Roger Access Control System

MCT88M-IO Operating Manual

Product version: 2.0

Firmware version: 1.0.6.193 or newer

Document version: Rev.L

CE



roger

1. DESIGN AND APPLICATION

The MCT88M-IO is an access terminal dedicated to RACS 5 system. The terminal is equipped with colour graphic display, sensor type keypad, 4 function keys and MIFARE® Ultralight/Classic/DESFire/Plus/ reader. Users can identify at the terminal with PINs, MIFARE cards and mobile devices equipped with NFC (Near Field Communication) or BLE (Bluetooth Low Energy) technology. MCT88M-IO can be connected to RS485 bus of MC16 access controller directly. Alternatively, the terminal can be connected to virtual controller through Ethernet network (LAN). When connected to MC16 controller it can be operated as access control terminal, Time&Attendance terminal and additionally it can be used to control the system especially in regard of building automation functionalities offered by RACS 5. When connected to virtual controller it can be operated as POS (Point of Sale) terminal or assets management terminal.

Characteristics

- RACS 5 system access terminal
- 13.56 MHz MIFARE Ultralight/Classic/DESFire/Plus proximity cards
- NFC and BLE mobile device identification
- Colour graphic display
- 3 LED indicators
- Buzzer
- Touch keypad with backlight
- 4 function keys
- 3 parametric (EOL) inputs
- 2 transistor outputs
- 1 relay output
- RS485 interface
- Ethernet (LAN) interface
- Tamper protection
- Screw terminals

Power supply

The terminal 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. TML 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

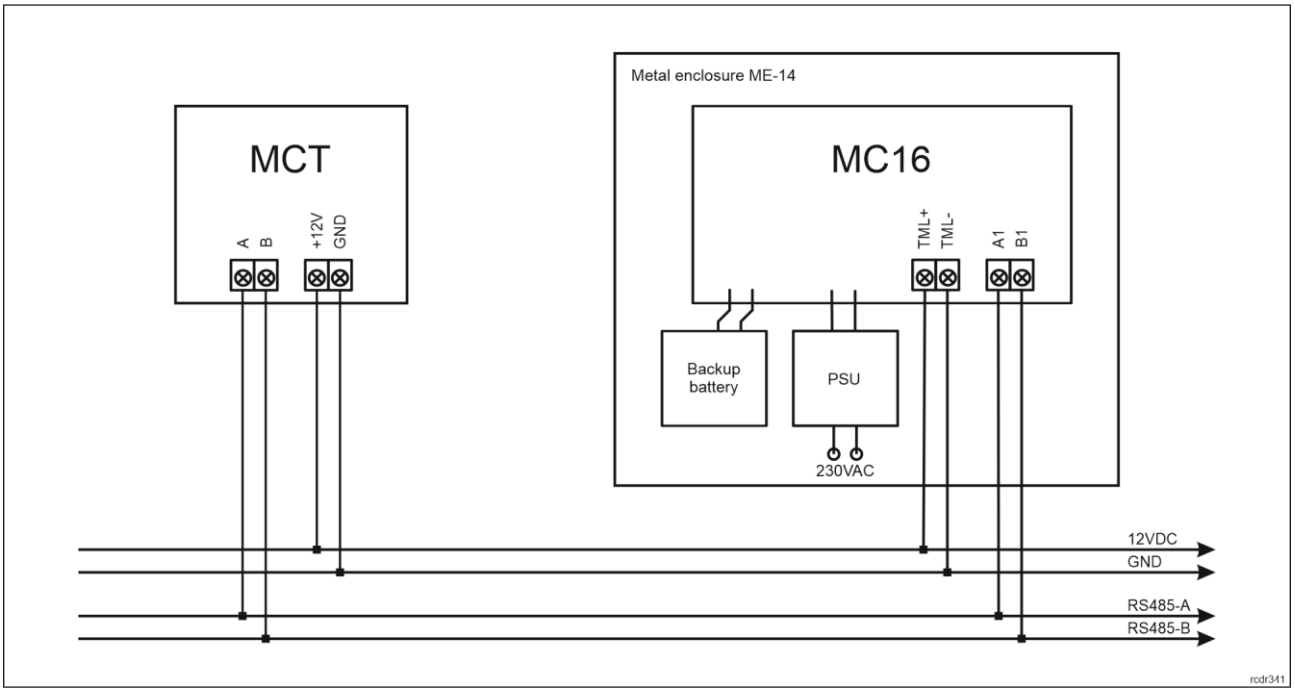


Fig. 1 MCT supply from MC16 access controller

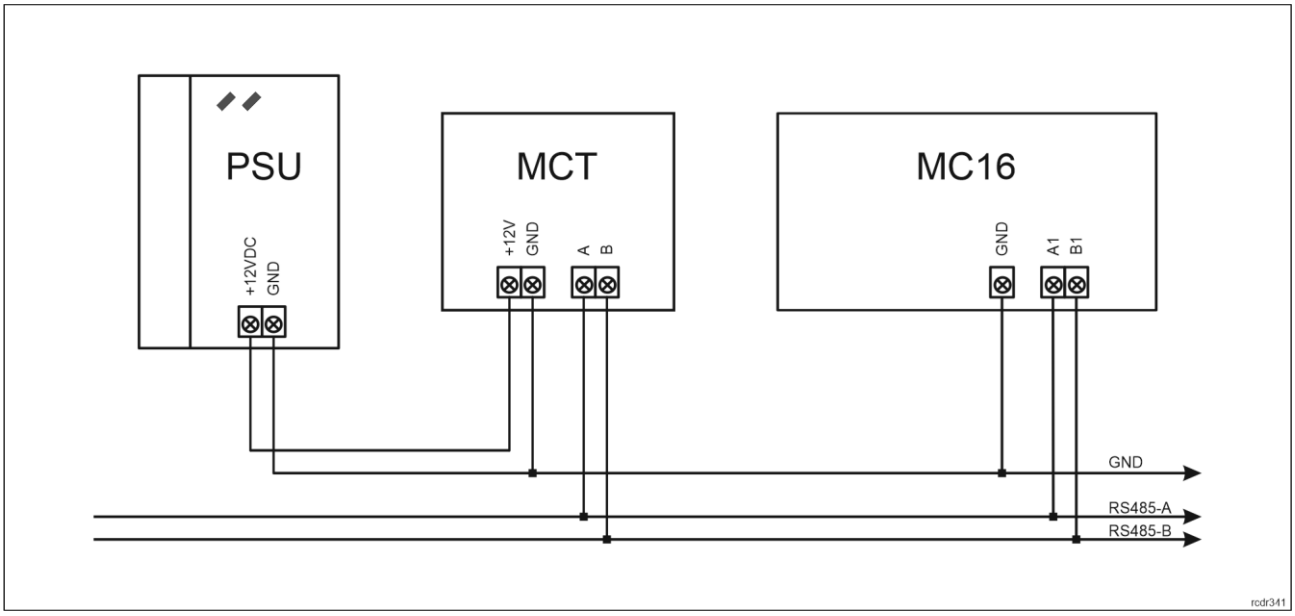


Fig. 2 MCT supply from dedicated power supply unit

RS485 bus

The primary 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.

Ethernet interface

Ethernet interface of MCT88M-IO terminal can be used for communication in LAN with virtual controller which operates as Windows service on a computer/server. Virtual controller enables the operation of MCT88M-IO as PoS terminal or assets management terminal. Virtual controller is a component of RogerSVC software package which is available at www.roger.pl.

Display

The terminal is equipped with colour display (4 lines, 16 characters each). The display can be configured in regard of background and font colours within low level configuration (RogerVDM) and in regard of displayed information within high level configuration by means of *Display* command in VISO software navigation tree which is explained in AN011 application note.
Moreover, default functions key icons, splash screen and screensaver can be replaced using device memory card. Four new icons must be copied to ICONS folder on memory card (fig. 6) and they must be named as icon_001.bmp, icon_002.bmp, icon_003.bmp and icon_004.bmp. Splash screen file in the same folder must be named as icon_000.bmp. Screensaver graphics must be named as scrnsvr.bmp and it must be copied to the main folder of memory card. Icons, splash screen and screen saver must in bmp format (without alpha channel) and with 24bit colour depth (can be saved with MS Paint). Icon size must be 60x60pixels while splash screen size and screen saver size must be 320x240pixels.

Keypad

The terminal is equipped with numeric touch keypad and backlight. The keypad can be used for user identification with PIN and for various keypad commands. By default, the key [#] is used for PIN confirming.

Function keys

The terminal is equipped with four touch function keys (fig. 3). Various functions can be assigned to these keys within high level configuration (VISO) e.g. door bell, Set T&A Mode, Register Guard Tour Event, Set Automation Node On, etc. Within low level configuration (RogerVDM) of the terminal it is possible configure if terminal distinguishes short and long key pressings. Consequently, each types of key press can be assigned with different function.
Numeric keypad includes [*] and [#] keys which can be configured as function keys.

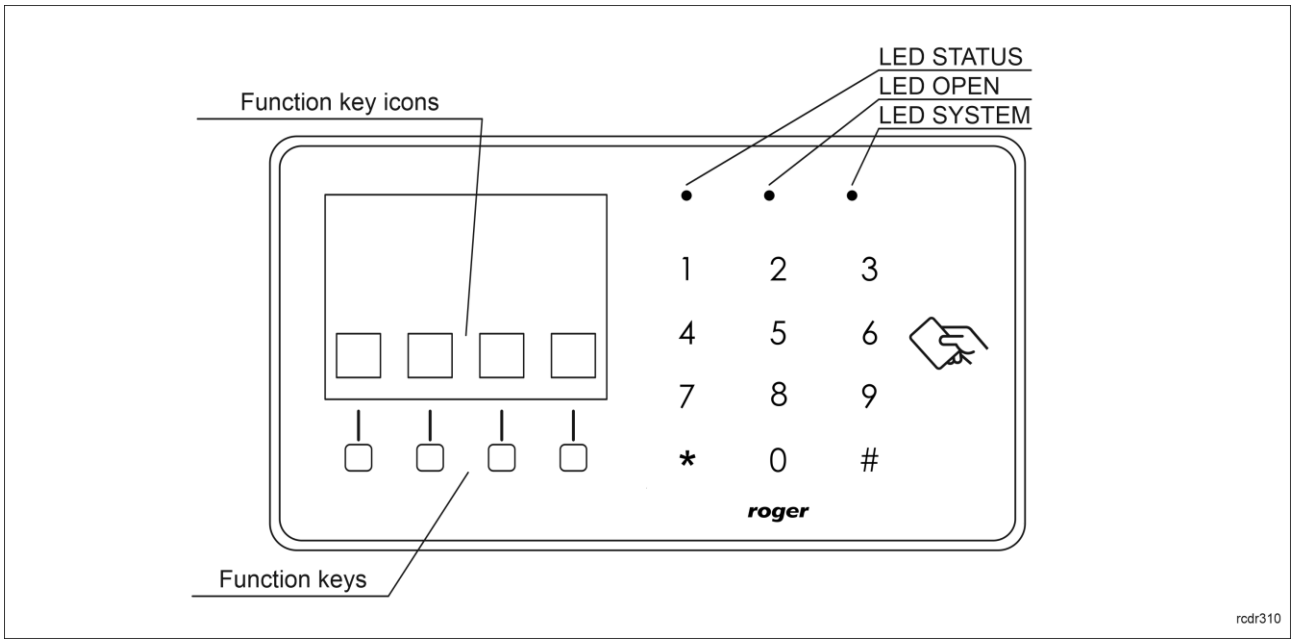


Fig. 3 LED indicators and function keys

LED indicators

The terminal is equipped with three LED indicators (fig. 3) which are used to signal integral functions and they can be additionally programmed with other available functions within high level configuration (VISO).

Table 2. LED indicators		
Indicator	Colour	Integral functions
LED STATUS	Red/green	Default colour of the indicator is red. If the terminal is assigned to Alarm Zone, then the LED indicates zone arming (red) or disarming (green).
LED OPEN	Green	LED indicates access granting.
LED SYSTEM	Orange	LED indicates card reading and can signal other system functions including device malfunction.

Note: Synchronic pulsing of LED indicators signifies lost communication with MC16 controller.

Buzzer

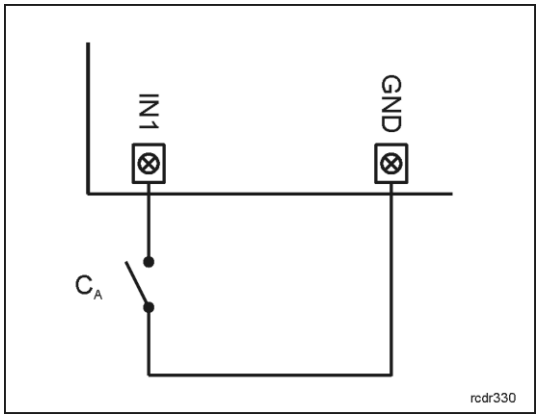
The terminal is equipped with buzzer which is used to signal integral functions and it can be additionally programmed with other available functions within high level configuration (VISO).

Inputs

The terminal offers 3 general purpose parametric inputs of NO, NC, 3EOL/DW/NO and 3EOL/DW/NC type and 1 input internally connected to tamper contact. Input types and electric parameters such as response time and parametric resistors 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.

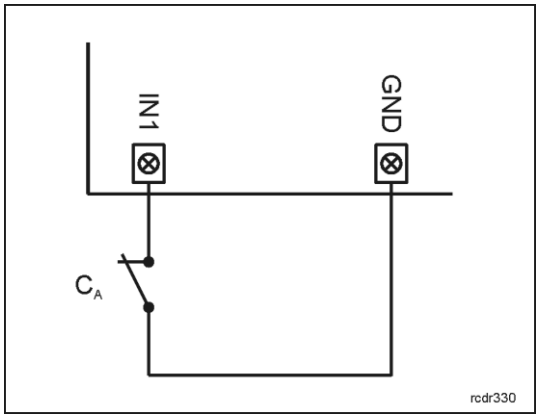
Table 1. Input types

NO input



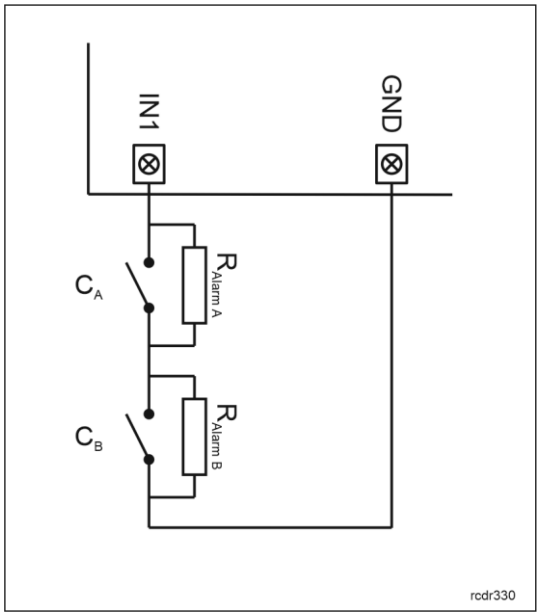
NO input can be in normal or in triggered state. In normal state C_A contacts are opened. Input triggering is caused by C_A contacts closing.

NC input



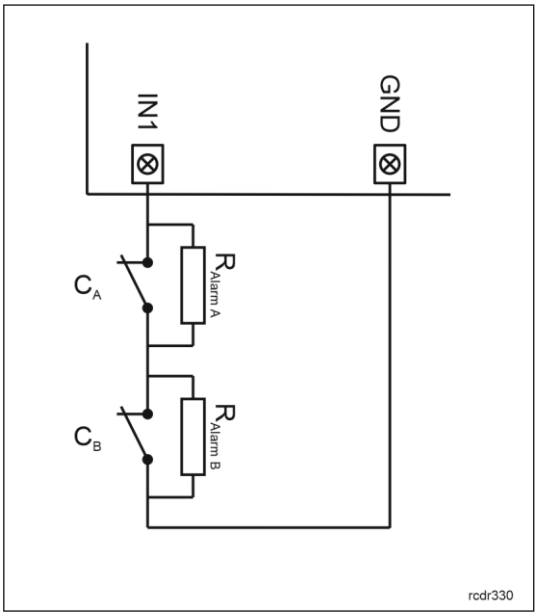
NC input can be in normal or in triggered state. In normal state C_A contacts are closed. Input triggering is caused by C_A contacts opening.

3EOL/DW/NO 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



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 (RogerVDM).

Tamper detector

Built-in tamper (sabotage) detector enables detection of unauthorized opening of device's enclosure as well as detachment of the enclosure from wall. The detector is internally connected to the terminal's input. It does not require low level configuration (RogerVDM) or any additional installation arrangements, but it is essential to mount front panel in such way as the tamper detector (fig. 6) would firmly press the back panel. The detector requires high level configuration which consists in assignment of the function *[133] Tamper Toggle o*n the level of a *Main Board* of a controller in VISO software navigation tree.

Outputs

The terminal offers 2 transistor open collector type outputs (15V/150mA rated) and 1 relay output with NO/NC contacts (30V/1.5A DC/AC rated). Electric parameters such as polarity are configured within low level configuration (RogerVDM). Functions 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.

Identification

Following user identification methods are offered by the terminal:

- MIFARE Ultralight/Classic/Plus/DESFire proximity cards
- PINs
- Mobile devices (NFC and BLE)

MIFARE cards

By default, the terminal reads serial numbers (CSN) of MIFARE cards, but it is possible to program cards with own numbers (PCN) in selected and encrypted sectors of card memory. The use of PCN prevents card cloning and consequently it significantly increases security in the system. More information on MIFARE card programming is given in AN024 application note which is available at www.roger.pl.

The technical characteristics of the device are guaranteed for RFID cards supplied by Roger. Cards from other sources may be used, but they are not covered by the manufactures warranty. Before deciding to use specific Roger products with third-party contactless cards, it is recommended to conduct tests that will confirm satisfactory operation with the specific Roger device and software in which it operates.

PINs

The terminal accepts variable length PINs (by default 4-8 digits concluded with [#] key).

Mobile devices (NFC and BLE)

The terminal MCT88M-IO enables user identification with mobile device using NFC (Android) or Bluetooth (Android, iOS) communication. Prior to use of BLE/NFC identification on the terminal, within its low level configuration (see section 4) configure own *NFC/BLE authentication factor encryption key* and *NFC/BLE communication encryption key* while in case of Bluetooth additionally verify if the parameter *BLE activated* is enabled. Install Roger Mobile Key (RMK) app on mobile device and configure the same parameters as in the terminal. Create key (authentication factor) in RMK defining its type and number, then create the same authentication factor in VISO software (fig. 4) and assign it to the user with adequate Authorisation(s) at the terminal. When user wants to identify at the terminal using mobile device then key (authentication factor) can be selected from the screen.

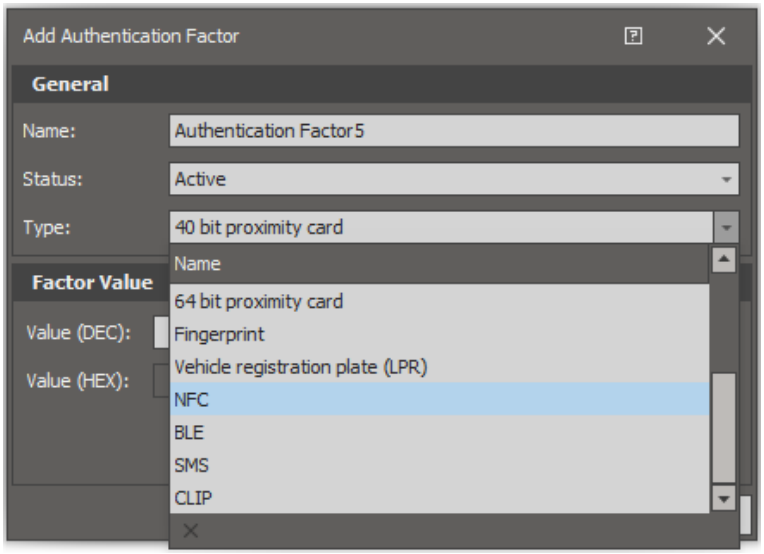


Fig. 4 Authentication factor type in VISO software

2. INSTALLATION

Table 4. Screw terminals	
Name	Description
OUT2	OUT2 output line

OUT1	OUT1 output line
IN3	IN3 input line
IN2	IN2 input line
IN1	IN1 input line
NO	REL1 relay normally opened contact
NC	REL1 relay normally closed contact
COM	REL1 relay common contact
B	RS485 bus, line B
A	RS485 bus, line A
GND	Ground
+12V	12VDC power supply
1,2,3,4,5,6,7,8	Ethernet port

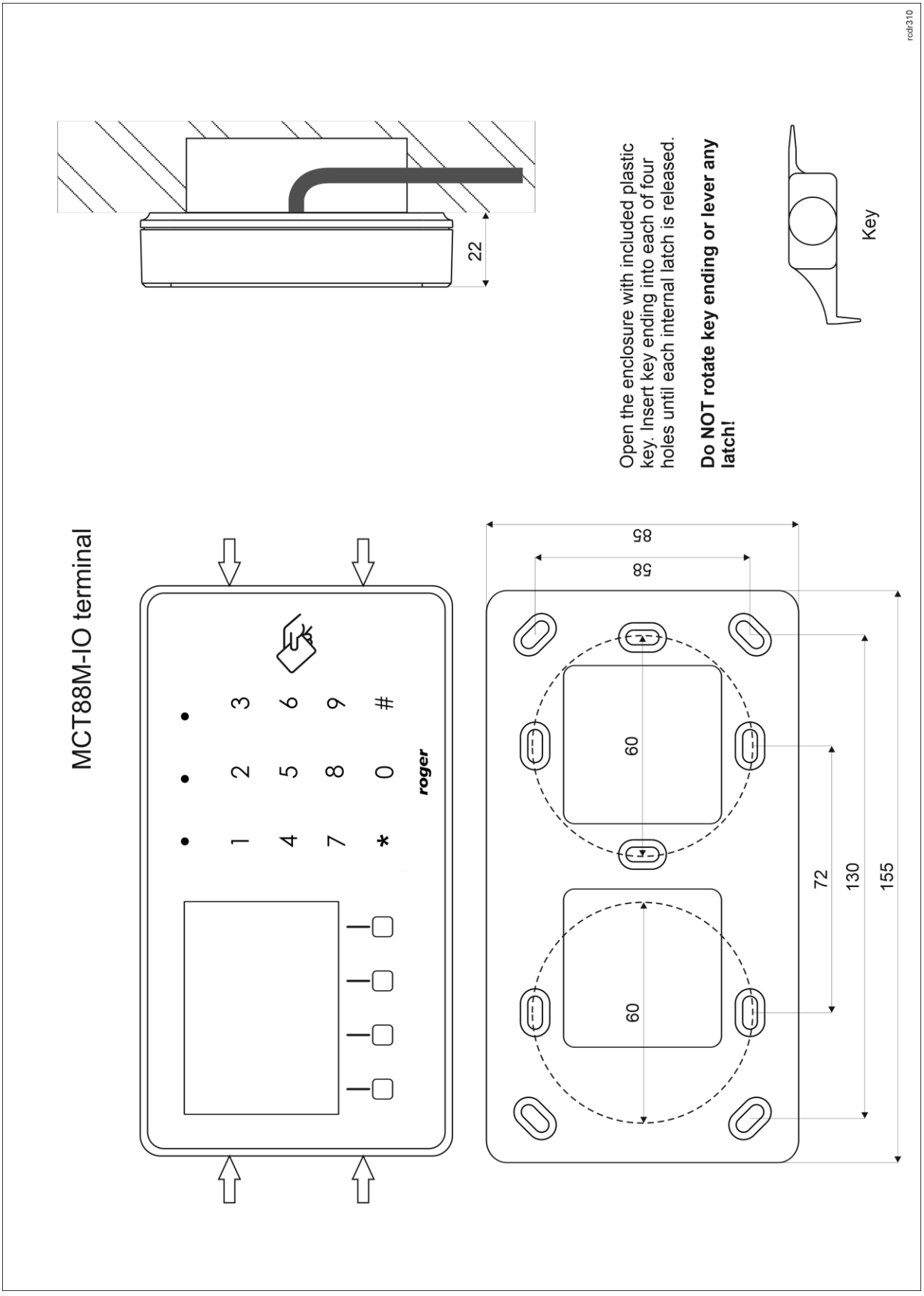


Fig. 5 MCT88M-IO installation

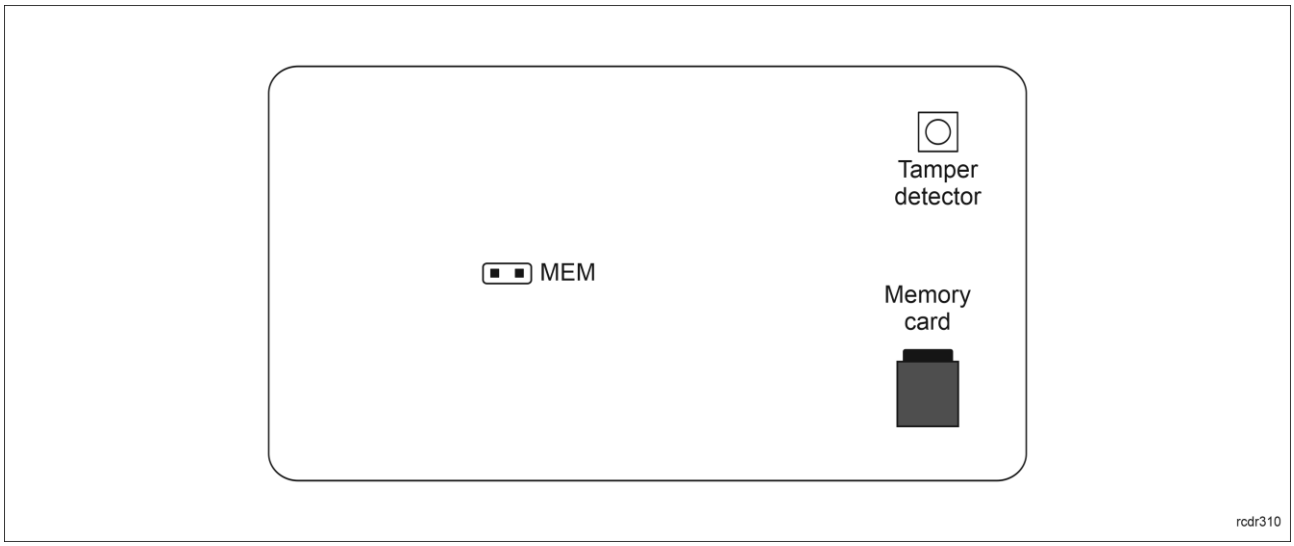


Fig. 6 Internal side of the front panel

Installation guidelines

- The terminal should be mounted on a vertical structure (wall) away from sources of heat and moisture.
- Front panel should be attached in such way as the tamper detector (fig. 6) would firmly press the back panel.
- All electrical connections should be done with disconnected power supply.
- If the terminal and controller are not supplied from the same PSU then GND terminals of both devices must be connected with any wire.
- Device can be cleaned by means of wet cloth and mild detergent without abrasive components. In particular do not clean with alcohols, solvents, petrol, disinfectants, acids, rust removers, etc. Damages resulting from improper maintenance and usage are not covered by manufacturer warranty.
- If the reader is installed in EU countries, the BLE radio power level (parameters: *BLE broadcasting power [dBm]* and *BLE transmission power [dBm]*) should be set to 1(-18dBm).

3. OPERATION SCENARIOS

Access, T&A and building automation terminal

The terminal when connected to MC16 access controller can be at the same time used for access control, Time&Attendance and building automation functionalities. The example of connection diagram for such scenario is shown in fig. 7 where the terminal's power supply line and RS485 bus are connected directly to the controller and relay outputs of MCX8 expander are used to control building automation. The terminal can also operate with MC16 controller using MCX2D/MCX4D expanders as in case of M16-PAC-KIT series. Various scenarios of operation with MC16 controllers are presented in AN002 application note.

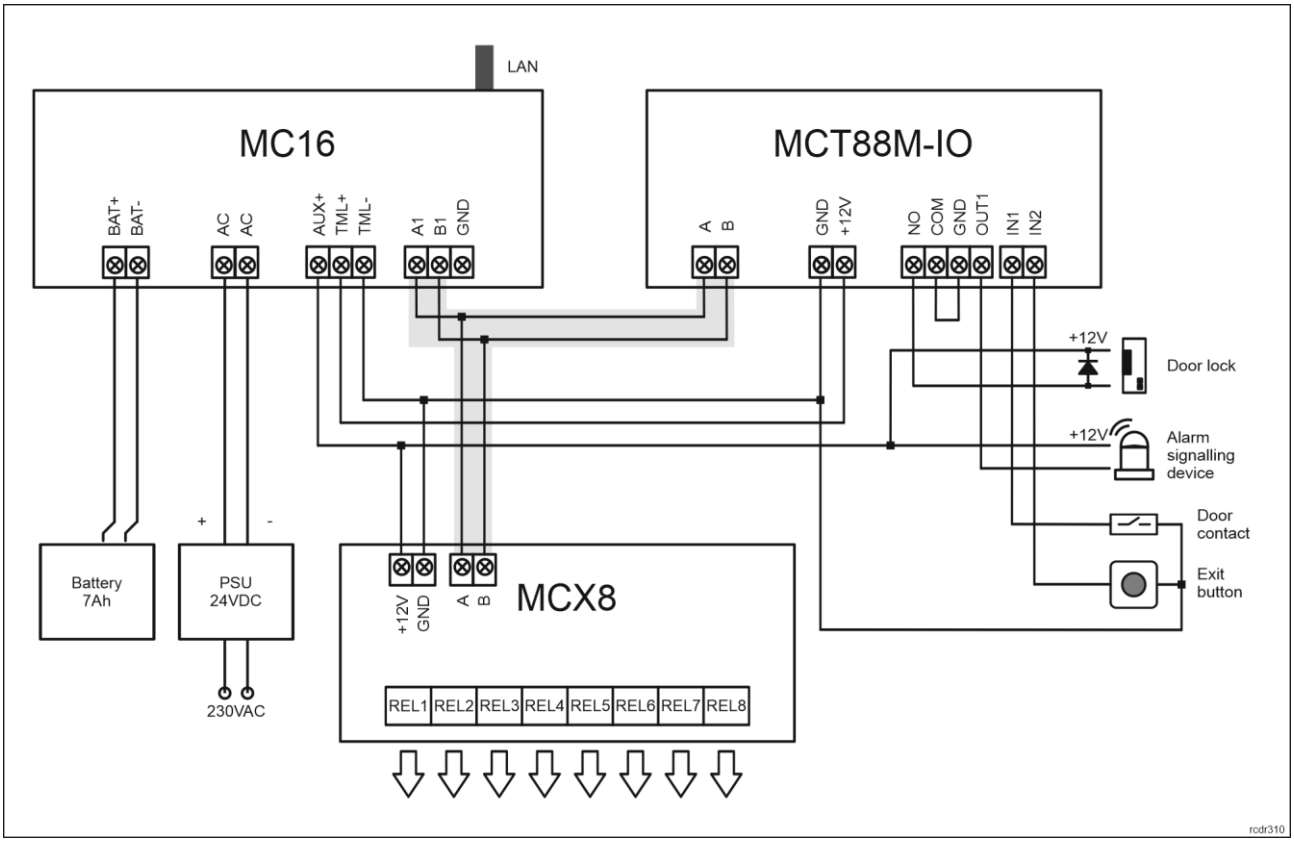


Fig. 7 Example connection diagram for the terminal and MC16 access controller

Vending terminal (PoS)

The MCT88M-IO terminal when connected to virtual controller via Ethernet (LAN) can be used as Point of Sale terminal. Virtual controller is a Windows Service installed on computer by means of RogerSVC software which is available at www.roger.pl.
Virtual controller with MCT88M-IO terminal can monitor and control products dispensing. Products are selected with terminal input lines (e.g. with connected button) and with function keys. The name of product is displayed by MCT88M-IO and after user identification (e.g. with proximity card) particular output line of the terminal is activated which on the other hand can be connected to vending machine dispenser or feeder. At the same time the controller deducts cost of the product from the user total limit which is defined by system administrator. The user can purchase certain amount of credits in advance or all costs can be settled when user leaves premises/hotel. The total amount of user's expenses are reported in VISO software and they can be made available to third party software through RACS 5 Integration Server.

Assets tracking terminal

The MCT88M-IO terminal when connected to virtual controller via Ethernet (LAN) can be used as terminal for management of assets under control of RACS 5 system. Virtual controller is a Windows Service installed on computer by means of RogerSVC software which is available at www.roger.pl. Assets management functionality requires licensed VISO EX software.
Virtual controller with MCT88M-IO terminal can monitor and control renting and returning of items by users. Rent or return function is selected with terminal input lines (e.g. with connected button) or with function keys. After user identification at the terminal (e.g. with proximity card) particular output line of the terminal can open lock to grant access to assets. It is possible to define users who can and cannot access assets. Assets must be assigned with identifiers so they could be recognized by the system. When asset is collected or returned by user then its identifier (proximity card, bar code, etc.) must be read/scanned. The virtual controller enables consolidated assets management and monitoring on the level of VISO software. More information on assets managements is given in AN026 Application note which is available at www.roger.pl.

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 or by manual addressing 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 terminal 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 contact (fig. 6) is not required.

Low level configuration (RogerVDM)

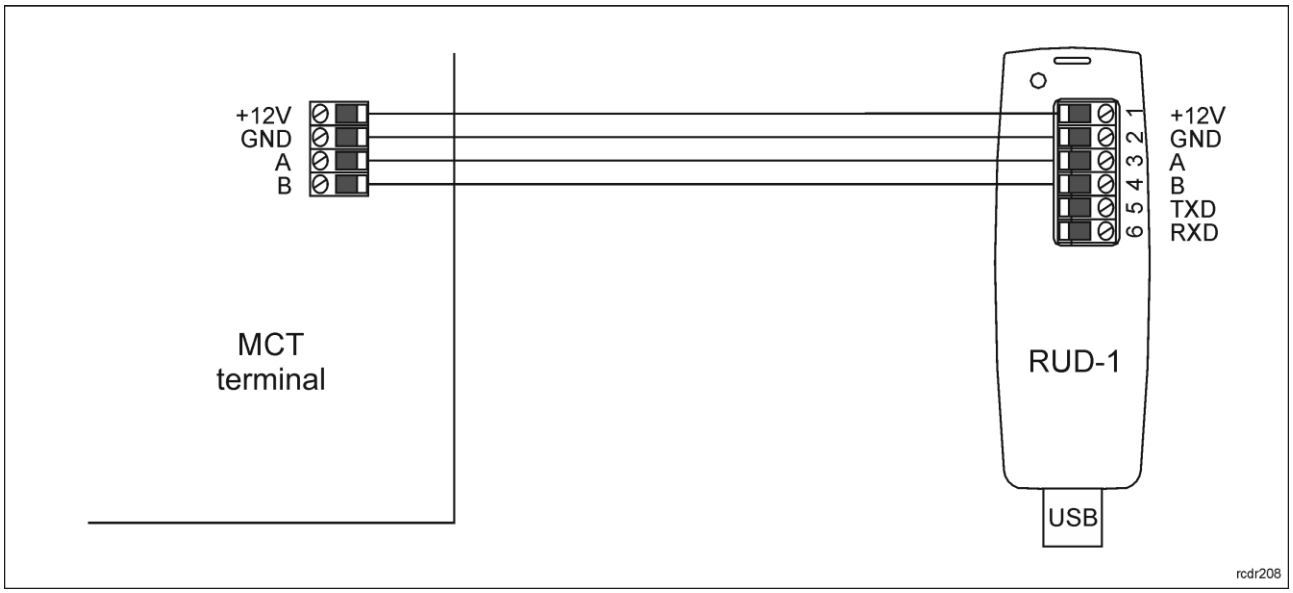


Fig. 8 Connection to RUD-1 interface.

Programming procedure with RogerVDM software (firmware 1.0.6.193 or newer):

1. Connect the device to RUD-1 interface (fig. 8) and connect the RUD-1 to computer's USB port.
2. Remove jumper from MEM contacts (fig. 6) if it is placed there.
3. Restart the device (switch power supply off and on) and orange LED SYSTEM will pulsate. Then within 5 seconds place jumper on MEM contacts and the terminal will display CONFIG MODE text.
4. Start RogerVDM program, select *MCT* device, *v1.0* 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. Select RS485 communication interface and specify unoccupied RS485 address in range of 100-115 or select Ethernet communication interface and specify IP address. Configure other low level configuration parameters as needed.
7. Click *Send to Device* to update the configuration of device.
8. Optionally make a backup by clicking *Send to File…* and saving settings to file on disk.
9. Remove jumper from MEM contacts and disconnect device from RUD-1 interface.

Programming procedure with RogerVDM software (firmware older than 1.0.6.193):

1. Place jumper on MEM contacts (fig. 6).
2. Connect the device to RUD-1 interface according to fig. 8 and connect RUD-1 to computer's USB port. The terminal will display CONFIG MODE text and orange LED SYSTEM will pulsate.
3. Start RogerVDM program, select *MCT* device, *v1.0* firmware version, *RS485* communication channel and serial port with RUD-1 interface.
4. Click *Connect,* the program will establish connection and will automatically display *Configuration* tab.

5. Select RS485 communication interface and specify unoccupied RS485 address in range of 100-115 or select Ethernet communication interface and specify IP address. Configure other low level configuration parameters as needed.
6. Click *Send to Device* to update the configuration of device.
7. Optionally make a backup by clicking *Send to File…* and saving settings to file on disk.
8. Remove jumper from MEM contacts and disconnect device from RUD-1 interface.

Note: If the USB port does not offer enough power output, then supply the terminal from external PSU with min. 12VDC/200mA power output.

Note: Do not read any cards nor press keypad when device is configured with RogerVDM.

Table 5. List of low level parameters	
Communication settings	
Communication interface	Parameter defines communication method of device with controller. Range: RS485, Ethernet. Default value: RS485.
IP address	Device IP address.
Subnet mask	Subnet mask.
Default gateway	Gateway IP address.
UDP port	UDP port
Ethernet encryption key	Parameter defines key for encryption of communication in Ethernet (LAN). Range: 1-16 ASCII characters.
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.
NFC/BLE authentication factor encryption key	Parameter defines encryption key for NFC/BLE authentication factors. Range: 4-16 ASCII characters.
NFC/BLE communication encryption key	Parameter defines key for encryption of NFC/BLE communication. Range: 4-16 ASCII characters.
BLE authentication factor class	Parameter defines acceptable type of keys (authentication factors) created in Roger Mobile Key app for Bluetooth (BLE) communication. UCE means lower security and quicker identification while REK means higher security and slower identification. It is necessary to apply classes in RMK which are acceptable for terminal. Range: [1]: REK, [2]: UCE, [3]: UCE + REK. Default value: [3]: UCE + REK.
NFC authentication factor class	Parameter defines acceptable type of keys (authentication factors) created in Roger Mobile Key app for NFC communication. UCE means lower security and quicker identification while REK means higher security and slower identification. It is necessary to apply classes in RMK which are acceptable for terminal. Range: [1]: REK, [2]: UCE, [3]: UCE + REK. Default value: [2]: UCE.
Optical signalisation	
LED SYSTEM pulsing when card near reader	Parameter enables LED SYSTEM (orange) pulsing when card is close to the device. Range: [0]: No, [1]: Yes. Default value: [0]: No.

Backlight level [%]	Parameter defines backlight level. When set to 0 then backlight is disabled. Range: 0-100. Default value: 100.
Backlight dimming when card/key used	Parameter enables temporary backlight dimming whenever card is read, or key is pressed. Range: [0]: No, [1]: Yes. Default value: [0]: No.
LED SYSTEM flash after card read	Parameter enables short flash of LED SYSTEM (orange) when card is read. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
LED SYSTEM flash after key press	Parameter enables short flash of LED SYSTEM (orange) when key is pressed. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
Acoustic signalisation	
Buzzer loudness level [%]	Parameter defines buzzer loudness level. When set to 0 then buzzer is disabled Range: 0-100. Default value: 100.
Short sound after card read	Parameter enables short sound (beep) generating by buzzer when card is read. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
Short sound after key press	Parameter enables short sound (beep) generating by buzzer when key is pressed. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
Keypad settings	
Keypad activated	Parameter enables deactivation of keypad. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
Time between keys in PIN [s]	Parameter defines max. time between two consecutive key pressings. Range: 0-64. Default value: 10.
Single key press	Parameter enables separate transmission of each pressed key to controller. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
PIN followed by [#] key	Parameter enables use of PINs with variable length. In such scenario PIN is concluded with [#] key. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
Min. length of PIN	Parameter defines the minimal number of digits for PIN entered with keypad. If the number of entered digits is lower than this parameter, then it cannot be sent to controller when concluded with [#] key. When set to 0 then PINs are disabled. Range: 4-8. Default value: 4.
Max. length of PIN	Parameter defines the maximal number of digits for PIN entered with keypad. If the number of entered digits reaches this parameter, then PIN is automatically sent to controller and [#] key pressing is not necessary. When set to 0 then automatic PIN transmission is disabled. Range: 0-8. Default value: 8.
[*] key press allowed before PIN	The parameter enables use of [*] key before PIN is entered. The key can be used for additional functionalities. Range: [0]: No, [1]: Yes. Default value: [0]: No.
[*], [#], [F1], [F2], [F3], [F4] key press options	Parameter defines key press type for [*], [#], [F1], [F2], [F3], [F4] keys. Range: [1]: Short press only, [2]: Long press only, [3]: Short and long press. Default value: [1]: Short press only.
Advanced settings	
Card/PIN buffer timeout [s]	Parameter defines time for card/PIN storing in device buffer. When the time elapses, the buffer is cleared even if card/PIN is not transmitted to controller. Range: 1-64. Default value: 10.
AF type	Parameter defines authentication factor type returned by terminal. Default value: [0010]: Number 40bits
Long card read time [s]	Parameter defines long card read time. When set to 0 then long read is disabled. Range: 0-64. Default value: 0

Long key press time [s]	Parameter defines long press time for such key types as [*], [#] and [F1] - [F4]. When set to 0 then long press is disabled. Range: 0-64. Default value: 2.
BLE session timeout [s]	Parameter defines maximal time for establishing connection between mobile device and terminal in Bluetooth technology. When timeout elapses, the session is interrupted by terminal so mobile device could attempt to establish connection again. When set to 0 then timeout is disabled. Range: 0-10. Default value: 3.
BLE broadcasting power [dBm]	Parameter defines power of broadcasting radio signal for Bluetooth communication. Range: [1]: -18, [2]: -12, [3]: -6, [4]: -3, [5]: -2, [6]: -1, [7]: 0. Default value: [1]: -18.
BLE transmission power [dBm]	Parameter defines power of transmission radio signal for Bluetooth communication. Range: [0]: Auto; [1]: -18, [2]: -12, [3]: -6, [4]: -3, [5]: -2, [6]: -1, [7]: 0. Default value: [0]: Auto.
Input types	
IN1, IN2, IN3	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.
Input response times	
IN1, IN2, IN3 [ms]	Parameter defines minimal duration of pulse which is required to trigger the input. Range: 50-5000. Default value: 50.
Parametric (EOL) input resistances	
Tamper, Alarm A, Alarm B [Ohm]	Parameter defines resistor for parametric (EOL) inputs.
Output polarity	
OUT1, OUT2, REL1	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.
Display	
Default background colour	Parameter defines default colour of font background.
Default font colour	Parameter defines default colour of fonts.
Default font background colour	Parameter defines default colour of font background.
File name with additional characters	File name with additional characters.
Screensaver	Parameter enables screensaver displaying. Range: [0]: No, [1]: Yes. Default value: [1]: Yes.
Screensaver display delay [s]	Parameter defines inactivity time before screensaver displaying. Range: 0-3600. Default value: 60.
Comments	
DEV, KBD1, IN1, IN2, IN3, IN4 (Tamper), OUT1, OUT2, REL1,	Parameter defines any text or comment which corresponds to the device/object. It is later displayed in VISO program.
CDI1	Parameter defines any text or comment which corresponds to the device/object. It is later displayed in VISO program or Roger Mobile Key app.
Serial card number (CSN) settings	
Serial number length (CSNL) [B]	Parameter defines the number of bytes from serial card number (CSN)

	which will be used to generate returned card number (RCN). RCN is the actual card number read by reader and it is created as sum of serial card number (CSN) and programmable card number (PCN).
Programmable card number (PCN) settings for Mifare Ultralight	
Sector type	Parameter defines sector type with programmable number (PCN). If the option [0]: None is selected, then card returned number (RCN) will include only CSN and PCN will be discarded. Range: [0]: None, [1]: SSN. Default value: [0]: None.
SSN first page number	Parameter defines location of SSN in card memory. Range: 4-12. Default value: 4.
Programmable card number (PCN) settings for Mifare Classic	
Sector type	Parameter defines sector type with programmable number (PCN). If the option [0]: None is selected, then card returned number (RCN) will include only CSN and PCN will be discarded. Range: [0]: None, [1]: SSN, [2]: MAD. Default value: [0]: None.
Format	Parameter defines format of PCN. Range: [0]: BIN, [1]: ASCII HEX. Default value: [0]: BIN.
First byte position (FBP)	Parameter defines the position of the first byte for PCN in data block on card. Range: 0-15. Default value: 0.
Last byte position (LBP)	Parameter defines the position of the last byte for PCN in data block on card. Range: 0-15. Default value: 7.
Sector ID	Parameter defines sector number where PCN is stored. Range: 0-39. Default value: 1.
Application ID (AID)	Parameter defines application ID number (AID) which indicates sector where PCN number is stored. Range: 0-9999. Default value: 5156.
Block ID	Parameter defines block number where PCN is stored. Range: 0-2 to for sectors 0-31 and 0-14 for sectors 32-39. Default value: 0.
Key type	Parameter defines key type used to access sector with PCN. Range: [0]: A, [1]: B, [2]: Roger. Default value: [0]: A.
Key	Parameter defines 6 bytes (12 HEX digits) key for accessing sector where PCN is stored.
Programmable card number (PCN) settings for Mifare Plus	
Sector type	Parameter defines sector type with programmable number (PCN). If the option [0]: None is selected, then card returned number (RCN) will include only CSN and PCN will be discarded. Range: [0]: None, [1]: SSN, [2]: MAD. Default value: [0]: None.
Format	Parameter defines format of PCN. Range: [0]: BIN, [1]: ASCII HEX. Default value: [0]: BIN.
First byte position (FBP)	Parameter defines the position of the first byte for PCN in data block on card. Range: 0-15. Default value: 0.
Last byte position (LBP)	Parameter defines the position of the last byte for PCN in data block on card. Range: 0-15. Default value: 7.
Sector ID	Parameter defines sector number where PCN is stored. Range: 0-39. Default value: 1.
Application ID (AID)	Parameter defines application ID number (AID) which indicates sector where PCN number is stored. Range: 0-9999. Default value: 5156.
Block ID	Parameter defines block number where PCN is stored. Range: 0-2 to for sectors 0-31 and 0-14 for sectors 32-39. Default value: 0.

Key type	Parameter defines key type used to access sector with PCN. Range: [0]: A, [1]: B. Default value: [0]: A.
Key	Parameter defines 16 bytes (32 HEX digits) key for accessing sector where PCN is stored.
Programmable card number (PCN) settings for Mifare Desfire	
Sector type	Parameter defines sector type with programmable number (PCN). If the option [0]: None is selected, then card returned number (RCN) will include only CSN and PCN will be discarded. Range: [0]: None, [1]: Desfire file. Default value: [0]: None.
Format	Parameter defines format of PCN. Range: [0]: BIN, [1]: ASCII HEX. Default value: [0]: BIN.
First byte position (FBP)	Parameter defines the position of the first byte for PCN in data block on card. Range: 0-15. Default value: 0.
Last byte position (LBP)	Parameter defines the position of the last byte for PCN in data block on card. Range: 0-15. Default value: 7.
Application ID (AID)	Parameter defines application ID number (AID) which indicates sector where PCN number is stored. Range: 0-9999. Default value: F51560.
File ID (FID)	Parameter defines file identifier in AID. Range: 0-32 for Desfire EV1 and 0-16 for Desfire EV0. Default value: 0.
Communication protection level	Parameter defines encryption method for communication between card and reader. Range: [0]: Plain, [1]: Data authentication by MAC, [2]: Full encryption. Default value: [0]: Plain.
Key number	Parameter defines application key number used for file read. Range: 0-13. Default value: 0.
Key type	Parameter defines encryption key type for Desfire file. Range: [0]: TDES Native, [1]: TDES Standard, [2]: 3-KTDES, [3]: AES128. Default value: [0]: TDES Native.
Key	Parameter defines access key for Desfire file with PCN. 3-KTDES key is 24 bytes (48 HEX digits), TDES and AES keys are 16 bytes (32 HEX digits).

Manual addressing

Manual addressing procedure enables configuration of new RS485 address with all other settings unchanged.

Manual addressing procedure (firmware 1.0.6.193 or newer):

1. Remove all connections from A and B lines.
2. Remove jumper from MEM contacts (fig. 6) if it is placed there.
3. Restart the device (switch power supply off and on) and orange LED SYSTEM will pulsate. Then within 5 seconds place jumper on MEM contacts and the terminal will display CONFIG MODE text.
4. Enter 3 digits of RS485 address in range of 100-115 with keypad.
5. Wait till device starts to emit continuous sound.
6. Leave jumper on MEM contacts to enable further configuration of device from VISO v2 software or remove jumper from MEM contacts to block such remote configuration.
7. Restart the device.

Manual addressing procedure (firmware older than 1.0.6.193):

1. Remove all connections from A and B lines.
2. Place jumper on MEM contacts (fig. 6).
3. Restart the device (switch power supply off and on). The terminal will display CONFIG MODE text and orange LED SYSTEM will pulsate.
4. Enter 3 digits of RS485 address in range of 100-115 with keypad.

5. Wait till device starts to emit continuous sound.
6. Remove jumper from MEM contacts and restart the device.

Memory reset

Memory reset procedure resets all settings to factory default ones including ID=100 address.

Memory reset procedure (firmware 1.0.6.193 or newer):

1. Remove all connections from A and B lines.
2. Remove jumper from MEM contacts (fig. 6) if it is placed there.
3. Restart the device (switch power supply off and on) and orange LED SYSTEM will pulsate. Then within 5 seconds place jumper on MEM contacts and the terminal will display CONFIG MODE text.
4. Press [*] or read any MIFARE card 11 times.
5. Wait till device confirms reset with continuous sound.
6. Leave jumper on MEM contacts to enable further configuration of device from VISO v2 software or remove jumper from MEM contacts to block such remote configuration.
7. Restart the device.

Memory reset procedure (firmware older than 1.0.6.193):

1. Remove all connections from A and B lines.
2. Place jumper on MEM contacts (fig. 6).
3. Restart the device (switch power supply off and on). The terminal will display CONFIG MODE text and orange LED SYSTEM will pulsate.
4. Press [*] or read any MIFARE card 11 times.
5. Wait till device confirms reset with continuous sound.
6. Remove jumper from MEM contacts and restart the device.

High level configuration (VISO)

The purpose of high level configuration is to define logical functioning of the terminal 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. Main firmware can be uploaded to the terminal by means of included memory card. The keyboard firmware update requires connection to computer with RUD-1 interface (fig. 8) and starting RogerVDM software. The latest firmware file is available at www.roger.pl.

Note: During the firmware update process, it is necessary to ensure continuous and stable power supply for the device. If interrupted the device may require repair by Roger.
Note: Backup configuration with RogerVDM software before firmware update because the update will restore factory default settings.

Main firmware update procedure:

1. Disconnect power supply.
2. Press and remove memory card from socket (fig. 6).
3. Using memory card reader, copy main firmware (*.frg) to the card and rename it as FW.BUF.
4. Insert the card into socket.
5. Connect power supply. During firmware update the LED STATUS (red) will pulsate and the LED OPEN (green) will be switched on and after firmware update the LED SYSTEM (orange) will pulsate.
6. Restart the device (switch power supply off and on) and orange LED SYSTEM will pulsate. Then within 5 seconds place jumper on MEM contacts and the terminal will display CONFIG MODE text.
7. Start RogerVDM program and perform low level configuration or restore the configuration from backup file using *Read from File…* command.

Keyboard 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 MEM contacts (fig. 6).
3. Restart the device (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 keyboard firmware (*.cyacd).
6. Click *Update* to start firmware upload with progress bar in the bottom.
7. When the update is finished, disconnect from RUD-1 interface and remove jumper from MEM contacts. Additionally, it is recommended to start memory reset procedure.

6. SPECIFICATION

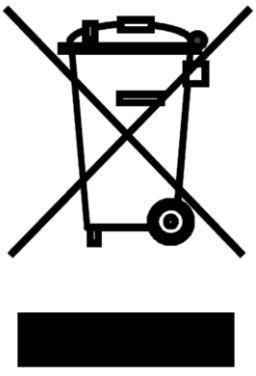
Table 6. Specification	
Supply voltage	Nominal 12VDC, min./max. range 10-15VDC
Current consumption (average)	~110 mA
Inputs	Three parametric inputs internally connected to the power supply plus (+12V) through a 5.6kΩ resistor, approx. 3.5V triggering level when configured as NO or NC.
Relay output	MCT88M-IO v1: Relay output with single NO/NC contacts, rated 30V/1.5A MCT88M-IO v2: Relay output with single NO/NC contacts, rated 30V/1A
Transistor outputs	Two (IO1, IO2) open collector outputs, 15VDC/150mA rated
Tamper protection	Enclosure opening reported to access controller
Identification methods	ISO/IEC14443A MIFARE Ultralight, Classic, Desfire EV1 and Plus proximity cards Mobile device (Android) compatible with NFC Mobile device (Android, iOS) compatible with BLE (Bluetooth Low Energy) v4.1
Reading range	Up to 7 cm for MIFARE and NFC Up to 10 m for BLE – depends on ambient conditions and particular mobile device. Terminal's radio power can be increased within low level configuration.
Distances	Up to 1200 m between controller and terminal (RS485)
IP Code	IP30
Environmental class (acc. to EN 50133-1)	Class I, indoor general conditions, temperature: +5°C to +40°C, relative humidity: 10 to 95% (no condensation)
Dimensions H x W x D	85 x 155,5 x 21,5 mm
Weight	190g
Certificates	CE, RoHS

7. ORDERING INFORMATION

Table 7. Ordering information	
MCT88M-IO	MIFARE DESFire/Plus access terminal; keypad; 4 function keys; colour display; on-board I/Os; RS485; Ethernet.
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 7. Product history		
Version	Date	Description
MCT88M-IO v2.0	04/2018	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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