

Advanced Multi-Cell Lithium Battery Load Analyzer
User Manual
2CE1EE



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WARNING: HIGH-CURRENT LOAD TESTER SAFETY

This device is capable of drawing up to 250 A from a 13.2 V quad battery pack. Improper use may result in burns, electric shock, serious injury, or death. Before using this equipment, carefully review and follow all safety precautions outlined below.

Electrical Hazards

- DO NOT exceed 250 A current draw under any circumstances.**
- DO NOT operate the device for more than 30 seconds continuously.**
- Keep metal objects away from battery terminals to avoid short circuits.**
- Keep dry. Never operate in wet or damp conditions.**

Thermal Hazards

- Device surfaces may become extremely hot during and after use.**
- Avoid contact with hot components to prevent burns.**

Operation Warnings

- A buzzer will sound at 250 A and continue until current drops to 0 A.**
- After each test, fully rotate the carbon pile knob counterclockwise to disengage the load (ensure visible gap between graphite and metal contact).**

Critical Reminders

- Always reset the device after use.**
- NEVER exceed the rated current or test duration.**
- Use extreme caution at all times.**

**FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT
IN SEVERE INJURY OR DEATH**

Section 1: Device Overview and Hardware Setup

Section 1.1: Device Layout

Images of the panel layout are provided below in figures 1.1-1.4 (JL).

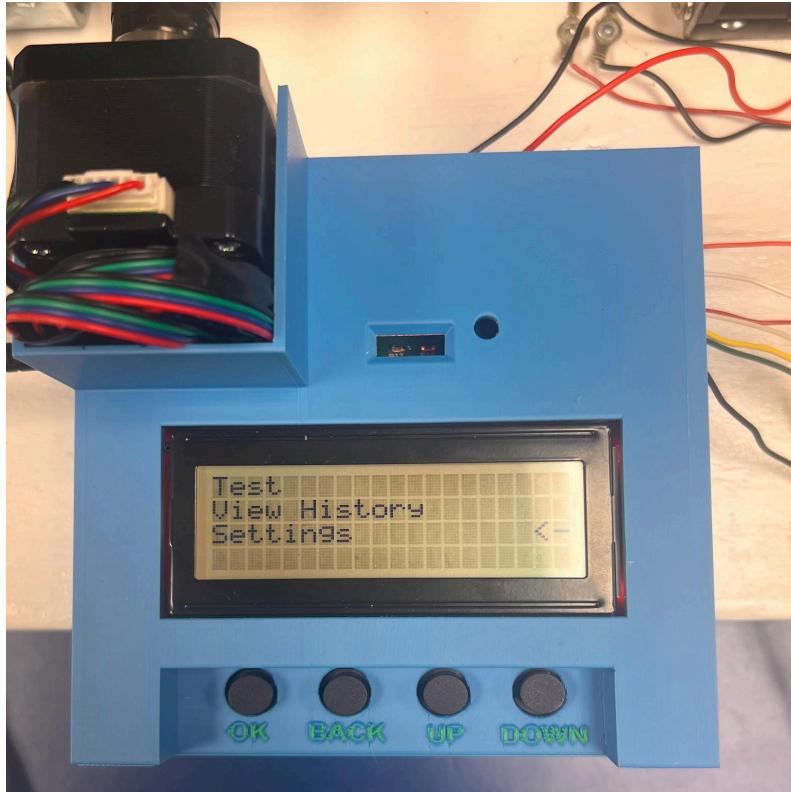


Figure 1.1: Top Panel Layout (JL)

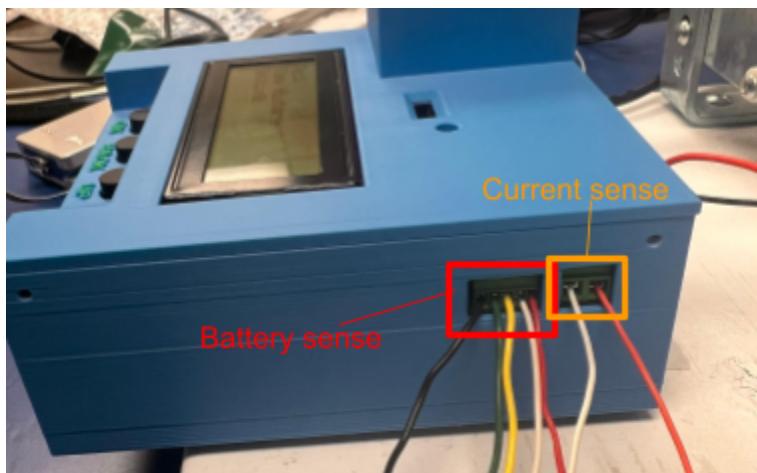


Figure 1.2: Right Side Panel Layout (JL)

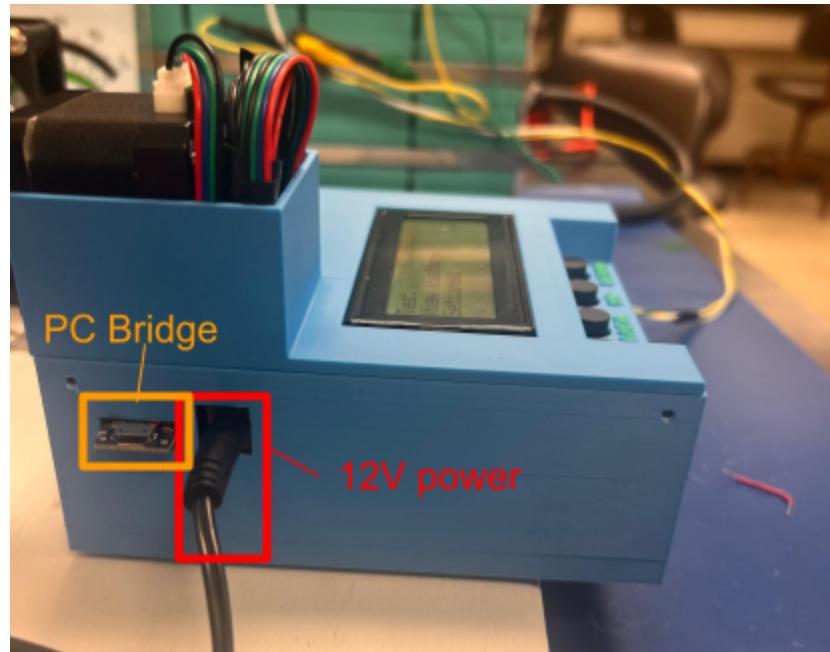


Figure 1.3: Left Side Panel Layout (JL)

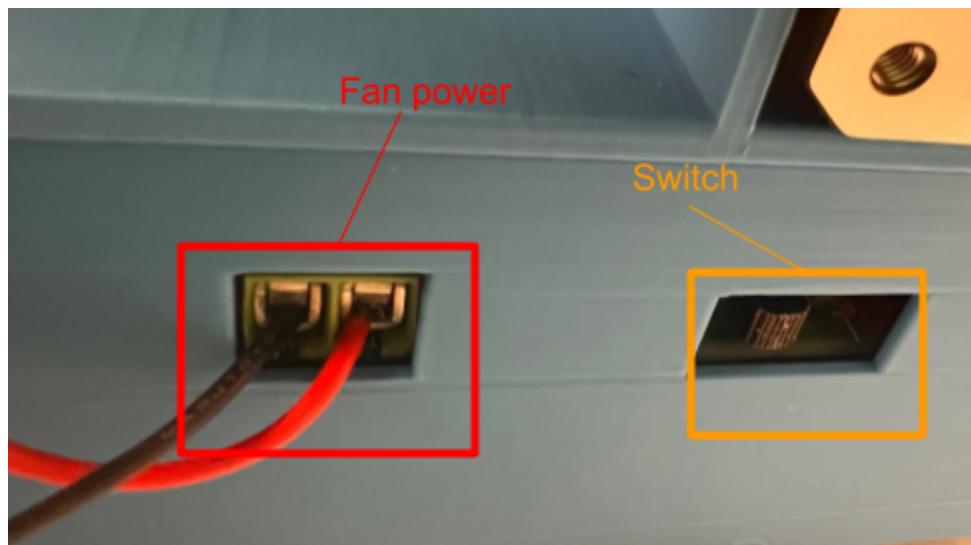


Figure 1.4: Back Side Panel Layout (JL)

Section 1.2 Device Wiring Check:

Although not always required, opening the device and rechecking the wiring is an important protocol to ensure that no wires are loose. Check that all sense wires are firmly connected to the terminal block. If any wires are loose, open the device case by removing the screws on each side (shown in figures 1.5-1.6) and carefully lifting the lid out. Be mindful of the stepper motor wire, which may partially block lid removal. Use a tuning tool to tighten any loose connections (JL).

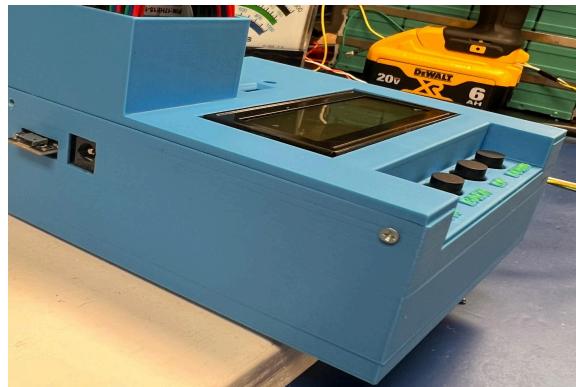


Figure 1.5: Left Side Screw (JL)

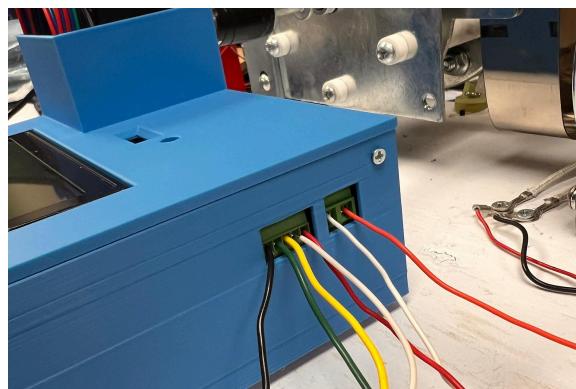


Figure 1.6: Right Side Screw (JL)

Figure 1.7 shows the internal components of the device (JL).

- Orange: switch (Right is ON, Left is OFF)
- Red: fan power
- Green: current sense
- Grey: battery sense
- Light Blue: power jack
- Purple: PC bridge



Figure 1.7: Internal Components of Device (JL)

Connect the sense wires in the following order from bottom to top: black, green, yellow, white, and red. For the shunt wires, orange should be on top, followed by white. Use figures 1.3 and 1.8 as a visual representation of how the wires should be connected (JL).



Figure 1.8: Top View of Voltage and Current Sense Wires (JL)

The fan connector should be wired with red on the left and black on the right. See figures 1.4 and 1.9 for more details (JL).

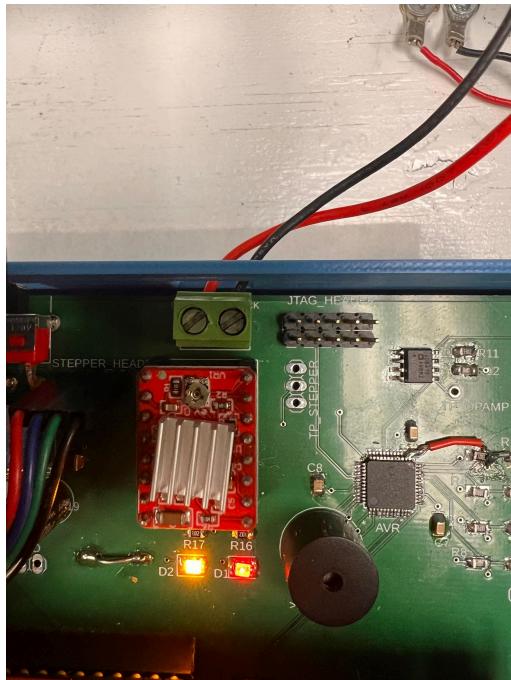


Figure 1.9: Top View of Fan Power Wires (JL)

For the stepper motor, ensure the wires are connected in this order: red, blue, green, and black. See figure 1.10 for more details (JL).

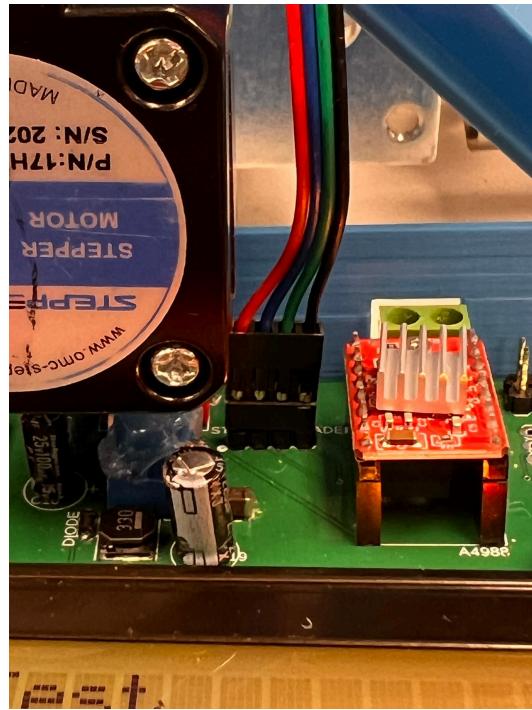


Figure 1.10: Stepper Motor Wire Connections (JL)

These connections are typically pre-installed, but if any wires are disconnected during shipping or use, this section can help restore proper function. After confirming all connections, slide the lid back under the stepper motor, align it over the pushbuttons, and reattach the screws on the side panels (JL).

Section 1.3 Powering the Circuit:

Use a 12V power adapter with a barrel-style connector. Plug the adapter into the barrel jack located on the left side of the device. Make sure the adapter wire does not come into contact with the carbon pile load (shown in figure 1.11), as this may cause the wire to melt and lead to damage (JL).

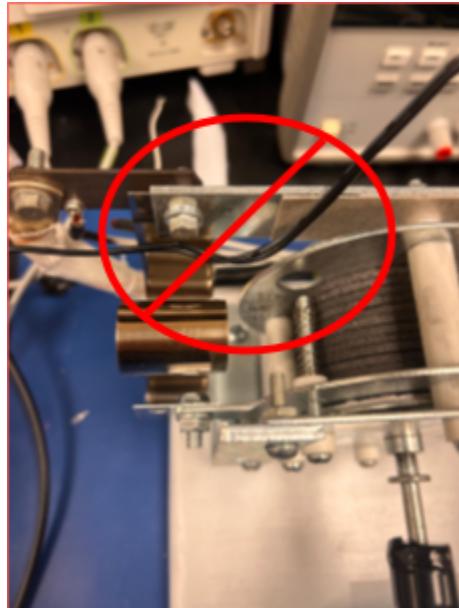


Figure 1.11: Power Adapter Wire Touching Carbon Pile Load (JL)

Move the switch to the right, and make sure you see both yellow and red light. The yellow indicates 12V, and red indicates 3.3V. The lights are shown in figure 1.12 (JL).



Figure 1.12: Status LEDs on Device (JL)

Section 1.4 Preparing the Carbon Pile:

Before connecting the battery, rotate the carbon pile knob counterclockwise using the coupler as shown in figure 1.13. There is a visible gap between the carbon pile disks. This step is critical. If the disks are not separated, connecting the battery could result in a spark that poses a safety hazard (JL).

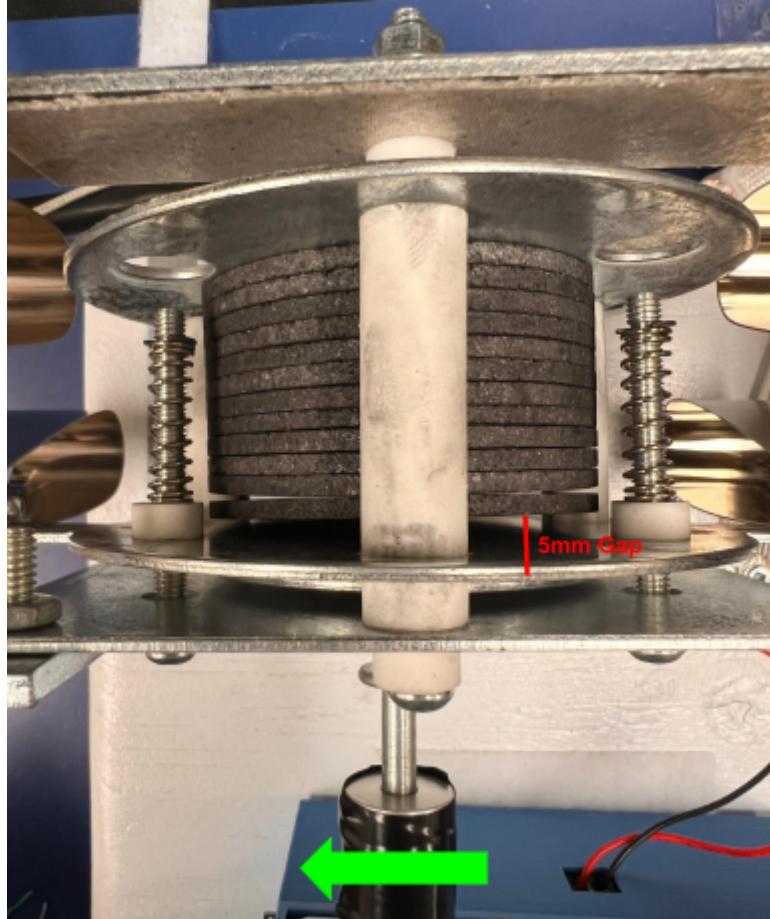


Figure 1.13: Rotate Carbon Pile Counterclockwise (JL)

Section 1.5 Connecting the Battery:

Connect the battery as follows (see figure 1.14 for reference): (JL)

- Green wire → Battery 1 positive terminal.
- Yellow wire → Battery 2 positive terminal.
- White wire → Battery 3 positive terminal.
- Red alligator clip → Red-marked square (Battery 4 positive terminal).
- Black alligator clip → Non-color-coded square (Ground/Negative terminal).

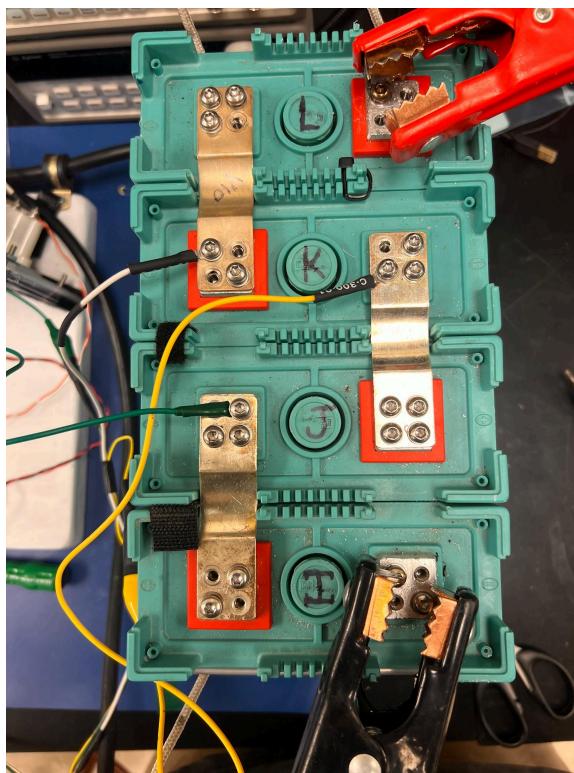


Figure 1.14: Top View of Battery After Alligator Clips and Sense Wires are Connected (JL)

When finished the setup should look like figure 1.15 (JL).

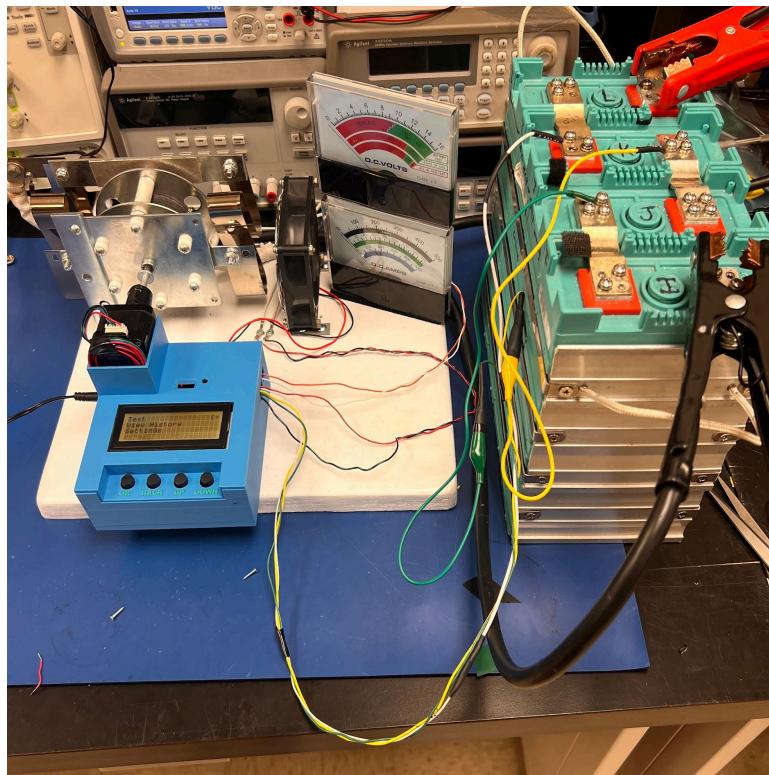


Figure 1.15: Complete Test Setup (JL)

Section 1.6 Disassembling Test Setup:

First remove the large alligator clips, before unscrewing each battery sense wires. Then you may safely power down the device by moving the switch to the left two positions or by unplugging the adapter. You must remember to disconnect the battery including the sense wires from the device before powering off the device (JL).

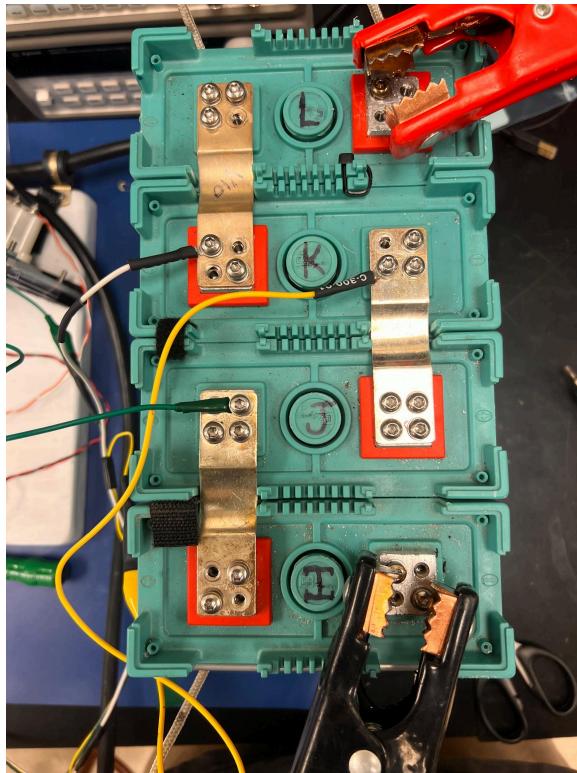


Figure 1.16: Battery Top View (JL)

Section 2: Local Interface

Section 2.1 Navigating the Main Menu: (JL)

1. Use **UP** or **DOWN** buttons to move the arrow cursor to **Settings**, then press **OK**.



Figure 2.1: Main Menu on Program Startup (JL)



Figure 2.2: Moving the Cursor Down (JL)

Section 2.2 Adjusting Settings: (JL)

1. Select Manual or Automated Test Mode

- Navigate to the settings menu from the main menu by moving the cursor to the ‘settings option’ and pressing **OK**.
- Once the settings menu appears, move the cursor to line 1 where it says ‘Mode’ and press **OK** to toggle between **Automated** and **Manual**.
-  *Set the mode to Manual.*

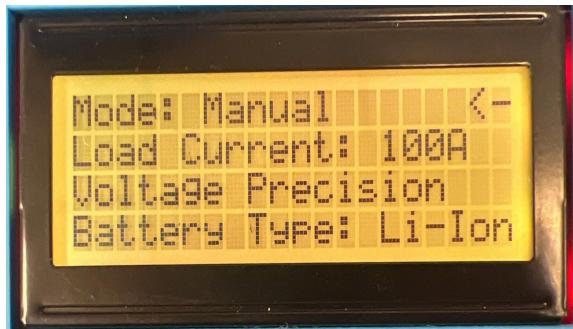


Figure 2.3: Changing the Testing Mode to Manual (JL)

2. Set Load Current

- From the **Settings** menu move the cursor to line 2 where it says ‘Load Current’

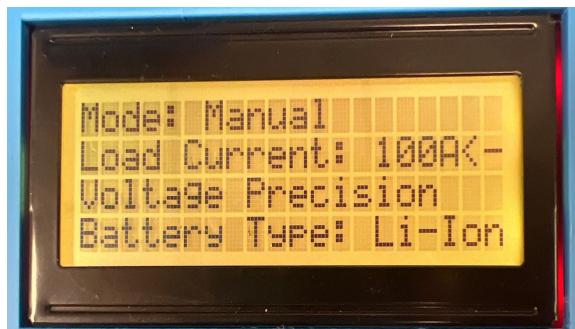


Figure 2.4: Move Cursor to Adjust Load Current (JL)

- Press **OK** to make the current adjustment.
 - The current is displayed vertically with line 1 representing the 100s digit, line 2 representing the 10s digit value, and line 3 representing the 1s digit value.
 - Press **OK** to increment the value, it will reset to 0 once it reaches the maximum value



Figure 2.5: Adjusting Hundreds Place of Current (JL)

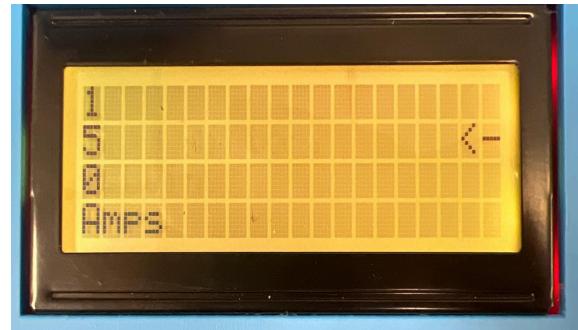


Figure 2.6: Adjusting Tens Place of Current (JL)

- Adjust the current to **250 or lower (for manual tests) or 200 or lower (for automated tests)**.

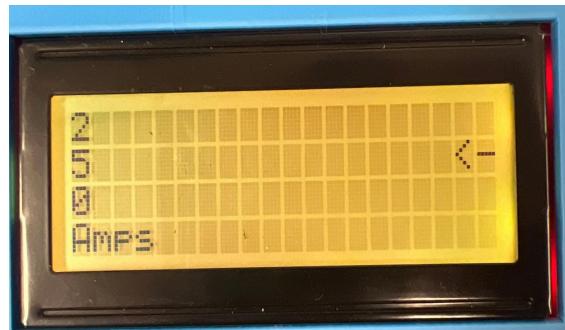


Figure 2.7: Adjusting Current to 250 A (JL)

- Once set, press **BACK** to save.

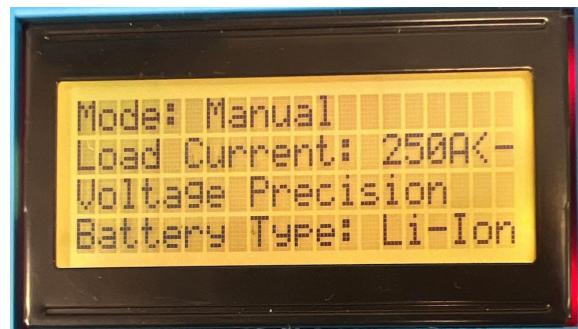


Figure 2.8: Return to Settings Menu After Current Adjusted (JL)

3. Set Voltage Precision

- Select **Voltage Precision**, press **OK**.



Figure 2.9: Scroll to Voltage Decimal Point (JL)

- Press **OK** to toggle between two modes

HIGH PRECISION MODE: 5.3 mV battery voltage accuracy

LOW PRECISION MODE: 8.5 mV battery voltage accuracy



Figure 2.10: High Precision Mode (JL)



Figure 2.11: Low Precision Mode (JL)

- Set to the desired precision mode, then press **BACK** once to return to the **Settings** menu and again to return to the **main menu**.



Figure 2.12: Return to Main Menu (JL)

Section 2.4 Running Manual Tests: (JL)

1. In the main menu, select **Test**, press **OK**.



Figure 2.13: Scroll to Test in the Main Menu (JL)

- If an error message appears, the battery may not be connected properly or the MCU has measured a battery cell with unloaded voltage less than 3.0V.

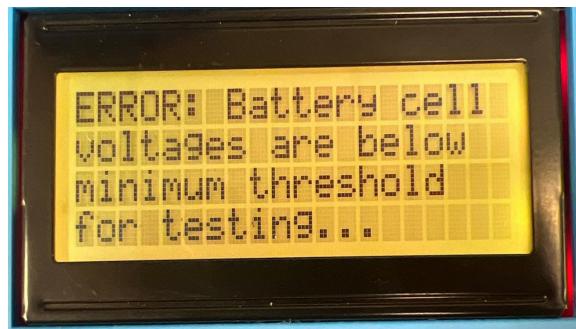


Figure 2.14: Low Battery Voltage Error Message (JL)

- If there is a cell below 3.0V go to “Disassemble Test Setup” (section 1.6) and replace or charge the battery cell
- Otherwise press **OK** or **BACK**, connect the battery, and retry.

- Follow the instructions displayed on the LCD screen.

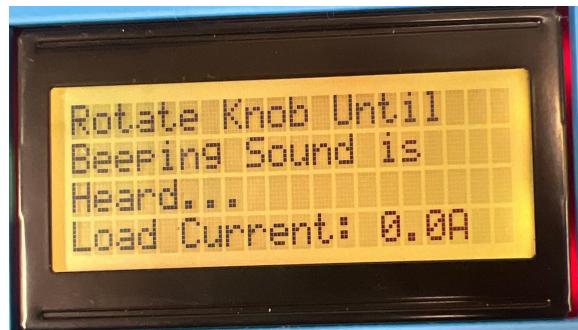


Figure 2.15: Adjust Carbon Pile Knob Screen (JL)

3. Begin Current Load:

- Rotate the carbon pile knob **clockwise** until the disks make contact.

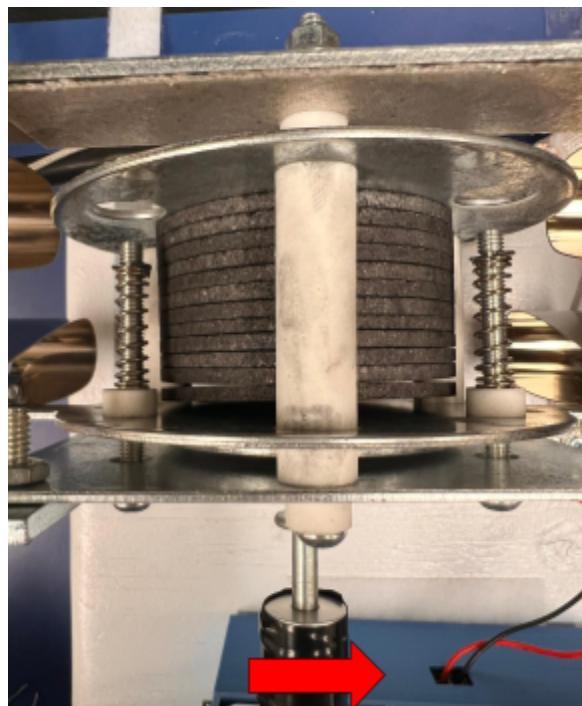


Figure 2.16: Rotate Carbon Pile Clockwise (JL)

- Monitor the **LCD current display** and match it with your current meter.



Figure 2.17: Current Display on LCD (JL)

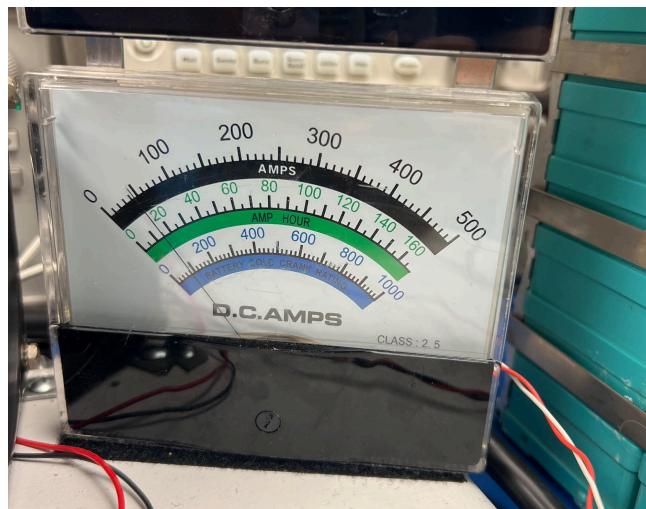


Figure 2.18: Current Display on Ammeter (JL)

4. Cancel Test:

- The test may be cancelled before loaded current has been reached simply by pressing **BACK**

5. Increase Load Current to Desired Current.

- Once the desired current set earlier (250 A in this case) is reached, a **beeping sound** will occur. There will sometimes be burning so do not let the carbon pile stay at this level for more than 30 seconds. It is highly recommended to turn the coupler (knob) back down to 0A ASAP once the beeping is heard to prevent excessive battery drainage.



Figure 2.19: Desired Current Reached (JL)

- Turn the knob **councclockwise** to bring the current back to **0A**.



Figure 2.20: Decrease Load Current Screen (JL)

6. Carbon Pile Gets Stuck (Troubleshooting Errors)

- If at any point during the loaded test, the shaft of either the motor or carbon pile becomes decoupled from the coupler, or the user is unable to crank the carbon pile down, quickly remove an alligator clip to prevent further discharging.
- The user may notice a spark (especially at higher currents)

Section 2.4 Running Automated Tests:

1. Preparing Automated Mode

- Navigate to Settings menu and change mode to Automated
- Set the current to a value less than or equal to 200 A



Figure 2.21: Automated Test Settings Menu Setup (JL)

2. Stepper Motor Setup (Troubleshooting Errors)

- The holes inside the coupler (figure) are filled with hot glue and trapped securely with electrical tape to prevent the internal bolts from unscrewing due to vibrations.
- However, if there are still issues with the coupler, ensure that the motor is secure by lightly pulling on it to make sure it does not come loose. If the motor is not tightly secured, remove the black tape and tighten the cylindrical shaft coupler with a screwdriver.

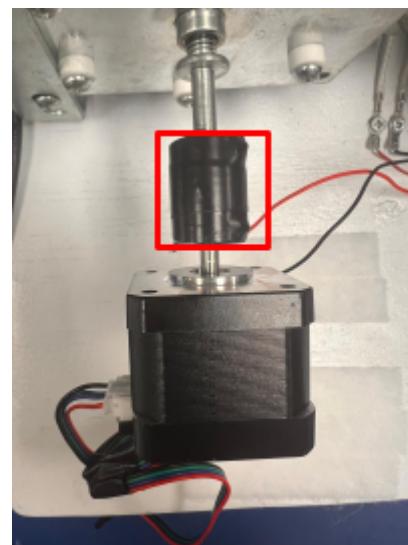


Figure 2.22: Stepper Motor Coupler with Tape (JL)



Figure 2.23: Stepper Motor Coupler Without Tape (JL)

- Once the cylindrical shaft coupler is properly secured, tightly wrap it in black tape to make sure it is properly supported.

3. Return to the Main Menu and Start a Test

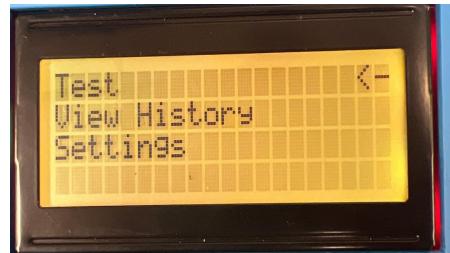


Figure 2.24: Main Menu Screen (JL)

- Press ok to run an automated test
- The test will be very quick while the motor is turning, it will display this message

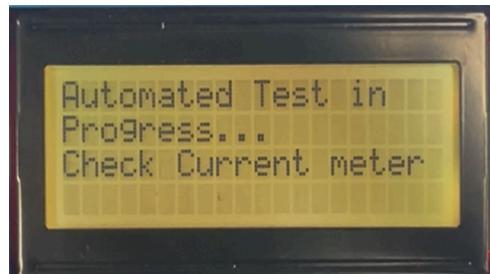


Figure 2.25: Automated Test in Progress Screen (JL)

- The motor will automatically spin down to 0A if the desired current is reached (<200A).

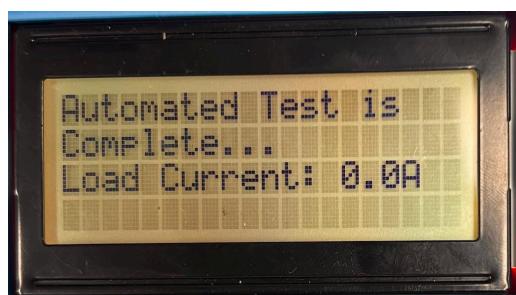


Figure 2.26: Automated Test Complete Screen (JL)

4. Current Needle Stuck (Troubleshooting Errors)

If the current needle EVER becomes stuck during an automated test, IMMEDIATELY press and hold the BACK button to cancel the test. If the current needle is still stuck after pressing the BACK button, manually rotate the knob counterclockwise until the current reaches 0A. To proceed safely, either:

1. Lower the current in the Settings menu before proceeding with another automated test
2. Switch to Manual mode in the Settings and test the battery at the desired current.

If neither of these options work, remove an alligator clip from the battery to break the circuit.

Section 2.5 Viewing Test Results (JL):

After either tests (manual or automated), a new screen will appear with result options:

- Navigate through each option

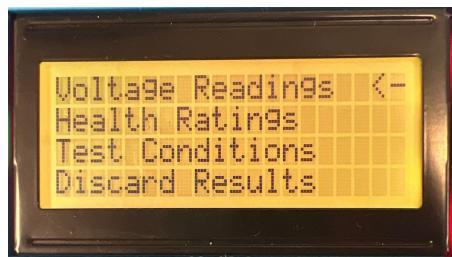


Figure 2.27: View Results Screen (JL)

- **View Voltage Readings**
- Hit back to return to view other options

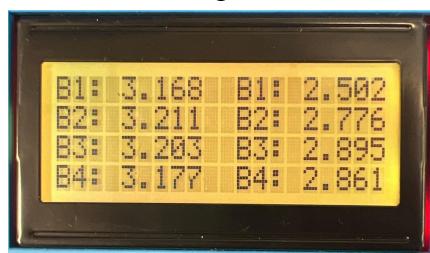


Figure 2.28: Voltage Readings Screen (JL)

- **View Health Results**

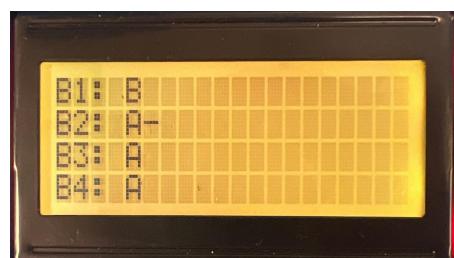


Figure 2.29: Health Ratings Screen (JL)

- **View Test Conditions**

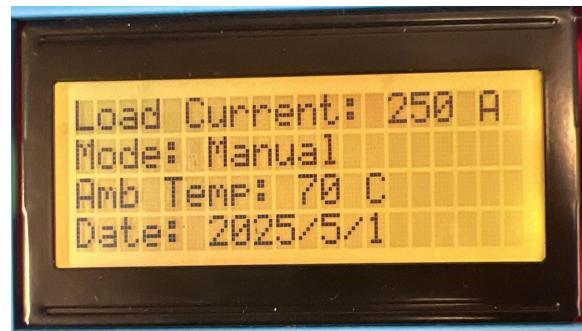


Figure 2.30: Test Conditions Screen (JL)

- **Discard Results**

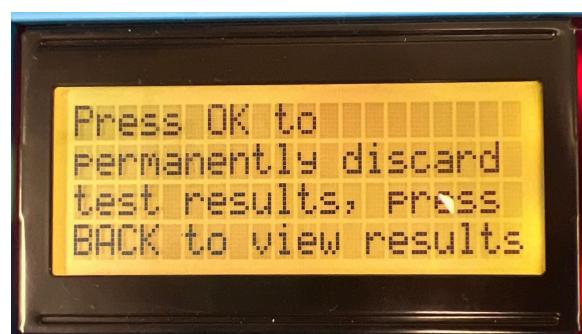


Figure 2.30: Discard Results Screen (JL)

Section 2.6 Saving Test Results: (JL)

1. Press **BACK**. You will see a prompt to save results.

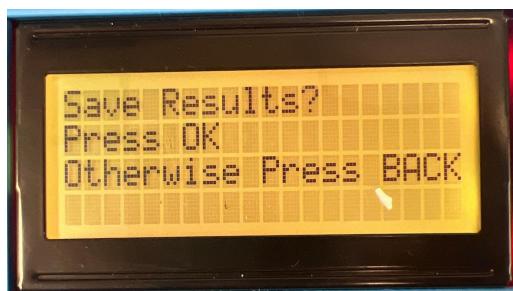


Figure 2.31: Save Results Screen (JL)

2. Press **OK** to access Quad Pack entries.



Figure 2.32: Quad Pack Screen (JL)

3. Use **UP/DOWN** to select a storage location (e.g., **Quad Pack 1**).

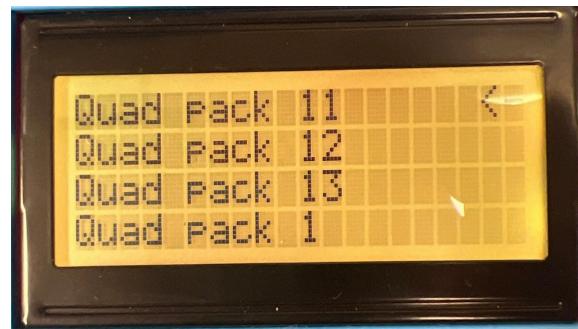


Figure 2.33: Select a Quad Pack to Save Results to (JL)

4. Press **OK** to confirm and **overwrite existing data** if needed.

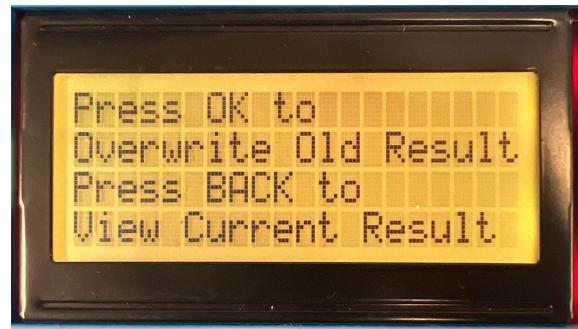


Figure 2.34: Overwrite Data Screen (JL)

5. Return to the **main menu**.

Section 2.7 Viewing Saved Data: (JL)

1. From the main menu, select **View History**.



Figure 2.35: Scroll Cursor on Main Menu to View History (JL)

2. Navigate to the desired **Quad Pack** entry.



Figure 2.36: Scroll to Quad Pack Screen (JL)

3. Press **OK** to view saved results.



Figure 2.37: View History Screen (JL)

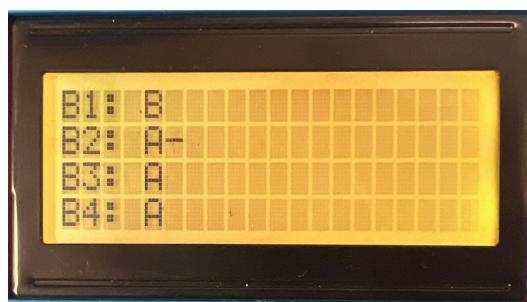


Figure 2.38: Results Screen (JL)

Section 3: Remote Interface:

If you are using this program for the first time or on a new computer, Python may need to be installed. Download the latest version of Python here: <https://www.python.org/downloads/> Follow the instructions to install Python on your computer. (TS)

You will also need to download the Pyserial library from this website: <https://pypi.org/project/pyserial/#files> Open your computer's terminal or command prompt and type “pip install pyserial”. An example is shown below in figure 3.1 (TS).



```
Command Prompt
Microsoft Windows [Version 10.0.26100.3775]
(c) Microsoft Corporation. All rights reserved.

C:\Users\tyler>pip install pyserial
```

Figure 3.1 - Command Prompt Window to Install Pyserial (TS)

Download the program “bla_remote_interface.py” Depending on your computer settings, it will most likely be placed in the Downloads folder of your computer. Move it to the Desktop folder so that it is easily accessible in the future (TS).

Open the remote interface program by right clicking on the Desktop icon named “bla_remote_interface.py”. Click “Open With” then “Choose another app” then Python 3.x (x differs based on the version installed). Then click “Just Once” or “Always” if it is available. See figure 3.2 for a visual representation of this screen. If the “Always” option is available, the previous process can be skipped after the first time and the program can be opened by double clicking it.

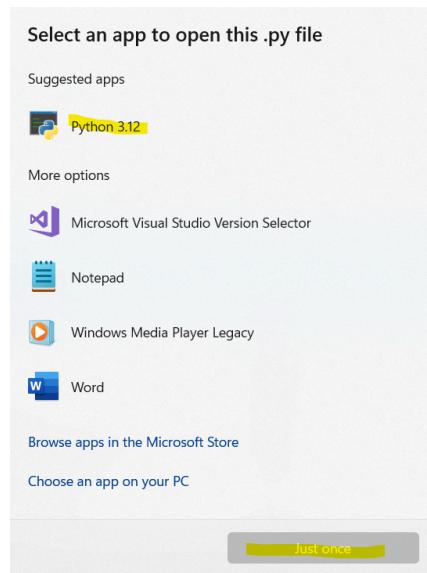


Figure 3.2 - Opening the Program Using Python (TS)

The screen in figure 3.3 below will be displayed. To quit the program, close the window or press the “Quit” button. The functions of the other buttons are described in the rest of the sections below (TS).

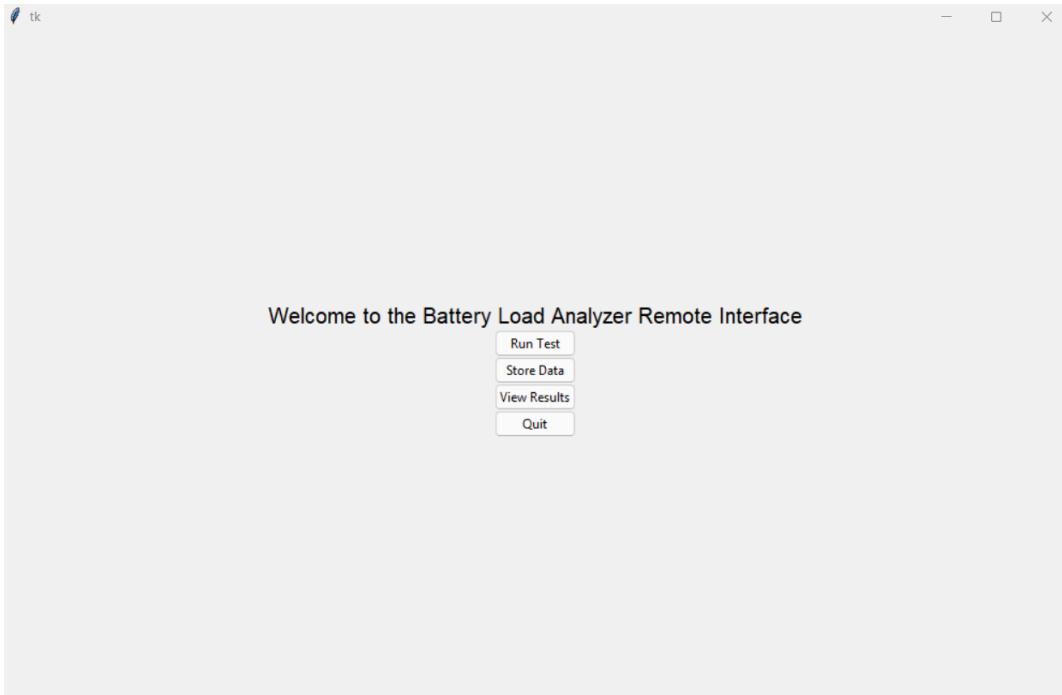


Figure 3.3 - Remote Interface Homescreen (TS)

Section 3.1: Connecting to a COM Port and Naming Batteries:

1: Connect the micro USB cable to the prototype's UART bridge and the USB port to the computer.

2: From the home page, click “Run Test” or “Store Data” The screen in figure 3.4 will be displayed. Choose the COM port the prototype is using that is connected to the device. See instructions below for further details (TS).

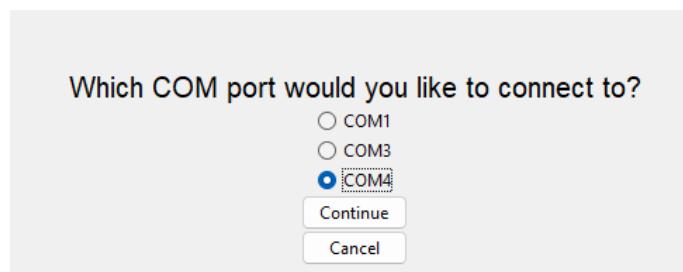


Figure 3.4 - COM Ports Screen (TS)

To check the COM port the prototype is running on, make sure the device is powered on and the USB port is connected to any USB port of the PC. Then, open Windows Device Manager on your PC. Scroll down to the “Ports (COM & LPT)” section and click the arrow to open the dropdown menu. Look for “Silicon Labs CP210x USB to UART Bridge” and check the COM port associated with it. See figure 3.5 for a visual representation of this process. Then, click the corresponding button in the GUI. Click “Continue” to continue or “Cancel” to return to the main menu (TS).

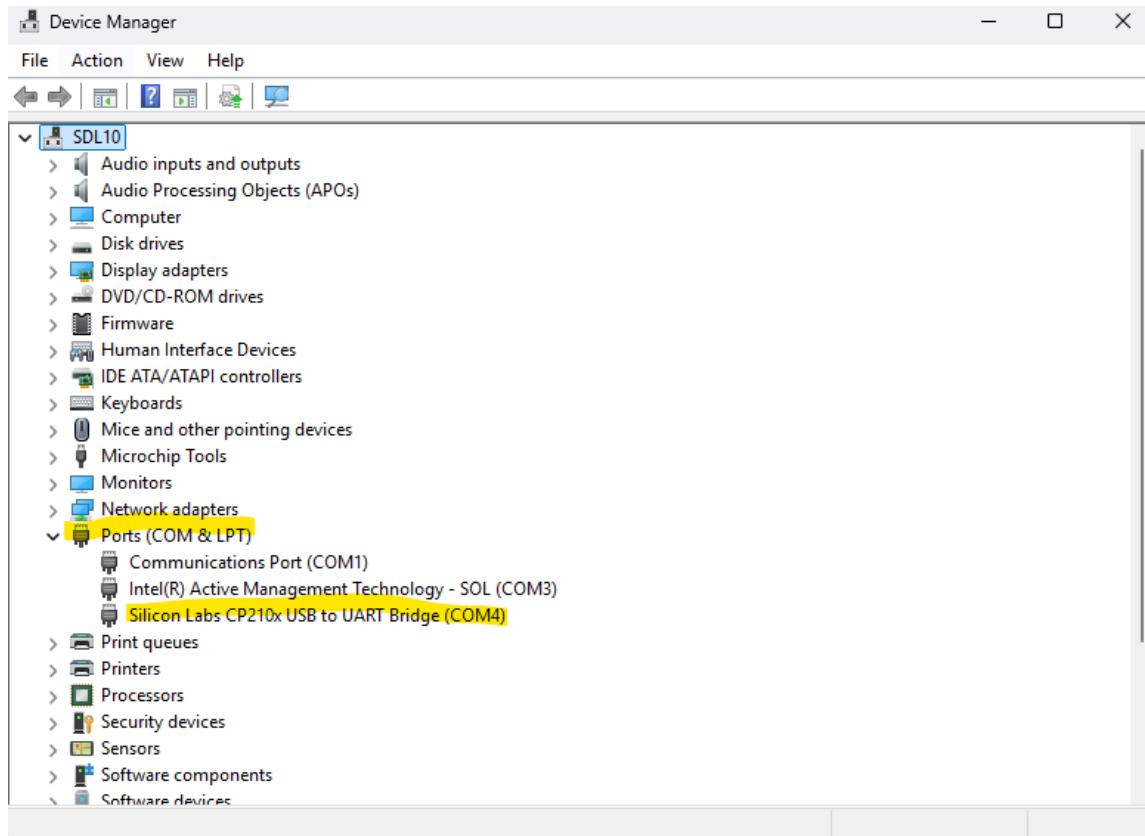


Figure 3.5 - Searching for COM Port Using Device Manager (TS)

The driver may need to be updated or installed before it can be used. Download the updated driver from

<https://www.silabs.com/developer-tools/usb-to-uart-bridge-vcp-drivers?tab=downloads>. Then, go back to Device Manager and right click on “Update Driver” then select “Browse my computer for drivers” and locate the downloaded driver folder. Follow the prompts to update the driver (TS).

If the CP2102 does not appear in the menu, that means the USB cable is not connected correctly to the PC or the PC’s USB port is not working properly. Check the connection and try using one of the PC’s other USB ports before continuing (TS).

⚠ Warning: If the incorrect COM port is selected or the USB cable is disconnected during a test or while transferring data, the program will freeze and not work properly.
Disconnect the USB cable from the computer and switch the power to the microcontroller off and then back on. Reconnect the USB cable to the computer then close the GUI program and reopen it. If a manual test is being run and the carbon pile knob was turned, make sure to turn the knob counterclockwise so the current on the ammeter is at 0 A. The USB cable does not need to be connected once the data transfer is complete (TS).

3: Next, the screen shown in figure 3.6 will be displayed. Select the identifiers for all four batteries and then press “Continue”. Press “Back” to return to the main menu. If the letter identifier is unknown or there is no letter identifier, choose “None.” Generally, quad pack batteries are numbered with a letter (Example: A) or letter than number (Example: A1) (TS).

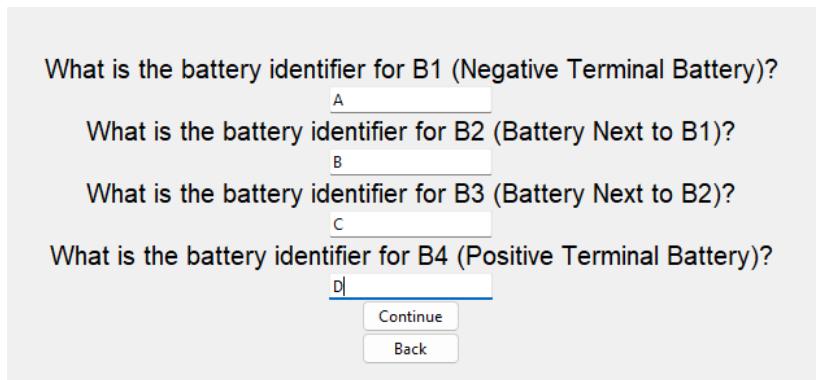


Figure 3.6 - Selecting the Battery's Letter Identifier (TS)

4: Continue to section 3.2 to run a test or 3.3 to retrieve past test results (TS).

Section 3.2: Running a Test:

1: Follow the procedure described in section 3.1 to connect to a COM port and name the batteries. Connect the battery to the prototype as described in section 1.5 (TS).

⚠ Warning: If the incorrect COM port is selected or the USB cable is disconnected during a test or while transferring data, the program will freeze and not work properly.

Disconnect the USB cable from the computer and switch the power to the microcontroller off and then back on. Reconnect the USB cable to the computer then close the GUI program and reopen it. If a manual test is being run and the carbon pile knob was turned, make sure to turn the knob counterclockwise so the current on the ammeter is at 0 A. The battery and USB cable do not need to be connected once the data transfer is complete (TS).

2: The screen in figure 3.7 will be displayed. Click “Run Test.” (TS)

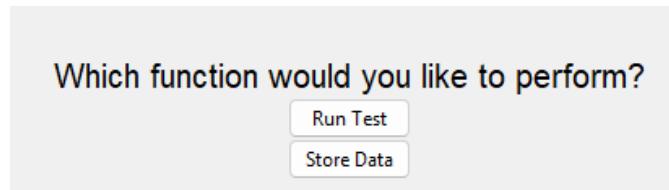


Figure 3.7 - Run Test or Store Data Screen (TS)

3: The screen in figure 3.8 will be displayed. Click “Start Test” to proceed with the test or “Cancel” to return to the main menu.

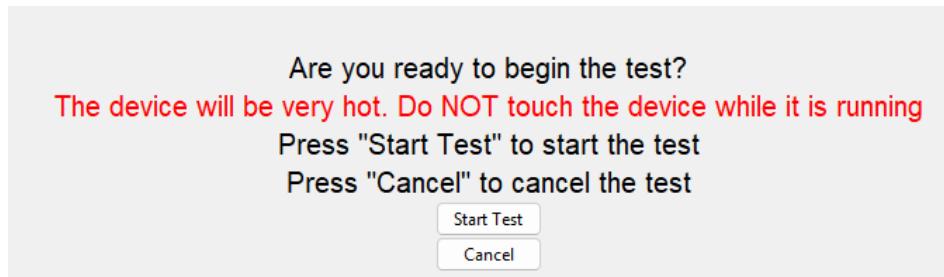


Figure 3.8 - Start Test Confirmation Screen (TS)

4a: If the battery is not connected properly, the error message in figure 3.9 will be displayed. Make sure the battery is set up as specified in section 1.5 of the User Manual and the USB port is connected properly. Once the setup is corrected, press the “Run Test Again!” button shown below to return to step 3 or press the “Cancel” button to end the test and go back to the main menu (TS).

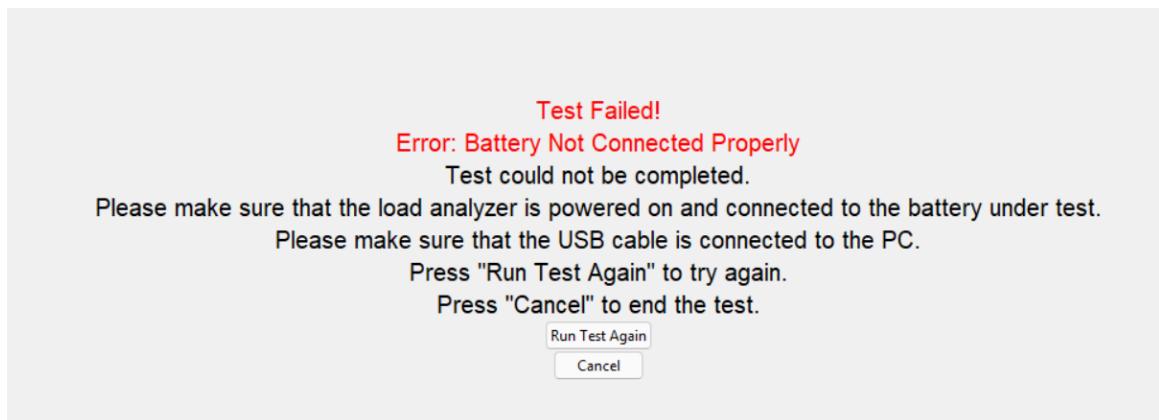


Figure 3.9 - Battery Connection Error Message (TS)

4b: If any of the batteries have an unloaded voltage of under 3.0 V, the error message in figure 3.10 will be displayed along with the battery unloaded voltages. Do not test this battery again until it has been charged. Select “Return to Main Menu” to go back to the main menu (TS).

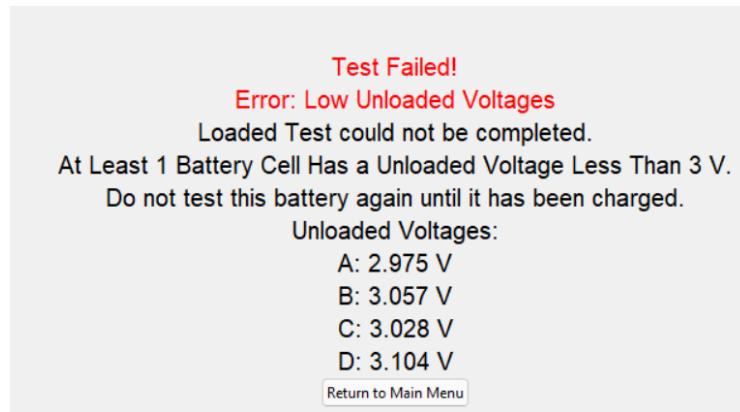


Figure 3.10 - Low Battery Voltage Error Message (TS)

4c: If the battery is correctly connected, the device will display the screen shown in figure 3.11, asking the user to specify the current they wish to run the loaded test at. Press “Continue” once the current is entered or “Cancel Test” to return to the main menu. Note that automated tests are limited to 200 A of current and manual tests are limited to 250 A of current to ensure user safety. Any currents higher than the specified limit will be reduced to the maximum allowed current (TS).



Figure 3.11 - Select Current Screen (TS)

5: Next, the screen in figure 3.12 will be displayed asking the user if they want to run an automated test or manual test. Select the testing mode or press “Cancel Test” to return to the main menu.

⚠ WARNING: The carbon pile discs will become very hot as this point. Make sure the fan is connected and ON before starting the test. Do NOT touch the carbon pile discs until the test ends and they have been given sufficient time to cool down. Do not draw more than 250 A of current from the battery. Do not draw current from the battery for more than a minute at a time. If the test ends unexpectedly, make sure the current is turned back down to 0 A as shown on the ammeter (TS).

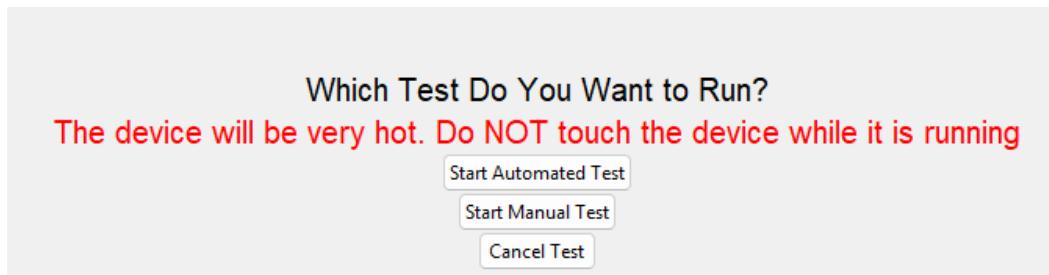


Figure 3.12 - Select Mode Screen (TS)

6a: If an automated test is selected, the device will display the screen shown in figure 3.13, while the automated test is being run. The GUI will switch screens when the test is complete. If the test is successful, skip to section 3.3 to learn how to view and save results. To cancel the test, press “Cancel” (TS).

⚠ WARNING: Do NOT touch the carbon pile discs until the test ends and they have been given sufficient time to cool down. If the stepper motor gets stuck or draws current for more than 30 seconds, immediately cancel the test. If the test ends unexpectedly, make sure the current is turned back down to 0 A as shown on the ammeter (TS).

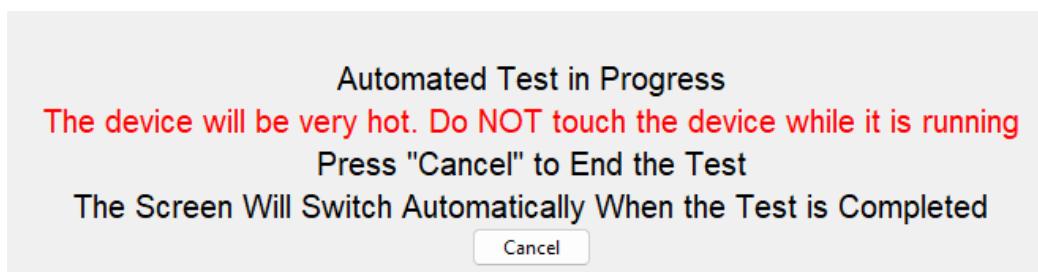


Figure 3.13 - Automated Test Screen (TS)

6b: If a manual test is selected, the device will display the screen shown in figure 3.14, prompting the user to begin the loaded test. The knob must be turned clockwise until the desired current is reached and the beeping sound is heard. The current will be displayed on the prototype's LCD as well as the analog ammeter. The screen will switch automatically once the current has reached the specified value in step 4c. Press "Cancel" to cancel the test early (TS). In both cases, continue to step 7.

⚠ WARNING: Do NOT touch the carbon pile discs until the test ends and they have been given sufficient time to cool down. Do not draw more than 250 A of current from the battery. Do not draw current from the battery for more than a minute at a time. If the test ends unexpectedly, make sure the current is turned back down to 0 A as shown on the ammeter (TS).

To prepare for the loaded test, turn the knob clockwise until the beeping is heard
The device will be very hot. Do NOT touch the device while it is running
Press "Cancel" to End the Test
The Screen Will Switch Automatically When the Test is Completed

Figure 3.14 - Increase Current Screen (TS)

7: The screen in figure 3.15 will be displayed. A buzzer will sound until the current is sufficiently decreased. Turn the knob counterclockwise until the buzzer stops. The screen will automatically change when the current is back down to 0 A (TS). If the test was cancelled, the user will be returned to the main menu. Otherwise, continue to step 8.

⚠ WARNING: Do NOT touch the carbon pile discs until the test ends and they have been given sufficient time to cool down. If the test ends unexpectedly, make sure the current is turned back down to 0 A as shown on the ammeter (TS).

Turn the knob counter-clockwise until the beeping stops

Figure 3.15 - Decrease Current Screen (TS)

8: The test is now complete. Disconnect the battery using the procedure described in section 1.6. Go to section 3.4 to learn more about viewing and saving results (TS).

Section 3.3: Retrieving Previous Test Results from the Local Interface:

1: Follow the procedure described in section 3.1 to connect to a COM port and name the batteries. Set up the prototype and battery as described in section 1 (TS).

⚠ Warning: If the incorrect COM port is selected or the USB cable is disconnected during a test or while transferring data, the program will freeze and not work properly. Close the program and reopen it. The USB cable does not need to be connected once the data transfer is complete (TS).

2: The screen in figure 3.16 will be displayed. Click “Store Data.” (TS)

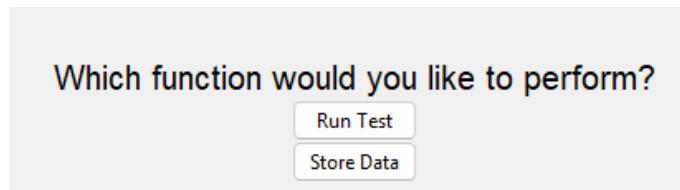


Figure 3.16 - Run Test or Store Data Screen (TS)

3: The screen in figure 3.17 will be displayed. Identify which quad pack the data you wish to retrieve from the local interface is stored under. See section 2 to determine how to view the data stored under each quad pack. Select a quad pack and then press “Continue”. Press “Back” to return to the main menu (TS).

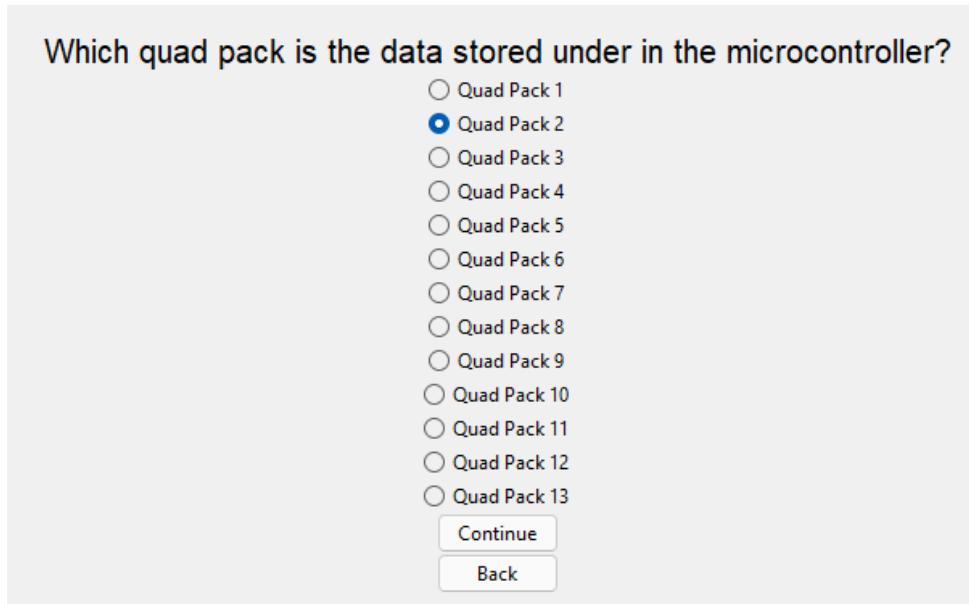


Figure 3.17 - Quad Pack Selection Screen (TS)

4: The data will now be requested from the microcontroller. Continue to section 3.4 to learn more about viewing and saving results (TS).

Section 3.4: Viewing Results and Saving Data:

- 1: Run a test or retrieve prior test results as described in sections 3.1 and 3.2.
- 2: The screen in figure 3.18 will be displayed asking if the user is ready to receive the test results from the microcontroller. Click “Yes” to proceed with the data transfer or “Cancel” to return to the main menu (TS).

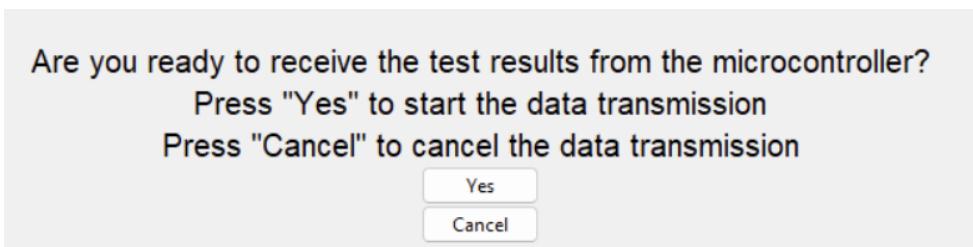


Figure 3.18 - Confirm Data Transfer Screen (TS)

- 3: The screen in figure 3.19 will display the results from the microcontroller. The battery voltages for each battery will be displayed first in the unloaded states then in the loaded states followed by the health ratings and loaded test current. To save the results, press the “Save Results” button. To discard the results, press the “Discard Results” button (TS).

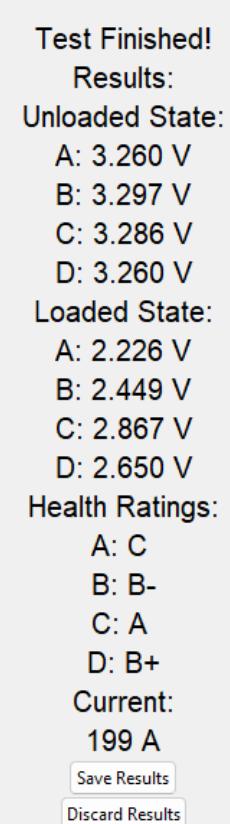


Figure 3.19 - Test Results Screen (TS)

Note: The following grading system in table 3.1 can be used to interpret the health ratings provided in the results:

Table 3.1: Health Ratings System Developed by Scott Tierno and Modified by Tyler Shaw (TS)

Loaded Voltage Range (with a 500 A load current)	Health Grade (~70°F Ambient Temp)	Description
2.90 and Up	A+	Near Perfect
2.80-2.89	A	Excellent Plus
2.70-2.79	A-	Excellent
2.60-2.69	B+	Near Excellent
2.50-2.59	B	Very Very Good
2.40-2.49	B-	Very Good
2.30-2.39	C+	Good Plus
2.20-2.29	C	Good
2.10-2.19	C-	Near Good
2.00-2.09	D+	Retest at Lower Current
1.90-1.99	D	Retest at Lower Current
1.70-1.89	D-	Retest at Lower Current
1.69 and down	F	Retest at Lower Current

* Retest at Lower Current may mean that the battery is still good for an Accy Battery Cell

4a: If “Discard Results” is pressed, the screen in figure 3.20 will appear, confirming the results should be discarded. Select “YES” to discard the results and return to the main menu or “NO” to not discard the results and go back to the previous page in step 3 (TS).

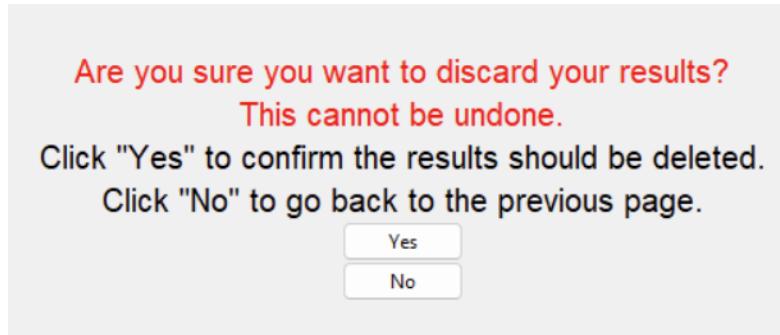


Figure 3.20 - Discard Results Warning Message (TS)

5a: The results will be discarded and the message shown in figure 3.21 will be displayed. Click “OK” to return to the main menu (TS).

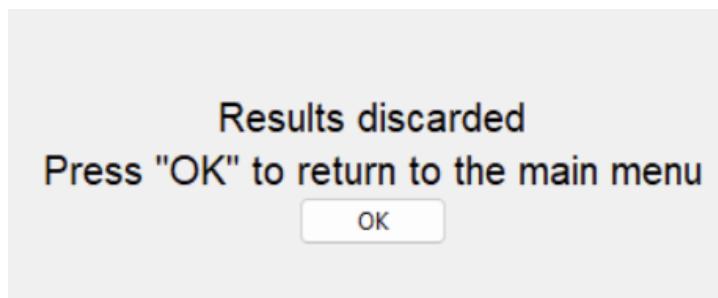


Figure 3.21 - Discard Results Confirmation (TS)

4b: If “Save Results” is pressed, the screen in figure 3.22 will appear. This screen will ask where the data should be saved and under what name. This is a File Explorer interface window which works similarly to Windows File Explorer. There are no restrictions on where the data can be saved so make sure the data is saved in an easily accessible location on the computer. Type the desired file name in the file name box. The file will be saved as a .txt file. Then, click “Save” to save the file or “Cancel” to not save a file (TS).

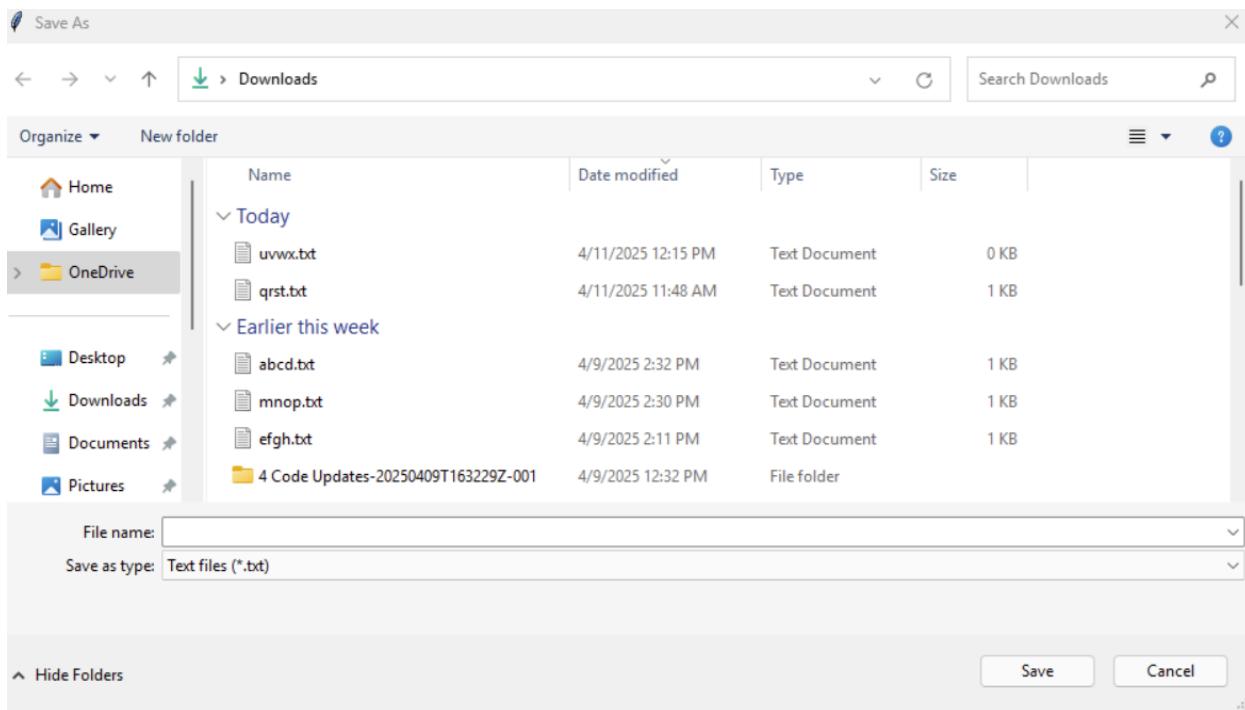


Figure 3.22 - Save File Windows File Explorer Interface (TS)

5b: If the file was saved successfully, the screen in figure 3.23 will be displayed. Press “OK to go back to the main menu (TS).

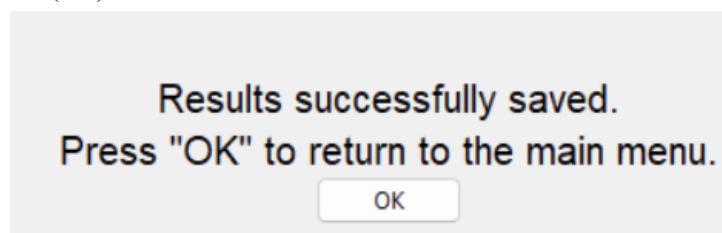


Figure 3.23 - Save File Confirmation Message (TS)

5c: If the file was not saved successfully or “Cancel” was pressed in step 4b, the screen in figure 3.24 will be displayed. Press “Try Again” to return to step 4b or “Cancel” to return to the main menu (TS).

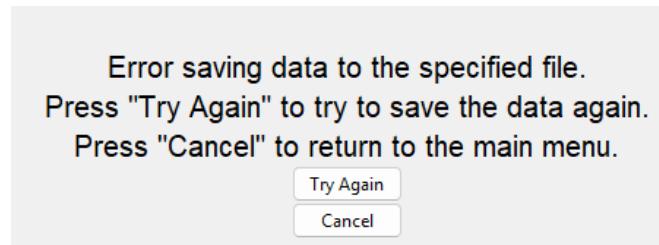


Figure 3.24 - Save File Error Message (TS)

Section 3.5 Viewing Past Results Saved on the Remote Interface:

1: From the home screen, click on “View Results.” (TS)

2: The following Windows File Explorer interface screen also shown in figure 3.25 will be displayed. This interface window works similarly to Windows File Explorer. Note that only .txt files will be displayed. Additionally, only .txt files generated by this program or in an identical format to those generated by this program will be properly displayed. Navigate to the location where your data is saved. Double click on the .txt file you wish to view or single click and then click “Open.” Click “Cancel” to not read a file (TS).

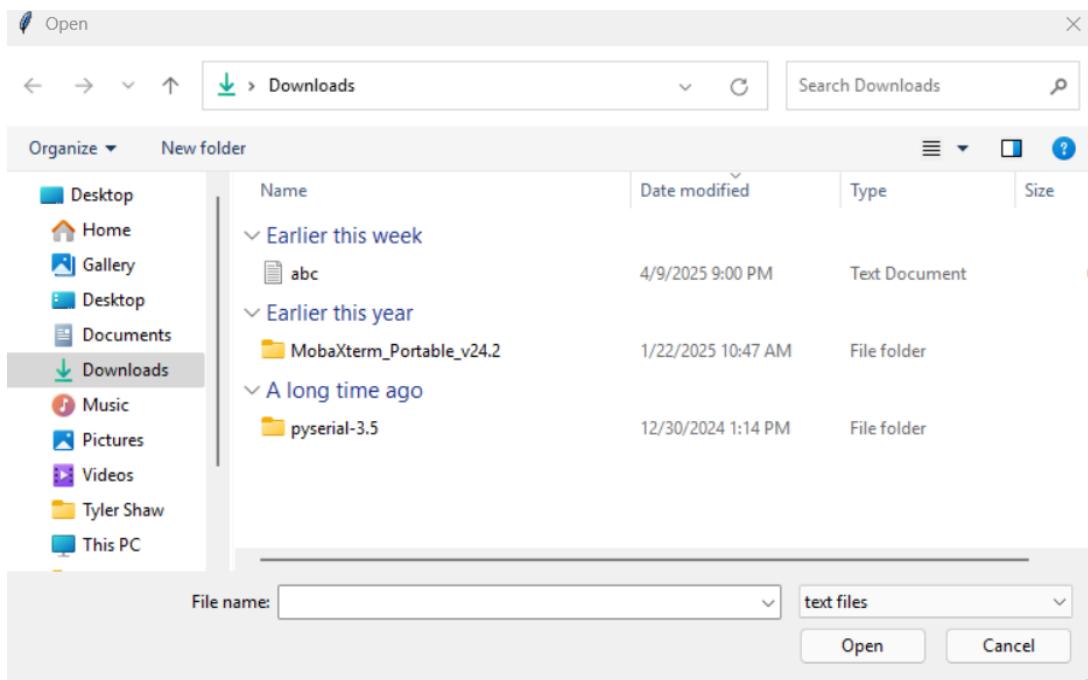


Figure 3.25 - Open File Windows File Explorer Interface (TS)

3a: If the file was successfully read, the screen in figure 3.26 will be displayed along with the results from the text file. Press “View More Results” to return to step 2b and view another set of results or “OK” to return to the main menu (TS).

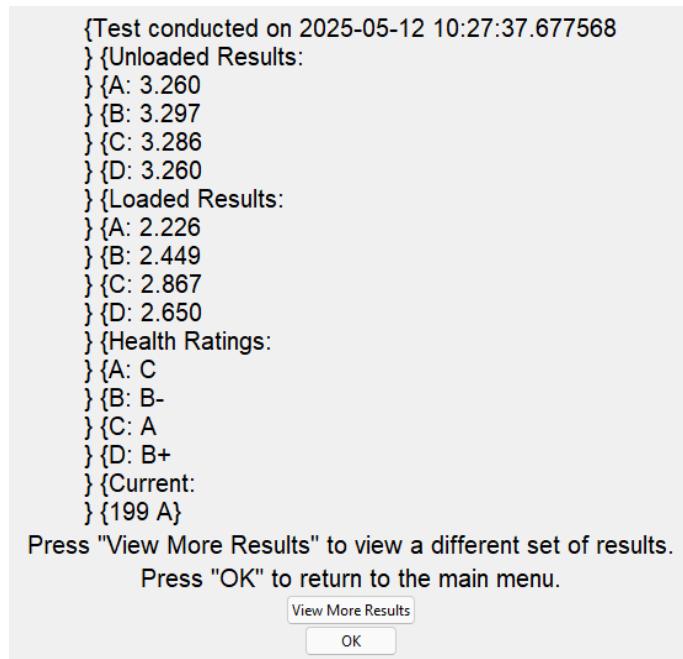


Figure 3.26 - Open File Results Screen (TS)

3b: If the file could not be read or “Cancel” was pressed, the error message in figure 3.27 will be displayed. Click “Try Again” to return to step 2 or “Cancel” to return to the main menu (TS).

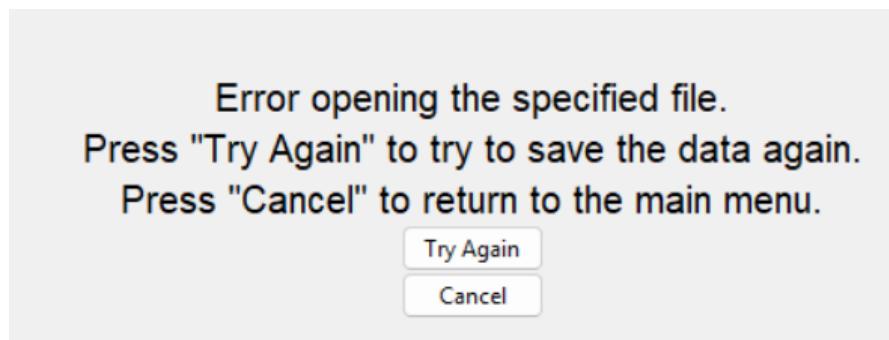


Figure 3.27 - Open File Error Message (TS)