

# Roger Access Control System 5 v 2

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## Cabling guidelines

### *Power supply cabling*

Generally it is recommended to supply RACS 5 devices in star topology, where each device is supplied with 12VDC voltage using dedicated wire pair or cable. In such case it is relatively easy to indicate required type and length of cabling as the whole current flows from PSU to device and it is not necessary to take into account current distribution. If bus or tree topology is applied then selection of adequate wire diameters is more difficult due to differentiated current values in particular branches.

Regardless of applied cabling topology, it is necessary to foresee the worst case i.e. the maximal consumed current by device when cables are selected for installation. In case of readers with built-in input and output lines (MCTxx-IO devices) such situation occurs when relay is activated and current consumption is increased by approximately 50mA. When open collector output is activated then reader current consumption is not increased but when load (e.g. door bell) controlled by the output is supplied from reader then reader supply current and load supply current are added which may result in voltage drop when such load is activated.

In RACS 5 system it is assumed that voltage drop between PSU terminals and supplied device terminals should not exceed 1.0V. This can be ensured by selection of wires with adequate diameter and installation of additional power supply units in vicinity of supplied devices. Instead of wires with greater diameter, the parallel connection of wires with smaller diameter can also be applied in order to lower the total resistance. Each additional pair of wires extends acceptable length of cable by the basic value e.g. when single pair of wires enables supply in 100m cable length then two pairs enable 200m cable length and three pairs enable 300m cable length.

Parallel connection of wires can be applied to supply all kinds of RACS 5 devices (expanders, readers, interfaces) but this solution cannot be applied for such communication buses as RS485, RACS CLK/DTA and Wiegand. Moreover, parallel connection is usually not useful in case of signal lines (e.g. detectors, buttons) as the required current is very low. In the table below the relation between the number of UTP cable wire pairs and maximal cable length for MCT62E reader is presented.

Number of wire pairs	Cable length
1	150m
2	300m
3	450m
4	600m

Tab. 1 Acceptable power supply cable length in relation to the number of UTP cable wire pairs for MCT62E reader

Supply current	1 pair	2 pairs	3 pairs	4 pairs
50mA	100m	200m	300m	400m
100mA	50m	100m	150m	200m
150mA	33m	66m	99m	131m
200mA	25m	50m	75m	100m
300mA	17m	34m	51m	68m
400mA	12m	24m	36m	48m
500mA	10m	20m	30m	40m
600mA	8m	16m	24m	32m
700mA	7m	14m	21m	28m
800mA	6m	12m	18m	24m
900mA	5m	10m	15m	20m
1000mA	4m	8m	12m	16m

Tab. 2 Maximal UTP cable length in relation to the number of wire pairs and required current

Note: In case of 1,0mm<sup>2</sup> wires the cable lengths from table 2 are doubled while in case of 1,5mm<sup>2</sup> wires they are tripled.

### Voltage drop for standard wire diameters

Supply current	2 x 0,5mm <sup>2</sup>	2 x 0,75 mm <sup>2</sup>	2 x 1,0 mm <sup>2</sup>	2 x 1,5mm <sup>2</sup>	2 x 2,5 mm <sup>2</sup>
50mA	0,042V	0,028V	0,021V	0,014V	0,009V
100mA	0,084V	0,056V	0,042V	0,028V	0,017V
150mA	0,126V	0,084V	0,063V	0,042V	0,026V
200mA	0,168V	0,112V	0,084V	0,056V	0,034V
300mA	0,252V	0,168V	0,126V	0,084V	0,051V
400mA	0,336V	0,224V	0,168V	0,112V	0,068V
500mA	0,420V	0,280V	0,210V	0,140V	0,085V
600mA	0,504V	0,336V	0,252V	0,226V	0,102V
700mA	0,588V	0,392V	0,294V	0,247V	0,119V
800mA	0,672V	0,448V	0,336V	0,168V	0,136V
900mA	0,756V	0,504V	0,378V	0,189V	0,153V
1000mA	0,840V	0,560V	0,420V	0,280V	0,170V

Tab. 3 Voltage drop for 10m wire pair

Supply current	2 x 0,5mm <sup>2</sup>	2 x 0,75 mm <sup>2</sup>	2 x 1,0 mm <sup>2</sup>	2 x 1,5mm <sup>2</sup>	2 x 2,5 mm <sup>2</sup>
50mA	240m	360m	480m	720m	1110m
100mA	120m	180m	240m	360m	590m
150mA	80m	120m	160m	240m	380m
200mA	60m	90m	120m	180m	290m
300mA	40m	60m	80m	120m	200m
400mA	30m	45m	60m	90m	150m
500mA	25m	35m	50m	70m	120m
600mA	20m	30m	40m	60m	100m
700mA	17m	26m	34m	50m	85m

800mA	15m	22m	30m	45m	75m
900mA	13m	20m	26m	40m	65m
1000mA	12m	18m	24m	35m	60m

Tab. 4 Maximal length of power supply cable for maximal acceptable 1.0V voltage drop

### **Power supply to MCX2D and MCX4D expanders**

MCX2D/MCX4D modules are supplied from 13,8VDC voltage and they are used for complex supply of electronic modules, readers and other door devices (locks, alarm signalling devices) and for backup battery charging. In such scenario the current from PSU can be significantly high and can exceed a few or even ten amperes. Therefore power supply to these devices requires special arrangements. PSU must be installed directly in vicinity of modules and connected with adequate cable. In case of PS2D/PS4D/PS8D power supply units such cables are included. For the maximal load, the voltage drop between PSU and supplied MCX2D/MCX4D module should not exceed 0.2V.

### **RS485 bus cabling**

In case of RACS 5 system it is not necessary to apply bus topology for RS485 communication and it is not necessary to install termination resistors. RS485 communication can be provided with any signal cables but unshielded twisted pair cable (UTP) is the recommended one. Any cabling topology (bus, star, tree) except for the loop can be applied. Shielded cables should be used only in case of strong electromagnetic interferences. In such case, cable shield must be connected in single point with power supply ground. The maximal length of RS485 bus between access controller and any device on the bus equals to 1200m. All devices on RS485 bus must have common ground. This condition is automatically satisfied if all devices are supplied from the same PSU. If not, then all ground terminals of power supply units, must be connected with ground terminal of access controller or expander which is the source of RS485 bus. The connection of ground terminals can be done with any wire. RS485 bus wires can be included in the same cable with wires used for power supply and other signal lines.

### **RACS CLK/DTA bus cabling**

Some of RACS 5 devices (i.e. MC16 access controller, MCX402-BRD and MCX102-BRD expanders) can communicate with PRTxx series readers. These readers communicate with access controllers and expanders via CLOCK (CLK) and DATA (DTA) lines. Any unshielded signal cables can be used for the CLK/DTA bus. Any cabling topology (bus, star, tree) except for the loop can be applied. The maximal length of the bus between access controller or expander and any PRT reader equals to 150m. All devices on CLK/DTA bus must have common ground. This condition is automatically satisfied if all devices are supplied from the same PSU. If not, then all ground terminals of power supply units, must be connected with ground terminal of access controller or expander which is the source of CLK/DTA bus. The connection of ground terminals can be done with any wire. CLK/DTA bus wires can be included in the same cable with wires used for power supply and other signal lines.

### **Door devices cabling**

Door devices such as electric locks, mag locks, signalling devices can be supplied from the same PSU as electronic devices (access controllers, expanders and readers). It is strictly necessary to install a suppression diode at terminals of inductive load (electric locks and maglocks). Most of door devices consume significant amount of energy and it is recommended to supply them directly from power supply unit with dedicated cables. Supply of door devices from the supply terminals of electronic devices is considered incorrect one and it should not be used in RACS 5 system.

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