SATCUBE

Satcube Ku User Manual

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Disclaimer

The information provided in this manual is for information purposes only. This document is subject to change without notice and may contain errors or inaccuracies. Make sure to acquire the most current version from the distributor before using the equipment.

This document is a user manual for the Satcube Ku terminal. It is important to observe all safety and transmission requirements listed in this document and to operate the Satcube Ku according to the guidelines provided in this manual.

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In Accordance with part 15 of the FCC rules

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.

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

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

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

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

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

Safety statements on batteries

To avoid unnecessary hazards, observe the following directions.

- Keep the battery packs away from fire.
- Do not disassemble, break or otherwise tamper with the battery packs.
- Do not drop the battery packs.
- Do not expose the battery packs to temperatures above 50 °C.
- Only use Lithium Ion battery packs that are supplied by Satcube.

In case of battery fault, contact Satcube support at www.satcube.com/customer-service/.

1. Introduction

The Satcube Ku provides the user with an internet connectivity anywhere on earth, by connecting to nearby geostationary satellites. It includes 1 hour on average transmit time standard plus offers additional hot-swappable batteries, iDirect or UHP Networks modem, Wi-Fi, flat antenna, amplifier (high efficiency GaN SSPA), upconverter, downconverter, heat pipe cooling system, positioning system and all necessary user interfaces (graphical and connections) in one compact package. This quick start guide is intended to help the operator with setting up and operating the terminal. Troubleshooting and safety instructions are provided in order to aid the operator in safely handling and maintaining the terminal.

a) IMPORTANT NOTE! Before reading further

Make sure you read through the system safety chapter before operating the equipment. Not adhering to the stated safety instructions there is chance of causing personal harm and equipment damage.

Before continuing take note of what kind of modem is installed in your Satcube terminal. Select terminal functionality is modem dependent. List of modems and configuration tradeoffs can be found in Appendix D Integrated Modem.

2. Contents and equipment list

*Table 1 Equipment list *Optional equipment*

Designation	Units	Dimensions	Weight
Satcube Ku	1	470 x 320 x 55 mm (18.5 x 12.6 x 2.17 in)	8 kg (17 lb)
Satcube Secure	1	470 x 320 x75 mm (18.5 x 12.6 x 2.95 in)	9.5 kg (20 lb)
Protective Case	1	550 x 400 x 250 mm (21.65 x 15.75 x 9.84 in)	
Power cable	1		
Batteries	3		
AC to DC converter	1		
Tripod in soft bag with mounting plate*	1	820 x 340 x 240 mm (32.3 x 13.4 x 9.5 in)	4.85 kg (10.7 lb)

3. System safety

The following general safety precautions must be observed during all phases of operation to avoid injuries or material damage.

b) Security notice

- **Do not substitute parts or modify equipment**
  Because of the danger of introducing additional hazards, do not perform any unauthorized modification of this product. If any unauthorized substitution of parts has been conducted the warranty will be declared void.

c) Environmental limitations

- **Wind strength**
  The Satcube Ku terminal should not be operated at wind speeds greater than 18 m/s or 40mph. The highest risk for the terminal to flip over is when the wind comes straight from behind the transmission direction and the antenna is at an upright position.
- **Temperature limitations**
  The Satcube Ku terminal has an operating temperature range of -20°C (-4°F) to 50°C (122°F).
  To avoid risk of high temperatures, please avoid placing the terminal in direct sunlight exposure.
- **Presence of reactive substances**
  Do not operate the equipment in the presence of flammable gases, liquids, fumes or equivalent.
- **Water and dust**
  The Satcube Ku terminal is designed to endure rough conditions and is IP65 rated (Ingress protection). See Figure 1 for a full explanation of different IP ratings and its implications to condition limitations.

First digit	Mechanical protection		Second digit	Water ingress protection	
0		No protection	0		No protection
1		Protected against solid objects over 50mm, e.g. accidental touch by hands	1		Protected against vertically falling drops of water e.g. condensation
2		Protected against solid objects over 12mm, e.g. fingers	2		Protected against direct sprays of water up to 15° from the vertical
3		Protected against solid objects over 2.5mm, e.g. tools & wires	3		Protected against direct sprays of water up to 60° from the vertical
4		Protected against solid objects over 1mm, e.g. wires, nails etc.	4		Protected against water splashed from all directions, limited ingress permitted
5		Protected against dust limited ingress, not harmfull deposits	5		Protected against low pressure jets of water from all directions, limited ingress permitted
6		Totally protected against dust	6		Protected against strong jets of water e.g. on ships deck, limited ingress permitted
n/a	n/a	n/a	7		Protected against the effects of temporary immersion between 15cm and 1m. Duration of test 30 minutes
n/a	n/a	n/a	8		Protected against long periods of immersion under pressure

Figure 1 Ingress Protection, IP, rating explanation chart. The Satcube Ku Terminal is rated IP65.

d) Electricity precautions

- **Keep away from live circuits**
  To avoid injuries, always disconnect power and discharge circuits before touching them. User must not remove equipment covers or tamper with electric circuits in any way.
- **Keep cables away from water**
  Ensure that the power cable and other used cables are not placed in submerged conditions or in areas where water could collect.
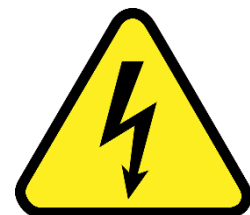
- **Make sure AC power supply is grounded**
  If the equipment is connected to an AC power supply, the power supply must be properly grounded in order to ensure safe operation.
- **Only connect the equipment to protected network**
  The mains supply network to which the terminal is connected must be protected by measures such as differentials and circuit breakers.

e) Operational precautions

- **Lifting and carrying**
  The terminal user should always handle the terminal with precaution and not lift with rapid motions to protect against personal injuries or equipment damage.
- **Cable routing and trip hazard**
  Ensure that all laid out cables do not create any trip hazards to personnel. Never place cables in areas where people are expected to move.
- **Antenna safety instructions**
  Use only manufacturer supplied antenna. Radiation exposure is calculated with respect to the supplied manufacturer antenna.
- **Keep a safety distance from the signal aperture**
  At all times, make sure that an area within a safety distance of the terminal is cleared before starting transmission to avoid radiation damages. The required safety distance depends on the antenna elevational angle, the height of personnel, possible bystanders or other objects such as buildings and trees. If the terminal is raised from the ground or elevational angle is increased the required safety distance decreases. The general formula to calculate the safety distance is: $L = \frac{H-h}{\tan(\theta)}$, see Figure 2 for explanation of the used variables. Table 2 shows safety distances for the situation in Figure 2.

*Table 2 Minimum safety distance for different angles if the Satcube Ku terminal is positioned 45 cm (1.48 ft) above the ground and is operated by someone who is 185 cm tall (6.07 ft). *Calculated from the radiated effect of the antenna – this is the minimum safety distance if the terminal is directed directly at the user. If the user is not within the direct beam of the antenna, such as behind the antenna, the safe distance is 20 cm (0.66 ft).*

Elevation angle (degrees)	Safety distance (meters / feet)
0	19* / 62.4*
1	19* / 62.4*
5	16 / 52.5
10	8 / 26.3
15	5.5 / 18.1
20	4 / 13.2
30	2.5 / 8.2
45	1.5 / 5
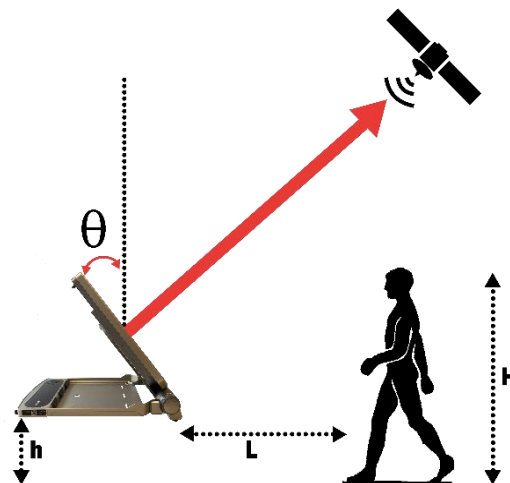
Figure 2 The user must always keep outside a safety distance given by L = $\frac{H-h}{\tan(\theta)}$ during transmission to avoid injury. H=height of object, h=terminal height above ground, θ = elevation angle, L=safety distance. See Table 2 for precalculated safety distances for a common mode of operation.

4. Deploy and Power On

a) Deploy terminal

- Unpack and position on a level surface. On rough terrain, the optional tripod can be used.
- Ensure terminal has clear line of sight towards satellite. A satellite finder app can be used to find approximate locations of satellites.

Figure 3 View from underneath the terminal showing how the front support legs unfolds.

b) Deploy front support

- The front support is stored underneath the terminal. Unfold it by holding the thin metal bar and pulling it away from the terminal until it reaches its limit as in Figure 3.

c) Deploy antenna

- Release the latch on the front of the terminal according to Figure 4. To unfold the antenna, simply hold the edge and lift it up 30cm / 1 foot.
- The antenna is deployed and secured by pulling the lever on the right-hand side of the front support as shown in Figure 5.
- Make sure that the right-hand side lock is deployed before proceeding.
- The adjustment wheel on the right-hand side raises and lowers the antenna and is used to fine tune elevation angle.

Figure 4 Latch on the front of the terminal. Pull to release before unfolding.

- In windy weather or when having a higher elevation than 45 degrees, further secure the antenna by using the wheel on the left-hand side according to Figure 6. In most cases, this is not needed.

Figure 5 Lock on right-hand side of the terminal. To SECURE in position, pull the lever as shown. Locked position in the right picture.

Figure 6 Wheel located on left-hand side of terminal. To LOCK/UNLOCK, turn as shown.

Figure 7 Connection ports are located on the front of the terminal. The DC power cable socket is located to the right. Ethernet and USB ports are located to the left. Left ethernet port is labeled LAN 1 and the right LAN 2.

Figure 8 Battery ports are indicated with orange arrows where the right most port charges the battery if the terminal is connected to a power source with the power cable.

d) Power on

- To use mains power or to charge battery, connect DC adaptor as guided by Figure 7.
- To use battery power, insert up to three batteries according to Figure 8.
- A battery in the right-hand slot will be charged when the terminal is connected to mains power.
- To turn on power, press and hold the red C-button seen in Figure 9.
- Icons in the bottom left corner of the display show if batteries are installed and their current power level. When connected to mains power, the right most battery will show a charging symbol if a battery is connected in this slot as illustrated in Figure 10.

Figure 9 Press and hold the red C-button to power ON.

Figure 10 Battery symbols.

5. Accessing the Graphical User Interface (GUI)

The GUI provides access to key functions, including starting/ending transmissions, enabling/disabling WIFI and terminal configuration. The connection can be done to the terminals static IP or to terminal dynamic IP assigned by modem DHCP. Using static IP way always works, dynamic IP is most convenient it does however require the modem to be configured to use DHCP.

Static IP approach:

- To access the GUI, connect your computer to one of the Ethernet ports on the front left-hand side of terminal shown in Figure 7. (NOTE: It is also possible to access the GUI with your computer/phone wirelessly, but this requires access to the terminal's WIFI network)
- Set the IP of the connected computer to 192.168.222.217 with a netmask of 255.255.255.248.
- Open a browser and type in 192.168.222.219 as the URL. This will display the GUI STATUS page.

Dynamic IP approach:

- Connect either to terminal WIFI or to ethernet using a cable to one of the Ethernet ports on the front left-hand side of terminal shown in Figure 7.
- Check the terminals assigned IP. This is done by looking at the device information screen on the display seen in Figure 21 where the IP address is visible.
- Open a browser and type in the IP address found on the device information view as the URL. This will display the GUI STATUS page.

6. Terminal Display Introduction and Navigation

The terminal display conveys a considerable amount of information to the user and is thus essential to know what the meaning is behind the icons as well as the how to navigate between the different screens.

a) Boot screen

At start-up, after the embedded system has booted, a checklist will show. It lists the things needed to happen before acquiring a satellite. As seen in Figure 11 GPS must be acquired, the satellite profile must be validated, and the modem must have booted. Check marks will populate the squares as the different criteria are met. During this time, a FAQ can be reached by clicking the house button on the terminal. If the
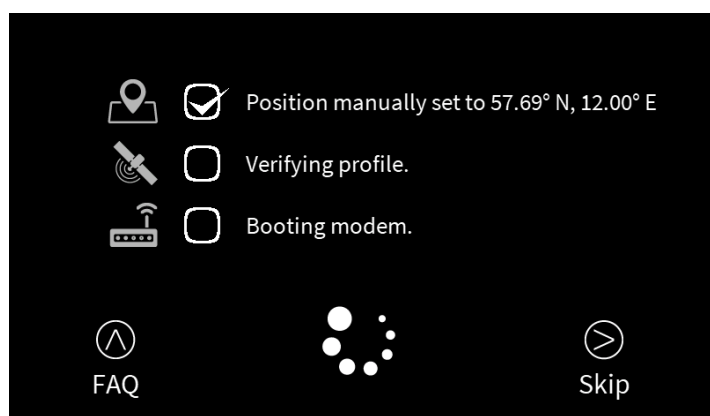
Figure 11 Boot screen currently showing GPS has been acquired and that the satellite profile has been validated. Before terminal can be used the modem has to start.

user does not wish to see this screen but rather see the pointing screen pressing the right arrow button will skip this view.

b) Pointing screen

In Figure 12 the pointing screen is shown. The wheel to the left presents the current Elevation difference, the distance from current value to satellite target value, with the big number in the figure +0.7°. Underneath this value is the current pointing value, currently pointing with an elevation of 18°. To the right in the figure the Polarization wheel is seen. In the figure the pointing value is -44° and the offset to satellite is +66°.
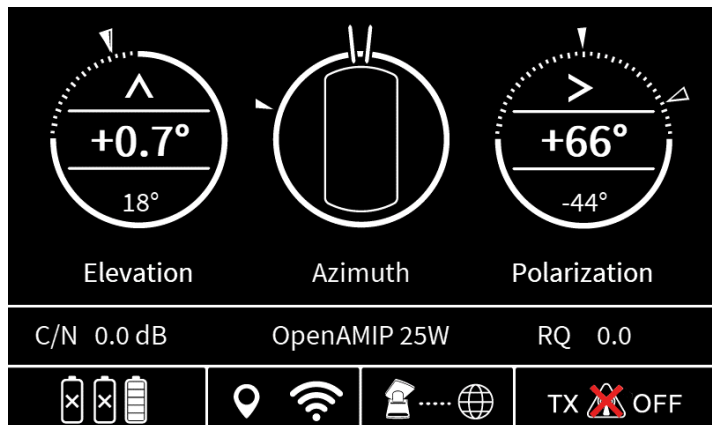
Figure 12 Pointing screen with current pointing values for elevation and polarization, the middle azimuth guidance with signal strength gauge and terminal status bar in the bottom part.

c) Status bar

In the bottom row of Figure 12 the status icons are shown. In the bottom left there are three battery indicators showing connected batteries and their power level. In this picture there is one battery connected that is fully charged. In Figure 16 the different battery symbols are shown; no connected battery, connected battery with corresponding charge level and the battery in the right most slot is charged by the terminal when mains power is connected. When the battery in the right most slot is fully charged, the symbol will change to Figure 13.

Figure 16 Shows the different battery symbols. No battery connected, battery connected with charge and battery connected and charging.

Figure 13 Right most battery is fully charged.

Figure 15 Indicates GPS is set to automatic and WIFI is turned on.
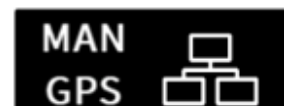
Figure 14 Terminal location is set to a manual GPS and the WIFI is switched off.

After the battery icons the GPS and network status are shown. During terminal startup, the icons will be flashing indicating that GPS is being acquired and WIFI and network is starting. A steady symbol indicates GPS have been acquired or WIFI or ethernet is operational as seen in Figure 15. In Figure 14 the automatic GPS was turned off and manual GPS was entered. The WIFI symbol was replaced with

the ethernet symbol due to the WIFI being turned off in the web GUI. To see how to enable the WIFI please consult Appendix A, Manual for the terminal's GUI.

Figure 17 Connection to modem not working in the left picture, connection established to modem in the middle-left picture, terminal receive lock in the middle-right picture, terminal also transmitting with an established internet connection to the right.

After network status the terminal link status is shown. The first icon symbolizes the terminal then a globe on the right side symbolizes the hub side or the internet. In between these symbols there can be dots, dots with a cross or arrows. Dots means that the terminal has started communication with modem. Dots with a cross means that this communication might be hindered. Modem being turned off, having the wrong Ip or OpenAMIP is not correctly configured. An arrow from globe towards terminal icon is an indication that there is a receive lock in the modem. An arrow going from terminal towards globe means that transmission has been started. If the globe gets a check mark in the top right corner, the terminal has established a connection to internet through the built-in cloud check and a popup window with the text "connection established" will be displayed. The different figures are shown in Figure 17.

In the last box of the status bar in the bottom right the terminal transmission status is shown. In Figure 12 the default status, transmission turned off

Figure 18 Transmission is allowed but has not been approved by user.

Figure 19 Transmission has been approved by user, pointing or other criteria for transmission not yet fulfilled.

Figure 20 Terminal transmit is turned on and led on top of antenna is on. Warning: See the safety instructions for operating terminal.

is displayed. The transmission status can be changed in three steps. The first step is shown in Figure 18 where the transmission is allowed but the user has not approved transmission, in Figure 19 the terminal user has approved transmission but all the criteria has not yet been fulfilled for the terminal to allow transmission. In Figure 20 the terminal is currently transmitting. All the criteria for transmission have been fulfilled. See the safety instruction for how to safely operate the terminal.

d) Information screen

In information view shown in Figure 21 following information can be found:

- Terminal location in GPS coordinates, latitude and longitude.
- Satellite Profile currently active. Either OpenAMIP profile or manual profile.
- Satellite position the current profile has active.

- Satcube terminal IP where web GUI can be reached for when using automatic acquisition of IP.
- Last part shows Current software version or an indication if a new software update is available. In Figure 21 the current software of the terminal is seen 0.7.28 and by pressing OK button a new software update can be downloaded.

	Latitude	57.69 N
	Longitude	12.00 E
	Profile	HellasSat
	Satellite	39.0 E
	IP address	172.18.10.10
	Software	0.7.25
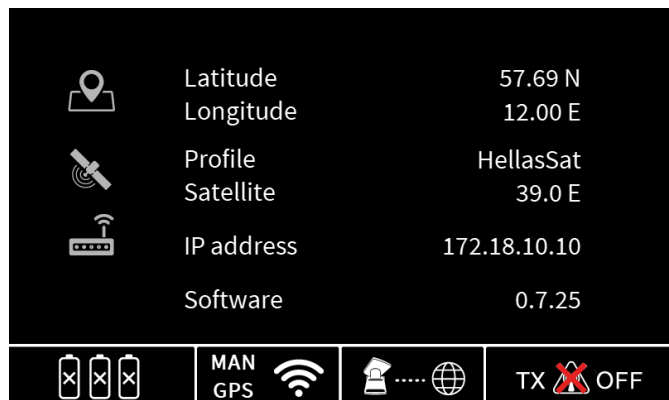
Figure 21 Device information screen showing terminal current set location, satellite profile, IP-address and software version.

e) Terminal navigation

- Proceed from waiting for GPS acquisition screen
  - o Right arrow button
- Show C/N or RQ value on screen
  - o While in pointing screen press up arrow
- Move to Device information / Information screen
  - o Click the home button (blue house) or right arrow. Click left arrow to return to pointing screen

f) Button functionality

Buttons described below can be seen in Figure 22.

- **White Cog**: Long press turns on/off transmission, short press brings the user to the terminal settings menu.

- **Blue House**: Brings user to home screen.

- **C:** Long press turns terminal on and off. Short press clears pointing data.

Figure 22 Terminal buttons.

- **OK**: Long press initiate beam switching procedure. Short press is used to agree to dialogs.

- **Up / Down arrow**: Short press shows / hides C/N and RQ value in pointing screen. Changes satellite profile when in home screen.

- **Right / Left arrow**: Short press switches between home screen and pointing screen.

- **Holding Left arrow** on terminal startup initiates terminal factory default settings.

7. Terminal settings and configuration

To function properly, the Satcube Ku terminal needs to know its own position and information about the satellite to which it will connect. All satellite details are stored in profiles which the user can switch between using the GUI or terminal display. Functionality might change depending on the modem, please see the Appendix D Integrated Modem list before continuing.

a) Terminal settings menu
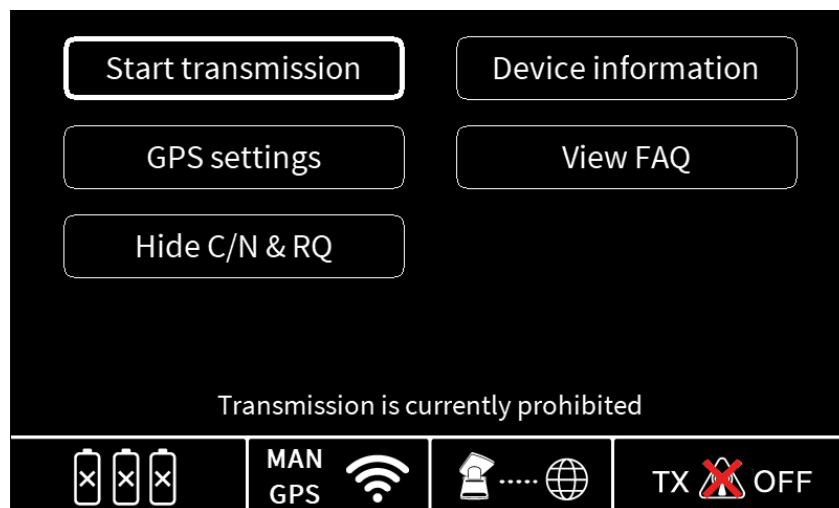
Figure 23 Settings menu on the terminal display.

Can be accessed by pressing the white cog button once.

- **Start transmission:** Use to start the transmission when the terminal is pointed towards the satellite.
- **GPS settings:** Set manual GPS coordinates or use the built-in GPS to automatically acquire coordinates.
- **Hide C/N & RQ:** Hide or show C/N and RQ on the pointing screen.
- **Device information:** Show the terminals information screen.
- **View FAQ:** A FAQ can be reached.

b) Terminal geolocation

- The terminal will use its built-in GPS to automatically acquire its coordinates.

- If the coordinates are not updated automatically, go to either GPS settings in the terminal settings menu, switch to **Manual**, enter the desired coordinates and press save.
- Or open the Web GUI, go to Settings, then scroll down to Position. Tick the **Manual setting** checkbox and enter the terminal's latitude and longitude in the selected format (decimal or deg/min/sec) as seen in Figure 41.
- Press SAVE to apply the settings.

Figure 24 GPS settings on the terminal display.

c) Profile selection

This can be done in one of two ways:
i. **Terminal display**
- Press on the device information in the terminal settings menu or use the left/right buttons to navigate to the **PROFILE** selection screen seen in Figure 25.
- Use the up/down buttons to select desired profile.

ii. **Graphical User Interface (GUI)**
Go to Settings. Under Satellite, choose the desired profile from the dropdown Preset menu. A new profile can be created if required shown in Figure 40.
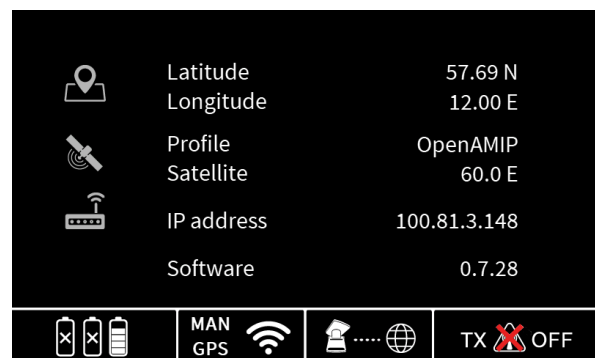
Figure 25 Profile selection screen on the terminal display.

d) Accessing the modem configuration

To configure the modem it is recommended to look through Appendix D Integrated Modem for the crucial information on how. Before using the terminal the user must configure the modem in order to receive a signal. Please refer to your service provider on settings and information regarding configuration for your terminal.

This section will help the user access the modem's GUI.

- Connect your computer to either of the two Ethernet ports described in Figure 7.
- Set the IP of the connected computer to 192.168.222.217 with a netmask of 255.255.255.248.
- Open a browser and navigate to the modem's GUI homepage by entering its IP address as the URL.

- The modem by default has IP address 192.168.222.222. It should always have this IP to be able to communicate with the terminal embedded system.

e) Recommended configuration

For the terminal to work as intended and to provide optimal user-experience the following configuration should be made.

- Set embedded modem to 192.168.222.222
    - Crucial to all terminal to modem communication. Services like OpenAMIP and SNMP will be able to send over configuration data and link information such as C/N values.
- Enable DHCP in modem, activate automatic IP acquisition in terminal.
    - Done to allow the user to browse the web GUI from the IP shown on terminal display.
    - Allows the terminal to connect to Satcube web service which enables terminal software upgrades, connectivity confirmation, enhanced customer support and troubleshooting.
    - Simplifies the configuration process.

f) Initiate factory reset

A factory reset of the terminal from a powered off state by turning on the terminal by clicking the red C. Directly after clicking the red C release it and hold down the left arrow button. Keep holding down the button until the terminal has restarted. Press OK when a choice for factory reset appears.

g) Cloud check

Cloud check is a feature where the terminal tries to connect to a Satcube server to verify the satellite link's internet connection. This info is then passed down to the user on the display as a pop up. It also changes the globe icon on the display in order to indicate the terminal is connected to internet. During the connection to the server information if a new software version is available to the user as seen in Figure 21.

Terminal has Cloud Check enabled by default and only works if the Satcube terminal has been given an internet enabled IP address from the modem.

h) Diagnostic data

At first start-up the terminal will ask the user if it agrees to share diagnostics data about the unit to Satcube. If the user agrees the terminal will when an internet connection is established send over anonymized data that only is used to improve the product and not used to track the user. For the best user experience this is recommended to be switched on. It will not impact system performance.

8. Terminal Alignment and Transmission

The Satcube Ku display has an intuitive guide to ensure the terminal is aligned correctly and maximum signal strength (C/N) is obtained.

a) Terminal pointing

- Correct pointing depends on three elements; Azimuth which is changed by rotating the terminal base, Elevation which is changed by altering the upwards/downwards angle of the upper part and Polarization which is changed by rotating the upper part. The required values are calculated from the information provided by the satellite profile.
- Use the buttons to navigate to the **POINTING** screen to view these as can be seen in Figure 26.
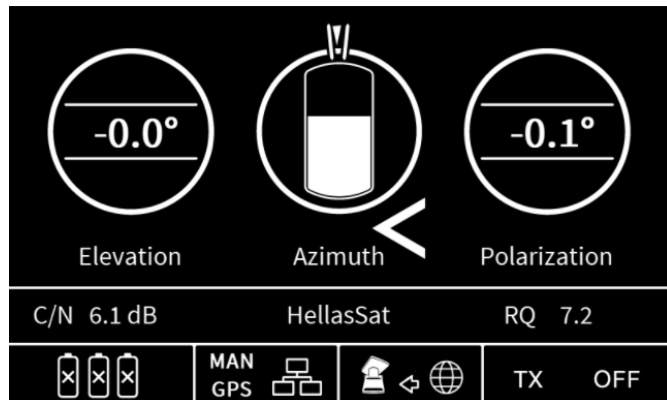
Figure 26 POINTING screen with current difference or offset from the absolute pointing value (0.0° for Elevation and 0.1° for Polarization) in the middle of the two circles. Azimuth is aligned within the two bars on top of middle circle.

b) Pointing the terminal

The Satcube terminal is pointed manually by the end-user in the different ways according to Figure 27.

- AZIMUTH: rotate the base of the terminal.
  On rough surfaces, lift the terminal slightly before rotating.
- ELEVATION: use the adjustment wheel on the right-hand side of the terminal.
  Large adjustments can be made by manually raising the antenna (as with initial deployment - see section 4). To fine tune the elevation angle, either lightly tighten the lock on the left side or pull the lever on the right side, seen in section 4 c), then use the right adjustment wheel.
- POLARIZATION: rotate the antenna by hand. Lock in position using the nut.

Figure 27 Terminal positioning angles. From left to right: Azimuth, Elevation and Polarization.

c) Maximizing signal strength

Elevation and Polarization sensors are not susceptible to interference, but disturbances in the local magnetic fields do affect the Azimuth compass. Therefore, users should first set Elevation and Polarization to within 0.2° of the correct value and then sweep the Azimuth to find maximum signal strength. If the terminal support surface is not level, fine tune the Elevation and check the Polarization again after Azimuth adjustment. Step by step instructions:

- Position the terminal to within 0.2° of the correct value for Elevation and Polarization and within 2° for Azimuth. Lock the adjustment wheel in position. If correctly positioned, a C/N-value should read visible, the azimuth gauge should be partially filled as seen in Figure 26.
- To optimize signal strength, rotate the terminal slowly from side to side (as described in section 6b) above. Watch how the C/N value and the level inside the azimuth gauge change during the sweep (higher C/N and higher white bar equals stronger signal). Carefully tune the azimuth until signal is maximized.
- Fine-tune elevation to further maximize the signal if possible. As the terminal is rotated in azimuth the elevation will change unless the surface is completely flat. Due to most surfaces are not perfectly flat or level this has to be done in order to point the terminal correct.
- If the previous steps were done properly the signal strength is now maximized, and the terminal is ready for transmission.
- **Troubleshooting:**
  If the C/N-value is zero for every position during the sweep above, do one of the following:
  i. Focus on maximizing the RQ value shown on the right during the sweep instead of the C/N value, since this also indicates signal strength.
  NOTE: the RQ value, stands for Receive Quality, comes from the terminal´s built in receiver. It is related in the same way as C/N which means this value can also be maximized when there is no C/N.
  ii. Access the modem's GUI as described in appendix A. In the modem's GUI, find the location which displays either a C/N or an SNR value. Rotate the terminal as described

above to maximize the displayed C/N or SNR value. Further instructions for using the modem's GUI are provided in the appendix and in the modem manufacturers manual.

d) Transmission criteria

There are a couple of different criteria for the terminal to allow transmission. If any of these have not been fulfilled the terminal will not be allowed to transmit.

- RQ value above the default of 2.
  - This value can be changed by going into the terminal web GUI settings (as seen in Appendix A - Settings |) as this value will change depending on what carrier is pointed to, to a minimum of 1. Criteria is set to make sure terminal has been pointed correctly before transmission.
- If OpenAMIP is configured terminal requires the permission from modem to allow transmission with the L 1 1 criteria. For more information about the L 1 1 criteria please consult the OpenAMIP documentation.
- Polarization value is pointed to within 0.5 degrees of target value.
- Elevation value is pointed to within 0.5 degrees of target value.
- No alarms are currently present.
- User approval of transmission. Given by turning on transmission.

During transmission, the following will also on top of the above described requirements disable transmission:

- RQ hastily dropping compared to a running average.
- RQ dropping significantly over a longer running average.

e) Blockage handler

During antenna blockage the transmission will temporary go down. Terminal monitors RQ value over time to decide if the antenna is blocked or if the antenna has been moved. After the RQ recovers to the same levels as before the blockage the terminal will restart the transmission automatically. If the RQ drops at the same time as a movement of the terminal is registered the transmission will be disabled. To restart the transmission the user will have to repoint the terminal and manually enable the transmission.

f) Prepare for transmission

Before starting the transmission, make sure the area in front of the terminal is clear to avoid radiation damage. Follow the safety instructions described in chapter 3, System safety. When transmission is turned on a hazard symbol is shown in the display, the hazard symbol can also be seen in Figure 28.

Figure 28 Hazard symbol, instructing of a safety distance of 19 m (63 ft) in front of the antenna.

g) Start transmission

i.   **via the terminal controls**
     Hold down the white gear button as can be seen in Figure 22.
     NOTE: The radiation hazard symbol on the terminal display indicates when the terminal transmission is turned **ON**.

ii. **via the GUI**
     Go to SETTINGS. On this page

     you will find a toggle button to turn the transmission ON/OFF described in Figure 37.

9. Multiple Beam Configuration

- **OpenAMIP**: Is the terminal to modem communication protocol. GPS and user commands are sent to the modem and terminal receives satellite position and frequency information.

- **Beam Selection**: The modem chooses the best deemed beam available at current location to be sent to the terminal using OpenAMIP. The selection is done from one of the preconfigured beams in the modem. Current beam is shown in the home screen as seen in Figure 29.
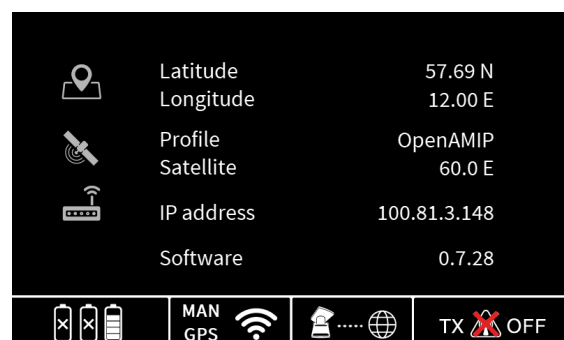
Figure 29 Terminal currently pointing towards a satellite at 60°E with information from OpenAMIP. While browsing satellite internet you can access terminal gui at IP 100.81.3.148

- **Beam Switch:** If first assigned beam cannot be accessed due to line of sight issues or weak signal a beam switch can be initiated. Done by either a long press of the OK button followed by a short press, or by pressing the settings button, navigate to "Beam switch" and press OK. Dots between terminal and globe will start to flash. New satellite/ frequency settings will have been acquired as flashing stops. Whereas the user can repoint the terminal and try to acquire into the new suggested Satellite or Beam.

In a beam switch at the very least the beam will change depending on available beams and available satellites at that location the beam switch might also change the satellite that the terminal should be pointed at.

When multiple beams have been configured to the modem and at least two of those beams is deemed by the modem to work in the current terminal location the following will happen.

- In a first stage the user has 10 minutes to point the terminal. After the 10 minutes an automatic beam switch will occur and change beam and/or satellite.
- If the user cannot find the carrier at the current location either due to line of sight issues or wants to run the terminal on a different beam/satellite a Beam switch can be requested from the modem.
- Beam switch is initiated by a long press on the OK button and acknowledging the following pop-up.
- If the user has locked onto a carrier and starts the terminal transmit the acquisition timers starts (the default for many systems is set to 45 seconds). Either the terminal is accepted into the network or not.
- If the terminal is not accepted after the 45 seconds another beam switch occurs where the user is directed to point to a different beam.

Notes:

In some cases, there are multiple beams from the same satellite which overlaps, usually with high throughput satellites. Sometimes the next beam in the modems beam map then is from the same satellite on the same polarization but a different frequency. The user then does not have to change anything as the frequency is changed automatically. Sometimes only the polarization changes in between the beams and sometimes also the satellite changes as well in a beam switch. Sometimes after the terminal is not accepted (Can be due to the terminal is not commissioned on that beam, too low C/N or other reasons) then if only frequency is changed the terminal will try to get into the second beam without any user input.

10. Internet access

Internet can be accessed either through the built-in WIFI hotspot or by connecting a device to an ethernet port. Ethernet is always active. WIFI is enabled/disabled via the GUI. By default, the WIFI password is "satcube123"; as this information is publicly available, it should be changed via the GUI to prevent unauthorized access.

a) Enabling WIFI and changing the password via the GUI

Go to SETTINGS. On this page, you will find a checkbox to turn the WIFI ON/OFF. Further down the page there is a field where the WIFI password can be changed according to Figure 41.

b) Connecting to internet

- A WIFI icon in the terminal display means internet can be accessed through the built-in hotspot. If the WIFI icon is replaced by an ethernet icon (three boxes) the WIFI is disabled. It can be enabled and disabled via the GUI shown in Figure 41.
- The ethernet LAN icon should always be shown and can be accessed through either one of the two ethernet LAN ports on the left front side of the terminal.
- If the WIFI icon or Ethernet LAN icon are alternating flashing, the module has not yet started.

11.   End transmission and power off

a) End transmission

- To end transmission, press and hold down the white gear wheel button, or use the GUI as described in section 6e. When the radiation hazard symbol turns white, the terminal is no longer transmitting.

b) Power off

- If the terminal is running on battery power, it can be turned off by pressing and holding down the red C-button next to the power symbol, a picture of the buttons can be seen in Figure 9. If the terminal is running on mains power, it can be turned off by disconnecting the cable.

c) Stow the terminal

- Loosen the lock on the adjustment wheel and fold the terminal. Make sure the latch on the upper antenna part is clasped tightly on to the base of the unit. Stow the terminal and the batteries in the provided case to avoid damage.

12.   Cleaning and maintenance

a) General guidelines

- In order to make sure the terminal is working as intended and to maximize the lifetime the following cleaning and maintenance routine should be adhered to. Failure to adhere to the

cleaning and maintenance guidelines in this section can cause permanent damage to the terminal and reduce the terminal's lifetime.

- If any damage is found, it should be reported immediately to Satcube support. A faulty terminal may cause harm to humans and other equipment and should not be used.
- During cleaning and maintenance, the terminal should be inspected for damages or faults. If any harm has come to the terminal, please check in with Satcube support to assess if proper and safe handling of the terminal is still possible.
- Every use: Make sure the fans can move freely and no excessive dust is present.
- Failure to check fan mobility might cause the terminal to overheat and cause permanent damage.

Figure 30 Fans behind fan cover.   *Figure 31 Fans disassembled for maintenance.*
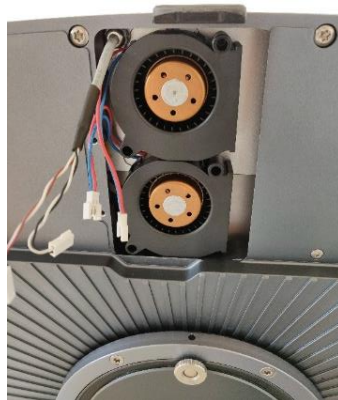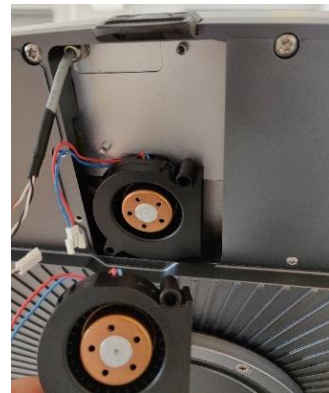
b) Cleaning the fans

- The cleaning is done by unscrewing the four T-10 torx screws attaching the fan cover to the terminal shown in Figure 30. The fans are then detachable from the terminal and can be cleaned or changed which is seen in Figure 31.
- The hot air exhaust from the fans should also be inspected to ensure there has been no accumulation of dust hindering airflow. Exhaust is shown in Figure 32. Cleaning of the fans can be done using cotton buds.

c) Cleaning the protective vents

- The protective vents should be cleaned to ensure proper functionality. There are three vents on the terminal. One close to the buttons and next to the Serial Number on the bottom part of the terminal as depicted in Figure 34. Another two are situated on the backside of the antenna on each side of the polarization center axis as seen in Figure 33.
- If the vents are not properly cleaned there is a possibility that pressure builds up which risks causing a malfunctioning terminal.
- Note that no sharp object should be used to clean the protective vents as that might damage the vent or alter their functionality.

Figure 32 Air exhaust at the backside of antenna.

Figure 34 Protective vent on base part of terminal next to the Serial Number.

Figure 33 Protective vents on backside of antenna.

d) Cleaning the moving mechanical parts

- The moving mechanical parts include:
  - The elevation wheels.
  - The elevation locking lever.
  - The polarization rotation mechanism.
- Inspection of moving mechanical structures is important to make sure no dirt is present hindering the movement of said parts.
- To clean the overall mechanical parts, use a damp cloth.

e) Cleaning the interfaces and connections

- Interfaces, ethernet, USB, DC power and L-band connectors should be inspected to ensure that no dirt or excessive dust is found. If any dirt or other potentially harmful substances are present immediately clean affected interface.

- Battery connections should be inspected to ensure no cleaning is needed.

f) Storage instructions

Before long time storage:
- Batteries should be charged.
- The terminal should be cleaned with a damp cloth to remove harmful substances.
- The terminal should be stored in a dry place in temperatures within specifications.

Appendix

A. Manual for the terminal's GUI

The GUI has 3 main tabs: Status, Settings, About. Functions for each tab is provided below.

1. *Status | System*

Figure 35 Status screen as seen when logged into the terminal web GUI.

- **Satellite information**: Information about what satellite profile is currently selected (using either the GUI or terminal display).
- **Target**: Theoretical positioning angles for maximum signal strength.
- **Orientation**: Current pointing angles.

- **Magnetic field** Measured magnetic field around the terminal. NOTE: High readings (above 100 µT) is an indication that pointing will be significantly affected and an alternative location should be found.
- **CALIBRATE**: If this button is present, it means that the terminal has not been calibrated with the updated calibration sequence. Please click the button and follow the instructions.
- **Position**: Terminal's current latitude/longitude.
- **Method/GPS status**: Whether coordinates have been entered manually and built-in GPS is disconnected.
- **GPS satellites**: Number of visible GPS satellites.
- **Active warnings**: Indicates whether system is experiencing any errors. GPS status monitors the built-in GPS. BUC/LNB status monitors the uplink/downlink (Block UpConverter/Low Noise Block downconverter).
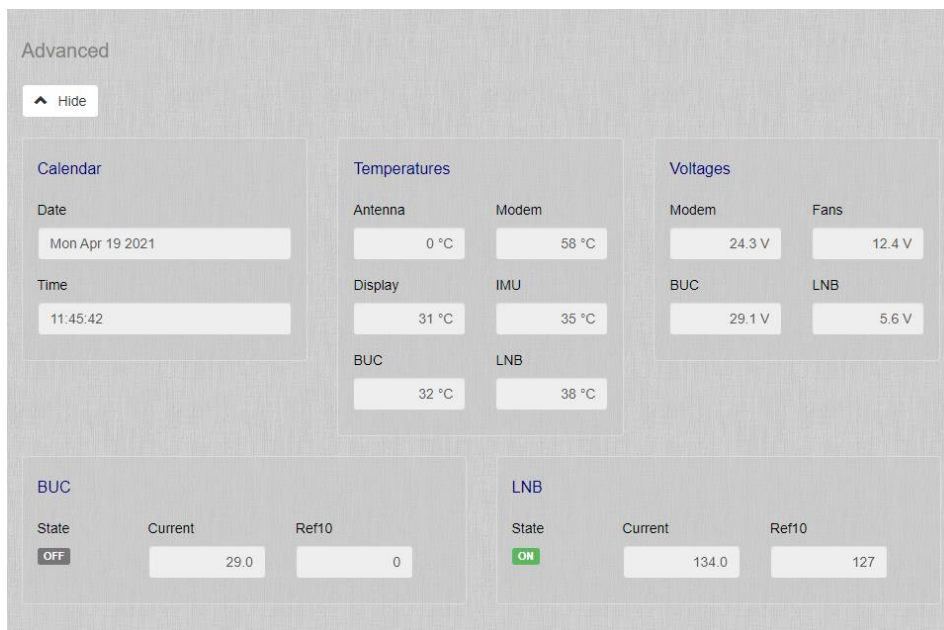
Figure 36 Web GUI status page for advanced monitoring of the terminal system.

- **Calendar**: displays current date and time
- **Temperatures***: Current temperatures for Antenna, System processor, Display, Inertial Measurement Unit, BUC and LNB.
- **Voltages:** Current voltages for modem, cooling fans, LNB and RF detector.
- **BUC and LNB**: indicate whether uplink/downlink are active together with current values for Current and REF10.

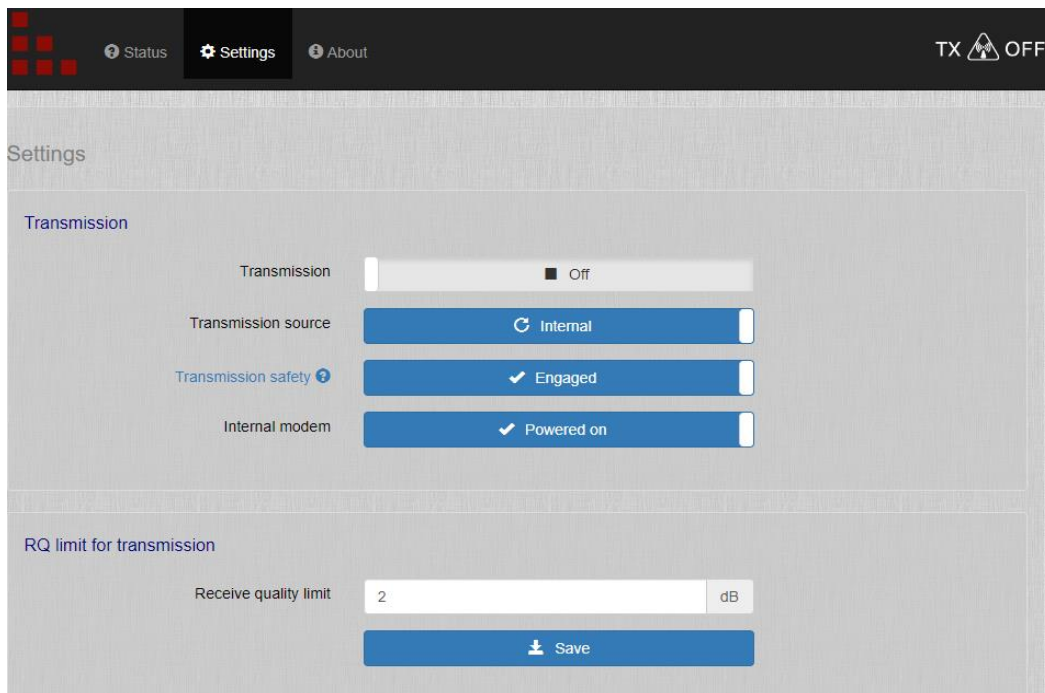## 2. *Settings |Transmission - RQ limit for transmission*

Figure 37 Control page providing toggle switches for POWER, TRANSMISSION and receive quality limit.

- **Transmission**: Use to turn transmission ON/OFF. CAUTION! Before turning on the transmission, make sure no-one is standing in front of the terminal.
- **Transmission source:** Switches between internal modem and optional external modem/device.
- **Transmission safety**: Enables the ability to disregard the terminal transmission checks described in section 8 d) Transmission criteria. Tranmsit symbol in the bottom right corner will change into the symbol in Figure 38.

Figure 38 When Override has been enabled the transmit icon changes into this figure.

- **Internal modem**: Allows the user to turn the modem power ON and OFF. Useful to power cycle the modem or turn the modem OFF in the case where an external modem should be used.
- **Receive quality limit (RQ)**: Set the lower required limit to allow terminal transmission. Used to make sure the terminal does not transmit unless pointed to a carrier. Recommended value is 1-3 dB depending on satellite strength.
- **TX Symbol** TX symbol in top right-hand corner indicates when a transmission is active.

3. *Settings | Position*

Figure 39 Position settings

Position: Select format for position (Decimal or deg/min/sec)**.** If checkbox is not checked, the terminal will calculate and fill in the current coordinates automatically. If the terminal's GPS malfunctions, check the box and enter the latitude/longitude manually before pressing SAVE.

4. *Settings | Satellite*

Figure 40 Page for editing preset satellite profiles in the GUI, which can then be accessed in the terminal display.

- **'Preset**: To edit an existing profile, select its name in the drop-down menu. You can also add new profiles. The CLEAR button clears the entire PRESET list.
- **Name:** Choose an appropriate name for the satellite profile in question.
- **Satellite name:** Enter the name of the satellite.
- **Longitude:** Enter the satellite's unique longitude.
- **Downlink polarization:** Select the correct polarization for the selected satellite.
- **Polarization offset:** Enter a polarization offset in degrees if the selected satellite has its polarization axis outside of the geostationary arch.
- **LNB/BUC LO frequency** Enter the frequencies appropriate for the selected satellite. LNB is used for receive/BUC is used in the transmit.
- **RF detector frequency** A known carrier frequency to identify the selected satellite. This is the L-band frequency given in kHz.
- **RF detector gain** Enter a value where the gain is increased if the selected carrier is weak.
- **RF detector bandwidth:** Carrier bandwidth should be entered in kHz. This enables the sensor to make a relative measurement of carrier strength to noise floor. If 0 is entered a point measurement of the absolute carrier power will be taken.
- **Save**: Clicking SAVE stores the current settings and uploads the profile to the terminal.

5. *Settings | WIFI*

Figure 41 WIFI settings

- **WiFi on:** Tick the checkbox to turn WIFI ON. This will be indicated on the terminal display.
- **Radio channel:** Set a specified WLAN channel or let the modem choose WLAN channel automatically.

- **Tx power:** Change the transmission power of the WIFI signal.
- **SSID broadcast:** Tick the checkbox to make the terminal's WIFI network visible to external devices.
- **SSID:** The name of the WIFI network that will be broadcast to devices within range. By default, the name is MPACKWIFI. We advise you to change this to enhance your security.
- **Security:** Displays the security protocol in use by the WIFI LAN. We advise use of WPA2 PSK/AES which is the most secure available.
- **Security key:** The current password required to connect to the WIFI network. The default password is satcube123. As this information is publicly available, we advise you to change the password to prevent unauthorized access to the WIFI network.
- **Save:** Stores the current settings and uploads them to the terminal.

6. *Settings | Network*

Figure 42 The NETWORK configuration page in the GUI.

- **Configuration: Automatic (DHCP)**: Will let the terminal acquire an IP-address automatically. Preferred that the modem is running the DHCP server.
  Static: Manually set a static. It is recommended to not use manual settings but to take an IP address from the modem. This enables functionality otherwise not accessible as is described in Section 7 e).
- **IP addresses:** Ip address of the Satcube terminal.
- **Mask:** Netmask assigned to the Satcube terminal.
- **Gateway:** The gateway that was assigned to the Satcube terminal-
- **DHCP server:** Enables a DHCP server on the Satcube terminal.
- **Lease range start:** The first address that will be assigned through the DHCP server.
- **Lease range end:** The last address that will be assigned through the DHCP server.

- **DNS server address:** The DNS that the DHCP server will assign to DHCP clients.

7. *Settings | General – Status*
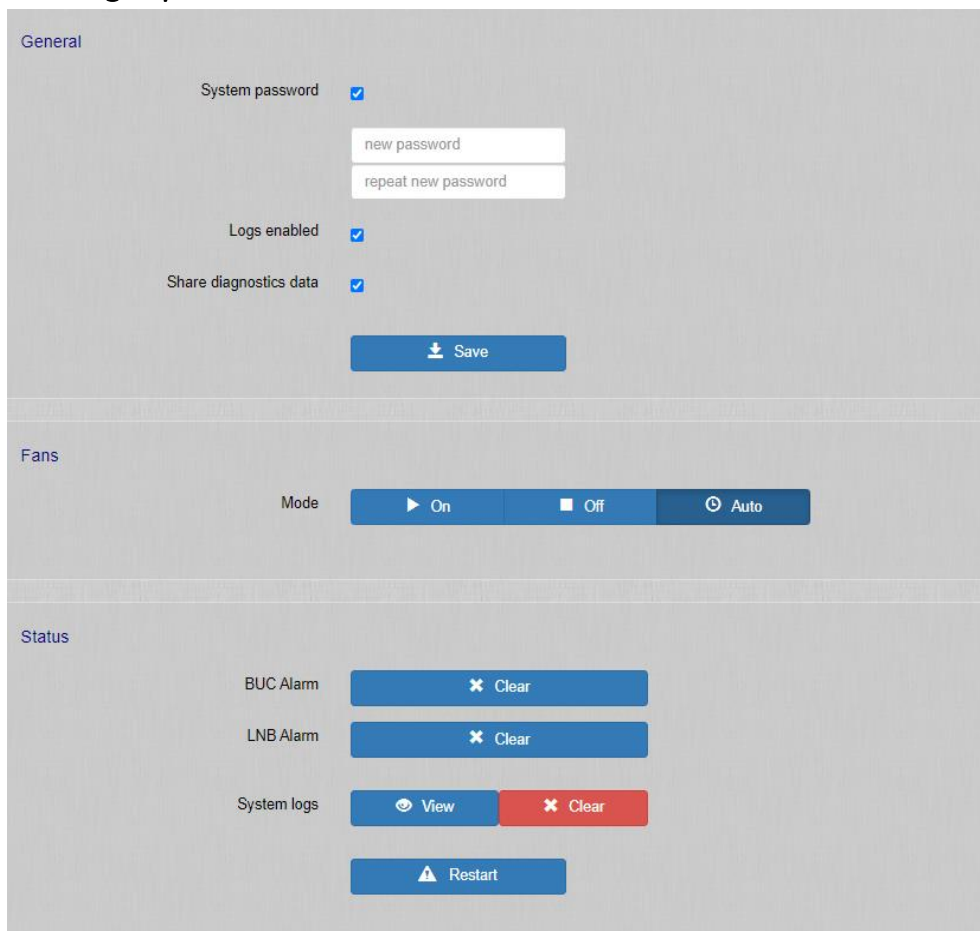
Figure 43 GENERAL and STATUS page

GENERAL

- **System password:** tick the check box to password protect access to the GUI. By default, this is `admin`. We advise you to change this to prevent unauthorized access to the terminal.
- **Logs enabled:** Tick the check box to generate log files. Unchecking this will result in the inability to for the support to solve issues experienced.
- **Share diagnostics data:** If the user agrees the terminal will when an internet connection is established send over anonymized data that only is used to improve the product and not used to track the user. For the best user experience this is recommended to be switched on. It will not impact system performance.
- **Fans**: Turn the fans ON/OFF or activate AUTO mode (fans will turn on automatically if the terminal gets hot.)

STATUS

- **BUC Alarm/LNB Alarm:** Alarms can be cleared and/or deactivated.
- **Systems logs:** VIEW the system logs or CLEAR to delete the logs.
- **Restart:** Restarts the Satcube terminal.

8. *About*

Figure 44 The ABOUT page of the GUI.

- **Software:** Displays current firmware version installed, build date and build hash.
- **Hardware**: Displays current hardware revision and the serial number unique for each terminal.
- **Upgrade:** Allows a new software version to be installed. Either upload a file from a local device and press Install, or with an active internet connection use the function Check for update. After Check for update turns green the update can be initiated by clicking the Install button.

B. Troubleshooting

Fault	Possible Cause	Action
Weak signal even after correct alignment	Objects blocking line of sight	Move terminal to a location with free line of sight
GPS does not show correct coordinates	No GPS signal	Enter GPS coordinates manually
Maximal signal strength not obtained at zero offset for all angles	IMU is not perfectly calibrated	Disregard offset and align for the angles that maximizes the C/N value
Network icon and WIFI icon alternatively flash OR unable to find WIFI	The WIFI module has not yet started	If the problem continues for longer than 2 minutes after startup try restarting the terminal. Alternatively, try changing the WIFI name (SSID) by connecting external equipment with an ethernet cable
Unable to connect to WIFI		Change WIFI name (SSID) and password by connecting external equipment with an ethernet cable

The C/N value is zero for all orientations	Wrong settings in satellite profile or modem profile	Try one of the following: 1. Check selected satellite and ensure correct frequencies and LOs set in terminal GUI and in modem 2. Check RQ value and use instead if C/N is needed during pointing 3. Check line of sight 4. Check Magnetic Field value in GUI under status. Typ: 50-80µT if >100µTthere is most likely significant interference and changing terminal location is advised. That allows for more accurate pointing values 5. Check correct GPS position is entered or has been found 6. [UHP-modem] Check SNMP IP-settings of modem (192.168.222.222). Should be set to Terminal IP: 192.168.222.219
Polarization value showing +45 degrees from "Zero position"	The antenna elements inside the antenna are shifted 45 degrees	This is perfectly normal.

Red RQ value	The embedded power sensor needs to be calibrated. Can only be red when RF Detector Bandwidth in the satellite preset is set to 0 (not recommended).	Set RF Detector bandwidth in as seen in Figure 40. Or: 1. Move the terminal to an open space with free line of sight towards open sky. Increase or decrease elevation angle to an angle that is more than 12 degrees away from nominal elevation towards the current selected satellite. Make sure the terminal is pointing towards open sky at this point. Otherwise choose a different elevation/azimuth/location. 2. Wait 3 seconds, see the RQ-value turn white. If the value is not turning white, make sure that the elevation angle is more than 12 degrees away from the elevation angle of the current selected satellite.

For further support, contact information can be found at www.satcube.com/customer-service/.

C. Technical specifications

1. General terminal specifications

Item	Specification
Dimensions Satcube Ku	470 / 300 / 55 mm (18.50 / 11.81 / 2.17 inches)
Total weight Satcube Ku	8 kg (17.6 lb)
Dimensions Satcube Secure	470 x 320 x75 mm (18.5 x 12.6 x 2.95 in)
Total weight Satcube Secure	9.5 kg (20 lb)
Data rate	Minimum 4 Mbps full duplex, up to 20 Mbps via HTS satellite
Batteries	3 hours transmit time (3 batteries) (additional hot-swappable batteries pack are optional).
Frequencies	Tx 13.75 – 14.50 GHz Rx 10.95 – 12.75 GHz
Polarization	Linear Horizontal / Vertical V/H or H/V
EIRP	Typical 46 dBW
G/T	9 dB/K
Satellite modem Satcube Ku	iDirect IQ200, iDirect 950mp, UHP-210, Newtec mdm-2510
Satellite modem Satcube Secure	iDirect 950mp
Power consumption	130 W (MAX)
Secondary links	WLAN
Interfaces	2 x LAN, 1 x USB host, WLAN Access Point (IEEE 802.11 b/g)
User interface	Satcube GUI, Display, Pointing system
Water and dust protection	IP65
DC input	24 VDC
AC/DC input range	100 – 240 VAC, 47 – 63 Hz, 150 W
Ambient temperature tolerance	-20°C (4°F) to 50°C (122°F)

2. Interface

- **Power input**

  The power input is located at the front right side of the terminal, covered by a rubber protection.

Figure C1 DC power input interface.

Figure C2 DC connector pin layout (terminal view).

Item	Specification
AC input range	100 to 240 VAC, 47 – 63 Hz
Power consumption	Up to 150 W
DC input voltage	24 VDC
DC connector type	Circular push pull connector
DC connector male type	Crimp contact
Current rating	7+7 A*
Pin count	4
Max. operating temperature	+ 120 °C
Min. operating temperature	- 20 °C
Connector IP grade	IP 68

* Pins are rated for 7A each pin, 2+2 pins for DC power. Cable is equipped with a 16A fuse of GBC type, according to DIN 72581, size 25x6mm.

- **LAN interface and USB interface**
  The LAN and USB connections are located at the front left side of the terminal, covered by a plastic protection.

Figure C2 LAN and USB interfaces.

Port	Type
1	100 Mbps Ethernet
2	100 Mbps Ethernet
3	USB

- **L-band interface**
  An L-band interface is available on the backside of the antenna, located at the top right. The interface consists of two SMA connectors with an impedance of 50 ohm. One of which allows to connect to the transmit port of the BUC, the Tx connector. The second connector, Rx connector, allows the connection to the output of the LNB. These can be used to connect external modems that works in the
  L-band, external signal generators or spectrum analyzers. The connectors are protected behind a plastic cover fastened with two torx T10 screws.

Figure C3a L-band interface, covered.

Figure C3b L-band interface, 50 ohms SMA connectors exposed.

3. *Battery pack*

The supplier states that this battery meets the requirements of Battery Directives and the battery parts are RoHS compliant.

Item	Specification
Type of battery	Lithium ion battery pack with PCM safety circuit and wires.
Cell model	INR18650-25R, 3.7V, 2500mAh
Weight	Approx. 488g
Rated capacity	5000mAh TYP. 4900mAh MIN.
Nominal voltage	18.5V
Watt hour rating	98 Wh
Charging method	Constant current + constant voltage
Max. charge voltage [V]	21V (4.2V/Cell)
Max. continuous charge current	4.0A
Rec. Charge cut off	100mA or timer 3.0h
Max. continuous discharge current	7.5A
Rec. discharge cut off	12.5V (2.5V/Cell)
Internal impedance	<200mΩ
Cycle life	After 250 cycles, >60% of initial capacity
Over-charge detection	4.25V typical
Over-discharge detection	2.50V typical
Discharge over-current detection	12A to 20A typical
Charge over-current detection	6A to 10A typical
Charge/discharge over-temperature detection	65°C typical
Ambient temp. range for storage ≤3 months	Approx. -10°C to 35°C
Ambient temp. range for storage ≤12 months	Approx. -10°C to 30°C

D. Integrated Modem

Satcube terminals come with integrated modems. It is either a UHP Networks modem, UHP-210, or an iDirect modem, IQ200. The use of the modems in the Satcube terminal is described in this section and a brief description on modem configuration. For extensive setup instructions or user manuals the reader is referred to respective modem manufacturer's own documentation.

In order to maintain and enable communication from the modem to the embedded system the modem should always have IP address 192.168.222.222/29 configured as that is essential to enable communication with the embedded system. This is also the default IP configuration of a modem in a Satcube terminal.

Please refer to the modem specific vendor for software update instructions, configurations guides and other modem specific resources.

1. *UHP-210*

In the UHP case the modem has 192.168.222.222 as default address. By default, the password is disabled. Setting up a UHP modem can be split up into two different categories. Profiles and general settings.

In the profiles you set the transmission details. Which includes mode of operation, SCPC or TDMA mode. ACM and TLC are also both set in this menu. In your chosen profile you set the profile to be valid to allow using it and enable autorun on the different profiles you want active at the same time. The Rx and Tx frequencies, in Ku-band, with associated symbol rate and roll off is configured into the profiles.

Listed below are some of the general settings that are essential for the modem to have to assure proper functionality in the Satcube terminal.

- Local Oscillator values
  - These are set in the "Site setup" page that can be accessed in the left-hand menu. The Rx1 and Transmit values should correspond to LNB and BUC LO values set in the satellite profile in the terminal GUI.
- Terminal Location
  - This is usually set in the modem by the terminal automatically from the terminal GPS location. When a manual position is preferable this setting is found in "Site setup".
- SNMP
  - The modem must allow terminal access to ensure full functionality of the terminal. SNMP setting is found under "Advanced" and "IP protocols". The access IP should be set to the terminal IP, 192.168.222.219.
- IP routing
  - In order to route the traffic properly between the remote terminal and the HUB the IP routing must be set correctly. This information should be supplied by the service provider. IP routing is found in "Advanced" and under "IP routing".
  - In this menu you also set the modem IP. If the modem ever loses the 192.168.222.222/29 address this IP address should be added by clicking "Add IP address".

o The IP routing table should contain a Tx map indicating what traffic should be sent to what SVLAN.
o The table should also contain a SVLAN RX. Which should correspond to the Tx map on the HUB side.

2. *iDirect IQ200*

The iDirect IQ200 has default IP-address 192.168.0.1 and to log in the defaults are:

- Username: admin
- Password: iDirect

After Satcube configuration the IP-address is 192.168.222.222/29. Login credentials are either as above or as follows:

- Username: admin
- Password: P@55w0rd!

All the transmission parameters in the IQ200 modem are set by your service provider by providing option files. For the Satcube terminal to work well in an iDirect system the following parameters that the service provider will need, to prepare the option files, are listed as either essential or helpful parameters.

Essentials:

- Modem Serial number
    o Found in the Modem GUI under Terminal information on the Dashboard page.
- Terminal available LNB LOs: 10 GHz, 10.75 GHz, 11.3 GHz
- Terminal available BUC LOs: 12.8 GHz, 13.05 GHz
- OpenAMIP set to communicate with 192.168.222.219 on port 5005.
    o For more information about OpenAMIP see Appendix E.
- Management port IP address 192.168.222.222/29.
- DHCP enabled on the data port.
    o This allows to disable manual IP settings in the terminal GUI and allows for smoother terminal configuration and adds cloud check functionality.
    o Allow at least three IP addresses with DHCP, one to modem, one to Satcube terminal and one to end-user.

Helpful or recommended:

- BUC 50W.
- No frequency references needed from modem.
- No DC power output needed from modem.
- 1dB compression point usually found at around -7 dBm.

After acquiring the option file/files from the service provider they should be uploaded to the modem through the GUI. In the Administration tab, select Software and Configuration. Here you can upload the corresponding option files. Here you can also upgrade the modem software.

3. *iDirect 950mp*

The iDirect 950mp comes in the Satcube Secure where WLAN is disabled to provide maximum security. The two LAN ports on the Secure are separated in one management port, LAN 1, and one data port, LAN 2, on the Satcube terminal, see Figure 7. This results in that on port LAN 1 the user can access the GUI but will not be able to send or receive any traffic. On port LAN 2 the user will only be able to send and receive traffic from the modem but will not be able to enter the GUI or the modem. Because the Satcube never receives any traffic from the modem the cloud check and connection established popup window described in the Status bar chapter is disabled as well as the share diagnostics data described in Settings | General – Status.

The modem is only reachable through port LAN 1 and has default IP-address 192.168.0.1, to log in the defaults are:

- Username: admin
- Password: iDirect

After Satcube configuration the IP-address is 192.168.222.222/29. Login credentials are either as above or as follows:

- Username: admin
- Password: P@55w0rd!

All the transmission parameters in the 950mp modem are set by your service provider by providing option files. For the Satcube terminal to work well in an iDirect system the following parameters that the service provider will need, to prepare the option files, are listed as either essential or helpful parameters.

Essentials:

- Modem Serial number
    - Found in the Modem GUI under Terminal information on the Dashboard page.
- Terminal available LNB LOs: 10 GHz, 10.75 GHz, 11.3 GHz
- Terminal available BUC LOs: 12.8 GHz, 13.05 GHz
- OpenAMIP set to communicate with 192.168.222.219 on port 5005.
    - For more information about OpenAMIP see Appendix E.
- Management port IP address 192.168.222.222/29 on modem port 1.
- DHCP enabled on the modem data port 2.
    - Allow at least two IP addresses with DHCP, one to modem and one to end-user.

Helpful or recommended:

- BUC 50W.
- No frequency references needed from modem.
- No DC power output needed from modem.
- 1dB compression point usually found at around -7 dBm.

After acquiring the option file/files from the service provider they should be uploaded to the modem through the GUI. In the Administration tab, select Software and Configuration. Here you can upload the corresponding option files. Here you can also upgrade the modem software.

E. OpenAMIP

Is a protocol that enables the modem to talk to an antenna control unit in this case the terminal embedded system. OpenAMIP requests the remote geo location from the terminal. Using that information, the modem decides from a beam map (a predefined set of satellite beams with the frequency information associated with different geolocations) which satellite and with what frequency settings to try to connect to a HUB. The position of the satellite as well as frequency and LO settings is sent to the pointing system and the LNB and BUC in the terminal. The terminal must then only be accurately pointed to be able to start transmission in a new location. Therefore, using OpenAMIP reduces the number of settings the remote terminal end-user must configure considerably and allows for a much simpler terminal use.

To utilize OpenAMIP on a Satcube Terminal the following information should be configured to the modem in order to allow for the necessary information exchange.

- IP-address should be set to the terminal IP-address: 192.168.222.219.
- Connecting on port 5005.
- An OpenAMIP license must be loaded onto the terminal. This license file is preloaded for terminals equipped with an IQ200 modem or a Newtec MDM2510 modem. For UHP terminals this can be acquired through Satcube support.

For detailed instruction on how to configure OpenAMIP for different modems please refer to modem manufacturer's manuals.

F. Embedded Network Topology

The Satcube Ku terminal's on-board components communicate on the 8-address subnet 192.168.222.216/248. The allocation of the different addresses can be found in Table 3. A network topology map can be found in Figure 45. All the switches are completely transparent to the network and allows all traffic. VLAN traffic out from the modem must pass through ethernet port 2 as the WIFI module blocks VLAN tagged traffic.
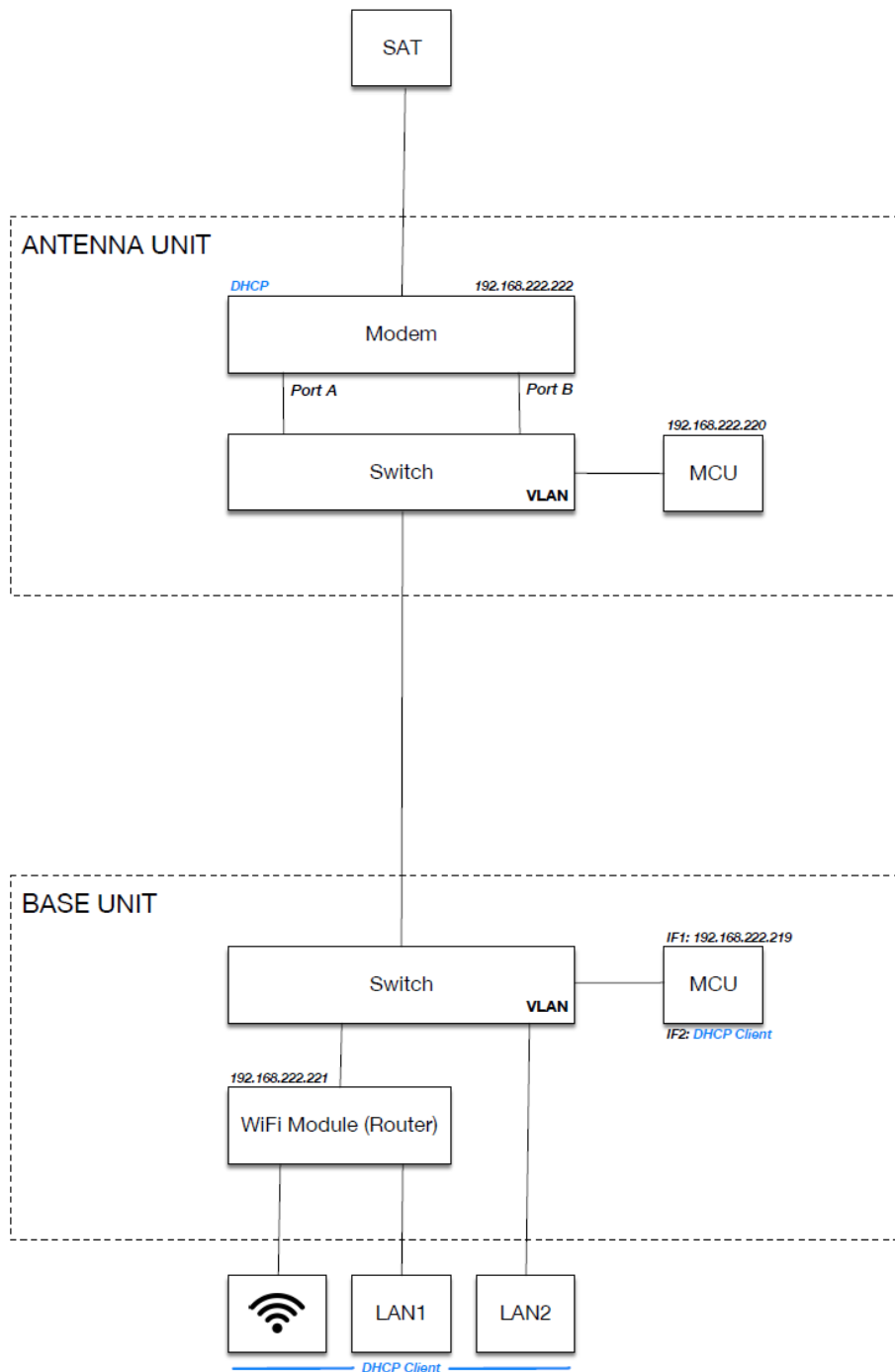

Figure 45 Network topology map showing the embedded system with switches and interface.

Table 3 Network addresses in the Satcube Ku terminal internal network.

IP address	Function	Comments
192.168.222.216	Subnet address	
192.168.222.217	Unassigned	Suitable for end user accessing the network
192.168.222.218	Unassigned	Suitable for end user accessing the network
192.168.222.219	MCU (Terminal)	User: admin Default Password: admin Alternative Password: satcube123
192.168.222.220	MCU (Antenna)	Reachable with added ":8080"
192.168.222.221	WiFi module	
192.168.222.222	Modem	IQ200 User: admin Pass: iDirect Pass2: P@55w0rd! UHP/Newtec No default pass.
192.168.222.223	Broadcast address	