CartaSense

CartaSense Ltd.

Manual for the

Installation, Operation & Maintenance

Of the

Wireless Sensing Product Family

Version; 1.3 Nov. 2013

The material in this document is the proprietary of
CartaSense Ltd.
Any unauthorized reproduction, use or disclosure of this material, or any part thereof, is strictly prohibited.
This material is meant solely for the use of CartaSense Ltd. employees and authorized CartaSense Ltd. customers

Legal Notice

Disclaimer and Limitation of Liability

CartaSense Ltd. and its affiliates, officers, directors, employees and agents provide the information contained in this Manual on an "as-is" basis and do not make any express or implied warranties or representations with respect to such information including, without limitation, warranties as to non-infringement, reliability, fitness for a particular purpose or application, usefulness, completeness or accuracy.

CartaSense Ltd. shall not in any circumstances be liable to any person for any special, incidental, direct, indirect or consequential damages, including without limitation, damages resulting from use of or reliance on information presented herein, or loss of profits or revenues or costs of replacement goods, even if informed in advance of the possibility of such damages.

Style Conventions

The following Table lists conventions that are used throughout this guide.

Convention	Used for
Verdana	Regular text
Arial Italics	Special terms
`Monospace`	Text entered by the user
	Action
	Notes, to draw attention and provide solutions to specific issues.

Comments & Suggestions

Customer suggestions are important to us and enable us to improve our documentation, making it more useful to you.

Please e-mail any comments about this guide or any other of CartaSense documentation to:

info@cartasense.com

Please include the following information with your comments:

Document title:

Page number:

Your name and organization (optional)

Contact Information

Address any technical questions or problems to CartaSense Ltd.
Address: 6 Ravnitzki St., Petach Tikva 49277, ISRAEL
Tel: +972-3-943-1543
Fax: +972-3-930-0877
Email: info@cartasense.com
Website: www.cartasense.com

Terms and Definition

Captions, abbreviations and definitions used throughout this document are presented herein.

Term	Definition
AAA	Triple A – Battery standard size
Abbr.	Abbreviated term
AC	Alternate Current (Abbr.)
APN	Access Point Name
CS	Communication Server
DC	Direct Current
FAKRA	UHF RF Antenna connector of the USG
GPRS	General Packet Radio Service is a packet oriented mobile data service available to all users of the 2.5G cellular communication GSM systems
GSM	Global System for Mobile communications (Cellular Standard)
LAN	Local Area Network
LED	Light Emitting Diode (Indicators of the USG and the AC adapter)
M	Million (1,000,000)
MCC	Mobile Country Code
MHz	Mega-Hertz – 1M Hertz (Hertz - radio frequency unit)
mm	Millimeters (1/1000 m)
MNC	Mobile Network Code
PASSWORD	APN's password
RF	Radio Frequency
RH	Relative humidity
RS	Resident Sensor, CartaSense resident wireless sensor
UHF	Ultra High Frequency
US	U-Sensor, CartaSense disposable wireless sensor
USERNAME	APN's username
USG	U-Sensor Gateway, CartaSense Wireless Sensor Gateway
V	Voltage
Wi-Fi	A Wireless LAN (Abbr. for Wireless Fidelity)

Table of Content

Legal Notice ..... *i*

Terms and Definition ..... *iii*

1 System Description *1*

1.1 Introduction **1**

1.2 System Overview **1**

1.3 Web application **2**

2 Product description *4*

2.1 U-Sensors (US) **4**

2.1.1 Operating the U-Sensor 4

2.1.1.1 Activation of the US 5

2.1.2 U-Sensor LED Indications 5

2.2 M-Sensor (Air) **5**

2.2.1 Deployment of the M-Sensor (Air) 6

2.2.1.1 Assembly of the M-Sensor (Air) 6

2.2.1.2 Activation of the M-Sensor (Air) 6

2.2.1.3 Operation of the M-Sensor (Air) 6

2.3 M-Sensor Soil **7**

2.3.1 Deployment of the Soil Sensor 7

2.3.1.1 Assembly of the Soil-Sensor 7

2.3.1.2 Activation of the Soil -Sensor 7

2.3.1.3 Operation of the Soil Sensor 7

2.4 M-Sensor Sun **7**

2.4.1 Deployment of the M-Sensor Sun (A-Sensor Sun) 8

2.4.1.1 Assembly of the Sun-Sensor 8

2.4.1.2 Activation of the Sun -Sensor 8

2.4.1.3 Operation of the Sun Sensor 8

2.5 Resident Sensor (RS) **8**

2.5.1 Deployment of the Resident Sensor 9

2.5.1.1 R-Sensor Assembly 9

2.5.1.2 RS activation and visual indications 10

2.6 U-Sensor Gateway **10**

2.6.1 Deployment of the USG 11

2.6.1.1 Assembly of the USG 12

2.6.1.2 Activating the USG 12

2.6.2 U-Sensor Gateway Backup power 13

2.6.3 SIM Card Requirements 14

2.6.3.1 SIM card APN 14

3 Installation and operation *15*

3.1 Pre-installation Preparations **15**

3.1.1 Tools 15

3.2 Site Survey 16

3.2.1 Warehouse 16

3.2.2 Truck and trailer 16

3.3 Mounting, installing and interconnecting 16

3.3.1 Pre-Installation Check List 16

3.3.2 Rules of "thumb" for locating wireless equipment 17

3.3.3 Equipment placement 17

3.3.3.1 General Considerations for USG location 17

3.3.3.2 Recommended Workmanship and Tips for Fixed USG Installation 18

3.3.3.3 Installation of Ethernet USG 18

3.3.4 U-Sensor Gateway setup 19

3.3.5 U-Sensor Gateway activation 20

3.3.6 Resident Sensor activation 21

3.3.7 Placement of wireless U-sensors 21

3.4 Mounting the wireless equipment 22

3.4.1 U-Sensor Gateway wall Mount 22

3.4.2 Truck installation 24

3.4.3 R-sensor installation 25

3.4.4 Mounting the M-Sensor: 25

4 Web Application test utility 26

5 Troubleshooting 27

5.1 Introduction 27

5.2 Problems 27

6 Appendices 29

Appendix-A: Product Specifications 29

A.1: U-Sensor Gateway Specifications 29

A.2: Resident Sensor Specifications 31

A.3: Disposable U-Sensor Specifications 32

A.4: M-Sensor Specifications 34

A.5: M-Sensor Soil specification 36

A.6: M-Sensor (A-Sensor Sun) specification 37

Appendix-B: Ethernet USG installation and setup process 38

B.1: Installation assumptions 38

B.2: Tools 38

B.3: Starting the installation 38

B.4: Trouble shooting 39

B.4.1: Check connectivity with the USG 39

B.4.2: Network connectivity 40

B.4.3: DHCP 40

B.4.4: Static configuration 42
B.4.5: Check connectivity with lancusrouter 43

Appendix-C: Creating Log Files 44

Appendix-D: FAQ 50

Appendix-E: Regulatory notices 53

Table of Figures

Figure 1: Typical system architecture 2
Figure 2: U sensor 4
Figure 3: M-Sensor, Air – front & rear view 6
Figure 5: A-sensor soil 7
Figure 6: M-Sensor Sun 8
Figure 7: Resident Sensor top & side view 9
Figure 8: Resident Sensor - bottom view 9
Figure 9: Ethernet U-Sensor Gateway 11
Figure 10: GPS- GPRS U-Sensor Gateway 11
Figure 11: Typical equipment allocation in a warehouse 19
Figure 12: USG mount drill scheme 22
Figure 13: Vertical USG installation 23
Figure 14: Horizontal USG installation 23
Figure 15: Resident sensor mounting 24
Figure 16: RS with USG and UHF Antenna using single mounting 24
Figure 17: Dashboard USG unit 25
Figure 17: M-sensor holder 25
Figure 18: Device search status 39
Figure 19: lancusrouter configuration 40
Figure 20: Device Status 41
Figure 21: Windows IP configuration 42
Figure 22: Terminal connection test with lancusrouter 43
Figure 23: Device manager screen 45
Figure 24: USB connection 45
Figure 25: Putty software screen 46
Figure 26: Putty software Session screen 47
Figure 27: Putty software Logging screen 48
Figure 28: Insert log file location 48
Figure 29: Opening log data 49
Figure 30: Opening log file 49

List of Tables

Table 1: U-Sensor elements 4
Table 2: U-Sensor indicator states, after pressing the pushbutton 5
Table 3: M-sensor elements 6
Table 4: Resident sensor elements 9
Table 5: RS LED indications 10
Table 6: USG indicators & controls 12
Table 7: U-Sensor Gateway LED Indications 13
Table 8: SIM requirements for cellular USG 14
Table 9: Pre-Installation Check List 16

1 System Description

1.1 Introduction

This manual describes the main features of the CartaSense Wireless Sensing Product Family and defines procedures for the installation, operation and servicing of the system products throughout sites and locations that require environmental monitoring and control.

The CartaSense Wireless Sensing Product family consists of the following:

- Single use shipment monitoring:
  - U-Sensor (US)
- Environmental monitoring:
  - R-Sensor (RS)- Resident Sensor
  - M- Sensors (MS).
- U-Sensor-Gateways (USG).
- Web application software management package.

The manual describes the system products and provides guidelines for a successful system installation.

1.2 System Overview

The CartaSense Wireless Sensing Product Family includes all the elements needed to collect measurements from sensors, transfer them to a central server and visualize them, in a way that provides added value business information. This business information may be used to take ad-hoc decisions or provide the basis for business strategy, thus bringing in significant savings.

CartaSense develops and manufactures various types of battery operated sensors and gateways. The gateways collect measurements from all the sensors and transfer them to a server and a web application to visualize the measurements and generate alerts.

- U-sensor (US) is a one-time-use sensor that accompanies controlled temperature shipments.
- R-sensor (RS) is a fixed installation sensor, used in warehouses.
- M-sensor (MS) is a rugged sensor for outdoor use (E.g. agricultural applications)
- U-sensor Gateway (USG) wirelessly collects the measurements from the sensors and sends it to a server.
- Fixed USG – is a gateway used in warehouses or trucks, with a GPS option.
- Dashboard USG – is a mobile gateway unit, powered from the truck cigarette lighter plug, where fixed installation in the truck is not possible or not economical.
- LAN USG – is a gateway that uses existing LAN infrastructure to connect to the server

Once a USG is identified to be in communication range, data is transmitted from the sensor to the gateway. Each USG is connected to the Communication Server (CS) either through LAN (Ethernet gateway) or cellular communication (GPRS Gateway), routing the received data from all sensors..

Each one of CartaSense wireless sensors has the capability to operate as a repeater to other Wireless sensors that are not in communication range with the Gateway. All the sensors automatically form a dynamic, self-healing, mesh network which is very resilient even when operating in harsh electromagnetic environments.

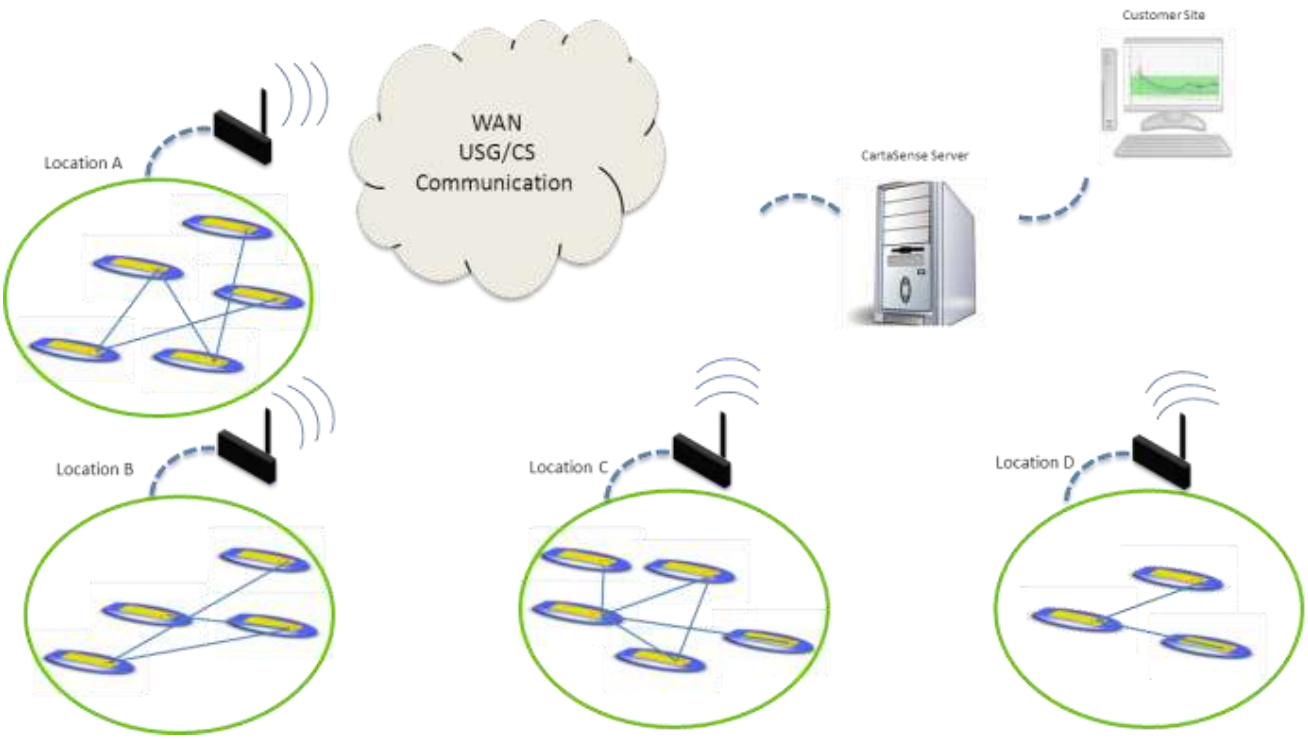


Figure 1: Typical system architecture

1.3 Web application

A Web application provides online access to the data collected from all around the monitored sites and faciltates real time monitoring and observation of temperature and relative humidity conditions down to the single package or pallet.

The application may be accessed from anywhere and enables the operator to perform the following functions:

- View measurements from individual sensors or clusters of sensors.
- View status of sensors and/or USGs.
- Monitor Sensors network structure and performance.

- Provide reports at various levels of system operation.
- Generate alarms when preset threshold conditions are exceeded.

A Web Application manual that provides a detailed description of the application and all its features is available under separate cover.

2 Product description

2.1 U-Sensors (US)

The U-sensor (US) is a portable and disposable temperature and relative humidity (RH) sensor.
The US is designed to be placed inside or near the monitored goods and transmits measurements of the temperature and humidity at that location.
See Figure 2 for US unit, for detailed specification see Appendix A.3: below
The US sensor should be placed in each pallet to monitor product through the overall supply chain.
The US periodically measures temperature and relative humidity. When connection is available to a U-Sensor Gateway, either directly or indirectly through another sensor, the measurements are uploaded to the communication server. When such connection is not available, measurements are stored in a non volatile memory and will be uploaded once wireless connection is re-established. See 3.3.7 for setup and installation.

2.1.1 Operating the U-Sensor

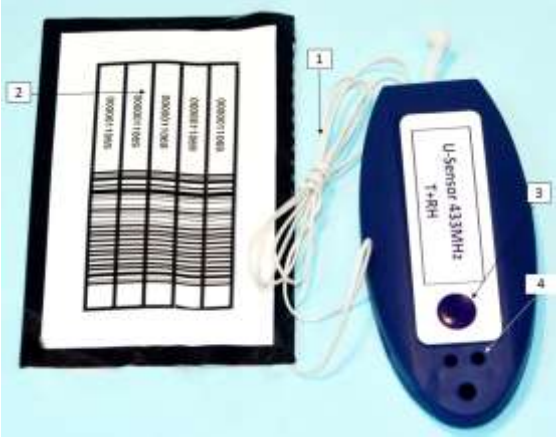


Figure 2: U sensor

Table 1: U-Sensor elements

	Item	Description
1	Antenna	For wireless communication
2	Barcode Sticker	U-Sensor unique identification
3	Power button	U-sensor activation and visual indication enable
4	Red LED	Active/not active, connected/not connected visual indicator

2.1.1.1 Activation of the US

- The US unit is powered up by pressing the power button for 3 seconds.

> Pressing the pushbutton of an active U-sensor, the red light indicator should light up in 1 sec (either continuously or blinking). If it does not light up, the U-sensor has not been activated

2.1.2 U-Sensor LED Indications

The US contains one red LED indicator. The LED indicator is normally off in regular operation. To make it active, and see the US state, the pushbutton has to be pressed. There are two distinct patterns to indicate the status of the US, as listed in Table 2.

Table 2: U-Sensor indicator states, after pressing the pushbutton

LED Indicator	Description
1 sec single blink	Activation visual feedback. Pressing the pushbutton for three seconds, while the US is not active, will cause the U-sensor to go active and to make a single blink of one second
Flashing red	Network connectivity indication. Pressing the pushbutton for at least one second, will cause the LED indicator to show the connectivity sate of the US. A one second repetitive blink means the US is not part of a sensor network and measurements are logged in the sensor's memory
Constant red	Network connectivity indication. Pressing the pushbutton for at least one second, will cause the LED indicator to show the connectivity sate of the US. A constant on LED light means the US is part of a sensor network and measurements are delivered to the U-sensor gateway

2.2 M-Sensor (Air)

M-Sensors are targeted for outdoor applications such as metering, agriculture and for integration with external sensors. The basic unit includes internal temperature and RH sensors and has an option for an additional module with extended RH capabilities. See Appendix A.4: for detailed specification.

2.2.1 Deployment of the M-Sensor (Air)

Figure 3: M-Sensor, Air – front & rear view

2.2.1.1 Assembly of the M-Sensor (Air)

- **Installing batteries:** Unscrew the rear cover of the batteries compartment (3) and install 2 AAA batteries. Make sure to keep polarity of battery as indicated in the compartment.

2.2.1.2 Activation of the M-Sensor (Air)

M-Sensor is activated by a pressing the push button for 3 seconds

The M-sensor gives a positive visual indication of the success of the activation process.

Table 3: M-sensor elements

	Item	Description
1	Power button	M-sensor activation and visual indication enable
2	LED indicator	Active/not active, connected/not connected visual indicator

2.2.1.3 Operation of the M-Sensor (Air)

The M-sensor, once active, connects to an available CartaSense sensors network.

2.3 M-Sensor Soil

The soil sensor has external soil moisture sensor probe and soil temperature probe, enabling precise monitoring of soil water content and temperature. The M-Sensor soil is used for tracking soil moisture and temperature trends in crops, vineyards, or other areas where moisture level is a concern.

See Appendix A.5: for detailed specification.

2.3.1 Deployment of the Soil Sensor

Figure 4: A-sensor soil

2.3.1.1 Assembly of the Soil-Sensor

Assembly of the M-Sensor soil is similar to the assembly of the M-sensor Air. Refer to paragraph 2.2.1.1.

2.3.1.2 Activation of the Soil -Sensor

- M-Sensor is activated by pressing the push button for 3 seconds
- The M-sensor gives a positive visual indication of the success of the activation process as described in Table 3

2.3.1.3 Operation of the Soil Sensor

The M-sensor, once active, connects to an available CartaSense sensors network.

2.4 M-Sensor Sun

The Sun sensor is based on the M-Sensor and has external sun radiation PPF sensor. The unit contains internal temperature sensors and optionally RH sensors - see Appendix A.6: for detailed specification.

Figure 5: M-Sensor Sun

2.4.1 Deployment of the M-Sensor Sun (A-Sensor Sun)

2.4.1.1 Assembly of the Sun-Sensor

Assembly is same as defined in 2.2.1.1

2.4.1.2 Activation of the Sun -Sensor

Activation is same as defined in 2.2.1.2

2.4.1.3 Operation of the Sun Sensor

The M-sensor, once active, connects to an available CartaSense sensors network.

2.5 Resident Sensor (RS)

The RS is a stationary wireless sensor that monitors temperature and RH environmental conditions and also serves as a range extender / repeater for other sensors in its vicinity. See Appendix A.2: for detailed specification. Figure 6 & Figure 7 depict the RS from top, side and bottom views and Table 4 defined RS controls & indicators.

1

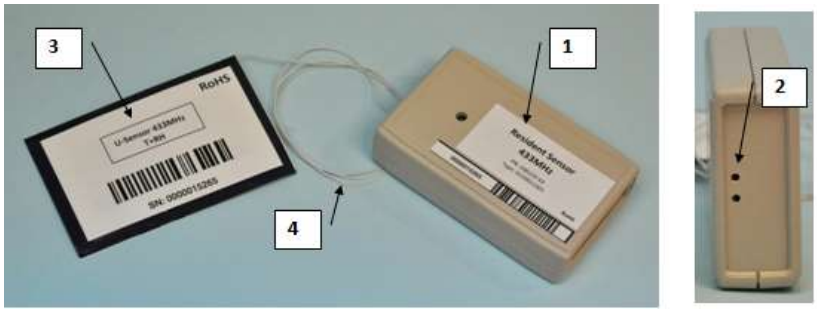


Figure 6: Resident Sensor top & side view

Figure 7: Resident Sensor - bottom view

Table 4: Resident sensor elements

Label	Name	Description
1	Resident Sensor ID	Unique ID of the Resident Sensor
2	Red LED Indicator	Indication for resident Sensor status
3	Sticker	Resident Sensor removable sticker
4	Antenna	Resident Sensor antenna
5	Batteries compartment	Holds 2 AAA batteries
6	Push Button	A countersunk operation button which is operated with a pin

2.5.1 Deployment of the Resident Sensor

2.5.1.1 R-Sensor Assembly

- Unpack the RS unit.
- Open up the Batteries compartment cover (5)
- Insert two AAA batteries.
- Make sure to keep batteries polarity as displayed in the compartment.
- Make sure that there is good contact of both battery poles
- Replace the Batteries compartment cover.

2.5.1.2 RS activation and visual indications

- Turn on the RS unit by pressing the on/off pushbutton (6) using a pin (paper clip or similar).
- The RS has one red LED indicator that can be seen from the two viewing / vent holes on the side and back panel (marked as element #2). This indicator blinks as defined in Table 5:

Table 5: RS LED indications

LED Indicator	Description
1 sec single blink	Activation visual feedback. Pressing the internal pushbutton for three seconds (use a pin), while the R-Sensor is not active, will cause the R-sensor to go active and to display a single blink of one second
Flashing red	Network connectivity indication: Pressing the pushbutton for at least one second, will cause the LED indicator to show the connectivity sate of the R-Sensor. A one second repetitive blink means the R-Sensor is NOT part of a sensor network and measurements are logged in the sensor's memory
Constant red	Network connectivity indication: Pressing the pushbutton, for at least one second, will cause the LED indicator to show the connectivity sate of the R-Sensor. A constant on LED light means the R-sensor is part of a sensor network and measurements are delivered to the U-sensor gateway

2.6 U-Sensor Gateway

The U-Sensor Gateway is designed to transmit all the data collected by CartaSense sensors throughout the monitored site to the communication server and through it – to the Web application.
The USG acts as an access point for U-sensors, R-Sensors, M-sensors and other CartaSense wireless sensors. The USG is the "root node" of the sensors network, where all measurements are uploaded to. The USG also connects to the communication server, further uploading measurements from the sensors through an internet connection, whether cellular or LAN based.
Several versions of USGs are available. – The USGs differ in their system interface and include the following:

- Cellular GPRS interface.
- GPRS cellular with GPS location module.
- Dashboard mounted GPS/GPRS unit
- Ethernet 10/100 MB interface

For detailed USG specifications – see Appendix A.1:

2.6.1 Deployment of the USG

Figure 8 and Figure 9 present the Ethernet and the GPRS-GPS USG units' and Table 6 defines all indicators, interface connectors and controls.

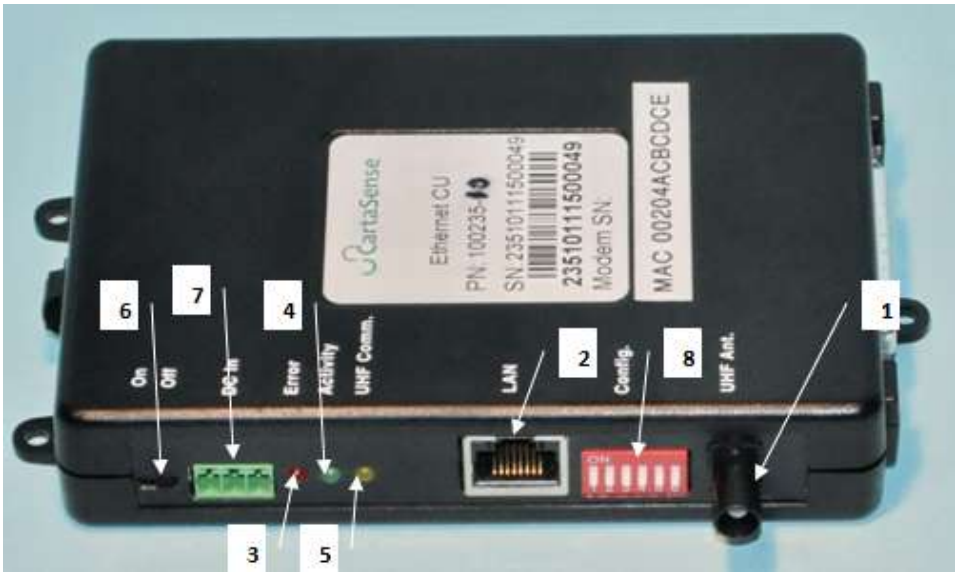


Figure 8: Ethernet U-Sensor Gateway

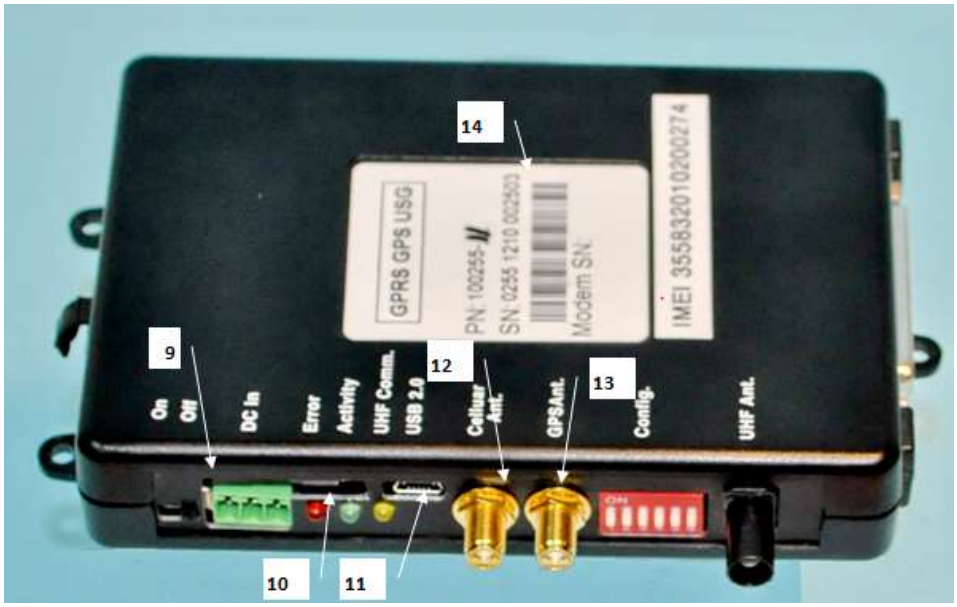


Figure 9: GPS- GPRS U-Sensor Gateway

Table 6: USG indicators & controls

Label	Name	Description
1	UHF Antenna Connector	used for communication with CartaSense Sensors. exists in all USG types
2	LAN Connector	Connection to LAN network
3	Red LED	Status indicator
4	Green LED	Status indicator
5	Yellow LED	Status indicator
6	On/off switch	Turn on/off the U-Sensor Gateway
7	External DC supply	Connection to 9-24V DC source
8	Configuration Switches	For proper operation – all switches should be in the OFF state (down position- for qualified technician use)
9	SIM Card Compartment	To hold the SIM card
10	SIM Card Push Button	Pushing this button pulls out the SIM card drawer to handle the card
11	Maintenance connector	For authorized and qualified service technicians only.
12	Cellular Antenna connector	To connect the cellular antenna for connection with the communication server
13	GPS Antenna Connector	To connect the GPS antenna
14	U-Sensor Gateway Serial number	Serial number of the U-Sensor Gateway

2.6.1.1 Assembly of the USG

- Unpack the USG unit, the attached A/C adaptor[1], and the attached UHF and cellular antennas[2].
- Connect the UHF and cellular antennas.
- Connect the power adaptor (7).

2.6.1.2 Activating the USG

Turn on the USG, via the power switch (6). After a short "lamp test" where all lights are on together, the LEDs will blink in a circular manner (red→ green→ yellow and back to red) for a period of around 30seconds.
The normal operation is that the red LED will blink until the USG connects to the server. After connection to the server, the green LED will light, with blink burst of the yellow LED, once per 18 seconds.

[1] Power adaptor varies between stationary and truck mobile installations.
[2] Type of antennas depends on USG interface, namely; Ethernet or cellular connections.

Observe that the Red, Green and yellow LEDs will light and blink at certain patters – as a function of USG status. Table 7 defines the meaning of the various LED patterns.

Table 7: U-Sensor Gateway LED Indications

Action	Visual indication	Comment
Power on		Lamp test.
Power on		Boot.
Wait for connection to server		Red blink until connected to server.
Connected to server		Green blinks according to battery level Yellow blink burst once per 18seconds.
SIM problem		All LEDs blink together.
Low battery – need to recharge immediately		Burst of 4 blinks on the green.
Server connection problem		Gateway has been connected in the last hour but currently it fails to communicate with the server.
Power save mode		USG stops GPRS and GPS activities. It continues to handle the communication with the sensors via the UHF network.
Power down mode		USG stops cellular and sensor connectivity. USG checks power connection status USG every 15 minutes. If power is applied and battery voltage rise, USG will revert to normal operation.

If SIM status is changed while the Gateway is under operation, indication will be observed only after the gateway is restarted.

2.6.2 U-Sensor Gateway Backup power

The USG includes an internal rechargeable battery.
The internal battery is used as backup power in case of short power outages.
The USG unit can operate for up to 9 hours without external power.
A built-in power save mechanism enables the USG to operate between 20-60 hours in a power saving mode, by delaying communication to the server until the batteries have been recharged to an appropriate level.

It is required to recharge the USG batteries when the YELLOW LED (5) blinks once per second.

2.6.3 SIM Card Requirements

For a GPRS Gateway, a SIM card is required. The cellular operator that supplies the SIM must be supported by CartaSense. Thus, first of all, one must verify that the operator is supported by CartaSense. Verification can be done by surfing CartaSense Demo Application, or by calling CartaSense for verification.

In order to have an optimal cellular connection, SIM card characteristics per Table 8 are required:

Table 8: SIM requirements for cellular USG

#	Required SIM feature
1	GPRS support
2	Full APN (not just WAP)
3	Standard generic APN
4	SMS support
5	No voice support
6	Cancel voice mail
7	Cancel any other services
8	Send CLI (CLI revealed)
9	Open to abroad use if using a mobile gateway(Roaming)
10	NO PIN – the SIM must not be locked by PIN!
11	Provide APN username and password of the network if required
12	Mobile network Code
13	Mobile country Code
14	APN
15	USERNAME
16	PASSWORD

A SIM card should have a contract for at least 32M Byte per month depending on implementation.

2.6.3.1 SIM card APN

SIM card APN configuration should be checked prior to the installation via the apns.xlsx file.[3] This file contains configuration of all cellular service providers supported by the gateway. If the configuration does not match, the device should be updated before the installation.

[3] Please contact CartaSense to obtain the latest supported operators list.

3 Installation and operation

Installation of a system site consists of the following stages;

- Planning – pre-installation.
- Assembling and mounting of the components..
- Acceptance testing of overall system.

3.1 Pre-installation Preparations

Pre-installation preparations are crucial for a successful installation of the CartaSense system and must be performed precisely and thoroughly.

The purpose of the pre-installation preparation is:

- Identify the best location for the system components in order to optimize the performance of the system.
- When using GPRS USG verify availability of good cellular communication in the area of installation.
- Verify high enough locations for mounting USG units to prevent them from being damaged by forklifts and loads.
- Locate AC outlets - Verify power outlet availability near the USG's planned location
- Check for the best location to place a Resident Sensor, if any. This depends on:
  - Size of area to be covered.
  - Specific needs (special cooling rooms, far dockings…)
- Estimate number of RS needed.
- Check coverage
- Add RS in places with low coverage

3.1.1 Tools

The installation team should to be equipped with the following tools:

- Cellular phone SIM free with WEB surfing capabilities - a cellular phone that works with any SIM card and is capable of surfing the internet.
- Laptop with cellular internet communication.
- Safe SIM – A SIM card with all the characteristics, as described in paragraph 2.6.3 should be verified ahead of time that it is suited for operation with the CartaSense system.
- Power cord extender.
- Thin screw driver – to pull the SIM card compartment out.
- Mini USB connector – for debug purposes.

3.2 Site Survey

3.2.1 Warehouse

For a warehouse installation, make a floor plan of the site that includes the following information:

- Location of storage racks
- walls – position and material
- AC outlets
- Cooling room locations
- Doors, docking bays
- For a GPRS USG, mark cellular reception levels[4] in the vicinity of an AC outlet (make sure the cellular phone is connected to the same operator that supplies the SIM card to the USG).
- For Ethernet USG, check for the location of RJ-45 outlets, where the USG can be placed, make sure that the outlets are active and that there is an adjacent AC outlet.
- Take pictures of the area near each electricity outlet
- Take pictures of the cooling rooms

3.2.2 Truck and trailer.

A dashboard USG model, specifically suited for non-fixed installation in trucks is available.
A simple experiment can verify the communication between the USG in driver's cabin to the sensors in the trailer.

For fixed installations in trucks and trailers, please contact CartaSense.

3.3 Mounting, installing and interconnecting

3.3.1 Pre-Installation Check List

Make sure that all steps in **Error! Reference source not found.** below are erified before you proceed to the next step:

Table 9: Pre-Installation Check List

	Operation
✓	All kit items are available
✓	There is a good cellular reception on site
✓	SIM card operates well and able to communicate
✓	You have a site plan and you know where you want to place the equipment
✓	You know how many Resident Sensors you have in order to boost the Gateway
✓	You know how many resident sensors you NEED
✓	There is a secured location for the Gateway
✓	There is a power outlet next to the Gateway

[4] Levels of cellular reception may be estimated by means of the cell-phone.

	Operation
✓	If you are using an Ethernet Gateway, make sure that LAN connection is available.

3.3.2 Rules of "thumb" for locating wireless equipment

The following issues should be considered in deciding the location of USG units

It is recommended to place the equipment in its potential location and test it prior to mounting the units. After verification, make the necessary location adjustments, if needed, and then mount the equipment to its permanent place.

A Cellular antenna should be located at least 2m away from a UHF antenna.

General

The following impair cellular reception (considered as transmission blockers and should be avoided-if possible):

Walls: Concrete walls, Reinforced Concrete, Metal walls.

Doors: Metal doors.

Liquids: Liquid containers and boxes.

Metallic objects: Metal racks, loaded forklifts

U-Sensor Gateway: USG Must be installed in an area with the best cellular reception (GPRS USG)

3.3.3 Equipment placement

3.3.3.1 General Considerations for USG location

USG works as a wireless router supporting two types of wireless networks; each one of the networks has different installation requirements:

a. **Cellular communication** (GPRS USG)
   - It is recommended to place the USG where a cellular (GSM) phone has good reception.
   - The cellular antenna can be extended to a maximum of 3m from the gateway (the maximum cable length), and should be located as high as possible for better reception and for protection from passing forklifts. Checking cellular reception with doors shut and open is a good indication to the doors blocking level

b. **LAN communication** (Ethernet USG)
   - Verify that an RJ45 Ethernet outlet is available in the vicinity of the USG.

- Lan cable length should not exceed 90 meters[5].

3.3.3.2 Recommended Workmanship and Tips for Fixed USG Installation

IMPORTANT: the USG is NOT an outdoor unit.

- USG must be kept in temperature between -20 and +60 degrees
- DO NOT EXPOSE THE USG TO DIRECT SUNLIGHT.
- Make sure the USG is protected from water and water spray
- In case such environment cannot be met, an additional protecting case should be employed.
-

CartaSense Fixed USG is usually installed in cold storage warehouses or other facilities.

- Make sure there is an electrical outlet within reach for powering the USG.
- Consider that the standard USG power cable length is 1.5m
- Use an AC power extension if necessary. Properly install and fasten the power extender. Install a dedicated power outlet if extending is not allowed or not possible
- The USG may be placed on a shelf, on a desk or mounted on the wall.
- The USG should be placed in a secure location however with an easy access. If it is positioned in high locations, the LED indicators should be visible.
- Position properly the UHF antenna, as high as possible and as remote as possible from a cellular antenna

The UHF antenna should preferably be located within a clear line of sight between it and the Resident Sensors.

3.3.3.3 Installation of Ethernet USG

Appendix-B: defines procedures and solutions for the installation of the Ethernet USG under various LAN circumstances (corporate LAN, firewalls etc.)

Figure 10 displays typical warehouse architecture and equipment location.

The resident sensors in this example are used to monitor the environment as well as repeaters.

Pay attention to the clear path the resident sensors are located avoiding interference.

[5] LAN cables should be CAT5 type cables suited for telecom applications

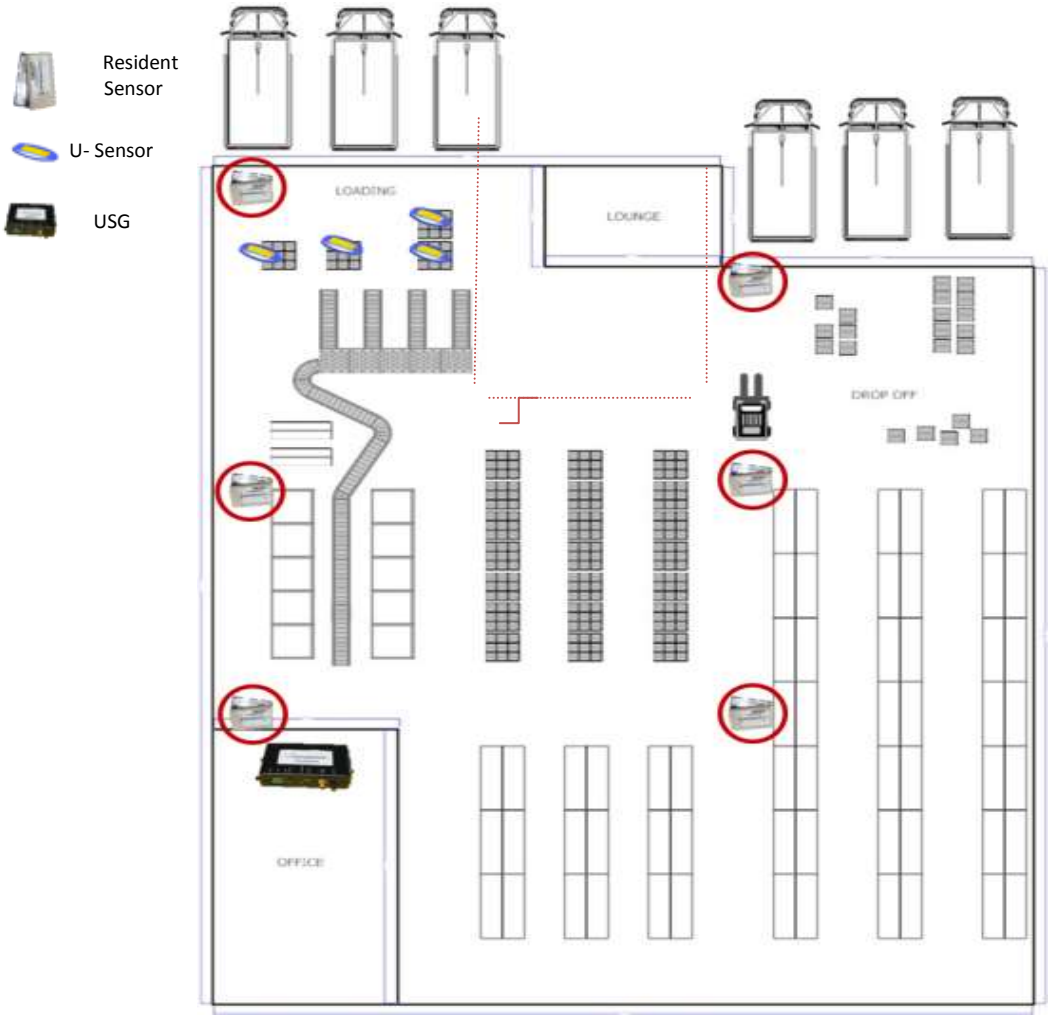


Figure 10: Typical equipment allocation in a warehouse

3.3.4 U-Sensor Gateway setup

For setup of the USG, follow the steps below (see Figure 8 and Figure 9):

- All dip-switches (8) should be in "off" position (all in down position)
- Connect ***UHF Antenna*** to UHF Antenna connector (1) on the front panel
- In case of a GPRS USG (either with GPS or without);
  - ✓ Open the ***SIM card compartment*** (9) by pushing the ***button*** (10) using a thin screwdriver
  - ✓ Insert the ***SIM card*** into the compartment. The dedicated Location fits the SIM card shape.
  - ✓ Push back the SIM card compartment. Make sure it is well inserted.

- ✓ Connect ***Magnetic cellular antenna*** to connector (12) on the front panel

Make sure that the SIM card you are using fulfills the SIM Card Requirements.

Make sure that the SIM card you are using is supported by CartaSense

- For GPS USGs, connect the ***Magnetic GPS antenna*** to connector (13) on the front panel

In some cases a dual antenna that supports both GPS and Cellular antenna can be used.

- For Ethernet USG
  - ✓ Connect LAN cable (RJ45) to LAN connector (2) on the front panel
  - ✓ Connect the other end of the LAN cable to an available LAN. Make sure that this LAN connection has direct access to the internet and it is not firewalled.

    For thorough technical information, refer to Appendix-B:
- Plug adapter ***AC or DC Power Supply*** to PWR connector on USG front Panel(7)
  - ✓ ***AC power supply*** - Plug the AC Power Supply to the electrical outlet
  - ✓ ***DC power supply*** - Plug the DC Power Supply to the Cigarette lighter outlet (for any mobile gateway such as Dashboard Gateway).

A Green LED on the Power Adapter indicates that it provides power feed to the USG.

3.3.5 U-Sensor Gateway activation

After the U-Sensor Gateway setup is completed, do the following (refer to Figure 9 and Table 7 for USG controls):

- Turn on the U-Sensor Gateway via the on/off switch (6). At first it will undergo a sequence of LED tests and eventually will turn Red.

With a GPRS unit, the test sequence is prolonged–until the GPRS modem connects.

- Once the USG connects to the communication server, the Green LED lights solid. If it blinks-it indicates that the USG battery is not fully charged – per Table 7.

> Assembly and operation stages are successful when power is on and a green led on the USG starts to blink within 5 minutes from power up.

If other LED indicators are showing, refer to chapter 5 for troubleshooting procedures.

3.3.6 Resident Sensor activation

Resident Sensors are usually deployed when:

- Stationary environmental monitoring is required.
- If the area cannot be covered with a single Gateway, then Resident Sensors can be used as battery operated repeaters / range extenders.

To operate (turn on) the Resident Sensor See 2.5.1 and Table 5.

- remove the batteries compartment cover (5)
- Insert two AAA batteries.
- Activate the RS by pushing the "activation PB" (6)

> To check whether the resident Sensor is connected to a U-Sensor Gateway, push the operation button. The red LED will blink consecutively if the sensor is connected

3.3.7 Placement of wireless U-sensors

Locating the wireless sensors in the following places will reduce the system performance (decrease transmission range).

- Near a PC.
- Near electric motors (like industrial fans, elevators, etc.)
- Industrial frequency controllers.
- Placing the antenna directly on a metal surface.

The CartaSense Wireless Solution is optimized by placing one sensor per each monitored pallet.

Placing the wireless sensor in the pallet is straight forward and easy:

- Power on and put the wireless sensor anywhere in or on the pallet.

> *The U-sensor* antenna should be stretched and if possible the antenna wire should extend outside the package.

3.4 Mounting the wireless equipment

Available option to mount the U-Sensor Gateway:

- U-Sensor Gateway wall Mount
- Truck installation

3.4.1 U-Sensor Gateway wall Mount

The U-Sensor Gateway should be affixed to its dedicated location. Figure 11 presents the drilling layout for mounting of the USG.

Figure 11: USG mount drill scheme

Use only flat head screws with a washer to mount the USG.
NEVER USE CONE HEAD SCREWES, AS IT WILL CAUSE DAMAGE TO THE MOUNTNG EARS

Figure 12 and Figure 13 present examples of a wall mount bracket which can be used for:

- Vertical and horizontal installation of the USG
- Installation of cables
- Installation of antennas

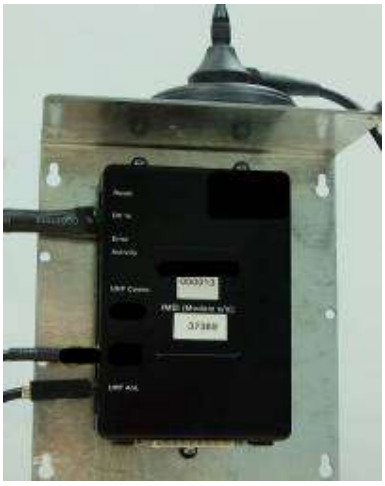


Figure 12: Vertical USG installation

Figure 13: Horizontal USG installation

Figure 14 and Figure 15 show the USG and the RS using one mounting bracket and also the installation of the RS separated from the USG.

Figure 14: Resident sensor mounting

Figure 15: RS with USG and UHF Antenna using single mounting

3.4.2 Truck installation

For a truck installation, there is a dashboard gateway version as depicted in Figure 16. The Dashboard USG is deployed as Portable USG, to provide real-time measurements from sensors in the truck cargo. The unit powered of the truck cigarette lighter.

The Dashboard USG may be placed on the dashboard in the cabin. If feasible - the installation should be firm enough so that the USG will not be moved accidentally.

Figure 16: Dashboard USG unit

The USG can operate for about 9 hours with an internal battery.

If the YELLOW LED (5) blinks at the rate of **one second,** connect the USG to Power source (AC/DC adapter or DC source).

3.4.3 R-sensor installation

The R-sensor is easily installed using a dual sided adhesive.

CartaSense recommends to use 3M VHB (4957F).

For disassembly option, use of 3M Dual Lock re-closable fasteners tape is recommended

3.4.4 Mounting the M-Sensor:

The M-sensor has several mounting options

- Holder:
  - Wall mount holder – as shown in Figure 17
  - Pole mount holder.
- Adhesive – use 3M Dual Lock™ reclosable fastener

Figure 17: M-sensor holder

4 Web Application test utility

After completion of site installation, site acceptance tests should be carried out to verify compliance of installation with site design and with customer requirements.

The CartaSense Web Application, available on the communication server, should be deployed to perform the acceptance tests.

The Web Application enables to verify completeness of the installation and provide detailed logging of the sensors' network topology installed, sensors' readings and hard copies of reports – for submission to customer.

5 Troubleshooting

5.1 Introduction

The following practical troubleshooting section is provided as a training resource for individuals learning how to install and use the Wireless Sensing Family products, and as a reference tool for those already familiar with its use and operation. It should be noted that this outline is not all inclusive, and is intended only as a guide.

5.2 Problems

Problem	Potential Cause	Suggested Action
U-Sensor Gateway does not operate	The USG is not connected to the power source for more than 9 hours and batteries were depleted.	Charge batteries until green LED is on
Gateway fails to connect for 15 minutes		Power off the gateway wait a minute and power it on
Gateway fails to connect (after resetting the gateway)	SIM card is not properly configured	Check the internet connection of the SIM by means of a cellular phone using the same GPRS parameters. Check Gateway connectivity with the safe SIM.
Gateway fails to connect (SIM is ok)	Network connectivity problems	Call CartaSense administrator to check if the network is operational.
Gateway fails to connect (Network ok)	Gateway is not configured properly to work with that SIM.	Provide log file of the connection that starts since power on and lasts 5 minutes. For creating the log file - refer to 1.1.1.1.1Appendix-C:
Tree view shows sensors that are no longer connected	USG lost cellular communication, therefore it shows the last image	
Tree view doesn’t show up.	Status is not updated yet. The tree structure is updated every 30 minutes.	Wait at least 45 minutes between the end of installation and the tree view.
R-Sensor doesn't work (no blinking light)	Batteries are not install properly	Re-Install batteries.
Resident Sensor or U-Sensor doesn’t appear to be connected to the network.	Not in range of the USG.	Verify that sensor led blinks twice (not connected). Make sure that antenna is open to its full length. Bring it close to the GW to verify that it is working. Add additional R-Sensor to cover the specific area.

Problem	Potential Cause	Suggested Action
RS or US sensors (with indicators showing that they are connected to the GW), but measurements are not shown in the database	USG lost connection to the Communication server.	Restart USG. Verify cellular communication.

6 Appendices

Appendix-A: Product Specifications

A.1: U-Sensor Gateway Specifications

Networking and system Configuration	
Communications	Multi-hop, cluster tree wireless sensor network
Number of Communications Channels:	Up to four
Multi-hops (Store and Forward)	Up to 15 hops
Network Robustness	Self-healing, adaptive
Temperature Update Rate per WL sensor	**Programmable from 2 min up to 255 min**
Max US/RS per USG	1000
Multiple USG (reader) operation	Up to four USG (readers) can coexist in the same area (i.e. Warehouse)
UHF Network	
Operating Frequency	433 MHz ISM band
Maximum rated output power	Less than 0dBm; Matching into 50 Ω Impedance.
Effective radiated power	Less than 0 dBm
Cellular Network	
GPRS Modem	Based on Tellit worldwide certified G24 module.
Frequency bands	Supports Quad band: 850/900/1800/1900 MHz
SIM Card	Integrated SIM card reader for 1.8V or 3.3V, with an external insert slot.
Ethernet Version	

	10/100 Mbps (configurable for DHCP and fixed IP)
GPS	
GPS module	Option available on cellular USG only
Antenna	Support for internal / external antenna
PHYSICAL AND ENVIRONMENTAL	
Dimensions:	LxWxD – 125 mm x 86 mm x 28 mm
Weight:	233 gram (including battery)
Color:	Black
Operating Temperatures:	-20°C to +60°C battery charge time will increase in low temperature
Internal Battery power:	LiOn battery pack – 3.7V, 0.8Ah. Support for up to 9 hours of operation when not connected to external power if fully charged.
Mobile (Truck) Power:	9-24V operation using lighter power adaptor.
Mains AC External Power:	Using an external 12V DC input from 110/230VA, 50/60 Hz adaptors (supplied with the USG).
Power	
DC power input	9-24 DC
Power Consumption	less than 100 mA at 12V DC input
Indicators	3 LEDS: Red, Green & Yellow

Rechargeable battery life is up to three years. After three years, the gateway should be refreshed /replaced.

A.2: Resident Sensor Specifications

Networking and system Configuration	
Communications Network	Multi-hop, cluster tree wireless sensor network
Number of Communications Channels:	Up to four
Multi-hops (Store and Forward)	Up to 15 hops
Network Robustness	Self-healing, adaptive
Temperature measurement Rate per RS	Remotely programmable from 2 min up to 255 min (default 10 min)
Certifications & Compliances	FCC,CE, WHO, RoHS, EN 12830, EN/UL 60950
UHF Network	
Operating Frequency	433 MHz ISM band.
Maximum rated output power	Less than 0 dBm; Matching into 50 Ω Impedance.
Effective radiated power	Less than 0 dBm
RF Read Range	Up to 500 m per hop in free space
PHYSICAL AND ENVIRONMENTAL	
Dimensions:	100 mm x 63 mm x 22 mm
Weight:	70 g
Color:	Grey
Power	
DC power input	2 AAA batteries (not included)
Measurement specifications	
Maximum measurement Range	Temperature: -35ºC to +65ºC Relative Humidity: 35% to 100% (from 0ºC to +60ºC)
Accumulated Operation Time	Over 400 days if connected to the WL network at 0ºC
Temperature Measurement Accuracy	±0.5ºC (in the range of -10ºC to +50 ºC) ±0.8ºC (in the range of -35ºC to -10ºC & 50ºC to +60ºC)
Temperature Resolution	0.1 ºC
Relative Humidity measurement accuracy	±5%
Relative Humidity Resolution	1%
Memory Capacity	2700 measurement points of each temperature and relative humidity
Storage Conditions	-20 ºC to +65ºC
Maximum continues temperature operation range	-20ºC to +60ºC Special AAA batteries are required for below -20 Celsius operation

A.3: Disposable U-Sensor Specifications

Networking and system Configuration	
Communications Network (between USG and any Wireless sensor):	Multi-hop, cluster tree wireless sensor network
Network Topology:	Cluster, mesh-tree
Number of Communications Channels:	Up to four
Multi-hops (Store and Forward)	Up to 15 hops
Network Robustness	Self-healing, adaptive
Temperature Update Rate per US	Remotely Programmable from 2 min up to 255 min (default 10 min)
Certifications & Compliances	FCC,CE, FDA approved materials for food contact , ROHS and WEEE compatible materials, WHO, EN 12830, EN/UL 60950
UHF Network	
Operating Frequency	433 MHz ISM band
Maximum rated output power	Less than 0 dBm; Matching into 50 Ω RF Impedance.
Effective radiated power	Less than 0 dBm
RF Read Range	Up to 500 m per hop in free space
PHYSICAL AND ENVIRONMENTAL	
Dimensions:	88 mm x 38 mm x 13 mm
Weight:	26 g
Color:	Blue
Power	
Internal batteries	CR2450
Measurement specifications	
Maximum measurement Range	Temperature: -35ºC to +65ºC Relative Humidity: 35% to 100% (from 0ºC to +60ºC)
Accumulated operation time	Over 160 days if connected to the WL sensor network at 0ºC, regular battery.
Temperature Measurement Accuracy	±0.5ºC (in the range of -10ºC to +50 ºC) ±0.8ºC (in the range of-35ºC to -10ºC & 50ºC to +60ºC)
Temperature Resolution	0.1 ºC
Relative Humidity measurement accuracy	±5%
Relative Humidity Resolution	1%
Memory Capacity	2700 measurement points of each temperature and relative humidity

Storage Conditions	0 ºC to +65ºC
Maximum continues Operation temperature range	-30ºC to +60ºC (under -20°C the battery life will be reduced)

A.4: M-Sensor Specifications

Networking and system Configuration	
Communications Network	Multi-hop, cluster tree wireless sensor network
Number of Communications Channels:	Up to four
Multi-hops (Store and Forward)	Up to 15 hops
Network Robustness	Self-healing, adaptive
Temperature measurement Rate per RS	Remotely programmable from 2 min up to 255 min (default 10 min)
Certifications & Compliances	FCC,CE, WHO, RoHS, EN 12830, EN/UL 60950
UHF Network	
Operating Frequency	433 MHz ISM band.
Maximum rated output power	less than 0dBm
RF Read Range	Up to 500 m per hop in free space at -4 dBm
PHYSICAL AND ENVIRONMENTAL	
Water-proof	IP67 for temperature only IP 65 if RH is required
Dimensions:	8.5 x 5 x h21 cm (Without the mount) 9 x 7 x h21.5 cm (Including mount)
Weight:	250gr. (Without the mount, including batteries) 300gr. (Including mount)
Color:	Grey
Power	
DC power input	2 replaceable AA batteries (not included)
Measurement specifications	
Maximum measurement Range (from 0ºC to +60ºC)	Temperature: -35ºC to +65ºC Relative Humidity: 35% to 100% Option for 0% to 100% is available with add-on module
Accumulated Operation Time	Up to 3 years if connected without battery replacement
Temperature measurement accuracy	±0.5ºC (in range -10ºC to +50 ºC) ±0.8ºC (in range -35ºC to -10ºC & 50ºC to +60ºC)
Relative Humidity measurement accuracy	Measurement range: 35% to 100% accuracy: ±5% Measurement range with add-on module : 0% to 100% accuracy: ±3%
Relative Humidity Resolution	1%
Memory Capacity	2500 measurement points of each temperature and relative humidity
Remote configuration	Product can be configured / programmed

Outdoor package	should withstand direct sunlight and condensation cycles
Storage conditions (without batteries)	-40ºC to +70 ºC
Operating Range (Lithium batteries)	-35ºC to +65 ºC
operation range (Alkaline batteries)	-20ºC to +50ºC

A.5: M-Sensor Soil specification

Networking and system Configuration	
Communications Network (between USG and RS & US):	Multi-hop, cluster tree wireless sensor network
Number of Communications Channels:	Up to four
Multi-hops (Store and Forward)	Up to 15 hops
Network Robustness	Self-healing, adaptive
Temperature measurement Rate per RS	Remotely programmable from 2 min up to 255 min (default 10 min)
Certifications & Compliances	FCC,CE, WHO, RoHS, EN 12830, EN/UL 60950
UHF Network	
Operating Frequency	433 MHz ISM band.
Maximum rated output power	Default is less than -4 dBm; Matching into 50 Ω Impedance. Maximum power can be configured to 11 dbm
RF Read Range	Up to 500 m per hop in free space at -4 dBm
PHYSICAL AND ENVIRONMENTAL	
Water-proof	IP67
Dimensions:	8.5 x 5 x h21 cm (Without the mount)
9 x 7 x h21.5 cm (Including mount)	
Weight:	250gr. (Without the mount, including batteries) 300gr. (Including mount)
Color:	Grey
Power	
DC power input	2 replaceable AA batteries (not included)
Measurement specifications	
Maximum measurement Range	Soil temperature: -35ºC to +65ºC Soil moisture: 0 to 239 KPsc
Accumulated Operation Time	Up to 3 years if connected
Temperature measurement accuracy	±0.5ºC (in range -10ºC to +50 ºC) ±0.8ºC (in range -35ºC to -10ºC & 50ºC to +60ºC)
Temperature Resolution	0.1 ºC
Memory Capacity	2500 measurement points of each temperature and relative humidity
Remote configuration	Product can be configured / programmed
Storage conditions (without batteries)	-20ºC to +70 ºC
Operating Range (Lithium batteries)	Soil temperature: -30ºC to +60ºC Soil Moisture: 10-200 kPa
operation range (Alkaline batteries)	-20ºC to +50ºC

A.6: M-Sensor (A-Sensor Sun) specification

Networking and system Configuration	
Communications Network (between USG and RS & US):	Multi-hop, cluster tree wireless sensor network
Number of Communications Channels:	Up to four
Multi-hops (Store and Forward)	Up to 15 hops
Network Robustness	Self-healing, adaptive
Temperature measurement Rate per RS	Remotely programmable from 2 min up to 255 min (default 10 min)
Certifications & Compliances	FCC,CE, WHO, RoHS, EN 12830, EN/UL 60950
UHF Network	
Operating Frequency	433 MHz ISM band.
Maximum rated output power	Less than 0 dBm
RF Read Range	Up to 500 m per hop in free space
PHYSICAL AND ENVIRONMENTAL	
Water-proof	IP67
Dimensions:	8.5 x 5 x h21 cm (Without the mount) 9 x 7 x h21.5 cm (Including mount)
Weight:	250gr. (Without the mount, including batteries) 300gr. (Including mount)
Color:	Grey
Power	
DC power input	2 replaceable AA batteries (not included)
Measurement specifications	
Accumulated Operation Time	Up to 3 years if connected
Photosynthetic Photon Flux (PPF) Range	–0 - 2000 μmol m^{-2} s^{-1}
Memory Capacity	2500 measurement points of each temperature and relative humidity
Remote configuration	Product can be configured / programmed
Storage conditions (without batteries)	-20ºC to +70 ºC
Operating Range (Lithium batteries)	Temperature: -30ºC to +60ºC
operation range (Alkaline batteries)	-20ºC to +50ºC (higher temperature available from several battery vendors)

Appendix-B: Ethernet USG installation and setup process

The installation process installs XPORT USG at customer premises.

B.1: Installation assumptions

The installation process is based on the assumptions that:

- USG is defined in the Amplia server.
- Lancusrouter is running at known IP port.
- Communication server is running.
- There is a network with DHCP server in the site.

B.2: Tools

The installation process and the trouble shooting require the following tools:

- Laptop
- Ethernet cable to connect the USG to Laptop directly.
- Lantronix DeviceInstaller software installed.
- ZOC terminal software[6].

B.3: Starting the installation

Connect the USG to the network via the Ethernet cable and power it on. The expected sequence as reflected by the LEDs is: all LEDs are on - means that the USG is has connected to the server and after that the green LED blinks. If this is the case, the installation ends here and the activity of the USG can be monitored by the browser thru the web interface

[6] See - http://www.emtec.com/zoc/.

B.4: Trouble shooting

B.4.1: Check connectivity with the USG

Open Device Installer and search for the USG. If the USG is found the result looks like the following:

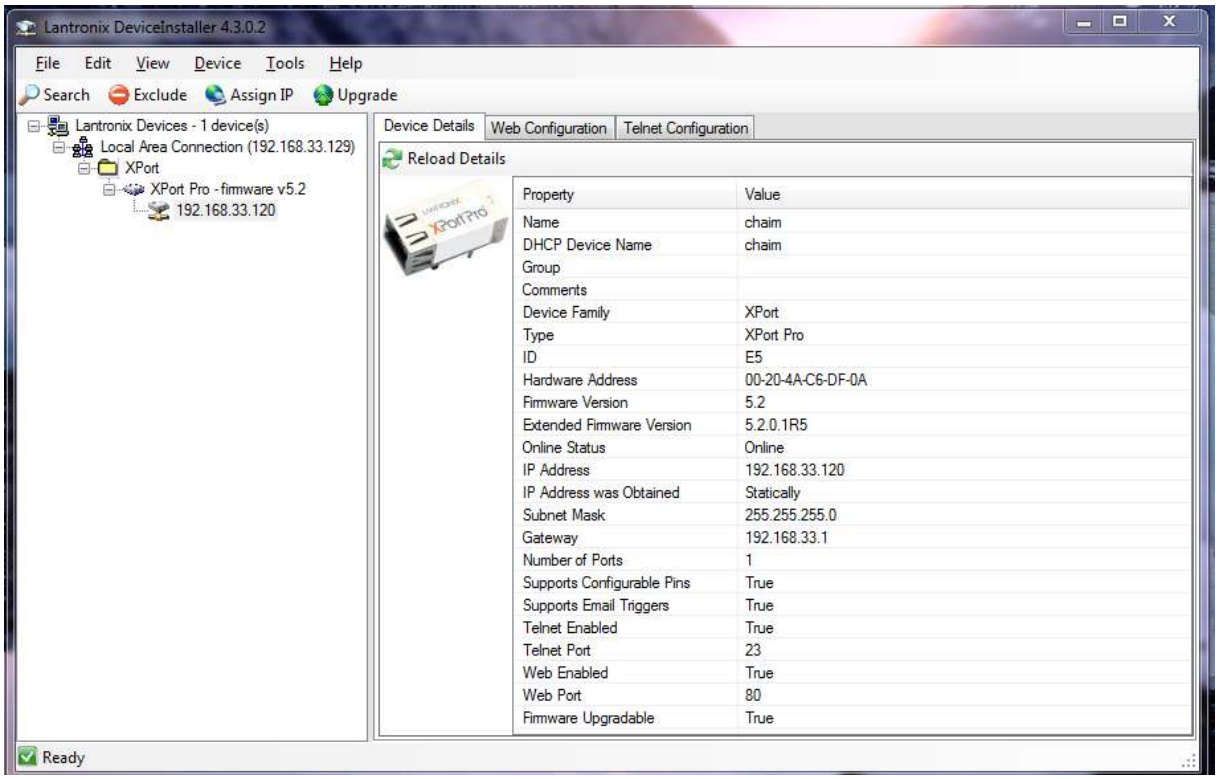


Figure 18: Device search status

- If the device is not found, connect the device by the Ethernet cable directly to the laptop and search the USG again.
  - If connected, then check the network, probably the laptop and the USG are not on the same network.
- If not connected, check Ethernet cable and laptop network settings.

- Reset XPORT to defaults
  - Turn off the USG
  - Put all the DIP switch in the "on" position
  - Turn on the USG.
  - Wait one minute.
  - Turn off the USG
  - Turn the DIP switches off again,
  - power the USG on
- Try to connect to DeviceInstaller again. If this time the connection is established, use the Web Configuration (select the web configuration tab in the device installer application) to configure lancusrouter's host and continue from start.

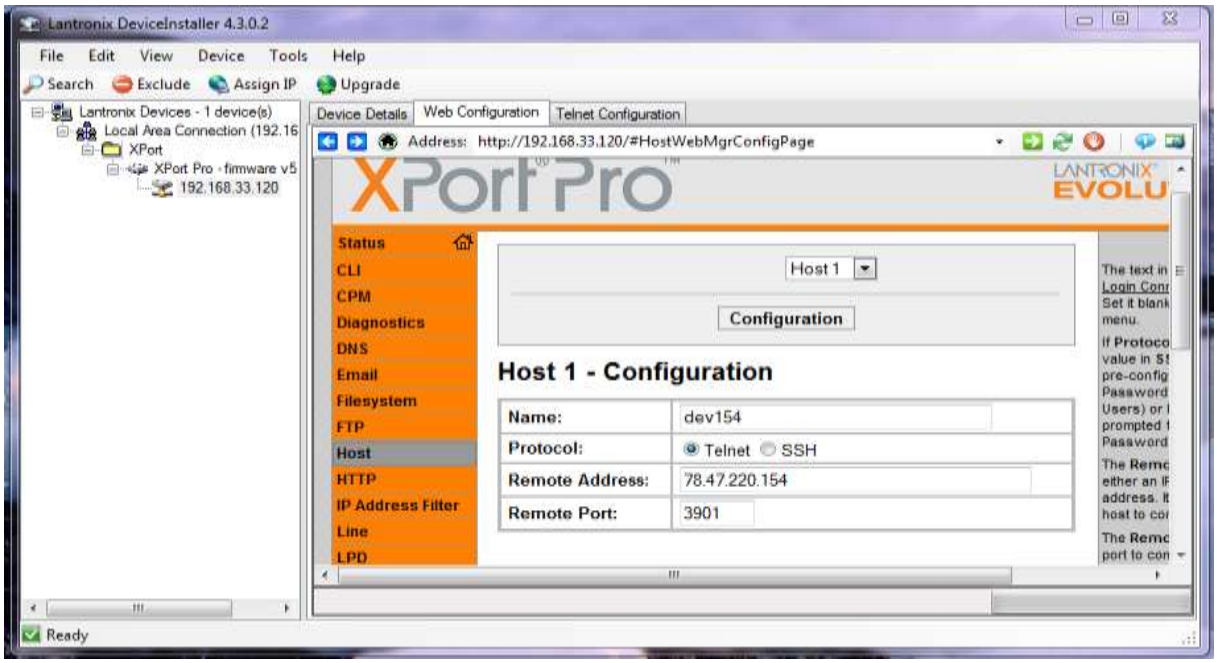


Figure 19: lancusrouter configuration

```
If still the USG does not connect the installation with this
device failed. Contact CartaSense for further support
```

B.4.2: Network connectivity

Assuming the USG is connected to the DeviceInstaller the following should be validated.

B.4.3: DHCP

The USG is configured to obtain its IP address gateway and DNS server from the DHCP server, By comparing network status provided by the DeviceInstaller and laptop configuration by using the command *"ipconfig /all"* we have all the information we need to do this test.

- The IP of the USG and the IP of the laptop should belong to the same subnet.
- The USG and the laptop should have the same Gateway and DNS server.

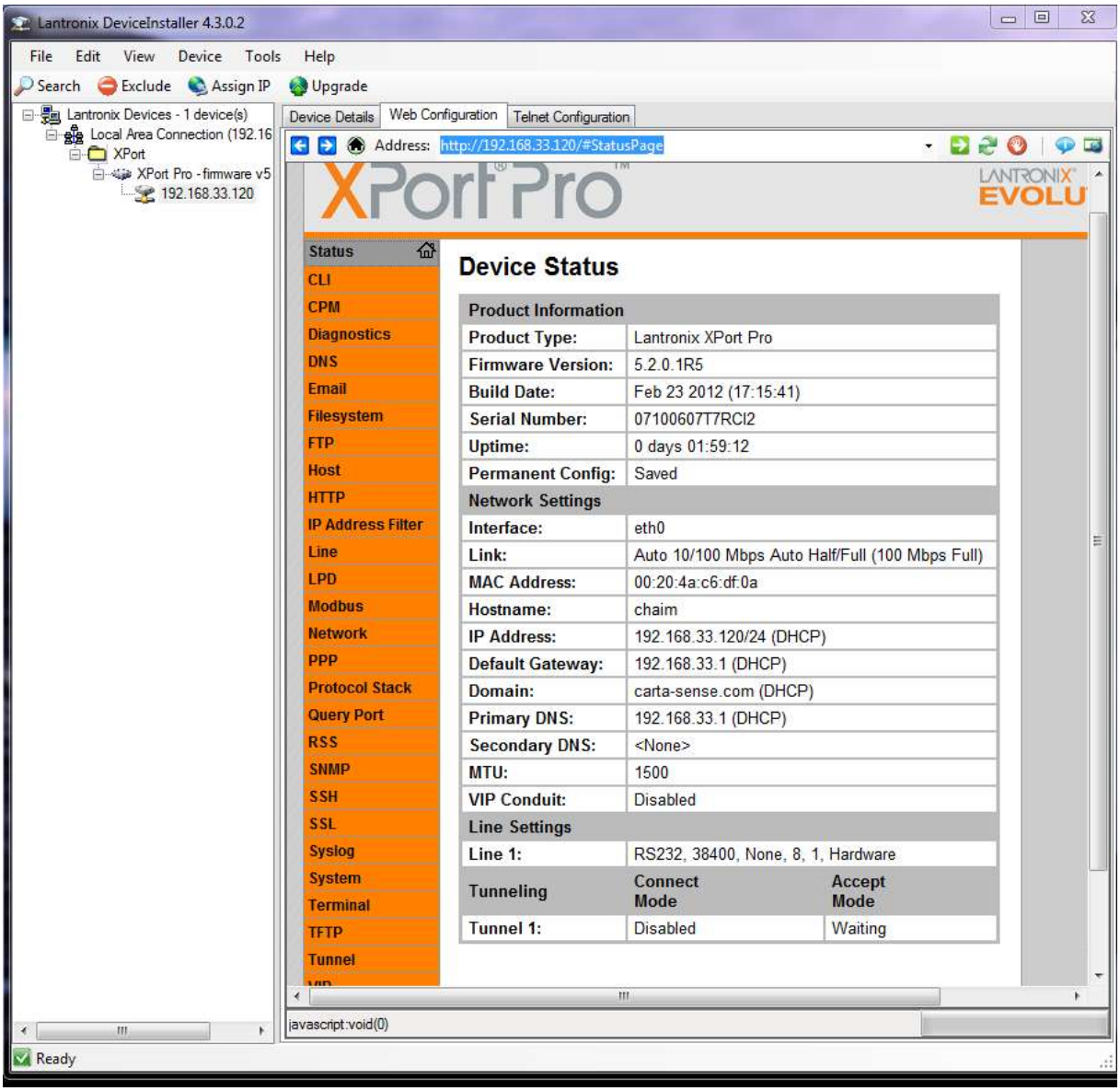


Figure 20: Device Status

```
Windows IP Configuration

   Host Name . . . . . . . . . . . . : hbelfer-dell
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No

   DNS Suffix Search List. . . . . . : carta-sense.com

Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . : carta-sense.com
   Description . . . . . . . . . . . : Realtek PCIe FE Family Controller
   Physical Address. . . . . . . . . : 24-B6-FD-1F-0A-E8
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . :
fe80::4c55:30fa:f4d1:d53f%13(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.33.129(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Tuesday, May 22, 2012 8:21:59 AM
   Lease Expires . . . . . . . . . . : Wednesday, May 23, 2012 8:21:59 AM
   Default Gateway . . . . . . . . . : 192.168.33.1
   DHCP Server . . . . . . . . . . . : 192.168.33.1
   DHCPv6 IAID . . . . . . . . . . . : 287618813
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-16-D0-EB-20-24-B6-FD-1F-
0A-E8
   DNS Servers . . . . . . . . . . . : 192.168.33.1
   Primary WINS Server . . . . . . . : 192.168.33.1
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

Figure 21: Windows IP configuration

In case the DHCP failed to allocate network parameters correctly, static configuration is required.

B.4.4: Static *configuration*

To configure static IP do the following steps:

- Select manually IP address which is not owned by any host.
- Select gateway DNS server and subnet mask similar to "ipconfig /all"
- Select Assign IP by the DeviceInstaller.
- Select "Assign a specific IP address"
- Select Next and fill IP address,Subnet mask and Default gateway.
- Select Next and Assign .

```
Now reboot the USG and see if it connects.
```

B.4.5: Check connectivity with lancusrouter

In case the USG is configured properly and still fails to connect the lancusrouter, use laptop' terminal to connect . Most terminal software will do the job . The ZOC terminal will be used to demonstrate connectivity test. The screenshot below presents testing to the lancusrouter of the development server. IP 78.47.220.154 port 3901 .

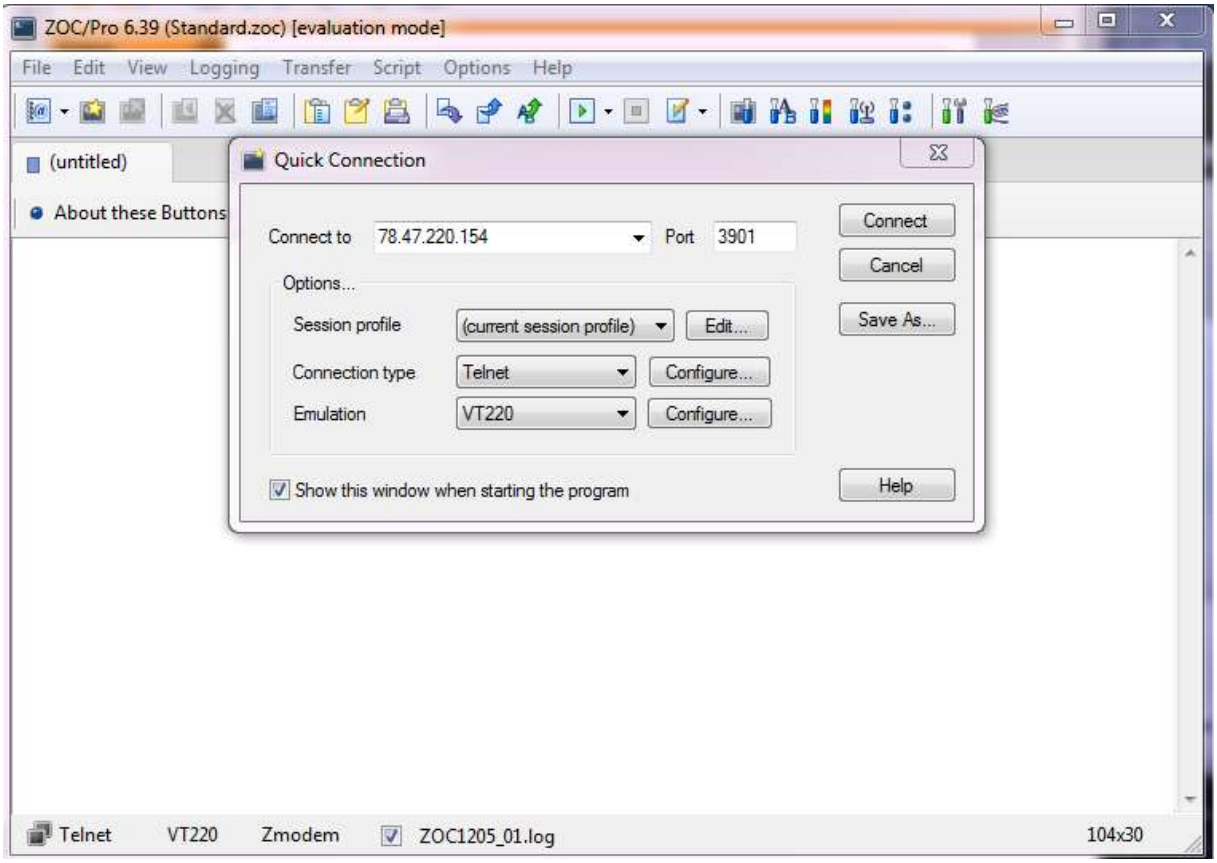


Figure 22: Terminal connection test with lancusrouter

Press connect and when the status bar indicates connection, press Z character. This indicates the lancusrouter to enter echo mode in which it returns any received character.

```
If this process fails the problem relates to firewall policy
which should be handled by the hosting company's IT.
```

When this problem is resolved, the connectivity problem will be also be resolved.

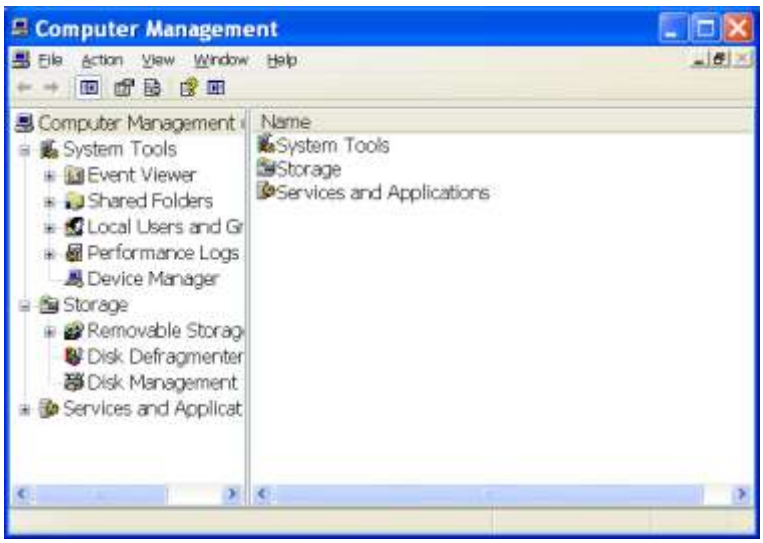
Appendix-C: Creating Log Files

To create the log file it is required to have any software which monitors ports like Putty or RealTerm[7].

Before you begin, turn off the USG by activating the On/Off button

Follow the steps below to create the required log file:

- Right click on *My Computer*. Go to Manage.
- On Windows 7 /8; press the window key, type "computer" and then press enter. Once the computer window is up, click on "computer" and then click on "manage



- Click on Device Manager. On the right hand side of the screen look for *Ports* and expand it. If you don't see it, just

[7] May be downloaded from http://realterm.sourceforge.net/

leave the screen visible at the place of the word port in alphabetical order.

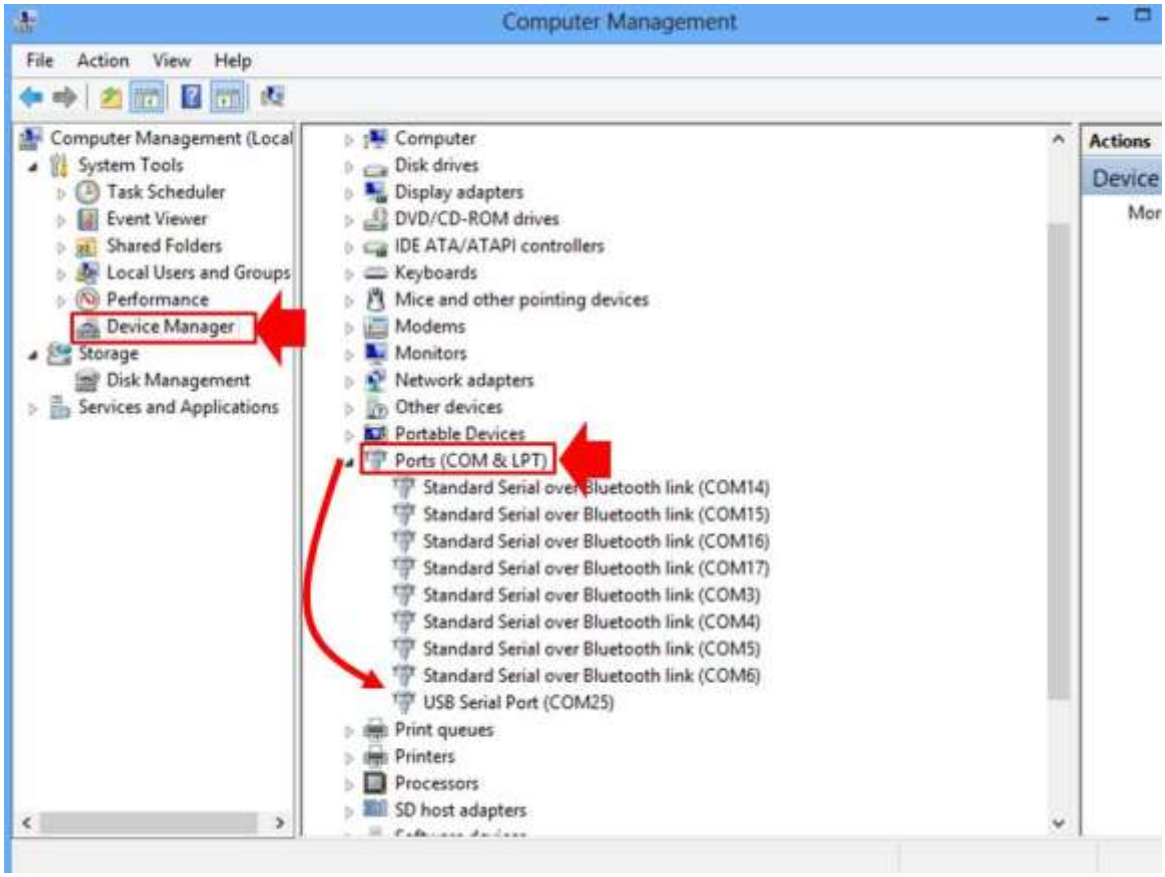


Figure 23: Device manager screen

- To be able to see the port number of the Gateway, connect a USB cable between front panel of the gateway (11) and computer. (see Figure 24).

Figure 24: USB connection

- Turn on the Gateway by activating the on/off switch (6). Take a look at the port manager on your desktop. You will

notice that the port number is added. This is the Gateway port number.

- The log file creation is demonstrated using the Putty software. Open ***Putty*** software.

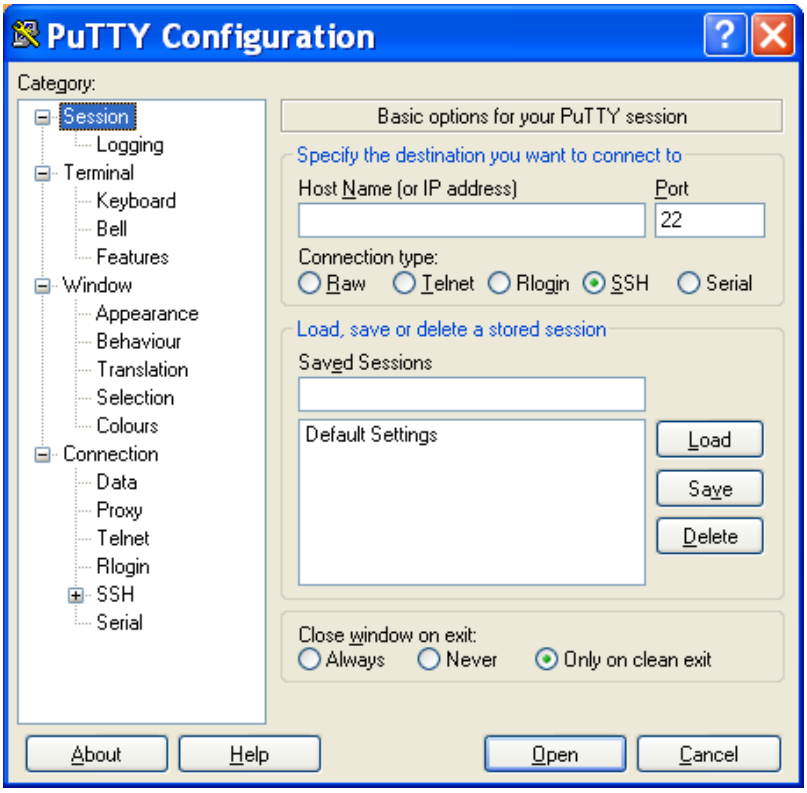


Figure 25: Putty software screen

- Click ***session*** from the list on the left side of the screen.

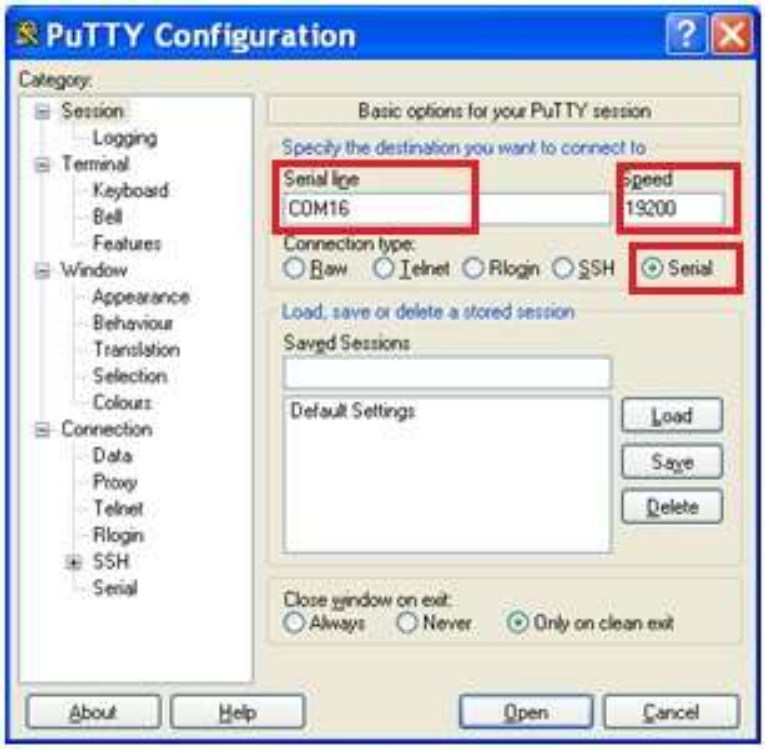


Figure 26: Putty software Session screen

- Click ***Serial*** radio button on the right.
- Type the COM port number in *Serial Line* Field. In this example the COM port number is 16.
- In the Speed field type 19200
- Click ***Logging*** from the list on the left (see Figure 27).

- Choose *All session output* radio button from the list on the right

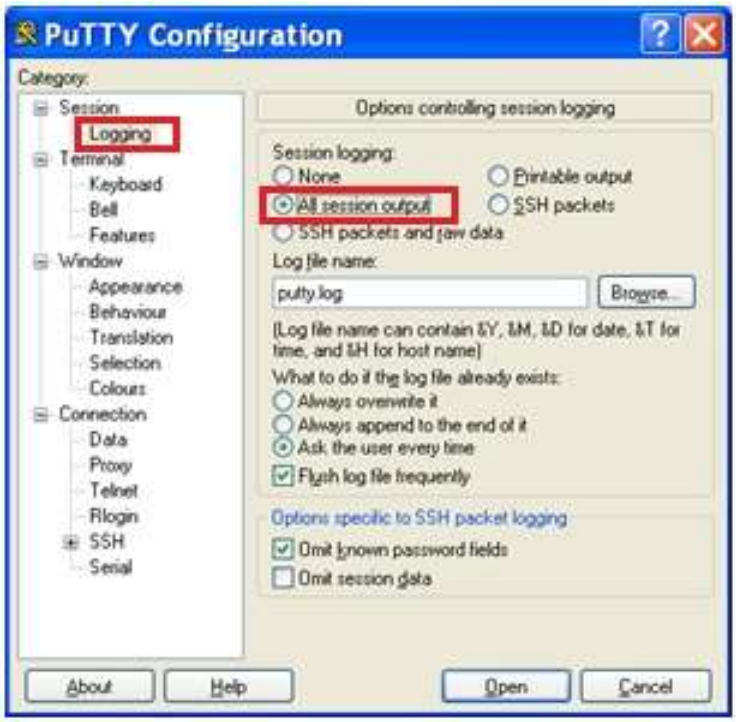


Figure 27: Putty software Logging screen

- Browse to choose the log file location.

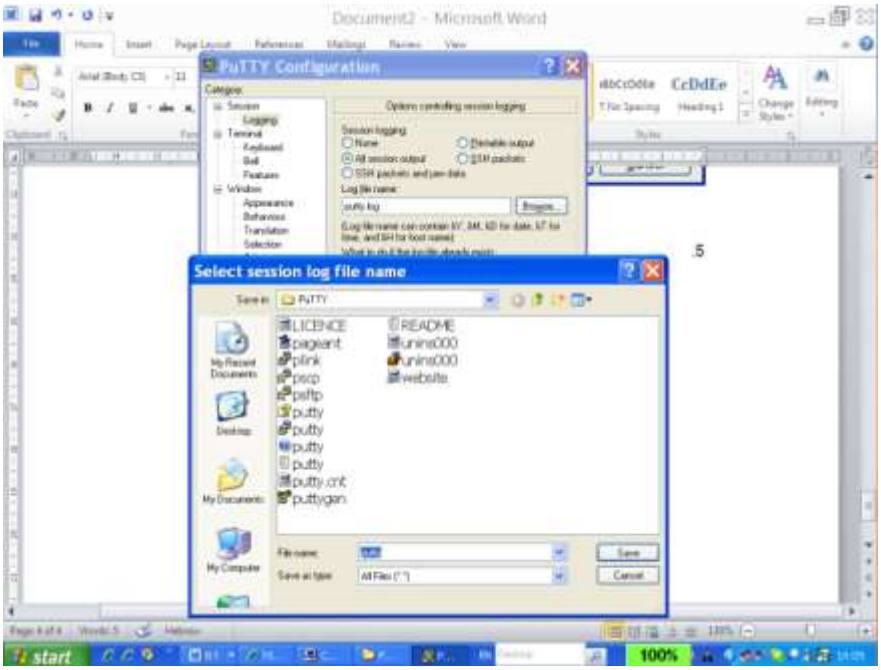


Figure 28: Insert log file location

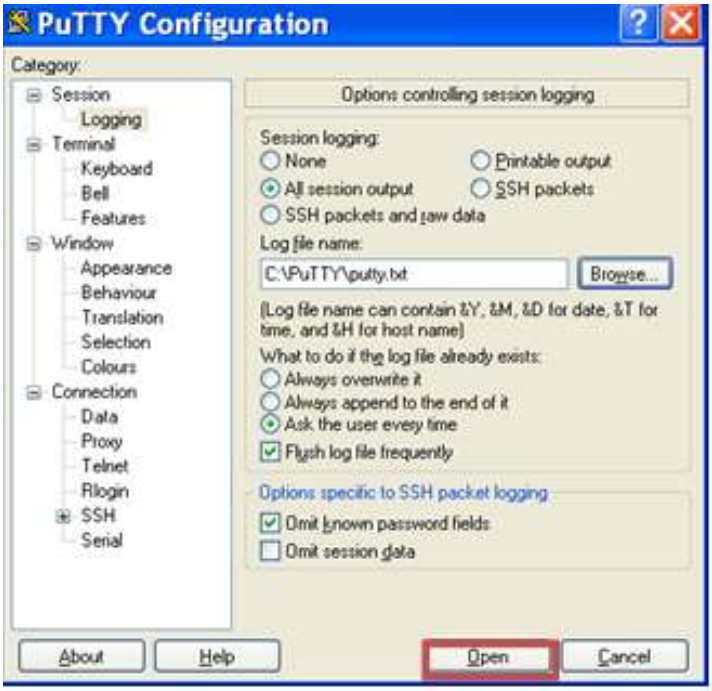


Figure 29: Opening log data

- Click *Open* button from the bottom of the screen. A black window opens. The log data appear on the screen, but also saved to a file. Search for the file name you created in the place you chose to store it.

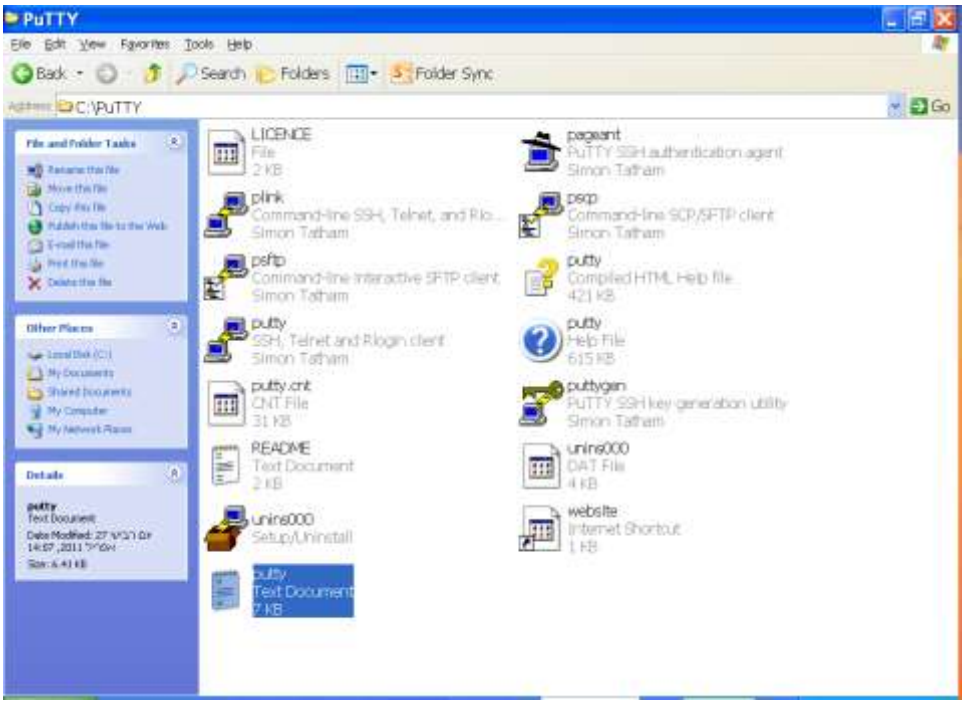


Figure 30: Opening log file

- This log file should be sent to CartaSense support team

Appendix-D: FAQ

Q: What are the differences between U-Sensor and R-Sensor?

A: *U-Sensors*
U-Sensors are used on each pallet to monitor the product itself. U-Sensors are disposable. The life time of a U-sensor is up to 160 days (at 0ºC).

Resident Sensors
Resident Sensors are used for environmental monitoring and as repeaters to boost UGS reception.
Resident Sensors are multiuse. Each resident Sensor holds two AAA batteries which can be replaced. The life time of a Resident Sensor is up to one year.

Q: When should I use R-Sensor?

A: Resident Sensors are used when:

- ✓ An environmental monitoring is required.
- ✓ The area that needs to be covered has blockers. In this case Resident Sensors can be used as repeaters to boost UGS reception.

Q: What happens to the measurements when a USG is not available and sensors are active?

A: As long as there is no connection with a gateway, all data measured by the Wireless Sensors is stored in each sensor's memory. Once the sensors identify a gateway to connect to, all data is transmitted to the gateway.

Q: Can I get an Ethernet USG with GPS option?

A: The GPS option is available only for cellular USG units.

Q: How do I decide if to use Ethernet USG or Cellular USG in my application?

A: Ethernet USG is used when there is a stationary installation and the USG is not mobile (like in a warehouse) and a LAN connection is available in the monitored site.

A cellular USG is used for mobile applications, like trucks and trailers, where LAN or Ethernet connectivity is rarely available.
In some cases, networking setup (like firewall), can cause delay in deployment. In that case, cellular units provide the easiest way to get a system up and running independent of the local IT configuration.

Q: When should I use the Cellular USG in stationary application?

A: A cellular USG can be used in a stationary installation when a LAN connection is not available.

Q: How do I know how many R-Sensor to use in a stationary application?

A: Number of Resident Sensors varies between sites. It depends on communication blockers such as Metal doors, concrete walls, racks, architecture, level of fluids in the products. The toughest the blockers the more Resident Sensors you need in order to bypass the blockers.

Q: How do I know the battery level & status of the R-Sensor ?, U-Sensor

A: CartaSense system provides statuses of the various system components. One of them is the battery status. Status data is stored in the database. When integrating CartaSense system, the application developer can use the data for any manipulation required such as battery status display, setting thresholds, alarms, etc.

Q: Can the interval between measurements be changed?

A: yes. The measurements time interval can be changed either remotely or during manufacturing procedure.

Q: In a cellular USG, what will be the data traffic?

A: A single sensor generates around 120KB per month. In truck installations with 30 U-Sensors, the average traffic is 3.5 MB per month. Traffic values may vary depending on number of sensors, measurements time interval, etc.

Q: Does CartaSense offer its own SIM for the cellular USG?

A: Yes. CartaSense offers a SIM card (optional). The user will be charged on a monthly basis.

Q: How do I decide what SIM company to choose?

A: The cellular data market is highly developed and there are offerings from operators and specialized MVNOs and dealers. Specifically, based on the application (static / roaming) the best deal should be sought.
It is recommended to purchase a bulk of data and that will be divided among the SIM cards upon use.

Q: Looks like GPS information is not accurate, what can be the cause?

A: It might be a problem with the antenna reception. It is required to make sure that the antenna is located in a place which has an outside connection. Sometimes the antenna might be located in a place with no reception, such as a tunnel or underground parking. There are areas where GPS satellites are not availability.

Q: Can I program the mode of connecting the cellular USG to the network? (Default is always on)

A: Yes. Cellular connection might be either always on (this is the default) or open each time the system transmits data and then close the connection.

Appendix-E: Regulatory notices

FCC / Industry Canada

This device complies with FCC Rules Part 15 and with Industry Canada license-exempt RSS standard(s). Operation is subject to two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may be received or that may cause undesired operation.

Industry Canada

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Class B digital device

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance (CartaSense Ltd.) could void the user's authority to operate the equipment.