User Manual
for
LEO-S Cold Chain Management
(TREK-120 & USM-S62)

V1.2

Contents

Chapter 1 General Information

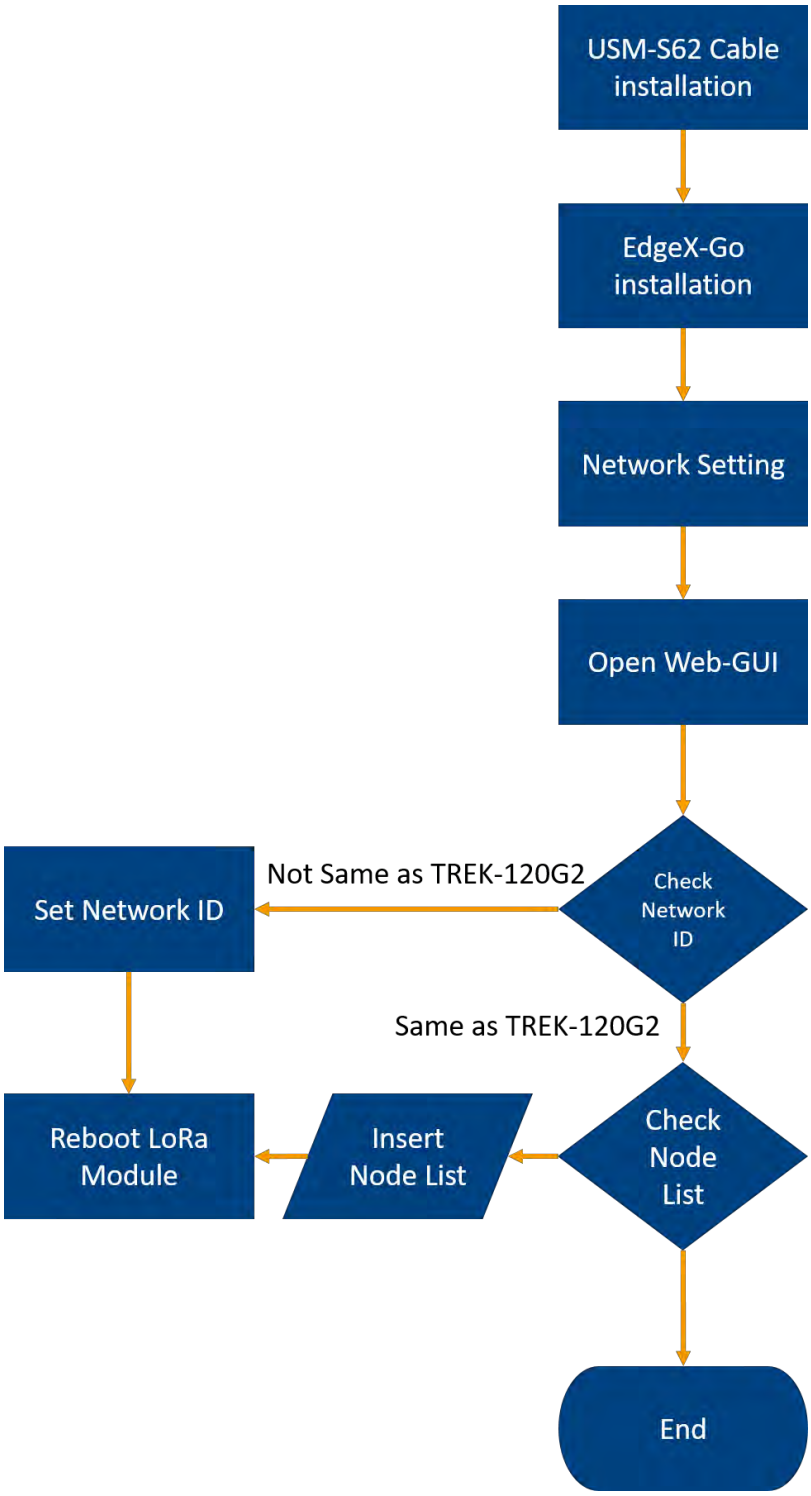
1.1 Introduction

Advantech Cold Chain Management offer a full function of Temperature and Humidity control analysis in supply chain. This LEO-S CCM Kit can apply in many environments such as hypermarket, food factory, museum, warehouse, medical management, etc. For use with us in-vehicle gateway, our LEO-S can achieve Uninterrupted Real-time Cold Chain Management.

This LEO-S CCM kit content USM-S62 as gateway install inside the building, and TREK-120G2 as sensor in every container or any place need temperature management.

1.2 General Specification

1.3 Installation flowchart



Chapter 2 System Setup

2.1 A Quick Tour of the LEO-S CCM Hardware Kit – TREK-120G2

2.1.1 Outlook

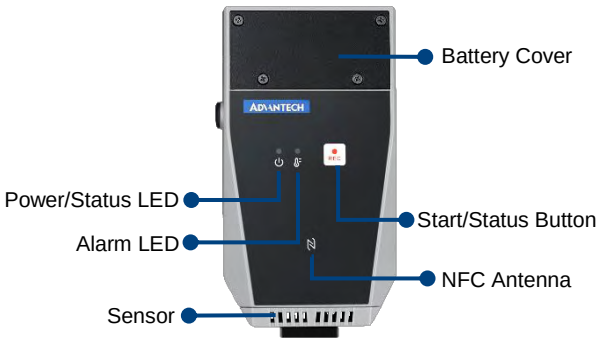


Figure 1 Front View of TREK-120G2

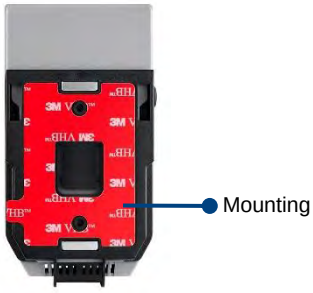


Figure 2 Back View of TREK-120G2

2.1.2 LED behavior

	Power/Status LED	Alarm LED
Standby	Green	N/A
Recording	Green	Green
Low Battery	Red	N/A
Over Critical	Green	Red

2.1.3 Mounting Methods

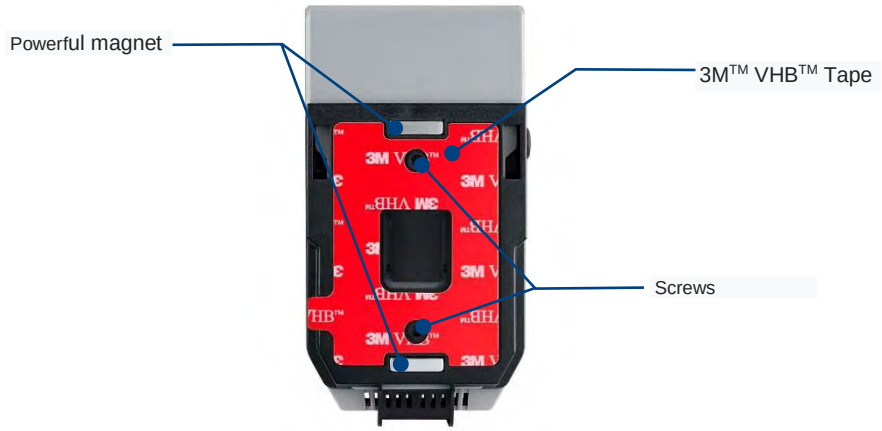


Figure 3 Three Different Mounting Methods of TREK-120G2

2.1.4 Battery Replacement

Step 1. Release 4 Screws on battery cover
Step 2. Open battery cover
Step 3. Take off the battery
Step 4. Install the new battery

Figure 4 Replace battery of TREK-120

Specifications

Temperature	Measurement Range	-30 ~ 70 °C (-22 ~ 158 °F)
	Accuracy Range	±0.4 °C from -10 ~ 70 °C (±32.72 °F from 14 ~ 158 °F) ±0.8 °C from -30 ~ -10 °C (±33.44 °F from -22 ~ 14 °F)
	Resolution	0.1 °C (32.18 °F)
Relative Humidity	Measurement Range	0 ~ 80% Relative Humidity
	Accuracy Range	±3% from 0–80% at 30°C (*The variation in accuracy is 0.05%/C)
NFC	Frequency	13.56MHz
	Function	Configuration and Sensor data bulk download
LoRa	Wireless Technology	Advantech LoRa technology
	Frequency	920-925MHz for Taiwan 902-928Mhz for US 863-870MHz for Europe 470-510MHz for China
	Wireless Range	>500 meters (line of sight)
	Topology	Star
Data Storage Capacity		Datalogs 5000 readings
LED Indicators		1 x Power status 1 x Alarm
Buttons		1 x Start button
Battery		3V/2400mAh wide-temperature primary (non-rechargeable) battery
Data Transmissions		NFC + LoRa
Mechanical	Mount Options	Fixed by adhesive tape, magnet, fastener, screws
	Dimensions (W x D x H)	123.47 x 65 x 24.5 mm (4.88 x 2.56 x 0.91 in)
	Weight	108 g (0.23 lb)
Environment	Operating Temperature	-30 ~ 70 °C (-22 ~ 158 °F)
	Storage Temperature	-40 ~ 85 °C (-40 ~ 185 °F)
	IP Rating	IP65
	Drop Tolerance	4 ft. drop onto concrete
	Certifications	CE/FCC/NCC/CCC

*Battery life time depends on operating environments

Note: NFC function is only Rx

2.2 A Quick Tour of LEO-S CCM Hardware Kit – USM110-S62

2.2.1 Outlook

Figure 5 USM-S62 LTE/Wi-Fi Antenna Side View

Figure 6 USM-S62 Lo-Ra Antenna Side View

Figure 7 USM-S62 Card Socket View

2.2.2 LED behavior

Figure 8 LED Behavior of USM-S62

	Left LED	Right LED
Power On	Green	Blue
Initializing	Green Orange Cross	N/A
Ready	Orange	N/A

2.2.3 Mounting Methods

Figure 9 Mounting Method of USM-S62

Chapter 3 Software Demo Utility Setup

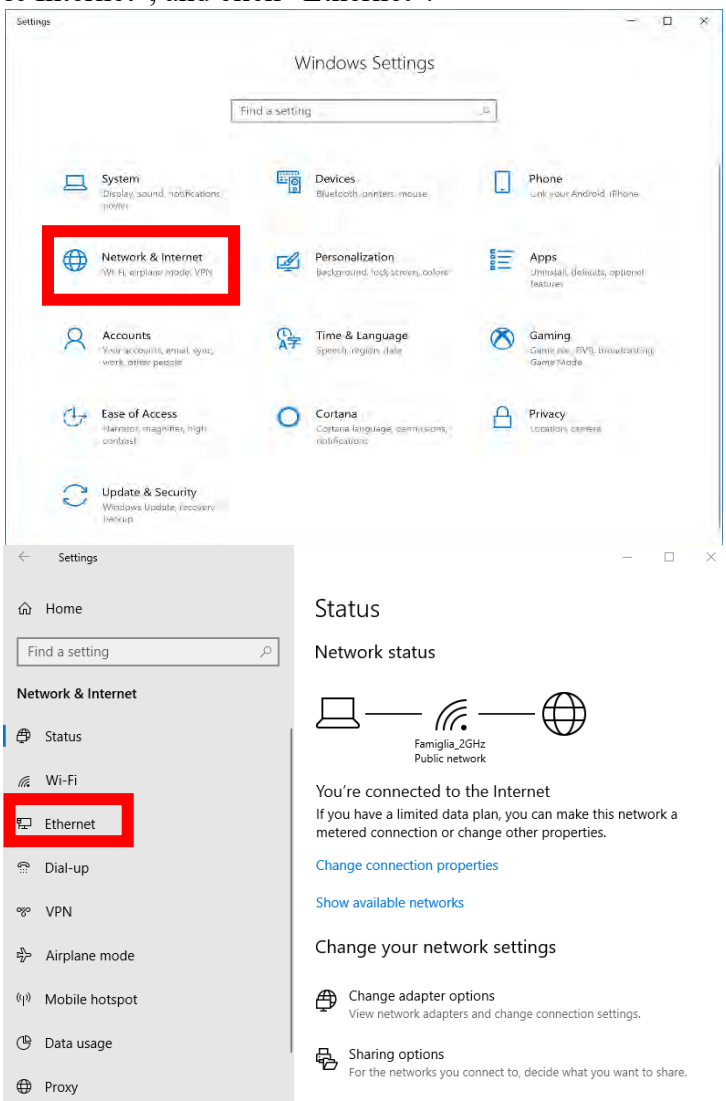
3.1 USM-S62 EdgeX-Go installation

EdgeX-Go Overview
Before we run EdgeX-Go on USM-S62 we must prepare at least 4GB memory size micro SD card. And stored three files into the micro SD card
Edgex-go
USM-S62
Edgex_installer
Edgex-go provide an environment for USM-S62 program, and the program will collect MQTT data from Lo-Ra antenna, final upload to WISE-PaaS. Edgex_installer is a program for automatically start EdgeX service and USM-S62 program.

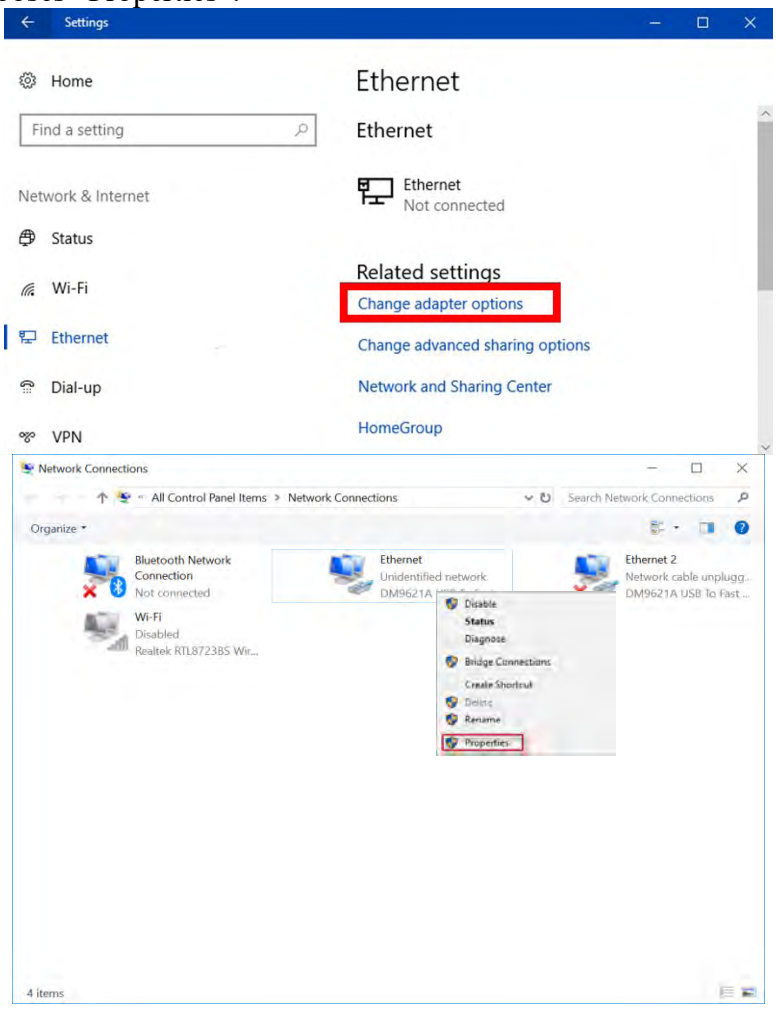
After we insert micro SD card, and power on USM-S62 device. We need to set our IPv4 Net-ID as same as USM-S62 but different Host-ID and also same subnet mask of network socket on our laptop/PC.

Management IP address	172.0.0.1
Mask address	255.255.255.0

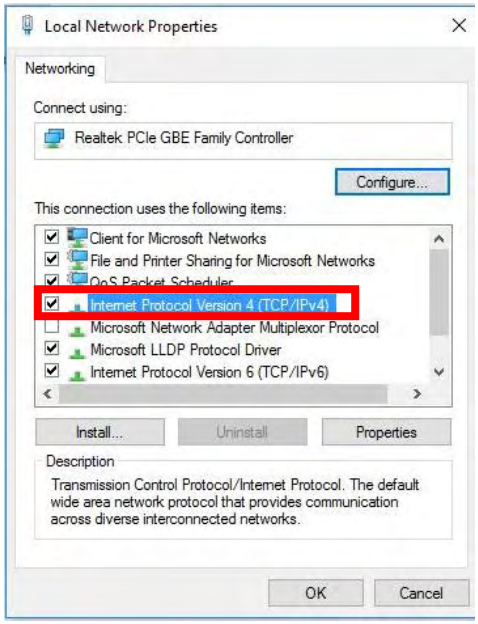
Open “Network & Internet”, and click “Ethernet”.



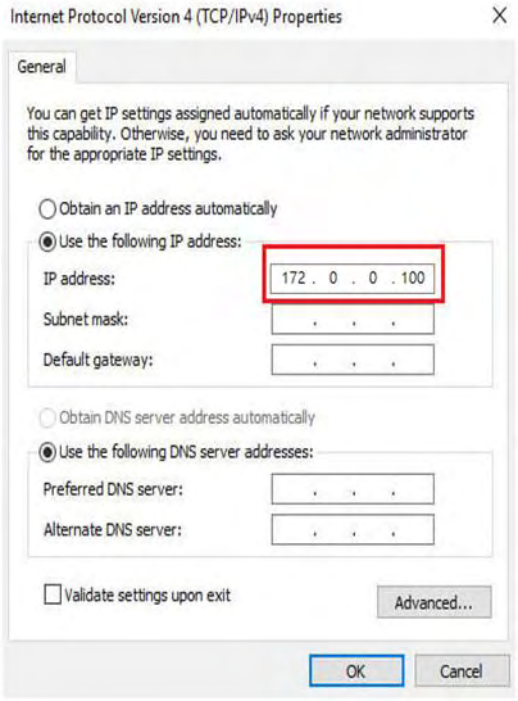
And will show Ethernet configuration interface. Choose “Change adapter options”. Right click chooses “Properties”.



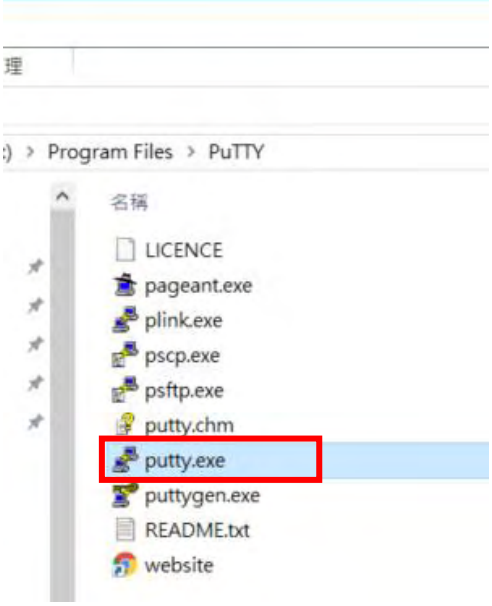
Roll down “The connection uses the following items:”, will find Internet Protocol Version 4 (TCP/IPv4), then double click it.



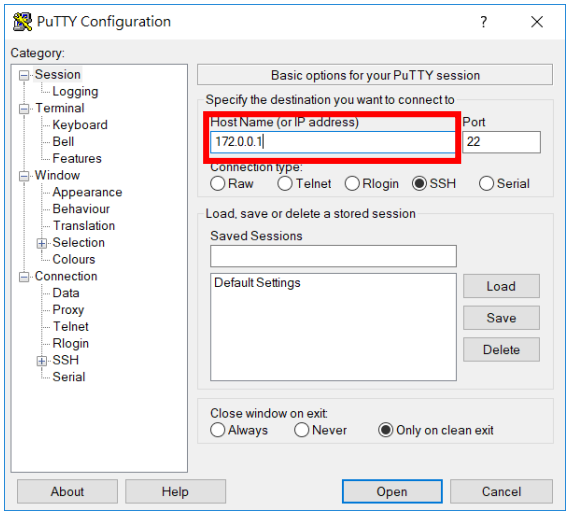
Set IP address “172.0.0.XXX”, Subnet mask “255.255.255,0”, and click “OK”



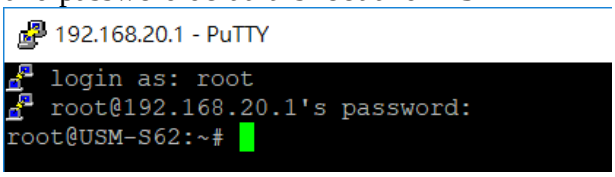
Download PuTTY from https://drive.google.com/file/d/1SQJit7bIxUo9gMa0CC7ZH_zzCWhD6yoN/view?usp=sharing, after installation, open putty executed file.



Open PuTTY Session with IP address 172.0.0.1



The login user name and password default is root and 1234

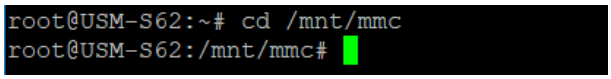


And we go to location /mnt/mmc, this location is where the micro SD card located.

Syntax

root@USM-S62:~#	cd /mnt/mmc

Display



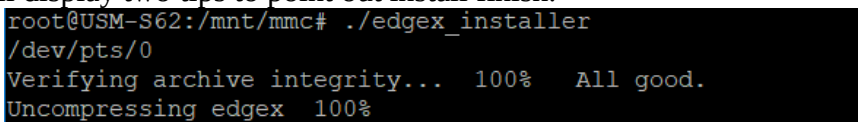
Now let's executed edgex_installer.

Syntax

root@USM-S62: /mnt/mmc#	./edgex_installer

Display

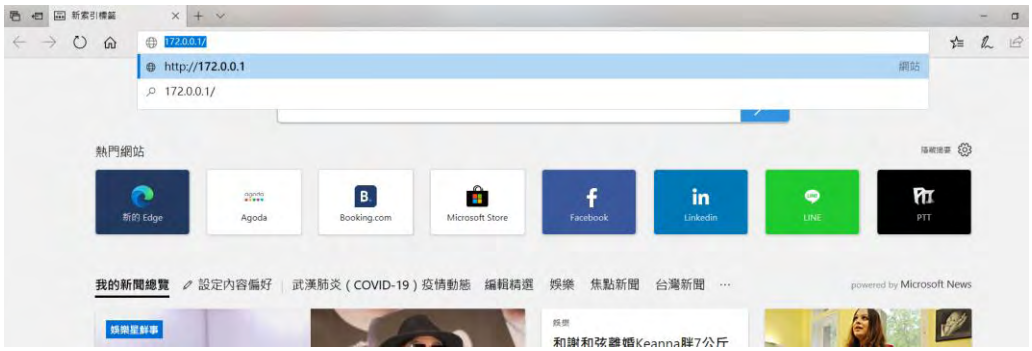
Final, it will display two tips to point out install finish.



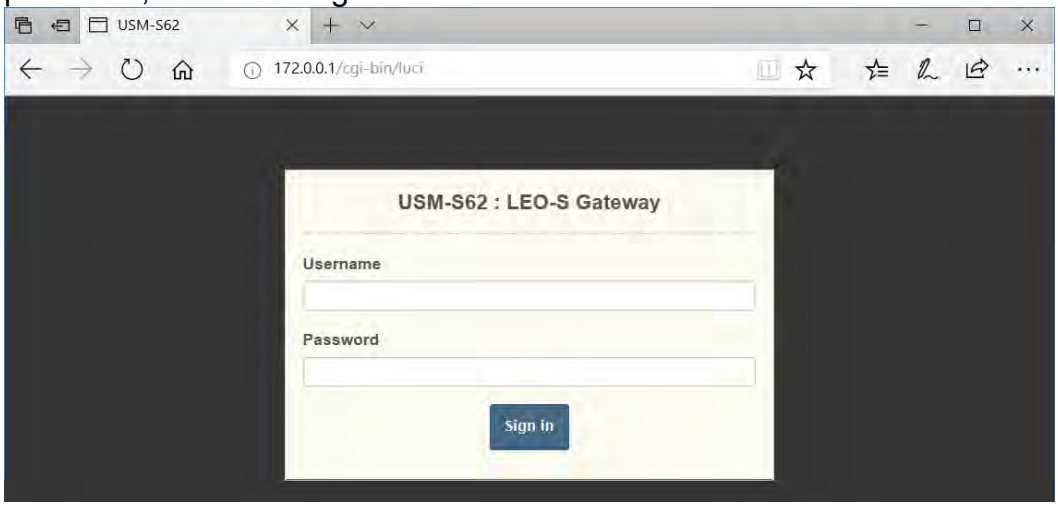
3.2 Web-GUI

3.2.1 Login

Open your browser (Chrome/ IE/ Edge/ Firefox). Insert “172.0.0.1”, this IP is USM-S62 Mask address.



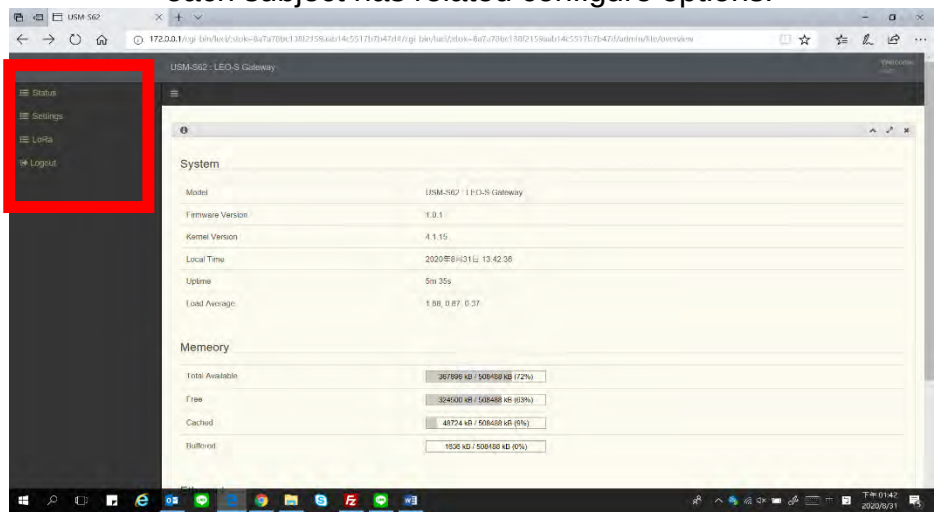
The figure below is the Web-GUI default interface. Insert username and password, and click “Sign in”.



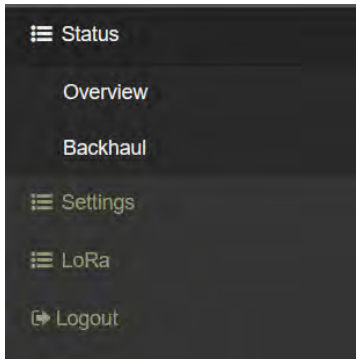
Username: root
Password:1234

3.2.2 Overview

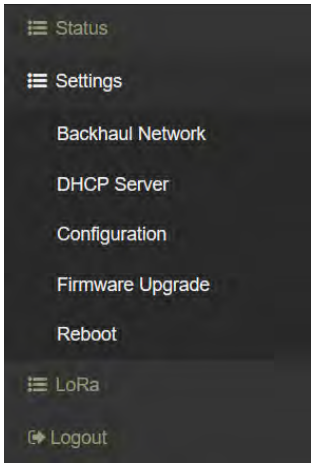
This Web-GUI will contain four parts in each subject on the left side. And each subject has related configure options.



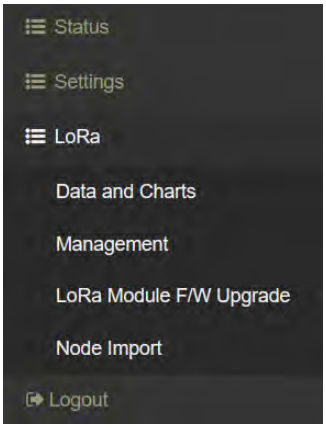
A. Status
   a. Overview
   b. Backhaul



B. Settings
   a. Backhaul Network
   b. DHCP Server
   c. Configuration
   d. Firmware upgrade
   e. Reboot



C. LoRa
   a. Data and Charts
   b. Management
   c. LoRa Module F/W Upgrade
   d. Node Import



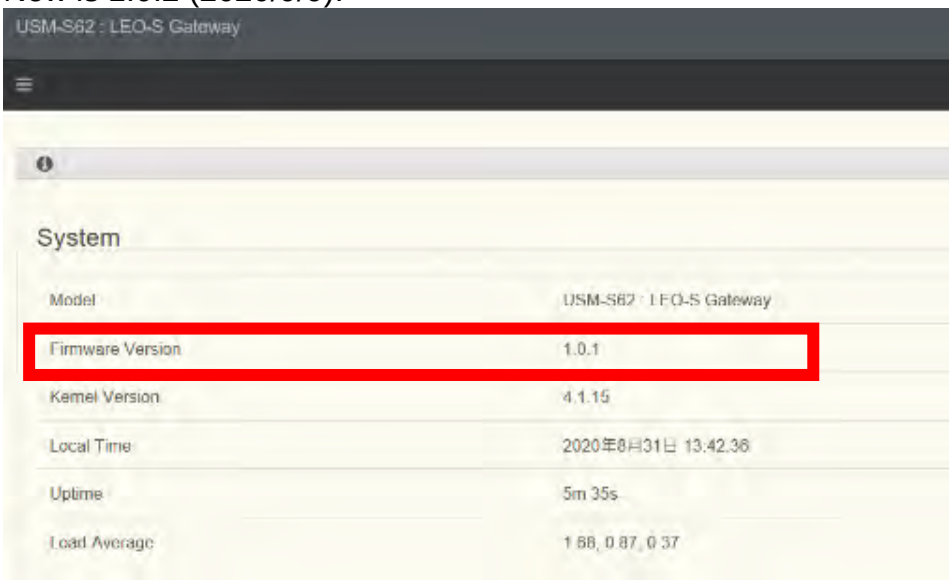
D. Logout

3.2.3 Firmware Check & Update Method

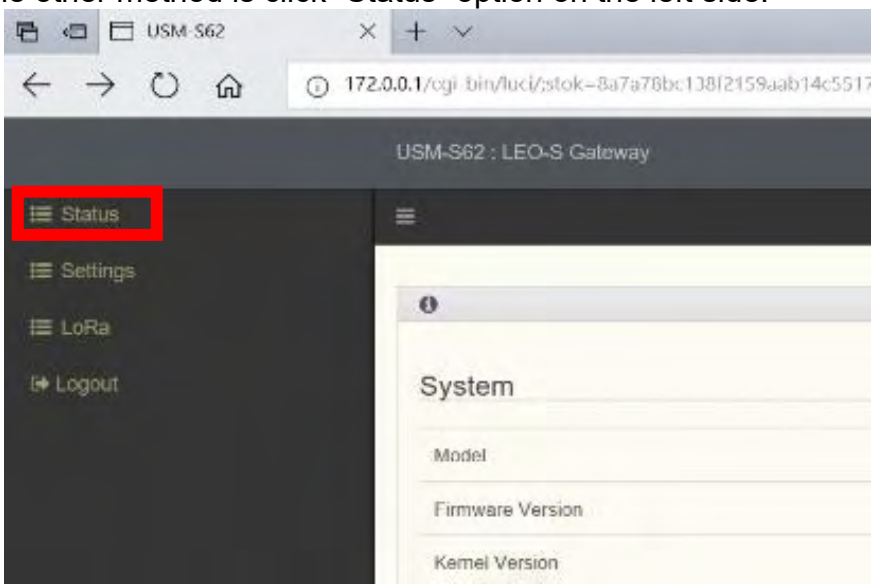
3.2.3.1 USM-S62 Firmware Version Check

At first we get USM-S62 and Start Web-GUI we need to check USM-S62 Firmware version if it is newest.

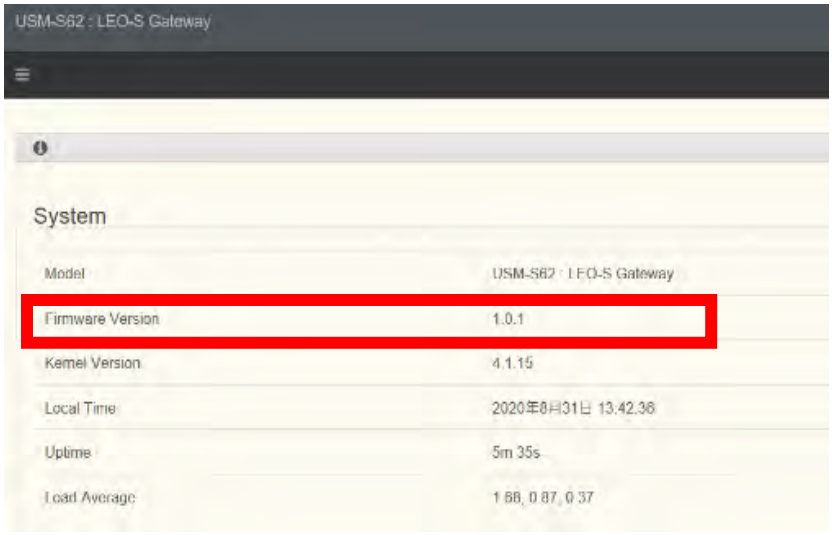
There are two methods to check the firmware, one when you start Web-GUI and login default page. We will see “Firmware Version”. Now is 1.0.2 (2020/9/9).



The other method is click “Status” option on the left side.



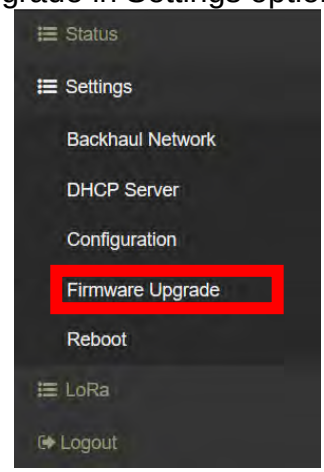
And click “Overview”.



3.2.3.2 USM-S62 Firmware Update Method

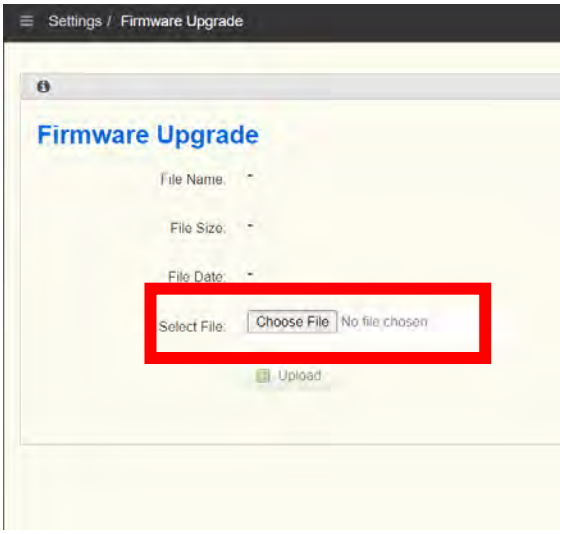
If the device firmware is not the newest or have some critical fix of firmware need to update, the new firmware file will upload to google drive and let end user download (Need Advantech related personnel permission).

Choose Firmware Upgrade in Settings option.



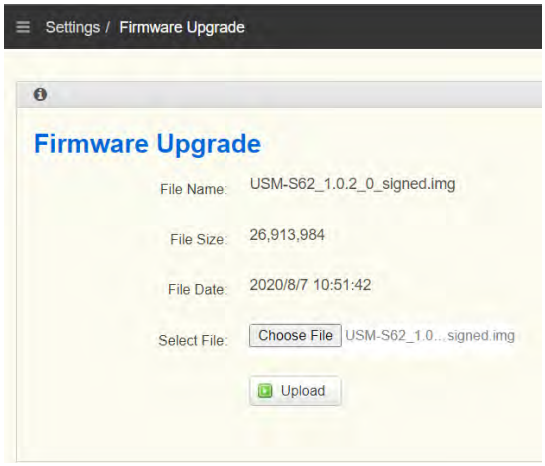
And user will go to Firmware Upgrade page

Then we can select firmware file in the “Select File” subject.



After you choose the firmware file that provide from Advantech, it will show file information on the page. Such as

- File Name
- File Size
- File Date

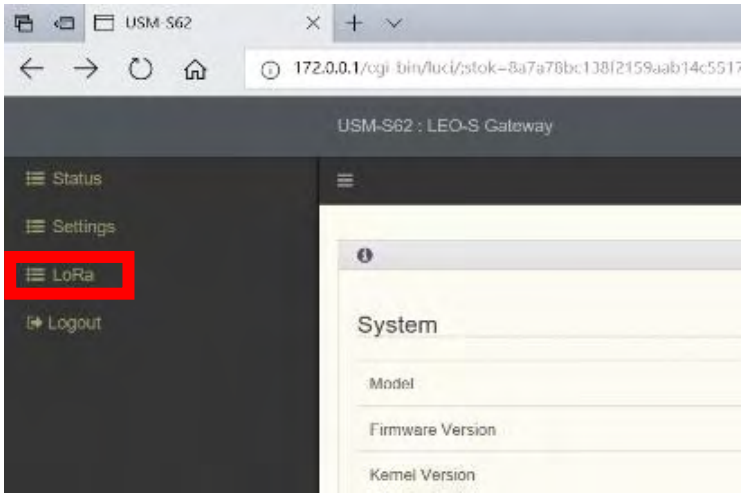


When you press Upload, the USM-S62 firmware will upgrade automatically. And the device will automatically reboot after upgrade.

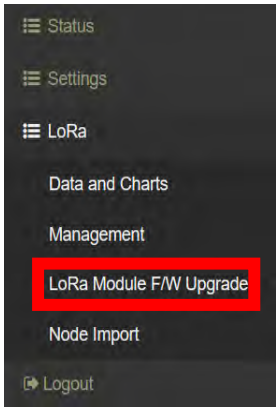
3.2.3.3 LoRa Module Firmware Version Check

In this part we continue from the previous part, we need to check LoRa module firmware version next.

Let us check the left side of Web-GUI. There is an option named “LoRa”



Click “LoRa” option, it will show four options. Click “LoRa Module F/W Upgrade”.

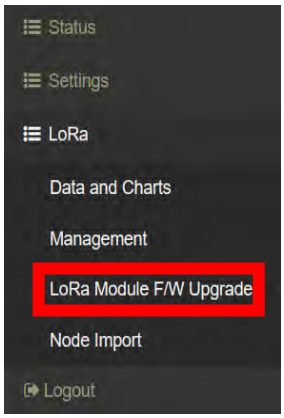


After click this option there will show an outline named “LoRa Module Firmware Management”, and we can check the firmware version. Now is R1.5.13 (2020/9/9).

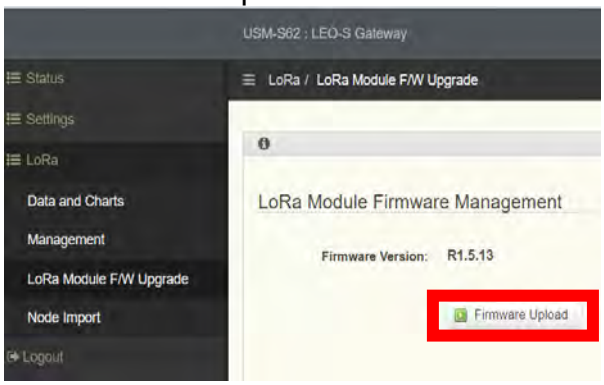
3.2.3.4 LoRa Module Firmware Update Method

If Lo-Ra module firmware is not the newest or have some critical fix of firmware need to update, the new firmware file will upload to google drive and let end user download (Need Advantech related personnel permission).

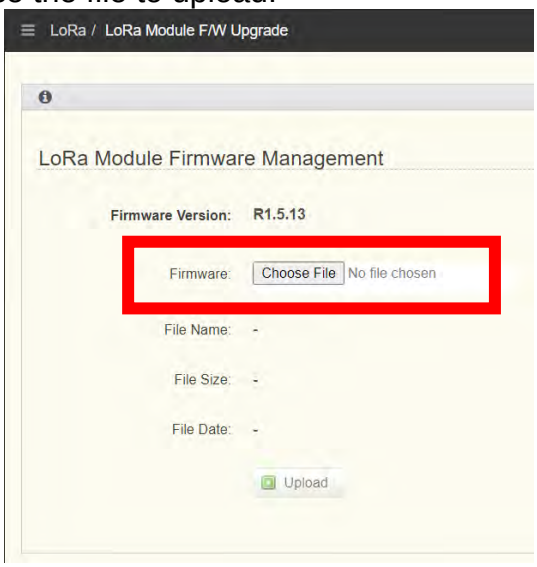
Click “LoRa” option, it will show four options. Click “LoRa Module F/W Upgrade”.



User will go to Lo-Ra Module Firmware Management, and there is a button named “Firmware Upload”

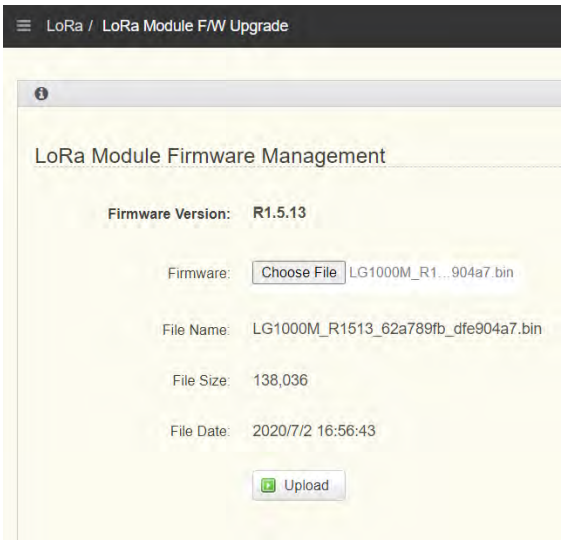


When we choose Firmware Upload, this page will show the button to let us choose the file to upload.

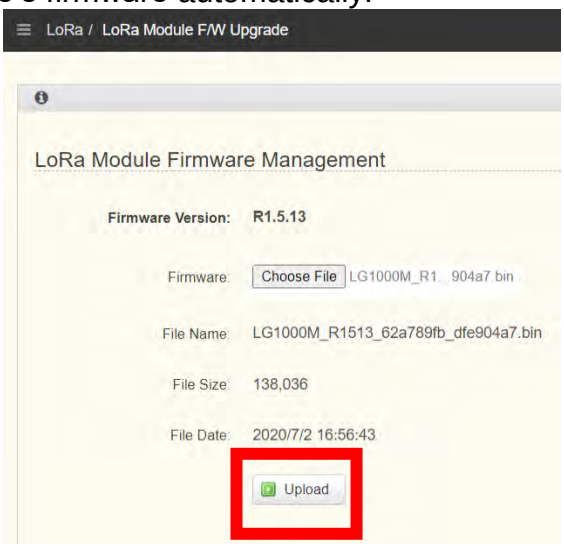


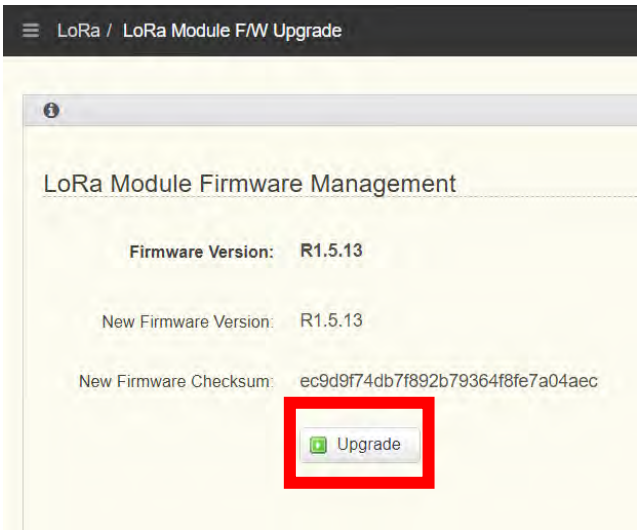
And after you choose the upload file this page will show this file information.

- File Name
- File Size
- File Date

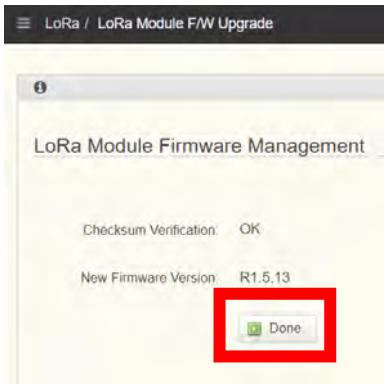


Press Upload button, then press Upgrade, USM-S62 will upgrade Lo-Ra module's firmware automatically.



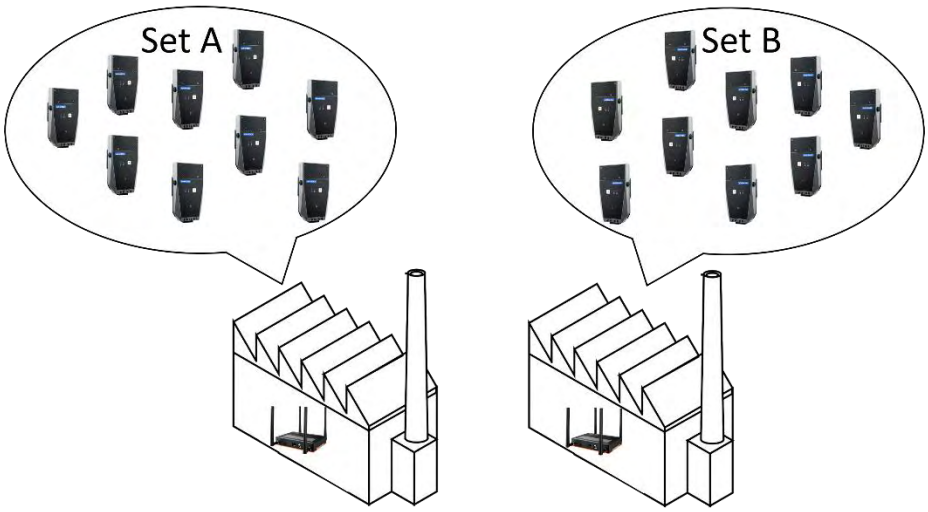


After upgrade firmware this page will shows that checksum verification is "OK", and the new firmware version. Just press "Done".

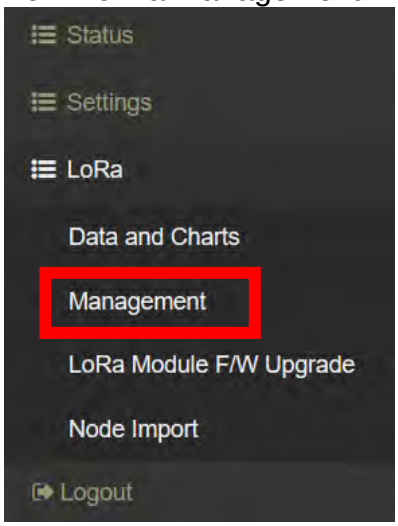


3.2.4 USM-S62 Change Network ID (Unavailable feature)

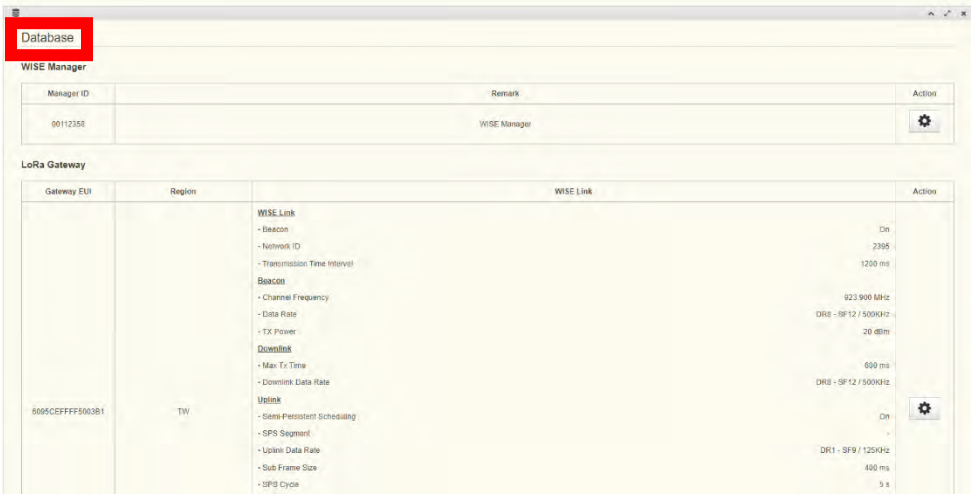
If customer have two or more gateways and each gateway manage different set of TREK-120G2, then we will need to know how to configure Lo-Ra Module Setting.



As the figure above, if we don't want Set A data connect to the USM-S62 on the right side, all we need to do is change the Network ID in the Lo-Ra Gateway page from Lo-Ra management.



When we scrolling down the page, there is a “Database” subject.



And we will also see a gear sign click the gear, and press “Edit”. We can change Network ID from this page

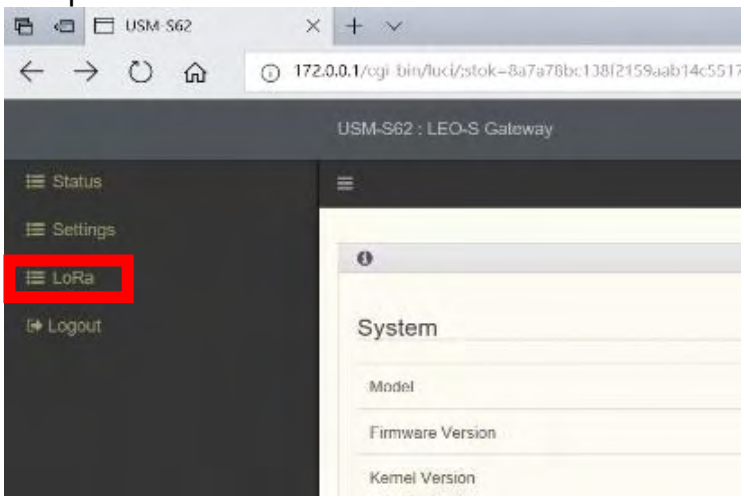
TREK-120G2 also have own Network ID, gateway Network ID must as same as TREK-120G2. It will never connect if the ID is not the same.

Now stage Advantech didn’t allow customer to change their Network ID of TREK-120G2

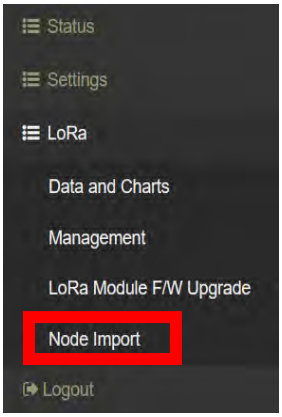
3.2.5 Insert Node List

If we need to connect both TREK-120G2 and USM-S62. USM-S62 must insert node list which content the TREK-120G2 ID we’re going to connect. This node list format can download from https://drive.google.com/file/d/1hPuointaZigjkSbuSWe2poBvZBG47va/view?usp=sharing

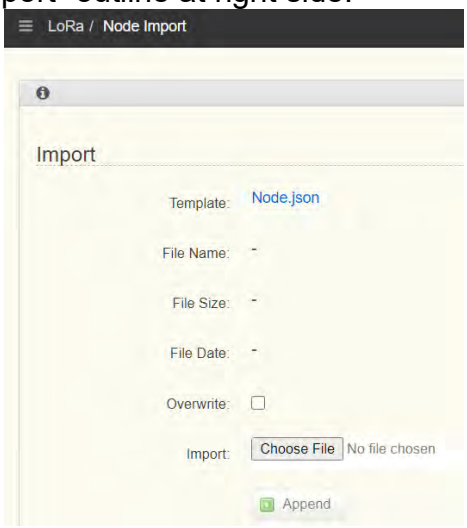
After we prepared node list, now we're going to insert it to USM-S62. Click "LoRa" option.



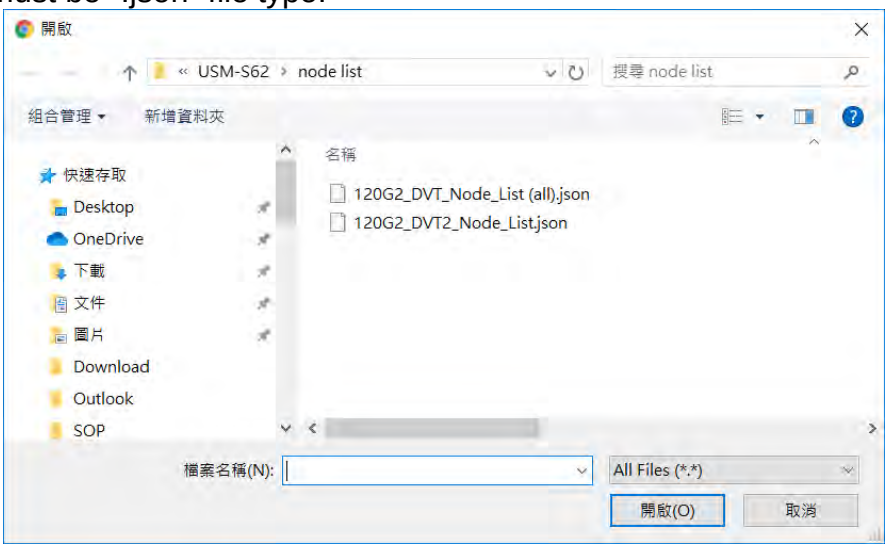
Click "Node Import"



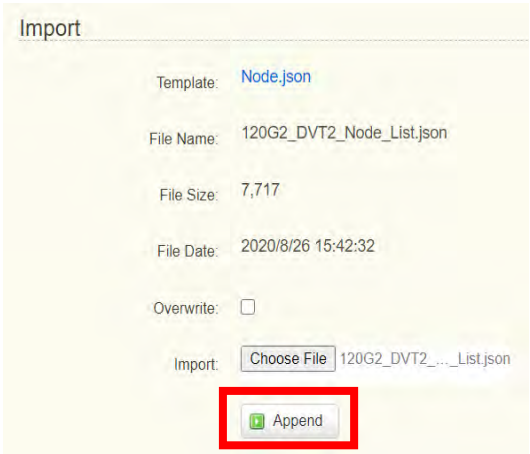
And it will show "Import" outline at right side.



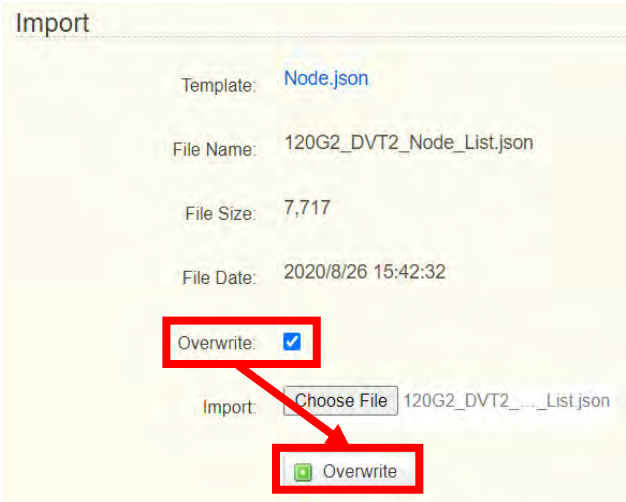
Click “Choose File”, choose the node list file where you download. This file must be “.json” file type.



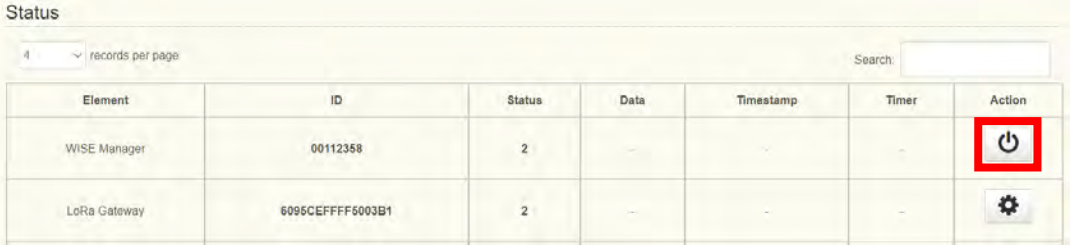
If you have previous node list inside your USM-S62, and we wish to keep that list inside, after choose file do not check “Overwrite” option, just click “Append”



If we want to update whole node list, please check the “Overwrite” option, and click “Overwrite”.

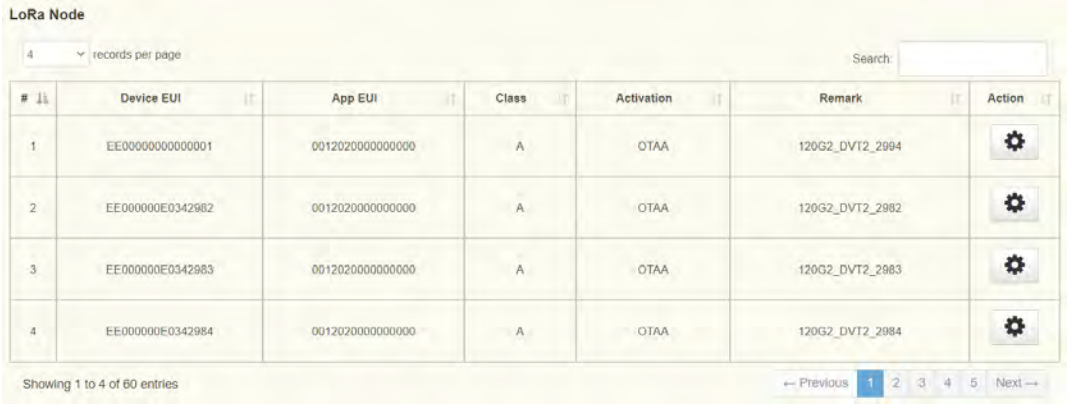


Every time we change the configuration of Lo-Ra, Web-GUI will return back to LoRa/Management page, and we must reboot the LoRa module.

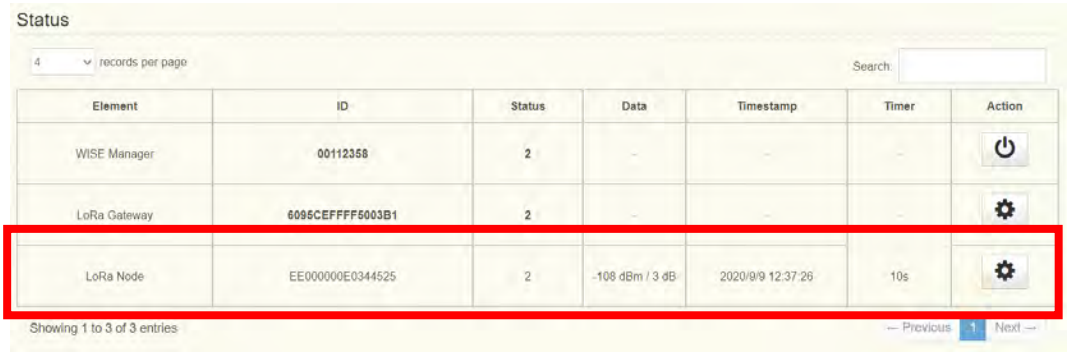


3.2.6 TREK-120 Connection Confirm

After reboot and login, go to LoRa/Management page, and roll the script down will show us all LoRa node we insert to USM-S62.



And wait 3~5 minutes, we will see the TREK-120G2 status below “Status” outline.



3.2.7 Cellular Network Setting (LTE version)

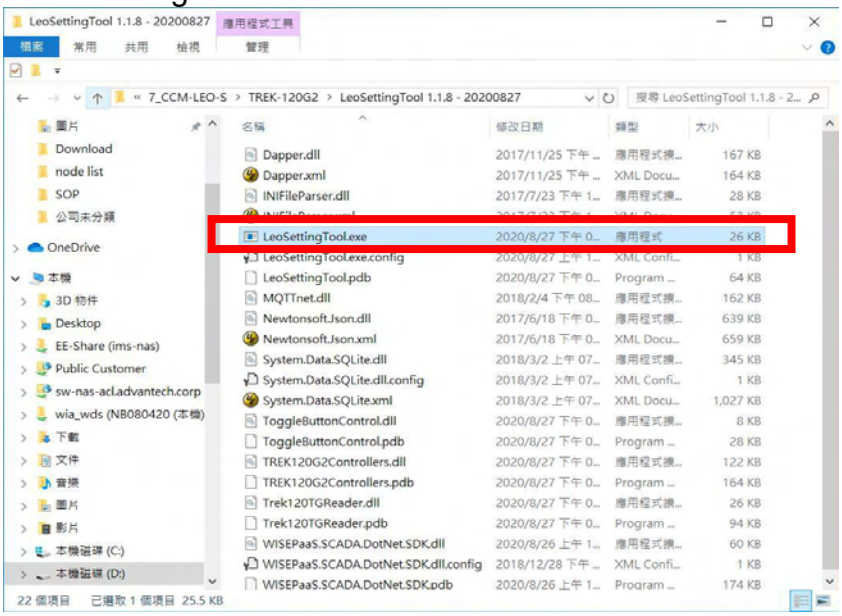
3.2.8 Wi-Fi Network Setting (WLAN version)

3.3 LEO-S TREK-120G2 Configuration Tool (Need TREK-120-ANR)

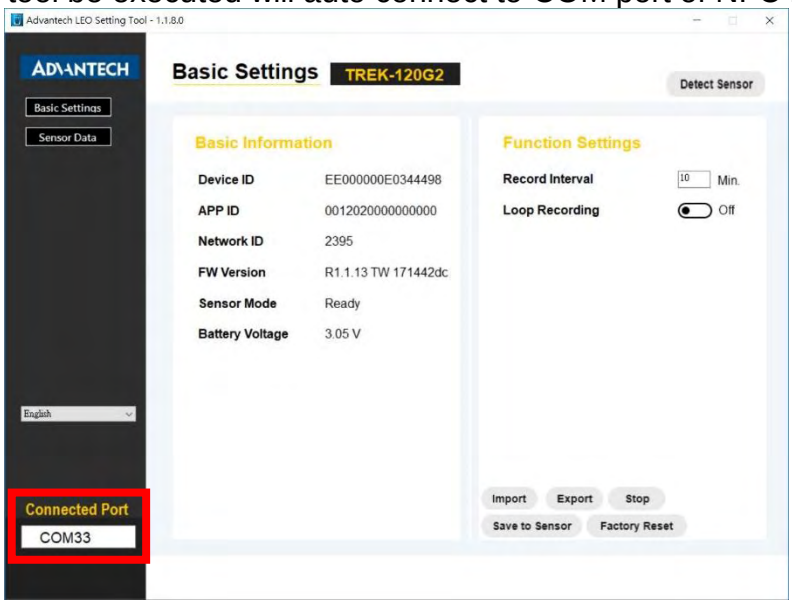
TREK-120G2 is wireless sensor with NFC feature, and we use configuration tool to set our TREK-120G2 and upload data backup data to WISE-PaaS.

Connect NFC reader to your laptop or personal computer with Windows OS.

Unzip “LeoSetting Tool 1.1.8.zip” (or later version), and open the folder, executed “LeoSettingTool.exe”.

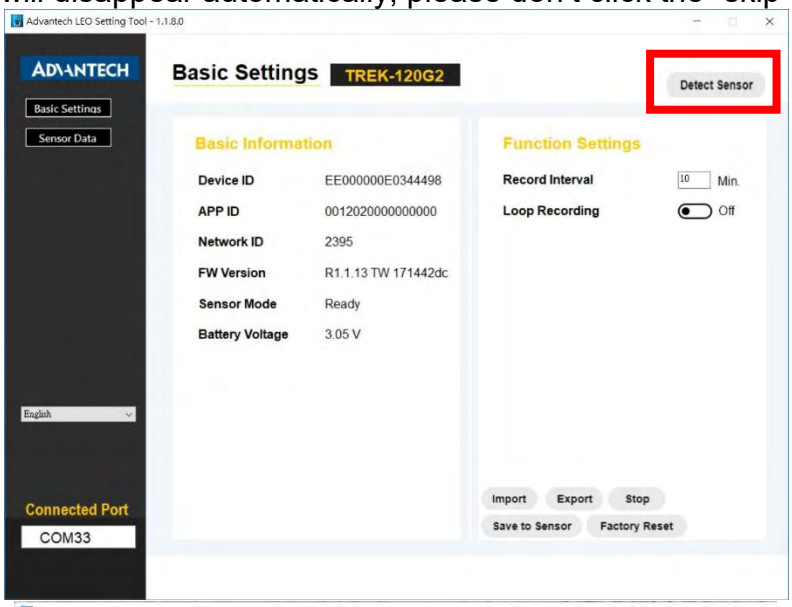


When the tool be executed will auto connect to COM port of NFC reader.

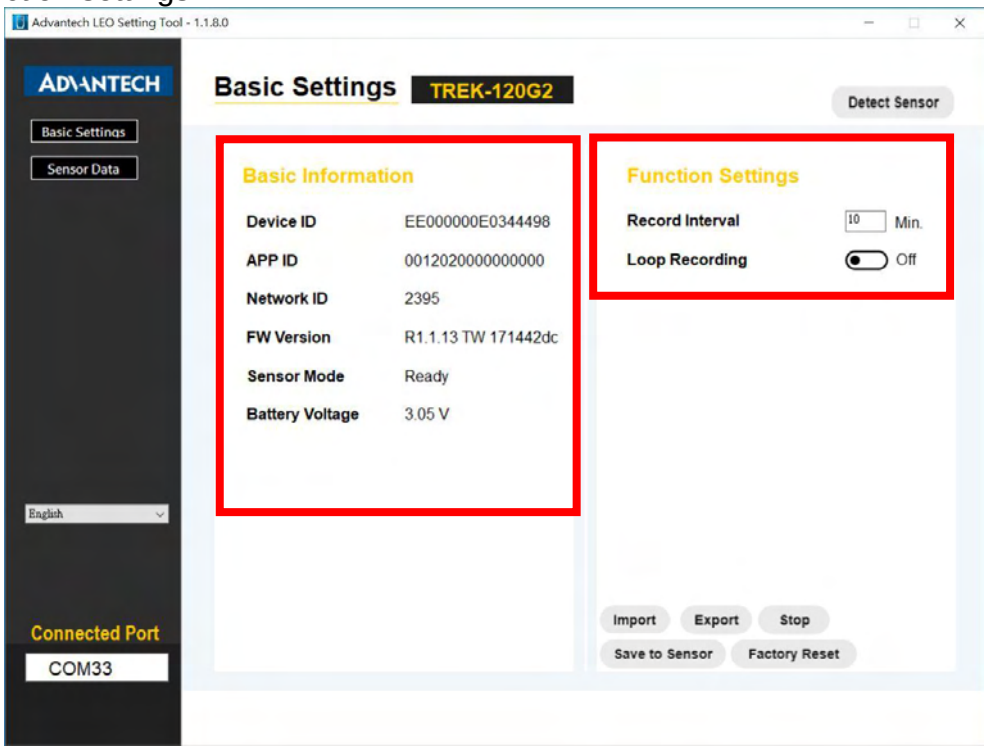


Put your TREK-120G2 on the reader, please make sure both “NFC mark” is aligned.

Click “Detect Sensor” on the upper right corner. After click the tool will show “Sensor detected, downloading information…”, after downloading this message will disappear automatically, please don’t click the “skip” button.



When finished detecting, this tool will show sensor's information and function settings.

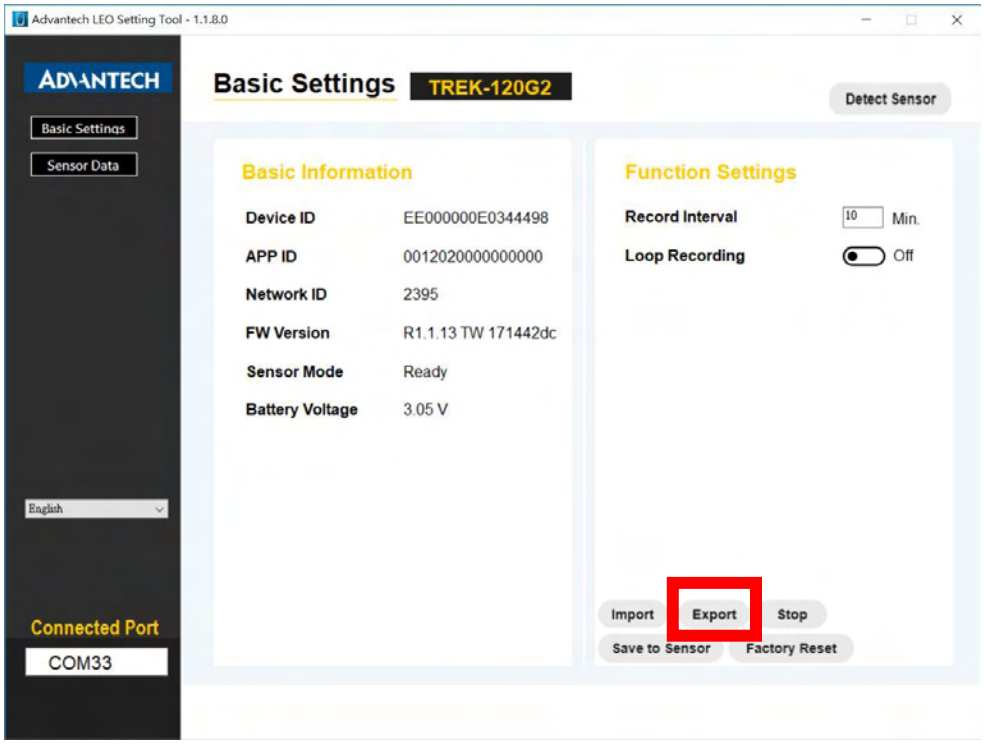


Basic information	
Device ID	This ID present sensor 's ID, each sensor have their own ID, and user can distinguish them with last 4 numbers.
APP ID	This ID can identify sensor type.
Network ID	Network name of gateway and sensor.
FW Version	This will show firmware version of this TREK-120G2
Sensor Mode	There are 3 modes of this Sensor mode information 1. Off: Factory default, in this mode user can't start Sensor. 2. Ready: In this mode, Sensor is Power On, but in sleep status. 3. Running: Sensor is start and recording. ※After change Sensor Mode must detect again to check the sensor mode is change or not.
Battery Voltage	Show sensor's battery voltage.

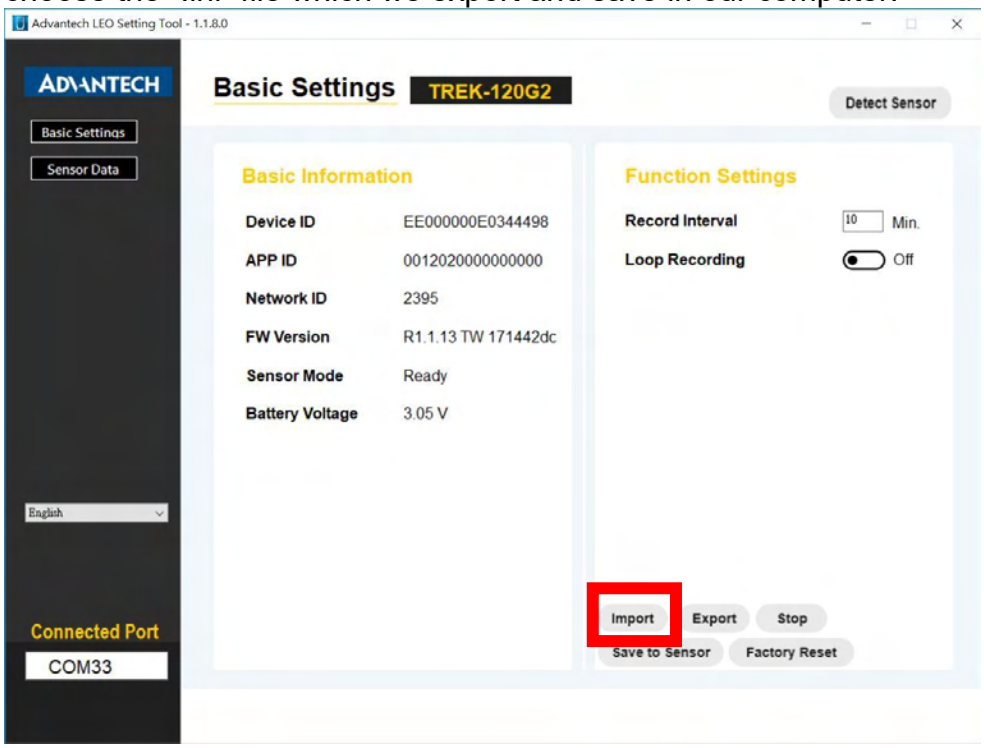
Function Settings	
Record Interval	To set transmitting time between each data.
Loop Recording	Repeat to record data

3.3.1 Basic Settings

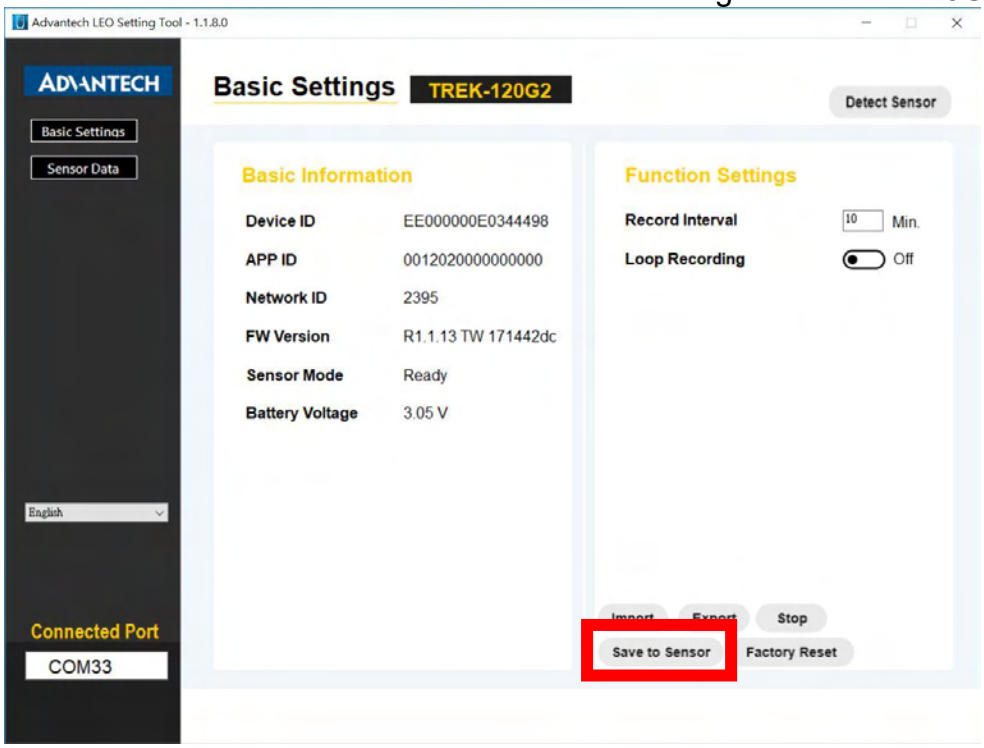
When click “Export”, this tool can save Function Settings of this TREK-120G2.



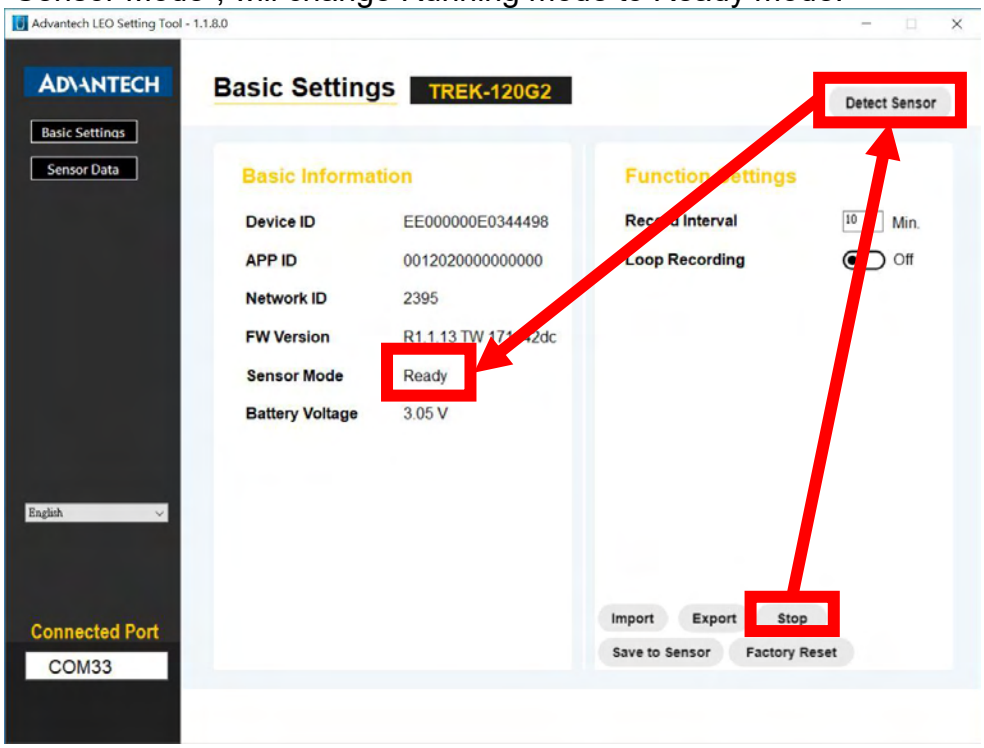
Next time if user need previous setting, you can click “Import” and choose the “.ini” file which we export and save in our computer.



Every time you change “Function Settings” or “Import” function setting user must click “Save to Sensor” to save the setting in to TREK-120G2.

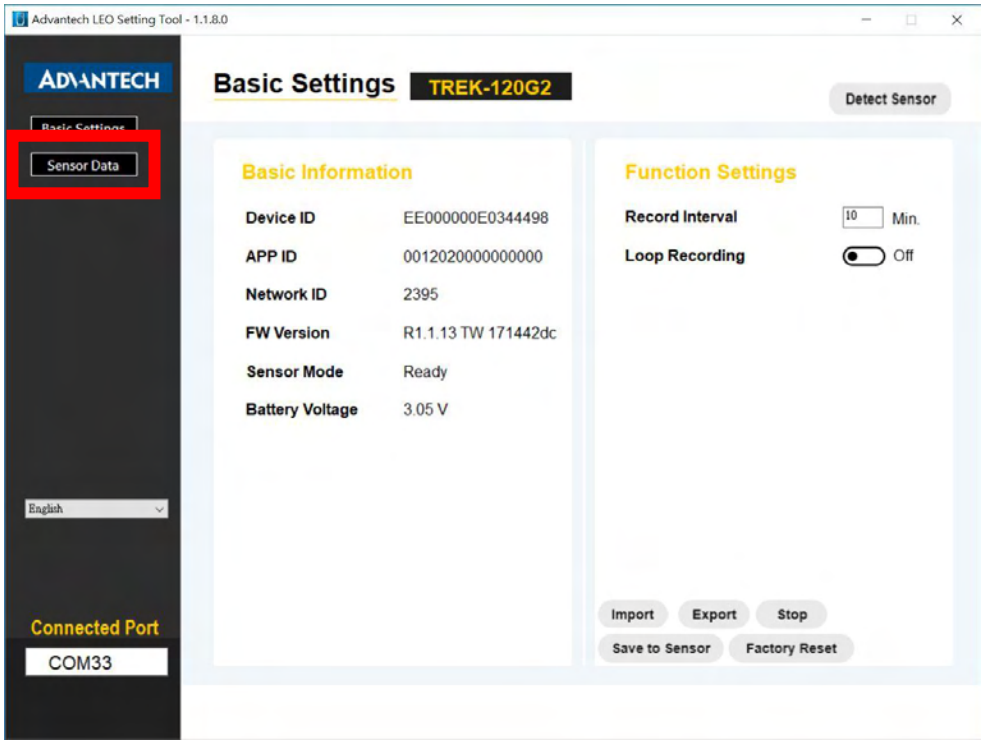


When we need to stop TREK-120G2, user can stop the device through click “Stop” button. After click “Detect Sensor” again, and check “Sensor Mode”, will change Running mode to Ready mode.

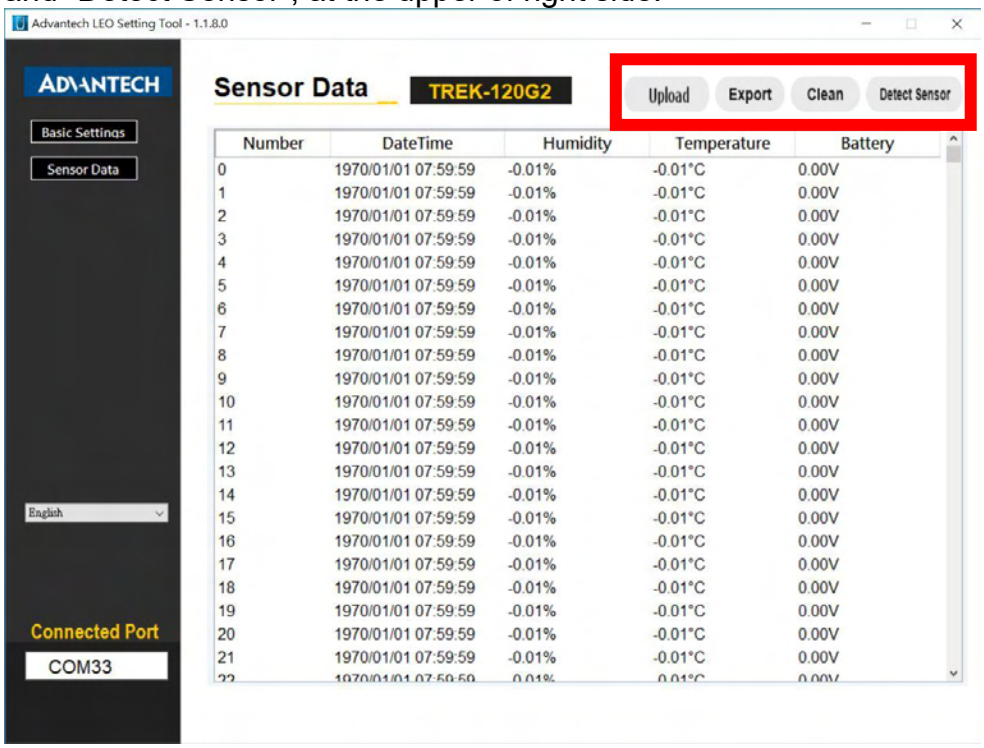


3.3.2 Sensor Data

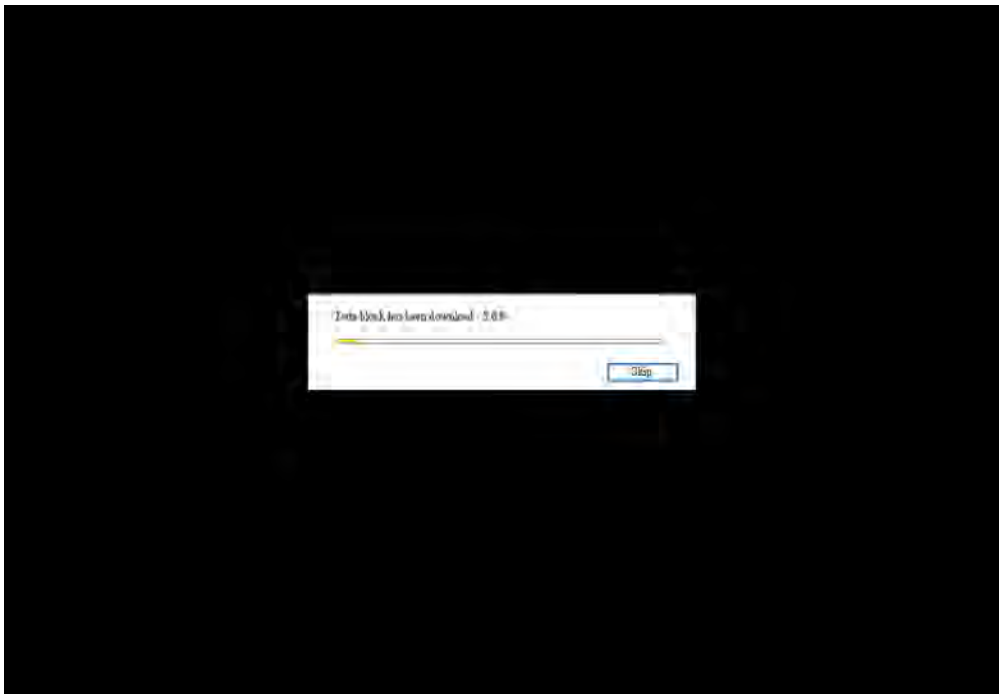
Put TREK-120G2 on NFC reader, and click “Sensor Data” on the upper of left



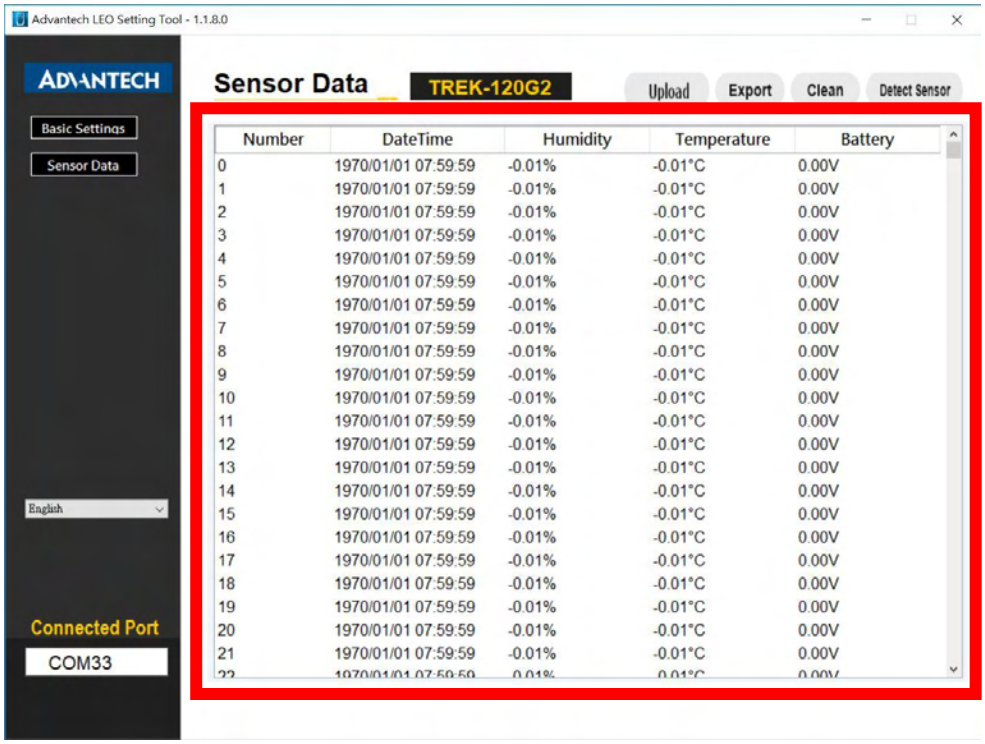
Into Sensor Data interface, user will see “Upload”, “Export”, “Clean” and “Detect Sensor”, at the upper of right side.



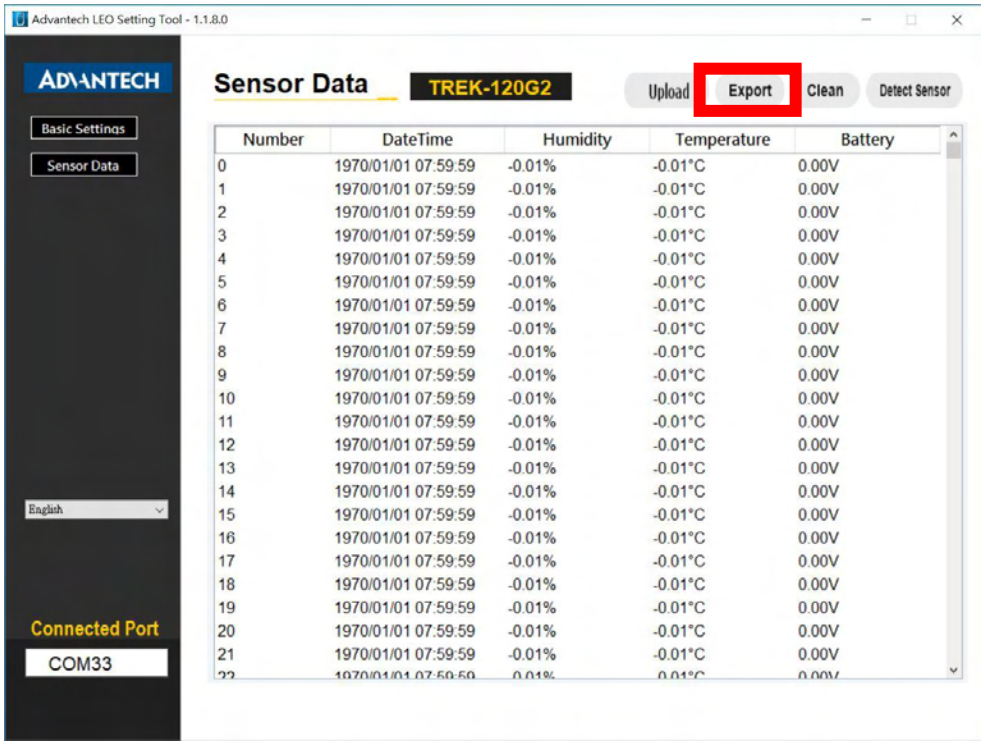
Click “Detect Sensor”, the tool will start to download data in TREK-120G2. It’ll take few seconds.

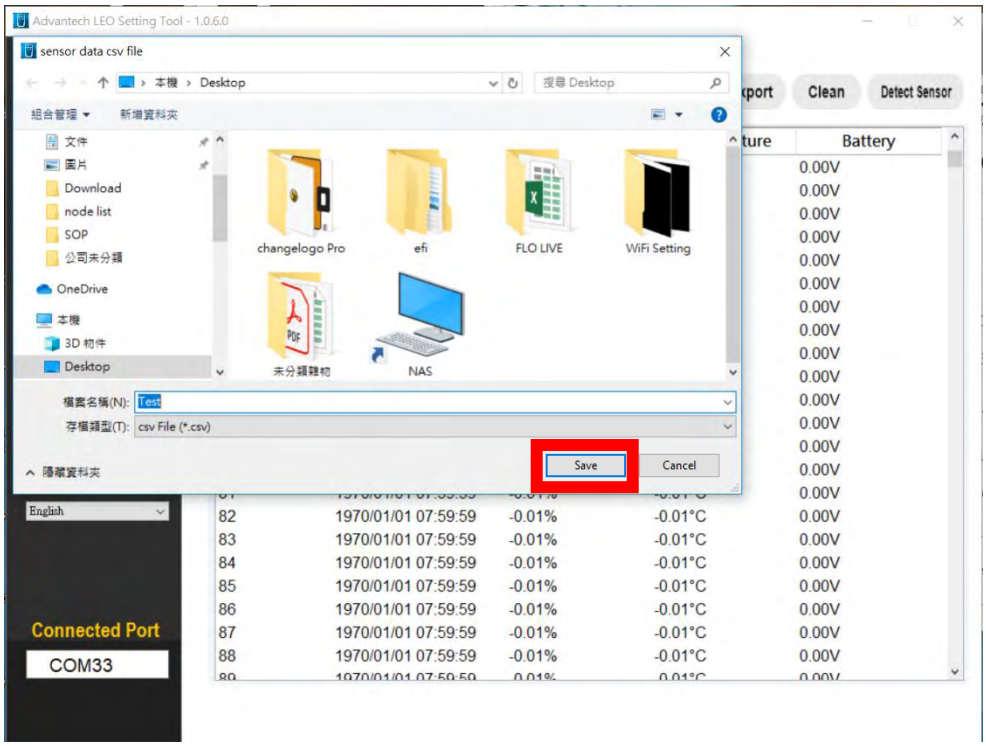


After download the blank space will show all data (5000 records) in TREK-120G2.

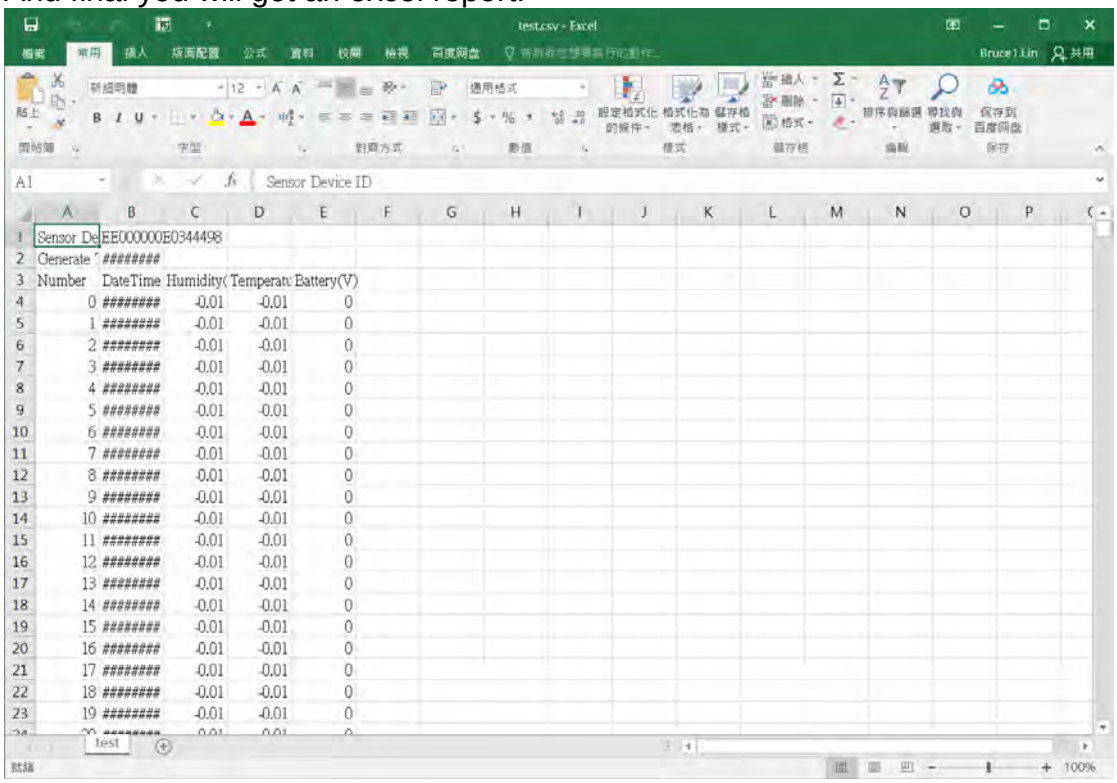


After detect sensor, you can click “Export” to make these data into .csv file and save it to where user wish to store.





And final you will get an excel report.



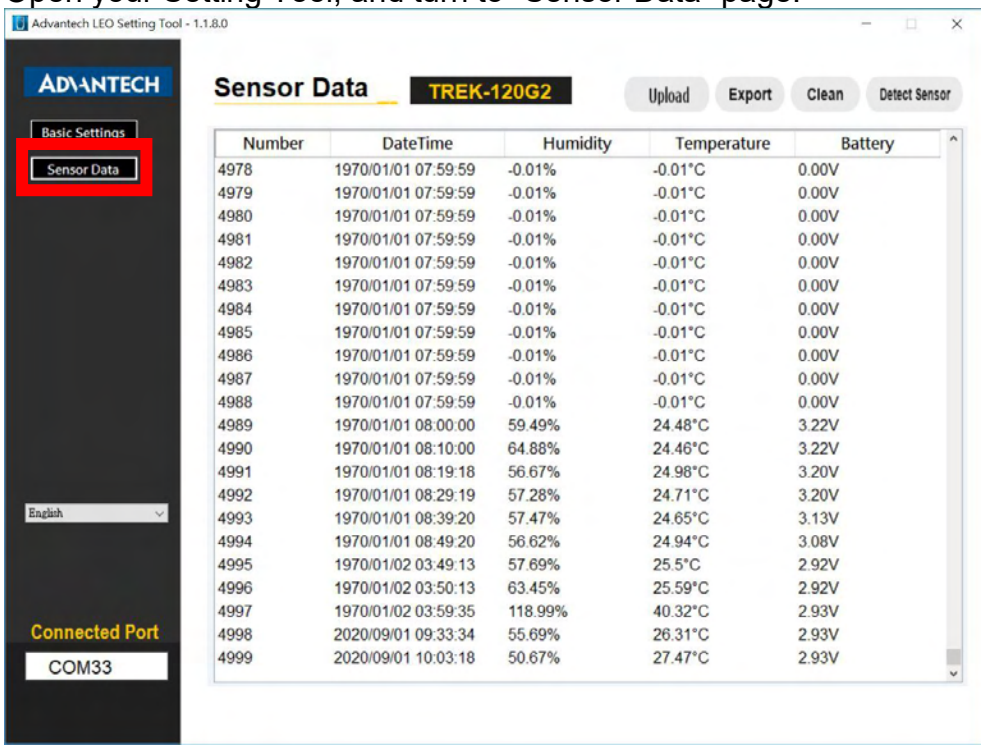
Microsoft Excel might show ##### in cells when a column isn't wide enough to show all of the cell contents. Formulas that return dates and times as negative values can also show as #####.

To make a column wider to show cell contents in full, double-click the right edge of the column header, or drag it to the width you want.

3.3.3 Upload backup data to Dash board

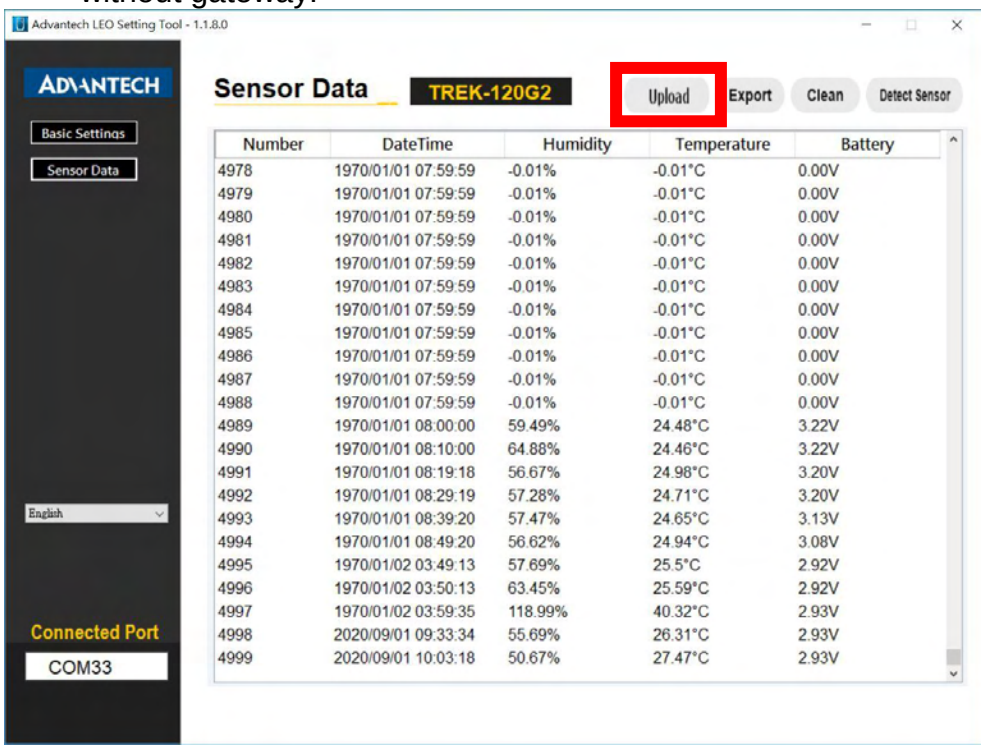
Under certain circumstances, Gateway LoRa module might loss signal and can't receive data from TREK-120G2, so we made an "Upload" function for TREK-120G2 to make up WISE-PaaS missing data.

Open your Setting Tool, and turn to "Sensor Data" page.



Number	DateTime	Humidity	Temperature	Battery
4978	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4979	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4980	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4981	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4982	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4983	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4984	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4985	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4986	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4987	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4988	1970/01/01 07:59:59	-0.01%	-0.01°C	0.00V
4989	1970/01/01 08:00:00	59.49%	24.48°C	3.22V
4990	1970/01/01 08:10:00	64.88%	24.46°C	3.22V
4991	1970/01/01 08:19:18	56.67%	24.98°C	3.20V
4992	1970/01/01 08:29:19	57.28%	24.71°C	3.20V
4993	1970/01/01 08:39:20	57.47%	24.65°C	3.13V
4994	1970/01/01 08:49:20	56.62%	24.94°C	3.08V
4995	1970/01/02 03:49:13	57.69%	25.5°C	2.92V
4996	1970/01/02 03:50:13	63.45%	25.59°C	2.92V
4997	1970/01/02 03:59:35	118.99%	40.32°C	2.93V
4998	2020/09/01 09:33:34	55.69%	26.31°C	2.93V
4999	2020/09/01 10:03:18	50.67%	27.47°C	2.93V

In this example, 2020/09/01 10:03:18 this data stored in sensor when gateway didn't power on. So it didn't upload to WISE-PaaS. And if you click "Upload" then you can make up this data to WISE-PaaS directly without gateway.



3.3.4 WISE-PaaS Setting

3.4 WISE-PaaS Dashboard Demo

Federal Communication Commission Interference Statement

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

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

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.