

Title: NEON Sensor Command, Control, and Configuration: Aqua TROLL 200		Date: 02/19/2014
NEON Doc. #: NEON.DOC.001173	Author: M. Fitzgerald	Revision: A

NEON SENSOR COMMAND, CONTROL, AND CONFIGURATION: AQUA TROLL 200

PREPARED BY	ORGANIZATION	DATE
Michael Fitzgerald	AQU	08/20/2013

APPROVALS	ORGANIZATION	APPROVAL DATE
Dave Tazik	CCB PROJ SCI	01/13/2014
Hanne Buur	CCB DIR SE	01/17/2014

RELEASED BY	ORGANIZATION	RELEASE DATE
Stephen Craft	SE	02/19/2014

See configuration management system for approval history.

© 2014 NEON Inc. All rights reserved.

The National Ecological Observatory Network is a project solely funded by the National Science Foundation and managed under cooperative agreement by NEON, Inc. 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.

Title: NEON Sensor Command, Control, and Configuration: Aqua TROLL 200		Date: 02/19/2014
NEON Doc. #: NEON.DOC.001173	Author: M. Fitzgerald	Revision: A

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	02/19/2014	ECO-01541	Initial release

Title: NEON Sensor Command, Control, and Configuration: Aqua TROLL 200		Date: 02/19/2014
NEON Doc. #: NEON.DOC.001173	Author: M. Fitzgerald	Revision: A

TABLE OF CONTENTS

1	DESCRIPTION.....	1
1.1	Purpose	1
1.2	Scope.....	1
2	RELATED DOCUMENTS AND ACRONYMS	1
2.1	Applicable Documents	1
2.2	Reference Documents.....	2
2.3	External References	2
2.4	Acronyms	2
3	INTRODUCTION	2
4	OVERVIEW OF SENSOR CONFIGURATION	3
5	COMMAND AND CONTROL	3
5.1	Error handling	3
5.2	Sensor controls specification	4
6	ASSEMBLY INTEGRATION	4
7	APPENDIX & BIBLIOGRAPHY	4

LIST OF TABLES AND FIGURES

Table 1.	L0 data products acquired from In-Situ Inc. Aqua TROLL 200	3
Table 2.	Sensor configuration settings	3
Table 3.	Data quality codes.....	3

Title: NEON Sensor Command, Control, and Configuration: Aqua TROLL 200		Date: 02/19/2014
NEON Doc. #: NEON.DOC.001173	Author: M. Fitzgerald	Revision: A

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 is needed for operating the In-Situ Inc. Aqua TROLL 200; used to make measurements of surface water level in lakes and streams. The Aqua TROLL 200 measures the pressure (as a proxy for depth), temperature, and depth of groundwater bodies where sensors are deployed. The Aqua TROLL 200 holds its calibration constraints within internal memory and performs the analog to digital data conversion internally before any data output occurs.

LEVELTROLL 500 NEON P/N 0317730000	FIRMWARE VERSION
Groundwater Pressure	1.26
Groundwater Temperature	1.26
Groundwater Conductivity	1.26

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.001323	ATBD for Aqua TROLL 200 (TBW)

Title: NEON Sensor Command, Control, and Configuration: Aqua TROLL 200		Date: 02/19/2014
NEON Doc. #: NEON.DOC.001173	Author: M. Fitzgerald	Revision: A

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]	In-Situ Inc. Aqua TROLL 100 and 200 Manual. Revision 006 May 2012
---------	---

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 Instrumentation 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 INTRODUCTION

The sensor configuration and sensor command and control described here are related to the groundwater pressure, temperature, and electrical conductivity. The parameters will be measured by the Aqua TROLL 200 in each groundwater well location at NEON aquatic sites. Each NEON Aquatic site will have up to 8 groundwater wells surrounding the aquatic feature. The sensor will be connected to a wireless transmitter (Banner Radio) which will send the data back to the Aquatic Portal for packaging and transmission to NEON HQ. As mentioned above the analog to digital conversion, as well as the conversion to calibrated unites is performed within the Aqua TROLL prior to output of the data for ingestion by the data acquisition system. Table 1 below details the data measurement streams and associated L0 data product ID's.

Table 1. L0 data products acquired from In-Situ Inc. Aqua TROLL 200

Parameters	L0 Data Products
Groundwater Pressure	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Groundwater Pressure Data Quality ID	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Groundwater Temperature	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Groundwater Temperature Data Quality ID	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Groundwater Electrical Conductivity	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Groundwater Electrical Conductivity Data Quality ID	NEON.DXX.XXX.DP0.XXXXXX.XXX.XXX.XXX.XXX
Battery Voltage	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
Groundwater Pressure	1/300 Hz	kPa
Groundwater Pressure Data Quality ID	1/300 Hz	Whole Number
Groundwater Temperature	1/300 Hz	deg. C
Groundwater Temperature Data Quality ID	1/300 Hz	Whole Number
Groundwater Electrical Conductivity	1/300 Hz	uS/cm
Groundwater Electrical Conductivity Data Quality ID	1/300 Hz	Whole Number
Battery Voltage	1/300 Hz	V

5 COMMAND AND CONTROL

The Aqua TROLL 200 does not include equipment that requires remote command and control through the location controller; however initial set-up of the sensor will select, as a built-in option, to collect the data as a linear average of 3 measurements collected in a burst collection and averaged to a single point measurement.

5.1 Error handling

The Aqua TROLL 200 does not report errors that need to be addressed, but does include quality codes for the collected data which will be output as a data stream. The following codes apply to all Data Quality ID data streams.

Table 3. Data quality codes

ID	Name	Description
----	------	-------------

Title: NEON Sensor Command, Control, and Configuration: Aqua TROLL 200		Date: 02/19/2014
NEON Doc. #: NEON.DOC.001173	Author: M. Fitzgerald	Revision: A

0	Normal	Parameter measured without errors using a current calibration.
1	User Uncal	Parameter measured without errors using an expired user calibration.
2	Factory Uncal	Parameter measured without errors using and expired factory calibration.
3	Error	Parameter measured with error, sentinel value supplied.
4	Warm-up	Sensor is warming up, sentinel value supplied.
5	Disabled	Sensor is disabled, sentinel value supplied.
6	Calibrating	Sensor is calibrating, calibration value supplied.
7	Off Line	Device is off line, sentinel value supplied.
8	Warning	Parameter measured without errors but does not meet normal quality criteria.

5.2 Sensor controls specification

The Aqua TROLL 200 will be attached to the wireless transmitter and configured to the above settings. The Aqua TROLL 200 will receive a query by the location controller. The Aqua TROLL 200 will respond with the preconfigured data stream.

6 ASSEMBLY INTEGRATION

All assembly integration is handled by the sensor internally in the Aqua TROLL 200. The data output from the Aqua TROLL 200 has already been converted from analog to digital signal with calibration constraints applied.

7 APPENDIX & BIBLIOGRAPHY

In-Situ, Inc. "Operators Manual – Aqua TROLL 100, Aqua TROLL 200" Revision 006, May 2012. Published Online.

<http://www.in-situ.com/products/water-quality/aqua-troll-instruments/aqua-troll-200-instrument/resources>