

# INSTRUCTION MANUAL



## WXT510 Weather Transmitter

Revision: 4/07



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# ***WXT510 Weather Transmitter***

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## **1. General Description**

The WXT510 Weather Transmitter, manufactured by Vaisala, measures wind speed and direction, precipitation, barometric pressure, temperature, and relative humidity—all in a single device that has no moving parts. The WXT510's SDI-12 signal can be measured by any of our SDI-12 equipped dataloggers. The WXT510 is about the size of our larger Gill radiation shield, making it ideal for use with our CR200-series dataloggers in applications requiring quick, short-term deployment. However, the WXT510 is not intended for weather stations that require research-grade performance.

### **1.1 Wind Speed and Direction**

The WXT510's wind sensor consists of three equally spaced transducers that produce ultrasonic signals. Wind speed and direction are determined by measuring the time it takes for the ultrasonic signal of one transducer to travel to the other transducers. Wind direction is not calculated when the wind speed drops below 0.05 m/s. In this case, the last calculated direction output remains until wind speed increases. The computed wind speeds are independent of altitude, temperature, and humidity. The WXT510 is preconfigured to provide the minimum, average, and maximum values for both wind speed and direction. Default wind speed units are m/s.

### **1.2 Precipitation**

The WXT510 uses the RAINCAP® Sensor to measure accumulated rainfall, rain intensity, and rain duration. Precipitation is measured one raindrop at a time. Whenever a raindrop hits the precipitation sensor, an electrical signal is produced that is proportional to the volume of the drop.

The sensor is also capable of distinguishing hail stones from raindrops. The measured rain and hail parameters are cumulative amounts of rain or hail, rain or hail intensity, and the duration of a shower.

### **1.3 Barometric Pressure, Temperature, and Relative Humidity**

The WXT510 has a PTU module that contains a capacitive silicon BAROCAP® sensor for barometric pressure measurements, a capacitive ceramic THERMOCAP® sensor for air temperature measurements, and a capacitive thin film polymer HUMICAP® sensor for relative humidity measurements. The PTU is housed in a naturally aspirated radiation shield that protects the PTU and reflects solar radiation. Default units are °Celsius for temperature and hPa for barometric pressure.

## **2. Specifications**

### **2.1 Wind Speed**

Measurement Range: 0 to 60 m s<sup>-1</sup>  
Accuracy: ±0.3 m s<sup>-1</sup> or ±3% whichever is greater (0 to 35 m s<sup>-1</sup>);  
±5% (36 to 60 m s<sup>-1</sup>)

## 2.2 Wind Direction

Measurement Range: 0° to 360°  
Accuracy:  $\pm 3^\circ$

## 2.3 Precipitation

Rainfall: cumulative accumulation after latest automatic or manual reset.  
Accuracy: 5% (Due to the nature of the phenomenon, deviations caused by spatial variations may exist in precipitation readings, especially in short time scale. The accuracy specification does not include possible wind induced error.)

Rain Duration: counting each ten second increment when droplet detected.  
Rain Intensity: one minute running average in ten second steps.

## 2.4 Barometric Pressure

Measurement Range: 600 to 1100 hPa (mbar)  
Accuracy:  $\pm 0.5$  hPa @ 0° to 30°C;  $\pm 1$  hPa @ -52° to +60°C

## 2.5 Air Temperature

Measurement Range: -52° to +60°C  
Accuracy:  $\pm 0.3^\circ\text{C}$  @ +20°C

## 2.6 Relative Humidity

Measurement Range: 0 to 100% RH  
Accuracy:  $\pm 3\%$  RH @ 0 to 90% RH;  $\pm 5\%$  RH @ 90 to 100% RH

## 2.7 Assembly

Input Voltage: 5 to 30 Vdc  
Typical Current Drain: 3 mA with default measuring intervals  
Output: SDI-12  
Operating Range: -52° to +60°C; 0 to 100% RH  
Dimensions: 9.4" (24.0 cm) height, 4.7" (12.0 cm) diameter  
Weight: 1.43 lbs (650 g)

# 3. Installation

## 3.1 Assembling the WXT510

1. Lift off the top of the transmitter.
2. Remove the PTU from the plastic bag and insert it into the WXT510 (see Figures 1 and 2).
3. Replace the top.
4. Tighten the three fixing screws.



FIGURE 1. Opened WXT510 with the PTU at the right.



FIGURE 2. A WXT510 with the PTU inserted inside of it.

### 3.2 Mounting to a Campbell Scientific Crossarm

The WXT510 is mounted on a CM202, CM204, or CM206 crossarm via the 18311 mounting pipe and the CM220 bracket. The 18311 pipe is shipped with the WXT510.

## 4. Wiring Table

TABLE 1. Connections to Campbell Scientific Dataloggers					
Color	Description	CR1000, CR800, CR850, CR3000, CR5000, CR9000(X)	CR10(X), CR510	21X, CR23X, CR7	CR200
Brown	Power	12 V	12 V	+12	SW Battery
Clear (silver) or Red	Power ground	G	G	G	G
Blue	SDI-12 Signal	C1	C2	C2	C1
White	SDI-12 Signal	C1	C2	C2	C1
Green	data ground	G	G	G	G
Yellow	Optional heater power (see note)	12V	12V	+12	SW Battery
Pink	Optional heater ground (see note)	G	G	G	G
Grey		Not used	Not used	Not used	Not used

**NOTE** Unless special ordered, the heater will not be operational for WXT510s purchased from Campbell Scientific. Although the heater is not operational, the WXT510 will have a pink and yellow wire. Do not connect the pink and yellow wire unless the heater is operational.

## 5. Example Programs

### 5.1 CR10X Program

The following example is the portion of a CR10X program that measures the WXT510. A complete program will include output processing instructions.

```

;                               wind direction                               wind speed
; Get WXT510 Values 1 - 6 (Dn=Wd min, Dm=Wd avg, Dx=Wd max, Sn=Ws min, Sm=Ws avg, Sx=Ws max)

22: SDI-12 Recorder (P105) ;
1: 0      SDI-12 Address
2: 1      Start Measurement (aM1!) ; corresponds with Wind message Command R1
3: 2      Port ; control port for SDI-12 comms
4: 15     Loc [ Value1 ]
5: 1.0    Mult
6: 0.0    Offset
    
```



```

23: Excitation with Delay (P22)
  1: 1      Ex Channel
  2: 0      Delay W/Ex (0.01 sec units)
  3: 50     Delay After Ex (0.01 sec units)
  4: 0      mV Excitation

; Get WXT510 Values 7 - 9 (Ta= air temp, Ua= rel humidity, Pa= air pressure)

24: SDI-12 Recorder (P105)
  1: 0      SDI-12 Address
  2: 2      Start Measurement (aM2!)      ; corresponds with Pressure Humidity and
  3: 2      Port                          Temp Message Command R2
  4: 21     Loc [ Value7 ]
  5: 1.0    Multiplier
  6: 0.0    Offset

25: Excitation with Delay (P22)
  1: 1      Ex Channel
  2: 0      Delay W/Ex (0.01 sec units)
  3: 50     Delay After Ex (0.01 sec units)
  4: 0      mV Excitation

;                               rain                               hail
; Get WXT510 Values 10 - 15 (Rc= amount, Rd= duration, Ri= intensity, Hc= amount, Hd= duration, Hi = intensity)

26: SDI-12 Recorder (P105)
  1: 0      SDI-12 Address
  2: 3      Start Measurement (aM3!)      ; corresponds with Precip Message Command R3
  3: 2      Port
  4: 24     Loc [ Value10 ]
  5: 1.0    Multiplier
  6: 0.0    Offset

```

## 5.2 CR1000 Program

The following example is the portion of a CR1000 program that measures the WXT510.

```

'CR1000

'Read WXT510 every 15 seconds and log data every hour
'assuming WXT510 is programmed for 15 second data interval
'SDI12 connected on C7 of CR1000
'WXT510 SDI12 address must be zero

'Declare Variables and Units
Public Batt_Volt
Public WXT510(15)

Alias WXT510(1)=Wdmin
Alias WXT510(2)=Wdavg
Alias WXT510(3)=Wdmax
Alias WXT510(4)=Wsmin
Alias WXT510(5)=Wsave

```

```
Alias WXT510(6)=Wsmax
Alias WXT510(7)=airtemp
Alias WXT510(8)=relhumidity
Alias WXT510(9)=airpressure
Alias WXT510(10)=Ramount
Alias WXT510(11)=Rduration
Alias WXT510(12)=Rintensity
Alias WXT510(13)=Hamount
Alias WXT510(14)=Hduration
Alias WXT510(15)=Hintensity

'Define Data Tables
DataTable(Table1,True,-1)
  DataInterval(0,60,Min,10)

  'final data format goes here

  Minimum(1,Batt_Volt,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan(15,Sec,1,0)
  'Default Datalogger Battery Voltage measurement Batt_Volt:
  Battery(Batt_Volt)
  'WXT510 SDI-12 Sensor measurements 1-6:
  SDI12Recorder(WXT510(1),7,"0","M1!",1,0)
  'WXT510 SDI-12 Sensor measurements 7-9:
  SDI12Recorder(WXT510(7),7,"0","M2!",1,0)
  'WXT510 SDI-12 Sensor measurements 10-15:
  SDI12Recorder(WXT510(10),7,"0","M3!",1,0)
  'Call Data Tables and Store Data
  CallTable(Table1)
  NextScan
EndProg
```

# Appendix A. Configuring the WXT510

## NOTE

Modifying the default configuration of the WXT510 requires the purchase of a grey configuration cable; contact Campbell Scientific for more information.

1. Connect one end of the grey Configuration Cable to a COM port on the PC and the other end of the cable to the “Service” connector on the WXT510.
2. Connect a 9 V battery to the Configuration Cable’s battery clip. The female contact of the battery clip is (+).
3. On your PC, run Vaisala’s WXT Configuration Tool Software and go to the Connection Setup Screen.
4. Enter the settings for each of the Connection Setup Screen’s parameters (see Figure A-1). The default settings are:
  - Connect using: enter the COM Port in which the Configuration Cable is connected.
  - Bits per second: 19200
  - Parity: 8-N-1
5. Click on the OK button.

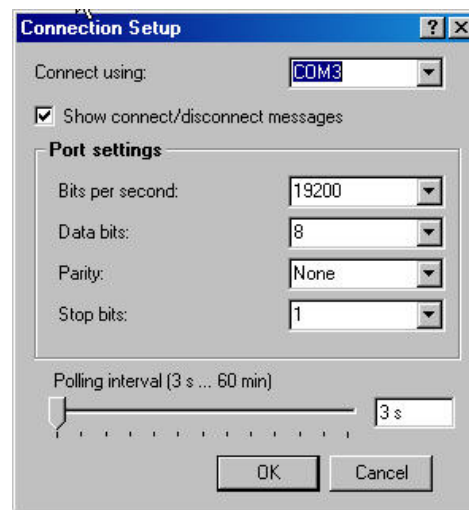


FIGURE A-1. Connection Setup Screen

6. Go to the Device Settings Screen and enter the settings for each of the parameters (see Figure A-2). Default settings are:
  - Device—Address: 0
  - Heating and self diagnostic—verify Enable Heating is NOT selected.
  - Heating and self diagnostics—Update Interval: 15 s
  - Communication protocol—select SDI-12 v1.3
  - User port settings—Port type: SDI-12

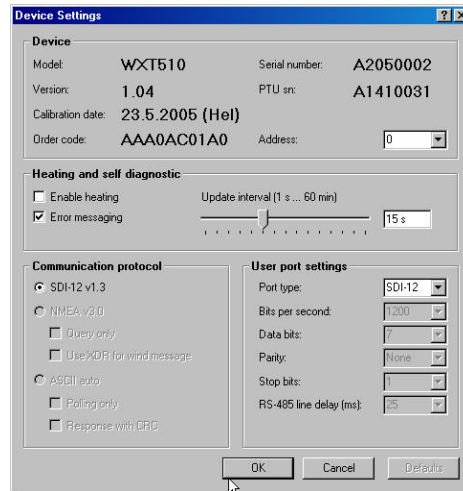


FIGURE A-2. Device Settings Screen

7. Click on the OK button.
8. Go to the Sensor Settings Screen (see Figure A-3). The default Wind and PTU Update intervals are set to 5 s.

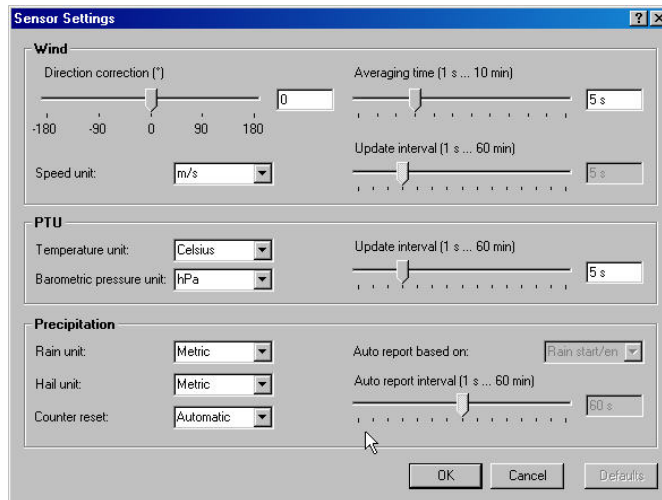


FIGURE A-3. Sensor Settings Screen

9. Click on the OK button.
10. Go to the Message Settings Screen and verify that Message Settings are as desired. The default settings are shown in Figure A-4.

Note: Hail accumulation should be checked.

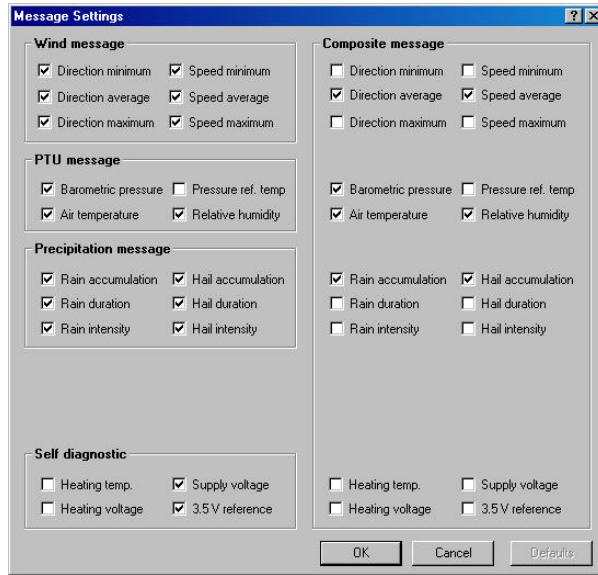


FIGURE A-4. Message Settings Screen

11. Click on the OK button.
12. Close the WXT Configuration Tool.
13. Remove the 9 V battery.
14. Disconnect the Configuration Cable.
15. Secure protective service port cap on PTU.





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