Agile Radio System User Manual

SQUARE ONE
LABORATORIES

DocumentVersion

Revision	Description of Change	Change Number	Date	Approval
Draft	Original Version	0000	20120217	
Release	First release	0001	20150331	

1 INDEX

2 IMPORTANT

READ ALL INSTRUCTIONS carefully before operating the Agile Radio System.

KEEP THIS USER MANUAL, as it contains important operating and service information that may be useful in the future.

NOTE:

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

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

3 SAFETY

WARNING

Any changes or modifications not expressively approved by Square One Laboratories (Australia) Pty Ltd could void the user's authority to operate this equipment.

WARNING

The Agile system must be installed by qualified and authorised technicians. Failure to use approved accessories specifically for the Agile equipment may result in the system operating in a dangerously unsafe condition.

OVERHEAD POWER LINES

When inspectingantennas and solar panels care must be taken. Insure there is clear space at all times from overhead power lines. Do not erect any ladderor associated climbing equipment if power lines are in the vicinity.

ANTENNA

The Agile Base Unit and Agile 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 Agile Base Unit or Agile Remote Unit that has a damaged antenna or antenna cable.

BATTERIES

Only use approved batteries in the Agile Radio equipment. All batteries can cause damage to equipment, property and/or bodily injury, such as burns. If a conductive material such as jewellery, 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 AgileRadio System uses sealed lead acid batteries as a power source. Do not puncture the case of the battery. Always dispose of a used battery in a responsible manner.

4 INTRODUCTION

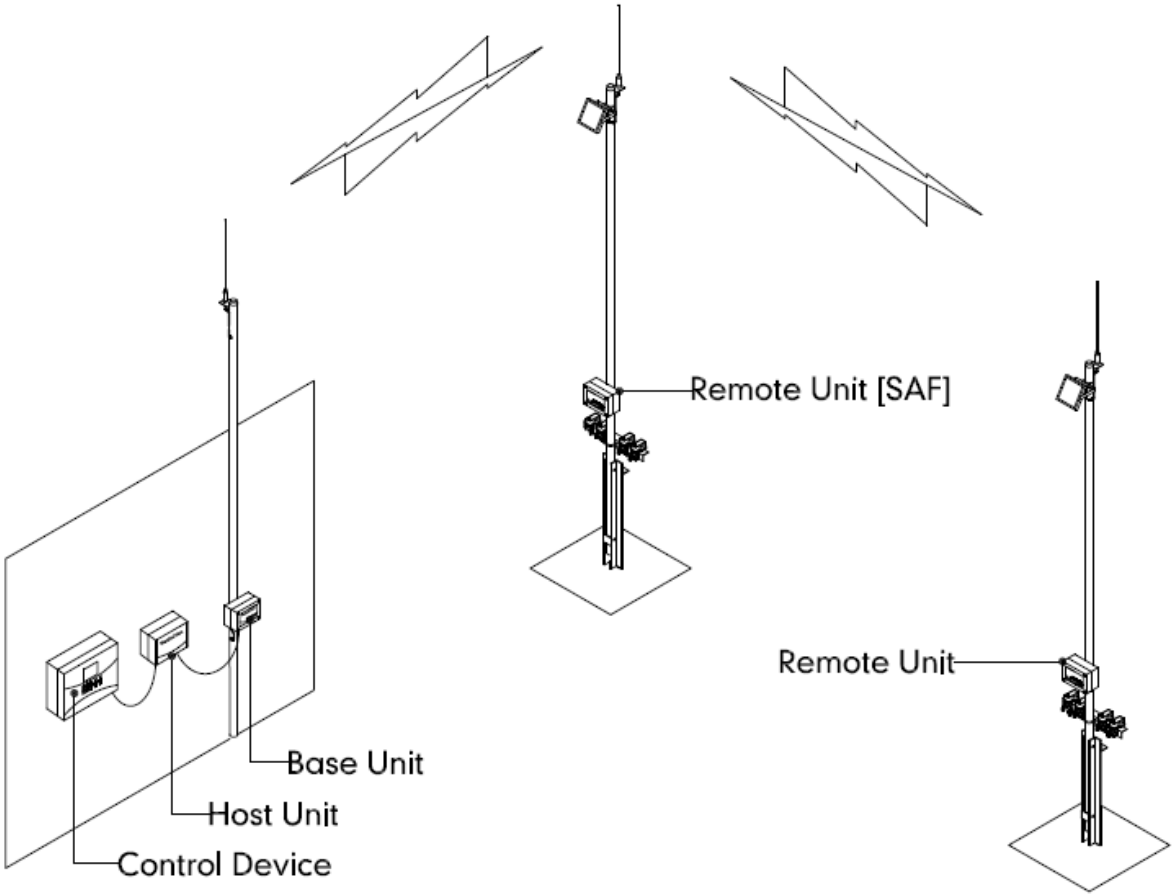

Figure: 4-1 Agile System Overview

4.1 Agile Host Unit

The AgileHost functions as acommunication interface between the control device and the wireless platform namely the Base Radio Unit and the Remote Units.

4.2 Agile Base Unit

The Base Unit is the communication [radio] platform between the Remote Units and the Host. The Base Unit stores the communication map of the network. The Agile Base can manage up to 254 remote units in a wireless network including the option of using multi-layer store & forward (SAF) repeaters.

4.3 Agile Remote Unit (RTU)

The Remote unit is a wireless device that operates on 6V DC power. It is used to convert the communication signal coming from the Agile Base Radio into physical commands such as turning on irrigation valves. It may also read inputs, such as a water meter pulse and send this information back to the Agile Base.

The Remote Unit houses a programmable radio and the main I/O card. Up to four expansion cards can be installed. The Agile Remote Units are modular in size from 1,3,5,7, 9 digital outputs, and 2 to 10 digital inputs.

4.4 AgileRadio Store and Forward (SAF) Unit

The Store and Forward [SAF] Unit is also commonly known as a repeater. The SAF unit makes it possible to extend the communication distance of your network by receiving a weak signal and retransmitting as a strong signal.

4.5 Antenna

The antenna is part of the communication system and functions in distinct two ways, to transmit communication signals and to receive communication signals.For the antenna to do this it has to convert electromagnetic energy from the air into electrical energy for the radio and visa a versa.

4.6 Solar Panel

The Solar Panel is used as part of the automatic battery charging system on the Remote Units. It converts the energy from the sun into electricity to charge the battery.

4.7 Grounding

The grounding system is used to divert harmful surges from lightning activity and dissipate this unwanted energy into the ground, thus keeping it away from sensitive electrical and electronic components.

5 OPERATION

5.1 Agile Host Unit

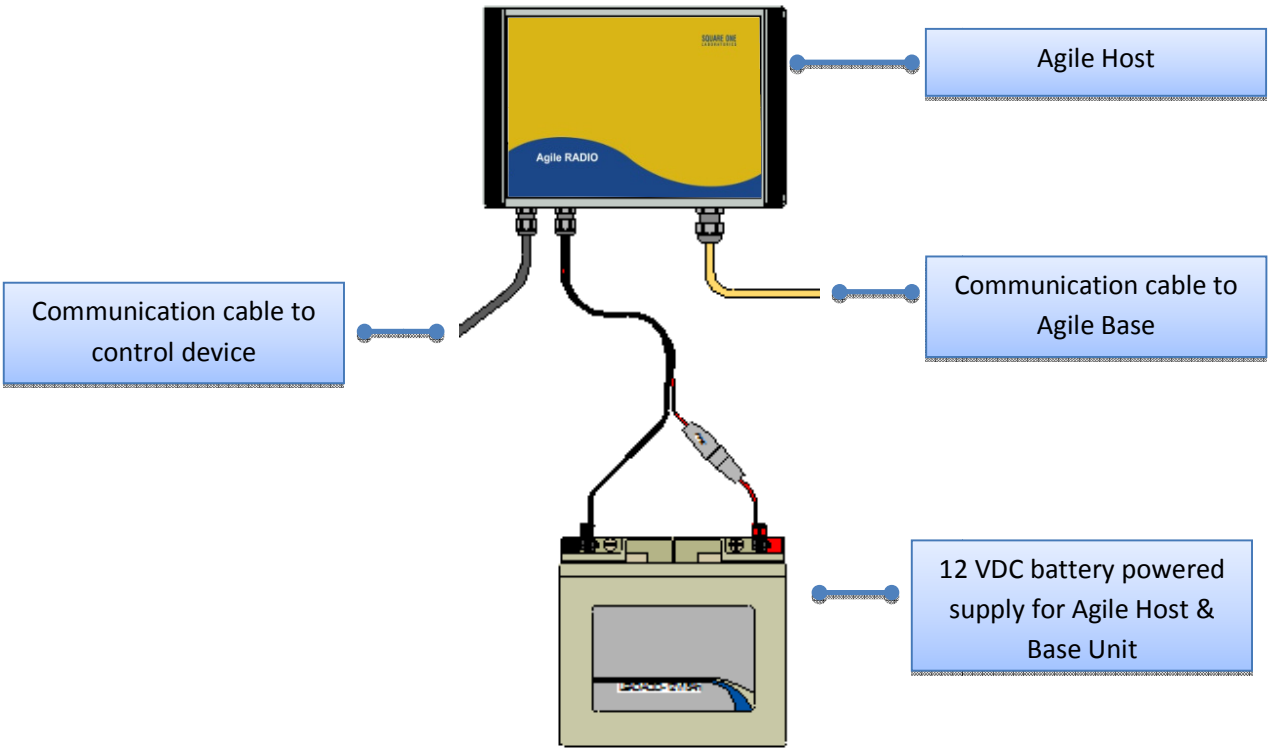

Figure: 5-1 Agile Host Components

The internals of the Agile Host Unit contains no serviceable parts. This unit is powered from a 12 VDC sealed lead acid battery via a serviceable fuse. This power source supplies power to both the Agile Host and Base Unit.

The Agile Host connects via a communication cable to the control device which is typical an irrigation controller. The irrigation controller contains the configuration and logic on how your irrigation system will function. When a remote device such as a valve needs to be operated, the control device sends a signal to the Agile Host. The Agile Host determines which output in the Agile Remote Unit needs to operate and sends this command to the Agile Base Radio.

Note: Disconnection of power to the Agile Host Unit will not delete important configuration settings.

5.2 Agile Base Unit

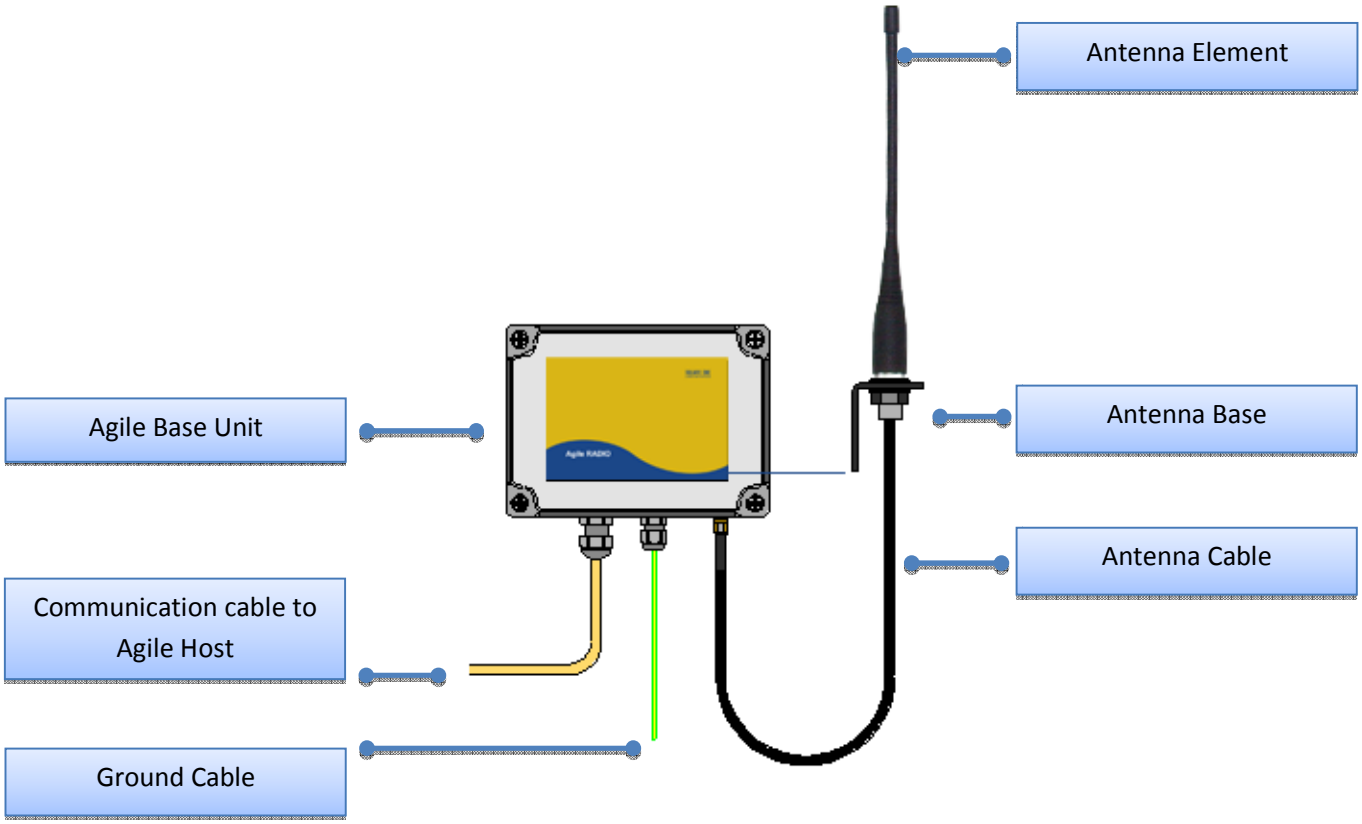

Figure: 5-2AgileBase Components

The Agile Base unit is typically powered from the Agile Host via the communication cable. The function of the Agile Base is to convert the signal from the Agile Host into a wireless signal for communicating between the remote field units. The Agile base has been programmed with the radio network and is responsible for co-ordinating all the wireless communication between the Agile Host and the Agile Remote Units.

Note: Disconnection of power to the Agile Base Unit will not delete important configuration settings.

Note: The internals of the Agile Base Unit contains no serviceable parts.

5.3 Agile Remote Unit

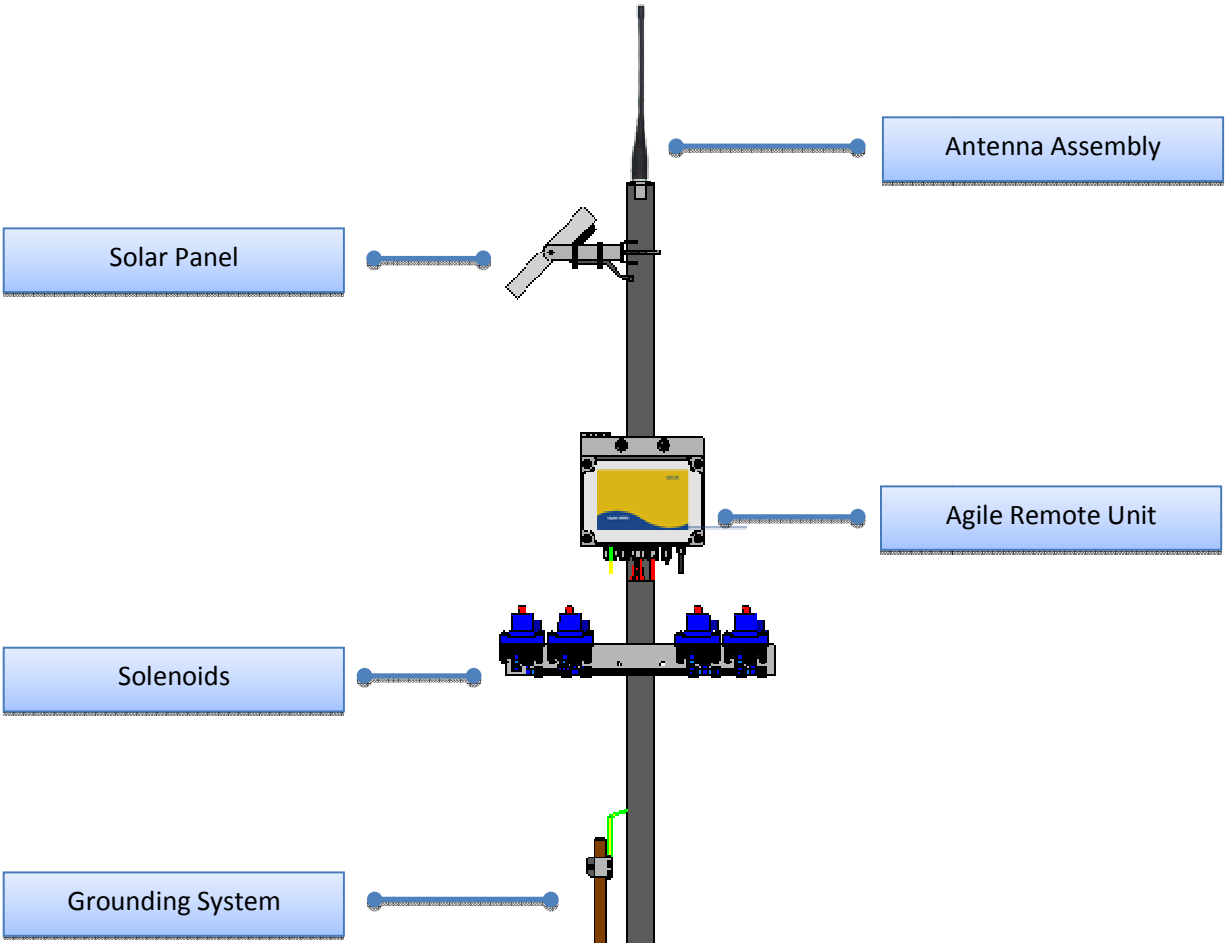

Figure: 5-3Typical Agile Remote Unit Components

The Agile Remote unit is typically powered from a 6VDC battery located inside the Agile Remote's enclosure. The battery is charged via a solar panel and voltage regulator. The Agile Remote contains addition circuitry to either control infield equipment such as latching solenoids to energise control valves and/or read electrical pulses generated from a water meter.

Note: The internals of the Agile Base Unit contains no serviceable parts.

Note: Disconnection of power to the Agile Remote Unit will not delete important configuration settings.

5.4 Antenna

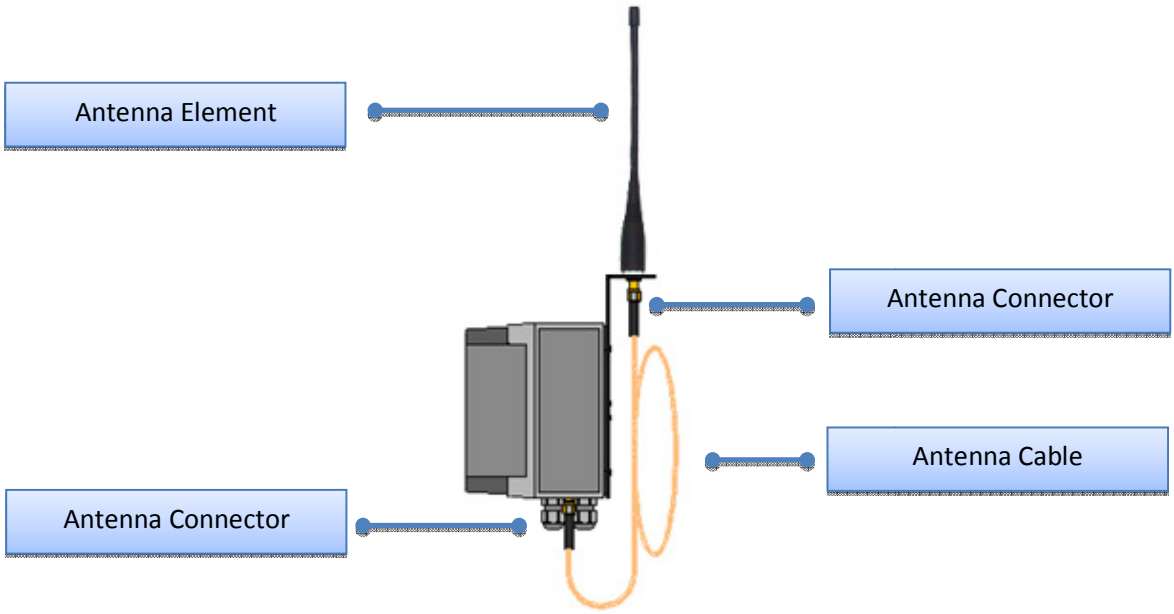

Figure: 5-5 Whip Antenna near the unit

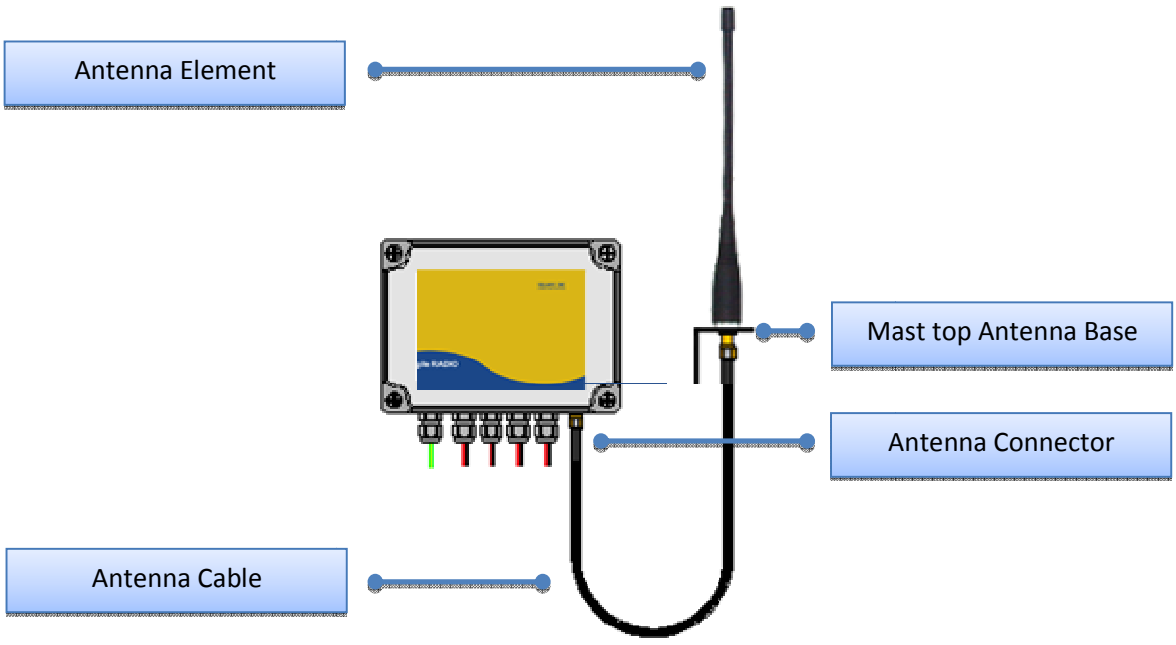

Figure: 5-6 Elevated antenna mount

There are two types of antenna mounting methods used with the Agile System. A unit top whip antenna (refer Fig. 5-5 above).is used for low crops requiring easy access such as spray rigs.

As used by the Agile Base or repeater sites and tall crops, the elevated antenna mounting is generally used for extended range. (refer Fig. 5-6 above).

The antenna is an integral part of the communication system. The height above the crop, the element length and vertical position plays an important part of maximising the performance and range of the wireless communication system.

Note: Antenna's should be maintained in a vertical position for best performance.

Note: If the Antenna element's is broken, it must be replaced immediately. Failure to do so could result in radio hardware failure.

Note: If the Antenna cable is damaged, it must be replaced immediately. Failure to do so could result in radio hardware failure.

5.5 Solar Panel

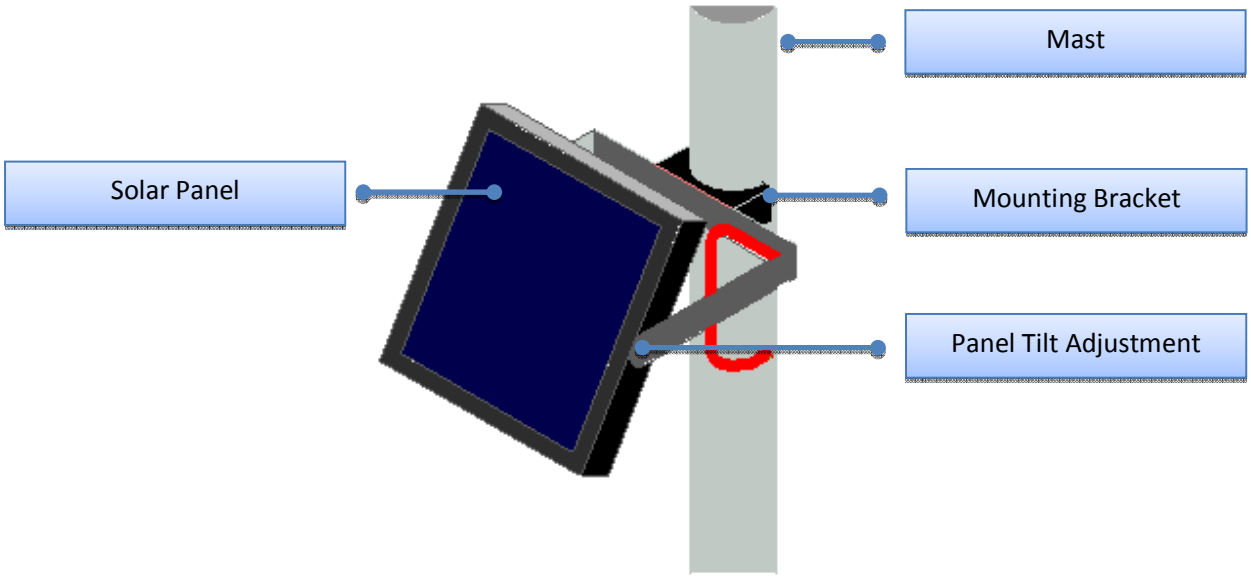

Figure: 5-7 Solar Panel Arrangement

The solar panel converts light energy from the sun into electricity to charge the battery located inside the Agile Remote Unit. For additional reliability and protection, the solar panel is connected via a voltage regulator (located inside the Agile Remote unit) to maximise the performance of the battery.

Note: The solar panel has been configured for 6 VDC operations.

Important: The solar panel orientation is important. Please refer to installation manual for correct solar panel alignment.

Important: The solar panel must be kept clean of physical obstructions such as dirt and bird dropping.

Important: The solar panel must be clear of shadows, IE: physical obstructions such as trees, buildings and masts that could cast a shadow over the solar panel should be avoided.

5.6 Grounding

Harmful surges from thunder and lightningactivity can induce high voltages into electrical and electronic components such as antenna's, antenna masts, Agileequipment and infield wiring.

These induced surges need to be redirected into the ground before they can cause harm to sensitive electronic components. The role of redirecting and dissipating these unwanted surges into the ground is the responsibility of the grounding system.

The grounding system is consists of a ground wire, ground clamp and ground rod (refer Fig. 10-1 below).

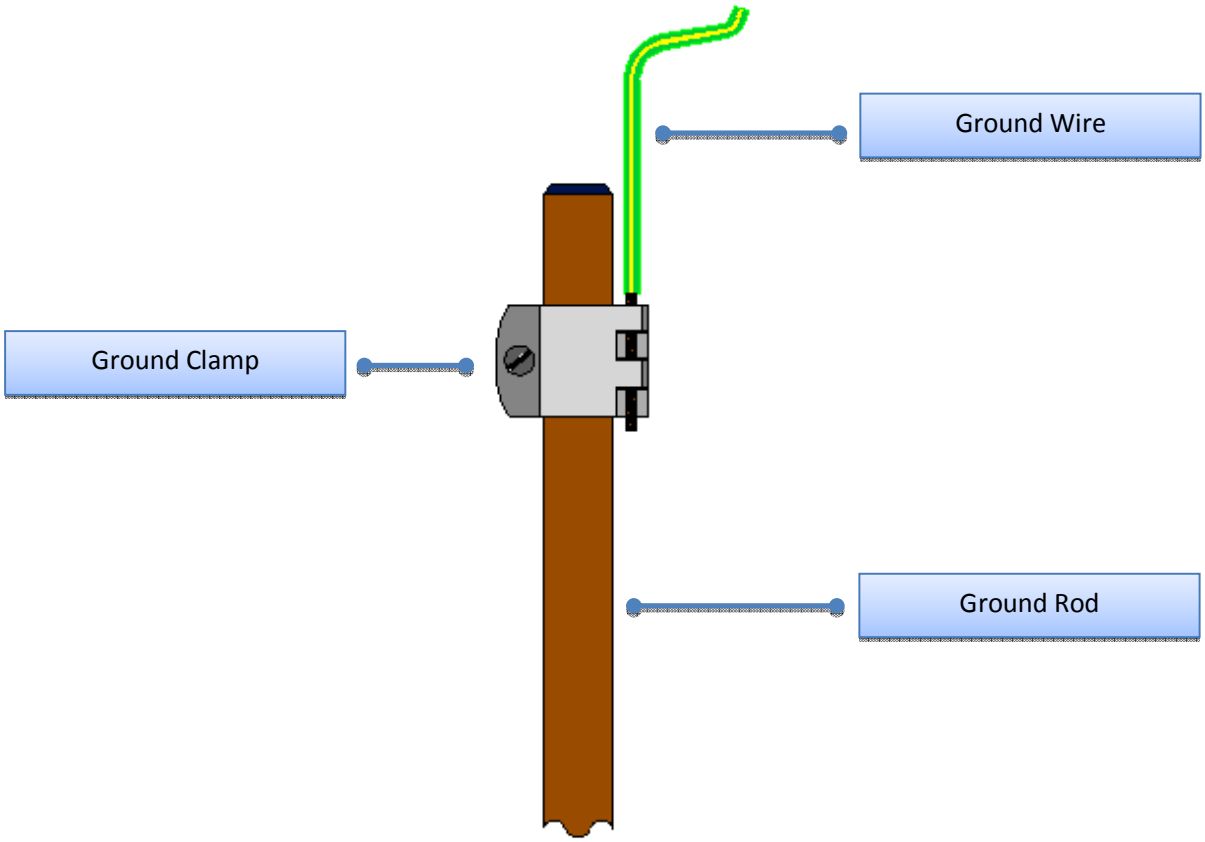

Figure: 5-8 Typical Ground Connection

Important: It's important that the integrity of the grounding system remain intact. The user should regularly inspect (Annually) the grounding system to make sure that the ground wire remains connected to the ground rod at all times.

6 SPECIFICATIONS

6.1 Agile Host

Environmental	
Operating Temperature	-20^{O} C to +65^{O} C (-4^{O} F to +140^{O} F)
Relative Operating Humidity	0 to 95% without condensation @ +50^{O} C (122^{O} 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 les 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

6.2 Agile Base

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

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

6.3 Agile 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

6.4 Solar Panel

Solar Panel Mechanical	
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
Colours	Red & White [+] Positive, Black & Blue [-] Negative

Solar Panel Electrical	
Wired for 6 Volts	Parallel
Rated Power	1.4*Watts
Volts at Max. Power	8 V @ 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.

6.5 Battery 12 V DC

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 Nut and Bolt]

12V Battery Electrical		
Nominal Voltage	12 Volts	
Nominal Capacity	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 @ 25° C Temp Coefficient -30mV/ °C	

6.6 Battery 6 V DC

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	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 @ 25° C Temp Coefficient -10mV/ °C	

7 TROUBLE SHOOTING

7.1 Agile Host

Problem	Possible Cause	Solution
Control device reports communication problem with Agile Host	Host unit has no power	Check serviceable fuse on main battery
Control device reports communication problem with Agile Host	Internal Damage	Call authorized service agent.

7.2 Agile Base

Problem	Possible Cause	Solution
Control device reports communication problem with AgileRemotes	Base unit has no power	Check serviceable fuse on main battery
Control device reports communication problem with AgileRemotes	Antenna disconnection	Inspect antenna connector, if loose, tighten firmly with finger pressure only. Do not use spanners or pliers.
Control device reports communication problem with AgileRemotes	Damage Antenna	Inspect antenna assembly, if damaged element or cable, replace immediately.
Control device reports communication problem with AgileRemote Unit	Internal Damage	Call authorized service agent.

7.3 Agile Remote Unit

Problem	Possible Cause	Solution
Remote unit fails to operate output	Remote unit has no power	Check that the solar panel orientation, surface of panel is clean and no shadows are cast over the panel.
Control device reports communication problem with AgileRemotes	Antenna disconnection	Inspect antenna connector, if loose, tighten firmly with finger pressure only. Do not use spanners or pliers.
Control device reports communication problem with AgileRemote Unit	Damage Antenna	Inspect antenna assembly, if damaged element or cable, replace immediately.
Control device reports communication problem with AgileRemote Unit	Internal Damage	Call authorized service agent.