Roger Access Control System
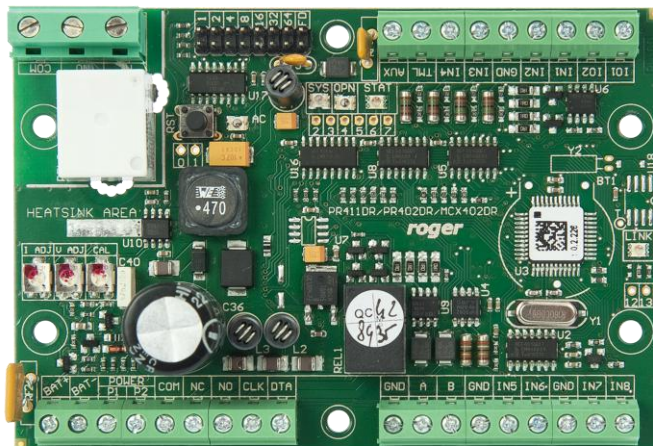
MCX402-BRD Operating Manual

Product version: 1.0

Firmware version: 1.1.0.302 or newer

Document version: Rev. E

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1. DESIGN AND APPLICATION

MCX402-BRD is I/O expander dedicated to the RACS 5 system. Depending on uploaded firmware the expander operates with two Wiegand interface terminals or two PRT series terminals. After connection to MC16 controller the device enables to control single door. The expander operates with backup battery which can be charged with 0.3A current. MCX402-BRD expander is offered separately or as a component of MC402-1-KIT and MC402-2-KIT.

Characteristics

- RACS 5 system I/O expander
- Power supply distribution for door devices
- 8 NO/NC inputs
- 2 transistor outputs
- 2 relay outputs
- 2 power supply outputs
- Backup battery charging
- RS485 interface
- Wiegand interface
- RACS CLK/DTA interface
- Screw terminals

Power supply

The expander can be supplied with 24VDC or 18VAC and in such scenario it offers 13.8VDC power supply outputs (AUX, TML) and backup battery charging. Alternatively the expander can be supplied with 12VDC but then it does not offer power supply outputs and battery charging.
The expander charges backup battery with 300mA stabilized current up to 13.8V. Backup power supply is activated automatically in case of main powers supply shortage. If the voltage at backup battery drops below approx. 10V then the battery is automatically disconnected from expander and remains disconnected until mains power supply returns.

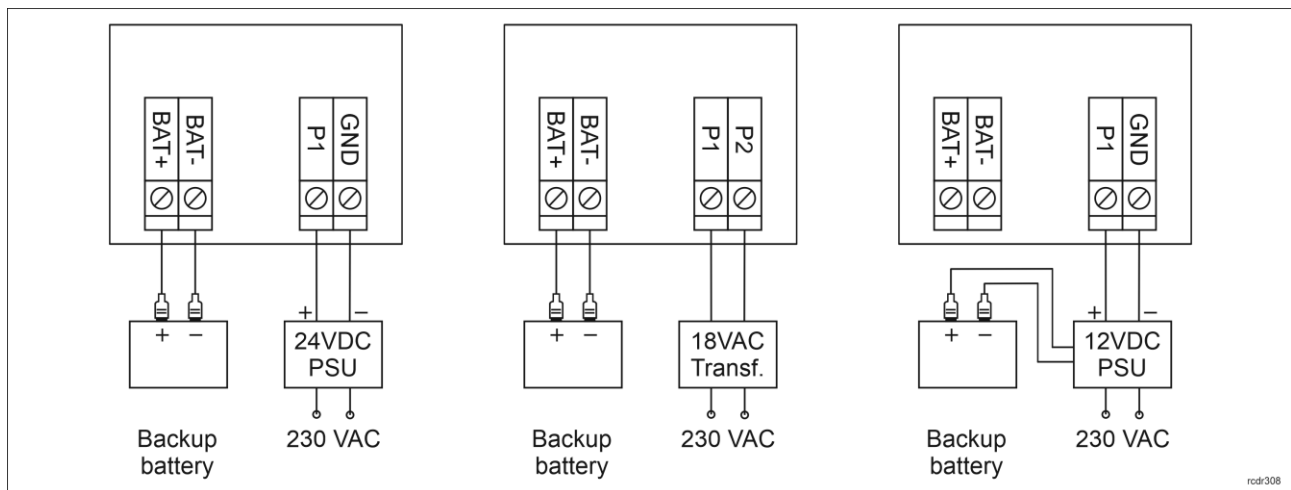Note: MCX402-BRD expander cannot be started using only power supply from backup battery.

Fig. 1 MCX402-BRD power supply

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

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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.

Wiegand bus

Wiegand interface can be used for communication with third party readers and terminals. Wiegand communication is ensured via expander input lines (IN1-IN4) and up to two Wiegand terminals can be controlled in such way by MC16 controller.

RACS CLK/DTA bus

The expander with factory uploaded firmware enables operation of Wiegand terminals with MC16 controller. In case of PRT readers with RACS CLK/DTA interface the expander must be uploaded with new firmware which is available at www.roger.pl. The expander enables the control of two PRT series readers with ID=0 and ID=1 addresses by MC16 controller.

LED indicators

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

Table 1. LED indicators		
Indicator	Colour	Integral function
AC	Red	AC power supply
STA	Red/ green	Current arming mode of Alarm Zone (armed/disarmed)
OPN	Green	Door unlocked
SYS	Orange	Various signalling functions including errors
LINK	Green	Data transmission on RS485 bus

Inputs

Expander offers 8 inputs (IN1 - IN8) of NO and NC type. Input types are defined within low level configuration (RogerVDM). Input functions are assigned within high level configuration (VISO). Multiple functions can be assigned to the same input at the same time.

Outputs

Expander offers two transistor outputs (IO1, IO2) and two relay outputs (REL1, REL2) with NO/NC contacts and respectively 30V/1,5A and 230VAC/5A max. loads. Electric parameters such as polarity are configured within low level configuration (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.

Power supply outputs

Expander offers 2 outputs (AUX, TML) in order to provide power supply to terminals, door lock and other external devices. Lines are protected respectively with 1.0A and 0.2A electronic fuses.

2. INSTALLATION

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. It is recommended to install the expander in the same enclosure as PSU.
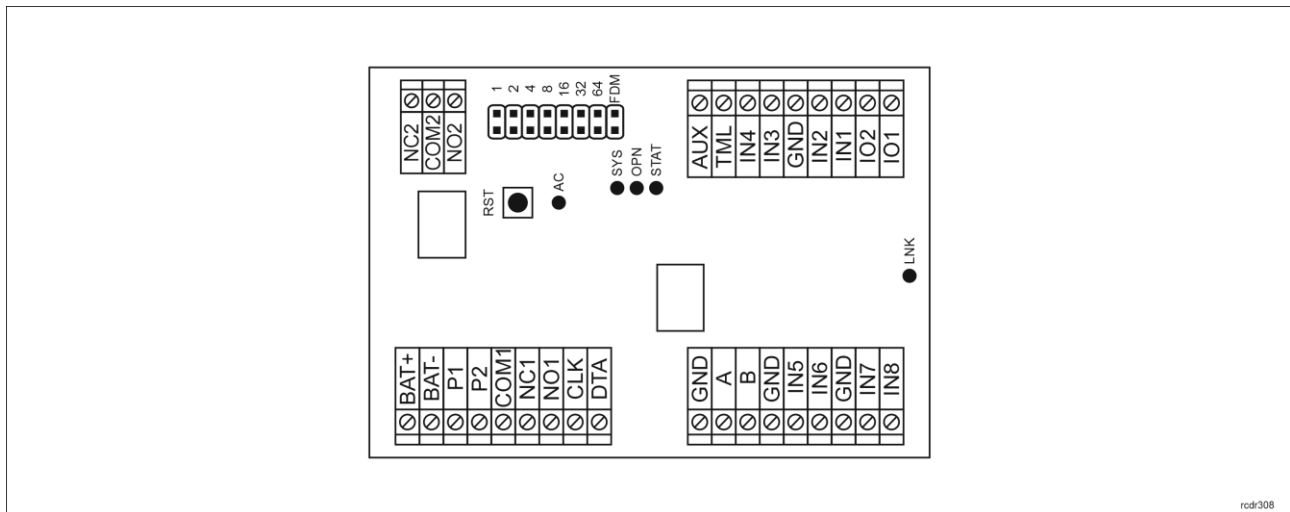
Fig. 2 MCX402-BRD expander

| Table 2. Screw terminals	
Name	Description
BAT+, BAT-	Backup battery
P1	24VDC input power supply
P2	Ground
AUX	12VDC/1.0 output power supply (for door lock)
TML	12VDC/0.2A output power supply (for readers)
IN1-IN8	Input lines
GND	Ground
IO1, IO2	15VDC/1A transistor output lines
A, B	RS485 bus
CLK, DTA	RACS CLK/DTA bus
NO1, COM1, NC1	30V/1.5A DC/AC (REL1) relay
NO2, COM2, NC2	230V/5A AC (REL2) relay
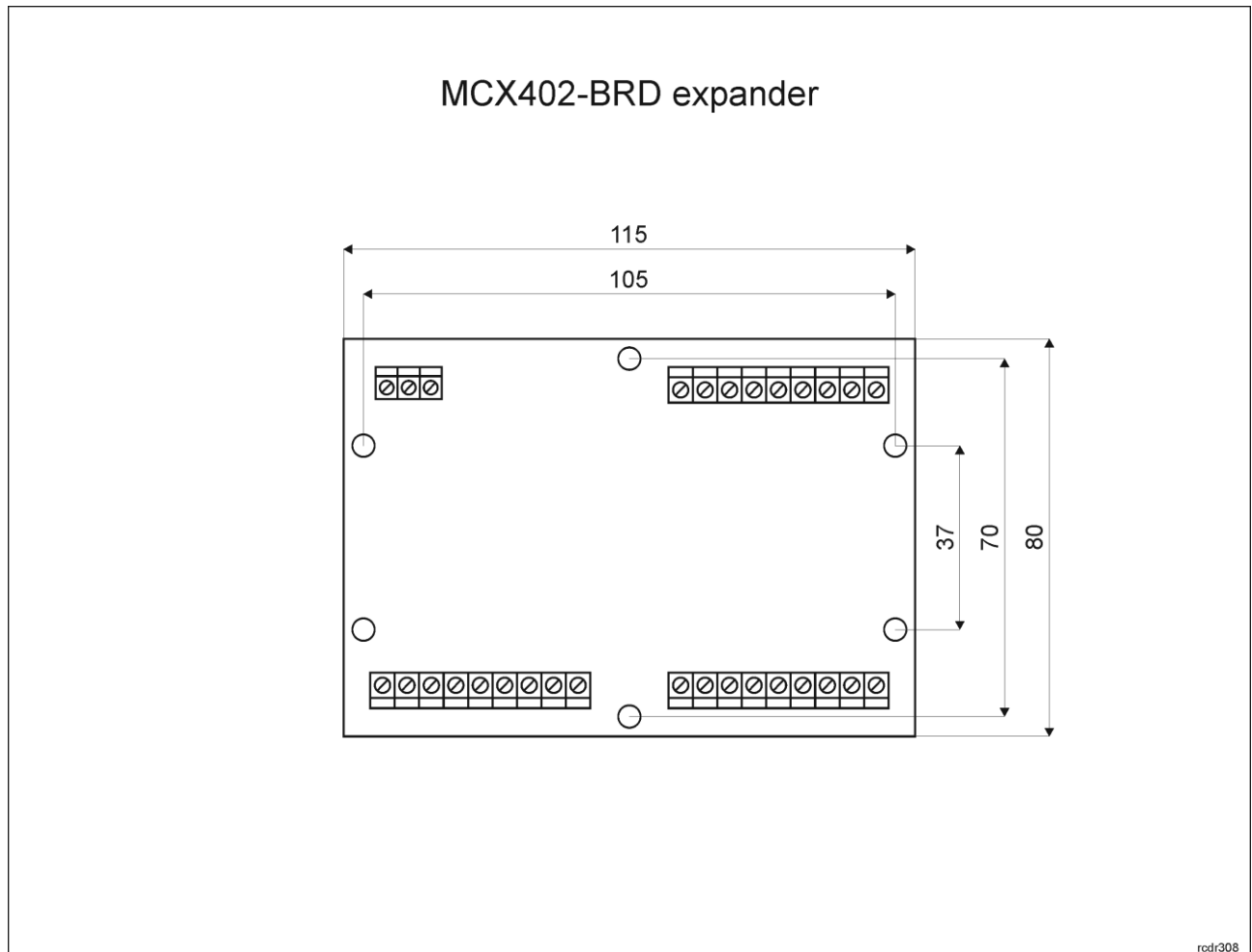
Fig. 3 MCX402-BRD installation

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

In typical scenario of operation, MCX402-BRD expander is used to control single door by MC16 controller. Depending on uploaded firmware the expander can operate with 2 Wiegand or PRT terminals. In practical applications expanders are usually installed within MCX402-1-KITs. The MCX402-2-KIT which is additionally equipped with PS1A module can be used to control two read-in doors by MC16 controller.
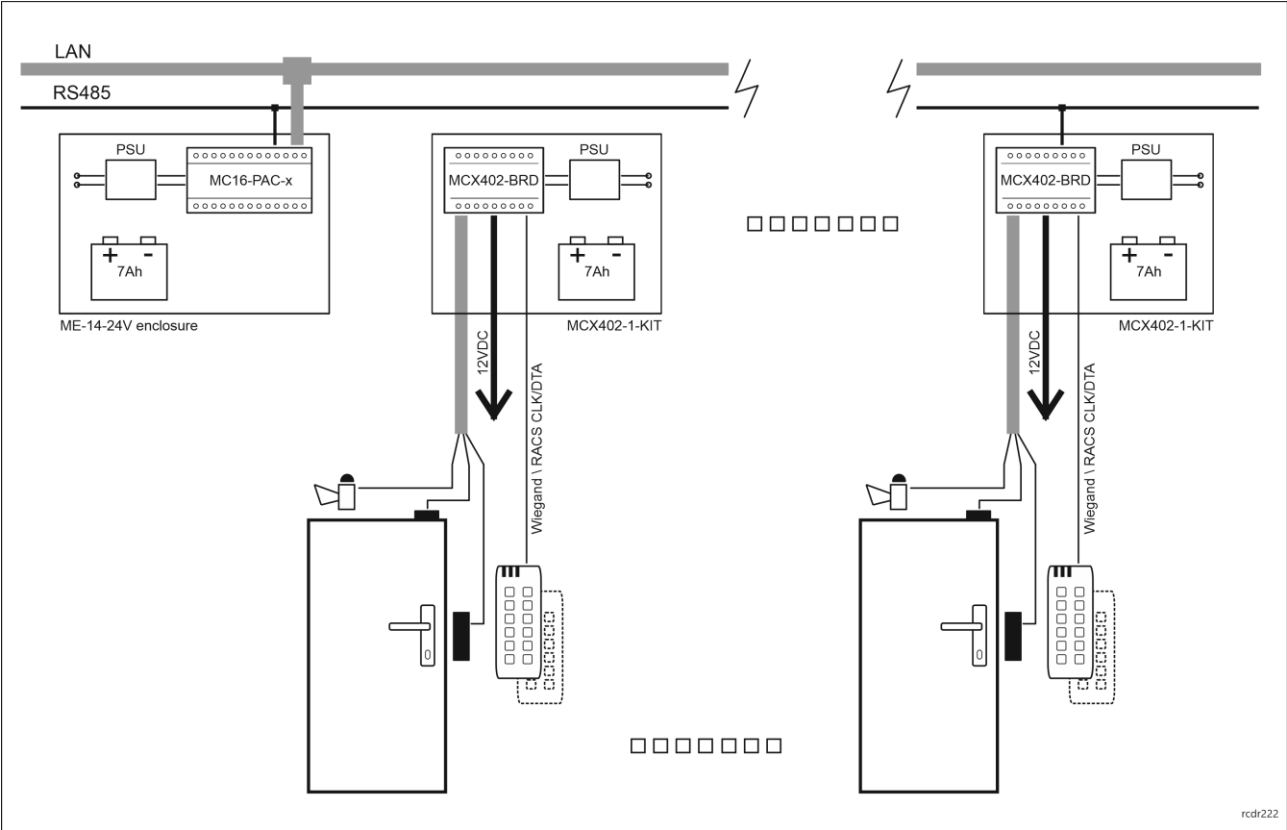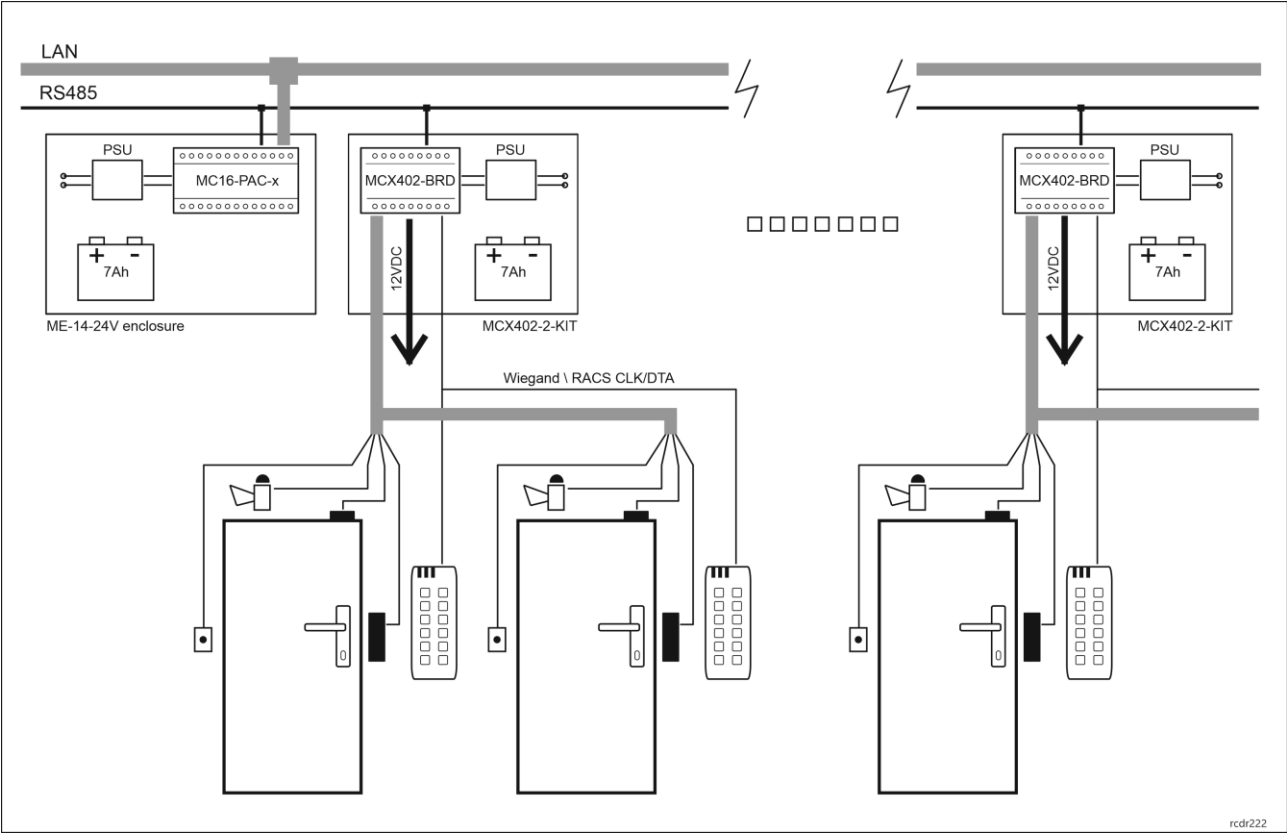
Fig. 4 Scenario of operation with MCX402-1-KITs

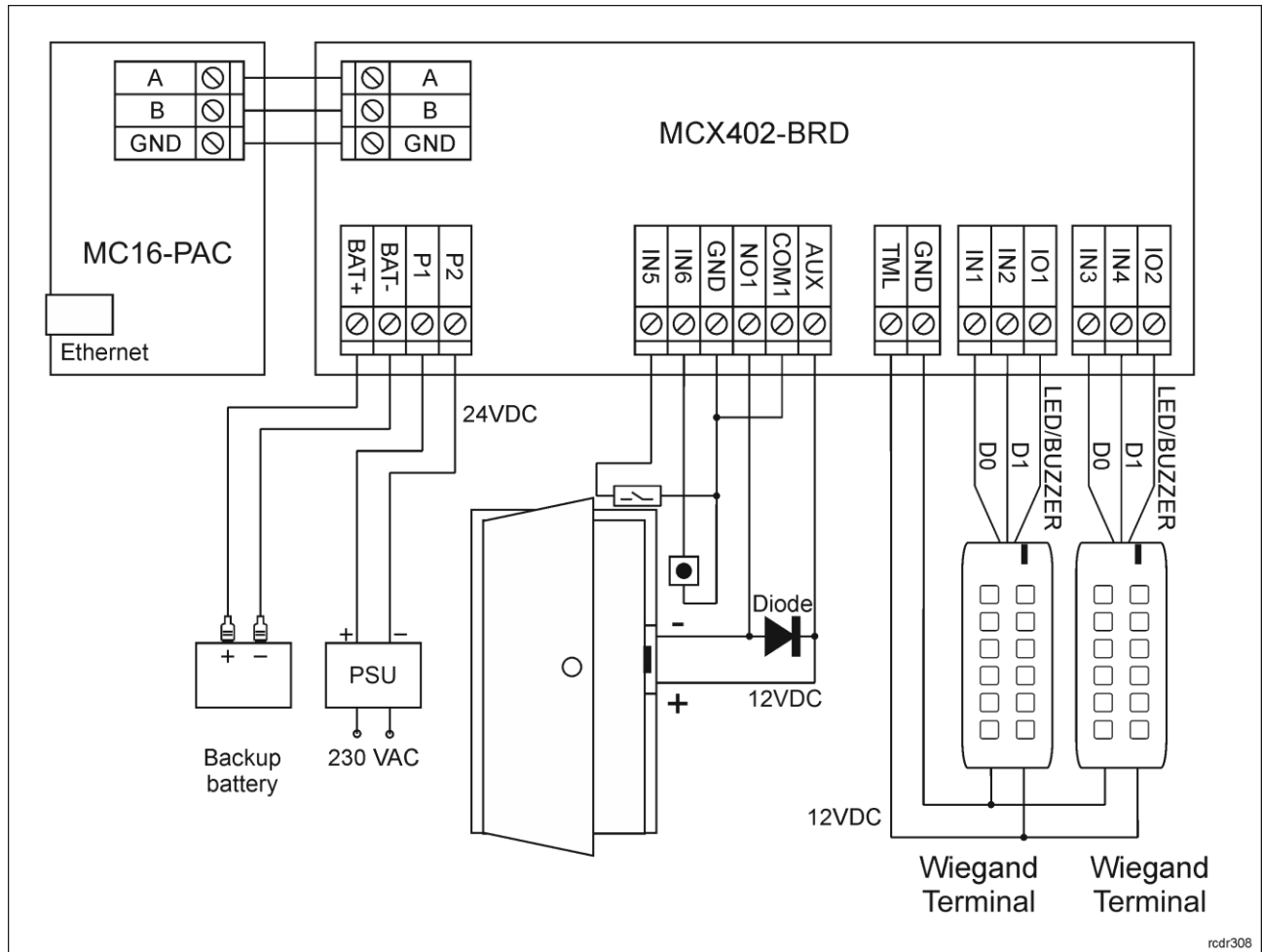Fig. 5 Scenario of operation with MCX402-2-KIT

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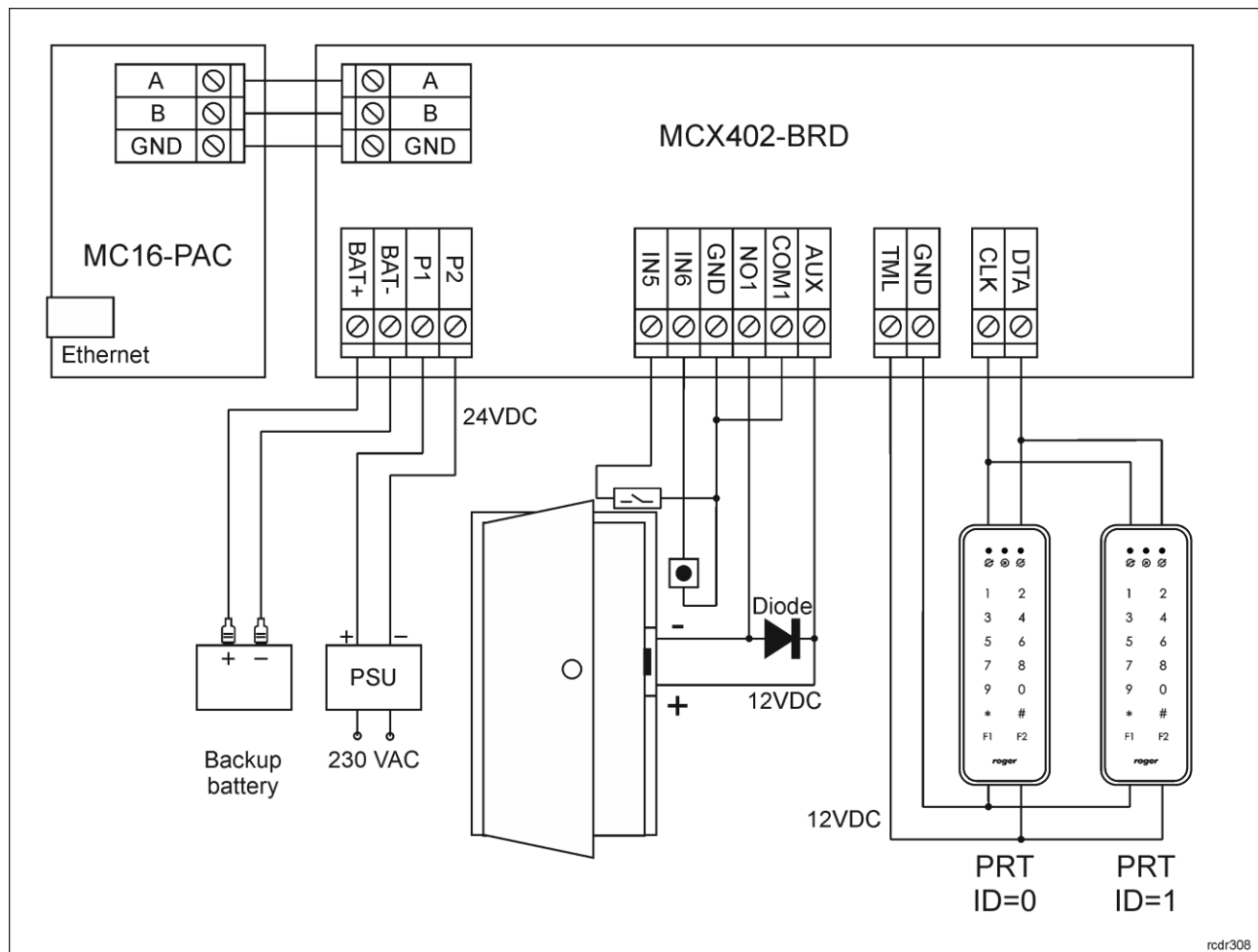Fig. 6 Typical door control with Wiegand readers

Fig. 7 Typical door control with PRT readers

4. CONFIGURATION

Low level configuration (RogerVDM)

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

Programming procedure with RogerVDM software:

1. Connect the device to RUD-1 interface (fig. 8) and connect the RUD-1 to computer's USB port.
2. Start RogerVDM program, select *MCX v1.x* device, firmware version, *RS485* communication channel and serial port with RUD-1 interface.
3. Click *Connect,* the program will establish connection and will automatically display *Configuration* tab.
4. Enter unoccupied RS485 address in range of 100-115, enable Wiegand or PRT terminals, configure input types (e.g. NC for IN5 according to fig. 6) and other settings according to requirements of specific installation.
5. Click *Send to Device* to update the configuration of device.
6. Optionally make a backup by clicking *Send to File…* and saving settings to file on disk.

Note: Time to connect to the device in RogerVDM is 30 seconds from power up. In case of timeout, a power reset should be performed just before the connection.
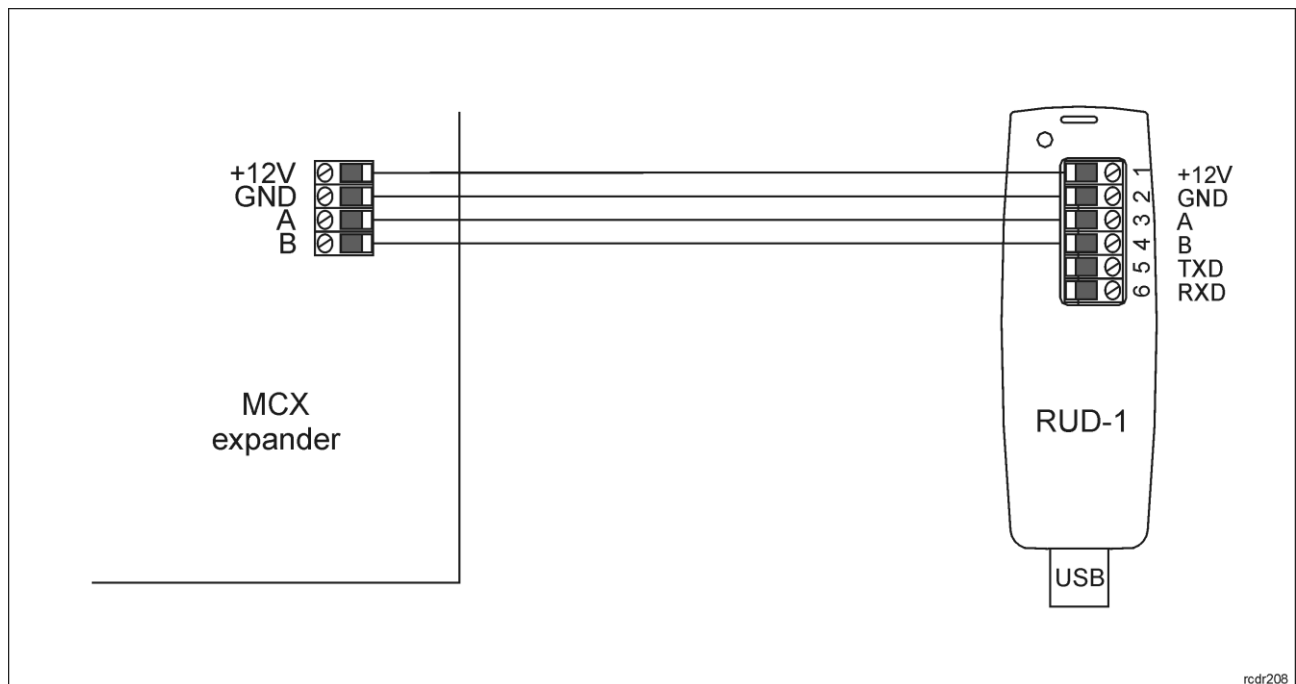
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Fig. 8 Connection to RUD-1 interface

Table 3. 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.
General settings	
Single key press**	When option is enabled then the whole PIN is transmitted to controller. When option is disabled then every pressed key is transmitted separately to controller. Range: Yes, No. Default value: Yes.
Min. PIN length	Parameter defines the minimal number of digits for PIN entered with keypad. When set to 0 then PINs are disabled. Range: 0-8. Default value: 4.
Max. PIN length	Parameter defines maximal number of digits in PIN. When set to 0 then PINs are disabled. Range: 0-8. Default value: 8.
[*] key clears PIN buffer	Parameter defines if already entered digits of PIN can be deleted with [*] key. Range: Yes, No. Default value: Yes
Time between keys in PIN [s]	Parameter defines max. time between two consecutive key pressings. Range: 1-64. Default value: 20.
PIN followed by [#] key	Parameter enables use of PINs with variable length. In such scenario every PIN is concluded with [#] key. Range: Yes, No. Default value: Yes.
AC return timeout [min.]	Parameter defines time after which return of AC supply is reported. Range: 0-250. When set to 0 then signalling is disabled. Default value: 2.
AC lost timeout [min.]	Parameter defines time after which lost AC supply is reported. Range: 0-250. When set to 0 then signalling is disabled. Default value: 10.

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Battery test period [min.]	Parameter defines time between battery tests. Range: 0-250. When set to 0 then testing is disabled. Default value: 10.
Input types	
IN1-IN8	Parameter defines input type. Range: [0]: NO, [1]: NC. Default value: [0]: NO.
Input comments	
IN1-IN8	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.
Output polarity	
REL1, REL2, IO1, IO2	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.
Output comments	
REL1, REL2, IO1, IO2	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.
Object comments	
DEV	Parameter defines any text or comment which corresponds to the device. It is later displayed in VISO program.
Wiegand terminal 1 / Wiegand terminal 2*	
Terminal enabled	When option is enabled then Wiegand terminal 1/2 is operated. Range: Yes, No. Default value: Yes.
Keypad enabled	When option is enabled then keypad on Wiegand terminal 1/2 is operated. Range: Yes, No. Default value: Yes.
AF type	Parameter defines authentication factor type returned by terminal. Default value: [16]: Number 40bits.
AF class	Parameter defines authentication factor class returned by terminal. Default value: [0002]: EM.
KBD comment	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.
CDI comment	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.
Card code length	Parameter defines type of Wiegand 26-66bit interface. Range:0-66. Default value: 26.
Card code reverse order	When option is enabled then expected card code returned by terminals is in reverse order. Range: Yes, No. Default value: No.
PIN format	Parameter defines format of PIN returned by terminal. Range: [0]: None, [1]: BIN, [2]: BCD, [3]: HEX. Default value: [0]: None.
PIN length	Parameter defines expected code length that is recognized as PIN. Range: 0 – no verification, 1-15 – verification off, 16-66 – verification on. Default value: 0.
PIN reverse order	When option is enabled then expected PIN returned by terminal is in reverse order. Range: Yes, No. Default value: No.
Single key press	When option is enabled then reader transmits the whole PIN to controller. When option is disabled then reader transmits every pressed key separately. Range: Yes, No. Default value: No.

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RACS CLK/DTA Terminal ID1 / Terminal ID0**	
Terminal enabled	When option is enabled then card reader on terminal ID0/ID1 is enabled. Range: Yes, No. Default value: Yes.
Keypad enabled	When option is enabled then keypad on terminal ID0/ID1 is enabled. Range: Yes, No. Default value: Yes.
AF type	Parameter defines authentication factor type returned by terminal ID0/ID1.
AF class	Parameter defines authentication factor class returned by terminal ID0/ID1.
KBD, CDI, BUZZER, LED SYSTEM, LED OPEN, LED STATUS comment	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.

* Wiegand settings are available when the factory default MCX402DR-WGx.hex firmware is uploaded to expander
** PRT readers settings are available when MCX402DRx.hex firmware from www.roger.pl is uploaded to expander

Manual addressing

The RS485 address of expander configured with RogerVDM is a software address. Alternatively hardware RS485 address can be configured with jumpers and such address has higher priority than software address.

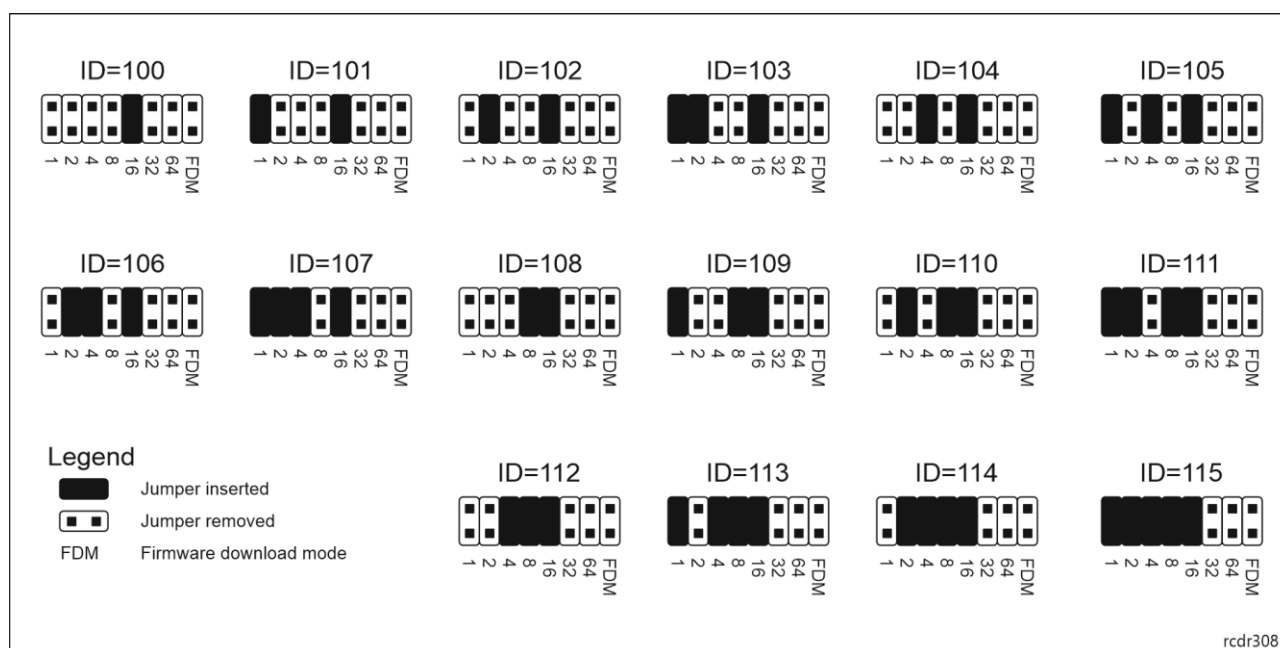Note: Each time the hardware RS485 address is modified the device must be restarted.

Fig. 9 Manual addressing of expander

Memory reset procedure

Memory reset procedure restores factory default settings including ID=100 software address.

Expander memory reset procedure:

1. Remove all connections from A, B, CLK and DTA terminals.
2. Place jumper on 64 contacts and restart device with RST button on device board or by switching supply off and on.
3. Remove jumper from 64 contacts when LED STAT (red), LED OPN and LED SYS are ON.

4. LED OPN and LED SYS will switch off and device shall restart automatically with factory default settings.

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

Factory new expander is equipped with a firmware dedicated to Wiegand readers. If the expander is to be operated with PRT readers then another firmware must be uploaded. Such firmware is available at www.roger.pl. Firmware update requires RogerISP program.

Expander 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
3. Restart device with RST button on device board or by switching supply off and on.
4. Start RogerISP software.
5. Select serial port emulated by RUD-1 interface and the option *USB-RS485 Converter*.
6. Select firmware file (*.hex), click *Program* and follow instructions on screen.
7. Once the firmware is uploaded remove the FDM jumper and restart the device.
8. Start Memory reset procedure.

6. SPECIFICATION

| Table 4. Specification	
Supply voltage	Nominal 18VAC, min./max. range 17-22VAC
	Nominal 12VDC, min./max. range 10-15VDC
	Nominal 24VDC, min./max. range 22-26VDC
Current consumption (average)	100 mA (excluding load points connected to AUX and/or TML outputs)
Battery charging current	300mA
Inputs	Eight (IN1..IN8) NO/NC inputs, triggering level app. 3.5V
Relay outputs	Two (REL1,REL2) relay outputs with isolated NO/NC contacts, 30V/1.5A (REL1) and 230VAC/5A (REL2) max. loads
Transistor outputs	Two (IO1, IO2) transistor outputs, max load 15VDC/1A
Power supply outputs	Two power outputs (AUX, TML), 12VDC/0.2A (TML) and 12VDC/1A (AUX) max loads
Distances	Up to 1200 m between controller and expander (RS485)
	Up to 150m between expander and Wiegand or PRT terminals
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	80 x 115 x 28mm
Weight	100g
Certificates	CE

7. ORDERING INFORMATION

Table 5. Ordering information

MCX402-BRD	Door expander; battery charge and maintenance; 1.2 A supply output; 18 VAC/40VA supply; 2 Wiegand readers interface
MCX402-1-KIT	1-door expander kit; ME-14 metal enclosure; MCX402-BRD I/O expander
MCX402-2-KIT	2-door expander kit; ME14 metal enclosure; MCX402-BRD I/O expander; PS1A-LCK power supply module
RUD-1	Portable USB-RS485 communication interface dedicated to ROGER access control devices

8. PRODUCT HISTORY

Table 6. Product history		
Version	Date	Description
MCX402-BRD v1.0	10/2017	The first commercial version of product
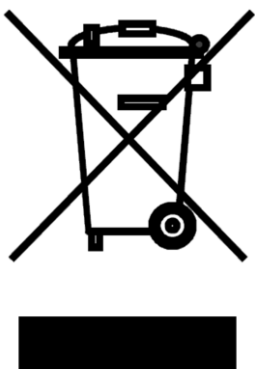
	This symbol placed on a product or packaging indicates that the product should not be disposed of with other wastes as this may have a negative impact on the environment and health. The user is obliged to deliver equipment to the designated collection points of electric and electronic waste. For detailed 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. Weight of the equipment is specified in the document.

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