EPLAB

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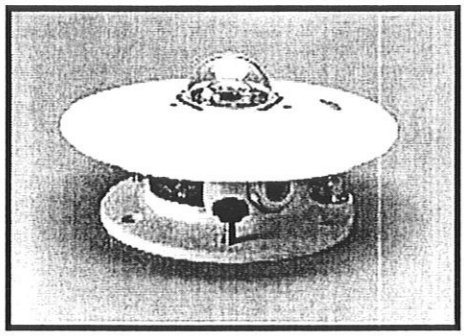
PRECISION SPECTRAL PYRANOMETER, MODEL PSP
Instruction Sheet



Introduction

The measuring of Atmospheric Radiation is generally divided in to two distinct spectral regions: the solar (shortwave) region and the terrestrial (longwave) region.

Solar radiation is a term used to describe visible and near-visible (ultraviolet and near-infrared) radiation emitted from the sun. The different regions are described by their wavelength range within the broad band range of 0.20 to 4.0 μm (microns). Terrestrial radiation is a term used to describe infrared radiation emitted from the atmosphere. The following is a list of the components of solar and terrestrial radiation and their approximate wavelength ranges:

Ultraviolet:	0.20 - 0.39 μm
Visible:	0.39 - 0.78 μm
Near-IR:	0.78 - 4.00 μm
Infrared:	4.00 - 100.00 μm

Approximately 99% of the solar radiation at the earth's surface is contained in the region from 0.3 to 3.0 μm while most of infrared radiation is contained in the region from 4.0 to 50 μm. Shortwave radiation is measured using pyranometers and pyrheliometers while longwave radiation is measured using a pyrgeometer.

Precision Spectral Pyranometer

Congratulations on your purchase of the Precision Spectral Pyranometer, Model PSP. The PSP is a Secondary Standard Pyranometer used for the precise measurement of Global Shortwave Radiation. National Meteorological Authorities, Universities and Research Institutes use this instrument in worldwide networks such as the Atmospheric Radiation Measurement (ARM) Program, the Baseline Surface Radiation Network (BSRN) and the Global Atmospheric Watch (GAW). It is equally suitable for the measurement of Reflected Shortwave Radiation (Albedo) or Diffuse Shortwave Radiation. Various shading devices are available from the Eppley Laboratory.

The PSP incorporates a wirewound thermopile with a temperature compensation circuit providing the PSP with an excellent temperature dependence (see Temperature Dependence Curve supplied with the Calibration Certificate). The PSP is supplied with a pair of WG295 Schott Glass Hemispheres with a uniform transmission between 285-2800 nm (nanometers).

Installation and Maintenance

The PSP should be free from obstructions (artificial and natural) above the plane of the sensing element. If this is not possible, the site selected should be as free as possible, especially to the south (in the Northern Hemisphere). The PSP should be located so that (a) no shadows (e.g. radio masts, buildings, trees, etc.) will be cast on it; (b) it is not too close to light-colored walls or other objects likely to reflect sunlight onto it; and (c) it is not exposed to artificial radiation sources. An accessible flat roof usually provides a good location for mounting the instrument.

In the case of a downward-looking PSP for the measurement of reflected radiation (albedo), the field of view should also be as free from obstructions as possible. A long boom with the PSP extending south of the stand will often be used to minimize the obstruction/shading (in the Northern Hemisphere).

The pyranometer should be securely attached to whatever mounting stand is decided upon, using the holes provided in the instrument's baseplate (4 ¾" diameter bolt circle) and, at the same time, leveling it with the adjustable leveling screws provided. By convention, the connector should face north in the Northern Hemisphere and south in the Southern Hemisphere. The stand should be sufficiently rigid to prevent the instrument from moving, especially in high winds.

The PSP produces a millivolt analog signal that is directly proportional to the irradiance being measured. Each instrument is provided with a Calibration Constant (Sensitivity) which, when divided into the signal, results in the Irradiance in watts per square meter (Wm^{-2}). Eppley recommends connecting the PSP to a Data Acquisition System or voltmeter using weather proof cabling (No. 22 gauge, twisted, shielded pair) such as Beldin 8761. A Bendix/Amphenol, 4-pin mating connector is supplied with the instrument. For easy disassembly of the mating connector, unscrew the outer most section while it is connected to the pyranometer.

The pin designations are as follows:

PIN	A	Thermopile Output (-)
	B	Thermopile Output (+)
	C	Case Ground (Shield)
	D	Not Used

Refer to the Datalogger's Instructions for connecting the cable to the datalogger.

Pyranometers in continuous operation should be inspected often (daily if possible). At these inspections, the hemisphere should be cleaned with a lint-free soft cloth, being careful not to scratch the surface. Particular care should be used in environments that may leave traces of salt, soot, sand, etc. Such abrasions can scratch the hemisphere and alter the original transmission properties of the glass. If frozen snow, glazed ice, hoarfrost or rime is present, an attempt should be made to remove the deposit carefully with warmed cloths. The desiccator should be inspected and if the silica gel is pink or white in color, it should be replaced or rejuvenated by drying in an oven at about 135°C for a few hours. The spirit level should be inspected regularly to ensure the instrument is level.

Some meteorological networks have had success in keeping the hemispheres free from frost, snow, dew, and moisture build-up by using Eppley ventilators, Model VEN, to continuously blow air over both the instrument case and hemisphere.

Calibration

These pyranometers are calibrated in an integrating hemisphere (artificial sky) where a diffuse radiation of approximately 700 watts/meter^2 is produced by a series of tungsten-filament lamps totaling about 5 KVA in power. The ambient temperature is maintained at approximately +25°C. The comparison reference is a working standard pyranometer calibrated against Eppley AHF Cavity Pyrheliometers that participate in the International Pyrheliometric Comparisons (IPC) every five years. Newport calibrations of the Precision Spectral Pyranometer reproduce the WRR to within ±1%. Eppley recommends a minimum calibration cycle of 5 years (in conjunction with the WRR) but encourages annual calibration for the highest measurement accuracy.

Consistency of the pyranometers' calibrations can be checked in the field by preserving a similar (calibrated) pyranometer for this purpose and occasionally (e.g. once per year) comparing it with the field instruments, side-by-side in sunlight, on a cloudless day.