Overview

The CWS220, CWS220A, and CWS220E are wireless versions of our SI-111 infrared radiometer. They measure the surface temperature of an object without physical contact. These radiometers have an internal spread spectrum radio* that transmits data to a CWB100-series wireless base station or to another wireless sensor.

Benefits and Features

- Provides road surface, plant canopy, soil surface, snow surface, and water surface temperature measurements
- Measures surface temperature continuously in the field
- Internal frequency-hopping, spread spectrum radio provides longer range and less interference
- Battery-powered using either alkaline batteries or a rechargeable battery and a solar cell
- A reliable, low maintenance, low power method for making measurements in applications where cabled sensors are impractical or otherwise undesirable
- Transmissions can be routed through up to three other wireless sensors
- Ideal for providing spatial averages
- Compatible with Campbell Scientific’s CR6, CR800, CR850, CR1000, and CR3000 dataloggers

Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Where Used</th>
<th>Frequency (MHz)</th>
<th>Compatible Base Stations</th>
<th>Compatible Wireless Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWS220</td>
<td>U.S., Canada</td>
<td>910 to 918</td>
<td>CWB100</td>
<td>CW5900, CW655</td>
</tr>
<tr>
<td>CWS220A</td>
<td>Australia, New Zealand</td>
<td>920 to 928</td>
<td>CWB100A</td>
<td>CW5900A, CW655A</td>
</tr>
<tr>
<td>CWS220E</td>
<td>Europe</td>
<td>868</td>
<td>CWB100E</td>
<td>CW5900E, CW655E</td>
</tr>
</tbody>
</table>

Why Wireless?

- Require less installation time and labor than running cables through conduit or burying them in trenches
- Can be used in buildings where local fire codes preclude the use of Santaprene-jacketed cables
- Ideal for applications that would require long cable lengths, which often decrease the quality of the measurement
- Use fewer datalogger channels

*CThe internal radio in the wireless sensor is not meant to move a lot of data quickly. It takes 15 to 30 seconds per hop when moving data from a sensor, through a sensor used as a repeater, and ending up at the base radio. Going through three repeaters could take a data packet anywhere from 45 to 90 seconds to get to the base radio.*
### Technical Description

The CWS220 series includes a thermopile, which measures surface temperature, and a thermistor, which measures sensor body temperature. The two temperature sensors are housed in a rugged body that contains a germanium window.

The radiometer can route its transmissions through up to three other wireless sensors. A datalogger is connected to a CWB100-series base station for processing and storing the data. The radiometer interfaces with a PC for configuration via the A205 CWS Sensor to PC Interface.

The calibration coefficients used for determining the target temperature by means of the Stefan-Boltzman equation are stored in the radiometer at the time of calibration.

### Specifications

#### Accuracy

<table>
<thead>
<tr>
<th></th>
<th>-10° to +65°C</th>
<th>-40° to +70°C</th>
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</thead>
<tbody>
<tr>
<td>Absolute Accuracy</td>
<td>±0.2°C</td>
<td>±0.5°C</td>
</tr>
<tr>
<td>Uniformity</td>
<td>±0.1°C</td>
<td>±0.3°C</td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.05°C</td>
<td>±0.1°C</td>
</tr>
</tbody>
</table>

- Power: 2 AA batteries with a battery life of 1 year assuming sensor samples taken every 10 minutes. Optional solar charging available.
- Average Current Drain: 300 μA with 15 minute polling
- Response Time: < 1 s to changes in target temperature
- Target Temperature Output Signal: 60 μV per °C difference from sensor body
- Body Temperature Output Signal: 0 to 2500 mV
- Optics: Germanium lens
- Wavelength Range: 8 to 14 μm (corresponds to atmospheric window)
- Field of View (FOV): 22° half angle
- Operating Temperature Range: -25° to +50°C

#### Field of View (FOV)

The CWS220 series has a 22 degree half angle field of view (FOV). The FOV is reported as the half-angle of the apex of the cone formed by the target (cone base) and the detector (cone apex). The target is a circle from which 98% of the radiation viewed by the detector is being emitted.

#### Ordering Information

**Wireless Infrared Radiometers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWS220</td>
<td>Wireless Infrared Radiometer, 900 MHz</td>
<td></td>
</tr>
<tr>
<td>CWS220A</td>
<td>Wireless Infrared Radiometer for Australia, 922 MHz</td>
<td></td>
</tr>
<tr>
<td>CWS220E</td>
<td>Wireless Infrared Radiometer for Europe, 868 MHz</td>
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</tbody>
</table>

**Power Options (choose one)**

- ALK: Alkaline Battery with Lid
- RC: Battery with Solar Panels

**Common Accessories**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A205</td>
<td>CWS Sensor to PC Interface.</td>
</tr>
<tr>
<td>26054</td>
<td>Pole Mounting Kit for attaching the sensor to a mast or pole.</td>
</tr>
</tbody>
</table>

### Internal 25 mW FHSS Radio

- FHSS Channel
  - CWS220, CWS220A: 50
  - CWS220E: 16
- Transmitter Power Output: 25 mW (+14 dBm)
- Receiver Sensitivity: -110 dBm (0.1% frame error rate)
- Typical Current Drain
  - Standby: 3 μA
  - Receive: 18 mA (full run)
  - Transmit: 45 mA
- Average Operating Current with 1 s Access Time: 15 μA
- Quality of Service Management: RSSI
- Additional Features: GFSK modulation, data interleaving, forward error correction, BCH (31,21), data scrambling