NEP50xx RS485/RS232/SDI12/USB & Analogue option

Sensor calibrations and output configurations.

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1.0 Prerequisites

- Please find the provided USB or download latest software from http://download.observator.com/files.

  The Main site.

  http://download.observator.com/files/

  Software

  http://download.observator.com/files/?dir=Software/NEP50xx

  For CFGs

  http://download.observator.com/files/?dir=NEP50XX%20calibration%20da

  To download a single CFG single file from the list.

  Please right click and press "**Save link as**"

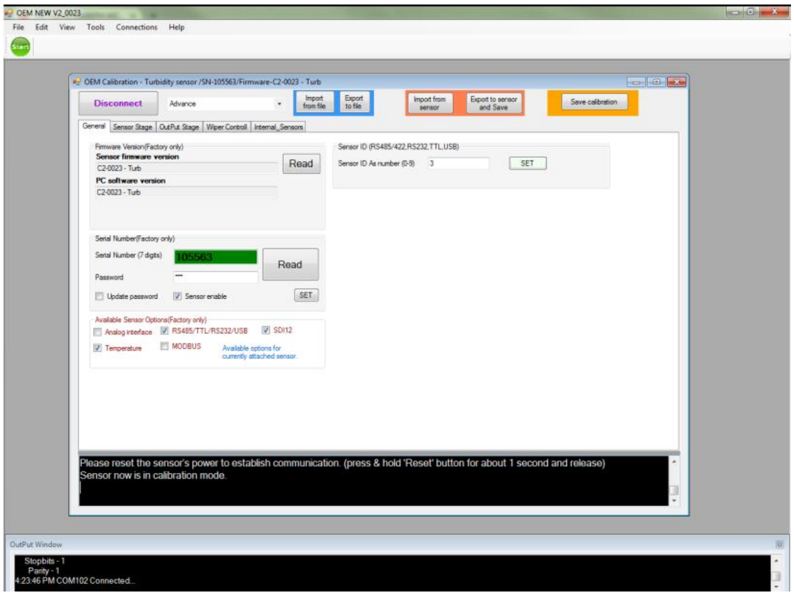
  To help locate files please use the "find or search" tool in your browser.

Important – Please make sure that to use matching revision of sensor's firmware and PC software.

Folder view

Name	Date modified	Type
Calibration	30/06/2016 12:47 ...	File fol
Device_CPU	6/06/2016 9:09 PM	File fol
Devices	6/06/2016 9:21 PM	File fol
Hex	6/06/2016 9:21 PM	File fol
Prerequisites & Drivers	6/06/2016 9:09 PM	File fol
Nephlometer OEM.exe	6/06/2016 9:09 PM	Applic
USB NEP5000 V3.exe	31/03/2016 7:25 PM	Applic
usb_config.txt	5/07/2016 4:22 PM	Text D
Docs	13/07/2016 9:57 AM	File fol

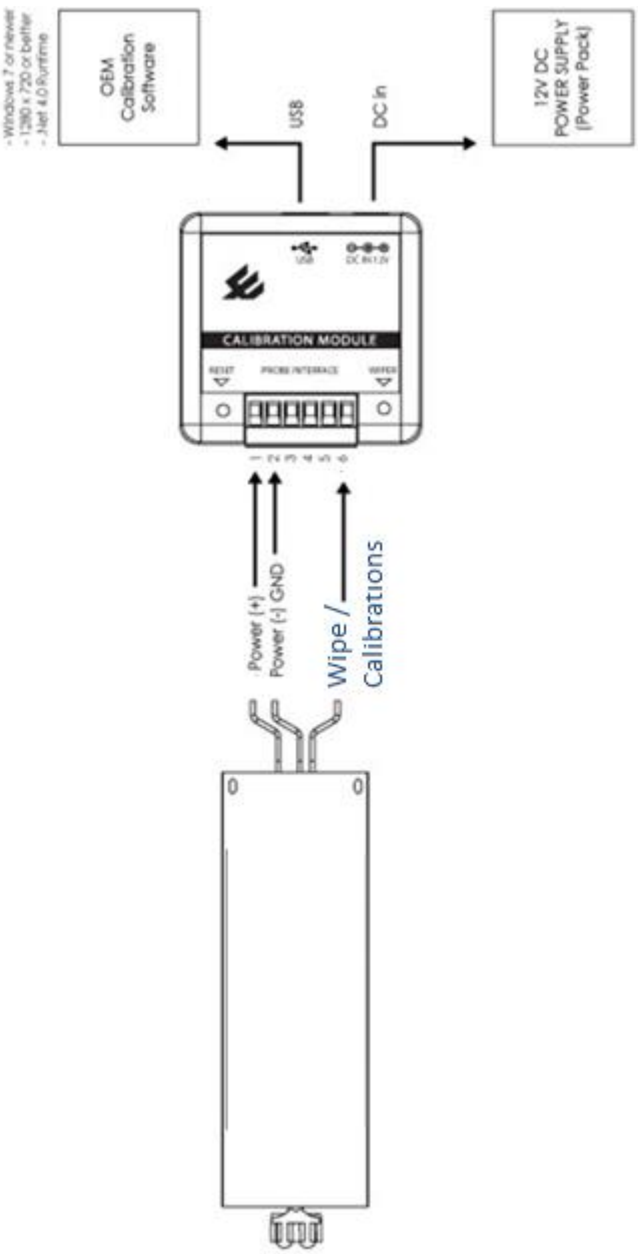
- "Nephlometer OEM.exe" calibration software installed PC.
  User may run this exe directly from USB or copy contains to a local drive (When coping please copy all the supporting folders to same location).



- Observator Instruments NEP50xx OEM calibration module, USB cable and supplied installation disk or USB drive.

2.0 Calibration Hardware Setup

Please setup your probe as follows. Note that the 12V power pack is not required if your USB port can deliver more than 200mA.



(Glanded cable)NEP500x RS485, RS232 & analogue option wire colours and its functions.

Wire colour	**NEPOEM Voltage option.**
Brown	DC+10Vto30V
Green	GND and RS232 GND
Grey	Wipe / Calibrations
White	Voltage out reference to GND OR 4-20mA Loop driver out to GND.
Blue	RS485 (-)
PINK	RS485 (+)
RED	RS232 TX
Yellow	RS232 RX

Subconn connector Option

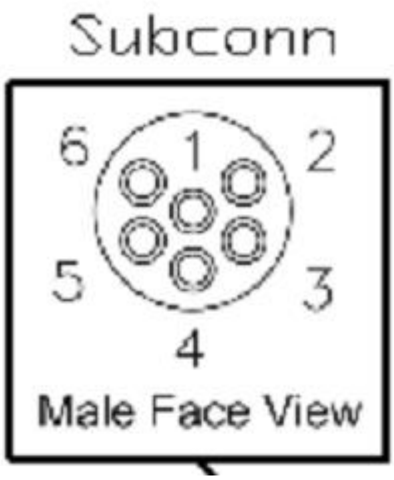
NEP50xx with 4-20mA current option. Subconn pins

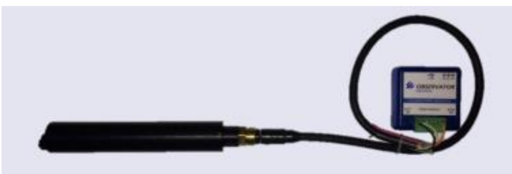
pin 1	Power(+)12V to 24V
pin 2	GND and RS232 GND
pin 3	RS485+ OR RS232 TX
Pin 4	RS485- OR RS232 RX
Pin 5	Calibration wire turbidity.
Pin 6	4-20mA current out through GND.

NEP5000 with pressure option (RS485 only). Subconn pins

pin 1	Power (+) 12V to 24V
pin 2	GND
pin 3	RS485+
Pin 4	RS485-
Pin 5	Calibration wire turbidity.
Pin 6	Calibration pressure.

Subconn Pin number	Subconn standard matching connector's Default wire colours.
Pin 1	Black
Pin 2	White
Pin 3	RED
Pin 4	Green
Pin 5	Orange
Pin 6	Blue

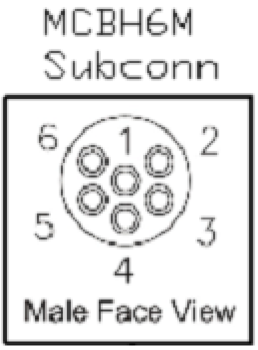




NEP5000 with PC interface to run configuration software

NEP5008 Sensor Pinouts OR wire colours.

SubConn connector SDI12 Option.



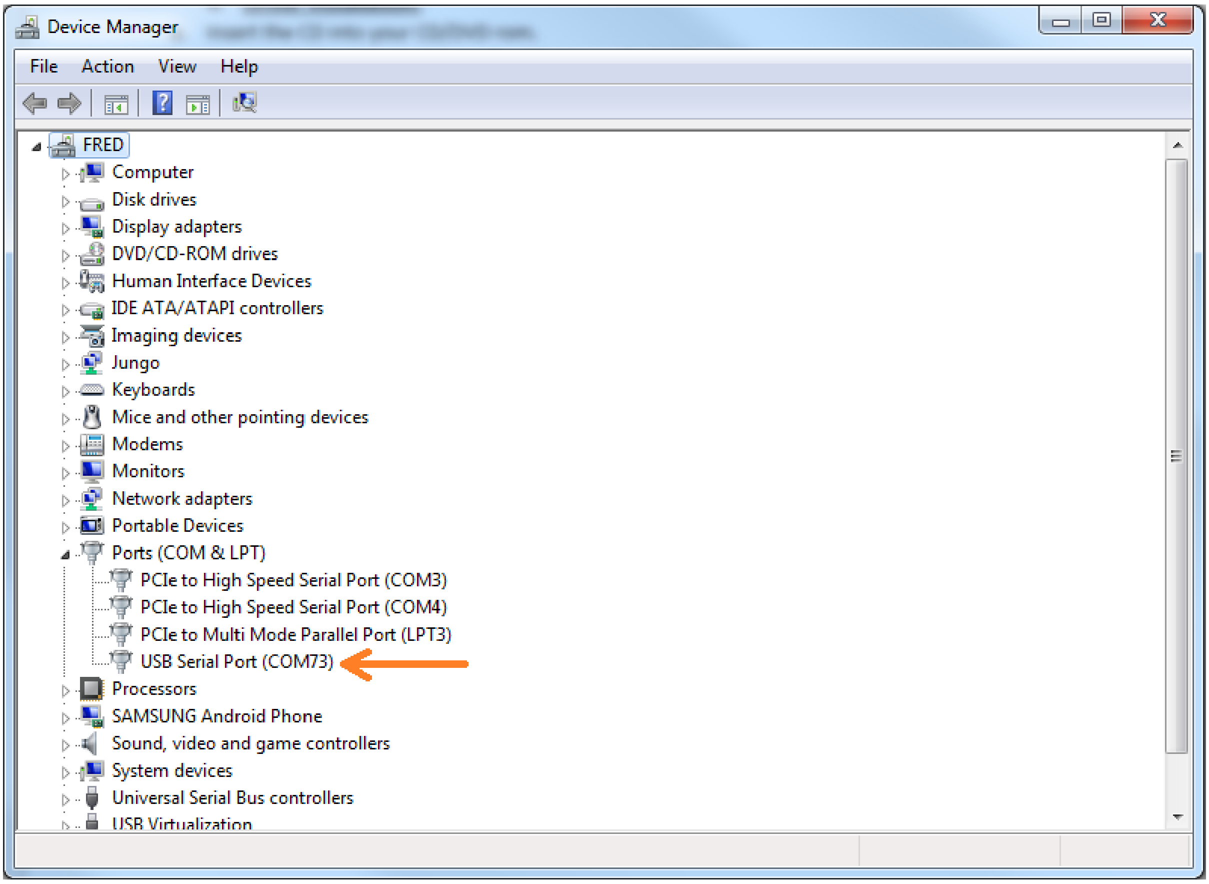
- Pin1- = Power GND, SDI12 GND and Voltage output GND.
- Pin2- =SDI12 Data.
- Pin3- =10 to 30V DC power (+ve).
- Pin4- =4-20mA loop to power GND via 100ohms
- Pin5- =Voltage Out.
- Pin6- =Calibration Communication Data.

SDI12 Glanded option

- Green- = Power GND, SDI12 GND and Voltage output GND.
- White- =SDI12 Data.
- Brown - =10 to 30V DC power (+ve).
- Blue - 4-20mA loop to power GND via 100ohms
- Yellow- =Voltage Out.
- Gray- =Calibration Communication Data.

3.0 Driver Installation

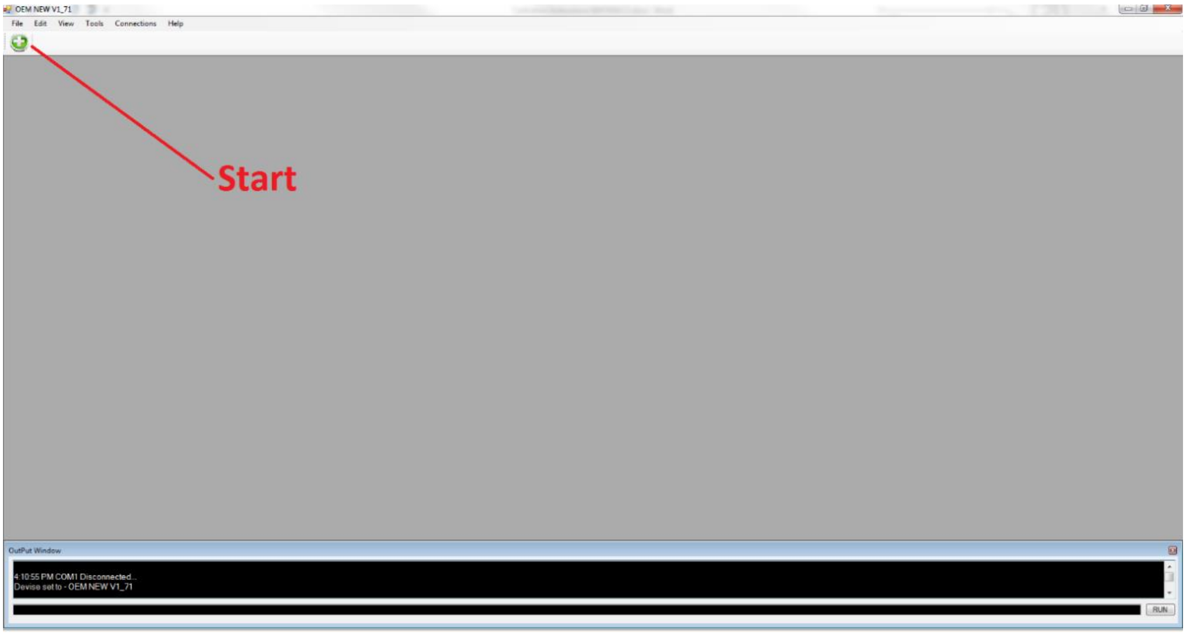
a. Insert the CD into your CD/DVD rom or Insert provided USB.
b. Connect Calibration module to PC via supplied USB cable.
c. Open “Windows device manager” and select the newly connected device.
d. Right click and click “Update device software” and then click “driver software from your computer” option.
e. Using the “Browse” button select optic diver when prompt and OK.
f. Wait for completion of driver installation.
g. After successful installation “Windows device manager” should display a com port in “Ports (COM & LPT)” Category.



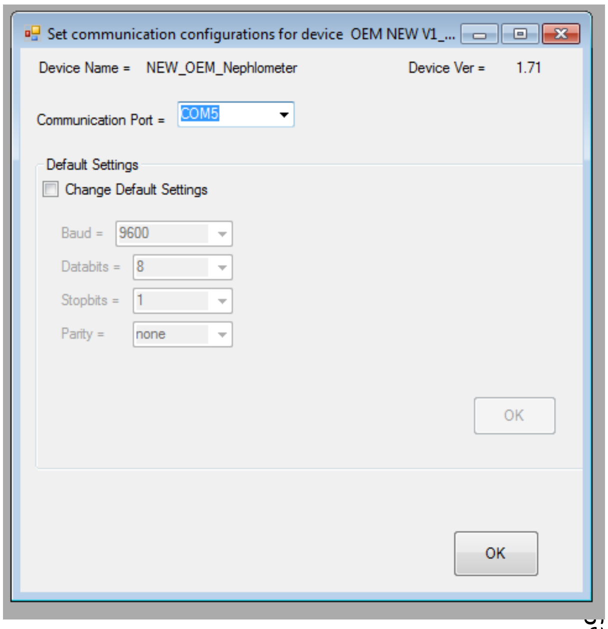
h. Note the new port number.

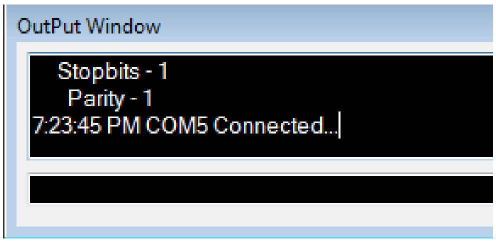
4.0 Software Connection Setup

a. Run calibration software and press “Start” Button.



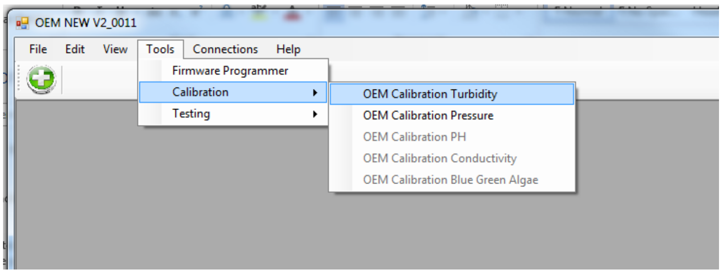
b. Select the correct COM port from dropdown box and press OK.



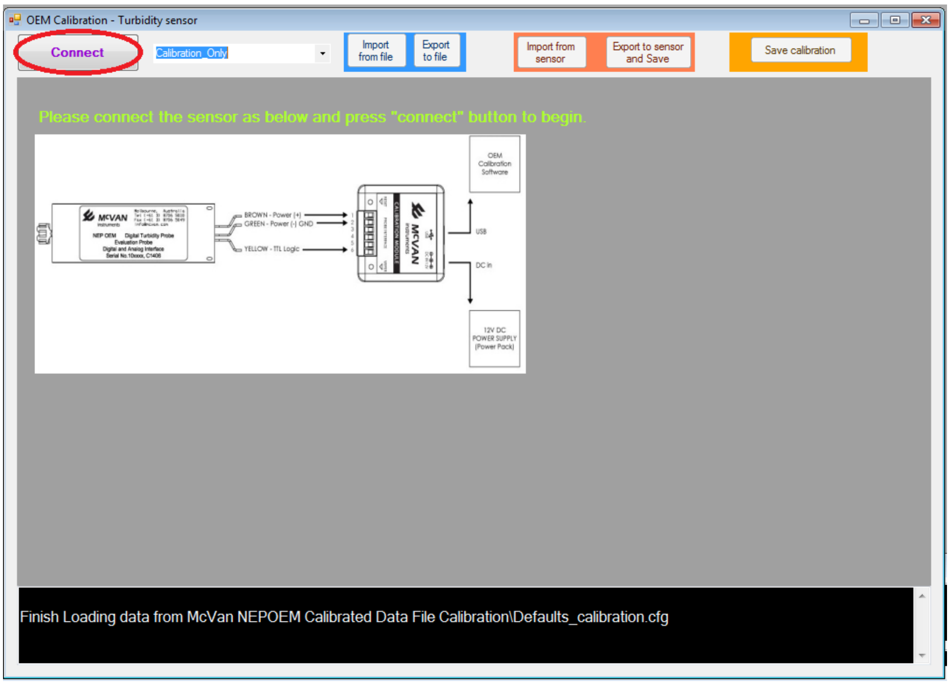


Note – Output Window should show following when correct communications port is select

c. Go to “Tools”, “Calibration” and select “OEM Calibration Turbidity”.

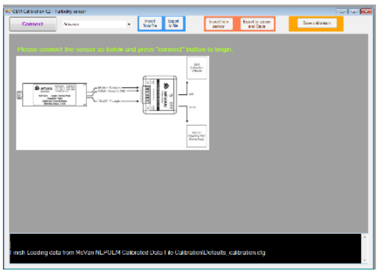


Note – Step 3.d will run the Calibration Window. Pressing the maximise button (top right) will enable a larger view.

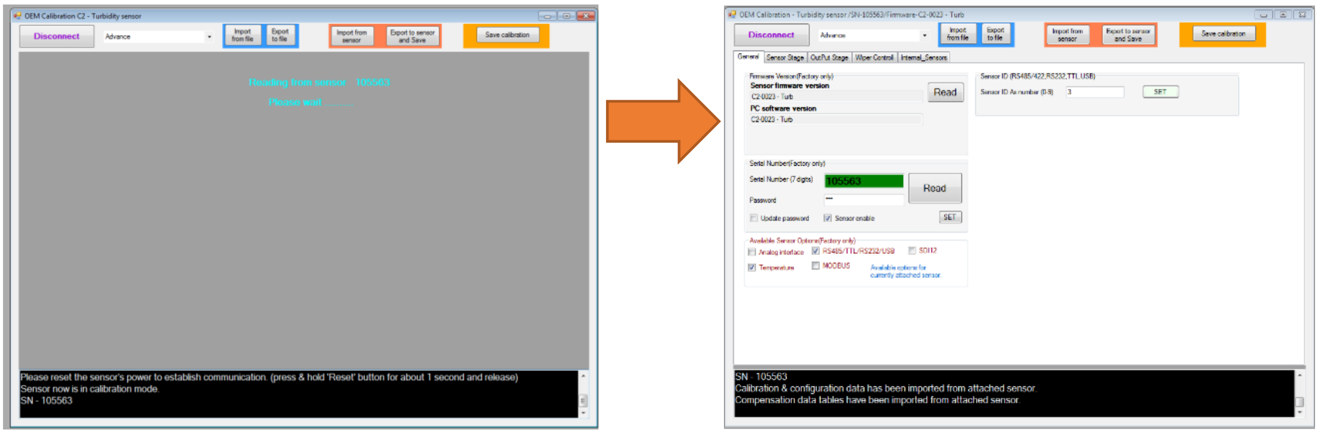


To establish a calibration connection with the sensor please follow the following procedure.

1. Press connect button “Connect Button” on the software.



2. Press “Reset” button on Calibration Module.



Output Window should show following when successful.

“SN -xxxxx
Calibration & configuration data has been imported from attached sensor.
Compensation data tables have been imported from attached sensor.”
Note 1 – First line showing that all the calibration data displaying are defaults values.
Note 2 – Select “Advance” in top left drop down window to display all Available Options.

5.0 Practices & Principles

A. Abstract

Chapter 5.0 outlines the strict guidelines that an operator should follow during the operation of the turbidity sensors. It is highly recommended that all operation staff read this chapter thoroughly independent of prior background knowledge. **Failure to do so may result in undesired measurement discrepancies.**

B. Laboratory Equipment

Quality laboratory equipment is essential during the calibration stages to minimise errors that may arise in the laboratory. Essential lab equipment includes: in-date reference solutions, infrared absorbent containers, wash solution, compressed air and a vice and stand.

Zero NTU reference (Amco Clear) & 'Top End' Reference solutions

Figure 5.1

Stand and Vice

Figure 5.2

Wash Solution

Figure 5.3

Infrared Absorbent Container

Figure 5.4

Compressed Air

Figure 5.5

All reference solutions should be replaced after expiry.
Infrared absorbent containers should be thoroughly washed after usage.
Wash solutions replaced regularly.

C. Probe Cleaning

Turbidity probe heads should always be cleaned before immersion into a reference solution. This process consists of rinsing the probe head with a Zero '0' NTU wash solution (distilled water is acceptable) then removing the moisture with compressed air.

Stains or other foreign matter may be removed with a lint free cloth. However, the probe should again be blown with a compressed air if a cloth is applied.

D. Probe Immersion

For accurate readings, the reference solution should be poured into an infrared absorbent container. This will minimise ambient radiation from disrupting the probe reading. Furthermore, there should be a minimum of 70mm height from the reference solution's surface to the container bottom.

Turbidity probe in 0 NTU solution
Probe is clamped in place

Figure 5.6

Turbidity probes should be inserted into the reference solution at a non-perpendicular angle with respect to the liquid surface. This will minimise the likelihood of bubble formation upon the optic head.

Once the conditions listed above have been satisfied, fix the probe into position with a clamp and stand. Figure 5.6 illustrates an appropriately configured measurement apparatus.

E. Wiping

Before logging data, the operator should always perform at least one wipe. The operator should note the raw NTU value before and after the wipe. If the raw NTU value changes significantly, it is likely that air bubbles have formed on the optic head. In this case, Section D should be repeated. Otherwise, proceed to Section F.

F. Measuring & Stabilisation

Provided Section E & D were performed without error, the turbidity probe is now ready to acquire data. Set the probe into data acquisition mode and observe the behaviour of the raw NTU value. Probe data will be valid once the raw NTU stabilises. Stabilisation typically takes anywhere between 5 to 10 seconds. However more time may be required for low NTU solutions (less than 100 NTU).

G. Post Measurement Cleaning

Turbidity probes should be cleaned immediately after usage. Failure to do so may result in the formation of stains that could pollute reference solutions.

6.0 General Settings

A. Firmware Version

The current firmware revision running on the connected probe. Please make sure that both probe and PC versions are in same revision.

B. Serial Number

Unique serial number assigned to the running probe during manufacturing. Serial numbers cannot be changed.

C. Password

Factory usage only.

General Settings Menu

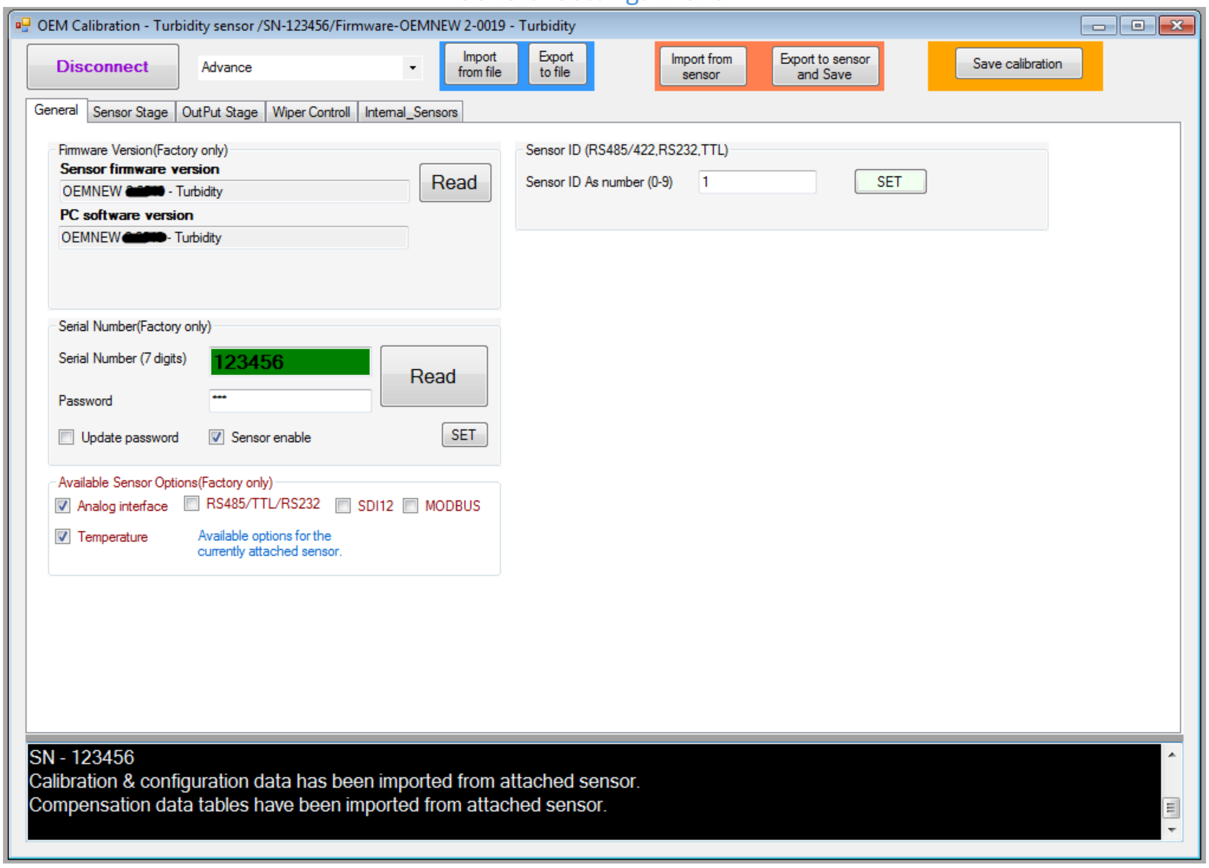


Figure 6.1

D. Sensor ID

Current ID of running sensor. Sensor ID can range from 0 to 9. Sensor ID is used for serial output.

E. Available Sensor Options

A list of output interfaces available to the probe. Corresponding hardware must be physically installed into the probe for outputs to be available.

7.0 Turbidity Sensor Calibration

Please read Chapter 5.0 Practices & Principles before attempting calibration instructions outlined in chapter 7.

A. Equipment

Before attempting calibration, please ensure that you have the following equipment:
Zero '0' NTU reference solution (Amco Clear), one 'top end' reference solution per each range, a vice stand, wash solution (Distilled water or Amco Clear), one infrared absorbent container per reference solution, compressed air.

0 NTU reference (Amco Clear) & 'Top End' Reference solutions

Figure 7.1

Stand and Vice

Figure 7.2

Wash Solution

Figure 7.3

Infrared Absorbent Container

Figure 7.4

Compressed Air

Figure 7.5

B. Preparation

Please thoroughly read Chapter 6.0 Section X before attempting subsequent steps!

C. Navigation

The turbidity range and sensitivity calibration options are located under the ‘Sensor Stage’ primary tab and ‘Sensor Calibrations’ secondary tab.

D. Range Selection

The turbidity sensor probe comprises three turbidity ranges; low, medium and high. Each range is optimised for measuring specific levels of turbidity **(Check order information for target ranges).**

NOTE: The ‘Auto’ option is not a discrete range, but rather a mechanism for the probe to dynamically adjust the range settings during data acquisition, thus automatically selecting appropriate range for the current sample. This is covered in section G.

Turbidity Calibration

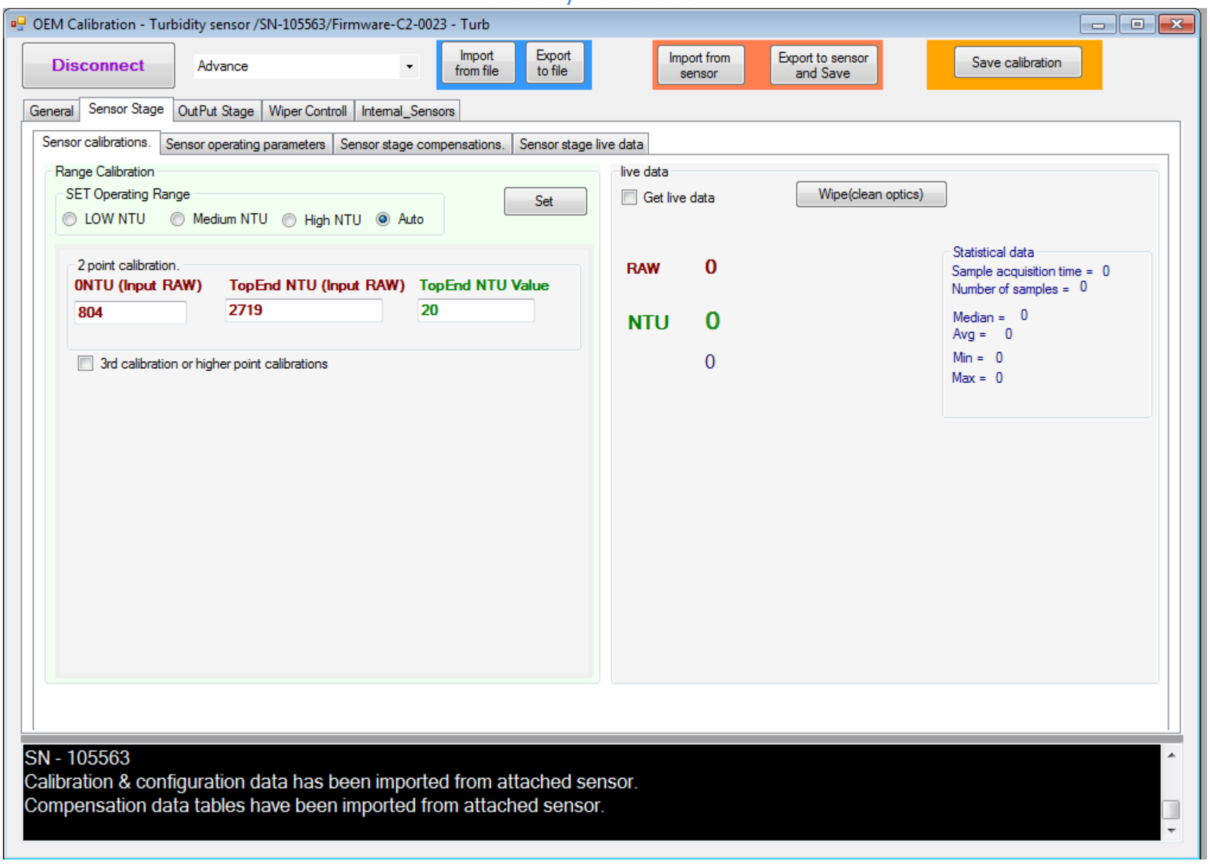


Figure 7.1

E. 2-Point Calibration

This is the process of normalising measured data between two reference points; 'low end' (Zero '0' NTU reference) and 'top end'.

a. **Turbidity Value**

To commence calibration of a particular range, the target 'top end' turbidity rating must first be specified. In the example illustrated in figure 7.1, the 'top end' solution has a turbidity rating of 1000 NTU. Thus, in this case we input the integer value of 1000 into the 'TopEnd NTU Value' text field (field in green).

b. **Low End**

Secondly, we must acquire the zero NTU offset of the turbidity sensor. *(NOTE: The offset is specific to each individual sensor).* This is achieved by measuring the turbidity of a Zero '0' NTU reference solution.

Start by first placing the probe in the reference Zero '0' NTU solution. Next, tick the 'Get Live Data' check box. Subsequently, the probe will commence measuring the solution. Allow the turbidity sensor a few seconds to stabilise **(Please refer to Chapter 6 Section X for recommended turbidity measuring practices)**. The turbidity sensor's raw measurement (value in red) should stabilise between 100 and 200. *(Ignore the NTU reading for now).*

Once stabilised, un-tick the 'Get Live Data' check box. Next, copy the raw measurement integer into the Zero '0' NTU (Input RAW)' text field.

c. **Top End**

Place the probe into the 'top end' solution. Next tick the 'Get Live Data' check box. Allow the probe time to stabilise **(Please refer to Chapter 6 Section X for recommended turbidity measuring practices)**. Once stabilised, un-tick the 'Get Live Data' check box. Next, either click on the 'TopEnd NTU (Input Raw)' label or in the adjacent text field, manually input the raw NTU value. Finally click the 'Set' button.

To clarify results, replace the probe into known turbidity solutions ranging between zero and the 'top end' solution.

d. **Committing to Memory**

Once satisfied with results, click the 'Save Calibration' button in the top right hand corner of the working window **(the button on the orange background)**. This will instruct the probe to retain the calibration settings even after power down.

F. Auto-Ranging

a. Abstract

The Auto-Ranging feature is a mechanism for the probe to dynamically adjust the range settings during data acquisition. Thus, ensuring that the probe always operates in the range that will give the finest available resolution.

To enable the auto-ranging feature, the probe must first be calibrated for all three ranges.

Auto-Range Setup

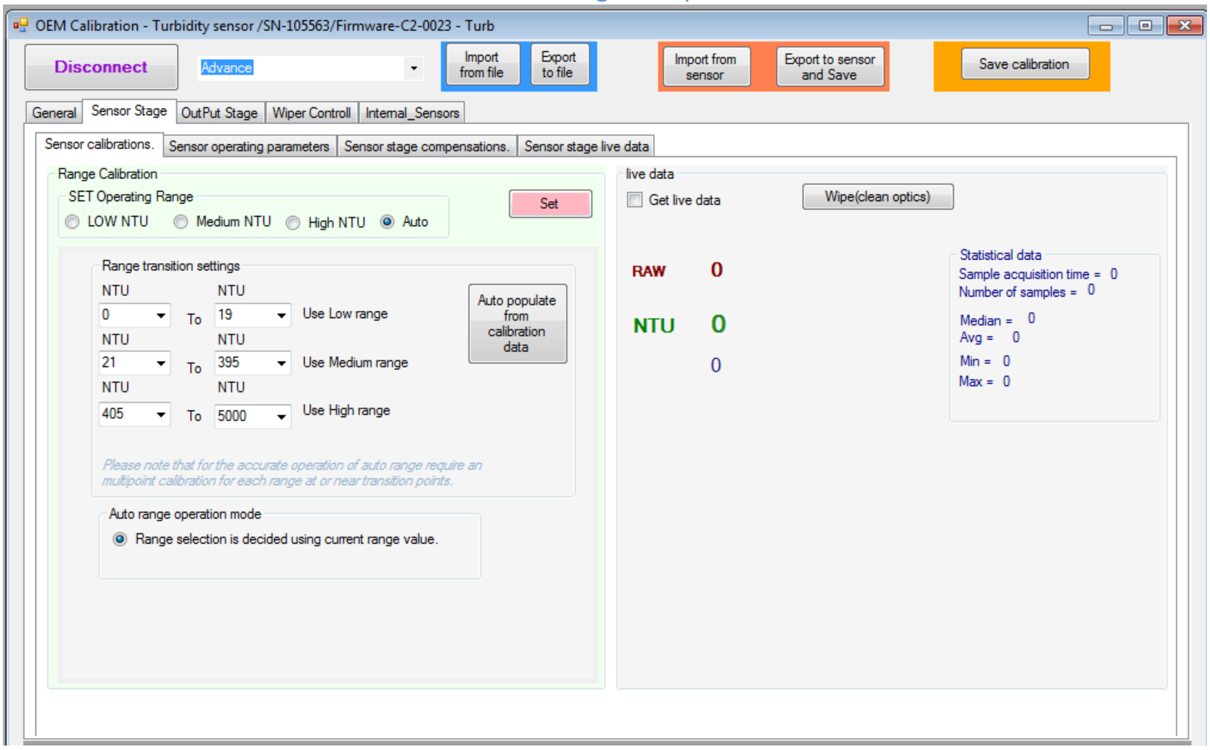


Figure 7.3

b. Navigation

The Auto-Range feature can be accessed by clicking on the ‘Sensor Stage’ tab, ‘Sensor Calibrations’ tab and finally selecting the ‘Auto’ radio button.

c. Enabling

The Auto-Range feature is enabled by clicking the ‘Auto populate from calibration data’ button. This will setup the overlapping turbidity values by extracting the results from the three rangers. Next, click the ‘Set’ button. Finally, click the ‘Save calibration’ button.

d. Verification

Verify the auto-ranging feature by sampling differing solutions that fall into the low, medium and high ranges. If setup correctly, the probe will automatically change its operating range to best suit the current solution.

9.0 Analogue Voltage Output Calibration

A. Navigation

The analogue voltage output configuration settings are located under the ‘Output Stage’ primary tab and ‘Analogue Out_RAW_setup’ secondary tabs (Figure 8.2).

B. Enabling Analogue Voltage Output

The voltage output is enabled by checking the ‘Analogue’ tick box. The sample rate can be adjusted by changing the integer value of the field box located next to the tick box. The integer value expresses the sample period in milliseconds.

C. Physical Calibration Setup

The voltage output can be measured with a laboratory grade multimeter (or voltmeter). All voltage enabled probes are calibrated in factory with digital multimeter.

D. Adjusting Bottom Limit

Select the ‘Set 0 NTU Offset’ radio button. Click ‘Apply/Test’ and the probe will output the voltage associated with the Zero '0' NTU offset.
The Zero '0' NTU voltage offset can be adjusted by moving the range slider. To increase the offset voltage, move the slider to the right. To decrease the offset voltage, move the slider to the left. Offset changes take effect after pressing the ‘Apply/Test’ button.

E. Adjusting Top Limit

Repeat step D procedure, but with the ‘Set Top end Limit’ radio control selected.

Voltage Output Calibration Arrangement

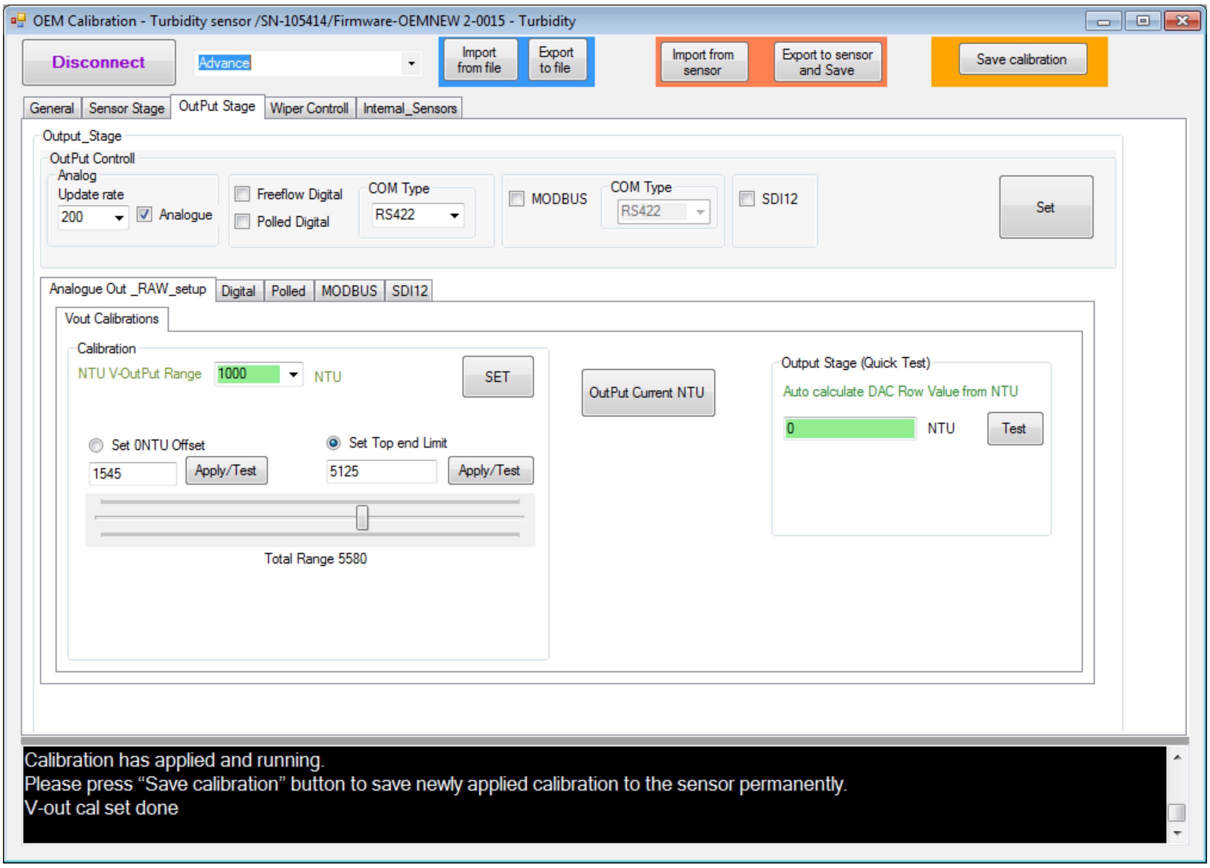


Figure 9.2

F. Setting Target Turbidity Upper Limit

The target turbidity upper limit can be set by specifying the turbidity level in the ‘NTU V-Out Range’ text box on the ‘Vout Calibrations’ tab.

For example, in figure 9.2 it can be observed that the target turbidity upper limit is set to 1000 NTU. In the case the probe measure a solution of 1000 NTU, the voltage induced on the output will be equal to the voltage specified by the ‘Top Limit’ (Section E). Similarly, if the probe measures a 0 NTU solution, the voltage on the output will be equal to the voltage specified by the ‘Bottom Limit’ (Section D).

G. Committing Calibration to Memory

Once satisfied with the settings, click the ‘Set’ button in the top right hand corner of the Calibration tab. Next click the ‘Set’ button on the ‘Output Stage’ tab. Finally, click the ‘Save Calibration’ button in the top right hand corner of the active window.

H. Verification

Analogue voltage outputs for turbidity levels may be simulated using the ‘Output Stage (Quick Test)’ feature. To do this, input an expectant turbidity level into the ‘Auto calculate DAC Raw Value from NTU’ value field. Next click the ‘Test’ button. The probe will subsequently output the corresponding voltage.

10.0 Analogue Current Loop

A. Abstract

The Analogue Current Loop output facilitates a milli-ampere current output interface. The current loop has a specified bottom limit of 4mA and an upper limit of 20mA.

B. Navigation

The analogue current output configuration settings are located under the ‘Output Stage’ primary tab and ‘Analogue Out_RAW_setup’ secondary tab (Figure 10.2).

C. Enabling Analogue Current Loop Output

The current loop output is enabled by checking the ‘Analogue’ tick box. The sample rate can be adjusted by changing the integer value of the field box located next to the tick box. The integer value expresses the sample period in milli-seconds.

D. Physical Calibration Setup

The current loop output can be measured with a laboratory grade multimeter (or ammeter).

A load resistance must be placed in series with the ammeter. The recommended load resistance is 100 ohms, however load resistance may vary between 50 to 270 ohms. All current loop enabled probes are calibrated in factory with Fluke 15B digital multimeters.

E. Adjusting Bottom Limit

Select the ‘Set 0 NTU Offset’ radio button. Click ‘Apply/Test’ and the probe will output the current associated with the 0 NTU offset. The 0 NTU current offset can be adjusted by moving the range slider. To increase the offset current, move the slider to the right. To decrease the offset current, move the slider to the left. Offset changes take effect after pressing the ‘Apply/Test’ button.

F. Adjusting Top Limit

Repeat step D procedure, but with the ‘Set Top end Limit’ radio control selected.

Current Loop Output Calibration Arrangement

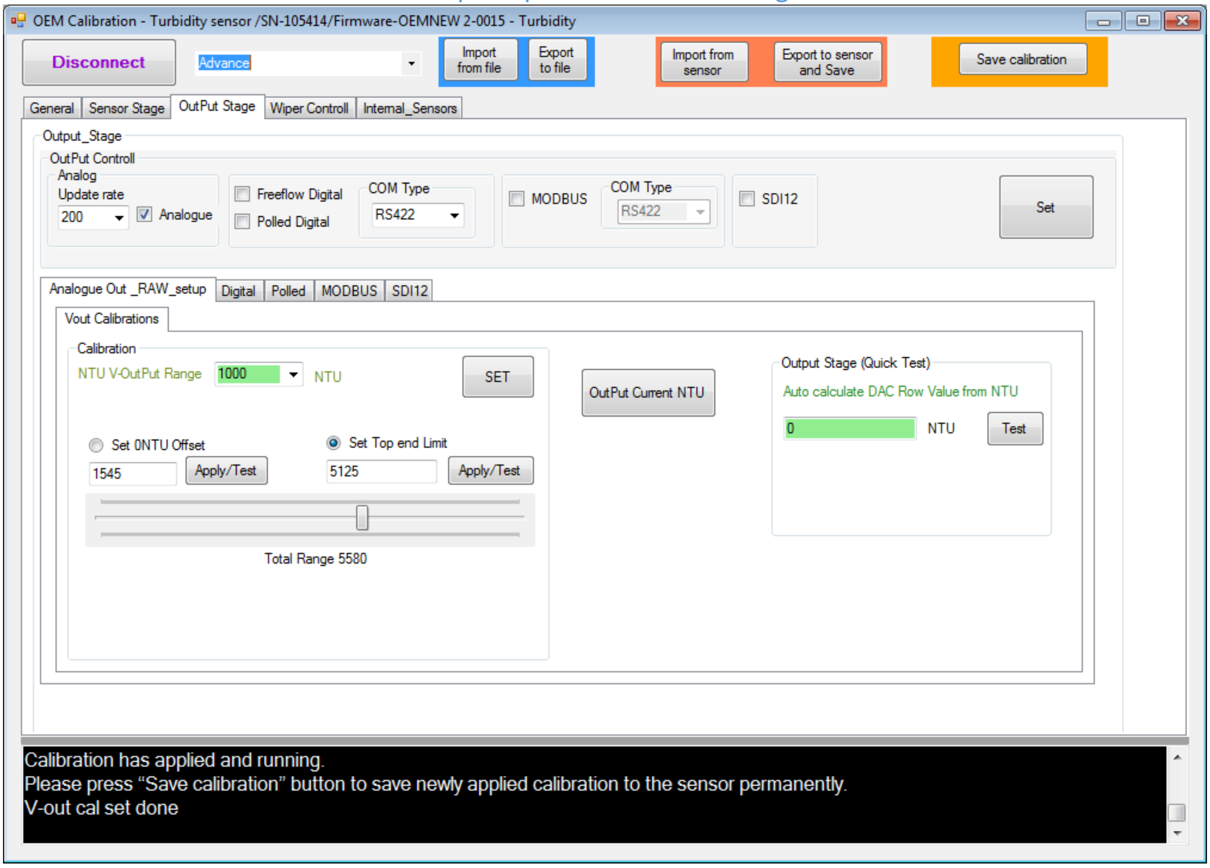


Figure 10.2

G. Setting Target Turbidity Upper Limit

The target turbidity upper limit can be set by specifying the turbidity level in the 'NTU V-Out Range' text box on the 'Vout Calibrations' tab.

For example, in figure 10.2 it can be observed that the target turbidity upper limit is set to 1000 NTU. In the case the probe measure a solution of 1000 NTU, the voltage induced on the output will be equal to the voltage specified by the 'Top Limit' (Section E). Similarly, if the probe measures a 0 NTU solution, the voltage on the output will be equal to the voltage specified by the 'Bottom Limit' (Section D).

Note that the Target Turbidity Upper Limit may be adjusted without having to repeat Section E & F.

H. Committing Calibration to Memory

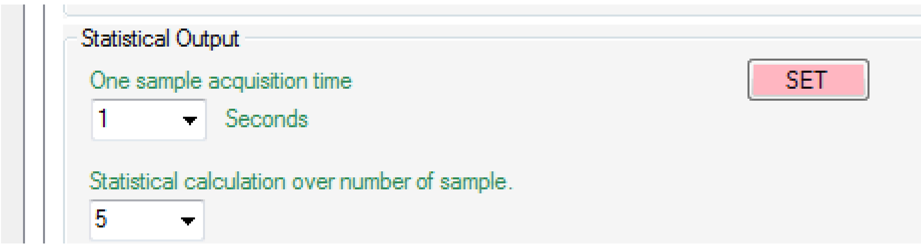
Once satisfied with the settings, click the ‘Set’ button in the top right hand corner of the Calibration tab. Next click the ‘Set’ button on the ‘Output Stage’ tab. Finally, click the ‘Save Calibration’ button in the top right hand corner of the active window.

I. Verification

Analogue voltage outputs for turbidity levels may be simulated using the ‘Output Stage (Quick Test)’ feature. To do this, input an expectant turbidity level into the ‘Auto calculate DAC Raw Value from NTU’ value field. Next click the ‘Test’ button. The probe will subsequently output the corresponding voltage.

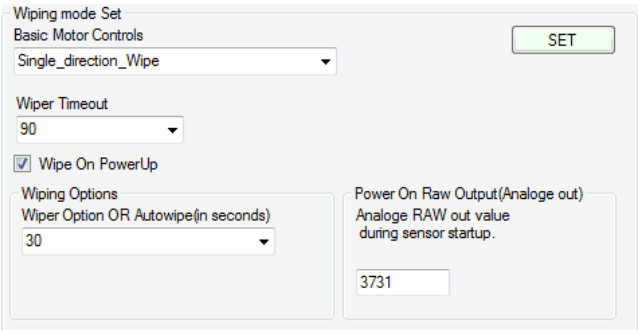
Statistical measurement’s configurations.

This user configurable settings are located in “Sensor stage > Sensor operating parameters”

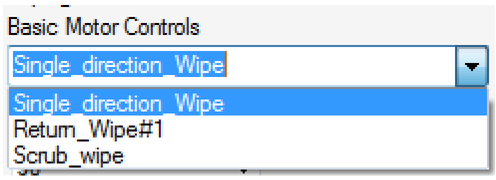


Wiper settings.

This user configurable settings are located in “Wiper control”



User may select how the wiper should operate when initiated by a logger or in auto wipe mode.



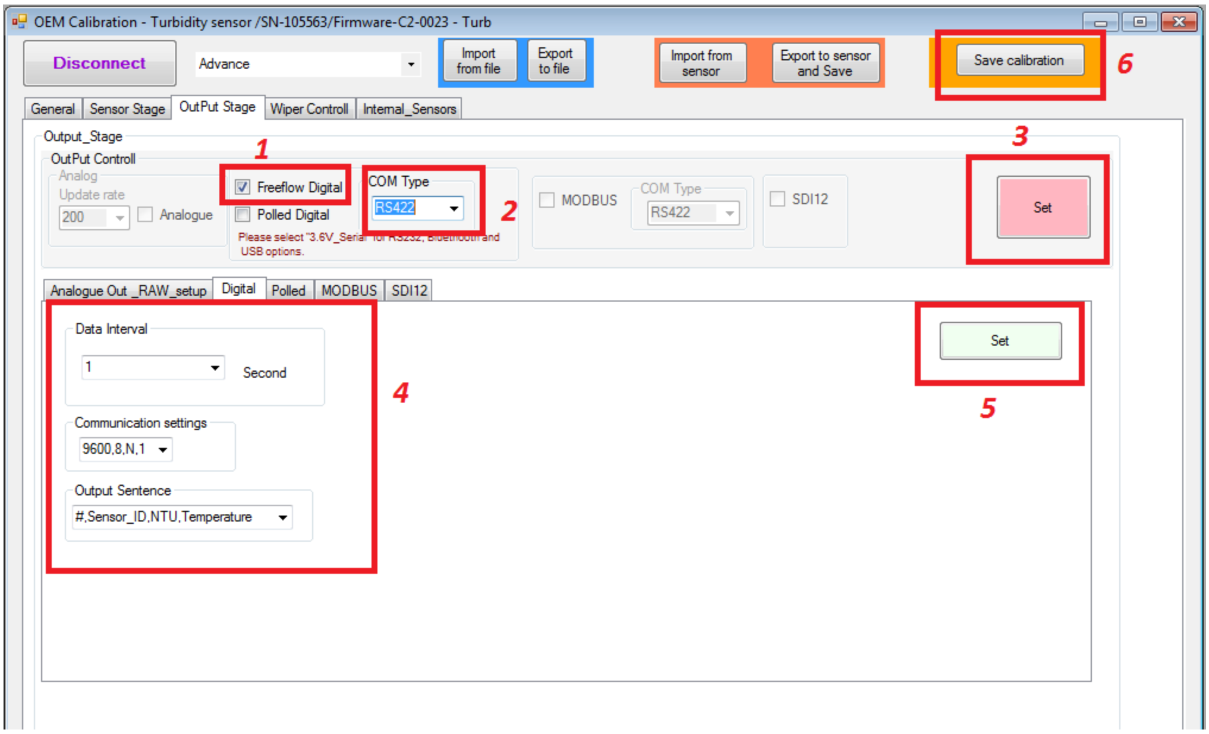
11.0 Serial output using RS485

The sensor can operate in two modes using Rs422/RS485 electrical data output.

1. Continuous free flow.
2. Rs485 Poled.

Continuous free flow.

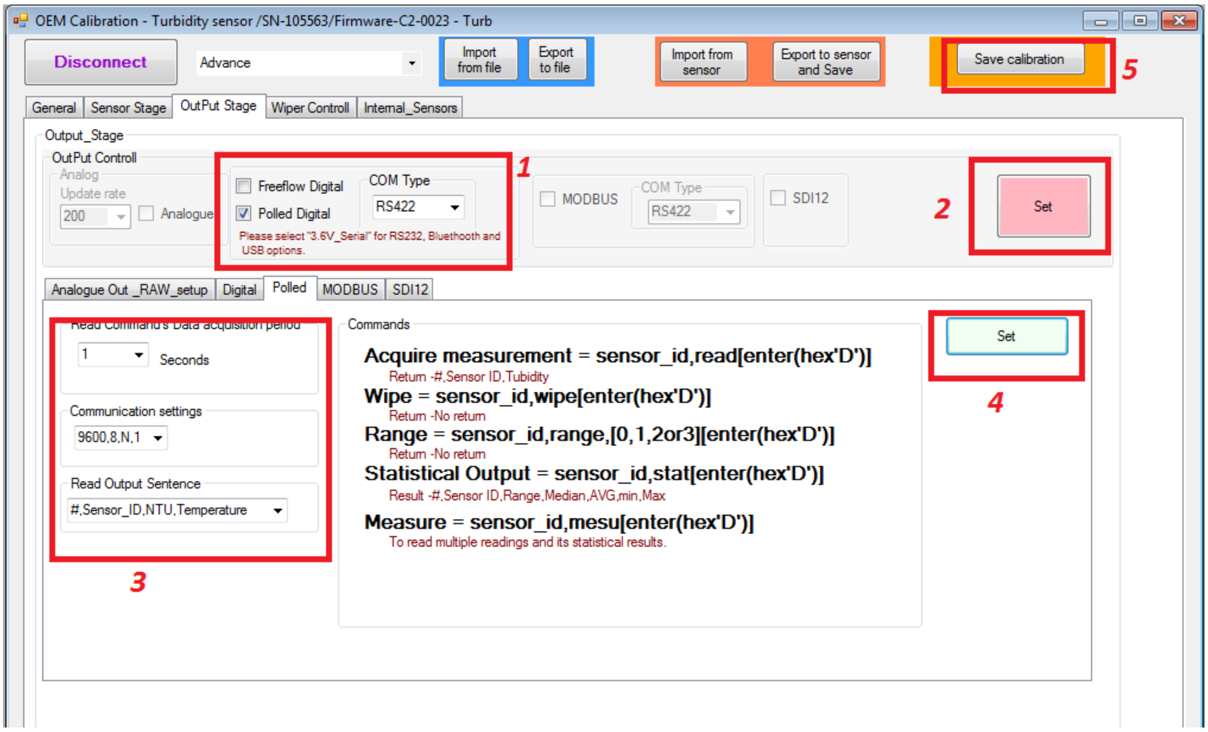
Please use the following settings and press buttons 3, 5 and 6 in sequence after selecting settings 1, 2 and 4.



This will output Continues RS422 data every 1 second Baud 9600, 8, n, 1.

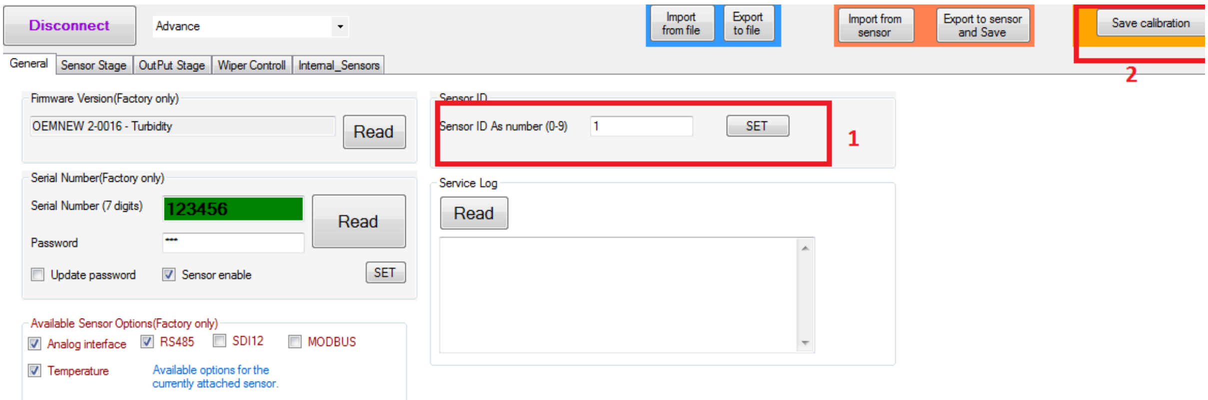
RS485 polled.

Please use the following settings and press buttons 4, 2 and 5 in sequence after selecting settings 1 and 3.



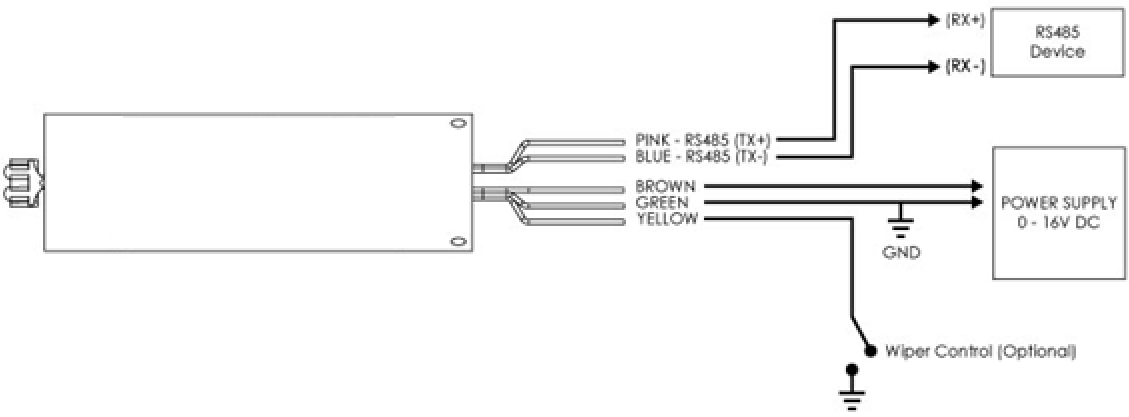
Set Sensor ID.

Please do step 1 and 2 in sequence.



With above settings the sensor will wait for following RS485 commands and responds accordingly.

Recommended RS485 and RS422 test setup.



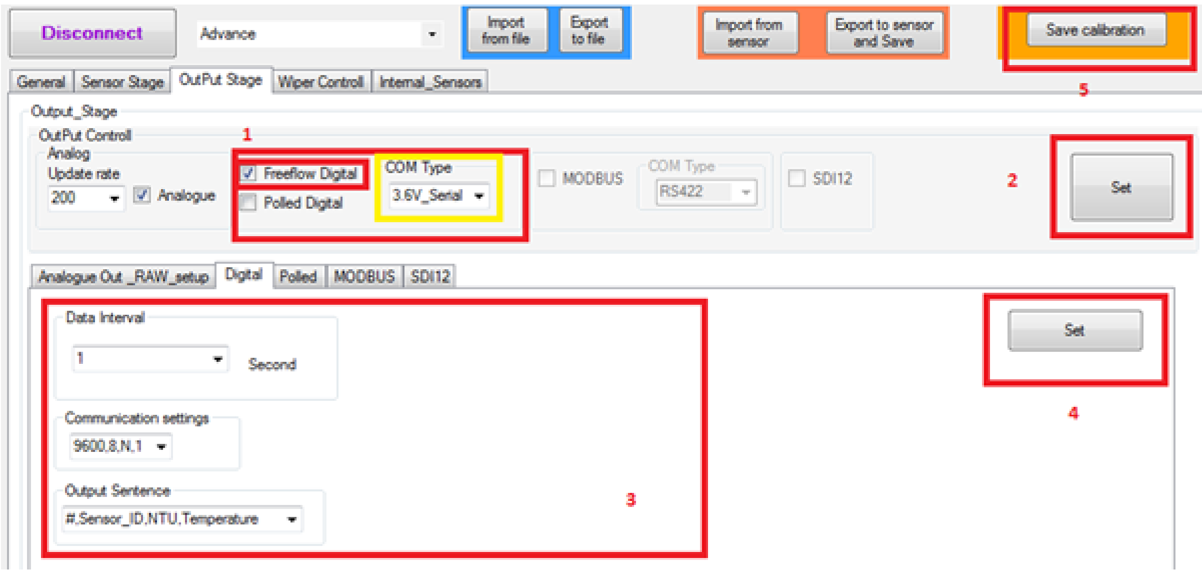
Serial output using RS232 (When RS232 hardware available on-board).

The sensor can operate in three modes when RS232 is available electrical data output.

1. Continuous free flow.
2. RS323 Poled.
3. RS232 calibration mode.

Continuous free flow.

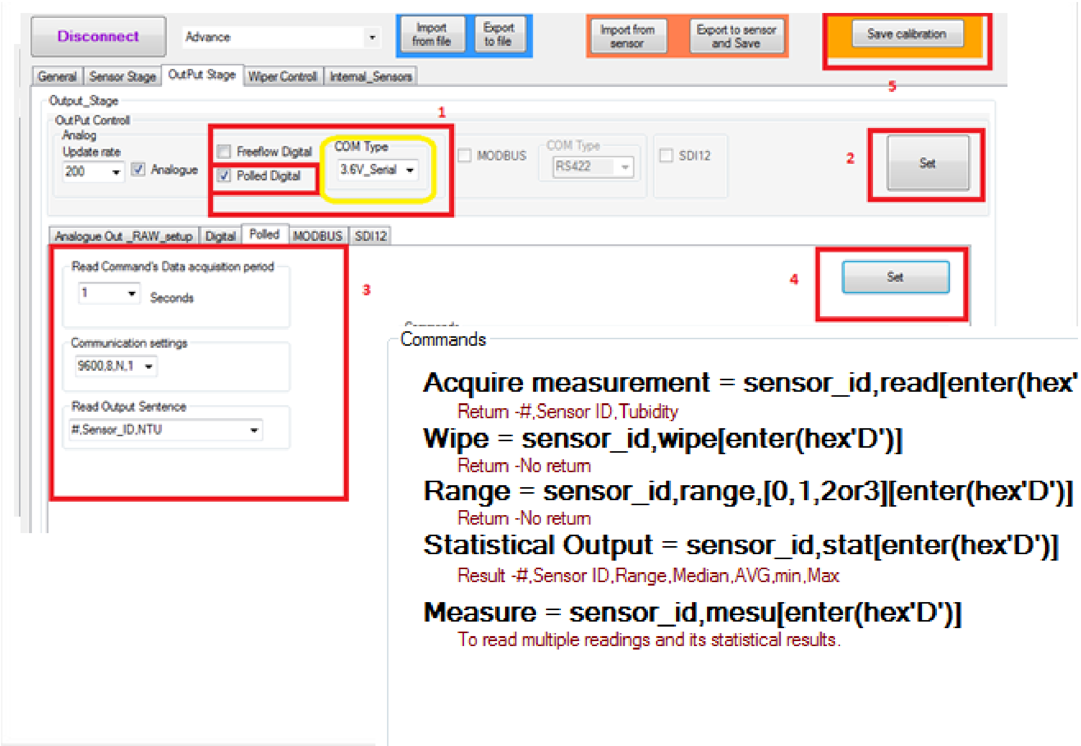
Please use the following settings and press buttons 4, 2 and 5 in sequence after selecting settings 1 and 3. Please note that when using RS232 hardware the option “COM Type” should be selected as “3.6V_Serial”.



This will output Continues RS232 data every 1 second Baud 9600, 8, n, 1 and auto wipe every 60 seconds.

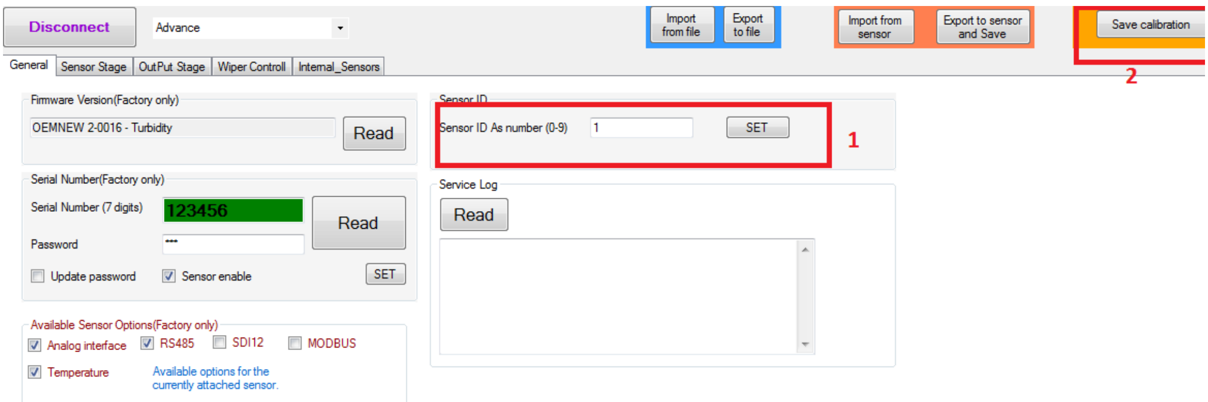
RS232 polled.

Please use the following settings and press buttons 4, 2 and 5 in sequence after selecting settings 1 and 3.



Please note that when using polled mode in RS232 hardware will echo all the transmit characters. Will echo all the commands.

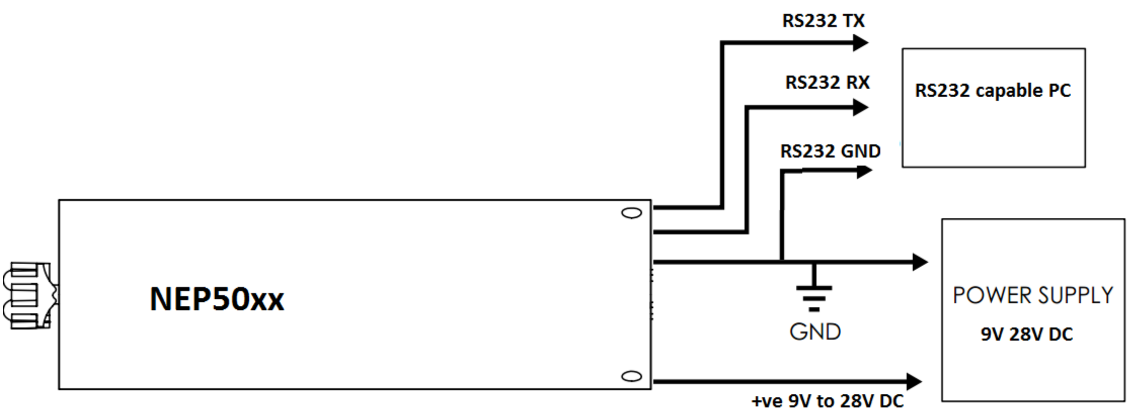
Set Sensor ID. Please do step 1 and 2 in sequence.



With above settings the sensor will wait for following RS485 commands and responds accordingly.

Access calibration mode using RS232 hardware (When available on-board).

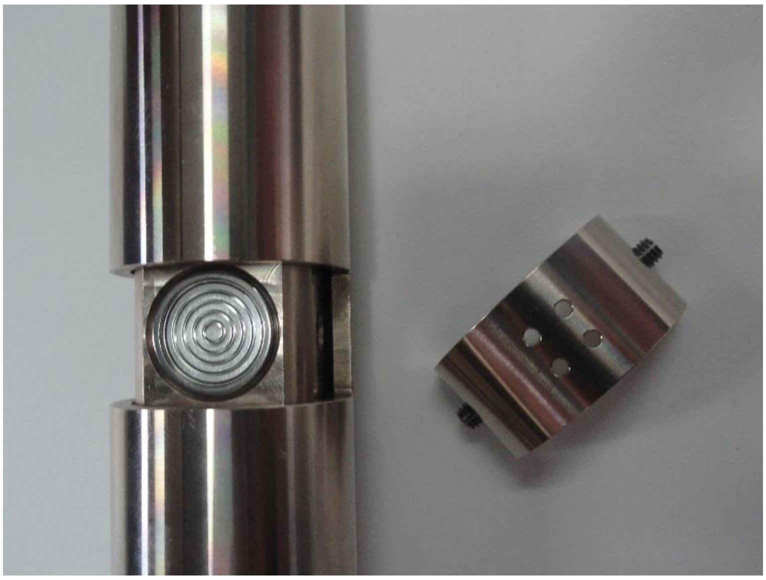
Calibration mode of the sensor can be access using the RS232 hardware. RS232 capable PC or RS232 to usb converter will be required with stable DC power supply.



Please refer to "4.0 Software Connection Setup" for further information regarding use of the calibration software and its procedures.

Please note that the Calibration module (Blue box) still can also be used for all the calibrations and configurations.

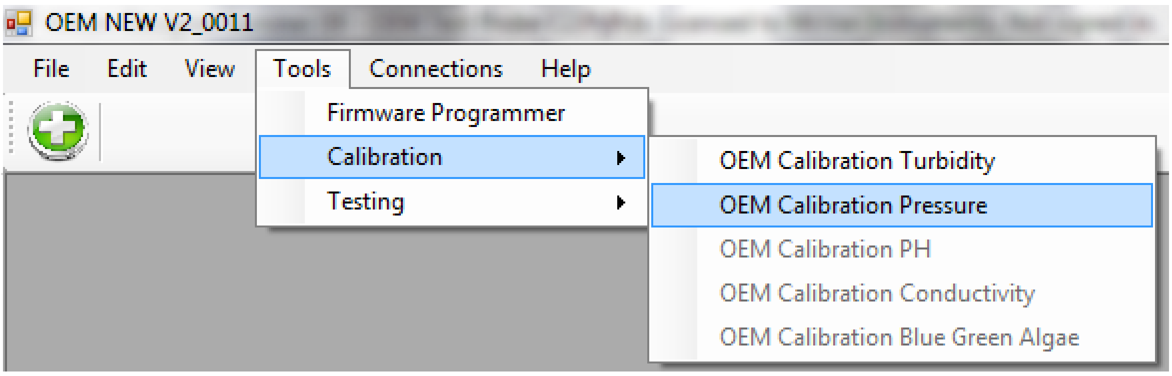
12.0 Pressure Sensor calibration.



Communication information.

Please plug appropriate calibration plug in to calibration module and follow step 3 through 5C.

> **8.a** To calibrate tempature sensor please click “Tools” menu item then Press “OEM Calibration Pressure”

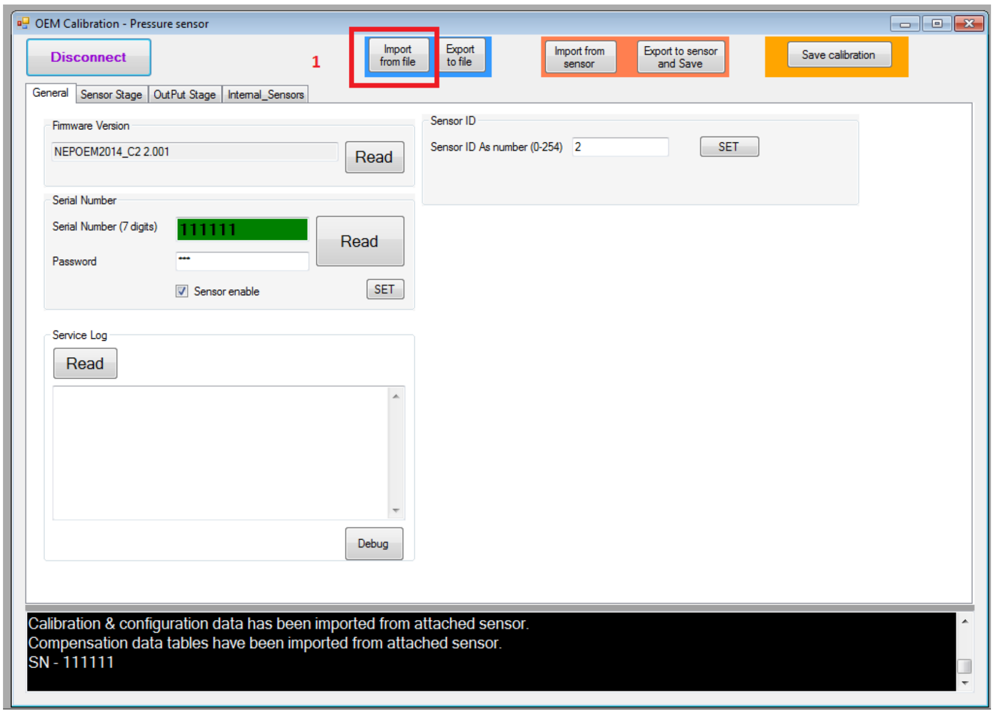


Press “Connect button” and then press “Reset” button in the Calibration module. Output Window should show following when successful.

Sensor now is in calibration mode.
SN - 111111
Calibration & configuration data has been imported from attached sensor.
Compensation data tables have been imported from attached sensor.

When the sensor establishes the connection to the pc software, software will then attempt to synchronize with the sensor. This will transfer all the calibration and configuration data to PC software.

<u>Load Supplied Calibration & Configuration file supplied by the factory calibration.</u>



Press “Import Config Data” button and select and open correct calibration file [Serial Number].cfg file.

Note1 – Factory will supply this unique [Serial Number].cfg file with each probe and this contains the factory calibration data and configuration data specific to each probe.

Note2- Please select “Advance” in top left drop down window to display all Available Options.

Note3- Press “Read” button under Serial number group in “General” to read attached probes serial number.

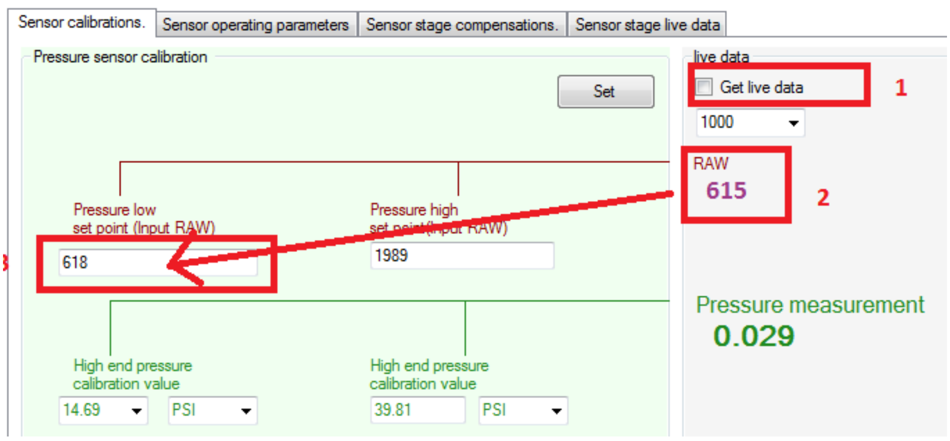
Requirements before the pressure calibration begin.

- Pressure sensor calibration is required a constant pressure camber which to apply various air or hydraulic pressures to the sensor while it's in calibration mode.
- A reference pressure sensor is required to monitor and to get calibration data.

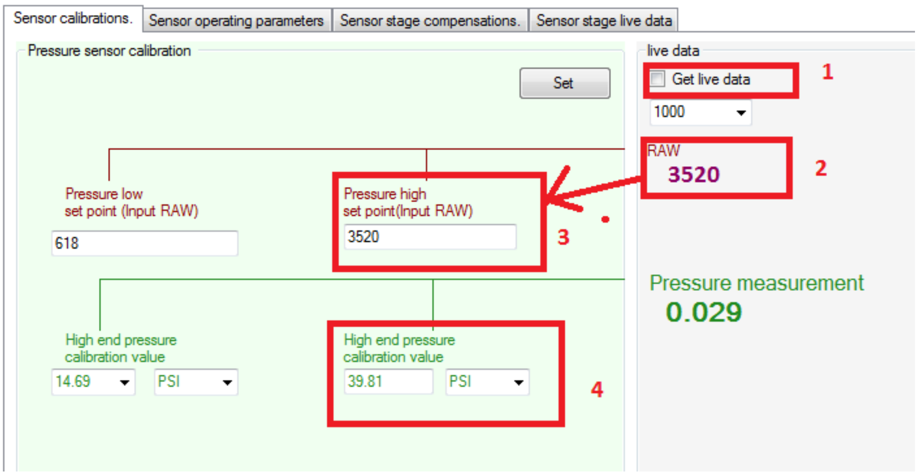
Pressure sensor calibration.

After establishing the calibration connection with the PC software please open the "sensor calibration" tab to begin calibration.

Calibration step#1 (low end pressure calibration) = Expose the pressure sensor to normal sea level pressure(~14.3PSI) and press get live data check box and allow 1 minute settling time. If RAW value appear to be stable enter the RAW data to *"pressure low set point"* Text box.

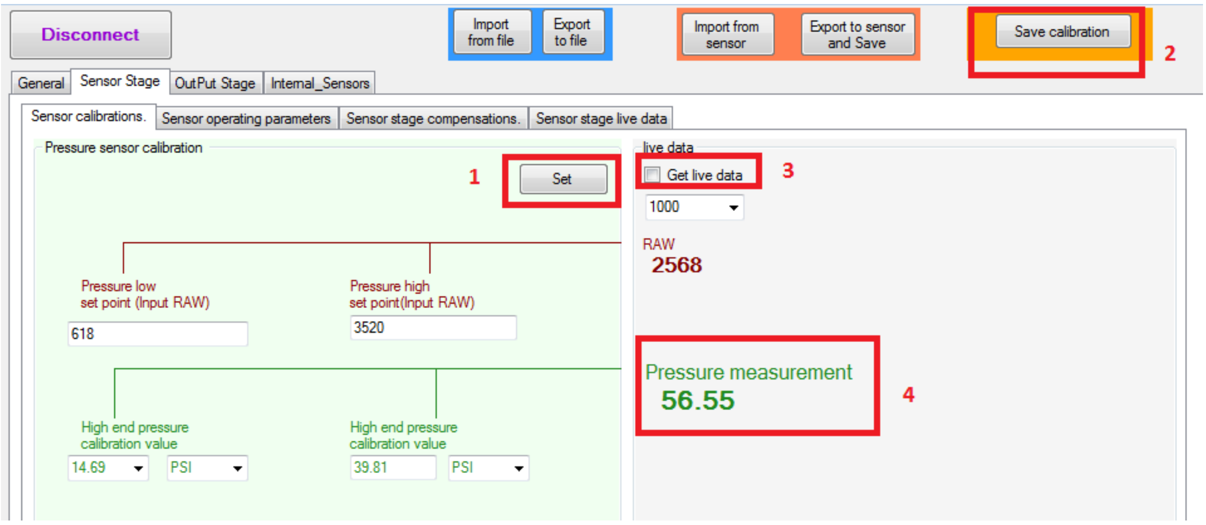


Calibration step#2 (High end pressure calibration) = Expose the pressure sensor to maximum pressure point and press get live data check box and allow 1 minute settling time. If RAW value appear to be stable enter the RAW data to *"pressure high set point"* Text box.



Then type reference pressure sensor value in "high end pressure calibration value" text box(step 4)

Calibration step#2(apply pressure calibration) = Press "Set" button in "pressure sensor calibration" window to apply to above values to the sensor. After completion of the setup press "live data" checkbox again to check pressure measurement "in green" shows as same as reference probe



Please note at this point applied data is saved in probes temporary memory and press "Save calibration" button to store calibration permanently.

Calibration step#3 = If sensor readout is within 0.02 FSO from the reference then the probe is assume to be calibrated. Press "Save Calibration" button and exit.

13 SDI12 Option

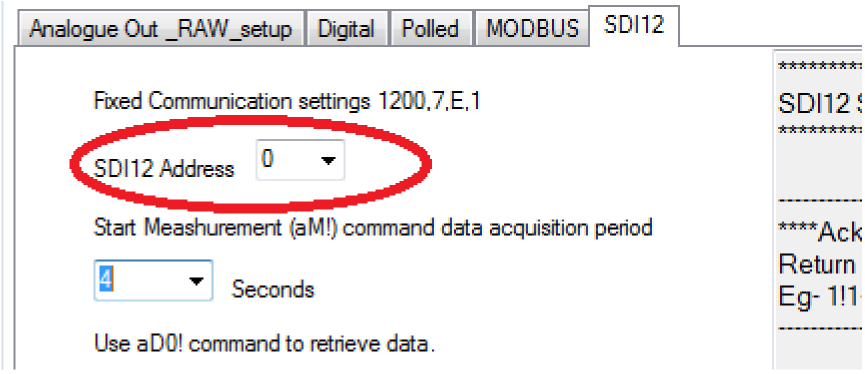
NEP50xx SDI12 option offers a comprehensive sensor operation through a wide range of SDI12 commands and its related internal configurations.
SDI12 option communicates in fixed communication setting of 1200,7,E,1.
Some of key operations.

- Initiate single turbidity measurement and read.
- Initiate multiple turbidity measurements and read its statistical results.
- Initiate wipe (Clean optics) operation.
- Change appropriate measurement range and “Auto range”.
- Basic SDI12 command set.

2.0 User configurable settings using that aid SDI12 measurements.

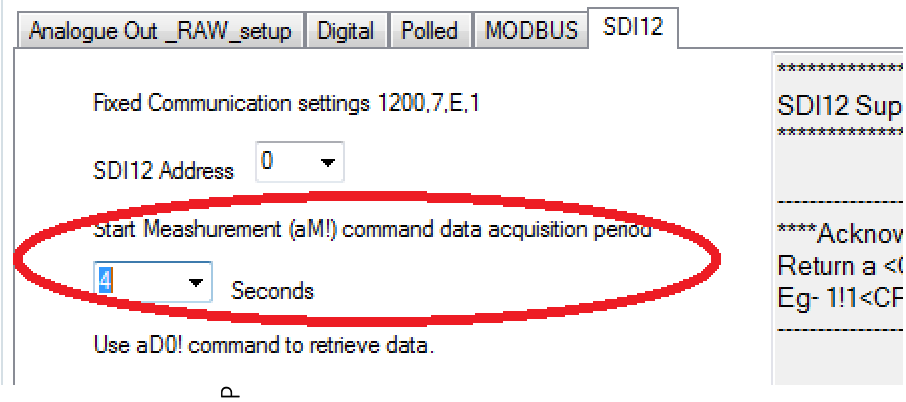
Some of the SDI12 operational parameters and sensor’s operational configurations that can be changed using PC configuration software.

2.1 SDI12 address.
SDI12 network address can be changed using “Output stage > SDI12” settings page in the configuration tool.



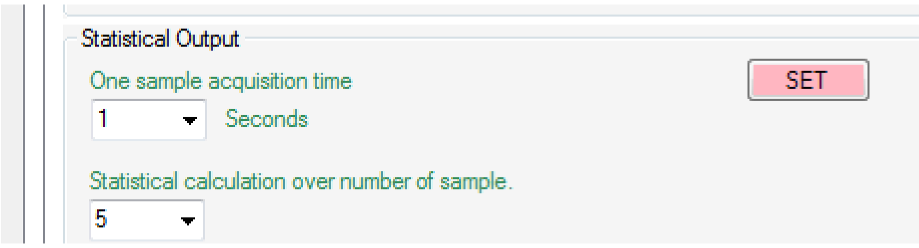
2.2 Measurement duration.

This option allows user to select between quick and stable measurement when using a single turbidity measurement command (aM!).



2.3 Statistical measurement’s configurations.

This user configurable settings are located in “Sensor stage > Sensor operating parameters”

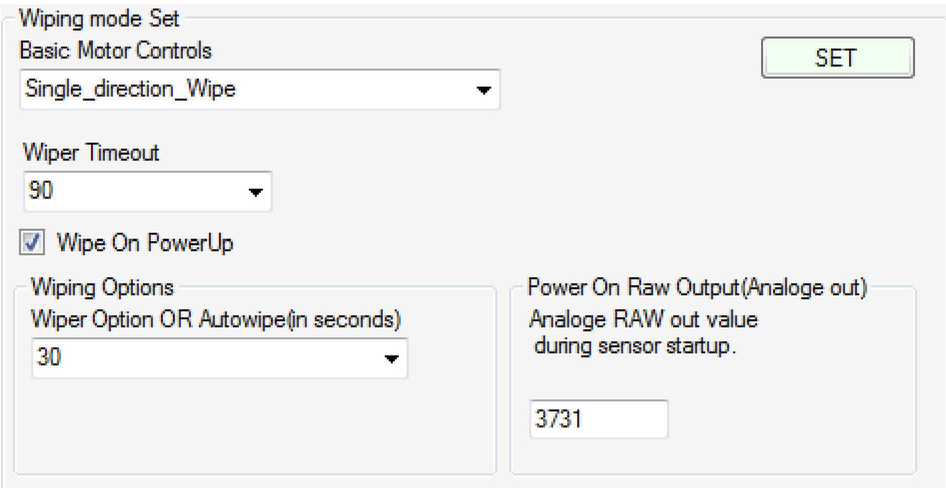


When using *“Start statistical measurement (aM6!)”* command the sensor may takes one second measurements and add to length of 5 data array. End of measuring its last measurement (5th) the sensor will calculate a statistical results from its most reason 5 measurements.

User may adjust these settings as desired.

2.4 Wiper settings.

This user configurable settings are located in “Wiper control”



3.0 Initiate single turbidity measurement and read.

User may issue Measure command (aM!) then wait appropriate delay and then use single measurement read(aD0!) command to read data.

Step #1

*******Take single measurement *******

Start measurement (aM!)

Return 20011<CR><LF>

aM! atttn<CR><LF>

a - the sensor address a - the sensor address

M - the start measurement ttt - the specified time, in seconds, until the sensor will have the measurement(s) ready

! - terminates the command n - the number of measurement values the sensor will make and return

in one or more subsequent D commands; n is a single digit integer with

a valid range of 0 to 9

Note that the measurement period is set to 2seconds

Step #2

Logger should wait's(delay) more than aM! Command's requested operational delay.

Step #3

******Single measurement read******

Send data command (aD0!)

Return a+NTU<CR><LF>

Eg- 2+2.75<CR><LF>

Note that 2.75 is the measured NTU value.

4.0 Initiate multiple turbidity measurements and read its statistical results.

User may issue “statistical measurement” command (aM6!) then wait appropriate delay and then use “statistical measurement read” (aD6!)command to read data.

Step #1

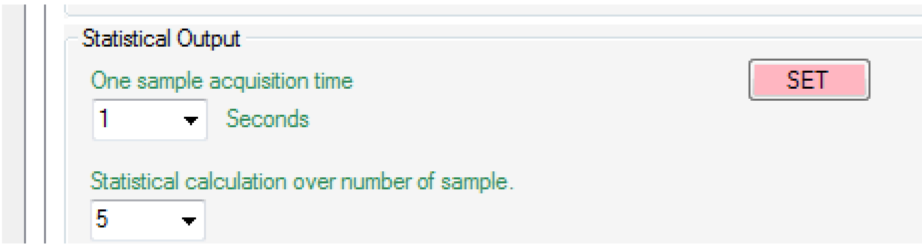
****Take full statistical measurement****
Start statistical measurement (aM6!)
Return 20061<CR><LF>
aM6! atttn<CR><LF>
a - the sensor address a - the sensor address
M6 - the start measurement ttt - the specified time, in seconds, until the sensor will have the measurement(s) ready
! - terminates the command n - the number of measurement values the sensor will make and return
in one or more subsequent D commands; n is a single digit integer with
a valid range of 0 to 9
Note that the measurement period is set to 6 seconds

Step #2

Logger should wait’s(delay) more than aM6! Command’s requested operational delay.

Step #3

**** Full statistical measurement read****
Send data command (aD6!)
Return a+TT.TT+MMMM.MM+AAAA.AA+LLLL.LL+SSSS.SS<CR><LF>
Eg- 1+23.58+714.53+714.52+714.24+714.85<CR><LF>
Note that.
TT.TT= Temperature
MMMM.MM = Median
AAAA.AA=Average
LLLL.LL = Minimum value
SSSS.SS = Maximum Value



When using “Start statistical measurement (aM6!)” command the sensor may takes one second measurements and add to length of 5 data array. End of measuring its last measurement (5th) the sensor will calculate a statistical results from its most reason 5 measurements.

5.0 Initiate wipe (Clean optics) operation.

Step #1

****Wiper Control****

Wipe command (aM1!)   Wipe action will be completed in 12s

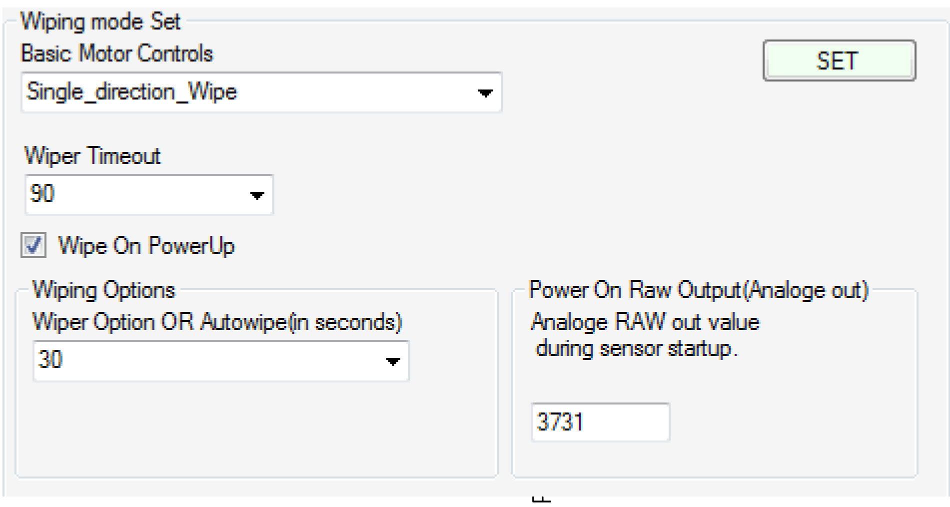
Return a0121<CR><LF>

Eg- 20121<CR><LF>

Note that 12 is requesting of 12 seconds of delay.

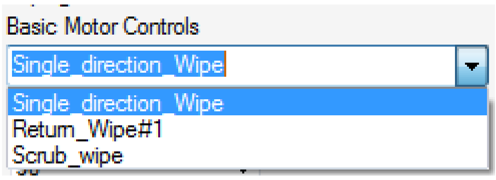
Step #2

Logger should wait’s(delay) more than aM1! Command’s requested operational delay.



Some Important points.

- If power on wipe is selected the SDI12 logger may wait more than 12s to finish its operation.
- “Auto wipe” feature is not available in SDI12 mode.
- User may select how the wiper should operate when SDI12 logger issuers aM! Command.



6.0 Change appropriate measurement range and “Auto range”.

During normal sensor operations the logger may issue any of the following to change the current measurement command.

Note that this is a temporary range change and when the sensor’s power resets the sensor range will restores to its default range that selected by the PC configuration software.

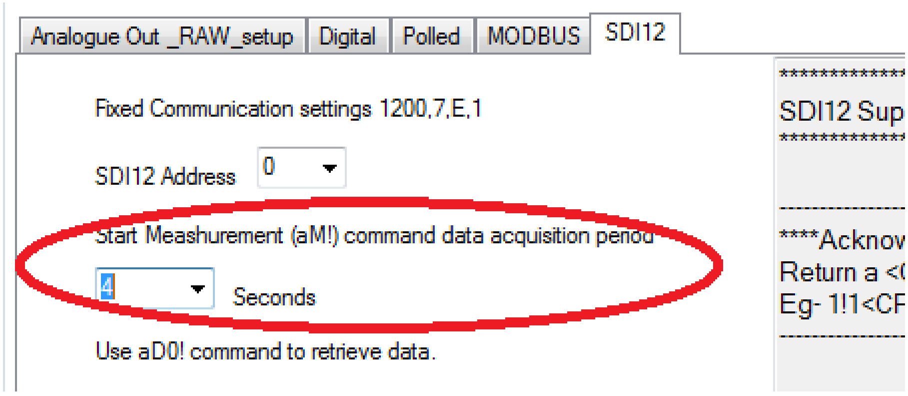
****Change NTU range****
High Range (5000NTU)
**Command (aM2!)
Return a0001<CR><LF>
Medium Range (3000NTU)
**Command (aM3!)
Return a0001<CR><LF>
Low Range (1000NTU)
**Command (aM4!)
Return a0001<CR><LF>

OR

****Auto Range (Probe’s software selects appropriate range) ****
Command (aM5!)
Return a0001<CR><LF>
Please note that auto range requires about 5 seconds to selects appropriate range and take a measurement. So in order to use this setting first need to use the

calibration software and select 5 second or more (Data actuation period) in the SDI12 configuration window.

Note that auto range is selected by the configuration software or by the SDI12 logger the single measurement's "**Measurement duration"** time **must** be set to a value higher than 4 seconds.



7.0 Basic SDI12 command set.

****Acknowledge Active Command (a!) ****
Return a <CR><LF>
Eg- 1!1<CR><LF>

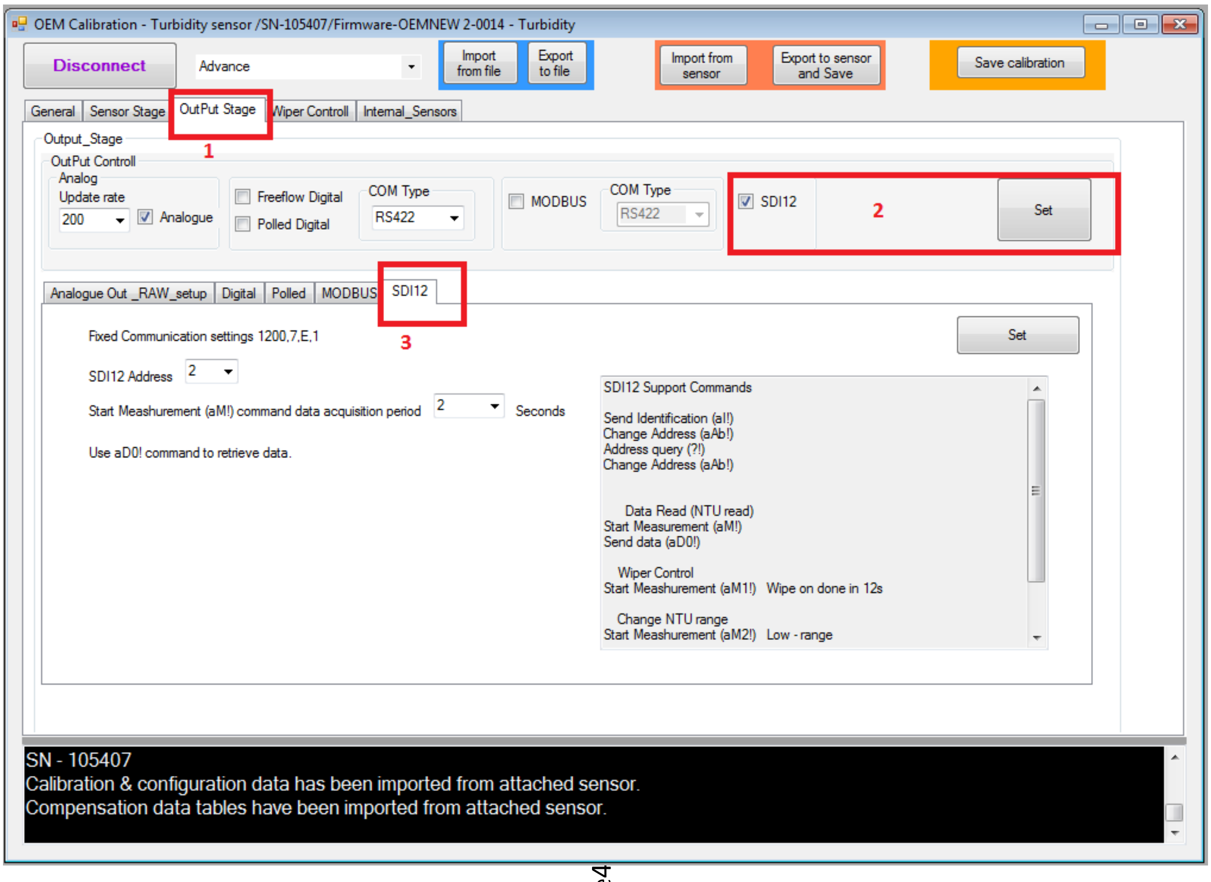
****Change Address Command (aAb!) ****
Return b<CR><LF>
Eg- 1A2!2<CR><LF>

****Address query command (?!)****
Return a<CR><LF>
Eg- ?!2<CR><LF>

Recommended logger's scripting guide.

It is recommended that to use following sequence of actions to obtain an accurate measurement from NEP50xx.

1. NEP50xx **power on** and allow 2 seconds or more for boot up to be completed.
2. Issue command "aM1!" to **Initiates a wipe** (clean optics) and wait 12 seconds.
3. Issue command "aM2!, aM3! Or aM4!" to select appropriate **measurement range**.
4. Issue command "Start Measurement (aM!)" to **initiate measurement** and wait 2 seconds to complete the measurement.
5. Issue a "Send data command (aD0!)" to **read data**.

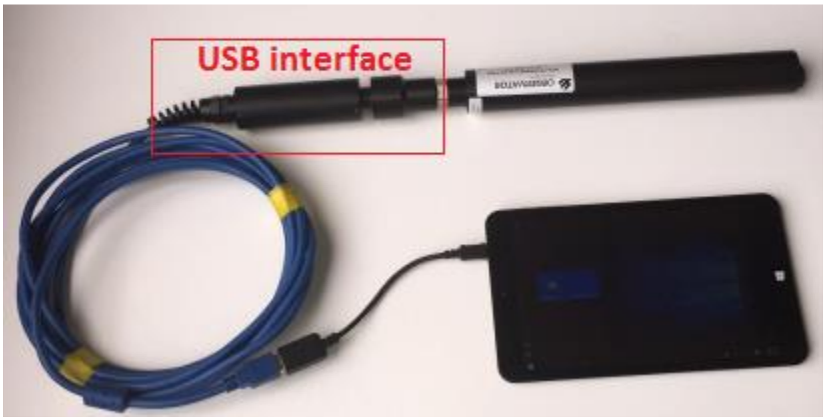


USB option.

This option must be specify at time-of-the-order and there are two types of configurations.

USB Type 1 = USB interface hardware is built inside of the NEP50XX body with glanded 5m USB cable. This option is ideal for the lab use or spot check type use.

USB Type 2= USB interface hardware is built in to a second detachable housing where any new or old (If you have already purchased a NEP50xxx) NEP50XX sensor can be used.



Impotent note if using with an existing probe – Due to various wiring arrangements and pinouts differences between RS485, RS232, analogue option and SDI12 option the Type 2 USB interface female connector's wiring must be matched to your existing probe. Please consider this at the time of the order.

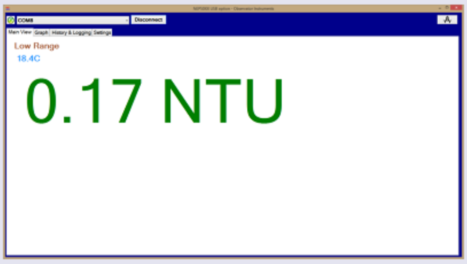
Available visualisation software for USB option

This software visualization is available for Windows and Android.

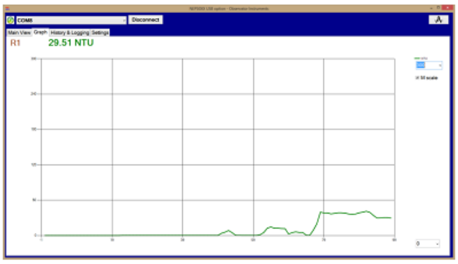
<u>Windows APP</u>

This app can run on windows 7, 8 and 10 in any tablet, laptop or desktop. USB OTG is required on the device.

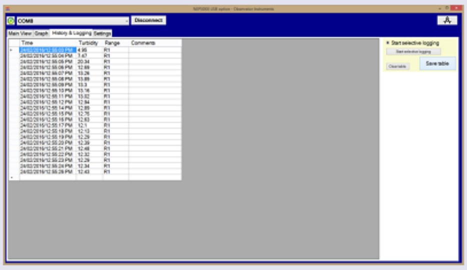
Please run “USB NEP5000 VX.exe”. Select correct windows assigned COM port and press “Connect button”



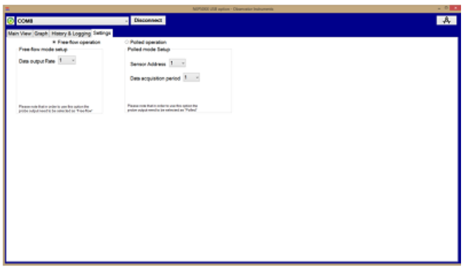
Main screen shows turbidity, temperature, range and wiping alert.



Graph screen shows turbidity and range.

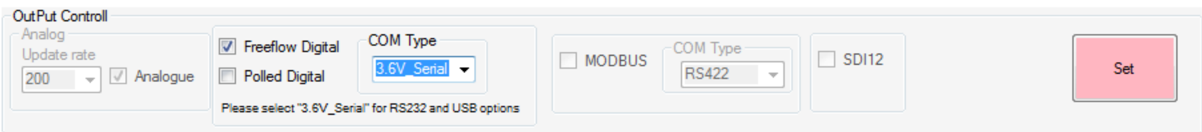


Log screen streaming time/date, turbidity, and range. Logs to file.

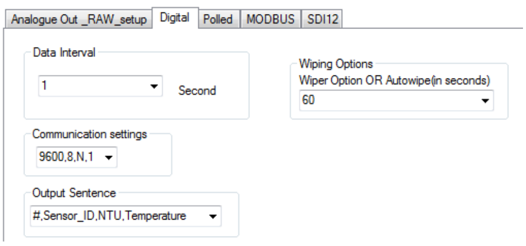


Setting screen selects polled or streaming modes

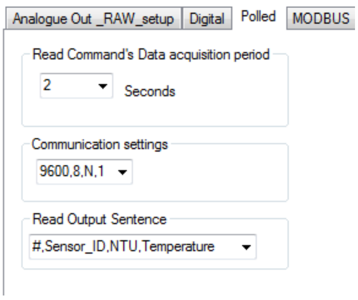
Impotent note – USB option require that you select output stage of the NEP50xx set to following.



Then select control format.



OR



Android APP

1. Getting Started

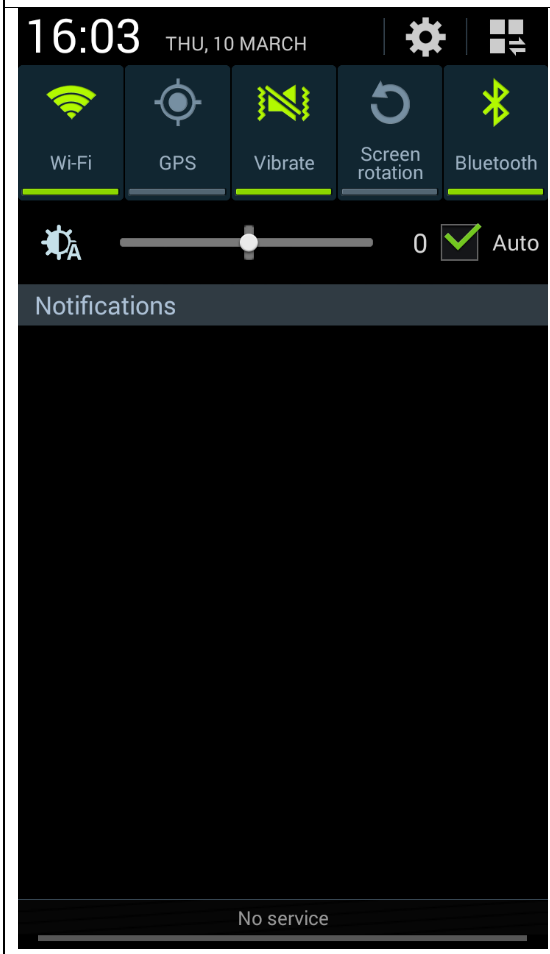
HH170 Android Companion Software is only compatible with Android 4.0 “Ice Cream Sandwich” and later.

Before launching the HH170 software, you must first disable the screen auto rotation feature within the Android Operating System.

NOTE: The Bluetooth radio must be enabled in the Android Operating System if connecting to a HH170 Handheld.

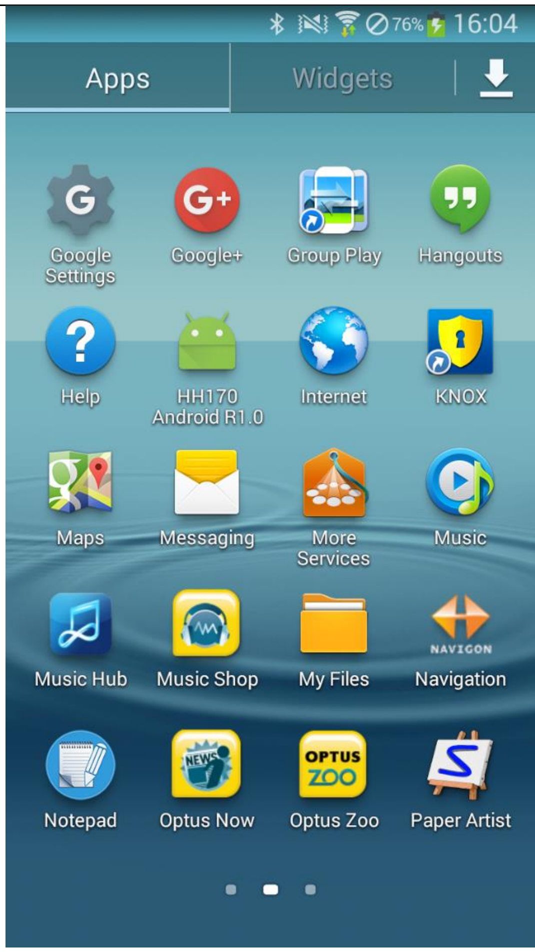
Navigate to the applications panel and search for the application called “HH170 Android R1.0”. Launch the application.

Figure 1



Disabling Screen Rotation

Figure 2

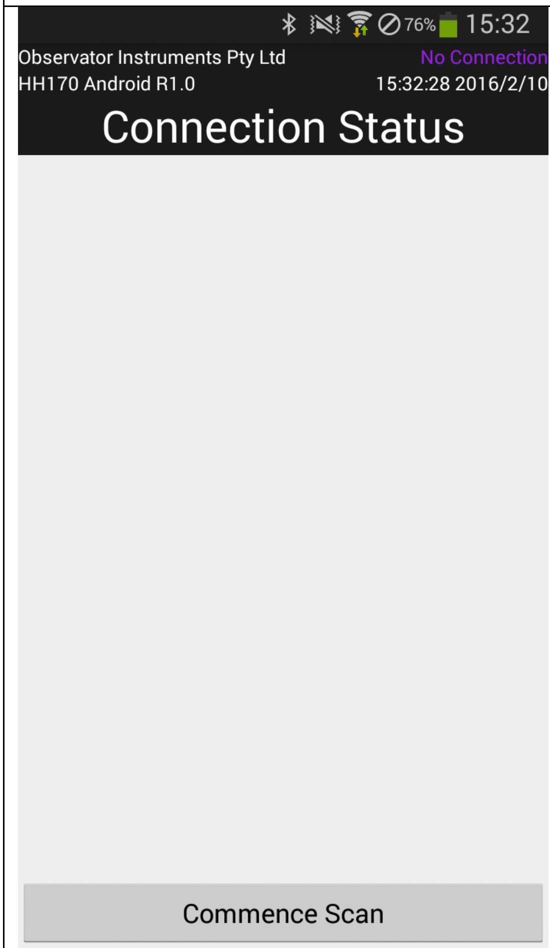
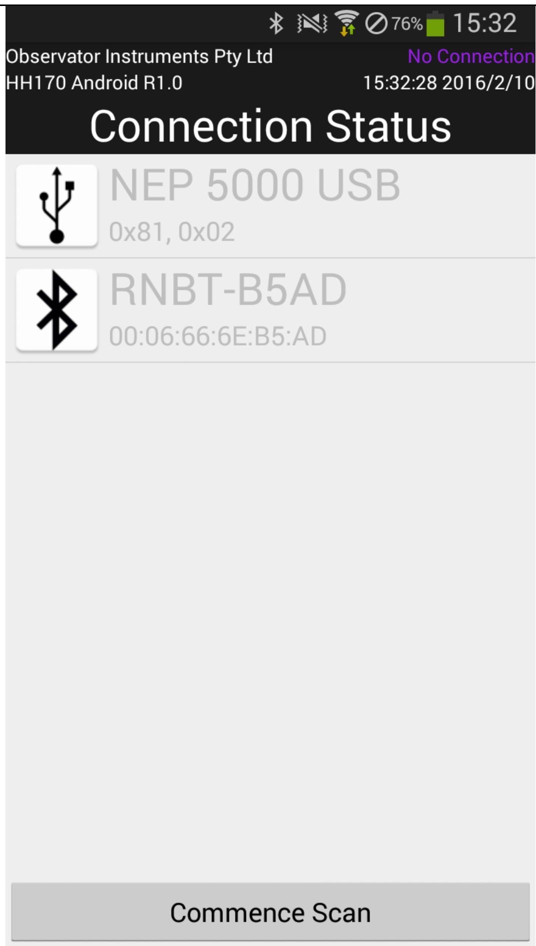


Launching Application

2. Connecting to Devices

HH170 Android Companion can connect with devices via the Bluetooth and USB OTG protocols.

Currently, the only connectable devices are the Observator Instruments HH170 Handheld and NEP 5000 USB Nephelometer.

Figure 3	Figure 4
	
Connection Status before commencing device scan	Connection Status after completing a device scan

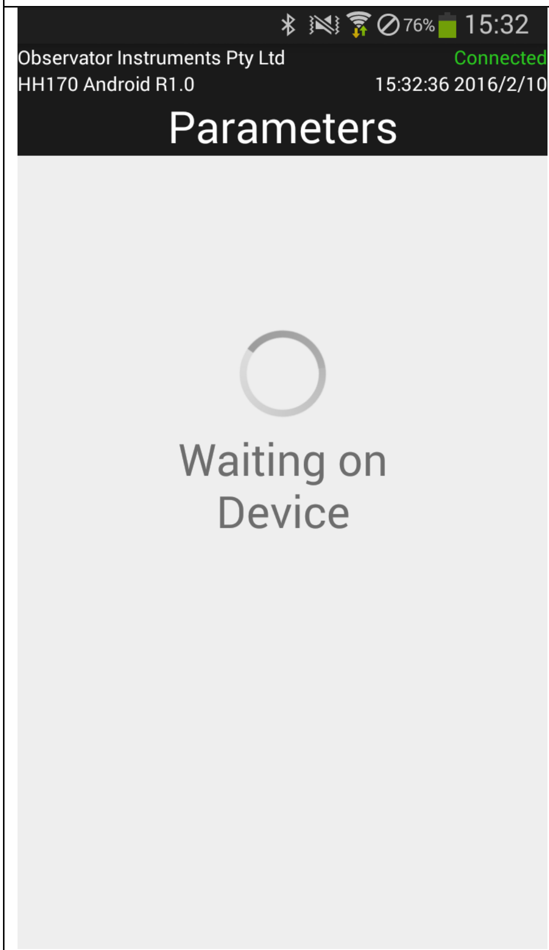
After start up, the user will be taken to the connection page (Figure 3).To begin, the user must press the “Commence Scan” button located at the bottom of the page. The software will scan for any compatible devices. (Note that programme activity can be followed by the notification in the top right hand corner.)

Upon scan completion, a list of available devices will populate the screen.

It can be seen in Figure 4 that the running instance is able to connect to either a NEP 5000 USB nephelometer via USB OTG or a HH170 Handheld via Bluetooth.

To start a connection and obtain runtime data, tap on the desired device in the list. This will initiate a connection handshake.

Figure 5



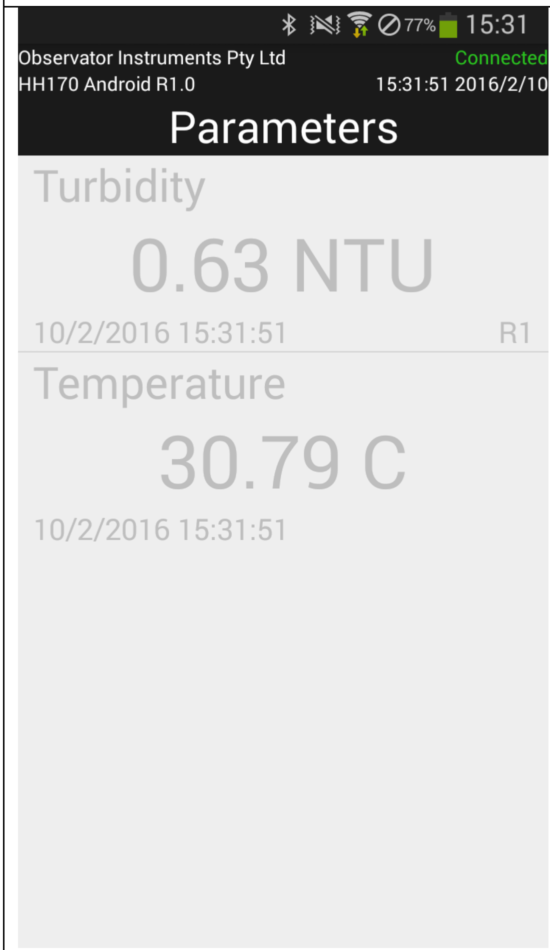
Disabling Screen Rotation

After a successfully handshaking, the software will wait for the connected device to transmit data. During this time, the device will display a “Waiting on Device” message.

3. Acquiring Data

After a successful connection has been established and data from the connected device has arrived, the Parameters and System Status screens will be populated in a similar manner to Figures 6 and 7.

It can be seen that parameters and system status information can be added the data list dynamically as they are received from the connected device.

<table>
<tr><th>Figure 6</th><th>Figure 7</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>Parameters screen displaying data from
a NEP 5000 USB nephelometer
with the temperature sensor enabled</td><td>System Status screen displaying system data
from a HH170 Handheld</td></tr>
</table>

Accessing calibrations and configuration in USB option.

Please follow the instructions subjected in section 4.0 “Software Connection Setup” to page 9 and then when the pc software prompt to press the reset button, instead pass the supplied magnet over the marked area of the USB’s probe body.

I Document History

Revision 3.6
28th October 2015
Edit by: Niran Pelpola
Ver 2.019 updates with SDI12.

Revision 3.7
24th February 2016
Edit by: Niran Pelpola
Ver 2.021
Auto range enhancements.

Revision 3.8
11h March 2016
Edit by: Niran Pelpola
Ver 2.021
Subconn wire colours & USB option.

Revision 3.9
13h July 2016
Edit by: Niran Pelpola
Ver 2.023
SDI12 update.
Statistical package update.

Revision 4.0
1st Aug 2016
Edit by: Niran Pelpola
Ver 2.024
Graphics update.

Revision 3.5
9th October 2015
Edit by: Haydn Kearsey

Revision 3.4
13th July 2015
Edit by:
Niran Pelpola

Revision 3.3
30th June 2015
Edit by:
Niran Pelpola

Revision 3.2
19th March 2015
Edit by:
Niran Pelpola

Revision 3.1
4th March 2015
Edit by:
Niran Pelpola
Changes:

Revision 3.0
26th February 2015
Edit by:
Niran Pelpola
Changes:

Revision 2.0
20th February 2015
Edit by:
Craig Anderson
Changes:
Document Creation

Revision 1.0
18th February 2015
Edit by:
Craig Anderson
Changes:
Document Creation

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