WPP QuickGuide

YSI EXO1 Calibration & Download Procedures

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| Updates | Description |
| July 2020 | combined calibration and download procedures |
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**Inventory:** As of July 2019, DWM-WPP has two YSI EXO1 multiprobe.

**GENERAL Description**: The EXO1 sonde is a multi-parameter instrument that collects water quality data. The sonde collects the data with up to four user replaceable sensors and an integral pressure transducer. WPP’s EXO1’s are equipped with sensors for LDO, pH, temperature, and conductivity.

Calibration Procedure

# INITIAL

* Remove probe guard
* Follow rinse procedure, ending with 1413 µS/cm standard
* Carefully immerse probes into 1413 µS/cm standard to above black tip on conductivity probe
* Create a new “Site ID” for the calibration checks by:
  + On Dashboard screen, with *Start Logging* showing in the green-highlighted area, press the “Enter” button
  + Scroll to, and select, the existing site ID
  + select *Add new*, then select *Site Name*
  + Key-in a name using the format *Cal[project ID]YYYYMMDD* (e.g., CalRSN20190405), finishing by highlighting the “ENTER bar” and pressing the “Enter” button.
  + Select *Save*
  + Select the newly created site ID
  + Select *Select [newly created site ID]*
  + Press “Esc” button to return to Dashboard screen without starting logging
* Press “Handheld” button; select *User ID*; select calibrator’s ID (last name) from User ID list
* **NOTE 1:** “**Select**” means highlight menu choice and press “Enter” button
* **NOTE 2: Rinse procedure** is: 2 x once-used DIW🡪2 x DIW carboy🡪2 x once-used cal. Std./check sol. (LIS has an extra rinse solution)🡪1 x in solution to be used for calibration or check🡪finish by filling to appropriate level with solution to be used for calibration/check
* **NOTE 3:** **Activate “Auto Stable”** for all readings recorded to file by pressing “Handheld” button; selecting *Auto Stable [on]*; then selecting *Start Auto Stable*

# CALIBRATION—SPECIFIC CONDUCTANCE

* Press calibration key and select *Conductivity*
* Select *Calibrate*
* Select *Specific Conductance*
* When the yellow caution sign next to the graph on the screen turns to a green check mark select *Calibration Value*
* Key in the value of the calibration standard being used, e.g.: 1413 (make sure units are µS/cm), select *Enter*
* When satisfied readings have stabilized (ca. “40s”) select *Accept Calibration*; “calibration successful” appears in display
* Calibration file includes “As found/As left” values; note these on the calibration sheet in the log book (as “initial reading” and “set to”)

## CHECK 1

* With probes still in the calibration standard, press “esc” button until back at dashboard screen (shows live readings)
* On the Dashboard screen *Start Logging* appears, highlighted in green; press “Enter” button. Select *Site*; then select “Cal” file created for this calibration; then select *Select [Cal file name]*
* Activate *Auto Stable* (see note 3, above)
* The display will automatically return to the Dashboard screen with the auto stable indicators flashing. When the auto stable indicator for all probes is a steady green, press “Enter” button; select *Start Now!* (unit is setup for continuous logging at 30 second intervals)
* Confirm logging has begun, if not, press “Enter” button again. [While actively logging, the Dashboard screen will display *Stop Logging,* highlighted in green, and a count-down clock showing the time to next reading];
* After 2 minutes from start, press “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book.

## CHECK 2

* Follow rinse procedure, ending with the conductivity standard (e.g.: 718 µS/cm) being used for Check 2
* Carefully immerse probes in the conductivity standard to above the black tip on conductivity probe
* Activate “Auto Stable” (see note 3, above)
* When the auto indicators are all a steady green press “Enter” button twice to begin logging data to the “Cal” file already selected
* Confirm logging has started
* After 2 minutes from start of logging press “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book

# CALIBRATION—DO %SATURATION (Local)

* Rinse probes and calibration cup with tap water
* Fill calibration cup to between the marks with **aerated** **tap water**
* Carefully immerse probes into aerated tap water
* Press “Calibration” button and select *ODO*; select *Calibrate*; select ***DO %local***
* When reading is stable (green check mark appears) select *Accept Calibration*
* **NOTE: If a 0 (zero) DO calibration is deemed necessary it must be done prior to *DO %Local* calibration!**

## CHECK 1

* Press “Handheld” button and activate “Auto Stable” (see note 3 above)
* When all auto stable indicators have turned to a steady green, press “Enter” button twice to start logging; confirm logging has begun
* After 2 minutes press “Enter” button to stop recording
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book

# CALIBRATION—pH

* Complete rinse procedure for pH 6.86 buffer
* Carefully immerse probes into buffer [*Note: pH is set up for NIST buffers—4.01, 6.86, and 9.18. If at some point a switch is made to US standard buffers—pH 4.01, 7.00, and 10.01—the setup will need to be changed to select “USA”.*]
* Press calibration key and select *pH*
* Allow one minute for temperature to stabilize. The unit will automatically recognize the buffer it’s in and adjust the calibration value based on temperature. DO NOT manually enter the calibration value.
* The screen will display the temperature, initial reading, and the “set to” value; record these in the calibration book (they will not be displayed on subsequent screens)
* When green check mark appears next to the graph in the display, select *Accept Calibration*
* Proceed directly to rinse procedure for next buffer (4.01 or 9.18)
* Carefully immerse probes into next buffer
* Allow one minute for temperature to stabilize. The unit will automatically recognize the buffer it’s in and adjust the calibration value based on temperature. DO NOT manually enter the calibration value
* The screen will display the temperature, initial reading, and the “set to” value: record these in the calibration book
* When green check mark appears next to graph in display, select *Accept Calibration*
* Select *Finish Calibration* (except in cases of doing a 3-point calibration)

## CHECK 1

* After calibration in second buffer, press “Handheld” button and activate “Auto Stable” (see note 3 above)
* When all auto stable indicators are a steady green, press “Enter” button twice to begin logging; confirm logging has begun
* After 2 minutes from start of logging press “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book

## CHECK 2

* Complete rinse procedure for pH 9.18 buffer (4.01 if 2nd calibration point was 9.18)
* Allow one minute for temperature to stabilize.
* Press “Handheld” button and activate “Auto Stable” (see note 3 above)
* When all auto stable indicators are a steady green, press “Enter” button twice to begin logging; confirm logging has begun
* After 2 minutes from start of logging press “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book

# FINAL PRE-SURVEY CHECKS—LIS, DO (SATURATED AIR), 0 DO

## **Low Ionic Standard (LIS)**

* Complete rinse procedure for LIS
* Carefully immerse probes into LIS
* Create a new pre-survey “Site ID” (or select, if it already exists) for the calibration checks by:
  + On Dashboard screen, with *Start Logging* showing in the green-highlighted area, press the “Enter” button
  + Scroll to, and select, the existing site ID
  + select *Add new*, then select *Site Name*
  + Key-in a name using the format *PRLISMMDDYY* (e.g., PRLIS040519; [Where PR indicates “presurvey check” and LISMMDDYY is the LIS batch being used]), finishing by highlighting the “ENTER” bar and pressing the “Enter” button.
  + Select *Save*
  + Select the newly created site ID
  + Select *Select [newly created site ID]*
  + **NOTE: Presurvey checks using the same batch of LIS are to be recorded to the same “site ID.” So if the site ID already exists it is used until a switch is made to a new batch (i.e., new batch = new site ID).**
* Press the “Handheld” button; activate “Auto Stable” (see Note 3 above)
* When all auto stable indicators are a steady green, press “Enter” button twice to begin logging; confirm logging has begun
* After 3 minutes from start of logging press “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book

## **DO SATURATED AIR CHECK**

* Dry DO sensor cap and temperature probe with a Kim Wipe; carefully place probes in calibration cup with small amount of water, making sure water does not touch sensor surfaces; tighten calibration cup to bulkhead (stopping when resistance starts to be felt)
* Press the “Handheld” button; activate “Auto Stable” (see Note 3 above)
* When all auto stable indicators have turned to a steady green, press “Enter” button twice to begin logging; confirm logging has begun
* After 3 minutes from start of logging press “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book

## **0 DO CHECK**

* Carefully immerse probes into saturated Sodium Sulfite solution
* Press the “Handheld” button; activate “Auto Stable” (see Note 3 above)
* When all auto stable indicators have turned to a steady green, press “Enter” button twice to begin logging; confirm logging has begun
* If 5 – 10 minutes have elapsed, and the auto stable indicators have NOT turned to a steady green, but the DO (mg/L) read out on the dashboard is less than 0.2 mg/L (< 0.2 mg/L), press “Enter” button twice to start logging; confirm logging has started.
* Press “Enter” button to stop logging (no need to capture more than one “0” reading)
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Confirm the DO column shows 0 mg/L (or at least <0.2 mg/l) and write value into calibration book
* Rinse storage/calibration cup and probes thoroughly with tap water
* affix probe guard to sonde
* Place a mL or two of tap water into storage/calibration cup, slide on over probe guard, and tighten the cup’s retaining ring snugly to the bulkhead of the sonde

# PACKING UP FOR FIELD CREWS

* Create a site ID list on the handheld, in the order the survey lead anticipates visiting the sites, by:
  1. On Dashboard screen, with *Start Logging* showing in the green-highlighted area, press the “Enter” button
  2. Scroll to, and select, the existing site ID
  3. select *Add new*, then select *Site Name*
  4. Key-in a name using the format *xxxxxx* (e.g., 123456; where xxxxxx is the OWM ID—with the dash omitted—for a given site), finishing by highlighting the “ENTER” bar and pressing the “Enter” button.
  5. Select *Save*
  6. Repeat steps 1 through 5 until all the site IDs for the survey have been entered
* Recharge battery in EXO handheld
* Fill in the pre-survey checklist at the top of the “Multi-probe pre-survey checklist and user report” form as the sonde, logger, etc. are being packed into the case, making sure all necessary items are present (not everything on the checklist is required for every survey).
* When all required items are present, close and latch the case, and affix checklist to handle on case.

# POST-SURVEY CHECKS—LIS, DO (SATURATED AIR)

## **LIS**

* Remove probe guard
* Follow rinse procedure, ending with Low Ionic Standard (LIS)
* Carefully immerse probes into LIS to above black tip on conductivity probe
* Press “Handheld” button; select *User ID*; select calibrator’s ID from User ID list
* Create a new “Site ID” for the post-survey checks by:
  + On Dashboard screen, with *Start Logging* showing in the green-highlighted area, press the “Enter” button
  + Scroll to, and select, the existing site ID
  + select *Add new*, then select *Site Name*
  + Key-in a name using the format *POLISMMDDYY* (e.g., POLIS040519; [Where PO indicates post-survey check and LISMMDDYY is the LIS batch being used]), finishing by highlighting the “ENTER bar” and pressing the “Enter” button. **[NOTE: The LIS batch used for the post-survey check should be the same one used for the pre-survey check!]**
  + Select *Save*
  + Select the newly created site ID
  + Select *Select [newly created site ID]*
  + Press the “Handheld” button; activate “Auto Stable” (see Note 3 above)
  + When all auto stable indicators have turned to a steady green, press “Enter” button twice to begin logging; confirm logging has begun
  + **NOTE: Post-survey checks using the same batch of LIS are to be recorded to the same “site ID.” So if the site ID already exists it is used until a switch is made to a new batch (i.e., new batch = new site ID)**
* After 3 minutes from start of logging press the “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book

## **DO SATURATED AIR CHECK**

* Dry DO sensor cap and temperature probe; carefully place probes in calibration cup with small amount of water, making sure water does not touch sensor surfaces; tighten calibration cup to bulkhead until resistance is felt
* Press the “Handheld” button; activate “Auto Stable” (see Note 3 above)
* When all auto stable indicators have turned to a steady green, press “Enter” button twice to begin logging; confirm logging has begun
* After 3 minutes from start of logging press “Enter” button to stop logging
* Review file by pressing “Data” button; select *View Data*; select *Show Data*; use arrow keys to navigate down to last record and scroll right to see data values. Write last recorded values into appropriate boxes in calibration book
* Affix probe guard to sonde; leave a mL or two of tap water in storage/calibration cup and secure cup to bulkhead of sonde

**Naming Conventions**

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| **DESCRIPTION (stored to)** | **FORMAT** | **EXAMPLE** |
| Calibration checks (“Site ID”) | *Cal[project ID]YYYYMMDD* | CalRSN20190429 |
| Final pre-survey checks (“Site ID”) | *PRLISMMDDYY* | PRLIS040219 |
| Sample Site (“Site ID”) | *[xxxxxx]* (the OWM ID for the sample, dash omitted) | 123456 |
| Post-survey checks (“Site ID”) | *POLISMMDDYY* | POLIS040219 |
| User ID (“User ID”) | *[user’s last name]* | Smith |

Data Upload Procedure

DATA FROM ATTENDED USE

**KorEXO Setup**

From the file settings menu the following setup options have been selected:

* On the **General Settings** tab:
  1. The following are set to “On”: *Automatically connect to instrument; automatically update Software/Firmware; automatically download data from instrument; automatically update time to PC time*.
  2. For file export the *csv delimiting character* is set to “,”; *csv export type* is “without header”
  3. The startup option for user login is set to “Off”
* On the **ISE** tab all options (NH4+, NH3, NO3-N, and Cl-) are set to “Off” (if probes for any of these are acquired in the future the appropriate one(s) will need to be turned on)
* On the **DO** tab *%Sat* is set to “Off”; *mg/L* is set to “On”, *% Local* is “On”; and *% LocalB* is “Off”
* All options on the tabs for **Algae, ORP, and PAR** are set to “off”
* On the **Barometer** tab the *Barometer* is “Enabled” and units set to “mmHg”
* On the **pH** tab *pH* is “On”; *mV* is “Off”
* On the **Conductivity** tab *Specific Conductivity* (µS/cm) and *TDS* (mg/L) are “enabled”; *Conductivity*, *Resistivity,* *Salinity, NLF Conductivity,* and *Water Density* are “Disabled”
* On the **Sonde** tab *Cable Power* and *Battery Voltage* are “Disabled”
* On the **Chlorophyll** tab all options are “Off”
* On the **Temperature** tab *Temperature* is “Enabled” and set to °C
* On the **Depth** tab *Depth* is “Enabled”; *Vertical Position* and *Absolute Pressure* are “disabled”
* On the tabs for **Turbidity, fDOM,** and **Wiper** all options are “Disabled/Off”
* On the **GPS** tab *GPS* is “On,” set to decimal degrees; *Altitude* is “Enabled”, set to m

**DATA UPLOAD**

Lab and Survey Data

* Locate the EXO-specific USB cable and use it to connect the handheld unit to the computer
* Open the KorEXO software and turn on the handheld (it is recommended that only one device be connected at a time)
* On the **HOME** page the *Instrument Connection Panel* will display connected devices and begin autoimporting data
* Data can be viewed either by:
  1. Selecting “View Downloaded Collected Data” next to the device shown in the *Instrument Connection Panel*; or
  2. Clicking on *Recorded Data* in the upper left of the screen
* Selecting “View Downloaded Collected Data” will go directly to the data-viewing screen; if *Recorded Data* was clicked a blank page is displayed, but clicking on the *Search* icon (green magnifying glass) in upper left of screen will display the data-viewing screen
* **Check the *Start Date* and *End Date* boxes to make sure any entries there encompass all data contained on the handheld**
* Click the check-box at the top of the **Results** column to select all files contained on the handheld
* Click the *View Selected Recorded Data* button at the bottom right of the window
* In the upper left of the data display window click on *Export to CSV*
* Save the unedited file (as a csv) to “C:/water lab/dldl/[4 digit survey year]/YSI EXO uploads” on the Instrument Lab computer using the file naming convention: yymmdd\_EXO[last 4 digits of logger serial number], e.g., 190715\_EXO4861
* Using two-person verification, confirm file integrity and proper file naming
* **Copy** the unedited file from the Instrument Lab computer “C” drive to “W:/dwm/N/data uploads/YSI-Attended”; set file properties to **Read Only**
* Notify Kari that new data have been placed in this folder
* Clear all the data in KorEXO by navigating to the “Recorded Data” screen, clicking on the *Search* icon (green magnifying glass), clicking the check-box at the top of the Results column, and selecting delete at the bottom right of the screen
* Close KorEXO and reopen before connecting the next handheld or sonde

Calibration Records

* Locate and connect the USB adapter to the handheld’s USB port; plug in a thumb drive (FAT32 formatted) to adapter
* With the handheld turned on, press the “Data” button and select *Backup Data*
* Make sure date and time parameters encompass the calibration data on the handheld and select *Include Sensor Info*
* Select *Backup Data*
* The next screen instructs to “Press ENTER . . .” to transfer data
* When the screen message indicates file transfer is complete remove the thumb drive and insert it into a USB port on the Instrument Lab computer; copy the unedited calibration records (they are the text files) to the “YSI EXO uploads” folder on the Instrument Lab computer’s C drive
* Using two-person verification, confirm file integrity and proper file naming, e.g., 190715\_EXO4861calrecords
* **Copy** the unedited calibration records to “W:/dwm/N/data uploads/YSI-Attended”; set file properties to **Read Only**

Deleting Data From Handheld

* After the two-person verification team has confirmed the integrity, proper naming, and saved copies in both required locations of all files being transferred, the data may be deleted from the handheld
* With the handheld turned on, press the “Data” button
* Select *Delete Data*
* Select *Delete All Data*
* Select *Delete Cal Records*; select “yes” on the next screen
* Delete old OWM IDs