ATM Calibration And Data Logging Sheets

APPENDIX H

QA/QC Data Sheet
YSI Multi-Parameter Sonde

DATE:____/____/____, INSTRUMENT MODEL:_____, S/N_____

1. DOWNLOAD
File:_____ Size:_____KB

2. DIAGNOSTICS
CONDUCTIVITY CELL CONSTANT (5 ± 0.5)_____
DO CHARGE READING (50 ± 25) _____
DO GAIN READING (1 ± 0.5)_____
BATTERY VOLTAGE_____

3. SPECIFIC CONDUCTANCE
CALIBRATION STANDARD USED_____µS/cm, CAL TEMP_____°C
ZERO READING IN AIR (CHECK)_____ (should be 0.0)
READING BEFORE CALIBRATION_____µS/cm, AFTER CALIBRATION_____µS/cm
CALIBRATION SUCCESSFUL? YES NO INITIAL_____

4. TURBIDITY
TYPE OF STANDARD_____CAL TEMP_____°C
TURBIDITY VALUES BEFORE CALIBRATION 0 NTU_____,100 NTU_____
TURBIDITY VALUES AFTER CALIBRATION 0 NTU_____,100 NTU_____
CALIBRATION SUCCESSFUL? YES NO INITIAL_____

5. pH
Circle: 1 POINT 2 POINT 3 POINT CAL TEMP_____°C
pH MILLI-VOLT READINGS: 7_____mV 10_____mV 4_____mV
pH VALUES BEFORE CALIBRATION: 7_____(pH) 10 _____(pH) 4 _____(pH)
pH VALUES AFTER CALIBRATION: 7 _____(pH) 10 _____(pH) 4 _____(pH)
(NOTE: +180 mV is pH = 10, 0 mV is pH=7, and –180 mV is pH=4)
CALIBRATION SUCCESSFUL? YES NO INITIAL_____

6. DISSOLVED OXYGEN
CHANGED DO MEMBRANE? YES NO If yes, when? ____/_____/___ ___:___:___
(a.) Air Calibration:
TIME IN CALIBRATION CUP TO ACHIEVE WATER-SATURATED AIR_____ minutes
BAROMETRIC PRESSURE IN MILLIMETERS OF MERCURY _____mm of Hg
(NOTE: multiply inches of Hg by 25.4 to get mm of Hg)
CAL TEMP_____°C
DO % VALUE BEFORE CALIBRATION_____% , AFTER CALIBRATION_____%
(b.) Winkler:
Winkler performed at:_____/_____/_____ _____:_____:_____
DO Concentration_____ mg/L
CALIBRATION SUCCESSFUL? YES NO INITIAL_____

7. DEPTH
DEPTH READING BEFORE:_____ meters, DEPTH READING AFTER:_____ meters

8. CHLORIDE
Circle: 1 POINT 2 POINT 3 POINT CAL TEMP_____°C
Standard:_____mg/L, Before Calibration:_____mg/L, After Calibration_____mg/L
Standard:_____mg/L, Before Calibration:_____mg/L, After Calibration_____mg/L
Standard:_____mg/L, Before Calibration:_____mg/L, After Calibration_____mg/L

9. INSTRUMENT
Batteries Changed: Yes or No
Clock Set: Yes or No
Memory Erased: Yes or No

10. DEPLOYMENT
File Name:_____
Start Logging at:___/_____/___ ___:____:___
Interval:_____minutes
Battery:_____days
Memory:_____days

QA/QC Data Sheet
600 XLM - Marsh Meter

DATE:____/____/____, INSTRUMENT MODEL:_____, S/N_____

1. DOWNLOAD
File:_____ Size:_____KB

2. Post Calibration
Conductivity Standard Used:_____µS/cm, Reading in Standard:_____µS/cm
Depth Reading Above Water Surface:_____meters

3. DIAGNOSTICS
CONDUCTIVITY CELL CONSTANT (5 ± 0.5)_____
BATTERY VOLTAGE_____

4. SPECIFIC CONDUCTANCE
CALIBRATION STANDARD USED_____µS/cm, CAL TEMP_____°C
ZERO READING IN AIR (CHECK)_____ (should be 0.0)
READING BEFORE CALIBRATION_____µS/cm, AFTER CALIBRATION_____µS/cm
CALIBRATION SUCCESSFUL? YES NO INITIAL_____

5. DEPTH
DEPTH READING BEFORE:_____ meters, DEPTH READING AFTER:_____ meters

6. INSTRUMENT

Batteries Changed:	Yes	or	No
Clock Set:	Yes	or	No
Memory Erased:	Yes	or	No

7. DEPLOYMENT
File Name:_____
Start Logging at:___/_____/___ ___:____:___
Interval:_____minutes
Battery:_____days
Memory:_____days

Marsh Station Retrieved from:_____

Marsh Station to be Deployed in:_____

CROSS-SECTION WATER QUALITY PROFILE

DATE: ____/____/99

Station ID: _____

Weather Condition: _____

WQ Samples Taken: _____(* identifies vertical layer on profiles in tables below)

NOTES: _____

_____

Handheld Instrument YSI 600XL - S/N: _____

PROFILE 1 Location:						Time From:		To:				
Vertical Layer	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Time												
Temperature (°C)												
SpCond (uS/cm)												
Salinity (ppt)												
DO %												
DO (mg/L)												
pH												
Depth (meters)												

PROFILE 2 Location:						Time From:		To:				
Vertical Layer	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Time												
Temperature (°C)												
SpCond (uS/cm)												
Salinity (ppt)												
DO %												
DO (mg/L)												
pH												
Depth (meters)												

PROFILE 3 Location:						Time From:		To:				
Vertical Layer	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Time												
Temperature (°C)												
SpCond (uS/cm)												
Salinity (ppt)												
DO %												
DO (mg/L)												
pH												
Depth (meters)												

YSI Technical Note

Tips For Deployment and Quality Assurance of Logged Data

Introduction

The following document is designed to aid users of the YSI 6000UPG, 6920, 600XLM, and 6600 in ascertaining the reliability of the data from their deployments. The recommended protocol emphasizes QA procedures with regard to dissolved oxygen, but deals with other parameters (conductivity/salinity, pH, ORP, and turbidity) as well. The procedures are only suggestions, and YSI recognizes that time and manpower constraints vary from site to site. However, we feel that, even if the protocol cannot be followed exactly in some cases, the general concepts described will be useful in setting up your instrument for deployment and determining whether sensor drift or failure has occurred under field conditions and, if problems are suspected, in isolating their cause.

Predeployment Procedure

(1) Prior to setting up for deployment, remove the sonde guard and clean all of the sensors. If fouling in previous deployments has been minimal, it may not be necessary to remove some of the probes from the sonde bulkhead. However, if fouling is extensive or if significant solid material has built up near the threads of the probes, we recommend that all probes be removed from the bulkhead and cleaned. Reinstall these probes according to the instructions in the manual, being careful that all connectors (probe and bulkhead) are free of water prior to replacement.

(2) If you are using a 6920, 6000UPG, or 6600 with a 6027 turbidity sensor, remove the turbidity wiper assembly from the probe and inspect visually. If the wiper pad appears worn or is dirty, replace the wiper assembly prior to deployment. Usually, turbidity wipers can maintain their function for over 30 days of deployment, but excessive fouling conditions can compromise the length of this time period. It is important to remember that a dirty or disintegrating wiper is likely to be responsible for incorrect parking of the wiper assembly during deployments. Therefore, err on the side of caution when deciding whether or not to replace a wiper.

(3) Clean the conductivity sensor with brush provided in the maintenance kit. Wet the sensor cavity and the brush with clean water and insert the brush several time into both sides of the conductivity cavity. After brushing is complete, rinse the cavity with clean water.

(4) Remove the old dissolved oxygen membrane and inspect the probe surface. If the silver electrodes show significant darkening, resurface the probe face with the very fine sandpaper disk found in the 6035 DO reconditioning kit following the instructions in the manual. Be sure to sand (approximately 10 strokes) parallel to the gold cathode. After sanding, rinse the probe face repeatedly with purified water and wipe clean with soft tissue.

(5) Reinstall a new DO membrane according to the instructions found in the manual. Be sure to stretch the membrane uniformly over the probe face and to roll the O-ring over the surface during installation to avoid puncturing the membrane. Trim the excess membrane "skirt" near the O-ring by circumscribing close to the O-ring with a sharp knife or single-edged razor blade. The membrane can also be applied while the probe is installed in the sonde and the sonde is supported vertically if the user feels more comfortable with this approach.

(6) Reinstall the sensor guard on the sonde, replace the sonde batteries if necessary, and connect the sonde to a laboratory computer.

(7) With the DO probe exposed to air, check the "DO Charge" by accessing the Diagnostics submenu of the sonde software (6000UPG) or by activating "DO Chg in the Report setup menu (6920 and 600XLM). Make sure that the value is between 25 and 75 after the sensor has been activated for approximately 2 minutes. If the value is above 75, remove the membrane, dry the probe and resurface. If a recheck of DO charge still shows a value above 75, contact YSI customer service for advice.

(8) Leave the sonde in air and start a Discrete Sample study at a four second sample interval. Observe the readings in air and then place the sonde in conductive water (sea or fresh, and air-saturated, if possible). Make certain that the readings do not rise precipitously to unreasonable values (in seawater) or rise a little and become jumpy (in fresh water). If these symptoms are observed, it is likely that the DO membrane has been punctured during installation. If so, remove the sonde guard, replace the membrane and repeat the air/water test. If high readings are still observed, contact YSI customer service for advice.

(9) If the DO sensor is functioning properly, proceed with calibration of the pH sensor as described in the manual. Remember that usually a 2-point calibration at either pH of 4 and 7 or at pH of 7 and 10 will provide good accuracy for most deployments. If an error message is encountered in the pH calibration procedure, first assure that the buffers are reliable before contacting YSI customer service.

(10) Calibrate the ORP sensor as described in the manual. Normally Zobell solution is used in this procedure.

(11) Perform a 2-point calibration of the turbidity sensor according to the instructions in the manual. Remember that the first calibration point must be zero NTU (clear water). The second point is user-selectable, but we recommend 100 NTU standard (either APS polymer or formazin). During the zero NTU calibration, activate the turbidity wiper manually by pressing "3" and make certain that the wiper is parking properly (not on the probe optics). This verification is greatly facilitated if the calibration is carried out in a glass beaker rather than the storage cup since the wiper position can be observed under these conditions. In addition, because debris can be carried over from previous deployments or from other calibration solutions, the use of the glass beaker also allows the user to determine that the "0 NTU" standard is indeed free from extraneous material. If the standard appears at all cloudy after immersion of the sonde, change the water repeatedly until a clear medium is obtained. If you encounter error messages during the calibration, first ascertain the quality of your standards by observing their homogeneity in a glass container. If the standard is contaminated, discard and replace with fresh reagent. If you continue to encounter an error message, contact YSI customer service for advice.

(12) Calibrate the conductivity sensor according to the instructions found in the manual. Be certain that the hole at the upper end of the probe is completely covered by standard solution. The YSI conductivity sensor is extremely linear and for this reason we do not recommend the use of low conductivity standards for its calibration. These standards are subject to significant contamination from reagent carryover or from leaching from the pH reference electrode. Standards of 10 mS/cm or greater are ideal and will provide accurate data over the entire range of the sensor (0-100 mS/cm) with much less risk of contamination.

(13) After calibration of all sensors except dissolved oxygen and depth is complete, place the sonde in the storage cup that contains approximately 1/8 inch of water. Be certain that the amount of water is not sufficient to cover the tip of the DO sensor. Also make certain that the vent screw of the storage cup is removed (Model 6000UPG) or that the storage cup is not tightened completely (Models 6920, 600XLM, and 6600) so that the inner atmosphere reflects the ambient barometric pressure. Calibrate the depth sensor according to the instructions in the manual.

(14) Set up and BEGIN your next Unattended (logging) study while leaving the sonde in the storage cup as described in (13). Be sure to set up the time of the deployment for several days longer than you anticipate for the actual field study. This will assure that DO post deployment quality assurance data can be obtained to ascertain the drift of the sensor during deployment as described in the next section. There is usually no reason to stop the logging in the field; it can be, and usually is, terminated manually on recovery. Therefore, if you anticipate a deployment of 14 days, set up the study for 20 days (or greater), etc.

(15) Log data for a few hours in water-saturated air as set up in (14). Approximately 2 hours before deployment, attach the sonde to a computer and calibrate the DO sensor to the ambient barometric pressure. Note that this calibration is possible without interrupting the logging study. The data recorded in water-saturated air prior to your deployment will thus be part of the data record for the study and will indicate initial sensor performance.

(16) Detach the cable from the sonde, install the connector cap, and deploy at your site.

HINTS ON PREDEPLOYMENT CALIBRATION:

- Never ignore error messages that appear during calibration. Try to identify the cause of the message using the procedures described above. Consult with YSI Customer Service before you override any calibration error.

- The turbidity sensor generally is not susceptible to significant drift during the deployment. Most problems occur because of foreign debris in the sonde compartment that may result in jumpy readings or a compromise of the wiper function. For this reason, it may be prudent to only assure good optical and wiper performance prior to deployment rather than to perform a full calibration. To check optical performance, remove the sonde guard and clean the face of the turbidity sensor with soft tissue. Start a Discrete Sample study at a four second interval. Then place your finger over the optics of the probe and observe the turbidity reading. The value should become large (either positive or negative). To assure wiper function, press the "3" key with the probe in air and make certain that a bi-directional cleaning cycle occurs and

that the wiper parks off of the optics. The calibration drift of the sensor should still be checked periodically, particularly if unusual readings are encountered during the previous deployment, but it may not be necessary to calibrate the turbidity probe for every deployment.

- Do not calibrate the turbidity sensor in white or opaque plastic vessels unless the sonde guard and the bottom plate are in place. Reflection from the light colored surface could cause artificially high readings, particularly at low NTU values.

- The conductivity sensor is also usually not susceptible to drift if the cell cavity is not contaminated with significant foreign material (barnacles, algal strands, etc.) As for turbidity, the calibration drift of the sensor should still be checked periodically, particularly if unusual readings are encountered in the previous study, but it may not be necessary to calibrate after each deployment.

- The pH sensor may drift during deployment and should always be recalibrated prior to the next deployment. However, the calibration does not require the care associated with the conductivity and turbidity sensors since small carryover of rinse water will not significantly affect the actual pH of buffers. A simple rinse in tap or purified water (at the tap or in a bucket) and minimal drying of the sonde will still assure a good pH calibration.

- YSI recommends an 8 hour "burn in" period between DO membrane installation and the calibration of the probe, in order to allow the membrane to relax to its deployment condition. Pulsing of the probe during this time (at the expected unattended sample interval) will assist in stabilizing the sensor. In a typical scenario, a sonde might be recovered at 8:00 AM and quality assurance, cleaning and membrane changes are done by 10:00 AM. If the sonde is immediately set up logging for the next study, it will be ready to calibrate by late in the afternoon of the same day as recovery. Remember that the break-in time of each probe is slightly different and also may depend on how thin the membrane is stretched. Our recommendation of 8 hours is a suggestion based on experience at YSI and may be too long or too short for your application. The best method to determine the appropriate break in period for your probe is to observe the stabilization of the DO readings in water-saturated air as described above in (15) above.

- Purchase a few 800 mL (6000UPG, 6600), 600 mL (6920), or 400 mL (600XLM) glass beakers as a substitute for the storage cup in calibration procedures. Having a number of calibration vessels is likely to enhance your efficiency (you won't have to replace solutions into bottles during the calibration of multiple sondes) and the transparency of the beakers will be a significant advantage in troubleshooting any problems with the turbidity sensor as described above.

The above suggestions might seem a little overwhelming at first. However, as you get used to them, they should become almost second nature. With experience, you should be able to follow the above advice and still carry out a predeployment calibration in less than 1 hour for your sondes.

Post Deployment Procedure

(1) On field recovery, place the sonde in the storage cup that contains approximately 1/8 inch of water. Be certain that the vent screw is removed (6000UPG) or the storage cups threads are loose (6920 and 600XLM) . Transport the sonde to the laboratory under these conditions while continuing to log data. Do not stop the logging associated with the study. On arrival at the laboratory, leave the sonde in this mode for 1-2 additional hours if possible, so that DO readings in air at a relatively stable temperature will be acquired.

(2) Terminate the logging study, upload the previous study in PC6000 format and perform a cursory examination of the data for all parameters using the YSI PC6000 software. Make a note of all obvious anomalies in the data that should be specially investigated in the post deployment procedure. **YSI analysis of field data is greatly facilitated by the availability of the file in PC6000 format.**

(3) Examine and record the DO readings in water-saturated air acquired after the deployment ended. This is easily done using the Quick View command from the File menu that shows the last page of data in the last logged file. These readings are generally reflective of the drift of the DO sensor during deployment. Remember, however, that the first few readings after recovery may be somewhat inaccurate due to lack of temperature equilibration between the DO membrane and the thermistor. In addition, if the membrane is heavily fouled on recovery, the readings can be compromised if the fouling layer has dried.

(4) If examination of the uploaded deployment file indicates any anomalies in the DOreadings, activate the Discrete Sample function in the Run menu and observe the DO readings at a 4 second sample interval with the probe in air. Then place the sonde in conductive water (sea or fresh, and air-saturated, if possible) while continuing to observe the readings. Make certain that the water is deep enough to completely cover the conductivity sensor. If the readings rise drastically (seawater) or become slightly higher and jumpy (fresh water) when the sonde is placed in water, there is likely to be a puncture or tear in the membrane that occurred during deployment. It is resulting in “crosstalk” between the DO and conductivity sensors via the conductive water. If the readings appear reasonable, then the deployment anomaly must be due to another cause.

Note that a check of the DO readings in water also provides valuable drift information for the deployment, as long as the water has been carefully saturated with air.

If a membrane puncture has occurred during deployment, the most likely cause is damage from environmental sources (floating sticks and debris, animals, etc.). Use of a coarse screen over the probe compartment in subsequent deployments may prevent (or at least minimize) this problem. Make certain that the screen is not so fine in grid that small particles will become imbedded and isolate the sonde from the environmental water.

(6) Access the Diagnostic submenu (6000UPG) or activate “DO Chg” in the Report setup menu (6920, 600XLM, and 6600) and observe and record the value of DO charge. The value should be in the 25 -75 range. However, if the value is above 75, but less than 130, the DO readings for the study have not been compromised. Probes with DO charge values above 75 in the postdeployment check should be resurfaced prior to the next deployment.

(7) Place the sonde in pH 7 buffer and activate the Discrete Sample mode at a 4 second interval. Record the pH value after approximately 3 minutes. This check is reflective of the pH drift during the deployment.

(8) Place the sonde in Zobell solution and activate the Discrete Sample mode at a 4 second interval. Record the ORP value after approximately 3 minutes. This check is reflective of the ORP drift during the deployment.

(9) Remove the sonde guard and observe the turbidity sensor to assure that the surface is clean and the wiper is not parked over the optics. Wipe the probe face dry with soft tissue. Start a Discrete Sample study at a 4 second interval. Place your finger over the sensor optics and observe the turbidity reading. It should rise to a large value (either positive or negative). Activate the wiper by pressing the "3" key and assure that a bi-directional wipe occurs. These checks will assure that the turbidity sensor is functioning properly on recovery and may be all that is required depending on the application. Drift of the sensor can be ascertained at the next predeployment calibration.

(10) Unless unusual readings have occurred during deployment or heavy barnacle fouling is evident, it is not usually necessary to check the drift of the conductivity sensor after each deployment. However, if physical fouling of the conductivity sensor is suspected, immerse the sonde in a standard of a known conductivity and record the reading to quantify the drift during deployment.

(11) Record your post deployment data in a standard form that can be stored in a notebook or binder for future reference. A form employed at YSI that might be used as a basis for this action is attached.

For any other information, please refer to the Operations Manual that came with your YSI sonde, or call YSI Technical Support at (800) 897-4151.

YSI FIELD DEPLOYMENT RECORD

STUDY FILE ID NUMBER: YSITEST1

SITE: SPRING RUN STREAM -- UPPER BRIDGE

DATE DEPLOYED: 1/1196

DATE RECOVERED: 2/15/96

SONDE TYPE: 6000UPG
SONDE ID NUMBER/TYPE: 91E00006

6030 ID NUMBER: 94H 22708 **TURBIDITY PROBE NUMBER: Y1305**
pH PROBE TYPE: INGOLD STANDARD
ORP PROBE TYPE: INGOLD STANDARD

PRE/POST DEPLOYMENT CHECK:

	PRE DEPLOYMENT	POST DEPLOYMENT
PARAMETER		
	SEAWATER	SEAWATER
TEMP, C		
DO, MG/L		
DO, % SAT		
pH		
ORP		
SP. COND		
TURBIDITY		

	COMP WITH INIT CAL	
	PREDEPLOYMENT	POSTDEPLOYMENT
DO, PERCENT SAT IN AIR	97	99
DO, CHARGE	52.3	48.3
COND STANDARD	10.0	NOT DONE
pH 7 BUFFER	7.00	6.90
pH 10 BUFFER	10.00	9.97
TURBIDITY FUNCTION	WIPE OK; ZERO OK; SENSITIVITY OK	WIPE OK; ZERO OK; SENSITIVITY OK
TURBIDITY, 0 NTU	0	NOT DONE
TURBIDITY, OTHER	100	NOT DONE
ORP, MVP	230	240
DEPTH, 0 FEET	0.0	0.12

NOTES:

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