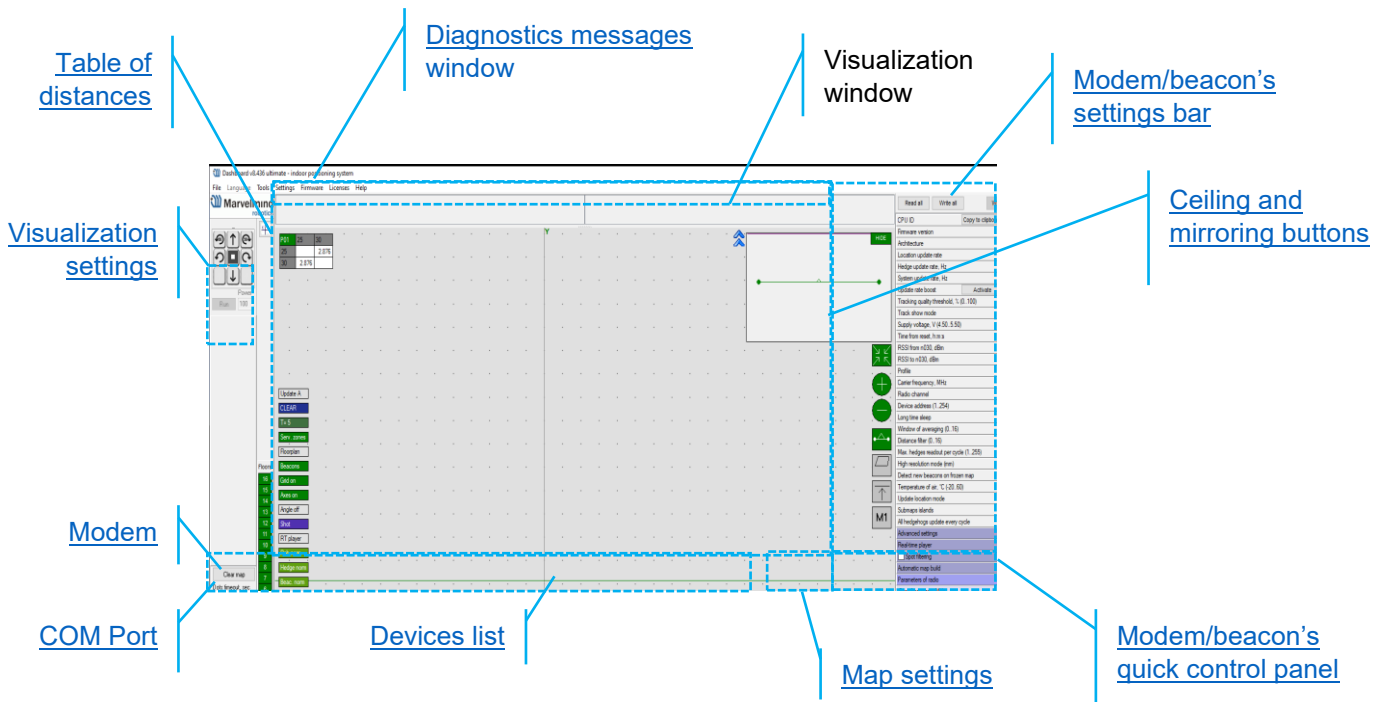


# 7. Dashboard Menu and Parameters

## 7.1. Dashboard General View

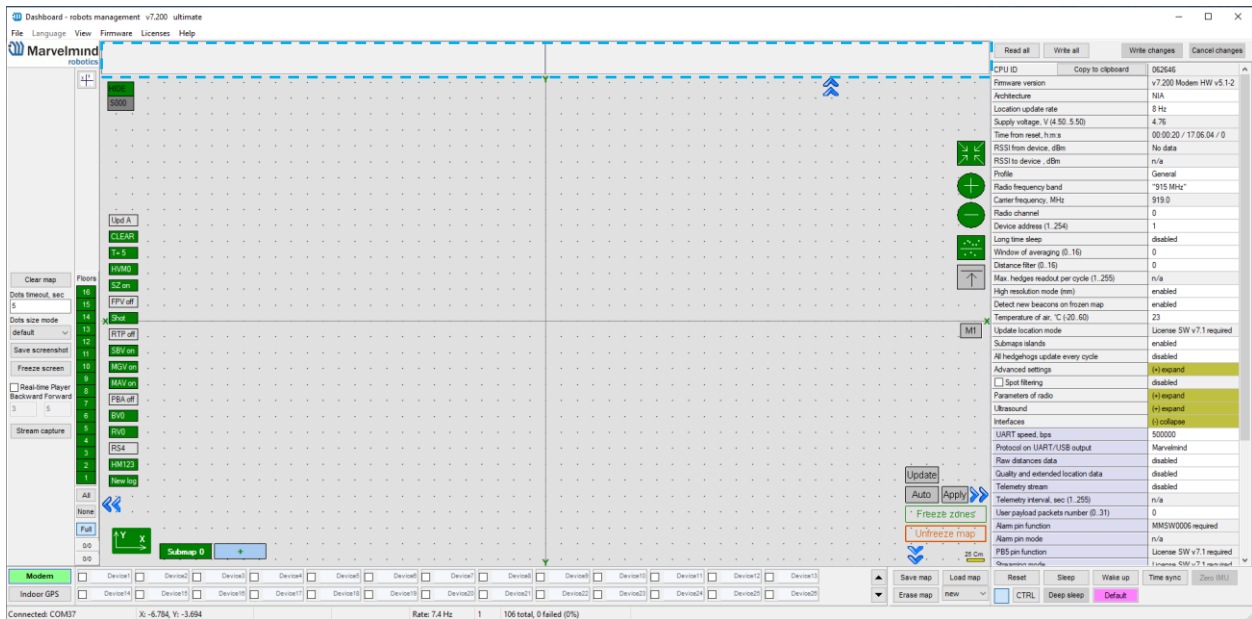
This picture shows the Dashboard's general interface and items' positions.



## 7.2. Diagnostics Messages Window

The diagnostic messages window is an area where essential system messages appear. It may contain a lot of helpful information.

The Diagnostics window is placed at the top of the Dashboard.



If the field is empty, the system found no issues with the launch. If you have any orange or red messages, please check them carefully and fix the problem.

There are 4 categories of reports:

- Orange – minor issue
- Red – major issue
- Green – Successfully completed settings
- Blue – Successfully completed process

## Here is the list of the messages (relevant for Dashboard v7.200):

### Left diagnostic window:

- Same ultrasonic frequency in submap0 beacons: n2, n3 - use beacons with different frequencies in IA submaps
- Paired beacons 25/26 ultrasonic and IMU fusion not completed. Angular difference: 45 degrees appears if the angle difference between beacons is more than 5 degrees
- IA architecture can't be selected. Upload IA firmware to modem
- NIA architecture can't be selected. Upload NIA firmware to modem
- MF NIA architecture can't be selected. Upload NIA firmware to modem
- No MF NIA license (MMSW0004) for beacons n5, n6, n7. Buy the license. MF NIA doesn't work even if the license is not activated for one beacon in the system
- Device N10 (V7.000) not supported
- N10 (V7.000) - too old. Update firmware
- N10 (V7.000) - newer than the dashboard. Update dashboard
- N10 (V7.000) - older than modem. Update firmware
- N10 (V7.000) - newer than modem. Update modem firmware
- Mixed IA and NIA devices
- UBX protocol for PX4 requires license MMSW0003. Buy the license
- Beacons not assigned to submaps: n10, n11. All submaps frozen. Unfreeze or add a submap
- Beacons not assigned to submaps: n10, n11. Maximum 4 beacons per submap. Add submap
- Beacons too close: n10, n11. Place beacons at least 2 meters from the modem
- Devices with duplicated addresses: n10, n11
- FEC mismatch to modem: n10, n11 - change FEC in radio parameters
- Discharged devices: n10, n11
- 'Distances were changed in frozen submap0
- Sleeping beacons in frozen submap0
- Network setting read failed - Error reading Super-Modem network settings
- Network setting write failed - Error writing Super-Modem network settings
  
- Not found UWB device - connect UWB beacon or UWB modem to Modem HW v5.1 (only for Marvelmind UWB devices. In progress)
- Single hedge readout per cycle - increase the value and refreeze the map - In IA, the number of transmitted coordinates of hedgehogs per cycle 1 is entered in the modem settings. This greatly slows down the update of the coordinates of hedgehogs in the dashboard (if there are many of them). By default, this parameter is 10
- Modem HW v4.9 doesn't support MF NIA
- You need at least 3 beacons for MF NIA. Add beacons
- Uploading map to beacons n10, n11, n12
- Check the table of distances for submap 0 – The [table of distances](#) is not white (there are discrepancies in distances)
- More than one beacon nailed to floorplan: n10, n11. Unnail for scaling

- Floorplan scaling: click the first point on the floorplan. ESC to cancel
- Floorplan scaling: click the second point on the floorplan. ESC to cancel
- Floorplan is glued. Can't scale
- Floorplan is glued. Can't move
- Can't move submap - beacons n10, n11 are nailed to floorplan
- Can't move submap - beacons n10, n11 are fixed
- Can't rotate submap - beacons n10, n11 are nailed to floorplan
- Can't rotate submap - beacons n10, n11 are fixed
- Can't move: beacon n10 is nailed to floorplan
- More than one fixed beacon in submap0. Submap doesn't automatically rebuild
- Not found USB connection. Possibly, the driver was not installed. Download and install driver
- Can't set manual location. Beacon 10 is in frozen submap0. Unfreeze for manual location
- Enable Interfaces/IMU via modem/Raw IMU data to see gyro
- Enable Interfaces/IMU via modem/Raw IMU data to see the accelerometer
- Beacon n10 has no license MMSW0007. Buy the license
- Beacon n10 has no license MMSW0008. Buy the license
- Map upload finished
- Switch to recorded state 719 - Revert to the previous state by CTRL+Z (license 7.1 required)
- Licenses updated
- Paired beacons 25/26 ultrasonic and IMU fusion completed. Angular difference: 2 degrees. 4
- Network setting read completed
- Network setting write completed

**Right diagnostic window:**

- Adding beacons on frozen map disabled
- Stream capture mode was disabled
- Map is not frozen
- Submaps not frozen: 0, 1, 2
- No optional SW pack license (MMSW0005) for beacons: n10, n11
- Stream capture mode enabled

## 7.3. Table of Distances

The table of distances shows the measured distance between all beacons. The map and its graphical visualization depend on distances, an essential system part.

There are two ways of measuring:

- Measuring by ultrasound (automatic)
- Measuring by user (manual)

Measuring by ultrasound is impossible for Mini-RX and Industrial-RX beacons.  
It is better to use manual input in noisy cases and cases with long distances.

Measuring by ultrasound:

1. In most cases, the system automatically builds the table of distances. If everything is good, there would be figures in cells, and they would change a little; the color of each cell would be white

HIDE	5	22	66	77
5		7.144	12.389	10.101
22	7.144		10.122	12.151
66	12.389	10.122		6.879
77	10.101	12.151	6.879	

2. If color differs, check the colors' definitions (next page) and solve the problem
3. Freeze the map only if the cells are white

Measuring by the user (necessary for Mini-RX beacons and Industrial-RX beacons and noisy cases):

- Use manual input if the table of distances wasn't built. It may happen if the environment is boisterous, or the distances exceed the maximum possible range of the beacons. In that case, the cells' color would be green
- Be careful with figures because a small mistake in the values will cause errors in location!



For accurate distance measurements, see [the Automatic submap self-calibration license](#)

How to freeze/enter distance manually:

- 7.3.1.1. Open the Dashboard. You will see the table of distances
- 7.3.1.2. Right click on the cell you want to freeze/enter. An additional menu will open. There you can control the distances table. Choose **Freeze distance for the pair** to freeze it

HIDE	5	22	66	77
5		7.144	12.300	10.101
22	7.144		10.1	
66	12.389	10.122		
77	10.101	12.151	6.8	

Freeze distance for pair  
 Freeze average for pair  
 Don't use distance  


---

 Freeze all  
 Unfreeze all  


---

 Enter distance for pair  


---

 Clear cell

7.3.1.3. Now, cells are frozen. Those values would not change until you unfreeze them. Even if beacons had been moved, distance would stay. **Be careful with frozen cells because a small mistake can significantly impact your tracking!**

HIDE	6	22	66	77
6		8.000	27.378	5.054
22	8.000		28.688	18.739
66	33.772	29.794		18.741
77	17.315	7.585	3.522	

7.3.1.4. Repeat for all cells

HIDE	6	22	66	77
6		8.000	4.200	11.400
22	8.000		13.100	6.500
66	4.200	13.100		10.800
77	11.400	6.500	10.800	

- White means that everything is good, you can freeze the map
- Yellow means that something seems to be wrong, check distances and sensors before freezing
- Red means some critical misses, **DO NOT freeze the map**. Manually measure and enter distances
- Green means frozen distance, you can freeze the map, but be careful with values

## 7.4. Multiple Devices Connected via USB

You can connect multiple devices to the Dashboard via USB and choose which you want to operate by choosing a different COM Port in the Dashboard.

To do that, just Right Mouse Button click on the device in the bottom left corner and choose a specific COM Port you want to use, or Right Mouse Button on the COM Port in the bottom left corner:

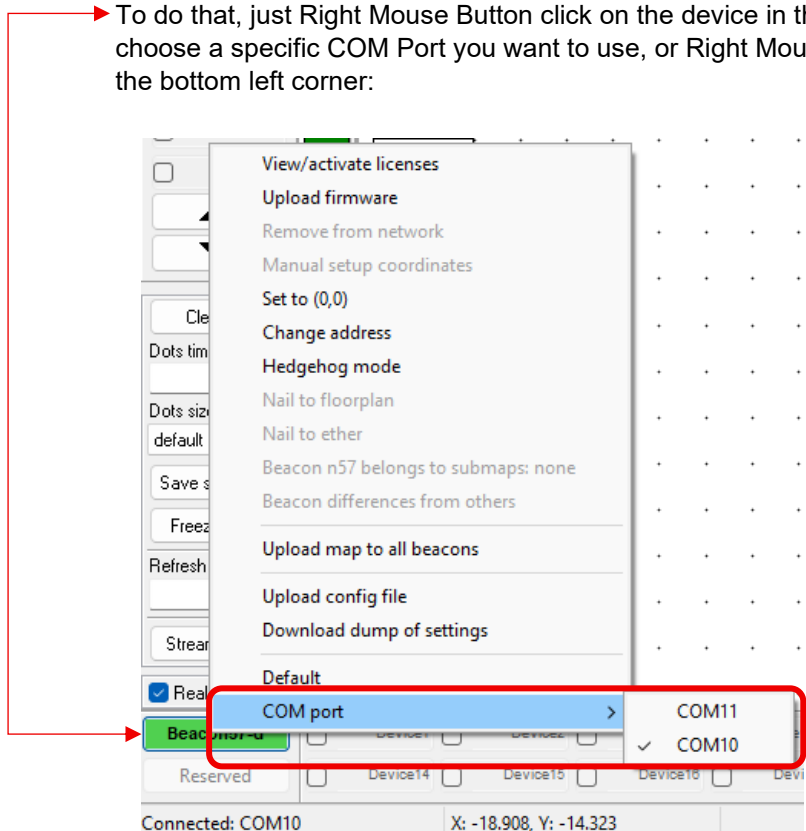


Figure 1. Choosing COM Port by clicking on Device button

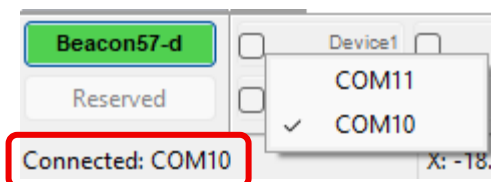
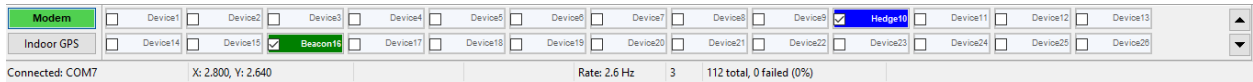


Figure 2. Choosing COM Port by clicking on COM Port status window

## 7.5. Devices List

The Devices list contains information about all the beacons in the system and allows users to search for, add, and delete beacons.



Modem automatically wakes up beacons which are turned on.

Devices in this section are divided into two types:

- Stationary beacon (beacon)
- Mobile beacon (hedge)

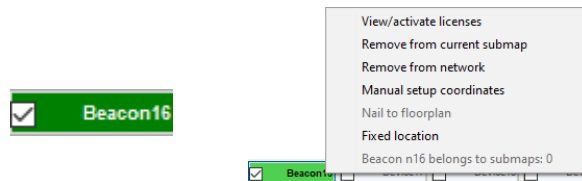
The devices list allows users to manage devices  
Use double click to put the beacon into sleep mode

### 7.5.1. Stationary beacon (beacon)

- Right click to open an additional menu

There you can:

- Remove the beacon from the current submap
- Remove the beacon from the whole network



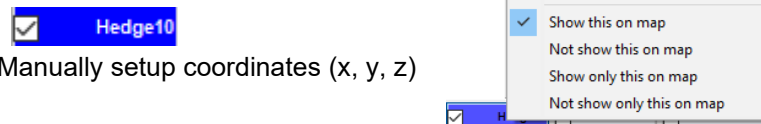
- Manually setup coordinates (x, y, z)

### 7.5.2. Mobile beacon (hedge)

- Right click to open an additional menu

There you can:

- Remove the beacon from the network
- Setup movement path
- Upload zones (allowed and denied)



- Manually setup coordinates (x, y, z)

## 7.6. Visualization Settings

The visualization settings window has some functions to control the visualization process:



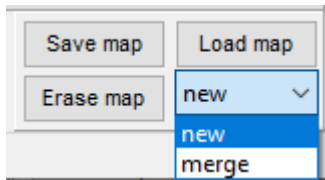
- Clear map – clear all movement path
- Dots timeout – time of path's existence (Video: [Help: Dots timeout](#))
- Dots size mode – the size of dots
- Save screenshot – screenshot file save to **Dashboard's folder/screenshots**
- Freeze screen – The map freezes, no updates of the path

Clear map
Dots timeout, sec 5
Dots size mode default
Save screenshot
Freeze screen
Refresh rate, fps 10
Stream capture
<input checked="" type="checkbox"/> Real-time player

## 7.7. Map Settings

Map Settings offer some helpful tools:

- Save map – saves map as *.ini* file into **Dashboard folder/maps**
- Load map – loads map from *.ini* format file
- Erase map – erases map and clears it
- New/merge – build a new map or upgrade the current map



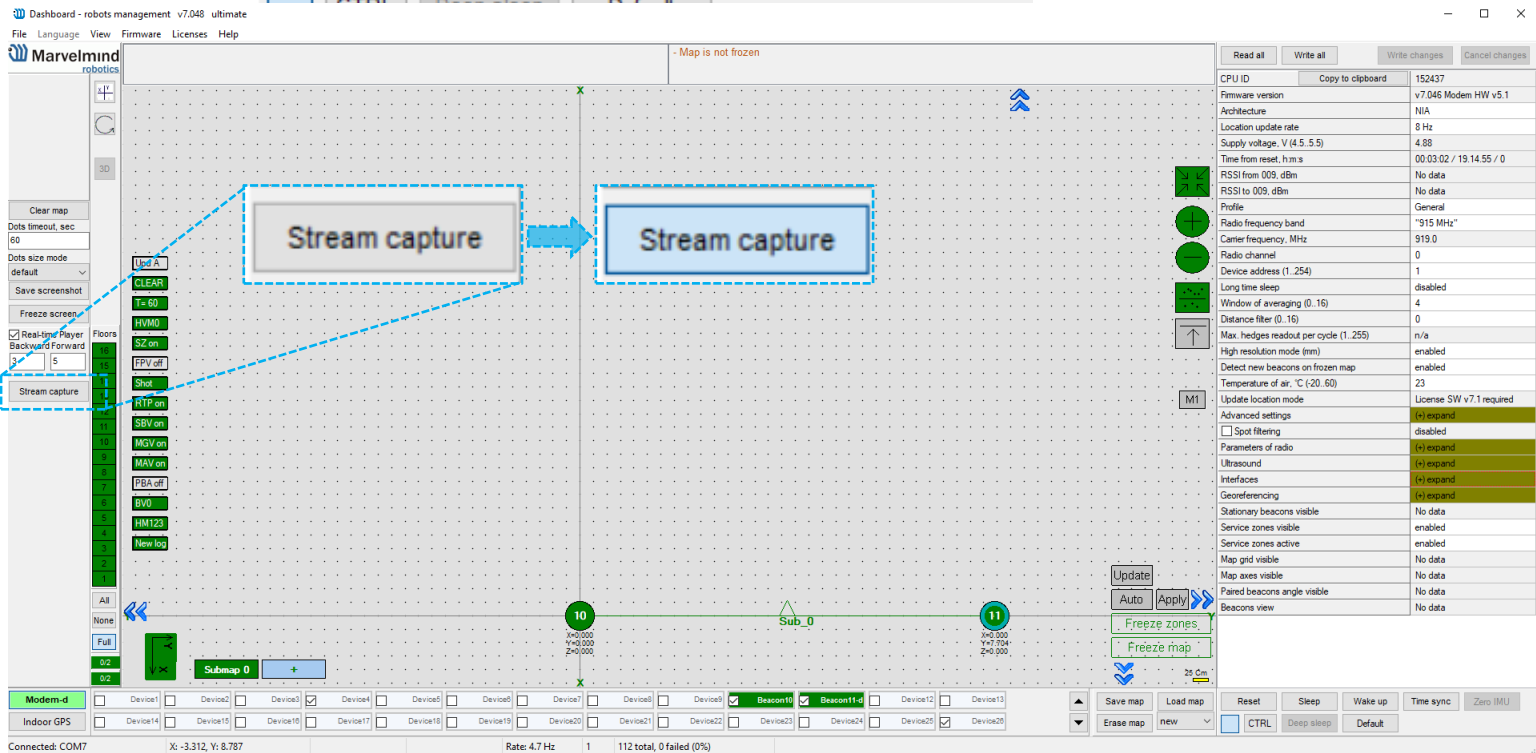
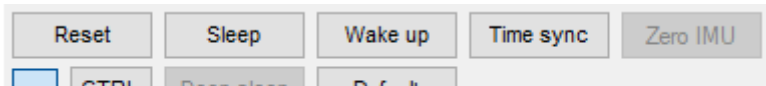
## 7.8. Dashboard Monitoring Mode

Dashboard Monitoring Mode is a mode that allows you to observe tracking without any ability to control and modify the system.

Now, you can divide permissions between users to avoid accidental changes to any settings and the system being corrupted. That is something like a safety button.

*This is the first version of Dashboard Monitoring Mode. New functionality and appearance may come with future SW updates*

How to enable Dashboard Monitoring Mode:



- Click on the “Stream capture” button (It will be renamed in future updates into “Dashboard Monitoring Mode”)
- If user changes any settings, 'dashboard monitoring mode' automatically disables and corresponding message is shown in top right information field.

## 7.9. Modem/Beacon's Quick Control Panel

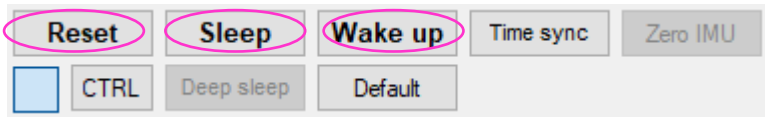
The control panel allows the user to interact with devices. It can work with one device or with all devices in the system.

List of functions:

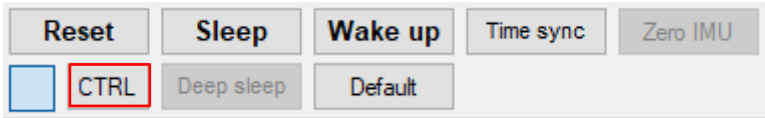
- Reset – Resets device
- Sleep – Send device asleep (battery economy mode)
- Wake up – Wakes up the device (from sleeping mode)
- Default – Drops all device's settings to factory default
- Time sync – Sends time from your PC to Hedgehog (for stream it out via UART)

Additional Ctrl feature:

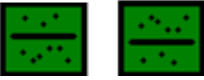




- To apply the action to all beacons in the system, use Ctrl + Left Click on the button. This applies only to buttons that turn **bold** while Ctrl is pressed.



- The CTRL button can replace the physical keyboard button for devices without a keyboard.



## 7.10. Ceiling and Mirroring Buttons on the Dashboard

- The **Mirroring** button allows the map to be displayed as a mirror reflection 
- The **Ceiling** button shows where the mobile beacon is located with respect to the stationary beacons 
- When the arrow points up, it means that the mobile beacon is below the stationary beacon 
- When the arrow points down, it means that the mobile beacon is **above the stationary beacons** 
- The **Center Map** button 



## 7.11. Detailed Settings

This bar allows users to adjust devices very precisely. It contains a lot of parameters for advanced usage

### 7.11.1. Modem Settings

#### 7.11.1.1. Basic Settings

Read all		Write all		Write changes		Cancel changes	
CPU ID	Copy to clipboard	15233B					
Firmware version	v8.436 Modem HW v5.1-2						
Architecture	NIA						
Location update rate	8 Hz						
Hedge update rate, Hz	n/a						
System update rate, Hz	6.3						
Update rate boost	Activate	MMSW0012 required					
Tracking quality threshold, % (0..100)	0						
Track show mode	Orange dots for low quality						
Supply voltage, V (4.50..5.50)	4.93						
Time from reset, h:m:s	00:43:27 / 20:56:41 / 0						
RSSI from n030, dBm	-31						
RSSI to n030, dBm	-51						
Profile	General (915 MHz band)						
Radio channel	0						
Device address (1..254)	1	Radio channel					
Long time sleep	disabled						
Window of averaging (0..16)	4						
Distance filter (0..16)	0						
Max. hedges readout per cycle (1..255)	n/a						
High resolution mode (mm)	enabled						
Detect new beacons on frozen map	enabled						
Temperature of air, °C (-20..60)	23						
Update location mode	License SW v7.1 required						
Update location mode	MMSW0005 required						
Submaps islands	MMSW0007 required						
All hedgehogs update every cycle	MMSW0008 required						
Advanced settings	(+ expand)						
Real-time player	(+ expand)						
<input type="checkbox"/> Spot filtering	disabled						
Automatic map build	(+ expand)						
Parameters of radio	(+ expand)						
Ultrasound	(+ expand)						
Interfaces	(+ expand)						
Georeferencing	(+ expand)						

Unique processor ID for each device (beacon or modem)

Firmware version of device (beacon or modem)

Architecture type (IA or NIA)

Location update rate settings: 1/20Hz – 16Hz+. Notice that real update rate may be limited by distances between beacons or radio profile

Power supply voltage of the device 5V+-0.2V is OK

Time from the latest reset

Strength of the radio signal to modem from beacons and vice versa. Maintain in the range of -25dBm to -80..-90dBm. Higher value - may overload. Lower – lost packets

Strength of the radio signal from modem to beacons and vice versa. Maintain in the range of -25dBm to -80..-90dBm. Higher value - may overload. Lower – lost packets

Chosen working band

Exact working frequency

CPU ID	Copy to clipboard	152437
Firmware version		v7.046 Modem HW v5.1
Architecture		NIA
Location update rate		8 Hz
Supply voltage, V (4.5..5.5)		4.88
Time from reset, h:m:s		00:00:27 / 17.01.04 / 0
RSSI from 009, dBm		-37
RSSI to 009, dBm		-33
Profile		General
Radio frequency band		"915 MHz"
Carrier frequency, MHz		919.0
Radio channel		0
Device address (1..254)		1
Long time sleep		disabled
Window of averaging (0..16)		4
Distance filter (0..16)		0
Max. hedges readout per cycle (1..255)		n/a
High resolution mode (mm)		enabled
Detect new beacons on frozen map		enabled
Temperature of air, °C (-20..60)		23
Update location mode		License SW v7.1 required

Pre-selected channel – one of the radio channels for communication between modem and beacons

Logical address of the device. Keep 2..255 for beacons. Address

TBD

Averaging between location update measurements. More value – less location jitter, but higher latency

Filter of distances (as opposed to filter of locations). More – better filtering, but may be too conservative and “kill” good measurements

TBD

Keep Enabled normally. Switch to cm for backward compatibility

If map is frozen, new beacons will be accepted in the map, if enabled

Measured temperature of the processor's crystal

TBD

## 7.11.1.2. Advanced Settings

Advanced settings	(-) collapse	TBD
Auto upload map to hedgehogs	enabled	TBD
<input type="checkbox"/> Reset timeout w/o dashboard, min (1..127)	disabled	TBD
Hedges timing correction, ms (-127..127)	n/a	TBD
Fast submaps search	disabled	TBD
Parameter A (-0.500..0.500)	0.000	TBD
Parameter B	No data	TBD
Parameter C	No data	TBD
Approach control	disabled	TBD
Quality dependent track dots size	disabled	TBD
Maximum track dot radius, cm (1..100)	n/a	If modem lost connection it restarts by itself
Track dot size change coef (0.01..1.00)	n/a	
Track dot color change coef (0.1..10.0)	n/a	
Handover mode	Handover mode 3	TBD
Resiliency mode	enabled	TBD
Resiliency timeout after disconnect, sec (1..255)	30	TBD
Ultrasonic frequencies measure mode	n/a	TBD
Advanced map build	enabled	TBD
Map build candidate live time (0..255)	20	TBD
Map build location hysteresis, m (0.00..2.55)	0.50	TBD
Map build location time hysteresys (0..255)	10	TBD

### 7.11.1.3. Parameters of Radio

Parameters of radio	(-) collapse
Base frequency, MHz	919.000
Radio profile	38 Kbps
Device address (0..99)	77
Channel	1
Modulation	GFSK
Power of TX	9 dBm
Channel spacing, KHz (25.391..405.457)	49.190
Intermediate frequency (ID), KHz (0..787)	152
Offset frequency, KHz (-203.13..201.54)	76.16
Deviation frequency, KHz (1.587..380.859)	20.628
Channel bandwidth, KHz (58.036..812.500)	101.553
CCA mode	always
DC blocking filter	enabled
Manchester	disabled
Whitening	enabled
FEC	enabled

Real carrier frequency

Selected radio profile with a set of profile settings. Choose between 38kbps (better range and interference immunity, but slower); 153kbps – balanced; and 500kbps – the fastest, but the lowest radio range and least immune to interference

Logical address of the device. Distinguish of beacon from another

One of a predefined radio frequency channels

Modulation – a part of the radio profile. Only for advanced users

Only for advanced users

Only for advanced users

Only for advanced users

Parameters of radio	(-) collapse
Base frequency, MHz	919.000
Radio profile	38 Kbps
Device address (0..99)	77
Channel	1
Modulation	GFSK
Power of TX	9 dBm
Channel spacing, KHz (25.391..405.457)	49.190
Intermediate frequency (ID), KHz (0..787)	152
Offset frequency, KHz (-203.13..201.54)	76.16
Deviation frequency, KHz (1.587..380.859)	20.628
Channel bandwidth, KHz (58.036..812.500)	101.553
CCA mode	always
DC blocking filter	enabled
Manchester	disabled
Whitening	enabled
FEC	enabled

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

## 7.11.1.4. Interfaces

Interfaces	(-) collapse	
UART speed, bps	500000	Speed of UART
Protocol on UART/USB output	Marvelmind	Type of protocol
Stream location data	enabled	Enable or disable receiving raw IMU data with IMU update rate (100Hz)
Raw distances data	disabled	TBD
Quality and extended location data	disabled	TBD
Telemetry stream	disabled	TBD
Telemetry interval, sec (1..255)	n/a	TBD
User payload packets from device (0..31)	0	TBD
User payload packets to device (0..31)	0	TBD
Alarm pin function	MMSW0006 required	TBD
Alarm pin mode	n/a	TBD
PB5 pin function	None	TBD
Streaming mode	Normal	TBD
Debugging data	disabled	TBD
SPI slave data output	n/a	TBD
Stream realtime timestamps	enabled	TBD
Use RS-485 for modem-beacon communication	n/a	TBD
Discrete input instead of UART TX	n/a	TBD

## 7.11.2. Beacon's Settings

### 7.11.2.1. Basic Settings

CPU ID	Copy to clipboard	143A24	Unique CPU ID
Firmware version		v8.407 Super-Beacon-4	Firmware version of device (beacon or modem)
Power save functions		enabled / active	TBD
Hedgehog mode (mobile beacon/tag)		enabled	Enable for mobile beacon and disable for stationary beacon
Supply voltage, V (3.50..4.35)		4.13	Measured voltage of internal battery
Time from reset, h:m:s		00:04:20 / 19:07:07 / 0	Time from the latest reset
RSSI from modem, dBm		-35	Strength of the radio signal from modem to this beacon, i.e. how the beacon "hears" the modem over radio. Keep below -25dBm and above -80dBm to avoid losses of packets. Lower end depends on radio profile and interference
RSSI to modem, dBm		-35	Strength of the radio signal from this beacon to the modem, i.e. how the modem "hears" the beacon over radio. Keep below -25dBm and above -80dBm to avoid losses of packets. Lower end depends on radio profile and interference
Profile		General (915 MHz band)	Select radio frequency band according to your HW: 433MHz or 915MHz
Carrier frequency, MHz		919.0	Real carrier frequency
Radio channel		0	
Device address (1..254)		24	
Height, m (-320.000..320.000)		0.000	
Measured temperature, °C		23	
Ultrasonic frequency, Hz (100..65000)		45000	
Advanced settings		(+) expand	
Real-time player		(+) expand	
IMU		(+) expand	
Parameters of radio		(+) expand	
Ultrasound		(+) expand	
Interfaces		(+) expand	
Misc. settings		(+) expand	
Hedgehog location shift		(+) expand	
Hedgehogs pairing		(+) expand	

CPU ID	Copy to clipboard	143333
Firmware version		v7.044 Super-Beacon-2
Power save functions		enabled / active
Hedgehog mode		disabled
Supply voltage, V (3.5..4.2)		3.83
Time from reset, h:m:s		00:00:30 / 18.12.10 / 0
RSSI from modem, dBm		-41
RSSI to modem, dBm		-41
Profile		General
Radio frequency band		"915 MHz"
Carrier frequency, MHz		919.0
Radio channel		0
Device address (1..254)		12
Height, m (-320.000..320.000) in submap 0		0.000
Measured temperature, °C		23
Ultrasonic frequency, Hz (100..65000)		37000
Desired speed, % (0..100)		n/a
IMU		(+) expand
Parameters of radio		(+) expand
Ultrasound		(+) expand
Interfaces		(+) expand
Misc. settings		(+) expand
Hedgehogs pairing		(+) expand
Real-time player		disabled
Real-time player backward (0..127)		3
Real-time player forward (0..127)		5

- Selected radio channel
- Selected device's address
- Height – must be set for stationary beacons.  
Must also be set for mobile beacons in 1D or 2D modes
- Processor's crystal's temperature
- Frequency of ultrasonic pulses – set according to your HW
- TBD
- TBD
- TBD
- TBD

Advanced settings	(-) collapse
Approach control	disabled
Virtual pen drawing	MMSW0013 required
Virtual pen mode selection	MMSW0013 required
Virtual pen draw diameter, cm (1..100)	MMSW0013 required
Virtual pen erase diameter, cm (1..100)	MMSW0013 required
Resiliency mode	enabled
Resiliency timeout after disconnect, sec (1..255)	30
High rate extrapolation	MMSW0017 required
Extrapolation backward, US samples (0..31)	n/a
Max. speed, m/s (0.000..32.000)	MMSW0017 required
Extrapolation timeout, samples (1..255)	MMSW0017 required
Extrapolation error correction (0.00..1.20)	MMSW0017 required

Real-time player	(-) collapse
Real-time player streaming	disabled
Real-time player for gaps	disabled
Real-time player for speed	disabled
Real-time player backward, US samples (0..31)	5
Real-time player forward, US samples (1..31)	5

Advanced settings	(-) collapse
Approach control	disabled
Virtual pen drawing	disabled
Virtual pen mode selection	By orientation
Virtual pen draw diameter, cm (1..100)	3
Virtual pen erase diameter, cm (1..100)	3
Resiliency mode	enabled
Resiliency timeout after disconnect, sec (1..255)	30
High rate extrapolation	MMSW0017 required
Extrapolation backward, US samples (0..31)	n/a
Max. speed, m/s (0.000..32.000)	MMSW0017 required
Extrapolation timeout, samples (1..255)	MMSW0017 required
Extrapolation error correction (0.00..1.20)	MMSW0017 required

## 7.11.2.2. IMU

IMU	(-) collapse
IMU mode	High performance
IMU type	LSM6DSM
Ax zero	0
Ay zero	0
Az zero	0
Ax K	1.000
Ay K	1.000
Az K	1.000
IMU PID settling time, sec	10
IMU lock	disabled
IMU filter samples (0..50)	MMSW0005 required
Max. acceleration, m/s <sup>2</sup> (0.000..40.000)	MMSW0005 required
Max. speed, m/s (0.000..32.000)	MMSW0005 required
IMU static filter	n/a
IMU static max noise (0..127)	n/a

Calibration settings of embedded IMU: X shift

Calibration settings of embedded IMU: Y shift

Calibration settings of embedded IMU: Z shift

Calibration settings of embedded IMU: X scale

Calibration settings of embedded IMU: Y scale

Calibration settings of embedded IMU: Z scale

### 7.11.2.3. Parameters of Radio

Parameters of radio	(-) collapse
Base frequency, MHz	919.000
Radio profile	38 Kbps
Device address (0..99)	77
Channel	1
Modulation	GFSK
Power of TX	9 dBm
Channel spacing, KHz (25.391..405.457)	49.190
Intermediate frequency (ID), KHz (0..787)	152
Offset frequency, KHz (-203.13..201.54)	76.16
Deviation frequency, KHz (1.587..380.859)	20.628
Channel bandwidth, KHz (58.036..812.500)	101.553
CCA mode	always
DC blocking filter	enabled
Manchester	disabled
Whitening	enabled
FEC	enabled

Real carrier frequency

Radio profile that is linked with many radio settings below. Helps to set them at once by choosing the profile. See similar in modem for more info

Device address – shall be set for each beacon different under one modem

One of the pre-selected frequency channels

Radio profile settings. No need to change manually. Only for advanced users

Radio profile settings. No need to change manually. Only for advanced users

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## 7.11.2.4. Ultrasound

Quality hysteresis	(-) collapse
Quality threshold, % (0..100)	100
Window size (1..15)	3

TX-RX – regular mode. Use it. The rest - internal

TBD

Power saving features. If not sure, keep default

Power saving features. If not sure, keep default

TBD

Frequency of ultrasonic pulses – set according to your HW

50% - default. 1% ... 99% lower strength of ultrasonic. Keep default

Number of ultrasonic pulses the TX beacon emits. More – stronger, but longer echo. For small distances – 1-10 periods. 20-30 – for 10-20 meters. For 20+ m – 50 periods

Internal settings

Automatic or manual gain control. Manual can be useful in special conditions: too high external audio noise, for example

Ultrasound	(-) collapse
Mode of work	Normal
Analog power in sleep	disabled
Ultrasonic frequency, Hz (100..65000)	45000
Duty, % (10..90)	50
Number of periods (1..255)	20
Use distance correction	enabled
Number of TDMA slots (1..8)	1
TDMA slot (1..1)	1
Handover	(+) expand
Receiver amplifier (0..4095)	200
Minimum signal level (0..30000)	0
Min. over raise for new front (0..200)	30
Min. front power (0..250)	5
Prefiltration coefficient (0..127)	0
Minimum signal quality (0..200)	2
Maximum line gradient down, % (0..200)	0
Max. speed, m/s (0.000..32.000)	5.000
Expand trigger search area	enabled
Don't show filtered location	enabled
Candidate filters	(+) expand
Toggle TX4/TX1,2,3,5	disabled
Minimum distance limitation	disabled
Minimum distance, m (0.0..25.5)	0.0
Auto measurements when radio gaps	enabled
Spot size, m (0.0..25.5)	3.0
Max. distance disperse, cm (1..255)	10
Plateau	(+) expand
Quality hysteresis	(+) expand
Absolute calibration	(+) expand
Filters of frequencies	(+) expand
Sunset features	(+) expand

Ultrasound	(-) collapse
Mode of work	Normal
Analog power in sleep	disabled
Ultrasonic frequency, Hz (100..65000)	45000
Duty, % (10..90)	50
Number of periods (1..255)	20
Use distance correction	enabled
Number of TDMA slots (1..8)	1
TDMA slot (1..1)	1
Handover	(+) expand
Receiver amplifier (0..4095)	200
Minimum signal level (0..30000)	0
Min. over raise for new front (0..200)	30
Max. distance disperse, cm (1..255)	10
Plateau	(+) expand
Quality hysteresis	(+) expand
Absolute calibration	(+) expand
Filters of frequencies	(+) expand
Sunset features	(+) expand

TBD

AGC settings. For advanced users only

AGC settings. For advanced users only

AGC settings. For advanced users only

AGC settings. For advanced users only

Deep ultrasonic trigger settings. For special cases only

Deep ultrasonic trigger settings. For special cases only

Keep ADC

Deep ultrasonic trigger settings. For special cases only

Deep ultrasonic trigger settings. For special cases only

Ultrasound	
(-) collapse	
Mode of work	Normal
Analog power in sleep	disabled
Ultrasonic frequency, Hz (100..65000)	45000
Duty, % (10..90)	50
Number of periods (1..255)	20
Use distance correction	enabled
Number of TDMA slots (1..8)	1
TDMA slot (1..1)	1
(+ expand)	
Receiver amplifier (0..4095)	200
Minimum signal level (0..30000)	0
Min. over raise for new front (0..200)	30
Min. front power (0..250)	5
Prefiltration coefficient (0..127)	0
Minimum signal quality (0..200)	2
Maximum line gradient down, % (0..200)	0
Max. speed, m/s (0.000..32.000)	5.000
Expand trigger search area	enabled
Don't show filtered location	enabled
(+ expand)	
Candidate filters	
Toggle TX4/TX1,2,3,5	disabled
Minimum distance limitation	disabled
Minimum distance, m (0.0..25.5)	0.0
Auto measurements when radio gaps	enabled
Spot size, m (0.0..25.5)	3.0



- Deep ultrasonic trigger settings. For special cases only
- Deep ultrasonic trigger settings. For special cases only
- Deep ultrasonic trigger settings. For special cases only
- Deep ultrasonic trigger settings. For special cases only
- Deep ultrasonic trigger settings. For special cases only

AGC low threshold, raise speed (1..10)	15	Deep AGC settings. For special cases only
Speed of amplification increase (1..200)	10	Deep AGC settings. For special cases only
AGC high threshold, raise speed (1..100)	100	Deep AGC settings. For special cases only
Speed of amplification decrease (1..200)	5	Deep AGC settings. For special cases only
Receive window low, m (0..255)	0	TBD
Receive window high, m (0..255)	255	TBD
Minimum distance limitation	enabled	TBD
Auto measurements when radio gaps	enabled	TBD
Filter selection	19 kHz	TBD
RX1 normal	disabled	TBD
RX2 normal	disabled	TBD
Handover	(-) collapse	TBD
Handover mode	Handover mode 3	
Updates for hard handover (0..63)	3	
Special hard handover zones	disabled	Enable/disable sensor RX1 in map building mode
Special hard handover T1, sec (0..1023)	120	
Special hard handover T2, sec (0..1023)	60	
Special hard handover N (0..255)	5	
Special hard handover sigma, m (0.00..5.00)	0.50	Enable/disable sensor RX2 in map building mode
Width of special handover zone, m (0.0..25.5)	2.0	
Length of special handover zone, m (0.0..25.5)	7.0	
File of dump for DAC		

Handover	
Handover mode	Handover mode 3
Updates for hard handover (0..63)	3
Special hard handover zones	disabled
Special hard handover T1, sec (0..1023)	120
RX3 normal	disabled
RX4 normal	disabled
RX5 normal	disabled
RX1 frozen	disabled
RX2 frozen	disabled
RX3 frozen	disabled
RX4 frozen	disabled
RX5 frozen	disabled
Additional parameters	(-) collapse
Obstacles probe	disabled
File of dump for DAC	

Enable/disable sensor RX3 in map building mode

Enable/disable sensor RX4 in map building mode

Enable/disable sensor RX5 in map building mode

Enable/disable sensor RX1 in map frozen/regular work mode

Enable/disable sensor RX2 in map frozen/regular work mode

Enable/disable sensor RX3 in map frozen/regular work mode

Enable/disable sensor RX4 in map frozen/regular work mode

Enable/disable sensor RX5 in map frozen/regular work mode

TBD

TBD

TBD

### 7.11.2.5. Interfaces

Interfaces	(-) collapse
UART speed, bps	500000
Protocol on UART/USB output	Marvelmind
PA15 pin function	SPI slave CS
Raw inertial sensors data	disabled
Processed IMU data	disabled

Speed of UART in hedgehog mode

Type of protocol

TBD

Enable or disable receiving raw IMU data with IMU update rate (100Hz)

Enable or disable receiving IMU+ultrasonic sensor fusion data with IMU update rate (100Hz)

### 7.11.2.6. Georeferencing

Georeferencing	(-) collapse
Latitude	N0.0000000
Longitude	E0.0000000

The same as with modem

The same as with modem

### 7.11.2.7. Misc. Settings

Misc. settings	(-) collapse
Sleep with external power	60 sec no connection

Timeout sleep settings

## 7.11.2.8. Hedgehogs Pairing Settings



Hedgehogs pairing	(-) collapse
Pairing mode	pair
Address of paired hedge (1..255)	8
Location against center	left
Base of the pair, cm (1..255)	10
IMU fusion for angle	enabled
Send location of center	enabled
Communication in pair	n/a

Enable for [Paired Beacons feature](#)  
Check chapter [Paired Beacons](#) for more details

Activate this parameter to pair beacons

Address of the beacon, current selected hedgehog paired with

Location against center of selected beacon in a pair

Actual distance between paired hedgehogs

If disabled, data will be sent only based on ultrasound

If disabled, location of the beacon will be sent

In IA: via UART, via Radio  
In NIA: Not applicable

## 7.12. Radio Frequency Band and Carrier Frequency

- For devices with HW 433 MHz allowable Radio band 433
- For devices with HW 915 MHz allowable Radio bands 868 and 915, but when using antennas at 433 MHz, it is possible to use 433 MHz

\*Mini-RX beacons and Super-Beacons are 868/915MHz only

It is possible to change the radio frequency, but radio performance can be severely degraded. It may be enough for smaller distances, up to 10-20 meters, but not more.

Radio frequency band	433 MHz
Carrier frequency, MHz	433.400

Radio frequency band	915 MHz
Carrier frequency, MHz	919.000

Radio frequency band	868 MHz
Carrier frequency, MHz	869.504



## 7.13. Different Beacons' Designations in the Dashboard

You can choose any color for your hedge, but it still has some permanent colors, which inform you about some tracking issues:

- **Blue** - standard mode and confident tracking
- **Orange** - system provides the best location data possible, but confidence is lower than blue
- **Transparent Blue** - lost radio packets
- **Transparent Orange** – weak ultrasonic coverage
- **Blinking Yellow** – no data from a beacon
- **Red** – beacon is outside of the geofencing zone
- **Blinking Grey** – no connection to a beacon

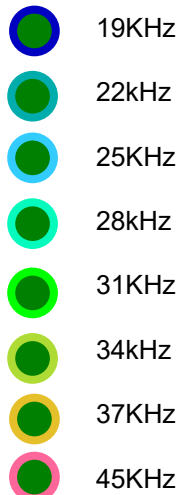
## 7.14. Different Beacons' Colors in the Dashboard

Beacons can have different ultrasonic frequencies. Because of that, they have other colors to make them easier to distinguish:

- Stationary beacons – Green center – 
- Mobile beacons – Dark blue center – 
- Different colors of stationary beacons are only in the IA architecture. In NIA, the stationary beacons are all green. Vice versa for IA, mobile beacons are all blue.

Examples:

- Stationary beacons:



- Mobile beacons:

