WindSonic

Ultrasonic Anemometer

User Manual







Applies to WindSonic option 1, 2 & 3, and WindSonic Metal units
with firmware 2368-115-02 onwards

Applies to WindSonic 75 option 1, 2 & 3 units
with firmware 2816-103-01 onwards

Applies to option 4 SDI-12 units from June 2011
with serial numbers 1122007 onwards

Applies to WindSonic option 5 and WindSonic 75 option 5 units

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Contents

1. Welcome to the WindSonic user manual 6
1.1. Overview of Content 6
1.2. Description of Icons 6
1.3. General Notes 7
1.4. User Manual Revision History 7
2. Product Overview 8
2.1. WindSonic Specification 8
3. Pre-Installation 9
3.1. Equipment supplied for non-Metal WindSonics 9
3.2. Accessories available for non-metal WindSonic 9
3.3. Equipment supplied for WindSonic Metal (non-analogue variant) 10
3.4. Accessories available for Equipment supplied for WindSonic Metal (non-analogue variant) 10
3.5. Equipment supplied for WindSonic Metal with Analogue Output 11
3.6. Accessories available for Equipment supplied for WindSonic Metal with Analogue Output 11
3.7. WindSonic CE, UKCA, FCC conformity 12
3.8. Right to change and revise 12
3.9. Packaging 12
3.10. Downloadable Software 12
3.11. WindSonic Part Numbers 13
4. Installation 14
4.1. Requirements 14
4.2. Installation Guidelines 15
4.3. Bench system test 16
4.4. Electrical 17
4.5. Connecting a WindSonic Option1 to a PC using RS-232 Power and Communications Cable 20
4.6. Connecting an Option 2, 3 or WindSonic M to a PC using RS-232 21
4.7. Connecting WindSonic Option 2 or 3 (NOT Metal) set for default RS-422 using Safe Mode 22
4.8. Connecting an RS422 output WindSonic M to a PC with an RS422 Interface/Converter 23
4.9. Changing an Option 2 or 3 Sensor set for RS-232 back to RS-422 24
4.10. Connecting to a PC using RS-422 (Option 2 or 3) 24
4.11. Using RS-485 (2-wire point-to-point) with Option 2 or 3 units 25
4.12. Using RS-485 (2-wire point-to-point) with Metal units 26
4.13. Using the Analogue Output (Option 3 and Metal with Analogue Output) 27
4.14. WindSonic Option 5 Modbus over RS-485 (2-wire point-to-point) 28
4.15. WindSonic Option 4 SDI-12 Protocol 28
5. Mechanical 29
5.1. Orientation 29
5.2. Alignment 29
5.3. Mounting 29
5.4. Earthing / Grounding (Metal WindSonic ONLY) 31
5.5. Heating 31

陕西威瑞仪器仪表有限公司 生产代理销售：实验检测设备 气象科学仪器设备
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6. WindSonic Option 1, 2 & 3 Message Formats 32
6.1. Gill format– Polar, (Default format) 32
6.2. Gill format – UV 34
6.3. NMEA Format (NMEA status codes) 35
6.4. NMEA Format (Gill status codes) 36
6.5. Gill format – Tunnel Mode (UU, Continuous) 36
6.6. Gill format – UV with Gust 37
6.7. Gill format – Polar with Gust 38
6.8. Analogue Outputs and Options 38
6.9. Wind Speed scaling 39
6.10. Tunnel mode 39
6.11. Analogue Output rate 40
6.12. Disabled outputs 40
6.13. Analogue Output Conditions 40
6.14. Analogue Output Conditions 40
6.15. Error condition reporting 40
6.16. Y1 setting (Default) 41
6.17. Y2 nnn Setting, User Set Fixed Analogue Output level in an error mode. 41
6.18. Y3 nnn setting Analogue Output cycles to a user determined level in an error mode. 41
6.19. Error Condition Reporting Notes 42
7. SDI-12 Commands (Option 4) 44
7.1. Message Format 44
7.2. Commands and Returns in Low Power Mode (aXLPM!) 45
7.3. Commands and Returns in High Power Mode (aXHPM!) 46
8. Modbus RTU Protocol (Option 5) 48
8.1. RS-485 Networking 48
8.2. Function Code Support 48
8.3. Requesting Measurement Data 48
8.4. Register Numbering And Ranges 48
8.5. Available Registers 48
8.6. Measurement Register Scaling 50
8.7. Invalid Measurement Values 50
Appendix A. Technical Specification - WindSonic Options 1, 2 & 3 51
Appendix B. Technical Specification - WindSonic Option 4 53
Appendix C. Technical Specification - WindSonic Option 5 54
Appendix D. Technical Specification - WindSonic Metal 55
Appendix E. Cable Assembly for WindSonic (9-Way Connector) 57
Soldering Contacts 57
Crimping Contacts 57
Connector Assembly 58
Connector Spares 60

陕西威瑞仪器仪表有限公司 生产代理销售：实验检测设备 气象科学仪器设备
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Appendix F. Cable Assembly for WindSonic M with Analogue Outputs (12-way connector) 61
Arrange Backshell (Gill Part Number 020-04991) 61
Prepare Cable 61
Prepare Connector Head (Gill Part 020-04990) 62
Assemble Connector to the cable 62
Appendix G. WindSonic Default Setup 64
Appendix H. WindSonic Safe mode 65
Using Safe Mode to get communication and to change settings 65
Safe Mode with Option 4 WindSonic 65
Operation Method Summary 66
Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind 69
Appendix J. Configuring Option 1-3 using terminal package 74
Entering Configuration mode 74
Returning to Measurement mode 74
Checking the Configuration 75
Changing a setting 75
Appendix K. Option 1-3 Configuration Commands 76
Bx – Baud rate 77
Cx – Analogue settings 77
CTx – Configuration Mode Timeout 77
SUSPENDCT – Suspend Configuration Mode Timeout 77
Dx – Diagnostic and Configuration Command 78
DRx - Direction Resolution options 78
Ex – Communications Protocol 78
Fx – Data and parity options 78
Gx – Reserved for Gill use only 78
GUSTINTx – Gust Interval in minutes 78
Hx – Power-up Message 78
Kxx to Kxxxx – Minimum Direction Velocity 80
Lx – Message Terminator 80
Mx to Mxx – Message Format 80
Nx – Node Address 81
Ox – ASCII Output Format 81
Px to Pxx – Output Rate 81
Q – Measurement Mode 81
Sx – Analogue Output Range 82
Tx – Analogue Output Type (Voltage or Current) 82
Ux – Output Units 82
Yx – Analogue Output, Error Status Condition 82
Configuration / Diagnostic Information 83
Appendix L. Option 1-3 Polled Mode Commands 84

陕西威瑞仪器仪表有限公司 生产代理销售：实验检测设备 气象科学仪器设备
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Gill format – Polled (Polar or UV) 84
Appendix M. WndView Software 85
Appendix N. WindSet Software 85
Using WindSet to set up WindSonic Option 5 85
Using WindSet to change the communications protocol 85
Using WindSet to change User Defined Strings 85
Appendix O. Status Codes 86
Option 1-3 and WindSonic Metal Status Codes 86
SDI-12 Status Codes 87
Appendix P. Maintenance & Fault-Finding 88
Cleaning 88
Servicing 88
Fault Finding 88
Returning Unit 89
Bench Test 89
Self – Test (Still Air) (Option 1-3 only) 89
Heater tests (if applicable) 89
Calibration 90
Appendix Q. Glossary & Abbreviations 91

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1. Welcome to the WindSonic user manual

This manual provides the information needed to get the best results from WindSonic.
The most recent version of this manual is available at gillinstruments.com.
Please read this manual before setting up and installing WindSonic.
Unless indicated otherwise, references to Option 1, 2, 3 & 5 also correspond to the WindSonic 75 Options 1, 2, 3 & 5 respectfully.

1.1. Overview of Content

The manual is split into 7 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 the manual is set out
- Chapter 2 provides a brief overview of the product
- Chapter 3 provides the information needed prior to installation of the product
- Chapter 4 goes through installation of the product
- Chapter 5 provides mechanical guidance for product and mounting bracket
- Chapter 6 explains message formats in detail
- Chapter 7 provides details about SDI-12 in the Option 4
- Chapter 8 provides details about Modbus in the Option 5

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

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1.3. General Notes

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

Care should be taken with WindSonic at all times. The product should be transported to site in the box, and only removed when ready to install.

During installation WindSonic should be supported and care should be taken not to drop the product.

Care should be taken when wiring the WindSonic to power and communications.

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 open or repair any of the parts of the product. Any attempt to dismantle any part of the product will invalidate the warranty provided by Gill Instruments.

1.4. User Manual Revision History

Document Version	Release Date	Key Changes
Issue 30	Nov 2022	New Manual Template
Issue 31	May 2024	GUSTINT command function added
Issue 32	August 2024	Incorporation of WIndSonic Metal information into this Manual, and of extended direction decimal place capabilities
Issue 33	December 2024	Introduction of the Option 5 Modbus WindSonic
Issue 34	August 2026	Update of technical specification and addition of configuration mode timeout

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2. Product Overview

The Gill WindSonic wind sensor is a very robust, lightweight unit with no moving parts, outputting wind speed and direction. The units of wind speed, output rate and formats are all user selectable.

The WindSonic can be used in conjunction with a PC, data logger or other device, provided it is compatible with one of the standard communication formats provided by the WindSonic.

WindSonic (options 1, 2 and 3), and WindSonic Metal may be configured using Wind software which is available, free of charge, from the Gill website www.gillinstruments.com. The output message format can be configured in Gill format, in Polar or UV (2-axis) format, and to either Polled (requested by host system) or Continuous output. Alternatively, it can be configured in NMEA (0183 Version 3). These are described in Section 6. WindSonic Option 1, 2 & 3 Message Formats on page 32.

WindSonic option 4 (SDI-12) may not be re-configured in any Gill output format and format is SDI-12 (V1.3) and described in Section 7. SDI-12 Commands (Option 4) on page 44.

WindSonic option 5 (Modbus) must be configured using WindSet - a Windows application that can be downloaded from the Gill Instruments website. The user manual for WindView can also be downloaded from the website. The Modbus registers can be found in Section 8. Modbus RTU Protocol (Option 5) on page 48.

2.1. WindSonic Specification

The WindSonic specification can be found in the Appendices of this manual.

- Appendix A. Technical Specification - WindSonic Options 1, 2 & 3 on page 51
- Appendix B. Technical Specification - WindSonic Option 4 on page 53
- Appendix C. Technical Specification - WindSonic Option 5 on page 54
- Appendix D. Technical Specification - WindSonic Metal on page 55

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3. Pre-Installation

3.1. Equipment supplied for non-Metal WindSonics

Item	Quantity
WindSonic	1
Connector and Mounting Screws comprising: -	
9 Way connector	1
Connector Contacts	9
Sealing Gland	1
Sealing Washer	1
Washer shake proof	3
Screws – M5 stainless steel	3

After you have successfully set up the WindSonic, we strongly advise that you then go back and read the rest of the manual to ensure that you get the best results from the WindSonic.

3.2. Accessories available for non-metal WindSonic

A range of accessories is available to support WindSonic. 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
Cable 4 Pair, twisted and shielded 24 AWG	026-03156
Cable 3 Pair, twisted and shielded 24AWG	026-02660
Cable 15 metres (4 twisted pairs (seven contact wires), shielded 24AWG – Seven Connector pins attached to one end and eight stripped wires the other).	1405-10-080
WindSonic connector (1 supplied as standard see above)	1405-PK-069
WindSonic Support Tube 0.5 metre (Aluminium)	1405-30-056
Bracket for mounting to a Pole, includes a WindSonic Adaptor	1771-PK-115

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3.3. Equipment supplied for WindSonic Metal (non-analogue variant)

Item	Quantity
WindSonic M	1
1405-PK-111 connector and Mounting kit consisting of:	
9 Way Connector Body	1
Connector Contacts	9
Connector Sealing Gland	1
Connector Sealing Washer	1
Mounting Screws – M5 stainless steel	3
Mounting Screw M5 Washer shake proof	3
Earthing Screw – M4 x 6 Stainless	1
Earthing Shakeproof Washer, M4	1
Earthing Ring Terminal Tag, M4	1

3.4. Accessories available for Equipment supplied for WindSonic Metal (non-analogue variant)

Accessory	Gill Instruments Part Number
Cable 4 Pair, twisted and shielded 24 AWG	026-03156
Cable 3 Pair, twisted and shielded 24AWG	026-02660
Cable 15 metres (4 twisted pairs (seven contact wires), shielded 24AWG – Seven Connector pins attached to one end and eight stripped wires the other).	1405-10-080
WindSonic M connector (1 supplied as standard see above)	1405-PK-111
WindSonic M Support Tube 0.5 metre (Aluminium)	1405-30-056
Bracket for mounting to a Pole, includes a WindSonic Adaptor	1771-PK-115

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3.5. Equipment supplied for WindSonic Metal with Analogue Output

Item	Quantity
WindSonic M	1
1405-PK-112 12-Way connector and Mounting kit consisting of:	
12-Way Connector Body	1
Connector Contacts	12
Connector Sealing Gland	1
Connector Sealing Washer	1
Mounting Screws – M5 stainless steel	3
Mounting Screw M5 Washer shake proof	3
Earthing Screw – M4 x 6 Stainless	1
Earthing Shakeproof Washer, M4	1
Earthing Ring Terminal Tag, M4	1

3.6. Accessories available for Equipment supplied for WindSonic Metal with Analogue Output

Accessory	Gill Instruments Part Number
Cable 4 Pair, twisted and shielded 24 AWG	026-03156
Cable 3 Pair, twisted and shielded 24AWG	026-02660
WindSonic M connector (1 supplied as standard see above)	1405-PK-112
WindSonic M Support Tube 0.5 metre (Aluminium)	1405-30-056
Bracket for mounting to a Pole, includes a WindSonic Adaptor	1771-PK-115

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3.7. WindSonic 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.
WindSonic complies with part 15 of the RCC 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

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

3.8. Right to change and revise

Gill Instruments reserve 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 reserve 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.

3.9. Packaging

Whilst the WindSonic is being moved to its installation site, the unit should be kept in its inner packaging. All the packaging should be retained for use if the unit has to be returned at any time, or if a self-test is performed.

3.10. Downloadable Software

Three software packages are available to help customers use WindSonic.

- Wind - this software can be used to set-up the product
- WindView - this software can be used to view the data provided by the product
- WindSet - this software is used to configure the Option 5 WindSonic

Both software packages can be downloaded from gillinstruments.com

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3.11. WindSonic Part Numbers

The following part numbers correspond to the WindSonic variants shown.

1405-PK-021	Black WindSonic Option 1 – RS-232 output only.
1405-PK-068	White WindSonic Option 1 – RS-232 output only.
1405-PK-038	Black WindSonic Option 2 – RS-232, 422 & 485 (point to point) output.
1405-PK-072	White WindSonic Option 2 – RS-232, 422 & 485 (point to point) output.
1405-PK-040	Black WindSonic Option 3 – RS-232, 422, 485 p to p & analogue output.
1405-PK-073	White WindSonic Option 3 – RS-232, 422, 485 p to p & analogue output.
1405-PK-100	Black WindSonic Option 4 – SDI-12 output only.
1405-PK-110	White WindSonic Option 4 – SDI-12 output only.
1405-PK-165	Black WindSonic Option 5 - Modbus over RS-485 only.
1405-PK-400	Black WindSonic 75 Option 1- RS-232 output only.
1405-PK-420	Black WindSonic 75 Option 2 RS-232, 422 & 485 (point to point) output.
1405-PK-430	Black WindSonic 75 Option 3 RS-232, 422 & 485 p to p & analogue output.
1405-PK-465	Black WindSonic 75 Option 5 - Modbus over RS-485 only.
1405-PK-200	WindSonic M –Heating, RS-232/422/485 point to point digital outputs.
1405-PK-300	WindSonic M –No Heating, RS-232/422/485 point to point digital outputs.
1405-PK-201	WindSonic M –Analogue Outputs and Heating, RS 232/422/485 point to point digital outputs.
1405-PK-301	WindSonic M –Analogue Outputs, No Heating, RS 232/422/485 point to point digital outputs.

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4. Installation

4.1. Requirements

Host system - One of the following:

- Option 1-3: PC fitted with a suitable interface to match the chosen communication format (RS-232, RS-422, or RS-485 (point to point)), compatible with the WindSonic option selected, and a suitable Terminal Emulation software package. For example, TeraTerm, puTTY or Wind Software that is available from the Gill website at https://gillinstruments.com/downloads/
- Option 5: PC running Windows with the WindSet application installed. This application can be downloaded from the Gill Instruments website.
- Other equipment with input/output compatibility to the WindSonic Option selected. For example, Data loggers.

Cable - To connect between the WindSonic and the host system

See Section 4.4.1. General Cable Properties on page 17 for cable specification.

- There are restrictions on the maximum cable lengths for correct operation.
- The cable should be routed up the inside of the mounting tube.

Mounting tube (e.g., 0.5-metre-long Gill part 1405-30-056)

- Standard tube 1.75 inches (44.45mm) Outside Diameter x 3mm wall thickness.
- Note it is important that the correct diameter tube is used to prevent damage to the WindSonic lower moulding when tightening the screws.

See Figure 2 Alignment and Mounting details on page 30.

- For non-hostile environments, Aluminium tube can be used.
- For hostile environments, you should select a material suitable for the intended environment. For example, stainless steel 316 for marine use.

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Mounting Bracket (Gill Part 1771-PK-115)

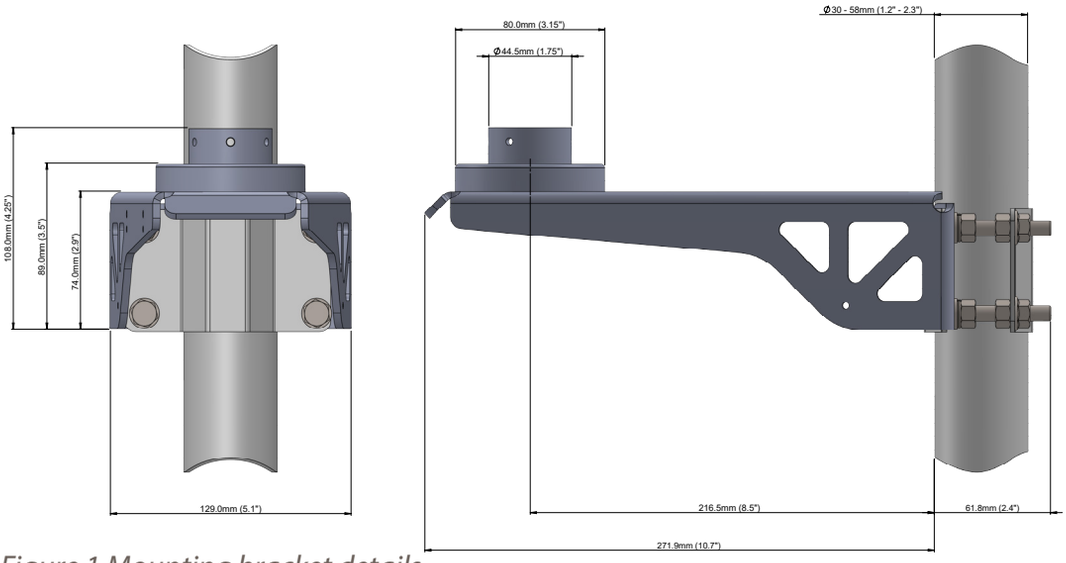


Figure 1 Mounting bracket details

Do NOT remove the black "rubber" transducer caps. Warranty is void if the coloured security seal is damaged or removed.

4.2. Installation Guidelines

The WindSonic has been designed to meet and exceed the stringent standards listed in its specification. Operating in diverse environments all over the world, WindSonic requires no calibration and adjustment whatsoever.

As with any sophisticated electronics, good engineering practice should be followed to ensure correct operation.

- Always check the installation to ensure the WindSonic is not affected by other equipment operating locally, which may not conform to current standards, e.g., radio/radar transmitters, boat engines, generators etc. Guidelines –
- Avoid mounting in the plane of any radar scanner – a vertical separation of at least 2m should be achieved.
- Radio transmitting antennas, the following minimum separations (all round) are suggested.
  - VHF IMM – 1m
  - MF/HF – 5m
  - Satcom – 5m (avoid likely lines of sight)
- Use cables recommended by Gill. If cables are cut and re-connected incorrectly (perhaps in a junction box) then EMC performance may be compromised if cable screen integrity is not maintained.
- Earth loops should not be created – wire the system in accordance with the installation guidelines.
- Ensure the power supply operates to the WindSonic specification at all times .

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Avoid turbulence caused by surrounding structures that will affect the accuracy of the WindSonic such as trees, masts and buildings. Ideally sensors should be mounted on the prevailing wind side of the site.

The WMO make the following recommendations:
The standard exposure of wind instruments over level open terrain is 10m above the ground. Open terrain is defined as an area where the distance between the sensor and any obstruction is at least 10 times the height of the obstruction.

If mounting on a building, then theoretically the sensor should be mounted at a height of 1.5 times the height of the building.
If the sensor is to be mounted on a mast boom, part way up a tower or mast, then the boom should be at least twice as long as the minimum diameter or diagonal of the tower. The boom should be positioned on the prevailing wind side of the tower.

Immunity test requirements for equipment intended to be used in an industrial electromagnetic environment have been applied. These test levels are above the levels expected to be experienced in normal use due to the above recommended siting conditions, but disturbances may be expected 150 to 200kHz.
If any interruption to performance is experienced due to external electromagnetic signals the product will automatically return to specification once the signals levels have diminished.

4.3. Bench system test



Prior to physically mounting the WindSonic in its final location, we strongly recommend that a bench system test is carried out to confirm the system is configured correctly, is fully functional and electrically compatible with the selected host system and cabling (preferably utilising the final cable length). The required data format, units, output rate, and other options should also all be set up at this stage.

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4.4. Electrical

4.4.1. General Cable Properties

A RS-422 compatible cable should be used, with the number of twisted pairs matching the application.
Generic description – Twisted pairs with drain wire, screened with aluminised tape,
with an overall PVC sheath of 6mm-12mm outer diameter. Wire size 7/0.2mm (24 AWG).

4.4.2. Cables for all Unheated WindSonics

The following table shows some suitable manufacturers' references; other manufacturers' equivalents can be used.

Application	No. of pairs	Gill ref. 24 AWG	Belden ref. 24 AWG	Batt electronics ref. 24 AWG
RS-232	3	026-02660	9730	91030
RS-422	4	026-03156	9728	91199
SDI-12	2	-	9729	-
Analogue only	3	026-02660	9730	91030

4.4.3. Cables for Heated WindSonics

The following table shows the cables to be used for heated WindSonic variants only.

Thicker or higher specification cable can be used up to 20 AWG. If long cables are used, then consideration should be given to powering the Heater using lower 20 AWG gauge wire or paralleling heater and sensor power cables (24v dc supply only) to reduce volt drops.

Alternatively locate the sensor/heater supply as close as possible to the unit and run data only over the longer cable distances.

Application	No. of pairs	Gill ref. 24 AWG	Belden ref. 24 AWG	Batt electronics ref. 24 AWG
RS 232	4	026-03156	9728	91199
RS 422/485	6	026-02661	9731	91031
Analogue only	4	026-03156	9728	91199

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4.4.4. Cable Length

The maximum cable length is dependent on the chosen communication format: RS-232, RS-422 or RS-485 (point to point), the baud rate, and, to a lesser extent, on the cable type and the local electrical 'noise' level. The table shows the typical maximum lengths at the given baud rates, using the recommended cable. If any problems of data corruption etc. are experienced, then a slower baud rate should be used. Alternatively, a thicker or higher specification cable can be tried

Communication format	Baud rate	Max. cable length
RS-232	9600	6.5 m (20 ft)
RS-422 or RS-485 point to point	9600	1 km (3200 ft)
Analogue – Voltage o/p	N/A	6.5m (20 ft)
Analogue – Current o/p	N/A	Resistance dependent
		(Max 300 Ω)
SDI-12	1200	90m (300 ft)

4.4.5. Power Supply for Unheated Variants

WindSonic Option 1 and 2 Units; Require a DC supply of between 5V – 30 V DC (30V DC max).
WindSonic Option 3 Units; Require a DC supply of between 7V– 30 V DC (30V DC max).
WindSonic Option 4 and 5 Units; Require a DC supply of between 9V – 30 V DC (30V DC max).
WindSonic 75 Units; Require a DC supply of between 12V – 30 V DC (30V DC max).

See the specification pages or datasheet for power usage.

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4.4.6. Power Supply for Heated Variants

DC Power Supply Voltage	10V to 30.0V DC.
AC Power Supply Voltage	24V RMS AC ±10 % @50/60Hz.
12VDC Power Supply	Allow for 2.2 Amps @ 12V DC (nominal supply), 26W max.
24VDC Power Supply	Allow for 4.2 Amps @24v AC or DC (nominal supply) 100W max.
Standby Heater Current	Approximately 40mA.

Heater Cable length should be minimised to avoid cable volt drops and ensure maximum voltage is received at the Anemometer.

A 24VDC Heater Supply capable of a minimum of 6 Amps is recommended for initial heating start up surge. Note that the Heater supply is isolated from the Sensor supply. However, it is permissible to connect a common 24VDC supply to both the Sensor supply connections and Heater supply connections if required. Neither the Sensor supply connections nor the Heater supply connections should be connected to the WindSonic M metal case.

Heater Cable length should be minimised to avoid cable volt drops and ensure maximum voltage is received at the Anemometer. If necessary, parallel up spare wires in the cable and connect to the heater pins in order to reduce volt drops.

There is no heating command on the heated WindSonic M, heating is enabled by internal temperature sensing devices and cannot be disabled except by removing the heater supply.

The WindSonic M has reverse polarity protection.

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4.5. Connecting a WindSonic Option1 to a PC using RS-232 Power and Communications Cable

1. The cable length for reliable operation is limited as shown in 4.4.4. Cable Length on page 18.
2. For longer cable runs, we recommend using the WindSonic configured with RS-422 output, and a RS-422/232 converter at the PC.
3. Power connections below must be reversed for WindSonic Options 2 and 3 set for RS-232 operation.

WindSonic 9 Way circular connector		Cable – 3 twisted pairs	Typical PC or RS-232 to USB Converter Serial Port 9 Way 'D' Connector	
Signal names	**Pin no's**		**Signal names**	**Pin no's**
TXD	5	→	RXD	2
RXD	7	←	TXD	3
Signal Ground	1	↔	Signal Ground	5
Do NOT connect at this end	N/A	screen and drain wires	Chassis ground	N/A

Signal names	Pin no's		DC Power Supply
V supply -	2	→	-ve
V supply +	3	→	+ve

Default Settings

The WindSonic Option 1 unit is factory configured with the following default settings:

M2, U1, O1, L1, P1, B3, H1, NQ, F1, E3, T1, S4, C2, G0, K50.

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4.6. Connecting an Option 2, 3 or WindSonic M to a PC using RS-232

1. Some PCs have a Serial RS232 interface and a suitable terminal emulation package already installed, which can easily be utilised with the WindSonic. Otherwise use Gill Wind Software.
2. The cable length for reliable operation is limited to 6.5m (20ft) (see Section 4.4.4 on page 18.)
3. For longer cable runs, we recommend using the WindSonic M configured with RS422 output, and a RS422/232/USB converter at the PC. See section 4.8 on page 23.

WindSonic 9 Way circular connector		Cable – 3 twisted pairs	Typical PC or RS-232 to USB Converter Serial Port 9 Way 'D' Connector	
Signal names	**Pin no's**		**Signal names**	**Pin no's**
TXD	5 / E	→	RXD	2
RXD	7 / G	←	TXD	3
Chassis Ground	1 / A	screen and drain wires	Chassis Ground	N/A
			Signal Ground	5

Signal names	Pin no's	DC Power Supply
V supply - & sig gnd	3 / C	-ve
V supply +	2 / B	+ve

Heating (heated units only)		Optional AC or DC Power Supply
Heater power +ve	8 / H	+ve
Heater power -ve	9 / J	-ve

Analogue (M units with Analogue only)		Analogue device
An. Speed Ch.1	L	Channel 1 Input
An. Direction Ch. 2	M	Channel 2 Input
Signal Ground	K	Common Return

Default Settings

The Metal WindSonic unit is factory configured with the following default settings:
M2, U1, O1, L1, P1, B3, H1, NQ, F1, E3, T1, S4, C2, G0, K50.

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4.7. Connecting WindSonic Option 2 or 3 (NOT Metal) set for default RS-422 using Safe Mode

Connecting WindSonic Option 2 or 3 set for default RS-422 to a PC using an RS-232 Safe Mode Connection.

WindSonic 9 Way circular connector			PC Typical 9 Way 'D' Connector	
Signal names	**Pin no's**	Cable – 3 twisted pairs	**Signal names**	**Pin no's**
TXD	5	→	RXD	2
RXD	7	←	TXD	3
Signal Ground	1		Signal Ground	5
Do NOT connect at this end	N/A	screen and drain wires	Chassis ground	N/A

Signal names	Pin no's		DC Power Supply
V supply +	2	→	+ve
V supply -	3	→	-ve

1. Connect the Option 2 or 3 WindSonic as per the above connection diagram.
2. See also Appendix H on page 65.
3. Hold down the * character (shift 8) and then apply power to the WindSonic. After approximately 3 seconds the unit will respond with Safe Mode.
4. To change output communication from RS-422 to RS-232 then remove any * characters on screen.
5. Type E3 and press Enter (changes E2 setting to E3).
6. E3 will be seen twice on screen to confirm the setting change to RS-232 has occurred.
7. Change any other configuration settings as required.
8. Type Q and press Enter to go back into measurement mode (garbled data may appear on screen if the original WindSonic Baud rate setting is not 19200bauds).
9. If required close the 19200-baud HyperTerminal connection and re-open at the WindSonic Baud rate. If a continuous data mode has been previously chosen, then data will scroll on screen. See Appendix D

(Note that supply voltage connections are reversed compared to the Option 1 RS-232 unit. Damage will not occur from a reverse voltage connection).

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4.8. Connecting an RS422 output WindSonic M to a PC with an RS422 Interface/Converter

WindSonic M must be set for RS422/RS485 mode (E2).
Wiring connections below are not the same as a standard WindSonic Option 2 or 3 unit.
For further details on how to change a WindSonic M from the Default Set RS232 Output (Mode E3) to RS422 Output (Mode, E2) please see Appendix H on page 65.

WindSonic 9 Way circular connector		Cable – twisted pairs	PC with RS-422/232 or USB convertor
Signal names	**Pin no's**		**Signal names Pi**
TXD+	4 / D	→	RXD+
TXD-	5 / E	→	RXD-
RXD+	6 / F	←	TXD+
RXD-	7 / G	←	TXD-
Chassis Ground	1 / A	screen / drain wires	Chassis Ground
			Signal Ground

Signal names	Pin no's	DC Power Supply
V supply - & sig gnd	3 / C	-ve
V supply +	2 / B	+ve

Heating (heated units only)		Optional AC or DC Power Supply	
Heater power -ve	9 / J	-ve	Power supply
Heater power +ve	8 / H	+ve	

Analogue (M units with Analogue only)		Analogue device
An. Speed Ch.1	L	Channel 1 Input
An. Direction Ch. 2	M	Channel 2 Input
Signal Ground	K	Common Return

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4.9. Changing an Option 2 or 3 Sensor set for RS-232 back to RS-422

Connect the Option 2 or 3 WindSonic as per Section 4.7 on page 22.
Repeat instructions shown in Section 4.7 on page 22 except that in Safe Mode set the E Command to E2 etc.

4.10. Connecting to a PC using RS-422 (Option 2 or 3)

WindSonic 9 Way circular connector		Cable – twisted pairs	PC with RS-422/232 or USB convertor
Signal names	**Pin no's**		**Signal names Pi**
TXD+	4		RXD+
TXD-	5		RXD-
RXD+	6		TXD+
RXD-	7		TXD-
Signal Ground	1		Signal Ground
Do NOT connect at this end	n/a	screen / drain wires	Chassis Ground

Signal names	Pin no's	DC Power Supply
V supply -	3	-ve
V supply +	2	+ve

WindSonic to be set for RS-422/RS-485 mode (E2, default).
Analogue Outputs are also simultaneously available from the Option 3 unit.

Default Settings

The WindSonic Option 2 and 3 unit is factory-configured with the following default settings:

M2, U1, O1, L1, P1, B3, H1, NQ, F1, E2, T1, S4, C2, G0, K50
See Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind on page 69 for further detail.

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4.11. Using RS-485 (2-wire point-to-point) with Option 2 or 3 units

1. The unit must be set for RS-422/485 mode (E2 setting).
2. WindSonics must be set in Polled mode, a node address letter may be given if required. (See Nx – Node Address on page 81).
3. Customers may poll using terminal software (NOT supplied).
4. As unit is point to point only it cannot be networked with other RS-485 2 wire devices.

WindSonic 9 Way circular connector		Cable – 3 twisted pairs	PC with RS485 card	
Signal names	**Pin no's**		**Signal names**	
TXD+	4		T/RXD +	
RXD+	6			
TXD –	5		T/RXD –	
RXD –	7			
Signal Ground	1		Signal Ground	
Do NOT connect at this end	N/A	Screen and drain wires	Chassis ground	
Signal names	**Pin no's**		**DC Power Supply**	
V supply -	3		-ve	
V supply +	2		+ve	

Analogue Outputs are also simultaneously available from the Option 3 unit.

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4.12. Using RS-485 (2-wire point-to-point) with Metal units

1. The unit must be set for RS-422/485 mode (E2 setting).
2. WindSonics must be set in Polled mode, a node address letter may be given if required. See Section 6.1 on page 32.
3. Customers may poll using terminal software (NOT supplied).
4. As unit is point to point only it cannot be networked with other RS-485 2 wire devices.

WindSonic 9 Way circular connector		Cable – 3 twisted pairs	PC with RS485 card
Signal names	**Pin no's**		**Signal names**
TXD+	4 / D		T/RXD +
RXD+	6 / F		
TXD –	5 / E		T/RXD –
RXD –	7 / G		
Chassis Ground	1 / A	Screen and drain wires	Chassis Ground
			Signal ground

Signal names	Pin no's	DC Power Supply
V supply - & sig gnd	3 / C	-ve
V supply +	2 / B	+ve

Heating (heated units only)		Optional AC or DC Power Supply
Heater power -ve	9 / J	-ve
Heater power +ve	8 / H	+ve

Analogue (M units with Analogue only)		Analogue device
An. Speed Ch.1	L	Channel 1 Input
An. Direction Ch. 2	M	Channel 2 Input
Signal Ground	K	Common Return

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4.13. Using the Analogue Output (Option 3 and Metal with Analogue Output)

1. If the Current output is used, the total output load MUST be below 300 ohms, including the cable resistance.
2. The current output loads must be returned to Signal Ground.
3. Reconfiguration of the analogue output requires a digital connection (See Section 4. Installation on page 14 and Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind on page 69).
4. In addition, the digital output can be connected if required using RS-232, 422 or 485 point to point, as shown in the previous sections.

WindSonic 9 Way circular connector		Cable – 3 twisted pairs	Data logger or Chart recorder
Signal names	**Pin no's**		**Signal names**
Analogue channel 1 (speed)	8 / L		Analogue Channel 1
Analogue Channel 2 (Direction)	9 / M		Analogue Channel 2
Signal Ground (Analogue Return)	1 / K		Signal Ground
Do NOT connect at this end	N/A	Screen and drain wires	Chassis ground

Signal names	Pin no's		DC Power Supply
V supply -	3 / C		-ve
V supply +	2 / B		+ve

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4.14. WindSonic Option 5 Modbus over RS-485 (2-wire point-to-point)

WindSonic option 5 Modbus uses the 2-wire RS-485 interface as shown here.
WindSonic Option 5 can only be configured using Gill WindSet.

WindSonic 9 Way circular connector			PC with RS485 card
Signal names	**Pin no's**	Cable – 3 twisted pairs	**Signal names**
RS-485 A	7		RS-485 A
RS-485 B	6		RS-485 B
Signal Ground	1		Signal Ground
Do NOT connect at this end	N/A	Screen and drain wires	Chassis ground
Signal names	**Pin no's**		**DC Power Supply**
V supply -	3		-ve
V supply +	2		+ve

4.15. WindSonic Option 4 SDI-12 Protocol

WindSonic option 4 SDI-12 is factory configured in SDI-12 mode and complies with SDI-12 Interface Standard V1.3, see 7. SDI-12 Commands (Option 4) for details.
WindSonic Option 4 is not compatible with Gill Wind, WindView or WindSet Software.

Connecting to an SDI-12 Interface (Option 4)

WindSonic 9 Way circular connector		Data logger or Chart recorder
Signal names	**Pin nos.**	**Signal names**
V+	2	V+ (12V)
V-	3	GND
GND	1	
SDI-12	5	Serial Data Line

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5. Mechanical

Before installing, see note at Section 4.3. Bench system test on page 16.

5.1. Orientation

Normally the WindSonic is mounted on a vertical tube, ensuring a horizontal Measuring Plane. See Figure 2 Alignment and Mounting details on page 30.

For indoor use the unit may be mounted with the Measurement Plane set to any required orientation.

5.2. Alignment

The WindSonic should be aligned to point to North, or any other reference direction –for example, the bow of a boat.

There are two arrows, a coloured rectangle, and an alignment notch to aid alignment.
See Figure 2 Alignment and Mounting details on page 30.

It is usually simpler to work first with a compass at ground level and identify a suitable landmark and its bearing.

5.3. Mounting

The support tube requires three 3 equally spaced holes, tapped M5, 7.5mm from the top of the tube. Pass the cable (fitted with the 9-way Clipper plug) through the tube.

The customer must fit appropriate strain relief to the cable.

Connect the plug by twisting it whilst pushing it gently into the socket on the WindSonic. When it locates, twist the outer sleeve clockwise to connect and lock the plug.

Fix the WindSonic to the tube using the 3 stainless steel screws provided. (Maximum mounting screw torque 1.5 Nm for aluminium and 3 Nm for stainless steel.)

It is the responsibility of the customer to ensure that the WindSonic is mounted in a position clear of any structure, which may obstruct the airflow or induce turbulence.

Do NOT mount the WindSonic in close proximity to high-powered radar or radio transmitters. A site survey may be required if there is any doubt about the strength of external electrical noise.

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5.3.1. Mounting Bracket (1771-PK-115)

1. Mount the Sensor on to the bracket mount and if using a Wind Sensor align so that the Sensor North Marker points to the bracket pole.
2. Secure the sensor to its mount using screws and washers supplied in the Sensor Box.
3. Torque screws to a maximum of 4 Nm.
4. The Bracket uses a clamp suitable for attaching to a vertical pipe with a diameter of 30-58mm. When mounting the Bracket Sensor, consider the position, orientation, and alignment of the unit. Mount at the top of a Pipe to ensure a clear unobstructed measurement view.
5. Note that the mounting pipe should first be degreased and when assembling the Bracket clamp assembly, the outer clamp nuts need to be tightened evenly to a torque figure of 3 Nm.
6. The moving plate part of the clamp needs to be reversed for poles below 38 mm diameter.
7. Screw an Earth cable minimum of 6mm2 to the Bracket chassis using Screw and Terminal Tag fixings supplied.

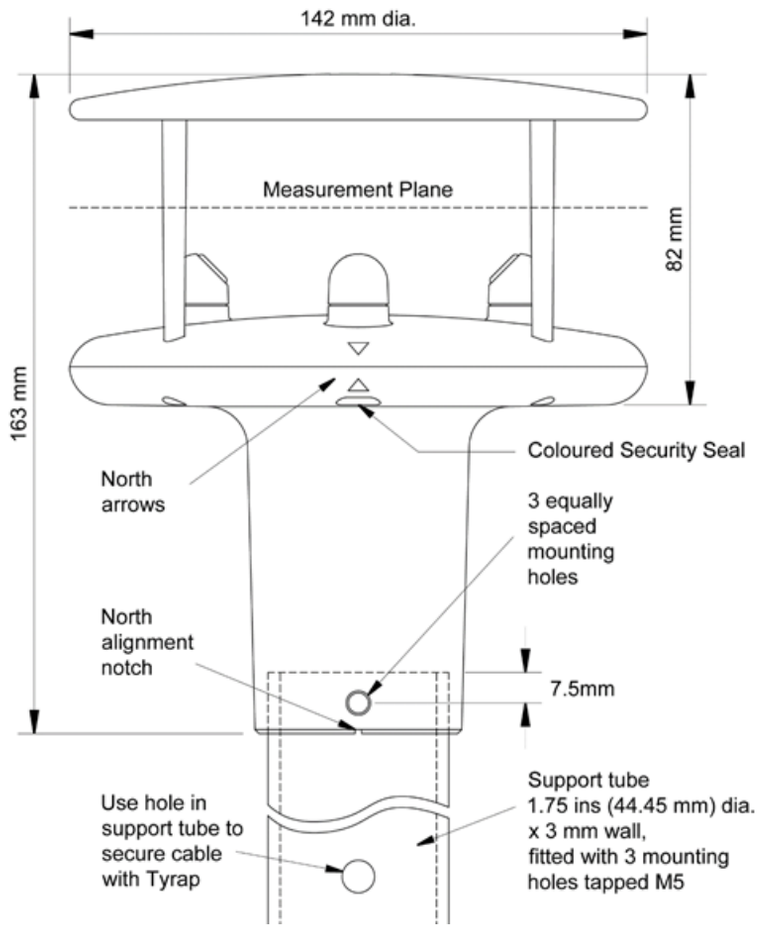


Figure 2 Alignment and Mounting details

Gill Instruments can supply a 0.5 metre Aluminium support tube with drilled and tapped M5 holes as above, part number 1405-30-056.

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5.4. Earthing / Grounding (Metal WindSonic ONLY)

Non-metal WindSonic should NOT be grounded as described here. The cable shield should only be connected to ground at the non-anemometer end, and should not connect to any metalwork on the WindSonic.

To ensure correct operation, and for maximum protection against lightning, the Metal WindSonic metalwork MUST be correctly earthed (grounded) to an appropriate grounding point.

The primary earth for the anemometer must be made using the M4 Earthing Point provided via a minimum of 6mm^2 copper wire to the ground point.

Remove the M4 Nylon screw from the mounting body of the WindSonic M and insert the M4 x 6 Earth Screw/ Shakeproof Washer/Ring Terminal lead connection and secure as shown below.

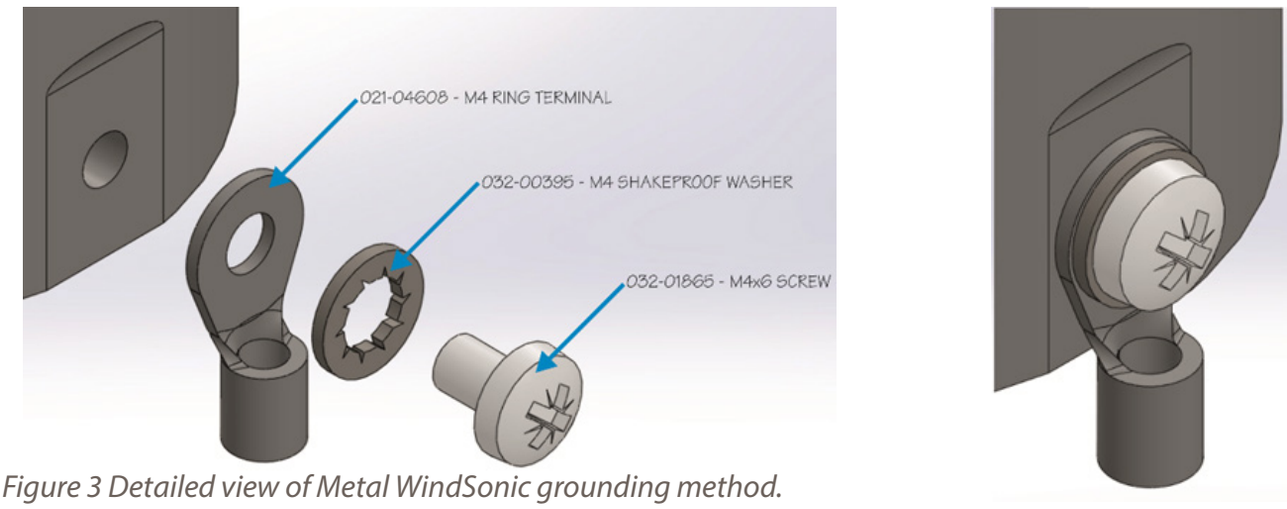


Figure 3 Detailed view of Metal WindSonic grounding method.

The 3 screws securing the anodised WindSonic M body to a Grounded metal pole/mast cannot be relied on to provide a good ground connection.

Inadequate Earthing/Grounding will degrade anemometer performance, particularly in the presence of radio frequency interference.

If junction boxes are used the cable screens must be joined with any cable screen continuing from the unit's cable via the junction box.

5.5. Heating

The WindSonic M can be ordered with Heating (Part 1405-PK-201).
Heating is autonomous and requires no set-up; it is continuously enabled and will operate on and off depending on temperature conditions that are likely to lead to icing.
Heating is applied to the transducer plate, the transducers and the reflector plate.
Upon switching on a WindSonic M heated unit, providing heater power is connected then a one-minute burst of heating will occur to give confidence that the heating is functioning.

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6. WindSonic Option 1, 2 & 3 Message Formats

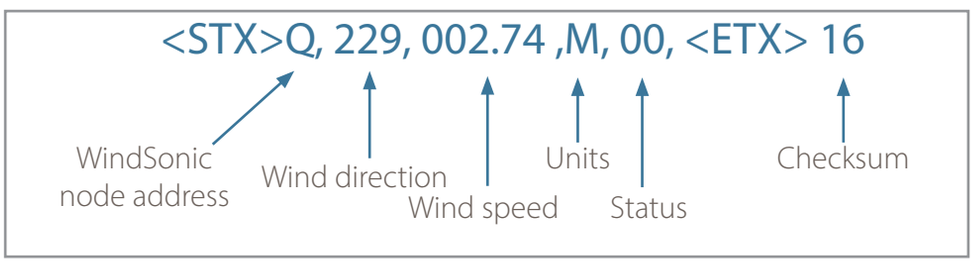
On applying power to the WindSonic Option 1-3, it will provide wind measurements in one of the following formats:

- Gill – Polar, Continuous (default format)
- Gill - UV, Continuous
- Gill – Polar Polled
- Gill – UV Polled
- NMEA – IIMWV or WIMWV (with NMEA status Codes)
- NMEA - IIMWV or WIMWV (with Gill Status Codes)
- Tunnel – U Direction, U Speed, Continuous
- Gill – Polar with Gust, Continuous
- Gill - UV with Gust, Continuous
- Gill – Polar with Gust, Polled
- Gill – UV with Gust, Polled

Each of these is described below.

Information on how to change the formats and settings follows in Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind.

6.1. Gill format– Polar, (Default format)



Where:

<STX>	=	Start of string character (ASCII value 2)
WindSonic node address	=	Unit identifier
Wind direction	=	Wind Direction
Wind speed	=	Wind Speed
Units	=	Units of measure (knots, m/s etc.)
Status	=	Anemometer status code (see Appendix O. Status Codes
<ETX>	=	End of string character (ASCII value 3)
Checksum	=	This is the EXCLUSIVE – OR of the bytes between (and not including) the <STX> and <ETX>characters.
<CR>	=	ASCII character
<LF>	=	ASCII character

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WindSonic node address

The default setting is 'Q'. If required the WindSonic can be configured to show a different alphabetical node letter (A to Z), so as to identify the WindSonic.

It is recommended that ID's A to F and K, M, N and P are not used, as these characters can be present in the data string.

Wind Direction

Indicated in degrees, from 0 to 359°, with respect to the WindSonic North marker.

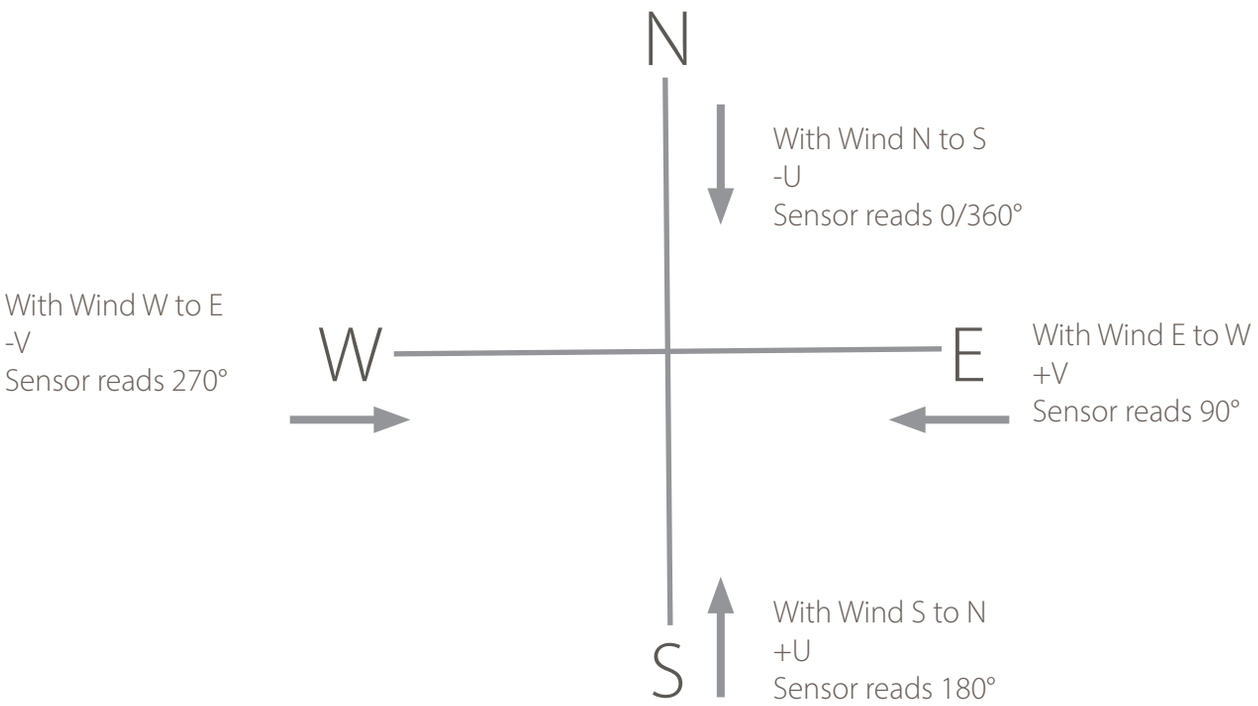


Figure 4 The measurement plane

Wind speed and units

Shows the Wind Speed in the Measurement Plane (See Figure 2 Alignment and Mounting details on page 30) in one of the following units:

Units	Identifier
Metres per second (default)	M
Knots	N
Miles per hour	P
Kilometres per hour	K
Feet per minute	F

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Low Wind Speeds (below 0.05ms)

Whilst the wind speed is below 0.05 metres/sec, the wind direction will not be calculated. In CSV mode no direction value will be output (e.g. Q,000.03,M,00,1C). In Fixed Field mode wind direction output will freeze at the last known valid direction value (e.g. Q,133, 000.02,M,00,1A) until a new valid value can be calculated. The above applies with the K command set for K50. If K for instance is set for 100 then the above applies at 0.1m/s.

Status

This indicates either:

Correct operation Code 00 and A (NMEA).
or Error codes
See Appendix O. Status Codes for explanation of codes.

Checksum

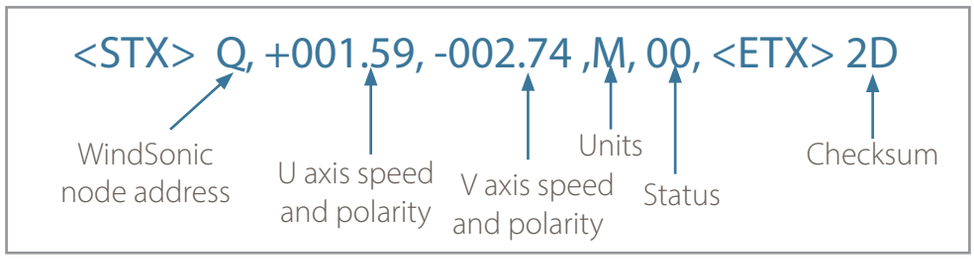
This enables the host system to check that the data has been correctly received. This is the EXCLUSIVE – OR of the bytes between (and not including) the <STX> and <ETX> characters.

Output rate (not displayed)

The WindSonic samples continuously and delivers wind information at ¼, ½, 1 (default setting), 2, or 4 outputs per second.

6.2. Gill format – UV

In this mode, the output is given as signed (i.e., positive, or negative) speeds along the 'U' (= South – North) axis and the 'V' (= East – West) axis.



Where:

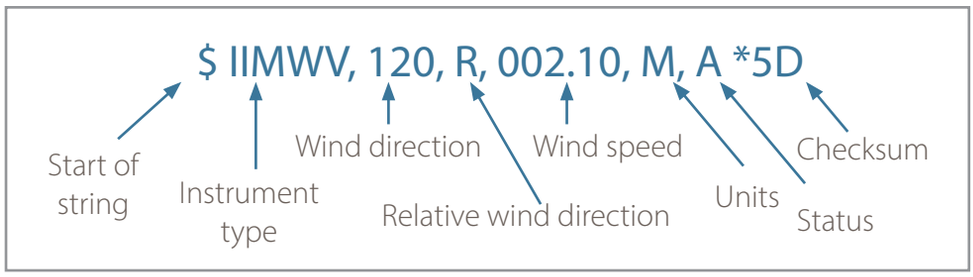
<STX>	=	Start of string character (ASCII value 2)
WindSonic node address	=	Unit identifier
U axis	=	speed & polarity
V axis	=	speed & polarity
Units	=	Units of measure (knots, m/s etc.)
Status	=	Anemometer status code, see Appendix O. Status Codes
<ETX>	=	End of string character (ASCII value 3)
Checksum	=	This is the EXCLUSIVE – OR of the bytes between (and not including) the <STX> and <ETX> characters

The WindSonic unit identifier, Units, and Checksum are described above.

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Figure 4 on page 33 shows the polarity of U and V if the wind components along the U and V axis are blowing in the direction of the respective arrows.

6.3. NMEA Format (NMEA status codes)



The Wind Direction, Wind Speed, and Units are as described above.

The Instrument Type – IIMWV - is a mnemonic for Integrated Instrument Mean Wind direction & Velocity (alternative start of string format WIMWV can be selected).

The Gill Status codes are as described in Appendix O. Status Codes.

A typical WindSonic configuration suitable for NMEA (See Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind)
M5, U1, O1, L1, P1, B3, H1, NQ, F1, E2, T1, S4, C2, G0, K50

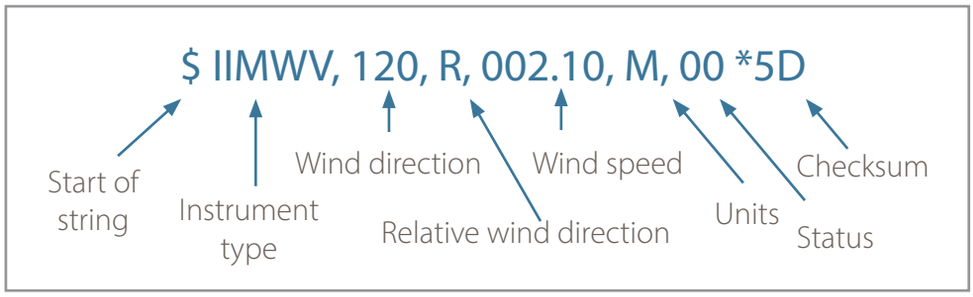
Consult specification NMEA 0183 version 3 (available on the web) for complete interface details.

The WindSonic can also be set for the alternative start of string NMEA format WIMWV (Mode 14), which is a Mnemonic for: Wind Instrument Mean Wind direction and Velocity.

The string format will appear as above but with WIMWV at the start of the string.

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6.4. NMEA Format (Gill status codes)



The Wind Direction, Wind Speed, and Units are as described earlier in this section.

The Instrument Type – IIMWV - is a mnemonic for Integrated Instrument Mean Wind direction & Velocity (alternative start of string format WIMWV can be selected).

The Gill Status codes are as described in Appendix O. Status Codes.

A typical WindSonic configuration suitable for NMEA (Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind)

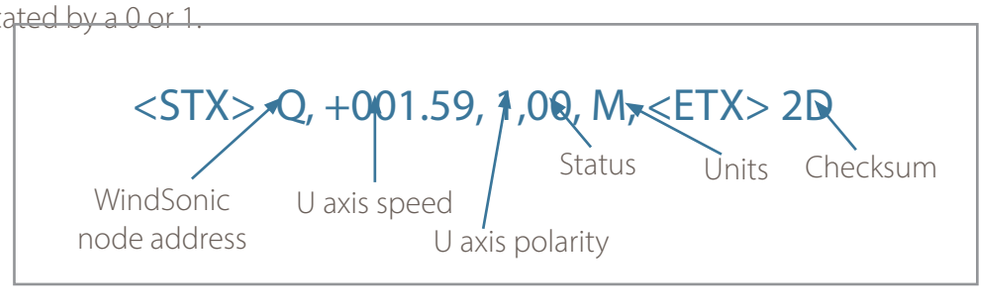
M16, U1, O1, L1, P1, B3, H1, NQ, F1, E2, T1, S4, C2, G0, K50

Consult specification NMEA 0183 version 3 (available on the web) for complete interface details.

6.5. Gill format – Tunnel Mode (UU, Continuous)

In this mode, the output is given as a signed figure (i.e. positive or negative) along the 'U' (= South – North) axis.

Direction is indicated by a 0 or 1.



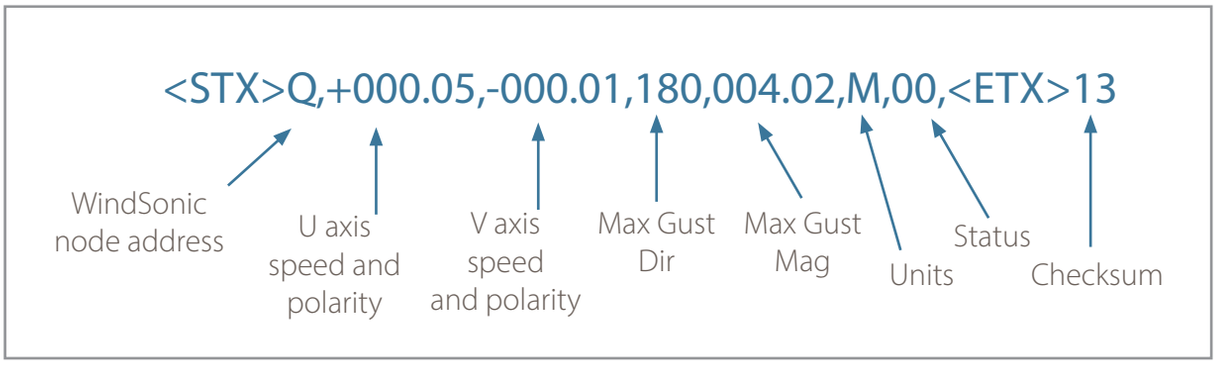
Where:

<STX>	=	Start of string character (ASCII value 2)
WindSonic node address	=	Unit identifier
U axis	=	U axis Wind Speed
U axis	U axis Wind Direction Polarity where: - 0 (–U vector) is a wind from the North direction or (+U vector) is a wind from the South direction.	

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6.6. Gill format – UV with Gust

In this mode, the output is given as signed (i.e., positive, or negative) speeds along the 'U' (= South – North) axis and the 'V' (= East – West) axis with both gust direction and magnitude included.



Where:

<STX>	=	Start of string character (ASCII value 2)
WindSonic node address	=	Unit identifier
U axis	=	speed & polarity
V axis	=	speed & polarity
Max Gust Dir	=	Maximum Gust Direction within the Gust Interval
Max Gust Mag	=	Maximum Gust Magnitude within the Gust Interval
Units	=	Units of measure (knots, m/s etc.)
Status	=	Anemometer status code, see Appendix O. Status Codes
<ETX>	=	End of string character (ASCII value 3)
Checksum	=	This is the EXCLUSIVE – OR of the bytes between (and not including) the <STX> and <ETX> characters

Maximum Gust Magnitude

Gust is calculated from a rolling 3s average of wind speed. The Maximum Gust Magnitude is the speed of the maximum Gust calculated over the selected Gust Interval (see GUSTINT). Gust Magnitude is reset at the end of the selected Gust Interval. Note that Gust Magnitude will not be calculated when 1/2Hz (P21) or 1/4Hz (P20) output rates are selected.

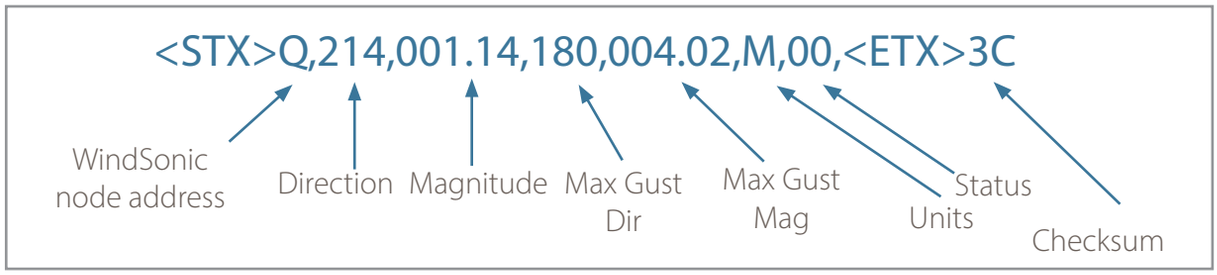
Maximum Gust Direction

The Maximum Gust Direction is the direction of the maximum Gust measured over the selected Gust Interval. Gust Direction is reset at the end of the selected Gust Interval. Maximum Gust Direction will not be calculated when 1/2Hz (P21) or 1/4Hz (P20) output rates are selected.

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6.7. Gill format – Polar with Gust

In this mode, the output is given as direction and velocity values with both gust direction and magnitude included.



Where:

<STX>	=	Start of string character (ASCII value 2)
WindSonic node address	=	Unit identifier
Direction	=	Wind Direction
Magnitude	=	Wind Speed
Max Gust Dir	=	Maximum Gust Direction within rolling gust period
Max Gust Mag	=	Maximum Gust Magnitude within rolling gust period
Units	=	Units of measure (knots, m/s etc.)
Status	=	Status code, see Appendix O. Status Codes
<ETX>	=	End of string character (ASCII value 3)
Checksum	=	This is the EXCLUSIVE – OR of the bytes between (and not including) the <STX> and <ETX> characters

6.8. Analogue Outputs and Options

Analogue outputs are only available from WindSonic Option 3 and WindSonic M 201/301. Analogue Wind Speed output is in Metres/Second only.

6.8.1. Voltage or Current output

The WindSonic (Option 3) can be configured for either Voltage (0 – 5 V) or Current (0 –20mA and 4 – 20 mA) outputs.

1. When using the current outputs, the load resistance between the Analogue outputs (Pins 8/L & 9/M) and Signal Ground (Pin 1) must be <= 300 ohms, including cable resistance. This is to ensure that the voltage levels on Pins 8/L & 9/M do not exceed 5V.
2. The current outputs must be returned to Signal Ground (Pin 1).

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6.8.2. Analogue Output Modes

Analogue Outputs	Polar Mode Modes 2 and 4	NMEA Mode Modes 5,14,15 &16	UV Mode Modes 1 and 3	Tunnel Mode Mode 12
Channel 1 (Pin 8/L wrt Pin 1)	Wind Speed	Wind Speed	U Wind Speed	U Wind Speed
Channel 2 (Pin 9/M wrt Pin 1)	Wind Direction	Wind Direction	U Wind Polarity	U Wind Polarity

6.8.3. Polar mode direction wraparound

The Wind Direction in Polar mode can be configured for either Standard (0 - 359°) or Wraparound (0 - 539°) options. If the Standard mode is used with a chart recorder, large swings of the recorder pen will be experienced each time the wind direction passes between 0 and 359°. Using the Wraparound mode, when the wind first changes from 0° to 359°, there will be a step change on the output, but after this first time the output will change smoothly each time the wind passes through 360°. (Similarly, the first time the wind veers from 539° to 180°; there will be a step change, after which the output will change smoothly).

Wind Direction (degrees)	Voltage Output (0v to 5V)		Current Output (0mA to 20mA)		Current Output (4mA to 20mA)	
	Standard	Wraparound	Standard	Wraparound	Standard	Wraparound
0	0	0	0.00	0.00	4.00	4.00
180	2.5	1.67	10.00	6.67	12.00	9.33
360	5.0	3.33	20.00	13.33	20.00	14.67
540	N/a	5.0	N/a	20.00	N/a	20.00

6.9. Wind Speed scaling

Analogue Outputs are always scaled in m/s irrespective of the digital output units of measurement setting.

The Wind Speed output can be configured such that full-scale output represents 5, 10, 20, 30, 40, 50, 60 (or 80 on WindSonic 75) metres/sec.

In all cases zero Wind Speed is represented by 0V, 0mA or 4mA.

6.10. Tunnel mode

When configured in Tunnel mode, Channel 1 output represents the wind speed along the U axis (South – North) scaled as described above.

Channel 2 gives the direction of the wind along the U axis, where a –U vector (= wind from the N direction) is represented by 0V (or 0mA, 4mA), and a +U vector is represented by 5V (or 20mA).

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6.11. Analogue Output rate

In Continuous and Polled modes, the analogue output update rate will be determined by the P command setting.

6.12. Disabled outputs

If the analogue outputs are not required, they can be disabled (Command S9).

6.13. Analogue Output Conditions

Analogue signals are output together with Digital Outputs signals.
Analogue signals are output continuously when in Digital Polled Mode.

The WindSonic provides the power for current output loads. Do not connect the WindSonic output to instruments where power for the current loop is provided by the instrument connecting to the WindSonic current output connections.

6.14. Analogue Output Conditions

Whilst the wind speed is below 0.05 metres/sec, the wind direction will not be calculated.
In both CSV mode and in Fixed Field mode, Channel 2 wind direction output will freeze at the last known valid direction value until a new valid value can be calculated.

The above applies with the K command set for K50. If K for instance is set for 100 then the above applies at 0.1m/s.

Wind Speed Condition	Channel 1 Speed Output	Channel 2 Direction Output
Greater Than 0.05m/s	0-5v, 0/4 – 20mA variable	0-5v, 0/4 – 20mA variable
Less Than 0.05m/s	0-5v, 0/4 – 20mA variable	Hold last known good reading above 0.05m/s speed until wind speed increases above 0.05m/s

6.15. Error condition reporting

In both CSV and Fixed Field Modes, if a valid wind measurement cannot be calculated due to a fault condition (for example all paths blocked), the Analogue outputs on Channels 1 and 2 can report a digital error status condition depending on the Y command setting.

The Y command is not applicable to WindSonic 75 Analogue output units. WindSonic 75 units will report Error conditions as though set for Y1 below.

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6.16. Y1 setting (Default)

Under data error conditions will switch back and forth between 0 and 5V (or 0/4 to 20mA) at the selected output rate.

The following table summarises the above reporting conditions with Analogue Outputs set for Polar Continuous Output and 0-5v (T1), 0-20mA (T5) and 4-20mA (T3).

Wind Speed Condition	Channel 1 Speed	Channel 2 Direction
Digital Error Code Output e.g. 01, 02, 04 etc.	Cycle 0 – 5 – 0 v at output rate	Cycle 0 – 5 – 0 v at output rate
	Cycle 0 – 20 – 0 mA at output rate	Cycle 0 – 20 – 0 mA at output rate
	Cycle 4 – 20 – 4 mA at output rate	Cycle 4 – 20 – 4 mA at output rate

6.17. Y2 nnn Setting, User Set Fixed Analogue Output level in an error mode.

The unit will output a fixed Voltage (T1 setting) or fixed milli-amp (T5/T3 settings) signal on the analogue output with a value depending on the Y2 nnn setting.
nnn is user-selectable value between 000 to 200.
Scale factor for fixed voltage output is 0.025V.
Scale factor for fixed current output is 0.1mA.
Therefore: -

nnn value = Required fixed Error Voltage/0.025 (voltage output setting T1).
nnn value = Required fixed Error Current/0.1 (current output settings T5/T3).

Under data error conditions then by setting the unit for Y2 configuration the analogue outputs will read a user set error value for the period of the error condition as follows with the unit in Polar Continuous Output and 0-5v (T1), 0-20mA (T5) and 4-20mA (T3).

Wind Speed Condition	Channel 1 Speed	Channel 2 Direction
Digital Error Code Output e.g. 01, 02, 04 etc	Error Condition nnn x 0.025 v (T1 setting).	Error Condition nnn x 0.025 v (T1 setting).
	Error Condition nnn x 0.1mA. (T5 & T3 setting)	Error Condition nnn x 0.1mA. (T5 & T3 setting)

6.18. Y3 nnn setting Analogue Output cycles to a user determined level in an error mode.

Under data error conditions the analogue outputs will switch back and forth between a user determined level (voltage or current) with a value depending on the Y3 nnn setting.
nnn is user-selectable value between 000 to 200.
Scale factor for upper voltage output is 0.025V.

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Scale factor for fixed current output is 0.1mA.
Therefore: -

nnn value = Required Error Voltage/0.025 (voltage output setting T1).
nnn value = Required Error Current/0.1 (current output settings T5/T3).

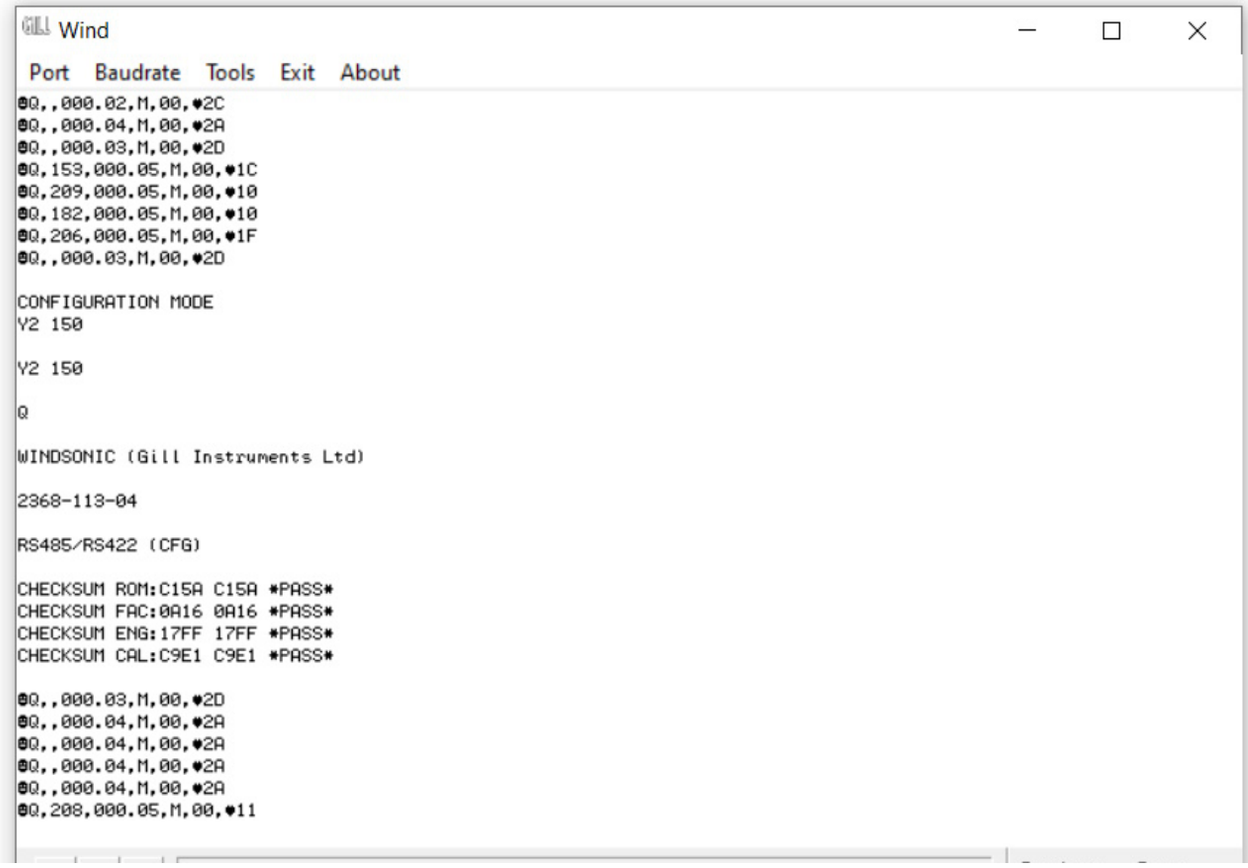
The following table summarises the above reporting conditions with Analogue Outputs set for Polar Continuous Output and 0-5v (T1), 0-20mA (T5) and 4-20mA (T3).

Wind Speed Condition	Channel 1 Speed	Channel 2 Direction
Digital Error Code Output e.g. 01, 02, 04 etc.	Cycle 0 – set v – 0 v at output rate	Cycle 0 – set v – 0 v at output rate
	Cycle 0 – set mA – 0 mA at output rate	Cycle 0 – set mA – 0 mA at output rate
	Cycle 4 – set mA – 4 mA at output rate	Cycle 4 – set mA – 4 mA at output rate

6.19. Error Condition Reporting Notes

1. Y1, Y2 and Y3 settings are implemented in firmware version 2368-110-01 and onwards.
2. The Y command is not reported in the D3 string, a Terminal Program is used to set up the Y Command.
3. When setting Y2 or Y3 level note that there is a space character after Y2 or Y3 and before the nnn value e.g., Y2 150.
   For instance, if the unit is set for 0-5v analogue outputs and it is required to report a fixed voltage level of 3.75v under error conditions (Y2 150) then: -
   Open a terminal program (e.g., HyperTerminal, Tera Term or Gill Wind Software (Wind Wizard not applicable)) at the matching COM Port connection and Baud rate.
   Type * to place the unit into CONFIGURATION MODE.
   Type Y2 150 and press the Enter key.
   Type Q and press Enter to return to Measurement Mode.
4. To check the Y settings then in Configuration Mode Type Y and press the Enter key and the unit will report Y1 or the full Y2 or Y3 setting e.g.
   Y
   Y2 0 (=Y2 000)
   Y
   Y2 1 (=Y2 001)
   Y
   Y2 10 (=Y2 010)
   Y
   Y2 100 (=Y2 100)

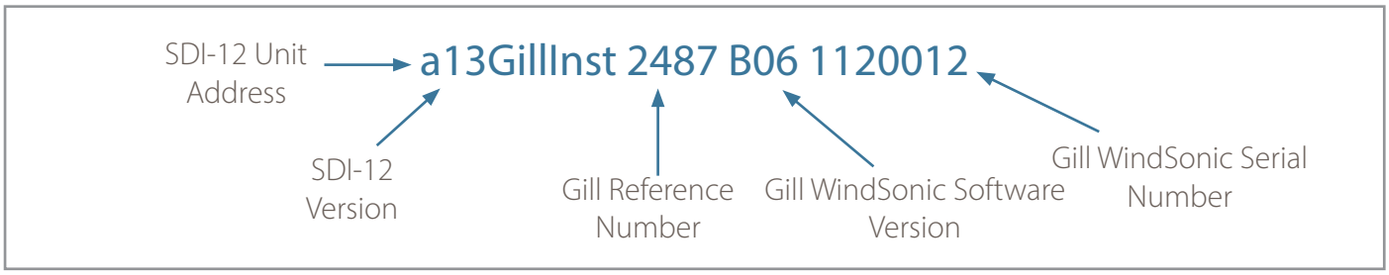
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7. SDI-12 Commands (Option 4)

7.1. Message Format



Under normal no error conditions a typical data output will show: -
0+083+000.02+00<CR><LF> e.g., Unit ID, Direction, Speed, Status Code.

Under error conditions e.g. blocked paths error code 04 the unit will pad the wind data with 9's as follows (Gill Fixed Field setting):-.
0+999+999.9+04<CR><LF> e.g., Unit ID, Direction, Speed, Status Code.

WindSonic Option 4 complies with SDI-12 Interface Standard V1.3
We advise that you download the full SDI-12 specification from www.sdi-12.org
All other commands not defined below respond with a 'zero data values ready' response.
All units of measurement are in metres per second. This cannot be re-scaled.
Wind Measurements are made at 1Hz.
The default operating mode is aXHPM!.
The default unit address is 0 (a or A = unit address).
The unit is set for fixed field operation.

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7.2. Commands and Returns in Low Power Mode (aXLPM!)

Note: - Rolling average data not available.
Use of the aR2!, aR3!, aR4! and aR5! (and their associated aRCn!) commands when the device is in aXLPM! (Low power - continuous) mode, will return a "zero data values ready" message.

Name	Command	Gill Output
Start Measurement (Polar)	aM!	atttn<CR><LF> e.g. a0053 Where a is unit identifier, 005 is measurement time in seconds and 3 is the number of data readings.
Send Data	aD0!	a<dir><mag><status><CR><LF> e.g. 0+083+000.02+00<CR><LF>
Start Measurement (UV)	aM1!	atttn<CR><LF> e.g. 00053
Send Data	aD0!	a<U><V><status><CR><LF> e.g. 0+000.00+000.02+00<CR><LF>
Start Measurement with CRC (Polar)	aMC!	atttn<CR><LF> e.g. 00053
Send Data	aD0!	a<U><V><status><CRC><CR><LF> e.g. 0+000.00+000.00+00JZY<CR><LF>
Start Measurement with CRC (UV)	aMC1!	a<CR>< LF> e.g. 0<CR><LF>
Acknowledge Active	a!	a<CR>< LF> e.g. 0<CR><LF>
Send Identification	aI!	a13GillInst 2487 B06 <sn><CR><LF> e.g. 013GillInst 2487B0611220012<CR><LF>
Change Address	aAb!	b<CR><LF> e.g. 1<CR><LF>
Address Query	?!	a<CR><LF> e.g. 0<CR><LF>
Measurement on demand	aXLPM!	0LP<CR><LF>
Continuous Reading	aXHPM!	0HP<CR><LF>

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7.3. Commands and Returns in High Power Mode (aXHPM!)

When in high power continuous mode, Wind data (Polar or Axis format) will be logged internally at 1Hz such that a 1-minute rolling average and 1 minute maximum (with associated direction) can be retrieved at any time.
1 minute averaged outputs are available using aR2!, aR3!, aR4! and AR5! Commands.

When powering up the unit wait 9.5 seconds before sending a command.

Name	Command	Gill Output
Continuous Measurement (Polar)	aR0!	a<dir><mag><status><CR><LF> e.g., 0+332+000.04+00><CR><LF>
Continuous Measurement with CRC (Polar)	aRC0!	a<dir><mag><status><CRC> <CR><LF> e.g., +272+000.02+00Ldg><CR><LF>
Continuous Measurement (UV)	aR1!	a<U><V><status><CR><LF> e.g., 0-000.03-000.01+00<CR><LF>
Continuous Measurement with CRC (UV)	aRC1!	a<U><V><status><CRC><CR><LF> e.g., +000.00-000.01+00DUx<CR><LF>
Averaged vector (UV) data converted to polar direction and magnitude. Scalar magnitude maximum and direction associated with that maximum	aR2!	a<dir_from_vectorav><mag_from_ vectorav><dir_at_mag_scalarmax><mag_ scalarmax><status><CR><LF>. e.g., 0+090+000.02+123+000.12+00<CR><LF>
Averaged vector (UV) data converted to polar direction and magnitude. Scalar magnitude maximum and direction associated with that maximum with CRC	aRC2!	a<dir_from_vectorav><mag_from_ vectorav><dir_at_mag_scalarmax><mag_ scalarmax><status><checksum><CR><LF> e.g., 0+090+000.02+123+000.12+00Hv <CR> <LF>
U and V values from the averaged vector (UV) data. Scalar magnitude maximum and direction associated with that maximum converted into U and V components.	aR3!	a<U_vectorav><V_vectorav><U_ from_scalarmax><V_from_ scalarmax><status><CR><LF> e.g., 0+000.00+000.02+000.07+000.10+00<CR ><LF>
U and V values from the averaged vector (UV) data. Scalar magnitude maximum and direction associated with that maximum converted into U and V components with CRC	aRC3!	a<U_vectorav><V_vectorav><U_ from_scalarmax><V_from_ scalarmax><status><checksum><CR><LF> e.g. 0.00+000.02+000.07+000.10+00JMJ<CR><LF>

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Name	Command	Gill Output
Scalar average direction and magnitude	aR4!	a<dir_scalarav><mag_scalarav><dir_at_mag_scalarmax><mag_scalarmax><status><CR><LF> e.g. 0+062+000.04+123+000.12+00<CR><LF>
Scalar average direction and magnitude with CRC	aRC4!	a<dir_scalarav><mag_scalarav><dir_at_mag_scalarmax><mag_scalarmax><status><checksum><CR><LF> e.g. 0+070+000.03+123+000.12+00JFr<CR><LF>
Scalar average direction and magnitude, then converted into U and V components.	aR5!	a<U_from_scalarav><V_from_scalarav><U_from_scalarmax><V_from_scalarmax><status><CR><LF> e.g. 0-000.01+000.03+000.07+000.10+00<CR><LF>
Scalar average direction and magnitude, then converted into U and V components with CRC.	aRC5!	a<U_from_scalarav><V_from_scalarav><U_from_scalarmax><V_from_scalarmax><status><checksum><CR><LF> e.g. 0+000.00+000.03+000.07+000.10+00E|[<CR><LF>
Start Measurement (Polar)	aM!	atttn<CR><LF> e.g. a0003
Send Data	aD0!	a<U><V><status><CR><LF> e.g. 0+000.00+000.02+00<CR><LF>
Acknowledge Active	a!	a<CR>< LF> e.g. 0<CR><LF>
Send Identification	aI!	a13GilllInst 2487 B06 <sn><CR><LF> e.g. 013GilllInst 2487B0611220012<CR><LF>
Change Address	aAb!	b<CR><LF> e.g. 1<CR><LF>
Address Query	?!	a<CR><LF> e.g. 0<CR><LF>
Measurement on demand	aXLPM!	0LP<CR><LF>
Continuous Reading	aXHPM!	0HP<CR><LF>

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8. Modbus RTU Protocol (Option 5)

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

8.1. 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

8.2. 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

8.3. Requesting Measurement Data

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

8.4. 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.

8.5. 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.

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Item	Units	32-bit float register address	32-bit integer registers address	16-bit integer register address	Definition
Speed	m/s	2000	4000	6000	Wind speed (polar magnitude).
Direction	degrees	2002	4002	6001	Wind direction (polar).
U-axis velocity	m/s	2004	4004	6002	Signed wind speed magnitude (vectorial).
V-axis velocity	m/s	2006	4006	6003	Signed wind speed magnitude (vectorial).
Max gust speed	m/s	2008	4008	6004	Maximum gust speed.
Max gust direction	degrees	2010	4010	6005	Maximum gust direction.
Min gust speed	m/s	2012	4012	6006	Minimum gust speed.
Min gust direction	degrees	2014	4014	6007	Minimum gust direction.
Extended Status Code	flags	2020	4020	6010	Engineering diagnostics.
WindSonic Status Flags	flags	2032	4032	6016	The WindSonic Status Code - see Appendix O. Status Codes on page 86.

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8.6. 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)

8.7. 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)

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Appendix A. Technical Specification - WindSonic Options 1, 2 & 3

Wind Measurement		
Units of Measure	Metres/second (m/s, Knots, Miles per hour (mph), Kilometres per hour (kph), Feet per minute (fpm)	
Output Frequency	0.25, 0.5, 1, 2, or 4 outputs per second	
Parameters	Digital	Analogue
	Polar - Speed and Direction UV - 2 axis, signed Speed NMEA Speed and Direction Tunnel - U speed & U Polarity Gust – Speed and Direction	Polar - Speed and Direction UV - U Speed and U Polarity NMEA – Speed and Direction Tunnel - U Speed & U Polarity
Wind Speed		
Values are dependent on anemometer being used		
Range	0 – 60m/s WindSonic 0 -75m/s WindSonic 75	0 – 5m/s, 0 – 10m/s, 0 – 20m/s, 0 – 30m/s, 0-40m/s, 0 – 50m/s, 0 – 60m/s, 0-80m/s.
Accuracy	<2% RMSE or 0.2m/s RMSE, whichever is greater (0-20m/s) <3% RMSE (20-60m/s) <5% RMSE (60-75m/s)	<2% RMSE or 0.2m/s RMSE, whichever is greater (0-20m/s) <3% RMSE (20-60m/s) <5% RMSE (60-75m/s)
Resolution	0.01 m/s	10 bits
Analogue output formats 0-5V 4-20mA 0-20mA	±1% of full-scale N.B. Analogue output impedance = 1KΩ (V out) Load resistance between the Analogue outputs (Pins 8 & 9) and Signal Ground (Pin 1) must be <= 300 ohms, including cable resistance.	
Wind Direction		
Range Accuracy Resolution	0 – 359 ° <2° RMSE (0-75m/s) 0.1°	0 – 359 ° or 0 – 539° (Wraparound mode) <2° RMSE (0-75m/s) 0.1°

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Digital Output Formats	
Gill	Continuous or Polled (output on request by host system) Polar (Speed and Direction) or UV (2 axis, signed Speed)
Marine - NMEA	NMEA 0183 version 3
Power Supply	
Input voltage	5 to 30 V DC Option 1 and 2 units (WindSonic) 7 to 30 V DC Option 3 units (WindSonic)
Current at 12v	Current requirement depends on variant i.e. RS-232 approximately 9mA rising to 44mA for Analogue variant. Lowest power consumption is obtained with the following configuration: - M2, P20, B3, S9 (approximately 5.5mA at 12v). 12 – 30 V DC Option 1, 2and 3 units (WindSonic 75) Current drain i.e., RS-232 approximately 13mA at 12v DC.

Environmental	
Protection Class	IP66
Operating Temperature	-35°C to +70°C
Storage Temperature	-40°C to +80°C
Operating Humidity	<5% to 100%

Mechanical	
External Construction	External - Acrylate Styrene Acrylonitrile, Polycarbonate blend
Mounting	Pipe mounting 1.75 inches (44.45mm) diameter
Weight	0.5kg
Size	142mm diameter x 163mm

Software	
Wind	Free PC Software to set-up WindSonic
WindView	Free PC Software to view and log WindSonic data

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Appendix B. Technical Specification - WindSonic Option 4

Output	
Units of measure	Metres/second (m/s)
Wind Speed	
Range	0 – 60 m/s
Accuracy	<2% RMSE or 0.2m/s RMSE, whichever is greater (0-20m/s) <3% RMSE (20-60m/s) <5% RMSE (60-75m/s)
Resolution	0.01 m/s
Wind Direction	
Range	0 - 359°
Accuracy	<2° RMSE (0-75m/s)
Resolution	1°
Digital output formats	
Digital Data	SDI-12 V1.3
Averaging	1 Minute Vector, 1 Minute Scalar, 1 Minute Maximum Speed
Anemometer status	Status OK and Error codes included as part of standard output message
Environmental	
Ingress protection	IP66
Temperature	Operating -35°C to +70°C
Humidity	Operating <5% to 100%
Power requirement	9.6 – 16 V DC. Current drain <2mA @12v low power operation Current drain <10mA @12v high power operation
Mechanical	
Size	diameter 142mm x 163mm
weight	0.5kg
Mounting	Pipe mounting 1.75 inches (44.45mm) diameter
Material	External - Acrylate Styrene Acrylonitrile, Polycarbonate blend.

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Appendix C. Technical Specification - WindSonic Option 5

Output	
Units of measure	Metres/second (m/s)
Wind Speed	
Range	0 – 60 m/s
Accuracy	<2% RMSE or 0.2m/s RMSE, whichever is greater (0-20m/s) <3% RMSE (20-60m/s) <5% RMSE (60-75m/s)
Resolution	0.01 m/s
Wind Direction	
Range	0 - 359°
Accuracy	<2° RMSE (0-75m/s)
Resolution	1°
Digital output formats	
Digital Data	MODBUS RTU
Gust Data	Gust min and max speed and direction
Anemometer status	Status OK and Error codes available
Environmental	
Ingress protection	IP66
Temperature	Operating -35°C to +70°C
Humidity	Operating <5% to 100%
Power requirement	9.6 – 16 V DC. Current drain <2mA @12v low power operation Current drain <10mA @12v high power operation
Mechanical	
Size	diameter 142mm x 163mm
weight	0.5kg
Mounting	Pipe mounting 1.75 inches (44.45mm) diameter
Material	External - Acrylate Styrene Acrylonitrile, Polycarbonate blend.

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Appendix D. Technical Specification - WindSonic Metal

Wind Measurement		
Units of Measure	Metres/second (m/s, Knots, Miles per hour (mph), Kilometres per hour (kph), Feet per minute (fpm)	
Output Frequency	0.25, 0.5, 1, 2, or 4 outputs per second	
Parameters	Digital	Analogue
	Polar - Speed and Direction UV - 2 axis, signed Speed NMEA Speed and Direction Tunnel - U speed & U Polarity Gust – Speed and Direction	Polar - Speed and Direction UV - U Speed and U Polarity NMEA – Speed and Direction Tunnel - U Speed & U Polarity
Wind Speed		
* Values are dependent on anemometer being used		
Range	0 – 60m/s WindSonic	0 – 5m/s, 0 – 10m/s, 0 – 20m/s, 0 – 30m/s, 0-40m/s, 0 – 50m/s, 0 – 60m/s, 0-80m/s.
Accuracy Resolution	2% RMSE (at 12m/s) 0.01 m/s	2% RMSE (at 12m/s) 10 bits
Output formats	RS232, RS422 & RS485 (2 wire Point to Point only) at baud rates 2400, 4800, 9600, 19200, 38400 Status OK and error codes (not for heating) included in output message	0-5V 4-20mA 0-20mA ±1% of full-scale N.B. Analogue output impedance = 1KΩ (V out) Load resistance between the Analogue outputs (Pins 8 & 9) and Signal Ground (Pin 1) must be <= 300 ohms, including cable resistance.
Wind Direction		
Range	0 – 359 °	0 – 359 ° or 0 – 539° (Wraparound mode)
Accuracy Resolution	2° RMSE (at 12m/s) 0.1°	2° RMSE (at 12m/s) 0.1°

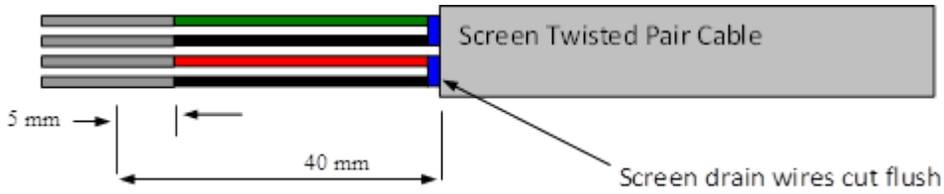
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Digital Output Formats	
Gill	Continuous or Polled (output on request by host system) Polar (Speed and Direction) or UV (2 axis, signed Speed) Tunnel: U speed & U polarity
Marine - NMEA	NMEA 0183 version 3
Power Supply	
Input voltage	5 to 30 V DC Option 1 and 2 units (WindSonic) 7 to 30 V DC Option 3 units (WindSonic)
Power at 12v	Current requirement depends on variant i.e. RS-232 approximately 9mA rising to 44mA for Analogue variant. Lowest power consumption is obtained with the following configuration: - M2, P20, B3, S9 (approximately 5.5mA at 12v).
Heater Power (heated variants only)	10V to 30.0V DC. 24V RMS AC ± 10 % @50/60Hz. Allow for 2.2 Amps @ 12V DC nominal supply (26W max.) Allow for 4.2 Amps @24v AC or DC nominal Supply (100W max.)
Environmental	
Protection Class	IP66
Operating Temperature	-35°C to +70°C (unheated) -40°C to +70°C (heated)
Storage Temperature	-40°C to +80°C
Operating Humidity	<5% to 100%
Hail	UL2218 Class 1
EMC	EN 61326:1998 & BSEN 60945, FCC CFR47 Parts 15.109 Class A
Mechanical	
External Construction	External - Aluminium Alloy 6061 T6 or T4, hard anodise finish. Connector - Polycarbonate blend
Mounting	Pipe mounting 1.75 inches (44.45mm) diameter
Weight	0.9kg
Size	142mm diameter x 163mm
Software	
Wind	Free PC Software to set up WindSonic
WindView	Free PC Software to view and log WindSonic data

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Appendix E. Cable Assembly for WindSonic (9-Way Connector)

Open the pack of parts provided with the WindSonic, or as accessories part 1405-PK-069 for Options 1-4 (1405-PK-111 for WindSonic Metal non-Analogue, 1405-PK-112 for WindSonic Metal with Analogue).
Note that the connector supplies the correct strain relief for cables with an outside diameter of 6-12mm).
Trim back the screened cable outer and screen sleeves 40mm.
Trim back the screen drain wires flush with the outer sleeve.
Strip back the connection wires by 5mm.



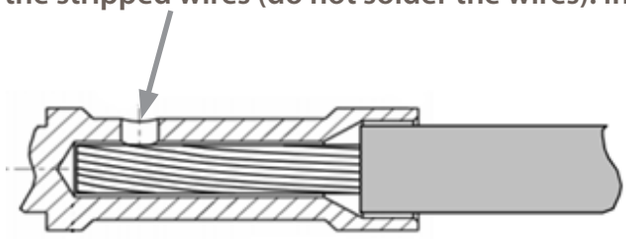
Soldering Contacts

Note that the supplied size 20 contacts are suitable for wire gauges 20 AWG to 24 AWG.
Tin solder the stripped wires.
Solder the contact pins to the wires.

Crimping Contacts

Note that the supplied size 20 contacts are suitable for wire gauges 20 AWG to 24 AWG.
Example crimp tools are: -
Daniels Manufacturing Corporation Tool AF8 and Turret TH1A.
https://www.dmctools.com/oscar/catalogue/af8_271/
https://www.dmctools.com/oscar/catalogue/th1a_3128/
or
Astro Tool Corporation Crimp tool 615708 and Turret 615709.
https://www.astrotool.com/products/615708-m22520-1-01-crimping-tool-dmc-af8/
https://www.astrotool.com/products/615709-m22520-1-02-turret-head-dmc-th1a/

Lightly twist the stripped wires (do not solder the wires). Insert the wire into the supplied



contact barrel and ensure that it can be seen through the contact inspection hole.

With the crimp tool fully open place the contact and wire into the crimp tool barrel.
Fully close the crimp tool allowing it to re-open on its own.
Visibly check that the wire is visible through the inspection hole. Connector Assembly.

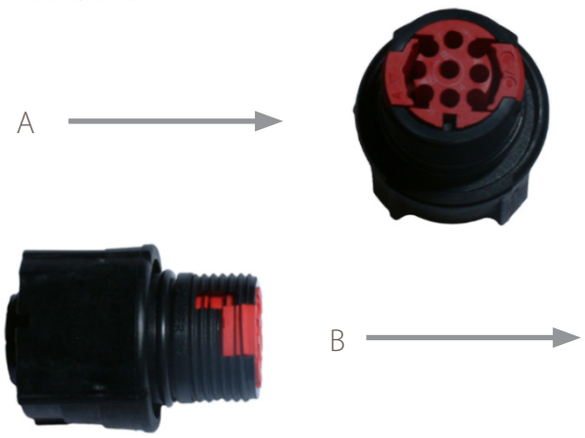
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Connector Assembly

To disassemble the connector, reverse this procedure Put the parts on the cable in the order as shown below.



Whilst squeezing the red retainer in the direction of ARROWS A, pull in the direction of ARROW B

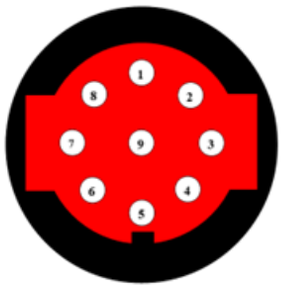


Your connector should now resemble the connector in the picture below.



Insert each contact pin until you feel a slight click. If you have inserted the contact into the incorrect hole it can be removed at this point by simply pulling it out. Please note there will be some resistance.





Rear view of connector

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Continue to insert all of the contacts you require. Once all of the contacts are inserted push the red retainer into place. NB. The retainer can only be pushed back into place if the contacts are fully engaged.



Fit the connector to the WindSonic so that you can finish assembling the connector.



Screw the back shell onto the connector until it is fully in place. Please note that the final rotations can be slightly stiff.



Now screw the next part of the connector into place.



Now screw the cable-clamping nut into place.



The connector can now be removed from the WindSonic.

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Connector Spares

For spares purposes the complete WindSonic Souriau Clipper connector comprises of: -

9-way Connector	CL1F1201.
Connector female contact	CM10SC10MQ (size 20 contact).
Sealing Gland Clipper size1	CL101021 (suitable for cables 6-12mm outer diameter).

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Appendix F. Cable Assembly for WindSonic M with Analogue Outputs (12-way connector)

The WindSonic M with analogue outputs is supplied with a mating 12-way connector.
Open the pack of connector parts supplied (Gill Part 1405-PK-112).
A set of assembly instructions are supplied with the connector together with:-.

Table of equivalent part numbers		
Part Name	**Gill Part No.**	**Cannon Trident Part No.**
Connector head, 12 way	020-04990	192993-0053
Metal backshell (7 pieces)	020-04991	192993-0083
Solder bucket contacts (5 per pack, (3 –off packs))	020-04469	192900-0635

Arrange Backshell (Gill Part Number 020-04991)

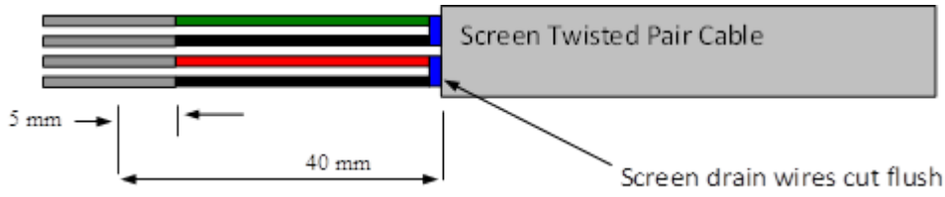
Pass parts 1-7 along the cable in the order shown in the diagram below.
(Note that the connector supplies the correct strain relief for cables with an outside diameter of 6.9 to 10.2mm).



Figure 5 Connector Backshell Parts: parts 1 - 7 are shown from left to right respectively

Prepare Cable

Trim back the cable outer and twisted pair screen sleeves 40mm (see diagram below).
Trim back the screen drain wires to a length of 24mm.
Strip back the connection wires by 7.1mm and tin solder.
Solder the bucket contacts to the wires.
Unused wires should be cut back and insulated.



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Prepare Connector Head (Gill Part 020-04990)

Remove the connector thread protector and place the O-ring (part 7) into the groove of the connector head (020-04990).



Place the O-ring around this part



Remove the thread protector

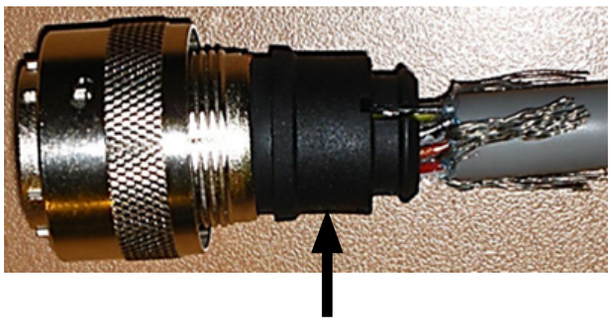
Assemble Connector to the cable

Push connector contacts through the red connector head seal into the appropriate location, when in place there should be a click as the contact locks into position.

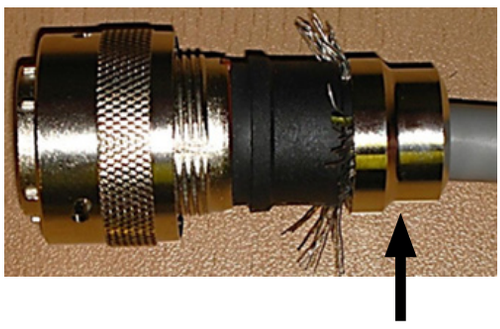
Once contacts are in position pass part 6 up the cable and into position as shown below.

Note: if a connector pin needs removing, use Cannon Extraction Tool, Manufacturer's Part 192922-1450.

Fold and spread screen wires over part 6 and then push up part 5 as shown to clamp screen wires between Parts 5 and 6.



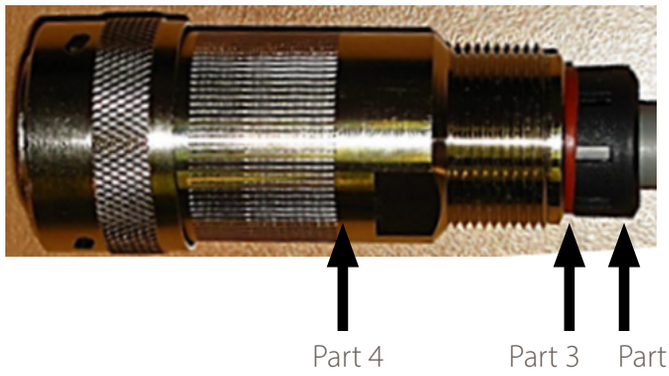
Part 6 is indicated by the arrow



Part 5 is indicated by the arrow

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Now screw in part 4 and torque up to a value of 10Nm.



Now screw in part 4 and torque up to a value of 10Nm.

Pass parts 3 and 2, the cable seal and cable grip from the connector kit, along the cable to the housing.

Now screw in item 1, the clamp nut, over parts 2 and 3 and onto the housing and torque up to a value of 10Nm.



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Appendix G. WindSonic Default Setup

The **WindSonic Option 1** unit is factory configured with the following default settings:

M2, U1, O1, L1, P1, B3, H1, NQ, F1, E3, T1, S4, C2, G0, K50,GUSTINT10,DP0

The **WindSonic Option 2 and 3** unit is factory configured with the following default settings:

M2, U1, O1, L1, P1, B3, H1, NQ, F1, E2, T1, S4, C2, G0, K50,GUSTINT10,DP0
See Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind for further details

Notes

WindSonic Option 1 set for RS-232 mode (E3, default)

WindSonic Options 2-3 to be set for RS-422/RS-485 mode (E2, default).

WindSonic Option 4 is set for SDI-12 only.

WindSonic Option 5 is set for Modbus only.

Analogue Outputs are also simultaneously available from the Option 3 unit.

WindSonic Option 4 is not compatible with Gill Wind, WindView or WindSet Software.

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Appendix H. WindSonic Safe mode

Using Safe Mode to get communication and to change settings

If an Option 1, 2, 3 or Metal WindSonic is not communicating an output then try the Safe Mode feature as described here.

For WindSonic Option 1, ensure the connections are as shown in Section 4.5 on page 20.

For WindSonic Option 2 & 3, ensure the connections are as shown in Section 4.6 on page 21 (analogue and heating circuits do not need to be connected for Safe Mode to work).

Safe Mode with Option 4 WindSonic

In the event the unit is not communicating in SDI-12 mode a unit check may be made in RS-232 safe mode for fault finding purposes (applies to units with serial number 11220007 and higher).

Wire the SDI-12 WindSonic as follows: -

WindSonic Option 4 RS-232 Fault Finding Connection		PC 9 Pin D Type Connector Com 1 Port
TX-	8	2
RX-	9	3
GND	1	5
V+	2	V+ PSU
V-	3	V- PSU

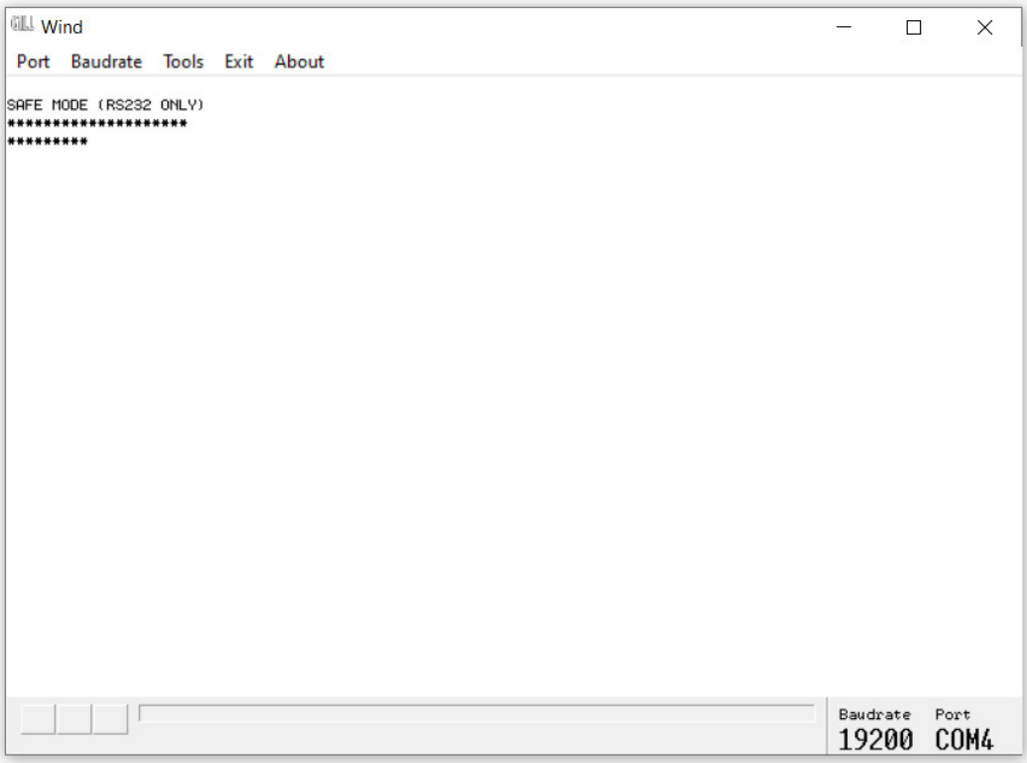
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Operation Method Summary

Connect the WindSonic as per the previous connection diagrams.

With WindSonic power off, set up a Terminal connection but with the Baud rate set to 19200 (this can be at variance with the original WindSonic Baud rate setting).

Hold down the * character (shift 8) and apply power to the WindSonic. After approximately 3 seconds the unit will respond with Safe Mode.
Remove any * characters on screen or press the Enter key.



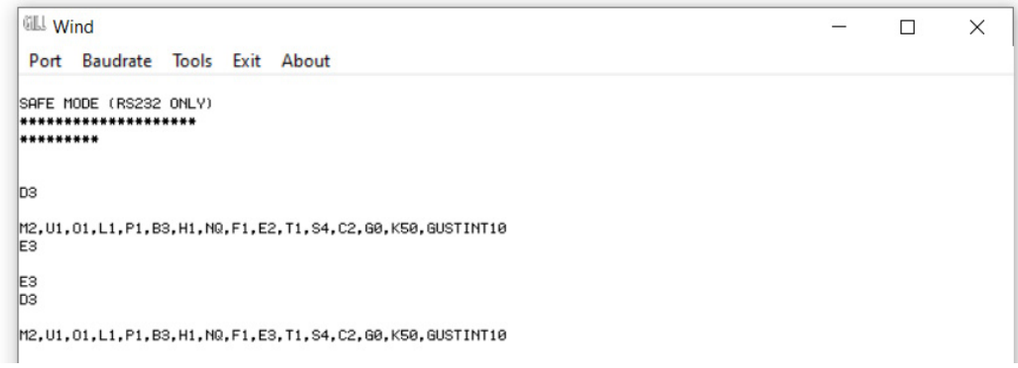
To check the current configuration settings Type D3 and press the Enter key.
To change any setting type in the appropriate command and then press the Enter key.
Type Q and press Enter to return to Measurement mode.
Turn off/on the unit to return to normal operation, note that comms may now be lost with the safe mode connection.



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Not applicable for Option 1 or 5 WindSonic

To Change the Communication setting from a unit set for RS-422 to RS-232 when in safe mode: -
Type E3 and press the Enter key.
If the change is successful, then another E3 will be shown.
Type D3 and press Enter to confirm if required.
Turn off/on the unit to return to normal operation, change the Wind Software baud rate setting to match that of the WindSonic to view data.



Only applicable to SDI-12 units

If commands are typed (followed by the Enter key) that the unit will not accept, then ILLEGAL COMMAND LINE will be reported.
Commands that will be accepted are: -
REPORT then press Enter key (see below).
SERIAL then press Enter key (see below).
SWVER then press Enter key (see below).

Type Q then press Enter key (see below) this allows data to scroll on screen.
The Wind data string can be examined to check for instance that the wind direction and speed are output, and the 2-digit status code is 00.
If the 2-digit Status Code is other than 00 refer to Appendix O. Status Codes.

Once the unit is turned off and back on again it will return to SDI-12 mode.

If you need to get back into Gill continuous data, then you have to perform the safe mode steps again.

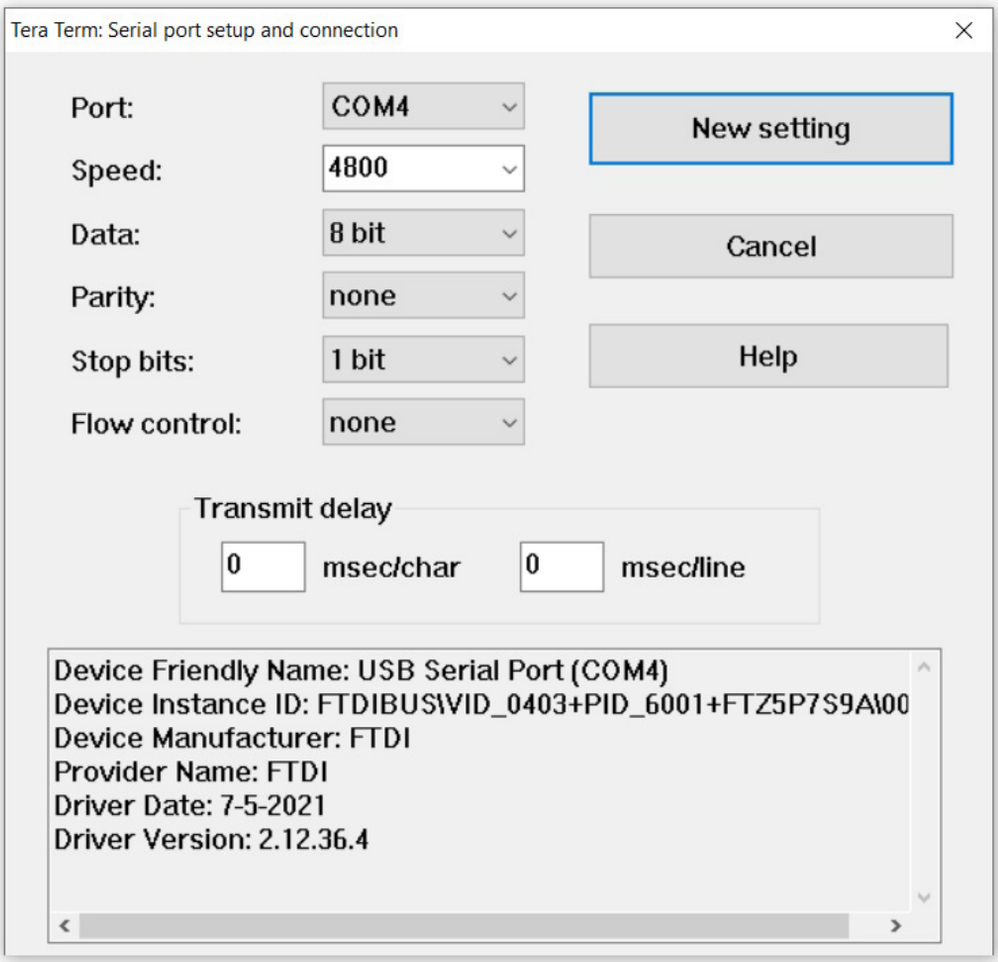
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Power to the WindSonic is turned off at this stage.

Open a Terminal Program e.g., Tera Term or HyperTerminal etc.

The Safe Mode settings are:

Baud Rate	4800
Data bits	8
Parity	None
Stop bits	1
Flow Control	None



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Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind

Gill Wind Software may be used to configure WindSonic Options 1, 2 & 3; alternatively, the user may elect to use another terminal emulator package such as Tera Term or puTTY etc. This section describes the commands used to change User and Communications settings.

Wind software is available to download, free of charge, from the Gill Instruments Limited website https://gillinstruments.com/software/

Wind software allows the unit configuration to be changed and to be able to display the Digital Data String on a PC screen.

NOTE: Wind is not compatible with WindSonic Option 4 – SDI-12 or WindSonic units prior to serial number 08100001 with a yellow or blue tab adjacent to the North Marker.

Connect both WindSonic transmit and receive data lines to the PC to establish 2-way communications.
Open Wind Software and select the appropriate Com Port from the drop-down menu and click on OK to reach the data screen.
If data is not correctly displayed, then on the Menu click on Tools/Synch Comms.

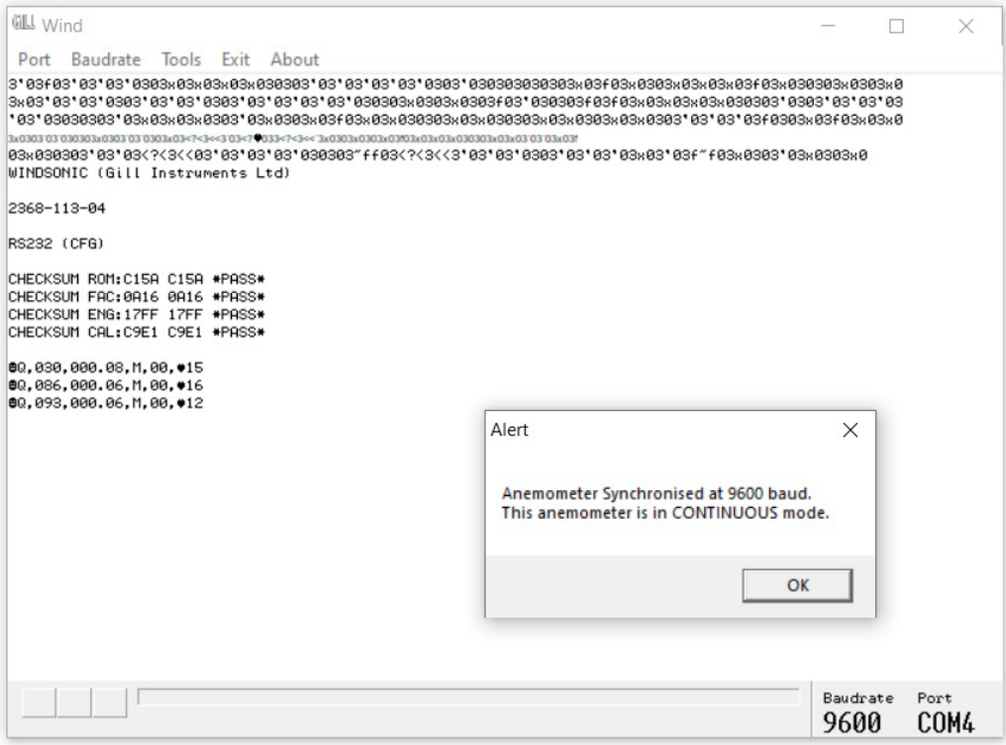


The Sensor will be interrogated, and Sensor Baud Rate and Mode settings detected and reported.
Wind software settings will be adjusted to match those of the sensor to show data scrolling on screen.
If after Synch Comms there is still a problem, repeat Synch Comms or switch off the sensor and switch back on again and repeat above procedure.

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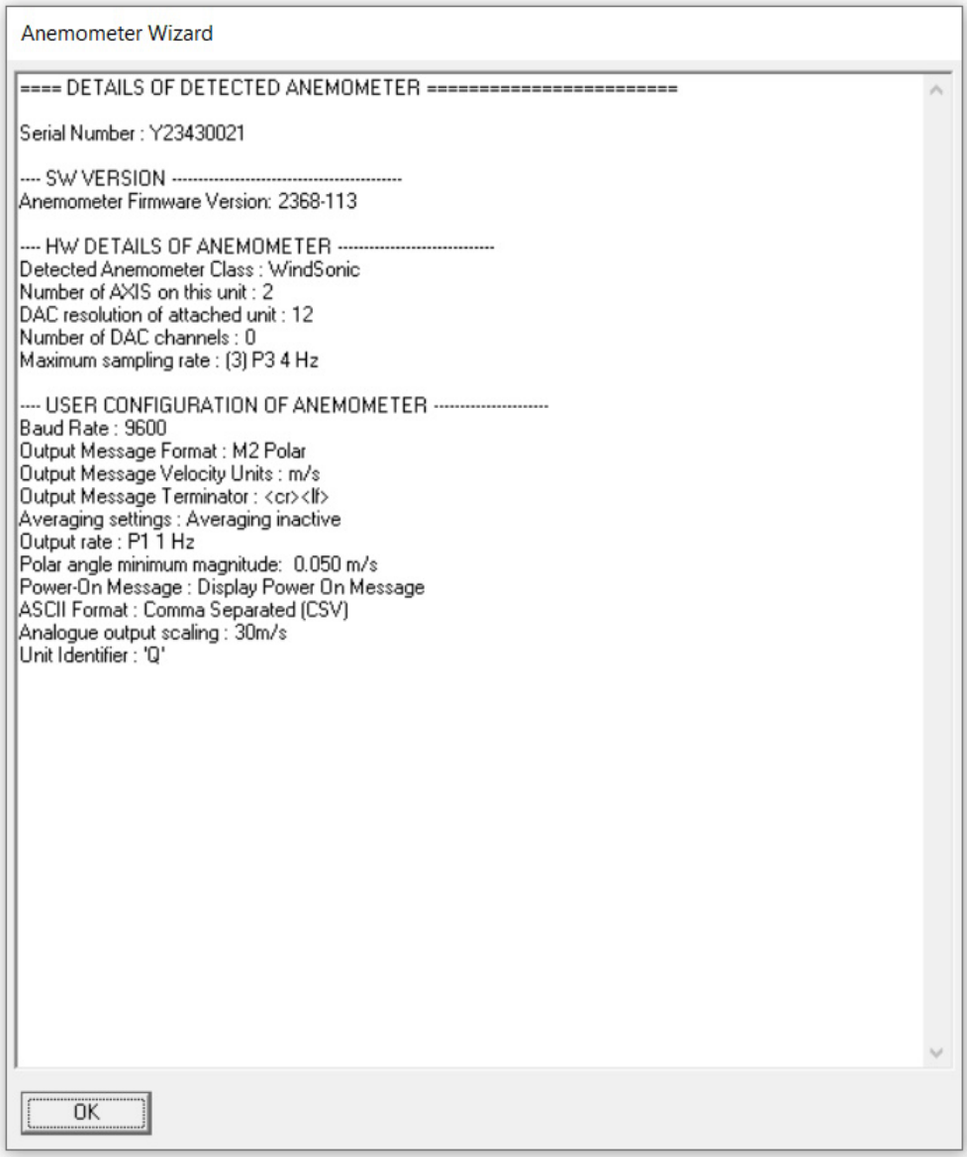
It is also possible to use Wind as a Terminal Program and change settings using the Configuration Mode of operation (Commands are listed in Appendix K on page 76).

If you wish to review the Sensor Settings, click on Tools/Report Config.



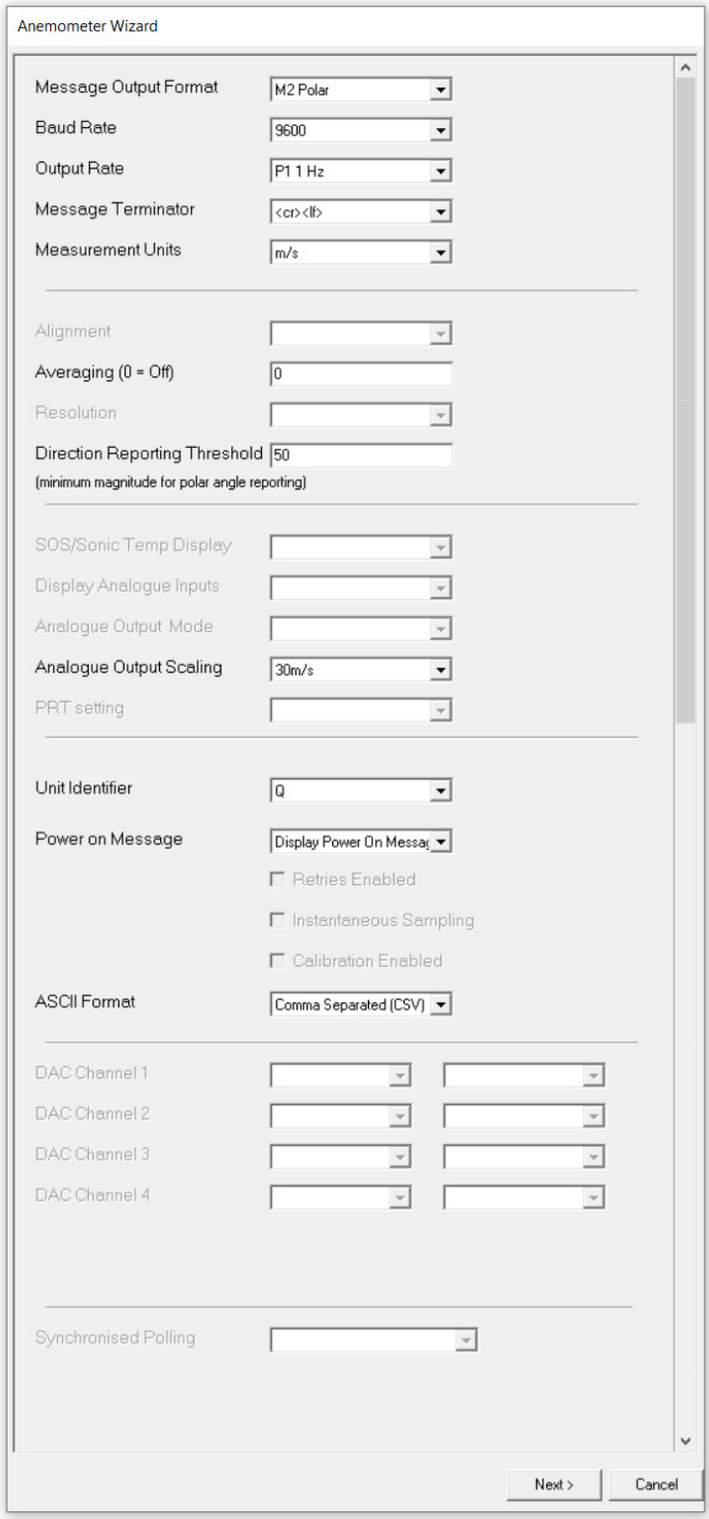
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When selected a similar message to that below will be seen.



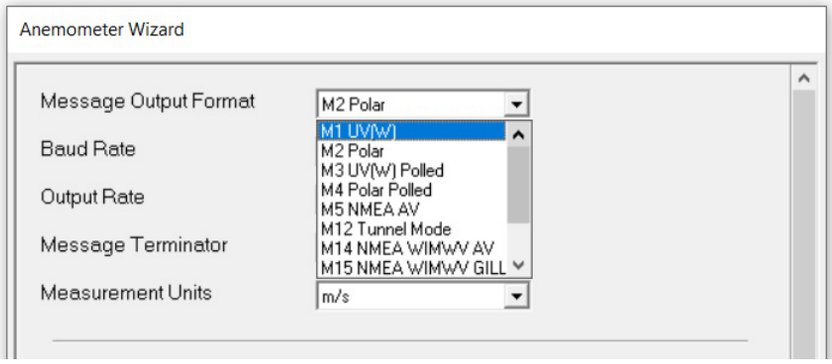
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To review and change the WindSonic configuration click on Tools/Wizard
Typical Screen is shown following: -

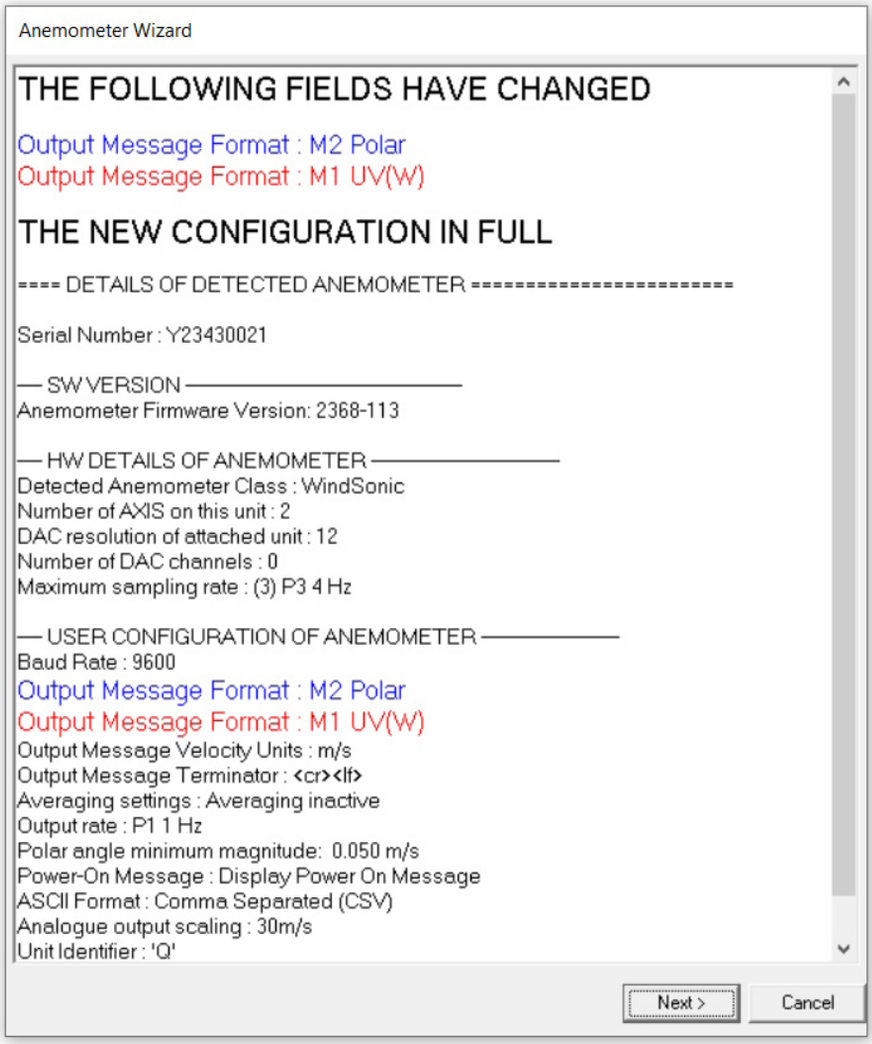


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To change a setting i.e., change from M2 (Polar) to M1 (UV), select M1 from the Wizard drop down list then click on Next.



The following screen will show settings that will be changed.
Then click on Next.



Wind will report Setting up Anemometer and then re-start the anemometer scrolling data in UV mode.

Note: - It is also possible to change settings in Wind using the Configuration Mode of operation. Commands are listed in Appendix K. Option 1-3 Configuration Commands

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Appendix J. Configuring Option 1-3 using terminal package

1. Determine the COM port the WindSonic is connected to.
2. Open preferred terminal program (Wind, Tera Term etc.)
3. Select COM port
4. Adjust the Port settings to match WindSonic settings. WindSonic default settings are :

Bits per second 9600
Data bits 8
Parity None
Stop bits 1
Flow Control (Handshaking) None

Click on OK and data similar to the following example will scroll on screen at the output rate:

```
☺Q, 229, 002.74, M, 00, ♥ 06
```

Entering Configuration mode

From Continuous mode	From Polled mode
Type *	Type * then <N> Where <N> is the Unit identifier

The WindSonic responds with a CONFIGURATION MODE message, stops reporting wind measurements, and waits for a command (as detailed below).

Returning to Measurement mode

Type Q then press ENTER

The WindSonic responds with a checksum test and then continuous wind information when in continuous mode, or on receipt of a Poll signal when in Polled mode.

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Checking the Configuration

We recommend that, as a standard procedure, you use this command prior to and after changing any settings. It shows the current settings for all the alterable settings.

Type *
Type D3 then press ENTER

The WindSonic responds with the default settings shown below for Option 1 units.

M2, U1, O1, L1, P1, B3, H1, NQ, F1, E3, T1, S4, C2, G0, K50,GUSTINT10,DR0

The WindSonic responds with the default settings shown below for Option 2 and 3 units.

M2, U1, O1, L1, P1, B3, H1, NQ, F1, E2, T1, S4, C2, G0, K50,GUSTINT10,DR0

We suggest you note down the settings, so that you can easily return to them.

To return to measurement mode: -
Type Q then press ENTER

All of the above settings are explained in the following sections.

Changing a setting

To change a setting, refer to the commands listed in Appendix K. Option 1-3 Configuration Commands. Enter the command of the new setting required, followed by ENTER. The new setting will be sent as a message by the WindSonic.

For example, to change the message format to NMEA, Type M5 and press ENTER

The WindSonic will reply M5. When the unit is returned to the Measurement mode, it will be in NMEA format.

The factory-set (default) settings are shown in bold in the following sections.
To Change E Command setting refer to Safe Mode operation, Appendix H. WindSonic Safe mode.

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Appendix K. Option 1-3 Configuration Commands

COMMAND	USER
B	Baud rate
C	Analogue angle wrapping
CT	Set Configuration Mode Timeout
D	Diagnostic and Configuration
DR	Direction Resolution
E	Set Physical Comms
F	Data and Parity Options
G	Not currently used
GUSTINT	Set Gust Interval in minutes
H	Power-Up message
K	Minimum Direction Velocity
L	Message Terminator
M	Message Format
N	Unit ID
O	ASCII Output format
P	Output rate
Q	MEASUREMENT MODE
S	Analogue output range
SUSPENDCT	Temporarily Suspend Configuration Mode Timeout
T	Analogue output type
U	Select Units
Y	Analogue Output, Error Status Condition
*	INTERACTIVE MODE

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Bx – Baud rate

Item	Options	Command
Baud rate	2400	B1
	4800	B2
	9600	**B3**
	19200	B4
	38400	B5

To change the Baud rate when using a terminal package-
E.g. If set to B3 (9600 baud) and it is required to set to Baud rate to B2 (4800 baud).
Type ***** to enter Configuration Mode.
Type **B2** and press **ENTER**, (Do not type any further commands at this stage).
Close the command line window.
Open a terminal package and set serial port Baud Rate to 4800 baud.
Type **B** and press **ENTER**, the letter B will be shown followed by capital B2
Type **Q** and press **ENTER**, data will scroll at the new baud rate.

Cx – Analogue settings

The following command is only valid for the WindSonic Option 3:

Item	Options	Command
Analogue Wraparound (Chart recorder facility)	Wrap around 0 – 539° **Normal 0 – 359°**	C1 **C2**

CTx – Configuration Mode Timeout

This reverts the unit back to measurement mode (exits configuration mode) if no command is received within the set period.

Item	Options	Command
Configuration mode timeout period	Set the configuration mode timeout period in seconds. x= 0-99 **Default = 0**	CTx **CT0**

SUSPENDCT – Suspend Configuration Mode Timeout

This temporarily halts the configuration mode timeout timer for the duration of the current configuration session.

Item	Options	Command
Suspend configuration mode timeout	ON **OFF (default)**	SUSPENDCT

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Dx – Diagnostic and Configuration Command

See Configuration / Diagnostic Information on page 83.

DRx - Direction Resolution options

Item	Options	Command
Number of decimal places for direction	**0**, 1 or 2*	Dx **D0**

* underlying resolution of the direction measurement ~0.08°

Ex – Communications Protocol

Item	Options	Command
Communications protocol	RS-422 / RS-485 (point to point), Opt 2&3 default RS-232 (Only option for Opt 1)	E2 E3
To change settings, refer to Connecting to a PC (Para's 4.6 and 4.7)		

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Fx – Data and parity options

Item	Options	Command
Data and parity options	**8 bits, no parity** 8 bits, even parity 8 bits, odd parity	**F1** F2 F3

Gx – Reserved for Gill use only

GUSTINTx – Gust Interval in minutes

Item	Options	Command
Gust Interval in minutes	Set the Gust Interval in minutes x=1-10 **Default = 10**	GUSTINTx **GUSTINT10**

Hx – Power-up Message

Item	Options	Command
Power-up message	**ON** OFF	**H1** H2

If the power up message is On, then a message similar to that below is output, whenever the unit goes into Measurement mode (i.e., when power is first applied to the unit, or unit returns to Measurement mode from Configuration mode).

WINDSONIC (Gill Instruments Ltd)
2368-114-03
RS485/RS422 (CFG)
CHECKSUM ROM: E15C E15C *PASS*
CHECKSUM FAC:0A42 0A42 *PASS*
CHECKSUM ENG:12BE 12BE *PASS*
CHECKSUM CAL:C980 C980 *PASS*

If any of these checksums fail, the word PASS will be replaced by FAIL and the unit will use its default settings. If the checksum repeatedly fails after power on – contact your supplier.

The exact message above may vary.

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Kxx to Kxxxx – Minimum Direction Velocity

Item	Options	Command
Minimum Direction Velocity	0.00m/s to 5m/s	**K50** KXX to KXXXX
This feature allows the minimum wind velocity to be set at which display of the direction is enabled in thousandth of a metre per second. The default is 50, which means that any wind magnitude less than 0.05m/s will have the wind direction omitted in Comma Separated Variable mode. E.g. Q,,000.04,M,3C. Or last wind reading at 0.05m/s or above repeated in Fixed Field Mode. E.g. Q,237,000.04,M,3C.		

Lx – Message Terminator

Item	Options	Command
Message terminator	**<CR> <LF>** <CR>	**L1** L2

Mx to Mxx – Message Format

Item	Options	Command
Message format	Gill, UV, Continuous	M1
	Gill, Polar, Continuous	**M2**
	Gill, UV, Polled	M3
	Gill, Polar, Polled	M4
	NMEA, IIMWV (NMEA status code)	M5
	Tunnel Continuous	M12
	NMEA, WIMWV (NMEA status code)	M14
	NMEA, WIMWV (Gill status code)	M15
	NMEA, IIMWV (Gill status code)	M16
	Gill, UV + Gust, Continuous	M21
	Gill, Polar + Gust, Continuous	M22
	Gill, UV + Gust, Polled	M23
	Gill, Polar + Gust, Polled	M24

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Nx – Node Address

Item	Options	Command
Node Address	**Q**… - (A to Z)	**N<Q>**

If used in polled mode then it is recommended that ID's A to F and K, M, N and P are not used, as these characters can be present in the data string.

Ox – ASCII Output Format

Item	Options	Command
ASCII output format	**Comma separated format (CSV)** Fixed field	**O1** O2

Example data string for CSV data changing to low wind less than 0.05m/s (set for K50) and error status code condition.
Q,156,000.05,M,00,19
Q,,000.04,M,00,2A (low wind, no direction figure output at 0.04m/s or lower).
Q,100,000.09,M,00,16
Q,,,M,04,24 (error data, no figures output in wind fields).

Example data string for Fixed Field data changing to low wind less than 0.05m/s (set for K50) and error status code condition.
Q,160,000.05,M,00,1C
Q,160,000.04,M,00,1D (low wind, last direction figure at 0.05m/s or above retained).
Q,170,000.06,M,00,1E
Q,999,999.99,M,04,0A (error data, wind fields padded with 9's).

Px to Pxx – Output Rate

Item	Options	Command
Output rate	**1 per second** 2 per second 4 per second 1 reading every 4 seconds 1 reading every 2 seconds	**P1** P2 P3 P20 P21

Q – Measurement Mode

Refer to Appendix I. Configuring WindSonic Option 1, 2 & 3 using Wind (Returning to Measurement mode).

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Sx – Analogue Output Range

The following command is only valid for the WindSonic Option 3:

Item	Options	Command
Analogue Range, Magnitude Scaling (Set Analogue Output Range)	0 – 5 metres per second 0 – 10 metres per second 0 – 20 metres per second **0 – 30 metres per second** 0 – 40 metres per second 0 – 50 metres per second 0 – 60 metres per second 0 – 80 metres per second (0-80m/s WindSonic 75 only) Analogue output disabled	S1 S2 S3 **S4** S5 S6 S7 S8 S9

Tx – Analogue Output Type (Voltage or Current)

The following command is only valid for the WindSonic Option 3:

Item	Options	Command
Voltage or Current output (Set Analogue Output Type) See supplementary notes, note 4	**0 - 5 Volt** 4 – 20 mA 0 – 20 mA	**T1** T3 T5 SUSPENDCT

Ux – Output Units

Item	Options	Command
Output Units	**Metres per second (M)** Knots (N) Miles per hour (P) Kilometres per hour (K) Feet per minute (F)	**U1** U2 U3 U4 U5

Yx – Analogue Output, Error Status Condition

Item	Options	Command
Output Level	**Full Scale level toggling** Fixed Steady level Pre-Set level toggling	**Y1** Y2 nnn Y3 nnn

Where nnn =000 to 200 see Section 6.15. Error condition reporting on page 40.

This command is not applicable to WindSonic 75 analogue output units.

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Configuration / Diagnostic Information

Each of these commands causes a response from the WindSonic

Item	Command	Response Format
Type and serial No.	D1	Y16120001
Software version	D2	2368-110-01
Unit configuration	D3	M2, U1, O1, L1, P1, B3, H1, NQ, F1, E2, T1, S4, C2, G0, K50,GUSTINT10,DR0
Supply Voltage	D5	+11.7v
Self-test	D6	*See Appendix P. Maintenance & Fault-Finding on page 88* ALIGNMENT LIMITS:0D59,0CF5 ALIGNMENT U: OD15 *PASS* ALIGNMENT V: OD16 *PASS* CHECKSUM ROM: AB7D AB7D *PASS* CHECKSUM FAC:04F4 04F4 *PASS* CHECKSUM ENG:082A 082A *PASS* CHECKSUM CAL: A9C1 A9C1 *PASS*
Hardware Configuration	D10	Serial Number: Y16120001 Software Version: 2368-110-01 Class: WINDSONIC (Gill Instruments Ltd) Number of axes on this unit: 2 Axes tilted 45deg to horizontal plane Analogue outputs: 2 (12bit) Analogue output modes: 0-5V 4-20mA 0-20mA Maximum output rate: 004Hz Maximum base rate on this unit is 16Hz sampling Available baud rates: 002400 004800 009600 019200 038400 Available messages: M1 M2 M3 M4 M5 M12 M14 M15 M16 Safe mode enabled Parity control allowed: F1 F2 F3 Communication modes: RS-232 RS-485/422

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Appendix L. Option 1-3 Polled Mode Commands

Gill format – Polled (Polar or UV)

When in the Polled mode, an output is only generated when the host system sends a Poll signal to the WindSonic consisting of the WindSonic Unit Identifier – that is, the relevant letter A – Z.

The output formats are otherwise as described earlier in this section.

The commands available in this mode are:

Description	Command	WindSonic response
WindSonic Unit Identifier	A ….. Z	Wind speed output generated
Enable Polled mode	?	(None)
Disable Polled mode	!	(None)
Request WindSonic Unit Identifier	? &	A ….. Z (as configured)
Enter Configuration mode	*<N>	CONFIGURATION MODE

Where <N> is the unit identifier, it is recommended that ID's A to F and KMNP are not used as these characters can be present in the data string.

Notes: -
It is suggested that in polled mode the following sequence is used for every poll for information.
? Ensures that the Sensor is enabled to cover the event that a power down has occurred.
A-Z Appropriate unit designator sent to retrieve a line of data.
! Sent to disable poll mode and reduce possibility of erroneous poll generation.
When in polled mode the system will respond to the data command within 130mS with the last valid data sample as calculated by the Output rate (P Mode Setting).

If the unit is powered down after use or upon switch on, then allow 5 seconds from switch on before sending poll commands.

Polled mode can only be used for point-to-point communications. It is not possible to network units on a common bus

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Appendix M. WindView Software

Gill WindView software allows for simple configuration of the WindSonic Option 1 - 3, as well as display and logging of output, and is available to download, free of charge from the Gill Instruments Limited website gillinstruments.com/software. The User Manual for WindView can also be downloaded from here.

Appendix N. WindSet Software

The Gill WindSet application provides the user with a simple interface to configure the Modbus WindSonic Option 5. The application installer, and user manual can be downloaded from the Gill Instruments Limited website gillinstruments.com/software.

Using WindSet to set up WindSonic Option 5

WindSet can be used to change the set-up as required. WindSet can be used to:

- Change the Modbus communications set-up
- Configure the user-defined strings

Run the application, and follow the instructions to connect to the target device.

Using WindSet to change the communications protocol

The COMMUNICATIONS screen can be used to select the protocol parameters used by the Option 5 WindSonic. To configure the protocol parameters:

1. Select the Slave address of the WindSonic. This address must be used by the master Modbus device to address this unit.
2. Set the serial baud rate (to be the same as the master Modbus controller is using).
3. The stop bits and parity (to be the same as the master Modbus controller is using).

Using WindSet to change User Defined Strings

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

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.

Each User Defined String can contain up to 16 characters.

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Appendix O. Status Codes

Option 1-3 and WindSonic Metal Status Codes

The Status code is sent as part of each wind measurement message.

Code	Status	Condition
00	**OK**	**Sufficient samples in average period**
01	Axis 1 failed	Insufficient samples in average period on U axis
02	Axis 2 failed	Insufficient samples in average period on V axis
04	Axis 1 and 2 failed	Insufficient samples in average period on both axes
08	NVM error	NVM checksum failed
09	ROM error	ROM checksum failed
A	-	NMEA data Acceptable
V	-	NMEA data Void

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SDI-12 Status Codes

Code	Status	Condition
00	**OK**	**Sufficient samples in average period**
01	Axis 1 failed	Insufficient samples in average period on U axis
02	Axis 2 failed	Insufficient samples in average period on V axis
04	Axis 1 and 2 failed	Insufficient samples in average period on both axes
08	NVM error	NVM checksum failed
09	ROM error	ROM checksum failed
51	Measurement average building	Will be output up to 68 seconds after power up whilst initialisation and 1 minute averaging calculations take place when in High Power mode.
A	-	NMEA data acceptable
V	-	NMEA data void

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Appendix P. Maintenance & Fault-Finding

Cleaning

If there is any build-up of deposit on the unit, it should be gently cleaned with a cloth moistened with soft detergent. Solvents should not be used, and care should be taken to avoid scratching any surfaces. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to remove ice or snow with a tool.

Do NOT remove black "rubber" transducer caps.

Servicing

There are no moving parts or user-serviceable parts requiring routine maintenance.
Opening the unit or breaking the security seal will void the warranty and the calibration.
In the event of failure, prior to returning the unit to your authorised Gill distributor, it is recommended that:

1. All cables and connectors are checked for continuity, bad contacts, corrosion etc.
2. A bench test is carried out as described in Bench Test on page 89.
3. You contact your supplier for advice

Fault Finding

Code	Solutions
No output	Check DC power to WindSonic, cable and connections. Check comms settings of WindSonic and host system match, including correct Com port Check unit is in Continuous mode Check that in-line communication devices are wired correctly. NOTE: It is usual for Anemometer TX + to be connected to converter device RX +
Corrupted output	Check comms settings of WindSonic and host system match. Try a slower baud rate. Check cable lengths and type of cable.
One way communication	Check WindSonic and host system are both set to the same protocol RS-232, RS-422, or RS-485. Check wiring is in accordance with the manual.
Failed / Incorrect WindSonic output, data invalid flag	Check that transducer path is not blocked

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Returning Unit

If the unit has to be returned, it should be carefully packed in the original packaging and returned to your authorised Gill distributor, with a full description of the fault condition.

Bench Test

1. Couple the WindSonic to the host system and power supply, using a known working test cable.
2. Check that the unit is correctly configured by going into Configuration mode and using D3.
3. Check for normal output data, and that the Status Code is OK – 00 (or A for NMEA format).
4. If the status code is other than 00 or A, refer to Appendix O. Status Codes.
5. Use an office fan or similar to check that the unit is sensing wind, turning the unit to simulate changing wind direction and to check that both axes are functioning.

Note that this is a quick functional test. There are no calibration adjustments; the unit is designed NOT to require re-calibration within its lifetime.

Self – Test (Still Air) (Option 1-3 only)

This test checks Alignment and Checksums.
Alignment tests: The unit performs a transducer geometry check and compares the result with its factory setting.
Checksum tests: The unit performs a check of its program and data memory.

This test is a stringent laboratory test, which will only be passed if carried out under still air conditions at room temperature (17-23˚C).

1. Use the original packing box (inner and outer) to enclose the unit. (The packaging is designed as a zero-wind enclosure).
2. Go into Configuration Mode ***** <**ENTER**>
3. Carry out the Self-test by entering **D6 <ENTER>**
   A message similar to that shown below will be generated:
   ALIGNMENT LIMITS:0D59,0CF5
   ALIGNMENT U: OD15 *PASS*
   ALIGNMENT V: OD16 *PASS*
   CHECKSUM ROM: AB7D AB7D *PASS*
   CHECKSUM FAC:04F4 04F4 *PASS*
   CHECKSUM ENG:082A 082A *PASS*
   CHECKSUM CAL: A9C1 A9C1 *PASS*

   For each of the Alignment tests a Pass or Refer to Manual message is generated.
   For each of the Checksum tests a Pass or Fail message is generated.
4. If any of the tests fail, contact your supplier.

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Note that the test will only pass if the specified temperature and zero wind conditions are met.
Check that there are no visible obstructions or damage to the unit before contacting Gill or your authorised distributor for further advice.

Heater tests (if applicable)

1. Connect the WindSonic M Heater wires to a 24v dc power supply.
2. Switch on the heater Power Supply and observe that heater current is drawn and is greater than 2.5 amps.
3. Heating current will be taken for approximately 60 seconds, check that the underneath of the top reflector plate has warmed up and the top of the transducer mounting assembly has warmed up.

Calibration

A Custom calibration is available from Gill Instruments. This must be specified at the time of order, or the unit must be returned to Gill Instruments for retrospective calibration.

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Appendix Q. Glossary & Abbreviations

Item	Meaning
CAL	Calibration
CR	Carriage Return
CSV	Comma Separated Variable
ENG	Engineering
FAC	Factory
KPH	Kilometres per Hour
LF	Line Feed
MPH	Miles per Hour
NMEA 0183 (version 3)	National Marine Electronics Association standard for interfacing marine electronic navigational devices
NVM	Non-Volatile Memory
PC	IBM compatible Personal Computer
ROM	Read Only Memory
RS-232	Communications standard
RS-422	Communications standard
RS-485	Communications standard
RXD	Received Data
TXD	Transmitted Data
SDI-12	Serial – Data Interface standard for microprocessor-based sensors
WMO	World Meteorological Organisation

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