Roger Access Control System

MCT80M-BLE Operating Manual

Product version: 1.0

Firmware version: 1.0.2.97 or newer

Document version: Rev. A

CE

roger

1. DESIGN AND APPLICATION

The MCT80M-BLE is an access terminal dedicated to RACS 5 system. Terminal enables identification of users by 13.56 MHz MIFARE® Ultralight/Classic/DESFire/PLUS cards and by use of smartphone with NFC (Near Field Communication) or BLE (Bluetooth Low Energy) technology. In case of Bluetooth identification the reading range can reach up to 10 meters while other methods offer a few centimetres reading range. The mobile identification requires Roger Mobile Key application installed on Android or iOS phone.
Reader is equipped with two functional keys: Door Bell and Light which can be programmed for other functions if necessary. MCT80M-BLE is connected to access controller through RS485 interface. MCT80M-BLE can be installed in outdoor locations without any additional protection measures. Because of its relatively small size, reader can be also used as a locker/cabinet reader.

Characteristics

- RACS 5 system access terminal
- 13.56 MHz MIFARE Ultralight/Classic/DESFire/Plus cards reading
- NFC and BLE mobile device identification
- Door Bell and Light function keys
- 3 LEDs
- buzzer
- RS485
- tamper
- outdoor environment
- dimensions: 100.0 x 45.0 x 16.0 mm (height x width x thickness)

Power supply

The terminal requires power supply voltage in range of 11-15VDC. It can be supplied from the MC16 access controller (e.g. TML output), from MCX2D/MCX4D expander 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

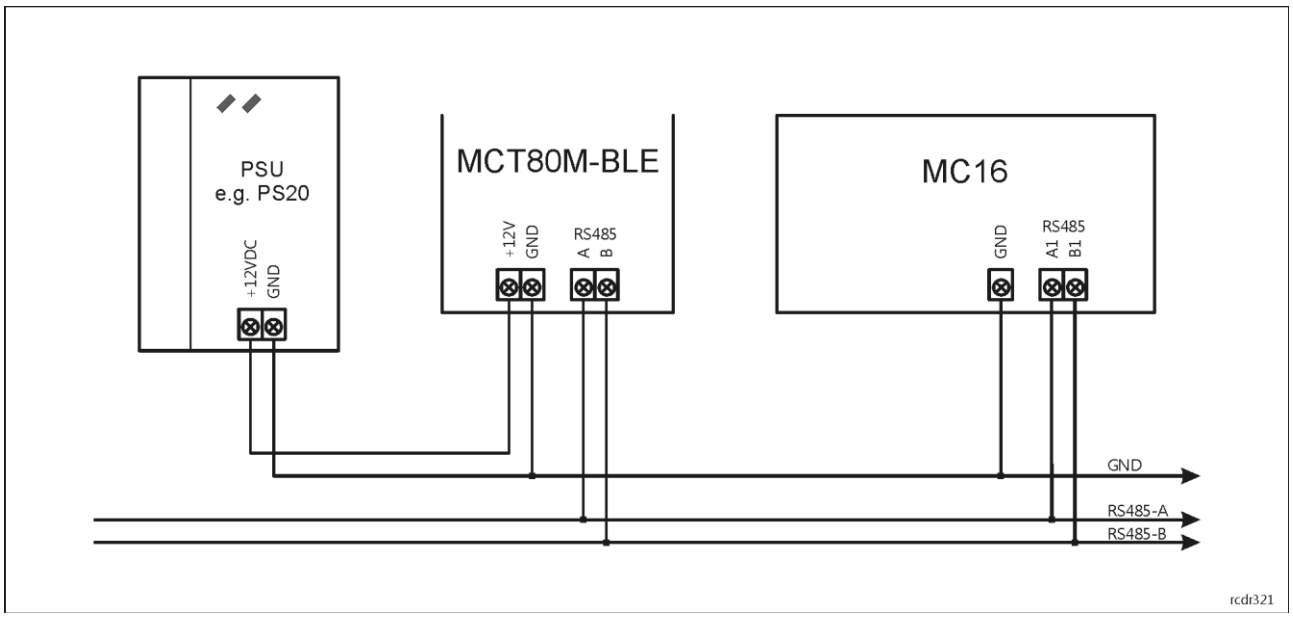


Fig. 1 MCT80M-BLE supply from dedicated power supply unit

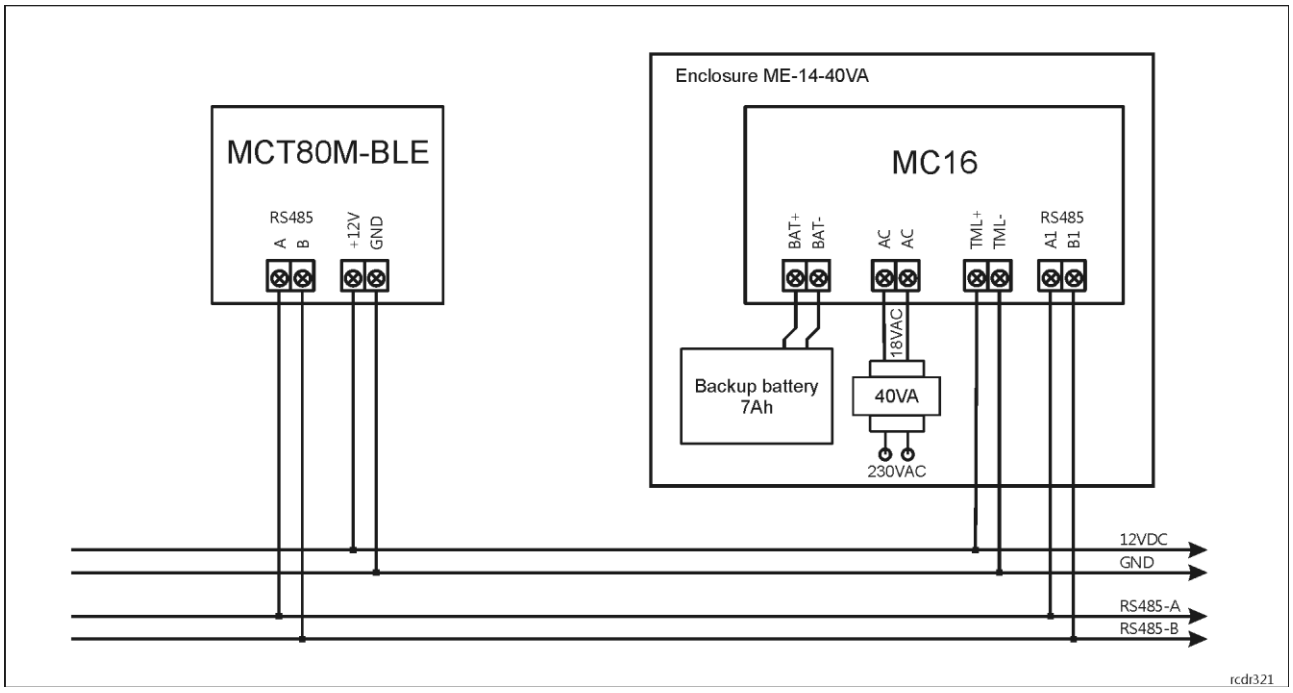


Fig. 2 MCT80M-BLE supply from MC16 access controller

RS485 bus

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

Function keys

The terminal is equipped with two touch function keys. Various functions can be assigned to these keys within high level configuration (VISO) e.g. 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 the terminal distinguishes short and long key pressings. Consequently each types of key press can be assigned with different function.

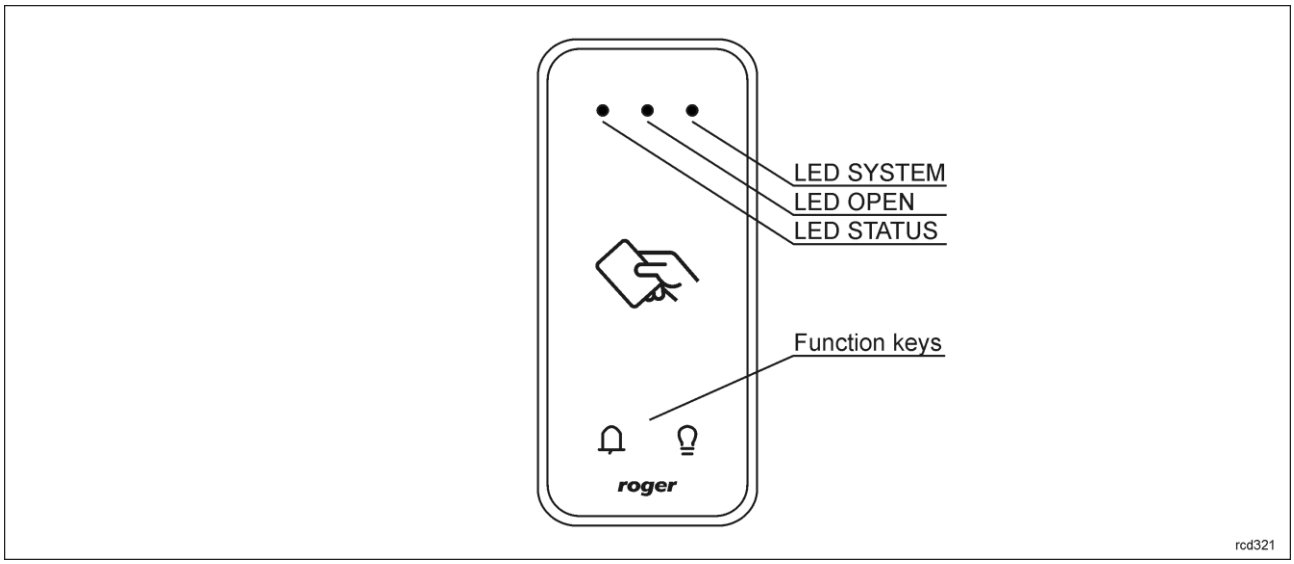


Fig. 3 LED indicators and function keys

LED indicators

The terminal is equipped with three LED indicators 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 indicator colour 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 all three LEDs 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).

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 would firmly press the back panel. (fig.6). 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.

Identification

Following user identification methods are offered by the terminal:

- MIFARE Ultralight/Classic/Plus/DESFire proximity cards.
- 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.

Mobile devices (NFC and BLE)

The terminal MCT80M-BLE enables user identification with mobile device (Android, iOS) using NFC or Bluetooth (BLE) 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 or with gesture.

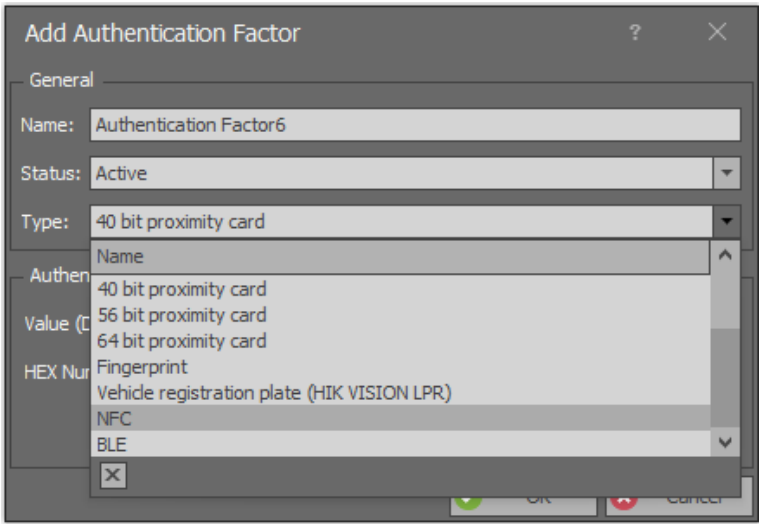


Fig. 4 Authentication factor type in VISO software

2. INSTALLATION

Table 3. Wires		
Name	Wire colour	Description
12V	Red	Supply plus
GND	Black	Ground
A	Yellow	RS485 bus, line A
B	Green	RS485 bus, line B

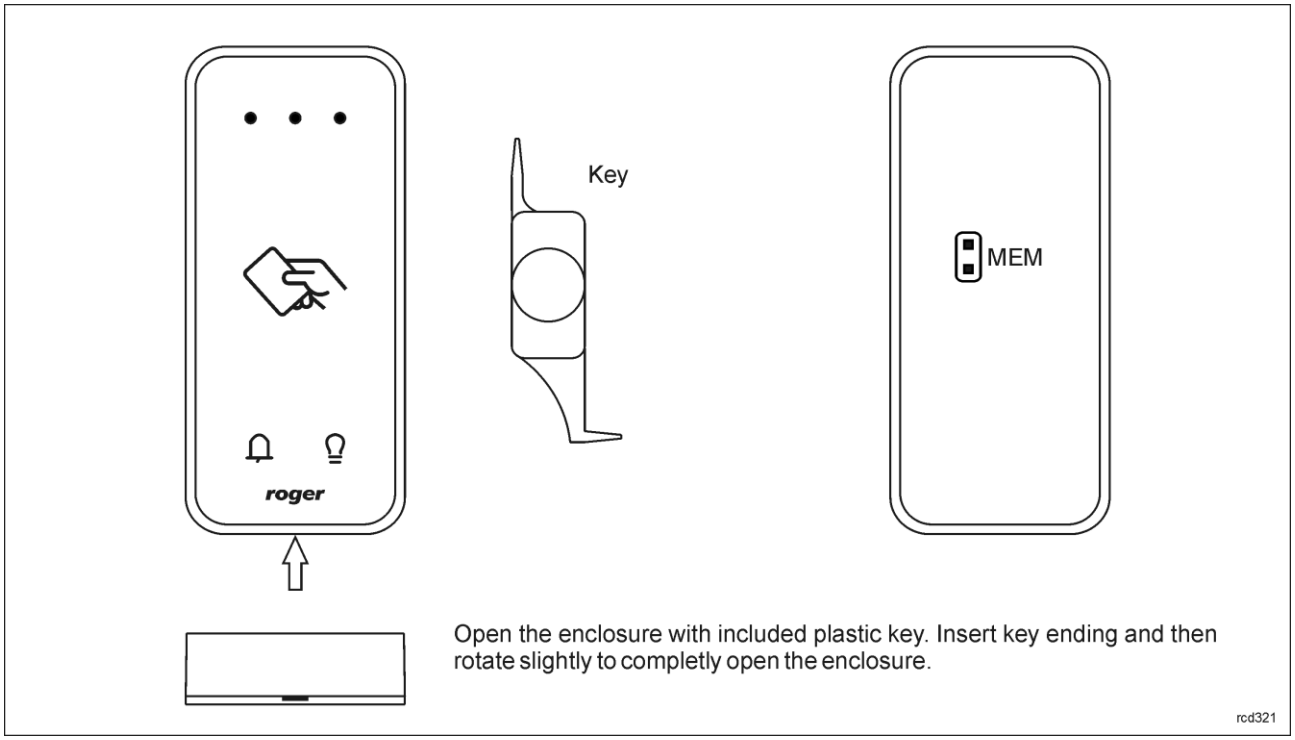


Fig. 5 Enclosure disassembly

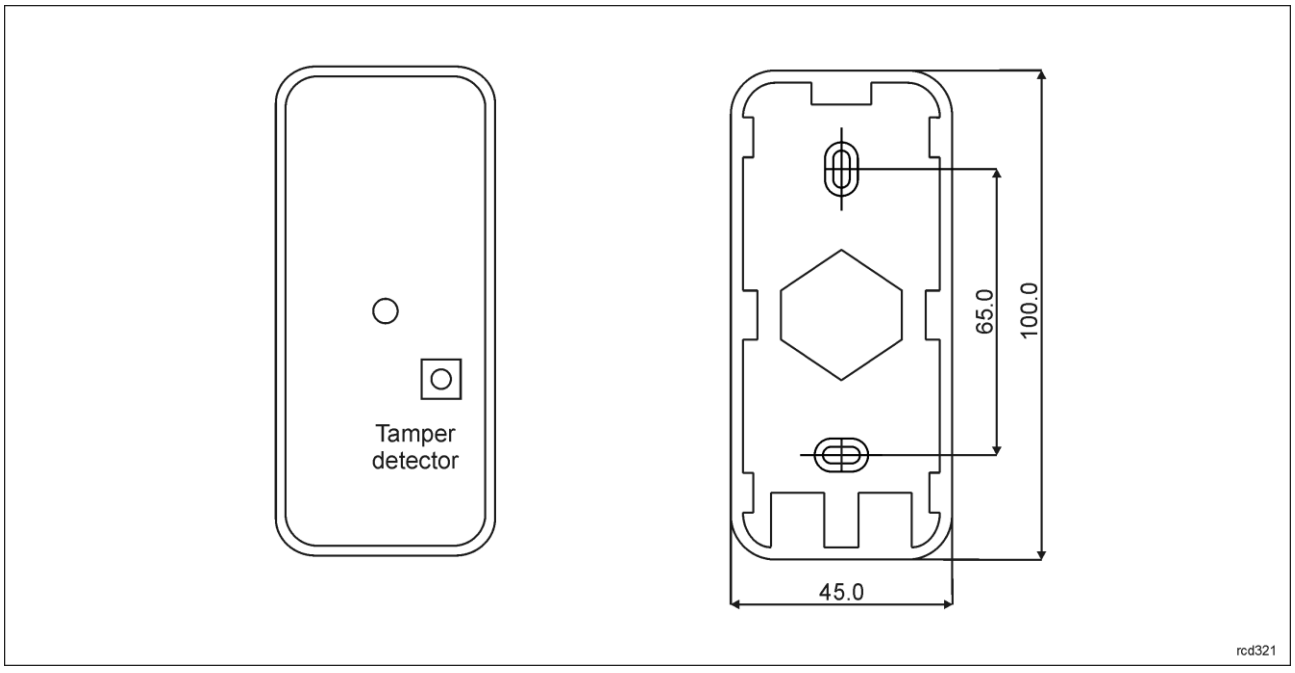


Fig. 6 Internal side of the front panel and back panel

Installation guidelines

- The terminal should be mounted on a vertical structure (wall) away from sources of heat and moisture.
- The back panel should be mounted with included screws according to fig. 6 and front panel should be attached in such way as the tamper detector 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.

- Clean front panel regularly by means of wet cloth and mild detergent. Do not clean by means of abrasive materials and strong cleaners like alcohols, solvents, etc. Damages to screen surface are beyond the scope of warranty.

3. OPERATION SCENARIO

The MCT80M-BLE terminal when connected to MC16 access controller can be at the same time used for access control, Time&Attendance and to control external devices with function keys. 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. The terminal can also operate with MC16 controller using MCX2D/MCX4D expanders as in case of M16-PAC-x-KIT series.

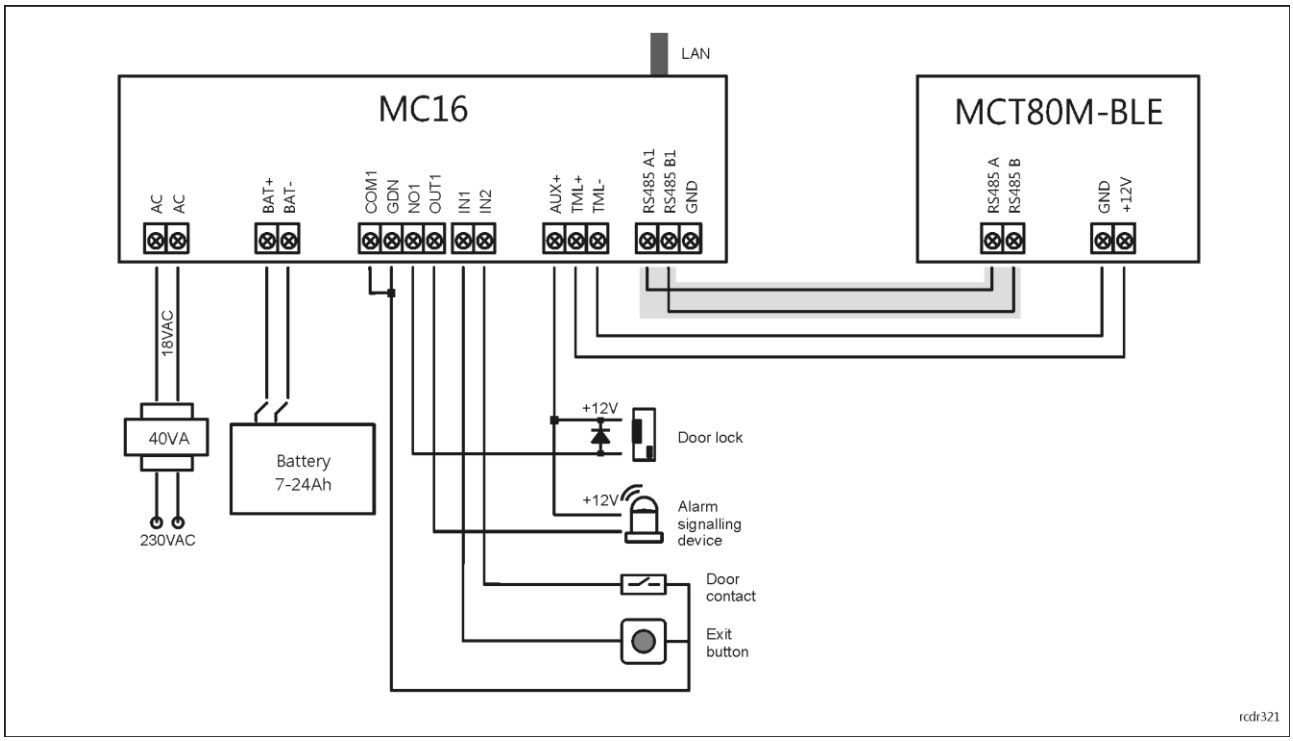


Fig. 7 Typical connection diagram for the terminal and MC16 access controller

4. CONFIGURATION

Low level configuration (RogerVDM)

The purpose of low level configuration is to prepare device for operation in RACS 5 system. In order to start the configuration, connect the terminal to RUD-1 interface (fig. 8) and start RogerVDM software.

Programming procedure with RogerVDM software:

1. Place jumper on MEM contacts (fig. 5).
2. Connect the device to RUD-1 interface (fig. 8) and connect the RUD-1 to computer's USB port. 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. Enter unoccupied RS485 address in range of 100-115 and other settings according to requirements of specific installation.
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: Do not read any cards when the device is configured with RogerVDM.

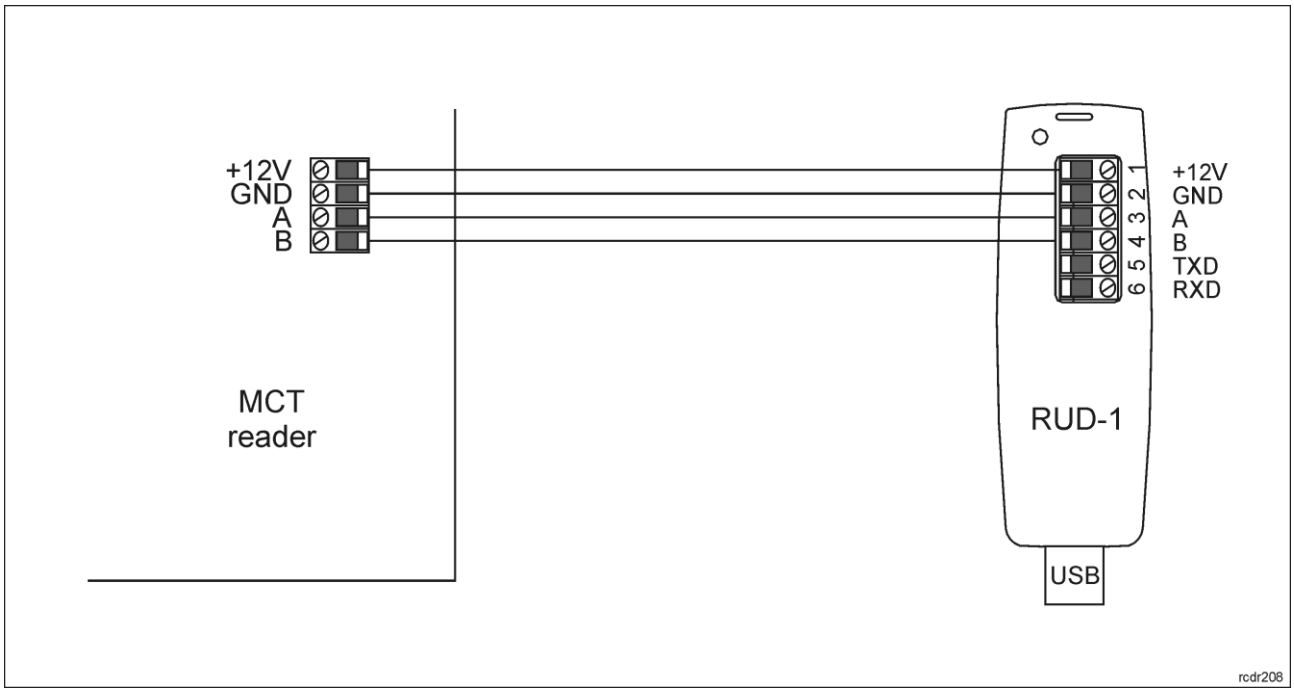


Fig. 8 Connection to RUD-1 interface.

Table 4. List of low level parameters	
Communication settings	
RS485 address	Parameter defines device address on RS485 bus. Range: 100-115. Default value: 100.
RS485 communication timeout [s]	Parameter defines delay after which device will signal lost communication with controller. When set to 0 then signaling is disabled. Range: 0-64s. Default value: 20s.
RS485 encryption	Parameter enables encryption at RS485 bus. Range: [0]: No, [1]: Yes. Default value: [0]: No.
RS485 encryption key	Parameter defines key for encryption of communication at RS485 bus. Range: 4-16 ASCII characters.
NFC/BLE authentication factor encryption key	Parameter defines encryption key for NFC/BLE key (authentication factor). 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.
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: [0]: 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: [0]: 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: [0]: 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: [0]: Yes.
Keypad settings	
Keypad activated	Parameter enables deactivation of keypad. Range: [0]: No, [1]: Yes. Default value: [0]: Yes.
[F1] and [F2] key press options	Parameter defines key press type for [Door Bell] and [Light] function keys. Range: [1]: Short press only, [2]: Long press only, [3]: Short and long press. Default value: [1]: Short press only.
Advanced settings	
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 [*], [#], [F1], [F2], [F3], [F4] keys. When set to 0 then long press is disabled. Range: 0-64. Default value: 2.
BLE activated	Parameter enables deactivation of Bluetooth transmission. Range: [0]: No, [1]: Yes. Default value: [0]: Yes.
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.
Comments	
DEV, KBD1, CDI1, IN1 (Tamper)	Parameter defines any text or comment which corresponds to the object. It is later displayed in VISO program.
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.
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:

1. Remove all connections from A and B lines.
2. Place jumper on MEM contacts (fig. 5).
3. Restart the device (switch power supply off and on) and orange LED SYSTEM will pulsate.
4. Enter 3 digits of RS485 address in range of 100-115 with any MIFARE card.
5. Wait till device starts to emit continuous sound.
6. Remove jumper from MEM contacts and restart the device.

Terminals without keypad can be addressed with multiple card readings where the N number of readings emulates digit of the address. Three series of readings with any MIFARE proximity card are necessary to set the address. After each series wait for two beeps and proceed with the next digit. Zero digit is emulated with 10 readings.

Example:
Programming of ID=101 address with card readings:

1. Read card 1 time and wait for two beeps.
2. Read card 10 times and wait for two beeps.
3. Read card 1 time and wait for two beeps.

Memory reset procedure

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

Memory reset procedure:

1. Remove all connections from A and B lines.
2. Place jumper on MEM contacts (fig. 5).
3. Restart the device (switch power supply off and on) and orange LED SYSTEM will pulsate.
4. 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 notes which is available at www.roger.pl.

5. FIRMWARE UPDATE

The update requires connection of reader to computer with RUD-1 interface (fig. 8) and starting RogerVDM software. The latest firmware file is available at www.roger.pl.

Firmware update procedure:

1. Place jumper on MEM contacts (fig. 5).
2. Connect the reader to RUD-1 interface (fig. 8) and connect the RUD-1 to computer's USB port. Orange LED SYSTEM will pulsate.
3. Start RogerVDM program and in the top menu select *Tools* and then *Update firmware*.
4. In the opened window select device type, serial port with RUD-1 interface and paths to main firmware file (*.frg) and additional firmware file (*.cyacd).
5. Click Update to start firmware upload with progress bar in the bottom.
6. When the update is finished, remove jumper from MEM contacts and restart the reader.

6. SPECIFICATION

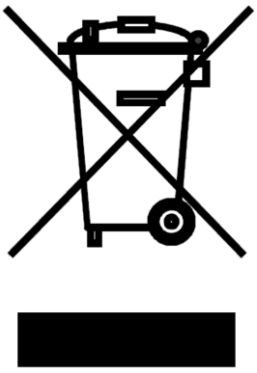
Table 5. Specification	
Supply voltage	Nominal 12VDC, min./max. range 10-15VDC
Current consumption (average)	~70 mA
Tamper protection	Enclosure opening reported to access controller
Identification methods	13.56MHz MIFARE Ultralight, Classic, Plus and Desfire proximity cards Mobile devices (Android, iOS) with NFC Mobile devices (Android, iOS) with Bluetooth Low Energy v4.1
Reading range	Up to 7 cm for MIFARE cards 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.
Distance	1200 m maximal cable length for RS485 bus between controller and terminal
IP Code	IP65
Environmental class (according to EN 50133-1)	Class IV, outdoor general conditions, temperature: -25°C to +60°C, relative humidity: 10 to 95% (no condensation)
Dimensions H x W x D	100 x 45 x 16 mm
Weight	~100g
Certificates	CE

7. ORDERING INFORMATION

Table 6. Ordering information	
MCT80M-BLE	MIFARE DESFire/Plus access terminal; keypad; 4 function keys; colour display; on-board I/Os; RS485; Ethernet
RUD-1	Portable USB-RS485 communication interface dedicated to ROGER access control devices

8. PRODUCT HISTORY

Table 7. Product history		
Version	Date	Description
MCT80M-BLE v1.0	03/2019	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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