METER

APOGEE QUANTUM SENSOR

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apogee
INSTRUMENTS
Made in USA

1. INTRODUCTION

The SQ-521 Full-Spectrum Quantum sensor from Apogee Instruments, Inc. is a high-accuracy, single-band radiometer designed for continuous measurement of photosynthetic photon flux density (PPFD) or photosynthetically active radiation (PAR) measurement in indoor or outdoor environments. The Apogee Full-Spectrum Quantum sensor has nearly equal sensitivity across the spectral range from 389–692 nm (PAR band is 400–700 nm) and is therefore a good choice for both above- and below-canopy measurement in outdoor environments and also for indoor environments, where artificial light sources are used.

The information in this document explains how to install the required hardware to mount Apogee SQ-521 sensors that have been preconfigured by METER Group to work seamlessly with METER ZENTRA series data loggers. 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 Full-Spectrum Quantum Sensor, please review the SQ-521 User Manual on the Quantum Sensor product page (apogeeinstruments.com/sq-521-ss-sdi-12-digital-output-full-spectrum-Quantum-sensor).

2. INSTALLATION

Follow the steps listed in Table 1 to install Apogee sensors in the field. A cable, mounting bracket, leveling plate, and screws are included with the sensor. Other tools will need to be provided.

Table 1 Installation

Tools Needed	**Wrench** 13 mm (0.5 in) **Flathead screwdriver** **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 above the canopy **Mounting bracket + leveling plate** Model AL-120 **Nylon screw** #10-32 x 3/8 in (included) **METER ZENTRA series data logger** ZL6 or EM60 **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 the Surroundings** For measurement of incoming PPFD in the outdoor environment, choose a location that allows the sensor to be above the plant canopy or in a position where the view of the sky is unobstructed (such as a large canopy gap or forest clearing). Ensure the sensor is not shaded from nearby objects (weather stations, mounting posts, etc.).
Mounting	**Install on Mounting Post** Use the U-bolt to mount the mounting bracket and sensor assembly (Section 2.1). The U-bolt is compatible with most meterological stands, poles, tripods, and other mounts. Ensure the sensor is oriented so the cable points toward true North (in the Northern hemisphere) or true South (in the Southern hemisphere) to reduce azimuth error. **Secure the System** Tighten the U-bolt nuts by hand until hand-tight, and then tighten with a wrench. **CAUTION: Do not overtighten U-bolt.** Adjust the three machine screws on the leveling plate until the integrated bubble level indicates that the sensor is level **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

The Apogee Quantum sensor must be level to accurately measure PPFD incident on a horizontal surface. Each Apogee Quantum sensor purchased from METER comes with an AL-120 Solar Mounting Bracket with Leveling Plate. The AL-120 can be mounted to either a horizontal or vertical post, depending on which set of holes is used.

1. 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.

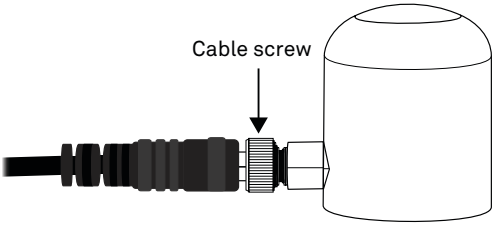

Figure 1 Attach M8 connector

3. Mount the sensor to the leveling plate (Figure 2) with the included nylon screw.

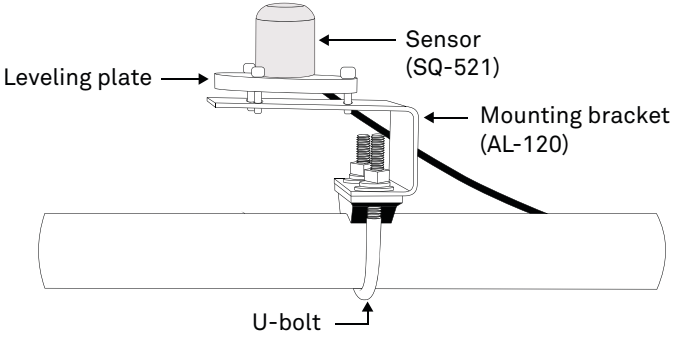

Figure 2 Apogee Quantum sensor mounting assembly

4. Attach the leveling plate to the mounting bracket using the included three machine screws.
5. Attach the mounting bracket either to a horizontal arm (Figure 2) or vertical post using the included U-bolt.

2.2 CONNECT TO METER ZENTRA SERIES LOGGER

The Apogee Quantum sensor is preconfigured by METER and works 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.

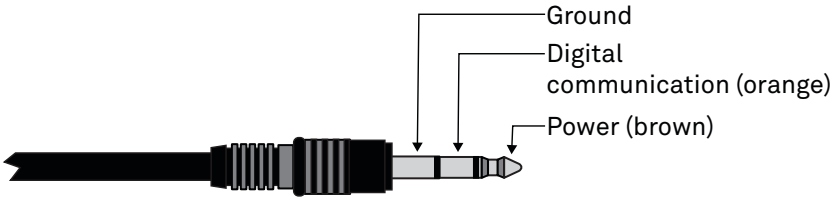

Figure 3 3.5-mm stereo plug connector wiring

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).

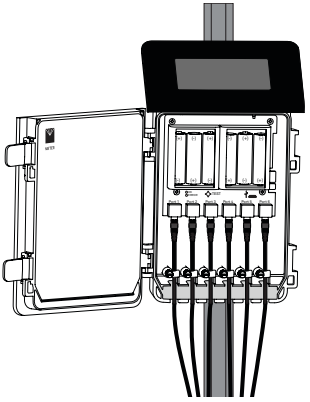

Figure 4 Logger connection

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

The Apogee Quantum sensors used with the ZENTRA system report PPFD in units of micromoles per square meter per second (µmol/m^2/s). Additionally, the sensor orientation information 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.
Sensor values are not reasonable	Verify the sensor is not shaded. Verify the angle of sensors.
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 Quantum sensors are returned for factory 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

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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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