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NETAFIM™

RadioNet

Advanced valve control

/ Installation Manual

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CE FC

Controller Version 1.0

Contents

1. Introduction

1.1 Scope of Manual

This manual provides instructions for the installation of RadioNet System and its related components. The manual is a reference tool to the hardware used within the system. The software aspects of the system are covered in the RadioNet Configuration & Diagnostics Manual. The aim is to provide a logical sequence of installation to enable a short set up time and insure reliable system operation.

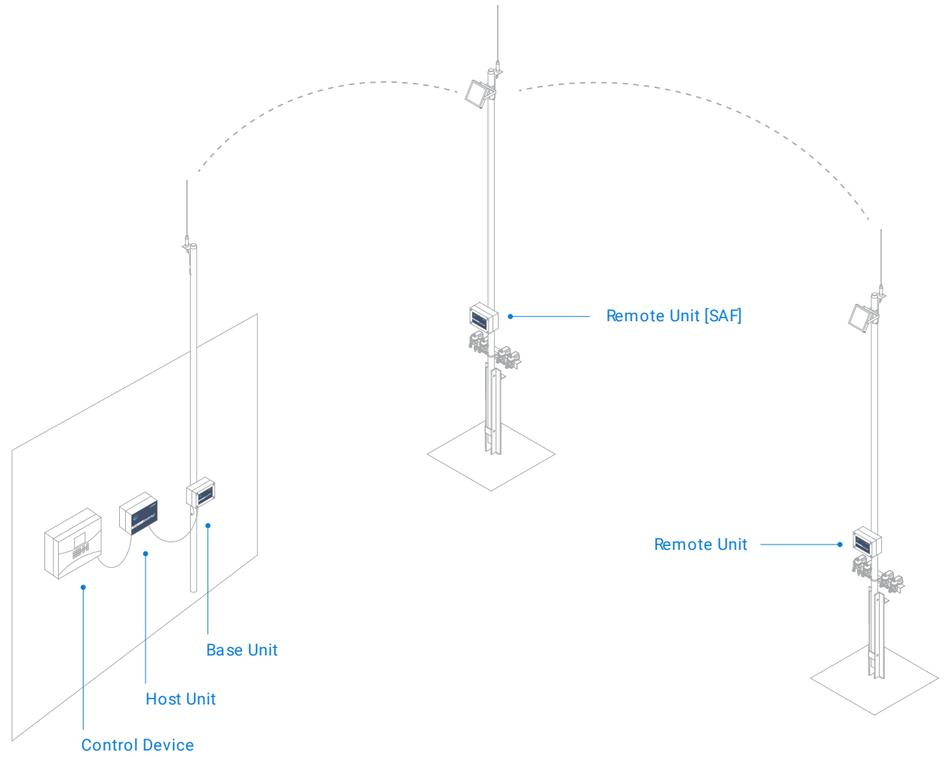
1.2 Identification of System Hardware

SAP Code	Application	Version
	PoleNet	V 3.27.02 or greater
00035-012000	RadioNet Host Unit	V 3.29.30 or greater
00035-012100	RadioNet Base Unit	V 2.75 or greater
00035-012200	RadioNet Remote Unit Agil	V 2.75 or greater
74330-012195	RadioNet Remote Unit 2x2	V 2.75 or greater
74330-012230	RadioNet Remote DCP	V 3.44 or greater
00035-013140	Remote Expansion Card	
00035-010350	¼ Wave Whip with 1m Coaxial	
00035-009500	S/Steel Whip Antenna Kit with 3m Low Loss Cable	
00035-005360	S/Steel Whip Antenna Kit with 6m Low Loss Cable	
00035-005365	S/Steel Whip Antenna Kit with 10m Low Los Cable	
00035-002950	Solar Panel and Regulator Kit 6V	
00035-005730	SLA Battery & Charger Mounting Kit	

1.3 System Overview

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 three basic components include the Host, Base, and Remote units.



1.3.1 Host Unit

The Host functions as an interface between the control system and the wireless platform namely the Base Radio Unit and the Remote Units. The Host communicates to the control application by RS485. The Host includes multiple interface protocols giving it the ability to integrate with GrowSphere Max.

1.3.2 Base Unit

The Base Unit is the communication [radio] platform between the Remote Units and the Host. The Base Unit stores the Route map of the network. The Base Unit radio is programmable to the system frequency. 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.

1.3.3 Remote Unit - RTU

The Remote Unit is the wireless Input-Output platform for the RadioNet system. The system has 3 models of Remote Units that can be selected: RadioNet RTU (SAF), RadioNet RTU 2x2, and RadioNet RTU DCP.

The RadioNet RTU houses a programmable radio and the base I/O card. The base card of the RTU can be expanded by up to four expansion cards. The RadioNet Remote Units are modular in size from 1,3,5,7, 9 digital outputs, and 2 to 10 digital inputs.

The RadioNet RTU2x2 houses a programmable radio and the base I/O card. The base card has 2 Outputs and 2 Inputs; it is not expandable.

The RadioNet RTU DCP houses a programmable radio and the base I/O card. To the base card up to four expansion cards can be installed. The RadioNet Remote Units are modular in size from 1,3,5,7, 9 digital outputs, 2 to 10 digital inputs, 7 analog inputs, as well RS232 communication card, all in the four expansion cards available.

1.3.4 SAF Remote Unit

The Store and Forward [SAF] or repeater mode in the RadioNet system can be activated in the RadioNet RTU and the RadioNet RTU 2x2 by updating the Route Map in the Base Unit. A Remote Unit configured in SAF mode maintains all of the Remote Unit features.

1.3.5 Antenna

Antennas are fitted to all radio units. An antenna (or aerial) is a transducer designed to transmit or receive electromagnetic waves. In other words, antennas convert electromagnetic waves into electrical currents and vice versa. Physically, an antenna is simply an arrangement of one or more conductors, usually called elements. The RadioNet system used various antennas for different applications.

1.3.6 Solar Panel

The Solar Panel is used as part of the automatic battery charging system on the Remote Units.

1.3.7 Output / Input Devices

The RadioNet System can connect to various output and input devices. like solenoids and relays, water-meters, analog sensor and communication sensors/devices.

2. Safety

ATTENTION

The RadioNet system must be installed by qualified and authorised technicians. Failure to use approved accessories specifically for the RadioNet equipment may result in the system operating in a dangerously unsafe condition. Unauthorized or incorrect modification of the product will negate the approval rating of the product and warranty. Be cautious when operating the equipment in a hazardous atmosphere [e.g. a mine site] as it could result in serious injury or death.

2.1 Radio Antennas

The RadioNet, Base Unit, and Remote Units when powered can emit radio energy from their antenna. Care must be taken not to hold on to the antenna of a powered unit. Deliberate misuse of the product could result in harm. Do not use any RadioNet Base Unit or RadioNet Remote Unit that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

WARNING

2.2 Batteries

Only use Netafim approved Batteries on the RadioNet equipment. All batteries can cause property damage and/or bodily injury, such as burns. If a conductive material such as jewelry, keys, or tools touch exposed terminals the conductive material may complete an electrical circuit (short circuit) and become quite hot. Exercise care in handling any charged battery, particularly when placing it inside container with metal objects. The RadioNet system uses sealed Lead Acid batteries or Lithium batteries as a power source. Do not puncture the case of the battery. If a battery is found to have a punctured case take caution in handling the battery and avoid contact with the corrosive material in the battery. Always dispose of a used battery in a responsible manner.

VOLTAGE

2.3 Connection to High Voltage

Only electricians qualified to work with high voltage should install RadioNet Remote Units interfacing with High Voltage equipment.

POWER LINES

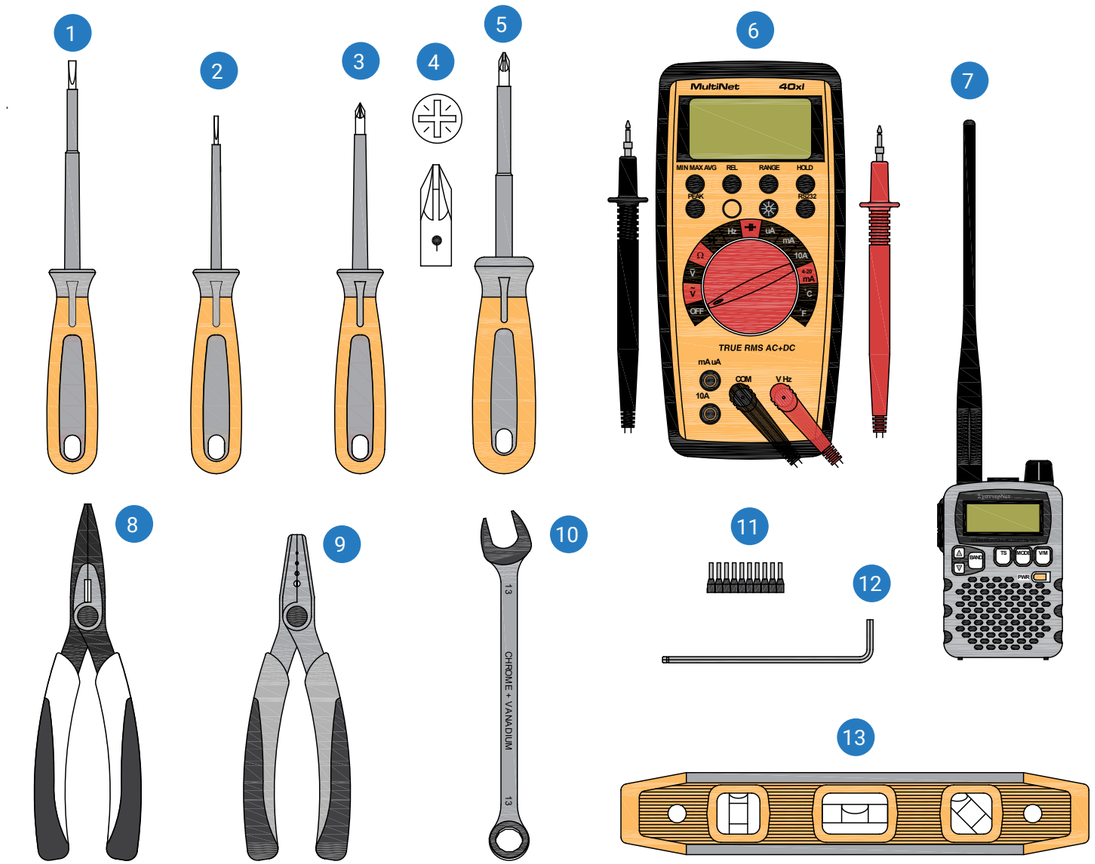
2.4 Overhead Power Lines

When installing antennas care must be taken. Insure there is always clear space from overhead power lines. Do not erect any mast and associated antenna if power line is in the vicinity. Check your relevant supply utility as to the clearances required in your region.

3. Tools

It is expected that the system will be installed by professional personal and therefore fully equipped.

However, the following tools are required as a minimum to install the RadioNet system.



1. 3.5mm Flat-Blade Screwdriver Used on all Host Terminals and Remote Unit Power Terminal
2. 2mm Flat-Blade Screwdriver *Supplied with the Host. Used on all Output and Input Terminals.
3. Philips - Cross Head Screwdriver #1 Used on all mounting screws in the Host, Base, and Remote.
4. Philips Screw and Driver markings.
5. Philips - Cross Head Screwdriver #2 Used on the Host, Base and remote Lid screws
6. Multimeter. Able to read Ohms, True RMS AC voltage and DC voltage as a minimum.
7. Radio Frequency Scanner. Required to listen to the system communications.
8. Long Nose Pliers. Used to place jumper on to the Remote Radio if the battery is fitted.
9. Ferrule Crimping Pliers.
10. 13mm Open End Ring Spanner. Used on all the U-Bolt clamps and 8mm Open End Ring Spanner used on all SMA Antenna nuts.
11. Bootlace Ferrules to suit 0.75mm2 cables. As fitted to the Aquative Solenoid.
12. 3mm Allan Key. Used on the Solar Panel Tilt angle adjustment.
13. Spirit Level.

4. Quick start guide

The Quick Start Guide is intended for installation personal that only require a logical sequence to follow.

4.1 Quick Start Guide- Before going into the Field

1. Sort the consignment into the major components, Host, Base Unit, Remote Units, Solar Panels, Batteries, and Antennas. Check against supply documentation.
2. Unpack all components and verify their contents. [See Section Dimensions and Contents as to what is supplied]
3. Match Antennas to the Base Unit and the Remote Units.
4. Match Solar Panel and Batteries to the Remote Units.
5. Place the Remote Units into a sequential order according to their Serial Number.
6. Record the information Project Name, Radio Frequency, Serial Numbers etc. on the System Data Sheet in Appendix 10.10.
7. Check the firmware version of the equipment upgrade as required. [This will require connecting via PoleNet to the equipment]
8. Install expansion cards to Remote Units if required.
9. Fit batteries and regulators to the Remote Units [Do Not Leave Powered Up]. Set correctly the battery switch according to the battery type.
10. Set the Solar Panel Tilt angle using the supplied template. [Record in System Data Sheet]
11. Trim Antennas to your site frequency.
12. With the aid of the site plan assign Remote Units to Valve or Valve clusters. Mark the Remote Unit as to its required location. Record the information on the Data Sheet.

4.1 Quick Start Guide - Central Site

1. Install the Base Unit Antenna.
2. Connect Base Unit to the antenna and fix the Base Unit
3. Mount the Host Unit [Check length of supplied RS485 Lead before fixing the unit]
4. Connect Host Battery and Charger. [See Section 6.3.2]
5. Mount the Control Unit [Check length of supplied RS485 Lead before fixing the unit]
6. Fix Power Supply Surge Unit.

4.1 Quick Start Guide - Remote Sites

1. Check that the Remote Unit is correct for the Location
2. Fit Solar Panel and Antenna to masthead. [Refer to Solar Panel installation Section].
3. Feed all cables through mast for protection.
4. Mount Remote Unit using supplied U-Bolt.
5. Connect Antenna to Remote Unit external SMA fitting.
6. Connect Solar Panel cable to regulator.
7. Connect Outputs either a solenoid or relay.
8. Connect digital/analog Inputs as required.
9. Connect power to the Remote Unit.
10. Check the LED flashes.
11. Listen for close command for all outputs.

Refer to the RadioNet Diagnostic and Configuration Manual for System Testing.

5. Radio license

The RadioNet system operates in the 402-474MHz frequency range. Check with your local authority to verify the availability of frequencies and the licensing regulations.

NOTE

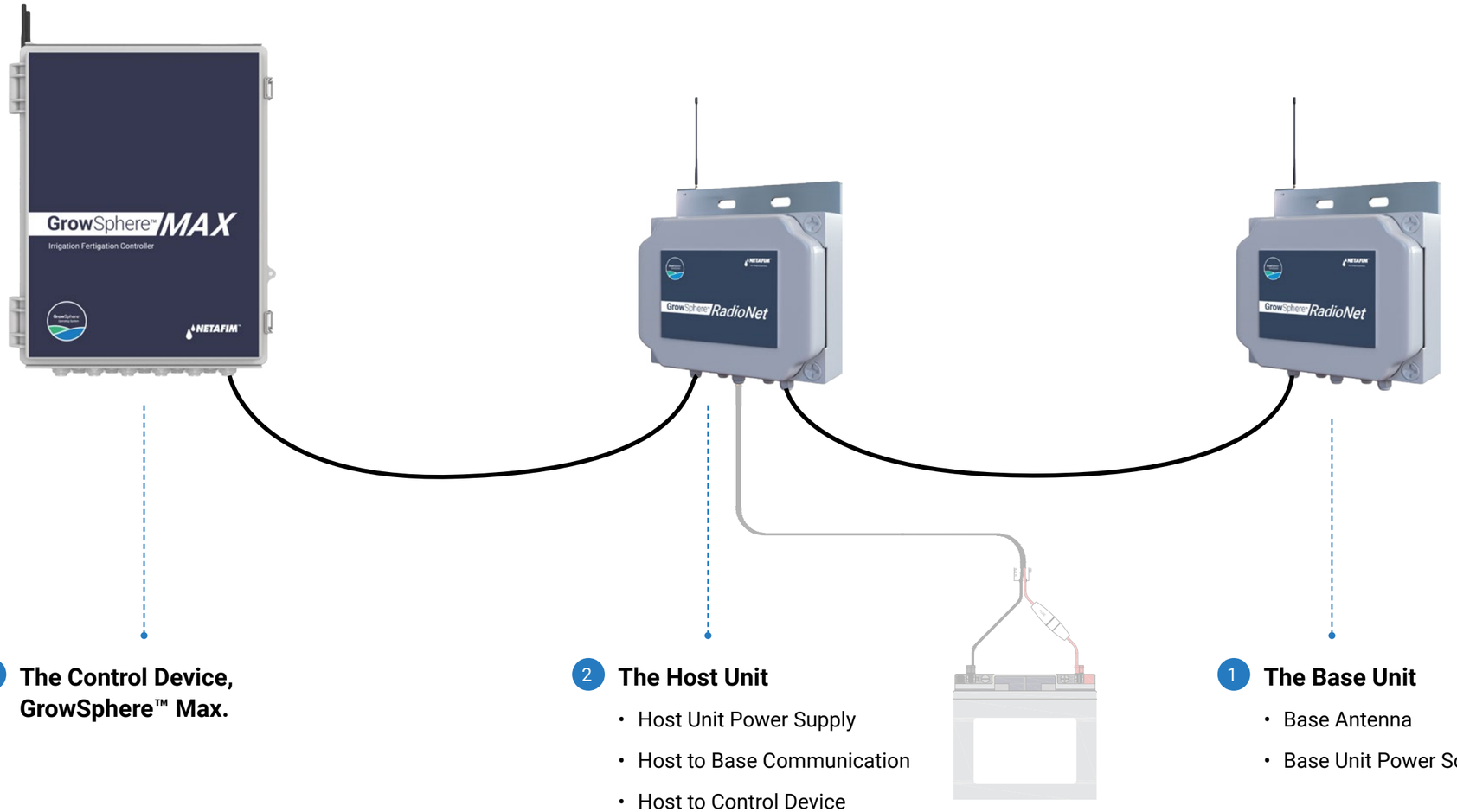
See Annex 1: For Frequencies requirements in your area.

- It is illegal to program the RadioNet system to frequencies within licensed bands without first obtaining an approved license.
- The RadioNet system transmit power must not exceed that of the license free regulations.
- It is highly recommended that the system is operated in a licensed band to insure interference free operation and maximize the systems communication reliability.

6. Installation manual - Central site

6.1 General Overview- Central Site

This section covers the installation of RadioNet components found at the Central Site.



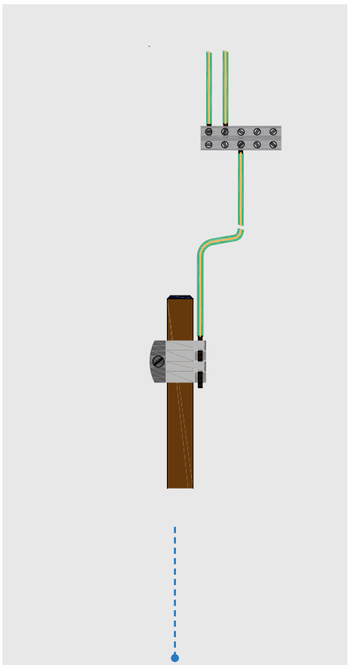
3 **The Control Device, GrowSphere™ Max.**

2 **The Host Unit**

- Host Unit Power Supply
- Host to Base Communication
- Host to Control Device Communication

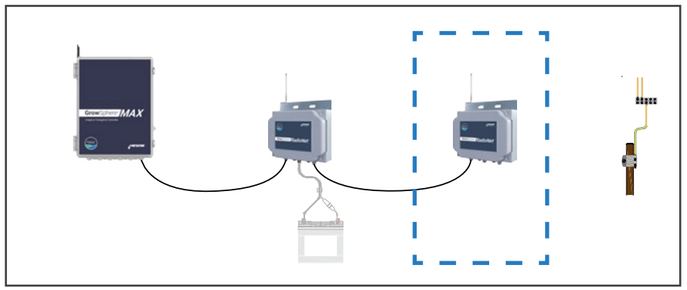
1 **The Base Unit**

- Base Antenna
- Base Unit Power Source



4 **Grounding of Central Site**

6.2 Installation - Base Unit



Recommended Sequence:

1. Locate the Base Antenna
2. Mount the Base Antenna
3. Mount the Base Unit [Pole Kit or Direct]
4. Connect the Antenna to Base
5. Power the Base Unit.

6.2.1 Base Unit- Antenna Site

NOTE

Netafim does not supply Antenna Masts. The supply of the mast and its suitability for the application is the responsibility of the Dealer or End User. Refer to Section 6.2.2 for the Mounting of the Antenna to the Mast.

The site for the Base antenna falls into two types:

1. A Standalone Mast
   - With the Base Unit attached
   - With the Base Unit remote.

In either case it is recommended that the design of the standalone mast should be a tilt-down type or at least one that offers easy access to the Antenna.

2. Mounted on a Building, Pump Shed or other existing structure. Mount the antenna mast as close as possible to the top of the building roof. Select the end of the building that is nearest to the area of operation.

In all cases the location of the Base Antenna should be governed by the following objectives.

   a. Height: Keep the antenna as high as possible. At least 9 meters off the ground.
   b. Obstacles: Clear path to the Remote Units.

- Refer to the Antenna Mounting section when considering how and where to site the Base Antenna.
- Refer to the RF Design Guide for recommendations.

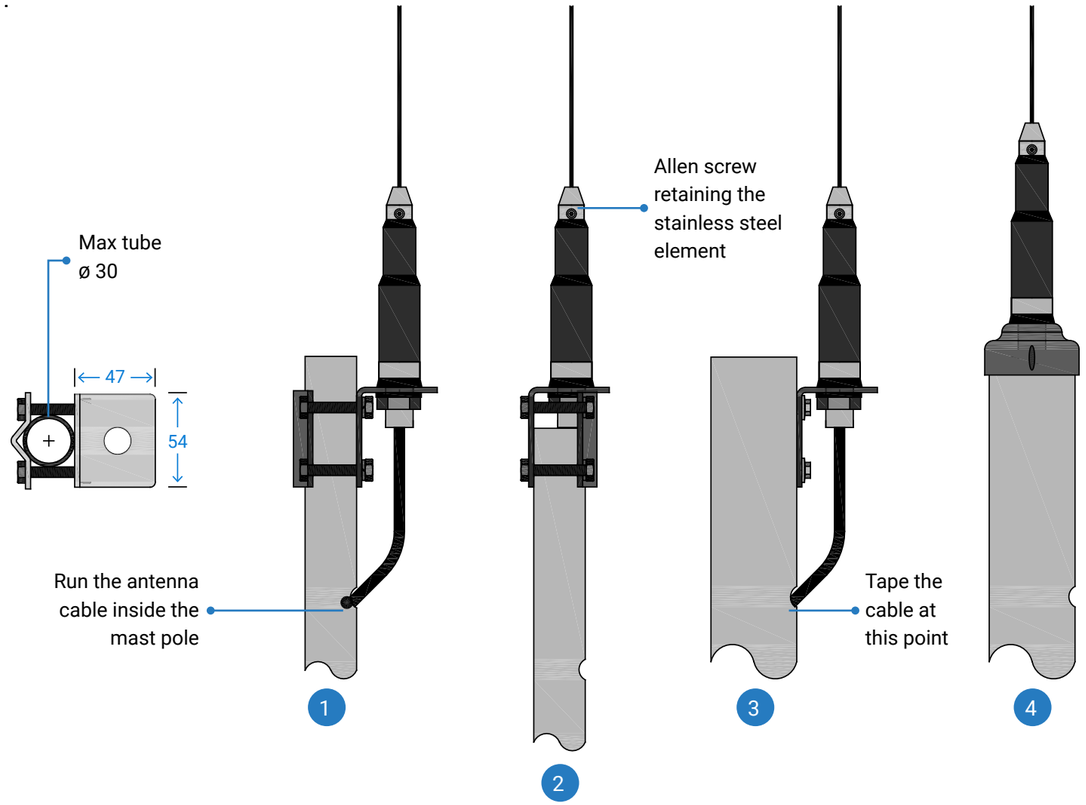
The standard Base Unit antenna is fitted with a 10-meter antenna cable; use it to the best advantage of the system.

6.2.2 Mounting the Base Antenna

The antenna cable should take a direct path to the Base Unit. Tight bends or crushing of the antenna cable must be avoided.

NOTE

The antenna must pre-cut to the system frequency before installation. Please refer to the cutting chart included in the Appendix at the back of the manual.



NOTE

Protect the Antenna cable from any damage.

- Remove any shape edges on the material the cable passes through.
- Sleeve the cable to provide an extra physical barrier if it must pass through any material
- In areas prone to bird damage:
  - The exposed antenna cable should be sleeved with a heavy wall poly tubing to provide extra mechanical protection.
  - Alternatively, install the antenna as per “B” or “D” in the drawing.

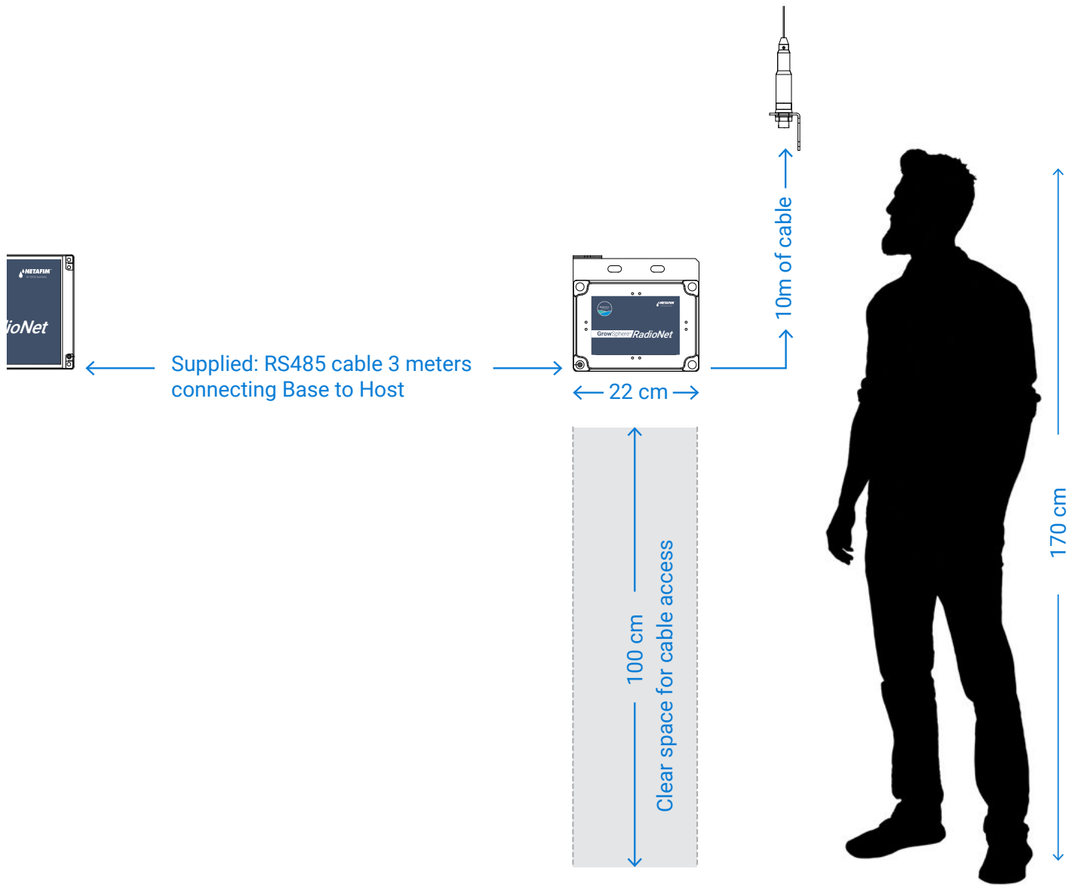
1. Antenna mounted on the bracket and attached to the mast tube. The antenna cable is run down the inside of the mast pole to provide physical protection to the cable.
   - Do Not loop and feed the cable down the open top of the tube, this method is prone to bird damage.
2. The Mounting bracket is reversed allowing the antenna cable to feed directly into the center of the mast pole.
   - Test first this may not be suitable for sizes of pole.
3. Where the mast pole is larger than 30mm in diameter, the angle mounting part of the assembly can be used and attached to the mast with screws.
   - The antenna cable is fed through a hole in the side of the pole, below the bracket.
4. By drilling a 16mm hole in the mast cap the antenna can be mounted directly on top of the mast. The cable is fed down the center of the mast pole.

6.2.3 Installation - Base Unit Enclosure Guidelines

The Base location must be easy to access. You need to connect to the Unit with a PC to configure the unit when installing the Base Unit.

- Mount at eye height [1.5 to 1.8m above the floor] and with a clear area 1m x1m in front of the Unit.
- Keep at least 100mm below and the width of the unit clear for cabling access.

The Base is connected to the Host

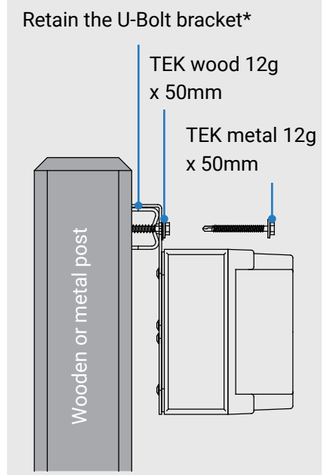


Two mounting options are available:

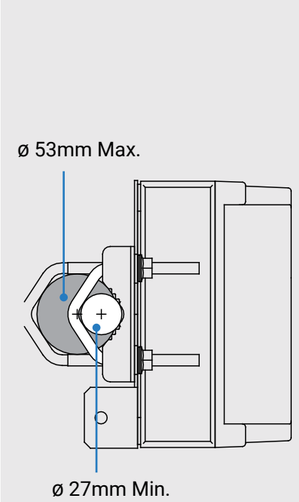
1. Using the back plate and all or part of the U-Bolt.
2. Removing the back plate and mounting through the enclosure.

6.2.3.1 Mounting with Back Plate fitted

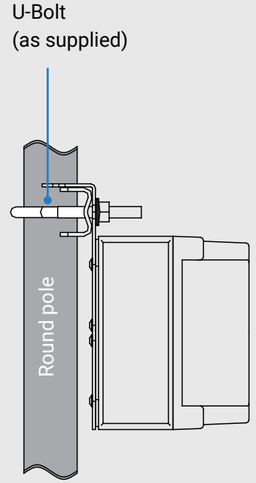
- To a pole with a diameter in the range of 27 to 52 mm using the supplied U-Bolt.
- Metal or wooden post by retaining the U-Bolt bracket and fixing using the appropriate TEK* screw form. [Metal or Wood *TEK is a hexagon drive screw]
- Retaining the bracket ensures clearance for the mounting plate screws and a stable mount if fixing to an uneven surface on a wooden post.
- The minimum length of the screws for this method is 50mm.



End view



Top view



End view

6.2.3.2 Mounting with Back Plate removed

- The Back Plate can be removed [it is attached with four screws] if the Base is to be fixed to a flat
- surface.
- Fixing is through the lid screw holes in each corner of the enclosure base.
- Screws should be a Pan head type with a screw thread diameter not greater than 4mm
- The Head of the screw should not exceed 8mm in diameter.

Once the Base is installed connect the Antenna Cable SMA nut to the underside of the Base Unit enclosure.

NOTE

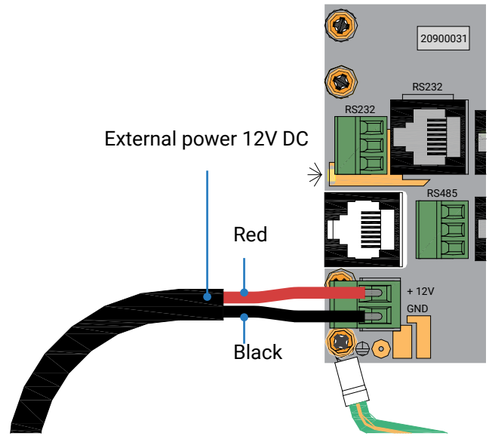
Tightening the antenna cable connector:

- The nut on the SMA plug should be tightened with an 8mm or 5/16" spanner.
- Hold the SMA jack on the enclosure at the same time with an 8mm spanner when tightening the nut.

6.2.4 Installing - Base Unit Power

The Base Unit can be supplied from two sources.

- Standard Method from the Host via the RS485 lead.
- Optional 12VDC terminal from an external source.



6.2.4.1 RS485 Standard Supply

Power for the Base Unit is supplied from the Host's power supply via the RS485 lead.

- The Standard RS485 lead supplied with the Host Unit is 3 meters in length.
- An optional 10-meter RS485 lead can be purchased.
- Runs longer than 10 meters in length must be fitted with an External 12VDC power supply.

6.2.4.2 External Optional Supply

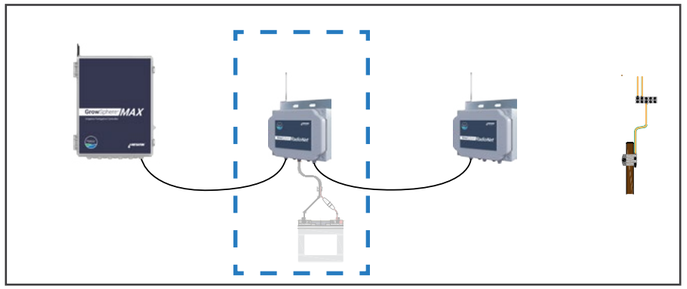
This is used if the Base Unit is to be located at a distance greater than 10 meters.

- A separate cable must connect to the "A" 12 VDC terminal. The power source can be direct from the Host's power supply or from another 12 V battery and charging system.
- The unit will detect power on the external terminal and auto-switch from the RS485 lead to 12V DC terminal.
- If using a separate battery to the Host, the power lead must be fitted with a fuse.
- Check the polarity on both ends of the power lead before inserting the fuse.

6.3 Installation - Host Unit

Recommended Sequence:

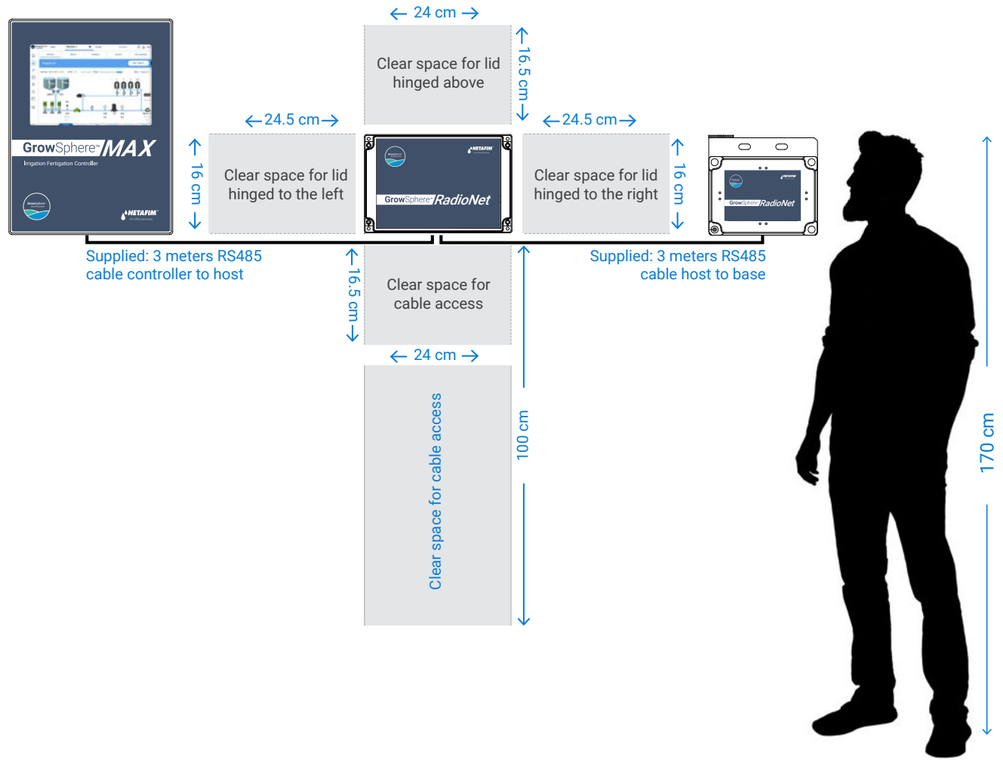
1. Position the Host Unit
2. Mount the Host Unit
3. Power the Host Unit.
4. Connect to Base Unit
5. Connect to the Control Device



6.3.1 Installation - Host Unit Enclosure Guidelines

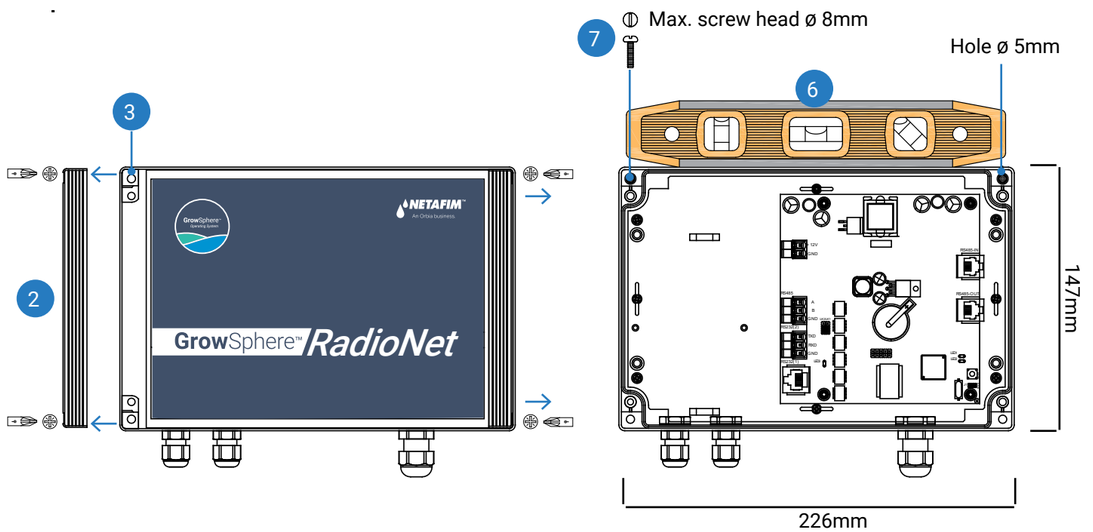
- The Host location must be easy to access.
- Mount at eye height [1.5 to 1.8m above the floor] and with clear area 1.2m x 1.2m in front of the Unit.
- Do Not run the RS485 cable near high voltage [>110 VAC] cables.
- Do Not run the RS458 cable in the vicinity of Motor Starters and Variable Speed Drives.
- Remember the need to connect to the Host Unit with a PC/Laptop to configure the unit.
- When mounting the Host, keep the area in the direction of the lid opening clear.
- Keep 100mm below and the width of the Host Unit clear of other devices for cable access.
- The supplied RS485 cable [Host to Base Unit] is only 3 meters long.
- The supplied RS485 cable [Control device to Host] is only 3 meters long.
- The Host is powered from a 12VDC battery. The power lead is 2m in length.
- The RS485 cable supplied for the Base connection to the Host, the lead are terminated at each end with a RJ45 x 8pin modular plug. The cable cannot be removed from the glands without cutting the cable.

An optional 10m RS485 lead can be ordered and supplied if the distance to the Base exceeds the standard length.



6.3.1.1 Mounting the Host Unit

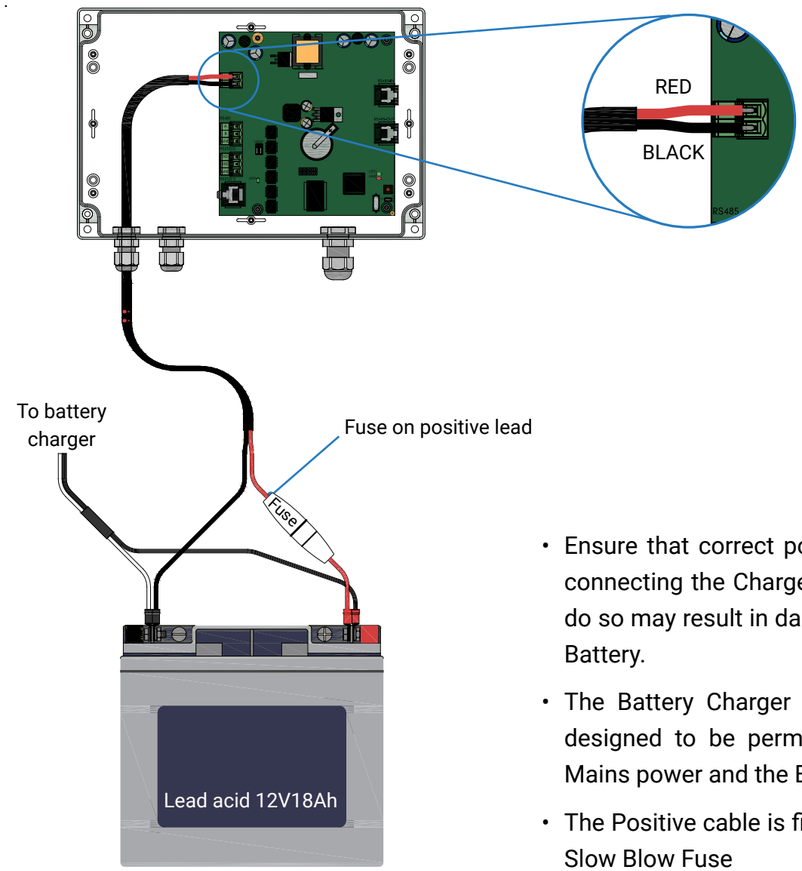
1. It is recommended that the Host and Control device are mounted on a flat surface.
2. Remove the left and right Cover Strips from the lid by prizing off with a <3mm blade screwdriver. There are driver access points on each strip on the outside long edge at the top and bottom.
3. Using # 2 Philips screwdriver undo the lid retaining screws.
4. Undo the hinge screws and remove the lid.
5. The Host enclosure is fixed through the holes in each corner of the enclosure.
6. Fix one top corner then level the unit before fixing the other corner.
7. Maximum screw head diameter must not exceed 8mm.
8. It is preferred that a Pan head screw be used, Countersunk screw heads can also be used.
9. **Do Not** over tighten the mounting screws as they can pull through the base.



6.3.2 Connection - Host Power

Power is supplied to the Host Unit from an 18-amp hour 12-volt DC lead acid battery. The battery charge is maintained by mains powered battery charger or an optional user supplied Solar-charging system.

- When connecting the 12VDC supply to the Host ensure that polarity is maintained.
- The Red lead must connect to the Positive [+] terminal on the Battery and on the Host.
- The Black lead must connect to the Negative [-] terminal on the Battery and the Host.
- The green LED 3 will flash when power is connected to the Host. LED 1 and LED 2 will be continuously lit at the same time.



- Ensure that correct polarity is maintained when connecting the Charger to the Battery. Failure to do so may result in damage to the charger or the Battery.
- The Battery Charger supplied by Netafim it is designed to be permanently connected to the Mains power and the Battery.
- The Positive cable is fitted with a 20mm x 5-amp Slow Blow Fuse

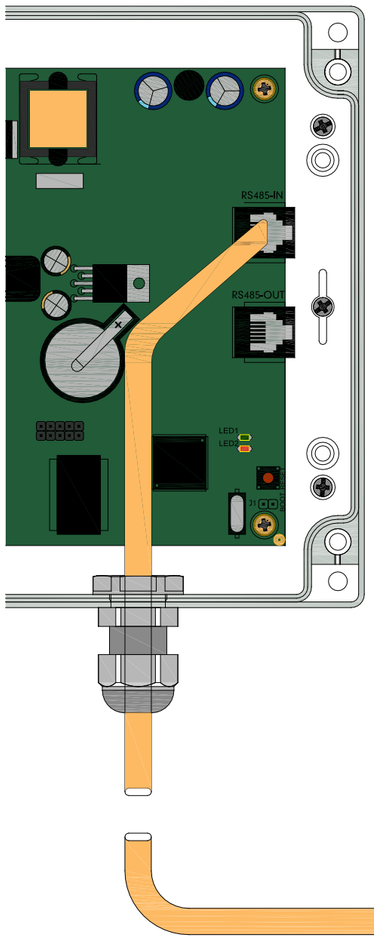
6.3.3 Connection - Host Communication

6.3.3.1 Connection - Host Unit to Base RS485

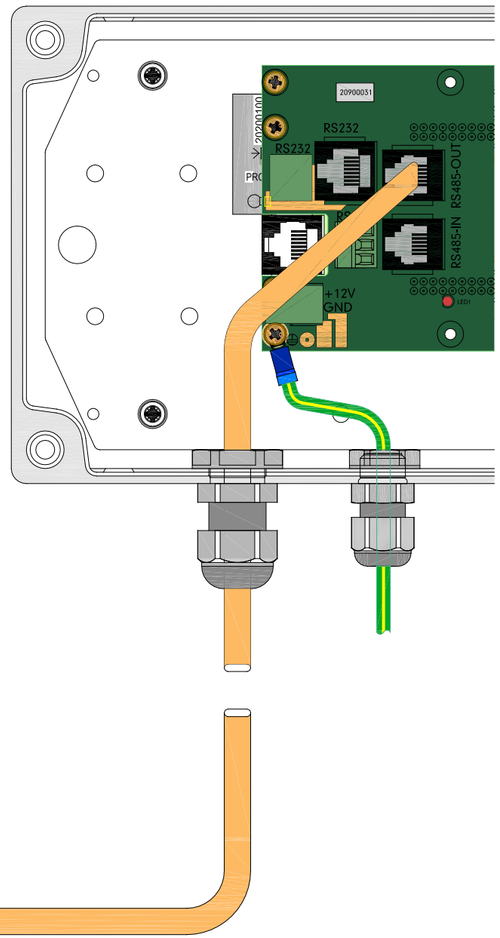
This connection provides the communication channel for the operation of the system. The host receives the command from the Control device interprets the command via the I/O map and sends the information to the Base to transmit to the Remote Units. This is a two ways communication.

- The Host is supplied with a 3-meter lead fitted with RJ45 plugs and two glands.
- Connect the RS485 supplied into the RS485 In port in the Host.
  This port is the upper port on the right side of the Host PCB.
- Connect the other end into the Base Unit RS485 Out port.
  This port is the upper port on the right side of the cluster on the Base Unit PCB.

Host RS485 In.



Base unit RS485 Out.



NOTE

Remember Connect “Top to Top” upper connector on both cards.

6.3.3.2 Connection - Host Unit to Control RS485

Communication to the GrowSphere Max Controller and the Host is by a proprietary RS485 serial format.

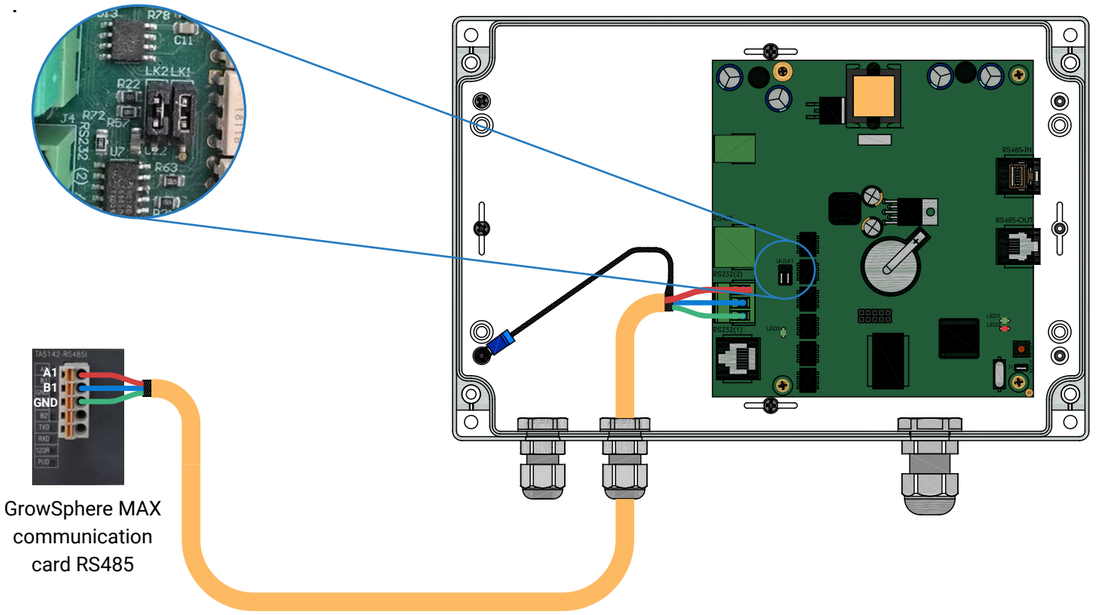
The GrowSphere Max must have one of the following communication cards installed:

1. NMC RS232 Card: Netafim Part # 74303-000010
2. NMC RS485 Card: Netafim Part # 74303-000011
   This is the default communication card for RadioNet and GrowSphere Max.

- Each Host is supplied with a 3-meter 3 core communication cable for connection between the GrowSphere Max and the Host.
- The Jumpers LK2 and LK1 must be in the upper position linking the center and bottom pins.
- The Shield wire is to be connected only to the Host Back Plate.
- Connection of wires:

Host RS485(1) Terminal Name	Host RS485(1) Label #	Host End Wire Color		GrowSphere Max End Wire Color	RS485 High Terminal Name	Grow Sphere Max RS485 Label #
A		**Red**		**Red**	B	
B		**Blue**		**Blue**	A	2
GND		**Green**		**Green**	Com	1
Host back plate		Shield				

Note: when using RS232 connection, the RX and TX are cross over.



GrowSphere MAX communication card RS485

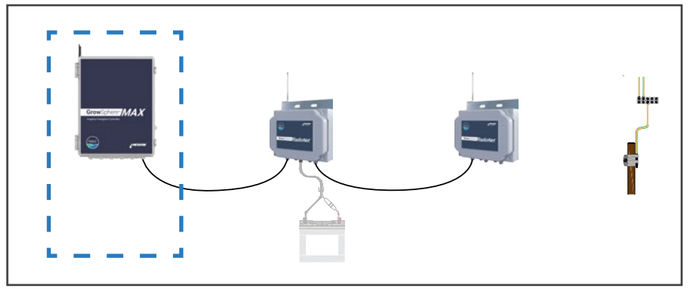
6.4 Installation - Control Device Guidelines

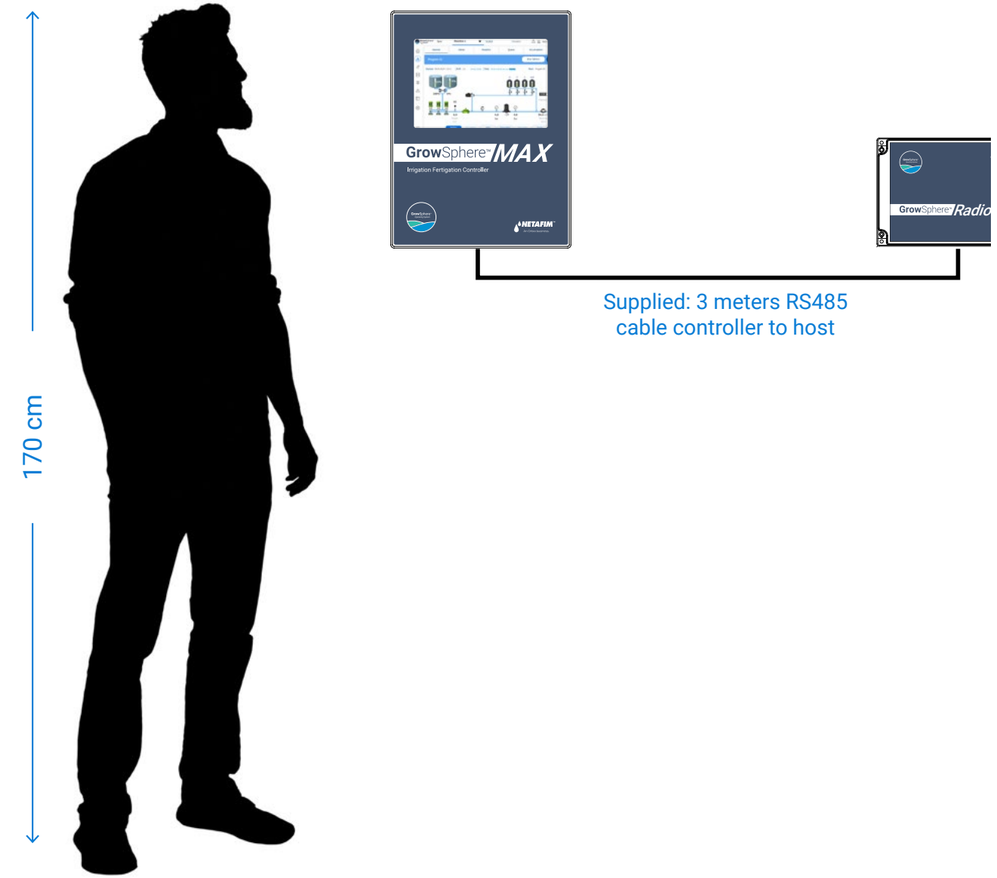
Refer to Installation Manual supplied with the Control Device for a full recommendation.

GrowSphere MAX user manual →

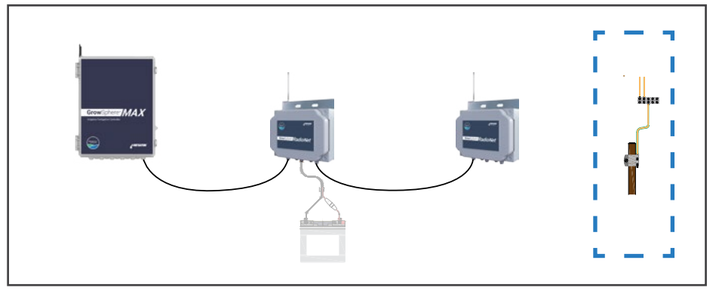
The Control Device drives the system. Access to this unit will be on a daily basis.

- The Control Unit should be in an easily accessible location.
- Mount the Control Unit with the display screen at eye height.
- There should be 1.2m x 1.2m clear area in front of the Control Device
- It should be within 3 meters of the Host.
- Communication to the Host from the Control Unit is via RS485; try to keep the cable length to the distance supplied.
- Do Not run the RS485 cable in close proximity to high voltage [>110 VAC] cables.
- Do Not run the RS485 cable in the vicinity of Motor Starters and Variable Speed
- Consider the connection of the other equipment to the controller.
  - Local Digital Outputs, e.g. Pumps, Filters, Fertilizer Injection Equipment.
  - Local Digital Inputs, e.g. Water and fertilizer meters.
  - Analogue Inputs, e.g. Pressure Transducers, EC and pH sensors.





6.5 Installation - Grounding of Central Site



- Proper grounding provides an easy path for electrical current to return to its source.
- Electrical equipment can be destroyed or partially damaged by voltage spikes, lightning hits, etc.
- Proper electrical grounding in combination with the RadioNet internal protection is essential to protect the system, reduce the risk of damage, and prolong its life.
- Correct selection and installation of grounding equipment will protect the system and reduce the risk of human injury.
- A grounding system should tie all non-current carrying conductors to earth ground (0 volts).
- The grounding system should present a minimum resistance to current flow.
- Make sure all items used are in good condition. For example, a corroded wire clamp attaching a ground wire to a ground coper rod might add 100 ohms or more resistance to a system.

Less than 5 ohms will be considered as a good ground.

6.5.1 Grounding - Guidelines

Bond all ground wires at a central point and take a single wire to the grounding rod.

- In the NMC Controller connect to the grounding bar inside the controller.
- In the Host Unit ground to the back mounting plate of the unit.
- In the Base Unit connect to the supplied crimp terminal.
- The ground wire must conform to the local electrical standards for minimum size and insulation color.
- The ground rod must conform to the local electrical standards for minimum size and construction.

6.5.2 Ground Rods

Ground Rods are used to efficiently connect the system to earth where current may be dissipated in the soil.

Material: Ground Rods should be copper clad steel.

Diameter: Minimum 16mm [5/8"] (or as per local regulations). Generally, the larger the rod diameter, the lower its resistance to current flow.

Length: Minimum 2.5 meters [8 feet] (or as per local regulations). A longer ground rod will reach a soil with higher moisture content. Moist soil carries current much better than drier soil.

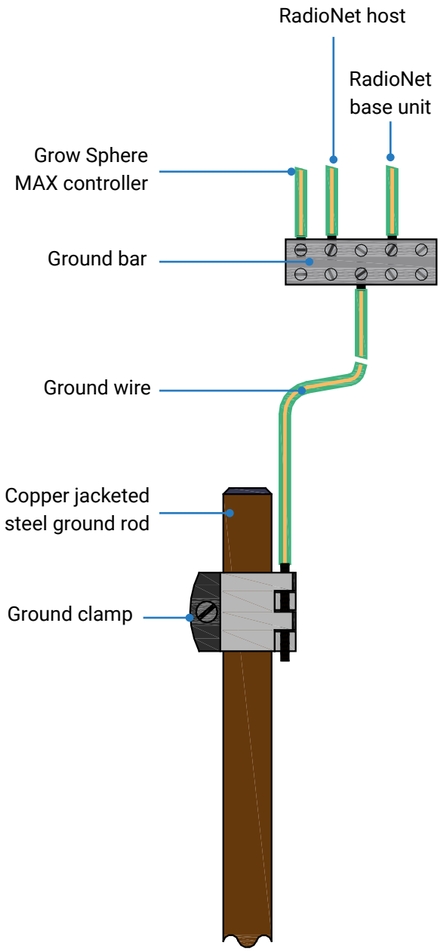
Single grounding: It is important that there is only one grounding location where a rod or series of rods are connected to each other using a ground wire.

NOTE

Multiple independent ground rods will increase the risk of current, from a lightning strike being dissipated through one rod and re-entering the system through an adjacent rod.

Location: Close to the main circuit breaker panel and in moist soil.

Rod installation: Drive the rod into the earth until about 100mm (4 inches) is left above grade. If it is impossible to drive the rod to the proper depth, it is acceptable to lay the rod horizontally, 800mm (2.5 feet) below grade. In cases where the rod is prone to damage, for example by lawnmowers or tractors it can be installed in a hole, about 200mm (8 inches) deep so that the rod is about 100mm under grade and 100mm above hole level.



NOTE

Some Electrical jurisdictions mandate two ground rods unless you can show less than 10 ohms resistance with one rod.

6.5.3 Ground Wire

The ground wire is a large copper wire that connects the main circuit panel to the ground rod.

- Typically, 4mm2 (10 -12 AWG) copper wire is sufficient for runs less than 4 meters.
- The wire insulation coloring should conform to local standards designating Earth wire.
- The ground wire should be protected from damage by lawnmowers, tractors, etc.
- It is important that the wire not be cut.
- Avoid tight bends in the cable.
- Do Not coil the earth cable under any circumstance. The coil will act as a chock creating high impedance in the cable while it is attempting to dissipate a surge.

6.5.4 Ground Clamps

Ground wires should not be merely wrapped around a ground rod. Ground clamps are used to attach a ground wire to a ground rod. The most common clamp is known as an acorn clamp. Make sure the ground clamps you select are rated for outdoor use. Do not use pipe clamps rated for water lines or hose clamps to attach the ground wire.

6.6 GrowSphere Host and Base Kit

The RadioNet Host and Base Kit was developed to facilitate the installation of the RadioNet base station components.

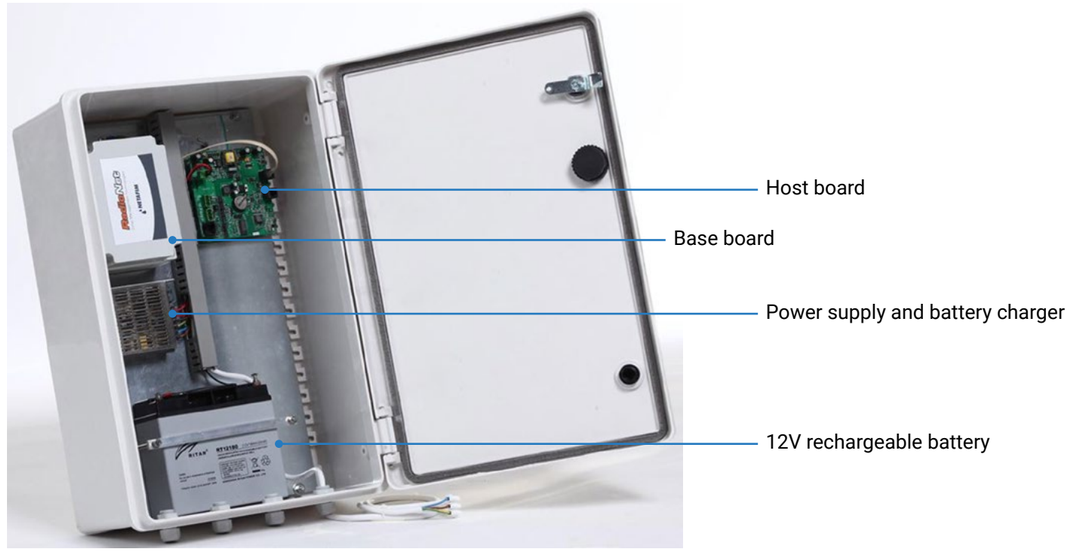
Each component of this new kit is installed inside a water-resistant enclosure.

This enclosure is prewired to save installation time, avoid connection mistakes and protect the electronic components.

The RadioNet Host and Base Kit includes:

Water Resistant Enclosure	
RadioNet Host	74330-012000
RadioNet Base	74330-012100
RadioNet Monopole Grounded Antenna 10 m. (33 ft)	74330-005120
Power Supply/Battery Charger 12VDC	74330-003010
Rechargeable Battery 12VDC	00107-008101

GrowSphere RadioNet Host and Base Kit: 74360-007600



7. Installation manual - Remote site

7.1 General Overview- Remote Site

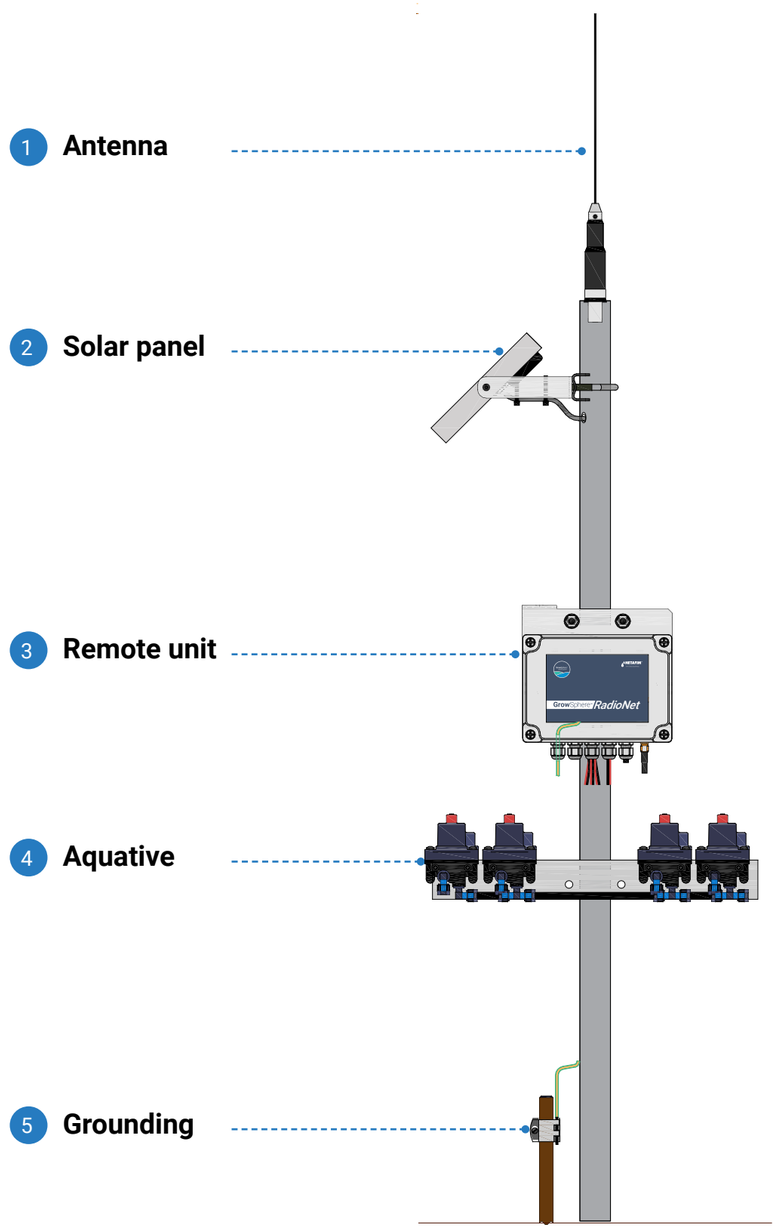
This section covers the RadioNet components found at a Remote site.

This includes:

1. The Antenna
2. The Solar Charging System
3. The Remote Unit and accessories
4. The Hydraulic Control Devices
5. Grounding

The Remote Unit has three main functions:

1. Digital Output: the RadioNet RTU device controlling up to 9 appliances, the RadioNet RTU 2x2 controlling up to 2 appliances, the RadioNet DCP controlling up to 7 appliances.
2. Digital Input: the RadioNet RTU device monitoring up to 10 appliances, the RadioNet RTU 2x2 device monitoring up to 2 appliances, the RadioNet DCP device monitoring up to 9 appliances and 9 Analog Inputs.
3. Radio signal Repeating Site or Store and Forward [SAF] device for all the RadioNet remote units.



7.2 Installation- Remote Site

Recommended Installation Sequence:

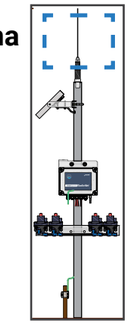
1. Mount the Remote Antenna
2. Adjust the Solar Panel Tilt angle.
3. Fit the Solar Panel
4. Install the Remote Battery
5. Mount the Remote Unit
6. Ground the System
7. Connect the Output Device
8. Connect the Input Device

NOTE

Netafim does not supply Antenna / Remote Unit Masts. The supply of the mast and its suitability for the application is the responsibility of the customer.

7.3 Installation- Remote Site Antennas

1 **Antenna**



7.3.1 Antenna Selection

NOTE

All systems must be cut to length according to the system operating frequency. Failure to do so will result in poor radio signal reception and transmission. Refer to the cutting chart in the Appendix for the ½-wave monopole antenna.

Generally, the Antenna should be mounted as high as practically possible. Mounting the antenna higher than necessary will require a heavier mast pole or pole stays both add cost to the system. Typically, the antenna should have at least 2 meters of clearance above the maximum crop height (crop canopy) in the direction of the Base Unit.

The RadioNet Antenna products can be divided into two systems:

1. The ground plane dependent flexible ¼-wave whip antenna with a 1-meter cable.
2. The ground independent ½-wave monopole antenna with rigid stainless steel element. This product is available with 3, 6, and 10-meter antenna cable lengths.

This results in four Antenna Options.

1/4 Wave Whip with 1m coaxial.

- Used in crops with a height less than 0.6 meters where the base antenna is in view of the remote antenna.
- Most vegetable crops on flat ground would fit this application

Monopole S/Steel Whip Antenna Kit, 3 m low loss cable.

- Used in crops with a height less than two meters in height.
- This suits low trellised crops: for example, wine and table grape vineyards, tomatoes, kiwi fruit, and passionfruit and cereal crops.

Monopole S/Steel Whip Antenna Kit 6.0m low loss cable.

- Used in crops with a height less than four meters.
- This suits most tree crops: Apples, Pears, Mangoes, Bananas, and Citrus for example.
- Obstacles such as terrain or vegetation can be overcome by using this antenna.
- Used if the Remote Unit is to be configured to be a repeater.

Monopole S/Steel Whip Antenna Kit, 10m low loss cable.

- Designed to be used as the Base Unit antenna.
- Used in Crops with a height less than eight meters.
- This suits tall tree crops.
- Obstacles such as terrain or vegetation can be overcome by using this antenna.
- Used if the Remote Unit is to be configured to be a repeater

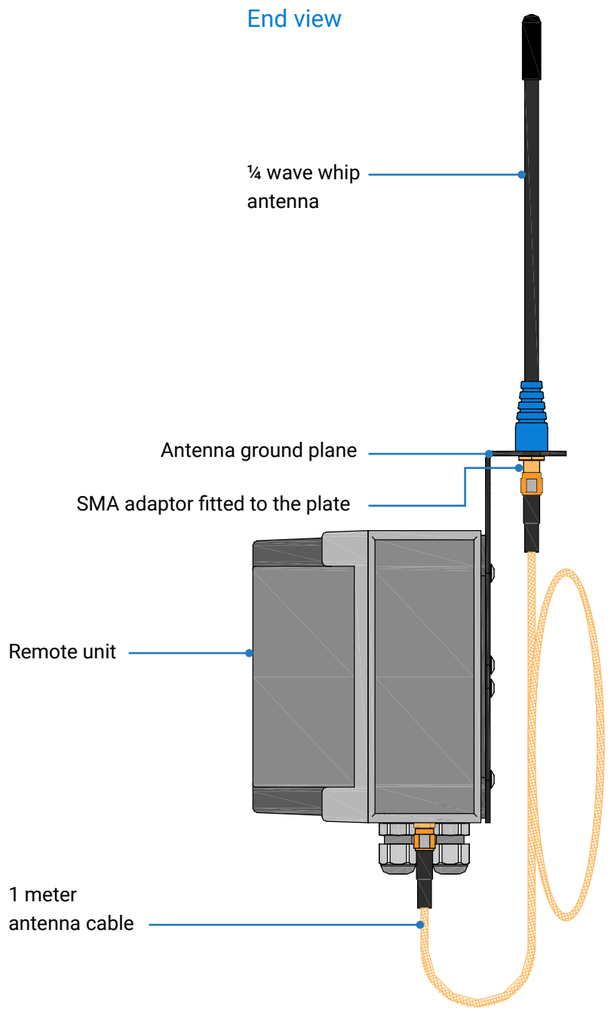
7.3.2 Installing - The ¼ Wave Whip Antenna

This antenna is used where the distance to the Base or a SAF unit is close and the application has little to no vegetation, terrain, or building obstacles in the signal path.

The system consists of three parts the Whip antenna, a SMA adaptor with nut and a one-meter antenna cable.

1. Remove the Nut from the Adaptor.
2. Install the SMA Adaptor to the back-plate tag with the fixed nut to the topside of the tag. Secure with the bulkhead nut on the underside.
3. Screw the ¼ Wave Whip on to the Adaptor.
4. Form an open loop with the spare cable and tie one side together.
5. Connect the Antenna Cable to the underside of the enclosure and to the adaptor.
6. Firm all nuts.

- The antenna must pre-cut to the system frequency.
- The system must mount on a Ground plane plate.
- The Remote Unit mounting back plate serves as the Ground Plane.
- Please consult with a Netafim Technical Representative if you wish to mount this antenna other than on the supplied mounting back plate.



7.3.3 Installing - The Stainless-Steel Monopole Antenna

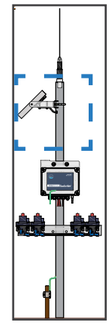
This Antenna System and its variations are covered in the Antenna Section of the Base Unit 6.2.2 please refer to this section. The ½ wave Monopole Antenna comes complete with various length antennae cables.

NOTE

The antenna must pre-cut to the system frequency before installation. Please refer to the cutting chart included in the package with the antenna.

7.4 Installation - Solar Panel

2 **Solar panel**



The Solar Panel is part of the Automatic Sealed Lead Acid Battery Charging System

Keep the Panel covered until the panel has been wired into the voltage regulator. At any given instant, the panel will output maximum power when exposed to the sun. Be careful not to short the panel output cables.

Photovoltaic [PV] modules are very sensitive to shading. Shading obstructions can be defined as soft or hard sources. Soft sources where the shadow is diffuse or dispersed such as a tree branch or other item is shading from a distance significantly reduce the amount of light reaching the cell(s) of a module. Hard sources are defined as those that stop light from reaching the cell(s), such as a blanket, tree branch, bird dropping, or the like, sitting directly on top of the glass. If enough cells are hard shaded, the module will not convert any energy and will, in fact, become a tiny drain of energy on the entire system intensity.

To capture the maximum amount of solar radiation over a year, the solar panel should be tilted at an angle approximately equal to a site's latitude, [a table of angles and latitudes is provided below] and facing within 15º of due north or south depending upon hemisphere the system is located. To optimize winter performance, the solar array can be tilted 15º more than the latitude angle, and to optimize summer performance, 15º less than the latitude angle.

If the solar panel tilt is within 15º of the latitude angle, expect a reduction of 5% or less in the system's annual energy production. If the solar panel tilt is greater than 15º off the latitude angle, the reduction in the system's annual energy production may fall by as much as 15% from its peak available value. During winter months at higher latitudes, the reduction will be greater.

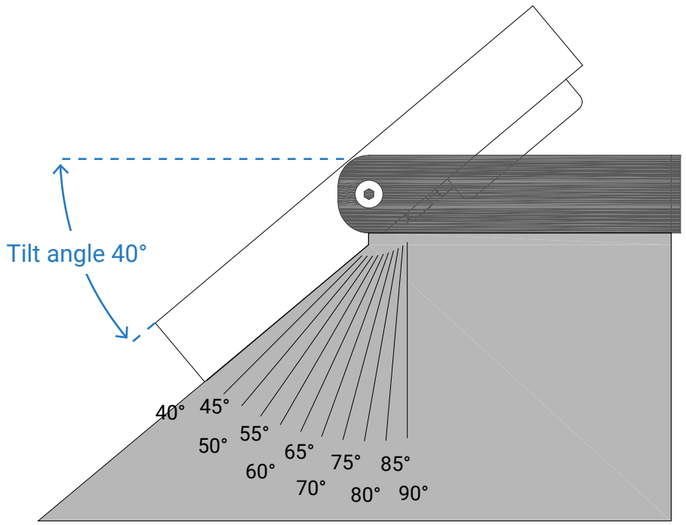
- The Solar Panel must be installed with the correct tilt angle set.
- Use the Template supplied [see below cut out] with the panel to set the tilt angle to your location.
- Set the Tilt angles to the panels before going into the field.

7.4.1 Using the Tilt Template

- For the best result enclosed the template to some card before cutting it out.
- Cut the template out of the page in the following order.

1. Along the 0-X line
2. Along the X-Y line
3. Then along the required tilt angle line. Note the tilt line does not intersect at the C point.
4. Place the “C” point at the tilt screw with the 0-X line will run along the bottom of the bracket.
5. Adjust the underside of the panel frame to line up with the tilt angle.

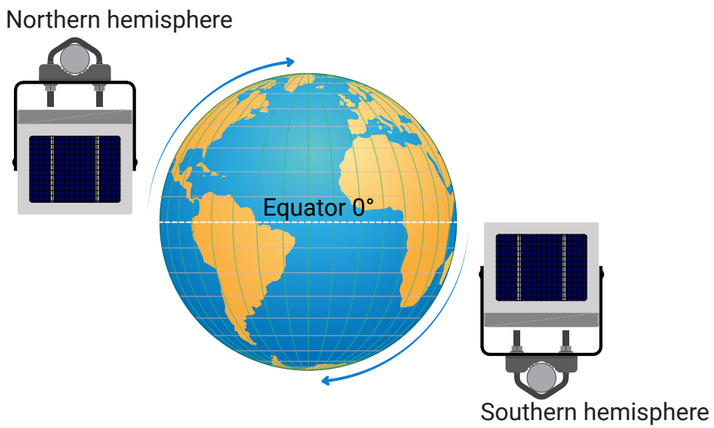
Latitude(°)	Tilt (°)
0-10	10
11-15	15
16-20	20
21-25	25
26-30	30
31-35	35
36-40	40
41-45	45
46-50	50
51-55	55
56-60	60
61-65	65
66-70	70
71-75	75



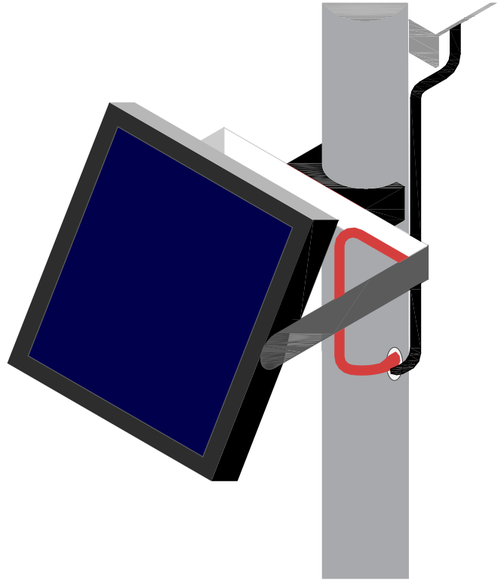
- Trim along 0 - X line.
- Align this line to the bottom of the bracket.
- Trim along X-Y line.
- The X point is to go hard aginst the inside of the bracket.
- Trim along your Tilt Angle.
- The C line is aligned with the Tilt Screw.

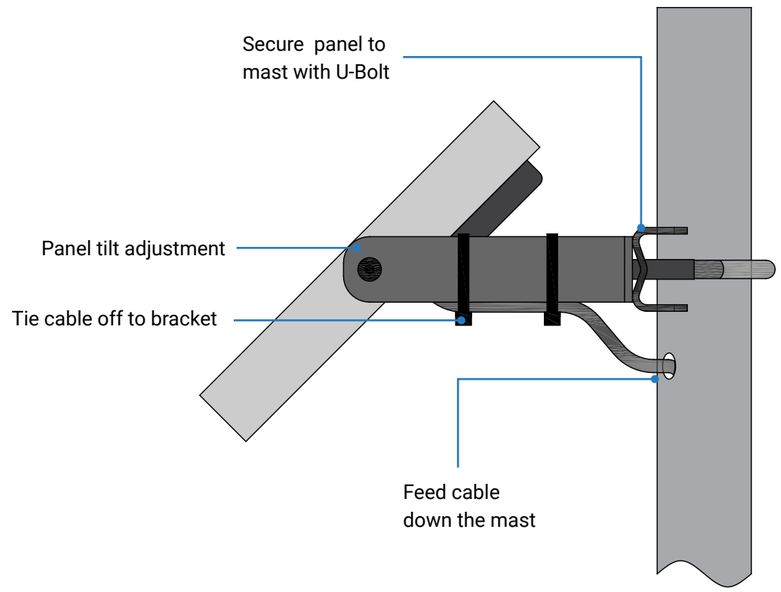
7.4.2 Mounting the Solar Panel

- For Maximum performance, face the module towards the equator. That is due North in the Southern hemisphere and due South in the w Hemisphere.
- Within 10 degrees of the equator the panel can face either pole without any reduction in performance.

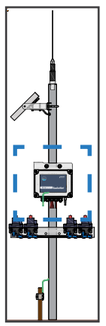


- The Solar Panel is attached to the antenna mast pole using the supplied U-Bolt
- It is recommended that the power cable from the panel is installed inside of the mast pole for protection.
- Tie the cable to the lower side of the bracket arms with cable or zip ties.
- Feed the power cable down the inside of the mast pole.
- Add extra protection to the cable where it passes through mast pole.
- Avoid and source of hard or soft shading.





7.5 Installation - Remote Unit



3 **Remote unit**

The Base Radio and the Remote Unit share the same enclosure and mounting system. Please refer to Section 6.6.2 Installing the Base Unit.

7.5.1 Installing - Remote Unit Power

The Remote Unit power supply requirement is for a constant 6-volt DC power source. Typically, this is provided in one of three ways.

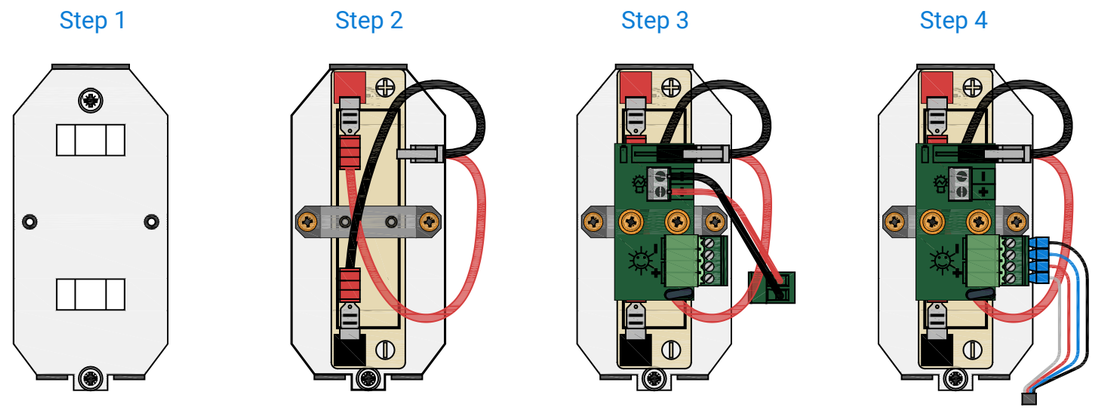
1. Auto-Charge – Lead Acid Battery or Lithium Battery with a solar charging system.
2. Rechargeable Battery Option.
3. Disposable Battery Option.

7.5.1.1 Auto-Charge: Sealed Lead Acid Battery and Solar System

The term Auto [automatic] refers to a system that automatically maintains the charge in the battery. This is achieved by connecting a 6-volt sealed Lead Acid Battery to a regulated charging system powered form a Solar Panel. [Refer to Section 11.4 for Solar Panel mounting information]

Shown below are the steps for installing the Battery and Voltage Regulating Kit:

It is best to install all the batteries to the Remote Units before installing them in the field.



Step 1. Installing the Cradle Base plate.

- Remove Screws “B” from the Main Mounting Plate.
- Install the Battery Cradle “A” with the Flat end up and the Notched end down.
- Secure the Cradle with screws “B”

Step 2. Installing the Battery.

- Install the “C” Sealed Lead Acid [SLA] Battery with the Positive [+] terminal Up.
- Fit the Battery retaining bracket “D” and screw down to the Cradle “A”.
- Fit the Battery Lead “E” like the Diagram with the lead wires running between the Regulator mount standoffs.

Step 3. Installing the Voltage Regulator.

- Attached the Regulator “F” to the Battery Cradle “D” with the screws “G”.
- Wire in the Terminal leads “H” to the Regulator card and to the Remote Card 207.
- **Take care with the Polarity of each Terminal. The Lead will cross over.**
  - On the Regulator the Positive [+] is the **BOTTOM** terminal.
  - On the Remote Card the Positive [+] is the **TOP** terminal.

Step 4. Wiring in the Solar Panel.

- ATTENTION **Cover the Panel before terminating any of the solar output wires.**
- There are two circuits outputting from the Panel in the cable “I”
- Circuit 1 RED [+] & BLACK [-]. Circuit 2 WHITE [+] & BLUE [-]. They are wired in parallel to the Regulator.
- The Both Negative [-] wires BLACK & BLUE are connected to the Top two terminal slots.
- Both Positive [+] wires RED & WHITE are connected to the Bottom two terminal slots. **Once all wires are terminated then the Panel can be exposed to light.**

7.5.1.2 Rechargeable Battery Option

The term Rechargeable refers to the use of the battery cradle for six x AA NiMH [Nickel-Metal Hydride] batteries.

- The NiMH AA sized batteries are available in mAh [milliampere -hour] Ratings from 1100 to 2900.
- The AA NiMH battery is rated at 1.2 Volts.
- The batteries are to be sourced by the Client.
- It is recommended that the highest available mAh rated battery be sourced. The higher the rating the longer interval between charging.
- The Client will need to source a NiMH x AA mains charger to recharge the batteries.

Precautions when using NIMH batteries:

- It is recommended that the Remote Unit Battery Thresholds be changed to the values in the table below when using NiMH batteries. [This is done using PoleNet Software].

Good	6.6 V
Warn	6.0 V
Low	5.5 V
Failed	5.0 V

- It is not recommended to leave the batteries connected to the Remote Unit once they have reached the Low threshold. This type of battery exhibits a fast fade in output once it falls below 1.1volts per cell.
- Leaving the battery pack connected for extended periods when the low threshold has been reached will significantly reduce the battery life.
- Do Not mix batteries of different age or service life.
- Date mark and number each battery to keep track of their age and usage.

7.5.1.3 Disposable Battery Option

The term Disposable refers to the use of [Netafim part # 00035-003170] the battery cradle for four x AA Lithium batteries.

- The Lithium AA sized batteries are available in mAh [milliampere -hour] Ratings from 2400 to 3000.
- The AA Lithium battery is rated at 1.5 Volts.
- The batteries are to be sourced by the Client.
- It is recommended that the highest available mAh rated battery be sourced. The higher the rating the longer interval between charging.
- These Batteries are NOT rechargeable.

Precautions when using Lithium batteries:

- It is recommended that the Remote Unit Battery Thresholds be changed to the values in the table below when using Lithium batteries. [This is done using PoleNet Software].

Good	5.5 V
Warn	5.2 V
Low	5.0 V
Failed	4.5 V

- It is not recommended to leave the batteries connected to the Remote Unit once they have reached the Low threshold. This type of battery exhibits a fast fade in output once it falls below 1.3 volts per cell.
- Do Not mix batteries of different age or service life.
- Date mark and number each battery to keep track of their age and usage.

7.5.2 Installing - Remote Unit Outputs

The Remote Unit output is designed to interface with the following:

- Devices intended to receive a pulsed DC voltage up to 15volts DC. This type of device is referred to as a latching solenoid or relay.
- Either two wire or three wire type devices
- See Appendix 10.3.3 for a list a compatible device.

The Remote Unit has a nominal firing voltage of 12VDC. Increasing the firing voltage will dramatically increase the current draw on the battery, shortening the battery's life.

CHECK

Take care when wiring into the output terminal, that the correct output number and location on the terminal is observed.

The Remote Unit Outputs **Do Not** follow a logical sequence.

RadioNet RTU Agile. Use the drawing below to locate the correct output number and its PoleNet Address number.

CARD.1. Remote Unit basic I/O Card 207

CARD.2. Remote Unit Expansion Card 208 #1

CARD.3. Remote Unit Expansion Card 208 #2

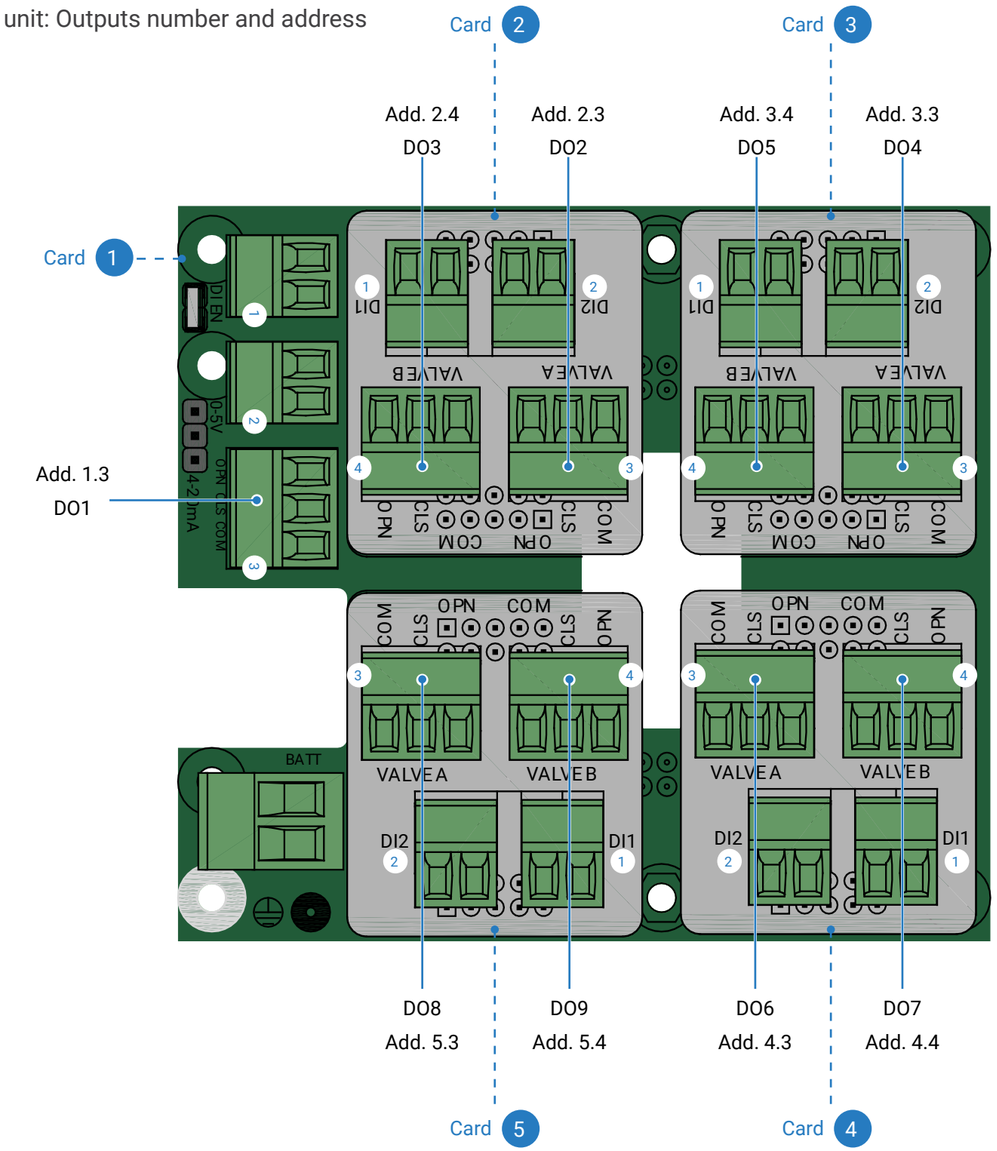
CARD.4. Remote Unit Expansion Card 208 #3

CARD.5. Remote Unit Expansion Card 208 #4

Add = Polenet address #

DO. = Digital output #

Remote unit: Outputs number and address



RadioNet RTU DCP. Use the drawing below to locate the correct output number and its PoleNet Address number.

CARD.1. Remote Unit basic I/O Card 232

CARD.2. Remote Unit Expansion Card 267 #1

CARD.3. Remote Unit Expansion Card 208 #2

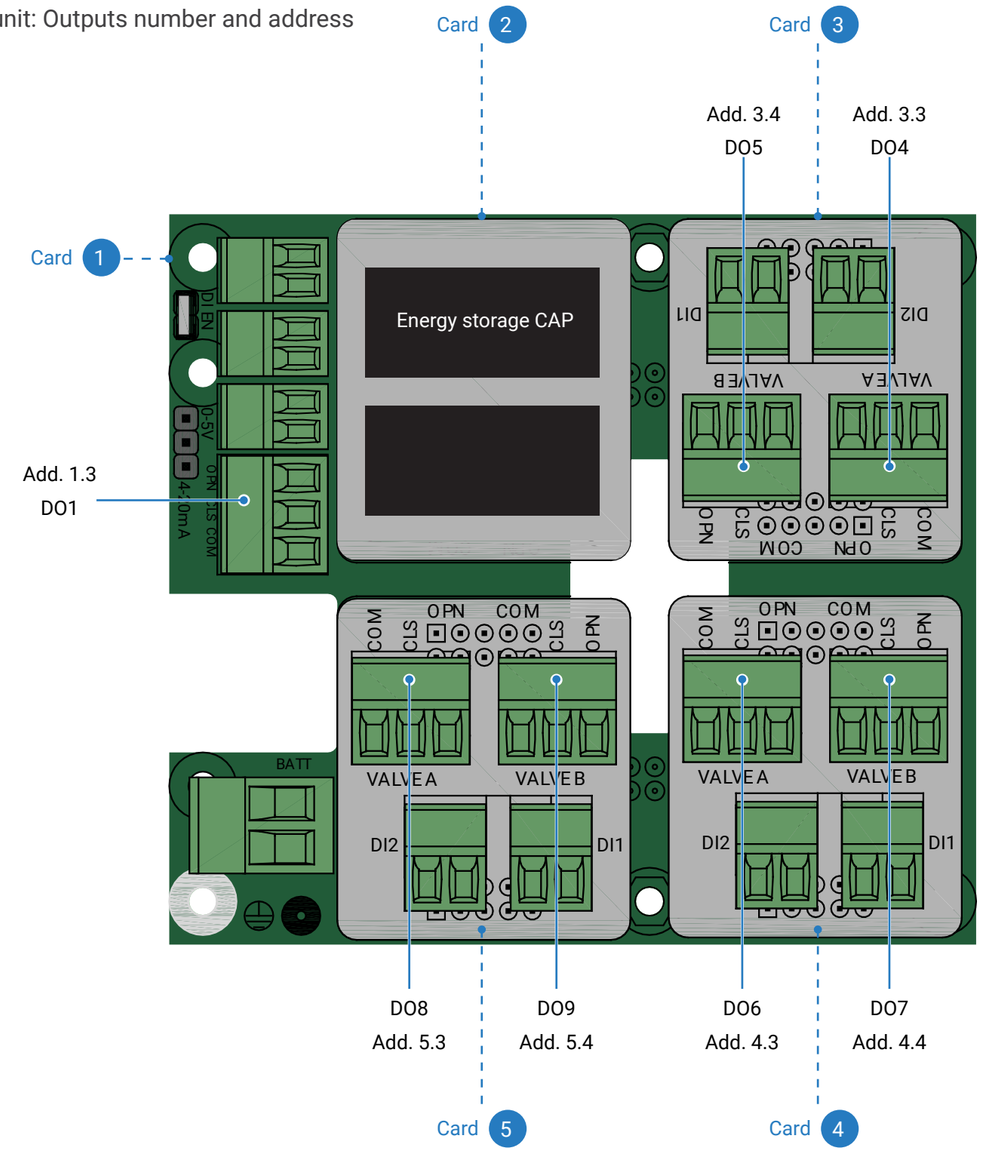
CARD.4. Remote Unit Expansion Card 208 #3

CARD.5. Remote Unit Expansion Card 208 #4

Add = Polenet address #

DO. = Digital output #

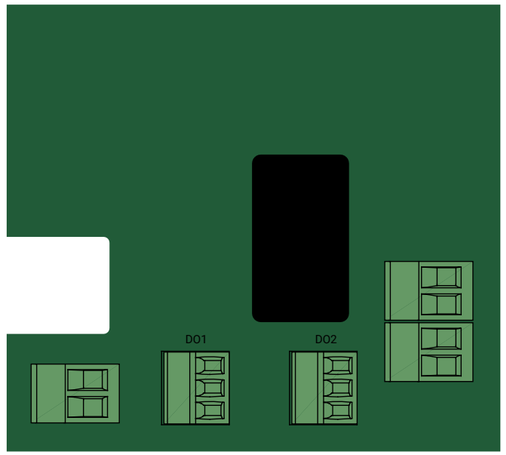
Remote unit: Outputs number and address



RadioNet RTU 2x2. Use the drawing below to locate the correct output number and its PoleNet

> **NOTE**
>
> The RadioNet RTU 2x2 has no expansion cards.

CARD.1. Unit basic I/O Card 307



7.5.2.1 Installing-Outputs: Main Board

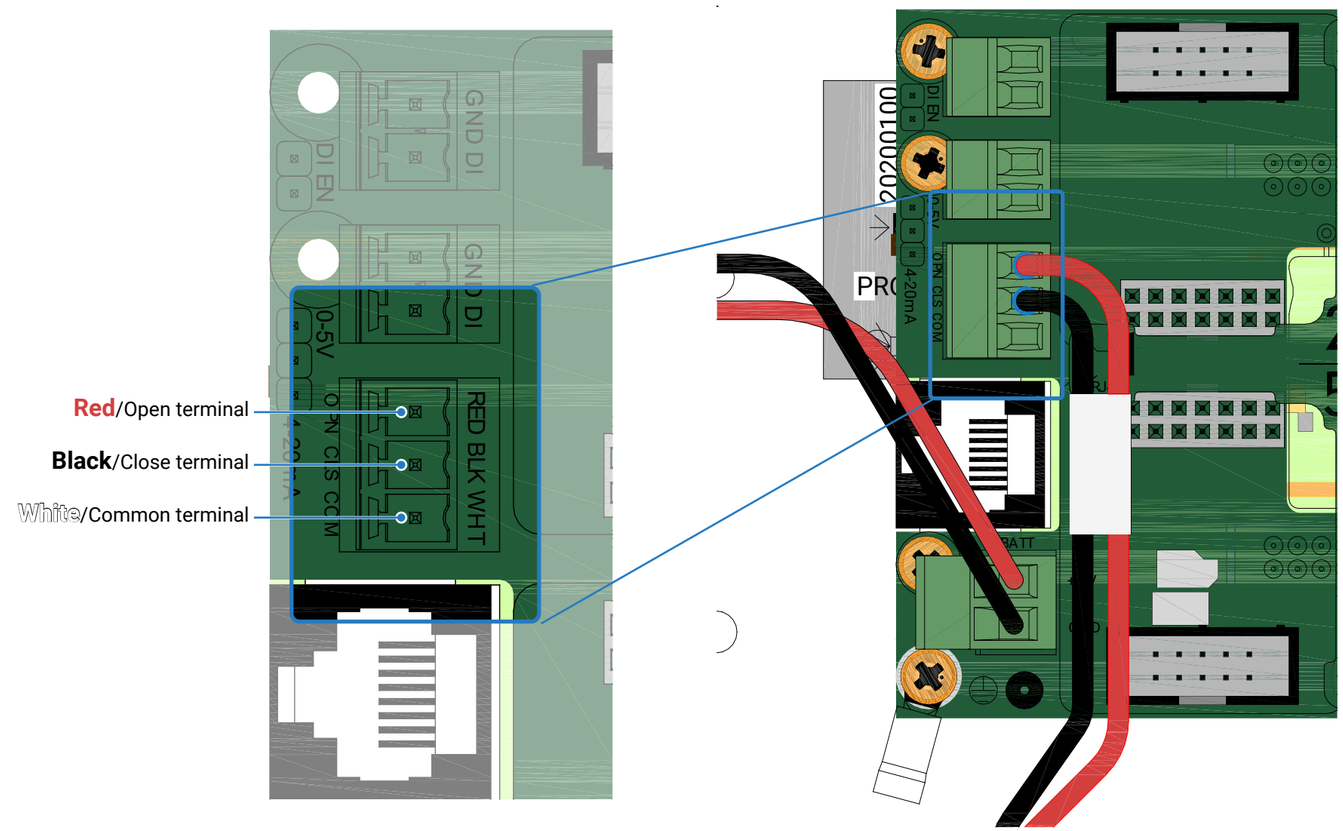
The main board of the Remote Unit has one output terminal. It is located on the left-hand side of the main card just above the RJ45 socket.

Remove the terminal to identify the terminal position.

For all Remote Output Terminals when connecting:

a. To a Two-wire device. Use the Open [OPN] and Close [CLS] Terminals only.

b. To a Three-wire device. Use the Open [OPN], Close [CLS] and the Common [COM] Terminals.



7.5.2.2 Installing- Outputs: Expansion Card

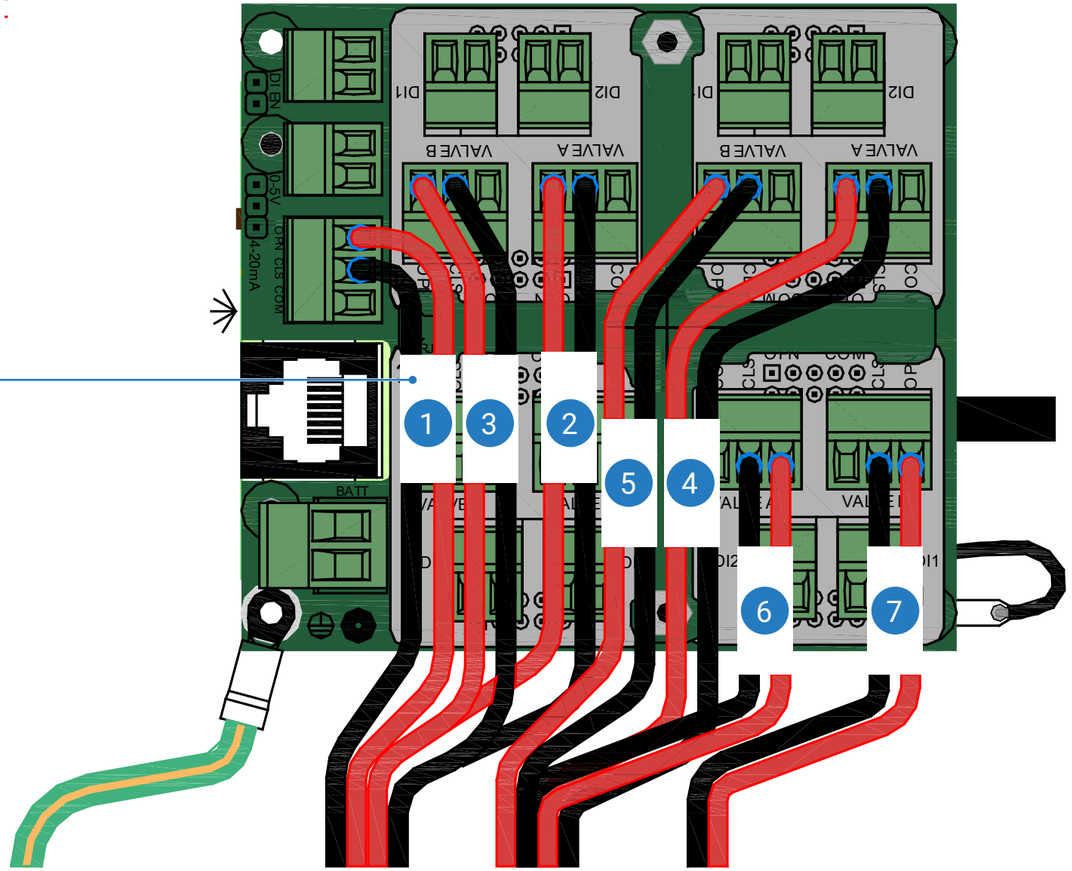
The basic Remote Unit can be expanded to a total of 9 outputs with the addition of a maximum of 4 expansion cards. These cards are installed on to the Main Card. The installation of these Cards must follow the first available vacant slot in a clockwise direction starting at Location 2.

The Output Terminals on the Expansion Cards are named in the same manner as the Output Terminal on the Main Card.

Follow the same connections as this terminal

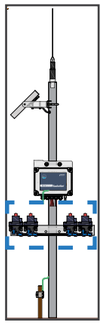
NOTE

When connecting the Netafim Aquative Solenoid it is recommended that the pair of wires from each solenoid is sleeved with heat-shrink tubing or taped together with electrical tape. This avoids the possibility of a cross connected solenoid.

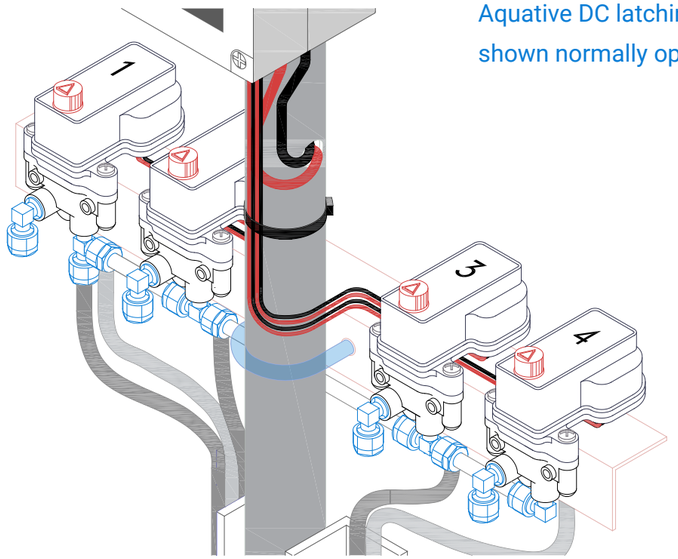


7.5.3 Output - Hydraulic Control Assembly

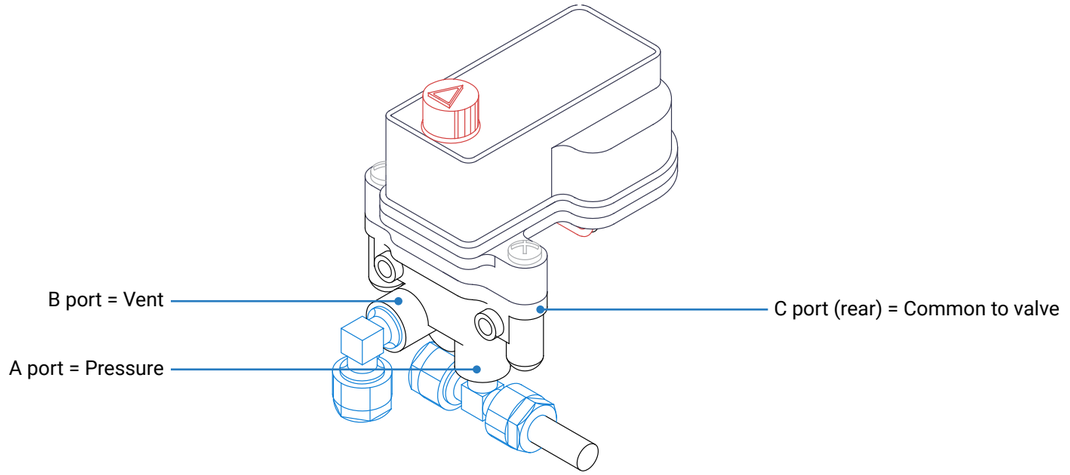
4 **Aquative**



Netafim recommend the use of the DC Aquative as the default solenoid with the RadioNet System. This section deals with the plumbing of this



Aquative DC latching solenoid
shown normally open = closed valve



- The standard plumbing is for a “Normally Closed” Valve. The Aquative is then Normally Open. Connect the Pressure Supply to Port “A”, Vent to Port “B” and the Valve to Port “C” the common.
- If the system requires a “Normally Open” Valve. Configure the Aquative as a Normally Closed solenoid by connecting the Pressure supply to Port “B” and making Port “A” the vent port.
- It is recommended that the remote valve be fitted with at least a Pressure Selector Tee [shuttle valve] to allow local command of the valve when it is operating.
- If the valve is located more than 100m from the solenoid it is recommended that the valve is fitted with a Galit Hydraulic Relay.
- 8mm Hydraulic Command Tube is the minimum recommend size.
- The pressure supply line to the Aquative assembly must be fitted with a good quality line filter.
- The Aquative can be supplied assembled on an aluminum-mounting bracket as shown above.
- The assembly can be supplied in various Aquative combinations from 2 to 10 unit per bracket.
- It is recommended that rather than using one x 9 Unit Aquative that a 5 Unit and a 4 Unit assembly be used mounted on the mast pole one on top of the other. The keeps the total assembly compact.
- Number or mark each solenoid and the solenoid wire pair for easy identification in the enclosure 1 - 7.

7.5.4 Output - Relay Device

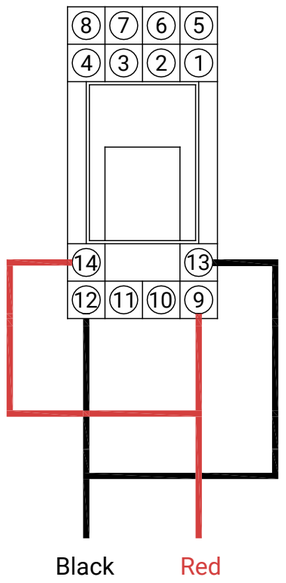
The Remote Unit can control equipment by switching either AC or DC power through a relay.

- Netafim recommend the use of the Idec-Izumi Latching Relay.
- The relay is only design to switch low current devices.

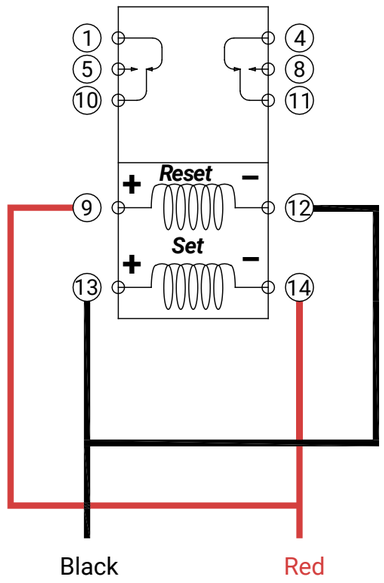
NOTE

This is a latching device. Test the relay operation before switching on the device it is controlling. It is possible that the unit operates opposite to your requirements.

Physical view



Logical view



Wiring Connection to Remote Unit using two wires.

Netafim Part # 73200-008900 Izumi 12VDC Latching Relay - Model No. RY2KS-U

Netafim Part # 73200-002250 Izumi Relay Base to suit relay.

7.5.5 RadioNet Agile RTU Installing - Remote Unit Digital Inputs

The Remote Unit will accept digital inputs from devices conforming to the following specifications:

- The contact is Voltage Free
- The Maximum “ON” resistance is 500 ohms.
- The Minimum Pulse width is 500 ms.
- The Pulse Frequency does not exceed 2 Hz. [120 Pulses per minute]

NOTE

A device with a High Pulse rate may result in constant Radio Traffic. Consult Netafim Technical Services before installing a device approaching the maximum pulse rate. The size of the system and the number of layers in the system may restrict the maximum pulse rate.

The Remote Unit Inputs follow a logical numbering sequence. On the Expansion Cards the numbering is in a clockwise direction.

Use the drawing below to locate the correct output number and its PoleNet Address number.

CARD.1. Remote Unit basic I/O Card 207

CARD.2. Remote Unit Expansion Card 208 #1

CARD.3. Remote Unit Expansion Card 208 #2

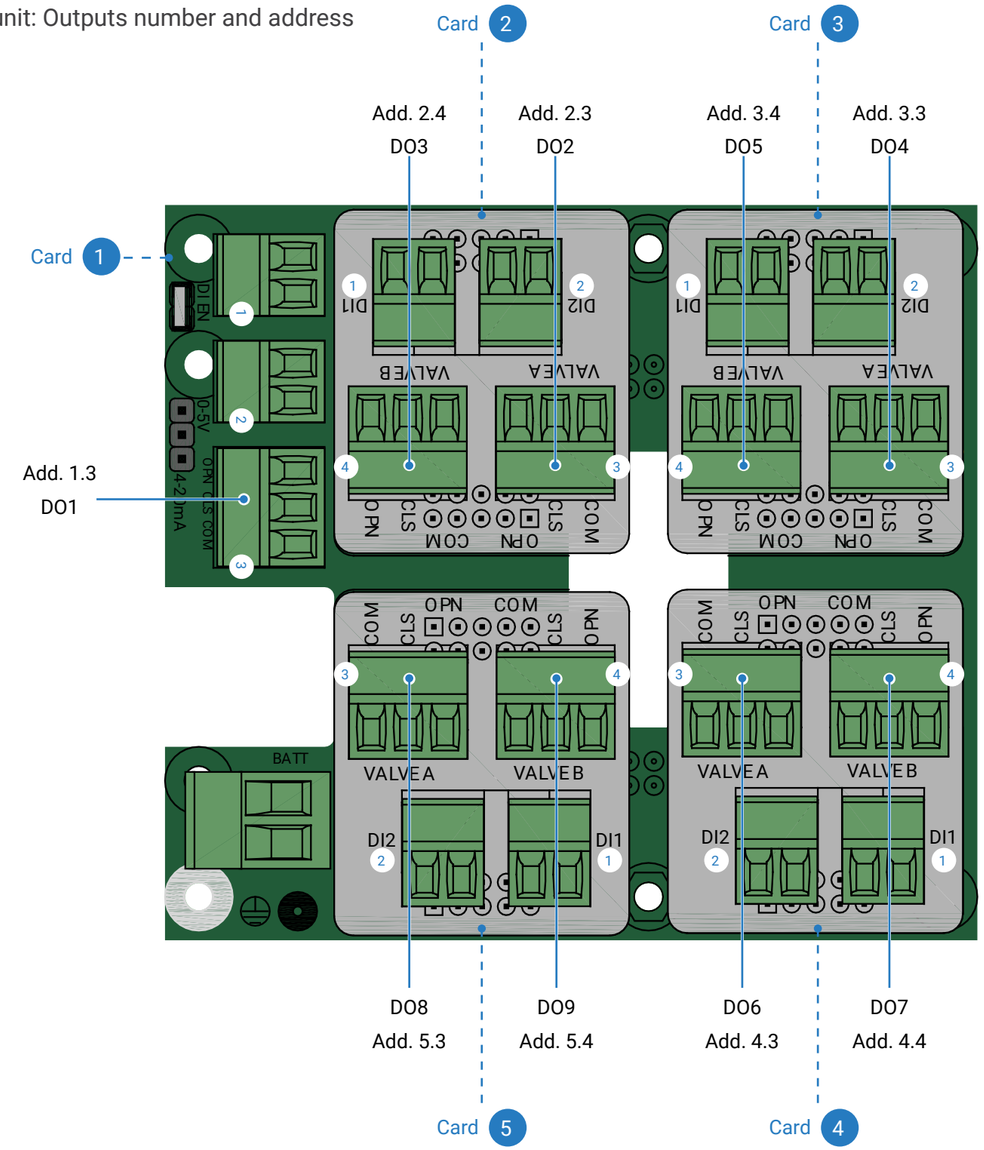
CARD.4. Remote Unit Expansion Card 208 #3

CARD.5. Remote Unit Expansion Card 208 #4

Add = Polenet address #

DO. = Digital output #

Remote unit: Outputs number and address

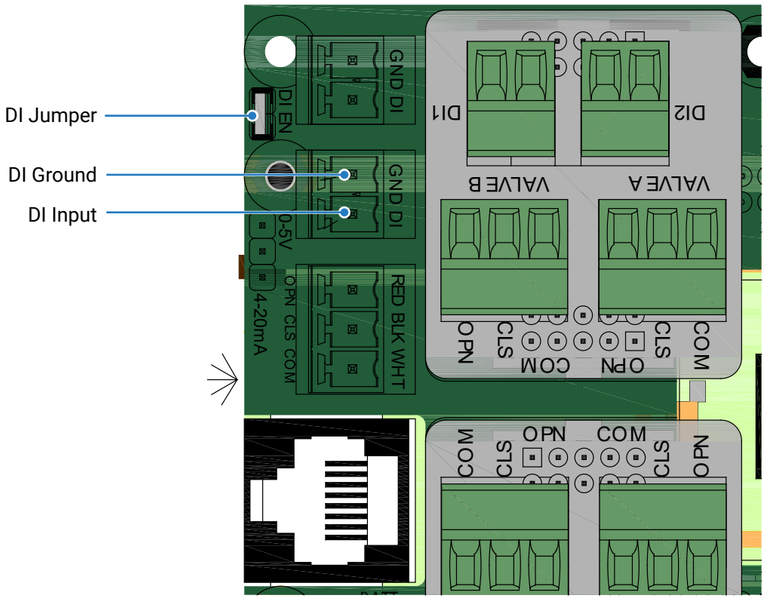


7.5.5.1 RadioNet RTU Agile Digital Inputs- Main Board and Expansion

The Remote Unit has the capacity to read a total of 10 Digital Inputs.

- Two are located on the Main Card above the Output terminal.
- Two are on each of the Expansion Cards.
- The Jumper must be in place for the Inputs to function.
- If the device is an Open Collector type, then observe the polarity of the Digital Input.

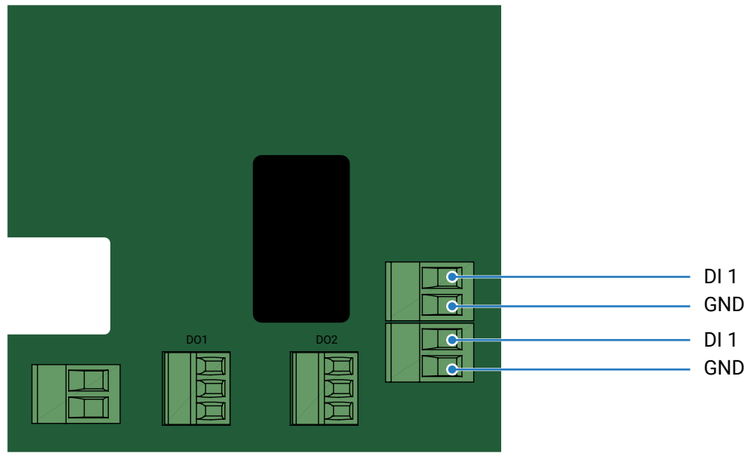
The Terminals have been removed from the Main Card below for clarity.



7.5.5.2 RadioNet 2x2 RTU Installing - Remote Unit Digital Inputs

The Remote Unit will accept digital inputs from devices conforming to the following specifications:

CARD.2. Unit basic I/O Card 307



7.5.5.3 RadioNet DCP RTU Installing - Remote Unit Digital Inputs

Analog Inputs and Communication card.

Displayed in the diagram to the right are the expansion cards:

CARD.1. Remote Unit basic I/O Card 232

CARD.2. Remote Unit 2xAI Expansion Card 235 #1

CARD.3. Remote Unit 2xDO,2x2DI Expansion Card 208 #2

CARD.4. Remote Communication Unit Expansion Card 208 #3 and Piggyback card 297 3.5 Voltage regulator

CARD.5. Remote CAP Unit Expansion Card 267#4

RadioNet DCP RTU –
Communication card and Piggy voltage regulator card for NetaCap soil moisture Sensor.

Communication card part number:

00035-013150 serial expansion card

RS232/485/SDI12 (card #231)

The piggy card part number:

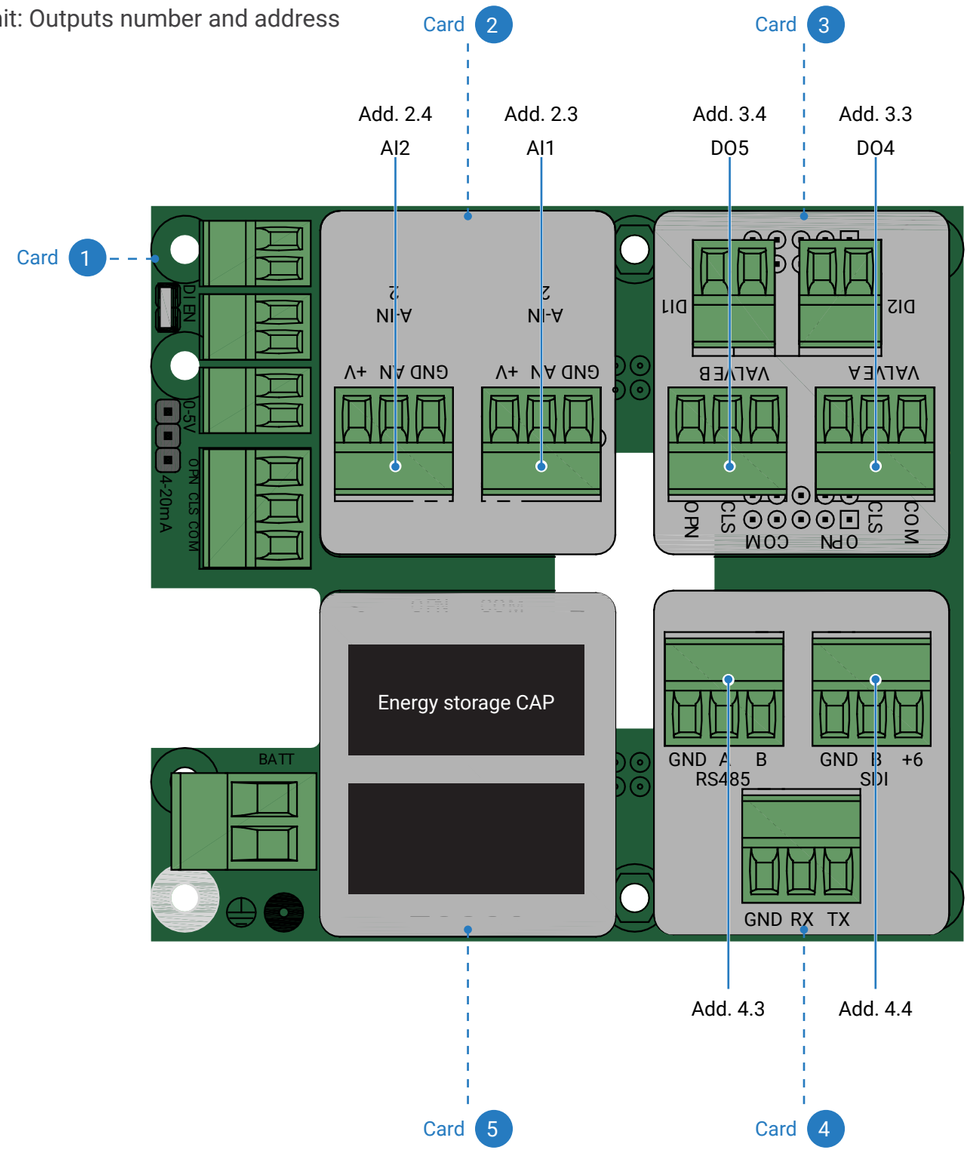
75330-000006 NetaCap 3.5V regulator

(card #297) - NetaCap or DFM.

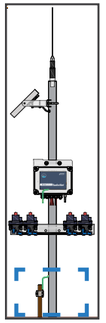
Add = Polenet address #

DO. = Digital output #

Remote unit: Outputs number and address



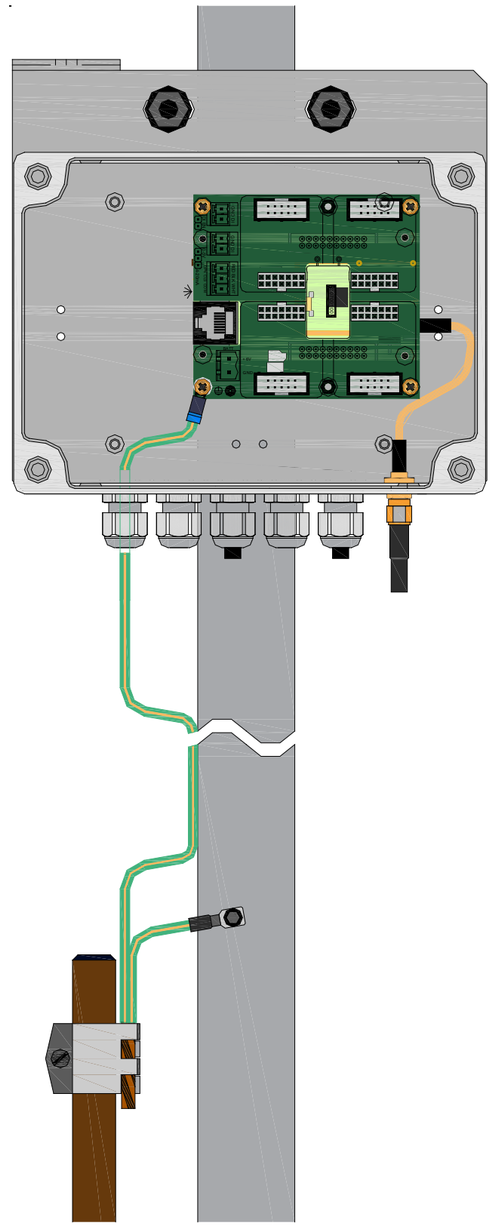
7.6 Installation - Grounding Remote Site



5 **Grounding**

Grounding is extensively dealt with under the Central Site Installation for more detail refer to Section 6.5.

- Proper electrical grounding in combination with the RadioNet internal protection is essential to protect the system, reduce the risk of damage, and prolong its lifetime.
- Correct selection and installation of equipment will help protect your system and reduce the risk of human injury.
- Proper grounding provides an easy path for electrical current to return to its source
- Less than 5 ohms will be considered as a good ground.
- Ground Rods: Ground rods are used to efficiently connect the system to earth where current may be dissipated in the soil. Typically, they are a Copper sheathed Steel Rod.
- Ground Wire: The ground wire is a large copper wire that connects the main circuit panel to the ground rod. Follow local regulation for minimum sizing.
  - It is important that the wire not be cut.
  - Avoid tight bends in the cable.
  - **Do Not** coil the earth cable under any circumstance.
- Ground Clamps: Ground wires should not be merely wrapped around a ground rod. The most common clamp is known as an acorn clamp. Do not use pipe clamps rated for water lines or hose clamps to attach the ground wire.



NOTE

It is highly Recommended that the Mast Pole have a separated Grounding Wire to the Remote Unit. The Ground Wires are then bonded before inserting into the Ground Rod Clamp.

8. Host Accessories

8.1 Installing - Host Input and Output Cards

The Host Unit can be fitted with two on board I/O cards.

- The Parallel Input Card.
- The 48 Output Card.

8.1.1 Installing-Host Parallel Input Card

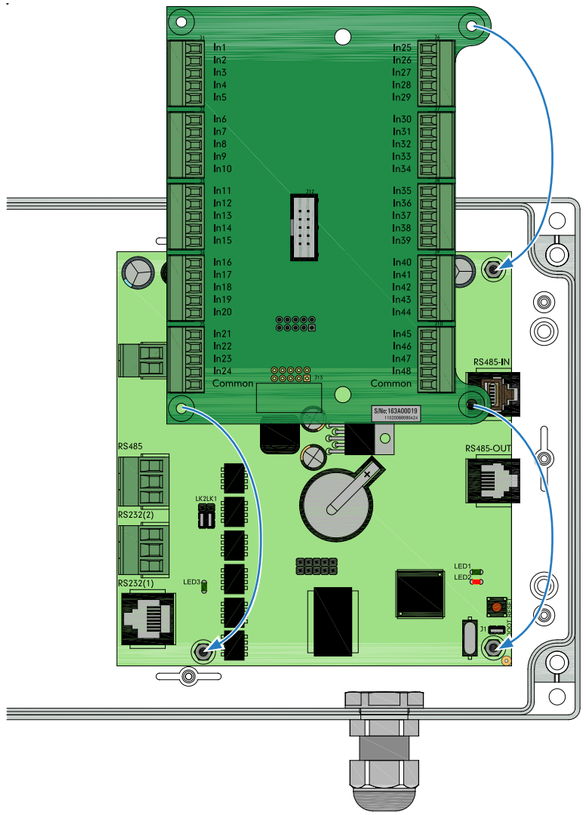
This card is designed to allow the RadioNet system to be used with any Control Device with a 24Volt AC output. The maximum number of 24VAC inputs the Card can except is 48. Each of the outputs from the Control Device can be configured in the Host to trigger one or more outputs on the RadioNet system. While the Output in the Control device is “ON” [powered] the Output in the mapped Remote Unit will remain “ON”.

NOTE

The Card is called an Input Card because it receives and input into the Host from an external Output.

The Input Card is installed in the Host Unit using the supplied standoff mounts and screws.

1. Remove the existing Host retaining screws.
2. Screw in the standoff mounts.
3. Install the Input Card making sure that the header on the under side of the card mates with the pins on the Host PCB.
4. Wire the Control device outputs into the Terminal on the Input Card. Follow the numbered sequence on the Input Card to insure easy output mapping.
5. Connect the Control device common to the common on the Input Card.
6. Use the Left side Common for Inputs 1 to 24 and the Right side Common for Inputs 25 to 48



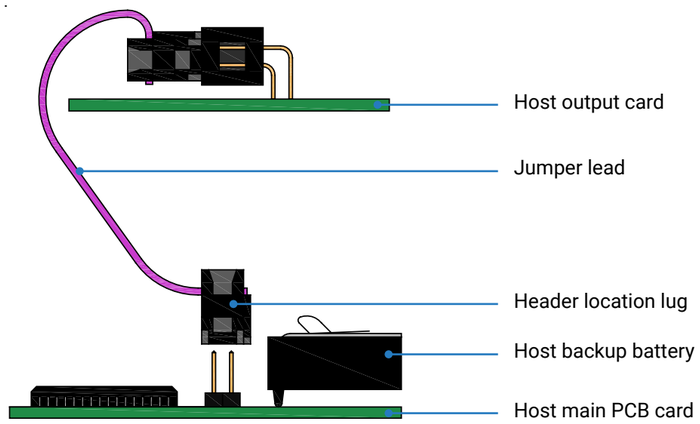
8.1.2 Installing - Host Output Card or Playback Card

The Output Card is installed in the Host Unit using the supplied standoff mounts and screws. If the Output Card is installed alone the Jumper Lead is used to connect to the Host. The Output Card can be installed with the Input Card.

This card is designed to allow the RadioNet system to be used with any Control Device that requires a dry contact as a digital input. The Card mimics an input received in a Remote Unit then outputs the state of this input to the Control device. The maximum number of inputs on the Card can mimic is 48. Each of the inputs from the Remote Units can be configured in the Host to trigger one or more outputs on the Playback Card

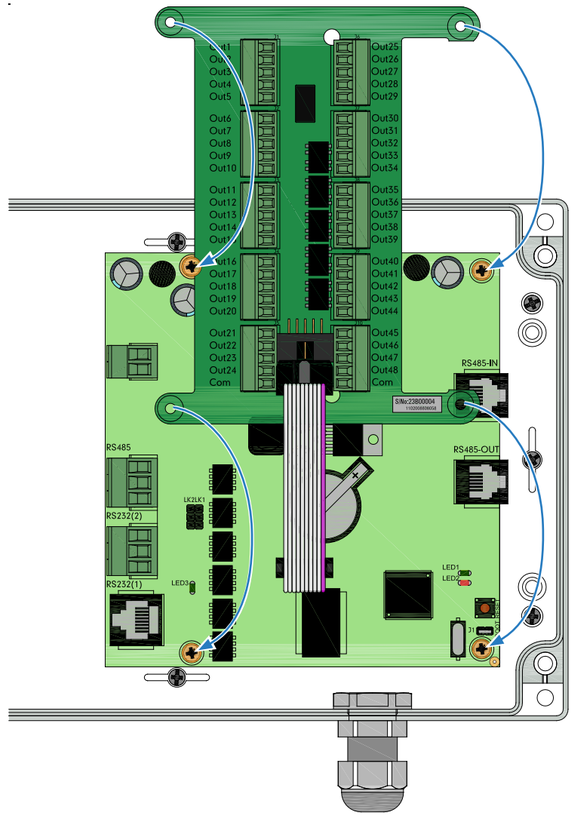
NOTE

The Card is called an Output Card because it plays back and input from a Remote Unit as an Output to the digital Inputs on the External Control device.



8.1.3 Host Output Card Only.

1. Remove the existing Host retaining screws.
2. Screw in the standoff mounts.
3. Connect the Jumper Lead to the header pins on the Host Board.
4. Install the Input Card then connect the Jumper Lead to the Header Socket in the lower middle of the Card.
5. Wire the Control device Inputs into the Terminal on the Output Card. Follow the numbered sequence on the Output Card to insure easy output mapping.
6. Use the Left side Common for Outputs 1 to 24 and the Right side Common for Outputs 25 to 48



9. Maintenance

9.1 Maintenance - Host Unit

The Host unit requires very little maintenance. However, the following checks are recommended.

- Every 12 months do visual inspection of the unit.
- Check the 12VDC power supply. [See the Battery Maintenance below]
- Check the RS485 lead from the controller for signs of damage
- Check the RS485 lead to the Base for signs of damage.
- Check inside the enclosure for signs of insect intrusion.

- Undertake remedial action where required.
  - Clean and or replace the battery.
  - Repair or replace any damaged leads.
  - Clean any insect or dust residue and seal any points of entry.

9.2 Maintenance - Base Unit

The Base unit requires very little maintenance. However the following checks are recommended.

- Every 12 months do visual inspection of the unit.
- Check the 12VDC power supply. [See the Battery Maintenance below]
- Check the RS485 lead to the Host for signs of damage.
- Check inside the enclosure for signs of insect intrusion.

- Undertake remedial action where required.
  - Clean and or replace the battery.
  - Repair or replace any damaged leads.
  - Clean any insect or dust residue and seal any points of entry.

9.3 Maintenance - Remote Unit

The Remote Unit will require very little maintenance. Periodic visual inspection of each unit will insure reliable operation. The following checks are recommended.

- Every 12 months do visual inspection of the unit.
- Check the wiring to the output devices. [Solenoids or relays]
- Check the Antenna and Antenna cable for damage.
- Check inside the enclosure for signs of insect intrusion.
- Check inside for signs of moisture ingress.
- Check that all terminal screws are tight.
- Check for any signs of corrosion on the battery terminals.
- Check the Solar Panel. [Refer to the Solar Panel Maintenance.]

- Undertake remedial action where required.
  - Repair or replace any damaged leads.
  - Repair or replace damaged antenna or antenna cable.
  - Clean any insect or dust residue and seal any points of entry.
  - Tighten screws where necessary.
  - Clean corroded battery terminals, coat with anti-corrosion product if necessary.

9.4 Maintenance - Solar Panel

Solar modules require very little maintenance. Under most conditions, normal rainfall is sufficient to keep the module glass clean.

- Check once per year for build–up of dust or debris.
- Modules that are mounted, flat [0 deg tilt angle] should be cleaned more often, as they will not “self-clean” as effectively modules mounted at a 15 deg tilt or greater.
- Once a year, check the tightness of terminal screws and the general condition of the wiring.
- Check to be sure that mounting hardware is tight. Loose bolts could result in a damaged panel.
- Check for possible shading of the panel from surrounding vegetation.

- Undertake remedial action where required.
  - Do not use solvents or abrasive cleaners on any part of the Photovoltaic module.
  - If dirt build-up becomes excessive, clean the glass with a soft cloth using mild detergent and water
  - Repair or replace any damaged leads.
  - Remove any vegetation shading the panel or re-site the panel
  - Tighten loose fixing screws and bolts.
  - Adjust the tilt angle if the screw is loose.

9.5 Maintenance - Batteries

All batteries supplied with the RadioNet system are valve regulated lead acid type. They are designed to be low maintenance. Gasses generated during float charge are recombined in the cell, meaning there’s no need to add electrolyte. They are trouble-free and safe for operation in any position. The batteries are designed to provide a long service life of approximately 4 to 5 years giving dependable service in normal operating conditions.

It is recommended that a visual inspection of the batteries be done every 12 months.

- Inspect for corrosion of the terminals.
- Corrosion build-up can create a good deal of electrical resistance, which can contribute to shortened battery life and the waste of power.
- Remove the charging device and check the unloaded voltage of the battery. Typically, the battery voltage should be at or slightly above the rated voltage of the battery.
- Check the charging system of a battery with a voltage at 20% of the rated voltage.
- Log on to the RadioNet Host on a six-monthly basis with the PoleNet software and the battery voltages. Batteries that are outside of the normal range should be visually inspected.

- Undertake remedial action where required.
  - If there is corrosion on the terminal carefully clean these with warm water.
  - Do not use solvents or abrasive cleaners.

10. Appendix

10.1 Appendix 1. Operating Frequencies

Frequency Range		Peak Power (mW)	Country	Designated Use	Licence	Comments
From (MHz)	To (MHz)					
433.05 MHz	434.79 MHz	25mW	AUST	LIPD	Free	
450.0 MHz	470.00 MHz	100mW	AUST	(2km Sub-Local) (Fixed Mobile)	Required	Repeater sites must also be registered
450.0 MHz	470.00 MHz	500mW	AUST	(5km Local) (Fixed Mobile)	Required	Repeater sites must also be registered
472.0125 MHz	472.1125 MHz	100mW	AUST	LIPD	Free	
433.05 MHz	434.79 MHz	25mW	NZ	SRD= Telemetry/ Telecommand	Free	
458.54 MHz	458.61 MHz	500mW	NZ	SRD = Unrestricted	Free	
466.80 MHz	466.85 MHz	500mW	NZ	SRD = Unrestricted	Free	
471.00 MHz	471.50 MHz	100mW	NZ	SRD = Unrestricted	Free	
433.05 MHz	434.79 MHz	100mW	IL	SRD= Telemetry/ Telecommand	Free	
450.00 MGz	470.00 MHz	120mW	USA	Agriculture	Required	FCC License

10.2 Appendix 2. Monopole Antenna Tuning

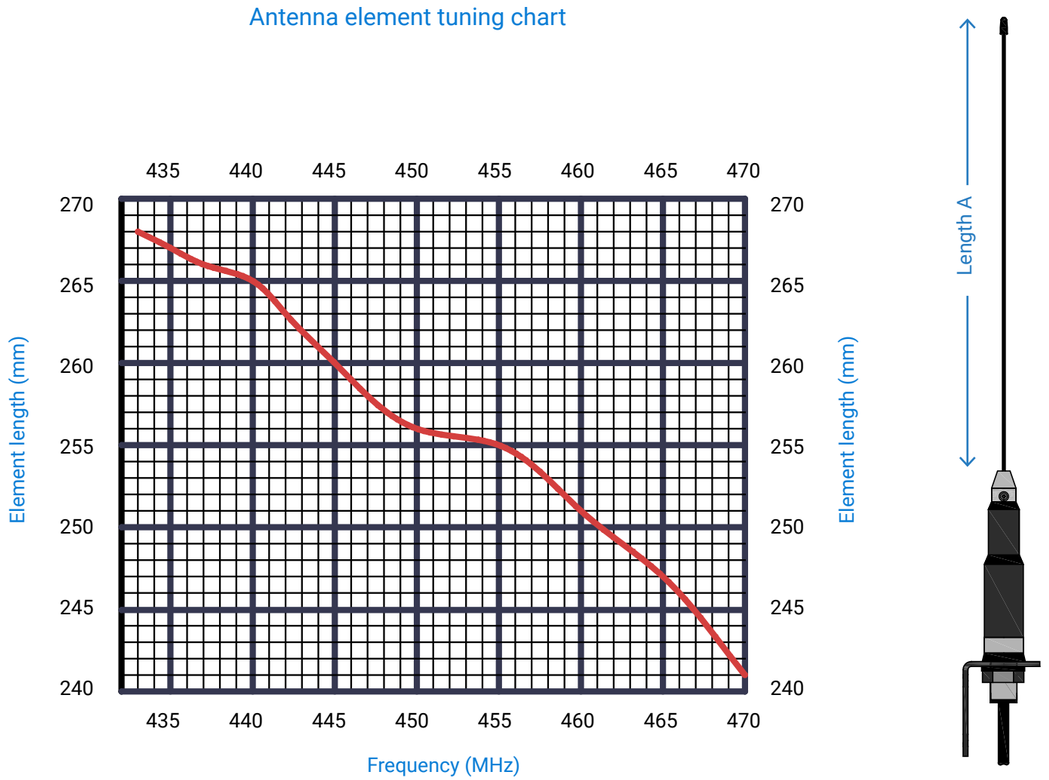
The ½ Wave Monopole Antenna element must cut to length according to the System Frequency

To tune the antenna:

1. Remove the element from the transformer by undoing the Allen Screw at the top of the transformer.
2. Refer to the chart below by selecting the system frequency on the bottom or top axis; trace the frequency line until it intersects the cutting line. Follow the intersecting length line to the left or right axis to find the desired length for the antenna element “A”.
3. Measure the element from the top end and cut at the desired length.
4. Fit the element back into the transformer and tighten the Allen screw.
5. The antenna is now ready for installation.

NOTE

The tuning chart below is provided as a guide only. All installations should be checked with a VSWR meter.



10.3 Appendix 3. Specifications

10.3.1 Host Unit

Environmental	
Operating Temperature	-20O C to +65O C (-4O F to +140O F)
Relative Operating Humidity	0 to 95% without condensation @ +50O C (122O F)
Operating Altitude	-400 m to +4000 m (-1300 ft to 13,000 ft) above sea level
Housing	IP66 with 1 cable gland and 1 capped hole

Mechanical	
Dimensions	240w x 160h x 120d mm
Weight	
Mounting	226 w x 146 h x 4.0dia mm

Electrical	
Power Requirements	Input Voltage 10 to 16Volts DC with less than 1Volt ripple
Current Consumption	Maximum 2.5 Amps
Current Consumption	Typical steady state 0.18 Amps

Communication	
Out Communication Ports	RS485 Multi Drop 2 Wire Output
In Communication Ports	RS232 to PC Serial port for PoleNet connection
In Communication Ports	Modbus Slave Binary RS232/RS485, 9600 to 115200 bps
In Communication Ports	NMC-PRO RS232/RS485, 9600 bps

10.3.2 Base Unit

Environmental	
Operating Temperature	-20 °C to +65 °C (-4 °F to +140 °F)
Relative Operating Humidity	0 to 95% without condensation @ +50 °C (122 °F)
Operating Altitude	-400 m to +4000 m (-1300 ft to 13,000 ft) above sea level
Housing	IP66 with 1 cable gland and 1 capped hole

Mechanical	
Dimensions	175 w x 127 x 99d mm
Weight	
Mounting	157w x 109h x 4.0dia mm [If supplied bracket not used]

Communication	
Communication Ports	RS485 Multi Drop 2 Wire
Software programming port	RS232

Radio	
RF Frequency	UHF 433 to 472 MHz PoleNet Programmable
Channel spacing	12.5 KHz

Radio Transmission	
(TX power-10 mW)	
(TX power-100 mW)	

Radio Receives	
TX RF power mode:	5 -16.3 mW @.30 °C - +60 °C (-22 °F to 140 °F)
Diagnostics	LEDs Red,

Electrical	
Input Voltage	
Host Source	(DC Power In) via RS485 12.00 to 13.80 VDC
External Source	12.00 to 13.80 VDC

10.3.3 Remote Unit

Environmental	
Operating Temperature	-20 °C to +65 °C (-4 °F to +140 °F)
Relative Operating Humidity	0 to 95% without condensation @ +50 °C (122 °F)
Operating Altitude	-400 m to +4000 m (-1300 ft to 13,000 ft) above sea level
Housing	IP66 with 1 cable gland and 1 capped hole

Mechanical	
Dimensions	175 w x 127 x 99d mm
Weight	
Mounting	157w x 109h x 4.0dia mm [If supplied bracket not used]

Communication	
Software programming port	RS232 to PC base PoleNet Software

Radio	
RF Frequency	UHF 433 to 472 MHz PoleNet Programmable
Channel spacing	12.5 KHz
Diagnostics	LED Red

Electrical	
Input Voltage	6 VDC
Outputs Number	9 Maximum
Outputs Type	Latching Two or Three wire Auto Sensing
Outputs Voltage	9-15.5 Volts
Outputs Firing Current	4 Amps Maximum
Short Circuit Protection	@ 5 Amps with Auto-Retry
Open Circuit Detection	Yes
Inputs Number	10 Maximum
Inputs Type	Voltage Free Contact
Inputs Resistance	500 ohms Maximum
Inputs Pulse Rate	2Hz Maximum [120 pulses per minute]
Inputs Pulse Width	500ms Maximum

10.3.4 Solar Panel

Solar Panel	
Dimensions	142 x 159 x 25mm [without the mounting bracket]
Weight	0.28 kg including cable
Cable length	5 meters
Cable	4 Cores
Conductor # / Dia	14/0.2mm
Nominal Area	0.4 mm2
Insulation	PVC/PVC Conductor / Sheath
Insulation Thickness	0.3mm
Sheath Thickness	0.5mm
Nominal O.D.	4.6mm
Colors	Red & White [+] Positive, Black & Blue [-] Negative

Solar Panel Electrical	
Wired for 6 Volts	Parallel
Rated Power	3*Watts
Volts at Max. Power	9V @ MP*
Current at Max. Power	182 mA*
Short Circuit Current	190 mA*
Open Circuit Voltage	10.7 V @ OC*
	* Values nominal due to manufacturing tolerance.

10.3.5 12 Volt DC Battery

12 V Battery Mechanical		
Dimensions	181.5 L x77 W x 167.5 H mm [Height included the Terminals]	
Weight	5.7 kg	
Terminal Type	T3 Bolted 13 x 14 x 2mm with 6mm Hole [Supplied with Bolt and Nut]	

12V Battery Electrical		
Nominal Voltage	12 Volts	
Nominal Capacity [20HR]	18 AH	
Rated Capacity	20-hour rate [0.90A]	18.0AH
	1 hour rate [11.16A]	11.16AH
Temp affects on capacity.	40° C	103%
	25° C	100%
	0° C	86%
Initial charge current	< 5.4A	
Voltage	14.4~15.0 V @ 25o C Temp Coefficient -30mV/ oC	

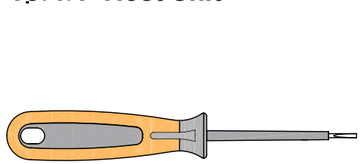
10.3.6 6 Volt DC Battery

6V Battery Mechanical		
Dimensions	97 L x 24 W x 57 H mm [Height included the Terminals]	
Weight	0.28 kg	
Terminal Type	T1 Spade 4.75 x 6.35 x 0.8mm]	

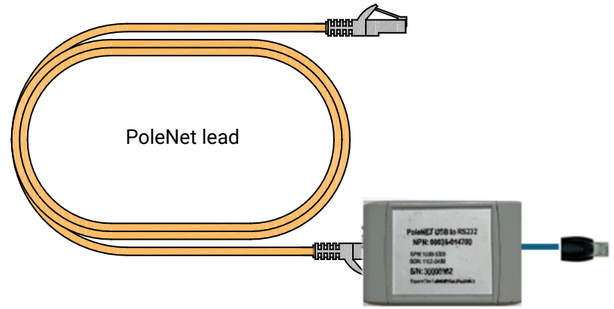
6V Battery Electrical		
Nominal Voltage	6 Volts	
Nominal Capacity [20HR]	1.2 AH	
Rated Capacity	20-hour rate [60mA]	1.20AH
	1 hour rate [740mA]	0.74AH
Temp affects on capacity.	40° C	103%
	25° C	100%
	0° C	86%
Initial charge current	< 0.36A	
Voltage	7.2~7.5 V @ 25o C Temperature Coeficiente -10mV/ o C	

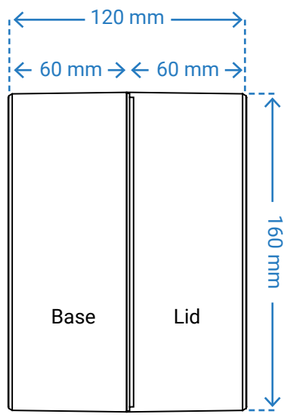
10.4 Appendix 4. Dimensions and Contents

10.4.1 Host Unit

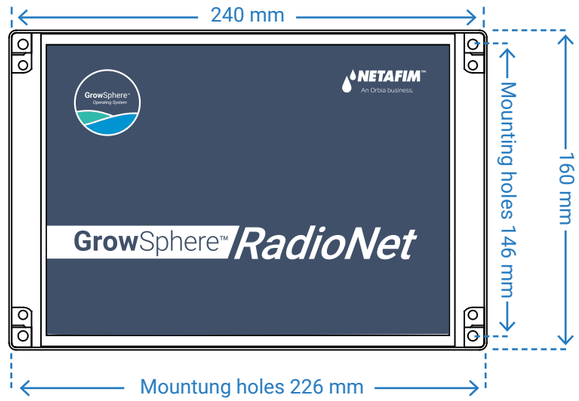


Flat screwdriver 2.0 mm blade





End view

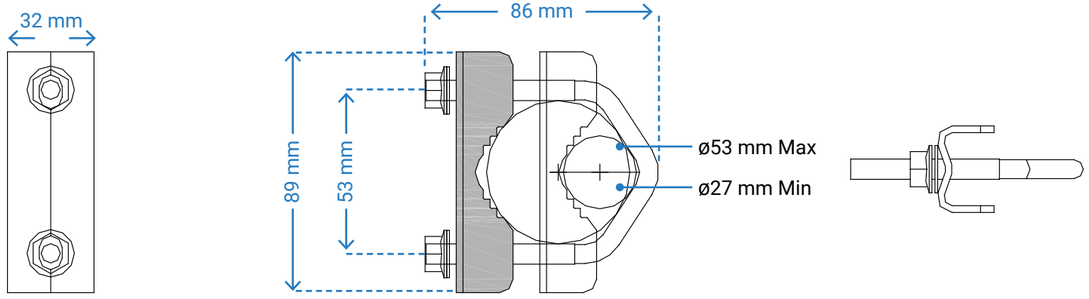


Front view

The Host is supplied with:

- Flat Screwdriver 2mm Blade for use on the terminal screws. [Loose]
- PoleNet Adaptor and Lead. [Loose]
- 2-meter fused DC power lead with terminals. [Fitted]
- 3-meter RJ11 [6p6c] Lead for RS485 communication to the Base Unit. [Fitted]

10.4.2 U-Bolt Clamp



The U-Bolt is supplied with the Base, Remote Unit, and the Solar Panel

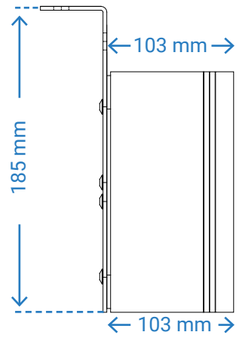
10.4.3 Base Unit and Remote Unit

Base Unit

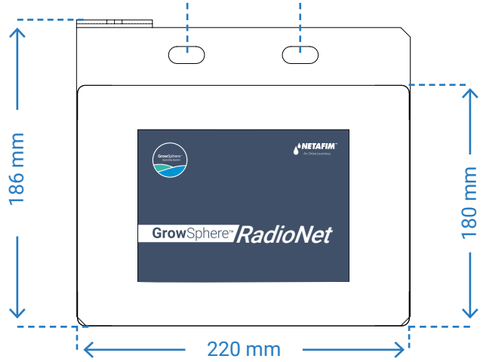
The Base enclosure is supplied with:

- A 50mm U-Bolt. [Loose]
- Aluminum Back Mounting plate. [Fitted]
- 5 x 12mm Glands. Remote Unit. [Fitted]
- 1 x Capped hole. Base Unit [Fitted]
- 1 x Open hole for gland access. Base Unit. [Fitted]

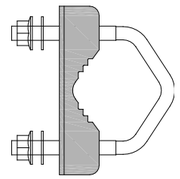
End view



Front view



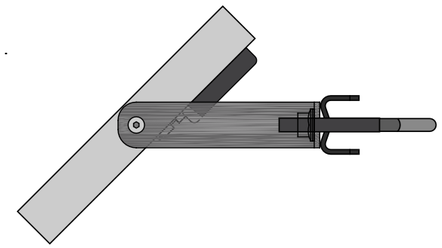
U-Bolt

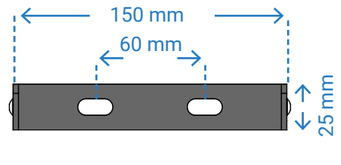


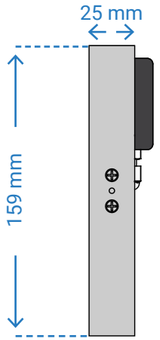
10.4.4 Solar Panel

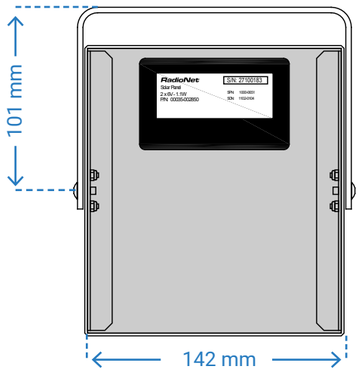
The Solar Panel is supplied with:

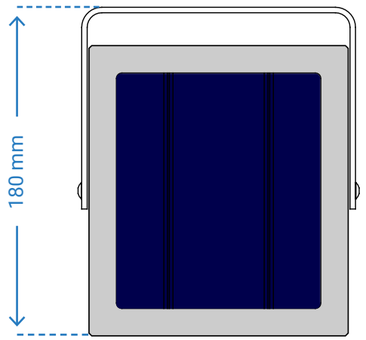
- A 50mm U-Bolt. [Loose]
- 5 meters of cable. [Fitted]









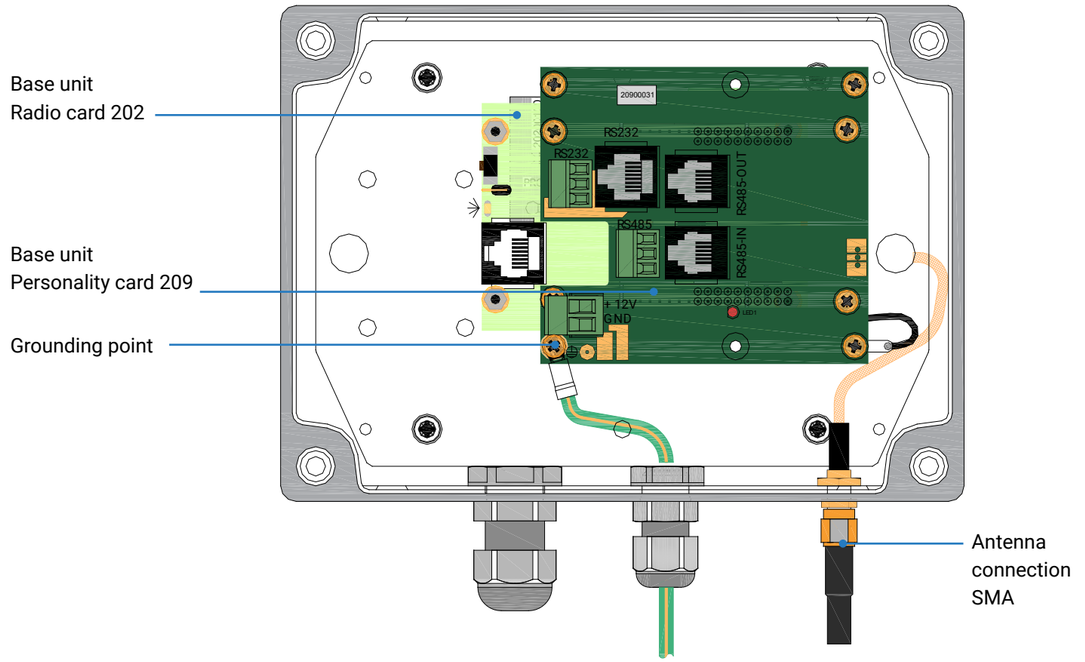


10.5 Appendix 5: Components

10.5.1 Base Unit Components

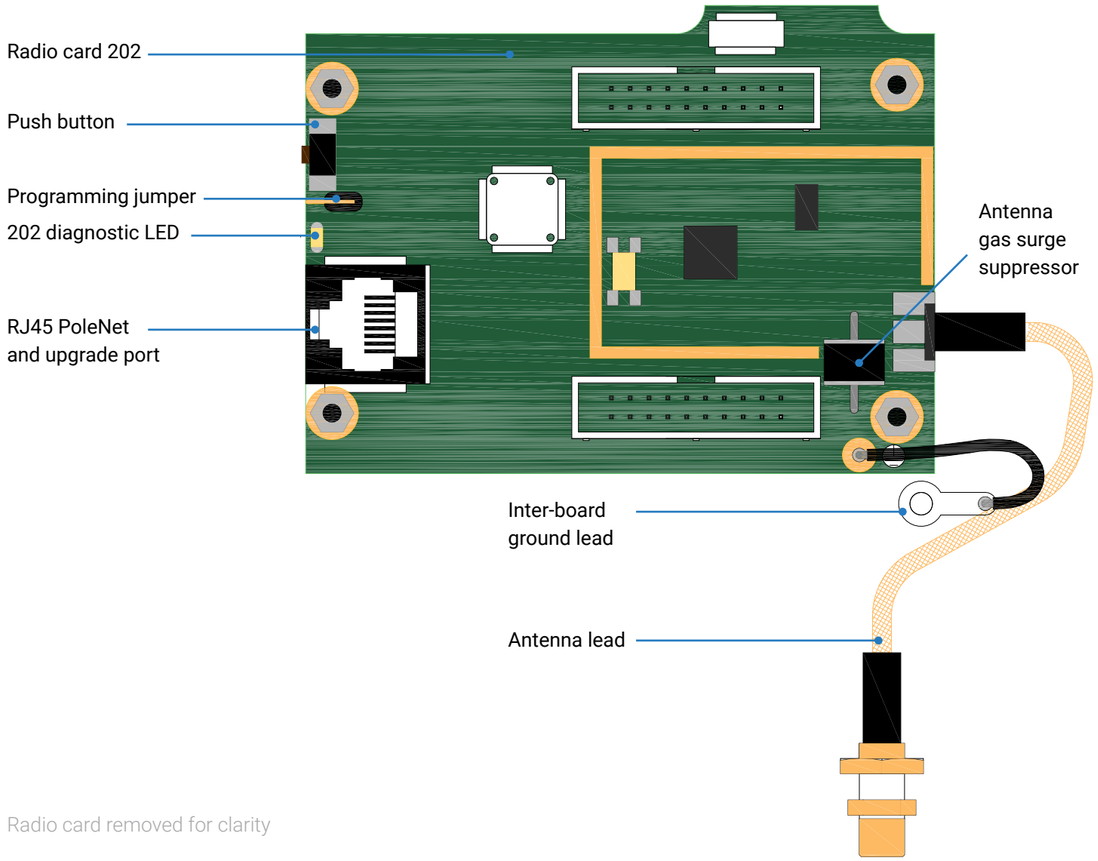
The Base Unit consist of two component cards. They are installed one above the other.

- The lower board is the radio card.
- the top board is the personality card.



10.5.1.1 Base Unit Radio Card 202

- Push Button: Forces the radio to transmit. Used for diagnostics.
- Programming Jumper: Jumper required when updating firmware.
- Diagnostic LED: Refer to the Configuration Manual for usage.
- Radio card RJ45 Port: Used with PoleNet to configure the Radio and update the firmware. [See the Configuration Manual for usage.]

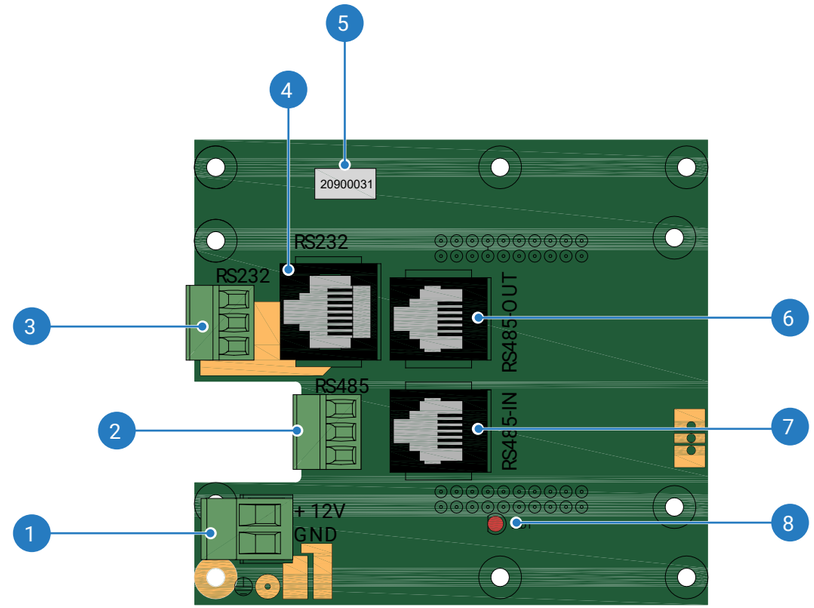


Radio card removed for clarity

10.5.1.2 Base Unit Personality Card 209

1. External source 12 VDC power supply terminal. [Must be fused if used]
2. Future use RS485 terminal.
3. Future use RS232 terminal.
4. Future use RS232 RJ45 socket.
5. ESN: Electronic Serial Number: Identifies the Card on the Host.
6. RS485-OUT RJ45 Socket [connection to host]
7. Future use RS485-in socket.
8. Diagnostics LED #1 209 Card

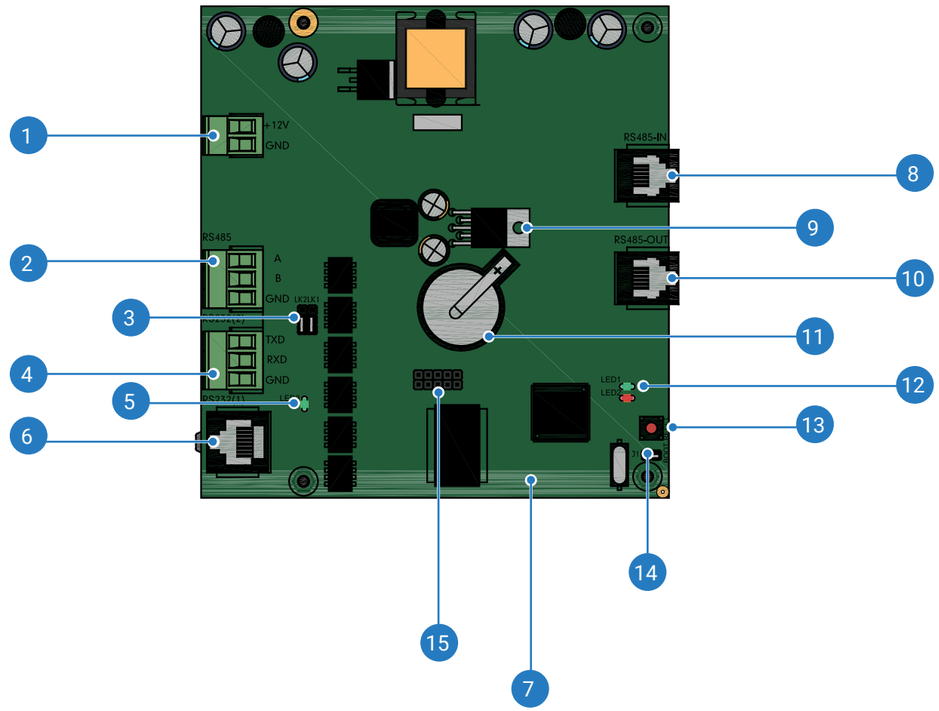
   The LED “H” flashes [slowly long on & off] when power is supplied to the card. The LED turns off after about 2 to 5 minutes. The LED “H” does not light when the programming jumper is in place on the radio card.



10.5.2 Host Unit Components

The indicated components are:

1. Power Supply 12 Volt DC Terminal
2. RS485 Terminal for connection to Control Device.
3. Communication configuration jumpers.
4. RS232 (2) Terminal for connection to the Control Device.
5. Diagnostic LED3 Green: Power indicator, flashes when the host is powered.
6. RS232 (1) Port for connection to Local PC for Configuration, Diagnostics and loading Firmware.
7. Host Serial ID number used for tracking of the Card.
8. RS485-In Socket for Connection to Base Unit.
9. U27 Regulator. Before changing any Jumpers discharge Personal Static electricity by grounding to the tab on the right on this component. This is to prevent permanent damage to the Host!
10. RS485-Out Socket. For future use.
11. Lithium backup battery CR2032
12. Diagnostic LED1 Red and LED2 Green. Not defined yet. When powered they are always on. They are off during firmware upgrading.
13. Reset Button.
14. Jumper J1: When linked the Host enters Bootstrap loader mode for Firmware updating.
15. J11 Header pins for connection to the Host onboard I/O cards.

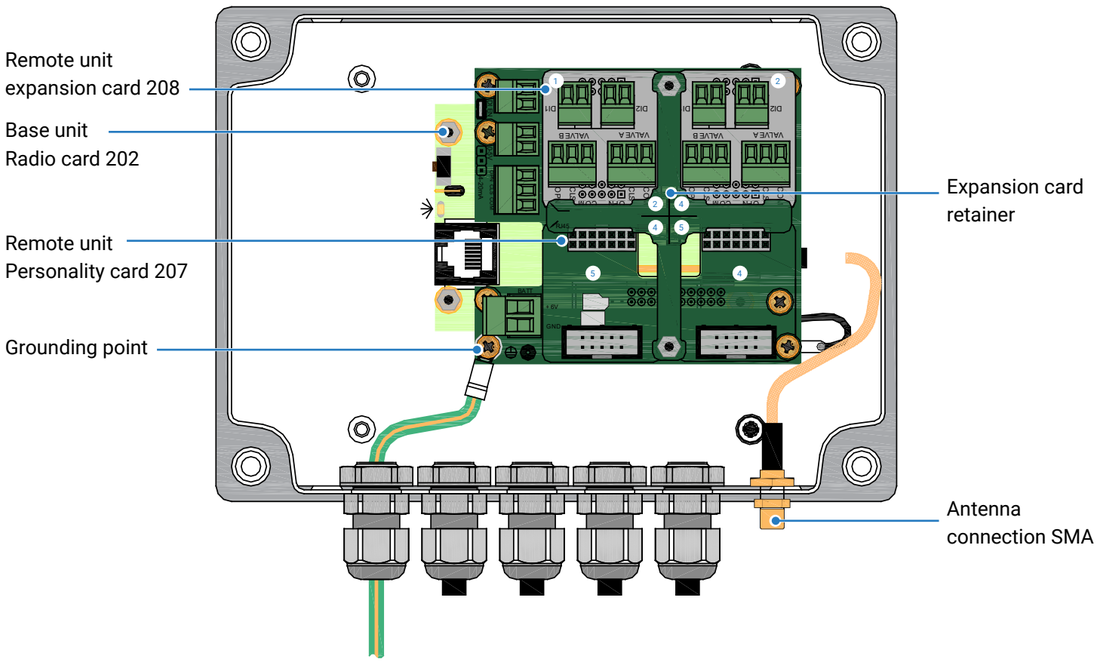


10.5.3 Remote Unit Components

The Remote Unit Agile RTU and the RTU DCP consist of three main component cards. They are installed one above the other.

Agile RTU Example:

1. The lower board is the radio card and
2. Above is the personality card or Base Input / Output card
3. To this up to four expansion cards can be installed.



Remote unit: Note radio card offset for clarity

10.5.3.1 Remote Unit Radio Card 202

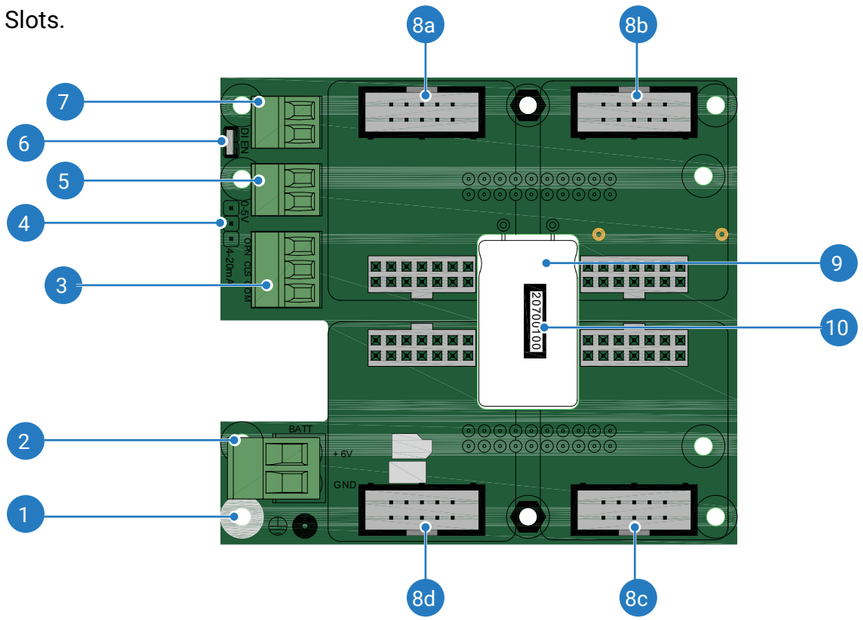
The Remote Unit shares the same Radio as the Base Unit. Please refer to Section 6.2.3.1 for the full description.

- Push Button: Forces the radio to transmit. Used for diagnostics.
- Programming Jumper: Jumper required when updating firmware.
- Diagnostic LED: Refer to the Configuration Manual for usage.
- Radio card RJ45 Port: Used with PoleNet to configure the Radio and update the firmware. [See the Configuration Manual for usage.]

10.5.3.2 Remote Unit Personality I/O Card 207

The Remote Unit Personality I/O card is equipped with the following:

- 2 x Digital Input terminals
- 1 x Latching Output
- 4 x Expansion Card Slots.



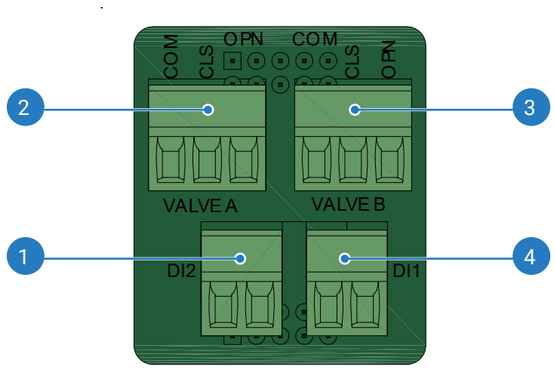
1. Grounding Point
2. Power Supply terminal 6 Volts DC.
3. Latching Output #1 Terminal. 2 or 3 wire pulsed output [DC Latching].
4. Future use.
5. Digital Input #2.
6. Digital Input Jumper. Must be in place.
7. Digital Input #1
8. 1 to 4 Header for the Optional I/O Expansion Card.
9. Outputs Capacitor
10. ESN: Electronic Serial Number.

10.5.3.3 Remote Unit Expansion Card 208

The Expansion I/O Card is added to the basic Remote Unit card to increase the input and output capacity of the whole unit.

The Expansion card is equipped with:

- 2 x Digital Inputs.
- 2 x latching Outputs.



1. Expansion Digital Input #2
2. Expansion Latching Output #1
3. Expansion Latching Output #2
4. Expansion Digital Output #1

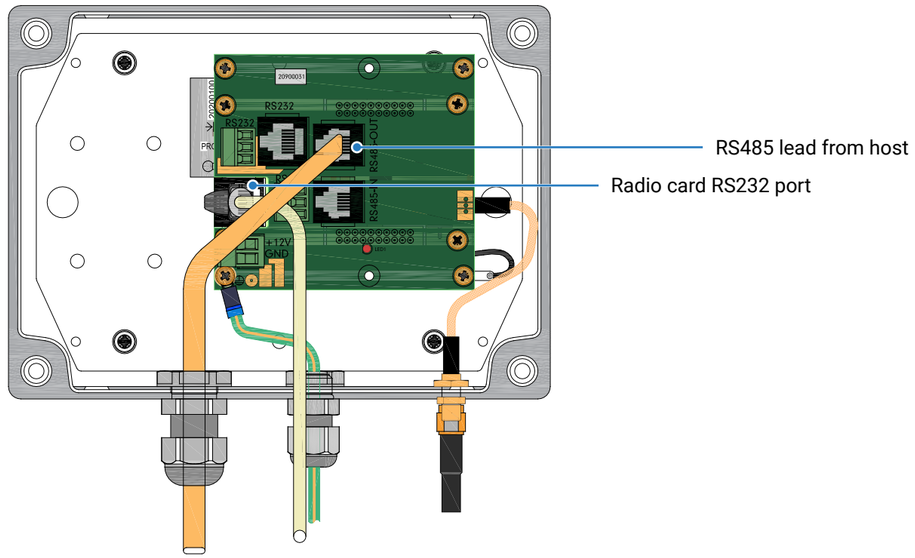
10.6 Appendix 6: PoleNet Connections

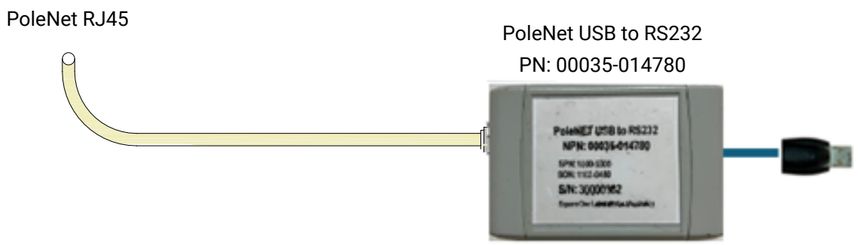
10.6.1 Base Unit RS232 to PoleNet Software and Loading Firmware

This connection is used to configure the Base Radio using the PoleNet Software. The Base radio is connected to the serial com-port of the programming PC using the lead and adaptor supplied with the Host Unit. When connecting with the PoleNet software the Base must be powered. Either using the Host RS485 lead or the external 12VDC power source.

Uses of the Port:

- Loading the System Route Map [RadioNet Manual Section 5.2.3]
- Configuring the Base Radio with: [RadioNet Manual Section 5.2.1]
  - System Frequency
  - Radio output power
  - The external power source, voltage thresholds.
- Loading firmware via the C:\ prompt. [RadioNet Manual Section 9.5]





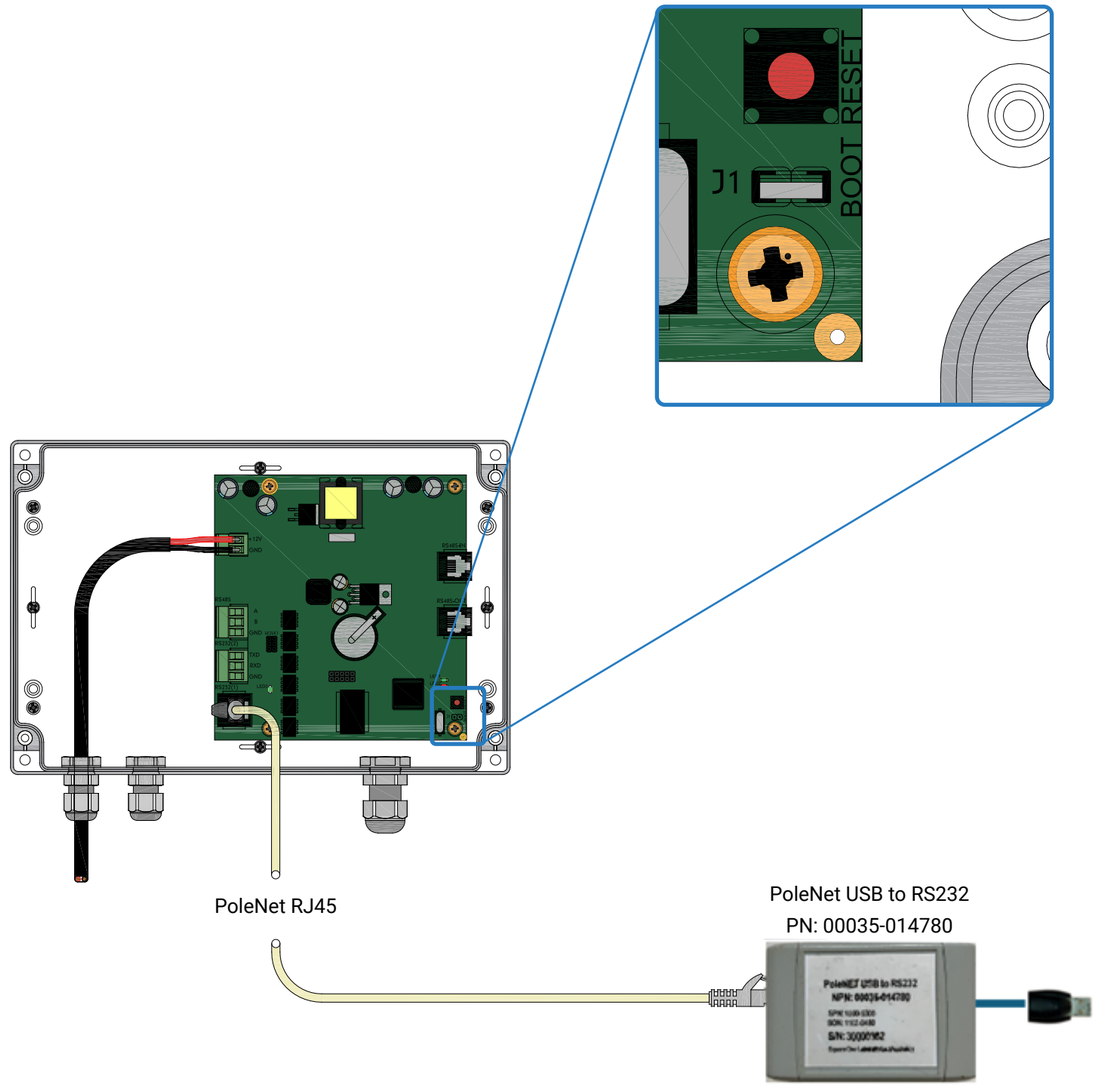
NOTE

Plugging in the PoleNet lead disables the push button function.

10.6.2 Host RS232 to PoleNet Software and Loading Firmware

For configuration and diagnostics of the RadioNet System the Host Unit must be connected to PC running the PoleNet software.

- This connection is serial RS232. A lead and PoleNet Adaptor is supplied with each Host for this purpose.
- It is recommended that this lead is left either inside the Host Enclosure or inside the Control Device enclosure on completion of the installation and commissioning.
- The Host must be powered by 12VDC before the PoleNet software will connect to the Host.
- Please refer to the RadioNet User Manual Section 5.3 for the use of the software.
- If the firmware in the Host must be changed then the Host must be placed into Bootstrap mode. [Refer to RadioNet User Manual Section 9.6] Bootstrap mode is activated by fitting a Jumper to link J1 in the bottom right corner of the Host.



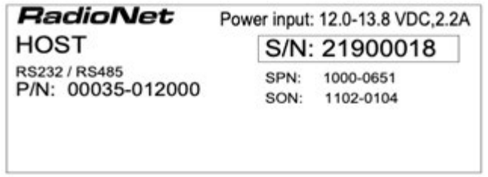
10.7 Appendix 7: Labels

All the Netafim RadioNet equipment is labelled on the outside of the enclosure. The information on the label is to identify the Unit. This identity is used in mapping and configuration of the system.

It is recommended that before installing any equipment that the Serial Numbers of all the equipment is recorded on the System Data Sheets.

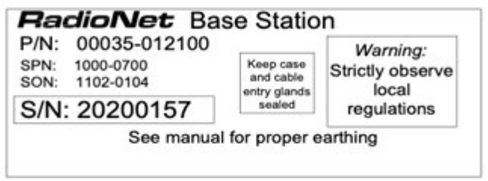
10.7.1 Host Unit

Located on the bottom side of the base.



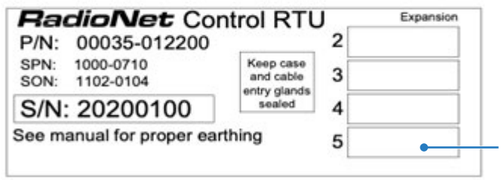
10.7.2 Base Unit

Located on the right side of the bas.



10.7.3 Remote Unit RTU

Located on the right side of the base



Mark on the Remote unit if Expansion Cards are fitted.

10.7.4 Solar Panel

Located on the back of the panel.

All labels display the following information:

- P/N: Netafim's Part Number
- S/N: Serial Number. This number also identifies the item in the system.
- SPN: Manufacturers Part Number. Not used by Netafim.
- SON: Manufacturers Batch Number. Not used by Netafim.

Record the following items on the table in the System Data Sheet section n the following pages

- Host Unit Serial Number.
- Base Unit Serial Number.
- Remote Units Serial Numbers.

10.8 Appendix 8: Latching Device Compatibility List

Manufacture	Model	Configuration	Wire	Color
Netafim	Aquative Series 1	12 VDC Latch Pulse	2	Orange (Open) Black/White (Close)
Netafim	Aquative Series 2	9-40 VDC Latch Pulse	2	Red (Open) Black (Close)
Baccara	Geva 60	12 VDC Latching Pulse	2	Red (Open) Black (Close)
Baccara	Geva 60	12 VDC Latching Pulse	3	Red (Open) White (Common) Black (Close)
Bermad	S985	12-50 VDC Latching Pulse	3	Red (Open) White (Common) Black (Close)
Bermad	S982	12-50 VDC Latching Pulse	2	Red (Open) Black (Close)
Bermad	S-392-2	6-40 VDC Latching Pulse	2	Red (Open) Black (Close)
Izumi	RY2KS	12 VDC Latch Pulse	2 or 3	

10.9 Appendix 9: Warranty Statement

Netafim products are warranted to be free from defects in material and workmanship for a period of ONE (1) YEAR, this express warranty is extended by Netafim to the original purchaser only, and only to those purchasing for purpose of leasing or solely for commercial, industrial, or governmental use.

This warranty is given in lieu of all other warranties express or implied which are specifically excluded, including warranties of merchantability or fitness for a particular purpose. In no event shall Netafim be liable for incidental or consequential damages to the full extent such may be disclaimed by law.

In the event of a defect, malfunction or failure to conform to specifications established by seller, or if appropriate, to specifications accepted by Seller in writing, during the period shown. Netafim, at its option, will either repair or replace the product or refund the purchase price thereof, and such action on the part of Netafim shall be the full extent of Netafim's liability hereunder.

This warranty is void if:

A. the product is used in other than its normal and customary manner.

B. the product has been subject to misuse, accident neglect, or damage.

C. unauthorized alterations or repairs have been made or unapproved parts used in the equipment.

This warranty extends only to individual products; batteries are excluded but carry their own separate limited warranty. Because each radio system is unique, Netafim disclaims liability for range, coverage, or operation of the system under this warranty except by a separate written agreement signed by an officer of Netafim. Non-Netafim manufactured products are excluded from this warranty, but subject to the warranty provided by their manufacturers, a copy of which will be supplied to you on specific written request. To obtain performance of this warranty, purchaser must contact its Netafim salesperson or Netafim at the address first above shown, attention Quality Assurance Department.

10.10 Appendix 10: System Data Sheet

The System Data Sheet as shown below provides an essential commissioning step that records information about the equipment used in the system. The sheet is designed to provide a ready reference for the key data required during the Mapping process when configuring the system. If you wish to print the data sheet it is provided in excel spreadsheet format with the PoleNet software.

Filling in the data sheet.

Headings and meanings.

1.	Project Name	The System Name The farm, project and or location
2.	Backup File Name	The Name of the Mapping and Route file for the System.
3.	Date	System Commissioned Date.
4.	RadioNet Host Serial #	Located on the bottom of the Host enclosure.
5.	RadioNet Base Unit Serial #	Located on the RHS* of the Base enclosure.
6.	RadioNet Host Firmware Version	PoleNet required to be connected to check.
7.	RadioNet Base Firmware Version	PoleNet required to be connected to check.
8.	RadioNet Remote Firmware Version	PoleNet required to be connected to check.
9.	RadioNet Frequency	The Frequency provided by the Licensing Authority.
10.	Cycle Time	4, 8, 16 and 32 second depending on the System.
11.	Site Latitude	This information is required to set the Solar panel.
12.	Tilt Angle	The angle the Solar Panel is set to for efficient operation.
13.	RadioNet Remote Units Serial #	Located on the RHS* of the Remotes enclosure.

Note: * RHS = Right Hand Side.

10.10.1 Filling in the data sheet

1.Fill-in the Remote Unit Serial #

2. Mark if the output is being used

3. Add the Output Description e.g. V1=Valve 1, F1=Filter 1, PM1=Pump1 etc.

4. Insert the internal Controller Output Number usually a sequential number after the local outputs on the controller

OUTPUTS		Main Card		Expansion Card 2				Expansion Card 3			
	RU Digital Output #	1		2		3		4		5	
Remote Unit S/N	20200100	1.3	X	2.3	X	2.4	X	3.3	X	3.4	
Output Description		V1		V2		V3		V4			
Controller Output #		17		18		19		20			
Remote Unit S/N	20200101	1.3	X	2.3	X	2.4		3.3		3.4	
		F5		F2							
		21		22							
	20200102	1.3	X	2.3		2.4					
		PM1									
Controller Output #		23									

The Inputs are filled in a similar manner.

INPUTS		Main Card				Expansion Card 2			
	RU Digital Input #	1		2		3		4	
Remote Unit S/N	20200101	1.1	X	1.2	X	2.1		2.2	
Input Description		WM1		DP1					
Controller Input #		9		10					

10.10.2 Example of filled in System Data Sheet

Project Name		RadioNet Frequency	MHz	
Backup File Name		Cycle Time	Sec.	
Date				
RadioNet Host S/N	RadioNet Host Version	Site Latitude	Deg.	Tilt Angle Deg.
RadioNet Base S/N	RadioNet Base Version	RadioNet Remote Version		

OUTPUTS		Main Card	Expansion Card 2		Expansion Card 3		Expansion Card 4		Expansion Card 5	
	RU Digital Output #	1	2	3	4	5	6	7	8	9
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										

Project Name				RadioNet Frequency	MHz		
Backup File Name				Cycle Time	Sec.		
Date							
RadioNet Host S/N		RadioNet Host Version		Site Latitude	Deg.	Tilt Angle	Deg.
RadioNet Base S/N		RadioNet Base Version		RadioNet Remote Version			

OUTPUTS		Main Card	Expansion Card 2		Expansion Card 3		Expansion Card 4		Expansion Card 5	
	RU Digital Output #	1	2	3	4	5	6	7	8	9
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										
Remote Unit S/N		1.3	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4
Output Description										
Controller Output #										

INPUTS		Main Card		Expansion Card 2		Expansion Card 3		Expansion Card 4		Expansion Card 5	
	RU Digital Input #	1	2	3	4	5	6	7	8	9	10
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											
Remote Unit S/N		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Input Description											
Controller Input #											

10.11 Appendix 11: NetaCap Soil Moisture Probe Connection.

The NetaCap soil moisture probe can be connected to the RadioNet DCP RTU.

The NetaCap probe is connected to the communication car and the Piggy voltage regulator card.

The communication port is the RS232 on the communication card, and the Piggy card is connected to the SD12 communication port.

The RadioNet communication expansion card part number and description:

00035-013150 Serial Expansion card RS232/485/SDI12 (Card #231)

The RadioNet communication expansion card part number and description:

00035-013150 Serial Expansion card RS232/485/SDI12 (Card #231)

The Piggy card part number and description:

75330-000006 NetaCap 3.5V regulator (Card #297) - NetaCap or DFM.

Wiring the NetaCap on the Serial card:

Green – TX on RS232

White – RX on RS232

Yellow – +V on SDI12

Brown – GND on SDI12

NOTE

The software setting and definition for the NetaCap soil moisture probe are explained on the RadioNet User Manual.