



# CSAT3BH

Heated Three-Dimensional  
Sonic Anemometer



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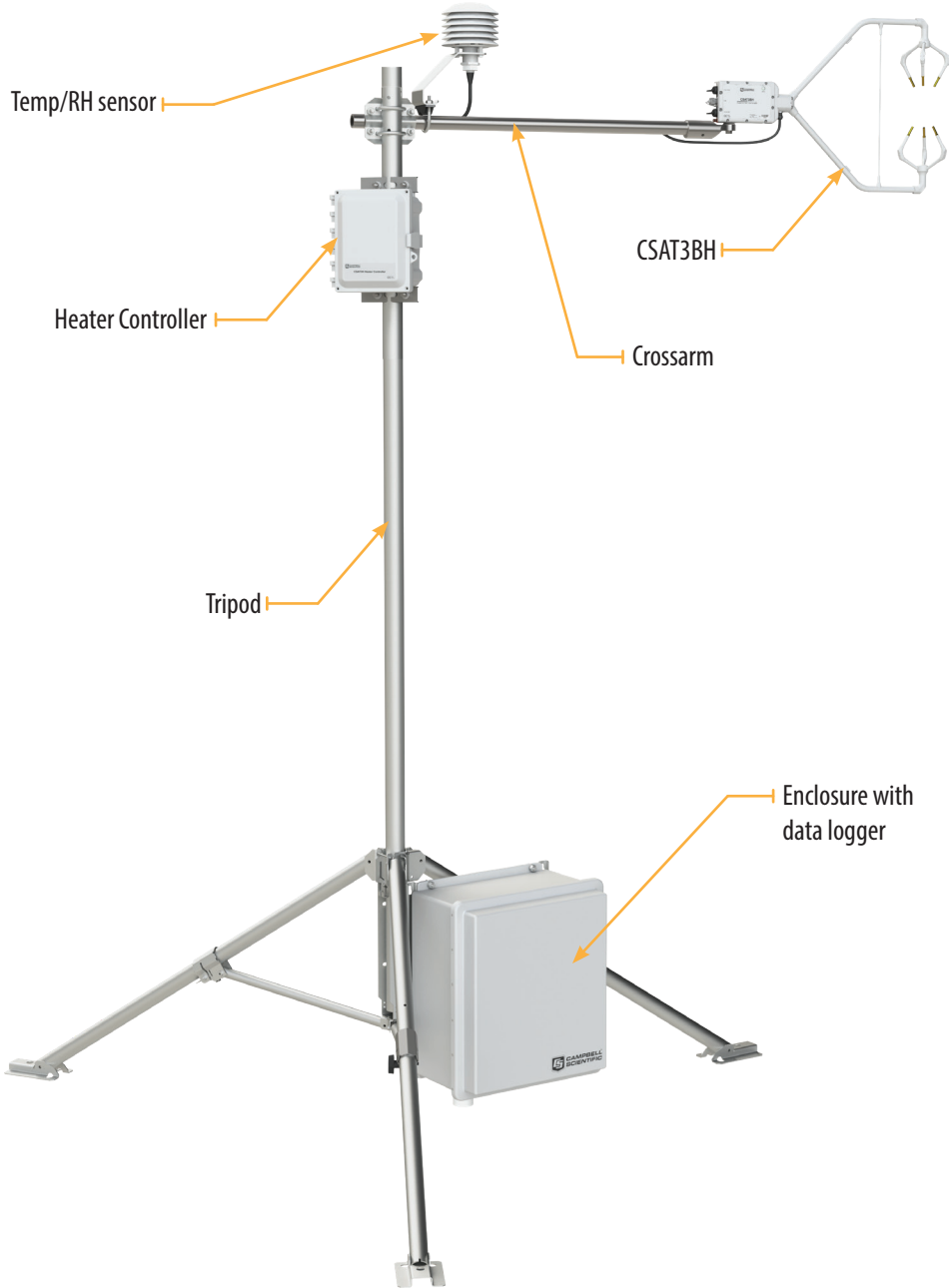


**IMPORTANT NOTE:** This Quick Deploy Guide is meant to be a general reference to give the installer an overview of the steps required to make this system operational.

## 1 Caution!

- Voltage input must be 22 – 32 VDC for the CSAT3H heater controller box and 9.5-32 VDC for the CSAT3BH.
- Always handle the CSAT3BH by holding the block at the back of the sensor. Handling it by the arms or transducers could cause geometric deformation, which degrades the measurements.
- The transducer faces are fragile. Do not scratch or rub the surface of the transducer.
- Ground the CSAT3BH, CSAT3H heater controller box, and data logger enclosure to the same grounding rod for the best measurement accuracy. Proper grounding to Earth will ensure maximum electrostatic discharge (ESD) and lightning protection. Ground the heater controller directly to the ground rod.
- Install USB drivers and Device Configuration Utility before attaching the sensor to a computer.

## CSAT3BH System



## Specifications

### Operating Temperature

Range: -40 to 50 °C

### Wind Accuracy (-40 to 50 °C, wind speed < 30 m/s, azimuth angles between ± 170 °C)

#### Offset Error

$u_x$  ± 8 cm/s max  
 $u_y$  ± 8 cm/s max  
 $u_z$  ± 4 cm/s max

#### Gain Error

Wind Vector ± 5° of horizontal: ± 2% of reading max  
Wind Vector ± 10° of horizontal: ± 3% of reading max  
Wind Vector ± 20° of horizontal: ± 6% of reading max

### Wind Resolution

$u_x$  1.0 mm/s RMS  
 $u_y$  1.0 mm/s RMS  
 $u_z$  0.5 mm/s RMS

### Wind Full Scale Range:

± 65 m/s

### Sonic Temperature Resolution:

± 0.002° C RMS at 25 °C

### Sonic Temperature Reporting Range:

-30 to 50 °C

### Measurement Rates

Data logger Triggered: 1–100 Hz  
Unprompted Output (to computer): 10, 20, 50, or 100 Hz  
Internal Self-Trigger Rate: 100 Hz

### Voltage Requirement:

9.5–32 VDC for CSAT3BH  
22–32 VDC for heater

### Current Requirement (10 Hz Measurement Rate)

Current @ 12 VDC: 110 mA  
Current @ 24 VDC: 65 mA

### Heaters:

Arms & Strut (at maximum heating) = 2.46 A @ 24 VDC  
Transducer Fingers (at maximum heating) = 3.75 A @ 24 VDC  
Total System Power Required (at maximum heating) = 6.2 A @ 24 VDC  
Quiescent power consumption = 30 mA @ 24 VDC

### Chassis Thermistor Accuracy:

± 0.1 °C

### Temp/Relative Humidity Accuracy:

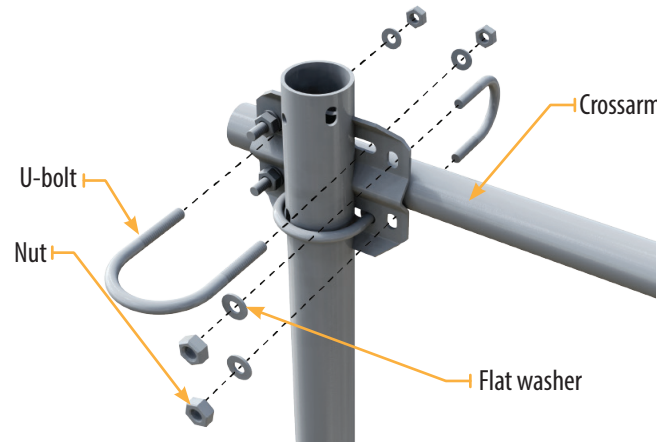
± 0.3 °C and ± 3%

## 2 Equipment

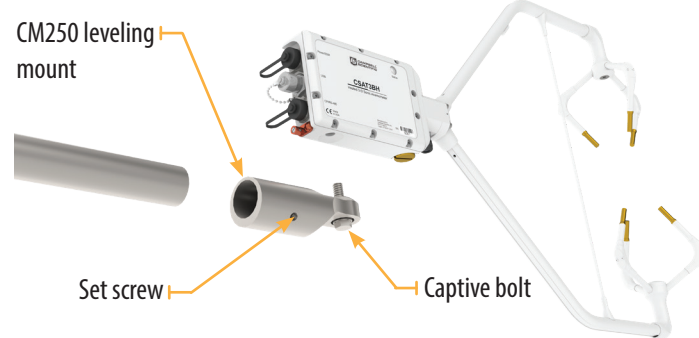
3/16 in hex key  
1/2 in open end wrench  
1/2 in socket wrench  
9/16 in socket wrench  
Flat-head screwdriver  
Bubble level

## 3 Hardware connections

1. Mount a 3.33 cm (1.31 in) outer diameter pipe or crossarm (such as a CM20X) to the tripod mast or tower.



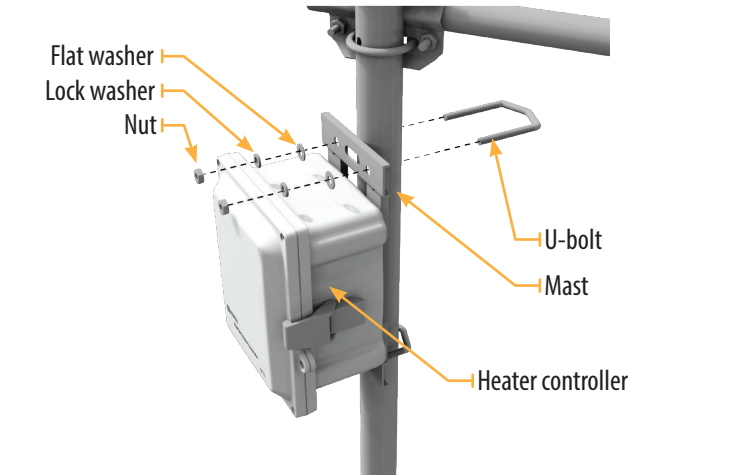
2. Mount the CM250 leveling mount to the end of the crossarm, securing it with two set screws.



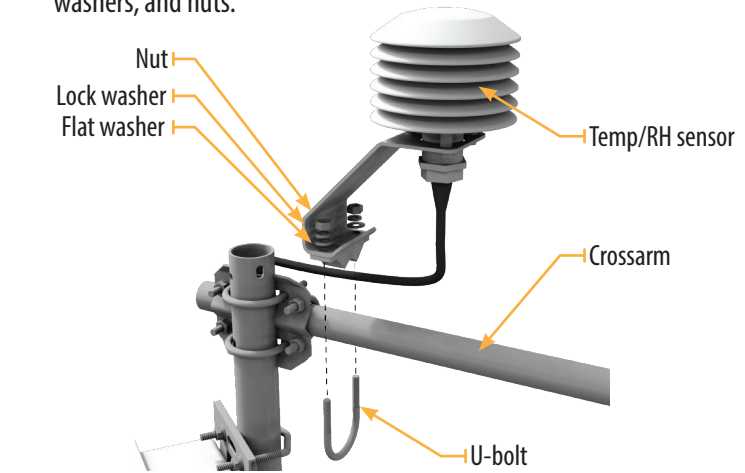
3. Use the captive bolt on the CM250 to mount the CSAT3BH. The orientation of the CSAT3BH should be level and pointing in the direction of the prevailing wind.
4. Use a compass to determine what direction the sonic is pointing. This direction is input into the CSAT\_AZIMUTH constant within the CRBasic program.
5. Ground the CSAT3BH by attaching one end of a user-supplied, 10 AWG wire from the copper ground lug on the back of the CSAT3BH block.



6. Earth (chassis) ground the other end of the wire to a ground rod driven into the ground next to the station. For more details on grounding, see section 2.3 of the CR6 data logger manual.
7. Position the heater controller within 15 feet of the CSAT3BH. Mount the controller to the tripod mast using two u-bolts, flat washers, lock washers, and nuts.



8. Mount the dedicated temp/RH probe to the end of the crossarm closest to the tripod/tower mast using a U-bolt, flat washers, lock washers, and nuts.



#### 4 CSAT3H heater controller connections.



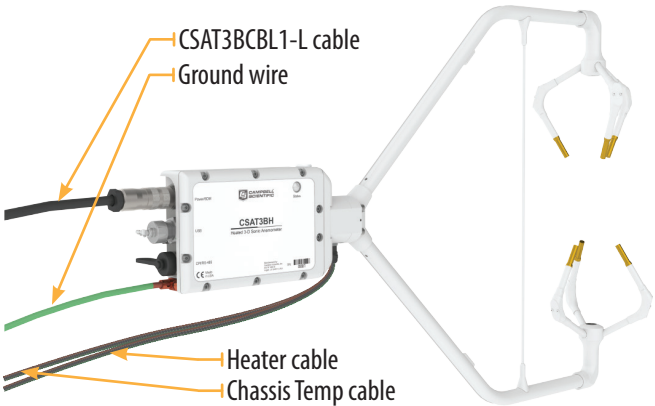
1. Connect the cable from the Temp/RH sensor to the heater controller connection labeled **Temp/RH**.

2. Connect the heater and chassis temp cables from the CSAT3BH to the **Heaters** and **Chassis Temp** connections on the heater controller.
3. With power turned off, connect the cable from the external 22–32 VDC power supply to the **Power In** connection.
4. Connect the RS-485 cable to the **RS-485 TX/RX** connection. The other end of this cable connects to the data logger in the main enclosure.
5. Connect one end of an 10 AWG ground wire to the ground lug (⊥) on the bottom of the heater controller. Connect the other end of this wire to the **SAME** ground rod as the CSAT3BH.

#### 5 Communications connections

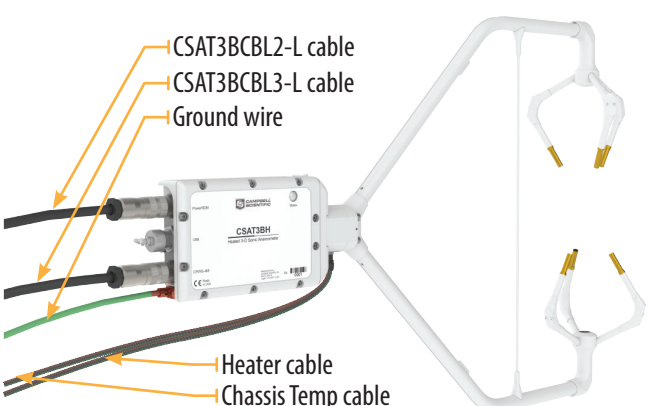
1. Connect power and communications cable(s).

##### SDM Communications



If using SDM communications, connect a CSAT3BCBL1-L (“L” denotes the cable length in feet) cable to the connector on the back of the CSAT3BH block labeled **Power/SDM**.

##### CPI Communications



If using CPI communications connect a CSAT3BCBL2-L cable and a CSAT3BCBL3-L-RJ to the connectors on the back of the CSAT3BH block labeled **Power/SDM** and **CPI/RS-485**, respectively.

2. Connect power and communications cable(s) to the data logger.

##### SDM Communications

If using SDM communications, connect the wires on the end of the CSAT3BCBL1-L and CSAT3HCBL1-L cables to the data logger according to the following table.

Wiring diagram for CSAT3BH with SDM		
CR6 terminal	CR1000X terminal	Wire Color
U5	C1	CSAT3BCBL1-White
U6	C2	CSAT3BCBL1-Yellow
U7	C3	CSAT3BCBL1-Blue
G	G	CSAT3BCBL1-Black
G	G	CSAT3BCBL1-Brown
G	G	CSAT3BCBL1-Clear
12V	12V	CSAT3BCBL1-Red
C3	C5/C7 (C5 paired w/C6)	CSAT3HCBL1-Brown
C4	C6/C8 (C7 paired w/C8)	CSAT3HCBL1-White
G	G	CSAT3HCBL1-Black

##### CPI Communications

If using CPI communications, connect the CSAT3BCBL2-L, CSAT3HCBL1-L, and CSAT3BCBL3-L cables to the data logger ports according to the following table.

Wire Diagram for CSAT3BH with CPI		
CR6 Terminal	CR1000X Terminal	Wire Color
G	G	CSAT3BCBL2-Black
12V	12V	CSAT3BCBL2-Red
C3	C5/C7 (C5 paired w/C6)	CSAT3HCBL1-Brown
C4	C6/C8 (C7 paired w/C8)	CSAT3HCBL1-White
G	G	CSAT3HCBL1-Black
RS-232/CPI	RS-232/CPI	CSAT3BCBL3-CPI RJ 45

**NOTE:** If using a CR1000X where C5/C6 or C7/C8 aren't available, an MD485 is required for serial communications. Consult the manual or contact Campbell Scientific for instructions on how to set up the MD485.

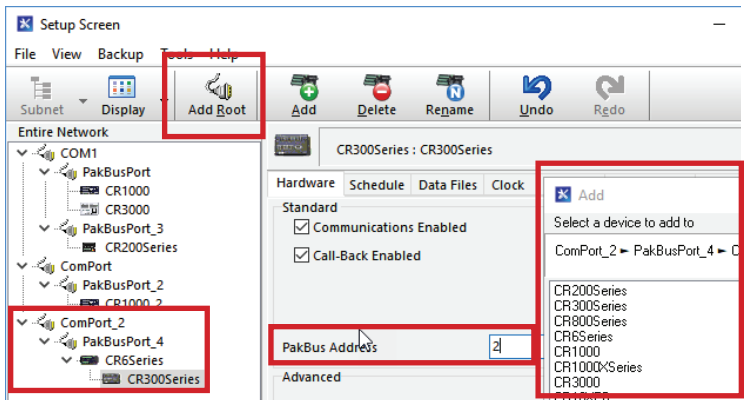
3. Ensure the data logger enclosure ground is connected to the **SAME** ground rod as the CSAT3BH and heater controller.
4. Use LoggerNet, PC400, or PC200W to send a data logger program to the data logger. Refer to **Section 6: Configuration** for instructions on establishing communications with the data logger.
5. Verify the green Status light on the CSAT3BH block is blinking, indicating measurements are being made and recorded in the data logger without diagnostic error conditions.



**NOTE:** In the default operating Mode 0, where the CSAT3BH measurements and output are triggered by a data logger, the CSAT3BH Status light will light to indicate a data logger is connected to the CSAT3BH and its program is running and sending measurement triggers.

#### 6 Data logger, heater controller configuration

1. From the LoggerNet toolbar click **Setup**. Make sure the **Standard** view is displayed. Click the blue button in the top right-hand corner of the screen to toggle between the **EZ** (Simplified) and **Standard** views.
2. Click **Add Root** and select the means of communications (either **IPPort** or **ComPort**). **ComPort** is used in this example.
3. From the **Add** window, select **PakBusPort**.
4. From the **Add** window, add a data logger. A CR6Series is used in this example. The default **PakBus Address** for the CR6 is 1.
5. From the **Add** window, add a CR300Series to the CR6Series as it is the data logger within the heater controller. The **PakBus Address** of the CR300 inside the heater controller is set to 2, so the address must be changed from 1 to 2 in the **Hardware** tab.



6. Close the **Add** window.
7. Make sure the PakBus addresses and ComPorts are correct. This allows communications to both the data logger and heater controller. It also allows the data logger and heater controller to communicate with one another.
8. Once everything is correct click **Apply**.
9. Connect to the CR6 data logger using Device Configuration Utility and navigate to **Deployment > Com Ports Settings**. Enter **Control COM3** for **Select the ComPort**, **115200 Fixed** for **Baud Rate**, and **RS-485 Half-Duplex PakBus** for **Configuration**.
10. Select the **Advanced** tab and change **Is Router** to **True** for the CR6. Click **Apply**.

