



Title: NEON Sensor Command, Control and Configuration (C3) Document: Direct and Diffuse Shortwave Radiation		Date: 05/16/2022
NEON Doc. #: NEON.DOC.000610	Author: M. SanClements	Revision: B

NEON SENSOR COMMAND, CONTROL AND CONFIGURATION (C3) DOCUMENT: DIRECT AND DIFFUSE SHORTWAVE RADIATION

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1 DESCRIPTION

1.1 Purpose

This document specifies the command, control, and configuration details for operating the sunshine pyranometer used for direct and diffuse shortwave radiation observations. It includes a detailed discussion of all necessary requirements for operational control parameters, conditions/constraints, set points, and any necessary error handling. All Level 0 Data Products generated by the sensor should be identified. The raw data are compensated by the DAS, but received at HQ for further processing as L0 unfiltered and uncorrected data product until its associated algorithms are applied to produce a QA/QC'd L1 data product in Standard Scientific Units.

1.2 Scope

The expectation is that the Delta-T Devices SPN1 Sunshine Pyranometer (NEON P/N: 0300050000; firmware version 1.05) will be used to make the measurements of direct and diffuse shortwave radiation, and sunshine presence (AD [04]). The reference documents for the Delta-T Devices SPN1 Sunshine Pyranometer are RD [03] and RD [04].

This document specifies the command, control, and configuration that are needed for operating this sensor. It does not provide implementation details, except for cases where these stem directly from the sensor conditions as described here.



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2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

AD [01]	NEON.DOC.000001	NEON Observatory Design (NOD) Requirements
AD [02]	NEON.DOC.000291	NEON Configured Sensor List
AD [03]	NEON.DOC.005004	NEON Level 1-3 Data Products Catalog
AD [04]	NEON.DOC.005005	NEON Level 0 Data Products Catalog
AD [05]	NEON.DOC.XXXXXX	NEON Direct and Diffuse Radiation ATBD (TBW)

2.2 Reference Documents

RD [01]	NEON.DOC.000008	NEON Acronym List
RD [02]	NEON.DOC.000243	NEON Glossary of Terms
RD [03]	Delta-T Devices Ltd. User Manual for the Sunshine Pyranometer type SPN1. John Wood. Version 1.0 June, 2007. Delta-T Devices Ltd. 130 Low Road, Burwell Cambridge CB25 OEJ, UK.	
RD [04]	Delta-T Devices Ltd. SPN1 Sunshine Pyranometer Quick Start Guide. Version 2.0 June, 2007. Delta-T Devices Ltd. 130 Low Road, Burwell Cambridge CB25 OEJ, UK.	

2.3 Acronyms

Acronym	Explanation
ATBD	Algorithm Theoretical Basis Document
C ³	Command, Control, and Configuration Document
SOP	Standard Operating Procedures
QA/QC	Quality Assurance/Quality Control
TIS	Terrestrial Instrument System
L0	Level 0
L1	Level 1
ENG	NEON Engineering group
CI	NEON Cyberinfrastructure group
DPS	NEON Data Products group
CVAL	NEON Calibration, Validation, and Audit Laboratory
SW _T	Total shortwave radiation
SW _D	Diffuse shortwave radiation
T _E	SPN1 Pyranometer internal thermostat temperature

2.4 Verb Convention

“Shall” is used whenever a statement expresses a convention that is binding. The verbs “should” and “may” express non-mandatory provisions. “Will” is used to express a declaration of purpose on the part of the design activity.



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3 INTRODUCTION

The sensor configuration and sensor command and control described here are related to the direct and diffuse shortwave Level 0 data products: total radiation, diffuse radiation, sun presence flag as listed below and in (AD[03]). A description of how sensor readings shall be converted to direct and diffuse shortwave radiation in $W\ m^{-2}$ is presented in the associated ATBD (AD[05]). Data products are listed in **Table 1**; “N” refers to the top level of the tower.

Table 1. L0 Data Products

L0 Data Product	NEON	DOM	SIT	DPL	PRN	REV	SPN	HOR	VER	REP
Total SW Radiation	NEON.	DXX.	XXX.	DPO.	00014.	001.	001.	001.	00N.	001
Diffuse SW Radiation	NEON.	DXX.	XXX.	DPO.	00014.	001.	002.	001.	00N.	001
Sun Presence Flag	NEON.	DXX.	XXX.	DPO.	00014.	001.	003.	001.	00N.	001



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4 OVERVIEW OF SENSOR CONFIGURATION

The total and diffuse shortwave radiation output shall be unfiltered and uncorrected $W\ m^{-2}$. The sun presence data acquisition streams will be in the format (0 or 1).

Table 2. Sensor configuration settings.

Parameter	Default Setting
Heater	Run
Total and diffuse SW radiation: Acquisition rate	1 Hz
Data acquisition streams	Total shortwave radiation (SW_T); Diffuse shortwave radiation (SW_D); Sun presence
Measurement mode cycle	Data acquisition requires a continuous sensor input cycle of R (wakes sensor and allows for additional inputs); I (this is the status information code which defines the output units as $W\ m^{-2}$ and relays the instrument serial number); S (sends the current reading in comma separated ASCII in the format <i>tttt.t, dddd.d, s</i> where total and diffuse readings are in $W\ m^{-2}$ and sunshine presence is 0 or 1)



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5 COMMAND AND CONTROL

5.1 Error Handling

This sensor provides no error notification.

5.2 Sensor <device> Controls Specification

The Delta-T Devices SPN1 Sunshine Pyranometer has an internal thermostat-controlled heater to prevent condensation and frost. This sensor heater device provides no heater flag and operates independently of external command and control as detailed by the manufacturer specifications in RD [03].



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6 ASSEMBLY INTEGRATION

N/A



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7 BIBLIOGRAPHY

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