SENSIT SYSTEM ✳

install guide

04-03-2015 | v1.5.2 RC

CONTENT

1   INTRODUCTION

The SENSIT vehicle detection system facilitates accurate measurement on occupancy of individual parking spaces in car parks, and on-street parking spaces. This information can be used to guide traffic to free parking spaces but can also be used for on-street parking enforcement and overstay detection. For on-street enforcement the number of occupied parking spaces can be compared with the number of payments realized by the pay station. For overstay detection the system alerts instantly a parking officer to the presence of nearby overstaying vehicles. Based on this information you can exactly determine which space to enforce.

All the SENSIT vehicle detection sensors are featured with detection and communicate wireless, creating their own network. The SENSIT sensors do not require power wiring, in contrast to conventional systems that require wiring throughout the car park and mounting onto the ceiling.

Easy installation of the sensors is guaranteed. Once installed no maintenance is required for years. The actual status (occupancy) of the sensor is transmitted to the Relay Node, which is part of the wireless mesh network.

Different types of ruggedly designed sensors are available to accommodate installation in indoor car parks, on-street spaces and road surfaces.

2   SENSIT SYSTEM

2.1   ARCHITECTURE

The actual status (occupancy) of the SENSIT sensors is finally collected by one or more Data Collector. The SENSIT sensors transmit their status via one or more Relay Nodes to the Data Collector. The Data Collector is the interface between the wireless sensors network and the SENSIT Interface Software running on the server. The Data Collector transmits status information about the sensors to the server using TCP/IP via Ethernet or GPRS communication.

Figure 1: System Architecture

For a parking site you need at least one Data Collector, a Relay Node and a SENSIT per parking bay.

2.2   THE SENSIT SENSORS

Three types of ruggedly designed sensors are available to accommodate installation in indoor car parks, on-street spaces and road surfaces. The standard, most used, SENSIT Sensor is the SENSIT IR. For regions with lots of snow the SENSIT Flush Mount is designed to withstand frequent snow ploughing. The SENSIT Surface Mount is designed for indoor car parks or roof tops where drilling is not allowed.

2.2.1   SENSIT IR

Vehicle detection sensor featured with dual detection technology (infrared and earth-magnetic field detection. The SENSIT IR is mounted into the floor of each parking space allowing for vandal resistant installation, making the unit suitable for on-street application.

SENSIT IR		
Operating frequency	SENSIT IR EU: 868.2 MHz SENSIT IR CN: 868.2 MHz SENSIT IR US: 902-928 MHz (FHSS) SENSIT IR AU: 915-927 MHz (FHSS)	
Detection	Magnetic and IR	Accuracy: 98%
Load resistance	Heavy traffic	
Mounting	Into the floor	
Weight	365 gram	(12.87 oz)
Dimensions	Ø 78 mm Into floor 55 mm	(3.07 inch) (2.16 inch)
Color	Black or Yellow (optional)	
Detection height	0...90 cm	(0 ... 35.5 inch)
Protection	IP67, completely sealed housing PE	
Operating temperature	-40 ... +85°C	(-40°F ... +185°F)
Power supply	Built in Lithium batteries expected lifetime of 5-10 years *	
Antenna	Included	

* Under normal circumstances and dependent on settings.

2.2.2 SENSIT FLUSH MOUNT

Vehicle detection sensor for flush mount installation in the road surface. The sensor is resistant to snow ploughs and offers vandal resistant installation. The SENSIT Flush Mount is featured with earth-magnetic field detection.

SENSIT Flush Mount		
Operating frequency	SENSIT FLUSH MOUNT EU: 868.2 MHz SENSIT FLUSH MOUNT CN: 868.2 MHz SENSIT FLUSH MOUNT US: 902-928 MHz (FHSS) SENSIT FLUSH MOUNT AU: 915-927 MHz (FHSS)	
Detection	Magnetic	Accuracy: 95%
Load resistance	Heavy traffic	
Mounting	Into the floor	
Weight	350 gram	(12.35 oz)
Dimensions	Ø 78 mm Into floor 72 mm	(3.07 inch) (2.09 inch)
Color	Black	
Detection height	0...90 cm	(0 ... 35.5 inch)
Protection	IP67, completely sealed housing PE	
Operating temperature	-40 ... +85°C	(-40°F ... +185°F)
Power supply	Built in Lithium batteries expected lifetime of 5-10 years*	
Antenna	Included	

* Under normal circumstances and dependent on settings.

2.2.3 SENSIT SURFACE MOUNT

Vehicle detection sensor designed for car parks where drilling is not allowed or non-permanent mounting is required. The unit is suitable for indoor car parks and rooftop parking's. The sensor can easily be glued onto the surface. Replacement can be achieved by removing the sensor installed in the mounting ring. The SENSIT Surface Mount is featured with dual detection technology (infrared and earth-magnetic field).

SENSIT Surface Mount		
Operating frequency	SENSIT SURFACE MOUNT EU: 868.2 MHz SENSIT SURFACE MOUNT CN: 868.2 MHz SENSIT SURFACE MOUNT US: 902-928 MHz (FHSS) SENSIT SURFACE MOUNT AU: 915-927 MHz (FHSS)	
Detection	Magnetic and IR	Accuracy: 98%
Load resistance	Regular traffic	
Mounting	On the floor surface	
Weight	455 gram	(16.05 oz)
Dimensions	Mounting ring: Ø 240 Sensor: Ø 167 cm Height: 35mm	(9.45 inch) (6.57 inch) (1.38 inch)
Color	Sensor black and yellow (optional black) ring	
Detection height	0...90 cm	(0 ... 35.5 inch)
Protection	IP67, completely sealed housing PE	
Operating temperature	-40 ... +85°C	(-40°F ... +185°F)
Power supply	Built in Lithium batteries expected lifetime of 5-9 years *	
Antenna	Included	

* Under normal circumstances and dependent on settings.

2.3   RELAY NODES

A Relay Node allows for communication increase and ensures a robust and reliable communication network. It ensures fast transmission of event messages from the vehicle detection sensors to the Data Collector.

2.3.1   SENSIT RELAY NODE 2G

The Relay Node 2G is has an improved communication range and a battery lifetime. It ensures a robust and reliable communication network. The Relay Node 2G ensures fast transmission of event messages from the SENSIT sensors to the Data Collector. Relay Node 2G should be mounted preferable at about 3 – 6 meters [10- 20 ft] from the floor (e.g. onto a lamppost) to allow for visible view of the sensors.

Relay Node 2G		
Operating frequency	SENSIT RELAY NODE 2G EU: 868.2 MHz SENSIT RELAY NODE 2G CN: 868.2 MHz SENSIT RELAY NODE 2G US: 902-928 MHz (FHSS) SENSIT RELAY NODE 2G AU: 915-927 MHz (FHSS)	
Weight	540 gram	(12.87 oz)
Dimensions	200 x 170 x 204 mm	(7.87 x 6.69 x 8.03 inch)
Mounting	Onto a pole, lamppost or wall, mounting bracket included.	
Mounting height	3 – 6 meters	(10 – 20 ft.)
Pole dimensions	Min. Ø 40 mm Max. Ø 150 mm	(1.57 inch) (6 inch)
Protection	IP65	
Operating temperature	-40 … +85°C	(-40°F … +185°F)
Communication range *	DC – RN 2G omnidirectional	35 m	(135 ft)
	DC – RN 2G directional max.	50 m	(164 ft)
	DC GPRS – RN 2G max.	10 m	(33 ft)
	RN 2G – RN 2G max.	100m	(328 ft)
	SENSIT – RN 2G omnidirectional	35 m	(135 ft)
	SENSIT – RN 2G directional	50 m	(164 ft)
Power supply **	Replaceable Lithium batteries expected lifetime of 5 years	
Antenna connection	Antenna included	

* Dependent on the environment.

** Under normal circumstances and dependent on settings.

2.4 DATA COLLECTORS

The actual status (occupancy) of the SENSIT sensors is collected by one or more Data Collector. The Data Collector is the interface between the wireless sensors network and the SENSIT Interface Software running at the server. The Data Collector transmits status information about the sensors to the server using TCP/IP Ethernet communication.

For a parking site you need at least one Data Collector, a Relay Node and a SENSIT per parking bay. One Data Collector is required per 250 parking bays. All Data Collectors must be separated as far as possible from each other, preferably at the remote corners of the site. The Data Collector is available in 2 different versions: the standard Data Collector and the Data Collector GPRS.

2.4.1 STANDARD DATA COLLECTOR

The Data Collector can be mounted in a central enclosure, however please ensure that the enclosure is not made of metal. The Data Collector is featured with RF communication with the SENSIT. The material used for the enclosure should be transparent for RF signals.

Data Collector		
Operating frequency	SENSIT DATACOLLECTOR EU: 868.2 MHz SENSIT DATACOLLECTOR CN: 868.2 MHz SENSIT DATACOLLECTOR US: 902-928 MHz (FHSS) SENSIT DATACOLLECTOR AU: 915-927 MHz (FHSS)	
Dimensions	125 x110 x 65 mm	(4.9 x 4.3 x 2.6 inch)
Weight	105 gram	(3.7 oz)
Protection	IP44	
Operating temperature	-0°C … +55°C	(32°F … +85°F)
Humidity	10%...90% relative humidity, non-condensing	
Communication range*	From SENSIT to Data Collector in principle unendless as the nodes communicate to each other. It is recommended to locate the nearest Relay Node within 25 meters (82 ft) of the Data Collector.	
Communication	RJ45 TCP/IP (or RS232 DIN-9 F)	
Power input	5 VDC power adapter included 110-240 VAC.	
Antenna connection	Antenna included	

* Dependent on the environment.

2.4.2 DATA COLLECTOR GPRS

The Data Collector GPRS can be installed virtually anywhere due to its IP65 weatherproof housing and embedded GPRS wireless modem. The only requirements are an AC mains power supply and that it should be installed within reach of the SENSIT wireless network.

Data Collector IP65 GPRS		
Operating frequency	SENSIT DATACOLLECTOR GPRS EU: 868.2 MHz SENSIT DATACOLLECTOR GPRS CN: 868.2 MHz SENSIT DATACOLLECTOR GPRS US: 902-928 MHz (FHSS) SENSIT DATACOLLECTOR GPRS AU: 915-927 MHz (FHSS)	
Dimensions	252 x 251 x 89 mm	(10 x 10 x 3.5 inch)
Weight	2200 gram	(77 oz)
Protection	IP65	
Operating temperature	-40°C … +65°C	(-40°F … +149°F)
Communication range*	From SENSIT to Data Collector in principle unendless as the nodes communicate to each other. It is recommended to locate the nearest Relay Node within 10 meters (33 ft) of the Data Collector GPRS.	
Communication	GPRS mobile	
Power input	110-240 VAC 50/60Hz	
Antenna connection	Antenna included	

* Dependent on the environment.

2.5   ADDITIONAL EQUIPMENT

Additional equipment is available to expand the functionality of the SENSIT system.

2.5.1   ELECTRONIC PARKING LICENSE

The Electronic Parking License (EPL) physically is a device that is positioned inside the car. Whenever the car stops for a specific period of time it considers the car to be parked and it will look for a wireless SENSIT network. If a network is detected, it will make itself know to the network. Its unique EPL identifier is registered at the server with SENSIT Interface Software (SIS). The SIS is triggered when parking bays that require a license change status (become occupied or free). When such a parking bay is occupied the system will calculate the odds of the parking bay being occupied by an unauthorized vehicle.

Electronic Parking License		
Operating frequency	SENSIT EPL EU: 868.2 MHz SENSIT EPL US: 902-928 MHz (FHSS) SENSIT EPL AU: 915-927 MHz (FHSS)	
Mounting	Attaches with suction pads to the windscreen on the inside of the car	
Weight	120 gram	(4.2 oz)
Dimensions	116 x 72 x 27 mm	(4.6 x 2.8 x 1.1 inch)
Color	Grey, RAL7016	
Protection	IP32	
Operating temperature	-40 … +85°C	(-40°F … +185°F)
Power supply	User replaceable AAA 1.5V alkaline batteries	
Antenna	Included	

2.5.2 SENSIT DISPLAY

The SENSIT Display is an in-network LED display that is part of the Wireless SENSIT Network (WSN). The LED display enables signage of free parking spaces for stand-alone parking guidance installations. The display is designed for outdoor use, indicating the number of available parking spaces per parking lot thus guiding motorists to the closest parking space.

Operating frequency	SENSIT DISPLAY EU: 868.2 MHz SENSIT DISPLAY US: 902-928 MHz (FHSS) SENSIT DISPLAY AU: 915-927 MHz (FHSS)
Display	Graphical display for outdoor use, single sided
Digit height	max. 3 digits 90 x 130 mm (3.5 x 5.1 in)
Dimensions	310 x 150 x 60 mm (12.2 x 5.9 x 2.4 inch)
Weight	1500 gram (52.9 oz)
Protection	IP55
Color	Black housing, Yellow LEDs
Readability	> 60 m (196 ft)
Viewing angle	120°
Operating temperature	0 ... +50°C (32°F ... +122°F)
Number of displays	Max. 2 displays can be used in the WSN, more displays will introduce to much latency for the whole system.
Power supply	230 VAC
Antenna	Included

2.6 SENSIT INTERFACE SOFTWARE

SENSIT Interface Software allowing easy system integration into enforcement, traffic guidance or parking guidance management application. The main features of the SENSIT Interface Software to help you and make easy system integration possible are:

- Installation
- Configuration
- Basic administration
- Integration

The SENSIT Interface Software enables easy installation of the wireless sensor network. Once the network and sensors are installed, the sensors will automatically appear in the software. Configuration of sensors to specific parking bays, parking zone and parking lot can easily be realized.

Additionally the software configures and monitors communication of the SENSIT node network. It monitors the data transfer between the sensors and the Data Collectors. Moreover it also analyzes communication reliability of the sensor network in a graphical map, automatically alerting areas for maintenance.

Easy integration can be done via to SOAP or REST interface.

SOAP or Simple Object Access Protocol, is a protocol specification for exchanging structured information. It relies on Extensible Mark-up Language (XML) for its message format.

The SOAP interface can query data from the SIS using the http(s) interface, the found data is returned in a XML description format.

Representational state transfer (REST) is a simple stateless architecture that generally runs over HTTP(S). REST involves reading a designated Web page that contains an XML file. The XML file describes and includes the desired content.

3 INSTALLATION PROCEDURE

3.1 HOW TO INSTALL THE SENSIT SYSTEM IN 4 STEPS

The installation of a SENSIT system can be described in 4-steps: The preparation, the installation of Data Collectors and Relay Nodes, the installation of SENSIT sensors and finally setting up the SENSIT Interface Software.

3.1.1 STEP 1 – PREPARATION

a. Arrange a scaled map of the site.
b. Make a site inspection to gather information:
   - Draw on the map where the parking bays are located.
   - Draw on the map where you can mount Relay Nodes
   - Draw on the map the possible locations for the Data Collector.
c. Make an installation plan:
   - Number every parking bays with a unique number.
   - Plan the final Relay Node and Data Collector locations to form a covering network.

Note
There is also a planning-tool (RelayNodeTool) available to plan the Relay Node and Data Collector locations. See chapter below for an example.

3.1.2 STEP 2 – DATA COLLECTORS AND RELAY NODE INSTALLATION

a. Install and power-up the Data Collector according the plan.
b. Activate and install the Relay Nodes according the plan.
c. Write the ID numbers of the Data Collectors and Relay Nodes at the right location in the plan.
d. Verify at the server that all Data Collectors and Relay Nodes are online.

3.1.3 STEP 3 – SENSIT INSTALLATION

a. Free the bays and close off the parking area.
b. Mark the right location at the road surface with a piece of chalk or paint.
c. Distribute the SENSIT sensors at the, to be installed locations and activate them with the magnet.
d. Make a list of the correct ID numbers and bay numbers.
e. Verify at the server if all SENSIT sensors come online.
f. Drill the holes and glue the SENSIT sensors.
g. Calibrate the SENSIT sensors without cars or metal tools in the neighborhood of the SENSIT's.

Note
Ask your Nedap account manager for special installation tools to configure, calibrate and register the ID to bay bindings.

3.1.4 STEP 4 – SETTING UP THE SENSIT INTERFACE SOFTWARE

a. Make a (simple) Inkscape drawing of the site based on the map and gathered information during STEP 1 and STEP 2.
   - Draw the Relay Nodes and Data Collectors at the right locations
   - Draw the bays at the right locations
b. Upload the SVG-drawing to the server.
c. Make a correct CSV-file and upload it to the server.
d. Verify if all Data Collectors, Relay Nodes and SENSIT sensors show up correctly in the system.

Note
Inkscape is an open-source drawing program to create the SVG (Scalable Vector Graphic) drawing.

4 RELAYNODETOOL

The RelayNodeTool software is developed to get a good estimation of the needed system components; Data Collectors and Relay Nodes. The estimation of needed components is based on drawings of the site. In this way you are able to get a good idea of the needed components.

In this example we are going to design the SENSIT system for two segments; the parking basement and the outside parking terrain at the Nedap Headquarter office.

4.1 SCALED DRAWING

First get a drawing of the parking lot(s) and find out if it are open areas or closed (indoor) areas. Try to get information about mounting locations, like lampposts and poles for Relay Nodes and power and internet for the Data Collector. Below you can find a map of the Nedap Headquarter office, with its parking areas.

Note

Please keep in mind that with help of this RelayNodeTool you can determine the needed components, but it will always be an estimation.
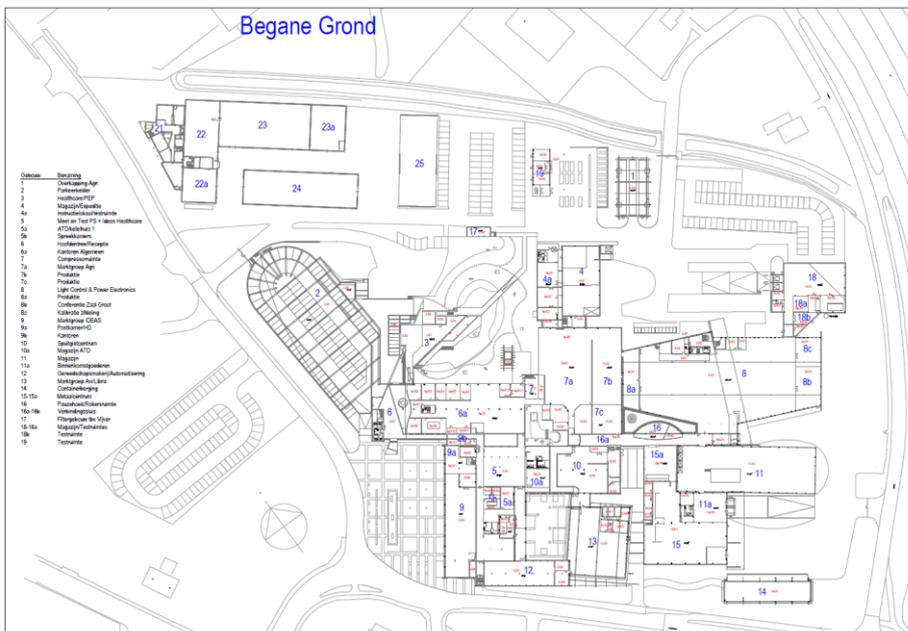
Figure 2: Example drawing of parking lots.

The drawing of a segment can be copied out of the larger map e.g. via the standard Snipping Tool of Windows.
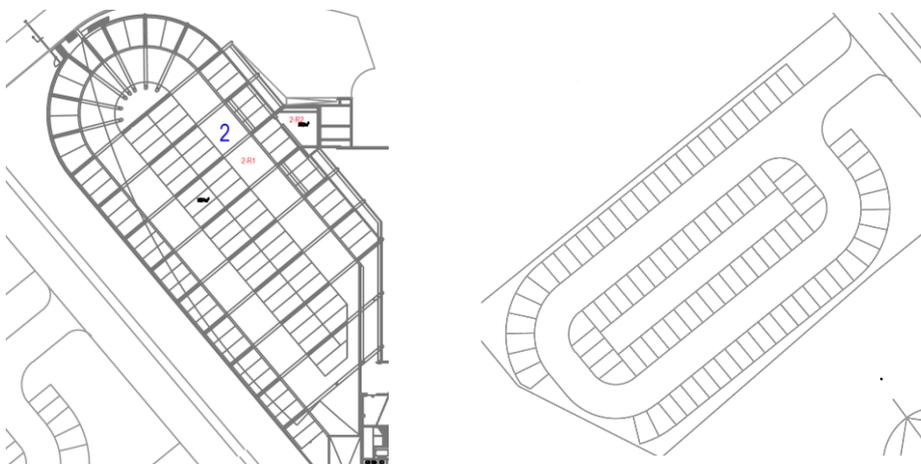
Figure 3: The Basement and the outside area.

4.2   START A NEW PROJECT

Fill-in the project details; the project title, your name and you company name. Please also indicate the country and region where the project is situated.

Figure 4: RelayNodeTool: Project details

4.3   THE FIRST SEGMENT

Via the option Segment -> Add new segment, or click on the tab <new> you can add a segment to the design. Fill-in the segment properties; the segment name and the number of parking bays.

Note

The Relay Node Tool will give you a warning if you have more than 500 bays in a segment. With more than 500 bays, segmentation is necessary. Please contact your Nedap account manager for more information.

Figure 5: RelayNodeTool: Segment properties

4.3.1 IMPORT MAP

First import the drawing via the Paste from clipboard option or open the map image file.
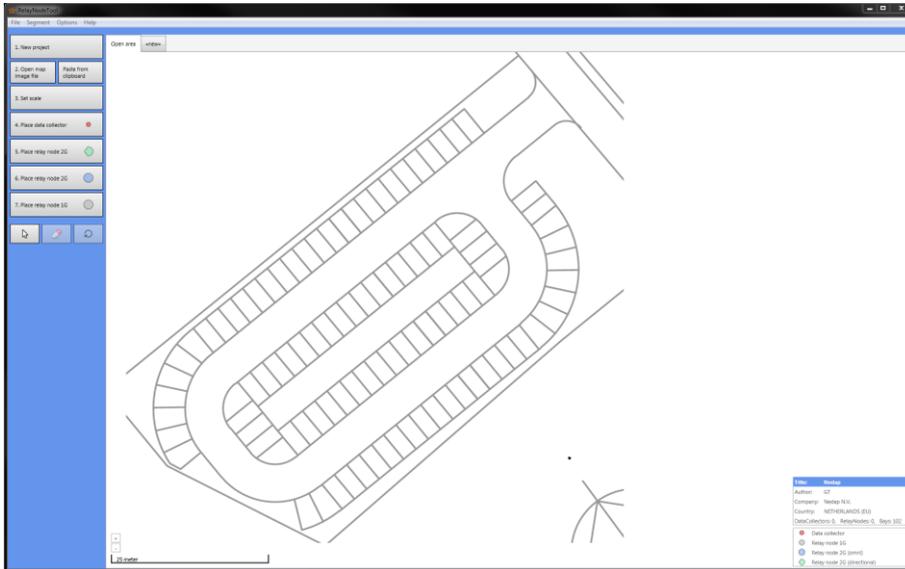
Figure 6: RelayNodeTool: Map import.

4.3.2 SET THE SCALE

Now set the scale, for an open area you set it at 25m if there isn't a clear indication about the size you can use the width of 10 parking bays:
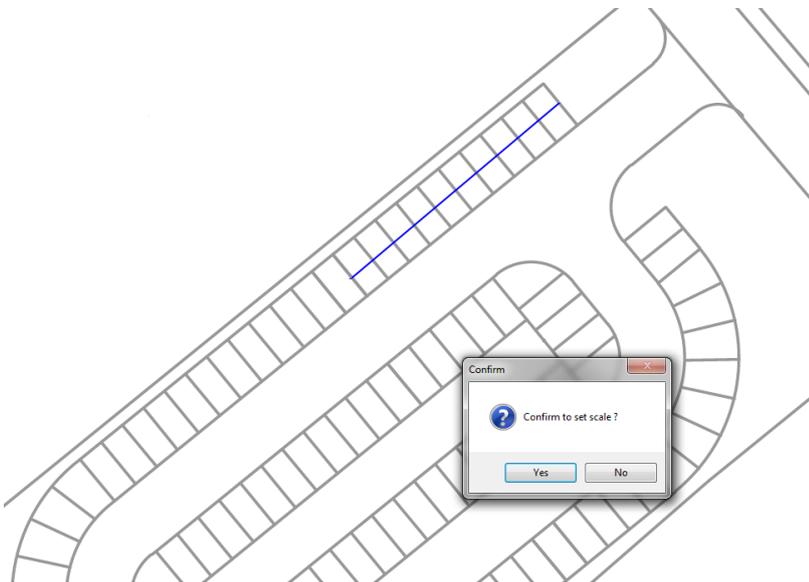
Figure 7: RelayNodeTool: Scaling of the map.

4.3.3   PLACE THE DATA COLLECTOR

Place at least one Data Collector for every 250 bays. Use the information you already gathered or ask the client for the installation options for the Data Collector(s). At least you need a power connection and for a standard Data Collector you also need an internet connection.
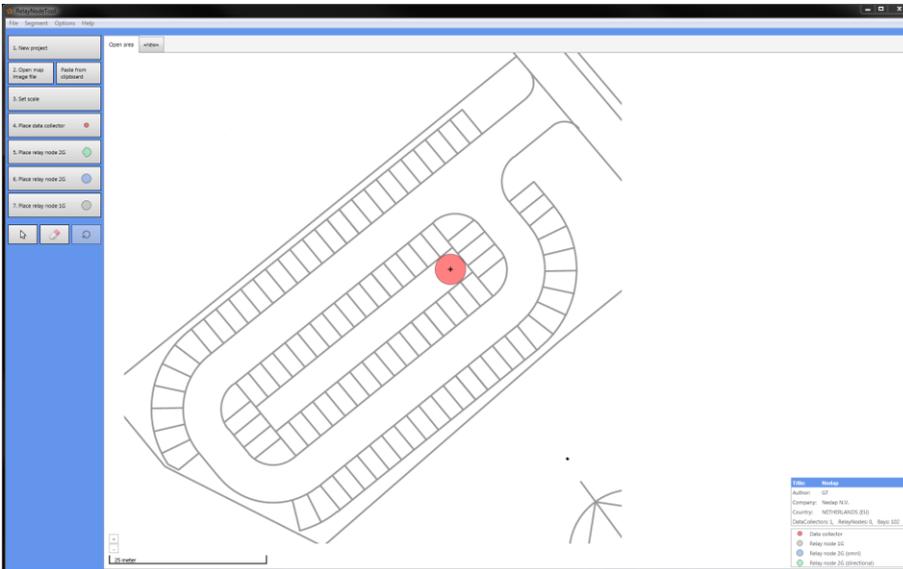
Figure 8: RelayNodeTool: DataCollector placement.

4.3.4   PLACE THE RELAY NODE

Place the Relay Nodes at locations were you can mount it e.g. at lampposts in a way that it covers all parking bays. With the tool you can choose between Relay Nodes 2G (omni- or directional) or Relay Nodes 1G.

Note
The Relay Node Tool will give you a warning if you have more than 16 Relay Nodes in a segment. With more than 16 Relay Nodes, segmentation might be necessary. Please contact your Nedap account manager for more information.
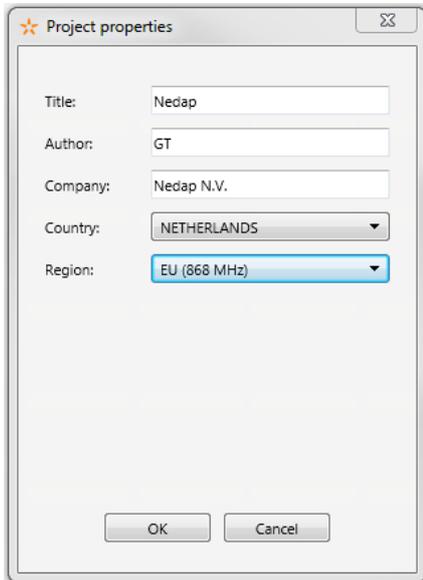

Figure 9: RelayNodeTool: RelayNode placement.

4.4   THE SECOND SEGMENT

Via the option Segment -> Add new segment, or click on the tab <new> you can add a segment to the design. Fill-in the segment properties; the segment name and the number of parking bays.
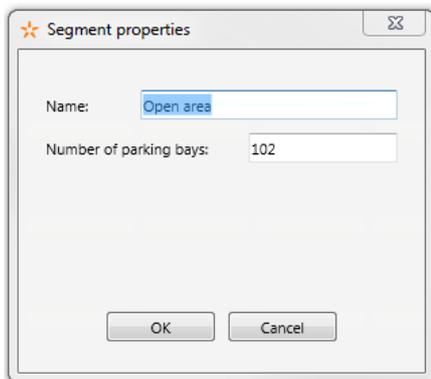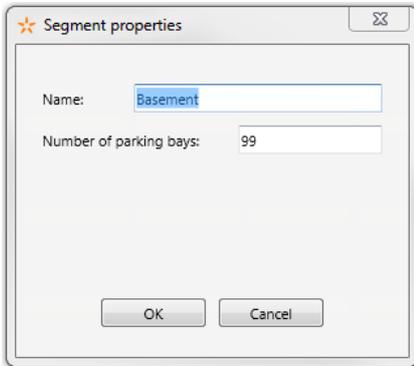

Figure 10: RelayNodeTool: Segment properties

4.4.1   IMPORT MAP

Also import the drawing for the second segment via the Paste from clipboard option or open the map image file.
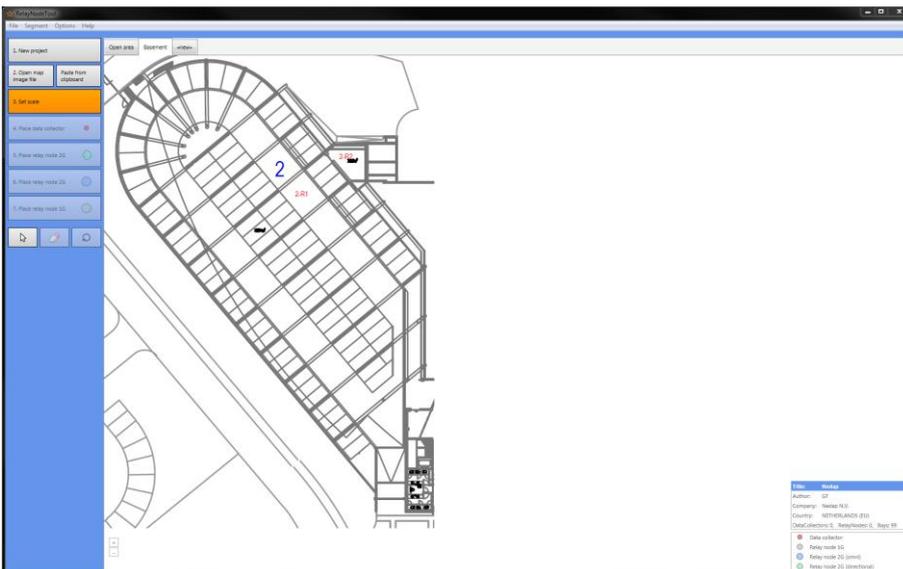
Figure 11: RelayNodeTool: Map import for the second segment.

4.4.2   SET THE SCALE

Also Set the scale, this location is a parking basement with a roof, large concrete columns and walls. This will influence the range of the Relay Nodes and therefore we advise to reduce the range with about 20%, so set the range to about 20m e.g. the width of 8 parking bays.
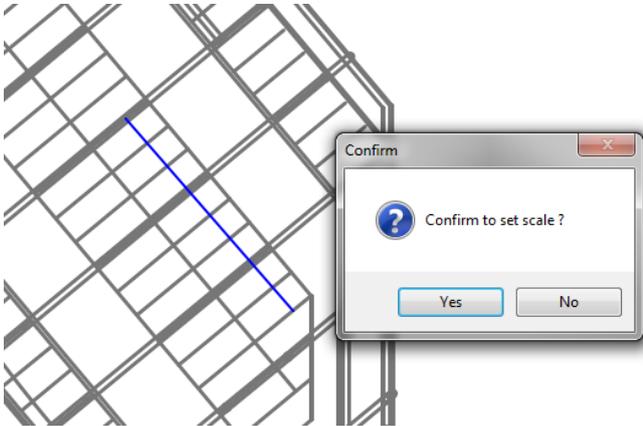
Figure 12: RelayNodeTool: Scaling of the map.

4.4.3   PLACE THE DATA COLLECTOR

Because this basement parking area is half open we can use the Data Collector of the open area, so we don't need to add one for this segment.

4.4.4 PLACE THE RELAY NODE

Place the Relay Nodes at locations were you can mount it e.g. at lampposts in a way that it covers all parking bays. With the tool you can choose between Relay Nodes 2G (omni- or directional) or Relay Nodes 1G.
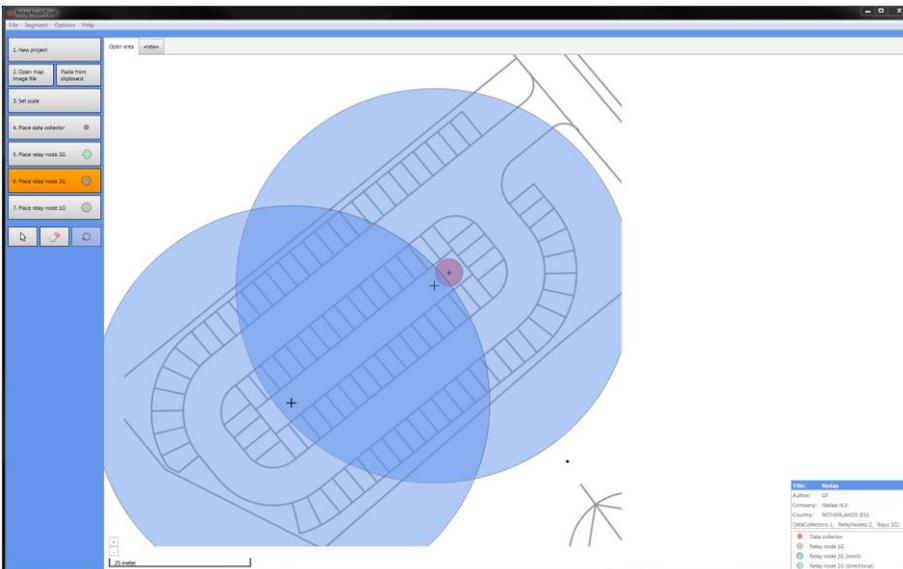
There are 2 large concrete walls and after every 3 parking bays there is large concrete pillar, all is indicated with red. This will influence the range and radiation pattern of the Relay Nodes.
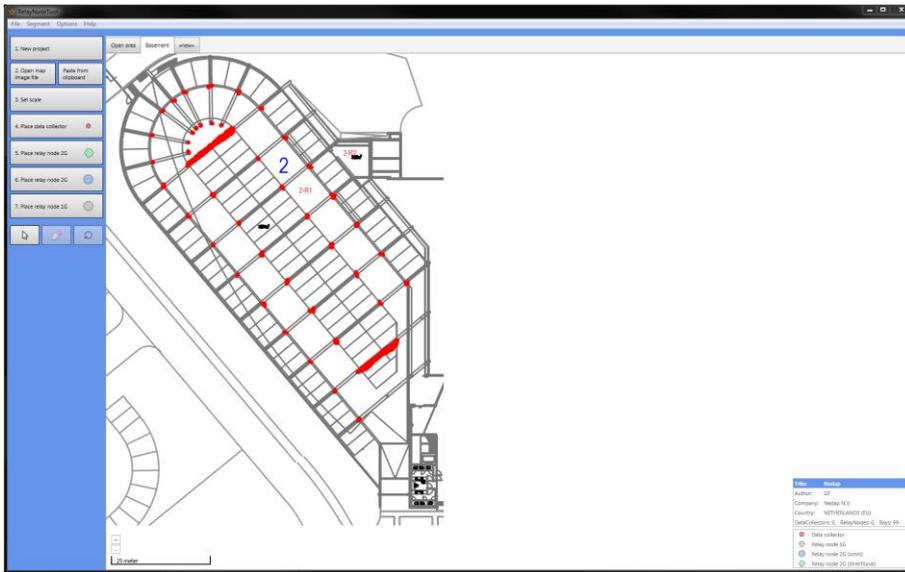
Figure 13: Imported map with concrete wall and pillar indication.

Probably with only 3 Relay Nodes 2G it is possible to get coverage of all bays, but because of these large influencing concrete objects we used 2 Relay Nodes 2G extra to make sure all SENSIT sensors are sufficient reachable.

Figure 14: RelayNodeTool: RelayNode placement

4.5   SAVE THE PROJECT

Now you can save the project file:
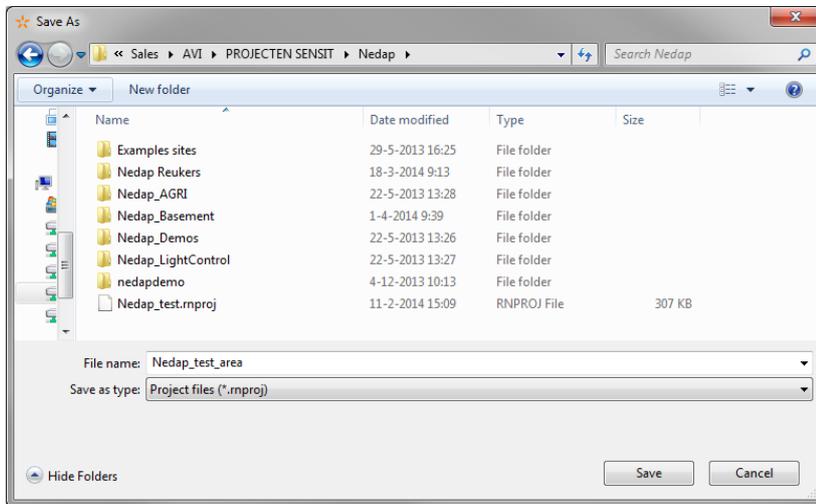
Figure 15: RelayNodeTool: Project save.

4.6   EXPORT PROJECT FILES

4.6.1   PROJECT FILE

You can send the project file (*.rnproj) to a colleague or Nedap so it can be reviewed.

4.6.2   SAVE AS IMAGE

You can save the segments you have designed to an image file, via the option File -> Save image (current segment and use it in your offer.

4.6.3   PRINT PROJECT

You can print the project file to a normal printer or to a PDF printer like the free PDF writer CutePDF (http://www.cutepdf.com/) and use this in your offer.

4.7   REQUEST PROJECT REVIEW

You can also request Nedap to review the project you have designed. Fill-in: your name, company, email address and phone number and write your comments on the design. With this information and the automatically added *.rnproj file Nedap can give you advise on the design.
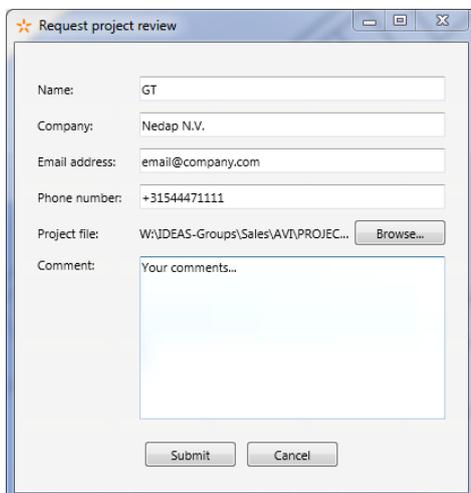
Figure 16: RelayNodeTool: Project review request

5 INSTALLATION DATA COLLECTOR

The Data Collector is available in two different versions. The installation of the standard Data Collector is described in chapter 5.3. The installation of a Data Collector GPRS, which has an IP65 weatherproof housing and features a GPRS modem, is described in chapter 5.4.

5.1 SAFETY PRECAUTIONS

The following safety precautions should be observed during normal use, service and repair.

- The Data Collector may only be installed and serviced by qualified service personnel.
- Disconnect the power supply before removing or installing any parts.
- To be sure of safety, do not modify or add anything to the Data Collector other than mentioned in this manual or indicated by NEDAP N.V.

5.2 FCC AND IC DECLARATIONS

FCC ID: CGDSENSDATA and IC: 1444A-SENSDATA

Compliance statements (part15.19)

This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada. 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.

Cet appareil se conforme aux normes RSS210 exemptés de license du Industry Canada. L'opération est soumis aux deux conditions suivantes: (1) cet appareil ne doit causer aucune interférence, et (2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Warning (part15.21)

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

RF Exposure (OET Bulletin 65)

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Information to the User (Part 15.106(b))

Note: This equipment generates, uses and can radiate radio frequent 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 not cause harmful interference to radio or television reception, which can be determine 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.

5.3 DATA COLLECTOR INSTALLATION

5.3.1 MOUNTING

The Data Collector can be mounted in a central enclosure, however please ensure that the enclosure is not made of metal. The Data Collector is featured with RF communication with the SENSIT. The material used for the enclosure should be transparent for RF signals.

Locate an appropriate position for the Data Collector, preferable on a location where power and communication is available (normally around the gate). Use the four keyholes to mount the Data Collector in the enclosure.
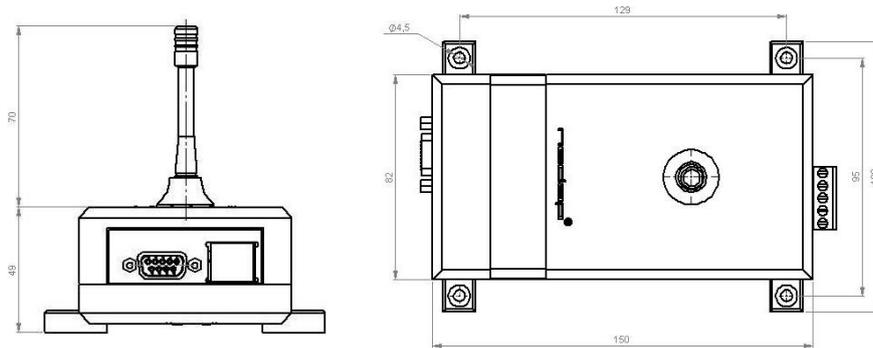
Figure 17: Data Collector dimensions (mm)
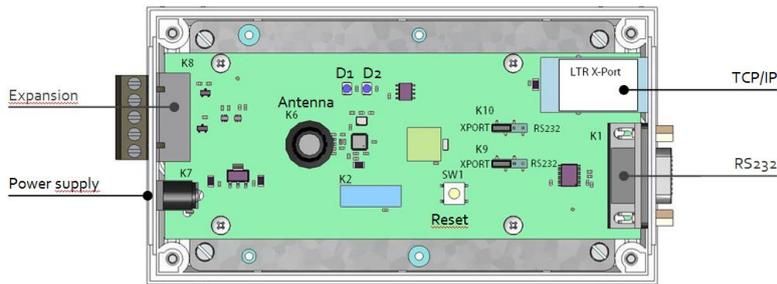
Figure 18: Data Collector connections

5.3.2   POWER SUPPLY

The Data Collector requires 5 VDC power, this power supply is included. The included adapter requiring AC power supply in the range from 100 – 240VAC. Maximum current consumption is 0.35A @ 240VAC. Adapter needs to be:

- CSA and UL approved according to NEC Class 2
- FCC compliant to Part 15
- CE compliant according to EMC and LVD directive (EN 60950-1)
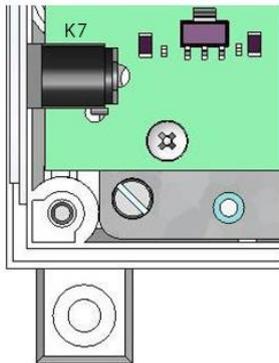
Figure 19: Power supply

5.3.3   TCP/IP COMMUNICATION

The Data Collector has on-board TCP/IP communication. The TCP/IP communication is used to send the messages from the SENSIT vehicle detections sensors to the SENSIT server software. See chapter 6.1 for details to configure the TCP/IP settings.

5.3.4   ANTENNA

The Data Collector is featured with an antenna for communication with the SENSIT nodes within the network. To enable reliable identification ensure to mount the Data Collector in an enclosure which is transparent for RF signals. The antenna is connected via the SMA 50 jack connector (K6) on the PCB.

5.3.5   LED INDICATIONS

The Data Collector is featured with two LEDs. Table 1 below describes the function of the LEDs.

Data Collector LED indication.	
Green (D1)	LED indicating the presence of the SENSIT network. A blink indicates that a SENSIT is active in the network.
Red (D2)	Each blink indicates the start of a timeslot (start) in the network

Table 1: LED indications

5.4 DATA COLLECTOR GPRS INSTALLATION

5.4.1 MOUNTING

The Data Collector GPRS can be installed virtually anywhere due to its IP65 weatherproof housing and embedded GPRS wireless modem. The only requirements are an AC mains power supply and that it should be installed within reach of the SENSIT wireless network.
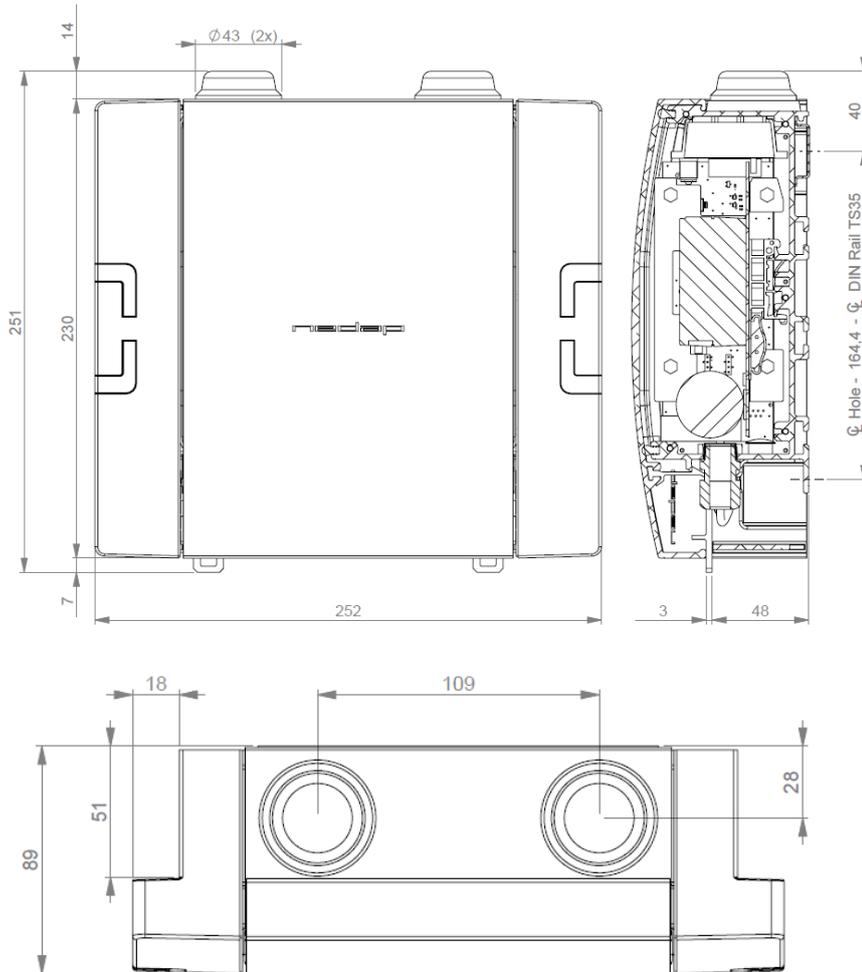
Figure 20: Data Collector IP65 GPRS dimensions (mm)

5.4.2 BACKUP BATTERY

Inside the Data Collector GPRS there is a backup battery. This battery is not connected when the Data Collector leaves the factory. During transport it should be disconnected.

The backup battery is used to keep alive the SENSIT wireless network in case the Data Collector is powered off temporarily.

When the SENSIT sensors cannot reach the Data Collector for a while, they will automatically go into a power saving sleep mode. In this sleep mode they check only once every 1 to 4 hours if the wireless network is active. The backup battery will prevent the sensors from falling asleep. Note that the communication with the SENSIT server software is not maintained with this backup battery.

Connect the backup battery to its connector just before connecting the AC mains power supply.
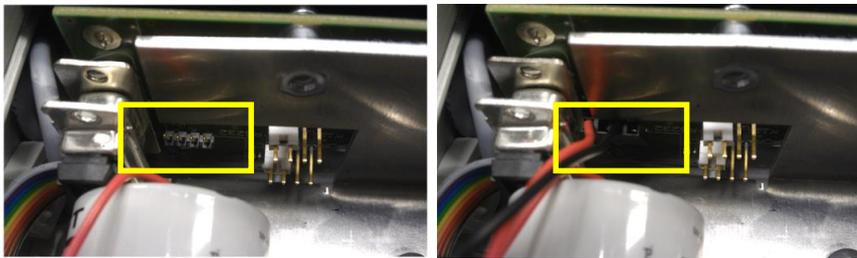
Figure 21: Backup battery connection

5.4.3 POWER SUPPLY

Connect an AC mains power supply to the Data Collector GPRS.
Input requirements: 100 – 240VAC 50/60Hz.
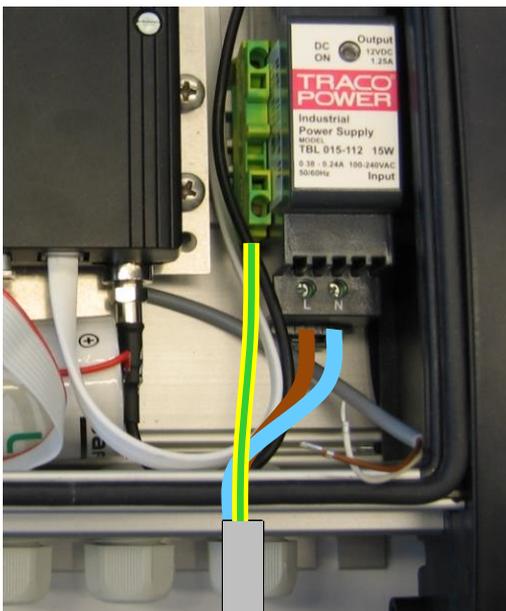
Figure 22: Power supply connection

5.4.4 SIM CARD

Push the small button (see yellow arrow) with a small screwdriver or pin, to eject the SIM card holder from the modem. Insert the SIM card and slide it back into the modem housing. For details about the GPRS configuration, see chapter 6.2.

Note
Make sure your remove the pin code from your SIM-card e.g. by using your mobile phone.

Figure 23: SIM Card installation

5.4.5 ANTENNA

The Data Collector is featured with two antennas. One for communication with the SENSIT nodes and the other is the GPRS antenna.

6 DATA COLLECTOR CONFIGURATION

6.1 TCP/IP CONFIGURATION

The standard Data Collector has on-board TCP/IP communication. The TCP/IP communication is used to send the messages from the SENSIT vehicle detections sensors to the SENSIT Interface Software running on the server.

The default fixed IP-address for the Data Collector is 192.168.1.2. Configuration can be done using a web browser. Click OK when the Authentication popup appears.

Next the SENSIT server settings should be configured. These settings are provided to you when the SENSIT Interface Software (SIS) is installed on the server.

Figure 24: Data Collector TCP/IP configuration

Enable the standard Data Collector to automatically establish the connection with the SENSIT Interface Software running at the server:

Channel 1 – Connection - Connect Mode - Active Connection: **Auto Start**.

Setup the SENSIT Server IP-address and port-number:
Channel 1 – Connection - Endpoint configuration - Auto increment for active connect: **check**
Channel 1 – Connection - Endpoint configuration - Remote Host: **<SERVER IP-ADDRESS>**
Channel 1 – Connection - Endpoint configuration - Remote Port: **<PORT NUMBER>**

Click OK to confirm the settings.
Click Apply settings to write the settings into the Data Collector.

Note
The Data Collectors automatically connect to the server via internet. Please make sure that the IP-address and assigned port is open in your firewall.

6.2   GPRS CONFIGURATION

The GPRS modem inside the Data Collector GPRS needs to be configured before it can access the internet and connect to the SENSIT Interface Software at the server. This is done by sending 2 SMS text messages to the Data Collector GPRS. Any GSM cell phone can be used to send these configuration text messages.

First the APN settings should be configured. These settings depend upon the mobile network provider. The settings are sent in a SMS message using the following format:
PROFILE:APN=<apn>;APNLOGIN=<login>;APNPASSWORD=<pwd>;DNS=<dns>;

Where: <apn>   APN (Access Point Name)
               <login>   User name
               <pwd>   Password
               <dns>   DNS (Domain Name Server)

Example:
PROFILE:APN=gprsinternet;APNLOGIN=gprs;APNPASSWORD=;DNS=;

Next the SENSIT server settings should be configured. These settings are provided to you when the SENSIT Interface Software (SIS) is installed on the server. The settings are sent in a SMS message using the following format:

PROFILE:HOSTNAME=<server>;PORT=<port>;SSL=<ssl>;
Where: <server>   SENSIT server hostname or ip-address
               <port>   Port number
               <ssl>   true / false depending if SSL security is used.

Note
Make sure the SMS does not get longer than the default message size of 160 characters.

Example:
PROFILE:HOSTNAME=217.114.111.246;PORT=10000;SSL=false;

6.3   GPRS MODEM LED BEHAVIOR

At the GPRS modem there is an indication LED (see yellow circle) that gives you some feedback about the status of the GPRS modem. It is a dual color LED; red and amber.

Figure 25: GPRS Modem status LED

6.3.1   RED LED

If the LED flashes red a packet is transmitted.

6.3.2   AMBER LED

Below you can find a description of the behavior of the amber colored LED:

- **Permanently off**

   Modem is in one of the following modes:

   Power Down, Airplane, Charge Only, Non-Cyclic Sleep Or Cyclic Sleep

- **600 ms on / 600ms off**

   Limited Network Service:

   No SIM card inserted, no PIN entered, network search in progress, ongoing user
   authentication or network login in progress.

- **75 ms on / 3 s off**

   IDLE mode:

   The modem is registered to the GSM network. No call is in progress.

- **75 ms on / 75 ms off / 75 ms on / 3 s off**

   The modem is actively connected to the GPRS network. In this state the modem is
   able to communicate with the SENSIT Server.

6.4   VERIFY COMMUNICATION

Via the SENSIT Interface Software (SIS) a more detailed description can be found in chapter
13.1. After choosing: Detection ➜ Data Collector choice at the left side of the screen. The
powered and to the internet connected Data Collector, should show up automatically in the
Data Collectors connected list.

Remove	Enable	Hostname or IP address	Port	Parameters
Update list				

Data collectors connected

List	Hostname or IP address	Port	Connect date
☐	109.34.172.231	1024	🔒 Fri 31 January 2014 03:34:45
	Number of server connection is 1 of max 5		

7 MOUNTING THE RELAY NODE 2G

7.1 SAFETY PRECAUTIONS

The following safety precautions should be observed during normal use, service and repair:

- The Relay Node only be installed and serviced by qualified service personnel.
- To be sure of safety, do not modify or add anything to the SENSIT Relay Node 2G other than mentioned in this manual or indicated by Nedap N.V.

7.2 FCC AND IC DECLARATIONS

FCC ID: CGDRELAY and IC: 1444A-RELAY

Compliance statements (part15.19)

This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada. 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.

Cet appareil se conforme aux normes RSS210 exemptés de license du Industry Canada. L'opération est soumis aux deux conditions suivantes: (1) cet appareil ne doit causer aucune interférence, et (2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Warning (part15.21)

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

RF Exposure (OET Bulletin 65)

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Information to the User (Part 15.106(b))

Note: This equipment generates, uses and can radiate radio frequent 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 not cause harmful interference to radio or television reception, which can be determine 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.

7.3   DIMENSIONS

See Figure 26 for the dimensions (in mm) of the Relay Node 2G unit.
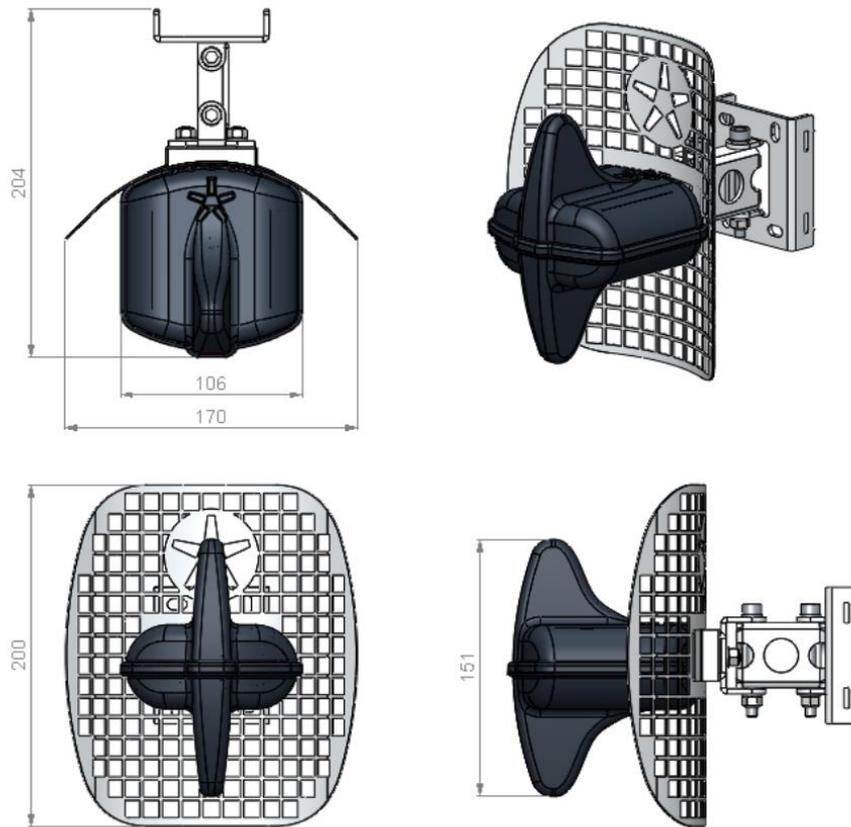
Figure 26: Dimensions Relay Node 2G (mm)

7.4   INSTALLATION CONDITIONS

The installation recommendation is based on the following environmental conditions;

* Dry weather conditions.

7.5   REQUIRED INSTALLATION MATERIALS

The following would be required for mounting of the SENSIT Relay Node 2G.

* Special Equipment: Ladder, Bucket-truck or an aerial platform
* TORX screw driver: T20
* Allen key: no. 5
* Wrench: size 10

7.6   INSTALLATION PROCEDURE

Below the mounting procedure for the Relay Node 2G. The Relay Node 2G features visual status feedback using two LED indicators: a green and a red LED.

SENSIT Relay Node 2G mounting procedure		
Step 1: Mounting	Mount the reflector and top of the housing on the pole or wall. With the Nedap asterisk at the top. The Relay Node 2G can also be mounted without the reflector for an omni-directional radiation pattern.	
Step 2: Power the Relay Node	Remove the isolation tabs, to power up the Relay Node.	
Step 3: Verify start-up	Green LED starts blinking fast (duration: 15 sec.), indicating that battery power has been connected correctly.	
Step 4: WSN search	Red LED starts to blink slowly. This indicates that the Relay Node didn't found an active WSN (wireless SENSIT Network) yet. It is searching for a WSN.	
Step 5: WSN found	Green LED starts slow blinking and red LED is turned off. This indicates that a WSN has been found.	
Step 6: Final installation	Now the Relay Node electronics can be installed at the pole or wall with a TORX (T20) screw driver.	

Note
The Green and Red feedback LED's are located in the yellow circle.

Note
After 15 minutes LED feedback is turned off, to save battery power.

Note
After 1 minute the LED feedback is turned off, to save battery power.

7.7 BATTERY REPLACEMENT

When the battery life of the Relay Node 2G fails after specified lifetime, the batteries can be changed make sure you use the right batteries:

D-cell Lithium Thionyl Chloride batteries (Li-SOCl$_2$) 3.6V, recommended types are:
- SAFT | LS 33600
- XENO | XL-205F

SENSIT Relay Node 2G battery replacement		
Step 1: Opening the housing	Open the Relay Node 2G housing by unscrewing the TORX, T20 screw.	
Step 2: Replace the batteries	Remove the old batteries and dispose them in the correct manner. Place the new 3.6V Lithium (Li-SOCL$_2$) batteries (see suggested types above) and make sure the polarity is correct, as indicated.	
Step 3: Verify start-up	Green LED starts blinking fast (duration: 15 sec.), indicating that battery power has been connected correctly.	
Step 4: WSN search	Red LED starts to blink slowly. This indicates that the Relay Node didn't found an active WSN (wireless SENSIT Network) yet. It is searching for a WSN.	
Step 5: WSN found	Green LED starts slow blinking and red LED is turned off. This indicates that a WSN has been found.	
Step 6: Final installation	Now the Relay Node electronics can be installed at the pole or wall with a TORX (T20) screw driver.	

Note
The Green and Red feedback LED's are located in the yellow circle.

Note
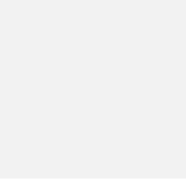After 15 minutes LED feedback is turned off, to save battery power.

Note
After 1 minute the LED feedback is turned off, to save battery power.

8 MOUNTING THE SENSIT IR

8.1 SAFETY PRECAUTIONS

The following safety precautions should be observed during normal use, service and repair:

- The SENSIT IR may only be installed and serviced by qualified service personnel.
- To be sure of safety, do not modify or add anything to the SENSIT IR other than mentioned in this manual or indicated by NEDAP N.V.

8.2 FCC AND IC DECLARATIONS

FCC ID: CGDSENSNODE and IC: 1444A-SENSNODE

Compliance statements (part15.19)

This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada. 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.

Cet appareil se conforme aux normes RSS210 exemptés de license du Industry Canada. L'opération est soumis aux deux conditions suivantes: (1) cet appareil ne doit causer aucune interférence, et (2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Warning (part15.21)

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

RF Exposure (OET Bulletin 65)

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Information to the User (Part 15.106(b))

Note: This equipment generates, uses and can radiate radio frequent 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 not cause harmful interference to radio or television reception, which can be determine 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.

8.3   DIMENSIONS

The SENSIT IR is designed for mounting into the floor of a parking space. See Figure 27 for the dimensions of the unit in mm.
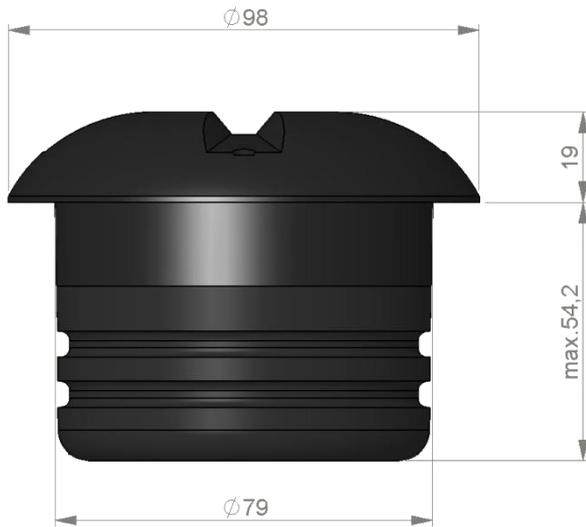
Figure 27: Dimensions SENSIT IR (mm).

8.4   INSTALLATION CONDITIONS

The installation recommendation is based on the following environmental conditions;

- Ambient temperature between 5 to 40 °C (41 to 104 °Fo
- Dry weather conditions
- Surface based on concrete, asphalt or pavement

8.5   REQUIRED INSTALLATION MATERIALS

The following would be required for mounting of the SENSIT IR.

- Equipment: Automatic core drill
- Drill size: Dimensions Ø 85 mm (3.35 in)
- Drill depth: 55 mm (2.16 in)
- Filler material: Liquid rapid mortar
- Required amount per sensor: Approx 100 ml

We have good results with the rapid mortar TM 5R. See appendix B for specifications.
Ensure to follow the guidelines and instructions as outlined on the filler material.

8.6   INSTALLATION PROCEDURE

Below the mounting procedure for the SENSIT sensor.

SENSIT sensor mounting procedure		
Step 1: Preparation	Indicate on the closed parking lot where the SENSIT sensor should be mounted. Distribute the SENSIT sensors over the parking lot and write down the correct ID numbers on your installation plan.	
Step 2: Drilling	Drill a hole of Ø 85 mm [3.35 in] and at least 55 mm [2.16 in] deep into the centre of the parking bay	
Step 3: Gluing	Apply the right amount of filler and pour into the hole.	
Step 4: Mounting	Double-check the node ID number and the parking bay on the installation plan and place the SENSIT sensor into the hole.	
Step 5: Cleaning-up	After mounting the SENSIT sensors in all parking bays or a selection of parking bays. Clean up the parking bays and remove all (metal) tools and objects.	
Step 6: Activating	All SENSIT sensors are set into transport/stock mode during shipment. After installation all mounted SENSIT sensors must be swept with the reset magnet.	
Step 7: Calibrating	After installation the SENSIT sensor must be calibrated. Ensure that the parking space is empty and that there is no car parked on top of the sensor or on neighboring parking bays. SENSIT sensors can be calibrated via the SENIST Interface Software (SIS). See chapter 13.6.6 for more information about calibration.	
Step 8: Glue curing	Leave the filler harden for 8 hours before vehicles are allowed in the parking space again.	

Note
Take attention that you fixate the SENSIT sensor during the curing time otherwise the sensor will start to float.

Note
Once out of the transport/stock mode the battery lifetime starts to count.

Note
When the SENSIT sensors are not calibrated they hardly send any messages. This is due to the fact that there are no events generated because the magnetic thresholds are not crossed.

8.7   REPLACEMENT

When the battery life of the SENSIT IR fails after specified lifetime, we advise to replace the unit completely. The SENSIT IR is fully sealed and for outdoor use, therefore batteries cannot be replaced.
Drill out the old SENSIT IR and complete the mounting procedure as describe in the previous paragraph.

Ensure to note the node ID number of the SENSIT IR to the parking bay. Update the parking bay configuration list in the SIS software to ensure the new sensor is linked to the right parking bay.

9   MOUNTING THE SENSIT FLUSH MOUNT

9.1   SAFETY PRECAUTIONS

The following safety precautions should be observed during normal use, service and repair.

- The SENSIT Surface Mount may only be installed and serviced by qualified service personnel.
- To be sure of safety, do not modify or add anything to the SENSIT Surface Mount other than mentioned in this manual or indicated by NEDAP N.V.

9.2   FCC AND IC DECLARATIONS

FCC ID: CGDSENSNODE and IC: 1444A-SENSNODE

Compliance statements (part15.19)

This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada. 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.

Cet appareil se conforme aux normes RSS210 exemptés de license du Industry Canada. L'opération est soumis aux deux conditions suivantes: (1) cet appareil ne doit causer aucune interférence, et (2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Warning (part15.21)

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

RF Exposure (OET Bulletin 65)

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Information to the User (Part 15.106(b))

Note: This equipment generates, uses and can radiate radio frequent 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 not cause harmful interference to radio or television reception, which can be determine 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.

9.3   DIMENSIONS

The SENSIT Flush Mount is designed for full mounting into the floor of a parking space. As the unit is fully flush with the road surface the unit is snow plough resistant. The SENSIT Flush Mount is only featured with magnetic detection. See Figure 28 for the dimensions of the unit in mm. The top of the SENSIT Flush Mount is laser engraved with the node ID number.
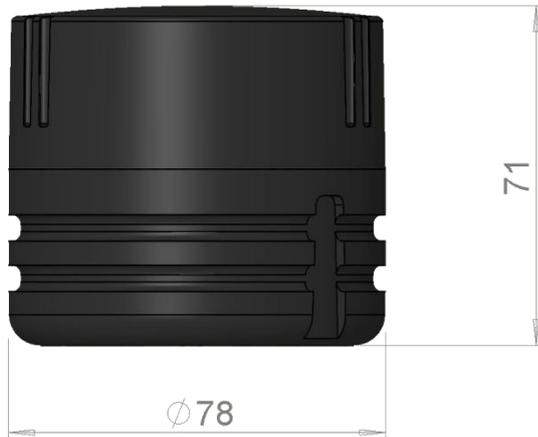

Figure 28: Dimensions SENSIT Flush mount (mm).

9.4   INSTALLATION CONDITIONS

The installation recommendation is based on the following environmental conditions;

- Ambient temperature between 5 to 40 °C [41 to 104 °F]
- Dry weather conditions
- Surface based on concrete, asphalt or pavement

9.5   INSTALLATION MATERIAL

The following would be required for mounting of the SENSIT FLUSH MOUNT.

- Equipment: Automatic core drill
- Drill size: Dimensions Ø 85 mm (3.35 in)
- Drill depth: 75 mm (2.95 in)
- Filler material: Liquid concrete mortar
- Required amount per sensor: Approx. 100 ml

We have good results with the rapid mortar TM 5R. See appendix B for specifications. Ensure to follow the guidelines and instructions as outlined on the filler material.

9.6   INSTALLATION PROCESS

Installation process as described in paragraph 8.6, however with above mentioned drilling depth. See figure below for more details about the mounting depth of the SENSIT Flush Mount, dimensions in mm.
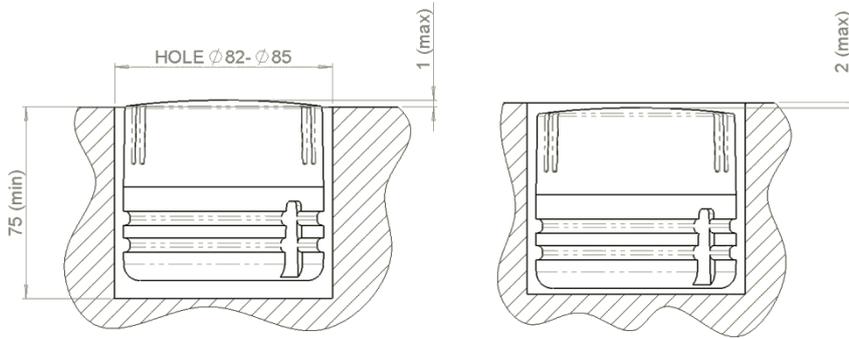

Figure 29: Mounting depth SENSIT Flush mount (mm).

9.7   REPLACEMENT

When the battery life of the SENSIT Flush Mount fails after specified life time, we advise to replace the unit completely. The SENSIT Flush Mount is fully sealed, therefore batteries cannot be replaced. Drill out the old SENSIT Flush Mount and complete the mounting procedure as described in paragraph 8.6.

Ensure to note the node ID number of the SENSIT IR to the parking bay. Update the parking bay configuration list in the SIS software to ensure the new sensor is linked to the right parking bay.

10 MOUNTING THE SENSIT SURFACE MOUNT

The SENSIT Surface Mount is designed for installations where the sensors cannot be drilled into the parking space e.g. multi storey car parks and rooftop car parks or existing car parks.

10.1 SAFETY PRECAUTIONS

The following safety precautions should be observed during normal use, service and repair.

- The SENSIT Surface Mount may only be installed and serviced by qualified service personnel.
- To be sure of safety, do not modify or add anything to the SENSIT Surface Mount other than mentioned in this manual or indicated by NEDAP N.V.

10.2 FCC AND IC DECLARATIONS

FCC ID: CGDSENSITSM and IC: 1444A-SENSITSM

Compliance statements (part15.19)

This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada. 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.

Cet appareil se conforme aux normes RSS210 exemptés de license du Industry Canada. L'opération est soumis aux deux conditions suivantes: (1) cet appareil ne doit causer aucune interférence, et (2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Warning (part15.21)

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

RF Exposure (OET Bulletin 65)

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Information to the User (Part 15.106(b))

Note: This equipment generates, uses and can radiate radio frequent 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 not cause harmful interference to radio or television reception, which can be determine 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.

10.3 DIMENSIONS

The SENSIT Surface Mount can easily be glued onto the surface of a parking space. The unit consists of two components;

* Sensor core; the black core is the vehicle detection sensor. This unit can be replaced after end of battery life.
* Mounting ring; the mounting ring allows easy installation onto the surface of a parking space.

See Figure 30 for the dimensions of the unit, dimensions in mm. The top of the SENSIT Surface Mount is laser engraved with the node ID number.
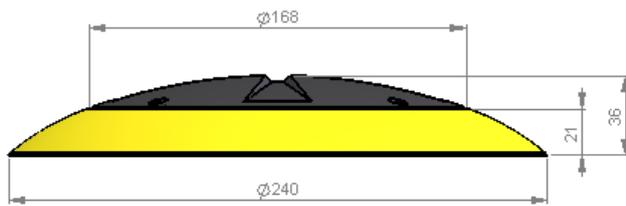

Figure 30: Dimensions SENSIT Surface Mount (mm).

10.4 REQUIRED INSTALLATION MATERIALS

The following would be required for mounting of the SENSIT FLUSH MOUNT.

* Equipment: Pneumatic kit dispenser
* Filler material: MSP or PU glue
* Required amount per sensor: Approx. 150 ml

Note
See Appendix 16B and 16C for more information about the recommended MSP or PU glue.

10.5 INSTALLATION PROCESS
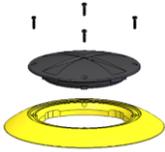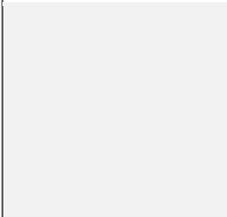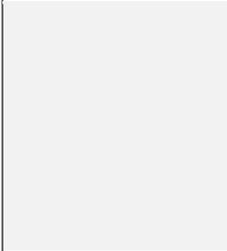
Follow the recommended installation procedure for the SENSIT Surface Mount as described below.

SENSIT Surface Mount mounting procedure			
Step 1: Preparation	Indicate on the closed parking lot where the SENSIT sensor should be mounted. Clean the location where the sensor should be mounted. Distribute the SENSIT sensors over the parking lot and write down the correct ID numbers on your installation plan.		
Step 2: Gluing	Pour the filler into the mounting ring of the SENSIT Surface Mount. A pneumatic kit dispenser makes it easy to apply the glue into the mounting ring. For good fixture with the surface please fill the entire mounting ring.		**Note** Ensure excessive glue is removed from the bottom black core part of the unit, as this will make it very difficult to replace the core part. For non-permanent mounting only glue the ring with a few dots of glue.
Step 3: Mounting	Press firmly and double check the ID number.		
Step 4: Cleaning-up	After mounting the SENSIT sensors in all parking bays or a selection of parking bays. Clean up the parking bays and remove all (metal) tools and objects.		
Step 5: Activating	All SENSIT sensors are set into transport/stock mode during shipment. After installation all mounted SENSIT sensors must be swept with the reset magnet.		**Note** Once out of the transport/stock mode the battery lifetime starts to count.
Step 6: Calibrating	After installation the SENSIT sensor must be calibrated. Ensure that the parking space is empty and that there is no car parked on top of the sensor or on neighboring parking bays. SENSIT sensors can be calibrated via the SENIST Interface Software (SIS). See chapter 13.6.6 for more information about calibration.		**Note** When the SENSIT sensors are not calibrated they hardly send any messages. This is due to the fact that there are no events generated because the magnetic thresholds are not crossed.
Step 7: Glue curing	Leave the glue dry for at least 4 hours before vehicles are allowed in the parking space again.		
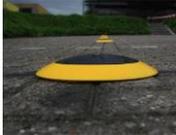
10.6   REPLACEMENT

When the battery life of the SENSIT Surface Mount fails after specified lifetime, we advise to replace the core. The core part of the SENSIT Surface Mount is fully sealed and for outdoor use, therefore batteries cannot be replaced.

SENSIT Surface Mount replacement procedure		
Step 1: Remove core	The mounting ring can remain positioned in the parking space. The core can be unscrewed using a TORX screwdriver. Unscrew the core by opening the 4 screws in the core part of the SENSIT Surface Mount using a T20 size bit screwdriver. Twist the core to lift up.	
Step 2: Replace core	Place a new core into the mounting ring by aligning the marks on the core part with the marks on mounting ring as indicated in figure 9. Strongly push down the core and secure with 4 screws. Write down the correct ID numbers of the replaced core on your installation plan.	
Step 3: Activating	All SENSIT sensors are set into transport/stock mode during shipment. After installation all mounted SENSIT sensors must be swept with the reset magnet.	
Step 4: Calibrating	After installation the SENSIT sensor must be calibrated. Ensure that the parking space is empty and that there is no car parked on top of the sensor or on neighboring parking bays. SENSIT sensors can be calibrated via the SENIST Interface Software (SIS). See chapter 13.6.6 for more information about calibration.	
Step 5: Update SIS	Ensure to note the node ID number of the SENSIT Surface Mount to the parking bay and update the parking bay configuration list in the SENSIT Interface Software (SIS), see chapter 13.6.2	

Note
Once out of the transport/stock mode the battery lifetime starts to count.

Note
Also ensure not metal parts (such as tools) aren't positioned in the surrounding of the sensors as this might affect calibration.

Note
When the SENSIT sensors are not calibrated they hardly send any messages. This is due to the fact that there are no events generated because the magnetic thresholds are not crossed.

11   MOUNTING THE SENSIT EPL

The SENSIT EPL is designed for installations at the windscreen of a vehicle.

11.1   SAFETY PRECAUTIONS
The following safety precautions should be observed during normal use, service and repair.
- The SENSIT EPL may only be installed and serviced by qualified service personnel.
- To be sure of safety, do not modify or add anything to the SENSIT EPL other than mentioned in this manual or indicated by NEDAP N.V.

11.2   FCC AND IC DECLARATIONS
FCC ID: CGDSENSITEPL and IC: 1444A-SENSITEPL

Compliance statements (part15.19)
This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada. 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.

Cet appareil se conforme aux normes RSS210 exemptés de license du Industry Canada. L'opération est soumis aux deux conditions suivantes: (1) cet appareil ne doit causer aucune interférence, et (2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Warning (part15.21)
Changes or modifications not expressly approved by party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure (OET Bulletin 65)
To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Information to the User (Part 15.106(b))
Note: This equipment generates, uses and can radiate radio frequent 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 not cause harmful interference to radio or television reception, which can be determine 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.

11.3   DIMENSIONS

The SENSIT EPL can easily be mounted on the inside of a vehicle. Clean the inside surface of the windshield and make sure it free of grease and dirt. Than attaches, the SENSIT EPL with the suction cups to the windscreen. See Figure 31 for the dimensions of the unit, dimensions in mm. The bottom of the SENSIT EPL is laser engraved with the node ID number.
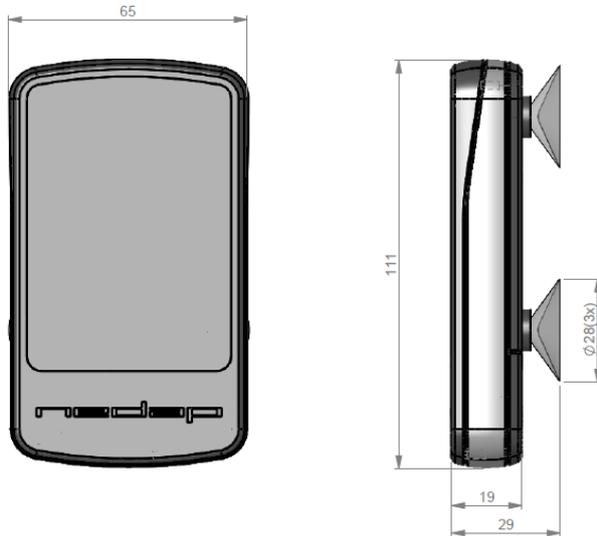

Figure 31: Dimensions SENSIT EPL (mm).

11.4   REQUIRED INSTALLATION MATERIALS

The following would be required for mounting of the SENSIT EPL.

- Equipment: Soft lint free cloth
- Cleaner material: Isopropyl alcohol

11.5   INSTALLATION PROCESS

Follow the recommended installation procedure for the SENSIT EPL as described below.

SENSIT Surface Mount mounting procedure		
Step 1: Preparation	Write down the unique ID-number of the SENSIT EPL and insert the AAA alkaline batteries.	
Step 2: Cleaning	Clean the windscreen at the location you like to install the SENSIT EPL.	
Step 3: Mounting	Attach the SENSIT EPL with the suction cups to the windscreen.	
Step4: Registration	Register the SENSIT EPL in the SIS by filling in the permit details and the by Step1 written unique ID-number, this explained in more details in chapter 13.4.1.	

12   PROJECT SUPPORT

Based on our thorough project analysis including configuration and installation advice we can offer the customer the best AVI solution.

12.1   SITE SURVEY & INSTALLATION ADVICE

This will consist of an engineer visiting the site to visually inspect and analyze the location. We will then carry out calculations and provide you with detailed configuration and installation advice for the equipment for a specific project.

12.2   ON-SITE CERTIFICATION

An engineer will visit the site to inspect the installation of the equipment on reliable and accurate detection. Nedap engineers are not involved in installation (wiring) of any equipment. The installation must be completed before the engineer arrives on-site. We will ensure that the operation confirms our commissioning requirements, only on condition of prior given installation advice.

13 SENSIT INTERFACE SOFTWARE

13.1 INTRODUCTION

The SENSIT Interface Software (SIS) enables easy system integration into an enforcement, traffic guidance or parking guidance management application.

The SENSIT Interface Software enables easy installation of the wireless sensor network. Once the network and sensors are installed and calibrated, the sensors will automatically appear in the software. Configuration of sensors to specific parking bays, parking zones and parking lot can easily be realized.

Additionally the software configures and monitors communication of the SENSIT node network. It monitors the data transfer between the sensors and the Data Collectors. Moreover it also analyzes communication reliability of the sensor network in a graphical map, automatically alerting areas for maintenance.

The SENSIT Interface Software is installed on a hosted server, so no IT infrastructure is required at the client. The software application can be approached with any modern web browser that supports Java can connect to the software application.

Each sensor site has a site specific URL indicated in the following way;
https://sitename.nedapparking.com

13.2 USERS

Start the web browser and enter the SENSIT Server hostname. A login screen will appear.

Please view the document outlining the Data Collector configuration settings for the details on the URL, login and password for your site. This information is required to obtain access.

13.2.1 LOGIN

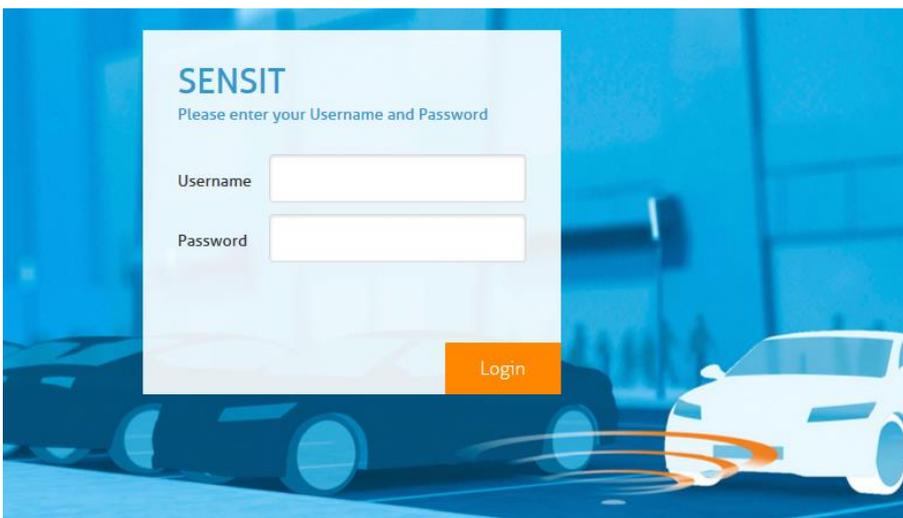The login screen provides access to the software. Enter username and password.

Figure 32: Login screen

Default logins are:

User: sensit
The SENSIT user has reduced functionality in the software. Only a subset of these options is available via the user login. Basically this login is available to check the status of the system. It does not allow changing the configuration or any other settings.

User: parkingapp
This login has reduced functionality in the software and is used for the Nedap parking app.

User: integrator
This user has reduced functionality in the software, used for third party integration via REST or SOAP.

User: sensitadv
This user has advanced functions and configuration possibilities.

The initial username and password are provided to you by Nedap.

13.2.2 LOGOUT
Click 'Logout' when you want to close the application.

13.3   DASHBOARD
The Dashboard is designed to give the user an overview on how the SENSIT system is performing. The Dashboard page contains several Widgets. A Widget summarizes and displays the actual state of SENSIT system.
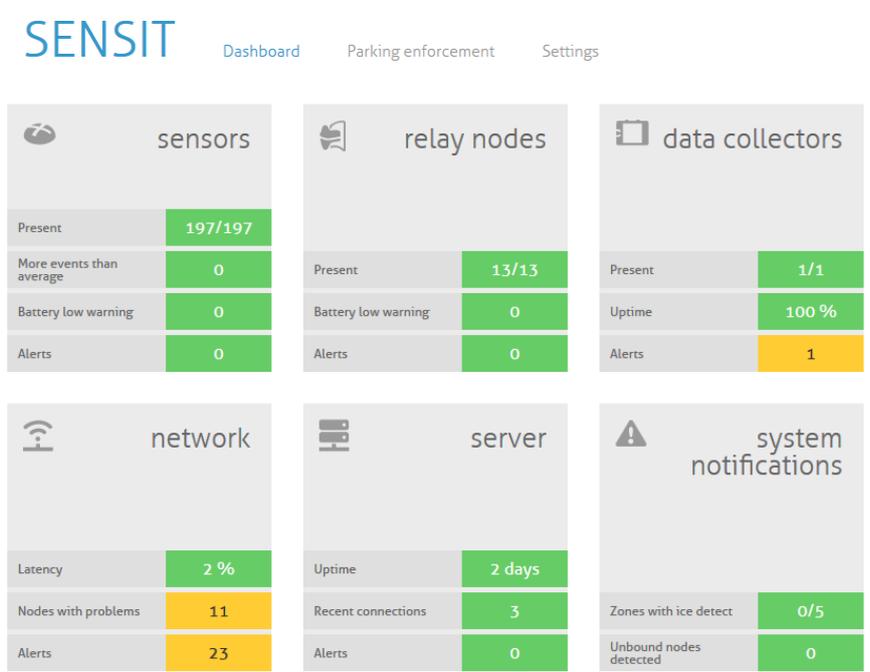
Figure 33: Dashboard screen

The Dashboard contains six main Widget categories: SENSIT sensor, Relay Nodes, Data Collectors, The wireless Network, the Server and system notifications.

The functions of the Dashboard are self-explaining by hover over pop-ups and help balloons

when needed. Every widget can be configured via the configuration symbol at the right corner of every widget, see figure below. The configuration symbol will automatically show if you move your mouse to the specific widget. In this screen you can change the different widget settings.
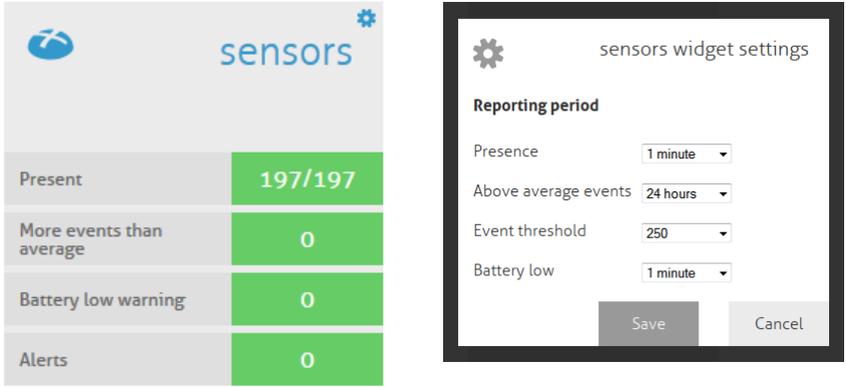
Note
Configuration is only available under sensitadv login.

Figure 34: Configuration symbol and widget settings screen

13.4 PARKING ENFORCEMENT

The Parking enforcement is a secondary dashboard, designed to give the user an overview on all parking enforcement related information. This parking enforcement dashboard summarizes and displays the actual status of a specific parking zone.
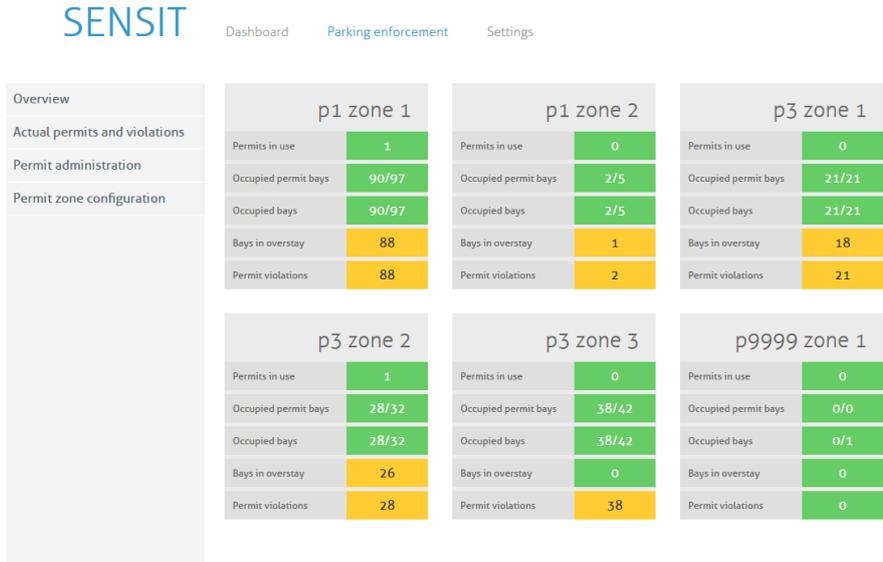
Figure 35: Parking enforcement dashboard screen

Different enforcement information of all parking zones are displayed: Permits in use, Occupied permit bays, Occupied bays, Bays in overstay and the Permit violations.

The Electronic Parking License (EPL) is a hardware device that is physically placed inside a vehicle or it is an App that is running on a smartphone. Whenever the vehicle with EPL hardware stops moving for a specific period of time, the EPL considers the vehicle to be parked. In that case, the EPL hardware will search for a SENSIT wireless network. If a network is detected, the EPL will make itself known to the network. As a result the unique EPL identifier is registered within the SENSIT Server system. The user of the EPL App is doing the same, it activates the parking action with it smartphone.

When a parking bay that requires a license, becomes occupied, the SENSIT system is notified. The system will calculate the odds of the parking bay being occupied by an unauthorized vehicle.

13.4.1   PERMIT ADMINISTRATION

In these screens all permit administration is performed. A permit is issued to a person and it can be a hardware EPL or an EPL App installed on a smart phone.
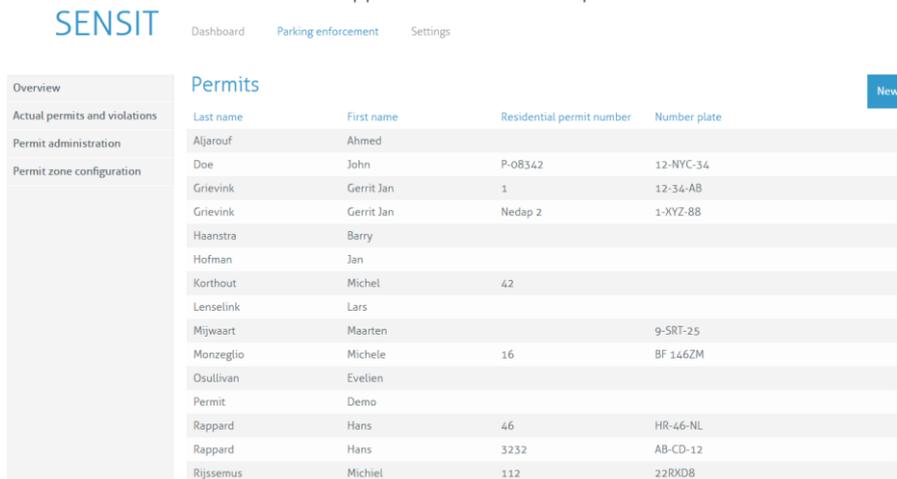

Figure 36: Permit administration screen

New permits can be added and existing permits can be edited or removed. A Residential permit number can be enter, name, license plate number and the EPL node ID in case of a issued hardware EPL. The permit can be disable and an expiration date can be used, an empty expiration date means valid forever. Than one or multiple parking zones can be selected where the permit is valid. Zone creation is explained in the next paragraph.

Figure 37: Edit permit screen

After creating a new permit, by filling in all needed details, a QR-code is automatically

generated. The EPL App needs this QR-code. The QR-code contains the URL of the SIS where the permit is created and a unique identifier.

13.4.2 PERMIT ZONE CONFIGURATION

In these screens all permit zone configuration is performed. A permit zone is a selection of one or multiple parking bays. A list of all available, already entered, zones are displayed in the screen below.
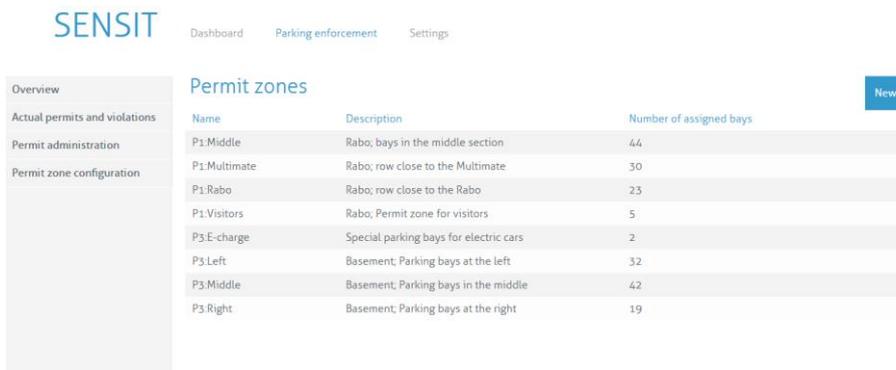

Figure 38: Permit zone configuration screen

New permit zones can be added and existing permits zones can be edited or removed. A permit zone name and description can be entered and the bays can be assigned in the selection screen.

Figure 39: Add/Edit a permit zone screen

A permit zone can be a parking lot(s), a parking zone(s), one or a selection of bays. This can easily be selected in the screen below.

Figure 40: Permit zone bays assignment screen

13.5   DETECTION

13.5.1   DATA COLLECTOR

In the Data Collector menu you can configure communication gateway settings between the Data Collectors and the SENSIT Server. Furthermore the screen provides an overview of the current Data Collector settings. The list of Data Collectors is automatically updated.

Gateway server setting

Select 'enabled' to enable the connection from Data Collector to the server. Enter the TCP port (or SSL port), to accept connections from the Data Collector(s). For a remote hosted SENSIT Server, the port number should not be changed. Because the port numbers are assigned by the Nedap system administrator.

Data Collector connection settings

In this menu you can set 'Host name' and communication 'Port' for the Data Collector. The Data Collector is displayed as a node, see below. The hostname of the Data Collector can normally be found on the housing. The SENSIT Server will try to establish a connection with the specified Data Collector. This does not work on remote hosted SENSIT Servers. See gateway server settings above.

The screen provides an overview of the current Data Collector settings. When entering new Data Collectors, the table is automatically updated.

Figure 41: Data Collector gateway server settings

13.5.2   NODE CROSS CHECK

The menu option 'Node cross check' displays all nodes currently visible in the system that are not allocated to a parking bay. These could be new or replaced SENSITs, but also the Relay Nodes and Data Collectors are shown here. Moreover this screen also displays parking bays without a node (if this information is entered via the parking bay configuration).

Figure 42: Node cross check

13.5.3 NODE PRESENCE

This screen will display information on the last received message from each node present in the network. It will outline the Node ID, type number, version and the timestamp of the last received message.

Node presence check (min)

If a node does not respond within a certain time period after transmission of the last message, the SENSIT Server will check if the node is still available. In this menu option you can select the time after receiving the last message (in minutes) when to send the Node presence check.

Node presence check retry

The 'Node presence check retry' specifies the number of times the SENSIT Server shall try to connect to the node.

Figure 43: Node presence

In the screenshot above several nodes are listed in the node cross check.
For example node id 00.0000.72BC is a SENSIT IR (type 3109). Every different type of node has its own Type code, see below the general use types:

000c	Data Collector
0018	Relay Node 2G
3003	Relay Node 1G
3109	SENSIT Flush Mount or SENSIT IR
310D	SENSIT Flush Mount or SENSIT IR
310E	Electronic Parking License (EPL)
8004	WSN Display

13.6 DEFINITION

13.6.1 RELAY NODE CONFIGURATION

You can click the Refresh button and verify if the Relay Node ID appears in the Current Relay Nodes list.

Figure 44: Relay Node configuration screen

The Relay Node ID is laser engraved on the Relay Node. There is also a 125kHz passive RFID label embedded into the Relay Node. This can be used for verification of the Relay Node or to localize Relay Nodes that are already installed in the field.

13.6.2   PARKING BAY CONFIGURATION

In the menu 'Parking bay configuration' SENSITs are allocated by their Node ID to individual parking bays.

The data is imported into the system via a csv-file (comma separated values). The following information should be entered into the csv-file separated by a comma (' , '). Note that the combination of parking lot-id and bay-number must be unique.

Note
Ensure that the filename and file path do not include any spaces.

Column 1	Parking lot ID (number indicating the parking lot).
Column 2	Zone ID (number indicating zone on the parking lot the bay is located in)
	Zone ID is also used to identify Relay Nodes (RN) or Data Collectors (DC).
Column 3	Bay number (number indicating individual parking bay).
	Bay number is also used to number a Relay Node or Data Collector
Column 4	Node ID. (SENSIT, Relay Node or Data Collector)
Column 5	GPS, Latitude (optional, in decimal degrees with max. 6 decimals).
Column 6	GPS, Longitude (optional, in decimal degrees with max. 6 decimals).
Column 7	GPS, Altitude (optional, in decimal degrees with max. 6 decimals).

```
 1  1,DC,1,00.0000.7608
 2  1,RN,1,00.0000.C4C5
 3  1,RN,2,00.0000.C4C2
 4  1,1,1,00.0000.601C,52.037617,6.623928
 5  1,1,2,00.0000.8664,52.037613,6.623889
 6  1,1,3,00.0000.60CC,52.037613,6.623853
 7  1,1,4,00.0000.8662,52.03761,6.623819
 8  1,1,5,00.0000.C02E,52.037605,6.623785
 9  1,1,6,00.0000.8663,52.037605,6.623748
10
```

Figure 45: Example parking bay configuration csv-file

Select the csv-file by clicking the 'Browse'-button, then click 'Import' to import the selected file.

When the csv-file is imported, the screen will display the information. At each given moment you can verify in this table the allocated SENSIT / Parking bay bindings. Refer to the node cross check display to verify if all SENSIT are assigned to a parking bay (see chapter 13.5.2). It is possible to incrementally expand the Parking bay configuration list by importing only additional allocation information (Parking lot ID, Zone ID, bay/place number and Node ID) via a new csv-file.

Figure 46: Parking bay configuration

Click the small green checkbox icon to (temporarily) inform the system that the parking bay is unavailable. Click the small pencil at the end of a row, an Update Node ID screen shows up, here you can change the Node ID number and the GPS coordinates. This can be used to replace a SENSIT or to correct a mistake.

Update Node ID ✕

Node ID
00.0000.601C

Latitude
52.037617

Longitude
6.623928

Altitude
0

Cancel   Save

Figure 47: Update Node ID

13.6.3 PARKING LOT CONFIGURATION

The parking state logging feature periodically saves occupancy status in the database. This feature must be enabled for the occupancy chart feature described in chapter 13.8.2.

Enable the 'parking lot state logging on' checkbox to start logging occupancy status of the parking lot in the database. The parking lot state logging interval setting selects the logging period in minutes. By default this is set to 60 minutes.

Detection		
Definition		
Relay node configuration		
Parking bay configuration		
Parking lot configuration		
Monitor configuration		
Overstay configuration		
Sensor calibration		
Display		

Parking lot configuration

Parking lot state logging on   ☑
Parking lot state logging interval (minutes)   15
Enable parking lot update events   ☑

update
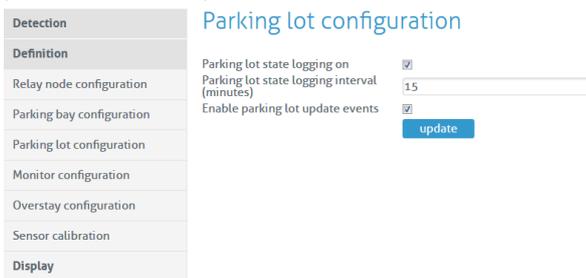
Figure 48: Parking lot configuration

13.6.4 MONITOR CONFIGURATION

Site Name
Fill in here the site name.

Monitor Color Mapping
Configure here the color mapping for the actual monitor status (free, occupied, overstay, and disabled).The selected colors are used in the monitor screen.

Map List
Here you can load the parking lot graphic file (SVG-format) into the system and assign it to a parking lot. The SVG-file can be created with Inkscape (http://inkscape.org). Nedap has an extension available for Inkscape that should be used to define where the parking bays are located on the map. See the advanced section, chapter 14.1 for more explanation and the workflow about the Inkscape program.

When the SVG-file is created, enter the ParkinglotID and the title. Then select the svg-file by clicking the 'Browse'-button and click Upload' to upload the selected file into the system.
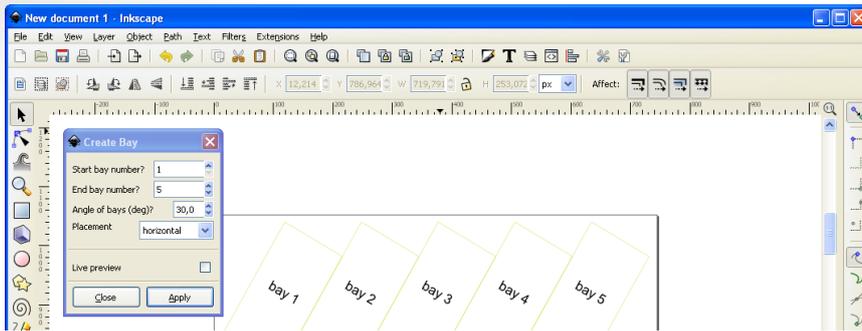
Figure 49: Inkscape

13.6.5 OVERSTAY CONFIGURATION

The SENSIT Server can be used for overstay applications, specifically where there is a need for a maximum time limit for free parking. The menu 'Overstay configuration' allows you to set several overstay parameters.

Figure 50: Overstay configuration

System overstay settings

With this option the global overstay function can be enabled. The settable Allowed parking time is the overstay time for all SENSIT sensors defined at the SENSIT Interface Server. This setting determines how long a parking bay should be occupied before an overstay situation occurs.

Overstay verification settings

When enabled, the SENSIT Interface Server will ask the SENSIT sensor if all state events are received in case of an overstay. The last state event message is transmitted again to the SENSIT Server to verify the overstay.

The Max number of retries (max value is 5) can be set. If an overstay verification fail it retry to receive the last state event message. If the final overstay verify attempts fail an unverified overstay event is generated.

13.6.6 SENSOR CALIBRATION

To ensure reliable operation of the system the SENSIT sensors should be calibrated before commissioning. Calibration values can be set for the magnetic detection in each axis (x, y and z). Default calibration values are 50 mGauss in each axis. The default value for the IR sensitivity is 9, the maximum. The IR sensitivity is only lowered in case of a ceiling or other coverage of the SENSIT sensors.

Note
The SENSIT nodes can only be calibrated when the specific bay and neighboring bays are not occupied by vehicle. When all SENSIT nodes need to be calibrated the parking lot must be completely empty.

Detection	Sensor calibration	
Definition		
Relay node configuration	Threshold X axis	50
Parking bay configuration	Threshold Y axis	50
Parking lot configuration	Threshold Z axis	50
Monitor configuration	IR sensitivity (0 = min, 9 = max)	9 ▾
Overstay configuration	Calibrate IR sensor only	☐
Sensor calibration	Calibrate node number	BC64
Display	or	
Monitor	Calibrate all nodes	☐
Diagnose	or	
	Calibrate by parkinglot	☐
	Parkinglot number	

Calibrate

* Only calibrate when the whole parking lot or specified bay is empty

Figure 51: SENSIT sensor calibration

SENSIT nodes can be calibrated individually. This by entering the Node ID of the specific sensor you want to calibrate into the field 'Calibrate node number'.

Alternatively you can calibrate all nodes or the nodes from a specific parking lot. When you click 'Calibrate all nodes' all SENSIT sensors in the network will automatically be calibrated. Click the 'Calibrate' button to start the calibration. In the menu an update message will start to keep you update on progress.

Incorrect occupied spaces can be indicated if a vehicle parked in the neighboring parking space activates the magnetic sensor. If the percentage of incorrect occupied (so actually free) is too high over the parking lot, the magnetic values can be adjusted by selecting a higher value e.g. 60 mGauss. If the percentage of incorrect free (actually occupied) spaces is too high the sensitivity of the magnetic threshold can be reduced to lower value e.g. 40 mGauss.

13.6.7 DISPLAY

Display Configuration

The 'Display configuration' screen allows you to control a display via the node network. This without any physical communication wiring. Only a power supply is required. The communication with a display is realized via a display node. Note that this functionality is only available for specific displays. Contact Nedap for more information. The display node is part of the network and can therefore communicate wirelessly via the node network. A maximum number of 2 displays can be controlled in a wireless mesh network of 500 sensors. Use of more displays will increase the communication latency.

Figure 52: Display configuration

The display will show the total number of available spaces on all the parking zones and parking lots it has been assigned to. In case you want to display information on individual zones, we advise you to allocate one display node to each parking zone.

The display configuration information is imported into the system via a csv-file (comma separated values). The following information should be entered into the csv-file separated by a comma (' , ').

- Column 1 Parking lot ID.
- Column 2 Zone ID.
- Column 3 Display node ID.
- Column 4 Full threshold. When less parking places are available, the display will indicate FULL.

Figure 53: Example display configuration csv-file

Select the csv-file by clicking the 'Browse'-button, then click 'Import' to import the selected file.

Display Current View

The display current view shows the actual display information per display node.

Display View Settings

The display view settings allow configuring the weekdays and time periods during which the display information should be updated. This can be used for example in cases where the display should be off during night time.

13.7 MONITOR

13.8 OCCUPANCY REPORT

The occupancy report displays the actual number of occupied bays in a parking lot.

Detection	Occupancy report			
Definition				
Monitor	Parking lot ID	Zone ID	Nr of bays	Bays occupied
	1	1	97	81
Occupancy report	1	2	5	4
	3	1	21	19
Occupancy list	3	2	32	27
	3	3	42	35
Occupancy chart	9999	1	1	1

Figure 54: Occupancy overview

13.8.1 OCCUPANCY LIST

The occupancy list shows the actual occupancy information per parking bay.

Figure 55: Occupancy list

Please find below a small table, which explains the different symbols:

State	Description
●	Occupied
P	Free
●●	Overstay

Sensor	Description
💡 🧲	Optical and Magnetic occupied
🧲	Magnetic occupied
💡	Optical occupied
	Free

13.8.2   OCCUPANCY CHART

The occupancy chart shows a graphical display of the occupancy status of the parking lot
during specified time. By filling in the parking lot ID number and the requested time period.
A graphic will be generated displaying the occupancy of the parking lot. The graphic is
generated based on history stored in the local database.Please note that the occupancy
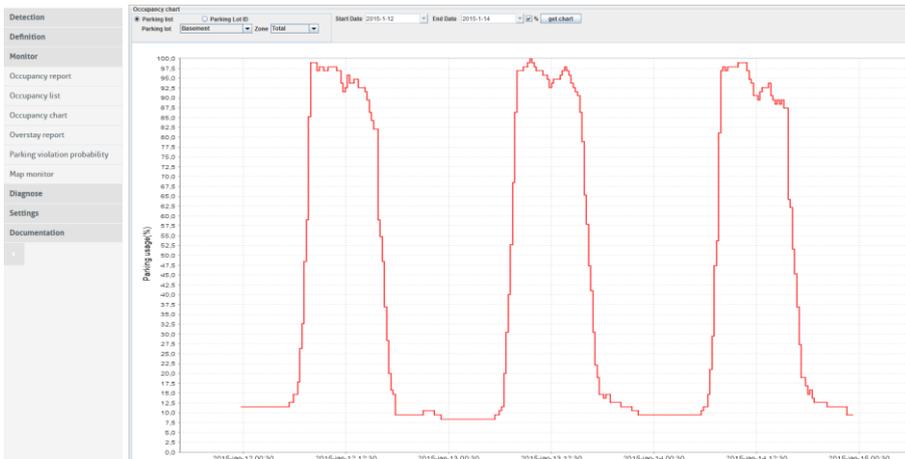state logging must be enabled, see chapter 13.6.3.

Figure 56: Occupancy chart

Click and drag in the chart to zoom into more detail.

13.8.3   OVERSTAY REPORT

The overstay report shows all the parking bays that currently are in overstay. Moreover it
also visualizes the parking start time for each parking bay.

Figure 57: Overstay report

13.8.4   PARKING VIOLATION PROBABILITY

The parking violations probability overview shows a list of all occupied parking bays that
require a license. The calculated violation probability is shown.

Figure 58: Parking violations overview

Third party applications can pick up items from this table using the documented SOAP or
REST interface. For more information on specific SOAP commands see the SENSIT
Software Integration Developer Guide. The REST API is explained at the left side under
Documentation. Violations that exceed a certain violation probability threshold can trigger

enforcement or more generic follow up activity.

13.8.5   MAP MONITOR

The monitor will show the actual parking lot status on an overview map. The SENSIT are placed on the map and their colors indicate the actual status.

Click on Graph - Sensor Draw Mode to show more sensor information details.
Click on Graph – Network Draw Mode to show network details (green=passive, red=active).
Click on Graph – Network Uptime Mode to show network uptime details (green=good, red=not good). Status reading must be enabled, see chapter: Status Reading Interval Settings.
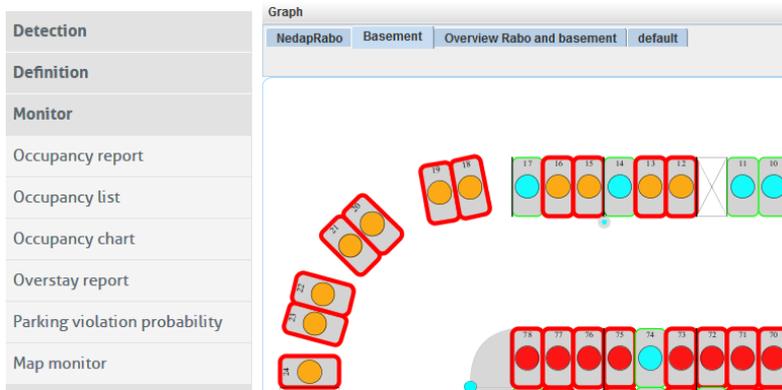
See chapter 13.6.4 how to configure the overview map.

Figure 59: Map Monitor

13.9   DIAGNOSE

13.9.1   ICE DETECT MODE

In this list the automatic global ice detection situation of the system is shown.

Ice detect mode

Name	Mode	Iced %	Monitor %	TotalBays	ActiveBays	IcedBays	Enabled	IceDetectLevel	IceAwayLevel
(/1/1)	false	26.7%	15.5%	97	15	4	true	90%	80%
(/1/2)	true	100.0%	20.0%	5	1	1	true	90%	80%
(/3/1)	false	0.0%	19.0%	21	4	0	true	90%	80%
(/3/2)	false	12.5%	25.0%	32	8	1	true	90%	80%
(/3/3)	false	23.1%	31.0%	42	13	3	true	90%	80%
(/9999/1)	false	0.0%	100.0%	1	1	0	true	90%	80%

<< < | > | >> Go to page: 1 ▾ Row count: 10 ▾   Showing 1-6 of 6

Figure 60: Ice detect mode

13.9.2   BATTERY LOW WARNINGS

In this list all SENSIT with a low battery voltage are mentioned. These warnings show up whenever the battery voltage of a SENSIT drops below the 3 Volt (Alarm level).

Battery low warnings

Solved	NodeID	Event time	Supply voltage	Alarm level
⊗	00.0000.51BD	Fri 05 December 2014 17:54:03	2.988	3
⊗	00.0000.6093	Thu 01 January 2015 16:22:32	3.54	3
⊗	00.0000.6102	Thu 01 January 2015 16:22:33	3.52	3

<< < | > | >> Go to page: 1 ▾ Row count: 10 ▾   Showing 1-3 of 3

Figure 61: Battery low warnings

13.9.3 BATTERY PLOT

This screen gives a graphical overview of the battery voltage of a single SENSIT.

Figure 62: Battery plot

13.9.4 SENSOR ANALYSIS

The sensor analysis is a tool to check the reliable operation of the SENSIT nodes in the system. The Sensor analysis provides information on the functional operation of a specific sensor during a specific time period.

The following information is displayed in the chart.

- X, Y, Z: Magnetic measurement values for X, Y and Z-axis.
- ITP, IRS: Infrared transmitter value (ITP) and infrared receiver (IRS) values (only for SENSIT IR).
- State: Occupancy state (red = magnetic sensor, blue = infrared sensor)

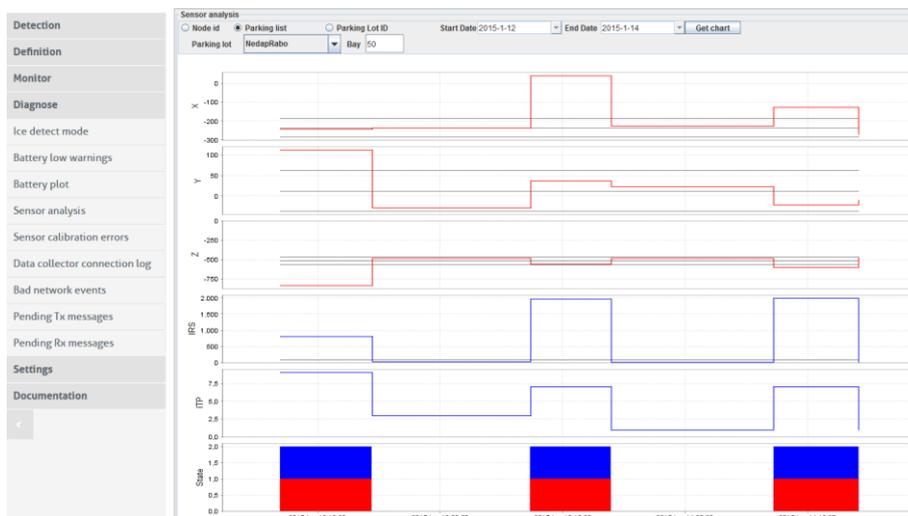Click and drag in the chart to zoom into more detail.

Note
The measurement values are only updated when the SENSIT sensor transmits an event to the server.

Figure 63: SENSIT sensor analysis

13.9.5 SENSOR CALIBRATION ERRORS

This screen indicates the SENSIT nodes that do not transmit any state event messages. For example, an event is created when a vehicle enters the parking bay and a difference in the magnetic field is has been detected. When the difference in the magnetic field does not

result in a state change event, in other words no change in the occupancy, this might indicate that the SENSIT has not properly been calibrated. The screen indicates the number of events received from a specific SENSIT without a state change.

13.9.6 DATA COLLECTOR CONNECTION LOG

This screen shows a list of all connects and disconnects of the Data Collectors in the system.

Figure 64: SENSIT sensor analysis

13.9.7 BAD NETWORK EVENTS

This table shows all events that a SENSIT generates, when it detects possible problems in the wireless communication.

Figure 65: Bad network events screen

13.9.8 PENDING TX MESSAGES

This table show all message in the transmit queue.

Figure 66: Pending TX messages screen

13.9.9 PENDING RX MESSAGES

This table show all message in the receive queue.

13.10 SETTINGS

13.10.1 USER SETTINGS

Change Password

In this screen the password of the current logged in user can be changed

13.10.2 SYSTEM SETTINGS

System Information
The system information menu offers the user the possibility to download log files and to change system specific settings.

Download log file
This setting is used to provide remote support. The log file contains all the information required for Nedap's engineers to analyze system information.

Download error log file
This setting is used to provide remote support. The log file contains all the information required for Nedap's engineers to analyze system information.

Download properties file
The properties file contains all the system settings. This file can be used for support purposes to verify the system.

Figure 67: System info

System Reboot
Click the 'Reboot'-button to reboot the SENSIT Server.

Time Configuration
Configure here the time zone settings of the SENSIT Server.

Node Gateway List
Here you can activate if a message for a specific SENSIT is only transmitted via the Data Collector(s) in the Gateway list. In this way only the involved Data Collector(s) are transmitting the message into the (local) Wireless SENSIT Network and not too all Data Collectors available in system. If a specific SENSIT doesn't communicate for in this case 24 hours the Gateway list will be clear for this SENSIT and a message for this specific SENSIT will be transmitted via all available Data Collectors.

Figure 68: Node gateway list screen

Local Configuration

Store events in database

Select this option to store events in the database of the SENSIT Server. Normally this option should be selected.

Recover lost messages

The event messages have a sequence number. With this sequence number, the SENSIT Server can determine if messages were lost. When this happens the SENSIT Server can ask the SENSIT to resend these lost messages. Enable the checkbox if this is desired.

Message recovery retry time

Message recovery retry time (in minutes) is the repeat time the system will search for events it has not yet received. The search will be repeated after the set time.

Restore received messages at startup

Select this option if you want to restore events at SENSIT Server startup.

Number of lost messages to recover at startup

You can select the maximum number of messages you want to recover per node (max. 32 messages).

Sensor select mode

This setting selects which sensor determines the occupied state.

Auto	Sensor is automatically selected using intelligent algorithms (Recommended setting).
Magnetic	Only the magnetic sensor is used.
Optical	Only the optical (infrared) sensor is used.
MagneticANDOptical	The parking bay is occupied when both sensor detect the vehicle (magnetic + optical).
MagneticOROptical	The parking bay is occupied when at least 1 of the sensors detect the vehicle.

Calibrate error after .. magnetic events when occupied

The SENSIT Server registers when both sensors of a SENSIT-IR disagree about the occupancy state. In automatic mode, the optical sensor has a higher priority. However when the optical sensor is dirty, this will have a negative result on the accuracy. This setting will generate a Calibration error when the optical sensor remains occupied while the magnetic sensor registered state changes several times. See also chapter 13.9.5.

Figure 69: SENSIT local configuration

Active Http Sessions

In this screen you can see all user logged in to the web-server. All active open web sessions are shown.

Status Reading Interval Settings

Enable the status reading to make the SENSIT Server request the network performance statistical counters for every node. Preferably this is done at night when there are relatively few vehicle movements. The status reading can be shown in the monitor, when selecting the Network Uptime Mode. See chapter 13.8.5.

Figure 70: Status reading

13.10.3 EXPERT SETTINGS

Console

The Console menu allows you to directly transmit commands to the SENSIT network. It is not recommended to experiment with the functionalities in this window unless instructed to you by Nedap technical support engineers.

Figure 71: Console

EPL settings

The matching time window is adjustable and can be set differently for the SENSIT EPL and the EPL App. This matching time window specifies the allowed time uncertainty of an EPL or EPL App. Based on this value an EPL or EPL App is included or excluded in the matching algorithm.

Detection	
Definition	
Monitor	
Diagnose	
Settings	
User settings	
System settings	
Expert settings	
Console	
EPL settings	

EPL system settings

Matching EPL device announcements and occupied Bays

Start interval time (in seconds)	-20
Stop interval time (in seconds)	20

Matching Permit announcements of Parking License App and occupied Bays

Start interval time (in seconds)	-20
Stop interval time (in seconds)	20

Update

EPL old licenses (deprecated)

Via this old EPL licenses menu it is possible to read the previous EPL administration screens. This menu will be removed in the next release. The new major release v1.5.x has a new way of administrating permits; hardware EPL's or EPL Apps. All administration is now group at the Parking enforcement dashboard.

14   ADVANCE CONFIGURATION

14.1   INKSCAPE

The maps for the Monitor map at the SIS must be in a Scalable Vector Graphic image. These SVG-file images can be created with an open-sources program Inkscape (http://inkscape.org). Nedap has an extension available for Inkscape that should be used to define where the parking bays, Relay Nodes and Data Collectors are located on the map.

After installing Inkscape and the Nedap Inkscape extensions the program can be started. By selecting Extensions -> SENSIT -> Create Bay... bays can be added to the drawing and by selecting Extensions -> SENSIT -> Create Node... nodes (Relay nodes or Data Collectors) can be added to the drawing. See also the figure below.
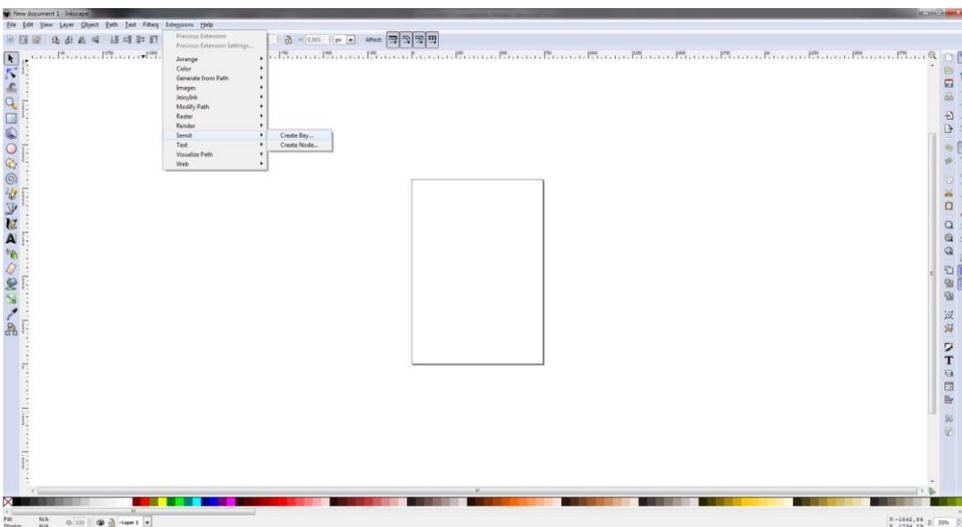
Figure 72: Inkscape SENSIT extensions

After selecting the Create bay... option a pop-up window appears, see Figure 73 below. You can add bays to the drawing. In this way a simple representation of the parking lot can be created. In this example 6 bays (bay number 1 to 6) are created.
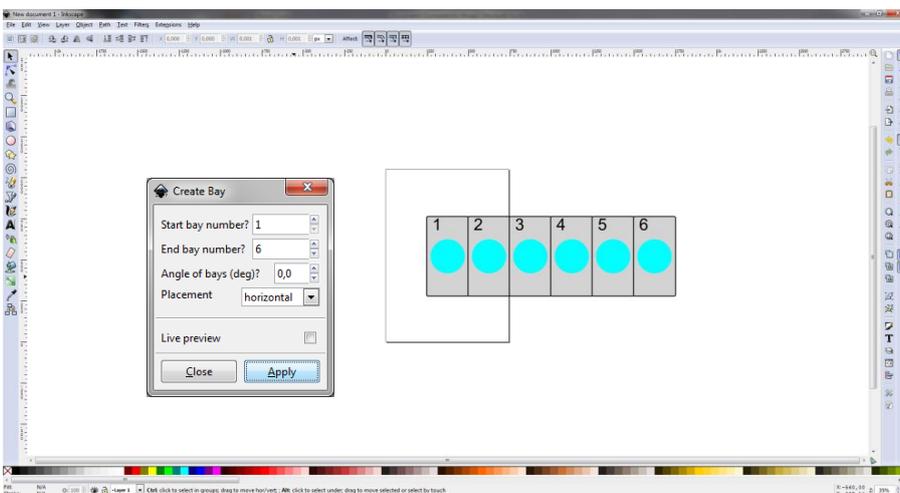
Figure 73: Inkscape, Create Bay

The same for adding Relay Nodes and Data Collectors. By selecting Extensions -> SENSIT -> Create Node... the Create Node pop-up window appears. In the example below a Data Collector with ID-number 8AB4 and a Relay Node with ID-number 8A9B is created and

place at the right location in the map.
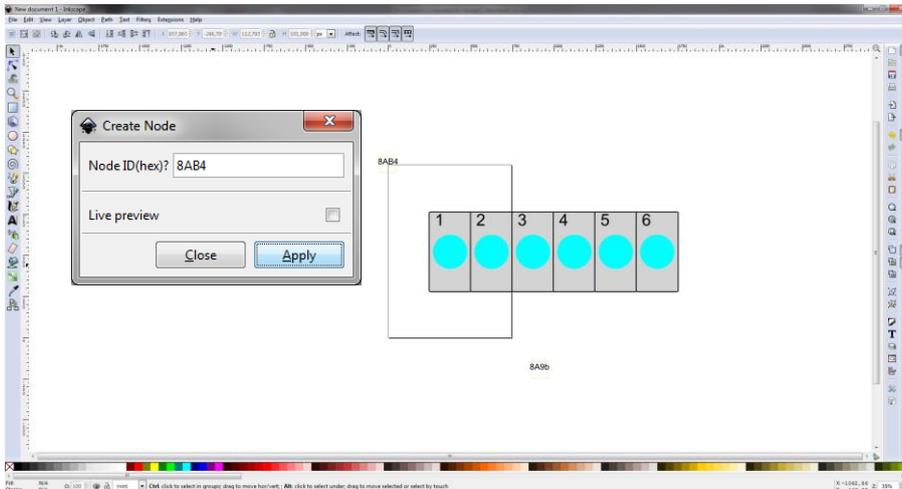
Figure 74: Inkscape, Create Node

When the drawing is finished the next step is to scale the drawing correctly so all bays, Relay Nodes and Data Collectors are nicely places in the map. First select al objects, this can be done easily with Ctrl + A. Select: File -> Document Properties… and then in Custom size, Resize page to content… add some top, bottom left and right margin to the page and select the button Resize page to drawing or selection. See also Figure 75 below.
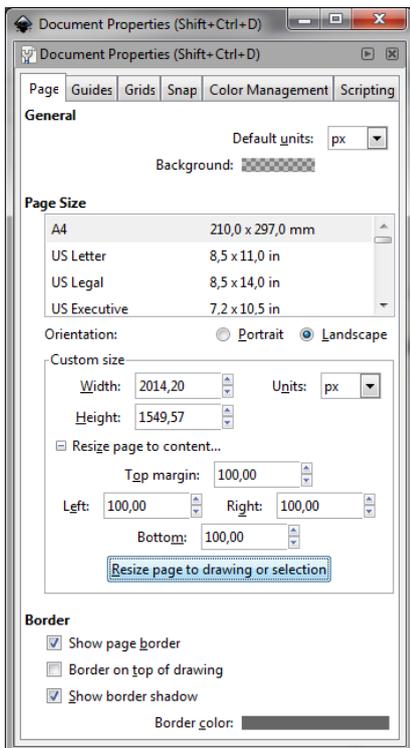
Figure 75: Inkscape, Resize page

After resizing the page the file can be saved as a SVG-file make sure you don't use spaces in the filename and after that uploaded to the SIS as described in chapter 6013.6.4.

15 FREQUENTLY ASKED QUESTIONS

15.1 GENERAL

What types of SENSIT sensors are available and what is the difference?
There are 3 different types of SENSIT sensors available:

1. SENSIT IR - Magnetic and optical sensor suitable to be built-into the floor of each parking space.
2. SENSIT Flush Mount - Magnetic sensor suitable to be built-into the floor of each parking space.
3. SENSIT Surface Mount - Magnetic and optical sensor for mounting onto the floor of a parking space

What is the accuracy of the SENSIT Flush Mount?
The magnetic sensor can achieve an accuracy of 95%.

What is the accuracy of the SENSIT IR and SENSIT Surface Mount?
The combination of the magnetic and optical sensor has an average accuracy of above 98%.

How scalable is the SENSIT system?
The SENSIT system is quite scalable. The theoretical maximum number of SENSIT nodes in one network is about 65000. In general, large installation need to be divided into smaller sub-networks (segments), which makes it better manageable and easier to understand. Sites that have more than 500 sensors or more than 15 Relay Nodes need segmentation. Please contact your Nedap account manager.

What is the temperature range for the SENSIT and SENSIT IR?
The temperature range for both SENSIT as well SENSIT IR is -40°C to 85°C [-40 to 185°F]. Temperatures below -30°C [-22°F] might affect accuracy of the magnetic sensor. The accuracy on the optical sensor remains unchanged.

How does the energy efficient Wireless SENSIT Network work?
The medium access protocol is based upon time division multiple access (TDMA). Time is divided into time slots, which (Relay) nodes can use to transfer data without having to content for the medium or having to deal with energy wasting collisions of transmissions. After the frame length, which consists of 16 time slots, the (Relay) node again has a period of time reserved for it. We have parameterized the duration of a time slot and the number of time slots. The default timeslot is 100ms and the number of timeslots in a frame is 16. In the US the system uses also Frequency Hop Spread Spectrum (FHSS); a pseudo random frequency hopping scheme every timeslot the SENSIT also changes the frequency. In this way the devices comply with FCC regulations.

If a SENSIT sensor decides to transmit a messages it asks the first Relay Node within reach if it is allowed to transmit a message to this Relay Node, if allowed the Relay Node will receive the message from the SENSIT and retransmits this message to the next Relay Node or directly to the Data Collector.

Can a SENSIT sensor been used to replace a loop detector?
The SENSIT sensor is designed to detect a changes in either optical or earth magnetic field. A continuous flow of traffic would generate a constant status change. Moreover since the system is based on wireless communication, communication is slower compared to hard wired loop. We therefore do not advise to use the SENSIT sensor to replace safety loops for critical applications.

15.2   MAGNETIC SENSOR

Is the magnetic sensor influenced by snow or ice?
We have tested the system with about 15 cm (5.9 in) of snow during multiple tests. Snow did not affect the accuracy of the magnetic performance.

Is the magnetic sensor influenced by dirt?
The magnetic sensor is not influenced by dirt like sand, mud or leafs.

How quickly does the magnetic sensor in the node react to a change in status?
Default the magnetic sensor checks its status change every second.

Can the magnetic sensor 'see' the magnetic difference between a car and truck?
In a static parking application a SENSIT sensor cannot observe a difference between a small vehicle and a large truck. The variation in the earth magnetic field changes under a car or truck does not depend on the height of the vehicle but on where a car or truck stops. See also the image below to clarify this in more details.
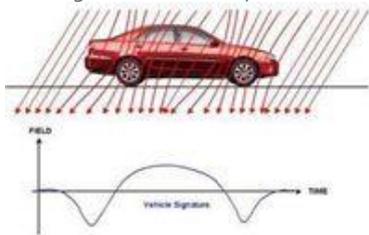
Image 1: Vehicle & earth magnetic field   Image 2: Truck & earth magnetic field
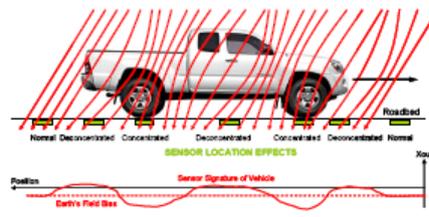
How does the SENSIT sensor detect a car and changes the magnetic status from free into occupied?
The magnetic status of the SENSIT sensor has changed if at any axis (X, Y, and Z) changes more than 50mGauss compared to the stored calibration vector. Normally the earth magnetic field vector is about 500mGauss. This can vary allot from place to place. In order to set the SENSIT sensor to local earth magnetic field we advise to calibrate the sensors.

How can I avoid a vehicle driving over the SENSIT sensor to trigger a status change event message?
When a vehicle is driving over a or multiple SENSIT sensors to reach the final parking bay the overdriven SENSIT sensors will transmit an occupied and free event message. If the overdrive filter isn't set. By default the overdrive filter is set to eliminate these kinds of messages. After setting the overdrive filter the SENSIT sensor will only transmit a status change event if the SENSIT sensor has been occupied of free for the set time.

15.2.1   CALIBRATION

Why calibrate?
The local earth magnetic field vector (value and direction) at an installed SENSIT sensor depends on the orientation of the SENSIT sensor, the amount of metal in the neighborhood and the location on the earth. When the calibration is done this local earth magnetic field vector is stored. It is therefore necessary to always calibrate the sensors.

How can I see if the calibration is done correctly?
When connecting the Data Collector to the SIS, the SIS software will indicate calibration errors for sensors which are not calibrated. In the Sensor data message there is a magnetic un-calibrated bit which warns you if the SENSIT sensor thinks it is not calibrated well.

Note
Setting or changing the overdrive filter affects reaction time.

Note
Default the overdrive filter is set at 8 seconds.

Does the parking need to be fully empty to calibrate the SENSIT sensors?
Yes, preferably the parking needs to be fully empty in order to calibrate the SENSIT sensors. If you need to calibrate a single parking bay it is sufficient if only all neighboring bays are empty. Easy calibration can be realized through the SIS website.

My parking lot is hardly ever empty, how can I calibrate the sensors?
If it is not possible to calibrate the entire parking lot, we suggest calibrating the parking lot section by section directly after installation of the SENSIT's.

15.3   OPTICAL SENSOR

What is the measuring interval of the optical sensor?
The optical sensors periodically checks once per second if there is a status change. (You can extend battery life by setting slowing measuring intervals.)

Why is the SENSIT IR featured with two detection technologies?
Double detection technology provides a higher accuracy rate. Each detection technology has its advantages and disadvantages. The combination of both ensures a reliable detection product in all circumstances and differentiates our product from any other product in the market. The optical sensor is potentially more accurate but sensitive for dirt, snow and ice. We specify an average accuracy of 95% for the SENSIT Flush Mount (only magnet) and 98% for the SENSIT IR (magnet and optical). In cases of snow or the optical sensor being covered the unit will automatically switch to earth magnetic field detection.

Which sensor is making the decision; occupied or free?
In most cases the optical sensor is indicating the final status. The algorithm inside the SENSIT sensor decides which type of sensor to trust. Of course you can ignore this and decide for yourself which sensor to use, because the state of the magnetic and the optical sensor is available.

What is the detection principal of the optical sensor?
The optical sensor is based on IR reflection. We are using a high power IR LED as transmitter and a sensitive IR diode as receiver. The IR radiation is reflected by the bottom of a car or truck and is received by the IR receiving diode. This means the bay is occupied.

Is the optical sensor influenced by snow or ice?
Yes the optical sensor detects based on something covering the sensor. In case the sensor is covered with snow or frost it will be seen as occupied. In the sensor data message there is a bit that warns you for possible ice on the SENSIT sensor. As the SENSIT IR is featured with dual sensing technology you can also decide to switch the sensors to magnetic detection in winter periods using the SIS software. Beside that on the SIS there is a global ice detection algorithm implemented which automatically can decide to switch to the magnetic sensor in case of ice or snow. See chapter 13.9.1 for more information.

Is the optical sensor influenced by dirt?
The optical sensor is designed to not easily be covered with little amounts of dust or sand and therefore this will not affect the performance. Larger amounts of dirt will disable the optical sensor. At an outdoor parking-lot, the self-cleaning surface of the SENSIT IR ensures that dirt is automatically flushed of and does not easily attach to the SENSIT IR. This makes it a very usable and practical system. The sites world-wide installed outdoors have since installation (in about 2006) never been cleaned.

What happens in case of sandstorms, when the optical sensor is covered?
When the optical is covered with sand the sensor cannot detect reflections of a vehicle that parks over the SENSIT sensor. So the optical sensor will indicate a free bay, the secondary (magnetic) sensor will detect the movement of the different cars above the SENSIT sensor. After a few (default: 10) mismatches between the continuous occupied optical sensor and the magnetic sensor the final status will be indicated by the magnetic sensor. As soon as the optical sensor is clean, the SENSIT sensor will automatically switch back to optical detection again.

Is the SENSIT IR affected by direct sun light?
Normally the optical IR sensor is not affected by sunlight. Only at locations close to the equator when the sun is directly above the SENSIT IR the optical sensor can give an overexposure alert, which will indicate a free bay.

15.3.1   CALIBRATION
What is the maximum range of the optical sensor?
The IR reflection depends very much on the reflection coefficient of surface it radiates at. Ceilings of over 3 meters (9 feet) are seen by the optical sensor. You can set the sensitivity of the optical sensor when applying the sensors for indoor applications.

Can the optical sensor been used indoors?
The optical sensor can be used indoors, for this the IR transmitting power needs to be adjusted (calibrated) to avoid the unit from detecting the ceiling.

15.4   MORE INFORMATION SENSIT AND MOUNTING
What filling material should I use?
The best way to fix the SENSIT sensors into the floor of the parking space is using rapid mortar (eg.TM 5R). Ensure to fixate the SENSIT sensors during curing time, to avoid them from floating in the mortar. When you want to use another brand of rapid mortal please sent us the datasheet so we can analyze this and advise you on use.

Is a SENSIT IR snow plough resistant?
When using the SENSIT IR in environments with snowy weather conditions, we advise to set a tolerance on the snow plough of 2 cm [0.78 in] to ensure the top of the sensor is not damaged by the snow plough. The SENSIT IR is not fully snow plough resistant; however it can withstand a few incidental hits. The SENSIT Flush Mount is snow plough resistant and can be used in areas with frequent snow conditions, at the cost of a bit lower accuracy.

15.5   INSTALLATION

How much time does an installation take?

Based on installation experiences, an estimation of the needed man hours for installing about 100 SENSIT IR is provided below.

Task	Description	Man hours
Preparation	Making a simple drawing of the parking lot and upload it to the SIM	2
Installation SENSIT IR	Determine location of every SENSIT IR, drilling holes and fixing them	8
Installation Relay Nodes	Mounting the Relay Nodes	1
Testing	Making a csv file, upload it to the SIS and verify if all SENSIT sensors are online	4

How do I start?

Please read chapter 3 of this document for a 4-step installation plan.

15.6   BATTERY LIFE

What is the battery life?

The battery life of the SENSIT sensor in a good performing network is 5 years this with default settings of the network and the measurement intervals.

Note
A network uptime below 99% will reduce the battery life significantly.

Can batteries be exchanged?

The SENSIT sensors are fully sealed to ensure reliable operation in the outdoor environment and to avoid any water leakage to the electronics. The batteries cannot be replaced, as this would create water leakage and unreliable operation. The SENSIT sensor needs to be replaced after end of battery life. The batteries of the Relay Node 2G can be replaced, see chapter 7.7.

Can I extend battery life of the SENSIT sensor by adjusting communication settings?

Yes you can extend battery life by adjusting the communication settings. Default the SENSIT sensors are set to 16 timeslots. This communication setting will realize a battery life time of 5 years and will achieve a good latency (fast and reliable communication network). For applications where slower communication (more latency) is allowed 32 timeslots is recommended to extend battery life time. Installations using over 15 Relay Nodes should also be set to 32 time slots.

How can I change the communication settings to extend battery life?

Please consult Nedap how to change the communication settings if your application allows slower communication or if your application needs more than 15 Relay Nodes.

How do we know if a SENSIT sensor runs out of batteries?

The battery voltages will be requested by the SENSIT Interface Server on a regular basis. The SIS will display an icon in the node presence list in the SIS if the battery is low or almost empty. See chapter 13.9.2 and chapter 13.9.3 for more information.

If I keep the product in stock for some time, do the batteries run down?

When shipped the units are in stock/transport mode to save battery life. That is why you need to swipe the SENSIT sensors with a reset magnet to get them out of stock mode. In stock/transport mode the SENSIT sensors hardly use any power. In this way you can have a SENSIT sensor in stock for e.g. a year without influencing the final battery life.

15.7   RELAY NODES

What is a Relay Node?

A Relay node consists of a SENSIT configured in an active role and a Relay Node mounting set. The mounting set allows for easy mounting of the Relay node onto a lamppost. The Relay node is a normal SENSIT but configured differently, a Relay Node has a more active role in the wireless network compared to a SENSIT. That is why we call a Relay Node an active node and a SENSIT a passive node. The continuous transmitting and receiving of an active node consumes more power than a passive node who is only listening to a few active nodes to stay synchronized and to receive incoming messages. The battery life of the Relay Node will be about 2 to 3 years. The advantage is that a Relay Node is still completely wireless and does not require any power or communication cabling.

What is a Relay Node 2G?

A Relay node 2G is a dedicated product for relaying message from the SENSIT sensors to the Data Collector. The Relay Node 2G has an active role and in the Wireless SENSIT Network. The battery lifetime of the Relay Node 2G is similar as the lifetime of the SENSIT sensors. The Relay Node 2G is wireless and does not require any power or communication cabling.

Why are Relay Nodes required?

Relay nodes are required to ensure a faster communication path to the Data Collectors, a more robust network and less energy consumption. Relay Nodes are required to ensure that SENSIT sensors positioned in the area can communicate directly via the Relay Node back to the central system. If each SENSIT sensor would need to communicate via the other SENSIT sensors installed in the floor, more communication 'hops' are needed. This will cause a slower communicating network, with a higher chance of missing a message and higher energy consumption.

How much Relay Nodes do I need to install?

The number of Relay Nodes depends on various parameters: number of SENSIT sensors, distances and obstructions. A minimum of 1 Relay Nodes and 1 Data Collector is required per installation to create a 2 path communication possibility for each SENSIT sensor. Nedap can provide you with more detailed information on the amount of Relay Nodes per installation for your site.

Has Nedap a tool to determine the number of needed Relay Nodes?

There is a tool available to make a better estimation of needed equipment, see chapter 4. Please ask your Nedap account manager for more information.

What is the communication distance between Relay Nodes and other components of the system?

Below the maximum recommended distances between the different nodes.

Data Collector	⇔ Relay Node	25 m	(82 ft)
Relay Node	⇔ Relay Node	50 m	(164 ft)
SENSIT	⇔ Relay Node	25 m	(82 ft)
Data Collector	⇔ SENSIT	25 m	(82 ft)
Data Collector	⇔ Relay Node 2G omni-directional	35 m	(135 ft)
Data Collector	⇔ Relay Node 2G directional	50 m	(164 ft)
Data Collector GPRS	⇔ Relay Node 2G	10 m	(33 ft)
Relay Node 2G	⇔ Relay Node 2G	100m	(328 ft)
SENSIT	⇔ Relay Node 2G omni-directional	35 m	(135 ft)
SENSIT	⇔ Relay Node 2G directional	50 m	(164 ft)

Note

Use of Relay nodes is mandatory to ensure a fast communicating, more stable and a less energy consuming SENSIT network.

How do I replace a Relay Node?
After end of battery life, the SENSIT can easily be taken out of the Relay Node mounting set. Only the SENSIT sensor configured as Relay Node would need to be replaced. The batteries of a Relay Node 2G can be replaced, see chapter 7.7.

Can the Relay Nodes also be used for indoor car parks?
Yes, the Relay Nodes can also be used for indoor car parks, see also picture below. Indoor car parks might require more Relay Nodes due to mounting height restrictions and influence of concrete on communication.

15.8   DATA COLLECTOR

What is the Data Collector?
The Data Collect is the central unit which collects the events from SENSIT sensors via the Relay nodes and transmits this information to the host system or SENSIT Interface Software.

Can I implement data from the Data Collector directly?
No, this feature is not supported and subject to change. For easy integration we advise to use the SENSIT Interface Software.

What is the most critical part of the SENSIT system?
The most critical part is the Data Collector when the power of the Data Collector is interrupted or if the Data Collector is damaged the whole Wireless SENSIT Network will stop working. Only with a good and powered Data Collector the wireless network will start. By using an UPS, (short) power failure can be solved.

Where do I mount the Data Collector?
The Data Collector can be installed within 25 m [84 ft] from the first SENSIT node or Relay Node. Be sure not to position the Data Collector in a metal enclosure as it will block the RF communication. The Data Collector can be mounted in a plastic housing, which is transparent for RF signals.

How can we make the Data Collector useable outdoors?
The standard Data collector can be placed in a plastic housing suitable for outdoor use. An outdoor box which is made of a conduction material or contains a lot of conduction material can create some problems as it blocks RF communication. A better solution is to use the Data Collector GPRS it has IP65 housing.

What power wiring (cable specs) do I need for the standard Data Collector?
Power: 100-240 VAC, 50-60 Hz, 180mA,
Power input: 5 VDC, max 1A
Power consumption: 5VA
Communication between Data Collector and SIS: Ethernet Cat 5 E

Can the Data Collector GPRS be powered by a solar panel?
There are already several customers who autonomously power the Data Collector GPRS with a solar panel. Also the Data Collector GPRS at the Nedap test-site is powered by a solar panel (since December 2011).

The autonomous solar panel system at the Nedap test-site is a 30Wp Solar panel, a charge regulator and two 22Ah /12V battery in parallel. See picture at the right

The Data Collector GPRS will not consume more than 60mA at 12VDC on average.

How much data will a Data Collector GPRS use?
Normally the data usage will be below 250MB per month.

Can I replace the antenna for one that I can mount on top of a metal box and keep the Data Collector inside this metal cabinet?
As for operational purposes this should not be an issue, on the condition that a suitable antenna is applied. However ETSI and FCC does not allow change of the antenna, and therefore as a manufacturer we cannot approve antenna change for this reason.

How often does the SENSIT sensor send an event to the Data Collector to alert a status change?
The SENSIT sensor sends an event message immediately after a status change.

The baud-rate of the Data Collector is 115200 can I change it into another value?
The baud-rate of the Data Collector is fixed, you cannot change it.

Can I built the Data Collector into a pay & display machine?
Yes, when the pay & display machine is featured with Ethernet communication, this communication could be applied. Keep into consideration that the RF antenna of the Data Collector should be positioned behind RF transparent material (such as plastic) and not incorporated in metal.

15.9   SENSIT INTERFACE SOFTWARE (SIS)

What is the SIS?

The SIS (SENSIT Interface Software) allows for easy configuration and filtering of event messages received by the Data Collectors. The SIS enables configuration, installation, basic administration and integration of the SENSIT system SIS functionality includes;

- Easy integration via SOAP or REST
- Easy remote support via web interface
- DNNP (Dynamic Node Numbering Protocol)
- Connection of multiple Data Collectors
- Filtering of events
- Easy event configuration
- Easy management of the entire Wireless SENSIT Network
- Automatic calibration
- Debug and analyze tool
- Automatic collection of missing messages
- Configuration of parking bays
- Stand-alone system with control of display per zone.
- Graphics to indicate parking spaces and overstay

Why use a SIS?

Configuration and integration of the data from the SENSIT system becomes much easier. The site can be accessed remotely allowing Nedap to give you better support on the installation.

Can I control a display with the SIS?

Yes using a wireless display node built-into a display, the display can become part of the Wireless SENSIT Network (WSN). You can set in the SIS software which parking zone the display should control and indicate. See chapter 13.6.7 for more information. Using this option a simple standalone application could be created with displays indicating available spaces. No more than 2 wireless displays are allowed in the WSN to make sure the display messages aren't influencing the WSN too much.

How does the overstay sequence work?

The accuracy of detection is of critical importance when using the information for enforcement applications. You want to avoid issuing unjustified tickets. In the table below the whole overstay sequence and how to check an overstay is explained.

Event	T	SENSIT	SIS
Car parked	t1	Detected optical + magnetic	
Overdrive filter (8s) passed.	t2	Event created and transmitted, including; sequence number, t2	
Event at DC	t3		
	t4		Event stored in database, including; t2, t3 and t4. SIS verifies sequence number
No change after 1 hour	t5	Event (created at t2) retransmitted	
	t6		Event already stored, so ignored by SIS
Overstay time elapsed	t7		Bay status changed into: overstay, verify request transmitted
Verify message received	t8	Last event (created at t2) is retransmitted	
Verify event received	t9		Bay status changed into: verified overstay
Enforcement officer is notified and arrives at the bay, enforcer sends verification request			
SOAP request received	t10		Verify request transmitted
Verify message received	t11	Last event (created at t2) is retransmitted	
Verify event received	t12		Bay status answered via the SOAP
Enforcer receives verification and can decide to issue a ticket after his final observations.			

How do we know when a SENSIT or Relay Node is working well?

With the node cross check menu on the SIS you can detect if all SENSIT sensors are still communicating. Logged in as an advanced user it is possible to get a graphical overview of the performance of the wireless SENSIT network. For more information, see chapter 13.8.5.

15.10 NETWORK & COMMUNICATION

How much events can a SENSIT node store?
Every SENSIT node is capable of storing 32 events in its internal memory.

What causes the latency of a SENSIT sensor?
The latency is built up out of different aspects;

- **The measurement interval;**
  The interval the SENSIT sensor verifies it status changed, default set at 1 second.
- **The overdrive filter;**
  The overdrive delay set in the SENSIT sensor is by default set at 8 seconds.
- **The number of hops;**
  The number of hops a message needs to arrive at the Data Collector, every hop takes about 2 seconds.
- **Passive collisions;**
  In a busy car park multiple SENSIT sensors want to transmit their status change message simultaneous, which might create passive collisions. In order to reduce this we advise to ensure that each SENSIT sensor can at least communicate with 2 Relay Nodes offering multiple communication paths.

Example with default settings and without passive collisions:
The magnetic and optical sensor measures every second if the status of the bay is changed. The overdrive filter waits 8 seconds before it transmits the event. In this example the event is transmitted via 2 Relay Nodes; first from the SENSIT to the nearest Relay Node and then from this Relay Node to the Relay Node close to the Data Collector and finally from this Relay Node to the Data Collector. The total (worst-case) time needed is:
Measurement + overdrive + SENSIT→RN + RN→RN + RN→Data Collector = 1+8+2+2+2 = 15s

Example with default settings and with one passive collision:
The magnetic and optical sensor measures every second if the status of the bay is changed. The overdrive filter waits 8 seconds before it transmits the event. In this example the event is transmitted via 2 Relay Nodes; the sequence of transmitting the messages is the same as in the example above but now a collision occurred in the first transmission; another SENSIT transmitted an event at the same time to the Relay Nodes. The total (worst-case) time needed is now:
Measurement + overdrive + collision + SENSIT→RN + RN→RN + RN→Data Collector = 1+8+10+2+2+2 = 25s

How many seconds does an event message take in general?
The transfer time is depending on the number of hops and if passive collisions take place. A collision free transfer via one Relay Node takes less than 5 seconds, for every extra hop add 2 seconds. For a busy parking lot take into account at least 10 seconds extra for possible passive collisions.

Is the package number always increasing per SENSIT?
Yes, the package number is automatically increased in sequence number per SENSIT and the message is unique based on a combination of SENSIT ID number and package number.

How do we map the double words corresponding to "Sent time" and "event time" to real dates?
The double word is the time in seconds from January 1st 1970 this is also used within UNIX and therefore also known as 'Unix-time'.

15.11 TECHNICAL MATTERS

What is the MTBF of the various components of the Wireless Space Count system?

In the table below the MTBF, MTTR and MTTF is given, so far this are estimated values.

	MTBF	MTTR without spare	MTTR with spare	MTTF
SENSIT IR	63 years	7 days	1 hour	~40 years
SENSIT Flush Mount	63 years	7 days	1 hour	~40 years
SENSIT Surface Mount	76 years	7 days	1 hour	~40 years
Relay Node	65 years	7 days	1 hour	~40 years
Relay Node 2G	52 years	7 days	1 hour	~40 years
Data Collector	53 years	14 days	1 hour	~40 years
Data Collector GPRS		14 days	1 hour	~40 years

16   APPENDIX

A   RAPID MORTAR

RAPID MORTAR TM 5R

100706-06

Product description

Rapid mortar TM 5R is produced of a cement with a very high reactivity to water, and quartz sand with a maximum aggregate of 0.4 mm. Special synthetic components provide for good adhesion to the surface. Rapid mortar TM 5R exhibits high strength within a very short period of time.

Application

Rapid mortar TM 5R is used for repairing concrete and concrete units, which have to be back in operation in a short period of time, i.e.:
- repairs of manhole covers and drains in road construction
- assembly of parking meters and road signs

User instructions

Rapid mortar TM 5R is prepared with water until a plastic mortar is obtained. The water is filled into the mixer first, and then Rapid mortar TM 5R is added. For every 25 kg of Rapid mortar TM 5R about 3.75 litres of water are added. Mixing time is about 3 minutes after which the mortar is applied using appropriate tools. The processing time is about 15 minutes at a temperature of 20ºC.

Yield

2 kg SchnellMortar TM 5R prepared with water will yield about 1 litre mortar.

Technical data
- State of aggregation: powder
- Colour: grey
- Density (kg/l): n.a.
- pH-Value: n.a.
- max. alkali content (% Na_2O-eq): n.a.
- max. chloride content (%): n.a.
- Colour code: n.a.
- Storage: dry, frost-protected, in closed packaging
- Shelf-life: when stored correctly at least 6 months after date of production

Packaging

Sacks, pallets, big bags.

Preliminary tests for the product's suitability are indispensable

Article number 5115

Tillman B.V. - Julianaweg 12 - 7078 AR Megchelen Gld.NL - tel. +31(0)315377541 - fax. +31(0)315377577 - info@tillman.nl - www.tillman.nl

B   MODIFIED SILICON POLYMER

Sabatack Fast
u l t r a - f a s t b o n d i n g

B.1   Description

Sabatack Fast is an ultra fast-acting 2-component, elastic, humidity-curing, MS polymer-based construction adhesive. Its primary use is bonding with fast hardening, handling after only 2 hours, which makes this product excellent for use in mass production. Sabatack Fast has a medium viscosity and a high modulus elasticity.

B.2   Field of application

Industrial and hand-made vehicle and coachwork construction, marine, ventilation and air conditions, electro-technology, equipment assembly, metal and tin processing, plastics technology, civil & environmental engineering and building & construction. For the elastic bonding of frames, profiles, plates etc. Also for sealing seams, overlaps, joints and cracks. Suitable for interior and exterior use. Excellent for use in mass production.

B.3   Advantages

* fast and controlled curing, high end strength
* adhesion without primer, fast drying
* can be painted wet-on-wet, hardly any shrinkage
* no blistering, almost odorless
* free from solvents, isocyanates and silicones
* UV-stable, high temperature resistance
* certificates: Wheelmark (164.106/1121/WCL MED0326), ISEGA (in connection with HACCP)

B.4   Method of use

For instructions for use, repaint ability and pre-treatment, see the relevant info sheets at **www.saba.nl**

B.5   TECHNICAL DATA

Order information

Other packaging and colours on request. The shelf life may vary for large packaging.

Safety recommendations

For more information about safety, see the relevant SABA safety data sheet.

Component A Component B

Basis	MS polymer, humidity-curing MS polymer, humidity-curing
Density	(EN 542) approx. 1.380 kg/m3 approx. 1.144 kg/m3
Solids content	approx. 100% approx. 85%
Open time	(23 °C, 50% RLV) approx. 10 minutes
Tack free	(23 °C, 50% RLV) completely after approx. 12 hours
Cure rate	(23 °C, 50% RLV) even after 48 hours
Hardness Shore A	(EN ISO 868) approx. 55
Volume alteration	(EN ISO 10563) < 5%
Modulus at 100%	(ISO 37/DIN 53504) approx. 1.5 N/mm2
Tensile strength	(ISO 37/DIN 53504) approx. 2.6 N/mm2

Elongation at break	(ISO 37/DIN 53504) approx. 330%
Shear strength	(ISO 4587) approx. 1.7 N/mm2
Working temperature	min. +5 °C to max. +35 °C
Storage temperature	min. +5 °C to max. +25 °C
Temperature resistance	min. -40 °C to max. +120 °C
Short temperature resistance	max. +180 °C (30 minutes)
Packaging	dual-cartridge
Contents	490 ml (contains 7 items)
Color	White (RAL 9003) black (RAL 9011)
Article No.	100201 DJW 100862 DJW
Shelf life	9 months (in unopened packaging)

C   POLYURETHAN

PERMAPUR® 2654 A/B

Universal Polyurethane liquid adhesive
PERMAPUR® 2654 A/B consists of two components A-component (Polyol) and a B-component (Isocyanate). The resin is supplied in a bi-pack. PERMAPUR 2654 A/B is used as an universal polyurethane resin which can be applied by pouring the fluid. The system is insensitive to moist and shows no blistering and is therefore less critical in processing.

Technical details

Color:	A-component black fluid
	B component dark brown fluid
Color mix:	Black
Processing time:	10 min / 20°C
Gel time:	15 min / 20°C
Curing time:	24 h /20°C
Viscosity:	4.500 mPa.sec/20°C
Hardness:	45° Shore D
Specific gravity:	1,5 g/cm3
Specific resistance:	1 x 1014 W.cm
Breakdown voltage:	20 KV/mm
Max. Temperature:	-25°C tot +120°C
Water absorption:	<1%
Storage:	At room temperature (20 ° C) in tightly closed Verpa Branching 12 months

D   DISCLAIMER

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E   DOCUMENT REVISION

Version	Date	Comment
1.3.3	24-02-2014	Start documents and new corporate style
1.4	14-04-2014	Adjustments for 1.4 release.
1.4.1	12-05-2014	Adjustments for release 1.4.1, RelayNodeTool added, Document renamed.
1.4.2	15-07-2014	Adjustments for release 1.4.2, FCC & IC Declaration and some small textual improvements.
1.4.3	27-10-2014	Adjustments for release 1.4.3, some small textual improvements.
1.5.0	17-12-2014	Adjustments for release 1.5.0; Parking enforcement screens.
1.5.1	17-12-2014	Adjustments for release 1.5.1; DNNP
1.5.2	04-03-2015	Adjustments for release 1.5.2; EPL