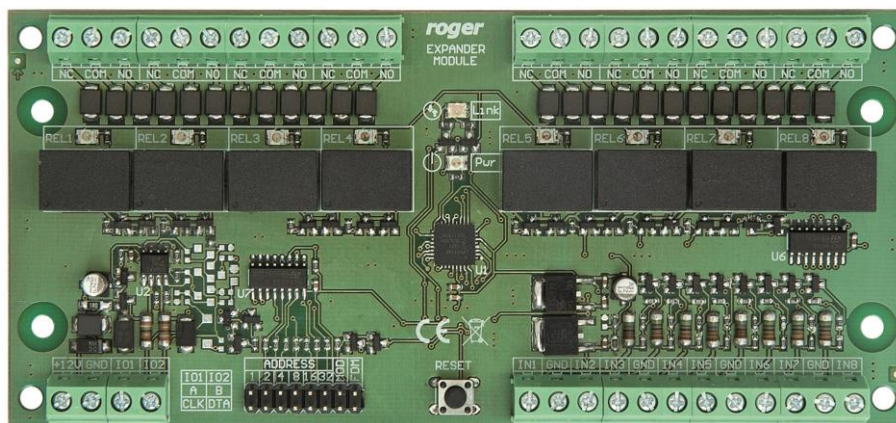*Roger Access Control System*

MCX2-BRD and MCX8-BRD Operating Manual

Product version: 2.0

Firmware version: 2.0.30.266 or newer

Document version: Rev. C

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1. DESIGN AND APPLICATION

MCX2-BRD and MCX8-BRD are I/O expanders dedicated to RACS 5 system. Both devices enable to increase the number of inputs and outputs in the system. Such I/Os are used for connection of door locks, door contacts, exit buttons, signalling devices, etc.

Both expanders are connected to access controller through RS485 interface.

Characteristics

- RACS 5 system I/O expander
- 2 parametric (EOL) inputs (MCX2-BRD)
- 8 parametric (EOL) inputs (MCX8-BRD)
- 2 relay outputs (MCX2-BRD)
- 8 relay outputs (MCX8-BRD)
- RS485 interface
- Screw terminals

Power supply

The expander requires power supply voltage in range of 11-15VDC. It can be supplied from MCX2D/MCX4D expander of MC16-PAC-KIT, from MC16 access controller (e.g. AUX output) or from dedicated power supply unit. The supply wire diameter must be selected in such way that the voltage drop between supply output and the device would be lower than 1V. The proper wire diameter is especially critical when device is located in long distance from the supply source. In such a case the use of dedicated power supply unit located close to the device should be considered. When separate power supply unit is used then its minus should be connected to controller's GND by means of signal wire with any diameter. It is recommended to use UTP cable for connection of device to controller. The table below shows maximal UTP cable lengths in relation to the number of wires used for power supply.

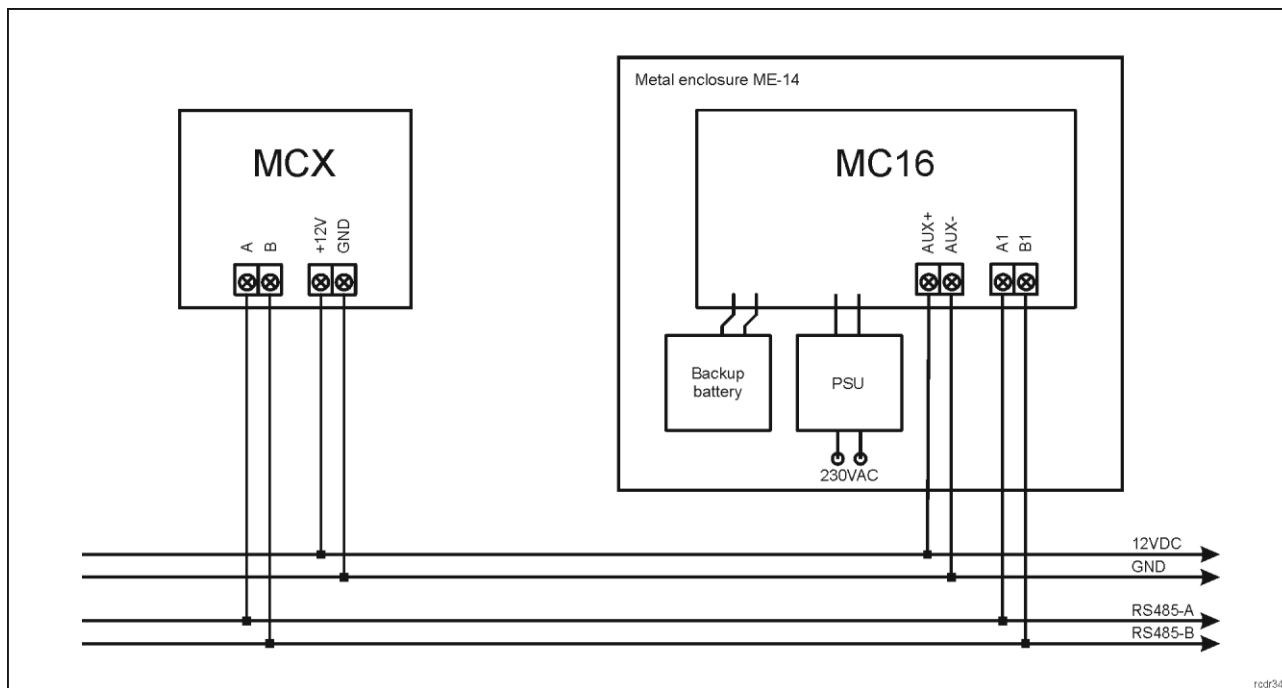| Table 1. Power supply cabling	
Number of UTP wire pairs for power supply	Maximal length of power supply cable
1	150m
2	300m
3	450m
4	600m

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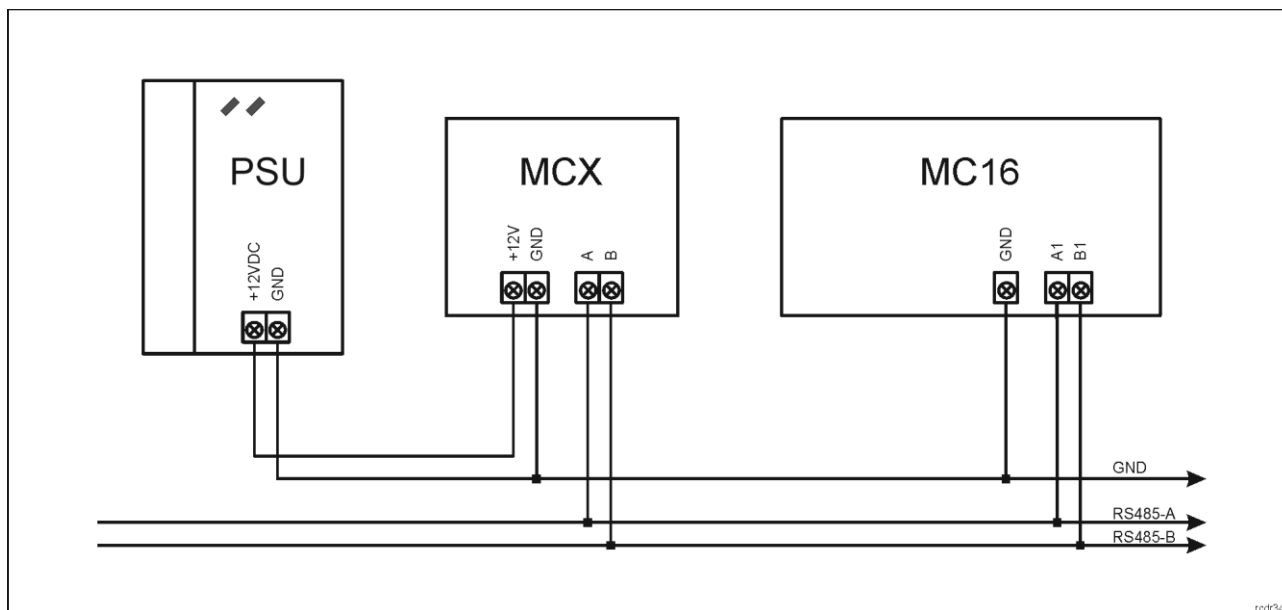Fig. 1 MCX supply from MC16 access controller

Fig. 2 MCX supply from dedicated power supply unit

RS485 bus

The communication method with MC16 access controller is provided with RS485 bus which can encompass up to 16 devices of RACS 5 system, each with unique address in range of 100-115. The bus topology can be freely arranged as star, tree or any combination of them except for loop. The matching resistors (terminators) connected at the ends of transmitting lines are not required. In most cases communication works with any cable type (standard telephone cable, shielded or unshielded twisted pair etc.) but the recommended cable is unshielded twisted pair (U/UTP cat.5). Shielded cables should be limited to installations subject to strong electromagnetic interferences. The RS485 communication standard used in the RACS 5 system guarantees proper communication in a distance of up to 1200 meters as well as high resistance to interferences.

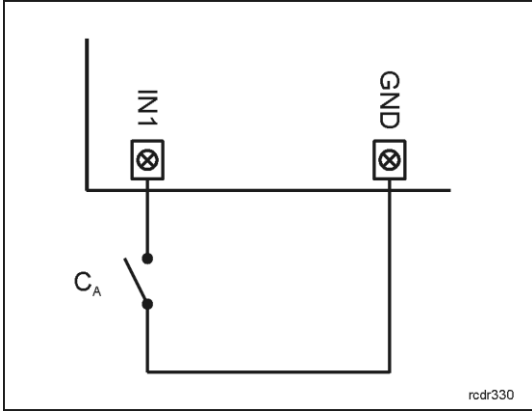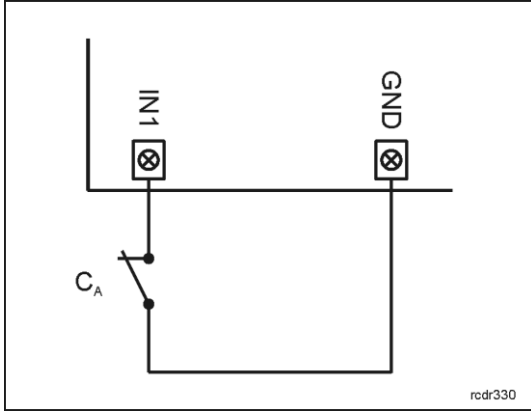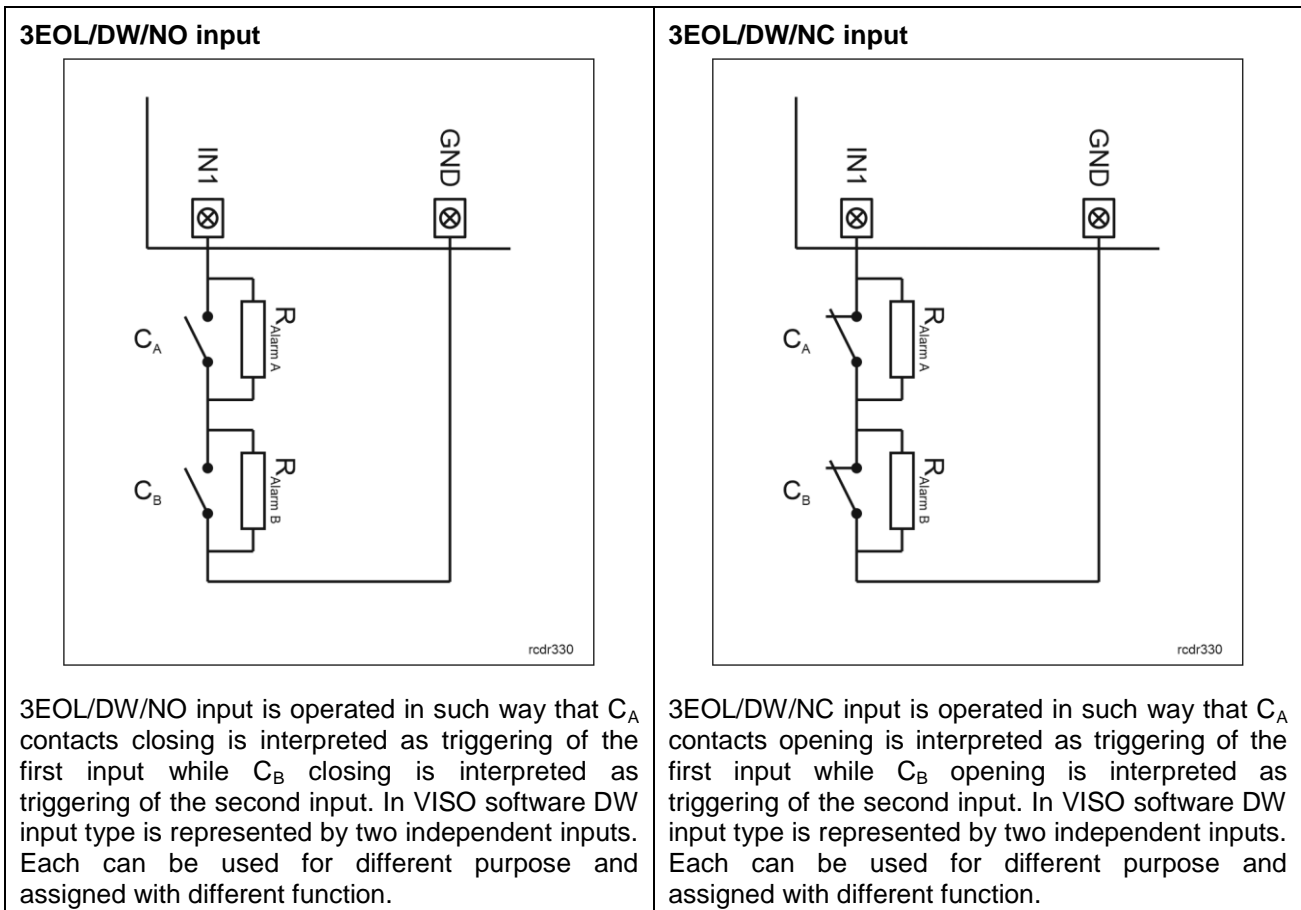Note: Do not use more than single pair in UTP cable for RS485 communication bus.

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LED indicators

Expanders are equipped with LED indicators which are used to signal integral functions.

Table 2. LED indicators			
Indicator	Symbol	Colour	Integral functions
PWR	⏻	Green	LED indicates expander power supply.
LINK	↕	Red	LED indicates communication on RS485 bus
REL1-REL8		Red	LED is on when corresponding relay is switched on.

Inputs

Expander offers general purpose parametric inputs of NO, NC, 3EOL/DW/NO and 3EOL/DW/NC type. Input types and electric parameters such as response time and parametric resistors are defined within low level configuration (VISO v2 or RogerVDM). Input functions are assigned within high level configuration (VISO). Multiple functions can be assigned to the same input at the same time.

Table 3. Input types	
NO input	**NC input**
NO input can be in normal or in triggered state. In normal state C_A contacts are opened. Input triggering is caused by C_A contacts closing.	NC input can be in normal or in triggered state. In normal state C_A contacts are closed. Input triggering is caused by C_A contacts opening.

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3EOL/DW/NO input	3EOL/DW/NC input
3EOL/DW/NO input is operated in such way that C_A contacts closing is interpreted as triggering of the first input while C_B closing is interpreted as triggering of the second input. In VISO software DW input type is represented by two independent inputs. Each can be used for different purpose and assigned with different function.	3EOL/DW/NC input is operated in such way that C_A contacts opening is interpreted as triggering of the first input while C_B opening is interpreted as triggering of the second input. In VISO software DW input type is represented by two independent inputs. Each can be used for different purpose and assigned with different function.

Parametric resistors

The same values of parametric resistors are used for all inputs i.e. 1kΩ; 1,2kΩ; 1,5kΩ; 1,8kΩ; 2,2kΩ; 2,7kΩ; 3,3kΩ; 3,9kΩ; 4,7kΩ; 5,6kΩ; 6,8kΩ; 8,2kΩ; 10kΩ; 12kΩ. In case of 3EOL/DW (Double Wiring) input type, Alarm A resistor defines a value of resistor used to detect triggering of the first input while Alarm B resistor defines a value of resistor used to detect triggering of the second input. Alarm A resistor value must differ from value of Alarm B resistor at least by three positions in the list above. Total resistance of wire used to connect contacts to input should not exceed 100 Ω. Default values of parametric resistors:

- Alarm A = 2,2 kΩ
- Alarm B = 5,6 kΩ

Response time

Response time parameter defines minimal impulse time on the input which triggers the input. Each input can be configured individually in range of 50 to 5000 ms within low level configuration (VISO v2 or RogerVDM).

Outputs

Expander offers relay outputs with NO/NC contacts. Electric parameters such as polarity are configured within low level configuration (VISO v2 or RogerVDM). Function are assigned to outputs within high level configuration (VISO). Multiple functions with different priorities can be assigned to the same output at the same time.

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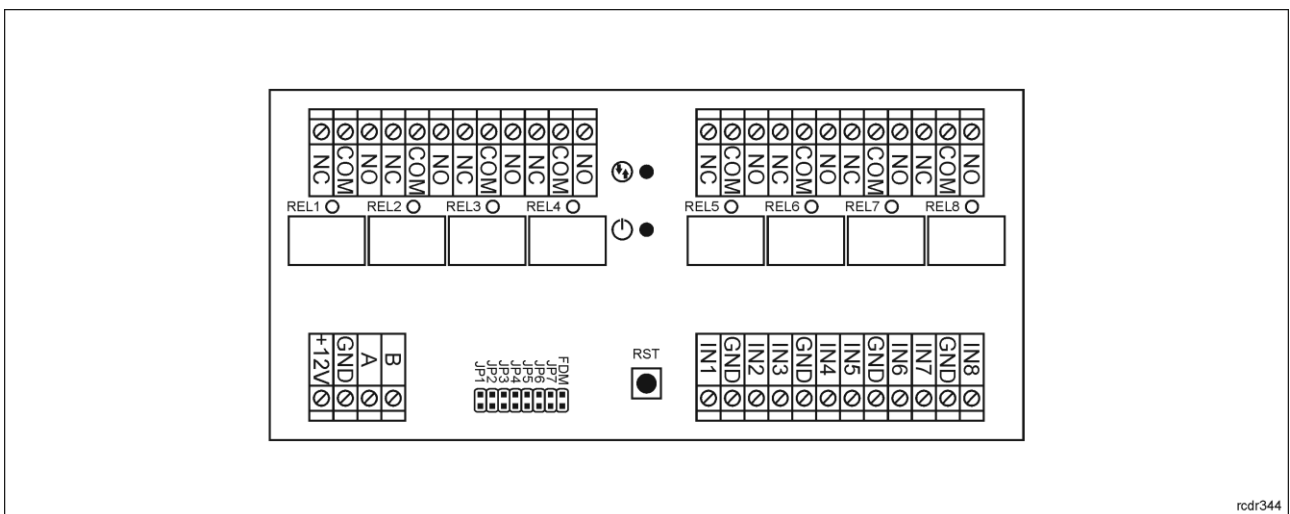# 2. INSTALLATION
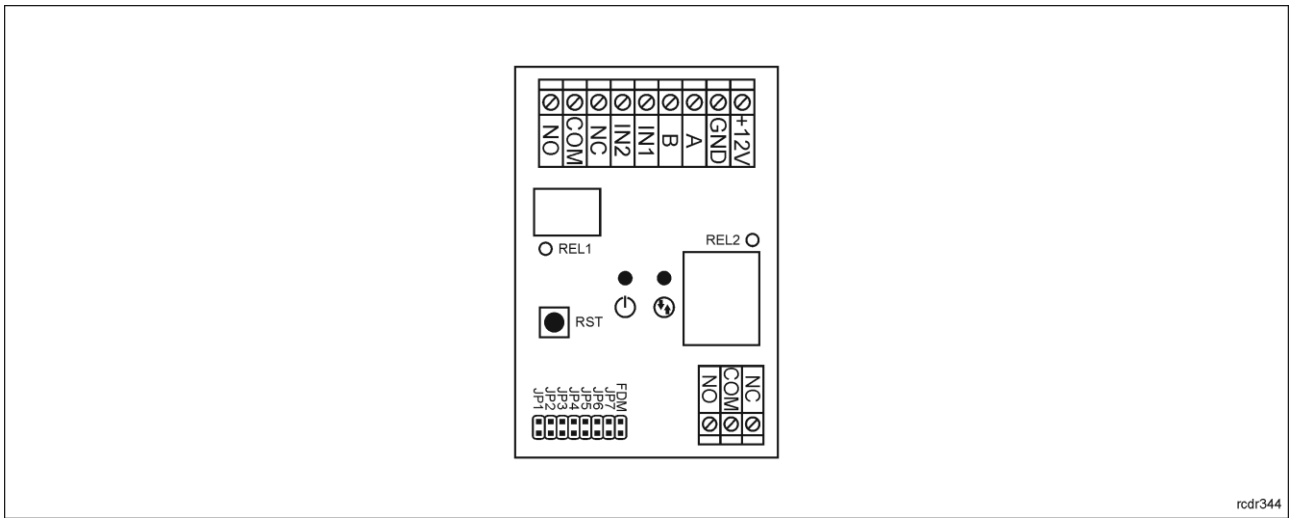
Fig. 3 MCX2-BRD expander

Table 4. MCX2-BRD screw terminals	
Screw terminal	Description
+12V	12VDC power supply
GND	Ground
A*	RS485 bus, line A
B*	RS485 bus, line B
IN1	IN1 input line
IN2	IN2 input line
NC	RELx relay output (NC)
COM	RELx relay common terminal
NO	RELx relay output (NO)

* In older versions of the MCX2-BRD expander, terminals A and B may be marked on the board respectively as IO1 and IO2.


Fig. 4 MCX8-BRD expander

Table 5. MCX8-BRD screw terminals	
Screw terminal	Description
+12V	12VDC power supply
GND	Ground
A	RS485 bus, line A
B	RS485 bus, line B
NC	RELx relay output (NC)
COM	RELx relay common terminal
NO	RELx relay output (NO)
IN1..IN8	IN1..IN8 input line

Each expander is equipped with a holder for installation on DIN35 rail. Therefore expanders can be installed in ME type enclosures equipped with such rail. Alternatively, expanders can also be mounted using screws and holes on expander board.

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MCX2-BRD and MCX8-BRD expanders
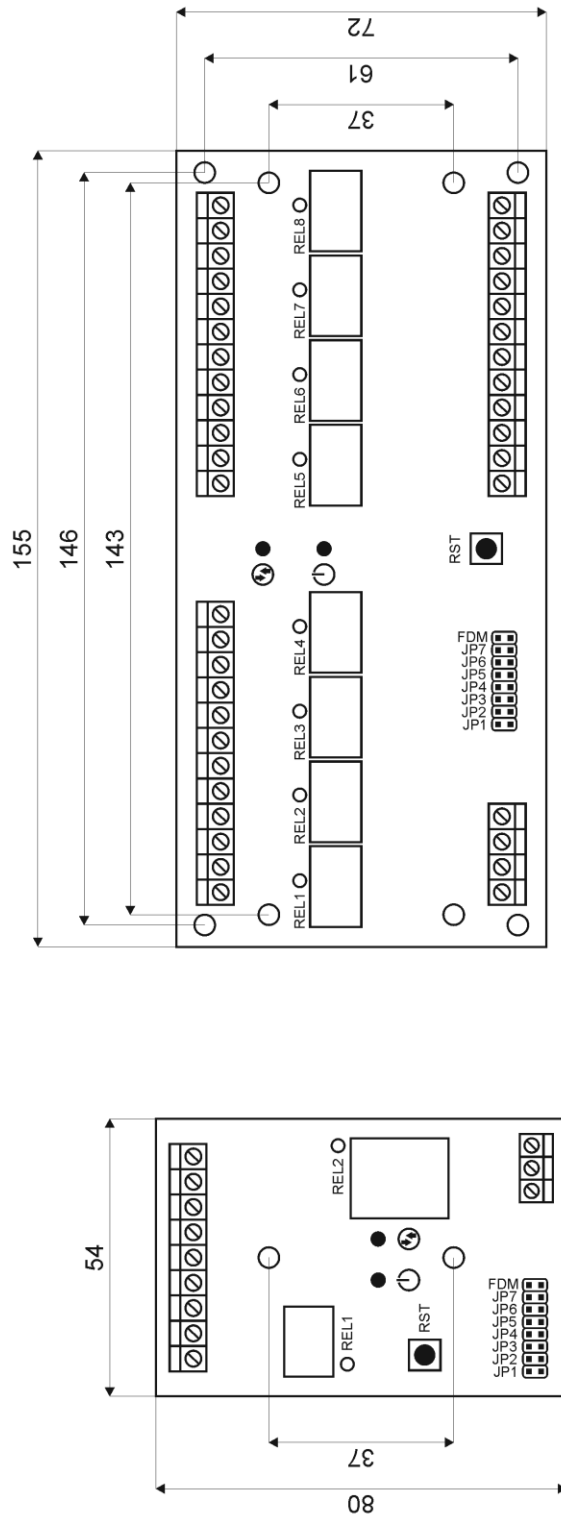
Fig. 5 MCX2-BRD and MCX8-BRD installation

Installation guidelines

- All electrical connections should be done with disconnected power supply.
- If the expander and controller are not supplied from the same PSU then GND terminals of both devices must be connected with any wire.

3. OPERATION SCENARIOS

MCX2-BRD expander when connected to MC16 access controller can be mainly used to increase the number of inputs and outputs if these which are offered by the controller and its terminals are not enough.

MCX8-BRD expander when connected to MC16 access controller can be used for:

- Universal access control in elevators (according to AN030 application note).
- Wired access control in lockers (according to AN029 application note).
- Hardware integration with intruder alarm panels (according to AN027 application note).
- Access control at doors (according to AN002 application note).
- Other application including building automation where additional I/O are required.

4. CONFIGURATION

The purpose of low level configuration is to prepare device for operation in RACS 5 system. In case of RACS 5 v1 system the address of device must be configured by means of RogerVDM software before connection to MC16 controller. While in RACS v2 system, low level configuration and addressing can be done with VISO v2 software during final configuration of the system. Therefore in RACS 5 v2 system the configuration from RogerVDM software and manual addressing are optional and during installation it is only necessary to properly connect the device to MC16 access controller.

Low level configuration (VISO v2)

In RACS 5 v2 system the expander can be installed at site without previous configuration. According to AN006 application note, its address and other settings can be configured from VISO v2 management software and during such configuration the access to its service contacts (fig. 3/4) is not required.

Low level configuration (RogerVDM)

The purpose of low level configuration is to prepare device for operation in RACS 5 system.
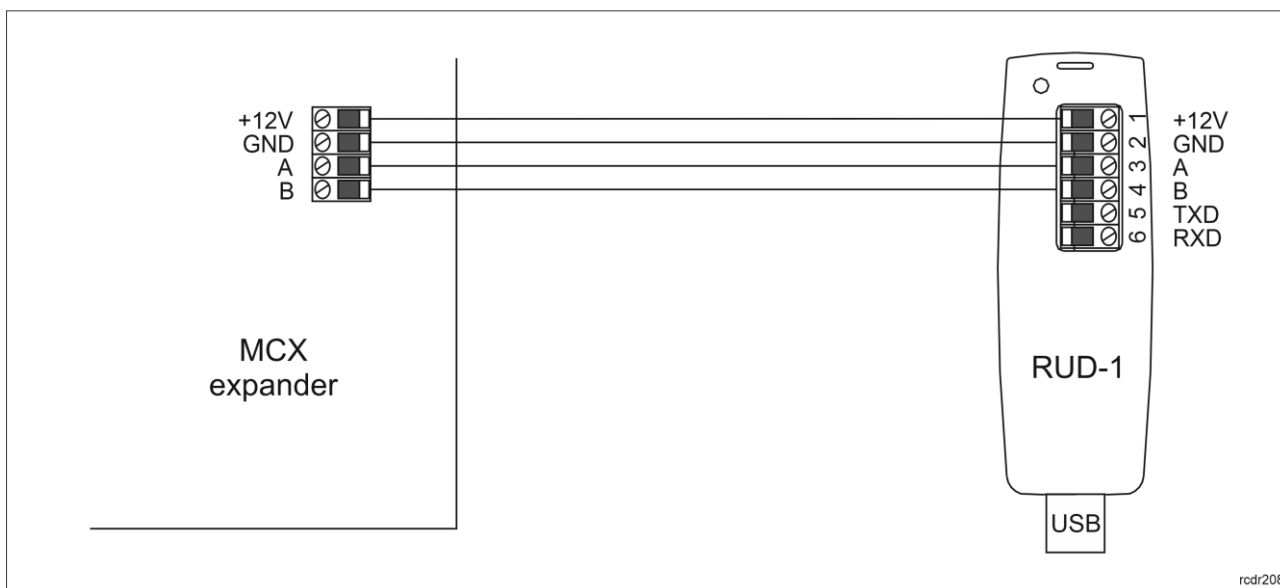

Fig. 6 Connection to RUD-1 interface (low level configuration)

Programming procedure with RogerVDM software:

1. Connect the device to RUD-1 interface (fig. 6) and connect the RUD-1 to computer's USB port.

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2. Remove jumper from JP7 contacts (fig. 3/4) if it is placed there.
3. Restart the device (press RESET button or switch power supply off and on) and LED PWR will pulsate. Then within 5 seconds place jumper on JP7 contacts.
4. Start RogerVDM program, select *MCX v2.x* device, *v2.0* firmware version, *RS485* communication channel and serial port with RUD-1 interface.
5. Click *Connect*, the program will establish connection and will automatically display *Configuration* tab.
6. Enter unoccupied RS485 address in range of 100-115 and other settings according to requirements of specific installation.
7. Click *Send to Device* to update the configuration.
8. Optionally make a backup by clicking *Send to File…* and saving settings to file on disk.
9. Disconnect from RUD-1 interface and leave jumper on JP7 contacts to enable further configuration of device from VISO v2 software or remove jumper from JP7 contacts to block such remote configuration.

Table 6. List of low level parameters	
Communication settings	
RS485 address	Parameter defines device address on RS485 bus. Range: 100-115. Default value: 100.
RS485 communication timeout [s]	Parameter defines delay after which device will signal lost communication with controller. When set to 0 then signaling is disabled. Range: 0-64s. Default value: 20s.
RS485 encryption	Parameter enables encryption at RS485 bus. Range: [0]: No, [1]: Yes. Default value: [0]: No.
RS485 encryption key	Parameter defines key for encryption of communication at RS485 bus. Range: 4-16 ASCII characters.
Input types	
IN1 – IN8	Parameter defines input type. Range: [1]: NO, [2]: NC, [3]: EOL/NO, [4]: EOL/NC, [5]: 2EOL/NO, [6]: 2EOL/NC, [7]: 3EOL/NO, [8]: 3EOL/NC, [9]: 3EOL/DW/NO, [10]: 3EOL/DW/NC. Default value: [1]: NO.
Parametric (EOL) input resistances	
Tamper, Alarm A, Alarm B [Ohm]	Parameter defines resistor for parametric (EOL) inputs.
Input response times	
IN1 – IN8 [ms]	Parameter defines minimal duration of pulse which is required to trigger the input. Range: 50-5000. Default value: 50.
Output polarity	
REL1 – REL8	Parameter defines polarity of output. Normal polarity means that the output by default is switched off while Reversed polarity means that the output by default is switched on. Range: [0]: Normal polarity, [1]: Reversed polarity. Default value: [0]: Normal polarity.
Comments	
DEV	Parameter defines any text or comment which corresponds to the device. It is later displayed in VISO program.
Input comments	
IN1 - IN8	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.
Output comments	
REL1 – REL8	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.

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Note: Table 6 includes summary of parameters for both versions of expanders. For instance IN3-IN8 and REL3-REL8 settings are not available for MCX2-BRD expanders.

Manual addressing

The RS485 address of expander configured with VISO v2 or RogerVDM is a software address. Alternatively a hardware RS485 address of MCX8-BRD expander can be configured with jumpers and such address has higher priority than software address.

Note: Each time the hardware RS485 address is modified the device must be restarted

If jumper is not placed on JP5 contacts then addresses in range 201-215 are set.
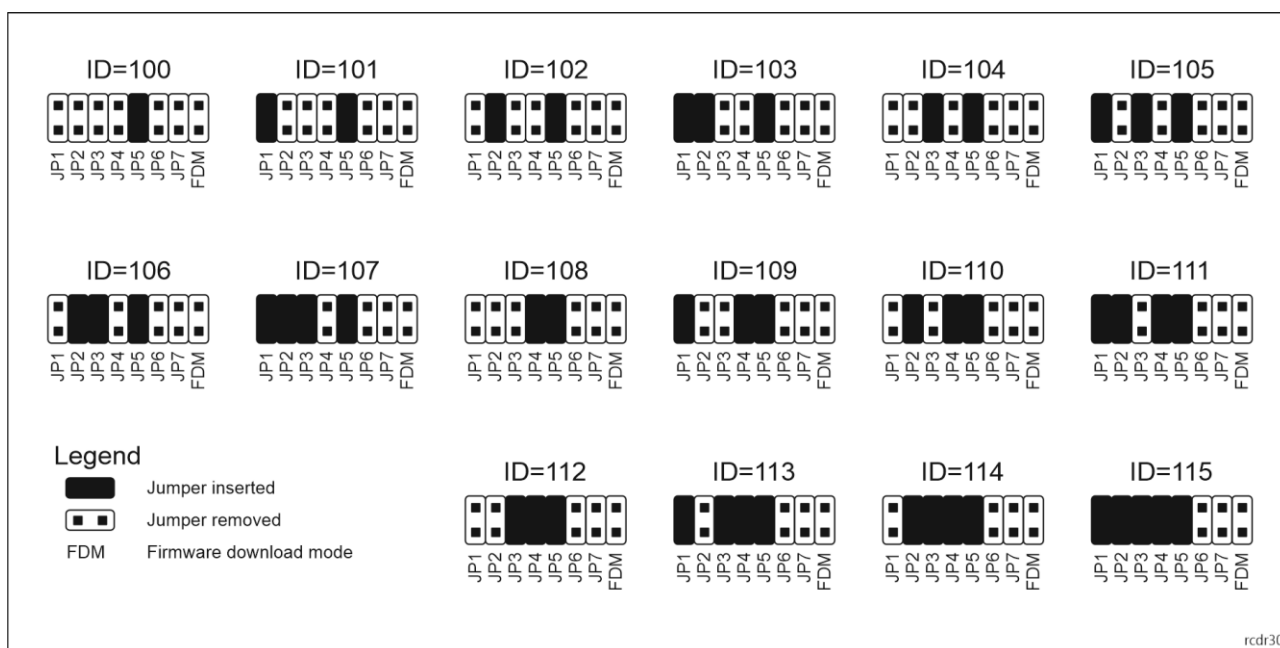
Fig. 7 Manual addressing of MCX8-BRD expander

High level configuration (VISO)

The purpose of high level configuration is to define logical functioning of the expander which communicates with the MC16 access controller and it depends on applied scenario of operation. The example of access control system configuration is given in AN006 application note which is available at www.roger.pl.

5. FIRMWARE UPDATE

The firmware of device can be changed to newer or older version. The update requires connection to computer with RUD-1 interface and starting RogerVDM software. The latest firmware file is available at www.roger.pl.

Firmware update procedure:

1. Connect the device to RUD-1 interface (fig. 8) and connect the RUD-1 to computer's USB port.
2. Place jumper on FDM contacts (fig. 3/4).
3. Restart the device (press RESET button or switch power supply off and on).
4. Start RogerVDM program and in the top menu select *Tools* and then *Update firmware*.
5. In the opened window select device type, serial port with RUD-1 interface and path to firmware file (*.hex).
6. Click *Update* to start firmware upload with progress bar in the bottom.
7. When the update is finished, remove FDM jumper and restart the device.
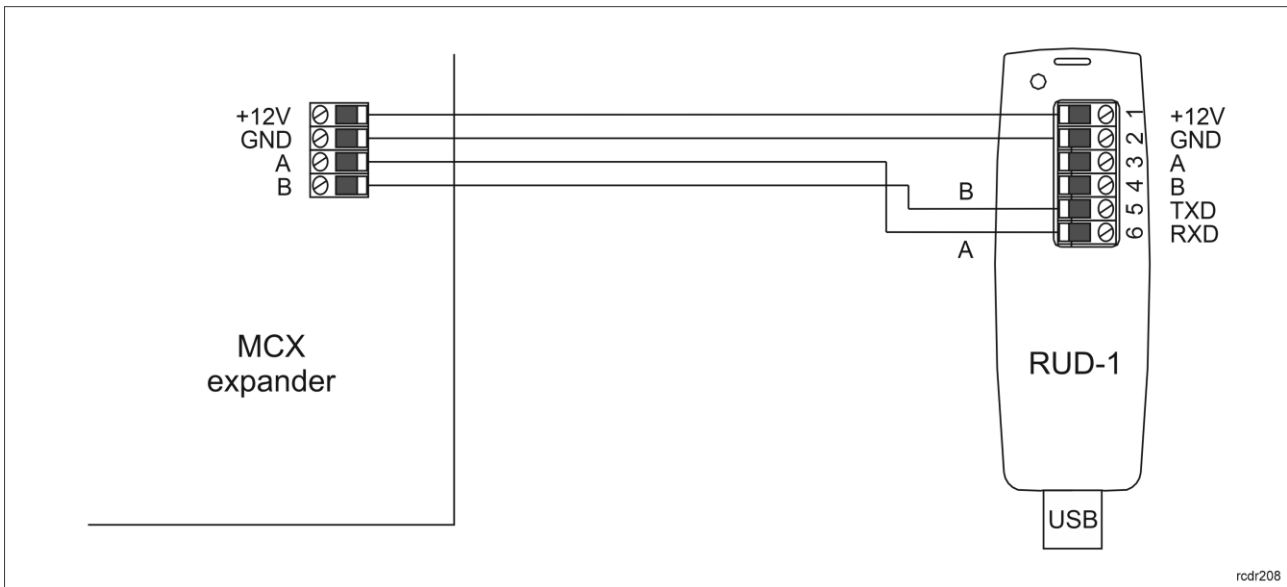
Fig. 8 Connection to RUD-1 interface (firmware update).

6. SPECIFICATION

Table 7. Specification	
Supply voltage	Nominal 12VDC, min./max. range 10-15VDC
Current consumption (average)	30mA (when relays off)
Inputs	MCX2-BRD: Two (IN1, IN2) MCX8-BRD: Eight (IN1..IN8) parametric inputs internally connected to the power supply plus (+12V) through a 15kΩ resistor, approx. 3.5V triggering level when configured as NO or NC.

Relay outputs	MCX2-BRD: Two relay outputs
	    REL1: 30VDC/1,5A
	    REL2: 30VDC/5A
	MCX8-BRD: Eight relay outputs:
	    REL1..REL8: 30VDC/1.5A
	Each with single NO/NC contacts.

Distances	Up to 1200 m between controller and expander (RS485)
IP Code	IP20
Environmental class (according to EN 50133-1)	Class I, indoor general conditions, temperature: +5°C to +40°C, relative humidity: 10 to 95% (no condensation)
Dimensions W x S x G	MCX2-BRD: 80 x 54 x 20 mm MCX8-BRD: 72 x 155 x 20 mm
Weight	MCX2-BRD: 50g MCX8-BRD: 115g
Certificates	CE

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7. ORDERING INFORMATION

Table 8. Ordering information	
MCX2-BRD	I/O expander; 2 supervised inputs; 2 relay outputs 1.5 A/30 V; 13.8 VDC supply input
MCX8-BRD	I/O expander; 8 supervised inputs; 8 relay outputs 1.5 A/30 V; 13.8 VDC supply input
RUD-1	Portable USB-RS485 communication interface dedicated to ROGER access control devices

8. PRODUCT HISTORY

Table 9. Product history		
Version	Date	Description
MCX2-BRD v1.0	03/2016	The first commercial version of product
MCX2-BRD v2.0	10/2019	PCB modifications, new low level configuration procedure
MCX8-BRD v1.0	03/2016	The first commercial version of product
MCX8-BRD v2.0	10/2019	PCB modifications, new low level configuration procedure

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