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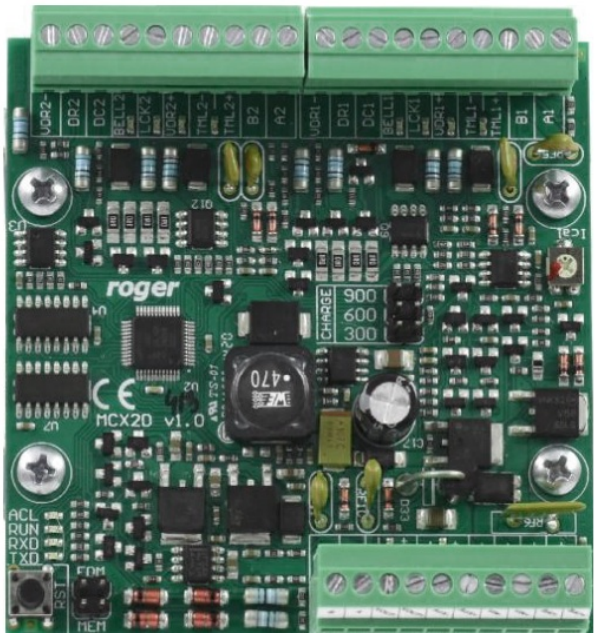
Roger MCX2D Access Control System



Specifications

Specification	
Supply voltage	13.8VDC; +/- 100mV (backup battery connected) 12.0VDC (no backup battery)
Current consumption (typical)	MCX2D: 50mA (expander module) + battery charging current + outputs (VOUT, AUX, TML, VDR)
Battery charging current	Configurable: ~0.3A/0.6A/0.9A
Inputs	Four (DCx, DRx) parametric inputs
Transistor outputs	Four (LCKx, BELLx) outputs, each with 15V/1A DC max load
Power supply outputs	Two 13.8VDC/0.2A outputs (VOUT, AUX) Two 13.8VDC/0.2A outputs (TML) Two 13.8VDC/1.0A outputs (VDR)

Distances	Up to 1200 m between the MC16 controller and the MCX expander (RS485). Up to 1200 m between the MCX expander and the MCT terminals (RS485) The total distance between the controller and any terminal cannot exceed 1200m.
Environment	Indoor general conditions, temperature: +5°C to +40°C, relative humidity: 10 to 75% (no condensation)
Dimensions W x S x G	80 x 80 x 20 mm
Weight	65 g
EN55032 class	A
Compliance	CE, RoHS

Product Usage Instructions

This document is subject to the Terms of Use in the current version published on the website www.roger.pl.. The manufacturer reserves the right to make changes to the product without prior notice.

DESIGN AND APPLICATION

MCX2D is an I/O expander dedicated to the RACS 5 system. The device, after connection to the MC16 access controller and the MCT series terminals, enables to control of 2 doors. The expander offers I/Os and distributes the power supply and the RS485 communication bus. The expander operates with a backup battery, which,,h depending on particular requirement, can be charged with 0.3A, 0.6A, or 0.9A current. The expander is equipped with removable terminal blocks, which facilitate electrical connections during installation and maintenance. MCX2D expander is offered separately as an electronic module for installation in a metal housing with a power supply or as a

part of MC16-PAC-2-KIT.

Characteristics

- RACS 5 system I/O expander
- Power supply distribution for door devices
- RS485 bus distribution for MCT terminals
- 4 parametric (EOL) inputs
- 4 transistor outputs
- 6 power supply outputs
- Backup battery charging
- RS485 interface
- Removable screw terminals

Power supply

The expander requires a 13.8VDC power supply, and it is recommended to apply a PS2D power supply unit for that purpose. Due to the relatively high current between the expander and the PSU, all connections should be made using short cables with adequate cross sections. PSxD series PSUs (Roger) are offered with two 30cm/1mm² cables dedicated to supply the expander. Multiple MCX2D expanders can be supplied from the same PSU, and in such a case, each connection must be made with an individual pair of cables. When the expander’s supply voltage is too low, the battery cannot be fully charged, and when the voltage is too high, the battery can be damaged. MCX2D, which is supplied from a PSU equipped with its own backup (e.g., UPS), can be supplied with 12VDC, but then it cannot be equipped with its own backup battery.

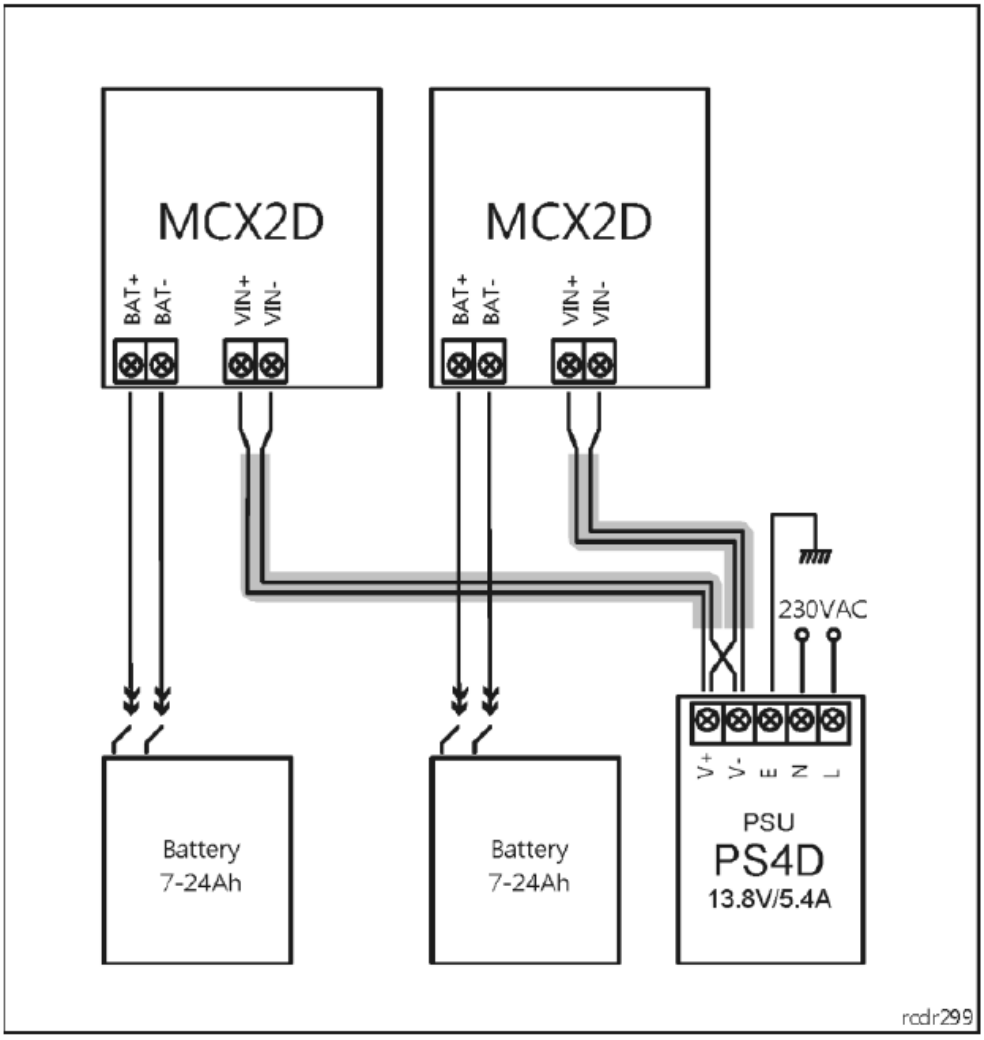


Fig. 1 Two MCX2D expanders supplied from the same PSU

Backup battery

MCX2D enables battery charging with 0.3A, 0.6A, or 0.9A current up to the level of voltage supplied to the expander (nominal 13.8VDC). The current is selected with jumpers (fig. 2). When the battery voltage drops to approximately 10V, it is disconnected from the expander. The battery is reconnected when the 13.8V supply to the expander is restored. To ensure battery charging up to 80% level within 24h (according to EN 60839 standard) following current settings must be applied:

- 300mA for 7Ah battery
- 600mA for 17Ah battery
- 900mA for 24Ah battery

RS485 interface

- MCX2D is an addressable device connected to the RS485 communication bus of the MC16 controller. At the same time, the expander distributes the bus to MCT terminals at each door. The expander can be operated with the default ID=100 address, or it can be assigned with an address in the range of 101-115. All devices on the RS485 bus of the MC16 controller, including MCX expanders and MCT terminals, must have unique addresses in the range of 100-115. MCX2D is addressed during low-level configuration by means of the RogerVDM software or manually during the memory reset procedure.
- 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 interference The RS485 communication standard used in the RACS 5 system guarantees proper communication a distances of up to 1200 meters,, as well as high resistance to interference If the expander and controller are powered by separate power supplies, it is necessary to short-circuit the expander's power supply minus (GND) with the controller's power supply minus (GND) using a separate wire of any small cross-section.

LED indicators

Expanders are equipped with LED indicators, which are used to signal integral functions. According to further mentioned procedures, the service mode is started by restarting the expander and placing a jumper on the MEM contacts.

Table 1. LED indicators

Table 1. LED indicators		
Indicator	Colour	Integral functions
ACL	Red	In normal mode, the LED indicates backup power supply from the battery instead of the PSU.

RUN	Red	Single pulse every 4 sec., normal mode, Quick pulsing: service mode Slow pulsing (0.5s/0.5s): No communication with controller Very slow pulsing (1s/1s): Configuration memory error In case of a Memory reset, this LED is used for manual addressing.
TXD	Red	LED indicates data transmission to the controller
RXD	Green	LED indicates data received from the controller
VDR, TML, VOUT, AUX	Green	LED indicates the voltage at a particular output.
LCK, BELL	Red	LED is on when the corresponding LCK output is switched on.

Inputs

Expander offers DC and DR 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 the low-level configuration (VISO v2 or RogerVDM). Input functions are assigned within the high-level configuration (VISO). Multiple functions can be assigned to the same input at the same time. In the standard scenario of door control, DC inputs are dedicated to the connection of door contacts, while DR inputs are dedicated to the connection of exit buttons, and they do not require low-level configuration as they can be operated with default settings:

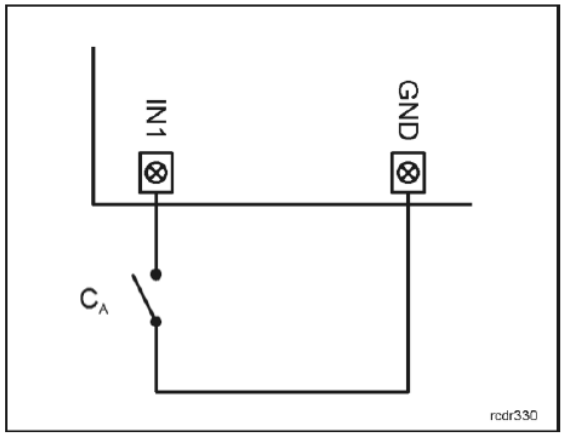
- DC inputs: NC type / 50ms response time
- DR inputs: NO type / 50ms response time

Table 2. Input types

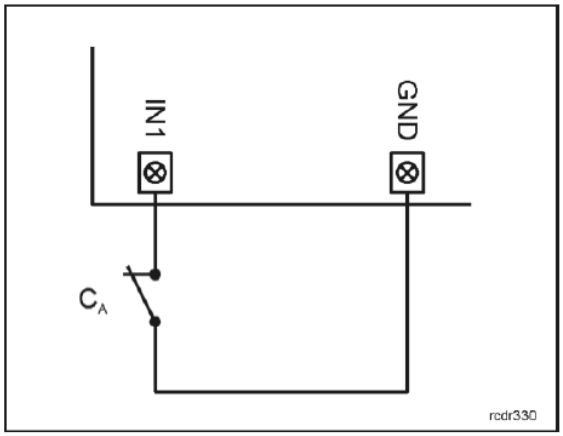
- NO input can be in a normal or triggered state. In the normal state, CA contacts are opened. Input triggering is caused by CA contacts closing.
- NC input can be in a normal or triggered state. In the normal state, CA contacts are closed. Input triggering is caused by CA contacts opening.

Table 2. Input types

NO input

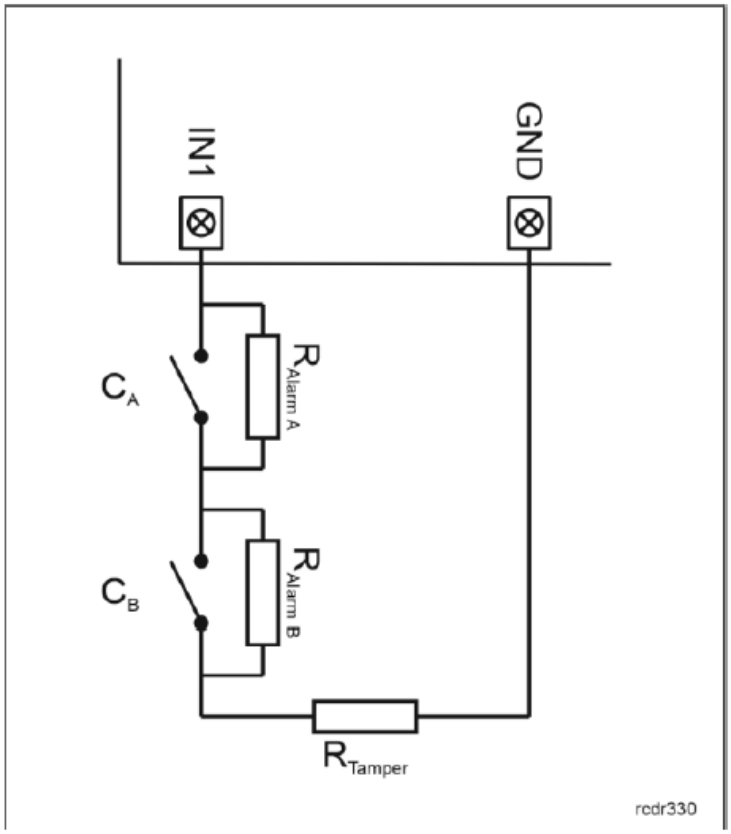


NC input

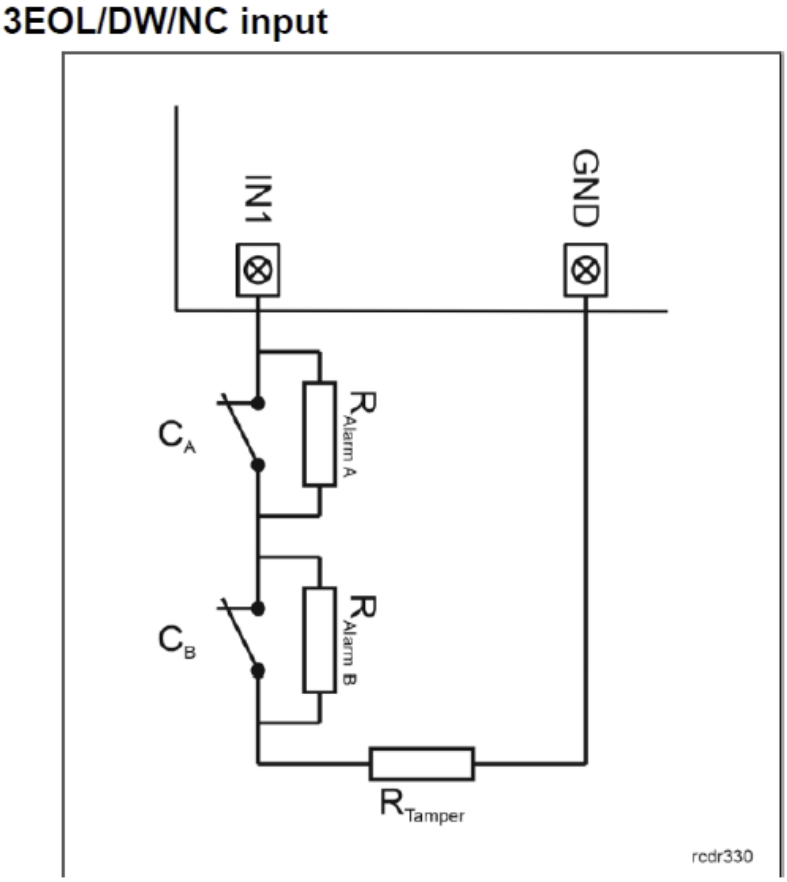


- 3EOL/DW/NO input is operated in such a way that CA contacts closing is interpreted as triggering of the first input, while CB closing is interpreted as triggering of the second input. In the VISO software DW input type is represented by two independent inputs. Each can be used for a different purpose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

3EOL/DW/NO input



- 3EOL/DW/NC input is operated in such wa way that CA contacts opening is interpreted as triggering of the first input, while CB opening is interpreted as triggering of the second input. Inthe the VISO software DW input type is represented by two independent inputs. Each can be used for a 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 the value of Alarm B resistor at least by three positions in the list above. The total resistance of the wire used to connect the contacts to the input should not exceed 100 Ω. Default values of parametric resistors:

- Alarm A = 2,2 kΩ
- Alarm B = 5,6 kΩ
- Tamper = 1,0 kΩ

Response time

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

Transistor outputs

Expander offers LCK and BELL transistor outputs. Electric parameters such as polarity are configured in n the low-level configuration (VISO v2 or RogerVDM). Functions are assigned to outputs within the high-level configuration (VISO). Multiple functions with different priorities can be assigned to the same output at the same time. In the standard scenario of door control, LCK outputs are dedicated to control door locks, while BELL outputs are dedicated to control alarm signalling devices and/or door bells. In the standard scenario of operation, both LCK and BELL outputs do not require low-level configuration.

Power supply outputs

Expander offers 6 outputs in order to provide power supply to athe access controller, terminals, door lock, and other external devices.

VDR outputs

VDR power supply output is dedicated to supplying the door lock, alarm signalling device, and other door-related devices. The terminal VDR+ is protected with a 1.0A electronic fuse. The terminal VDR is internally shorted to ground (GND). The green LED indicator is located at the VDR+ terminal to signal the voltage at the output.

TML outputs

TML’s power supply output is dedicated to supplying readers at the door. The terminal TML+ is protected with a 0.2A electronic fuse. The terminal TML is internally shorted to ground. The green LED indicator is located at the TML+ terminal to signal the voltage at the output.

VOUT outpuThe t

The OUT power supply output is dedicated to supplying additional electronic modules, and it can also be used to supply the connected access controller. The terminal VOUT+ is protected with a 0.2A electronic fuse.. The terminal VOUT- is internally shorted to

ground. The green LED indicator is located at the VOUT+ terminal to signal the voltage at the output.

- **Note:** If the MC16 access controller is supplied from the expander, then it cannot be supplied at the same time by its own PSU, and it cannot operate with its own backup battery.

AUX output.
AUX power supply output is dedicated to supplying optional electronic modules. The terminal AUX+ is protected with a 0.2A electronic fuse. The terminal AUX- is internally shorted to ground. The green LED indicator is located at the AUX+ terminal to signal the voltage at the output.

INSTALLATION

The expander should be installed in a metal enclosure with a door and a power supply. The enclosure must be earthed by means of PE wire. The manufacturer offers a range of enclosures designed for electronic modules and equipped with power supplies. The installation site should be away from heat and moisture sources and protected from unauthorized access. The connection between the power supply and the expander should be made using a cable with a minimum cross-section of 0.5 mm^2 and a length of up to 50 cm. The PSxD series power supply comes with cables with a cross-section of 1 mm^2 and a length of 30 cm, which can be used to power the expander. All electrical lines connected to the expander must run inside the building. All electrical connections should be made with the power off. The network circuit supplying the device must be equipped with an installation switch.. After completing installation and start-up, close the enclosure.

- Installation may only be performed by a qualified person with the appropriate permits and authorizations for connecting and intervening in 230VAC and low-voltage networks. It is not permitted to use the enclosure without a properly installed and technically functional electric shock protection circuit (PE).

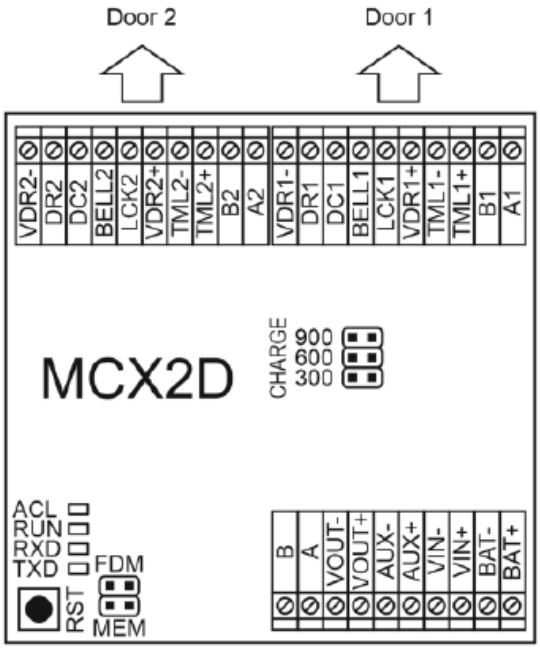
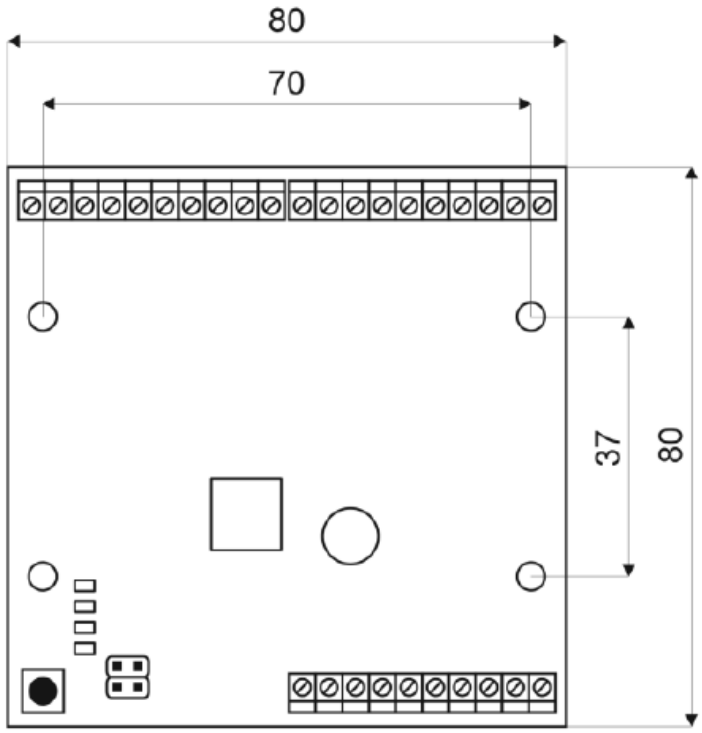


Fig. 2 MCX2D expander

Table 3. MCX2D screw terminals

Table 3. MCX2D screw terminals	
Name	Description
BAT+, BAT-	Backup battery
VIN+, VIN-	13.8VDC input power supply
AUX+, AUX-	13.8VDC/0.2A output power supply (for general purpose)
VOUT+, VOUT-	13.8VDC/0.2A output power supply (to controller)
A, B	RS485 bus (to controller)
Ax*, Bx	RS485 bus (to readers)
TMLx+, TMLx-	13.8VDC/0.2A output power supply (to readers)

VDRx+, VDRx-	13.8VDC/1.0A output power supply (to door lock)
LCKx	15VDC/1.0A transistor output line (door lock)
BELLx	15VDC/1.0A transistor output line (alarm signalling device)
DCx	Input line (door contact)
DRx	Input line (exit button)



OPERATION SCENARIOS

In a typical scenario of operation, MCX2D expanders are used in MC16-PAC-2-KIT two-door access control kits (fig. 4 and 6). In the alternative scenario of operation, multiple MCX2D expanders are connected to multidoor MC16 access controller (fig. 5). In such scenario the maximal number of expanders operated by MC16 controller depends on its type and it is limited by available range of addresses ID=100-115 on RS485 bus of MC16 controller where all MCX and MCT devices must have unique addresses. For example, in the case of read-in/out doors, it is possible to control max. 6 doors in such a setup as MC16-PAC-6 + 3 x MCX2D + 12 x MC, T, while in the case of read-in doors, it is possible to control max. 10 doors in such setup as MC16-PAC-10 + 5 x MCX2D + 10 x

MCT. In both cases, 15 addresses on the RS485 bus are occupied. It is also possible to mix read-in and read-in/out doors within a single MC16 controller if the limitation related to the number of RS485 addresses is preserved.

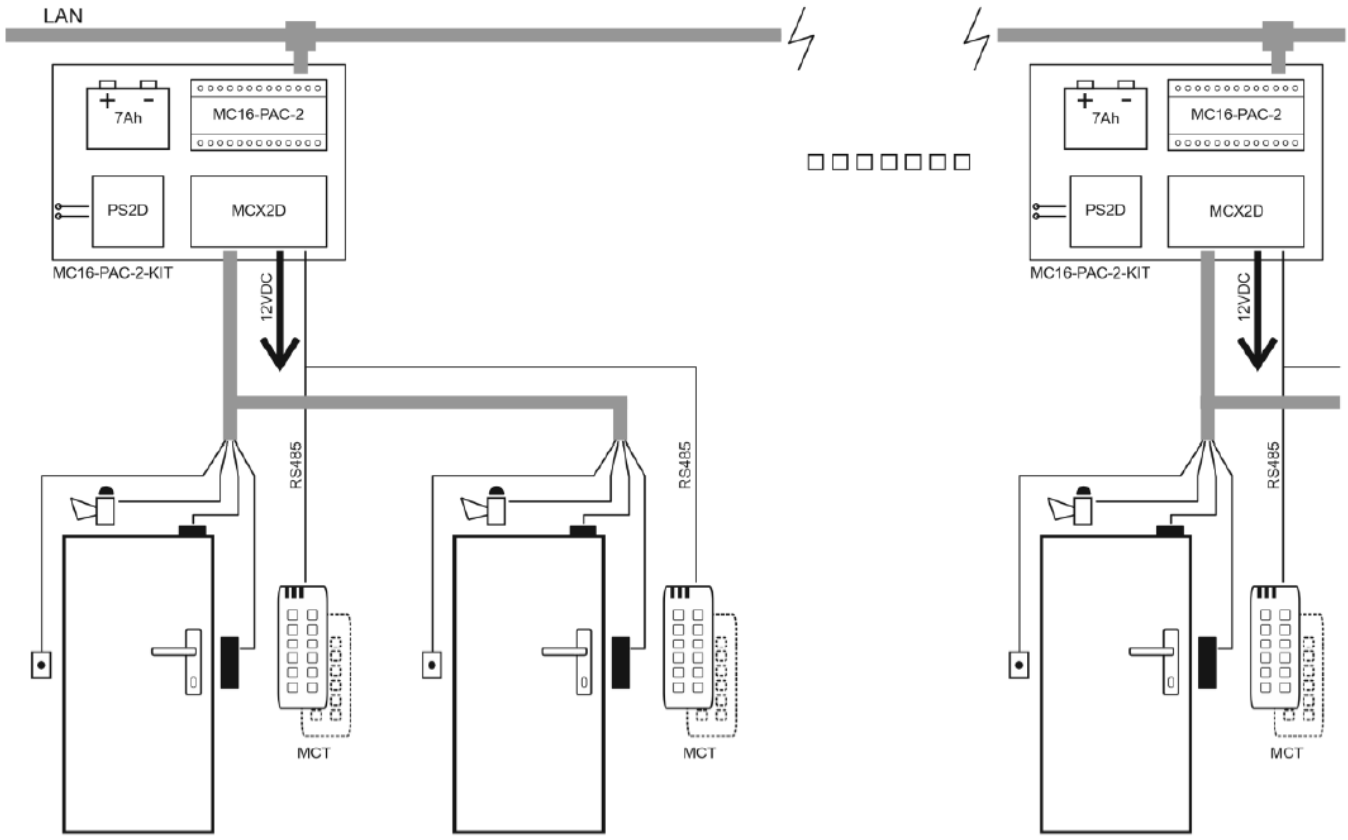


Fig. 4 Scenario of operation with MC16-PAC-2-KITs

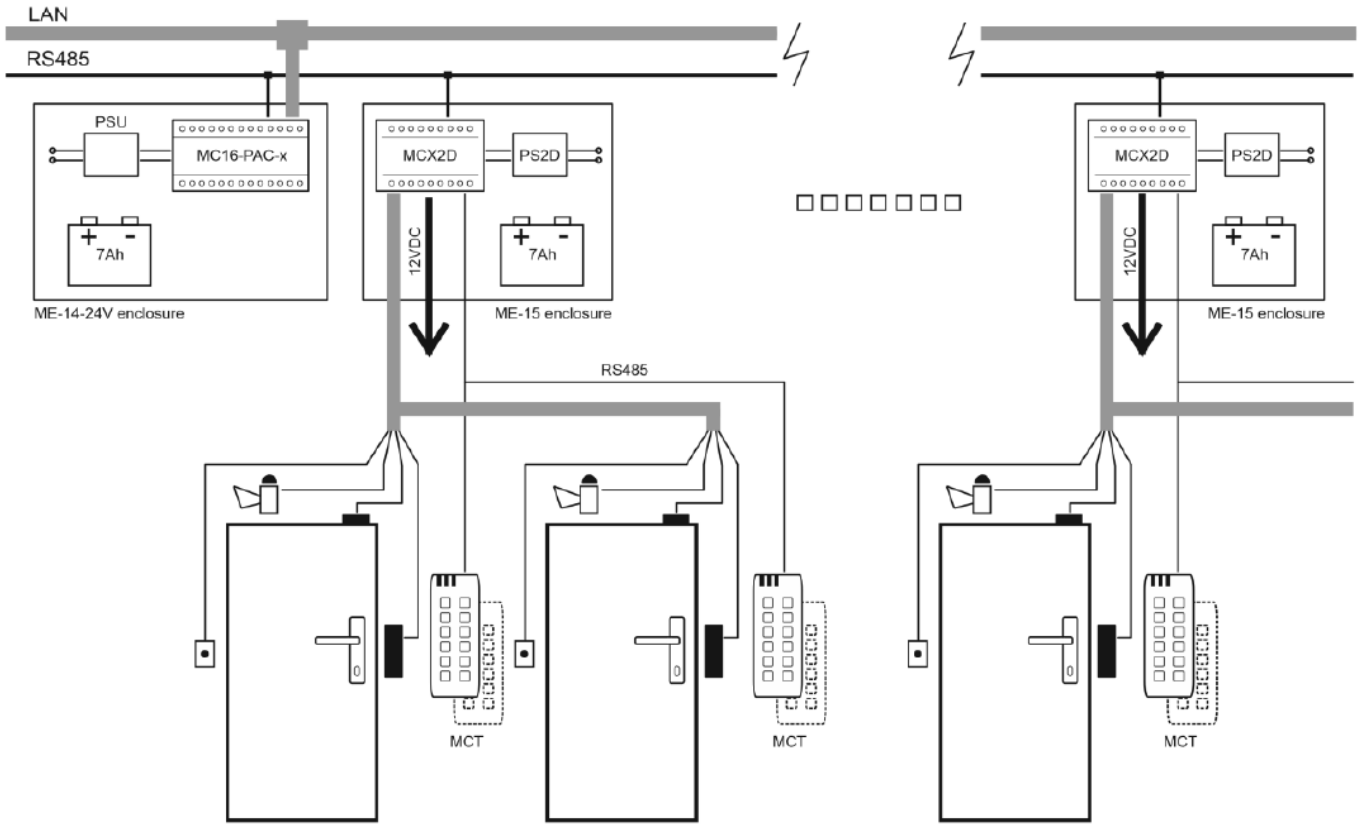


Fig. 5 Scenario of operation with multiple MCX2D expanders

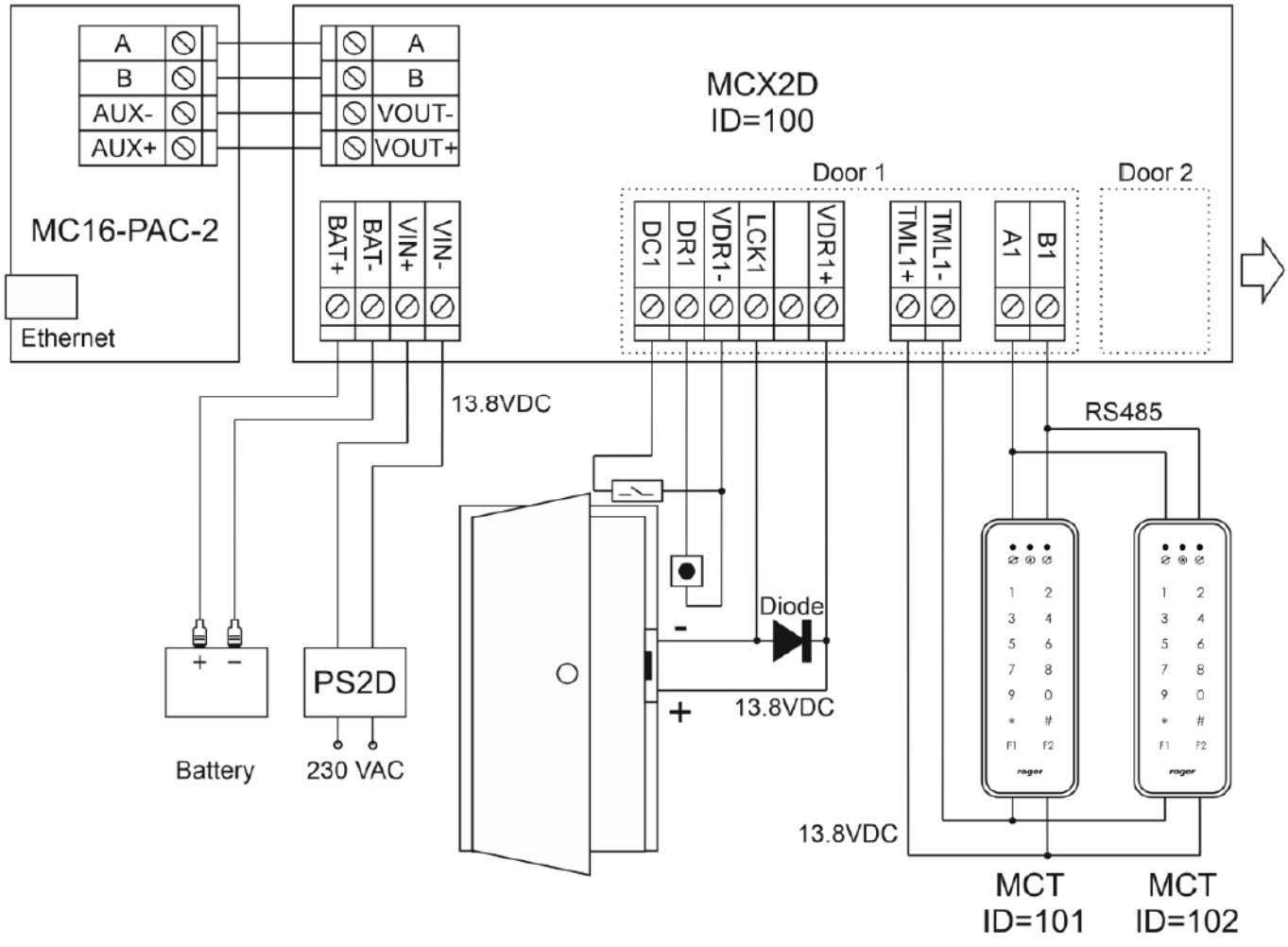


Fig. 6 Connection diagram for MCX2D expander in MC16-PAC-2-KIT

CONFIGURATION

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

Low-level configuration (VISO v2)

In the RACS 5 v2 system, the expander can be installed at the site without previous configuration. According to the AN006 application note, its address and other settings can be configured from VISO v2 management software a,, nd during such configuration,n the access to its service contacts (fig. 2) is not required.

Low-level configuration (RogerVDM)

The purpose of the low-level configuration is to prepare the device for operation in the RACS 5 system. Programming procedure with RogerVDM software (firmware 1.1.30.266 or newer):

1. Connect the device to the RUD-1 interface (fig. 7) and connect the RUD-1 to the computer’s USB port.
2. Remove jumper from MEM contacts (fig. 2) if it is placed there.
3. Restart the device by pressing the RST button, andthe the RUN LED indicator will pulsate. Then, within 5 seconds, place the jumper on the MEM contacts, and the RUN LED indicator will pulsate quickly.
4. Start the RogerVDM program, select the MCX v1.x device, v1.x firmware version, RS485 communication channel, and serial port with RUD-1 interface.
5. Click Connect, and the program will establish a connection and automatically display the Configuration tab.
6. Therange of 100-115 (if necessary) and other settings according t he quirements of

the 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 o file on disk.
9. Disconnect from the RUD-1 interface and leave the jumper on the MEM contacts to enable further configuration of the device from the VISO v2 software, or remove the jumper from fthe MEM contacts to block such remote configuration.

Programming procedure with RogerVDM software (firmware older than 1.1.30.266):

1. Connect the device to the RUD-1 interface (fig. 7) and connect the RUD-1 to the computer's USB port.
2. Place jumper on MEM contacts (fig. 2).
3. Restart the device by pressing the RST button,andthe RUN LED indicator will pulsate.
4. Start the RogerVDM program, select the MCX v1.x device, v1.x firmware version, RS485 communication channel, and serial port with RUD-1 interface.
5. Click Connect, and the program will establish a connection and automatically display the Configuration tab.
6. Enter an unoccupied RS485 address in the range of 100-115 (if necessary) and other settings according to the requirements of the 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 a file on disk.
9. Remove jumper from MEM contacts and disconnect device from RUD-1 interface.

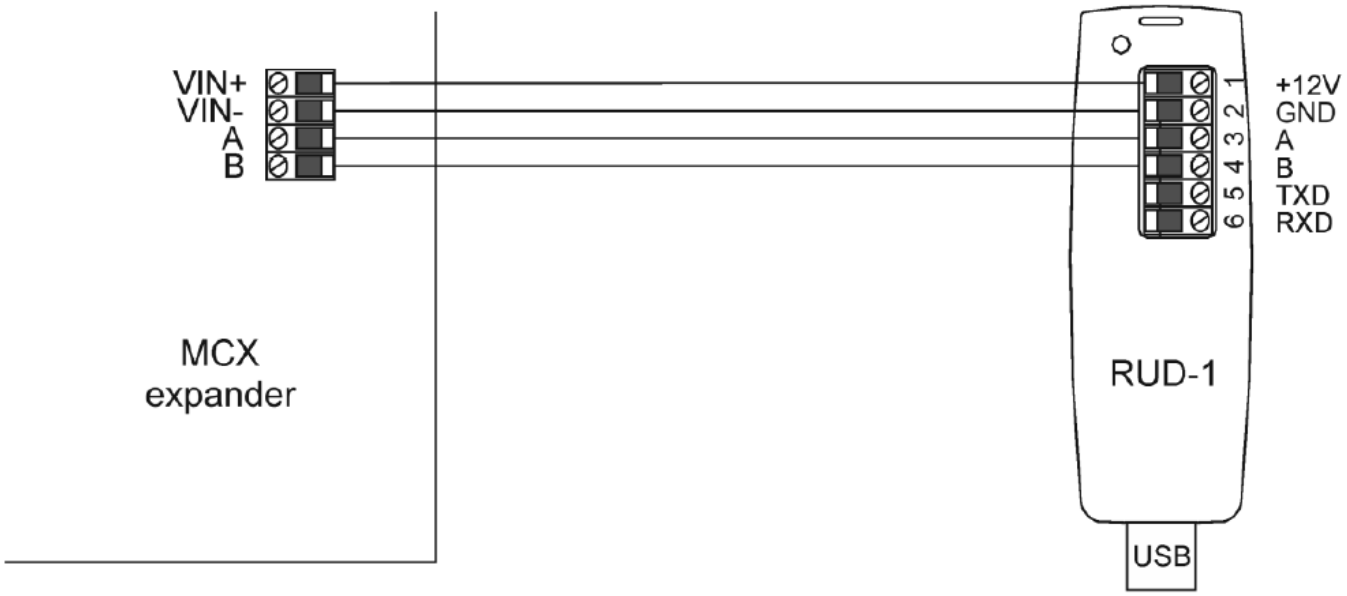


Fig. 7 Connection to RUD-1 interface (low-level configuration

Table 4. List of low-level parameters tion)

Table 4. List of low-level parameters	
Communication settings	
RS485 address	The parameter defines the device address on the RS485 bus. Range: 100-115. Default value: 100.
RS485 communication tim eout [s]	The parameter defines the delay after which the device will signal lost communication with the controller. When s et to 0, then signalling is disabled. Range: 0-64s. Default value: 20s.
RS485 encryption	The parameter enables encryption on the RS485 bus. R ange: [0]: No, [1]: Yes. Default value: [0]: No.
RS485 encryption key	A parameter defines the key for the encryption of comm unication on the RS485 bus. Range: 4-16 ASCII charact ers.

Input types	
DC1, DR1, DC2, DR2	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 for DC is [2]: NC. Default value for DR is [1]: NO.
Parametric (EOL) input resistances	
Tamper, Alarm A, Alarm B [Ohm]	A parameter defines a resistor for parametric (EOL) inputs.
Input response times	
DC1, DR1, DC2, DR2 [ms]	The parameter defines the minimal duration of the pulse that is required to trigger the input. Range: 50-5000. Default value: 50.
Output polarity	
LCK1, BELL1, LCK2, BELL2	The parameter defines the polarity of the output. Normal polarity means that the output by default is switched off, whereas 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, PWR	A parameter defines any text or comment that corresponds to the device/object. It is later displayed in the VISO program.
Input comments	

DC1, DR1, DC2, DR2	A parameter defines any text or command that correspo nds to the object. It is later displayed in the VISO progra m.
Output comments	
LCK1, BELL1, LCK2, BEL L2	A parameter defines any text or comment that correspon ds to the object. It is later displayed the ISO program.

Memory reset and manual addressing

Memory reset procedure resets all settings to factory default ones, and it enables to manual configuration of the address on the RS485 bus. Memory reset and manual addressing procedure (firmware 1.1.30.266 or newer):

1. Remove all connections from LCK1 and DC1 lines.
2. Remove jumper from MEM contacts (fig. 2) if it is placed there.
3. Connect LCK1 and DC1 lines.
4. Restart the device by pressing the RST butto, anthe d the RUN LED indicator will pulsate. Then, within 5 seconds, place the jumper on the MEM contacts, and the ACL LED indicator will pulsate.
5. Disconnect LCK1 and DC1 lines, and the RUN LED indicator will pulsate slowly. The number of consecutive flashes will correspond to the expander’s address on the RS485 bus.
6. Press the RST button at a certain moment to define a certain address (table 1) or press the RST button after 16 flashes when the ACL and RUN LED indicators are switched on to define the default ID=100 address.
7. Disconnect from RUD-1 interface and leave jumper on the MEM contacts to enable further configuration of the device from the VISO v2 software, or remove the jumper from MtheM contacts to block such remote configuration.

Memory reset and manual addressing procedure (firmware older than 1.1.30.266):

1. Remove all connections from LCK1 and DC1 lines.
2. Place jumper on MEM contacts (fig. 2).

3. Connect LCK1 and DC1 lines.
4. Restart the device by pressing the RST button, andthe the ACL LED indicator will pulsate.
5. Disconnect LCK1 and DC1 lines, and the RUN LED indicator will pulsate. The number of consecutive flashes will correspond to the expander’s address on the RS485 bus.
6. Press the RST button at a certain moment to define a certain address (table 5) or press the RST button after 16 flashes when ACL and RUN LED indicators are switched on to define the default ID=100 address.
7. Remove the jumper from the MEM contacts and restart the device.

Table 5. RS485 address encoding

Table 5. RS485 address encoding			
Number of RUN LED flashes	RS485 address	Number of RUN LED flashes	RS485 address
1	101	9	109
2	102	10	110
3	103	11	111
4	104	12	112
5	105	13	113
6	106	14	114
7	107	15	115
8	108	16	100

Example:

To select ID=105 address within the memory reset procedure, press the RST button after 5 flashes of the UN LED indicator.

High-level configuration (VISO)

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

FIRMWARE UPDATE

The firmware ofthe the device can be changed to a newer or older version. The update requires a connection to a computer with the RUD-1 interface (fig. 2) and starting the RogerVDM software. The latest firmware file is available at www.roger.pl.

Firmware update procedure:

1. Connect the device to the RUD-1 interface (fig. 8) and connect the RUD-1 to the computer's USB port.
2. Place jumper on FDM contacts (fig. 2).
3. Restart the device by pressing the ST button, andthe the TXD LED indicator will switch on.
4. Start the RogerVDM program and in the top menu select Tools and then Update firmware.
5. In the opened window, select device type, serial port with RUinterfaceace, nd path to firmware file (*.hex).
6. Click Update to start firmware upload with a progress bar at the bottom.
7. When the update is finished, remove the FDM jumper and restart the device. Additionally, it is recommended to start the memory reset procedure.

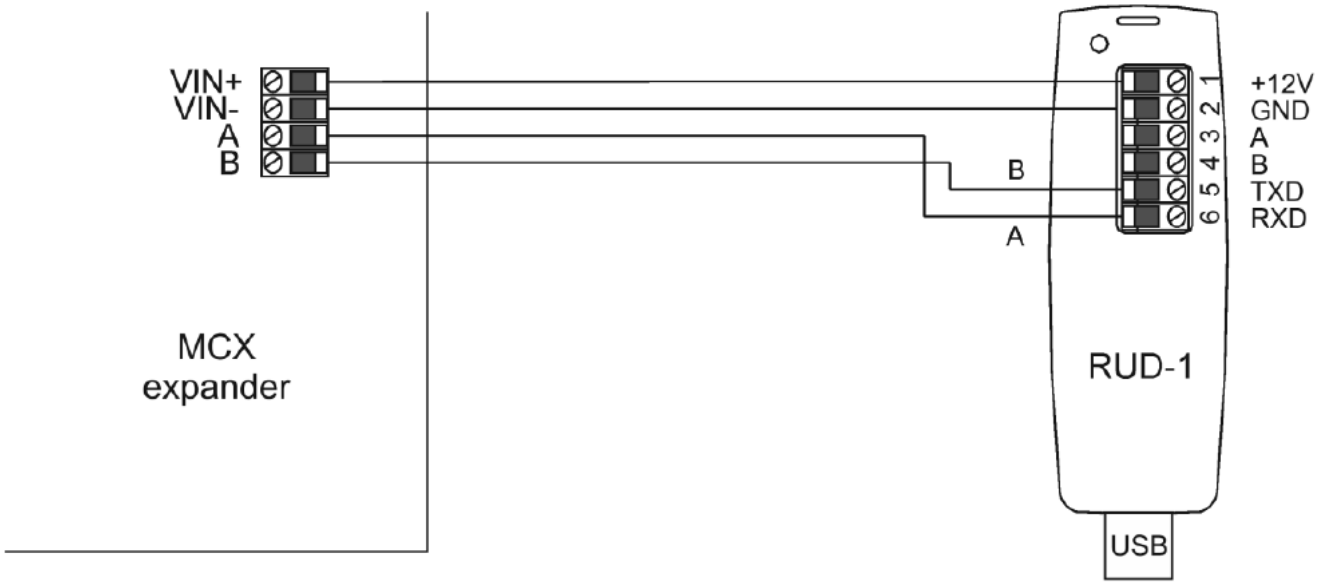


Fig. 8 Connection to RUD-1 interface (firmware update)

ORDERING INFORMATION

Table 7. Ordering information

Table 7. Ordering information	
MCX2D	MCX2D expander electronic module for installation in a metal hou sing with a
	power supply
MC16-PAC-2-KIT	2-door access control kit; ME-15 metal enclosure; MC16-PAC-2 a ccess controller module; MCX2D I/O expander; PS2D power supply
RUD-1	Portable USB-RS485 communication interface dedicated to ROG ER access control devices

PRODUCT HISTORY

Table 8. Product history

Version	Date	Description
MCX2D v1.0	10/2017	The first commercial version of the oduct

This symbol, placed on a product or packaging, indicates that the product should not be disposed of with other wastes, as this may hurt the environment and health. The user is obliged to deliver equipment to the designated collection points of electric and electronic waste. For detailed information on recycling, contact your local authorities, waste disposal company, or point of purchase. Separate collection and recycling of this type of waste contributes to the protection of the natural resources and is safe to health and the environment. The weight of the equipment is specified in the document.

Contact:

- Roger sp. z o.o. Sp.k. 82-400 Sztum Gościszewo 59
- Tel.: +48 55 272 0132
- Fax: +48 55 272 0133
- Tech. support: +48 55 267 0126
- E-mail: support@roger.pl
- Web: www.roger.pl

FAQs

How can I reset the memory in the MCX2D system?

To reset the memory, follow the instructions in the user manual provided by the manufacturer. Typically, a memory reset involves specific steps to clear and reconfigure the system settings.

What is the significance of LED indicators in service mode?

LED indicators in service mode signify different statuses such as communication errors, configuration memory errors, and normal operation. Refer to the user manual for detailed information on interpreting the LED signals

Documents / Resources

	Roger MCX2D Access Control System [pdf] Instruction Manual MCX2D, MCX2D Access Control System, MCX2D, Access Control System, Control System, System

References

- User Manual

ROGER

Access Control System, Control System, MCX2D, MCX2D Access Control System, Roger, System

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