Precision Agriculture

RadioNet

Advanced valve control

/ User Manual

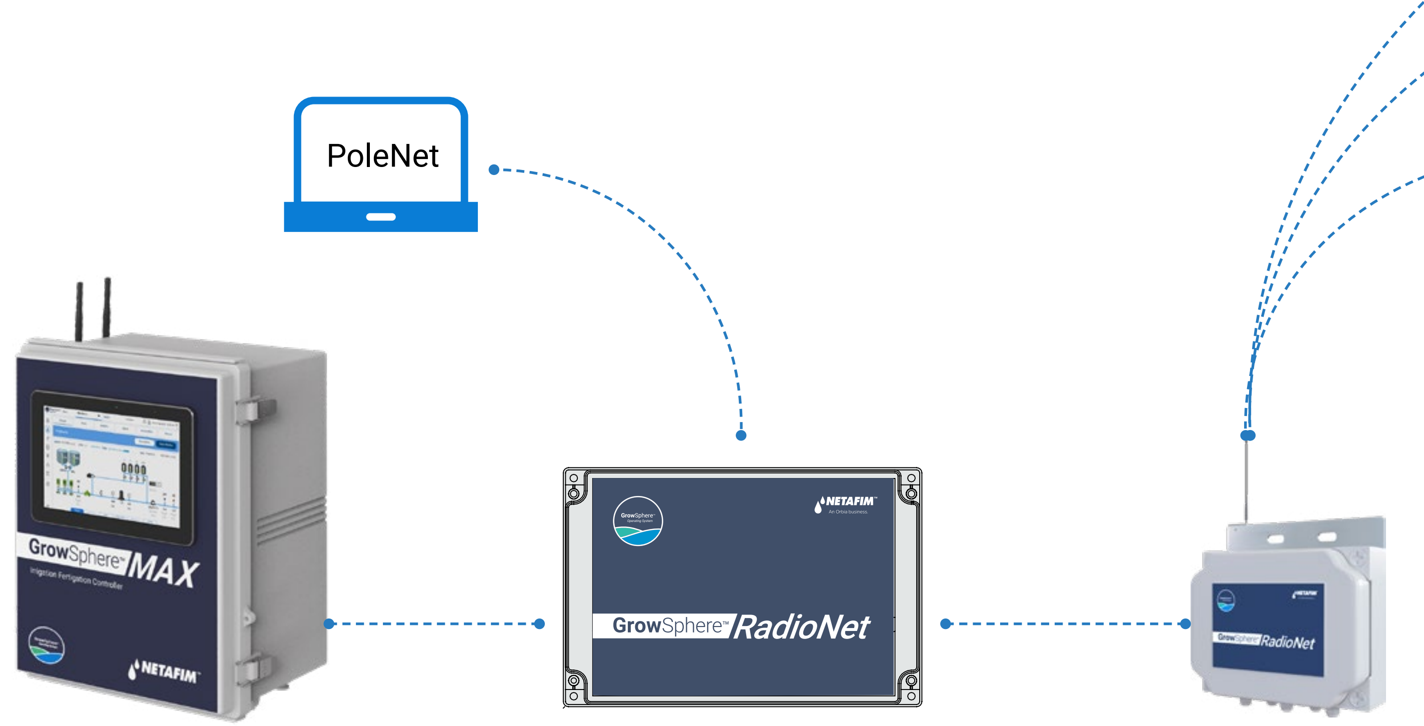
Scan to GrowSphere™ website

Controller Version 1.0

Contents

1. Introduction

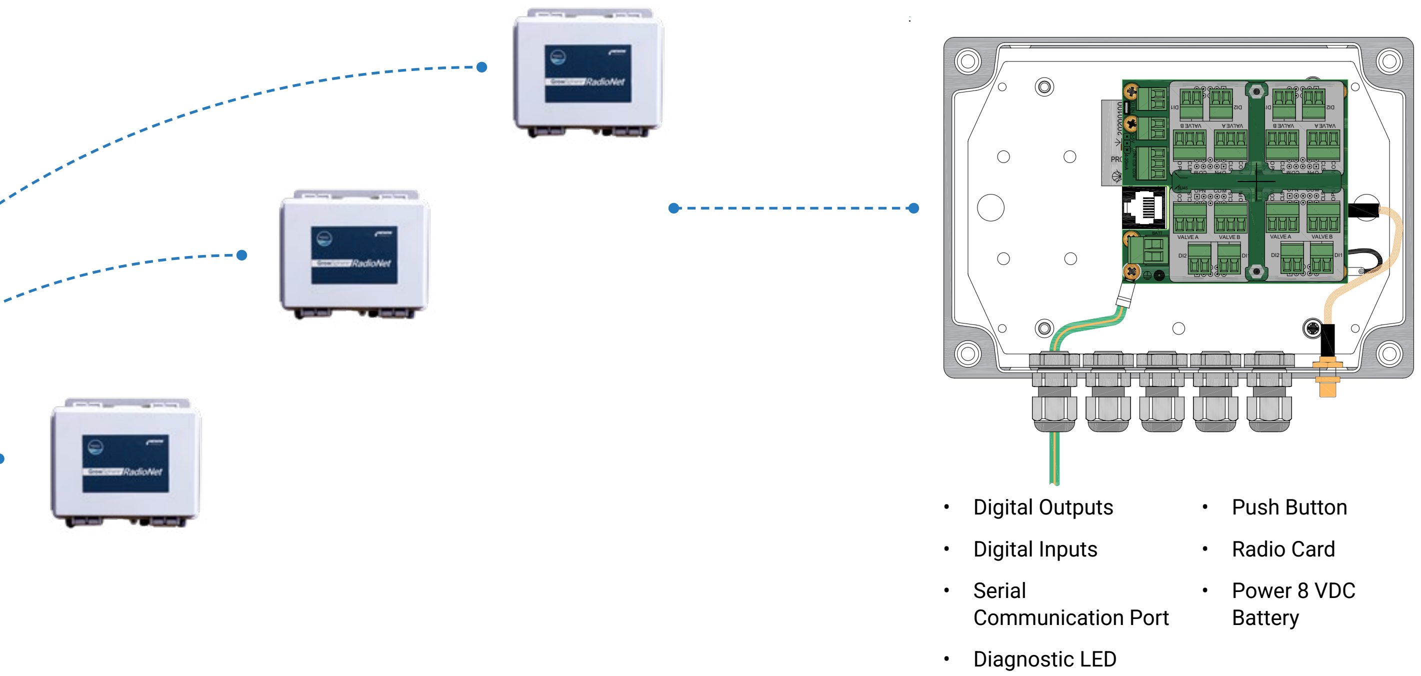
GrowSphere RadioNet by Netafim is the new generation of wireless control and monitoring systems. Extra detail has been given to the RadioNet range of products to make it versatile, reliable and user friendly.



The Control Device, GrowSphere™ Max

The Host Unit

The Base Unit



The 3 basic components include the Host, Base and Remote units.

The Host includes multi-interfaces giving it the ability to integrate to a wide range of controllers commercially available for horticultural automation.

The RadioNet Base can manage up to 254 remote units in a wireless network including the option of using multi-layer store & forward (SAF) repeaters.

The RadioNet remote units are modular in size from 1,2,3,5,7 and 9 digital outputs according the RadioNet remote unit model.

Establishing wireless connectivity presents a unique set of challenges, which often includes natural obstacles, remote locations and distant central office. There is a need for amplified reliability to protect against unplanned downtime in the operation process. There may be already-in-use technologies that will not enable wired solution (retrofit).

Understanding these issues and how to address them is essential in deploying a remote wireless solution.

Netafim's broad-base design, manufacturing and engineering capabilities gives RadioNet the distinct advantage of having a full control and monitoring solution under one reliable system.

Its superior communication, connectivity and programmability makes RadioNet an agile system that enhances the performance, data and operating reliability of remote sites.

2. PC Software – GrowSphere™ PoleNet

The Netafim PoleNet PC is a user-friendly interface software designed specifically for RadioNet and SingleNet Netafim devices.

Notably, this software is exclusively compatible with Windows Operating Systems.

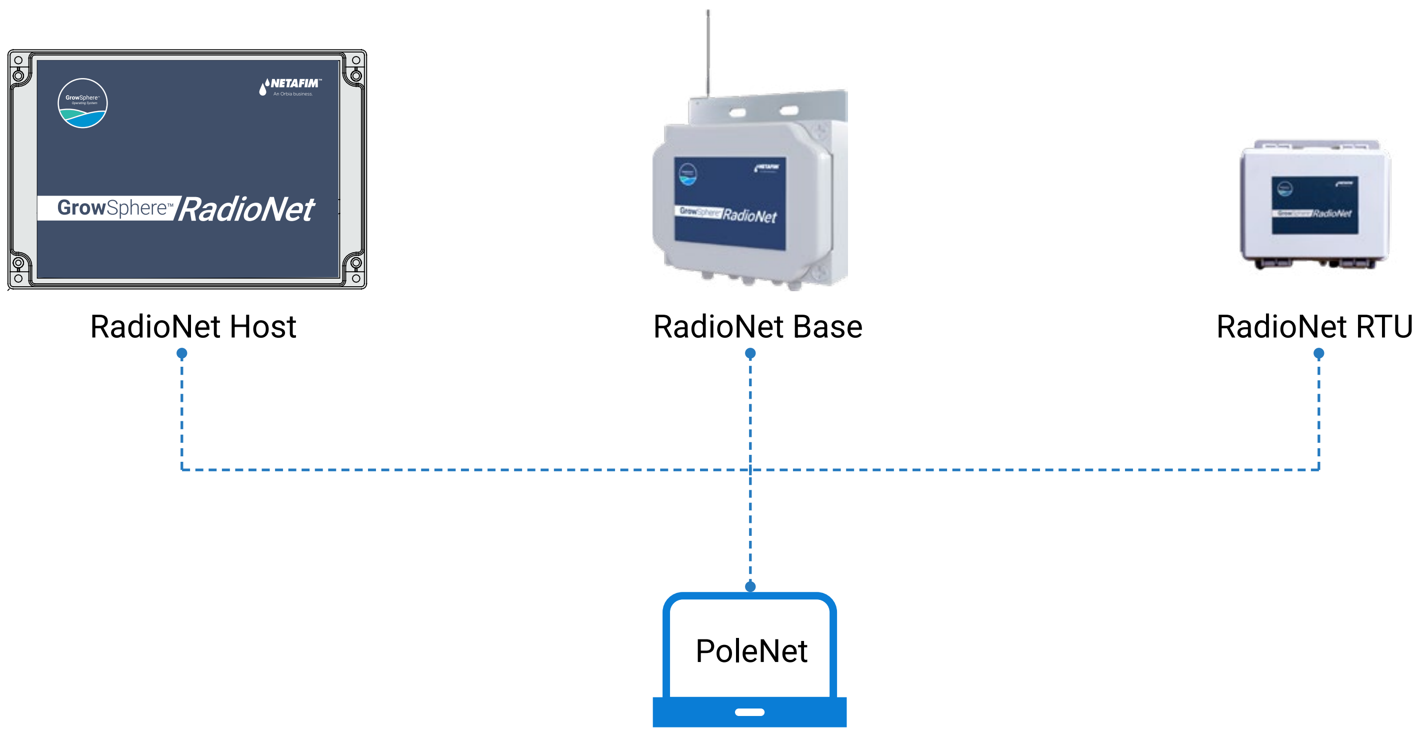
The Netafim PoleNet PC software includes three fundamental functions.

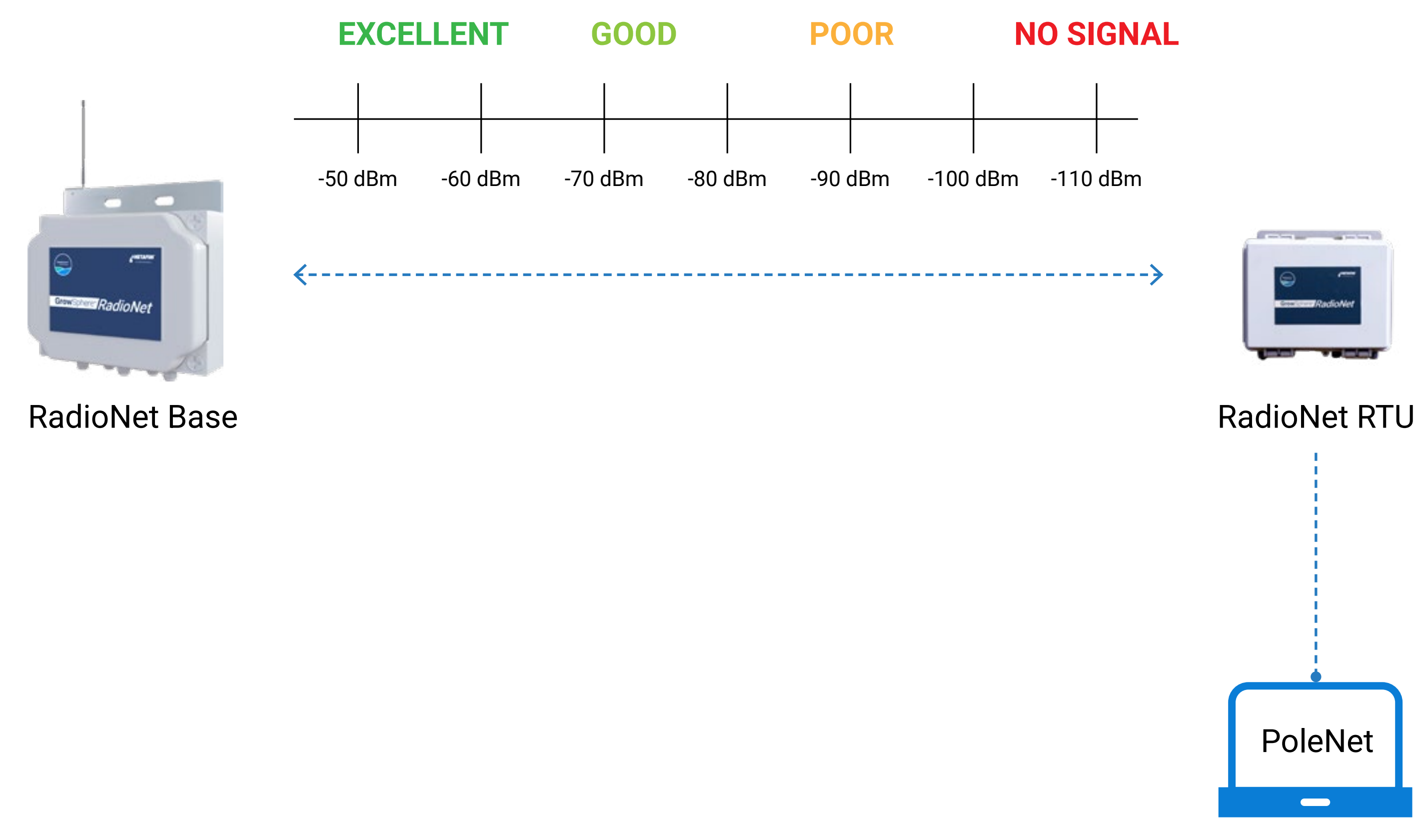
- Configuration tools for the RadioNet & SingleNet Hardware.
- Local & remote diagnostic tools for the RadioNet & SingleNet Hardware.
- Conducting radio survey analysis for the RadioNet System.

Configuration tools include programming of the radio, mapping, network management and setting alarm levels.

Diagnostics tools include the testing of digital inputs and outputs, monitoring signal strengths, battery voltages and operating temperatures.

As RF signals are invisible, the PoleNet PC software provides us with additional user-friendly tools to assist in designing and managing and diagnosing RF networks.

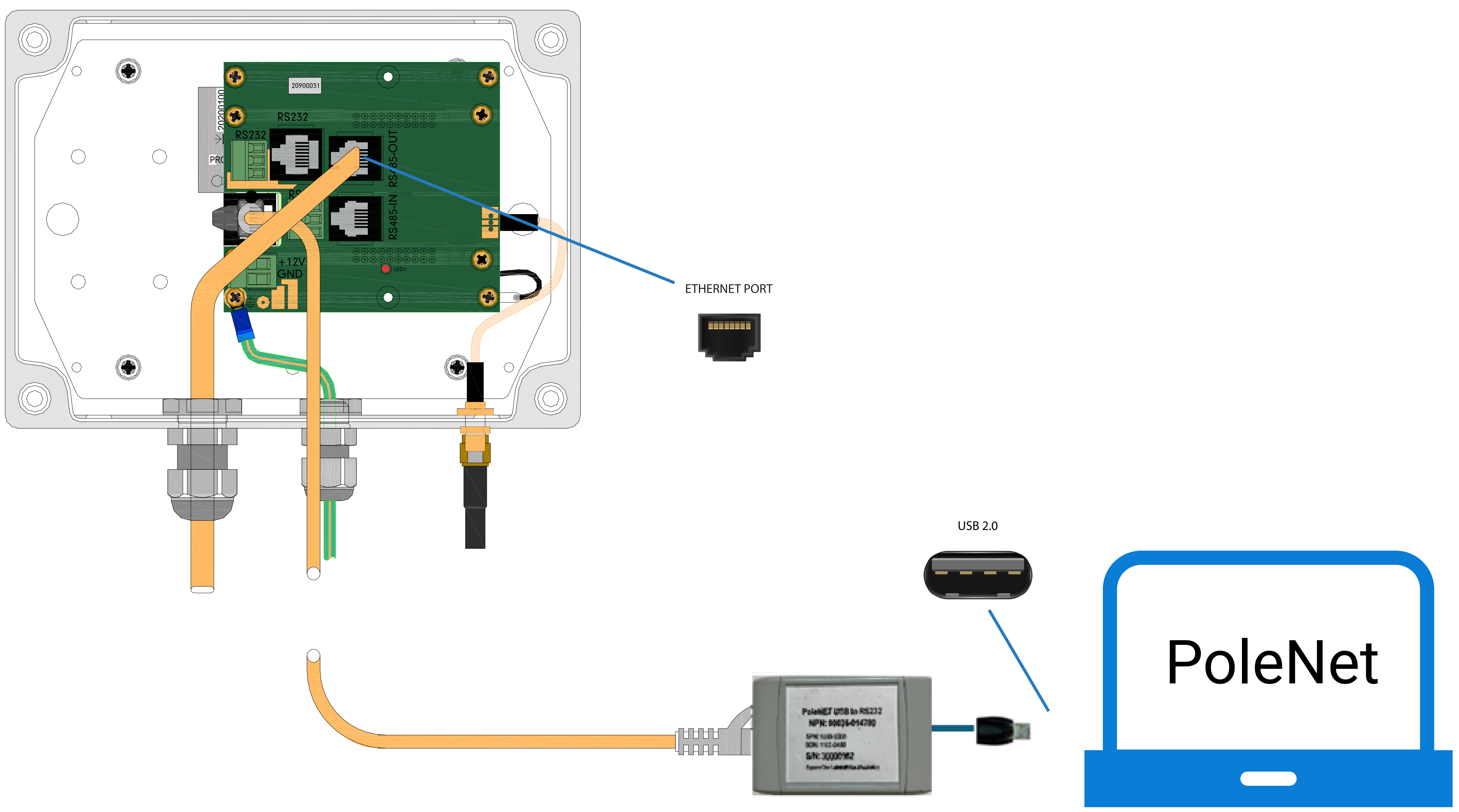




3. PC Communication Connection to RadioNet Base Unit

Set 1 Connect Communication lead.

Base Unit -Direct communication connection via USB Port



4. Settings and Definitions for a New RadioNet System

To initiate a new radio system or project that requires definition and creation, the following components are essential:

- RadioNet Host
- RadioNet Base Station
- All RTU remote units of the system

A new network is necessary to establish for the communication between all RTU remote units and the RadioNet Base Station.

Certain RTU remote units can be designated as SAF Remote units, which stands for Store and Forward (repeater).

These SAF remote units function as repeaters for the selected RTU remote unit.

This functionality is set when there are RTU remote terminals that lack a clear line of sight with the RTU Base or are situated at a distance exceeding the maximum communication distance between the Base RTU and the remote RTU.

There are two options for setting the Remote RTU network:

1. **Adding each RTU manually:**

Enter the ID number, type, and expansion card for each RTU remote unit manually.

This process can be conducted offline without the need for physical connection to the RadioNet Host.

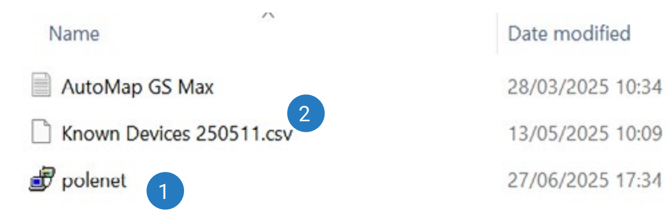
2. **Adding each RTU automaticaly:**

Connect the RTU remote units one by one to open the PoleNet software. This action will read and add each RTU remote unit, including its RTU ID, type and expansion cards.

This recommended settings process will ensure accuracy and set the appropriate settings for each RTU remote unit.

4.1 Definition of a RadioNet Remote RTU Network Manually

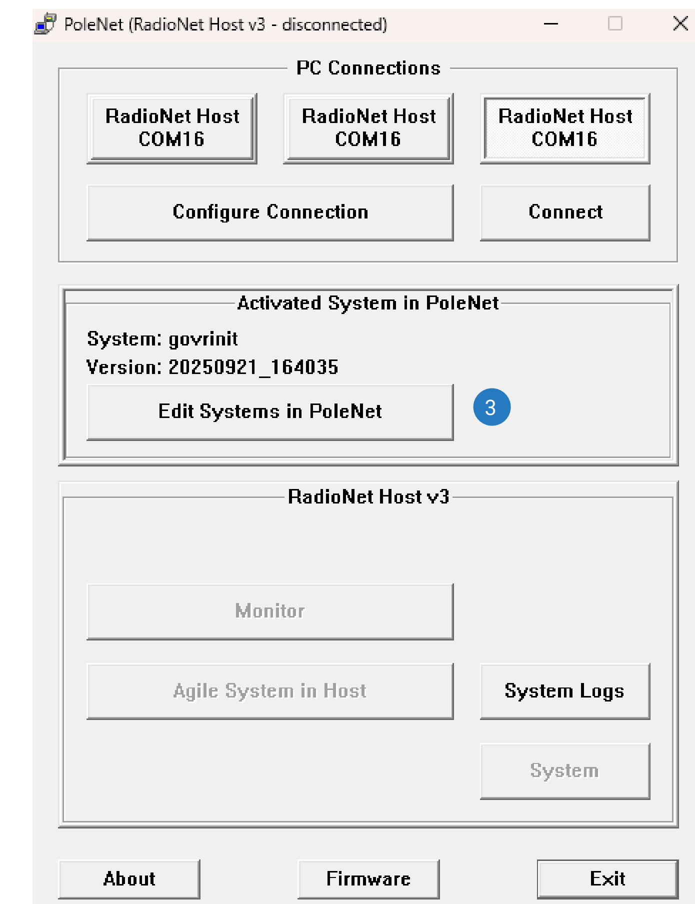
1. Launch the PoleNet PC software.
2. Verified the presence of the Files “AutoMap GS Max” and “Know Devices 250511.csv” within the same folder.



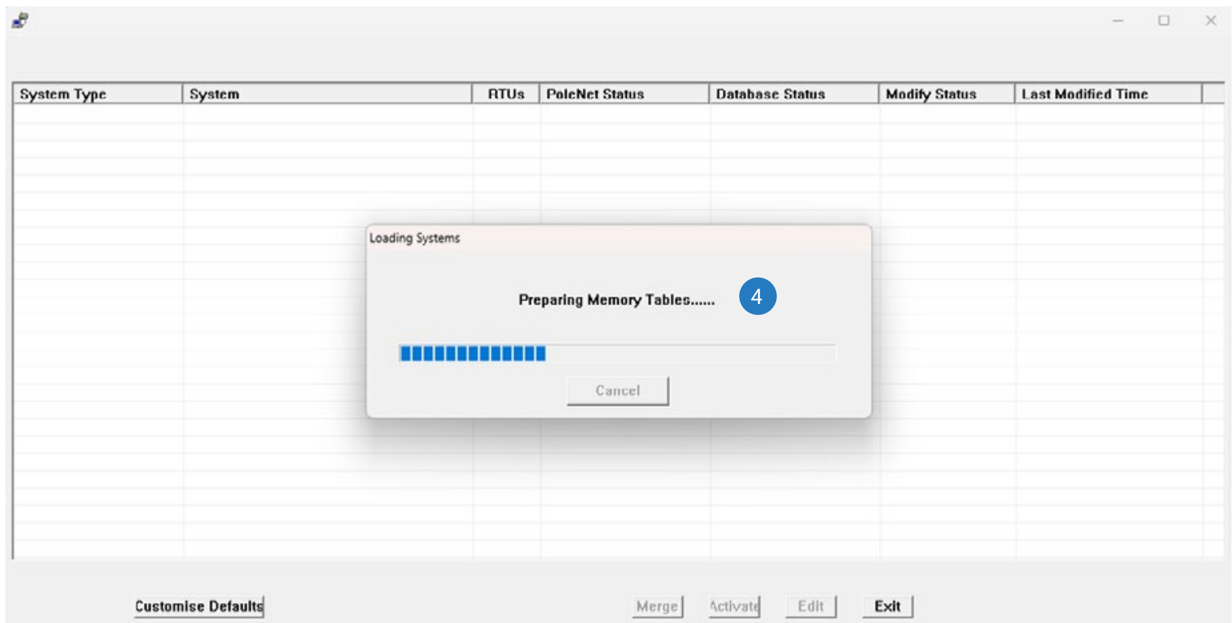
3. Select “Edit System” from the menu.

NOTE

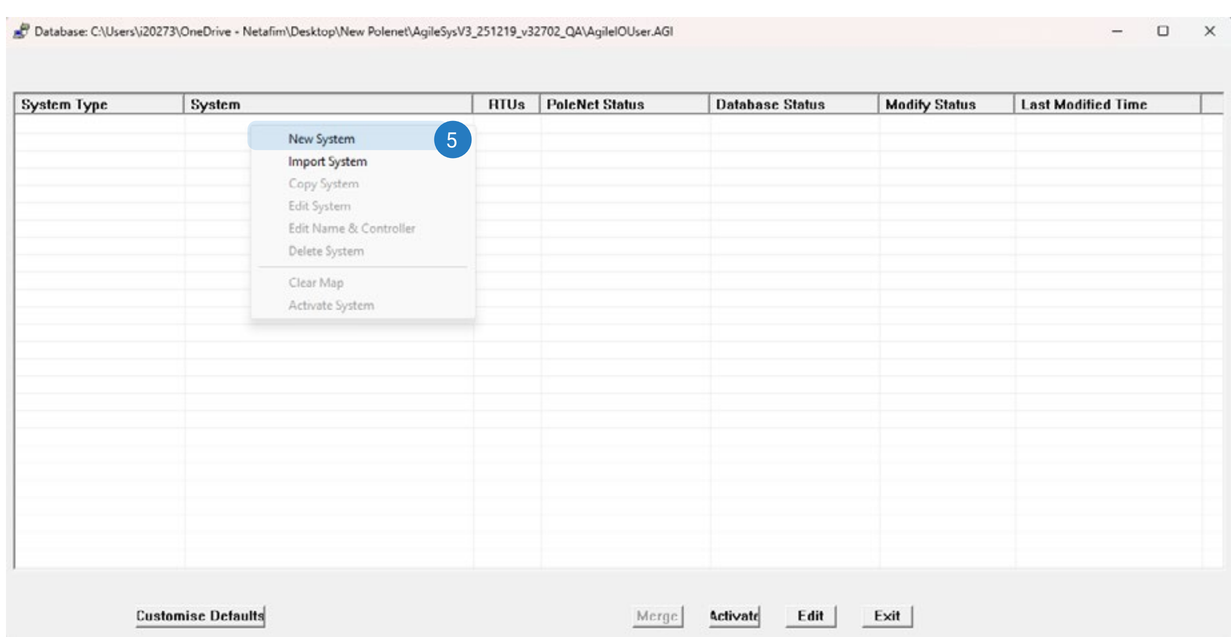
It is not necessary to be connected to the Host.



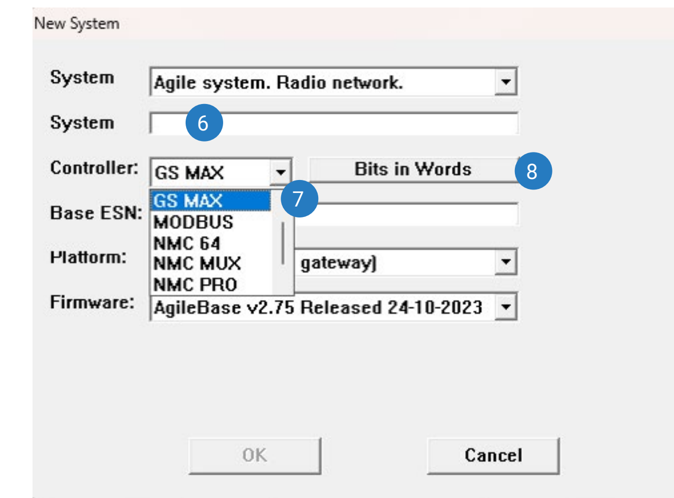
4. A new screen will be opened, and a new database will be created in the same location as the PoleNet software is located.



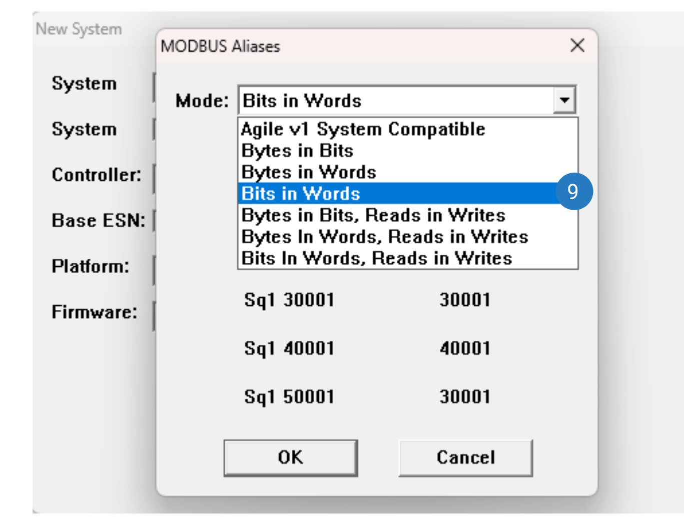
5. Right-click on the new screen and select "New System."



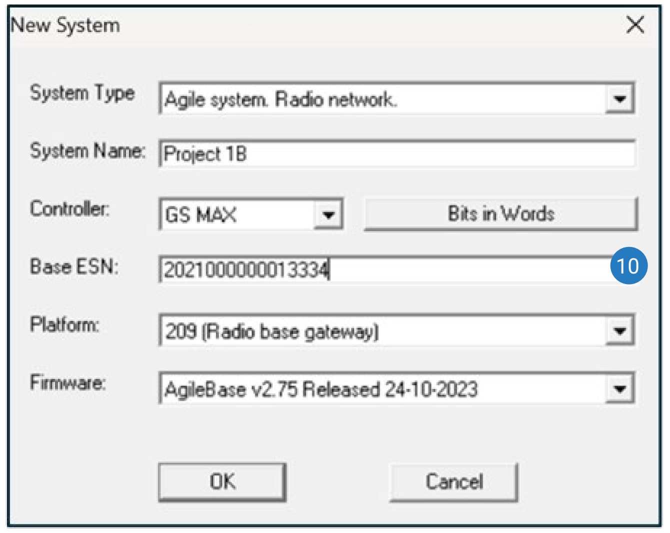
6. Write the System Name that you like to give to this system, in this case the name is Project 1.
7. Select Controller: GS Max.
8. Click on Select an Alias mode



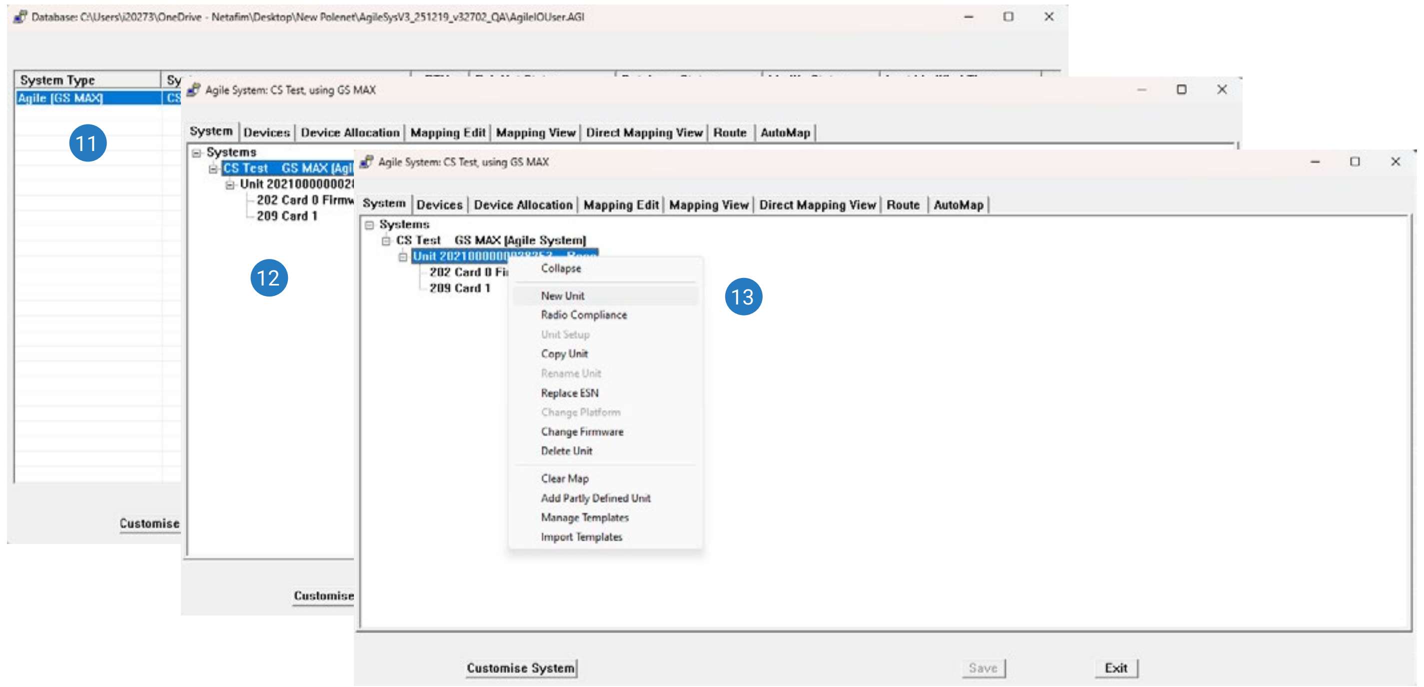
9. Chose Bits in Words. Select OK.



10. Set the ID of the RadioNet Base Station.



11. A new System is created, then Right click on the System name (Project 1).
12. The base will be added to the system.
13. Right click on the Base, at the new window select New Unit to start adding the RTU remote units that are on the network of this new system- Project 1.



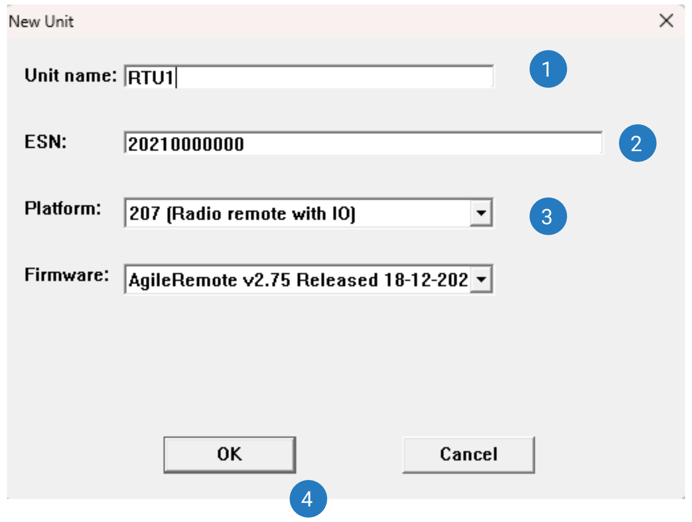
4.1.1 Settings for the RadioNet RTU Network.

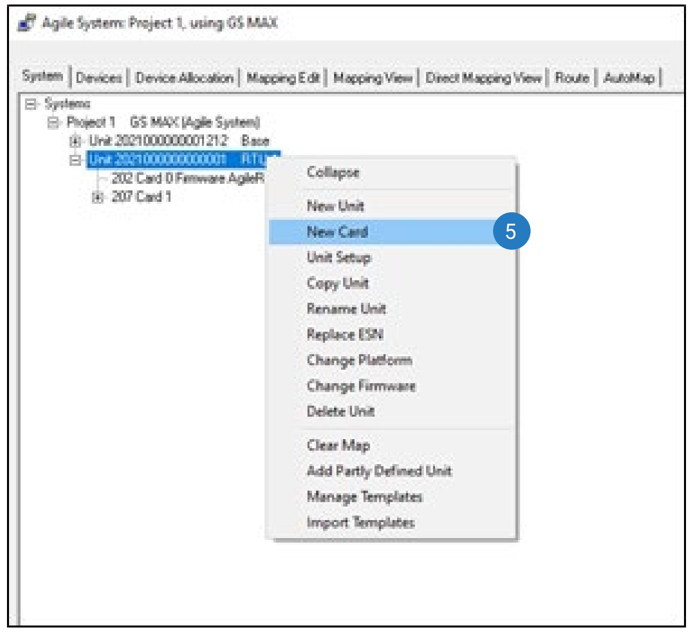
When the New Unit was selected, then on the new window will need to be set:

1. The Unit name: on this example was set RTU 1
2. The RTU ID – ESN (electrical serial number) it is a fix number that was given at the factory.
3. Set the Platform, it is the RadioNet type, the system can have 3 RTU types.

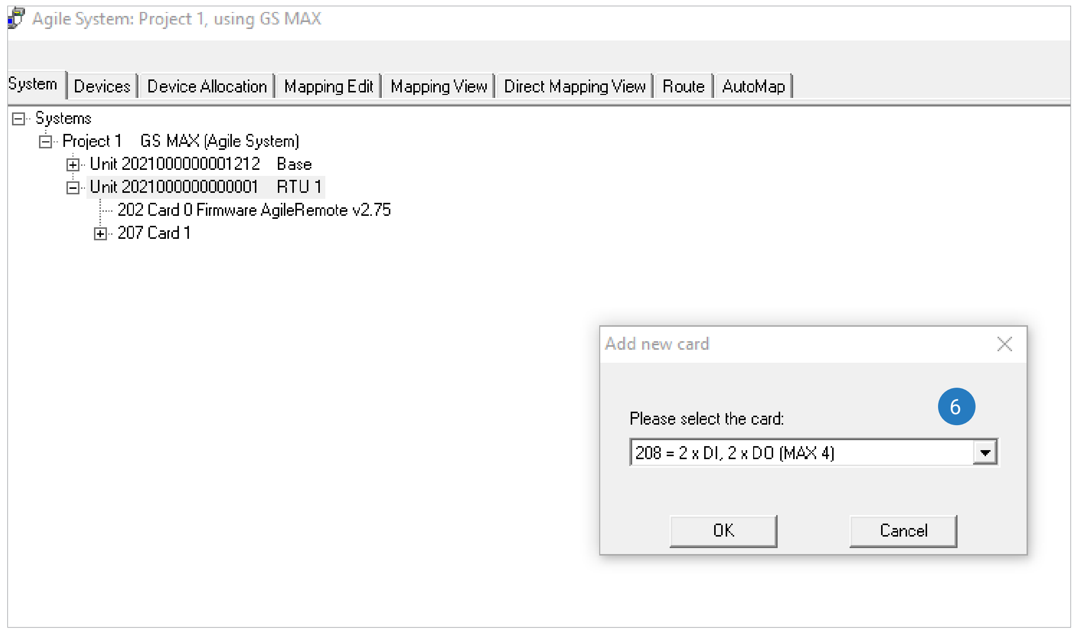
- 207 (Radio remote with IO) it corresponds to the RadioNet Agil RTU
- 232 (Radio data acquisition) it corresponds to the RadioNet DCP RTU
- 307 (Radio remote 2x2) it corresponds to the RadioNet 2x2 RTU.
  in this case the RadioNet Agile RTU (207) was selected.

4. Click OK.
5. The Agile RTU was added to the system. Expansion cards can be added to this RTU. Right click on the RTU unit will open a new selection window with several selection options. Choose New Card.

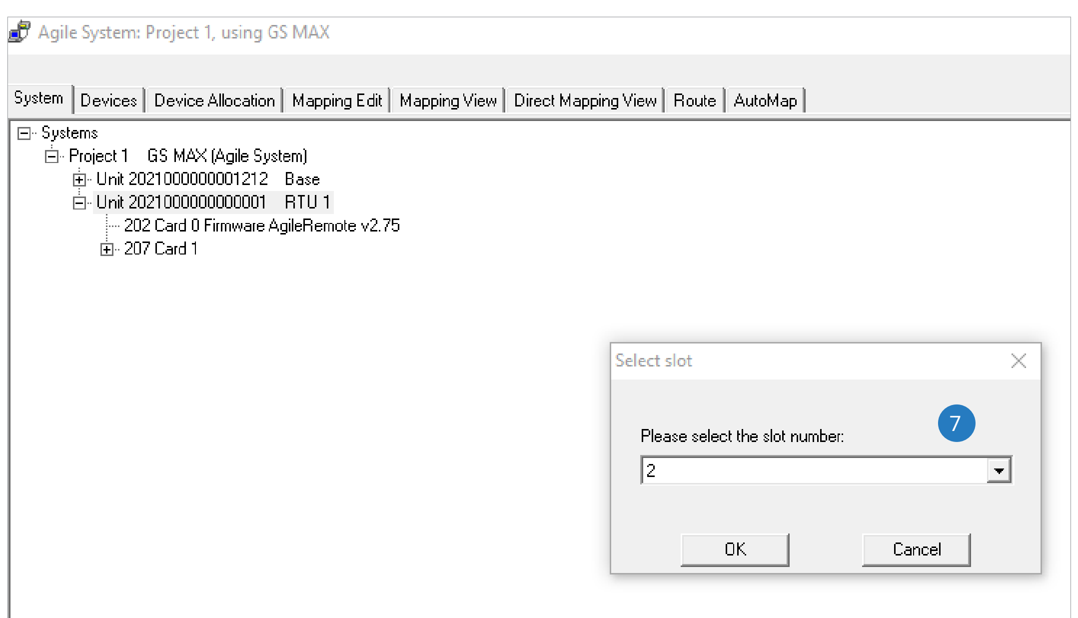




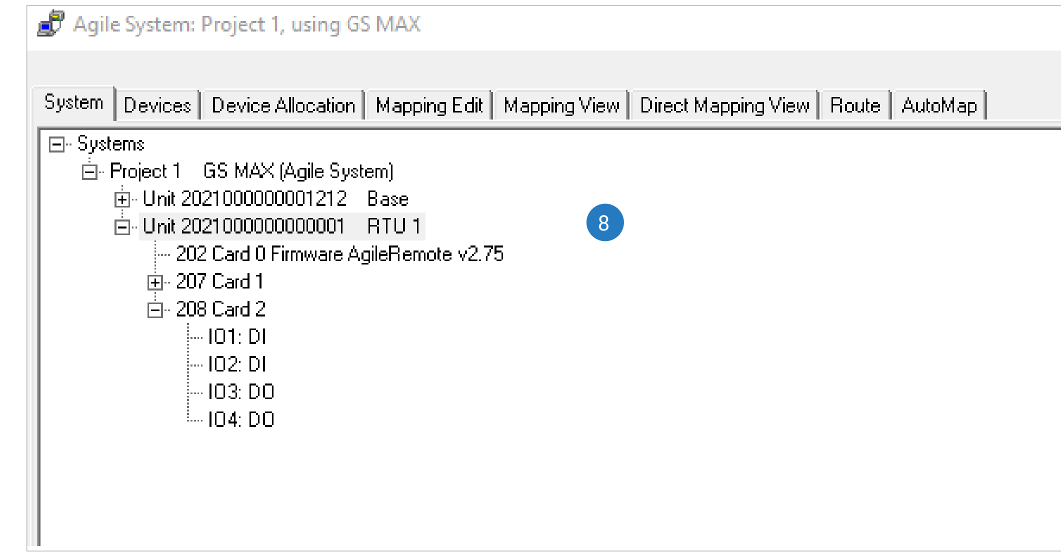
6. On the new window choose the card 208=2xDI,2xDO (Max4).



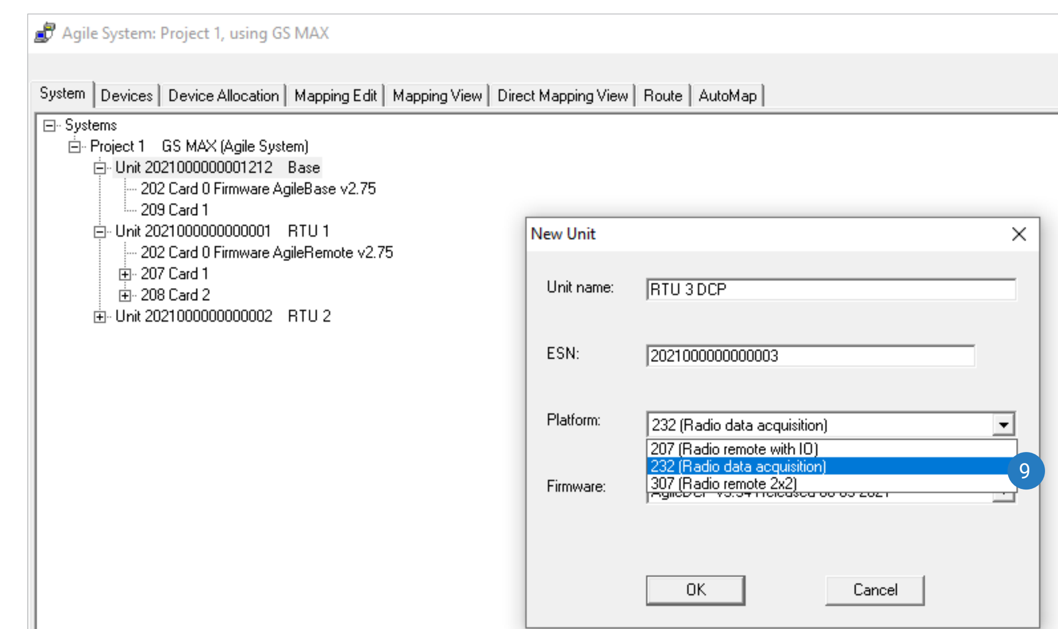
7. The Agile RTU has 4 open locations (slots) for the expansion card. The location numbers are Expansion Card 2,3,4, or 5. (the Card 1 is the main card).
The card 2 was selected.



8. The expansion card with 2 Digital Inputs and 2 Digital Outputs was added to the Agile RTU. The card is designated as card number 2 based on its location.
The maximum number of expansion cards that can be attached to the RTU is 4.

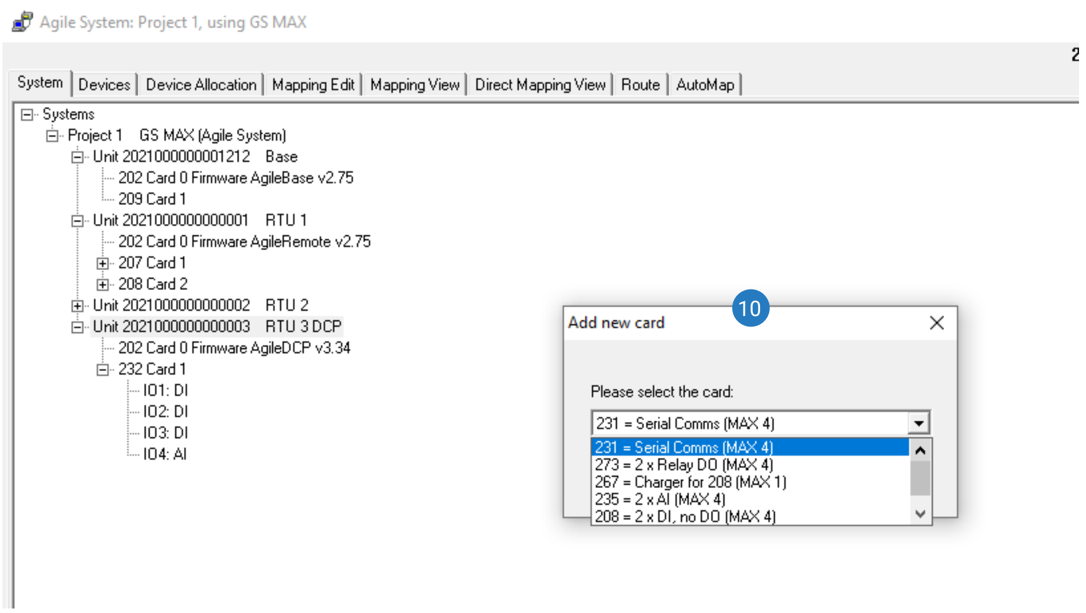


9. The next RTU that will be added is the RadioNet DCP RTU. The name of new RTU in the platform selection list is 232 (Radio data acquisition).
The 232 represent the card type.
Select this RTU and click OK

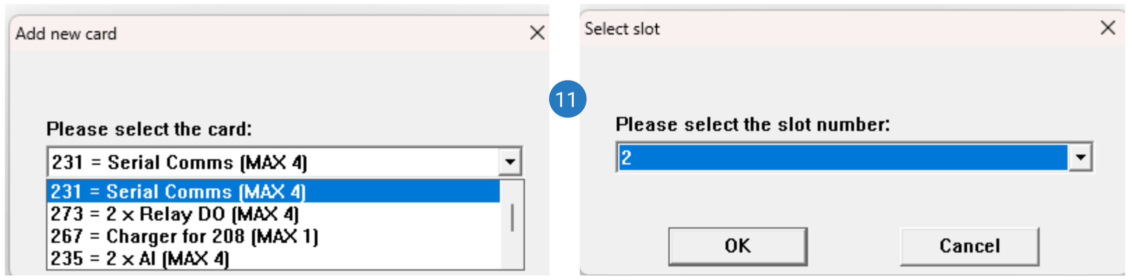


10. Expansion card selection
    The new DCP RTU was added to the Project 1, the mani RTU card 1 has 3 Digital Inputs and One Analog Input, The expansion cards that can be added are:

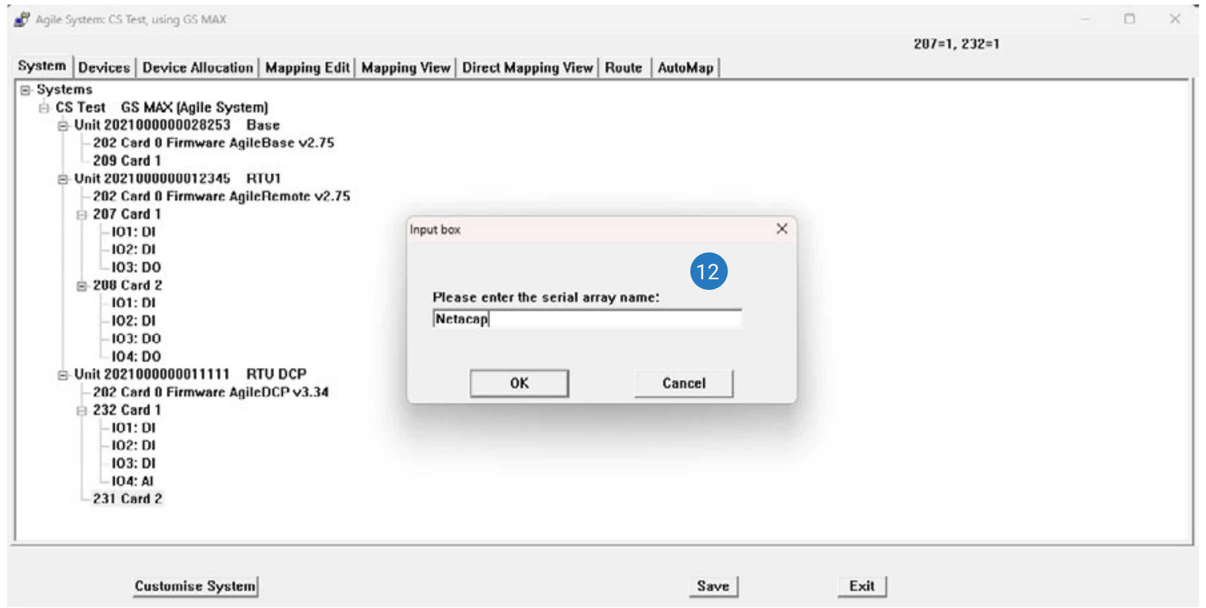
- 231 = Serial Comm, with Serial RS232, RS 485 or SDI12.
- 273 = 2Relay DO
- 267= Charge for 208. If needed when a card 208, 2 DI and 2 DO is selected.
- 235 = 2xAI. An Analog Input card.
- 208 = 2XDI, no DO (card 267 is not needed).
- 208 = 2xDI, 2xDO. (card 267 is needed).



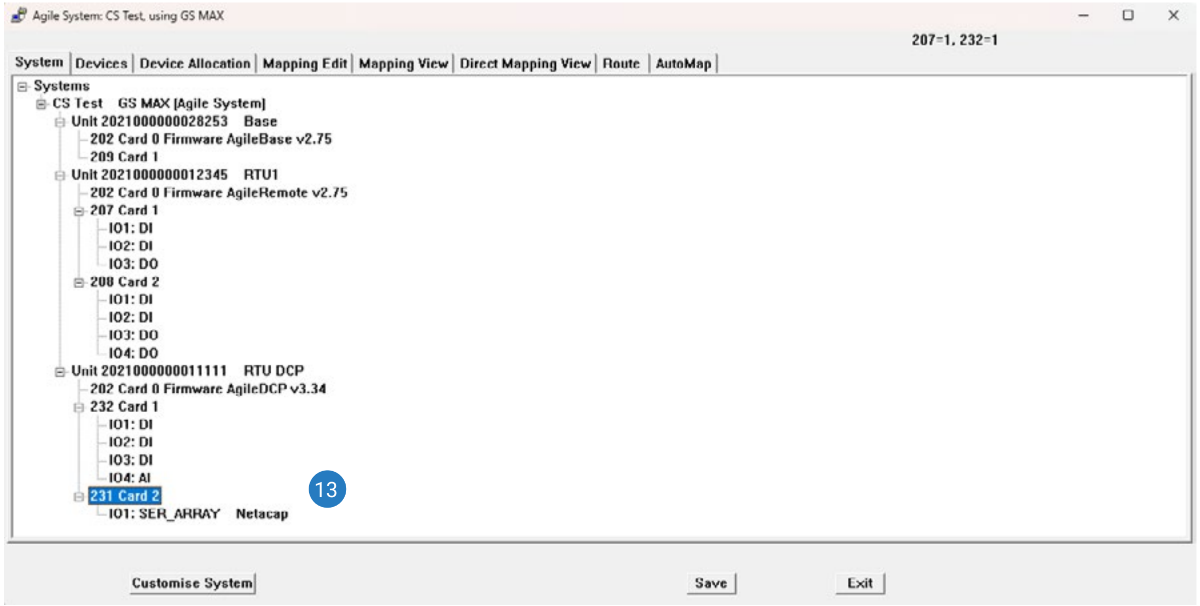
11. When the System is equipped with a NetaCap sensor, its definition must be established beforehand. To add the New Card to the RadioNet DCP RTU, select the Expansion Card “231=Serial Comms (Max4)” from the “Add new card” box.
    Next, select the card location number from the prompt “Please select the slot number:”.



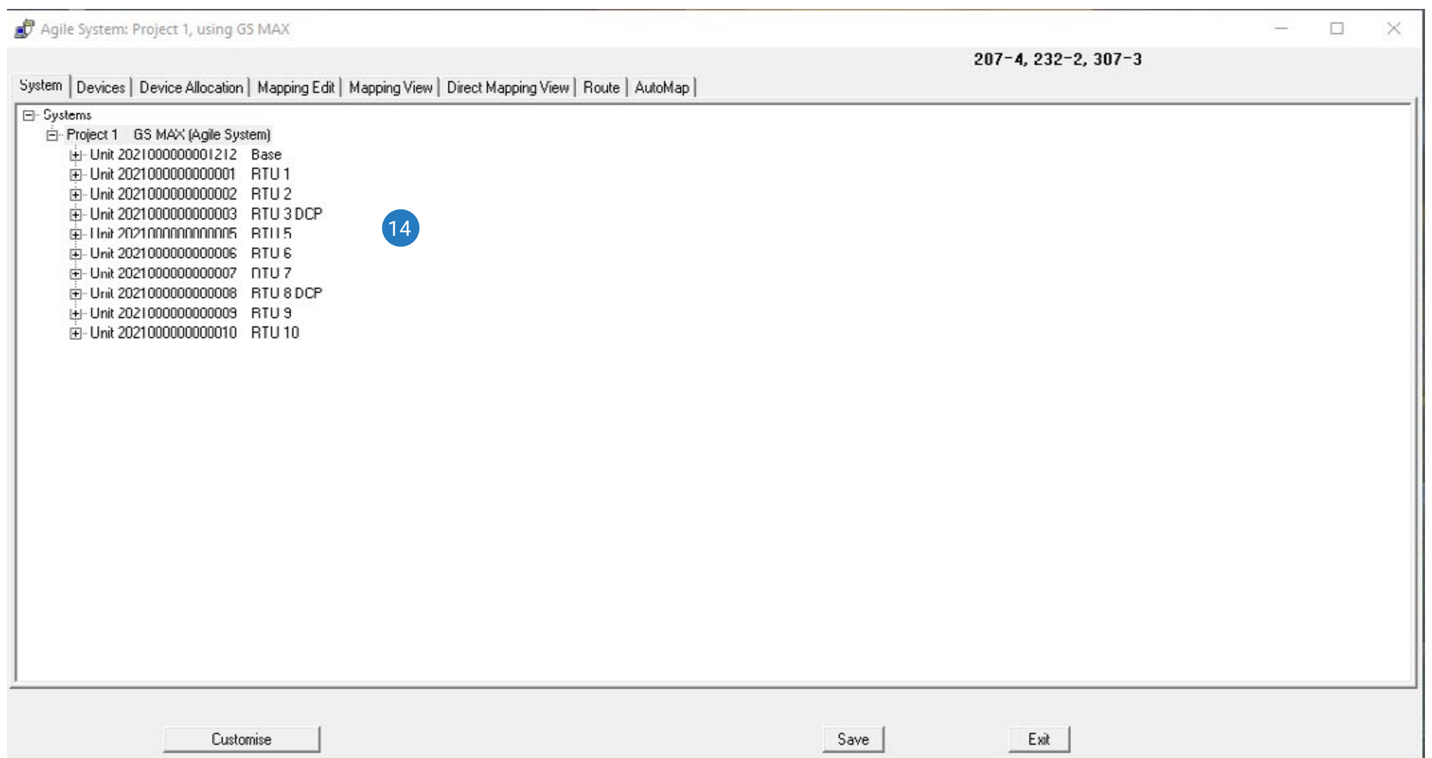
12. The card number 2 will be added. Right-click on the card number 2 and select “New Serial Array” from the popup window. A box will then appear asking to edit the serial array name. In this case, select “NetaCap” Confirm “OK.”



13. The Serial Card with the NetaCap name was added.



14. The RadioNet RTU network can be saved following the settings outlined in the preceding paragraphs.
    For Project 1, a network of 10 Remote Terminal RTUs was established.
    The RadioNet RTU 3 and 8 are RadioNet DCP RTUs. Select "Save" to save the setting on the System Database.



4.1.2 Settings for RadioNet RTU Route to the Base Station. Store and Forward – SAF.

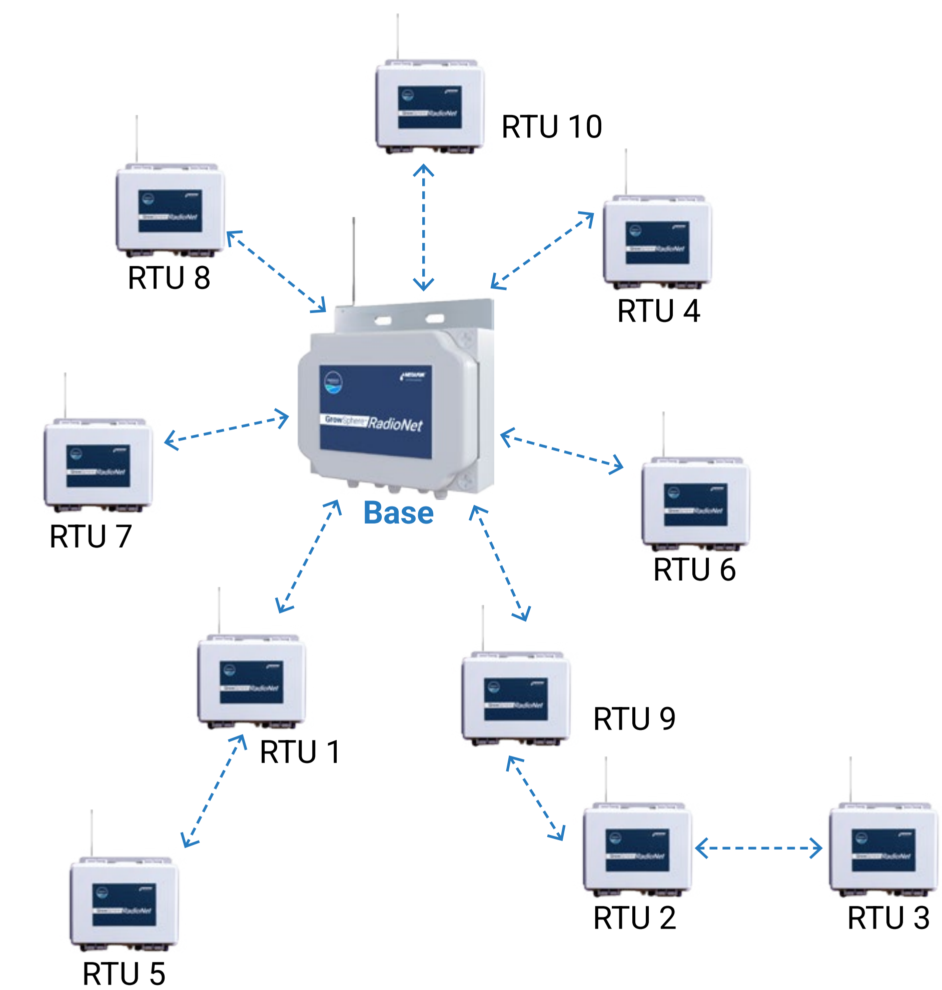
The RadioNet RTUs establish communication with the Base station to ensure optimal and stable connectivity.

To achieve this, the Remote RTU must maintain a clear line of sight between its antennas and the Base station, and it must not exceed the maximum range specified for the selected radio frequency.

The Remote RTU can be configured as a repeater, relaying communication between other RTUs and the Base station. This function is known as Store and Forward (SAF).

For instance, the following communication route will be established for System Project 1:

RadioNet remote RTU route to the Base station



- RadioNet RTU1 communicates with the Base RTU, which functions as a repeater SAF for RadioNet RTU5.
- RadioNet RTU 4, RadioNet RTU 6, RadioNet RTU 7, RadioNet RTU 8 and RadioNet RTU 10 communicates with the Base RTU.
- RadioNet RTU 9 communicates with the Base RTU, which functions as a repeater SAF for RadioNet RTU2. The RadioNet RTU 2 functions as a repeater SAF for RadioNet RTU3.

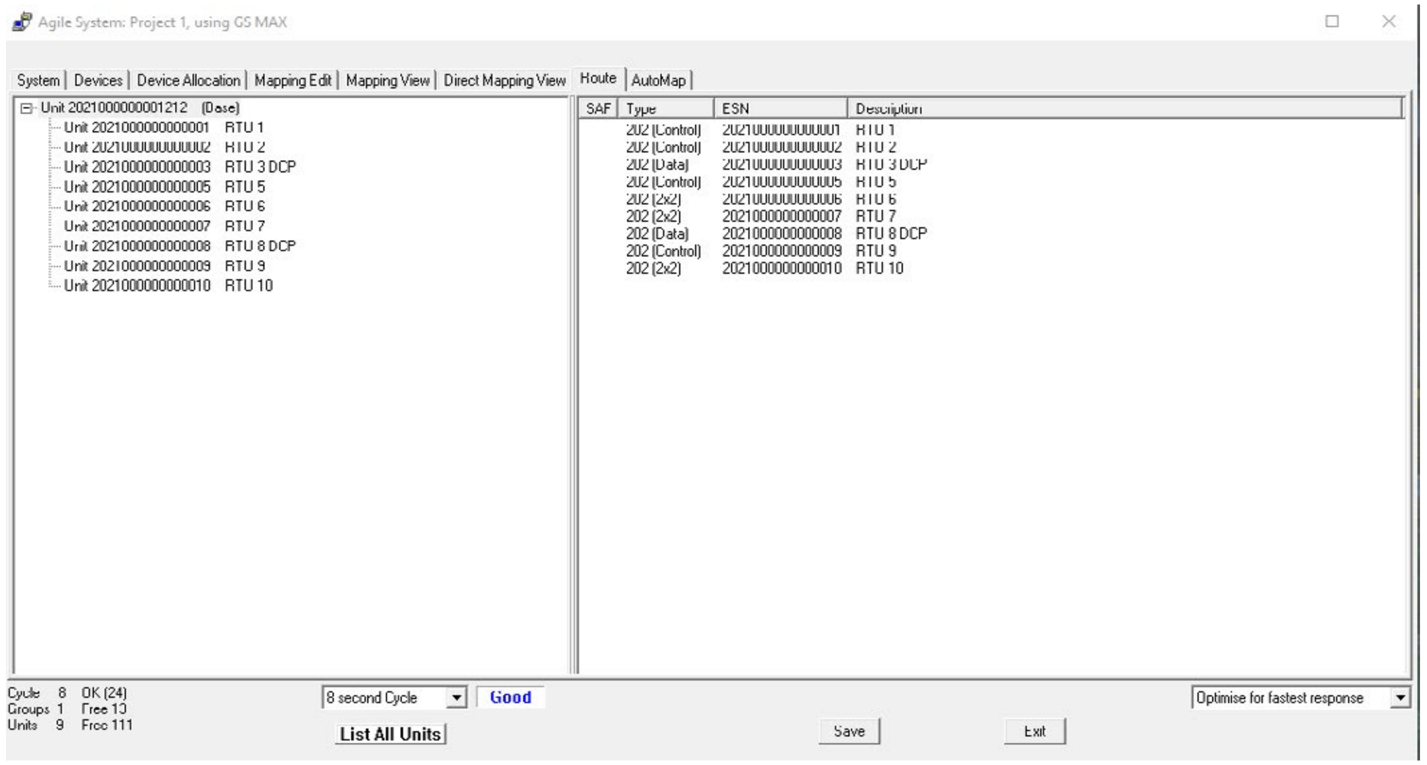
NOTE

Only the Remote Agile RTU and Remote 2x2 RTU are capable of acting as SAF RTUs. The Remote DCP RTU doesn't support the repeater function.

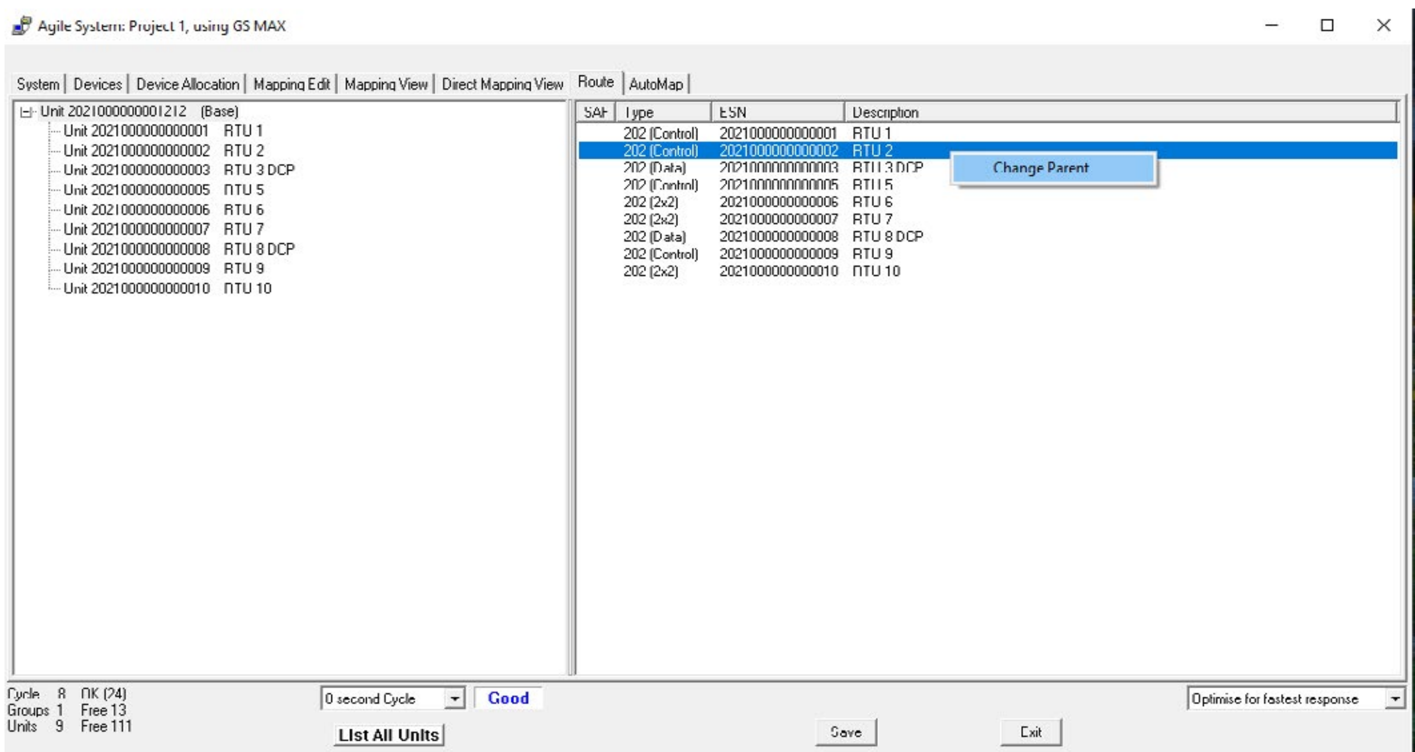
4.1.3 Route the Remote RTU Network to the Base RTU for Project 1

The PoleNet PC software incorporates a routing function that simplifies the routing process. This function is stored at the RadioNet Host and subsequently transmitted to the Base, where the radio network is established and configured.

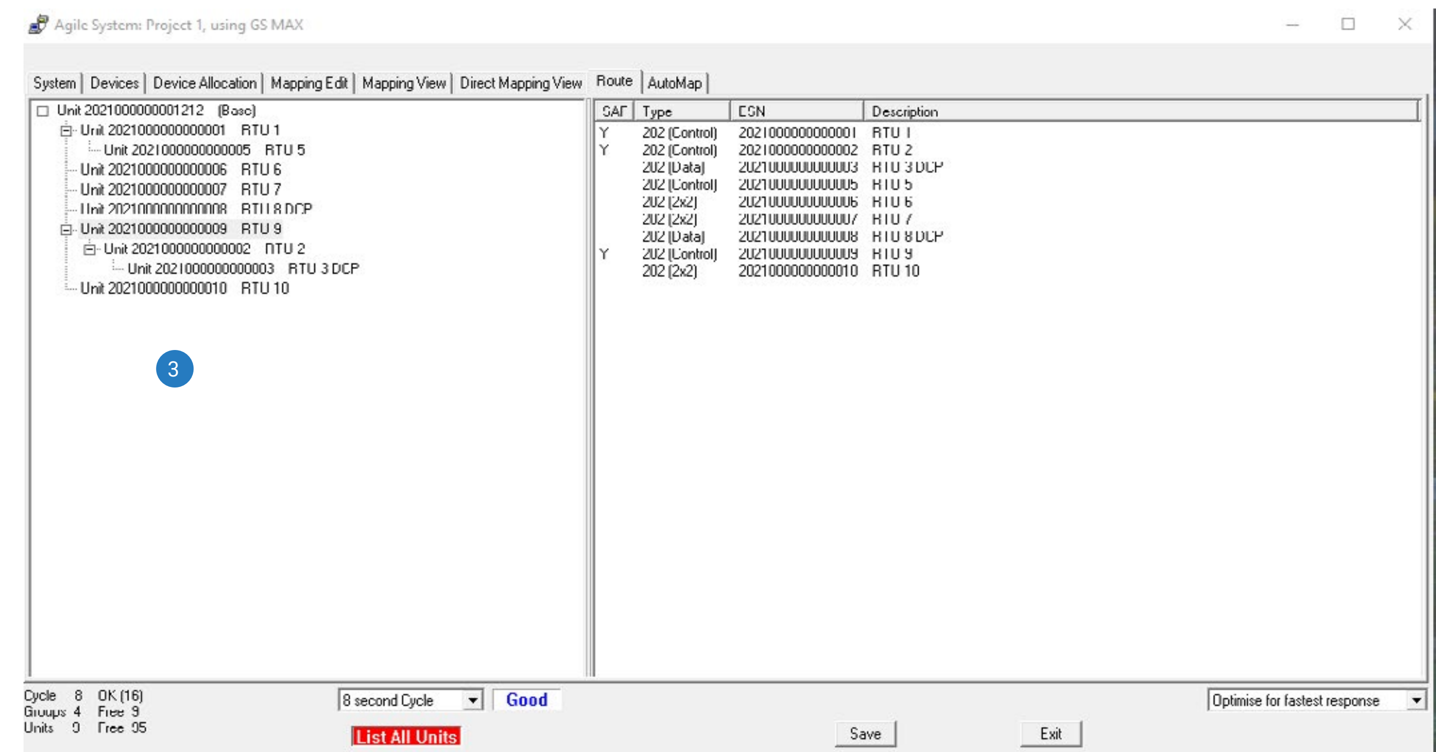
1. Select the "Route" tab. On the left side, you will find the RadioNet Base and RadioNet RTU of the system. On the right side, you will find a list of the RadioNet RTU that are set to communicate with the Base.



2. Configure the RadioNet RTU 2 to communicate with the base via the RTU 9. Right-click on the RTU 2 and select "Change Parent." The parent device is the RTU 9 through which the RTU 2 will communicate.). The parent can be the Base station or the selected RTU for SAF.



3. When all the RadioNet RTUs are already configured to their Parents, the Base RTU or the RadioNet RTU that will communicate, at the left side of the screen, the network route of the system Project 1 will be displayed.



NOTE

These settings are stored in the database of the PC where the configuration was performed. The procedure for downloading this database to the Host will be explained in paragraph 5.6.2.

5. Define a RadioNet RTU Network by Auto-Settings RadioNet RTU

The following paragraph explains the recommended procedure to build the RadioNet Remote RTU with the Base Station. This action will read and add each RTU remote unit, including its RTU properties, ID, type and expansion cards.

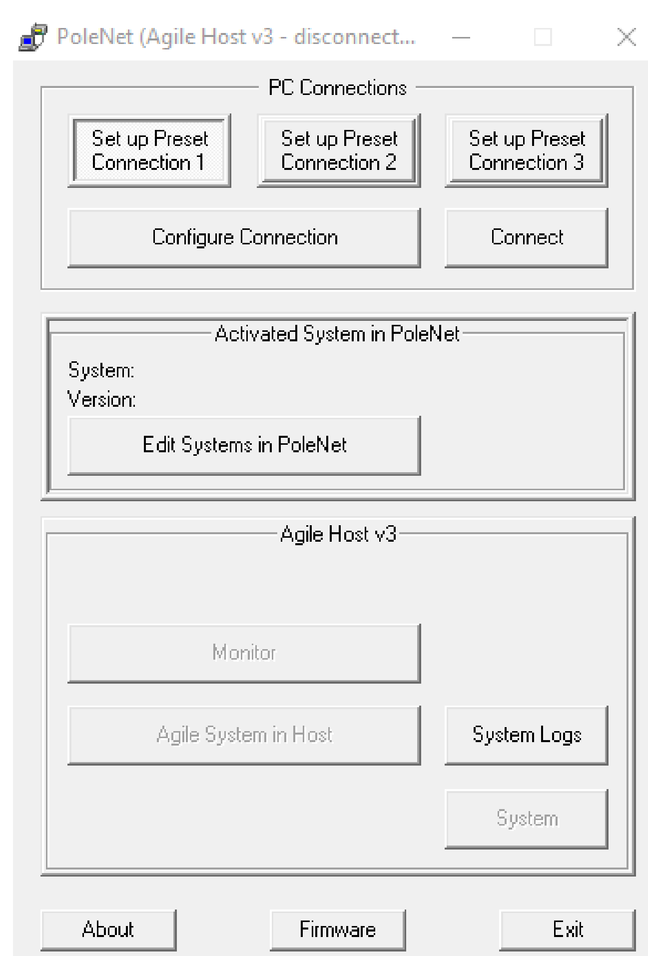
This recommended settings process will ensure accuracy and set the appropriate settings for each RTU remote unit.

5.1 Creating a New Project

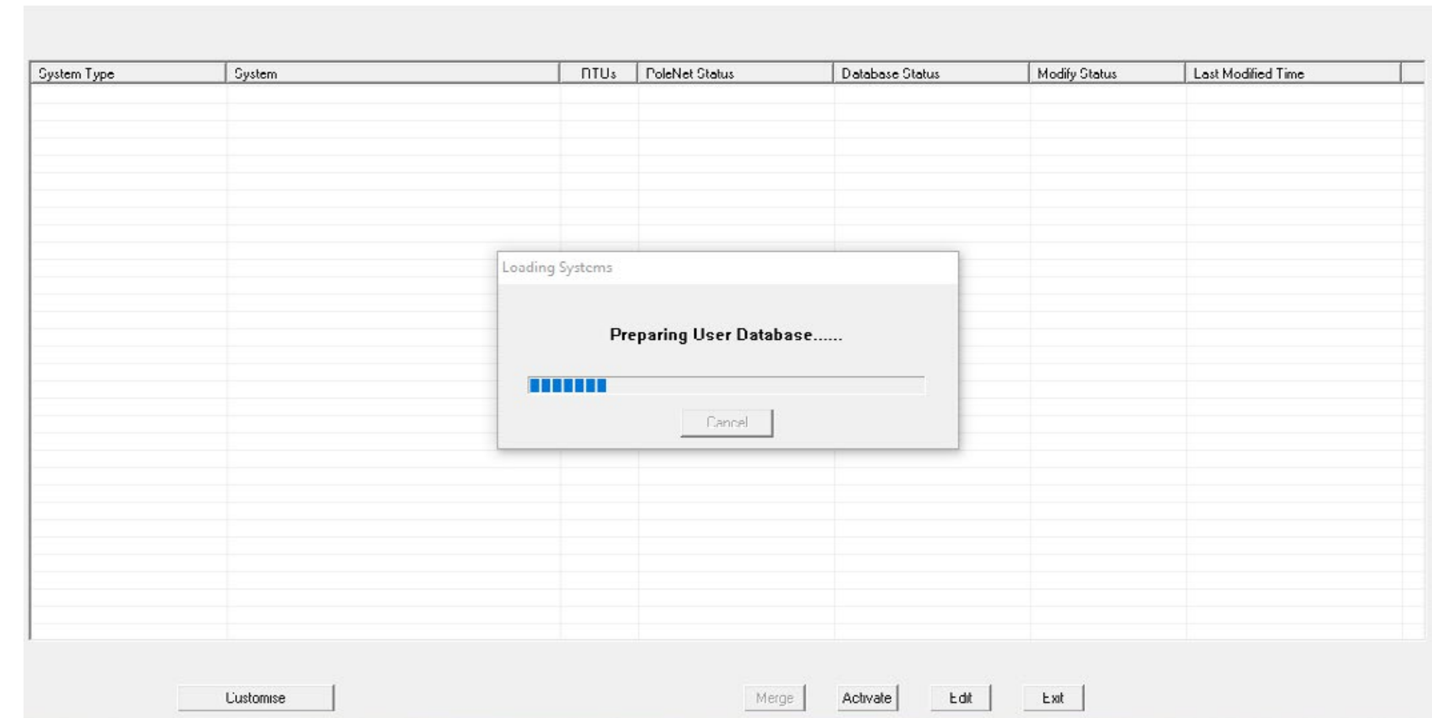
The user will need to create a new project before adding the Base station and Remote RTU.

1. Launch the PoleNet PC software and select

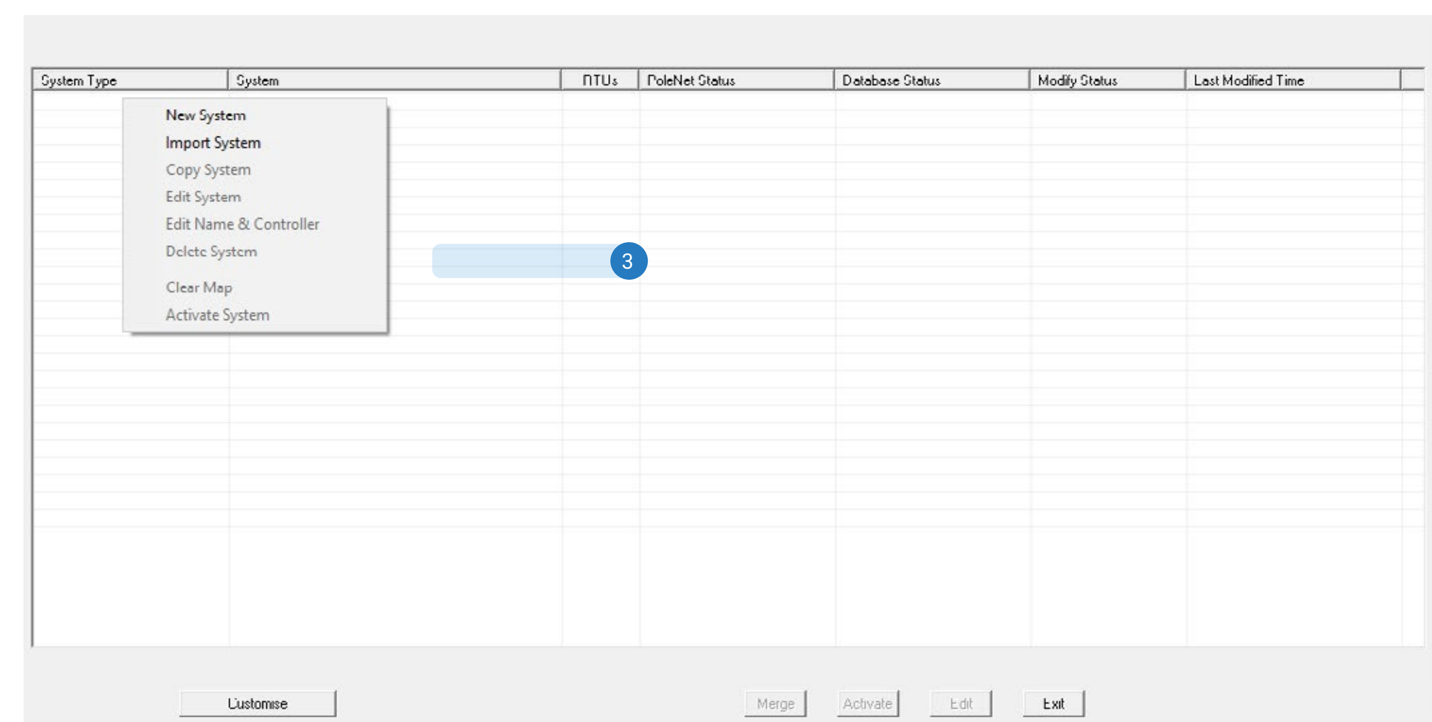
> **NOTE**
>
> It is not necessary to be connected to the Host.



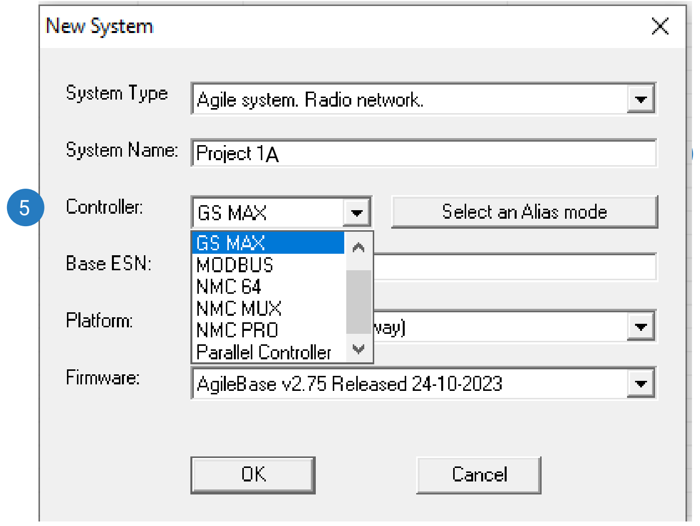
2. A new screen will be opened, and a new database will be created in the same location as the PoleNet software is located.



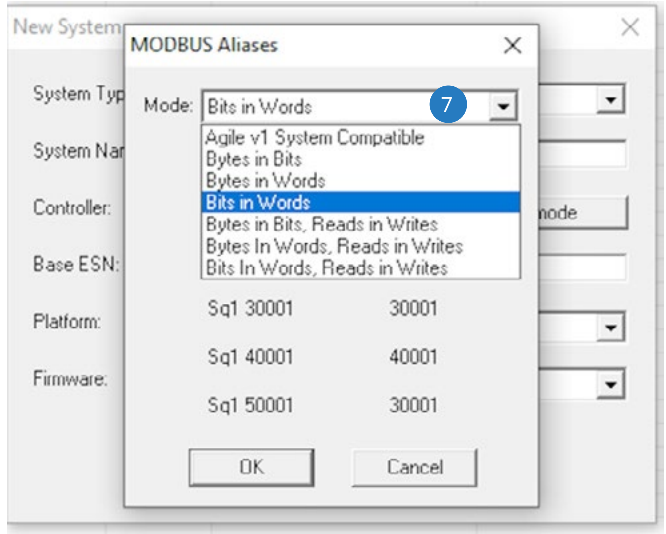
3. Right-click on the new screen and select "New System".



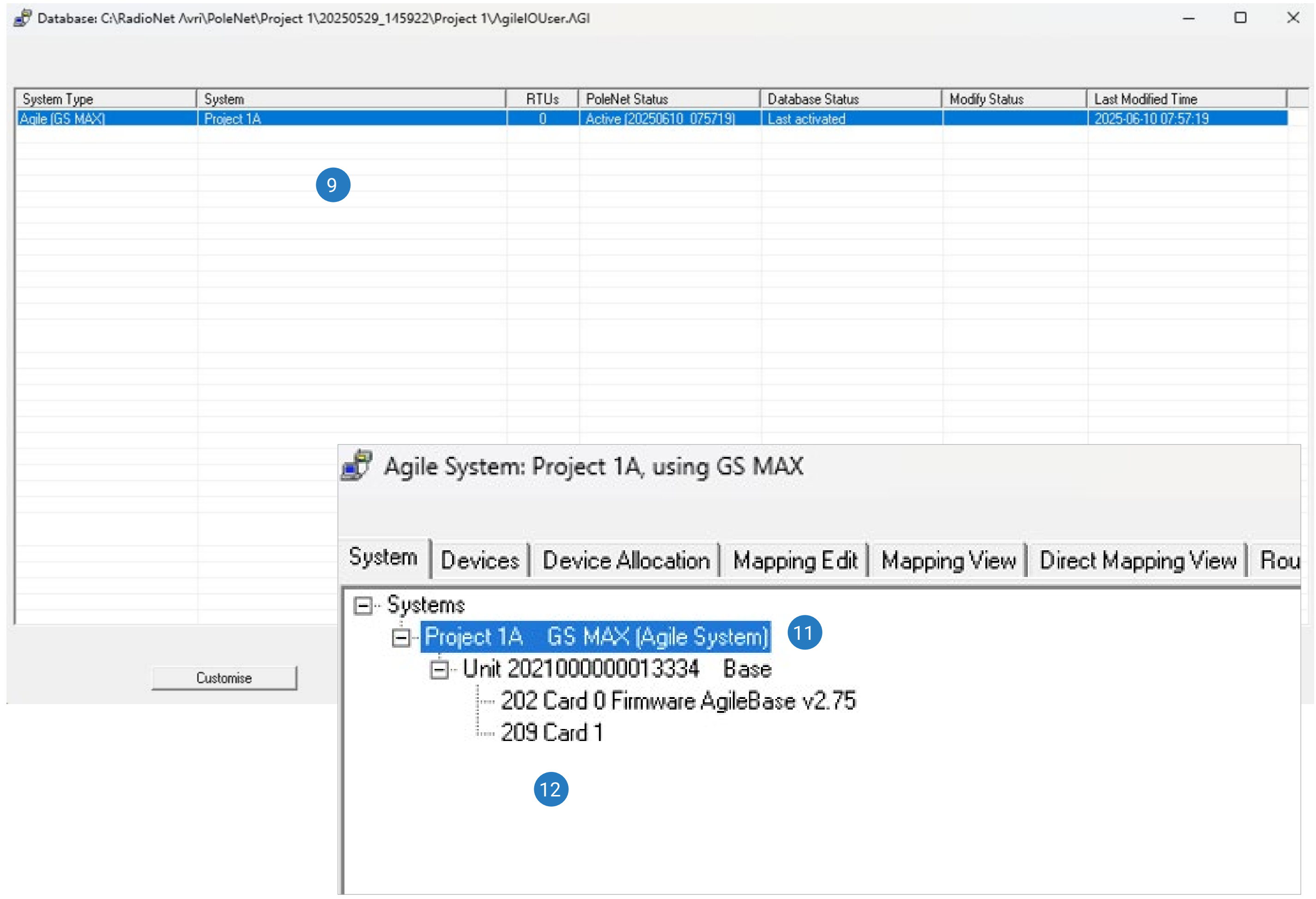
4. Write the System Name that you like to give to this system, in this case the name is Project 1A.
5. Select Controller: GS Max.
6. Click on Select an Alias mode



7. Chose Bits in Words. Select OK.
8. Set the ID of the Base Station, the ID can be found on the enclosure label and inside the enclosure near the programing pins.



9. A new System is created, then Right click on the System name (Project 1A).
10. The Base will be added to the system.
11. Right click on the Base
12. At the new window select "New Unit" to start adding the RTU remote units that are on the network of this new system- Project 1A.



5.2 Base Station Settings

The Base station needs to be configured with the radio settings like the radio frequency and the transmission power.

1. Launch the PoleNet Software application.

   Navigate to the "Setup" menu and select "Set up Preset Connection 1."

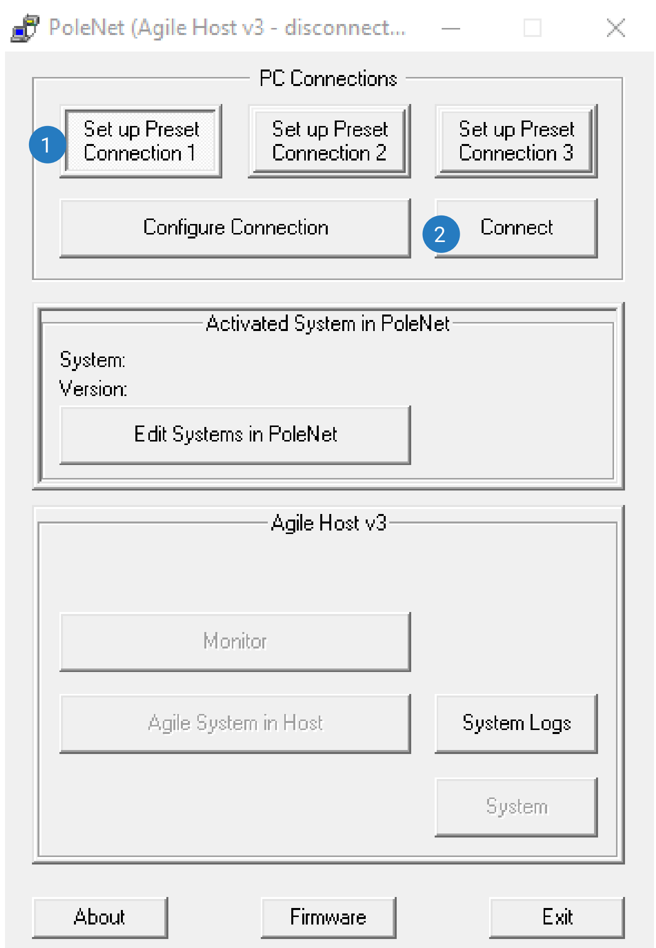
   The application presents three tabs: "Select Setup Preset Connection 1," "Select Setup Preset Connection 2," and "Select Setup Preset Connection 3."

   By selecting one of these tabs, you can define a connection to various communication ports and systems.

   For instance, Connection 1 can be configured to connect to Com port 3 and have the RadioNet system, while Connection 2 can be configured to connect to Com port 5 and have the SingleNet system.

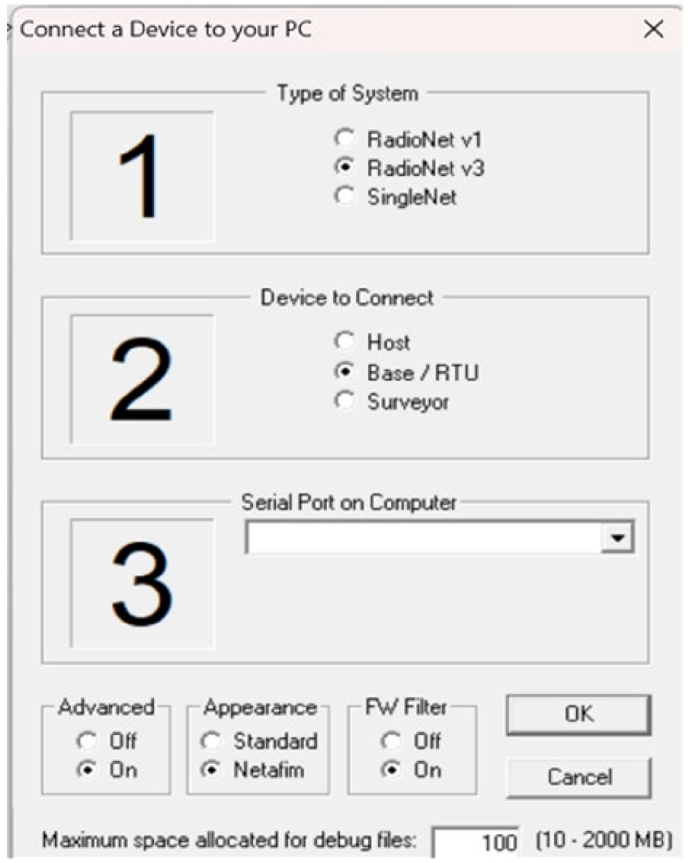
   Both systems are simultaneously connected to the PoleNet Software.

2. Select Configure Connection



Then at the new screen select:

- Type of System, RadioNet V3
- Device to Connect, Base/RTU
- Serial Port, select your serial port connection. On this example is selected Com 3.
- Advance, On
- Appearance, Netafim
- FW Filter On
- Then select OK



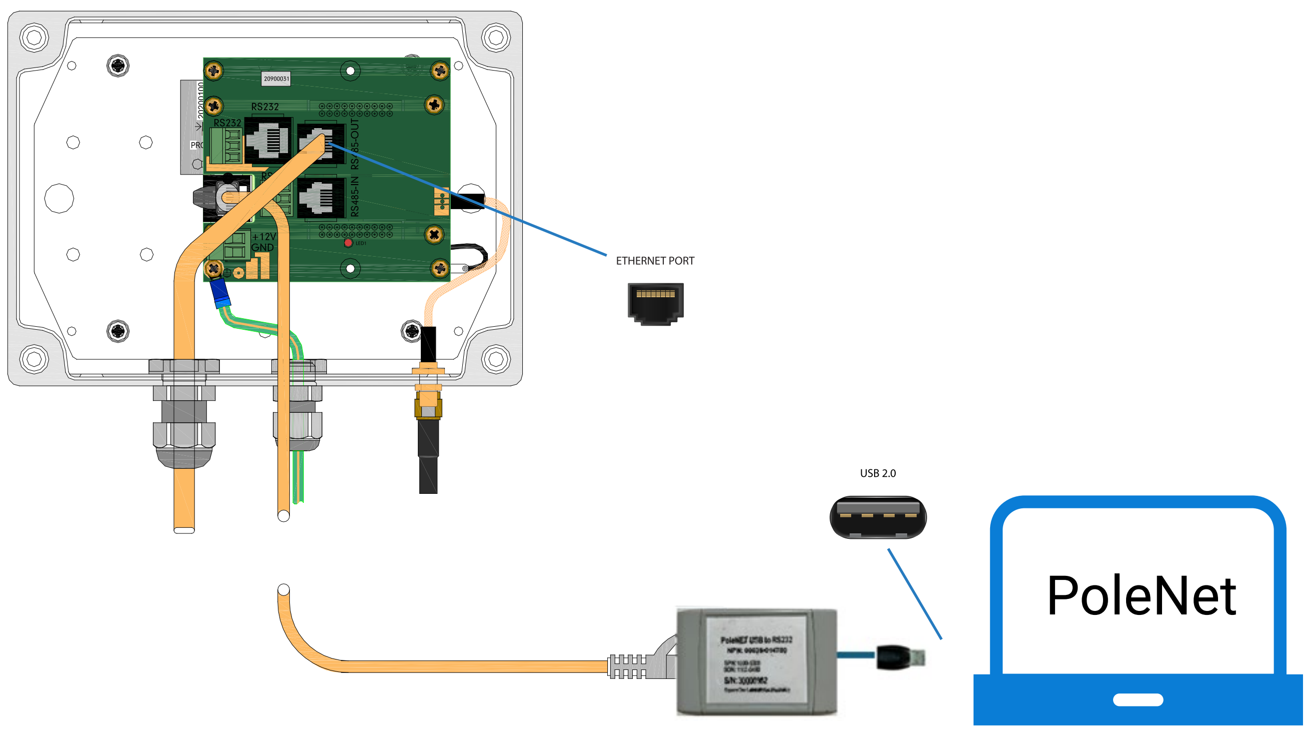
5.3 Connection of the Base Station to PoleNet Software

Connect the PoleNet plugs and cable to the Base Station and the PC with the PoleNet software.

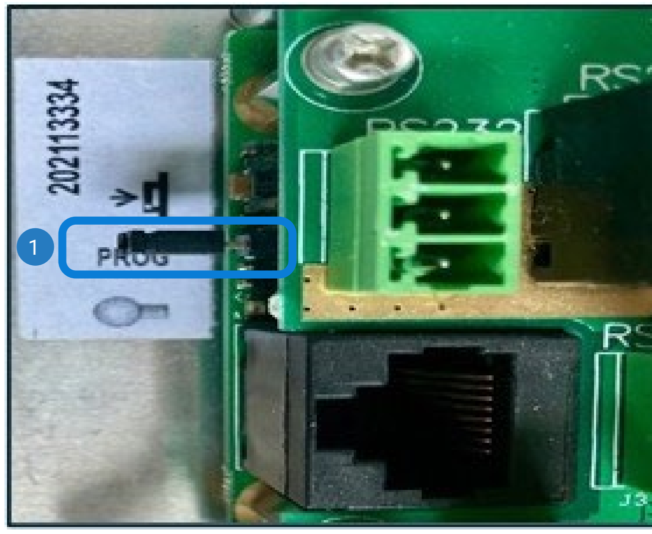
NOTE

For this connection is recommended to use the PoleNet USB to RS232 device

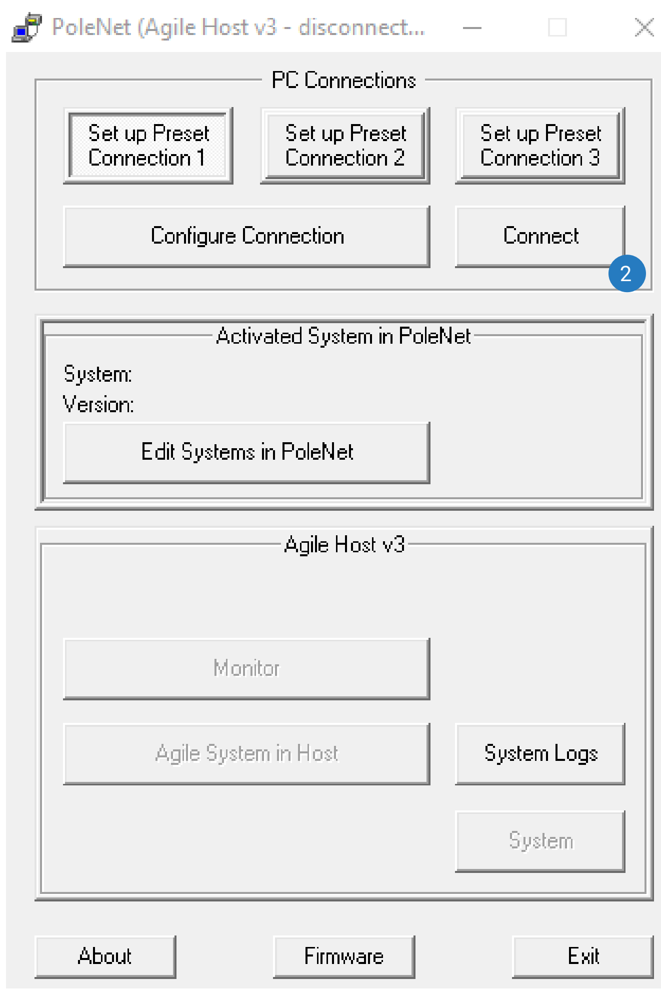
Part number 00035-014780.



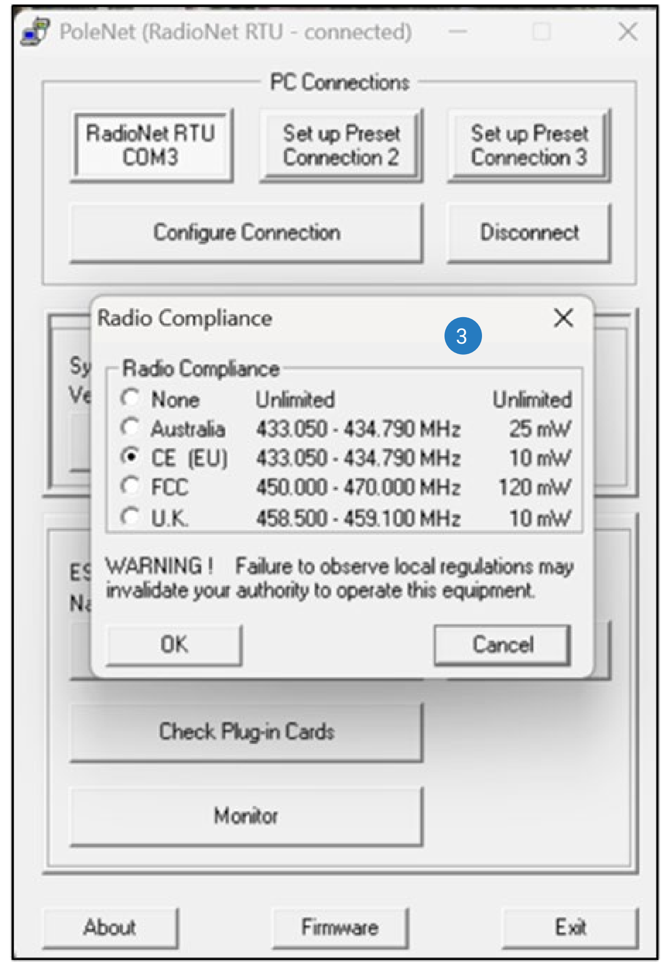
1. To enable the modification of the Base's frequency setting, the programming jumper must be connected to the programming pins.



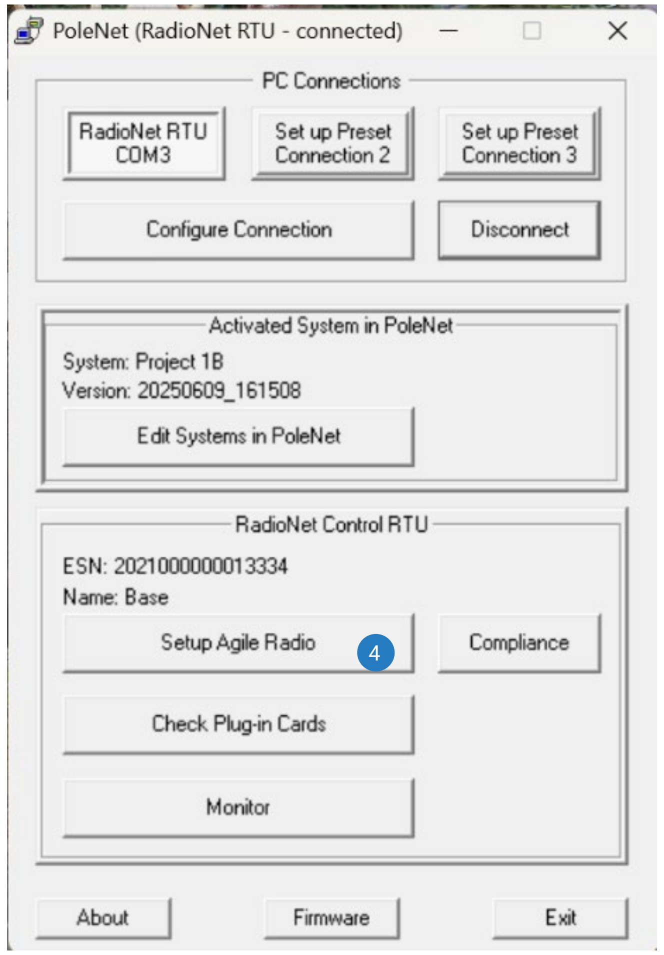
2. At the PoleNet select: Connect



3. Click on "Compliance" and select the Frequency Compliance for your country. If the same frequency selected for the RadioNet Base Station. Confirm "OK".



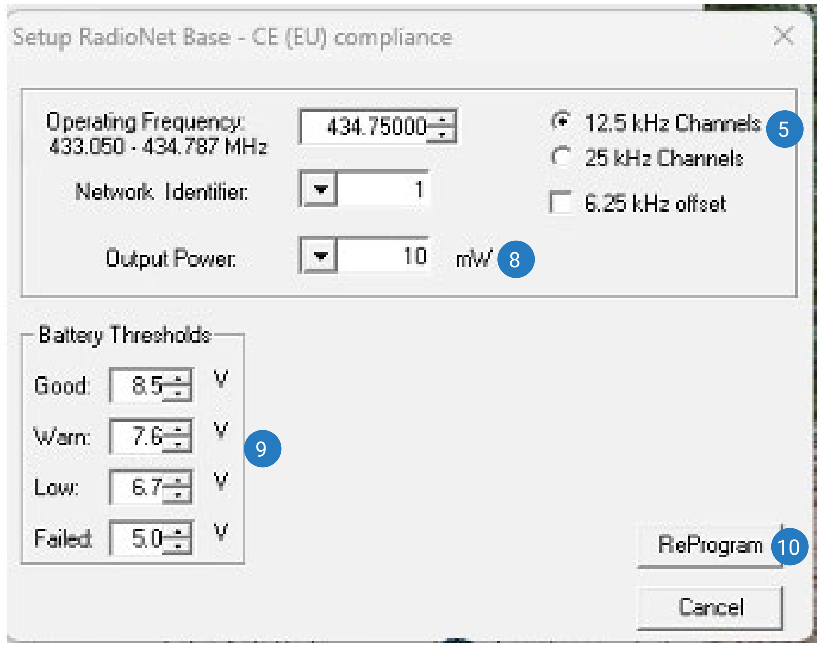
4. Select Setup Agile Radio, then proceed to select OK.



5. A new window will then open, presenting the radio settings for selection
6. Select Channel Spacing & Offset (if applicable).
   The channel spacing is configurable to either 12.5 kHz or 25 kHz. The channel spacing setting (default 12.5 KHz) determines the next frequency increment.
   For those countries that support channel spacing of 6.25 kHz, then selecting the 6.25 kHz offset will enable the center frequency to offset by 6.25 kHz.
7. Define Operating Frequency
   The Agile Radio's operating frequency is software configurable between 402 MHz and 470 MHz. The programmed frequency must comply with either your local or national RF spectrum licensing organization.

NOTE

All RadioNet Remotes and the RadioNet Base must all be set to the same frequency.



8. Network ID default is 1, it is the ID number for this project network.
9. Output Power, The Agile Radio's operating power is software configurable between 1mW and 500 mW. The Output power setting should be equal or less than that defined by the radio license parameters that you are operating under.

NOTE

Note: If the power setting is above 10mW, do not power up the RadioNet without an antenna connected.

10. Battery Thresholds, Four Battery alarm thresholds can be set to advise the RadioNet Host when different battery voltage levels are sensed. While on the network, crossing any of these thresholds causes the Host unit to be notified.

Good: Battery voltage is OK.

Warn: Battery voltage has reached the "warning level", should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.

Low: Battery voltage has reached the "low" level, should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.

Failed: Battery voltage has dropped below the "Failed" threshold. The RadioNet Remote sends an alarm message and then turns off all outputs, stops monitoring the inputs, turns off the radio and goes into hibernation, periodically awakening to check if the battery voltage has recovered.

NOTE

Please refer to the Diagnostic section to view the current battery voltage level. The solar panel might need cleaning or rechecking for correct orientation.

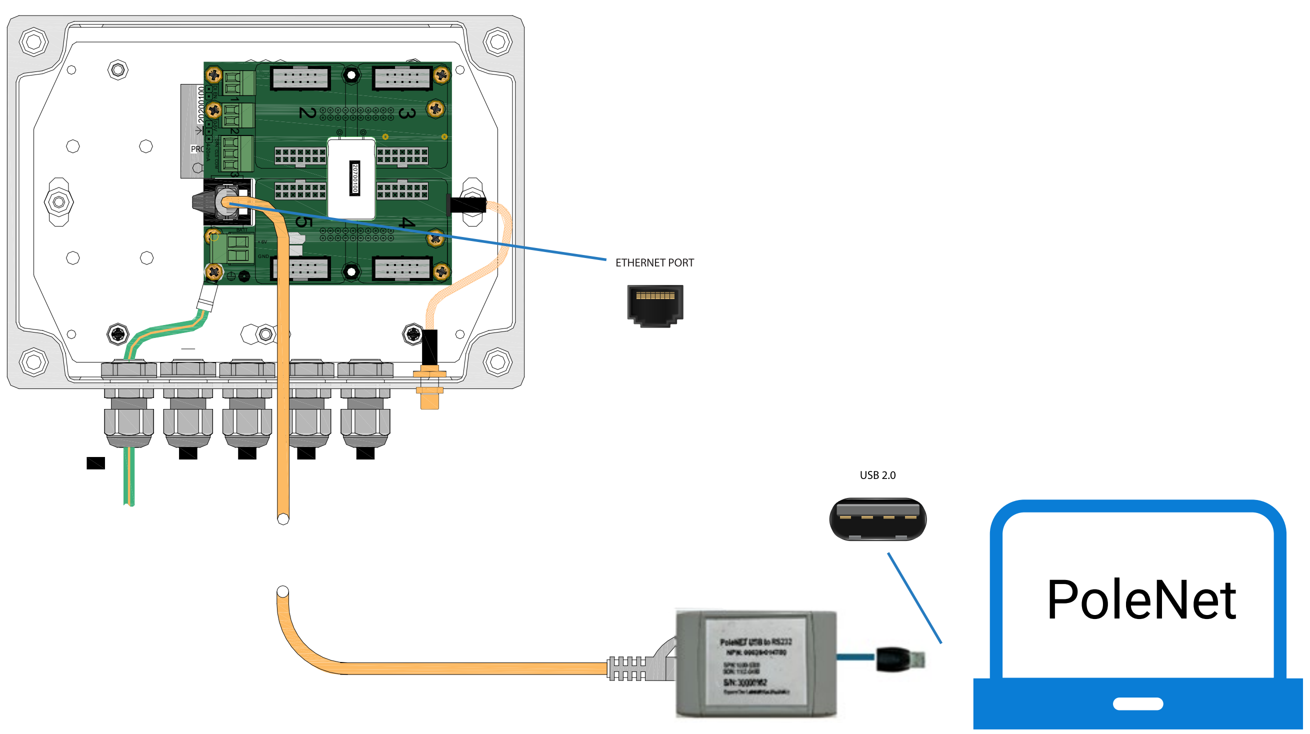
11. Select "Reprogram" to save all the settings on the RadioNet Base Station.

5.4 Defining the Remote Radio Network.

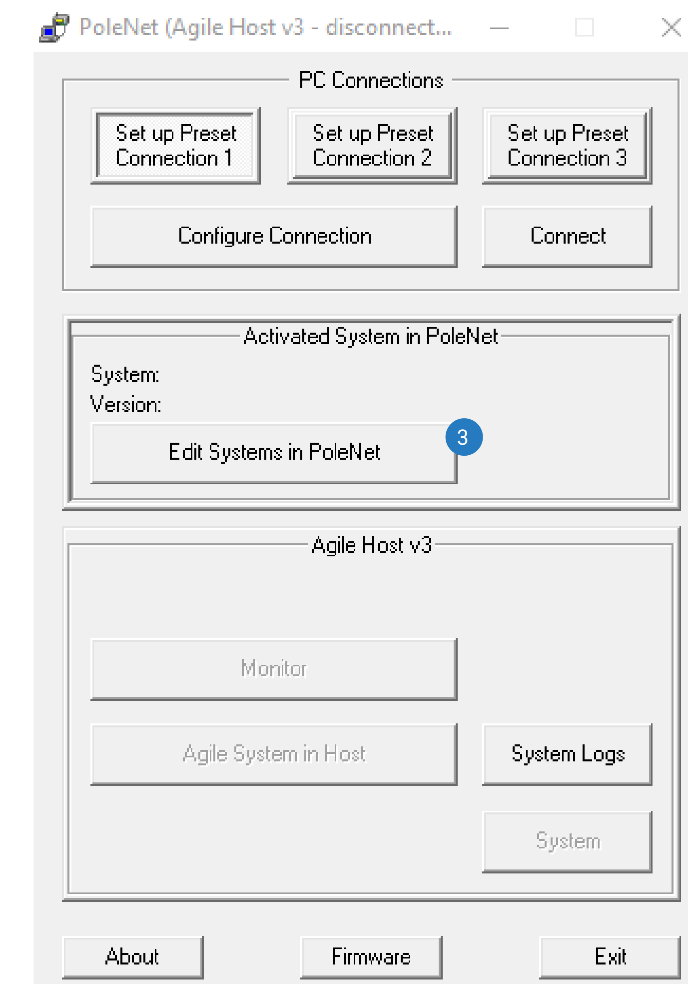
The definitions for the Project 1A network will be implemented by sequentially connecting each Remote RTU to the PoleNet.

The PoleNet will subsequently acknowledge the presence of a new RTU, as it is not already defined within the active network

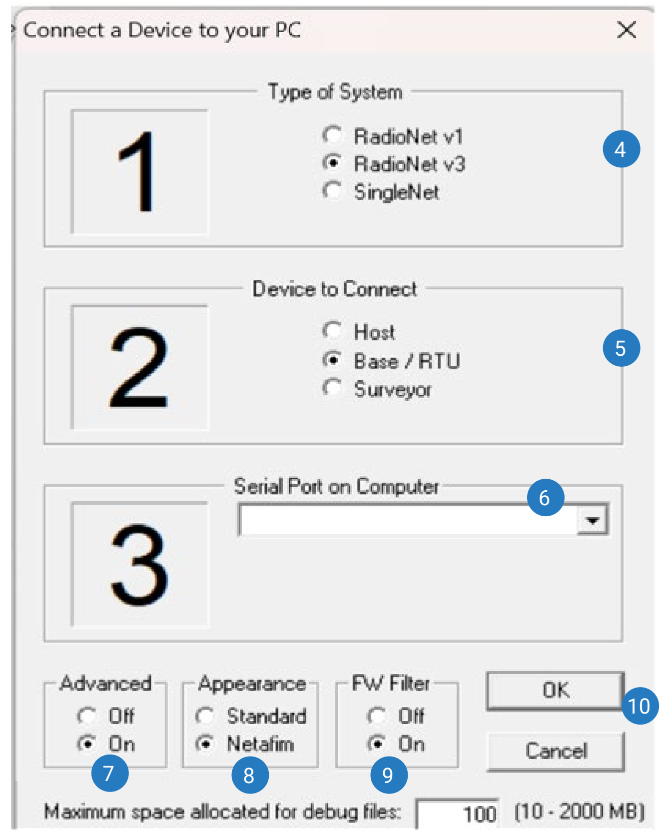
1. Connect the PoleNet plugs and cable to the initial Radio RTU and the PC equipped with the PoleNet software. Power the RadioNet RTU

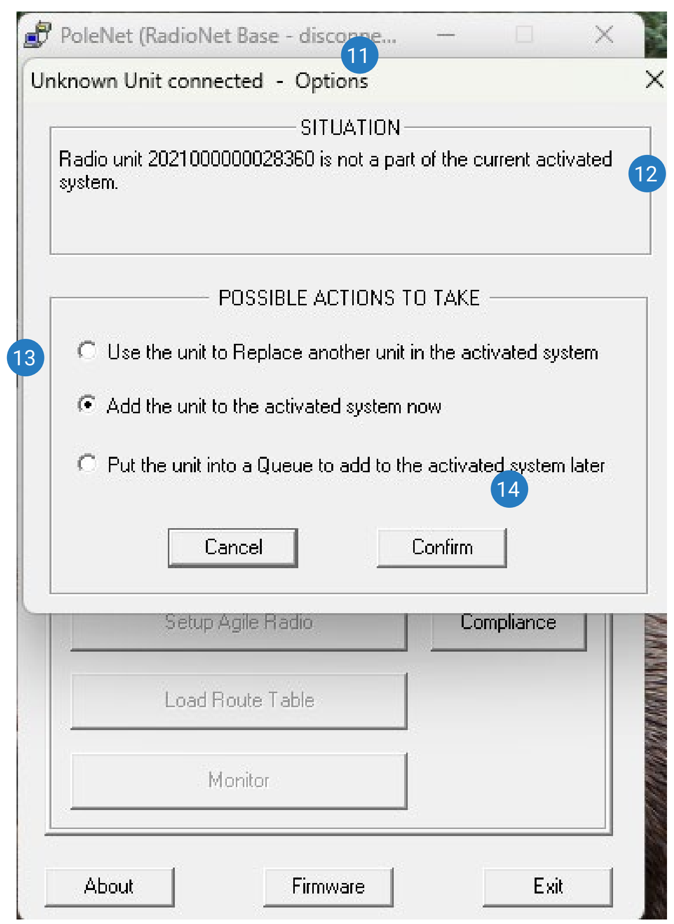


2. Launch the PoleNet Software application.
3. At the PoleNet select "Configure Connection." In the newly opened window, confirm the following settings:



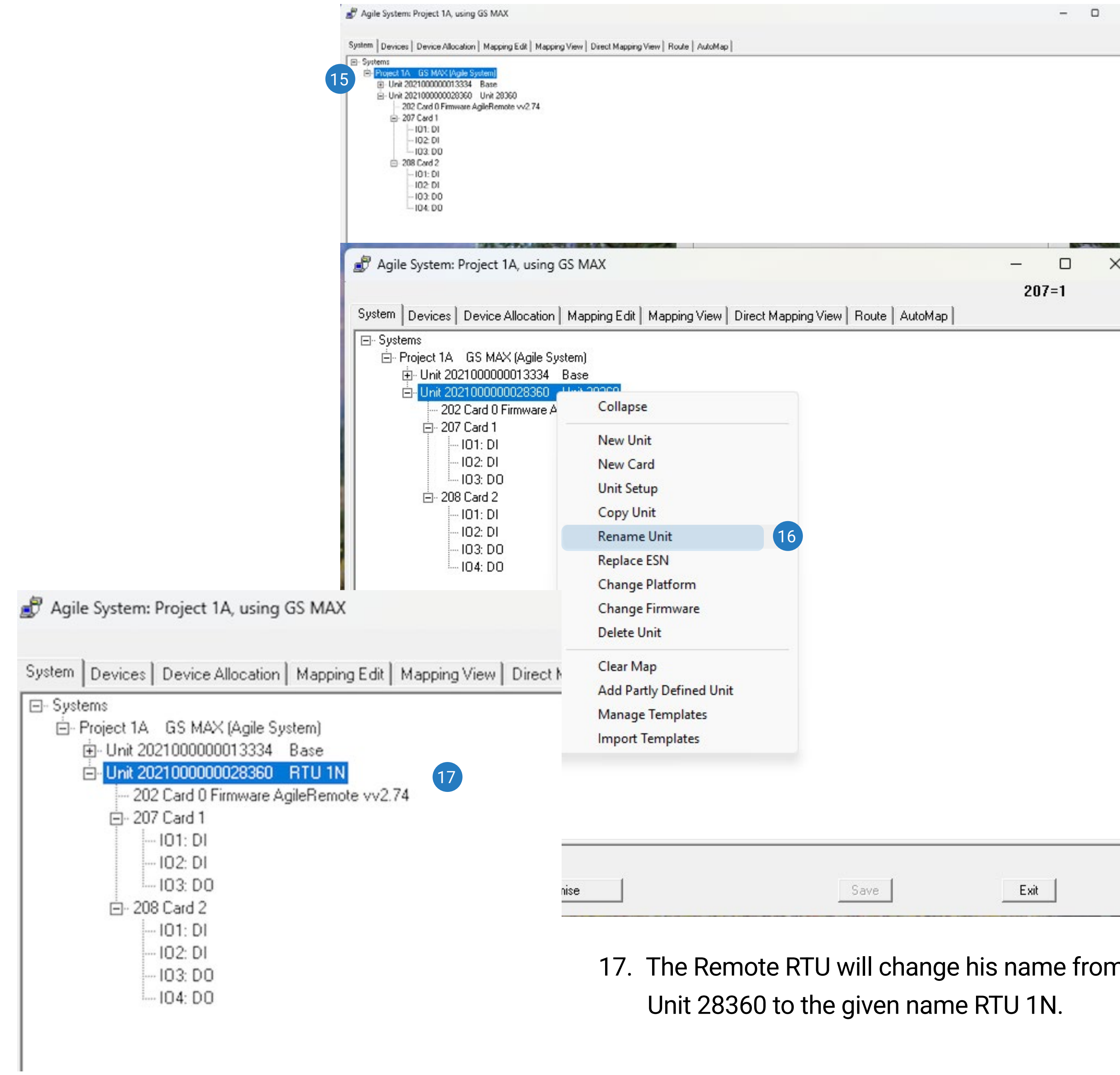
4. Type of System, RadioNet V3
5. Device to Connect, Base/RTU
6. Serial Port, select your serial port connection. On this example is selected Com 3.
7. Advance, On
8. Appearance, Netafim
9. FW Filter On
10. Then select OK





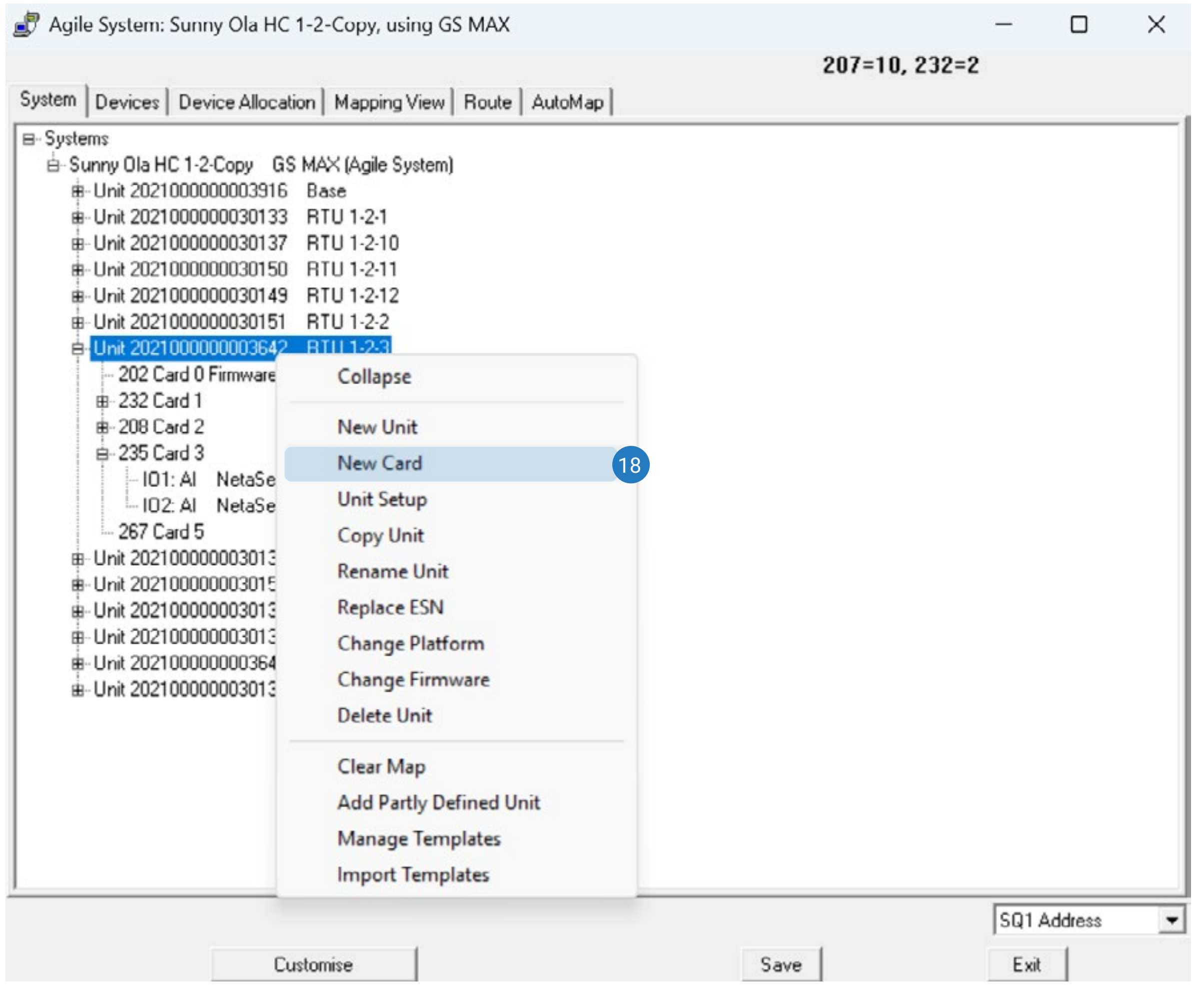
11. The new screen will display a message with selection options.
12. The message will display the RadioNet RTU ID number and indicate that the device is not part of the currently activated system.
13. The Possible Actions section will present the available options for action. The “Add the unit to the active system” option will be selected.
14. Finally, the “Confirm” button will be clicked.

15. The Remote RTU will be automatically added to the actual active project. By selecting the + button, the RTU unit will expand, displaying the RTU I/O cards.
16. The User can assign a Name/Description to the Remote RTU. Right-click the RTU ID number, then select Rename Unit. In the new window, set the name to this RTU, as in the example, set it to RTU 1N. Finally, confirm by selecting Yes.



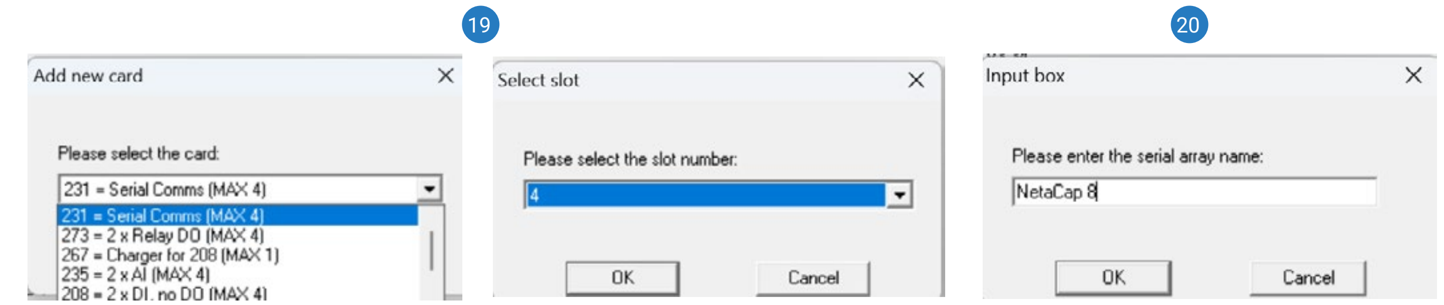
17. The Remote RTU will change his name from Unit 28360 to the given name RTU 1N.

18. When the System is equipped with a NetaCap sensor, its definition must be established beforehand. To add the New Card to the RadioNet DCP RTU, right click on the DCP RTU, for example RTU DCP 1-2-3. Select New card.

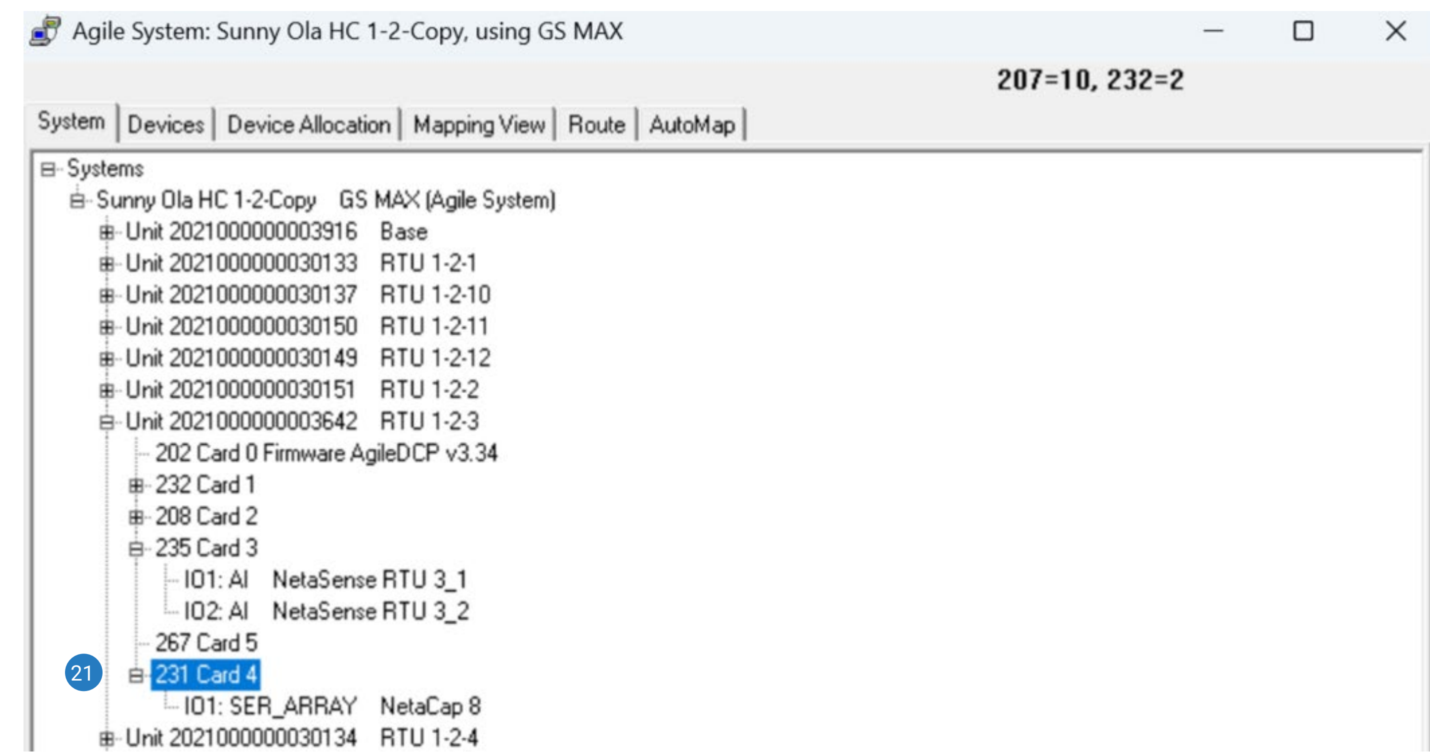


19. Select the Expansion Card "231=Serial Comms (Max4)" from the "Add new card" box. Next, select the card location number from the prompt "Please select the slot number:"

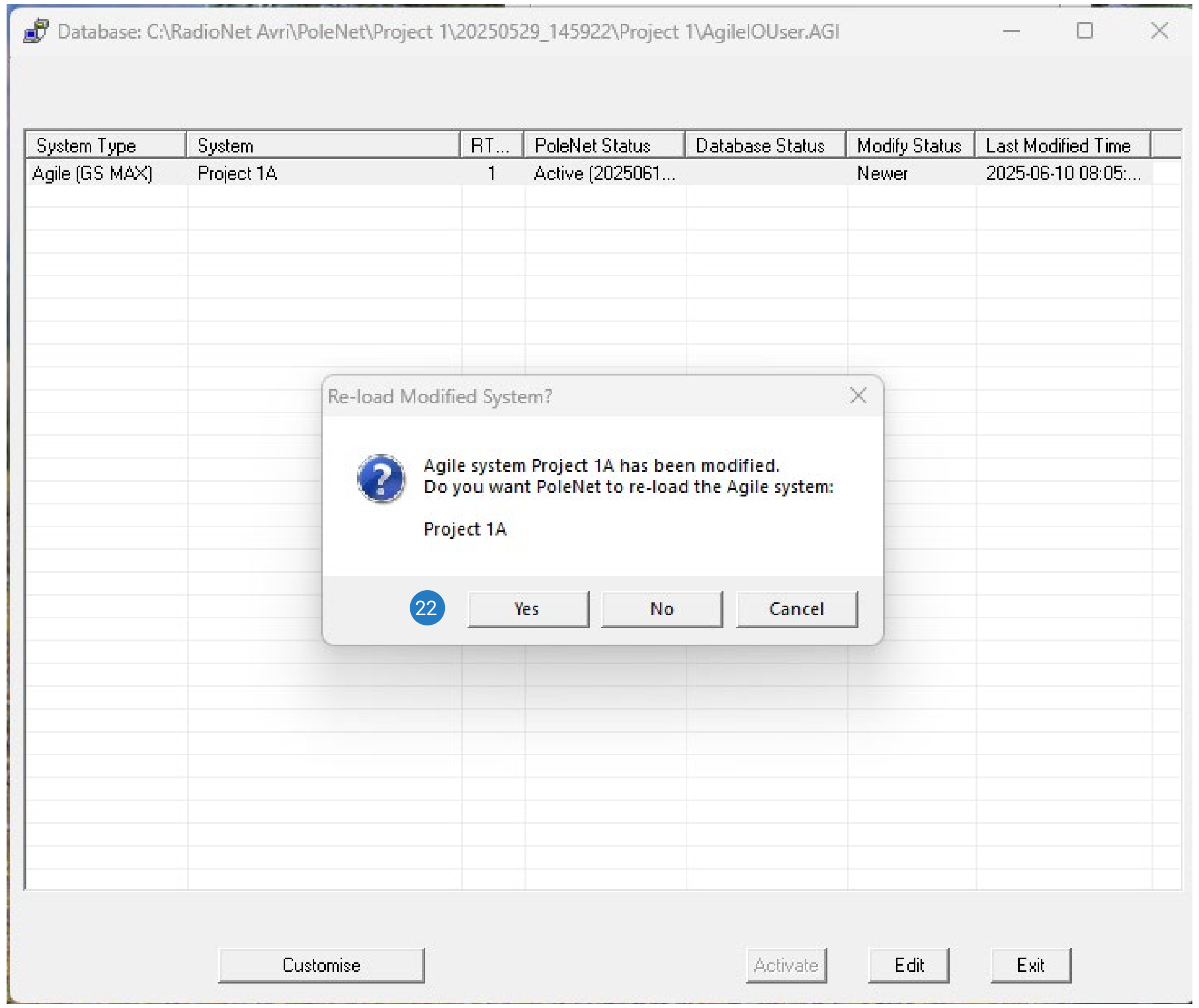
20. The card number 4 will be added. Right-click on the card number 4 and select "New Serial Array" from the popup window. A box will then appear asking to edit the serial array name. In this case, select "NetaCap 8." Confirm "OK."



21. The Serial Card with the NetaCap 8 name was added.



22. Proceed to incorporate the remaining Remote RTU for this project, following the outlined steps described above.
    Upon completion of the network with all the system Remote RTU, select "Save" to save the Project 1A network. The new message will ask to Reload the System project 1A. confirm "Yes



5.5 Remote RadioNet RTU Settings

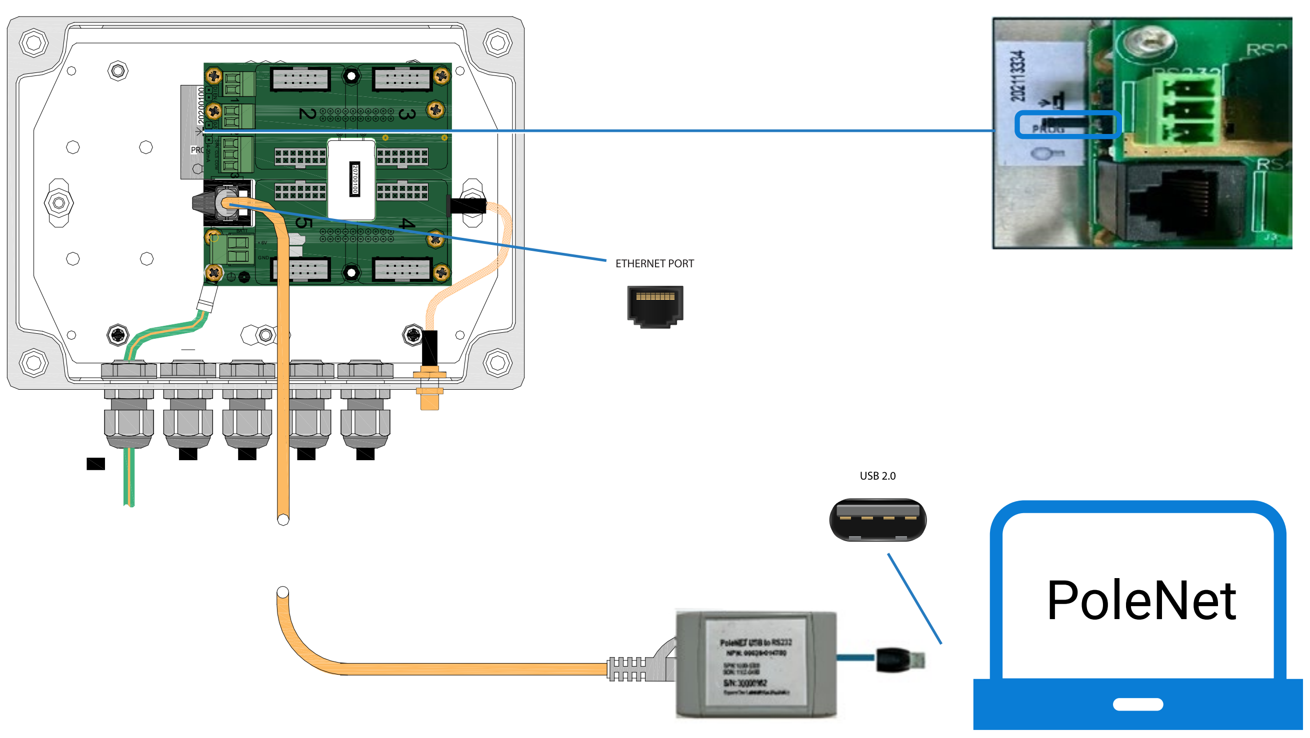
The Remote RadioNet RTU in the network must have the frequency settings of the Base Station.

The following paragraph explains all the setting of the Remote RTU.

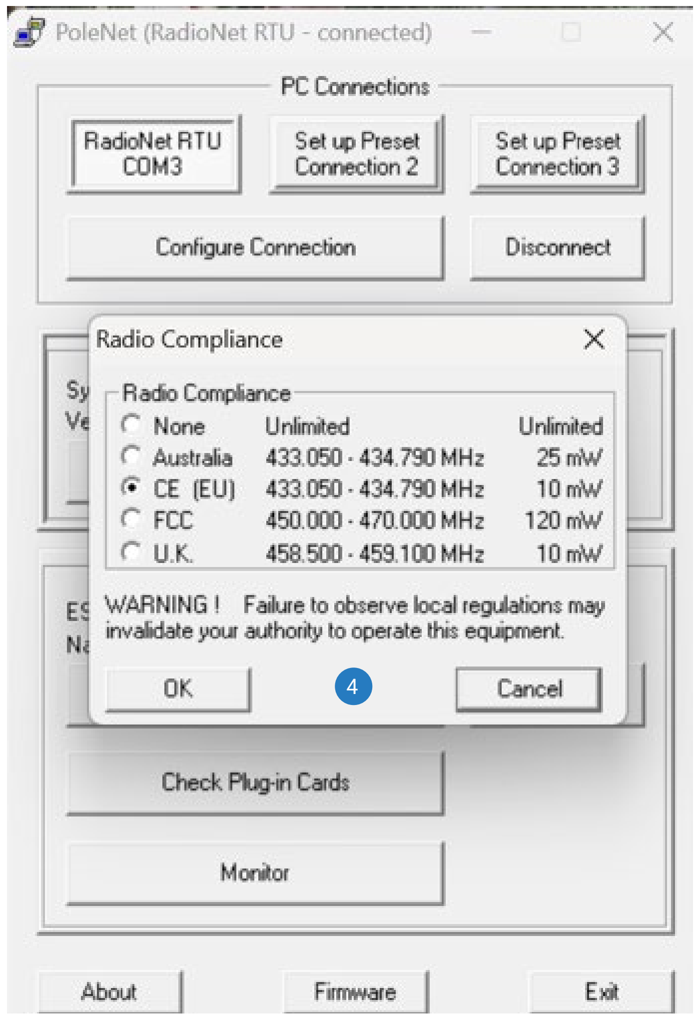
The three Remote RTU models have the same settings and configurations.

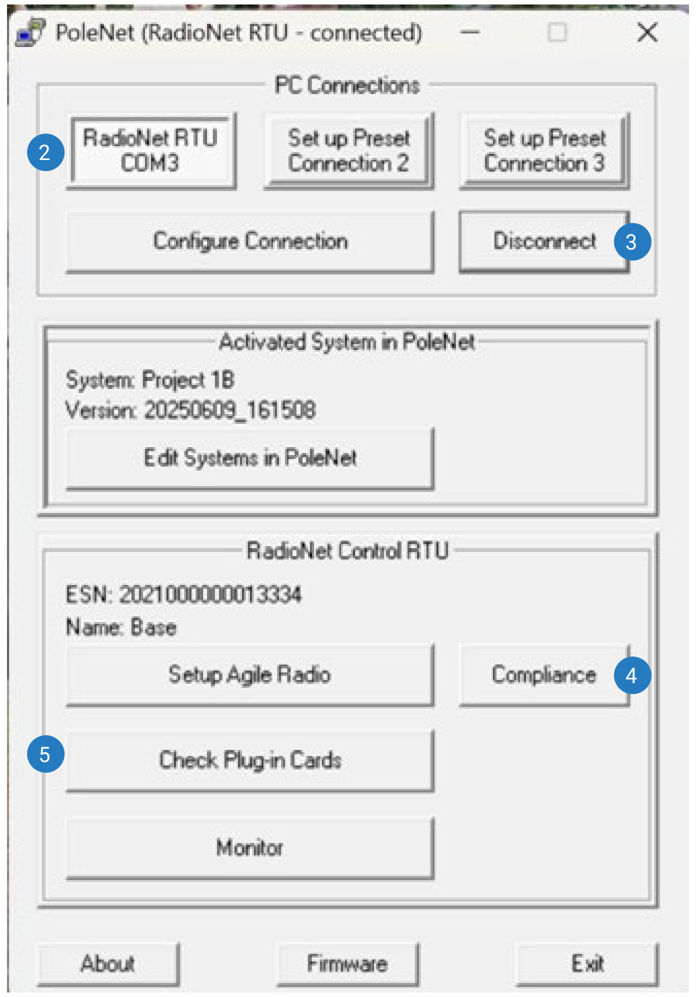
1. Connect the PoleNet plugs and cable to the initial Radio RTU and the PC equipped with the PoleNet software. Power the RadioNet RTU.

> **NOTE**
>
> The Programing Jumper must be inserted for setting the frequency and the output power!

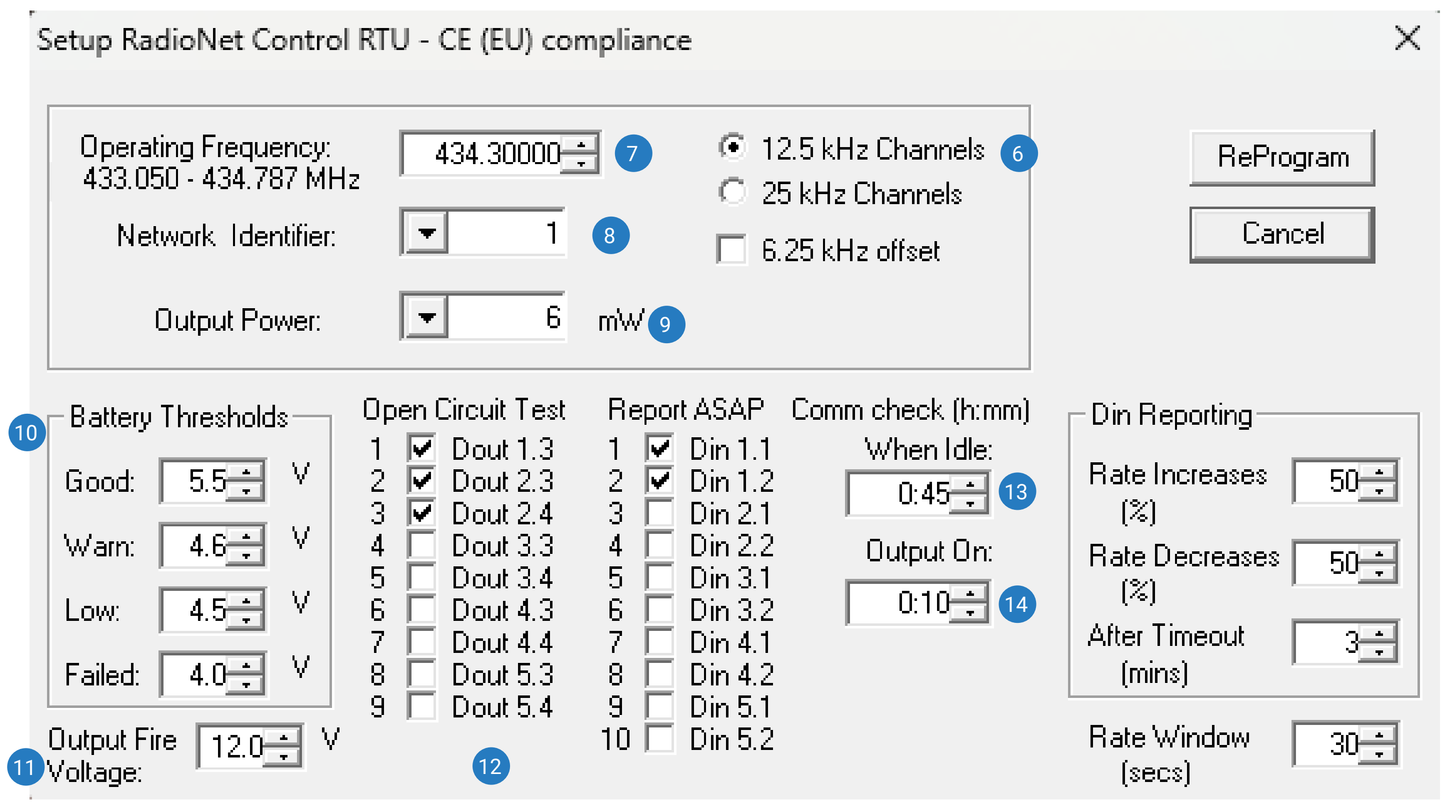


2. Launch the PoleNet Software application. When RadioNet RTU is selected.
3. Click on “Connect”.
4. Click on “Compliance” and select the Frequency Compliance for your country. It is the same frequency selected for the RadioNet Base Station. Confirm “OK”.





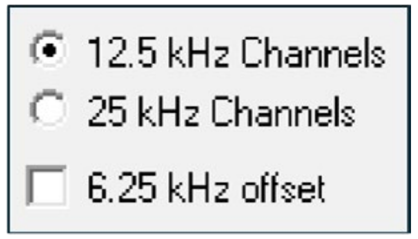
5. Click on Setup Agile Radio.
6. Select Channel Spacing & Offset (if applicable).
7. Define Operating Frequency.
8. Network Identity by default is set to 1.
9. Define Output Power.
10. Define Battery Thresholds.
11. Define Output Firing Voltage.
12. Enable/Disable Open Circuit Detection.
13. Define Comm. check interval when outputs are Idle.
14. Define Comm. check interval when outputs are Active.
15. Select Reprogram Button or Cancel.



5.5.1 Setup Remote RTU Settings Definitions.

The following paragraph explains each one of the possible setup's definitions

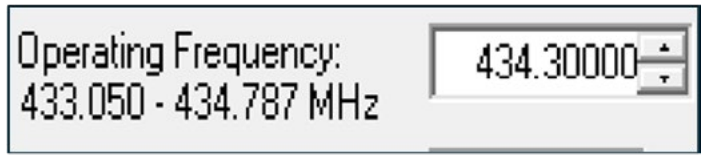
Channel Spacing & Offset



The channel spacing is configurable to either 12.5 kHz or 25 kHz. The channel spacing setting (default 12.5 KHz) determines the next frequency increment.

For those countries that support channel spacing of 6.25 kHz, then selecting the 6.25 kHz offset will enable the center frequency to offset by 6.25 kHz.

Operating Frequency



The Agile Radio's operating frequency is software configurable between 402 MHz and 470 MHz. The programmed frequency must comply with either your local or national RF spectrum licensing organization.

NOTE

All RadioNet Remotes and the RadioNet Base must all be set to the same frequency.

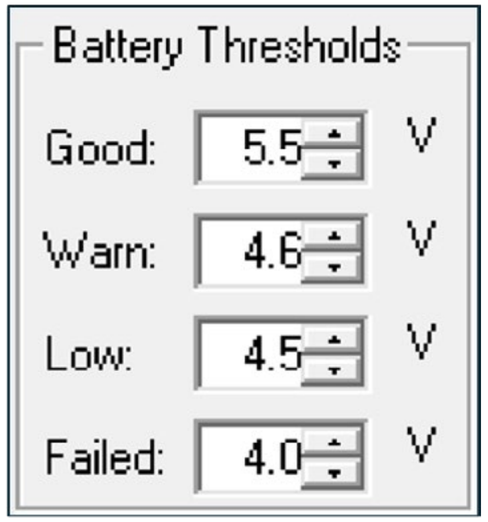
Output Power

The Agile Radio's operating power is software configurable between 1mW and 500 mW. The Output power setting should be equal or less than that defined by the radio license parameters that you are operating under.

NOTE

If the power setting is above 10mW, do not power up the RadioNet without an antenna connected.

Battery Thresholds



Four Battery alarm thresholds can be set to advise the RadioNet Host when different battery voltage levels are sensed. While on the network, crossing any of these thresholds causes the Host unit to be notified.

- **Good:** Battery voltage is OK.
- **Warn:** Battery voltage has reached the "warning level", should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.
  IE: The solar panel might need cleaning or rechecking for correct orientation.
- **Low:** Battery voltage has reached the "low" level, should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.
  IE: The solar panel might need cleaning or rechecking for correct orientation.
- **Failed:** Battery voltage has dropped below the "Failed" threshold. The RadioNet Remote sends an alarm message and then turns off all outputs, stops monitoring the inputs, turns off the radio and goes into hibernation, periodically awakening to check if the battery voltage has recovered.

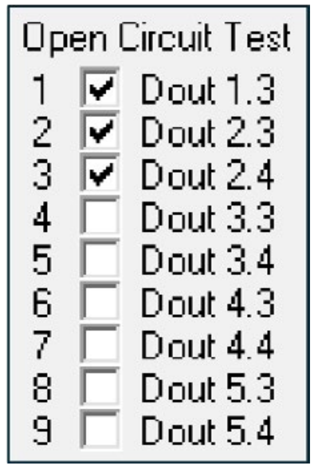
NOTE

Please refer to the Diagnostic section to view the current battery voltage level

Output firing voltage

The Output firing voltage (default 12 VDC) is user configurable between 9 – 16 VDC. This setting is a global setting and effects all the outputs within the RadioNet Remote unit to which you are connected. When nonstandard solenoids and relays are being used, please contact Netafim Technical Support for further assistance.

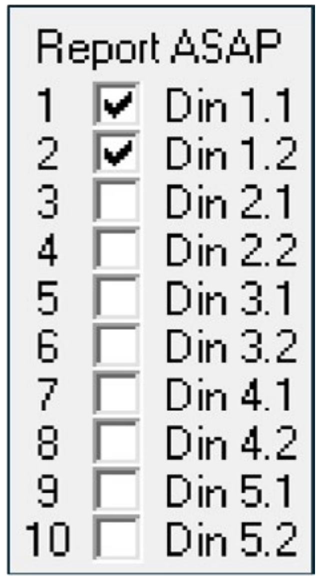
Open Circuit Detection



Each output of the RadioNet Remote has Open Circuit (O/C) detection enabled as default. Whenever the output is activated the RadioNet checks to see if a solenoid or relay has been connected. If no device has been detected, the RadioNet will send an alarm message to the RadioNet Host and will also display the status in PoleNet monitor mode. Should a nonstandard solenoid or relay be used and the open circuit alarm condition is unwarranted, then the user can disable that individual output.

Report ASAP

When the immediate report of Digital input status is requested, the corresponding Digital Input selection box must be checked.



Following a digital input's state change from ON to OFF or vice versa, the unit attempts to report this change to the host.

If an input is configured to "Report ASAP," it makes an immediate report, and if there are other digital inputs that have not yet been reported, it also reports them.

When the Digital Input selection box is NOT checked, the unit waits until one or more of the following events occur to trigger it to report its latest values for the input:

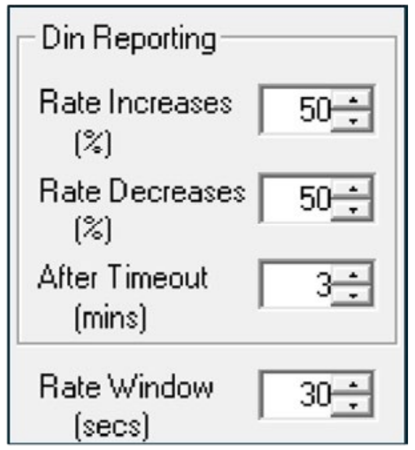
- Another digital input is due to be reported

- The unit has waited for the "After Timeout" delay from the time its input first changed

NOTE

These settings do not apply to Remote RTU DCP.

- Din Reporting, Rate Increase (%), Rate Decrease (%), Ater Timeout (mins) and Rate Window (sec).

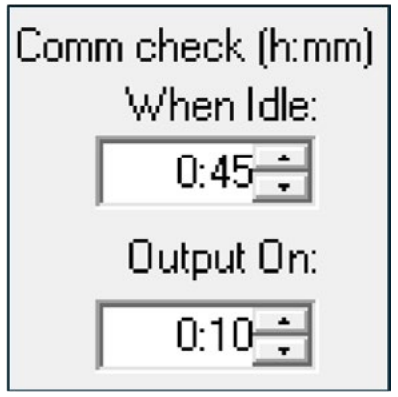


  These settings are related to the digital input that is measuring the pulse rate of the digital input. Then the pulse rate is constant and is not over the “Rate Increase” and Rate decrease” values in % the window of the measure rate, then the Remote RTU will report to pulse rate to the Host every 5 minutes.
  When the pulse rate is over the “Rate Increase” and “Rate Decrease” values in % the window of the measure rate, then the Remote RTU will report to pulse rate to the Host with a delay of the set “After Time Out (mins)”. This works even if the units are configured to not report their input periods.
  The “Rate Window” is a time interval set in seconds that is utilized to process the input period reported by the RTU to the host.
  It is strongly recommended to utilize this feature to minimize the variability in period calculations. The function processes data for the specified number of seconds, resulting in periods being averaged and delayed. Consequently, it may take up to the entire duration of the rate window for data from a single pulse to be fully processed.

NOTE

It is recommended to use the default values for these settings.

- Comm. Check (h:mm)
  A communication check between the RadioNet Remote and its Master can be user defined. There are two independent intervals which are user configurable.



NOTE

The Master can be either the Base Unit or a SAF Remote Unit.

When idle: Configurable between “Off” and 36 hours
Output On: Configurable between “Off” and 2 hours 15 minutes.
Should an output be active and the Remote unit loses communication with its master within the defined time limit, The Remote unit will close all active outputs until re-connection is established.

5.5.2 Settings for RadioNet RTU Route to the Base Station. Store and Forward – SAF

The RadioNet RTUs establish communication with the Base station to ensure optimal and stable connectivity.

To achieve this, the Remote RTU must maintain a clear line of sight between its antennas and the Base station, and it must not exceed the maximum range specified for the selected radio frequency.

The Remote RTU can be configured as a repeater, relaying communication between other RTUs and the Base station. This function is known as Store and Forward (SAF).

The procedure for setting the Store and Forward (SAF) it is described on paragraph 4.1.3

5.6 Loading a New System/Project to the RadioNet Host

The database for a New System/Project, with the devices Base Station and Remote RTU network, has been established. The database is situated within the computer folder where the PoleNet software is located.

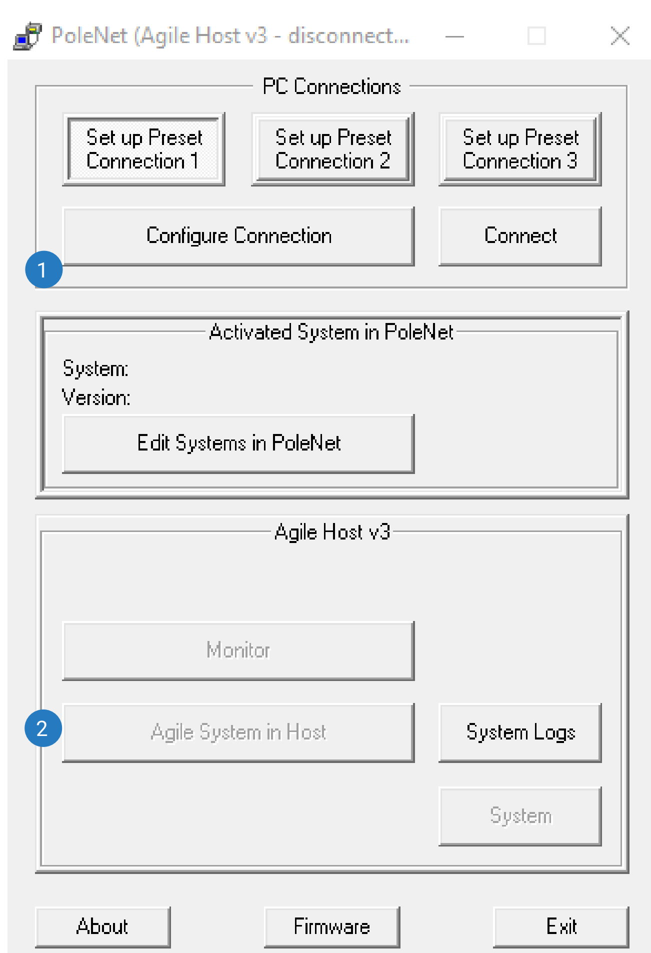
The subsequent step will involve loading this database into the RadioNet Host.

5.6.1 System Turned Active and Loaded to the RadioNet Host

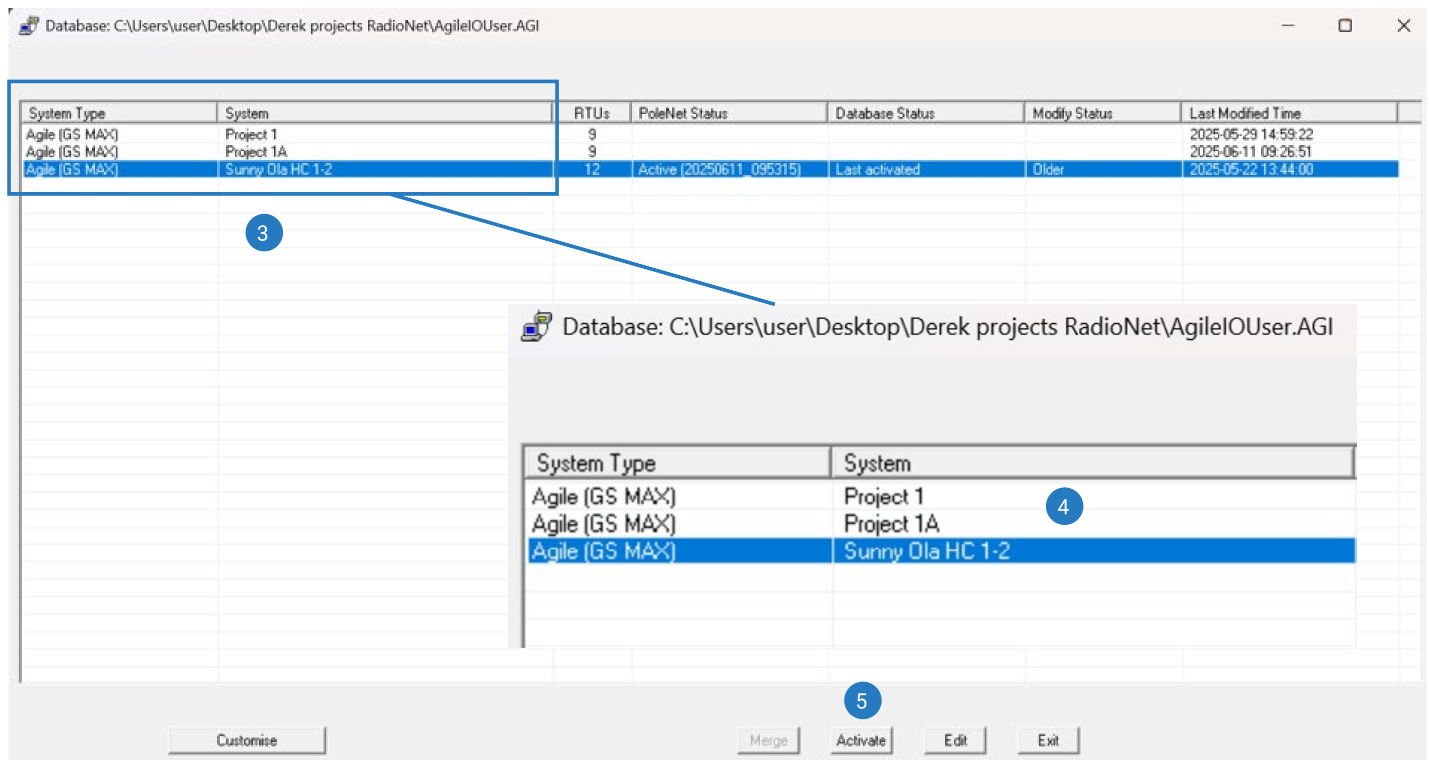
Upon initiating communication with the PoleNet PC software, the RadioNet Host initiates the process by requesting the selection of an operational System to be displayed on the Host.

The System/Project residing in the PC database must be in an "Active" status to facilitate its loading onto the Host.

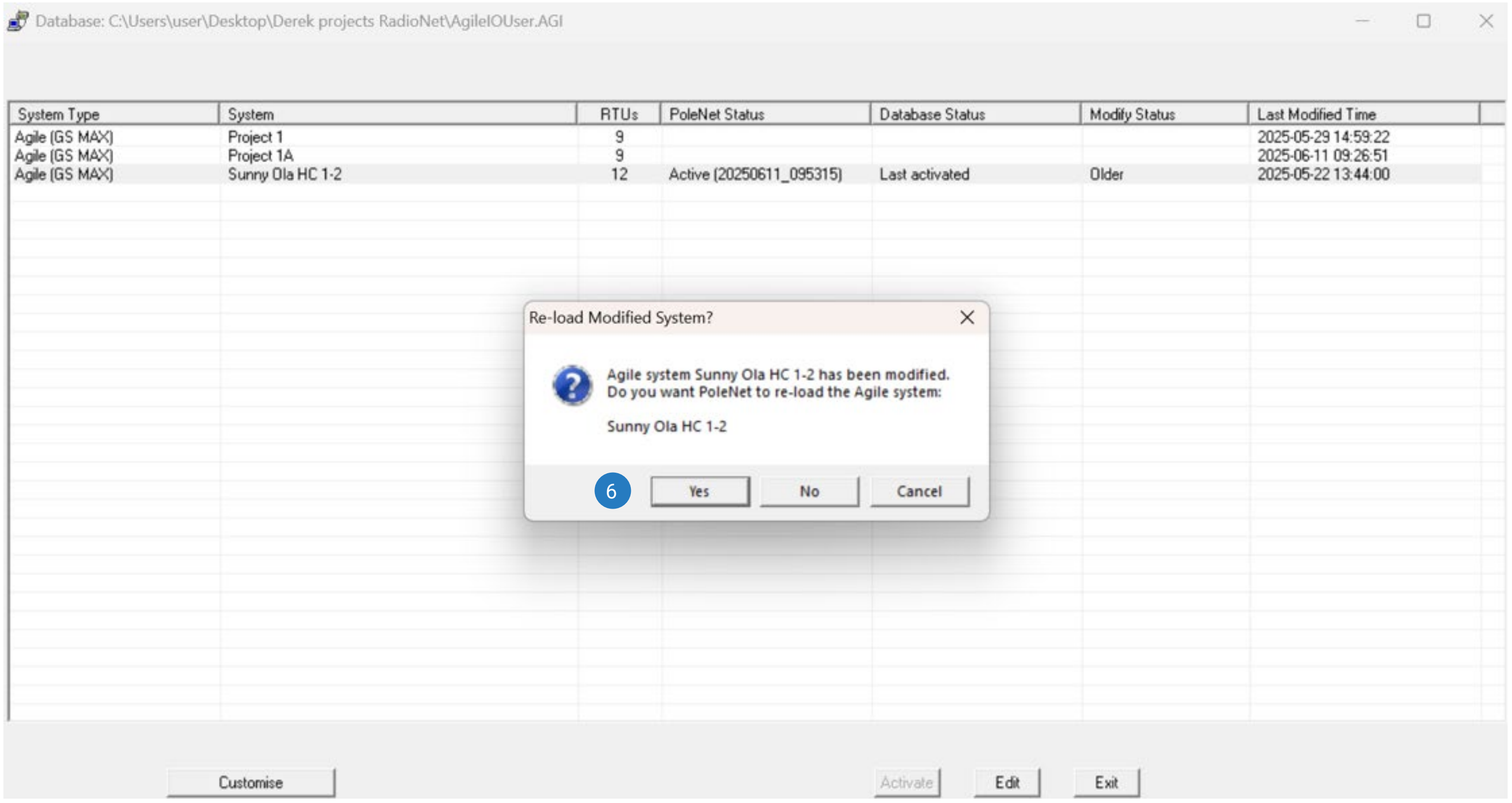
1. Launch the PoleNet PC Software.
2. Select "Edit System in PoleNet"



3. A new window will display, a list of all systems currently in the database. As shown in the "System" column, there are three systems listed.
   - Project 1
   - Project 1A
   - Sunny Ola HC 1-2
4. The System Sunny Ola HC 1-2 will be activated for this demonstration. Please select this system by clicking on it.
5. Then select "Activate"



6. A pop-up message will prompt you to confirm the activation of the Sunny Ola HC 1-2 system by accepting any modifications made. Select “Yes” to proceed.



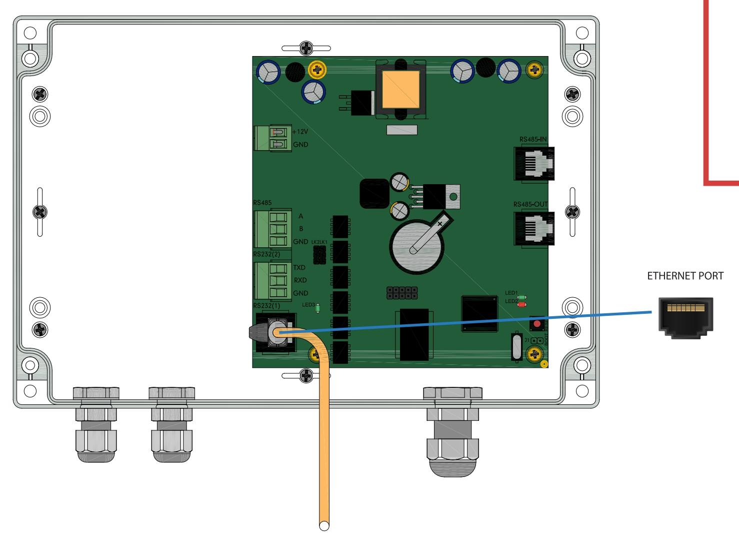
5.6.2 Connect the RadioNet Host to PoleNet Software.

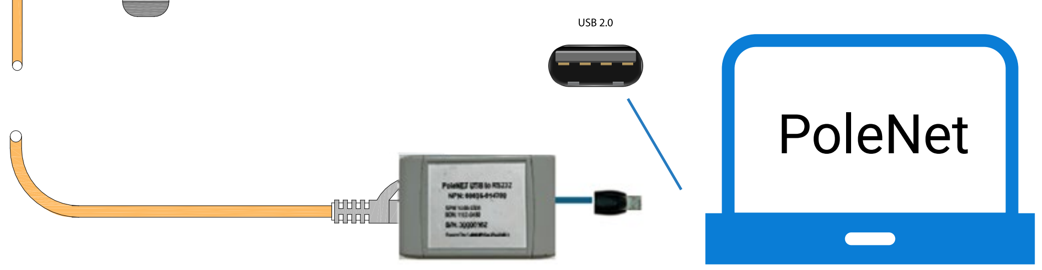
1. Connect the PoleNet plugs and cable to the Base Station and the PC with the PoleNet Software. Then power ON the Host with 12 VDC (2 Amp) power supply.

NOTE

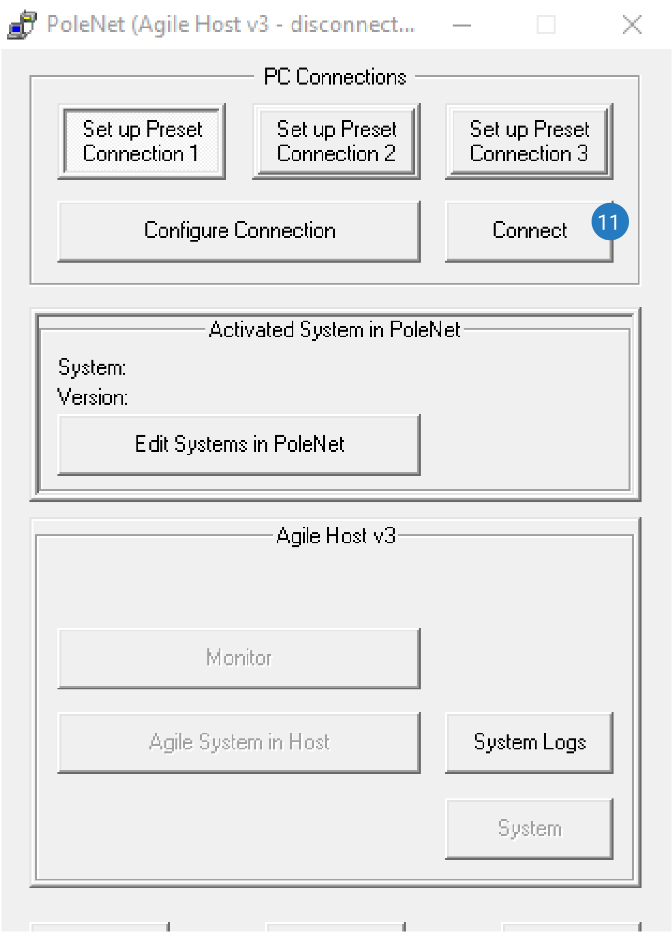
For this connection is recommended to use the PoleNet USB to RS232 device

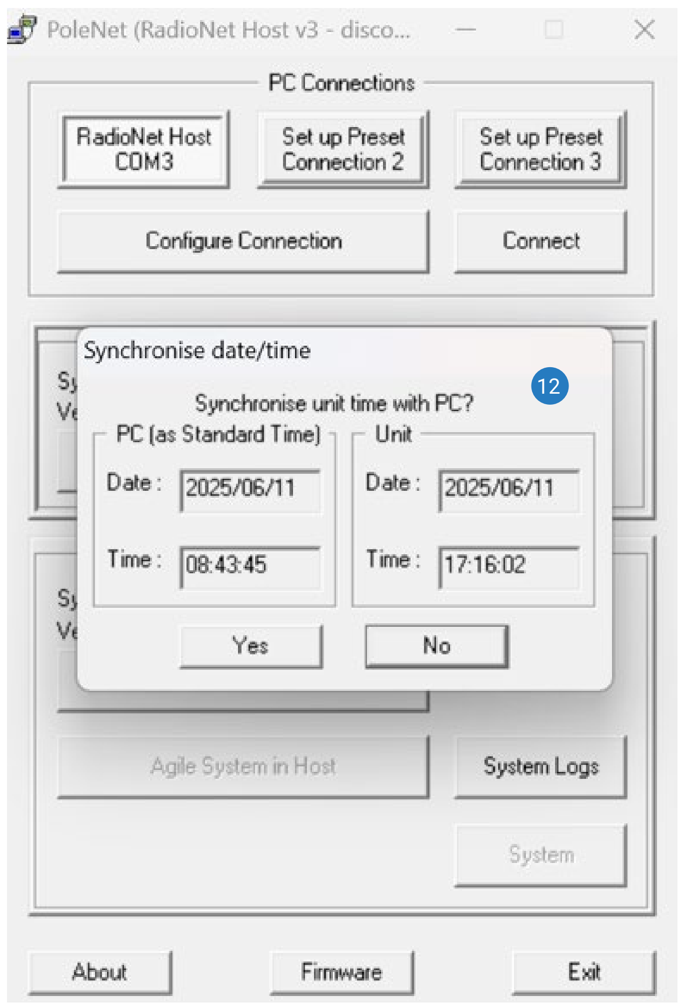
Part number 00035-014780



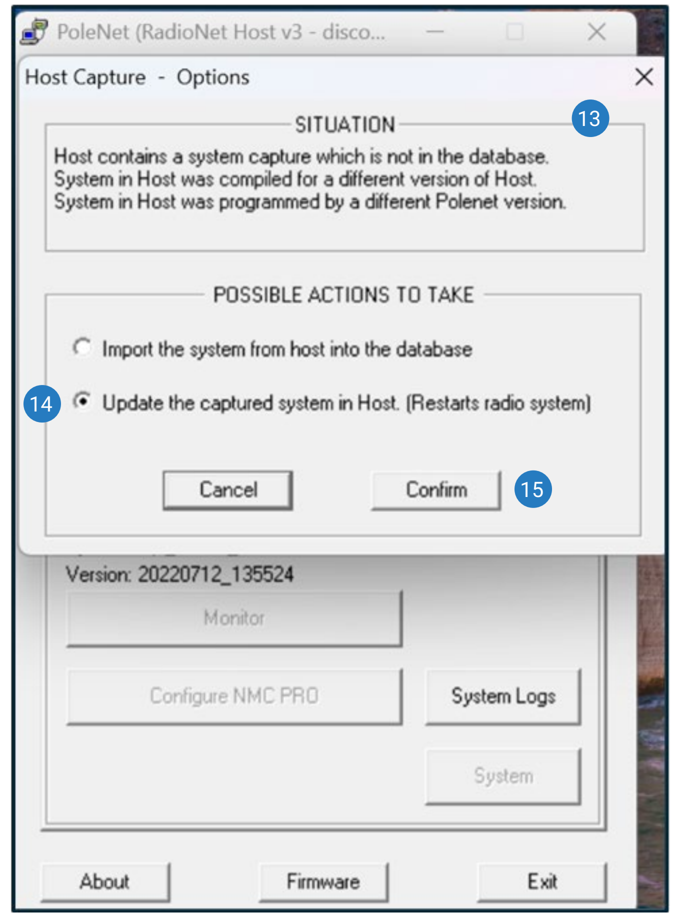


2. Launch the PoleNet Software application.
3. At the PoleNet select "Configure Connection." In the newly opened window, confirm the following settings:
4. Type of System, "RadioNet V3"
5. Device to Connect, "Host"
6. Serial Port, select your "Serial Port Connection". On this example is selected Com 3.
7. Advance, "On"
8. Appearance, "Netafim"
9. FW Filter "On"
10. Then select "OK"
11. Select "Connect" to stablish the communication between the RadioNet Host and the PoleNet PC Software.
12. The popup window is for the time and date update by the user or synchronization with the PC time and date. According to your selection choose "Yes" or "No".

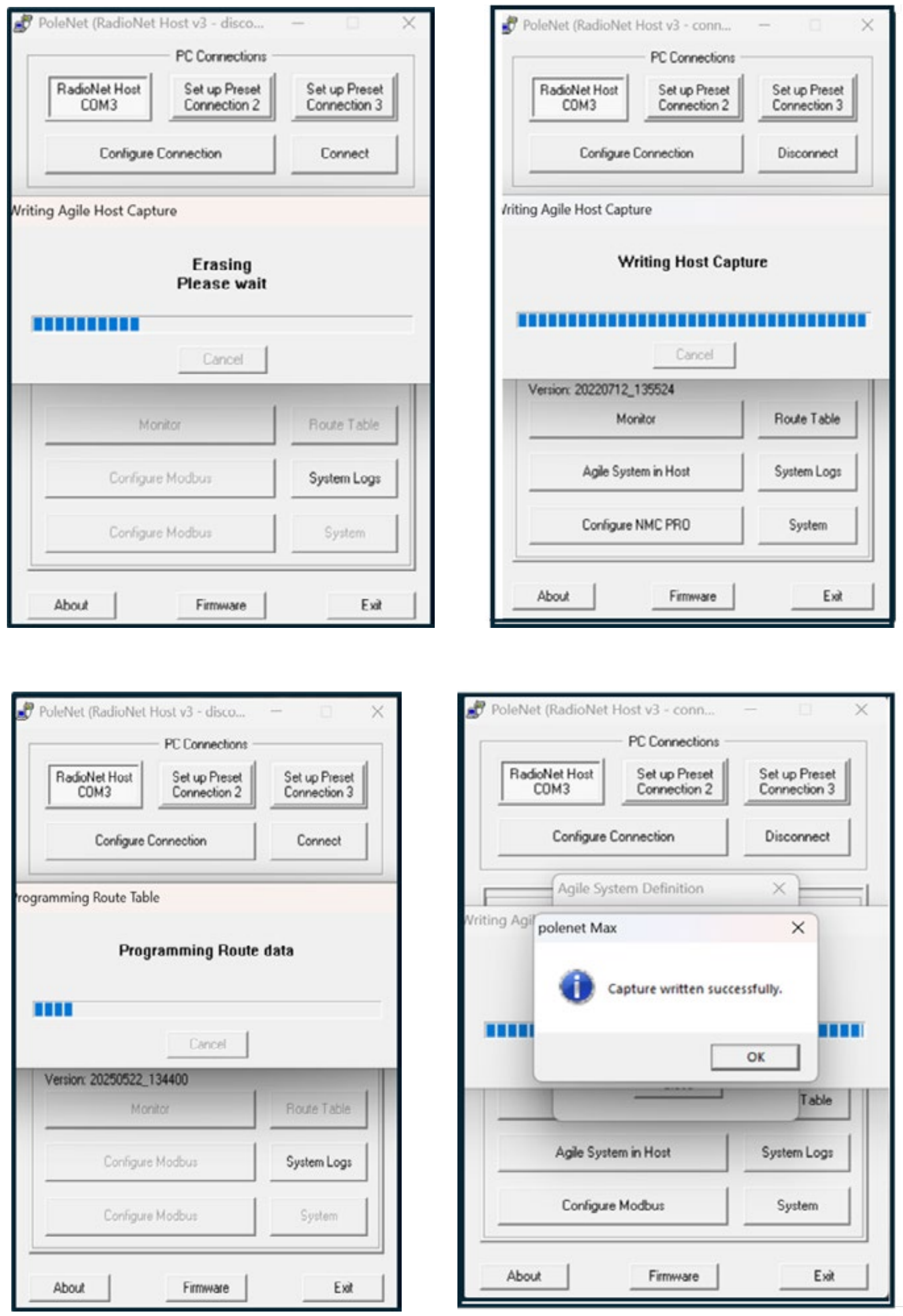




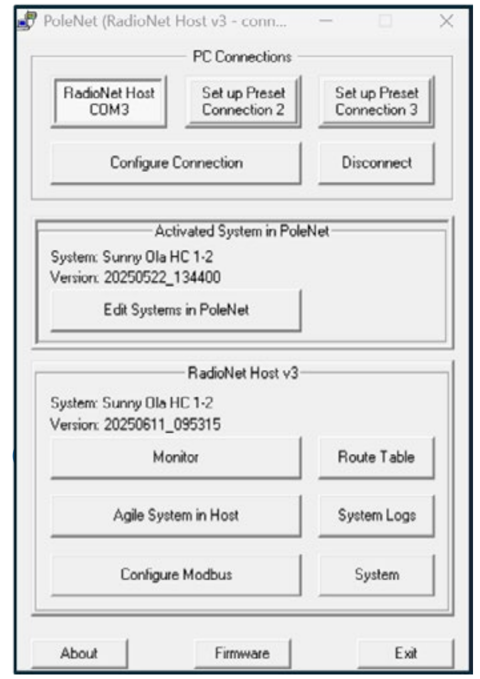
13. The new window will pop up with an explanation and an action to take.
    Situation: This message clarifies whether the RadioNet Host has the same System of the PoleNet active system (Sunny Ola HC 1-2) or a distinct system.
    The PoleNet program recognizes that there is a different system stored in the Host.
14. Possible Actions to Take:
    - Import the System from Host into the Database:
      Selecting this action saves the actual system stored in the RadioNet Host into the PC database.
    - Update the Capture System in Host (Restart Radio System):
      By selecting this option, the active system in the PoleNet PC software (Sunny Ola HC 1-2) is loaded into the RadioNet Host, and the radio system is restarted.
      Select the Update the Capture System in Host (Restart Radio System).
15. Select "Confirm".



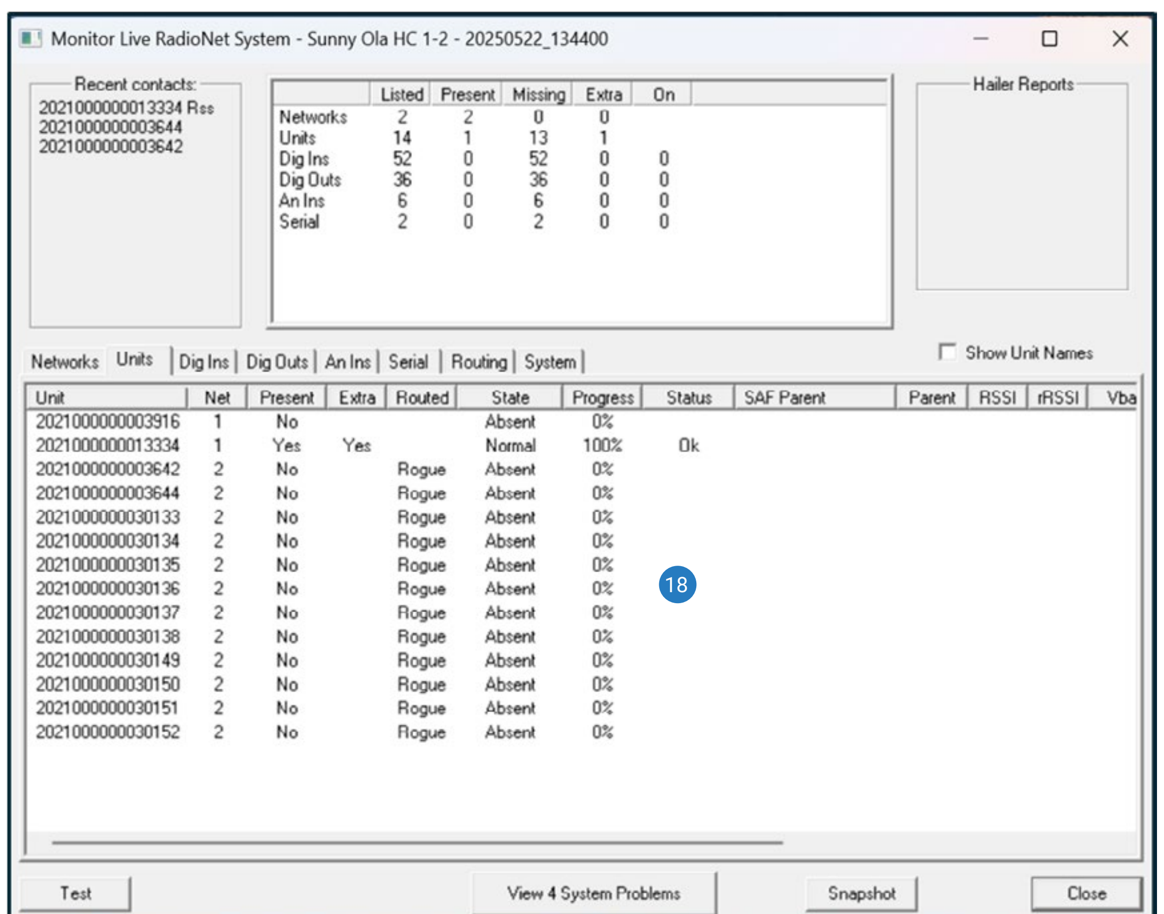
16. The System Sunny Ola HC 1-2 will initiate the process of loading all system settings.
    This process includes erasing the existing system stored in the RadioNet Host and writing the capture system (Sunny Ola HC 1-2) and updating the system routing.
    Upon completion of the process, a message will be displayed indicating that the "Capture has been written successfully."
    Subsequently, the user should select "OK" to proceed.



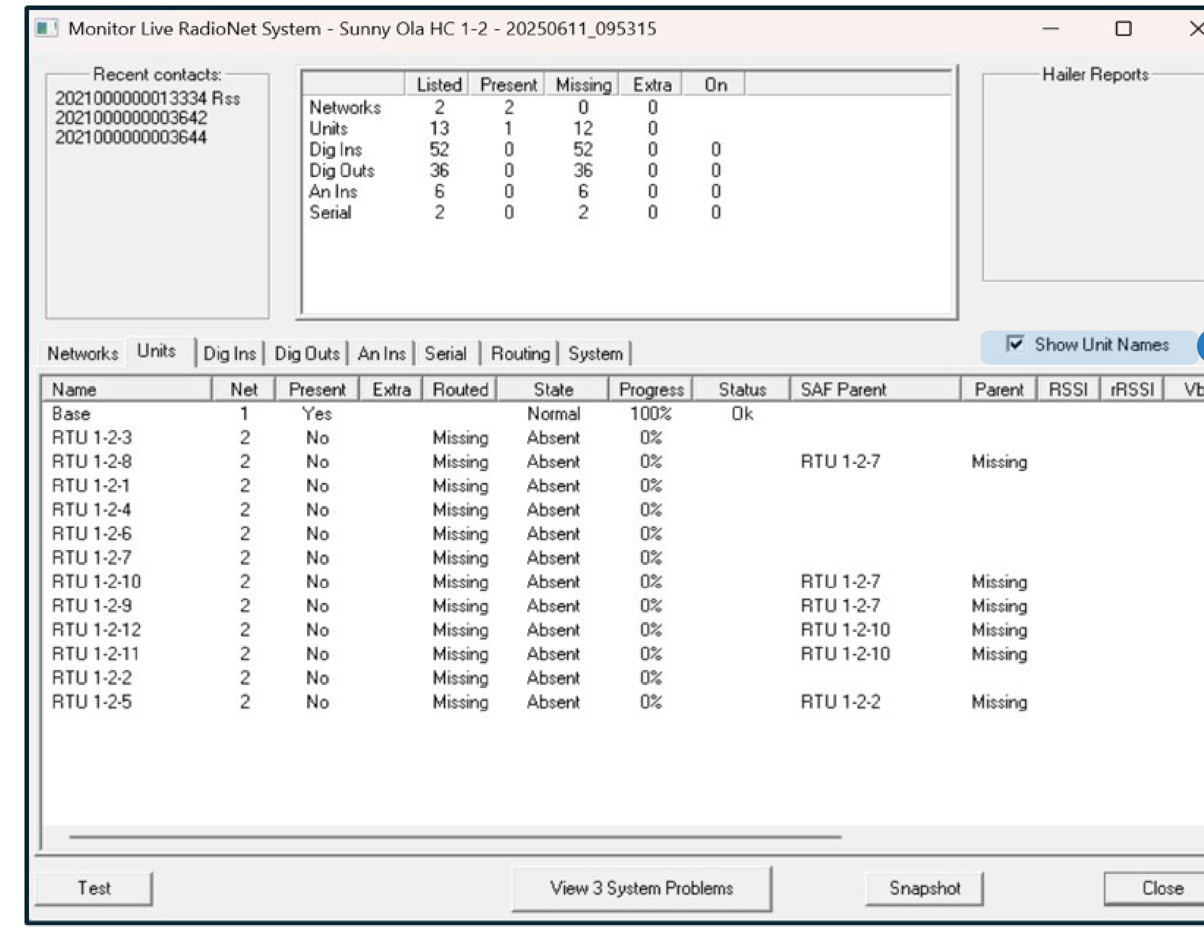
17. Select monitor to display the RadioNet RTU units participating in the system.



18. All RadioNet RTU units will be listed in the Unit column, with their ID numbers in ascending order.



19. By selecting “Show Units Name,” the Unit Column will display all the Remote RadioNet RTUs by the user’s specified name during the RTU definition explained in paragraph 5.4 bullet 16.



NOTE

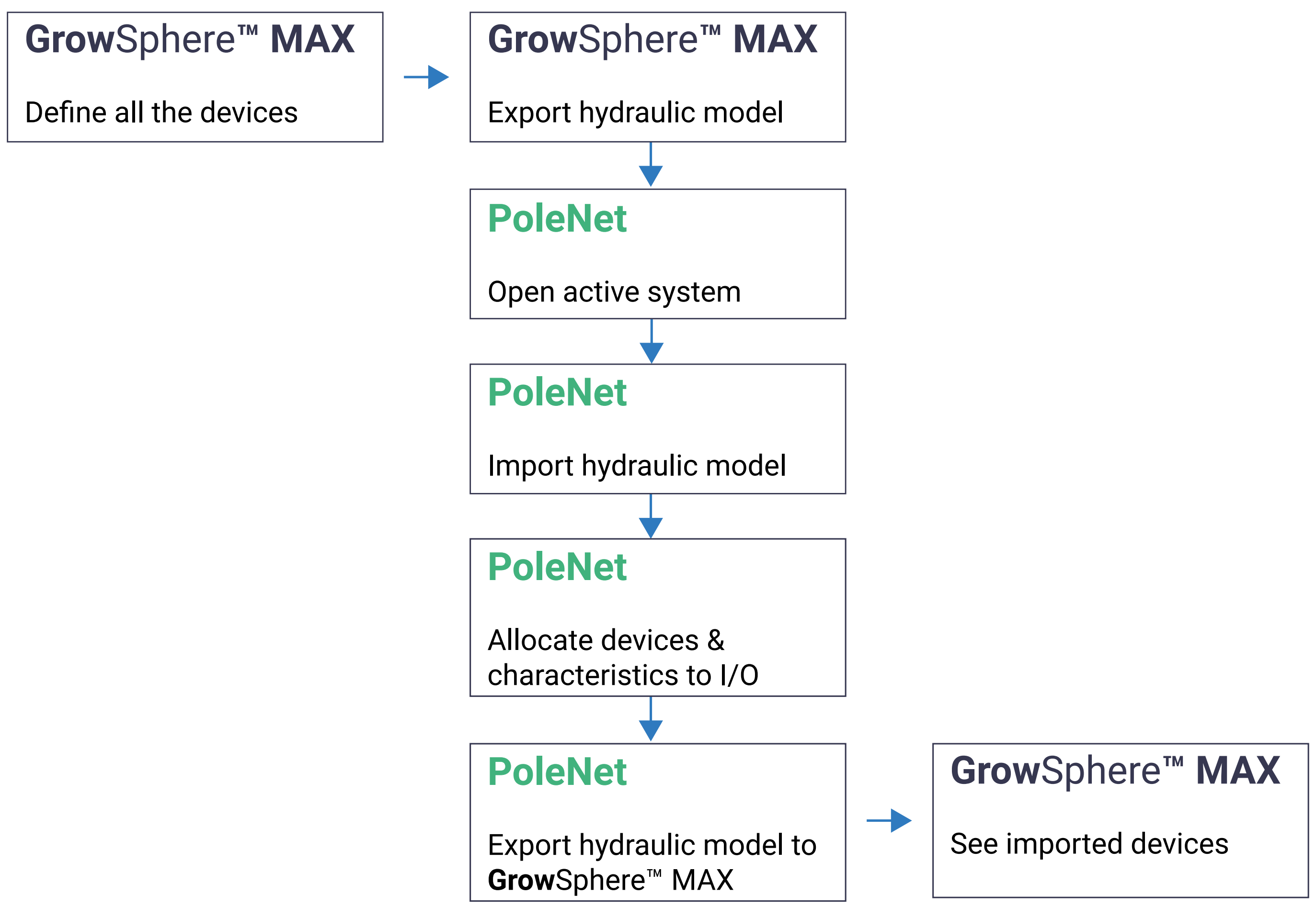
The settings that were previously defined for the RadioNet Remote RTU Network and stored in the RadioNet Host are now prepared for the allocation of Grow Sphere Max devices.

6. GrowSphere™ Max Devices

When the Netafim GrowSphere Max fertigation controller will control some or all of the devices with RadioNet Remote RTU units, it will be necessary to utilize the PoleNet PC software to allocate the RadioNet system Inputs and Outputs of the remote RTU units to the desired **Grow**Sphere™ devices.

The following diagram illustrates the flow of this process:

PoleNet to GrowSphere™ Max

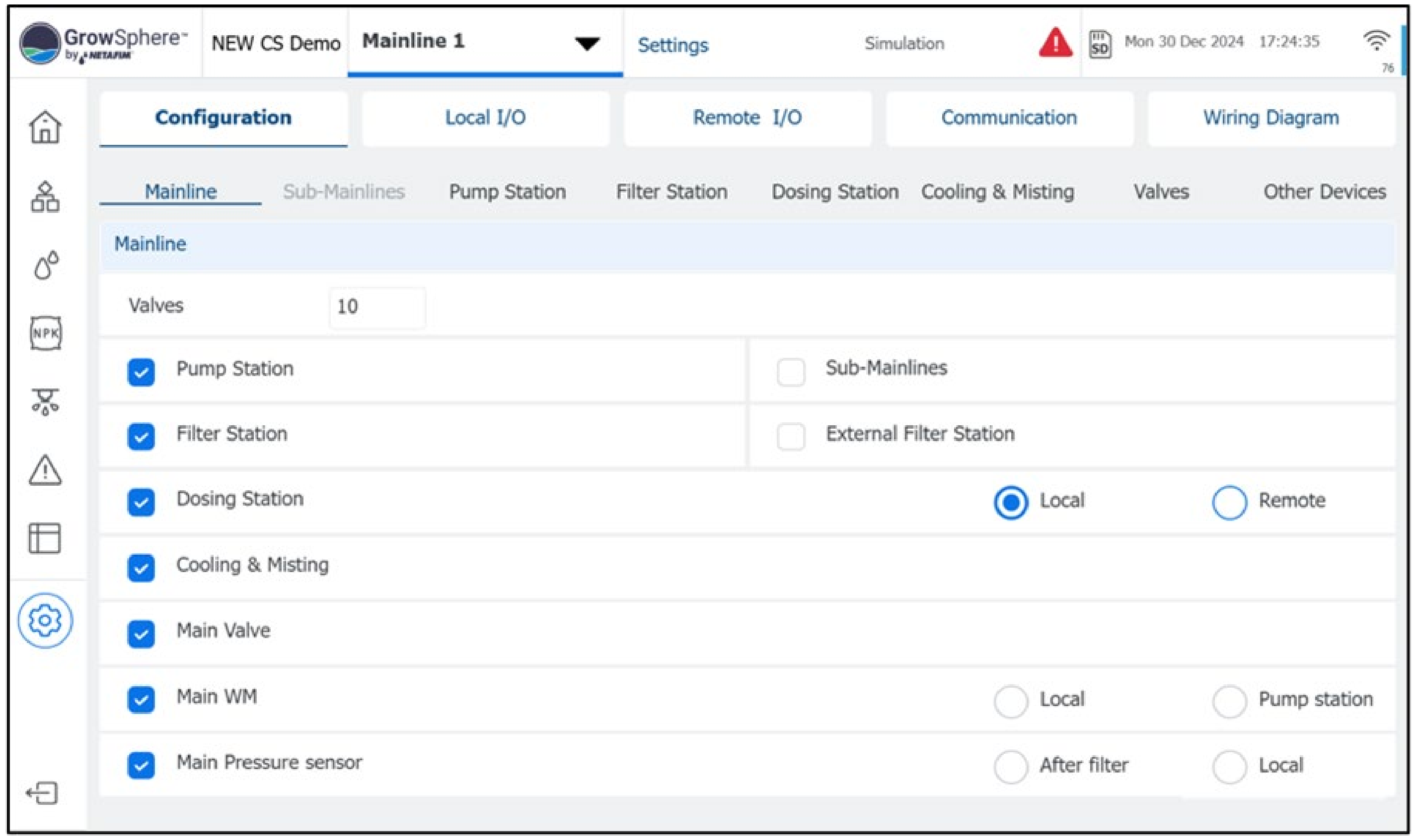


1. The GrowSphere Max device configuration, including the number of valves, pumps, filters, and other components.
2. These devices are stored in the Hydraulic Model file. This file is saved to a GrowSphere Max SD card.
3. The PoleNet PC software is launched, and the Remote RTU system associated with this project is selected to "Active".
4. The GrowSphere Max Hydraulic Model is imported into the PoleNet PC Software.
5. The user allocates each GrowSphere Max device and its characteristics to the desired remote I/O ports.
6. The list of devices and their connections to the I/O ports is exported to the GrowSphere Max.
7. The exported devices are stored in the GrowSphere Max and displayed on the corresponding category screens.

6.1 GrowSphere™ MAX Devices

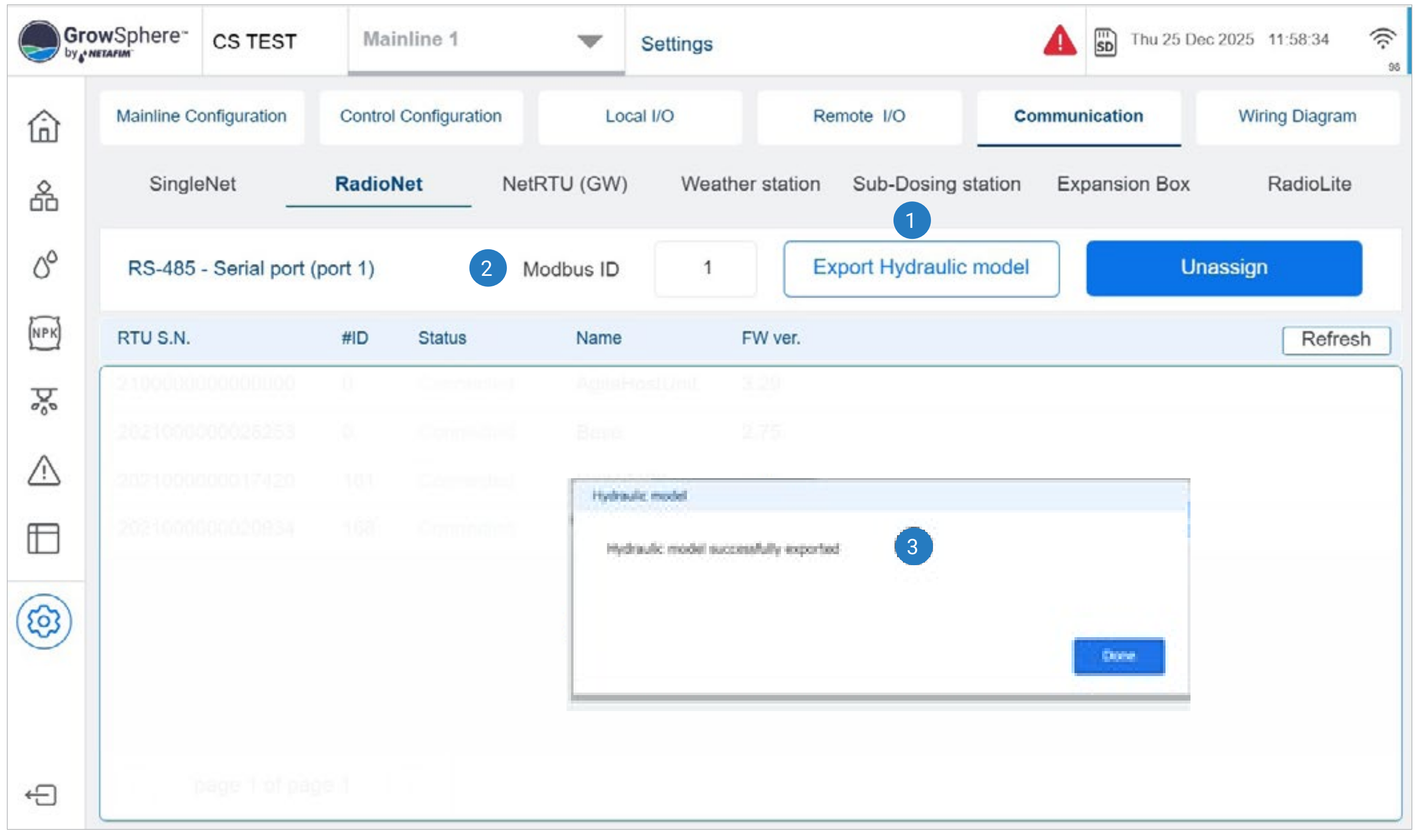
The user will define all the devices per main line at the GrowSphere Max.

Like Valves, Pumps, Filters, Dosing Channels, Cooling & Misting, Main Valves, Water Meters, Dosing meters, analog sensors.



6.1.1 Export Hydraulic Model.

1. Upon defining all devices on the GrowSphere Max Controller, the user can export these definitions to a file by selecting "Export Hydraulic Model."
2. The Hydraulic Model file is stored in the GrowSphere Max Memory SD Card.
   It is imperative that the Modbus ID matches the System ID on PoleNet. By default, it is 1.
3. The export confirmation will be displayed upon successful completion of this action.



NOTE

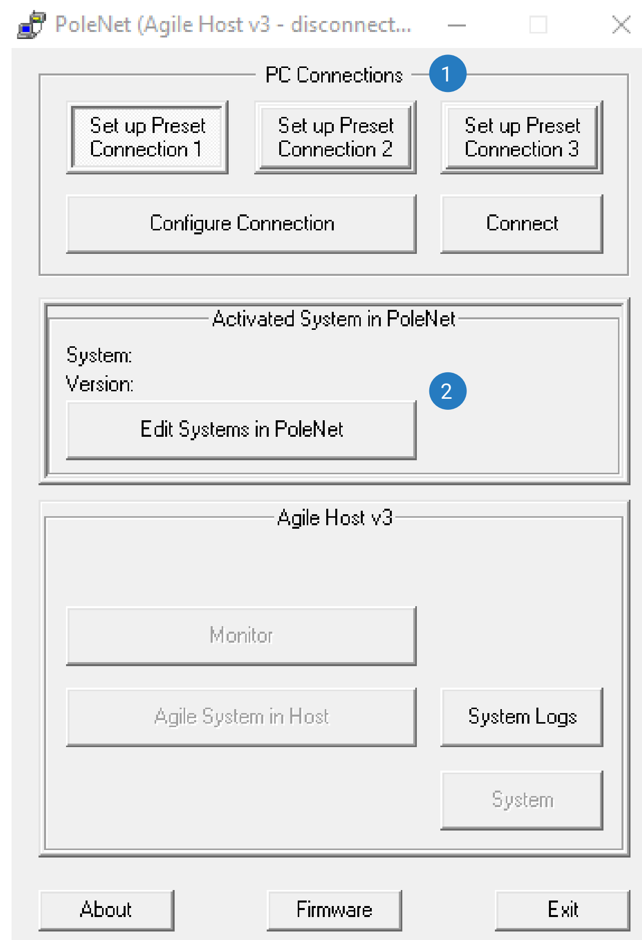
The Export Hydraulic Model may take a minute or longer to complete. Please wait until the successful export confirmation is received.

6.2 PoleNet PC Software

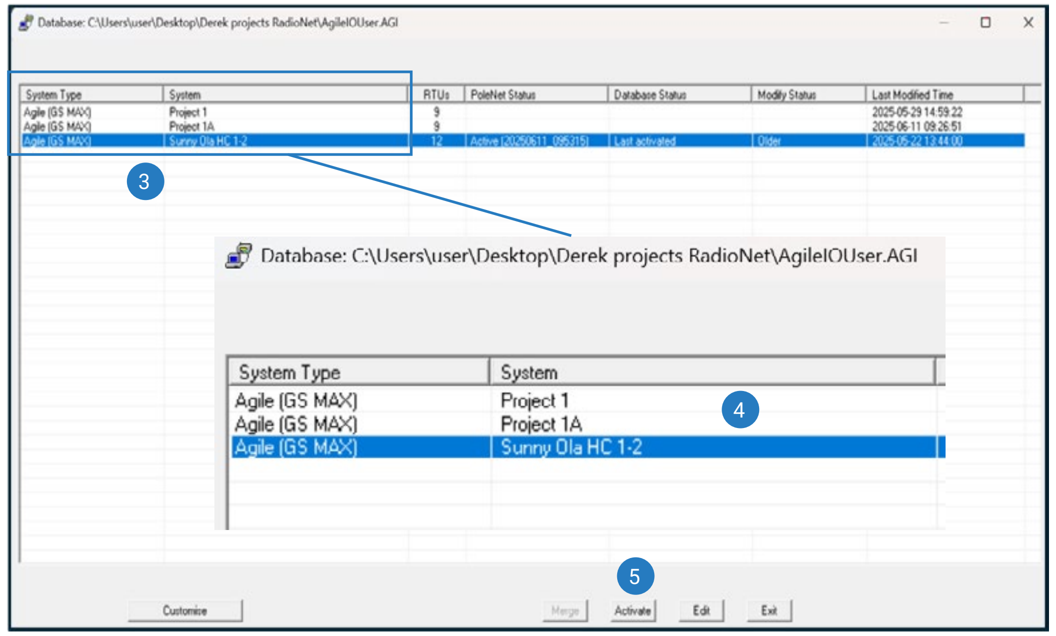
The following instructions are for importing the GrowSphere Max System to the PoleNet PC software and allocateingd the devices.

6.2.1 PoleNet System and Definitions

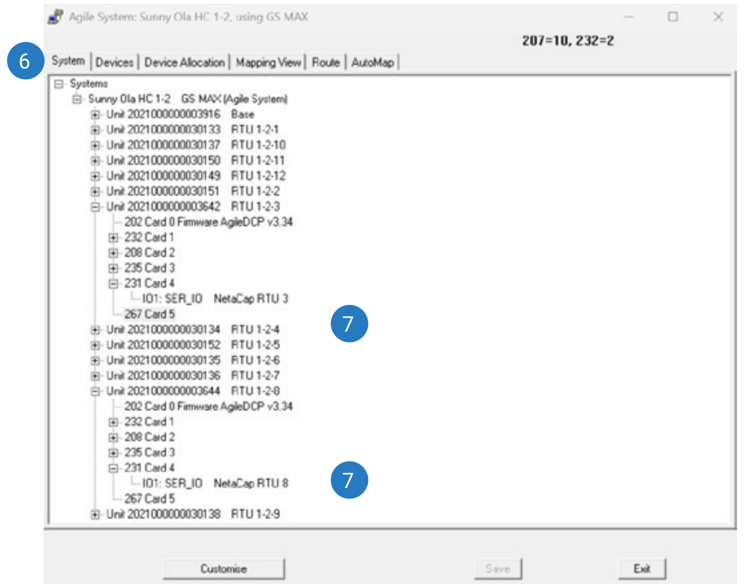
1. Launch the PoleNet PC Software.
2. Select “Edit System in PoleNet”.



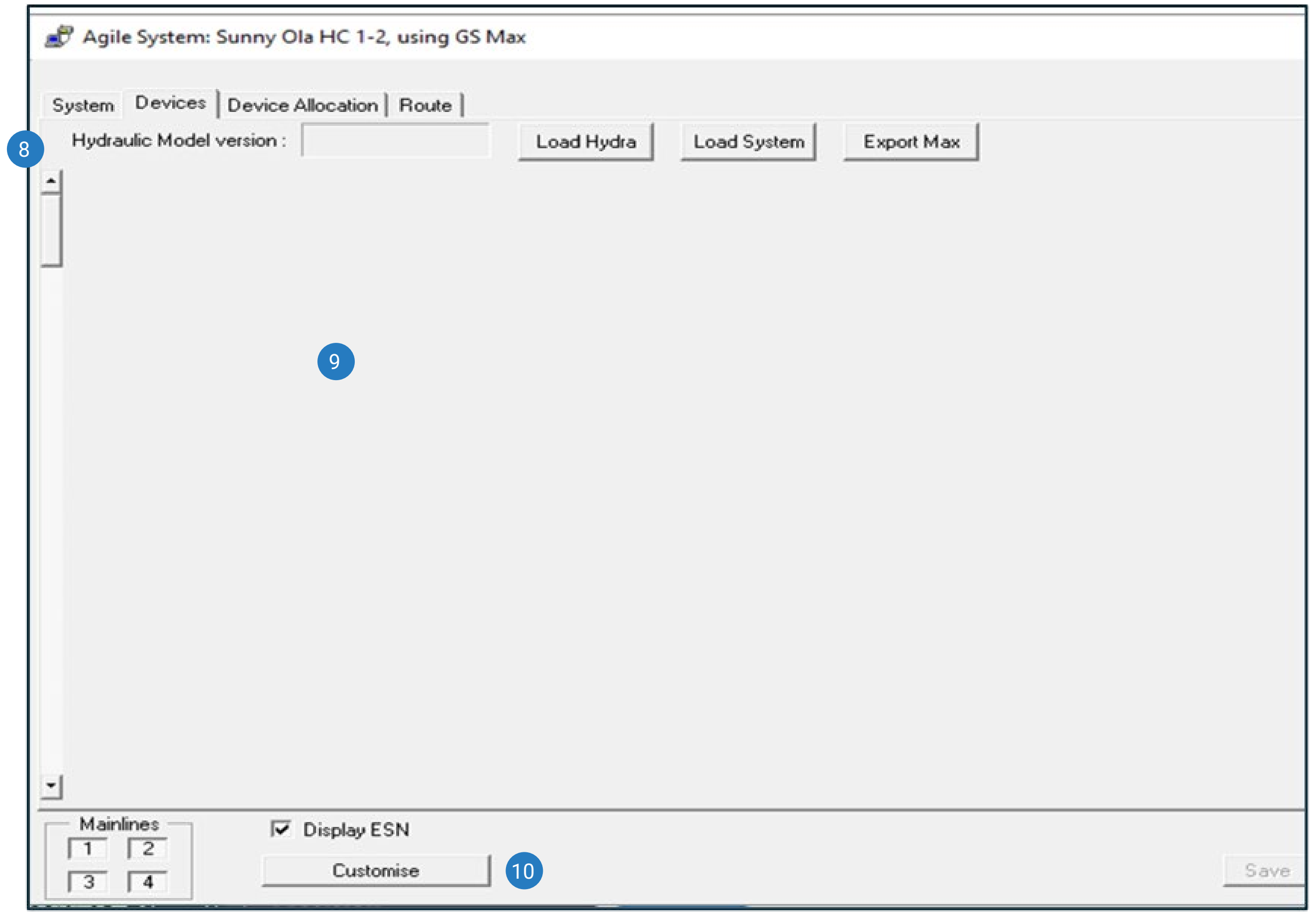
3. The PoleNet Systems Screen will display all the System on the Database.
4. The System “Sunny Ola HC 1-2” will be activated for this demonstration. Please select this system by clicking on it.
5. Then select “Activate”



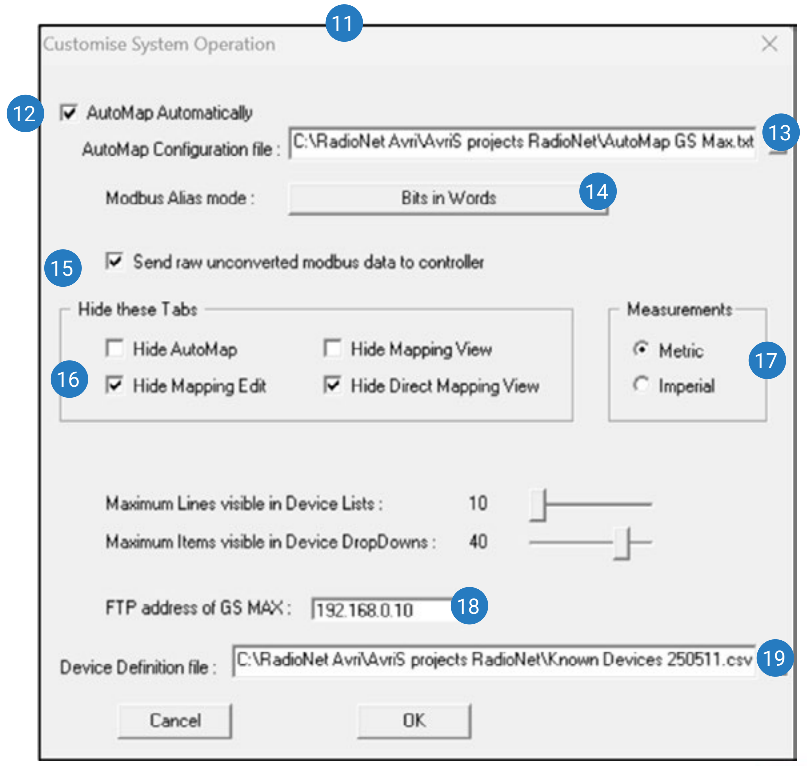
6. The tab “System” lists the following Remote RadioNet RTUs on this system: Sunny Ola HC 1-2.
7. The RadioNet RTU named RTU 1-2-3 and RTU 1-2-8 on the expansion card 4 (Communication Card RS232) is defined a NetaCap soil moisture sensor.



8. Select the “Devices” tab.
9. On this tab, all the devices imported from the GrowSphere Max will be displayed. Currently, there are no devices in the system.
10. Select “Customized” at the bottom of the screen.



11. The Customize System Operation screen provides essential definitions for file location and screen layout.
12. Ensure that “AutoMap Automatically” is selected.
13. Select “AutoMap Configuration file” as “AutoMap GS Max.txt.” Use the square button on the right to browse for the file location (this file is located at the same folder of the PoleNet PC software).
14. Verify that “Modbus Alias Mode” is set to “Bits in Words.”
15. Select “Send raw unconverted Modbus data to controller.”
16. It is recommend checking “Hide Mapping Edit” and “Hide Direct Mapping View.”
17. Select measurements that align with your Measurements units.
18. “FTP address of GS Max” the FTP address of GrowSphere Max is 192.168.0.10. By default, this address is set.
19. “Device Definition file” provide standard settings for standard/known models of devices. Use the latest version for new systems, (this file is located at the same folder of the PoleNet PC software). Select OK.



6.2.2 AutoMap Table and Import Hydraulic Mode File

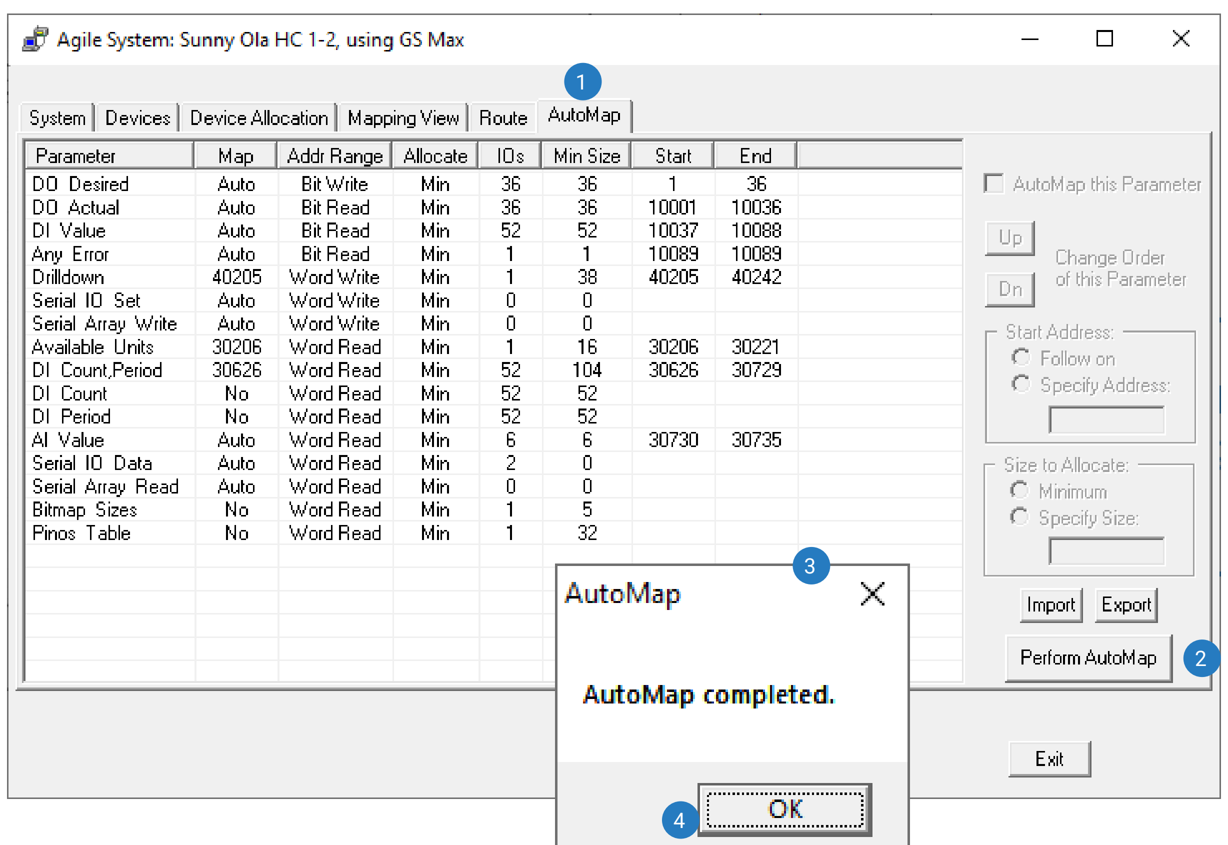
The PoleNet PC Software contains the RadioNet Remote RTU network.

The subsequent step involves performing a Modbus mapping to assign each RadioNet Input, Output, and Communication device an address that corresponds to the GrowSphere Inputs and Outputs addresses, which align with the Modbus table.

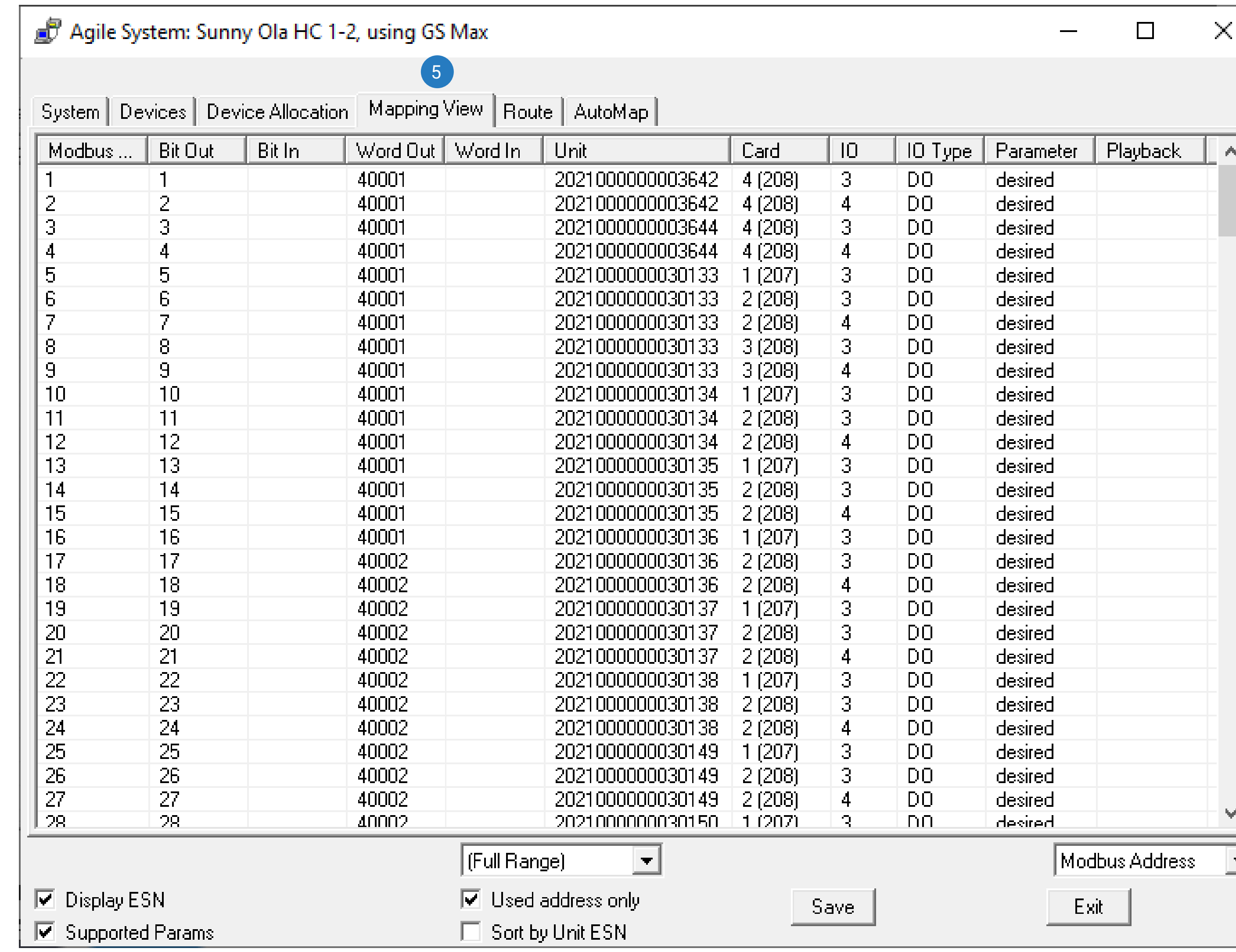
The PoleNet Software possesses the capability to execute an automatic Automap, assigning a dedicated address to each Input, Output, and Communication device on the Modbus table.

This Automap function ensures the avoidance of potential errors.

1. Select the AutoMap tab.
2. Select the option "Perform AutoMap."
   The Automap will be executed, and a Modbus table will be created.
3. When the process is completed, a popup message will confirm that it has been completed.
4. Select OK.



5. Select the Mapping View Tab. This tab contains the created Modbus Table, which includes all device addresses and information. Scroll down to view the complete table information.

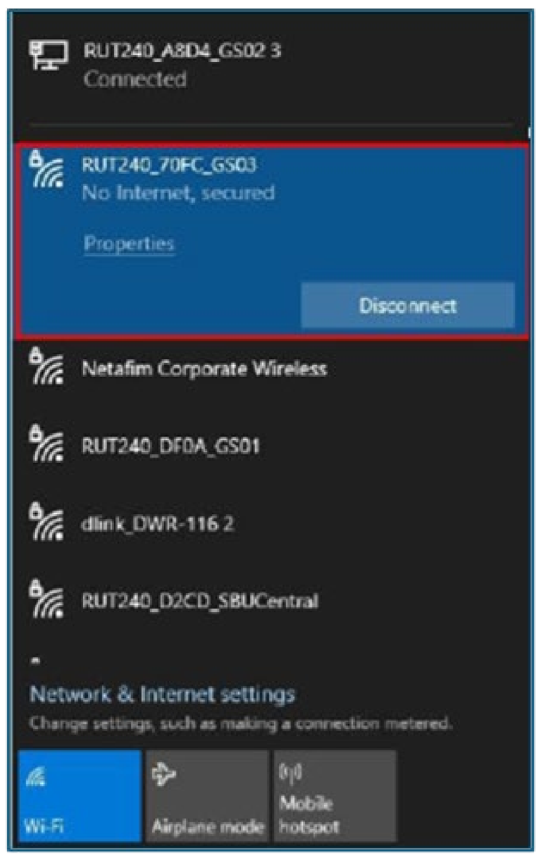


6.3 Load the GrowSphere Max Hydraulic Model into PoleNet

The hydraulic Model file was previously generated by the GrowSphere Max controller and is stored on the GrowSphere Max SD memory card.

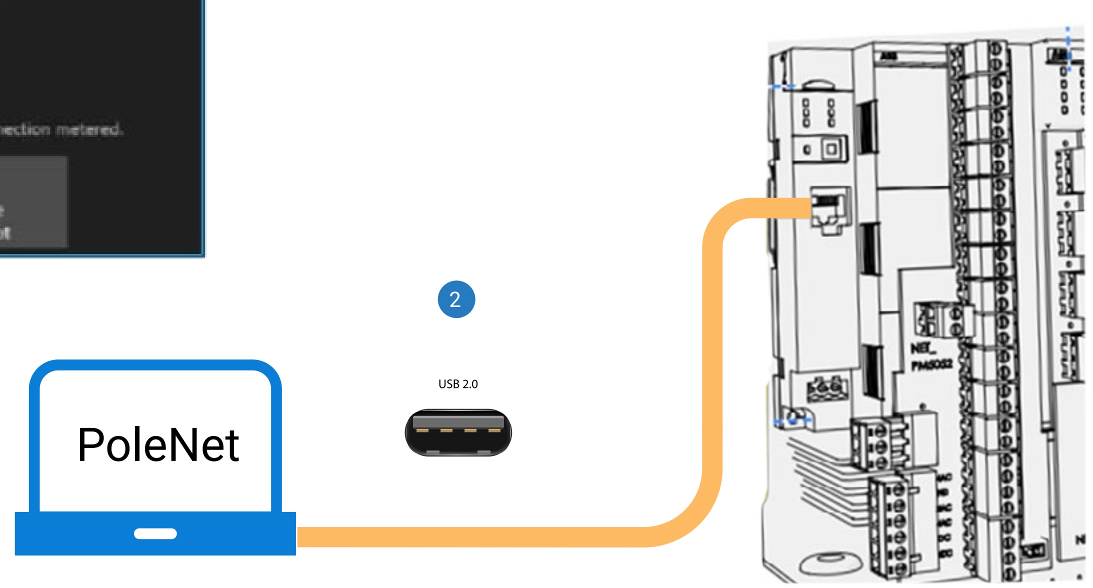
To load this file into the PoleNet PC software, the GrowSphere Max server must establish communication with the PC running the PoleNet software.

Communication can be established via LAN connection or Wi-Fi between the two devices.

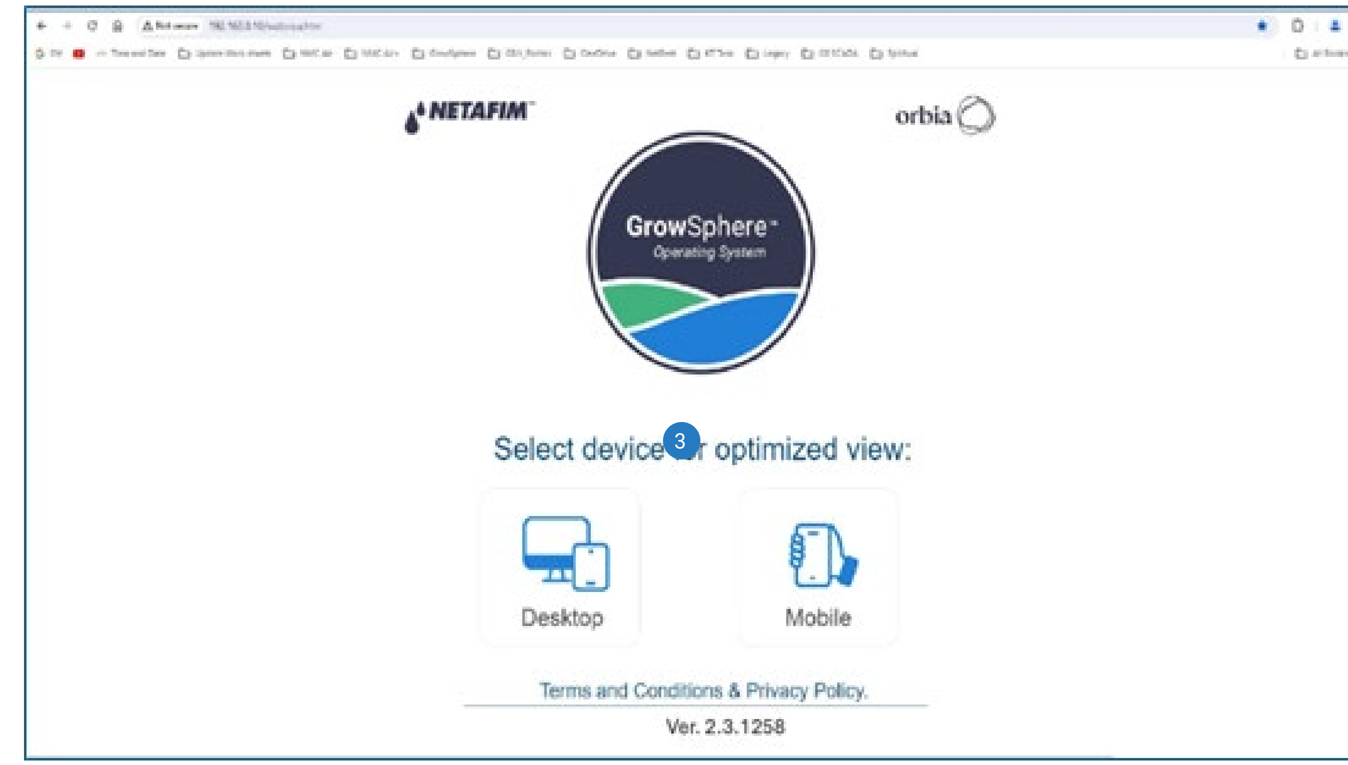


1

2



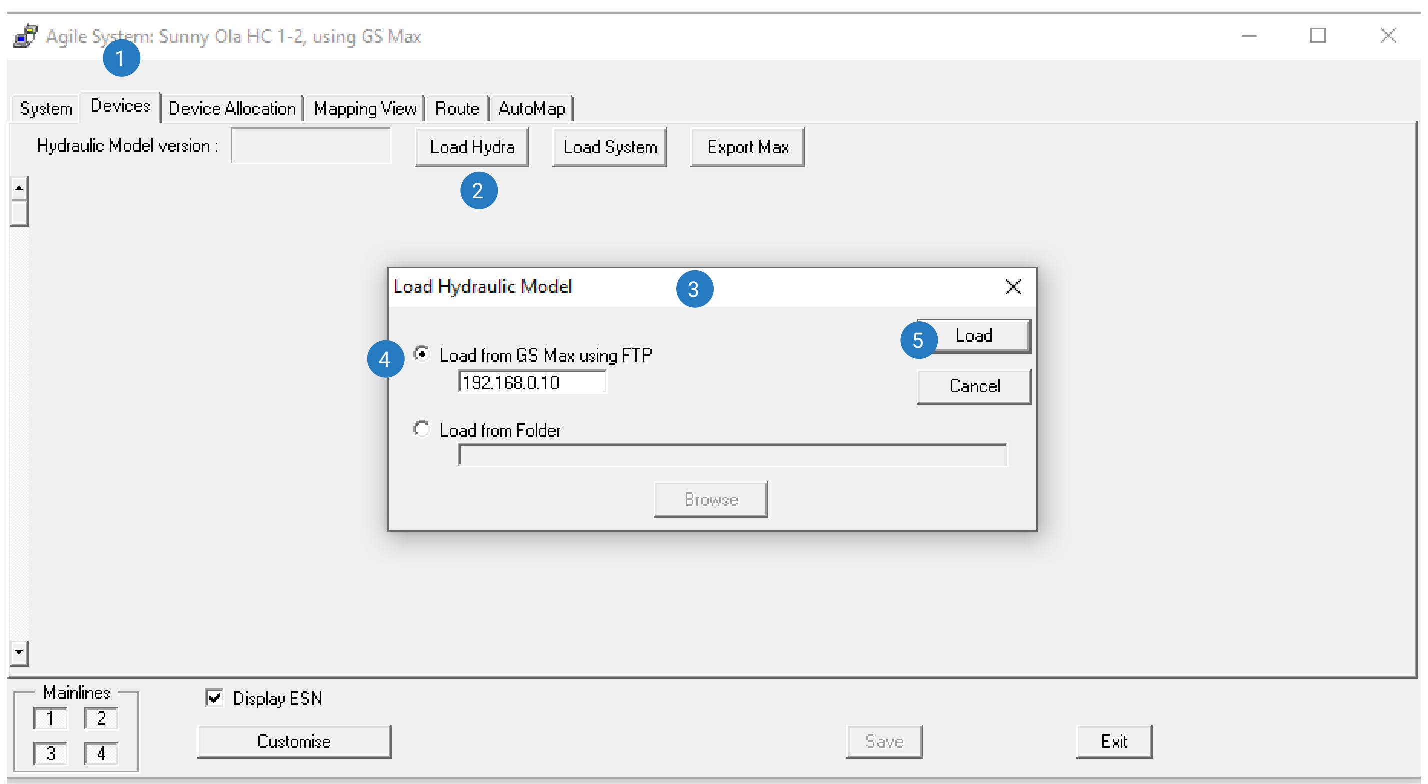
1. Connect your PC to the GrowSphere Max
   Wi-Fi network (Teltonika cellular modem). The Teltonikca Cellular Modem has a label with the Wi-Fi name and Password.
2. Alternatively, you can connect your PC directly to the GrowSphere Max using a LAN connection.



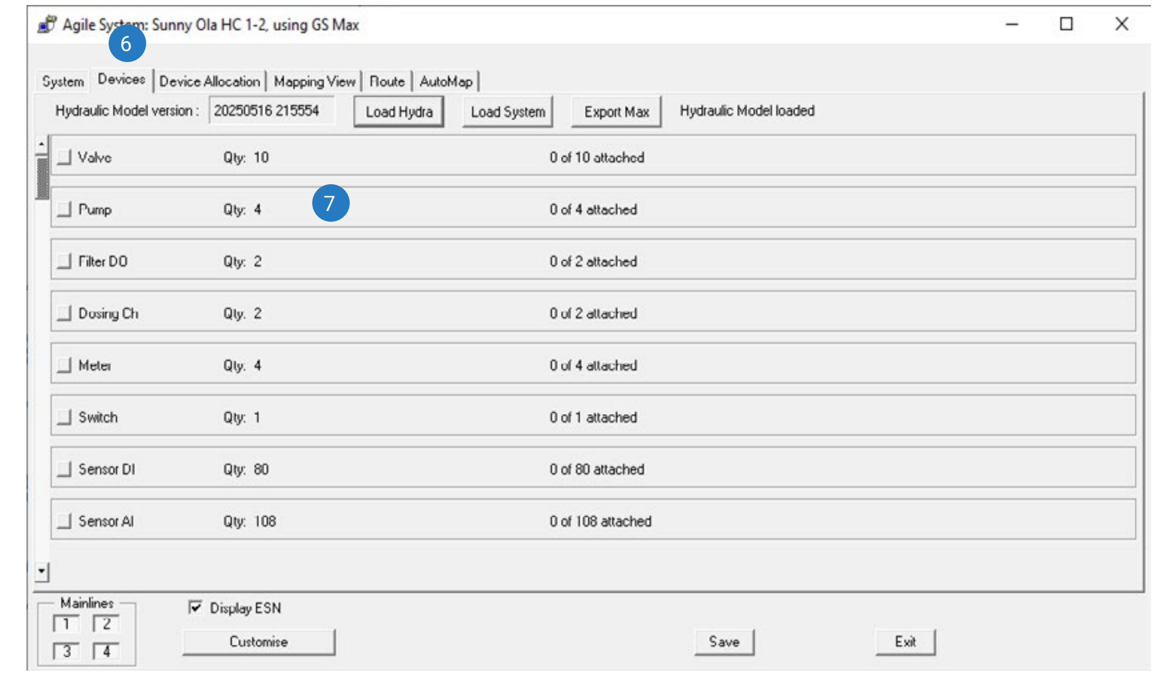
6.3.1 Loading a New Hydraulic Mode from the GrowSphere Max

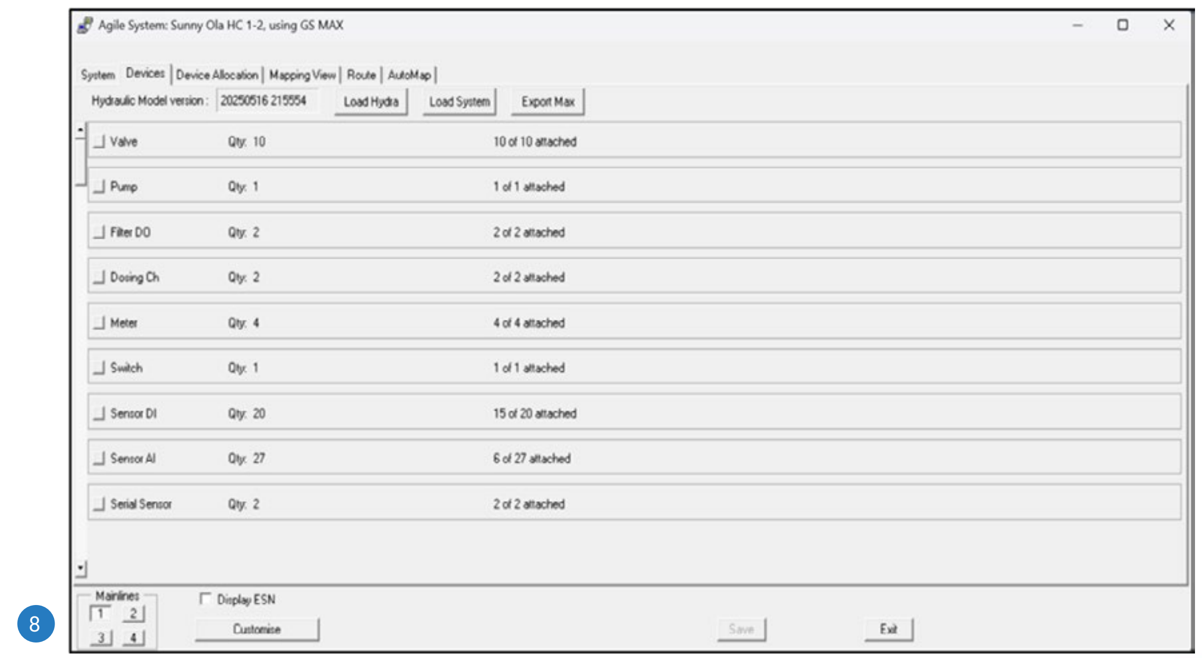
The following steps outline the process of allocating devices loaded from a **Grow**Sphere™ Max Hydraulic Model that was not previously configured using the PoleNet2Max PC software.

1. Access the "Devices" tab on the PoleNet PC Software.
2. Select "Load Hydra" to load the GrowSphere Max Hydraulic Model.
3. The "Load Hydraulic Model" window will appear.
4. Select "Load from GS Max using FTP." The default address for GrowSphere Max is 192.168.0.10.
5. Select "Load" to initiate the process of loading the Hydraulic Model into the PoleNet PC Software.



6. The Devices Tab now presents a comprehensive overview of all the loaded devices from the Hydraulic model and categorized based on their respective device types. This categorization provides a detailed representation of the total devices of the four Main Lines.
7. For instance, the total number of Valves is 10, while the total number of Pumps is 4, etc.





6.3.2 Loading an Existing Hydraulic Model from the GrowSphere Max

NOTE

The “Load System” function is **not essential** for routine settings. Its sole purpose is to address situations where the GrowSphere MAX lacks sufficient information to establish a system in PoleNet, then if this function is not required, omit this chapter.

When the GrowSphere MAX system is fully configured using PoleNet, please load the capture from the RadioNet host or import the system from their database instead.

This will already include all Device settings that are present in the MAX.

For the Load System to function effectively, it is imperative that you edit a RadioNet system that **precisely corresponds** to the system in operation when the MAX allocation was exported.

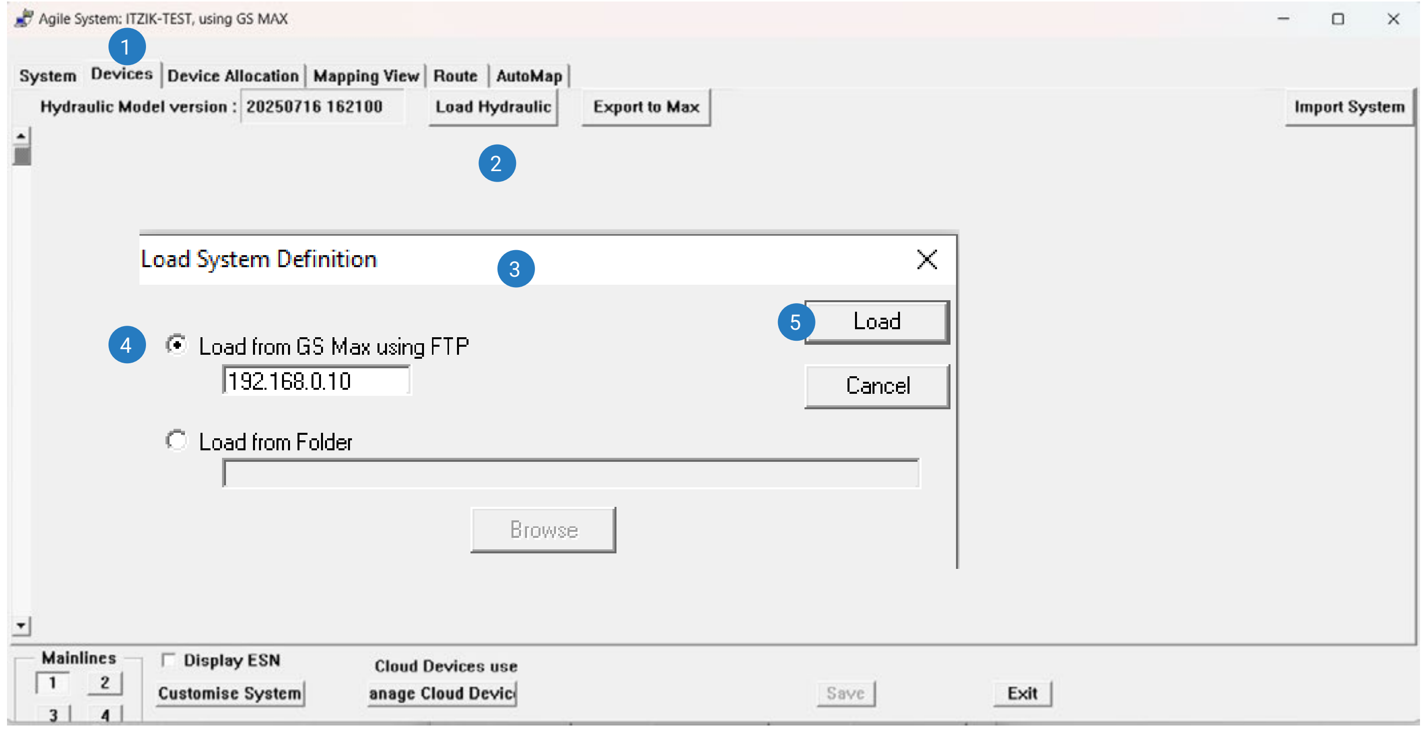
The Load System will terminate its operation if there is a mismatch, as the system definition stored within the GrowSphere MAX does not possess sufficient information to define a system in PoleNet.

To obtain the matching system definition, you may follow either of the following approaches:

- Connect PoleNet to the RadioNet host and download the Capture from it.
- Import the System from the active PoleNet database at the time of export.

The following steps outline the process of allocating devices loaded from a Grow Sphere Max Hydraulic Model created with PoleNet2Max program.

1. Access the “Devices” tab on the PoleNet PC Software.
2. Select “Load Hydra” to load the **Grow**Sphere™ Max Hydraulic Model.
3. The “Load Hydraulic Model” window will appear.
4. Select “Load from GS Max using FTP.” The default address for GrowSphere Max is 192.168.0.10.
5. Select “Load” to initiate the process of loading the Hydraulic Model into the PoleNet PC Software.



6.4 Devices Configuration and Allocation to RadioNet I/O

Each device is assigned a dedicated category line based on its type and characteristics.

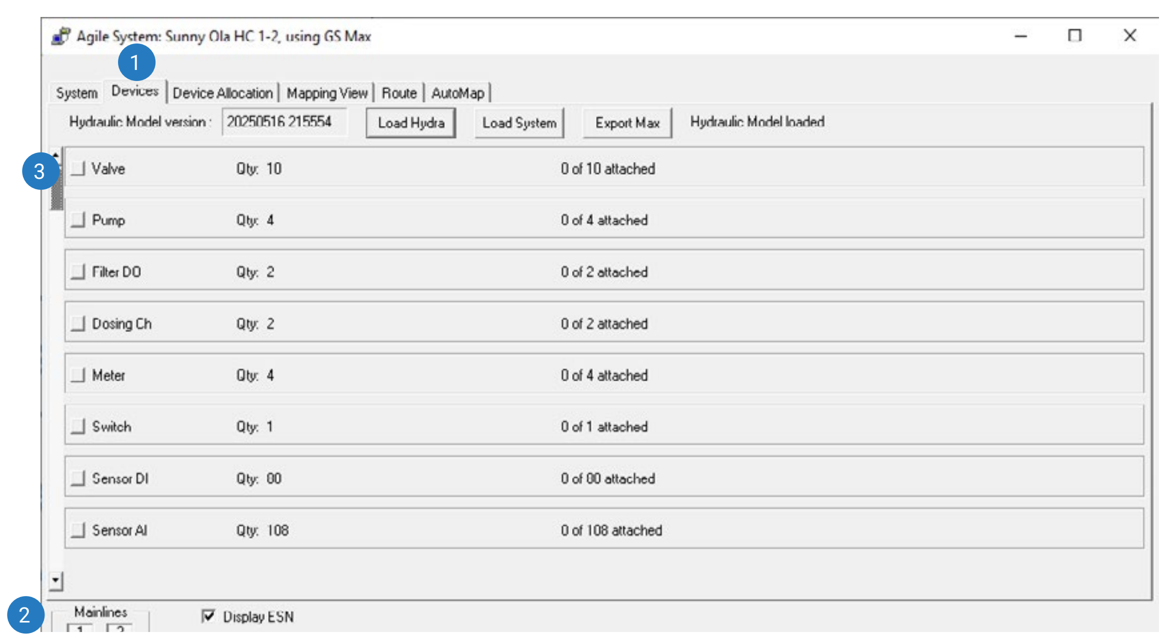
For instance, each Valve will be associated with a dedicated RadioNet RTU output, with its characteristics, such as nominal flow rate, irrigation area, and the main line to which it belongs, are also defined.

These definitions and settings will be performed for each Mainline individually by the user.

> **NOTE**
>
> The Appendix 1 Paragraph 8 provides detailed information on the edition tools available, including copy-paste functionality and the ability to transfer settings from one device to another, known as Clone devices.

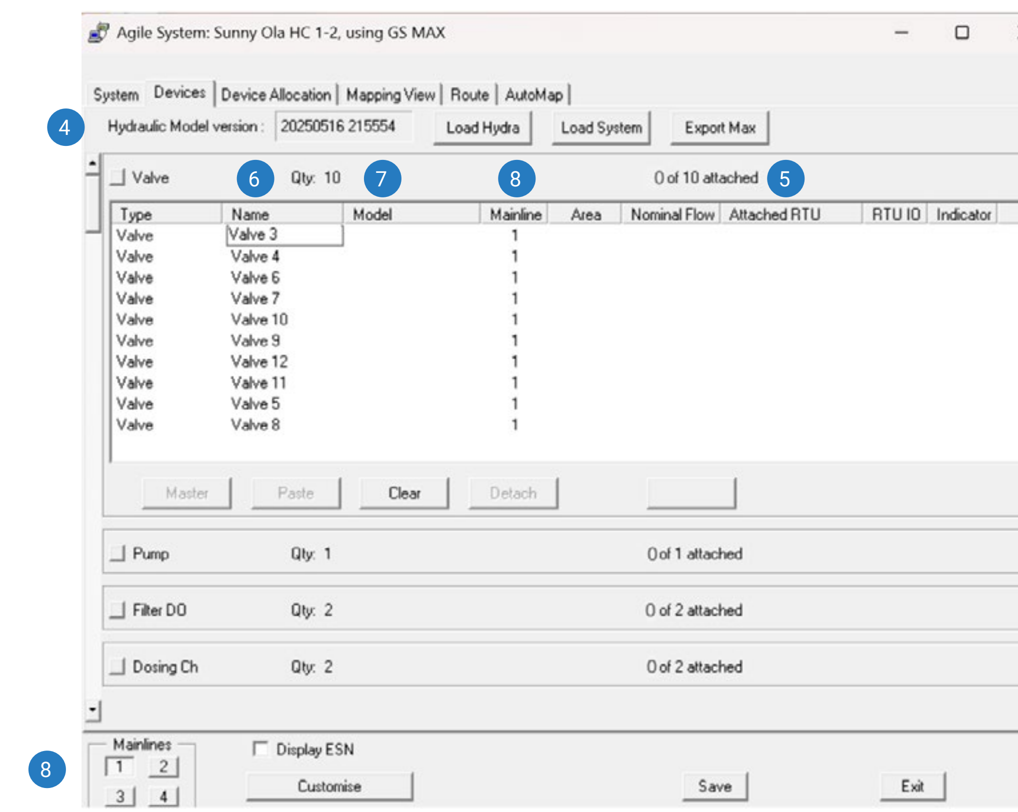
6.4.1 Valves Configuration

1. Select the “Devices” tab.
2. Select “Mainline” 1 only. All the devices of this main line will be displayed.
3. Click on the square bouton near the “Valve”. This main Line 1 has 10 valves.

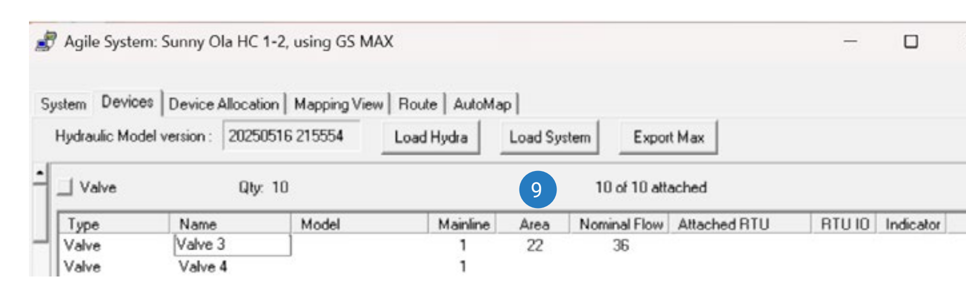


Screen Information:

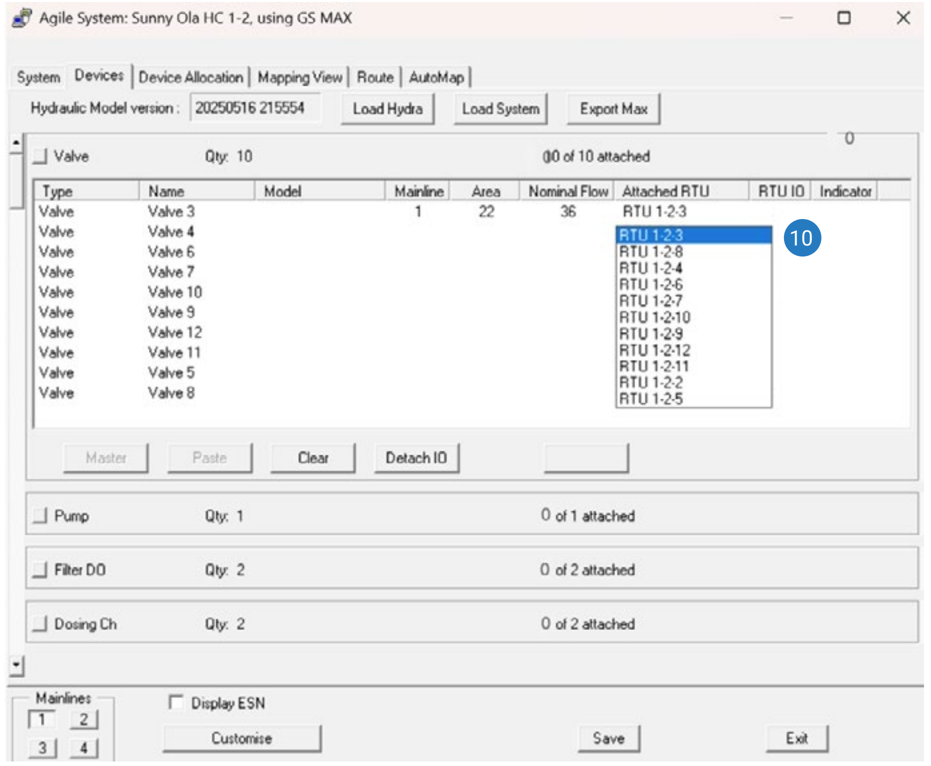
4. The file name or number of the Hydraulic Model.
5. The number of valves available and their respective allocation status.
6. Valves Names, the user can edit the valve names by selecting this field and entering a new name. Press Enter to continue.
7. Model, the user can edit a valve model for informational purposes only.
8. The mainline to which these valves belong (the mainline was already selected).



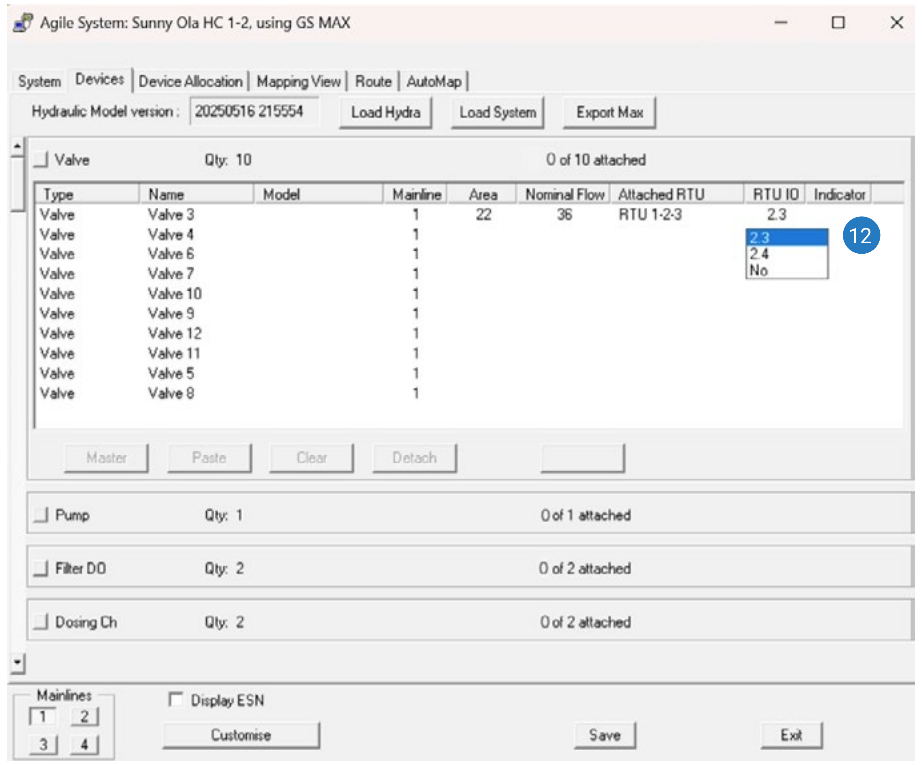
9. Edit the “Area” it is the area irrigated by this valve and its “Nominal Flow” it is the valve nominal flow rate.



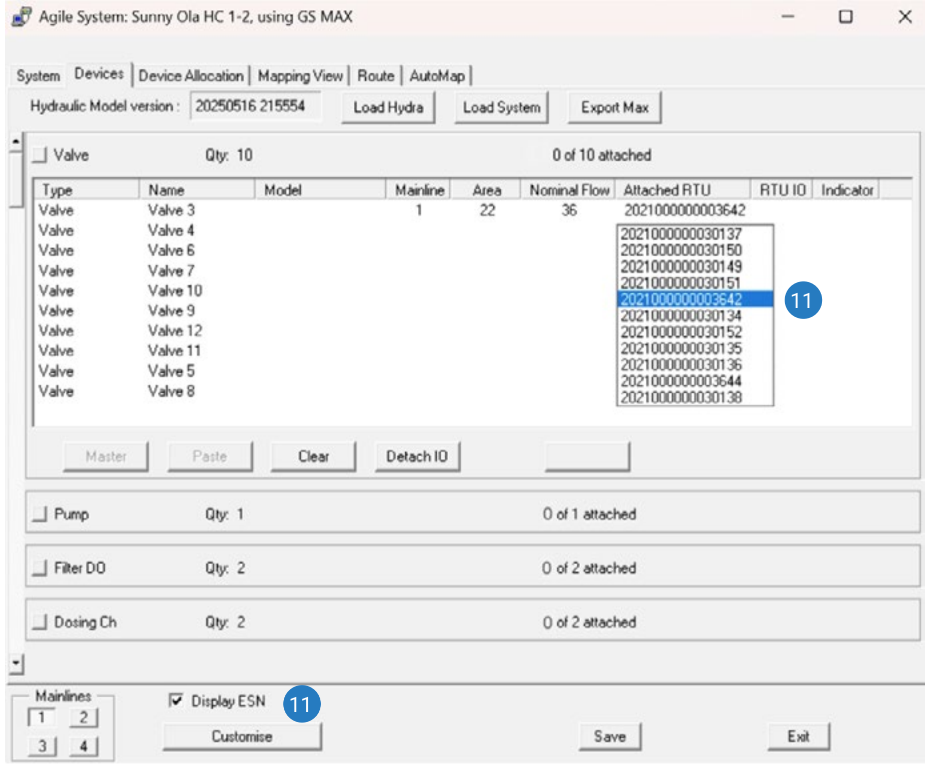
10. Select "Attached RTU." The RadioNet RTU for the selected valve will be selected from the list of all system RTUs, based on their names. In this example, RTU 1-2-3 was selected.



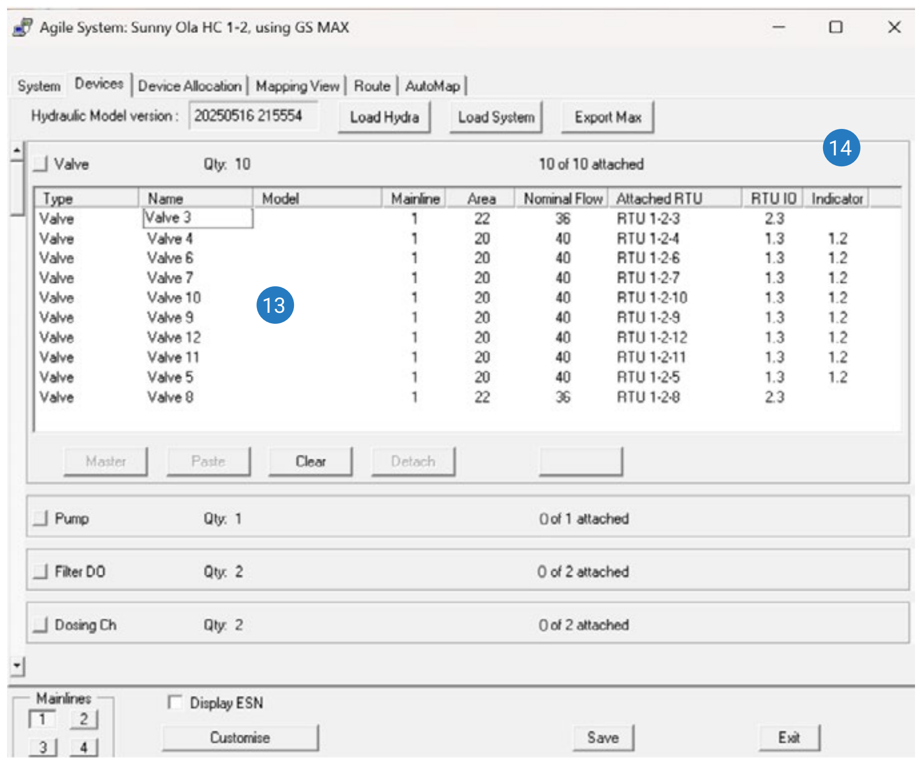
12. Select "RTU IO." The connection I/O for this valve must be selected. In this case, the Expansion Card 2, connection Output 3 is selected (2.3).



11. When requested to view the RadioNet RTU list by the IDN (ESN), please ensure that the checkbox "Display ESN" is selected.

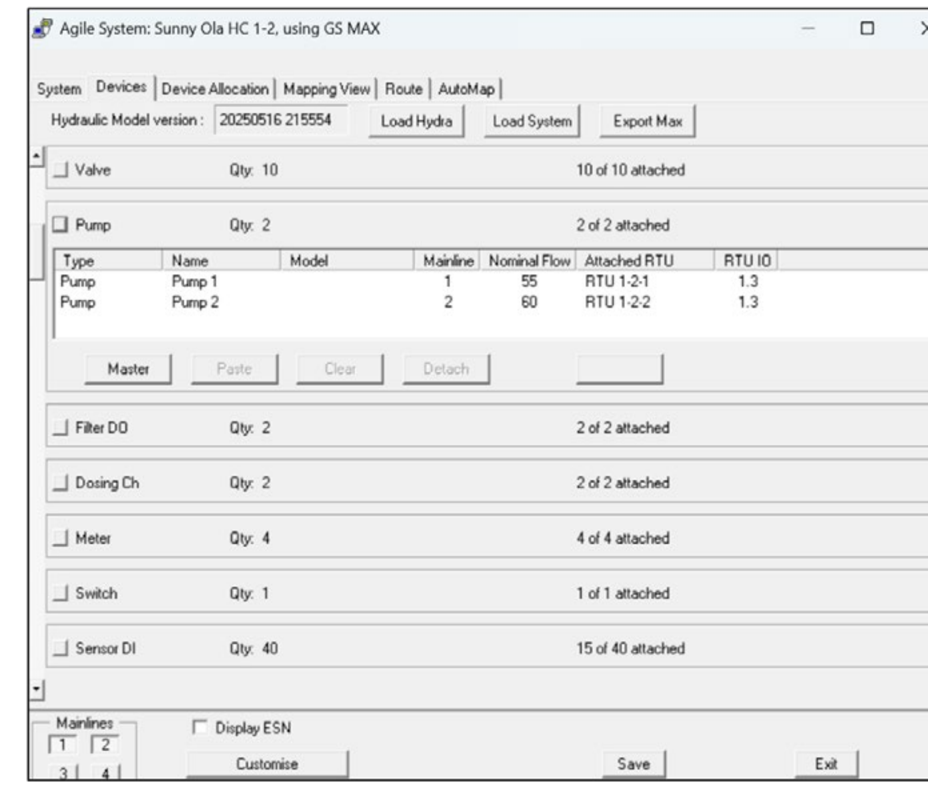


13. Continue allocating the RTU and I/O to the remaining valves. The “10 of 10 attached” indication confirmed that all 10 valves were successfully attached and allocated to the RTU I/O.
14. Irrigation Valve with Indicator: An irrigation valve equipped with a digital pressure switch, provides a digital input to confirm the valve’s open status and the line’s pressurization. A corresponding digital input, the indicator, is connected to one of the RTU’s digital inputs.For instance, the “Valve 4” has an indicator connected to digital input 1.2.



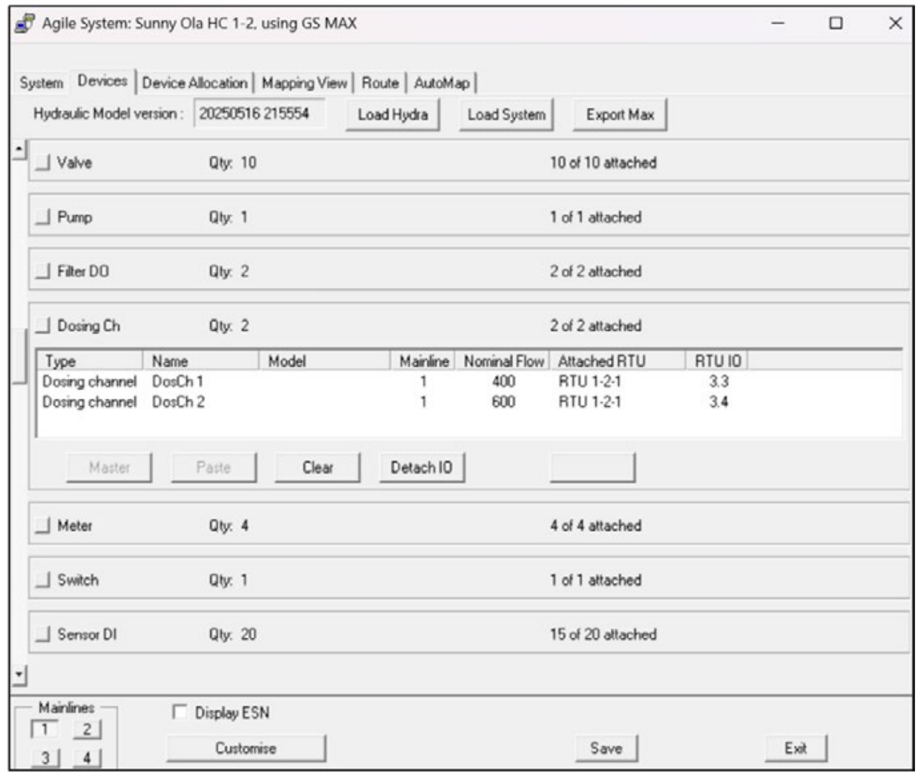
6.4.2 Pumps Configuration

The Pumps I/O allocation is similar to the Valves, preceding with the definition for the Pumps’ Name, Model if it is required, Mainline, Nominal flow rate, Attached RTU and RTU IO output.



6.4.3 Dosing channels Configuration

The Dosing Channels I/O allocation is similar to the Valves, preceding with the definition for the Dosing Channel Name, Model if it is required, Mainline, Nominal flow rate, Attached RTU and RTU IO output.



6.4.4 Meter (Water Meters) Configuration

The Meters - water meters Digital Inputs allocation, preceding with the definition for the Meter Name, Model, Mainline, Pulse Rate (Liters per Pulse for Metric Units, Gallons per Pulse for Imperial Units). Select the Attached RTU and Digital Input.

6.4.5 Switch and Sensor DI.

The Switch and Sensor DI, Digital Inputs allocation, preceding with the name definition, the Digital input action – N.O. (normally open) or N.C. (normally close). Select the Attached RTU and Digital Input.

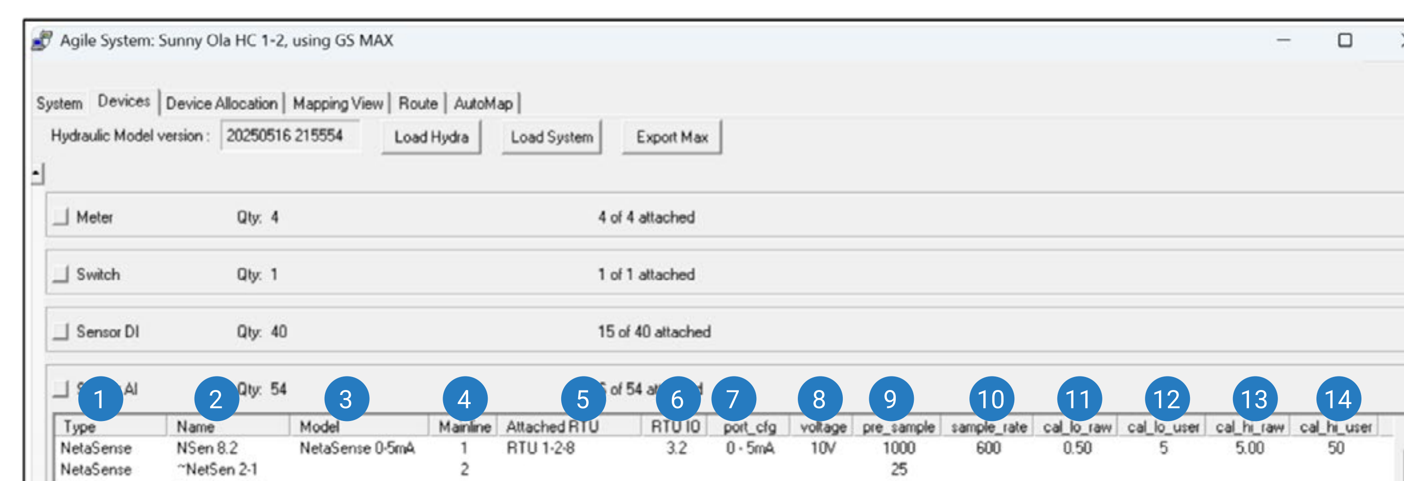
6.4.6 Sensors AI.

The analog sensors are defined and connected to the RadioNet DCP analog inputs, as only this RTU type has analog inputs.

The analog sensor in the category corresponds to the list of sensors defined in the GrowSphere Max and imported into the Hydraulic Mode table.

The following fields must be configured:

1. Type: Loaded from the Hydraulic model.
2. Name: Editable by the user.
3. Model: Selected for NetaSense sensors.
4. Mainline: Indicates the mainline of the sensor location.
5. Attached RTU: Selected RTU for sensor connection.
6. RTU ID: Analog input selected for sensor wiring.
7. port_cnf: Selected from Drop List for sensor input type (current or voltage).
8. voltage: Supplied voltage to the sensor by the RTU (working voltage).
9. pre_sample: Time in milliseconds before sensor energization and reading.
10. sample rate: Delay in seconds between sensor reading.
11. cal_low_row: Low value calculated by the RTU that correspond to the port_config range.
12. cal_low_user: Low value set by the user, corresponding to the cal_low_row).
13. cal_hi_row: High value calculated by the RTU that correspond to the port_config.
14. range.cal_hi_user: High value set by the user, corresponding to the cal_hi_row).

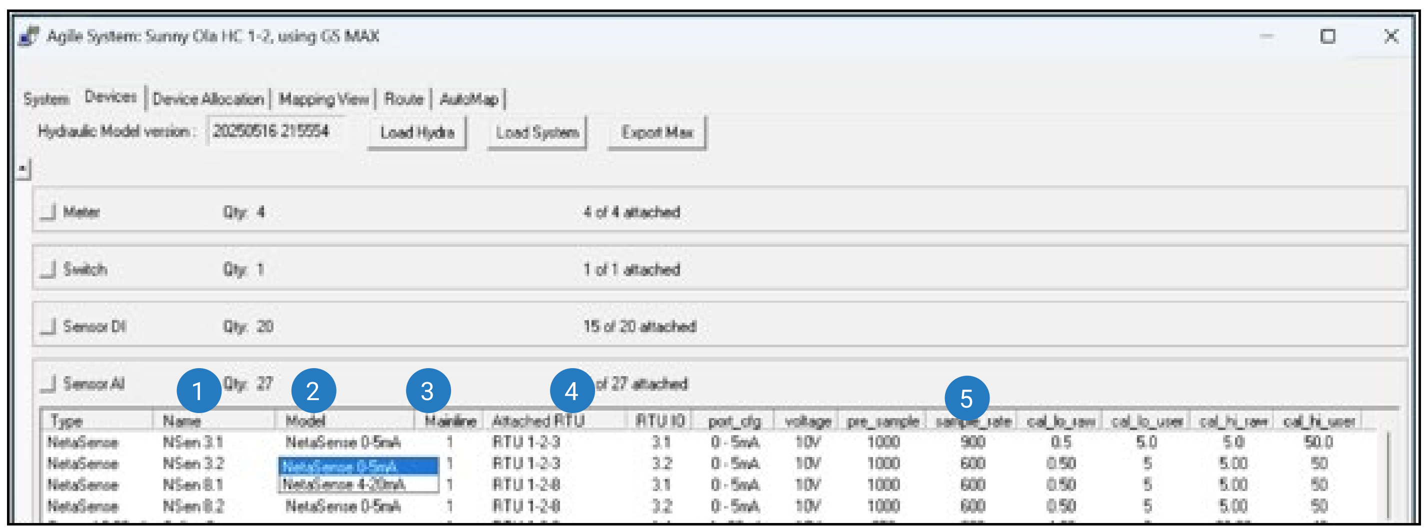


6.4.6.1 NetaSense Sensor Configuration.

The NetaSense sensor configuration values described in the adobe paragraph are loaded automatically by the PoleNet software for the NetaSense soil moisture sensor, these values are pre-defined according to the sensor type.

The user is required to edit and configure the following settings.

1. Sensor Name.
2. Model, it is selected from a popup list.
3. Attached RTU
4. RTU ID.
5. Sample rate.

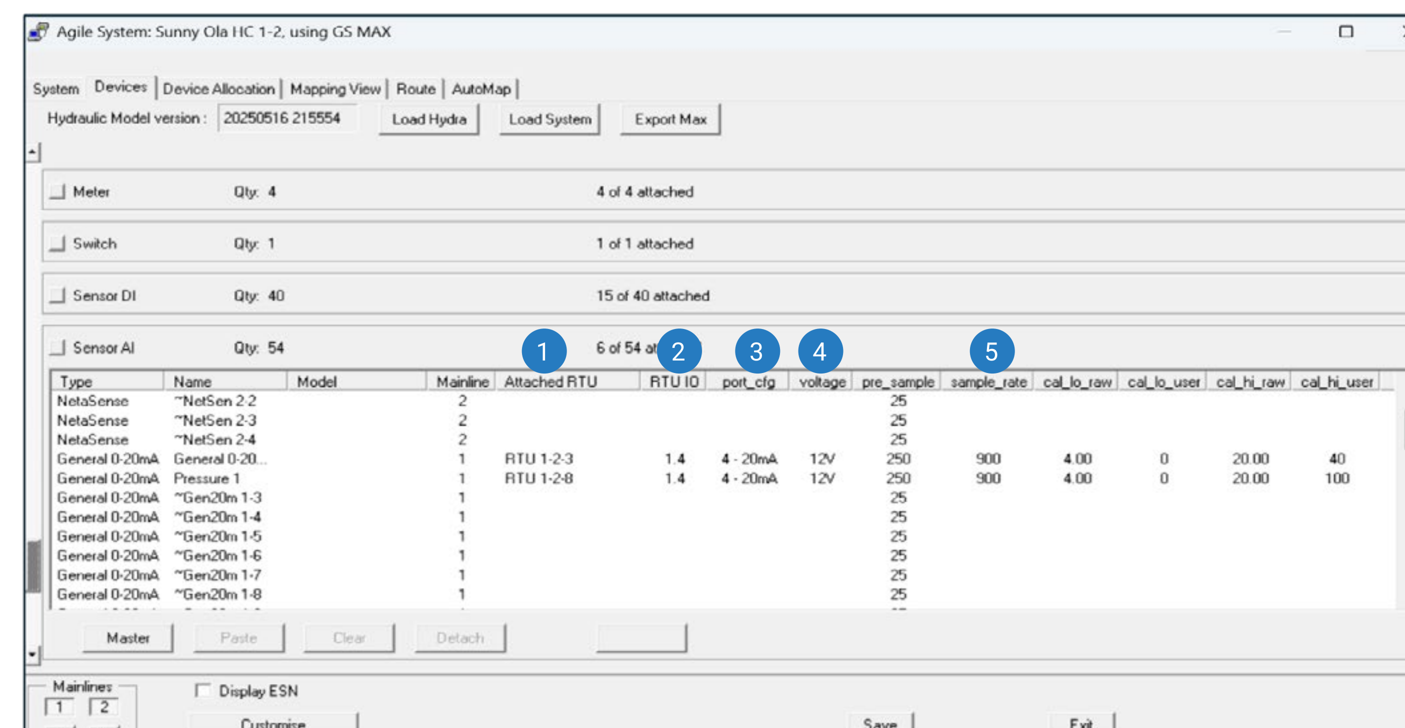


6.4.6.2 Sensor ID Definitions for General Sensor, Pressure Sensors, etc.

When the sensor type loaded from the Hydraulic Model table is a General Sensor, Pressure Sensor, etc., it is necessary to define all the sensor parameters explained in paragraph 6.4.6.

For instance, in the following picture, a sensor type “General 0-20mA” was named “Pressure 1.”

1. The RTU 1-2-8 was attached.
2. The RTU ID was selected 1.4.
3. The “port-cfg” was selected to 4-20mA, according to the sensor type.
4. The “voltage” was set to 12V, according to the sensor’s working voltage.
5. The “pre_sample” was set to 250 msec., according to the sensor data sheet.
6. The “sample_rate” was set to 900 sec., (15 minutes), according to the user’s requirements.
7. The sensor range is 0 to 10 bar. Therefore, the “cal_lo_user” is set to 0 (cero), and the “cal_hi_user” is set to 100. This corresponds to GrowSphere Max 10.0, and the right digit is a decimal value. Sensor range 4mA = 0bar 20mA= 100 (10.0)bar

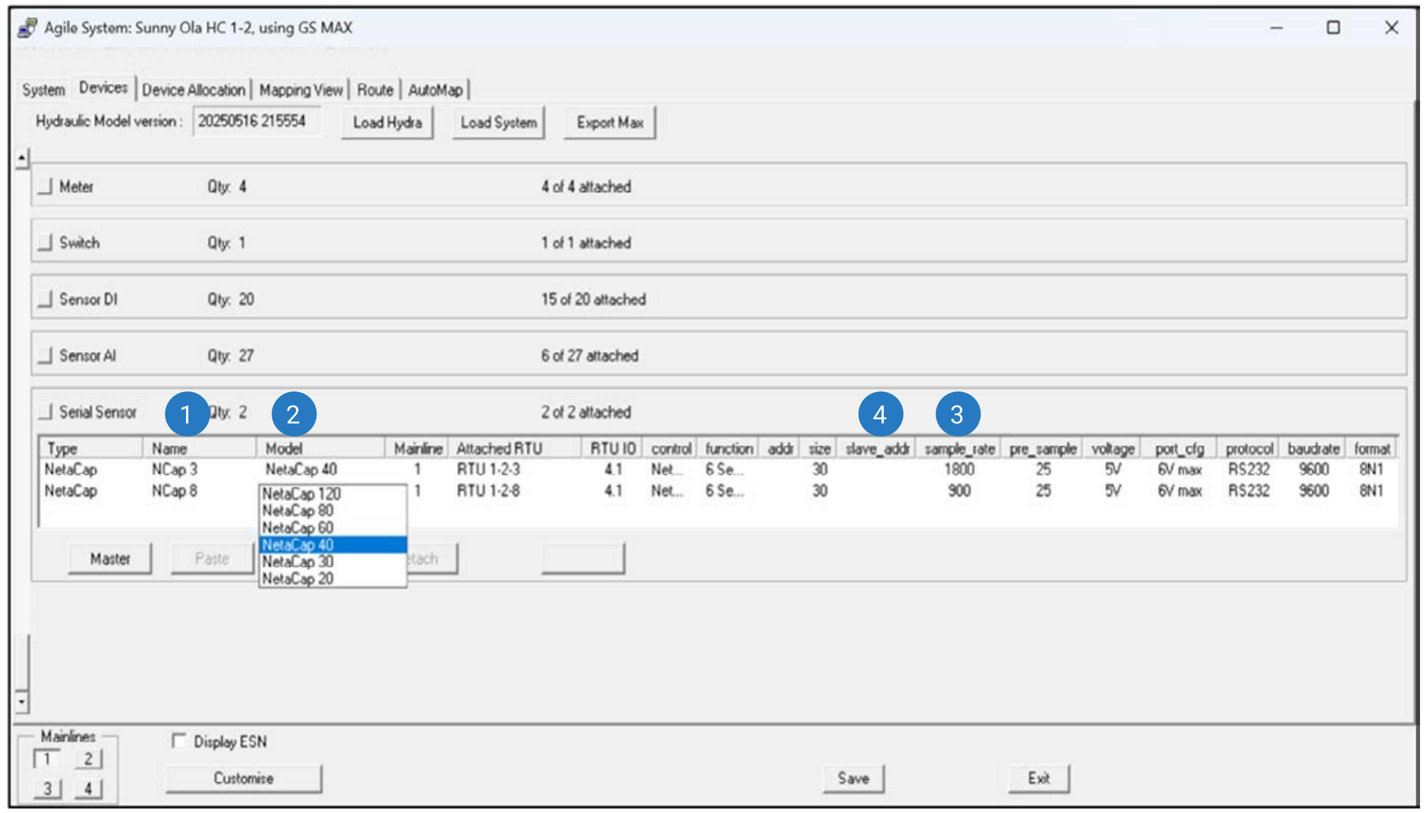


6.4.6.3 Serial Sensor Definitions

The serial sensor is defined on PoleNet according to the explanation in paragraph 5.1.1. bullet 11 and paragraph 9.2.3. bullet 18.

The “Type” column contains the defined NetaCap prob sensor in a corresponding main line and RTU location. In this case, there are two NetaCap sensors: one on RTU 1-2-3 and one on RTU 1-2-8, on Mainline 1. The following settings need to be selected:

1. Name: The “Name” can be edited.
2. Model: Select the NetaCap “Model” from the dropdown list. When the NetaCap model is selected, PoleNet automatically loads all the settings that correspond to this model. “Attached RTU” and “RTU ID” are automatically loaded according to the location of each NetaCap.
3. The “sample_rate”: The sample rate can be edited by the user.
4. The “slave address” can be edited using the sensor ID; however, this information is not mandatory.



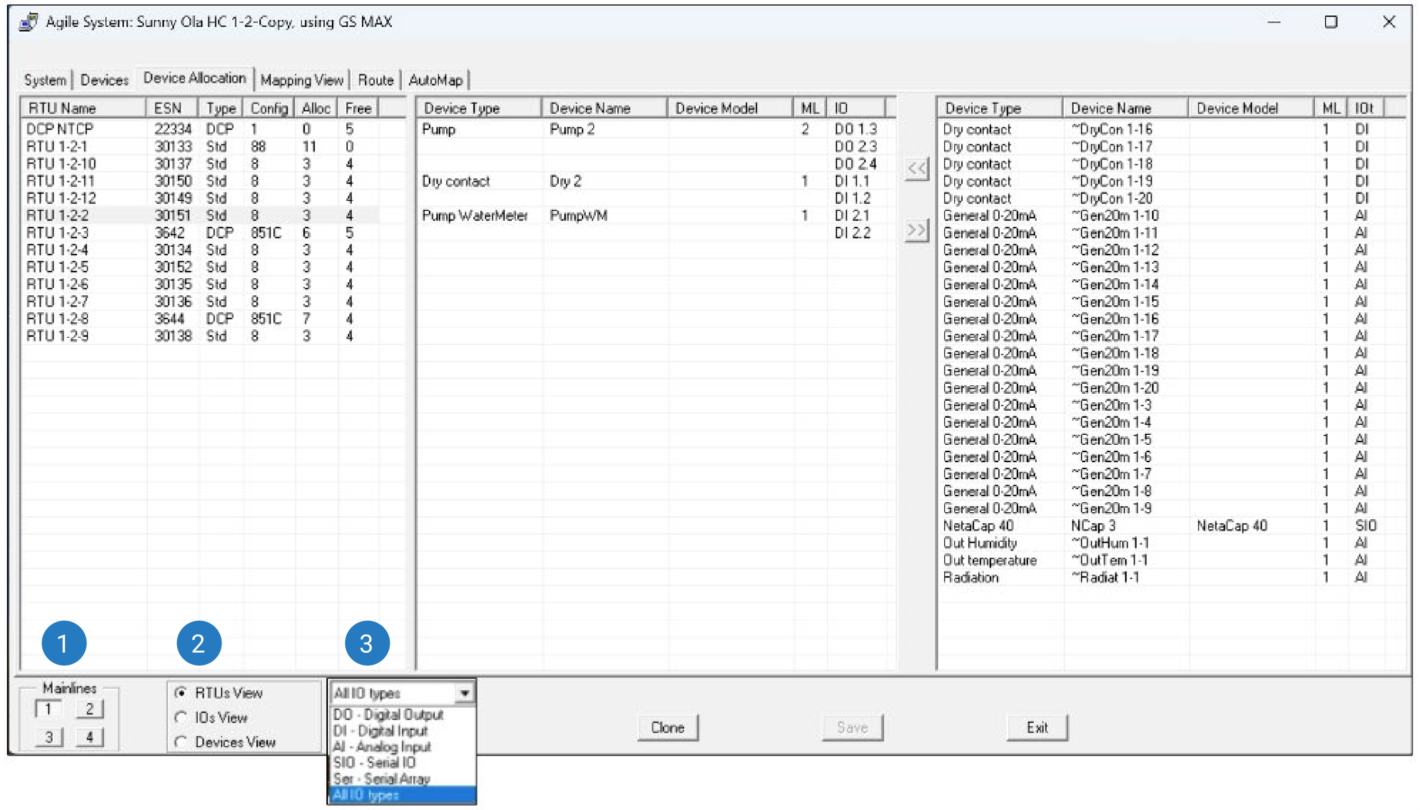
6.5 Device Allocation Tab

The **Device Allocation** tab serves as an information table that enables the editing of RadioNet RTU I/O and attached devices.

This tab comprises three tables: the left table presents a comprehensive list of all RadioNet RTUs; the central table displays the RadioNet RTU selected from the left table; and the right table represents the devices attached to the selected RTU’s inputs and outputs.

At the bottom of the screen, users can select from the following display options:

1. **Mainlines**: Users can select a single main line to display devices belonging to that line or select multiple mainlines.
2. **Information Display**: Options include “RTU View,” “IO View,” and “Device View.”
3. **I/O Display**: Users can select the I/O to display for the selected RTU.



6.5.1 Device Allocation View - Devices View

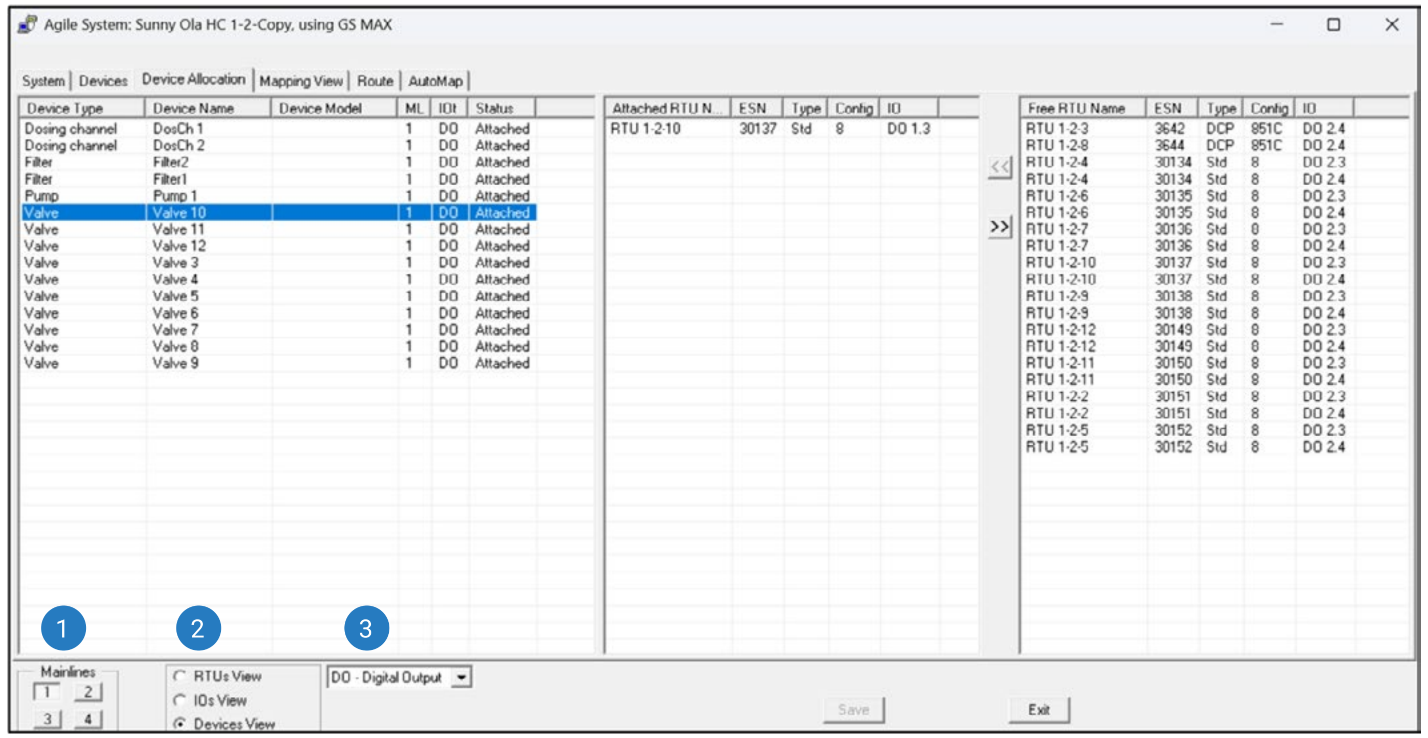
The picture below shows the Device View when the following options are selected:

1. "Mainline 1"
2. Sort by "Devices View"
3. Sort by DO – "Digital Outputs"

These selections display the left table with devices of mainline 1 allocated to an Output.

The Valve 10 is highlighted, and the central table displays the RTU where the Valve 10 is attached. It includes the RTU serial number, type, and IO number for the Valve 10.

The right table presents all the RTUs in the system with available I/O ports.



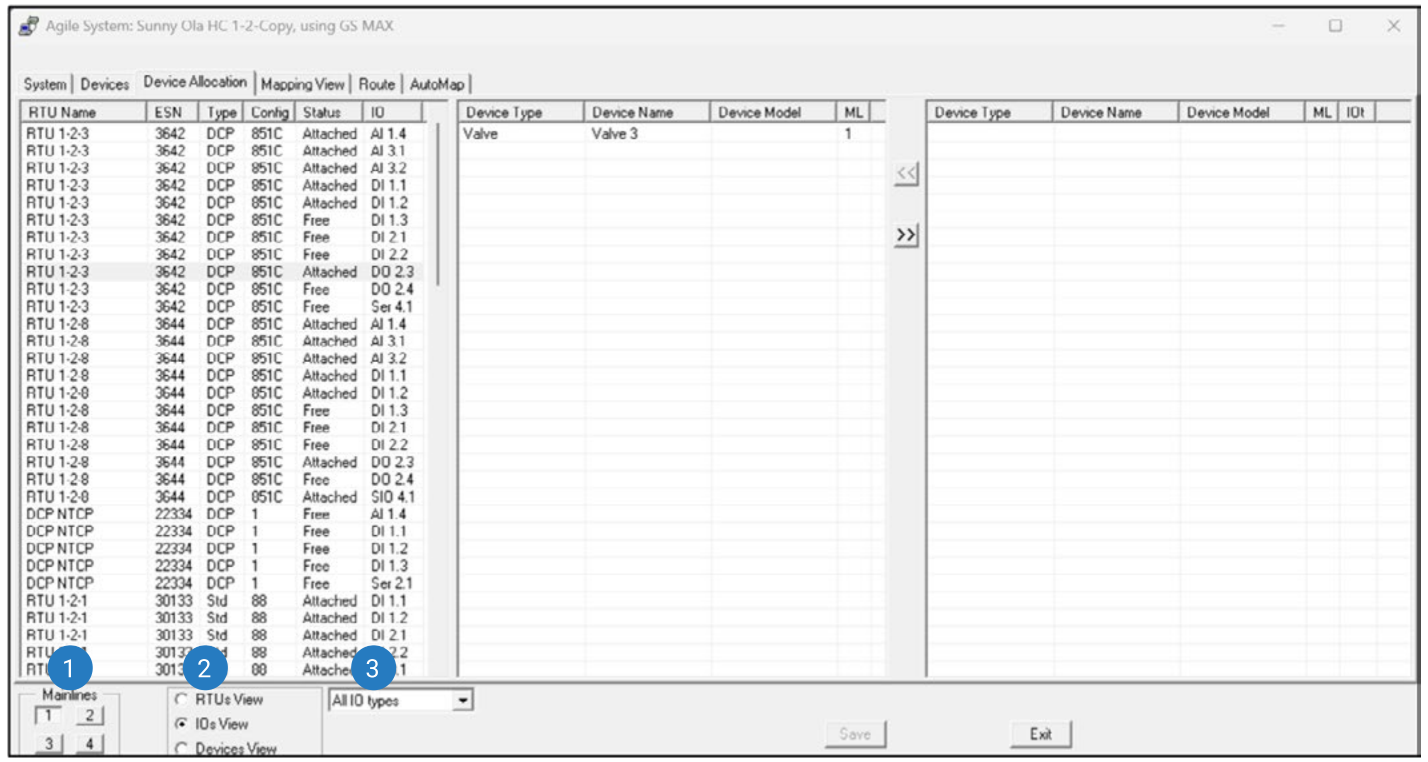
6.5.2 Device Allocation View – IOs View

The picture below shows the Device View when the following options are selected:

1. "Mainline 1"
2. Sort by "IOs View"
3. Sort by Do – "All types"

These selections present the left table with the following information: "RTU Name," "ISN" (last four RTU ID numbers), "RTU Type," "Config" (Modbus address), "Attached or Free" (I/O status), and "IO Type" and "Number."

The RTU1-2-3 DO 2.3 is highlighted. The central table displays the "Device Type" as Valve and the "Device Name" as "Vave 3," which belongs to "ML 1."



6.5.3 Attach Device to RadioNet RTU I/O

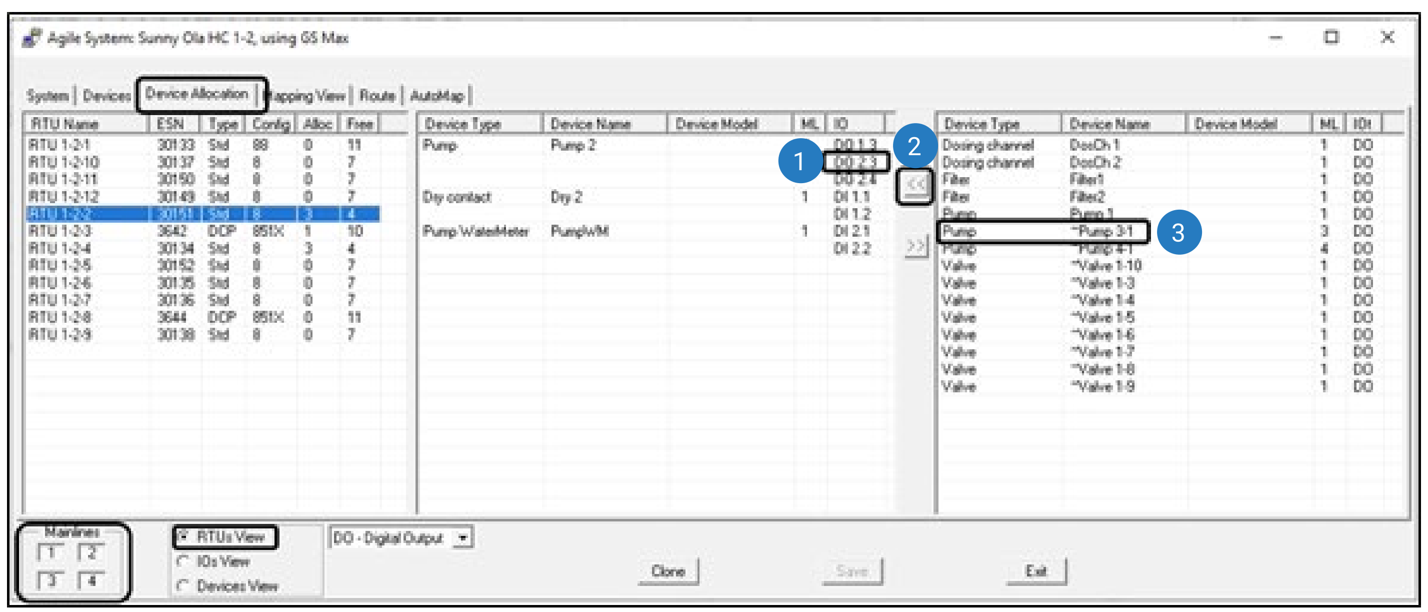
The “Device allocation” tab, in additional to shows the definitions done on the previous device settings, have an ability to edit and allocate a device to an I/O or to remove an I/O from a device.

The following picture shows the procedure to add a device to an RTU

In the RTU View, the Left table displays all the RTUs, while the Right table enumerates all the unattached Devices of an IO type (here, DO). The Middle column represents the RTU you have selected from the Left list. It lists all the IOs of the selected RTU in the right column and displays all the devices attached to the IOs of the selected RTU. This is where you can define the RTU devices.

- To add a Device to the RTU, follow these steps:

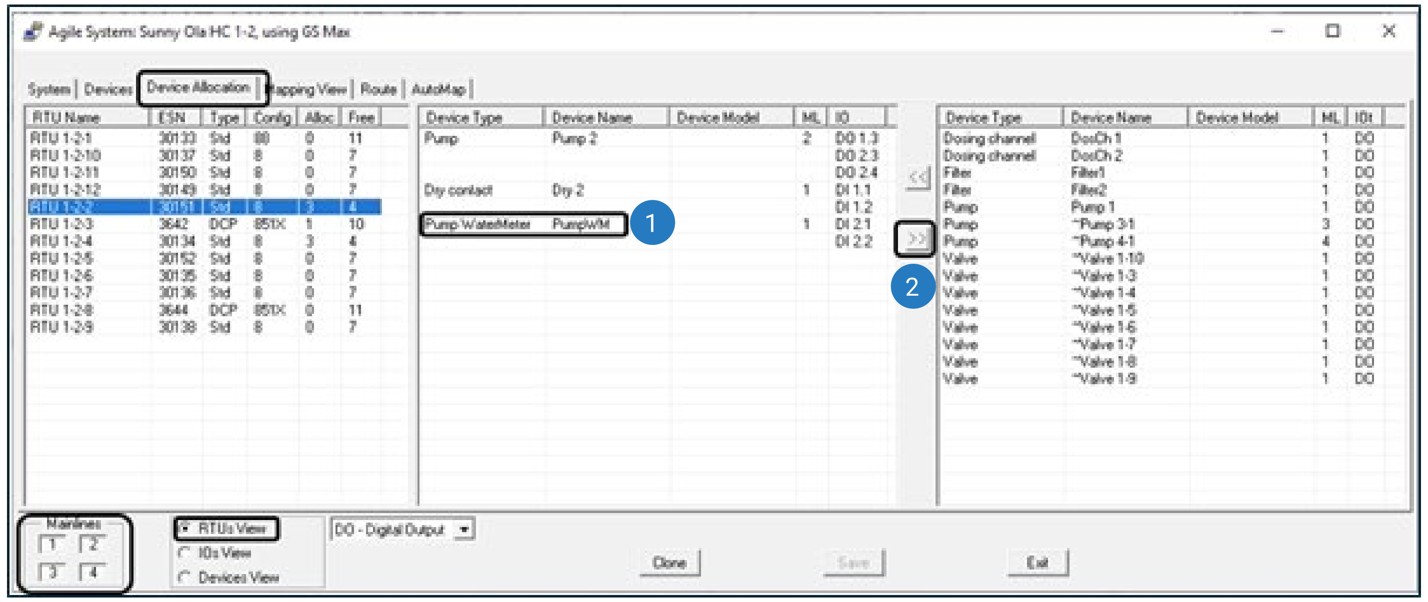
1. Select the IO (Input/Output) port to which you intend to connect the Device.



2. Right-click the selected IO port and select “Add Device.” <<
3. Alternatively, you can directly click on the Device you want to add.

- To Remove a Device from a RadioNet RTU, follow these steps:

1. Double-click the Device.
2. Alternatively, click the Device and then click the “>>” button.



6.6 Export the Defined System to GrowSphere Max

The allocation of hydraulic devices to the RadioNet RTU I/O has been completed, and a Modbus table has been created containing all the device information and addresses in a format that the GrowSphere Max can read.

This table must be exported to GrowSphere Max. The PoleNet PC software provides a straightforward procedure for exporting the table.

To load this file into the GrowSphere Max, the GrowSphere Max server must establish communication with the PC running the PoleNet software.

Communication can be established via LAN connection or Wi-Fi between the two devices.

- Connect your PC to the GrowSphere Max Wi-Fi network (Teltonika cellular modem).
- Alternatively, you can connect your PC directly to the GrowSphere Max using a LAN connection.

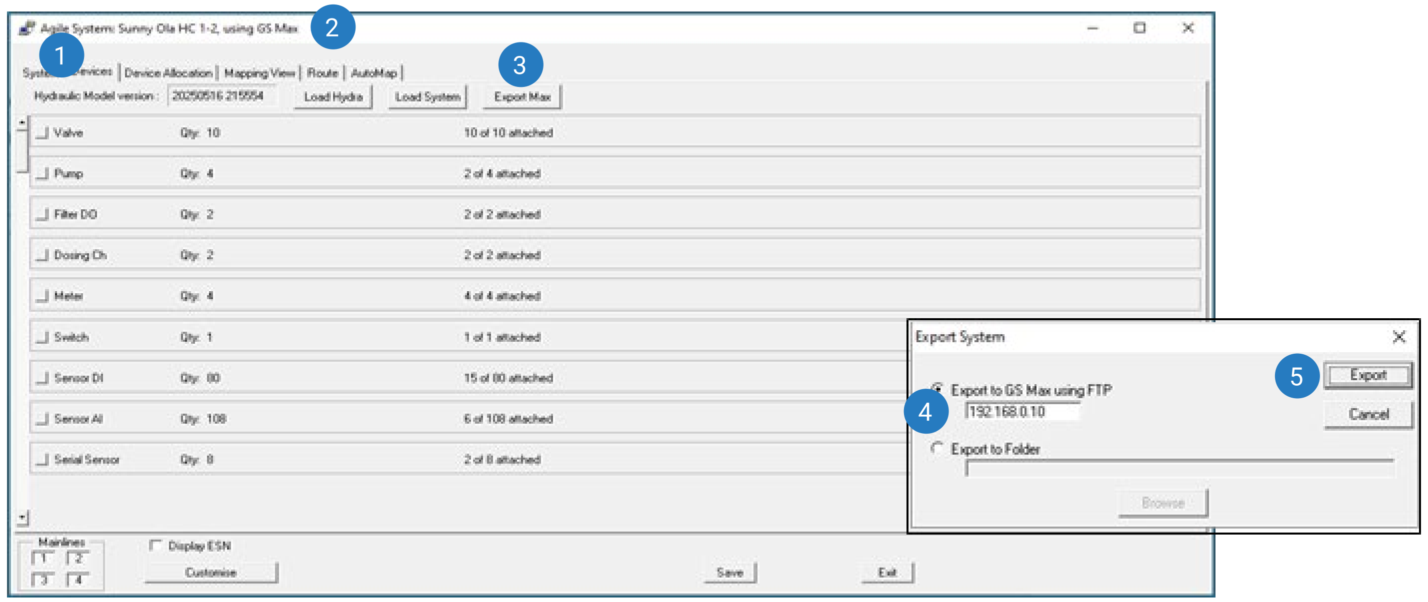
NOTE

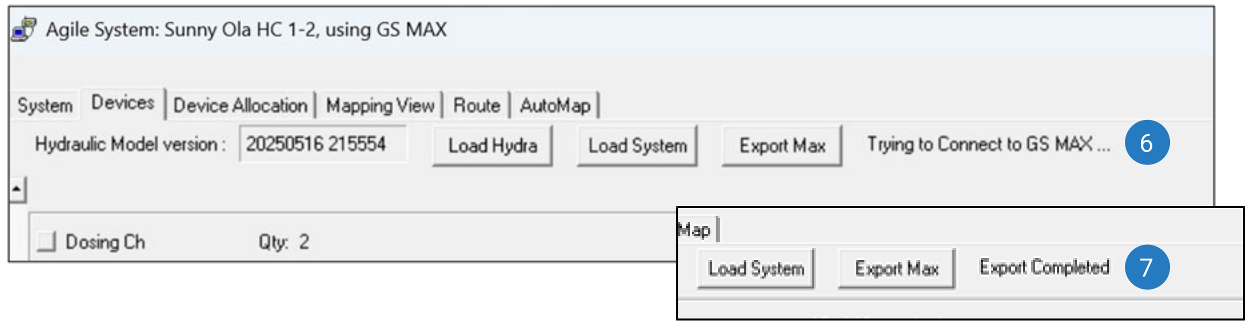
Paragraph 10.3 provides an explanation of how to establish communication between the PoleNet PC software and the GrowSphere Max controller.

It is important that the PoleNet is not connected to the Host during the execution of the "Export to Max" process.

Select to start the process:

1. Access the "Devices" tab in the PoleNet Software.
2. Ensure that the correct system is selected, in this case, "Sunny Ola HC 1-2."
3. Proceed to the "Devices" tab and press the "Export to MAX" button.
4. In the newly opened window, verify that "Export to GS Max using FTP" is selected, and the GrowSphere Max address is correct. By default, it is set to 192.168.0.10.
5. Click on "Export" to initiate the process.
6. The export to GrowSphere Process will commence. The progress of the process will be communicated via a message located on the right side of the "Export MAX" button.
7. message "Export Completed" will appear upon the completion of the export process.



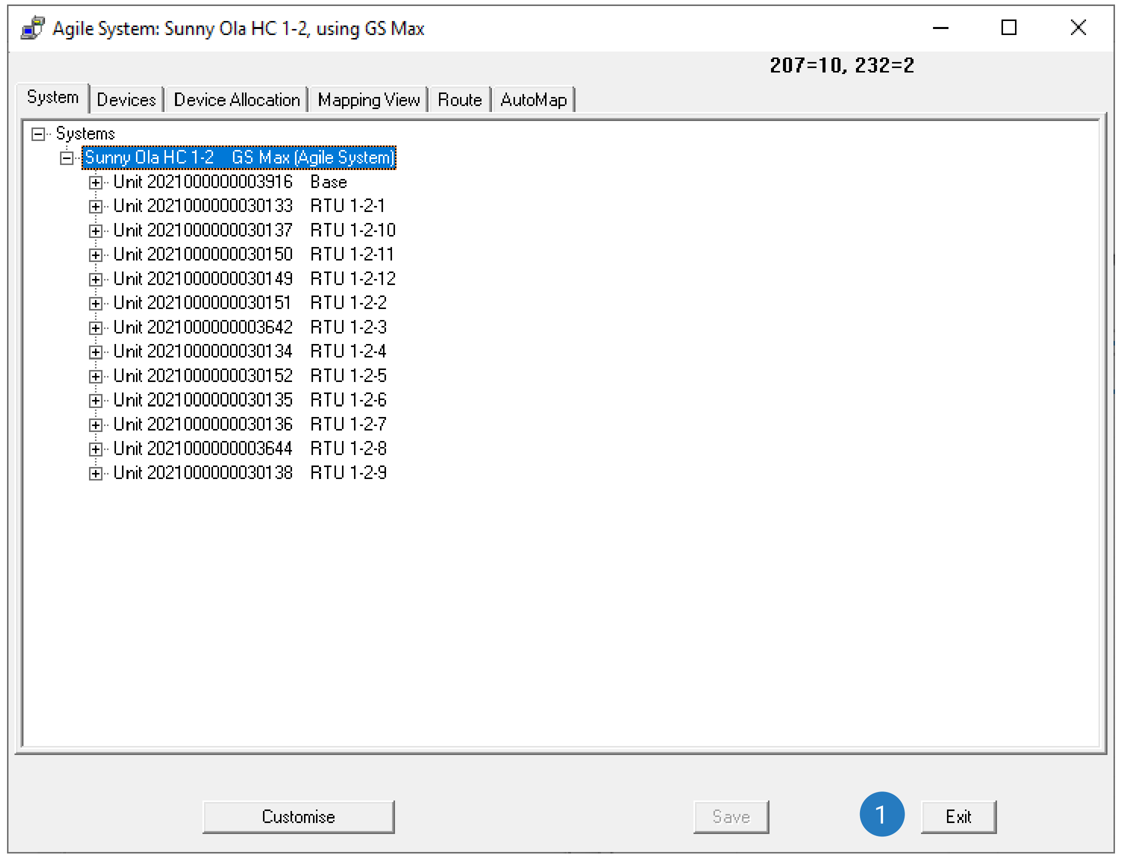


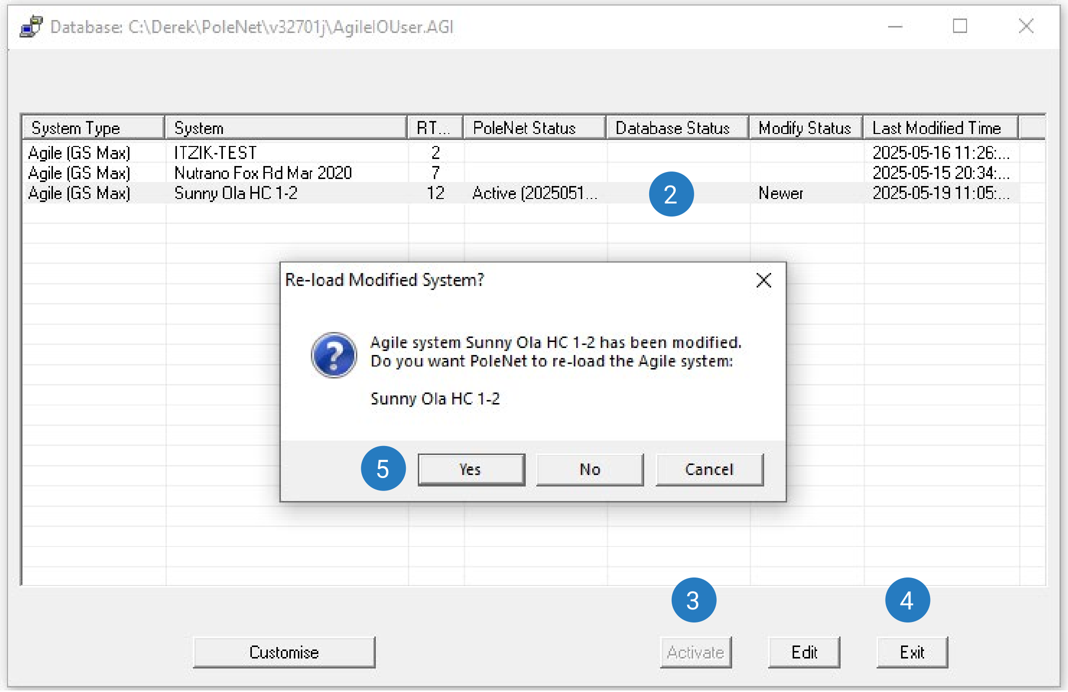
6.6.1 Load Active System on RadioNet Host

The system Sunny Ola HC 1-2 is stored in the computer database and contains all the definitions and settings for this system.

The system Sunny Ola HC 1-2 must be loaded onto the RadioNet Host. Please proceed with the following instructions.

1. After exporting the data, select "Exit" to return to the Main database.
2. Choose the system "Sunny Ola HC 1-2."





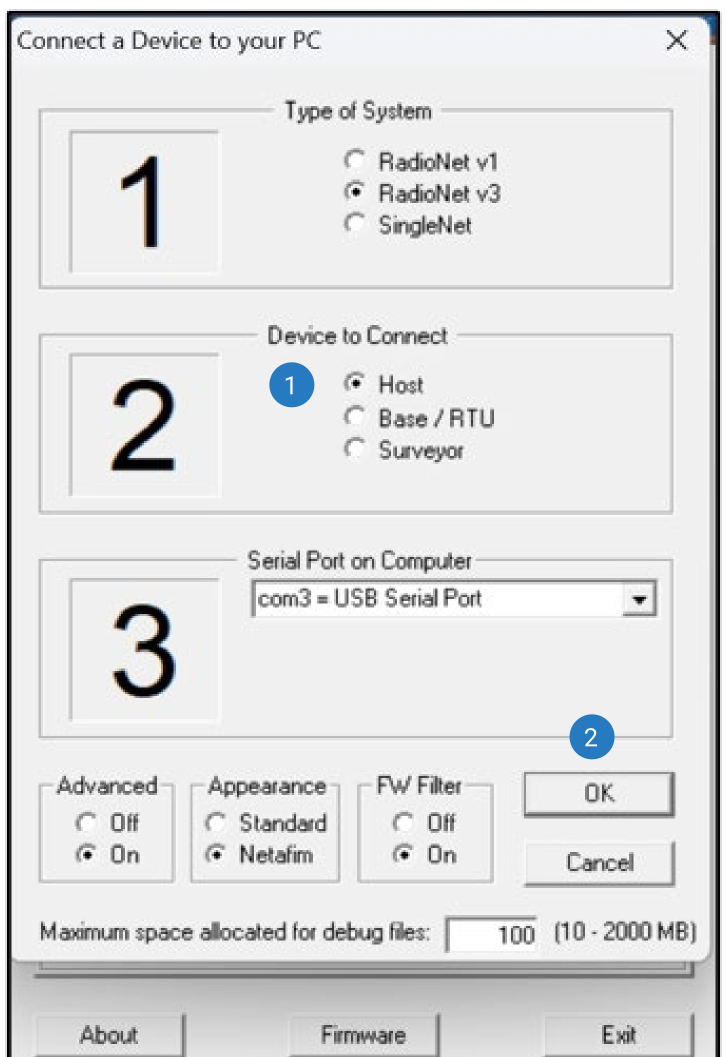
3. If the system is not already active, select "Activate"
4. Then select "Exit."
5. PoleNet will prompt you to reload the modified system. Select "Yes."

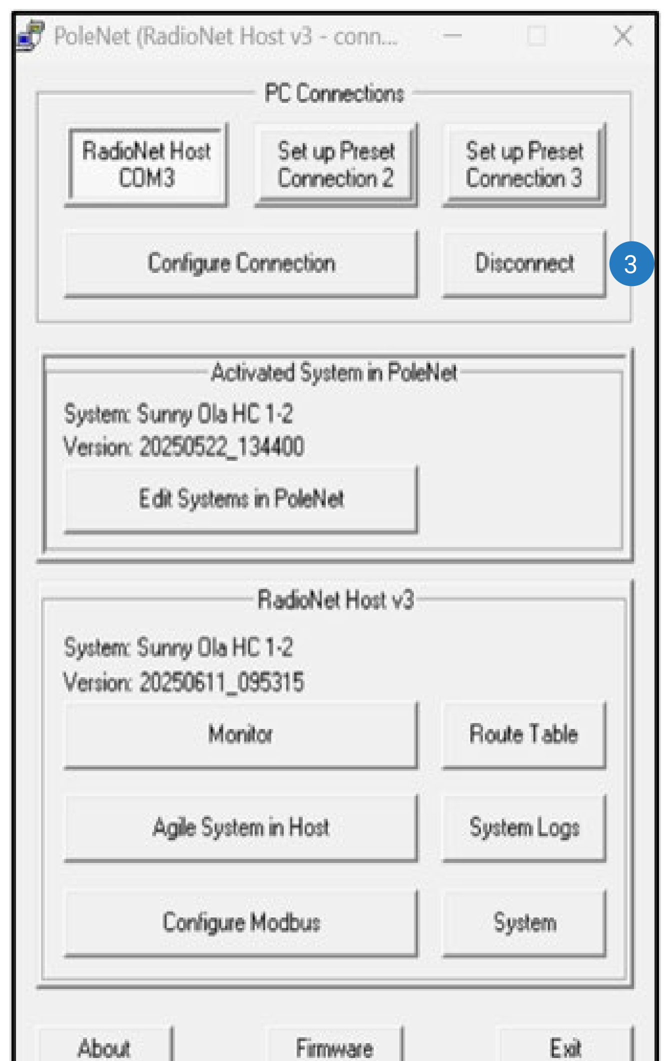
6.6.2 Reconfigure and Restart RadioNet Host

The RadioNet Host must have communication with the PoleNet PC software to be able to start the reconfigure process.

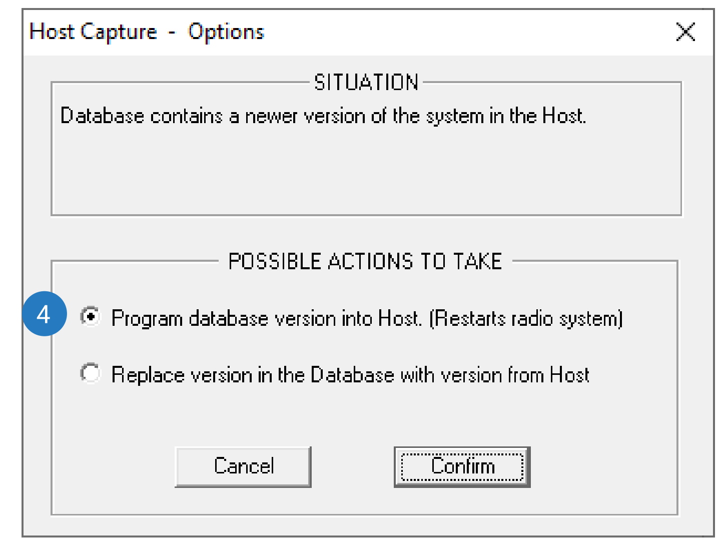
If the RadioNet Host is not yet connected to PoleNet, select “Configure Connection” and then set

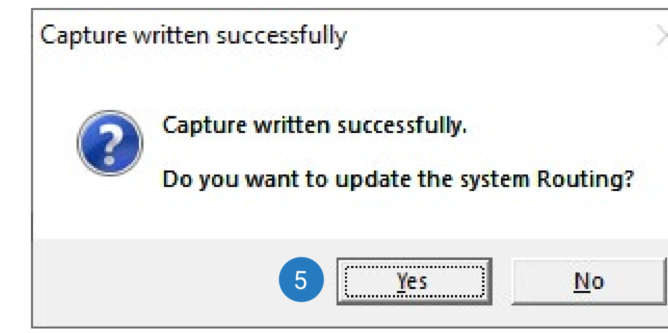
1. RadioNet V3
2. RadioNet “Host”.
3. Then click “OK”.





4. Select “Connect”, when the communication is established the button will change to “Disconnect”.
5. The PoleNet will detect your new version and ask you which Action to take, select “Program database version into Host” then click “Confirm”.
6. PoleNet may offer to update the system Routing?
   Click “Yes”, unless you are certain that the Routing does not need to be updated.



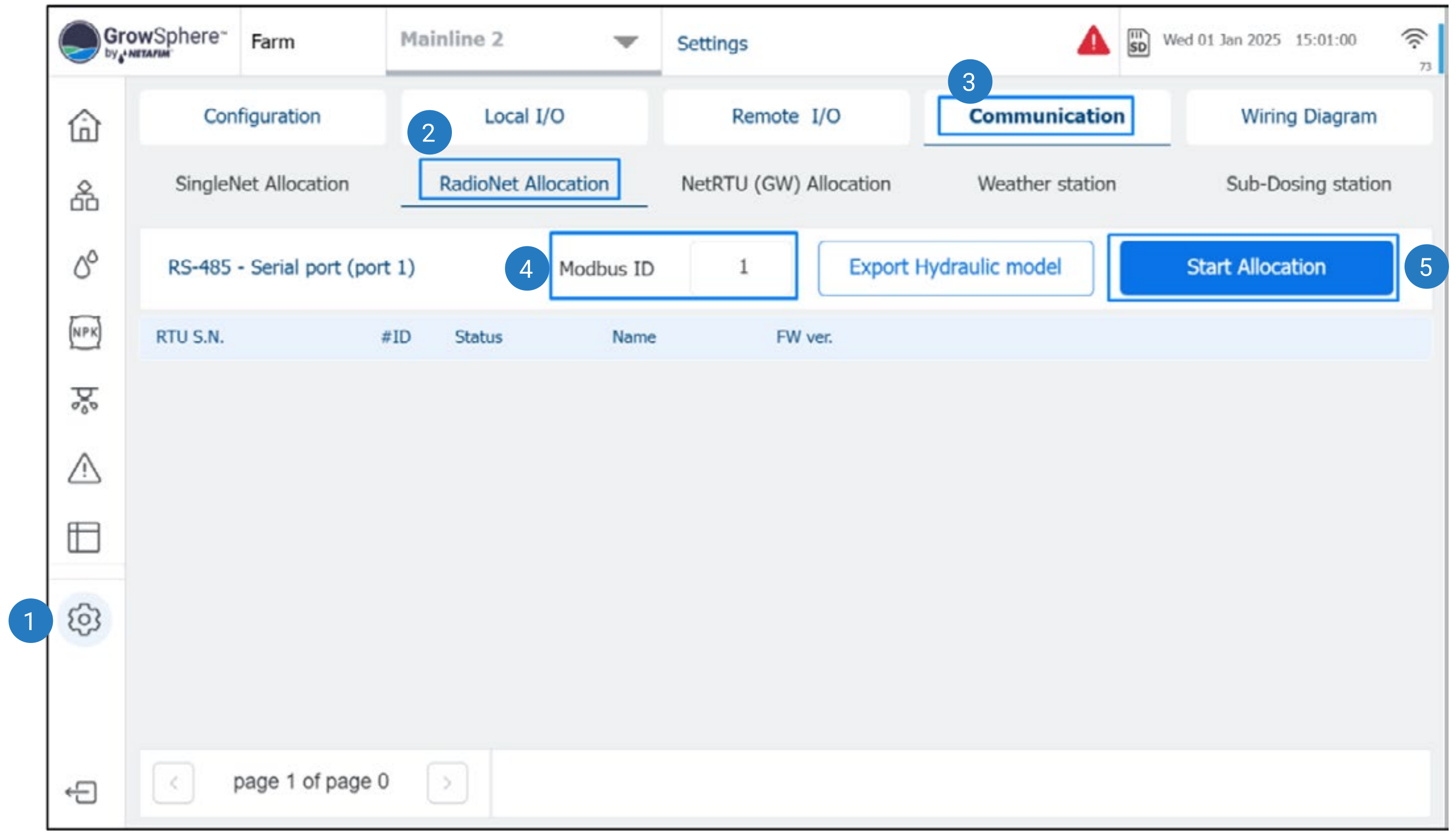


6.6.3 GrowSphere Max Devices Allocation.

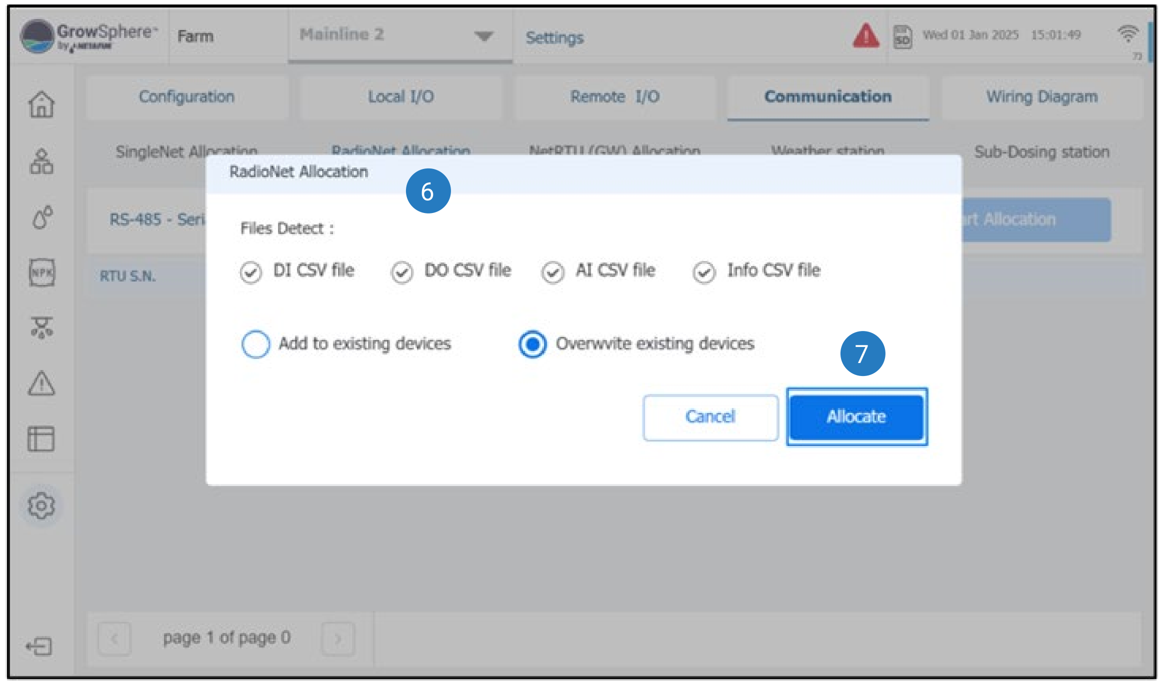
The file containing the device allocation to the RadioNet RTU I/O was saved on the GrowSphere SD card after the completion of the “Export Max” process.

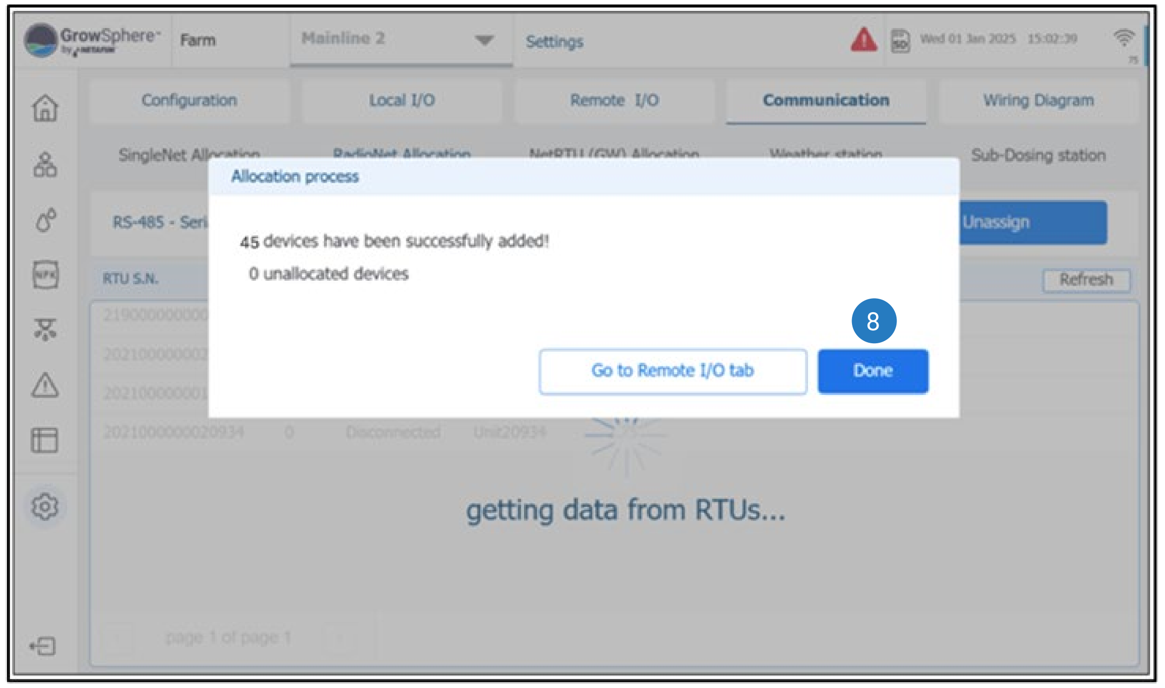
The GrowSphere Max is required to read and allocate these devices.

1. Select “Settings” from the GrowSphere Max screen.
2. Select the “Communication” tab.
3. Select the “RadioNet Allocation” tab.
4. Verify that the “Modbus ID” is the same on your system. By default, both the GrowSphere Max and PoleNet are set to ID 1.
5. Select “Start Allocation.”

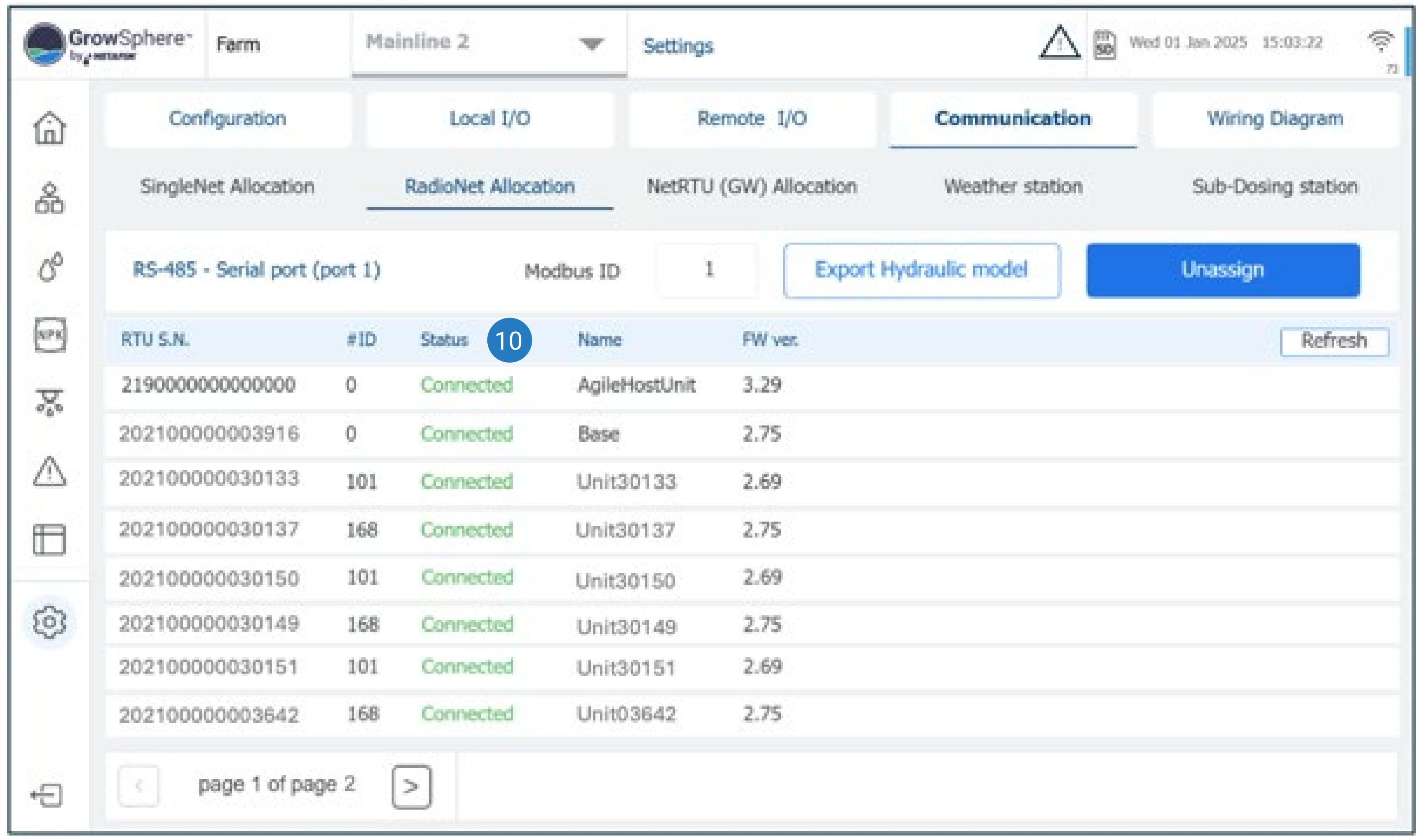


6. The newly installed screen will verify the detection of all devices.
7. Select “Allocate.”
8. Upon successful allocation, a confirmation message will display, indicating the number of devices allocated. Select “Done”.

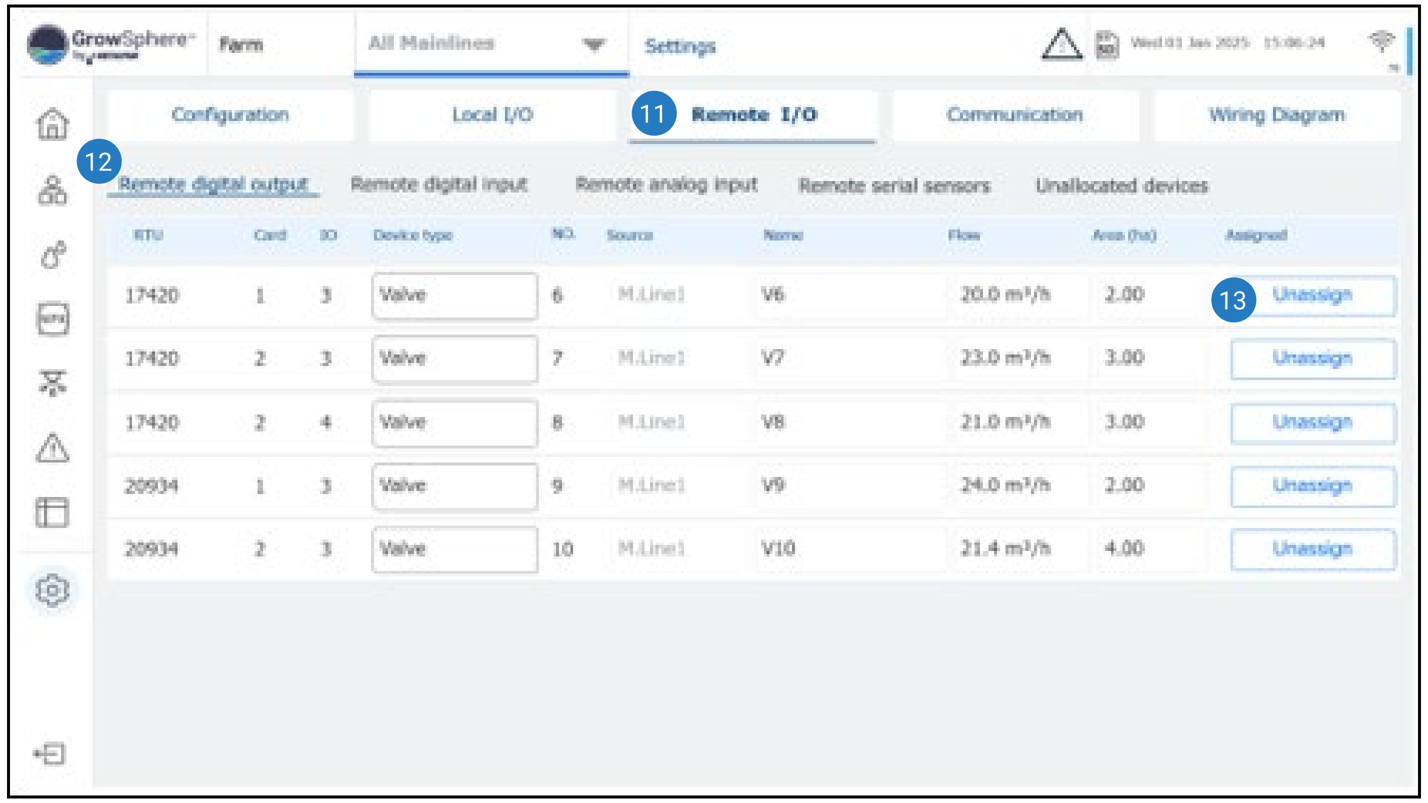




9. The Remote RadioNet RTU initiates communication with the RadioNet Base Station, activating the network. Subsequently, the Host communicates with the GrowSphere Max, informing it of the connected Remote RTUs.
10. The "Communication" tab's "RadioNet Allocation" tab displays the currently "Connected" Remote RTUs in the Status column.



11. Select the Remote I/O tab. This screen displays all the subtabs containing information about **all the remote devices'** inputs and outputs, including:
- Remote Digital Outputs
- Remote Digital Inputs
- Remote Analog Inputs
- Remote Serial Sensors
- Unallocated devices
12. For instance, select the subtab "Remote Digital Outputs." This screen displays the connection and the hydraulic characteristics of each device.
13. By selecting the "Unassign" button, the device will be placed in the "Unallocated devices" tab.



6.6.4 Output Devices Test

When device allocation is completed, it is strongly advised to test the devices' connections and operations by systematically turn ON and turn Off them, utilizing the GrowSphere manual operation or the PoleNet PC Software manual output test.

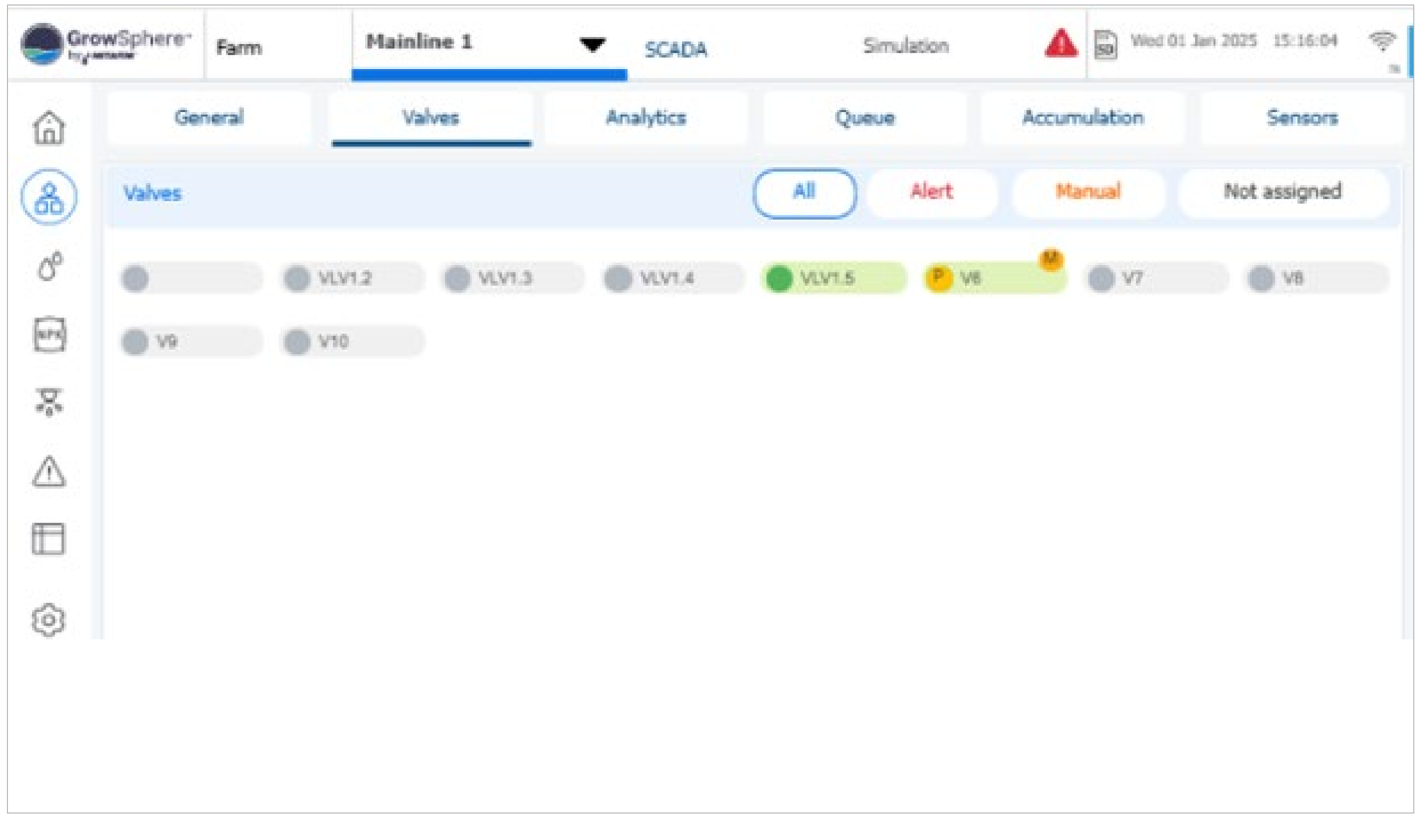
The devices output test is recommended to be conducted using the GrowSphere manual operation function.

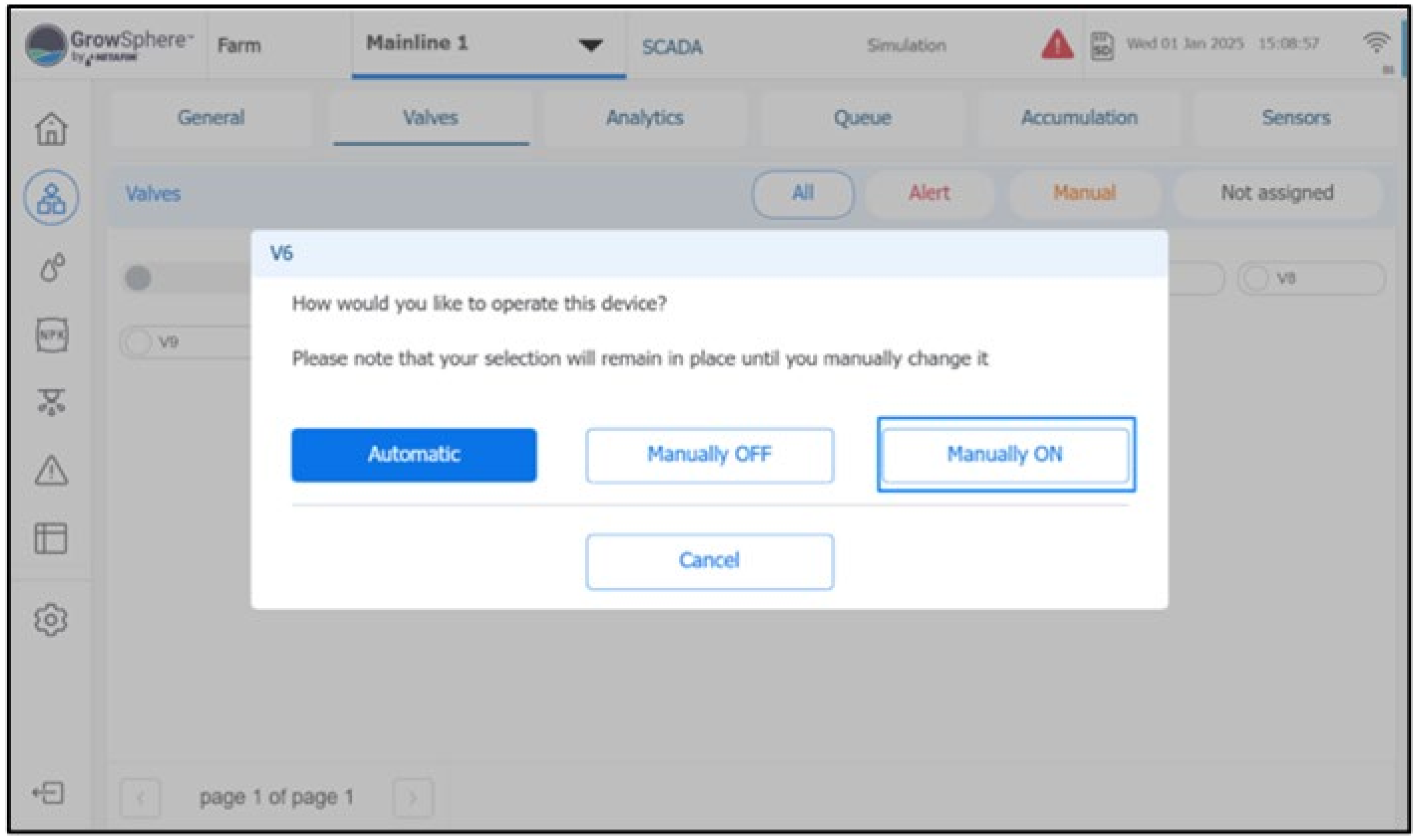
Each of the Output devices, such as pumps, valves, filters, and dosing channels, can be manually turned (ON/OFF).

For instance, on the SCADA view, select the Valves tab and right-click the valve you wish to test.

A popup window will present a "Manually ON" and "Manually Off" test option.

After manually activating the valve, it will be highlighted in green, and the Yellow M circle will notify that the valve has been manually activated.





7. Firmware Upgrade Procedure for RadioNet Host, Base, RTU

To guarantee the consistent performance of the RadioNet network and devices, it is imperative that all components of the network system are equipped with the latest firmware version.

The PoleNet software package contains a folder named as “SQ1FW.”

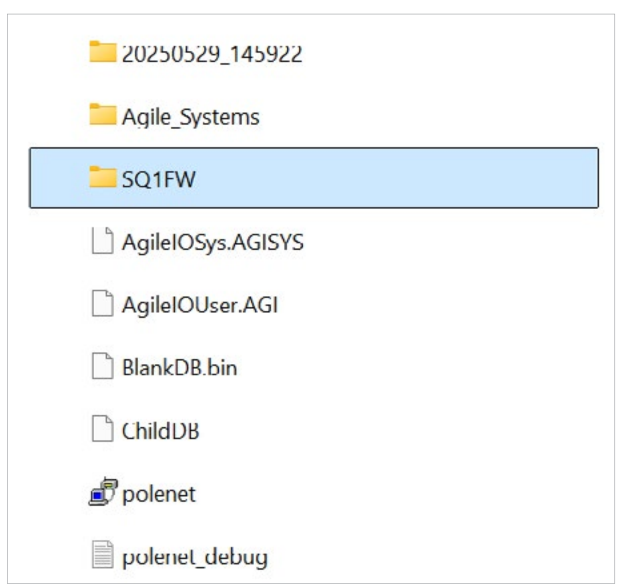
This folder is situated within the same directory as the PoleNet PC software.

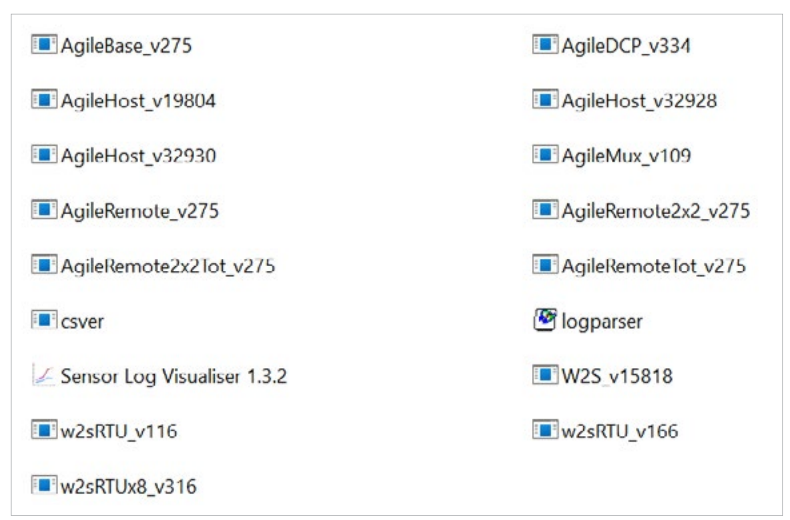
The “SQ1FW” folder contains all the firmware for all RadioNet models.

The actual RadioNet firmware versions are:

PoleNet	V 3.27.02 or greater
RadioNet Base	V 2.75 or greater
RadioNet Remote 2x2	V 2.75 or greater

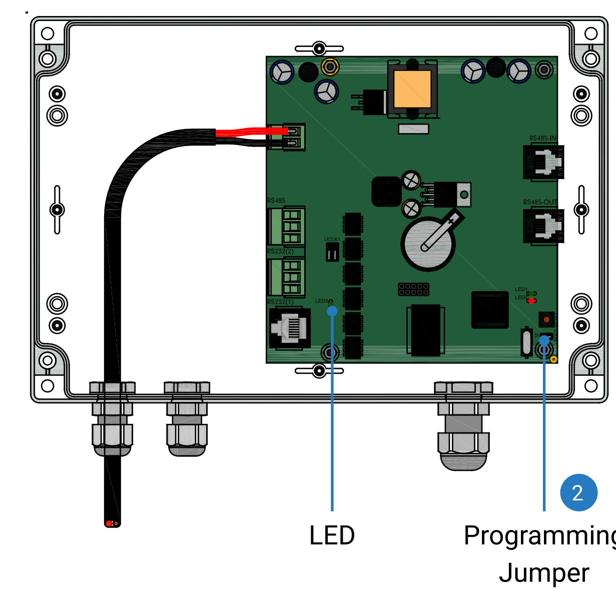
RadioNet Host	V 3.29.30 or greater
RadioNet Remote	V 2.75 or greater
RadioNet Remote DCP	V 3.44 or greater



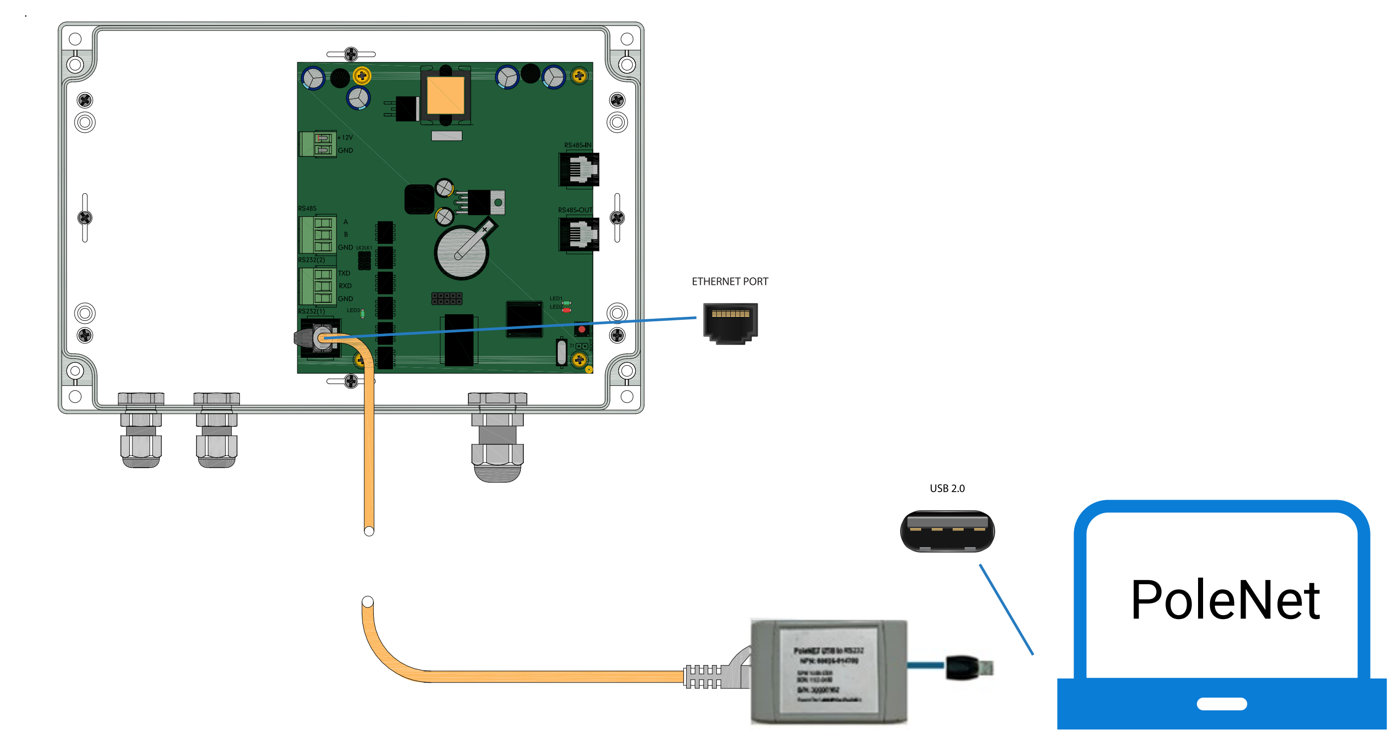


7.1 RadioNet Host Firmware Update

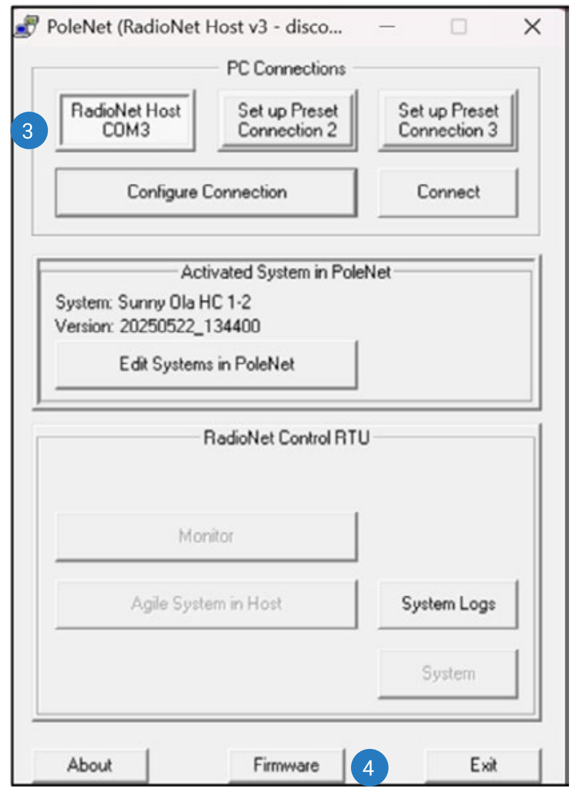
The following steps outline the procedure for updating the RadioNet Host firmware.

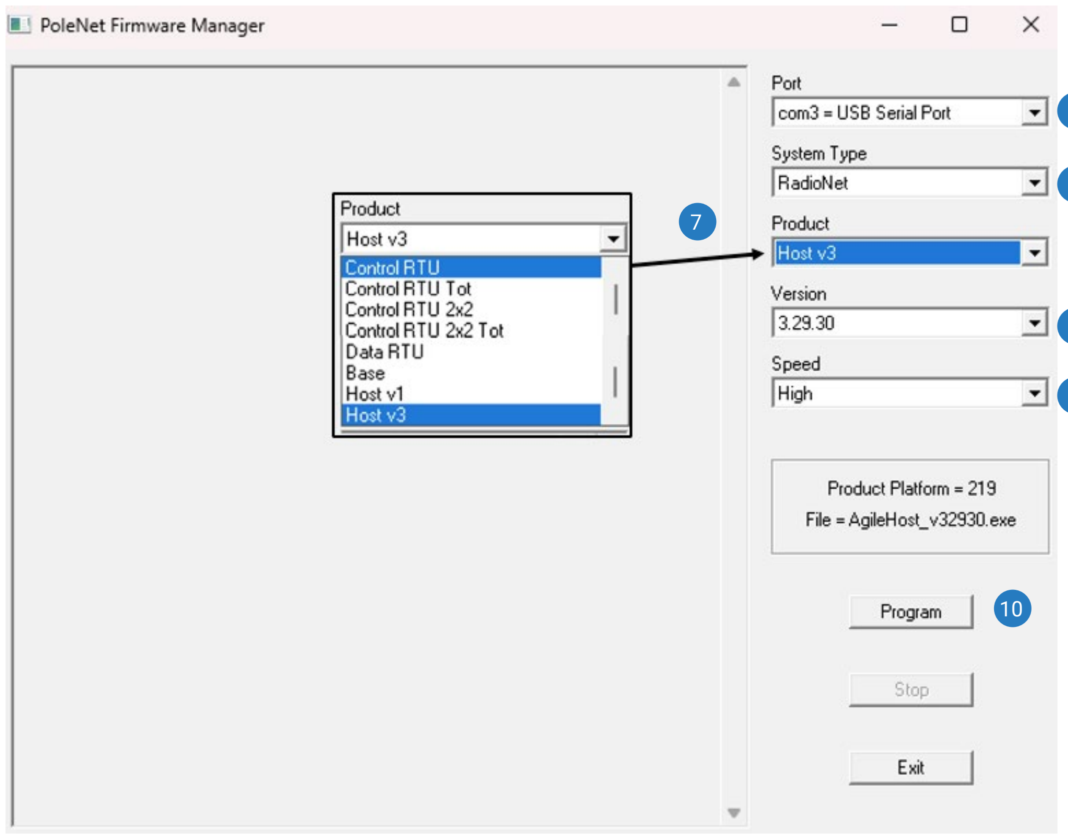


1. Connect the PoleNet PC Software to the RadioNet Host.
2. Insert the programming jumper between the two pins located in the lower right corner of the Host Card. Connect the Host power.

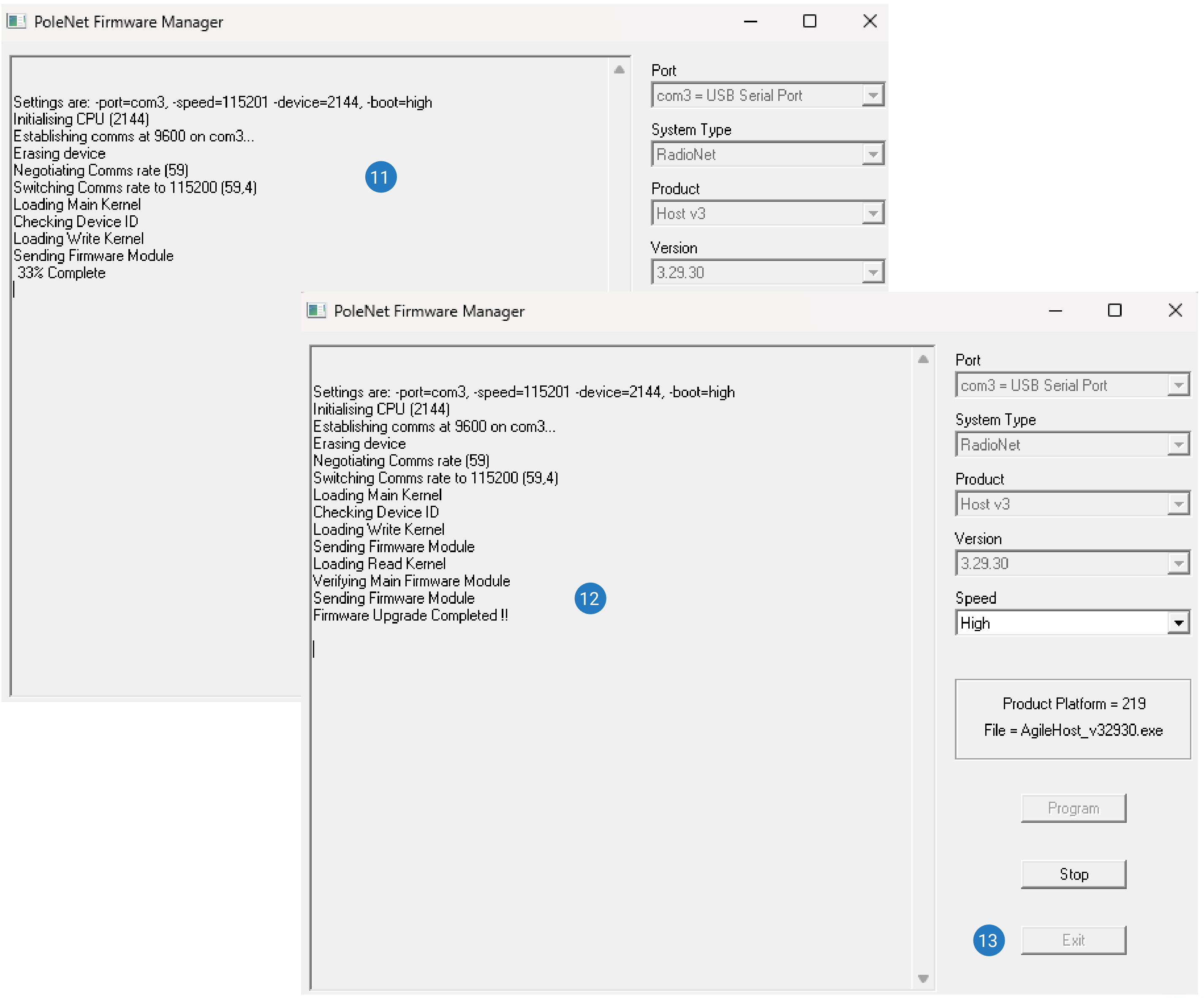


3. Launch the PoleNet PC Software when the Host and Comm port are selected.
4. Click on the “Firmware” button.
5. On the right side of the new screen, confirm that the correct “Port” is selected.
6. Select “System Type” as “RadioNet”.
7. Select “Product” as “Host v3”.
8. Select the most updated version of “Version”.
9. Select “Speed” as “High”.
10. Click on the “Program” button to initiate the programming process.



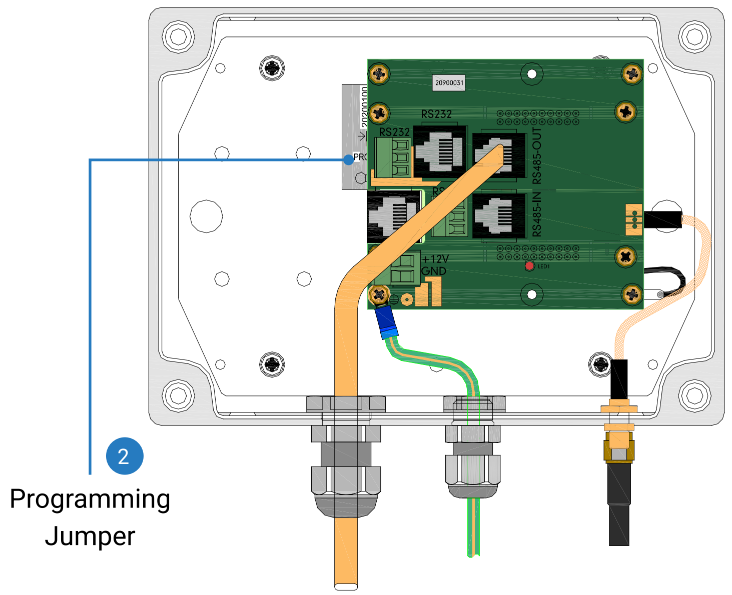


11. The firmware update process will commence, and the update progress will be displayed on the left side of the screen.
12. Upon successful completion of the firmware update, you will be notified at the end of the process update.
13. Finally, select “Exit.”

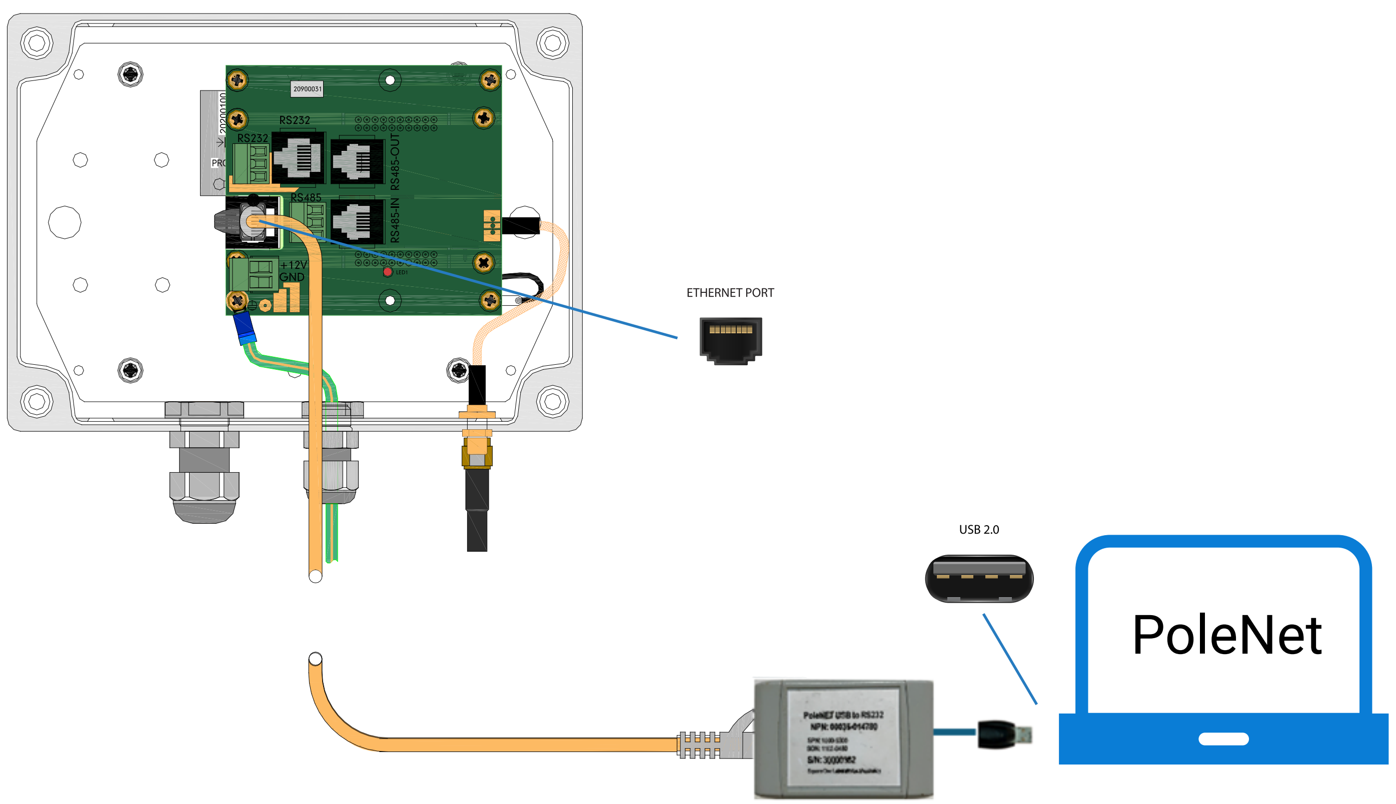


7.2 RadioNet Base Firmware Update

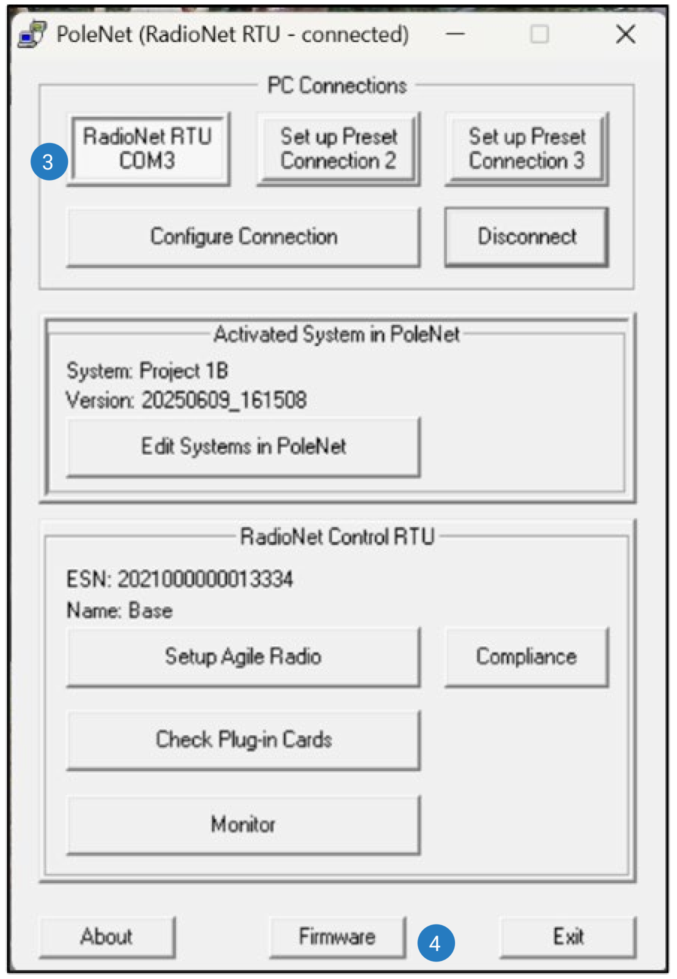
The following steps outline the procedure for updating the RadioNet Base firmware.



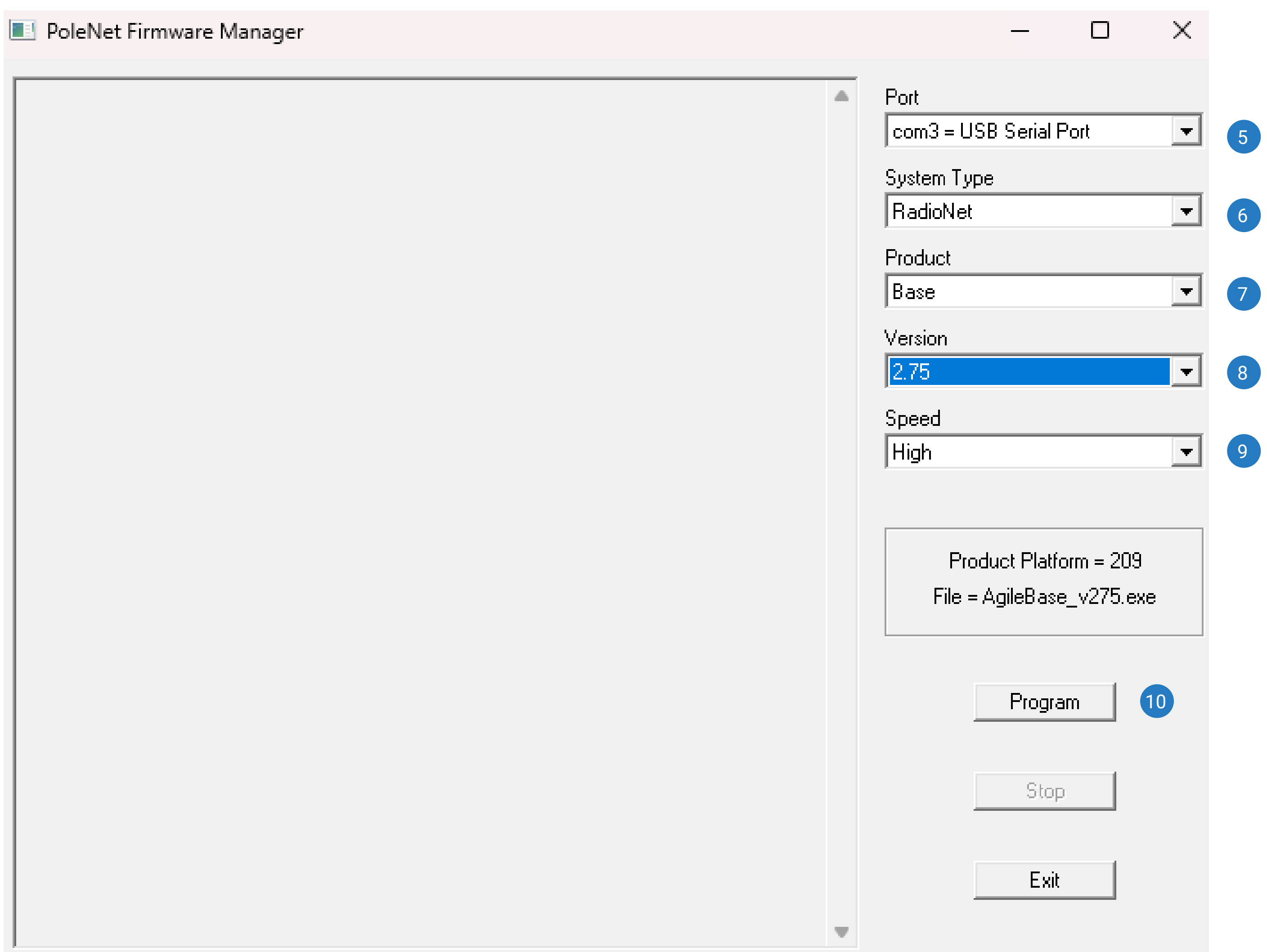
1. Connect the PoleNet PC Software to the RadioNet Base.
2. Insert the programming jumper between the two pins located in the left side of the Base Card. Connect the RTU power to power the Base.

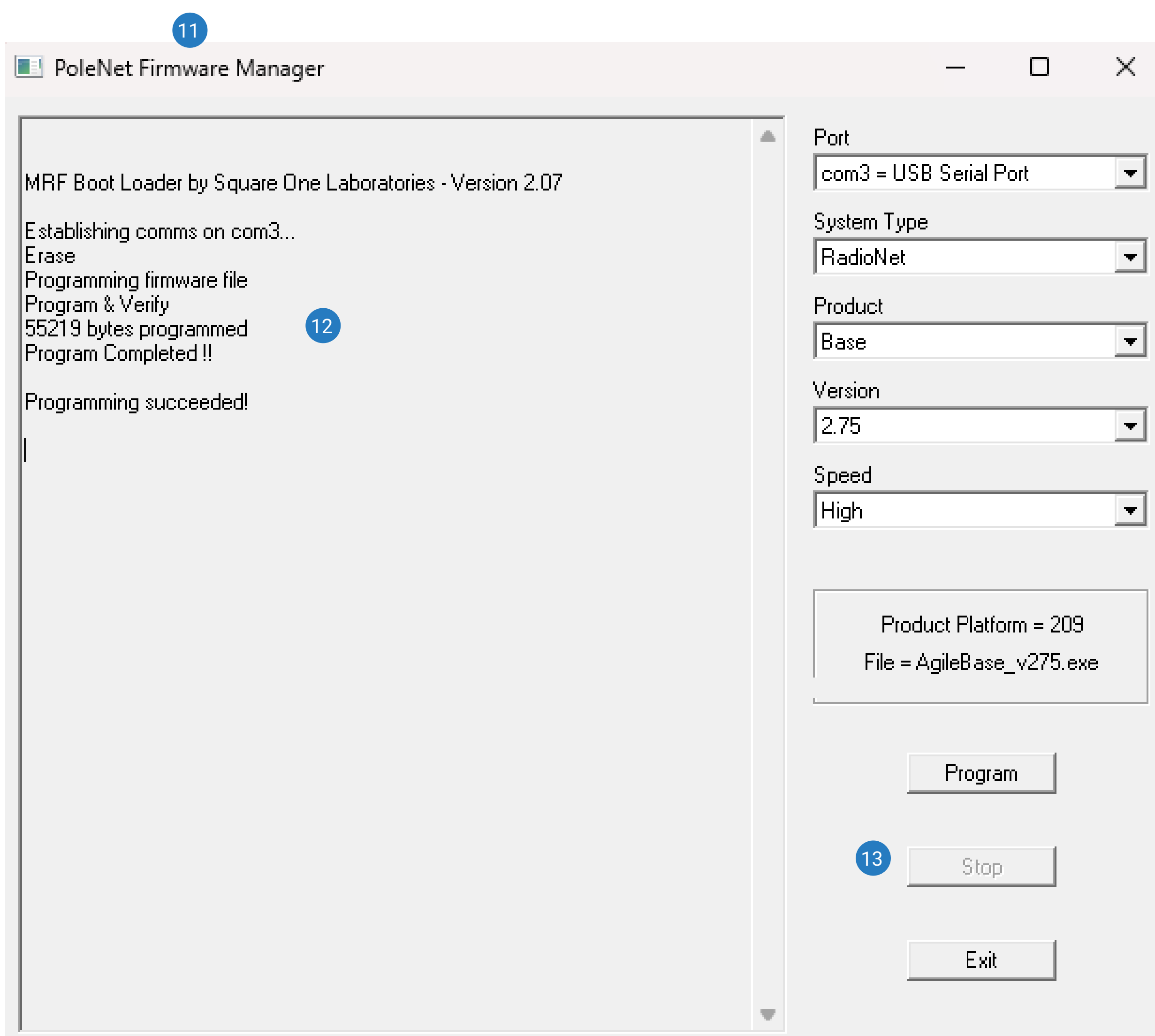


3. Launch the PoleNet PC Software when the RadioNet RTU and Comm port are selected.
4. Click on the “Firmware” button.



5. On the right side of the new screen, confirm that the correct "Port" is selected.
6. Select "System Type" as "RadioNet".
7. Select "Product" as "Base".
8. Select the most updated version of "Version".
9. Select "Speed" as "High".
10. Click on the "Program" button to initiate the programming process.
11. The firmware update process will commence, and the update progress will be displayed on the left side of the screen.
12. Upon successful completion of the firmware update, you will be notified at the end of the process update
13. Finally, select "Exit."



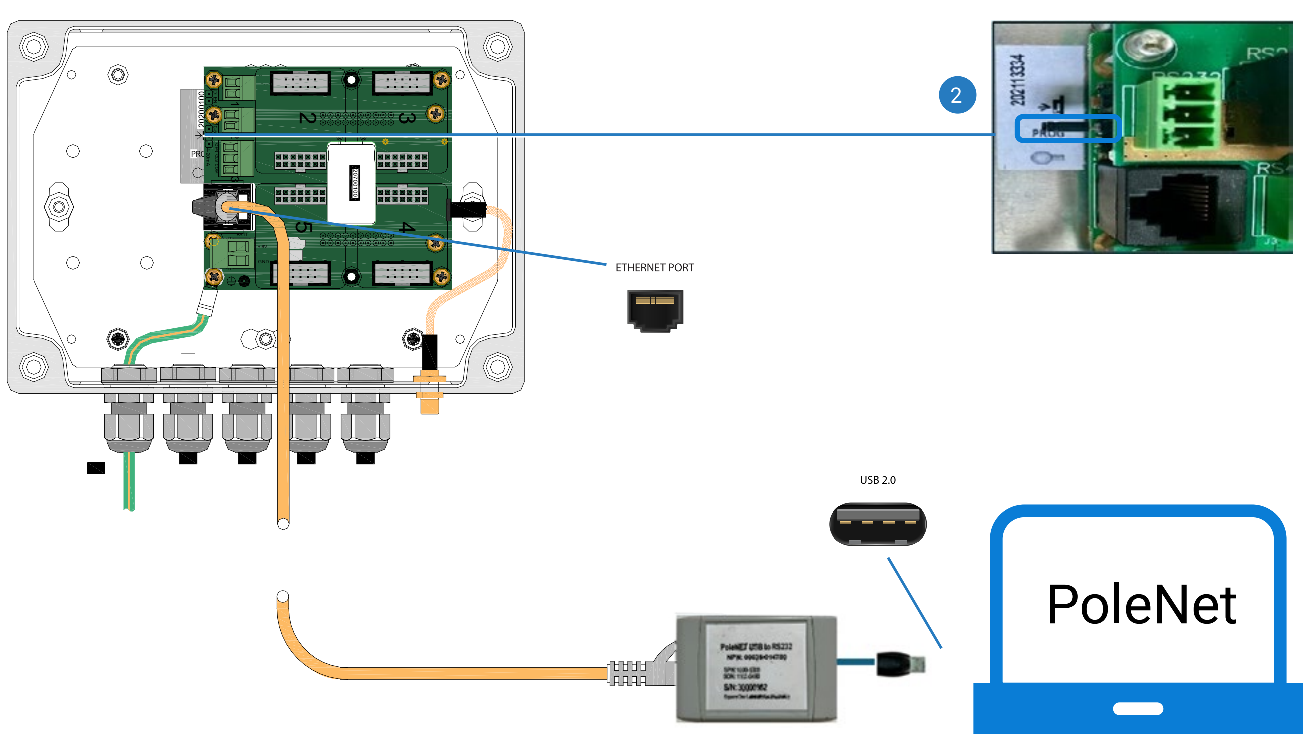


7.3 Remote RadioNet RTU Firmware Update

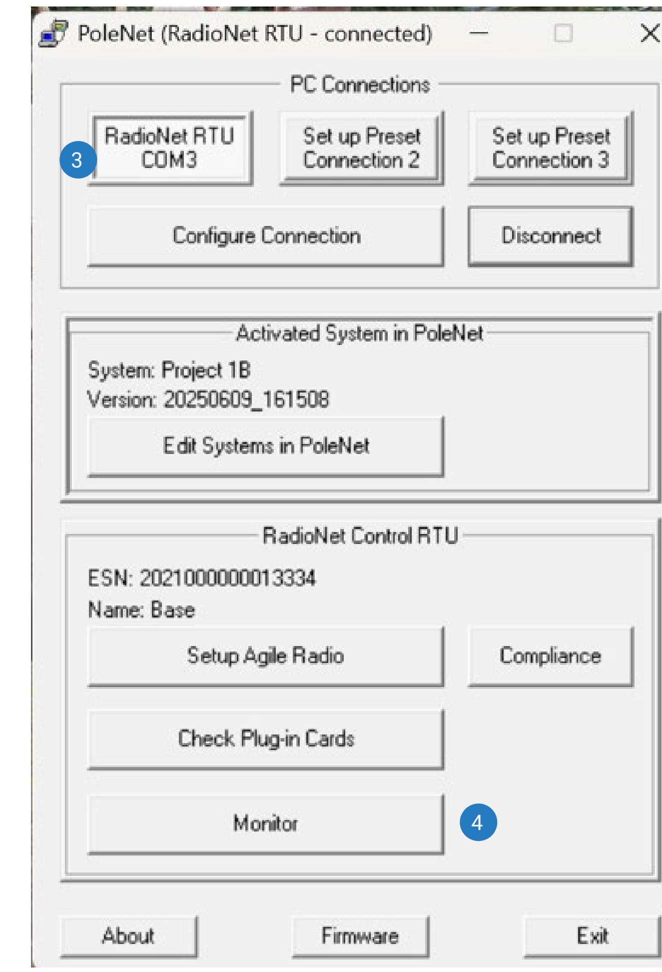
The following steps outline the procedure for updating the RadioNet Remote RTUs firmware.

> **NOTE**
>
> The described firmware update procedure is the same for all the Remote RTU Models.

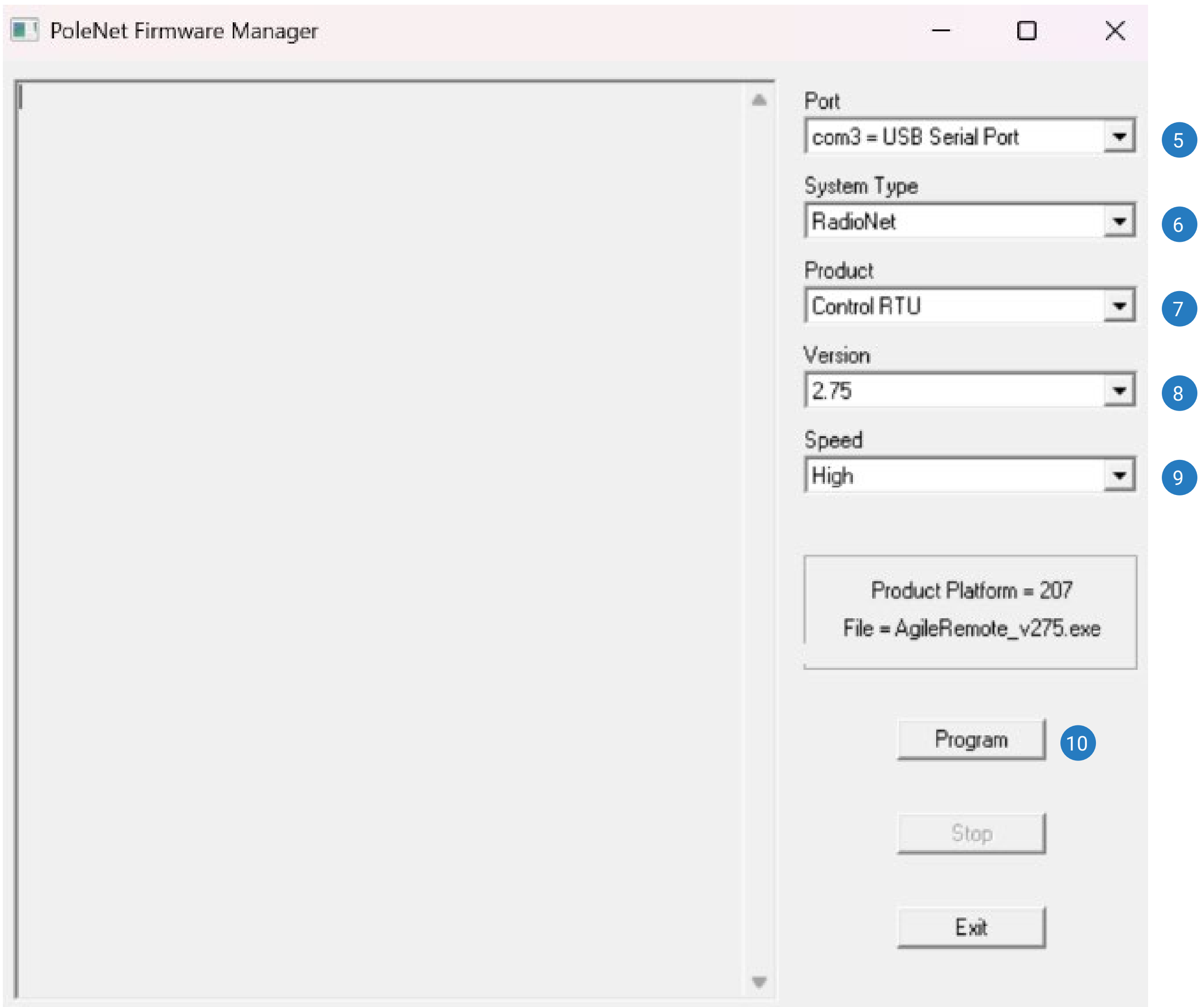
1. Connect the PoleNet PC Software to the RadioNet Base.
2. Insert the programming jumper between the two pins located in the left side of the Base Card. Connect the Host power to power the Base.

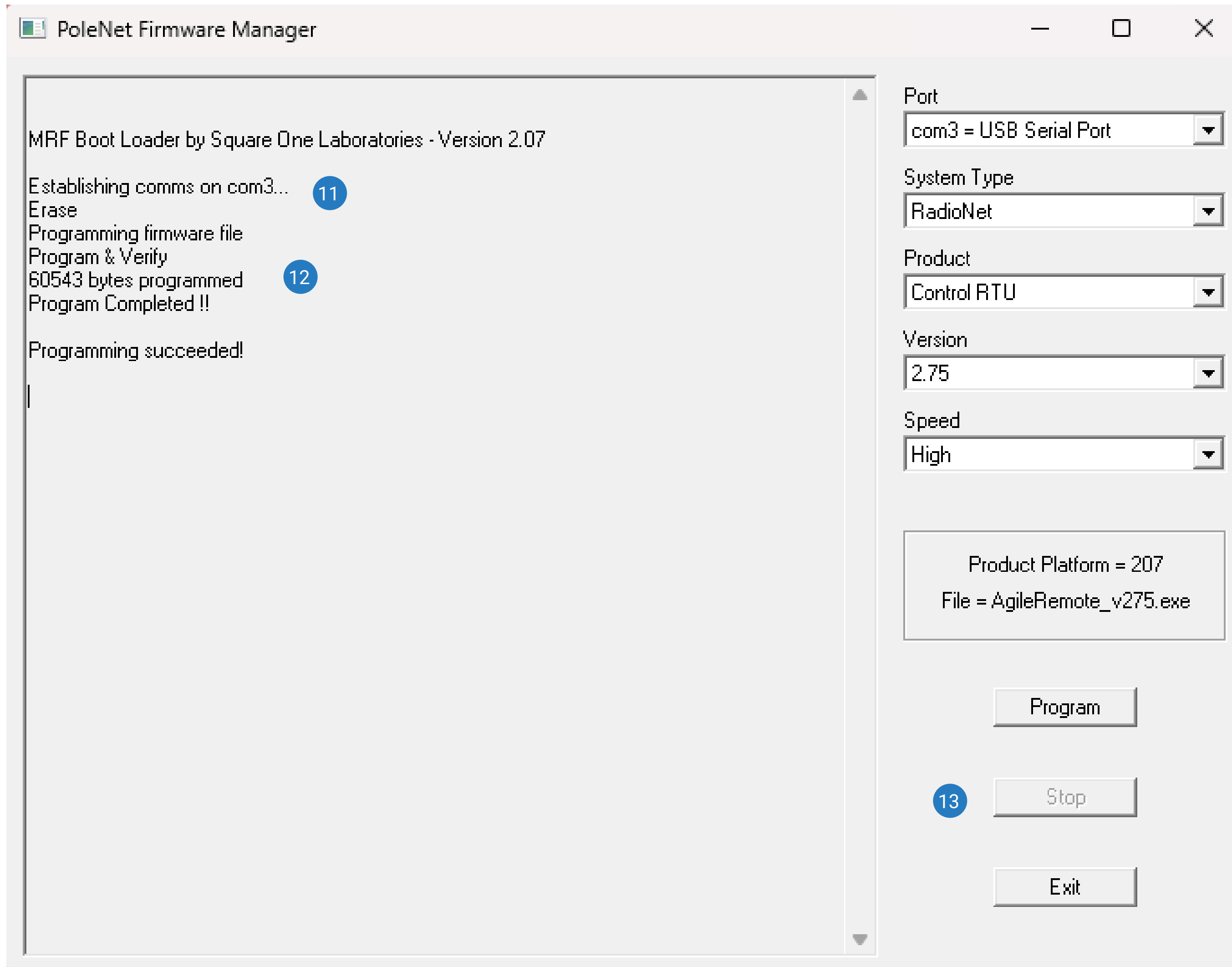


3. Launch the PoleNet PC Software when the RadioNet RTU and Comm port are selected.
4. Click on the "Firmware" button.



5. On the right side of the new screen, confirm that the correct "Port" is selected.
6. Select "System Type" as "RadioNet".
7. Select "Product" as "Control RTU" for the Remote Agile RTU, "Control 2x2" for the Remote 2x2 TU and "Data RTU" for the Remote DCP RTU.
8. Select the most updated version of "Version".
9. Select "Speed" as "High".
10. Click on the "Program" button to initiate the programming process.
11. The firmware update process will commence, and the update progress will be displayed on the left side of the screen.
12. Upon successful completion of the firmware update, you will be notified at the end of the process update.
13. Finally, select "Exit."





8. Appendix A: Editing Tools for PoleNet PC Software

The PoleNet PC Software provides comprehensive edit tools to streamline the process of defining devices and assigning them to the RadioNet Remote RTU I/O.

The subsequent paragraph explains the available edit tools and outlines the user-friendly procedure for setting and defining devices.

8.1 RadioNet Host Firmware Update

It is probably cleaner and easier to edit everything using the keyboard, without the mouse.

Navigation Options:

- Use Home and End to jump to first or last row.
- Use PgUp and PgDn to jump up/down by 1 page.
- Use arrow keys to move from column to column, or row to row.
- This also works for columns that use lists of values. You can't "get stuck" in a list until it is in edit-mode.
- Some columns are Read-Only, and they use a different background to make it obvious.

Normal cells behave like Excel cells:

- When you "arrive", you can type in new text, and it will replace what used to be in the cell.
- If you want to modify the text that was there, you must click at the text to set the insertion-point cursor.
- You can use Ctrl-C, Ctrl-V, Ctrl-X, Shift+Left/Right, Home, End, Esc to edit the cell
- After typing, the Enter key saves the text and auto-advances to the next cell on the Right, because it assumes you want to stay on the row to input all the data for that device.
- Or after typing, use Up, Dn, PgUp, PgDn to save the text and move up or down to another cell.

Editing cells that use lists:

- When you "arrive" to change a setting, you Must press any text key (e.g. space) to start edit-mode.
- The list starts in compact format (shows single item). Mouse-click on arrow button for Dropdown format.
- Use any arrow key or PgUp, PgDn, Home, End to move through the list.
- Or press a key that matches the 1st letter of any setting to cycle through the settings that match.
- Press Esc to return to the original setting. (I think it should also exit edit-mode.).
- To exit edit-mode you Must press Enter and auto-advance (or click on Clear, but it will erase the setting).

8.2 Device Configuration – Editing Values Using the Mouse

Editing using the mouse is also easy, and quick for dropdown lists.

Navigation options:

- Use the mouse scroll-wheel (or the scrollbar on the right side of the block) to scroll the list up/down (Note: a redraw bug sometimes leaves scraps of cell borders when you scroll down)
  - Some columns are Read-Only, and they use a different background to make it obvious
  Normal cells behave like Excel cells:
- After you first click on a cell, you can type in new text, and it will replace what used to be in the cell.
- If you click again, you can edit the text, with the cursor set to the position that you clicked on
- You can use Shift+MouseClicks to select sub-text.
- See the previous paragraph for notes about using the keyboard.
- After typing, the Enter key saves the text and auto-advances to the next cell on the Right,
- because it assumes you want to stay on the row to input all the data for that device.
- While editing a cell, if you click a different cell, your changes to the first cell are discarded.

Editing cells that use lists:

When you "arrive" to change a setting, you click the cell twice to start edit-mode: two normal clicks for Dropdown list format or double-click the cell for compact format (shows single item).

- While editing a list, if you click a different cell, the first cell reverts to its original OR is set to the first item.
- To exit edit-mode you Must choose a list item (or click on Clear, but it will erase the setting)
- You can also use the keyboard, as described in the previous page.

8.3 Device Configuration – Master and Paste

Flexible bulk copying of data from a Master device or selection of cells

Most systems have multiple instances of identical devices.

Master and Paste avoids the need to repeat the same settings again when you set up a system:

- Set up a single device.
- Mark it as a Master.
- Paste all its settings to chosen identical devices.

And Master and Paste makes it safe and easy to rapidly modify settings:

- Make changes to a single device.
- Highlight those changes and mark them as a set of Masters.
- Paste those changes to other devices, without changing any other cells.

Paste only overwrites cells that have been Highlighted, even if other columns have Master cells.

Exception: if you Paste into a Model cell then all the model's values are copied into that row.

Most columns can have a Master cell. (Not Type, Name, Mainline, Attached RTU, RTU IO, Indicator)

Selection of rows, columns, cells use standard Windows combinations of mouse with Shift and Ctrl keys.

(Click in the Type column is a short-cut to select all valid cells in that row, but cells not visibly highlighted.)

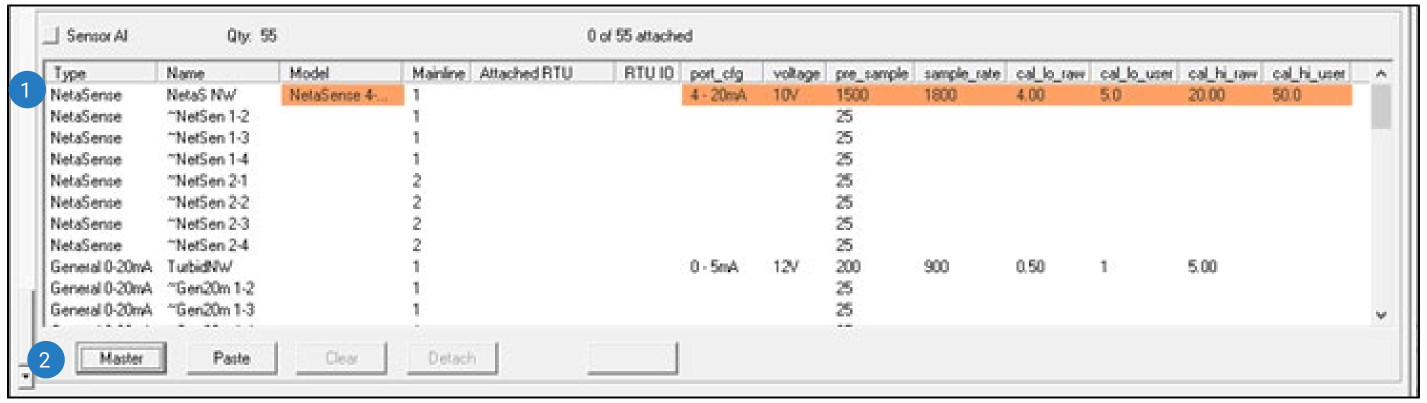
8.3.1 Edit Definitions Using Master and Paste Tools.

The following example illustrates a complex task:

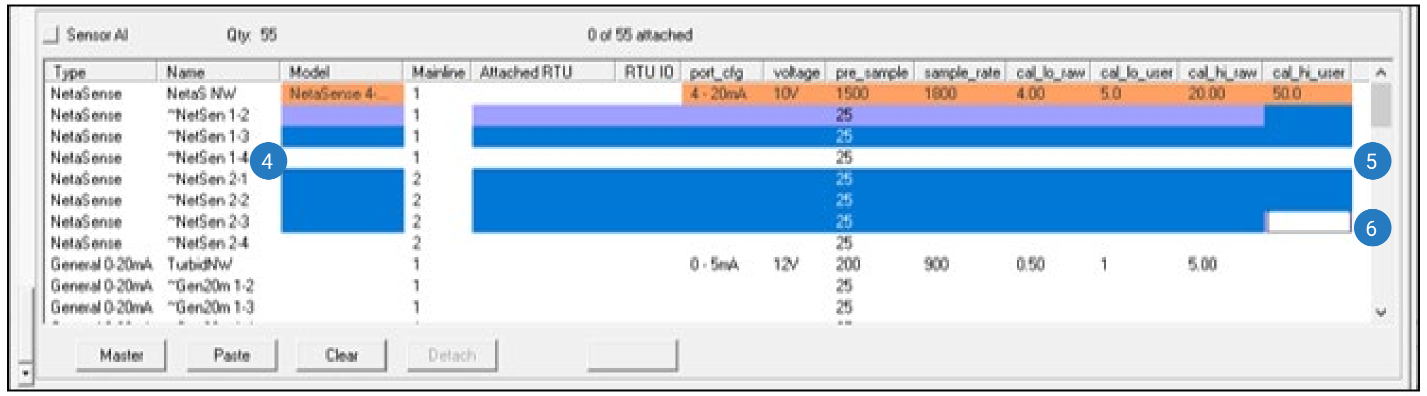
"NetaS NW" – NetaSense Soil Moisture Sensor - has non-standard pre_sample and sample_rate.

Copy to NetSen 1-2,1-3,2-1,2-2,2-3

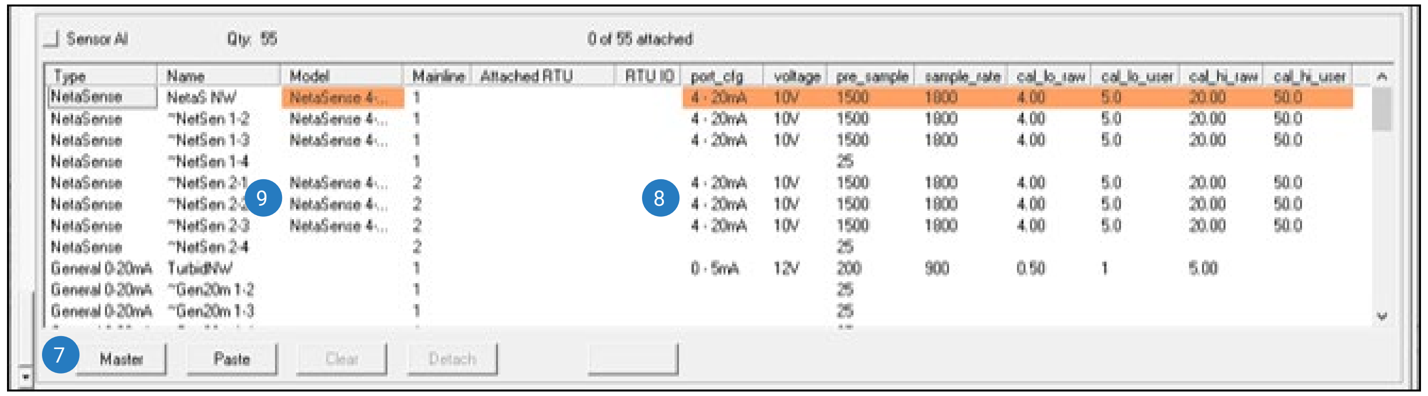
1. Click in Type cell of "NetaS NW"
2. Click Master button to mark the whole row as Master (orange)
3. Click in Model cell of NetSen 1-2



4. Hold Shift key, click in cal_hi_user to select whole row
5. Hold Shift key, click in cal_hi_user of NetSen 1-3 to select the whole block of rows
6. Hold Ctrl key, click in cal_hi_user of NetSen 2-1,2-2,2-3 to add those 3 rows to the selection.



7. Click Paste button to copy data from the Master cells to all the highlighted cells.
8. Process complete!
9. Edit the Names of those devices,



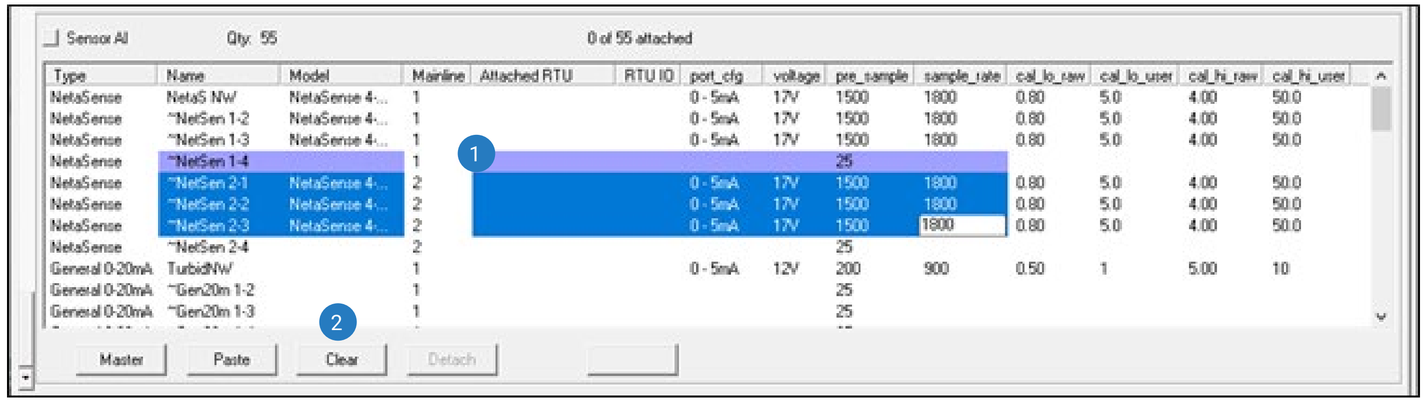
8.4 Device Configuration – Clearing Data

When it is necessary to remove or delete a selected setting, the Clear button can be utilized to swiftly and efficiently clear multiple settings.

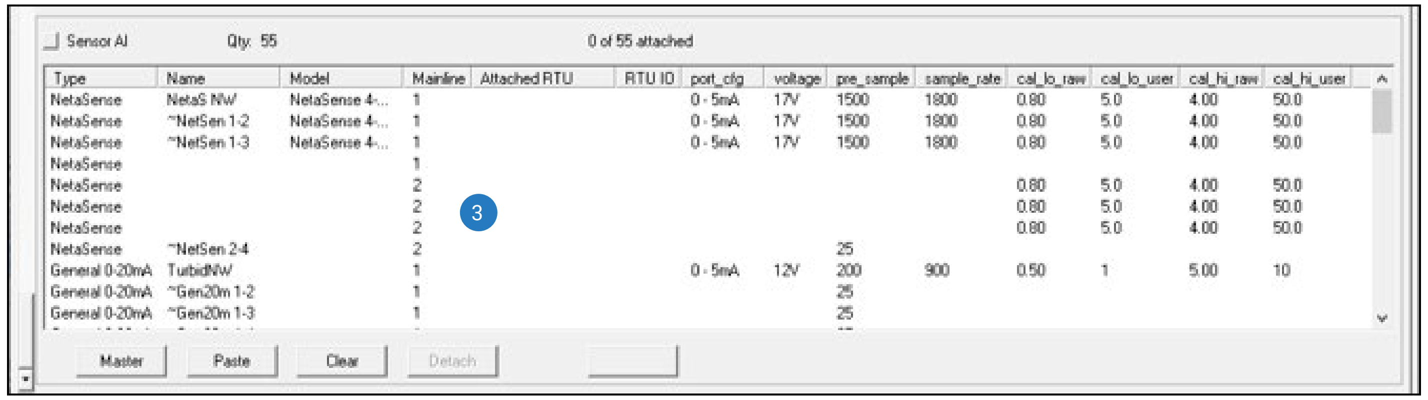
The Clear button can be used to clear any non-Read-Only data, including:

- Name.
- Model.
- Attached RTUs.
- Flow Indicators.
- Settings from drop lists.
- Other user data (Max or RadioNet).

1. Select a group of cells, columns, rows in the usual way



2. Click the Clear button.
3. The selected settings are deleted.



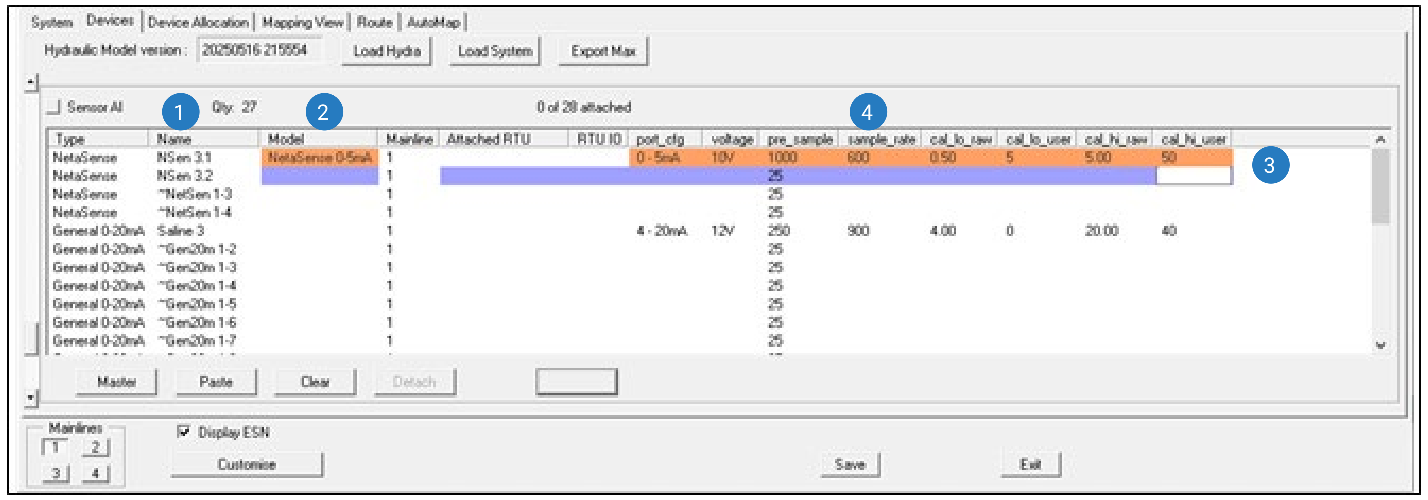
8.4.1 Device Configuration – AI sensors

The following settings can be manually edited and utilize the edit tools, including Master and Paste.

The example system includes RTU 1-2-3, which requires two NetaSense sensors.

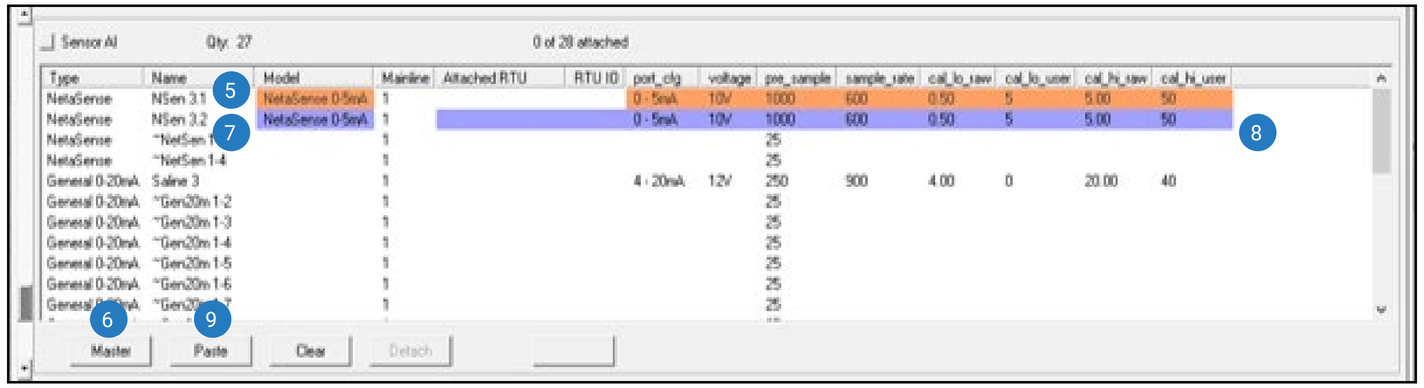
Set up the NetaSense Soil Moisture Sensor:

1. Set the name for both NetaSense sensors.
2. Select the sensor model for Sensor 3.1 from the Model list and select NetaSense 0-5mA.
3. The PoleNet PC software will automatically add all the default settings.
4. Set the sample rate to the required delay between sensor readings. The default is 900 seconds (10 minutes delay).



Use Master and Paste to copy the settings from Sensor 3.1 to Sensor 3.2:

5. Select the Type cell in the first NetSense.
6. Press the “Master” button to mark the entire row as Master (orange).
7. Using the Shift key, select the Model cell in the second NetSense.
8. Then hold the Shift key and click on the cal_hi_user cell to select the entire row.



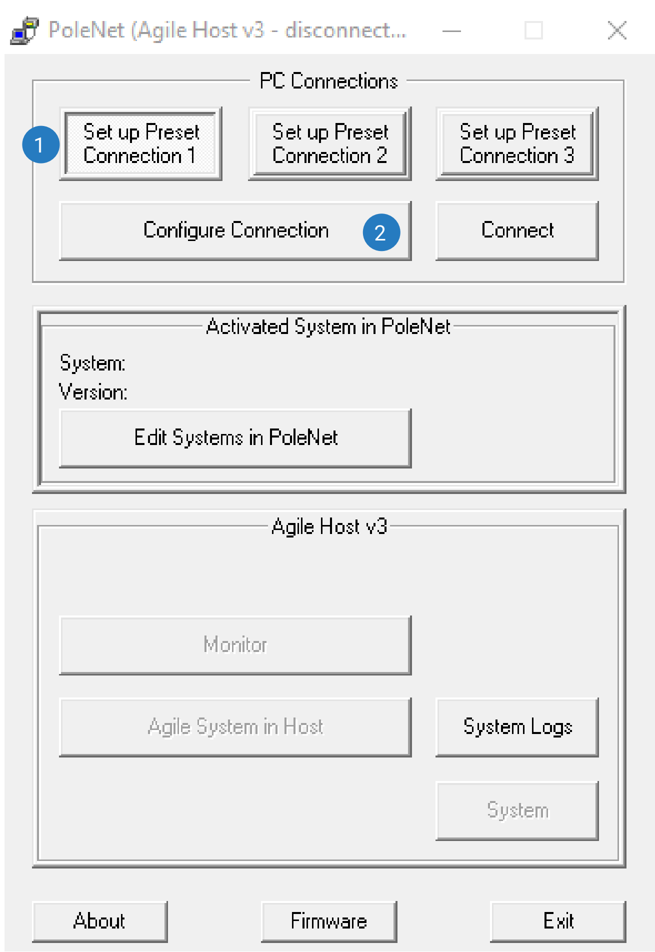
9. Appendix B: RadioNet Base Station and RadioNet Remote RTU Setup

The following paragraph outlines the setup for the RadioNet Remote RTU. These settings are applicable to all RadioNet Remote RTU models.

9.1 Base Station Settings

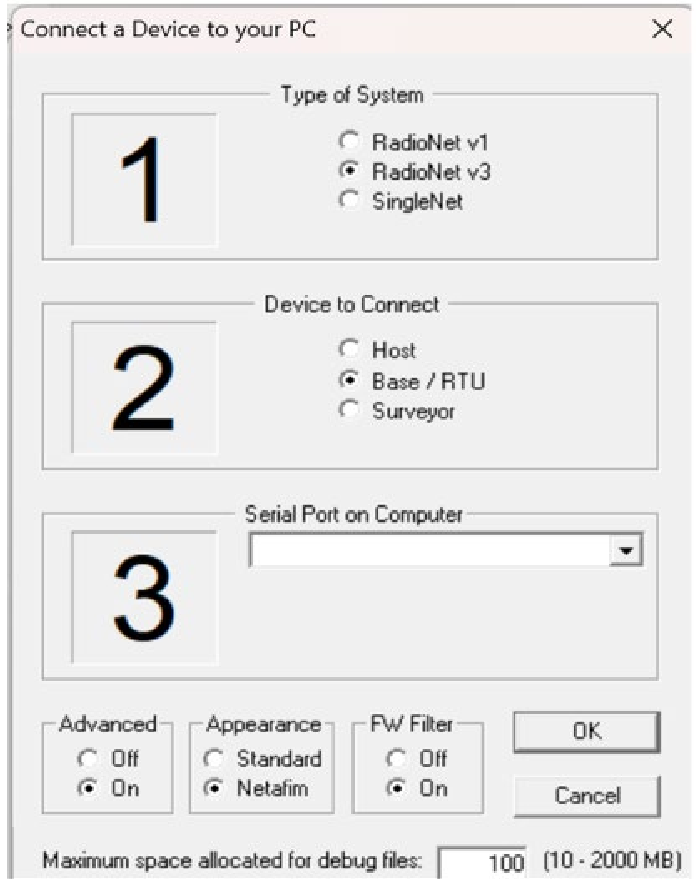
The Baset station needs to be configure the radio settings like the radio frequency and the transmission power.

1. Launch the PoleNet Software application.
   Navigate to the “Set up” menu and select “Set up Preset Connection 1.”
   The application presents three tabs: “Select Set up Preset Connection 1,” “Select Set up Preset Connection 2,” and “Select Set up Preset Connection 3.”
   By selecting one of these tabs, you can define a connection to various communication ports and systems.
   For instance, Connection 1 can be configured to connect to Com port 3 and have the RadioNet system, while Connection 2 can be configured to connect to Com port 5 and have the SingleNet system.
   Both systems are simultaneously connected to the PoleNet Software.
2. Select Configure Connection



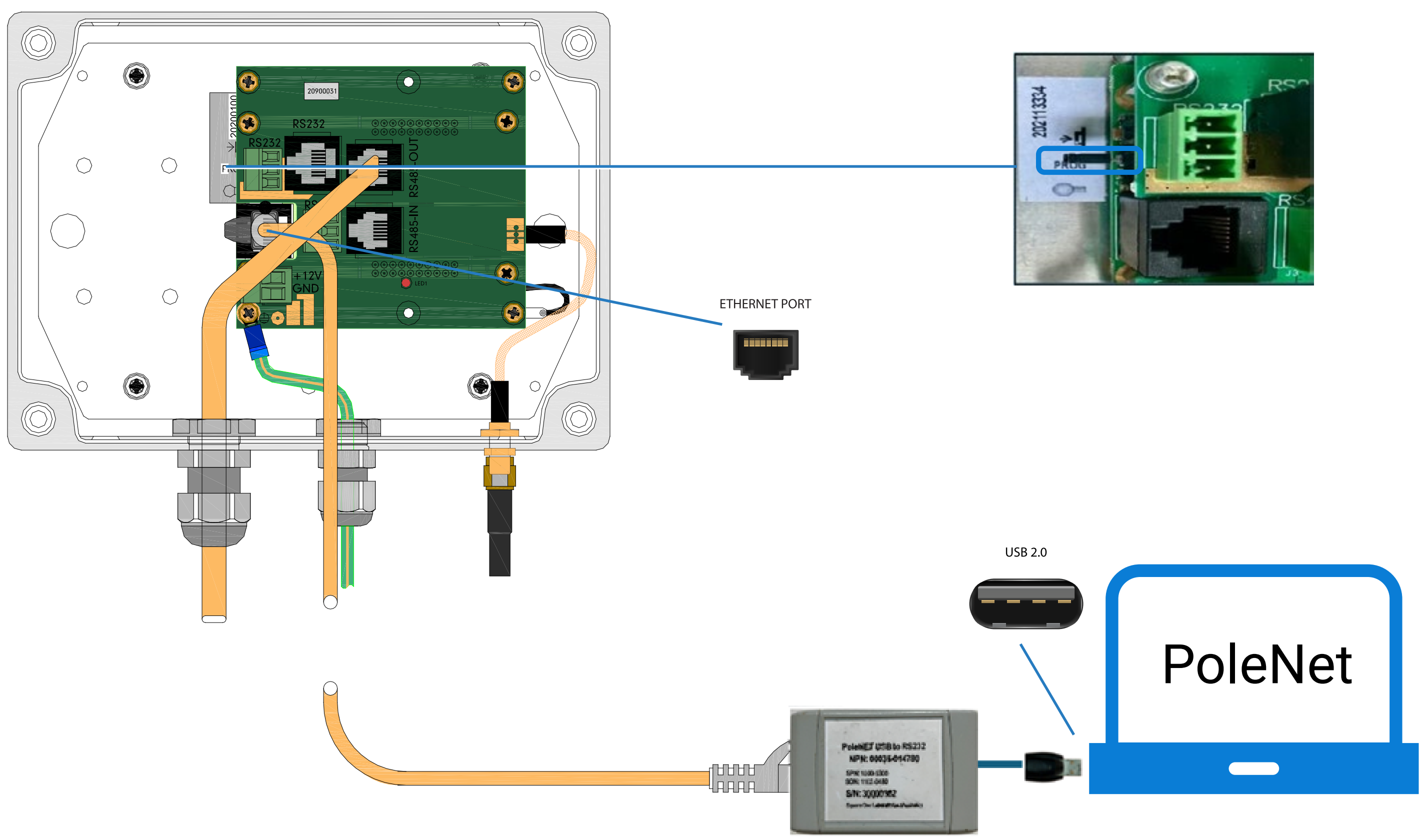
At the new screen select the following options:

- Type of System, RadioNet V3
- Device to Connect, Base/RTU
- Serial Port, select your serial port connection. On this example is selected Com 3.
- Advance, On
- Appearance, Netafim
- FW Filter On
- Then select OK

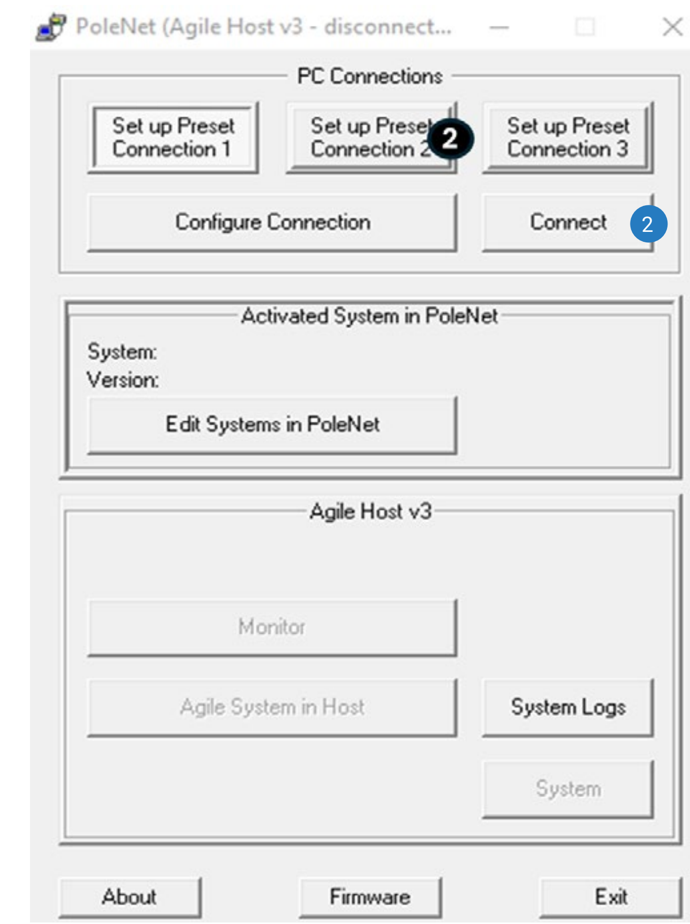


9.1.1 Connection of the Base Station to PoleNet Software

Connect the PoleNet plugs and cable to the Base Station and the PC with the PoleNet software.



1. To enable the modification of the Base's frequency setting, the programming jumper must be connected to the programming pins.
2. At the PoleNet select: Connect.

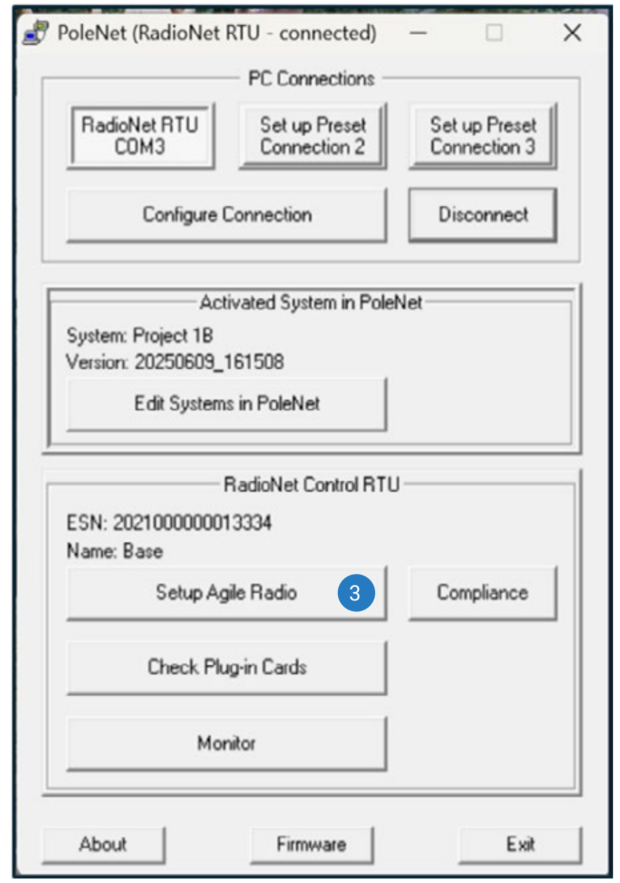


NOTE

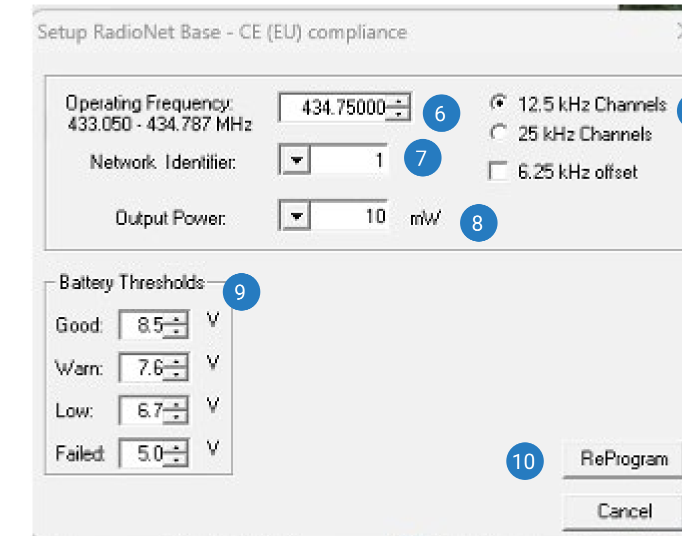
For this connection is recommended to use the PoleNet USB to RS232 device

Part number 00035-014780.

3. Select Setup Agile Radio, then proceed to select OK.
4. A new window will then open, presenting the radio settings for selection.
5. Select Channel Spacing & Offset (if applicable). The channel spacing is configurable to either 12.5 kHz or 25 kHz. The channel spacing setting (default 12.5 KHz) determines the next frequency increment.
   For those countries that support channel spacing of 6.25 kHz, then selecting the 6.25 kHz offset will enable the center frequency to offset by 6.25 kHz.



6. Define Operating Frequency
   The Agile Radio's operating frequency is software configurable between 402 MHz and 470 MHz. The programmed frequency must comply with either your local or national RF spectrum licensing organization.
7. Network ID default is 1, it is the ID number for this project network.
8. Output Power, The Agile Radio's operating power is software configurable between 1mW and 500 mW. The Output power setting should be equal or less than that defined by the radio license parameters that you are operating under.



NOTE

If the power setting is above 10mW, do not power up the RadioNet without an antenna connected.

9. Battery Thresholds, Four Battery alarm thresholds can be set to advise the RadioNet Host when different battery voltage levels are sensed. While on the network, crossing any of these thresholds causes the Host unit to be notified.

   Good: Battery voltage is OK.

   Warn: Battery voltage has reached the "warning level", should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.

   IE: The solar panel might need cleaning or rechecking for correct orientation.

   Low: Battery voltage has reached the "low" level, should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.

   IE: The solar panel might need cleaning or rechecking for correct orientation.

   Failed: Battery voltage has dropped below the "Failed" threshold. The RadioNet Remote sends an alarm message and then turns off all outputs, stops monitoring the inputs, turns off the radio and goes into hibernation, periodically awakening to check if the battery voltage has recovered.

10. Select the "Reprogram: Button to reprogram the RadioNet Base station.

9.2 Remote RadioNet RTU Setup

The Remote RadioNet RTU in the network must have the frequency settings of the Base Station.

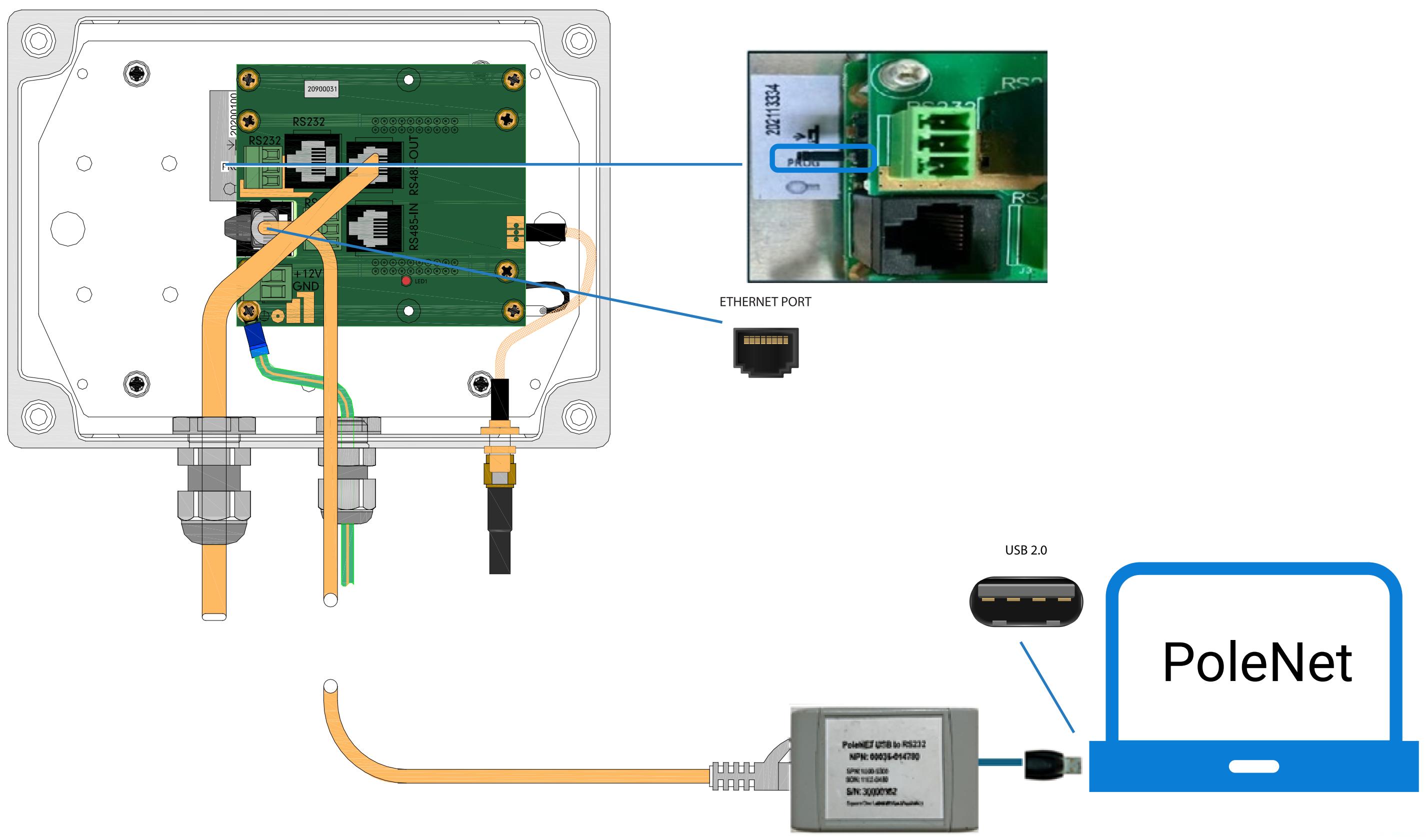
The following paragraph explains all the setting of the Remote RTU.

The tree Remote RTU models have the same settings ad configurations.

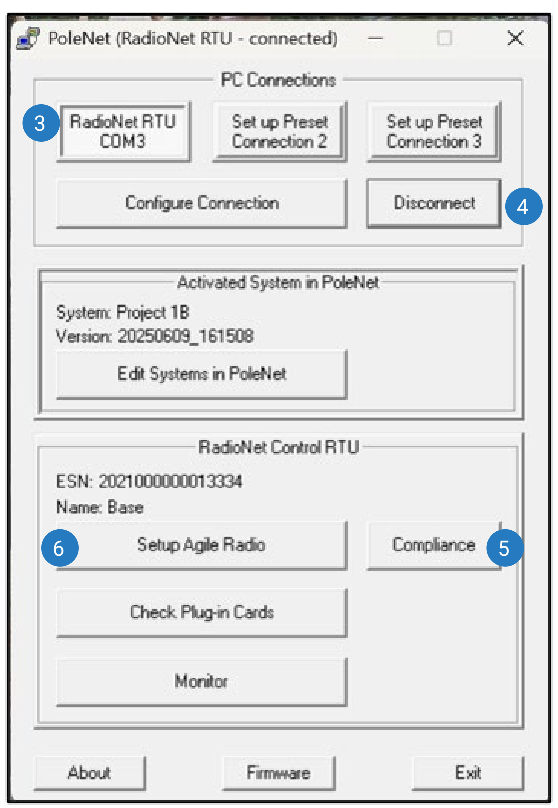
1. Connect the PoleNet plugs and cable to the initial Radio RTU and the PC equipped with the PoleNet software. Power the RadioNet RTU.

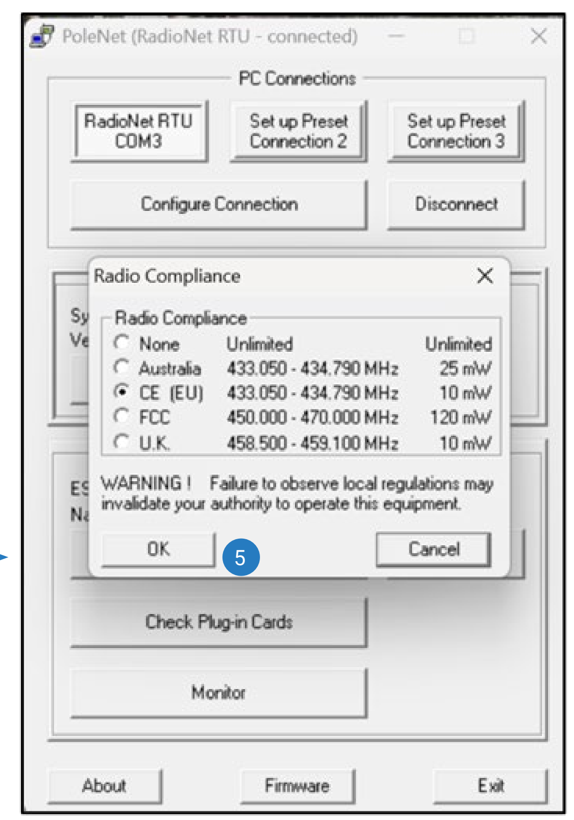
NOTE

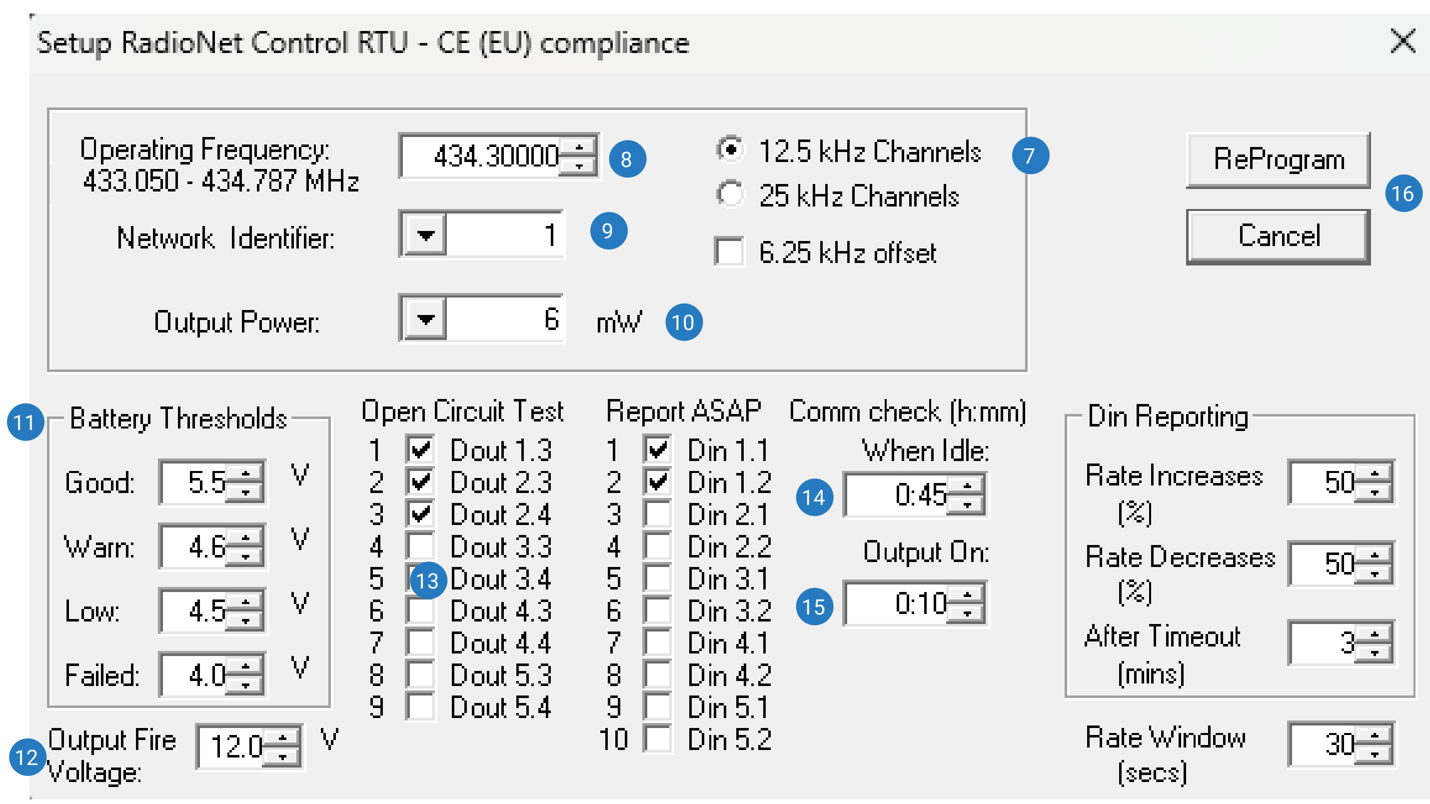
The Programing Jumper must be inserted for setting the frequency and the output power!



2. Launch the PoleNet Software application.
3. When it is selected the RadioNet RTU
4. Click on “Connect”.
5. Click on “Compliance” and select the same frequency selected for the RadioNet Base Station. Confirm “OK”.
6. Click on Setup Agile Radio.
7. Select Channel Spacing & Offset (if applicable)
8. Define Operating Frequency
9. Network Identity by default is set to 1
10. Define Output Power
11. Define Battery Thresholds
12. Define Output Firing Voltage
13. Enable/Disable Open Circuit Detection
14. Define Comm. check interval when outputs are Idle
15. Define Comm. check interval when outputs are Active
16. Select Reprogram Button or Cancel



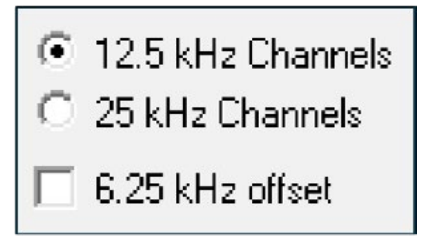




9.2.1 Setup Remote RTU Settings Definitions.

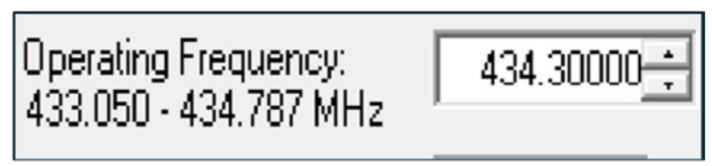
The following paragraph explains each one of the possible setup's definitions.

Channel Spacing & Offset



The channel spacing is configurable to either 12.5 kHz or 25 kHz. The channel spacing setting (default 12.5 KHz) determines the next frequency increment.
For those countries that support channel spacing of 6.25 kHz, then selecting the 6.25 kHz offset will enable the center frequency to offset by 6.25 kHz.

Operating Frequency



The Agile Radio's operating frequency is software configurable between 402 MHz and 470 MHz. The programmed frequency must comply with either your local or national RF spectrum licensing organization.

NOTE

All RadioNet Remotes and the RadioNet Base must all be set to the same frequency.

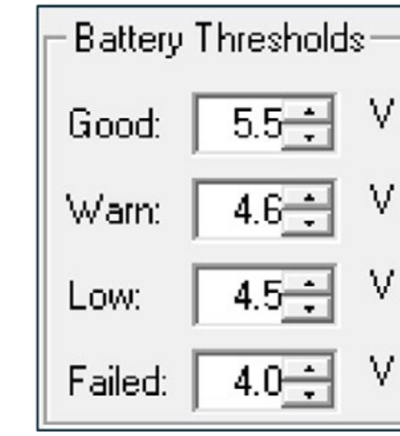
Output Power

The Agile Radio's operating power is software configurable between 1mW and 500 mW. The Output power setting should be equal or less than that defined by the radio license parameters that you are operating under.

NOTE

If the power setting is above 10mW, do not power up the RadioNet without an antenna connected.

Battery Thresholds



Four Battery alarm thresholds can be set to advise the RadioNet Host when different battery voltage levels are sensed. While on the network, crossing any of these thresholds causes the Host unit to be notified.

- **Good**: Battery voltage is OK.
- **Warn**: Battery voltage has reached the "warning level", should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.
  IE: The solar panel might need cleaning or rechecking for correct orientation.
- **Low**: Battery voltage has reached the "low" level, should a rechargeable power supply be installed, further investigation would be required to determine why the battery voltage can't be maintained at a good level.
  IE: The solar panel might need cleaning or rechecking for correct orientation.
- **Failed**: Battery voltage has dropped below the "Failed" threshold. The RadioNet Remote sends an alarm message and then turns off all outputs, stops monitoring the inputs, turns off the radio and goes into hibernation, periodically awakening to check if the battery voltage has recovered.

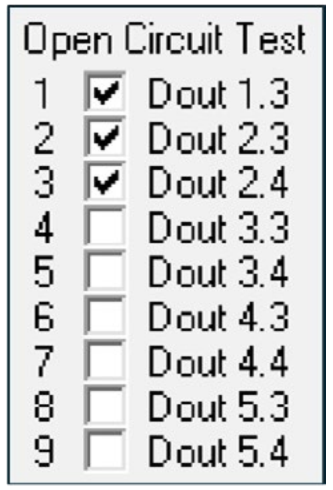
NOTE

Please refer to the Diagnostic section to view the current battery voltage level

Output firing voltage

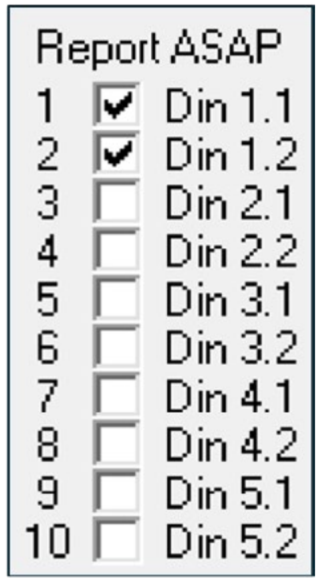
The Output firing voltage (default 12 VDC) is user configurable between 9 – 16 VDC. This setting is a global setting and effects all the outputs within the RadioNet Remote unit to which you are connected. When nonstandard solenoids and relays are being used, please contact Netafim Technical Support for further assistance.

Open Circuit Detection



Each output of the RadioNet Remote has Open Circuit (O/C) detection enabled as default. Whenever the output is activated the RadioNet checks to see if a solenoid or relay has been connected. If no device has been detected, the RadioNet will send an alarm message to the RadioNet Host and will also display the status in PoleNet monitor mode. Should a nonstandard solenoid or relay be used and the open circuit alarm condition is unwarranted, then the user can disable that individual output.

Report ASAP



When the immediate report of Digital input status is requested, the corresponding Digital Input selection box must be checked.

Following a digital input's state change from ON to OFF or vice versa, the unit attempts to report this change to the host.

If an input is configured to "Report ASAP," it makes an immediate report, and if there are other digital inputs that have not yet been reported, it also reports them.

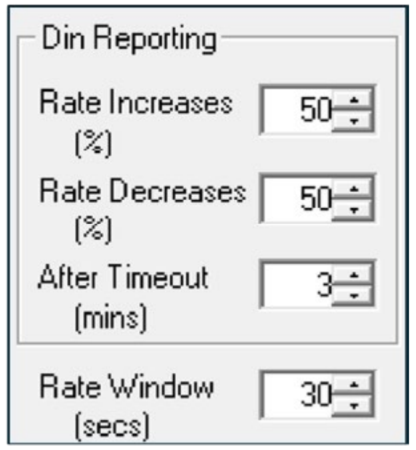
When the Digital Input selection box is NOT checked, the unit waits until one or more of the following events occur to trigger it to report its latest values for the input:

- Another digital input is due to be reported
- The unit has waited for the "After Timeout" delay from the time its input first changed

NOTE

These settings do not apply to Remote RTU DCP.

Din Reporting, Rate Increase (%), Rate Decrease (%), Ater Timeout (mins) and Rate Window (sec).



These settings are related to the digital input that is measuring the pulse rate of the digital input. Then the pulse rate is constant and is not over the "Rate Increase" and Rate decrease" values in % the window of the measure rate, then the Remote RTU will report to pulse rate to the Host every 5 minutes.

When the pulse rate is over the "Rate Increase" and "Rate Decrease" values in % the window of the measure rate, then the Remote RTU will report to pulse rate to the Host with a delay of the set "After Time Out (mins)". This works even if the units are configured to not report their input periods.

The "Rate Window" is a time interval set in seconds that is utilized to process the input period reported by the RTU to the host.

It is strongly recommended to utilize this feature to minimize the variability in period calculations. The function processes data for the specified number of seconds, resulting in periods being averaged and delayed. Consequently, it may take up to the entire duration of the rate window for data from a single pulse to be fully processed.

NOTE

it is recommended to use the default values for these settings.

Comm. Check (h:mm)

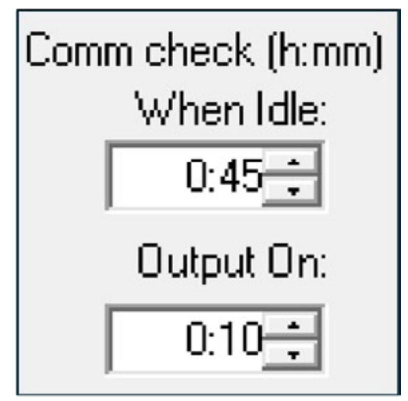
A communication check between the RadioNet Remote and its Master can be user defined. There are two independent intervals which are user configurable.

> **NOTE**
>
> The Master can be either the base Unit or a SAF Remote Unit.

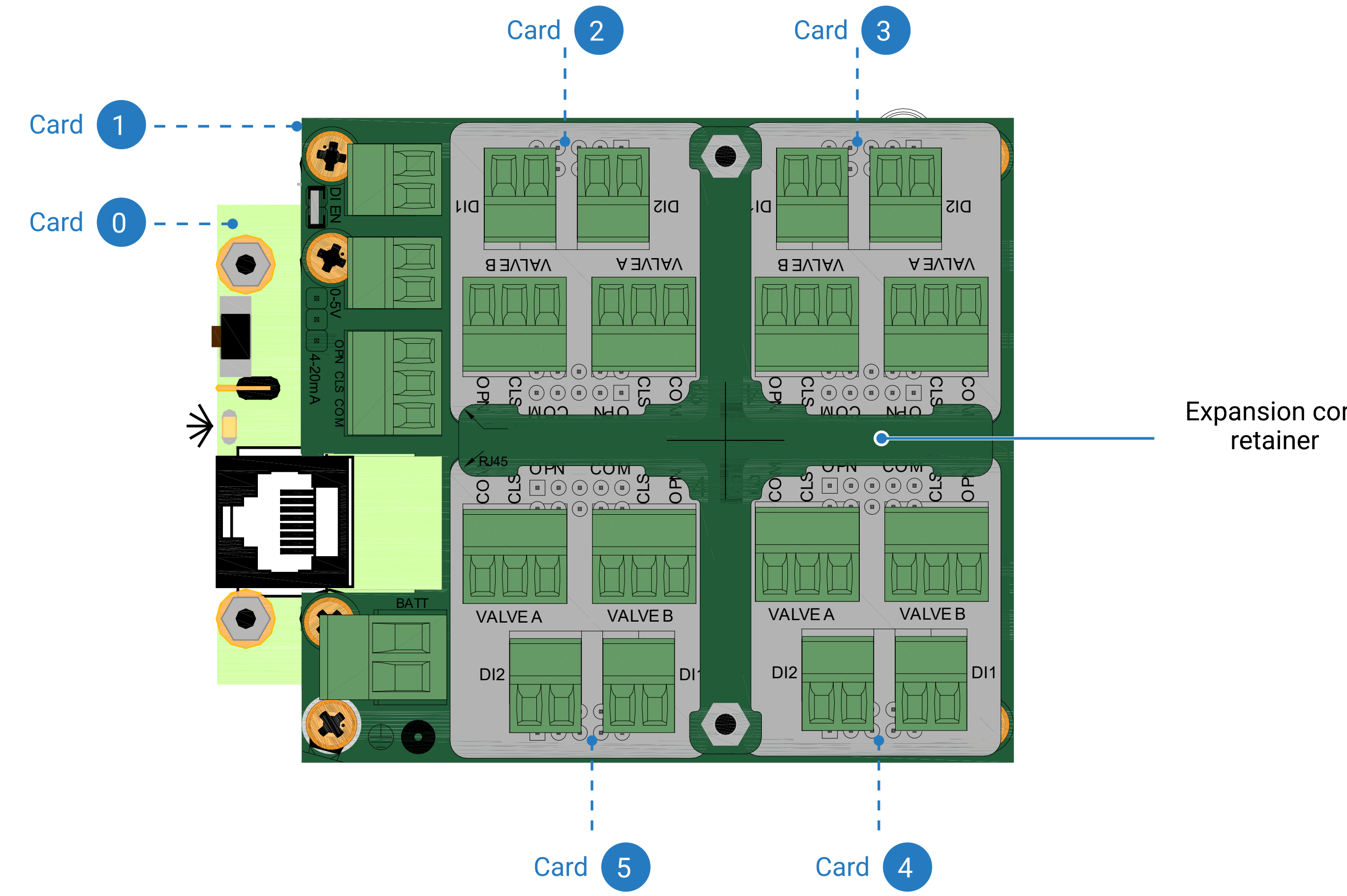
When idle: Configurable between "Off" and 36 hours

Output On: Configurable between "Off" and 2 hours 15 minutes.

Should an output be active and the Remote unit loses communication with its master within the defined time limit, The Remote unit will close all active outputs until re-connection is established.



9.3 RadioNet Remote RTU Card Number

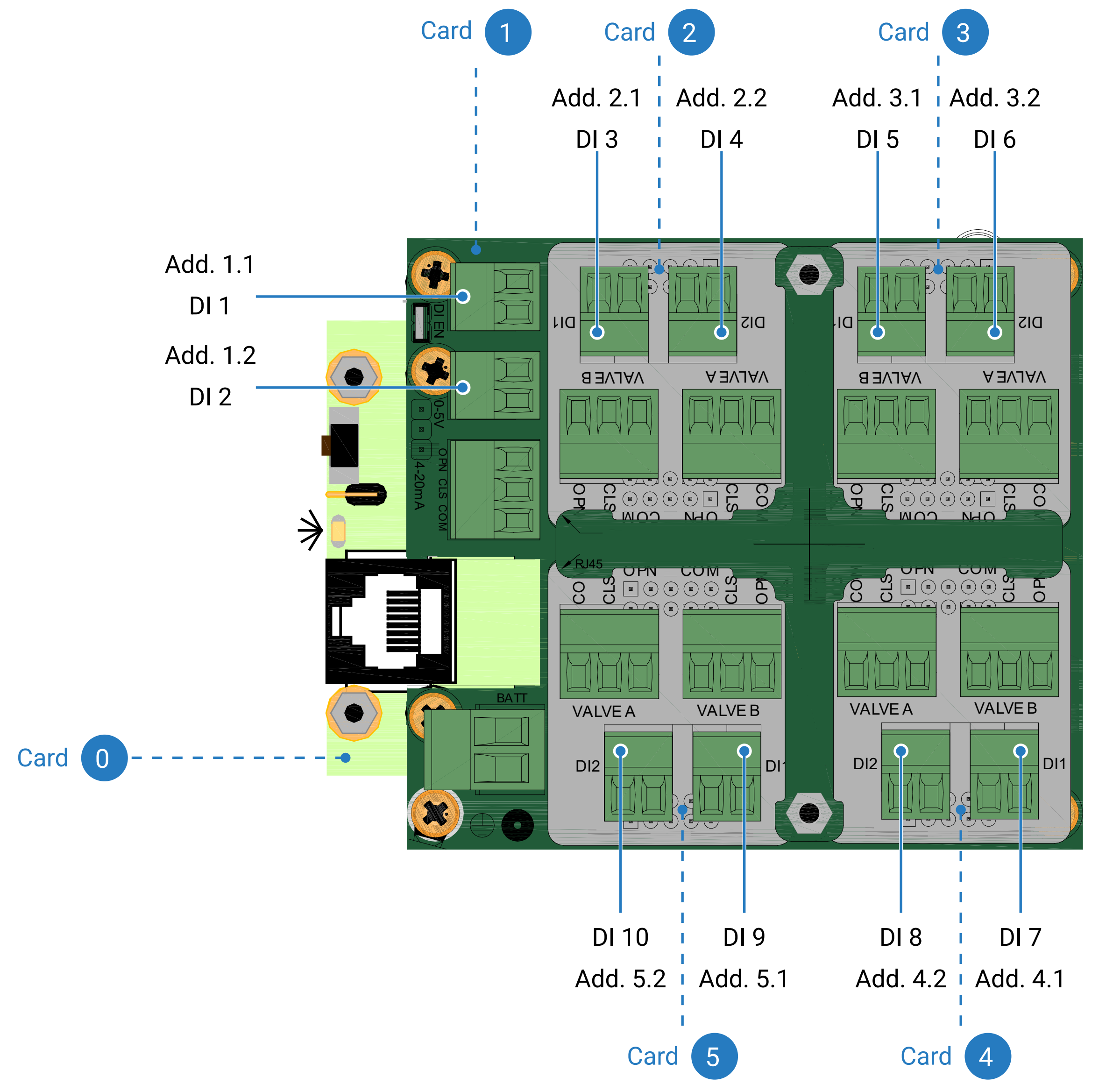


Card Address

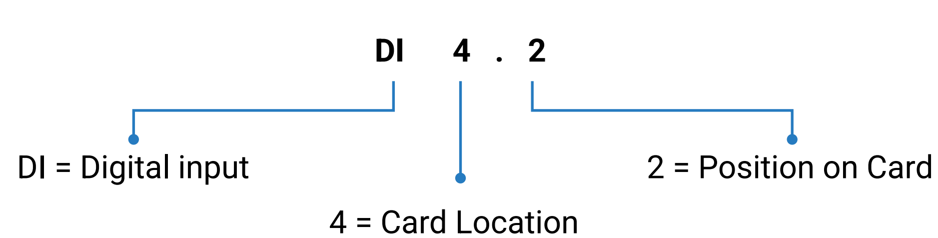
2 . 2020000000000109 . 1 . 3

Network # | Remote ESN | Card Location | Position on Card

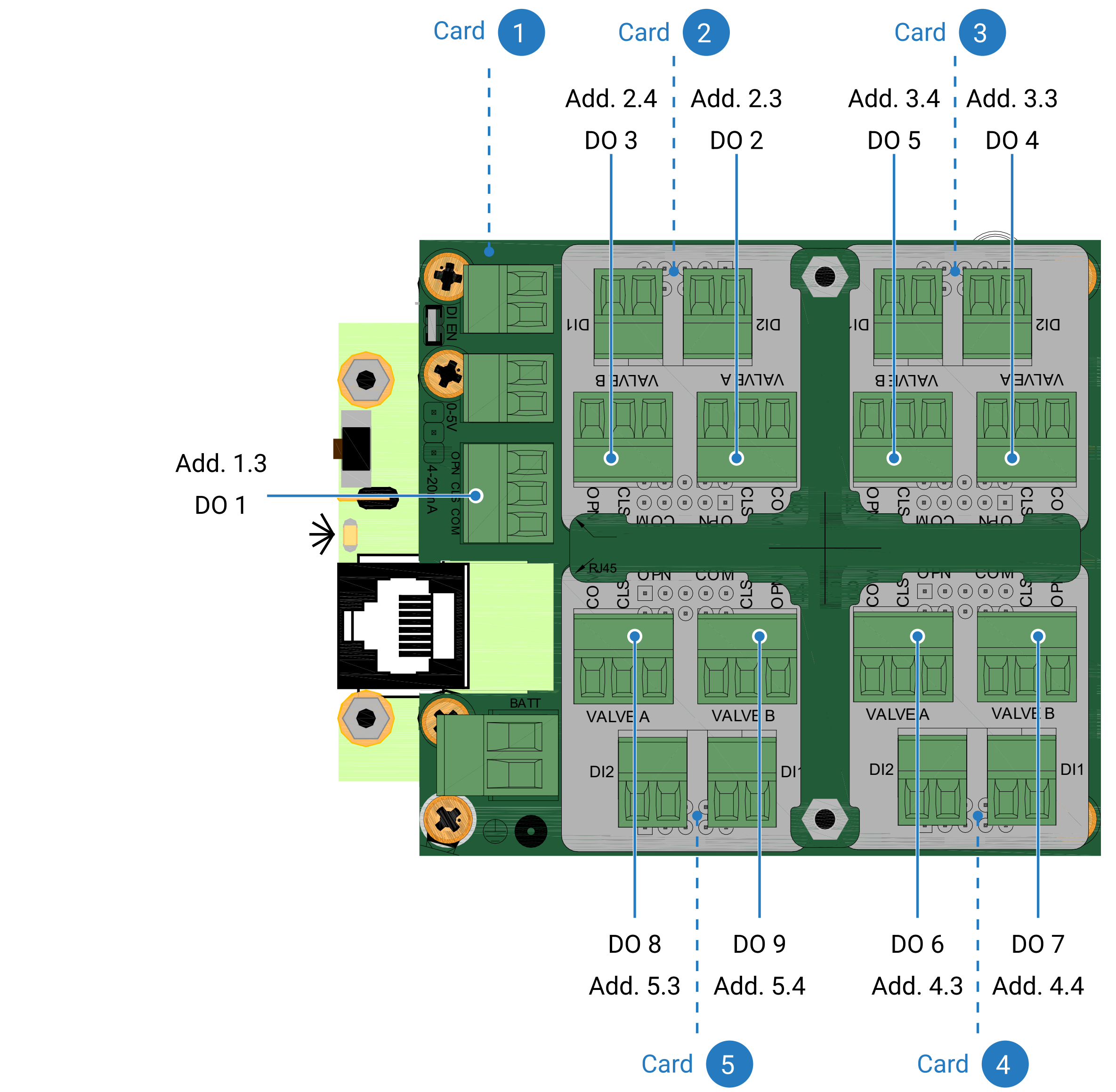
9.3.1 RadioNet Remote RTU – DI Position and Number



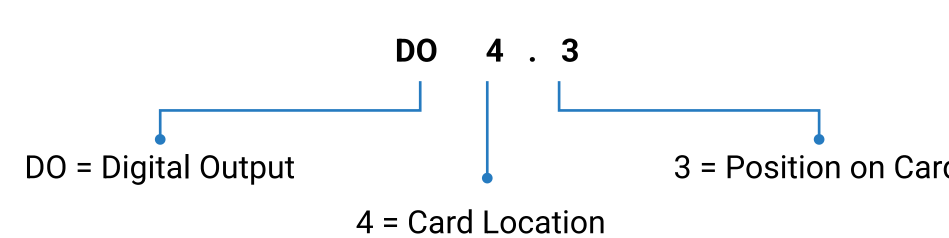
Digital Input Address



9.3.2 RadioNet Remote RTU – DO Position and Number



Digital output Address



10. Appendix C Radio Surveyor Mode

Designing a reliable wireless control system necessitates a comprehensive understanding of local factors that can disrupt the radio communication between the Remote RTU and the Base station, including:

- **Location**: The proximity to obstacles, such as buildings or trees, can affect signal strength.
- **Existing Atmospheric Noise and Interfering Signals**: Natural noise and external signals can interfere with radio communication.
- **Topography**: The terrain, including elevation and slope, can impact signal reception.
- **Distance**: The distance between the RTU and the Base station can affect signal strength.
- **Foliage**: The presence of foliage can block or attenuate radio signals.
- **Climate**: Weather conditions, such as rain or humidity, can affect signal quality.
- **Project Boundaries**: The physical boundaries of the project site can influence signal reception.

Some of these influences can be mitigated by relocating the Remote RTU, elevating the antennas above the crop canopy, and utilizing Remote RTU as a SAF – Repeaters.

The PoleNet incorporates a Surveyor Mode, a crucial function that enables the User and Technician to conduct a quality test for the selected working radio frequency and signal strength at the installation site for the RadioNet system.

The RadioNet Remote Agile RTU and the RadioNet Remote 2x2 RTU can be employed to execute the Surveyor Mode function.

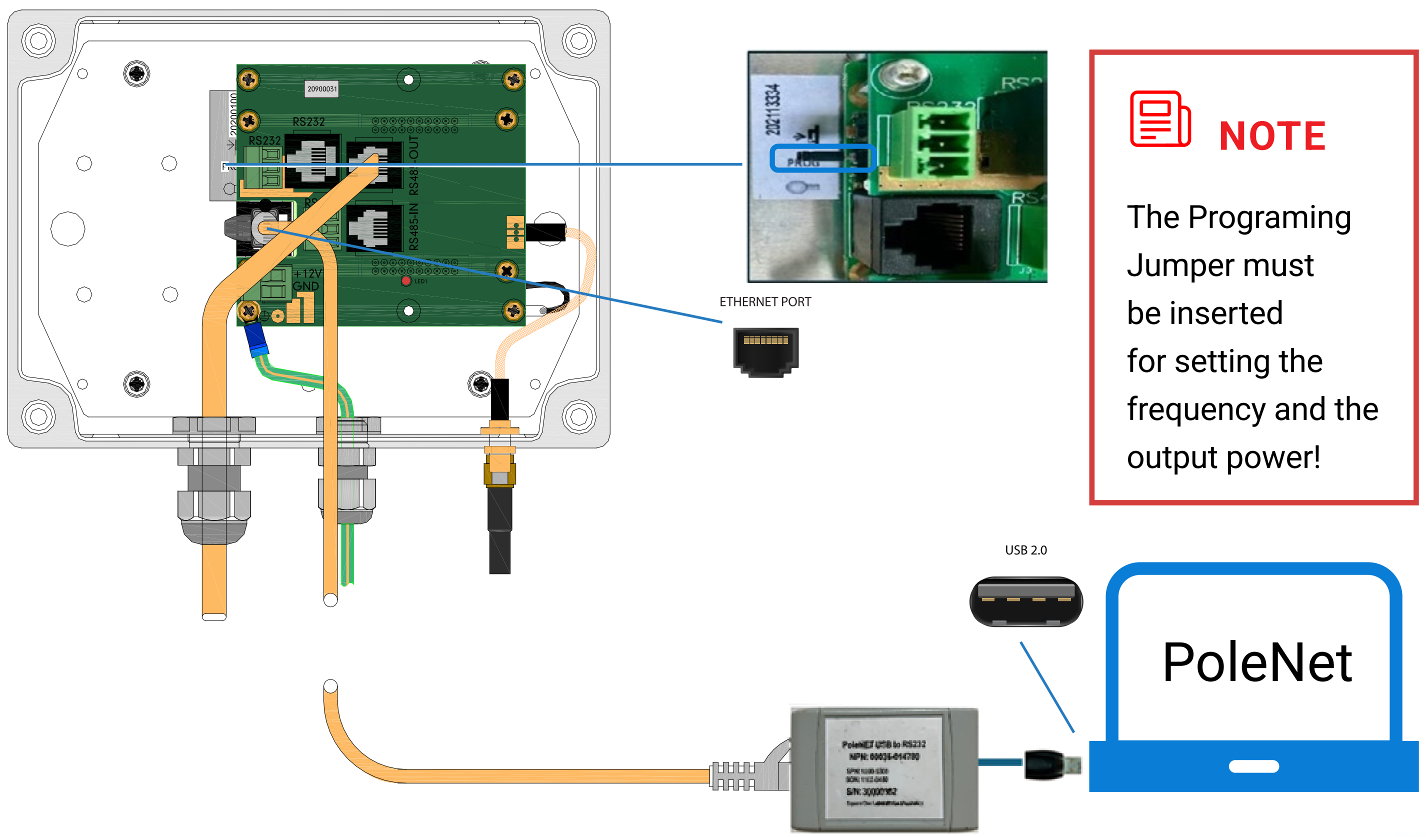
10.1 Surveyor Mode - RSSI Floor

The RSSI Floor test mode is used to determine how noisy the project site is at the nominated operating frequency. The results will provide you with an understanding of the amplitude and duration of the recorded noise levels.

NOTE

RSSI - Received Signal Strength Indication is a measurement of the power present in a received radio signal.

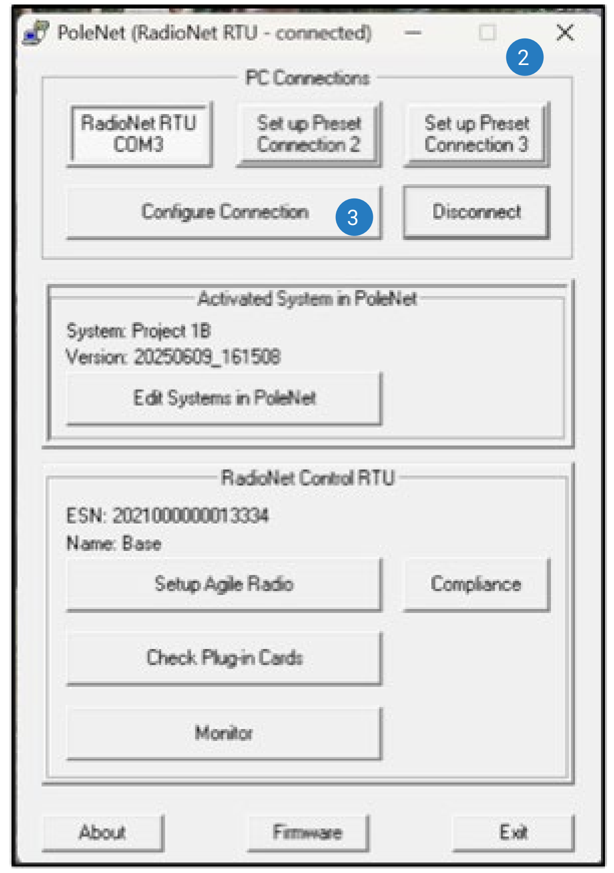
Place the RadioNet Remote RTU on the Base location. Ensure that your test unit has a good antenna at an equivalent height and proximity to the project being investigated. A poor antenna can yield artificial, higher-than-actual results.

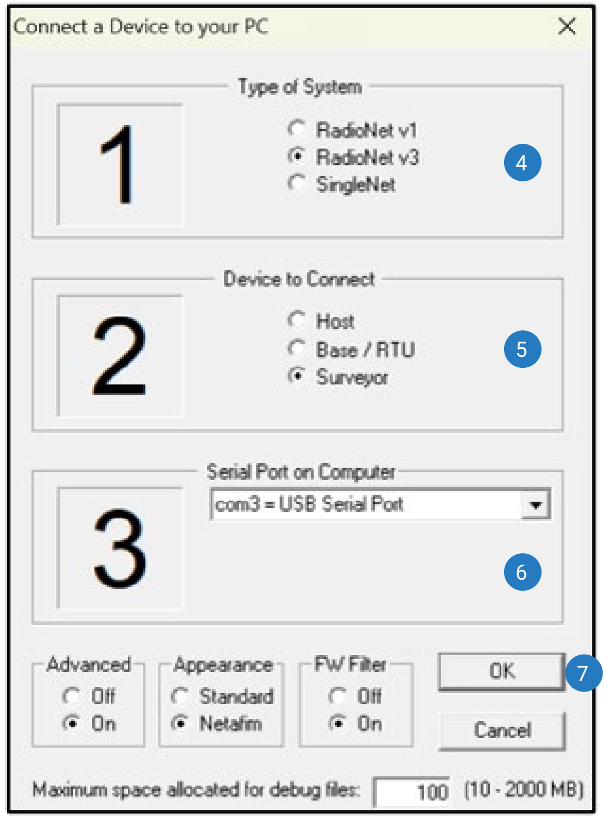


NOTE

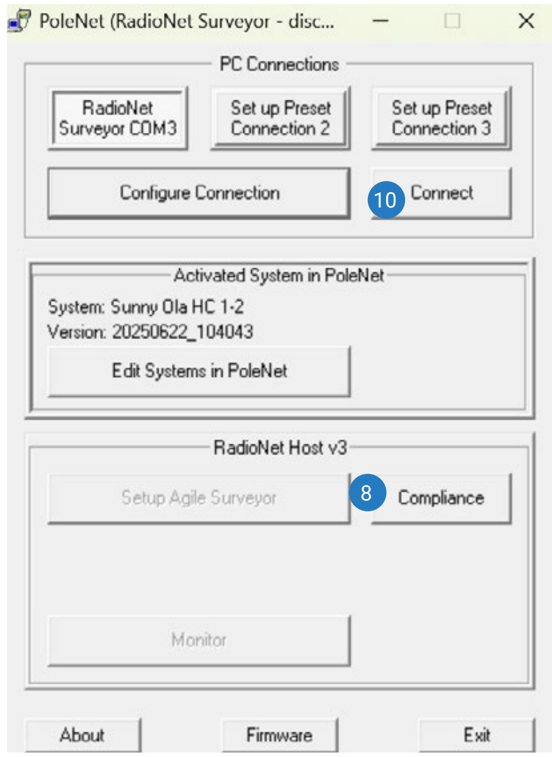
The Programing Jumper must be inserted for setting the frequency and the output power!

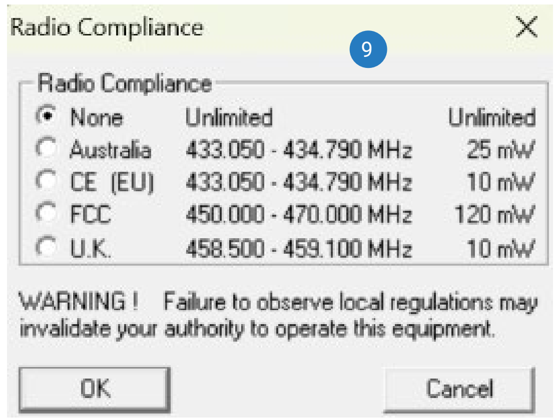
1. Connect the PoleNet plugs and cable to the initial Radio RTU and the PC equipped with the PoleNet software. Power the RadioNet RTU.
2. Launch the PoleNet Software application.
3. Select "Configure Connection".
4. Select RadioNet v3
5. Select Surveyor'
6. Select the Serial Port
7. Select OK



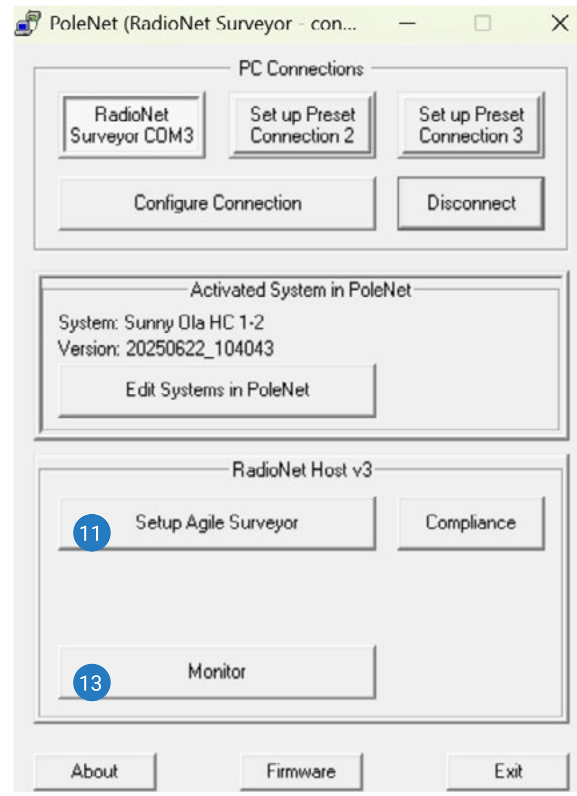


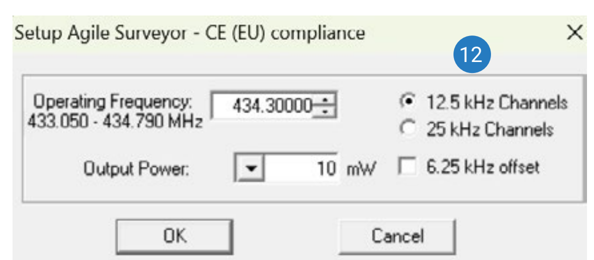
8. Select "Compliance"
9. Select the Frequency Compliance for your country. Is the same frequency selected to the RadioNet Base Station. Confirm "OK".
10. Select Connect.



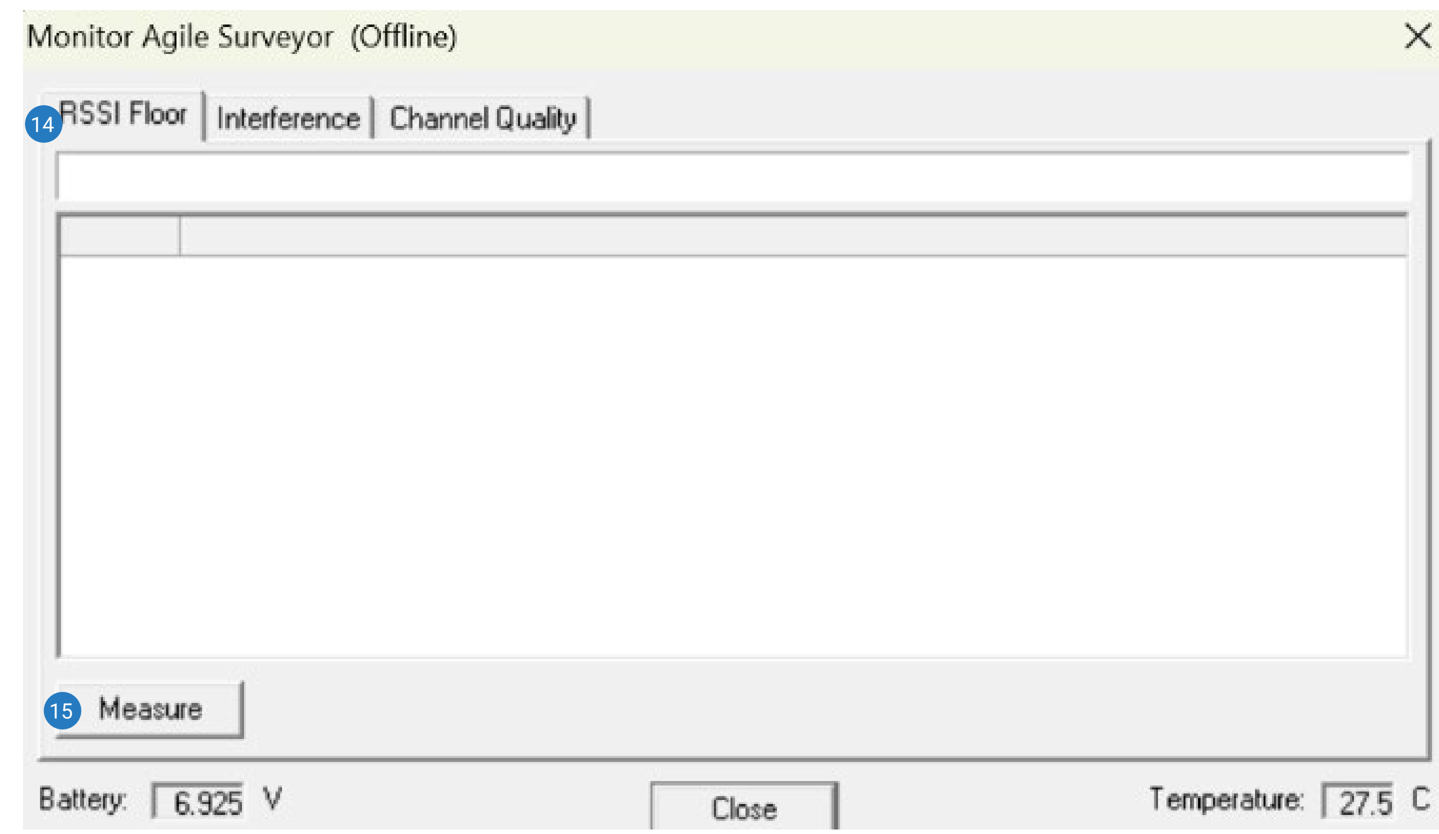


11. Select Setup Agile "Surveyor"
12. Select your "Operating Frequency" and the "Output Power", which are recommended for the test to set the maximal permitted power. Select OK to save the settings. After saving, the programing jumper can be removed!
13. Select "Monitor"



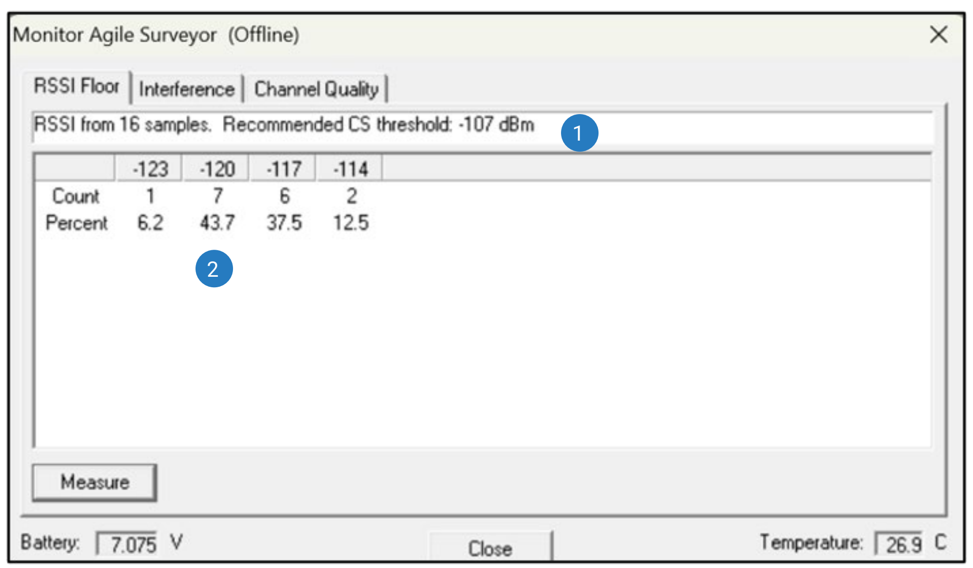


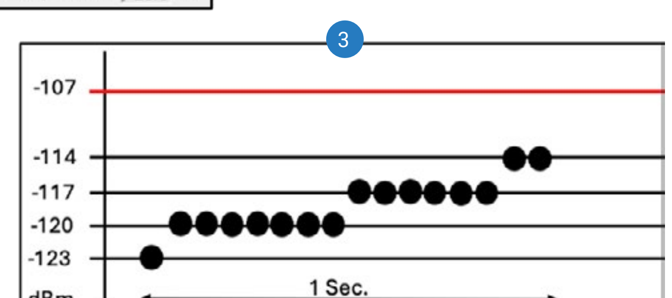
14. The New Screen, Monitor Agile Surveyor, has three tabs. Select the RSSI Floor tab.
    The RSSI Floor test mode is used to determine the noise level at the selected operating frequency on the project site. The results provide an understanding of the amplitude and duration of the recorded noise levels.
    Prior to executing the test, ensure that the battery level is satisfactory and the temperature is below the specified maximum operating temperature, as indicated at the bottom of the screen.
    Select Measure to start the RSSI Floor test. It is a very short test, and you may run it several times to check that the results are consistent.
15. Select "Measure"



10.1.1 Definitions of the Radio Survey Mode – RSSI Flor Tab

1. The Results Window displays the average noise level received at the time of performing the test. The Surveyor unit then provides a recommendation of approximately 6dB (Decibels) greater than the average RSSI floor recorded when performing the interference mode test. The result window shows that the test runs 16 Samples, and the Recommended CS threshold is -107 dBm.
2. Sample Window Results. When the Remote RTU preforms the Floor test, the unit listens for RF signals for 1 second and records the strength, number of pulses and the percentage of time that the noise was heard. It then displays the samples taken. The atmospheric noise has been recorded as -114 dBm in this example, to establish a communication. A good result would see the noise floor no greater than -6dBm below the reported RSSI of your Remote units.
3. The results were plotted on a graph, which visually represented the test. The test duration was one second, providing a snapshot of the RSSI noise floor.





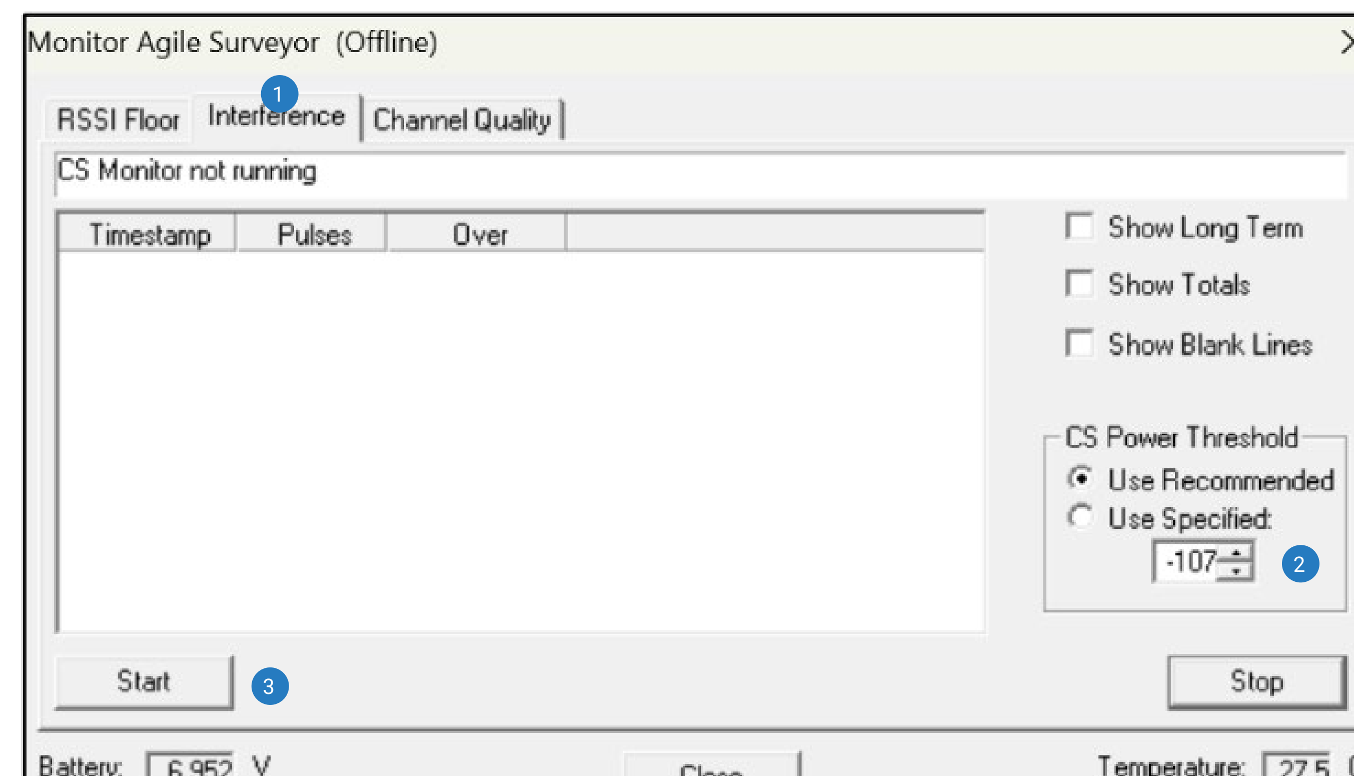
10.2 Surveyor Mode – Interference

The purpose of the interference mode test is to record any strong interfering RF signals over a longer period of time.

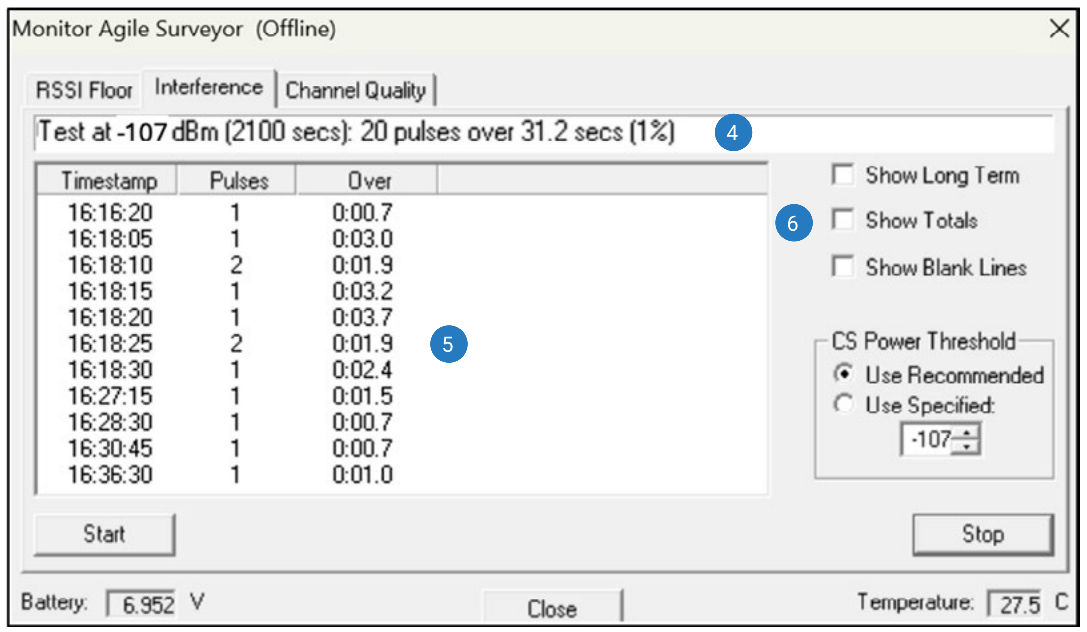
It is recommended to run the interference test using the threshold given by the RSSI Floor test, but you may specify an alternate noise threshold, which is used to ignore weak RF signals.

RF interference is not always present or consistent and may be stronger or more prevalent at different times of the day, so it's best to listen over a long period of time to obtain an accurate result.

1. Select the "Interference" tab
2. The "CS Power Threshold" is by default set to the recommended value tested on the "RSSI Floor"test.
3. Select Start to initiate the Interference test. The Stop button will be selected when the test needs to be finalized.

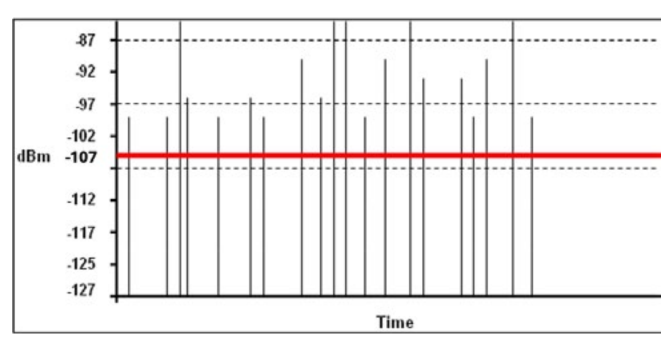


4. The top line gives a summary for the test, showing the Threshold (-107 dBm), the number of times the unit detected interference above the threshold (20 pulses) and the total duration of the interference (31.2 seconds).
5. The middle section contains periodic reports from the unit
6. The checkboxes to the right control how the data is shown. If no boxes are selected, PoleNet displays readings of fresh data every 5 seconds, but only if there was some interference during that time.



This test doesn't record the amplitude of the interfering RF signals but the number and period of the pulses that exceed the programmed threshold limit. In the example given above, the threshold has been set to -107 dBm.

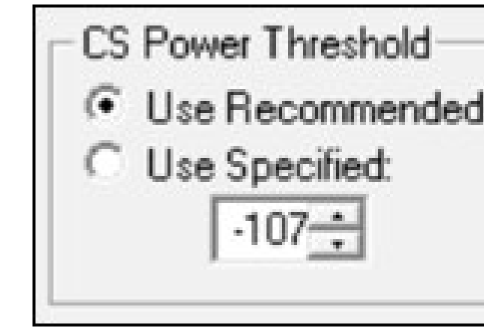
Figure below shows graphically, what the results would look like if transposed onto a graph. This example shows that interfering RF signals do exist at this site at the test frequency.



10.2.1 Definition of Radio Surveyor Mode – Interface Tab

CS Power Threshold

The "CS Power Threshold" defines the level in which atmospheric noise and interfering RF signals will be recorded. IE: Only signals which are stronger than -107 dBm will be counted. The user has the option to use the recommended value as calculated during the RSSI Floor test or define a user specified threshold.



NOTE

If using specified threshold level, the maximum level is limited to -84 dBm.

Result Window

The results window displays the accumulative results since the test was first stated. The unit samples and accumulates results every 5 seconds.

Example: Signal threshold was set to -102 dBm, the test has been running for a total of 7015 seconds, 112 pulses were recorded above the threshold setting, totaling 55.2 seconds, which overall, relates to 0% interference duty cycle.

NOTE

If no interfering signal was recorded, you will not see information in the data samples window.

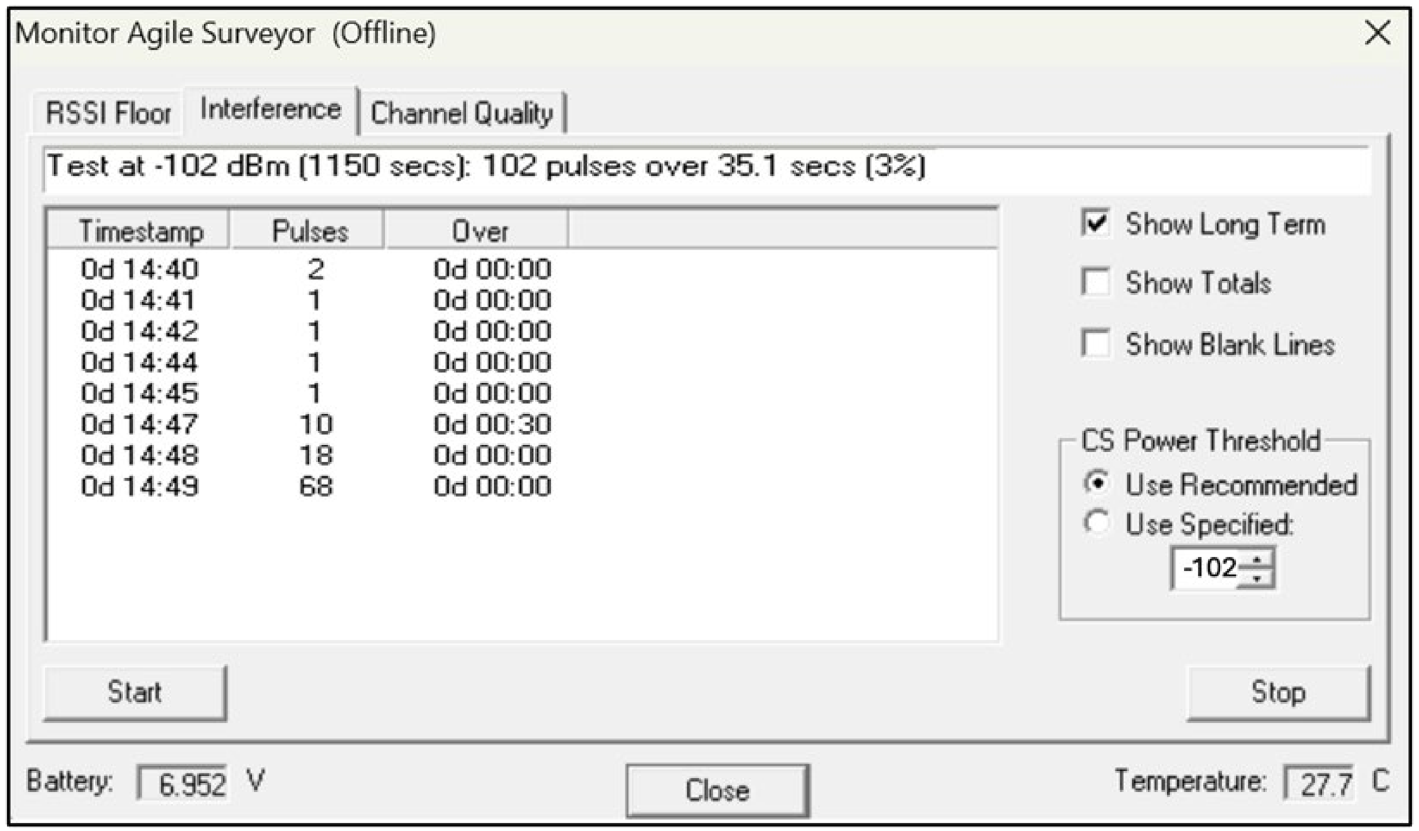
Show Long Term

When selected, the data sample window displays the “Show Longer Term” results.

For “Show Long Term” then each line of the report covers a whole minute (instead of 5

seconds). The Timestamp reports the local time of day but also includes the days since the test started, incrementing at midnight. The “Over” time format depends on whether “Show Totals” is on or off.

IE: Only the periods of time when RF interference was recorded above the threshold setting.

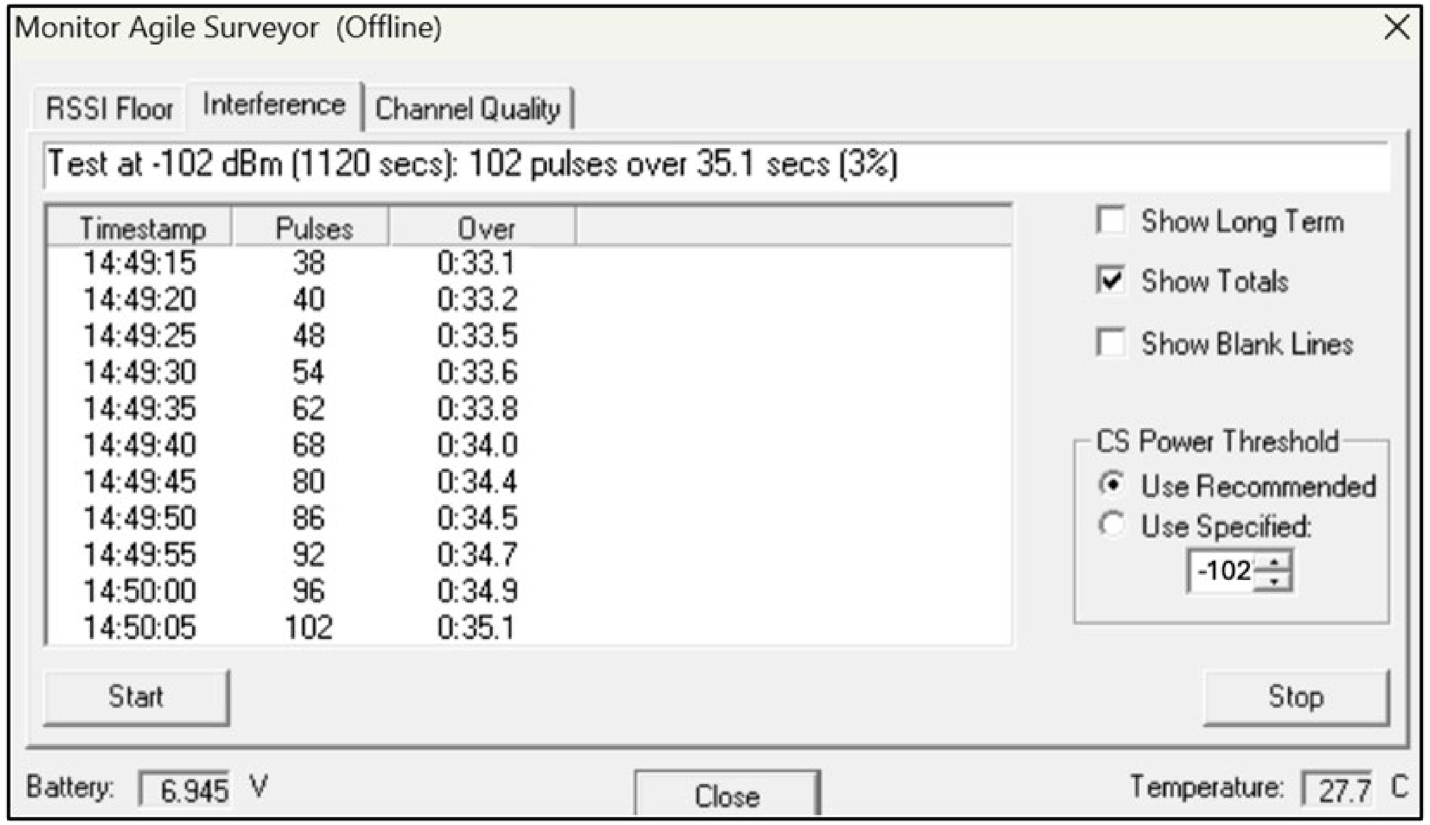


Show Totals

The “Show Totals” option changes the “Pulses” column to show a running total instead of the number of pulses in that time period. This makes it easy to calculate out the number of pulses or the amount of interference between any two times in the list.

When selected, the data sample window displays the accumulative total results, both the number of pulses and the total time that the RF interference was recorded above the threshold setting.

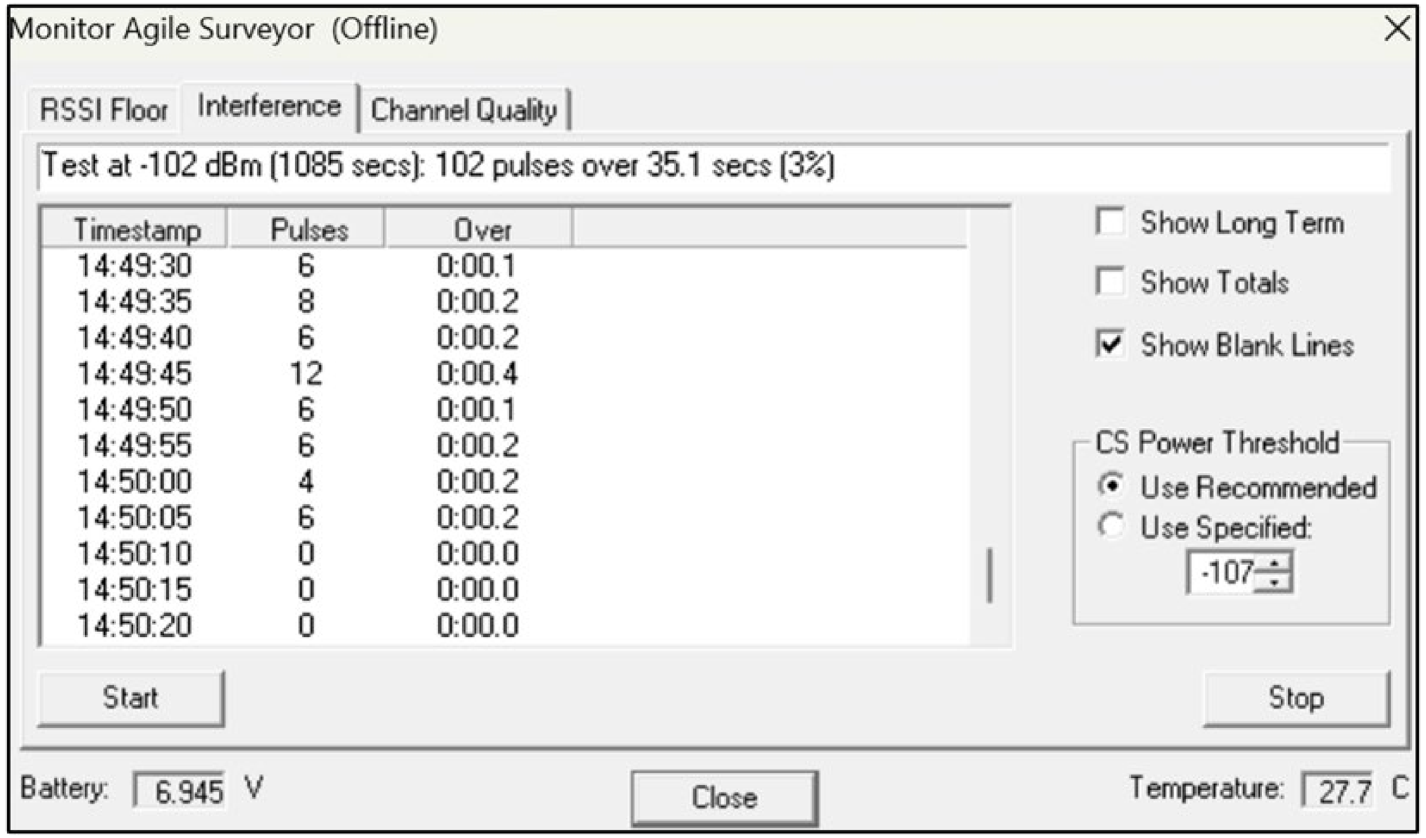
Example: At 14:50, a total of 96 pulses with a total combined time of 34.9 seconds was recorded above the threshold (-102dBm).



Show Blank Lines

When selected, the data sample window displays the results for every 5 second period. Should that period sense interference, both the number of pulses and the duration of the pulses will be recorded.

The "Show Blank Lines" list includes a report for every time period, rather than ignoring times without interference. This may help make it quicker to identify when long periods of interference start and finish, and it gives the assurance that the test is still running normally.



NOTE

It is recommended to perform the Interface test for a minimum of 24 hours.
The PoleNet PC software can be disconnected from the Remote RTU. The Remote RTU will continue executing the interference test until it is manually terminated by selecting the "Stop" button.

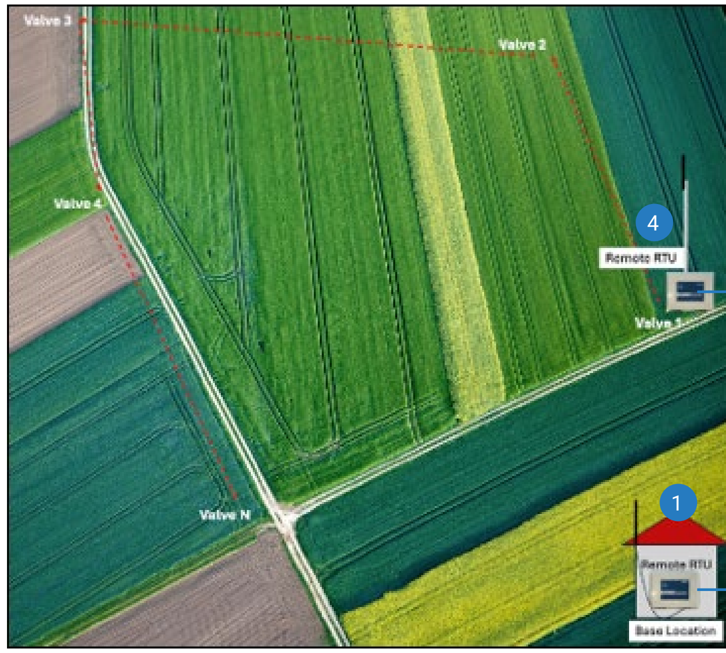
10.3 Survey Mode – Channel Quality

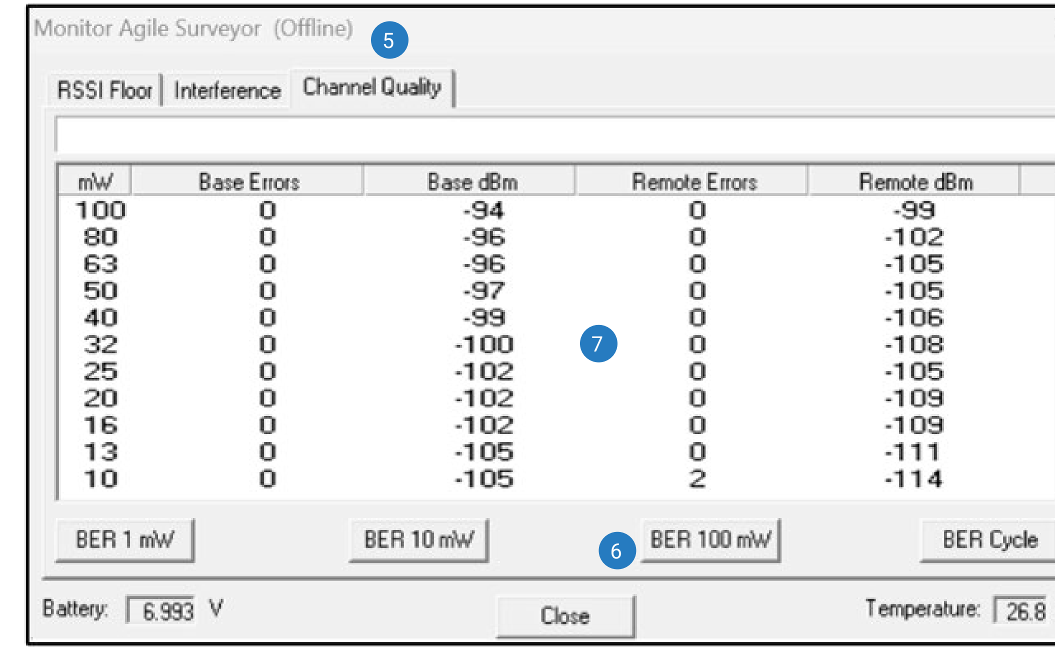
The Channel Quality test mode is used to determine the integrity of the communication path between the Base Station unit and Remote RTU units. We also call this a range test. Only two Remote RTU units are required to perform this test, together with a laptop and PoleNet PC software.

It is important that when conduction this test, the base and the remaining Remote RTUs are powered Off.

Typically, 1 unit (termed the Base) is installed at either the base site or a repeater site, the other unit (termed the Remote) is moved from remote site to remote site to perform the required tests. The test antenna's used should represent as close as possible the type and height of the antenna's that would typical be used for the type of project under test.

The test performed records both the signal strength and the signal quality. The signal strength is displayed in dBm and the signal quality displays the Bit Error Rate (BER). Both results are as important as each other, as you should have good signal strength and no or very low BER results.

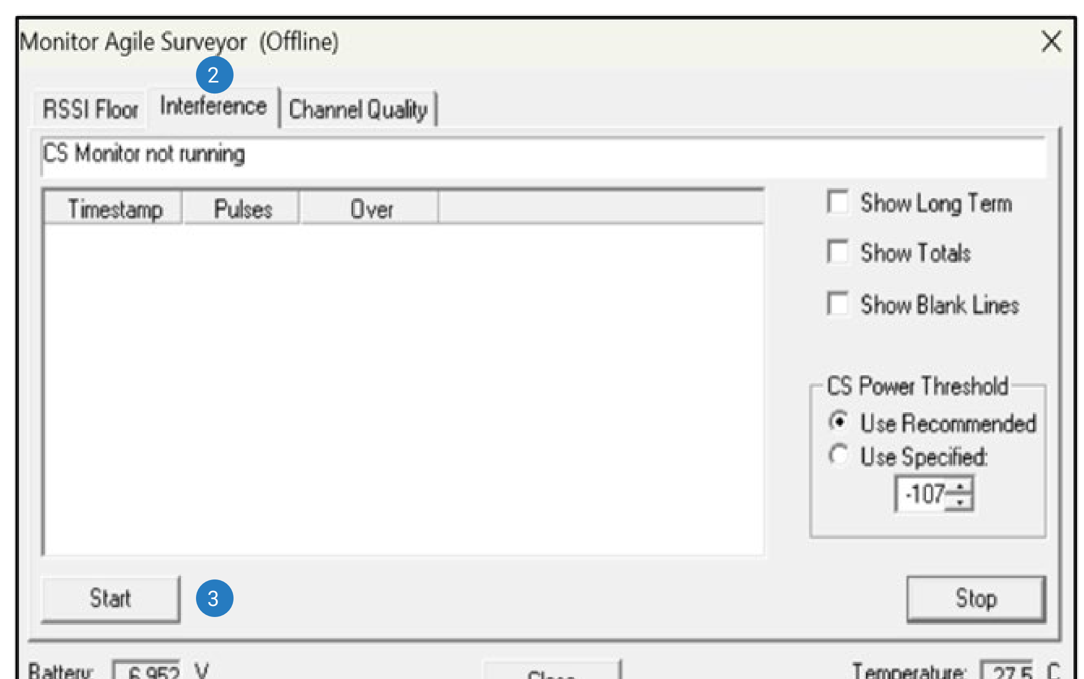




mW	Base Errors	Base dBm	Remote Errors	Remote dBm
100	0	-94	0	-99
80	0	-96	0	-102
63	0	-96	0	-105
50	0	-97	0	-105
40	0	-99	0	-106
32	0	-100	0	-108
25	0	-102	0	-105
20	0	-102	0	-109
16	0	-102	0	-109
13	0	-105	0	-111
10	0	-105	2	-114

Test procedure:

1. Configure a Remote RTU at the Base station connected to the antenna. This Remote RTU will function as a Base station for the Channel Quality Test.
2. Connect in Surveyor mode to the radio acting as “base” and select “Interference” tab.
3. Then Select Start, disconnect the PoleNet PC Software and let it run the “Interference test”.
4. Travel with the RadioNet RTU to access remote radio sites where irrigation valves or other devices are situated and will be controlled by the Remote RTU.
5. Connect the PoleNet PC Software and execute the “Channel Quality” test.
6. Select “BER 100 mW” to start running the test.
7. The Cannel Quality test will start to measure the RSSI level between the two Remote RTU.



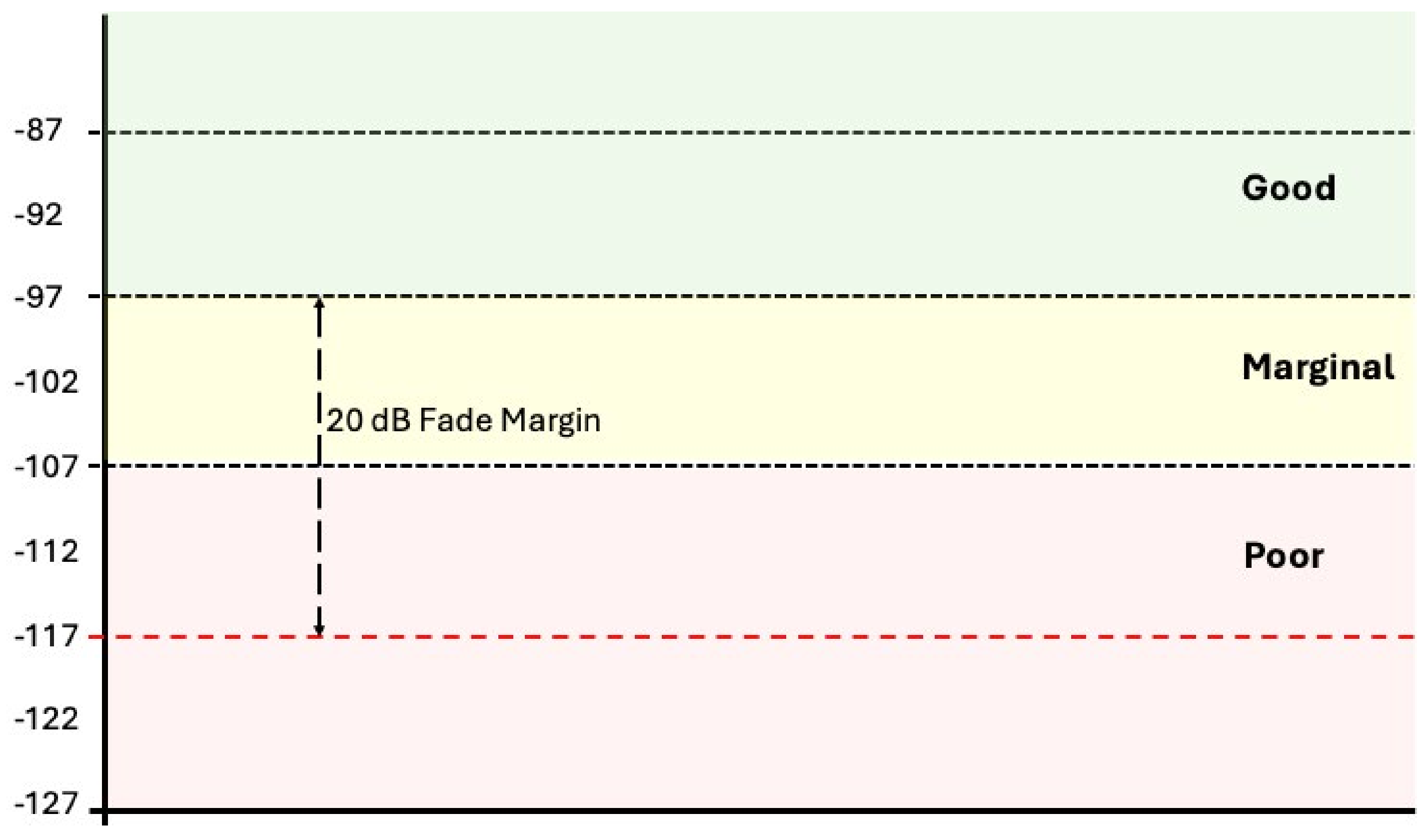
NOTE

The results explanation is on paragraph 10.3.2. Bit Error.

10.3.1 Signal Strength

Signal strength is measured in dB. Decibels (dB) is a logarithmic scale and is expressed as a ratio. In short, -3db is half (1:2), -10dB is 10 times smaller (1:10) while -20dB is 100 times smaller (1:100).

Since the receiver sensitivity of the RadioNet is -117dBm and Netafim recommends using a 20dB fade margin for telemetry applications, a signal strength recorded above -97dBm is considered a good signal for reliable communications. Should the signal be marginal, between -97dBm and -107dBm, then communications signals will still be received, but may induce communication retries which introduce communication delays. Signals below -107dBm are considered poor and unreliable for successful communications.



Definitions:

1. **Power Level test Buttons**: The channel quality test will be initiated when the required transmission power level button is selected. The remote unit will start by communicating at the highest power level selected, slowly reducing the power levels until the base unit doesn't respond. At each power level, data packets are transferred back and forth so the test is performed in both directions.

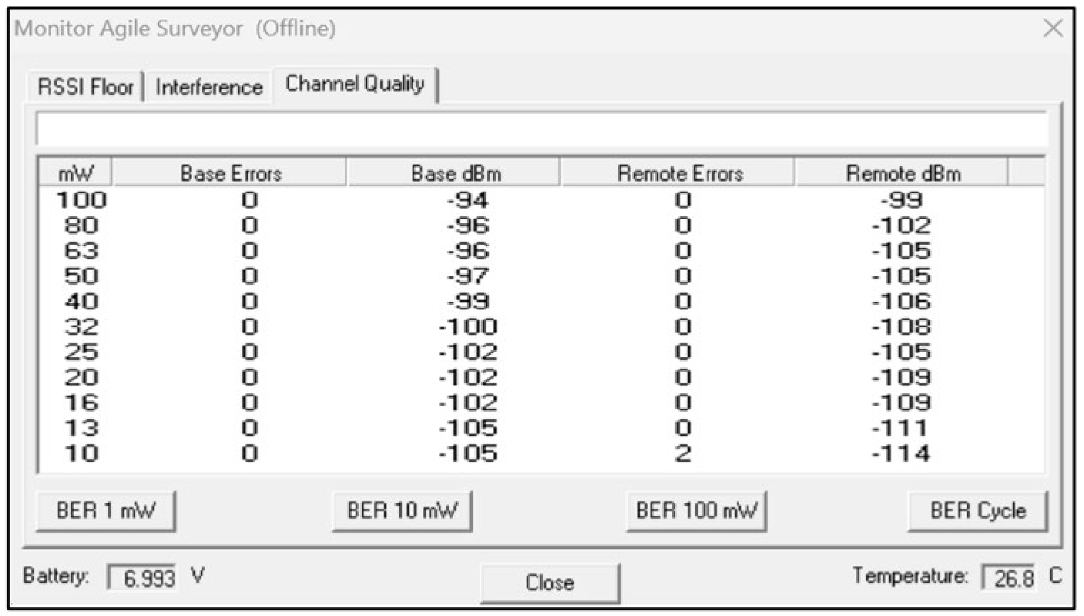
NOTE

Do not perform power tests greater than 10mW without an antenna connected.

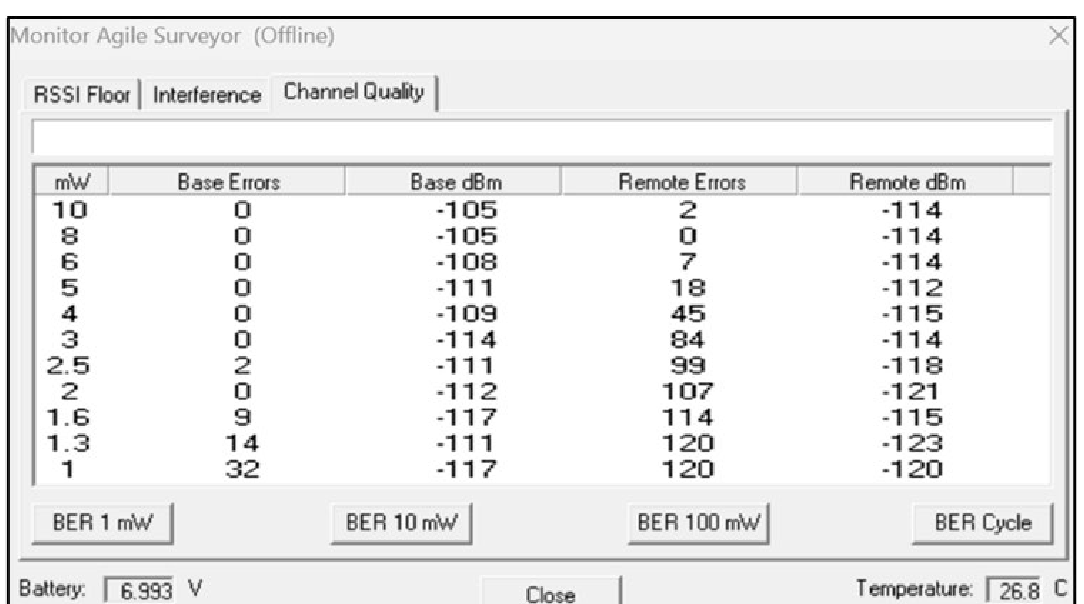
2. **mW – milli Watt**: This column represents the power level at which the test was performed.
3. **Base Errors**: This column represents the number of errors that the base test unit recorded after receiving the data packets from the remote test unit.
4. **Base dBm**: This column represents the signal strength reported by the base test unit after listening to the remote test unit.
5. **Remote Errors**: This column represents the number of errors that the remote test unit recorded after receiving the data packets from the base test unit.
6. **Remote dBm**: This column represents the signal strength reported by the remote test unit after listening to the base test unit.

10.3.2 Bit Error Rate

When a channel quality test is performed, a known packet of information (1000 data bits) is sent between the 2 test units. If some of the data is corrupted, then the amount of corrupt data is recorded. This gives you a good understanding of the quality of the signal path between the two test units.



mW	Base Errors	Base dBm	Remote Errors	Remote dBm
100	0	-94	0	-99
80	0	-96	0	-102
63	0	-96	0	-105
50	0	-97	0	-105
40	0	-99	0	-106
32	0	-100	0	-108
25	0	-102	0	-105
20	0	-102	0	-109
16	0	-102	0	-109
13	0	-105	0	-111
10	0	-105	2	-114



mW	Base Errors	Base dBm	Remote Errors	Remote dBm
10	0	-105	2	-114
8	0	-105	0	-114
6	0	-108	7	-114
5	0	-111	18	-112
4	0	-109	45	-115
3	0	-114	84	-114
2.5	2	-111	99	-118
2	0	-112	107	-121
1.6	9	-117	114	-115
1.3	14	-111	120	-123
1	32	-117	120	-120

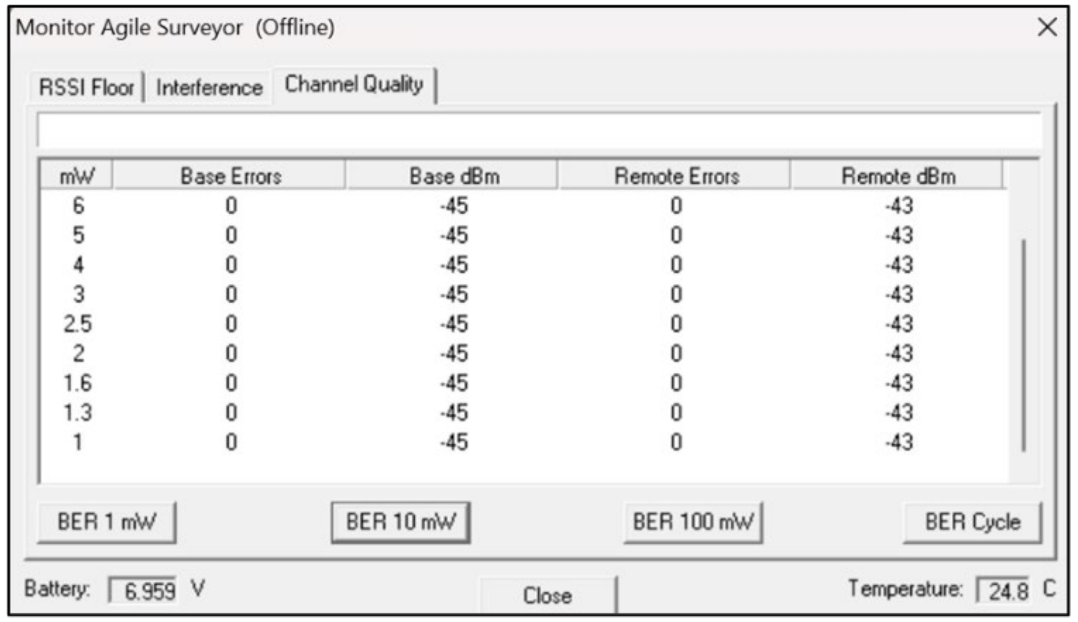
The example given above shows the results of a poor channel quality test. If we compare the results for the 100mW test, the base heard the remote ok at -94 dBm, but the signal strength recorded by the remote was marginal at -99 dBm. It was found that the coaxial cable was damaged at the remote site. If we now compare the results at 10mW, we can see that the BER test started to show errors in the quality of the data being received.

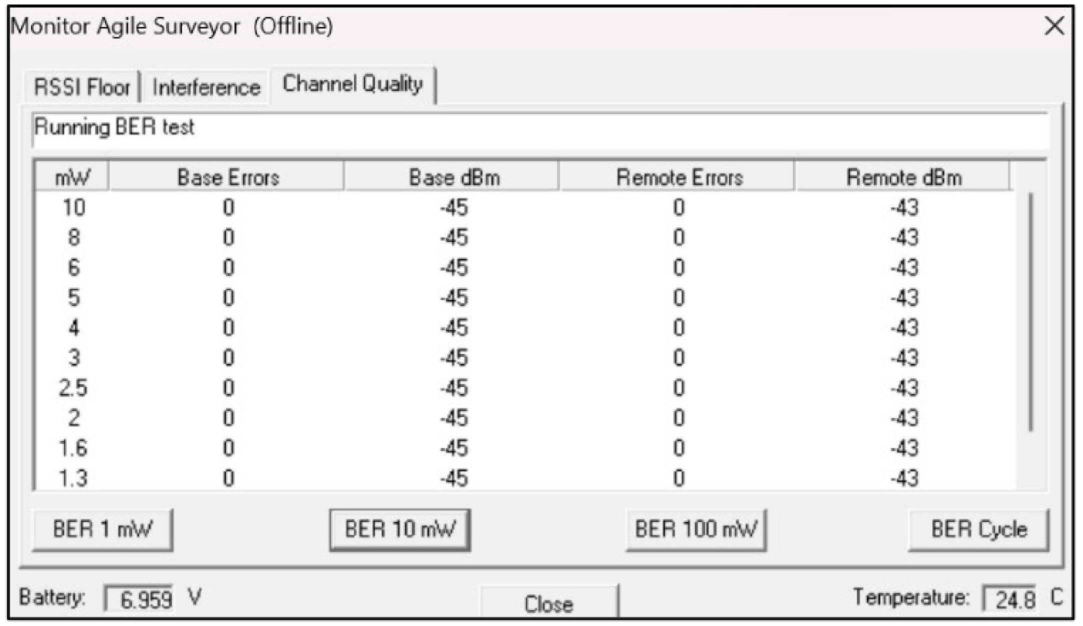
NOTE

The Base results refer to the Remote RadioNet RTU situated at the base station location.

The following results are for a BER of 10 mW test. In this case, the Remote RTUs were very close to each other, which explains the excellent results.

10.4 Off – Frequency Interference test





The purpose of this test is to detect any interference from radio system which operate on different frequencies.

Radios on other channels should not cause audible interference on your channel, however other radios networks in your area may be running at much higher power levels and that high amount of energy can swamp your system and desensitize your radios, which results in lower amounts of signal being received and this can lead to significant system instability if it persists.

Interfering radio networks may be powerful transmitters within several kilometers of the site, or may be your own CB or other radios, sharing the same mast as the base. If interference persists, messages can fail and remote radios will be dropped from the system. In fact, if several radio units are dropping off despite having good RSSI levels, this can indicate off-frequency interference.

The Off-frequency Interference test involves repeating the standard Channel Quality test over a long period of time and looking for a change or a shift in the prevailing results. In each channel quality test the results should degrade from a strong signal with no errors to a weak signal with quite a few errors.

We can identify the power level at which the errors become significant (e.g. 10 errors) and call it the “knee”. The “knee” should not vary much each time you repeat the test unless there has been a burst of interference, so the Off-frequency interference tests look for unusual values and knee changes.

It is possible that any interference might be on-frequency (which should have been discovered by the standard Interference test).

If you can listen to the channel during the test with a radio scanner, then the interference will be on-frequency if you can hear it, off-frequency if you cannot.

The test uses the remote radio’s power setting, so you may need to change it before you start.

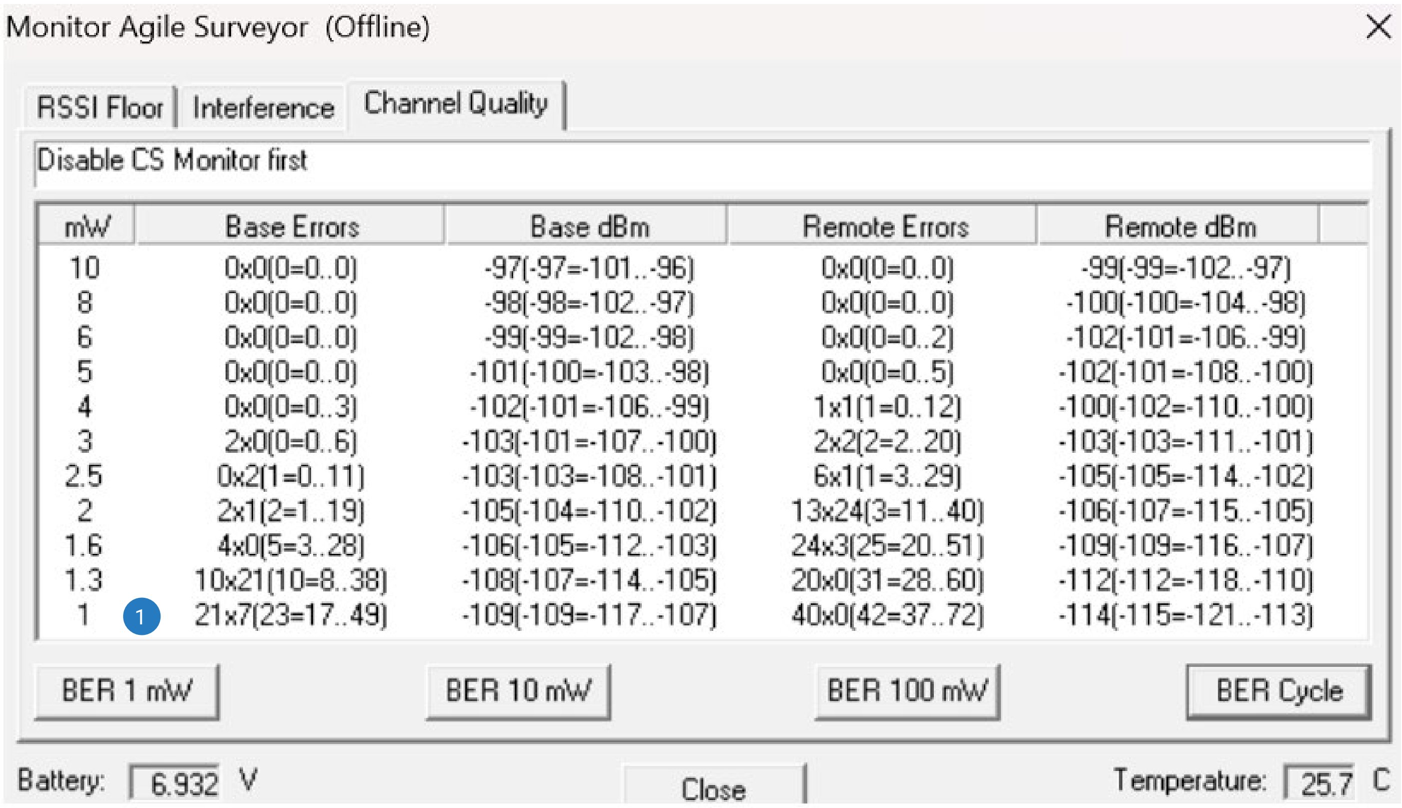
The results table now shows much more data than for the standard Channel Quality test and you will usually need to resize the widths of 1 or more columns if you wish to see all the information.

Each cell contains the most recent value and the average, minimum and maximum values.

Cells reporting Errors also indicate how often the particular power level cell was considered to be the “knee” point.

The values of each cell are updated with each new BER test.

1. For example, if a cell in an Errors column says “21x7(23=17...49)”, that means the most recent Error value = 21, the power level was the knee point 7 times, the average Error value was 23, the minimum value was 17 and the maximum value was 49.



mW	Base Errors	Base dBm	Remote Errors	Remote dBm
10	0x0(0=0..0)	-97(-97=-101..-96)	0x0(0=0..0)	-99(-99=-102..-97)
8	0x0(0=0..0)	-98(-98=-102..-97)	0x0(0=0..0)	-100(-100=-104..-98)
6	0x0(0=0..0)	-99(-99=-102..-98)	0x0(0=0..2)	-102(-101=-106..-99)
5	0x0(0=0..0)	-101(-100=-103..-98)	0x0(0=0..5)	-102(-101=-108..-100)
4	0x0(0=0..3)	-102(-101=-106..-99)	1x1(1=0..12)	-100(-102=-110..-100)
3	2x0(0=0..6)	-103(-101=-107..-100)	2x2(2=2..20)	-103(-103=-111..-101)
2.5	0x2(1=0..11)	-103(-103=-108..-101)	6x1(1=3..29)	-105(-105=-114..-102)
2	2x1(2=1..19)	-105(-104=-110..-102)	13x24(3=11..40)	-106(-107=-115..-105)
1.6	4x0(5=3..28)	-106(-105=-112..-103)	24x3(25=20..51)	-109(-109=-116..-107)
1.3	10x21(10=8..38)	-108(-107=-114..-105)	20x0(31=28..60)	-112(-112=-118..-110)
1	21x7(23=17..49)	-109(-109=-117..-107)	40x0(42=37..72)	-114(-115=-121..-113)

The example on the previous page indicates a system that suffers from occasional off-frequency interference.

This has caused 3 effects in the data:

- Base Errors reports 2 different knee areas (2.5-2 mW and 1.3-1 mW). Normally there would be a single knee area, but here the interference temporarily reduces the received signal level and so the extra knee occurs at higher power levels and occurs less often.
- Base Errors report a big difference between min and max values, and the average value is closer to the stronger (minimum) value, which indicates that the errors are occasionally much worse than normal.
- There are some noticeable max Error counts at power levels that have low average Error values and good average signal strength dBm values. (e.g. At 3mW, Base Errors have max of 6 but an average Errors of 0 and average dBm of –101.

11. Glossary

Baud	A data transmission rate (bits/second).
BER	The bit error rate (BER) is the number of bits that have errors relative to the total number of bits received in a transmission.
Comm.	An abbreviation for "communication"
dBm	dBm (sometimes dBmW) is an abbreviation for the power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW).
ESN	An abbreviation for "Electronic Serial Number"
ID	An abbreviation for "Identification"
I/O	An abbreviation for "Inputs/Outputs"
LED	An abbreviation for light-emitting diode, which is a small semi-conductor device that converts electrical energy into bright light.
mW	A unit of power, milliwatt, which is a unit 1000 times less than a watt
kHz	The hertz (symbol: Hz) is a measure of frequency per unit of time, or the number of cycles per second. kHz is 1000 Hz.
MHz	The hertz (symbol: Hz) is a measure of frequency per unit of time, or the number of cycles per second. MHz is 1,000,000 Hz.
NMC	An abbreviation for "Netafim Management Controller"
O/C	An abbreviation for "Open Circuit"
PB	An abbreviation for "Push Button"
PC	An abbreviation for "Personal Computer"
RF	An abbreviation for "Radio Frequency"
RSSI	Received Signal Strength Indication (RSSI) is a measurement of the power present in a received radio signal
SAF	An abbreviation for "Store And Forward", more commonly known as a repeater
S/C	An abbreviation for "Short Circuit"
USB	Universal Serial Bus (USB) is a serial bus standard to interface devices to a host computer
VDC	Voltage Direct Current. The voltage measurement in a DC system