocessor

Highly integrated circuit with the functionality of a CPU, normally housed on a single chip. It comprises a control unit, arithmetic and logic unit, several registers and a link system for connecting memory and peripheral components. The main performance features are the internal and external data bus and address bus widths, the command set and the clock frequency. Additionally, a choice can be made between CISC and RISC processors. The first commercially available worldwide microprocessor was the Intel 4004. It came on the market in 1971.

#### Mkey

An abbreviation for "Module **key**block". A common term given to keys found on Provit display units. They can be freely configured with Mkey utilities.

#### Modem

Modulator/demodulator. > Modulation/demodulation device, add-on card, or external device that allows information to be exchanged between computers over the telephone network using digital/analog or analog/digital signal conversion.

#### MTC

An abbreviation for "Maintenance Controller". The MTC is an independent processor system that provides additional functions for a B&R industrial PC that are not available with a normal PC. The MTC communicates with the B&R industrial PC via the ISA bus (using a couple register).

#### MTCX

An abbreviation for »Maintenance Controller EXtended«. The MTCX is an independent processor system that provides additional functions for a B&R industrial PC that are not available with a normal PC. The MTCX communicates with the B&R industrial PC via the ISA bus (using a couple register).

## Ρ

#### Panel

A common term for B&R display units (with or without keys).

#### Panelware

A generic term given for standard and special keypad modules offered by B&R.

#### PLC

Programmable Logic Controller; Computer-based control device that functions using an application program. The application program is relatively easy to create using standardized programming languages [IL, FBD, LAD, AS, ST]. Because of its serial functionality, reaction times are slower compared to connection-oriented control. Today, PLCs are available in device families with matched modular components for all levels of an automation hierarchy.

#### Power Panel

Power Panel is part of the B&R product family and is a combination of an operator panel and controller in one device. This covers the PP21 and PP41 products.

#### Provit

An abbreviation for **»PRO**cess**VI**sualization**T**erminal« Product family name for B&R industrial PCs.

#### Provit 2000

Product family name for B&R industrial PCs. It is divided into the following products: IPC2000, IPC2001, Compact IPC (IPC2002) and the display units belonging to them.

#### Provit 5000

Product family name for B&R industrial PCs. It is divided into the following products: IPC5000, IPC5600, IPC5600C and the display units belonging to them.

#### R

#### RAM

An abbreviation for "Random Access Memory". Semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. The various ROM memory types do allow random access, but they cannot be written to. The term RAM refers to a more temporary memory that can be written to as well as read.

#### RBS

An abbreviation for "Reset Battery Status". This status, which can be checked with the command RHDM, shows the result of the measurement of charging current maintenance.

#### ROM

An abbreviation for "Read-Only Memory". Semiconductor memory where programs or data were permanently stored during the production process.

#### RS232

**R**ecommended **S**tandard **N**umber **232**. Oldest and most widespread interface standard, also called a V.24 interface. All signals are referenced to ground making this an unbalanced interface. High level: -3 ... -30 V, low level: +3 ... +30 V. Cable lengths up to 15 m, transfer rates up to 20 kBit/s. For point-to-point connections between 2 participants.

#### RS422

**R**ecommended **S**tandard **N**umber **422**. Interface standard, balanced operation, increased immunity to disturbances. High level:  $2 \dots -6 V$ , low level:  $+2 \dots +6 V$ . 4-wire connection [inverted/not inverted], cable lengths up to 1200 m, transfer rates up to 10 Mbit/s, 1 sender can carry out simplex communication with up to 10 receivers.

#### RS485

**R**ecommended **S**tandard **N**umber **485**. Interface standard upgraded from RS422. High level: 1.5 ... -6 V, low level: +1.5 ... +6 V; 2-wire connection [half duplex operation] or 4-wire connection [full duplex operation. Cable lengths up to 1200 m, transfer rates up to 10 Mbit/s. Up to 32 participants can be connected to an RS485 bus [sender/receiver].

#### RTS

An abbreviation for "**R**equest **T**o **S**end". 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 the hardware specifications of the RS-232-C standard.

#### RXD

An abbreviation for "Receive (**RX**) **D**ata". A line for transferring 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.

# SDRAM

S

An abbreviation for "Synchronous Dynamic Random Access Memory". A construction of dynamic semiconductor components (DRAM) that can operate with higher clock rates than conventional DRAM switching circuits. This is made possible using block access. For each access, the DRAM determines the next memory addresses to be accessed.

# SRAM

An abbreviation for "Static Random Access Memory". A semiconductor memory (RAM) made up of certain logic circuits (flip-flop) that only keeps stored information while powered. In computers, static RAM is generally only used for cache memory.

Т

Touch screen

Screen with touch sensors for activating an item with the finger.

TXD

An abbreviation for "Transmit (**TX**) **D**ata". 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.

U

## USB

An abbreviation for »**U**niversal **S**erial **B**us« A serial bus with a bandwidth of up to 12 megabits per second (Mbit/s) for connecting a peripheral device to a microcomputer. Up to 127 devices can be connected to the system using a single multipurpose connection, the USB bus (e.g. external CD drives, printers, modems as well as the mouse and keyboard). This is done by connecting the devices in a row. USB allows devices to be changed when the power supply is switched on (hot plugging) and multi-layered data flow.

## UPS

An abbreviation for "Uninterruptible Power Supply". The UPS supplies power to systems that cannot be connected directly to the power mains for safety reasons because a power failure could lead to loss of data. The UPS allows the PC to be shut down securely without losing data if a power failure occurs.

Appendix A

#### W

#### Windows CE

Compact 32-bit operating system with multitasking and multithreading that Microsoft developed especially for the OEM market. It can be ported for various processor types and has a high degree of real-time capability. The development environment uses proven, well-established development tools. It is an open and scalable Windows operating system platform for many different devices. Examples of such devices are handheld PCs, digital wireless receivers, intelligent mobile phones, multimedia consoles, etc. In embedded systems, Windows CE is also an excellent choice for automation technology.

Figure 1:	UPS - Charging Unit	19
Figure 2:	Block diagram of the entire system	20
Figure 3:	UPS Charging Unit 9A0100.11	21
Figure 4:	Dimensions 9A0100.11	23
Figure 5:	Device Interfaces 9A0100.11	24
Figure 6:	Pin assignment - RS232 cable	28
Figure 7:	Status LEDs	29
Figure 8:	Type A Battery Unit 9A0100.12 Revision Comparison	31
Figure 9:	Dimensions 9A0100.12 <= Revision E0	32
Figure 10:	Dimensions 9A0100.12 > Revision E0	33
Figure 11:	Type B Battery Unit 9A0100.14 Revision Comparison	34
Figure 12:	Dimensions 9A0100.14 <= Revision D0	35
Figure 13:	Dimensions 9A0100.14 > Revision D0	36
Figure 14:	Type C Battery Unit 9A0100.16	37
Figure 15:	Dimensions 9A0100.16	38
Figure 16:	Battery Unit 9A0100.13	39
Figure 17:	Battery Unit 9A0100.15	40
Figure 18:	Battery Unit 9A0100.17	41
Figure 19:	Null modem cable 9A0017.0x	42
Figure 20:	Mounting rail	44
Figure 21:	Mounting Plates UPS Charging Unit	45
Figure 22:	Mounting the UPS 24 VDC	45
Figure 23:	UPS Device Mounting Orientation 9A0100.11	46
E		17
Figure 24:	Mounting Plates UPS Charging Unit	47
Figure 24: Figure 25:	Cable Connection for Battery Units	48
Figure 24: Figure 25: Figure 26:	Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation	48 49
Figure 24: Figure 25: Figure 26: Figure 27:	Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage	48 49 49
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28:	Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software	48 49 49 52
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29:	Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection	48 49 49 52 53
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30:	Mounting Plates UPS Charging Unit   Cable Connection for Battery Units   Mounting Methods for Lead-Acid Battery Units During Operation   Mounting Methods for Lead-Acid Battery Units in Storage   Start B&R UPS Configuration Software   Tray menu selection   Uninstall	48 49 49 52 53 54
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31:	Mounting Plates UPS Charging Unit   Cable Connection for Battery Units   Mounting Methods for Lead-Acid Battery Units During Operation   Mounting Methods for Lead-Acid Battery Units in Storage   Start B&R UPS Configuration Software   Tray menu selection   Uninstall   Uninstall	48 49 49 52 53 54 54
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31: Figure 32:	Mounting Plates UPS Charging Unit   Cable Connection for Battery Units   Mounting Methods for Lead-Acid Battery Units During Operation   Mounting Methods for Lead-Acid Battery Units in Storage   Start B&R UPS Configuration Software   Tray menu selection   Uninstall.   Uninstall wizard selection   Overview of tabs	48 49 49 52 53 54 54 55
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31: Figure 32: Figure 33:	Mounting Plates UPS Charging Unit   Cable Connection for Battery Units   Mounting Methods for Lead-Acid Battery Units During Operation   Mounting Methods for Lead-Acid Battery Units in Storage   Start B&R UPS Configuration Software   Tray menu selection   Uninstall.   Uninstall wizard selection   Overview of tabs.   Standard buttons	48 49 49 52 53 54 54 55 55
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 31: Figure 32: Figure 33: Figure 34:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description	48 49 49 52 53 54 54 55 55 57
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 31: Figure 32: Figure 33: Figure 34: Figure 35:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description	48 49 49 52 53 54 55 55 57 58
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31: Figure 31: Figure 32: Figure 33: Figure 34: Figure 35: Figure 36:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description	48 49 49 52 53 54 55 55 55 57 58 59
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 31: Figure 32: Figure 33: Figure 34: Figure 35: Figure 36: Figure 37:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Firmware" tab description Upgrade successful.	48 49 49 52 53 54 55 55 57 58 59 60
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31: Figure 32: Figure 32: Figure 33: Figure 34: Figure 35: Figure 36: Figure 37: Figure 38:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description "Firmware" tab description Upgrade successful "Communication" tab description	48 49 49 52 53 54 55 55 57 58 59 60 61
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31: Figure 32: Figure 32: Figure 33: Figure 34: Figure 35: Figure 35: Figure 36: Figure 37: Figure 38: Figure 39:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description Upgrade successful "Communication" tab description	48 49 52 53 54 55 55 57 58 59 60 61 62
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 32: Figure 33: Figure 33: Figure 34: Figure 35: Figure 35: Figure 36: Figure 37: Figure 38: Figure 39: Figure 40:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Firmware" tab description "Firmware" tab description "Communication" tab description "Service" tab description Monitoring settings	48 49 52 53 54 55 55 57 58 59 60 61 62 64
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 32: Figure 33: Figure 33: Figure 34: Figure 35: Figure 35: Figure 36: Figure 37: Figure 38: Figure 39: Figure 40: Figure 41:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description "Firmware" tab description "Firmware" tab description "Communication" tab description "Service" tab description Monitoring settings Error message "no UPS found".	48 49 52 53 54 55 55 57 58 59 60 61 62 64 65
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 32: Figure 33: Figure 33: Figure 34: Figure 35: Figure 35: Figure 36: Figure 37: Figure 38: Figure 39: Figure 40: Figure 41: Figure 42:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description "Firmware" tab description "Firmware" tab description "Service" tab description "Service" tab description "Service" tab description Monitoring settings Error message "no UPS found". Power failure message.	48 49 49 52 53 54 55 55 57 58 59 60 61 62 65 65
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31: Figure 32: Figure 33: Figure 33: Figure 35: Figure 36: Figure 37: Figure 38: Figure 39: Figure 39: Figure 40: Figure 41: Figure 42: Figure 43:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Firmware" tab description "Firmware" tab description "Settings" tab description "Service" tab description "Service" tab description "Service" tab description Monitoring settings Error message "no UPS found" Power failure message.	48 49 49 52 53 54 55 57 58 59 60 61 62 65 65 66
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 32: Figure 33: Figure 33: Figure 34: Figure 35: Figure 36: Figure 36: Figure 37: Figure 38: Figure 39: Figure 40: Figure 41: Figure 42: Figure 43: Figure 44:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall. Uninstall. Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description "Firmware" tab description Upgrade successful. "Communication" tab description "Service" tab description Service" tab description Service" tab description Monitoring settings Error message "no UPS found" Power failure message. Shut down signal message.	48 49 49 53 54 55 55 57 58 60 61 62 65 66 66 66
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 30: Figure 32: Figure 33: Figure 33: Figure 34: Figure 35: Figure 36: Figure 37: Figure 38: Figure 39: Figure 40: Figure 41: Figure 42: Figure 43: Figure 45:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description "Firmware" tab description Upgrade successful "Communication" tab description "Service" tab description Service" tab description Service tab description Monitoring settings Error message "no UPS found" Power failure message. Shut down signal message UPS start shut down message Open security configuration.	$\begin{array}{c} 48\\ 49\\ 49\\ 52\\ 53\\ 54\\ 55\\ 55\\ 58\\ 90\\ 61\\ 62\\ 65\\ 66\\ 68\\ \end{array}$
Figure 24: Figure 25: Figure 26: Figure 27: Figure 28: Figure 29: Figure 30: Figure 31: Figure 32: Figure 33: Figure 33: Figure 35: Figure 36: Figure 37: Figure 38: Figure 39: Figure 40: Figure 42: Figure 42: Figure 44: Figure 45: Figure 46:	Mounting Plates UPS Charging Unit Cable Connection for Battery Units Mounting Methods for Lead-Acid Battery Units During Operation Mounting Methods for Lead-Acid Battery Units in Storage Start B&R UPS Configuration Software Tray menu selection Uninstall Uninstall wizard selection Overview of tabs. Standard buttons "About" tab description "Settings" tab description "Firmware" tab description Upgrade successful. "Communication" tab description "Service" tab description Service" tab description Monitoring settings Error message "no UPS found" Power failure message. Shut down signal message UPS start shut down message Open security configuration.	$\begin{array}{c} 48\\ 49\\ 49\\ 52\\ 53\\ 44\\ 55\\ 55\\ 55\\ 58\\ 90\\ 61\\ 64\\ 65\\ 66\\ 68\\ 69\\ \end{array}$

# Figure index

Figure 48:	Safety menu functions	. 70
Figure 49:	UPS Settings in Windows NT	. 73
Figure 50:	UPS - Windows 2000 settings - Manufacturer	. 74
Figure 51:	UPS - Windows 2000 settings - Type	. 75
Figure 52:	UPS - Windows 2000 settings - Signal Polarity	. 76
Figure 53:	UPS - Configuration dialog box in Windows 2000	. 77
Figure 54:	UPS - Windows XP settings - Manufacturer	. 78
Figure 55:	UPS - Windows XP settings - Type	. 79
Figure 56:	UPS - Windows XP settings - Signal Polarity	. 80
Figure 57:	UPS - Configuration dialog box in Windows XP	. 81
Figure 58:	HMI Drivers & Utilities DVD 5SWHMI.0000-00	107
Figure 59:	Behavior when the mains supply voltage fails	111
Figure 60:	Switching on the UPS, Battery OK	114
Figure 61:	Switching on the UPS, Battery OK (with button)	115
Figure 62:	Switching on the UPS, Battery Empty	115
Figure 63:	Switching on the UPS, Battery Empty (with button)	116
Figure 64:	RS232 Interface Handshake Signal	118
Figure 65:	Handshake lines when a brief power failure occurs	119
Figure 66:	Handshake lines when a power failure occurs	120
Figure 67:	Handshake Lines During POT	121
Figure 68:	Handshake lines during power failure without RS232 cable	122
Figure 69:	Setting the maximum charging current	127
Figure 70:	Reduction of rechargeable battery capacity over time	128
Figure 71:	Effect of temperature on the battery life span	129
Figure 72:	Panasonic battery LC-R122R2P data sheet	130
Figure 73:	Panasonic battery LC-R127R2P data sheet	131
Figure 74:	Hawker Cyclon data sheet	132
Table index

Table 1:	Manual history	11
Table 2:	Environmentally-friendly separation of materials	. 15
Table 3:	Organization of safety notices	16
Table 4:	Model numbers	17
Table 5:	Technical Data 9A0100.11	21
Table 6:	Delivery 9A0100.11	23
Table 7:	Power mains connection	24
Table 8:	Load Connection	. 25
Table 9:	Fuses	26
Table 10:	Battery connection	26
Table 11:	Relay output	27
Table 12:	Ext. Button, Temperature Sensor Connection	27
Table 13:	RS232 interface	28
Table 14:	LED Status - Flashing Sequences and their Meaning	29
Table 15:	Technical Data 9A0100.12	31
Table 16:	Delivery 9A0100.12	33
Table 17:	Technical Data 9A0100.14	34
Table 18:	Delivery 9A0100.14	36
Table 19:	Technical Data 9A0100.16	37
Table 20:	Delivery 9A0100.16	38
Table 21:	Technical Data 9A0100.13	39
Table 22:	Technical Data 9A0100.15	40
Table 23:	Technical Data 9A0100.17	41
Table 24:	Null Modem Cable 9A0017.01 and 9A0017.02	42
Table 25:	Cable Connection Examples	46
Table 26:		52
Table 27:	ray menu settings	53
Table 28:	Standard button functions	55
Table 29:	1001 Lips example	56
Table 30:	Shut down options.	67
Table 31:	UPS Configuration Software warnings	70
Table 32:	Figure 1 program settings	82
Table 33:	Example - Hyper Ferminal Conliguration in Windows 2000 / XP for COMT	82
Table 34:	Determine the LIPS exercising mode	03
Table 35.	Detecting the OFS operating mode	03 01
Table 30.	RCP (Patton Change Request)	04
Table 37.	whend (LIPS time stamp)	07
Table 30:	BBS (Beset Battery Status)	
Table 39.	TMU (Time Worst Low)	00
Table 40.	SDT (Shut Down Time)	01
Table 41.	POT (Power On Time)	. 02
Table 43	I CS (Load Current Set)	92
Table 44	PFL (Power Fail Level)	
Table 45	Switching thresholds between battery / mains operation (18 V)	
Table 46	Switching thresholds between battery / mains operation (10 V)	
Table 47	CTL (Charge Temperature Low)	95
1 4010 17.		

145

#### Table index

Table 48:	Minimum Charging Temperature for Battery Units	95
Table 49:	CTH (Charge Temperature High)	96
Table 50:	Maximum Charging Temperature for Battery Units	96
Table 51:	AGE (Lifespan of the Battery)	97
Table 52:	Maximum Life-span for Battery Units	97
Table 53:	DIT (Digital Input Button)	98
Table 54:	LTL (Life Time LED)	99
Table 55:	Measurement of charging current maintenance	100
Table 56:	Setting CCD (Charge Count Down)	101
Table 57:	Setting RCL (Remain Current Low)	102
Table 58:	RCL of Battery Units	102
Table 59:	Setting RCH (Remain Current High)	103
Table 60:	RCH of Battery Units	103
Table 61:	Battery operation parameters	104
Table 62:	Battery operating parameters - Panasonic LC-R127R2P 7.2 Ah (9A0100.12).	104
Table 63:	Battery operation parameters - Panasonic LC-R122R2P 2.2 Ah (9A0100.14).	104
Table 64:	Battery operation parameters - Hawker Cyclon 4.5 Ah (9A0100.16)	105
Table 65:	UPS Firmware Versions	105
Table 66:	5SWHMI.0000-00 - HMI Drivers & Utilities DVD	107
Table 67:	Testing the battery when switching on	113
Table 68:	Digital input electrical characteristics	117
Table 69:	Relay output contact data	123
Table 70:	Panasonic LC-R127R2P characteristics	124
Table 71:	Panasonic LC-R122R2P characteristics	125
Table 72:	Hawker Cyclon characteristics	125
Table 73:	Overview of UPS parameters	133

#### Model number index

## 5

5SWHMI.0000-00.		17,	107
-----------------	--	-----	-----

### 9

17,	42
17,	42
17,	21
17,	31
17,	39
	17, 17, 17, 17, 17,

17,	34
17,	40
17,	37
17,	41
	17, 17, 17, 17,

### М

MAUSV1-0	17
MAUSV1-E	17
MAUSV1-F	17

#### Model number index

## Α

ADI	134
AGE97,	133
Automation Runtime	134

## В

B&R Automation Runtime	134
B&R Control Center	134
B&R UPS Configuration Software .	51
Help	56
Installation	51
Security Configuration	53
Start	52
Structure	55
Uninstall	54
Battery connection	26
Battery Units	31
Type A (24 V / 7.2 Ah)	31
Type B (24 V / 2.2 Ah)	34
Type C (24 V / 4.5 Ah)	37
Baud rate	134
BCR	87, 133
BIOS	134
Bit	134
Blink signals	29
Buffer mode	112
Bus unit	134
Button	28, 116
Byte	
-	

# С

CCD	101, 133
CD-ROM	134
CE mark	135
Charging current	58, 93, 126
COM	135
COM1	135
COM2	135
COM3	135
Compact IPC	135
CompactFlash	135
Configuration using HyperTerminal	82
Control Center	134

Controller	. 136
СТН96,	133
CTL95,	133
СТЅ	. 136

### D

DCD	
Deep discharge protection	
Digital input	116, 117
Disposal	
DIT	. 98, 116, 133
DSR	
DTR	
DVD	

### Ε

Electric Current Setting	58, 93,	126
Ext. Button		27
External button		116

## F

Firmware	136
Fuses	26

### Η

Handshake	137
HyperTerminal	
Setting up a CCD	101
Setting up an RCH	103
Setting up an RCL	102

#### I

Interface	
IPC	
5000	
5000C	
5600	
5600C	
ISA	

Index

#### Index

### L

LCS	
LED	138
Load Connection	25
LTL	

### Μ

Manual history	11
Measurement of charging current	nt mainte-
nance	100
Microprocessor	138
Mkey	138
Model numbers	17
Modem	138
Monitoring	64
Motherboard	138
Mounting instructions	
Rechargeable Batteries	47
UPS devices	44
Mounting rail	44
MTC	
MTCX	139

## Ν

42
•

### Ρ

Panel	139
Panelware	139
PFL	94, 133
PLC	139
POT	92, 133
Power mains connection	24
Power Panel	139
Provit	139
Provit 5000	139

### R

RAM	 140
RBS	 140
RCH	 133

RCL10	)2, 133
READ	34, 133
Rechargeable Batteries	124
Hawker Cyclon Rechargeable Batter	y 12 V,
4.5 Ah	125
Lead acid battery 12 VDC 2.2 Ah	125
Lead acid battery 12 VDC 7.2 Ah	124
Relay output2	26, 123
Contact Data	123
Replacement Batteries	39
Batteries; 2 pcs., 12 V; 4.5 Ah	41
Batteries; 2 pcs., 12V; 2.2 Ah	40
Batteries; 2 pcs., 12V; 7.2 Ah	39
RHDM	34, 133
ROM	140
RS232	140
RS232 interface2	28, 118
Pin assignments	
Power Failure	119
RS422	140
RS485	140
RTS	140
RXD	140

## S

Safe shutdown	112
Safety notices	16
Dust, humidity, aggressive gases .	14
Environmentally-friendly disposal	15
Installation	14
Intended use	13
Introduction	13
Operation	14
Programs	15
Transport and storage	13
Viruses	15
SDRAM	141
SDT	. 91, 133
Security configuration	68
Serial interface	
Power failure	119
Software	
Configuration	51
Monitoring	63
SRAM	141
Status LEDs	

Switching threshold	22, 24, 128
---------------------	-------------

### Т

Tab	
Communication	61
Info	57
Monitoring	62
Operating system	59
Settings	58
Technical appendix	
Relay output	123
Serial interface	118
Switching On	113
Switching on the UPS	113
UPS Behavior	111
User button and external button	116
Temperature sensor	27
Tool Tips	56
Touch screen	141

TWL	 133
TXD	 141

### U

UPS	
Characteristics	19
Contents of delivery	23
Device interfaces	24
Dimensions	23
Mounting guidelines	44
Technical data	21
UPS Functions	20
USB	

### W

Warnings	70
whrd	133
Windows CE	142

#### Index