# OPERATOR'S MANUAL

# OBS-Mobile

11/09

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# OBS-Mobile Table of Contents

*PDF viewers note: These page numbers refer to the printed version of this document. Use the Adobe Acrobat® bookmarks tab for links to specific sections.*

# *Section 1. Operations*

## 1.1 Software Installation

Insert the CD and select “Install OBS-Mobile”. Follow the installation wizard to install the software.

The main purpose of this section is to explain how to program and operate the OBS-3A with OBS-Mobile. It covers: 1) turning the OBS-3A ON and testing the sensors, 2) setting it up to sample in one of two modes, 3) recording data with the Archer or uploading data from the OBS-3A, 4) importing data into a spreadsheet, 5) plotting data with OBS-Mobile, and 6) turning the OBS-3A OFF.

## 1.2 Running OBS-Mobile

1. Select the **OBS-Mobile** program  to start the utility.


*FIGURE 1-1. OBS Mobile main screen*

2. **OBS-Mobile** will create a new data log file. Files are automatically named with Greenwich Date and Time as follows: OBS3A_20090408_172433.log. The files are save in the **My Documents\OBS Mobile Logs** folder on the Archer. To save the file using a different name or location select the **File** pop up menu and **Data File Location**.


*FIGURE 1-2. Designating Your Own File Name and Destination*

Data received from OBS-3A while it is connected to the Archer will be stored in this file (see FIGURE 1-3).

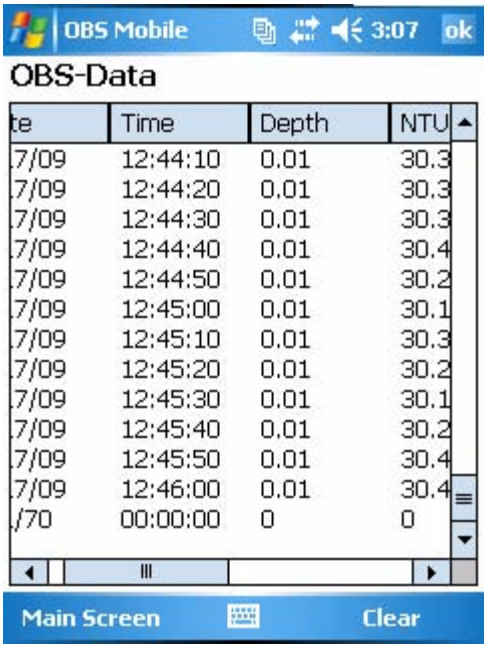



*FIGURE 1-3. Data Window*

3. Connect the OBS-3A to the Archer with the test cable (FIGURE 1-4).

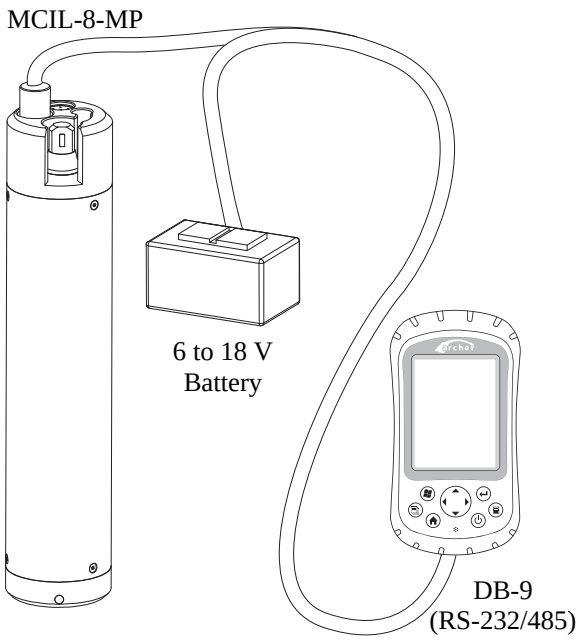



*FIGURE 1-4. Connections and Wiring of Field Cable*

4. Click  **Connect/Disconnect** to get a "connect"  and synchronize the OBS-3A clock with your PC by clicking  .

# 1.3 Pop-Up Menus

OBS-Mobile has Pop-up menus for **Files**, and **OBS-3A** (see FIGURE 1-5).


*FIGURE 1-5. OBS Mobile Pop-Up Menus*

The **OBS-3A menu** allows you to set **Serial Port Settings**, **Retrieve** and **Restore** Coefficients, **Erase Flash** Memory, and put the instrument into a low power **Sleep.**

# 1.4 Communication Settings

The **Serial Port Settings** is used to configure the Archer communication settings. The default communication settings are: 115 kbs, 8 data bits, no parity, no flow control. These settings will work for most applications. In order to pick a slower baud rate, select the desired rate from the dialog box and click **Apply** (see FIGURE 1-6). The rate adjustment takes two seconds. If your Archer is set to the wrong rate for some reason, use the check box to select **ONLY change handheld**. Then click **Apply** and the  button.

If you get the OBS-3A information box, the baud rate of the unit is synchronized with your Archer. If you don't get an information box, repeat the above procedure using a different baud rate.

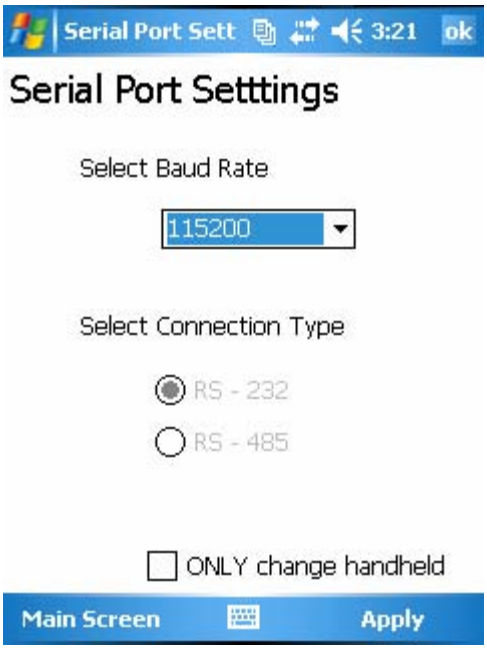



*FIGURE 1-6. Dialog Box for Changing Baud Rate*

## 1.5 Testing Sensors

1. Before daily operations and deployments, verify the instrument clicking  **Survey**. Select all installed sensors and click **Start Survey**. Click  **Open Plot** to view the data .

2. Wave your hand in front of the OBS sensor; the turbidity signal on the top plot of FIGURE 1-7 will fluctuate and data will scroll.

3. Blow on the temperature sensor to observe an increase in temperature (red trace on the middle plot of FIGURE 1-7).

4. Dip the pressure sensor in water and a small elevation in the pressure signal will occur (bottom plot of FIGURE 1-7).

5. Dip the sensor in salty water and conductivity will increase (blue trace on middle plot).

6. Click  **OBS-3A Info** to view time, serial numbers, depth corrections, and software versions (FIGURE 1-8).

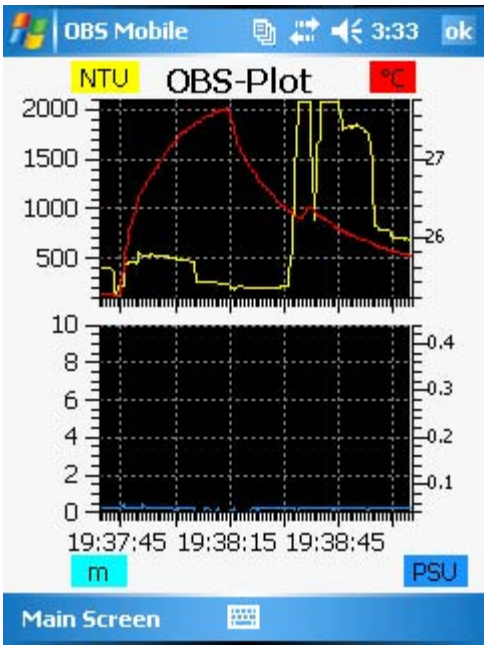



*FIGURE 1-7. Test Data Sample*

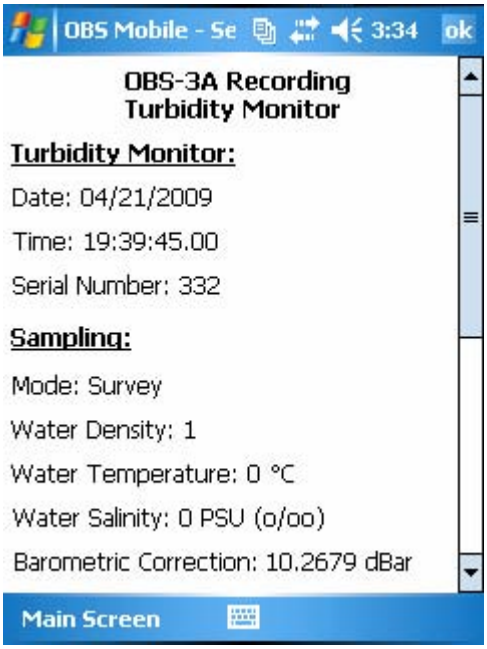



*FIGURE 1-8. Window for Viewing Instrument Information*

# 1.6 Water-Density and Barometric Corrections

Since depths are estimated from pressure measurements, it is important to set the water temperature and salinity so the OBS-3A can correct for water density and calculate depth in meters or feet (this will not affect temperature or salinity measurements). Also, the sensor measures absolute pressure so another correction must be made for barometric pressure. **Be sure to do this while the OBS-3A is at the surface.** Doing so when the instrument is submerged will result in large errors in the depth measurement. The error will be approximately equal to the instrument depth when the correction is made. Depending on the magnitude of barometric pressure fluctuations at the sampling site and the desired accuracy, you may want to correct data for atmospheric effects using barometric pressure simultaneously recorded at a nearby site.

# 1.7 Sample Statistics

Three types of statistics can be selected for the OBS-3A measurements.

1. Measures of central tendency, the mean and median.

2. Measures of variation or spread within a sample, the standard deviation ($\sigma$) and cumulative percentages, such as $X_{25}$ and $X_{75}$ (where X is the measured depth or NTU)

3. Wave statistics, significant height and dominant period.

Statistics are computed for each sample and logged in the FLASH. The raw data are not saved. The mean is the arithmetic average of the values ($\sum x / n$), where $\sum x$ is the sum of the sample values (x) and n is the number of values (sample size). The median ($X_{50}$) is the value that exceeds 50% of the sample values and is the best measure of central tendency when a sample has outliers. The percentages, $X_{25}$, $X_{50}$, $X_{75}$, etc. exceed 25, 50, and 75% of the sample values. The OBS-3A uses a spectral method developed by the U.S. Army Corps of Engineers to calculate wave heights in depth units and periods ($H_s$ and $T_s$). $H_s$ is the average height of the one-third largest waves, and reports it in the selected depth units (meters or feet). $T_s$, is the time in seconds associated with the peak spectral-density in the wave spectrum.

# 1.8 Definitions

The following definitions are useful when programming the OBS-3A.

***Interval***: The time in seconds between the start of one sample and the beginning of the next. In cyclic mode, this is the time between samples, and in setpoint mode, there are two intervals, one slow and the other fast. The interval must be longer than the duration plus some time for statistical computations. OFW will prompt you if too short an interval is selected.

***Duration***: This is the length of time in seconds that the OBS-3A is measuring its sensors. The duration must always be less than the interval. The minimum duration is five seconds and the maximum is the longer of the wave record

length or the 2048 / rate. Note: the product of the rate and the duration cannot exceed 2048.

***Rate***: Rate is the frequency of sampling for the duration of measurements. All sensors are sampled at the same rate, typically 2, 5, 10, or 25 times per second (Hz). For example, a rate of 25 Hz for a 60-second duration will produce a sample with 1500 measurements for each sensor. When wave statistics are chosen, the rate must be selected in the **Wave Setup** box.

***Power***: This indicates the percentage of time over the duration of a sample that sensors are ON. Higher power levels mean larger samples, better statistics, and shorter battery life. Lower levels spare the batteries but result in more random noise in sample statistics.

***Record Length***: When wave measurements are selected, this sets the time in seconds for which depth measurements are made for the wave-spectral computations. Use a record length of 512 seconds for inshore waters (lakes and rivers), protected bays and estuaries. For coastal waters with intermediate periods (6 to 9 seconds) use 1024 seconds. For the open ocean select a record length of 2048 seconds to record long period waves ($T_s$ > 10 seconds).

***Depth***: This is the user's best estimate of the water depth when the OBS-3A is deployed. It is an initial value needed by the unit to compute wave heights and correct for the attenuation of dynamic pressure with depth. When depth is specified in the **Wave Setup** box, the OBS-3A automatically measures height above bottom after reaching the deployment depth.

***Height Above Bottom***: This is distance above the bottom in meters or feet where the OBS-3A will come to rest after it is deployed. It is an alternative initial value used by the unit to correct for pressure attenuation. When height above bottom is selected, depth is automatically computed once the unit has come to rest.

# 1.9 Sampling Schedules

The main factors that need to be considered when setting up OBS-3A sampling schedules include:

- Sampling interval needed to characterize the processes of interest (e.g. water-level fluctuations, flood and transport duration, tidal and surf conditions, etc.).
- Maximum sediment concentration.
- Statistical requirements, such as sample size and sampling rates.
- Battery capacity.

The goal is to pick a sampling scheme that gets essential information without taking too many samples or sampling too often. Inefficient sampling produces a data avalanche, unnecessary processing, and excessive battery consumption. Sampling schedules are set with the **interval**, **duration**, and **rate** parameters. **Interval** sets the time in seconds between the start of one sample and the beginning of the next, e.g. how often data are recorded. Select the longest

interval that will show the changes in turbidity and water depth that you wish to investigate. **Rate** sets the number measurements per second, in Hz, taken during a sample. The quicker turbidity and depth change, the higher the sampling rate should be to get a stable average value for a sample. Finally, **Duration** sets the period of time for measurements and how long sensor outputs will be averaged. For example, with an interval of 30 seconds and a duration of five seconds, the OBS-3A will make measurements for five seconds starting every 30 seconds. The number of measurements in a sample (sample size) is the product of the duration and the rate. So if the rate was 25 Hz in the prior example, the sample size would be 5 X 25 = 125 measurements. TABLE 1-1 provides some recommended ranges for these parameters in various sampling environments. Always select duration and rate to give a sample size of at least 30, and to reduce random sampling noise below 50% of its maximum value, select them to give a size greater than 200.

**TABLE 1-1. Sampling Schedules**

| Environment | Rate (Hz) | Duration (sec) | Interval |
|---|---|---|---|
| | | | |
| **River/Stream** | 2-5 | 30-100 | 300-900 |
| **Beach** | 5-25 | 30-200 | 60-900 |
| **Estuary** | 5-10 | 10-60 | 600-3600 |

# 1.10 Sampling Modes

**Survey:** Select the survey mode when operating the unit with a cable connection to a PC and when high data rates are desired. Data can be logged with a PC at rates up to 120 lines per minute (2 Hz).

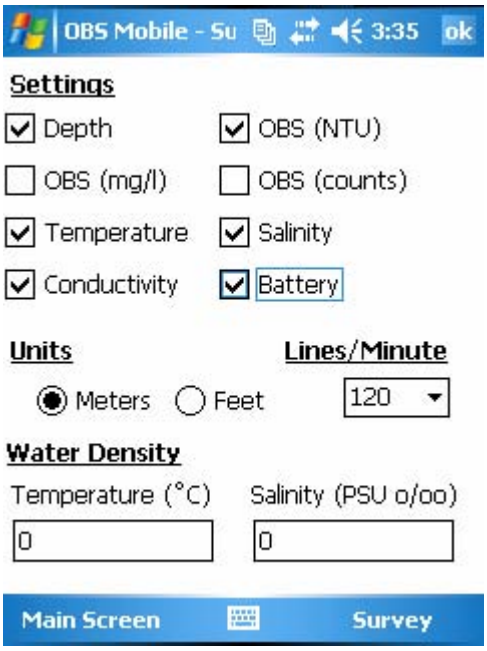
**Cyclic sampling:** Use cyclic sampling to record data internally in the 8 Mb, non-volatile FLASH memory at regular intervals, e.g. every 1, 5, 15, or 30 minutes. Depending on the number of sensors measured and the statistics selected, the OBS-3A can log as many as 200,000 lines of data (one per hour for 23 years) including: time, date, depth, NTUs, $^{o}$C, and salinity.

# 1.11 Surveying

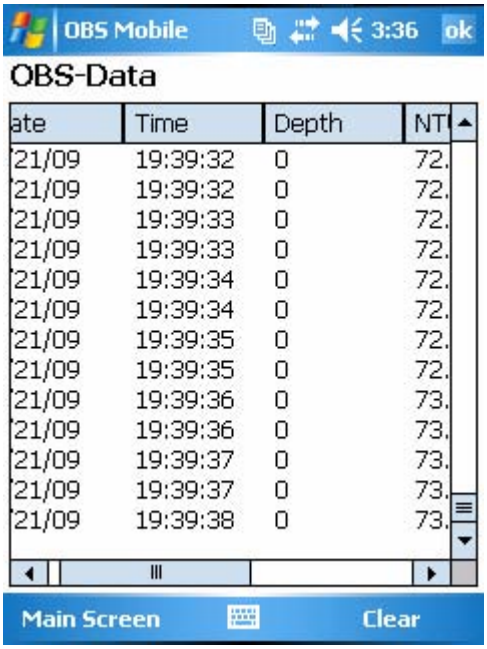
If you have a pressure sensor, click  **Bar. Corr.** (***do not do this when the OBS-3A is submerged***). The OBS-3A takes about five seconds to measure the surface pressure and compute a barometric correction.

1. Connect OBS-3A to PC with survey cable.

2. Use  to select: sensors, lines per minute, depth units (**Meters** or **Feet**), water **Temperature**, and **Salinity**. Selection of temperature and salinity only affects the depth calculation. It does not influence temperature or salinity measurements.




3. Click **Start Survey** and check data flow in data window.




4. A file for logging data was created when you started the **OBS-Mobile**.

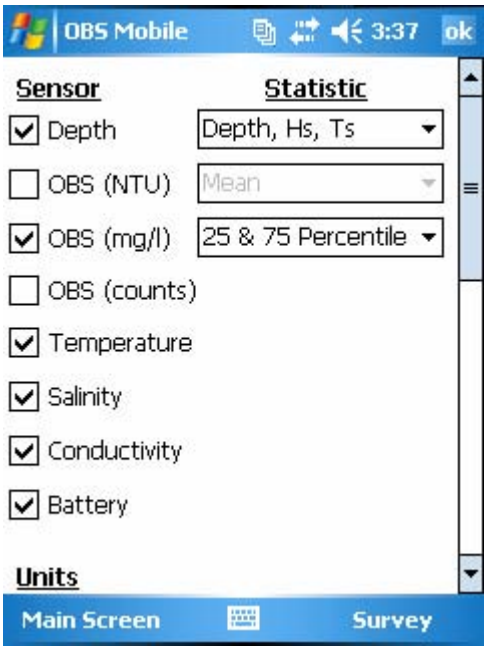
   You can review data at any time with **Open** or import the log file directly into an Excel spreadsheet for post-survey processing and plotting (see Section 1.18—Excel Spreadsheets)

# 1.12 Cyclic Sampling

This mode is for logging data at regular time intervals such as 1, 10, 15, 30, etc. minutes for example.

1. Request  **Barometric Correction**. **Be sure to do this while the OBS-3A is at the surface.** Doing so when the instrument is submerged will result in large depth errors.

2. Click  and select sensors, statistics, depth units (meters or feet), water temperature, and salinity. Selection of temperature and salinity only affects the depth calculation. It does not influence temperature or salinity measurements.




3. Configure the **Wave Setup** if you want to measure wave heights and periods (see Section 1.8—Definitions). Do this before scheduling the other sample parameters.

4. Select **Interval, Duration, Rate**, and **Power** level; see recommendations in "Sampling Schedules" (Section 1.9). The duration must be longer than the **Record Length**. The minimum duration for the **Record Length** will be computed and displayed by the OBS-Mobile.

5. Click **Start Sampling** to begin logging data. Unplug test cable; install dummy plug and locking sleeve. The instrument is ready for deployment.

# 1.13 Data Retrieval

1. Remove dummy plug and connect OBS-3A to PC with test cable.

2. Run the **OBS-Mobile** (see Section 1.2).

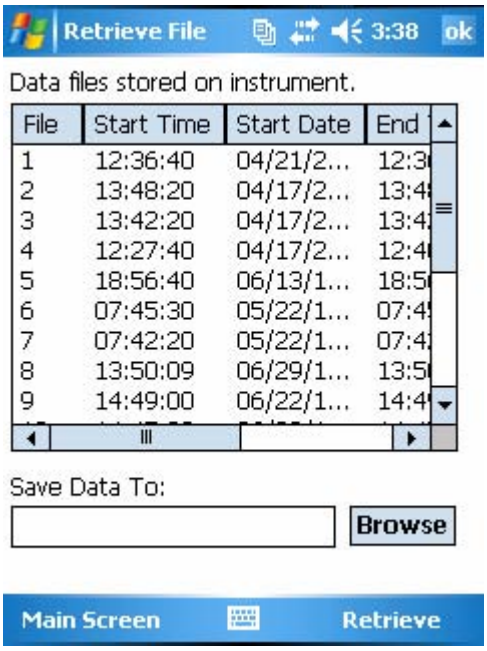
3. Check the Data Window to verify the instrument is transmitting data.

4. Click 

to end data collection and use  **Get File** to save data in a file.

5. Highlight the data with the start and end times you want.

6. Click **Browse,** select a destination and file name. Then click **Retrieve** to download the data.




7. Wait for the progress bar to disappear and examine data as a plot or test file (Section 1.16—Graphing).

# 1.14 Shutdown

From the **QBS** menu (see Section 1.3—Pop-Up Menus), select **Sleep**. See menus shown in the following section.

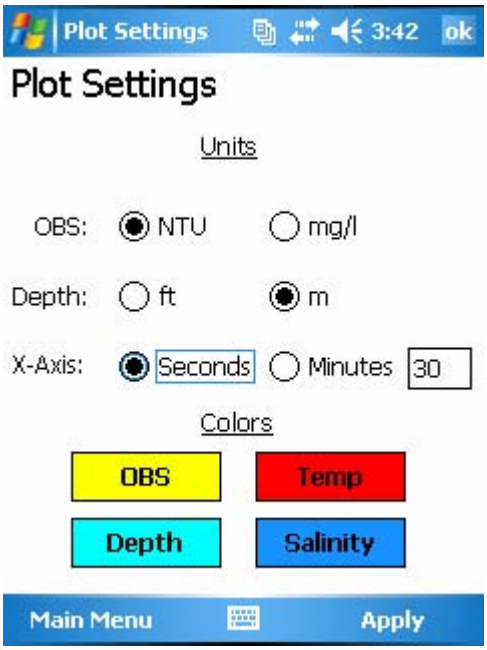
## 1.15 View Data

1. Click  and select a file to view.

2. Click  to view data.

## 1.16 Graphing

1. Click  and select a file to view. Click the Plot Settings  button.

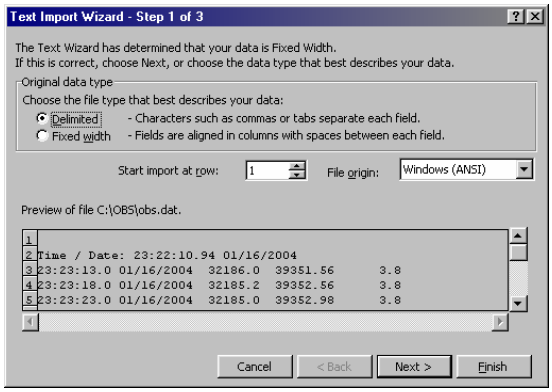


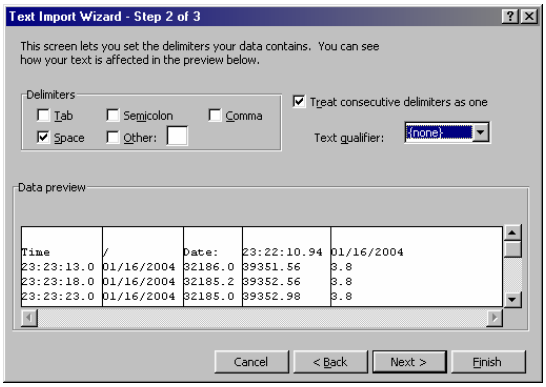

2. Use the x-axis time scale to set the amount of data you need on the graph.

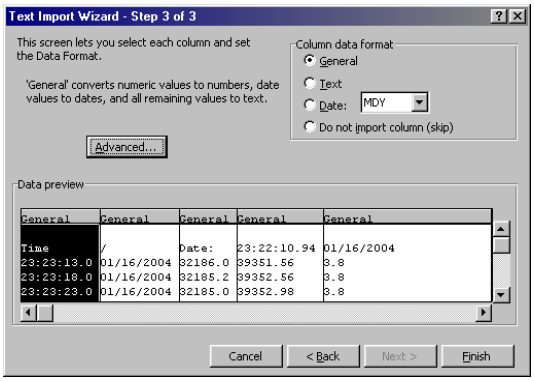
3. Click  to view the plot.

## 1.17 Excel Spreadsheets

To make an Excel spreadsheet from OBS-3A data, start Excel and set file type to **All**. Open a data file and select **Delimited** in Step 1 of 3 of the Text Import Wizard. Click **Next >** and select the delimiter **Space**; **Treat consecutive delimiters as one**; and {none} for **Text qualifier**. In Step 3 of 3, select the **General Column data format** and click **Finish**.




# 1.18 Erasing Data Memory

To erase the flash data memory, do the following:

1) Click on the OBS-3A pop up menu.

2) Select “Erase Flash Memory.”

3) The erased-block-interval counter will be displayed every 100 blocks. There are 8192 blocks and the process takes ~ 1/2 hour.

By following this procedure data in the FLASH memory is erased, so **be careful**!

# Section 2. Troubleshooting

This section will help you isolate problems that can be easily fixed such as cable-continuity, processor reset, and battery replacement from serious ones such as sensor, computer and electronic malfunctions, and damaged mechanical parts that will require our help. The problem symptoms are shown with underlined, bold text.

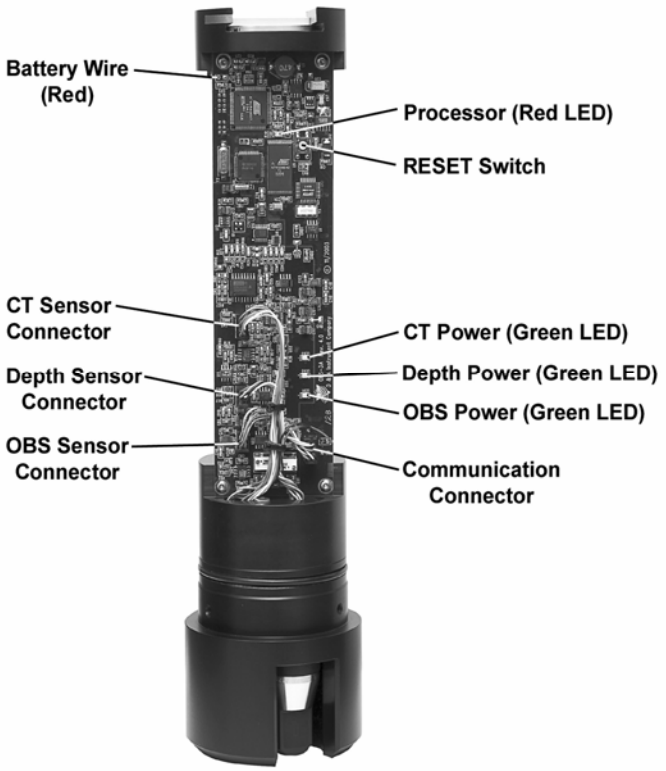



*FIGURE 2-1. Component locations*

**Unit does not communicate with the Archer.**

There are several possible causes for this symptom.

1. The test/umbilical cable is damaged or improperly connected.
2. The OBS-3A is sleeping and will not wake up.
3. The batteries are dead.

4. The OBS-3A and the Archer are not set to the same baud rate or communication protocol (e.g. RS-232, USB, RS-485).

   - Check **Serial Port Settings** on the **OBS-3A** tab. The default baud rate is 115.2 kb. If the Archer is not set to this speed, follow the steps in Section 1.4 to set it.

   - If the OBS-3A still fails to respond, try changing Archer baud rates and clicking  until communication is established (e.g. 57.6, 38.4, 19.6, 9.6 kb, etc.). If this fails, switch the Archer back to 115.2 kb and go to the next step.

   - Reconnect the cable and try  .

   - Replace the main batteries; see Section 2.2 and try  .

   - If you have a survey cable, connect instrument to external power and try  .

   - Remove the unit from the pressure housing and press and release the RESET button. Try  .

**Power failed due to battery clip corrosion or a broken power wire.**

Check for a broken red wire connecting the battery tube and circuit board. Green powder or tarnish on the battery contact parts indicates salt-water corrosion. Remove the electronics from the pressure housing. Pull battery-clip-retainer pin out with needle-nose pliers and slide the clip from its track. Clean the corroded surfaces of clip and track with a Scotch-brite® pad and reassemble unit.

**OBS or other sensor malfunction.**

- Inspect for physical damage such as a broken or bent thermistor, a dirty conductivity sensor, or an OBS sensor fouled with marine growth.

- Open unit and inspect for broken sensor and communication wires and loose connectors (FIGURE 2-1).

- Check sensor power by starting Survey mode  and selecting all sensors. Green LEDs should illuminate for installed sensor.

- If the depth sensor reads high and does not change, it may need to be cleaned (see pressure-sensor maintenance, Section 5.2).

- If the sensors appear to be in working order, the digitizer or microcontroller may be damaged. Such problems usually require factory service.

**Bright sun near the surface ( < 2 meters) or black-colored sediments cause erroneous OBS readings.**

Do not survey in shallow water between 10:00 and 14:00 local time and avoid areas with suspended black mud.

**Changing the water temperature in the setup dialog box does not change the temperature measurement.**

This is normal. Temperature inputs only change the water density correction used to convert pressure to depth.

**OBS-3A indicates different NTU values in the field than other turbidimeters.**

Not all turbidity meters read the same! OBS sensors are checked with a Hach 2100N laboratory instrument, using U.S. EPA-approved, formazin turbidity standards before leaving our factory. Turbidimeters other than the 2100N will read different NTU values on natural water samples.

**OBS-3A indicates different suspended sediment levels in the field than in the laboratory.**

This results from a change in sediment size or color (see Section 8). You may have to perform a field calibration with water samples.

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