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| <i>Title:</i> NEON Sensor Command, Control and Configuration (C3) Document: 2D Wind |                           | <i>Date:</i> 02/29/2016 |
| <i>NEON Doc. #:</i> NEON.DOC.000387   | <i>Author:</i> J. Roberti | <i>Revision:</i> C      |

## NEON SENSOR COMMAND, CONTROL AND CONFIGURATION (C3) DOCUMENT: 2D WIND

| <b>PREPARED BY</b> | <b>ORGANIZATION</b> | <b>DATE</b> |
|--------------------|---------------------|-------------|
| Josh Roberti       | FIU                 | 01/06/2016  |
|                    |                     |             |
|                    |                     |             |

| <b>APPROVALS</b> | <b>ORGANIZATION</b> | <b>APPROVAL DATE</b> |
|------------------|---------------------|----------------------|
| Andrea Thorpe    | SCI                 | 02/26/2016           |
| Vlad Aleksiev    | PSE                 | 02/22/2016           |
|                  |                     |                      |
|                  |                     |                      |

| <b>RELEASED BY</b> | <b>ORGANIZATION</b> | <b>RELEASE DATE</b> |
|--------------------|---------------------|---------------------|
| Judy Salazar       | CM                  | 02/29/2016          |

See configuration management system for approval history.

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## Change Record

| REVISION | DATE       | ECO #     | DESCRIPTION OF CHANGE   |
|----------|------------|-----------|---|
| A        | 05/17/2012 | ECO-00418 | INITIAL RELEASE   |
| B        | 05/28/2013 | ECO-00593 | Minor Updates   |
| C        | 02/29/2016 | ECO-03635 | Error Handling Update<br>Adjusted Settings update: <ol style="list-style-type: none"> <li>1. Changed 45° offset configuration to respective default settings for each sensor-type</li> <li>2. Deactivated Speed of Sound and Sonic temperature measurements for extreme-heated 2D (CD00860000)</li> </ol> |
|          |            |           |   |
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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

Gill's WindObserver II 2D Sonic Anemometer (RD [03]), and Extreme Weather WindObserver 2D Sonic Anemometer Heated (RD [04]) will be used throughout NEON's Observatory to monitor wind conditions. For the remainder of this document, the WindObserver II and Extreme Weather WindObserver will be referenced as 'WOII' and 'EWWO', respectively. Two versions of the WOII will be used: i) non-heated and ii) and heated. Version 1 will be used in locations where icing is not plausible, while version 3 will be used in areas where icing is likely. If severe icing is eminent (e.g. Tundra, mountainous terrain), the EWWO will be used. The firmware that shall be used with these sensors is version 6.01.

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 2D wind 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                          |
|--------------|--|
| CD00310010   | Assembly, 2D Sonic and Junction Box Non-Heated |
| CD00310000   | Assembly, 2D Sonic Heated and Junction Box     |
| CD00860000   | Assembly, Extreme 2D Sonic and Junction Box    |

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Further detailed sensor info under each DGD is as following:

1. Under CD00310010:
  - a. NEON P/N: 0303440000
    - i. Sensor WindObserver II 2D Sonic Anemometer non-heated
    - ii. Firmware Version: 6.01
2. Under CD00310000:
  - a. NEON P/N: 0303440001
    - i. Sensor WindObserver II 2D Sonic Anemometer Heated
    - ii. Firmware Version: 6.01
3. Under CD00860000:
  - a. NEON P/N: 0303440005
    - i. Sensor Extreme Weather WindObserver 2D Sonic Anemometer Heated
    - ii. Firmware Version: 6.01

## 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.000780 | Algorithm Theoretical Basis Document (ATBD) 2D Wind Speed and Direction |
| AD [07] | NEON.DOC.XXXXXX | Standard Operating Procedure (SOP) 2D Wind Speed and Direction          |

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## 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] | Gill Instruments Ltd. 2007. User Manual: WindObserver II Ultrasonic Anemometer. Document # 1390-PS-004. Issue 17.                                    |
| RD [04] | Gill Instruments Ltd. 2011. User Manual: Extreme Weather WindObserver with Enhanced Heating Ultrasonic Anemometer. Document # 1390-PS-0018. Issue 6. |

## 2.3 Acronyms

| Acronym        | Explanation  |
|----------------|--|
| ATBD           | Algorithm Theoretical Basis Document               |
| C <sup>3</sup> | 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 |

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### 3 ASSEMBLY, 2D SONIC AND JUNCTION BOX NON-HEATED / HEATED / EXTREME HEATED INTRODUCTION (CD00310010 / CD00310000 / CD00860000)

The following sections describe the configuration and command and control related to the three 2D sonic and junction box assemblies and corresponding data products (see Appendix). The communication standard for digital output with the 2D wind sonic anemometers shall be RS422. For more information regarding maintenance or topics concerning computer algorithms, please refer to AD [07] and AD [06], respectively.

### 4 ASSEMBLY, 2D SONIC AND JUNCTION BOX NON-HEATED / HEATED / EXTREME HEATED INTRODUCTION OVERVIEW OF SENSOR CONFIGURATION (CD00310010 / CD00310000 / CD00860000)

Table 1 details the configuration settings of the non-heated and heated 2D sonic and junction box assemblies (NEON P/N: 0303440000 and 0303440001). Table 2 details the configuration settings of the extreme heated 2D sonic and junction box assembly (NEON P/N: 0303440005).

**Table 1.** Sensor configuration settings of NEON P/N: 0303440000 and 0303440001. Settings denoted by \* are only applicable for NEON P/N: 0303440001.

| Parameter                 | Default Setting                | Code  | Adapted Setting     | Code |
|---------------------------|--------------------------------|-------|---------------------|------|
| Baud rate                 | 9600 (pulses s <sup>-1</sup> ) | B3    |                     |      |
| Duplex mode               | Full Duplex                    | E1    |                     |      |
| Data & parity options     | 8 bit, no parity, 1 stop bit   | F1    |                     |      |
| Averaging                 | Off                            | G0000 |                     |      |
| Heater                    | Off                            | H1    | Activated*          | H2*  |
| NMEA settings             | "IIMWV"                        | K1    |                     |      |
| ASCII message terminator  | "CR LF"                        | L1    |                     |      |
| Data output               | ASCII Polar continuous         | M2    | ASCII UV continuous | M1   |
| Node address              | <A>                            | NA    |                     |      |
| Output format             | CSV                            | O1    |                     |      |
| Output (acquisition) rate | 1 Hz                           | P1    |                     |      |
| Speed output              | m s <sup>-1</sup>              | U1    |                     |      |
| Vertical output padding   | Off                            | V1    |                     |      |

|                              |     |    |    |    |
|------------------------------|-----|----|----|----|
| 45° Offset                   | Off | X1 |    |    |
| Speed of sound / Sonic Temp. | Off | A0 | On | A3 |
| Wind wraparound              | On  | C1 |    |    |

**Table 2.** Sensor configuration settings of NEON P/N: 0303440005.

| Parameter                    | Default Setting                | Code  | Adapted Setting     | Code |
|------------------------------|--------------------------------|-------|---------------------|------|
| Baud rate                    | 9600 (pulses s <sup>-1</sup> ) | B3    |                     |      |
| Duplex mode                  | Full Duplex                    | E1    |                     |      |
| Data & parity options        | 8 bit, no parity, 1 stop bit   | F1    |                     |      |
| Averaging                    | Off                            | G0000 |                     |      |
| Heater                       | Off                            | H1    | Activated           | H2   |
| NMEA settings                | "IIMWV"                        | K1    |                     |      |
| ASCII message terminator     | "CR LF"                        | L1    |                     |      |
| Data output                  | ASCII Polar continuous         | M2    | ASCII UV continuous | M1   |
| Node address                 | <A>                            | NA    |                     |      |
| Output format                | CSV                            | O1    |                     |      |
| Output (acquisition) rate    | 1 Hz                           | P1    |                     |      |
| Speed output                 | m s <sup>-1</sup>              | U1    |                     |      |
| Vertical output padding      | Off                            | V1    |                     |      |
| 45° Offset                   | On                             | X2    |                     |      |
| Speed of sound / Sonic Temp. | Off                            | A0    |                     |      |
| Wind wraparound              | On                             | C1    |                     |      |

## 5 ASSEMBLY, 2D SONIC AND JUNCTION BOX NON-HEATED COMMAND AND CONTROL (CD00310010)

### 5.1 Error handling



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If the sensor is operating under the influence of error, the data output’s status will reference a variable other than 00, 60, or 66, and the condition shall be deemed “failed” (Table A1). If a failed condition lasts for more than three hours, it is recommended that the issue be forwarded to Problem Resolution and Tracking. Since Gill Instruments does not offer any command / control functions to handle errors, the sensor may need to be manually repaired.

**Table 3.** Truth table for sensor error handling.

| Control parameter(s)                    | Condition | Data acquisition system action                   | Output to CI  |
|---|-----------|--|---|
| Sensor status ≠ 00, 60, or 66 > 3 hours | failed    | Location controller – configuration needed (TBD) | measurement/control parameters → trouble ticket (TBD) |

## 5.2 Sensor controls specification

N/A

## 6 ASSEMBLY INTEGRATION

N/A

## 7 APPENDIX

### 7.1 List of Level 0 data product

**Table 4.** List of Level 0 data product associated with DPName: 2D wind (non-heated; CD00310010) and (heated; CD00310000).

| DGD Agile PN              | DPNumber  | fieldName        | description                         | Acquisition frequency (Hz) | dataType | units           |
|---------------------------|---|------------------|-------------------------------------|----------------------------|----------|-----------------|
| CD00310010;<br>CD00310000 | NEON.DOM.SITE.DP0.00001.001.01306.HOR.VER<br>.000 | uVectorComponent | U (North-South)<br>vector component | 1                          | real     | metersPerSecond |

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|  |   |                    |  |   |         |                 |
|--|---|--------------------|--|---|---------|-----------------|
|  | NEON.DOM.SITE.DP0.00001.001.01307.HOR.VER<br>.000 | vVectorComponent   | V (East-West) vector<br>component        | 1 | real    | metersPerSecond |
|  | NEON.DOM.SITE.DP0.00001.001.01308.HOR.VER<br>.000 | soundSpeed         | Speed of sound                           | 1 | real    | metersPerSecond |
|  | NEON.DOM.SITE.DP0.00001.001.01309.HOR.VER<br>.000 | sensorTemp         | Temperature of<br>sensor                 | 1 | real    | celsius         |
|  | NEON.DOM.SITE.DP0.00001.001.01310.HOR.VER<br>.000 | 2dWindSensorStatus | Health Status of 2D<br>wind speed sensor | 1 | integer | NA              |

**Table 5.** List of Level 0 data products associated with DPName: 2D wind (extreme-heated; CD00860000).

| DGD Agile PN | DPNumber  | fieldName          | description                              | Acquisition<br>frequency (Hz) | dataType | units           |
|--------------|---|--------------------|--|-------------------------------|----------|-----------------|
| CD00860000   | NEON.DOM.SITE.DP0.00001.001.01306.HOR.VER<br>.000 | uVectorComponent   | U (North-South)<br>vector component      | 1                             | real     | metersPerSecond |
|              | NEON.DOM.SITE.DP0.00001.001.01307.HOR.VER<br>.000 | vVectorComponent   | V (East-West) vector<br>component        | 1                             | real     | metersPerSecond |
|              | NEON.DOM.SITE.DP0.00001.001.01310.HOR.VER<br>.000 | 2dWindSensorStatus | Health Status of 2D<br>wind speed sensor | 1                             | integer  | NA              |

|   |                           |                         |
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## 8 BIBLIOGRAPHY

N/A