

# Quick Start Guide

Smartrek Plug n' Play  
Monitoring System



**[SMART]REK  
TECHNOLOGIES**

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# 1 Introduction

Smartrek Plug n' Play monitoring system delivers a powerful, modular, easy to setup sensor platform for the Internet of Things, using Spidermesh, a cooperative wireless mesh technology. The sensors system stands out when it comes to network scalability and to autonomous long-life sensors (operating on primary batteries). Therefore, large areas can be easily monitored using a single network. Typical applications include industrial, agricultural and environmental monitoring, as well as any monitoring that is occurring in harsh wireless conditions, such as in forests, mountains, urban canyons, etc.

Some benefits of using the Smartrek monitoring system include:

- Near real-time data collection
- Wireless connectivity in wireless extreme environments (high occlusion environments)
- Easy installation, with no specific knowledge required
- Local private network that does not require infrastructures or any other connectivity
- Encryption ready for increased security
- Scalable network, add more sensors as you go
- Battery operation, in most cases, with 3 to 7 years continuous operation

## 2 Getting Started

The Smartrek Plug n' Play monitoring system includes:

- 1x Gateway
- 1x Tablet (HMI)
- Sensors (pressure, temperature, flowmeter, water level, remote controls, etc.)



Figure 1: The Gateway



Figure 2: The Tablet



Figure 3: The Tablet

### 2.1 Basic Components

The Smartrek network is controlled by a Gateway, which orchestrates communication and syncing between sensors. Without a Gateway running, sensors cannot sync to the network and fall into the network search mode, therefore staying awake at all time, until they lock back to the network or until they drain out of batteries.

Then, a tablet is paired (via bluetooth) to the Gateway as a mean to tap into the system and to provide a visual interface to store, view, export the recorded data from the sensors network. This Android tablet is running the Smartrek Sugarheld App. Network and system configuration, sensors configuration as well as data are made accessible through this app. Additionally, data can be sent to the Cloud and viewed remotely from the Smartrek Web App. For this option, the tablet has to be connected to the Internet, either through a local Wifi connection or a cellular LTE connection. To enable cellular connectivity, insert a SIM card with a data plan into the tablet. Figure 4 illustrates a typical Smartrek Plug n' Play monitoring system deployment with local and remote access setup.

The monitoring system comes pre-configured. The system default values are shown in Table 1. If the system hasn't been pre-configured, the Installation Wizard should pop-up when launching the Smartrek Sugarheld App, as shown in Figure 5. Follow the Wizard to get the system up and running.

#### 2.1.1 Navigating the Sugarheld App

To launch the Smartrek Sugarheld App on the tablet, locate the Smartrek icon as shown in Figure 6 and tap on it to start the App. The App should restore the last page viewed, or, if the app hasn't been preconfigured, then the Installation Wizard will auto-launch (5).

Depending on the configuration of the App, there are 3 to 4 tabs to navigate in the software.

The Map Tab The Map tab shows the entire monitoring systems on a satellite or road map. The sensors will appear on the map at their installation location (where the nodes were scanned into the App). To zoom in and out, use the + and - button at the bottom of the view. To move on the map, open the menu (see Section 2.1.2) and tap on Unlock if the map is locked to the current GPS

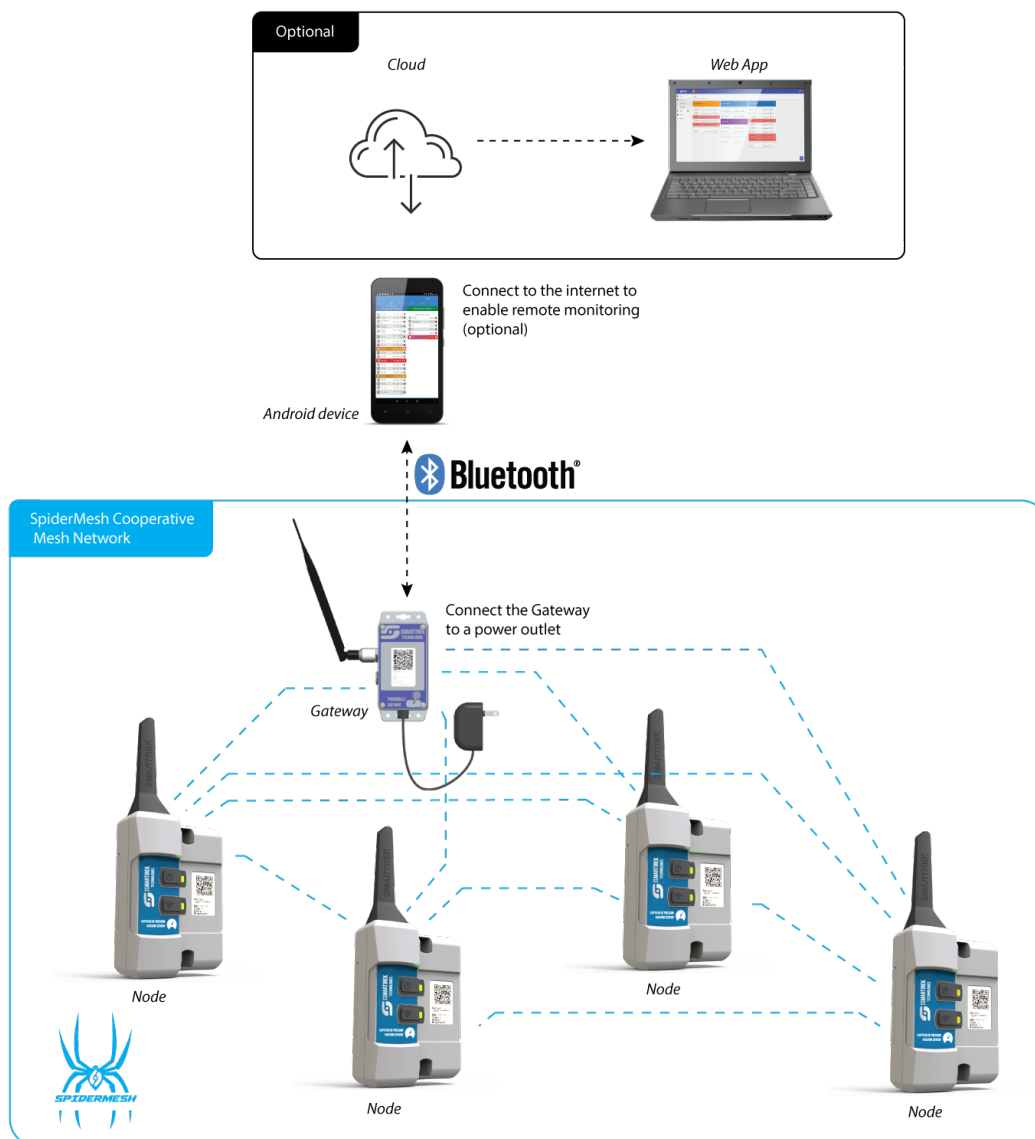


Figure 4: Typical Smartrek Monitoring System Deployment

Table 1: Default system values

Configuration	Default Value
Channel	1
Gateway	5% awake time (energy saving mode), hop count = 8
Online Folder Selector	Google Drive
Enable History	Yes
Send Logs	Yes
Writer	Yes
Google Account	Pre-configured (should be made available to the user by the seller)
Table	1
Alarms	All options enabled
Choose Theme	Modern
Select Active Sensors	Gateway, Repeater, ...
Map	Can be either pre-configured or not

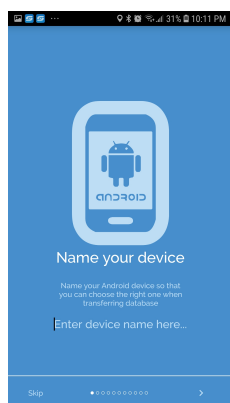


Figure 5: Installation Wizard



Figure 6: App Icon

location of the tablet. Table 2 lists the actions available from the Map Tab.

Table 2: Map Tab Actions

Action	Description
Change Map View	Bottom Menu -> Sat Map/Road Map. Change from roadmap view to satellite map view.
Unlock-/Lock GPS location	Bottom Menu -> Lock/Unlock. Unlock or lock map center to the current tablet GPS location.
Edit Map Layers	Bottom Menu -> Layers. Choose map layers to hide/unhide.
Set Map Zero	Bottom Menu -> Set Zero. Set the current map center as the (0, 0) map coordinates. This center coordinates will be used when downloading the road/satellite map.
Set Node Location	Bottom Menu -> Set node location. Opens the barcode scanner. Scan the barcode of a sensor to set its location to the current tablet GPS location.
Download Base Map	Bottom Menu -> More... -> Cache base map. Downloads the preliminary satellite or roadmap at the current (0, 0) coordinate.
Download Map	Bottom Menu -> More... -> Cache sat map/Cache roadmap. Downloads the detailed satellite or roadmap at the current (0, 0) coordinate.

The Nodes Tab The Nodes tab contains the sensors list, including the list of available Gateways. The available sensors are presented in Table 3. Table 4 lists the actions available from the Nodes Tab.

The Cfg (Configuration) Tab The Cfg tab, or configuration tab is used to setup the monitoring system.

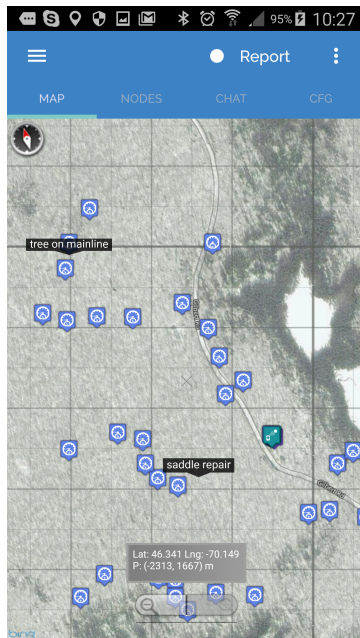


Figure 7: Installation Wizard

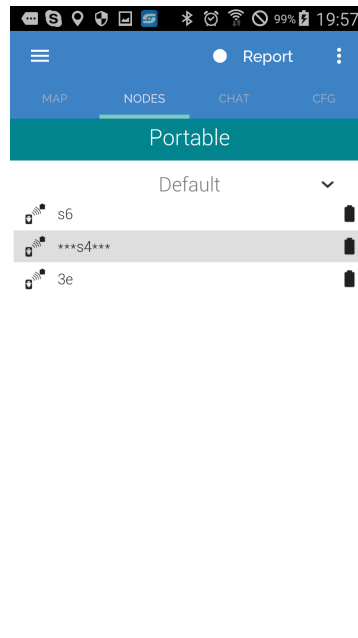


Figure 8: Nodes Tab

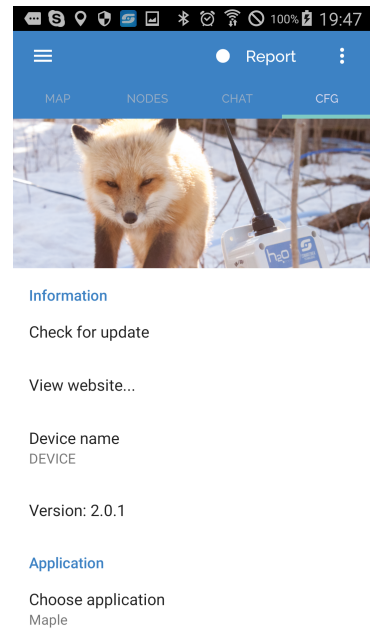


Figure 9: Cfg Tab

Table 3: Available Sensors

Sensor	Description
Gateway	Mesh network controller (Required)
Handheld	Optional sniffer, or portable gateway that can be used to roam on the network. This is useful when the only network available is the Smartrek network, in which case the handheld can be used to tap into the system and view and control devices wherever, inside of the Smartrek network.
Repeater	A Smartrek network extender. Repeaters should be added whenever a sensor is too far from the current network or the signal is not strong enough.
Vacuum	Measures vacuum from 0 to 29.9 in Hg
Ultrasonic Level	Measures a distance or level, using an ultrasonic beam. Can be used with liquids, solids, snow, etc. (please specify the substance to be measured when ordering)
Relay (Remote Control)	Control equipment with 2x 24V output. Optional 2x current sensors and 1x dry contact monitoring or totalizer.
Reverse Osmosis	Control a Reverse Osmosis or Osmosis machine (compatible with H2O Innovation brand)
Tensiometer	Measures soil tension from 0 to 100 cbar.
Refractometer	Measures concentration of aqueous solutions (compatible with Atago brand process refractometers)
Pressure	Measures liquid pressure. Available ranges: -14 .. 100 psig, 0 .. 300 psig, 0 .. 1.5 bara, 0 .. 1000 psig, other upon request.
Water Level	Measures water column height for groundwater level monitoring or tank level. Available ranges: 10m, 30m, 60m, 120m.
Flowmeter	Measures flow and water volume from an industrial flowmeter featuring a pulse output. Can be used with any agricultural and industrial flowmeter/magmeter.
Thermometer RTD	Measures temperature from an RTD PT-100 sensor.
Thermocouple	Measures temperature from a thermocouple type K.
Digital Inputs	Monitors up to 6x dry contacts.
Watermark	Measures soil tension (resistive measurement).
Hygrometer	Measures soil humidity (conductance measurement).
Conductivity	Measures liquid conductivity. Available probe ranges: Ko.1, K1.0, K10.
Tensiometer MPS6	Measures soil tension.
pH	Measures liquid pH.
O.R.P.	Measures liquid oxydo-reduction potential.
D.O.	Measures liquid dissolved oxygen.
4-20mA Transmitter	Transmits a 4-20mA signal.
4-20mA Receiver	Receives a 4-20mA signal.

Table 4: Nodes Tab Actions

Action	Description
Add Device	Bottom Menu -> New Node. Add new sensor to the monitoring system.
Remove Device	Long click on the device to be removed -> Delete node. Delete the sensor from the monitoring system.
Edit Device	Long click on the device to edit -> Edit node. Change sensor configuration, such as sensor name, location, type, re-scan barcode.
Configure Gateway	Swipe to the Gateway list -> Click on the gateway to configure -> Change configuration
Activate/De-activate Gateway	Swipe to the Gateway list -> Long click on the gateway to activate (establish Bluetooth connection with the Gateway) -> Activate/Deactivate node.
Transfer Database	Bottom Menu -> Transfer -> Wifi (when the device to transfer to is on the same wifi network), Share via file (email, etc. transfer)
View Sensor Details	Swipe to the sensors list -> Click on the sensor to view details.
View Network Activity	The sensor polling action is visually shown by a grey moving bar animation. Data sent out to the sensor is shown by the grey bar moving from left to right and data sent back from the gateway is shown by the grey bar moving from right to left.
View Sensors Lists	Swipe Left-Right to navigate between sensors lists.



Table 5: Cfg Tab Actions

Action	Description
Information	
Check for update	Check for available software update.
Device name	Change tablet's name. Optional.
Version: ...	The current software version.
Installation Wizard	
Launch wizard	Launch the Installation Wizard now.
Device Configuration	
RF Channel	The network channel (choose from 1 to 16). The sensors will have to be configured on the same network channel in order to sync with the Gateway.
Alarm Configuration	
Alarms	Choose whether errors and warnings should trigger an alarm. Enable use speech synthesis for alarms to be announced. Enable use peristant pane to keep track of errors/warnings history in the Notification Pane.
Advanced alarms settings	Specify new alarm rules. For example, set the app to ignore all low voltage alarms.
Cell and eamil on phone params.	Setup email and SMS notifications frequency.
Cell phone map	Setup cellphone numbers to send SMS notifications to (when tablet is connected to the internet through a LTE cellular connection).
Email map	Setup email and cellphone numbers to send SMS notifications to (when tablet is connected to the interet through a Wifi connection).
Display Configuration	
Unit settings	Choose display units (metric/imperial, etc.)
Choose theme	Skin the app.
Online Folder	
Online folder selector	Choose the Cloud data hosting provider. GDrive recommended.
Update online log folders daily	Force daily data refresh on the Cloud.

Table 6: Cfg Tab Actions (continued)

Action	Description
Google	
Web page	Launch the Web App
Table	Choose table to write to. Multiple tables can be written to the Cloud on the same account. Default = 1.
Google Account	Select or create the Google Account to use. Data will be stored on this user's Google Drive.
Writer Mode	When enabled, the current Gateway/Tablet will write to the Cloud. When unchecked, the tablet will not sync with the gateway and will rather download and display data already stored on the Cloud and written by another tablet set in Writer mode.
Send logs	Send full data history to the Cloud
Database	
Select active sensors	Choose sensors lists to display/hide
Enable history	save data to the local disk
DB backup	backup the current sensors lists (database)
DB restore	restore a saved sensors lists (database)
Transfer	Transfer the current database to another device.

## 2.1.2 Opening Menus

Most pages offer more configuration options hidden in a menu. To open this menu, most tablet will provide either a button on the device, or it can sometimes be triggered by long-pressing the back button. Refer to the User Manual of the tablet for more information on how to open contextual menus.

## 2.2 Sensors

Once the Basic Components have been installed and configured, it's time to add sensors to the network. With the Tablet running the Smartrek Sugarheld App, navigate to the Nodes Tab. Open the bottom menu (see Section 2.1.2) and click on Add Node. The Add new node dialog will open (Figure 10). Click on the barcode icon to launch the barcode scanner. Scan the barcode on the sensor to be added ( 11). Once the device has been successfully scanned, the MAC address field, the Serial Number field and the Node Type will have updated with the barcode information. Click on the Name field and Name the sensor (Figure 12). Click on the checkmark at the top right corner of the page add the sensor.

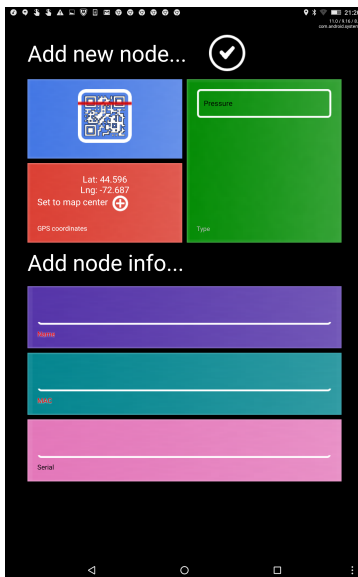


Figure 10: Add Node Dialog



Figure 11: Scan Barcode

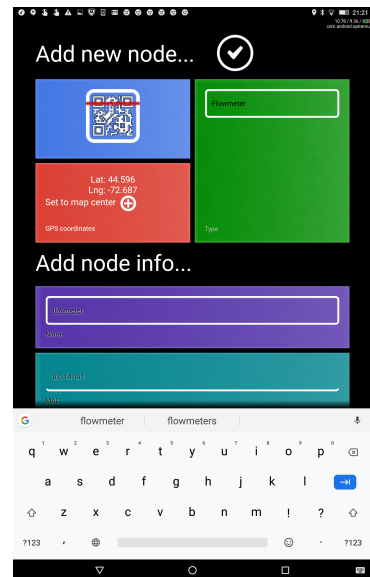


Figure 12: Name Sensor

For specific information on each sensor type and their configuration and usage, refer to that specific Sensor Guide.

## 2.3 Finalizing the Installation

Once the sensors have been added to the system, start data-logging by pairing the Tablet to the Gateway. This is referred to as Gateway Activation. To activate the gateway and launch the Bluetooth link between the two devices, on the Tablet running the Sugarheld App, navigate to the Nodes Tab. Swipe to the Gateway list and long press the Gateway to be activated. A menu will open. Click on Activate Node. The app will restart and the name of the gateway will have updated to \*\*\* name\_of\_the\_gateway \*\*\*.

The gateway will be highlighted in red until the connection is successfully established between the

two devices. The system is up and running and datalogging when:

- The Gateway has been activated and its name is surrounded by asterix
- The Gateway is not highlighted in red (indicating a successful link between the Tablet and the Gateway)
- The headers of the sensors lists (modern theme) or pages (legacy theme) are coloured. When greyed out, this indicates that the system is not running and the sensors are not currently communicating with the Gateway.
- A grey bar animation is seen moving from side to side, indicating communication between the Gateway and the Sensor.

Once these conditions have been met, data should start accumulating in the local storage of the tablet and the sensors should be seen updating their values. The system is up and running. For details on how to fine-tune the system configuration, please refer to the complete User Manual, available on our [website](#).

### 3 Setting Up Remote Access

To access the system remotely, the Tablet has to be connected to the internet, using a local Wifi connection, or by adding a SIM card with a data plan into the Tablet. Then, in order to access the Smartrek Web App, a few settings have to be configured in the Cfg Tab of the App. Alternatively, data can be sent through SFTP to a private server. In this case, the user will have to build its own connector and/or dashboard to view the monitoring system remotely. Please contact Smartrek for help in building the connector. Table 7 lists the required app configuration in the Cfg Tab for remote system access with the Smartrek Web App.

Table 7: Required Configuration for Remote Access

Configuration	Value
Online Folder Selector	GDrive (Google Drive)
Account (under Google)	Any Google/Gmail account
Enable History	Enabled
Send Logs	Enabled
Writer	Enabled

Once properly configured, a toast will appear on the tablet, at the bottom of the screen, every minute with one of the messages listed in Table 8. Once the Google Drive Operation Ok appears at the bottom of the screen, then the system is ready to be viewed from the Smartrek Web App. On a PC/tablet/cellphone, open or install the Chrome browser and launch the web app at the following address [https://www.smartrektechnologies.com/vip/sugarheld/proto/Web32\\_general](https://www.smartrektechnologies.com/vip/sugarheld/proto/Web32_general).

Log into the same account as defined in the Smartrek Sugarheld App. Click on the user icon in the toolbar at the top of the page. Choose GDrive and log into the Google Account. Grant access to the Web App, clicking on Advanced Settings and continue in the case of a security warning from Google (this is because the app isn't published on the Google Play Store).

Once logged in, a green animated bar will appear on the top of the screen indicating that data is being fetched from the account. Wait for the green bar to disappear and navigate to My Sensors -> List By Type to view the sensors lists as shown in Figure 13. To view the details of the sensors, click on the menu next to the sensor (3 vertical dots) and click on Details. The Sensor Detail View is presented in Figure 14.

Table 8: Toast Messages Indicating Cloud Connection Status

Message	Description
Google Drive Downloading...	The online folder is currently being created on the Cloud and data will be accessible soon. Wait until the Google Drive Ok message appear.
Google Drive Operation Ok	Cloud connection established. Data is being uploaded to the Cloud at regular intervals.
Google Drive Operation Error	There was a problem establishing connection to the Cloud. Verify internet connection.

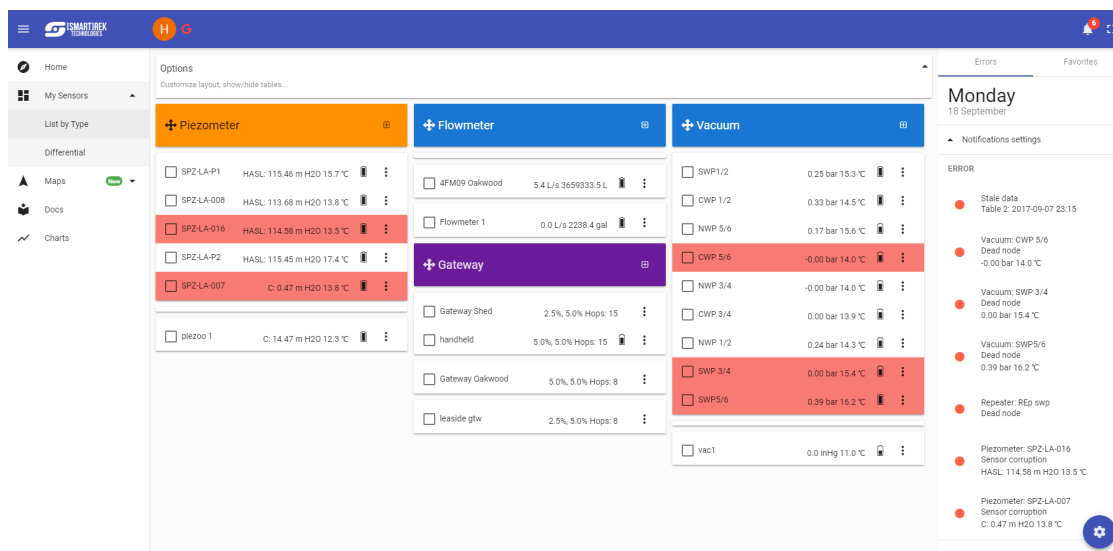


Figure 13: Sensors Lists on the Web App

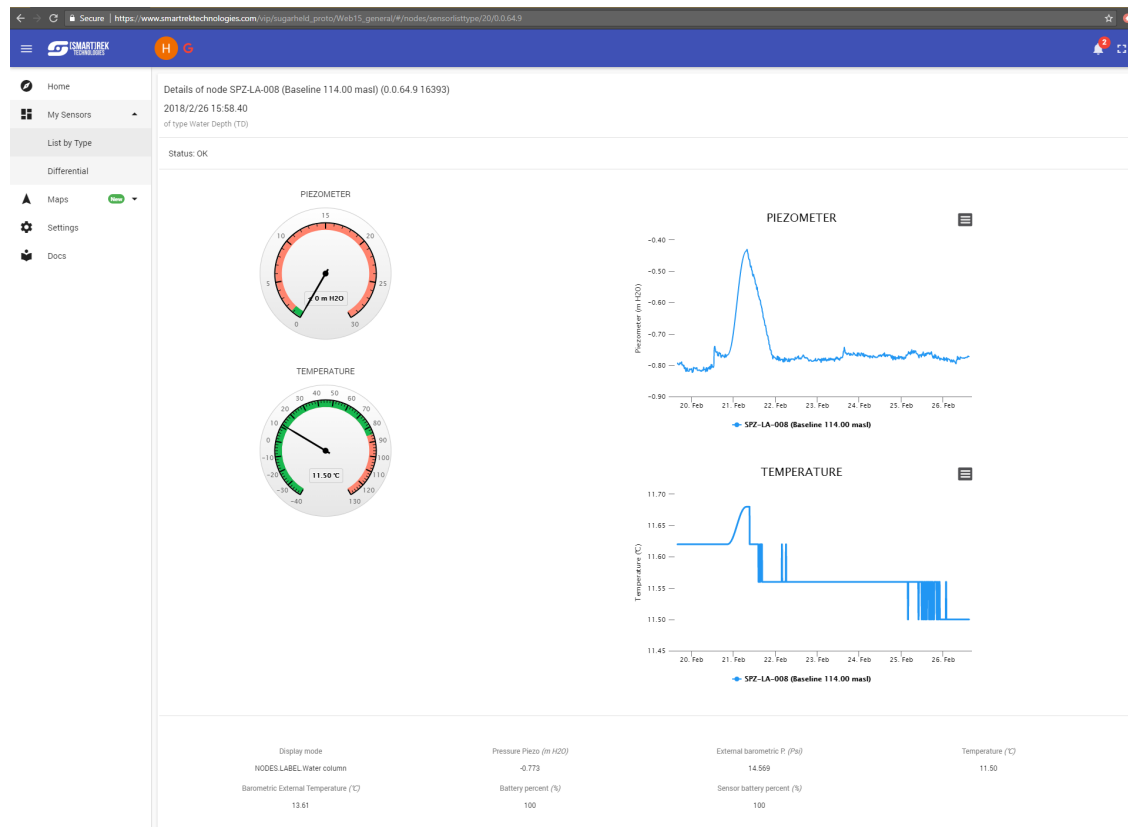


Figure 14: Detail View of a Sensor

## 4 Exporting Data

Logged data can be exported either from the Android App or from the Web App.

### 4.1 Exporting from the Smartrek Sugarheld App

To export data from the Smartrek Sugarheld App, navigate to the Nodes Tab and swipe to the desired sensor page. Click on the sensor to open the Sensor Detail page. Then click on the Chart icon at the top right corner of the page to generate the logged history chart. From the Chart view, open the Bottom Menu and click on Export.

### 4.2 Exporting from the Web App

To export data from the Web App, navigate to the List By Type page, select all Sensors (from the same type) to do a bulk data export. Then, click on the + icon on the top header of the list. Select Export to tsv. Select the date range and whether all data should be exported or should data be trimmed down to 1 entry per N entry.

## 5 Frequently Asked Questions

### 5.1 How many Gateways can I connect to each tablet?

Only one.

### 5.2 What is the maximum number of nodes I can connect to each Gateway?

You can connect unlimited nodes.

### 5.3 What is the range of the node?

The maximum range is 10 km in direct line of sight but it varies based on infrastructure, weather, obstructions and topography. Range in Northern deciduous forest is 500 m. Range in underground tunnels varies around 500 m.

### 5.4 Must all nodes be within this radius?

No, only one node needs to be able to connect directly with the gateway. As long as additional nodes are within range of each other the data collected can be relayed to the gateway.

### 5.5 Do the nodes need to be in a sheltered area?

No, the nodes are weatherproof.

### 5.6 What is the operating temperature range of the nodes?

-18 to 55C (Battery specification). In the vent the unit is being used in direct sunlight and high heat conditions, it is recommended to be deployed in the shade.

### 5.7 Am I able to verify the connectivity of the nodes when installing them?

Yes.



## 5.8 What is the expected battery life of the nodes

3 years, but it varies based on chosen datalogging speed

## 5.9 What, if any, are seasonal considerations that might affect the range of the system?

Foliage, can reduce ranges of nodes. Spring flooding can inundate nodes. Snow cover, snowfall, fog, and ambient humidity can affect range of nodes.

## 5.10 Can I add additional nodes at a later date?

Yes.

## 5.11 Is there a maximum number of hops before reaching gateway?

31 (100 coming soon). But default will be set at 8.

## 5.12 Can I vary sampling rate at any time without changing other settings?

Yes.

## 5.13 Can I register both a tablet and a handheld device to the same gateway?

No.

## 5.14 How is the Channel determined and by whom?

It is preset to 1 unless specified before.

## 5.15 Can I obtain a real time reading at any time?

Yes

## 5.16 Can I link my iPhone or iPad to the gateway?

No, it can only be done through the web app on iPhones and iPads. Android can link directly.

## 5.17 Can I access the "raw" data?

Yes, it can export to .tsv (tab delimited excel compatible format).

## 5.18 Does the node location in the system affect the battery life?

No. This is a benefit of this technology.

## 5.19 What do nodes do with data if no gateway can't be located?

Data will be lost, but user gets notified for the lost/missing connection.

## 5.20 Can the node report to more than one gateway?

No.

## 5.21 What is the buffer size that the gateway has in case of power failure?

One week with the Li-ion battery.

## 5.22 Can it be integrated with LoRa systems?

Not at the moment but will be available soon.

## 5.23 What is the data size? How much data can be stored in 1 GB?

Years of data.

## 5.24 Do the nodes have internal memory?

No.

## 5.25 Is the data encrypted?

It can be. 128 bit AES.

## 5.26 Will the tablet store the data on the SD card as well as send it to the Cloud?

Yes.

## 5.27 How far can the base station be from the node to communicate?

It is the same as between each node (10 km line of sight, 500 m in deciduous forests).

## 5.28 I have been looking at the Smartrek Web App but I can't see any data under "My Sensors"

You are probably not logged on, or the tablet isn't connected to the internet. To log on the link, enter the same login that is set in the tablet, under the google drive section in the Cfg Tab.

## 5.29 If I set an alarm for my sensor, will the system notify me when the "trigger" level is reached?

Yes, it will and the notification is done via audio alarms on the main tablet and, optionally, via SMS and email.

## 5.30 How does the base station work?

The base station or gateway needs a power supply and an internet connection. It is possible to add a SIM card on the Android tablet for a cellular connection. With this SIM card, the tablet will access the internet and upload data to the Cloud. There is also a rechargeable battery inside the gateway that will last about a week, but for permanent installation, it will need AC.

### 5.31 Does it need the Wifi connection or does it use the tablet as hotspot?

The tablet needs to have an internet connection. The tablet can use a Wifi or its built in cell capabilities with a SIM card.

### 5.32 What does the system consist of at a minimum?

A basestation (gateway), a tablet, a node with any accessories required (depending on the sensor type). The tablet is the brain or controller of the system. It uploads your information to the internet (as long as an internet connection is available, and stores a backup locally on its internal memory.

### 5.33 How does the Tablet connect with the Gateway to view and get data?

The Tablet connects via Bluetooth to the Gateway. The tablet then upload the information to the internet using an available Wifi connection, or you can insert a SIM card and purchase a low cost IOT data plan from one of many carriers.

### 5.34 How does the Gateway connect to the outside network (Cloud) in order to use remotely?

If no internet connection is available, you can still access all devices from the tablet, however, you cannot access any of them remotely.

### 5.35 Is there a data buffer in the gateway?

No.

### 5.36 How long is the battery backup in the gateway?

One week.

### 5.37 Is the tablet cellular capable?

Yes.

### 5.38 What happens to data collection in event of power failure

Data is lost.

### 5.39 Can this system integrate into an existing SCADA system?

Yes, but SCADA integration requires customization with an NRE fee.

### 5.40 Can I download my history?

Yes, from both the Tablet and the Cloud.

### 5.41 What happens when my node battery dies?

It will stop sending data. A warning will be sent before the node reaches its critical voltage.

### 5.42 Do I see the battery status of the node on my dashboard?

Yes.

### 5.43 Are there any alarms that get set for low battery?

Yes, the node turns yellow in the App and you can setup to receive a text message in the Cfg Tab.

### 5.44 What systems are supported?

Android, for the App running in the tablet. Chrome for the Web App.