



# STONEX S900 V2 GNSS Receiver **User Manual**



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## Introduction

This document is user guide for S900 V2 and it is intended to introduce how to use the receiver correctly.

S900 V2 GNSS receiver is a multiple-frequency receiver and designed for GNSS surveying applications. It is available as a base station, or as a standalone rover, which can be switched freely whenever and wherever, offering maximum versatility in the system configuration to meet your specific requirements. At the same time, S900 V2 receiver can upgrade easily to continually meet your new demand.

The integrated design of the receiver makes the S900 V2 only 1.3 kg, which is light and portable. The internal antenna supports the all satellite system signals like Beidou, GPS, GLONASS, Galileo, QZSS, IRNSS. The users no longer have to worry about upgrading RTK hardware to support other satellite systems.

The internal use of the latest Sensor Fusion system allows the field to take the tilt measurement without calibration, and the field surveying is more convenient.

The new S900 V2 has the new GSM modem. Worldwide LTE, UMTS/HSPA+ and GSM/GPRS/EDGE coverage Multi-constellation GNSS receiver available for applications requiring fast and accurate fixes in any environment. EG25-G is backward-compatible with existing EDGE and GSM/GPRS networks, ensuring that it can be connected even in remote areas devoid of 4G or 3G coverage.

This chapter provides basic information to help you get familiar with your GNSS receiver.

Key Features:

- Rugged housing
- Support full constellation satellites
- 4G LTE and Bluetooth / WLAN datalink support
- UHF datalink with internal 1 W radio module
- Easy configuration from Web UI and remote server.
- Support New Sensor for Tilt measure
- Intelligent connection
- IP67

# 1. Receiver appearance

## 1.1 Front view



**Figure 1.1:** Receiver front view

The following table contains the description of the receiver front view.

ITEM	DESCRIPTION
1. Satellite indicator	<p>Off: no satellite tracked</p> <p>Flashing red: satellites tracked but not positioned</p> <p>Flashing green: satellites positioned but not fixed</p> <p>Green: fixed solution</p> <p>Flashing green and red alternately: GNSS board abnormal</p>
2. Datalink indicator	<p>Green: datalink setting succeeds</p> <p>Flashing green: data in normal transmission</p> <p>Flashing blue: in static mode, flashing blue according to static sampling interval</p>

3. Power key	Switch on/off the receiver Short press to broadcast current operation mode and status
4. Power indicator	Green: the power supply in 30%-100% Flashing green: power in 10%-30% Flashing red: power < 10% with warning beep
5. Bluetooth indicator	Blue: Bluetooth has connected Off: no connection

## 1.2 Bottom view



**Figure 1.2:** Receiver bottom view

The following table contains the description of the receiver bottom view.

ITEM	DESCRIPTION
1. 7-pin LEMO	Connects PC or handheld device, USB + serial port
2. 5-pin LEMO	Connects external power and the external radio
3. TNC connector	Connects to the UHF antenna for the internal radio module



## 2. Web Interface

S900 V2 receiver has Web UI functionality. By getting access to its internal hotspot, you can easily manage it on the Web UI. As long as you have a smart phone, PC or handheld with WIFI functionality, you can easily connect to the S900 V2 receiver to view status, download data and configure the receiver.

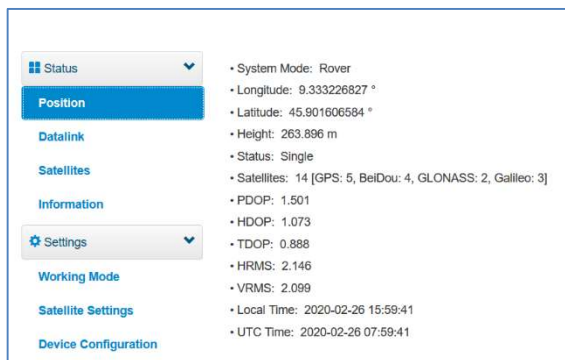
S900 V2 receiver is default to open WIFI automatically when it's powered on. Use smart phone/PC/handheld to search the receiver hotspot, whose name is its serial number, and connect it. Receiver WIFI only supports getting access to Web UI to check status and set up mode, not for Internet connection.

The WIFI hotspot name is the serial number of the receiver.

Enter the IP address: 192.168.10.1. A window will pop up when the user log in, which need to fill in the user, that is "admin", and password that is "password".

### 2.1 Status

The status page displays the current state of S900 V2 receiver, including position information, data link status, satellite charts, and instrumentation information. Click on a module to display its details.



Status	• System Mode: Rover
Position	• Longitude: 9.333226827 °
Datalink	• Latitude: 45.901606584 °
Satellites	• Height: 263.886 m
Information	• Status: Single
Settings	• Satellites: 14 [GPS: 5, BeiDou: 4, GLONASS: 2, Galileo: 3]
Working Mode	• PDOP: 1.501
Satellite Settings	• HDOP: 1.073
Device Configuration	• TDOP: 0.888
	• HRMS: 2.146
	• VRMS: 2.099
	• Local Time: 2020-02-26 15:59:41
	• UTC Time: 2020-02-26 07:59:41

## 2.2 Settings

The Settings page includes working mode, satellite Settings, device configuration, NMEA messages, view logs, and configuration sets. You can set the host mode, satellite system, system parameters, and NMEA message. And you can view and download the logs as well. Also you could upload, download, delete and apply the related configuration. Click on a module to display its details.

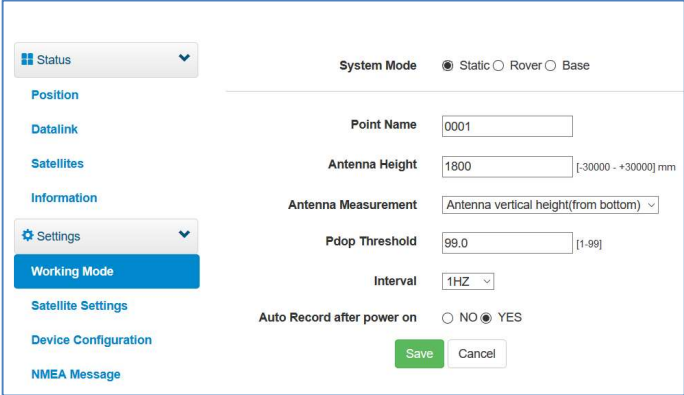
### 2.2.1 Working mode

You can select different work mode to configure, static, rover and base. In different mode, there are different configuration you can make.

#### Static Mode

It's possible input the point name, antenna height, PDOP threshold. And the antenna measurement and collect interval. These are all the parameters can be used in static collection.

At last, there are two record options. If you activate auto record, it will collect data automatic when you power on the receiver.



The screenshot shows the 'Working Mode' configuration interface. On the left is a sidebar menu with options: Status, Position, Datalink, Satellites, Information, Settings (selected), Working Mode (highlighted), Satellite Settings, Device Configuration, and NMEA Message. The main content area is titled 'System Mode' and shows three radio buttons: Static (selected), Rover, and Base. Below this, several configuration fields are visible: Point Name (0001), Antenna Height (1800 mm), Antenna Measurement (Antenna vertical height(from bottom)), Pdrop Threshold (99.0), Interval (1HZ), and Auto Record after power on (NO selected, YES unselected). At the bottom right are 'Save' and 'Cancel' buttons.

## Rover Mode

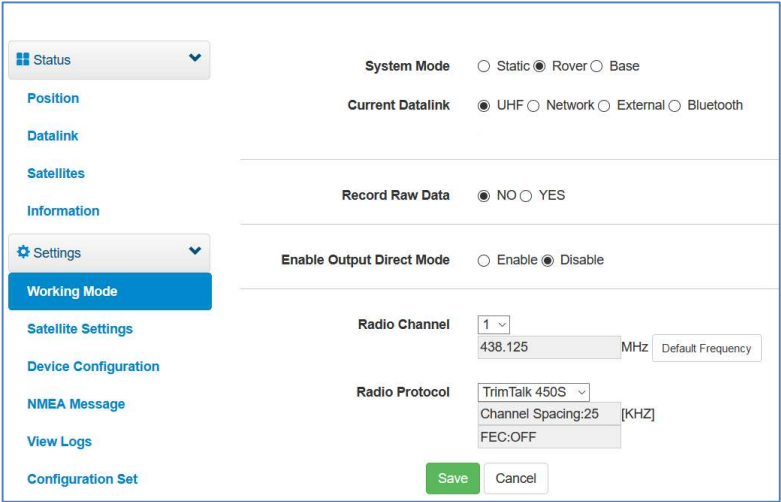
In rover mode, you can select different datalink. Different datalink also has different options can be edited. The datalink includes UHF, Network, External and Bluetooth.

If you select UHF mode, then you can select radio channel and radio protocol as you want. You also can select whether store the raw data. One important thing, channel 8 is used for inputting, you can input the frequency you want, but channel 1-7 can't be edited.

If you select Network, then besides select aRTK timeout and record raw data, the most important is you can input CORS information, such as IP, account.

If you select External, then it can connect to external radio. There is a very important thing, the external serial port band rate, this should be same with external radio.

Then the last it's Bluetooth, after selecting the datalink as Bluetooth, there are little option that you can configure.



The screenshot displays the 'Working Mode' configuration page of the Stonex S900 V2 GNSS Receiver. The interface includes a sidebar menu on the left with options like Status, Position, Datalink, Satellites, Information, Settings, Working Mode (selected), Satellite Settings, Device Configuration, NMEA Message, View Logs, and Configuration Set. The main configuration area contains the following settings:

- System Mode:** Radio buttons for Static, Rover (selected), and Base.
- Current Datalink:** Radio buttons for UHF (selected), Network, External, and Bluetooth.
- Record Raw Data:** Radio buttons for NO (selected) and YES.
- Enable Output Direct Mode:** Radio buttons for Enable and Disable (selected).
- Radio Channel:** A dropdown menu set to '1', with a text input field showing '438.125' and 'MHz' units, and a 'Default Frequency' button.
- Radio Protocol:** A dropdown menu set to 'TrimTalk 450S', with a text input field showing 'Channel Spacing:25' and '[KHZ]' units, and a text input field showing 'FEC:OFF'.

At the bottom of the configuration area, there are 'Save' and 'Cancel' buttons.

## Base Mode

Base mode also contains different datalink, most of the parameters are same. The only difference is the base mode has some more options can be edited. For example you can set the base data type, start base and base position and so on.

If you select UHF mode, most of the settings are same as rover. But you can set the radio power.

If you select Network, then besides set the data type, site ID, base position and record raw data, the most important is you can input APN account, APN user and password, connect mode, caster address and port.

Status

- Position
- Datalink
- Satellites
- Information
- Settings
- Working Mode**
- Satellite Settings
- Device Configuration
- NMEA Message
- View Logs
- Configuration Set
- Download
- Raw Data
- Backup Data
- Management

**System Mode**     Static  Rover  Base

**Current Datalink**     UHF  Network  External  Bluetooth  Dual

---

**Automatically Start Base**     NO  YES

**Data Type**

**Site ID**

**Pdop Threshold**     [1-99]

**Base Position**     Single  Repeat Position

---

**Record Raw Data**     NO  YES

---

**Radio Channel**      MHz Default Frequency

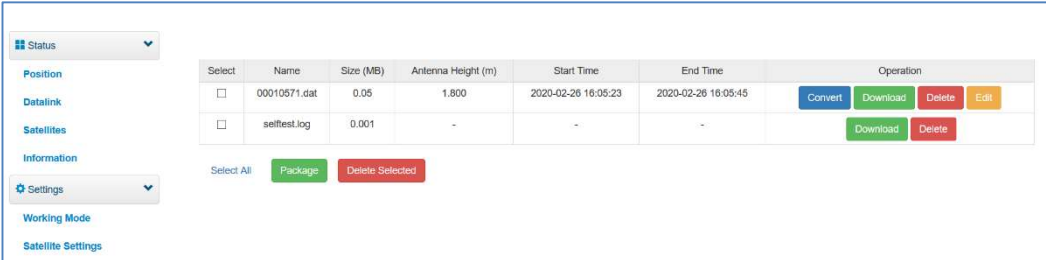
**Radio Protocol**      [KHZ]

**Radio Power**

Save
Cancel

## 2.3 Download

The download page provides downloads of raw data and backup data. Click on a module to display its details.



The screenshot shows a web interface for downloading data. On the left is a sidebar with navigation options: Status (expanded), Position, Datalink, Satellites, Information, Settings (expanded), Working Mode, and Satellite Settings. The main area contains a table with the following data:

Select	Name	Size (MB)	Antenna Height (m)	Start Time	End Time	Operation
<input type="checkbox"/>	00010571.dat	0.05	1.800	2020-02-26 16:05:23	2020-02-26 16:05:45	Convert Download Delete Edit
<input type="checkbox"/>	selftest.log	0.001	-	-	-	Download Delete

Below the table are two buttons: "Select All" (green) and "Delete Selected" (red).

## 2.4 Management

In this page, the user can upgrade the firmware, register the device, modify the login password, format the instrument disk, self-check, restore the factory Settings, restart equipment and other operations.

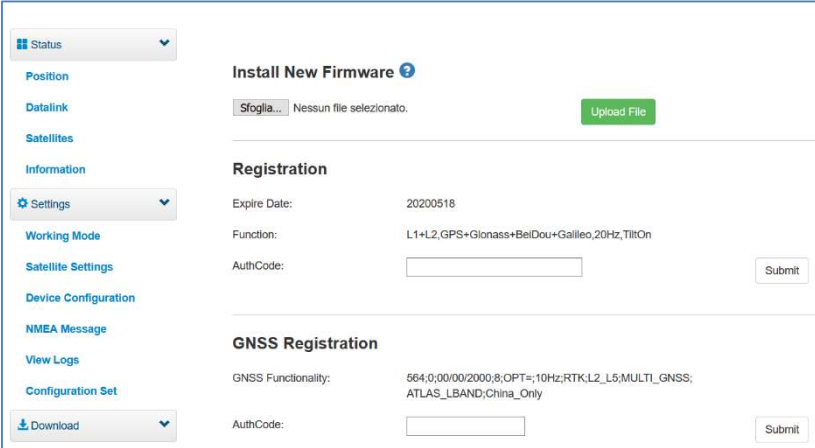
### 2.4.1 Install new firmware

In the management of the WEB UI page, you can see that “online update”, click “browse”, select the required to upgrade the firmware, click the “upload document”, system will restart to upgrade. After the upgrade, you can view the current “firmware version” on the “instrument information” page.

### 2.4.2 Device register

The register code consists of 32 digits and letters. You can register the device via WEB UI. The detailed steps are shown as followed.

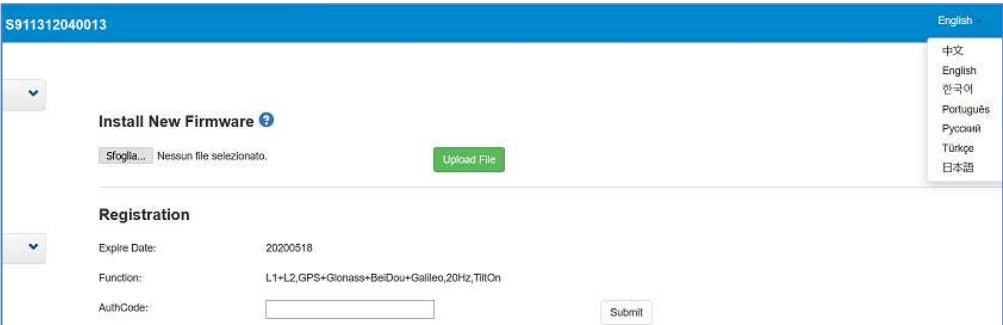
In management page, you can see “registration”. Input register code and click submit, and then registration is done. After registration, you can check the expiration time of current registration in the page.



The screenshot shows a web interface with a left sidebar containing navigation options: Status, Position, Datalink, Satellites, Information, Settings (selected), Working Mode, Satellite Settings, Device Configuration, NMEA Message, View Logs, Configuration Set, and Download. The main content area is titled 'Install New Firmware' and contains an 'Upload File' button. Below this is the 'Registration' section, which displays 'Expire Date: 20200518' and 'Function: L1+L2,GPS+Glonass+BeiDou+Galileo,20Hz,TiltOn'. It includes an 'AuthCode:' input field and a 'Submit' button. The 'GNSS Registration' section below shows 'GNSS Functionality: 564;0;00/00/2000;8;OPT=;10Hz;RTK;L2\_L5;MULTI\_GNSS; ATLAS\_LBAND;China\_Only' and another 'AuthCode:' input field with a 'Submit' button.

## 2.5 Set the language

As you can see, there is language button in the right-up side of WebUI. And the S900 V2 has 7 languages to set up. They are Chinese, English, Korean, Portuguese, Russian, Turkish and Japanese.



This screenshot shows the same web interface as above, but with a language selection menu open in the top right corner. The menu lists the following languages: English (selected), 中文 (Chinese), English, 한국어 (Korean), Português (Portuguese), Русский (Russian), Türkçe (Turkish), and 日本語 (Japanese). The background content is partially visible, showing the 'Install New Firmware' and 'Registration' sections.

## 3. Basic operation

### 3.1 Power on receiver

Short-Press the power button, the power indicator will light on and you will hear one beep, then S900 V2 will be powered on.

### 3.2 Power off receiver

Long press the power button, all indicators interval flashing and the voice prompted "power off". Then short-press the power button to confirm power off.

### 3.3 Model view and switch

#### **Model view**

When receiver is powered on, short press the power button and then it will voice broadcast the current working mode and data link.

#### **Model switch**

When the receiver is powered on, connect it with handheld or other instruments so as to set up and switch the working mode of receiver.

### 3.4 Receiver self-check

Self-check functionality is to check whether every module works normally. When S900 V2 receiver has indicators off or module doesn't work normally, you can use self-check to inspect the receiver. S900 V2 self-check consists of six parts, namely GNSS, radio, network, WIFI, Bluetooth, and sensor. The self-check results will be voice broadcasted in the process. Self-check operation and result broadcast are as followed:

When receiver is powered on, press power button and hold it until the receiver voice broadcasts "power off". Press it again until the receiver sounds a beep and voice broadcasts "self-check", which means the receiver starts to operate self-check. New receiver is recommended to operate self-check at least once.

In the process of self-check, each module inspection is followed by its inspection result. If the module inspection passes, it will voice broadcast "OK" and module led keeps on until the whole self-check finishes. If the module inspection fails, it will voice broadcast current module inspection fail, keep module led flashing and buzzer sounding until you restart the receiver. Self-check lasts for about 1 minute. If there is self-check failure, please contact local dealer.

If every module indicator is lit with no flashing, and voice broadcast says every module work normally (such as "GPS self-check. OK."), it means all the modules work normally. Receiver starts to work after the whole self-check finishes

### 3.5 Insert cards

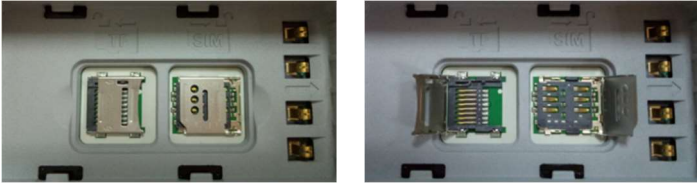
If you need to use the SIM card, you should insert the SIM card before you power on the S900 V2.

The bottom of receiver is left and right battery slot, which are marked by arrow A and arrow B respectively. Both the MicroSD card and the SIM card slot are inside the battery slot pointed by arrow A.

Replace procedure of MicroSD card and SIM card:

- (1) Push the bottom slide lock in the direction of arrow A. Press the corresponding direction push key on the side of the receiver, and open the battery cover.
- (2) Remove the battery and you will see the SIM card and MicroSD card slot at the bottom of the battery slot.
- (3) Push the upper cover of the card slot outward in the direction of the arrow above the card slot to open the card slot, put the SIM card or MicroSD card into the card slot (the same direction as the icon), cover the card slot cover. Open the upper cover in the arrow direction, then install or uninstall the MicroSD or SIM card (card shape is same as the above mark).





**Figure 3.1:** MicroSD and SIM card slots (open on the left, closed on the right)

## 4. New IMU Technology

The New S900 V2 series receivers are equipped with the new IMU<sup>1</sup> System that allows tilted measurement (TILT).

It has the following advantages:

- The initialization process is much simpler.

You can use *Stonex Cube-a* field software to calibrate the sensor; Cube-a will ask to initialize the IMU when needed and it will show how to do it. The process is very fast, usually a few seconds for IMU initialization.

- The receiver with integrated inertial navigation module ensures the real-time interference-free tilt compensation.

It's not affected by any geomagnetic and external metal structures and other environmental influences. It adopts "satellite and inertial navigation" dual inspection.

- Fast and precise survey.

It's possible to survey and store points with just one measure with slant pole up to 60° (2 cm accuracy up to 30°, 5 cm accuracy up to 60°).



### 1. Optional activation

## 4.1 IMU with Stonex Cube-a

### 4.1.1 Sensor Activation and Configuration

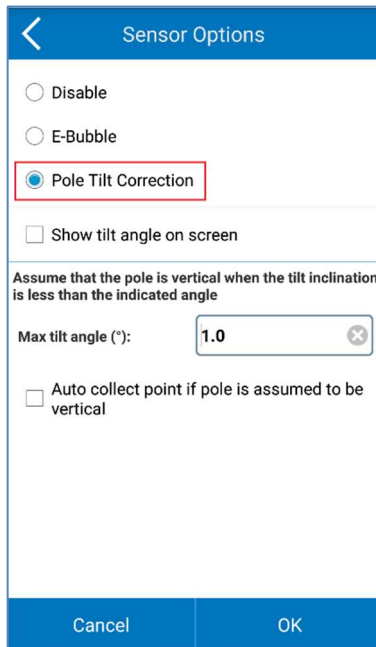
To use the S900 V2 with new IMU technology it's necessary to enable the feature in the specific options menu.

Before using the receiver to collect points with the slanted pole, check if the pole tilt correction functionality has been enabled.

With Stonex Cube-a, follow this path to find the configuration menu:

**Configure → System Settings → Sensor Options.**

There, enable the **Pole Tilt Correction**.



**Sensor Options**

Disable

E-Bubble

Pole Tilt Correction

Show tilt angle on screen

Assume that the pole is vertical when the tilt inclination is less than the indicated angle

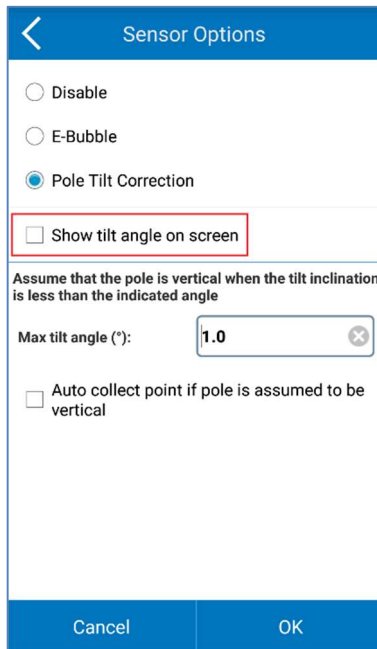
Max tilt angle (\*):

Auto collect point if pole is assumed to be vertical

Cancel OK

In the same screen, it is possible to ask the software to show on screen the angle of the tilt angle (in decimal degrees,  $0^\circ$  = true vertical).

To show this information, mark the relative check inside the Sensor Option menu.



The screenshot shows a mobile application interface titled "Sensor Options". It features a blue header with a back arrow and the title. Below the header, there are three radio button options: "Disable", "E-Bubble", and "Pole Tilt Correction", with "Pole Tilt Correction" selected. A red rectangular box highlights the checkbox labeled "Show tilt angle on screen", which is currently unchecked. Below this checkbox, there is a text instruction: "Assume that the pole is vertical when the tilt inclination is less than the indicated angle". Underneath this instruction is a text input field labeled "Max tilt angle (\*)" containing the value "1.0" and a clear button (an 'x' in a circle). At the bottom of the screen, there are two buttons: "Cancel" and "OK".

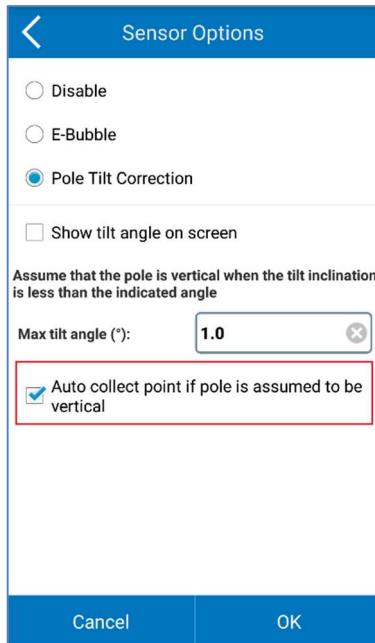
The user can also define the verticality tolerance of the instrument.

That is, the maximum value of the (sensor) tilt angle that the software shall accept when checking for the pole verticality.

The value is in decimal degrees.

Example: 0.3 means +/-  $0.3^\circ$  from true (local) verticality.

Finally, there is also the possibility of automatically starting the measurement of the point, when the pole is considered vertical.



Sensor Options

Disable

E-Bubble

Pole Tilt Correction

Show tilt angle on screen

Assume that the pole is vertical when the tilt inclination is less than the indicated angle

Max tilt angle (°):

Auto collect point if pole is assumed to be vertical

Cancel OK

## 4.1.2 Initialization

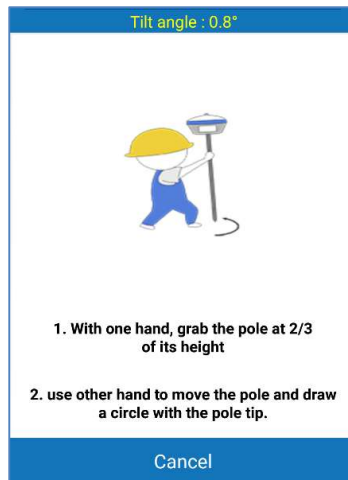
After the activation of the sensor, go in Survey mode.

If the sensor is not ready to work yet, Cube-a will show you which operations are necessary to perform its initialization.

There is a necessary pre-requisite to use the IMU: the status of the GNSS solution must be **Fixed** (Fixed, aRTK Fixed, Surefixed or ExtraSafe Fixed).

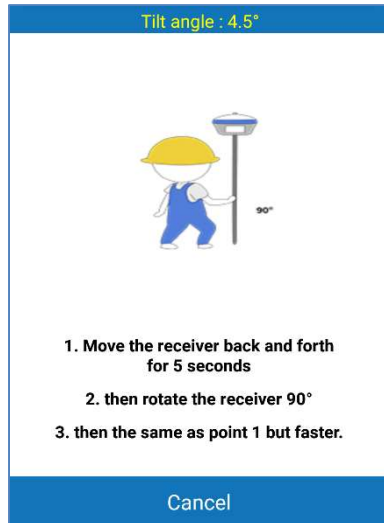
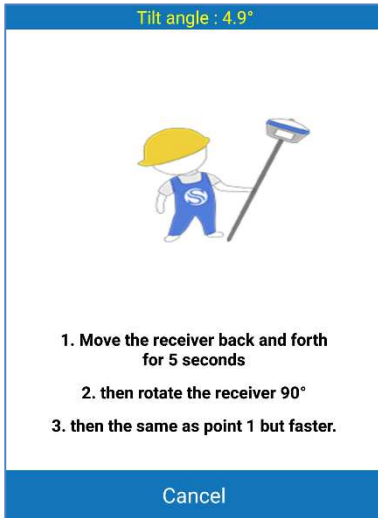
**When, and only when, the receiver is in Fixed, and if the sensor needs to be initialized**, two different popup screens could show up.

The first screen shows up seldomly: it lets the sensor adjust for the local magnetic field. Just rotate the pole with the device as shown in the picture below.



The second screen lets the sensor adjust the calibration parameters based on the local GNSS position and accuracy.

Move the receiver back and forth for a few seconds in a direction. Then rotate the system about 90 degrees and repeat the movements, in the same direction as before, as shown in the picture below.



If the screen does not disappear, try changing position to get lower RMS values and then repeat the two steps.

***It could happen that during the survey, the screens show up: this means that the IMU accuracy has degraded and it's necessary to adjust it:*** shake the receiver for a few seconds and it will be ready to continue to work.

### 4.1.3 RMS Study and Sensor Calibration

You can check the accuracy of the tilt compensation through the RMS quality check.

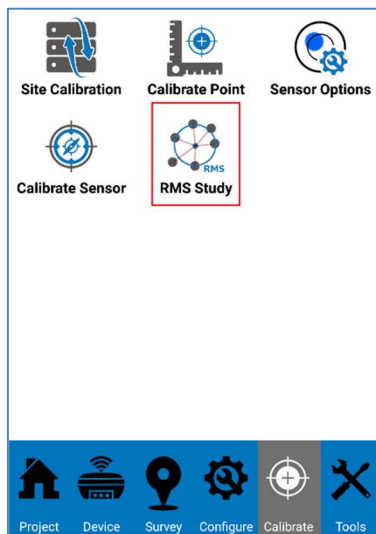
If the accuracy (RMS) is good, then you can continue working. If the accuracy (RMS) is not good, then calibrate the sensor using the Calibrate Sensor tool.

The RMS Study performs the study of the quality/accuracy of repeated measures (keep the pole tip at the same exact position on the ground).

How to use it?

Open the **Calibrate** menu, then select the **RMS Study** command.

When inside the RMS Study screen, click **Start** to collect the measures.

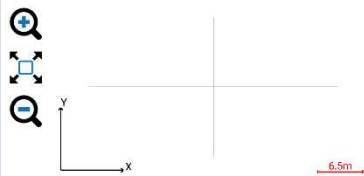




The application will collect measures/positions at an average frequency of 1Hz. Collected positions will be averaged and RMS values will be computed.

The RMS values let the user to verify if the accuracy of the device falls within some required accuracy upper limit. If the RMS values are not satisfactory then the user can, and he should, proceed with the calibration.

Tilt angle : 0.5°

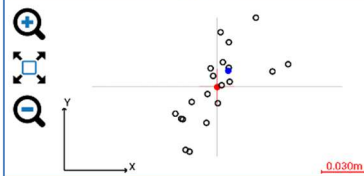


Use the first point as the reference point

Number of points	0
Easting StdDev	-
Northing StdDev	-
Height StdDev	-
Average Easting	-
Average Northing	-

Clear	Delete last	Add
Start	Cancel	Save

Tilt angle : 4.9°



Use the first point as the reference point

Number of points	21
Easting StdDev	0.019
Northing StdDev	0.023
Height StdDev	0.017
Average Easting	514247.961
Average Northing	5045444.463

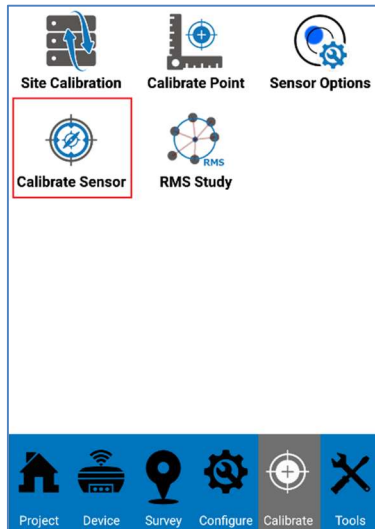
Clear	Delete last	Add
Start	Cancel	Save

The user has the control of the number of sample positions used in the RMS calculation. When the user decides to complete the check, he can press **Stop** to stop the automatic position acquisition.

As said, if the RMS values are not satisfactory then the user can, and he should, proceed with the sensor calibration.

This operation is also suggested when the user changes the pole height and/or the pole type (there could be a change in the straightness of the pole).

To calibrate the sensor, select the **Calibrate** page and then click on the **Calibrate Sensor** command.

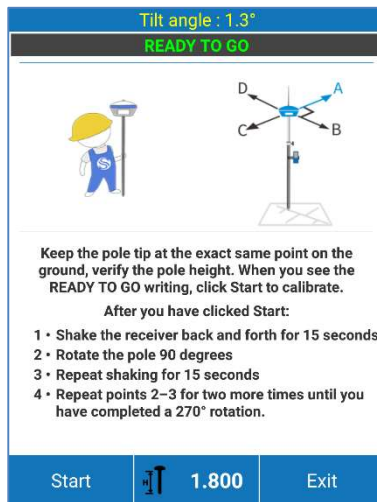


Follow the shown instructions to perform the calibration.

A **Fixed** GNSS solution is mandatory.

**Check the antenna height:** a wrong antenna height will make the calibration not accurate.

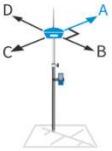

Wait for the message **Ready To Go**, start the calibration by clicking on the **Start** button.



As shown in the picture below, to correctly calibrate the sensor, it's necessary to choose an arbitrary first direction as a reference (direction A), then start to move the receiver back and forth along that direction and until a message asking to change the direction appears.

Tilt angle : 1.9°

DIRECTION A




Keep the pole tip at the exact same point on the ground, verify the pole height. When you see the **READY TO GO** writing, click Start to calibrate.

After you have clicked Start:

- 1 • Shake the receiver back and forth for 15 seconds
- 2 • Rotate the pole 90 degrees
- 3 • Repeat shaking for 15 seconds
- 4 • Repeat points 2-3 for two more times until you have completed a 270° rotation.

Stop


 **1.800**

Exit

Rotate the receiver 90 degrees clockwise, reaching the direction  $A+90^\circ = B$ , and continue to move back and forth the device.

Tilt angle : 1.5°


**ROTATE OF 90° - A -> B**



Keep the pole tip at the exact same point on the ground, verify the pole height. When you see the **READY TO GO** writing, click Start to calibrate.

After you have clicked Start:

- 1 • Shake the receiver back and forth for 15 seconds
- 2 • Rotate the pole 90 degrees
- 3 • Repeat shaking for 15 seconds
- 4 • Repeat points 2–3 for two more times until you have completed a 270° rotation.

Stop  1.800 Exit


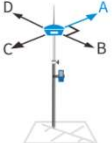
This operation must be repeated for 3 times, thus every 90 degrees up to a total of 270° clockwise.

After moving the device back and forth along the direction D, the message **Calibration Terminated** will appear.

If the calibration fails, an error message will be shown. In this case, repeat the calibration procedure.

Tilt angle : 9.9°


**CALIBRATION TERMINATED**

Keep the pole tip at the exact same point on the ground, verify the pole height. When you see the **READY TO GO** writing, click Start to calibrate.

After you have clicked Start:

- 1 • Shake the receiver back and forth for 15 seconds
- 2 • Rotate the pole 90 degrees
- 3 • Repeat shaking for 15 seconds
- 4 • Repeat points 2–3 for two more times until you have completed a 270° rotation.

Start
 1.800
Exit

## 5. Accessories

### 5.1 Carrying case

The external appearance of the transport container is shown in the Figure 4.1.



Figure 4.1: External appearance of container

### 5.2 Standard accessories

#### **Adaptor**

Power adaptor (model: DSA-40CA-12) with 3 plugs (US, UK and EU).

#### **Power supply**

Charger (model: CH-04) for battery BP-5S

#### **Batteries**

Two lithium-ion batteries (model: BP-5S) 7.4V, 3400mAh

#### **Cable**

Multi-port link cable (model: LM.GK205.ABL) between receiver and PC or controller; USB or 7-pins LEMO for PC or controller and 7-pins LEMO for receiver.

## 6. Technical specification

### RECEIVER

	GPS: L1 C/A, L1C, L2C, L2P, L5
	GLONASS: L1 C/A, L2C, L2P, L3, L5
	BEIDOU: B1, B2, B3
Satellite Tracked	GALILEO: E1, E5A, E5B, E5 ALTBOC, E6
	QZSS: L1 C/A, L1C, L2C, L5, L6
	IRNSS: L5
	SBAS: L1, L5
Channels	555
Position Rate	5 Hz
Signal Reacquisition	< 1 sec
RTK Signal Initialization	Typically < 10 sec
Hot Start	Typically < 15 sec
Initialization Reliability	> 99.9 %
Internal Memory	8 GB
Micro SD Card	Expansion slot up to 32 GB
Tilt sensor	E-Bubble levelling IMU (optional) <sup>5</sup>



## POSITIONING<sup>1</sup>

HIGH PRECISION STATIC SURVEYING	
Horizontal	3 mm + 0.1 ppm RMS
Vertical	3.5 mm + 0.4 ppm RMS
CODE DIFFERENTIAL POSITIONING	
Horizontal	0.25 m RMS
Vertical	0.45 m RMS
SBAS POSITIONING <sup>2</sup>	
Horizontal	0.30 m RMS
Vertical	0.60 m RMS
REAL TIME KINEMATIC (< 30 Km) – NETWORK SURVEYING <sup>3</sup>	
Fixed RTK Horizontal	8 mm + 1 ppm RMS
Fixed RTK Vertical	15 mm + 1 ppm RMS

## INTEGRATED GNSS ANTENNA

High accuracy four constellation micro-strip antenna, zero phase center, with internal multipath suppressive board

## INTERNAL RADIO (optional)<sup>5</sup> TRM121 1W

Type	Tx - Rx
Frequency range	410 – 470 MHz 902.4 – 928 MHz
Channel Spacing	12.5 KHz / 25 KHz
Range	3 – 4 Km in urban environment Up to 10 Km with optimal conditions <sup>4</sup>

### INTERNAL MODEM

GSM integrated	EG25-G
Band	LTE FDD: B1/B2/B3/B4/B5/B7/B8/B12/ B13/B18/B19/B20/B25/B26/B28 LTE TDD: B38/B39/B40/B41 UMTS: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8 Nano SIM card

### COMMUNICATION

I/O Connectors	7-pins Lemo and 5-pins Lemo interfaces. Multifunction cable with USB interface for PC connection
Bluetooth	2.1 + EDR, V4.1
Wi-Fi	802.11 b/g/n
Web UI	To upgrade the software, manage the status and settings, data download, etc. via smart phone, tablet or other Internet enabled electronic devices
Reference outputs	RTCM 2.3, 3.2 CMR, CMR+, ROX
Navigation outputs	NMEA 0183

### POWER SUPPLY

Battery	2 rechargeable and replaceable 7.2 V – 3.400 mAh Intelligent lithium batteries
Voltage	9 to 28 V DC external power input with over-voltage protection (5 pins Lemo)
Working Time	Up to 12 hours (2 batteries hot swap)
Charge Time	4 hours (typical)

## PHYSICAL SPECIFICATION

Dimensions	φ 157 mm x 76 mm
Weight	1.19 Kg (with one battery) 1.30 Kg (with two batteries)
Operating Temperature	-40°C to 65°C (-40°F to 149°F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)
Waterproof/Dustproof	IP67
MIL- STD	MIL-STD-810F
Shock Resistance	Designed to endure to a 2 m pole drop on concrete floor with no damage
Vibration	Vibration resistant

### Specifications are subject to change without notice

1. Accuracy and reliability are generally subject to satellite geometry DOPs), multipath, atmospheric conditions and obstructions. In static mode they are subject even to occupation times, the longer is the baseline, the longer must be the occupation time.
2. Depends on SBAS system performance.
3. Network RTK precision depends on the network performances and are referenced to the closest physical base station.
4. Varies with the operating environment and with electromagnetic pollution.
5. Optional, it can be activated via firmware.

## Appendix 1: Default radio configuration

The internal radio TRM121 can transmit on the 410-470MHz and 902.4-928 MHz band; users can choose radio channel and radio protocol through the handheld software or WEB interface. The default frequency of each channel is in the following table.

Channel	Frequency
1	438.125 MHz
2	440.125 MHz
3	441.125 MHz
4	442.125 MHz
5	443.125 MHz
6	444.125 MHz
7	446.125 MHz
8	447.125 MHz

Main features and general performance of the internal radio are summarized below.

<b>General performance</b>	
Frequency range	Fixed frequency: 410-470 MHz
	Hopping frequency: 410-470 MHz and 902.4-928 MHz
Band width	Fixed frequency: 12.5 KHz, 25 KHz
	Hopping frequency: 280 KHz
Modulation scheme	Hopping frequency: GMSK
	Fixed Frequency: GMSK, 4FSK
<b>Transmitter</b>	
RF output power	High power (1.0 W)
<b>Modem</b>	
Rate	Fixed frequency: 9600bp, 19200bps
	Hopping frequency: 115200bps
Modulation	GMSK

## Appendix 2: Copyrights, warranty and environmental recycling

### Copyrights and trademarks

© 2020, STONEX® Limited. All rights reserved.

STONEX®, the STONEX® logo, and S900 V2 GNSS receiver are trademarks of STONEX® Limited.

*STONEX® Cube-a*, *STONEX® Cube Connector* are trademarks of STONEX® Limited.

Bluetooth is a trademark owned by Bluetooth SIG, Inc. and licensed to Trimble Navigation Limited. All other trademarks are the property of their respective owners.

### Release Notice

This is the March 2020 release of the STONEX® S900 V2 GNSS new model receiver user guide.

The following limited warranties give you specific legal rights. You may have others, which vary from state/jurisdiction to state/jurisdiction.

### Standard Limited Warranty

Version 2020

The terms and conditions of this Limited Warranty constitute the complete and exclusive warranty agreement between The Customer or Dealer and STONEX® for the Product and supersedes any prior agreement or representation made in any STONEX® sales document or advice that may be provided to Customer by any STONEX® representative in connection with Customer's purchase of the Product. No change to the conditions of this Limited Warranty is valid unless it is made in written form and signed by an authorized STONEX® supervisor.

STONEX® warrants that its Products:

(1) are free from defects in materials or workmanship for generally 1 years (accessories or specific parts for which different limited warranty period shall apply).

(2) have been tested/calibrated in proper working status prior to shipment.

The warranty period starts from date of first sale of the instruments. At its sole discretion, under the warranty period, STONEX® will repair the product or send parts for replacement at its expense. STONEX® agrees to repair or replace the defected instrument within thirty (30) days only if STONEX® Europe recognizes that the defects of the instrument are not caused by human factors or no obvious damage to its surface is visible. STONEX® warrants any new replaced parts or products are warranted to be free from defects in materials and workmanship for thirty (30) days or for the remainder of the Limited Warranty Period of the Product in which they are installed, whichever is longer. Faulty Parts or Products replaced under this Limited Warranty shall become property of STONEX®. All products that have to be repaired have to be returned to our technical representative office location via any delivery company the customer prefers, nevertheless STONEX® is not accountable for the unlikely event that the Products gets lost in transit. Any damage inflicted by the customer or by third party after the products has been delivered to the customer is excluded from the limited warranty as well any damage arising from an improper use, from any action or use not provided for in the enclosed user guides and/or manuals.

## Shipping policy

The Customer or the dealer is required to pay for the charges for shipping of fault parts or instruments to STONEX® representative office and STONEX® is providing the shipping for return. Dealers need to follow STONEX® repair/service procedure to achieve a better and prompt service result.

## Return policy Dead On Arrival instruments

All returned products have to be shipped to STONEX® representative office.

The original Purchaser has a period of seven (7) days starting from date of purchasing to signal the existence of a defect in the instrument for a full refund

(less shipping and handling), provided the merchandise is in new, resalable condition and returned in the original, undamaged packaging. Customer has to pay for both the return and the original freight fees, regardless of the original freight paid by the Company. All warranty books, instruction manuals, parts and accessories must be included as well as the original box in which the item was shipped. We recommend placing the original carton inside another box, to avoid any additional damage to the carton itself. In some cases, returns of special items will require a re-stock fee. Acceptance of returned merchandise is final only after inspection by STONEX®.

Above terms and policies shall apply as for hardware. Dealers need to follow STONEX® repair/service procedure to achieve a better and prompt service result.

## Firmware/Software warranty

Stonex doesn't warrant that operation of Firmware/Software on any instruments will be uninterrupted or error-free, or that functions contained in Firmware/Software will operate to meet your requirements.

Stonex will forward the Software/Firmware Fix to the dealer or customer. Firmware/software Fix means an error correction or other update created to fix a previous firmware version that substantially doesn't conform to the instruments specification.

## Over Warranty repair(s) policy

Customer shall pay the standard repair fees for any service (whether part replacement or repairs) and performed by STONEX® under request and explicit authorization of the customer itself. In this case the customer is charged for return shipment's fees as well.

## Disclaimer and Limitation of Remedy

All other express and implied warranties for this product, including the implied warranties of merchantability and fitness for a particular purpose and/or non-infringement of any third party's rights, are hereby disclaimed. Stonex® expressly disclaims all warranties not stated in this limited warranty. Any implied warranties that may be imposed by law are limited in duration to the



term of this limited warranty. Some jurisdictions do not allow the exclusion of implied warranties or limitations on how long an implied warranty lasts, so the above exclusions or limitations may not apply to customer. Customer must read and follow all set-up and usage instructions in the applicable user guides and/or manuals enclosed. If customer fails to do so, this product may not function properly and may be damaged. Customer may lose data or sustain personal injuries. Stonex®, its affiliates and suppliers do not warrant that operation of this product will be uninterrupted or error free; as do all electronics at times. If this product fails to work as warranted above, customer's sole and exclusive remedy shall be repair or replacement. In no event will Stonex®, its affiliates or suppliers be liable to customer or any third party for any damage in excess of the purchase price of the product. This limitation applies to damages of any kind whatsoever including (1) damage to, or loss or corruption of, customer's records, programs, data or removable storage media, or (2) any direct or indirect damages, lost profits, lost savings or other special, incidental, exemplary or consequential damages, whether for breach of warranty, contract, tort or otherwise, or whether arising out of the use of or inability to use the product and/or the enclosed user guides and/or manuals, even if Stonex, or an authorized Stonex® representative, authorized service provider or reseller has been advised of the possibility of such damages or of any claim by any other party. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages for some products, so the exclusions or limitations may not apply to customer. This limited warranty gives customer specific legal rights, and customer may also have other rights which vary from country/state/jurisdiction to country/state.

## Instruments

2 year on STONEX® Products:

GNSS receiver: S900 V2 GNSS Series

## Accessories

### **Accessories and specific parts warranty**

For accessories provided by Stonex with the instruments S900 V2 GNSS the following general warranty time is for reference:

- Power Adaptor, cables, batteries: 2 years.

- Batteries: 6 months

## Environmental recycling

The cardboard box, the plastic in the package and the various parts of this product have to be recycled and disposed of in accordance with the current legislation of your Country.

### **For countries in the European Union (EU)**

The disposal of electric and electronic device as solid urban waste is strictly prohibited: they must be collected separately.

Contact Local Authorities to obtain practical information about correct handling of the waste, location and times of waste collection centre. When you buy a new device of ours, you can give back to our dealer a used similar device.

The dumping of these devices at unequipped or unauthorized places may have hazardous effects on health and environment.

The crossed dustbin symbol means that the device must be taken to authorize collection centres and must be handled separately from solid urban waste.



### **For countries outside European Union (EU)**

The treatment, recycling, collection and disposal of electric and electronic devices may vary in accordance with the laws in force in the Country in question.

## Appendix 3: Safety Recommendations

### Warnings and Cautions

An absence of specific alerts does not mean that there are no safety risks involved in the use of this equipment.

Always follow the instructions that accompany a Warning or Caution, reported in this.

This information is intended to minimize the risk of personal injury and/or damage to propriety. In particular, observe safety instructions that are presented in the following form:

**WARNING** - A Warning alerts about risk for health and/or damage to the propriety. A warning identifies the nature of the risk and the extent the possible injury and/or damage. It also describes how to protect yourself and/or the equipment from this risk.

**CAUTION** - A Caution alerts about a possible risk of damage to the equipment and/or loss of data, but no risk for human safety.

### Wireless Module Approval

The receivers use internal wireless modules or can be connected to an external data communications UHF radio. Regulations regarding the use of the radio-modems vary greatly from country to country. In some countries, the unit can be used without obtaining an approval license. Other countries require specific approval or auto certification by the set maker.

Before using this instrument, check if authorization to operate the receiver is required in your country. It is the responsibility of the importer to verify if it is necessary a certification or license for the equipment in the country of use.

## Instrument Approval

Covers technical features of the equipment relatives to electromagnetic emissions that can cause interference and disturbances to other instruments (note like EMC compatibility) or generate not correct functionalities of the instrument itself. Approval is granted by the manufacturer of the equipment. Some countries have unique technical requirements for operation in particular frequency bands. To comply with those requirements, Stonex srl may modified the equipment to be subjected to grant.

Unauthorized modification of the units voids already got approvals, the warranty time and the operational licenses of the instrument.

## UHF 410-470 MHz / 902.4-928 MHz Data transceiver

### General Antenna Installation Warning

1. All antenna installation and servicing are to be performed by qualified technical personnel only. When servicing the antenna, or working at distances closer than those listed below, ensure the transmitter has been disabled.
2. Typically, the antenna connected to the transmitter is a directional (high gain) antenna, fixed-mounted on the side or top of a building, or on a tower. Depending upon the application and the gain of the antenna, the total composite power could exceed 90 watts ERP. The antenna location should be such that only qualified technical personnel can access it, and that under normal operating conditions no other person can touch the antenna or approach within 0.6 meters of the antenna.

You can see below a table showing the Antenna Gain versus Recommended Safety Distance:

	Antenna Gain		
	0-5 dBi	5-10 dBi	10-16.5 dBi
<b>Minimum RF safety distance</b>	0.6 meters	1.06 meters	2.3 meters

### **For USA**

The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy. Proper use of this radio modem results in exposure below government limits. The following precautions are recommended:

**DO NOT** operate the transmitter when someone is located less than 20 cm (7.8 inches) of the antenna.

**DO NOT** collocate (place within 20 cm) the radio antenna with any other transmitting instruments.

**DO NOT** operate the transmitter unless all RF connectors are secure, and any open connectors are properly terminated.

**DO NOT** operate the equipment near electrical blasting caps or in an explosive atmosphere.

All equipment must be properly used according to the installation instructions for safe operation.

All equipment should be repaired and calibrated only by a qualified technician

### **For Europe**

The European Community provides some Directives for the electronic equipments introduced on the market.

All the relevant information's are available on the European Community website:

<http://ec.europa.eu/enterprise/sectors/rtte/documents/>

The text of the Directive 99/05 regarding telecommunication equipments is available, while the applicable Directives (Low Voltage and EMC) are available at:

<http://ec.europa.eu/enterprise/sectors/electrical>

### **Bluetooth/WiFi radio Module**

The radiated output power of the internal Bluetooth module of this equipment is far below the FCC and EU radio frequency exposure limits. In any case, be sure to use the equipment with the radio far at least 20 cm from the human body. The Bluetooth module match the guidelines found in radio frequency “safety standards and recommendations” published by Scientific organizations.

Stonex srl therefore believes the internal wireless radio is safe for use by end users. The level of energy emitted is far less than the electromagnetic energy emitted by wireless devices such as UMTS phones. However, the use of Bluetooth/WiFi may be restricted in some special situations or place, like aircraft , hospital ,etc. If you are unsure of existence of restrictions, you should ask for authorization before switching on the Bluetooth radio.

### **Raccomandation for installing antennas for internal radios**

An absence of specific alerts does not mean that there are no safety risks involved in the use of this equipment.

Always follow the instructions that accompany a Warning or Caution, reported in this. This information are intended to minimize the risk of personal injury and/or damage to propriety. In particular, observe safety instructions that are presented in the following form:

#### **CAUTION**

For your own safety, and to match the RF Exposure requirements of the FCC, always observe these precautions:

Always maintain a minimum separation distance of 20 cm (7.8 inches) between yourself and the radiating antenna.

Do not collocate (place within 20cm) the radio antenna with any other transmitting device.

Do not switch on the GSM or UHF module without the antenna mounted to the external connector.

UHF Antennas having a gain greater than 5 dBi, are strictly prohibited for use with this device. The required antenna impedance must be 50 ohms.

## Rechargeable Lithium-ion batteries

These receivers use a rechargeable Lithium-ion battery.

### WARNING

- Avoid direct contact with the rechargeable Lithium-ion battery if it appears damaged. Battery liquids are corrosive and, contact with it can result in personal injury or damage to properties.

To prevent injury or damage:

- If the battery leaks, avoid contact with the battery fluid.
- If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
- If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

### WARNING

- Do not create damage at the rechargeable Lithium-ion battery.

A damaged battery can cause an explosion, with risk of fire, and can result in personal injury and/or property damage.

To prevent injury or damage:

- Do not use or charge the battery if it appears to be damaged. Signs of damage are discoloration, warping, leaks of liquids.
- Do not expose the battery to fire, high temperature, or direct strong sunlight.
- Do not introduce the battery in water or liquid substance, in general.
- Do not use or store the battery in very hot ambient.
- Do not drop or puncture the battery.
- Do not open the battery and do not put in short-circuit its electrical contacts.



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