

Weight Scale Integration

OVERVIEW

The following document aims to provide an overview of the weight scale integration into the Harvard Apparatus pump platform. A basic overview will be provided, and any additional features added to improve the overall functionality of the scale itself will be explained.

Additional features include:

- Support on the pump interface for scale functions such as tare
- Display of the scale reading on the pump GUI
- “Auto-Tare” option to allow quick transition into new measurements
- “Slow-Down” to dramatically increase accuracy for high sensitivity applications
- “Anti-Drip” to prevent spillage after measurement without having to manually adjust the tubing

Platform Support

Currently, the pump firmware is designed to support only the **Mettler Toledo XS** series, the **Ohaus Defender 5000** series, and the **Ohaus Ranger** series.

Pictured below is the back plate of a Harvard Peristaltic Pump with weight scale support. The scale is connected to the innermost RJ11 port₁ and a PC can optionally be connected to send commands via the outermost port₂.



FEATURE EXPLANATION

This section gives a more detailed overview of the three key additional features mentioned in the overview above.

Auto-Tare

The auto tare feature allows for the user to select to automatically tare the connected scale each time the pump is run. This feature aims to improve the user experience of those who might use the same settings to dispense multiple samples. Without having to stop and clear the scale each time, the user can accomplish their task much more quickly and easily. This feature can be easily disabled in the scale settings menu for those who prefer to manually clear the scale between runs or accumulate weight over multiple runs.



NOTE: When enabled, auto-tare will occur every time the run button is pressed, even upon a pause.

Slow-Down

The slow down functionality allows the user to more accurately dispense their solution by effectively eliminating the risk of over dispensing due to high motor rates. To do this, the user selects an additional slower taxi rate setting and an additional taxi weight less than the overall weight goal. When this taxi weight is reached, the motor will automatically adjust to the taxi rate. This allows users who require large weight targets to speed up the dispensing process without risking an increased loss of accuracy. For those users who do not need such a high level of precision, this feature can be selectively disabled in the scale settings menu.

Anti-Drip

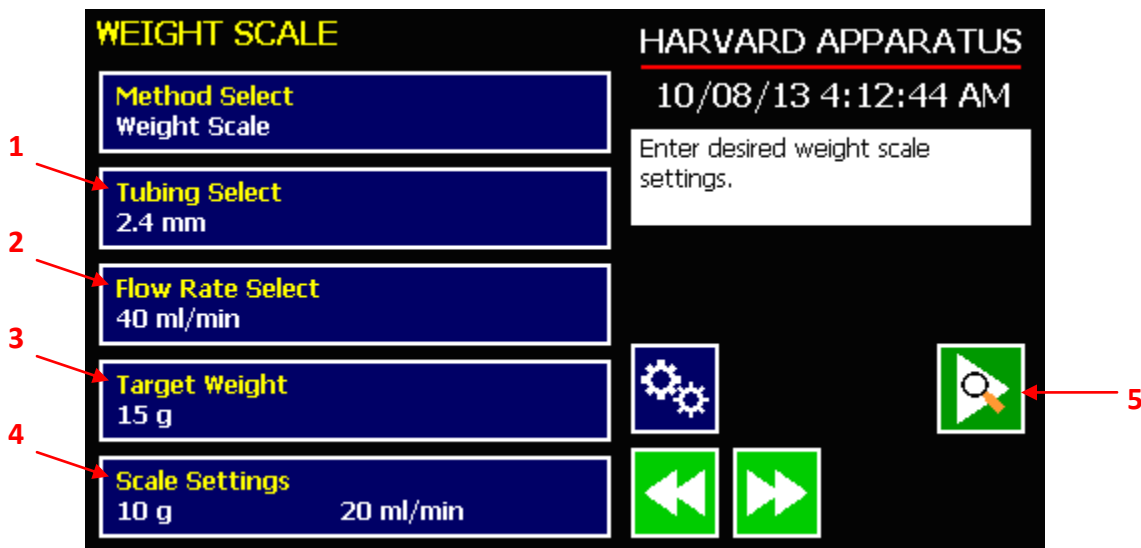
When enabled, the anti-drip feature automatically runs the motor 90° in the reverse direction for the 416 milliseconds after the pump finishes dispensing at 10% of the maximum motor speed. This prevents any unwanted solution still in the tubing from dripping out and skewing the accuracy of the measurement. This feature will greatly improve the accuracy of highly precise applications. Like all other weight scale features, anti-drip can be selectively disabled from the scale settings menu.

PUMP INTERFACE

Regardless of the choice of scale platform, the pump-end user interface remains standardized. The following section aims to provide a basic overview of these screens along with an explanation of the different buttons and information they contain.

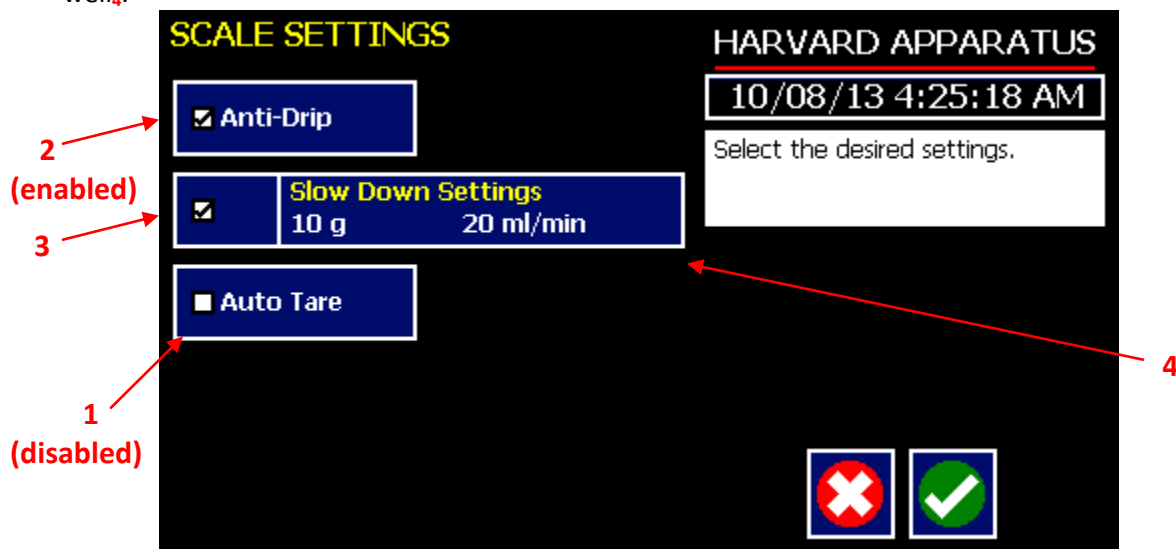
Weight Scale Method Main

This is the main screen for the weight scale method. From here, the tubing/syringe diameter¹, flow rate², and target weight³ can be set. Additionally, this is where the scale settings menu⁴ can be accessed from. When all the settings are satisfactory, the run preview button can be pressed to proceed to the run screen⁵.



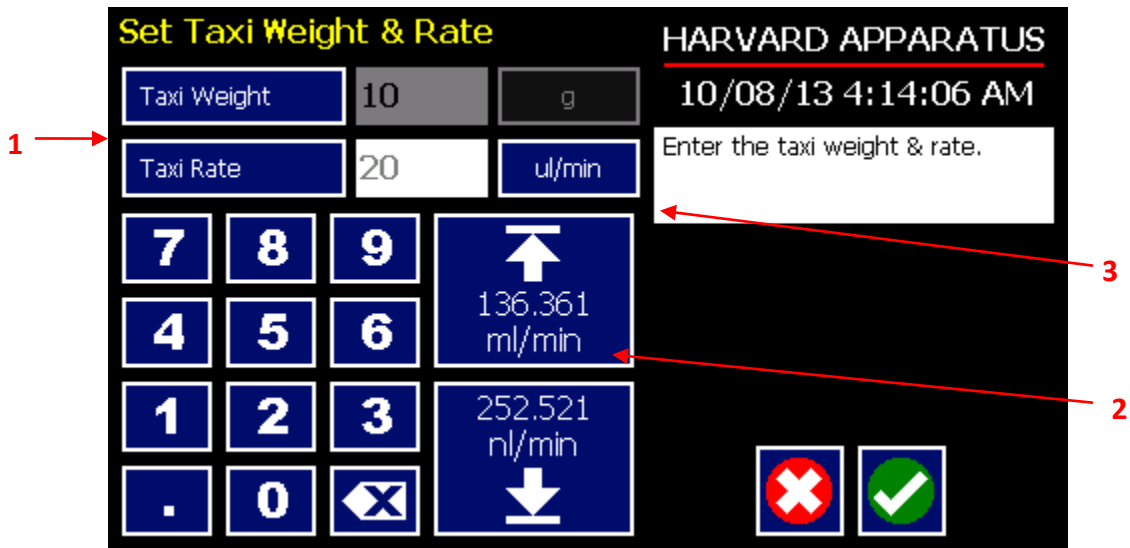
Weight Scale Settings Menu

This is the screen from which the optional features such as anti-drip¹, auto-tare², and slow-down³ are enabled. The slow-down taxi rate and weight settings are changed from this screen as well⁴.



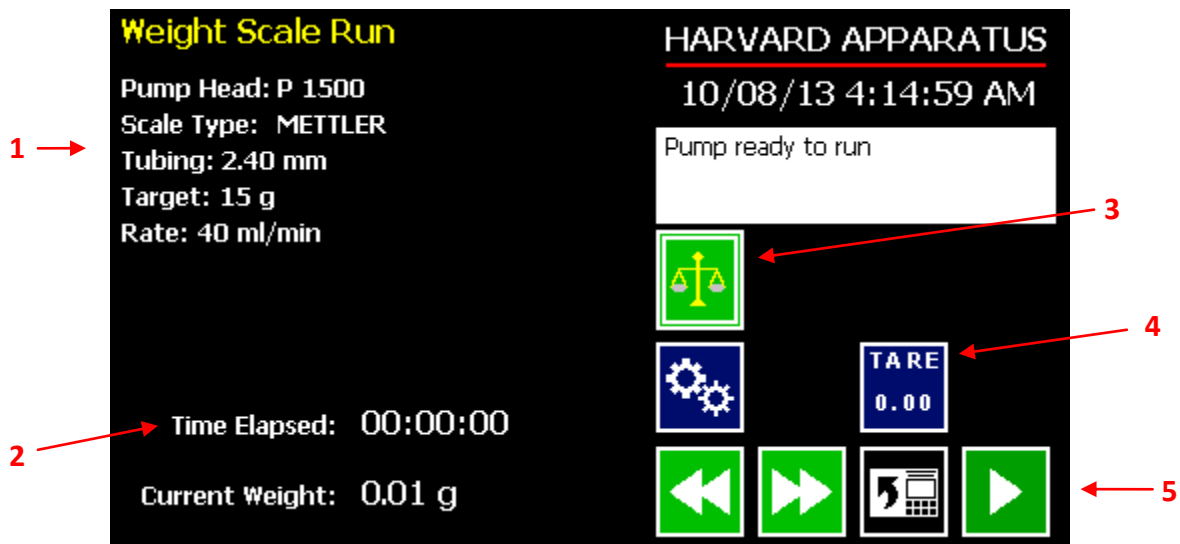
Weight Scale Slow Down Settings

On the slow down settings screen the user can enter the taxi rate/weight₁ and adjust the units for each using the appropriate units buttons₂. As a shortcut, the taxi rate can be entered using the maximum and minimum buttons₃. However, the taxi rate and the taxi weight must be lower than the flow rate and the target weight.

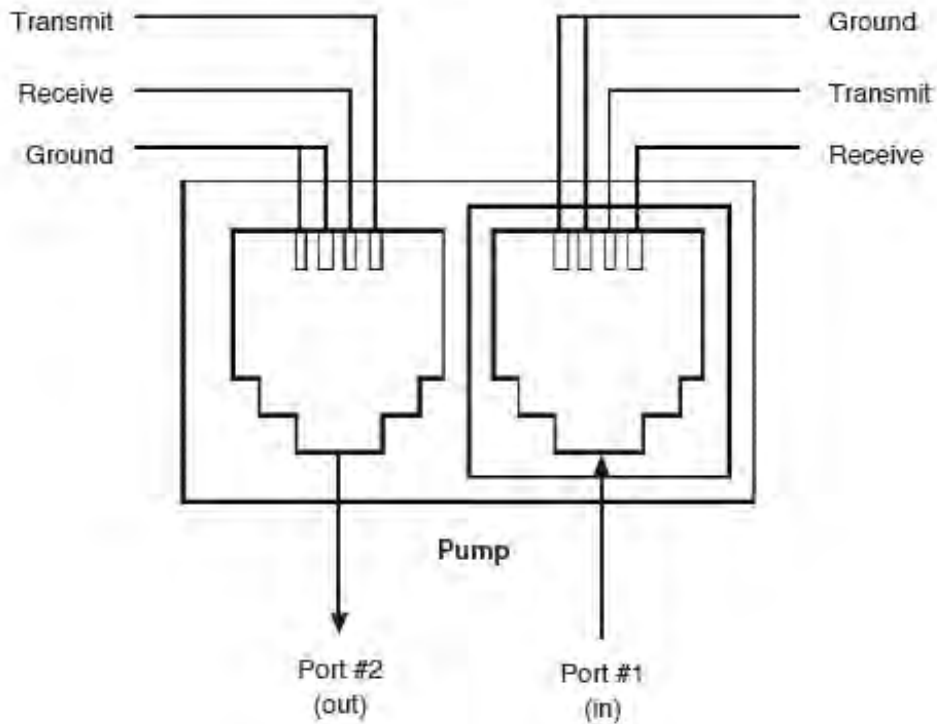


Weight Scale Method Run

The run screen is the screen from which the method is executed. The information about the scale and method settings₁ is displayed in the top left for reference. The time elapsed and current weight₂ are displayed as well. The scale icon₃ indicates the connection status of the scale, green for connected and red for disconnected. The tare button₄ is present on the run screen and can be used to send the tare command from the pump GUI. The motor can be started by pressing the run button₅ in the bottom right corner.



RS232 Connection



Port #1: PC
Port #2: Scale

CURRENT PC COMMANDS

This section provides a brief overview of the current weight scale commands. Each command is listed along with its function and appropriate syntax. All commands only work while within the weight scale method on the pump.



NOTE: When in the Weight Scale Method, the pump defaults to POLL=REMOTE. See the Peristaltic Pump User Manual for additional information.



NOTE: It is recommended that the user is on the “run” screen of the weight scale method. Settings should not be changed while the motor is running.

Weight Scale Settings

In order for the weight scale to communicate with the pump, the following RS232 settings must be used on the weight scale:

Baud Rate: 9600
Data Bits: 8
Parity: None
Stop Bits: 1
Handshaking: None

Scale Type

Sets or displays the current scale type.

Syntax: type

Rate

Sets the rate, passing no rate value will display the current rate

Syntax: srate { [float] [PL|UL|ML|L]/[US|MS|SEC|MIN|HR] }

Taxi Rate

Sets the taxi rate, passing no rate value will display the current taxi rate

Syntax: trate { [float] [PL|UL|ML|L]/[US|MS|SEC|MIN|HR] }

Target Weight

Sets the target weight, passing no weight value will display the current weight target

Syntax: sweight { [float] [G|KG] }

Current Weight

Queries the current weight reading of the connected scale

Syntax: cweight

Taxi Weight

Sets the taxi weight, passing no weight value will display the current taxi weight.

Syntax: tweight { [float] [G|KG] }

AutoTare

Turns the auto-tare feature on or off. Passing no setting will display the current setting.

Syntax: atare {on|off}

AntiDrip

Turns the anti-drip feature on or off. Passing no setting will display the current setting.

Syntax: drip {on|off}

Slow down

Turns the slow down feature on or off. Passing no setting will display the current setting.

Syntax: slow {on|off}

Zero

Sends the zero command to the connected scale

Syntax: zero

Tare

Sends the tare command to the connected scale

Syntax: tare

Run

Starts the weight scale method

Syntax: srun

Stop

Stops the weight scale method

Syntax: sstop

Status

Returns the status of the connected scale

Syntax: sstat

Response:

- D* - Scale is disconnected
- ** - Motor is stalled
- R* - Motor is running
- G* - Target is reached and motor is stopped
- S* - Target is not reached and motor is stopped