



## Determine an Object's Surface Temperature without Physical Contact

### Overview

The SI-111, manufactured by Apogee, is a precision infrared radiometer that determines the surface temperature of an object without physical contact. It measures both the subject's

surface temperature and the sensor-body temperature. A Campbell Scientific data logger uses these measurements to calculate the correct temperature of the subject.

### Benefits and Features

- › Compatible with most Campbell Scientific data loggers
- › Measures surface temperature continuously in the field
- › Provides road surface, plant canopy, soil surface, snow surface, and water surface temperature measurements
- › Avoids influencing the temperature, providing more accurate measurements
- › Ideal for providing spatial averages
- › Rugged construction—two temperature probes housed in an aluminum body with a germanium window

### Detailed Description

The SI-111 consists of a thermopile, which measures surface temperature, and a thermistor, which measures sensor body temperature. The two temperature sensors are housed in a rugged aluminum body that contains a germanium window.

Both the thermopile and the thermistor output a millivolt signal that most of our data loggers can measure. The data logger uses the Stefan-Boltzman equation to correct for the effect of sensor body temperature on the target temperature. The corrected readings yield an absolute accuracy of  $\pm 0.2^{\circ}\text{C}$  from  $-10^{\circ}$  to  $+65^{\circ}\text{C}$ .

### Field of View (FOV)

The SI-111 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.

*Note: Prior to November 2008, the SI-111 was named the IRR-P.*

## Specifications

|                                  |   |
|----------------------------------|---|
| Input Power                      | 2.5 V excitation (for thermistor)                       |
| Response Time                    | < 1 s (to changes in target temperature)                |
| Target Temperature Output Signal | 60 $\mu$ V per $^{\circ}$ C difference from sensor body |
| Body Temperature Output Signal   | 0 to 2500 mV  |
| Optics                           | Germanium lens  |
| Wavelength Range                 | 8 to 14 $\mu$ m (corresponds to atmospheric window)     |
| Field of View (FOV)              | 22 $^{\circ}$ half angle                                |
| Operating Temperature Range      | -55 $^{\circ}$ to +80 $^{\circ}$ C                      |

|                                   |   |
|-----------------------------------|---|
| Operating Relative Humidity Range | 0 to 100% RH  |
| Cable Description                 | 4.5 m (14.76 ft) twisted, shielded 4-conductor wire with Santoprene casing, ending in pigtails                                  |
| Absolute Accuracy                 | › $\pm$ 0.5 $^{\circ}$ C (-40 $^{\circ}$ to +70 $^{\circ}$ C)<br>› $\pm$ 0.2 $^{\circ}$ C (-10 $^{\circ}$ to +65 $^{\circ}$ C)  |
| Uniformity                        | › $\pm$ 0.3 $^{\circ}$ C (-40 $^{\circ}$ to +70 $^{\circ}$ C)<br>› $\pm$ 0.1 $^{\circ}$ C (-10 $^{\circ}$ to +65 $^{\circ}$ C)  |
| Repeatability                     | › $\pm$ 0.1 $^{\circ}$ C (-40 $^{\circ}$ to +70 $^{\circ}$ C)<br>› $\pm$ 0.05 $^{\circ}$ C (-10 $^{\circ}$ to +65 $^{\circ}$ C) |
| Diameter                          | 2.3 cm (0.9 in.)  |
| Length                            | 6 cm (2.4 in.)  |
| Weight                            | 190 g (6.7 oz)  |

For comprehensive details, visit: [www.campbellsci.com/si-111](http://www.campbellsci.com/si-111) 



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