Jack of All Spades
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User Interface Design Document

Chemistry Instrumentation: Control, Data Acquisition and Offline Analysis
For Dr. Mitchell Bruce with the Chemistry Department at the University of Maine, Orono

12/03/2025

V1.0

Table of Contents

1 Introduction

This document presents the system requirements for Chemistry Instrumentation: Control, Data Acquisition and Offline Analysis. This project is being undertaken by a team of seniors at the University of Maine in order to fulfill the capstone requirements of a Computer Science degree. This is being undertaken in collaboration with the chemistry department at the University of Maine.

1.1 Purpose of This Document

Within this document, the user interface is described. We describe the design standards, walk through the architecture, and describe all data that can be put into the system. This document will serve to guide the creation of the UI of the program, ensuring that design standards are met.

This document was reviewed in collaboration with the client to create a common foundation for the project. It serves as a guide to the team for the user interface design. Additionally, it allows the client and the Computer Science Department to assess the progress of the team and provides guidelines for assessing project completion.

1.2 References

Bruce, M. (2025). *Chemistry Instrumentation: Control, Data Acquisition and Offline Analysis*. ms, University of Maine.

Fowler, M. (2018). *UML distilled*.

Jestel, E., Ayer, A., Roy, B., Letourneau, C., & Gouveia, C. (2025). *System Requirements Review*. ms. University of Maine.

Jestel, E., Ayer, A., Roy, B., Letourneau, C., & Gouveia, C. (2025). *System Design Document*. ms. University of Maine.

2 User Interface Standards

This section serves to describe the consistent design standards used throughout the project. The goal for this design is to have extremely clear visual language with as little complexity as possible.

Our program is primarily utilized by students. These students will be in an unfamiliar setting and therefore are not expected to have any experience or competency with the equipment. As such, we want to minimize the possibility for user error and reduce the need for TAs to help students through the process. To that end, we seek consistent visual language, well labeled buttons, and on-screen instructions. We also seek to have multiple cues, both visual and textual, when the users are acting in error or taking actions that are incongruous with the intended uses. In order to keep the usage simple, we present the students with a single page that all actions will occur on, called the *instrument page*.
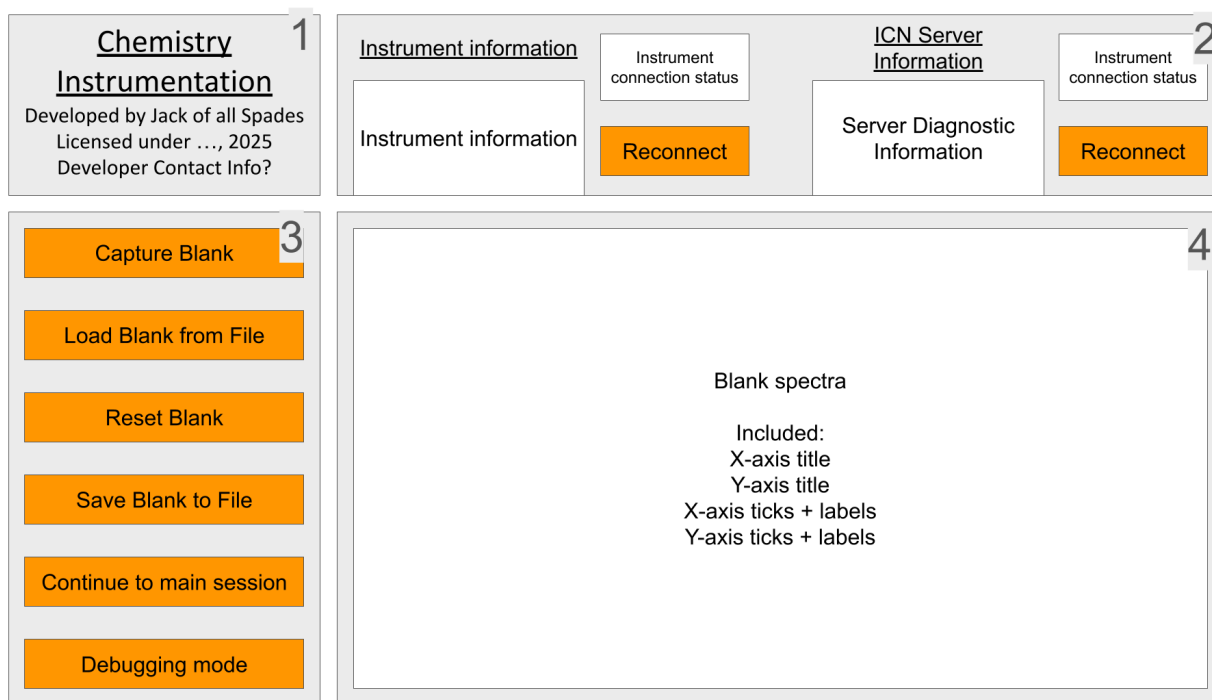

Figure 2.1 Instrument Page. This figure is an illustration of the Instrument Page, which is the primary page by which the user will interact with the software. It includes a section for ICN student login, sample capture, data visualization, and instructions on what steps to take.

The Instrument Page (Fig. 2.1) is comprised of four primary sections:
1. ICN Student Login
2. User Instructions
3. Sample Capture

4. Data Visualization

The first section, User Login, which is located in the top left corner of the screen, is where the student will enter their ICN username to login to their ICN student account. After typing their ICN username, the student will click/press the *Login* button. Once the student has finished their work on the system, they should click/press the *Reset* button, which will log them out as well as reset the entire page.

The next section, User Instructions, which is located in the top right corner of the screen, lets the student know what steps they should generally take to use the software and record samples from the instrument. Each step in the instructions is a button that can be clicked/pressed to show text on the right side with an explanation of the step.

Section 3 of the page, located in the bottom left corner, is the Sample Capture Section, which is where the student will capture a sample. To capture a sample, the student will click/press the *Take Sample* button. There is also an *Advanced Options* button, this brings the user to an advanced options popup, this will be discussed further later.

Finally, there is the data visualization section, which takes up most of the screen, and in the bottom right. This section is where the student can see a graphical representation of the data sample, or samples, collected during their session. If there are multiple samples, the graphs will be overlaid on top of one another.

Before the students use the software, lab TAs will set up the software for the student. This is done in the *Setup page*.
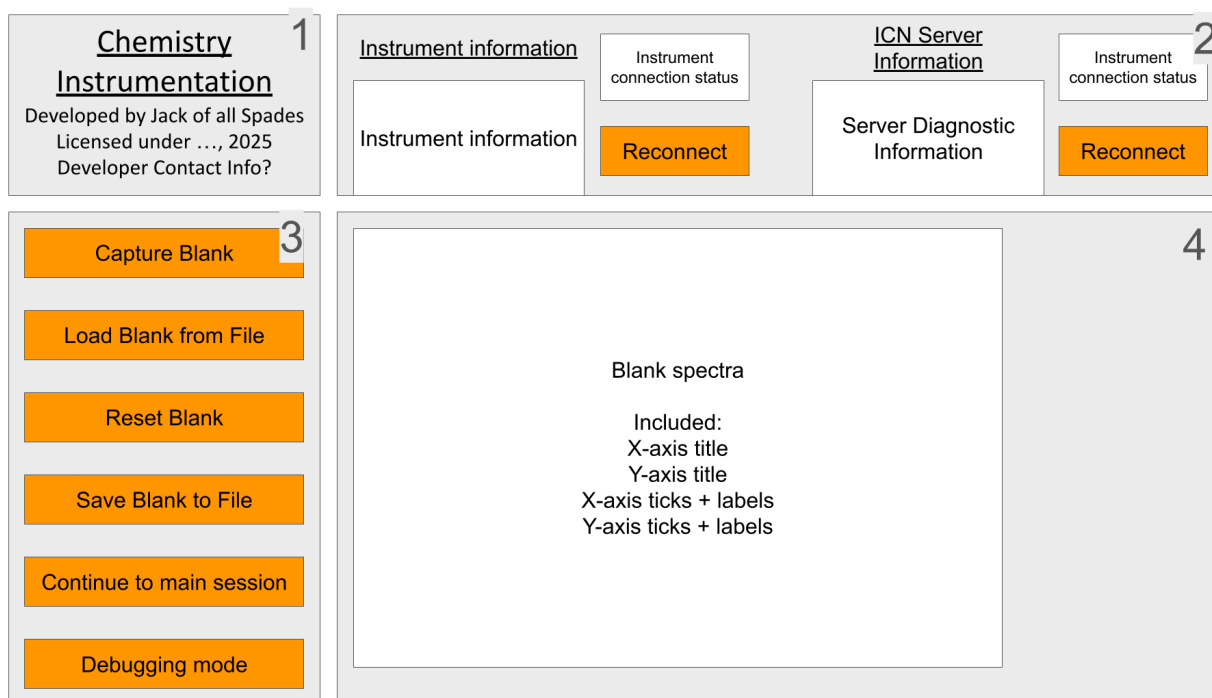

Figure 2.2 Setup Page. This figure is an illustration of the Setup page that the lab TAs will use to set up the software for the students.

In this page, the lab TA can capture or load the proper blank, verify instrument connection, ICN server connection, and any necessary debugging, before continuing to the Instrument page for the students. The page is broken down into four sections:

1. Software Information
2. Instrument and ICN Server information
3. Blank Setup, Continue to main session, and Debugging
4. Blank Data Visualisation

The first section, *Software Information*, simply has information regarding the name of the software, the developers involved in making it, and other basic information. This section will likely have nothing for the TA to interact with.

The next section, *Instrument and ICN Server information*, is where the TA can see information regarding information and connections status regarding the Instrument, as well as the ICN Server.

Section 3, allows the TA to set up the blank, enter Debugging mode, and continue to the instrument page for the students. The TA can capture a blank by clicking/pressing the *Capture Blank* button, and then save the blank to file by clicking/pressing the *Save Blank to File*. They can load a blank sample from the computer by clicking/pressing the *Load Blank from File* button, where a file explorer will pop up, allowing the TA to choose a blank sample file. The TA can enter debugging mode by clicking/pressing the *Debugging mode* button. There is also the *Continue to main session* button, which allows the TA to continue to the instrument page, which the students then use to make their measurements.

Finally, there is the data visualization section, which takes up most of the screen, and in the bottom right, similar to the *Data viewer* from the Instrument page. This section is where the TA can see a graphical representation of the blank sample.

3   User Interface Walkthrough

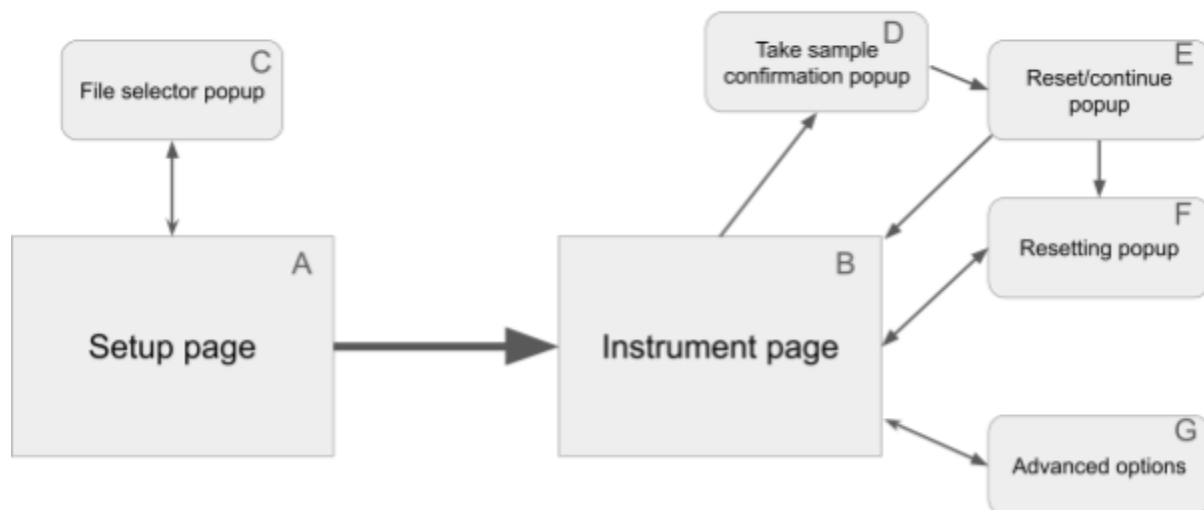This section will walk through the navigation of the entire system.

Figure 3.1: Navigation Diagram

Figure 3.1 shows the navigation diagram. This diagram shows the path in which the user navigates to each screen in the system.

The navigation diagram begins with the Setup page (A), which won't need any further explanation because it was covered in section 2 (See figure 2.1). On this page, the TA can either capture a new blank or select an already existing file.
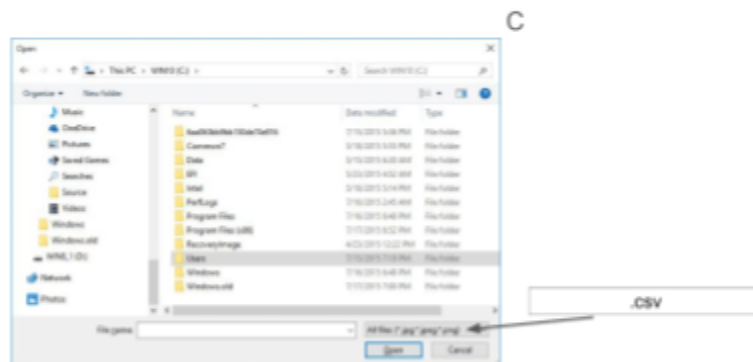

Figure 3.2: File Selector Pop-up

Selecting a blank file will bring up the File Selector Pop-up (C) as depicted in Figure 3.2. In this directory, the TA can navigate through files on the local machine to select a saved blank for use on the spectrometer. Once a file is highlighted, they will click open and the pop-up will close, loading the file into the setup page (A).

Once the TA is done setting up, they will select the "continue to main page" button that will take them to the instrumentation page (B). This is the main page that students will be using to capture their data (See figure 2.1). Once a student clicks "take sample", they will be prompted with the Sample Confirmation Pop-up (D).
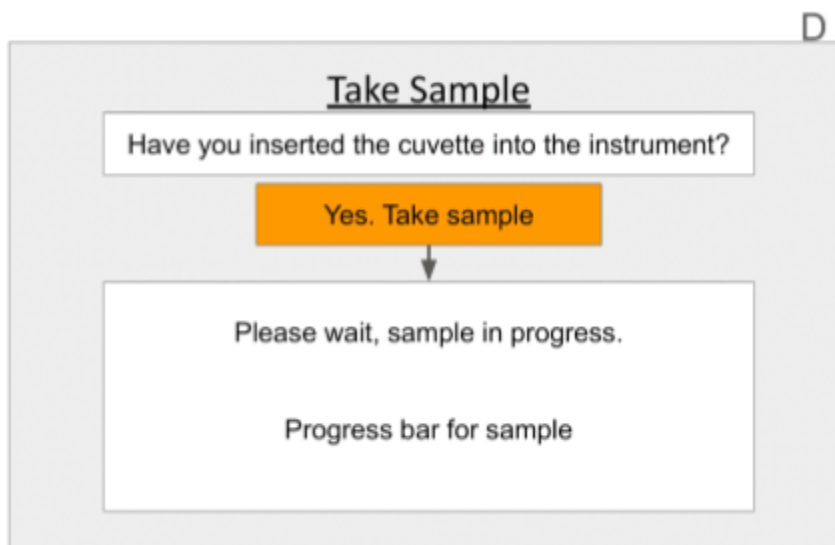

Figure 3.3: Take Sample Confirmation Pop-up

The Take Sample Confirmation Pop-up is shown in figure 3.2. This popup shows some simple instructions for the students to follow in order to take the sample. Once the sample is collected, the system will automatically navigate to the next pop-up.

E

Sample taken

File "filename" [not] uploaded to ICN server

Continue taking samples.
Back to instrument page

I'm done taking samples.
Reset

Figure 3.4: Continue/Reset Pop-up

After a sample is successfully collected, the system navigates to the continue/reset pop-up depicted in figure 3.4. This figure has three components: A simple text box that tells the user if the data was successfully sent (Or failed to send), a button to continue taking more samples, and a button to reset the program.

F

Resetting

File "filename1" [not] uploaded to ICN server
File "filename2" [not] uploaded to ICN server
File "filename3" [not] uploaded to ICN server

Reset complete.
Back to instrument page

Figure 3.5: Resetting Pup-up

If the user selected to reset the program, they will be taken to a new popup that will show the files sent to the ICN server as well as a button to confirm the reset and return to the instrumentation page (B). This pop-up can be seen in figure 3.5.

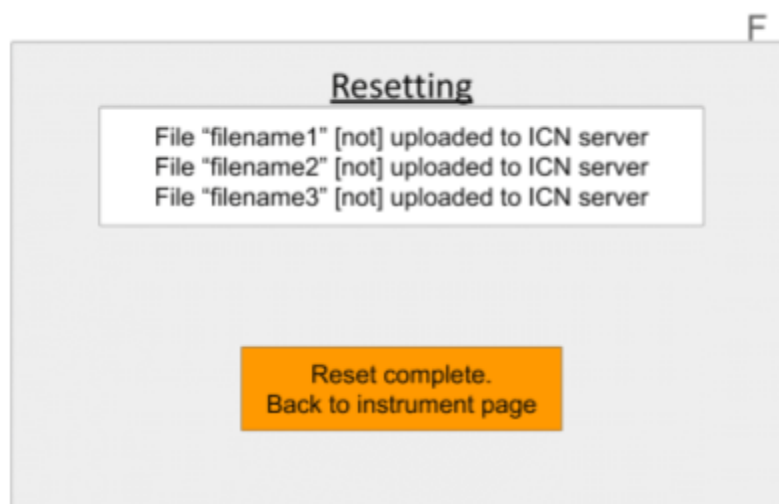On the bottom left of the instrumentation page (B), there is a button for the advanced settings. Clicking this button will bring up the Advanced Options page (G). This screen, shown in figure 3.6, is a screen for the TA to use to either load an existing blank or capture a new blank without having to restart the system to get back to the setup page.

4 Data Validation

In order to keep the User Interface as simple as possible for the user we are limiting the number of places that a user can input data into the system. The following table indicates all of the places and the types of data that a user can input into that field, as well as any checks that we must perform on the data entered.

Element	Location	Data type	Limits
Username	Figure 2.1, Section 1	String	Must be a username validated by ICN Must be <20 characters
Xmin	Figure 2.1, Section 4	Float	Less than Xmax More than 199 nm
Xmax	Figure 2.1, Section 4	Float	More than Xmin Less than 801 nm
Ymin	Figure 2.1, Section 4	Float	Less than Ymax More than 0
Ymax	Figure 2.1, Section 4	Float	More than Ymin Less than 5
Load Blank from File	Screen 1, Section 3	String (File explorer)	Must be a .csv file in the "blanks" folder
Save Blank to File	Screen 1, Section 3	String (File explorer)	Must be a .csv file with a name that follows the Windows filename creation rules

Appendix A - Agreement Between Customer and Contractor

This document outlines the user interface design that is agreed upon by the customer and the development team for the Chemistry Instrumentation project. By signing and dating in the specified fields, both parties agree on the information outlined within the contents of this document.

In the event that any information within this document changes, the software team is liable to meet with the client and review any alterations. If both parties agree to the new information, new signatures and dates will be recorded for the new version.

Mitchell Bruce   **11/x/2025**

Customer Name   Customer Signature   Date

Alexander Ayer   **11/x/2025**

Team Member   Team Member Signature   Date

Conall Gouveia   **11/x/2025**

Team Member   Team Member Signature   Date

/s/ Eric Jestel
Eric Jestel   **11/x/2025**

Team Member   Team Member Signature   Date

/s/ Chris Letourneau
Chris Letourneau   **11/x/2025**

Team Member   Team Member Signature   Date

11/x/2025

Bryce Roy

Team Member   Team Member Signature   Date

Appendix B – Team Review Sign-off

Below are the signatures of all the team members working on the chemistry instrumentation project. By signing this document, all team members agree to its contents and format. Along with signatures, any member can provide comments in the provided space to list any concerns or disagreement that they may have with the information covered within this document.

Alexander Ayer		**11/17/2025**	N/A
Print Name	Signature	Date	Comments

Eric Jestel	/s/ Eric Jestel	**11/x/2025**	N/A
Print Name	Signature	Date	Comments

Chris Letourneau	/s/ Chris Letourneau	**11/17/2025**	N/A
Print Name	Signature	Date	Comments

Conall Gouveia		**11/17/2025**	N/A
Print Name	Signature	Date	Comments

Bryce Roy		**11/17/2025**	N/A
Print Name	Signature	Date	Comments

Additional Comments:

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Appendix C – Document Contributions

Eric Jestel: Worked on 1 (not citations). Some writing for 2. Created all figures.

Alex Ayer: Wrote the walkthrough

Bryce Roy:

Chris L: Worked on section 1 and section 4

Conall Gouveia: Wrote as well as revised Section 2