Roger Access Control System

MCT12M SERIES OPERATING MANUAL

DOMINO series

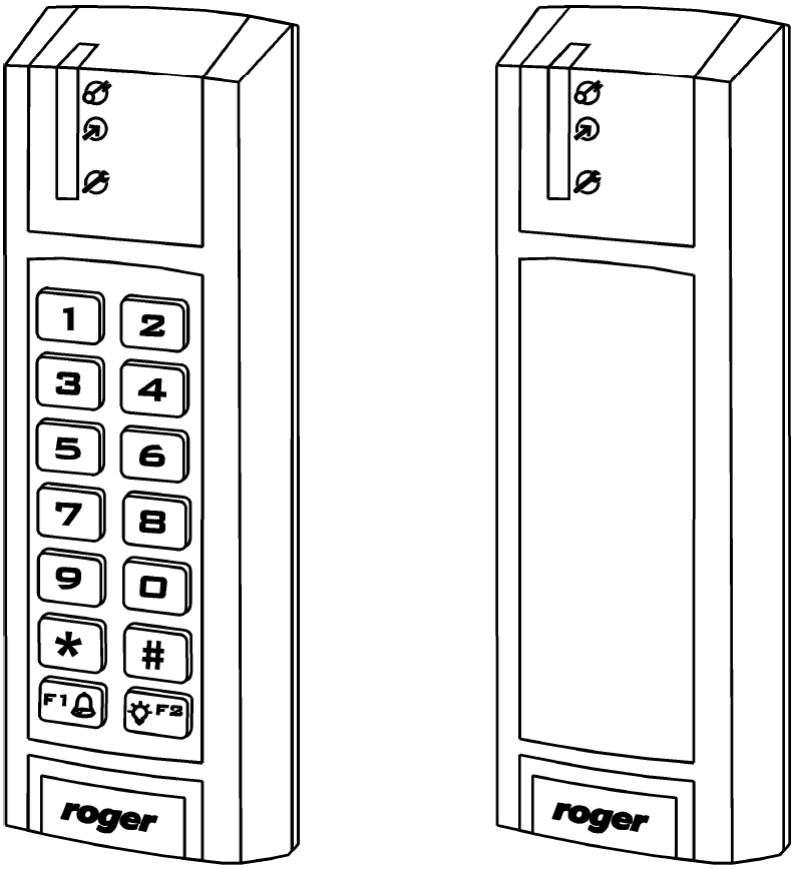
Firmware: v1.1.2 and higher

Hardware version: v1.0

Document version: Rev. D

This document refers to the following products:

MCT12M, MCT12M-BK, MCT12M-IO, MCT12M-IOBK, MCT12M-DIO, MCT12M-DIOBK



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CONTENTS

FUNCTIONAL DESCRIPTION

GENERAL DESCRIPTION

The MCT12M series readers are outdoor RFID access terminals dedicated to the RACS 5 access control system. The readers need to be connected to a host device, which usually is an access controller and can't operate autonomously. The MCT12M terminal can read either a factory programmed card serial number (CSN) or any user card number (PCN) programmed in encrypted data blocks or files on a card. Because the CSN card numbers are not encrypted and can be duplicated, they should not be used for access control systems in general; rather the PCN number should be used. For systems which require the highest security level the MIFARE® DESFire EV1 or MIFARE® PLUS cards, supported by MCT12M-DIO and MCT12M-DIOBK terminals, are recommended. The MCT12M series readers with the IO option offer the set of inputs and outputs which, in most cases, should be capable of operating single door passages without the necessity to use inputs or outputs located on an access controller or expansion unit. There are three inputs available on the reader which can be individually configured for various pulse times and contact topologies. Optionally, inputs can be configured for Double Wiring function which allows operation with two NO/NC contacts connected to a single input and, because of this, doubles the total number of input signals monitored by the reader. The reader offers two open collector transistor outputs and one relay type output with single isolated NO/NC contact. All outputs can be configured for Normal Polarity (output normally OFF) or Reverse Polarity (output normally ON). Communication with the controller is achieved through an RS485 bus which can utilize free topology (e.g. three, star and combination of them) and any type of signal cables. The maximum distance between the controller and reader is limited to 1200m of cable run. Configuration of the reader, as well as firmware upgrade, is made through an RS485 and requires the RogerVDM (Windows) program. Because of its narrow shape the MCT12M can be installed on a door frame and other door construction elements with limited space.

FEATURES

- 13,56 MHz ISO14443A
- MIFARE® ULTRALIGHT
- MIFARE® Classic 1k and 4k
- MIFARE® Plus (1)
- MIFARE® DESFire EV1 (1)
- Reads factory programmed card number (CSN)
- Reads user programmed card number (PCN)
- Up to 7 cm reading range for Ultralight and Classic ISO cards
- Up to 3 cm reading range for DESFire and Plus ISO cards
- Support for normal and long card reading method
- RS485 communication interface
- Three LEDs
- Three parametric type input lines (2)
- Configurable input pulse range (50…5000ms)
- *Double Wiring* input option
- Relay output NO/NC 1.5A/30V (2)

- Two transistor outputs 150mA/15V [2]
- *Normal* or *Reverse* output polarity
- Buzzer with loudness level adjustment
- Silicon rubber keypad with regulated backlight level[3]
- Two function keys [3]
- Tamper contact with detection of enclosure detachment and opening
- 12VDC power supply
- Configuration and firmware upgrade through RS485 (RogerVDM)
- Outdoor environment
- Dimensions:
- CE mark

[1] refers to MCT12M-DIO and MCT12M-DIOBK
[2] doesn't refer to MCT12M and MCT12M-BK
[3] doesn't refer to product version without keypad

RFID TRANSPONDERS

MCT12M series readers support ISO 14443A and MIFARE® transponders. By default, reader is configured to read Chip Serial Number (CSN) however, it is possible to configure it to read other data sectors.

Note: Reading the Programmable Card Number (PCN) from MIFARE® Plus, DESFire EV0 and EV1 is possible only by means of MCT12M-DIO and MCT12M-DIOBK readers.

CARD CODE

Whenever card is read reader sends to controller RCN number (Returned Card Number). In general, RCN can be formed from a combination of CSN and PCN sections (RCN = CSN + PCN). CSN section is a fragment of RCN which has been taken from CSN number. PCN section is a fragment of RCN which has been taken from programmable data sectors. PCN number can be protected from any modifications and unauthorized reading attempts by its encryption. It is strongly recommended to use PCN numbers because of their higher level of security.

<table>
<tr><td colspan="2">RCN</td></tr>
<tr><td>CSN section</td><td>PCN section</td></tr>
</table>

Note: The 'h' letter placed at the end of a sequence of digits presented in examples below indicates hexadecimal number format.

CSN SECTION

Configuration of CSN section is made by defining of CSNL parameter which specifies the number of bytes taken from CSN number and used in the RCN number. In general, depending on a card type, CSN may contain 4 or 7 bytes but the CSNL parameter can be set from 0 to 15 bytes and following cases may occur:

- **CSNL**=0 means that no CSN bytes will be included in RCN and as result the RCN will be solely formed from PCN number.
- If number of available CSN bytes is lower than declared CSNL parameter then the CSN number is filled by leading zeros.
- If CSNL is lower than number of bytes available in CSN, then RCN gets least significant bytes (LSB) of CSN number only.

Example

CSNL=5 and CSN contains 4 bytes:

55h	66h	77h	88h

CSN section in RCN number will be formed:

00h	55h	66h	77h	88h

Example

CSNL=2 and CSN contains 4 bytes:

55h	66h	77h	88h

CSN section in RCN number will be formed as:

77h	88h

PCN SECTION

PCN section is read from programmable data sectors of the card. The type of location where PCN number is stored is defined by **Sector type** parameter.

Sector type	PCN location
NONE	RCN number is formed only by CSN number and PCN number is not used.
SSN	PCN is read from the indicated sector and block of a card. AID number (Application ID) is ignored.
MSN	PCN is read from indicated block in the first identified sector, which has been marked by two-byte AID number. In some cases many sectors may be marked by indicated AID, so it is possible to read a random value from the block.
DESFire	PCN is read from the file indicated by AID.

The number of bytes which are read from the file (DESFire cards) or from block (other cards) is defined by parameters: FBP (first byte) and LBP (last byte). If the FBP>LBP then it is treated as normal sequence of byte reading but if FBP<LBP then it is treated as reverse sequence of bytes.

PCN can be coded in data block on card either as binary form (BIN) or text form (ASCII HEX) which is specified by **Format** parameter. In case of ASCII HEX coding one byte represents one character in hexadecimal, e.g. '0100 0001' means 'A' while in BIN format this same bits mean two hexadecimal digits: 4 and 1 (41h). In case of ASCII HEX coding the length of read PCN code is twice less than difference between FBP and LBP parameters. FBP and LBP parameters are defined separately for Classic, Plus and DESFire

cards. PCN read-out parameters from Ultralight card are the same as for Classic cards, while storage location of PCN code is fixed and cannot be defined.

Example

Settings: **FBP**=5, **LBP**=9, **Format**=BIN . The contents of the data block on card is presented below:

						FBP				**LBP**						
Pos.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BIN	00h	11h	22h	33h	44h	55h	66h	77h	88h	99h	AAh	BBh	CCh	DDh	EEh	FFh

read PCN code read from block:

55h	66h	77h	88h	99h

Example

Settings: **FBP**=9, **LBP**=5, **Format**=BIN. The form of data stored on card block is presented below:

						LBP				**FBP**						
Pos.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BIN	30h	31h	32h	33h	34h	35h	36h	37h	38h	39h	41h	42h	43h	44h	45h	46h

read PCN code read from block:

39h	38h	37h	36h	35h

Example

Settings: **FBP**=3, **LBP**=10, **Format**=ASCII HEX. The form of data stored on card block is presented below:

				FBP							**LBP**					
Pos.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ASCII	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
BIN	30h	31h	32h	33h	34h	35h	36h	37h	38h	39h	41h	42h	43h	44h	45h	46h

read PCN code read from block:

34h	56h	78h	9Ah

Example

Settings: **FBP**=2, **LBP**=10, **Format**=ASCII HEX. The form of data stored on card block is presented below:

			FBP								**LBP**					
Pos.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ASCII	‘0’	‘1’	‘2’	‘3’	‘4’	‘5’	‘6’	‘7’	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
BIN	30h	31h	32h	33h	34h	35h	36h	37h	38h	39h	41h	42h	43h	44h	45h	46h

read PCN code read from block:

02h	34h	56h	78h	9Ah

Example

Settings: **FBP**=10, **LBP**=2, **Format**=ASCII HEX . The form of data stored on card block is presented below:

			LBP								**FBP**					
Pos.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ASCII	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
BIN	30h	31h	32h	33h	34h	35h	36h	37h	38h	39h	41h	42h	43h	44h	45h	46h

PCN code read from block:

0Ah	98h	76h	54h	32h

RCN NUMBER

RCN number is created by combining CSN and PCN sections and is specified by **Format**, **CSNL**, **FBP** and **LBP** parameters.

Example

Settings **CSNL**=4, **FBP**=8, **LBP**=10, **Format**=BIN. CSN and PCN numbers are formed as below:

CSN						
C1h	C2h	C3h	C4h	C5h	C6h	C7h

PCN																
Pos.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BIN	AAh	BBh	CCh	DDh	EEh	FFh	00h	11h	22h	33h	44h	55h	66h	77h	88h	99h

RCN code read from block:

RCN						
CSN section				PCN section		
C4h	C5h	C6h	C7h	22h	33h	44h

Depending on output format RCN number may be transmitted to controller in different ways. Few examples of transmitting options of the same RCN=C4C5C6C7223344h number by readers which work in various output formats are presented below.

Example

RCN number which is sent by reader working on *Number 64 bit* **card number data type**:

00h	C4h	C5h	C6h	C7h	22h	33h	44h

In this example original RCN number was filled by leading '0' digits.

RCN number which is sent by reader working on *Number 40 bit* **card number data type**:

C6h	C7h	22h	33h	44h

In this example original RCN number was reduced at two leading bytes (C4h and C5h).

RCN number which is sent by reader working on *Number 24 bit* **card number data type**:

22h	33h	44h

In this example original RCN number was reduced at four leading bytes (C4h, C5h, C6h and C7h).

RCN number which is read by PRT series reader working on RACS CLK/DTA mode which reads 40 bits of code:

C6h	C7h	22h	33h	44h

In this example original RCN number was reduced at two leading bytes (C4h and C5h).

Notes:

1. In order to configure the reader to read CSN number only it should be selected **Sector type**=NONE, while **CSNL** parameter set according to required code length.

2. In order to configure the reader to read code stored in PCN sector only, the **Sector type** parameter should be set to value other than '0' – NONE, while **CSNL** parameter should be set to 0.

3. If RCN number configured in reader is longer than the length of code transmitted by the reader in selected mode, then reader omits leading digits of RCN code.

4. If RCN number configured is shorter than the length of code transmitted by the reader in selected mode, then reader adds leading zeroes to the RCN code.

INPUTS

MCT12M series readers with IO option (e.g. MCT12M-IO, MCT12M-DIO, MCT12M-IOBK, MCT12M-DIOBK) are equipped in three parametric inputs. During the low level configuration it is possible to define parameters specifying operation method of inputs. The following parameters are available to set for inputs:

- Type of topology
- Parametric resistance
- Response time
- Names or comments

Note: Inputs functions are defined via VISO software which is intended for high-level configuration of RACS 5.

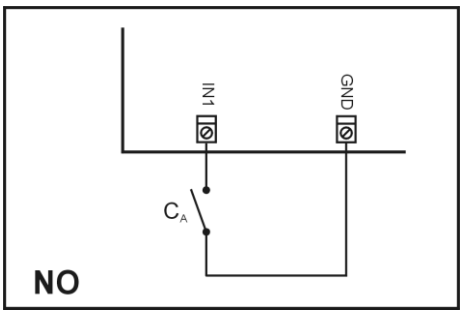
INPUT TYPES

Input type specifies the topology of contacts and resistors attached to the input. Basically, inputs allow to recognize a single alarm (active) state, nevertheless in case of DW input type (Double Wiring) a single physical input can be a source of two independent input signals called respectively INxA and INxB. The following types of inputs are available:

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

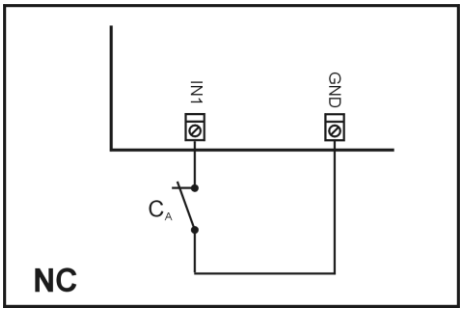
NO TYPE

Input of such type can be in normal or in triggered state. In normal state CA contacts are opened. Triggering of input is caused by closing the CA contact.



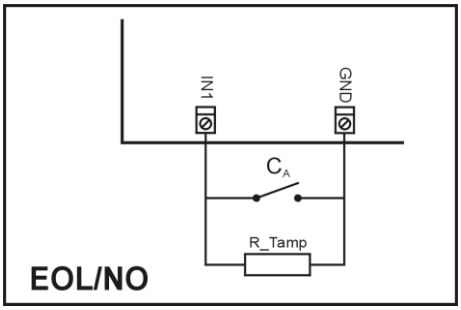
NC TYPE

Input of such type can be in normal or in triggered state. In normal state CA contacts are closed. Triggering of input is caused by opening the CA contact.



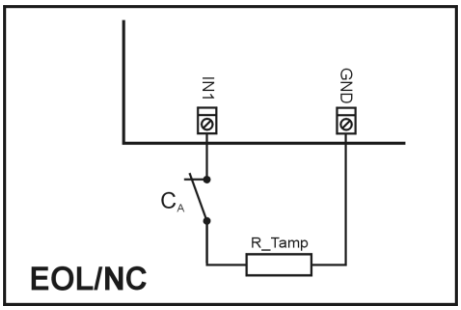
EOL/NO TYPE

Input of such type can be in normal, triggered or sabotage (tamper) state. In normal state CA contacts are opened. Triggering of input is caused by closing the CA contact. The changing of RTamp resistor resistance in normal state indicates a sabotage (tamper) state.



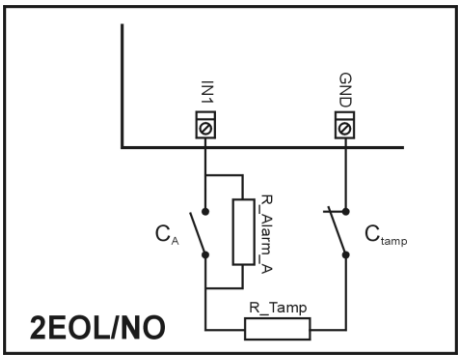
EOL/NC TYPE

Input of such type can be in normal, triggered or sabotage (tamper) state. In normal state CA contacts are closed. Triggering of input is caused by opening the CA contact. The changing of RTamp resistor resistance in normal state indicates a sabotage (tamper) state.



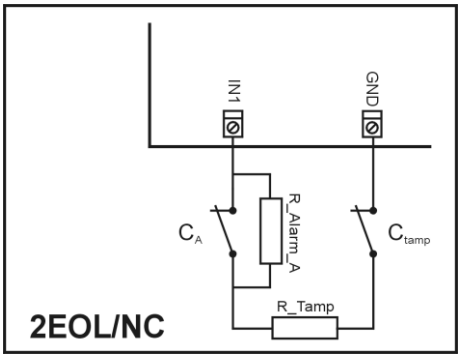
2EOL/NO TYPE

Input of such type allows to recognize a normal, triggered, sabotage and damage state. In normal state CA contact is opened, while CTamp contact is closed. Triggering of input is caused by closing the CA contact. Opening of CTamp contact is recognized as a sabotage state. Shorting input to the ground is recognized as a damage state.



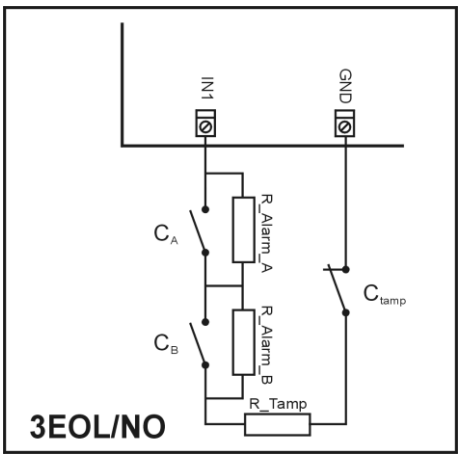
2EOL/NC TYPE

Input of such type allows to recognize a normal, triggered, sabotage and damage state. In normal state CA and CTamp contacts are closed. Triggering of input is caused by opening the CA contact. Opening of CTamp contact is recognized as a sabotage state. Shorting input to the ground is recognized as a damage state.



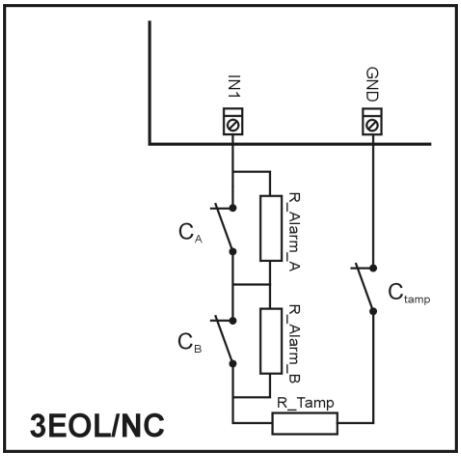
3EOL/NO TYPE

Input of such type allows to recognize following states: normal, triggered, masking, triggered with masking, sabotage and damage. In normal state CA and CB contacts are opened, while CTamp contact is closed. Triggering of input is caused by closing the CA contact. Closing of CB contact is recognized as state of masking. Triggered with masking state will be recognized in case of simultaneous shorting of CA and CB contacts. Sabotage state will be recognized in case of CTamp contact opening. Shorting input to the ground is recognized as a damage state.



3EOL/NC TYPE

Input of such type allows to recognize following states: normal, triggered, masking, triggered with masking, sabotage and damage. In normal state CA, CB and CTamp contacts are closed. Triggering of input is caused by opening the CA contact. Opening of CB contact is recognized as masking. Triggered with masking state will be recognized in case of simultaneous shorting of CA and CB contacts. Sabotage state will be recognized in case of CTamp contact opening. Shorting input to the ground is recognized as a damage state.



3EOL/DW/NO OR 3EOL/DW/NC TYPE

Inputs of such type operate in the same way as 3EOL/NO and 3EOL/NC input types however with one difference that in this case the masking state is interpreted as triggering of second input. In VISO software DW input type is presented as two independent inputs INxA and INxB which can be used for a different functions in the system.

PARAMETRIC RESISTORS

For all inputs the same values of parametric resistors are used. Resistors may vary over a range of: 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. **Tamp** resistor defines a value of resistor used to detect a sabotage state. **Alarm A** resistor defines a value of resistor used to detect triggered state. **Alarm B** resistor defines a value of resistor used to detect an additional triggering state of 3EOL/DW input type or masking state of 3EOL input type. **Alarm A** resistor value must differ than value of **Alarm B** resistor at least three positions one the listed range. Total resistance of wire used to connect contacts to input should not exceed 100 Ω. Default values of parametric resistors:

- **Tamp** = 1 kΩ
- **Alarm A** = 2,2 kΩ
- **Alarm B** = 5,6 kΩ

RESPONSE TIME

Response time parameter determines a minimum duration of impulse on input line, which will cause a change of its state. For every input it is possible to set its individual **response time** over a range from 50 to 5000 ms.

NAME OR COMMENT

Name or comment parameter allows to associate any text (description) with an input, which will be visible in VISO software, making easier to identify and operate the system.

OUTPUTS

MCT12M series readers with IO option (e.g. MCT12M-IO, MCT12M-DIO, MCT12M-IOBK, MCT12M-DIOBK) are equipped in two transistor outputs and one relay output. In low-level configuration (RogerVDM) it is possible to define output polarity and a comment.

OUTPUT POLARITY

Output polarity determines electric state of the output in normal state. **Output polarity** can be *Normal* or *Reverse*. When configured to *Normal polarity* output normally remains in OFF state and switches to ON state when triggered. When configured for *Reversed polarity* output normally remains ON and when triggered it switches OFF.

NAME OR COMMENT

Name or comment parameter allows to associate with output any text (description), which will be visible in VISO software, making easier to identify and operate the system.

READER CONFIGURATION

The full configuration of the reader can be done by means of RogerVDM (Widnows) program. The reader RS485 address can be set either from RogerVDM program or by means of manual procedure described later in this document (*Address Manual Programming*).

PROGRAMMING FROM PC

To perform this method reader has to be connected to PC via RUD-1 interface and programmed by means of RogerVDM software (available on www.roger.pl).

Programming procedure:

1. connect reader to RUD-1 interface according to Fig. 1;
2. put jumper on MEM contacts;
3. restart the reader (switch power supply off and short RST contacts for a while);
4. while LED SYSTEM is flashing, in RogerVDM click: Device -> New;
5. select proper device model, firmware version, communication channel and serial port, on which RUD-1 is installed;
6. click Connect, the software will establish connection with the reader and automatically will proceed to Configuration tab, which enables full configuration of the reader;
7. set the parameters (configuration window is shown on Fig. 6, the description of available options is given in Table 3);
8. click Send to device – the software will send the configuration to reader;
9. remove jumper from MEM contacts;
10. restart the reader – the reader will switch to normal operation with new settings.

Note: Do not press keypad or read card when reader is under operation with RogerVDM program.

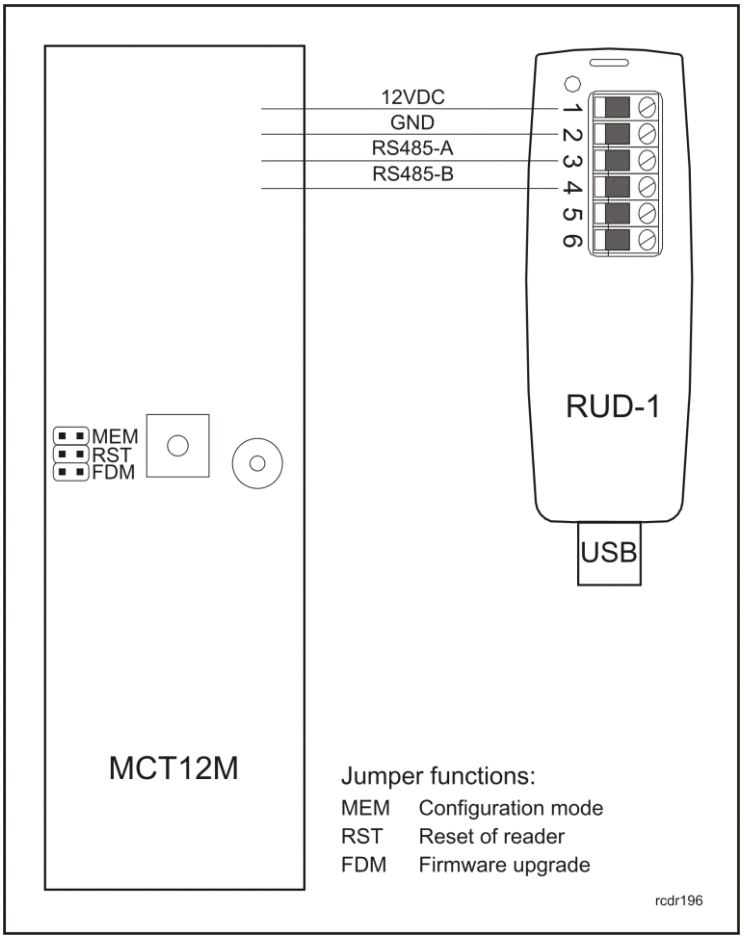


Fig. 1 Reader connection method to RUD-1 interface.

CONFIGURATION PARAMETERS

Table 1: Configuration parameters description		
Parameter name	**Available values**	**Description**
Communication settings		
RS485 address	RS485A (range of 100-115)	Parameter sets device RS485 bus address.
Communication lost signalisation delay	0..64 [s]	Defines time in seconds after which reader will signal lost of communication with controller.
Optical signalisation		
LED SYSTEM pulsing when card is close to the reader	0 - Off 1 - On	When option is active LED SYSTEM will be pulsing whenever card is in the reader field.
Keypad backlight level	0 - 100%	Defines keypad backlight level. Value 0 switches backlight off.

Keypad backlight animation	0 - Off 1 - On	When option is active reader reduces keypad backlight level when reader is not used and restores full keypad backlight level after any key is pressed or card is read.
Keypad backlight dimming	0 - Off 1 - On	When option is set keypad backlight is switched off for a while whenever card is read or key pressed.
LED SYSTEM flash after card read	0 - Off 1 - On	When option is set LED SYSTEM generates single flash whenever card is read.
LED SYSTEM flash after key press	0 - Off 1 - On	When option is set LED SYSTEM generates single flash whenever key is pressed.
Parametric inputs resistance		
Tamper	1k..12k	Parameter defines value of Tamper resistor for parametric input.
Alarm A	1k..12k	Parameter defines value of Alarm A resistor for parametric input.
Alarm B	1k..12k	Parameter defines value of Alarm B resistor for parametric input.
Input types		
IN1	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	Parameter defines topology of contacts and resistors connected to input.
IN2	as above	as above
IN3	as above	as above

Input response time		
IN1	50..5000 [ms]	Parameter defines a minimum duration of impulse on input line, which will cause a change of its state.
IN2	as above	as above
IN3	as above	as above
Output polarity		
OUT1	0 - Normal polarity 1 - Reverse polarity	Output polarity determines electric state of output in normal (not triggered) mode.
OUT2	as above	as above
REL1	as above	as above
Acoustic signalisation		
Buzzer loudness level	0..100%	Defines buzzer loudness level. Value 0 switches buzzer off.
Short sound after card read	0 – No 1 – Yes	When option is set buzzer generates short beep whenever card is read.
Short sound after key press	0 – No 1 – Yes	When option is set buzzer generates short beep whenever key is pressed.
CSN settings		
CSNL	0..16 (Bytes)	CSNL parameter specifies the number of bytes taken from CSN number and used to create the RCN number.
Keypad settings		
Time between keys	0..64 [s]	Defines max. time in seconds between two consecutive key press.
Single key press	0 – On 1 – Off	When option is active reader will report every single key press to controller.
PIN followed by [#] key	0 – On 1 – Off	When option is set [#] key is required to mark PIN end.
Min. length of PIN	0..16 (digits)	Defines minimal number of digits in PIN.

Max. length of PIN	0..16 (digits)	Defines maximal number of digits in PIN.
Allow [*] on PIN start	0 – No 1 – Yes	When option is active reader allow to use asterisk [*] key on the first position of PIN.
[*] key press type	1 - Short press only 2 - Long press only 3 - Short and long press	Defines key press options for [*] key.
[#] key press type	as above	as above
[F1] key press type	as above	as above
[F2] key press type	as above	as above
Advanced settings		
Stop card/PIN reading when buffer full	0 – No 1 – Yes	When option is active reader stops card/PIN reading until previous PIN/card is transmitted to controller.
Clear card/PIN buffer time out	0..64 [s]	Time in seconds after which Card/PIN buffer will be automatically cleared.
Buffer overflow signalisation	0 – Off 1 – On	When option is active reader will signal on LED SYSTEM that card/PIN buffer overflow occurred.
Card/PIN encryption over RS485 bus	0 – Off 1 – On	When option is active reader will encrypt card/PIN data transmitted over RS485 communication bus.
Card number data type	– None – Numer16b…64b – CID32B – ABA_TRACK2 – F8C16 – F16C32 – GUID – SAN	Defines type of data read from the card.
Long card read time	0..64 [s]	Defines time required to indicate long card read.
Long key press time	0..64 [s]	Defines time required to indicate long key press.
Comments		

Comments allow to enter any text associated with described component. Comments are visible in VISO software, making easier to identify components of the device.		
Mifare Classic settings		
Sector type	0 - NONE 1 - SSN 2 - MAD	Defines type of data sector where PCN number is stored. When [0] is selected the RCN number is formed from PCN number only.
Format	0 - BIN 1 - ASCII HEX	Format of data in the block.
First byte position (FBP)	0..15	Specifies position of the byte in data block where PCN number begins.
Last byte position (LSB)	0..15	Specifies position of the byte in data block where PCN number ends.
Sector ID	0..39	Data sector where PCN number is stored.
AID	0000 – FFFFF	Specifies AID number (Application Identifier) which indicates sector where PCN number is stored (by default Roger AID number is 5156).
Block ID	0..14	Data block where PCN number is stored.
Key type	0 - A key type 1 - B key type 2 - Roger key type (RSS)	Specifies key type used to encrypt data stored on the card.
Key	000000000000-FFFFFFFFFFFF	6 bytes key used to encrypt data stored on the card.
Mifare Plus settings		
Sector type	0 - NONE 1 - SSN 2 - MAD	Defines type of data sector where PCN number is stored. When [0] is selected the RCN number is formed from PCN number only.
Format	0 - BIN 1 - ASCII HEX	Format of data in the block.
First byte position (FBP)	0..15	Specifies position of the byte in data block where PCN number begins.

Last byte position (LSB)	0..15	Specifies position of the byte in data block where PCN number ends.
Sector ID	0..39	Data sector where PCN number is stored.
AID	0000 – FFFFF	Specifies AID number (Application Identifier) which indicates sector where PCN number is stored (by default Roger AID number is 5156).
Block ID	0..14	Data block where PCN number is stored.
Key type	0 - A 1 - B 2 - Roger	Specifies key type used to encrypt data stored on the card.
Key	00000000000000000000000000000000- FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	16 bytes key used to encrypt data stored on the card.
Mifare DESFire settings		
Sector type	0 – NONE 1 – DESFire file	Specifies the type of sector where PCN number is stored. If value '0' is set then RCN will be formed from CSN number only. If value '1' is chosen then PCN code will be read form file on the card.
Format	0 - BIN 1 - ASCII HEX	Format of data in the block.
First byte position (FBP)	0..15	Specifies position of the byte in data block where PCN number begins.
Last byte position (LSB)	0..15	Specifies position of the byte in data block where PCN number ends.
AID	0000..FFFFF	Specifies AID number (Application Identifier) of the file where RCN code is stored. Mifare DESFire can hold up to 28 AID numbers.
File ID	0..32	Defines file number in which RCN is placed. For DESFire EV0 cards it is acceptable number from 0 to 16, however in EV1 cards numbers from 0 to 32 can be used.

Communication protection level	0 – Plain 1 – Data authentication by MAC 2 – Full encryption	Defines type of encryption method used in communication between card and reader.
Key ID	0..13	Defines key ID of application which is used to encrypt file.
Key type	0 – TDES Crypto DESFire Native Mode 1 – TDES Crypto Standard Mode 2 – 3KTDES Crypto 3 – AES128 Crypto	Defines key type used to encrypt data on card.
Key	00000000000000000000000000000000-FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	Key used to encrypt data on card. 3KTDES key type contains 24 bytes, TDES and AES keys contain 16 bytes.

MANUAL PROGRAMMING OF ADDRESS

This procedure is intended to set a new RS485 bus address of the reader while maintaining the rest of configuration settings.

In order to set RS485 address manually follow this steps:

1. remove all connections from A and B lines;
2. put jumper on MEM contacts;
3. restart the reader (switch power supply off and on or short RST contacts for a while);
4. while LED SYSTEM is flashing enter three digits which will set the RS485 address;
5. remove jumper from MEM contacts;
6. restart the reader (switch power supply off and on or short RST contacts for a while).

Readers without keypad can be manually programmed by so called *multiple card reading* method. In this method key pressing is emulated by multiple card reading. In order to emulate key [N] read card N-times and then wait for two beeps. Once you hear two beeps you can proceed further with emulation of next digit. Digit 0 is emulated by 10-times of card reading. Any ISO 14443A card can be used for multiple card reading method.

Example

In order to program 101 address:

1. read card 1 time and wait for double beep;
2. read card 10 times and wait for double beep;
3. read card 1 time and wait for double beep;
4. wait until reader restarts with a new address.

MEMORY RESET

Memory reset procedure deletes all configuration settings and restores factory defaults with RS485 address set to 100.

To perform memory reset follow these steps:

1. remove all connections from A and B lines (yellow and green wires);
2. put jumper on MEM contacts;
3. restart the reader (switch power supply off and on or short RST contacts for a while);
4. while LED SYSTEM is flashing press [*] or read any MIFARE® card 11-times;
5. remove jumper from MEM contacts.

FIRMWARE UPGRADE

Firmware can be upgraded by means of RogerVDM software and RUD-1 communication interface. The file with latest firmware is available at www.roger.pl .

Firmware upgrade procedure:

1. connect reader to RUD-1 interface according to Fig. 2;
2. put jumper on FDM contacts (location of contacts is given on Fig. 2);
3. restart the reader (switch power supply off and on or short RST contacts for a while);
4. run RogerVDM software;
5. choose: *Tools -> Update Firmware;*
6. select device type, communication port for RUD-1, and path to firmware file (*.hex);
7. click *Update* and follow the instructions on the screen.

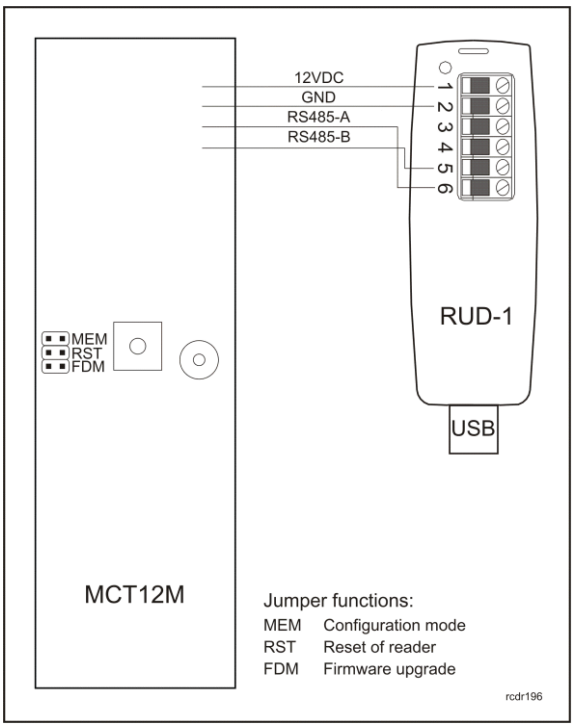


Fig. 2 Connecting reader to RUD-1 interface for firmware upgrade.

INSTALLATION GUIDELINES

1. Reader should be mounted on a vertical piece of supporting structure, usually wall, away from sources of heat and moisture.
2. The rear panel should be mounted with use of delivered screws with orientation shown on Fig. 4 so that tamper lever leans on the surface and firmly presses the tamper switch.
3. Reader is delivered with deep version of bottom panel which is intended to be used when reader is installed on metal surface and/or if there is a need for an extra space for connection wires.
4. Any electrical connections should be done without any voltages.
5. When using separate power supply sources for the reader and the controller it is necessary to short both supply minus.

Table 2: MCT12M and MCT12M-BK connection wires description

Name	Wire colour	Description
12V	Red	Supply plus
GND	Black	Supply minus
A	Yellow	RS485 bus wire A
B	Green	RS485 bus wire B

Table 3: MCT12M-IO/MCT12M-DIO and MCT12M-IOBK/MCT12M-DIOBK connection wires description

Name	Wire colour	Description
12V	Red	Supply plus
GND	Black	Supply minus
A	Yellow	RS485 bus wire A
B	Green	RS485 bus wire B
COM	Red-blue	REL1 relay output, common contact
NC	Grey-pink	REL1 relay output, normally closed contact
NO	Pink	REL1 relay output, normally opened contact
IN1	Brown	IN1 input line
IN2	Blue	IN2 input line
IN3	Grey	IN3 input line
IO1	White	IO1 transistor output
IO2	Violet	IO2 transistor output

SPECIFICATION AND DRAWINGS

TECHNICAL SPECIFICATION

Table 4: Technical specification	
Supply voltage	10-15 VDC
Current consumption (average)	MCT12M/MCT12M-IO/MCT12M-DIO: ~85 mA MCT12M-BK/MCT12M-IOBK/MCT12M-DIOBK: ~65 mA
Inputs	Three inputs internally connected to the power supply plus (+12V) through a 5.6kΩ resistor, approx. 3,5V triggering level when configured as NO or NC.
Relay outputs	One relay output with single NO/NC contacts, rated 30V/1,5A
Transistor outputs	Two open collector type transistor outputs, rated 15V/150mA
Reading distance	up to 7 cm (for ISO MIFARE® Ultralight, Classic) up to 4 cm (for ISO MIFARE® DESFire EV1, Plus)
Anti-sabotage protection (TAMPER)	Isolated contact, 50mA/24V, normal closed when enclosure is closed and attached to flat surface
Proximity cards	MCT12M/MCT12M-BK/MCT12M-IO/MCT12M-IOBK: 13.56MHz MIFARE® Ultralight, Classic MCT12M-DIO/MCT12M-DIOBK: 13.56MHz MIFARE® Ultralight, Classic, DESFire EV1 and Plus
Distances	Up to 1200 m of cable distance between controller and reader
Ingress protection	IP65
Environmental class (according to EN 50133-1)	Class IV, outdoor, temperature: -25°C – +60°C, relative humidity: 10 to 95% (non-condensing)
Dimensions H x W x D	152,5 X 46 X 23 mm (low profile bottom part of enclosure) 152,5 X 46 X 35 mm (high profile bottom part of enclosure)
Weight	150g
Approvals	CE

Note: Generally, reading range of device depends on several factors which the most important are: type and quality of a card, card position relative to the reader, electrical interferences in surrounding area and presence of metal objects in reader's neighborhood. Nominal reading range was declared for Roger reference ISO card placed in parallel to the front surface of the reader in such a way that card center is aligned with vertical axe of the reader and located approx. 3 cm from the lower edge of the enclosure.

ORDERING

Table 5: Ordering guide	
Product	**Characteristic**
MCT12M	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic outdoor reader, dark grey enclosure, silicone keypad with backlight, 0.5m connection cable.
MCT12M-BK	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic outdoor reader, dark grey enclosure, 0.5m connection cable.
MCT12M-IO	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic outdoor reader, built-in inputs/outputs, dark grey enclosure, silicone keypad with backlight, 0.5m connection cable.
MCT12M-IOBK	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic outdoor reader, built-in inputs/outputs, dark grey enclosure, 0.5m connection cable.
MCT12M-DIO	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic, DESFire EV1 and Plus outdoor reader, built-in inputs/outputs, dark grey enclosure, silicone keypad with backlight, 0.5m connection cable.
MCT12M-DIOBK	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic, DESFire EV1 and Plus outdoor reader, built-in inputs/outputs, dark grey enclosure, 0.5m connection cable.
RUD-1	Communication interface USB-RS485 with 12VDC supply output.

PRODUCT HISTORY

Table 6: Product history	
Product	**Version description**
MCT12M v2.0	The first commercial version of the product.
MCT12M-BK v2.0	The first commercial version of the product.
MCT12M-IO v1.0	The first commercial version of the product.
MCT12M-IOBK v1.0	The first commercial version of the product.
MCT12M-DIO v1.0	The first commercial version of the product.
MCT12M-DIOBK v1.0	The first commercial version of the product.

DRAWINGS

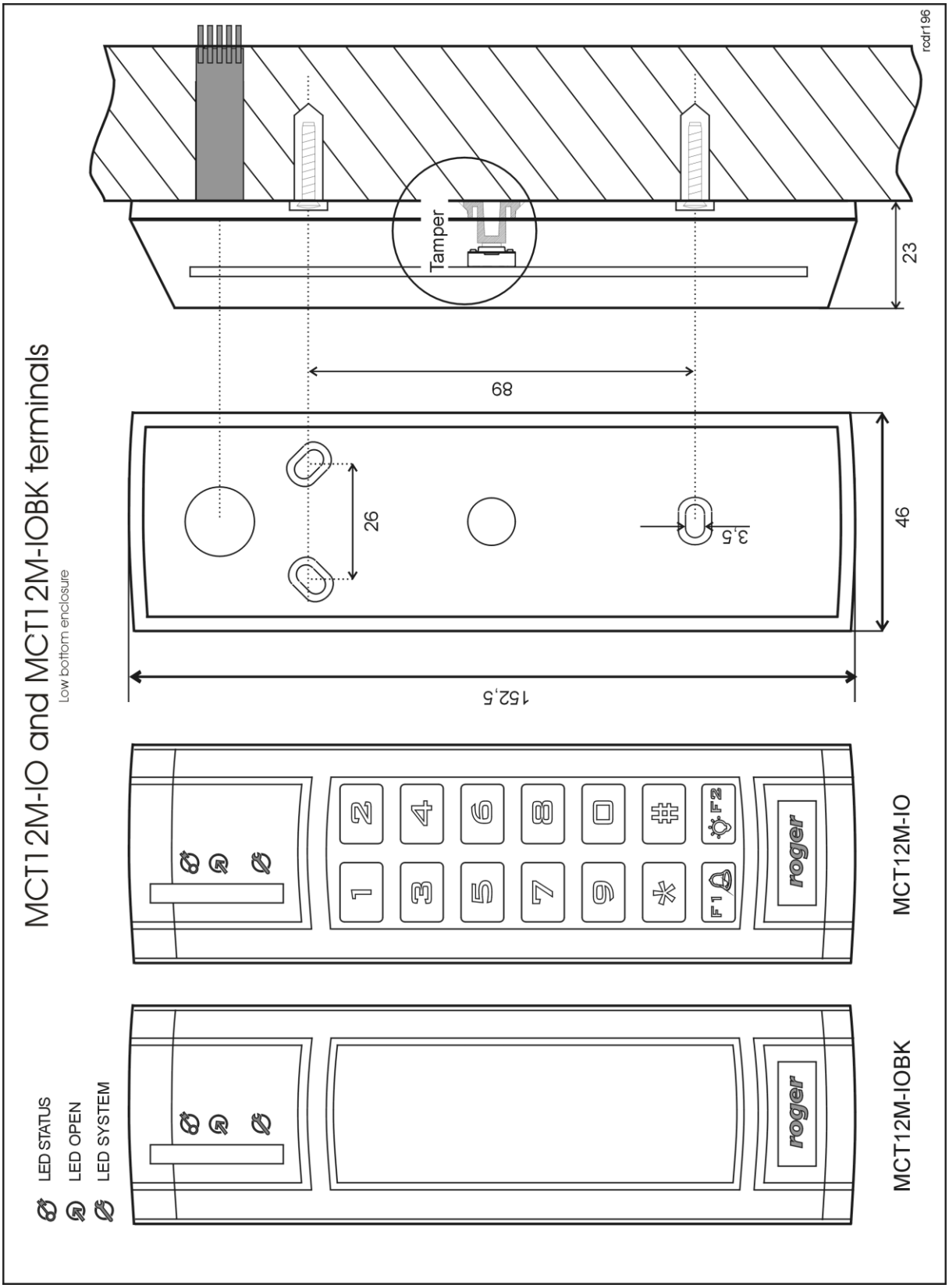


Fig. 3 Reader view, low bottom enclosure.

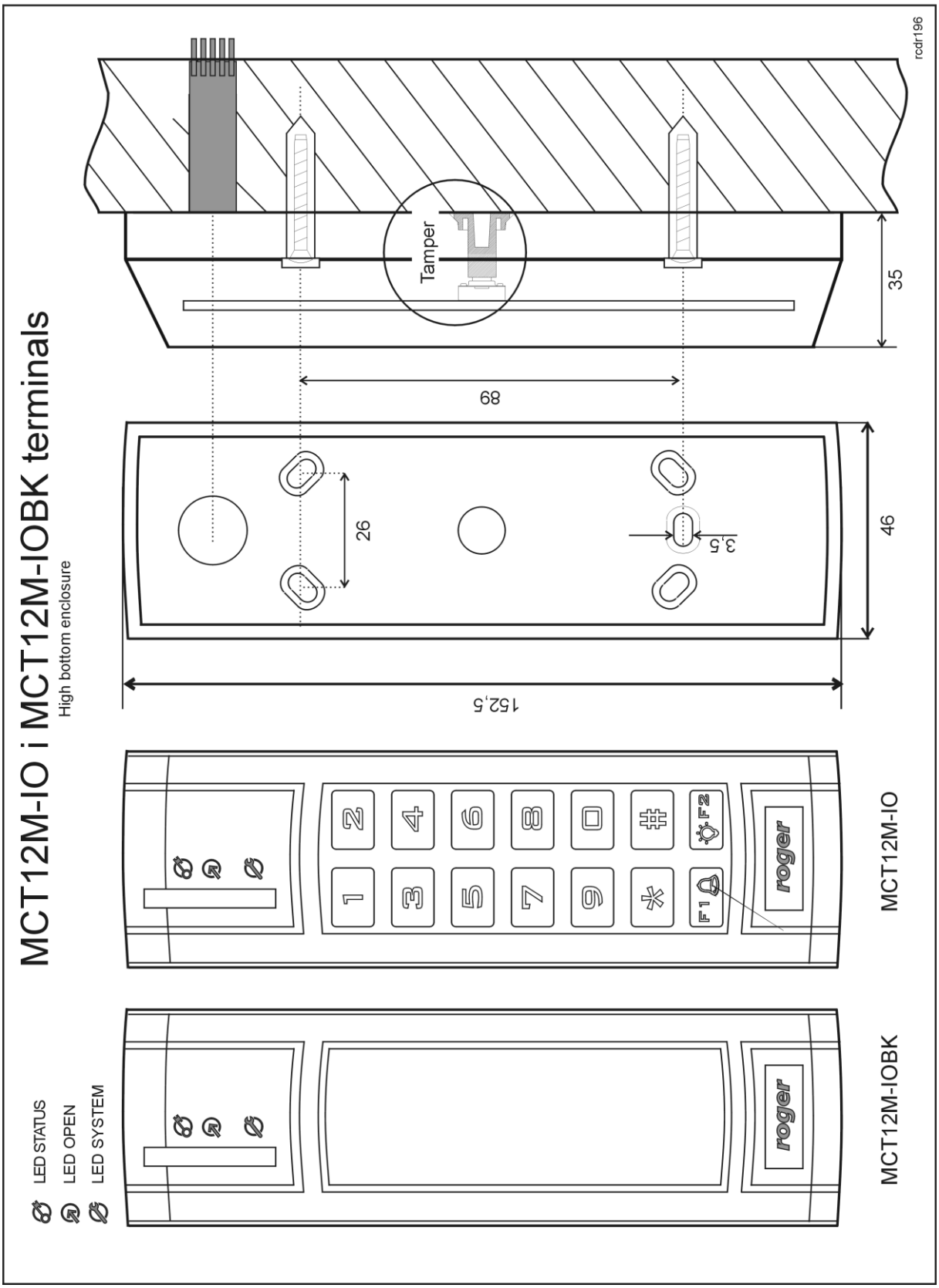


Fig. 4 Reader view, high bottom enclosure.

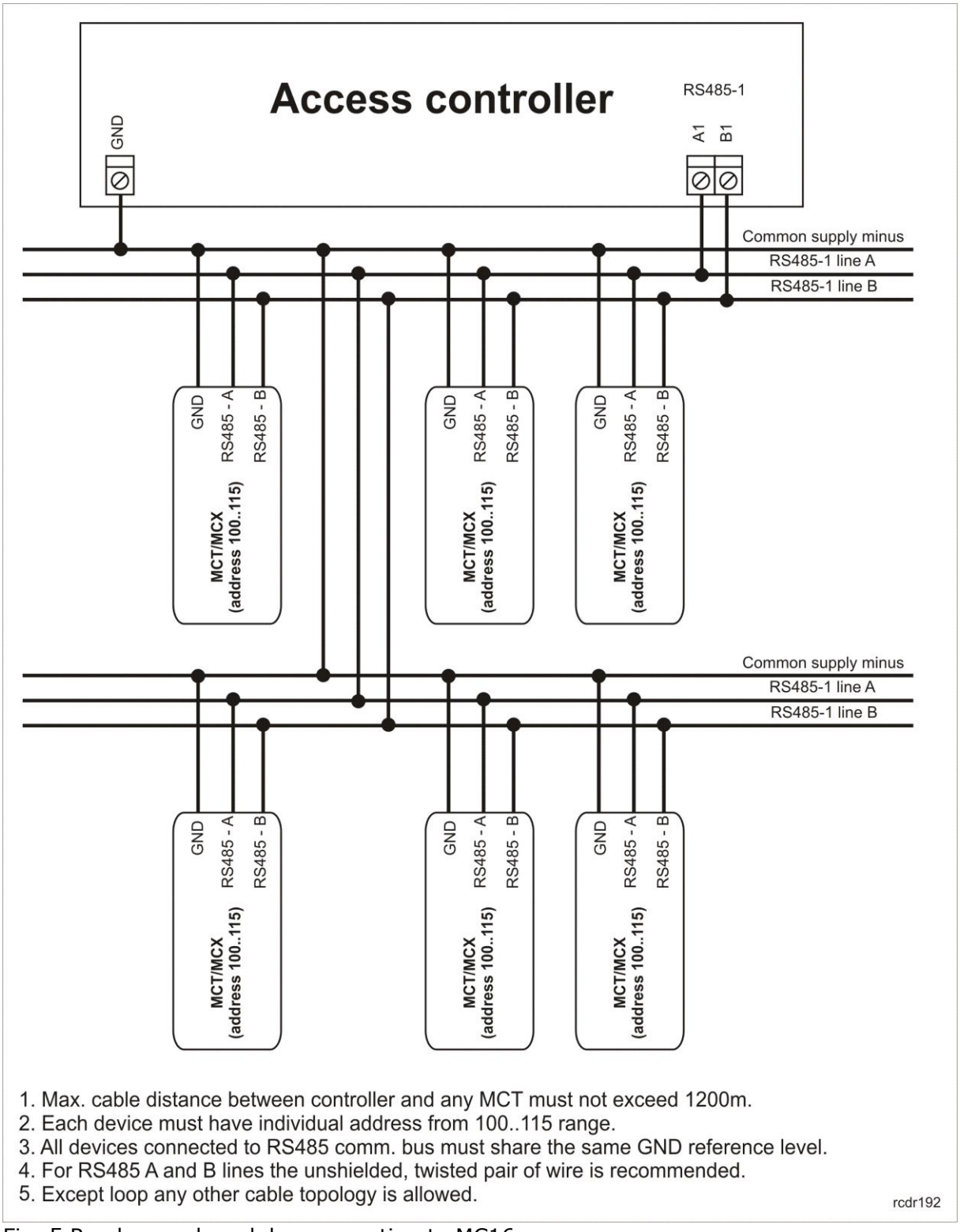
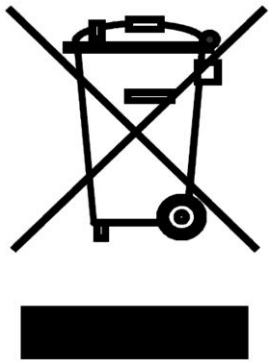


Fig. 5 Readers and modules connection to MC16.

	The symbol of a crossed-through waste bin on wheels means that the product must be disposed of at a separate collection point. This also applies to the product and all accessories marked with this symbol. Products labeled as such must not be disposed of with normal household waste, but should be taken to a collection point for recycling electrical and electronic equipment. Recycling helps to reduce the consumption of raw materials, thus protecting the environment. Weight of the equipment is specified in the document.

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