

BIOLOGICAL STUDIES SECTION
STANDARD OPERATING PROCEDURES MANUAL
(SOP)

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Methods for Measuring Water Transparency

Personnel of the Office of Water Management obtain measurements of water transparency in one of two ways. The instrument most often used to obtain these measurements is the Secchi Disk. A more precise measurement of light penetration includes the use of a spherical quantum sensor (LI-COR LI-1938). Instructions on the use of each of these instruments is detailed below.

I. Secchi Disk

The Secchi Disk commonly used is a circular metal plate 20 cm in diameter, with the upper surface divided into four equal quadrants, alternately painted black and white. A line is attached to the center and graduated in either English or metric units.

The Secchi Disk is lowered into the water column until it just disappears and then raised till it again reappears. The average of the readings obtained when it disappears and when it reappears is referred to as the Secchi Disk Depth.

Some important considerations must be kept in mind. Sunglasses should not be worn, and testing should be done in the shade if possible. Different observers, time of day, degree of roughness of the water, and clearness of the atmosphere will affect readings. Therefore, all Secchi Disk records should carry full information on the above items. Standardizing as many of these factors as possible will assist in making the data more comparable.

Further information can be found in Welch (1948).

II. LI-193B Spherical Quantum Sensor

Use of Spherical Quantum Sensor

The LI-193SB Spherical Quantum Sensor is used for measuring Photosynthetically Active Radiation (PAR) in aquatic environments, and specifically the photosynthetic Photon Flux Fluence Rate (PPFFR). The LI-193SB gives an added dimension to underwater PAR measurements in that it measures PAR from all directions. The LI-193SB Sensor can also be used in air.

The sensor connector should be lubricated with silicone grease before mating it to the 2222UWB Cable to provide a waterproof seal. The connector pins are small, and care should be exercised when mating the connectors to prevent damage. The yellow dots on the connectors must be aligned to assure proper connections.

For mounting purposes, the sensor has three 6-32 threaded mounting holes on the underside. It is recommended that the LI-192SB Sensor be attached at all times to a suitable mount such as the LI-COR Lowering Frame for protection from impact breakage. NOTE: DO NOT USE LI-COR 2222UWB UNDERWATER CABLE TO SUPPORT THE SENSOR AND LOWERING FRAME, AS DAMAGE TO THE CABLE CAN RESULT. AN AUXILIARY CABLE SHOULD BE USED FOR SUPPORTING THE LOWERING FRAME AND SENSOR. IN ADDITION, THE 2222UWB CABLE SHOULD NOT BE BENT SHARPLY NEAR THE SENSOR. This auxiliary cable needs to be marked in depth increments (e.g., every foot) along its total length. The sensor should be allowed to equilibrate at each depth before readings are taken. Readings are taken by turning the function knob to the Quantum/Millivolt selector and adjusting the range to the lowest usable scale to insure the most accurate readings. As the sensor is lowered through the water column continual adjustment of the range selector will be needed.

Care should be taken to make readings throughout the water column under comparable conditions. Readings taken when the sun is alternately covered and uncovered by clouds will not provide information suitable for use.

The acrylic diffuser is sealed to the metal housing with an O-Ring, and may be removed without affecting the calibration constant. However, the metal housing should not be disassembled as the calibration constant may be affected. Also, the connector should not be removed from the metal housing. Sensor design has been tested for water leakage and implosion to withstand 500 psi so that it may be used to a depth of 300 meters. Further information can be found in the manual supplied from the manufacturer.

Reference

Welch, P.S., 1948. Limnological Methods. Country Life Press, Garden City, N.Y., pp. 159-167.