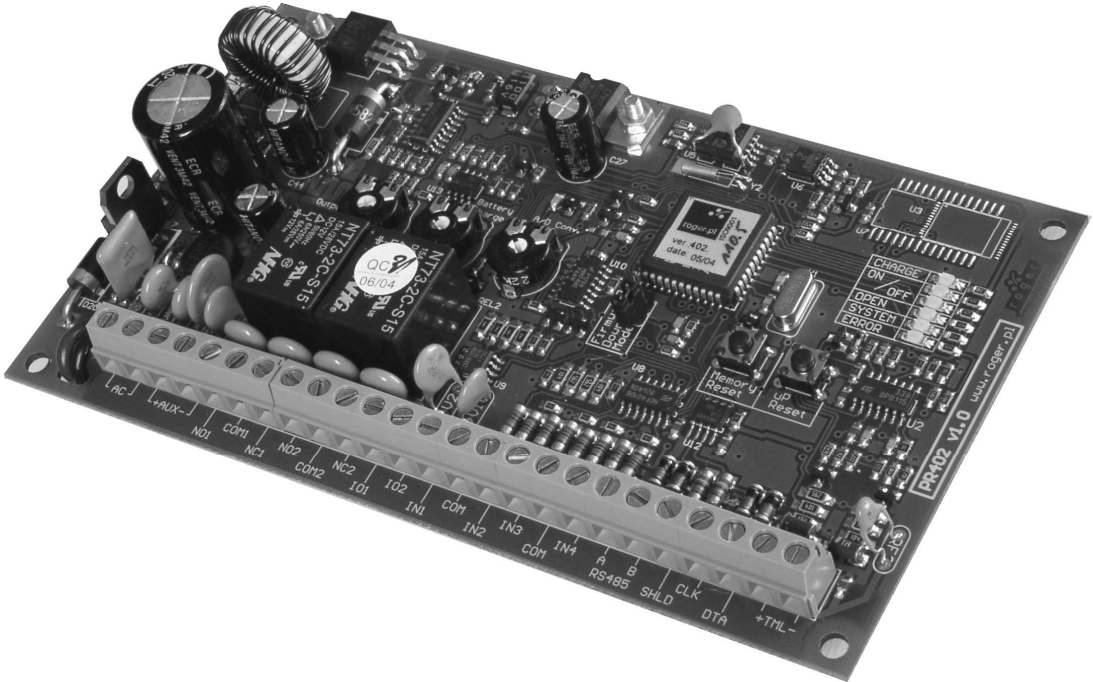# PR402 v2.0
Installer Manual
Rev.D

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Introduction

This document contents minimum information required for electrical connections, installation and initial tests of PR402 access controller.

Installation

The PR402 module can be installed in any metal or plastic enclosure which guarantees adequate protection from dust, water and moisture. Also, it should assure required temperature, ingress protection and security. All wirings must be made before module will be powered on. Battery (if used) should be connected once the PR402 is powered by AC.

Factory new unit is configured to address ID=00 and has MASTER PIN (1234) and MASTER card (delivered together with the new device), in necessary new MASTER card/PIN/address can be programmed manually during **Memory Reset** procedure which is explained later in this document. The MASTER card/PIN can be used for initial testing of the controller - the single use of MASTER card/PIN activates REL1 output for approx. 4s, while double, consecutive, use of MASTER card/PIN changes controller's arming mode and switches IO1 output to reverse state.

Note: The MASTER card delivered with new controller will be recognized as MASTER one when read on the PRT series reader configured to RACS mode.

All devices working in given access system and connected to the same RS485 communication bus should have common minus (common GND). This can be achieved by connecting all minuses from power supplies located in given system with separate, additional, wire or by connecting each power supply minus with earth however the second solution might crate problems when electrical potentials of the earth is not the same in different parts of electrical installation.

Note: It is forbidden to short positive outputs (DC+) from various power supplies and other DC outputs available in the system.

Setting address

Before you connect controller to RS485 communications bus it should be programmed with adequate address (ID number=00..99). Controller's address can be set manually during **Memory Reset** procedure or from PC computer.

Note: Connecting two or more controllers with the same address will cause communications conflict on the communication bus.

If you connect controller to separate COM port it is not necessary to change its address because there is no risk of conflict in address. Also, in such a case, you can use PR Master program to search COM port for newly connected controller and eventually, change its address. Once the controller has right address it can be disconnected from COM port and installed in designated system.

Power supply

Controller can be powered from AC source which delivers 18-22VAC/30VA power; it can be ME-1 metal enclosure (from Roger) with built-in 40VA transformer or another AC source which provides required voltage and power.

Optionally, PR402 can be supplied directly from 12VDC, in this case 12VDC supply voltage should be connected to +ACC- terminals which are normally used for reserve battery (for details see wiring diagram below). Additionally, when supplied from 12VDC, **B.Supp**. programming jumper (on PR402 board) should be closed (jumper on). When powered from 12VDC, PR402 must not be connected to AC supply nor operate with reserve battery - reserve supply should be assured by 12VDC system used to supply controller.

Note: Always carefully calculate wire gauge used to power PR402 from 12VDC supply system, note that amount of current required by controller can be as high as 2A and depends on total current sourced from AUX and TML terminals. The PR402 board itself consumes less then 100mA.

Powering PR402 access controllers from 12V DC supply system
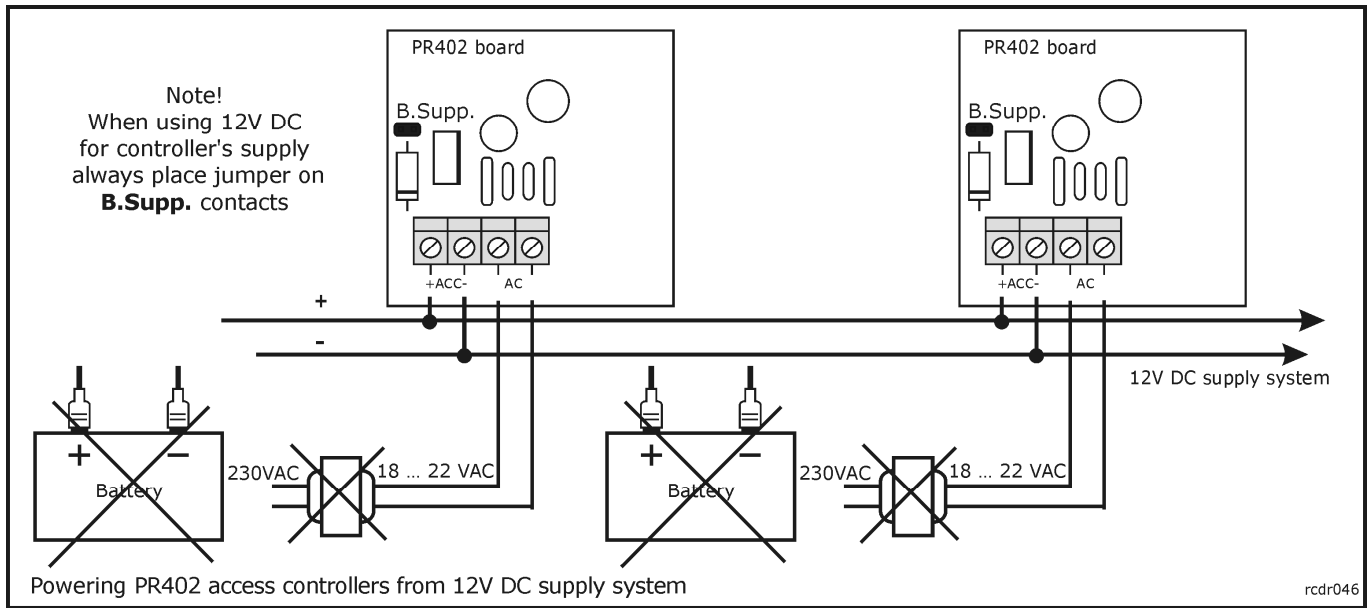
Reserve battery

PR402 controller is capable to operate with reserve battery however presence of battery is not obligatory to run controller. When installed, battery provides two important features:

- Delivers power supply in case of AC network failure
- Provides an extra current in time moments when total current consumption exceeds capability of built-in AC supply circuit (1.5A)

PR402 was originally designed for operation with 12V/7Ah battery nevertheless it can work with other batteries with higher or lower capacitance as well. When in standby, reserve battery is charged with constant 300mA current until it reaches 13.8V level which indicates that battery is fully charged. During battery charging, DC output voltage (available on AUX and TML terminals) may vary from 11.5-13.8V and depends on battery charging phase. Controller checks periodically battery level and when it drops below 12V indicates **Low Battery** or when drops below 11.5V indicates **Battery Failure**. In case when system runs on reserve battery (when AC supply is lost) and battery level drops below 10V, battery is automatically disconnected from the controller; battery is automatically re-connected when AC supply returns. The maximum current which can be delivered by battery is electronically limited to 2.5A.

Note: It is not possible to start controller on battery itself (without AC supply) - to start operation PR402 requires AC supply however once started it can run later on battery itself.

Charging current adjustment

When required battery charging current can be adjusted in 100-500mA range. In order to set required charging current connect battery to controller and using adequate screwdriver rotate POT1 potentiometer, use battery which are partly discharged. Charging current should be observed using multimeter connected in series with battery plus or minus.

Note: It is forbidden to set battery charging current below 100mA level because in this case charging current control is not guaranteed.

Connection of door lock

In most cases door locks are inductive type loads and generate strong voltage surges when switching to off state. This phenomenal can corrupt electronic circuits and/or change its behaviour (e.g. hung-up). In order to protect PR402 system from these effects, every inductive load (like door lock or any other coil e.g. relay coil) should be protected with silicon diode (e.g. 1N4007) connected

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as close as possible to device it protects. Also, door locks should be wired using separate pair of wires connected directly to the source of power.

Door lock wiring   rcdr049
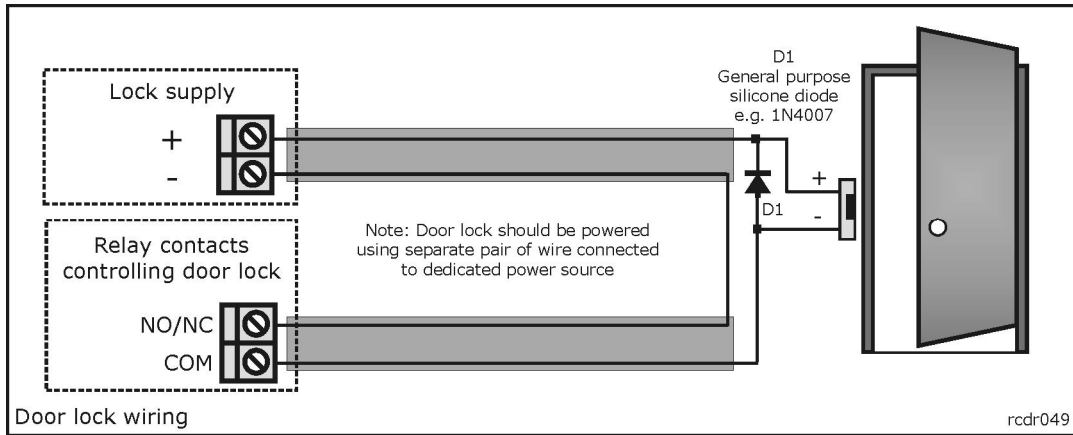
Inputs

PR402 offers four programmable inputs (IN1, IN2, IN3 and IN4). All of them have the same electric structure and can be configured as NO or NC. Each input is internally biased to supply plus (+12V) through 5.6kΩ resistor, this makes that +12V is observed on the not connected (floating) input.

The NO type input goes active when shorted to supply minus (GND), ff input is left unconnected or shorted to +12V it represents passive (normal) state.

The NC line in passive (normal) state should be connected to supply minus (GND), it becomes active (triggered) when connection with GND is discontinued. If input is left unconnected or shorted to +12V it is in active (triggered) state.

Note: If required, inputs can be connected together - still they can be programmed to different functions.

Relay outputs

PR402 has two, programmable, relay outputs (REL1 and REL2). Each of them offers one NO/NC/COM contact 24V/1.5A with built-in voltage surge protection.

Note: Appling voltages above 30V to REL1/REL2 terminals will damage electronic components used to protect relays' contacts, this will corrupt functionality of relay output.

In normal state NC terminal is shorted to COM while NO remains isolated. When active, NO is shorted to COM while NC is isolated. When controller is not supplied or supplied with voltage below its minimum level, relay outputs remain not active.

Transistor outputs

There are two transistor outputs IO1 and IO2 available on PR402 controller, both have identical electrical structure. When passive (normal state) transistor outputs represent high impedance, when active (triggered state) outputs short to supply minus (GND). Each output can sink max. 1A DC to GND; switched voltage must be 15VDC or less. The IO1 and IO2 are internally protected from currents above 1A.

RS485 communication bus

The RS485 serial communications interface in PR402 consist of three terminals: A, B and SHLD. Electrically, it represents RS485 standard however there are two important changes with respect to common RS485 standard:

- daisy chain structure is not required

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- terminating resistors are not required

Generally, free topology of communication bus is allowed, comm. bus cables can form "three", "star" or any combination of them however closed loops are forbidden. It is recommended to use UTP cable for A and B lines nevertheless any type of signal cables is accepted as well. The use of shielded cables should be limited to those installation were strong electromagnetic interferences are expected.

The maximum length of cable run between communication interface and individual controller or between CPR32-SE network controller (if installed in system) and individual controller, or between communication interface and CPR32-SE network controller must not exceed 1200m. For longer distances use UT-3 or UT-4 interfaces. Using two UT-3 units communication distances can be extended by next 1200m, while for UT-4 distance is not limited because it uses computer network.

### Connecting readers and extension modules

Access terminals (readers) and extension modules (e.g. XM-2, XM-8) can be connected to controller through CLK and DTA lines. Controller can operate either with Roger access terminals or with any other readers which support Wiegand or Magstripe data output protocols. Any type of signal cable can be used for CLK and DTA lines. Each device connected to controller through CLK/DTA line must have its individual address (0..15) however this rule is valid only for devices using **RACS Clock and Data** interface.

Note: Normally, the maximum guaranteed cable length between controller and any other device connected to CLK/DTA line is limited to 150m. When using **RACS Clock and Data** interface in most cases communication will run satisfactory for up to 500m distances.

For best card reading results readers should be installed on non-metal surfaces. When installed on metal structures the reading range can be reduced up to 50%. This effect can be limited by installing the reader in some distance above metal construction (for this purpose you can use non-metal spacer min. 10mm thick between controller and supporting surface). Readers should be installed on at least 0.5m distance one from each other; also, two readers should not be aligned along the same geometrical axe.

Connecting Wiegand and Magstripe readers

Follow schematic drawing below when connecting Wiegand or Magstripe readers to PR402 controller. Note, that for operation with these types of readers you must use PR Master program to configure controller (by default controller if pre-configured for **RACS Clock and Data**).

Wiring two Magstripe readers to PR402 controller

Wiring two Wiegand readers to PR402 controller
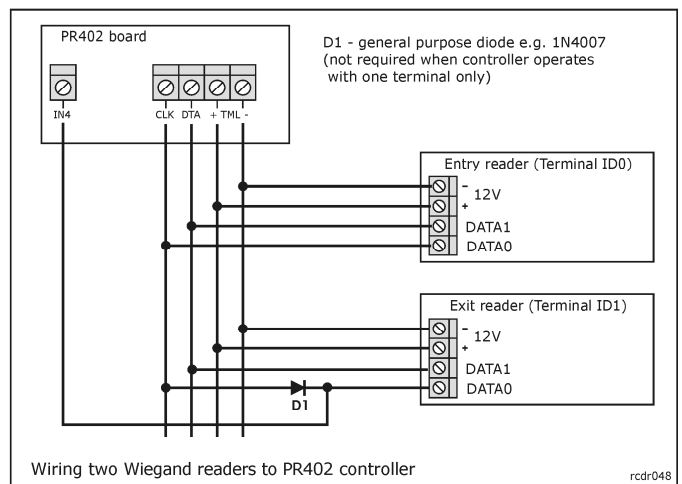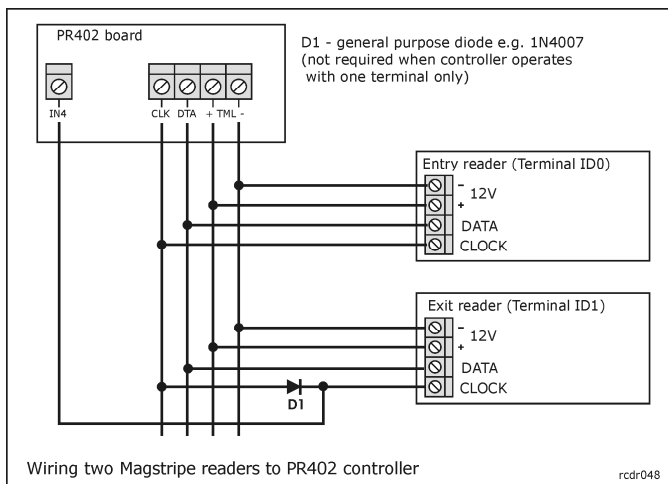
Memory Reset

Memory Reset procedure enables erasing of current settings and returning to default factory settings. Full procedure also allows to program new MASTER card/PIN as well as new address of the controller. After Memory Reset procedure, the controller automatically enters normal working mode.

Simplified Memory Reset procedure (firmware 2.18.2 or newer)

Simplified Memory Reset restores default settings and automatically sets controller address ID=00. MASTER card and PIN cannot be configured. This procedure does not require connection of PRT series external terminal.

- Remove connections to CLK and DTA terminals of the controller
- Connect CLK terminal with DTA terminal
- Press and hold MEMORY RESET button until LED 4 on the controller pulsates
- Release MEMORY RESET button
- Disconnect CLK and DTA terminals
- After a few seconds the controller shall restart automatically and switch to normal mode

Simplified Memory Reset procedure (firmware older than 2.18.2)

Simplified Memory Reset restores default settings and enables programming of new MASTER card while controller address is automatically configured as ID=00. This procedure requires connection of any PRT series reader. The reader must be configured as RACS Clock&Data terminal with ID0 or ID1 and connected through CLK and DTA lines.

- Press and hold MEMORY RESET button until LED OPEN ⏻ (green) on the reader or LED 4 on the controller pulsates
- Release MEMORY RESET button
- Read any card at the reader — this will be a new MASTER card
- After a few seconds the controller shall restart automatically and switch to normal mode

Full Memory Reset procedure

Full Memory Reset restores default settings and enables programming of new MASTER card, MASTER PIN and controller ID address. This procedure requires connection of PRT series reader with keypad (e.g. PRT12LT). The reader must be configured as RACS Clock&Data terminal with ID0 or ID1 and connected through CLK and DTA lines.

- Press and hold MEMORY RESET button until LED OPEN ⏻ (green) on the reader or LED 4 on the controller pulsates
- Release MEMORY RESET button
- Enter new MASTER PIN (3-6 digits) followed with the [#] key or skip this step and press only the [#] key
- Read any card at the reader — this will be a new MASTER card or skip this step and press only the [#] key
- Enter two digits (in range of 00 to 99) by means of keypad – this will be new ID address or skip this step and press only the [#] key so the default ID=00 could be assigned
- After a few seconds the controller shall restart automatically and switch to normal mode

After Memory Reset, controller resumes its work with default factory settings and entered address. You can then initially test its operation using the MASTER card or PIN (if available). Using the MASTER card/PIN once activates the REL1 output for 4 seconds (LED OPEN ⏻ is on for the time when REL1 is active). Using of MASTER card/PIN twice switches the IO1 output to the opposite state and changes arming mode (LED STATUS ⏻ changes its colour).

Note: If current address of the controller is hardware type (FixedID) then address entered within Memory Reset procedure is ignored.

Firmware upgrade

During manufacturing process controller is programmed with latest version of firmware, nevertheless it can be later upgraded with newer versions as they are released. Roger design team continuously work on enhancements so the new firmware versions are released quite often (every new firmware version is published on www.roger.pl). Our customers are advised to register at web site so Roger will let inform when new versions are ready for download. The new firmware can be

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downloaded without removal of the controller from it original place of installation. The detailed description of firmware upgrade procedure can be found in *Firmware upgrade.pdf* available at www.roger.pl.

New firmware can be uploaded to controller through RS485 communication bus from the **RogerISP v3** program. Once the controller is upgraded it should be fully reconfigured. Also, if the unit was already working in the system it is necessary to update its version setting in access system database command:*…Networks/Controllers/Commands/Restart controller and verify version..*.

Note: Whenever you upgrade firmware in controller it is necessary to upgrade **PR Master** program as well. For most update firmware/software visit www.roger.pl

Table: Terminal assignments

Terminal	Function
+ACC-	Reserve battery
AC	AC supply input, 18-22V/30VA
+AUX-	Unswitched DC output 12VDC/1A, AUX (-) internally shorted with GND, output current internally limited
REL1-NO	REL1 output, normally open contact, 24V/1.5A
REL1-COM	REL1 output, common contact, 24V/1.5A
REL1-NC	REL1 output, normally closed contact, 24V/1.5A
REL2-NO	REL2 output, normally open contact, 24V/1.5A
REL2-COM	REL2 output, common contact, 24V/1.5A
REL2-NC	REL2 output, normally closed contact, 24V/1.5A
IN1	IN1 input, internally pulled up to supply plus through 5.6kΩ resistor
COM	Input common, internally shorted with supply minus (GND)
IN2	IN1 input, internally pulled up to supply plus through 5.6kΩ resistor
IN3	IN1 input, internally pulled up to supply plus through 5.6kΩ resistor
COM	Input common, internally shorted with supply minus (GND)
IN4	IN1 input, internally pulled up to supply plus through 5.6kΩ resistor
IO1	IO1 transistor output, 15VDC/1.0A
IO2	IO2 transistor output, 15VDC/1.0A
RS485 A	RS485 communication bus, line A
RS485 B	RS485 communication bus, line B
SHLD	RS485 cable shield
CLK	Reader/extension modules interface, line CLOCK
DTA	Reader/extension modules interface, line DATA
+TML-	Unswitched DC output 12VDC/200mA dedicated to supply external reader and/or extension modules, TML(-) internally shorted with GND, output current internally limited

Table: Technical specification

Parameter	Value
Supply voltage	Nominal 18VAC, min./max. range 18-22VAC
Power consumption	30VA

Distances	Between controller and reader or extension module: max. 150 m
	Between controller and communications interface or CPR32-SE network controller: 1200m
Environmental class (according to EN 50131-1)	Class I, Indoor-General, temperature: 5°C- +40°C, relative humidity: 10 to 95% (non-condensing)
Dimensions	151 X 87 mm
Weight	~ 100g
Approvals	CE

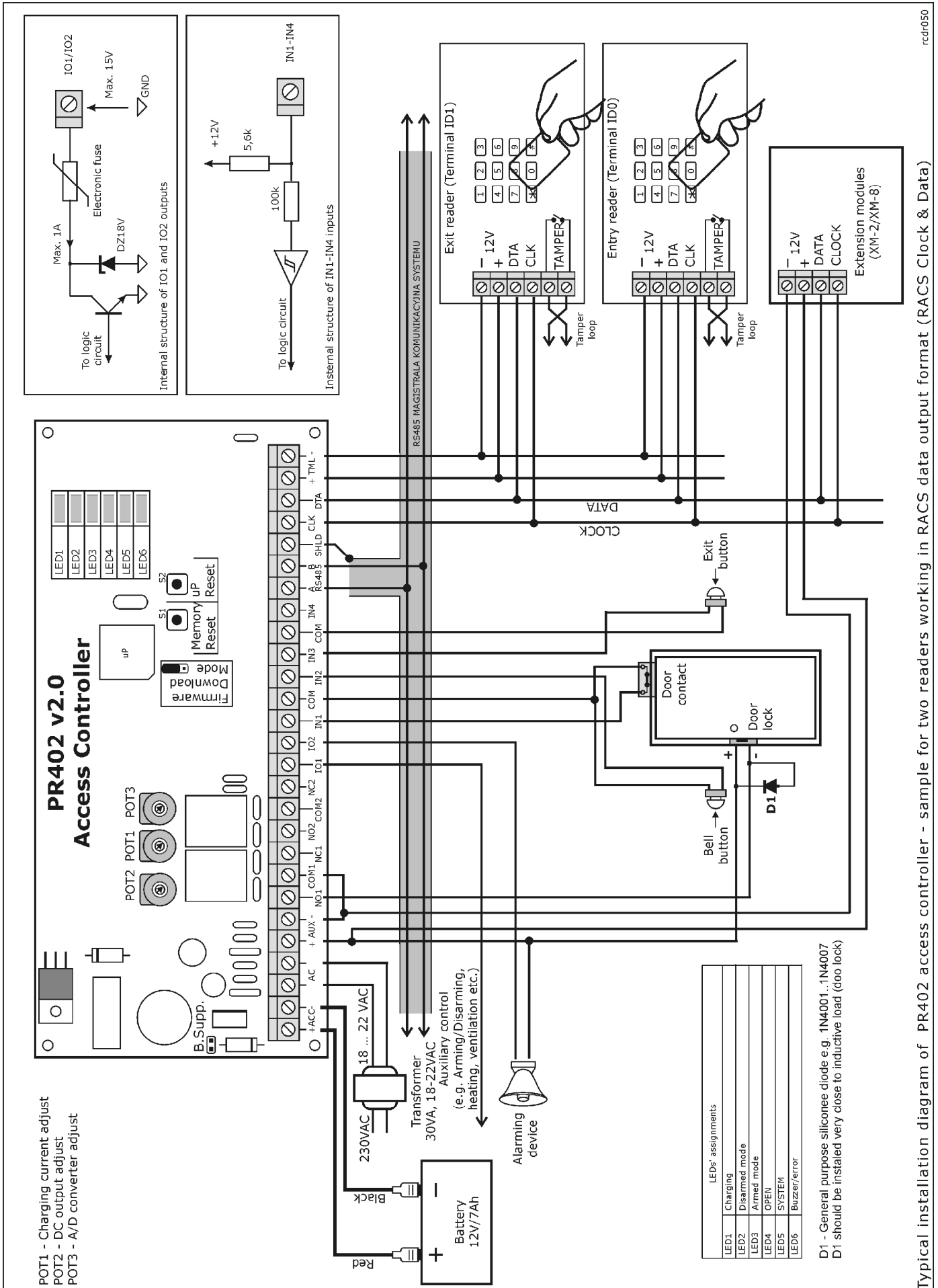| Ordering information	
PR402	PR402 access controller with ME-1 metal enclosure
PR402-BRD	PR402 module, board only
ME-1	Metal enclosure with 40VA transformer
ME-2	Metal enclosure with 80VA transformer
ZMPR-1	Assembly kit for ME-2 enclosure, allows for assembly of up to four PR402 boards into single ME-2 enclosure, also suitable for extension modules
RM-2	Relay module with plastic enclosure, the RM-2 offers two relays with one NO/NC contact 24V/1.5A rated, relay contacts are protected by surge arresters, each relay can be triggered by applying supply plus or minus, the maximum amount of current required to trigger relay is less then 5mA, two LEDs to indicate triggering of relevant relay
RM-2-BRD	RM-2 module, board only
XM-2	Input/output addressable extension module with plastic enclosure, digital communication according to RACS Clock and Data protocol, two NO/NC inputs and two relay outputs, each relay offers one NO/NC contact 24V/1.5A/24V rated, relay contacts protected by surge arresters, two LEDs to indicate triggering of relevant relay
XM-2-BRD	XM-2 module, board only
UT-2	RS232-RS485 communication interface
UT-2USB	USB-RS485 communication interface
UT-4	Ethernet-RS485/RS232 communication interface

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Typical installation diagram of PR402 access controller – sample for two readers working in RACS data output format (RACS Clock & Data)

POT1 - Charging current adjust
POT2 - DC output adjust
POT3 - A/D converter adjust

LEDs' assignments	
LED1	Charging
LED2	Disarmed mode
LED3	Armed mode
LED4	OPEN
LED5	SYSTEM
LED6	Buzzer/error

D1 - General purpose siliconee diode e.g. 1N4001..1N4007
D1 should be instaled very close to inductive load (doo lock)