NEON SENSOR COMMAND, CONTROL AND CONFIGURATION (C3) DOCUMENT: MULTISONDE, STREAM

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See configuration management system for approval history.

The National Ecological Observatory Network is a project solely funded by the National Science Foundation and managed under cooperative agreement by Battelle. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	02/19/2014	ECO-01541	Initial release
B	05/12/2016	ECO-03752	Expand the number of data streams collected from the Multisonde
C	12/07/2016	ECO-04311	Revision of the tables for the multisonde to link the individual probes to Data Product Numbers
D	06/02/2017	ECO-04760	Revision to include the firmware version and update RAW BGA units to percent.
E	09/03/2019	ECO-06249	Updated firmware versions, inclusion of signal output adapter.
F	01/17/2020	ECO-06351	Added information about Averaging options in the configuration of the body.
G	08/11/2021	ECO-06613	Updated to add part numbers for stream sensors without chla probes, removed raw streams, updated KorEXO software version, DO % saturation local stream added.
H	03/22/2022	ECO-06793	• Minor formatting updates
J	08/15/2022	ECO-06861	Updated firmware numbers for body and turbidity probe

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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 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 multisonde assemblies exist in three instances and 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
HB07530000	YSI EXO2 Multisonde with FDOM
HB07530010	YSI EXO2 Multisonde with no FDOM
0320170001	Conductivity/Temperature – YSI EXO sonde
0320170003	Dissolved Oxygen (Optical) – use with YSI EXO sonde
0320170004	Turbidity, use with YSI EXO sonde
0320170005	Total Algae, use with YSI EXO sonde
0320170006	fDOM, use with YSI EXO sonde
0320170015	pH/ORP, unguarded, use with YSI EXO2 sonde
HB07530020	Assembly, Multisonde with Sensors, with FDOM, No Total Algae
HB07530030	Assembly, Multisonde with Sensors, No FDOM, No Total Algae
0320170026	Sensor - Conductivity/Temperature -use KorExo 2.0 and YSI EXO sonde
0320170027	Sensor - Dissolved Oxygen (Optical) -use KorExo 2.0 and YSI EXO sonde
0320170028	Sensor - Turbidity -use KorExo 2.0 and YSI EXO sonde
0320170030	Sensor - fDOM, -use KorExo 2.0 and YSI EXO sonde
0320170031	Sensor - pH/ORP, unguarded -use KorExo 2.0 and YSI EXO sonde

Further detailed sensor info under each DGD is as following:

1. Under DGD HB07530000:
    a. HB07530000, Sensor, YSI EXO2 Multisonde with FDOM, firmware version 1.0.73 or 1.0.86
    b. 0320170001, Conductivity/Temperature – YSI EXO sonde, firmware version 3.0.5
    c. 0320170003, Dissolved Oxygen (Optical) – YSI EXO sonde, firmware version 3.0.0
    d. 0320170004, Turbidity, use with YSI EXO sonde, firmware version 3.0.4
    e. 0320170005, Total Algae, use with YSI EXO sonde, firmware version 3.0.5
    f. 0320170006, fDOM, use with YSI EXO sonde, firmware version 3.0.0
    g. 0320170015, pH/ORP, unguarded, use with YSI EXO2 sonde, firmware version 3.0.0
2. Under DGD HB07530010:
    a. HB07530010, Sensor, YSI EXO2 Multisonde with no FDOM, firmware version 1.0.73 or 1.0.86
    b. 0320170001, Conductivity/Temperature – YSI EXO sonde, firmware version 3.0.5
    c. 0320170003, Dissolved Oxygen (Optical) – YSI EXO sonde, firmware version 3.0.0
    d. 0320170004, Turbidity, use with YSI EXO sonde, firmware version 3.0.4
    e. 0320170005, Total Algae, use with YSI EXO sonde, firmware version 3.0.5
    f. 0320170015, pH/ORP, unguarded, use with YSI EXO2 sonde, firmware version 3.0.0
3. Under DGD HB07530020:
    a. HB07530020, Sensor, YSI EXO2 Multisonde with FDOM, No Total Algae, firmware version 1.0.73 or 1.0.86
    b. 0320170026, Conductivity/Temperature -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.5
    c. 0320170027, Dissolved Oxygen (Optical) -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.0
    d. 0320170028, Turbidity -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.4
    e. 0320170030, fDOM, -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.0
    f. 0320170031, pH/ORP, unguarded -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.0
4. Under DGD HB07530030:
    a. HB07530030, Sensor, YSI EXO2 Multisonde with No FDOM, No Total Algae, firmware version 1.0.73 or 1.0.86
    b. 0320170026, Conductivity/Temperature -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.5
    c. 0320170027, Dissolved Oxygen (Optical) -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.0
    d. 0320170028, Turbidity -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.4
    e. 0320170031, pH/ORP, unguarded -use KorExo 2.0 and YSI EXO sonde, firmware version 3.0.0

Other important parts that are not a DGD:

5. NEON PN 0320170008, Sensor Accessory – Anti fouling guard for YSI EXO2 sonde.
6. NEON PN 0320170007, Sensor – Central wiper for YSI EXO sonde only
7. NEON PN 0320170017, DCP Signal Output Adapter v1.0 – Connects to YSI field cable and converts signal to RS-232 or SDI-12
8. NEON PN 0320170025, DCP Signal Output Adapter v2.0 – Connects to YSI field cable and converts signal to RS-232 or SDI-12

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

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 Acronyms

Acronym	Explanation
ATBD	Algorithm Theoretical Basis Document
AIS	Aquatic Instrument System
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 Cyberinfrastructure group
DPS	NEON Data Products group
CVAL	NEON Calibration, Validation, and Audit Laboratory

3 MULTISONDE, STREAM INTRODUCTION (HB07530000 (W/FDOM) AND HB07530010 (NO FDOM))

The sensor configuration and sensor command and control described here are related to the multisonde associated data products. A description of how sensor readings shall be converted to L1 DPs is presented in the associated ATBD (AD[06]). The AIS assembly used to generate these data products consists of multiple components, which vary according to the site type and location within a site. This document describes the assemblies that are deployed at stream sites. At stream sites the components include the sonde body, pH, DO, turbidity, total algae (chlorophyll a), temperature, conductivity and fDOM sensors, an enclosure and stainless steel infrastructure which allows water to free flow past the sensors which both protecting the multisonde and holding in position. At stream sites there are two measurement locations. The upstream location does not contain the fDOM sensor, while the downstream location does contain the fDOM sensor; otherwise these assemblies are identical.

Configuration settings and the command and control structure are described below in Section 4. The L0 data products resulting from this sensor are listed under Section 7.1 in the appendix.

4 MULTISONDE, STREAM OVERVIEW OF SENSOR CONFIGURATION (HB07530000 (W/FDOM) AND HB07530010 (NO FDOM))

4.1 Multisonde, Stream Sensors

The multisonde assemblies shall be configured to output the data streams defined in **Table 1**, **Table 2**, and **Table 3**. The sampling frequency for HB07530000 and HB07530010 is shown in **Table 1**.

The Multisonde assemblies contain a central wiper that is used to limit the accumulation of biological growth that will impact measurements. The wiper function shall be configured according to **Table 2** for the Multisonde assemblies.

The multisonde assemblies should be set to an averaging mode of "accelerated" according to **Table 3**.

Table 1. Configuration setting for Multisonde, Stream (HB07530000 and HB07530010).

Parameter	Sample Frequency	Units
Actual conductivity	0.0167 Hz	µSiemens/cm
Specific conductivity	0.0167 Hz	µSiemens/cm
Temperature	0.0167 Hz	celsius
Water depth of measurement	0.0167 Hz	Meter
Pressure of surface water	0.0167 Hz	psi
Dissolved oxygen as percent of saturation	0.0167 Hz	%
Dissolved oxygen concentration	0.0167 Hz	mg/L
pH	0.0167 Hz	pH
pH sensor voltage	0.0167 Hz	mV
Raw signal of BGA sensor	0.0167 Hz	%
Blue-green algae (BGA) phycocyanin (PC) concentration	0.0167 Hz	g/L
Raw signal of chlorophyll sensor	0.0167 Hz	%
Chlorophyll a concentration	0.0167 Hz	g/L
Raw signal of turbidity sensor	0.0167 Hz	%
Turbidity of water as FNU	0.0167 Hz	FNU
Raw signal of fluorescent dissolved organic matter sensor	0.0167 Hz	%
Fluorescent dissolved organic matter concentration as quinine sulfate equilivents	0.0167 Hz	QSU*
Wiper Position	0.0167 Hz	V
Battery voltage	0.0167 Hz	V
Main voltage	0.0167 Hz	V
Date and Time	0.0167 Hz	Date and Time

* Quinine Sulfate Units

Table 2. Multisonde wiper configuration, Stream (HB07530000 and HB07530010).

Parameter	Setting
Samples per Wipe	5

Table 3. Multisonde averaging mode configuration, Stream (HB07530000 and HB07530010).

Parameter	Setting
Averaging Mode	Accelerated

5 MULTISONDE, STREAM INTRODUCTION (HB07530020 (W/FDOM NO CHLA) AND HB07530030 (NO FDOM NO CHLA))

The sensor configuration and sensor command and control described here are related to the multisonde associated data products. A description of how sensor readings shall be converted to L1 DPs is presented in the associated ATBD (AD[06]). The AIS assembly used to generate these data products consists of multiple components, which vary according to the site type and location within a site. This document describes the assemblies that are deployed at stream sites. At stream sites the components include the sonde body, pH, DO, turbidity, temperature, conductivity and fDOM sensors, an enclosure and stainless steel infrastructure which allows water to free flow past the sensors which both protecting the multisonde and holding in position. At stream sites there are two measurement locations. The upstream location does not contain the fDOM sensor, while the downstream location does contain the fDOM sensor; otherwise these assemblies are identical.

Configuration settings and the command and control structure are described below in Section 4. The L0 data products resulting from this sensor are listed under Section 7.1 in the appendix.

6 MULTISONDE, STREAM OVERVIEW OF SENSOR CONFIGURATION FOR KOREXO 2.0 (HB07530020 (W/FDOM NO CHLA) AND HB07530030 (NO FDOM NO CHLA))

6.1 Multisonde, KorEXO Software

The KorEXO software is installed on the computer used to configure and calibrate the EXO2 multisonde body and probes. The following version should be used in the laboratory and field for those activities: 2.3.10.0

6.2 Multisonde, Stream Sensors

The multisonde assemblies shall be configured to output the data streams defined in **Table 1**, **Table 2**, and **Table 3**. The sampling frequency for HB07530000 and HB07530010 is shown in **Table 1**.

The Multisonde assemblies contain a central wiper that is used to limit the accumulation of biological growth that will impact measurements. The wiper function shall be configured according to **Table 2** for the Multisonde assemblies.

The multisonde assemblies should be set to an averaging mode of “accelerated” according to **Table 3**.

Table 4. Configuration setting for Multisonde, Stream (HB07530020 and HB07530030).

Parameter	Sample Frequency	Units	YSI Parameter
Actual conductivity	0.0167 Hz	µSiemens/cm	5
Specific conductivity	0.0167 Hz	µSiemens/cm	7
Temperature	0.0167 Hz	celsius	1
Water depth of measurement	0.0167 Hz	Meter	22
Pressure of surface water	0.0167 Hz	psi	20
Dissolved oxygen as percent of saturation	0.0167 Hz	%	211
Dissolved oxygen as percent of saturation at local conditions	0.00333 Hz	%	214
Dissolved oxygen concentration	0.0167 Hz	mg/L	212
pH	0.0167 Hz	pH	18
pH sensor voltage	0.0167 Hz	mV	17
Turbidity of water as FNU[1]	0.0167 Hz	FNU[1]	223
Fluorescent dissolved organic matter concentration as quinine sulfate equilivents	0.0167 Hz	QSU[2]	228
Wiper Position	0.0167 Hz	V	229
Battery voltage	0.0167 Hz	V	28
Main voltage	0.0167 Hz	V	230
Date and Time	0.0167 Hz	Date and Time	

[1]Formazin Nephelometric Units [2] Quinine Sulfate Units

Table 5. Multisonde wiper configuration, Stream (HB07530020 and HB07530030).

Parameter	Setting
Samples per Wipe	5

Table 6. Multisonde averaging mode configuration, Stream (HB07530020 and HB07530030).

Parameter	Setting
Averaging Mode	Accelerated

7 MULTISONDE, STREAM COMMAND AND CONTROL HB07530000 (W/FDOM) AND HB07530010 (NO FDOM) HB07530020 (W/FDOM NO CHLA) AND HB07530030 (NO FDOM NO CHLA)

7.1 Error handling

This is no active or direct error monitoring. However, if the Multisonde output streams exhibit problems the sonde may be queried to determine if there are any internal faults. The sonde reports these internal faults via the SONDE_FULT YSIP command. The fault code be determined by performing the command Get Device Status and looking at bit 4 in the response. **Table 7** shows the bit position descriptions.

Table 7. Truth table for sensor error handling.

Device Status Bit Position	Condition	Data acquisition system action	Output to CI
0	Low Battery (<3.6V)	None	None
1	Low External Voltage (<7.5V)	Send trouble ticket	None
2	Low Real Time Clock Battery (<1.8V)	Send trouble ticket	None
3	microSD card Fault	None	None
4	Bluetooth Fault	None	None
5	Sensor Address Fault (address = 0)	Send trouble ticket	None
6	Power/Comms FPGA Fault	Send trouble ticket	None
7	Sensor #1 Over Power (>2000mW)	Send trouble ticket	None
8	Sensor #2 Over Power	Send trouble ticket	None
9	Sensor #3 Over Power	Send trouble ticket	None
10	Sensor #4 Over Power	Send trouble ticket	None
11	Sensor #5 Over Power	Send trouble ticket	None
12	Sensor #6 Over Power	Send trouble ticket	None
13	Sensor #7 Over Power	Send trouble ticket	None
14	Sensor #8 Over Power	Send trouble ticket	None
15	Sensor #9 Over Power	Send trouble ticket	None
16	Sensor #10 Over Power	Send trouble ticket	None
17	Sensor #11 Over Power	Send trouble ticket	None
18	Sensor #12 Over Power	Send trouble ticket	None
19	Sensor #13 Over Power	Send trouble ticket	None
20	Sensor #14 Over Power	Send trouble ticket	None
21	Sensor #15 Over Power	Send trouble ticket	None
22	Sensor #16 Over Power	Send trouble ticket	None
24-31	Reserved	NA	NA

7.2 Sensor controls specification HB07530000 (w/FDOM) and HB07530010 (no FDOM) HB07530020 (w/FDOM no chla) and HB07530030 (no FDOM no chla)

N/A

8 ASSEMBLY INTEGRATION HB07530000 (W/FDOM) AND HB07530010 (NO FDOM) HB07530020 (W/FDOM NO CHLA) AND HB07530030 (NO FDOM NO CHLA)

N/A

9 APPENDIX

9.1 List of Level 0 data product

Table 8. List of Level 0 data product associated with DPName: Water Quality.

DGD Agile PN	DPNumber	fieldName	description	Acquisition frequency (Hz)	dataType	units
0320170001	NEON.DOM.SITE.DP0.20005.001.01371.HOR.VER.000	conductance	Conductivity at ambient temperture	0.01667	real	microsiemens PerCentimeter
	NEON.DOM.SITE.DP0.20005.001.01093.HOR.VER.000	specificConductance	Conductivity auto-corrected to 25 degrees C	0.01667	real	microsiemens PerCentimeter
	NEON.DOM.SITE.DP0.20005.001.01378.HOR.VER.000	surfaceWaterTemperature	Temperature in surface water	0.01667	real	celsius
HB07530000 or HB07530010	NEON.DOM.SITE.DP0.20005.001.01664.HOR.VER.000	sensorDepth	Water depth of measurement	0.01667	real	meter
	NEON.DOM.SITE.DP0.20005.001.01663.HOR.VER.000	sondeSurfaceWaterPressure	Pressure of surface water measured by the multisonde in psi	0.01667	real	poundsPerSquareInch
	NEON.DOM.SITE.DP0.20005.001.01670.HOR.VER.000	wiperPosition	Position of wiper	0.01667	real	volt
	NEON.DOM.SITE.DP0.20005.001.01372.HOR.VER.000	batteryVoltage	Battery voltage	0.01667	real	volt
	NEON.DOM.SITE.DP0.20005.001.01647.HOR.VER.000	sensorVoltage	Main voltage	0.01667	real	volt

DGD Agile PN	DPNumber	fieldName	description	Acquisition frequency (Hz)	dataType	units
0320170003	NEON.DOM.SITE.DP0.20005.001.01360.HOR.VER.000	dissolvedOxygenSaturation	Dissolved Oxygen Percent Saturation	0.01667	real	percent
	NEON.DOM.SITE.DP0.20005.001.01151.HOR.VER.000	dissolvedOxygen	Dissolved Oxygen Concentration	0.01667	real	milligramsPerLiter
0320170015	NEON.DOM.SITE.DP0.20005.001.01657.HOR.VER.000	pH	Measurement of pH in water	0.01667	real	pH
	NEON.DOM.SITE.DP0.20005.001.01658.HOR.VER.000	pHvoltage	pH meter voltage	0.01667	real	millivolt
0320170005	NEON.DOM.SITE.DP0.20005.001.01667.HOR.VER.000	blueGreenAlgaeRaw	Raw signal of blue-green algae sensor as a percent of full scale detected in the sample	0.01667	real	percent
	NEON.DOM.SITE.DP0.20005.001.01659.HOR.VER.000	blueGreenAlgaePhycocyanin	Blue-green algae phycocyanin concentration in water	0.01667	real	microgramsPerLiter
	NEON.DOM.SITE.DP0.20005.001.01666.HOR.VER.000	chlorophyllRaw	Raw signal of chlorophyll a sensor as a percent of full scale detected in the sample	0.01667	real	percent
	NEON.DOM.SITE.DP0.20005.001.01660.HOR.VER.000	chlorophyll	Chlorophyll a concentration in water	0.01667	real	microgramsPerLiter
0320170004	NEON.DOM.SITE.DP0.20005.001.01669.HOR.VER.000	turbidityRaw	Raw signal of turbidity sensor as a percent of full scale detected in the sample	0.01667	real	percent
	NEON.DOM.SITE.DP0.20005.001.01662.HOR.VER.000	turbidity	Turbidity of water as FNU	0.01667	real	formazinNephelometricUnit

DGD Agile PN	DPNumber	fieldName	description	Acquisition frequency (Hz)	dataType	units
0320170006	NEON.DOM.SITE.DP0.20005.001.01668.HOR.VER.000	fDOMRaw	Raw signal of fluorescent dissolved organic matter sensor as a percent of full scale detected in the sample	0.01667	real	percent
	NEON.DOM.SITE.DP0.20005.001.01661.HOR.VER.000	fDOM	Fluorescent dissolved organic matter concentration as quinine sulfate equilivents	0.01667	real	quinineSulfate Unit

Table 9. List of Level 0 data product associated with DPName: Water Quality, use KorExo 2.0.

DGD Agile PN	DPNumber	fieldName	description	Acquisition frequency (Hz)	dataType	units
0320170026	NEON.DOM.SITE.DP0.20005.001.01371.HOR.VER.000	conductance	Conductivity at ambient temperature	0.01667	real	microsiemens PerCentimeter
	NEON.DOM.SITE.DP0.20005.001.01093.HOR.VER.000	specificConductance	Conductivity auto-corrected to 25 degrees C	0.01667	real	microsiemens PerCentimeter
	NEON.DOM.SITE.DP0.20005.001.01378.HOR.VER.000	surfaceWaterTemperature	Temperature in surface water	0.01667	real	celsius
HB07530020 or HB07530030	NEON.DOM.SITE.DP0.20005.001.01664.HOR.VER.000	sensorDepth	Water depth of measurement	0.01667	real	meter
	NEON.DOM.SITE.DP0.20005.001.01663.HOR.VER.000	sondeSurfaceWaterPressure	Pressure of surface water measured by the multisonde in psi	0.01667	real	poundsPerSquareInch
	NEON.DOM.SITE.DP0.20005.001.01670.HOR.VER.000	wiperPosition	Position of wiper	0.01667	real	volt
	NEON.DOM.SITE.DP0.20005.001.01372.HOR.VER.000	batteryVoltage	Battery voltage	0.01667	real	volt
	NEON.DOM.SITE.DP0.20005.001.01647.HOR.VER.000	sensorVoltage	Main voltage	0.01667	real	volt

DGD Agile PN	DPNumber	fieldName	description	Acquisition frequency (Hz)	dataType	units
0320170027	NEON.DOM.SITE.DP0.20005.001.01360.HOR.VER.000	dissolvedOxygenSaturation	Dissolved Oxygen Percent Saturation	0.01667	real	percent
	NEON.DOM.SITE.DP0.20005.001.06397.HOR.VER.000	localDissolvedOxygenSat	Dissolved Oxygen Percent Saturation at Local Conditions	0.01667	real	percent
	NEON.DOM.SITE.DP0.20005.001.01151.HOR.VER.000	dissolvedOxygen	Dissolved Oxygen Concentration	0.01667	real	milligramsPerLiter
0320170031	NEON.DOM.SITE.DP0.20005.001.01657.HOR.VER.000	pH	Measurement of pH in water	0.01667	real	pH
	NEON.DOM.SITE.DP0.20005.001.01658.HOR.VER.000	pHvoltage	pH meter voltage	0.01667	real	millivolt
0320170028	NEON.DOM.SITE.DP0.20005.001.01662.HOR.VER.000	turbidity	Turbidity of water as FNU	0.01667	real	formazinNephelometricUnit
0320170030	NEON.DOM.SITE.DP0.20005.001.01661.HOR.VER.000	fDOM	Fluorescent dissolved organic matter concentration as quinine sulfate equivalents	0.01667	real	quinineSulfateUnit

9.2 Tables for clarification of data stream numbers and calibration status

Table 10. Data stream numbers and calibration status with FDOM.

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
0320170001	NEON.DOM.SITE.DP0.20005.001.01371.HOR.VER.000	conductance	Conductivity at ambient temperture	0	no
	NEON.DOM.SITE.DP0.20005.001.01093.HOR.VER.000	specificConductance	Conductivity auto-corrected to 25 degrees C	1	yes
	NEON.DOM.SITE.DP0.20005.001.01378.HOR.VER.000	surfaceWaterTemperature	Temperature in surface water	2	no
HB07530000	NEON.DOM.SITE.DP0.20005.001.01664.HOR.VER.000	sensorDepth	Water depth of measurement	3	no
	NEON.DOM.SITE.DP0.20005.001.01663.HOR.VER.000	sondeSurfaceWaterPressure	Pressure of surface water measured by the multisonde in psi	4	no
	NEON.DOM.SITE.DP0.20005.001.01670.HOR.VER.000	wiperPosition	Position of wiper	17	no
	NEON.DOM.SITE.DP0.20005.001.01372.HOR.VER.000	batteryVoltage	Battery voltage	18	no
	NEON.DOM.SITE.DP0.20005.001.01647.HOR.VER.000	sensorVoltage	Main voltage	19	no

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
0320170003	NEON.DOM.SITE.DP0.20005.001.01360.HOR.VER.000	dissolvedOxygenSaturation	Dissolved Oxygen Percent Saturation	5	yes
	NEON.DOM.SITE.DP0.20005.001.01151.HOR.VER.000	dissolvedOxygen	Dissolved Oxygen Concentration	6	no
0320170015	NEON.DOM.SITE.DP0.20005.001.01657.HOR.VER.000	pH	Measurement of pH in water	7	yes
	NEON.DOM.SITE.DP0.20005.001.01658.HOR.VER.000	pHvoltage	pH meter voltage	8	no
0320170005	NEON.DOM.SITE.DP0.20005.001.01667.HOR.VER.000	blueGreenAlgaeRaw	Raw signal of blue-green algae sensor as a percent of full scale detected in the sample	9	no
	NEON.DOM.SITE.DP0.20005.001.01659.HOR.VER.000	blueGreenAlgaePhycocyanin	Blue-green algae phycocyanin concentration in water	10	no
	NEON.DOM.SITE.DP0.20005.001.01666.HOR.VER.000	chlorophyllRaw	Raw signal of chlorophyll a sensor as a percent of full scale detected in the sample	11	no
	NEON.DOM.SITE.DP0.20005.001.01660.HOR.VER.000	chlorophyll	Chlorophyll a concentration in water	12	yes
0320170004	NEON.DOM.SITE.DP0.20005.001.01669.HOR.VER.000	turbidityRaw	Raw signal of turbidity sensor as a percent of full scale detected in the sample	13	no
	NEON.DOM.SITE.DP0.20005.001.01662.HOR.VER.000	turbidity	Turbidity of water as FNU	14	yes
DGD Agile PN	**DPNumber**	**fieldName**	**description**	**Stream Number**	**Calibration**

0320170006	NEON.DOM.SITE.DP0.20005.001.01668.HOR.VER.000	fDOMRaw	Raw signal of fluorescent dissolved organic matter sensor as a percent of full scale detected in the sample	15	no
	NEON.DOM.SITE.DP0.20005.001.01661.HOR.VER.000	fDOM	Fluorescent dissolved organic matter concentration as quinine sulfate equilivents	16	yes

Table 11. Data stream numbers and calibration status with no FDOM.

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
0320170001	NEON.DOM.SITE.DP0.20005.001.01371.HOR.VER.000	conductance	Conductivity at ambient temperture	0	no
	NEON.DOM.SITE.DP0.20005.001.01093.HOR.VER.000	specificConductance	Conductivity auto-corrected to 25 degrees C	1	yes
	NEON.DOM.SITE.DP0.20005.001.01378.HOR.VER.000	surfaceWaterTemperature	Temperature in surface water	2	no
HB07530010	NEON.DOM.SITE.DP0.20005.001.01664.HOR.VER.000	sensorDepth	Water depth of measurement	3	no
	NEON.DOM.SITE.DP0.20005.001.01663.HOR.VER.000	sondeSurfaceWaterPressure	Pressure of surface water measured by the multisonde in psi	4	no
	NEON.DOM.SITE.DP0.20005.001.01670.HOR.VER.000	wiperPosition	Position of wiper	15	no
	NEON.DOM.SITE.DP0.20005.001.01372.HOR.VER.000	batteryVoltage	Battery voltage	16	no
	NEON.DOM.SITE.DP0.20005.001.01647.HOR.VER.000	sensorVoltage	Main voltage	17	no
0320170003	NEON.DOM.SITE.DP0.20005.001.01360.HOR.VER.000	dissolvedOxygenSaturation	Dissolved Oxygen Percent Saturation	5	yes
	NEON.DOM.SITE.DP0.20005.001.01151.HOR.VER.000	dissolvedOxygen	Dissolved Oxygen Concentration	6	no

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
0320170015	NEON.DOM.SITE.DP0.20005.001.01657.HOR.VER.000	pH	Measurement of pH in water	7	yes
	NEON.DOM.SITE.DP0.20005.001.01658.HOR.VER.000	pHvoltage	pH meter voltage	8	no
0320170005	NEON.DOM.SITE.DP0.20005.001.01667.HOR.VER.000	blueGreenAlgaeRaw	Raw signal of blue-green algae sensor as a percent of full scale detected in the sample	9	no
	NEON.DOM.SITE.DP0.20005.001.01659.HOR.VER.000	blueGreenAlgaePhycocyanin	Blue-green algae phycocyanin concentration in water	10	no
	NEON.DOM.SITE.DP0.20005.001.01666.HOR.VER.000	chlorophyllRaw	Raw signal of chlorophyll a sensor as a percent of full scale detected in the sample	11	no
	NEON.DOM.SITE.DP0.20005.001.01660.HOR.VER.000	chlorophyll	Chlorophyll a concentration in water	12	yes
0320170004	NEON.DOM.SITE.DP0.20005.001.01669.HOR.VER.000	turbidityRaw	Raw signal of turbidity sensor as a percent of full scale detected in the sample	13	no
	NEON.DOM.SITE.DP0.20005.001.01662.HOR.VER.000	turbidity	Turbidity of water as FNU	14	yes

Table 12. Data stream numbers and calibration status with FDOM and no chla, use KorExo 2.0.

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
0320170026	NEON.DOM.SITE.DP0.20005.001.01371.HOR.VER.000	conductance	Conductivity at ambient temperture	30	no
	NEON.DOM.SITE.DP0.20005.001.01093.HOR.VER.000	specificConductance	Conductivity auto-corrected to 25 degrees C	31	yes
	NEON.DOM.SITE.DP0.20005.001.01378.HOR.VER.000	surfaceWaterTemperature	Temperature in surface water	32	no
HB07530020	NEON.DOM.SITE.DP0.20005.001.01664.HOR.VER.000	sensorDepth	Water depth of measurement	30	no
	NEON.DOM.SITE.DP0.20005.001.01663.HOR.VER.000	sondeSurfaceWaterPressure	Pressure of surface water measured by the multisonde in psi	31	no
	NEON.DOM.SITE.DP0.20005.001.01670.HOR.VER.000	wiperPosition	Position of wiper	32	no
	NEON.DOM.SITE.DP0.20005.001.01372.HOR.VER.000	batteryVoltage	Battery voltage	33	no
	NEON.DOM.SITE.DP0.20005.001.01647.HOR.VER.000	sensorVoltage	Main voltage	34	no

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
0320170027	NEON.DOM.SITE.DP0.20005.001.01360.HOR.VER.000	dissolvedOxygenSaturation	Dissolved Oxygen Percent Saturation	30	yes
	NEON.DOM.SITE.DP0.20005.001.06397.HOR.VER.000	localDissolvedOxygenSat	Dissolved Oxygen Percent Saturation at Local Conditions	31	no
	NEON.DOM.SITE.DP0.20005.001.01151.HOR.VER.000	dissolvedOxygen	Dissolved Oxygen Concentration	32	no
0320170031	NEON.DOM.SITE.DP0.20005.001.01657.HOR.VER.000	pH	Measurement of pH in water	30	yes
	NEON.DOM.SITE.DP0.20005.001.01658.HOR.VER.000	pHvoltage	pH meter voltage	31	no
0320170028	NEON.DOM.SITE.DP0.20005.001.01662.HOR.VER.000	turbidity	Turbidity of water as FNU	30	yes
0320170030	NEON.DOM.SITE.DP0.20005.001.01661.HOR.VER.000	fDOM	Fluorescent dissolved organic matter concentration as quinine sulfate equivalents	30	yes

Table 13. Data stream numbers and calibration status with no FDOM and no chla, use KorExo 2.0.

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
0320170026	NEON.DOM.SITE.DP0.20005.001.01371.HOR.VER.000	conductance	Conductivity at ambient temperture	30	no
	NEON.DOM.SITE.DP0.20005.001.01093.HOR.VER.000	specificConductance	Conductivity auto-corrected to 25 degrees C	31	yes
	NEON.DOM.SITE.DP0.20005.001.01378.HOR.VER.000	surfaceWaterTemperature	Temperature in surface water	32	no
HB07530030	NEON.DOM.SITE.DP0.20005.001.01664.HOR.VER.000	sensorDepth	Water depth of measurement	30	no
	NEON.DOM.SITE.DP0.20005.001.01663.HOR.VER.000	sondeSurfaceWaterPressure	Pressure of surface water measured by the multisonde in psi	31	no
	NEON.DOM.SITE.DP0.20005.001.01670.HOR.VER.000	wiperPosition	Position of wiper	32	no
	NEON.DOM.SITE.DP0.20005.001.01372.HOR.VER.000	batteryVoltage	Battery voltage	33	no
	NEON.DOM.SITE.DP0.20005.001.01647.HOR.VER.000	sensorVoltage	Main voltage	34	no
0320170027	NEON.DOM.SITE.DP0.20005.001.01360.HOR.VER.000	dissolvedOxygenSaturation	Dissolved Oxygen Percent Saturation	30	yes
	NEON.DOM.SITE.DP0.20005.001.06397.HOR.VER.000	localDissolvedOxygenSat	Dissolved Oxygen Percent Saturation at Local Conditions	31	no

DGD Agile PN	DPNumber	fieldName	description	Stream Number	Calibration
	NEON.DOM.SITE.DP0.20005.001.01151.HOR.VER.000	dissolvedOxygen	Dissolved Oxygen Concentration	32	no
0320170031	NEON.DOM.SITE.DP0.20005.001.01657.HOR.VER.000	pH	Measurement of pH in water	30	yes
	NEON.DOM.SITE.DP0.20005.001.01658.HOR.VER.000	pHvoltage	pH meter voltage	31	no
0320170028	NEON.DOM.SITE.DP0.20005.001.01662.HOR.VER.000	turbidity	Turbidity of water as FNU	30	yes

9.3 Assembly schematic drawing

N/A

10 BIBLIOGRAPHY

YSI Inc. (2019) EXO User Manual. YSI Incorporated, Yellow Springs, OH. pp. 181. Manual number 603789, Rev. H.