Uninterruptible power supply

User's Manual

Version: **5.30 (March 2014)**

Model no.: **MAUSV1-0**

Chapter 1: General information

Chapter 2: Technical data

Chapter 3: Commissioning

Chapter 4: Software

Chapter 5: Accessories

Appendix A

Chapter 1 • General information

1 Manual history

Version	Date	Change
4.30	18-Aug-00	• First version
4.40	07-Sep-00	• Changed to a new layout
4.50	29-Sep-00	• Changes / New features
4.60	19-Apr-01	• Corrected mistake in the cable description • Corrected mistake about the handshake signal lines
4.70	03-Oct-01	• Restructured mnual • Added B&R UPS configuration software • Corrected mistake regarding possible storage/operating position of lead acid batteries • Changed to a new layout
4.80	23-Sep-02	• Corrected mistake in the figure Figure 13 "9A0100.14 ≥ Rev. C0 - Dimensions" on page 27- Hole spacing • Add maximum cable length (15m) of self-assembled RS232 connection cable • Added 9A0100.16 UPS battery unit type C 24 V / 4.5 Ah • Added 9A0100.17 UPS batteries 2 pcs. 12 V / 4.5 Ah • Added safety notices • Description of new commands in UPS firmware version 2.0 and higher • Added functions of the B&R UPS configuration software in version 2.0 and higher • Updated section "Monitoring using Windows XP with Operating System UPS Service" on page 62 • Updated section "Configuring the UPS using HyperTerminal" on page 64 • Updated section "UPS Overload Behavior" on page 89 • Description of the new UPS configuration software functions • Added switching thresholds
4.90	05-May-03	• Use of new icons for safety notices • Revised Signal display of "LED status indicators" on page 19 • Revised communication settings for hyperterminal connection, see Table 37 "Terminal program settings" on page 64 (without hardware handshake!) • Added new commands from UPS firmware version 2.10: DIT command (Digital Input Taste) - LTL command (Life Time LED) - CCD command (Charge Count Down) - RCL command (Remain Current Low) - RCH command (Remain Current High) - RBS command (Reset Battery Status) - UPS read command RHDM • Added description for the function of the charging current retention measurement • Additions to the glossary due to new UPS commands in firmware version 2.10 • Updated section "Warnings and notifications" on page 57 • Changeover to a new A5 book template • Added HMI Drivers & Utilities CD (Model Nr. 5S0000.01-090) • Updated section "UPS Firmware Differences" on page 81
5.00	23-Feb-04	• Revised installation of battery units (see Chapter 3 "Commissioning", section "Mounting Guidelines for Battery Units" on page 41) • Revised installation of the UPS charging unit (see Chapter 3 "Commissioning", "Mounting the UPS charging unit" on page 38) • Added data sheet for Hawker Cyclon batteries • Corrected and revised the state diagrams and signal lines (located in Appendix A) • The section "UPS command sequences" is now described in greater detail in 4 "Software" section "Configuring the UPS using HyperTerminal" on page 64 • New figures added for the battery unit and the null modem cable

Table 1: Manual history

Version	Date	Change
5.10	23-Nov-09	• Renamed "Chapter 3 Installation" to 3 "Commissioning". • Renamed "Chapter 5 Technical Appendix" to A "Appendix A". • Revised wording in technical data. • Updated section "Environmentally friendly disposal" on page 10. • Updated sections "Environmental conditions - Dust, humidity, aggressive gases" on page 9 and "Viruses and dangerous programs" on page 9. • Moved section about UPS functionality from Appendix A to 12. • Added maintenance interval for UPS battery units and replacement batteries. • Revised glossary. • Revised table note formatting. • Replaced information text on cover page with updated text. • Updated altitude information for replacement batteries, added information about altitude throughout document (footnote). • Changed headings for safety notices (e.g.: Important! -> Warning!) • Changed table formatting for technical data (charging unit, battery units). • Added Chapter 5 "Accessories" to the manual. • Updated battery in the "Environmentally friendly separation of materials" table in "Separation of materials" on page 10. • Corrected lifespan specifications for battery units and replacement batteries.
5.20	16-Feb-10	• Changed color of borders, dimension lines and arrows to orange in the graphics. • Changed table caption on page 109.
5.30	06-Mar-14	• Revised entire manual according to current formatting standards. • Added Revision G0 to the battery unit 9A0100.12 - see "9A0100.12" on page 21. • Added Revision F0 to the battery unit 9A0100.14 - see "9A0100.14" on page 25. • Added Revision D0 to the battery unit 9A0100.16 - see "9A0100.16" on page 29. • Updated section "Precautions for handling and use" on page 36. • Revised section "Cable connection" on page 41.

Table 1: Manual history

2 Safety notices

2.1 Intended use

Programmable logic controllers (PLCs), operating/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 industrial environments. 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, their use in flight control or flight safety systems as well as in the control of mass transportation systems, medical life support systems or weapons systems.

2.2 Protection against electrostatic discharge

Electrical components that can be damaged by electrostatic discharge (ESD) must be handled accordingly.

2.2.1 Packaging

- **Electrical components with a housing**
  ...Do not require special ESD packaging but must be handled properly (see "Electrical components with a housing").
- **Electrical components without a housing**
  …Must be protected by ESD-suitable packaging.

2.2.2 Guidelines for proper ESD handling

Electrical components with a housing

- Do not touch the connector contacts on connected cables.
- Do not touch the contact tips on circuit boards.

Electrical components without a housing

The following applies in addition to the points listed under "Electrical components with a housing":

- Any persons handling electrical components or devices with installed electrical components must be grounded.
- Components may only be touched on their narrow sides or front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable storage surfaces!
- Components should not be subjected to electrostatic discharge (e.g. through the use of charged plastics).
- Ensure a minimum distance of 10 cm from monitors and TV sets.
- Measurement devices and equipment must be grounded.
- Measurement probes on potential-free measurement devices must be discharged on sufficiently grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly integrated at B&R (conductive floors, footwear, arm bands, etc.).
- These increased ESD protective measures for individual components are not necessary for customers handling B&R products.

2.3 Policies and procedures

Electronic devices are never completely failsafe. If the programmable control system, operating/monitoring device or uninterruptible power supply fails, the user is responsible for ensuring that other connected devices, e.g. motors, are brought to a secure state.

When using programmable logic controllers or operating/monitoring devices as control systems together with a Soft PLC (e.g. B&R Automation Runtime or comparable product) or Slot PLC (e.g. B&R LS251 or comparable product), safety precautions relevant 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 the installation, commissioning and servicing of devices are only permitted to be carried out by qualified personnel. Qualified personnel are those familiar with the transport, mounting, installation, commissioning and operation of devices who also have the appropriate qualifications (e.g. IEC 60364). National accident prevention regulations must be observed.

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

2.4 Transport and storage

During transport and storage, devices must be protected against undue stress (mechanical loads, temperature, humidity, aggressive atmospheres, etc.).

2.5 Installation

- Installation must be performed according to this documentation using suitable equipment and tools.
- Devices may only be installed by qualified personnel without voltage applied. Before installation, voltage to the control cabinet must be switched off and prevented from being switched on again.
- General safety guidelines and national accident prevention regulations must be observed.
- Electrical installation must be carried out according to applicable guidelines (e.g. line cross sections, fuses, protective ground connections).

2.6 Operation

2.6.1 Protection against touching electrical parts

To operate programmable logic controllers, operating/monitoring devices or uninterruptible power supplies, it is necessary for certain parts to carry dangerous voltage levels over 42 VDC. Touching one of these parts can result in a life-threatening electric shock. This could lead to death, severe injury or damage to equipment.

Before turning on the programmable logic controller, operating/monitoring devices or the uninterruptible power supply, the housing must be properly grounded (PE rail). Ground connections must be established even when testing or operating operating/monitoring devices or the uninterruptible power supply for a short time!

Before turning the device on, all parts that carry voltage must be securely covered. During operation, all covers must remain closed.

2.6.2 Environmental conditions - Dust, humidity, aggressive gases

The use of operating/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 can affect functionality and may prevent sufficient cooling, especially in systems with active cooling systems (fans).

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

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

2.6.3 Viruses and dangerous programs

This system is subject to potential risk 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 preventive measures such as virus protection programs, firewalls, etc. and making sure that software is only obtained from trusted sources.

2.7 Environmentally friendly disposal

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

2.7.1 Separation of materials

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

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

Table 2: Environmentally friendly separation of materials

Disposal must comply with applicable legal regulations.

3 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding these safety guidelines and notices can be life-threatening.
Caution!	Disregarding these safety guidelines and notices can result in severe injury or substantial damage to equipment.
Warning!	Disregarding these safety guidelines and notices can result in injury or damage to equipment.
Information:	This information is important for preventing errors.

Table 3: Organization of safety notices

4 Guidelines
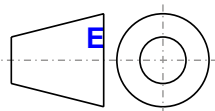
European dimension standards apply to all dimension diagrams in this document.

All dimensions are specified in mm.

Range of nominal sizes	General tolerance according to DIN ISO 2768 (medium)
Up to 6 mm	±0.1 mm
For 6 to 30 mm	±0.2 mm
For 30 to 120 mm	±0.3 mm
For 120 to 400 mm	±0.5 mm
For 400 to 1000 mm	±0.8 mm

Table 4: Range of nominal sizes

5 Overview

Product ID	Short description	on page
	24 VDC UPS modules	
9A0100.11	UPS 24 VDC, 24 VDC input, 24 VDC output, serial interface	14
	Battery units	
9A0100.12	UPS battery unit type A, 24 V, 7 Ah, incl. battery cage	21
9A0100.14	UPS battery unit type B, 24 V, 2.2 Ah, incl. battery cage	25
9A0100.16	UPS battery unit type C, 24 V, 4.5 Ah, incl. battery cage	29
	Cables	
9A0017.01	RS232 null modem cable, 0.6 m, for connecting UPS and IPC (9-pin female DSUB connector - 9-pin female DSUB connector)	35
9A0017.02	RS232 null modem cable, 1.8 m, for connecting UPS and IPC (9-pin female DSUB connector - 9-pin female DSUB connector)	35
	Other	
5SWHMI.0000-00	HMI Drivers & Utilities DVD	82
	Replacement batteries	
9A0100.13	UPS batteries type A (replacement part), 2x 12 V, 7 Ah, for battery unit 9A0100.12	32
9A0100.15	UPS batteries type B (replacement part), 2x 12 V, 2.2 Ah, for battery unit 9A0100.14	33

Product ID	Short description	on page
9A0100.17	UPS batteries type C (replacement part), 2x 12 V, 4.5 Ah, for battery unit 9A0100.16	34

Chapter 2 • Technical data

1 Introduction

The UPS module 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 module allows the load system (e.g. B&R industrial PC) to be shut down securely without losing data if a power failure occurs.

Figure 1: UPS charging unit

1.1 Features

- 24 VDC input voltage
- 24 VDC output voltage
- Industrial installation
- Communication via serial interfaces
- Status indicators
- Deep discharge protection
- Short circuit protection
- Maintenance free battery units

1.2 UPS functionality
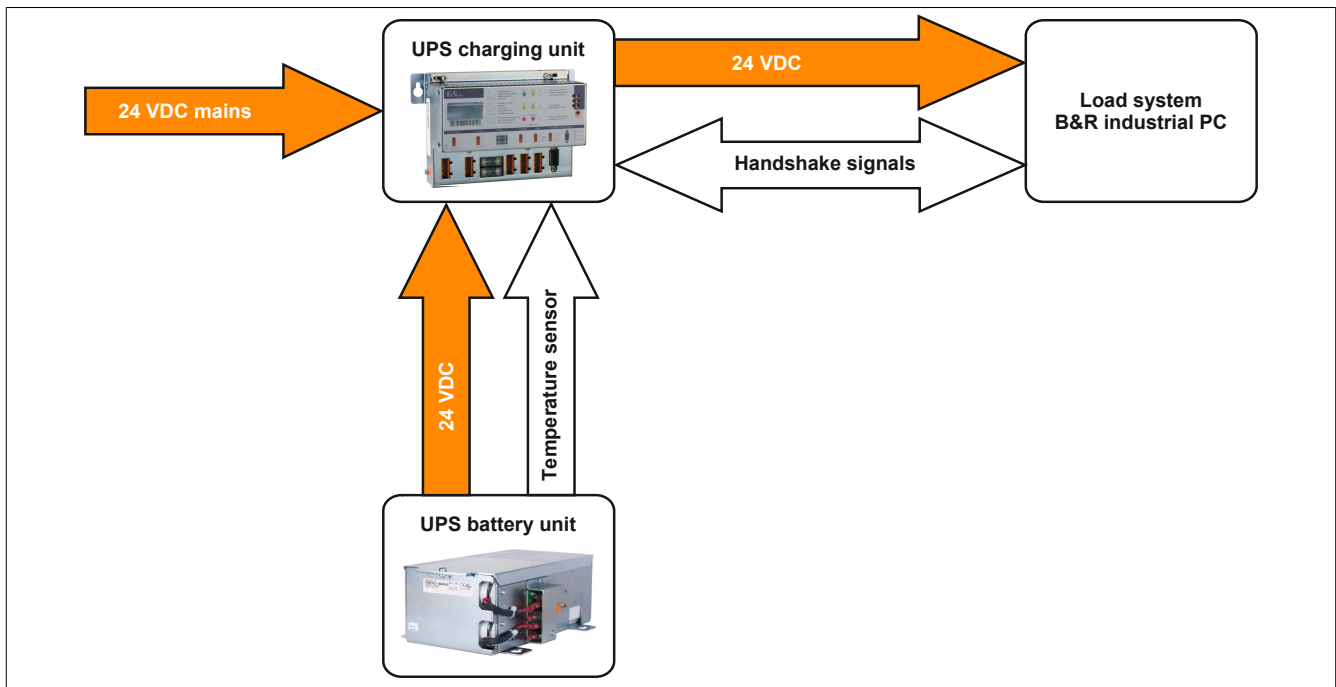
Figure 2: Block diagram of the complete system

In normal operation, the 24 VDC supply voltage is routed directly to the load system. If the mains supply voltage fails, the UPS battery unit powers the load system power so that shutdown can take place properly without losing data.

Data and commands are exchanged between the UPS and the load system via the handshake signals on the RS232 interface. To operate the UPS without connecting it to the load system via the RS232 cable, see "Operation without the RS232 cable" on page 93.

> ## Information:
>
> **Using the UPS to protect the power supply for life support machines is not permitted!**

2 Individual components

2.1 Charging unit

2.1.1 9A0100.11

2.1.1.1 General information

The UPS module 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 module allows the load system (e.g. industrial PC) to be shut down securely without losing data if a power failure occurs.

- 24 VDC input voltage
- 24 VDC output voltage
- Industrial installation
- Communication via serial interfaces
- Status indicators
- Deep discharge protection
- Short circuit protection
- Maintenance free battery units

2.1.1.2 Order data

Model number	Short description	Figure
	24 VDC UPS modules	
9A0100.11	UPS 24 VDC, 24 VDC input, 24 VDC output, serial interface	
	Required accessories	
	Battery units	
9A0100.12	UPS battery unit type A, 24 V, 7 Ah, incl. battery cage	
9A0100.14	UPS battery unit type B, 24 V, 2.2 Ah, incl. battery cage	
9A0100.16	UPS battery unit type C, 24 V, 4.5 Ah, incl. battery cage	
	Cables	
9A0017.01	RS232 null modem cable, 0.6 m, for connecting UPS and IPC (9-pin female DSUB connector - 9-pin female DSUB connector)	
9A0017.02	RS232 null modem cable, 1.8 m, for connecting UPS and IPC (9-pin female DSUB connector - 9-pin female DSUB connector)	
	Optional accessories	
	Replacement batteries	
9A0100.13	UPS batteries type A (replacement part), 2x 12 V, 7 Ah, for battery unit 9A0100.12	
9A0100.15	UPS batteries type B (replacement part), 2x 12 V, 2.2 Ah, for battery unit 9A0100.14	
9A0100.17	UPS batteries type C (replacement part), 2x 12 V, 4.5 Ah, for battery unit 9A0100.16	

Table 5: 9A0100.11 - Order data

2.1.1.3 Technical data

Product ID	9A0100.11
General information	
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Interfaces	
COM1	
Type	RS232 [1]
Design	9-pin male DSUB connector
Support	
Operating systems	
Windows XP Professional	Yes
Windows XP Embedded	Yes
Windows NT 4.0	Yes
Windows ME	Yes
Windows 2000	Yes
Windows 98	Yes
Windows 95	Yes

Table 6: 9A0100.11 - Technical data

Product ID	9A0100.11
Electrical characteristics	
Fuse	Yes, for mains supply, battery, battery charger [2]
Deep discharge protection	Yes, cutoff threshold 21 VDC
Reverse polarity protection	Yes, for mains supply and battery
Short circuit protection	Yes
Output during battery operation	
Voltage range	21 to 26.8 VDC (40°C) or 28.2 VDC (0°C)
Rated voltage value	24 VDC
Max. output current	8 A (load-side)
Output during mains operation	
Voltage range	20 to 30 VDC or 23.5 to 30 VDC depending on the configured switching threshold [3]
Rated voltage value	24 VDC
Max. output current	8 A
Input during mains operation [4]	
Power failure bypass	Max. 20 min at 150 W load
Voltage range	20 to 30 VDC at a switching threshold of 18 V 23.5 to 30 VDC at a switching threshold of 21.5 V [3]
Rated voltage value	24 VDC
Battery switching threshold	18 V
Battery charging data	
Charging clearing voltage	27.6 VDC
Charging current	Depending on the type, adjustable from 0.88A to 2.88A [5]
Environmental conditions	
Temperature	
Operation	0 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	Max. 9 to 200 Hz and 1 g (9.8 m/s² 0-peak)
Storage	Max. 2 to 500 Hz and 4 g (39.2 m/s² 0-peak)
Transport	Max. 2 to 500 Hz and 4 g (39.2 m/s² 0-peak)
Shock	
Operation	15 g, 11 ms
Storage	100 g, 6 ms
Transport	100 g, 6 ms
Altitude	
Operation	Max. 3000 m
Mechanical characteristics	
Dimensions	
Width	185 mm
Height	115 mm
Depth	69 mm
Weight	Approx. 1100 g

Table 6: 9A0100.11 - Technical data

1)   CTS (Clear To Send): Signals power failure
        DCD (Data Carrier Detect): Signals shutdown
        DTR (Data Terminal Ready): Signals remote shutdown of the UPS
2)   The charging unit fuse is not necessary with Revision L0 and higher.
3)   Can be set using B&R UPS configuration software or HyperTerminal (18 or 21.5 VDC).
4)   Regulated DC voltage
5)   Adjustable in 0.01 A increments: using B&R UPS Configuration Software and HyperTerminal (from 0.5 - 2.88 A) or 0.25 A: using button (from 0.88 to 2.88 A).

2.1.1.4 Dimensions
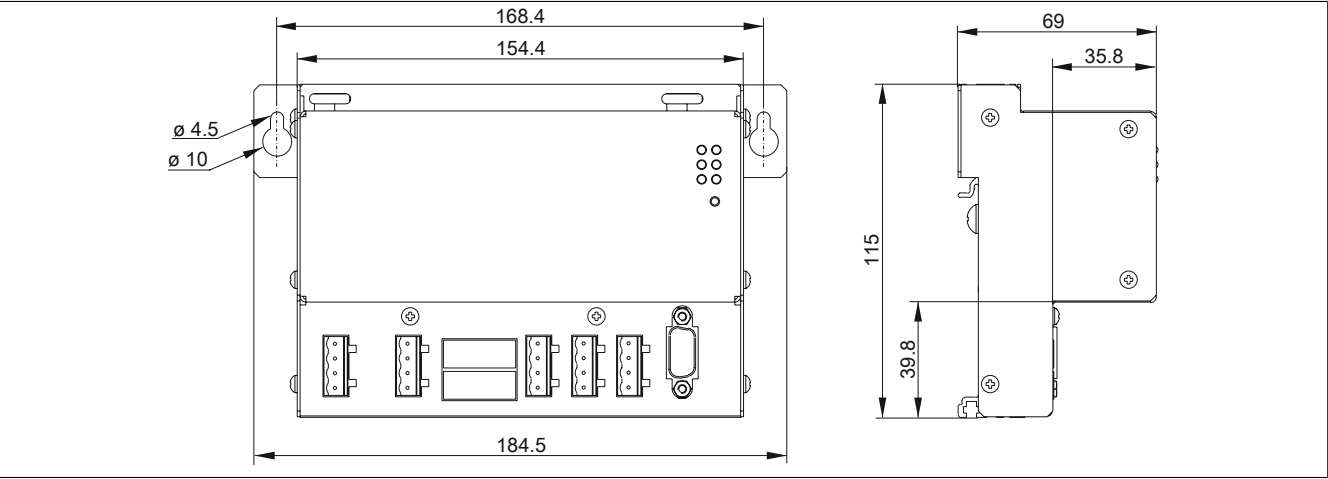
Figure 3: 9A0100.11 - Dimensions

2.1.1.5 Device interfaces and slots
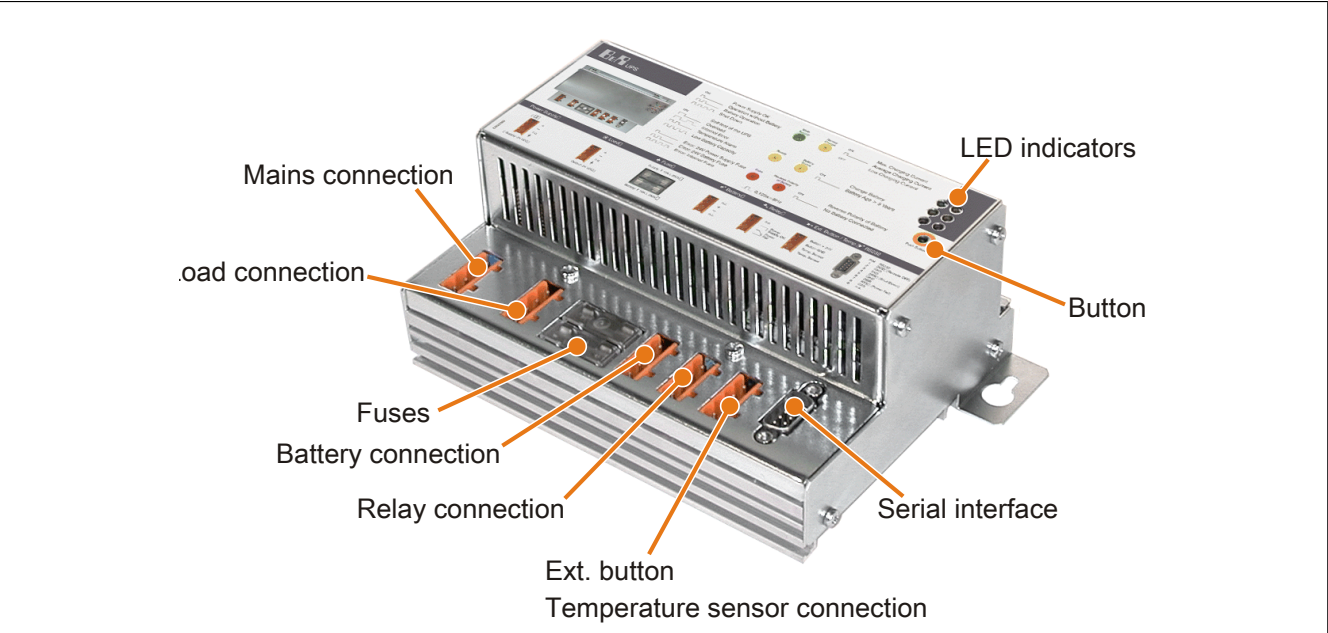
Figure 4: 9A0100.11 - Device interfaces

2.1.1.5.1 Mains connection

24 V mains supply connection. Regulated DC voltage, 24 VDC nominal voltage value, voltage range according to the set switching threshold[1] when 18 V: 20 to 30 VDC or when 21.5 V: 23.5 to 30 VDC:

Power mains connection		
Pin	**Assignment**	
+	Input VDC+	
-	Input VDC-	
N.C.	Not connected	
⏚	Ground connection	

Table 7: Power mains connection

Correct pinout is 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.

---

[1] Can be set using B&R UPS configuration software or HyperTerminal (18 or 21.5 VDC).

2.1.1.5.2 Load connection

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

Load connection		
Pin	**Assignment**	
+	Output VDC+	
-	Output VDC-	
N.C.	Not connected	
⏚	Ground connection	

Table 8: Load connection

Correct pinout is 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 [2] 18 V: 20 to 30 VDC, 21.5 V: 23.5 to 30 VDC; maximum output current: 8 A

For battery operation:

Rated voltage value 24 VDC, voltage range 21 to 26.8 VDC (+40 °C) or 28.2 VDC (0 °C); maximum output current: 8 A

2.1.1.5.3 Fuses

The two replaceable fuses on the front side of the device protect the power mains input and the battery connection from overcurrent, 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 fuse 5*20 mm 10 A (slow blow) / 250 V

Fuses		
Mains	10 A / 250 V	Mains
Battery	10 A / 250 V	
		Battery
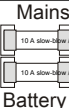
Table 9: Fuses

2.1.1.5.4 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	
+	Battery + Pin	
-	Battery - Pin	
N.C.	Not connected	

Table 10: Battery connection

Correct pinout is also indicated on the UPS.

Warning!

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

---

[2] Can be set using B&R UPS configuration software or HyperTerminal (18 or 21.5 VDC).

2.1.1.5.5 Relay output

A power failure is also signaled immediately by the UPS by setting a relay output. An external electrical circuit can be switched (closed or open) using the relay output.
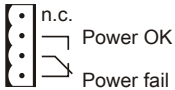
Relay output		
Pin	**Assignment**	
N.C.	Not connected	n.c.
Power OK	Relay output	Power OK
Power fail		Power fail

Table 11: Relay output

Relay output contact data "Relay output" on page 94.

2.1.1.5.6 External 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.
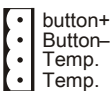
External button, temperature sensor connection		
Pin	**Assignment**	
Button +	Positive edge input	button+
Button -	Negative edge input	Button–
Temp.	Temperature sensor	Temp.
Temp.	Temperature sensor	Temp.

Table 12: External button, temperature sensor connection

2.1.1.5.7 RS232 interface

The UPS communicates with the load system (e.g. B&R industrial PC) via the serial interface.
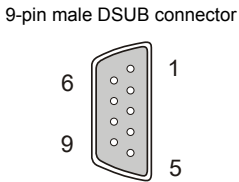
RS232 interface		
	RS232	
Type	RS232	
UART	16550-compatible, 16-byte FIFO	
Transfer rate	Max. 115 kbit/s	
Bus length	Max. 15 m	9-pin male DSUB connector
Pin	**Assignment**	
1	DCD	
2	RxD	
3	TxD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	N.C.	

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 from B&R under the model number 9A0017.01 (length = 0.6m) and 9A0017.02 (length = 1.8m).

The cable can also be made by the user. A self-made cable can have a maximum length of 15 meters. The pins must be connected as follows:
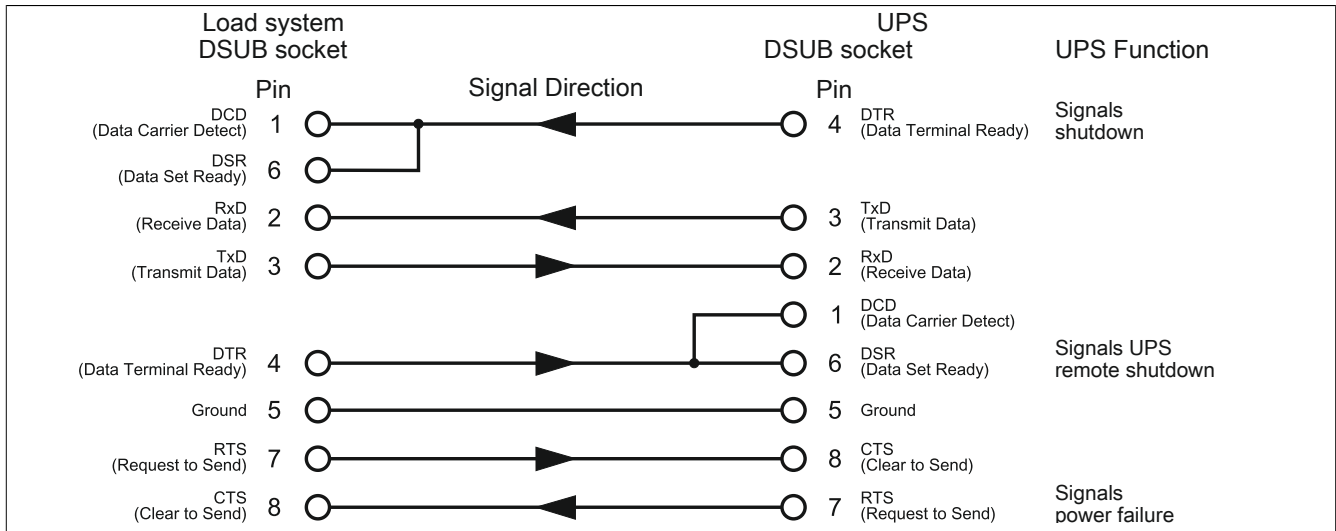
Figure 5: Pinout - RS232 cable

2.1.1.5.8 Button

For possible uses of the user button, "button, ext. button (digital input) and DIB (digital input button)" on page 89.

2.1.1.5.9 LED status indicators

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 rechargeable battery via the user button ("Setting the maximum charging current" on page 96). Each LED can display several different types of information based on flashing sequence:
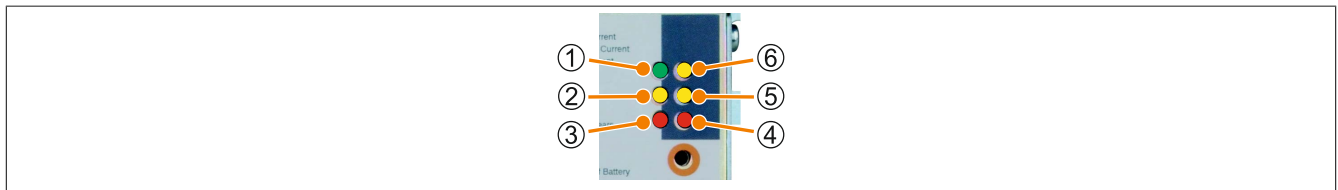
Figure 6: LED status indicators

Function	Color	LED Number	Flashing sequences / Interval:
Operation	Green	1	Mains operation OK / Mains operation without battery supply / Battery operation / Shutdown
Status	Yellow	2	UPS self-test / Overload / Internal error / Temperature alarm / Battery level too low
Fuses[1]	Red	3	Error: 24 V-fuse mains or supply voltage < 20 V or 23.5 V (depending on the switching threshold 18 or 21.5V) / Error: 24 V-fuse battery / Error: Internal fuse
Battery re-verse polarity	Red	4	Battery reverse polarity / No battery connected

Table 14: LED Status - Flashing Sequences and their Meaning
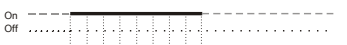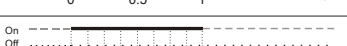
Function	Color	LED Number	Flashing sequences / Interval: ⊓⌐ 0.125 s = 8 Hz	
Battery status	Yellow	5		Change battery (battery defective or failed level check) Battery age exceeded (dependent on battery type) or battery level low
Battery charging	Yellow	6		Max. charging current = max. charging current Med. charging current = 30 - 60 % of max. charging current Low charging current = 0 - 30% of max. charging 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).

2.2 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.

2.2.1 9A0100.12

2.2.1.1 General information

- Maintenance-free lead acid battery
- 2 Panasonic 12 V 7.2 Ah rechargeable batteries connected in series
- Rated voltage: 24 V
- Capacity: 7.2 Ah

2.2.1.2 Order data

Model number	Short description	Figure
	Battery units	
9A0100.12	UPS battery unit type A, 24 V, 7 Ah, incl. battery cage	
	Optional accessories	
	Replacement batteries	
9A0100.13	UPS batteries type A (replacement part), 2x 12 V, 7 Ah, for battery unit 9A0100.12	

Table 15: 9A0100.12 - Order data

2.2.1.3 Technical data

Product ID	9A0100.12		
Revision	**00**	**F0**	**G0**
General information			
Battery			
Type	Panasonic 12V 7.2 Ah; two rechargeable batteries connected in series		
Service life	Up to 10 years [1]		
Design	Maintenance-free lead acid battery		
Temperature sensor	NTC resistance		
Maintenance interval during storage	6 month interval between charges		
Certification			
CE	Yes		
cULus	Yes		
GOST-R	Yes		
Electrical characteristics			
Nominal voltage	24 V		
Capacity	7.2 Ah		
Fuse	-		Yes
Battery charging data			
Charging current [2]	Typ. 2.88 A		
Environmental conditions			
Temperature			
Operation	0 to 40°C [3]		
Storage	-15 to 40°C		
Transport	-15 to 40°C		
Relative humidity			
Operation	25 to 85%, non-condensing		
Storage	25 to 85%, non-condensing		
Transport	25 to 85%, non-condensing		
Altitude			
Operation	Max. 3000 m		

Table 16: 9A0100.12, 9A0100.12, 9A0100.12 - Technical data

Product ID	9A0100.12		
Mechanical characteristics			
Dimensions			
Width	200 mm	202 mm	
Length	155 mm	155.5 mm	
Height	125 mm	120 mm	116 mm
Weight	Approx. 6100 g	Approx. 6350 g	

Table 16: 9A0100.12, 9A0100.12, 9A0100.12 - Technical data

1) Depends on the ambient temperature and charge/discharge cycles.
2) Maximum charging current.
3) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

2.2.1.4 Dimensions

Figure 7: 9A0100.12 ≥ Rev. G0 - Dimensions

Figure 8: 9A0100.12 ≥ Rev. E0 und ≤ Rev. F0 - Dimensions
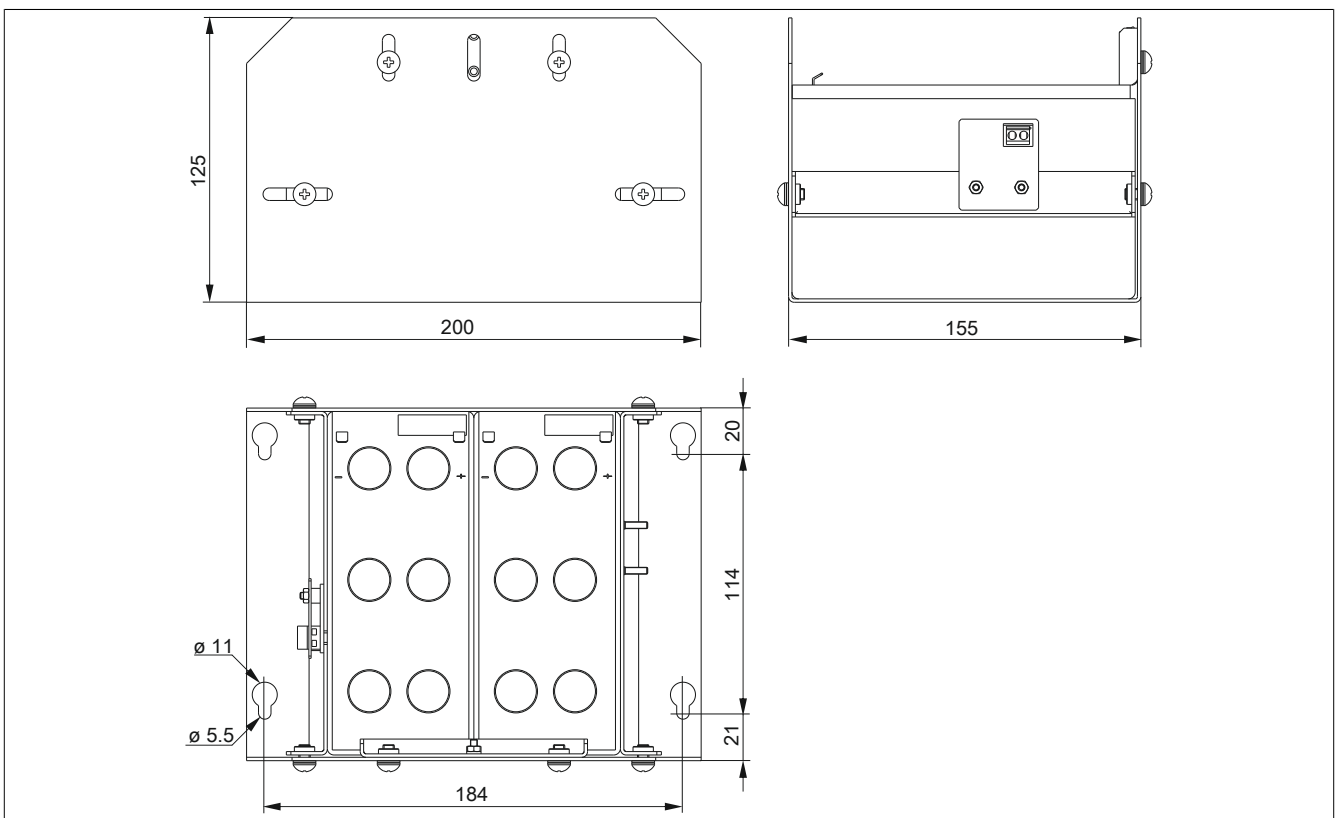
Figure 9: 9A0100.12 ≥ Rev. D0 - Dimensions

2.2.1.5 Drilling template
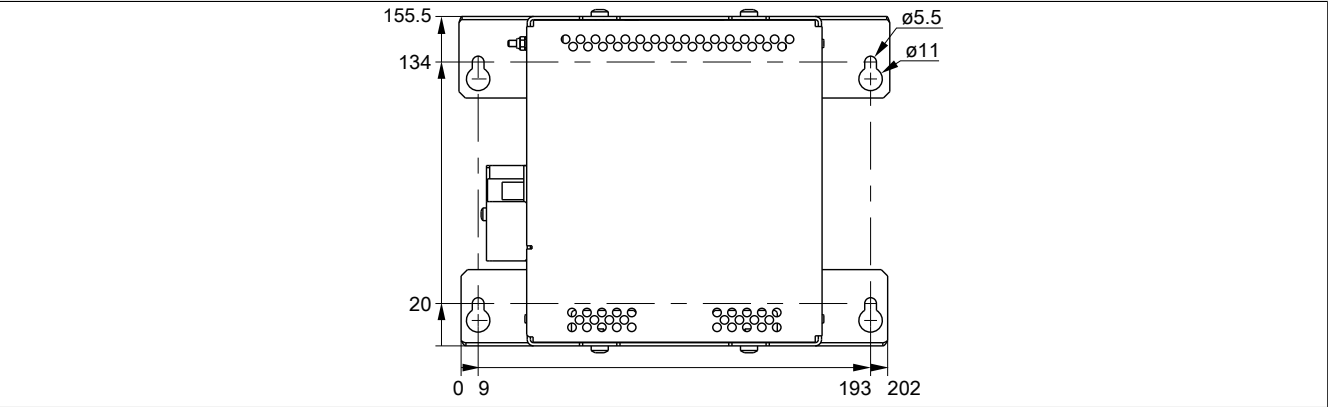
Figure 10: 9A0100.12 ≥ Rev. G0 - Drilling template

2.2.1.6 Contents of delivery

Quantity	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 17: 9A0100.12 - Contents of delivery

2.2.2 9A0100.14

2.2.2.1 General information

- Maintenance-free lead acid battery
- 2 Panasonic 12 V 2.2 Ah rechargeable batteries connected in series
- Rated voltage: 24 V
- Capacity: 2.2 Ah

2.2.2.2 Order data

Model number	Short description	Figure
	Battery units	
9A0100.14	UPS battery unit type B, 24 V, 2.2 Ah, incl. battery cage	
	Optional accessories	
	Replacement batteries	
9A0100.15	UPS batteries type B (replacement part), 2x 12 V, 2.2 Ah, for battery unit 9A0100.14	

Table 18: 9A0100.14 - Order data

2.2.2.3 Technical data

Product ID	9A0100.14		
Revision	**00**	**E0**	**F0**
General information			
Battery			
Type	Panasonic 12V 2.2 Ah; two rechargeable batteries connected in series		
Service life	Up to 5 years [1]		
Design	Maintenance-free lead acid battery		
Temperature sensor	NTC resistance		
Maintenance interval during storage	6 month interval between charges		
Certification			
CE	Yes		
cULus	Yes		
GOST-R	Yes		
Electrical characteristics			
Nominal voltage	24 V		
Capacity	2.2 Ah		
Fuse	-		Yes
Battery charging data			
Charging current [2]	Typ. 0.88 A		
Environmental conditions			
Temperature			
Operation	0 to 40°C [3]		
Storage	-15 to 40°C		
Transport	-15 to 40°C		
Relative humidity			
Operation	25 to 85%, non-condensing		
Storage	25 to 85%, non-condensing		
Transport	25 to 85%, non-condensing		
Altitude			
Operation	Max. 3000 m		
Mechanical characteristics			
Dimensions			
Width	120 mm		115 mm
Length	180 mm	181.5 mm	
Height	80 mm	71.5 mm	78 mm
Weight	Approx. 2300 g	Approx. 2500 g	Approx. 2550 g

Table 19: 9A0100.14, 9A0100.14, 9A0100.14 - Technical data

1) Depends on the ambient temperature and charge/discharge cycles.
2) Maximum charging current.
3) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.
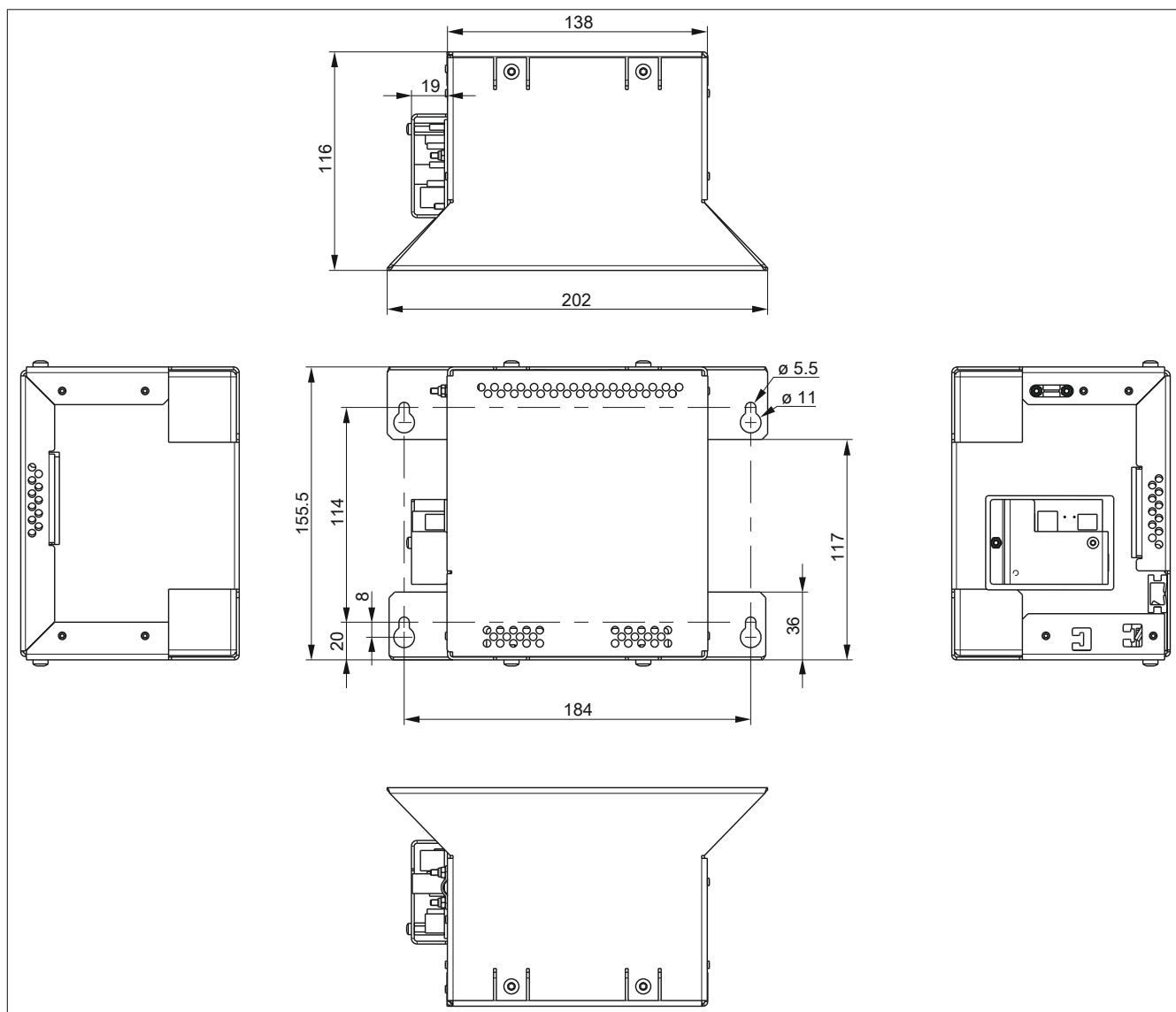
2.2.2.4 Dimensions
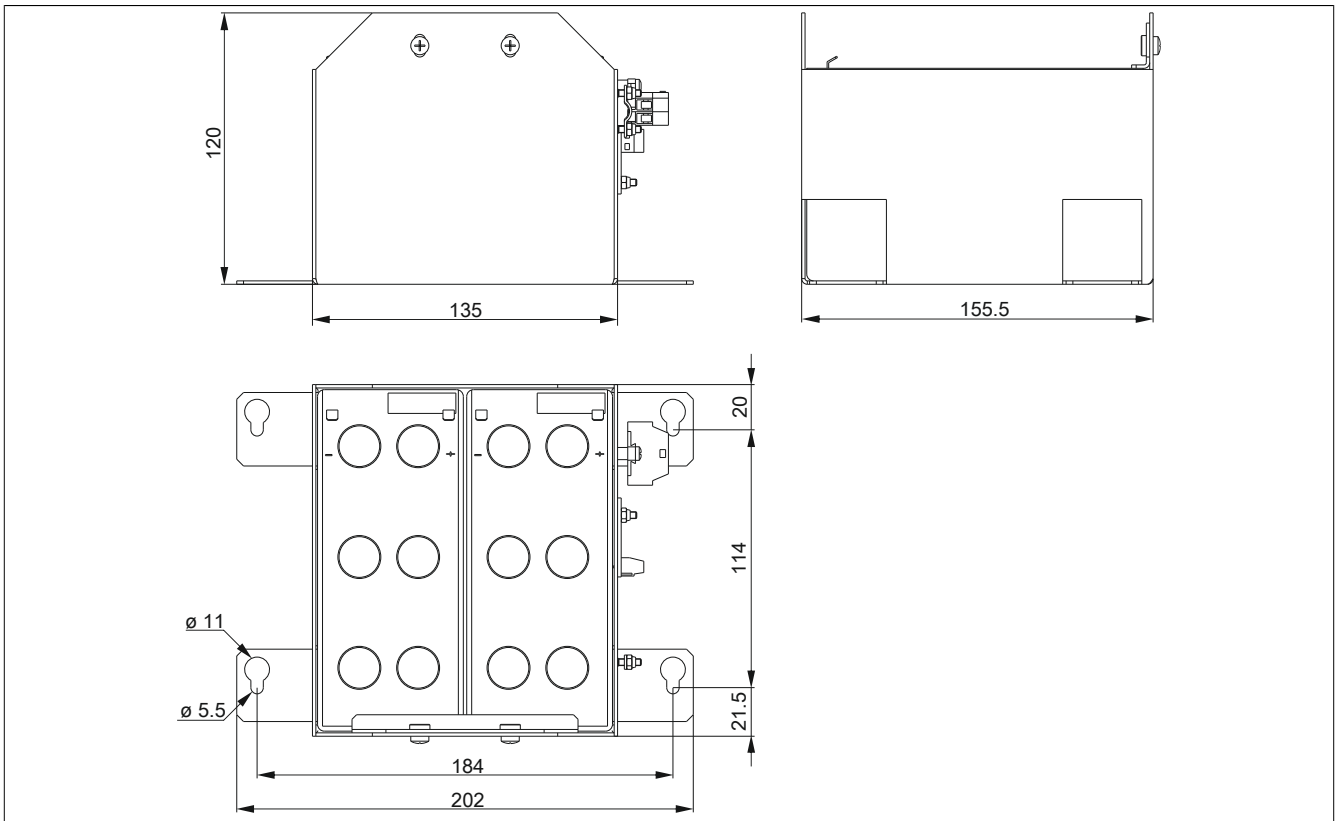

Figure 11: 9A0100.14 ≥ Rev. F0 - Dimensions

Figure 12: 9A0100.14 ≥ Rev. D0 und ≤ Rev. E0 - Dimensions

Figure 13: 9A0100.14 ≥ Rev. C0 - Dimensions

Chapter 2
Technical data
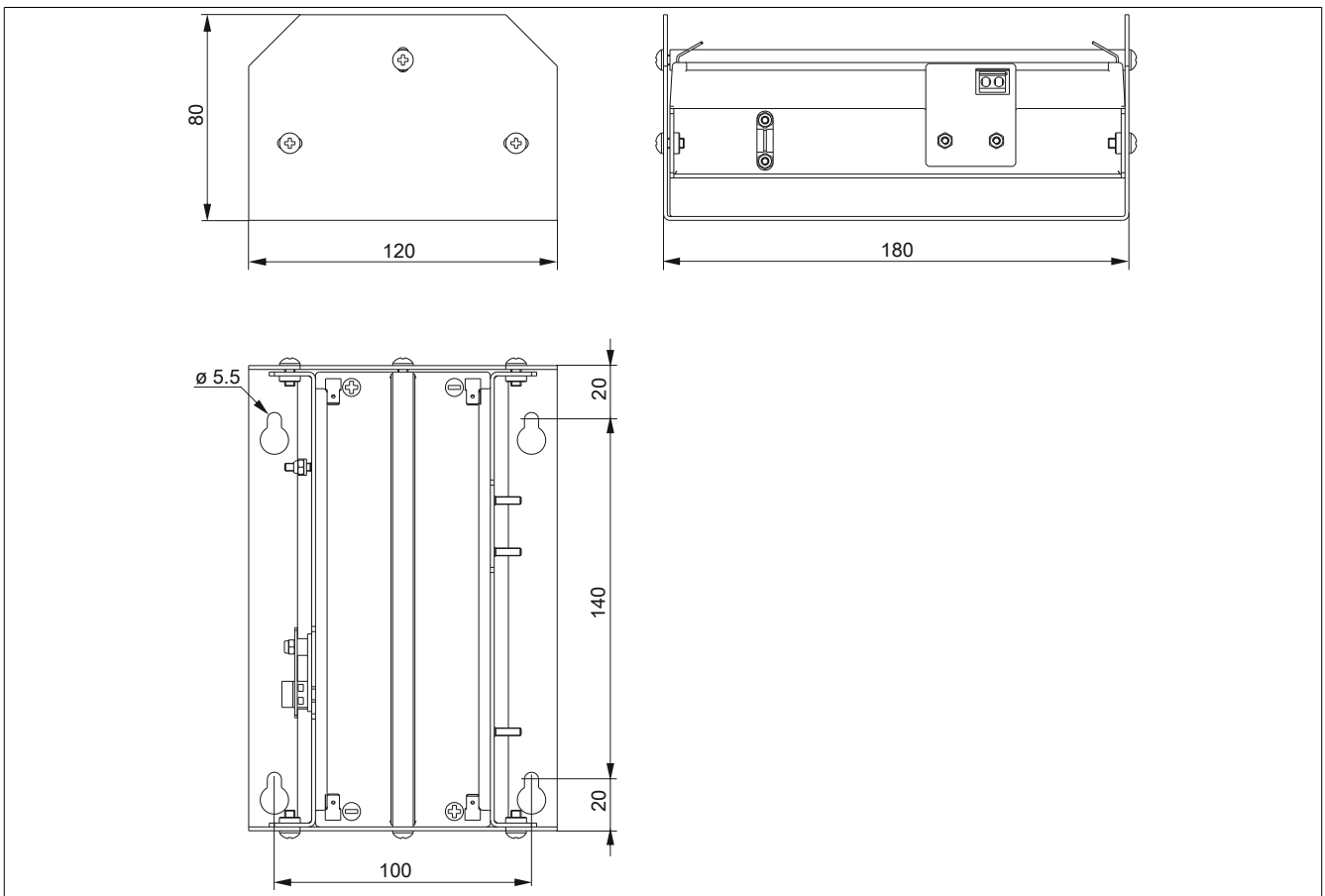
2.2.2.5 Drilling template
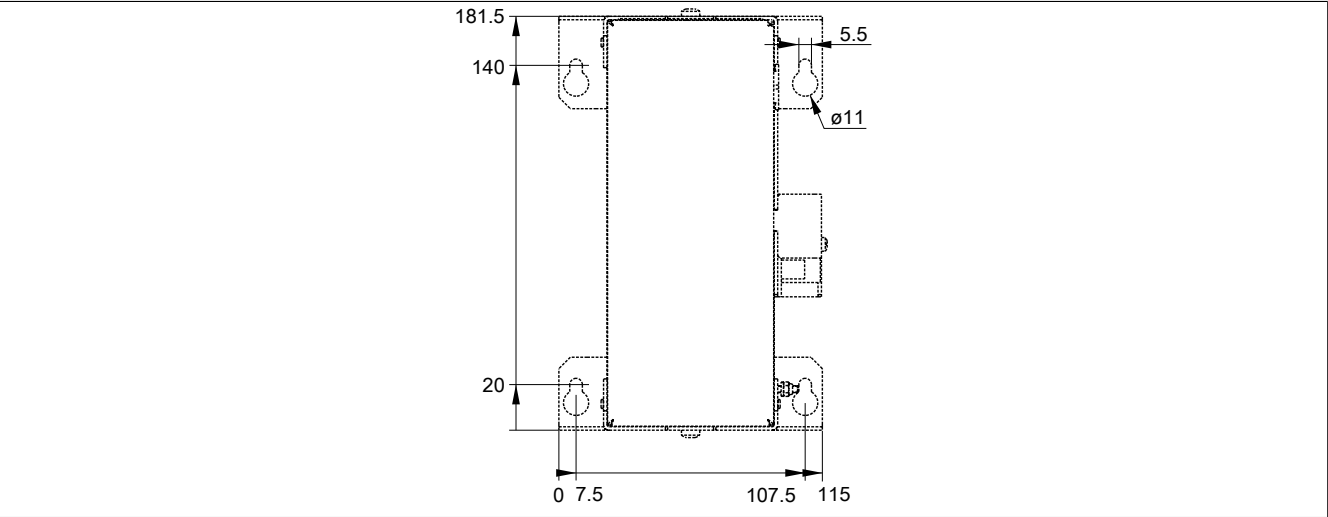
Figure 14: 9A0100.14 ≥ Rev. F0 - Drilling template

2.2.2.6 Contents of delivery

Quantity	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 20: 9A0100.14 - Contents of delivery

2.2.3 9A0100.16

2.2.3.1 General information

- Single cell rechargeable battery
- 2 Hawker Cyclon 12 V 4.5 Ah rechargeable batteries connected in series
- Rated voltage: 24 V
- Capacity: 4.5 Ah

2.2.3.2 Order data

Model number	Short description	Figure
	Battery units	
9A0100.16	UPS battery unit type C, 24 V, 4.5 Ah, incl. battery cage	
	Optional accessories	
	Replacement batteries	
9A0100.17	UPS batteries type C (replacement part), 2x 12 V, 4.5 Ah, for battery unit 9A0100.16	

Table 21: 9A0100.16 - Order data

2.2.3.3 Technical data

Product ID	9A0100.16	
Revision	**00**	**D0**
General information		
Battery		
Type	Hawker Cyclon 12V 4.5 Ah; two rechargeable batteries connected in series	
Service life	Up to 15 years [1]	
Design	Single cell	
Temperature sensor	NTC resistance	
Maintenance interval during storage	6 month interval between charges	
Certification		
CE	Yes	
cULus	Yes	
GOST-R	Yes	
Electrical characteristics		
Nominal voltage	24 V	
Capacity	4.5 Ah	
Fuse	-	Yes
Battery charging data		
Charging current [2]	2.88 A	
Environmental conditions		
Temperature		
Operation	-40 to 80°C [3]	
Storage	-65 to 80°C	
Transport	-65 to 80°C	
Relative humidity		
Operation	5 to 95%, non-condensing	
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	
Altitude		
Operation	Max. 3000 m	
Mechanical characteristics		
Dimensions		
Width	145 mm	
Length	223.2 mm	
Height	78.2 mm	
Weight	Approx. 5000 g	

Table 22: 9A0100.16, 9A0100.16 - Technical data

1) Depends on the ambient temperature and the charge/discharge cycles at 20 °C (up to 80% battery capacity).
2) Maximum charging current.
3) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.
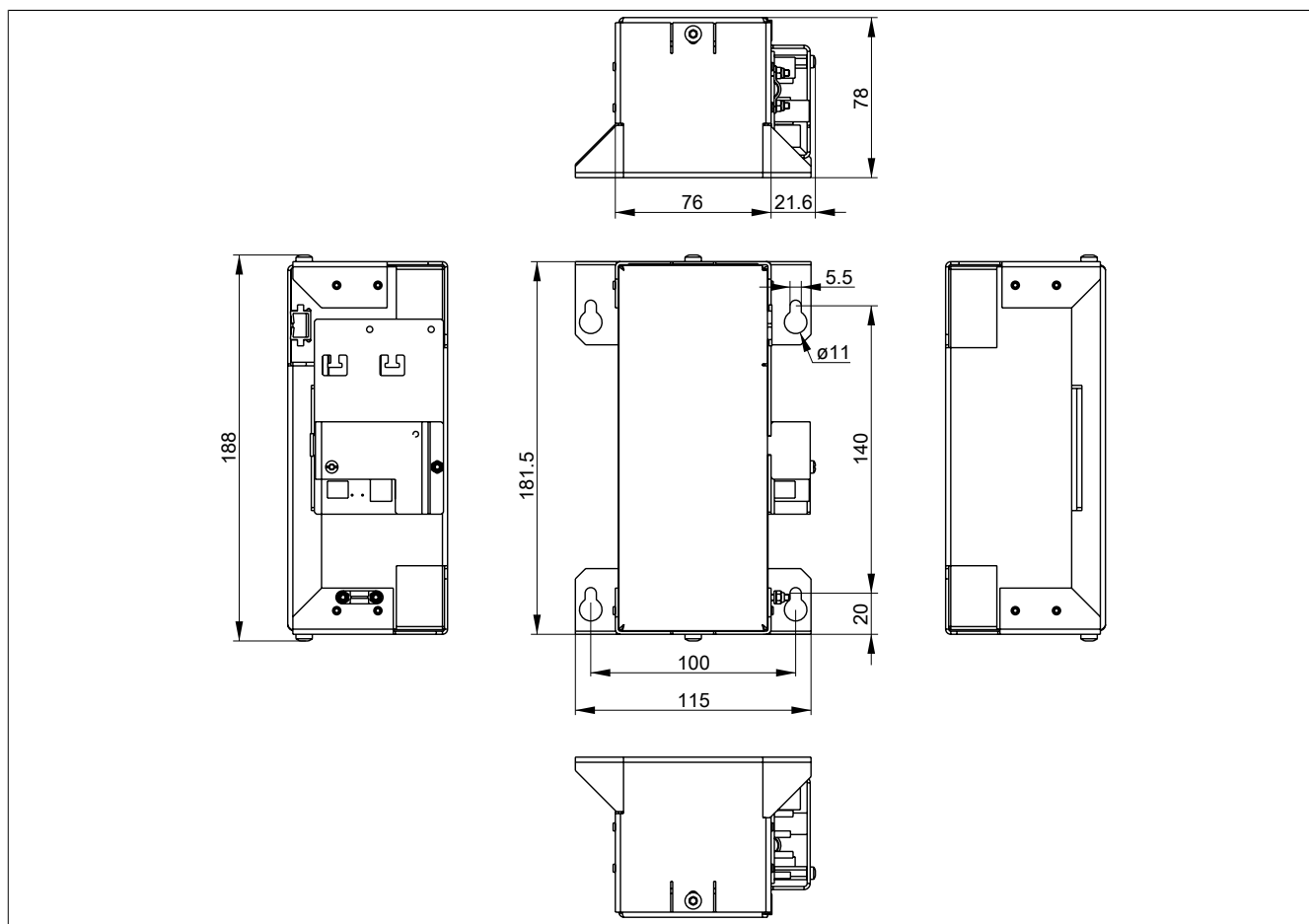
2.2.3.4 Dimensions
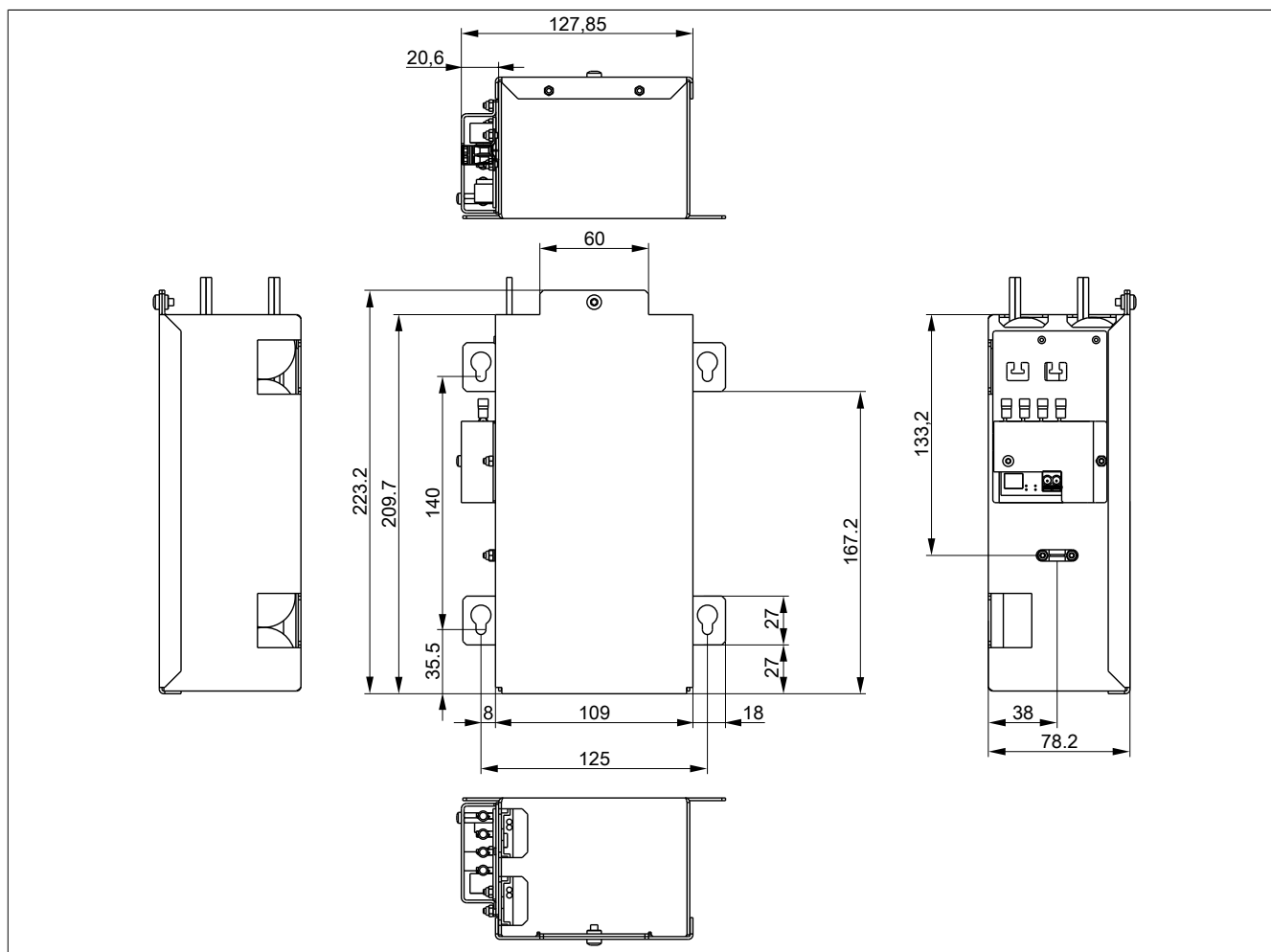
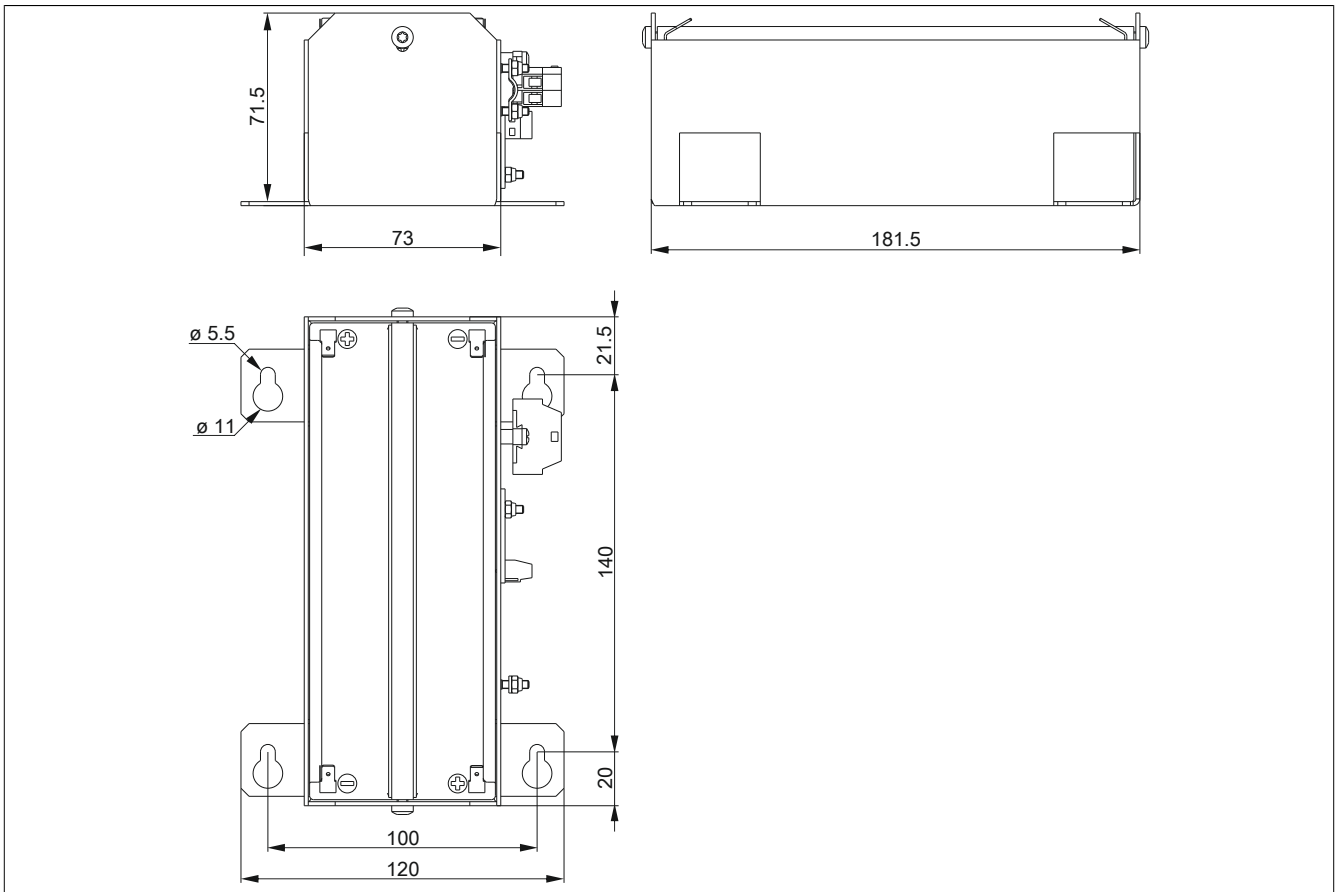
Figure 15: 9A0100.16 ≥ Rev. D0 - Dimensions
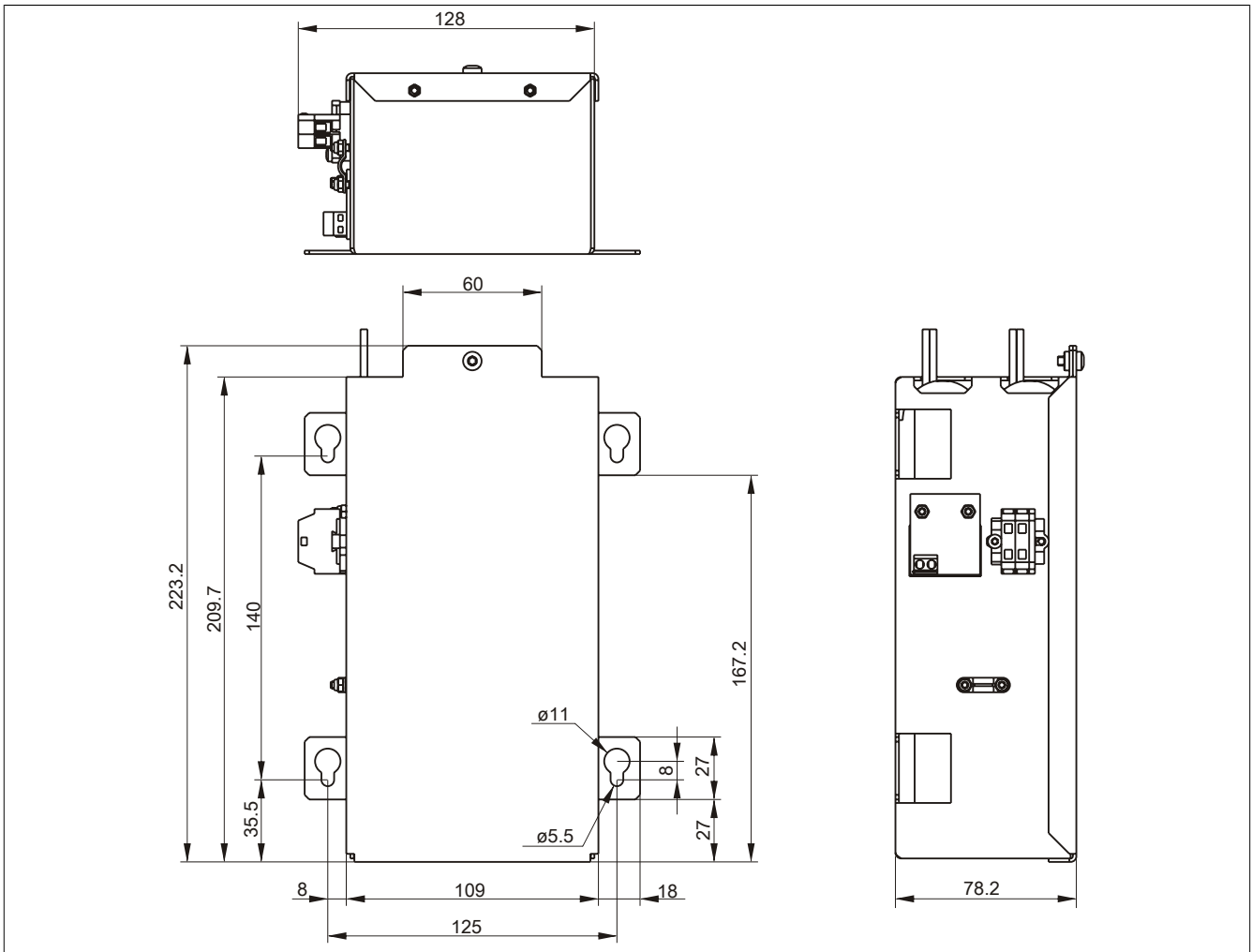
Figure 16: 9A0100.16 ≥ Rev. C0 - Dimensions

2.2.3.5 Drilling template
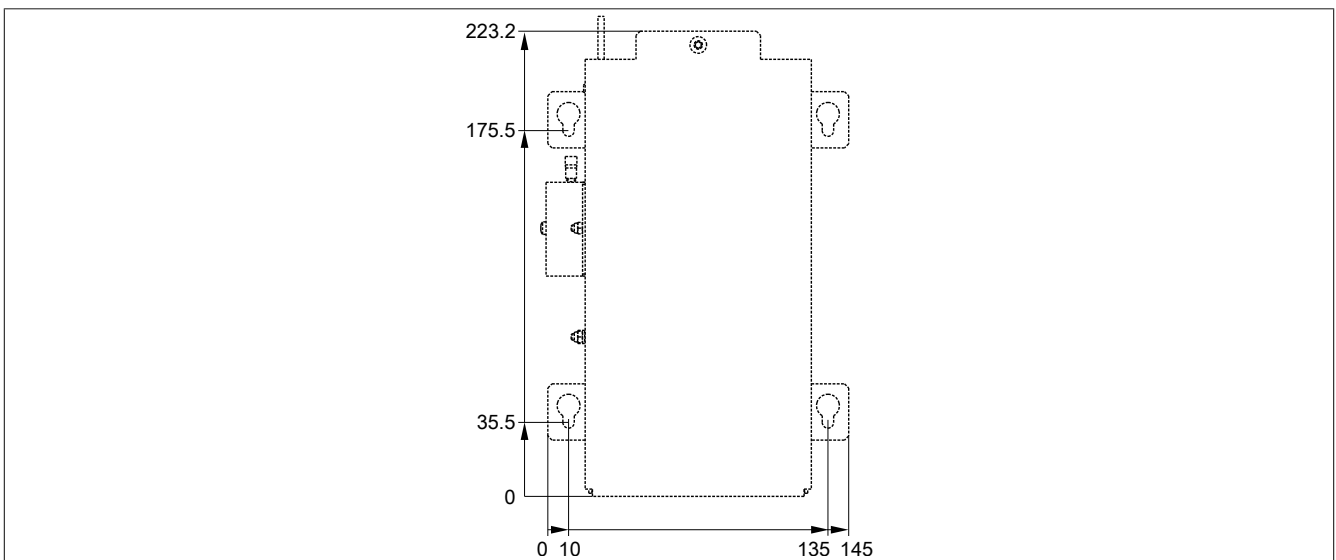
Figure 17: 9A0100.16 ≥ Rev. D0 - Drilling template

2.2.3.6 Contents of delivery

Quantity	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 23: 9A0100.16 - Contents of delivery

2.3 Replacement Batteries

2.3.1 9A0100.13

2.3.1.1 General information

- Replacement battery for 9A0100.12 battery unit
- Maintenance-free lead acid battery
- 2 Panasonic 12 V 7.2 Ah rechargeable batteries
- Rated voltage: 24 V
- Capacity: 7.2 Ah

2.3.1.2 Order data

Model number	Short description	Figure
	Replacement batteries	
9A0100.13	UPS batteries type A (replacement part), 2x 12 V, 7 Ah, for battery unit 9A0100.12	

Table 24: 9A0100.13 - Order data

2.3.1.3 Technical data

Product ID	9A0100.13
General information	
Battery	
Type	Panasonic 12 V 7.2 Ah
Service life	Up to 10 years [1]
Design	Maintenance-free lead acid battery
Maintenance interval during storage	6 month interval between charges
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Electrical characteristics	
Nominal voltage	12 V
Capacity	7.2 Ah
Battery charging data	
Charging current [2]	Typ. 2.88 A
Environmental conditions	
Temperature	
Operation	0 to 40°C [3]
Storage	-15 to 40°C
Transport	-15 to 40°C
Relative humidity	
Operation	25 to 85%, non-condensing
Storage	25 to 85%, non-condensing
Transport	25 to 85%, non-condensing
Mechanical characteristics	
Dimensions	
Width	64.5 mm
Length	151 mm
Height	100 mm
Weight	Approx. 5200 g

Table 25: 9A0100.13 - Technical data

1)   Depends on the ambient temperature and charge/discharge cycles.
2)   Maximum charging current.
3)   Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

2.3.2 9A0100.15

2.3.2.1 General information

- Replacement battery for 9A0100.14 battery unit
- Maintenance-free lead acid battery
- 2 Panasonic 12 V 2.2 Ah rechargeable batteries
- Rated voltage: 24 V
- Capacity: 2.2 Ah

2.3.2.2 Order data

Model number	Short description	Figure
	Replacement batteries	
9A0100.15	UPS batteries type B (replacement part), 2x 12 V, 2.2 Ah, for battery unit 9A0100.14	

Table 26: 9A0100.15 - Order data

2.3.2.3 Technical data

Product ID	9A0100.15
General information	
Battery	
Type	Panasonic 12 V 2.2 Ah
Service life	Up to 5 years [1]
Design	Maintenance-free lead acid battery
Maintenance interval during storage	6 month interval between charges
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Electrical characteristics	
Nominal voltage	12 V
Capacity	2.2 Ah
Battery charging data	
Charging current [2]	Typ. 0.88 A
Environmental conditions	
Temperature	
Operation	0 to 40°C [3]
Storage	-15 to 40°C
Transport	-15 to 40°C
Relative humidity	
Operation	25 to 85%, non-condensing
Storage	25 to 85%, non-condensing
Transport	25 to 85%, non-condensing
Mechanical characteristics	
Dimensions	
Width	34 mm
Length	117 mm
Height	66 mm
Weight	Approx. 1900 g

Table 27: 9A0100.15 - Technical data

1) Depends on the ambient temperature and charge/discharge cycles.
2) Maximum charging current.
3) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

2.3.3 9A0100.17

2.3.3.1 General information

- Replacement battery for 9A0100.16 battery unit
- Single cell rechargeable battery
- 2 Hawker Cyclon 12 V 4.5 Ah rechargeable batteries
- Rated voltage: 24 V
- Capacity: 4.5 Ah

2.3.3.2 Order data

Model number	Short description	Figure
	Replacement batteries	
9A0100.17	UPS batteries type C (replacement part), 2x 12 V, 4.5 Ah, for battery unit 9A0100.16	

Table 28: 9A0100.17 - Order data

2.3.3.3 Technical data

Product ID	9A0100.17
General information	
Battery	
Type	Hawker Cyclon 12 V 4.5 Ah
Service life	Up to 15 years [1]
Design	Single cell
Maintenance interval during storage	6 month interval between charges
Certification	
CE	Yes
cULus	Yes
Electrical characteristics	
Nominal voltage	12 V
Capacity	4.5 Ah
Battery charging data	
Charging current [2]	Typ. 2.88 A
Environmental conditions	
Temperature	
Operation	-40 to 80°C [3]
Storage	-65 to 80°C
Transport	-65 to 80°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Dimensions	
Width	38 mm
Length	205 mm
Height	102 mm
Weight	Approx. 3600 g

Table 29: 9A0100.17 - Technical data

1) Depends on the ambient temperature and charge/discharge cycles.
2) Maximum charging current.
3) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

2.4 Null modem cable 9A0017.0x

2.4.1 General information

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.

2.4.2 Order data

Model number	Short description	Figure
	Cables	
9A0017.01	RS232 null modem cable, 0.6 m, for connecting UPS and IPC (9-pin female DSUB connector - 9-pin female DSUB connector)	
9A0017.02	RS232 null modem cable, 1.8 m, for connecting UPS and IPC (9-pin female DSUB connector - 9-pin female DSUB connector)	

Table 30: 9A0017.01, 9A0017.02 - Order data

2.4.3 Technical data

Product ID	9A0017.01	9A0017.02
General information		
Certification		
CE	Yes	
GOST-R	Yes	
Mechanical characteristics		
Dimensions		
Length	0.6 m	1.8 m

Table 31: 9A0017.01, 9A0017.02 - Technical data

Chapter 3 • Commissioning

1 Precautions for handling and use

Spills and leaks:

Any further spillage or leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is prohibited. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

Waste disposal:

Used batteries must be disposed of in an environmentally friendly recycling process.

Neutralized mud must be stored in closed containers and stored/disposed of in accordance with applicable regulations. After neutralization and testing, larger spills diluted with water must be disposed of in accordance with applicable regulations.

Handling and storage:

- Batteries must be kept in cool, dry and well ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Batteries must be protected from adverse weather conditions and separated from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Damage to containers where batteries are stored and transported must be prevented.
- Keep away from fire, sparks and excessive heat.

1.1 9A0100.12, 9A0100.13, 9A0100.14, 9A0100.15

Information:

Exact information about operation, storage and transport as well as other safety guidelines can be found in the latest edition of the Material Safety Data Sheet MSDS-LC 01/R2. This can be downloaded from the B&R website www.br-automation.com or the Panasonic website www.panasonic.com.

1.2 9A0100.16, 9A0100.17

Information:

Exact information about operation, storage and transport as well as other safety guidelines can be found in the latest edition of the Material Safety Data Sheet MSDS 853024. This can be downloaded from the B&R website www.br-automation.com or the Enersys website www.enersysreservepower.com.
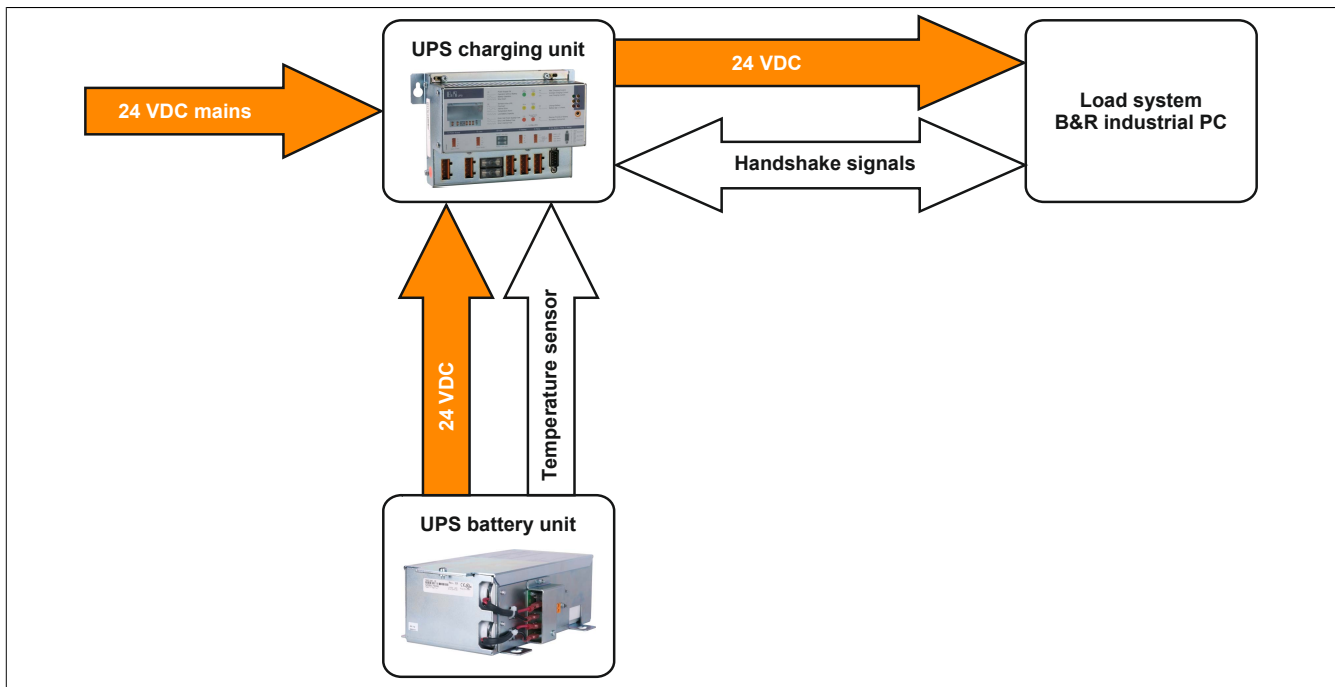
2 Getting started

Figure 18: Block diagram of the complete system

1. Unpack the UPS and the battery unit.

2. Set up and install the UPS charging unit (see "Mounting the UPS charging unit" on page 38). 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.

3. Set up and install the battery unit (see "Mounting Guidelines for Battery Units" on page 41).

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 "RS232 interface" on page 18) can be used.

5. Connect the UPS load connection to the load system that should be supplied. For the connection, use the 4 pin male connector included in the delivery and a user-provided cable with a cross section of 2x 2.5 mm². 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 "Cable connection" on page 41).

7. Attaching the battery unit connection cable (red and black leads) to the battery input of the UPS with the 4 pin male connector 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 male connector (external button / temperature sensor connection) included in delivery.

9. UPS connection to a 24 VDC power supply: The connection is made using the 4 pin male connector included with the delivery and a cable provided by the customer with a 2x 2.5 mm² 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).

11. Configure the UPS (see Chapter 4).

12. Enable monitoring (see Chapter 4).

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!

3 Mounting the UPS charging unit

> ## Information:
>
> **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.
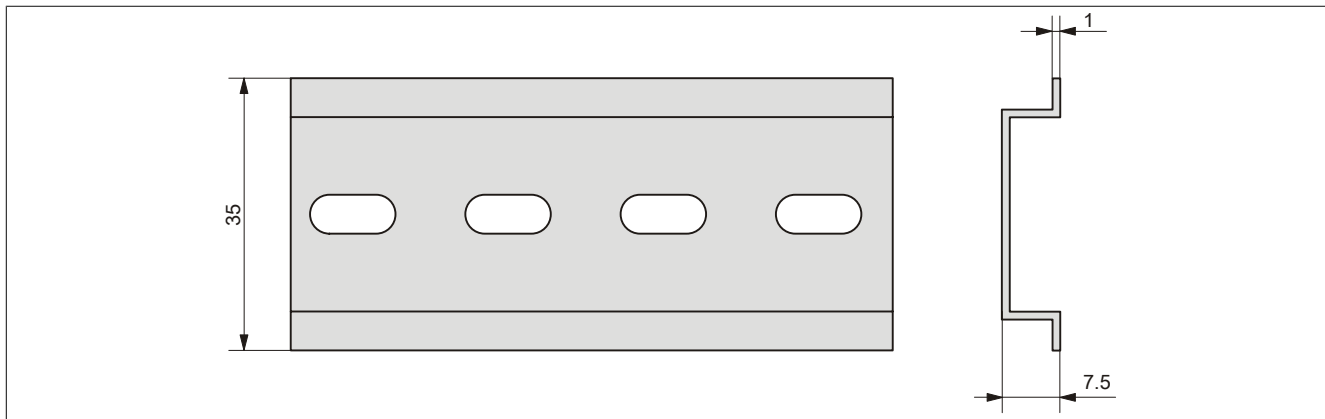

Figure 19: Mounting rail

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.

Figure 20: Mounting Plates UPS Charging Unit

The exact positioning of the mounting holes can be taken from the dimension diagram for the UPS device (see Figure 3 "9A0100.11 - Dimensions" on page 16).

3.1 Cable connection

The following image shows two examples of proper cable connections to the UPS.
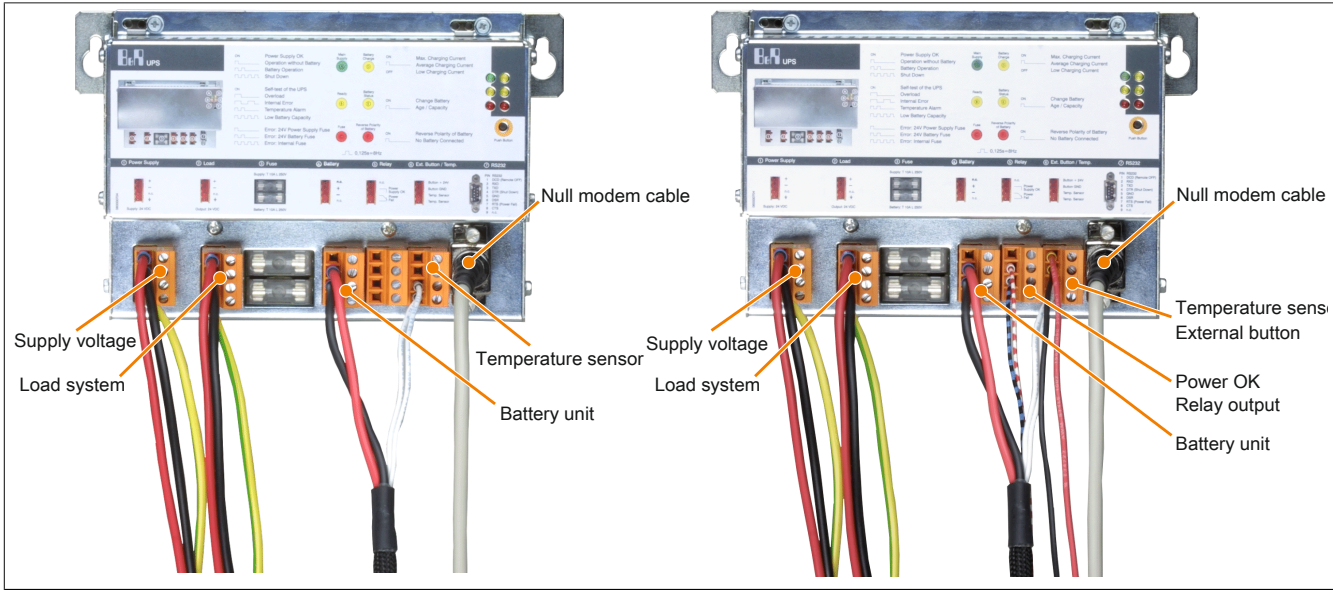
Figure 21: Cable Connection Examples

3.2 Mounting orientation

The UPS can only be installed horizontally, e.g., on mounting rail.
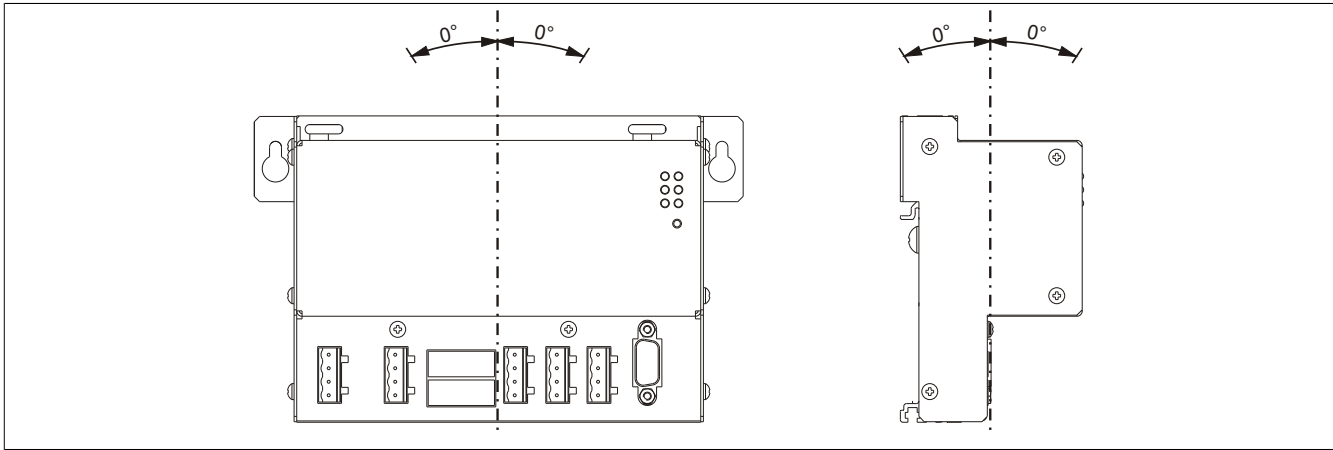
Figure 22: UPS Device Mounting Orientation 9A0100.11

3.3 Spacing for air circulation

In order to guarantee sufficient air circulation, the specified amount of space above, below, to the side and behind the charging unit must be provided. The minimum specified spacing is indicated in the following diagram.

Do not cover the cooling slots. Air must flow naturally between the bottom (connections) and the top (vents).

Figure 23: Mounting spacing

4 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.
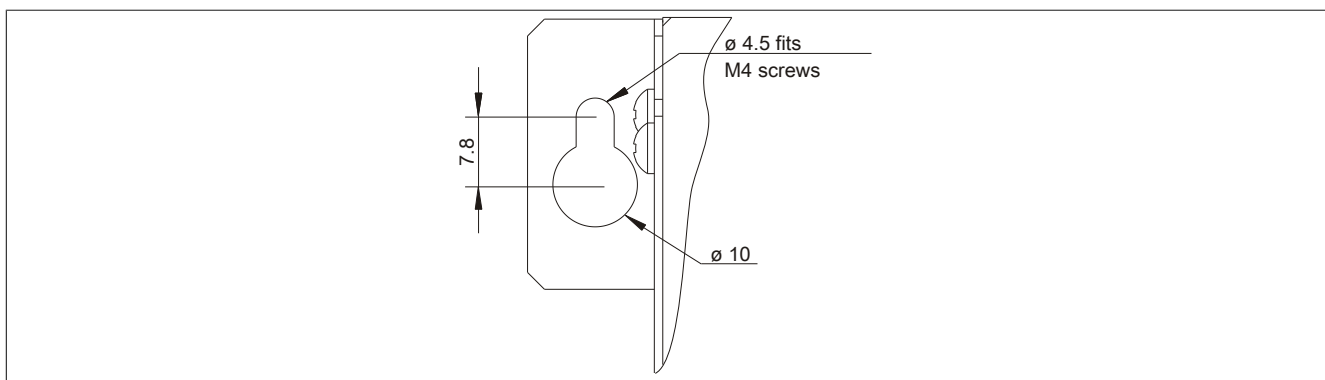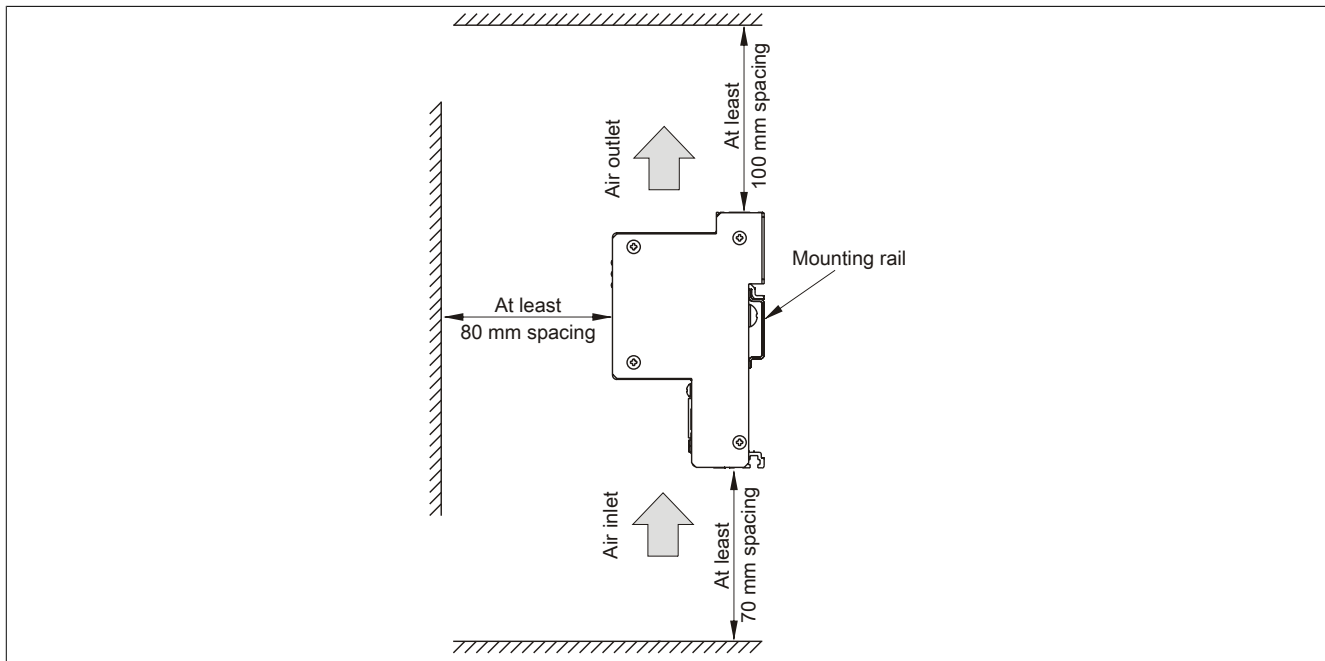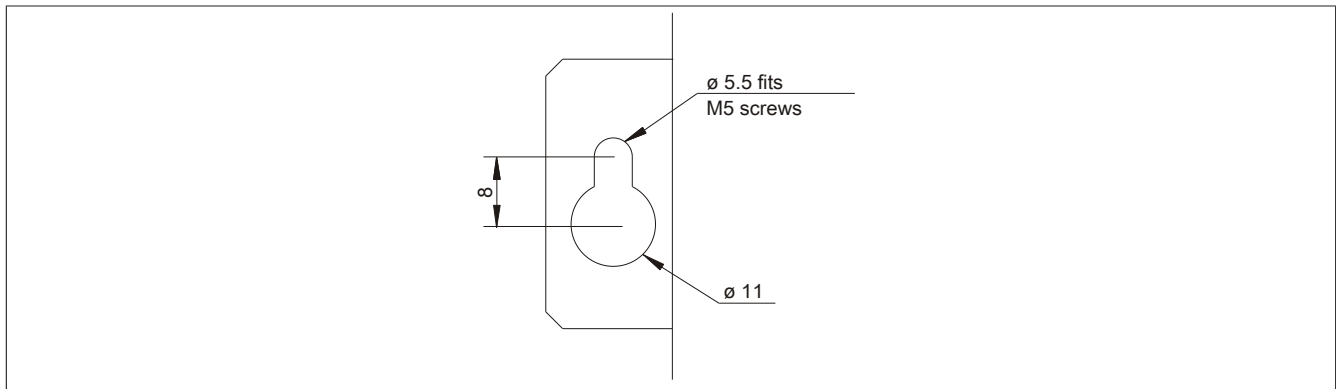

Figure 24: Mounting Plates UPS Charging Unit

4.1 Procedure

1. Disconnect the power supply to the UPS charging unit.

2. Install the battery unit. Information about the drilling template can be found in the drilling template diagram for the respective battery unit. Ensure that the distance between the battery unit and the UPS charging unit allows them to be connected with the UPS cable.
   Installation requires 4 M5 screws, 4 washers and 1 screw lock (min. torque 1.3 Nm; screw depth as per applicable DIN regulations and specific application). These are not included in delivery.

4.2 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.

4.2.1 Procedure for 9A0100.12 up to Rev. F0 / 9A0100.14 up to Rev. E0 / 9A0100.16 up to Rev. C0
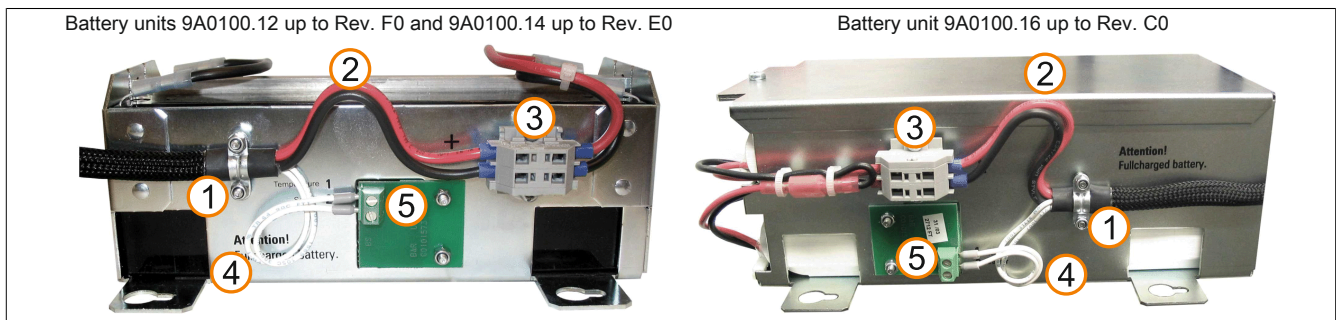
Figure 25: Cable Connection for Battery Units

1. Fasten the attachment cable to the clamps on the battery unit (the two self-locking nuts require a 5.5mm 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).

4.2.2 Procedure for 9A0100.12 Rev. G0 and up / 9A0100.14 Rev. F0 and up / 9A0100.16 Rev. D0 and up

1. Install the battery unit. The drilling templates can be found in section "Battery units" on page 21. Ensure that the distance between the battery unit and the UPS allows them to be connected with the UPS cable.
   Installation requires 4 M5 screws, 4 washers and 1 screw lock (min. torque 1.3 Nm; screw depth as per applicable DIN regulations and specific application). These are not included in delivery.

2. Connect the UPS cable to the battery unit. When doing so, make sure to connect the red and black wires to the power supply (orange screw clamp). Be sure to use the right connection terminals (red wire for +; black wire for -)!
   Connect the white and brown wires to the temperature sensor (green screw clamp terminal block) (white wire for 1; brown wire for 2).
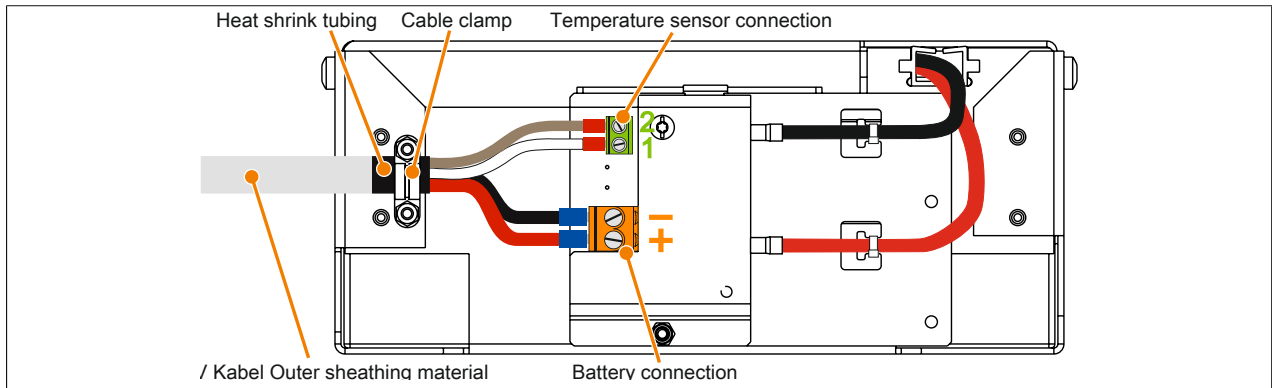
Figure 26: Connecting the UPS cable to the battery unit – 9A0100.12 Rev. G0 and up or 9A0100.14 Rev. F0 and up
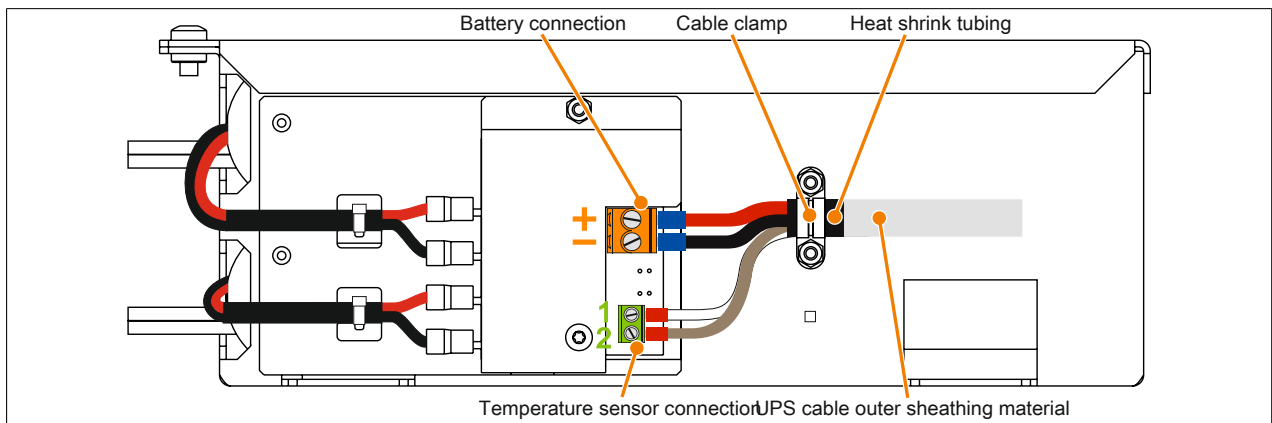
Figure 27: Connecting the UPS cable to the battery unit – 9A0100.16 Rev. D0 and up

3. Tighten the connected wires in the screw clamps with a screw driver (to a max. tightening torque of 0.4 Nm).

4. Fasten the UPS cable to the cable clamp. This is done by loosening the two nuts (M3) on the cable clamp and feeding the UPS cable through.

5. Fasten the UPS cable using the cable clamp. Tighten the previously removed nuts onto the cable clamp in alternating order (max. 0.35 Nm torque).

6. Connect the 4-pin screw clamp to the UPS charging unit and tighten the two screws with a screwdriver (max. torque 0.4 Nm).

4.3 Mounting orientation

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

4.3.1 9A0100.12, 9A0100.13, 9A0100.14, 9A0100.15

Information:

Exact information about operation, storage and transport as well as other safety guidelines can be found in the latest edition of the Material Safety Data Sheet MSDS-LC 01/R2. This can be downloaded from the B&R website www.br-automation.com or the Panasonic website www.panasonic.com.

4.3.1.1 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).
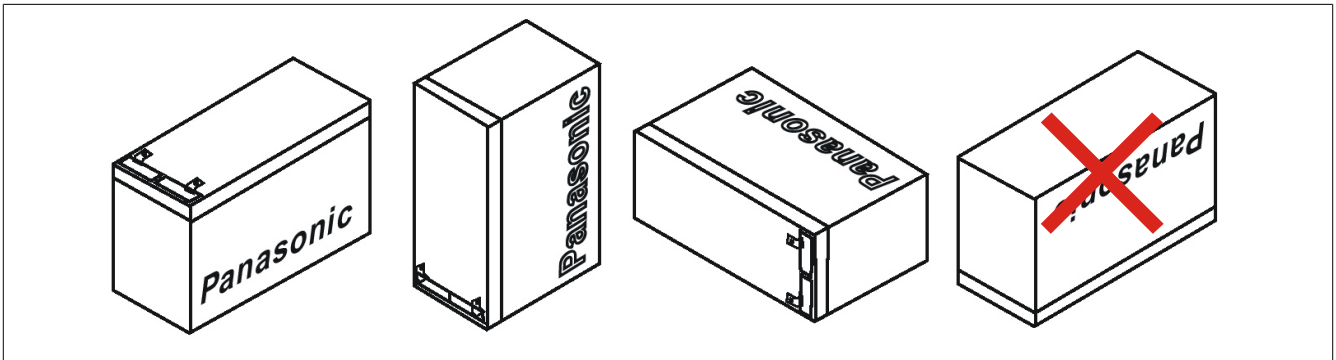
Figure 28: Mounting Methods for Lead-Acid Battery Units During Operation

4.3.1.2 Storage

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.
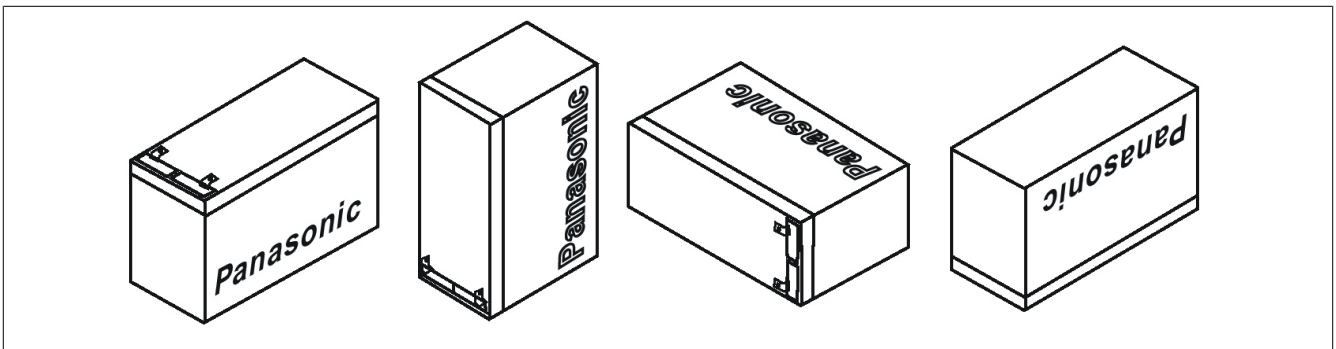
Figure 29: Mounting Methods for Lead-Acid Battery Units in Storage

4.3.2 9A0100.16, 9A0100.17

Information:

Exact information about operation, storage and transport as well as other safety guidelines can be found in the latest edition of the Material Safety Data Sheet MSDS 853024. This can be downloaded from the B&R website www.br-automation.com or the Enersys website www.enersysreservepower.com.

4.3.2.1 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 website www.br-automation.com.

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** and select **Programs**.
- Then select **B&R Automation** / **UPS** and click on the program **UPS Configuration**:
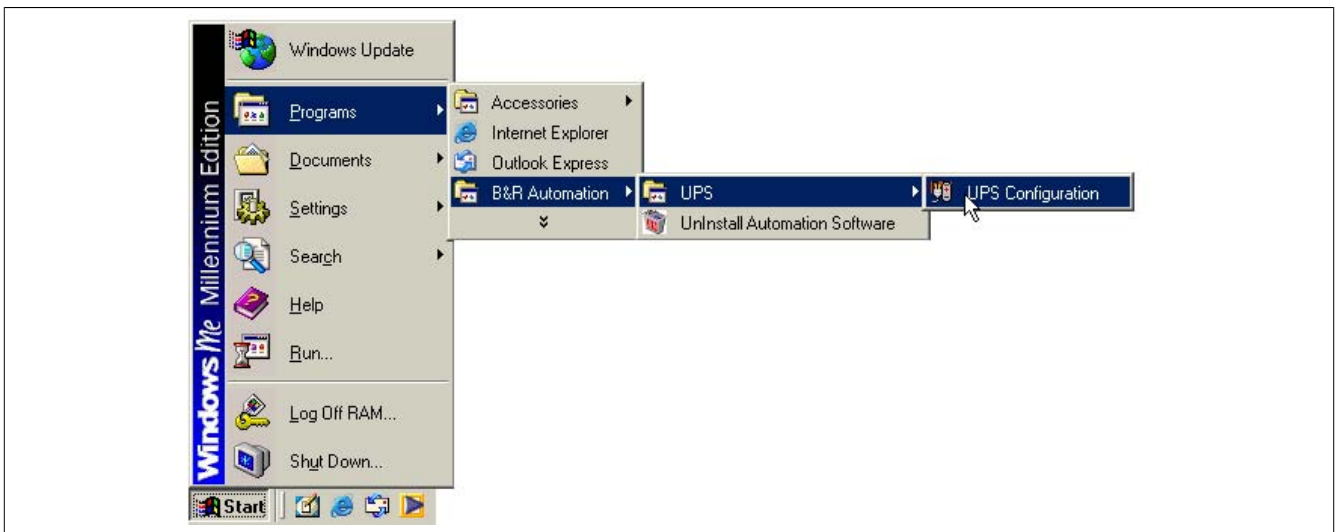
Figure 30: Start B&R UPS Configuration Software

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

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

Table 32: 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 31: Tray menu selection

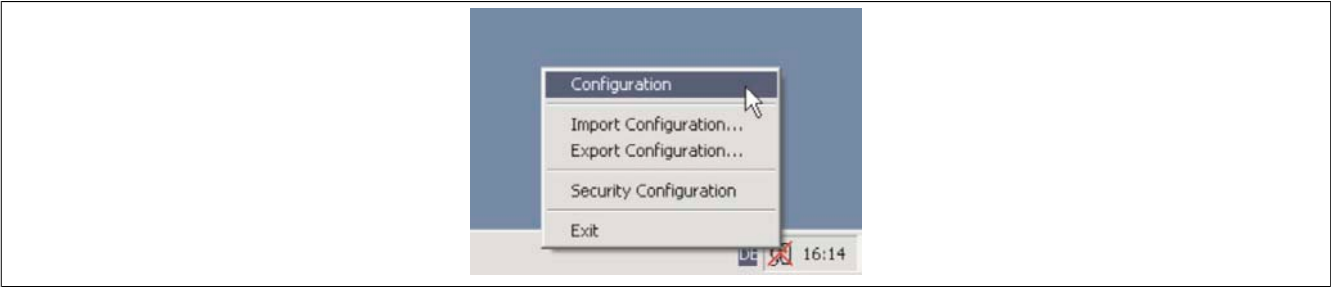| Selection	Function
Settings	This selection opens the configuration screen, where the UPS parameters can be read / edited and transferred to the UPS.
Import Configuration...	A previously saved configuration file (containing all UPS parameters) can be selected here. The parameters saved in this file 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 "Security configuration / Menu language" on page 55.
Exit	This exits the B&R UPS Configuration Software. Exiting the software ends monitoring as well.

Table 33: 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 Uninstalling

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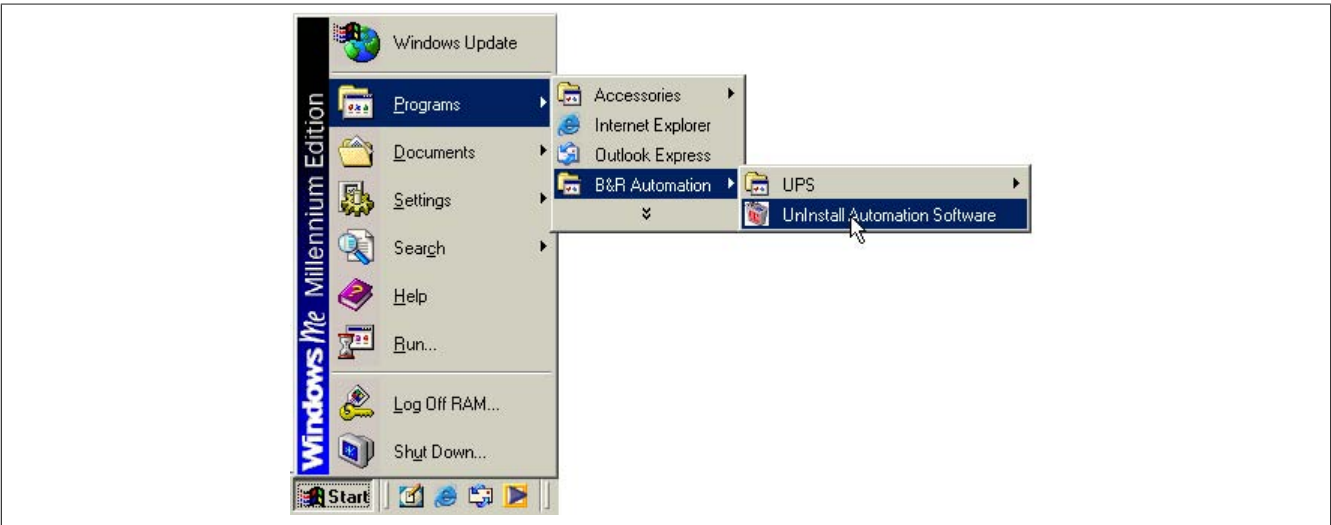

Figure 32: Uninstalling

Once the uninstall wizard has been started, all installed B&R software (e.g. B&R Automation StudioTM) is displayed: The programs to be removed can now be selected from the following dialog box. If the B&R UPS Configuration Software is the only program installed, then it is the only one which can be selected.
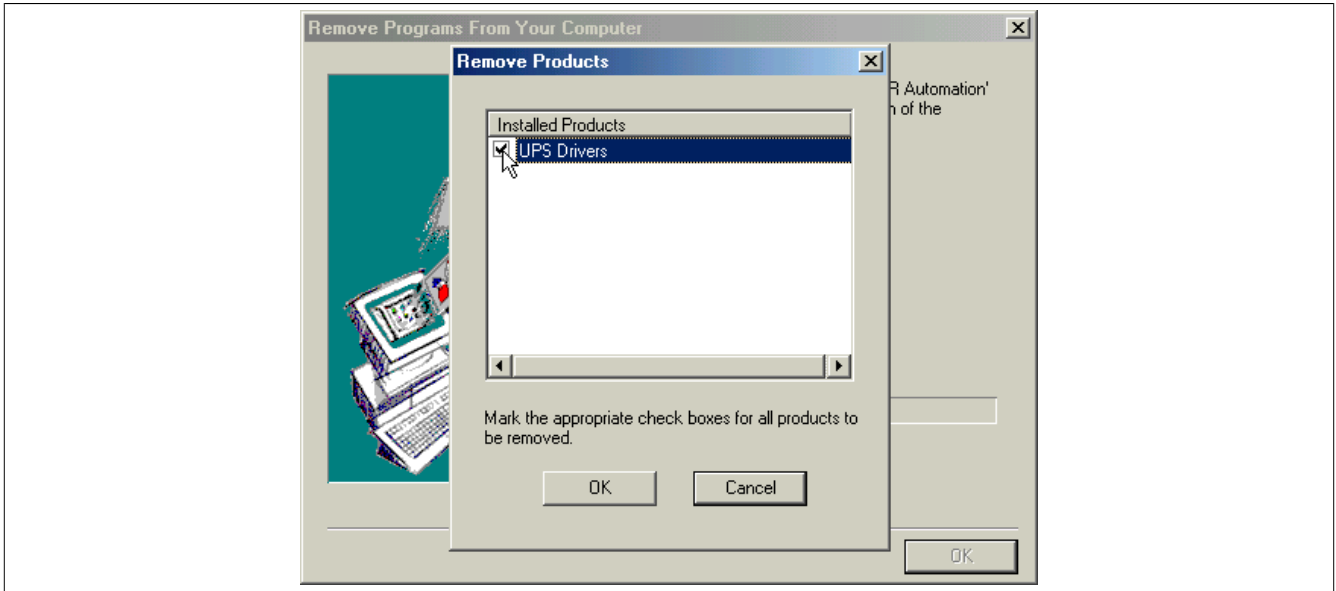
Figure 33: Uninstall wizard selection

The software is then removed by clicking "OK".

1.4 Layout

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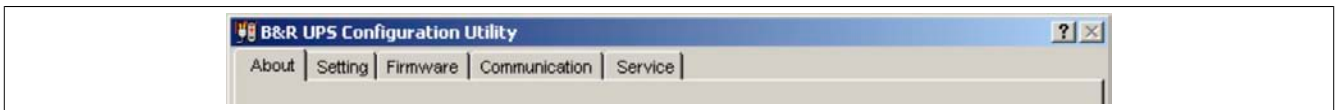

Figure 34: Overview of tabs

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:

Figure 35: Standard buttons

These buttons are explained here below:

Selection	Function
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 ≥ 2.10. This button only appears if the connected battery unit failed the measurement of charging current maintenance (more detailed information in Section "Measurement of charging current maintenance" on page 77). 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. ## Caution! **Pushing this button does not guarantee secure operation of the UPS. The battery unit could be defective.**
OK	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 34: Standard button functions

Chapter 4
Software

1.4.1 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.
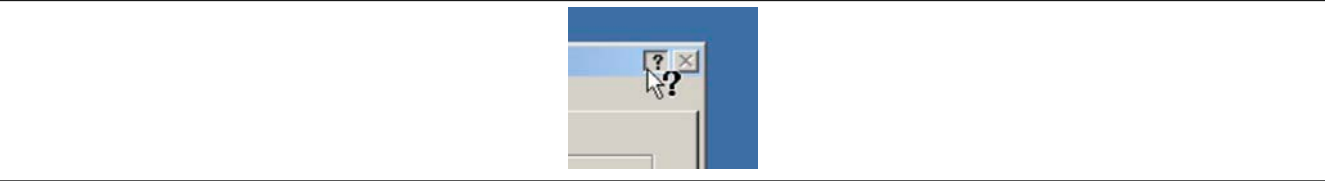
Figure 36: Tool Tip help

This is also used as a quick and easy way to display the value ranges for time settings. See figure Figure 37 "Tool Tips example" on page 48.
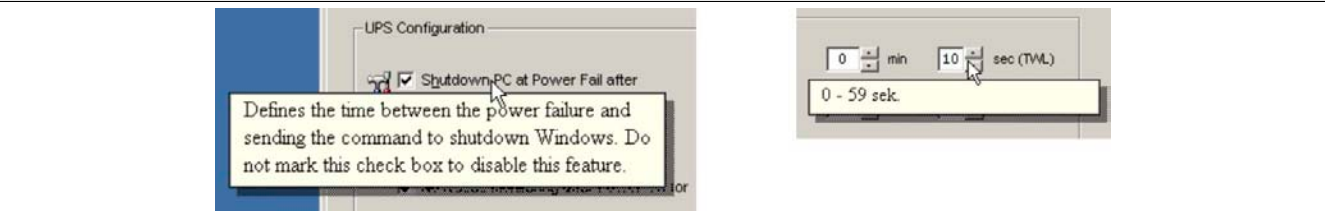
Figure 37: Tool Tips example

1.5 Tab Descriptions

1.5.1 "About" Tab

This page displays the software version and copyright information.
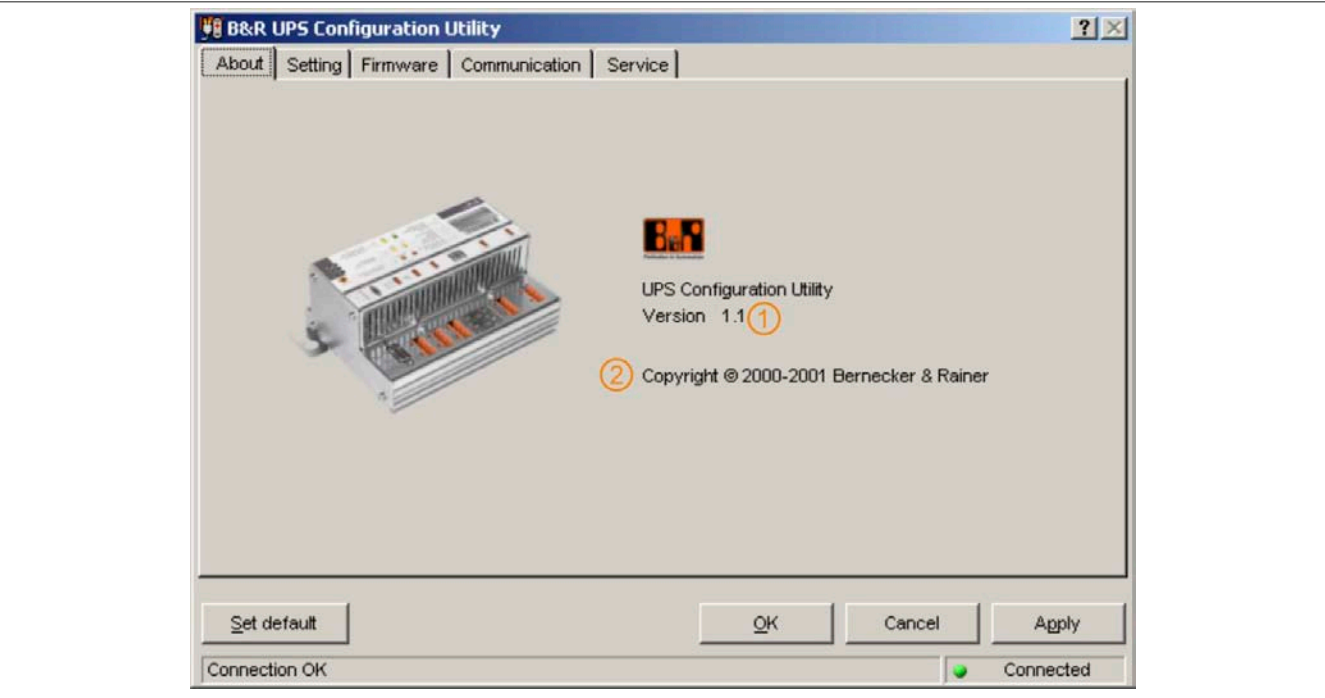
Figure 38: "About" tab description

No.	Description
1	Shows the version of the B&R UPS Configuration Software
2	Copyright information

1.5.2 "Settings" Tab

The main B&R UPS parameters can be configured on this page.
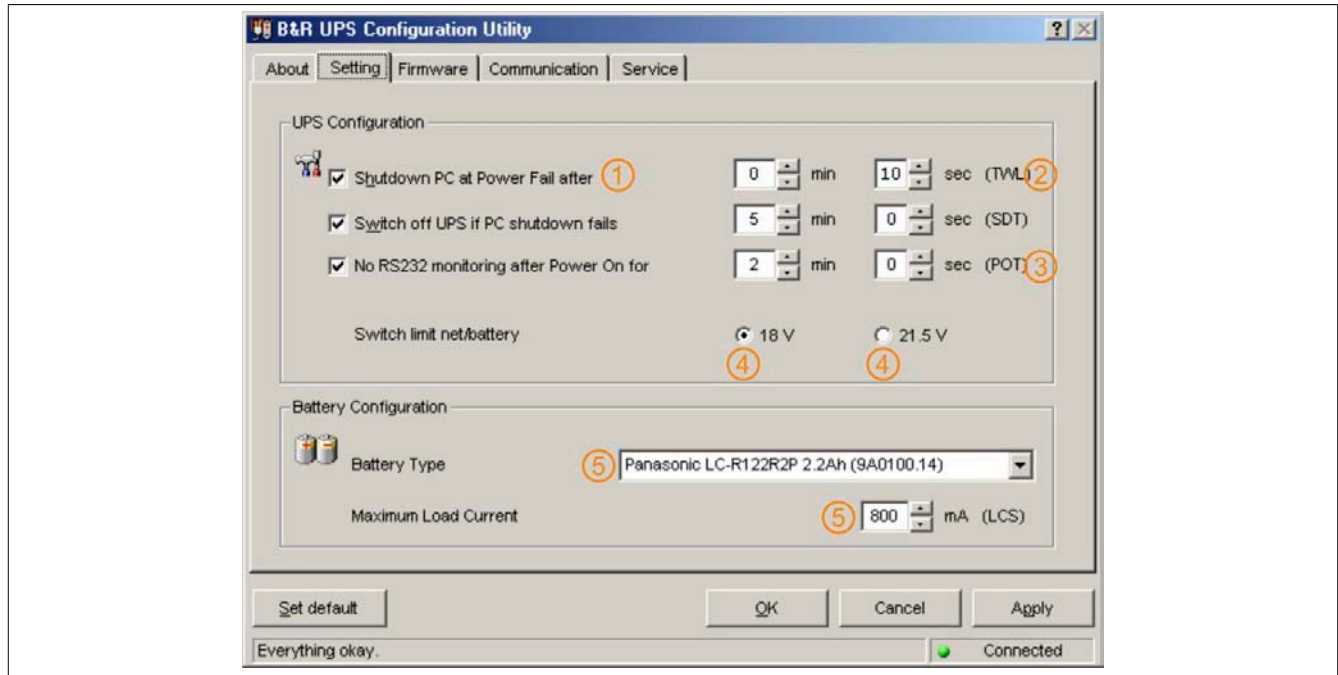
Figure 39: "Settings" tab description

No.	Description
1	Option for setting the time that passes between when a power failure occurs and when the signal is sent to shut down.
2	If the load system was unable to shut down then the UPS can cut off the power itself after this time as passed.
3	Delay until power failure signals are sent to the load system for the first time after powering on.
4	Option for setting the switching threshold at which mains operation is switched to battery operation. This function is only supported in UPS firmware versions ≥ 2.0.
5	Option for selecting the connected battery unit and setting the value for limiting the max. charging current.

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.
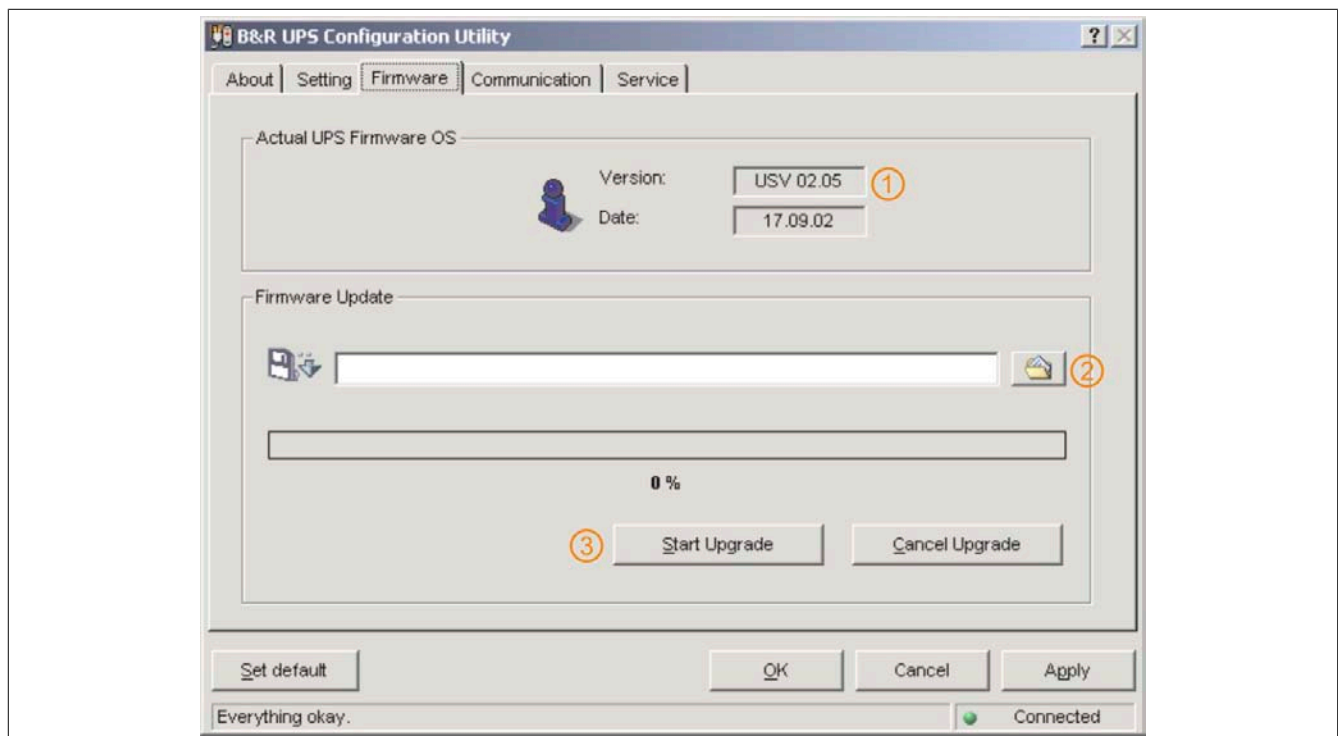
No.	Description
1	Version and date of B&R UPS firmware.
2	Option for selecting an update file to transfer to the B&R UPS. This function is only supported in UPS firmware versions ≥ 2.0.
3	Option for starting the B&R UPS upgrade. This function is only supported in UPS firmware versions ≥ 2.0.

This B&R UPS operating system can be updated starting with UPS firmware version ≥ 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:
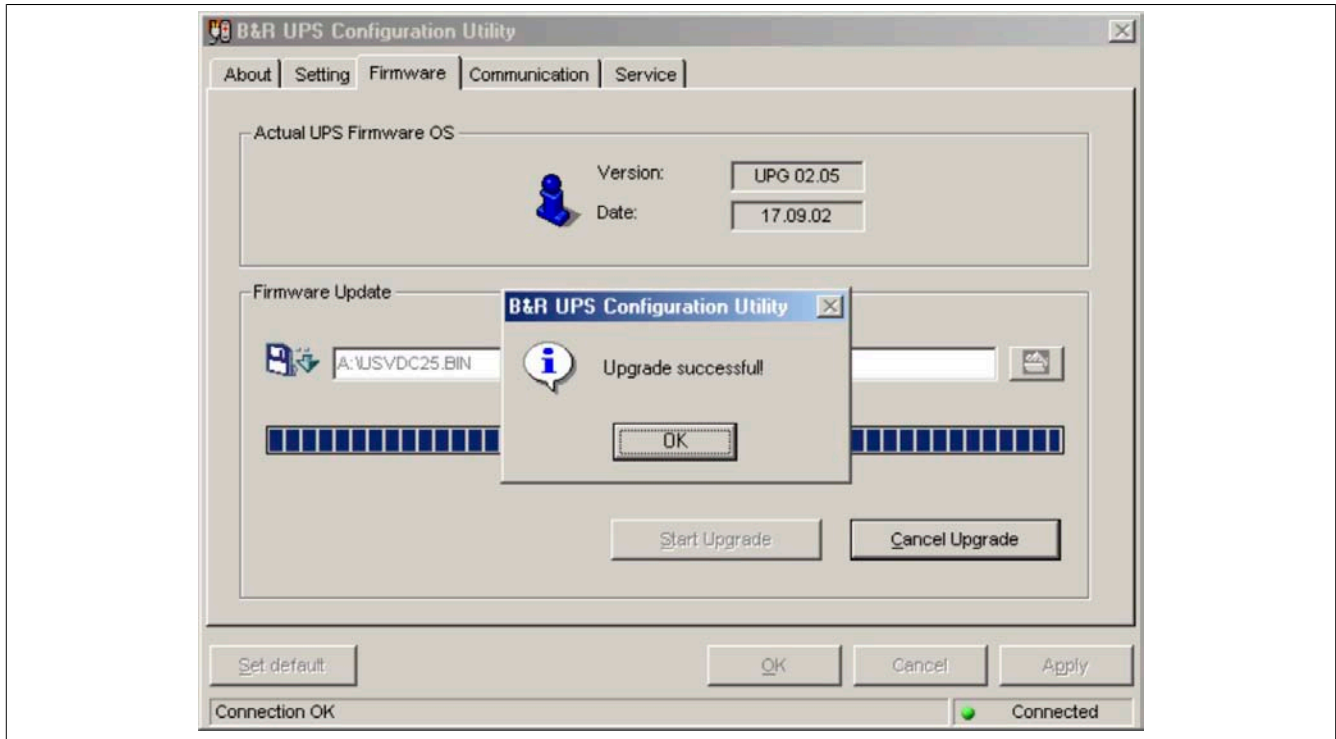
Figure 40: Upgrade successful

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

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

1.5.4 "Communication" Tab

The COM port used for the UPS is defined on this page.
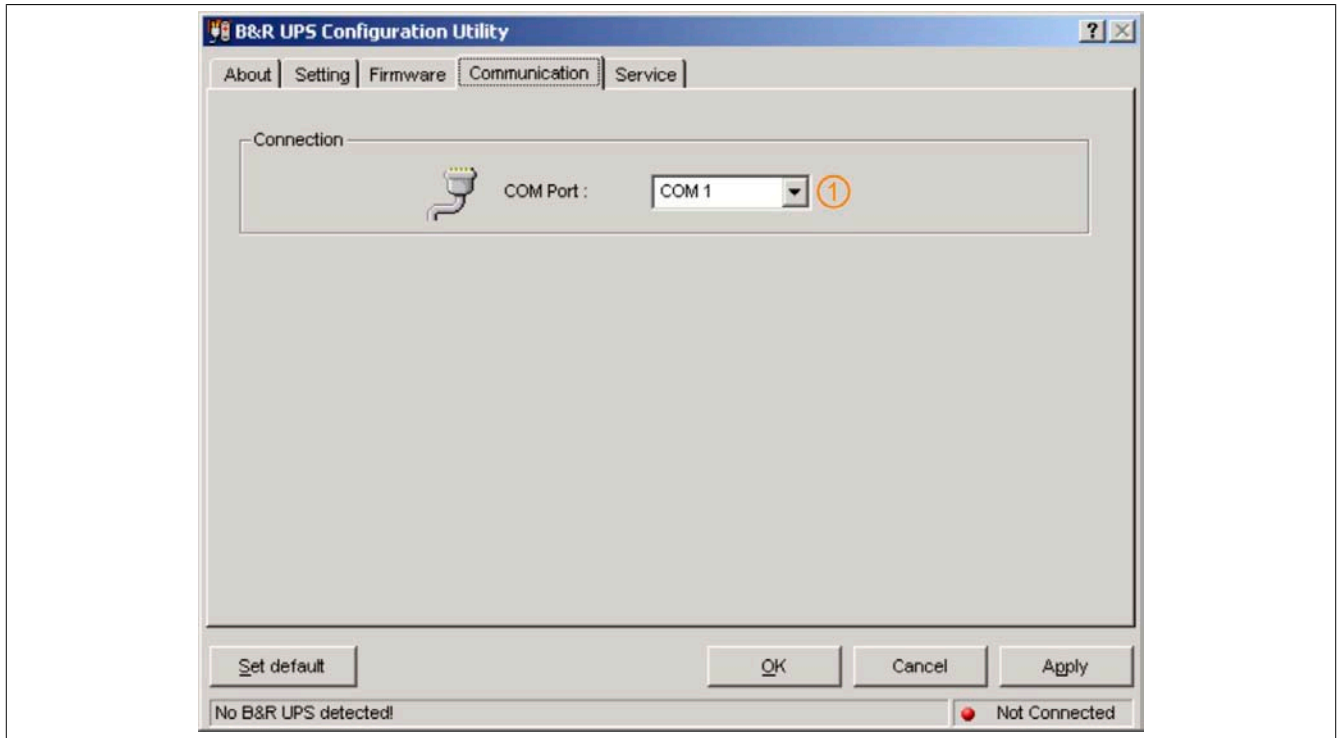
Figure 41: "Communication" tab description

No.	Description
1	Option for configuring the COM port

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 pinout. These interfaces are combined RS232/422 interfaces and do not have the handshake lines required by the UPS service.

1.5.5 "Monitoring" 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 59, Section "Monitoring using Windows 2000 with Operating System UPS Service" on page 60 and Section "Monitoring using Windows XP with Operating System UPS Service" on page 62.
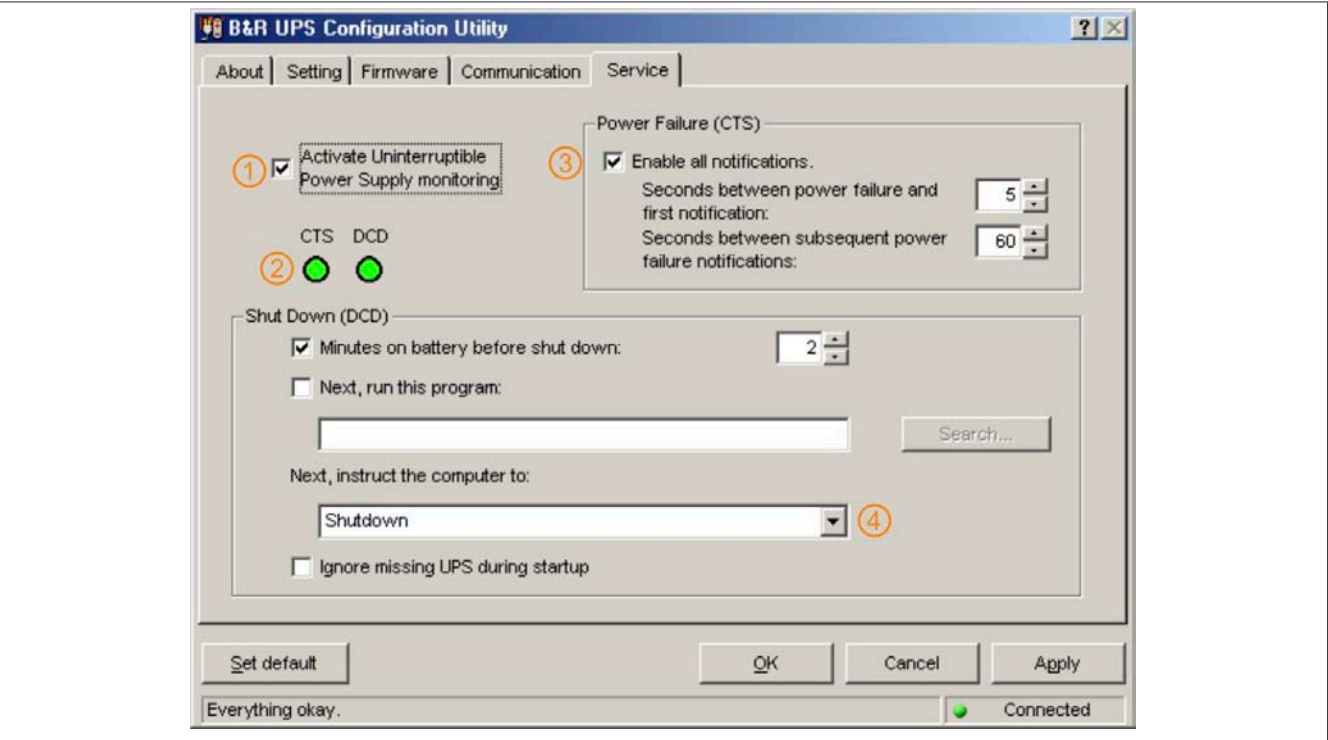
Figure 42: "Service" tab description

No.	Description
1	Option for activating UPS monitoring.
2	UPS status indicator.
3	Option for activating notifications on the screen.
4	Option for configuring the shutdown mode of UPS monitoring.

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 59).

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 about the necessary settings, see sections "Monitoring using Windows NT4.0 with Operating System UPS Service" on page 59, "Monitoring using Windows 2000 with Operating System UPS Service" on page 60 and "Monitoring using Windows XP with Operating System UPS Service" on page 62.

Otherwise it is assumed that an operational UPS is connected to the load system.

1.6.1 Monitoring on Windows 95/98/ME/NT4.0/2000/XP
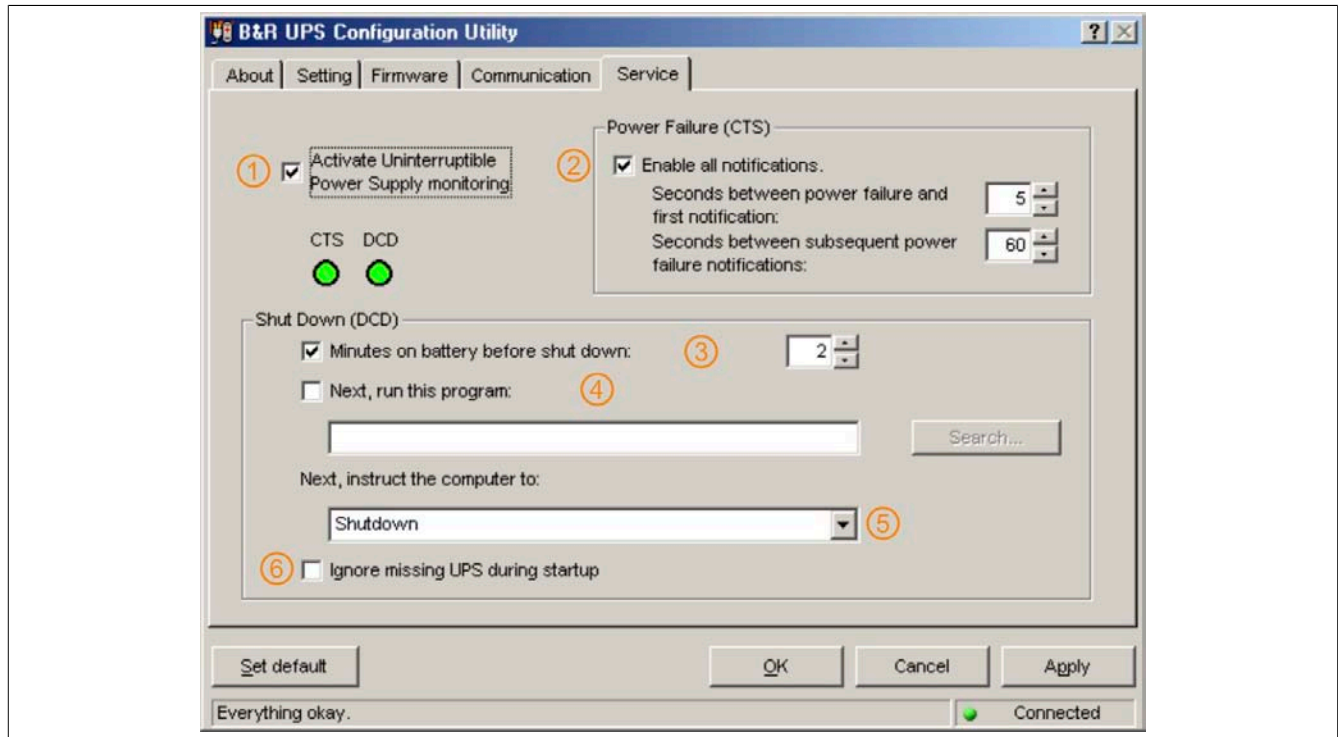
Figure 43: Monitoring settings

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 44: Error message "no UPS found"

2 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 45: Power failure message

3 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 46: 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:

Figure 47: UPS start shut down message

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

4 Now run this program

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

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

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

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

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

5 Next, instruct the computer to

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

The following options are available:

- No action
- Shut down
- Force shut down

Selection	Function
No action	The B&R UPS Configuration Software will **not** initiate a shut down of the load system. Shutdown must be initiated by an application program.
Shut down	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. **Information:** **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 35: Shut down options

6 Ignore missing UPS during startup

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

Warning!

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 48: Open security configuration

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

Figure 49: Set password

Configurations can be made once a password has been set:
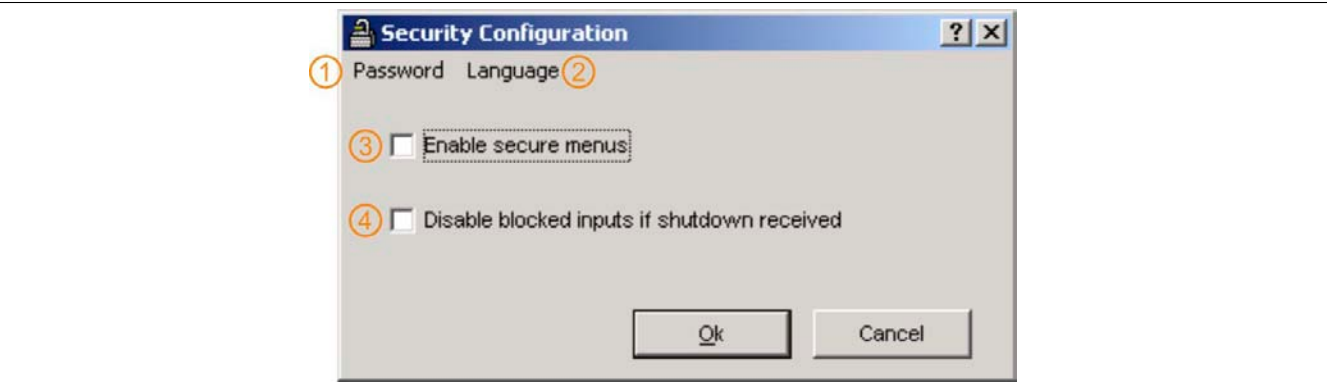
Figure 50: Description of security configuration

No.	Description
1	Option for changing the password.
2	Option for changing the menu language (German / English).
3	Option for enabling password query.
4	When this function is enabled, settings can still be made AFTER a shutdown signal has been received.

1.7.1 Menu functions

Figure 51: 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 and notifications

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

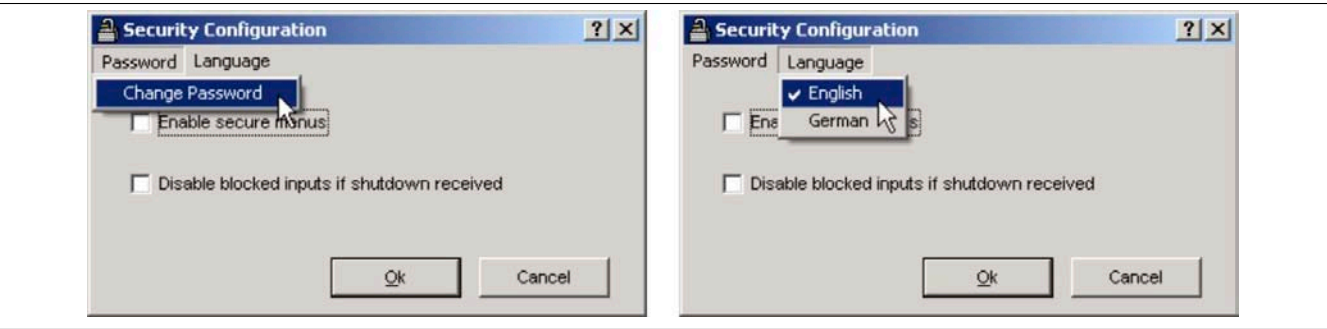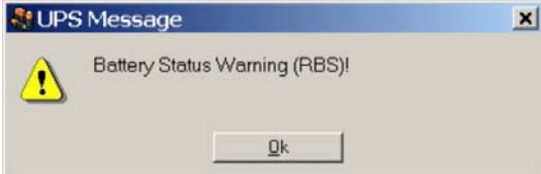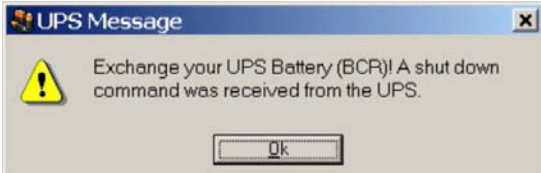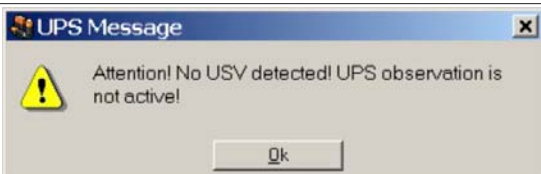| Warning displayed	Description	Repair / Remedy
B&R UPS Configuration Utility ✕ ❌ USV konnte an folgender Schnittstelle nicht gefunden werden:1 Stellen Sie sicher, daß: 1. Kein anderes Programm diese Schnittstelle benutzt. COM 1 2. Sie Administratorrechte haben. (NT u. 2000) 3. COM 1 Schnittstelle in Ihrem PC vorhanden ist [OK]	No operable, correctly connected UPS was found on the se-lected COM interface. The warning is only displayed at start-up or when transferring the set parameters to or from the B&R Configuration Software.	Check COM settings. Checking the UPS connec-tions.
USV Nachricht ✕ ⚠ Die USV startet mit dem Niederfahren [Bestätigen]	The UPS starts when the load system is shut down. This warning is only displayed in UPS monitoring mode.	Check UPS power supply.
USV Nachricht ✕ ⚠ Ein Niederfahrensignal wurde von der USV empfangen. [Bestätigen]	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 ✕ ⚠ Exchange your UPS Battery (BCR)! UPS observation is not active! [Ok]	The measurement of charging current maintenance deter-mined that the quality of the connected battery unit is insuf-ficient for proper UPS operation. This warning is only dis-played in when starting the B&R Configuration Software.	Check battery unit.
UPS Message ✕ ⚠ Battery Status Warning (RBS)! [Ok]	The measurement of charging current maintenance deter-mined 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 Con-figuration Software.	Check battery unit.
UPS Message ✕ ⚠ Exchange your UPS Battery (BCR)! A shut down command was received from the UPS. [Ok]	The measurement of charging current maintenance deter-mined 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 power resume. [Ok]	A short power interruption has occured, and power was re-stored before the TWL had elapsed. This warning is only dis-played in UPS monitoring mode.	Check UPS power supply.
UPS Message ✕ ⚠ Attention! No USV detected! UPS observation is not active! [Ok]	No operable, correctly connected UPS was found on the se-lected COM interface. This warning is only displayed in when starting the B&R Configuration Software.	Check COM settings. Checking the UPS connec-tions.

Table 36: UPS Configuration Software Warnings

Chapter 4
Software
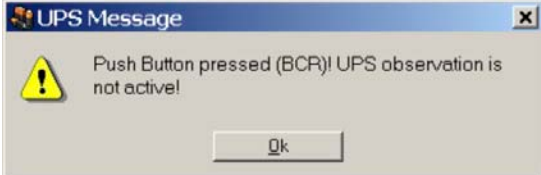
Warning displayed	Description	Repair / Remedy
UPS Message — Temperature Alert Battery (BCR)! UPS observation is not active! [Ok]	The temperature measurement has determined that the temperature of the connected battery unit is outside the specified range. If the temperature of the battery unit is above 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 — Push Button pressed (BCR)! UPS observation is not active! [Ok]	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.	-

Table 36: UPS Configuration Software Warnings

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):
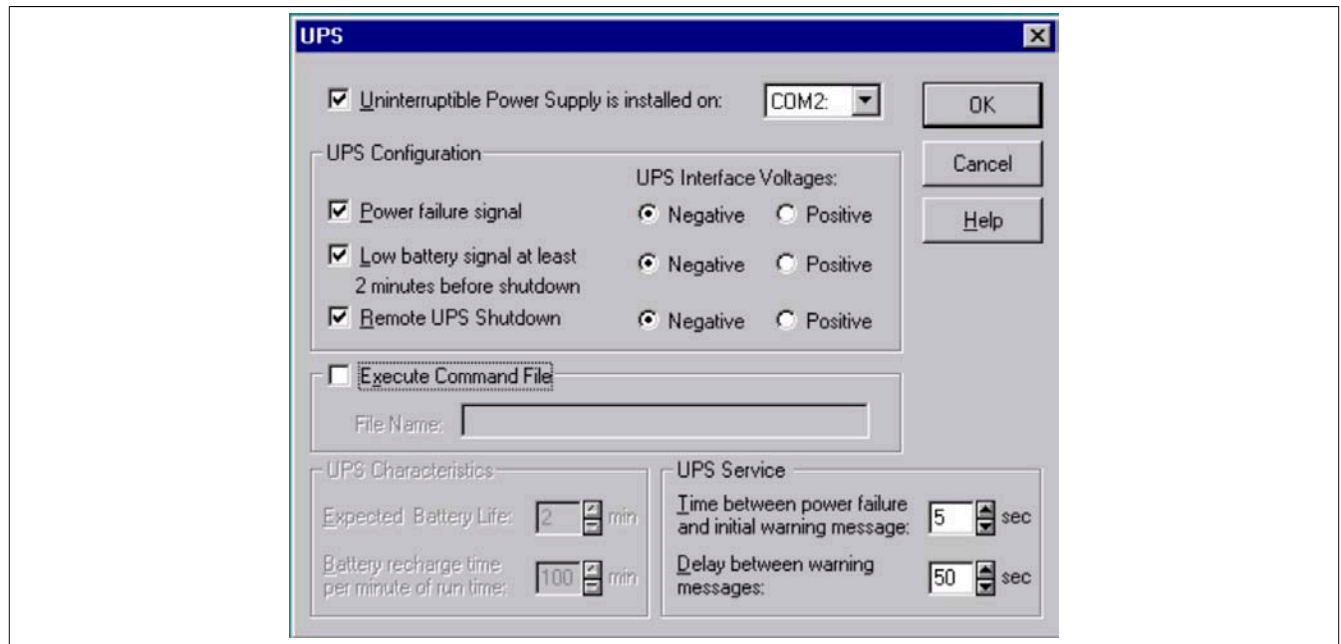
Figure 52: UPS Settings in Windows NT

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 pinout. 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.

Figure 53: UPS - Windows 2000 settings - Manufacturer

A generic UPS must be selected as manufacturer and the model must be set to "Custom":
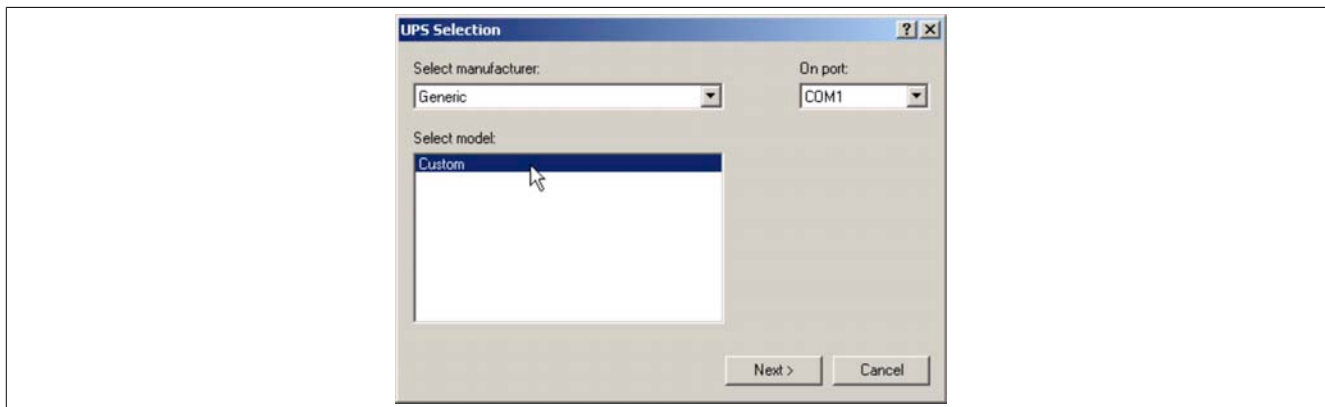
Figure 54: UPS - Windows 2000 settings - Type

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 pinout. These interfaces are combined RS232/422 interfaces and do not have the handshake lines required by the UPS service.

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

Figure 55: UPS - Windows 2000 settings - Signal Polarity

Information:

Remote shutdown of the UPS with the default Windows2000 UPS service does not work (the UPS always switches itself off after the SDT time).

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

Figure 56: UPS - Configuration dialog box in Windows 2000

4 Monitoring using Windows XP with Operating System UPS Service

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

Go to Start - Settings - Control Panel - Power Options - UPS
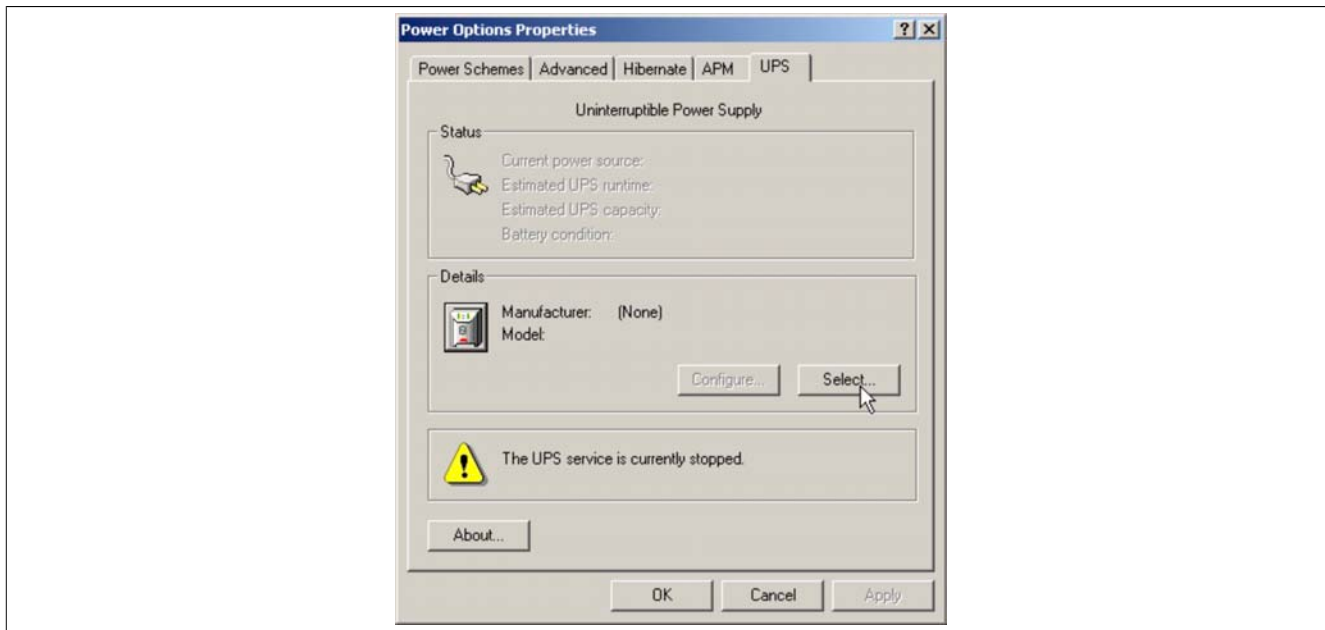
A manufacturer can be selected under the UPS tab.
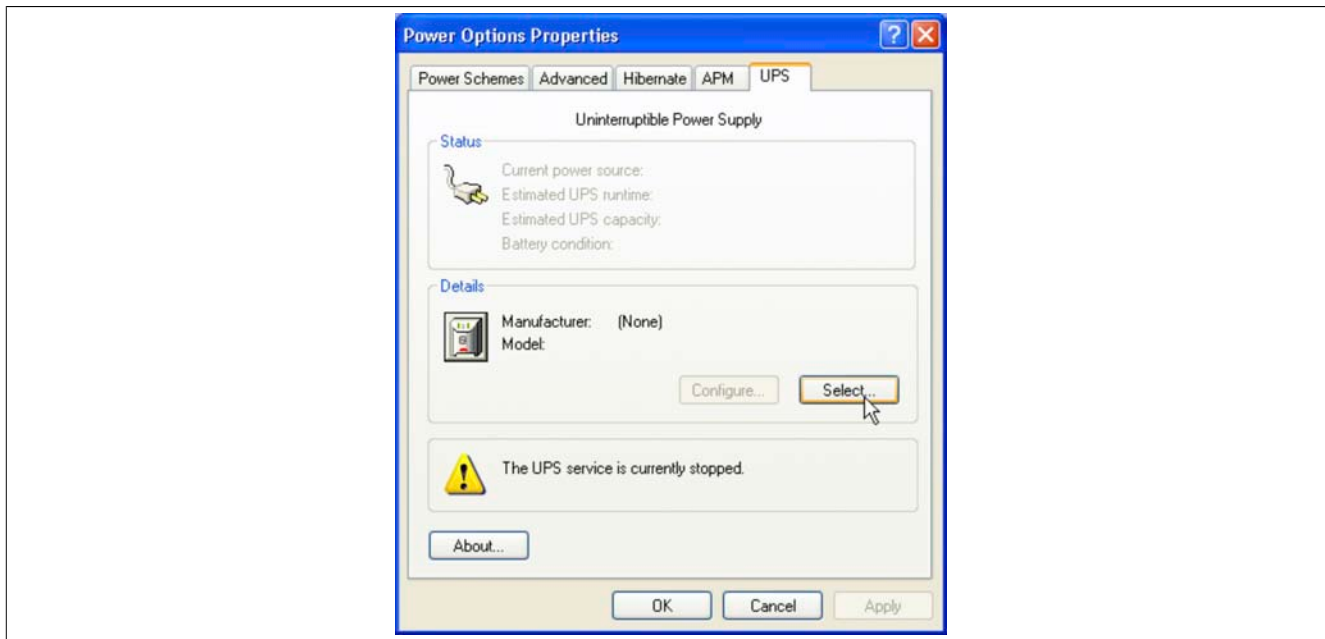
Figure 57: UPS - Windows XP settings - Manufacturer

A generic UPS must be selected as manufacturer and the model must be set to "Custom":
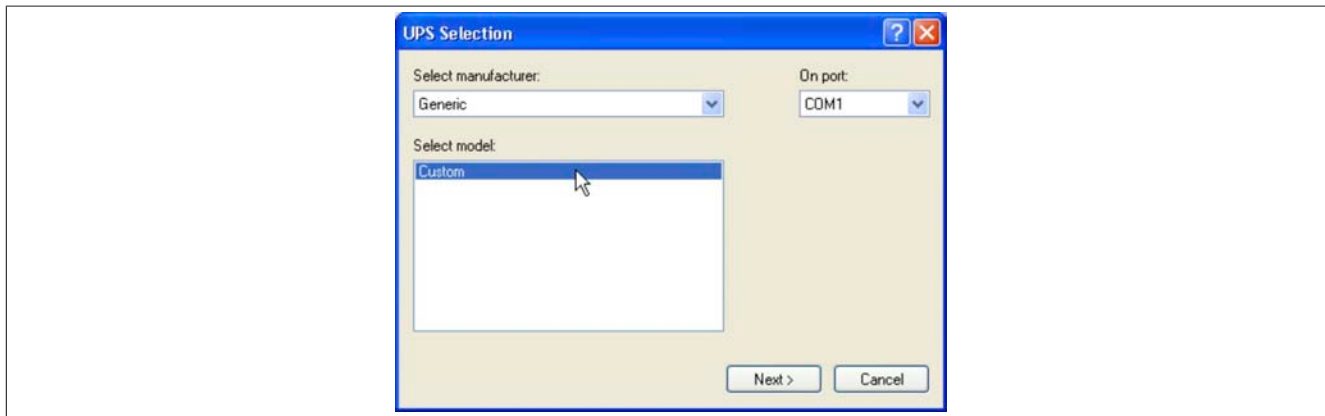
Figure 58: UPS - Windows XP settings - Type

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 pinout. These interfaces are combined RS232/422 interfaces and do not have the handshake lines required by the UPS service.

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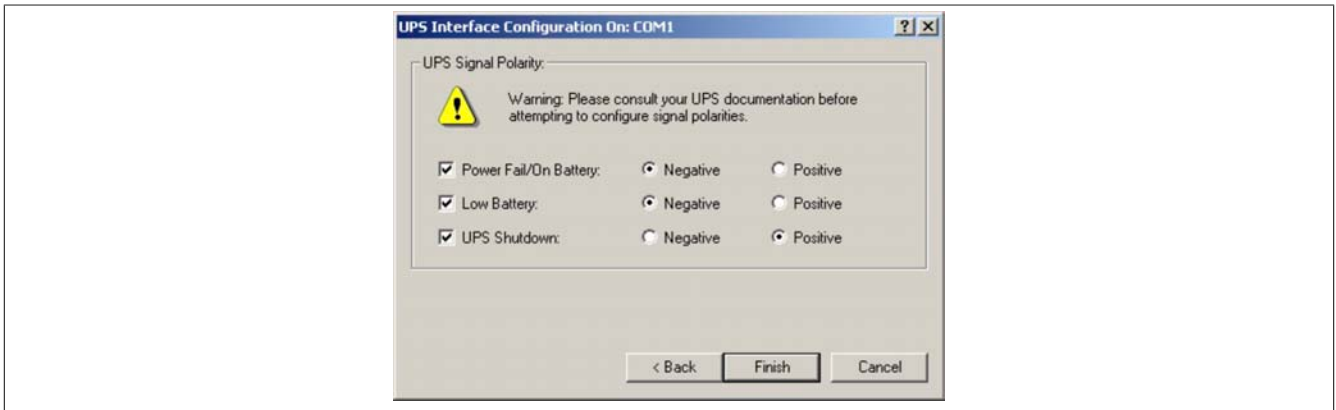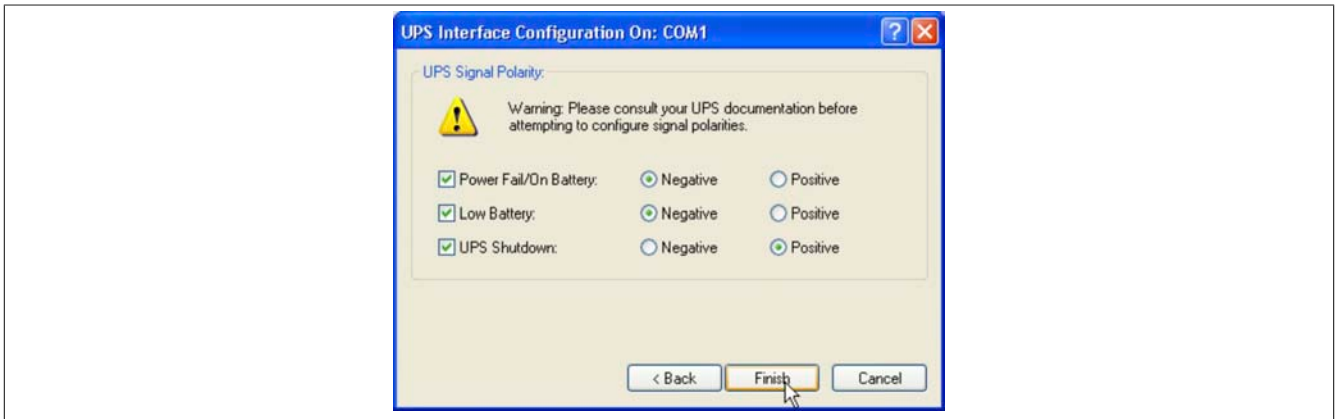

Figure 59: UPS - Windows XP settings - Signal Polarity

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).

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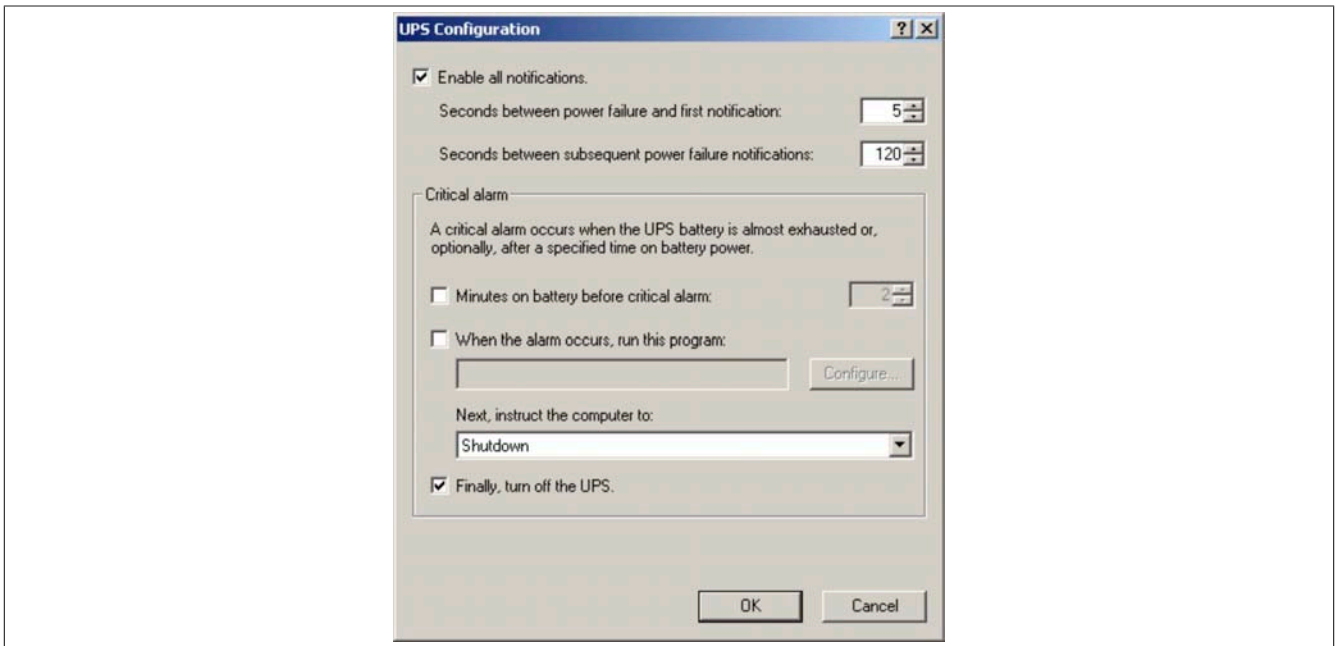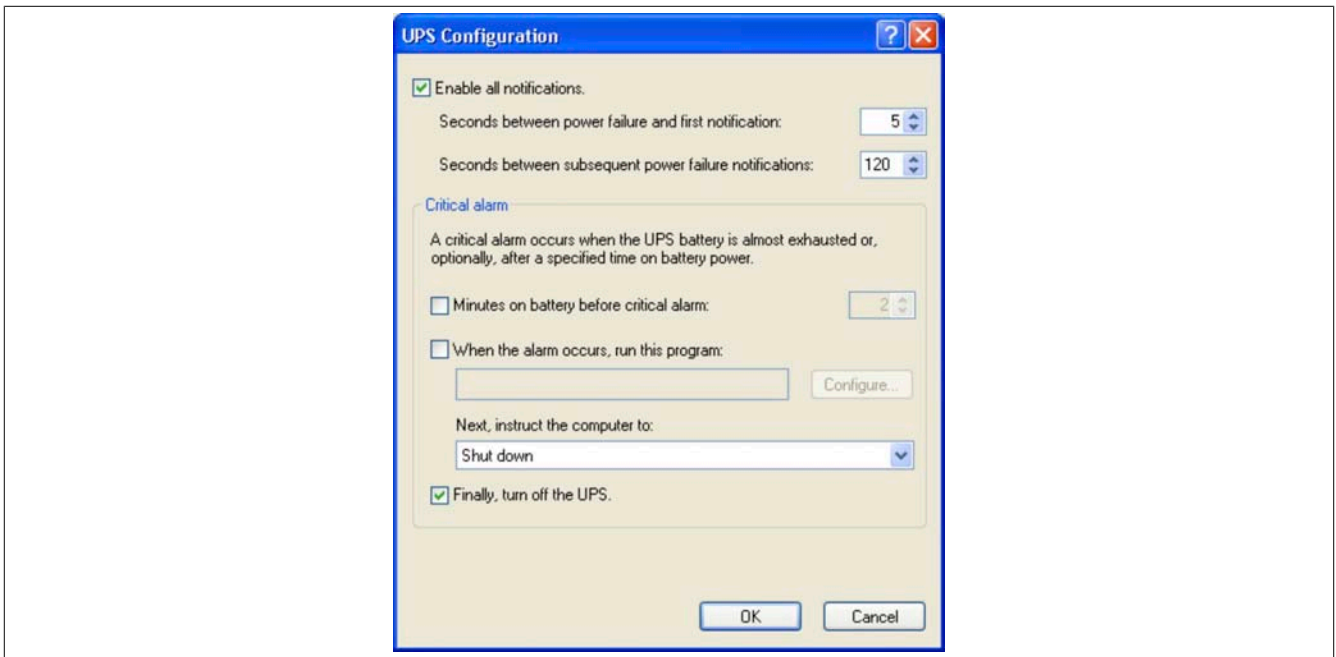

Figure 60: UPS - Configuration dialog box in Windows XP

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:

Parameter	Value
COM Port	The COM port where the UPS is installed
Bits per Second	19200 bps
Data bits	8
Parity	None
Stop bits	1
Flux controller	None

Table 37: Terminal program settings

The setting could look like the following examples for Windows2000 and WindowsXP:
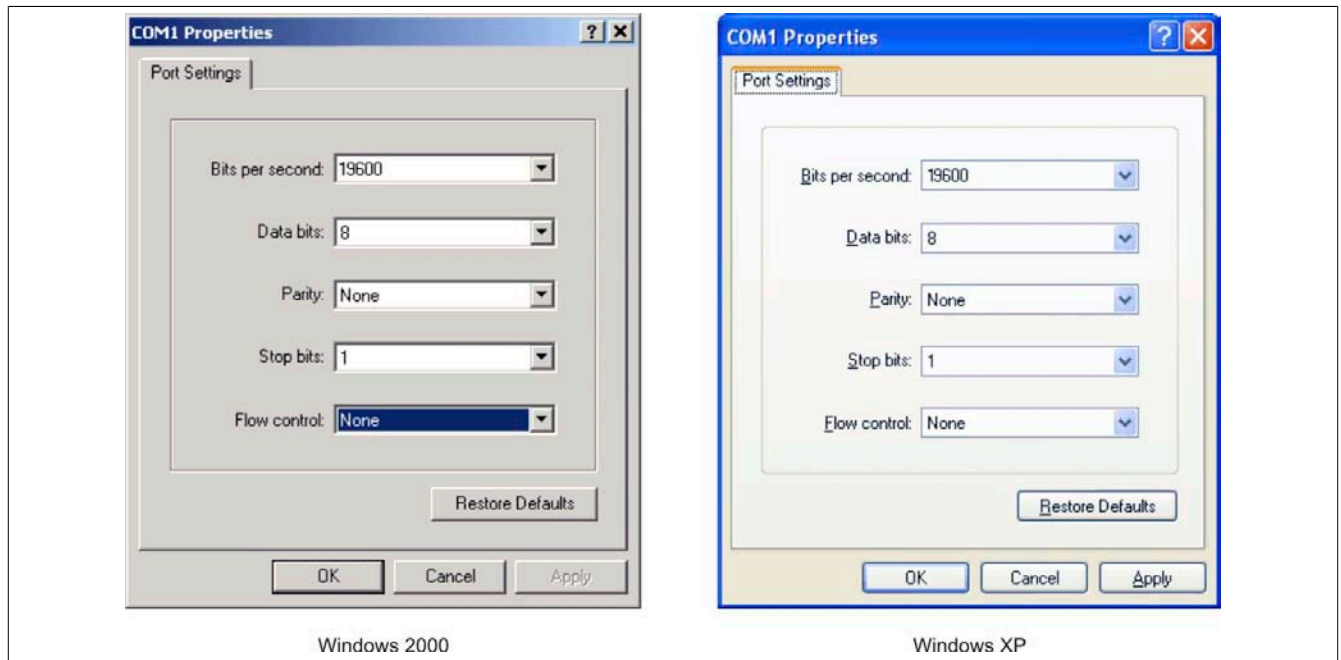
Figure 61: Example - HyperTerminal Configuration in Windows 2000 / XP for COM1

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:

Symbol	Meaning in English	Meaning in German	Hex value
<SP>	Space	Spaces	10
<CR>	Carriage return	Carriage return	0D
<LF>	Line feed	Line feed	0 A

Table 38: Definition of UPS symbols

5.1 Detecting the UPS operating mode

Firmware	Command supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

Table 39: 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 ≥ 2.0	#READ
Version ≥ 2.10	#RHDM (Read High-grade Discharge Measurement Status)

Table 40: 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 = 12

5.2.1.1 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 ≥ 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 = 000

5.2.2.1 Command sequence

Sending from the load system:

```
#READ<CR><LF>
```

Response from UPS:

The values listed here are sample values.

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

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 USV Firmware ≥ 2.10

Firmware version ≥ 2.10 with command **"#RHDM"**

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

DIT =0000
LTL =000
1CCD =10000
RCL =1000
RCH =1000
RBS =000

5.2.3.1 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>
RBS<SP>=<SP>0000<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 ≥ 2.0	Yes

Table 41: BCR (Battery Change Request)

5.2.4.1 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:

x=0 ... Battery OK

x=1 ... Battery faulty

x=2 ... Battery temperature alarm

x=3 ... Button pressed

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

Warning!

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 timestamp)

The UPS timestamp is needed to calculate the battery lifespan.

Firmware	Command supported
Version < 2.0	No
Version ≥ 2.0	Yes

Table 42: whrd (UPS timestamp)

5.2.5.1 Command sequence

Sending from the load system:

The command can only be entered and transmitted in lower case letters.

```
@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 timestamp "01.01.2000 00:00:00".

5.2.6 RBS (Reset Battery Status)

One funtion of #RHDM is to call up the results of the measurement of charging current maintenance (see Section "Measurement of charging current maintenance" on page 77).

Firmware	Command supported
Version < 2.10	No
Version ≥ 2.10	Yes

Table 43: RBS (Reset Battery Status)

5.2.6.1 Command sequence

Sending from the load system:

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

```
#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 ... Battery OK

x=0001...Change batteries

x=0002 ... Battery faulty

5.2.6.2 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 timestamp is automatically reset as well (see "Resetting the battery life-span stamp" on page 89).**

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>
```

Chapter 4
Software

5.3 Set UPS Parameters

5.3.1 TWL (Time Worst Low)

TWL (Time Worst Low)	Command supported
Version < 2.0	Yes
Version ≥ 2.0	Yes

Table 44: 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 ""Settings" Tab" on page 49) 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 = 10 sec

#TWL=200 TWL = 200 sec

5.3.1.1 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 ≥ 2.0	Yes

Table 45: 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

5.3.2.1 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 ≥ 2.0	Yes

Table 46: 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.**

5.3.3.1 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 ≥ 2.0	Yes

Table 47: 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=0.60 charging current = 0.60 A

#LCS=2.15 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.no. 9A0100.14) is 0.88 A. The 0.88A 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 96.

5.3.4.1 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 ≥ 2.0	Yes

Table 48: 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

Example:

#PFL=215 PFL = 21.5 V

5.3.5.1 Switching thresholds between battery / mains operation

PFL = 18V

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

Table 49: Switching thresholds between battery / mains operation (18V)

PFL = 21.5V

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

Table 50: Switching thresholds between battery / mains operation (21.5V)

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

5.3.5.2 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 ≥ 2.0	Yes

Table 51: 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 Celsius.

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

Default value:

#CTL=0000 CTL = 0°C

Example:

#CTL=-040 CTL = -40°C

#CTL=0010 CTL = +10°C

> # 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 52: Minimum Charging Temperature for Battery Units

5.3.6.1 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 ≥ 2.0	Yes

Table 53: 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:

#CTH=0040 CTH = +40°C

Example:

#CTH=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 54: Maximum Charging Temperature for Battery Units

5.3.7.1 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 ≥ 2.0	Yes

Table 55: 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[1]
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 56: Maximum Life-span for Battery Units

1)   Depends on the ambient temperature and charge/discharge cycles.

For information about resetting the battery lifespan stamp, see "Additional function of the user button starting with UPS Firmware version 2.0" on page 89.

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

5.3.8.1 Command sequence

Sending from the load system:

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

Response from UPS:

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

5.3.9 DIB (Digital Input Button)

Firmware	Command supported
Version < 2.10	No
Version ≥ 2.10	Yes

Table 57: DIB (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.

Warning!

Secure UPS operation is not guaranteed after activating this function (DIB=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 #DIB = OFF or ON_

Default value:

#DIB=OFF function deactivated

Example:

#DIB=ON_ function activated

Information:

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

5.3.9.1 Command sequence

Sending from the load system:

```
#DIB=ON_<CR><LF> or
#DIB=OFF<CR><LF>
```

Response from UPS:

```
OK!___DIB<SP>=<SP>1<CR><LF> or
OK!___DIB<SP>=<SP>0<CR><LF>
```

5.3.10 LTL (Life Time LED)

Firmware	Command supported
Version < 2.10	No
Version ≥ 2.10	Yes

Table 58: 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 transmitted in either upper or lower case letters.

Possible input value range #LTL = OFF or ON_

Default value:

#LTL=ON_ activate function

Example:

#LTL=OFF deactivate function

5.3.10.1 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 59: 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 60: 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 68). 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 only 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 one 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.

5.4.1.1 Command sequence

Sending from the load system:

```
#RCL=020<CR><LF>
```

Response from UPS:

```
OK!___RCL<SP>=<SP>20<CR><LF>
```

5.4.2 Setting RCL (Remain Current Low)

Firmware	Command supported
Version < 2.10	No
Version ≥ 2.10	Yes

Table 61: 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 = 20mA

#RCL=123 RCL = 123mA

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 62: RCL of Battery Units

5.4.2.1 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 of RCH (Remain Current High)

Firmware	Command supported
Version < 2.10	No
Version ≥ 2.10	Yes

Table 63: 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 = 80mA

#RCH=234 RCH = 234mA

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 64: RCH of Battery Units

5.4.3.1 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 65: 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 66: 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	15 mA	Minimum
Remain Current High	40 mA	Maximum

Table 67: Battery operating 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 68: 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-Nov-00	1.05 (UPSDC15.BIN)	• First version
D0	03-Sep-01		
E0	26-Mar-02		
H0	28-Oct-02	2:01 AM (UPSDC21.BIN)	• Establishment of battery lifespan re-worked due to a Real Time Clock (RTC) read error. • 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. • The command for reading the battery charge condition (BCR) has been added (for more information, see Section "BCR (Battery Change Request)" on page 67). • It is now possible to upgrade the UPS firmware using the B&R USP Configuration Software. • New UPS battery unit 9A0100.16 Typ C 24 V 4.5 Ah has been implemented.
I0	29-Oct-02	2:05 AM (UPSDC25.BIN)	• 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 73 for more info).
J0	30-Oct-02	2:06 AM (UPSDC26.BIN)	• A flickering overload LED was removed due to high frequency overcurrent load.
K0	27-Jan-03		
K5	14-Feb-03	2.10 (UPSDC210.BIN)	• Error correction: LED status displays synchronized due to blinking irregularities. • 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 "Measurement of charging current maintenance" on page 77 for more info). • 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 "LTL (Life Time LED)" on page 76 for more info). As a default setting, the blinking is activated. • It is now possible to operate the buttons found on the UPS (user button and input button) with the software command DIB (see Section "DIB (Digital Input Button)" on page 75 for more info). • The UPS parameter read command "#RHDM", which is used to read the parameters DIB, LTL, CCD, RCL, RCH and RBS, has been added. • The UPS parameter "WHRD" had been added to read the UPS timestamp for the calculation of the battery life-span.
L0	28-Aug-03	2:11 AM (UPSDC211.BIN)	• The length of time during which the highest allowable output current (8A) may be exceeded, in the range from 8 to 14A, has been raised from 10 to 30 seconds (see Section "UPS Overload Behavior" on page 89 for more info).

Table 69: UPS Firmware Versions

Chapter 4
Software

Chapter 5 • Accessories

The following accessories have successfully completed functional testing at B&R and are approved for use with this device. Nevertheless, it is important to observe any limitations that may apply to the complete system when operated with other individual components. When operating the complete system, the specifications for the individual components must be adhered to.

All components listed in this manual have been subjected to extensive system and compatibility testing and are approved for use. B&R can make no guarantee regarding the functionality of non-approved accessories.

1 HMI Drivers & Utilities DVD

1.1 5SWHMI.0000-00

1.1.1 General information

This DVD contains drivers, utilities, software upgrades and user's manuals for B&R panel system products (see the "Industrial PCs" or "Visualization and operation" section of the B&R website at www.br-automation.com).

When the DVD is created, its contents are identical to the files found in the Downloads section of the B&R website (Service / Material-related downloads).

1.1.2 Order data

Model number	Short description	Figure
	Other	
5SWHMI.0000-00	HMI Drivers & Utilities DVD	

Table 70: 5SWHMI.0000-00 - Order data

1.1.3 Contents (V2.20)

BIOS product upgrades

- Automation PC 620 / Panel PC 700 CPU board 815E and 855GME BIOS
- Automation PC 620 / Panel PC 700 CPU board X855GME BIOS
- Automation PC 620 / Panel PC 700 CPU board 945GME BIOS
- Automation PC 620 / Panel PC 700 CPU board 945GME N270 BIOS
- Automation PC 680
- Automation PC 810 / Automation PC 820 / Panel PC 800 B945GME BIOS
- Automation PC 810 / Panel PC 800 945GME N270 CPU board BIOS
- Automation PC 810 / Panel PC 800 GM45 CPU board BIOS
- Provit 2000 product family - IPC2000/2001/2002
- 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
- Power Panel 300/400 BIOS devices
- Power Panel 300/400 BIOS user boot logo
- Power Panel 500 / Automation PC 510 / Automation PC 511 BIOS
- Panel PC 310

Device drivers

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

Firmware upgrades

- Automation PC 620 / Panel PC 700 (MTCX, SDLR, SDLT)
- Automation PC 810 (MTCX, SDLR, SDLT)
- Automation PC 820 (MTCX, SDLR, SDLT)
- Mobile Panel 100 (SMCX)
- Panel PC 300 (MTCX)
- Power Panel 100 (aPCI)
- Power Panel 300/400 (aPCI)
- Power Panel 300/400 (MTCX)
- Power Panel 500 / Automation PC 510 / Automation PC 511 (MTCX, SDLR, I/O board)
- Panel PC 800 (MTCX, SDLR, SDLT)
- UPS firmware

Utilities/Tools

- B&R Embedded OS Installer
- Windows CE Tools
- User boot logo conversion program
- SATA RAID Installation Utility
- Automation Device Interface (ADI)
- CompactFlash service life calculator (Silicon Systems)
- Miscellaneous
- MTC utilities
- B&R Key Editor
- MTC & Mkey utilities
- Mkey utilities
- UPS configuration software
- ICU ISA configuration
- Intel PCI NIC boot ROM
- Diagnostic programs

Windows

- Windows CE 6.0
- Windows CE 5.0

- Windows CE 4.2
- Windows CE 4.1
- Windows CE Tools
- Windows Embedded Standard 2009
- Windows Embedded Standard 7
- Thin client
- Windows NT Embedded
- Windows XP Embedded
- VNC viewer

MCAD templates for

- Industrial PCs
- Visualization and operating devices
- Slide-in label templates
- Custom designs

ECAD templates for

- Industrial PCs
- Automation PCs
- Automation Panel 900
- Panels (Power Panel)

Documentation for

- Automation PC 511
- Automation PC 620
- Automation PC 680
- Automation PC 810
- Automation PC 820
- Automation Panel 800
- Automation Panel 900
- Panel PC 310
- Panel PC 700
- Panel PC 725
- Panel PC 800
- Power Panel 15/21/35/41
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200
- Mobile Panel connection box
- Provit 2000
- Provit 3030
- Provit 4000
- Provit 5000
- Provit Benchmark
- Provit Mkey
- Windows CE 5.0 help documentation
- Windows CE 6.0 help documentation
- Windows NT Embedded application guide
- Windows XP Embedded application guide
- Uninterruptible power supply
- Implementation guides

- B&R Hilscher fieldbus cards (CANopen, DeviceNet, PROFIBUS, PROFINET)

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 or 21.5 V[3], 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[4], i.e. when the mains supply voltage fails, the load system continues to operate without interruptions::
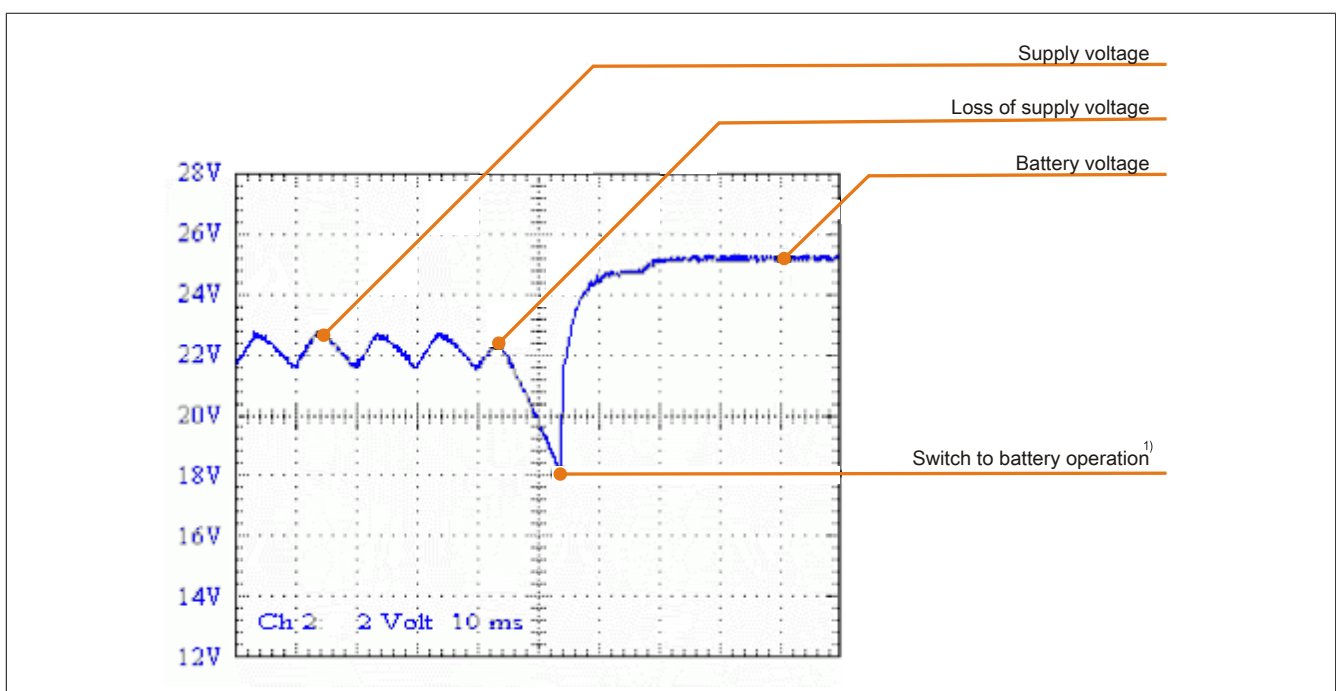
Figure 62: Behavior when the mains supply voltage fails

1.1 Buffer mode

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 4 "Software" on page 45).**

1.1.1 Deep discharge protection

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

---

[3] Depending on the switching threshold. Can be set using B&R UPS configuration software or HyperTerminal (18 or 21.5 VDC).
[4] 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.

1.2 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 4 "Software" on page 45). 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 4 "Software" on page 45 and "Power failure" on page 91).**

> ## 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 4 "Software" on page 45 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	Status
<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 26V is reached (controlled internally and dependent on temperature) the supply voltage is switched through to the load system.

Table 71: 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 "CTH (Charge Temperature High)" on page 74), 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 "LED status indicators" on page 19) 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 "button, ext. button (digital input) and DIB (digital input button)" on page 89).

> ## 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:

Appendix A
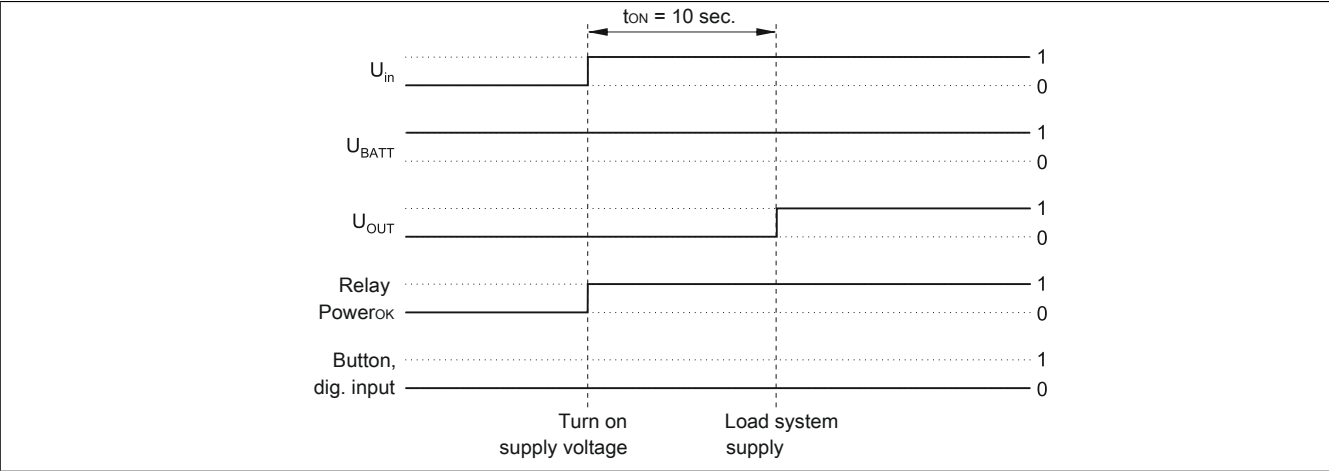
Figure 63: Switching on the UPS, Battery OK
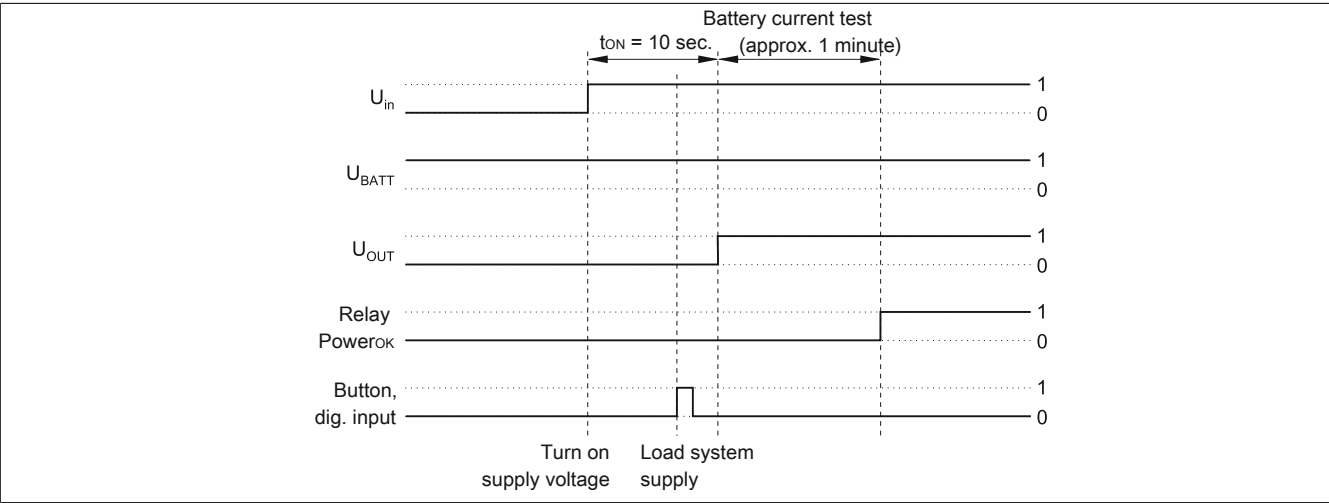
Figure 64: Switching on the UPS, Battery OK (with button)
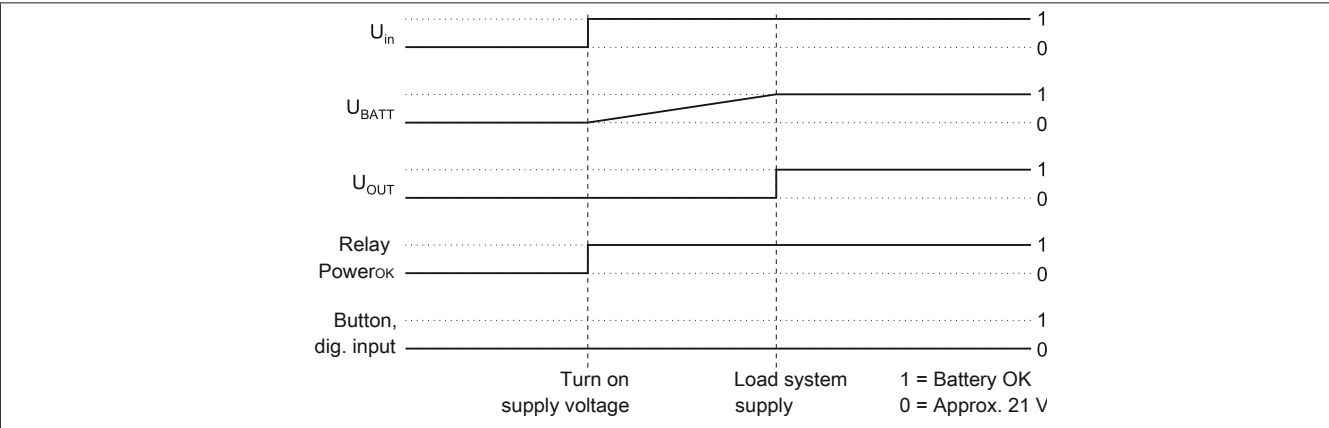
Figure 65: Switching on the UPS, Battery Empty
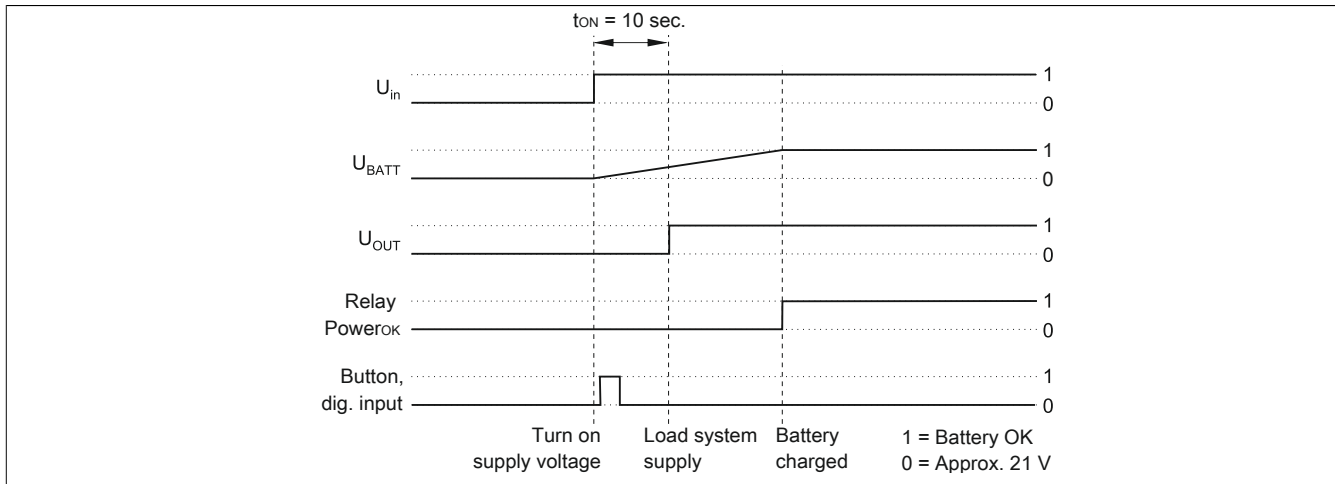
Figure 66: Switching on the UPS, Battery Empty (with button)

1.4 UPS Overload Behavior

If the maximum permitted output current of 8 A is exceeded, the following turn-off times apply: Between 8 - 14A, the UPS shuts down after 30[5)] seconds. Over 14A output current, the UPS shuts down in one second.

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

1.5 button, ext. button (digital input) and DIB (digital input button)

The user button, the external button (see "Device interfaces and slots" on page 16 for location), and the software UPS command DIB (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 DIB is changed in the software.

> # 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 96. 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

1.5.1.1 Resetting the battery life-span stamp

With a UPS firmware version 2.0 and higher, the timestamp 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.

[5)] Revision dependent. 10 seconds for a 9A0100.11 UPS 24 VDC < revision L0

The UPS timestamp 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 timestamp 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 timestamp)" on page 68.

1.5.1.2 Digital input

Digital input	Electrical characteristics
Design	Sink
Nominal voltage	24 VDC
Maximum input voltage	30 VDC
Switching Threshold Low Range Switching range High Range	<5 V 5 V to 15 V = 15 V
Input impedance	Approx. 5 kΩ
Input current	Approx. 5 mA at 24 VDC
Input delay	Max. 1 ms
Separation	No electrical isolation

Table 72: 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):
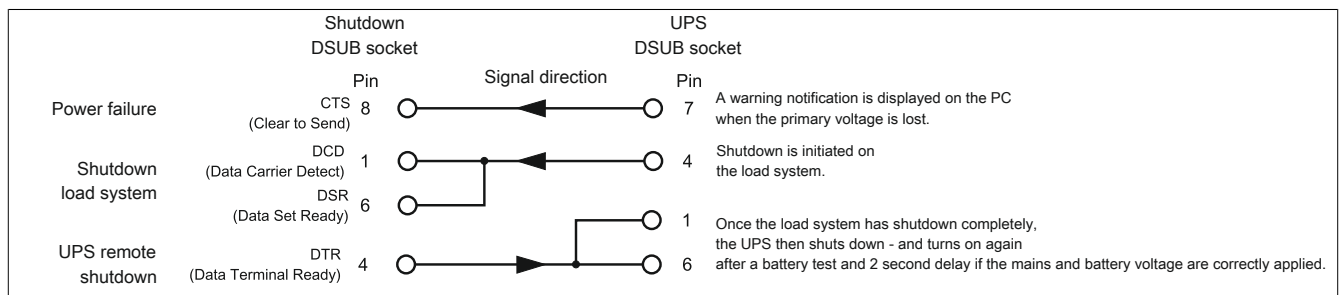
Figure 67: Handshake signals from the RS232 interface

See the figure "RS232 interface" on page 18 for the complete pinout of the RS232 cable.

1.6.1 Power failure

a) The voltage briefly sinks below the minimum level:
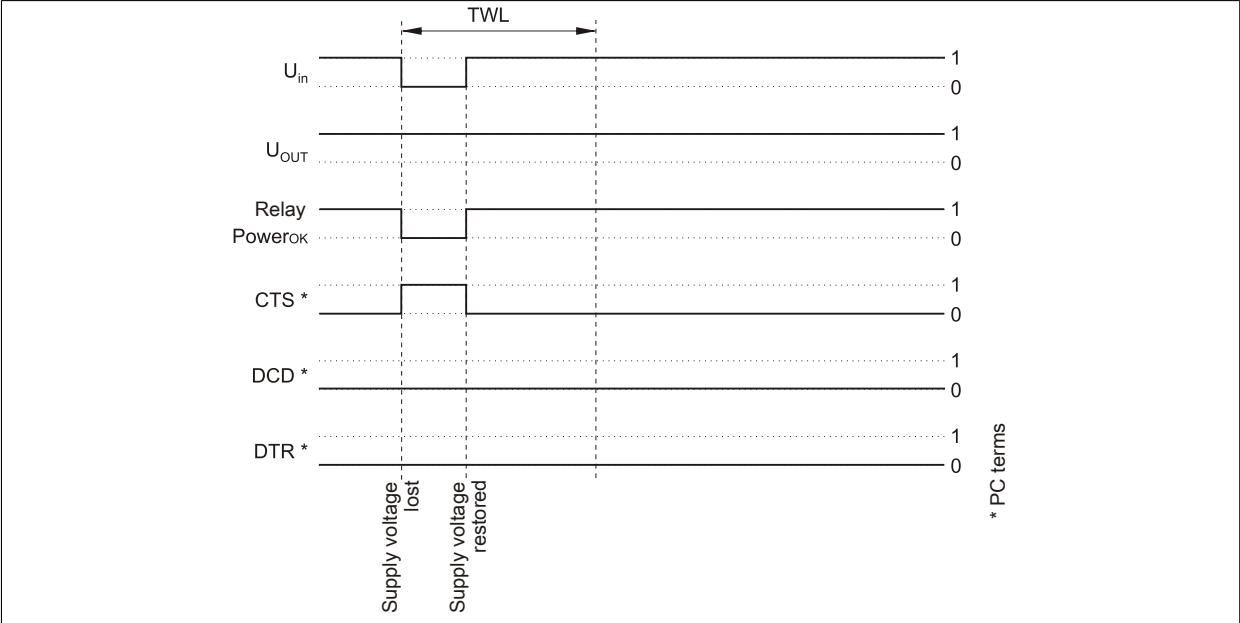
Figure 68: Handshake lines when a brief power failure occurs

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 4 "Software" on page 45), the load system is not effected.

b) The supply voltage fails for a longer period of time:
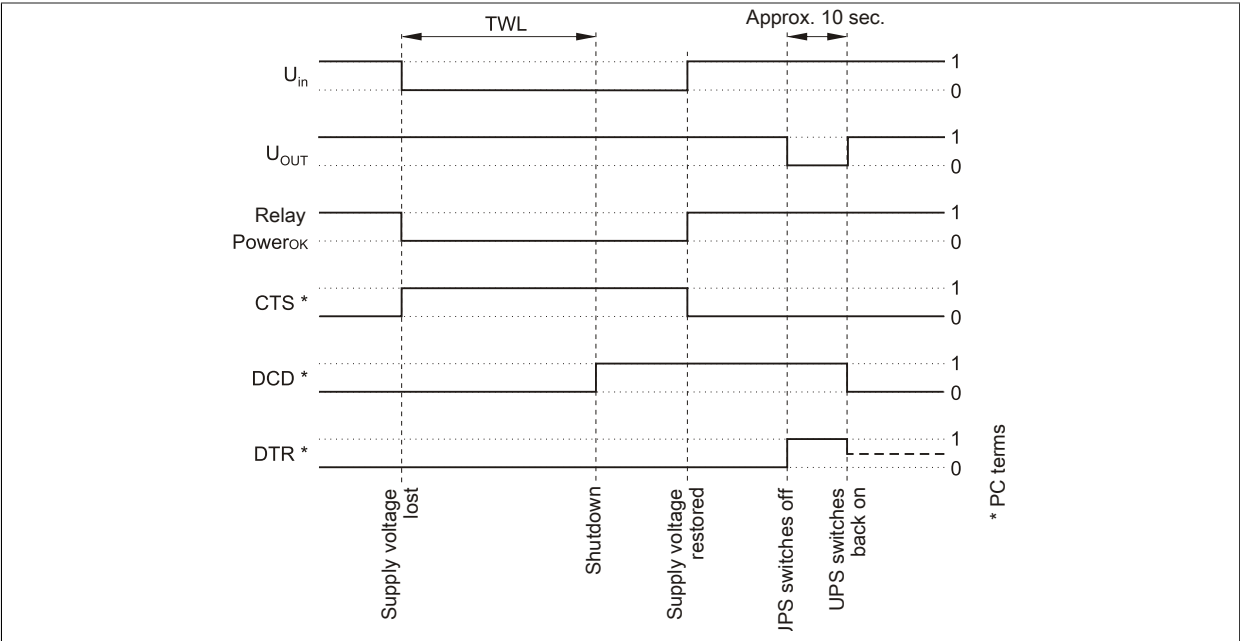
Figure 69: Handshake lines when a power failure occurs

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, WindowsNT 4.0 UPS Service waits for an additional 2 minutes (default time - can be set, see the Chapter "Software" on page 45) 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 the Chapter 4 "Software" on page 45).

c) Power failure during POT

If a power failure occurs during POT, the respective handshake signals are set after this time has passed.
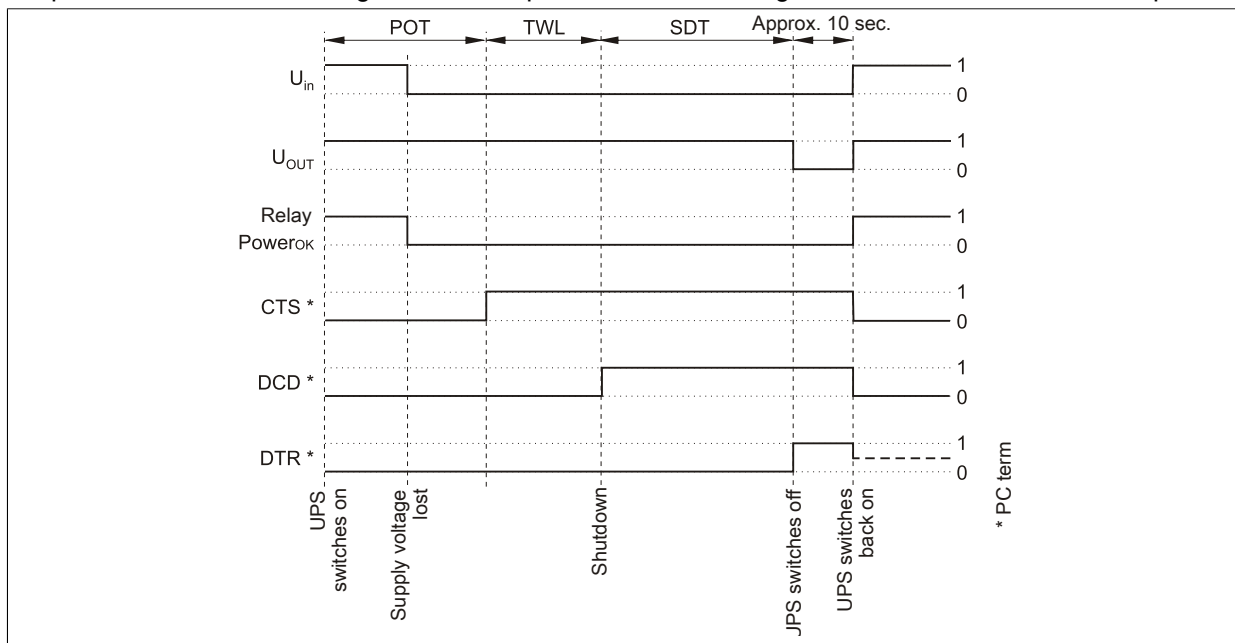
Figure 70: Handshake Lines During POT

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:
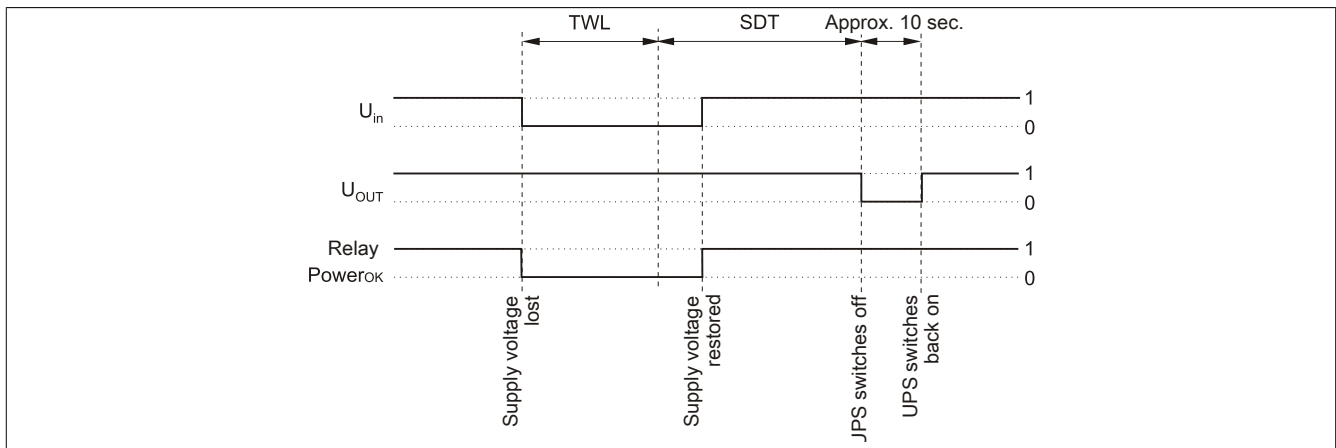
Figure 71: Handshake lines during power failure without RS232 cable

As shown in the figure above, the times TWL and SDT (to change the values, see the Chapter "Software" on page 45) 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.

Appendix A

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
Type of contact	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	≤ 30 mΩ / 100 mA / 6 V
Response time at rated voltage and +20°C	Typical 6 ms
Release time with / without parallel diode	Typical 2.5 ms / 10 ms
Chatter time N.O. / N.C.	Typical 0.5 ms / 4 ms
Max. switching rate without load / at rated load	1200 min^{-1} / 30 min^{-1}
Coil heating at continuous current limit	Approx. 7 K
Protection in accordance with DIN 40050/IEC 529	Wash tight IP67 soldering machine compatible IP50

Table 73: 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 (UPS batteries; 2 pcs., 12V, 7.2Ah)		9A0100.12, 9A0100.13
Nominal voltage		12 V
Rated capacity		7.2 Ah
Capacity dependent on discharging current (T = +25°C)	at 20 h discharging time (360 mA / T = +25°C)	7.2 Ah
	at 10 h discharging time (680 mA / T = +25°C)	6.8 Ah
	at 5 h discharging time (1260 mA / T = +25°C)	6.3 Ah
	at 1 h discharging time (4900 mA / T = +25°C)	4.9 Ah
Capacity dependent on ambient temperature	at 20 h discharging time (T = +40 °C)	102%
	at 20 h discharging time (T = +25 °C)	100%
	at 20 h discharging time (T = 0 °C)	85%
	at 20 h discharging time (T = -15 °C)	65%
Self discharge (T = +25 °C)	Charge remaining after 3 months	91%
	Charge remaining after 6 months	82%
	Charge remaining after 12 months	64%
Internal resistance at full charge (T = +25°C)		Approx. 40 mΩ
Maximum charging current (T = +25 °C)		2.88 A
Maximum charging voltage (T = +25 °C)		13.6 V - 13.8 V
Dimensions in mm (L x W x H)		151 x 64.5 x 100
Weight		2.5 kg

Table 74: Panasonic LC-R127R2P characteristics

2.2 Characteristics of Lead Acid Battery 12 VDC 7.2 Ah

Panasonic LC-R127R2P 12 V / 7.2 Ah (UPS batteries; 2 pcs., 12V, 7.2Ah)		9A0100.12, 9A0100.13
Nominal voltage		12 V
Rated capacity		2.2 Ah
Capacity dependent on discharging current (T = +25°C)	at 20 h discharging time (360 mA / T = +25°C)	2.2 Ah
	at 10 h discharging time (680 mA / T = +25°C)	2.9 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 temperature	at 20 h discharging time (T = +40 °C)	102%
	at 20 h discharging time (T = +25 °C)	100%
	at 20 h discharging time (T = 0 °C)	85%
	at 20 h discharging time (T = -15 °C)	65%
Self discharge (T = +25 °C)	Charge remaining after 3 months	91%
	Charge remaining after 6 months	82%
	Charge remaining after 12 months	64%
Internal resistance at full charge (T = +25°C)		Approx. 70 mΩ
Maximum charging current (T = +25 °C)		0.88 A
Maximum charging voltage (T = +25 °C)		13.6 V - 13.8 V
Dimensions in mm (L x W x H)		177 x 34 x 66
Weight		0.8 kg

Table 75: Panasonic LC-R127R2P characteristics

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

Hawker Cyclon (UPS batteries; 2 pcs., 12V, 4.5 Ah)	9A0100.16, 9A0100.17
Nominal voltage	12
Rated capacity	4.5 Ah
Storage time (T = +25°C)	2 years (without recharging)
Internal resistance at full charge (T = +25°C)	Approx. 5 mΩ
Maximum charging current (T = +25 °C)	2.88 A
Maximum charging voltage (T = +25 °C)	14.7 V to 15 V
Dimensions in mm (L x W x H)	205 x 38 x 102
Weight	1.77 kg

Table 76: 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 8A 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 0.88A by default. This can however be set between 0.88A and 2.88A using the button on the front (a lower charging current increases the life of the 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 (0.25A). Pushing the button once more when the maximum charging current (2.88A) is reached sets the default value of 0.88A.

The electric current which has been set is shown by the UPS status LEDs as a binary code:
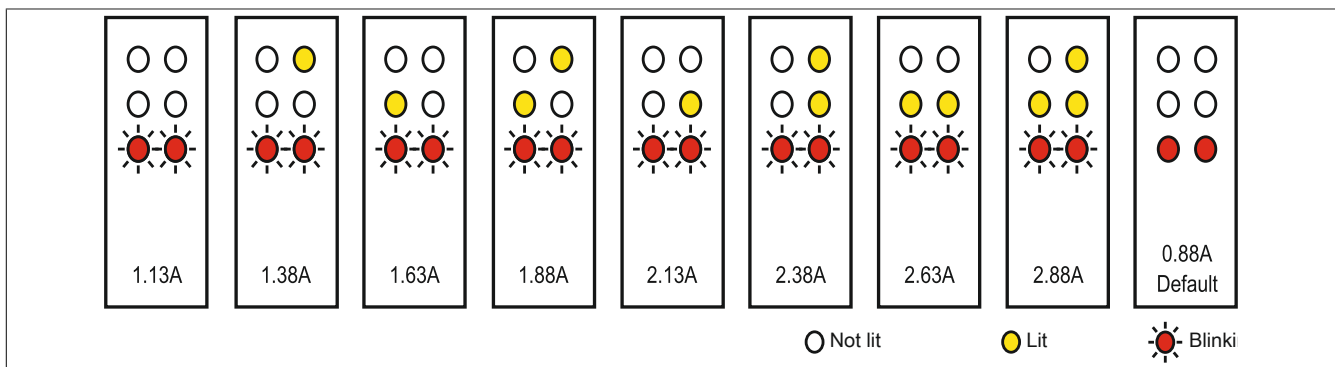
Figure 72: Setting the maximum charging current

If the button is not pushed for approximately 1minute, 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.no. 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 the Chapter "Software" on page 45. 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 72) and changing it using the button during the current setting mode overwrites the value. If this setting mode is changed without saving the current setting (by restarting the UPS), the value set using the LCS command remains.

2.6 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 "LED status indicators" on page 19 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 "Switching on the UPS" on page 87).

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 21V, 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 150W for 20 minutes (at ambient temperatures of -10 to 40°C).

The battery capacity reduces over time, as shown in the following diagram:
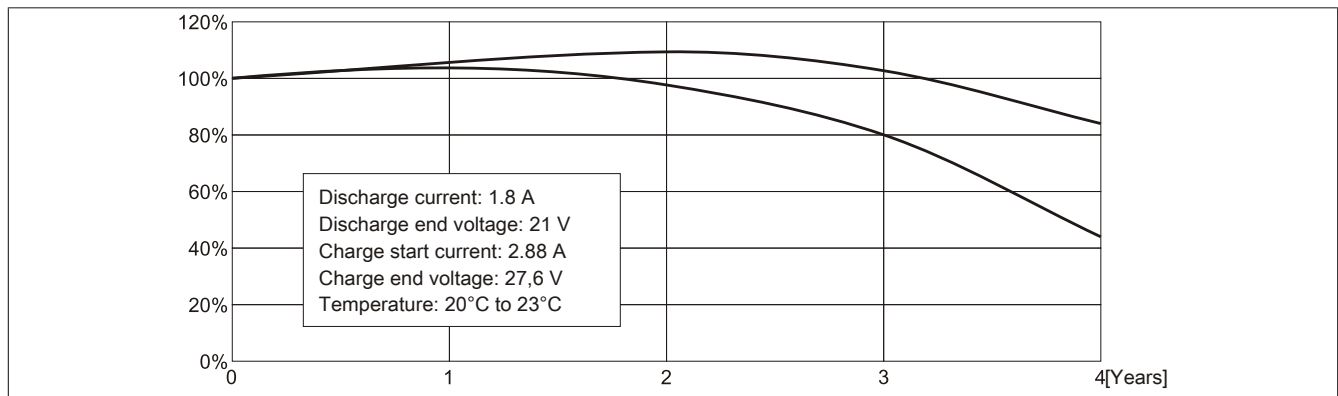
Figure 73: Reduction of rechargeable battery capacity over time

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 = 1.8A (up to Vbatt = 21V) e.g. 200 times and then charged with I = 2.88A, the rated capacity can only be 60% of the 7.2Ah. If it is only 30% discharge, then this procedure can be repeated up to 1200 times. For exact details, see the data sheets for Panasonic batteries (see "LC-R122R2P data sheet" on page 99 and "LC-P127R2P data sheet" on page 100).

Temperature influences have the following effect on the the life-span of the battery.
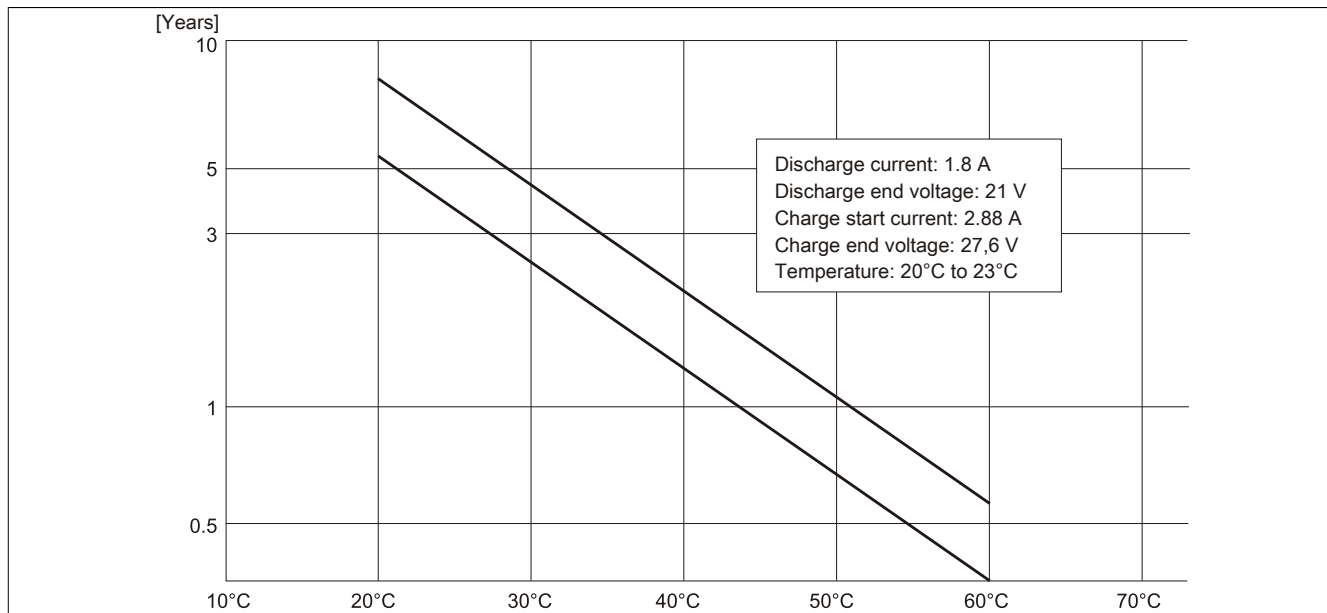
Figure 74: Effect of temperature on the battery life span

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 "LED status indicators" on page 19).

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)

* 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.

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)

Dimensions inch (mm)

Specifications

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

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

Duration of discharge vs. Discharge current (note)

Characteristics

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

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

Figure 75: Panasonic battery LC-R122R2P data sheet

Appendix A

2.9 LC-P127R2P data sheet

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

LC-P127R2P(a)
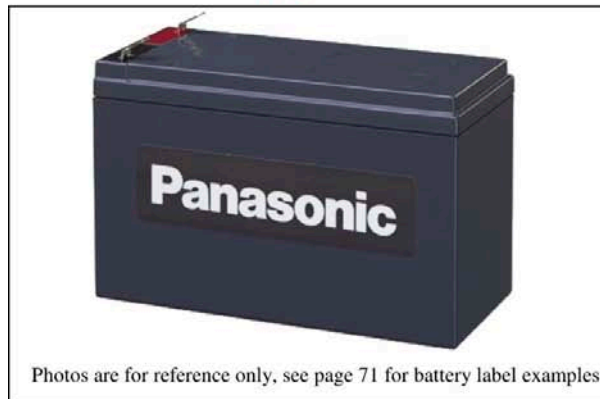
Photos are for reference only, see page 71 for battery label examples.

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

* This product adopts UL94V-0-compliant resin as the material of the battery case. Product color is gray. Optionally, type LC-X127R2P(a) which adopts less-flame-retardant resin complying with UL94HB is also available. Product color is black.

Dimensions inch (mm)

5.945 +0.098/-0.020 (151 +1.5/-0.5)
2.539 +0.098/-0.020 (64.5 +1.5/-0.5)
0.236 (6)
65.15
1.89 (48)
3.701 +0.098/-0.020 (94 +1.5/-0.5)
5.193 (150.2)
0.012 (0.3)
2.508 (63.7)

Specifications

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

Characteristics

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

(Note) The above characteristics data are average values obtained within three charge/discharge Cycles not the minimum values.
(Note) For cycle use of the battery, please contact us in advance.

Discharge characteristics (77°F (25°C)) [note]

Terminal voltage (V): 15.0 14.0 13.0 12.0 11.0 10.0 9.0 8.0 7.0 6.0 5.0
23.04A 11.52A 5.76A 2.88A 1.44A 0.72A 0.36A
(Minute) (Hour)
Discharge time

Duration of discharge vs. Discharge current [note]

Duration of discharge (Hour) / (Minute)
104°F (40°C)
77°F (25°C)
32°F (0°C)
5°F (-15°C)
(mA) (A)
Discharge current

Figure 76: Panasonic battery LC-R127R2P data sheet

2.10 Hawker Cyclon data sheet

The following data sheet contains a section of the battery manufacturer's data sheet.
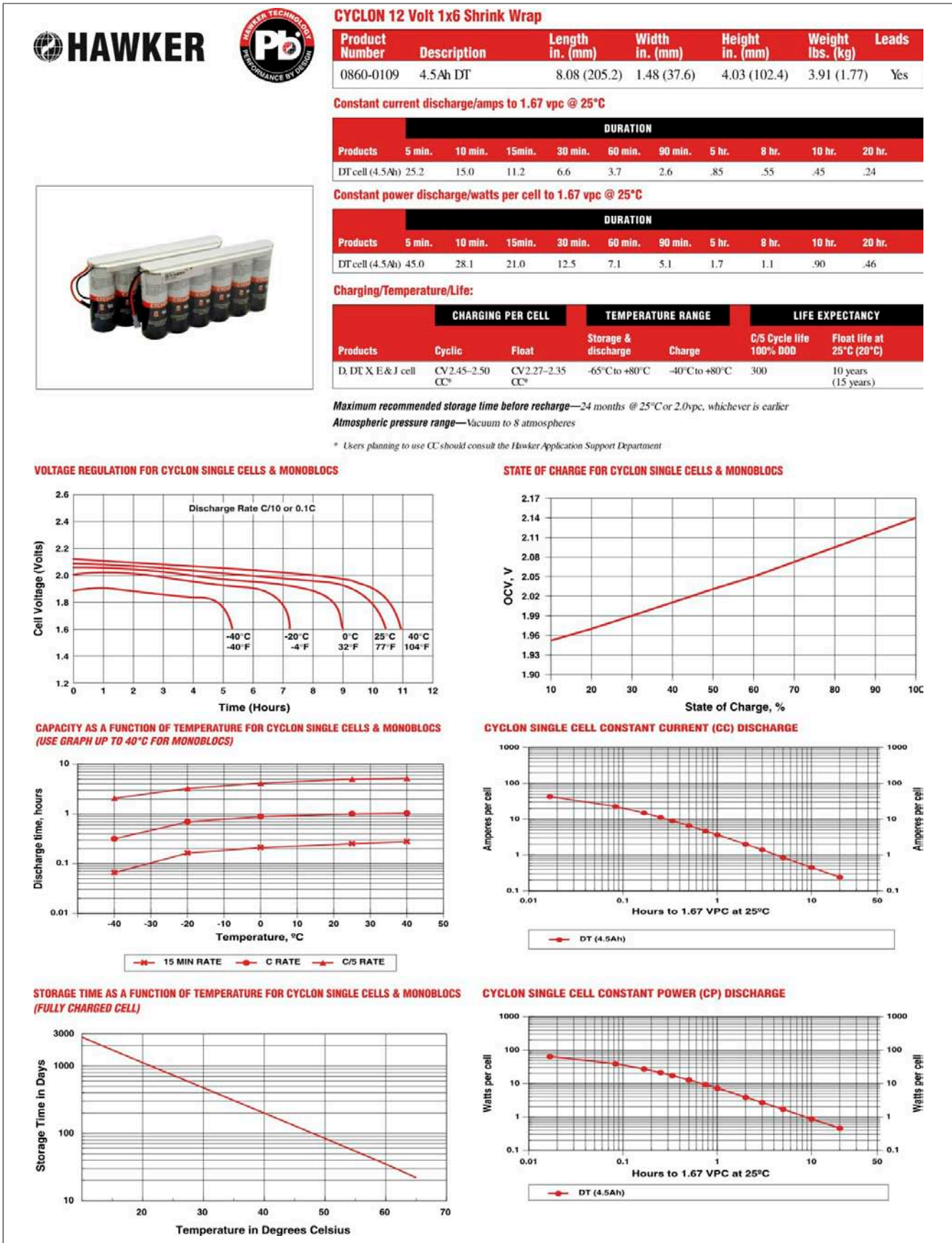
Figure 77: Hawker Cyclon data sheet

3 Overview of UPS parameters

Term	Function
#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 "**B**attery **C**hange **R**equest". This command is used to read the current charging status for the connected battery unit and the current status of the battery unit.
#CCD	An abbreviation for "**B**attery **C**hange **D**own". 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 "**C**harge **T**emperature **H**igh". This command is used to set the maximum allowable charging temperature of the connected battery unit. The battery unit is charged until this temperature is reached.
#CTL	An abbreviation for "**C**harge **T**emperature **L**ow". This command is used to set the lowest allowable charging temperature of the connected battery unit. When the temperature falls below this value, the battery unit is not charged anymore.
#DIB	An abbreviation for "**D**igital **I**nput **B**utton". This command is used to operate the button found on the UPS and the external input button via the software.
#LCS	An abbreviation for "**L**oad **C**urrent **S**et". The charging current for the battery unit can be set using this signal.
#LTL	An abbreviation for "**L**ife **T**ime 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 "**P**ower **F**ail **L**evel". 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 "**P**ower **O**n **T**ime". The first signals from the UPS to the load system are sent once this time has passed.
#RCH	An abbreviation for "**R**emain **C**urrent **H**igh". 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	An abbreviation for "**R**emain **C**urrent **L**ow". 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 "**R**ead **H**igh-grade **D**ischarge **M**easurement Status". This command is used (in UPS firmware versions 2.10 and up) to read the UPS parameters: DIB, LTL, CCD, RCL, RCH and RBS.
#SDT	An abbreviation for "**S**hut **D**own **T**ime". After SDT, the UPS shuts itself down once the DCD signals has been set.
#TWL	An abbreviation for "**T**ime **W**orst **L**ow". TWL is the time that passes between a power failure and sending the signal to shut the load system down.
@whrd	This command is needed to read the timestamp, which is needed for the battery life-span calculation.

Table 77: Overview of UPS parameters

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