

## Application note

# NEP-5000 SDI-12 option Hydrospider Halytech logger

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Confidentiality: Not confidential

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Author: Vic Grosjean

## Document history

The Observator range is in continuous development and so specifications may be subject to change without prior notice. When in doubt about the accuracy of this document, contact the Observator Group.

### Reference documents

Type of document / tool	Product type and name (incl. url)
Software	<a href="#">NEP-5000</a>
CFG files	<a href="#">NEP-5000</a>
Datasheet	<a href="#">NEP-5000</a>
Manual	<a href="#">NEP-5000</a>
Application notes	<a href="#">NEP-5000-SDI-12 option with Campbell logger</a>
	<a href="#">NEP-5000-SDI-12 option for H-522+ &amp; H-500XL loggers</a>
	<a href="#">NEP-5000-SDI-12 option with Hydros spider logger</a>
	<a href="#">NEP-5000-SDI-12, RS485 and analogue: wiper operations</a>
	<a href="#">NEP-5000 multi-point calibration</a>
	<a href="#">NEP-5000 firmware updating procedure</a>
	<a href="#">Pressure calibration</a>
	<a href="#">Shroud installation</a>
Videos	<a href="#">Temperature calibration</a>
	<a href="#">Wiper replacement</a>
	<a href="#">NEP-5000</a>

### Revision history

Date	Amendments	Company, position
2019-03-06	Initial document creation	Observator Australia, Document Controller
2019-03-17	Added reference documents	Observator Australia, Document Controller
2019-04-12	Removed section "Advanced Operations"	Observator Australia, Document Controller
2019-07-03	Quality review	Observator Australia, Operation Manager
2020-01-30	Updated document format	Observator Australia, Document Controller
2020-03-08	Updated configuration section	Observator Australia, Document Controller
2022-10-09	Update video links	Observator Australia, Document Controller

### Procedure sign-off:

Date	Company, position	Status
2019-03-09	Observator Australia, Document Controller	Finished
2019-12-06	Observator Australia, Managing Director	Approved
2020-03-05	Observator Group, Communication Officer	Approved

**Distribution list**

Date	Company, position

## Summary

This document describes the integration of NEP-5000 family sensors with HydrosSpider Halytech loggers using Serial Digital Interface SDI-12 protocol.

The NEP-5000 family of sensors offers a comprehensive list of functions using its built-in SDI-12 interface. Configuration of the NEP-5000 sensor using its Personal Computer (PC) configuration software and implementation of Halytech software will be discussed for the following scenarios.

### Chapter 3: “Basic operations”

- **Section 3.1:** “Simple reading of turbidity (general use)”
- **Section 3.2:** “Reading of turbidity using auto-range feature after an optical wipe (recommended option)”

Important note: All examples and procedures that are discussed in this document are best applied to firmware version C2.027 and above.

Important note: End users may request NEP-5000 settings from the factory according to above scenarios during the time of ordering.

Important Note: All sensor configurations that are described below require the user to connect to the sensor's calibration software. Please refer to NEP-5000 manual.

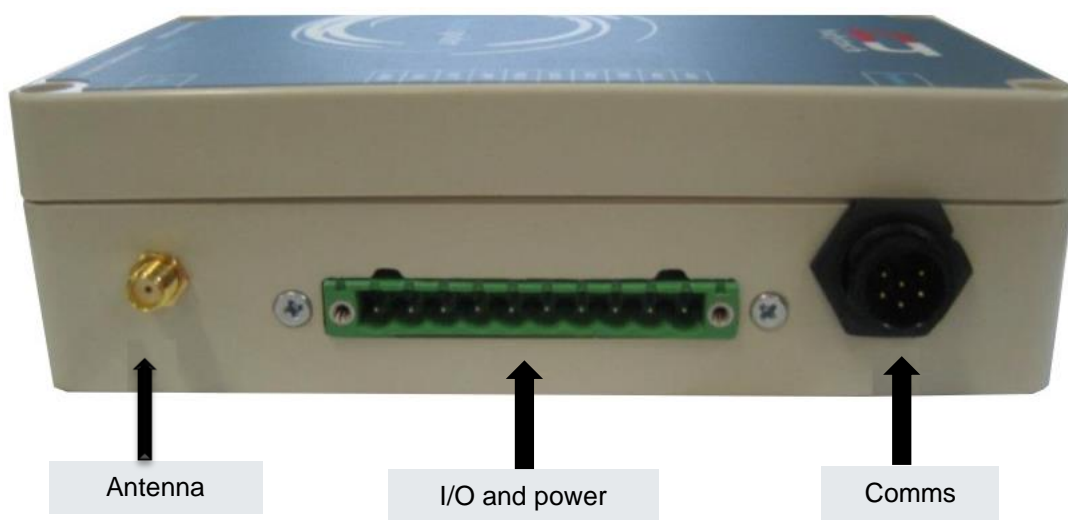
## Table of contents

<b>1</b>	<b>Wiring diagrams .....</b>	<b>6</b>
<b>2</b>	<b>Configure Hydros spider .....</b>	<b>8</b>
	2.1.1 Logging instruction .....	8
<b>3</b>	<b>Basic operations .....</b>	<b>10</b>
3.1	Simple reading of turbidity (general use) .....	10
	3.1.1 Setting up your NEP-5000 family turbidity sensor for simple turbidity readings (general use) .....	10
	3.1.2 Mode of operation .....	10
	3.1.3 Use PC configuration software .....	10
	3.1.4 Configure Hydros spider logger .....	12
3.2	Reading of turbidity using auto-range feature after an optical wipe (recommended option) .....	14
	3.2.1 Setting up your NEP-5000 family turbidity sensor for stable turbidity readings and allowing wiper to control via SDI-12 .....	14
	3.2.2 Mode of operation .....	14
	3.2.3 Use PC configuration software .....	14
	3.2.4 Configure Hydros spider logger .....	16
<b>4</b>	<b>Check logging history .....</b>	<b>18</b>

## 1 Wiring diagrams

This chapter describes the required wiring to connect HydrosSpider loggers to your NEP-5000 turbidity probe using Serial Digital Interface SDI-12 communication protocol.

The HydrosSpider has three connector groups on the right side of the case. The user will need to connect the Input/Output (I/O) and power to the NEP-5000 Probe and external power supply. The “Comms” connector will be connected to the computer (please refer to logger manual for complete installation instructions).



GND	CHG	GND Battery
BATT	12V Battery	
SWP	12V Probe	
485-		
485+		
SDI-12	SDI-12 Probe	
DIN1		
AIN1		
GND	GND Probe	

Use the following NEP-5000 sensor wiring for the following scenarios.

### Chapter 3: “Basic operations”

- **Section 3.1:** “Simple reading of turbidity (general use)”
- **Section 3.2:** “Reading of turbidity using auto-range feature after an optical wipe (recommended option)”

### Advanced operations:

- Reading the statistical view of turbidity in a fixed period of time.

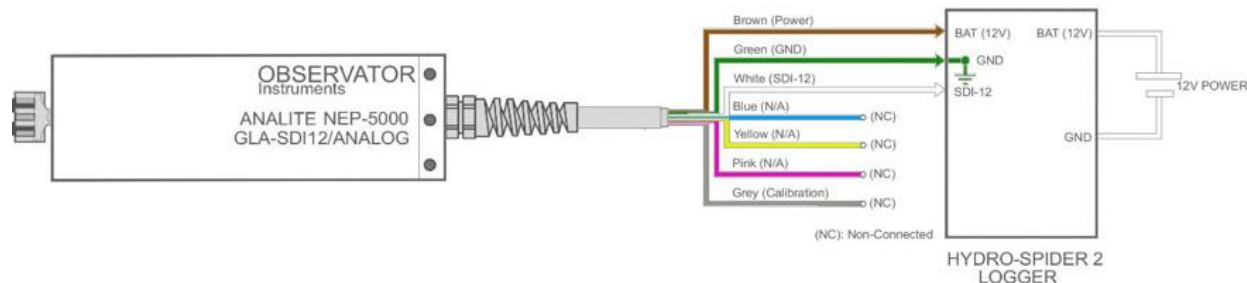


Figure 1.A: # Wiring Diagram WD8-A: SDI-12 (glanded)

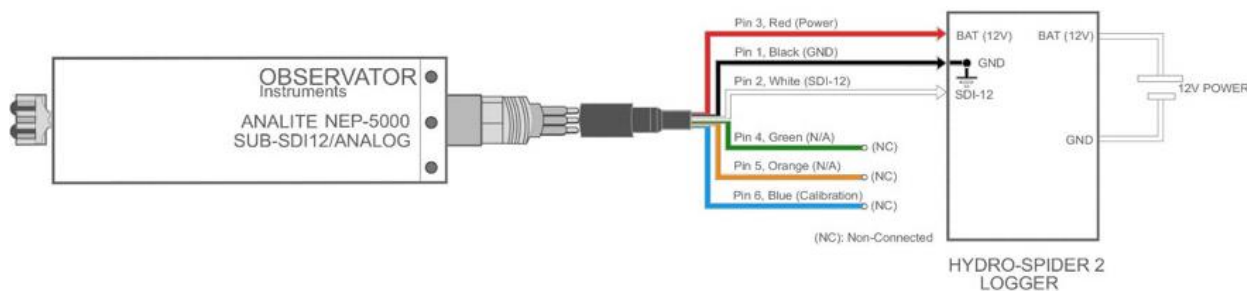


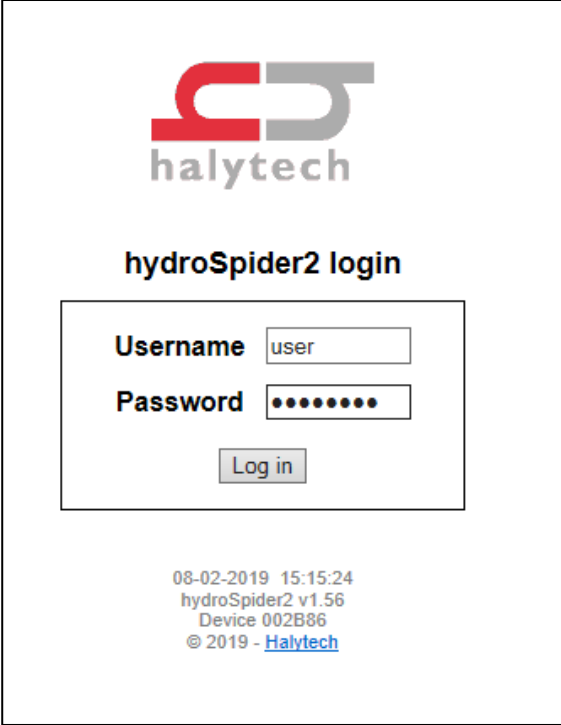
Figure 1.B: #WD7-A: SDI-12 (SubConn)


Note: Users experiencing higher voltage on the SDI-12 line (e.g. 6V instead of 5V), may require to place a 33k resistor between SDI-12 data and ground.

## 2 Configure HydrosSpider

### 2.1.1 Logging instruction

1. Once powered and fully connected to your windows computer, disconnect your computer from all networks, wait 30 seconds and open a new browser (refer to **Chapter 1** for “Wiring diagrams”).
2. Request the following address: <http://192.168.0.177/>
3. Enter your credentials:
  - Default username: **user**
  - Default password: **changeme**



  
halytech

**hydroSpider2 login**


**Username**

**Password**

08-02-2019 15:15:24  
hydroSpider2 v1.56  
Device 002B86  
© 2019 - [Halytech](http://www.halytech.com)



4. Access the “Change Setup” window and setup your “Location”, “Time & Date”, “User & Password”:



**hydroSpider2**  
SDI-12 and RS-485

Home >> Change Setup

### Change Setup

[Location](#)  
[User & Password](#)  
[Input Setup](#)  
[Controls](#)  
[Network](#)  
[Reports](#)  
[Modem Diagnostics](#)

[Time & Date](#)  

Select Input to Calibrate

Select Alarm to Change

[Email](#)  
[Twitter](#)  
[Advanced](#)

[Manual Setup Management](#)
[Automatic Setup Management](#)

[Manual Software Upgrade](#)
[Automatic Software Upgrades](#)

Save setup to disk

Exit change setup

Exiting setup will re-enable logging

### Change Time and Date Settings

**Time and Date**

Current date   2019  
 Current time    (hh:mm:ss) - 24 Hour  
 Time zone   (Sydney is +10:00)  

Set from computer

**Time Synchronisation (NTP)**

Automatic NTP ☐  
 NTP server   

Synchronise now

Note: daylight saving is not supported.

Cancel

Save

### Change User / Password

**Administrator account**

Username   
 Password   

The administrator account can be used to change and view setup.

**Service account**

Username   
 Password   

The service account can be used to perform tests and input calibration.

**User account**

Username   
 Password   

The user account can only be used to view setup.

Cancel

Save

20-02-2019 15:21:03  
 hydroSpider2 v1.56  
 Device 002B86  
 © 2019 - Halytech

### Change Location

**Location**

Location (short)   
 Location (long)   

Cancel

Save

20-02-2019 15:20:04  
 hydroSpider2 v1.56  
 Device 002B86  
 © 2019 - Halytech

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Page 9 | 19  
V20221009

## 3 Basic operations

### 3.1 Simple reading of turbidity (general use)

#### 3.1.1 Setting up your NEP-5000 family turbidity sensor for simple turbidity readings (general use)

This setup requires users to have the following:

- NEP-5000 family sensor.
- NEP-5000 calibration module (calibration kit).  
Or request these settings during time of ordering.
- 12V Direct Current (DC) power supply.
- NEP-5000 user manual.

#### 3.1.2 Mode of operation

The logger powers up the sensor using one of its power control switches and waits for the sensor (boot up time allowing total time of about twenty seconds to accommodate the power on wipe feature).

Note: In this scenario the sensor will automatically carryout an optical clean (wipe) soon after boot up. Once the twenty seconds of boot up and wipe time has elapse, the logger issues a measure command (aM!) followed by read command (aD0!) to retrieve the newly measured turbidity value.

#### 3.1.3 Use PC configuration software

The sensor configurations that is shown below requires users to connect to the sensor using its calibration software.

- Turbidity measuring range = Auto or desired single range.  
In calibration software under “Sensor Stage” > “Sensor calibration”.
- Data acquisition time = 4 seconds or more if Auto range is selected or 2 seconds when single range is selected.  
In calibration software under “Output Stage” > “SDI-12 tab”.
- SDI-12 address = 0 (Default) or any desired address.
- Communication protocol of the sensor = SDI-12.

**Range Calibration**

SET Operating Range  
☐ LOW NTU   ☐ Medium NTU   ☒ High NTU   ☐ Auto   Set

Range transition settings

NTU	To	NTU	Use
0	To	97	Use Low range
103	To	995	Use Medium range
1005	To	3000	Use High range

**Auto-Range**

Auto populate from calibration data

OutPut Control

Analog Update rate: 200   ☐ Freeflow Digital   ☐ Polled Digital   COM Type: 3.6V\_Serial   ☒ SDI12

Fixed Communication settings 1200,7,E,1

SDI12 Address: 0   **accusation time**

Start Measurement (aM!) command data acquisition period: 2 Seconds

**OR**

**Range Calibration**

SET Operating Range  
☐ LOW NTU   ☐ Medium NTU   ☒ High NTU   ☐ Auto   Set

2 point calibration.

ONTU (Input RAW)	TopEnd NTU (Input RAW)	TopEnd NTU Value
156	3540	3000

**Single Range**

3rd calibration or higher point calibrations

OutPut Control

Analog Update rate: 200   ☐ Freeflow Digital   ☐ Polled Digital   COM Type: 3.6V\_Serial   ☒ SDI12

Fixed Communication settings 1200,7,E,1

SDI12 Address: 0   **accusation time**

Start Measurement (aM!) command data acquisition period: 2 Seconds

To commit the above settings to permanent memory, please press 'set' followed by "save calibration".

- Wiper operation set to power on wipe.  
In calibration software under "Wiper Control".

**General** | **Sensor Stage** | **OutPut Stage** | **Wiper Control** | **Internal\_Sensors**

**Wiping mode Set**

Basic Motor Controls

Single\_direction\_Wipe

Wiper Timeout: 10

☒ **Wipe On PowerUp**

Wiping Options

Wiper Option OR Autowipe(in seconds 60000max): OFF

Power On Raw Output(Analog out)  
Analog RAW out value during sensor startup.

0

SET

### 3.1.4 Configure Hydrosponder logger

In the “Change Input Setup” menu of the Hydrosponder, set up a new SDI-12 input, called “Turbidity” as follows:

The screenshot shows the 'Change Input Setup' window with a table of input channels. Channel 1 is highlighted with a red box. The table has columns: Type, Source, Name, User ID, Units, and Logging.

	Type	Source	Name	User ID	Units	Logging
1	SDI-12	Interface	Turbidity	0	NTU	General
2	Disabled					
3	Disabled					
4	Disabled					
5	Disabled					
6	Disabled					
7	Disabled					
8	Disabled					
9	Disabled					
10	Disabled					
11	Disabled					
12	Disabled					
13	Disabled					
14	System (Voltage)	External Battery	External Battery	13	V	General
15	System (Voltage)	Charger	Battery Charger	14	V	General
16	System (Temperature)	Temperature	System Temperature	15	C	General

Select “Advanced Option” by clicking on the gearwheel icon and setup a measurement command “M” as follows and press “OK”:

The screenshot shows the 'Turbidity Options' dialog box. The 'Advanced Option' section is highlighted with a red box. The 'Device address' is set to 1, the 'Command' is set to M (v1.0+), and the 'Parameter' is set to 1. The 'OK' button is also highlighted with a red box.

**Turbidity Options**

This channel's options have been changed from their defaults. Changed options are highlighted in orange.

Default ID: 0

Log difference in reading over logging period: ☐

Minimum change required to log: 0.000

Warmup source: No warmup

**Advanced Option**

Device address: 1

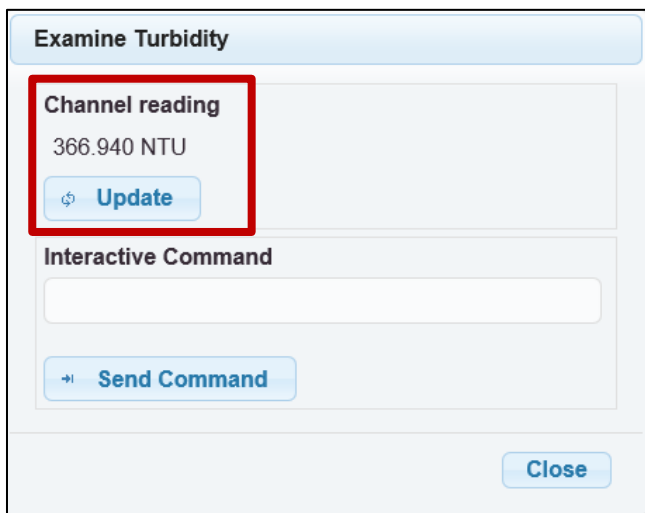
Command: M (v1.0+)

Parameter: 1

Sampling period: Same as logging

Cancel OK

In the “Change Input Setup” menu of the HydrosSpider, click on the “magnifying glass” icon to test your measurement command and check the turbidity value:

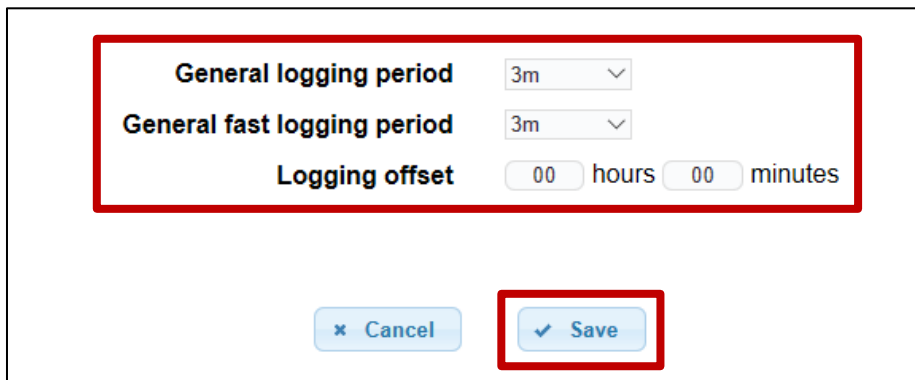


**Examine Turbidity**

**Channel reading**  
366.940 NTU

**Interactive Command**

In the “Change Input Setup” menu of the HydrosSpider, select the “logging interval” and “logging offset” period as required per your application:

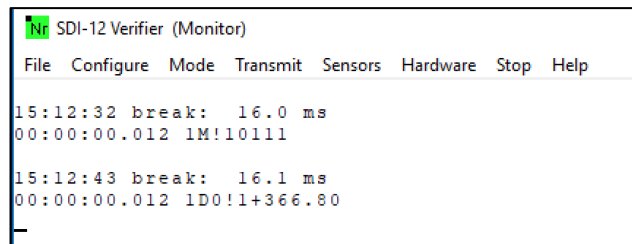
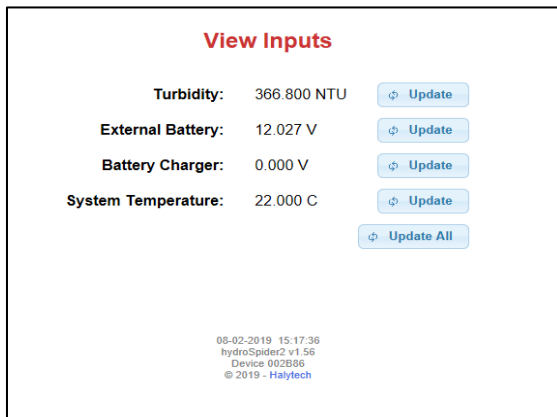


**General logging period** 3m

**General fast logging period** 3m

**Logging offset** 00 hours 00 minutes

Note: You have successfully configured your measurement and wiping command and can go to the “View Input” menu of the HydrosSpider, or check the logging history or use a “SDI-12 Verifier” to make sure each command has been set up properly.



## 3.2 Reading of turbidity using auto-range feature after an optical wipe (recommended option)

### 3.2.1 Setting up your NEP-5000 family turbidity sensor for stable turbidity readings and allowing wiper to control via SDI-12

This setup requires users to have the following:

- NEP-5000 family sensor.
- NEP-5000 calibration module (calibration kit).  
Or request these settings during time of ordering.
- 12V DC power supply.
- NEP-5000 user manual.

### 3.2.2 Mode of operation

The logger powers up the sensor using one of its power control switches and waits for the sensor (boot up time of four seconds).

After the boot up delay has elapsed, the logger will send a SDI-12 wipe command (0M1!) followed by sixteen seconds of wipe completion delay. Once the wipe completion delay has elapsed, the logger issues a measure command (aM!) followed by the read command (aD0!) to retrieve the newly measured turbidity value.

### 3.2.3 Use PC configuration software

The sensor configurations that is shown below requires users to connect to the sensor using its calibration software.

- Turbidity measuring range = Auto or desired single range.  
In calibration software under “Sensor Stage” > “Sensor calibration”.
- Data acquisition time = 4 seconds or more if Auto range is selected or 2 seconds when single range is selected.  
In calibration software under “Output Stage” > “SDI-12 tab”.
- SDI-12 address = 0 (Default) or any desired address.
- Communication protocol of the sensor = SDI-12.

**Range Calibration**

SET Operating Range

☐ LOW NTU ☐ Medium NTU ☐ High NTU ☒ Auto

Set

Range transition settings

NTU	To	NTU	Use
0	To	97	Use Low range
103	To	995	Use Medium range
1005	To	3000	Use High range

Auto populate from calibration data

**Auto-Range**

OutPut Control

Analog Update rate: 200

☐ Freeflow Digital ☐ Polled Digital

COM Type: 3.6V\_Serial

☒ SDI12

Please select "3.6V\_Serial" for RS232, Bluetooth and USB options.

Analogue Out\_RAW\_setup Digital Polled MODBUS SDI12

Fixed Communication settings 1200,7,E,1

SDI12 Address: 0

Start Measurement (aM!) command data acquisition period

4 Seconds

Use aDU! command to retrieve data.

SDI12 Supported

\*\*\*\*Acknowledge Return a <CR><LF> Eg- 1!1<CR><LF>

**Range Calibration**

SET Operating Range

☐ LOW NTU ☐ Medium NTU ☒ High NTU ☐ Auto

Set

2 point calibration.

ONTU (Input RAW)	TopEnd NTU (Input RAW)	TopEnd NTU Value
156	3540	3000

☐ 3rd calibration or higher point calibrations

**Single Range**

OutPut Control

Analog Update rate: 200

☐ Freeflow Digital ☐ Polled Digital

COM Type: 3.6V\_Serial

☒ SDI12

Please select "3.6V\_Serial" for RS232, Bluetooth and USB options.

Analogue Out\_RAW\_setup Digital Polled MODBUS SDI12

Fixed Communication settings 1200,7,E,1

SDI12 Address: 0

Start Measurement (aM!) command data acquisition period

2 Seconds

Use aDU! command to retrieve data.

SDI12 Supported

\*\*\*\*Acknowledge Return a <CR><LF> Eg- 1!1<CR><LF>

- Wiper operation set not to power on wipe (untick).  
In calibration software under “Wiper Control”.

General Sensor Stage OutPut Stage **Wiper Control** Internal\_Sensors

Wiping mode Set

Basic Motor Controls

Single\_direction\_Wipe

Wiper Timeout

10

☐ Wipe On PowerUp

Wiping Options

Wiper Option OR Autowipe(in seconds 60000max)

OFF

Power On Raw Output(Analogue out)

Analogue RAW out value during sensor startup.

0

SET

### 3.2.4 Configure Hydrosponder logger

In the “Change Input Setup” menu of the Hydrosponder, set up a new SDI-12 input, called “Wipe” as follows:

**Change Input Setup**

	Type	Source	Name	User ID	Units	Logging
1	SDI-12	Interface	Turbidity	0	NTU	General
2	SDI-12	Interface	Wipe	1	Stats	General
3	Disabled					
4	Disabled					
5	Disabled					
6	Disabled					
7	Disabled					
8	Disabled					
9	Disabled					
10	Disabled					
11	Disabled					
12	Disabled					
13	Disabled					
14	System (Voltage)	External Battery	External Battery	13	V	General
15	System (Voltage)	Charger	Battery Charger	14	V	General
16	System (Temperature)	Temperature	System Temperature	15	C	General

Select “Advanced Option” by clicking on the gearwheel icon and setup a wiping command “M1” as follows and press “OK”:

**Wipe Options**

[? Help](#)

ⓘ This channel's options have been changed from their defaults. Changed options are highlighted in orange.

**Default ID**  
1

**Log difference in reading over logging period**  
☐

**Minimum change required to log**  
0.000

**Warmup source**  
No warmup

**Device address**  
1

**Command**  
M1

**Parameter**  
1

**Sampling period**  
Same as logging

[Cancel](#)
[OK](#)



In the “Change Input Setup” menu of the HydrosSpider, click on the “magnifying glass” icon to test your Wiping command and check if the sensor is wiping:

**Examine Wipe**

**Channel reading**  
0.000 Stats

**Interactive Command**  
  
Error: no response from sensor

In the “Change Input Setup” menu of the HydrosSpider, select the “logging interval” and “logging offset” period as required per your application:

**General logging period** 3m

**General fast logging period** 3m

**Logging offset** 00 hours 00 minutes

**Note:** You have successfully configured your measurement and wiping command and can go to the “View Input” menu of the HydrosSpider, or check the logging history or use a “SDI-12 Verifier” to make sure each command has been set up properly.

**View Inputs**

Turbidity: 366.800 NTU

Wipe: 0.000 Stats

External Battery: 12.027 V

Battery Charger: 0.000 V

System Temperature: 22.000 C

08-02-2019 15:17:36  
hydroSpider2 v1.56  
Device 007856  
© 2019 - Halytech

**SDI-12 Verifier (Monitor)**

File Configure Mode Transmit Sensors Hardware Stop Help

```
15:12:14 break: 16.0 ms
00:00:00.012 IM1!10161

15:12:31 break: 16.1 ms
00:00:00.012 ID0!1+0.00

15:12:32 break: 16.0 ms
00:00:00.012 IM!10111

15:12:43 break: 16.1 ms
00:00:00.012 ID0!1+366.80
```

## 4 Check logging history

The user can check the logging history of the logger, in the “History” tab by clicking on “Get History”:

The user will have access to the raw data and will need to manually extract the relevant information based on the “UserID” (refer to “UserID” selected in the “Change Input Setup” menu of the software):

	A	B	C	D	E
1	20/02/19	15:21:59	1	926	0
2	20/02/19	15:21:42	0	926	406.35
3	20/02/19	15:21:30	13	1517	12.027
4	20/02/19	15:21:30	15	1422	22
5	20/02/19	15:21:30	14	1521	0
6	20/02/19	15:21:29	1000	10001	EXITSETP
7	20/02/19	15:20:54	1000	301	CLKCHG
8	20/02/19	15:20:55	1000	300	CLKCHG
9	20/02/19	15:19:56	1000	301	CLKCHG
10	8/2/2019	15:25:11	1000	300	CLKCHG
11	8/2/2019	15:24:40	1000	10000	ENTRSETP
12	8/2/2019	15:24:13	0	926	406.58
13	8/2/2019	15:24:01	1	926	0
14	8/2/2019	15:24:00	13	1517	12.019
15	8/2/2019	15:24:00	15	1422	22
16	8/2/2019	15:24:00	14	1521	0

Date	Time	UserID	SecondaryID	Measured Value	
20/02/19	15:27:1	0	926	406.04	Turbidity
20/02/19	15:27:0	1	926	0	Wipe
20/02/19	15:27:0	13	1517	12.019	External Battery
20/02/19	15:27:0	15	1422	22	System Temperature
20/02/19	15:27:0	14	1521	0	Battery Charger
20/02/19	15:24:1	0	926	365.4	Turbidity
20/02/19	15:24:0	1	926	0	Wipe
20/02/19	15:24:0	13	1517	12.019	External Battery
20/02/19	15:24:0	15	1422	21.7	System Temperature
20/02/19	15:24:0	14	1521	0	Battery Charger

Type	Source	Name	User ID	Units	Logging
1	SDI-12	Interface	Turbidity	0	NTU General
2	SDI-12	Interface	Wipe	1	Stats General
3	Disabled				

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