WindUltra

High accuracy, compact anemometer

User Manual

GILL

Table of Contents

1. Welcome

Welcome to the WindUltra user manual.

About this manual

This manual provides the information needed to get the best results from WindUltra.
The most recent version of this manual is available at gillinstruments.com.
Please read this manual before setting up and installing WindUltra.

1.1.   Overview of Content
The manual is split into 6 chapters. Each chapter represents an activity in the use of the product. Additional detailed information is contained in the Appendices at the end of the manual.
- Chapter 1 explains how this manual is set out
- Chapter 2 provides a brief overview of the product
- Chapter 3 provides the information needed to set-up the product
- Chapter 4 provides the information needed to install the product
- Chapter 5 provides the information needed to use the product
- Chapter 6 provides guidance for product maintenance and fault finding

1.2.   Description of Icons
The following icons are used in this manual.

Icon	Description
⚠	A note that is important and that should be observed
ⓘ	Information or a recommendation to ensure best results
▶	The start of a set of instructions

1.3.   Description of WindUltra Component Parts
This manual contains references to WindUltra component parts. These references may form part of an instruction or recommendation. When a component part is referenced, the name of the part starts with capital letters (e.g. Pole Mount, Locking Screw, etc.). The drawing or location of these component parts can be found in drawings in the main sections of the manual.

1.4. General Notes

Before the product is used for the first time it is essential to read and understand this manual. Please keep the manual safe for future reference.

The product should be transported to site in the box and only removed when ready to install. Care should be taken with the product during installation, it should be kept in the box until the mount has been installed and careful handling is advised to reduce the risk of dropping the product.

Care should be taken when wiring the power and communications cable and the allocation of power to the correct wire/pin should be checked. When attaching the connector to the product, the location of the alignment notch should be observed in order to avoid potential damage.

The product should be stored and operated within the limits described in the specification (Appendix A).

Maintenance should be limited to the procedures described in this manual. Additional maintenance or cleaning may damage the sensors.

No attempt should be made to modify, adapt, open or repair the product. Any attempt to modify, adapt, open or repair the product will invalidate the warranty provided by Gill Instruments.

1.5. Software Licences

The product uses some software developed by third parties. In accordance with the licence agreements, the relevant acknowledgements can be found at gillinstruments.com

1.6. User Manual Revision History

Document Version	Release Date	Key Changes
1.0	02/06/23	First Release

2. Product Overview

2.1. WindUltra Product Range

The WindUltra product range is designed to:
- Provide high quality wind measurements
- Be easy to set up and install
- Be easy to maintain

WindUltra hardware is available in a number of configurations:
- WindUltra Sensor Unit only
- WindUltra Sensor Unit with 1 inch pole mount, supplied with or without an M12 connector or cable
- WindUltra Sensor Unit with 2 inch pole mount, supplied with or without an M12 connector or cable
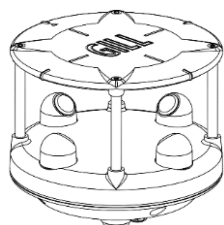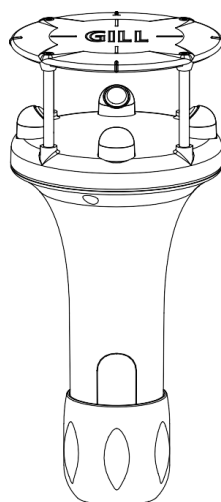
WindUltra Sensor Unit	WindUltra with 1 inch (25-26mm) pole mount	WindUltra with 2 inch (44-51mm) pole mount
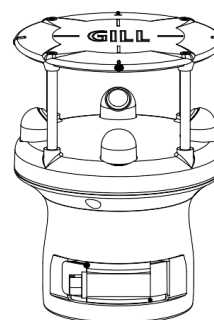
Figure 1 – WindUltra Product Range

The components included in each configuration/part number are shown below.

Gill Instruments Part Number	Sensor Unit	1 inch pole mount	2 inch pole mount	M12 mating connector	2m cable with M12 connector
1416-PK-210-00	Y				
1416-PK-210-01	Y			Y	
1416-PK-210-02	Y				Y
1416-PK-210-10	Y	Y			
1416-PK-210-11	Y	Y		Y	
1416-PK-210-12	Y	Y			Y
1416-PK-210-20	Y		Y		
1416-PK-210-21	Y		Y	Y	
1416-PK-210-22	Y		Y		Y

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2.2. WindUltra Component Parts

WindUltra consists of a number of different parts. These parts may be referred to in this manual so it is important to understand their naming. The diagram below lists the key parts within the product.
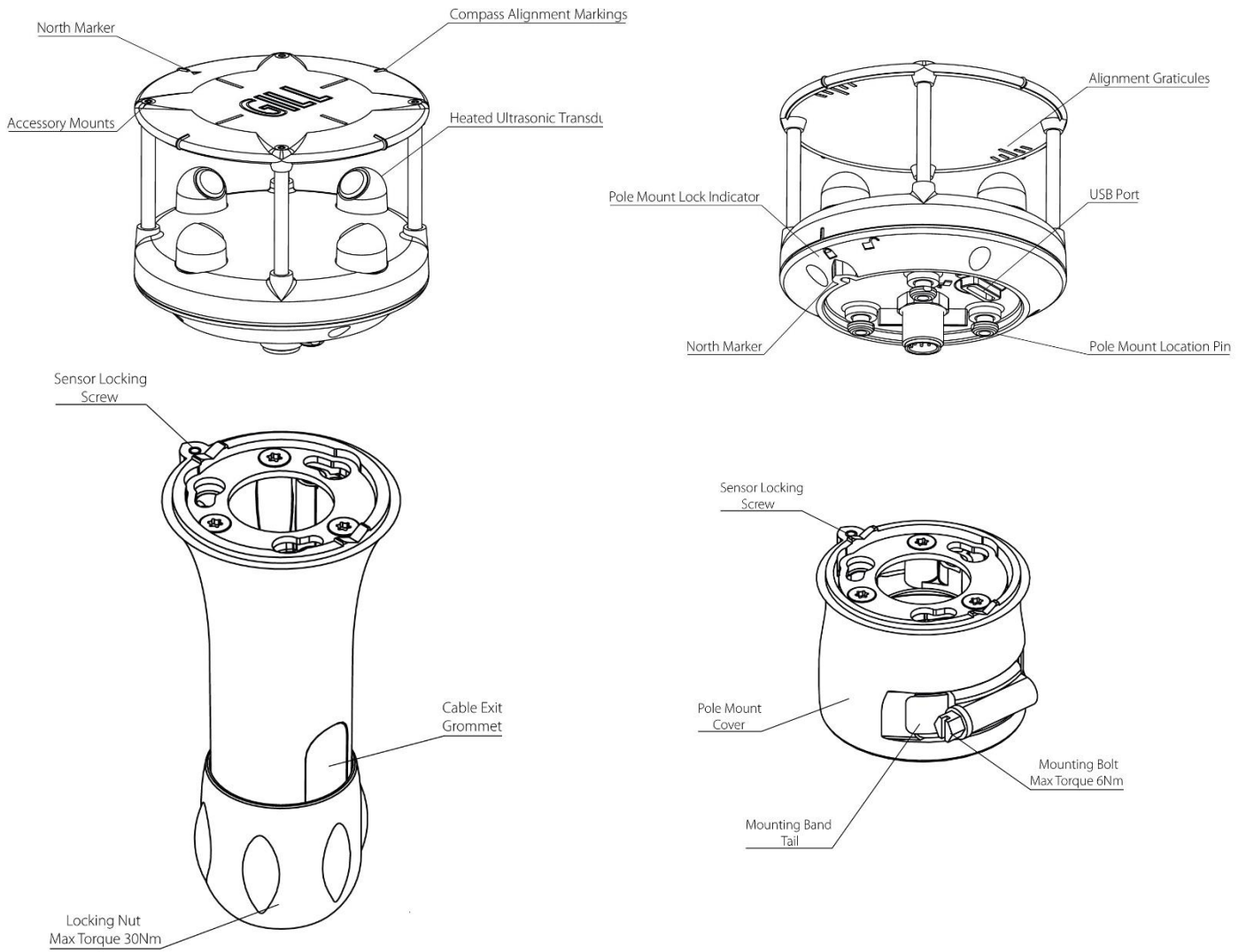
Figure 2 – WindUltra Component Parts

2.3. Downloadable Software

Two software packages are available to help customers use WindUltra.

- WindSet   - this software can be used to set-up the product before installation
- WindView - this software can be used to view the data provided by the product

Both software packages can be downloaded from gillinstruments.com.

2.4. WindUltra Accessories

A range of accessories is available to support WindUltra. A list of accessories is shown below.

More information, and the most up to date list of accessories can be found at gillinstruments.com.

Accessory	Gill Instruments Part Number
Connector, M12, 8 way, field wireable	1416-PK-002
Cable, for power and communications, 2m with M12, 8 way over moulded connector	1416-PK-011
Cable, for power and communications, 5m with M12, 8 way over moulded connector	1416-PK-012
Cable, for power and communications, 10m with M12, 8 way over moulded connector	1416-PK-013
Cable, for power and communications, 20m with M12, 8 way over moulded connector	1416-PK-014
Pole Mount, 1 inch (25-26mm), black	1416-PK-021
Pole Mount, 2 inch (44-51mm), black	1416-PK-022
Pole Mount Adaptor Kit	1416-PK-023
Cable, for WindUltra set-up, 0.8m, USB (Type A) to USB (Micro-B)	1416-PK-031

2.5. CE, UKCA, FCC conformity

This product carries the CE and UKCA marks. A copy of the Declaration of Conformity can be downloaded from gillinstruments.com.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

2.6. Right to change and revise

Gill Instruments reserves the right to change or revise the product without notice or the obligation to notify any person or organisation of such change or revision.

Gill Instruments reserves the right to change or revise the information supplied in this manual without notice or the obligation to notify any person or organisation of such change or revision.

The reproduction and distribution of the documentation and software supplied with this product and the use of its contents is subject to written authorization from Gill Instruments.

3. Set-up WindUltra

3.1. Introduction

WindUltra is designed as a flexible product able to support a range of user definable options. This chapter provides:

- An overview of the configurable features
- Information about connecting WindUltra to WindSet so WindUltra can be set-up
- An introduction to the WindSet set-up software

3.2. Configurable features

WindUltra is designed to allow the following features to be configured:

- Measurement output Interface, e.g. RS422, RS485, SDI-12
- Measurement output frequency e.g. 1Hz, 2Hz, polled
- Measurement units e.g. m/s, mph, kph, knots
- The data, and the order of data, contained in the output message
- The heater operation

| i | WindUltra should be set-up before installation to enable the unit to be tested and the set-up confirmed. More details of WindSet can be found in the next sections of this manual.

The default set-up can be found in Appendix B. It is recommended that this information is reviewed before continuing.

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3.3. Connecting WindUltra to WindSet

For initial setup, it is recommended that WindUltra is connected to WindSet using the USB to USB, power and data cable available as an accessory (Gill Instruments part no. 1733-PK-031).

It is also possible to connect WindUltra to a PC using the M12 connector on WindUltra, this connection should be used for the installation itself.

To connect WindUltra to a PC USB port follow the instructions below.

1. Turn the USB Port Cover on WindUltra counter clockwise to open it
2. Allow the USB Port Cover to rise upwards
3. Remove the USB Port Cover
4. Connect a USB power and data cable to WindUltra and to a PC (Note: Some USB cables are Power only. To connect to WindSet the USB cable must be able to support power AND data)
5. When WindUltra is set-up, replace the USB Port Cover and turn clockwise until the slot aligns with the locked padlock symbol

⚠️ The USB (Type A) to USB (Micro B) cable can power WindUltra unit for configuration. **The USB cable should not be used to power WindUltra in normal operation.**
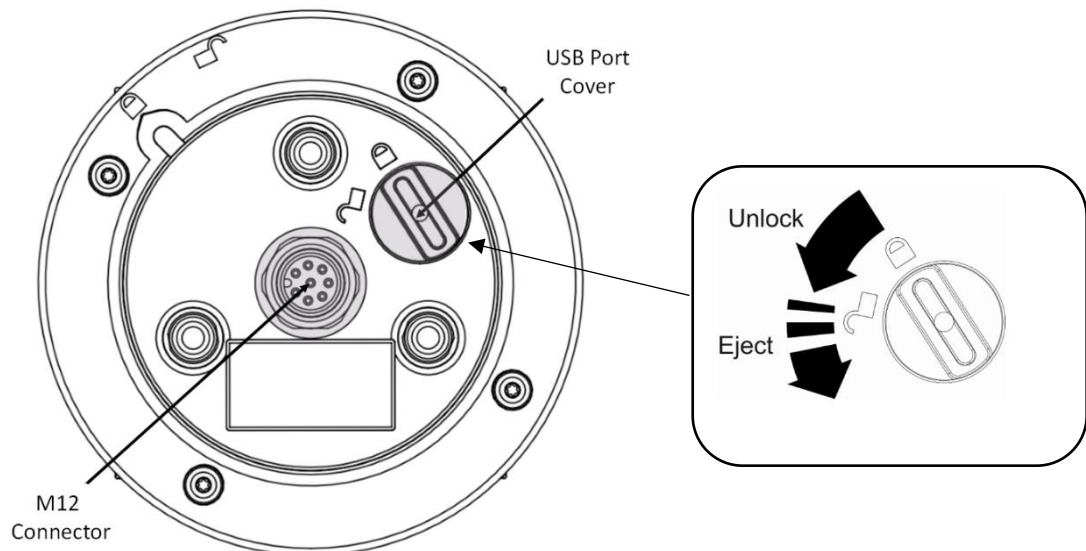
Figure 3 – WindUltra USB Port Cover

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3.4. WindSet Set-Up Software

A free-to-download software package called WindSet is available to enable WindUltra to be set-up.

WindSet is compatible with Windows 10.

WindSet software can be downloaded from www.gillinstruments.com.

⚠️ WindUltra can only be configured via the USB cable or via RS485 2-wire via the M12 connector. **Configuration via RS422 connection is not possible.**
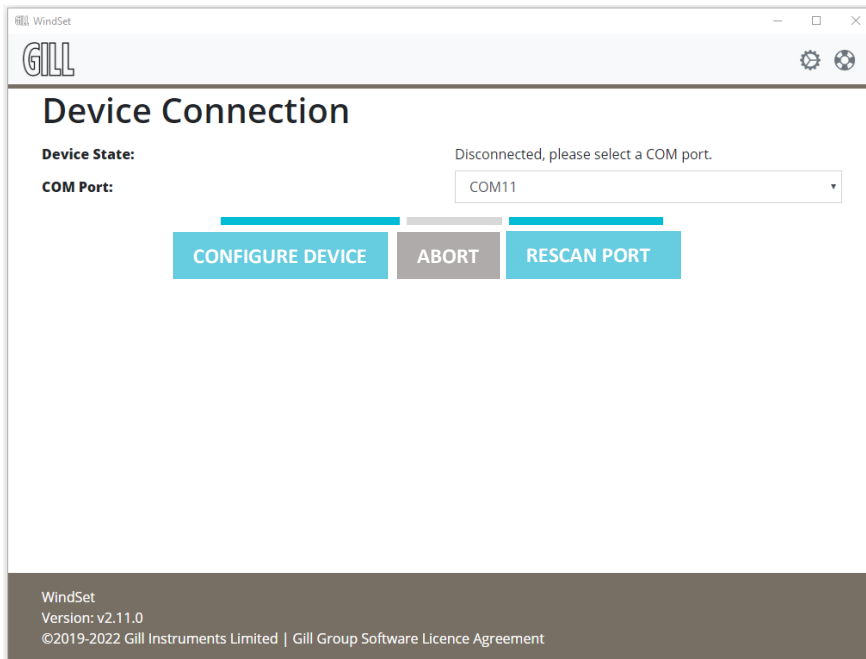
Figure 4 – WindSet Connection Screen

WindSet can be used to create a user specific set-up that can be loaded onto WindUltra.

To use WindSet:

1. Connect WindUltra to the PC running WindSet using an appropriate cable
2. Open WindSet on the PC
3. Allow WindSet to identify the appropriate COM port
4. Use the drop down menu to select the appropriate COM port
5. Click on the **CONFIGURE DEVICE** button
6. The WindSet Home screen will now be displayed
7. If a copy of the original configuration is required, click on the **EXPORT TO FILE** button   * *Optional Step*
8. Select the appropriate screen at the top of the page and make the required change (see Appendix D for details)
9. Return to step 7 to change additional settings
10. When all required setting have been changed click on the **WRITE TO DEVICE** button
11. Click on the **EXPORT TO FILE** button   * *Optional Step*
12. Measurement & protocol changes will be applied when the 'write to unit' button is pressed
13. Once configuration is complete, click on **DISCONNECT FROM DEVICE** before unplugging the cable

ℹ️ As shown above, it is recommended that the **EXPORT TO FILE** button is used to save the set-up before writing it to WindUltra. This will ensure that a copy of the set-up is available if it needs to be checked, or if the set-up needs to be written to another WindUltra.

4. Install WindUltra

4.1. Introduction

To install WindUltra, it is recommended that the following steps are taken:

- Select an appropriate site
- Prepare the equipment
- Install the unit

4.2. Select an appropriate site

When selecting a site three attributes need to be considered:

- Physical location and obstructions
- Distance from the power supply and data collection system
- EMC interference

4.2.1 Physical location and obstructions

To achieve the most consistent measurements WindUltra should Ideally be located according to the World Meteorological Organisation (WMO) guidelines. More information about these guidelines can be found at www.wmo.int. In summary, where the product and site allow, it is recommended that a wind sensor should be located 10m above ground and at a reasonable distance from buildings and trees. Ideally the reasonable distance should be 10 times the height of the nearest building or tree.

When selecting the site, North alignment should be considered. The wind measurement includes direction information based on the north marker included in the wind sensor design. Measurements can be adjusted by entering the offset between north and the alignment of the north marker into WindUltra using WindSet.

4.2.2 Distance from the power supply and data collection system

The site should be close enough to power and communications to enable correct operation.

- The maximum cable lengths for power will depend on the voltage of the power supply used, the current drawn by the product and the resistance of the cable selected. Make sure that the power available at the connector to the product is sufficient to ensure correct operation. More information about the power requirements can be found in section 4.3.3.
- The maximum cable lengths for communications will depend on the communications protocol selected. It is recommended that the following maximum cable lengths are used:
    - RS422 - 1000m
    - RS485 - 1000m
    - SDI-12 - 90m

4.2.3 Electromagnetic Interference

The site selected should be away from strong sources of electromagnetic noise.

The product has been tested and certified to work in normal conditions. High levels of electromagnetic noise may affect the performance of the product. To ensure accurate operation the following guidelines are provided:

- Do not mount the product in close proximity of a high power radar or radio transmitter. In particular:
  - o Avoid mounting the product in the plane of any radar scanner - a vertical separation of at least 2m is recommended.
  - o Avoid mounting the product within:
    - 1m of a VHF/IMM transmitter
    - 5m of a MF/HF transmitter
    - 5m of a Satcom transmitter, and avoid line of sight
- Ensure that any cable wires not used are isolated and grounded at the terminating equipment/user end.
- Ensure that the signal ground is properly connected to improve noise immunity.
- Ensure earth loops are not created
- Use cables recommended in accordance with this manual
- Do not exceed the maximum cable lengths recommended in this manual
- Ensure the power supply operates to the WindUltra specification at all times

4.3. Prepare the equipment

To install the product the following additional equipment will be required:

- Power and Communications Cable
- Power Supply
- Data Communications (for example computor, data logger, PLC)

4.3.1 Power and Communications Cable

Gill Instruments can supply cable suitable for connecting to the product to power and data collection systems. It is recommended that any cable used meets the specification shown below.

The maximum length of the cable will be set by the chosen communications protocol.

Cable Feature	Recommendation	
Wire Size	24 AWG	
Strand Size	7 x 32 AWG	
Pairing	Twisted pair with drain wire	
Screening	Screened with aluminium tape	
Outer Diameter	6-8mm	
Number of pairs required and maximum cable length	RS422	4 pairs, max. length = 1000m
	RS485	3 pairs, max. length = 1000m
	SDI-12	2 pairs, max. length = 90m

4.3.2 Connector Pin Allocation

The pin allocation for the M12 power and communications connector is shown below.

It is recommended that:

- Any cable wires not used should be isolated and grounded at the terminating equipment/user end.
- Signal ground should be used in conjunction with RS422 TX/RX lines in order to improve noise immunity.
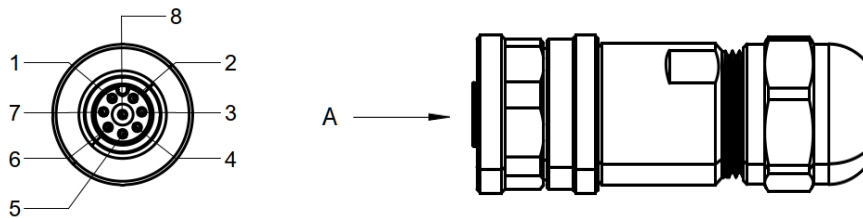
VIEW ON ARROW A

Figure 5 – M12 Connector Pin ID

Pin	Wire Colour	RS-422	RS-485	SDI-12
1	White	Voltage Supply (V-)	Voltage Supply (V-)	Voltage Supply (V-)
2	Brown	Rx-	-	-
3	Green	Rx+	-	-
4	Yellow	Tx-	Data -	-
5	Grey	Tx+	Data +	-
6	Pink	Voltage Supply (V+)	Voltage Supply (V+)	Voltage Supply (V+)
7	Blue	Signal Ground	Signal Ground	Signal Ground
8	Red	-	-	SDI-12 Signal

4.3.3 Power

The power required to be supplied **at the unit** is shown below. Any voltage drop between the power supply and the unit should be considered.

	Supply Voltage	Average current (12V dc power)	Peak current (12V dc power)	Power
WindUltra without heating active	5-30v at the unit	<20mA	<100mA	< 1 watt
WindUltra with heating active	10v-30v at the unit	<300mA	<800mA	<7.6watts with heating

WARNING: HOT SURFACE
When heating is activated, the heated ultrasonic transducers will get very hot and should not be touched.

4.4.   Install the WindUltra
To install WindUltra the steps below should be followed:
- Select the cable route
- Select alignment method
- Install the Pole Mount
- Install the Sensor Unit

4.4.1 Select the Cable Route
The 1 inch (25-26mm) pole mount allows the cable to be routed inside or outside the mounting pole.
The 2 inch (44-51mm) pole mount is designed to be used with a mounting pole that allows the cable to be routed inside the pole.

If the 1 inch pole is being used, and the cable is to be run outside the mounting pole, then
1. The Locking Nut and Locking Nut Insert should be removed from the Pole Mount
2. The Cable Exit Cover should be carefully removed from the pole mount by sliding it downwards
3. The circular insert in the Cable Exit Cover should be carefully punched out to create a hole
4. The cable should be fed through the hole
5. The Cable Exit Cover and cable should be reassembled into the pole mount
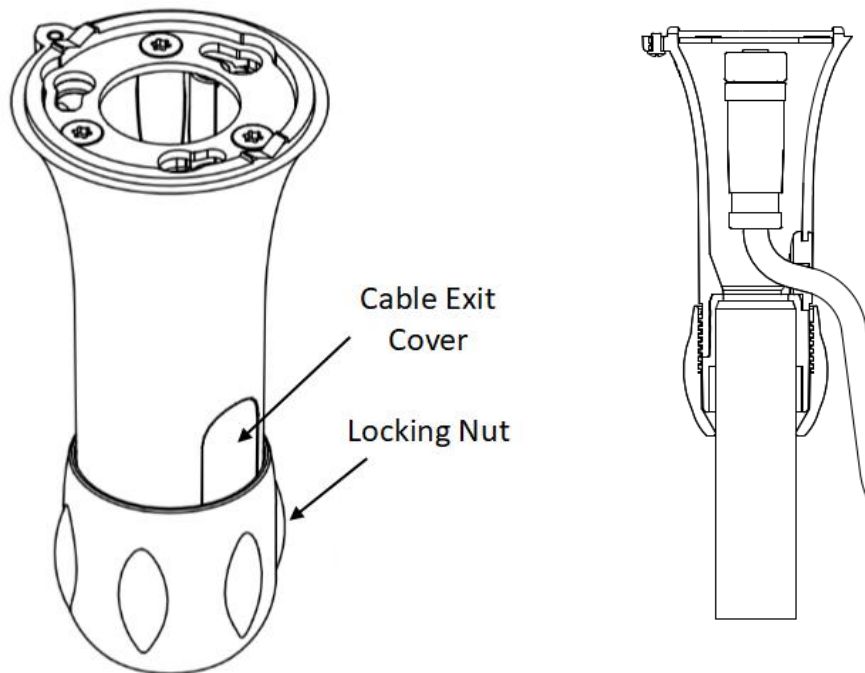
Figure 6 – WindUltra 1 inch Pole Mount Cable Exit Cover

4.4.2 Install the Pole Mount

The WindUltra Pole Mount can be mounted on:

- a pole with diameter 25-26mm (1 inch mount)
- a pole with diameter 44-51mm (2 inch mount)

1. Ensure the pole is securely fixed and vertical
2. Push the Pole Mount firmly onto the pole and check it is pushed fully onto the pole and level
3. Align the Pole Mount to North, if required – see next section
4. Secure the Pole Mount into place using
    a. the Locking Nut for the 1 inch pole mount. The Locking Nut can be tightened by hand or by using a 42mm A/F spanner. **The maximum torque used should not exceed 30Nm.**
    b. the Mounting Bolt for the 2 inch mount. The Mounting Bolt can be tightened using a 7mm hex socket or a flat blade screwdriver. If possible the Mounting Band Tail should be fed inside the Pole Mount Cover. **The maximum torque used should not exceed 7Nm**
5. Check the North alignment

Figure 7 – WindUltra Pole Mount Component Parts
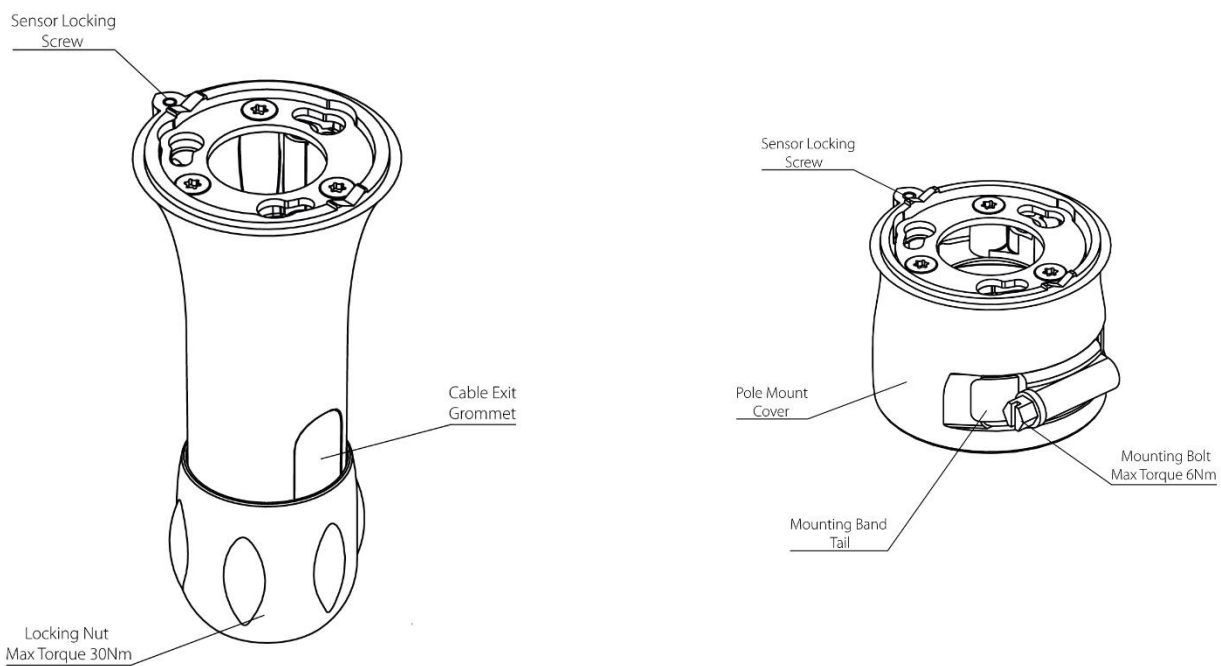
4.4.3 Select Alignment Method

For accurate wind direction data, the product must be aligned to a reference point. This can be done in two ways:

Alignment to North

To align the product to North, use
- the North Alignment Notch/North Alignment Edges on the Pole Mount (recommended)
- the North Alignment Marker on the sensor unit

Using the North Alignment Notch/Edge

The pole mounts incorporate
- a North Alignment Notch which can be used to align the sensor using a pointer or sighting tube
- a North Alignment Edge that can be used to align the sensor using a compass
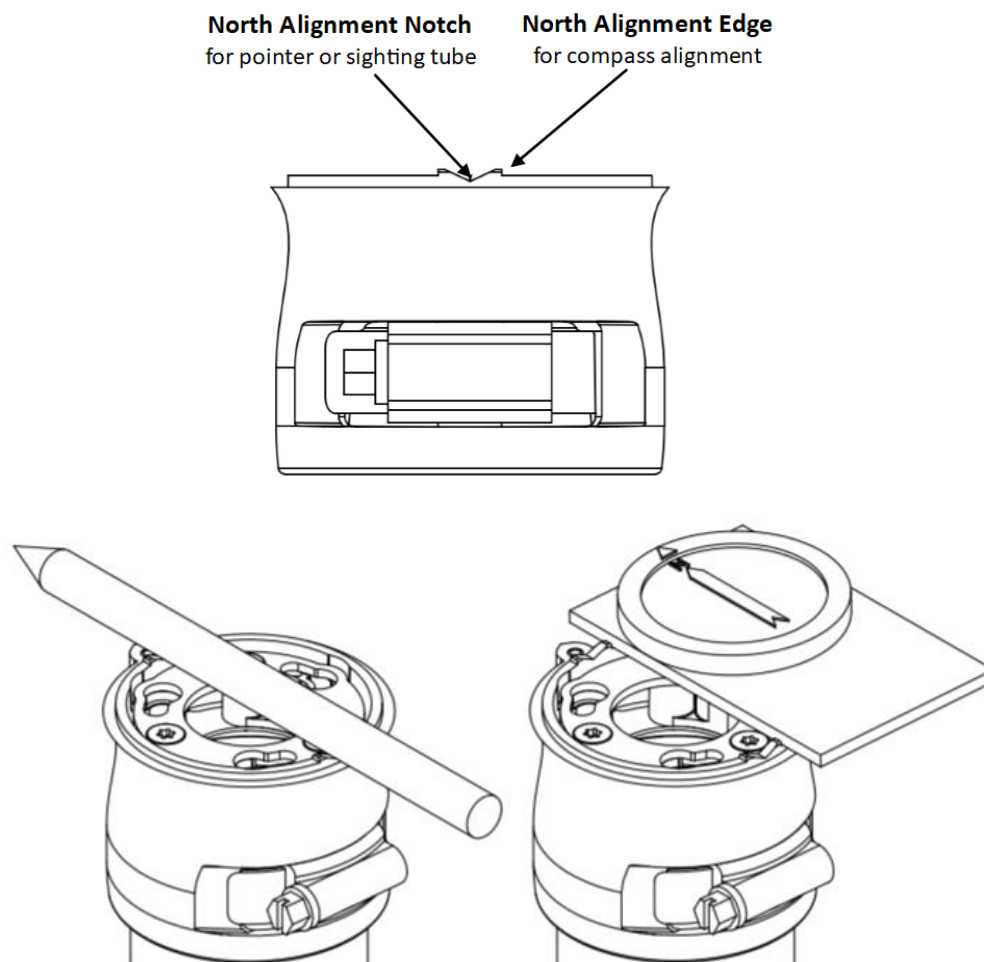
Figure 8 – WindUltra Alignment tools

Using the North Alignment Marker

The Sensor Unit incorporates a North Alignment Marker on the top of the reflector cover. This marker can be used for alignment once the sensor head has been installed onto the Pole Mount.

Alignment to other directions

If it is not possible to align the sensor to North, then the direction of the North Alignment Marker on the Sensor Unit should be measured and loaded into the product using WindSet. (e.g. if the north marker is pointing East then the angle to enter into WindSet is 90º, if the north marker is pointing West then the angle is 270º).

A compass aligned using the North Alignment Edge of the Pole Mount can be used to measure the correct angle to enter into WindSet.

4.4.4 Install the Sensor Unit

The WindUltra Sensor Unit can now be installed

1. If not already in place, route the power and communications cable through the Pole Mount
2. Connect the cable to the Sensor Unit
3. Place the Sensor Unit onto the Pole Mount and turn counter clockwise to secure in place
4. Tighten the Sensor Locking Screw. **The maximum torque used should not exceed 0.55Nm.**
5. Adjust the cable to an appropriate length/tension
6. Secure the cable in place, and install additional cable support as appropriate

5. Use WindUltra

5.1. Introduction

Once installed, WindUltra will provide data in the format selected during the set-up process described earlier. This chapter provides information on:

- The data provided by WindUltra
- The status codes provided by WindUltra
- The WindSet software package
- How to fault find in the event of abnormal operation of the WindUltra.

5.2. WindUltra data

The data output records provided by WindUltra contains two types of data:

- Measurement data – this contains the measurements taken by the sensor
- Status data – this contains information about the status of the sensor

More details of the measurement data that is available and how to set-up WindUltra to report that data is contained in the appendices.

5.3. Status Codes

WindUltra is designed to provide a measurement status code with each measurement. The status code indicates if the sensor has experienced any difficulty in making a measurement. The status code can be included in the data reported by the unit.

i In normal operation the following status codes indicate that no warning messages are present:

Output mode	"No warning" status code
ASCII/MODBUS/SDI-12 output	0
NMEA output	A

A list of status codes can be found in **Appendix C** and the appropriate appendix describing the chosen communications protocol.

5.4. WindView software

Gill Instruments recommends use of WindView to view and log the data provided by WindUltra.

WindView is compatible with Windows 10.

WindView can be downloaded from: http://www.gillinstruments.com/main/software.html.

More information about how to use WindView can be found in **Appendix J**.

5.5. Fault Finding

If any difficulty is experienced when using WindUltra, a fault finding guide can be found in **Appendix I.**

6. Maintain WindUltra

6.1. Introduction

WindUltra does not normally require regular maintenance however, to help ensure the best results from the product this chapter provides information on:

- Product Maintenance and Calibration
- Fault Finding
- Product Repair

6.2. Product Maintenance and Calibration

Although the product requires minimal general maintenance, Gill Instruments recommends that the product be kept reasonably clean, and that ice and snow be allowed to defrost naturally.

⚠️ When completing general maintenance, care should be taken with the black transducers. A reduction in the wind sensor performance may occur if the transducers are damaged.

⚠️ If there is a build-up of deposits on the product, these should be cleaned using a cloth, moistened with mild detergent. **Solvents should not be used and care should be taken to avoid scratching.**

⚠️ When maintaining the product, do not use high pressure sprays or high temperature/stream cleaning.

⚠️ If any part of the product is exposed to ice or snow, the unit should be allowed to defrost naturally. The ice or snow should not be removed with a tool, or by additional heat being applied.

It is recommended that any mounting bracket, mounting bolts, connector fixings and cable clamps are checked periodically. It is recommended that these checks are carried out when other checks are scheduled.

The product should not require calibration under normal circumstances.

6.3. Fault Finding

A Fault Finding guide can be found in **Appendix I**.

If the solutions listed do not clear the fault, please contact Gill Instruments Technical Support. The contact details for Gill Instruments Technical support can be found at www.gillinstruments.com.

6.4. Product Repair

If the product is damaged, a range of spare parts can be supplied by your local distributor or directly from Gill Instruments.

Minor Repairs

Gill Instruments offers a range of accessories such as replacement pole mounts and cables that can be replaced by the user. A list of these parts, and their part numbers, is available on gillinstruments.com.

Major Repairs

If the sensor unit is damaged it can be returned for repair via a local distributor or directly to Gill Instruments.

The unit should be carefully packed in the original packaging or similar packaging to avoid any further damage. Where possible, a description of the fault, and a list of any fault codes seen, should be included.

Contact details to return a unit to Gill Instruments can be found at gillinstruments.com.

6.5. Warranty Repairs

If the product experiences issues during the warranty period, please contact Gill Instruments. If necessary the unit can be returned to Gill Instruments together with a copy of the original invoice.

The unit should be carefully packed in the original packaging or similar packaging to avoid any further damage. Where possible, a description of the fault, and a list of any fault codes seen, should be included.

Instructions on how to return a unit to Gill Instruments can be found at gillinstruments.com.

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Appendix A – Specification

WIND SPEED	
Range	0-75m/s (168mph, 270km/h)
Accuracy	0-20m/s < 2% RMSE or 0.1m/s RMSE (whichever is greater) >20m/s < 3% RMSE
Resolution	0.01m/s
Threshold	0.01m/s
Response time	0.125 seconds

WIND DIRECTION	
Range	0-360°
Accuracy	0-20m/s < 1° RMSE >20m/s < 2° RMSE
Resolution	1°

DATA OUTPUT CONFIGURATION	
Output rate	Polled or 1, 2, 4 or 8Hz in broadcast mode
Parameters	Polar wind and gust speed and direction, Signed U & V vectors, Supply voltage
Wind speed units	m/s, knots, mph, km/h, ft/min
Wind direction units	Degrees

PROTOCOLS & INTERFACES	
Polled ASCII	RS-485, configurable output string
Broadcast ASCII	RS-485, configurable output string
Modbus RTU	RS-485, 32-bit float, 32-bit and 16-bit integer registers
NMEA 0183	RS-422, configurable output string
SDI-12	SDI-12
Baud rate	1200 to 115200

CONNECTIVITY	
Primary connector	M12 8-way
Configuration port	USB 2.0 Micro B

POWER SUPPLY	
Voltage	5 to 30 VDC, 12 VDC optimum
Power	< 100 mW to 800 mW @70m/s unheated < 7.6 W heated
Heating operation	M12 input: available 10 to 30 VDC,
Over voltage protection	To 38 VDC & reverse polarity

MECHANICAL	
Materials	Thermoplastic and marine-grade stainless steel
Size	84mm diameter With 1" pole mount: 189mm height or With 2" pole mount: 107mm height
Weight	With 1" pole mount: 270g or With 2" pole mount 260g

ENVIRONMENTAL	
Operating Temperature	-40°C to +70°C
Storage Temperature	-40°C to +80°C
Operating Humidity	< 5% to 100% RH
Rainfall	300 mm/hr

TEST & REGULATORY STANDARDS	
Protection class	IP69k, IP68 & IP66 EN 60529:1992
EMC	BS EN 61326 : 2013 BS EN 60945 : 2002 & FCC
Regional markings	CE, UKCA, FCC Part 15
RoHS compliant	Yes

COUNTRY OF ORIGIN	
Country of Origin	United Kingdom

WARRANTY	
Warranty	24 months

SOFTWARE	
WindSet	Free easy-to-use configuration tool
WindView	Free easy-to-use wind measurement visualisation and logging software

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Appendix B - WindUltra Default Set-up

The WindUltra default set up is shown below. The set up can be changed using WindSet software as described in **Appendix D**.

Setting	Default Set-up
Comms	RS485
Protocol	Gill ASCII
Baud Rate	38400
Data Connection	Data Bits 8, Parity None, Stop Bits 1, Flow Control None.
Node ID	Q
Output Rate	1Hz
Message Mode	Continuous
ASCII Set Up	Carriage Return and Line Feed, Echo On
North Alignment	0
Wind Sensor	On
Wind Speed Units	MS (metres/sec)
Wind Direction Units	Degrees
Report Format	Node, Wind , Wind Speed, Wind Speed Unit Letter, Status, Checksum.
Status Message Output	On
Report Message Output	On
Unit Message Output	On
Inputs Message Output	On
Output Sentence	Comma Separated Variable

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Appendix C – WindUltra Measurement, Derived and Status Data

Measurement Data

Parameter	Example output	Output on error	Description
Node address	'Q'	–	User defined address to identify the sensor
Relative wind direction (°)	'259'	'999' (1) or blank (2)	The measured wind direction over the sample period. Reported as 0 - 359 ° (360° is reported as 0°). See note (3)
Relative wind speed	'003.45'	'999.99' (1) or blank (2)	The measured wind direction over the sample period
Wind speed units letter	'M'	–	Single-character. Units of Speed are user-selectable in WindSet. 'M' = m/s, 'K' = km/hour, 'N' = Knots, 'S' = Statute miles/hour
Measurement Status Code	'00'	'04' / '08'	'00' Wind measurement valid '04' Wind measurement invalid '08' Configuration Data Error
Relative wind U vector	'-012.34'	'+999.99' (1) or blank (2)	The measured wind velocity in the U direction
Relative wind V vector	'+001.23'	'+999.99' (1) or blank (2)	The measured wind velocity in the V direction
User defined string 1	'Site 123'	–	Fixed data string entered by user via WindSet.
User defined string 2	41 24.2028	–	Fixed data string entered by user via WindSet.
User defined string 3	10.4418	–	Fixed data string entered by user via WindSet.
Heating Status Code	'0000 0007'	'0004 0007'	Hexadecimal codes describing the status of the heating. See the heating status flags below.
Supply voltage	'09.5'	'99.9' (1) or blank (2)	The supply voltage measured at input to the sensor.
Extended Status	'0000'	Non-zero	Provide information to support regarding these status codes.

(1) Format when Fixed Field Enabled = true
(2) Format when Fixed Field Enabled = false
(3) At near zero speeds, relative wind direction can vary significantly from measurement to measurement. To avoid this affecting the data the reported direction can be frozen when the wind speed is below a set value. This value can be set in WindSet.

Derived Data

Parameter	Example output	Output on error	Description
Maximum Gust Speed	'015.27'	'999.99' (1) or blank (2)	3s average updated at 4Hz (as per WMO spec) Max will be reset every gust interval Gust interval can be different from averaging period (eg may want 10 min wind average, and a 1 min gust interval) Gust interval can be specified in minutes Also called Peak Gust.
Maximum Gust Direction	'037'	'999' (1) or blank (2)	The wind direction of the reported Maximum Gust Speed.
Minimum Gust Speed	'003.45'	'999.99' (1) or blank (2)	3s average updated at 4Hz (as per WMO spec), i.e. K=12 samples. Minimum will be reset every gust interval. Gust interval can be different from averaging period (e.g. may want 10 min wind average, and a 1 min gust interval) Gust interval can be specified in minutes
Minimum Gust Direction	'354'	'999' (1) or blank (2)	The wind direction of the reported Minimum Gust Speed.
Wind Speed (Vector Average)	'000.05'	'999.99' (1) or blank (2)	Vector average wind speed (see Appendix L)
Wind Direction (Vector Average)	'326'	'999.99' (1) or blank (2)	Vector average wind direction (see Appendix L)
Wind Speed (Scalar Average)	'000.06'	'999.99' (1) or blank (2)	Scalar average wind speed (see Appendix L)
Wind Direction (Scalar Average)	'327'	'999.99' (1) or blank (2)	Scalar average wind direction (see Appendix L)

Measurement Status Code

Status Code ASCII/MODBUS/SDI-12	Status Code NMEA	Description
00	A	Wind Measurement Valid
04	V	Wind Measurement Invalid
08	n/a	Configuration Data Error

Heater Status Code

When a Heater Status Digit is reported as "1", this indicates the status/action below

		Hexadecimal Value			
		8	4	2	1
Status Digit	Digit 1	Reserved	Reserved	Reserved	Reserved
	Digit 2	Reserved	Reserved	Reserved	Reserved
	Digit 3	Reserved	Reserved	Heater hardware fault – Contact Gill Technical Support	Heater hardware fault – Contact Gill Technical Support
	Digit 4	Supply voltage is above safe maximum	Heater comms fault – Contact Gill Technical Support	Configuration Error – Contact Gill Technical Support	Supply voltage is below minimum required
	Digit 5	Reserved	Reserved	Reserved	Reserved s
	Digit 6	Reserved	Reserved	Reserved	Reserved
	Digit 7	Heater controller power-up test timer is active	Reserved	Reserved	Reserved
	Digit 8	Heating is inhibited due to supply voltage out-of-range	Heater is active (i.e. the heater circuit is drawing current)	Heating enabled in set-up but may not be active	Device has heating capability

Appendix D – WindSet Software

Gill Instruments provide a free of charge software package called WindSet to enable the WindUltra to be set-up.

WindSet software can be downloaded from www.gillinstruments.com.

⚠️ WindUltra can only be configured via the USB cable or via RS485 2-wire via the M12 connector. **Configuration via RS422 connection is not possible.**
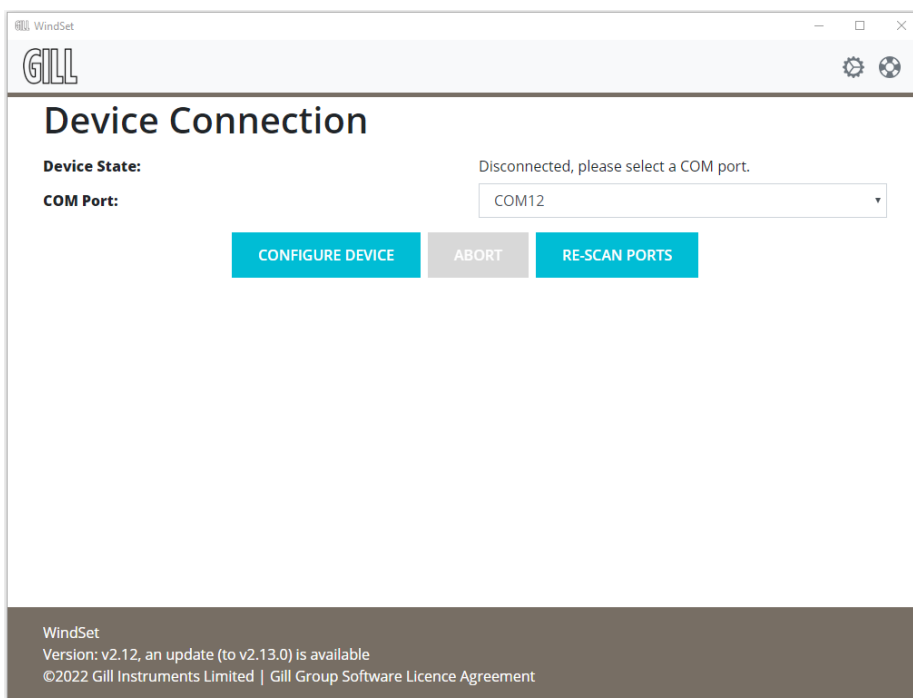
Figure 9 – WindSet Connection Screen

Using WindSet to connect to WindUltra

To use WindSet:

1. **Download WindSet** from gillinstruments.com
2. **Install WindSet** on your PC
3. **Open WindSet** – it may appear in a "Gill" program folder
4. **Connect WindUltra** to your PC (Gill Instruments recommend using a USB to USB power and data lead)
5. Select the appropriate **COM Port** from the drop down list:
6. If there are no COM Ports showing in the drop down list
   a. Click on **RE-SCAN PORTS**
   b. If a "No device found" box appears, please refer to Appendix I (Fault Finding).
7. Click on **CONFIGURE DEVICE**
8. WindSet will display the set-up HOME screen

WindSet set-up screen explained

WindSet uses a Graphical User Interface (GUI). The navigation aids within WindSet are shown below. The terms shown in the table (Screen, Button, etc.) will be used to describe how to use WindSet.

Figure 10 – WindSet Home Screen
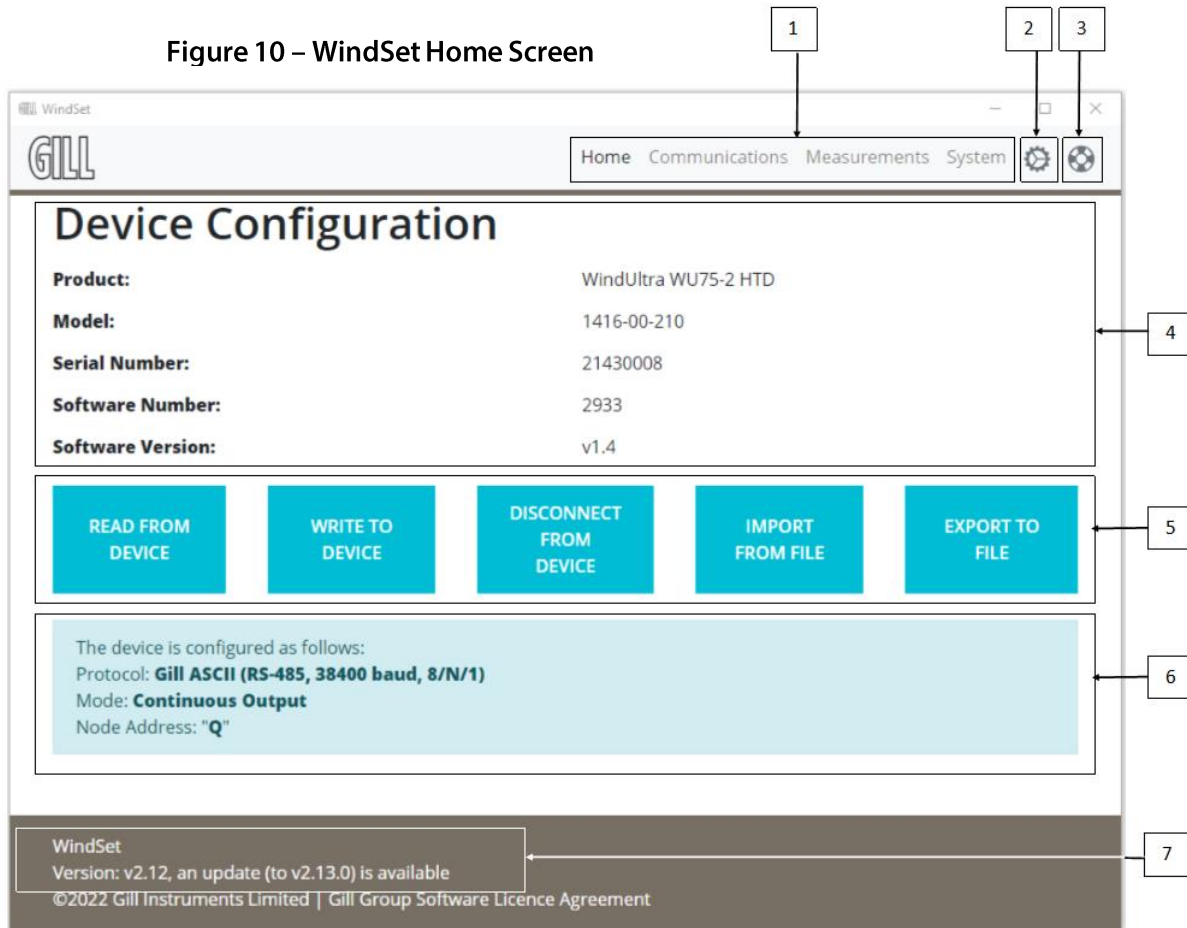
	Navigation Aid	Purpose
1	WindSet Screen	Enables access to different screens within WindSet. These screens allow different parts of the WindUltra set-up to be changed
2	Cog icon	Enables "notifications of updates to WindSet" to be switched on or off
3	Lifebuoy icon	Enables access to features to help with Technical Support
4	WindUltra Information	Information about the hardware and software of the WindUltra currently connected to WindSet
5	Set-up Management Buttons	These buttons allow set up files to be read from or written to the connected device or to folders on the PC being used
6	Set-up Summary	Information about the set-up (or configuration) of the WindUltra currently connected to WindSet
7	WindSet information	Summary information about the WindSet program, including information about new versions of WindSet

Note: When using WindSet, additional information about a setting can be seen by hovering over a drop down list or text entry box.

Using WindSet to set up WindUltra

Once the current WindUltra set-up has been downloaded, WindSet can be used to change the set-up as required. WindSet can be used to:

- Change the communications set-up
- Change the data output rate, the data included in the output and the order of data provided
- Control the sensor and change the measurement units

Using WindSet to change the communications protocol

The **COMMUNICATIONS** screen can be used to select the protocol used by WindUltra. To select one of the protocols available

1. Click the **Selected Protocol** drop down list
2. A list of the protocols available in the connected WindUltra will appear
3. Click on the required protocol
4. The variable associated with the selected protocol will be displayed in the lower section of the screen. These variables can now be entered as required. More information about the variables available is contained in the relevant protocol appendix.
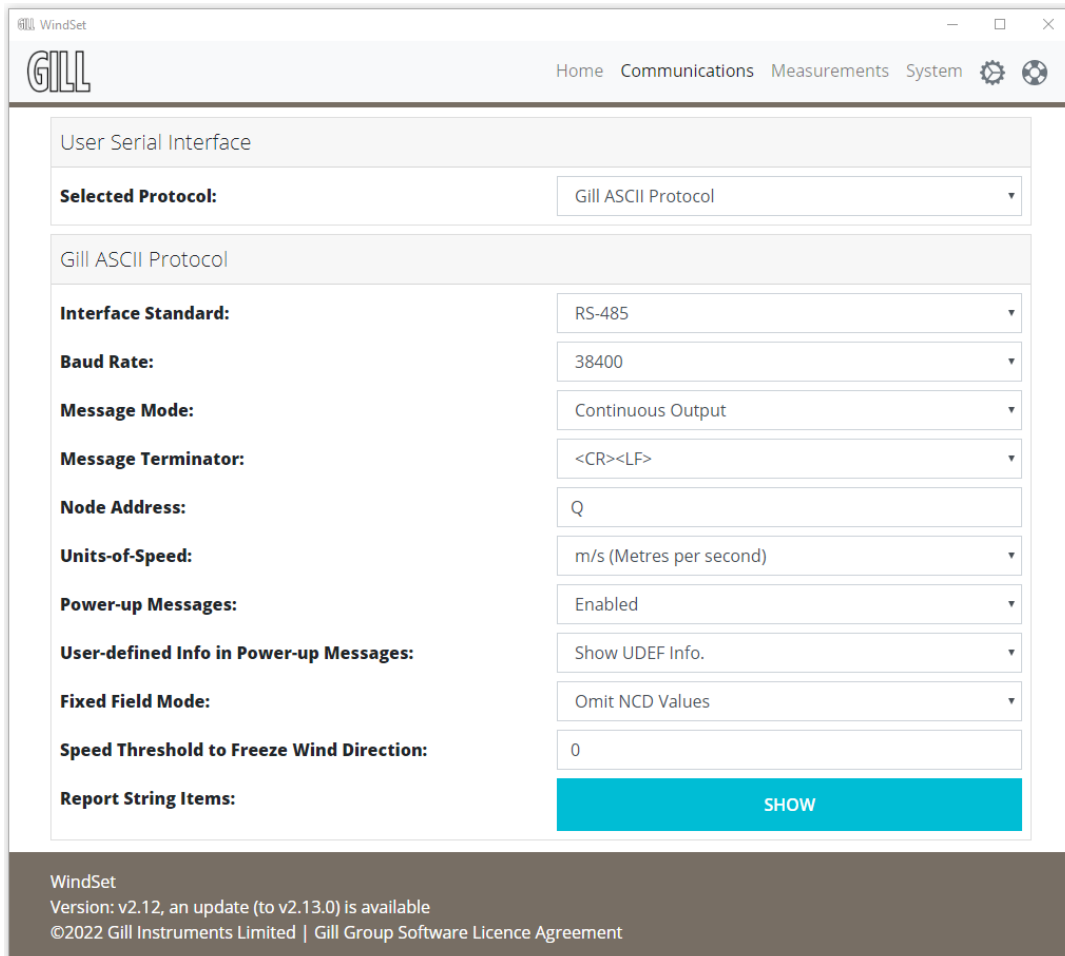

Figure 11 – WindSet Communication Settings

Using WindSet to change the wind measurement settings

The **MEASUREMENTS** screen can be used to change the wind measurement settings used by WindUltra. To select one of the protocols available

1. **North Alignment Offset** can be used if the WindUltra is not going to be aligned to the north. An offset, measured in degrees, can be entered to allow for any difference in alignment. For example, if the North Marker on the WIndUltra is going to be aligned with East, a North Alignment Offset of +90º should be entered.

2. **Wind Sample Rate** is the rate at which data messages will be sent when WindUltra is set to Continuous mode. The Wind Sample Rate can be selected from the drop down menu.

3. **Gust Interval** is the interval over which the minimum and maximum gust will be observed. A gust is defined as a 3 second running average of measured wind speed. The maximum and minimum gust in a specific gust interval can be reported by WindUltra. The gust interval can be set between 1-60 minutes. For example, if the gust interval is set to 10 minutes then the maximum average wind speed recorded over a 3 second period during each 10 minute interval will be reported.

4. **Long-Term Average Period** is the average of all the readings taken at one second intervals over the average period. The 2-min and 10-min presets update every one minute. A "Custom" option allows setting the update interval (1 to 600 seconds) as well as the averaging period.
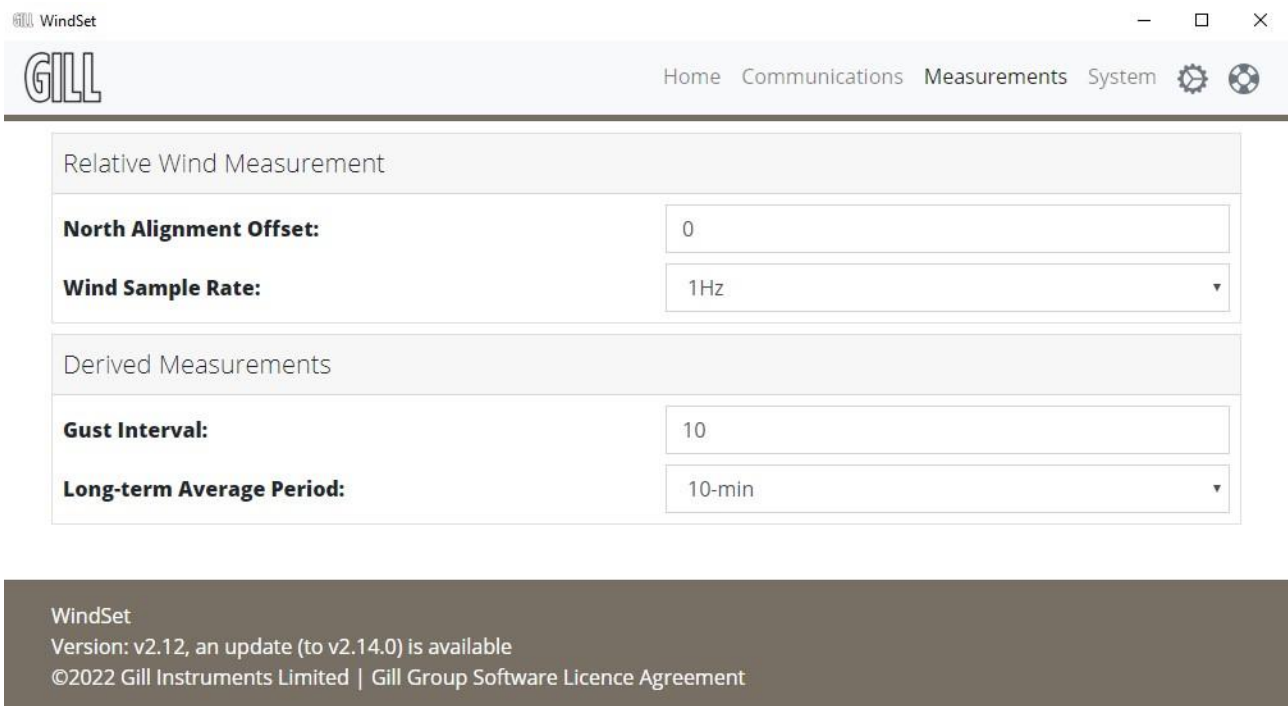
Figure 12 – WindSet Measurement Settings

Using WindSet to change User Defined Strings

The **SYSTEM** screen can be used to change the User Defined Strings used by WindUltra.

User Defined Strings can be used for a number of purposes including:

- Additional identification information (e.g. longitude and latitude information, site name, etc.)
- Additional device information (e.g. last inspection date)
- Additional set-up explanation (e.g. Baud rate setting)

Each User Defined String can contain up to 16 characters.
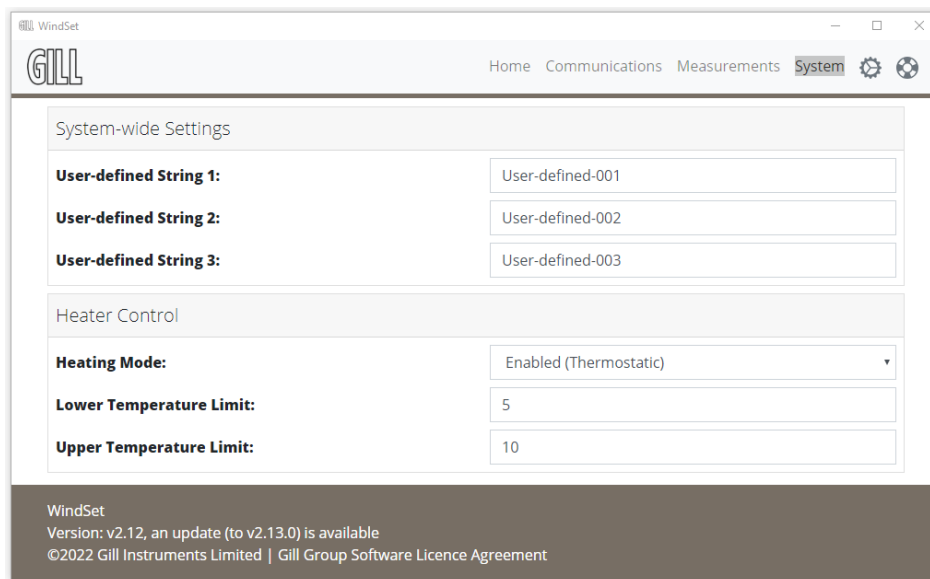
Figure 13 – WindSet System Settings

Using WindSet to change the heater control settings

The **SYSTEM** screen can be used to change the **Heater Control Settings** used by WindUltra. There are two type of heater settings:

Heating Mode

This setting selects the way the heater will work. The options are

- Disabled – this mode disables the heater
- Enabled (Thermostatic) – this mode switches the heater on and off at the pre-defined lower & upper temperature limits
- Enabled – this mode switches the heater on continuously

Lower and Upper Temperature Limits

- If the Enabled (Thermostatic) mode is selected, it is possible to set the temperature at which the heating will be switched on and off (these settings are in degrees celsius).
- The Lower Temperature Limit should be set to the temperature at which the heater will switch on.
- The Upper Temperature Limit should be set to the temperature at which the heater will switch off.

Figure 14 – WindSet Heater Control

WARNING: HOT SURFACE
When heating is activated, the heated ultrasonic transducers will get very hot and should not be touched.

Appendix E - WindUltra ASCII Data Output

Overview
The ASCII protocol provides output of measurement data in a configurable ASCII message. Messages can be output continuously at the configured message sample rate (CONTINUOUS MODE) or on demand (POLLED MODE).

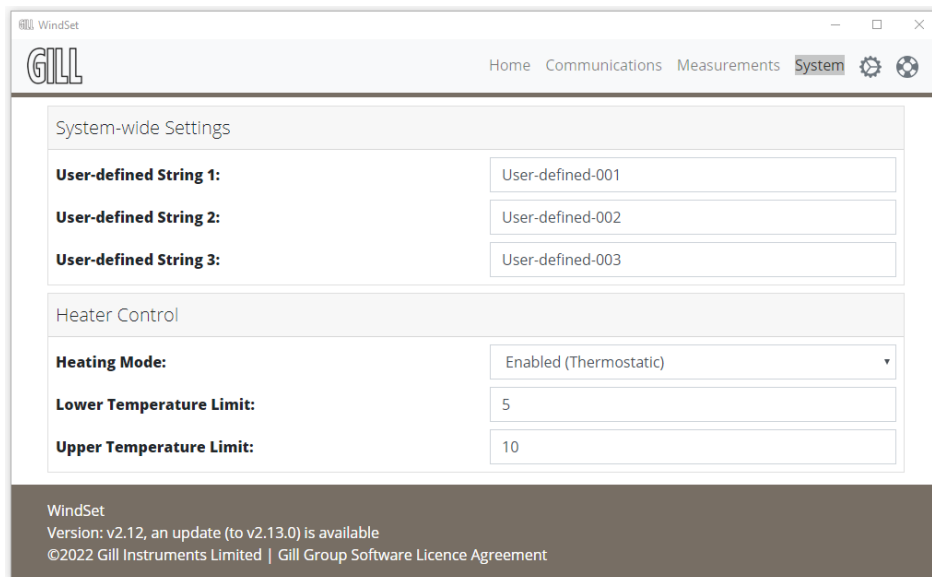In Continuous Mode the device transmits a data message at a constant frequency. The message frequency is set in WindSet. There is also the option for the device to transmit a series of status messages on power-up. The format of these messages is shown below. These status messages are not available when the sensor is being used in Polled Mode.

In Polled Mode the device transmits a data message when it receives a message containing the Node Address character(s). The Node Address can be between 1 and 8 characters in length. The maximum inter-character gap in a polled request is 10ms. In Polled Mode the device makes measurements at the configured sample rate, and provides the most recent measurement in response to the poll message. The typical response time to a poll request is 1ms after the receipt of the Node Address. The device can be polled immediately after the measurement message has been received, however duplicate measurements will be provided if the gap between polled requests is smaller than the measurement rate.

The data is provided in the format shown below.

WindUltra Power-Up Message
In Continuous Mode and if selected the sensor will output a power-up message containing the following information:

- Standard product information string
- User-defined product info strings (optional)
- Sensor status
- List of data contained in messages
- Units used in data contained in messages

An example output is as follows:

```
Ultrasonic Anemometer 4751-00-035 2933 v1.0
User-defined-001
User-defined-002
User-defined-003
STARTUP FROM SOFTWARE RESET
NODE,DIR,SPEED,ULSPEED,STATUS,CHECK
-,DEG,MS,-,-,-
```

Note that within the optional power-up messages it is possible to further control whether the user-defined product info strings (User-defined-001, User-defined-002, and User-defined-003) are shown.

WindUltra default ASCII data message

The device outputs an ASCII data message that contains a CSV portion containing data based on the Measurement Data Items.

The general message format is as follows:

- The 'STX' (start of text, ASCII value 2) and 'ETX' (end of text, ASCII value 3) characters are used as the start-of-message and end-of-message characters.
- The " , " (comma) character is used as the field separator in the CSV portion of the message.
- A single byte XOR checksum of the CSV portion of the message is appended after the end-of-message character.
- A user-selectable set of characters is used to terminate the message (<CR> or <CR><LF>).
- Numeric fields are output with leading zeros
- Invalid data is indicated either by a full-scale value eg '999.999' or a blank (null) field (configurable)
- Fields that can be negative are preceded with '+' or '-'

The content and order of items in the data message string is configurable (see Configuration). Note that very low baud rates (e.g. 1200, 2400 baud) make certain communications impossible, e.g. high polling rates, high sampling rates, and long response strings may be incompatible with these low baud rates.

An example of an ASCII data message is shown below.

NODE, DIR, SPEED, STATUS

<STX>Q,014,000.06,00, <ETX>40

Where:-

Character	Description
STX	(Start of Text)
Q	Node letter
14	Wind direction
0.06	Wind speed
0	Status code
ETX	(End of Text)
40	Checksum

Using WindSet to change the reported parameters of WindUltra

▶ 1. Click the **Show** button next to report string items 9scroll down to the the full list).
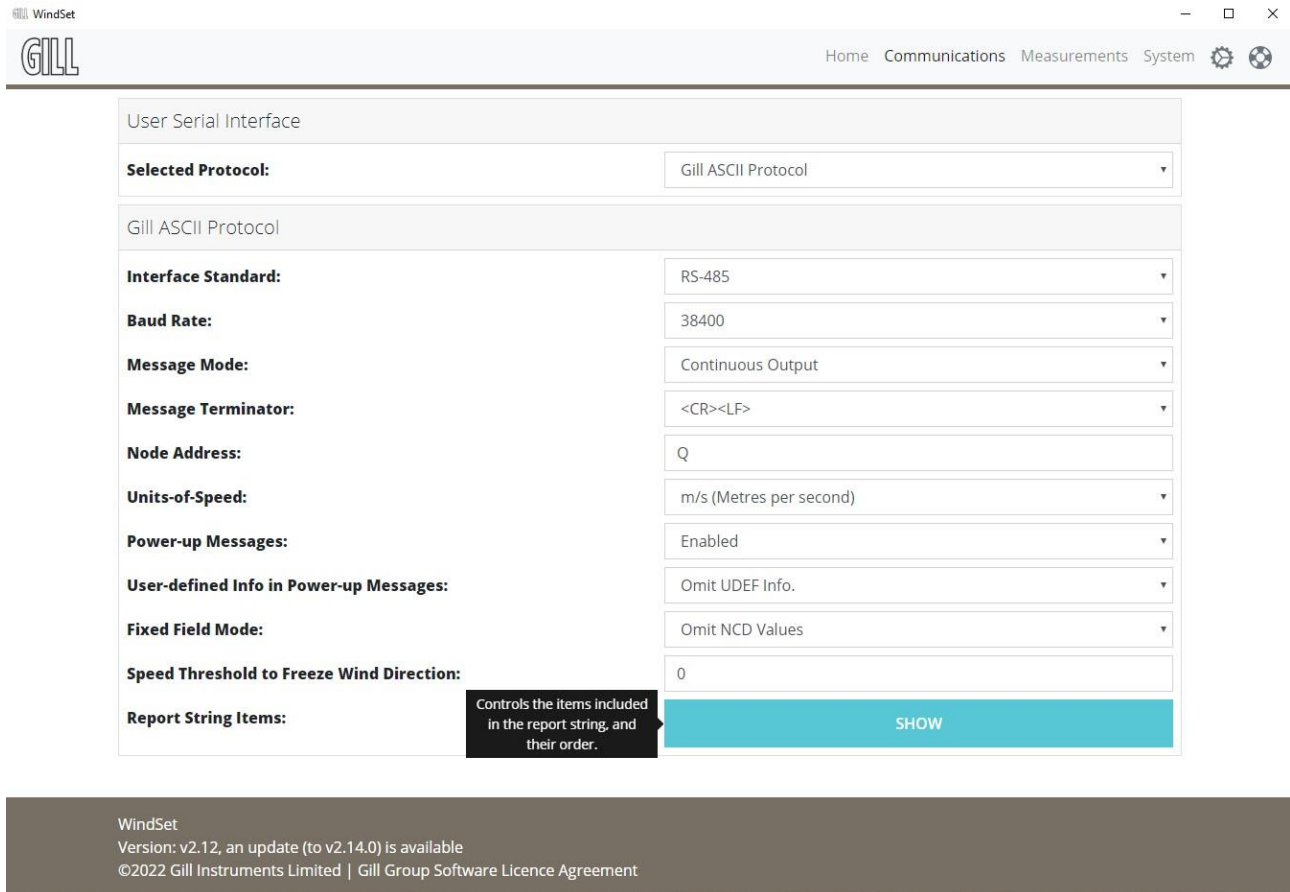
Figure 15 – WindSet Output Configuration

▶   2.   Default parameters are listed from 1-6 as shown below.
         3.   The order of these parameters can be changed to suit the intended application of the sensor by clicking the drop-down arrow for each field.
         4.   Clicking **ADD** will place another configurable parameter field at the end of the string. Selecting **REMOVE** will remove the final parameter field.

⚠   Additional parameters can only be added at the end of the string; therefore items should be ordered from the first parameter onwards.

Figure 16 – WindSet Report String Items

Appendix F – WindUltra MODBUS Data Output

Ideal for any networked installation of devices, the Modbus RTU protocol provides data in a number of different formats.

RS-485 Networking

Multiple units can be connected on the same 2-wire RS-485 network. Note that:

- each unit must be configured with a different Modbus slave address
- the typical response time of the unit to a Modbus poll is in the order of 10 milliseconds
- the maximum response time of the unit to a Modbus poll is in the order of 3 seconds
- a delay of at least 2 milliseconds must be respected between consecutive Modbus polls

Function Code Support

The following Modbus Function Codes are supported in order to return data from the unit:

- 03: Read Holding Registers - to return measurements
- 17: Report Server (slave) ID - to return unit information

Modbus Function code 03 Read Holding Registers is used to return measurements from the unit.

Register Numbering and Ranges

Note - in Modbus terminology the first register is referred to as number 1, but 'on-the-wire' the address of that register is 0.

The register ranges used in this device are as follows:

- 2,000+ for 32-bit IEEE 754 floating point data format.
- 4,000+ for 32-bit integer data format.
- 6,000+ for 16-bit integer data format.

Available Registers

The complete list of available registers, their location, format and units is shown below. Note that SI units are used for all available data items.

Item	Units	32-bit float register address	32-bit integer registers address	16-bit integer register address
Speed	m/s	2000	4000	6000
Direction	degree	2002	4002	6001
U-axis velocity	m/s	2004	4004	6002
V-axis velocity	m/s	2006	4006	6003
Max gust speed	m/s	2008	4008	6004
Max gust direction	degrees	2010	4010	6005
Min gust speed	m/s	2012	4012	6006
Min gust direction	degrees	2014	4014	6007
Heater Status Flags	flags	2016	4016	6008
Heater Fault Flags	flags	2018	4018	6009
System Status Flags	flags	2020	4020	6010
System Supply Voltage	volts	2022	4022	6011
Long-term Vector-Average Speed	m/s	2024	4024	6012
Long-term Vector-Average Direction	degrees	2026	4026	6013
Long-term Scalar-Average Speed	m/s	2028	4028	6014
Long-term Scalar-Average Direction	degrees	2030	4030	6015

For item definitions, please see appendix C.

Measurement Register Scaling

Available measurements are available in three data formats, with different scaling factors in order to accommodate data that includes decimal fractions:

- 32-bit float - no scaling
- 32-bit integer - scaled x 100 (except status flags)
- 16-bit integer - scaled x 10 (except status flags)

Invalid Measurement Values

If a valid request is made for a measurement or other value which is unavailable, an "invalid" value will be indicated by:

- 32-bit float - 0x7FC00000 (hexadecimal - NaN)
- 32-bit integer - 0x7FFFFFFF (hexadecimal)
- 16-bit integer - 0x7FFF (hexadecimal)

Requesting Unit Information

Modbus Function code 17 (0x11 hexadecimal) Report Server ID is used to read information specific to a Modbus device.

Report server (slave) ID

Field	Field size (bytes)
Manufacturer string	32
Model string	32
Options string	16
Software version string	16
Serial number	32
Device / Server / Slave address	2
Modbus run status indicator	1
Reserved	1
User-definedproductinformationstring1	16
User-definedproductinformationstring2	16
User-definedproductinformationstring3	16

Supported Devices

WindUltra has been tested with the following Modbus master devices:

- Simply Modbus data communication test software (www.simplymodbus.ca/)
- Ammonit Meteo-40M data logger (www.ammonit.com)
- Campbell CR6 data logger (www.campbellsci.com)
- Campbell CR1000X data logger (www.campbellsci.com)

It should also function correctly with other Modbus-compliant master devices.

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Appendix G – WindUltra NMEA 0183 Data Output

Overview

WIndUltra supports the transmission of ASCII measurement and status data sentences in accordance with the NMEA 0183® Standard ('Standard for Interfacing Marine Electronic Devices'). Parametric sentences for measurement and status data are output continuously at 1 Hz.

The device operates as a 'talker' only (an NMEA 0183 term referring to the originator of messages across an NMEA 0183 link), incoming sentences (i.e. query and command sentences) are ignored.

The NMEA 0183 Standard is closely aligned to IEC Standard 61162-1:2016. Whilst v4.10 of the NMEA 0183 Standard is implemented by this protocol package it should in theory be backward compatible to version NMEA 0183 2.0 (according to a statement in the introduction of the specification document).

Interface Configuration

The sentences for this protocol are transferred via an RS-422 interface. The interface has the following configuration:

- Baud Rate: 4800
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Output Rate

Parametric sentences (for measurement data) are transmitted continuously at 1 Hz. This transmission is unaffected by the user-selectable wind sample rate.

Supported Sentences

In the following sections describing the sentences that are implemented the start of each sentence is shown as '$--', the '--' after the start delimiter ('$') is to be set to the device's talker identifier, by default this will be 'WI' (Weather Instrument). Alternatively, 'II' (Integrated Instrumentation) can be selected via the WindSet communications tab.

Wind Speed and Angle

$--WIMWV,x.x,a,x.x,a,A*hh<CR><LF> Fields:
$--IIWIMW,x.x,a,x.x,a,A*hh<CR><LF> Fields:

1. x.x   Wind angle, 0 to 359 degrees.
2. a   Reference, 'R' = relative, 'T' = theoretical.
3. x.x   Wind speed.
4. a   Wind speed units, 'K' = km/hour, 'M' = Meters/second, 'N' = Knots, or 'S' = Statute miles/hour.
5. A   Status, 'A' = data valid, 'V' = data invalid.
6. hh   Checksum

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Appendix H – WindUltra SDI-12 Data Output

Overview

This protocol allows the device to communicate with a device acting as an SDI-12 Data Recorder in accordance with the SDI-12 specification. The device implements the 'Sensor' role described in the spec.

Protocol version 1.3 is implemented.

The Address Character can be set to 0 to 9 (standard range), a to z or A to Z (extended range).

The command/response messages are transferred via a bidirectional tri-state serial line which is part of the three-wire (serial, ground, and +12V) SDI-12 interface. UARTs connected to the serial line should have the following configuration:

- Baud Rate: 1200
- Data Bits: 7
- Stop Bits: 1
- Parity: Even

Supported Commands

Note: for each of the available aMx!, aC!, and aRx! commands, there exists an equivalent aMCx!, aCC!, and aRC! command that provides a 3 character CRC on the associated send data command (aD0!, aD1! ...) immediately before the <CR><LF> characters. The CRC is calculated as per the SDI-12 Standard.

Polled Measurement Commands

Name	Command	Response	Example
Start measurement (polar)	aM!	atttn<CR><LF>	a0023 ('002' => 2s response time - guarantees a new measurement will have been published.)
Send data (polar)	aD0!	a<dir><mag><status><CR><LF>	e.g. 0+083.2+000.02+0000<CR><LF>
Start measurement (UV)	aM1!	atttn<CR><LF>	a0003
Send data (UV)	aD0!	a<U><V><status><CR><LF>	e.g. 0+000.001+000.023+0000<CR><LF>
Start measurement (gust)	aM2!	atttn<CR><LF>	a0005
Send data (gust)	aD0!	a<dir><speed><dir_at_max_ gust><max_gust_speed><dir_at_ min_gust><CR><LF>.	+332.1+000.201+123.2+004.124+321.2<CR>< LF>
Send data (gust cont.)	aD1!	a<min_gust_ speed><status><CR><LF>.	e.g.0+000.024+0000<CR><LF>

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Continuous Measurement Commands

Name	Command	Response	Example
Continuous measurement (polar)	aR0!	a<dir><speed><status><CR><LF>	0+332+000.04+0000><CR><LF>
Continuous Measurement (UV)	aR1!	a<U><V><status><CR><LF>	0-000.10-000.20+0000<CR><LF>
Gust	aR2!	a<dir><speed><dir_at_ max_gust><max_gust_speed><dir_at_ min_gust><min_gust_speed><status><CR><LF>.	0+332.1+000.201+123+004.12 +321+000.02+0000<CR><LF>

Concurrent Measurement Commands

Name	Command	Response	Example
Concurrent measurement	aC!	atttn<CR><LF>	000212<CR><LF>
Send data (polar)	aD0!	a<dir><mag><status><CR><LF>	e.g. 0+083.3+000.024+0000<CR><LF>
Send data (UV)	aD1!	a<U><V><status><CR><LF>	e.g. 0+000.001+000.022+0000<CR><LF>
Send data (gust)	aD2!	a<dir><speed><dir_at_max_gust><max_gust_speed><dir_at_min_gust><min_gust_ speed><status><CR><LF>.	e.g. 32.1+000.201+123.2+004.124 +321.2+000.024+0000<CR><LF>

Other Commands

Name	Command	Response	Example
Acknowledge Active	a!	a<CR><LF>	e.g. 0<CR><LF>
Send Identification	aI!	Allcccccccccmmmmmmvvvxxxx…xxx<CR><LF> device model number field <mmmmmm> is used for software version optional field <xxx> is used for serial number	e.g. 013GillInst 2933000GILL0001<CR><LF>
Address Query	?!	a<CR><LF>	e.g. 0<CR><LF>

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Appendix I – Fault Finding

Connecting WindUltra with a USB-USB cable

Symptom	Possible Solutions
Problem communicating with WindSet software using a USB-USB cable	▪ Check power is available to WindUltra. At least one of the LEDs next to the WindUltra USB port should be lit. ▪ Check WindUltra is operating correctly. The red LED on the WindUltra should be flashing intermittently (0.5Hz) to confirm correct operation. If the red LED is not flashing in this way refer to the WindUltra LED guide in appendix K* ▪ Check the USB-USB cable supports power and communications connections. If you are not sure try connecting a different type of device to your PC to confirm a data connection. ▪ Check that the PC has the necessary drivers loaded. If required download the driver from: https://www.st.com/en/development-tools/stsw-stm32102.html ▪ Type "Device Manager" into the Windows Search Box ▪ Click on "Ports (COM & LPT)" ▪ Check for "USB Serial Port (COM x)", if this is not present then the PC requires a USB driver. The driver can be downloaded from the internet using the link above. ▪ If WindSet is still not communicating correctly with WindUltra then contact Gill Instruments Technical Support.

*When configuring with WindSet, the red LED will be on constantly until disconnected.

Connecting to WindUltra with a Serial to USB cable (USB at host system, M12 at WindUltra)

Symptom	Possible Solutions
Problem communication between a host system using a serial-USB convertor. (Host system with a USB connector, WindUltra with an M12 connector)	▪ Check power is available to WindUltra. At least one of the LEDs next to the WindUltra USB port should be lit. ▪ Check WindUltra is operating correctly. The red LED on the WindUltra should be flashing intermittently (0.5Hz) to confirm correct operation. If the red LED is not flashing in this way refer to the WindUltra LED guide in appendix K. ▪ Check that the PC has the necessary drivers loaded. If required download the driver from: https://www.ftdichip.com/Drivers/VCP.htm ▪ Type "Device Manager" into the Windows Search Box ▪ Click on "Ports (COM & LPT)" ▪ Check for "USB Serial Port (COM x)", if this is not present then the PC requires a USB driver. The driver can be downloaded from the internet using the link above. ▪ Check that the signal ground, D+ and D- wires are connected correctly. ▪ Depending on the terminating system, check that the D+ and D- wires require termination with a load resistor. ▪ Depending on the terminating system, check that the D+ and D- wires require biasing. ▪ Check that the USB-RS485 convertor is fully compliant.

Operational Fault Finding

Symptom	Possible Solutions
No output	- If the red LED under the USB port cover is off then check the power to the sensor - the red LED should flash at approximately 0.5Hz. - If the red LED is continuously on or flashing at 5Hz, then power cycle the sensor – If the red LED is not flashing in this way refer to the WindUltra LED guide in appendix K. - Check the current available at the sensor is sufficient to power the sensor. - Check the communication settings of the sensor and the host system are correct, including the COM port. - Check the communications wiring to the sensor is correct. - If appropriate, check the sensor is in Continuous mode. - For multi-sensor networks, check other sensors connected to the network are correctly set up. - If the fault persists then contact Gill Instruments Technical Support.
Corrupted output / One way communication	- Check communications settings of sensor and host system match. - For multi-sensor networks, check other sensors connected to the network are correctly set up. - Try a slower baud rate. - Check cable lengths and type of cable. - Check for appropriate serial termination resistance for long cable runs. - Check serial biasing is appropriate for other equipment on the network. - If communication problems persist then contact Gill Instruments Technical Support.
Problems with measurements / data invalid flag	- If the orange LED is On with a very bright flicker, or the Status Code indicates an Invalid Measurement, check the ultrasonic signal path is not blocked. - If measurement problems persist then contact Gill Instruments Technical Support.
Unit resets	- Check that the power supply is within the required limits at the sensor. The sensor voltage can be set to be reported in the output data. - Check the current provided to the sensor is sufficient for the sensor set-up (which may include heating). Allow for any other equipment connected to the same power supply. - If the sensor continues to reset then contact Gill Instruments Technical Support.
Heater does not switch on	- Note: If the green LED is on then the heater circuit is being powered – the heaters are lower powered and focused where heating is needed. It may take time before any heating can be felt. - Check power to the sensor is within the required limits at the sensor. The sensor voltage can be set to be reported in the output data. Confirmation that the voltage is within the required limits can be obtained from the Heater Status Code. The Heater Status Code can be set to be reported in the output data. - Check the sensor has heating enabled. This information can be found in the Heater Status Code. The Heater Status Code can be set to be reported in the output data. - Check the temperature at which the heater is set to be switched on and switched off. These temperatures are set as part of the sensor set-up and can be confirmed and changed using WindSet. - Check the remaining Heater Status Codes. If heater problems persist then contact Gill Instruments Technical Support.

Appendix J – WindView Software

Gill Instruments provide a free of charge software package called WindView to enable the data provided by WindUltra to be viewed. WindView is compatible with Windows 7 and Windows 10.

WindView software can be downloaded from www.gillinstruments.com.

## Using WindView to connect to WindUltra

To use WindView:

1. **Download WindView** from gillinstruments.com
2. **Install WindView** on your PC
3. **Open WindView** – it may appear in a "Gill" program folder
4. Connect WindUltra to your PC (Gill Instruments can supply a USB to M12 convertor if required)
5. Click on "**File"** in the Menu Bar at the top left of the screen
6. Click on "**Connect…**"
7. The screen shown below will appear.
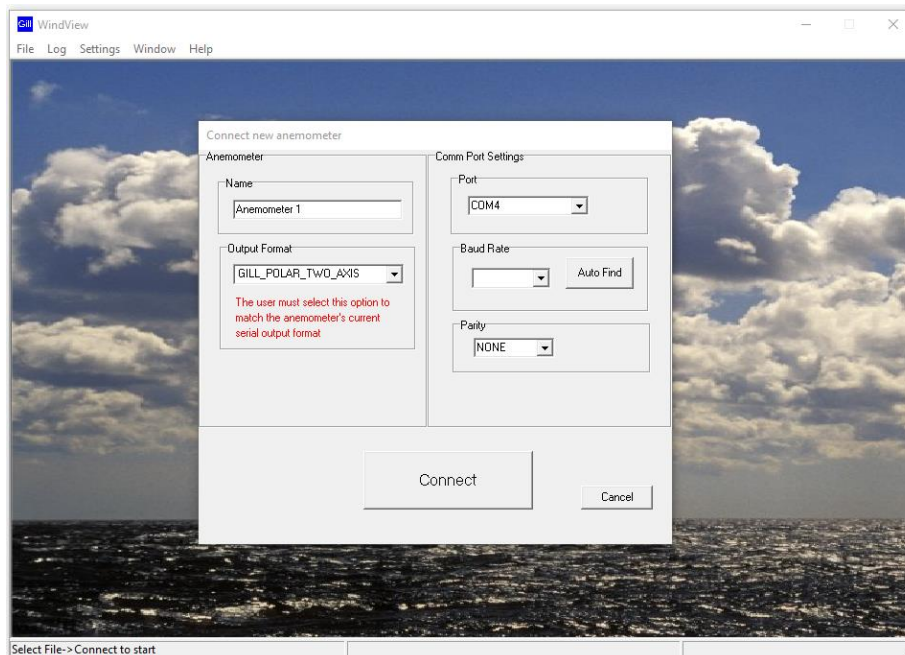
To set up WindView for use with WindUltra:

1. In the **Name** field, type a name for the device
2. In the **Output** format field select either GILL_POLAR_TWO_AXIS or GILL_UV_TWO AXIS depending on the set-up of the WindUltra (default = GILL_POLAR_TWO_AXIS)
3. In the **Port** field, select the port that is connected to the WindUltra (possible ports used can be found by opening the PC device manager and expanding the "Ports (COMS & LPT)" section)
4. In the **Baud Rate** field selected the baud rate of the WindUltra (default = 38400)
5. In the **Parity** field select the parity set-up for the WindUltra
6. Click on **CONNECT**
7. The data screen shown below will be displayed. This screen contains the data currently being provided by WindUltra. Alternative displays (windsock or graph) can be selected by clicking on the appropriate tab.
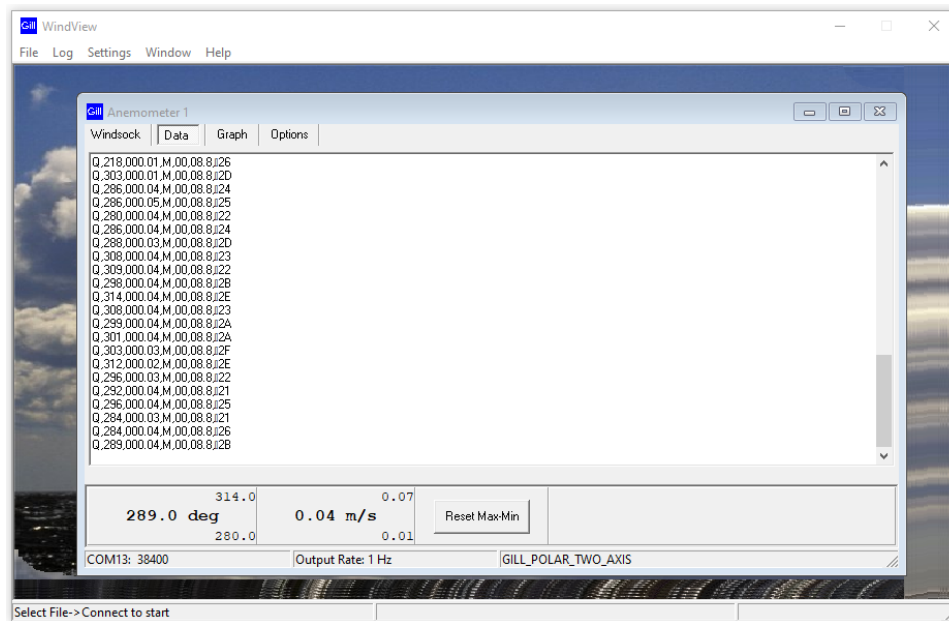
The data shown in the screen above is presented in numeric format. The data can also be presented as a windsock or as a graph. The presentation of the data is selected by using the **Windsock** or **Graph** tabs at the top of the data screen.

Additional WindView features

WindView contains a number of additional features that can be used to

- Change the way the data is presented
- Allow the data to be logged for future analysis
- Allow an alarm to be activated if certain conditions occur

Alternative Data Displays

In addition to displaying the data in Numeric, Windsock or Graph formats, it is possible to adjust the scale of the display and some elements of the presentation. To make these adjustments select the **Settings** Menu in the Menu Bar at the top of the WindView screen, and select

- Units
- Display Mode
- Graph
- Windsock

to make the adjustments required. Once a selection is made, the available options will be displayed

Logging Data for future use

The data provided by WindUltra can be saved to a file for future use or analysis.

To name and set up the file

1. Select **Settings** in the Menu Bar at the top of the WindView screen.
2. Select **Logging** from the drop down menu
3. Use the window displayed to set the size, format, location and description for the output file
4. To start logging click on **Log** in the Menu Bar and click on **Start**
5. To stop logging click on **Log** in the Menu Bar and click on **Stop**

Setting Alarms

The data provided by WindUltra can be used to provide an alarm if a threshold is exceeded.

To configure the alarm

1. Select **Settings** in the Menu Bar at the top of the WindView screen.
2. Select **Alarm** from the drop down menu
3. Select the trigger condition (tick **Enable** in Windspeed Alarm or Direction Alarm)
4. Select the conditions under which the alarm should be activated
5. Select the type of alarm required
6. Click on **Apply**

Note: The alarm needs to be reset once the trigger condition has been met and the alarm activated

Appendix K - Status LEDs

WindUltra contains three LEDs which can be seen through the USB Port Cover on the underside of the Sensor Unit.
These LEDs confirm correct operation of the Sensor Unit, or can indicate specific error conditions.

Red LED		
LED Status	Description	Recommended Action
0.5Hz Pulse	Normal Operation	
Off	Fault	Check power, then contact Gill Instruments Technical Support
5Hz Flash	System Error	Power cycle, then contact Gill Instruments Technical Support
On	Start Up Error*	Power cycle, then contact Gill Instruments Technical Support

*When configuring with WindSet, the red LED will be on constantly until disconnected.

Orange LED		
LED Status	Description	Recommended Action
Rapid Flash	Normal Operation	
On, bright flicker	Ultrasonic Error	Inspect transducers for debris, clean carefully, if required. Contact Gill Instruments Technical Support

Green LED	
LED Status	Description
Off	Heaters are Off
On	Heaters are On

Appendix L – Derived Parameter Calculations

Gust:

Measurement Value	Definition
Minimum Wind Speed	The minimum 3s-average speed measurement within the **gust interval.** Each 3s average speed is computed as $\sqrt{(\bar{u}^2 + \bar{v}^2)}$ where $\bar{u} = \frac{\sum_{k=1}^{K} U_k}{K}$ and $\bar{v} = \frac{\sum_{k=1}^{K} V_k}{K}$ and U_k and V_k are the u and v vector components of 4Hz sample S_k
Wind Speed Gust	The maximum 3s-average speed measurement within the **gust interval** Each 3s average speed is computed as $\sqrt{(\bar{u}^2 + \bar{v}^2)}$ where $\bar{u} = \frac{\sum_{k=1}^{K} U_k}{K}$ and $\bar{v} = \frac{\sum_{k=1}^{K} V_k}{K}$ and U_k and V_k are the u and v vector components of 4Hz sample S_k
Wind Direction of Minimum Wind Speed	The wind direction when the Minimum Wind Speed occurred. Computed by using the same $\bar{u}$ and $\bar{v}$ used for the Minimum Wind Speed calculation.
Wind Direction of Gust	The wind direction of the reported Wind Speed Gust. Computed by using the same $\bar{u}$ and $\bar{v}$ used for the Wind Speed Gust calculation.

Long Term Wind Average:

Measurement Value	Definition
Wind Speed (Vector Average)	Vector Average speed is computed as $\sqrt{(\bar{u}^2 + \bar{v}^2)}$ where $\bar{u} = \frac{\sum_{n=1}^{N} U_n}{N}$ and $\bar{v} = \frac{\sum_{n=1}^{N} V_n}{N}$ and U_n and V_n are the u and v vector one-second average measurements
Wind Direction (Vector Average)	Vector Average direction is computed using: $\bar{d} = atan2\frac{\bar{v}}{\bar{u}}$ Computed by using the same $\bar{u}$ and $\bar{v}$ used for the Wind Speed calculation.
Wind Speed (Scalar Average)	Scalar Average speed is computed from N 1Hz samples (S) as $\frac{\sum_{n=1}^{N} S_n}{N}$
Wind Direction (Scalar Average)	Scalar Average direction is computed from N 1Hz samples as $\bar{d} = atan2\frac{\bar{V}}{-\bar{U}}$ where $\bar{U} = \frac{\sum_{n=1}^{N} U_n}{N}, \bar{V} = \frac{\sum_{n=1}^{N} V_n}{N}$ and $U_n = cos(\theta_n), V_n = sin(\theta_n)$ θ_n = nth 1Hz direction sample

**We represent this supplier.
For more information contact
Observator Instruments:**

**T: +31 (0)180 463411
E: info@observator.com**

Rietdekkerstraat 6
2984 BM Ridderkerk
The Netherlands

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