# EAS 199B: Documentation for Salinity Control Checklist

In addition to the physical testing required for validation of your salinity control system, please provide the additional data described on this page. The next pages provide a template for presenting the data and code.

## Content Requirements

The supplemental documentation should include the following data and plots.

1. Updated calibration plots and equations for the calibration of salinity as a function of analog output value. The plots should be an overlay of your calibration data and curve fit(s). List the equations in the body of the document. The equations should include constants with at least 4 and no more than 6 significant digits.
2. Values for $\Delta$UCL, $\Delta$LCL and the typical $\sigma$ used to estimate $\Delta$UCL and $\Delta$LCL. Include a sample histogram of a data set that you used to estimate $\sigma$.
3. Data and plot documenting the measurement of deadtime. The plot should show the system response (analog output or salinity) versus time during the deadtime test. Report the value of deadtime you have measured.
4. Value of the gain (G) used in your program.
5. Value of the overflow-mixing factor (F) used in your program
6. Listing of your Arduino code.

## Presentation of data

Refer to the sample layout given in the next two pages. Your documentation should have a cover sheet *or* a heading with the names of all members in your group, along with the Course Number and meeting times (e.g. 10:15 AM –12:05 PM MW Section). Your documentation should be formatted with the following attributes.

- Neat, word-processed document – no handwritten notes.
- Brief, say one or two-sentence, description of the data presented. You do not need to explain the data. However you should provide a short text description of what the data (e.g. plot or table) represents. Write in complete sentences. Check your spelling. Note that MS Word considers "deadtime", written as one word, to be misspelled. That is one case (probably the only case in this assignment) where the spell checking feedback from MS Word should be ignored.
- Page numbers on each sheet.
- A table summarizing the control parameters.
- Arduino code listed in mono-spaced font, e.g. Courier New, Monaco, with an appropriate font size (9 point Courier New is OK).

# Documentation for Salinity Control
## MW Section, 10:15 AM – 12:05 PM

<div style="text-align:right">

**EAS 199B**
**February 25, 2013**

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### Group Members

Jane Doe, Joe Smith, Mbeke Svoboda, Hendrik Verdimeister

### Salinity Calibration

Include a plot of salinity versus analog output. Show the calibration equation(s) in the body of the text document. It's OK to show the equations on your plots, but the equations need to be in the body of the document where they can be easily read.

### Typical Variability of Salinity

Include two plots here. One plot shows the typical behavior of salinity versus time while the system is in steady state. The second plot is a histogram of that data. Report the mean and standard deviation of the data in the histogram. The standard deviation provides a rational basis for estimating $\Delta$UCL and $\Delta$LCL.

### Deadtime Measurement

Include a plot of salinity versus time that shows the deadtime of your system. The data for a deadtime measurement is likely to be variable, so repeating the measurement of deadtime is likely to give different results. The measurement is also subjective since the determination of when the system has regained steady state is a judgment, not a precise measurement. Therefore, the plot you provide here should be typical. The plot provides rational evidence for your estimate of your system's deadtime.

### Summary of Control Parameters

List the control parameters for your system in the following table.

| Parameter | Value | Units |
|---|---|---|
| Typical $\sigma$ from calibration | | none (mass fraction) |
| $\Delta$UCL = $\Delta$LCL | | none (mass fraction) |
| Dead band | | none (mass fraction) |
| Dead time | | seconds |
| Gain (G) | | none |
| Overflow mixing factor (F) | | none |

## Arduino Code

List your Arduino code on this and the following pages. Use a mono-spaced font like Courier, Courier New or Monaco. Adjust the font size to help fit the code on the page width, but do not use an excessively small font. For example, the following code sample is in 9 point Courier New. Your code is likely to span multiple pages. Where possible, add page breaks to make the code more readable, e.g. at the start of function definitions. However, be judicious in your use of paper. For example, there is no need to start each function on a separate page.

```
//  File:  wait_for_deadtime.ino
//
//  Structure of salinity control code to implement a deadtime
//  during which no salinity correction is made.  This code is
//  incomplete and will not compile.

unsigned long last_salinity_update;  //  Time of last correction

void setup() {
  Serial.begin(9600);
  last_salinity_update = millis();   //  Initial value; change later
}

void loop() {
  float LCL, UCL, salinity;
  int deadtime = ... ;

  salinity = salinity_reading( ... );
  update_LCD( ... );

  // -- Check for deadtime
  if ( ( millis() - last_salinity_update ) > deadtime ) {

    if ( salinity>UCL ) {
      //  add DI water:  several missing steps
      last_salinity_update = millis();
    }

    if ( salinity<LCL ) {
      //  add salty water:  several missing steps
      last_salinity_update = millis();
    }
  }
}
```