6. Setting up the System

6.1. Introduction

Our system supports Non-Inverse Architecture, Inverse Architecture, and MF NIA. However, we strongly recommend starting from NIA in a 2D configuration (2 stationary beacons and 1 mobile beacon). Once you achieve perfect results in NIA, you can set up the system in IA.

Check:

8 basic steps from unpacking to autonomous drive/flight

Step-by-step guide on how to build complex maps

Detailed explanation of complex map building:

Building submaps: Part 1

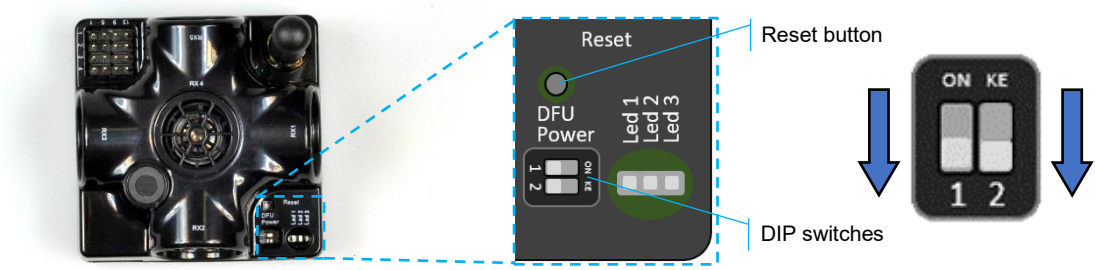
Building submaps: Part 2

6.2. DIP Switch Positions

This chapter shows different DIP switcher positions of devices in the example of a Super-Beacon.

6.2.1. DIP Switch Position for OFF Beacon

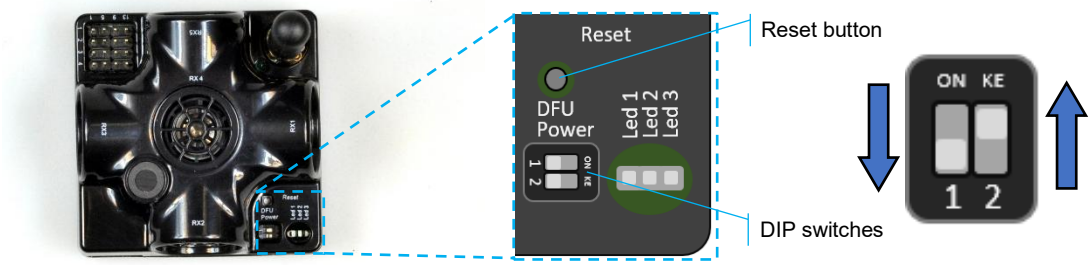
Only charging the device is possible when the DIP switch is in this position.



6.2.2. DIP Switch Position for Work and HEX Programming

Put DIP switch to this position:

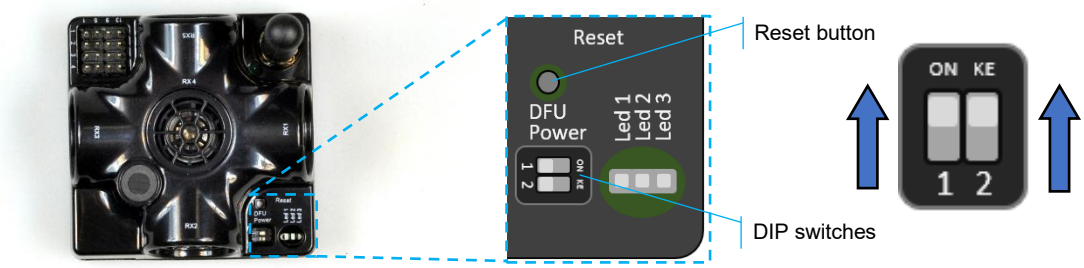
- To turn on the beacon
- For HEX programming (via Dashboard)



6.2.3. DIP Switch Position for DFU Programming

Put DIP switch to this position:

- For DFU programing (via Marvelmind DfuSe from the software package)



Put the DIP switch in position for work and restart the beacon after DFU programming.

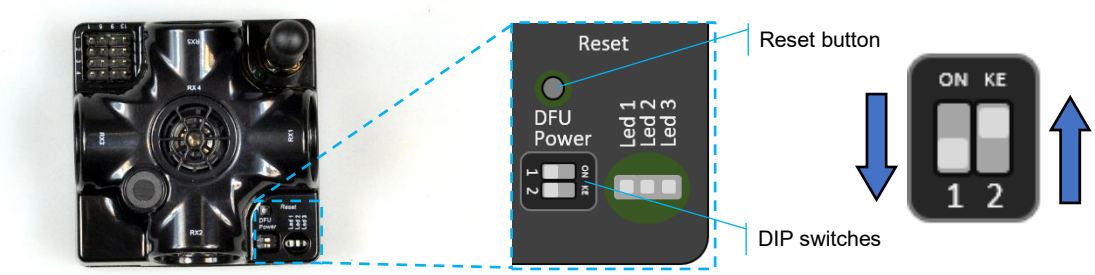
6.3. Starter Set Super-MP-3D (NIA, IA, and MF NIA)

The steps below describe the first time you set up the system in NIA.

Super-Beacons and Modem HW v5.1 required.

This Set can be used in IA and NIA. Use NIA Software for Non-Inverse Architecture and IA Software for Inverse Architecture.

1. Unpack the system. Check our tutorial video on Unpacking Starter Set Super-MP-3D
2. Charge all the beacons using a USB cable. Complete charging takes about 1-2 hours
3. Turn the beacons on: Place DIP switches as shown in the picture below



4. Download SW Pack
5. Open Dashboard in NIA folder
6. If you receive “Windows protected your PC” window, check this chapter
7. Update all the beacons (HEX programming):
8. Run the Dashboard and update the SW for all beacons and modem using Dashboard => Firmware => Choose the file => Program
9. Note: On Windows 10 and later, the STM32 USB driver is installed automatically by the OS – no manual driver installation is required. The Dashboard does not show the driver download link in recent versions

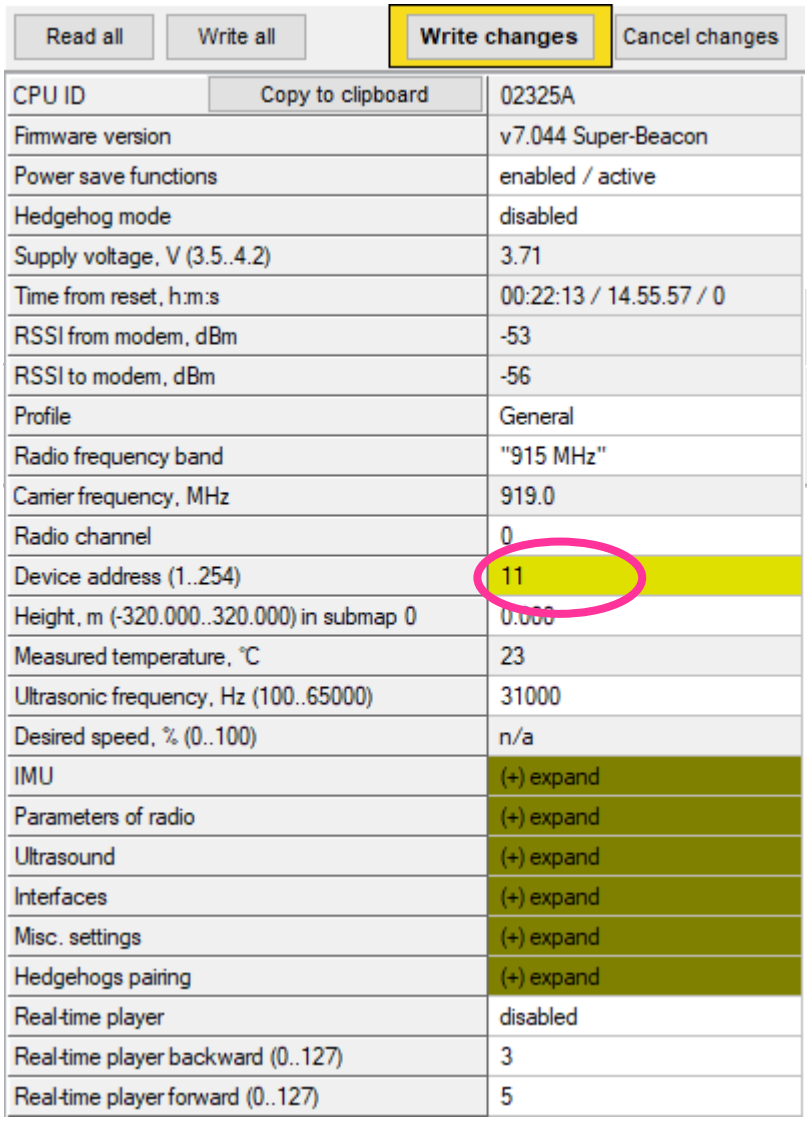
10. Ensure that:

- You are programming the modem's SW to the modem and the beacon's SW to the beacon
- You are using SW for Super-Beacon, if you have Super-Beacon, etc. You have the SW from the same SW pack, i.e., the Dashboard SW, modem SW, and beacon SW must be from the same SW pack. Don't mix SW releases

If you face difficulties in updating software for the devices, update them via DFU mode. Check out **Software Updating via DFU Mode chapter**

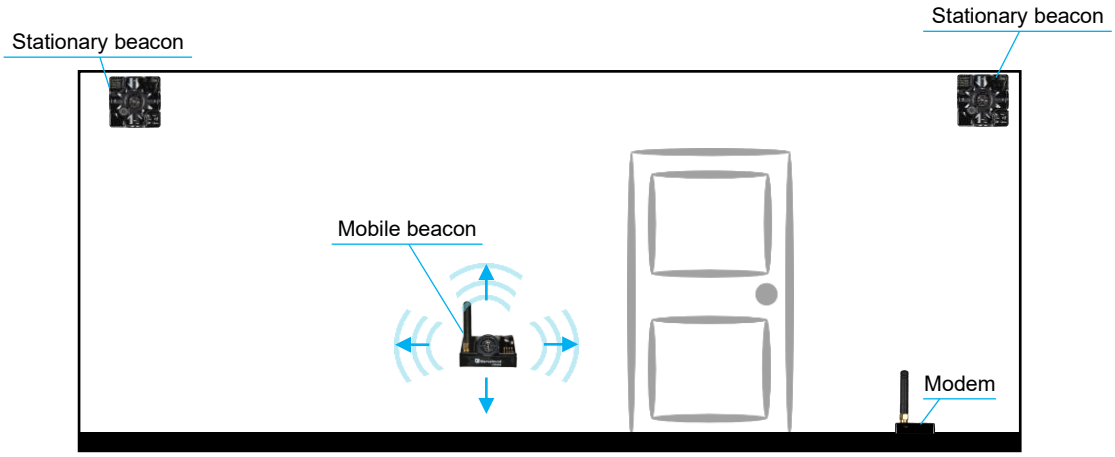
11. While the beacon or modem is connected to the Dashboard, click the DEFAULT button to upload the default settings. Do this after each SW upgrade for all devices!

12. Write down the beacon's address for future use or change the address at your convenience. Enter the device address and press ENTER - press the Write changes button. Beacons' addresses should not be repeated

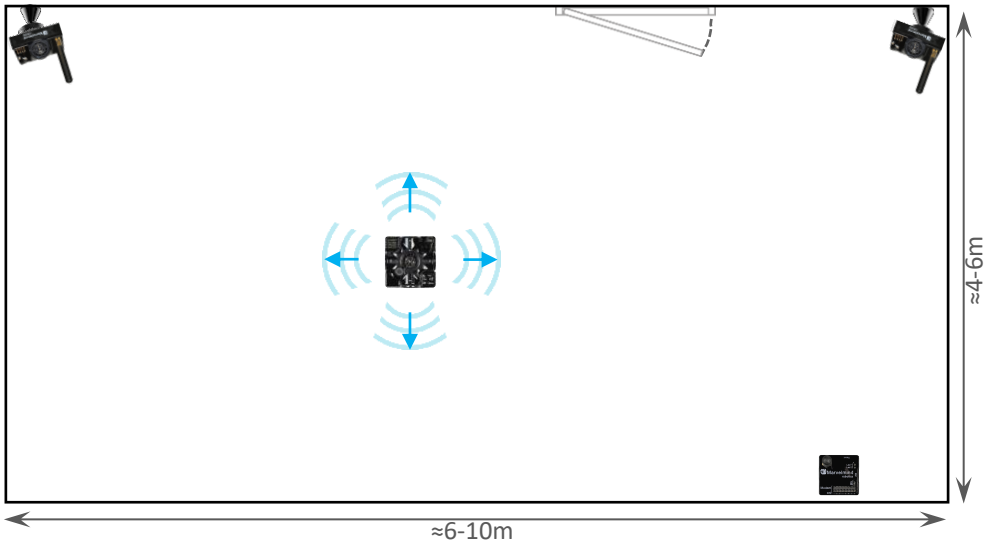


13. Place the stationary beacons high on the walls vertically in a way that will provide optimal ultrasonic coverage. Write down the beacon's height for future changes in the settings. The help video on installation can be found here - Help: how to place beacons

14. Side view of 2D configuration:



15. Top view of 2D configuration:



16. More information about the placement can be found in the Placement Manual

17. Connect the modem via USB to a Windows PC with the Dashboard installed

18. Run the Dashboard. In the left corner of the Dashboard, the modem should be shown as connected

19. Wake up all beacons by pressing the correct addresses on the Dashboard panel

Only 4 stationary beacons may be in 1 submap. If you wake up more beacons, create a new submap for them, or it won't be displayed on the map and in the table of distances.

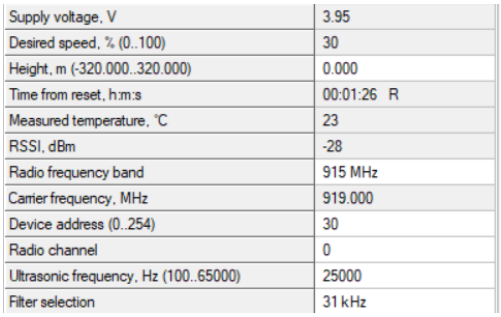
20. It may take up to 7-10 seconds for the beacons to wake up

21. Notice that if the modem is not active and is not powered, the beacons will go into sleep mode automatically after 1 minute

22. If this is the first time you wake up the beacons, the system may run the frequency search. If this step does not work, disconnect the modem and connect the beacon again via USB. Press the DEFAULT button in the Dashboard and the Read All button to ensure the radio settings are the default

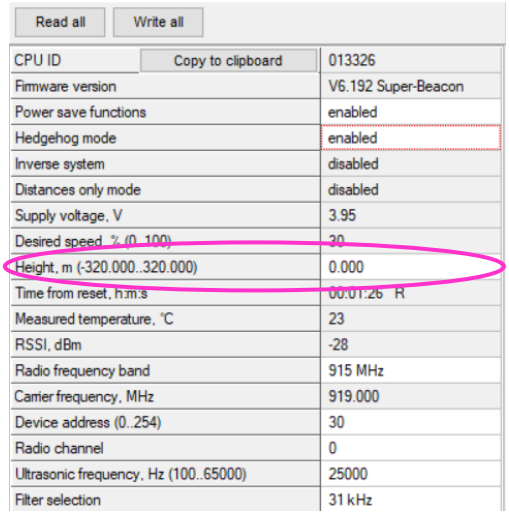
    Check that the radio settings on the modem and the radio settings on the beacon are the same

23. Now you can check RSSI, voltage, ultrasonic filter settings, etc., on the panel in the right corner of the Dashboard



Supply voltage, V	3.95
Desired speed, % (0..100)	30
Height, m (-320.000..320.000)	0.000
Time from reset, h:m:s	00:01:26 R
Measured temperature, °C	23
RSSI, dBm	-28
Radio frequency band	915 MHz
Carrier frequency, MHz	919.000
Device address (0..254)	30
Radio channel	0
Ultrasonic frequency, Hz (100..65000)	25000
Filter selection	31 kHz

24. Enter the height of stationary beacons. Choose beacon in the list and enter the height value



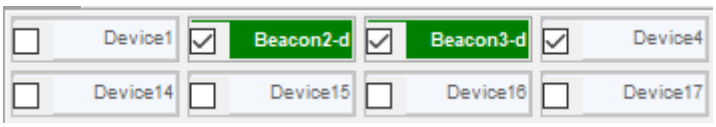
Read all | Write all

CPU ID	Copy to clipboard	013326
Firmware version		V6.192 Super-Beacon
Power save functions		enabled
Hedgehog mode		enabled
Inverse system		disabled
Distances only mode		disabled
Supply voltage, V		3.95
Desired speed, % (0..100)		30
Height, m (-320.000..320.000)		0.000
Time from reset, h:m:s		00:01:26 R
Measured temperature, °C		23
RSSI, dBm		-28
Radio frequency band		915 MHz
Carrier frequency, MHz		919.000
Device address (0..254)		30
Radio channel		0
Ultrasonic frequency, Hz (100..65000)		25000
Filter selection		31 kHz

Enter the height for the mobile beacon if you are using a 2D mode

25. One modem in the current version supports 250 beacons (mobile + stationary combined). You may need to scroll to find their addresses if you do not see some of your connected beacons on the map

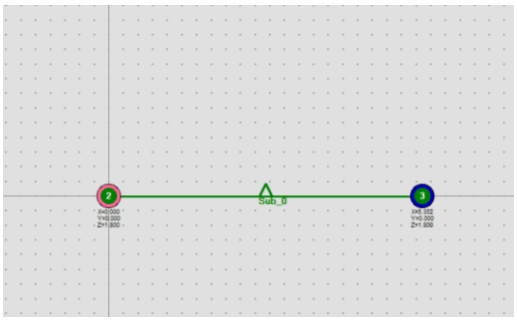
26. Double-click on the device both to put it into sleep mode and to wake it up



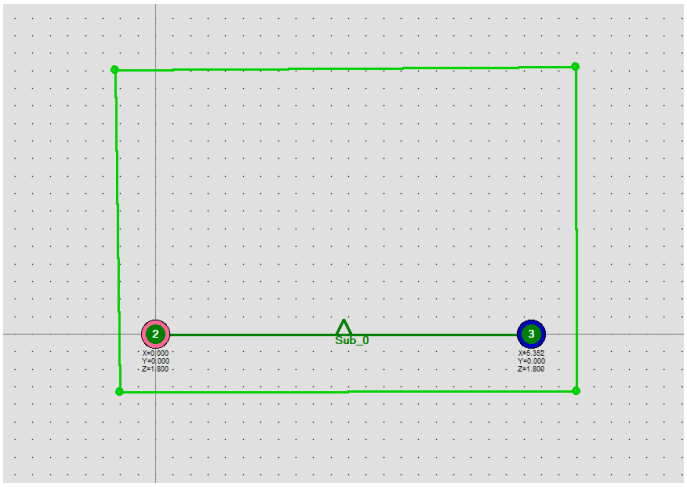
27. The map will form and zoom in automatically

28. If the map does not form well, check the table of distances in the left corner of the Dashboard. The cells must be colored white; it means the distances between the stationary beacons are measured correctly

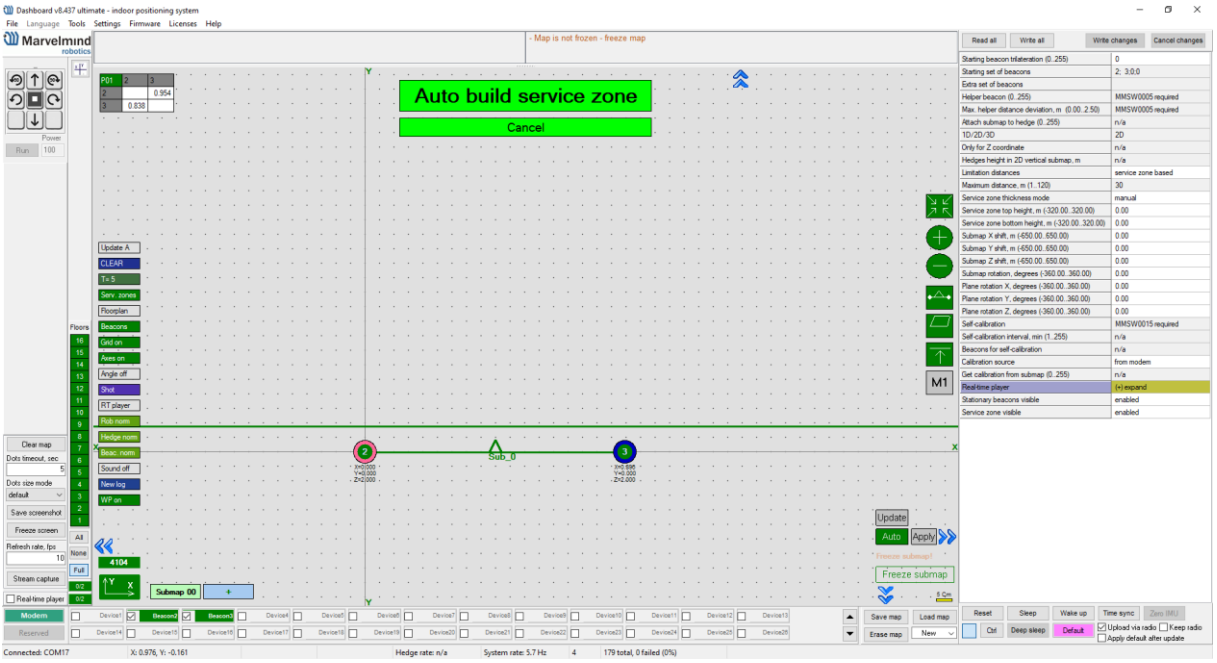
29. If you see some empty cells or marked yellow/red in the table, it indicates that distances between some beacons are measured inconsistently or not at all. Try to re-position them because there is usually an obstruction of some sort between the beacons. If you have any problems, check the Table of distances chapter

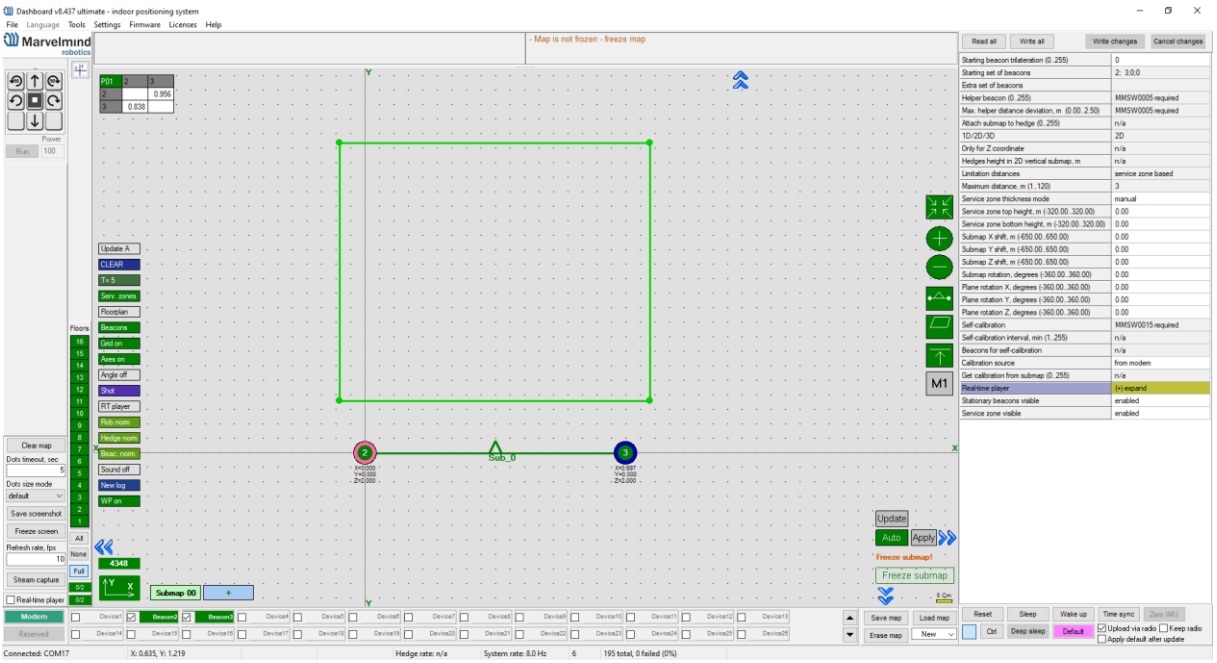


30. Important: Build the service zone AFTER freezing the submap (see next step). Building it before freezing may result in an inaccurate zone if the submap continues to change. Make a service

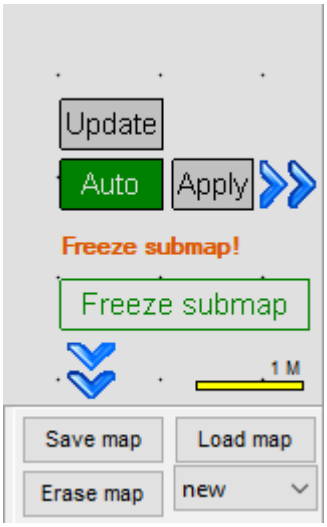


zone by clicking on the map with **Shift + Left Mouse Button**. Alternatively, use the new Auto-build service zone feature (left-click on the submap button, if a service zone has not been built yet it will be offered to build it automatically) – the Dashboard will automatically build a zone based on beacon positions. After auto-building, verify the zone matches the actual tracking area and adjust if needed. See the Submaps chapter for more details

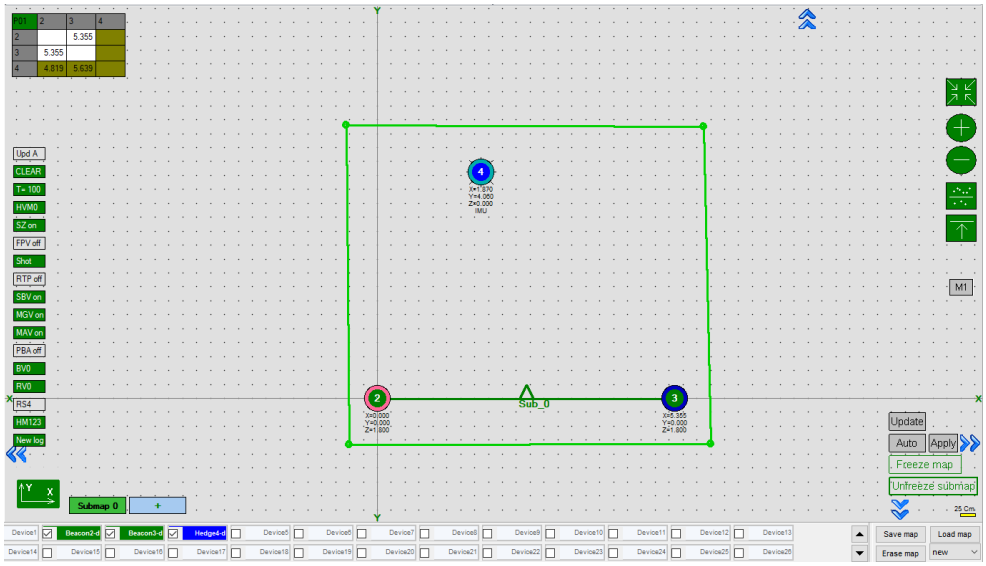

Auto build service zone
Cancel
- Map is not frozen - freeze map


- Map is not frozen - freeze map

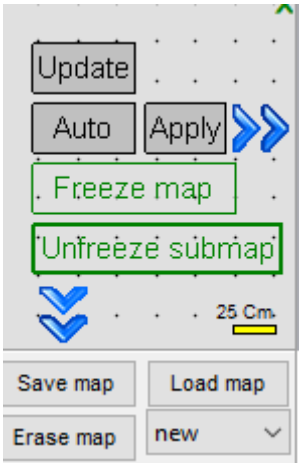
31. Freeze the Submap by clicking the button. Stationary beacons will stop measuring relative distances and will be ready to measure the distance from the mobile beacon(s)



32. Turn on and wake up the mobile beacon by following the same steps as with the stationary beacon. More details are in our [video]



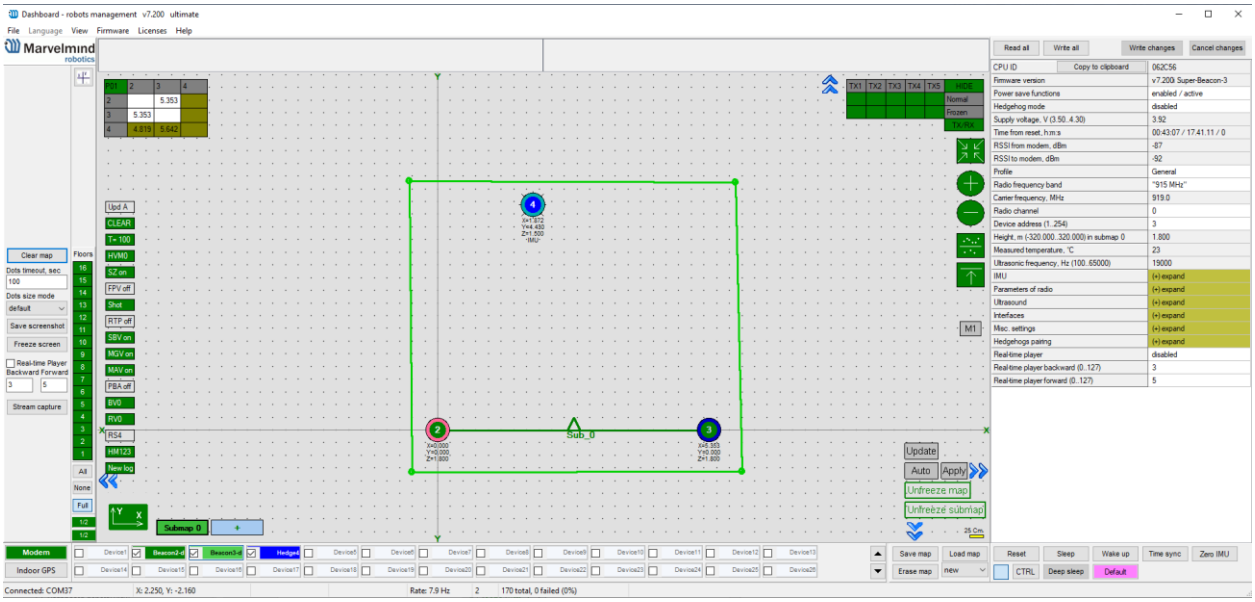
33. If you see on the devices' panel in the Dashboard that the beacon is colored orange, it means there are some differences in some of the settings between beacons. For example, some sensors may be off, and some ultrasonic or radio settings may be different. You can manually change the sensors' settings by clicking on the panel in the upper right corner of the Dashboard to change the cells from gray to green to turn on the sensor. It is recommended that the default settings on all beacons and the modem are used if this is your first time using the system



34. If everything looks good and the table of distance is colored white, freeze the submap and the map

P01	2	3
2		5.374
3	5.330	

35. The system is now fully operational

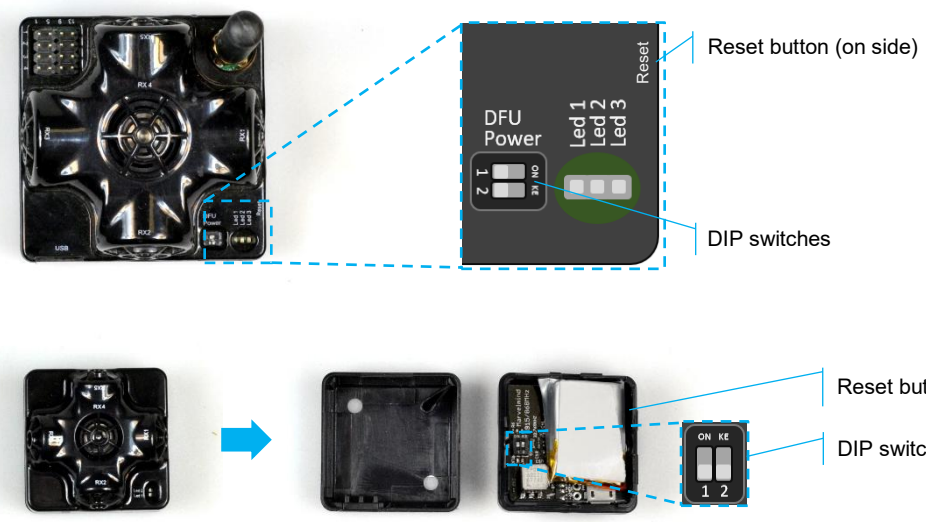


36. You can upload a picture/map of your room in the Dashboard. You can use a different picture for every floor. Go to Loading the floorplan (Help video)

6.4. Starter Set NIA-SmallDrone

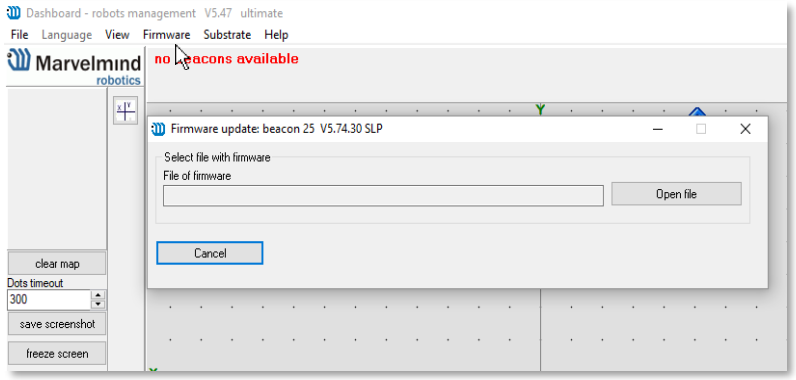
The steps below describe how to set up the system for the first time. Super-Beacon, Mini-TX beacons, and a modem are required.

1. Unpack the system. Look at a similar unpacking video of HW v4.9. The videos have differences, but the basics are the same
2. Charge all the beacons using a USB cable. Complete charging takes about 1-2 hours
3. Turn the beacons on
4. Download SW Pack
5. Update all the beacons:



Marvelmind robotics

6. Run the Dashboard and update the SW for all beacons and modem using **Dashboard => Firmware => Choose the file => Program**



7. If you receive “Windows protected your PC” window, check this chapter
8. Note: On Windows 10 and later, the STM32 USB driver is installed automatically by the OS – no manual driver installation is required. The Dashboard does not show the driver download link in recent versions
9. Make sure that that:
10. You are programming the modem’s SW to the modem and the beacon’s SW to the beacon
11. You are using SW for Mini-TX if you have Mini-TX and the SW from the same SW pack, i.e., the Dashboard SW, modem SW, and beacon SW must be from the same SW pack. Don’t mix SW releases

If you face any issues during the software update, use DFU for updating the devices. Check out **Software Updating via DFU Mode chapter**.

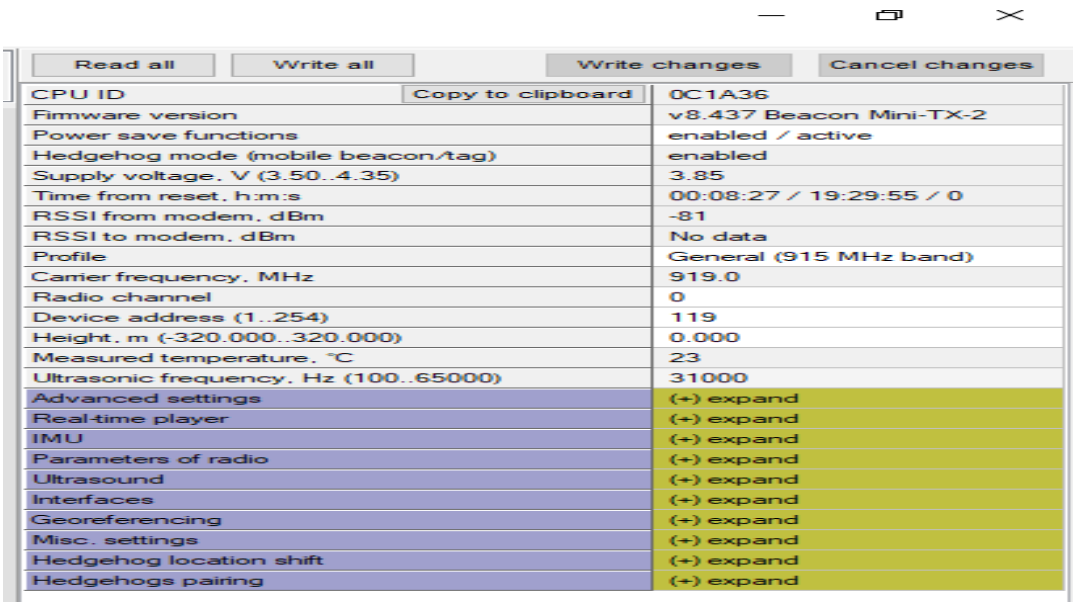
If you have uploaded the latest firmware for all of the boards, you can start to activate the system:

12. While the beacon or modem is connected to the Dashboard, click the DEFAULT button on the Dashboard to upload the default settings

13. Write down the beacon's address for future use or change the address at your convenience as shown here

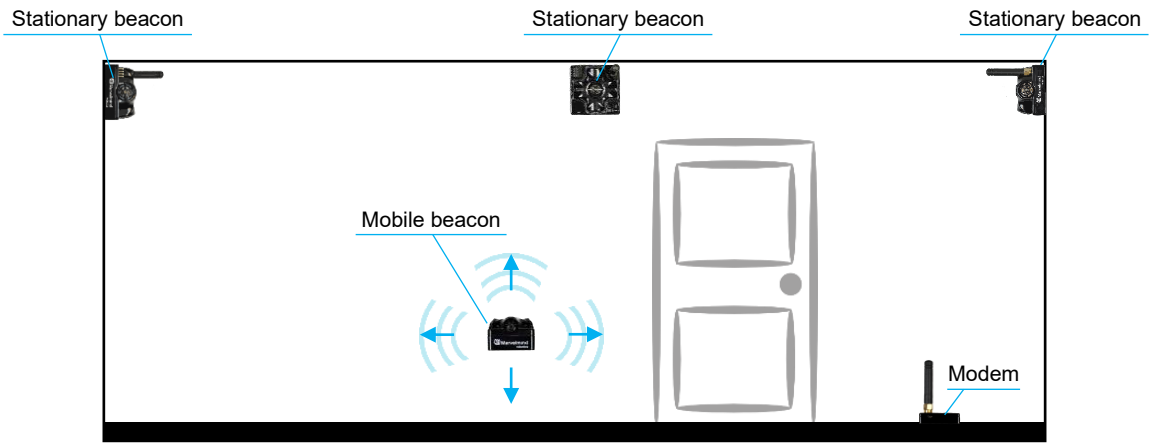
Hedgehog mode	enabled
Inverse system	enabled
Distances only mode	disabled
Supply voltage, V	3.70
Desired speed, % (0..100)	30
Time from reset, h:m:s	00:00:04 R
Measured temperature, °C	23
RSSI, dBm	-74
Radio frequency band	915 MHz
Carrier frequency, MHz	919.000
Device address (0..254)	154
Radio channel	0
Ultrasonic frequency, Hz (100..65000)	n/a
Filter selection	n/a
IMU	(+) expand
Parameters of radio	(+) expand
Ultrasound	(+) expand
Interfaces	(+) expand
Georeferencing	(+) 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

14. Mini-TX can operate only as mobile beacon, so "hedgehog mode" is enabled by default and cannot be disabled. You don't need to enable hedgehog mode for Mini-TX manually.

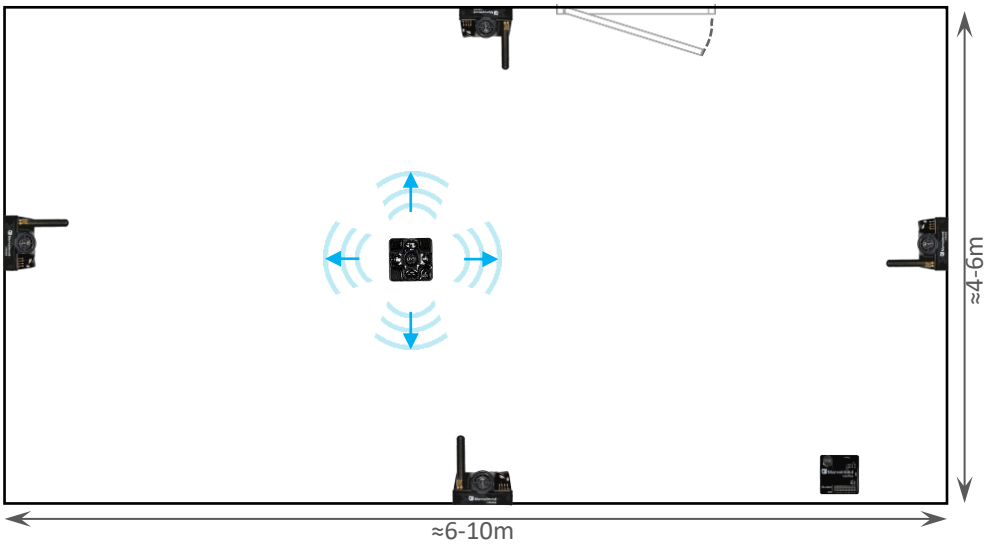


15. Place the stationary beacons high on the walls vertically in a way that will provide optimal ultrasonic coverage. Write down the beacon's height for future changes in the settings. The help video on installation can be found here

16. Side view:



17. Top view:



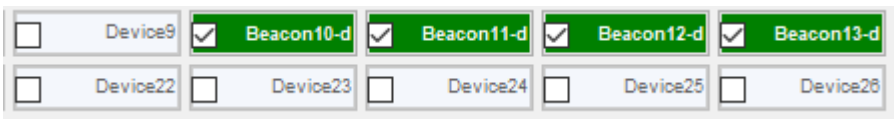
18. Connect the modem via USB to a Windows PC with the Dashboard installed

19. Run the Dashboard. In the left corner of the Dashboard, the modem should popup as you connect it

20. Wake up all beacons by selecting them in the Dashboard on the panel

21. It may take up to 7-10 seconds for the beacons to wake up

22. Notice that if the modem is not active and is not powered, the beacons will go into sleep mode



automatically after 1 minute

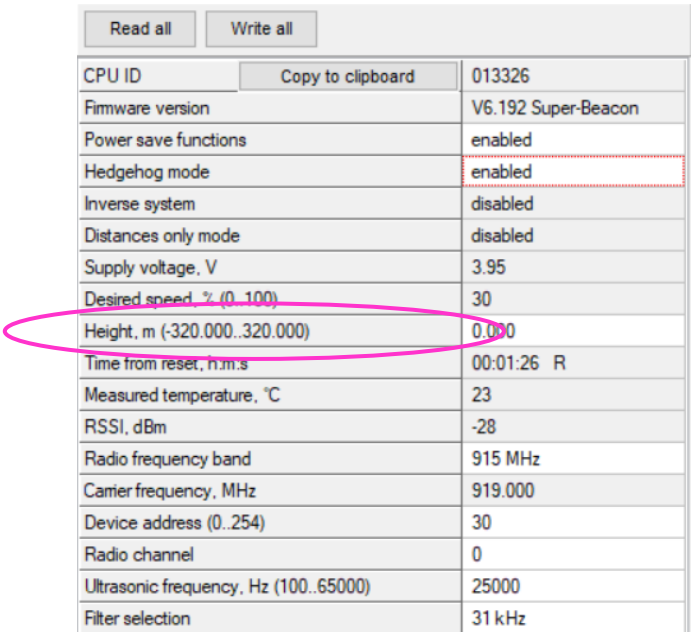
23. The system may run the frequency search if it is the first time you wake up the beacons. If this step does not work, disconnect the modem and connect that beacon again via USB. Press the DEFAULT button in the Dashboard and the Read All button to make sure that the radio settings are the default ones

24. Check that the radio settings on the modem and the radio settings on the beacon are the same

25. Now you can check RSSI, voltage, ultrasonic filter settings, etc., on the panel in the right corner of the Dashboard

Supply voltage, V	3.95
Desired speed, % (0..100)	30
Height, m (-320.000..320.000)	0.000
Time from reset, h:m:s	00:01:26 R
Measured temperature, °C	23
RSSI, dBm	-28
Radio frequency band	915 MHz
Carrier frequency, MHz	919.000
Device address (0..254)	30
Radio channel	0
Ultrasonic frequency, Hz (100..65000)	25000
Filter selection	31 kHz

26. Enter the height of stationary beacons. Choose beacon in the list and enter the height value



27. One modem in the current version supports 250 beacons (mobile + stationary combined). If you do not see some of your connected beacons on the map, you may need to scroll to find their addresses

28. Double click on the device to put it into sleep mode or wake it up

Only 4 stationary beacons may be in 1 submap. If you wake up more beacons, create a new submap for them; otherwise, they will not be displayed on the map and in the table of distances.

Build the map:

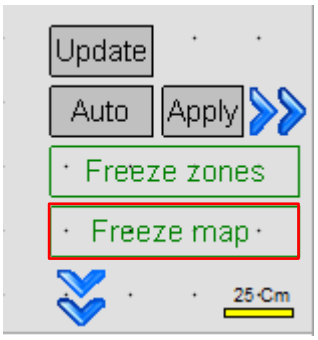
29. Open the Dashboard

30. Click on the Submap. You will see the table of distances

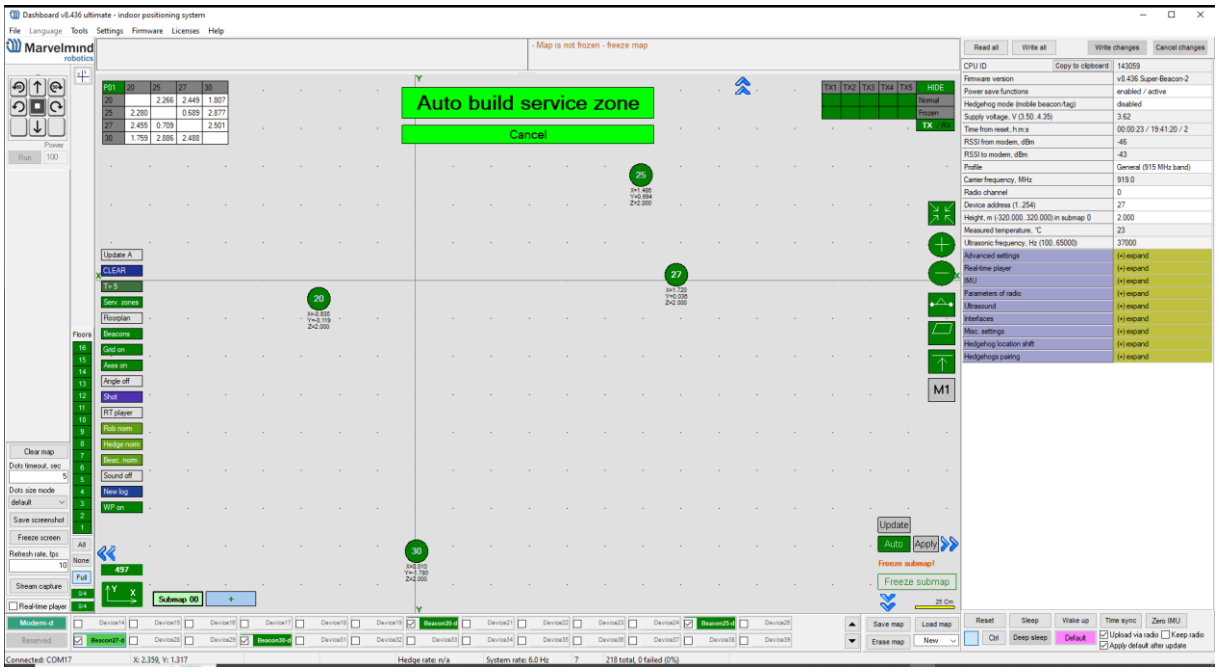
HIDE	5	22	66	77
5		7.144	12.389	10.101
22	7.144		10.122	12.151
66	12.389	10.122		6.879
77	10.101	12.151	6.879	

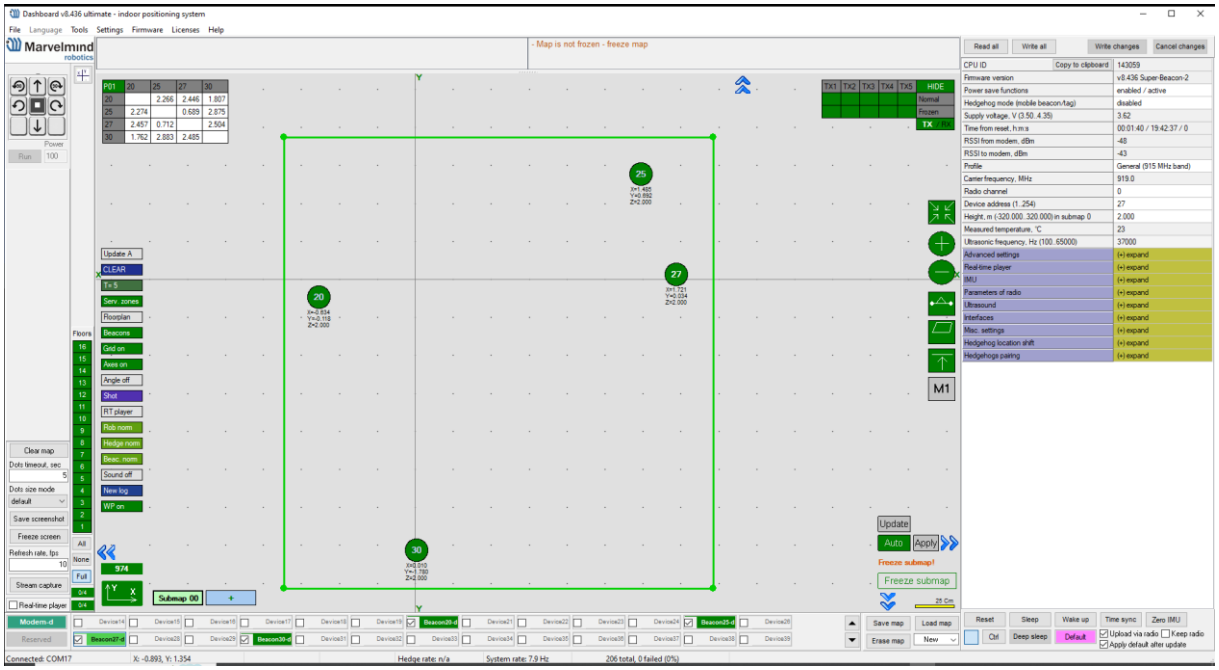
31. It will automatically calculate the distances between the beacons. If some of them are red, it means that the beacons can't calculate the distances by themselves. Check that there are no obstacles between the beacons and there is a direct line of sight

32. If every cell is white, freeze the map by clicking the button. Stationary beacons will stop measuring relative distances and will be ready to calculate distance from the mobile beacon(s)



33. Build the service zone for the submap after freezing it. Use Shift+Left Mouse Button clicks on the map to draw the zone boundary. Alternatively, use the Auto-build service zone feature (left-click on the submap button; if the service zone has not been built yet, Dashboard will offer to build it automatically). After building, verify the zone covers the intended tracking area and adjust if needed. For drones, it is especially important to define the service zone correctly. See the Submaps chapter for details





34. Turn on and wake up the mobile beacon, following the same steps as the stationary beacon. Here is a helpful video

35. If you see on the devices' panel in the Dashboard that the beacon is colored orange, it means there are some differences in some of the settings between beacons. For example, some sensors may be off, and some ultrasonic or radio settings may be different. You can manually change the sensors' settings by clicking the panel in the upper-right corner of the Dashboard to turn the cells from gray to green and turn on the sensor. It is recommended that the default settings on all beacons and the modem be used if this is your first time using the system

36. After you freeze the map of stationary beacons, wake up the mobile beacon. It will be traceable in

5-7 seconds

37. The system is now fully operational. Tip for drones: to increase the location update rate, consider switching to a 500 kbps radio profile. See: how to increase location update rate

6.5. Starter Set Industrial-NIA-01

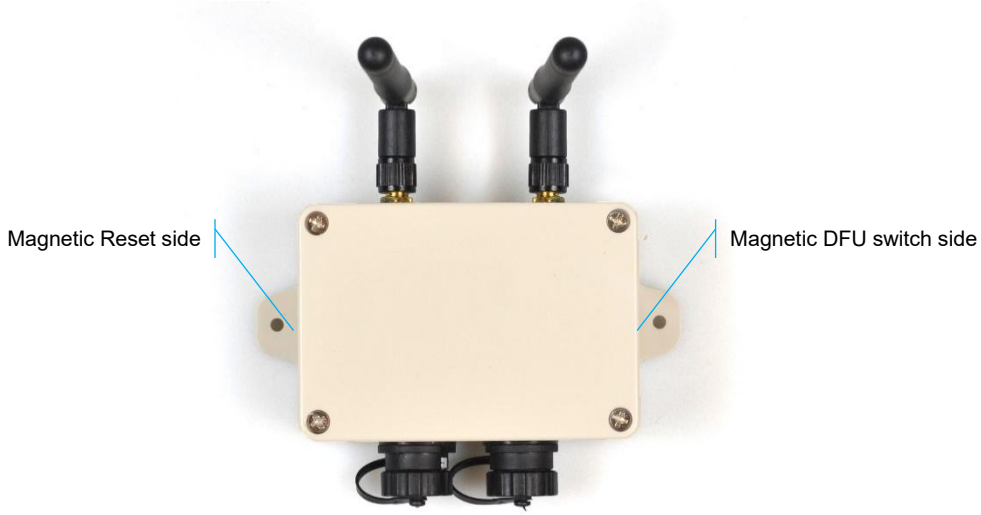
The steps below describe the first setup of the system.

This is a Non-Inverse Architecture. You can find the description and comparison of architectures here.

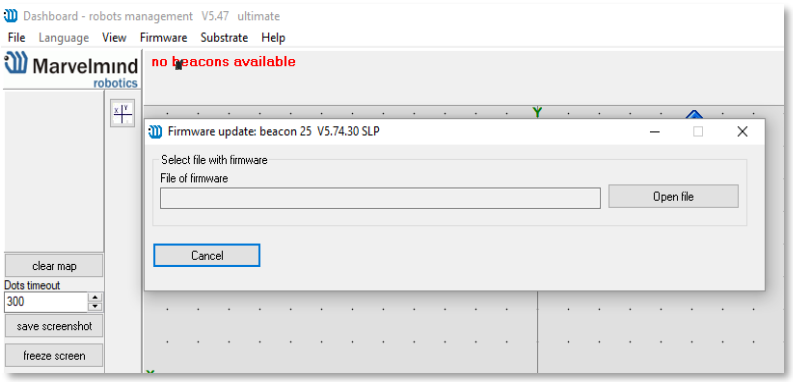
Pay attention: Industrial beacons have different HW and SW.
Read more on the **Industrial Beacon page**.
Industrial beacons have no battery, so use a power supply cable.
Use specific Industrial beacon's SW for specific Industrial beacons.

Do not disassemble the Industrial beacons. Otherwise, the warranty will be lost.
Version 3 of Industrial RX (from April 2022) **supports ONLY +5V power supply**. Don't use a +12V power supply converter for this version, it will burn the beacon!
Version 3 doesn't have UART RX, but now it is possible to use an Interface connector as a power supply for this version.

1. Unpack the system. Take a look at the similar unpacking video for HW v4.9. They are different, but they have some similar basics
2. You do not have to charge Industrial beacons; they have no battery
3. You do not have to turn it on - Industrial beacons are permanently ON
4. Download SW Pack
5. Update all the beacons:



6. Run the Dashboard and update the SW for all beacons and modem using **Dashboard => Firmware => Choose the file => Program**



If you receive “Windows protected your PC” windows, check this chapter

Note: On Windows 10 and later, the STM32 USB driver is installed automatically by the OS – no manual driver installation is required. The Dashboard does not show the driver download link in recent versions

7. Ensure that:

   - 7.1 You are programming the modem’s SW to the modem and the beacon’s SW to the beacon
   - 7.2 You are using SW for Industrial beacon if you have Industrial beacons, and you have the SW from the same SW pack, i.e., the Dashboard SW, modem SW, and beacon SW must be from the same SW pack. Don’t mix SW releases

If you face any issues during the software update, use DFU for updating the device. Check out **Software Updating via DFU Mode chapter**.

If you have uploaded the latest firmware for all the boards, you can start to activate the system:

8. While the beacon or modem is connected to the Dashboard, click the DEFAULT button on the Dashboard to upload the default settings

9. Write down the beacons' addresses for future use or change the address at your convenience as shown here:

Hedgehog mode	enabled
Inverse system	enabled
Distances only mode	disabled
Supply voltage, V	3.70
Desired speed, % (0..100)	30
Time from reset, h:m:s	00:00:04 R
Measured temperature, °C	23
RSSI, dBm	-74
Radio frequency band	915 MHz
Carrier frequency, MHz	919.000
Device address (0..254)	154
Radio channel	0
Ultrasonic frequency, Hz (100..65000)	n/a
Filter selection	n/a
IMU	(+) expand
Parameters of radio	(+) expand
Ultrasound	(+) expand
Interfaces	(+) expand
Georeferencing	(+) 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

11. Choose the Industrial-TX-25 beacon and enable “Hedgehog mode”. Use this beacon as a mobile beacon in the future. Here is a help video

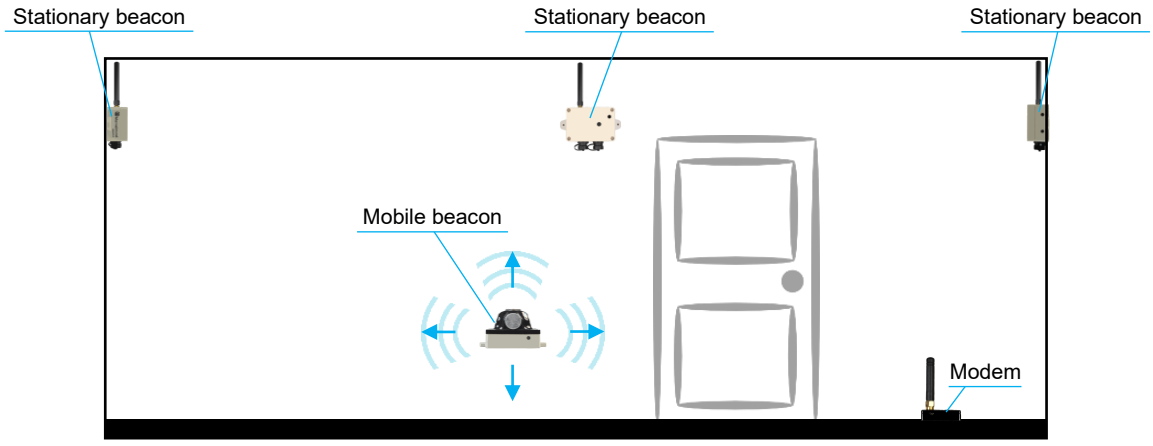
Power save functions	enabled / active
Hedgehog mode	enabled
Supply voltage, V (3.50..4.35)	4.08
Time from reset, h:m:s	00:02:55 / 19.20.54 / 0
RSSI from modem, dBm	-81
RSSI to modem, dBm	n/a
Profile	General (915 MHz band)
Carrier frequency, MHz	919.0
Radio channel	0
Device address (1..254)	104
Height, m (-320.000..320.000)	0.000
Measured temperature, ℃	23
Ultrasonic frequency, Hz (100..65000)	45000
Advanced settings	(+) expand
IMU	(+) expand

12. Press the RESET (Industrial beacons have magnetic re button on your beacons and modem after programming

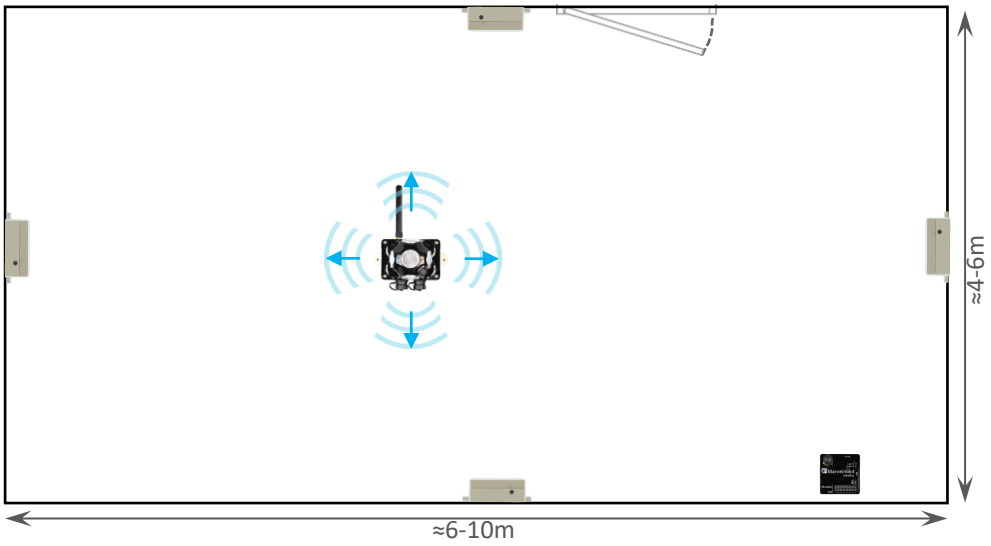
13. After programming devices with the latest software, the modem and beacons are ready for use

14. Place the stationary beacons high on the walls vertically in a way that will provide optimal ultrasonic coverage. Write down the beacon’s height for future changes in the settings. The help video on installation can be found here

15. Side view:



17. Top view:

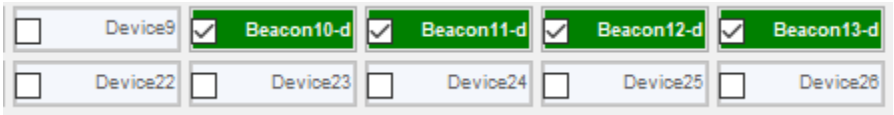


18. Connect the modem via USB to a Windows PC with the Dashboard installed

19. Run the Dashboard. In the left corner of the Dashboard, the modem should be shown as connected

20. Wake up all beacons by clicking on the buttons in the Dashboard on the panel

21. It may take up to 7-10 seconds for the beacons to wake up



22. If the modem is not active and is not powered, the beacons will go into sleep mode automatically after 1 minute

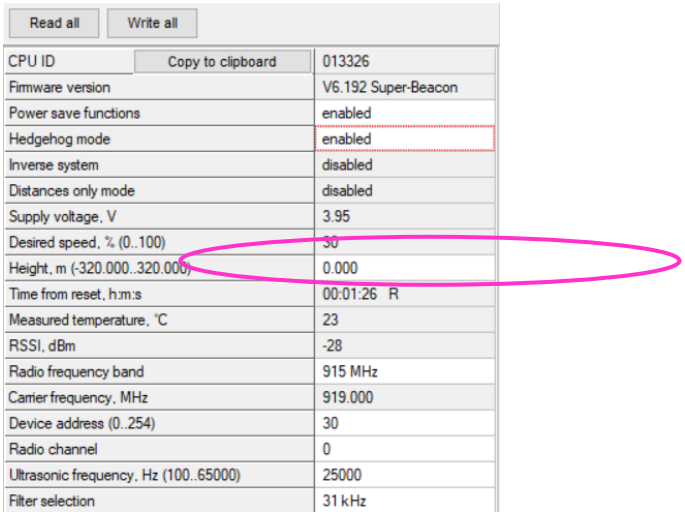
23. The system may run the frequency search if it is the first time you wake up the beacons. If this step does not work, disconnect the modem and connect that beacon again via USB. Press the DEFAULT button in the Dashboard and the Read All button to make sure that the radio settings are the default ones

24. Check that the radio settings on the modem and the radio settings on the beacon are the same

25. Now you can check RSSI, voltage, ultrasonic filter settings, etc., on the panel in the right corner of the Dashboard

Supply voltage, V	3.95
Desired speed, % (0..100)	30
Height, m (-320.000..320.000)	0.000
Time from reset, h:m:s	00:01:26 R
Measured temperature, °C	23
RSSI, dBm	-28
Radio frequency band	915 MHz
Carrier frequency, MHz	919.000
Device address (0..254)	30
Radio channel	0
Ultrasonic frequency, Hz (100..65000)	25000
Filter selection	31 kHz

26. Enter the height of stationary beacons. Choose beacon in the list and enter the height value



Enter the height for the mobile beacon if you use 2D mode

One modem in the current version supports 250 beacons (mobile + stationary combined). If you do not see some of your connected beacons on the map, you may need to scroll to find their addresses

27. Double click on the device to put it into sleep mode or wake it up

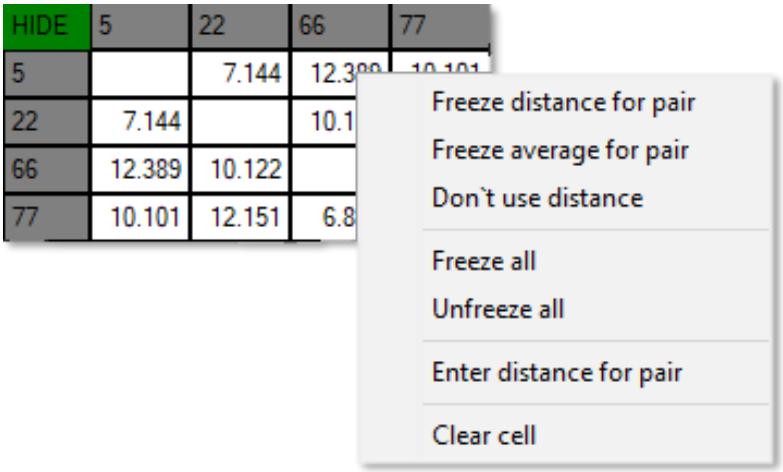
Only 4 stationary beacons may be in 1 submap. If you wake up more beacons, create a new submap for them. Or it won't be displayed on the map or in the distances table.

28. Now you can proceed to building the map:

Industrial-RX beacons cannot build the map automatically, so you have to make it manually.

29. Open the Dashboard. You will see the table of distances

30. Right click on the cell where you want to enter the distance. An additional menu will open; there you can control the distances. Choose **Enter distance for pair** to enter the value

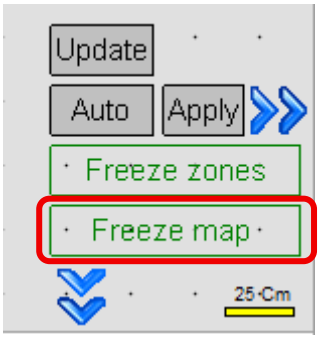


31. Now, enter the measured value (measure it with a laser distance meter or so). Those values will not change until you unfreeze or clear them. Even if beacons had been moved, distance would stay. Be careful with frozen cells because a small mistake can significantly impact your tracking!

32. 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	

33. Freeze the map by clicking the button. Stationary beacons will stop measuring relative distances and will be ready to measure the distances from the mobile beacon(s)



34. Build the service zone for the submap after freezing it. Use Shift+Left Mouse Button clicks on the map to draw the zone boundary. Alternatively, use the Auto-build service zone feature (right-click on the submap button) to automatically build a zone based on beacon positions. For 3D maps with multiple submaps, use the 3D auto-build feature. After building, verify the zone covers the intended tracking area and adjust if needed. See the Submaps chapter for details

35. Turn on and wake up the mobile beacon, following the same steps as the stationary beacon. Here is a help video

36. If you see on the devices' panel in the Dashboard that the beacon is colored orange, it means there are some differences in some of the settings between beacons. For example, some sensors may be off, and some ultrasonic or radio settings may be different. You can manually change the sensors' settings by clicking on the panel in the upper right corner of the Dashboard to change the cells from gray to green to turn on the sensor. It is recommended that the default settings on all beacons and the modem be used if this is your first time using the system

37. After you freeze the map of stationary beacons, wake up the mobile beacon. It will be traceable within 5-7 seconds

38. The system is now fully operational