METER

APOGEE IR RADIOMETER

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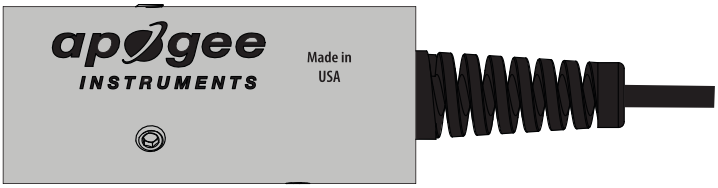
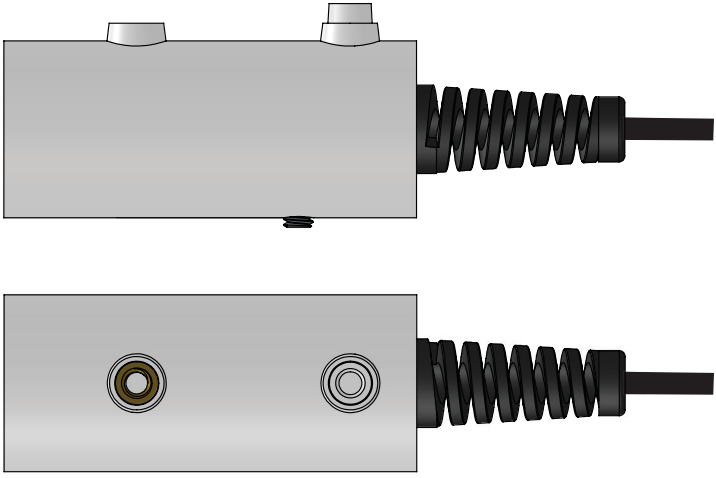
SI-400 Series



SIL-400 Series



1. INTRODUCTION

The SI and SIL series Infrared (IR) Radiometers from Apogee Instruments, Inc. are designed specifically for high-accuracy, noncontact, surface temperature measurements for environmental applications. The IR radiometers in the SI series have research-grade accuracy with uncertainty of ±0.2 °C over a wide range of temperatures and temperature differences. The SIL series are lower cost with commercial-grade uncertainty of ±0.5 °C over a more restrictive temperature range and are a great choice for many environmental monitoring applications.

Apogee IR radiometers purchased from METER come preconfigured by METER to work seamlessly with METER ZENTRA series data loggers. The information in this document explains how to integrate Apogee IR radiometers into the ZENTRA system. Details of how the ZENTRA system handles the data are also included. Please read this document carefully in its entirety before going out to the field.

For more information on the Apogee IR radiometers, please review the Infrared Radiometer User Manuals on the Apogee Infrared Radiometer product page (apogeeinstruments.com/infraredradiometer).

2. INSTALLATION

Follow the steps listed in Table 1 to install Apogee sensors in the field.

Table 1 Installation

Tools Needed	**Wrench** 13 mm (0.5 in)
	Wrench 11 mm (0.4375 in), for AM-250 mounting bracket only
	Mounting post 33.0 to 53.3 mm (1.3 to 2.1 in) diameter post, pole, tripod, tower, or other similar infrastructure that extends to the desired mounting height
	Mounting bracket Model AM-220 for SI series or AM-250 for SIL series (included in order)
	METER ZENTRA series data logger ZL6 or EM 60
	METER ZSC Bluetooth® Sensor Interface (optional)
	METER ZENTRA software ZENTRA Utility, ZENTRA Utility Mobile, or ZENTRA Cloud

Table 1 Installation (continued)

Preparation	**Conduct System Check** METER strongly recommends setting up and testing the system (sensors and data loggers) in the lab or office. Inspect and verify all components are intact. Visit the data logger product page for the most up-to-date software and firmware. Verify all sensors are functional and read within expected ranges. **Consider Field of View (FOV) Requirements** The measurement FOV of the IR radiometer will depend on mounting height, mounting angle, and the sensing half angle of the radiometer. Use the Apogee IRR Calculators (apogeeinstruments.com/irr-calculators) to help calculate the FOV from these parameters and help determine mounting height requirements to achieve the desired FOV.
Mounting	**Install on Mounting Post** Use the included bolts to mount the mounting bracket and the sensor at the needed angle (Section 2.1). Remove the green sensor protection cap. **Secure the System** Tighten the U-bolt or straight bolt to lock the sensor orientation. Tighten the U-bolt nuts by hand until hand-tight, and then tighten with a wrench. **CAUTION: Do not overtighten U-bolt.** **Secure and Protect Cables** **NOTE: Improperly protected cables can lead to severed cables or disconnected sensors. Cabling issues can be caused by many factors such as rodent damage, driving over sensor cables, tripping over cables, not leaving enough cable slack during installation, or poor sensor wiring connections.** Install cables in conduit or plastic cladding when near the ground to avoid rodent damage. Gather and secure cables between the sensors and the data logger to the mounting post in one or more places to ensure cable weight does not pull the plug free from its port. **Connect to Data Logger** Plug the sensor into a data logger. Use the data logger to make sure the sensor is reading properly. Verify these readings are within expected ranges. For more instructions on connecting to data loggers, refer to Section 2.2.

2.1 SET UP MOUNTING ASSEMBLY

IR radiometers must be mounted such that their FOV encompasses the surface of interest. Each IR radiometer purchased from METER comes with the appropriate mounting bracket that can be mounted to either a horizontal or vertical post, depending on which set of holes is used.

1. For the SIL series, the connector is already fully attached; skip to step 3.

   For the SI series, align the cable M8 connector pins with the sensor M8 connector holes and seat connectors fully.

2. Tighten the cable screw until hand-tight (Figure 1).

   M8 connectors are easy to overtighten. Do not use pliers or other tools to tighten this connector.

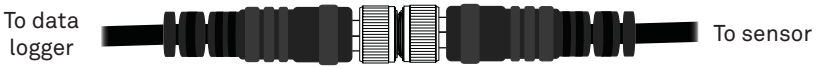


Figure 1 Attach M8 connector

3. Attach the mounting bracket either to a horizontal arm or vertical post using the included U-bolt.
4. Attach the sensor to the mounting bracket using the included U-bolt or straight bolt (Figure 2).

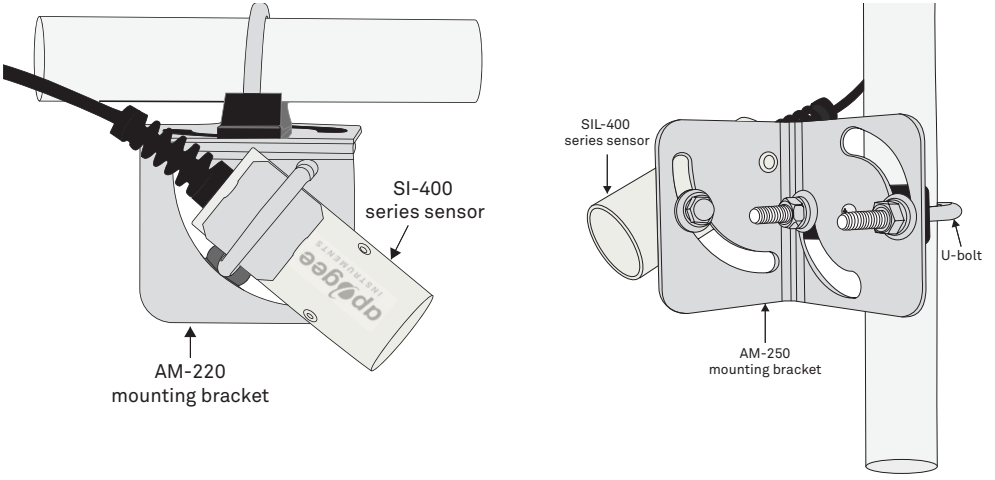


Figure 2 Apogee IR sensor and mounting bracket

5. Orient the sensor to the proper angle to achieve the desired FOV. Use the Apogee IRR Calculators (apogeeinstruments.com/irr-calculators) to help calculate FOV.

2.2 CONNECT TO METER ZENTRA SERIES LOGGER

The Apogee IR radiometers are preconfigured by METER and work seamlessly with METER ZENTRA series data loggers. The sensor comes with a 3.5-mm stereo plug connector (Figure 3) to facilitate easy connection with the data loggers. Apogee sensors come standard with a 5-m cable.

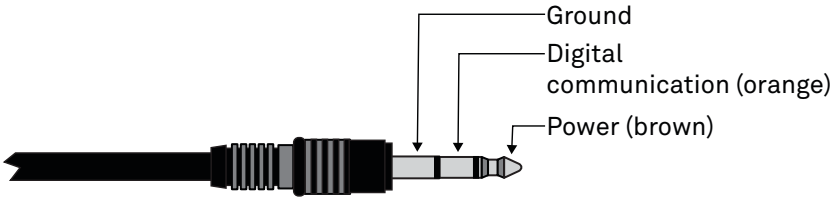


Figure 3 3.5-mm stereo plug connector wiring

Check the METER download webpage for the most recent data logger firmware. Logger configuration may be done using either ZENTRA Utility (desktop and mobile application) or ZENTRA Cloud (web-based application for cell-enabled ZENTRA data loggers).

1. Plug the stereo plug connector into one of the sensor ports on the logger (Figure 4).

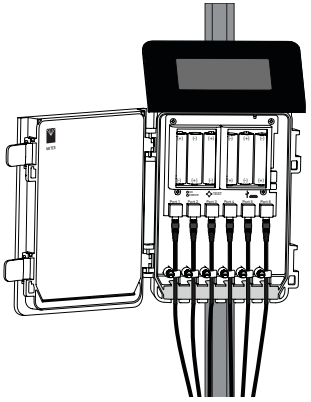


Figure 4 Logger connection

2. Connect to the data logger via ZENTRA Utility with a laptop and USB cable or ZENTRA Utility Mobile app with a mobile device supporting Bluetooth® communication.
3. Use ZENTRA Utility to scan the ports and make sure the sensors were properly identified by the logger and are reading properly.

   METER data loggers should automatically recognize the Apogee sensor.
4. Use ZENTRA Utility to set the measurement interval.
5. Use ZENTRA Utility to configure communication settings for data transfer to ZENTRA Cloud.

Sensor data can be downloaded from METER data loggers using either ZENTRA Utility or ZENTRA Cloud. Refer to the logger user manual for more information.

3. DATA INTERPRETATION

Apogee IR radiometers used with the ZENTRA system report target temperature and internal sensor temperature in units that are configurable by the user. Additionally, the sensor orientation information of the SIL-series commercial-grade IR radiometer is provided in the metadata tab of ZENTRA Cloud and ZENTRA Utility Microsoft® Excel® file downloads. Sensor orientation is reported as the zenith angle in units of degrees, with a zenith angle of 0° indicating a sensor oriented straight up.

4. TROUBLESHOOTING

This troubleshooting section details possible major problems and their solutions. If the problem is not listed or these solutions do not solve the issue, contact Customer Support.

Table 2 Troubleshooting

Problem	Possible Solution
Sensor not responding	Check power to the sensor and logger. Check sensor cable and stereo plug connector integrity. Check that the SDI-12 address of the sensor is `0` (factory default). Check this with ZENTRA Utility by going to Actions, select Digital sensor terminal, choose the port the sensor is on, and send the `?I!` command to the sensor from the dropdown menu.
Inaccurate target temperature	Remove dew or frost formation on the sensor optical filter. Remove any salt deposits (due to irrigation water or sea spray) accumulation on the filter, using a dilute acid (e.g., vinegar). Salt deposits cannot be removed with solvents such as alcohol or acetone. Clean dust and dirt from the aperture and the filter (usually a larger problem in windy environments). Dust and dirt are best removed with deionized water or rubbing alcohol. In extreme cases, remove the plastic radiation shield and clean the filter with acetone. Remove any spiders, insects, nests, or other debris in the aperture leading to the filter. Repellent should be applied around the aperture entrance (not on the filter).
Cable or stereo plug connector failure	If the stereo plug connector is damaged or needs to be replaced, contact Customer Support for a replacement connector or splice kit. If a cable is damaged refer to the METER wire-splicing guide for cable repair.

It is recommended that Apogee IR radiometer sensors are returned for recalibration every 2 years. Visit Apogee repairs (apogeeinstruments.com/recalibration-and-repairs) or contact Apogee Technical Support (techsupport@apogeeinstruments.com) for details.

5. CUSTOMER SUPPORT

NORTH AMERICA

Customer support representatives are available for questions, problems, or feedback Monday through Friday, 7:00 am to 5:00 pm Pacific time.

Email: support.environment@metergroup.com
sales.environment@metergroup.com

Phone: +1.509.332.5600

Fax: +1.509.332.5158

Website: metergroup.com

EUROPE

Customer support representatives are available for questions, problems, or feedback Monday through Friday, 8:00 to 17:00 Central European time.

Email: support.europe@metergroup.com
sales.europe@metergroup.com

Phone: +49 89 12 66 52 0

Fax: +49 89 12 66 52 20

Website: metergroup.de

If contacting METER by email, please include the following information:

Name	Email address
Address	Instrument serial number
Phone	Description of the problem

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METER Group, Inc. USA
2365 NE Hopkins Court Pullman, WA 99163
T: +1.509.332.2756 **F**: +1.509.332.5158
E: info@metergroup.com **W**: metergroup.com

METER Group AG
Mettlacher Straße 8, 81379 München
T: +49 89 1266520 **F**: +49 89 12665220
E: info.europe@metergroup.com **W**: metergroup.de