# AutoDropper MK2

Ver 2024.04.01

## Owner’s Manual

April 2024

www.AutoDropper.net

## Caution

**Do not power on the device prior to connecting the bulk dispenser cable to the electronics box. Doing so may damage the electronics.**

# Disclaimer

Handloading is a serious matter that deserves your utmost attention and respect. Safe handloading practices and procedures are included in various reloading manuals. The user of the AutoDropper must therefore have read and understood these practices and procedures fully before proceeding. The user of the AutoDropper should seek the help and guidance of a handloading expert before attempting to handload. Careless or improper handloading can result in firearm damage, property damage, severe injury or death. AutoDropper, LLC takes no responsibility for any damage or harm that may result from the use of the AutoDropper in the handloading process.  Handloading involves the handling of dangerous material. Follow the manufacturers handling requirements. The AutoDropper shall only be used with smokeless powder. **DO NOT use black powder or black powder substitute with the AutoDropper, as these may ignite with a static charge.**

# Balance Setup

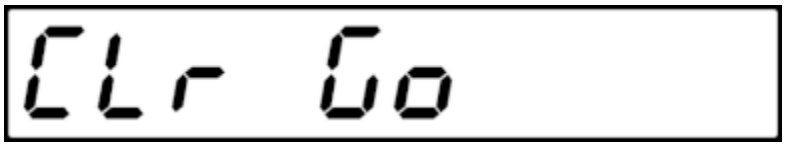
To allow the AutoDropper to communicate with the balance, as well as to optimize the response of the balance, a number of options have to be changed. A factory reset may be necessary if the balance's configuration is unknown.

## Factory Reset

1. Power ON balance. Wait for a few seconds until the self test completes.
    a. The balance displays:

    b. If not, press the "ON:OFF" key to turn off display
2. While holding the "PRINT" and the "SAMPLE" keys
    a. Press the "ON:OFF" key
    b. Release the "PRINT" and the "SAMPLE" keys
3. Press the "SAMPLE" key until display is:


4. Press the "PRINT" key
5. Press the "RE-ZERO" key until display changes to:



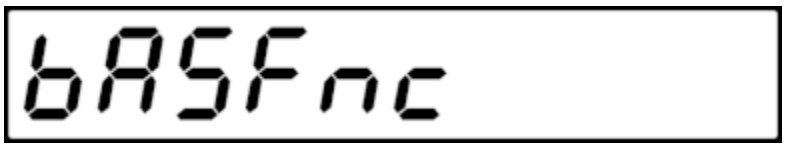

6. Press the "PRINT" key
    a. Balance displays temporarily


    b. Balance returns to weighing mode. Balance has been factory reset.

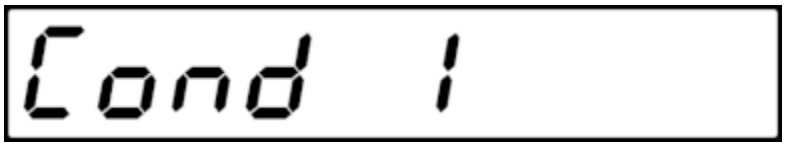
# Balance Configuration

| Key | Description |
|---|---|
| SAMPLE | • When pressed and held in the weighing mode, enters the function table mode.<br>• Selects the class or item in the function table mode. |
| RE-ZERO | Changes the parameter. |
| PRINT | • When a class is displayed, moves to an item in the class.<br>• When an item is displayed, stores the new parameter and displays the next class. |
| CAL | • When an item is displayed, cancels the new parameter and displays the next class.<br>• When a class is displayed, exits the function table mode and returns to the weighing mode. |

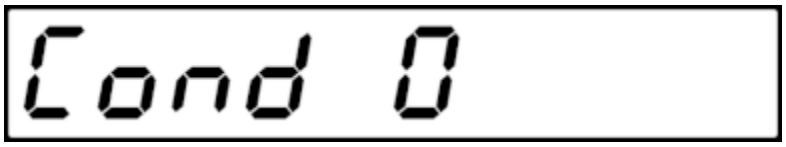
1. Press and hold the “SAMPLE” key until display changes to:



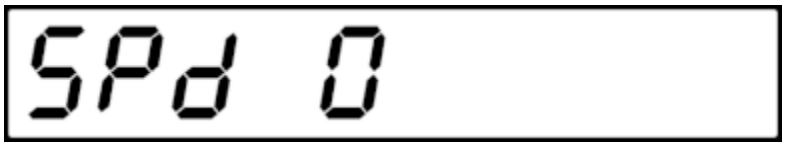

2. Press the “PRINT” key
3. Press the “SAMPLE” key until display is:



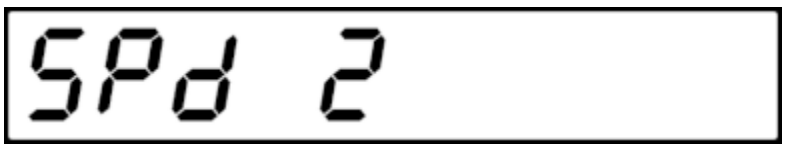

4. Press the “RE-ZERO” key until display changes to:




5. Press the “SAMPLE” key until balance displays:

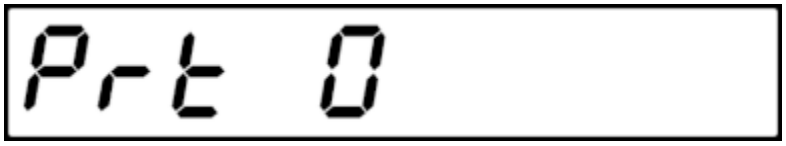



6. Press the “RE-ZERO” key until display changes to:

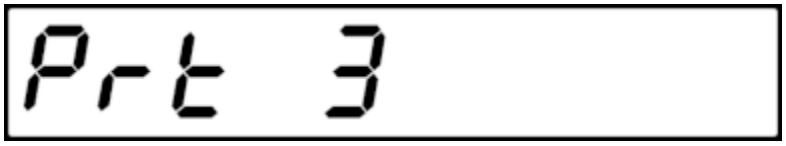


7. Press the “PRINT” key
8. Press the “SAMPLE” key until balance displays:


9. Press the “PRINT” key
10. Press the “SAMPLE” key until display is:

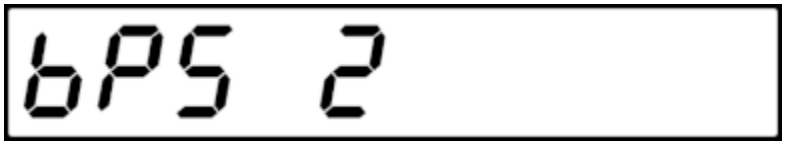



11. Press the “RE-ZERO” key until display changes to:

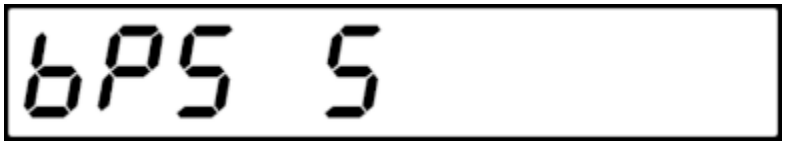



12. Press the “PRINT” key
13. Press the “SAMPLE” key until display is:

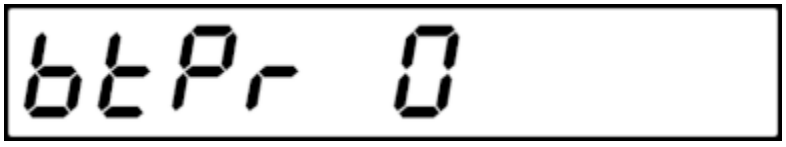

14. Press the “PRINT” key
15. Press the “SAMPLE” key until display is:



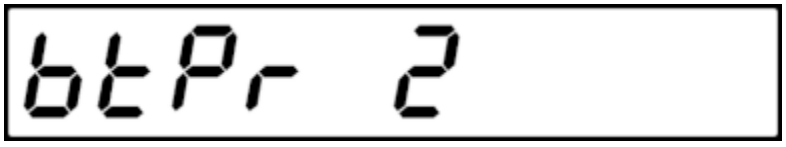

16. Press the “RE-ZERO” key until display changes to:




17. Press the “SAMPLE” key until display is:




18. Press the “RE-ZERO” key until display is:




19. Press the “PRINT” key

20. Press the “SAMPLE” key until display is:

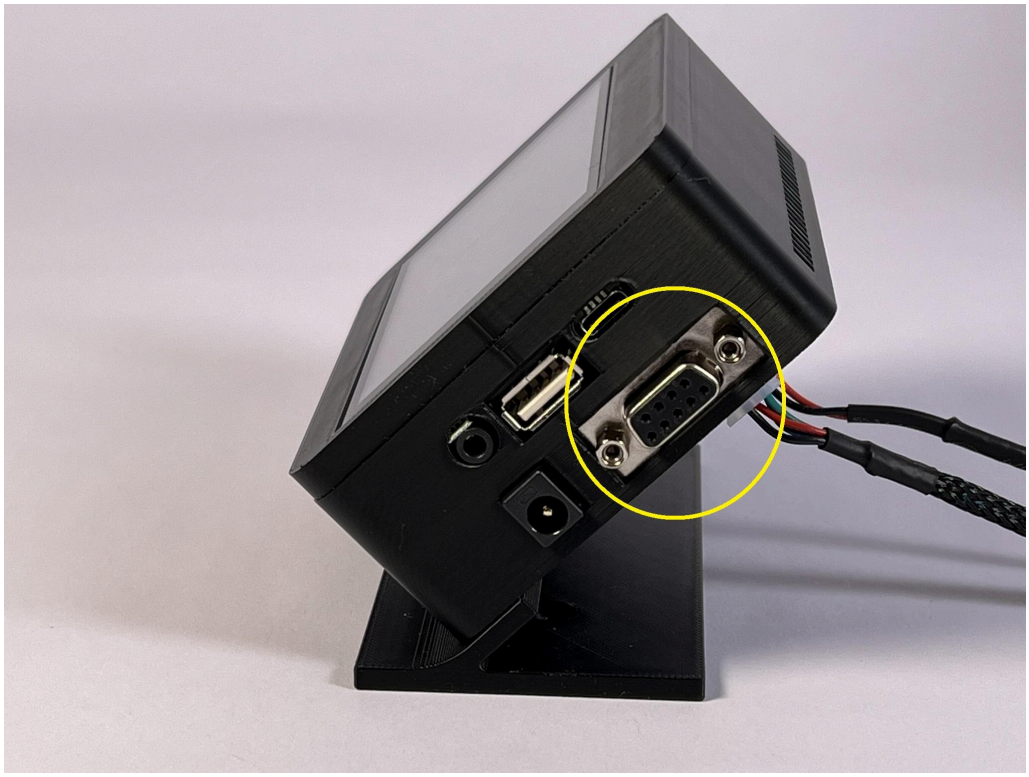

21. Press the “PRINT” key
22. Press the “SAMPLE” key until “GN” is displayed
23. Press the “RE-ZERO” key. Small circle should appear on screen.
24. Press the “SAMPLE” key until “g” is displayed
25. Press the “RE-ZERO” key. Small circle should appear on screen.
26. Press the “PRINT” key
27. Press the “CAL” key
28. Press the “MODE” key until “GN” is displayed.

# Assembly

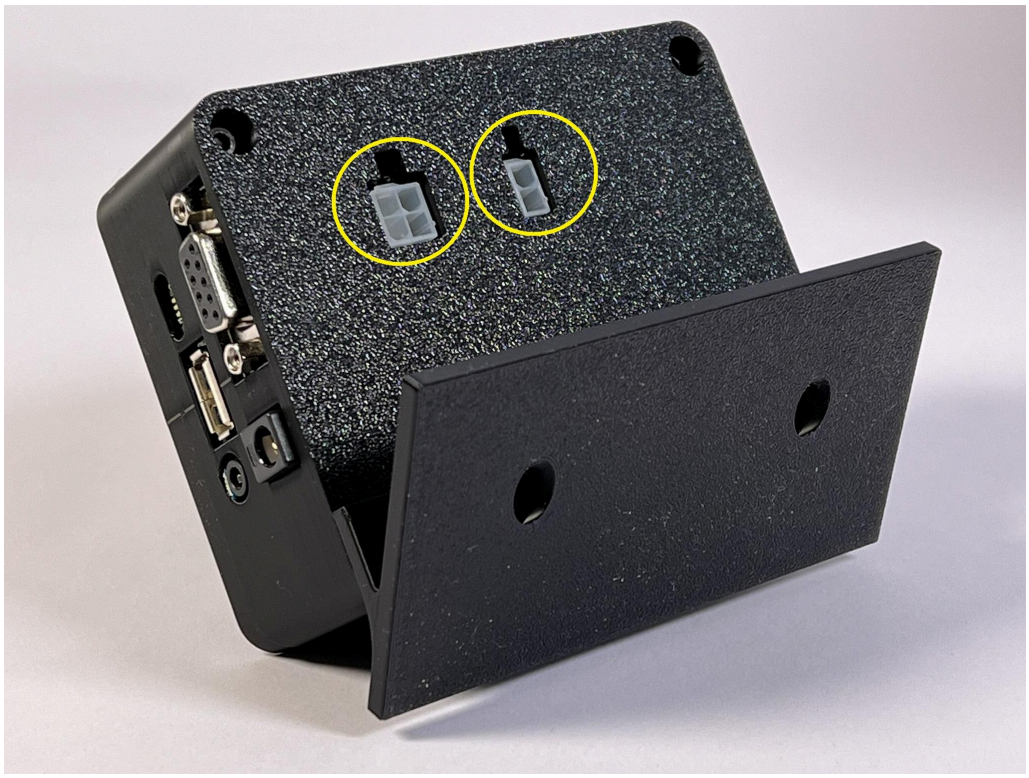
## Electronics

1. Connect the female end of the serial cable to the balance.

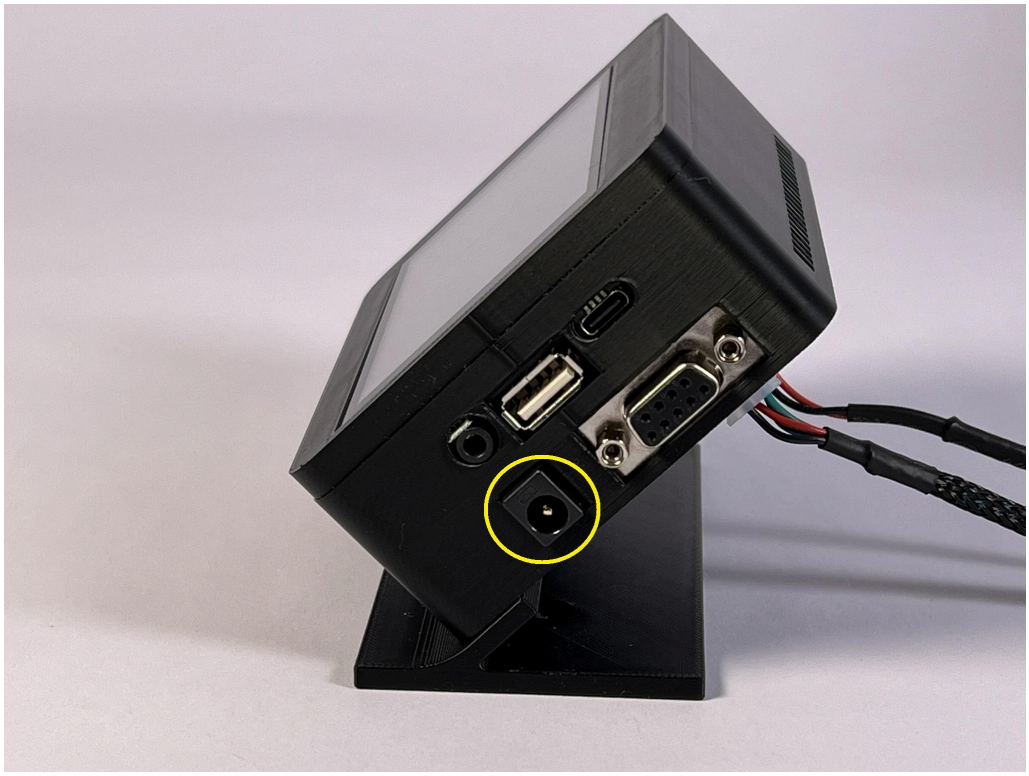
2. Connect the male end of the serial cable to the AutoDropper.



3. Connect the bulk dispenser cable and trickler cable



4. Connect the 24vdc power supply



## Cup Guide

1. Place the cup and the cup guide on the balance platform.

2. Ensure that the cup is in the middle of the platform. Easy way to check is to look through the hole in the top cover.

3. The underside of the cup guide has a double sided tape attached to it. Peel the backing and carefully press it on the balance platform.

# Balance airflow shield installation

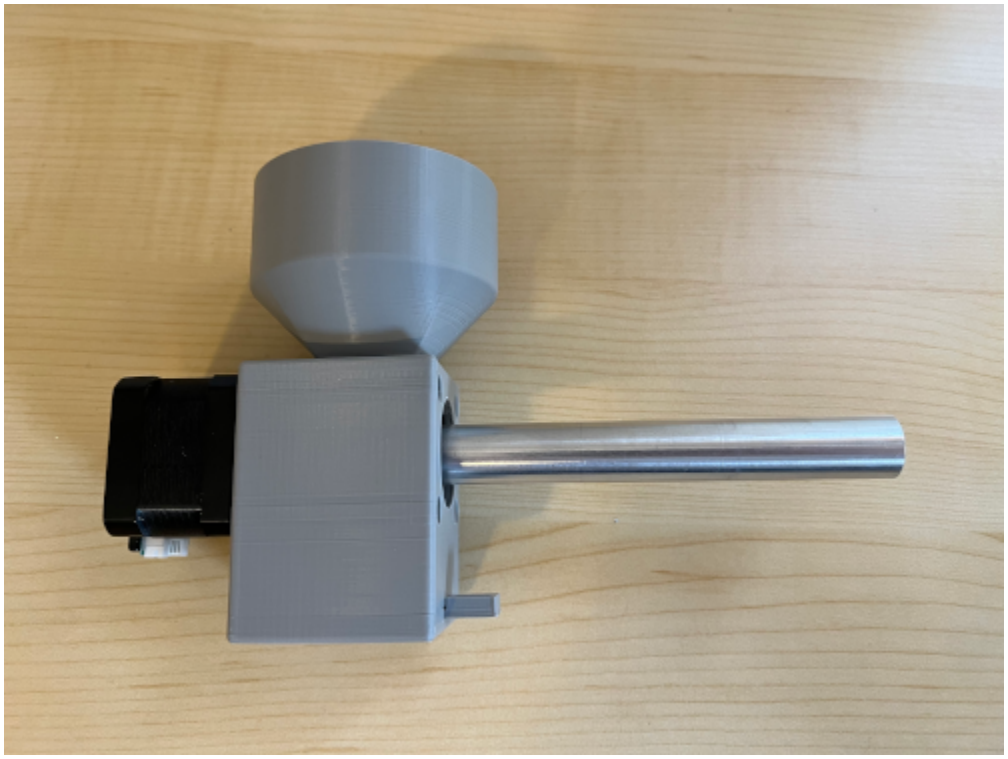
The AutoDropper MK2 ships with replacement draft shields for the balance. Simply replace the existing side draft shields on the balance with ones provided. The supplied draft shields have a small and large opening, the small is used for the trickler and the large for the bulk dispenser. Align the bulk dispenser and trickler so that drop tubes are directly above the powder cup. Reinstall the top air shield. The factory hole in the top air shield can be covered by masking tape to prevent air from interfering with the balance. Note that the front air shield is not installed to allow the user to remove/insert the powder cup after dispensing.

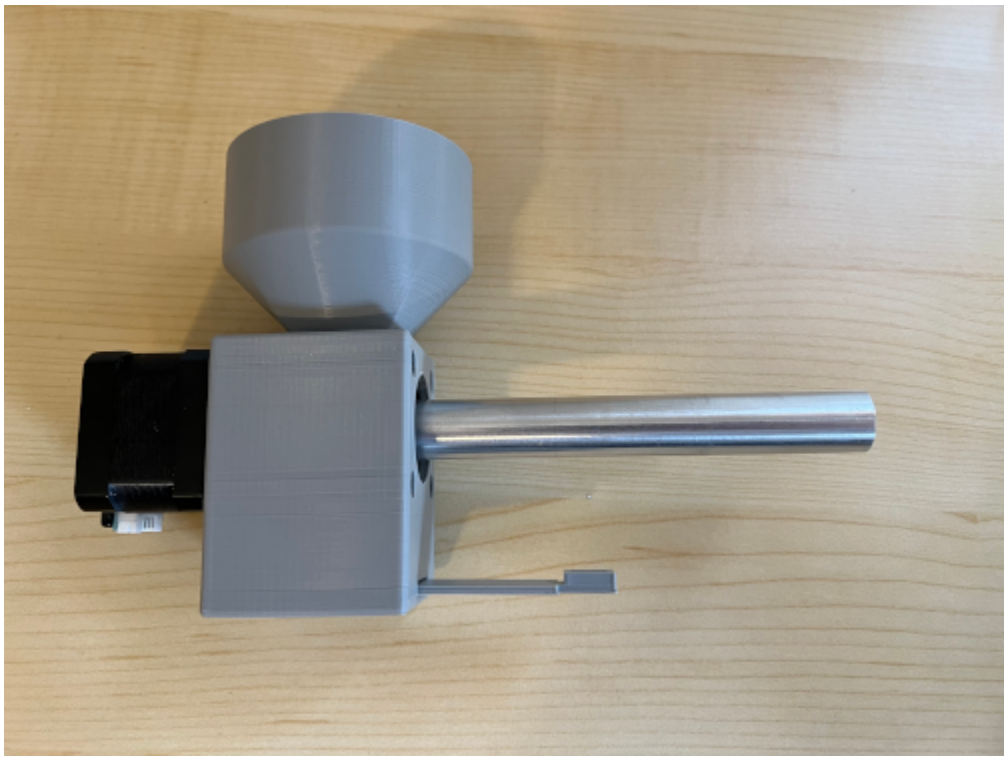
# Bulk Dispenser

The bulk dispenser can dispense loads as small as 1.5 gn. Dispensing loads smaller than 1.5 gn is accomplished using the trickler.

## Drain Door

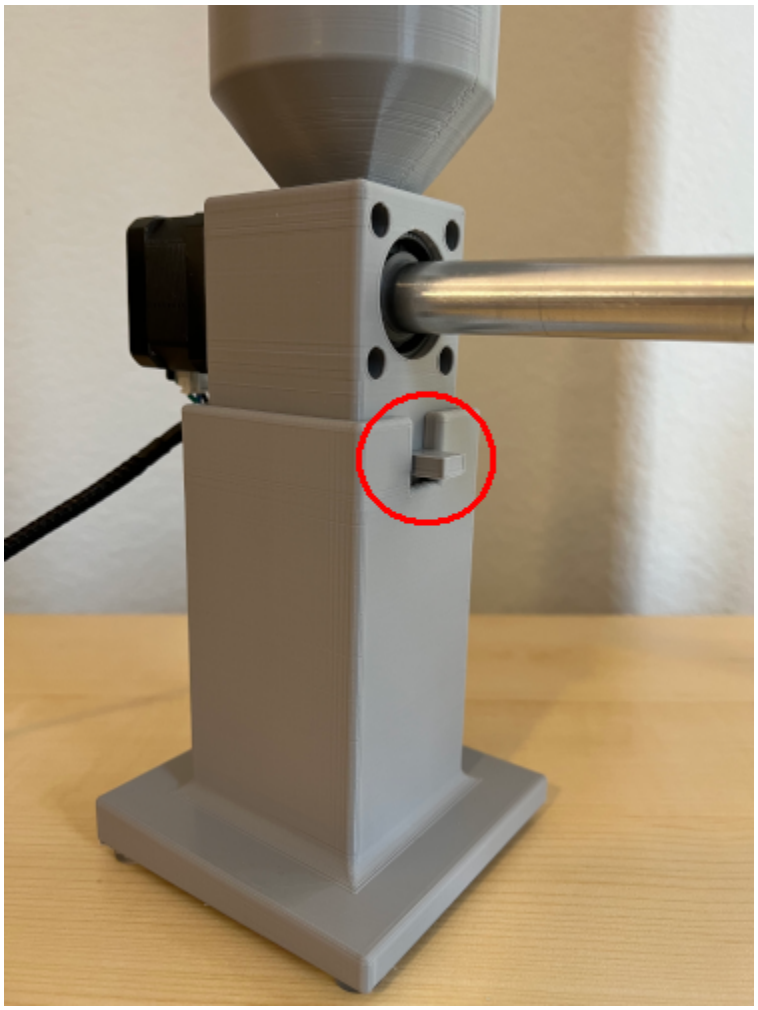
The drain door allows for easy draining of powder that is contained in the hopper. The drain door should be oriented correctly when it’s inserted into the hopper.





# Base

The base and the hopper can be separated by gently wiggling the two parts while pulling them apart. Ensure that the drain door is properly installed before reattaching the hopper to the base. See picture below of correct drain door installation. The base has 4 rubber bumpers attached to ensure that it does not move during use.



## Cleaning Process

To clean the bulk dispenser:

1. Tilt the bulk dispenser so that the aluminum tube is pointing up. This is to ensure that powder does not spill out of the aluminum tube.
2. Lightly tap the hopper or aluminum tube to move powder back towards the hopper and away from the tube opening.
3. With the bulk dispenser tube pointing up slightly, separate the hopper from the base by grabbing the two parts and wiggling them while pulling them apart.
4. Set the hopper on top of the powder container, aligning the hole at the bottom of the hopper with the hole in the powder container.
5. Pull the trap door out of the hopper fully. Powder will begin to drain from the hopper to the powder container. Additionally a funnel may be used to guide the powder back to the container.
6. Once all of the powder from the hopper has drained, insert the trap door back into the hopper. See picture of trap door above for correct orientation.
7. Place the powder container opening below the aluminum tube and tilt the hopper so that the aluminum tube is pointing downwards to drain any powder left in the aluminum tube.
8. Use a small painter’s brush, to remove any powder stuck in the aluminum tube.
9. Using a small painter's brush. Brush any left over flakes of powder from the clear extension tube atop the hopper.
10. Remove the extension tube and set it aside.
11. Using a small painter’s brush, brush any powder left in the hopper.
12. Once again set the hopper on top of the powder container, aligning the hole at the bottom of the hopper with the hole in the powder container. Remove the trap door to drain any left over powder.
13. Check for powder from the bottom of the hopper. Use a brush to remove any flakes of powder.
14. Install the trap door. Install the extension tube. Connect the base with the hopper.

# Trickler

The trickler angle should be adjusted so that the bottom of the tip is 5.5” above the table/desk. This angle worked well in internal testing for all powder types. The published powder reports on the web site are using this setting unless noted. The base has 4 rubber bumpers attached to ensure that it does not move during use.

## To adjust the angle

1. Loosen the wingnut
2. Adjust the angle
3. Tighten the wingnut

## Cleaning Process

To clean the trickler:

1. Tilt the trickler assembly so that the open end of the tube is pointing up. This is to ensure that powder does not spill out of the tube.
2. Place the powder container opening below the tube and tilt the trickler so that the tube is pointing downwards to drain powder from the hopper and the tube.
3. Use a small painter’s brush, to remove any powder stuck in the hopper and tube.

# Usage

- It is assumed that the bulk dispenser and the trickler have been connected to the electronics box. **Turning on the power to the electronics box without these connections may damage the electronics.**
- It is assumed that the balance and the electronics box have been connected via the serial cable as instructed in this manual.
- It is assumed that the balance has been sufficiently warmed (turned on) for at least 15 min.
- It is assumed that the balance's display is turned on and that it's displaying "0.00 GN".

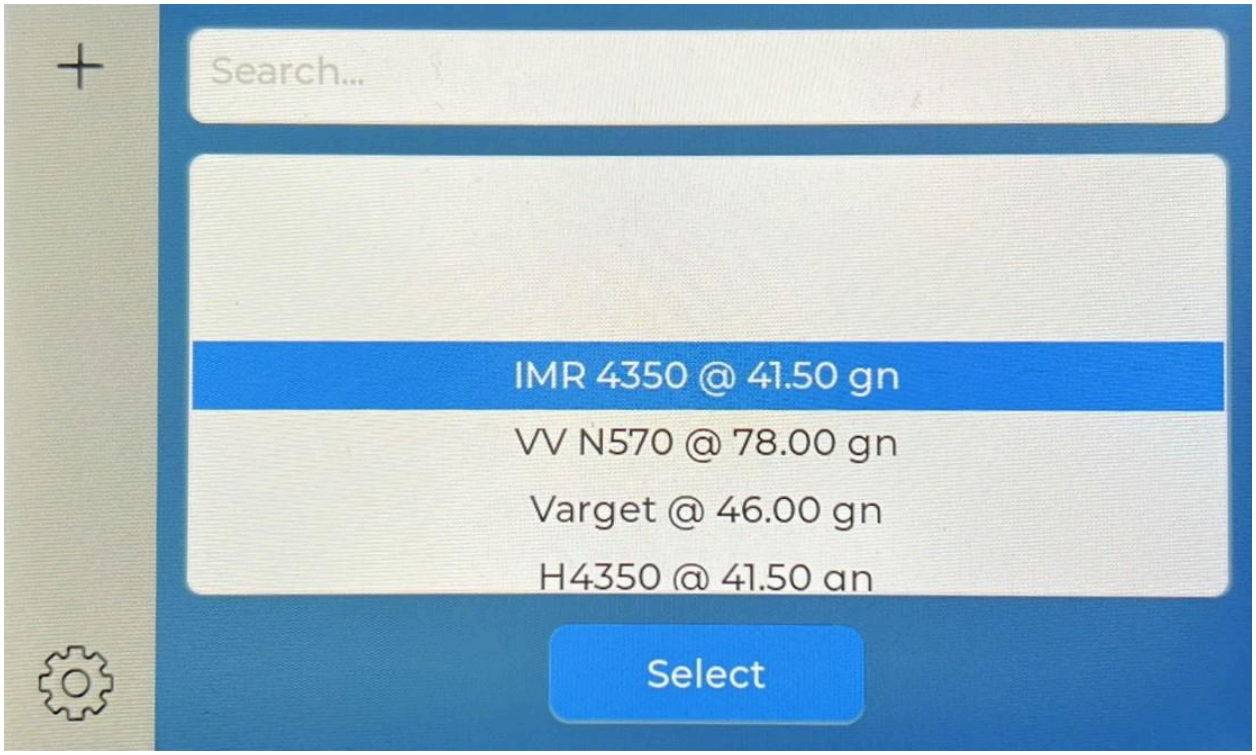
Power on the electronics box.

## If the display shows: Connecting to balance…


That means that the AutoDropper is not able to communicate with the balance.
Things to check:

- Ensure that the electronics box and the balance are connected via the serial cable.
- Ensure that the balance display is on and that it reads "0.00 GN"
- Ensure that the balance was configured following the "Balance Configuration" section of this manual.

If the display shows the load profiles screen.



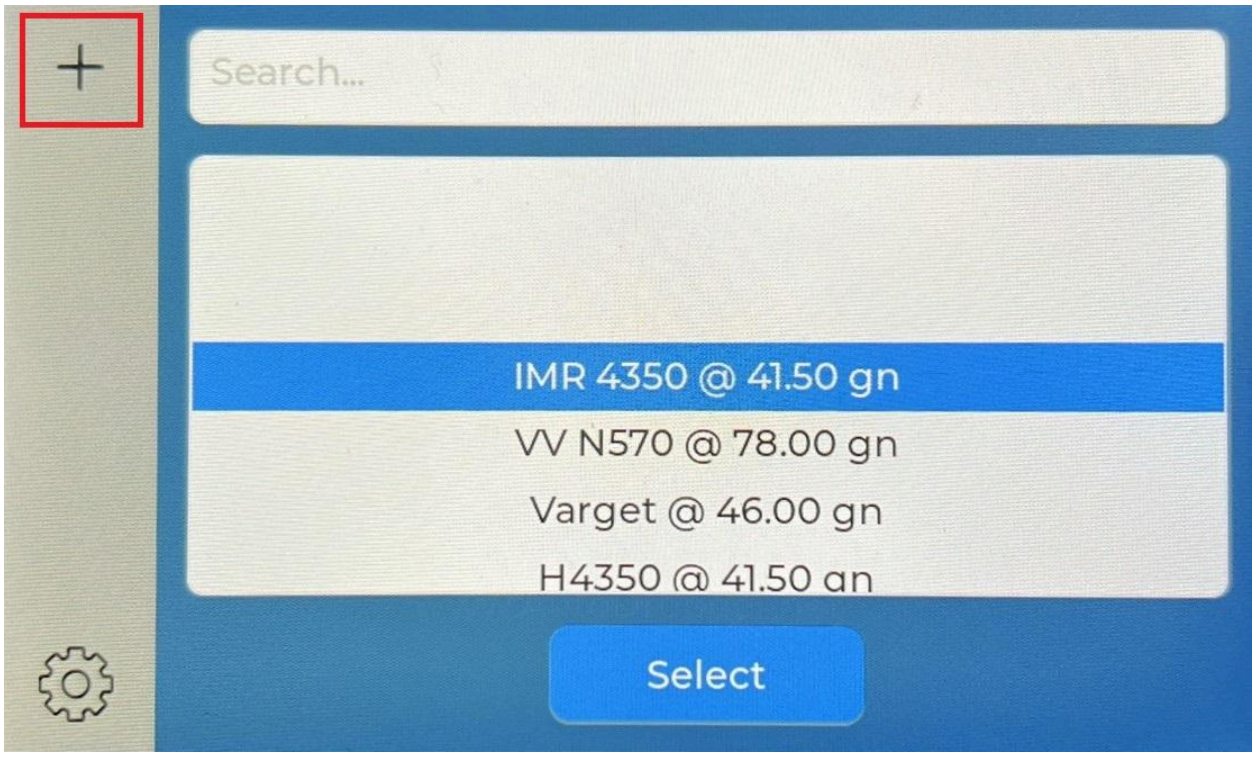

That means that the AutoDropper was able to establish communication with the balance and passed all system checks.

# Dispense Process

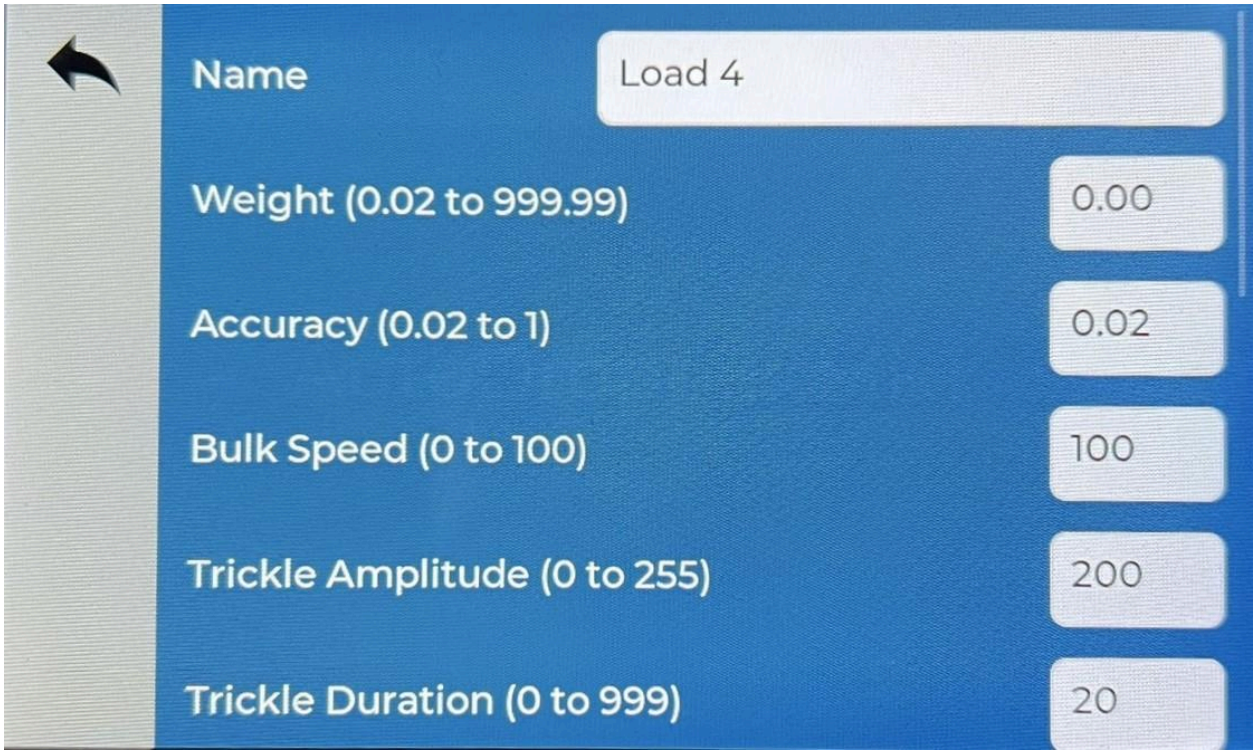

The above drawing is a visual representation of the dispense process. The bulk dispenser will run at full speed until it reaches the bulk slowdown point. The dispenser will then start to slow down until it reaches the trickler point. The trickler will trickle up to the pulse 1 point. The pulse 1 will pulse until the pulse 2 point. The pulse 2 will pulse until it reaches the target weight of 41.50 GN.

# Adding a Load Profile

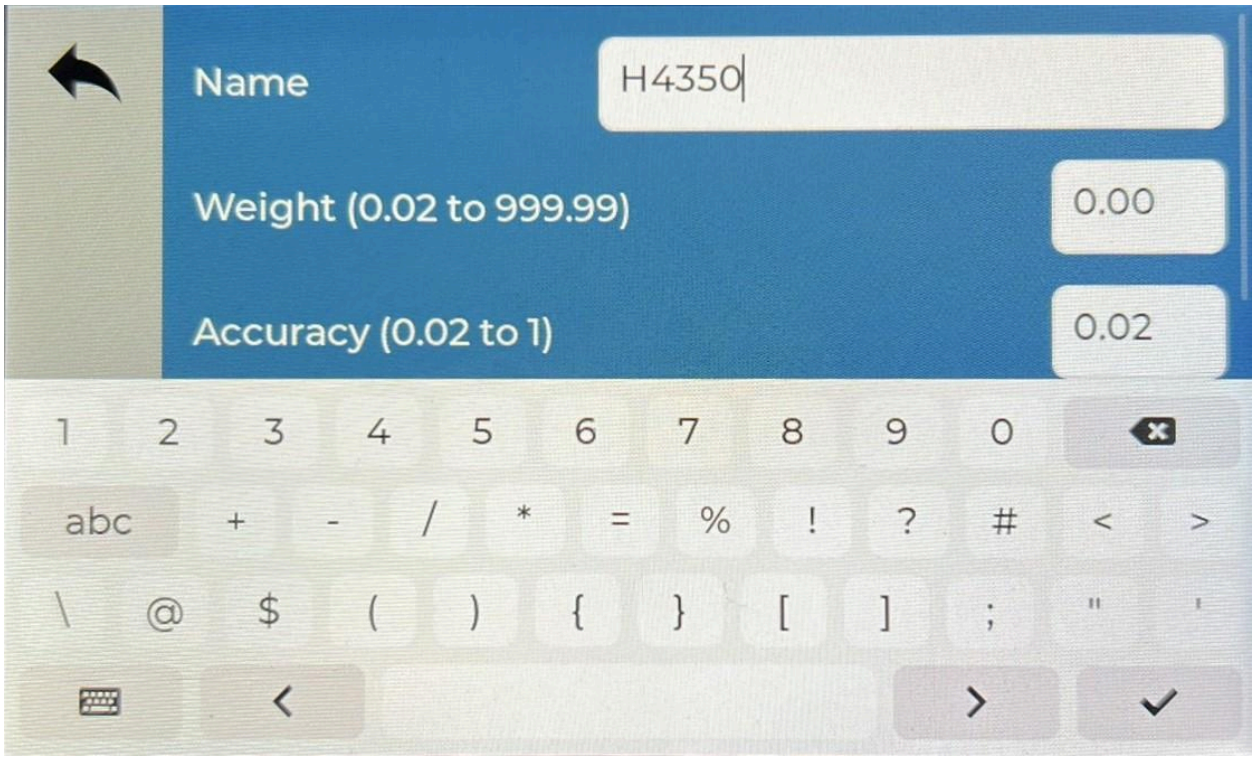
To add a load click the “plus” button.



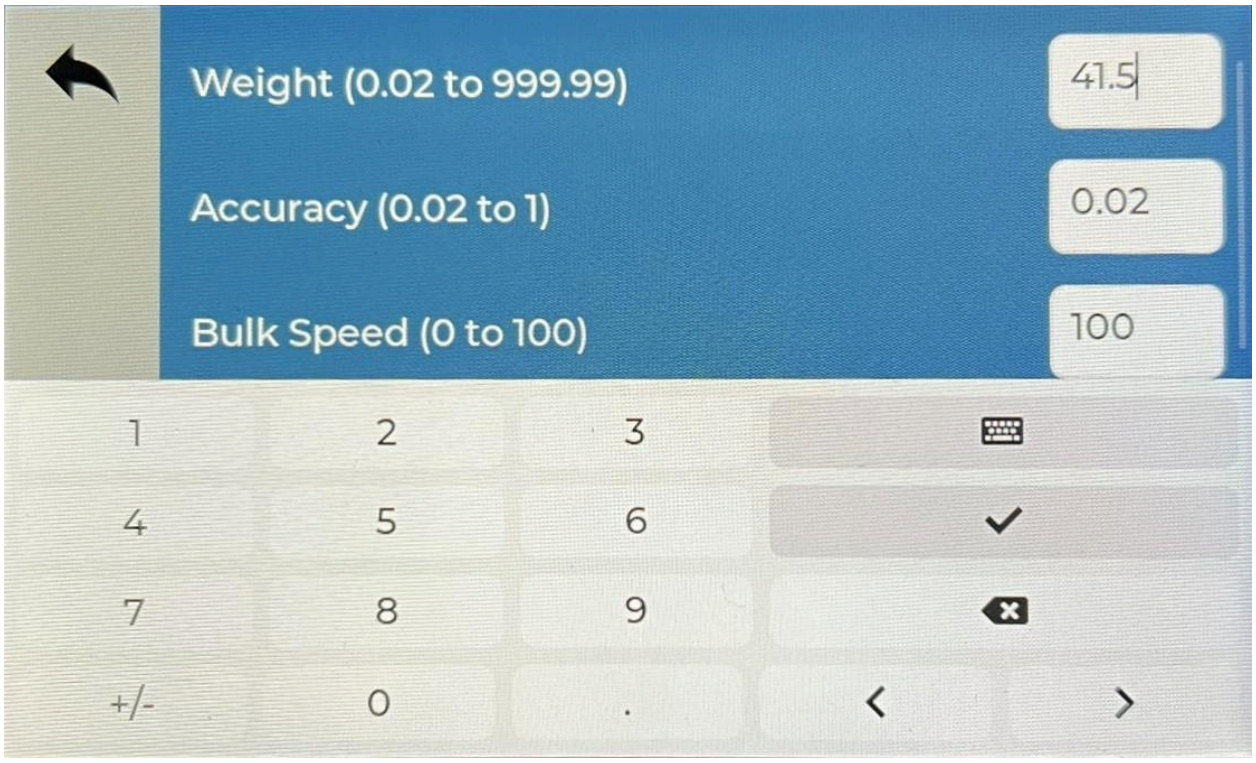

The system will create a new load profile and move to the edit load profile screen. Most of the parameters can be kept at their default value with the exception of the weight and accuracy. By default weight is set to 0.00 GN. Accuracy is set to ±0.02 GN. Accuracy should be set to the larger of 0.02 or ½ of a single kernel’s weight. This only comes into play with very large and heavy single kernel powder such as VV N570, where each kernel weighs in at ~0.08 GN. In this situation accuracy should be set to ½ * 0.08 = 0.04 GN. Adjusting accuracy will automatically update *Pulse 1 Start* and *Pulse 2 Start* values. Other parameters may be tweaked to suit the user's needs. See the Load Parameters for an explanation of these parameters.



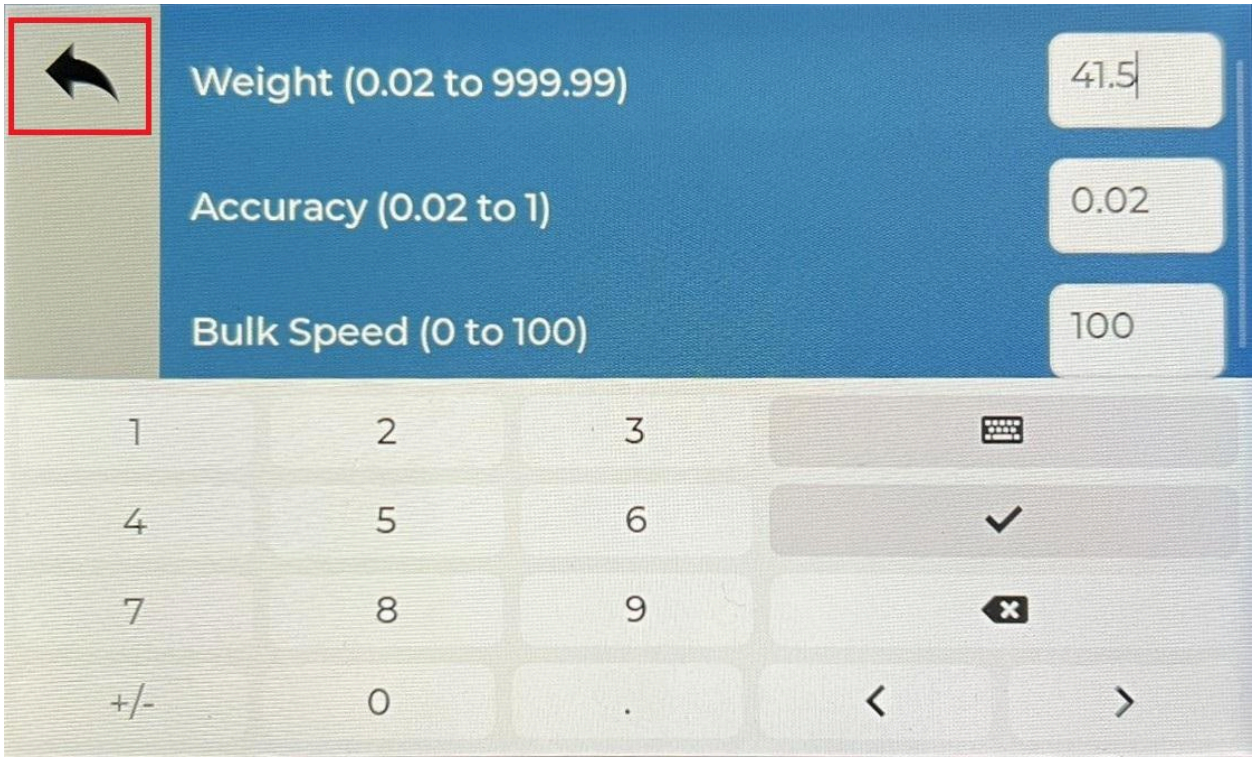

To change the load profile parameter simply click on the textbox and a virtual keyboard will be displayed on the screen. Take some time to familiarize yourself with the virtual keyboard.



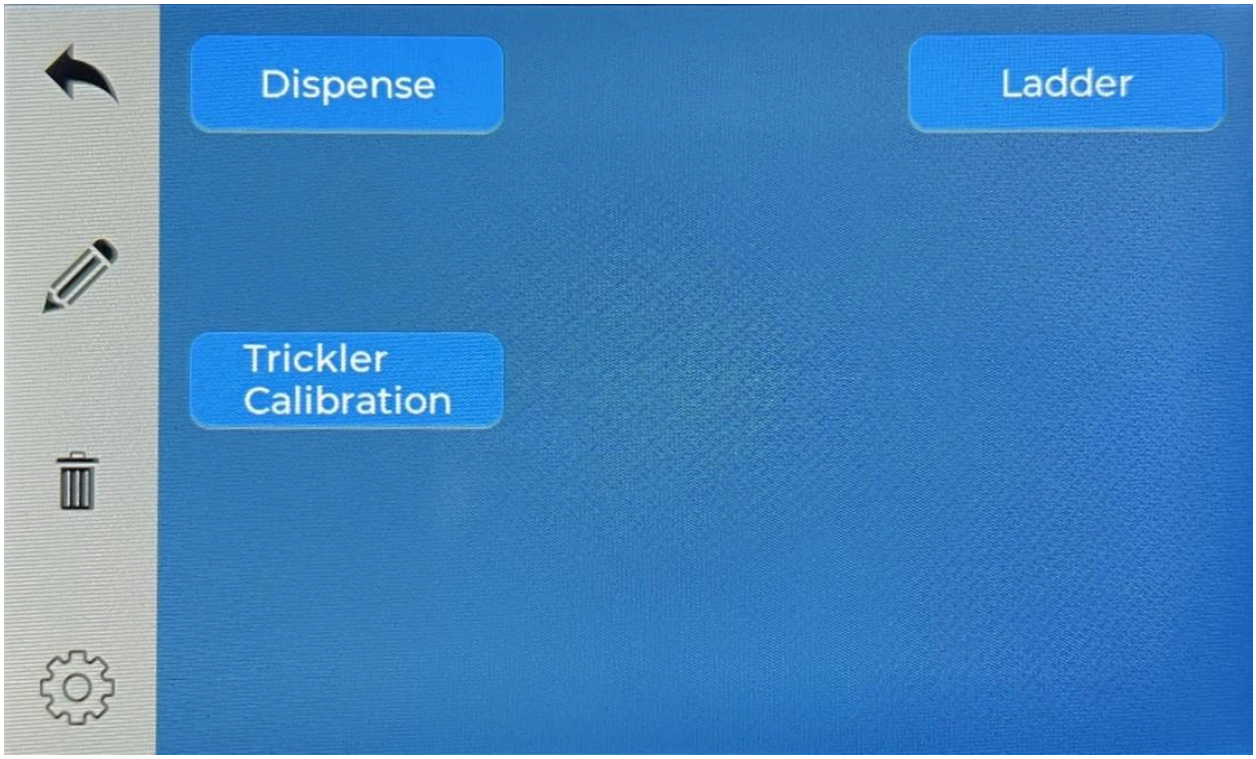
Different virtual keyboards are used for different parameters. For parameters involving numbers a numerical keyboard will be displayed.



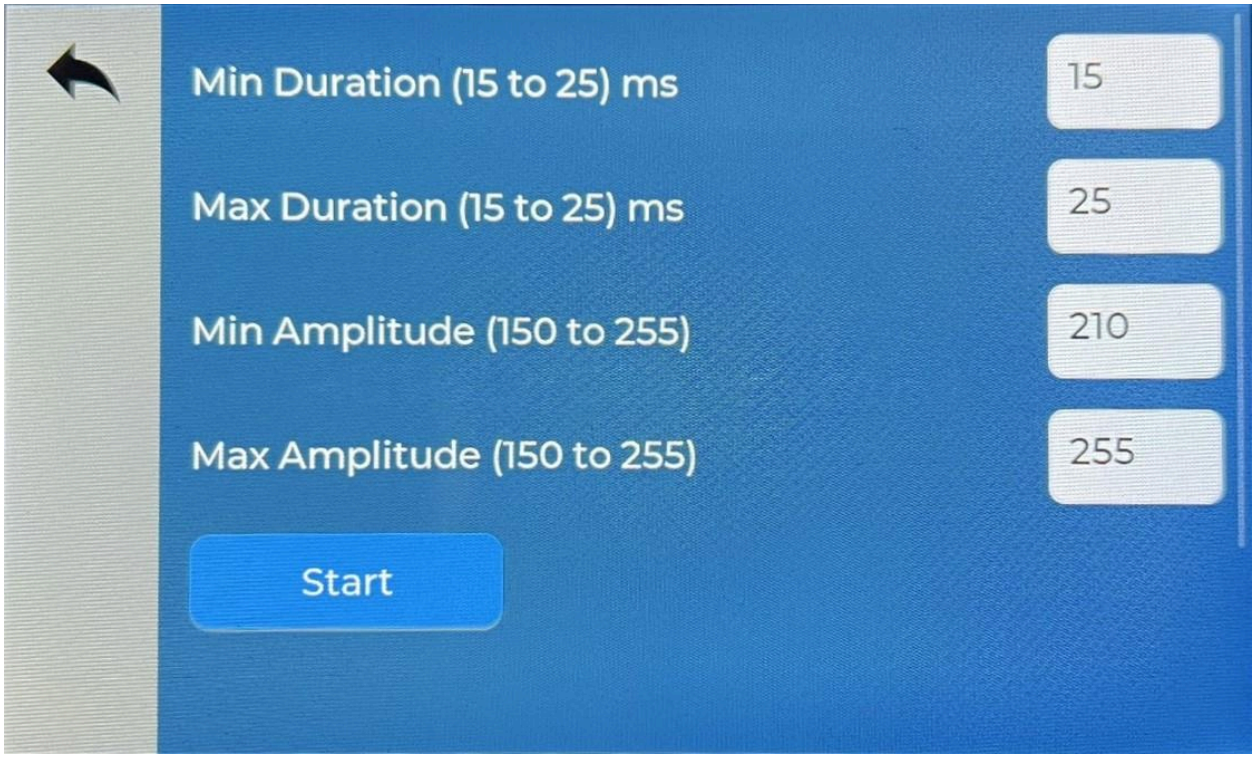

Once the name, weight and accuracy have been set return to the load profile screen by clicking the back button.



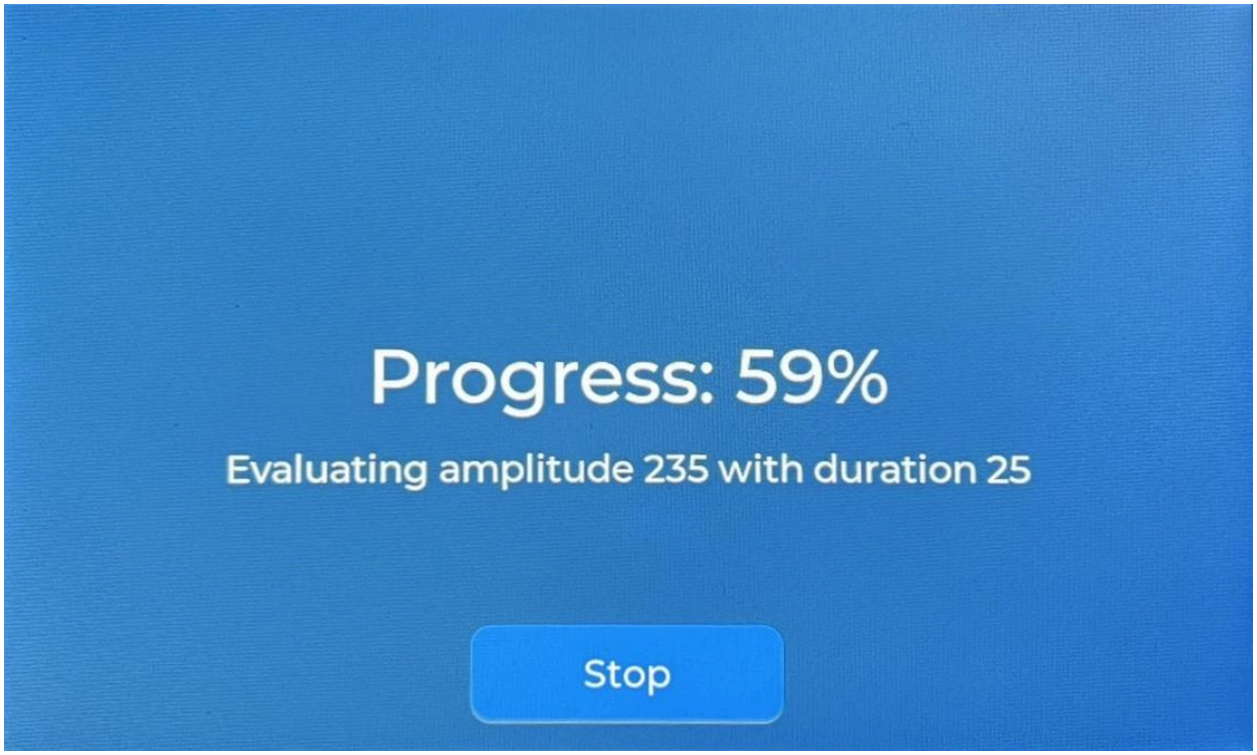
The next step in configuring a load profile is to run the “Trickler Calibration” process to detect the best trickle amplitude and duration for the powder. If the same powder is used you may manually set the trickle amplitude and duration on the edit load profile screen and skip this step.



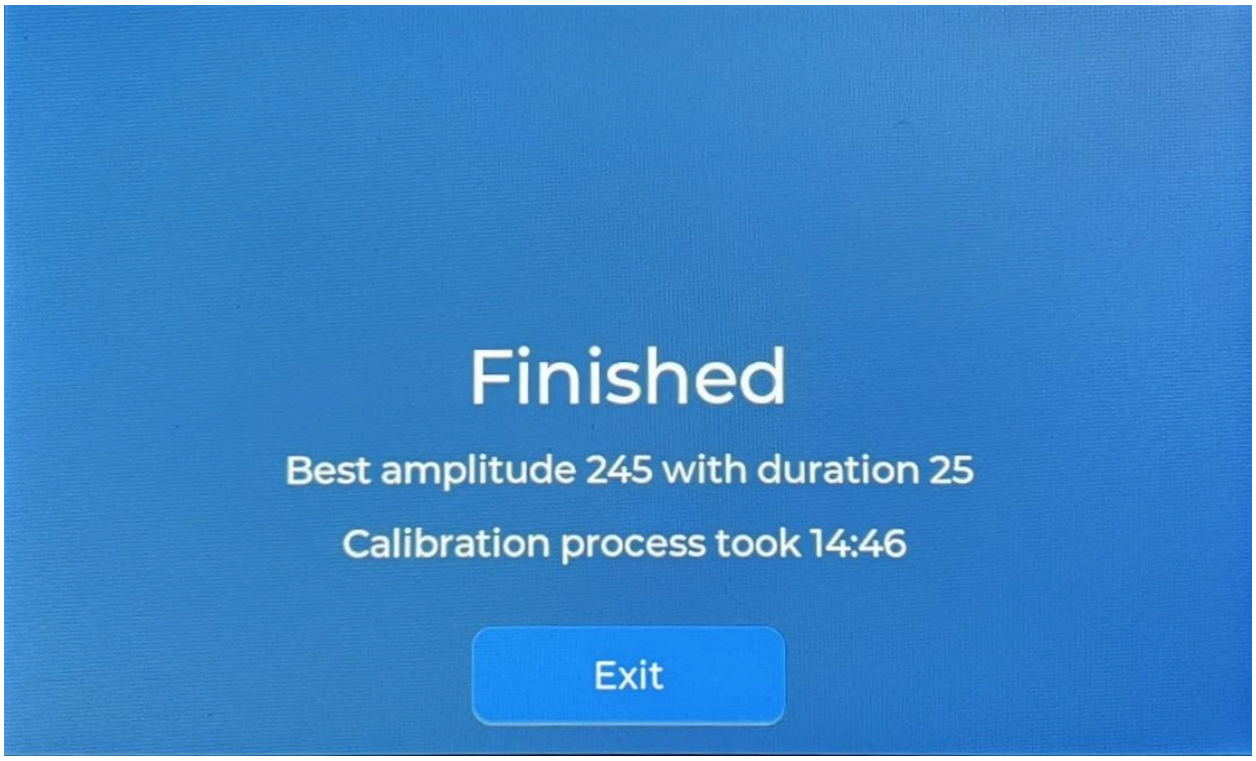

The default parameters should be accepted unless a user wishes to expand/constrict the range of values to test. To start the process click the “Start” button.




Progress will be reported on screen along with the current amplitude and duration being evaluated. The process can be stopped at any time by clicking the “Stop” button. However doing so will discard all current progress.

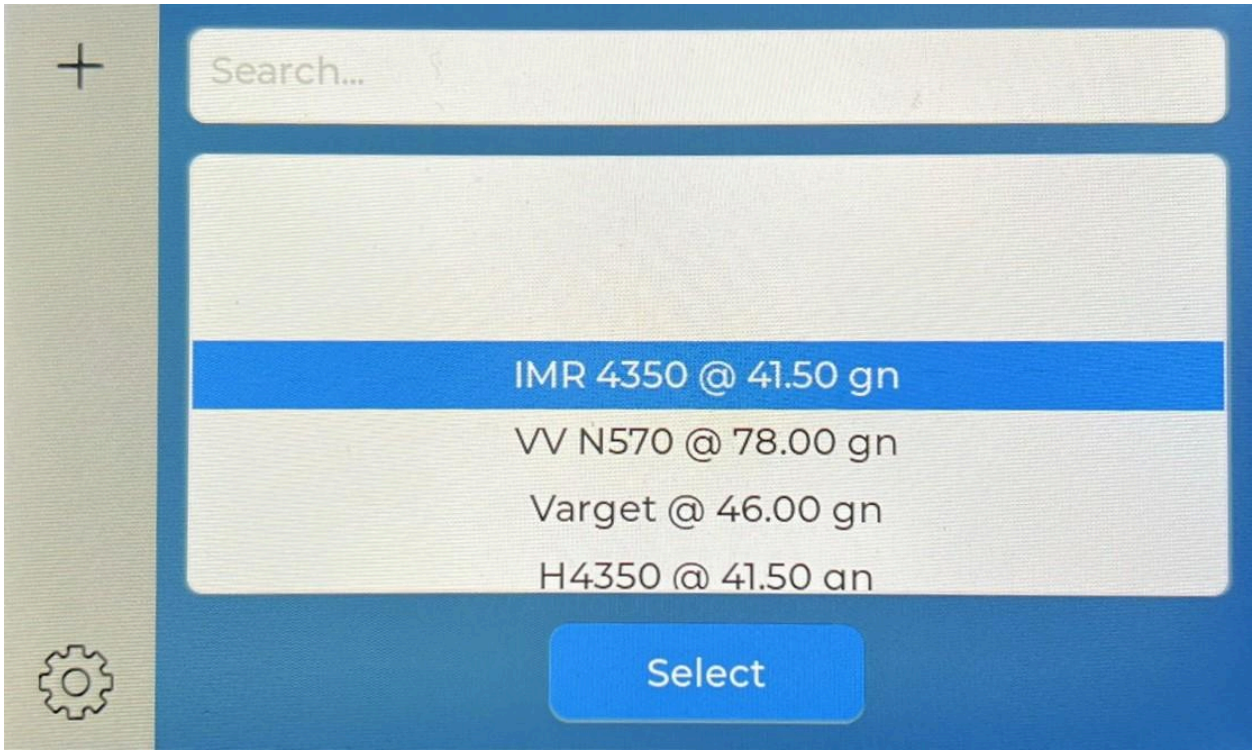


Once the process completes the load profile will be updated automatically with the best amplitude and duration. Click “Exit” to return back to the load profile screen.

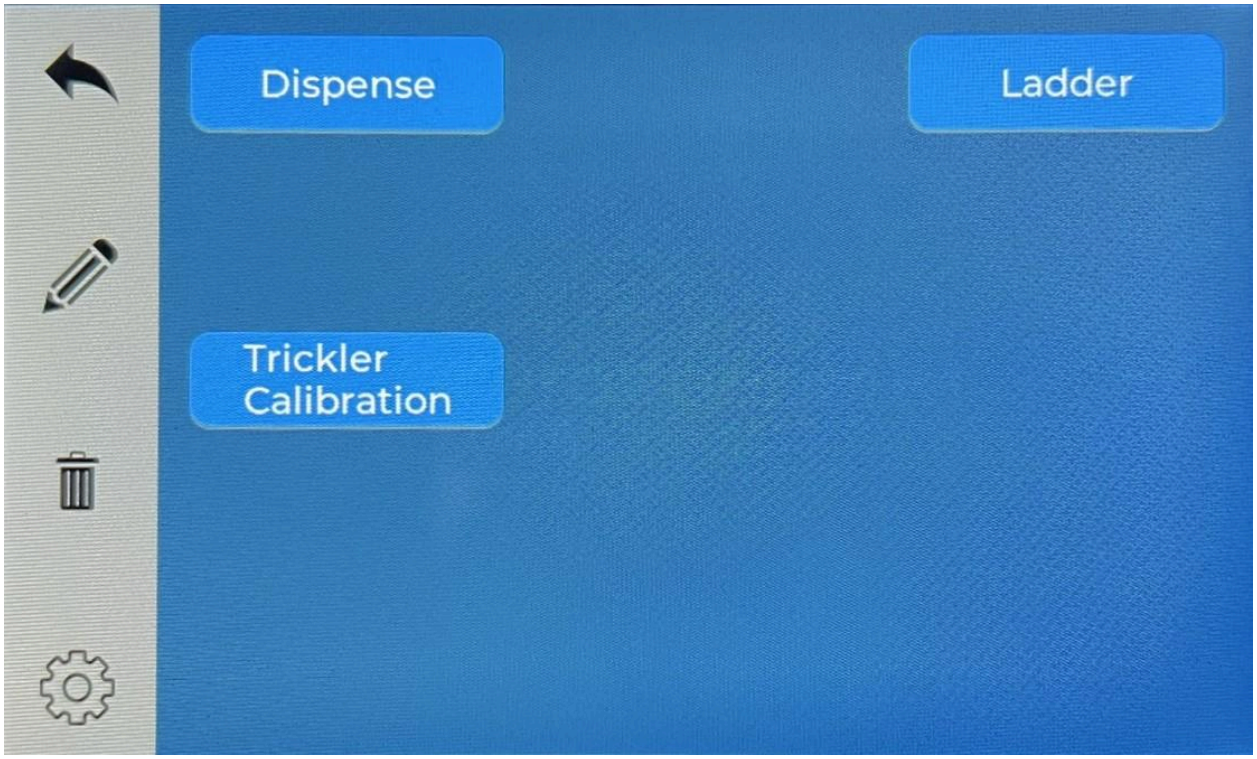



## Selecting a Load Profile

On the load profiles screen, scroll through the list of load profiles stopping on the load profile of interest and click the “Select” button. The system will move to the load profile screen.

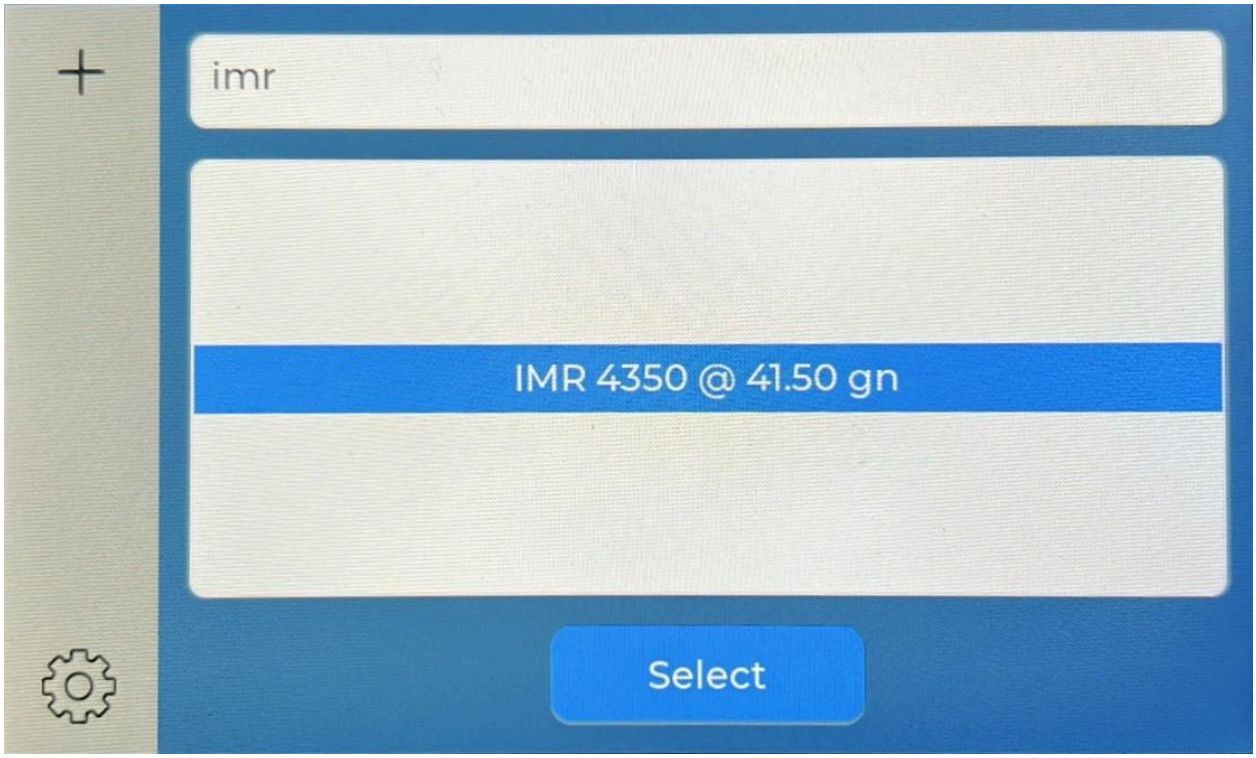



Load profile screen.



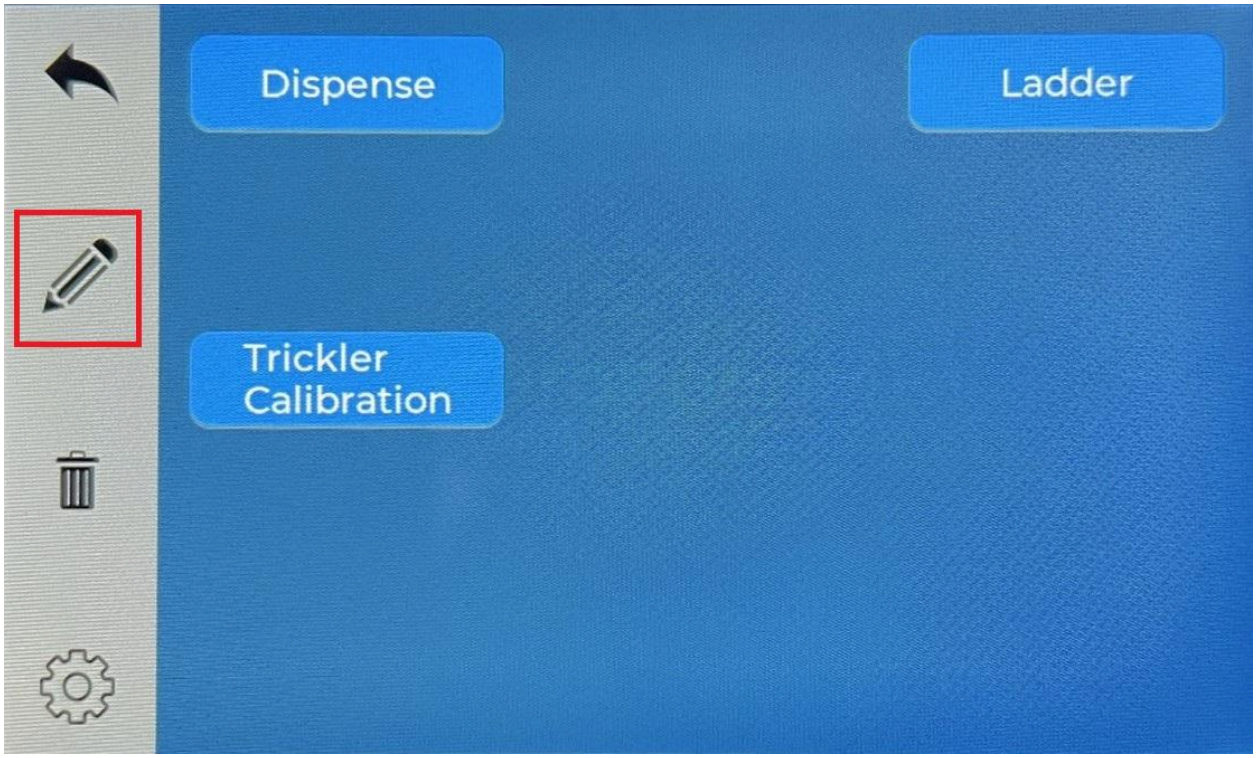
## Filtering Load Profiles

The search function can be used to filter the list of load profiles. This is especially helpful as the number of load profiles in the system increases.

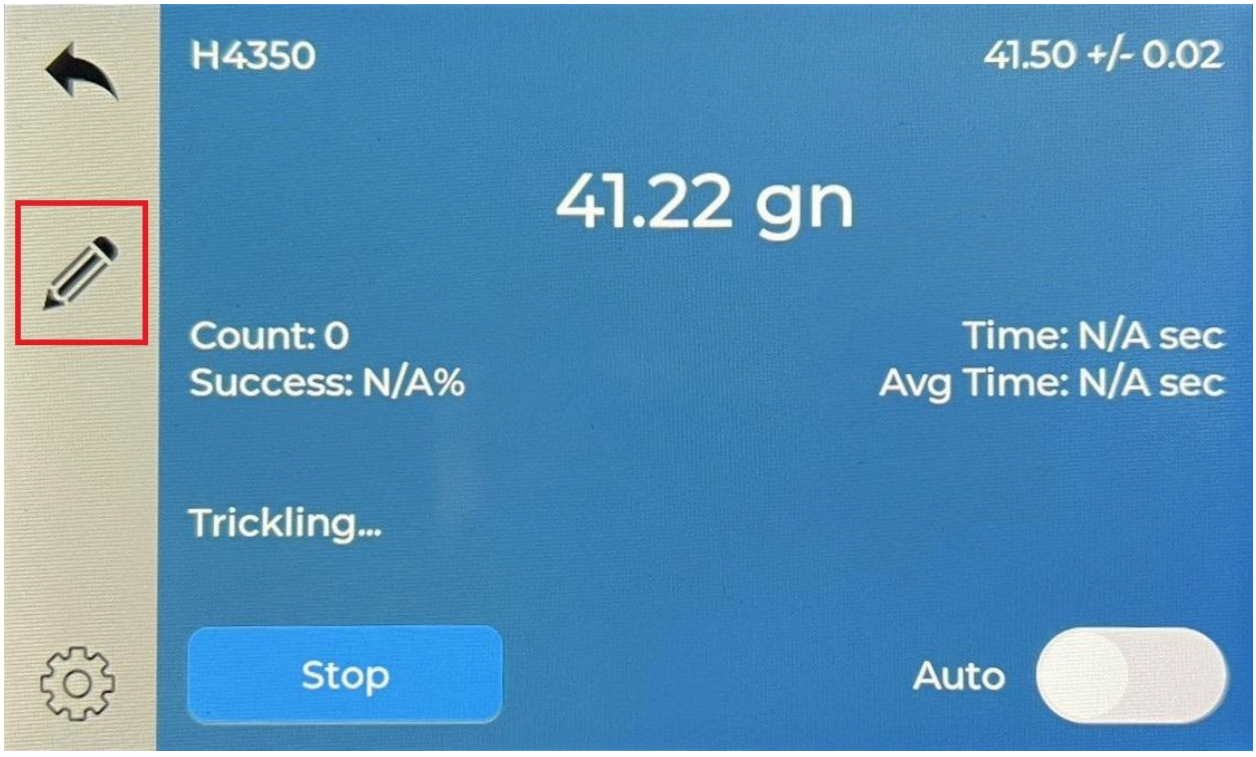



## Editing a Load Profile

A load profile can be edited by clicking on the “pencil” button on the load profile screen.

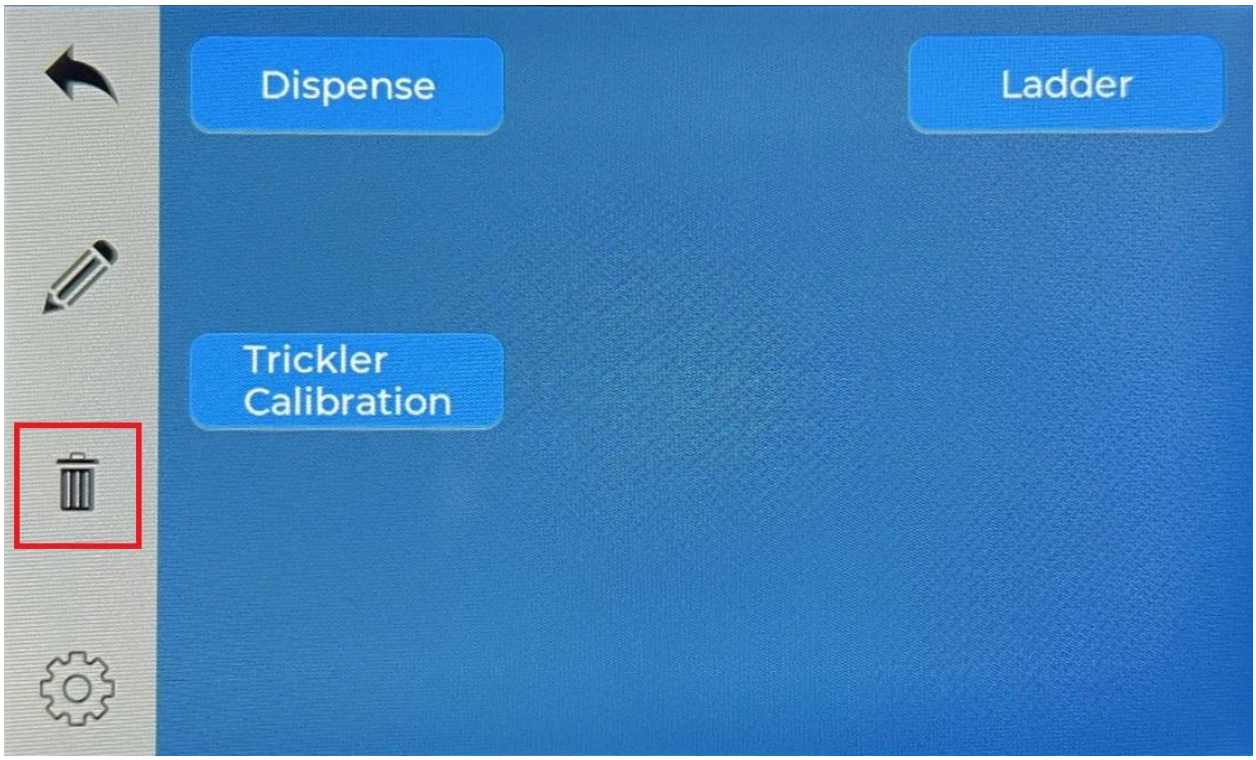



A load profile can also be edited from the dispense screen.



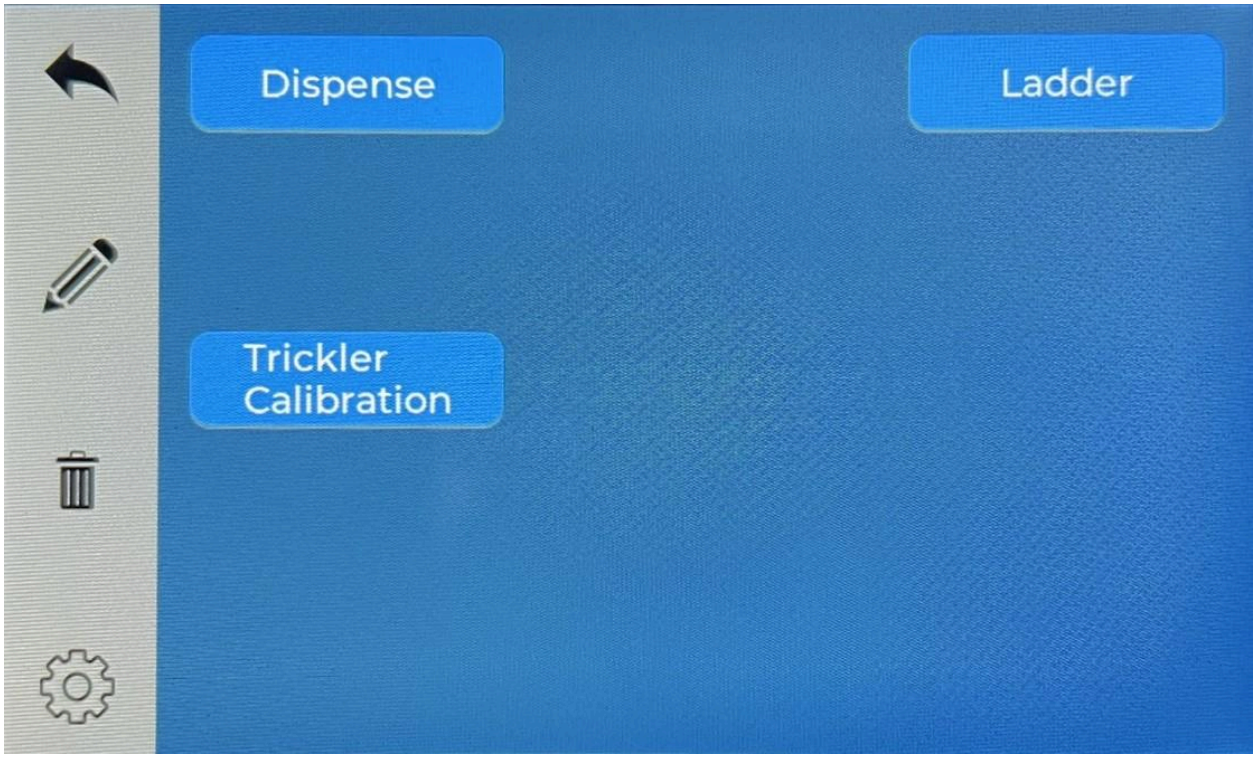
## Deleting a Load Profile

To delete a load profile click the “trash can” button on the load profile screen.




## Dispensing a Load

To dispense a load click the “Dispense” button on the load profile screen. The system will move to the dispense screen.




Click the “Dispense” button to dispense a single load. The system will only dispense if the balance is reporting a weight that is between the minimum and maximum balance value specified in the system settings. Once a load has been dispensed simply place an empty cup back on the balance and click the dispense button again.

To cancel a dispense click the “Stop” button.
Dispensing will stop if either one of these occurs:

- User lifts the powder cup off the balance
- Balance is turned off
- Connection to balance is severed


## Dispense Status

The background will turn green if the dispense was successful.


The background will turn red if the dispense was unsuccessful.

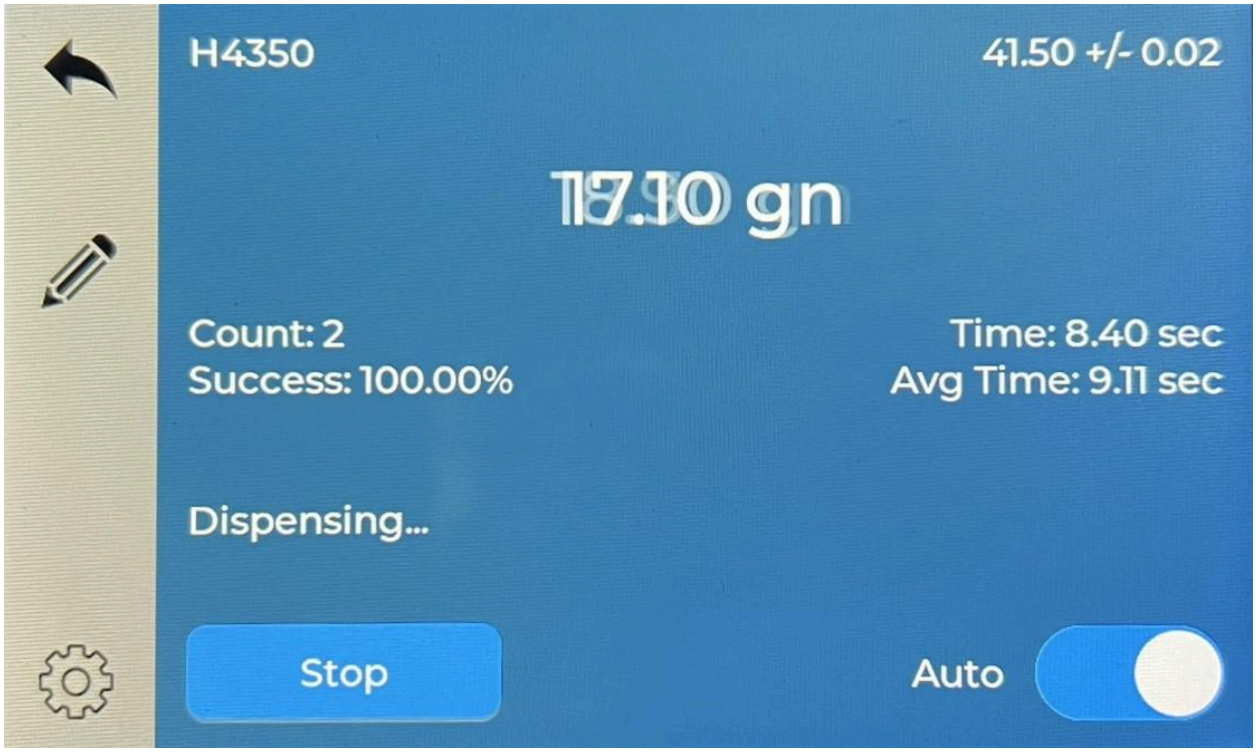
## Dispense Statistics

The dispense screen has the following statistics:

- Count - number of successful dispenses
- Success - percentage of successful dispenses vs total dispenses
- Time - last successful dispense time
- Avg Time - average time of successful dispenses


## Auto Dispensing a Load

Toggle the “Auto” switch on. With the “Auto” switch on, anytime an empty cup is placed back on the balance the system will automatically start to dispense.

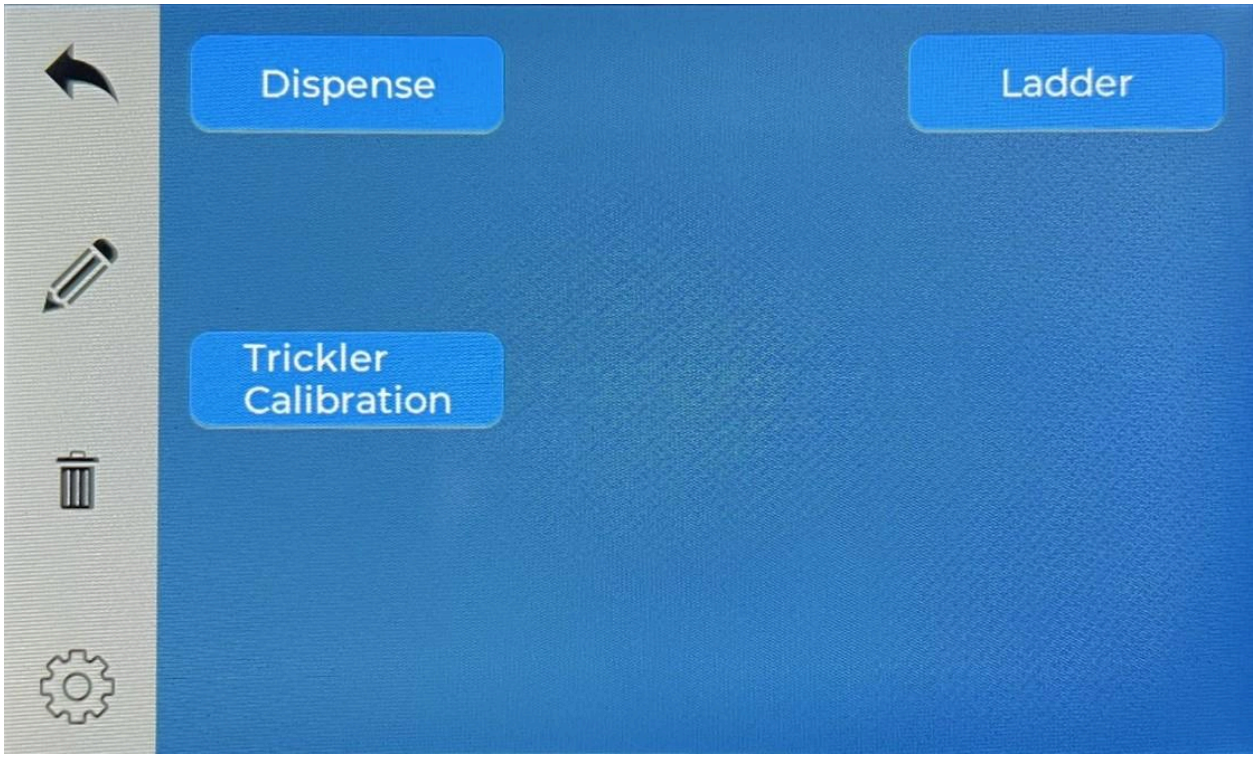



## Ladder

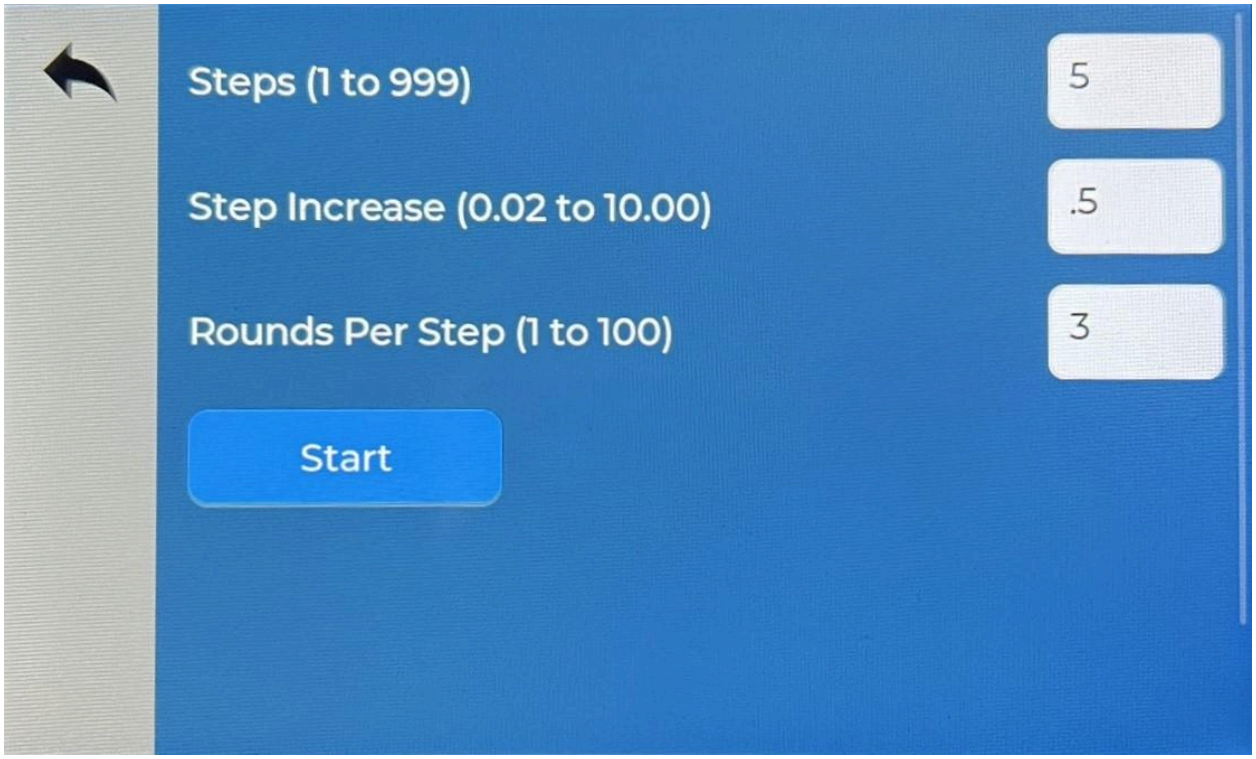
A load ladder is used to automatically dispense loads with increasing weights. The load ladder uses the load's weight as the starting weight. Three additional parameters are required steps, step increase and rounds per step. The AutoDropper will not count a bad (overthrown or underthrown) load as part of the rounds per step. The AutoDropper will prompt the user before moving to another ladder step.
In the example below a load ladder is defined with a starting weight of 41.5 GN, 5 steps, 0.50 GN increase per step and 3 rounds per step. A bad load of 42.55 GN is included to demonstrate the AutoDropper not counting a bad load as part of rounds per step. Thus the following loads should be dispensed:

- 41.50, 41.50, 41.50
- 42.00, 42.00, 42.00
- 42.50, 42.50, 42.55, 42.50
- 43.00, 43.00, 43.00
- 43.50, 43.50, 43.50

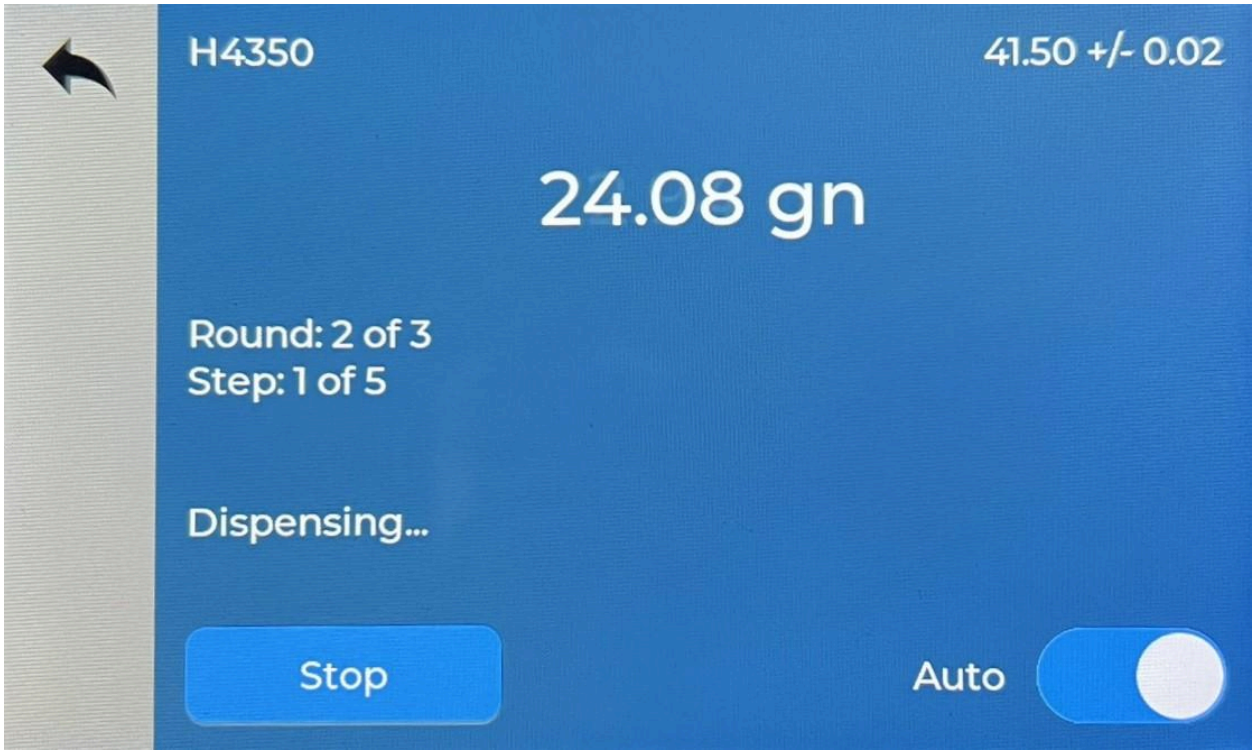
Click the "Ladder" button on the load profile screen.




Specify ladder parameters and click the “Start” button.

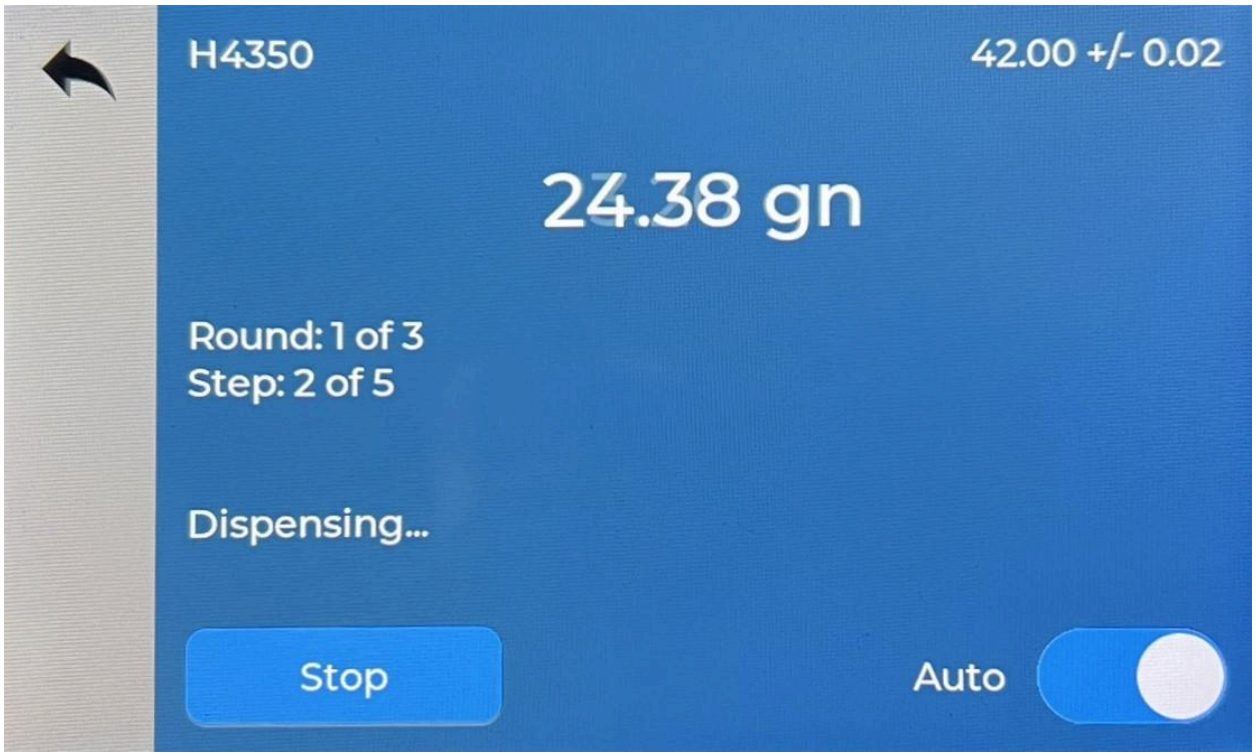



Similar to the the dispense screen either press the “Dispense” button to dispense a single load or toggle the “Auto” switch on to auto dispense.




The system will prompt the user before moving to the next ladder step. Selecting “No” will result in another load being dispensed at the current weight. This can be beneficial if for whatever reason another load needs to be dispensed at the current weight. Selecting “Yes” will move to the next ladder step.

Target weight has been changed from 41.50 GN to 42.00 GN.




Similar to the dispense screen the background will change to green if a dispense was successful and red otherwise. The screen also reports the progress by updating the round and step values. The back button can be used to cancel the load ladder.


# Load Parameters

| Parameter Name | Default Value | Value Range | Notes |
|---|---|---|---|
| Name | | | |
| Weight | 0 GN | 0.02 to 999.99 GN | |
| Accuracy | ± .02 GN | 0.02 to 1.0 GN | By default the accuracy is +/- 0.02 GN. Dispense result within the +/- 0.02 GN of the target weight would be valid and accepted. The accuracy parameter allows the user to increase the valid result range.<br><br>This parameter should be left at default unless dispensing powder with kernels heavier than .08 GN such as VV N570. In these cases margin of error should be set to ½ of the kernel weight. |

| | | | |
|---|---|---|---|
| | | | Example:<br>Powder N570 has a kernel weight of .08<br><br>Weight: 41.50 GN<br>Accuracy: ± 0.04 GN<br><br>Results in valid range [41.46, 41.54] |
| Bulk Speed | 100% | 0 to 100% | Speed at which the bulk dispenser tube spins at, thus directly related to how fast powder is dispensed. Recommend keeping it at 100% unless load weight is so small that speed must be slowed to prevent overthrow. **When the bulk speed is changed the system will have to go through its bulk dispense learning process.** |
| *Bulk Slowdown Offset (AI)* | 0.00 | 0 to 100 GN | Offset at which the bulk dispenser will start its slow down process.<br><br>This parameter is adjusted by the system if “AI Enabled” is ON. |
| *Bulk Lag (AI)* | 0.00 | 0 to 100 GN | Difference between current balance reported weight vs predicted actual. The system must account for powder that is in flight before it lands on the balance and for the time that the balance takes to report it back.<br><br>This parameter is adjusted by the system if “AI Enabled” is ON. |
| Trickle Amplitude | 250 | 0 to 255 | Intensity at which the vibrations will occur at. A higher number means a stronger vibration. |
| Trickle Duration | 23 ms | 0 to 999 ms | Amount of time the trickler will vibrate for. |
| Trickle Start | .24 GN | 0.02 to 999.99 GN | Difference from Pulse 1 Start at which point trickle starts. |
| *Trickle Delay (AI)* | 120 ms | 0 to 999 ms | Amount of time between trickles. |

| | | | |
|---|---|---|---|
| | | | This parameter is adjusted by the system if “AI Enabled” is ON. |
| Pulse 1 Start | .04 GN | 0.02 to 999.99 GN | Difference from Pulse 2 Start at which point pulse 1 starts. |
| *Pulse 1 Delay (AI)* | 420 ms | 0 to 999 ms | Amount of time between pulse 1 pulses.<br><br>This parameter is adjusted by the system if “AI Enabled” is ON. |
| Pulse 2 Start | .06 GN | 0.02 to 999.99 GN | Difference from target weight at which point pulse 2 starts. |
| Pulse 2 Delay | 1200 ms | 0 to 999 ms | Amount of time between pulse 2 pulses. |

# Settings

| Parameter Name | Default Value | Notes |
|---|---|---|
| AI Enabled | Yes | When set to yes, the system will learn from previous dispense failures and adjust load parameters automatically. |
| Rezero Balance | Yes | When set to yes, balance will be re-zeroed if its current weight is not 0.00 and is between the “Min Balance Value” and the “Max Balance Value”. |
| Min Balance Value | - 0.02 GN | Dispensing will not be allowed when balance is reading less than this value. |
| Max Balance Value | 0.02 GN | Dispensing will not be allowed when balance is reading more than this value. |
| Screen Brightness | 60% | |
| WiFi SSID | | |
| WiFi Password (WPA) | | |
| Update Server | | autodropper.s3.us-west-1.amazonaws.com<br><br>Location that the system checks for and fetches firmware updates. |

# Firmware Update

The system supports two ways to update the firmware running on the device. The primary approach is to utilize the WiFi capability of the system to query the update server. The update server will inform the MK2 of the latest available firmware. To check for an update select “Check for update” in the system settings. The MK2 will inform the user if the system is running the latest firmware or whether they want to update to the latest firmware. The secondary approach is to copy the firmware onto a fat32 formatted USB flash drive. Please note that Microsoft Windows will only format USB flash drives as fat32 that are 32GB or smaller in size. With the drive attached to the MK2 select the option “Update from USB”. The system will prompt the user to update the firmware if it finds an update on the USB flash drive.

# Tips

## Bulk Speed

- In general the bulk speed should be kept at 100% as it will automatically slow down as it approaches the trickle target.
- Setting bulk speed to 0% effectively turns of the bulk dispenser and only the trickler will be used to dispense powder.

## Trickler

- By default the bottom of the tip end of the trickler should be 5.5” above the desk/table.
- Keeping the trickler angle constant makes switching powders easier and quicker. If the trickler angle is varied between powders, then the user will have to keep track of it and set it according to the powder being dispensed.
- Trickle amplitude and duration should be used to tune trickling.
- Powder reports on the web site were performed with the default angle unless noted.
- Setting too long of a trickle duration may result in overthrows.
- Setting too low of a trickle or pulse delay may result in overthrows.
- Make note of overthrow reasons displayed on the dispense page to correctly diagnose and fix overthrow issues.
- It may be better to accept an occasional overthrow vs 100% success ratio at a slower pace.

# Warranty

The AutoDropper MK2 is warranted to be free from any defects in material or workmanship under normal use for the period of two (2) years from the invoice date. The warranty is transferable to subsequent owners. The warranty covers all parts and components supplied with the AutoDropper MK2. Please keep a copy of your invoice as this will serve as your proof of

purchase. This product is intended for non-commercial use. Any other use of this product will void the warranty.

Warranty claims can be submitted by emailing AutoDropperLLC@gmail.com