Callidus 8 port UHF RFID reader

(v1.0)

INSTALLATION AND SERVICE GUIDE

Version 1.0
01 August 2021

RoHS

HISTORY OF REVISIONS AND REPAIRS

5.8.2021   preliminary release v1.0

C8P UHF RDR 8 PORT RFID READER GEN2 FEATURES

- RFID tag reading, inventorying and editing
- People counting
- Additional alarm outputs
- Additional binary inputs
- Additional binary outputs
- Smarter way of RFID detection inside AM TRX or RF TRX pedestal and even outside the pedestal
- Easy installation and setup
- External and internal alarm actions
- And much more…

REFERENCE MANUAL

CONTENT

LIST OF PICTURES

1. OPERATION GUIDELINES

⚠️ **CAUTION!** Before operating this device, all operating technicians should study this manual and device technical data to understand and follow the safety instructions. Keep these instructions with the device for further reference. If you have any questions, contact your device representative or distributor.

This is a Class A product. In a domestic environment, this product may cause high-frequency interference. In this case, it may require the user to take appropriate precautions.

2. BASIC INFORMATION

- The "C8P UHF RDR" is an eight-port UHF RFID reader with Ethernet, USB and GPIO connectivity
- The local user interface consists of two LEDs (for Reader and RFID status), one internal button and internal buzzer
- Reader has also 2 connectors for people counters, connector for light and external buzzer used for alarm indication
- The reader allows power over ethernet or external adapter
- All configuration parameters and device functionality can be controlled with browser via webserver or with customized software that communicate with reader via REST API

3. PRE-INSTALL TASKS

3.1 C8P UHF RDR system placement

- Inside the compactible AM TRX or RF TRX pedestal
- Outside the pedestal on the ceilings, walls, etc.

3.2 Installation equipment for C8P UHF RDR system

- 1x C8P UHF reader GEN2
- 1x compatible pedestal with RFID antenna (inside installation)
- 1x LAN cable (with PoE)
- 2x coaxial cables with SMA connectors (if used multiple antennas)
- 1x external power supply if used without PoE
- Laptop with browser (Google Chrome recommended)

4. SPECIFICATIONS

4.1 UHF RFID

Operating frequency US version	902 - 928 MHz
Operating frequency EU version	865,6 - 867,6 MHz
RFID protocol support	GEN2
Reading speed	Up to 750 tags/sec
Reading distance	Up to 5 m (depending on multiple factors as position, presence of metals or objects filled with liquid, used tags, antenna gain and more)
Transmit power	Adjustable from -10 dBm to +30 dBm in 1 dBm steps

4.2 Power

Power over Ethernet	PoE 802.3 af
Or external adapter	100-240VAC to 48V/0.5A
Power consumption	max. 12 W

4.3 Connectivity

UHF RFID antenna	8x SMA female / 50Ω
LAN	10/100Mbit Ethernet, IPv4 DHCP or static IP
USB	1x USB B
People counter	2x RJ45 6pin connector for IR sensors
Alarm optical indicator	1x RJ45 4pin connector for RGB LED
Alarm sound indicator	1x 2pin connector for external buzzer
Binary input	2x opto-isolated max. 30V DC
Binary output	2x opto-isolated max. 60V/0,5A DC

4.4 User interface

Optical indicators	2x RGB LED
Sound indicator	Internal buzzer
Button	Reset to factory default button

4.5 Software interface

RFID API	Callidus REST API

4.6 Mechanical specifications

Height	89 mm
Width	175 mm
Depth	26 mm
Weight	0,25 kg

4.7 Environmental

Ambient temperature	0 - 35 °C (equipment for normal indoor use)
Relative humidity	0 - 90 % (non-condensing)
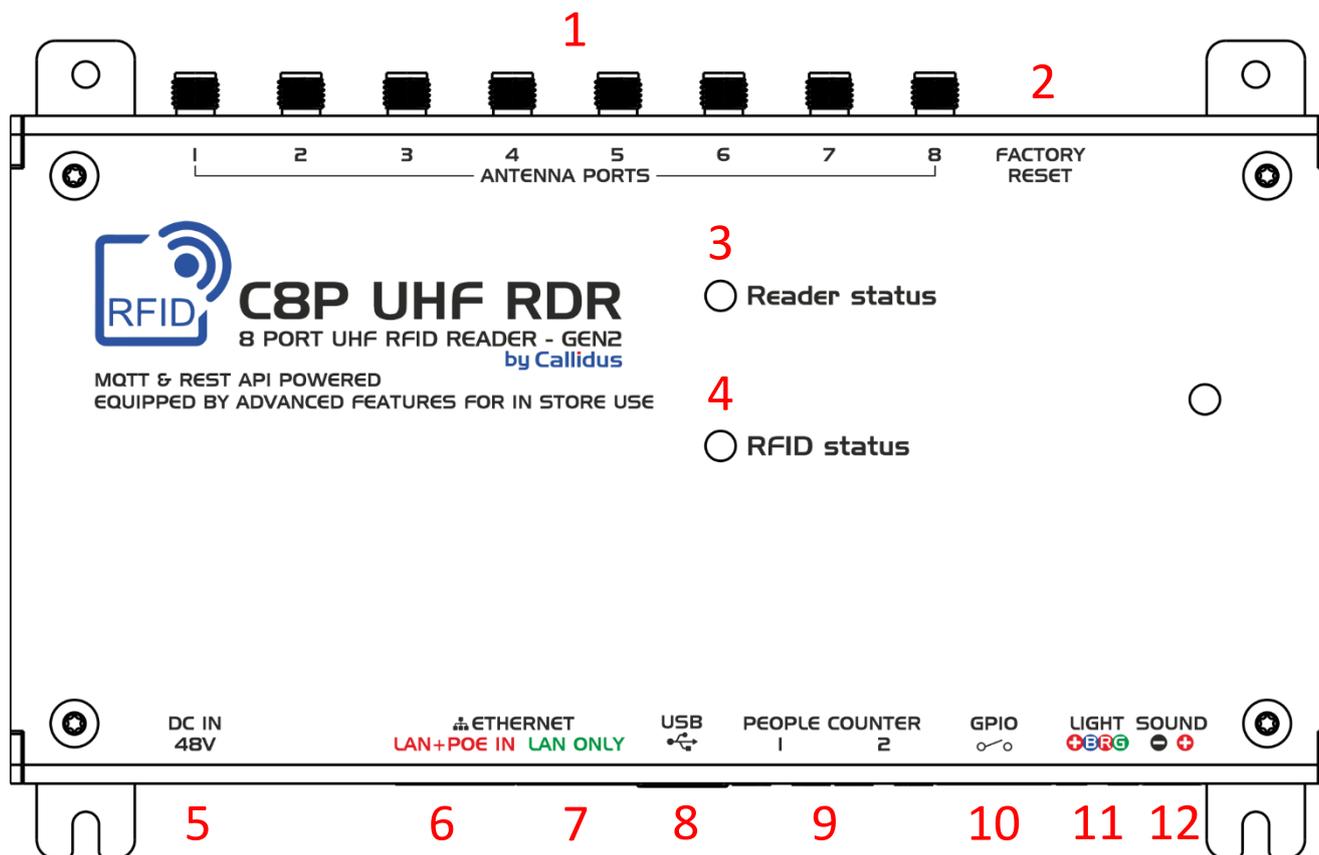
1. **Antenna ports** – 8x SMA female connectors for antennas
2. **Factory reset** – button, hold for 10 s to reset all settings to factory default (including networking configuration)
3. **Reader status** – LED indicating status of reader
4. **RFID status** – LED indicating status of RFID module
5. **DC IN 48V** – input voltage (external power supply)
6. **LAN+PoE IN** – data communication with PoE
7. **LAN only** – data communication only
8. **USB** – currently not used
9. **People counter** – input for people counter IR sensors
10. **GPIO** – universal binary input and output (opto-isolated)
11. **Light** – optical signaling output (RGB light)
12. **Sound** – alarm output of acoustic signaling (piezo)

Table 1 LED "Reader status" colors and their meaning

Glows blue	Device is powered up, but does not have IP address.
Glows orange	Device has IP address and no client is connected.
Glows green	Client is connected.
Flashes orange	Device is in bootloader mode and waiting for new firmware to be uploaded.
Glows white	Device is in bootloader mode and uploading new firmware.
Flashes green	New firmware has been uploaded.

Table 2 LED "RFID status" colors and their meaning

Glows green	RFID reading is ON.
Glows orange	RFID is currently writing.

6.1   Connecting to the PC/Laptop

- The device can be powered by ethernet cable itself if the network supports PoE feature or else DC 48V/0.5A external power adapter must be used.
- The ethernet cable must be connected with the device and the PC/Laptop in the same ethernet network.
- Then the device has to be discovered. RFID reader is very simple to find. Just open up "eComm Discoverer" and search for name "C8PURDR". Then just double click on that row and new window with login should appear.
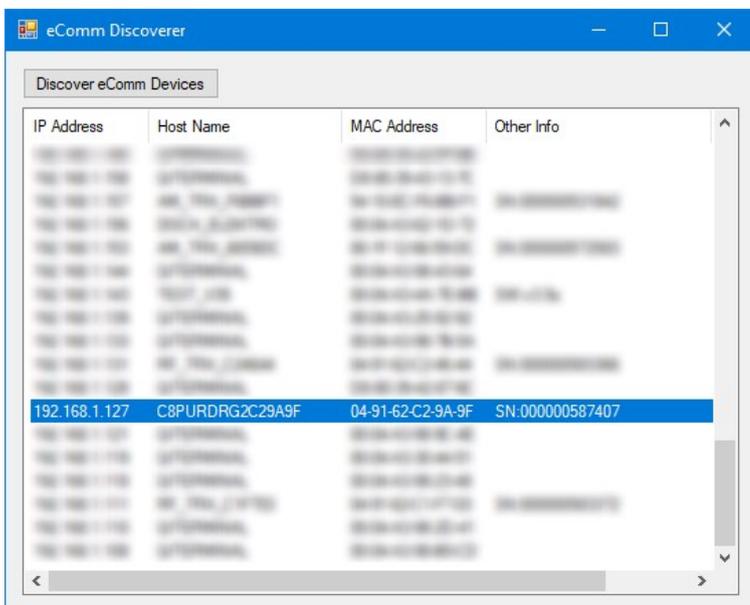

Figure 1 Device discovery software - eComm Discoverer
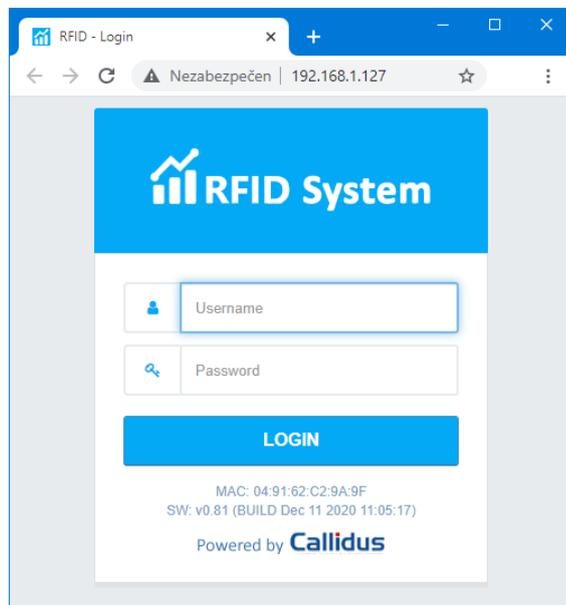
Figure 2 Login page

6.2   Login details

Username for user with limited rights:	**user**
Default password:	Call + last 6 numbers of MAC
Example for MAC '1A:2B:3C:4D:5E:6F':	Call4D5E6F

Username for admin with full rights:	**admin**
Default password:	Call + last 6 numbers of MAC with reverted double digits
Example for MAC '1A:2B:3C:4D:5E:6F':	CallD4E5F6

6.3   Software description

After successful login as admin, Dashboard page should appear. On the left side is menu consisting of 11 tabs:

1. **Dashboard** – basic information about reader such as device and system statuses, tags memory etc.
2. **Tags** – list of saved tags, reading statistics, start/stop inventorying
3. **Edit tags** – used for editing access or kill password, EPC, user memory, tag locks or simply for inspection of all banks
4. **RFID** – all settings about RFID like region, power, antenna ports, hop table, protocols and filters
5. **People counting** – PC settings, status and counters if internal PC used
6. **Alarms** – alarm indication settings
7. **GPIO** – input and output configuration
8. **Date & time** – time synchronization and time zone offset settings
9. **Networking**
10. **Firmware update**
11. **Factory reset**

6.4   People counting

⚠️ **CAUTION!** The People Counter (PC) is only available if at least two or more pedestals are installed. A prerequisite for proper PC operation is that all pedestals are installed in the same direction.

People counting can be done with 2 possible ways, depending if RFID reader is working alone or with AM/RF TRX system:

a) RFID reader works alone without AM/RF TRX system, people counting and direction determination is done with RFID reader and IR sensors are connected to RFID reader input labeled "People counter".

b) RFID reader works with AM/RF system. Typically, both boards are in the same pedestal and IR sensors are connected to AM/RF board input labeled "People count". People counting is then handled by AM/RF system and shared with RFID via local networking for tags direction determination.
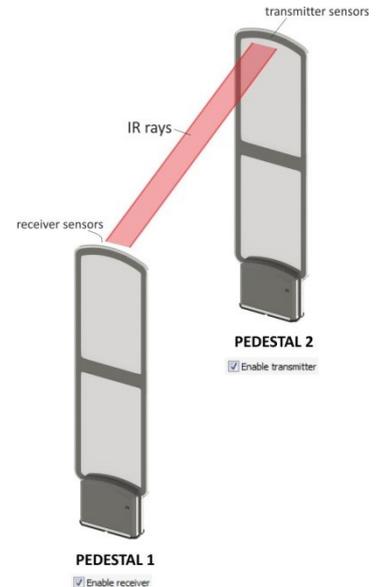
PC setup for AM TRX or RF TRX with RFID

PC sensors are connected to AM/RF TRX electronic board. RFID reader and AM/RF TRX electronic board have to be in the same network. Group ID and Pedestal ID have to be set correctly in the Networking folder.

The standard installation is when, from the side view of the antennas, the Master antenna is the left most one (Pedestal ID 0) and other Slave pedestals are placed to the right (Pedestal ID 1 – n). This arrangement makes it easier for us to check the correct PC settings.

Figure 3 Networking – Group ID and Pedestal ID

At first, we will set the Master antenna, due to the following one, works as Transmitter or Receiver (it can be found out in the documentation of the particular antenna type how the transmitting or receiving diodes of the PC system are oriented due to placement of electronic boards).
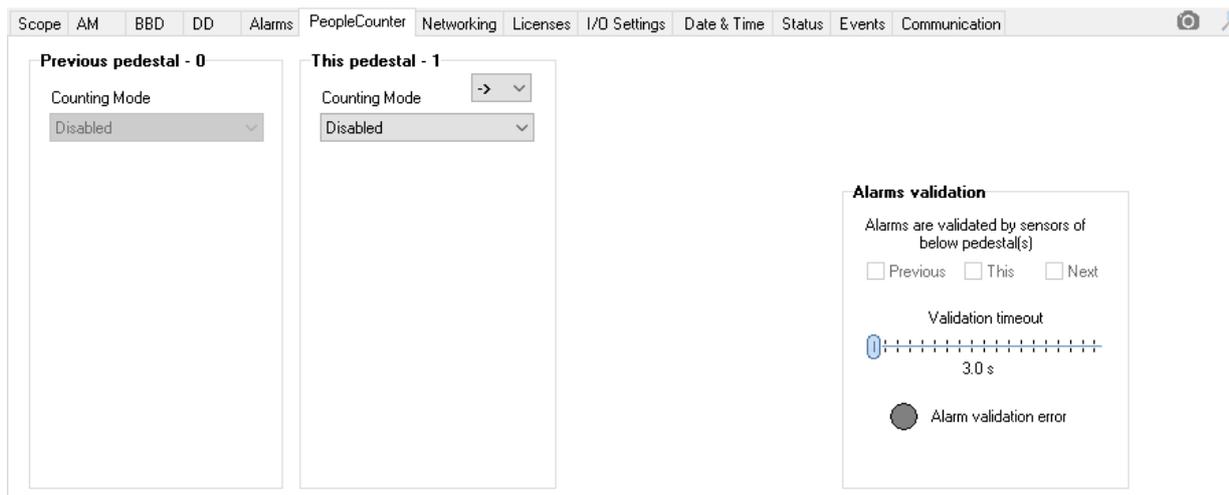
Figure 4 Main screen of PeopleCounter - PeopleCounter not in use

If, in our example, the master is set so that the following antenna is a receiver, after selecting the Counting mode – Receiver, the screen looks like this:
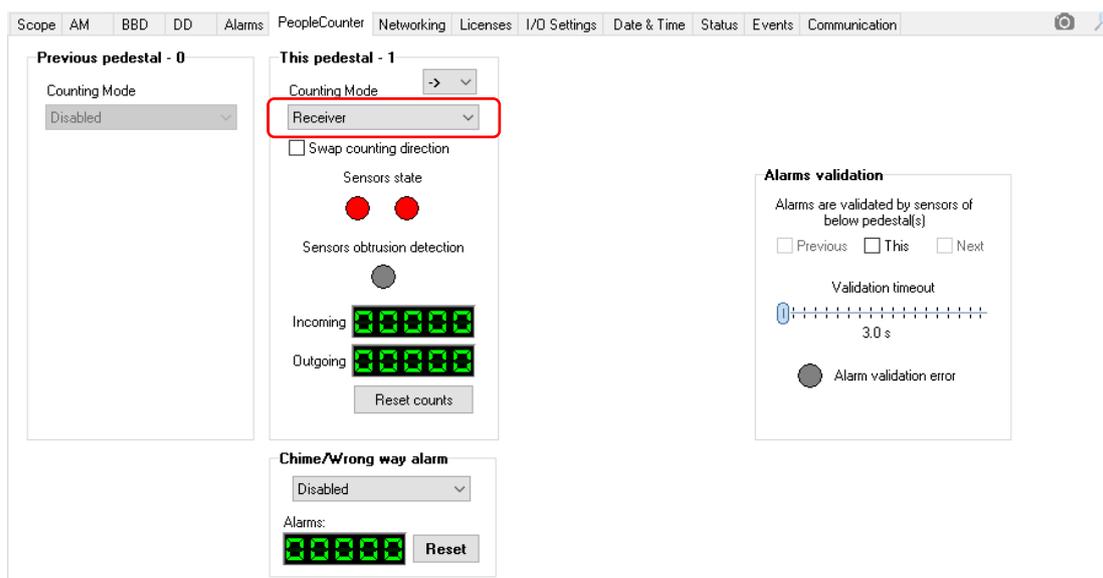
Figure 5 PeopleCounter screen - none signal from TX sensor

Red LEDs indicate that the transmitter does not lit to the receiving sensors. The SlavesAutoConfiguration option automatically selects all the following Slave antennas to the correct Counting Mode. If no using the Slaves Autoconfiguration option, it is necessary to set each Slave system manually.
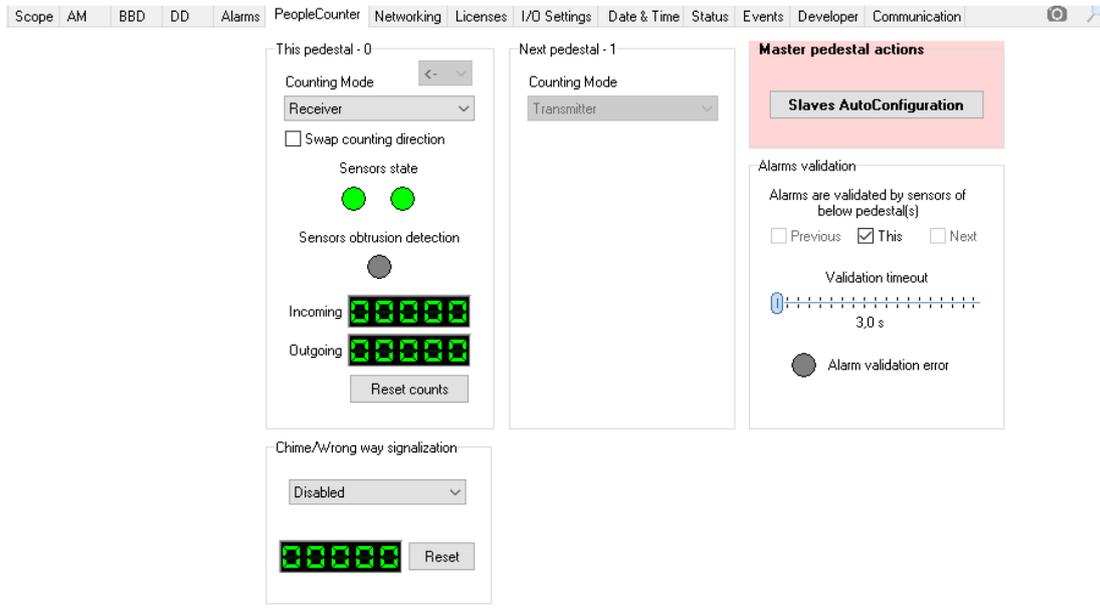
Figure 6 *PeopleCounter screen - visible signals from TX sensor*

If everything is well installed, the LED is green, the status of next antenna can be seen in the Next pedestal window – in this case that the Transmitter is set. Passing through the antenna will shade the sensors, the Sensor stat will blink red and the counter will increment, depending of the direction of passage.

Once the PC is correctly setup on AM/RF TRX it is necessary to setup RFID. In this case sensors are connected to AM/RF TRF electronic board, so on Evaluating sensors External PC is used. Group ID and Pedestal ID has to be same as on Receiver shown on Figure 3. After pressing Save settings all new tags should now have assigned direction from external PC sensors.
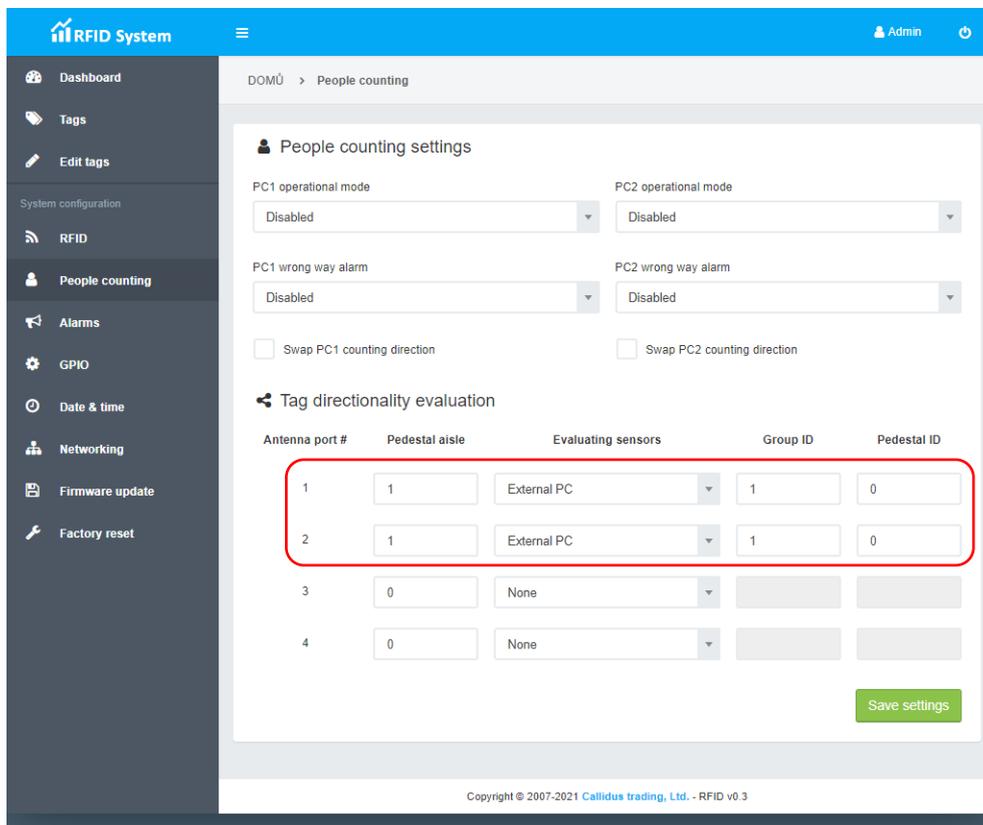
Figure 7 *People counting on RFID – settings for external PC*

PC setup for RFID only

PC sensors are connected to RFID reader. Pedestal 1 is connected to PC1 and set as receiver. Pedestal 2 is connected to PC2 and set as transmitter. LEDs indication have same meaning as before. Red LED indicate that the transmitter does not lit to the receiving sensors, green indicate visible signal from TX and grey means that sensors are disabled.

As before Evaluating settings have to be setup. In this case receiver is on PC1 so Evaluating sensors are set to Internal PC1. After pressing Save settings all new tags should now have assigned direction from internal PC sensors.
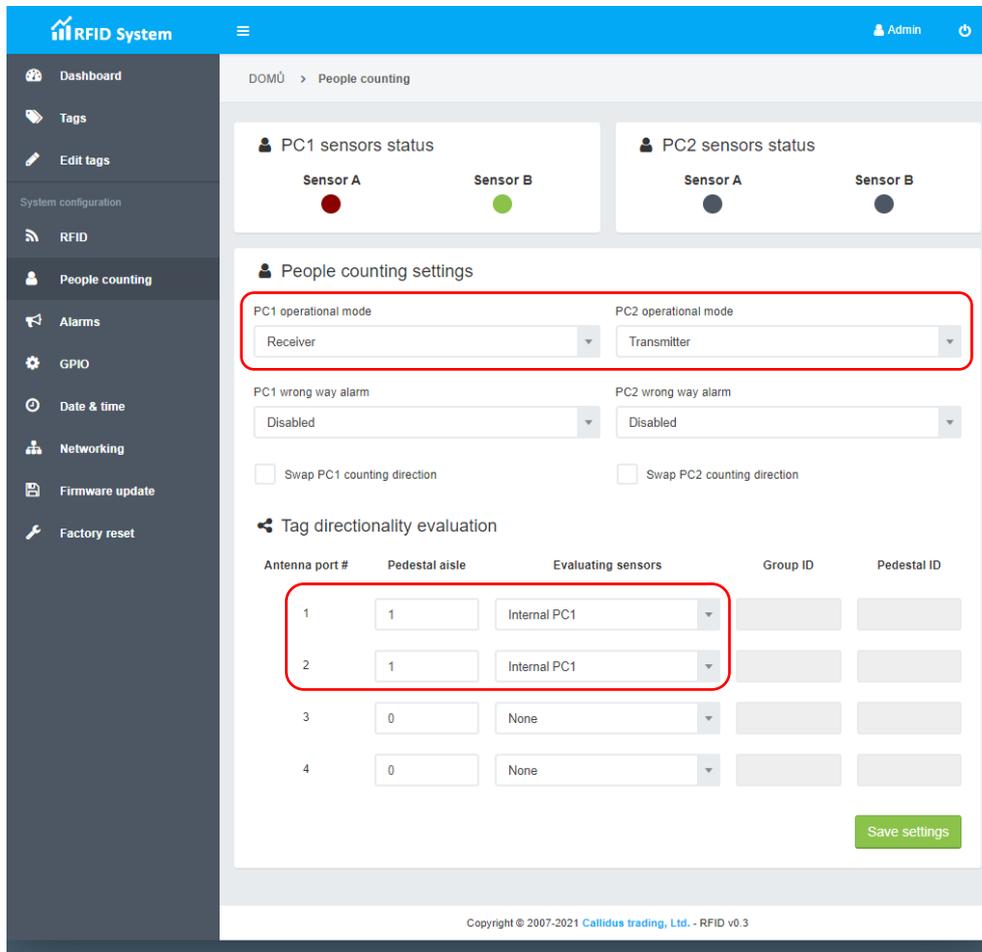
Figure 8 *People counting on RFID – settings for internal PC*

6.5   Alarms

RFID reader has 8 predefined alarms, that are fully customized. Each alarm consists of light and sound indication. Light sequence has 3 steps, where each step has color and duration. Sequence can be repeated. After that it is possible to set delay between alarms and decoration color. Sound indication has also sequence of 3 steps, where each step has ON interval and OFF interval. Just like light can be repeated and delayed between alarms. Each sound alarm can have different volume for internal or external buzzer.

Current version does support stand-alone configuration and alarm can be triggered by reader itself if alarm criteria are met or can be triggered by superior system via API or GPI.

7.1   Reader installation and placement

C8P UHF RDR Reader can be installed inside a pedestal or outside the pedestal like ceiling, cash desk, wall, etc. When the RFID reader is installed within the AM TRX or RF TRX pedestal, it can be used for both RFID and AM/RF tag detection. One reader is fixed inside one pedestal and that can be used for 1 or 2 entrance/s. The reader is placed inside the pedestal, the pedestal can be installed by following the user manual for AM/RF TRX installation and placement. If the reader is placed outside the pedestal, antennas can be placed anywhere like ceiling, cash desk, wall, etc. The antennas are connected to the reader via coaxial cables.

7.2   Reader cable and wiring

For inside AM TRX or RF TRX pedestal:

- In case of using LAN cable with PoE features the reader needs to be wired only with 1x LAN cable and 1-4 coaxial cables with SMA connectors. External power supply will be needed if LAN cable does not have PoE feature.
- RFID antennas are placed inside the pedestal to detect the RFID tags in the entrance. The antennas can be placed in the TOP and BOTTOM of multiple pedestals (2, 3 or more pedestals) to detect RFID tags in the total detection range.
- The AM TRX pedestal wiring details are given in the AM/RF TRX installation and service guide. GPIO interface is connected with a universal output port (ref. AM/RF TRX installation and service guide) in AM/RF TRX el. board
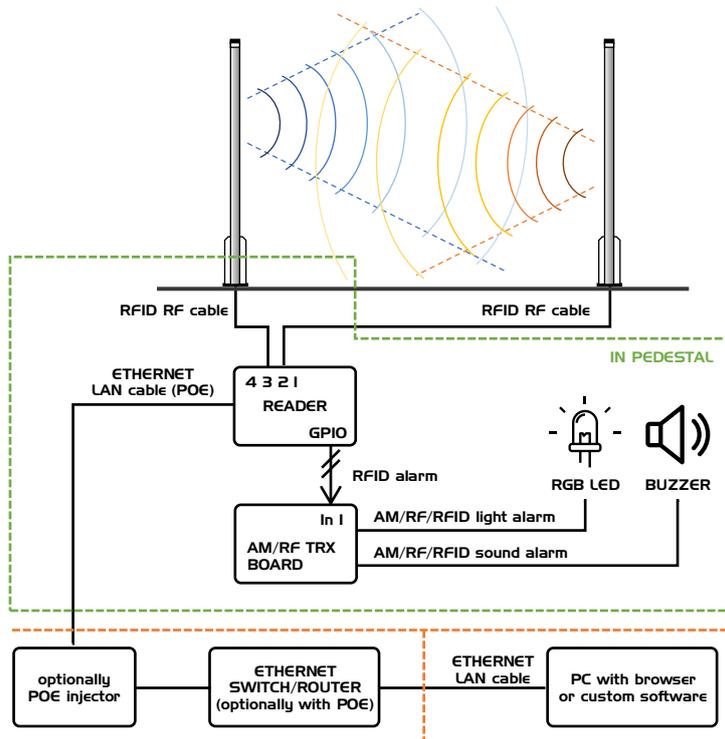
Figure 9 *Installation example of 2 pedestals with AM TRX or RF TRX*
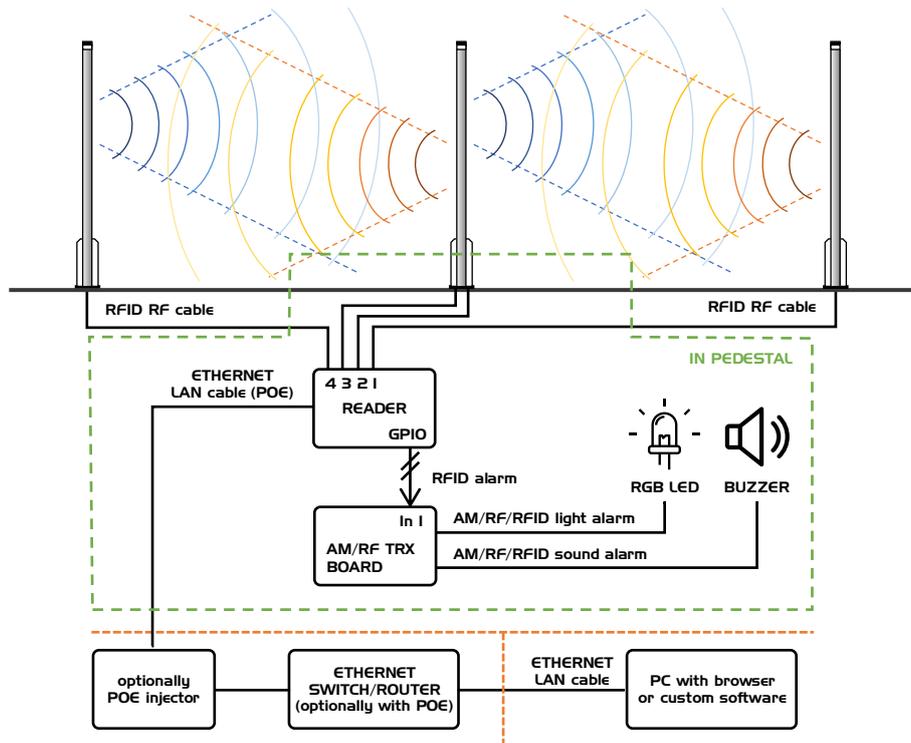
Figure 10 *Installation example of 3 pedestals with AM TRX or RF TRX*

For outside AM TRX pedestal:

- In case of using LAN cable with PoE features the reader needs to be wired only with 1x LAN cable and 1-4 coaxial cables with SMA connectors. External power supply will be needed if LAN cable does not have PoE feature
- RFID antennas are placed on the wall, ceiling, cash desk, floor, etc. and connected to the reader via coaxial cables

8. REST API IMPLEMENTATION

Callidus C8P UHF RDR supports REST API based interface for directly getting data from device.

Request are done via an HTTP GET or POST request. These requests are sent to corresponding RFID device IP address and port 80, where they are processed by embedded web server.

For all commands is necessary to have HASH key, that is used for verification. This HASH key is obtained as an answer after authorization and is valid 10 minutes after last command. If no command is sent in that interval, new authorization has to be performed.

All responses to commands are JSON objects.

All commands and responses are described in detail in the documentation: Callidus C8P UHF RDR G2 – REST API description.

8.1 Advantages of REST API

- Customer has full control over data, no 3rd party servers required
- Unlimited access, no monthly fee, no fee per store or tags limitation
- Very low requirements on hardware
- Simple implementation for new or already existing systems
- Flexibility with other systems or devices

8.2 Quick test examples

Figure 11 Example in PowerShell (Windows)

Figure 12 Example in Bash (Linux)

9. DECLARATION

9.1 Equipment modification caution

Equipment changes or modifications not expressly approved by manufacturer, the party responsible for FCC &/or CE compliance, could void the user's authority to operate the equipment and could create a hazardous condition.

9.2 Limitation of liability

Circumstances may arise where because of a default on manufacturer part or other liability is, you are entitled to recover damages from manufacturer. In each such instance, regardless of the basis on which you are entitled to claim damages from manufacturer, manufacturer is liable for no more than damages for bodily injury (including death) and damage to real property and tangible personal property; or any other actual and direct damages resulted from omission or failure of performing legal duties under this Warranty Statement, up to the listed contract price of each product.

Manufacturer will only be responsible for or indemnify your loss, damages or claims based in contract, tort or infringement under this Warranty Statement.

This limit also applies to manufacturer's suppliers and its reseller. It is the maximum for which manufacturer, its suppliers, and your reseller are collectively responsible.

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10. NOTES