PurePLATE

Microplate Cleaning System (MCS)
User's Guide V2.3

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Preface

Limited Warranty

All PurePlate MCS(s) and accessories sold by IonField Systems are under warranty against manufacturing defects in parts for the three (3) month period from the date of installation. For countries with longer warranty requirements, the variation will be noted on the documentation shipped with the instrument. If a customer elects to do a self-installation, the warrantee period begins the date the system is shipped to the customer. The PurePlate MCS will operate with the designated automated system to provide the service for which it is designed in accordance with IonField Systems published specifications.

IonField Systems disclaims all warranties, express or implied, other than those set forth in the published specifications or manufacturer's instructions for use. IonField Systems expressly disclaims any and all warranties of merchantability and/or fitness for any particular purpose.

Important Cautions and Warnings

The PurePlate MCS is designed for professional, commercial use only and is intended for use in biopharmaceutical, agricultural, forensics, genomics and life science research laboratories. Use of the MCS other than for its intended use or in any manner inconsistent with this User's Guide may cause personal injury, damage to the MCS, or affect its operability and constitutes a breach of the applicable Agreement.

The PurePlate MCS is designed to operate only with parts and supplies furnished or approved by IonField Systems. The MCS has a few serviceable parts. The MCS is designed for parts to be rapidly replaced to maximize uptime. All service must be provided by persons qualified and authorized by IonField Systems or under the guidance of IonField Systems. Unauthorized modifications or repairs to the MCS and/or use of parts not supplied by IonField Systems may cause serious personal injury, damage to the MCS, or affect its operability and constitutes a breach of the applicable agreement. The end user assumes all responsibility for incidental and/or consequential damage from any unauthorized modifications or repairs or use of parts not supplied by IonField Systems.

As with other electrical appliances, the PurePlate MCS has specific electrical and environmental requirements. The requirements are set forth in this User's Guide. Use or operation of the MCS with different or fluctuating electric power or in environments not specified may cause personal injury, damage to the MCS, or affect its operability to operate as intended and constitutes a breach of the warranty.

For information concerning use of the PlasmaCharger Controller and other IonField products or accessories, please refer to their respective User's Guides.

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Contact Us

For Sales or Customer Support, please contact IonField's Main Office at +1.856.437.0330

Alternatively email sales@ionfieldsystems.com or email support@ionfieldsystems.com

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All Controller Modules and other components of PurePlate MCSs are labeled with unique serial numbers. Please have the serial numbers for the Controller Module and the MCS available when contacting Customer Support.

Additional support information, including videos on system operation, is available at www.ionfieldsystems.com

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Table of Contents

1. Introduction

Purpose

This guide is the main reference and operating guide on how to operate the PurePlate MCS system and software.

Background

The PurePlate MCS consists of up to six separate components. The main components are the Rinse Module, Plasma Module and Communications Module. The Rinse Module is the first step in the cleaning process, it receives a dirty microplate, dispenses a microliter amount of high concentration of alcohol into each well, spins it out, rinses the plate with a high-pressure alcohol/water mixture, then centrifuges the plate dry. The Plasma Module receives recently rinsed and dried microplates, which it then generates and blows ionized air (plasma) onto to break apart and evaporate organic molecules. The Communication Module which acts as an operator's interface and allows robotic automation through the integrated API. The secondary components include a pump enclosure for the Rinse Module, a PlasmaCharger Controller to generate plasma, and an optional, extra cost alcohol/water mixing enclosure.

Features

The PurePlate MCS has physical and software safeguards and features that enable it to be used quickly, easily, and safely.

Hardware

- **Plate Types**: Given that customers use multiple types of plates in their assays and these plates can have a wide variety of well configurations and heights, the Rinse Module has custom plate holders that are 3D printed to precisely position the top of the microplate the same distance from the dispensers and at the same radius in the centrifuge. These holders are made specifically for each type of plate. The Rinse Module can accommodate typical microplates in the standard SBS footprint with varying heights, and also more specialized plates with different footprints, such as the Patchplate Quattro, if the footprint is the same or smaller than the SBS standard, as well as prototype metal microplates that are barely a mm in height.
- **Ease of Use**: The Rinse Module can be entirely operated in automated mode, or through the touchscreen on the Communication Module. In manual operation, with the press of one button, the Rinse Module can be operated in "One Plate Mode" or "Two Plate Mode" which will be explained later in this guide. Two Plate Mode provides faster throughput.
- **Servicing**: The Rinse Module and Plasma Module can be accessed internally with one Allen key wrench, in less than 3 minutes each. The entire mechanical structure of the Rinse Module can be opened and removed from the enclosure in less than 5 minutes, while the Plasma Module's internals are immediately accessible from opening the lid.

- **Safety**: The Plasma Module generates Ozone which can cause respiratory irritation. The irritation is based on concentration and exposure time. There is no Ozone leakage from the Plasma Module during or after operation and we recommend leaving the exhaust fan on at all times. The Rinse Module's centrifuge should be inspected regularly. It's manufactured using a 3D printed ceramic plastic and is normally programmed to run at 1500 rpm or less. Effectively the entire mass rotating is some type of polymer. The aluminum enclosure of the Module is rated to contain the plastic parts inside by a factor of safety of over 10.
- **Sensors**: The Rinse Module can detect that both microplates/holders are properly entered before it spins. The centrifuge motor has highly sophisticated integrated sensors that can detect imbalances and stop applying force to the rotor well before any catastrophic failure occurs. The Rinse Module also has a sensor to detect if the drain is clogged and water is building up inside prevent normal operation. There are flow sensors in the pump lines to ensure both pumps are operating at maximum pressure to ensure adequate cleaning power for each microplate. We suggest that waste containers have sensors to alert the MCS or automation controller they are filled to capacity.
- **Alcohol/Water Mixer**: An option with the MCS system is a separate enclosure that when turned on will automatically start filling up a specific sized tank with a user programmed mix of 10% alcohol, and 90% water. You can hook up the hoses, turn it on, and come back in a few minutes and it will be done. This unit should have automatic shutoffs preventing overflow.
- **Clean in Place:** The Rinse Module can be easily cleaned of all biologics through a clean in place procedure. Simply insert the feed hose into whatever cleaning solution you would like to use and using the custom rinse settings run the rinse cycle as long as you like. If the fan is left on continuously, the Rinse Module will completely dry. Depending on the assay material, rinsing after every run may be appropriate.

Software

The software on the Communication Module was designed to be simple and easy to use. It has numerous features that can tailor the user's microplate cleaning requirements.

- **Automation Mode**: Upon startup the unit will be by default in automation mode where it can send and receive commands from a robotics system using Ethernet/IP communication. It can then relay those messages and check on the statuses of the Rinse and Plasma Modules, and issue commands to the PlasmaCharger controller.
- **Manual Mode**: The Communication Module can be set to operate completely via the touchscreen. The operator can either operate in a short-hand mode that simulates a full regular rinse/plasma cycle, or it can be operated via a custom menu that allows multiple rinse, centrifuge, or flip cycles with any number of plates entered.
- **Settings**: When selected the Communication Module can change the settings on both the Plasma and the Rinse Modules, and those settings will remain in place for both Automated and Manual modes. On the Plasma Module, the duration of the plasma treatment can be

changed. On the Rinse Module, the duration of the rinse, the speed of the centrifuge and the duration of the micro dispense can be changed.

- **Error Modes**: The MCS is full of sensors to detect faults. From each motor detecting force imbalances, to flow and water level sensors, the MCS is able to shut down operation in a split second and alert the operator to the error and how to fix it via the touchscreen on the Communication Module.

2. Components

Rinse Module

Figure 1 – Rinse Module

The Rinse Module is the first step in the cleaning process and has 4 vibration resistant feet. It has a 2” (50.8mm) hose exhaust in the rear and 4 feet positioners on the top for the Plasma Module. The positioners align the two module handoff platforms in X and Y.

Plasma Module

Figure 2 – Plasma Module

The Plasma Module is the second step in the cleaning process and can either be situated by itself or on top of the Rinse Module. It also has a 2” exhaust hose hookup in the back.

Communication Module

Figure 3 – Communications Module

The Communication Module contains all of the automation software and acts as a physical interface for the operator to control both the Rinse and the Plasma Modules. It can also receive and send commands via Ethernet to the Robotics system.

Pump Module

Figure 4 – Pump Module

This Pump Module intakes a solution from a tank and outputs a pressurized hose to the Rinse Module for cleaning. It also has a power line that connects to the Rinse Module.

PlasmaCharger Controller

Figure 5 – PlasmaCharger Controller

The PlasmaCharger Controller is used to generate plasma for the MCS's Plasma Module. It is the same proven technology that we use to clean pipette tips in our Controller.

Source/Waste Tanks (Optional)

Figure 6 – Waste/Source Storage

It is recommended to have 2 solution tanks. One for source solution and one for waste. To simplify maintenance, you may opt to run the waste hose to a suitable drain for easy disposal – check if this option is allowed in your facility. Additional tubing may be required – contact an Ionfield Systems representative for assistance and recommended products to use. We recommend at least a 5-gallon solution tank for the source and waste containers. Make sure all containers used are bio-resistant and chemically resistant to alcohol, DMSO, and all chemicals used in your assays.

Exhaust Hose

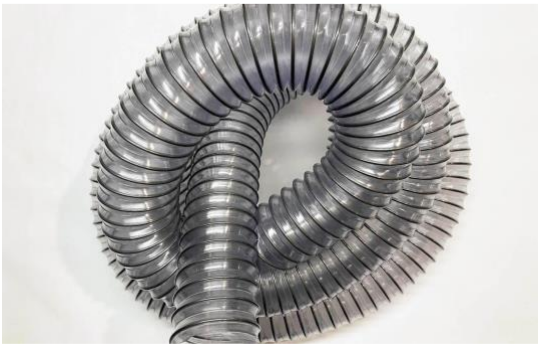


Figure 7 – Exhaust Hose

Exhaust hoses with 2” diameter are included for the Plasma and Rinse Modules to vent Ozone and contaminated mist, respectively. However, the customer may want to use their own if the hose needs to be longer or to meet facility requirements.

Serial Cable

Figure 8 – Serial Cable

The serial cable is used to connect the Plasma Module to the PlasmaCharger.

Note: The Serial port on the Rinse Module is only for programming the actuator if necessary.

Ethernet Cable

Figure 9 – Ethernet Cable

Included are three Ethernet cables for communication between the Communication Module and the Rinse and Plasma Modules. They also provide communication between the Communication Module's and the Robotics (if activated).

Power Cables

Figure 10 – Power Plugs

Depending on the country and building the customer is in, an appropriate power cable type will be provided. There are 4 power cables, one each for the Rinse Module, Plasma Module, Communications Module, and the PlasmaCharger Controller.

Microplate Holders

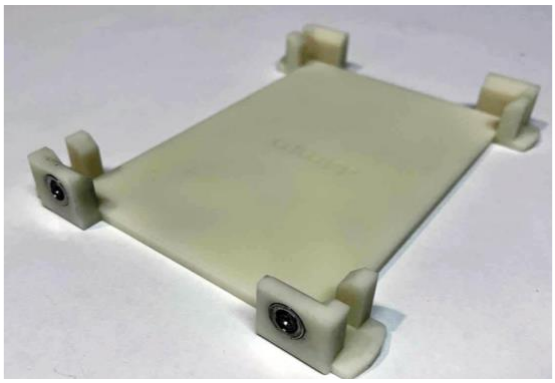


Figure 11 – Microplate Holder

These plate holders are for each of the Modules. A standard set comes with 3x 1536 format microplate holders, 3x 384 format microplate holders, and 3x 96 format microplate holders – all standard height. There are three plate holders per type of microplate, 1 for the Plasma Module and 2 for the Rinse Module. They are inserted with the magnetic holders facing towards the unit.

We also can provide plate holders for microplates with less or taller Z height. These are produced to the requirements of the lab. These holders allow microplates to work in our system effectively as if they were all the same shape and size. If you have a specialty plate, we can work with you to create a custom

plate holder that can accommodate any size as long as it is equal to or smaller than the standard ANSI microplate footprint.

Micro Dispense Filter

Figure 12 – Micro Dispense Filter

The Rinse Module comes with a filter in order to prevent clogging of the 16 or 32 holes on the micro dispense head (option of holes chosen at time of order). The filter will be inspected in the maintenance schedule and can be replaced easily.

Liquid Tubing

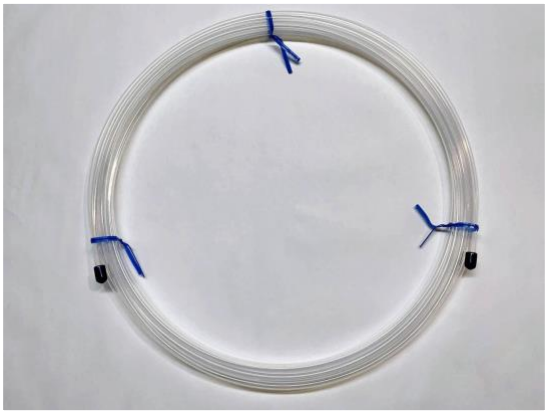


Figure 13 – Liquid Tubing

This ¼" OD tubing is used between the pump module and the Rinse Module.

Plasma Tubing

Figure 14 – Plasma Tubing

This ½" OD tubing is designed to be resistant to ozone and is used between the Plasma Module and PlasmaCharger. The PlasmaCharger Adapter (Figure 17) is used to connect this tubing to rear of the PlasmaCharger labeled "Exhaust".

Hose Clamp

Figure 15 – Exhaust Hose Clamp

This clamp (two supplied) is used to fix the 2" exhaust hoses onto the rear of Plasma and Rinse Modules.

Rinse Module Micro Dispense Cleaning Tool

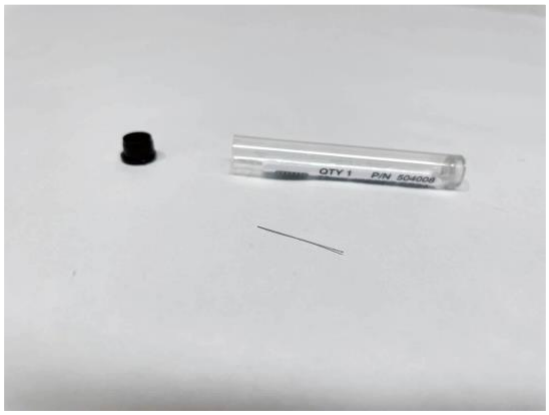


Figure 16 – Rinse Module Micro Dispense Cleaning Tool

This tiny bit is designed to ream the holes on the dispense head inside the Rinse Module in order to clear the hole if they become obstructed.

PlasmaCharger Adapter

Figure 17 – PlasmaCharger Adapter

This connector plugs into the PlasmaCharger “Exhaust” to supply air to the Plasma Module.

Drain Adapter and Teflon Tape

Figure 19 – Drain Adapters and Teflon Tape

This 1/4NPT tube adapter can be used on the rear of the Rinse Module to connect a drain hose/tube, ½' ID tube adapter is included. The Teflon tape is used to assist in sealing the adapters to the drain.

Note: ½ ID tube is recommended to provide proper drainage. Provide a downward pitch without high spots.

Mixture in Tube Adapter

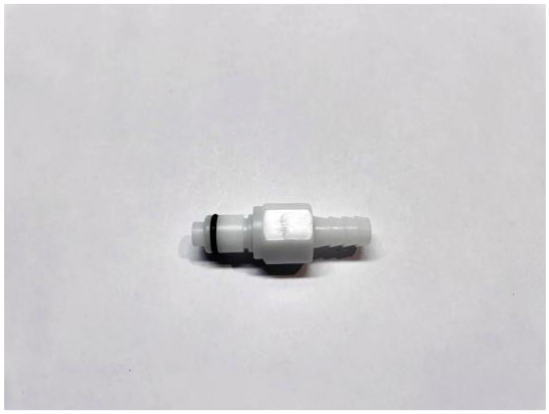


Figure 18 – Tube Adapter for Air

This 5/16" ID tube adapter connects to the Pump Module labeled "Mixture In" and the liquid tube (customer sourced) to draw liquid from source container being using.

3. Setup and Operation

Overview of Operation

The PurePlate MCS cleans any format microplate to background levels using a multistep process. This process is performed using a sequence of events programmed into the Communications Module, starting with the Rinse Module. After placing the microplate into the correct holder, either the robotics scheduler/controller or an operator at the Communications Module will trigger the program to start.

1st Stage

The 1st Stage has the plate travel inside the Module and travel into the centrifuge. The plate will be quickly spun in the centrifuge to remove the residual assay material form the wells. Typically, this step removes over 99% of any fluid in the well. Normally in the program, the microplate moves to the next stage without exiting the Rinse Module.

2nd Stage

The 2nd Stage has the plate travel inside the Module and is positioned correctly under the micro dispense head when it turns on. This dispenser accurately dispenses a mixture (user defined) into every well. The exact volume is based on the speed the microplate moves under the dispenser. After dispensing the plate moves into the centrifuge. A pause/dwell can be programmed to increase the effectiveness of the solvent mix. Then the microplate(s) is spun in the centrifuge, reducing the volume of liquid to that held by surface tension.

2nd Stage

The microplate will then be positioned for rinsing by the high-pressure water rinse head. Rinse time is set in the program. Once that time is up, the rinse head turns off and the microplate is again moved into the centrifuge. In Two Plate Mode, the centrifuge will slowly flip 180 degrees until the 2nd plate holder is accessible for movement and the process repeats for the 2nd microplate. After the programmed spin, one (or both, depending on mode being used) microplate(s) will be moved to the handoff position. To continue, another microplate is placed in the holder in the handoff position.

Once the 2nd plate is placed into the 2nd plate holder, the 2nd stage must be triggered again by either robotics or the operator at the Communications Module. The 2nd plate holder enters, is dispensed, spun, then rinsed similarly to the 1st plate holder, and is inserted into the centrifuge. The centrifuge will then spin for 10 seconds at a max RPM specified by the Communications Module. After spinning it will eject the 1st plate holder and wait for further input.

Once the 1st plate is removed from the plate holder, the 3rd stage must be triggered again by either the robotics or the operator at the Communications Module. The 1st plate holder will enter, skipping the rinse step, centrifuge flips 180 degrees, and the 2nd plate holder ejects. The module will then be ready for further input.

3rd Stage

At this point the Plasma Module takes over. Either robotics or an operator will transfer a freshly rinsed plate from the Rinse Module and place it onto the plate holder in the Plasma Module. *NOTE: Since the Rinse Module has two plate capabilities and the Plasma Module has one plate capability, it is advised that when you remove the 1st plate from the Rinse Module, you immediately place it in the Plasma Module and run the Plasma cycle.*

The 3rd stage is running the Plasma Module which can be either done through a command from the robotics or an operator at the Communications Module. The plate holder will enter, the Plasma Controller will turn on automatically, and plasma will be blown into the microplate. After the specified duration of time as dictated by the Communications Module, the plate holder will be ejected and the system ready for a new plate.

4th Stage

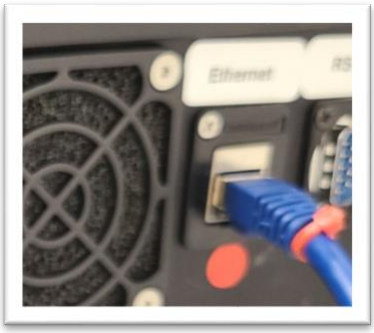
Options – the above description is based on programmed operation using the Command Module. Alternatively, individual steps in this process may be run in Manual Mode. Also, a robotic controller/scheduler, can either call up and run programmed methods in the Command Module or send individual steps as in Manual Mode.

Quick Start Installation Instructions

Color in Instructions = Colors on Unit and Parts

1

Connect blue ethernet cable with the **RED CABLE TIE** from the Rinse Module (rear) to the Communication Module (rear) - any port. Components are also marked with a **RED LABEL.**



2

Connect blue ethernet cable with the **ORANGE CABLE TIE** from the Plasma Module (rear) to the Communication Module (rear) - any port. Components are also marked with an **ORANGE LABEL.**

3 Connect RS 232 serial cable with the **BRIGHT PINK CABLE TIE** from Plasma Module (rear) to Plasma Charger (rear) - *"RS232"* port marked with a **BRIGHT PINK LABEL.**

4 Connect *RS 232* silver key connector (no wire) into PlasmaCharger (rear) - *"to cleaning station"* port marked with a **PURPLE LABEL.**

5 Connect high voltage connector with the **YELLOW CABLE TIE** from Plasma Module to PlasmaCharger (rear) marked with a **YELLOW LABEL.'**

6 Using ½" black tubing with gray CPC connector and **GREEN CABLE TIE**, connect *"Air Connection"* on Plasma Module (rear) to *"Exhaust"* on PlasmaCharger (rear). Components are also marked with a **GREEN LABEL.**

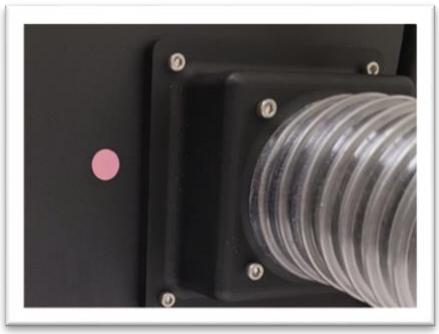
7 Using ¼" clear tubing, connect *"Rinsehead"* on Rinse Module marked with a **WHITE LABEL** (rear) to *"Rinsehead"* on Pump Module marked with a **WHITE LABEL**. Push the tubing into the connection port until tight and fully seated.

8 Using ¼" clear tubing, connect *"Micro Disp"* on Rinse Module (rear) marked with a **GRAY LABEL** to the container holding the Micro dispense solution.

9 Using ½" black tubing with white CPC connector and **BLACK CABLE TIE**, connect "Mixture In" on Pump Module (rear) marked with a **BLACK LABEL** to the container holding Rinse Solution.

10 Using gray power cord with the **BLUE CABLE TIE** with plug from Pump Module, connect to Rinse Module (rear) - *"MCS Pump"* connector. Screw to tighten. Components are also marked with a **BLUE LABEL.**

11 Using hose clamp, connect 2" clear tubing to Rinse Module exhaust marked with a **LIGHT PINK LABEL.**

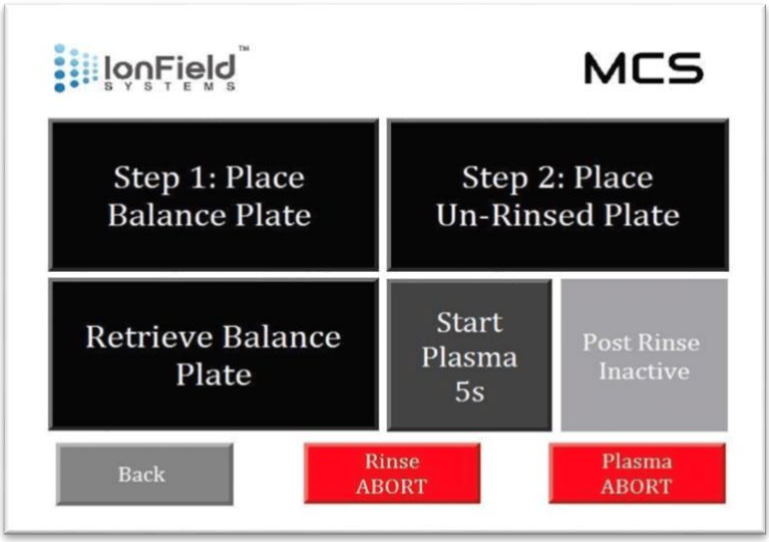


12 Using hose camp, connect 2” clear tubing to Plasma Module exhaust marked with a **LIGHT PINK LABEL.**

13 Wrap a small amount of the included Teflon tape around the threads of the drain plug adapter and then screw into the drain hole – marked with a **YELLOW LABEL**). Connect to ½” ID drainage hose (hose not included).

14 Connect power cords to the PlasmaCharger, Communication Module, Rinse Module, and Plasma Module – all marked with **BROWN LABELS.** Plug into AC power.

15 Power up all modules in any order. On home screen of Communication Module, abort then reset both Rinse Module and the PlasmaCharger.



Powering Up PurePlate

- After roughly 60 seconds, the Rinse and the Plasma Module should initialize.
- The Communications Module should display the 'Cautions and Warnings!'
- Initialize/Home the 'Rinse' and 'Plasma' modules.
  - > *Read the 'Cautions and Warning!' screen and Press 'Accept'*
  - > *Press 'Rinse Module Control'*
  - > *Press 'Abort' once, then press 'Aborted! Press Again to Reset', this will initialize and home the Rinse Module.*

- *Ensure rinse fluid and micro-dispense fluid (if being used) containers are filled and connected (user supplied).*
- *Press 'Prime Rinse Head', rinse head pump will prime and complete after proper PSI in sensed.*
- *If being used, Press 'Prime Micro-Dispense Head', micro-dispense head pump will prime and complete after proper PSI is sensed.*
- *Navigate back to 'Select MCS Control' screen and press 'Plasma Module Control'.*
- *Press 'Abort' once, then press 'Aborted! Press Again to Reset', this will initialize and home the Plasma Module.*
- *Press 'Prime Plasma', priming of the plasma generator will occur and complete.*

- Setup is complete and an operator should be able to fully interact with both Modules through the Communications Module.

Cleaning Microplates

There are two main modes to clean microplates. Either you can run the modules in fully robotic automation control mode, or manually with the Communication Module.

Robotic Automation Control Mode

There are instructions further down in this guide for programming and utilizing Automated Mode. Upon startup in order to activate Automated Mode you must press a few buttons, see below for instruction. After activation, the Communication Module should send and receive commands to all Modules and the Robotics without further input from the operator.

Manual Mode (Manual Method Control or Rinse Module Control)

The Communications Module can be used to run the Rinse and Plasma Modules completely customized by using the touchscreen. See below for instructions.

Operating the PurePlate MCS through the Communication Module Touchscreen

1. Complete Initial Setup.
2. There are four options available,
   A. Manual Method Control allows you to run both modules step by step. This will be the most useful menu for running manually and editing/validating methods.
   B. Robotic Automation Control lets you switch control over entirely to your automation system.
   C. Rinse Module Control lets you change parameters and trigger specific tasks within the Rinse Module.
   D. Plasma Module Control lets you change parameters and trigger specific tasks within the Plasma Module.

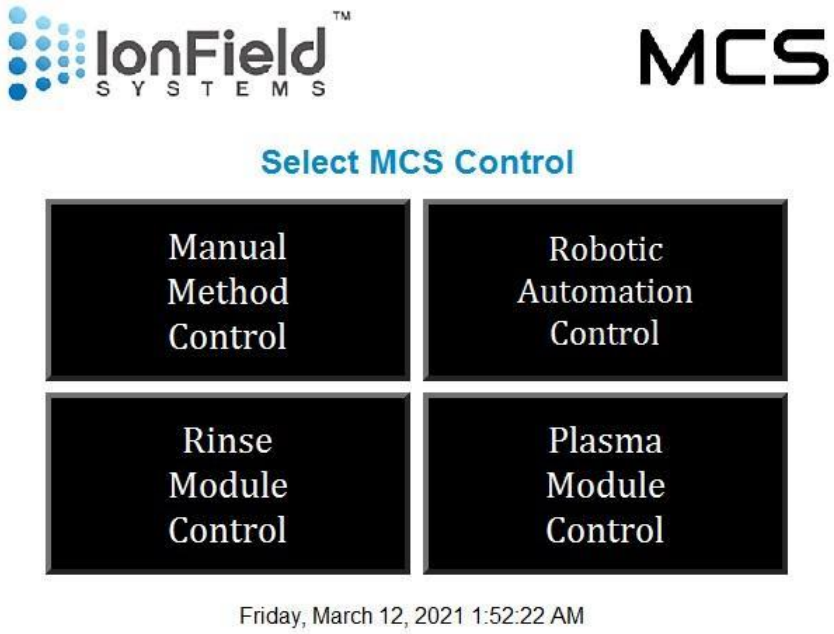


Figure 19 – TOUCHSCREEN – Main Menu

4. **Manual Recipe Control Menu** – Once here, you may select/edit the method of operation. In the top half you will see the available methods, with arrow buttons to scroll up and down. To the right of the arrows are buttons to 'open', 'save', 'delete' and 'rename'. They function as implied, except that 'open' transmits the recipe details to the bottom of the screen for editing. It suggested that for robotically integrated systems, a number be assigned to each method (01-99 as the firmware supports 99 methods).

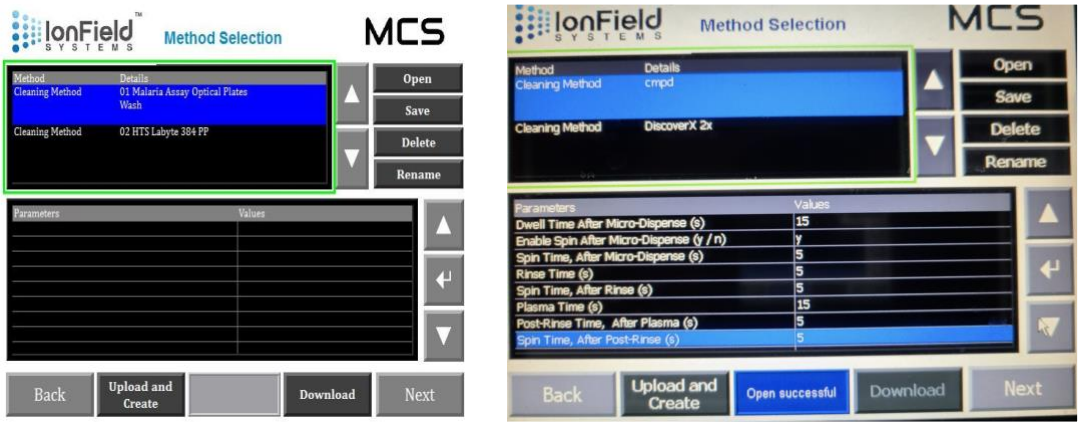


Figure 20 – TOUCHSCREEN – Recipe Control

5. **Manual Method Control Menu** – Here is shown the control menu when a method is open and ready to edit. In the bottom half of the screen are the 'parameters' and 'values'. To the right are arrow buttons that allow you to scroll up and down the available parameters. When one is highlighted in blue and you wish to edit, press the return arrow button between the up and down selector arrows. This action will bring up a text entry field. When you've typed in what you want, press the similar return arrow button in the bottom right.

A. To save your edited method, press 'save' in the top right.

B. When ready to begin rinsing plates, press 'Download' to transfer the method to the Rinse Module.

C. Press 'next' when you have downloaded the appropriate method.

D. To make a new method, press 'Upload and Create' at the bottom.

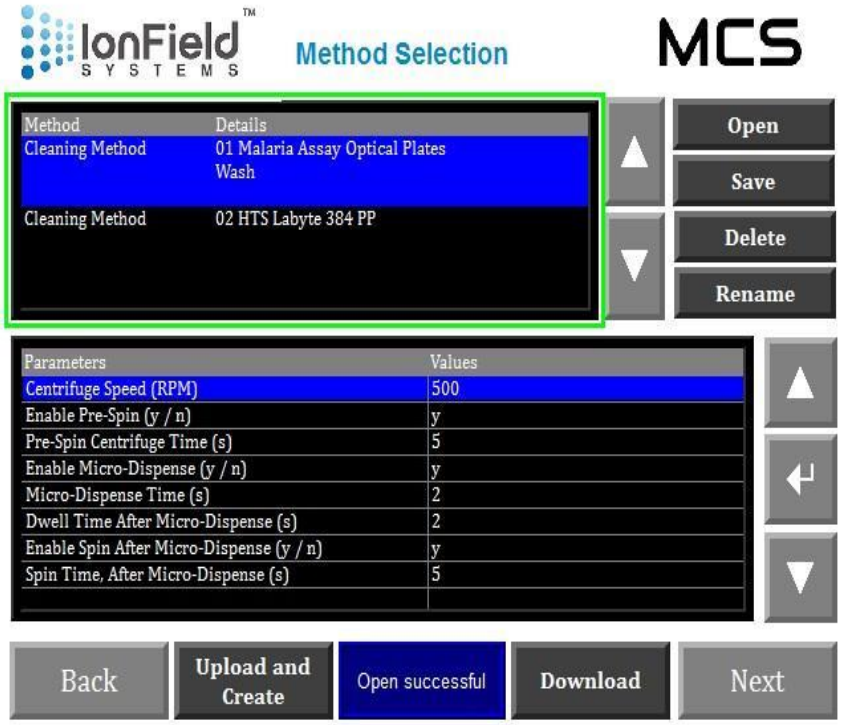


Figure 21 - TOUCHSCREEN - Open Recipe Control

6. **Plate Mode Selection** - Once 'Next' is pressed, you will be asked whether you intend running in one or two plate mode. Running in two plate mode offers a more efficient cleaning run but when running manually will take more planning and organization to keep both plates properly labelled and in order. If you run one plate mode, make sure to keep the dummy plate in the system or the system will sense it is missing and fault out ending the run. Dummy plates should be the same

size/weight as the plate being cleaned so the centrifuge does not risk being imbalanced. Press one of the options to move forward.

Figure 22 – TOUCHSCREEN – Plate Mode Selection

7. **One Plate Mode** - You will now be shown the manual control screen. This screen allows you to control both modules simultaneously and you should follow the simply labelled 'Steps' to proceed with cleaning. This screen shows 'One Plate' mode.

A. Before pressing 'Step 1' make sure the balance plate is in the plate holder and is the same weight/size as the un-rinsed plate you want to be cleaned. If you are in 'Two Plate' mode, simply place the 1st un-rinsed plate here instead of the balance plate before pressing 'Step 1'.

B. Before pressing 'Step 2' make sure to place the un-rinsed plate right-side up in the appropriately sized plate holder. If you are in 'Two Plate' mode, this will be the 2nd un-rinsed plate. The plate holder label will tell you what type of plate it accepts. Press 'Step 2' and the plate will enter the Rinse Module and the method will begin. When the method is complete the first microplate will be ejected. Place the next un-rinsed microplate and choose 'step 2', in the holder to continue the process.

C. If you then wish to run the Plasma Module, simply place the rinsed microplate into the appropriately sized plate holder in the Plasma Module and press the 'Start Plasma' button.

D. To retrieve the balance plate (or if in 'Two Plate' mode, the 2nd rinsed plate) press the now enabled 'Retrieve Balance Plate' button. Replace it with the second un-rinsed microplate from the next pair of microplates to continue the process.

E. 'Post Rinse' is a button used for a quick rinse of a plate in the ejected plate holder. This is only available in single plate run mode. This may be useful if acid is detected on the freshly plasma

treated plate. We only recommend this if you are seeing problems with excess plasma treatment or with highly sensitive assays.

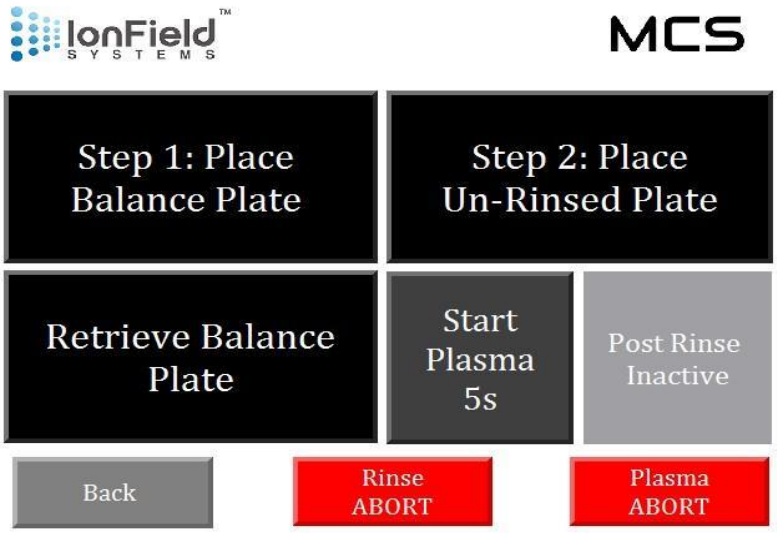


Figure 23 – TOUCHSCREEN – One Plate Mode

8. **Two Plate Mode** - If you select 'two plate' mode you will see this screen. Read the above steps for information on how to use this screen. The main difference not listed above is that you can now press the 'Activate Continuous Rinse Mode' button.

A. In 'Continuous Rinse Mode' you are able to run plates at a faster pace. This essentially eliminates the 'Step 3' section, where instead of going step 1, 2, 3 you move back and forth from step 1 to step 2. In order to do this, each time after you retrieve a recently rinsed plate, insert an un-rinsed plate in its place, and press the correct button (either Step 1 or Step 2). You can continue going back and forth as long as you'd like while in this mode between the 1st and 2nd plates.

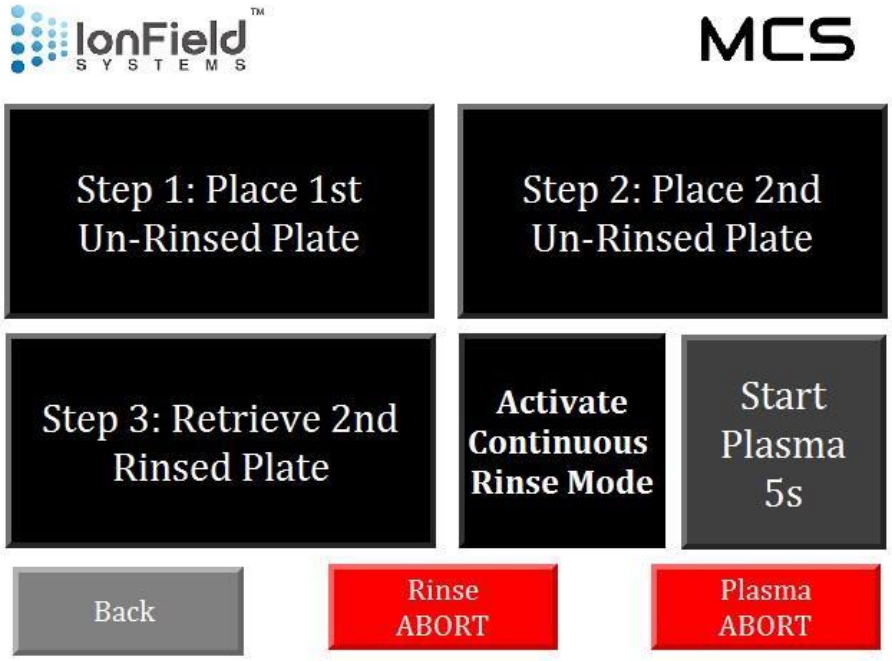


Figure 24 – TOUCHSCREEN – Two Plate Mode

9. **Rinse Module Control** - If you press the 'Rinse Module Control' from the Main Menu you will be shown the below screen. Here you may execute every individual step the Rinse Module can execute.

A. 'Enter' will cause the plate holder currently ejected to be inserted into the centrifuge.
B. 'Exit' will cause the currently upright plate holder in the centrifuge to be ejected to the exterior.
C. 'Rinse' will cause the plate holder currently ejected to be inserted and rinsed with the high-pressure spray for the duration displayed. The plate will then be inserted into the centrifuge.
D. 'Flip' will cause the centrifuge to flip 180 degrees allowing access to the alternate plate holder.
E. 'Centrifuge' will cause the centrifuge to first check if both plate holders have a plate in them, then it will spin at the specified RPM and duration displayed
F. 'Micro Dispense' will cause the currently ejected plate holder to be inserted and carefully rinsed with a low volume of whatever liquid is entered into the appropriate holder based on the duration displayed.

You may either select 'Plasma Module Control' to move to the next screen, or press 'Parameters' to fine-tune the tasks of this menu.

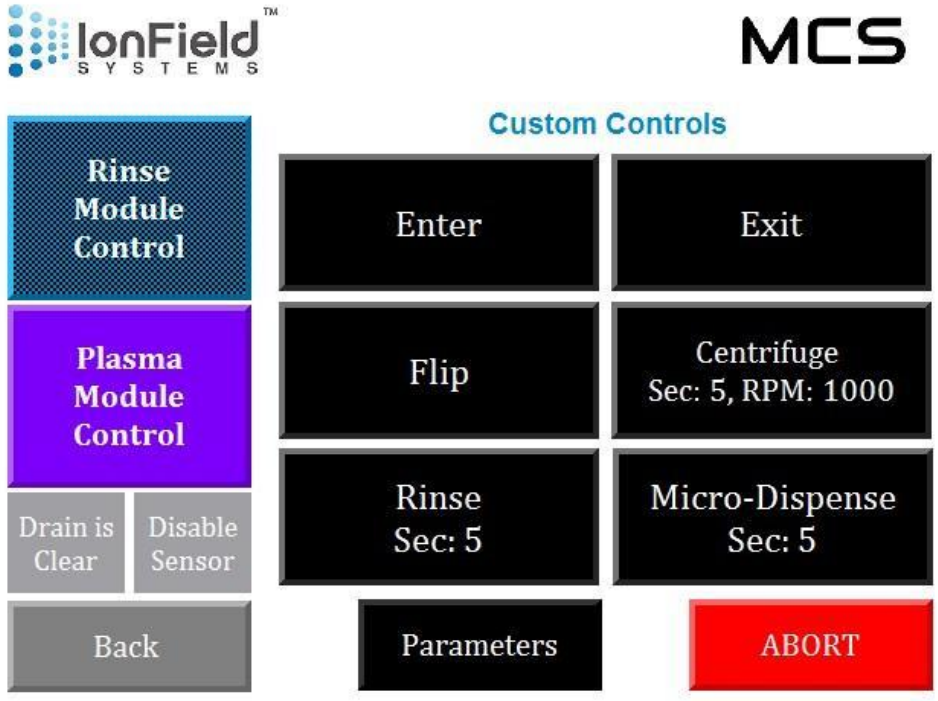


Figure 25 – TOUCHSCREEN – Rinse Module Control

10. **Rinse Module Parameters** - If you select 'Parameters' you will be taken to the below screen. This screen allows you prime the pumps and edit the duration and speed of various tasks on the previous 'Rinse Module Control' screen. When you select a parameter to edit, a number pad will pop up with a specification for the upper and lower limits for the parameter.

A. You may also select to prime either of the two pumps, the micro dispense head pump, or the rinse head pump by pressing the respective button. This will cause the current plate holder to be inserted if outside, the door to shut, and the prime will go for a short duration. Listen to ensure that no air remains trapped in the lines if you have recently changed the liquid tanks.

B. The PSI pressure gauges will help determine if the priming is done, and also help determine if there are contaminants in the liquid heads that require cleaning. Make sure during normal operation that the pressure gauges stay within the green areas.

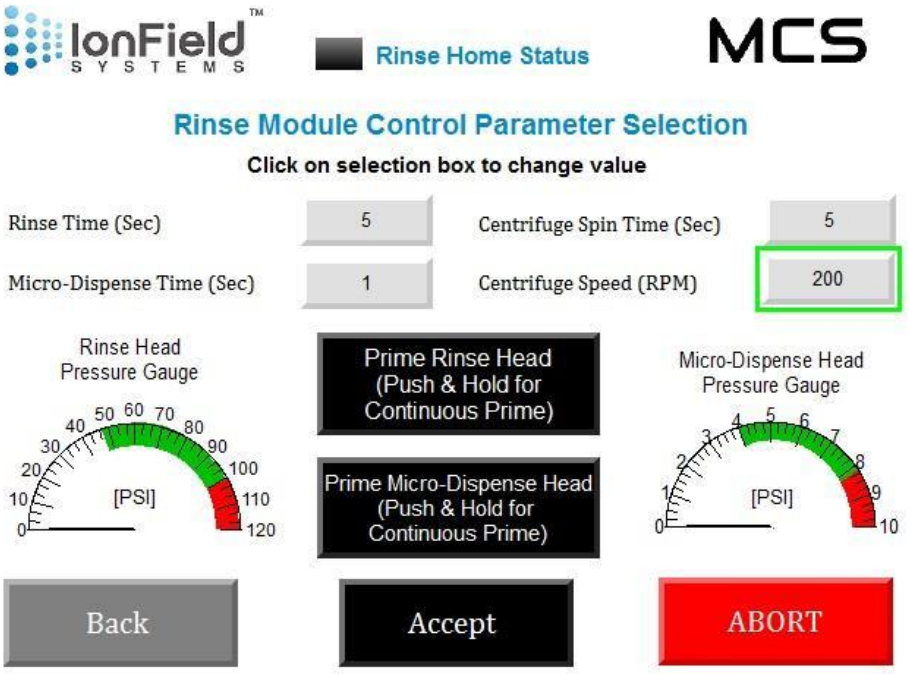


Figure 26 – TOUCHSCREEN – Rinse Module Parameters

11. **Plasma Module Control** - If you had selected 'Plasma Module Control' from the 'Rinse Module Control' screen, you would see the following menu below.

A. There is one parameter to edit here – Plasma Time. Simply press the grey numbered button next to it to edit the duration of plasma.

B. The rest of the information are from sensors in the plasma module.

C. You may start plasma by pressing the large black button on the right side.

D. The Ceramic Temperature Gauge will tell you the operating temperature of the plasma generator. It takes a few fires to get up to operating temperature and should hover in the 'green' area between 50 C and 90 C.

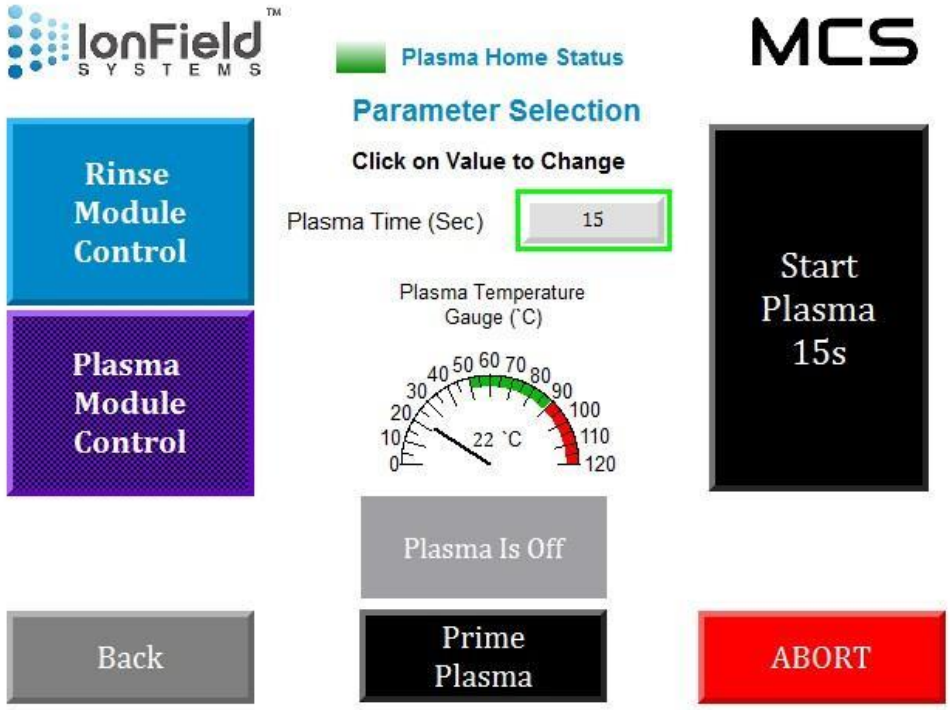


Figure 27 – TOUCHSCREEN – Plasma Module Control

12. **Robotic Automation Control** – If you select 'Robotic Automation Control' on the main screen, you will see the following screen. Shown is an example error code that will appear if the unit encounters a fault. Press the corresponding 'abort' button depending on the module involved to reset.

A. You can press 'Click to Enter String Command' in order to enter a manual string command to test manually the command structure and see the related output. When setting up interface software, the commands will halt on an error to help identify mismatched or inappropriate command exchanges.

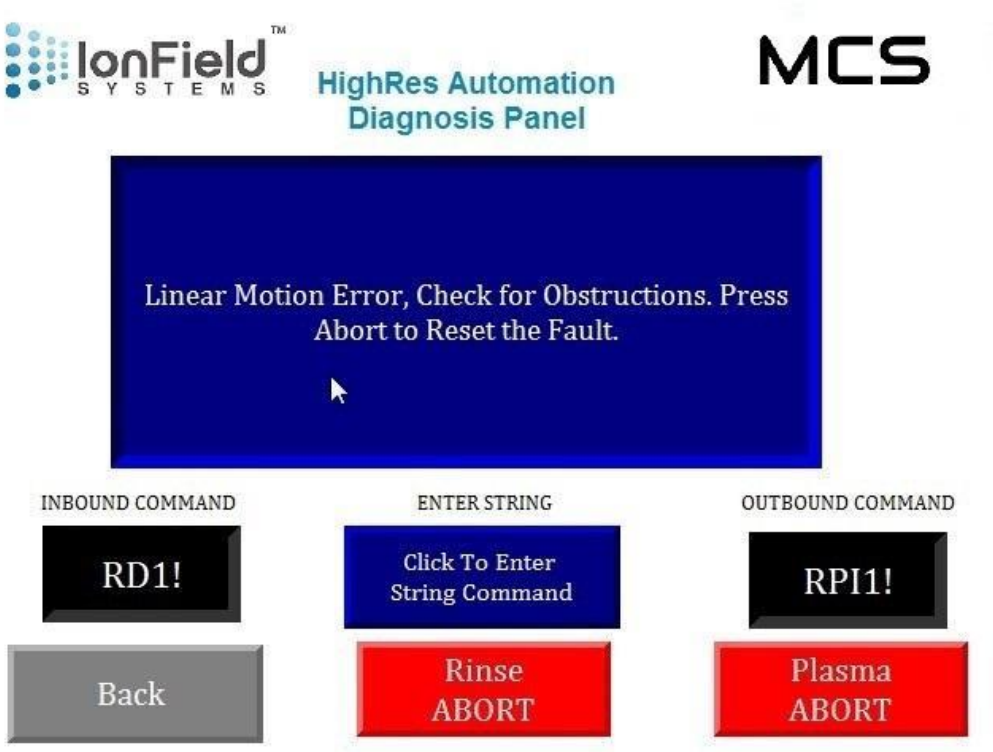


Figure 28 - TOUCHSCREEN - Automation Control

Troubleshooting

Reread the Setup section of Setup and Operation and go through the steps to ensure all connections and the power startup sequences are correct. A common error is if the Communications Module is turned on before either the Rinse or the Plasma Module have been turned on.

Error Messages

Below is a list of all of the potential error messages that may pop up and a brief description of what the message means and how to recover from each. Once you are satisfied the problem has been fixed, press the 'Close' button and you may resume interacting with the TOUCHSCREEN.

1. "Microplate Not Detected"

This message occurs when you are attempting to enter a plate holder without a microplate present. You will not be able to centrifuge until this is resolved.

2. Remove Rinsed Microplate

In 'One Plate' operation mode, if you have rinsed a plate and try to retrieve the dummy plate without retrieving the rinsed plate, this message shows up. You must first remove the rinsed microplate then attempt to retrieve the dummy plate again.

3. Process Has Been Aborted! Press Again to Reset the Process

If you attempt to abort the process, this message appears. You must press the same abort button to resume once you have figured out the problem and solved it. This will abort any process you were in the middle of, so you must restart anything you were in the middle of.

4. Rinse Module Error! Out of Rinse Fluid, Fill Up and Prime

The pressure sensor is detecting a low amount of fluid pressure, most likely a result of no liquid being pushed through the tubing. Most likely this means you have run out of solution and need to refill your source tank for the high-pressure rinse. Try refilling it then rerunning the prime operation until all air is out of the tubes.

5. Rinse Module Error! Out of Micro Dispense Fluid, Fill Up and Prime

This is similar to error 4 above, most likely the micro dispense source tank is empty. Try refilling it then rerunning the prime operation until all air is out of the tubes.

6. Failed to Prime Rinse Fluid, Try Again

When you are priming the high-pressure rinse fluid, it may take multiple times to clear out all the air in the tubes. Try pressing the prime button again until this error does not appear, and it sounds like the flow is consistent.

7. Drain is Full, Check the Drain

The water sensor in the rinse tank checks the water level. If the level rises too high that means the drain is not properly open and water is building up in the module. In order to prevent contamination and other corrosion issues the drain must be cleared of any obstruction, or the waste tank may be full.

8. Linear Motion Error, Check for Obstructions. Press Abort to Reset the Fault

The linear motion refers to the Rinse Module's linear arm that moves the microplate holders in and out. The error occurs when the voltage spikes due to an obstruction that causes the torque to error out. Make sure that the arm is not running into anything. You may need to open the lid and peer inside with a flashlight to ensure there aren't any broken microplates or other debris that is preventing the belt and linear track from moving the full length of the module.

9. Centrifuge Motion Error, Press Abort to Reset the Fault

This is similar to error 8 except that the centrifuge torque limit has exceeded. This could be either the motion was halted by hitting something, or the rotational alignment is off. You will

need to refer to the maintenance guide to remove the electronics lid and look inside with a flashlight to ensure the centrifuge can move freely, smoothly, and without obstruction or some other damage to the mechanical assembly before restarting the MCS.

10. Pressure in Rinse Head Reached Maximum Threshold - Check for Clogs in Pipelines and Possible Clog at Rinse Head

The pressure sensor within the rinse head tubing can detect if the pressure is abnormally high. This typically means that there is something clogging up the rinse head itself. Refer to the maintenance tasks in this guide to clean out the water knife. Also check the tubing for anything but that is less likely to be the case.

11. Pressure in Micro Dispense Reached Maximum Threshold Check for Clogs in Pipelines and Possible Clog at Micro-Dispense Head

This is similar to error message 10 but instead for the micro dispense tubing and micro dispense head clogs.

12. Plate Holder Not Detected

If you fail to insert a plate holder and tell the MCS to enter the linear arm, it will check for a plate holder. If the plate holder is not present it will reject your command and eject the linear arm to wait for another plate holder. If a microplate holder is present, this means that the proximity sensor is misaligned and needs calibration. Call IonField Systems support.

13. No Plate to Rinse

If you run the rinse command without a plate in the microplate holder, it will give you this error. Place a microplate onto the plate holder and try again. If a microplate is present, this means that the proximity sensor is misaligned and needs calibration. Call IonField Systems support.

14. No Plate to Micro-Dispense

If you run the micro dispense command without a plate in the microplate holder, it will give you this error. Place a microplate onto the plate holder and try again. If a microplate is present, this means that the proximity sensor is misaligned and needs calibration. Call IonField Systems support.

15. Linear Motion Under Voltage, Check Manual to Follow Instructions

If a fuse blows in the electronics enclosure of the Rinse Module, you will see this error. You must open the electronics panel and replace the linear motion drive fuse. See photo below for fuse replacement location. Follow the maintenance guide to open the electronics enclosure. Replace with a 5x20mm fast acting fuse, 7A for 120v or 3A for 220v, by carefully pushing the tab up on the proper fuse location.

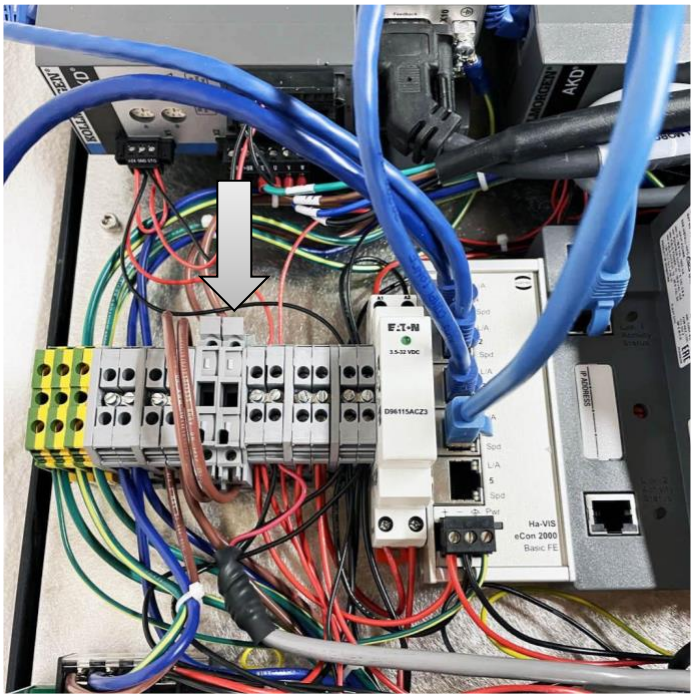


Figure 29 – Rinse Module – Linear Fuse

16. Centrifuge Motion Under Voltage, Check Manual to Follow Instructions

This is similar to error 15, except the failure is the centrifuge drive fuse. Refer to the below photo for fuse location. Replace with a 5x20mm fast acting fuse, 10A for 120v or 5A for 220v, by carefully pushing the tab up on the proper fuse location.

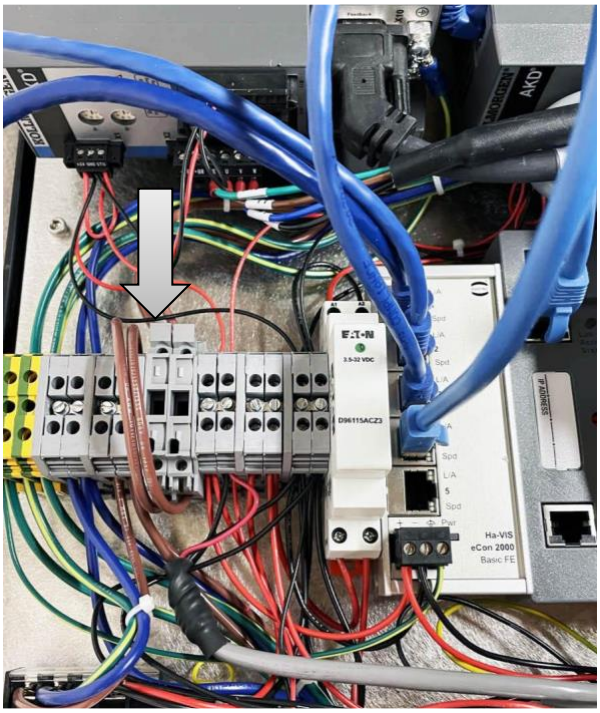


Figure 30 – Rinse Module – Centrifuge Fuse

Safety Note

The PurePlate MCS system has some self-checking programming to determine what state it's in. This allows the user to turn it off at any point or to do custom rinse/plasma cycles as many times as they want. However, there is one known situation that could cause problems. If two plates of unequal weight are loaded, the MCS is unable to detect the weight differences. This unequal balance could cause the centrifuge to report an error if it detects the imbalance, or is the delta is small, it may not detect the imbalance. We have tested the scenario where it doesn't detect the imbalance and felt/heard a minor vibrational force being applied to the centrifuge. In this scenario you should immediately turn off the module as we cannot anticipate every unbalanced scenario and the resulting stress on the centrifuge will shorten the centrifuge bearings life.

In order to ensure this doesn't happen always make sure that both equal weighted plates have been loaded with their proper plate holders into the centrifuge before issuing a spin command. This can occur in two possible ways, the automation can issue a command of rinsing the 2nd plate, when in reality it is the 1st plate entered. The 2nd possibility is if the operator uses the communications module and hits either the spin option, or the 2nd plate placed option when the 1st plate has not been entered.

4. Automation Guide

Overview

Communications between the automation system and the PurePlate MCS system are very easy to follow and only contain a few commands. Communication is done over a single Ethernet cable connected to the Communications Module. The communications module then will send and receive commands over Ethernet cables to all other modules including the Rinse Module, Plasma Module, and PlasmaCharger Controller (via Serial).

Commands (this section may change based on user interface needs)

Commands sent from the Automation to Rinse Module

SI! - When the communications module is turned on and functional, it will return with "SI!".

SRM! - This will return with the current state of the Rinse Module. Possible states will be listed below.

SRMPD1! - This tells the Communications Module that the first dirty plate has been delivered to the Rinse Module.

SRMPD2! - 2nd dirty plate has been delivered.

SRMPP1! - This tells the CM (Communications Module) that the first clean plate has been picked up from the Rinse Module.

SRMPP2! - 2nd clean plate has been picked up.

Commands sent from Automation to Plasma Module

SPM! - This will return with the current state of the Plasma Module. Possible states will be listed below.

SPMPD1! - This tells the CM that the 1st plate has been delivered to the Plasma Module.

SPMPP1! - This tells the CM that the 1st plasma cleaned plate has been picked up from the Plasma Module.

Possible states of Rinse and Plasma Modules:

SRMB! - The rinse module is busy either initializing or processing a plate.

SPMB! - The plasma module is busy either initializing or processing a plate.

SRMHO1! - The rinse module's 1st plate holder is open and ready to accept the 1st dirty plate.

SPMHO1! - The plasma module's 1st plate holder is open and ready to accept the 1st dirty plate.

SRMHO2! - The rinse module's 2nd plate holder is open and ready to accept the 2nd dirty plate.

SRMPU1! - The rinse module's 1st plate holder contains a clean plate and is ready for the automation to pick it up.

SPMPU1! - The plasma module's 1st plate holder contains a clean plate and is ready for the automation to pick it up.

SRMPU2! - The rinse module's 2nd plate holder contains a clean plate and is ready for the automation to pick it up.

Example Command Sequence

R – Robotics PK – PlasmaKnife

Note: MCS only responds, never initiates communication to Robotics.

All modules are turned on. 2 seconds pass.

R: SI! **PK: SI!** - Robotics sent an initialization command – PK says yes, I'm turned on and initialized. However, this says nothing about the state of the rinse or Plasma Module.

R: SRM! **PK: SRMB!** - R asks if rinse module is ready – PK says no.

Roughly 25 seconds pass.

R: SRM! **PK: SRMHO1!** - R asks if rinse module is ready – PK says yes, the 1st plate holder is open and ready for the 1st dirty plate.

R: SRMPD1! **PK: N/A** - R says it has delivered the 1st plate. At this point the PK will begin its 1st plate rinsing procedure, when it's done it will eject the 2nd plate holder ready for the 2nd plate. There is no response from PK for this command. If the command is misinterpreted it will give back a "SCE!" Response.

R: SRM! **PK: SRMB!** - R asks if rinse module is ready – PK says no. (its processing)

Roughly 40 seconds pass.

R: SRM! **PK: SRMHO2!** - R asks if rinse module is ready – PK says yes, the 2nd plate holder is open.

R: SRMPD2! **PK: N/A** - R says it has placed the 2nd plate. The rinse module will rinse the 2nd plate, spin the centrifuge, and then present the 1st plate cleaned. During this process will respond with "SRMB!"

Roughly 50 seconds pass.

R: SRM! **PK: SRMPU1!** - R asks if rinse module is ready – PK says the 1st clean plate is ready for pick up.

R: SRMPP1! **PK: N/A** - R says it has picked up the 1st clean plate. PK will then tell the rinse module to eject the 2nd clean plate.

Roughly 15 seconds pass.

R: SRM! **PK: SRMPU2!** - R asks if rinse module is ready – PK says yes the 2nd clean plate is ready for pickup.

R: SRMPP2! **PK: N/A** - R says it has picked up the 2nd plate.

R: SRM! **PK: SRMHO1!** - R asks if rinse module is ready – PK says yes, the 1st plate holder is open and ready for a dirty plate.

R: SPM! **PK: SPMHO1!** - R asks if plasma module is ready – PK says yes.

R: SPMPD1! **PK: N/A** - R says it has delivered the 1st plate. Same as rinse module.

R: SPM! **PK: SPMB!** - R asks if plasma module is ready – PK says it's busy processing.

Roughly 65 seconds pass.

R: SPM! **PK: SPMPU1!** - R asks if plasma module is ready – PK says yes the 1st clean plate is ready for pickup.

R: SPMPP1! **PK: N/A** - R tells PK the 1st plate has been removed.

R: SPM! **PK: SPMHO1!** - R asks if Plasma is ready – PK says yes, 1st plate holder is open.

R: SPDMFM! **PK: SCE!** - This is not a valid command, so the PK is confused and responds with an error message.

5. Assembly Guide

Rinse Module

Steps 1-2: Prep for removal of either the entire lid or just the electronics cap.

1. If installed, remove the Plasma Knife Module from atop of Rinse Module by simply lifting it straight up.
2. Remove the eight 8-32 flat head cap screws from the top, front, and sides of the Rinse Module () from the middle of the 3 rows of screws. You will now be able to lift up the entire electronics cap, but not access the electronics themselves. If you wish to do so, proceed to steps 3-4. Otherwise, if you only need to interact with the mechanical assembly, proceed to step 5.

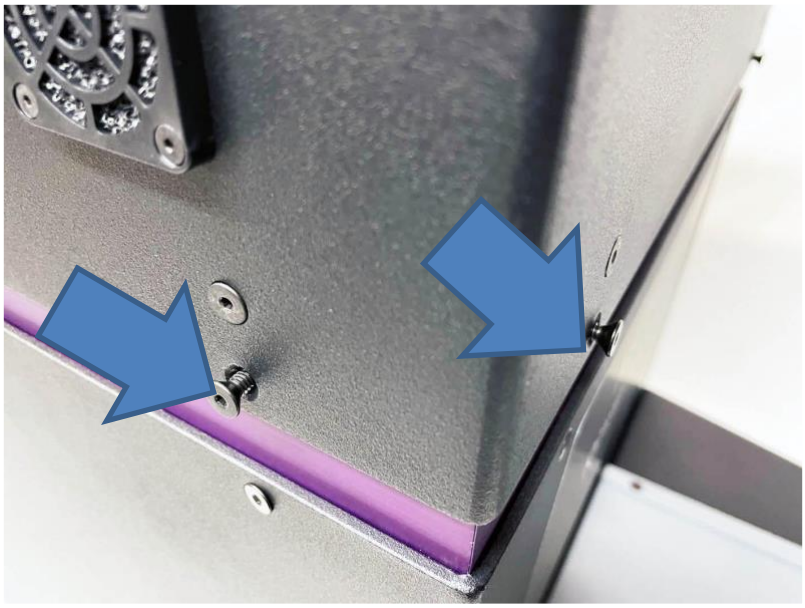


Figure 31 – Rinse Module – Middle Screw Location

Steps 3-4: Gain access to internal electronics by removal of the electronics cap.

3. Remove the eight 8-32 flat head cap screws (*Figure 29*) from the top, front, and sides of the Rinse Module from the top row of screws, above the ones you have already removed. Then remove the two 8-32 flat head cap screws from the rear of the unit.

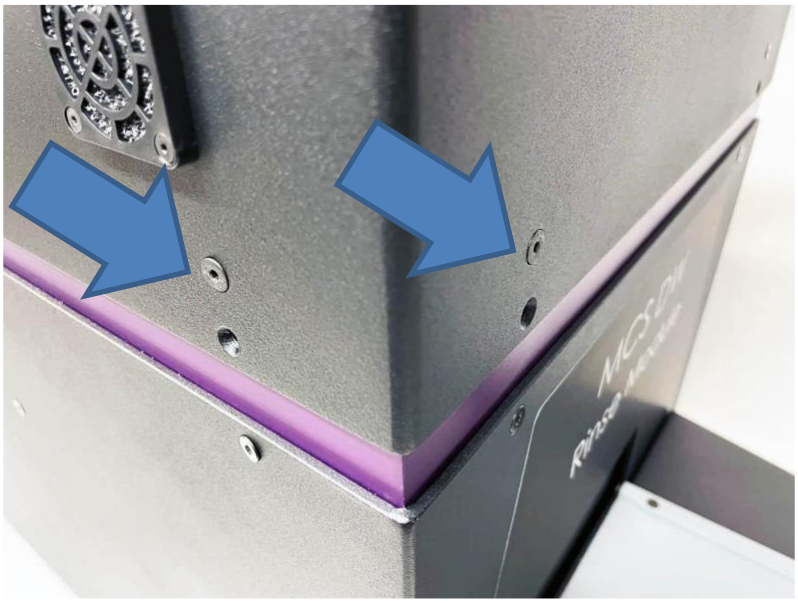


Figure 32 – Rinse Module – Screw Location

Figure 33 – Rinse Module - Rear Screw Location

4. Carefully lift up the electronic lid. It should slide straight up, then you can slide it to gain access to the internal electronics. Take care not to also lift up the electronics panel underneath, but

leave it sitting on top of the unit. You should now have complete access to the internal electronics. (*Figure 34*)

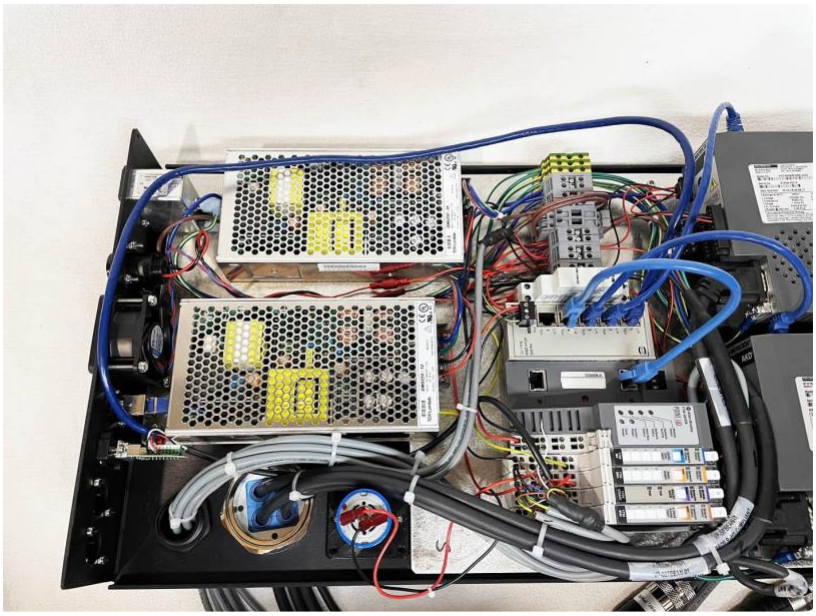


Figure 34 – Rinse Module - Electronics Exposed

Steps 5-7: Removing the electronics panel to gain access to the mechanical assembly.

5. While you can remove the electronics panel after performing steps 1-4, we suggest you either only perform steps 1-2, or, if you have performed steps 3-4, we suggest putting the electronics

lid back on, and reattaching the eight 10-32 screws you took out in step 3 in the top row, as well as the 2 screws on the rear panel. Simply put them back in the same way you took them out.

6. Once the electronics panel is reattached to the electronics lid, you may proceed to slide the entire electronics portion up, and then to the side. You now have partial access to the mechanical assembly.

Figure 35 – Rinse Module – Cover Ajar

7. If you require further access to the mechanical assembly, you may slide the lid further and adjacent to the Rinse Module as shown below. Rest the lid on something soft so it does not

damage the table or the exterior finish of the Rinse Module (*Figure 33*). You should now have access to all internal mechanisms.

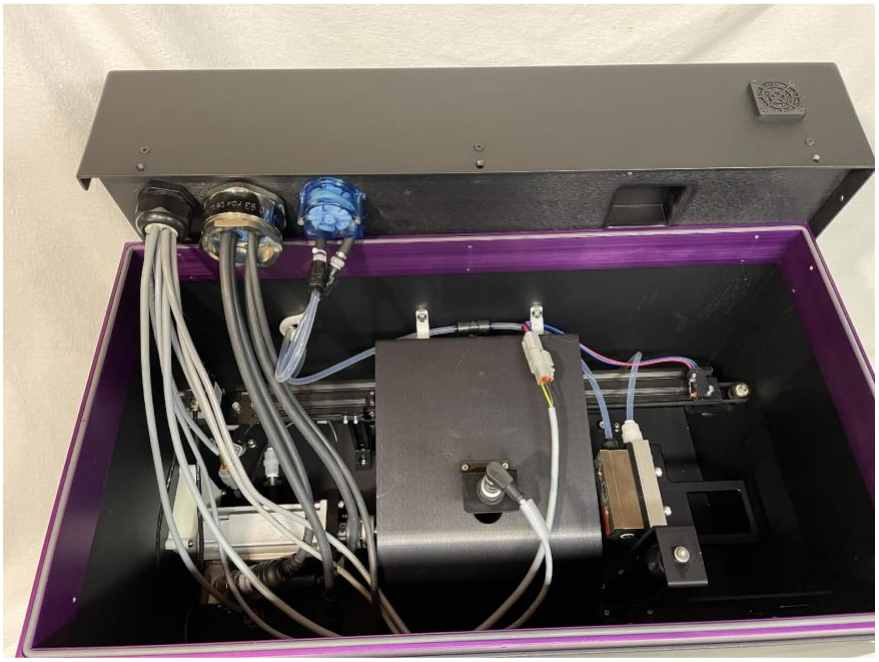


Figure 36 – Rinse Module – Cover Removed

Steps 8-9: Removing rinse unit assembly.

8. Make sure to disconnect all wires leading to the electronics portion of the Rinse Module. Ensure all cables are properly labelled before disconnection. Follow the below photos for a step-by-step walkthrough of all the cables and tubes to be disconnected.

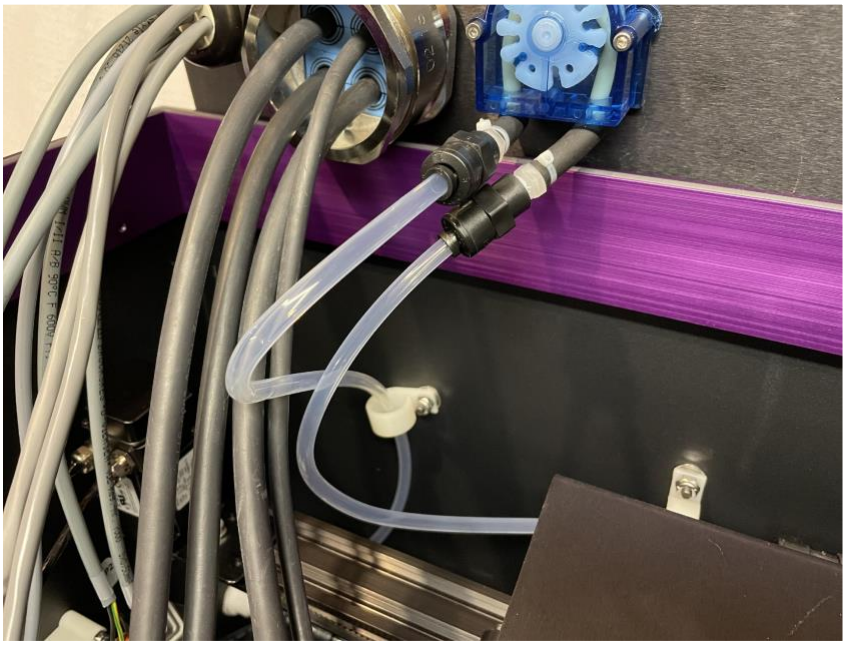


Figure 37 – Rinse Module – Micro Dispense Tubes

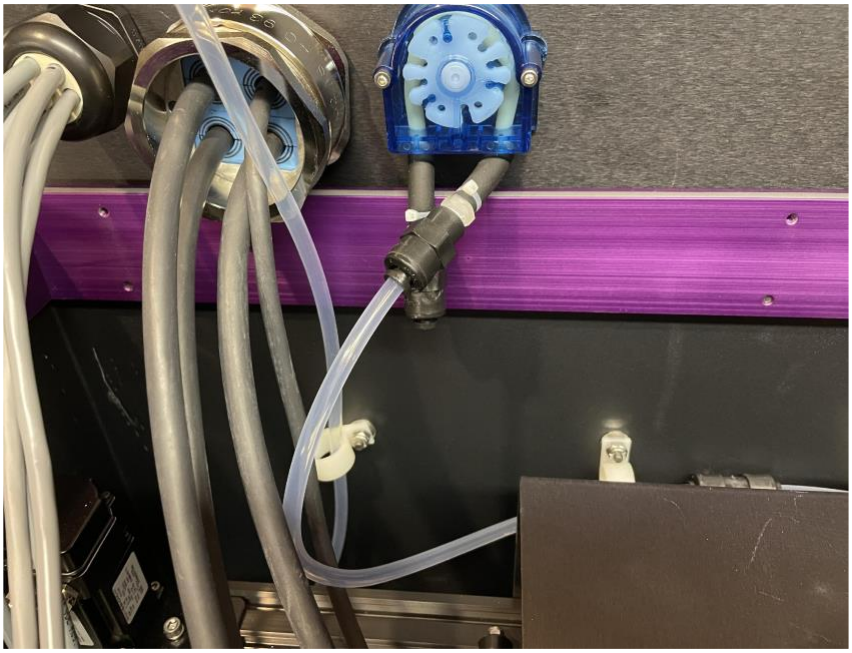


Figure 38 – Rinse Module – Micro Dispense Tubes

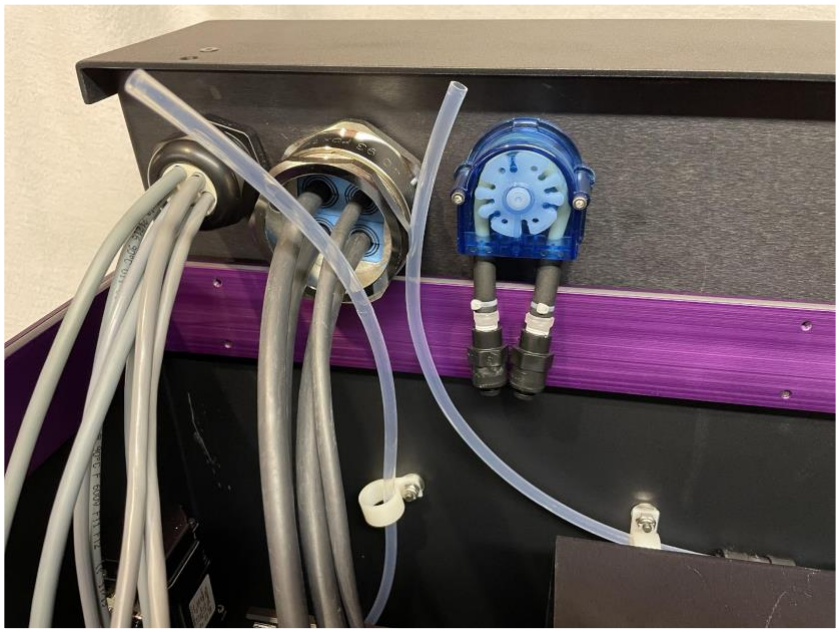


Figure 39 – Rinse Module – Micro Dispense Tubes

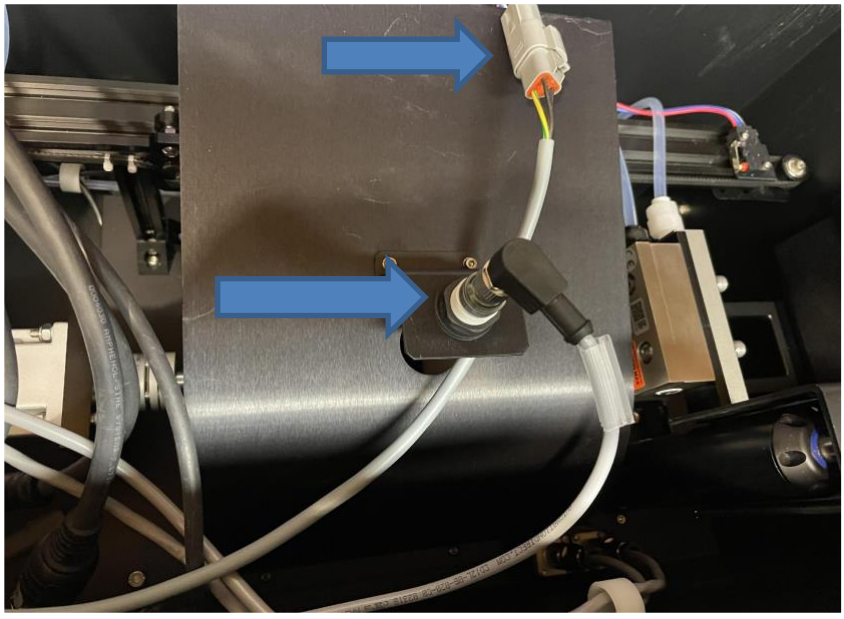


Figure 40 – Rinse Module – Microplate Sensor and Limit Switch

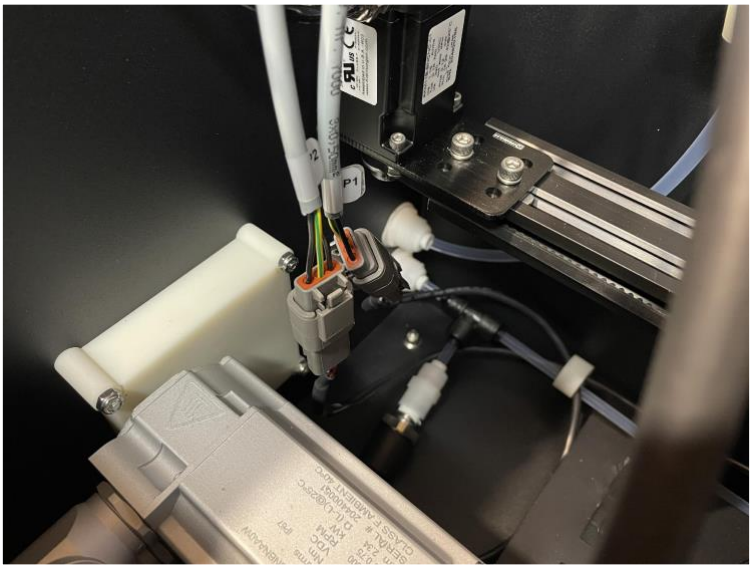


Figure 41 – Rinse Module – Sensor Plugs P1 and P2

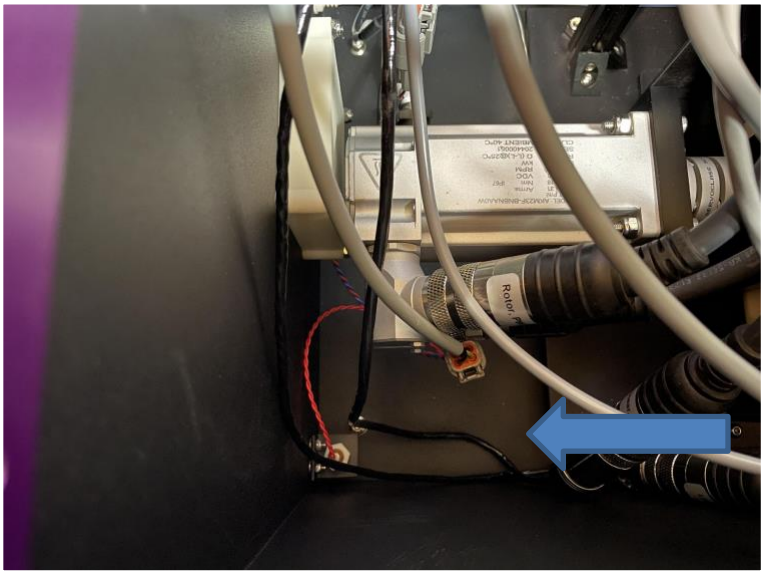


Figure 42 – Rinse Module – Water Level Sensor

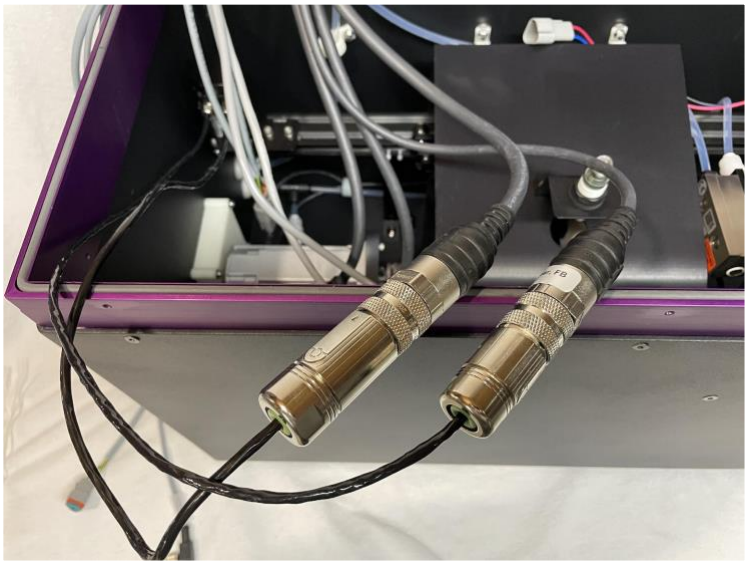


Figure 43 – Rinse Module – Linear Motor Cables

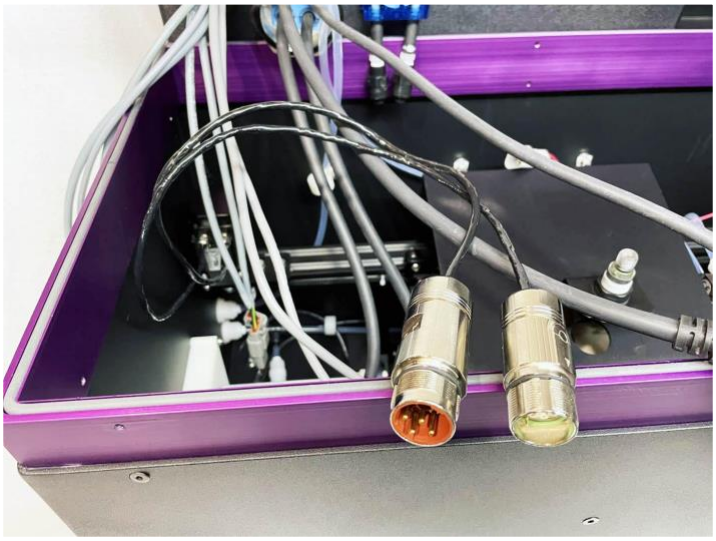


Figure 44 – Rinse Module – Linear Motor Cables Disconnected

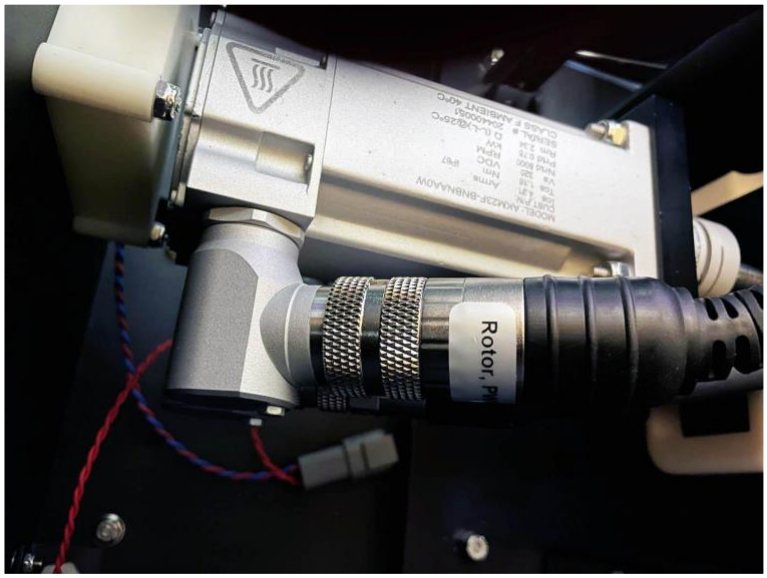


Figure 45 – Rinse Module – Centrifuge Motor Cables

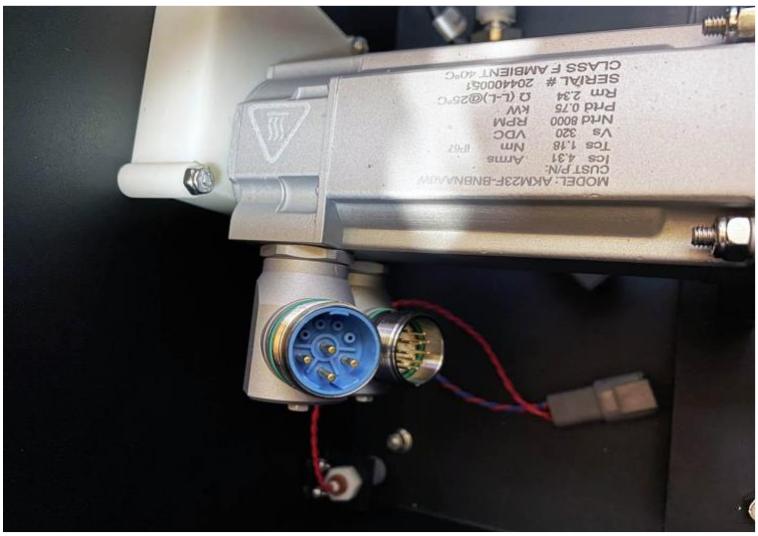


Figure 46 – Rinse Module – Centrifuge Motor Cables Disconnected

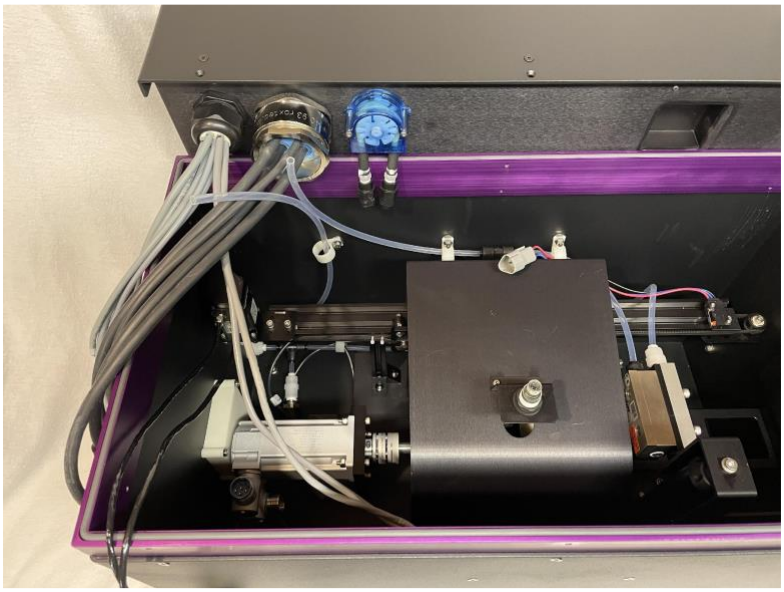


Figure 47 – Rinse Module – All Cables Disconnected

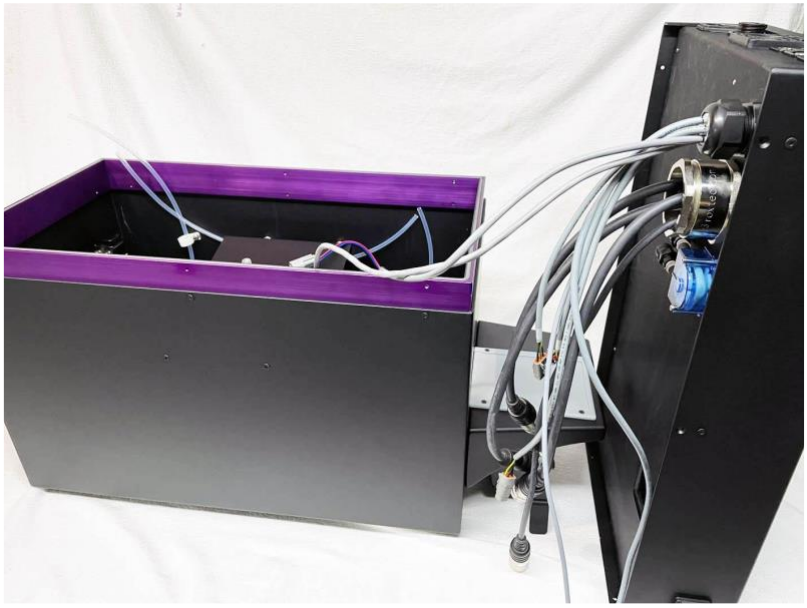


Figure 48 – Rinse Module – Electronics Lid Removed

Figure 49 – Rinse Module – Door Panel (held in place by leaf spring)

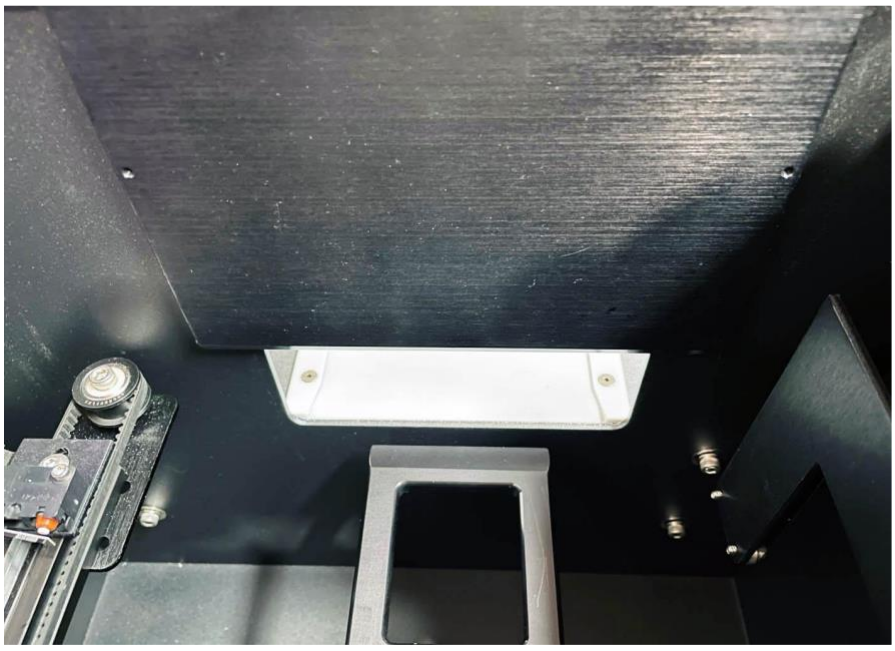


Figure 50 – Rinse Module – Door Panel Removed

Figure 51 – Rinse Module – Door Panel Separated

Figure 52 – Rinse Module – Door Panel Separated

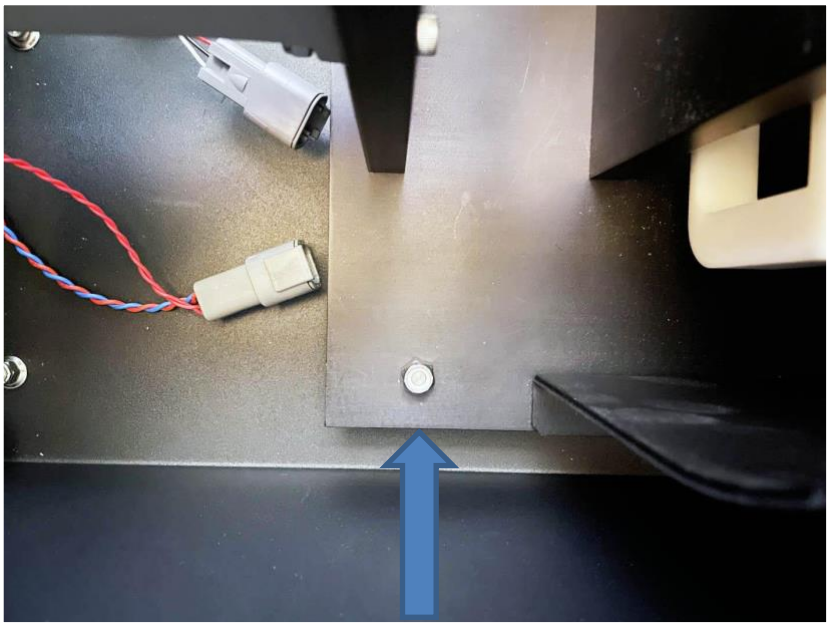


Figure 53 – Rinse Module – Base Plate 1st Nut Location

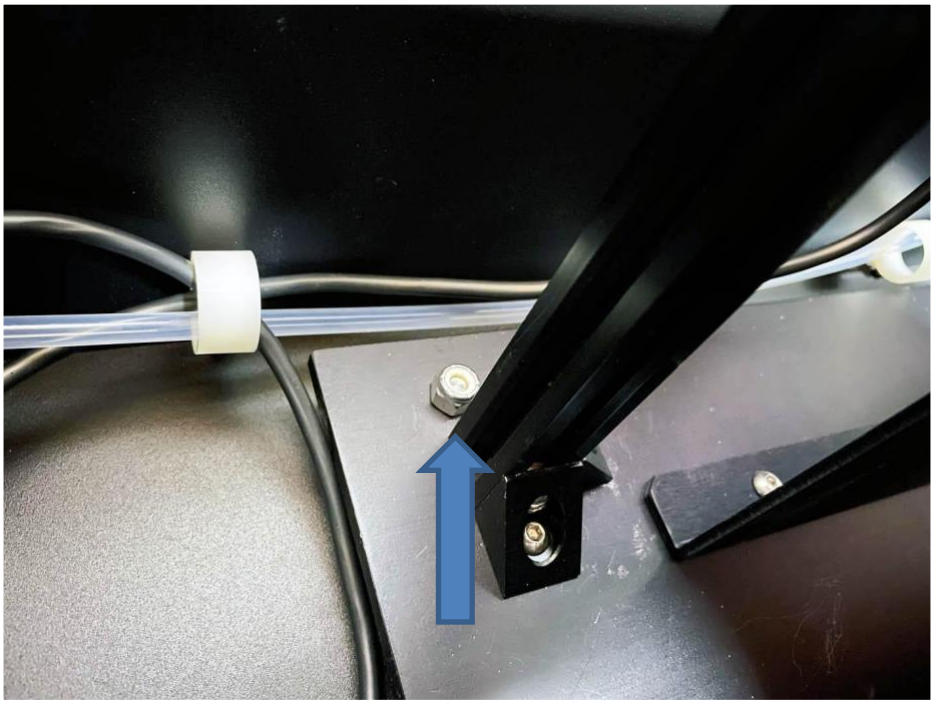


Figure 54 – Rinse Module – Base Plate 2nd Nut Location

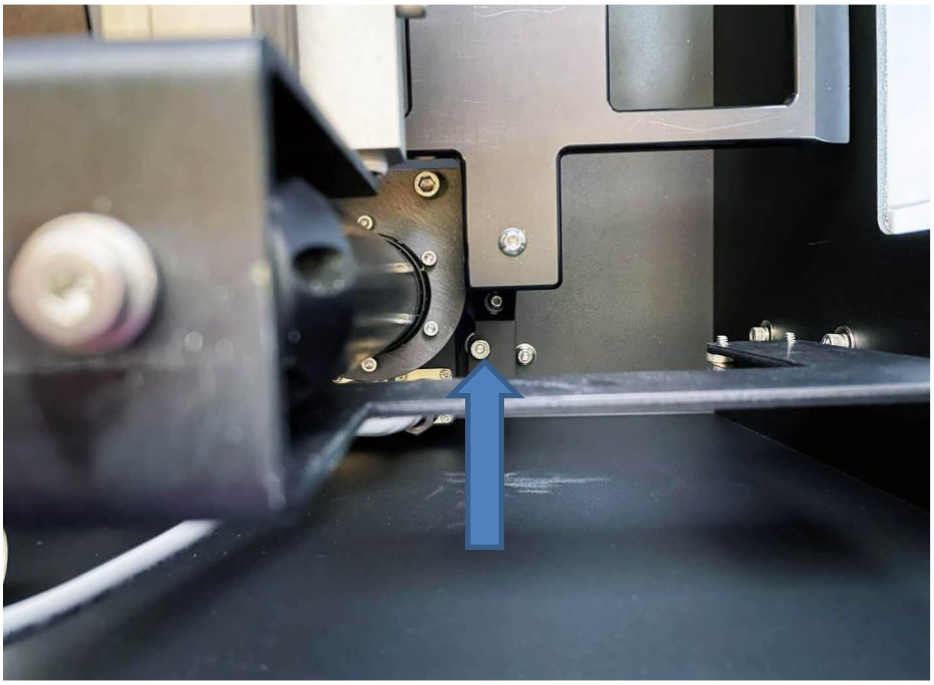


Figure 55 – Rinse Module – Base Plate 3rd Nut Location

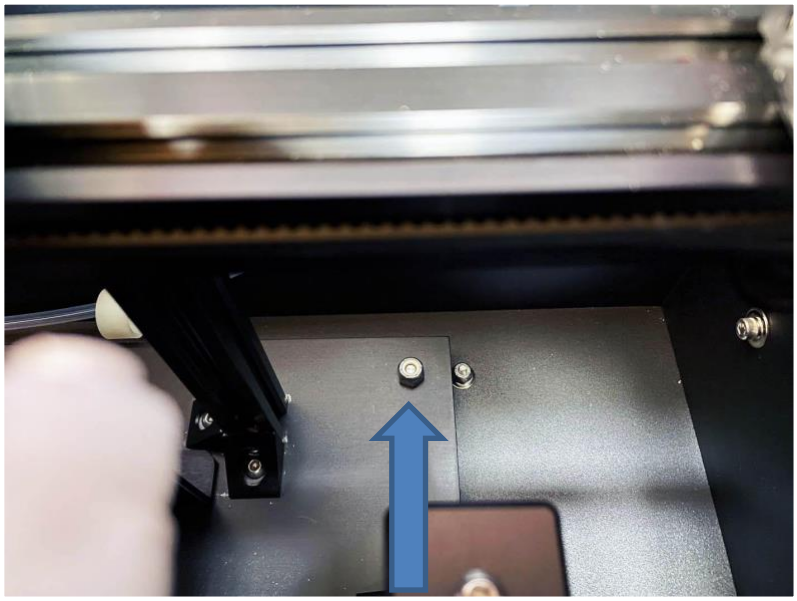


Figure 56 – Rinse Module – Base Plate 4th Nut Location

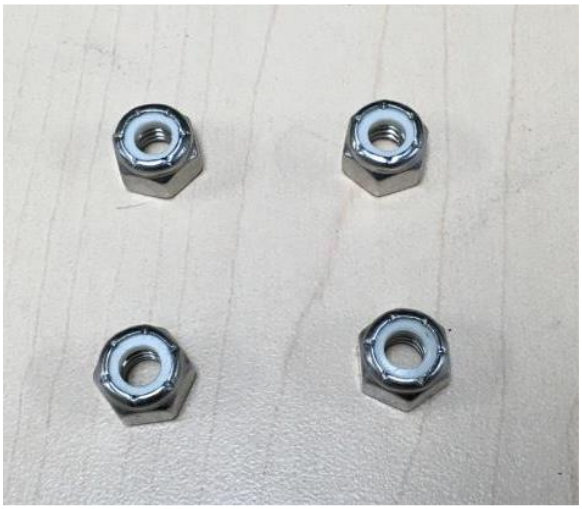


Figure 57 - Rinse Module – 4 Nuts from Base Plate

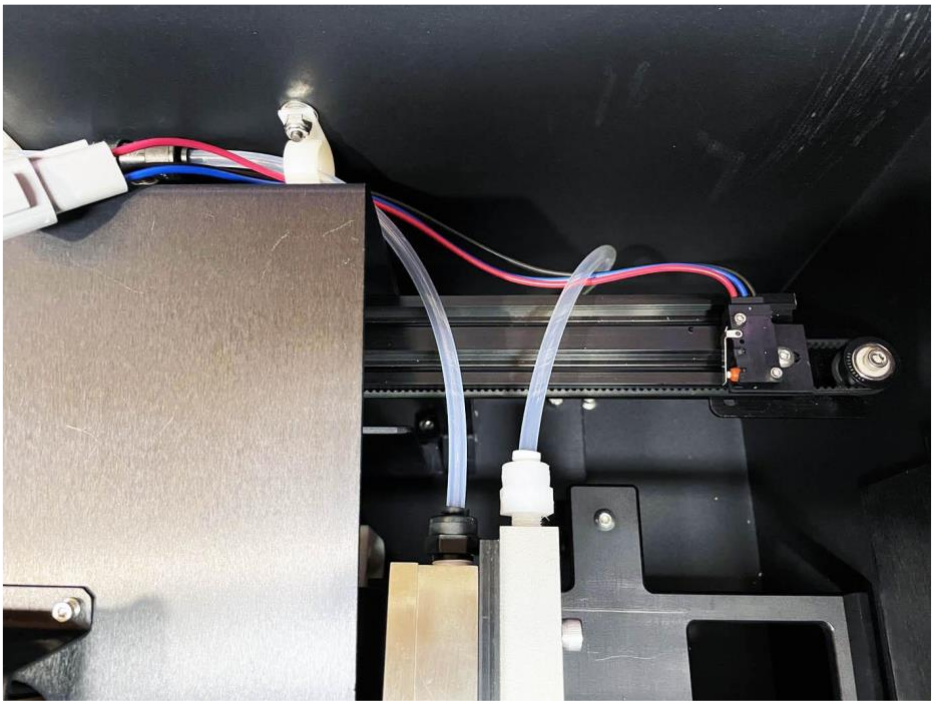


Figure 58 – Rinse Module – Head's Tubes

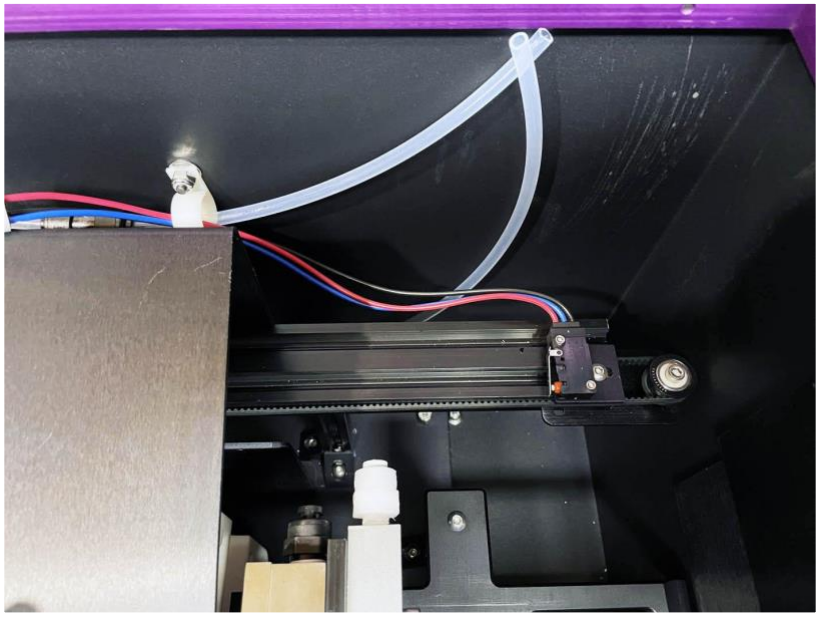


Figure 59 – Rinse Module – Head's Tubes Removed

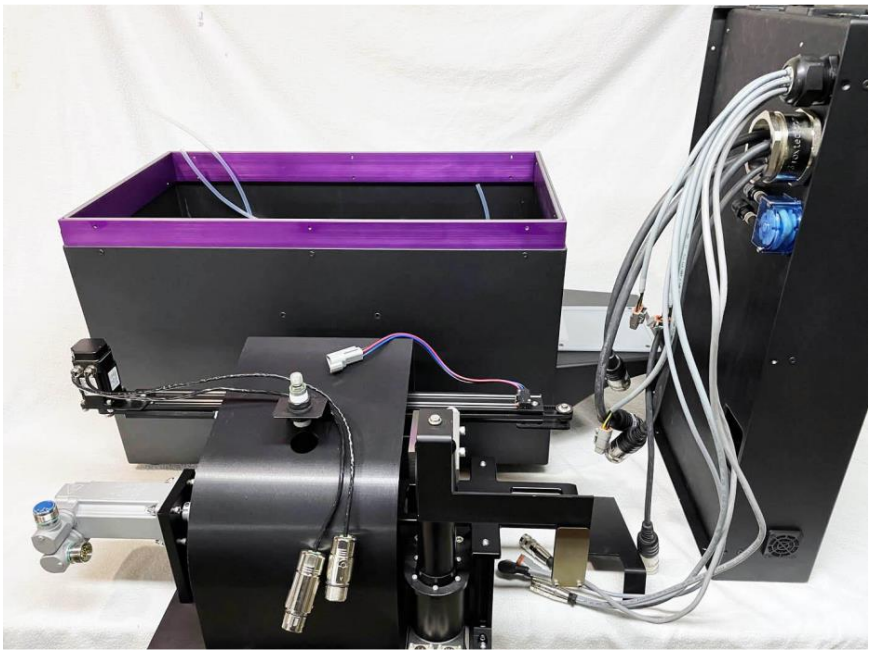


Figure 60 – Rinse Module – Mechanicals Removed

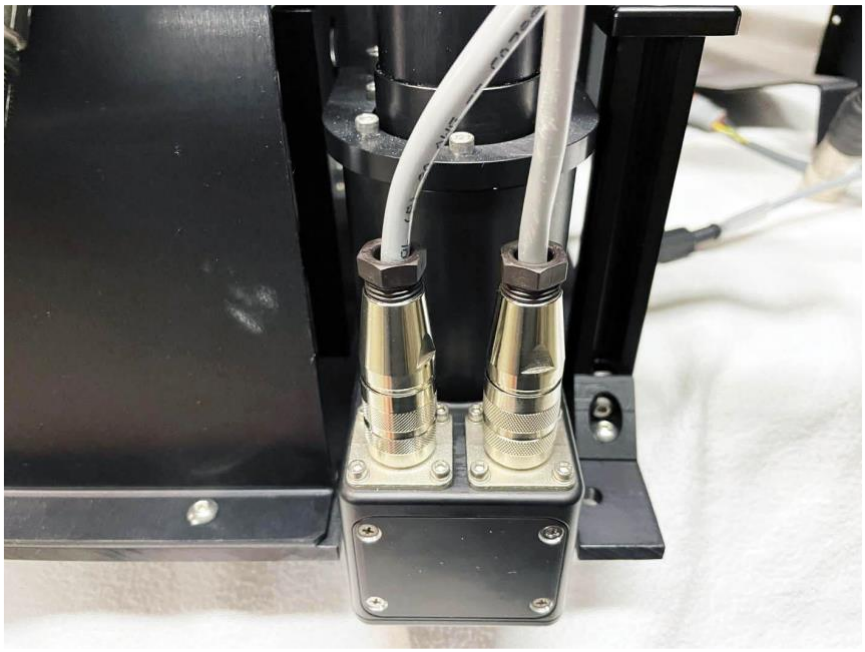


Figure 61 – Rinse Module – Actuator Plugs

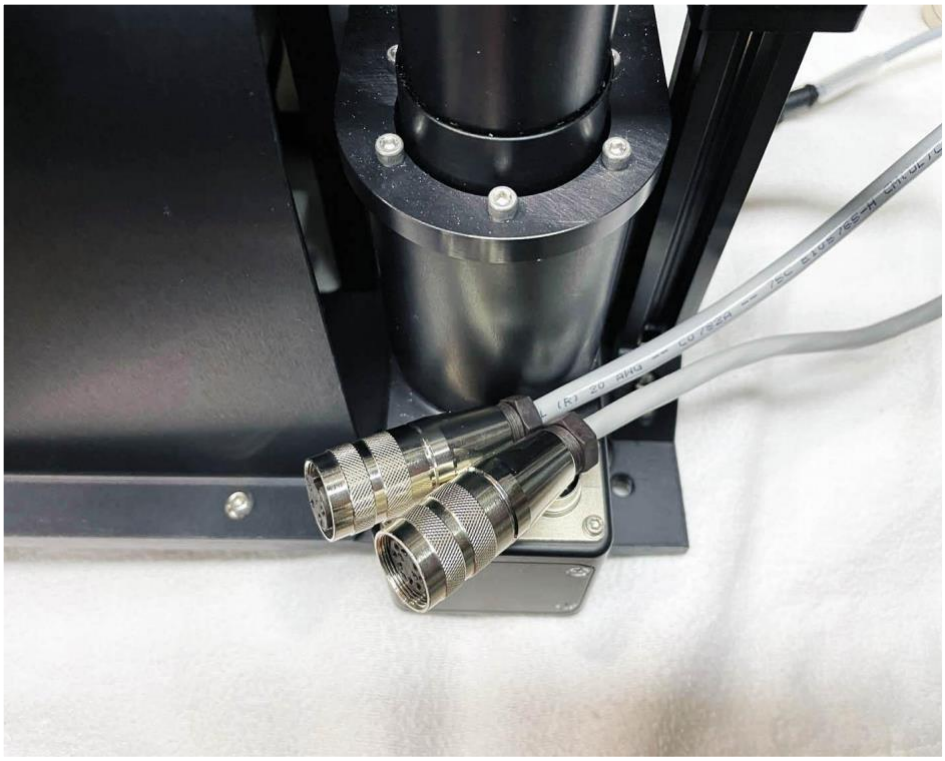


Figure 62 – Rinse Module – Actuator Plugs Removed

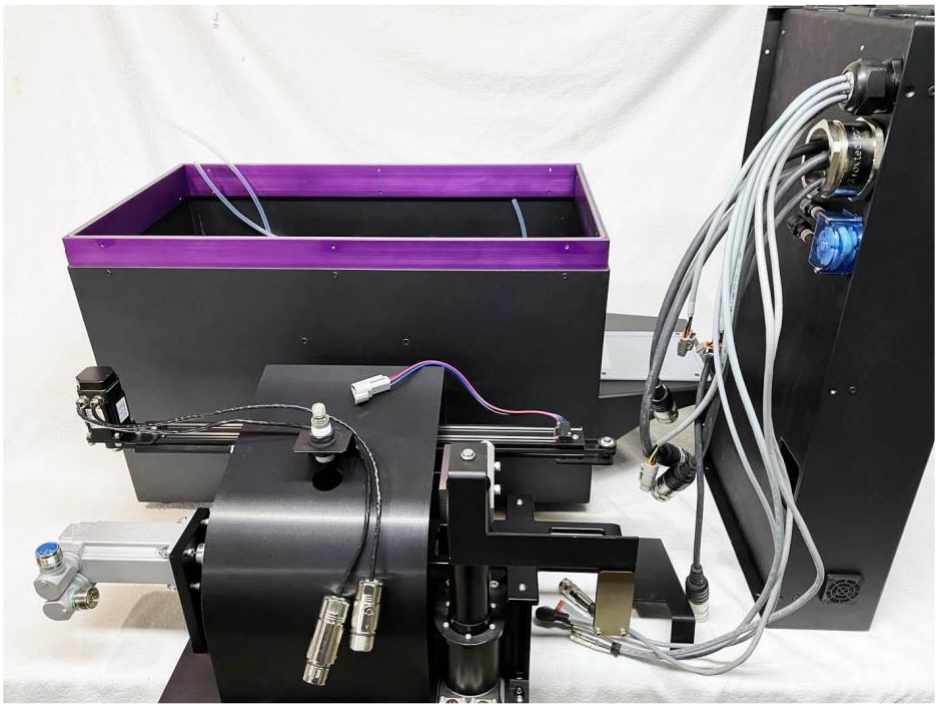


Figure 63 – Rinse Module – Full Mechanical Access

9. Disconnect cables as shown in above photos. Be careful when disconnecting the microplate sensor not to unscrew the entire sensor, but only to remove the connector. Locate and remove the four ¼-20 lock nuts (Figure 53, Figure 54, Figure 55, Figure 56). Disconnect further tubes and motor cables. Carefully lift out the entire mechanical unit, be careful with the still connected actuator cables.

Plasma Module

Step 10: Removing lid on Plasma Module (Figure 64).

Figure 64 – Plasma Module

Remove the six 8-32 flat head cap screws located on the lid on the sides and the back. Remove lid and carefully lift the back side up, keeping the front touching the Plasma Module. This procedure is required because there is a door actuator plug that needs to be unplugged before the lid can be fully removed. Refer to Figure 65.

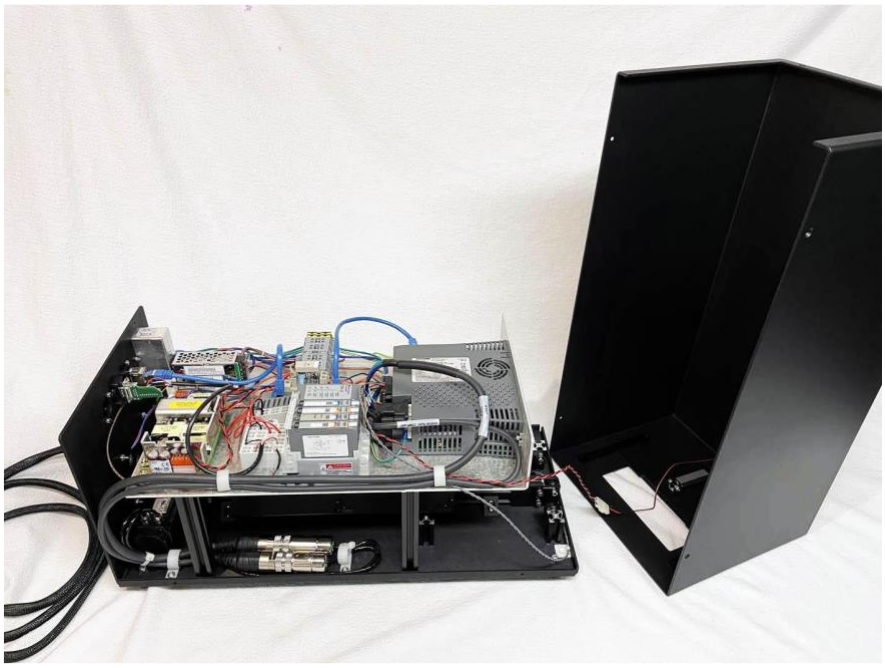


Figure 65 – Plasma Module – Access to Door Actuator Plug

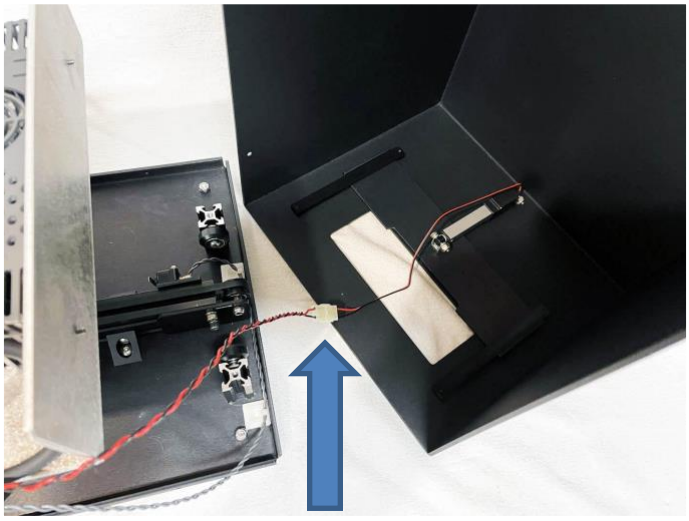


Figure 66 – Plasma Module – Interior of Lid, Location of Door Actuator Plug

Step 11: Replacing "Plasma Generator"

a. Remove the lid and place aside. Refer to step 10.

b. See *Figure 67* for what the Plasma Generator looks like shown by red arrows. (color of Plasma Generator may vary but is usually beige or white)

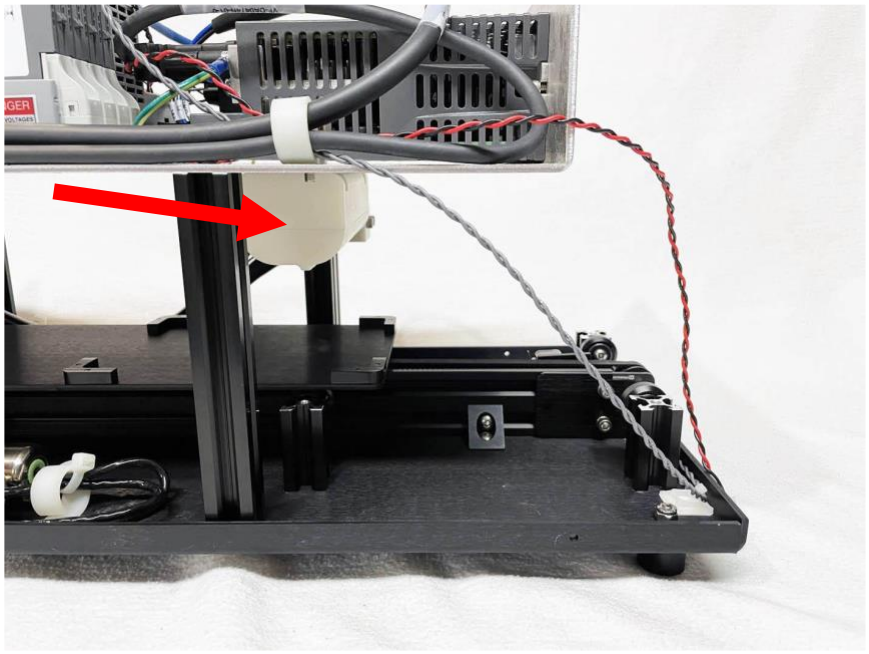


Figure 67 – Plasma Module – Plasma Generator

c. Remove the plastic ½" air tubing from the quick disconnect fitting on the side of the Plasma Generator.

d. Use a 3/16" allen key to remove the two screws shown in *Figure 68* to remove the Plasma Generator.

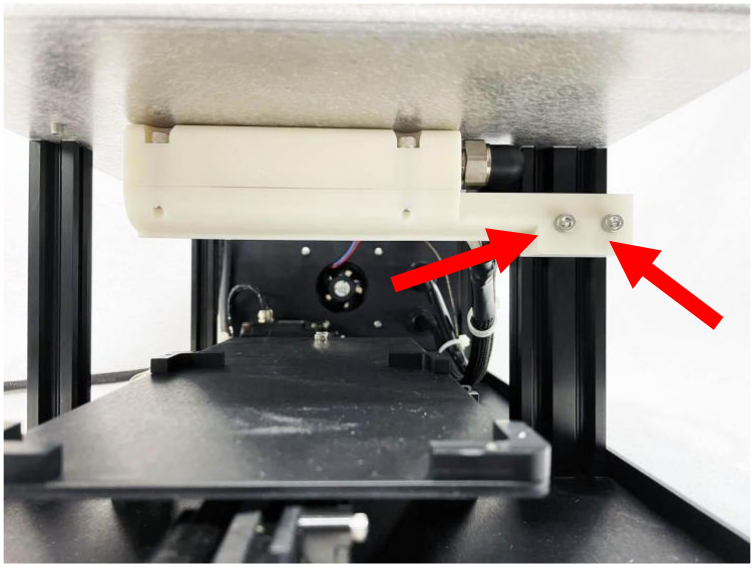


Figure 68 – Plasma Module – Plasma Generator Screws

e. Remove the large gold plug from the back of the PlasmaCharger Controller (*Figure 70*).

Figure 69 – PlasmaCharger Controller

f. On the gold HV connector, using a 5/64 allen key remove the three 4-40 button head cap screws. Loosen the two socket head cap screws on the strain relief to allow disassembly of the HV connector. Using a very small flat bladed screwdriver (1.5mm or equivalent) push the relief tabs on the pins inwards to allow pin to be extracted (note: there are two tabs on each pin). Disassemble the connector as shown in Figure *70.*

(Note: do not cut the cable as future use may be needed)

Figure 70 – Plasma Module – Gold Plug Disassembled

g. Unscrew the black plastic strain relief at the back of the Plasma Module so you can pull the cable through add remove from unit.

h. Place the parts and Plasma Generator assembly aside. You will no longer be using these components.

INSTALLING THE NEW PLASMA GENERATOR

i. Feed the 4 metal pin contacts of the new Plasma Generator (It may look like the old plasma generator, or it may be the new TC-96 style with a large metal bracket) and cable through the black plastic strain relief.

j. Connect the air hose to the quick disconnect located on the plasma generator.

k. Position the new Plasma Generator and install the two ¼”-20 SHCS to the plasma generator, similar to how the old one was removed. Adjust the Plasma Generator offset height to 3mm. This will be the measurement between the bottom of the Plasma generator and the top of a micro plate installed onto a plate holder being used.

l. Pull through the snakeskin cord so it is not sagging and tighten the strain relief on the back of the plasma module.

ASSEMBLING THE NEW GOLD PLUG

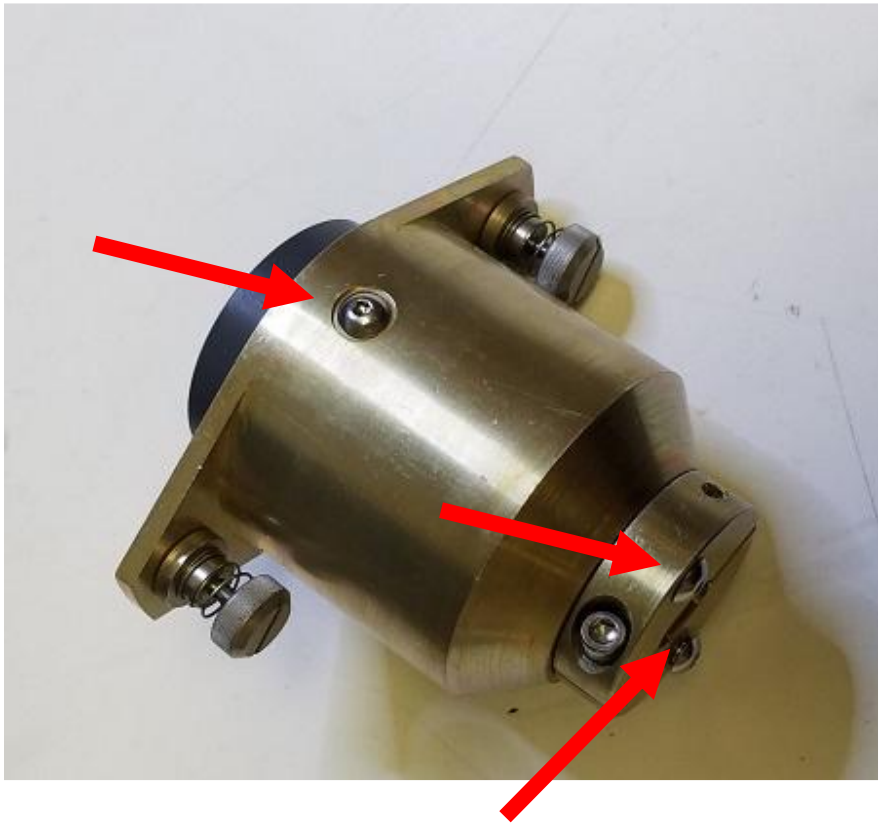


Figure 71 – Plasma Module – Gold Plug Screw Location

m. Using a 5/64” allen key remove the 3 button head screws (shown by red arrows above in *Figure 71*) on the new Plasma Generator’s gold plug so it looks like below (*Figure 72)*:

Figure 72 – Plasma Module – Gold Plug Disassembled

n. Loosen the 2 socket-head screws on the gold strain relief clamp until you can slide the 4 pins and the snakeskin cord through the clamp as shown below (*Figure 73*):

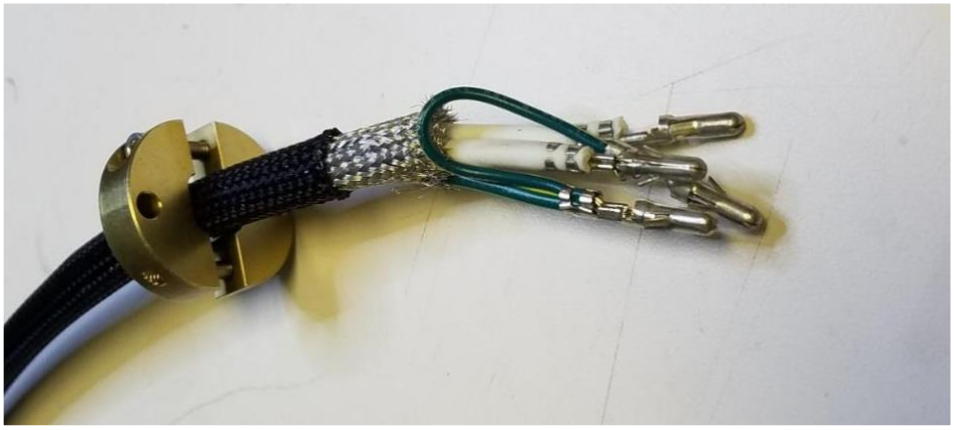


Figure 73 – Plasma Module – Gold Plug Inserts

o. Slide the 4 pins and the snakeskin cord through the large gold hood (*Figure 74*):

Figure 74 – Plasma Module – Gold Plug

p. Slide the two white pins into the larger diameter holes on the grey insert. Make sure the insert is facing away from the plug as shown below (*Figure 75*). Make sure to push in the pin all the way until it clicks. Once in place, it becomes difficult to slide it out. Then slide the two green grounding pins into the smaller diameter holes until they click as well.

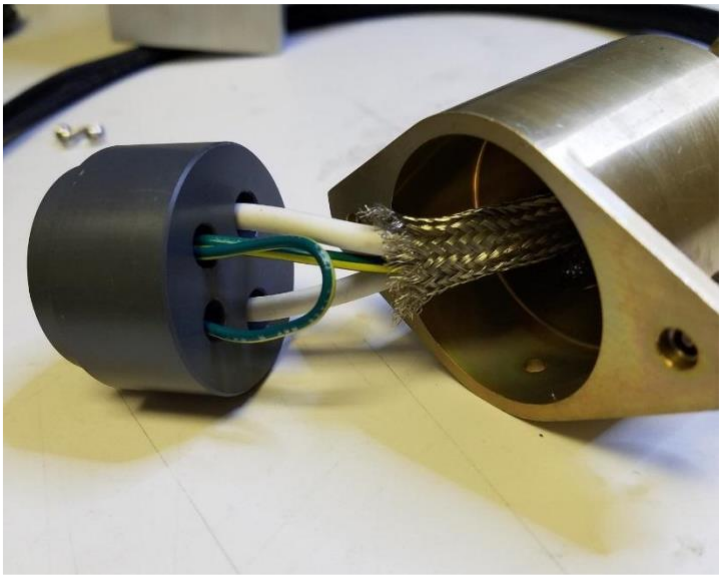


Figure 75 – Plasma Module – Gold Plug Cables

q. Slide the gold hood over the grey insert and line up the through hole on the hood with the threaded hole on the insert. Re-screw in the shorter button head screw (*Figure 76*).

Figure 76 – Plasma Module – Gold Plug Reassembled

r. Make sure the metallic shielding is outside of the gold hood and spread it out, so it has a secure contact with the gold hood. Push the snakeskin cord against the gold plug until it looks like the photo below (*Figure 74*):

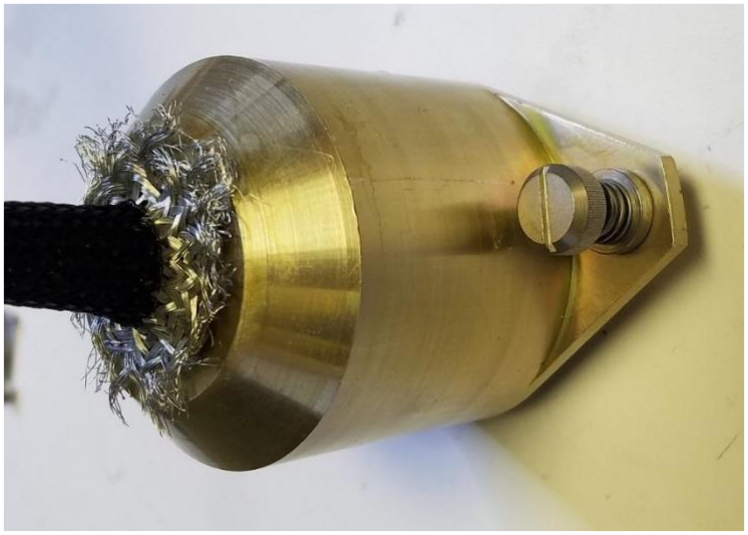


Figure 77 – Plasma Module – Gold Plug Shielding

s. Slide the gold clamp with the 2 screws towards the gold hood. This will secure the metallic shielding to the hood and hold the snakeskin cord in place.

Note: First you'll want to screw in halfway one of the longer button-head screws from the gold clamp into the gold hood. Then you'll want to tighten the two socket head clamp screws on the snakeskin cord.

Once that's set you should be able to screw in the 2nd and final button-head screw on the gold clamp all the way into the gold hood. Then finish tightening the other screw. All 4 screws should be tight, and the shielding should be securely pressed against the gold hood, as well as the clamp is securely tightened down on the snakeskin cord as shown below (*Figure 75*).

Figure 78 – Plasma Module – Gold Plug Completed

t. Re-plug the gold plug into the PlasmaCharger.

u. Replace the lid on the plasma module and re-screw the 8 button heads in place.

5. Maintenance Schedule and Tasks

Overview

These tasks and schedules are recommendations by IonField Systems. Due to customer's varying demands and schedules placed on the PurePlate MCS, you may find over time that you need to perform maintenance more or less often. Certain types of assays may cause more problems/issues, or you may be running plates on an irregular schedule. We recommend you start with our maintenance schedule initially and modify the maintenance schedule as experience is gained.

Weekly Tasks

a. Inspect microplate holders for debris. Especially check the magnets as they can pick up magnetic particles and over time this can prevent proper magnetic adhesion to the linear arm. You can clean these easily with a wet paper towel. Do not use anything rough or anything with a chemical. If damage is done to the magnets contact IonField Systems for a replacement.
b. Inspect the linear arm's magnets for debris, similar problem as step a. Check proper adhesion by placing the microplate holder back onto the unit and have the magnets connect. They should provide decent resistance to pulling apart, a pound or so of force.
c. Using the Rinse Module Control with the TOUCHSCREEN, place an empty microplate and use the micro-dispense button. Then eject the plate and check to see proper dispensing in every 1536 or 384 (dependent on which micro dispense head is installed) well from the micro dispense head. If any of the holes are not filled with liquid, perform the micro dispense cleaning procedure as follows. If the micro dispense head has clogged holes, take the provided micro-drill and gently insert into the clogged hole, remove, and repeat a few times. Re-run the prime option on the TOUCHSCREEN to test cleanliness. Repeat until clean. If clogging persists, contact support.

Monthly Tasks

a. Perform all weekly tasks.
b. Turn off the unit and disconnect the main power from the rinse module. Follow the disassembly guide to remove the electronics portion and set aside. Disconnecting cables and tubes is not advised.
c. Inspect the linear belt system for any tears or breaks in the belt, slide the linear arm back and forth and make sure it glides smoothly. If you feel resistance this may be the bearings corroding or debris on the rail. Slight resistance is fine, but over time if it is increasing contact IonField Systems for guidance.
d. Inspect the micro dispense tubing inside of the peristaltic pump located underneath the electronics enclosure. Inspect for leaks, tears, or cracks. You do not need to open the pump up.

e. Inspect the mechanics, and screws and note down any corrosion or problems. Some minor corrosion is expected but if it continues it may cause problems.
f. Inspect the centrifuge for cracks or stress fractures in the printed portion. Inspect the bearings for corrosion. Spin the centrifuge physically to check for smooth rotation.
g. Inspect the tubes for bacterial growth or any debris.

Rinse Head Cleaning Procedure

Overview

To clean the MCS Rinse Module's rinse head in order to prevent any gaps in rinse head coverage and ensure proper microplate cleaning.

Procedure

1. Follow steps 1-6 in the Maintenance guide in order to remove the electronics portion and slide it ajar so that you can access the water knife shown below (Figure 76). Remove the two screws shown.

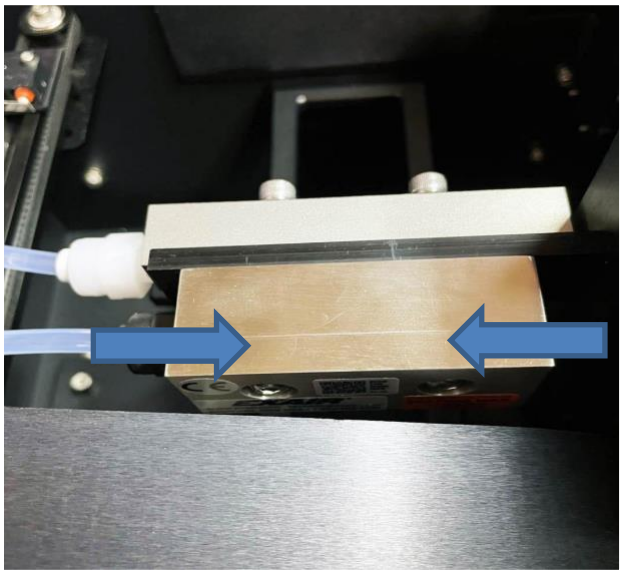


Figure 79 – Rinse Module – Rinse Head Screw Locations

2. Once the screws are removed, you may remove half of the rinse head. A thin metal shim will either fall out or can be slid off, be careful not to lose it. The rinse head will look like the image below (Figure 77), make sure to wipe down the interior and blade surface with a lint-free paper towel or other clean wipe. Don't use anything except water. Make sure to clean the bottom exposed edge as indicated by the arrow. This is the edge where water escapes and where clogs will occur.

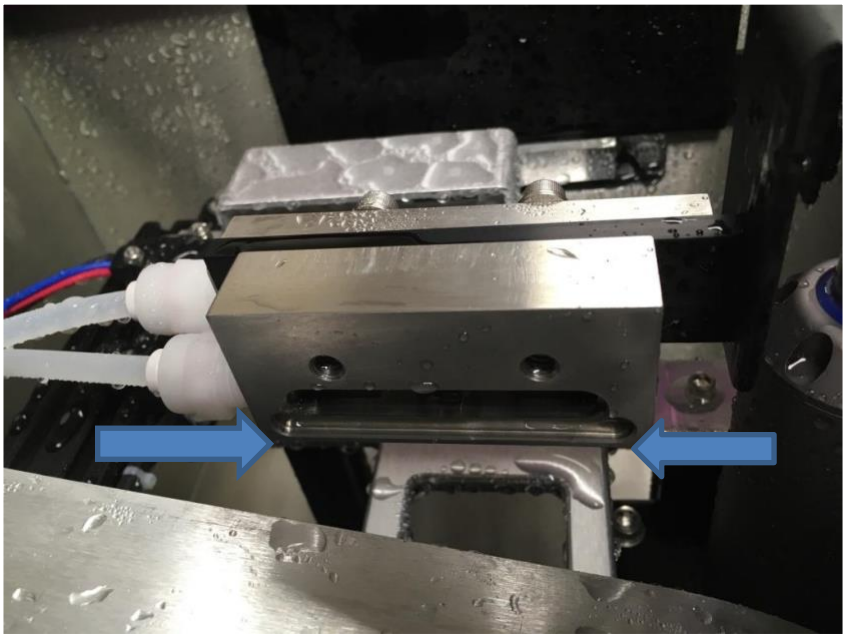


Figure 80 – Rinse Module – Rinse Head Open for Cleaning

3. If you need to, you can remove the entire rinse head assembly by removing the other two screws holding the micro dispense head on the other side. This may cause problems with the alignment and care must be taken putting it back together. Put the components aside (shown below) and clean them with water and another lint free rag or clean lint free paper towel. Be very careful not to bend the shim as it is very thin. Any bend or distortion can affect the rinse head blade and therefore degrade cleaning effectiveness.

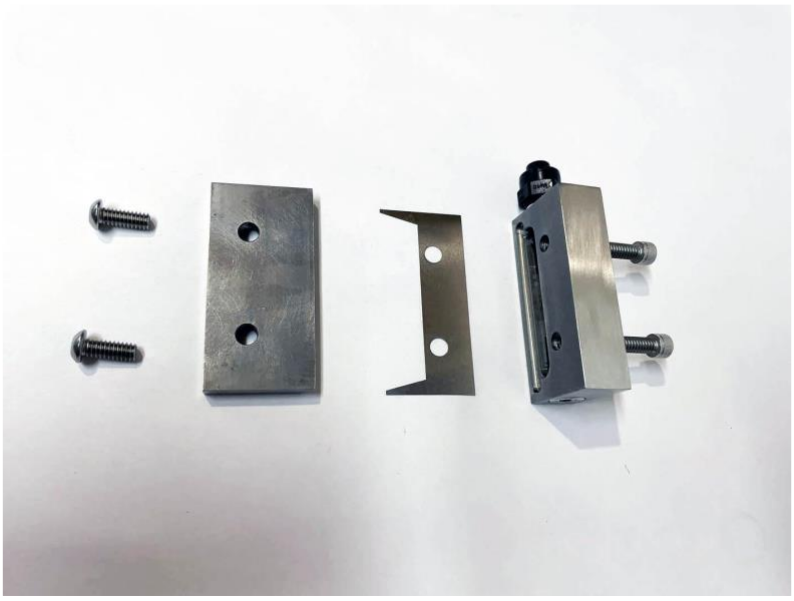


Figure 81 – Rinse Module – Rinse Head Components

4. Reassemble the rinse head and screw it back into place. Make sure to place the shim as shown below (Figure 79) when reassembling.

Figure 82 – Rinse Module – Rinse Head Shim Alignment

5. Once everything is reassembled and back in the Rinse Module, make sure the alignment was not bumped out of place. You need to slide a microplate underneath the rinse head and the micro dispense head and ensure that the water blade's coverage and the micro dispenser will adequately cover the entire width of the microplate as shown below (Figure 80)

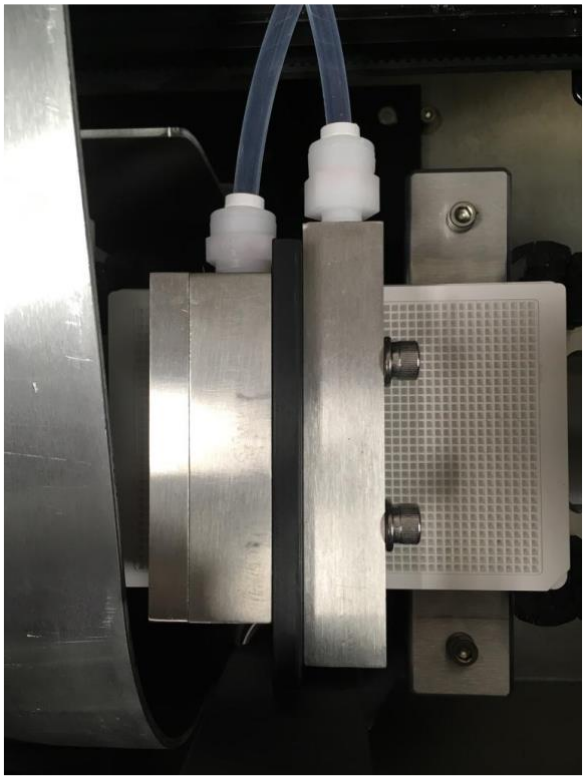


Figure 83 – Rinse Module – Rinse Head Alignments

Micro Dispense Cleaning Procedure

Overview

To clean the MCS Rinse Module's micro dispense head in order to prevent any gaps in dispensing coverage and ensure proper microplate cleaning.

Procedure

1. Follow steps 1-6 in the Maintenance guide in order to remove the electronics portion and slide it ajar so that you can access the micro dispense shown below (Figure 76). Remove the two screws shown.

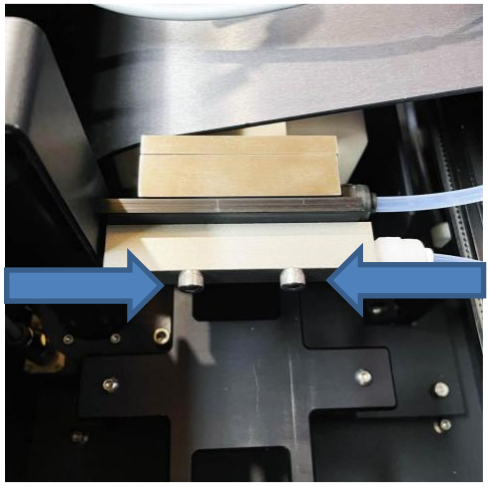


Figure 84 – Rinse Module – Micro Dispense Screw Locations

2. Once removed, take out the micro dispense cleaning tool that was included in your shipment, as shown below.

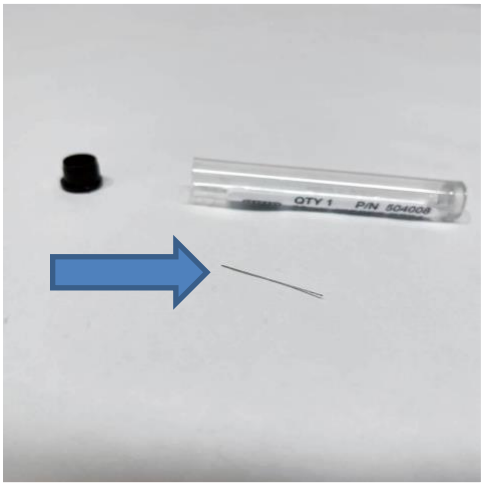


Figure 85 – Component – Micro Dispense Cleaning Tool

3. Using the cleaning tool, poke through, one by one, each hole on the edge of the dispenser gently dislodging any debris. Make sure to then rinse out the interior with water, checking visually for any obstruction in any of the dispenser holes.

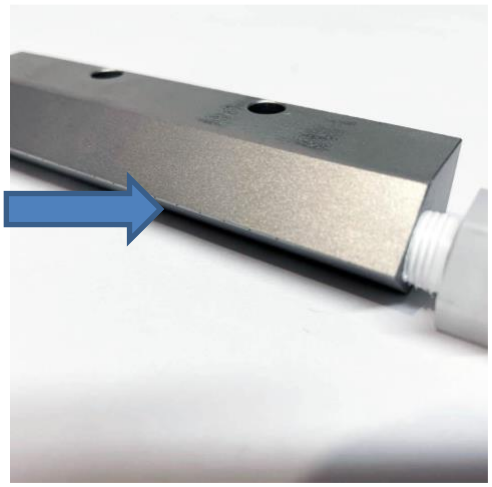


Figure 86 – Component – Micro Dispense

4. Once everything is reassembled and back in the Rinse Module, make sure the alignment was not bumped out of place. You need to slide a microplate underneath the rinse head and the micro dispense head and ensure that the rinse head blades coverage and the micro dispense will adequately cover the entire width of the microplate as shown below (Figure 91)

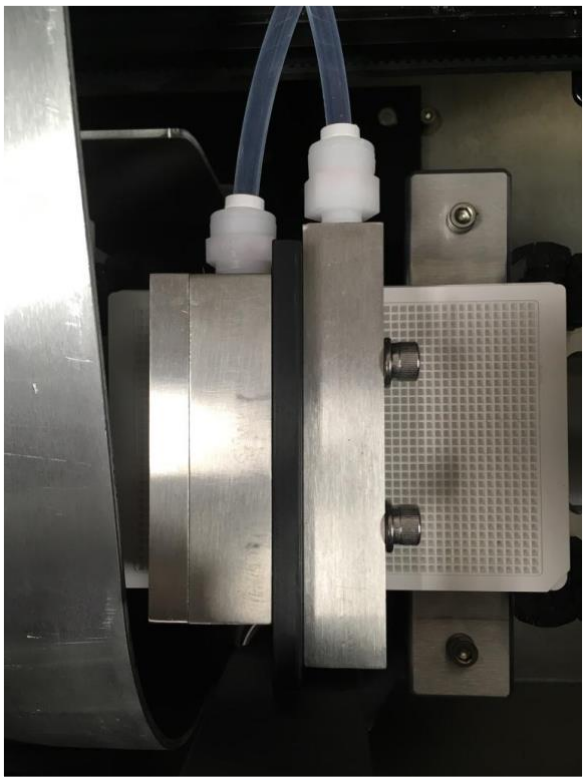


Figure 87 – Rinse Module – Rinse Head Alignments