



METEOROLOGICAL INSTRUMENTS

INSTRUCTIONS

ResponseONE

MODEL 91500

**ULTRASONIC ANEMOMETER
w / INTERNAL COMPASS**



OPERATING INSTRUCTIONS

Model 91500 *ResponseONE* Ultrasonic Anemometer

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MODEL 91500
ResponseONE
ULTRASONIC ANEMOMETER



1.0 INTRODUCTION

The Model 91500 *ResponseONE*[™] Ultrasonic Anemometer is a 2-axis, no-moving parts wind sensor equipped with an internal compass. It is ideal for general meteorological applications requiring accurate and reliable measurement.

The sensor features wide operating range, compact size, easy installation, low power operation and durable corrosion-resistant construction throughout. The internal compass provides wind direction orientation and is suitable for mobile and portable applications.

The sensor features durable corrosion-resistant construction throughout. An internal compass provides wind direction orientation when needed.

The *ResponseONE* installs on readily-available 1 inch (IPS) pipe. Wiring connections are made in a convenient, weather-proof junction box; special connectors and custom cables are not needed.

Measured data is output in a serial format. NMEA, SDI-12, RMYT, and ASCII protocols are available to suit many applications. Continuous serial output or polled operation may be used.

RS-232 or RS-485 serial format options allows direct connection to YOUNG displays, marine NMEA systems, data loggers, or other compatible serial devices.

Operating parameters are easily reviewed and changed using the *ResponseONE CONFIG* program available for download at www.youngusa.com. All settings are stored internally in non-volatile memory.

2.0 SPECIFICATIONS

WIND SPEED

Range: 0 - 70 m/s (156 mph)
 Resolution: 0.01 m/s
 Accuracy: 0 - 30 m/s ±2% or 0.3 m/s
 30 - 70 m/s ±3%
 Response Time: <0.25 seconds

WIND DIRECTION

Azimuth Range: 0 - 360 degrees
 Resolution: 0.1 degree
 Accuracy: ± 2 degrees
 Response Time: <0.25 seconds

COMPASS

Range: 0 - 360 degrees
 Resolution: 0.1 degrees
 Accuracy: ± 2 degrees

SERIAL OUTPUT (Selectable)

Interface Type: RS-232 or RS-485/422, SDI-12
 Formats: ASCII Text - polled or continuous
 NMEA - continuous
 SDI-12 - polled
 RMYT - continuous
 Baud Rates: 1200, 4800, 9600, 19200 and 38400

GENERAL

Output rate: 0.1 to 10 Hz
 Power Supply: 10 - 30 VDC,
 7 mA typical, 80 mA max
 Protection Class: IP66
 EMC Compliance: FCC Class A digital device
 IEC standard 61326-1
 Dimensions: 23 cm high x 13.5 cm wide
 Weight: 0.5 kg (1.1 lb)
 Shipping Weight: 1.4 kg (3.1 lb)
 Operating Temperature: -40 - +60°C

3.0 BEFORE INSTALLATION

3.0 UNPACKING THE *ResponseONE*

The *ResponseONE* comes in a custom shipping carton. Carefully inspect the instrument when first unpacking and report any visible damage to your YOUNG supplier. Be sure to retain the bird spikes and orientation ring for use.

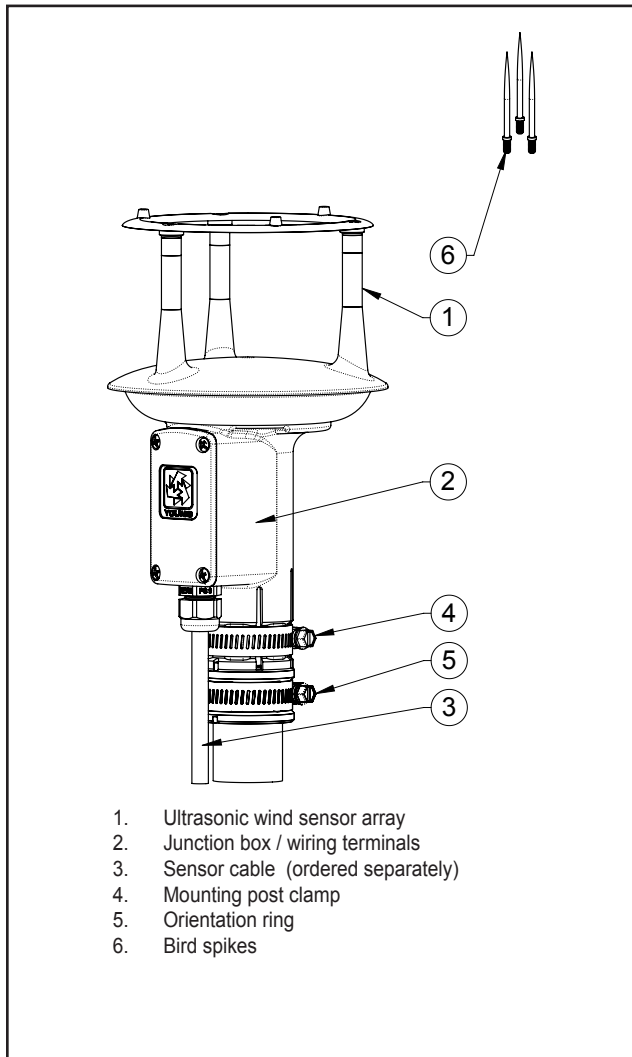


Figure 3.0 *ResponseONE* Features

The *ResponseONE* arrives fully calibrated and ready to use. As supplied, the sensor is configured as follows:

FACTORY DEFAULT CONFIGURATION

| | |
|--------------|-------------------------------------|
| Protocol: | RS-232 ASCII / RS-485 (Output Only) |
| Baud Rate: | 9600 |
| Wind Format: | Polar |
| Wind Units: | m/s, Degrees azimuth |

Default connections are shown in APPENDIX A, FIGURE A1. Other options are also described in APPENDIX A. These are accomplished using the *ResponseONE CONFIG* program which is available at www.youngusa.com. **Note: Always connect and bench test a complex system before installation in the field.**

4.0 INSTALLATION

4.1 PLACEMENT

Proper instrument placement is important. Eddies from buildings, trees, or other structures can influence measurements. Locate the sensor well away from obstructions. As a general rule, air flow around a structure is disturbed to 10 times the height of the structure downwind and 1-1/2 times the height of the structure above the roof.

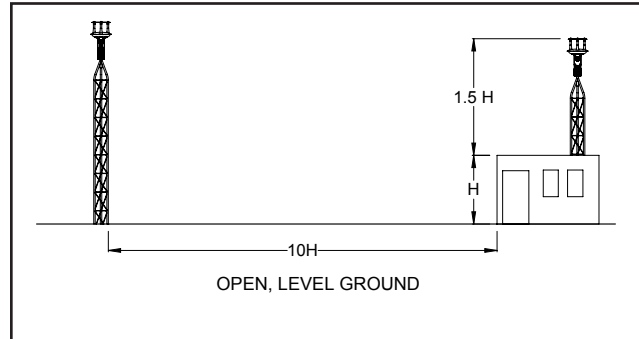


Fig 4.1 Wind Siting Considerations

4.2 MOUNTING AND ALIGNMENT

The *ResponseONE* mounts on standard 1-inch (IPS) pipe. This is commonly available steel pipe with an outside diameter of 1.34 inches (34 mm). The mounting pipe should be installed securely in a vertical orientation.

Most applications require aligning the wind sensor array to geographic north (0 degrees). In this orientation the junction box faces SOUTH (180 degrees). See the diagram in APPENDIX B for details. Two methods are suggested below

4.2.1 ORIENTATION USING BUILT-IN ELECTRONIC COMPASS.

Place *ResponseONE* sensor on mounting pipe, fully seating it on the pipe and allowing for free rotation of the sensor. Connect cable as indicated in APPENDIX A and apply power to the system. Rotate the sensor 1-1/4 rotations (CW or CCW). With junction box cover removed, locate and press and hold the "calibrate" button for 3 seconds; the indicator light will blink rapidly to indicate that calibration mode is active (See Fig 4.2.1). Slowly rotate the sensor in the opposite direction for 1-1/4 rotations (this will also serve to unwind the cable around the mounting pipe). After completing the rotations, press and hold the "calibrate" button again for 3 seconds; the indicator will double blink. Tighten the mounting post band clamp to secure the sensor. **DO NOT OVER-TIGHTEN.** The *ResponseONE* will output correct wind direction data; the indicator will blink once per second.

To disable the compass, press and hold the button for one second. The indicator light will no longer blink.

Important: Be sure to allow for magnetic declination in your measurement. A declination value can be entered using the *ResponseONE CONFIG* program or it can be compensated in the data-logger program. Please note that declination may change if the sensor is moved to a new location.

<http://www.ngdc.noaa.gov/geomag-web/#declination>

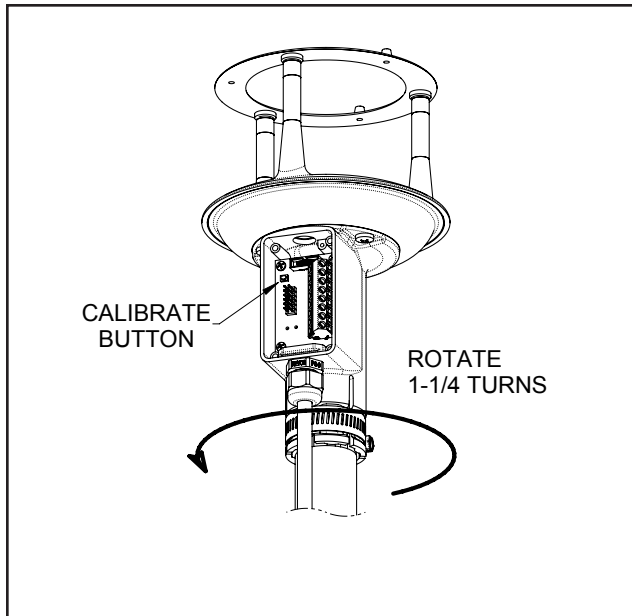


Fig 4.2.1 Orientation of Wind Sensor Using Electronic Compass

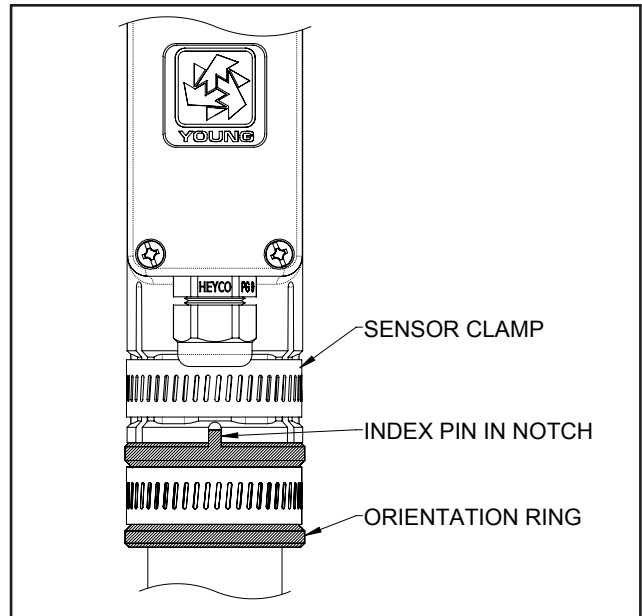


Fig 4.2.3 Proper Engagement of Orientation Ring with Sensor

4.2.2 ORIENTATION USING KNOWN GEOGRAPHIC DATA

Obtain accurate geographic data for the installation site, this can be a topographic map, graphical GPS map or detailed road map.

- 1 Place orientation ring over pipe with guide pin up.
- 2 Place sensor mounting post over pipe.
- 3 Using the transducers as a sighting aid, align the sensor with a remote feature that represents the proper orientation (Fig 4.2.2). After alignment, tighten the mounting post band clamp to secure the position. **DO NOT OVER-TIGHTEN.**
- 4 Slide the orientation ring up so its guide pin is fully engaged in the sensor mounting post notch (Fig 4.2.3). Tighten the orientation ring band clamp to secure its position. **DO NOT OVER- TIGHTEN.**

If the *ResponseONE* is later removed, the orientation ring will preserve the sensor alignment.

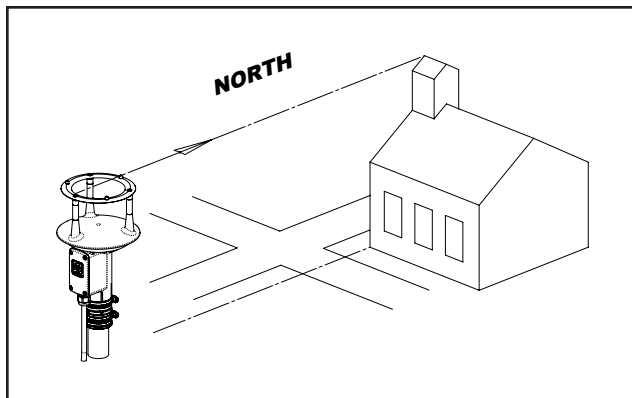


Fig 4.2.2 Sighting of Wind Sensor using Geographic Feature

4.3 WIRING CONNECTIONS

The *ResponseONE* is supplied with RS-232, RS-485 and SDI-12 signal capability. Please select the signal type desired and refer to the appropriate WIRING CONNECTIONS diagram in APPENDIX A for connecting the *ResponseONE* to your serial device. Please note, the *ResponseONE* is not equipped with analog outputs.

5.0 OPERATION

5.1 SERIAL OUTPUT FORMATS

The *ResponseONE* comes standard with the following serial output formats:

| Format/Protocol | Wiring Format |
|-----------------------------|----------------|
| ASCII Polled and Continuous | RS-232, RS-485 |
| NMEA 0183 v3.0 Automatic | RS-232, RS-485 |
| SDI-12 Polled | SDI-12 |
| RMYT | RS-485 |

Detailed information about each protocol is in the following section.

If you wish to change settings from the factory default values shown in Section 3, this is easily done using the *ResponseONE CONFIG* program described in Section 6.0.

5.1.1 ASCII

ASCII output format provides continuous measurement data in text format at any of the available baud rates.

The wind measurement in ASCII output appears either in POLAR (default) or CARTESIAN UV format. With POLAR format, the wind speed threshold and wind speed units are user-selectable. With CARTESIAN the wind threshold is ignored and wind speed units are always meters per second (m/s).

ASCII POLAR FORMAT

```
a www.wv ddd.d ss*cc<CR>
```

where:

a = Sensor address
www.wv = Wind speed
ddd.d = Wind direction
ss = Status code
* = Asterisk (ASCII 42)
cc = Checksum
<CR> = Carriage return (ASCII 13)

ASCII CARTESIAN (UV) FORMAT

```
a uu.uu vv.vv ss*cc<CR>
```

where:

a = Sensor address
±uu.uu = U-axis wind speed (m/s)
±vv.vv = V-axis wind speed (m/s)
ss = Status code
* = Asterisk (ASCII 42)
cc = Checksum
<CR> = Carriage return (ASCII 13)

CHECKSUM is a two-character hexadecimal value (in printable ASCII format) generated by taking the exclusive-or of all characters up to the asterisk. STATUS CODE shows a non-zero value when the sensor cannot acquire sufficient samples or a measurement error has occurred. See APPENDIX C for more information on status codes.

5.1.2 ASCII POLLED

ASCII POLLED is like ASCII format described above except just one serial output string is sent for each polling command received. The polling command is `Ma!` where 'a' is the sensor address (valid characters: 0-9, A-Z, a-z). The default address is '0' (ASCII 48).

5.1.3 RMYT

RMYT is a 6-byte binary data format sent at 9600 baud using RS-485 OUTPUT ONLY mode. It is for use with the YOUNG Model 06201 Wind Tracker.

5.1.4 NMEA

NMEA format provides continuous measurements in standard NMEA marine sentences at 4800 baud. The *ResponseONE* must be connected to a NMEA-capable device. Specific details of the NMEA data string are below:

NMEA FORMAT

```
$WIMWV,ddd,R,www.w,u,A*cc<CR><LF>
```

where:

WI = Device type (weather instrument)
MWV = Wind direction and speed
ddd = Wind direction (degrees)
www.w = Wind speed
u = Wind speed units
S = mph
N = knots
K = kmph
M = m/s
A = Data status code: A=valid, V=invalid
* = Asterisk (ASCII 42)
cc = Checksum
<CR><LF> = Carriage return, Line feed (ASCII 13, 10)

CHECKSUM is the two-character printable hexadecimal value generated by taking the exclusive-or of all characters between '\$' and '*'.
'\$'

5.2 SDI-12

SDI-12 stands for serial data interface at 1200 baud. It is often used to interface battery powered data recorders with microprocessor based devices designed for environmental data acquisition. SDI-12 is typically used when low power usage is required. The SDI-12 device normally remains in a low power, standby state until it is polled at which time a measurement is sent. SDI-12 can effectively address multiple sensors on the same cable.

5.2.1 SDI-12 MEASUREMENT COMMANDS

Model 91000 uses the SDI-12 (v1.3) serial communication protocol to initiate measurements and set sensor operation parameters. The default sensor address is 0 (zero), and can be changed to any valid single-character value if needed. Additional details about the SDI-12 protocol may be found at www.sdi-12.org.

After initial power-up with 12 VDC, the sensor is in a low-power standby state with a quiescent current of 4.2 mA. A valid and properly addressed SDI-12 command wakes the sensor to initiate a measurement, set or check operating parameters. After command processing has finished, the sensor returns to the low-power standby state.

SDI-12 'M' or 'C' commands initiate a measurement. The sensor response message indicates the maximum time needed before the measurement is ready, and data values will be available. The maximum time ranges from 1 to 5 seconds depending on the Sample Count.

If an 'M' command initiates a measurement, the sensor sends a Service Request when the measurement is ready to be retrieved. When the polling device receives the Service Request it then sends a 'D' command to request measurement results from the sensor. With 'C' commands, no Service Request is sent, and the polling device must wait the full delay time before sending the 'D' command to request the measurement.

SDI-12 Measurement commands and responses are listed below.

| COMMAND | RESPONSE | DESCRIPTION |
|---------|---|---|
| aM! | attts<CR><LF> | Take a measurement |
| aMc! | attts<CR><LF> | Take a measurement with CRC checksum |
| aC! | atttss<CR><LF> | Take a concurrent measurement |
| aCC! | atttss<CR><LF> | Take a concurrent measurement with CRC checksum |
| aD0! | a+www.ww+ddd.d<CRC><CR><LF> (Polar) a±uu.uu±vv.vv<CRC><CR><LF> (Cartesian) | |

where:

- a = Sensor address
- ttt = Delay time (seconds)
- s/ss = Number of samples to collect
- www.ww = Wind speed (selected units)
- ddd.d = Wind direction (degrees)
- ±uu.uu = U-axis wind speed (m/s)
- ±vv.vv = V-axis wind speed (m/s)
- <CRC> = CRC checksum (only where requested)
- <CR><LF> = Carriage return, line feed (ASCII 13, 10)

Wind data format depends on the sensor Output Format parameter setting (Polar or Cartesian).

5.2.2 SDI-12 NON-MEASUREMENT COMMANDS

The SDI-12 protocol includes standard commands for identifying the sensor and changing its address.

| COMMAND | RESPONSE | DESCRIPTION |
|---------|-------------------------------------|---|
| ?! | a<CR><LF> | Address Query |
| a! | a<CR><LF> | Acknowledge Active |
| aI! | a13 YOUNG C091000 vvvnnnnnn<CR><LF> | Send Identification vvv = Firmware Version nnnnnn = Serial Number |
| aAb! | b<CR><LF> | Change Address a = Sensor address b = New sensor address |
| aV! | a0000<CR><LF> | Start Verification |

5.2.3 EXTENDED COMMANDS

The SDI-12 command set may be customized with Extended Commands to accommodate manufacturer settings and other functions. Extended Commands are listed below. Where two responses are shown, one is for a valid command, the other is for an invalid (ERR) command.

| COMMAND | RESPONSE | DESCRIPTION |
|---------|---|--|
| aXB! | aXB, OK<CR><LF> | Save parameter settings to flash. |
| aXFn! | aXF, F=n<CR><LF> | n = Output Format code. 0 or 1 (Polar or Cartesian) |
| | aXF,ERR F=0/1<CR><LF> | |
| aXPn! | Parameter report, 4 reports needed for all parameters | |
| | aXP1, F=f, UW=uw, T=t, S=s, W=w, CE=ce<CR><LF> | |
| | a = Sensor address | |
| | f = Wind Format | |
| | uw = Polar wind speed units | |
| | 1=mph | |
| | 2=knots | |
| | 3=km/h | |
| | 4=m/s | |
| | t = Threshold, polar only (0-150 cm/s) | |
| | s = Sample count, internal (1-800) | |
| | w = Wait (seconds) | |
| | ce=Compass Enable | |

aXP2, OD=od, M=m, CD=cd, PWR=v VDC<CR><LF>
od=WD Offset
m=WS Multiplier
cd=Compass Declination
v=Supply Voltage

aXPn,ERR n=1/2/3/4 ONLY<CR><LF>

aXSnnn! nnn = Sample Count (001-800 samples)
aXS, S=nnn<CR><LF>
aXS,ERR S=001-800 ONLY<CR><LF>

aXMnnnnn! nnnnn=WS multiplier x 10000 (00000 - 30000)
aXM, M=nnnnn<CR><LF>
aXM,ERR M=00000-30000 ONLY<CR><LF>

aXTnnn! nnn = Wind Speed Threshold (000 - 150 cm/s)
aXT, T=nnn<CR><LF>
aXT,ERR T=000-150 ONLY<CR><LF>

aXUWn! n = Wind Speed Units (1=mph, 2=knots, 3=kmph, 4=m/s)
aXUW, UW=n<CR><LF>
aXUW,ERR UW=1/2/3/4 ONLY<CR><LF>

aXOD±nnnn! ±nnnn = Wind Direction Offset x 10 (-3600 to 3600)
aXOD, OP=±nnnn<CR><LF>
aXOD,ERR OD=-3600 - +3600 ONLY<CR><LF>

aXCEn! n = Compass Enable (0=Disable, 1=Enable)
aXCE, CE=n<CR><LF>
aXCE,ERR CE=0/1 ONLY<CR><LF>

aXCDnddmm! nddmm = Declination (n=E/W/0, dd=DEG, mm=MIN)
aXCD, CD=nddmm<CR><LF>
aXCD,ERR CD=nddmm n=E/W/0, dd=00-90, mm=00-60 ONLY<CR><LF>

IMPORTANT! PARAMETER CHANGES MUST BE STORED IN FLASH MEMORY USING THE aXB! COMMAND OR THEY WILL REVERT TO PREVIOUSLY STORED VALUES AT POWER UP. The aXB! command may be sent after all changes have been made, or not sent at all if the changes are temporary.

SAMPLE COUNT (aXSnnn!)

This command sets the number of internal samples used to calculate the median measurement result. More internal samples consume more power while providing greater immunity to conditions like turbulent high-speed wind. Fewer samples consume less power while providing less immunity to disruptive conditions. Default setting is 100.

THRESHOLD (aXTnnn!)

Threshold sets the minimum wind speed needed before a new polar wind direction is calculated. The default value is 25 cm/s (0.25 m/s). A greater-than-zero threshold can help provide more meaningful scalar wind direction averages. The threshold for Cartesian (UV) output format is automatically zero regardless of this setting.

5.3 LOW POWER OPERATION

Average current consumption with default settings is about 7.5 mA. This configuration uses minimal power and enables all features even though they may not be used. This is suitable for many low power applications.

To reduce current consumption further, additional strategies include disabling unused outputs, using polled serial operation, increasing the output interval, and limiting the sample count to the minimum optimal number. Faster baud rates also reduce power by limiting transmit duration.

6.0 SETTING OUTPUTS AND OPERATING PARAMETERS

6.1 SENSOR CONFIGURATION WITH *ResponseONE* CONFIG PROGRAM (RECOMMENDED)

The YOUNG *ResponseONE* CONFIG program is available from the factory web site: www.youngusa.com. It provides an easy method for checking and configuring sensor operation. Install the program on a Windows 7 or higher PC and follow instructions that appear on the program screen to retrieve current sensor settings or send new settings.

6.1.1 Opening the Program

After installing the program on your PC, click the desktop icon to open the program. The following screen should appear:

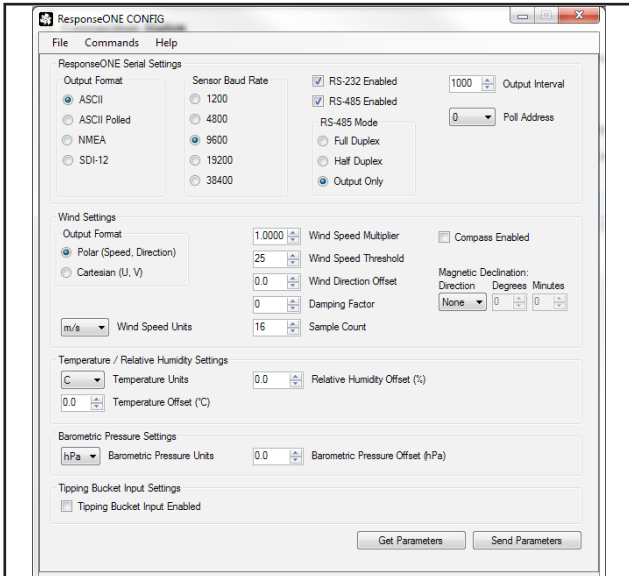


Fig 6.1 *ResponseONE* CONFIG program opening screen

If you are using the *ResponseONE* for the first time, the default settings will appear. For reference these are:

FACTORY DEFAULT CONFIGURATION

| | |
|--------------|-------------------------------------|
| Protocol: | RS-232 ASCII / RS-485 (Output Only) |
| Baud Rate: | 9600 |
| Wind Format: | Polar |
| Wind Units: | m/s, Degrees azimuth |

If these settings are correct for your application, then you may proceed with operation of the device. If you wish to change any settings, available options can be selected from menu items visible. After changes are made, the *ResponseONE* CONFIG program automatically saves the new settings in flash memory

6.2 SENSOR CONFIGURATION USING A GENERAL PURPOSE COMMUNICATIONS PROGRAM

A general purpose text-based serial communications program like **HyperTerminal** may be used to manually configure the sensor by sending simple text commands. The following guidelines apply:

The YOUNG sensor and communication program must operate at the same baud rate and be properly connected. Sensor RS-232 mode must be enabled. See the RS-232 wiring diagram, FIGURE A1, in APPENDIX A.

Factory default sensor baud rate is 9600, Configure the serial communications program for NO handshaking and 1 start, 8 data, 1 stop bit, no parity, no flow control.

The sensor must be in COMMAND MODE in order to set parameters. Enter COMMAND MODE by sending three ESC characters (ASCII 27) in quick succession while the sensor is running. When the sensor is in COMMAND MODE, it sends a '>' prompt character indicating that it is ready to accept commands.

If the prompt does not appear after sending three indicating characters, re-check wiring and communication program setup. If the sensor baud rate is unknown, try sending the ESC characters at each of the five available baud rates (1200, 4800, 9600, 19200 and 38400). It is also possible that sensor parameters have been purposely configured to disable RS-232 mode. If this is the case, the following method must be used.

In order to provide access under all conditions, the sensor always begins operation at power up with serial communications set to 38400 baud and RS-232 connections enabled. Immediately after power up, there is a short time window in which to send the ESC characters and enter COMMAND MODE.

To use this feature, set your serial communication program baud rate to 38400. Remove power then wait 5 seconds. Re-apply power to the sensor. The sensor will transmit four asterisks immediately after power up. After the asterisks appear, send three ESC characters. The COMMAND MODE '>' prompt should appear. To do this using *ResponseONE* CONFIG, connect the *ResponseONE* to your computer, open the program (make sure the correct serial port is selected), then go to the 'COMMANDS' menu and select 'ACQUIRE *ResponseONE*'.

A window will come up telling you that the serial port will be set to 38400 baud. Click 'OK' to continue. Then simply apply power to the *ResponseONE* and the program will connect automatically.

6.3 COMMAND OVERVIEW

After the '>' prompt appears, send '???' to display a list of available commands. Send 'RPTV' to report current settings. (Note that some values in the report are for factory settings and cannot be changed by the user.)

Commands are case sensitive and the exact format must be used. For example, the SET01nn command requires two digits for the serial format code. If you send SET014 instead of SET0104 the sensor will reject the command and indicate an error. End all commands with a carriage return (ASCII 13). In HyperTerminal, do this by pressing the ENTER key.

After receiving the carriage return, the sensor will evaluate the command. Valid commands will be executed. Current settings can be evaluated at any time by sending RPTV to get a new report.

IMPORTANT NOTE:

The YOUNG **ResponseONE CONFIG** program automatically saves all settings to flash memory when they are sent to the sensor. Settings that are changed manually must be saved to flash with the SET77 command.

COMMAND

DESCRIPTION

| | |
|------------|---------------------------|
| SET01nn | Set output mode |
| SET02n | Set output format |
| SET03nn | Set baud rate |
| SET04n | Set wind speed units |
| SET05a | Set sensor address |
| SET06nnn | Set wind speed threshold |
| SET07nnnnn | Set wind speed multiplier |
| SET08±nnnn | Set direction offset |
| SET09dd | Set damping factor |
| SET10nnnn | Set output interval |
| SET12nnn | Set sample count |
| SET13n | Set wind output format |
| SET25n | Turn compass on/off |
| SET26nddmm | Set compass declination |
| SET77 | Save settings |
| XX | Operate mode |
| RPTV | Report current settings |
| ?? | Display command list |
| HELP | Display command list |

6.4 COMMAND DETAILS

COMMAND

DESCRIPTION

| | |
|----------------|---|
| SET01nn | Enable RS-232 and RS-485 output modes. Default value is 12 |
| Where nn=04 | Enable RS-232 |
| 08 | Enable RS-485 output only |
| 16 | Enable RS-485 half duplex |
| 24 | Enable RS-485 full duplex |
| Usage example: | |
| >SET0104 | Enables RS-232 only. |
| SET02n | Set the serial output format. Default value is 2. |
| Where n= 1 | RMYT |
| 2 | ASCII |
| 3 | ASCII POLLED |
| 4 | NMEA |
| 5 | SDI-12 |
| Usage example: | |
| >SET022 | Sets output to ASCII continuous. Note: If SDI-12 is selected, save settings (SET77) then power must be cycled off, then on again to operate properly. SDI-12 automatically sets baud rate to 1200 and disables RS-232 and RS-485. |

SET03nn Set the baud rate for RS-232/RS-485 serial communication. Default value is 96. Note: Baud rate must be the same as connected device.

| | |
|-------------|------------|
| Where nn=12 | 1200 baud |
| 48 | 4800 baud |
| 96 | 9600 baud |
| 19 | 19200 baud |
| 38 | 38400 baud |

Usage example:
>SET0338 Sets baud rate to 38400.

SET04n Set wind speed units (ASCII, ASCII POLLED, NMEA and SDI-12). Default value is 4.

| | |
|------------|-------|
| Where n= 1 | mph |
| 2 | knots |
| 3 | mph |
| 4 | m/s |

Usage example:
>SET044 Sets wind speed to m/s.

SET05a Set sensor address for ASCII POLLED and SDI-12. Note: This is the address when polling with the "aM!" command (SDI-12) and 'Ma!' command (ASCII Polled) where 'a' is the address. Default value is 0.

Where a= 0-9, A-Z, or a-z
Usage example:
>SET052 Sets polling address to number 2.

SET06nnn Set the wind speed threshold. Minimizes erratic wind direction indications at very low wind speeds. In polar mode, this allows the sensor output to mimic a mechanical wind vane that retains its orientation when there is no wind. Default value is 25.

Where nnn= 000-150 cm/s
Usage example:
>SET06025 Sets wind speed threshold to 25 cm/s.

SET07nnnnn Set wind speed multiplier. Value is x10000. All wind speed measurements are multiplied by this parameter. Default value is 10000 for a multiplier of 1.0000.

Where nnnnn= 00000-30000
Usage example:
>SET0709909 Sets multiplier to 0.9909
>SET0710023 Sets multiplier to 1.0023

SET08±nnnn Set wind direction offset. Value is degrees x10 and may be positive or negative. Wind direction is always re-scaled to a 0-360 range after offset is applied. Default value is 00000.

Where ±nnnn= -3600 to +3600
Usage example:
>SET08-0012 Offsets wind direction reading by -1.2 degrees
>SET08+0005 Offsets wind direction reading by +0.5 degrees

SET09dd Set damping factor. Default value is 00. This means no damping is applied. High damping values at long output intervals can slow the rate at which indicated wind values change. Wind measurement outputs are damped using the following formula:

$$S_{damped} = [(dd-1) * S_{damped} + S_{sample}] / dd$$

Where dd= Damping factor (00-99)
S_{damped} = New or last damped wind speed
S_{sample} = New wind speed

Usage example:
>SET0905 Sets damping factor to 5 (Note: Damping factor only applies to wind reading.)

Continued on next page...

SET10nnnn Set output interval. Sets the time interval between measurements in one millisecond increments. Lower values increase power consumption when continuous measurements are taken. Default is 1000.

Where nnnn= 0000-9999

Usage example:
>SET101000 Sets output interval to 1000 milliseconds (1 second) (Note: If output interval is set too low, the *ResponseONE* will automatically calculate the minimum output interval.)

SET12nnn Set sample count. The rate at which the sensor internally takes complete sonic wind samples is greater than 200 times per second. This command sets the number of internal samples used to calculate the median measurement result. Default is 100.

Where nnn= 000-800

Usage example:
>SET12016 Sets sample count to 16.
More internal samples consume more power while providing greater immunity to conditions like turbulent high-speed wind. Fewer samples consume less power while providing less immunity to disruptive conditions. This command interacts with the OUTPUT INTERVAL setting. More samples may require a longer output interval.

SET13n Set ASCII output format. Determines whether ASCII and ASCII POLLED serial outputs provide wind data in either Polar (speed and direction) or Cartesian (UV) form. Default is Polar.

Where n= 0 Polar
 1 Cartesian (UV)

Usage example:
>SET130 Sets output format to polar.

SET25n Turn compass on or off. Default is 0.

Where n= 0 Off
 1 On

Usage example:
>SET251 Turns compass on. Note: This command should only be used if the sensor has been calibrated at current location. Calibration automatically turns on compass.

SET26nddmm Set compass (magnetic) declination. Magnetic declination is the angle between magnetic north and true north.

Where n= E, W, or 0 (East, West, or none)
 dd= 00 to 90 degrees
 mm= 00 to 60 minutes

Usage example:
>SET26W0606 Set declination to West 6° 6' (zip code 49686)

SET77 Save all settings to non-volatile memory. Any settings which have not been saved will be lost when power is removed. Saved settings are loaded at power up. This command may be used any time the sensor is in COMMAND MODE. Note: **ResponseONE CONFIG** program automatically sends this command when <Send Parameters> button is pressed.

XX Returns the sensor to OPERATE MODE

RPTV Report current settings

?? Display command list

HELP Display command list

7.0 EXAMPLE SETTINGS

Suggested settings. Not all possible setting combinations are shown. The **ResponseONE CONFIG** program is recommended for changing setup parameters. See wiring diagrams for jumper settings.

7.1 FACTORY DEFAULT

| | |
|-----------------------|---------|
| RS-232 | Enabled |
| RS-485 (Output Only) | Enabled |
| Serial Output Format: | ASCII |
| Output Interval | 1000 |
| Sample Count: | 100 |

7.2 MINIMUM POWER

| | |
|-----------------------|----------|
| RS-232 | Enabled |
| RS-485 | Disabled |
| Serial Output Format: | ASCII |
| Output Interval | 1000 |
| Sample Count: | 16 |

7.3 HIGH WIND

| | |
|---------------|------|
| Output Delay: | 1000 |
| Sample Count: | 200 |

AVERAGE CURRENT DRAW AT 12V

| Output Format | Output Interval | Sample Count | Baud Rate (bps) | Average |
|-----------------|-----------------|--------------|-----------------|-------------------|
| | | | | Current Draw (mA) |
| SDI-12 (polled) | 5 minutes | 16 | 1200 | 4.5 |
| | 5 minutes | 100 | 1200 | 4.5 |
| ASCII | 1 second | 16 | 9600 | 8.4 |
| | 1 second | 100 | 38400 | 20.7 |
| ASCII Polled | 5 minutes | 16 | 9600 | 5.8 |
| NMEA | 1 second | 16 | 4800 | 7.4 |
| | 1 second | 50 | 4800 | 12.4 |
| RMYT | 0.25 second | 16 | 9600 | 15.6 |
| | 1 second | 200 | 9600 | 34.2 |

8.0 EMC COMPLIANCE

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

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.

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme à la norme NMB-001 du Canada.

EN55011/CISPR 11, Group 1, Class B device.

Class B equipment is suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

9.0 WARRANTY

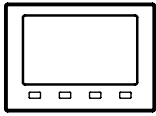
This product is warranted to be free of defects in materials and construction for a period of 12 months from date of initial purchase. Liability is limited to repair or replacement of the defective item. A copy of the warranty policy may be obtained from R. M. Young Company.

10.0 CE COMPLIANCE

This product has been tested and complies with European CE requirements for the EMC Directive. Please note that shielded cable must be used.

APPENDIX A: WIRING CONNECTIONS

Figure A1: RS-232 SERIAL CONNECTION



Serial Device

SETTINGS

Output Mode: RS-232
 Output Format: ASCII, ASCII POLLED, or NMEA
 Baud Rate: 1200, 4800, 9600, 19200 or 38400

Set connected device baud rate to match *ResponseONE*.
 1 start bit, 8 data bits, no parity, 1 stop bit, no flow control.

Use shielded cable. Connect cable shield to earth ground as shown.
 (Color code is for Young 18446 cable)

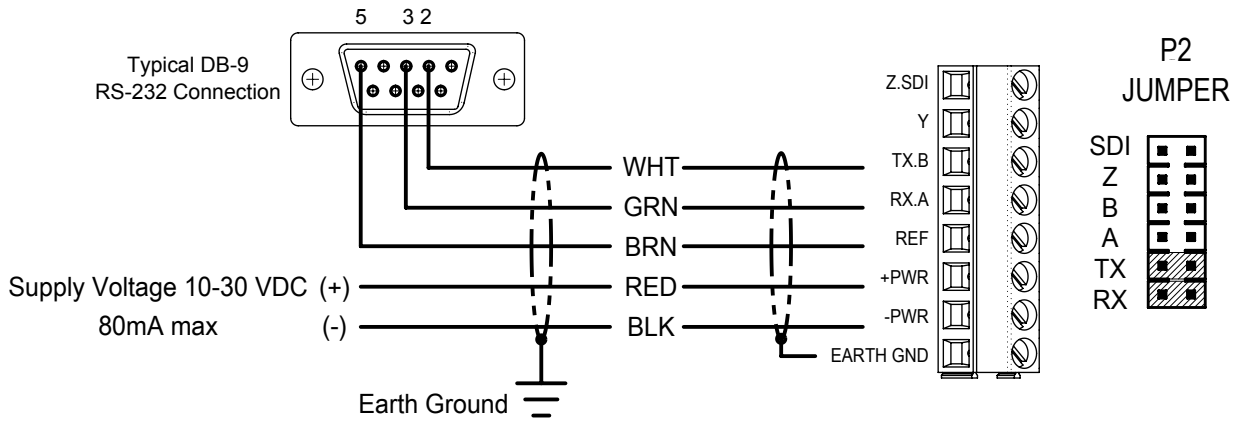
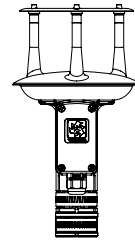
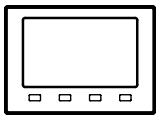


Figure A2: RS-485 / RS-422 SERIAL CONNECTION - FULL DUPLEX



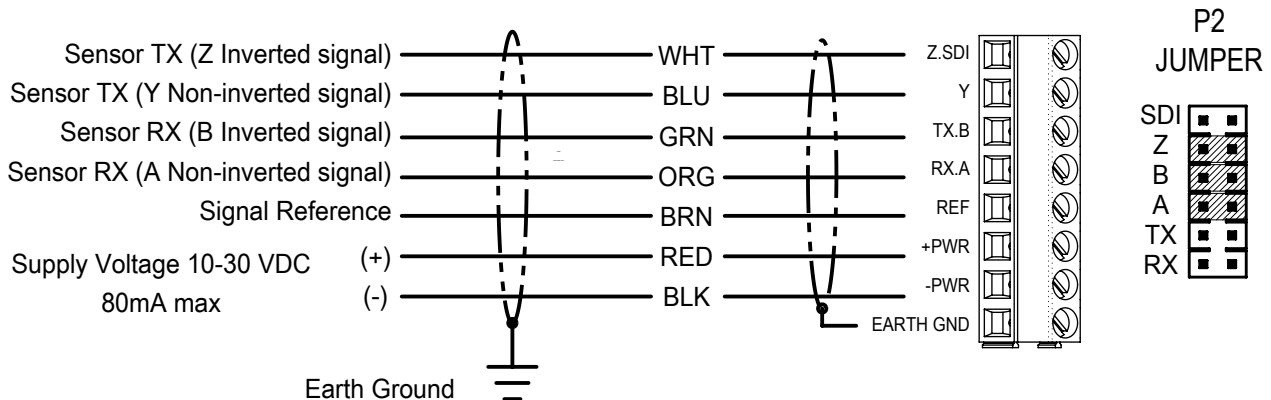
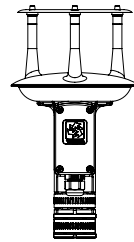
Serial Device

SETTINGS

Output Mode: RS-485 Full Duplex
 Output Format: ASCII, ASCII POLLED, or NMEA
 Baud Rate: 1200, 4800, 9600, 19200 or 38400

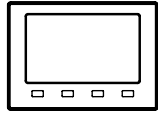
Set serial device baud rate to match *ResponseONE*.
 1 start bit, 8 data bits, no parity, 1 stop bit, no flow control.

Use shielded cable. Connect cable shield to earth ground as shown.
 (Color code is for Young 18660 Cable)



APPENDIX A: WIRING CONNECTIONS

Figure A3: RS-485 / RS-422 SERIAL CONNECTION - HALF DUPLEX



Serial Device

SETTINGS

Output Mode: RS-485 Half Duplex
 Output Format: ASCII, ASCII POLLED, or NMEA
 Baud Rate: 1200, 4800, 9600, 19200 or 38400

Set serial device baud rate to match *ResponseONE*.
 1 start bit, 8 data bits, no parity, 1 stop bit, no flow control.

Use shielded cable. Connect cable shield to earth ground as shown.
 (Color code is for Young 18446 Cable)

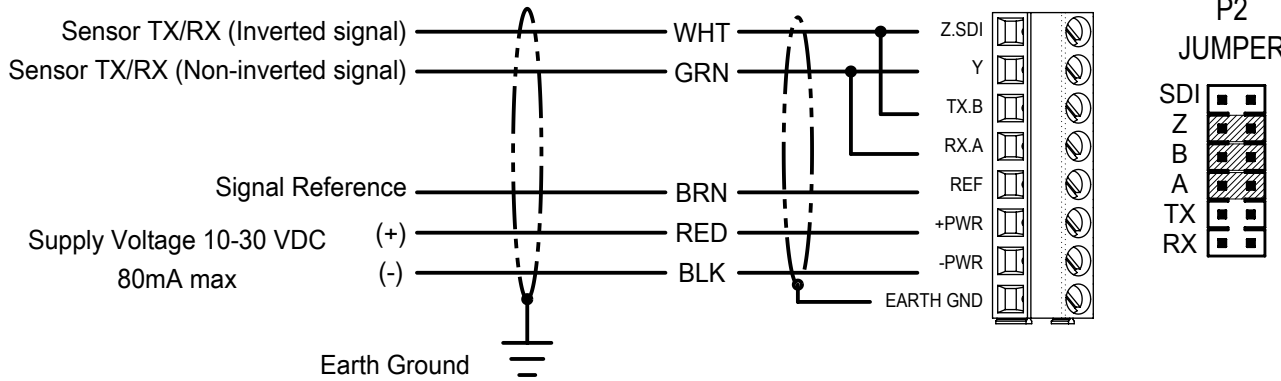
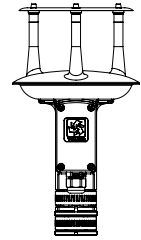
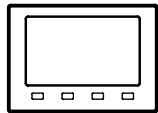


Figure A4: RS-485 / RS-422 SERIAL CONNECTION - OUTPUT ONLY



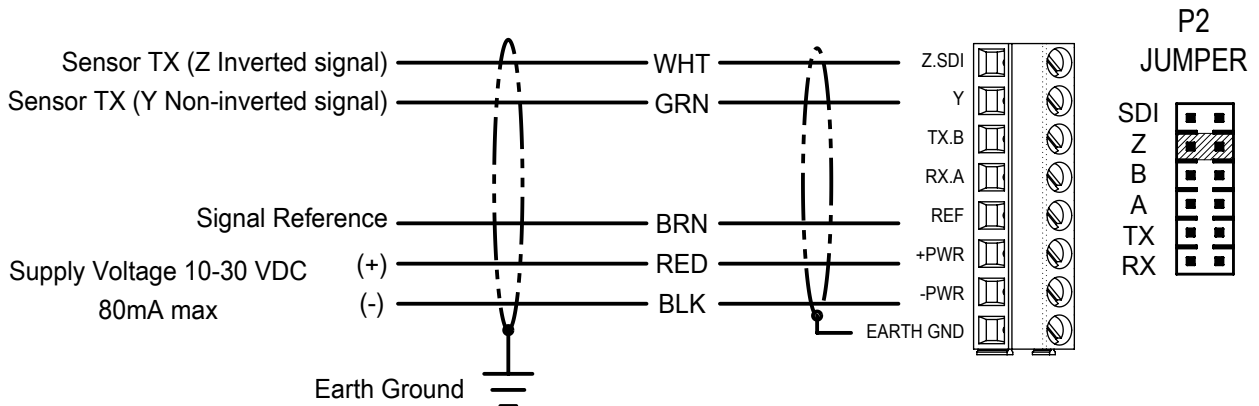
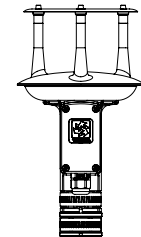
Serial Device

SETTINGS

Output Mode: RS-485 Output Only
 Output Format: ASCII, or NMEA
 Baud Rate: 1200, 4800, 9600, 19200 or 38400

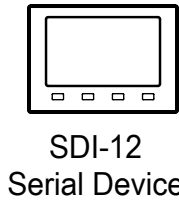
Set serial device baud rate to match *ResponseONE*.
 1 start bit, 8 data bits, no parity, 1 stop bit, no flow control.

Use shielded cable. Connect cable shield to earth ground as shown.
 (Color code is for Young 18446 Cable)

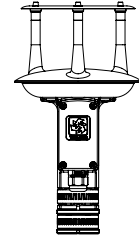


APPENDIX A: WIRING CONNECTIONS

Figure A5: SDI-12 SERIAL CONNECTION



Use shielded cable.
Connect cable shield to earth ground as shown.



P2
JUMPER

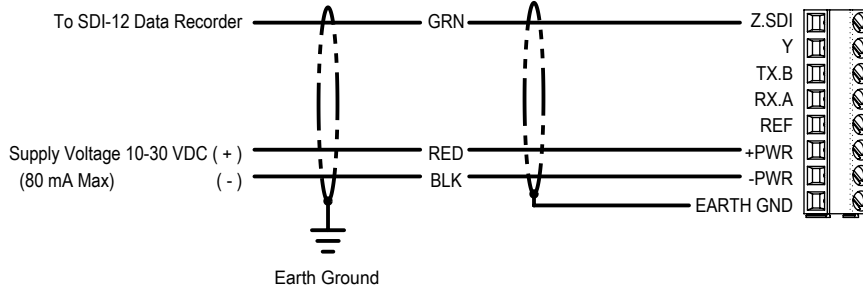
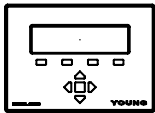


Figure A6: RS-485 SERIAL CONNECTION - FULL DUPLEX

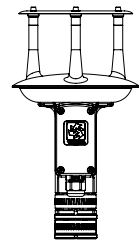


SETTINGS

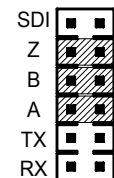
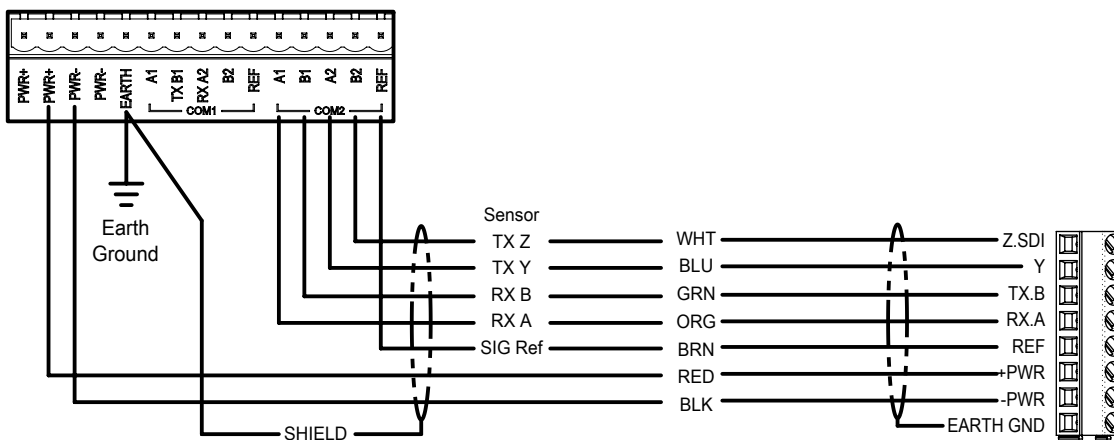
Output Mode: RS-485 Full Duplex
Output Format: ASCII, ASCII POLLED, or NMEA
Baud Rate: 1200, 4800, 9600, 19200 or 38400

Set 26800 Translator baud rate to match *ResponseONE*.

Use shielded cable. Connect cable shield to earth ground as shown.
(Color code is for Young 18660 cable)



P2
JUMPER



APPENDIX A: WIRING CONNECTIONS

Figure A7: 06201 WIND TRACKER



SETTINGS
 Output Mode: RS-485 Output Only
 Output Format: RMYT
 Baud Rate: 9600

These are the default sensor settings as shipped unless otherwise requested.
 Use shielded cable. Connect cable shield to earth ground as shown.
 (Color code is for Young 18446 Cable)

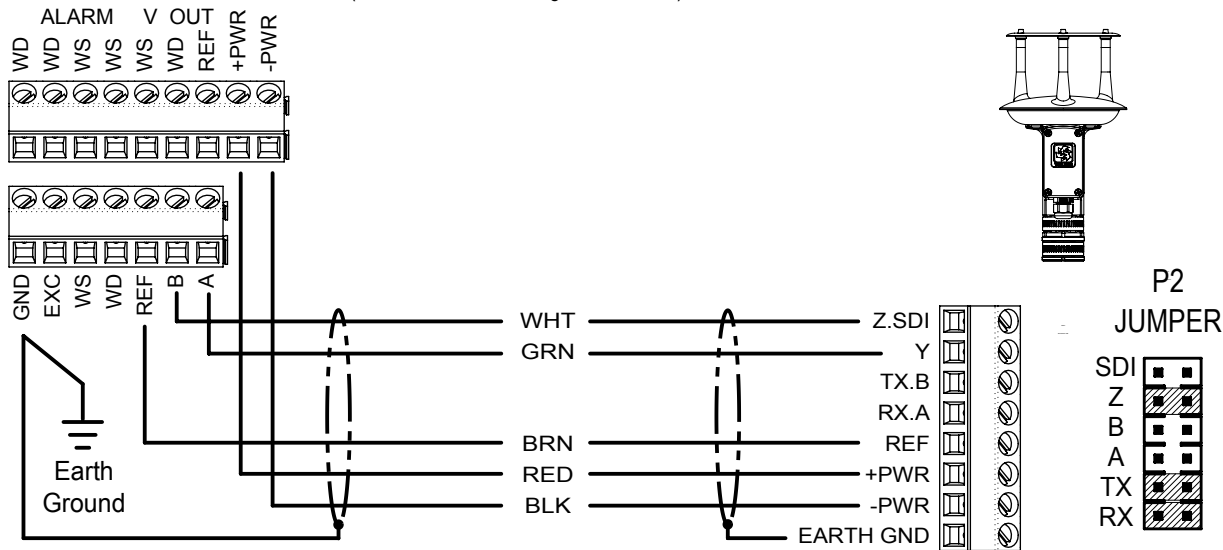
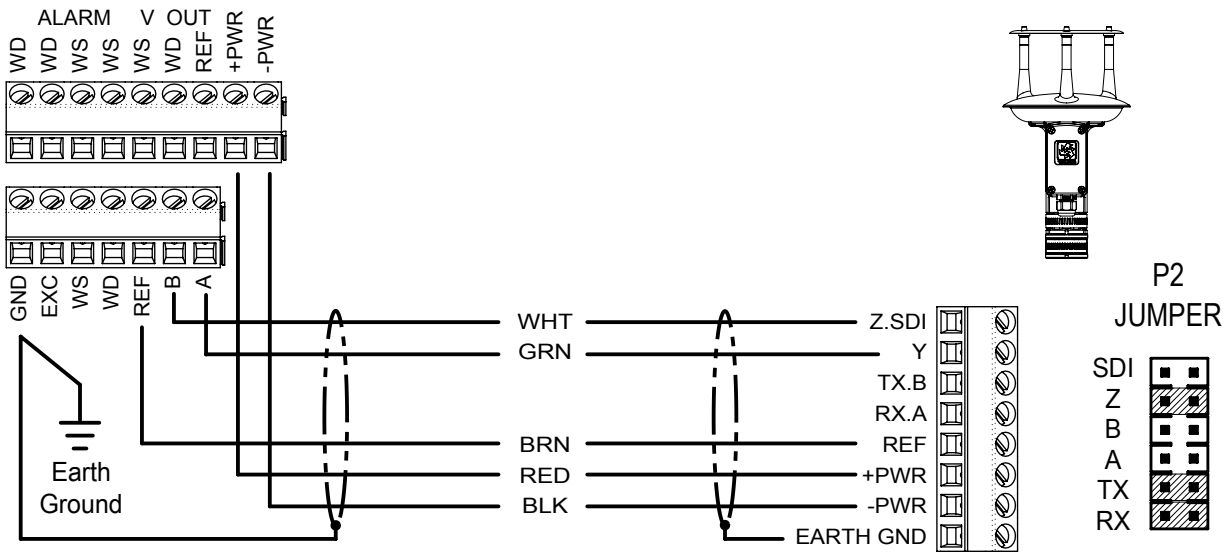


Figure A8: 06206 MARINE WIND TRACKER

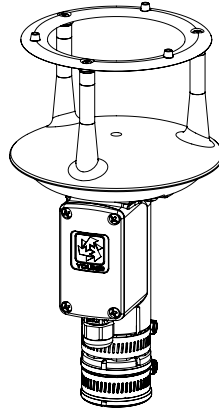


SETTINGS
 Output Mode: RS-485 Output Only
 Output Format: NMEA
 Baud Rate: 4800

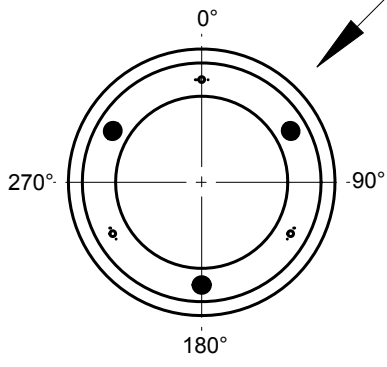
Use shielded cable. Connect cable shield to earth ground as shown.
 (Color code is for Young 18446 Cable)



APPENDIX B: SENSOR ORIENTATION AND DIMENSIONS

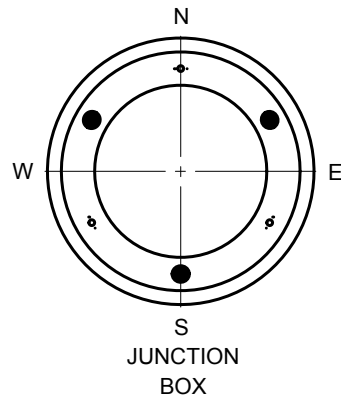


EXAMPLE:
"WIND AT 45°"

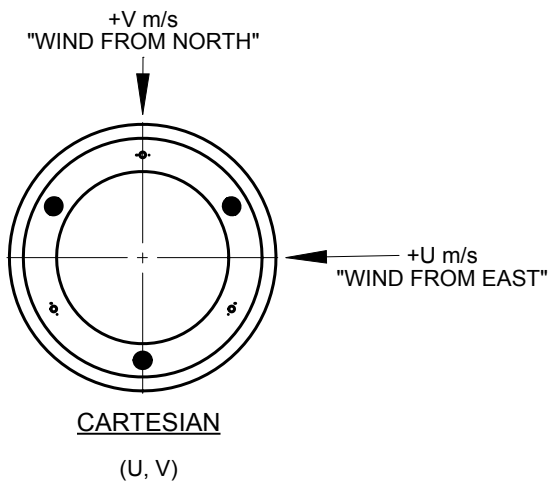


POLAR

(WIND SPEED, WIND DIRECTION)

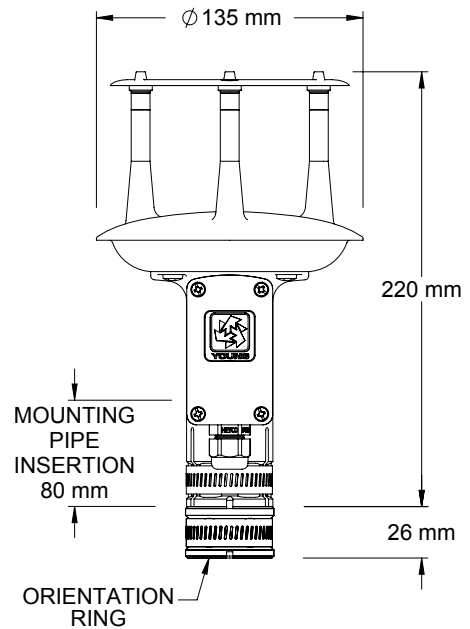


**JUNCTION
BOX**



CARTESIAN

(U, V)



Mounting:
Standard 1-inch (IPS) pipe.
OD 1.34" ($\varnothing 34\text{ mm}$)

Note:
Install unit vertically as shown to
avoid moisture damage to circuitry.

APPENDIX C: TROUBLESHOOTING

| Problem | Solution |
|-----------------------------------|--|
| No Output | <ul style="list-style-type: none"> • Check input voltage at sensor (10 – 30 VDC). • Check wiring connections. • Verify serial settings (baud rate, 1 stop bit, 8 data bits, no parity, no flow control). • ‘Acquire’ the sensor with the ResponseONE CONFIG program (see section 6.2) and verify setup mode. |
| One-way communication | <ul style="list-style-type: none"> • Check wiring connections. • ‘Acquire’ the sensor with the ResponseONE CONFIG program (see section 6.2). • Change output mode to RS-485 full or half duplex, or RS-232. |
| Status codes other than 00 appear | <ul style="list-style-type: none"> • Status codes other than 00 (or ‘A’ in NMEA mode) mean there is an error. See ‘Status Codes’ section for details. |
| No response to poll command | <ul style="list-style-type: none"> • Check power supply. • Check wiring connections. • Verify serial settings (baud rate, 1 stop bit, 8 data bits, no parity, no flow control). • Verify sensor address (if the sensor’s address is ‘0’, then the poll command is ‘0M!’ in SDI-12 mode and ‘M0!’ in ASCII Polled mode.). • ‘Acquire’ the sensor with the ResponseONE CONFIG program (see section 6.2) and verify setup mode. |
| Direction is incorrect | <ul style="list-style-type: none"> • If compass is off, make sure junction box is facing south. • ‘Acquire’ the sensor with the ResponseONE CONFIG program (see section 6.2) and verify settings. Enable and calibrate compass if needed, enter compass declination, and set the wind direction offset (default is 0000). • Turn compass on and calibrate if needed. |

Status codes for ASCII output are hex values added together before output (a status code of 03 would be a code of 01 and 02). NMEA only allows for ‘acceptable’ or ‘void’ data. SDI-12 does not show a status code.

| Status Code | Meaning |
|-------------|--|
| 00 | Valid data |
| 01 | Transducer path A blocked or dirty, clear blockage and clean transducers |
| 02 | Transducer path B blocked or dirty, clear blockage and clean transducers |
| 04 | Transducer path C blocked or dirty, clear blockage and clean transducers |
| A | NMEA data acceptable (NMEA wind data only) |
| V | NMEA data void (NMEA wind data only) |