X20(c)BC0088

1 General information

EtherNet/IP is an Ethernet-based fieldbus. EtherNet/IP was developed by Allen-Bradley (Rockwell Automation) and later transferred to the Open DeviceNet Vendor Association (ODVA) as an open standard. In 1998, a working group at ControlNet International developed a procedure for setting the published Common Industrial Protocol to Ethernet. EtherNet/IP was published in March 2000 as an open industrial automation standard based on this procedure.

This bus controller makes it possible to connect X2X Link I/O nodes to EtherNet/IP. The bus controller can be operated via interface module X20IF10D1-1 or by 3rd-party systems with EtherNet/IP scanner functionality.

- Fieldbus: EtherNet/IP
- Integrated 3-port switch for efficient cabling
- Auto-configuration of I/O modules
- Can be configured by the scanner (master) using configuration assembly
- Web interface
- DHCP-capable
- Configurable I/O cycle (0.5 to 4 ms)
- Minimum fieldbus cycle time (also requested packet interval or RPI): 1 ms

Information:

Only the standard function model (see the respective module description) is supported when the bus controller is used together with multi-function modules it has automatically configured itself.

Automation Studio V4.3 or later can be used to easily create configuration files (e.g. EDS files, binary files). All other function models are also supported by transferring configuration data to the bus controller (e.g. using the scanner via a "configuration assembly").

Automation Studio can be downloaded at no cost from the B&R website (www.br-automation.com). The evaluation license is permitted to be used to create complete configurations for fieldbus bus controllers at no cost.

2 Coated modules

Coated modules are X20 modules with a protective coating for the electronics component. This coating protects X20c modules from condensation and corrosive gases.
The modules' electronics are fully compatible with the corresponding X20 modules.

For simplification purposes, only images and module IDs of uncoated modules are used in this data sheet.

The coating has been certified according to the following standards:

- Condensation: BMW GS 95011-4, 2x 1 cycle
- Corrosive gas: EN 60068-2-60, method 4, exposure 21 days

2.1 Starting temperature

The starting temperature describes the minimum permissible ambient temperature when the power is switched off at the time the coated module is switched on. This is permitted to be as low as -40°C. During operation, the conditions as specified in the technical data continue to apply.

Information:

It is important to absolutely ensure that there is no forced cooling by air currents in a closed control cabinet, for example using a fan or ventilation slots.

3 Order data

Model number	Short description	Figure
	Bus controllers	
X20BC0088	X20 bus controller, 1 EtherNet/IP interface, integrated switch, web interface, 2x RJ45, order bus base, power supply module and terminal block separately!	
X20cBC0088	X20 bus controller, coated, 1 EtherNet/IP interface, integrated switch, web interface, 2x RJ45, order bus base, power supply module and terminal block separately!	
	Required accessories	
	System modules for bus controllers	
X20BB80	X20 bus base, for X20 base module (BC, HB, etc.) and X20 power supply module, X20 end plates (left and right) X20AC0SL1/ X20AC0SR1 included	
X20PS9400	X20 power supply module, for bus controller and internal I/O power supply, X2X Link power supply	
X20PS9402	X20 power supply module, for bus controller and internal I/O power supply, X2X Link power supply, supply not electrically isolated	
X20cBB80	X20 bus base, coated, for X20 base module (BC, HB, etc.) and X20 power supply module, X20 end plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20cPS9400	X20 power supply module, coated, for bus controller and internal I/O power supply, X2X Link power supply	
	Terminal blocks	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20BC0088, X20cBC0088 - Order data

4 Technical data

Model number	X20BC0088	X20cBC0088
Short description		
Bus controller	EtherNet/IP adapter (slave)	
General information		
B&R ID code	0x26D8	0xE67F
Status indicators	Module status, network status, bus function	
Diagnostics		
Module status	Yes, using LED status indicator and software	
Bus function	Yes, using LED status indicator and software	
Network status	Yes, using LED status indicator and software	
Power consumption		
Bus	2 W	
Additional power dissipation caused by actuators (resistive) [W]	-	
Certifications		
CE	Yes	
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X	
UL	cULus E115267 Industrial control equipment	
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5	
EAC	Yes	
KC	Yes	-
Interfaces		
Fieldbus	EtherNet/IP adapter (slave)	
Variant	2x shielded RJ45 (switch)	
Cable length	Max. 100 m between 2 stations (segment length)	
Transfer rate	10/100 Mbit/s	
Transfer		
Physical layer	10BASE-T/100BASE-TX	
Half-duplex	Yes	
Full-duplex	Yes	
Autonegotiation	Yes	
Auto-MDI/MDIX	Yes	
Min. cycle time [1)]		
Fieldbus	1 ms	
X2X Link	500 µs	
Synchronization between bus systems possible	No	
Electrical properties		
Electrical isolation	EtherNet/IP isolated from bus and I/O	
Operating conditions		
Mounting orientation		
Horizontal	Yes	
Vertical	Yes	
Installation elevation above sea level		
0 to 2000 m	No limitation	
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m	
Degree of protection per EN 60529	IP20	
Ambient conditions		
Temperature		
Operation		
Horizontal mounting orientation	-25 to 60°C	
Vertical mounting orientation	-25 to 50°C	
Derating	-	
Starting temperature	-	Yes, -40°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	

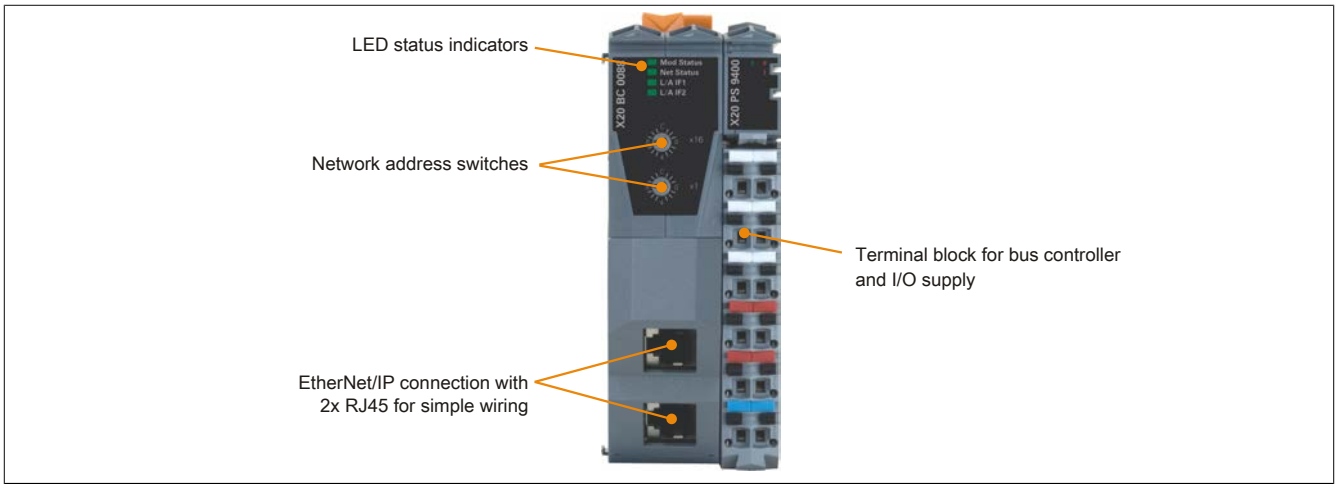
Table 2: X20BC0088, X20cBC0088 - Technical data

Model number	X20BC0088	X20cBC0088
Relative humidity		
Operation	5 to 95%, non-condensing	Up to 100%, condensing
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	
Mechanical properties		
Note	Order 1x terminal block X20TB12 separately. Order 1x power supply module X20PS9400 or X20PS9402 separately. Order 1x bus base X20BB80 separately	Order 1x terminal block X20TB12 separately. Order 1x X20cPS9400 or X20cPS9402 power supply module separately Order 1x X20cBB80 bus base separately
Pitch 2)	37.5 +0.2 mm	

Table 2: X20BC0088, X20cBC0088 - Technical data

1) The minimum cycle time specifies the time up to which the bus cycle can be reduced without communication errors occurring.
2) Pitch is based on the width of bus base X20BB80. In addition, power supply module X20PS9400 or X20PS9402 is always required for the bus controller.

5 Operating and connection elements



5.1 LED status indicators

Figure	LED	Color	Status	Description
	Mod status1)	Green	On	Indicates that there is at least one client connection
			Blinking	Bus controller not yet configured.
			Flickering	HTTP file upload (firmware or configuration file)
		Red	On	Major unrecoverable fault.
			Blinking	Major recoverable fault.
		Green/Red	Blinking	Initialization/Self-test
	Net status1)	Green	On	Indicates at least one established active scanner (master) connection
			Blinking	Indicates no established active scanner (master) connection
			Off	Indicates no IP address has been assigned
		Rot	On	Indicates an IP address has been used more than once
			Blinking	Indicates a timeout on at least one connection
		Green/Red	Blinking	Initialization/Self-test
	L/A IFx	Green	Blinking	Ethernet activity taking place on the RJ45 interface (IF1, IF2) indicated by the respective LED
			On	Indicates an established connection (link), but no communication is taking place
			Off	Indicates that no physical Ethernet connection exists

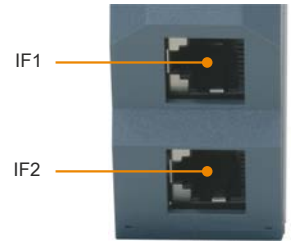
1) The "Mod status" and "Net status" LEDs are green/red dual LEDs.

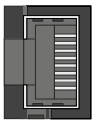
5.2 EtherNet/IP address switching positions

Switch position	Description
0x00	The IP address saved in flash memory is used. The adapter is started via DHCP if attribute 3 (configuration control) of the TCP/IP interface object was set to DHCP.
0x01 to 0x7F	The last position of the IP address saved in flash memory is changed to the address switch value. The IP address saved in flash memory is not changed. All other adapter parameters are read from flash memory and used without being changed.
0x80 to 0xEF	Sets the bus controller to DHCP mode for this range. The DNS server is informed of the current hostname. A hostname is generated according to how the network address switches are set. Example: The generated hostname is made up of three elements: "br" + "eip" + Address switch position (three decimal places) This means, for example, that the following hostname is generated for address switch position 0xD7 (dec. 215): "breip215".
0xF0 to 0xFD	Reserved (same function as position 0xFF).
0xFE	Initializes all bus controller parameters with default values during booting. No values are read from flash memory. The communication parameters correspond to the values assigned with switch setting 0xFF.
0xFF	Initializes all communication parameters with default values. All other bus controller parameters are read from flash memory. Default parameters: • IP address: 192.168.100.1 • Subnet mask: 255.255.255.0 • Gateway: 192,168,100,254 • Primary NetBIOS name: "br" + MAC address • Secondary NetBIOS name: "br" + "eip" + address switch number (decimal) • X2X Link configuration: 1 ms cycle time • X2X Link cable length: 0 m

5.3 Ethernet interface

For information about wiring X20 modules with an Ethernet interface, see section "Mechanical and electrical configuration - Wiring guidelines for X20 modules with Ethernet cables" of the X20 user's manual.



Interface	Pinout		
	Pin	Ethernet	
 Shielded RJ45	1	RXD	Receive data
	2	RXD\	Receive data\
	3	TXD	Transmit data
	4	Termination	
	5	Termination	
	6	TXD\	Transmit data\
	7	Termination	
	8	Termination	

6 Setting the IP address (default value)

Changes to the network address switch are only applied after a restart (power cycle). If the bus controller is restarted with the address switch value 0xFF, it is initialized with IP address 192.168.100.1. This address is also the factory default setting.
This IP address can be used to establish a connection to the bus controller. The internationally unique MAC address is listed on the housing side of the bus controller. The combination of "br" and the MAC address results in a unique name (primary NetBIOS name) that also makes it possible to access the bus controller.

Example of the primary NetBIOS name:

MAC address:	00-60-65-00-49-02
Resulting NetBIOS name:	br006065004902

This means that, without additional parameter changes, either the default IP address 192.168.100.1 or the NetBIOS name "br+MAC" can be used to communicate with the controller.

Since NetBIOS is being used, the bus controller can only be accessed via this name if there are no intermediary routers or gateways in the way.

7 Automatic IP assignment by a DHCP server

If a address switch position between 0x80 and 0xEF is configured, the bus controller will attempt to request an IP address from the DHCP server. The assigned IP address can be queried with a "ping" command together with the hostname. The bus controller registers this hostname on the DHCP server, which should forward it to a DNS server.

Example: The hostname (DNS name) is made up of three elements:
"br" + "eip" + Address switch value (three decimal places).
This means, for example, that the following hostname is generated for address switch setting 0xD7 (dec. 215): "breip215".

If DNS service is not available on the network, the bus controller's two NetBIOS names can also be used for access. The secondary NetBIOS name is identical to the hostname; at address switch value 0x00, it is identical with the primary NetBIOS name. The bus controller can only be reached via its NetBIOS name if no other routers or gateways are in the way.

8 Changing the IP address with the network address switches

The address switches can be used to change the last byte in the IP address configured on the bus controller. The IP address saved in flash memory is not changed. If the address switches are set to 0x00, the bus controller applies the IP address last saved to flash memory. Switch positions between 0x01 and 0x7F cause the last position of the IP address (the lowest byte) to be overwritten by the value of the address switch. This provides the user a quick and easy way to address a large number of bus controllers. In short, an IP address between 192.168.100.1 and 192.168.100.127 can be selected for a bus controller using the address switches without requiring any additional software configuration.

9 Saving an IP address to flash memory

The IP parameters in the flash memory can be changed via the EtherNet/IP protocol or using the Telnet interface (see EtherNet/IP in the user's manual). If the IP address should be set via the TCP/IP object (class 0xF5), then the new address will only be saved to flash if instance attribute 3 (configuration control) of the TCP/IP object is set to 0 (see CIP specification).