



<i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		<i>Date:</i> 05/16/2022
<i>NEON Doc. #:</i> NEON.DOC.001300	<i>Author:</i> J. Roberti	<i>Revision:</i> C

NEON SENSOR COMMAND, CONTROL AND CONFIGURATION (C3) DOCUMENT: SOIL THROUGHFALL

PREPARED BY	ORGANIZATION	DATE
Josh Roberti	FIU	12/10/2015

APPROVALS	ORGANIZATION	APPROVAL DATE
Kate Thibault	SCI	05/16/2022

RELEASED BY	ORGANIZATION	RELEASE DATE
Tanisha Waters	CM	05/16/2022

See configuration management system for approval history.



Title: NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		Date: 05/16/2022
NEON Doc. #: NEON.DOC.001300	Author: J. Roberti	Revision: C

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	07/14/2014	ECO-01340	Initial Release
B	01/13/2016	ECO-03566	Revise document using the new C3 document template. Updated DP numbers to new format
C	05/16/2022	ECO-06818	<ul style="list-style-type: none">Revised NEON logo and fine print



Title: NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		Date: 05/16/2022
NEON Doc. #: NEON.DOC.001300	Author: J. Roberti	Revision: C

TABLE OF CONTENTS

1 DESCRIPTION..... 1

1.1 Purpose..... 1

1.2 Scope..... 1

2 RELATED DOCUMENTS AND ACRONYMS..... 2

2.1 Applicable Documents..... 2

2.2 Reference Documents..... 2

2.3 Acronyms..... 2

3 SOIL THROUGHFALL COLLECTOR, TIPPING BUCKET INTRODUCTION (cf04550000) 3

4 SOIL THROUGHFALL COLLECTOR, TIPPING BUCKET OVERVIEW OF SENSOR CONFIGURATION (cf04550000)..... 4

5 SOIL THROUGHFALL COLLECTOR, TIPPING BUCKET COMMAND AND CONTROL (cf04550000) 5

5.1 Error Handling..... 5

5.2 Sensor Controls Specification..... 5

6 ASSEMBLY INTEGRATION..... 6

7 APPENDIX..... 7

7.1 List of Level 0 Data Product..... 7

7.2 Assembly Schematic Drawing..... 9

8 BIBLIOGRAPHY.....10

LIST OF TABLES

Table 1. Sensor configuration settings..... 4

Table 2. List of Level 0 data product associated with DPName: soil throughfall 8



Title: NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		Date: 05/16/2022
NEON Doc. #: NEON.DOC.001300	Author: J. Roberti	Revision: C

1 DESCRIPTION

1.1 Purpose

This document specifies the command, control, and configuration details for operating a NEON sensor used for instrumental 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.

1.2 Scope

Met One’s 372C non-heated tipping bucket (RD [03], RD [04]) will be used throughout NEON’s Observatory to monitor soil throughfall. Each tipping bucket will be accompanied by trough-type collectors. There is no firmware associated with these sensors because they are analog devices. 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.

A complete set of the Level 0 data products generated in this document can be found in appendix.

The soil throughfall assembly will consist of following Data Generating Device (DGD) based on Data Generating Device DGD List and Hierarchies doc (AD [05]):

DGD Agile PN	DGD Agile Description
CF04550000	Assembly, Soil Throughfall Collector, Tipping Bucket

Further detailed sensor info under each DGD is as following:

1. Under CF04550000:
 - a. NEON PN #: CF06900000
 - b. sensor description: Subsystem, throughfall precipitation, soil



Title: NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		Date: 05/16/2022
NEON Doc. #: NEON.DOC.001300	Author: J. Roberti	Revision: C

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

Applicable documents contain information that shall be applied in the current document. Examples are higher level requirements documents, standards, rules and regulations.

AD [01]	NEON.DOC.000001	NEON Observatory Design (NOD) Requirements
AD [02]	NEON.DOC.000291	NEON Configured Sensor List
AD [03]	NEON.DOC.005003	NEON Scientific Data Products Catalog
AD [04]	NEON.DOC.005005	NEON Level 0 Data Products Catalog
AD [05]	NEON.DOC.001104	Data Generating Device DGD List and Hierarchies
AD[06]	NEON.DOC.001963	NEON Algorithm Theoretical Basis Document for Throughfall

2.2 Reference Documents

Reference documents contain information complementing, explaining, detailing, or otherwise supporting the information included in the current document.

RD [01]	NEON.DOC.000008	NEON Acronym List
RD [02]	NEON.DOC.000243	NEON Glossary of Terms
RD [03]	Met One Instruments. 2005. Operational Manual: Model 375C 8" Rain Gauge. Document # 375C-9800.	
RD [04]	Met One Instruments. 2010. 370 – 380 Series Precipitation Gauges (datasheet).	

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



<i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		<i>Date:</i> 05/16/2022
<i>NEON Doc. #:</i> NEON.DOC.001300	<i>Author:</i> J. Roberti	<i>Revision:</i> C

3 SOIL THROUGHFALL COLLECTOR, TIPPING BUCKET INTRODUCTION (CF04550000)

The United States Geological Survey (USGS; 2009) defines throughfall as precipitation that falls directly to the ground or rainwater / snowmelt that falls through the canopy. Measuring throughfall is of importance for hydrologic and ecologic communities because its chemical composition varies greatly than that of precipitation (Likens and Bormann 1995) and it is used as an indirect way to measure interception. Interception is defined as the amount of precipitation that evaporates or is absorbed by trees (Leonard 1961). This document describes the configuration, command and control related with the throughfall collectors and their corresponding data products (**Table 1**). For information regarding maintenance or topics concerning computer algorithms, please refer to the SOP (AD [5]) and ATBD (AD [6]) documents, respectively.



Title: NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		Date: 05/16/2022
NEON Doc. #: NEON.DOC.001300	Author: J. Roberti	Revision: C

4 SOIL THROUGHFALL COLLECTOR, TIPPING BUCKET OVERVIEW OF SENSOR CONFIGURATION (CF04550000)

Met One's 372C precipitation gauge configurations are presented in **Table 1**.

Table 1. Sensor configuration settings.

Parameter	Default Setting
Data acquisition streams	Tip (reed closure / pulses)
Acquisition rate	N/A
Tipping threshold	0.5 mm



<i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		<i>Date:</i> 05/16/2022
<i>NEON Doc. #:</i> NEON.DOC.001300	<i>Author:</i> J. Roberti	<i>Revision:</i> C

5 SOIL THROUGHFALL COLLECTOR, TIPPING BUCKET COMMAND AND CONTROL (CF04550000)

5.1 Error Handling

Met One's tipping buckets do not output error statuses. In the event of no sensor output or erroneous data readings, manual repairs to the tipping bucket and/or wiring shall be completed.

5.2 Sensor Controls Specification

N/A



<i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		<i>Date:</i> 05/16/2022
<i>NEON Doc. #:</i> NEON.DOC.001300	<i>Author:</i> J. Roberti	<i>Revision:</i> C

6 ASSEMBLY INTEGRATION

N/A



<i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		<i>Date:</i> 05/16/2022
<i>NEON Doc. #:</i> NEON.DOC.001300	<i>Author:</i> J. Roberti	<i>Revision:</i> C

7 APPENDIX

7.1 List of Level 0 Data Product



<i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		<i>Date:</i> 05/16/2022
<i>NEON Doc. #:</i> NEON.DOC.001300	<i>Author:</i> J. Roberti	<i>Revision:</i> C

Table 2. List of Level 0 data product associated with DPName: soil throughfall

DGD Agile PN	DPNumber	fieldName	description	Acquisition frequency (Hz)	dataType	units
CF04550000	NEON.DOM.SITE.DP0.00006.001.01896.HOR.VER.000	TFPrecipBucketTips	Indicator of throughfall precipitation bucket tips	N/A	integer	N/A



<i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		<i>Date:</i> 05/16/2022
<i>NEON Doc. #:</i> NEON.DOC.001300	<i>Author:</i> J. Roberti	<i>Revision:</i> C

7.2 Assembly Schematic Drawing

N/A



Title: NEON Sensor Command, Control and Configuration (C3) Document: Soil Throughfall		Date: 05/16/2022
NEON Doc. #: NEON.DOC.001300	Author: J. Roberti	Revision: C

8 BIBLIOGRAPHY

Likens, G. E., and F. H. Bormann, 1995: *Biogeochemistry of a Forested Ecosystem*. Springer – Verlag, 159 pp.

Leonard, R. E., 1961: Interception of Precipitation by Northern Hardwoods. Station Paper No. 159, Northeastern Forest Experiment Station, USDA Forest Service, Upper Darby, PA, 16 pp.

United States Geological Survey (USGS), 2012: General Introduction and Hydrologic Definitions. [Available online at <http://water.usgs.gov/wsc/glossary.html>]