

Title: NEON Sensor Command, Control, and Configuration: Multisonde/CDOM		Date: 02/19/2014
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NEON SENSOR COMMAND, CONTROL, AND CONFIGURATION: MULTISONDE/CDOM

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Change Record

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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	External References	2
2.4	Acronyms	2
3	INTRODUCTION	3
4	OVERVIEW OF SENSOR CONFIGURATION	3
5	COMMAND AND CONTROL	4
5.1	Error handling	4
5.2	Sensor controls specification	4
5.3	Rationale for wipers.....	4
6	ASSEMBLY INTEGRATION	4
7	APPENDIX & BIBLIOGRAPHY	4

LIST OF TABLES AND FIGURES

Table 1.	L0 data products acquired from YSI EXO2 Multiparameter Water Quality Sonde (Multisonde) ...	3
Table 2.	Sensor configuration settings	3

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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

This document specifies the command, control, and configuration settings that are needed for operating the YSI EXO2 Multiparameter Water Quality Sonde (Multisonde); used to make measurements of surface water temperature, surface water conductivity, surface water pH, surface water dissolved oxygen, surface water turbidity, and surface water chlorophyll in lakes and streams. The multisonde is a central sensor body that holds individual sensors for each measurement parameter listed below. The multisonde sensors hold their calibration constants within internal memory inside each sensor and perform the analog to digital data conversion internally before any data output occurs.

SENSOR MEASUREMENT	NEON PN	FIRMWARE VER.
Multisonde Body without Sensors 0-10m depth	0320170020	1.0.9
Multisonde Body without Sensors 0-100m depth	0320170021	1.0.9
Multisonde Central Wiper	0320020007	1.1.3
Surface water Temperature	0320020001	1.1.3
Surface water Conductivity	0320020001	1.1.3
Surface water pH	0320020015	1.1.0
Surface water Dissolved Oxygen	0320020003	1.1.0
Surface water Turbidity	0320020004	1.1.0
Surface water Chlorophyll a	0320020005	1.1.0
Surface water Chromophoric Dissolved Organic Matter	0320020006	1.1.0

This document specifies the command, control, and configuration that is 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. No command and control is required at the time of deployment. Only sensor configuration is required at the time of deployment.

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
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.001167	ATBD for Multisonde (TBW)

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

2.3 External References

External references contain information pertinent to this document, but are not NEON configuration-controlled. Examples include manuals, brochures, technical notes, and external websites.

ER [01]	YSI EXO Multisonde Manual Item# 603789REF Revision B
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2.4 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
AIS	Aquatic Instrument System
L0	Level 0
L1	Level 1
ENG	NEON Engineering group
CI	NEON Cyber infrastructure group
DPS	NEON Data Products group
CVAL	NEON Calibration, Validation, and Audit Laboratory
WTEMP	Water Temperature
CDOM	Chromophoric Dissolved Organic Matter
fDOM	Fluorescent Dissolved Organic Matter
DO	Dissolved Oxygen
COND	Actual Conductivity

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3 INTRODUCTION

The sensor configuration and sensor command and control described here are related to the stream and lake water Temperature, Actual Conductivity, pH, Dissolved Oxygen, Turbidity, Chlorophyll a, CDOM . As mentioned above the analog to digital conversion, as well as the conversion to calibrated units is performed within the multisonde prior to output of the data for ingestion by the data acquisition system. Table 1 below details the data measurements streams and associated L0 data product ID's.

Table 1. L0 data products acquired from YSI EXO2 Multiparameter Water Quality Sonde (Multisonde)

Parameters	L0 data products
Temperature*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Conductivity*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
pH*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Dissolved Oxygen*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Dissolved Oxygen*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Turbidity*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Chlorophyll a*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
CDOM*	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX

* As of Rev A of this document, the AQU data products catalog is TBW. This table will be updated when that catalog becomes available.

4 OVERVIEW OF SENSOR CONFIGURATION

Data coming from the sensors is defined in Table 1, above. Table 2 below details the Data Streams coming from the sensors, the required data collection frequency, the units coming directly from the sensor, and base units.

Table 2. Sensor configuration settings

DATA STREAMS	DATA COLLECTION FREQUENCY	DATA STREAM UNITS
Central Wiper Position	1/60 Hz	V
Barometric Pressure**	1/300 Hz	bar
Surface Water Pressure Transducer	1/300 Hz	bar
Surface Water Temperature	1/300 Hz	degrees C
Surface Water Conductivity	1/300 Hz	μSiemens/cm
Surface Water pH	1/300 Hz	pH units
Surface Water pH	1/300 Hz	mV
Surface Water Dissolved Oxygen	1/300 Hz	mg/L
Surface Water Dissolved Oxygen	1/300 Hz	% air saturation
Surface Water Turbidity	1/300 Hz	NTU
Surface Water Chlorophyll a	1/300 Hz	ug/L
Chromophoric Dissolved Organic Matter	1/300 Hz	QSU
Chromophoric Dissolved Organic Matter	1/300 Hz	raw
Date and time	1/60 Hz	TBD

* Quinine Sulfate Units

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5 COMMAND AND CONTROL

Biofouling is anticipated to occur at all aquatic sites in the NEON Domains to varying degrees. Biofouling is caused by the buildup of algae and other surface films that will grow or are deposited on the optical lenses of the sensors. The multisonde has a central wiper that will need to be programmed to operate 1 minute +/- 15 seconds before the data collection takes place from the sensors to wipe the optics and ensure quality data is collected. The central wiper is configured with a potentiometer that reports voltage (V) as a function of position of the wiper head as a sensor output from this unit.

5.1 Error handling

The multisonde sensor set does not report errors that need to be addressed.

5.2 Sensor controls specification

The sonde will be configured in the RS-232 menu to the above sensor configuration. The sonde will receive a query by the location controller. The sonde responds with the preconfigured data stream.

5.3 Rationale for wipers

Wipers are required to remove biofouling from optical lenses of the sensors. The wipers will be programmed using the KOR software (Proprietary software written by YSI for use with the YSI EXO multisondes) to operate once every 12 samples which equates to the wiper running once per hour. No programming will be required on the Location Controller side for programming the wiper.

6 ASSEMBLY INTEGRATION

This occurs but is handled by the sensors internally in the multisonde body and data output from the multisonde has already been converted from analog to digital signal with calibration constants applied. This sensor reports raw data values for pH, Turbidity, Chlorophyll a, fDOM, and Wiper Position.

7 APPENDIX & BIBLIOGRAPHY

YSI EXO Multisonde Manual Item# 603789REF Revision B

<http://www.ysi.com/media/pdfs/YSI-EXO-Brochure.pdf>

<http://www.exowater.com/manuals-software.php>