

PR411DR v1.0 Access Controller Installation Guide

Firmware version: 1.11.1230

Document version: Rev. B



Introduction

This document contains minimum information that is necessary to properly install the device and to perform initial tests. **Full functional description of the controller has been included in the general PRxx1 series access controllers manual which is available on www.roger.pl.**

Controller can be programmed manually or from PC. Connecting the controller to the PC requires utilization of the relevant communication interface (UT-2, UT-2USB, UT-4 or RUD-1) however the RUD-1 is attractive solution because it provides 12VDC output which can be used to power programmed device.

Manual programming can be performed from external PRT series reader connected to the controller board.

Later, for device's maintenance and control so called **Programming Cards** (Utility Cards) can be used. Programming Cards are standard proximity cards which were assigned specific programming or control functions.

Note: The PR411 requires PR Master 4.3.3 or higher.

Installation

The PR411DR controller is delivered in plastic enclosure dedicated to be installed on 35mm DIN rail. Installer must arrange proper enclosure and location to assure condition indicated in Technical Data section later in this document.

The new, factory-made controller has the address ID=00 and is equipped with the MASTER card which can be used for the initial tests. Also, it has peace of 35mm DIN rail which can be used to fix controller in the box which is not equipped with such a rail.

All the access controllers running in the same access network and connected to the same RS485 communication bus should have common supply minus (GND). In order to ensure this, all the GND terminals from various power supply units used in the system (including access controllers with built-in power modules) should be connected together using separate wire. Eventually, the common supply minus (GND) of the entire system can be earthed however in one, arbitrary selected, point only.

Note: Under no circumstances the positive terminals of power supply units used in the system can be connected together. This note applies also for the supply outputs available on controllers equipped with its own (built-in) power supply circuits (e.g. PR411, PR402).

Readers can be installed on metal surfaces but in such case the reading distance reduction should be expected. The reading distance reduction effect can be minimized by installing readers on the non-metal spacer (at least 10 mm thick). The distance between two proximity readers should be min. 0.5 m. In case when two readers have to be installed on opposite sides of the same wall, it is recommended that they will not create the same geometrical axis. If this is not possible, a metal plate beneath each of them should be installed and additionally, an extra non-metallic spacer between reader and metal plate can be installed to improve reading distance.

Setting Address

When controller has to work autonomously, address setting can be skipped however if it has to work in the networked system, together with other controllers, the unique address (ID number from range 00..99) should be assigned to it. Presence of two or more devices having the same address causes the communication conflict and makes a proper communication with the device impossible.

Note: A new controller can be connected to the existing system without the necessity to change its address, however only under condition that no controller existing in the system has the address identical to the address of the new unit being connected. Once the controller is connected to the communication bus, it should be found in the management software and the final address can be assigned to it. It is strongly recommended to keep address ID=00 free.

There are four methods of setting controller address:

- During update of controller firmware (**FixedID**)
- Using programming contacts (jumpers)
- Manually during **Memory Reset** procedure
- From PR Master program

The first two methods of addressing are called *hardware addresses* while two others are called *software addresses*. The main difference between these two addressing methods is that *software addresses* can be changed either from the PR Master program or during **Memory Reset** procedure whilst with *hardware address* neither **Memory Reset** nor PR Master program cannot change it.

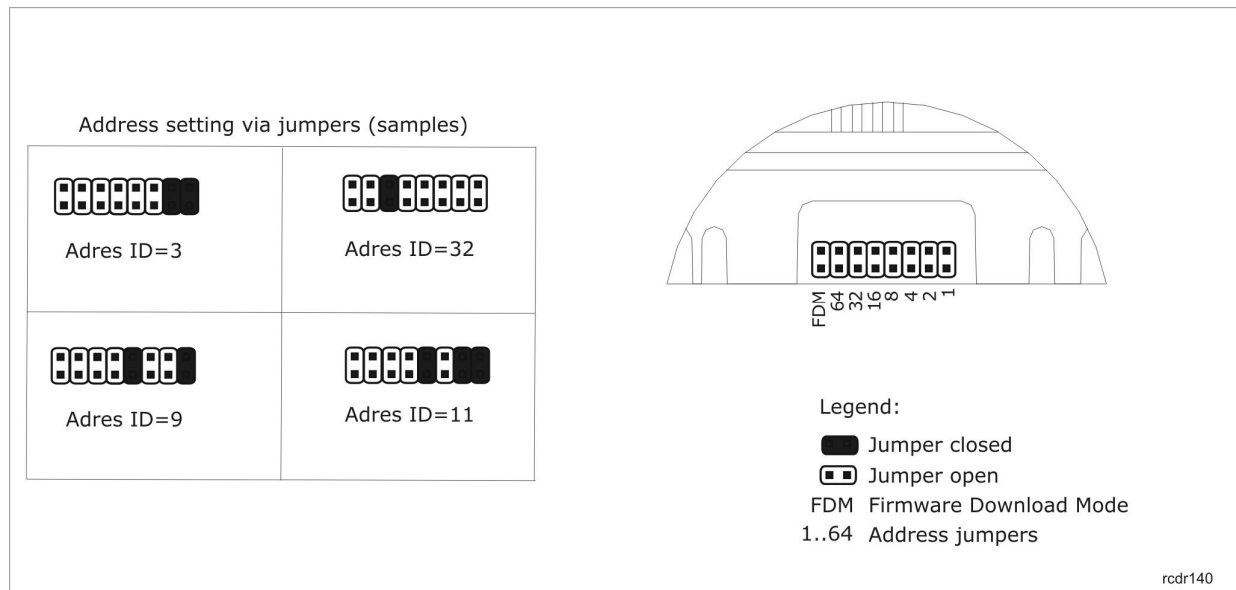
Setting Address During Firmware Update

The so called FixedID can be set during update of the controller firmware. When controller is uploaded with a new firmware RogerISP program ask the operator for a ID address he/she wants to assign to the unit. Once the FixedID is selected and uploaded to the controller it is not possible to change it unless next firmware update. If FixedID address is not required operator should select FixedID=none.

Note: When using FixedID address no other method except firmware update can be used to change controller address again. The FixedID address is kept even in case of controller configuration error. Thanks to this feature controller can be always found on the communication bus on the same address it was assigned during firmware update.

Setting Address on Programming Jumpers

If controller doesn't utilize FixedID address then address can be set using programming contacts. Each programming contact has individual value (1, 2, 4, 8, 16, 32, 64) assigned to, closing certain programming contacts by jumpers makes the address is equal to the sum of values represented by closed contacts. Each time the new address is set, controller must be restarted (via RESET button or powering device off and on) to make new settings active. If address above 99 was set then controller ignores this settings and works with *software address* which can be set from PR Master program or manually during **Memory Reset**.



Setting Software Address

When *hardware addressing* is not used (i.e. FixedID=none and jumper address is set within 100..127 range) then address can be set manually during **Memory Reset** procedure or from PR Master program. For detailed procedure of setting address via Memory Reset see section "Memory Reset" later in this document.

Note: If controller works with *hardware address* set during firmware upgrade or on programming jumpers then *software address* set during **Memory Reset** or from PR Master program is ignored.

In order to set (change) address from PR Master program, controller should be connected to PC via communication interface (UT-2, UT2-USB, UT4 or RUD-1) and then registered in database of PR Master program. Once, it is registered in program operator can set new address for the unit using *Change ID* command.

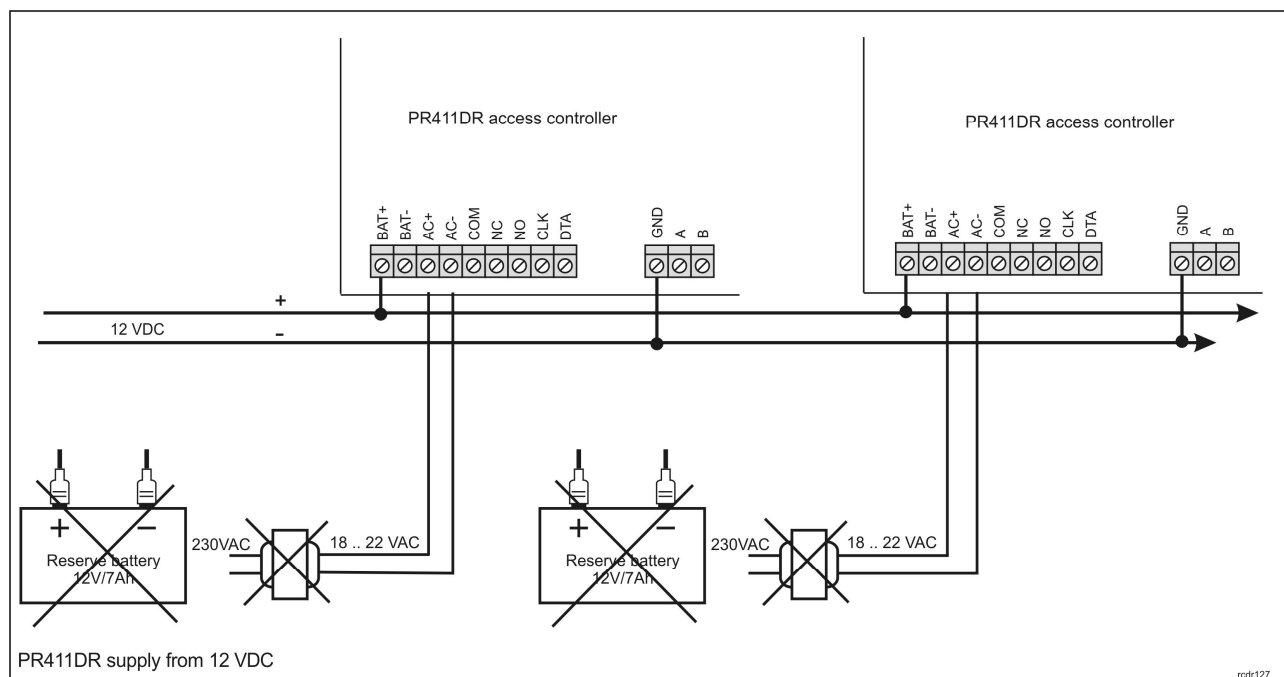
Note: Address set manually during **Memory Reset** procedure can be change by PR Master program and vice verso.

Power Supply

Controller can be supplied from AC transformer connected to AC+ and AC- terminals (polarity marks "+" and "-" have no meanings in this case). The AC transformer must deliver 16,5-22V and min. 20VA of power. Alternatively, controller can be supplied from 12VDC however in such a case it cannot work with reserve battery.

Note: The 12 VDC supply system used to supply access system should provide power in case when AC supply is discontinued and for time required for the specific installation.

When controller is supplied from DC voltage, it is forbidden to connect it neither to AC transformer nor reserve battery. It must be assumed that up to 1.5A of DC current can be consumed by controller and auxiliary equipment connected to it and therefore adequate wire size (gauge) must be used to supply controller.



Note: If the controller is supplied from DC voltage it is necessary to disable detection of low battery and lack of AC power, otherwise system will report failures which in fact doesn't exist.

Wiring Door Lock

In majority of cases, door unlocking devices have inductive characteristics. It means that turning off the current flowing through the device cause the over voltage condition (voltage surges) which can interfere with the controller electronics. In extreme cases it may lead the controller to work improperly or even hug-up the unit. Moreover, the presence of over voltages causes quicker attrition of the relay contacts. In order to limit negative impact of over voltages, it is necessary to utilize a general use semiconductor diode e.g. 1N4007 (one piece of such diode is delivered with the controller). It should be connected as close as possible to the inductive element (electric strike or magnetic lock). The door locking device can be supplied directly from the controller via AUX/GND terminals.

Inputs

All the controller's inputs (IN1-IN8) have identical electric structure and can be configured as NO or NC lines. The NO input is triggered by shorting it to supply minus (GND) while the NC input must be normally shorted to supply minus (GND) and it becomes triggered when connection with ground is discontinued. Every input is internally connected (pulled up) to the power supply plus (+12V) through a 15k Ω resistor.

Relay Outputs

Controller provides two relay type outputs: REL1 and REL2. The REL1 output offers one switched contact rated 24V/1.5A while REL2 output can be used to switch 230VAC and up to 5A. In the normal state (relay is off) the NC-COM contacts are shorted. In the triggering state (relay is on) the NO-COM contacts are shorted. In case of lack of the power, both outputs remain in the off state.

Transistor Outputs

There are four transistor outputs (IO1, IO2, CLK and DTA) available in the controller. All these lines are of the open collector type, i.e. in the normal (off) state are pulled to supply plus via 15k Ω resistor and when on, they short to supply minus. The IO1/IO2/CLK/DTA lines can switch current up to 1A DC while voltage connected to the output must not exceed 15VDC. In case of over-current state, transistor outputs are automatically switched off and the controller automatically restarts.

Note: The CLK/DTA lines can be used as general purpose outputs only in a case when controller doesn't work neither with PRT series reader nor XM-2 extension module.

RS485 Communication Bus

The RS485 bus consists of two signal lines A and B. In the RACS 4 any communication bus topology can be used (star, tree or any combination of them), in other words RACS 4 accepts free bus topology. The matching resistors (terminators) connected at the ends of transmitting lines are also not required. In majority of cases communication works without any problems using any cable type (ordinary telephone cable, shielded or unshielded twisted pair etc. e) but the recommended one is an unshielded, twisted pair one (UTP). Using shielded cables should be limited to installations liable to strong electromagnetic interferences. The RS485 communication standard used in the RACS 4 guarantees a proper communication on a distance up to 1200 meters and features a high resistance to interferences. For communication on longer distances, the UT-3 or UT-4 interface should be used. A pair of UT-3 interfaces increases communication distance by additional 1200 m while using an UT-4 interface makes possible to utilize communication through a computer network (LAN or WAN).

Connecting External Readers

Logically, controller can operate with two access points which can provide two-way door control and which are called: **Terminal ID0** and **Terminal ID1**.

Physically, Terminal ID0 can be realized using any PRT series reader configured to **RACS address ID=0** mode and connected to CLK/DTA lines or, any Wiegand type reader connected to IN1 and IN2 inputs. Data transmitted by each of these two readers is interpreted as transmission from Terminal ID0.

Physically, Terminal ID1 can be realized using any PRT series reader configured to **RACS address ID=1** mode and connected to CLK/DTA lines or any Wiegand type reader connected to IN3 and IN4 inputs. Data transmitted by each of these two readers is interpreted as transmission from Terminal ID1.

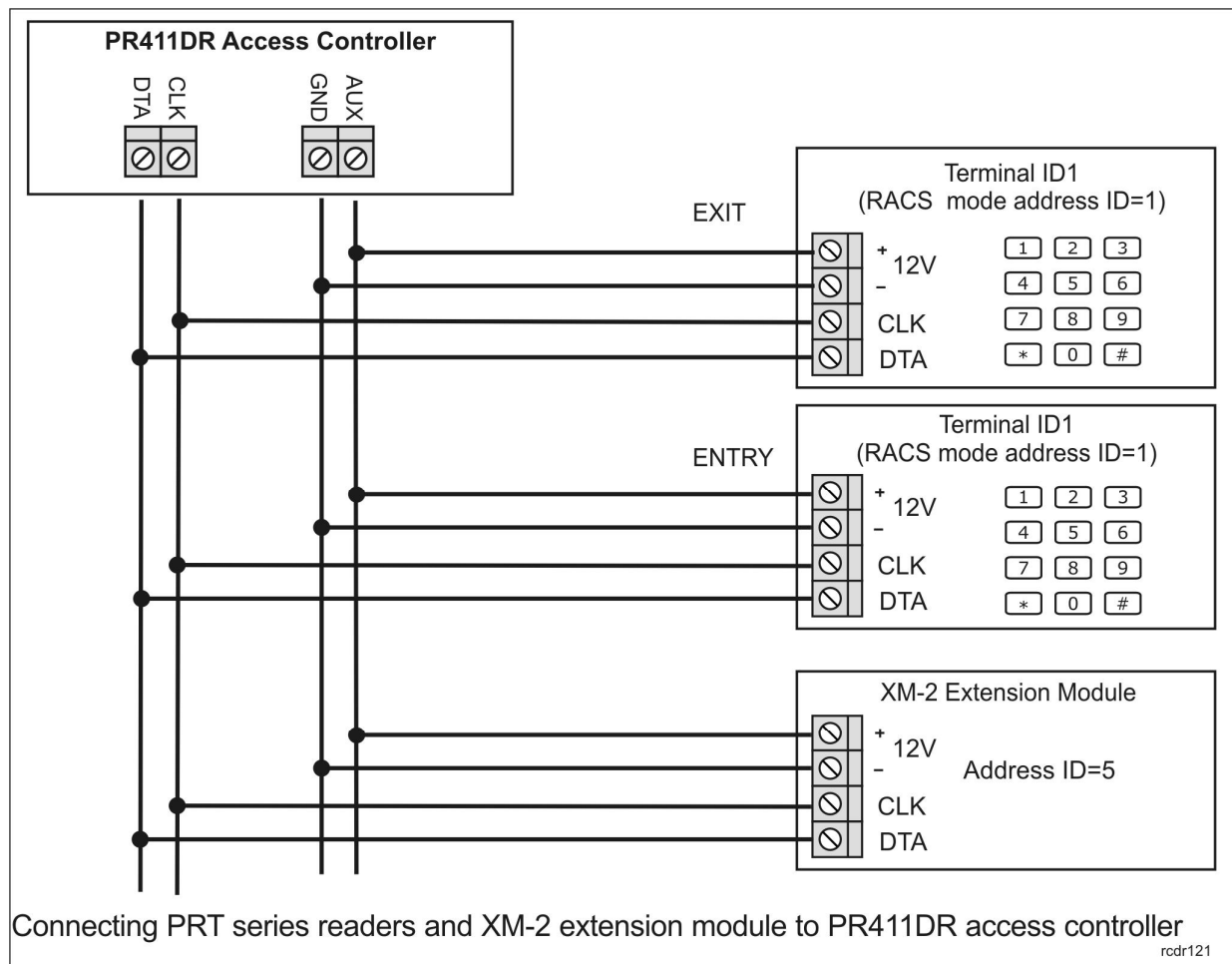
Totally, up to four readers can work simultaneously with the controller however they will be interpreted as two access terminals only: Terminal ID0 and Terminal ID1. Operation with each reader can be activated or deactivated in configuration settings.

Note: When working with Wiegand readers it is necessary to adequately configure controller for data format used by given Wiegand reader otherwise controller will not recognize transmissions from the reader.

Connecting PRT Series Readers and XM-2 Extension Module

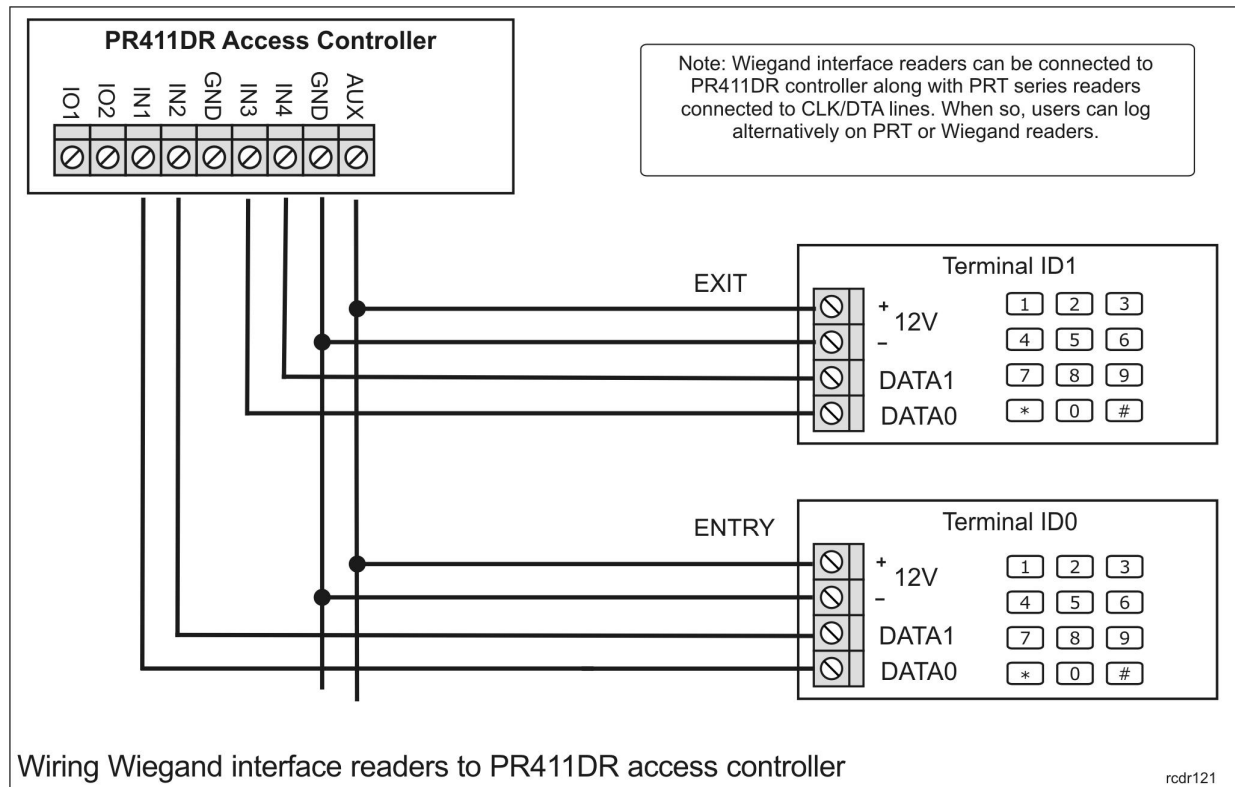
Controller can operate with two PRT series readers and one XM-2 extension module connected via CLK and DTA lines. The PRT series readers can operate in various operating modes including Wiegand, Magstripe and RACS (Roger) however for operation on CLK and DTA lines they must be configured either to **RACS mode address ID=0** or **RACS mode address ID=1**. The XM-2 must be configured to address ID=5. For CLK and DTA lines any type of cables can be used as well. The guaranteed communication distance is 150 meters. The unit address should be set up before device will be connected to the controller.

Note: Devices communicating using the RACS Clock & Data standard (e.g. PRT readers) can be connected to the controller with cables significantly longer than 150m (even up to 500m), but the communication on such distance is not guaranteed by the manufacturer.



Connecting Wiegand Readers


Controller can operate with various Wiegand type readers which transmit from 26 to 66 bits of data and using different data formats. IN order to adopt controller for this wide range of readers installer must adequate configure controller. The Wiegand readers should be connected to controller using schematic diagram presented below.



Logically, data transmitted from the Wiegand reader connected to IN1 and IN2 lines is interpreted by controller as data received from Terminal ID0 while data transmitted from the Wiegand reader connected to IN3 and IN4 lines is interpreted as data received from Terminal ID1.



Note: It may happen that some type of Wiegand readers may not work properly with controller. In such a case the PR-GP reader may solve the problem. The PR-GP works as electrical interface between reader and controller.

Memory Reset

The **Memory Reset** procedure clears all existing settings in controller memory and restores factory ones. Also, **Memory Reset** enables for enrolment of the new MASTER card and/or PIN and new ID number (address). After **Memory Reset**, controller automatically switches to normal working mode and enters Armed mode (LED STATUS  in on and red). There are two methods of Memory Reset: Simplified and Full. No matter which method is used programming is done on the external PRT series reader connected to CLK/DTA lines.


Simplified Memory Reset Procedure



This method clears entire memory and allows for programming of a MASTER card however doesn't allow for programming of the controller address (address is automatically set to ID=00) and MASTER PIN. This procedure requires any PRT series reader connected to controller via CLK/DTA lines but do not require use of a keypad.

- Remove all connections from CLK and DTA lines.
- Short CLK and DTA lines.
- Press RESET button for a while – all LEDs will light up.
- Remove connection between CLK and DTA lines — all LEDs switch to off and then LED OPEN  (green) starts flashing.
- While LED OPEN  is flashing read any card — this will be a new MASTER card.
- Once the previous step is accomplished reader automatically returns to normal mode of operation and enters Armed mode.

Full Memory Reset Procedure

This procedure requires PRT series reader equipped with keypad and configured to the **RACS mode address ID0**. The *Full Memory Reset* procedure clears entire controller memory and allows for programming of a MASTER card and/or PIN as well as setting up of a new address (ID number).

- Remove all connections from CLK and DTA lines.
- Short CLK and DTA lines.
- Press RESET button for a while – all LEDs will light up.
- Remove connection between CLK and DTA lines — all LEDs switch to off and then LED OPEN  (green) starts flashing.
- Using external reader enter a new MASTER PIN code (3-6 digits) followed with the [#] key or skip this step pressing the [#] key alone.
- Read any card — it will be a new MASTER card — or skip this step by pressing the [#] key.
- Enter two digits (from 00 to 99 range). These digits program a new ID address for the controller. Eventually, instead of programming controller address press the [#] key alone and controller will automatically assume address ID=00.
- Once the previous step is accomplished reader automatically returns to normal mode of operation and enters Armed mode.

After **Memory Reset**, controller resumes its work with default configuration settings. You can then initially test its operation using the MASTER card or PIN (if they were programmed). Using the MASTER card/PIN once activates the REL1 output for 4 seconds (LED OPEN  lights up for the entire time when REL1 is active). Using MASTER card/PIN twice switches the IO1 output to the opposite state and changes arming mode (LED STATUS  changes its color).

Front Panel

Controller is equipped with front panel dedicated to indicate various states of the device and with the RESET pushbutton which when pressed for a while makes device to restart on the same rules as when powering device off and on. The RESET button can be used in following situations:

- to start device running anew
- during memory **Memory Reset** procedure
- during **Firmware Download** procedure

Location of LEDs and RESET button of PR411DR front panel



LED signals	
AC	AC supply input
DC	DC supply output
ARMED/DISARMED	Current arming mode (LED STATUS)
OPEN	Door unlocked (LED OPEN)
SYSTEM	Various meanings (LED SYSTEM)
LINK	RS485 data flow signalling, dual color LED, green for data transmitted and red for data received

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Firmware Upgrade

During manufacturing process controller is programmed with a latest available version of firmware. The firmware can be later upgraded to newer versions. Detailed description of the firmware upgrade procedure can be found in the *Firmware upgrade.pdf* manual available at www.roger.pl. Loading an upgraded firmware to the controller is done using RS485 communication bus and does not require dismounting the device from the place of installation.

RogerISP is the software used for upgrading firmware (it can be downloaded at www.roger.pl). After the firmware is upgraded, always perform the **Memory Reset** procedure and assign a proper ID address to the controller. If the controller being upgraded worked in the RACS system before, you need to assign to it ID address it had before. Also, you need to go to the PR Master managing software, and run the command: **/Subsystems/Controllers/Commands/Restart, verify type and version** – this operation will update data related to the controller firmware version in the access system database.

Note: Because it may happen that the new firmware is not supported by older PR Master program, it is recommended to update the managing PR Master software as well.

Firmware upgrade procedure

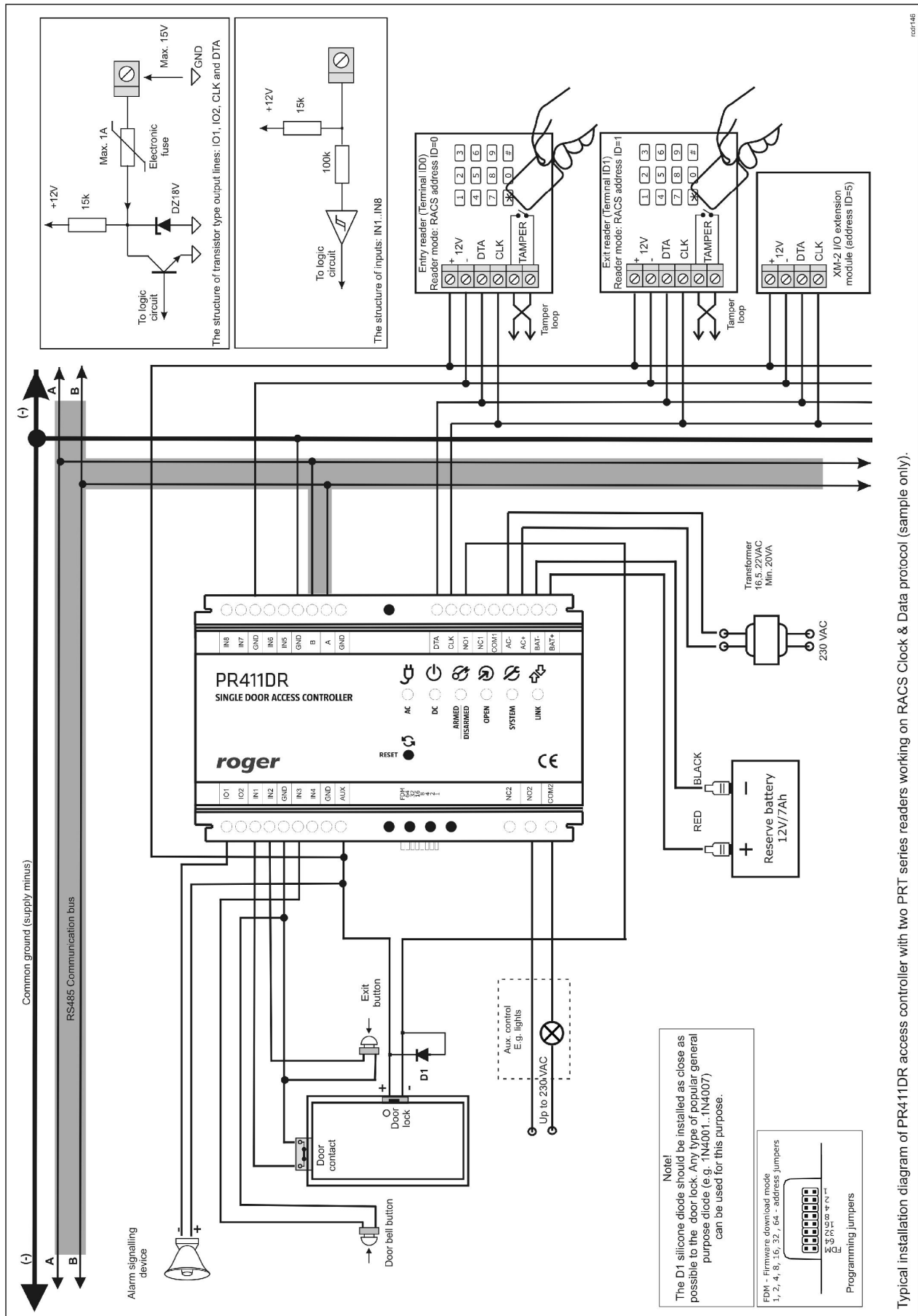
- Power up the reader
- Place jumper on FDM contacts
- Preset RESET button for a while
- Start RogerISP program and select COM port you have connected the upgraded controller
- If you using RUD-1 interface select *RS-485* option in RogerISP

- Click on *Erase* command, RogerISP program will detect device type and select proper communication protocol (you should see *P89 series simplex, 19200* in the bottom of the RogerISP program), finally old firmware will be erased.
- In *Firmware* text window select file with the firmware you want to upload to the unit (file extension: HEX) then click on *Program*.
- Once the new firmware is uploaded, remove jumper from FDM contacts and pres RESET button for a while.
- Re-configure the unit either manually or from PC.

Note: If you use RUD-1 interface you can supply programmed controller directly from supply output delivered by RUD-1. For this option connect +12V from RUD-1 to AUX on controller and GND from RUD-1 to GND on controller.

Installation Notes

- Installer should install the device in such a way that, when needed, it will be possible to access connection terminals and programming contacts.
- Before the controller is installed, it is recommended to assign the destination address (ID number) to it.
- Together with the controller, a proximity MASTER card is delivered. Nevertheless, for the MASTER card function any EM card can be programmed instead of original one.
- The MASTER card is delivered with the factory new device.
- When the MASTER card/PIN is lost, it can be programmed anew during Memory Reset procedure.
- All the electrical connections should be done only when the power supply is disconnected.
- All the devices communicating within access network (readers, extension modules, controllers) should share common minus potential.
- A silicone diode of general use e.g. 1N4007 should be always connected in parallel to the door locking device (magnetic lock, electric strike, relay coil) — one piece of such diode is delivered with the controller. It should be connected as close as possible to the inductive element.
- Optionally, system supply minus can be earthed in one arbitrary selected location. Do not connect system supply minus to the earth in more than one place.



Typical installation diagram of PR411DR access controller with two PRT series readers working on RACS Clock & Data protocol (sample only).

Technical Data	
Supply voltage	16,5-22 VAC or 10-15 VDC
Reserve battery	13.8V/7Ah, charging current app. 300mA
Current consumption	Average: 100 mA (PR411DR electronic module only)
Inputs	NO/NC inputs, electrically biased to +12V via 15 k Ω resistor, triggering level app. 3.5V
REL1 output	Single NO/NC contact, 30V/1.5A max. load
REL2 output	Single NO/NC contact, 230VAC/5A max. load
Transistor outputs IO1/IO2/CLK/DTA	Open collector transistor outputs, internally biased to +12V via 15 k Ω resistor, when active short to ground, 1A/15VDC max. load
Distances	RS485 comm. bus: up to 1200m Between the reader and controller: max. 150 m Between controller and XM-2 expansion module: max. 150 m
Environmental class (according to EN 50131-1)	Class I, indoor general conditions, temperature: +5°C- +40°C, relative humidity: 10 to 95% (no condensation)
Dimensions	85x124x73mm
Weight	App. 200g
Certificates	CE

Ordering Information	
PR411DR	PR411DR controller, PC plastic enclosure mountable on 35 DIN rail.
RM-2	Module consisting of two relay outputs rated 1.5A/24V each with one switched contact NO/NC. Relays can be triggered by applying low or high voltage signal. Triggering of relay is indicated by LED on the module's board.
RM-2 PCB	RM-2 PCB module without enclosure.
XM-2	Input/output addressable extension module provides two input lines NO/NC and two relay outputs with one switched contact NO/NC rated 1.5A/24V. Communication with parent device can be performed using CLK/DTA lines. The module can be located in a distance of 150 m from the host device (controller).
XM-2 PCB	XM-2 PCB module without enclosure.
UT-2	RS232-RS485 communication interface.
UT-2USB	USB-RS485 communication interface.
UT-4	Ethernet-RS485/RS232 communication interface.
RUD-1	USB-RS485 communication interface with 12V DC/150mA supply output.

Contact

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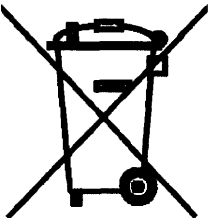
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	<p>Such symbol on the product or its package means that the product should not be disposed together with other wastes, because it may cause negative effects to environment and humans health. User is responsible for delivering used equipment to the allotted locations for gathering used electrical and electronic devices. Detailed information on recycling can be found at relevant local authorities, in a disposing company or in a place, where the product was bought. Separate gathering and recycling of such wastes contributes to natural resources protection and is safe for humans health and for natural environment. The equipment's weight is shown in the guide.</p>
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