

3 CPUs

3.1 GENERAL INFORMATION

The CPU is operated on the BP300 base plate module. It requires two slots. A CPU cannot be used on an expansion unit.

3.2 TECHNICAL DATA



Module ID	CP100	CP104	CP200 / CP210
Model Number	2CP100.60-1	2CP104.60-1	2CP200.60-1/ 2CP210.60-1
Description	2010 CPU, 128 + 256 KB SRAM, 1 RS232 interface, 1 electrically isolated RS232/TTY, 1 electrically isolated RS485/RS422, RS485/RS422: network capable, Order application memory separately!	2010 CPU, 128 + 256 KB SRAM, 1 RS232 interface, 1 electrically isolated RS232/TTY, 1 electrically isolated CAN interface, CAN: network capable, Order application memory separately!	CP200: 2010 CPU, 128 + 2 MB SRAM, 1 RS232 interface, 1 electrically isolated RS232 1 electrically isolated RS485/RS422, 1 electrically isolated CAN interface, RS485/RS422 + CAN: network capable, Order application memory separately! CP210: 2010 CPU, 128 KB+6 MB SRAM, 2x4 KB Cache, MMU+FPU, 1 RS232 interface, 1 electrically isolated RS232, 1 electrically isolated RS485/RS422, 1 electrically isolated CAN interface, RS485/RS422 + CAN: network capable, Order application memory separately!
C-UL-US Listed	Yes	Yes	Yes
Base Plate Module	BP300	BP300	BP300
B&R ID Code	\$20	\$20	\$50 / \$51
Communication	RISC	RISC	RISC

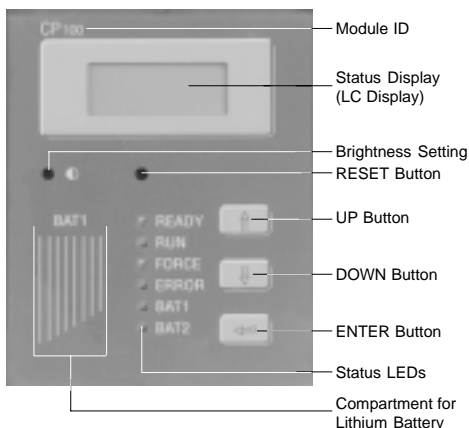
Module ID	CP100	CP104	CP200 / CP210
MMU and FPU	No	No	No / Yes
Command Cycle Time	0.8 μsec	0.8 μsec	0.125 μsec
Dual Ported RAM (DPR)	128 KByte SRAM	128 KByte SRAM	128 KByte SRAM
System RAM	256 KByte SRAM	256 KByte SRAM	2 / 6 MByte SRAM
Cache	No	No	2 *4 KByte
Application Memory (not incl.)	ME910 or ME913		
Real Time Clock Resolution	Nonvolatile, backup battery 10 msec		
RAM Buffering Lithium Battery (in CPU) Gold Foil Capacitor (in CPU) Battery Monitoring	At least 2 years ¹⁾ At least 10 min Yes		
System Bus	Yes		
Key Switch	Yes		
Reset Button	Yes		
Three Configuration Buttons	UP, DOWN, ENTER; can be programmed by user		
Status Display	Alphanumeric LC Display (2 lines with 8 characters each), 6 Status LEDs		
Standard Communication Interfaces			
Application Interface (IF1) Isolation Connection Distance Baudrate	RS232 No 9 pin D-type plug max. 15 m / 19200 Baud max. 64 kBaud		
Application Interface (IF2) Isolation Connection Distance Baudrate	RS232 / TTY ²⁾ Yes 9 pin D-type plug RS232: max. 15 m / 19200 Baud, TTY: max. 300 m max. 64 kBaud		RS232 Yes 9 pin D-type plug max. 15 m / 19200 Baud max. 64 kBaud
Application Interface (IF3) Isolation Connection Distance Baudrate	RS485 / RS422 ²⁾ Yes 9 pin D-type plug max. 1200 m max. 347 kBaud	CAN Yes 9 pin D-type plug max. 1000 m Length 10 - 60 m: 500 kBits/sec Length 100 - 200 m: 250 kBits/sec Length 800 - 1000 m: 50 kBits/sec	RS485 / RS422 ²⁾ Yes 9 pin D-type plug max. 1200 m max. 347 kBaud
Application Interface (IF4) Isolation Connection Distance Baudrate	----	----	CAN Yes 9 pin D-type plug max. 1000 m Length 10 - 60 m: 500 kBits/sec Length 100 - 200 m: 250 kBits/sec Length 800 - 1000 m: 50 kBits/sec
READY Relay Switching Voltage Nominal Maximum Max. Load on Contacts Transient Voltage Protection	Normally open 24 VDC / 230 VAC 30 VDC / 270 VAC 3 A 2 kV External protection required		
FORCE Relay Switching Voltage Nominal Maximum Max. Load on Contacts Transient Voltage Protection	Normally open 24 VDC / 230 VAC 30 VDC / 270 VAC 3 A 2 kV External protection required		
Power Consumption (incl. APM)	max. 10 W		max. 20 / 22,5 W
Storage Temperature	With APM inserted incl. lithium battery: -20 °C to +60 °C		
Dimensions (H, W, D) [mm]	285, 80, 185		

¹⁾ A full battery has to be found in the APM, otherwise the buffer time is reduced to 1 year because the RAM in the APM is also buffered!

²⁾ The interface can be set with software.

3.3 STATUS AREA

The status area contains status LEDs, a 2-digit status display, various buttons and the lithium battery compartment.



3.3.1 Status LEDs

READY	The CPU is running with no errors.
RUN	The "RUN" LED lights if at least one application task is running. The LED goes out if the PCC is switched into service mode.
FORCE	The "FORCE" LED lights if at least one process variable is set to a defined value (see Function FORCE of the PG2000 Programming System).
ERROR	There is an error on the PCC or undefined status or the CPU was stopped (Service Mode). More information is shown on the LCD display.

BAT1	If this LED is lit, the battery is missing, or the voltage of the battery in the CPU is not enough to buffer the RAM if the PCC is not under power.
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BAT2	If this LED is lit, no lithium battery is available in the APM, or the voltage from the lithium battery is not enough to buffer the RAM if the PCC is not under power.
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The voltage of both batteries are monitored by the system software.

3.3.2 Status Display

The first line on the LCD display contains the versions number of the operating system software and boot type (coldstart - T, warmstart - I) as default (e.g. "V1.21 IN").

During PCC operation, an error number is shown if an error occurs (e.g. "FatalErr", 9100, "SERVICE" etc.). See "PG2000 Software User's Manual" (MASYS2PG-E).

The user has the possibility to freely select the messages that will be shown on the display using a function block (e.g. "POWER/OK" etc.).

The brightness of the LCD display can be set using a small screwdriver (2.5mm).

3.3.3 Configuration Buttons

UP Button

The following Boot modes can be set with the UP button:

1) Coldstart (T)

The **Coldstart** is actually a first initialization of the CPU. The operating system is restarted completely. All modules which are not stored in the application RAM are lost, allocated memory is cleared and the contents of the entire application RAM is deleted. The system structures (all information from the operating system for orderly CPU functionality) is recreated. All variables (inputs, outputs and flags) are initialized with a null value. Tasks found in the user EPROM or stored in the nonvolatile RAM, are started. All existing initialization sub-programs (INIT SPs) are executed.

2) Warmstart (I)

During a **Warmstart**, all battery buffered data (all tasks in the user-RAM, all flags, I/O data, etc.) is restored. This causes all tasks to have the same status as before the INIT (task started or task stopped). All existing initialization sub-programs INIT SPs) are executed.

ENTER Button

The selected boot procedure is executed when the ENTER button is pressed.

Software Evaluation

The three configuration buttons UP, DOWN and ENTER can also be freely programmed by the user and can be accessed in the program. See the "Library Reference Manual" (MASYS2LRM-E) and Section "2.5 Key Switch" in this manual for more information.

3.3.4 Diagnose Mode

If the UP and ENTER buttons are pressed when booting, the system goes into Diagnosis Mode. In Diagnosis Mode, the PCC only boots the operating system software. That means **all application programs are ignored** and are therefore inactive. After booting in Diagnosis Mode, the PCC goes into Service Mode.



After booting in Diagnosis Mode, the PCC can only be booted with a Coldstart or again in Diagnosis Mode (booting with Warmstart is not possible).

3.3.5 Reset Button

The Reset button can be pressed with any pointed object (e.g. a ballpoint pen). By pressing the reset button, a hardware reset is executed, i.e.:

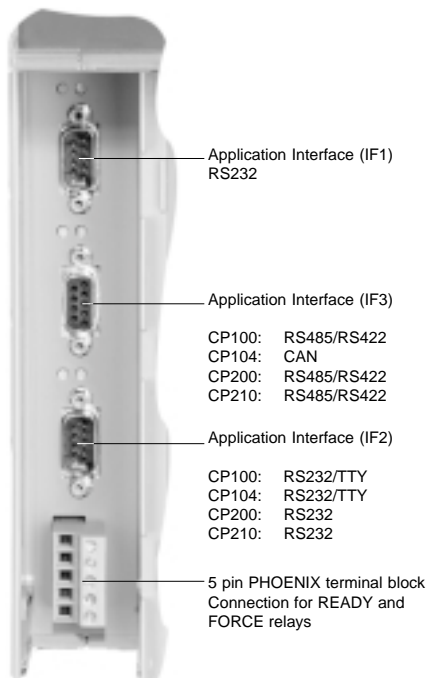
- All user programs are stopped.
- All outputs are set to zero.
- All multiprocessors in the system are also reset.

The PCC then goes into SERVICE mode.

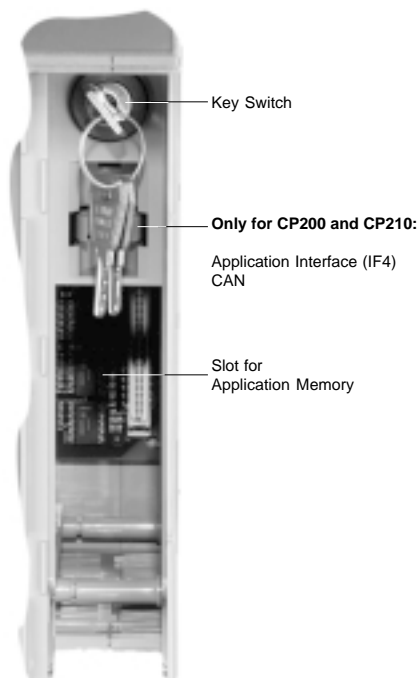
3.4 CONNECTION AREA

Behind the module doors, you can find the serial interfaces (online interface), a terminal block for the FORCE and READY contacts, a key switch and the application memory slot:

Behind Left Module Door



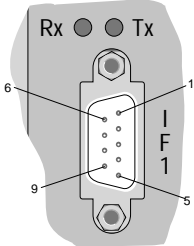
Behind Right Module Door



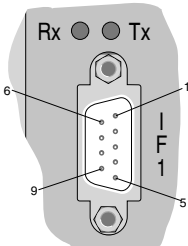
3.5 APPLICATION INTERFACE (IF1)

The non-electrically isolated IF1 application interface is also able to handle fibre optics connection. The fibre optics cable is supplied by a short circuit protected 4.8 V supply voltage (4.8 V \pm 6%, max. 150 mA) on pin 4 of the D-type connector (M).

3.5.1 CP100 und CP104

Interface	Description	Pin Assignments					
Application Interface RS232  9 Pin D-Type Connector (M)	<p>The standard RS232 interface is freely available for the user. IF1 is modem capable.</p> <p>A standard RS232 cable is used for the online connection to PG. This cable is available from B&R:</p> <table><tr><th>Name</th><th>Model Number</th></tr><tr><td>RS232 Cable</td><td>0G0001.00-090</td></tr></table> <p>LEDs above the interface indicate if data is being sent (Tx) or received (Rx).</p> <p>Max. Baudrate: 64 kBaud Max. Cable Length: 15 m</p>	Name	Model Number	RS232 Cable	0G0001.00-090	RS232	
		Name	Model Number				
		RS232 Cable	0G0001.00-090				
		1	DCD	Data Carrier Detect			
		2	RXD	Receive Signal			
		3	TXD	Transmit Signal			
		4	DTR	Data Terminal Ready (+4.8 V / 150 mA)			
		5	GND	Ground			
		6	DSR	Data Set Ready			
		7	RTS	Request To Send			
8	CTS	Clear To Send					
9	RI	Ring Indicator					

3.5.2 CP200 and CP210

Interface	Description	Pin Assignments						
Application Interface RS232  9 Pin D-Type Connector (M)	<p>The standard RS232 interface is freely available for the user. IF1 is modem capable.</p> <p>A standard RS232 cable is used for the online connection to PG. This cable is available from B&R:</p> <table border="1"><thead><tr><th>Name</th><th>Model Number</th></tr></thead><tbody><tr><td>RS232 Cable</td><td>0G0001.00-090</td></tr></tbody></table> <p>LEDs above the interface indicate if data is being sent (Tx) or received (Rx).</p> <p>Max. Baudrate: 64 kBaud Max. Cable Length: 15 m</p>	Name	Model Number	RS232 Cable	0G0001.00-090		RS232	
	Name	Model Number						
	RS232 Cable	0G0001.00-090						
	1	NC						
	2	RXD	Receive Signal					
	3	TXD	Transmit Signal					
	4	DTR	Data Terminal Ready (+4,8 V / 150 mA)					
	5	GND	Ground					
	6	DSR	Data Set Ready					
	7	RTS	Request To Send					
8	CTS	Clear To Send						
9	NC							

3.6 APPLICATION INTERFACE (IF3)

IF3 is a RS485/RS422 or as CAN interface depending on the CPU.

3.6.1 RS485/RS422 Interface (CP100, CP200 and CP210)

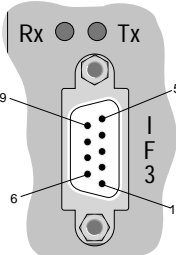
The electrically isolated interface is freely available to the user. The configuration is set with software in the application program.

The 5 V supply is electrically isolated and is used to connect termination resistors (when networking several RS485 interfaces).

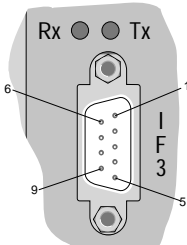
LEDs above the interface indicate if data is being sent (Tx) or received (Rx).

Max. Baudrate: 347 kBaud

Max. Cable Length: 1200 m

Interface	Pin Assignments CP100			Pin Assignments CP200		
		RS485	RS422		RS485	RS422
Application Interface RS485/RS422  9 Pin D-Type Connector (F)	1	NC	NC	1	NC	NC
	2	res.	TXD	2	res.	TXD
	3	DATA	RXD	3	DATA	RXD
	4	NC	NC	4	res.	res.
	5	GND	GND	5	GND	GND
	6	+5 V / 200 mA	+5 V / 200 mA	6	+5 V / 200 mA	+5 V / 200 mA
	7	res.	$\overline{\text{TXD}}$	7	res.	$\overline{\text{TXD}}$
	8	$\overline{\text{DATA}}$	$\overline{\text{RXD}}$	8	$\overline{\text{DATA}}$	$\overline{\text{RXD}}$
	9	NC	NC	9	res.	res.

3.6.2 CAN Interface (CP104)

Interface	Description	Pin Assignments										
<div>Application Interface CAN</div> <div></div> <div>9 Pin D-Type Connector (M)</div>	<p>The interface is electrically isolated. The node number is set with software. The connection is made using a T connector (7AC911.9).</p> <p>The INTEL 82527 processor is used as CAN Controller.</p> <p>Both status LEDs for receive and transmit above the male D-type connector indicate the activity of the CAN bus between controller and optocoupler.</p> <p>Max. Baudrate:</p> <table><tr><td>500 kBit/sec</td><td>Bus Length:</td><td>10 - 60 m</td></tr><tr><td>250 kBit/sec</td><td>Bus Length:</td><td>100 - 200 m</td></tr><tr><td>50 kBit/sec</td><td>Bus Length:</td><td>800 - 1000 m</td></tr></table>	500 kBit/sec	Bus Length:	10 - 60 m	250 kBit/sec	Bus Length:	100 - 200 m	50 kBit/sec	Bus Length:	800 - 1000 m		CAN
	500 kBit/sec	Bus Length:	10 - 60 m									
	250 kBit/sec	Bus Length:	100 - 200 m									
	50 kBit/sec	Bus Length:	800 - 1000 m									
	1	NC										
	2	CAN L										
	3	GND										
	4	NC										
	5	NC										
	6	res.										
7	CAN H											
8	NC											
9	NC											

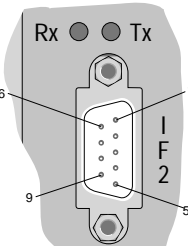
3.7 APPLICATION INTERFACE (IF2)

The electrically isolated interface is freely available to the user. The configuration is set with software in the application program.

LEDs above the interface indicate if data is being sent (Tx) or received (Rx).

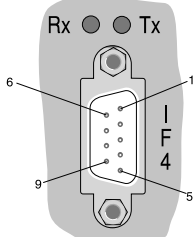
Max. Baudrate: 64 kBaud

Max. Cable Length: RS232: 15 m
 TTY: 300 m ... only for CP100 and CP104!

Interface	Pin Assignments CP100, CP104			Pin Assignments CP200, CP210	
Application Interface RS232/TTY  9 Pin D-Type Connector (M)		RS232	TTY		RS232
	1	res.	TXD	1	res.
	2	RXD	Curr 1	2	RXD
	3	TXD	res.	3	TXD
	4	res.	RXD	4	res.
	5	GND	GND	5	GND
	6	res.	TXD Ret	6	res.
	7	RTS	Curr 2	7	RTS
	8	CTS	res.	8	CTS
	9	res.	RXD Ret	9	res.

3.8 APPLICATION INTERFACE (IF4)

Only the CP200 and CP210 CPUs are equipped with this CAN interface.

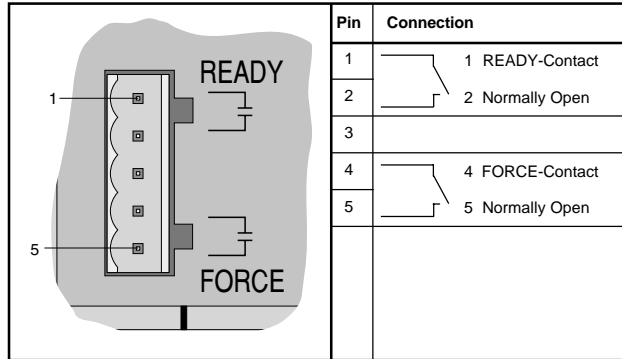
Interface	Description	Pin Assignments										
<div>Application Interface CAN</div> <div></div> <div>9 Pin D-Type Connector (M)</div>	<p>The interface is electrically isolated. The node number is set with software. The connection is made using a T connector (7AC911.9).</p> <p>The INTEL 82527 processor is used as CAN controller.</p> <p>Both status LEDs for receive and transmit above the male D-type connector indicate the activity of the CAN bus between controller and optocoupler.</p> <p>Max. Baudrate:</p> <table><tr><td>500 kBit/sec</td><td>Bus Length:</td><td>10 - 60 m</td></tr><tr><td>250 kBit/sec</td><td>Bus Length:</td><td>100 - 200 m</td></tr><tr><td>50 kBit/sec</td><td>Bus Length:</td><td>800 - 1000 m</td></tr></table>	500 kBit/sec	Bus Length:	10 - 60 m	250 kBit/sec	Bus Length:	100 - 200 m	50 kBit/sec	Bus Length:	800 - 1000 m		CAN
	500 kBit/sec	Bus Length:	10 - 60 m									
	250 kBit/sec	Bus Length:	100 - 200 m									
	50 kBit/sec	Bus Length:	800 - 1000 m									
	1	NC										
	2	CAN L										
	3	GND										
	4	NC										
	5	NC										
	6	res.										
7	CAN H											
8	NC											
9	NC											

3.9 RELAY CONTACTS

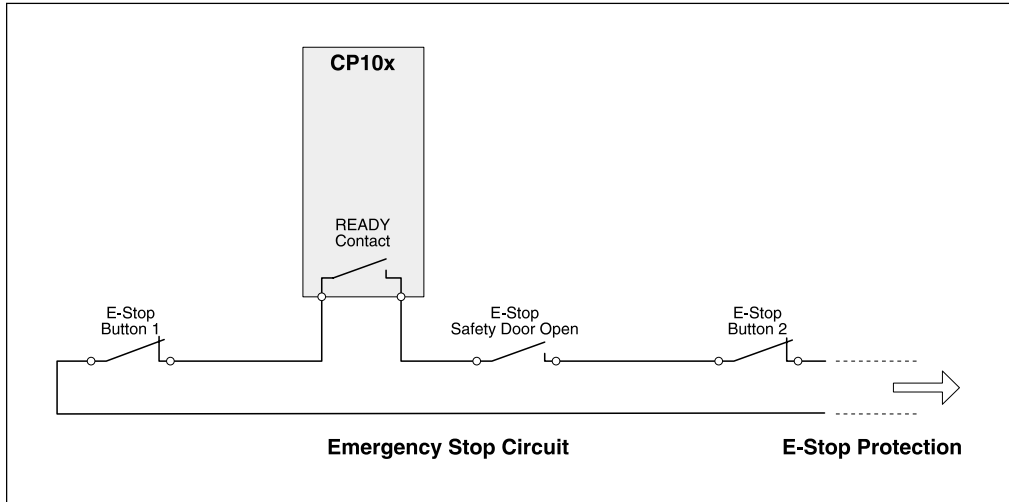
A 5 pin PHOENIX connector can be found behind the left-hand module door which allows for the connection of two relays.

3.9.1 READY Relay

This contact (normally open) can be used for an EMERGENCY STOP function. The relay reacts to a current loss when a reset occurs and when the entire PCC is stopped by the programming system. It can be set or reset by the operating system. Errors which cause the relay to open are defined in the operating system. It is also possible however, to define other errors that should cause the contact to open with the help of function blocks. The relay is linked with the "RUN" status LED on the CPU.



The READY relay contact can be added into the EMERGENCY STOP circuit:

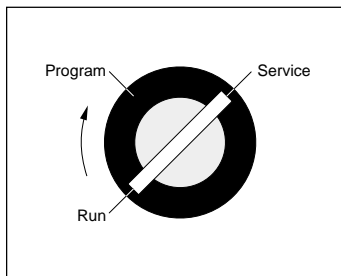


3.9.2 FORCE Relay

The FORCE relay contact is linked with the "FORCED" LED and is closed if at least one process variable is set to a defined value (**FORCE** function in the PG2000 programming system).

3.10 KEY SWITCH

The CP100 CPU has a three position key switch (The following description refers to version 1.10 and higher of the operating system PCC software.):



Run

In this position it is not possible to transfer application programs to the CPU or to influence running applications from the programming system. The user only has limited status functions (reading and writing variables).

The UP/DOWN keys are inactive. The PCC can only be stopped by pressing the RESET key.

If the key is in this position during power-on, all tasks which are held in the application EPROM or application RAM are started.

Program Programs in the CPU can be started, stopped and deleted from the programming device/PG2000. All status function of the programming system are available for the user.

The MODE/SELECT keys are active. The PCC can be stopped by pressing the RESET key. Positions **Run** and **Program** can be switched between at any time while the PCC is running.

If the key switch is in this position at power-on, all tasks which are held in the application EPROM or application RAM are started.

Service If this position is switched to during PCC operations, the PCC is rebooted with a RESET, i.e. application programs are stopped and the all outputs are set to zero. Then the PCC goes into SERVICE mode. Only the system software runs in SERVICE mode, all application programs are inactive.

If the key switch is set to **Program** during PCC operation, the PCC reboots with the INIT boot mode (see section "Configuration Buttons").

If the key switch is in this position at power-on, the PCC goes automatically to SERVICE mode.

3.11 PROGRAMMING

The CPU is programmed using the programming system. Several programming languages are available:

- ☐ STL (statement list)
- ☐ LAD (ladder diagram)
- ☐ PL2000 (structured text)

3.12 RAM BUFFERING

3.12.1 General Information

RAM buffering backs up Application RAM, Dual Ported RAM and System RAM. When power to the PCC is lost, the lithium battery in the CPU or the application memory supplies the RAM in the CPU and APM.

3.12.2 Buffer Possibilities

RAM (program and data memory) is buffered by ...

- ... a lithium battery in the application memory module
- ... a lithium battery in the CPU
- ... a gold foil capacitor (during battery change)

3.12.3 Buffer Times

The following table contains an overview of buffer times if a full battery is being used.

Full Battery in		RAM Buffer Times
CPU	APM	
		10 min. with charged gold foil capacitor
	●	1 year for RAM in both modules
●		1 year for RAM in both modules
●	●	2 years for RAM in both modules

3.12.4 Battery Monitoring

The battery voltage is monitored cyclically. The cyclic load test does not shorten the battery life significantly but serves to give an early warning of weakened battery capacity.

The status information "Battery OK" is available from the B&R-TRAP function "SYS_battery".

3.13 CHANGING THE LITHIUM BATTERY

The lithium battery is found under the battery cover BAT1 near the status display.

Lithium Battery: 3 V / 950 mAh
Model Number: 0AC201.9 (5 lithium batteries)

Storage Time: Max. 3 years at 30 °C (86° F)
Relative Humidity: 0 to 95 % (non-condensing)

The design of the product allows batteries to be changed regardless of whether the PCC is under power or not. However in some countries, changing batteries under operating power is not allowed. For this reason, B&R recommends batteries be changed when the PCC is not under power.

When changing the battery without power, the gold foil capacitor in the CPU and/or the lithium battery in the application memory supplies the RAM.

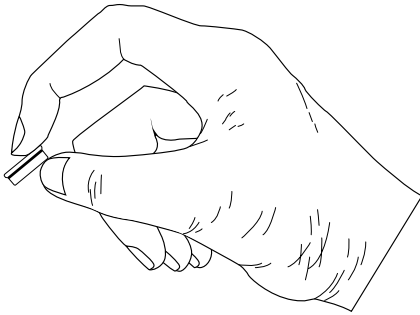
If application memory is not inserted, the following points are to be considered:

- To guarantee that the gold foil capacitor is charged, the PCC must be turned on for at least 5 minutes without interruption before changing the battery.
- After shutting down the system, the battery must be changed within 10 minutes.

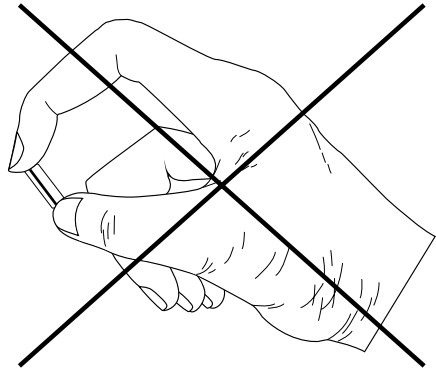
Procedure for Changing a Battery

- 1) Remove voltage to power supply
- 2) Discharge electrostatic energy by touching the mounting rail or the ground connection (not in the power supply!).
- 3) Open lithium battery cover and hold open
- 4) Pull the battery from the compartment using the removal ribbon
- 5) Remove lithium battery (do not use uninsulated tools to remove battery-> short circuit). The battery is only allowed to be held on the flat sides. Insulated tools can also be used to remove the battery.

Right:



Wrong:



- 6) Insert new battery with correct polarity (don't forget to replace removal strip)
- 7) Close battery cover
- 8) Replace voltage to power supply



Lithium batteries are considered hazardous waste! Please dispose of batteries according to the guidelines in your area.

