

X20CP158x and X20CP358x

1 General information

Based on state-of-the-art Intel® ATOM™ processor technology, X20 CPUs cover a wide spectrum of requirements. They can be implemented in solutions ranging from standard applications to those requiring the highest levels of performance.

The series starts with Intel® ATOM™ processor 333 MHz compatible models – X20CP1583 and X20CP3583. With an optimum price/performance ratio, it has the same basic features as all of the larger CPUs.

The basic model includes USB, Ethernet, POWERLINK V1/V2 and replaceable CompactFlash card. The standard Ethernet interface is capable of handling communication in the gigabit range. For improved real-time network performance, the onboard POWERLINK interface supports poll response chaining mode (PRC).

In addition, there are up to three multi-purpose slots for additional interface modules.

- Intel® ATOM™ 1600/1000/600 Performance with integrated I/O processor
- Entry-level CPU is Intel® ATOM™ 333 MHz-compatible with integrated I/O processor
- Ethernet, POWERLINK V1/V2 with poll response chaining and onboard USB
- 1 or 3 slots for modular interface expansion
- CompactFlash as removable application memory
- Up to 512 MB DDR2-SRAM according to performance requirements
- CPU redundancy possible
- Fanless
- Extremely compact

2 Order data - X20CP158x



Model number	Short description
	X20 CPUs
X20CP1583	X20 CPU, ATOM 333 MHz compatible, 128 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, 1 X20TB12 terminal block, slot cover and X20 locking plate (right) X20AC0SR1 included, order application memory separately.
X20CP1584	X20 CPU, ATOM 0.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, 1 X20TB12 terminal block, slot cover and X20 locking plate (right) X20AC0SR1 included, order application memory separately.
X20CP1585	X20 CPU, ATOM 1.0 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, 1 X20TB12 terminal block, slot cover and X20 locking plate (right) X20AC0SR1 included, order application memory separately.
X20CP1586	X20 CPU, ATOM 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, 1 X20TB12 terminal block, slot cover and X20 locking plate (right) X20AC0SR1 included, order application memory separately.
	Required accessories
	CompactFlash-cards
0CFCRD.0128E.01	CompactFlash 128 MB WD extended temp.
0CFCRD.0512E.01	CompactFlash 512 MB WD extended temp.
0SDMIC.0512E.01	Micro SD Card 512MB extended Temp.
5CFCRD.016G-06	CompactFlash 16 GB B&R (SLC)
5CFCRD.0512-06	CompactFlash 512 MB B&R (SLC)
5CFCRD.1024-06	CompactFlash 1 GB B&R (SLC)
5CFCRD.2048-06	CompactFlash 2 GB B&R (SLC)
5CFCRD.4096-06	CompactFlash 4 GB B&R (SLC)
5CFCRD.8192-06	CompactFlash 8 GB B&R (SLC)
	Optional accessories
	Batteries
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect the cells against short circuit. For emergency information, call RENATA SA at +41 61 319 28 27.
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell

Table 1: X20CP1583, X20CP1584, X20CP1585, X20CP1586 - Order data

Included in delivery

Model number	Short description
4A0006.00-000	Backup battery (see also section 20 "Exchanging the lithium battery")
-	Interface module slot covers
X20AC0SR1	X20 locking plate, right
X20TB12	X20 terminal block, 12-pin, 24 V keyed

Table 2: X20 CPUs - Contents of delivery

3 Technical data - X20CP158x

Product ID	X20CP1583	X20CP1584	X20CP1585	X20CP1586
Short description				
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V1/V2), 2x USB, 1x X2X Link			
System module	CPU			
General information				
Cooling	Fanless			
B&R ID code	0xD45B	0xC370	0xC3AE	0xC3B0
Status indicators	CPU function, overtemperature, Ethernet, POWERLINK, CompactFlash, battery			
Diagnostics				
Battery	Yes, using status LED and software	Yes, with status LED and software status	Yes, using status LED and software	Yes, with status LED and software status
CPU function	Yes, using status LED			
CompactFlash	Yes, using status LED			
Ethernet	Yes, using status LED			
POWERLINK	Yes, using status LED			
Overtemperature	Yes, using status LED			
CPU redundancy possible	No			
ACOPOS capability	Yes			
Visual Components support	Yes			
Power consumption without interface module and USB	8.2 W	8.6 W	8.8 W	9.7 W
Internal power consumption of the X2X Link and I/O supply ¹⁾				
Bus	1.42 W			
Internal I/O	0.6 W			
Additional power dissipation caused by the actuators (resistive) [W]	-			
Electrical isolation				
IF1 - IF2	Yes			
IF1 - IF3	Yes			
IF1 - IF4	No			
IF1 - IF5	No			
IF1 - IF6	Yes			
IF2 - IF3	Yes			
IF2 - IF4	Yes			
IF2 - IF5	Yes			
IF2 - IF6	Yes			
IF3 - IF4	Yes			
IF3 - IF5	Yes			
IF3 - IF6	Yes			
IF4 - IF5	No			
IF4 - IF6	Yes			
IF5 - IF6	Yes			
PLC - IF1	No			
PLC - IF2	Yes			
PLC - IF3	Yes			
PLC - IF4	No			
PLC - IF5	No			
PLC - IF6	Yes			
Certification				
CE	Yes			
cULus	Yes			
ATEX Zone 2	Yes			
KC	-		Yes	
GL	Yes			
GOST-R	Yes			
CPU and X2X Link supply				
Input voltage	24 VDC -15% / +20%			
Input current	Max. 1.5 A			
Fuse	Integrated, cannot be replaced			
Reverse polarity protection	Yes			
X2X Link supply output				
Nominal output power	7.0 W ²⁾			
Parallel operation	Yes ³⁾			
Redundant operation	Yes			
Input I/O supply				
Input voltage	24 VDC -15% / +20%			
Fuse	Required line fuse: Max. 10 A, slow-blow			
Output I/O supply				
Rated output voltage	24 VDC			
Permitted contact load	10.0 A			
Supply - General information				
Status indicators	Overload, operating status, module status, RS232 data transfer			

Table 3: X20CP1583, X20CP1584, X20CP1585, X20CP1586 - Technical data

X20CP158x and X20CP358x

Product ID	X20CP1583	X20CP1584	X20CP1585	X20CP1586
Diagnostics	Yes, using status LED			
RS232 data transfer	Yes, using status LED and software	Yes, with status LED and software status	Yes, using status LED and software	Yes, with status LED and software status
Module run/error	Yes, using status LED and software	Yes, with status LED and software status	Yes, using status LED and software	Yes, with status LED and software status
Overload	Yes, using status LED and software	Yes, with status LED and software status	Yes, using status LED and software	Yes, with status LED and software status
Electrical isolation	No			
I/O feed - I/O supply	Yes			
CPU/X2X Link feed - CPU/X2X Link supply	Yes			
Controller				
CompactFlash slot	1			
Real-time clock	Nonvolatile, 1 s resolution, -10 to 10 ppm accuracy at 25°C			
FPU	Yes			
Processor	ATOM™ E620T ATOM™ E640T Atom™ E680T			
Type	333 MHz 0.6 GHz 1.0 GHz 1.6 GHz			
Clock frequency	333 MHz 0.6 GHz 1.0 GHz 1.6 GHz			
L1 cache	24 kB			
Data code	32 kB			
Program code	512 kB			
L2 cache	-			
Integrated I/O processor	Processes I/O data points in the background			
Modular interface slots	1			
Remanent variables	Max. 64 kB ⁴⁾	Max. 256 kB ⁴⁾		Max. 1 MB ⁴⁾
Shortest task class cycle time	800 µs	400 µs	200 µs	100 µs
Typical instruction cycle time	001 µs	0.0075 µs	00044 µs	0.0027 µs
Data buffering	Yes			
Battery monitoring	Min. 2 years at 23°C ambient temperature			
Lithium battery	Min. 2 years at 23°C ambient temperature			
Standard memory	128 MB DDR2 SDRAM 256 MB DDR2 SDRAM 512 MB DDR2 SDRAM			
RAM	128 MB DDR2 SDRAM 256 MB DDR2 SDRAM 512 MB DDR2 SDRAM			
User RAM	1 MB SRAM ⁵⁾			
Interfaces				
IF1 interface	RS232			
Signal	Connection made using 12-pin X20TB12 terminal block			
Design	900 m			
Max. distance	Max. 115.2 kbit/s			
Transfer rate	Max. 115.2 kbit/s			
IF2 interface	Ethernet			
Signal	1x shielded RJ45 port			
Design	Max. 100 m between two stations (segment length)			
Cable length	10/100/1000 Mbit/s			
Transfer rate	10/100/1000 Mbit/s			
Transmission	10 BASE-T/100 BASE-TX/1000 BASE-T			
Physical interfaces	10 BASE-T/100 BASE-TX/1000 BASE-T			
Half-duplex	Yes			
Full-duplex	Yes			
Autonegotiation	Yes			
Auto-MDI / MDIX	Yes			
IF3 interface	POWERLINK (V1/V2) managing or controlled node			
Fieldbus	Type 4 ⁶⁾ Type 4 ⁷⁾ Type 4 ⁶⁾ Type 4 ⁷⁾			
Type	Type 4 ⁶⁾ Type 4 ⁷⁾ Type 4 ⁶⁾ Type 4 ⁷⁾			
Design	1x shielded RJ45 port			
Cable length	Max. 100 m between two stations (segment length)			
Transfer rate	100 Mbit/s			
Transmission	100 BASE-TX			
Physical interfaces	100 BASE-TX			
Half-duplex	Yes			
Full-duplex	No			
Autonegotiation	Yes			
Auto-MDI / MDIX	Yes			
IF4 interface	USB 1.1/2.0			
Type	USB 1.1/2.0			
Design	Type A			
IF5 interface	USB 1.1/2.0			
Type	USB 1.1/2.0			
Design	Type A			
IF6 interface	X2X Link master			
Fieldbus	X2X Link master			
Operating conditions				
Mounting orientation	Yes			
Horizontal	Yes			
Vertical	Yes			

Table 3: X20CP1583, X20CP1584, X20CP1585, X20CP1586 - Technical data

Product ID	X20CP1583	X20CP1584	X20CP1585	X20CP1586
Installation at elevations above sea level 0 to 2000 m >2000 m	No limitations Reduction of ambient temperature by 0.5°C per 100 m			
EN 60529 protection	IP20			
Environmental conditions				
Temperature Operation Horizontal installation Vertical installation Derating Storage Transport	-25 to 60°C -25 to 50°C See section "Derating" -40 to 85°C -40 to 85°C			
Relative humidity Operation Storage Transport	5 to 95%, non-condensing 5 to 95%, non-condensing 5 to 95%, non-condensing			
Mechanical characteristics				
Note	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery
Dimensions Width Height Depth	150 mm 99 mm 85 mm			
Weight	400 g			

Table 3: X20CP1583, X20CP1584, X20CP1585, X20CP1586 - Technical data

- 1) The specified values are maximum values. The exact calculation is included as a data sheet in the module documentation and can be downloaded from the B&R website.
- 2) When operated at temperatures above 55°C, a derating of the rated output current to 5 W for the X2X Link supply must be taken into consideration.
- 3) In parallel operation, only 75% of the rated power can be assumed. It is important to make sure that all power supplies operating in parallel are switched on and off at the same time.
- 4) Can be configured in Automation Studio.
- 5) 1 MB SRAM minus the configured remanent variables.
- 6) See the POWERLINK help system under "General information, Hardware - IF/LS".
- 7) See the POWERLINK online help documentation under "General information, Hardware - IF/LS".

4 Order data - X20CP358x



Model number	Short description
	X20 CPUs
X20CP3583	X20 CPU, ATOM 333 MHz compatible, 128 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, 1 X20TB12 terminal block, slot covers and X20 locking plate (right) X20AC0SR1 included, order application memory separately.
X20CP3584	X20 CPU, ATOM 0.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000BASE-T, 1 POWERLINK interface, incl. supply module, 1 terminal block, slot cover and X20 locking plate (right) included, order application memory separately.
X20CP3585	X20 CPU, ATOM 1.0 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000BASE-T, 1 POWERLINK interface, incl. supply module, 1 terminal block, slot cover and X20 locking plate (right) included, order application memory separately.
X20CP3586	X20 CPU, ATOM 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000BASE-T, 1 POWERLINK interface, incl. supply module, 1 terminal block, slot cover and X20 locking plate (right) included, order application memory separately.
	Required accessories
	CompactFlash-cards
0CFCRD.0128E.01	CompactFlash 128 MB WD extended temp.
0CFCRD.0512E.01	CompactFlash 512 MB WD extended temp.
0SDMIC.0512E.01	Micro SD Card 512MB extended Temp.
5CFCRD.016G-06	CompactFlash 16 GB B&R (SLC)
5CFCRD.0512-06	CompactFlash 512 MB B&R (SLC)
5CFCRD.1024-06	CompactFlash 1 GB B&R (SLC)
5CFCRD.2048-06	CompactFlash 2 GB B&R (SLC)
5CFCRD.4096-06	CompactFlash 4 GB B&R (SLC)
5CFCRD.8192-06	CompactFlash 8 GB B&R (SLC)
	Optional accessories
	Batteries
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect the cells against short circuit. For emergency information, call RENATA SA at +41 61 319 28 27.
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell

Table 4: X20CP3583, X20CP3584, X20CP3585, X20CP3586 - Order data

Included in delivery

Model number	Short description
4A0006.00-000	Backup battery (see also section 20 "Exchanging the lithium battery")
-	Interface module slot covers
X20AC0SR1	X20 locking plate, right
X20TB12	X20 terminal block, 12-pin, 24 V keyed

Table 5: X20 CPUs - Contents of delivery

5 X20CP358x - Technical data

Product ID	X20CP3583	X20CP3584	X20CP3585	X20CP3586
Short description				
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V1/V2), 2x USB, 1x X2X Link			
System module	CPU			
General information				
Cooling	Fanless			
B&R ID code	0xD45C	0xC3AD	0xC3AF	0xBF2B
Status indicators	CPU function, overtemperature, Ethernet, POWERLINK, CompactFlash, battery			
Diagnostics	Yes, using status LED and software			
Battery	Yes, using status LED			
CPU function	Yes, using status LED			
CompactFlash	Yes, using status LED			
Ethernet	Yes, using status LED			
POWERLINK	Yes, using status LED			
Overtemperature	Yes, using status LED			
CPU redundancy possible	No	Yes		
ACOPOS capability	Yes			
Visual Components support	Yes			
Power consumption without interface module and USB	8.2 W	8.6 W	8.8 W	9.7 W
Internal power consumption of the X2X Link and I/O supply ¹⁾				
Bus	1.42 W			
Internal I/O	0.6 W			
Additional power dissipation caused by the actuators (resistive) [W]	-			
Electrical isolation				
IF1 - IF2	Yes			
IF1 - IF3	Yes			
IF1 - IF4	No			
IF1 - IF5	No			
IF1 - IF6	Yes			
IF2 - IF3	Yes			
IF2 - IF4	Yes			
IF2 - IF5	Yes			
IF2 - IF6	Yes			
IF3 - IF4	Yes			
IF3 - IF5	Yes			
IF3 - IF6	Yes			
IF4 - IF5	No			
IF4 - IF6	Yes			
IF5 - IF6	Yes			
PLC - IF1	No			
PLC - IF2	Yes			
PLC - IF3	Yes			
PLC - IF4	No			
PLC - IF5	No			
PLC - IF6	Yes			
Certification				
CE	Yes			
cULus	Yes			
ATEX Zone 2	Yes			
KC	-		Yes	
GL	Yes			
GOST-R	Yes			
CPU and X2X Link supply				
Input voltage	24 VDC -15% / +20%			
Input current	Max. 1.5 A			
Fuse	Integrated, cannot be replaced			
Reverse polarity protection	Yes			
X2X Link supply output				
Nominal output power	7.0 W ²⁾			
Parallel operation	Yes ³⁾			
Redundant operation	Yes			
Input I/O supply				
Input voltage	24 VDC -15% / +20%			
Fuse	Required line fuse: Max. 10 A, slow-blow			
Output I/O supply				
Rated output voltage	24 VDC			
Permitted contact load	10.0 A			
Supply - General information				
Status indicators	Overload, operating status, module status, RS232 data transfer			

Table 6: X20CP3583, X20CP3584, X20CP3585, X20CP3586 - Technical data

X20CP158x and X20CP358x

Product ID	X20CP3583	X20CP3584	X20CP3585	X20CP3586
Diagnostics	RS232 data transfer Module run/error Overload Yes, using status LED Yes, using status LED and software Yes, using status LED and software			
Electrical isolation	I/O feed - I/O supply CPU/X2X Link feed - CPU/X2X Link supply No Yes			
Controller				
CompactFlash slot	1			
Real-time clock	Nonvolatile, 1 s resolution, -10 to 10 ppm accuracy at 25°C			
FPU	Yes			
Processor	Type Clock frequency L1 cache Data code Program code L2 cache ATOM™ E620T 333 MHz 0.6 GHz - 24 kB 32 kB 512 kB ATOM™ E640T 1 GHz Atom™ E680T 1.6 GHz			
Integrated I/O processor	Processes I/O data points in the background			
Modular interface slots	3			
Remanent variables	Max. 64 kB ⁴⁾	Max. 256 kB ⁴⁾		Max. 1 MB ⁴⁾
Shortest task class cycle time	800 µs	400 µs	200 µs	100 µs
Typical instruction cycle time	001 µs	0.0075 µs	0.0044 µs	0.0027 µs
Data buffering	Battery monitoring Lithium battery Yes Min. 2 years at 23°C ambient temperature			
Standard memory	RAM User RAM 128 MB DDR2 SDRAM 256 MB DDR2 SDRAM 1 MB SRAM ⁵⁾ 512 MB DDR2 SDRAM			
Interfaces				
IF1 interface	Signal Design Max. distance Transfer rate RS232 Connection made using 12-pin X20TB12 terminal block 900 m Max. 115.2 kbit/s Max. 1152 kbit/s			
IF2 interface	Signal Design Cable length Transfer rate Transmission Physical interfaces Half-duplex Full-duplex Autonegotiation Auto-MDI / MDIX Ethernet 1x shielded RJ45 port Max. 100 m between two stations (segment length) 10/100/1000 Mbit/s 10 BASE-T/100 BASE-TX/1000 BASE-T Yes Yes Yes Yes			
IF3 interface	Fieldbus Type Design Cable length Transfer rate Transmission Physical interfaces Half-duplex Full-duplex Autonegotiation Auto-MDI / MDIX POWERLINK (V1/V2) managing or controlled node Type 4 ⁶⁾ 1x shielded RJ45 port Max. 100 m between two stations (segment length) 100 Mbit/s 100 BASE-TX Yes No Yes Yes			
IF4 interface	Type Design USB 1.1/2.0 Type A			
IF5 interface	Type Design USB 1.1/2.0 Type A			
IF6 interface	Fieldbus X2X Link master			
Operating conditions				
Mounting orientation	Horizontal Vertical Yes Yes			
Installation at elevations above sea level	0 to 2000 m >2000 m No limitations Reduction of ambient temperature by 0.5°C per 100 m			

Table 6: X20CP3583, X20CP3584, X20CP3585, X20CP3586 - Technical data

Product ID	X20CP3583	X20CP3584	X20CP3585	X20CP3586
EN 60529 protection	IP20			
Environmental conditions				
Temperature				
Operation				
Horizontal installation	-25 to 60°C			
Vertical installation	-25 to 50°C			
Derating	See section "Derating"			
Storage	-40 to 85°C			
Transport	-40 to 85°C			
Relative humidity				
Operation	5 to 95%, non-condensing			
Storage	5 to 95%, non-condensing			
Transport	5 to 95%, non-condensing			
Mechanical characteristics				
Note	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery		
Dimensions				
Width	200 mm			
Height	99 mm			
Depth	85 mm			
Weight	470 g			

Table 6: X20CP3583, X20CP3584, X20CP3585, X20CP3586 - Technical data

- 1) The specified values are maximum values. The exact calculation is included as a data sheet in the module documentation and can be downloaded from the B&R website.
- 2) When operated at temperatures above 55°C, a derating of the rated output current to 5 W for the X2X Link supply must be taken into consideration.
- 3) In parallel operation, only 75% of the rated power can be assumed. It is important to make sure that all power supplies operating in parallel are switched on and off at the same time.
- 4) Can be configured in Automation Studio.
- 5) 1 MB SRAM minus the configured remanent variables.
- 6) See the POWERLINK help system under "General information, Hardware - IF/LS".

6 X20 CPUs - Status LEDs

Figure	LED	Color	Status	Description
	R/E	Green	On	Application running
			Blinking	Boot mode system start: CPU initializing the application, all bus systems and I/O modules ¹⁾
		Red	On	SERVICE mode
			Blinking	The "R/E" LED blinks red and the "RDY/F" LED blinks yellow when there is a license violation.
			Double flash	BOOT mode (during firmware update) ¹⁾
		RDY/F	Yellow	On
	Blinking			The "RDY/F" LED blinks yellow and the "R/E" LED blinks red when there is a license violation.
	S/E	Green/Red		Status/Error LED. The statuses of this LED are described in section 6.1 ""S/E" LED".
	PLK	Green	On	A link to the POWERLINK peer station has been established.
			Blinking	A link to the POWERLINK peer station has been established. The LED blinks when Ethernet activity is taking place on the bus.
	ETH	Green	On	A link to the peer station has been established.
			Blinking	A link to the peer station has been established. Indicates Ethernet activity is taking place on the bus.
	CF	Green	On	CompactFlash inserted and detected
		Yellow	On	CompactFlash read/write access
DC	Yellow	On	CPU power supply OK	
	Red	On	Backup battery empty	

Table 7: X20 CPUs - CPU status indicators

1) The process can take several minutes depending on the configuration.

6.1 "S/E" LED

The Status/Error LED is a green/red dual LED. The LED status can have different meanings depending on the operating mode.

6.1.1 Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Green - Status	Description
On	Operates the interface as an Ethernet interface

Table 8: Status/Error LED - Ethernet operating mode

6.1.2 POWERLINK V1

Status LED		Status of the POWERLINK node
Green	Red	
On	Off	The POWERLINK node is running with no errors.
Off	On	A system error has occurred. The error type can be read using the PLC logbook. An irreparable problem has occurred. The system cannot properly carry out its tasks. This state can only be changed by resetting the module.
Blinking alternately		The POWERLINK managing node has failed. This error code can only occur when operated as a controlled node. This means that the configured node number lies within the range 0x01 - 0xFD.
Off	Blinking	System failure. The red blinking LED signals an error code (see section 6.2 "System failure error codes").
Off	Off	Module is: <ul style="list-style-type: none"> Off Starting up Not configured correctly in Automation Studio Defective

Table 9: Status/Error LED - POWERLINK V1 operating mode

6.1.3 POWERLINK V2

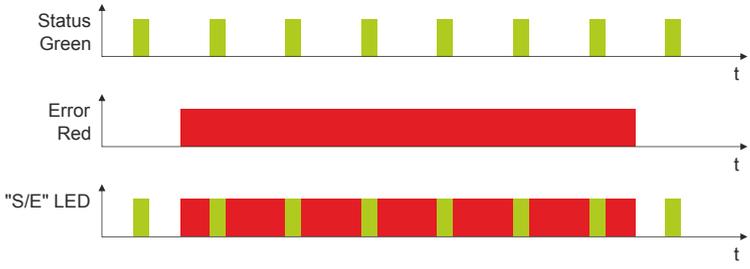
Red - Error	Description
On	<p>The module is in an error mode (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED:</p> <ul style="list-style-type: none"> • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE  <p>Note: The LED blinks red several times immediately after startup. This is not an error.</p>

Table 10: Status/Error LED as Error LED - POWERLINK operating mode

Green - Status	Description
Off	<p>Mode The module is in NOT_ACTIVE mode or:</p> <ul style="list-style-type: none"> • Switched off • Starting up • Not configured correctly in Automation Studio • Defective <p>Managing node (MN) The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the defined time frame (timeout), then the module will immediately enter PRE_OPERATIONAL_1 mode. If POWERLINK communication is detected before the time expires, however, then the MN will not be started.</p> <p>Controlled node (CN) The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the defined time frame (timeout), then the module will immediately enter BASIC_ETHERNET mode. If POWERLINK communication is detected before this time passes, however, then the module will immediately go into PRE_OPERATIONAL_1 mode.</p>
Green flickering (approx. 10 Hz)	<p>Mode The module is in BASIC_ETHERNET mode. The interface is being operated as an Ethernet TCP/IP interface.</p> <p>Managing node (MN) This state can only be changed by resetting the module.</p> <p>Controlled node (CN) If POWERLINK communication is detected while in this state, the module will transition to the PRE_OPERATIONAL_1 state.</p>
Single flash (approx. 1 Hz)	<p>Mode The module is in PRE_OPERATIONAL_1 mode.</p> <p>Managing node (MN) The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place.</p> <p>Controlled node (CN) The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then transitions to the PRE_OPERATIONAL_2 state. An LED lit red in this state indicates a failure of the MN.</p>
Double flash (approx. 1 Hz)	<p>Mode The module is in PRE_OPERATIONAL_2 mode.</p> <p>Managing node (MN) The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state.</p> <p>Controlled node (CN) The module can be configured by the MN in this state. A command then changes the state to READY_TO_OPERATE. An LED lit red in this mode indicates a failure of the MN.</p>
Triple flash (approx. 1 Hz)	<p>Mode The module is in the READY_TO_OPERATE state.</p> <p>Managing node (MN) Cyclic and asynchronous communication. The received PDO data is ignored.</p> <p>Controlled node (CN) The module configuration is complete. Normal cyclic and asynchronous communication. The PDO data sent corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. An LED lit red in this mode indicates a failure of the MN.</p>

Table 11: Status/Error LED as Status LED - POWERLINK operating mode

Green - Status	Description
On	Mode The module is in PRE_OPERATIONAL_2 mode. PDO mapping is active and cyclic data is being evaluated.
Blinking (approx. 2.5 Hz)	Mode The module is in STOPPED mode. Managing node (MN) This status is not possible for the MN. Controlled node (CN) No output data is produced or input data supplied. It is only possible to enter or leave this mode after the MN has given the appropriate command.

Table 11: Status/Error LED as Status LED - POWERLINK operating mode

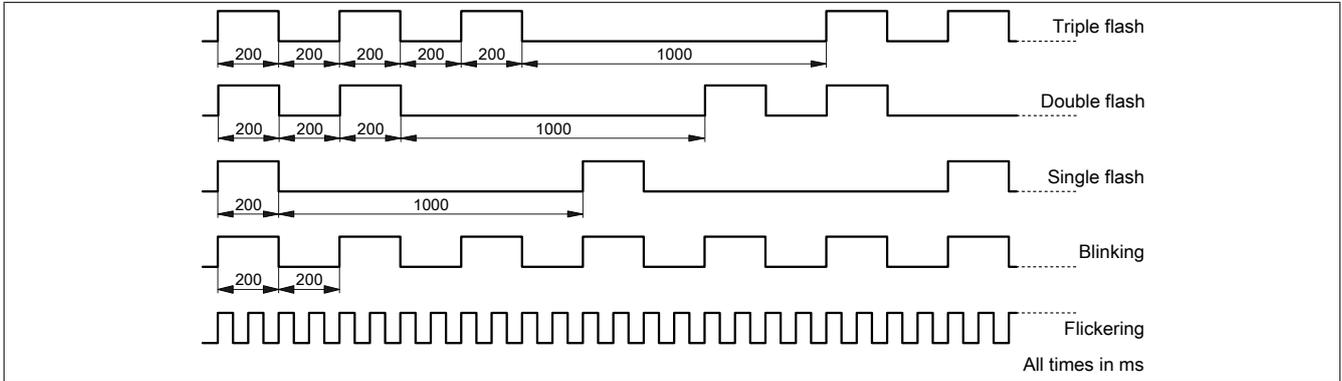


Figure 1: LED status indicators - Blinking patterns

6.2 System failure error codes

Incorrect configuration or defective hardware can cause a system failure error code.

The error code is indicated by the red Error LED using four switch-on phases. The switch-on phases have a duration of either 150 ms or 600 ms. The error code is output cyclically every 2 seconds.

Error description	Error code indicated by red status LED									
RAM error: The module is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The module or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 12: Status/Error ("S/E") LED - System failure error codes

Key:
 • ... 150 ms
 - ... 600 ms
 Pause ... 2 second delay

7 LED status indicators for the integrated power supply

Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	RESET mode
			Blinking	PREOPERATIONAL mode
			On	RUN mode
	e	Red	Off	No power to module or everything OK
			Double flash	LED indicates one of the following states: <ul style="list-style-type: none"> • The X2X Link supply for the power supply is overloaded • I/O supply too low • Input voltage for X2X Link supply too low
	e + r	Red on / Green single flash	Invalid firmware	
	S	Yellow	Off	No RS232 activity
			On	The LED lights up when data is being sent or received via the RS232 interface.
	l	Red	Off	The X2X Link supply is within the valid limits
On			The X2X Link supply for the power supply is overloaded	

Table 13: X20 CPUs - LED status indicators for the integrated power supply

8 Operating and connection elements

X20CP158x

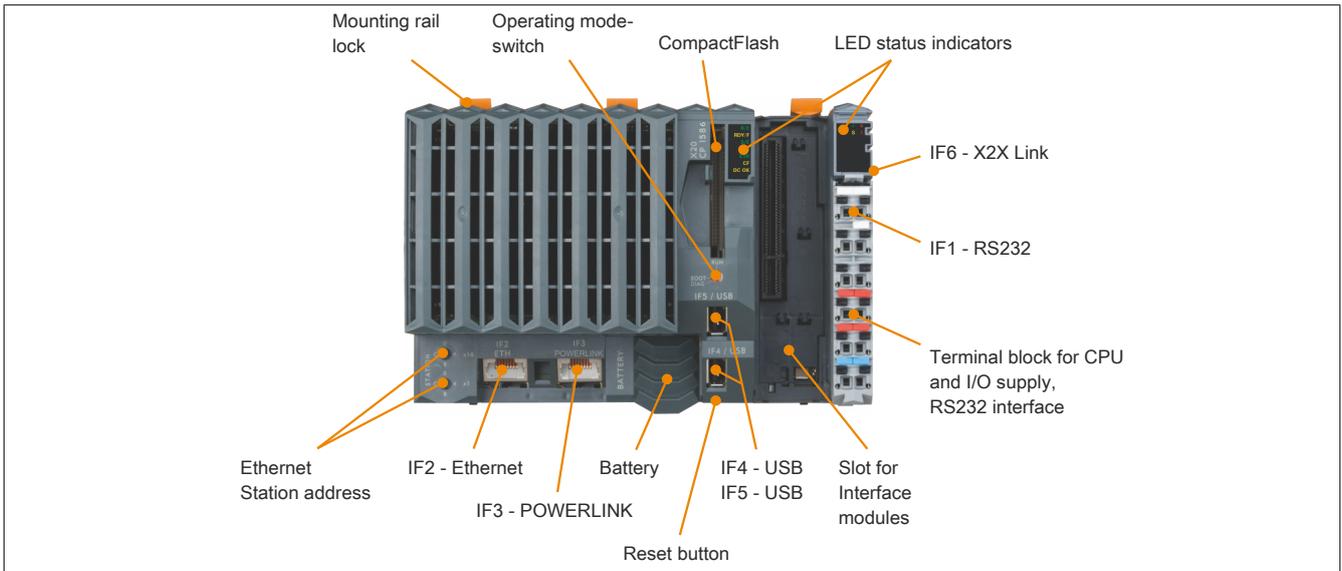


Figure 2: X20 CPUs - Operating elements for X20CP158x

X20CP358x

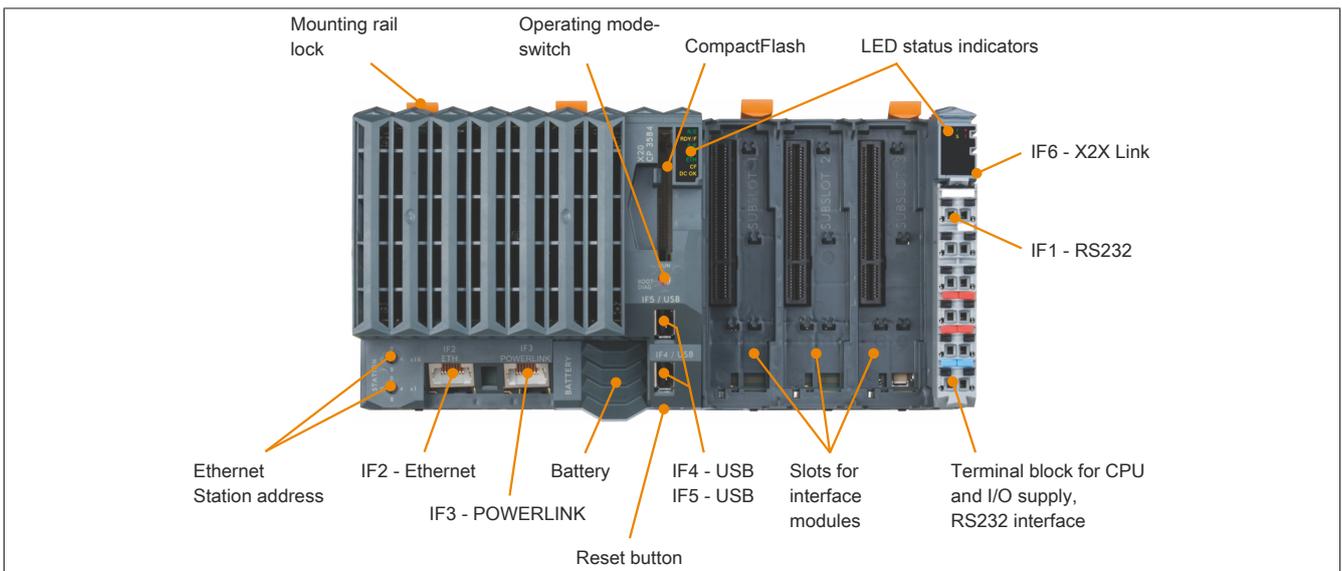


Figure 3: X20 CPUs - Operating elements for X20CP358x

9 Slot for application memory

These CPUs require application memory in order to operate. The application memory is provided in the form of a CompactFlash card. It is not included with the CPUs, but must be ordered separately as an accessory.

Information:

The CompactFlash card must not be removed during operation.

10 Operating mode switch

The operating mode switch is used to set the operating mode.



Figure 4: X20 CPUs - Operating mode switch

Switch position	Operating mode	Description
BOOT	BOOT	When the switch is in this position, the default B&R Automation Runtime (AR) system is started and the runtime system can be installed via the online interface (B&R Automation Studio). User flash memory is deleted only after the download begins.
RUN	RUN	RUN mode
DIAG	DIAGNOSE	Boots the CPU in diagnostic mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostic mode, the CPU always boots with a cold restart.

Table 14: X20 CPUs - Operating modes

11 Reset button

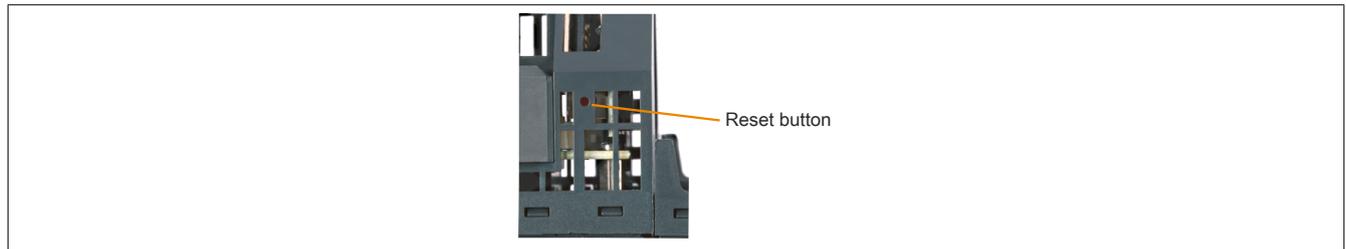


Figure 5: X20CPUs - Reset button

The reset button is located below the USB interfaces on the bottom of the housing. It can be pressed with any small pointed object (e.g. paper clip). Pressing the reset button triggers a hardware reset, which means:

- All application programs are stopped.
- All outputs are set to zero.

The PLC then boots into Service mode by default. The boot mode that follows after pressing the reset button can be defined in Automation Studio.

12 CPU supply

A power supply is integrated in the X20 CPUs. It has a feed for the CPU, the X2X Link and the internal I/O supply. Supply for the CPU and X2X Link is electrically isolated.

Pinout

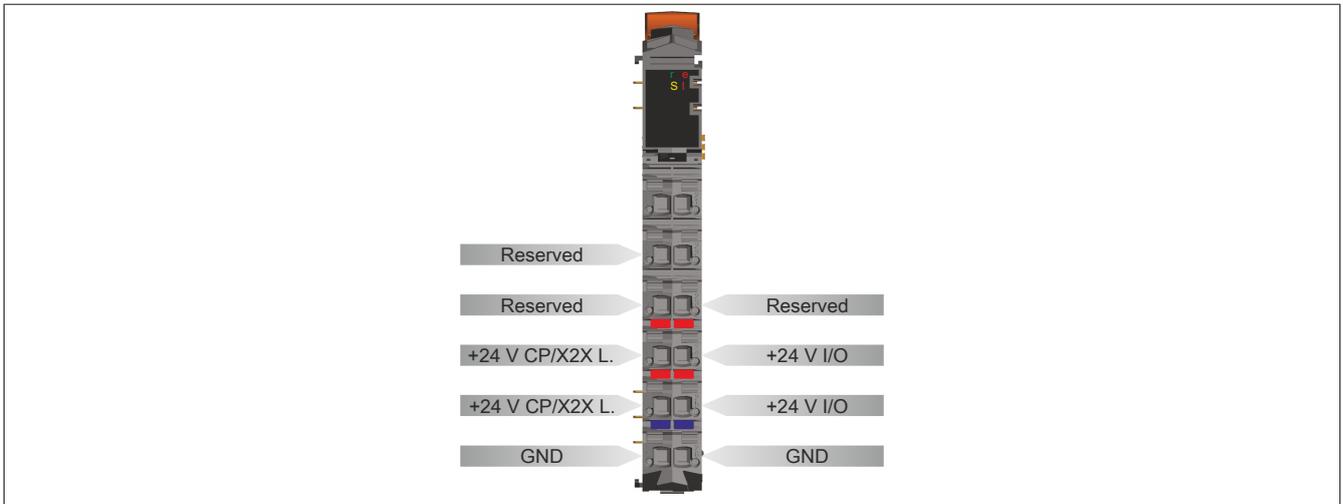


Figure 6: X20 CPUs - Pinout of the integrated power supply

Connection examples

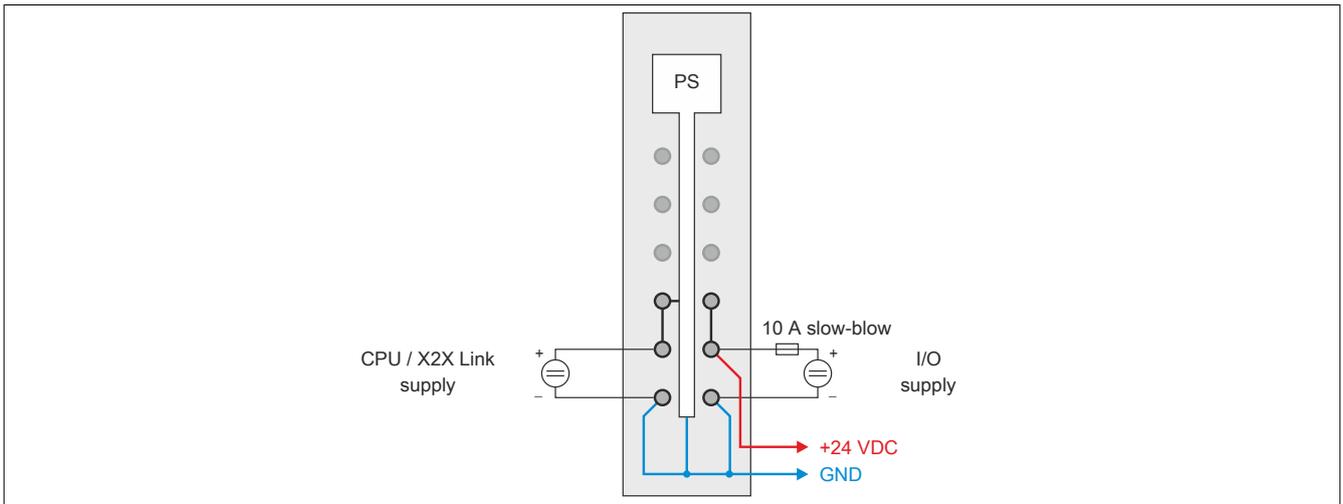


Figure 7: Connection example with 2 separate supplies

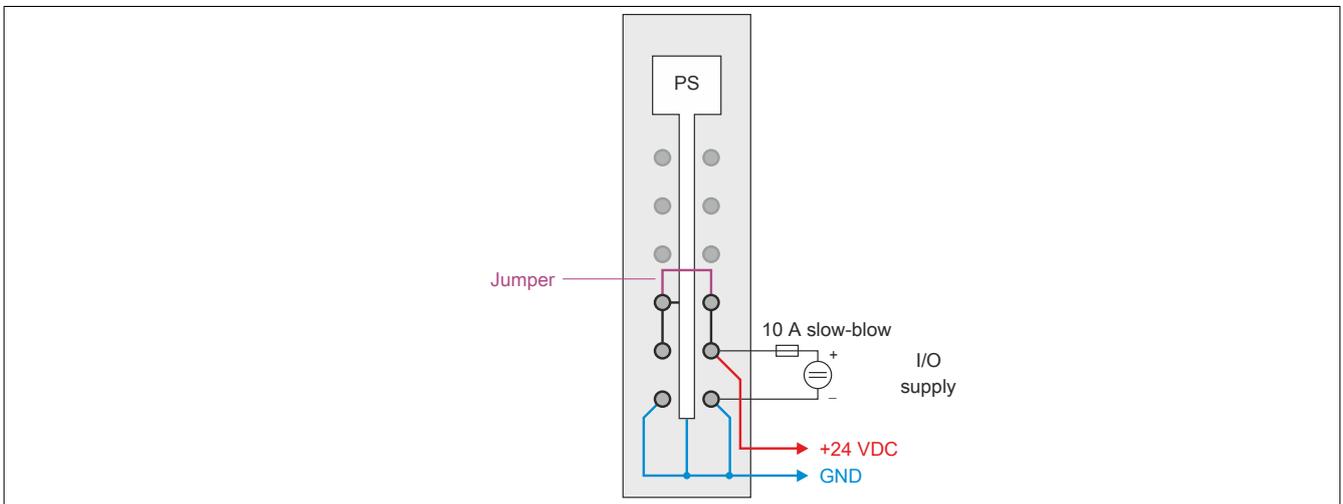


Figure 8: Connection example with a supply and jumper

13 RS232 interface (IF1)

The non-electrically isolated RS232 interface is primarily intended to serve as an online interface for communication with the programming device.

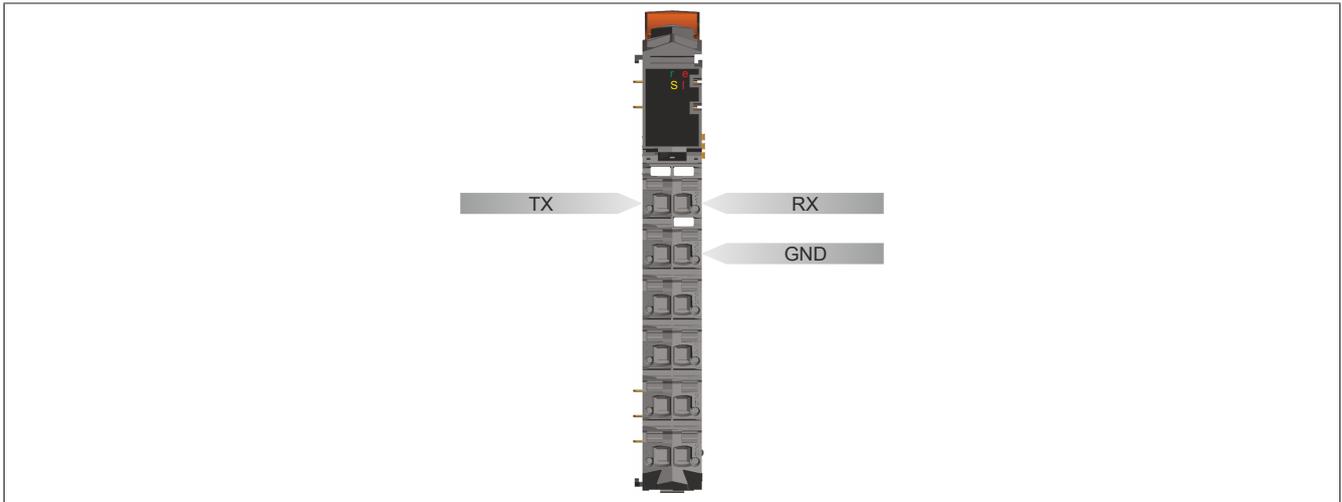


Figure 9: X20 CPUs - Pinout of the RS232 interface (IF1)

14 Ethernet interface (IF2)

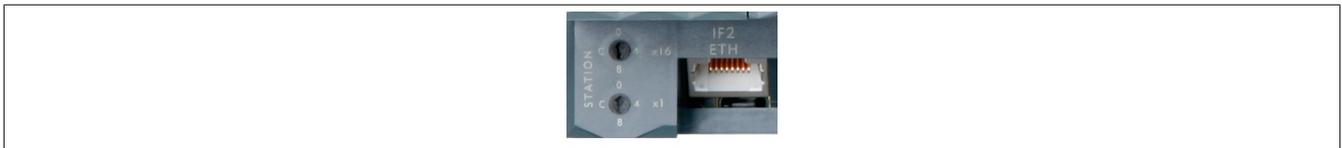


Figure 10: X20 CPUs - Ethernet interface (IF2)

The IF2 is executed as the 10 BASE-T / 100 BASE-TX / 1000 BASE-T gigabit Ethernet interface.

The INA2000 station number of the Ethernet interface is set using the two hex switches.

Information about cabling X20 modules with an Ethernet interface can be found on the B&R website in the module's download section at www.br-automation.com.

Information:

The Ethernet interface (IF2) is not suitable for POWERLINK (see 15 "POWERLINK interface (IF3)").

Pinout

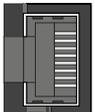
Interface	Pinout		
	Pin	Ethernet	
 Shielded RJ45 port	1	D1+	Data 1+
	2	D1-	Data 1-
	3	D2+	Data 2+
	4	D3+	Data 3+
	5	D3-	Data 3-
	6	D2-	Data 2-
	7	D4+	Data 4+
	8	D4-	Data 4-

Table 15: Pinout for RJ45 port

15 POWERLINK interface (IF3)

POWERLINK V1

Switch position	Description
0x00	Operation as managing node.
0x01 - 0xFD	Node number of the POWERLINK node. Operation as controlled node.
0xFE - 0xFF	Reserved, switch position not permitted

Table 16: POWERLINK V1 - Node numbers

POWERLINK V2

Switch position	Description
0x00	Reserved, switch position not permitted
0x01 - 0xEF	Node number of the POWERLINK node. Operation as a controlled node.
0xF0	Operation as a managing node.
0xF1 - 0xFF	Reserved, switch position not permitted

Table 17: POWERLINK node number

Ethernet mode

In this mode, the interface is operated as an Ethernet interface. The INA2000 station number can be set using the B&R Automation Studio software.

Pinout



Information about cabling X20 modules with an Ethernet interface can be found on the B&R website in the module's download section at www.br-automation.com.

Pin	Assignment
1	RxD
2	RxD\
3	TxD
4	Termination
5	Termination
6	TxD\
7	Termination
8	Termination

Table 18: X20 CPUs - Pinout for POWERLINK interface (IF3)

16 USB interfaces (IF4 and IF5)



Figure 11: X20 CPUs - USB interfaces (IF4 and IF5)

IF4 and IF5 are USB interfaces. The connection is made using a USB 1.1/2.0 interface.

The USB interfaces can only be used for devices approved by B&R (e.g. floppy disk drive, DiskOnKey or dongle).

Information:

USB interfaces cannot be used for online communication with a programming device.

17 Slots for interface modules

The CPUs have one or three slots for interface modules.

Various bus and network systems can easily be integrated into the X20 system by selecting the corresponding interface module.

18 Overtemperature cutoff

To prevent damage, the CPU is cut off and reset when the processor reaches 110°C or the circuit board reaches 95°C.

The following errors are entered in the logbook:

Error number	Error description
9204	WARNING: System halted because of temperature check
9210	WARNING: Boot by watchdog or manual reset

Table 19: X20 CPUs - Logbook entries after overtemperature cutoff

19 Data / Real-time clock buffering

The CPUs are buffered by a backup battery. The following areas are buffered:

- Remanent variables
- User RAM
- System RAM
- Real-time clock

Battery monitoring

The battery voltage is checked cyclically. The cyclic load test of the battery does not considerably shorten the battery life, instead it gives an early warning of weakened buffer capacity.

The status information "Battery OK" is available from the system library function "BatteryInfo" and the CPU's I/O mapping.

Replacement interval for battery

The battery should be replaced every 4 years. The replacement intervals recommended by B&R reflect the batteries' average service life and operating conditions. It does not represent the maximum buffer duration.

20 Exchanging the lithium battery

The CPUs have a lithium battery. The lithium battery is found in a separate compartment on the bottom of the module and protected by a cover.

Backup battery data

Model number	
4A0006.00-000	1 pcs.
0AC201.91	4 pcs.
Short description	Lithium battery, 3 V / 950 mAh, button cell
Storage temperature	-20 to 60°C
Storage time	Max. 3 years at 30°C
Relative humidity	0 to 95%, non-condensing

Table 20: X20 CPUs - Backup battery data

Important information about the battery exchange

The product design allows the battery to be changed with the PLC switched either on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on. To prevent data loss, the battery must be changed within 1 min. with the power off.

Warning!

The battery must be replaced by a Typ CR2477N Renata battery only. The use of another battery may present a risk of fire or explosion.

The battery may explode if handled improperly. Do not recharge, disassemble or dispose of in fire.

Procedure for exreplacing the battery

1. Touch the mounting rail or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
2. Remove the cover for the lithium battery. Do this by sliding it down and away from the CPU.



Figure 12: X20 CPUs - Remove lithium battery cover

3. Remove the battery from the holder (do not use pliers or uninsulated tweezers -> risk of short circuiting). The battery should not be held by its edges. **Insulated** tweezers may also be used to remove the battery.

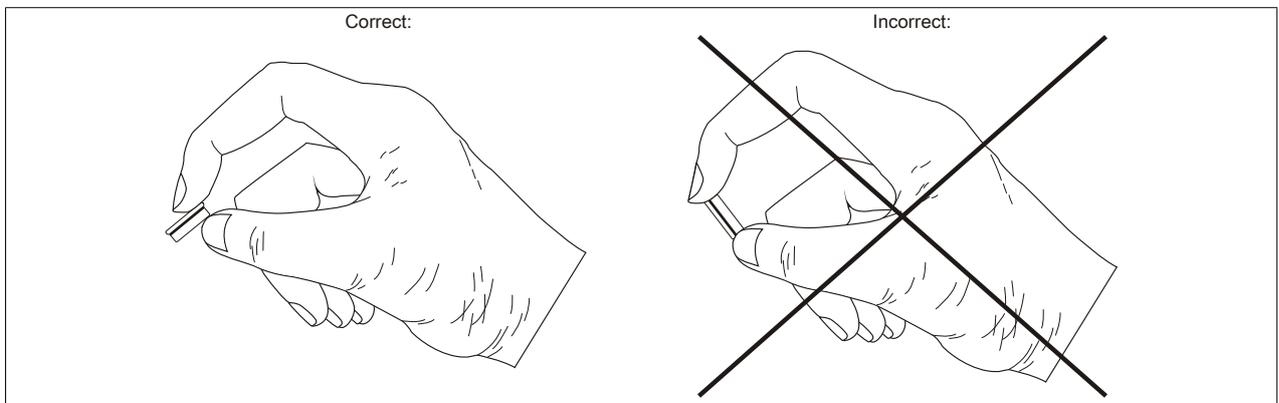


Figure 13: X20 CPUs - Correct grip for the battery

4. Insert the new battery with the correct polarity. To do this, lay the battery with the "+" side up on the right part of the battery holder under the USB interface IF4. Then secure the battery in the holder by pressing above the left part of the battery holder.
5. Replace the cover.

Information:

Lithium batteries are considered hazardous waste. Used batteries should be disposed of in accordance with applicable local regulations.

21 Programming the system flash memory

General information

In order for the application project to be executed on the CPU, the Automation Runtime operating system, the system components and the application project must be installed on the CompactFlash card.

Creating a CompactFlash using a USB card reader

The easiest way to perform an initial installation is by creating a fully programmed CompactFlash card using a USB card reader.

1. Creating and configuring a project in Automation Studio
2. In Automation Studio, select **Tools / Create CompactFlash**
3. In the dialog box that opens, select a CompactFlash card and then generate it
4. Insert the finished CompactFlash into the CPU and turn on the CPU's supply voltage
5. CPU booting

For details about commissioning: See help system under "Automation Software / Getting Started"

Installation over an online connection

The CPUs are delivered with a default B&R Automation Runtime system (with limited functions) already installed. This runtime system is started in Boot mode (operating mode switch in the BOOT position or no CompactFlash / invalid CompactFlash inserted). It initializes the Ethernet interface and onboard serial RS232 interface, making it possible to download a new runtime system.

1. Insert the CompactFlash card and switch on the power to the CPU. When the switch is in the BOOT position, a new or invalid CompactFlash card starts the CPU with the default B&R Automation Runtime system.
2. Establish a physical online connection between the programming device (PC or industrial PC) and the CPU (e.g. over an Ethernet network or the RS232 interface).
3. Before you can establish an online connection via Ethernet, the CPU must be assigned an IP address. In Automation Studio, select **Settings** from the Online menu and then click on the **Browse targets** button to search for B&R target systems on the local network. The CPU should appear in the list. If the CPU has not already received an IP address from a DHCP server, right-click on it and select **Set IP parameters** from the shortcut menu. All necessary network configurations can be made on a temporary basis in this dialog box (should be identical to the settings defined in the project).
4. Configure online connection in B&R Automation Studio. For details about the configuration: See help system under "Automation Software / Communication / Online communication"
5. Start the download procedure by selecting the **Services** command from the **Project** menu. Then select **Transfer Automation Runtime** from the pop-up menu. Now follow the instructions provided by B&R Automation Studio.

22 Information regarding switching from X20CPx48x to X20CPx58x

- A hardware upgrade is required for some X20 IFxxxx interface modules. This can be installed from Automation Studio by selecting **Tools/Upgrades** from the menu.

In addition, some modules specify a specific hardware revision. The following table provides an overview:

Model number	Minimum upgrade version	Minimum hardware revision
X20IF1020	1.1.5.1	H0
X20IF1030	1.1.5.1	I0
X20IF1041-1	-	-
X20IF1043-1	-	-
X20IF1051-1	-	-
X20IF1053-1	-	-
X20IF1061	-	E0
X20IF1061-1	-	-
X20IF1063	1.1.5.0	-
X20IF1063-1	-	-
X20IF1065	-	-
X20IF1072	1.0.5.1	-
X20IF1082	1.2.2.0	-
X20IF1082-2	1.2.1.0	-
X20IF1086-2	1.1.1.0	-
X20IF1091	1.0.5.1	-
X20IF10A1-1	-	-
X20IF10D1-1	-	-
X20IF10D3-1	-	-
X20IF10E1-1	-	-
X20IF10E3-1	-	-
X20IF10G3-1	-	-
X20IF10H3-1	-	-
X20IF2772	1.0.6.1	-
X20IF2792	1.0.5.1	-

Table 21: X20 CPUs - Minimum upgrade version and minimum hardware revision for X20 IFxxxx interface modules

- The X20CPx58x CPUs are supported by B&R Automation Studio V3.0.90.20 and higher.
- If an X20CPx48x is to be replaced by an X20CPx58x in an existing Automation Studio configuration, the X20CPx58x may not be listed as one of the available options even though the upgrade for the CPU has already been installed. If this is the case, it is necessary to upgrade the X20CPx48x.
- Starting with Automation Runtime 4.x, USB devices are integrated in Automation Runtime dynamically so that they no longer need to be configured in Automation Studio. In order to use a USB device, its internal device name needs to be obtained at runtime. For an example, see the Automation Studio help system for the library "AsUSB / Examples".