Laminar Wash™ MINI 1000 System User Manual

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Laminar Wash MINI 1000 System User Manual

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The information contained in this manual is believed to be accurate, but Curiox Biosystems Pte. Ltd. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

IMPORTANT NOTICE

Please carefully adhere to all instructions provided in this User Manual, as failure to do so may result in the invalidation of your service contract.

Trademarks

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Chapter 1:

General Information

Chapter Overview

- General Information
- Introduction to the Laminar Wash MINI 1000
- Chemical Compatibility
- Safety
- Customer Service and Technical Support

General Information

In general, this user manual has been written for the purpose of providing technical, installation, operating and troubleshooting information to the operators of the Laminar Wash MINI 1000 (MINI). The content of this manual includes:

- How to set up and operate the MINI
- The principle of operation and modes of function for the MINI
- Safety features of the MINI and precautions to ensure safe operation
- Troubleshooting procedures and maintenance

Introduction to the MINI

The Laminar Wash system enables sample preparation for multi-color flow cytometry, single-cell 'omics, and other cellular analytical methods. It bypasses the need for centrifugation for washing cells in suspension. The Laminar Wash technology is designed to maintain samples in a 16-droplet based format instead of using a conventional microwell with walls. It is a centrifuge-less processing method using the unique wall-less features of the Laminar Wash technology combined with an automated washer. The MINI generates a laminar flow for each drop on the Laminar Wash Strip via dual-nozzle action, with one nozzle dispensing liquid into the drop and the other nozzle aspirating liquid. The Laminar Wash workflow is superior to the traditional centrifugation method by enabling the equivalent of multi-centrifuge washes in a one-step automated wash that may be accomplished within a shorter length of time.

Technical Specifications

Description	Specification
Physical	
Dimensions	232 mm H x 275 mm W x 187.5 mm D
Weight	3.5 kg
Electrical	
Voltage Requirement	100 - 240 V (+/- 10% fluctuation in nominal voltage)
Voltage Input	24V ⎓ 3.0A
Environmental	
Environment	Indoor Use
Operating Temperature Range	4 - 28 °C
Operating Humidity	< 80%, non-condensing
Altitude	Up to 2000m
Pollution Degree	Degree 2
Operation	
Plate Type	Laminar Wash Strip in 16-well format
Capacity	1 strip per operation
Performance	
Flow rate at nozzle	5-20µL/s
Volume capacity	80µL per nozzle at factory settings
Wash sequence	8 wells simultaneous washing
Dilution factor per cycle	Approx. 3.5 times at factory settings
Bulk flow rate for priming	Approx. 300mL/ min
User Interface	
Display	LCD display
Input control	6 input buttons
Number of washes per cycle	50 selectable washes
External Interface	
Electrical inlet	Power inlet jack
1x liquid inlet	A connector for incoming fresh wash buffer
1x liquid outlet	A connector for outgoing waste wash buffer

Chemical Compatibility

The components exposed to fluids and reagents are composed of materials which were selected to be resistant against common chemical substances. However, some common disinfectants should not be used when decontaminating the MINI. Table 1-1 on page 4 lists the material composition of the main components of the MINI and shows some reagents which do not pose issues when in contact with these components. However, some reagents are not compatible with the component materials, and prolonged contact should be avoided to prevent corrosion and damage.

Component	Material	Approved Chemicals	Incompatible Chemicals
Internal base structure	Stainless Steel (304)	Ethanol, Benzene, Chloroform, Acetaldehyde, Propylene Glycol, Isopropanol, Formaldehyde, Phenol, Grease, Potassium Permanganate	Hypochlorite bleach, Sulfuric Acid
Some minor components of main body	Delrin (Polyoxymethylene)	Ethanol, Benzene, Soap Solutions, Tetrahydrofuran, Formaldehyde, Propylene Glycol, Isopropanol, Potassium Permanganate	Acetic acid, Grease, Ketones, Ozone, Phenol, Ammonia, Hypochlorite bleach, Iodine, Hydrogen Peroxide, Phosphoric Acid, Sodium Hydroxide (>50%)
Internal structural parts	Stainless Steel (304)	Ethanol, Benzene, Chloroform, Acetaldehyde, Propylene Glycol, Isopropanol, Formaldehyde, Phenol, Grease, Potassium Permanganate	Hypochlorite bleach, Sulfuric Acid
Tubing	Plastic	Acids, Bases, Alcohols, Salts	Ketones, Hydrocarbons

Table 1-1: *Chemical compatibility between the component materials in the MINI, including common reagents and disinfectants. (Adapted from Ingersoll Rand Industrial Technologies, 2008 & K-mac Plastics).*

Safety

User Attention Notifications

Several user attention phrases are used throughout this manual. Each phrase should draw the following level of attention from the user:

NOTE	Points out useful information.
IMPORTANT	Indicates information necessary for proper instrument operation.
CAUTION	Cautions users regarding potentially hazardous situations with regard to user injury or damage to the instrument if the information is not heeded.
!WARNING!	Warns users that serious physical injury can result if warning precautions are not heeded.

Chemical Hazards

!WARNING! CHEMICAL HAZARD

Some chemicals used can be potentially hazardous, and can cause injury or illness.

- Read and understand the Safety Data Sheets (SDS) provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials.
- Minimize contact with and inhalation of chemicals. Wear appropriate personal protective equipment when handling chemicals (e.g., safety glasses, gloves, or clothing). For additional safety guidelines, consult the SDS.
- Do not leave chemical containers open.
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer's clean up procedures as recommended on the SDS.
- Comply with all local, state/provincial, or national laws and regulations related to chemical storage, handling, and disposal.

Chemical Waste Hazards

- Read and understand the Safety Data Sheets (SDS) provided by the manufacturers of the chemicals in the waste container before you store, handle, or dispose of chemical waste.
- Minimize contact with chemical waste. Wear appropriate personal protective equipment when handling chemicals (e.g., safety glasses, gloves, or clothing).
- Use precaution when emptying the waste bottle.
- Dispose of waste bottle contents in accordance with good laboratory practices and local, state/ provincial, or national environmental and health regulations.

Safety Data Sheets

Some chemicals used with the MINI may be listed as hazardous. Warnings are displayed on the labels of all chemicals when hazards exist.

SDS provides users with safety information needed to store, handle, transport and dispose of the chemicals safely. Curiox recommends updating laboratory MSDS records periodically.

Instrument Safety Labels

The following safety labels are located on the MINI. The safety alert symbol indicates a potential safety hazard.

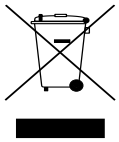
Symbol	Description
	Pinch point hazard and sharp needles caution. Access is restricted to trained maintenance personnel.
	Separate collection for electrical and electronic equipment.
	Potential Biohazards. Some assays or specimens may pose a biohazard. Adequate safety precautions should be taken as outlined in the specimen's package insert.

Table 1-2: *Instrument safety labels*

Instrument Safety Features

Power Supply

The universal power adapter can accommodate electrical power in the range of 100 - 240 V. The resultant output to the MINI power jack is 24 V DC.

Disconnecting Device

When operating the machine, always position the power adapter at a location that is easily accessible to the user. Disconnect machine by detaching the power adapter plug.

Stop

Activating the **START/ STOP** button in the middle of a washing cycle will cause the machine to halt activity immediately. The machine returns to home position when the **START/ STOP** button is pressed again.

Figure 1-3: *Stop Button and Rail Guard*

Machine Homing

In the event that power to the machine is cut off in the middle of a washing cycle and subsequently switched on again, the machine will return to home position.

Rail Guard

A rail guard (see Figure 1-3) is installed as a safety feature to prevent user's access to moving plunger block during machine operation. Access to plunger block is restricted to trained maintenance personnel.

Safety Precautions

- At the end of a wash process, remove the strip from the feeder platform immediately to prevent the wells from drying, stressing cells and/or deteriorating biological integrity.
- Keep the area around the power supply free from liquid.
- During active operation, keep your hands off the instrument other than using the display panel.
- If there is an unexpected error, reset the instrument by turning the power switch off and back on.

General Precautions

- Do not use any other strip except the specified 16 wells format Laminar Wash Strip with the MINI.
- Do not load more than one Laminar Wash Strip in the MINI at a time.
- Use only the supplied power adapter cord for electrical supply to the unit.
- Do not allow particles larger than 200 µm to enter any of the liquid tubes.
- Be careful not to spill liquid onto the interior of the MINI.
- Always perform a cleaning cycle with an appropriate cleaning solution at the end of an experiment.
- Keep the original packaging material in case the unit should ever need to be shipped.
- Do not attempt to open or remove the instrument casing or motor parts. Doing so will void the calibration and warranty and may cause permanent damage to the instrument.
- Contact only qualified Curiox personnel for servicing of the MINI.

Prior to System Operation

Ensure that all users of the MINI have:

- Received instruction in general safety practices for laboratories.
- Received instruction in specific safety practices for the instrument.
- Received instruction on handling of biohazards if biohazardous materials are to be used on the system.
- Read and understood all related SDS.

CAUTION:
Avoid using the MINI in a manner not specified by Curiox. While the system has been designed to protect the user, this protection may be impaired if the instrument is used improperly.

CE Mark

Based on the testing described below and information contained herein, this instrument bears the CE mark.

Directive 2014/30/EU Electromagnetic Compatibility

This device has been type-tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1:2013/ IEC 61326-1:2012 Electrical equipment for measurement, control and laboratory use.

Directive 2014/35/EU Low –Voltage Device

This device has been verified and found to meet the requirements of Directive 2014/35/EU “electrical electronic equipment designed for use within certain voltage limits”.

The device has been type-tested by an independent testing laboratory and was found to meet the requirements of this Directive. Verification of compliance was conducted to the limits and methods of the following:

EN 61010-1, “Safety requirement for electrical equipment for measurement, control and laboratory use. Part 1, General requirements.”

EN 61010-2-081, “Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes.”

Directive 2015/863 Restriction On the use of Hazardous Substances (ROHS 3)

This device has been verified and found to meet the requirements of Directive 2015/863 “restriction on the use of certain hazardous substances in electrical and electronic equipment”.

Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE)

Dispose of the device according to Directive 2012/19/EU, on “waste electrical and electronic equipment (WEEE)” or local ordinances.

FCC

Based on the testing described below and information contained herein, this instrument bears the FCC mark.

FCC CFR 47 Part 15B Unintentional Radiators

This device has been type-tested by an independent, accredited testing laboratory and found to meet the requirements of CFR, Title 47, Part 15B for unintentional radiators.

Customer Service and Technical Support

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Chapter 2:

Functional Description

Chapter Overview

- Introduction
- Functional Description

Introduction

This chapter gives a detailed overview of the parts of the MINI and the phases which outline a typical washing process.

Functional Description

The simple interface located on the top front panel of the MINI allows operators to adjust the number of desired wash cycles and the initial sample volume which will be shown numerically on the display. The main components of the MINI are shown below.

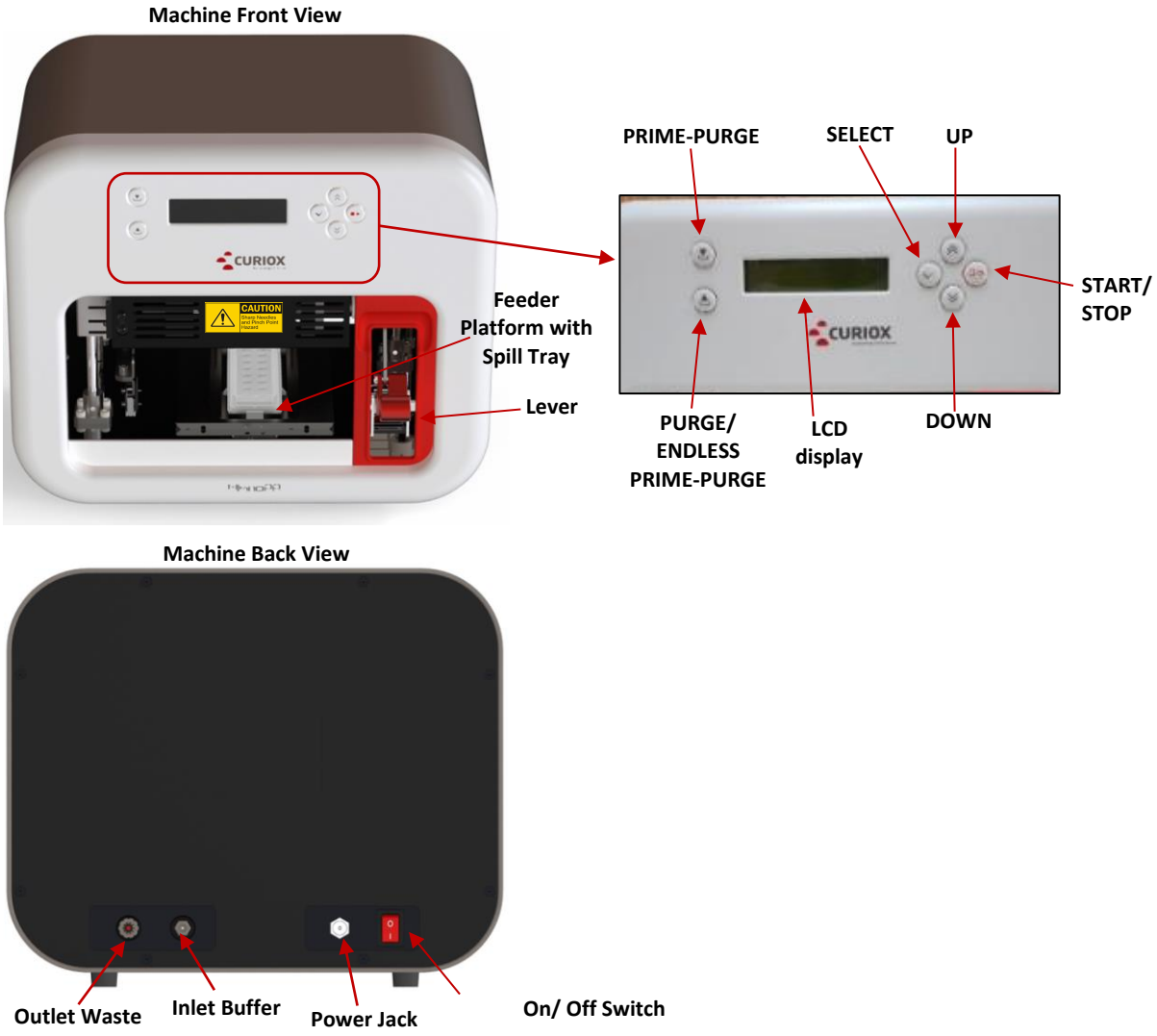


Figure 2-1: *Front and back view of the Laminar Wash MINI with main components labelled.*

Wash Cycle Process

The strip wash cycle process is as follows; a schematic representation of the process is shown in Figure 2.2.

1. Load strip onto the feeder platform and select parameters accordingly by using **SELECT** and **UP** or **DOWN** buttons.

2. Bring the lever down to engage strip and press the **START/ STOP** button**.**

3. Dispensing head tops up well content based on the indicated initial volume.

4. Aspirating head aspirates full volume based on internal firmware. It is intended that contact between aspirating nozzles and well droplet breaks before aspiration is completed. Once the aspiration nozzles complete the aspiration of existing drops to a residual volume, it continues to aspirate air.

5. Dispensing head tops up well contents based on internal firmware.

6. Steps 4 and 5 are repeated until the stipulated number of washes are reached, ending with step 4.

   NOTE: If only 1 wash is specified, the machine will only run until step 4.

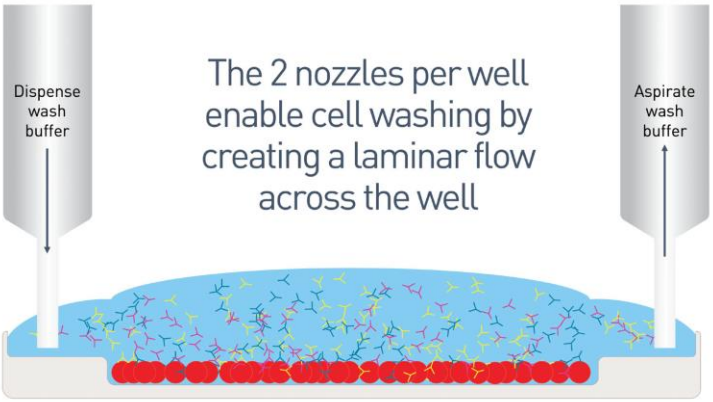


Figure 2-2: *Laminar wash on the MINI*

Chapter 3:

Setup

Chapter Overview

- Unlocking and Installation
- Unlocking
- Preparation for Operation

Unlocking and Installation

Upon arrival of the MINI package, check that all the accessories listed below are present. Some of the components of the MINI have been secured with locking screw and pillars to protect against damage during transportation. Remove locking screw and pillars shown in the steps below before installing and powering up the MINI.

List of items:

- Laminar Wash MINI 1000
- Power Adapter (Output 24V, 3A)
- Electrical Power Cord
- Allen Key Size 3 for Unlocking
- User Manual in USB Thumb Drive
- Declaration of Conformity
- Filter
- 1m Tubing (diameter 3.2mm), Red Coded Ring on Connector connected to Filter
- 1m Tubing (diameter 6.4mm), White Coded Ring on Connector
- Priming Strip
- Calibration Slide
- 2 Adaptors
- Spill Tray
- Bottle Cap with Inlet and Outlet Connections (3 pieces)

Unlocking

MINI has been secured by screw and plastic holders to prevent damage to machine moving parts during transportation. Perform the following steps to unlock the machine.

1. With the use of an Allen Key (size 3), turn anti-clockwise to loosen M4 screw attached to the machine lever.

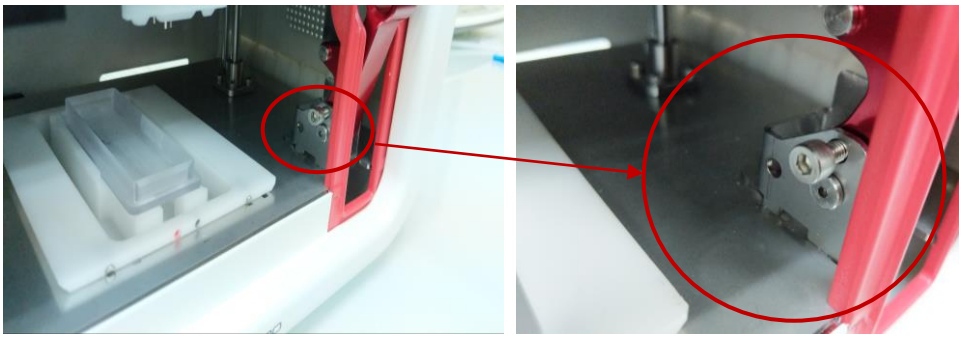


Figure 3-1: *Unlocking machine lever.*

2. Remove plastic holders (2 pieces) that are attached to the machine pillars, one on left front, and the second on right back.

Figure 3-2: *Unlocking machine pillar*

3. Perform the same steps in reverse order to prepare machine for transportation.

IMPORTANT: Machine must be properly secured in the manner specified above to prevent damage to moving parts when transported from one location to another.

Installation

1. Place the MINI on a flat surface and in an environment with temperature and humidity conditions as stipulated in “Technical Specifications” on page 3.

2. Connect power cable and delivery tubes to machine in the manner specified below (Figure 3-3).

    a. Connect the power cable to the universal power adaptor.
    b. Insert the “Power Jack” onto the back of the MINI.
    c. Insert the two delivery tubes into the respective ports on the MINI.

    - Install a clean filter into one end of the inlet tubing and insert into the “Inlet Buffer” (red port) on the MINI.
    - Insert the other end into wash buffer bottle via the buffer inlet bottle cap. Refer to the next section “Buffer Inlet Bottle Cap Installation” for installation instructions.
    - Insert one end of the outlet tubing into the “Outlet Waste” (white port) on the MINI and the other end into an empty waste bottle.

      IMPORTANT: The buffer inlet bottle cap must not be used on the waste bottle.

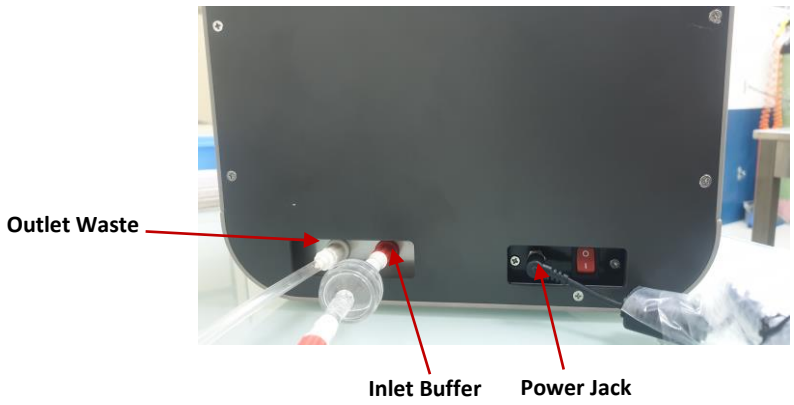


Figure 3-3: *Connecting power supply as well as inlet and outlet tubing.*

Buffer Inlet Bottle Cap Installation

IMPORTANT: The buffer inlet bottle cap must not be used on the waste bottle.
The buffer inlet bottle cap is only compatible with glass bottles.

1. 3 sets of buffer inlet bottle caps are packed with the machine. Each bottle cap comes with an one-way valve for air inlet and a pre-installed tubing attached to the red connector, as shown in Figure 3-4 below.

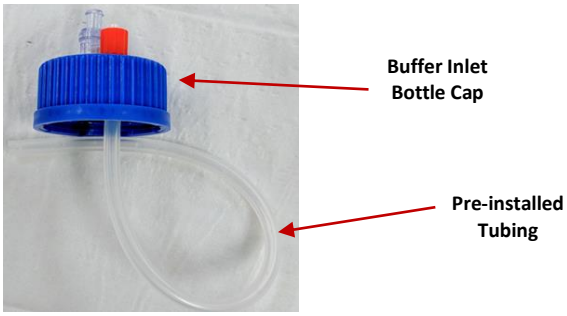


Figure 3-4: *Buffer inlet bottle cap*

2. Connect a buffer inlet bottle cap onto a glass bottle containing the wash buffer of choice, as shown in Figure 3-5 below.

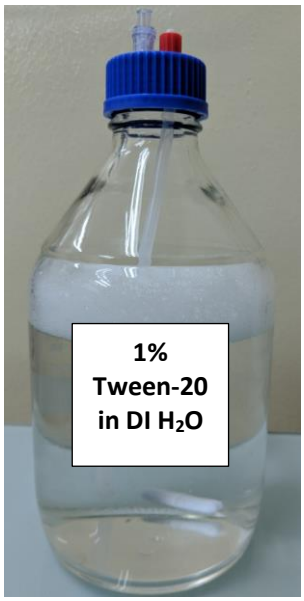


Figure 3-5: *Buffer inlet bottle cap connected to glass bottle containing wash buffer of choice.*

3. Install a clean filter onto one end of the inlet tubing and insert into the red port on the MINI. Insert the other end into wash buffer bottle via the buffer inlet bottle cap. Refer to Figure 3-3.

Preparation for Operation

If the machine is to be installed or eventually moved into a cold room (i.e., 4°C), acclimatize the machine in the cold room for at least 3 hours. It is recommended to do a weekly calibration test to ensure optimal performance, and recalibration is required upon moving the machine out from the cold room.Proceed to the following calibration steps afterward.

It is required to perform priming of the machine with 1% Tween 20 in 70% Ethanol, followed by 1% Tween 20 in DI water and finally with Wash Assay Buffer at the start of the day's operation.
NOTE: If the subsequent wash assay requires a sterile environment, the priming strip should be sterilized by rinsing with 70% Ethanol and drying under UV before use.

IMPORTANT: Priming consumes approximately 30ml of fluid. Please ensure sufficient fluid in the buffer bottle, priming from an empty bottle will affect machine performance.

1. Ensure the power jack is connected. Power up the MINI and wait for the homing sequence to complete.

2. Enter priming Mode by pressing the **PRIME-PURGE** button.

3. Ensure the two delivery tubes are properly connected to their respective ports (red and white) on the MINI. A clean filter should be installed into one end of the inlet tubing and inserted into the red port on the machine. The other ends of the tubes should be connected to either the buffer bottle (red port) or the waste container (white port).

4. Ensure that buffer bottle is filled with the appropriate fluid.

5. Place the priming strip onto the feeder platform, bring lever down to engage strip.

6. Short-press the **START/ STOP** button to initiate the auto-prime with 1% Tween 20 in 70% Ethanol process. LCD will display 'Prime-Purge Starting Get Ready'. Press the **START/ STOP** button again to confirm and perform wash.

7. MINI completes the auto-prime with 1% Tween 20 in 70% Ethanol when the LCD display 'Wash Completed Remove Strip'

8. Repeat steps 2 to 7, replacing fluid selection to 1% Tween 20 in DI water.

9. Long-hold **SELECT** button to enter Service mode.

10. Press the **PRIME-PURGE** button, LCD will display 'Add 80 Get Ready', followed by the **START/ STOP** button to dispense 80µL of 1% Tween 20 in DI water into all wells to verify the dispensing performance.

11. Long-hold **SELECT** to return to Operation mode.

12. Short-press **SELECT** to toggle between Wash Number, Initial Volume and Flow Rate. Use **UP** and **DOWN** buttons to select 7X wash with 80µL initial volume at 5µL/s flow rate.

13. Short-press the **START/ STOP** button to initiate wash, and short-press the **START/ STOP** button again to verify the aspiration performance.

14. Repeat steps 2 to 7, replacing fluid selection to the desired Wash Assay Buffer. The machine is now ready for operation.

Chapter 4:

Operation

Chapter Overview

- Before Operating the MINI
- Operational Safety
- Operation Mode
- Service Mode
- Shutdown Procedure

Before Operating the MINI

The MINI should be placed on a flat surface and in an environment with temperature and humidity as stipulated in “Technical Specifications” on page 3.

Operational Safety

The MINI possesses the following built-in safety features which prevent the machine from operating under unsafe conditions.

Power Supply

The universal power adapter can accommodate electrical power in the range of 100 - 240 V. The resultant output to the MINI power jack is 24 V DC.

Stop

Activating the **START/ STOP** button in the middle of a washing cycle will cause the machine to halt activity immediately. The machine returns to home position when the **START/ STOP** button is pressed again.

Machine Homing

In the event that power to the machine is cut off in the middle of a washing cycle and subsequently the machine is switched on again, the machine will return to its home position.

Safety Precautions

In addition to the built-in safety features of the MINI, below are some precautions that operators are advised to take while using the MINI to ensure their safety and to preserve the accuracy of the experiments.

- At the end of a wash process, remove the strip from the feeder platform immediately to prevent the wells from drying, stressing cells and/or deteriorating biological integrity.
- Keep the area around the power supply free from liquid.
- During active operation, keep your hands off the instrument other than using the display panel.
- If there is an unexpected error, reset the instrument by turning the power switch off and back on.

Operational Mode

The Operation Mode allows an operator to carry out initial aspirations as well as washes.

LCD and Buttons

- ***User Interface LCD Display***
  The user interface shows the parameters and status of the MINI washer.
- ***PRIME-PURGE button***
  Press the **PRIME-PURGE** button to initiate priming with purging sequence. LCD displays 'Prime_Purge Get Ready'. Make sure lever is lowered and press the **START/ STOP** button to continue priming sequence.
- ***PURGE/ ENDLESS PRIME-PURGE button, long press***
  Long press the **PURGE/ ENDLESS PRIME-PURGE** button will initiate endless prime-purge sequence. LCD display 'EL Prime_Purge Get Ready'. Make sure lever is lowered and press the **START/ STOP** button to continue endless washing sequence.

  Short press the **PURGE/ ENDLESS PRIME-PURGE** button will initiate the purge function. Purging will run without activating the priming sequence.
- ***SELECT button, short press***
  User can toggle between 'Wash No.', 'Initial Vol.' and 'Flow Rate' through **SELECT** button.
- ***SELECT button, long hold***
  Long hold the **SELECT** button to toggle between Operation Mode and Service Mode.

- ***START / STOP button***
  Press the **START/ STOP** button to initiate command on LCD screen. When pressed mid-operation, it activates **STOP** and halts all activities immediately. A second press will return the machine to home.

- ***"Initial Volume"***
  The "Initial Volume" value will indicate the volume of the droplets in the wells of the strip just before the wells undergo washing. If droplet volumes in wells vary (e.g. 40µl and 60µl droplets in the same strip), specify the largest volume (60µl).

- ***UP and DOWN buttons***
  The **UP** and **DOWN** buttons allow continuous change in value when held. Values of 1-50 for "Number of Washes", 1-80 for "Initial Volume" and 2-20 for "Flow Rate".

Wash Cycle

1. Place strip in feeder platform and lower lever to engage strip. Contact switch detects that the lever and head has been lowered.

2. Based on indicated initial volume, dispensing nozzles top up well contents until 80µL (e.g. if initial volume is 50µL, dispensing head adds 30µL to the droplet).

3. Aspirating nozzles aspirate full volume based on internal firmware. It is intended that contact between aspirating nozzles and well droplets break before aspiration is completed. Once the aspiration nozzles complete the aspiration of existing drops at the given height of the nozzles, they continue to aspirate air.

4. Dispensing head tops up well contents based on internal firmware.

5. Steps 3 and 4 are repeated until stipulated number of washes is reached, ending the wash with step 3. *NOTE*: If only 1 wash is specified, the machine will only run until step 3.

6. Buzzer beeps and LCD displays 'Wash Complete', raise lever to retrieve strip.

7. To wash the second column of 8 wells on the strip, lift the feeder platform and toggle right or left.

Service Mode

The Service Mode allows an operator to carry out priming, cleaning and draining operations. While in Service Mode, long holding **SELECT** enters (and exits) this mode.

LCD and Buttons

- ***PRIME-PURGE button, short press***

  Press the **PRIME-PURGE** button to perform 80µL dispensing. Make sure head is lowered and press the **START/ STOP** button to continue dispensing sequence.

- ***SELECT button, short press***

  Short press the **SELECT** button to toggle between calibration parameters. Consult Curiox representative to proceed with the calibration procedure.

Volume Calibration

It is recommended to perform volume calibration of the machine during new machine installation, yearly and after long term storage. Ensure to switch to a calibration strip when performing the volume calibration process.

- ***PRIME-PURGE button***

  Press the **PRIME-PURGE** button, while in Service mode, to calibrate the dispensing values.

  1. Weigh calibration strip to prepare for the calibration step. Place calibration strip in feeder platform.

  2. Lower lever to engage calibration strip. Contact switch detects that fluidic head has lowered.

  3. Press the **START/ STOP** button. Dispensing nozzles dispense 80µL into calibration strip wells.

  4. Remove calibration strip by lifting lever. Visually inspect that droplet levels on the calibration strip are uniform.

  5. Weigh the filled calibration strip on a calibrated balance.

  6. Weight of empty calibration strip is subtracted from weight of filled calibration strip.

  7. Resultant value is divided by number of wells (8) to obtain average volume dispensed per well, with the assumption that 1mg = 1µL and that all wells are filled evenly.

  8. Scroll through the calibration parameters, by short pressing **SELECT** button, until “Dispensing Backlash” option reached. Key in the difference in dispensed volume as an integer. E.g. Volume calculated is 75µL, add 5 (80-75=5) to the last saved integer showed in the LCD.

  9. Repeat until 80µL is achieved uniformly.

Shutdown Procedure

It is required to perform priming of the machine with 1% Tween 20 in DI water, followed by 1% Tween 20 in 70% Ethanol and finally without fluid at the end of the day's operation, as per *Appendix A: Machine Operation and Priming Instructions*. Follow the steps below to prepare the machine for shutdown.

IMPORTANT: Priming consumes approximately 30ml of fluid. Please ensure sufficient fluid in the buffer bottle, priming from an empty bottle will affect machine performance.

1. Ensure the two delivery tubes are properly connected to their respective ports (red and white) on the MINI. A clean filter should be installed into one end of the inlet tubing and inserted into the red port on the machine. The other ends of the tubes should be connected to either the buffer bottle (red port) or the waste container (white port).

2. Ensure that the bottle is filled with the appropriate fluid of 1% Tween 20 in DI water.

3. Place the priming strip onto the feeder platform, lower lever to engage strip.

4. In Operation mode, press the **PRIME-PURGE** button to initiate prime-purge with 1% Tween 20 in DI water. Press the **START/ STOP** button to begin priming.

5. MINI completes the prime-purge with 1% Tween 20 in DI water when machine goes back to home page.

6. Repeat steps 2 to 5, replacing fluid selection to 1% Tween 20 in 70% Ethanol.

7. Repeat steps 2 to 5, replacing selection to air intake only

8. Power down the MINI and prepare for storage.

Chapter 5:

Maintenance and Troubleshooting

Chapter Overview

- Maintenance Schedule
- Common Problems for Troubleshooting
- Technical Support

Maintenance Schedule

Below is the maintenance schedule to ensure that the MINI runs smoothly and efficiently.

Action	Daily	Weekly	As Required
It is required to perform priming of the machine with 1% Tween 20 in 70% Ethanol, followed by 1% Tween 20 in DI water and finally with Wash Assay Buffer at the start of the day's operation, as per *Appendix A: Machine Operation and Priming Instructions*.	✓		
It is required to perform priming of the machine with 1% Tween 20 in DI water, followed by 1% Tween 20 in 70% Ethanol and finally without fluid at the end of the day's operation, as per *Appendix A: Machine Operation and Priming Instructions*.	✓		
Wash filter under running DI water on a weekly basis.		✓	
Bleach run for cleaning of internal fluidics. 1. Initiate continuous wash with 1 % Bleach for **strictly 10 minutes only**. 2. Rinse the external surface of an inlet tube thoroughly with DI water and run another continuous wash with 1% Tween 20 in DI water for **20 minutes minimum**. **Caution: Bleach is corrosive agent, perpetual wash with 1% Tween 20 in DI water should be run immediately after the 10 minutes bleach run. Failure to do so may cause damage to the machine's component.**			✓
Sending unit to Curiox Biosystems for service. Decontaminate washer and complete Appendix B.			✓

Common Problems for Troubleshooting

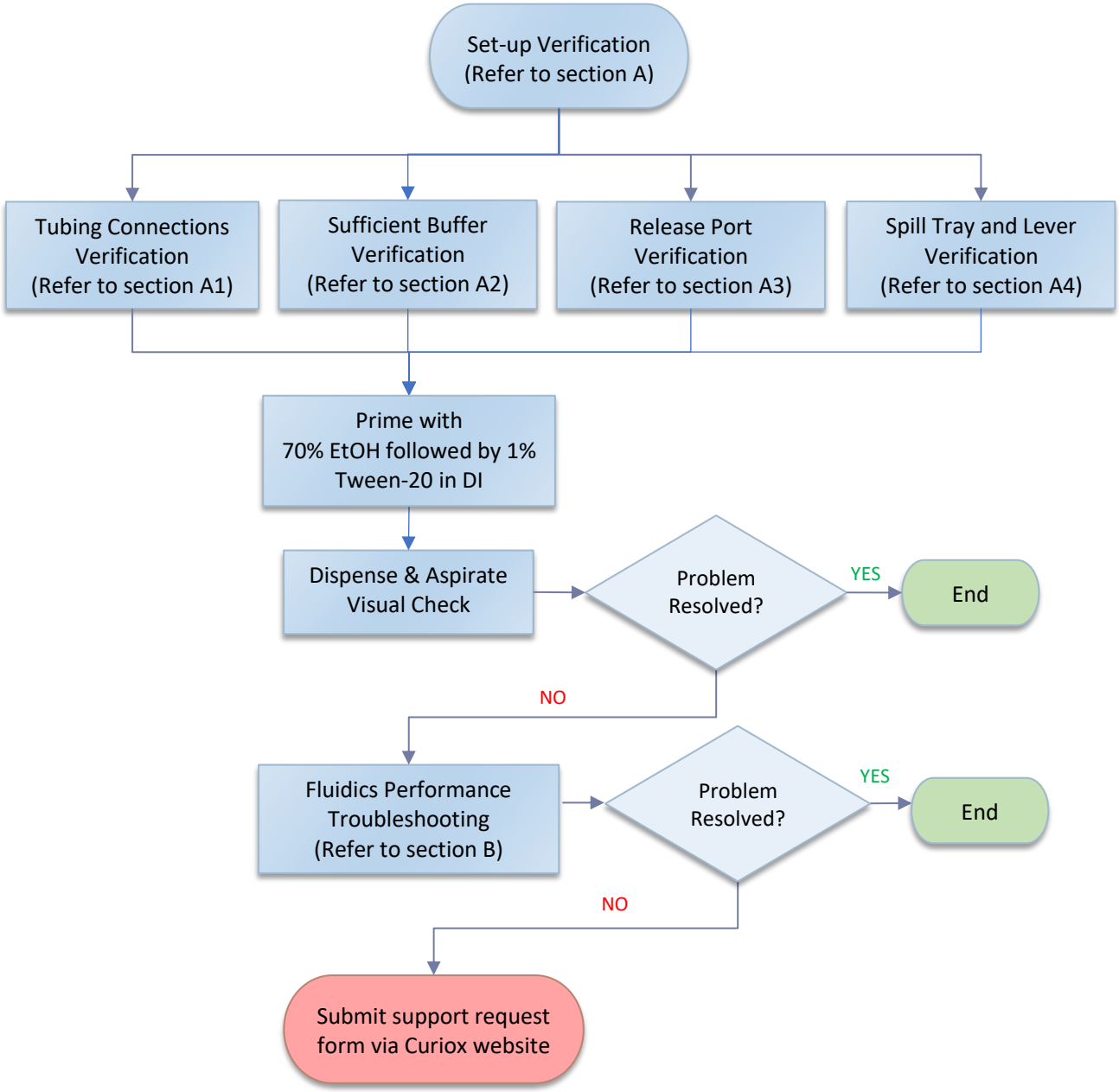
Problem 1: Display panel is not lit up/ Machine has no power/ Failure to initialize/ Motor error

Possible cause: Power is not switched on, or MINI1000 is not plugged into electricity supply.

- Ensure the jack is properly connected to the MINI1000, and that the power is switched on.
- Ensure that the adaptor is working.

Problem 2: Failure to dispense and aspirate properly/ Inconsistent residual volume

- Refer to the flowchart below for the overall troubleshooting process. Perform set-up verification followed by fluidics performance troubleshooting as described in the corresponding sections A and B to resolve the problem.



A Set-up verification:

A1) Tubing connections verification

Check for any signs of leaking on the machine's inlet and outlet tubing. Also, check the tubing connections for any leakage. Where leakage is present, disassemble and carefully reassemble the affected tubing connection.

A2) Sufficient buffer verification

Verify that buffer being supplied to the machine is sufficient and that tubing is completely submerged in buffer.

A3) Release port verification

Verify that the release port located on the bottle cap is not blocked.

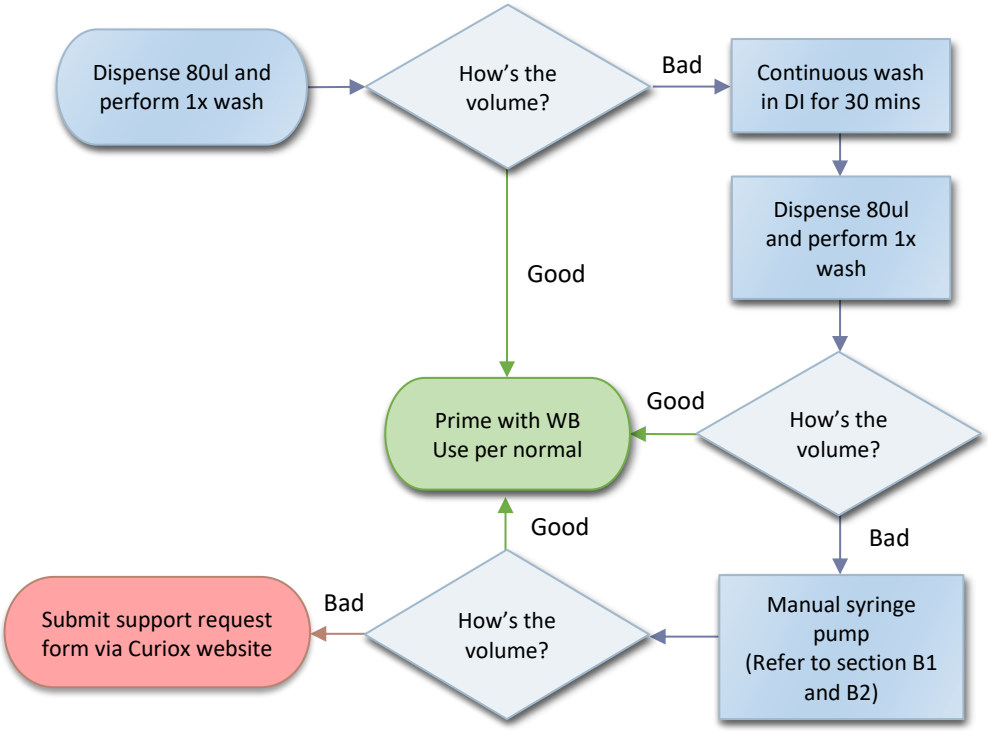
A4) Spill tray and lever verification

Verify that the spill tray is positioned properly by checking if the arrow on the machine is aligned with the circle on the spill tray.

Verify that the lever can be fully lowered down and that the aspirating and dispensing nozzle tips are positioned correctly within each well

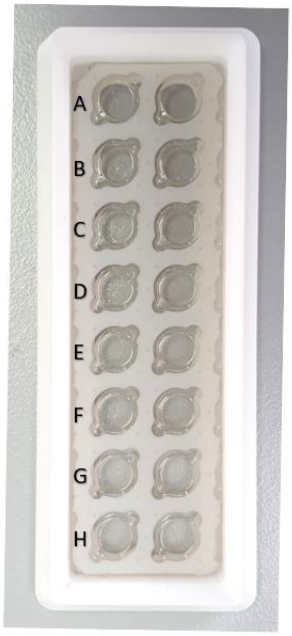
A5) Perform standard prime with 1% Tween-20 in 70% EtOH followed by 1% Tween-20 in DI water. Do a dispense and aspirate visual check to see if the issue is resolved. Where inaccuracies are dispensed and aspirated volume is still observed, proceed to the next section for fluidics performance troubleshooting.

B Fluidics performance troubleshooting flowchart



B1) Identify the affected dispensing and aspirating nozzles corresponding to the affected well(s) using the plate and nozzle mapping.

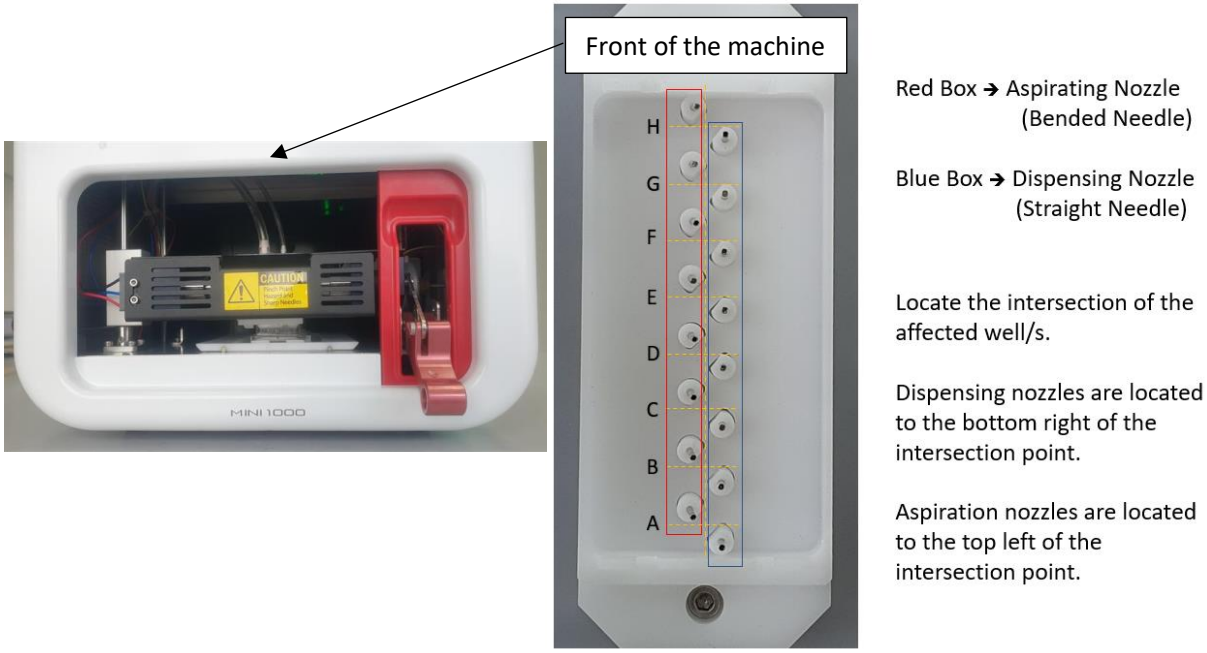
B1.1 Plate mapping:



Locate affected well according to this plate mapping

Refer to nozzle mapping to test the affected nozzle

B1.2 Nozzle mapping



B2) Execute manual syringe pump

B2.1 Prime-purge with air to remove any liquid from the fluidic pathways.

B2.2 Fit the tubing connected with the syringe to the affected dispensing nozzle.

B2.3 Pull the plunger fully to the back. There should be minimal resistance.

Note: If there is significant resistance, there is clogging. Please submit a support request form through curiox website.

B2.4 Try to push in the plunger. You should feel resistance upon pushing the plunger.

B2.5 Remove the tubing from the dispensing nozzle.

B2.6 Pull the plunger fully to the back to fill the syringe with air.

B2.7 Fit the tubing connected with the syringe to the affected aspirating nozzle.

B2.8 Push the plunger fully into the syringe. There should be minimal resistance.

Note: If there is significant resistance, there is clogging. Please submit a support request form through curiox website.

B2.9 Try to pull the plunger. You should feel resistance upon pulling the plunger.

B2.10 Perform a prime-purge with 1% Tween-20 in 70% EtOH.

B2.11 Perform a prime-purge with 1% Tween-20 in DI water.

B2.12 Do dispense and aspirate visual check to see if the issue is resolved. If the problem persists, please submit a support request form via Curiox website.

Technical Support

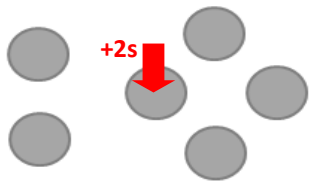
Kindly visit us at www.curiox.com to submit a support request form or email us at sales@curiox.com if you require technical support or advice.

Appendix A:

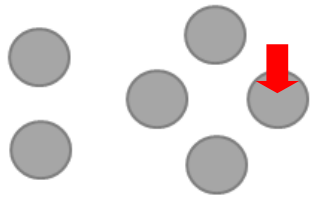
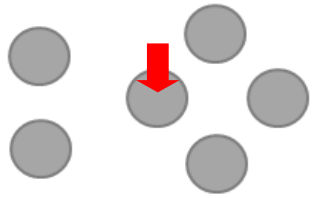
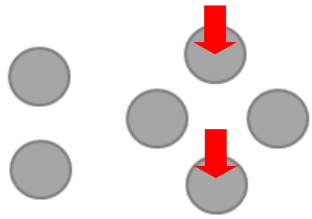
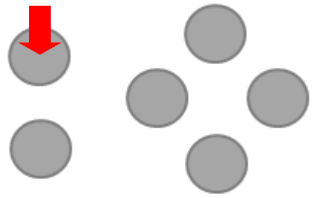
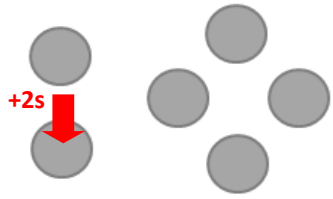
Machine Operation and Priming Instructions

MACHINE OPERATION INSTRUCTIONS

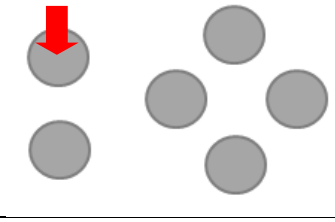
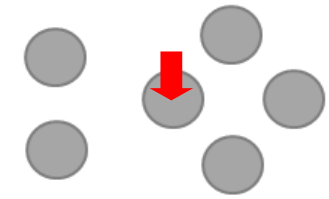
Toggle between **Operation mode** and **Service Mode**

	Long press **SELECT** button: • To toggle between Operation mode and Service mode

Operation mode: UI displays "Wash No.", "Initial Volume" and "Flow Rate"

	Short-press **START/ STOP** button: • Press the **START/ STOP** button to initiate wash cycle (**Fluidic head has to be lowered**) • In the middle of operation, press the **START/ STOP** button to stop operation. Press the **START/ STOP** button again to return to home position.
	Short-press **SELECT** button: • Toggle between "Wash No." "Initial Volume" and "Flow Rate"
	Press/hold **UP** or **DOWN** button: • Adjust "Wash No." (1-50) or "Initial Volume" (1-80) or "Flow Rate" (2-20) • Press for individual values, hold for continuous increment/decrement
	Press **PRIME-PURGE** button: • Perform **standard** prime-purge • Fluidic head must be lowered and priming strip must be present
	Long press **PURGE/ ENDLESS PRIME-PURGE** button: • Perform continuous run cycle • Fluidic head must be lowered and priming strip must be present

Service Mode: UI display "SERVICE MODE MINI V1.0"

	Press **PRIME-PURGE** button: • Perform 80µL dispensing • Fluidic head must be lowered and calibration strip must be present
	Short press **SELECT** button: • To toggle between calibration parameters • **Consult** Curiox Representative to process with calibration procedure

PRIMING INSTRUCTIONS

Ensure all buffers are filtered; use the priming strip for all priming steps
Press PRIME-PURGE button to execute *Prime-Purge*. Insert priming strip onto the stage, lower the lever, and press the START/ STOP button

Start of day:

- Prime 1% Tween-20 in 70% EtOH
- Prime 1% Tween-20 in DI H_2O
- Dispense 80µL in all wells to verify dispensing performance
- Run 7X wash with 80µL initial volume to verify aspiration performance
- Prime wash buffer (e.g. FACS buffer); ***washer is now ready for use***

End of day:

- Prime 1% Tween-20 in DI H_2O
- Prime 1% Tween-20 in 70% EtOH
- Prime air (disconnect buffer inlet from bottle and prime); ***washer is now clean for storage***

Bleach run for cleaning of internal fluidics:

- Prime 1% sodium hypochlorite in DI H_2O
- Long press **PURGE/ ENDLESS PRIME-PURGE** to enter continuous wash
- Insert **priming** strip onto platform and press the **START/ STOP** button
- Press the **START/ STOP** button again to confirm
- Allow continuous wash to run for **strictly 10mins**
- After 10mins, press the **START/ STOP** button again to stop the run and return the strip respectively.
- Rinse the external surface of inlet tube thoroughly with DI water.
- Perform continuous wash with 1% Tween-20 in DI H_2O for **20mins** minimum; ***proceed to intended usage***

Appendix B:

Acknowledgment of Decontamination

Acknowledgment of Decontamination Form

Decontamination is required prior to MINI return to Curiox Biosystems for reasons such as servicing and maintenance. It is required that you fill out this form to acknowledge that decontamination had been conducted on the instrument. Failure to do so may result in the return of the instrument to your address for decontamination.

PRODUCT SERIAL NO.	
CONTACT INFORMATION	
Dr./Mr./Mrs./Ms. (Please circle accordingly)	JOB TITLE
NAME	EMAIL ADDRESS
COMPANY	PHONE NUMBER
DECONTAMINATION INFORMATION	
DECONTAMINATION METHOD	
DECONTAMINATION DATE	
ACKNOWLEDGEMENT	
I hereby acknowledge that this piece of equipment has been decontaminated and sealed in accordance to the procedure recommended in this manual prior to shipment to Curiox Biosystems. To the best of my knowledge, the equipment is safe to handle by the receiving personnel. Name _____ Signature and Date _____	

Appendix C:

Purchase Information and Feedback

Purchase Information and Feedback Form

PURCHASE INFORMATION	
PRODUCT SERIAL NO.	
PURCHASED BY	**PURCHASED FROM**
COMPANY	DISTRIBUTOR
ADDRESS	DATE OF PURCHASE
PHONE	DATE OF DELIVERY
FAX	
CONTACT INFORMATION	
Dr./Mr./Mrs./Ms. (Please circle accordingly)	JOB TITLE
NAME	EMAIL ADDRESS

FEEDBACK (PLEASE CHECK/COMMENT ACCORDINGLY)					
	Excellent	Good	Average	Poor	Comments
User Guide					
Ease of Use					
Reliability					
Operating Costs					
Overall Experience					

Do you have any other comments/suggestions about the Laminar Wash™ MINI? If so, please let us know below.

_____

Please send your feedbacks to sales@curiox.com.

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