Roger Access Control System

PRT12MF-DES, PRT82MF, PRT84MF and PRT84ME readers

Operating Manual

Firmware version: v1.0.8 or newer

Hardware version: 1.0

Document version: Rev. D

CE

This document refers to the following products:

PRT12MF-DES, PRT12MF-DES-BK, PRT82MF, PRT82MF-BK, PRT84MF, PRT84MF-BK and PRT84ME

Contents

1. GENERAL DESCRIPTION

1.1 Introduction

PRT12MF-DES, PRT82MF, PRT84MF and PRT84ME readers are designed to work with access controllers which support RACS CLK/DTA or Wiegand 24..66 bit data output formats. Readers cannot be operated as standalone devices and they are dedicated to read and transmit card number or PIN to access controller. PRT84ME also read EM125kHz UNIQUE. Contrary to other PRTxxMF series readers, PRT12MF-DES readers can also read the most secure MIFARE DESFire and MIFARE Plus card in full range (both CSN and PCN). The factory new reader is pre-configured with RACS CLK/DTA operating mode and ID=0 address. The mode can be changed from PC (RogerVDM) or within the procedure of manual programming of operating mode.

1.2 Features

- ISO14443A, EM125kHz UNIQUE RFID proximity cards:
    - MIFARE® ULTRALIGHT
    - MIFARE® Classic 1k and 4k
    - MIFARE® DESFire EV0 and EV1 (PRT12MF-DES only)
    - MIFARE® Plus (PRT12MF-DES only)
    - EM125kHz UNIQUE (PRT84ME only)
- CSN and PCN reading
- RACS CLK/DTA output format
- Wiegand 26..66 bit output format
- Three LED indicators
- LEDs controlled by inputs (Wiegand mode)
- Buzzer with adjustable loudness
- Buzzer controlled by input (Wiegand mode)
- Adjustable keypad backlight
- Two function keys (PRT12MF-DES)
- Tamper contact
- Programming from PC (RogerVDM software)
- 0.5m connection cable
- Outdoor use
- CE Mark

1.3 Card number

RCN (Returned Card Number) which is transmitted by reader to access controller consists of two sections corresponding to two numbers stored on MIFARE card i.e. read only CSN (Chip Serial Number) and custom PCN (Programmed Card Number). It is not obligatory to use both numbers for the composition of RCN as it can include only CSN section or only PCN section.
When the system is configured for the operation with RCN number which includes PCN section then cards from other systems will not be recognized. Cards with PCN must be earlier programmed by administrator of the system. It can be done with any card writer e.g. RUD-3 and RUD-4 devices and with RogerVDM software. By default PRT readers are configured for the reading of RCN with only CSN section (RCN=CSN).

Note: Encrypted PCN is protected against modifications and unauthorized reading. It is recommended to apply PCN in systems that require high security.

Any PRT reader must be configured with the same parameters as card writer used to program cards. The definition of RCN explains how the resulting card number is created from CSN and PCN sections of the card.

RCN	
CSN section	PCN section

Note: In the examples below the letter 'h' signifies hexadecimal number.

1.3.1 CSN section

CSN section can be a part of RCN and it is based on factory defined chip serial number of MIFARE card. CSN is read only number. It is not encrypted and it can be copied on more cards with widely available programming devices.
In order to configure CSN section it is necessary to specify how many bytes of CSN will be used in RCN by reader when card is read. This is configured by means of the parameter *Serial number length (CSNL)* in RogerVDM software during low level configuration of reader. Depending on MIFARE card type the CSN can include 4 or 7 bytes of data while the CSNL parameter can be configured in range of 0 to 15 bytes. Therefore following scenarios are possible:

- CSNL=0 means that no CSN byte will be used in RCN so the RCN will be based only on PCN section.
- If the number of CSN bytes in card memory is lower than CSNL parameter then leading zeros are used for missing bytes.
- If the CSNL parameter is lower than the number of CSN bytes then the CSN section of RCN will include only least significant bytes (LSB) of CSN.

Example
If *CSNL=5* and CSN includes four bytes of data as below then CSN section of RCN is 0055667788.

55h	66h	77h	88h

Example
If *CSNL=2* and CSN includes four bytes of data as below then CSN section of RCN is 7788.

55h	66h	77h	88h

1.3.2 PCN section

PCN section can be a part of RCN and it stored on card's memory. This number can be defined and modified by administrator of the system. PCN is stored in specified sector and block of memory and it is encrypted with selected key. The location of PCN is specified by *Sector type* parameter in RogerVDM software during low level configuration of PRT reader. The parameter can be *NONE*, *SSN, MAD* or *Desfire file*.

Sector type parameter	**PCN reading**
NONE	PCN is omitted. RCN is based only on CSN.
SSN	PCN is read from specified sector and block of card's memory. AID (Application ID) is ineffective.
MAD	PCN is read from specified block in the first encountered sector which is indicated by configurable AID (Application ID). If more than one sector includes AID then PCN will be random.
Desfire file	PCN is read from the file in card's memory indicated by AID.

The number of data bytes read from file (for MIFARE Desfire cards) or data block (for remaining MIFARE cards) is specified by indicating first byte position in block (*FBP* parameter) and last byte position in block (*LBP* parameter). If *FBP>LBP* then the reading order is normal and if *FBP<LBP* then the reading order is reversed.

PCN can be stored on card in binary format (*BIN*) or text format (*ASCII HEX*) which is configured with *Format* parameter. If *ASCII HEX* format is selected then single byte represents character in hexadecimal format e.g. '0100 0001' corresponds to 'A' while in *BIN* format the same bytes can be presented as '41' hexadecimal number. In case of *ASCII HEX* format the length of PCN is two times shorter than it would result from difference of *FBP* and *LBP* parameters. These parameters are defined separately for each of MIFARE Classic, Plus and Desfire formats. In case of PCN of MIFARE Ultralight, the settings of MIFARE Classic are used but the location of PCN is not configurable.

Example
If *FBP=5*, *LBP=9*, *Format=BIN* and data block is as below then PCN is 5566778899.

						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

Example
If *FBP=9*, *LBP=5*, *Format=BIN* and data block is as below then PCN is 3938373635.

						FBP				**LBP**						
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

Example
If *FBP=3*, *LBP=10*, *Format=ASCII HEX* and data block is as below then PCN is 3456789A.

				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

Example
If *FBP=2*, *LBP=10*, *Format=ASCII HEX* and data block is as below then PCN is 23456789A.

			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

Example
If *FBP=10*, *LBP=2*, *Format=ASCII HEX* and data block is as below then PCN is A98765432.

			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

1.3.3 RCN format rules

RCN (Returned Card Number) which is transmitted by reader to access controller consists of CSN section and PCN section specified by such parameters in RogerVDM software as: *Format*, *Sector type, AID, CSNL, FBP and LBP*.

Example
If *CSNL=4*, *FBP=8*, *LBP=10*, *Format=BIN* and sections CSN and PCN are as below:
Section CSN=C4C5C6C7

CSN						
C1h	C2h	C3h	C4h	C5h	C6h	C7h

Section PCN=223344

PCN																
Poz.	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

then RCN is RCN=CSN+PCN=C4C5C6C7223344.

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

The number returned by PRT reader with Wiegand 66 bit output format (64 data bits + 2 control bits):

00	C4h	C5h	C6h	C7h	22h	33h	44h

The number returned by PRT reader with Wiegand 42 bit output format (40 data bits + 2 control bits):

C6h	C7h	22h	33h	44h

The number returned by PRT reader with Wiegand 26 bit output format (24 data bits + 2 control bits):

22h	33h	44h

The number returned by PRT reader in RACS CLK/DTA output format (40 data bits):

C6h	C7h	22h	33h	44h

Note:
1. The RCN returned by reader includes only CSN section if the parameter *Sector type=None* and the parameter *Serial number length (CSNL)* is in range of 1-7 depending on the number of bytes intended for identification.
2. The RCN returned by reader includes only PCN section if the parameter *Sector Type≠None* and the parameter *Serial number length (CSNL)=0*.
3. If the actual RCN is longer than the maximal length for particular output format then the reader cuts leading bytes when transmitting the RCN to access controller. It concerns RACS CLK/DTA format which always transmits 40 data bits and Wiegand formats which can transmit 2 to 8 bytes (16..64 bits).
4. If the actual RCN is shorter than the maximal length for particular output format then the reader inserts leading zeros when transmitting the RCN to access controller. It concerns RACS CLK/DTA format which always transmits 40 data bits and Wiegand formats which can transmit 2 to 8 bytes (16..64 bits).

2. OPERATING MODES AND OUTPUT FORMATS

Readers can be configured with RACS CLK/DTA or Wiegand 26..66 bit operating modes. Additionally, output formats can be configured for Wiegand mode.

2.1 RACS CLK/DTA mode

RACS CLK/DTA mode is dedicated for operation of reader with Roger access controllers. In this mode the reader uses two communication lines called CLK and DTA for bidirectional transmission. Each reader configured to the RACS CLK/DTA mode must have an unique address in range from 0 to 3. In RACS CLK/DTA mode LED and buzzer are controlled by communication protocol and no additional control lines for this purpose are necessary. In case of communication loss with host controller all reader LEDs are flashing.

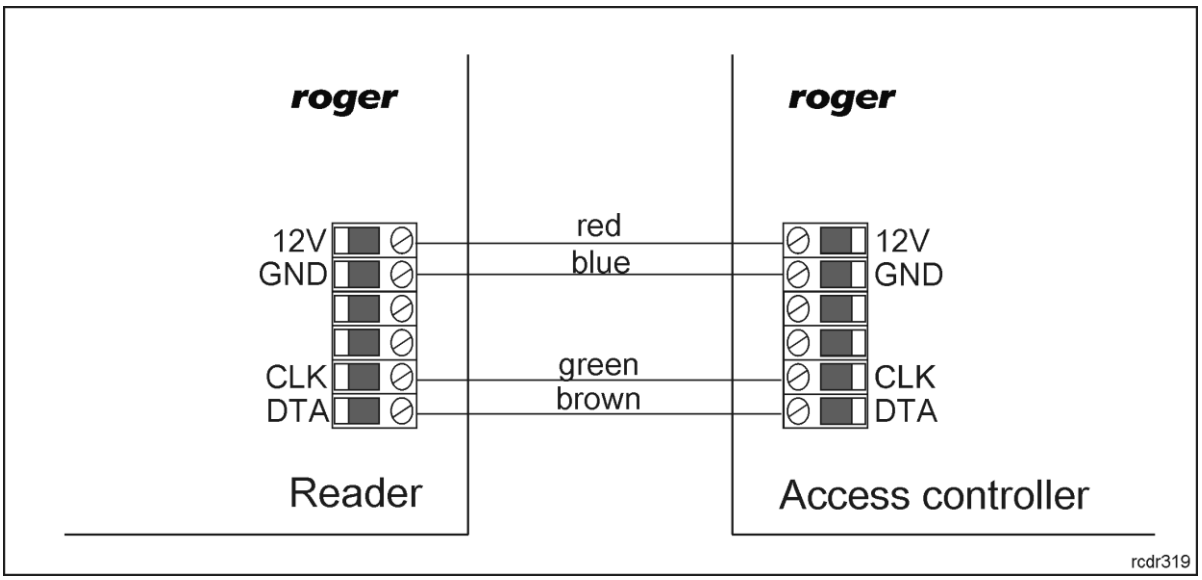


Fig. 1 Connection of reader to access controller (RACS CLK/DTA)

2.2 Wiegand mode

In this mode reader transmits data using CLK and DTA lines which are respectively connected to controller's DATA0 and DATA1 input lines. The transmission is unidirectional while LEDs and buzzer can be controlled by reader's IN1 and IN2 inputs.

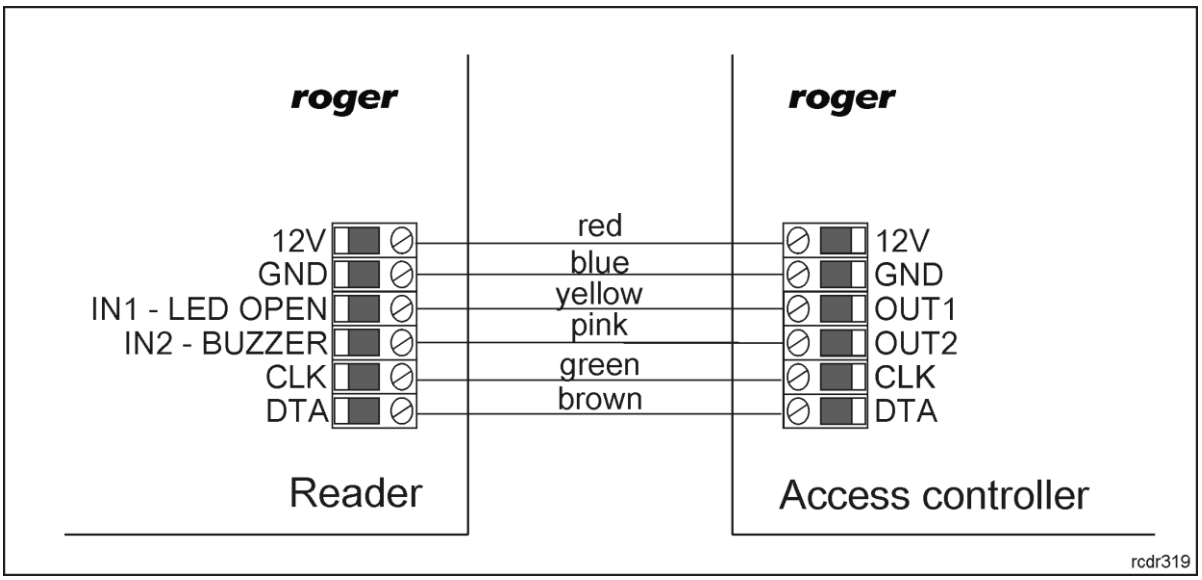


Fig. 1 Connection of reader to access controller (Wiegand)

3. READER CONFIGURATION

Readers can operate in various operating modes which determine the method of communication with controller. The mode and related output format can be configured with RogerVDM program (Windows) or within the procedure of manual programming of operating mode

3.1 RogerVDM configuration

To perform this method reader has to be connected to PC via RUD-1 interface (fig. 3) and programmed by means of RogerVDM software which is available at www.roger.pl.

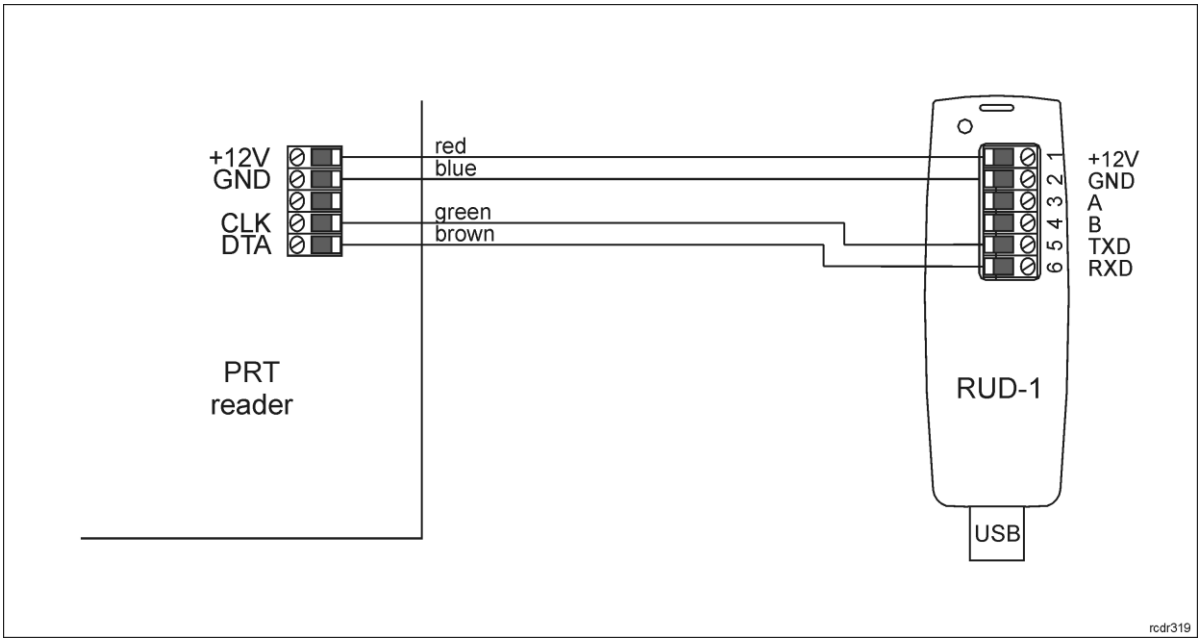


Fig. 3 Connection of reader to RUD-1 interface

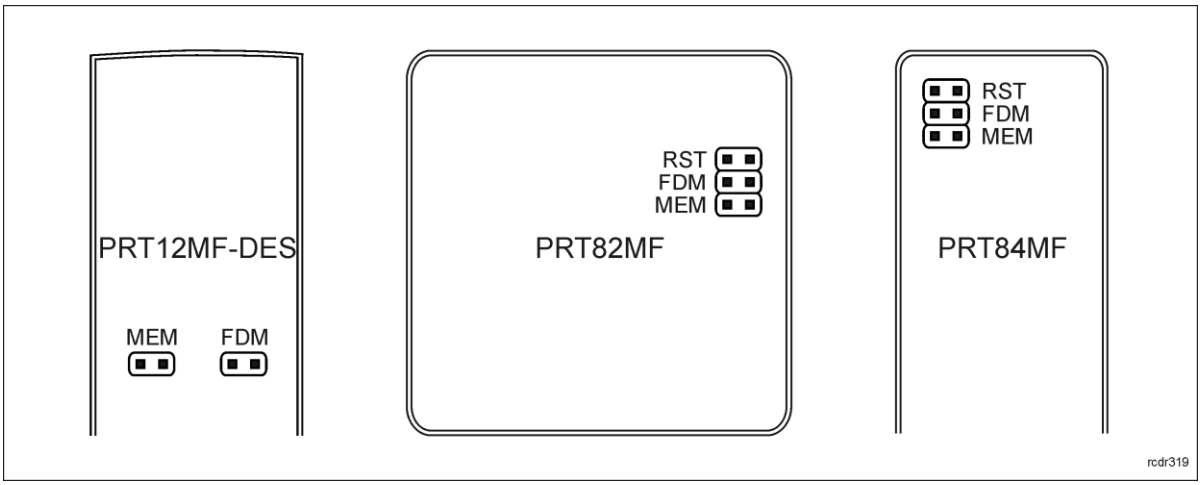


Fig. 4 Location of service contacts

Connection method

1. Connect the reader to RUD-1 interface (fig. 3) and connect the RUD-1 to computer's USB port.
2. Place jumper on MEM contacts (fig. 4).
3. Restart the reader (switch power supply off and on or short RST contacts for a moment) and orange LED SYSTEM will pulsate.

4. Start RogerVDM program, select *PRT v1/2.x* device, firmware version, *RS232* communication channel and serial port with RUD-1 interface.
5. Click *Connect*, the program will establish connection and will automatically display *Configuration* tab.
6. Depending on requirements of specific installation configure operating mode, address and other settings.
7. Click *Send to Device* to update the configuration of reader.
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 reader from RUD-1 interface.

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

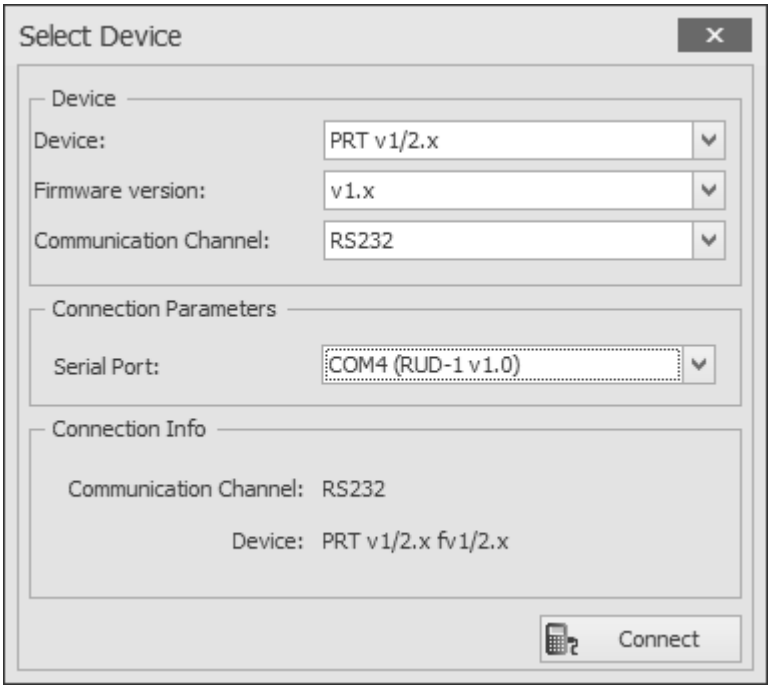


Fig. 5 Select Device window view

Table 1. Configuration parameters		
Parameter name	**Range**	**Description**
General		
Name	16 ASCII characters	Device description, any comment.
Communication settings		
Operating mode	0 – RACS CLK/DTA 1 – Wiegand	Parameter defines data output format which reader uses for communication with controller.
RACS CLK/DTA address	0..3	Reader address for RACS CLK/DTA address.
Wiegand card output format	0..5	Wiegand card output format: 0 - Wiegand 26 bit 1 - Wiegand 34 bit 2 - Wiegand 42 bit 3 - Wiegand 66 bit 4 - Wiegand 32 bit, no control bits

		5 - Wiegand 32-bit, reverse order, no control bits
Wiegand keypad output format	0..6	Sets the PIN/keys transmission options for Wiegand mode (details in table 3, chapter 3.2): 0 – The PIN code 1 to 10 digits and transmitted as a BCD number 1 - The PIN code 1 to 12 digits and transmitted as a binary number 2 - Each key pressed is immediately transmitted to the host controller as a sequence of 4 bits plus 2 control bits 3 - Each key pressed is immediately transmitted to the host controller as a sequence of 4 bits without control bits 4 - Each key pressed is immediately transmitted to the host controller as a sequence of 8 bits plus 2 control bits 5 - Each key pressed is immediately transmitted to the host controller as a sequence of 8 bits without control bits 6 - 1..6 keys long PIN, keys are buffered and send to host controller as sequence of 24 bits
RS485 communication timeout [s]	0 – function disabled 1..64	Defines time in seconds after which reader will signal lost of communication with controller. Available settings: 0 to 64 [s].
Optical signalisation		
LED SYSTEM control input for Wiegand mode	0 - None 1 - IN1 2 - IN2	Defines the input line which will control LED SYSTEM when reader operates in Wiegand mode.
LED OPEN control input for Wiegand mode	0 - None 1 - IN1 2 - IN2	Defines the input line which will control LED OPEN when reader operates in Wiegand mode.
LED STATUS control input for Wiegand mode	0 - None 1 - IN1 2 - IN2	Defines the input line which will control LED STATUS when reader operates in Wiegand mode.
LED SYSTEM pulsing when card is close to 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 upon any key is pressed or card 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 upon card read	0 - Off 1 - On	When option is set LED SYSTEM generates single flash whenever card is read.

LED SYSTEM flash upon key press	0 - No 1 - Yes	When option is set LED SYSTEM generates single flash whenever key is pressed.
Input types		
IN1	0 – NO 1 – NC	Defines input type.
IN2	0 – NO 1 – NC	Defines input type.
Acoustic signalization		
Buzzer loudness level	0..100%	Defines buzzer loudness level. Value 0 switches buzzer off.
Buzzer control input in Wiegand mode	0 - None 1 - IN1 2 - IN2	Selects input which will control buzzer in Wiegand mode.
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.
Serial card cumber (CSN) settings		
Serial number length (CSNL) [B]	0..16	Defines number of CSN bytes used to form RCN.
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 timeout [s]	0..64	Defines time from the last card/PIN entry till moment when card/PIN buffer is automatically erased.
Buffer overflow signalisation on LED SYSTEM	0 - Off 1 - On	When option is active reader will signal on LED SYSTEM that card/PIN buffer overflow occurred.
Card/PIN encryption	0 - Off 1 - On	When option is active the card/PIN data will be encrypted when transmitted over RS485.
Programmable card number (PCN) settings for Mifare Classic		
Sector type	0 – NONE 1 – SSN 2 – MAD	Specifies the type of sector where PCN number is stored. If value '0' is chosen then RCN will be formed from CSN number only.
Format	0 – HEX 1 – HEX ASCII	Specifies coding method of PCN number in data block.
First byte position (FBP)	0..15	Specifies position of the byte in data block where PCN number begins.
Last byte poistion (LBP)	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.

Application ID (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..15	Specifies block number within sector where PCN code is stored.
Key type	0 - A 1- B 2- Roger	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.
Programmable card number (PCN) settings for Mifare Plus		
Sector type	0 – NONE 1 – SSN 2 – MAD	Specifies the type of sector where PCN number is stored. If value '0' is chosen then RCN will be formed from CSN number only.
Format	0 – HEX 1 – HEX ASCII	Specifies coding method of PCN number in data block.
First byte position (FBP)	0..15	Specifies position of the byte in data block where PCN number begins.
Last byte position (LBP)	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.
Application ID (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..15	Specifies block number within sector where PCN code is stored.
Key type	0 - A 1 - B	Specifies key type used to encrypt data stored on the card.
Key	00000000000000000 000000000000000..F FFFFFFFFFFFFFFFFF FFFFFFFFFFF	16 bytes key used to encrypt data stored on the card.
Programmable card number (PCN) settings for Mifare DESFire		
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 – HEX 1 – HEX ASCII	Specifies coding method of PCN number in data block.
First byte position (FBP)	0..15	Specifies position of the byte in data block where PCN number begins.
Last byte position (LBP)	0..15	Specifies position of the byte in data block where PCN number ends.
Application ID (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 (FID)	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.
Communication protection level	0 – Plain 1 – Data authentication by MAC 2 – Full encryption	Defines type of encryption between card and reader.
Key number	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..FFFFFFFFFFFFFFFFFFFFFFFFFFFF	Key used to encrypt data on card. 3KTDES key type contains 24 bytes, TDES and AES keys contain 16 bytes.

3.2 Manual programming of operating mode

The operating mode of the reader can be configured manually without RogerVDM software.

Manual programming procedure:

1. Remove all connections from CLK and DTA lines.
2. Put jumper on MEM contacts (see fig. 4).
3. Restart the reader (switch power supply off and on or short RST contacts for a moment).
4. While LED SYSTEM is flashing enter three digits which will select required operating mode (table 2).
5. Remove jumper from MEM contacts and restart the reader.

If Wiegand operating mode is selected then by default IN1 input is configured to control LED OPEN while IN2 is configured to control buzzer. If necessary these settings can be changed by means of RogerVDM software.

Table 2. Operating mode codes	
Code	**Operating mode**
000	RACS CLK/DTA address ID=0
001	RACS CLK/DTA address ID=1
002	RACS CLK/DTA address ID=2
003	RACS CLK/DTA address ID=3
10x	26 bit Wiegand
11x	34 bit Wiegand

12x	42 bit Wiegand
13x	66 bit Wiegand
14x	32 bit Wiegand, no parity
15x	32 bit Wiegand, reverse order, no parity

The third digit of the operating mode code (marked by "x") specifies the method which reader applies when transmitting PIN or key. For details regarding methods of PIN transmission refer to table 3.
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 mode 001:

- read card 10 times and wait for two beeps
- read card 10 times and wait for two beeps
- read card 1 time and wait for two beeps

Table 3. PIN and key transmission options

Code	Description	Details
X=0	1-10 digits long PIN, transmitted in BCD format	Each key pressed is buffered in reader's memory; with a press of a [#] key reader transmits entire PIN code. The PIN code is transmitted as a BCD coded number.
X=1	1-12 digits PIN, transmitted in binary format	Each key pressed is buffered in reader's memory; with a press of a [#] key reader transmits entire PIN code. The PIN code is transmitted as a binary number.
X=2	Each key pressed is transmitted separately as 4-bit number plus 2 control bits	Each key pressed is immediately transmitted to the host controller as a sequence of 6 bits (EXXXXP) where XXXX represents the code of the pressed key supplemented by two control bits (E and P). The E represents the even bit calculated from the first half of a transmitted code where P represents the parity of a second half of the bit stream. This format is compatible with HID 5355 series readers, option "with parity". Key coding as in Table B.
X=3	Each key pressed is transmitted separately as 4-bit number	Each key pressed is immediately transmitted to the host controller as a sequence of 4 bits (XXXX) which represent the code of the pressed key, no control bits added. This format is compatible with HID 5355 series readers, option "without parity". Key coding as in Table B.
X=4	Each key pressed is transmitted separately as 8-bit number with parity	Each key pressed is immediately transmitted to the host controller as a sequence of 10 bits (EXXXXXXXXP) where XXXXXXXX represents the code of the pressed key supplemented by two control bits (E and P). The E represents the even bit calculated from the first half of a transmitted code where P represents the parity of a second half of the bit stream. Key coding as in Table A.

X=5	Each key pressed is transmitted separately as a 8-bit number without parity bits	Each key pressed is immediately transmitted to the host controller as a sequence of 8 bits (XXXXXXXX) where XXXXXXXX represents the code of the pressed key supplemented by two control bits (E and P). The E represents the even bit calculated from the first half of a transmitted code where P represents the parity of a second half of the bit stream. Key coding as in Table A.
X=6	1-6 keys long PIN transmitted as Wiegand 26 bit stream with control bits	1-6 keys long PIN, each key represented by 4-bit long codes (key codes according to table B). Reader sends data after six keys are pressed or earlier when # key is pressed. Key's buffer is cleared if no keys have not been entered within programmed timeout. Examples: Keys entered "1234#" – code transmitted "001234" Keys entered "123456" – code transmitted "123456"

Table A. 8-bit key coding		
Key	**HEX**	**BIN**
0	F0	11110000
1	E1	11100001
2	D2	11010010
3	C3	11000011
4	B4	10110100
5	A5	10100101
6	96	10010110
7	87	10000111
8	78	01111000
9	69	01101001
*	5A	01011010
#	4B	01001011
F1	3C	00111100
F2	2D	00101101

Table B. 4-bit key coding		
Key	**ASCII**	**BIN**
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110

7	7	0111
8	8	1000
9	9	1001
*	A	1010
#	B	1011

3.3 Memory Reset

The Memory Reset procedure restores factory configuration settings and sets reader to RACS CLK/DTA address ID=0 operating mode.

Memory Reset procedure:

1. Remove all connections from CLK and DTA lines.
2. Put jumper on MEM contacts (fig. 4).
3. Restart the reader (switch power supply off and on or short RST contacts for a moment).
4. While LED SYSTEM is flashing press * or read any ISO 14443A card 11-times.
5. Remove jumper from MEM contacts and restart the reader.

4. INSTALLATION GUIDELINES

- Reader should be mounted on a vertical piece of supporting structure, usually wall, away from sources of heat and moisture.
- The rear panel should be mounted with use of delivered screws in orientation shown on installation drawings so that tamper lever touched the surface and firmly pressed the tamper switch.
- The reader enclosure consists of a front and rear panel. Before installation it is necessary to separate them by means of included key or flat screwdriver according to fig. 6.
- It is recommended to install PRT82MF reader on a flush type box 60mm diameter.
- PRT12MF-DES reader is delivered with additional extended base panel which is intended to be used when reader is installed on metal surface and/or if there is a need for extra space for connection wires.
- Any electrical connections should be done without any voltages.
- When using separate power supply sources for the reader and the controller it is necessary to short both GND terminals. Do not short 12V terminals.
- The front panel of PRT82MF/PRT84MF reader should be periodically cleaned with a slightly moistened cloth and soft detergent. It is forbidden to use abrasives and heavy duty detergents such as alcohols, solvents, gasoline etc. Damage caused by improper maintenance is not covered by warranty.

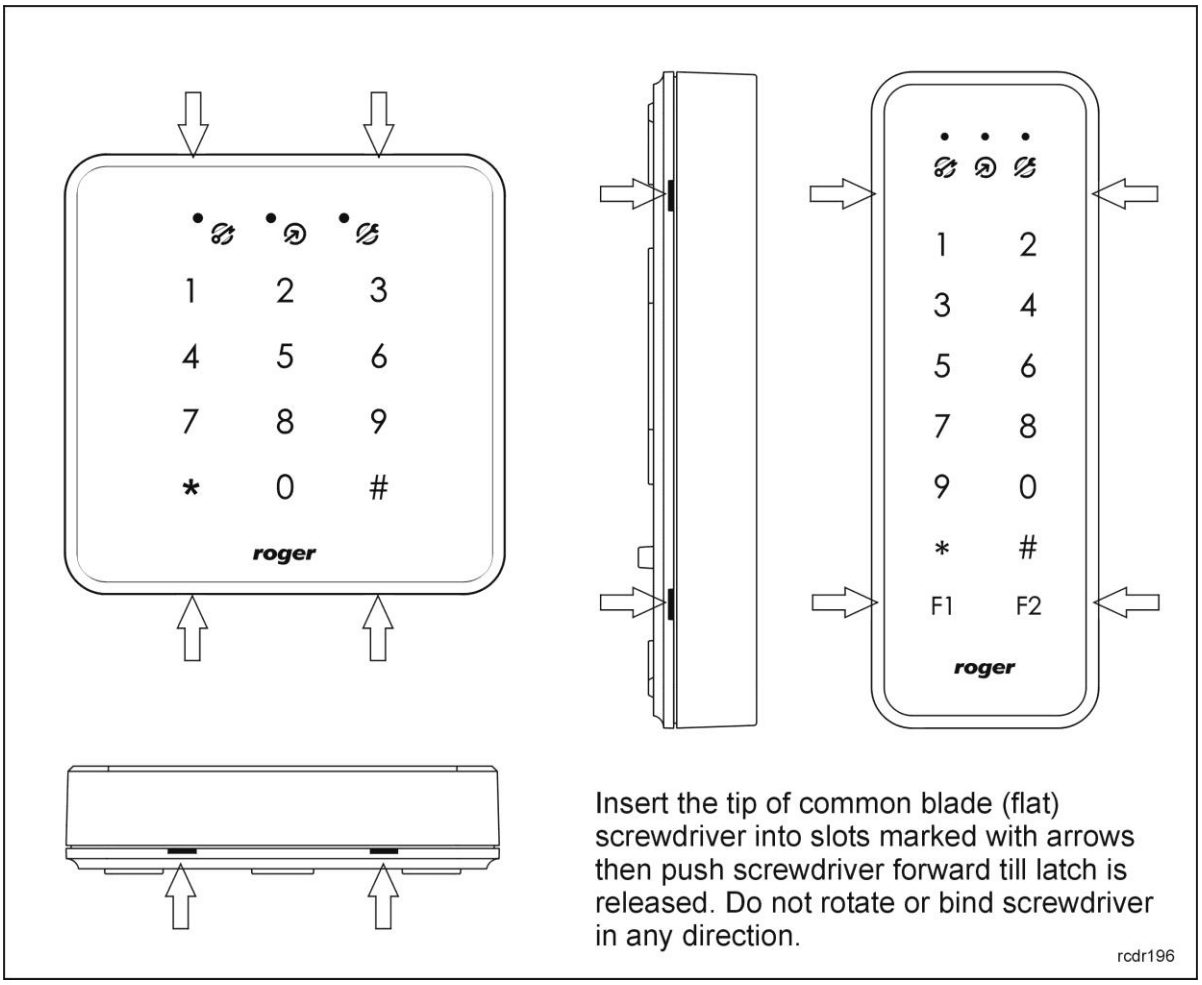


Fig. 6 PRT82MF/PRT84MF enclosure disassembly

Table 4: Connection wires		
Name	**Wire colour**	**Description**
12V	Red	Supply plus
GND	Blue	Supply minus
CLK	Green	RACS CLK/DTA communication line CLK
DTA	Brown	RACS CLK/DTA communication line DTA
IN1	Yellow	IN1 input
IN2	Pink	IN2 input
TAMP	Grey	Tamper switch contacts.
TAMP	White	

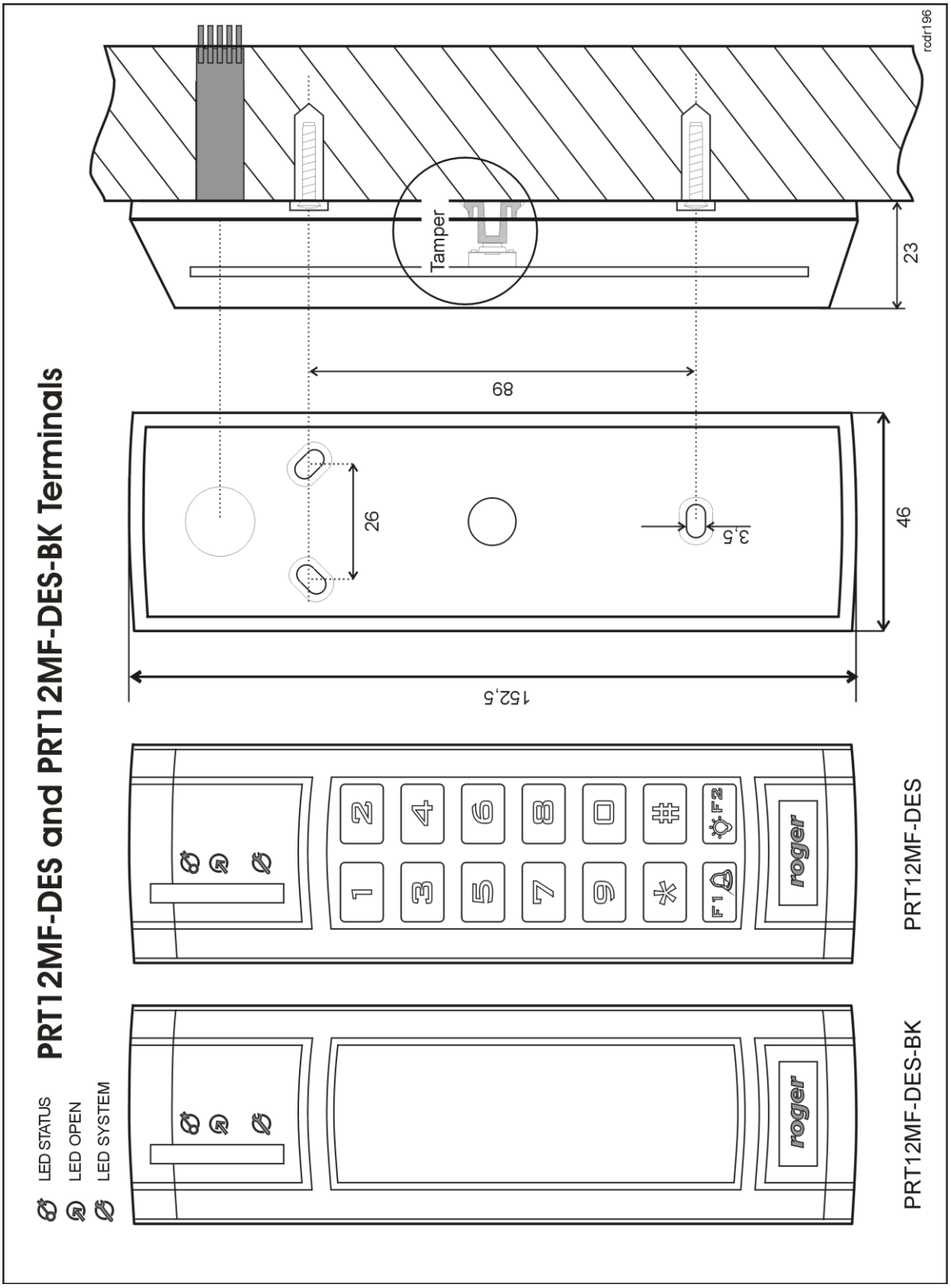


Fig. 7 Dimensions and tamper details, standard (low profile) bottom enclosure

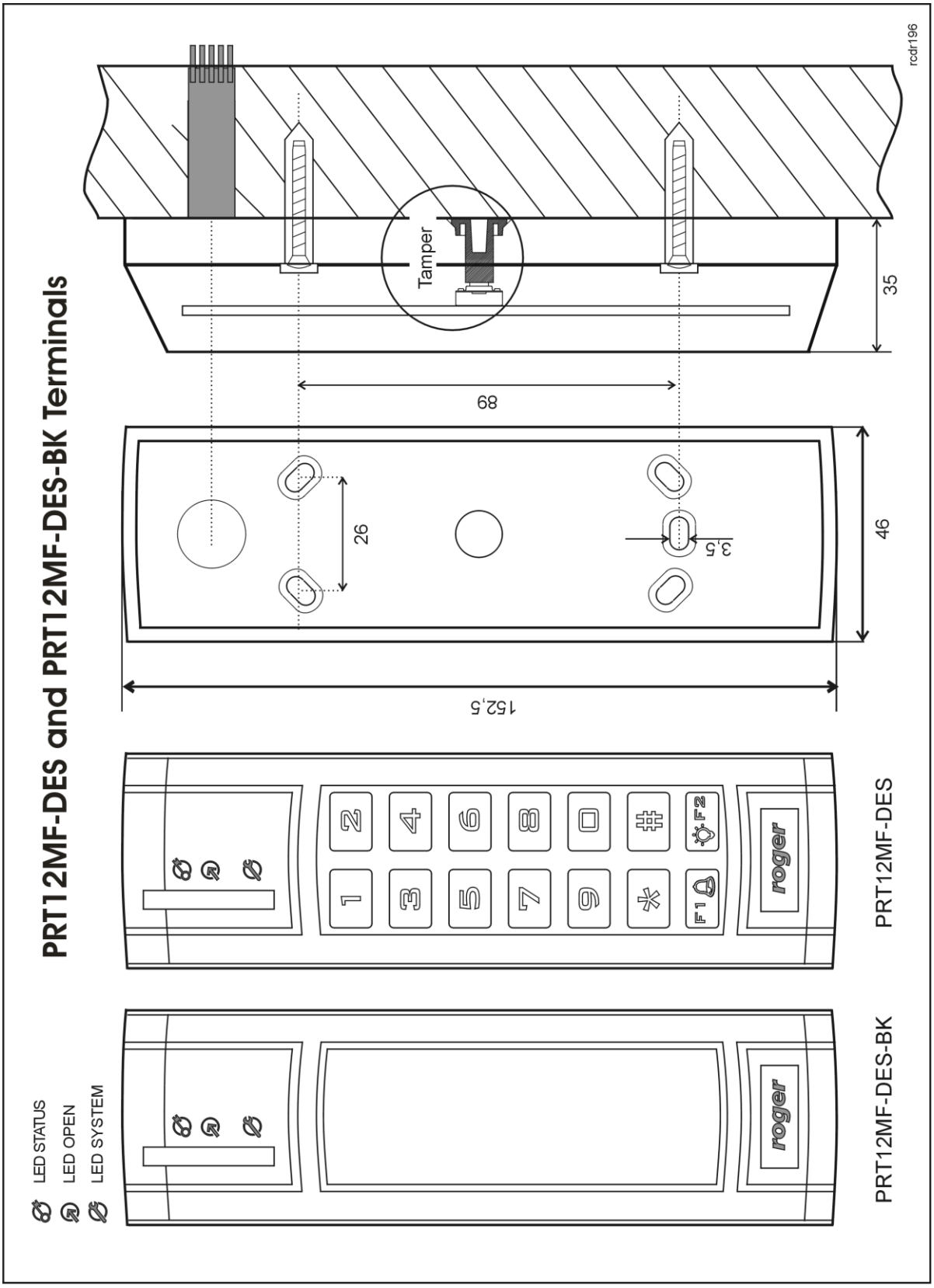


Fig. 8 Dimensions and tamper details, standard (high profile) bottom enclosure

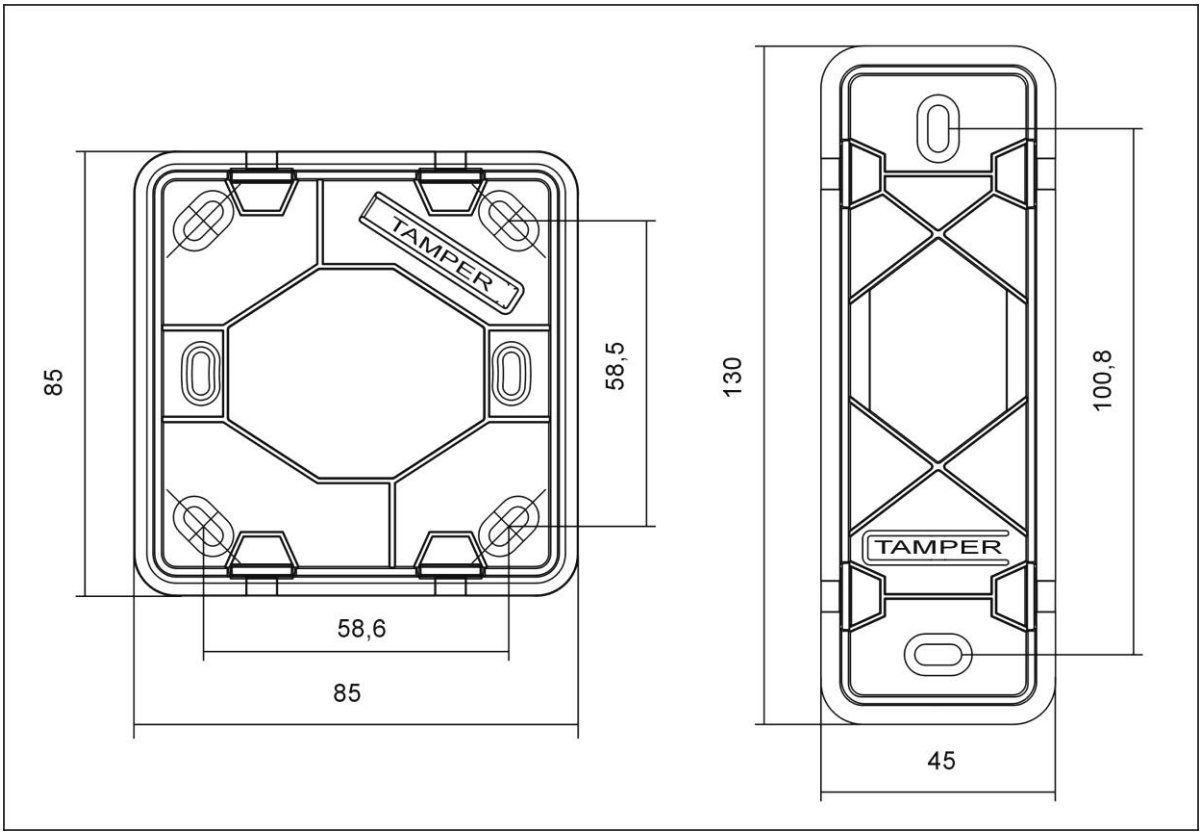


Fig. 9 Dimensions and tamper details

5. FIRMWARE UPDATE

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

Firmware update procedure:

1. Connect reader to RUD-1 interface according to fig. 3.
2. Put jumper on FDM contacts (fig. 4).
3. Run RogerVDM application.
4. Choose *Tools -> Update Firmware*.
5. Select device type, communication port for RUD-1, and path to firmware file (*.hex).
6. Click *Update* and follow the instructions.

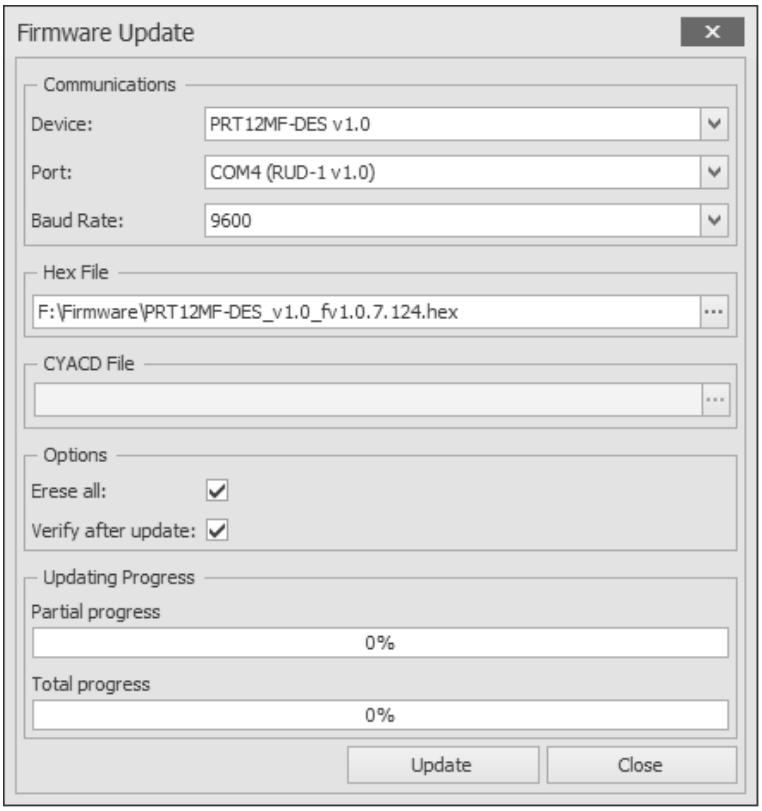


Fig. 10 Firmware Update window view.

6. TECHNICAL SPECIFICATION

Table 5. Technical specification	
Supply voltage	Nominal 12VDC, min./max. range 10-15VDC
Current consumption (average)	PRT12MF-DES: ~70 mA PRT12MF-DES-BK: ~50 mA PRT82MF: ~60 mA PRT82MF-BK: ~45 mA PRT84MF: ~65 mA PRT84MF-BK: ~50 mA PRT84ME: ~65 mA
Inputs	Two (IN1..IN2) NO/NC inputs, approx. 3.5 triggering level
Tamper protection	Isolated 50mA/24V contacts, shorted when enclosure is closed
Proximity cards	PRT12MF-DES/PRT12MF-DES-BK: 13.56MHz MIFARE Ultralight, Classic, DESFire EV1 and Plus PRT84ME: 13.56MHz MIFARE Ultralight, Classic and EM125kHz UNIQUE Remaining PRT readers: 13.56MHz MIFARE Ultralight, Classic
Reading range	Up to 7 cm (for ISO MIFARE® Ultralight, Classic) Up to 5 cm (for ISO MIFARE® DESFire EV1, Plus) Note: Reading distance is defined for good quality proximity cards placed in optimal position against the reader. For all readers the optimal position for card reading is in the front of the device (card surface parallel to the front).

Distances	150m maximal cable length for RACS CLK/DTA bus between controller and reader
IP code	PRT12MF-DES: IP65 PRT82MF/PRT84MF/PRT84ME: IP30 Note: The IP65 is guaranteed assuming that the enclosure adheres tightly to the surface on which the device is installed. In the case of an uneven surface, the installer must use additional sealing, e.g., in the form of a plastic mass between the bottom part of the enclosure and the surface on which Iit is mounted.
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) Class II, indoor conditions, temperature: -10°C to +50°C, relative humidity: 10 to 95% (no condensation) PRT12MF-DES: Class IV PRT82MF/PRT84MF/PRT84ME: Class II
Dimensions H x W x D and weight	PRT12MF-DES: 152,5 x 46 x 23(35) mm; 150g PRT82MF: 85 x 85 x 22 mm; 100g PRT84MF: 130 x 45 x 22 mm; 100g PRT84ME: 130 x 45 x 22 mm; 110g
Certificates	CE

7. ORDERING

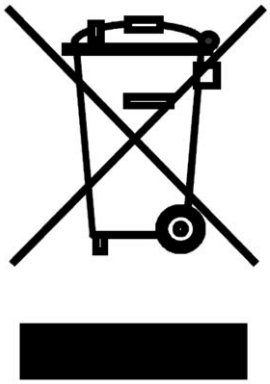
Table 6. Ordering guide	
PRT12MF-DES	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic, DESFire EV0, EV1 and Plus outdoor reader, dark grey enclosure, silicone keypad with backlight, 0.5m connection cable.
PRT12MF-DES-BK	13.56 MHz ISO/IEC 14443A/MIFARE® Ultralight, Classic, DESFire EV0, EV1 and Plus outdoor reader, dark grey enclosure, 0.5m connection cable.
PRT82MF	Dark grey enclosure, sensor keypad.
PRT82MF-BK	Dark grey enclosure, without keypad.
PRT84MF	Dark grey enclosure, sensor keypad, two function keys.
PRT84MF-BK	Dark grey enclosure, without keypad.
RUD-1	Portable communication interface USB-RS485 with 12VDC output.

8. PRODUCT HISTORY

Table 7. PRT12MF-DES product history			
Electronic module	Firmware	Date	Description
v1.0	fv1.0.8.126	08/07/2015	The first commercial version of the product.

Table 8. PRT82MF and PRT84MF product history

Electronic module	Firmware	Date	Description
v1.0	fv1.0.4.116	08/08/2014	The first commercial version of product.
v1.0	fv1.0.8.126	08/07/2015	Memory Reset Procedure changes, possibility of manual operating mode programming added, reduced current consumption.
v2.0	fv2.0.8.126	08/07/2015	Increased the reading distance of PRT84MF.



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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