



Ultrasonic Wind Gauge

User's Manual



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1. Introduction

Ultrasonic Wind Gauge (referred to as USWG in this text) is a one-axis ultrasonic anemometer. The instruments measure the transit time of the ultrasonic pulse between a pair of opposite ultrasonic transducers, in both directions. From the measurements of t_F and t_B , the wind velocity component in the direction of the two transducers can be calculated by the following equation:

$$V = D/2 \cdot (1/t_F - 1/t_B)$$

where:

D = distance between the two transducers

t_F = forward transit time

t_B = backward transit time

The main features of USWG are:

- Highly accurate and reliable wind velocity measurement
- LCD display of average wind velocity
- Continuous wind velocity reading
- Two communication interfaces: "REMOTE" and "INPUT/OUTPUT"
- Automatic interface to FinishLynx photo-finish system
- Remote starting option via cable
- Powered by 4 x AA size batteries or optional AC adaptor
- Automatic shut off for power saving
- Track and field sport wind velocity measurement



2. Overview of the Ultrasonic Wind Gauge

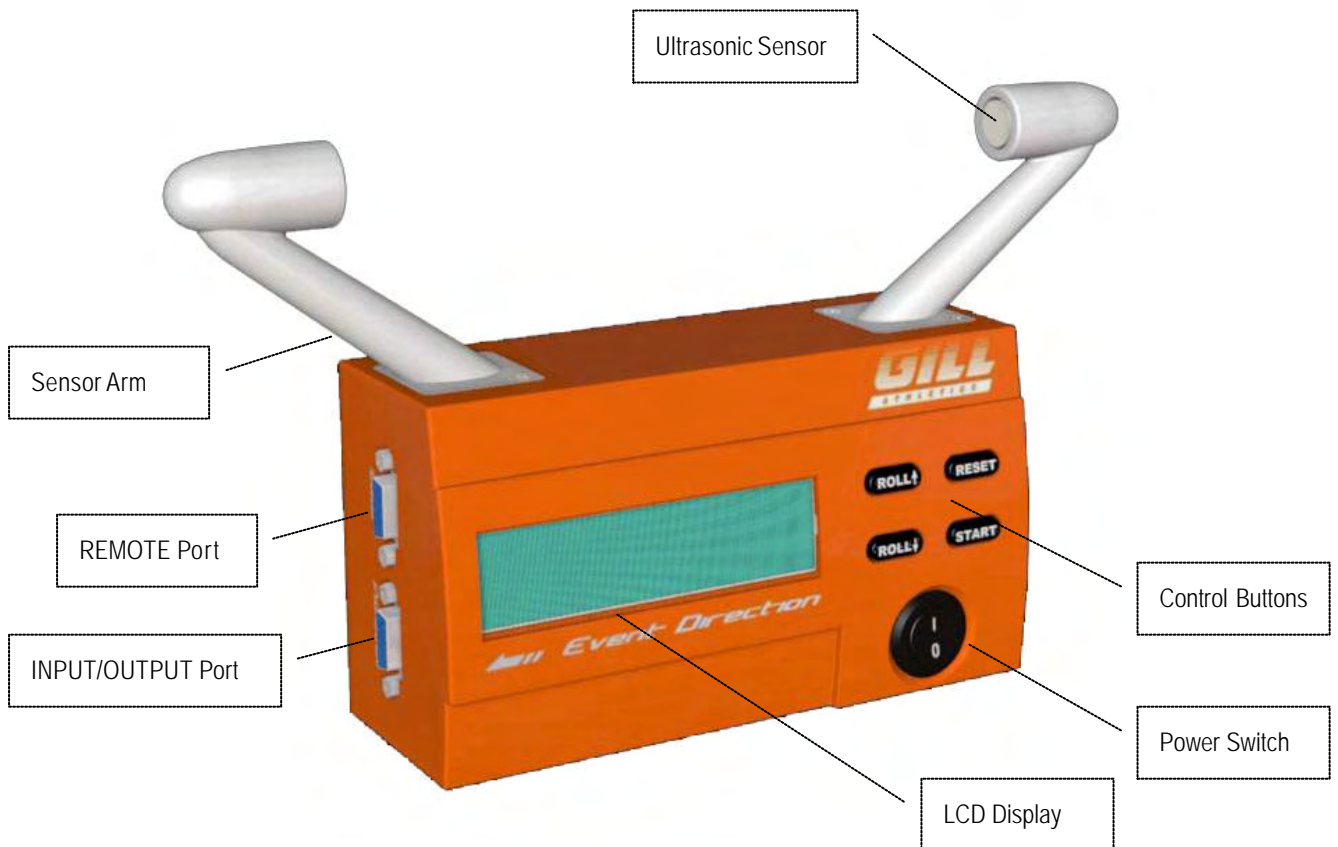


Figure 1. Overview of Ultrasonic Wind Gauge



3. Specifications

PARAMETER	SPECIFICATION
Measurement Range	0.01 m/s - 20.00 m/s
Measurement Resolution	0.01 m/s
Wind velocity Reading	Rounded in accordance with IAAF Rule 163.10
Communication Interfaces	“Remote” port: RS232 “Input/Output” port : RS485
Communication Protocol	9600 Baud, 7 data bits, even parity, 1 stop bit
Connecter Type	9 pin D type female
Battery	4 x AA cells (rechargeable, alkaline or zinc carbon)
Battery Life	Approximately 60 hours continuous operating use with alkaline cells ⁽¹⁾
Automatic Power Off	1. When idle for 2 hours 2. When dead battery
AC adapter	Input: 110/120V AC or 220/240V AC (Optional) Output: 9V DC, 500mA
Dimensions	285 x 158 x 72 mm
Weight	0.66 Kg

Table 1. Specification of Ultrasonic Wind Gauge

⁽¹⁾Note that battery life may vary under different applications with different type of batteries.



4. Power

1. Four size AA batteries (rechargeable, alkaline or zinc carbon) are required.
2. Specified linear regulated AC adaptor (DC 9 volt, 500mA) provides an optional power source in addition to batteries.
3. Mixed use of batteries of different chemical type is strictly prohibited.
4. USWG will shut off automatically if the system idles for over 2 hours. It is suggested that user check up the system status after a long time duration of no operation. If the system has been shut off, users have to turn off the power switch to reset the system before turn it on again.
5. A message of “Battery Low !” will be displayed on the LCD panel when the battery power is low. It is recommended to replace the batteries or use AC adaptor if the “Battery Low !” message is displayed.
6. When the battery power is too low, USWG will shut off automatically to prevent from over-discharge of the batteries.
7. **The batteries should be removed before the gauge been put into storage.**

5. Handling & Cautions

1. Sensor protection caps must be removed before use. When the system is not in use, the sensor protection caps must be replaced.
2. USWG is a precision instrument. Do not touch or hammer or strike the two arms of the instrument.
3. Carefully hold the body instead of the arms when handling the unit.
4. Do not use in raining or thunder-striking environment.

6. Communication Interfaces

USWG has two communication ports for automatic interaction with other devices through direct connection. The two receptacles on the left side panel labeled “REMOTE” and “INPUT/OUTPUT” provide the physical connection.

6.1 REMOTE port

A remote device connected to this port will receive wind velocity data automatically at the end of each wind velocity measurement. The device must be RS232 compatible and be programmed to receive the formatted data streams.



6.2 INPUT/OUTPUT port

A remote device connected to this port may both receive and send information to and from the wind gauge via serial communication. The USWG may be started, the time interval for wind velocity measurement may be set or reset, and the most recent wind gauge measurement may be requested by the communicating device.

6.3 Interface Connection

USWG communicates with a computer via the serial communication port labeled INPUT/OUTPUT on the left side panel of the gauge. This serial communication port has RS485 line drivers for long distance communication (up to 450 m).

Computer interface connection instructions:

1. Plug the serial communication cable (9 pin D-Subminiature, male connector) into the INPUT/OUTPUT connector on the left side of the gauge.
2. The cable and connector pin connections for **short distance communication** ($L < 12$ m) are as follows:

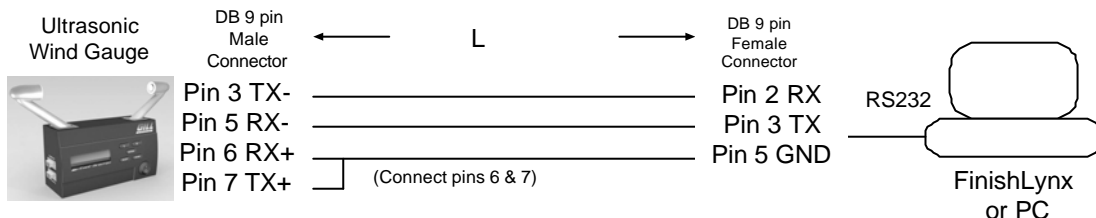


Figure 2. Short distance communication connection

3. **Long distance communication** ($L > 12$ m) requires an RS232 to RS485 converter to boost the computer or FinishLynx signal. The cable and connector pin connections are as follows:

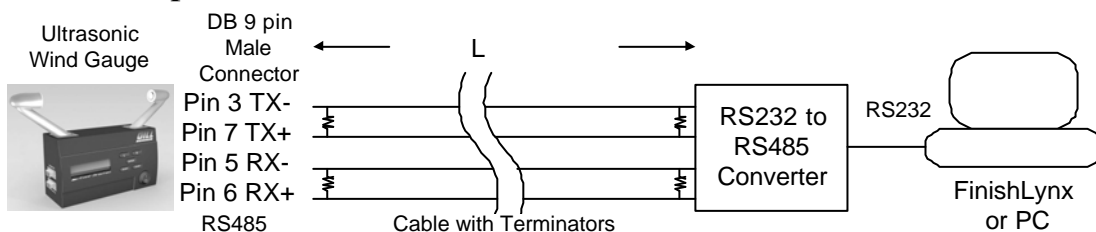


Figure 3. Long distance communication connection

4. Configure the computer for transmission as follows: **Baud Rate = 9600;**
Data Bits=7; Parity=Even; Stop Bits=1.



7. Operation Modes

USWG can be operated manually or automatically via a remote computer. Two operation modes are defined:

1. Auto Control Mode: a remote computer controls the wind velocity measurement through RS485 serial communication interface.
2. Local Control Mode: users operate the wind velocity measurement by using the four control buttons on the front panel or the remote starting cable.

7.1 Auto Control Mode

For Auto Control mode, a remote computer with FinishLynx software controls the wind velocity measurement through RS485 serial communication interface. While the gauge goes into Auto Control mode, an “auto” string followed by the measure interval will be displayed on LCD panel. At this moment, the four control buttons on front panel and the remote start button won't respond until the Auto Control mode exits.

The priority of Auto Control mode command is higher than Local Control mode operation. Once the two operations conflict, the Auto Control mode command will be executed. Nevertheless, mixing use of Local Control operation with Auto Control operation is prohibited.

7.1.1 Command format for Auto Control

```
<0x01><0x13>CW<opcode><0x02><data><0x04>  
<opcode> = R | S | I | O  
<data> = <digit><digit>  
<digit> = 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
```

Opcode :

R – Reset.

<data> = nothing, send '00'

S – Start. Begin taking a wind reading.

<data> = nothing, send '00'

I – Interval. Set the length of the next reading.

<data> = number of seconds

O – Output. Send the most recent reading.

<data> = nothing, send '00'



7.1.2 Data format for Auto Control

```

<0x01><0x13>GW<0x02><0x10>0013<reading><0x04>
<reading> = <sign><digit><digit>.<digit><digit>
<sign>    = +|-
<digit>   = 0|1|2|3|4|5|6|7|8|9
  
```

7.2 Local Control Mode

The default operation mode when powered on is Local Control mode. In Local Control mode, users may change the event setting by pressing ROLL⁻ and ROLL- buttons, and start/reset the wind velocity measurement by pressing the START and RESET buttons. Users also can control the start/reset action in Local Control mode by pressing the remote start button if the remote starting cable is attached to the “REMOTE” port. The last event setting of Local Control mode will be stored in the EEPROM memory of the gauge, and will be recalled when next time powered on.

The function definitions of the control buttons is listed in Table 2. The configuration of LCD display for Local Control mode is depicted in Figure 4. Table 3 lists all events for Local Control mode, in which the 8th event, “last result”, is used for recall the most recent wind velocity measurement reading. The time duration of wind velocity measurement for various event is listed in Table 4. For a detail operation of wind velocity measurement under various event, please refer to Appendix A and B.

Button caption	Function description when pressed
ROLL ⁻	Select next event item
ROLL-	Select previous event item
START	Start countdown timer to take a wind velocity measurement
RESET	Reset countdown timer to prepare for measurement

Table 2. Button function definitions for Local Control mode

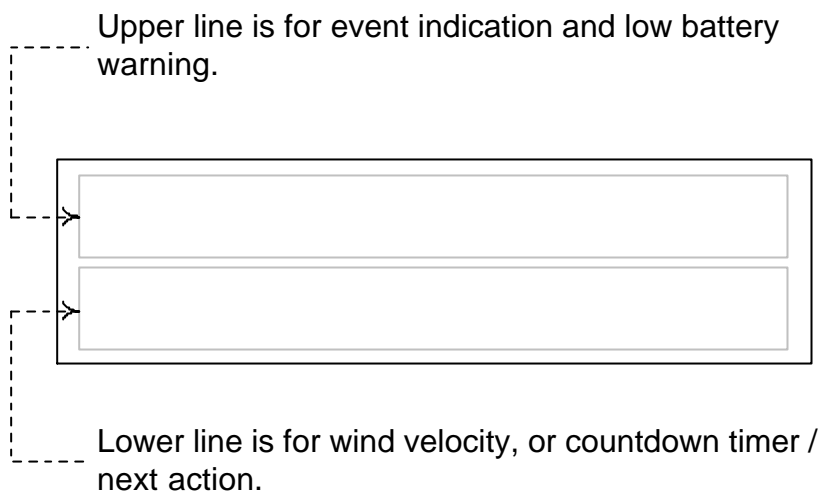


Figure 4. LCD display configuration for Local Control mode

No.	Event Menu
1	1> 100m
2	2> 200m
3	3> 100m hurdles
4	4> 110m hurdles
5	5> long jump
6	6> triple jump
7	7> continuous
8	8> last result

Table 3. Event list for Local Control mode

Event	Interval
100m	10 sec
200m	10 sec
100m hurdles	13 sec
110m hurdles	13 sec
long jump	5 sec
triple jump	5 sec
continuous	1 sec

Table 4. Time duration of wind velocity measurement for various event



Appendix A. Example of measurement for “100m hurdles” event

Step	Operation	LCD Display	Description
1	Press power switch “ 1 ” to turn on the unit	GILL ATHLETICS US Wind Gauge	Display product information for 3 seconds
2		1> 100m START or ROLL ?	Display last event setting, ready for operation
3	Press ROLL - or ROLL - button to set event as “100m hurdles”	3> 100m hurdles START or ROLL ?	Select event setting as “100m hurdles ”
4	Press START button	3> 100m hurdles 13 sec or RESET ?	The timer starts to count down from 13 seconds to zero
5-a	If necessary, press RESET button before timer count down to zero to stop measurement	3> 100m hurdles START or ROLL ?	The countdown timer is reset and the measurement is aborted
5-b		3> 100m hurdles +01.50 m/sec	Measured wind velocity will be displayed at the end of countdown
6-a or	Press RESET button	3> 100m hurdles START or ROLL ?	Prepare for next wind velocity measurement
6-b or	Press START button	3> 100m hurdles 13 sec or RESET ?	Start another wind velocity measurement
6-c	Press ROLL - or ROLL - button to change event setting		
7	If necessary, press ROLL - or ROLL - button to event 8 to recall last wind velocity reading	8> last result +01.50 m/sec	The most recent wind velocity measurement will be displayed

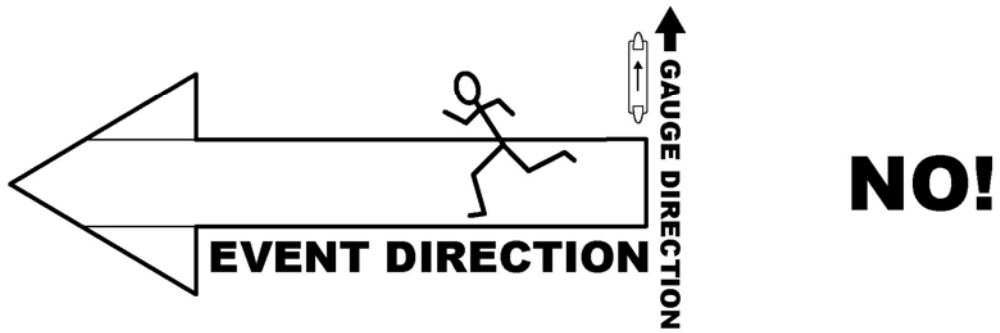
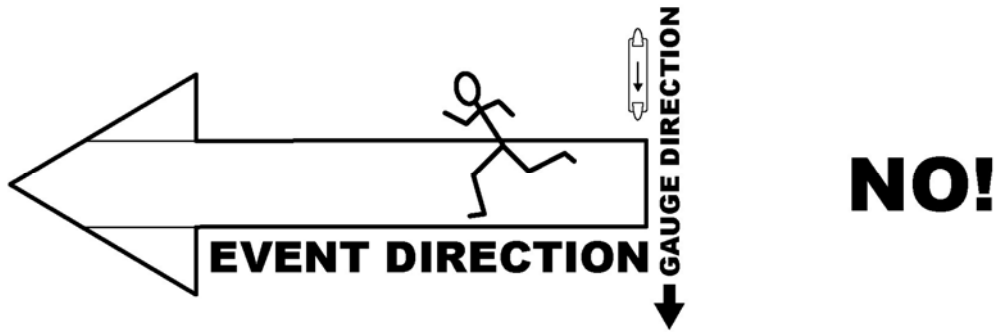


Appendix B. Example of measurement for “continuous” event

Step	Operation	LCD Display	Description
1	Press power switch “ 1 “ to turn on the unit	GILL ATHLETICS US Wind Gauge	Display product information for 3 seconds
2		1> 100m START or ROLL ?	Display last event setting, ready for operation
3	Press ROLL - or ROLL - button to set event as “continuous”	7> continuous START or ROLL ?	Select event setting as “continuous”
4-a	Press START button	7> continuous 1 sec or RESET	Starts wind velocity measurement
4-b		7> continuous * 1 sec or RESET	A flashing * mark indicates measurement is going on
4-c		7> continuous * +01.50 m/sec	Wind velocity is displayed and updated for every second
5-a or	Press RESET button	7> continuous START or ROLL ?	Stop wind velocity measurement
5-b	Press ROLL - or ROLL - button to change event setting		Stop wind velocity measurement, select event setting
6	If necessary, press ROLL - or ROLL - button to event 8 to recall last wind velocity reading	8> last result +01.50 m/sec	The most recent wind velocity measurement will be displayed



Appendix C. Setup Diagrams For Proper Device Placement



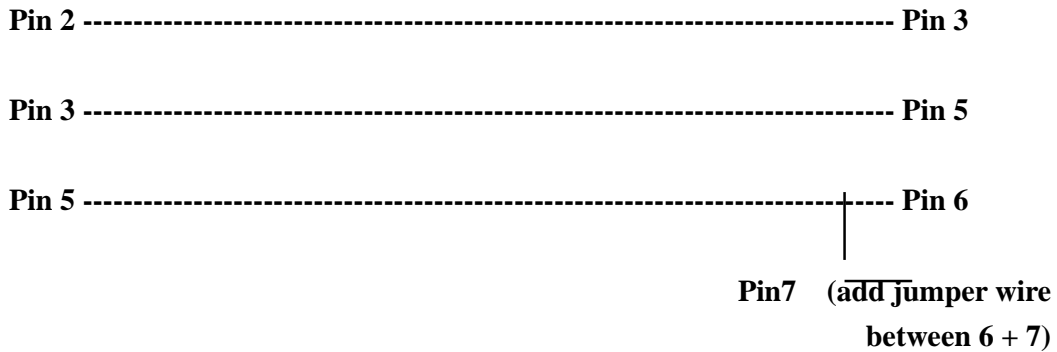


Appendix D. Lynx connection and Contact Information

Gill Wind Gauge Cable

Computer End
DB9 Female
DB9 Male

Wind Gauge End



Lynx System Developers, Inc.

179 Ward Hill Ave
Haverhill, MA 01835
(tel)978-556-9780
(fax)978-556-9781
www.finishlynx.com



Appendix E. Troubleshooting

Check internal connections.



If your wind gauge suddenly stops working, take off the back panel and check to see that the connections haven't come loose. If they have, simply put them back on and replace the back panel.