Curiox Pluto HT C-FREE™ ™ Workstation User Manual

Pluto HT C-FREE™ Workstation [CF-PLU-LH08HT-01]

While the information in this manual is considered accurate, Curiox Biosystems Pte. Ltd. disclaims all liability for errors and reserves the right to modify specifications without notice.

IMPORTANT NOTICE

Adherence to all instructions in this User Manual is crucial. Using the instrument in ways not specified by the manufacturer in this manual may damage the protection provided by the system. Non-compliance may lead to the invalidation of your service contract.

Curiox Biosystems Locations

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Pluto HT Systems

Part No.	**Description**	**Details**
CF-PLU-LH08HT-01	C-FREE™™, Pluto HT Workstation	C-FREE™™, Pluto HT System, Standard 96-well automated liquid handling head

Contents

Chapter 1

General Information

Chapter Overview

- General Information
- Introduction to the Pluto HT System
- Chemical Compatibility
- Safety
- CE Mark
- Customer Service and Technical Support
- Instrument Storage and Shipping

Introduction to the Pluto HT System

Welcome to the Curiox C-FREE™ Pluto HT System (Pluto system, or Pluto HT system), a state-of-the-art automated liquid handling platform designed to revolutionize sample preparation in flow cytometry and cell analysis workflows. Developed with a focus on enhancing laboratory efficiency and biosafety, the Pluto HT system significantly reduces hands-on time and inter-operator variability. This introduction will guide you through the system's capabilities, design, and how it can streamline your laboratory processes, ensuring high-quality results with less manual intervention.

Distinctive Features of the Pluto System:

The Pluto HT system is distinguished by several key features that set it apart in the field of automated sample preparation:

Curiox C-FREE™ Wash Technology: Integrating the latest advancements in cell washing, the Pluto HT system employs Curiox C-FREE™ Wash technology, which provides gentler handling of cells compared to traditional methods. This technology ensures higher stain indexes for cleaner resolution of cell populations, crucial for precise analytical outcomes.

Compact Footprint: Designed to be accommodated in almost any lab environment, the Pluto HT system boasts a compact footprint. This design consideration allows for optimal use of laboratory space without sacrificing functionality.

Standard 96-Well Plate Format: The system utilizes Curiox Validated Plates that have a standard 96-well plate format, facilitating integration into existing workflows with minimal adaptation required. This feature ensures compatibility and ease of use, particularly for labs already using this format.

End-to-End Automation: From liquid handling to cell washing, the Pluto HT system provides complete automation of the sample preparation process. This end-to-end automation minimizes the potential for human error and increases throughput, making it ideal for high-demand environments.

Enhanced Reporting and Audit Trail: Tailored to meet the needs of both clinical and research markets, the Pluto HT system features advanced reporting capabilities and a robust audit trail. These features ensure compliance with regulatory standards and provide comprehensive documentation for review and analysis.

The Pluto HT system is your partner in delivering efficient, reliable, and reproducible results, making it an indispensable tool for modern laboratories focused on cell analysis.

General Information

This user manual provides technical guidance, installation instructions, operational procedures, and troubleshooting information for operators of the C-FREE™ Pluto HT System. It covers the following areas:

- Setup and operation
- Operating principles and functional modes

- Safety features and operational precautions
- Troubleshooting and maintenance procedures

Technical Specifications

Description	Specification	
Physical		
Dimensions (D x W x H)	740 mm x 1090 mm x 1168 mm 29.1 in. x 42.9 in. x 46 in.	
Weight	240 kg / 529.1 lbs	
Electrical		
Power Requirements	100-240VAC, 50/60Hz, 10A	
Fuse	250VAC, 10A (AC250V, T10AL, 5x20mm)	
Environmental		
Place of use	Indoor use	
Operating Temperature Range	19 - 25 °C	
Operating Humidity	20% ~ 80%, non-condensing	
Altitude	2000 m below	
Mains supply voltage fluctuations	(100-240) VAC ± 10%	
Device Type	Fixed benchtop device	
Pollution Degree	Degree 2	
Operation		
Plate Type	Curiox 300 µL 96 well U-bottom plates, Curiox 2.2 mL 96 well U-bottom deep well plates, Curiox liquid reservoirs	
Deck Capacity	28 SBS positions	
96-channel Pipette (9 mm fixed-pitch)		
Pipetting Principle	Air displacement	
Range of Pipetting	1~1000 µL	
Liquid Level Detection	Pressure sensing	
Pipetting Accuracy	5 µL	≤8%
	50 µL	≤2.5%
	250 µL	≤1.4%
	500 µL	≤1.5%
	1,000 µL	≤1.0%
Positional Accuracy	±0.1 mm X,Y,Z axes	
Single-Channel Pipette		
Pipetting Principle	Air displacement	
Range of Pipetting	1~1,000 µL	
Liquid Level Detection	Pressure sensing	
Pipetting Accuracy	5 µL	≤8%
	50 µL	≤2.5%
	250 µL	≤1.4%
	500 µL	≤1.5%
	1,000 µL	≤1.0%
Positional Accuracy	±0.1 mm X,Y,Z axes	
Gripper		
Force Control	1~16N	
Maximum Travel Length	92 mm	
Minimum Travel Length	74 mm	

Description	Specification
Z-axis Travel Distance	150 mm
Maximum Loaded Weight	≤1,000 g/ 2.205 lbs
Temperature Control Module (CPAC)	
Dimension (W × D × H)	140 mm × 98 mm × 81 mm 5.5 in. x 3.85 in. x 3.19 in.
Shell Material	HIPS
Input Voltage	24V DC
Wattage	120W
Temperature Control Range	4℃~80℃
Heating Rate	4°C → 21°C < 1 min, 20K/min. 21°C → 95°C < 6.5 min, 8K/min.
Cooling Rate	95°C → 21°C < 5 min, 11K/min. 21°C → 4°C < 4 min, 6K/min.
Temperature Accuracy	±0.5℃
Temperature Uniformity	≤±1°C @4°C ≤±0.5°C @15°C & 40°C ≤±2°C @90°C
Communication Interface	RS422/485
Tilter	
Dimension (W×D×H)	140 mm × 98 mm × 70 mm 5.5 in. x 3.85 in. x 2.76 in.
Weight	1.3 kg / 2.86 lbs
Input Voltage	24VDC
Wattage	60W
Angle Control Range	0~60 degrees
Load mass	Less than 350 grams
Communication Interface	CAN
User Interface	
Display	12-inch touchscreen
Input control	Touchscreen interface
External Interface	
RJ45 port	Used for communication with third party device [an administrator-only port]
USB port	Top: DC 5V, USB flash disk port, used for file transfer Bottom: OTG port, only used for internal debug
Labware	
Pipette tips	1. 50 µL non-filter, non-sterilized 2. 50 µL non-filter, sterilized 3. 250 µL non-filter, non-sterilized 4. 250 µL non-filter, sterilized 5. 1000 µL non-filter, sterilized 6. 1000 µL non-filter, non-sterilized
Plates	Curiox 96 well, U-bottom, standard microplate, SBS format Curiox 96 well, U-bottom, deep well, SBS format
Tubes	5mL round bottom polystyrene tube 3mL blood collection tube Tube rack

Chemical Compatibility

The components of the Pluto HT Workstation that come into possible contact with fluids and reagents are made from materials chosen for their resistance to common chemicals. However, certain disinfectants should not be used for decontamination. Table 1-1 on page 4 details the material composition of these components and identifies compatible reagents. Note that some reagents are incompatible with these materials and their prolonged contact should be avoided to prevent corrosion and damage. Do not use undocumented reagents without consulting Curiox Technical Support.

Table: Chemical compatibility between the component materials and accessories in the Pluto system, including common reagents and disinfectants. (Adapted from: CP LabSafety www.calpaclab.com, US Plastic www.usplastic.com/catalog/files/charts/Tygon%20CC.pdf accessed Jan 2023.)

Component	Material	Approved Chemicals	Incompatible Chemicals
Deck, Suction Pipe, Waste Liquid Tube	Stainless Steel (304)	Ethanol, Benzene, Chloroform, Acetaldehyde, Propylene Glycol, Isopropanol, Formaldehyde, Phenol, Grease, Potassium Permanganate, Hydrogen Peroxide	Hypochlorite bleach, sulfuric acid
Waste Liquid Reservoir	Teflon	Hydrochloric acid (HCl), Sulfuric acid (H2SO4), Nitric acid (HNO3), Sodium hydroxide (NaOH), Acetone Benzene	
Seal Ring	Silicon	Ethanol, isopropyl alcohol, detergents, ethylene glycol, propylene glycol, formaldehyde, formamide, sodium hypochlorite, hydrogen peroxide, sulfuric acid (<3M), ozone	Chloroform
TC-Shell	HIPS	Ethanol, Dilute acids (e.g., acetic acid), Dilute alkalis (e.g., sodium hydroxide solution), Some detergents	Strong acids (e.g., sulfuric acid), strong alkalis (e.g., concentrated sodium hydroxide), organic solvents (e.g., toluene, xylene), acetone
Syringe	Ceramic	Hydrochloric acid (HCl), Sulfuric acid (H2SO4), Nitric acid (HNO3), Sodium hydroxide (NaOH), Acetone, Benzene	Hydrofluoric acid (HF), strong alkalis
Trash Bin, Waste Liquid Reservoir, Drive Pipe	ABS	Ethanol, Dilute acids (e.g., acetic acid), Dilute alkalis (e.g.,	Acetone, Benzene, Toluene, Methylene chloride, Strong acids (e.g., sulfuric acid),

Component	Material	Approved Chemicals	Incompatible Chemicals
		sodium hydroxide solution), Some detergents	Strong alkalis (e.g., concentrated sodium hydroxide)
Drive Pipe	PC	Ethanol, Dilute acids (e.g., acetic acid), chloride (NaCl) solutions, Sodium hydroxide (NaOH) (dilute)	Acetone, benzene, toluene, methylene chloride, concentrated sulfuric acid, ammonia
Carriers	6061-T6 Aluminum	Ethanol, Benzene, Propylene Glycol, Isopropanol, Formaldehyde, Ozone, Grease, Phenol, Hydrogen Peroxide	Hypochlorite bleach, soap solutions, sulfuric acid, potassium permanganate, phosphoric acid

Safety

User Attention Notifications

This manual uses several user attention phrases, each designed to draw a specific level of attention:

NOTE: Provides useful information.

IMPORTANT: Highlights information essential for proper operation of the instrument.

CAUTION: Alerts users to potential hazards that could cause injury or damage to the instrument if ignored.

!WARNING!: Indicates a serious risk of physical injury if precautions are not followed.

Chemical Hazards

!WARNING!	CHEMICAL HAZARD: Handle with care. Exposure to chemicals used in this process can cause serious injury or illness.

Understand Safety Data: Before storing, handling, or using chemicals, thoroughly read and understand the Material Safety Data Sheets (MSDSs) provided by the chemical manufacturer.

Minimize Exposure: Avoid direct contact and inhalation of chemicals. Always wear appropriate personal protective equipment such as safety glasses, gloves, and protective clothing. Refer to the MSDS for more safety guidelines.

Seal Containers: Ensure all chemical containers remain tightly closed when not in use.

Monitor for Leaks: Regularly check for chemical leaks or spills and promptly follow the manufacturer's recommended cleanup procedures listed on the MSDS if an incident occurs.

Follow Legal Requirements: Adhere to all applicable local, state, provincial, or national regulations concerning the storage, handling, and disposal of chemicals. Operate only in a laboratory environment meeting biosafety standards as defined by local regulations.

Chemical Waste Hazards

Review Safety Data: Ensure you read and comprehend the Material Safety Data Sheets (MSDS) from the chemical manufacturers before storing, handling, or disposing of chemical waste.

Protective Measures: Minimize contact with chemical waste. Always wear suitable personal protective equipment, such as safety glasses, gloves, and protective clothing, when handling chemicals.

Cautious Handling: Exercise caution when emptying waste bottles.

Proper Disposal: Dispose of the contents of waste bottles following good laboratory practices and in compliance with local, state/provincial, or national environmental and health regulations.

Material Safety Data Sheets

Chemicals used with the Pluto HT system may be hazardous. Warning labels are affixed to all chemical containers to identify potential risks.

Material Safety Data Sheets (MSDS) offer essential safety information for the storage, handling, transportation, and disposal of chemicals. It is advisable to periodically update your laboratory's MSDS records.

For Material Safety Data Sheets for Curiox reagents, please contact us at 650-226-8420 (US) or +65 6507 0361 (international). Alternatively, you can contact the chemical manufacturer directly or visit their website for more information.

Instrument Safety Labels

A safety label with a safety alert symbol is affixed to the Pluto HT system to warn users of potential safety hazards. This symbol is universally recognized and prompts users to exercise caution when operating the equipment.

Symbol	Description
	Warning. Risk of personal injury to the operator or a safety hazard to the instrument or surrounding area
	Warning. Hot surface. Burn hazard.
	Warning. Pinch point hazard.
	Danger. Hazardous voltage. Risk of electrical shock.
	Biohazard. Biological risk present; use appropriate PPE and handle waste safely.

Important Safety Instructions

Modification Warning

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Radio Interference

This equipment has been designed and tested to CISPR 11 Class A. It may cause radio interference; in which case you may need to take measures to mitigate the interference. Do not use this device in proximity to sources of strong electromagnetic radiation (e.g., unshielded intentional RF sources), as these may interfere with proper operation.

Intended Use:

Do not use this instrument for anything other than its designed purpose.

Power and Maintenance:

Always disconnect the power to the instrument before cleaning or performing routine maintenance.
Do not disassemble the unit.

Install Correct Labware on the Deck:

Ensure plates, tube rack(s), and pipette tips have been securely inserted in their correct positions and orientation. Failure to do so may result in damage to the instrument.
Use only Curiox Pluto branded and supplied plates, tube racks, and pipette tips.
Do not reuse plates, tubes, and pipette tips.

Proper Use and Protection:

If the equipment is used in a manner other than that specified by Curiox, the protection provided by the equipment may be impaired.

Operational Safety:

Keep hands clear of the instrument platform as it moves in and out of the instrument.
To avoid muscle strain or back injury, use lifting aids and proper lifting techniques when removing or replacing the instrument.

Chemical and Biohazard Safety:

Equipment can be hazardous due to the use of chemical and biohazardous substances. This instrument can be used with potentially biohazardous materials. Use appropriate personal protective equipment (gloves, safety goggles, lab coat, etc.) for handling and disposing of biohazardous materials.

Instrument Door Operation:

Avoid opening the door while the equipment is in operation. If the door is opened, the equipment will

stop. Ensure the equipment has completely stopped before proceeding.

Disposal:

Follow End-User's institutional Standard Operating Procedure (SOP) for decommissioning and disposal of laboratory instrument and accessories.
Follow End-User's institutional SOP(s) for safe disposal of used labware including pipette tips, plates and tubes.

Safety Precautions

Always keep the area around the power supply dry to avoid any potential hazards.

During operation, refrain from touching the instrument, except when interacting with the display panel.

If an unexpected error occurs, reset the Pluto HT system by switching the power off and then back on.

General Precautions

- Only use Curiox Validated Plates with the Pluto HT system.
- Only use the power cord supplied with the unit for electrical supply.
- Avoid spilling liquids inside of the instrument.
- Conduct a cleaning cycle using the appropriate solution after each experiment.
- Retain the original packaging material for potential future shipping needs.
- Do not open or remove the instrument casing or motor parts; this can void the warranty and calibration and may cause irreversible damage.
- For any service needs, contact only qualified Curiox personnel.

Prior to System Operation

Ensure that all users of the Pluto HT Workstation have:

- Received training on general laboratory safety practices.
- Been instructed on specific safety protocols for operating this instrument.
- Been trained in handling biohazards if biohazardous materials are to be used with the system.
- Read and understood all relevant Material Safety Data Sheets (MSDS).

CAUTION	Avoid operating the Pluto HT system in ways not specified by Curiox. Although the system is designed to protect users, this protection can be compromised 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 for Emissions and Immunity.

Verification of compliance was conducted to the limits and methods of the following:

- EN 61326-1: 2021 Emissions
- Harmonics Current Emission (Class A)
- Voltage Fluctuation/ Flicker
- Conducted Emission (Group 1 Class A)
- Radiated Emission (Electric Field) (Group 1 Class A)
- EN 61326-1: 2013 Immunity
- Electrostatic Discharge Immunity
- RF Radiated Immunity
- Electrical Fast Transient/ Burst Immunity
- Voltage Surge Immunity
- Conducted Disturbance Immunity
- Voltage Dips & Interruptions Immunity

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”.

Directive 2015/836/EU Restriction On the use of Hazardous Substances (ROHS 3)

This device has been verified and found to meet the requirements of Directive 2015/836/EU “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.

Customer Service and Technical Support

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Instrument Storage and Shipping

Before transportation, disinfect the equipment by wiping it with 70% isopropyl alcohol. For long-distance transportation, ensure that moving parts are secured and packed in shock-proof packaging. Retain the original packing material for future transportation needs.

For transportation and moving of equipment, please contact the Curiox technical support team. The instrument is quite heavy; it is recommended that at least four adult males carry it or use a forklift with a load capacity of at least 400 kg.

Stow the instruments in a regulated storage environment: Temperature: 4-28ºC, Humidity <80% RH, non-condensing.

The equipment must be transported in its packaged state, kept upright, and protected from tumbling and rain. Do not unpack the equipment without Curiox personnel present and handle it with care during transportation.

CAUTION	Do not touch moving parts while the device is energized or in operation. Prevent serious personal injury: Do not put your hand into equipment gaps. Do not move the device without the manufacturer's consent.

Chapter 2

Functional Description

Chapter Overview

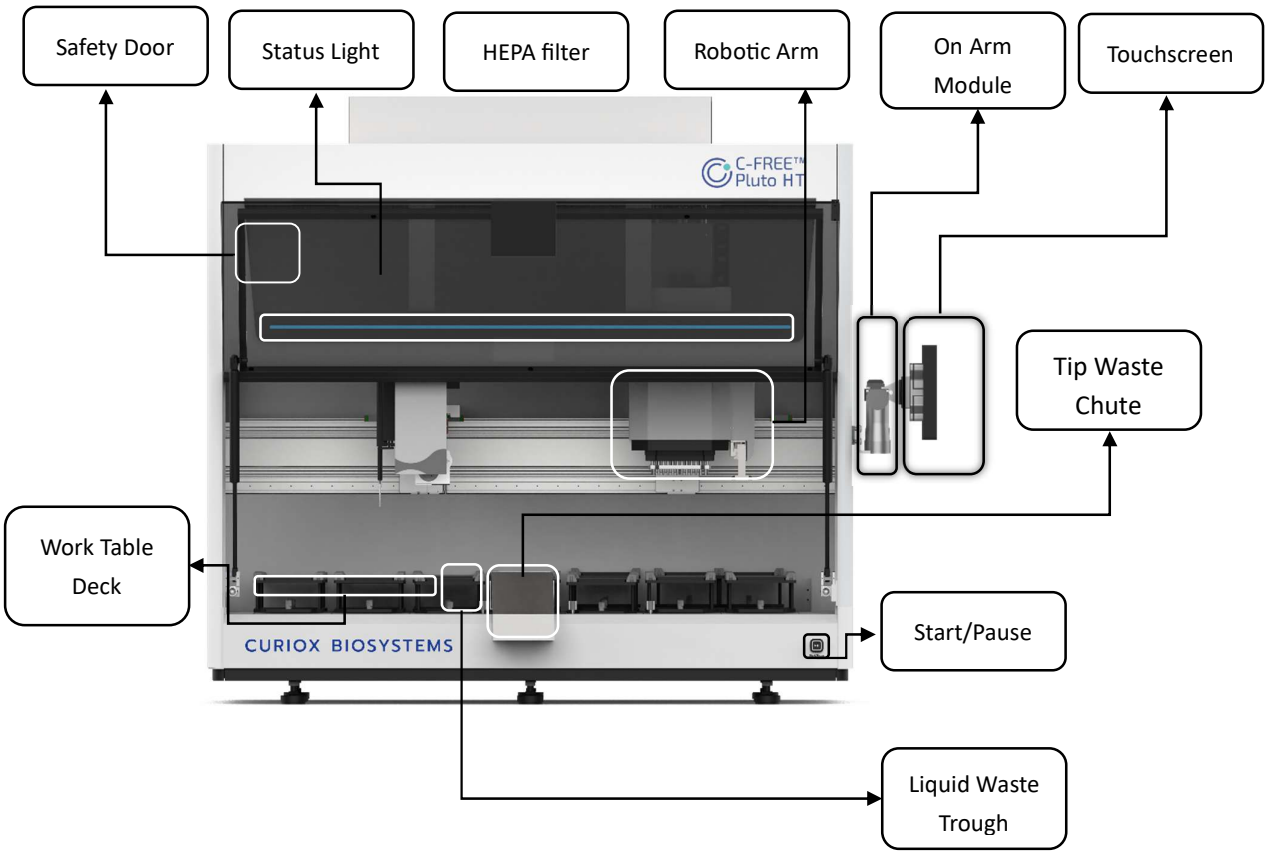
- Introduction
- Functional Description

Introduction

This chapter provides a detailed overview of the Pluto system components.

Functional Description

The main components of the Pluto HT system are shown below:



Main Components

Safety Door

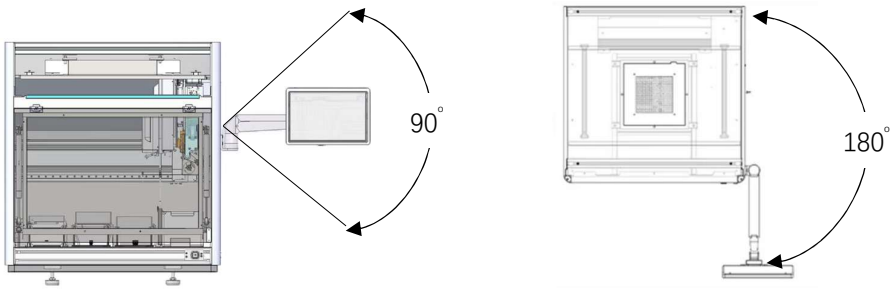
To ensure the safety of the operators, the Pluto HT system can sense the status of the safety door. Once the door is opened during the run, the system will automatically pause until the door is closed again.

Status Light

The status light will be turned on and stay blue when powered on.

Touch Screen

The Pluto HT system is equipped with a 12-inch LED touchscreen and an adjustable arm support. The arm can rotate 180 degrees forward and backward, and 90 degrees up and down, as shown below.



Tip Waste Bin and Liquid Waste Trough

The waste chute is used to collect solid waste generated during the experimental run.

Start/Pause Button

Automatic Switching:

- Switches on when you start the runner application.
- Switches off when you close the application.

Status Indication:

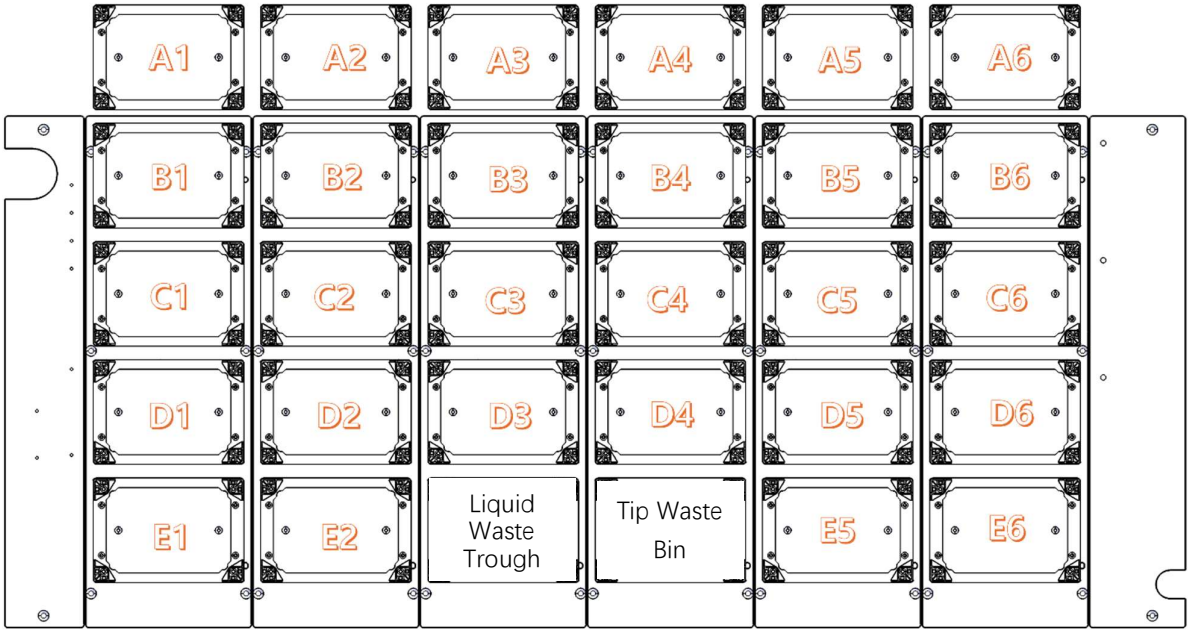
- Stays green when the application is in operation.
- Flashes when the application is on standby.

Hardware Interface

- E-STOP: E-Stop button connector
- RJ45: used for communication with third party device [an administrator-only port]
- USB port (top): DC 5V, USB flash disk port, used for file transfer
- USB (bottom): OTG port, only used for internal debug
- Power connector: Connect to power cable, AC100-250V 10A
- Fuse connector: F10AL250V (Notice: if the fuses are damaged, only replace with ones specified by Curiox)
- Power Switch: turns power on or off.

Worktable/Deck

The Pluto HT system supports up to 28 SBS plate positions.

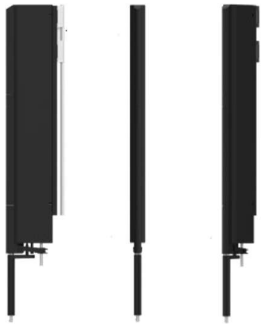


Integrated modules

	Parts name	Type
Pipette Module	96-Channel	F96M
	Single-Channel	SPM
Gripper Module	Left/Right	RGM
MSCH Module	Temperature control module	MT-120
Other	HEPA Filter	Positive pressure
		Negative pressure

Pipette Modules

The Pluto HT system is equipped with a fixed 24 Channel pipette and four single channel pipettes.

Specification	96-Channel Pipette	Single-Channel Pipette
		
Size/Dimension	9 mm fixed-pitch	Individual Z-axis 18 mm distance flexible channel pipette module
Partial Loading Support	Yes	No
Rapid Replacement Support	Yes	
Consumables and Adapters	Compatible with all kinds of SBS/SLAS standard-pitch consumables, module adapters	
Pipetting Principle	Air displacement	
Range of Pipetting	1-1,000 µL	
Liquid Level Detection	Pressure sensing (pLLD) – Only Single-Channel	

Specification	96-Channel Pipette	Single-Channel Pipette
Pipetting Accuracy	≤8% @ 5 µL ≤2.5% @ 50 µL ≤1.4% @ 250 µL ≤1.5% @ 500 µL ≤1.0% @ 1,000 µL	
Positional Accuracy	± 0.1 mm X,Y,Z axes	

Gripper Module

The gripper module can move different consumables on the deck.

	Parameters
Force control	1-16 N
Maximum travel length Lmax	92 mm
Minimum travel length Lmin	74 mm
Z-axis travel distance	150 mm
Maximum loaded weight	≤1,000 g

Temperature Control Module

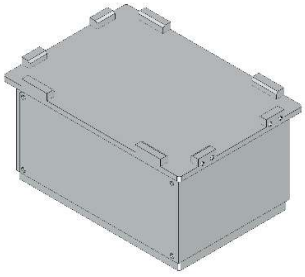
The CPAC module is capable of heating, cooling liquids in a plate, and provides different temperature conditions during experimental tests for reagents on deck. Different consumables can be matched by

adapters.

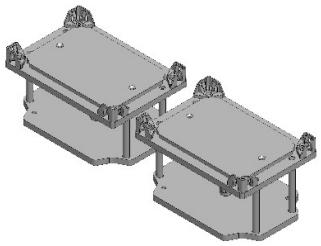
	MT-120
Dimension (W×D×H)	140 mm × 98 mm × 81 mm
Shell Material	HIPS
Input Voltage	24V DC
Wattage	120W
Temperature Control Range	0℃- 120℃
Heating Rate	$t_{4\rightarrow21°C}$ < 1 min., 20K/min. $t_{21\rightarrow95°C}$ < 6.5 min., 8K/min.
Cooling Rate	$t_{95\rightarrow21°C}$ < 5 min., 11K/min. $t_{21\rightarrow4°C}$ < 4 min., 6K/min.
Temperature Accuracy	±0.2℃
Temperature Uniformity	≤±1℃@4℃ ≤±0.5℃@15℃&40℃ ≤±2℃@90℃
Communication Interface	RS422/485
Adapter	For consumable fixing, see adapter list

Tilter Accessory

The tilter used with the Pluto HT system is an optional component designed for accelerated sample settling.



Adapters and Carriers

	Image	Description
Curiox Deep Well Plate Adapter		For use with Curiox 96-well deep well plate (U-bottom)
Curiox Microplate Adapter		For use with Curiox 96-well microplate (U-bottom)
57 mm/62 mm Carrier		SBS/SLAS standard pitch consumables

HEPA Module

Perform air filtration to ensure air cleanliness during operation.

Protection Level	H13
Wind	150m3/h
Wind Speed	0.4m/s±20%
Wind Pressure	80-100Pa
Noise	＜65dB(A)
Specifications	Positive pressure / negative pressure optional
Life Time (recommended)	HEPA：8-10 months in ordinary environment; 12 months in clean environment

Chapter 3

Installation

Chapter Overview

- Product Label
- Unboxing and Checking
- Placing the Instrument
- Free Instrument Arm
- Install Pipettor Modules
- Software Update

Product Label

The product labels can be found on the exterior or interior of the product and provide basic information about the product.

	Manufacturers
	Production date
	Validity period
	Serial number
	Check the instructions
	General warning signs
	Electronic device disposal

Unboxing and Checking

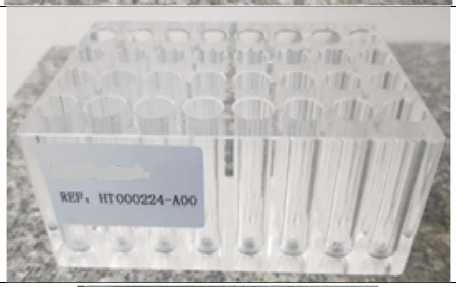
Unboxing

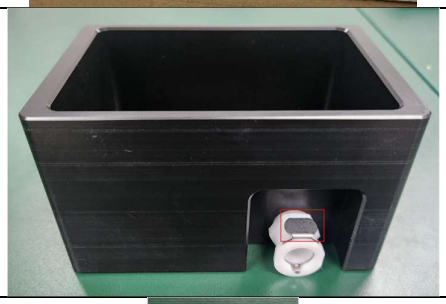
Please follow the instructions in Appendix A for unboxing the Pluto HT system.

Packing list

After unboxing, please check all the instruments and accessories in the list below. To prevent damage, some of the parts may be packaged individually inside of the crate. Please ensure that all the materials are matched to the packing list. If any items are damaged or missing, please contact the manufacturer or dealer, and be sure to retain the original packaging materials.

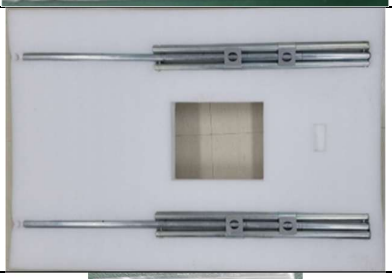
No	Part/Specification	Q'TY	Image
1	Pluto HT Instrument		

2	Sample Pipe support HT000223-A00 (32 holes)	3 EA	
3	Sample Pipe support HT000224-A00 (32 holes)	1 EA	
4	Sealing ring / 2.5x1.0mm	80 EA	
5	Tip Waste Chute Revvity Part Name: Refuse Chute	1 EA	
6	Screw for Waste chute	2 EA	
7	96-Channel Head	1 EA	

8	Single channel Pipette head	4 EA	
9	Liquid Waste Tank	1 EA	
10	Fitting-Male	1 EA	
11	Tube	1.5M	
12	Bottle Cap	1 EA	
13	Liquid Waste Bottle	1 EA	
14	Carrier with Thumbscrew – Label: A01, A07 and B07	3EA	

15	Snap-fit (=Corner Bracket)	10 EA	
16	Snap-fit Screw	10 PCS	
17	Thumb screw (Set Screw for Head Installation)	4 EA	
18	Plastic Cover	4 EA	
19	Torx wrench / torx 10 (3.0mm)	1 EA	

20	Hex key	1 SET	
21	Expansion Quick Release	8 EA	
22	Power cord (Please check if it is the correct power cord for the nation)	1 EA	
23	Fuse	2 EA	
24	USB A-A Cable	1 EA	

25	CPAC adapter for DWP	Depends on the number of CPAC installed machine	
26	Thumb Screw for Carrier	2 EA	
27	Open-end Spanner	1 EA	
28	Handling Gear	1 SET	
29	CPAC adapter Screw - Revvity Part Name: 2.5x4 Screw	10 EA	
30	CPAC adapter for Pluto MTP	2 EA	

31	THUMB_DRIVE (USB Memory Stick)	1 EA	

Depending upon your system configuration, some or all of these parts may be in your container. Confirm the parts and quantities listed below.

Part/Specification	Quantity	Image	Check
Tilter			☐
CPAC			☐

Getting Started

For a step-by-step guide to setting up the product, refer to the hardcopy Quick Start Guide document.

Placing the Instrument

The instrument is a fixed benchtop system. Ensure the work area is well-ventilated, and does not contain corrosive or flammable gases, or strong magnetic interference.

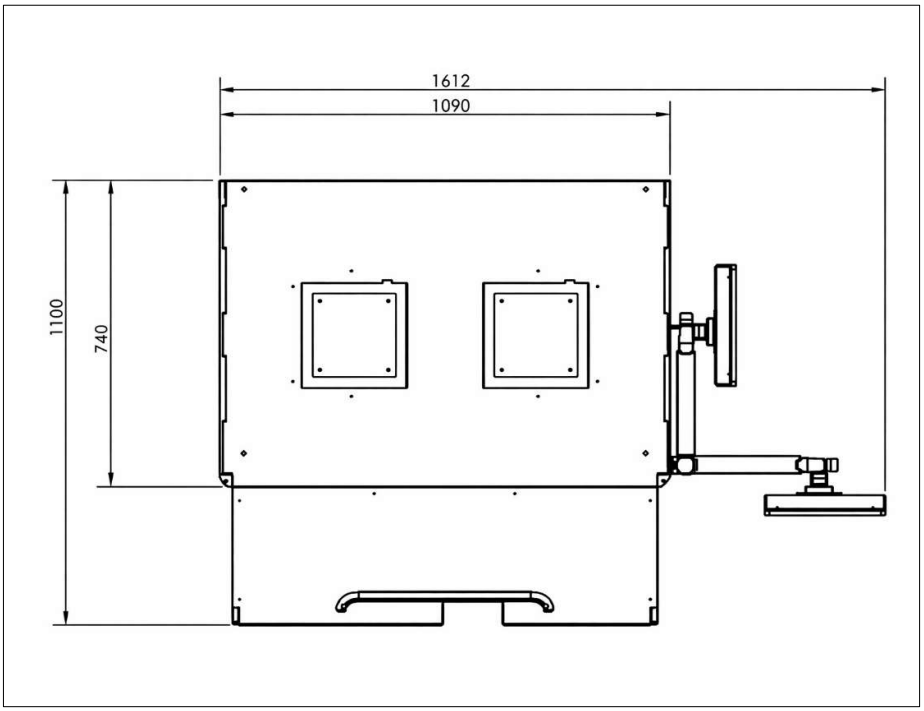
Note

- Do not install the instrument on a combustible surface.
- Do not place the device in a position where it is difficult to turn off.
- Do not place the instrument in a wet or dusty location.
- Do not place the instrument on a cushioned or unstable surface.
- Do not place the instrument against a wall or stack other objects around/against it.
- Please use forklift truck with load bearing 300KG or more when moving (Contact Curiox personnel before moving instrument).

There are moving parts inside the container. Ensure safe operating practices.

Space Requirement

The Pluto HT system space requirement is as depicted.



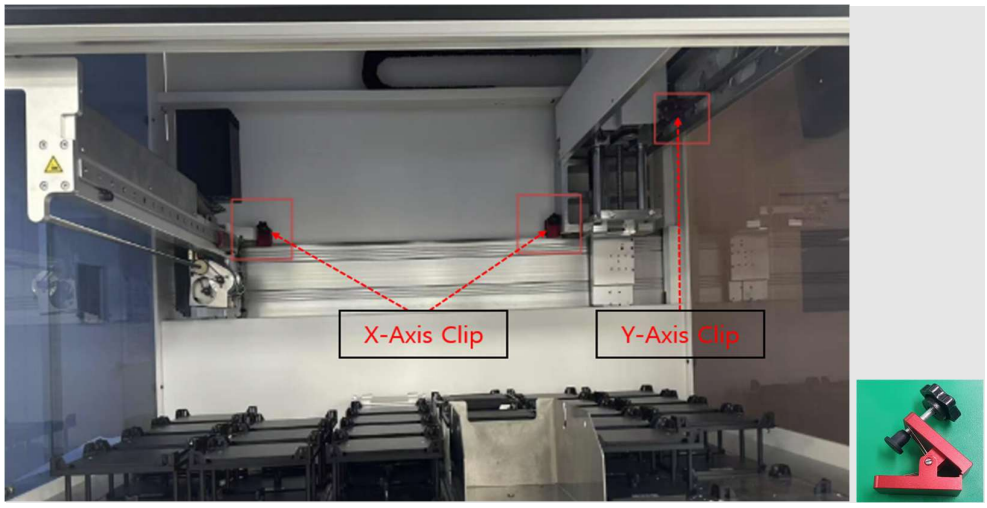
Working Environment

Working temperature	19°C-25°C
Relative Humidity	20%-80%, no condensation
Altitude	2000m below
Barometric Pressure	80kPa-106kPa
Place of Use	Indoor use
Device Type	Fixed benchtop device

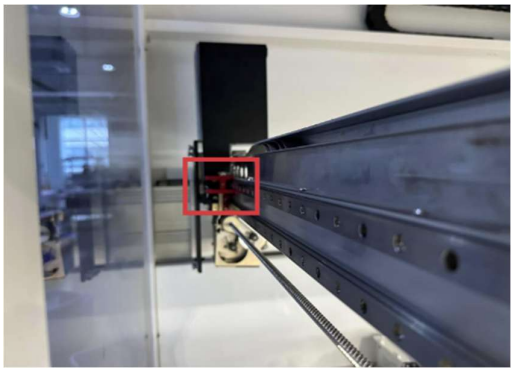
Remove the machine from the wooden box pallet and place it on a suitable countertop. At least six people are required to carry the instrument safely. The countertop should be able to hold (400kg / 882 lbs) plus the weight of related consumables and accessories.

Free Instrument Arm

1) Open the door and remove the clips located on the left and right sides of the X-axis. Then, remove the clip attached to the Y-axis of the 96-channel head. Remove a total of three clips. Rotate the knob on the slider clip counterclockwise and loosen it to remove the slider.



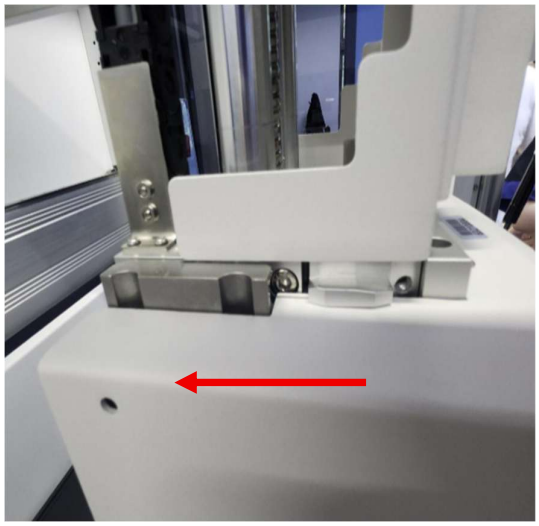
2) Slide the single-channel head to the right along the X-axis, and you will see a clip fixed to the Y-axis at the back. Remove this clip.



Install Pipettor Modules

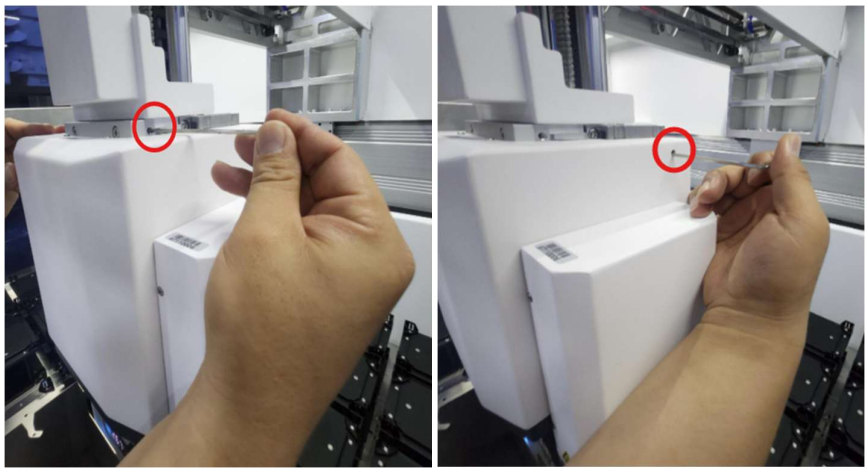
Install 96-channel Head To The Robotic Arm

The 96-channel pipettor is secured on the left and right sides with 4 screws in total. To install, mount the pipettor on the mounting section and push it towards the back of the HT so that it is fully inserted.

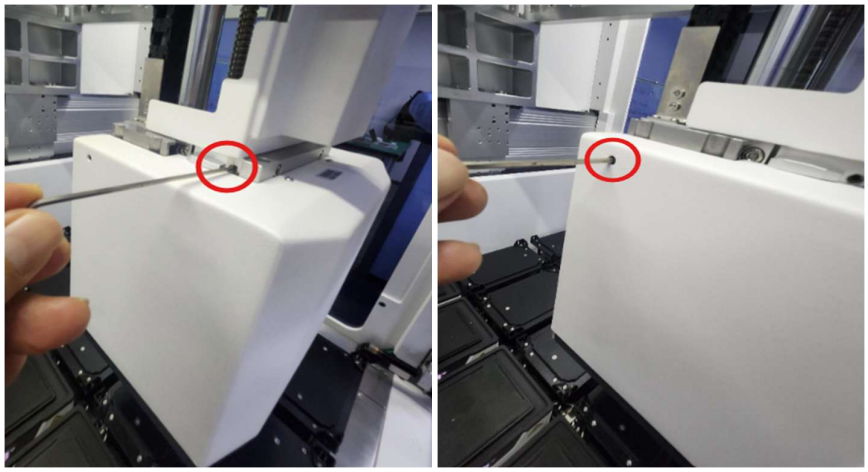


Fasten the screws into two positions on both the left and right sides as shown in the image below. **On the right side, lowering the Gripper will reveal the hole**.

[Right Side]

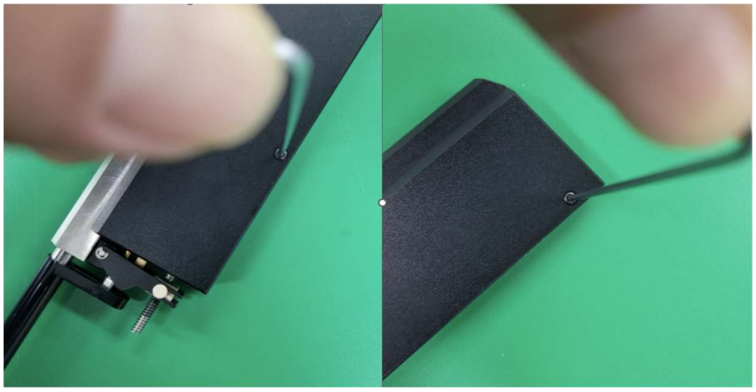


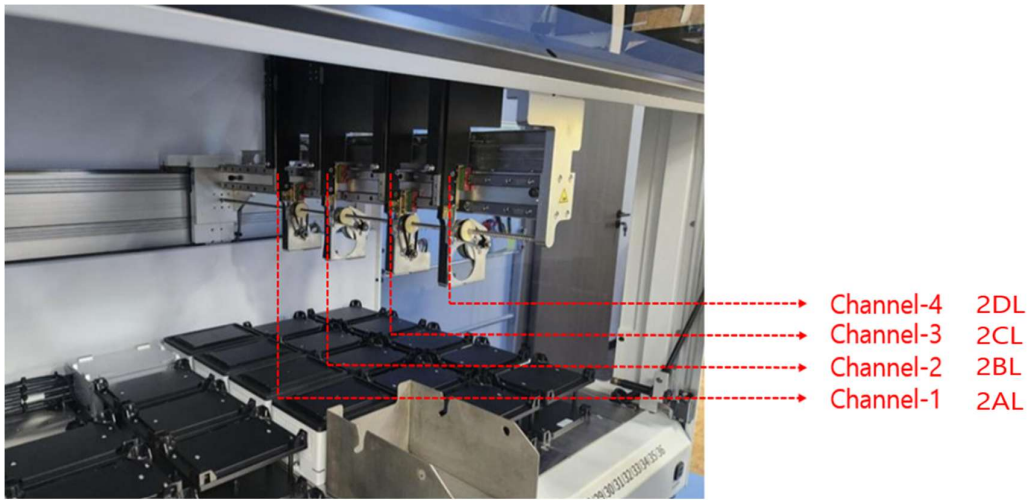
[Left Side]



Install Single Channel Heads To The Robotic Arm

Loosen the two set screws installed inside the two holes in each Single Channel Pipette





Install a Single Channel Pipette for each channel. The installation method is the same as for Pluto LT/MT. Align the head with the designated hole and secure it by tightening the two set screws.

Software Update

Please contact technical support for software updates.

Chapter 4

Operation

Chapter Overview

- Preparation for Operation
- GUI introduction
- Operation

Preparation for Operation

Power On The Instrument

Connect the power cable and turn on the instrument.

Note

- Only the power cord specified by Curiox (250V10A) can be used to connect the power supply.
- Make sure the power switch is in the off position before connecting the power supply.

Be sure that the ground wire in the power outlet is working correctly.

Do not pull the power cord when pulling out.

Do not touch the metal part of the plug.

Module Function Check and Verification

Position Calibration

Instruments are finely calibrated for position accuracy before shipping. Recalibration may be necessary during installation due to shipping and transportation movement.

Position calibration ensures accurate alignment of the dispensing head over the target wells or containers. This process involves setting reference points and adjusting the X, Y, and Z axes to guarantee precise fluid dispensing. Please refer to the appendix B for more information on position calibration.

Run Volume Verification Protocol

Please contact Curiox personnel for assistance.

Run Gripper Verification Protocol

Please contact Curiox personnel for assistance.

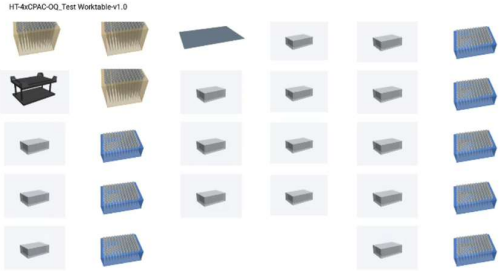
GUI Introduction

Manual Settings

Click the button on the main window to access the manual settings screen (settings for lighting, HEPA, and rank).

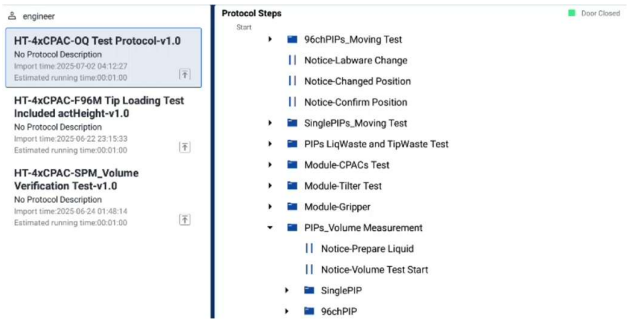
Worktable Viewer

Click to access the worktable viewer button, which allows you to get detailed information on the consumables on the instrument deck.



Run Protocol Step By Step

Click to access a protocol's step menu.



Settings

Import

Automatic import of experimental data (protocol, instrument parameters, worktable, modules, adapters, consumables, etc.)

Export

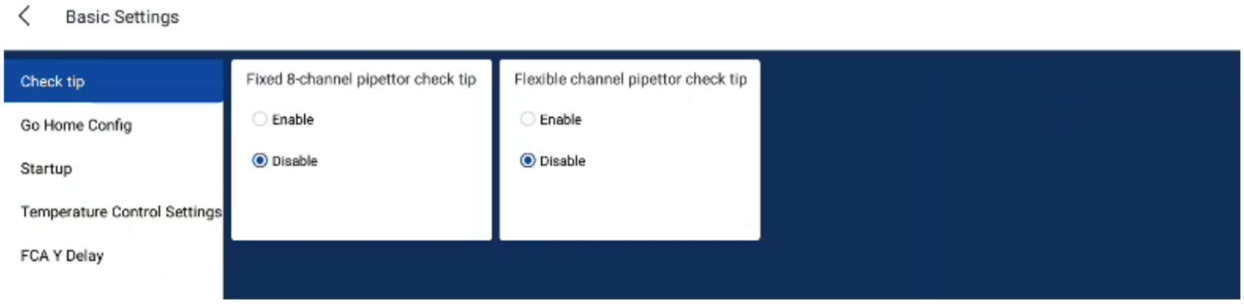
The device execution log is stored in the database. You can export this database to an SD card for analysis and backup.

Data Manage

Used to export or delete protocols, worktables, instrument parameters and to edit liquid class information.

Basic Settings

This includes basic functions like tip check for pipettor， go home after executing protocol completed etc.



Module Debugging

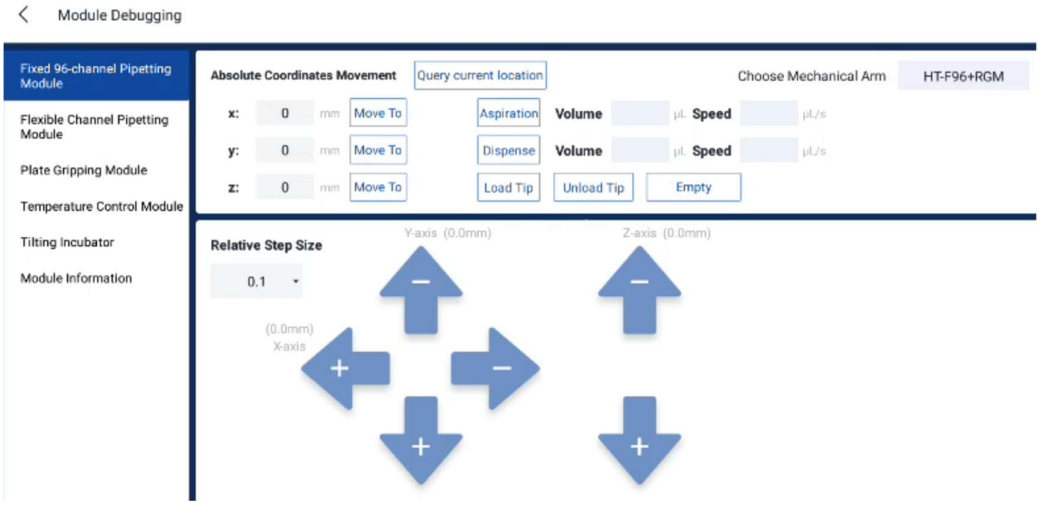
Used for debugging and setting up manual control of each module.

Fixed 96-channel Pipetting Module

Used to access the 96-channel debugger. The user selects this command to check the current location of X/Y/Z motor, and to manually manage settings for aspirate, dispense, load/unload tips, and relative move or absolute move.

Relative move: Move distance relative to current position, increase or decrease step size to move.

Absolute move: Move distance relative to home position.



Flexible Channel Pipetting Module

For flexible channel debugging, the user chooses this command to check the current location of X/Y/Z motor, and to manually manage settings such as aspiration, dispense, load/unload tips, and relative move or absolute move. Selecting ‘linkage to Y/Z zero’ moves the pipettor to the zero coordinate. Selecting ‘linkage to Y/Z far end’ moves the pipettor to its maximum axis position.

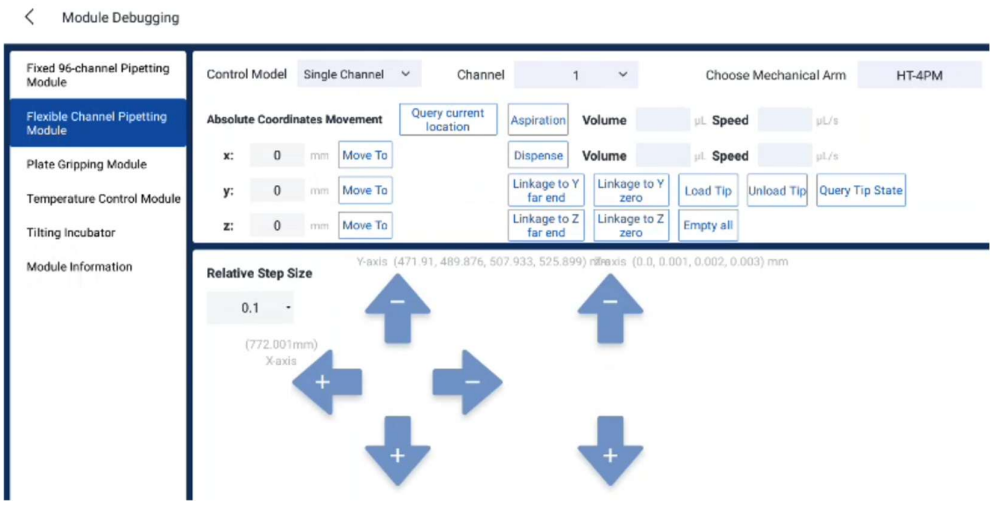
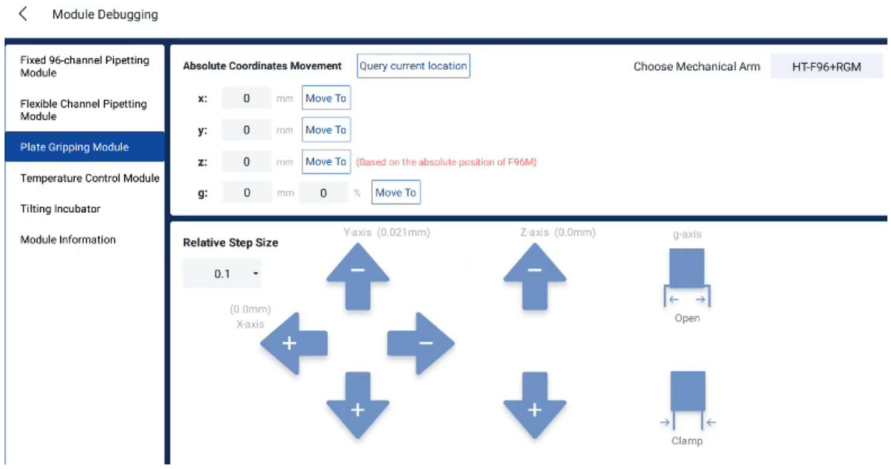


Plate Gripping Module

For gripper module debugging, user can get the current position of each motor and control motor movement in X, Y, Z three directions manually.

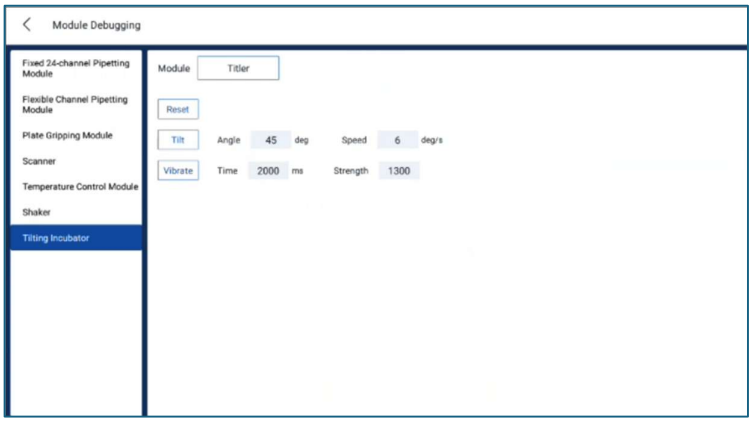


Temperature Control Module

Used for debugging temperature control functions. The user selects one module at a location (CPAC1_B19, CPAC22_DD19, CPAC3_A19, CPAC4_C19). The user can see the current temperature, set target temperature, and set temperature when the module is switched on.

Tilting Incubator

This is used to adjust the tilter device, and can control the tilter device reset, tilt angle, tilt speed, vibration time and vibration intensity parameters.

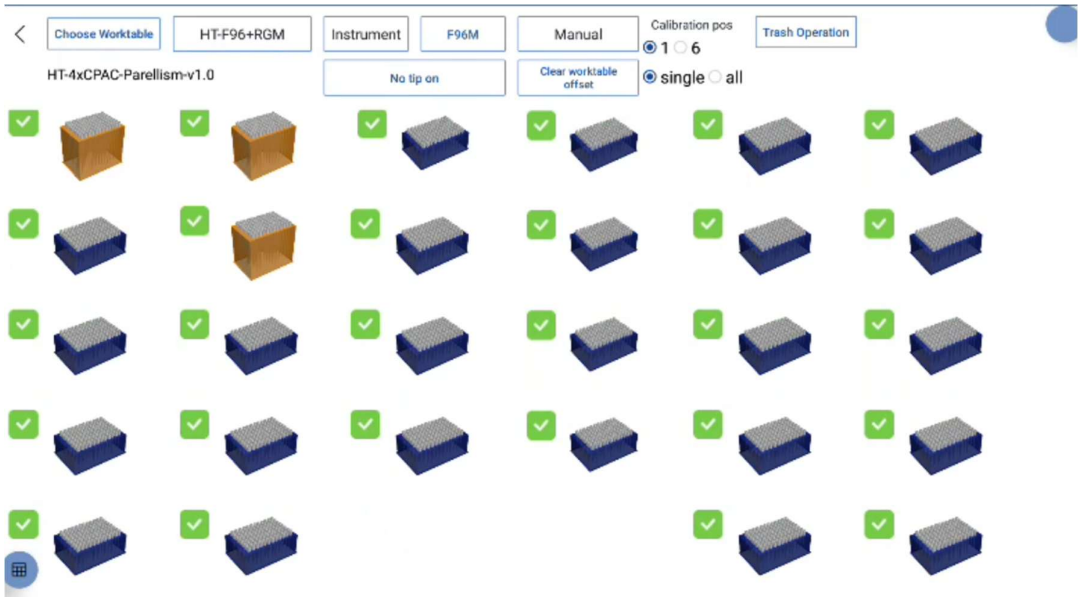


21 CFR Part 11

Please refer to the 21 CFR Part 11 User Guide for information on user management and information on audit trail.

Position Calibration

Usually position calibration has been done at the factory and the user does not need to calibrate on site. If the user wants to perform calibration, please contact a Curiox engineer for help.



About

Displays software information.

Log Out

Allows users to log out of the current account.

Operation

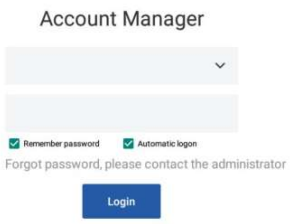
Please follow the instructions below to run your protocols.

Open Software

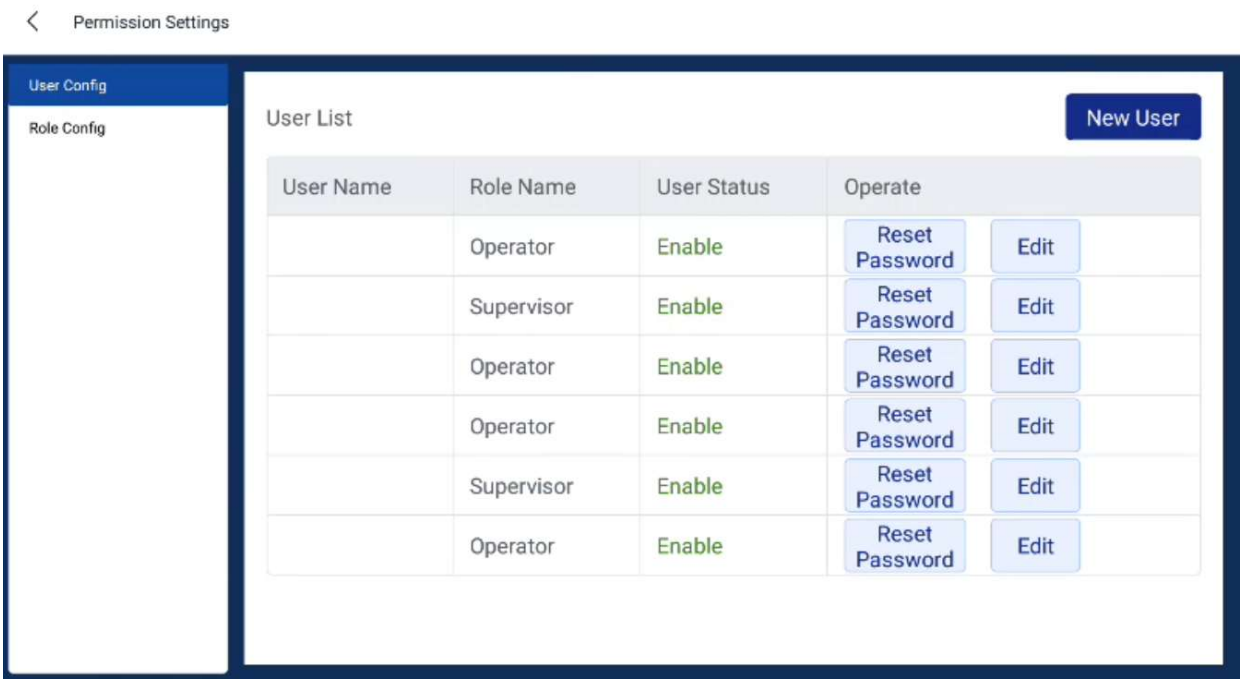
After powering on the device, the PlutoLTStartUp V2 application will automatically start up.

User Login

After opening the PlutoLTStartUp V2 application, there will be an account login pop-up window.



During initial setup, only the Admin account is available. The default username and password for the Admin account are: ‘admin’ and ‘123456’ respectively. After logging in, please change the password of the Admin account if needed. Only Admin accounts can add new accounts with different roles. This can be done be going to ‘Permission Settings’, then ‘User Config’.

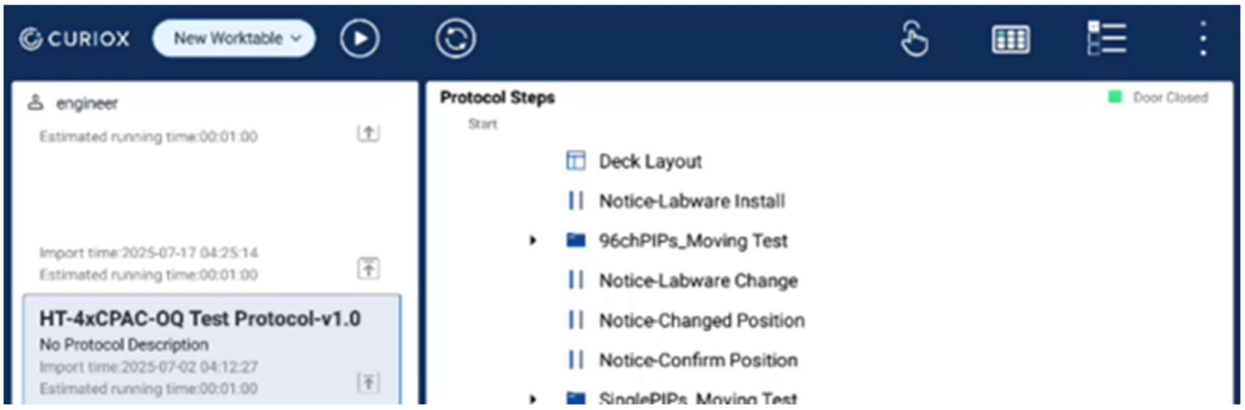


For non-admin accounts, please contact your admin for the password to your account.

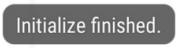
Once logged in, the main window will display the protocol list on the left side. On the right side, detailed information of each protocol is shown.

Instrument Initialization

The device needs to be initialized every time the power is turned on, the control software is restarted, or a fault is resolved.



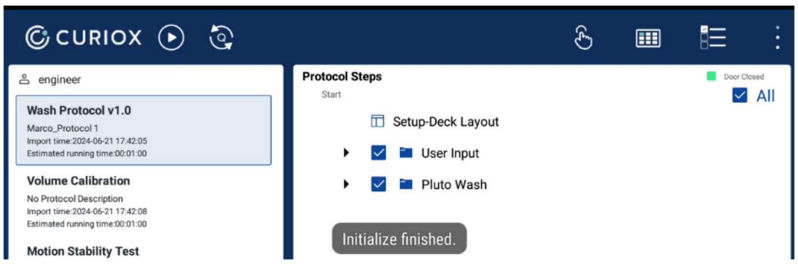
Click  to initialize the device.

After the device has been initialized, the 'initialize finished' 

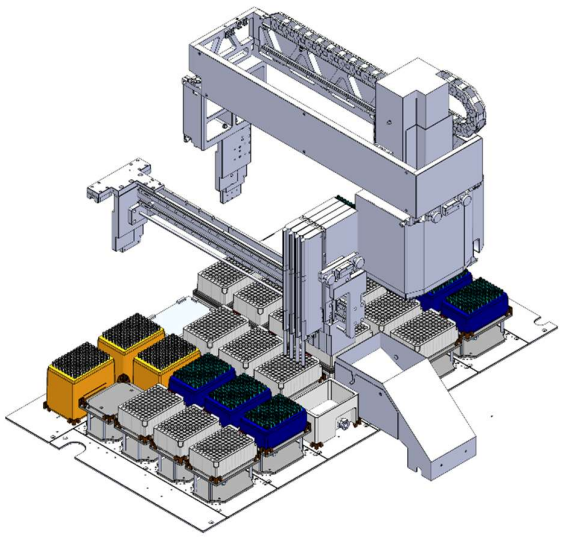
message will show in the center of the screen, and the user can then move to the next operation.

The icon of initialize button will change to , which can be used to initialize the device quickly.

ATTN： When there is movement occurring in the device, do not touch any internal parts!



The pipettor modules will return to their home position (as shown below) when the initialization is finished.

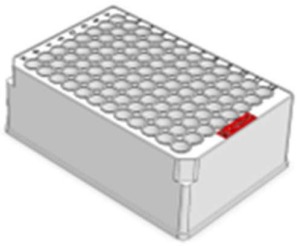


Home positions of the on-arm modules

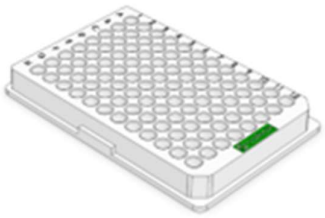
Prepare the deck

Plates and Tips

The Pluto HT system uses two types of Curiox Validated Plates to maximize the performance during experiment runs.

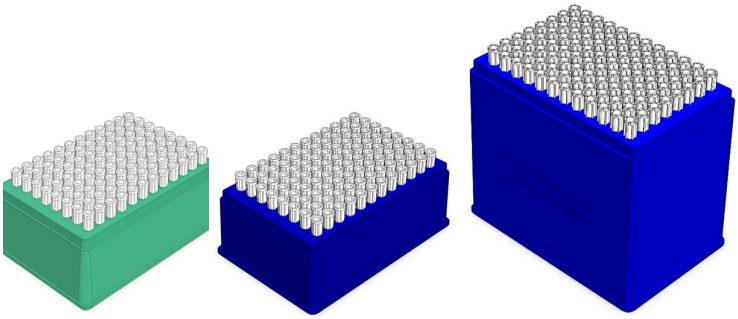


Curiox 96 well, U-bottom, Deep Well



Curiox 96 well, U-bottom, microplate

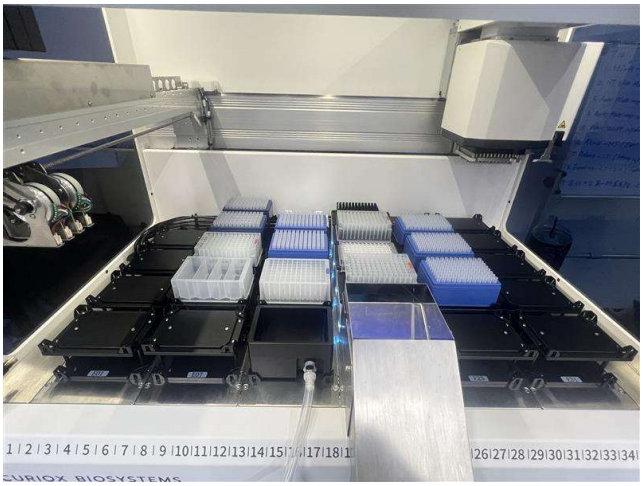
The Pluto HT system uses three types of pipette tips: 50 µL, 250 µL, and 1,000 µL tips. Please ensure the tip box is full before placing it onto the deck. This will prevent running issues.



50 µL tip box (left), 250 µL tip box (middle), and 1,000 µL tip box (right)

Deck Layout

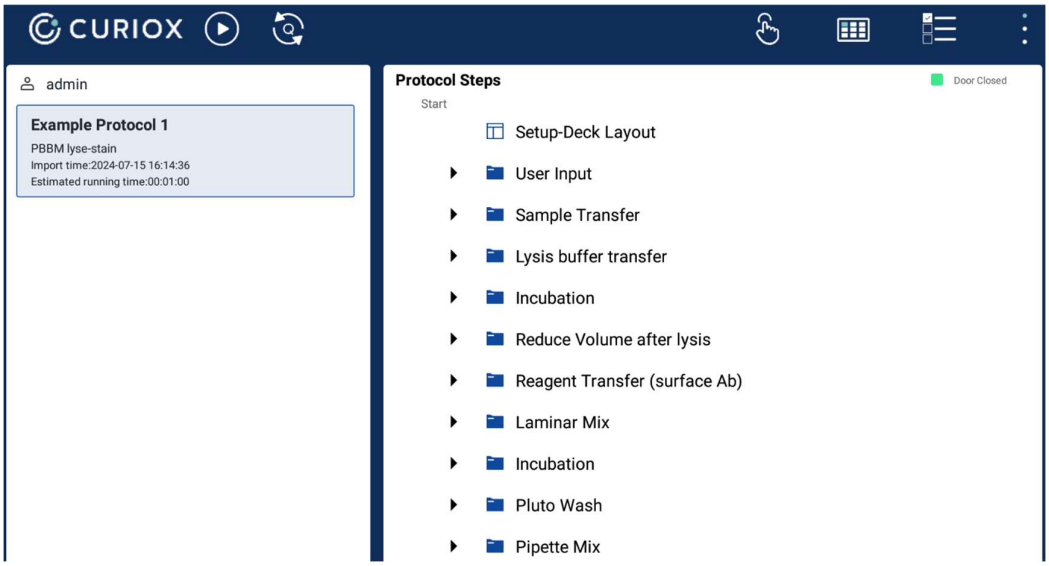
Each of the protocols listed in the Runner software are designed based on the system's specific deck layout. Select  to check the deck layout and prepare the deck before each run.



Run the Protocol

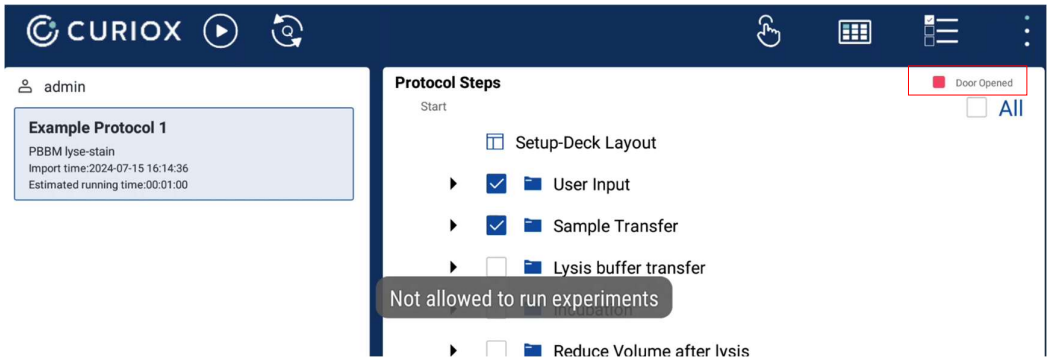
Select the desired protocol.

The main steps of this protocol will be shown on the right side of the display, allowing you to review the protocol and make changes as needed.

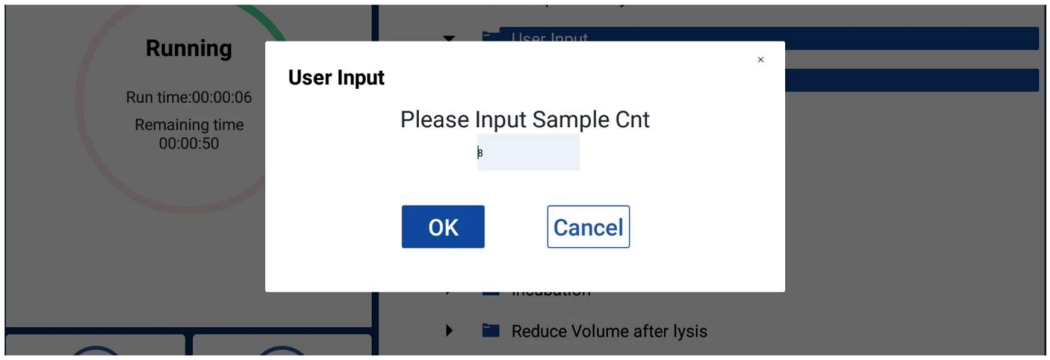


Close the safety door. Then  click the start button to run the experiment.

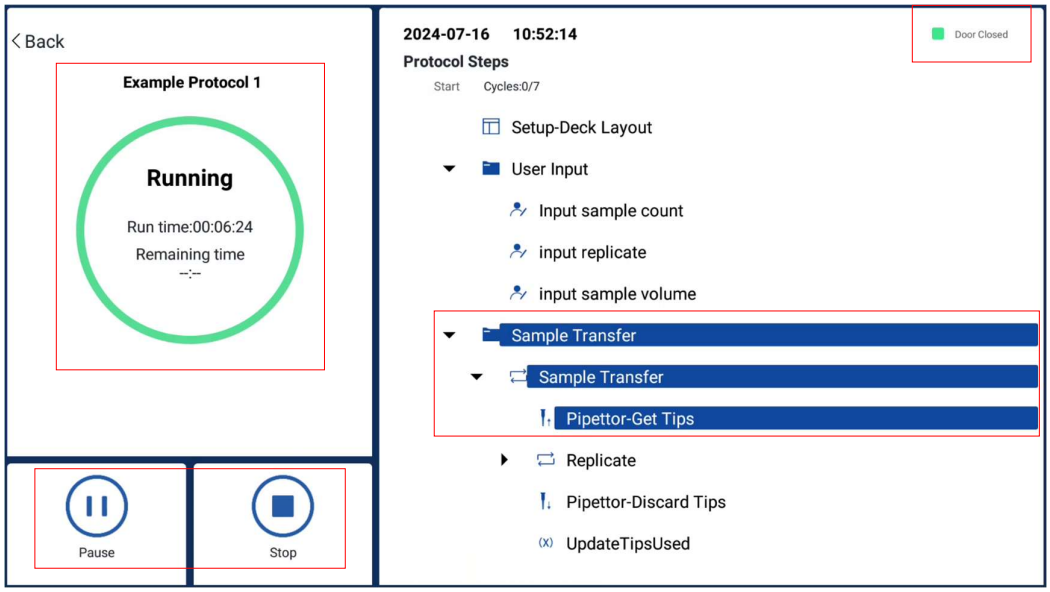
Note	Close the door gently to avoid sensor error. If the safety door remains open, users cannot start the run. A warning message will appear.



Some of the protocols may require key parameters of the experiment to be added (i.e., Sample Number, Replicate Number, Sample Volume, etc.)



During the run, the current steps (on right) and the status info (on left) will be shown. Users can press the Pause or Stop buttons (on bottom left corner of screen) if they need to pause or abort the run.

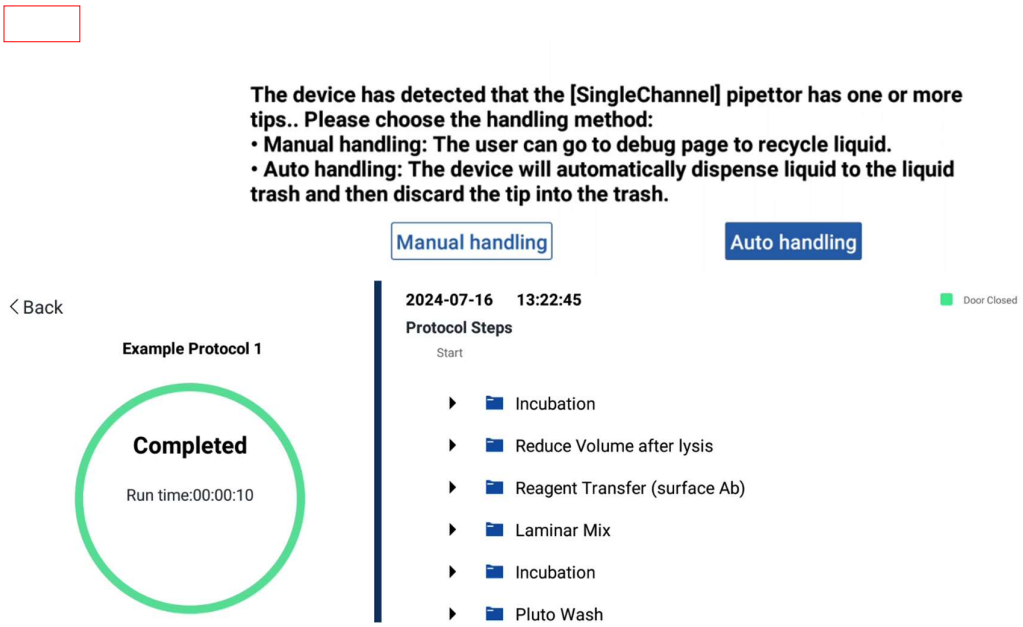


NOTE	Although it is possible to pause and continue the run by directly opening/closing the safety door, Curiox does not recommend this action. Doing this may affect the experiment results.

If the run is aborted by hitting the Stop button when a tip is on the pipettor, a message will show on the screen. You can choose to eject the tip via the manual handling or the auto handling method.

!WARNING!	Pausing when the pipettor is dispensing/aspirating liquid will severely effect the **ACCURACY** of your experiment and **DATA QUALITY**. Use this button with caution.

When the run is completed, you can click the back button on the top left corner of the screen and go back to the main window of the Runner app.



Chapter 5

Maintenance and Troubleshooting

Chapter Overview

- Device Maintenance
- Troubleshooting

Device Maintenance

This section provides an overview of general maintenance procedures. For more details, refer to the Pluto System Maintenance Guide.

Clean After Experiment Run

After each run, following these steps will ensure that the instrument is properly maintained and ready for the next run.

Power Off and Access:

Turn off the power switch and open the front door.

Remove Labware:

Remove all labware after the run. Leaving labware with any chemical reagents may result in damage to the system.

Empty the Waste Bin:

Empty the waste bin(s) after each run and wash with DI water and 70% isopropyl alcohol.

Ethanol Disinfection:

If necessary, use a 75% ethanol to wipe the surface of the instrument and function modules 2-3 times.

Nucleic Acid Removal:

If needed, use a nucleic acid scavenger to moisten a clean paper towel and wipe the surface of the instrument and function modules 2-3 times.

Water Cleaning:

If necessary, use DI water to moisten a dust-free paper towel and wipe the surface of the instrument and function modules 2-3 times.

Drying:

1. After wiping, allow the instrument to air-dry naturally.
2. Once the instrument is dry, close the front door.

HEPA Maintenance

Under normal usage conditions, the primary filter of the air filtration system is effective for 3 months. It is recommended to replace the filter every 3 months. The high-efficiency filter has a validity period of 12 months, with a recommended replacement interval of 12 months. The filters should only be replaced by Curiox authorized technical support personnel.

Other Conditions

Prior to disposal, use 70% isopropyl alcohol to clean and disinfect the equipment.

Troubleshooting

Common faults and possible solutions are listed in this section. If you encounter any issues not mentioned in this manual, please contact Curiox technical support.

An Error Occurs During Initialization

- Turn the power off and on again and then reinitialize.
- If an error related to CPAC or Tilter occurs, contact the Curiox service team for assistance.

The Equipment Does Not Power On

- Confirm that the power cord is properly connected.
- Check the fuse condition as unstable AC power may cause the fuse to blow, preventing the equipment from powering on.

Unusual Noise Occurs During Tip Loading

- Recalibrate the position of the single/multi-channel.
- Check if the O-ring is worn out.

Liquid Leaks After The Aspiration Operation

- Check if the O-ring is worn out.
- Try to replace the tip(s) and attempt again.

Labware Is Not Secured Properly

- Check if the corner bracket is damaged or not. If it is damaged, replacement is necessary.

An Error Occurs In CPAC

- If condensation has caused water to accumulate on the CPAC surface, remove the water and dry thoroughly before running it again.

An Error Occurs During Protocol Operation

- Take a photo of the error code, export logs and then send them to the Curiox service team. We will provide feedback as soon as possible.

Appendix A

Unboxing The System

Curiox ships your Pluto HT system in a sturdy plywood crate. The shipping crate uses hooks and latch clamps to secure the top, side, and bottom panels together. Using latches, instead of nails or screws, means you won't need a crowbar (or a lot of force) to disassemble the crate, and you can reassemble it later if needed.

To release the latches, flip the latch tab up and turn it to the left (counterclockwise). This action moves the clamp arm out of its corresponding retaining bracket. You can then flip the latch arm away from the crate.

Caution	Crate edges can get roughed up during shipping. Wear work gloves to protect your hands from wood splinters.

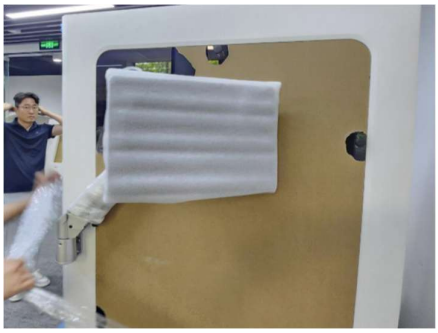
1) Unlock the 32 latches securing all sides.

2) After releasing the latches, remove the top panel. Then, remove the four side panels.

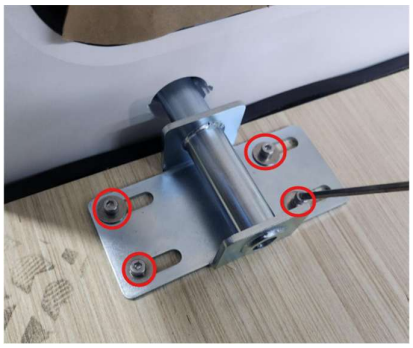
3) Remove the handle rod on top of the machine and set it aside. This is the handle used to lift the machine.

4) Cut the clear film and remove the accessory boxes, setting them aside.

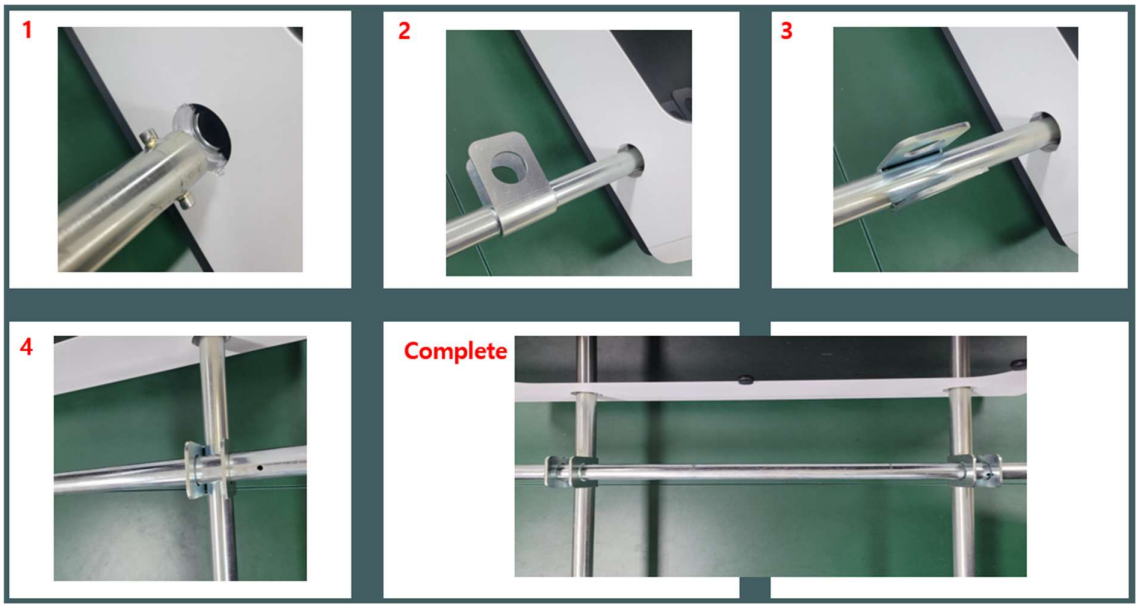
5) Remove the foam from the screen bracket.



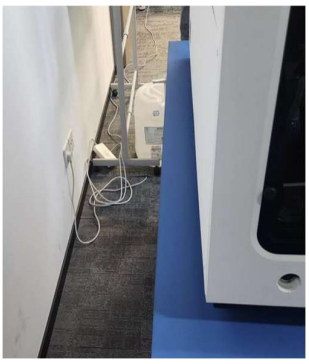
6) Remove the screw to detach the bracket attached to the bottom wood crate. A total of four brackets need to be removed. When removing the bracket, remove the metal rod along with the machine and take them out together.




7) Insert the handle rod into the four holes on both sides of the machine.

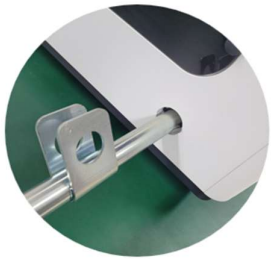


8) With the assistance of **at least six people**, carefully move the entire machine out of the wooden pallet and place it on a suitable countertop. It is recommended to leave some space behind the machine.

9) After placing the machine on the table, remove the handle rods and cover the holes with the hole cover in the accessory box.

 - Hole Cover



Appendix B

Position Calibration

This section explains the position calibration method.

Preparation

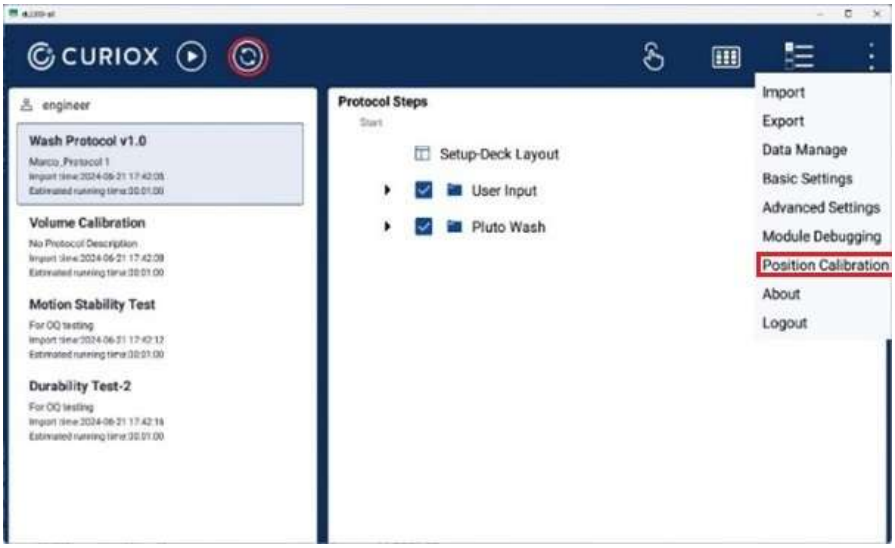
Prepare the tools needed:

- Auto calibration tool
- Calibration Fixture x 1
- Feeler Gauge x 1

Position Calibration

Calibration is carried out in the following sequence.

1. Select 96-channel pipette module (in Instrument mode)
2. Perform position calibration for columns 2-6
3. Select Single channel pipette module (in Module mode)
4. Perform position calibration for columns 2-6
5. Select Single channel pipette module (in Instrument mode)
6. Perform position calibration for column 1
7. Perform liquid trash position calibration
8. Perform tip trash position calibration

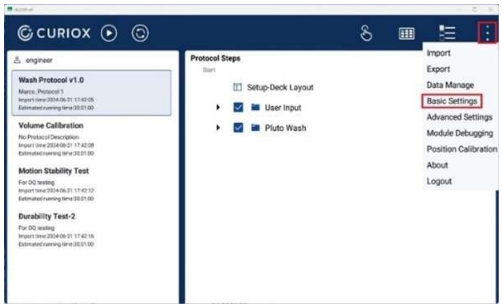


After powering on the equipment and initialization is completed, you can access the calibration menu. Be sure initialization is completed first.

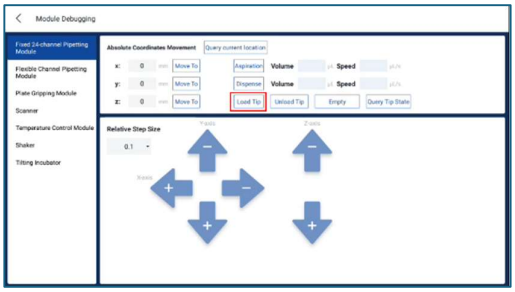
Before Calibration

Before the position calibration, users need to select the worktable they want to calibrate and switch the status of the pipettors.

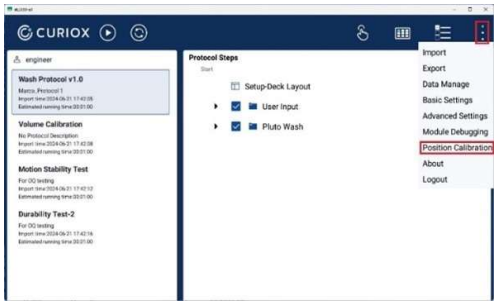
1. Tap the icon and then select **Basic Settings** menu.



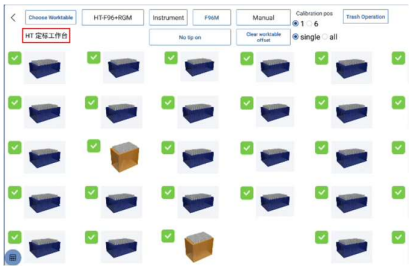
2. In the **Module Debugging** page, select **Fixed 96-channel** in the left list and touch the **Load Tip** button.



3. Return to the previous page and touch the **Position Calibration** item.



3. Touch Choose Worktable and select Calibration Worktable.



Module Selection

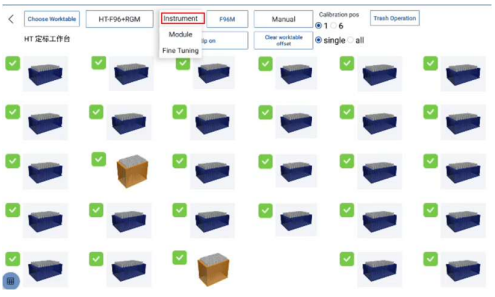
The Pluto HT system has 3 modules that require position calibration. Before proceeding with calibration, select the module that requires calibration and proceed to the next step.

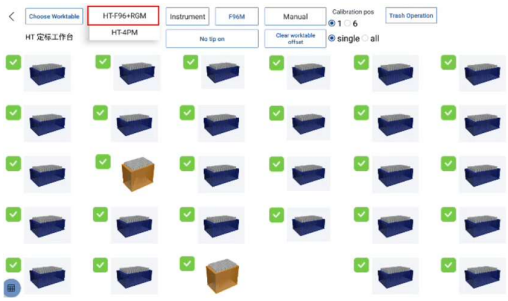
Caution	It is important that the 96-channel pipette calibration is completed first in columns 2-6. After which the remaining modules can be calibrated.

96-channel Pipette Selection

1.Touch and select **Instrument**.

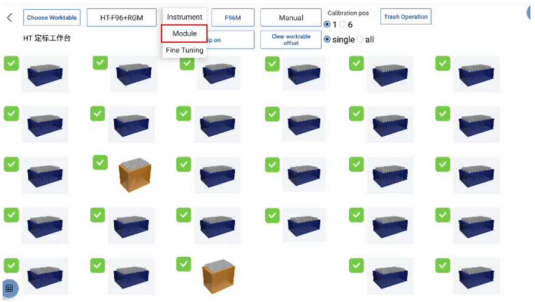
2. Touch the item below and select **Fix96**.



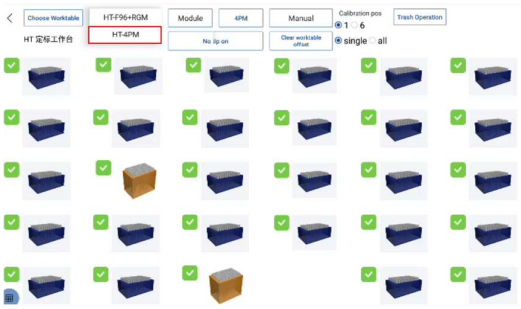


Single Channel Pipette Selection

1. Tap the item below and select **Module**.



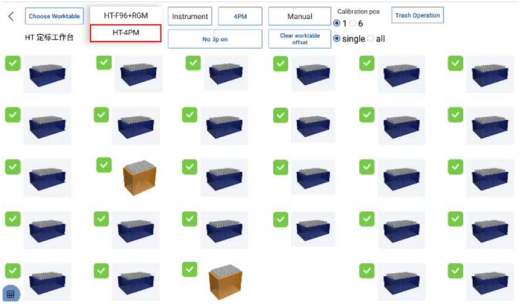
2. Tap the item below and select **Single Channel**.



ATTN: After completing the above two calibration steps, you also need to select the single channel and calibrate the first column in **Instrument** mode.

3. Tap the item below and select **Instrument**.

4. Tap the item below and select **Single Channel**.



Trash Selection

1. Tap the item below and select Instrument/Module (96-channel using **Instrument** mode; Single channel using **Module** mode)

2. Tap the item below and select **Trash Operation.**

3. Tap **To Liquid Trash Pos/To Trash Pos.**

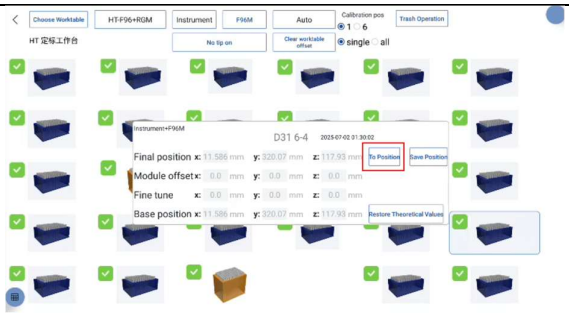
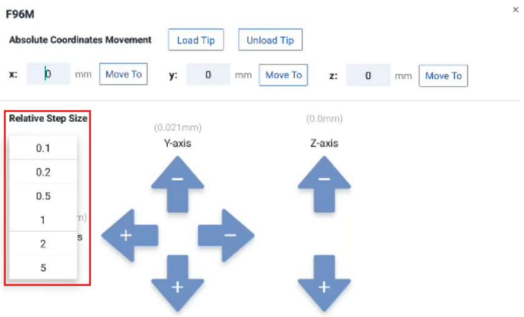
Position Alignment

Each module has a different calibration method.

Module	Calibration Position	Description
96-channel Pipette	**Columns 2-6**	
Single Channel Pipette	**One Position (In Module Mode)**	Only need to calibrate one position and the remaining positions will be automatically calculated.
Single Channel Pipette	**Column 1 (In Instrument Mode)**	The single channel robotic arm limits the 96-channel's reach. Therefore, calibration of the first column can only be performed with the single channel.

Position Alignment – 96-channel Pipette

1. Install the auto calibration tool at the location where alignment will be performed. And tap below Icon, choose **Auto.**	2. Touch the **Labware** at the location where auto calibration tool is put and touch the **To Position** button.

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>3. When you touch To Position, the selected module will come near the position of auto calibration tool.</td><td>4. Please check the probe is within 3mm above the auto calibration tool. (If not, touch the Navigator icon (at the top right corner) and Select the Step length to move each time you touch the button).
  </td></tr>
<tr><td>5. Click Auto Calibration and Save Position, the probe will move automatically.
  </td><td>6. Calibration for that deck position is complete.</td></tr>
</table>

Position Alignment – Single Channel Pipette

Single channel alignment is the same as 96-channel alignment, but **only one position needs to be aligned**.

Position Alignment – Trash

Ensure that the tip is at the inner center of the trash.

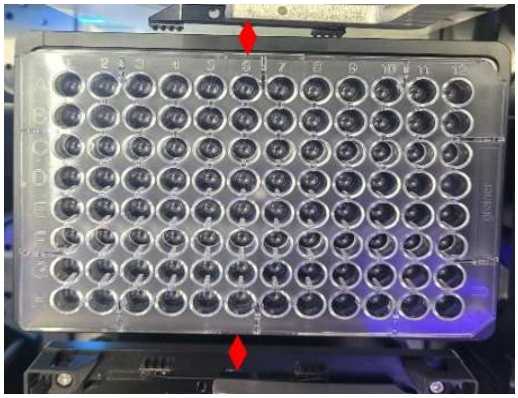
Position Alignment – Gripper

The gripper only needs to be aligned at the **D2 Position**.

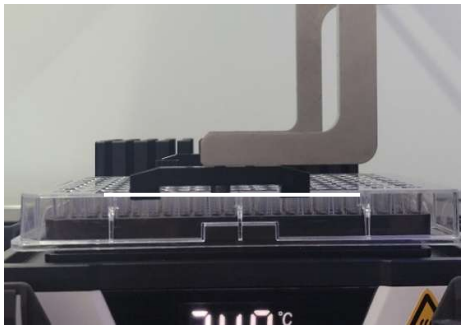
Before moving the gripper, please adjust the mode in position calibration first, as follows:

1. Adjust the X-axis so that the black screw attached under the gripper is located in the center of column 6 of the plate.

2. Adjust the Y axis so that the distance between both sides of the plate and the **gripper tongs is equal.** It doesn't have to be very accurate.



3. Adjust the Z axis so that the black screw on the tongs is at the surface of the plate.



4. After finishing the X, Y and Z alignment, Press the **Save Position** button to save the position values.

Appendix C

Acknowledgement of Decontamination

Acknowledgment of Decontamination Form

Decontamination is required prior to the PLUTO HT system being returned to Curiox Biosystems (i.e., for servicing, maintenance, etc.). You are required to fill out this form to acknowledge that decontamination has 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 D

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					

If you have any other comments/suggestions about the PLUTO HT system, please let us know below.