# RFID DAS <span style="color:red">Track Master</span> Reader
## Installation Guide

# Federal Communications Commission (FCC) / IC Canada Compliance Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B device under Part 15 of the FCC regulations. The limits are designed to provide protection against harmful interference in a commercial environment. This equipment is designed to intentionally radiate RF energy and if not installed correctly in accordance with instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in any given installation. If this equipment does cause interference which can be determined by turning the equipment on and off, the interference may be reduced by:

Increasing the separation between the equipment and the receiver
Reorient or relocating the equipment antenna.

Only the recommended antennas listed in Appendix A should be used with this equipment and the output power should be set depending on the cable length in accordance with the PervasID Power tool. (see section on antenna connection)

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65 and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated so that the antennas are kept at least 0.5594 m or more away from a person's body (excluding extremities: hands, wrists, feet and ankles).

## ETSI Compliance and Japanese Compliance

The RFID DAS Track Master Reader (the Reader) is a product and has been certified to IEC 60950-1/EN 60950-1 and EN 301 489-1/EN 301 489-3.

**Warning:** Please read this manual in its entirety before operating the RFID DAS Track Master Reader, as personal injury or equipment damage may result from improper use. Under no circumstances should the Reader enclosure be opened.

**Caution:** Risk of explosion if lithium battery (Model Number: CR 1216; located inside the RFID DAS Track Master reader) is replaced by an incorrect type. Dispose of used batteries according to the instructions.

**Caution:** A PoE Injector and PoE splitter that meets the RFID DAS Track Master Reader PSU Specification must be used to power the Reader, or a power supply unit (PSU) that meets the RFID DAS Track Master Reader PSU Specification must be used to power the Reader. Any Other PSU could be dangerous and failure to ensure this could make the product unsafe.

**Caution:** Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## Check List

The PervasID RFID DAS Track Master system is an 8-port & 16-port UHF DAS RFID Reader (the Reader). The reader is capable of feeding eight or sixteen antennas, allowing tag information to be uploaded over its Ethernet interface to a server for processing, analysis and display. The real-time information of assets is thereby logged. The PervasID RFID DAS Track Master System consists of:

1. A PervasID RFID DAS Track Master Reader with a LAN port
2. A PoE Injector and AC cord & a PoE Splitter with DC connector or PSU
3. 15m Coaxial cables for the Sales floor area and 10m Coaxial cable for the stockroom areas
4. Single Antennas with brackets
5. Dual Antennas
6. Quad Antennas
7. Cat 6 Cable (for PoE splitter to Reader)

Please check the equipment delivered against the  packing list and the BOM at the end of the store specific floor plan.

To ensure all equipment has been delivered correctly.

# Table of Contents

# List of Acronyms

CRC Cyclic Redundancy Check

DAS Distributed Antennas System

EIRP Effective Isotropic Radiated Power

EPC Electronic Product Code

ERP Effective Radiated Power

ETSI European Telecommunications Standards Institute

FCC Federal Communications Commission

ISO International Organisation for Standardisation

RF Radio Frequency

RFID Radio Frequency Identification

RSSI Received Signal Strength

Rx Receiver

Tx Transmitter

UHF Ultra High Frequency

# 1 Introduction

This manual provides detailed instructions for installing, connecting, the RFID DAS Track master 8-port & 16-port System.

The intended audience for this manual is the operator installing the RFID DAS Track Master Reader. It is presumed that the operator has a good knowledge of RF propagation, exposure limits, radio interference, RFID, the EPC Gen2 spec, software, hardware systems integration and network connectivity.

## 1.1 RFID DAS Track Master

The RFID DAS Track Master is a fixed UHF RFID Reader that provides sensitive detection of RFID tags.



**Figure 1a: PervasID DAS 9380 8-port Reader**          **Figure 1b: PervasID DAS 9316 16-port Reader**

The RFID DAS Track Master system consists of a centralised RFID DAS controller/Reader unit connected to antennas using coax cables. The antennas should be distributed over the interrogation area, as per the floor plan, positioned as in figure (figure 6), in the interrogation area. Antennas should typically not be separated by more than that detailed in the design specification supplied by PervasID.

The RFID DAS unit is equipped with an Ethernet interface (LAN port) allowing tag information to be uploaded to a server for processing, analysis and display.

## 1.2 Requirements for Using RFID DAS Track Master System

**IT Interface Requirements**
TCP/IP network equipment is required to connect to the Reader. Once connected to the Network, connectivity can be confirmed by the IT department.

**Power Requirements**
An external PoE injector and PoE splitter are provided, which are delivered with the equipment.

**Antennas to be used**
The RFID DAS Track Master is equipped with eight independent TX/RX antenna ports. These can be connected to:
1) PervasID Single antenna (1 port used)
2) PervasID Dual antenna (2 ports used)
3) PervasID Quad antenna (4 ports used)



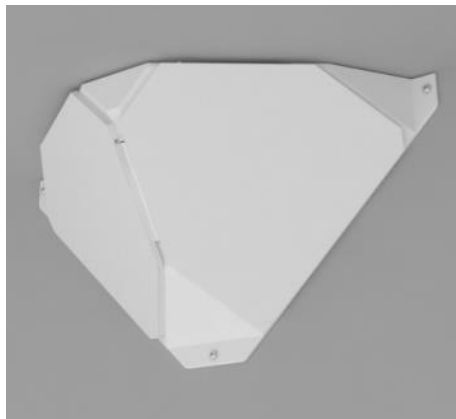Figure 1c: Single Antenna          Figure 1d: Dual Antenna          Figure 1e: Quad Antenna

# 2 Installing the DAS RFID Track Master System

The following figures (Figures 2a & 2b and 3) illustrate the Tx/Rx, Power, USB and LAN port located at the back of the RFID DAS Track Master Reader. Antenna ports and LED status indicators are located on the front panel of the Reader. An illuminated Green light on *Power* indicates that the Reader powered is on. An illuminated Green LED light on any RF port (ie. RF 1 – RF 8) indicates the port is active. An illuminated Green *Read* light indicates the Reader is successfully detecting tags. An illuminated Green *CRC* light indicates there is a CRC error with a tag read.

Under normal operation, the LEDs of the active ports will flicker indicating activity on the ports and the read LED will flicker as tags are read during read cycles.
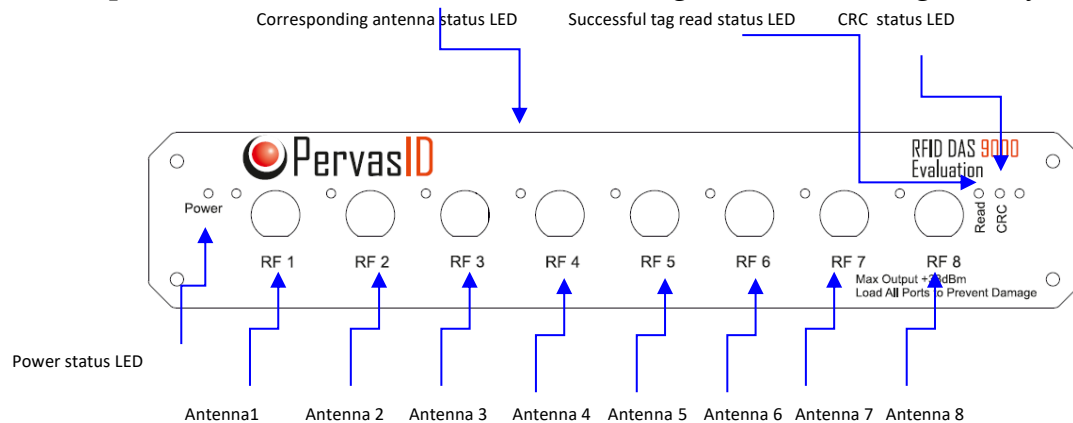
Figure 2a: DAS RFID Track Master 8-port Antenna Ports and Status LEDs
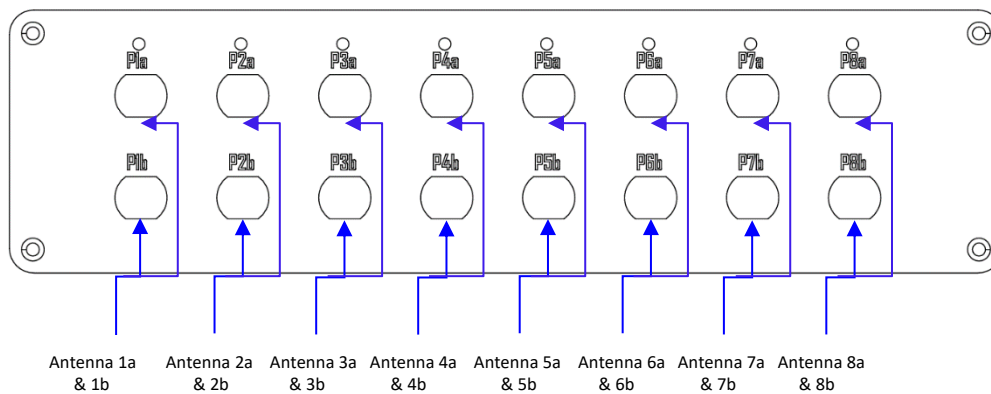
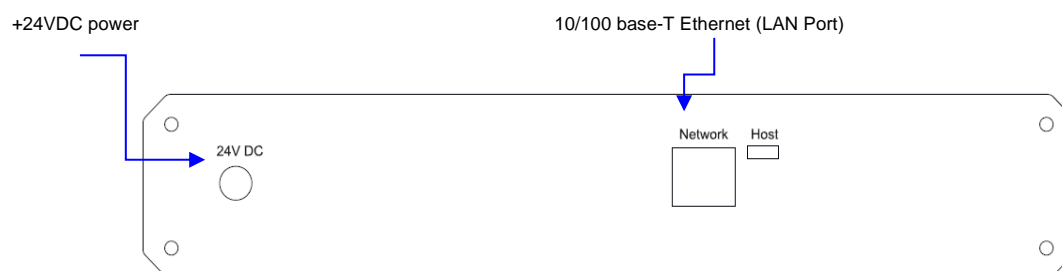Figure 2b: DAS RFID Track Master 16-port Antenna Ports

Figure 3: RFID DAS Port Connections

# 2.1 Installing and Connecting the RFID DAS Track Master Reader

### 1. Site considerations

In a customer site; we need to take big consideration to the environment and leave everything in better shape than when we arrived.

a. Ladders are clean or are covered to not mark walls when the ladder is rested on the wall.

b. Clean hands or wear gloves when mounting the antennas and/or clean off marks afterwards.

c. If uncertain of anything, ask manager before start installing redo/remake will take much longer time and will also maybe involve other units (painting etc.)



### 2. Mark out the Antenna locations

Each zone needs to be marked out carefully, to place the antenna in its location for example Cell2/A2 highlighted in the red circle above would be clearly marked on
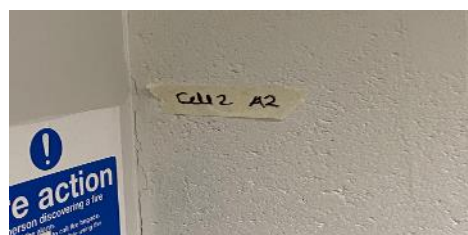


the wall prior to the installation starting.

### 3. Awareness when marking out antenna placement

a, Check what type of ceiling is in the room, is it a suspended ceiling? Is access above the ceiling available?

b, If a closed ceiling look at the walls to see if you can install the antennas on the wall

c, Is there any obstructions where we want to place the antennas? ie, lighting, CCTV, Fire sensors, etc.

d, Ensure that antennas are not placed behind metallic objects, such as metal shelves, metal racking or pillar that can cause reflections (ie clear line of sight from the antenna location to the centre of the zone) and ensure that being 0.5m away from lights



### 4. Position the Reader appropriately and mount the Reader in a stable location

Choose an appropriate location for the Reader to allow all coax cables to reach the positioned antennas. Place reader with the feet down. Always keep the reader away from extreme temperatures and sources of electromagnetic interference as this may degrade performance and lifetime of the Reader.

Caution It should be noted that heat is generated when the Reader is actively running, and care should be taken to ensure appropriate ventilation. Other equipment or items should not be placed on top of the Reader (please install feet down).

**5. Connect the antennas to the RF ports on the Reader using the coax cables**

Each RF port should be connected to its corresponding RFID antenna as laid out in the floorplan.

**Warning:** The Reader will be seriously damaged if any of the ports are not connected to an antenna or terminated with a 50-ohm load before operating it.

The following steps need to be taken in order for the system to function reliably:

1) Follow the floor plan for the antenna locations, see example shown in figure 6. The antennas should also be positioned:

1a) Tilting down 45 degrees towards the middle of the interrogation area and towards the opposing antenna.
1b) Away from metallic objects which appear in their field of view,
1c) Away from sources of interference (such as compact florescent lights)
1d) With a separation between antennas greater than 0.25m shown in figure 7a,7b & 7c.
1d) Away from locations where persons are likely be within 0.25m of the radiating face of the antenna for periods exceeding 6 minutes.

2) The antennas should be securely mounted in accordance with the local Health and Safety Regulatory Compliance and with the instructions supplied with the antenna brackets.

3) Attach the antenna cables to the antenna ports on the Reader as detailed in the installation diagram (Figure 4a & 4b). The cable connectors should be as tight as can be comfortably achieved by hand, but under no circumstances should tools be used to tighten.
4) Do not bend or kink the Coaxial cables and never pull the Coax cables by the connectors (Figure 4c).
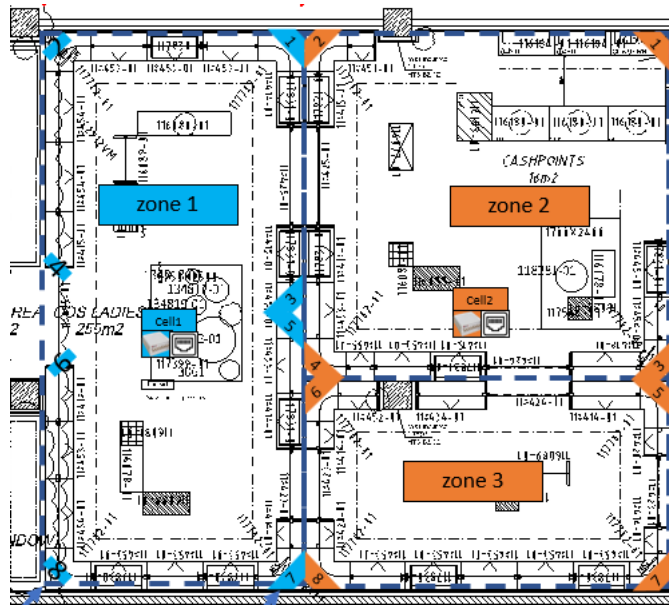
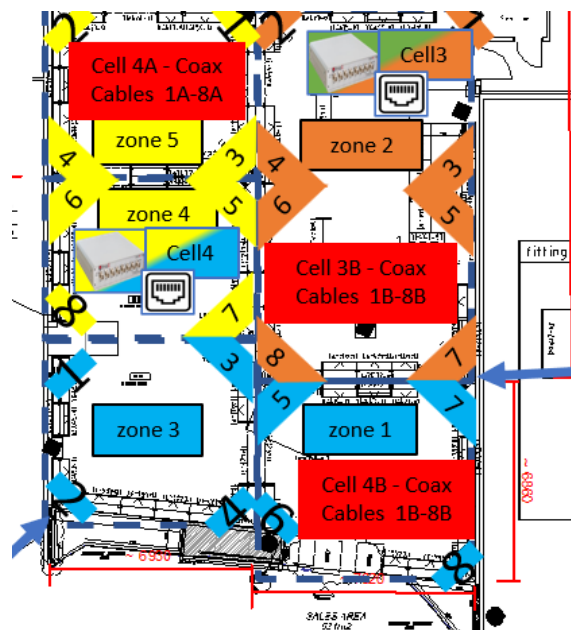Figure 4a: Typical 8-port Antenna Set up – using ports 1,2,3,4,5,6,7,8 or 1,2,3,4



Figure 4b: Typical 16-port Antenna Set up – using ports 1,2,3,4,5,6,7,8 A and 1,2,3,4,5,6,7,8 B

- Do not Install the PoE splitter on top of the reader.
- Label the cable for the appropriate port to antenna number.
- Avoid twisting cables when unwinding.
- Do not pull the cables by the connectors.
- Do not tread on the coax cables or kink the coax cables.

Less than 3.9 inches Bending Radius

Greater than 3.9 inches Bending Radius

Do not pull the cables by the connectors.

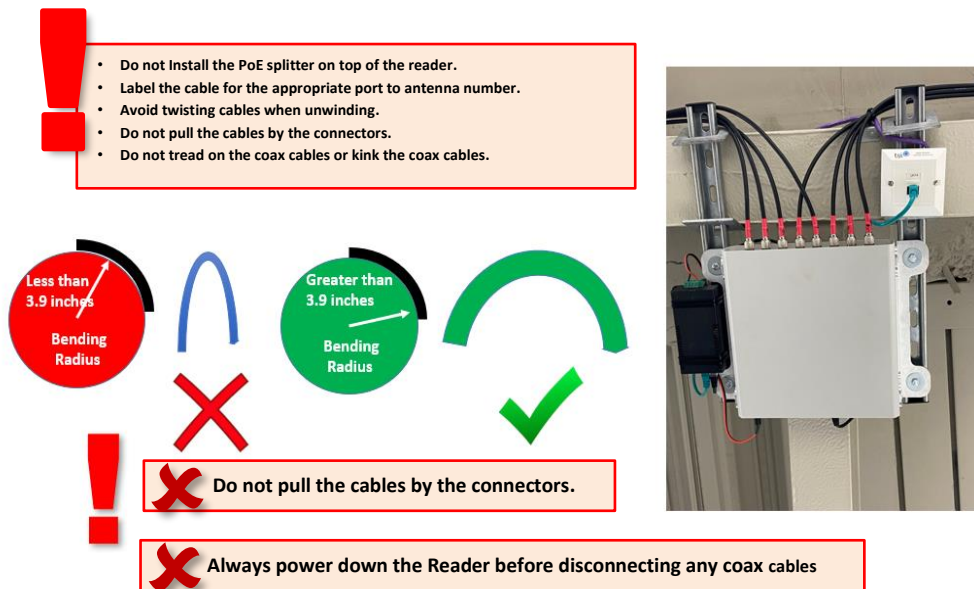Always power down the Reader before disconnecting any coax cables

Figure 4c: Typical reader installation.



Figure 5: Typical Single Antenna and Dual Antennas Installed.
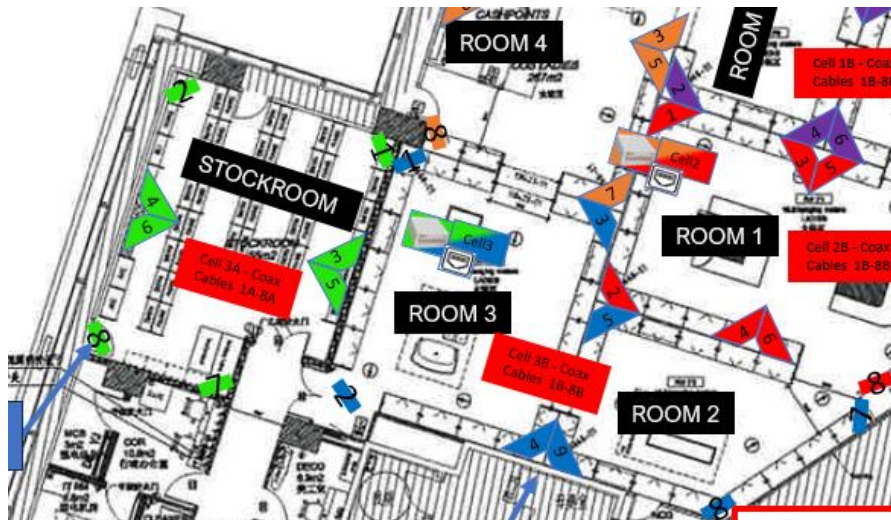
Figure 6: Example antenna placements over an interrogation area



**Single Antenna installation over 2 zones**

- **Tilt the antennas 45 degrees to the center of the zone.**
- **Point the antennas facing their opposite antenna.**
- **Avoid twisting cables when unwinding.**
- **Do not pull the cables by the connectors.**
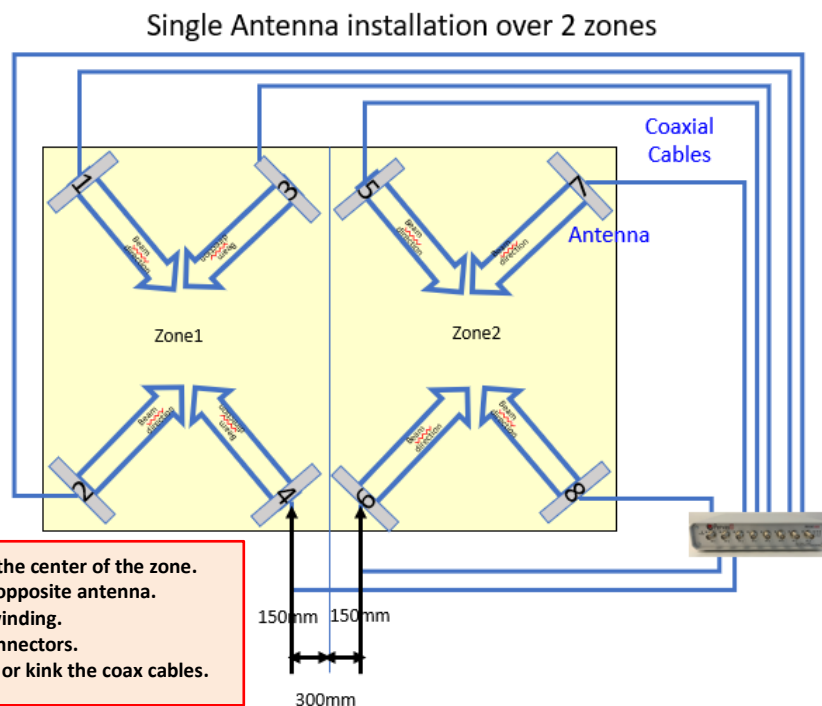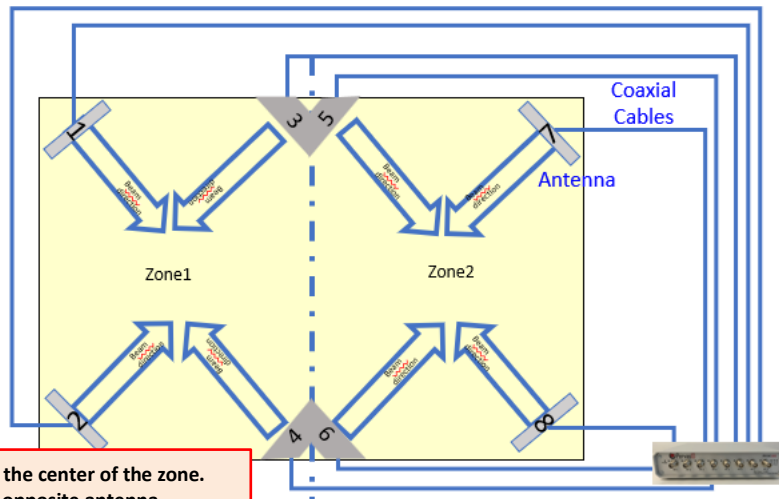- **Do not tread on the coax cables or kink the coax cables.**

Figure 7a shows the Single Antenna placement over 2 zones.

Dual Antenna installation over 2 zones

- **Tilt the antennas 45 degrees to the center of the zone.**
- **Point the antennas facing their opposite antenna.**
- **Avoid twisting cables when unwinding.**
- **Do not pull the cables by the connectors.**
- **Do not tread on the coax cables or kink the coax cables.**

Figure 7b shows the Dual Antenna placement over 2 zones.
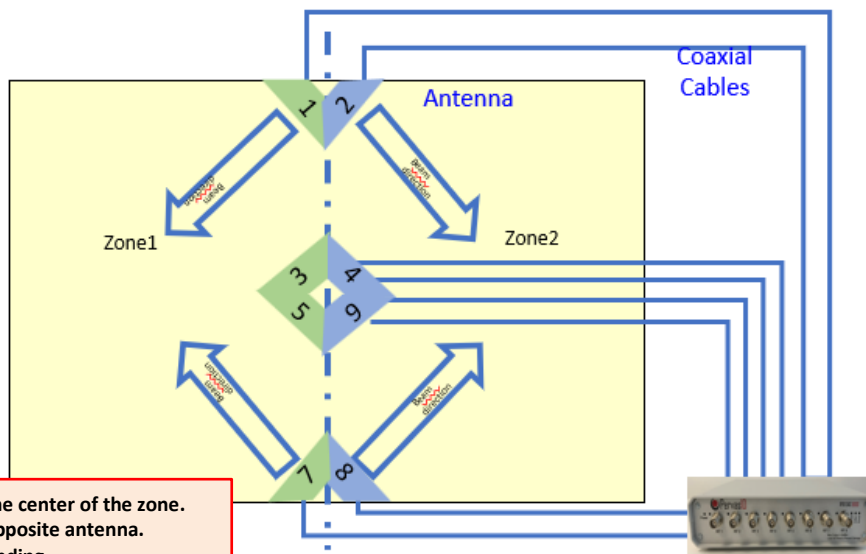


Quad and Dual Antenna installation over 2 zones

- **Tilt the antennas 45 degrees to the center of the zone.**
- **Point the antennas facing their opposite antenna.**
- **Avoid twisting cables when unwinding.**
- **Do not pull the cables by the connectors.**
- **Do not tread on the coax cables or kink the coax cables.**

Figure 7c shows the Quad Antenna placement over 2 zones.

## 6. Connect the Reader to the network

The reader is now ready to be installed to the network.

 Connect the CAT6E cable from the PoE port on the PoE injector directly to the PoE port on the PoE Splitter.  Plug the Ethernet cable from the LAN port on the PoE splitter into the Ethernet port on the back of the reader. Once the Reader is powered, it will communicate with a hosted server, Shown in figure 8.

## 7. Connect power to the Reader

You should connect the PoE injector into a suitable power outlet inside the Data cabinet.
Connect the DC jack from PoE splitter adjacent to the reader into the DC port on the rear of the reader. NEVER POSITION THE PoE SPLITTER ON TOP OF THE READER.

Once everything is successfully connected, the Power and Status LEDs at the back of the Reader should be illuminated green. The connection and activity LEDs on the Ethernet should indicate a network connection (both green and orange LEDs).

The DAS Track Master reader comes pre-configured, all that is required is to connect the system to the network. The IT department will verify that the reader is visible on the network and will validate the system.
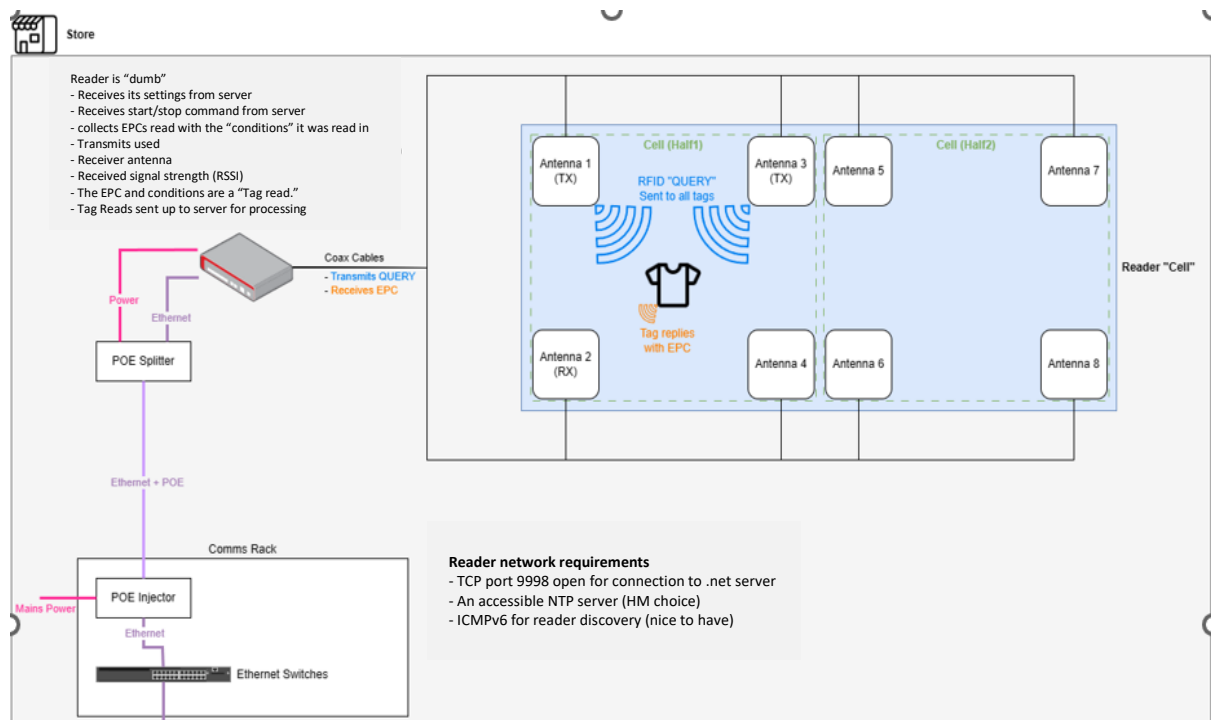


Figure 8: Shows a high-level connectivity schematic.

**8.Complete the Installation record sheet**

**Once you have installed a cell into the store, fill out the Installation record sheet with details requested.**

| Store Name | | | | Person Name | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cell | Description | MAC Address of Reader | Patch Outlet ID. | Switch Port | Comments | Cable (m) 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| | | First Floor | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | |
| | | Ground Floor | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | |
| | | Basement | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | |

# 2.2 Compliance with ETSI Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

European Council Recommendation 1999/519/EC details basic restrictions and reference levels on human exposure to electromagnetic fields as advised by the ICNIRP and states that adherence to these recommended restrictions and reference levels should provide a high level of protection as regards the established health effects that may result from exposure to such fields.

By the very nature of the RFID DAS Track Master reader system design and installation for correct operation, users should not find themselves within close proximity of the antennas. EN 62311:2008 is the applicable Harmonised Standard for EM fields generated by this RFID DAS Track Master system and all installations comply with this standard and the recommendations, and are safe when antennas are installed such that:

**(a) A minimum antenna separation of 0.25m is maintained**

**and**

**(b) An individual can be no nearer than 0.25m from an antenna for a period of 6 minutes at any one time.**

These guidelines are based on the Maximum Permissible Exposure (MPE) Calculation Report generated by UL. Please get in touch with techsupport@pervasid.com should you wish you see the report.

It is the installers responsibility to ensure that the combination of the configured reader output power, cables losses and antenna gain used do not exceed local regulations. PervasID provide a tool to help calculate the power settings of the reader which should be used to achieve the maximum allowed output power for various antenna and cable combinations. If you require a copy of this document please email support@pervasid.com.

**Warning:** We strongly recommend that users must follow above guidelines. Under no circumstances should the RFID DAS Track Master System be installed and operated outside these specifications.