

Profilers **Samplers** Flotation



mclanelabs.com

Phytoplankton & Particle Sampler & McLanePro

User Manual

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Included with the PPS

A new Particle and Phytoplankton Sampler (PPS) includes a USB drive that contains the User Manual and [McLanePro](#), the graphical user interface for samplers built with McLane Research Labs' Gen3 electronics. Each PPS also includes a toolkit. The toolkit and contents are referred to throughout this User Guide, and should remain with the instrument at all times.



The toolkit pictured is only an example.

Actual toolkit contents may vary and are subject to change without notice.

Contact McLane

| | |
|-------------------|---|
| TELEPHONE SUPPORT | +1 508.495.4000 |
| FAX | +1 508.495.3333 |
| EMAIL | MCLANE@MCLANELABS.COM |
| WEBSITE | www.mclanelabs.com |
| Mailing Address | McLANE RESEARCH LABS 121 Bernard E. Saint Jean Drive, East Falmouth, MA 02536 USA |

When contacting McLane for technical support, please provide the following:

- Firmware version and [instrument serial number](#).
- Problem description including files from the onboard MicroSD[®] card, if possible.

Contact mclane@mclanelabs.com with questions about retrieving files.

McLane Research Laboratories is on the Web at <http://www.mclanelabs.com> or via email at mclane@mclanelabs.com.

The [PPS pages](#) on the McLane website contain links to documentation including Technical Bulletins, and papers that describe the development and use of the PPS.

Printable User Manual

Check the [PPS User Manual page](#) on the McLane website for updates and a downloadable PPS & McLanePro User Manual.

Training Videos

McLane has several training videos relating to the PPS. These videos are included on the USB drive that ships with a new sampler and can also be downloaded from the McLane website <https://mclanelabs.com/phytoplankton-sampler/pps-videos/>

A description of each video and content is provided below for reference.

| Video | Content |
|---|---|
| Battery Replacement with Drop-in Battery Holder | Shows user replaceable 'D' cell alkaline batteries installation in the PPS. |
| Replacing O-rings | Provides the steps to clean and install O-rings. |
| Priming the PPS | Illustrates the second step in the priming process for the PPS. The complete process can be found in the PPS user manual. |

Serial Number

A McLane instrument serial number begins with 'ML' followed by five numbers and a dash (-) with two more numbers.

Example: ML12345-01

This information is located in multiple places:

- On a label attached to the controller housing.
- On a label on the pump or valve assembly.
- Programmed into the electronics and reflected on the McLanePro main display.

The screenshot displays the McLanePro software interface. At the top, there's a header with the McLanePro logo, a 'Port' dropdown set to 'COM3', and buttons for 'Refresh', 'Connected', and 'Disconnect'. Below this, a status bar shows 'Device: Particle and Phytoplankton Sampler - [PPS]', 'Serial#: 99999-99' (highlighted with a red box), and 'Firmware: 1.12.2 - [DO NOT Release!]'. Further down, it shows 'Instrument Date: Mar/01/2023', 'Instrument Time: 14:55:01', and an 'Adjust Instrument Clock' button. A navigation bar includes tabs for 'Schedule', 'Deployment', 'Offload', 'Manual Operation', 'Admin', 'SD Card', and 'Configuration'. Below the navigation bar are buttons for 'Edit Schedule', 'Export', and 'Import'.

The main content area is divided into two sections. The first section, 'Deployment Parameters', includes fields for 'Available sample ports' (23) and 'Number of events' (3). It has tabs for 'Start/Interval', 'Start/End', and 'Offset'. The 'Start/End' tab is active, showing 'Start Date/Time: Mar/01/2023 - 11:30:00', 'Days: 0', 'Hours: 0', and 'Minutes: 3'. A 'Populate Events' button is located to the right. The second section, 'Deployment Event Parameters', has an 'Edit Event' dropdown set to 'All Events' and another 'Populate Events' button. It contains three event types: 'Water Flush', 'Sample', and 'Fixative Flush'. Each event type has a table with columns for 'Volume (mL)', 'Flow Rate (mL/Min)', and 'Min. Flow Rate (mL/Min)'. The 'Water Flush' event has values of 100, 125, and 20 respectively. The 'Sample' event has values of 250, 100, and 20. The 'Fixative Flush' event has values of 75, 75, and 20.

McLanePro Introduction

McLanePro is the graphical user interface for samplers utilizing McLane Research Labs' Gen3 electronics. This section outlines the features and functionality of McLanePro. This information will help with using McLanePro to operate McLane samplers.

McLanePro Introduction topics

- [Install McLanePro](#)
- [Connecting Battery Power](#)
- [Closing the Controller Housing](#)
- [Connecting to the PPS](#)
- [Setting the Instrument Clock](#)
- [The Schedule Tab](#)
- [The Deployment Tab](#)
- [The Offload Tab](#)
- [The Manual Operation Tab](#)
- [The Admin Tab](#)
- [The SD Card Tab](#)
- [The Configuration Tab](#)
- [The Help Menu](#)
- [The Activity Log](#)
- [Offline Mode](#)

Install McLanePro

Installation

McLanePro can be downloaded from the "Software Utilities" section of the McLane website:

<https://mclanelabs.com/software-utilities/>

There will also be a version of McLanePro supplied on a USB drive, included in the toolkit.

Follow the installation wizard instructions to install the program.

McLanePro Updates

McLanePro will detect available updates and prompt the user for installation when starting up the program. Follow the update wizard instructions to install the latest version of McLanePro.

System Requirements

| | |
|------------------|---------------------------|
| Operating System | Windows 10/11 - 32/64 bit |
| Disk Space | 450 MB |
| Memory (RAM) | 4GB |

Connecting the Batteries

Follow these steps to load the drop-in battery holder and connect to the electronics. Always use caution when [opening and closing the controller electronics housing](#).

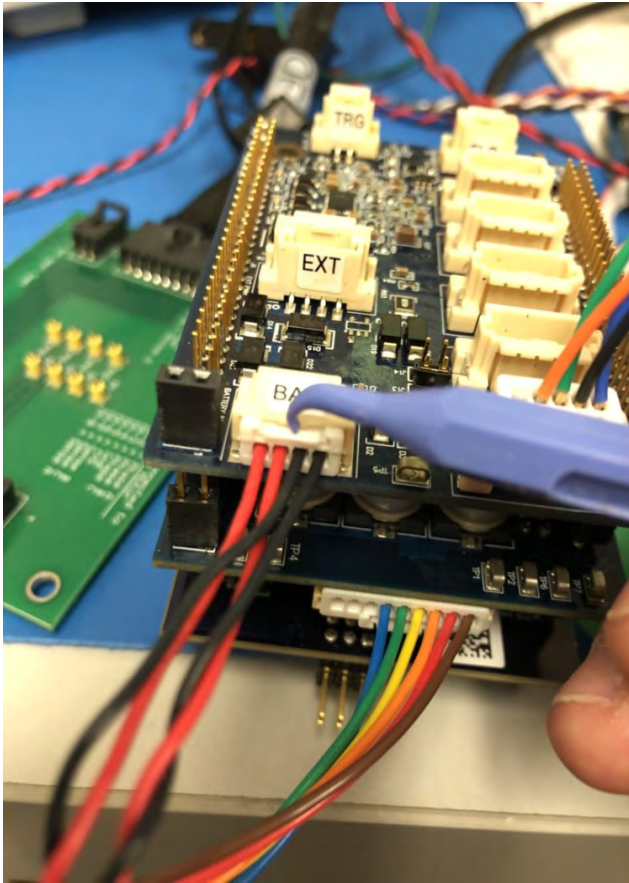
Related topics

[Opening the Controller Housing](#)

1. Open the controller housing, and remove the electronics, and top end cap from the controller housing tube.
2. Disconnect the battery connector from the electronics.



The battery connector uses a latch to secure the connection. Gently press on the tab to release the connector from the shell.



3. Remove the battery enclosure cap.



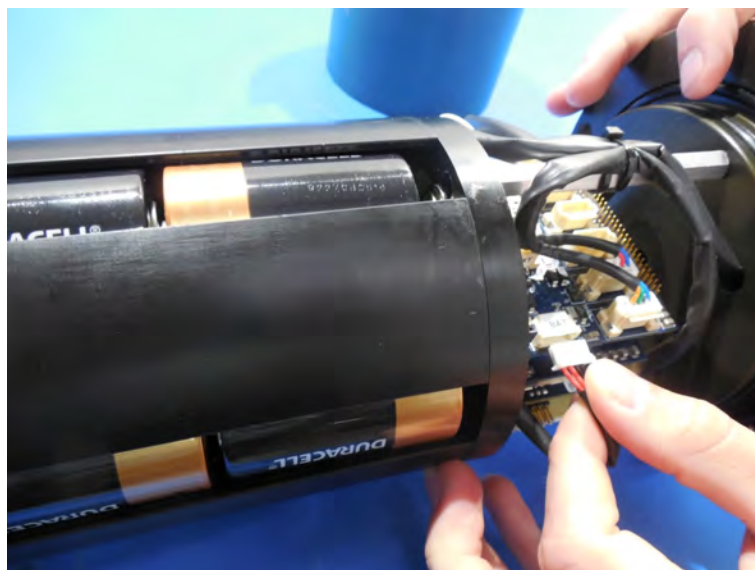
4. Load batteries into the battery holder observing correct polarity.

- A video that explains correct battery placement can be downloaded from the [PPS Videos](#) page on McLane's website.

5. Secure the battery enclosure cap.



6. Reconnect the batteries to the electronics.



Close the Controller Housing

It is important to ensure that the controller housing is sealed correctly before performing operations with the PPS. O-rings and sealing surfaces should be regularly cleaned with isopropyl alcohol. Inspect O-rings for signs of wear and the presence of any foreign material (which can cause leaks). Look for small cracks and feel for grit, sand, or hair. Lubricate with a thin coating of provided Parker O-Lube as necessary. The toolkit has spare O-rings, and additional O-rings may be purchased from McLane.



Keep hard objects such as tools or shackles away from the anodized controller housing. Scratches from these objects will localize galvanic action and can cause deep crevices or pitting.



Use caution to avoid scratching the O-rings, end cap, or the sealing surface of the vessel where the O-rings sit. Scratches could cause leaks.

Once the battery holder has been installed and connected to the PPS electronics:

1. Carefully inspect the O-rings on the end cap for any foreign material or residue. Clean with a lint-free wipe and lubricate as needed.
2. Carefully inspect the O-ring sealing surface on the controller housing tube. Wipe away old or excess lubricant and verify the gland is clean and clear of debris or scratches. Lubricate this surface with a thin film of Parker O-Lube.
3. Replace the internal desiccant, or verify that the desiccant is still absorbent.
4. Slide the controller and end cap into the controller housing, ensuring that the O-rings evenly enter the housing.
5. Gently push on the end cap so the O-rings are completely engaged in the housing and no gap remains between the housing tube and the end cap.
6. Rotate the end cap to align the end cap bolt holes with the controller housing tube.
7. Install the end cap hardware. Ensure that the bolt holes have plastic insulators installed before adding hardware.
8. Secure the end cap bolts and tighten enough that the split lock washers compress under the bolt heads. Be careful not to over-tighten.

Connecting to the PPS

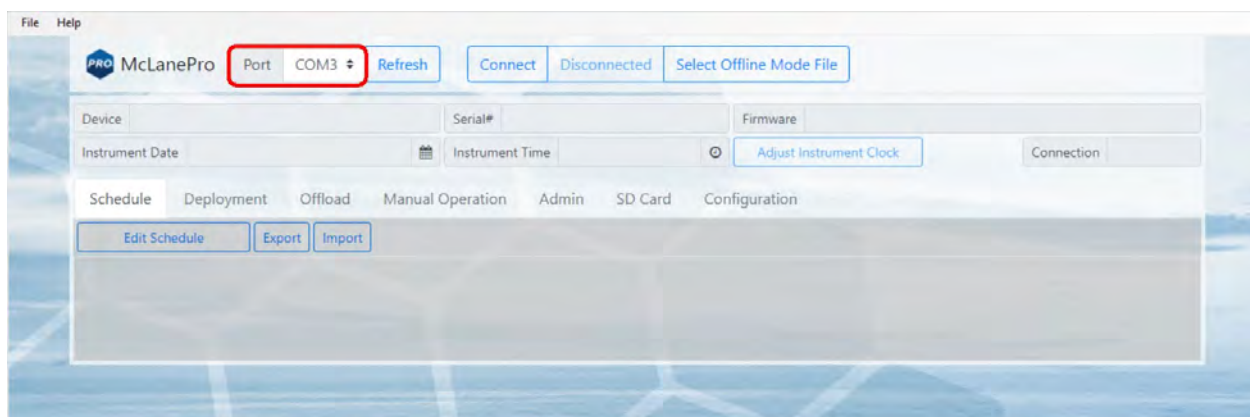
McLanePro is used to communicate with the PPS. McLane ships a USB cable that connects to the six pin communications connector on the housing end cap. A host computer provides the electronics with USB power, to communicate with the sampler. Battery power is required for operation of external hardware.



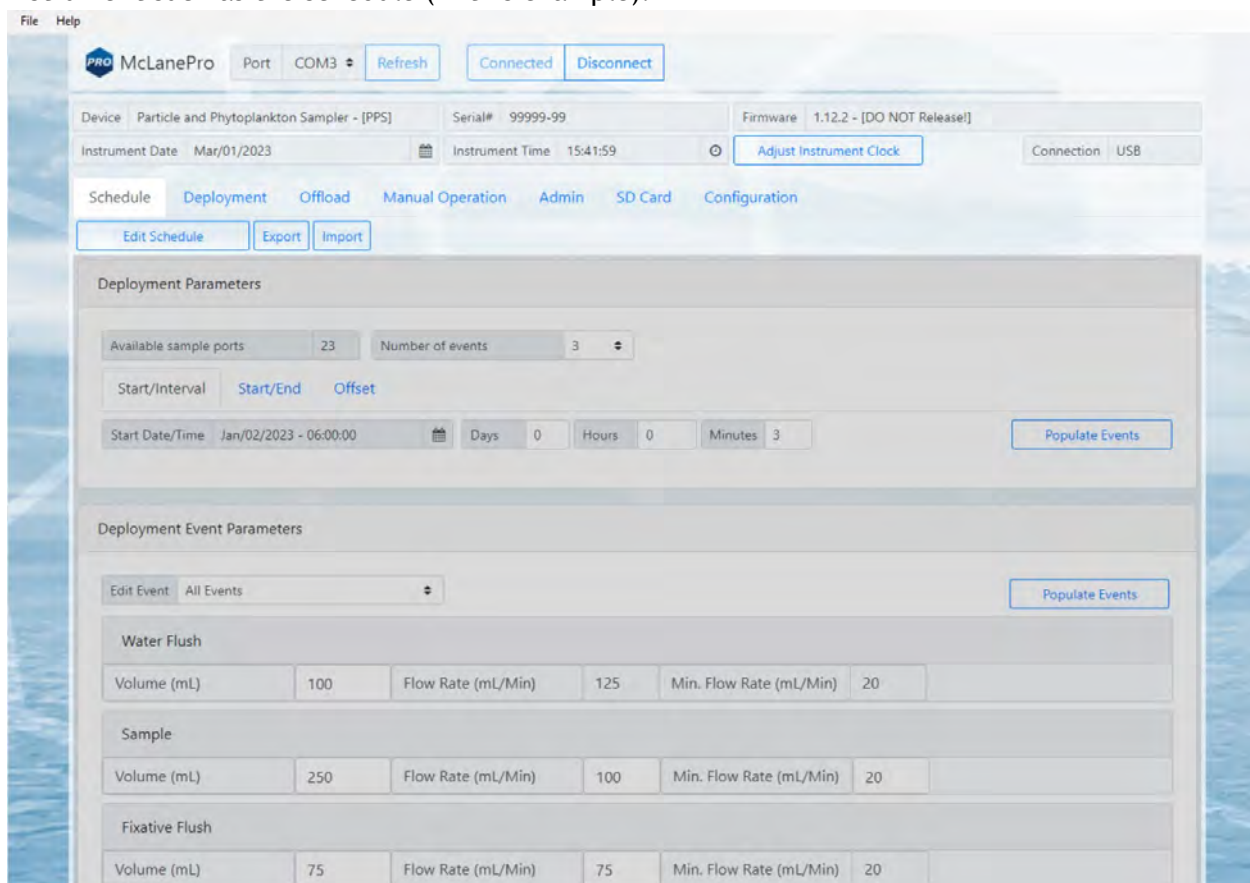
1. Remove the dummy plug from the communication port on the PPS.
2. Plug the USB COM cable onto the COM bulkhead of the PPS. It is important to always plug into the PPS before plugging into the computer.
3. Plug the USB COM cable into a USB port on the host computer.
4. After plugging the USB cable into the host computer, the host computer should recognize the USB connection as a virtual serial port.
5. Open McLanePro.
6. Find and select the communication (COM) port associated with the McLane PPS in the **Port**

window.

7. Click **Connect**.

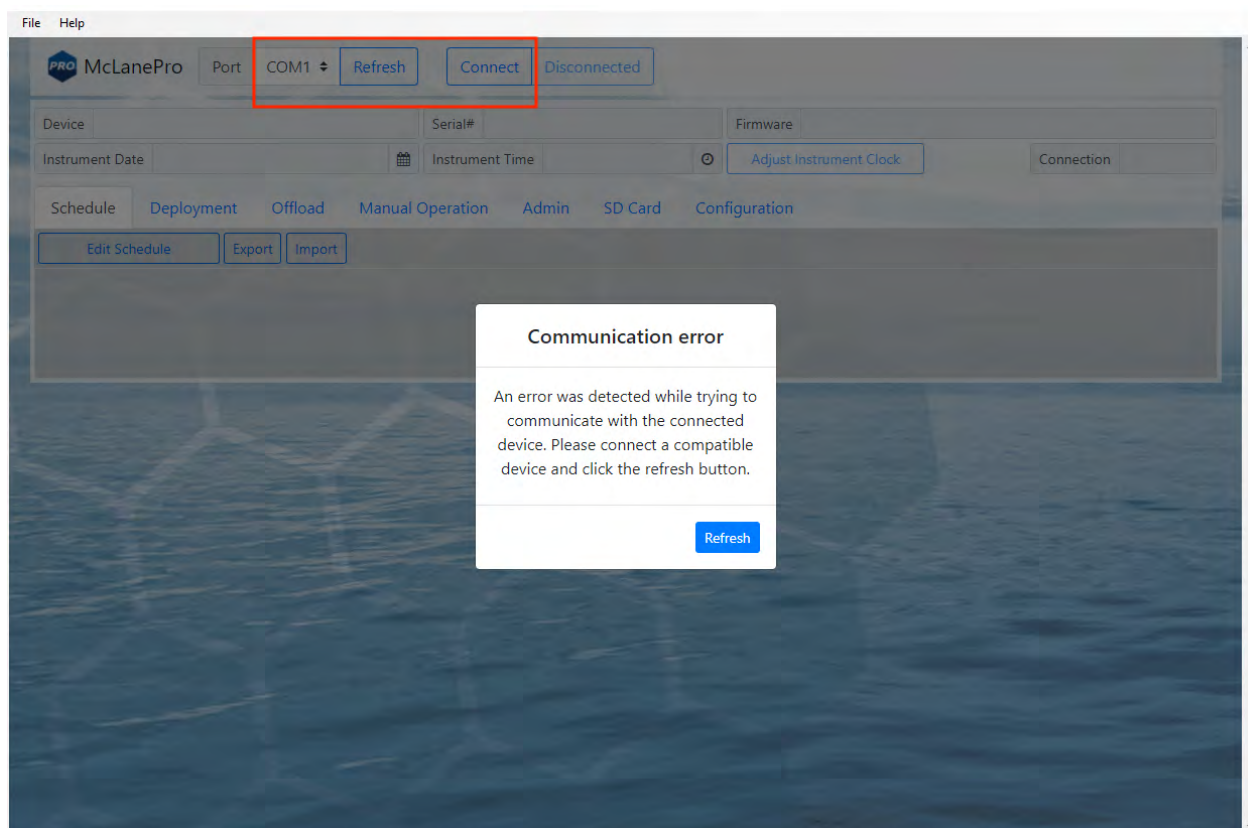


In the above example, the communication port associated with the PPS is COM 3. After successfully connecting to the PPS, McLanePro tabs will display data stored on the instrument such as the schedule (in this example).



Communication Error Message

If a communication error is displayed, click **Refresh** and select a different COM port from the drop-down menu.

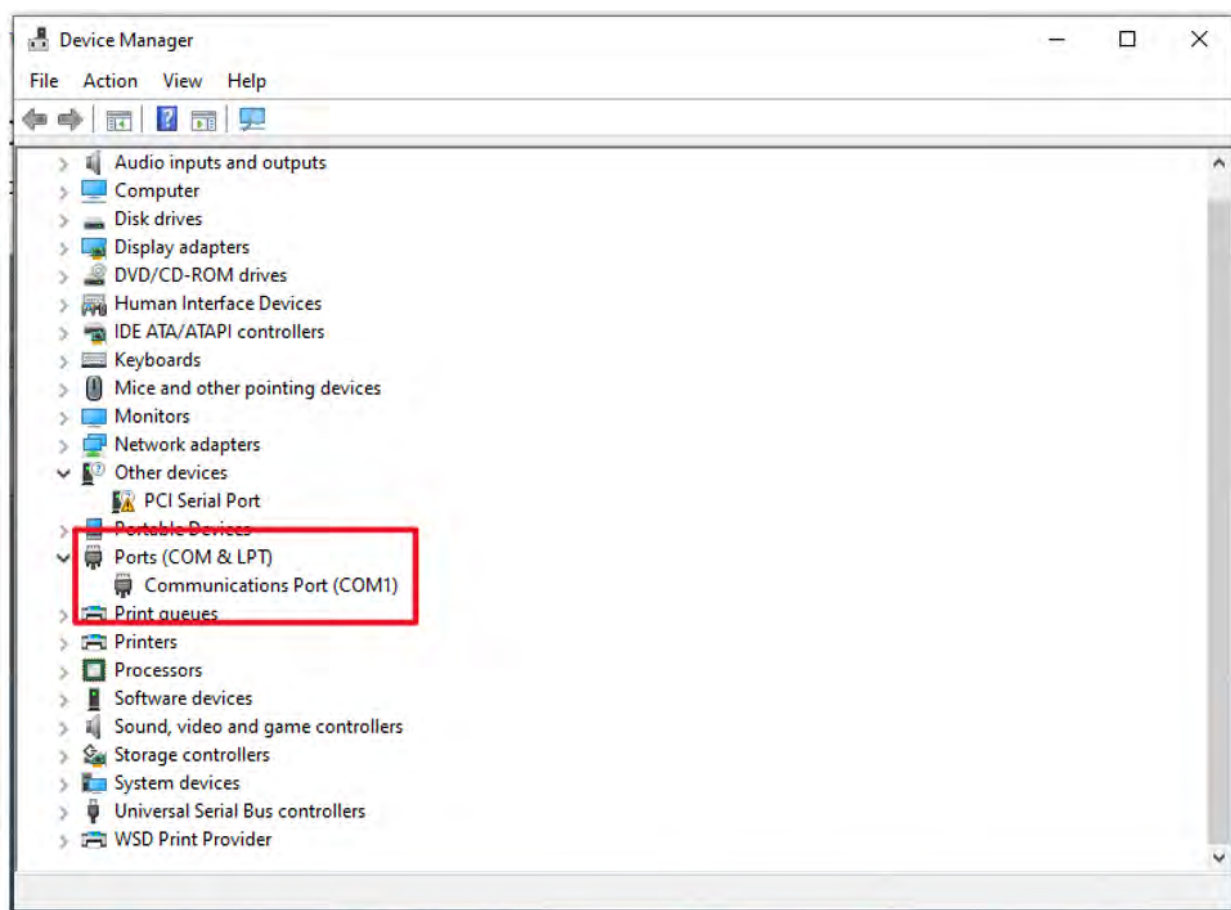


Communication Troubleshooting

If the computer has gone to sleep while connected to the device, McLanePro may need to be closed and reopened in order to reestablish communications.

If no communication ports are responding, or none are listed, check the available COM ports in the Windows Device Manager. Device Manager can be accessed by clicking the Windows start menu and typing "device manager".

Device Manager lists the available COM ports under "Ports."



When plugging and unplugging the device to/from the computer, a port should appear and/or disappear from the Device Manager list of ports. This indicates the COM port that should be selected in McLanePro and that the device should communicate on.

If no COM port appears when connecting to the device, power to the system may need to be reset. Schedule and deployment data will be retained through this process. Refer to the [Connecting the Batteries](#) section of this manual. Disconnect the battery and the USB connection, wait 30 seconds, and reconnect the battery.

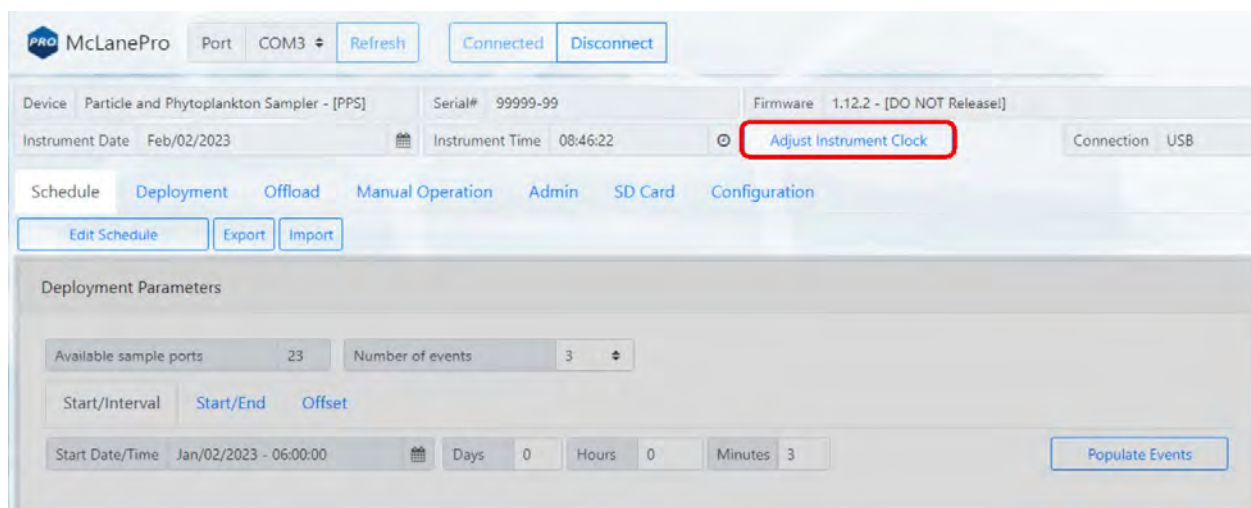
If the device remains unresponsive, try disconnecting the device, restarting the computer, and reconnecting.

In rare cases, some computers may have difficulty reliably recognizing the USB COM port and a different computer may be necessary to successfully communicate with the device.

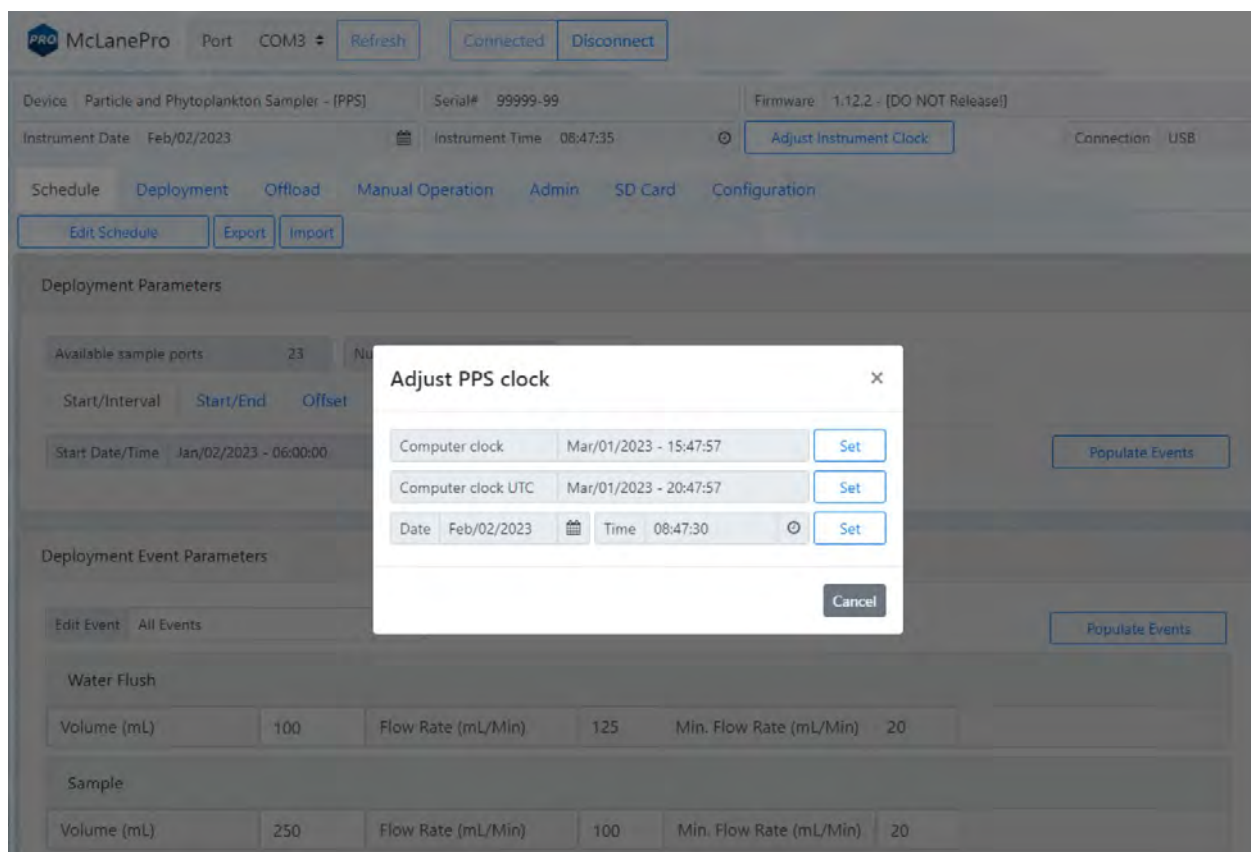
Setting the Instrument Clock

The instrument time is reset if both the USB COM cable and the batteries are disconnected. Always be sure to check the instrument time before deploying the system.

To set the instrument time press the **Adjust Instrument Clock** button.



Click the **Set** button to set any of the available time values.



The Schedule Tab

The **Schedule** tab is used to define a deployment schedule before deploying the PPS.

The screenshot displays the McLanePro software interface. At the top, there's a header with the McLanePro logo, a 'Port' dropdown set to 'COM3', a 'Refresh' button, and 'Connected'/'Disconnect' status buttons. Below this, a metadata bar shows 'Device: Particle and Phytoplankton Sampler - [PPS]', 'Serial#: 99999-99', 'Firmware: 1.12.4 - [DO NOT Release!]', 'Instrument Date: Mar/06/2023', 'Instrument Time: 08:39:22', an 'Adjust Instrument Clock' button, and 'Connection: USB'. A navigation bar includes tabs for 'Schedule', 'Deployment' (selected), 'Offload', 'Manual Operation', 'Admin', 'SD Card', and 'Configuration'. Below the navigation bar are 'Edit Schedule', 'Export', and 'Import' buttons.

The main content area is divided into two sections:

- Deployment Parameters:** Contains 'Available sample ports' (23) and 'Number of events' (3). It has sub-tabs for 'Start/Interval', 'Start/End' (selected), and 'Offset'. The 'Start Date/Time' is set to 'Mar/06/2023 - 08:05:00'. Below this are fields for 'Days' (0), 'Hours' (0), and 'Minutes' (5), along with a 'Populate Events' button.
- Deployment Event Parameters:** Features an 'Edit Event' dropdown set to 'All Events' and another 'Populate Events' button. It lists four event types with their respective parameters:
 - Water Flush:** Volume (mL) 100, Flow Rate (mL/Min) 125, Min. Flow Rate (mL/Min) 20.
 - Sample:** Volume (mL) 1000, Flow Rate (mL/Min) 100, Min. Flow Rate (mL/Min) 20, Time Limit (H 0, M 0).
 - Fixative Flush:** Volume (mL) 75, Flow Rate (mL/Min) 75, Min. Flow Rate (mL/Min) 20.
 - Antifouling Flush:** Radio buttons for 'Pre-Sample' and 'Post-Sample' (selected). Volume (mL) 20, Flow Rate (mL/Min) 75, Min. Flow Rate (mL/Min) 20.

Schedule a Deployment

Follow these steps to define a deployment using a scheduled start date and time.

Before scheduling and deploying the PPS, make sure the instrument time is set!

1. Click the **Schedule** tab.
2. Click the **Edit Schedule** button.

The screenshot displays the McLanePro software interface. At the top, there's a header with the McLanePro logo, a 'Port' dropdown set to 'COM3', a 'Refresh' button, and 'Connected'/'Disconnect' status buttons. Below this, a metadata bar shows 'Device: Particle and Phytoplankton Sampler - [PPS]', 'Serial#: 99999-99', 'Firmware: 1.12.4 - [DO NOT Release!]', 'Instrument Date: Mar/06/2023', 'Instrument Time: 08:39:22', an 'Adjust Instrument Clock' button, and 'Connection: USB'.

The main navigation bar includes tabs for 'Schedule', 'Deployment' (selected), 'Offload', 'Manual Operation', 'Admin', 'SD Card', and 'Configuration'. Below these are 'Edit Schedule', 'Export', and 'Import' buttons.

The 'Deployment Parameters' section contains:

- 'Available sample ports' set to 23 and 'Number of events' set to 3.
- 'Start/Interval' tabs with 'Start/End' selected and 'Offset' disabled.
- 'Start Date/Time' set to 'Mar/06/2023 - 08:05:00', 'Days' 0, 'Hours' 0, and 'Minutes' 5. A 'Populate Events' button is on the right.

The 'Deployment Event Parameters' section includes:

- 'Edit Event' dropdown set to 'All Events' and another 'Populate Events' button.
- 'Water Flush' parameters: Volume (mL) 100, Flow Rate (mL/Min) 125, Min. Flow Rate (mL/Min) 20.
- 'Sample' parameters: Volume (mL) 1000, Flow Rate (mL/Min) 100, Min. Flow Rate (mL/Min) 20, Time Limit H 0, M 0.
- 'Fixative Flush' parameters: Volume (mL) 75, Flow Rate (mL/Min) 75, Min. Flow Rate (mL/Min) 20.
- 'Antifouling Flush' section with radio buttons for 'Pre-Sample' and 'Post-Sample' (selected), and parameters: Volume (mL) 20, Flow Rate (mL/Min) 75, Min. Flow Rate (mL/Min) 20.

There are two sections used to set up a deployment. The first section, Deployment Parameters, allow for setting of the schedule type or modifying an existing schedule. The second section, Deployment Event Parameters, allows for setting all or individual event parameters related to PPS sampling operations.

- *Deployment Parameters*

- **Available sample ports** - displays the maximum available sample ports that may be used for a deployment. This is based on the current instrument configuration. For example, if the antifouling option is configured, the maximum available ports will be reduced by one.
- **Number of events** - defines the number of PPS samples to be collected during the deployment. This may not exceed the available sample ports value.
- **Start/Interval** - the start/interval tab allows for scheduling a deployment according to a fixed start time and interval between sample events.

- **Start/End** - the start/end tab allows for scheduling a deployment according to a fixed start time and end time. Events will be scheduled at regular intervals between these two dates and times. The final event will start at the defined end date.
- **Offset** - the offset tab allows for applying an offset time to the existing schedule. This preserves the timing between samples, but allows for updating the time schedule according to the defined offset.

The screenshot displays the McLanePro software interface. At the top, there's a header with the McLanePro logo, a 'Port' dropdown set to 'COM3', a 'Refresh' button, and 'Connected' and 'Disconnect' buttons. Below this is a status bar showing 'Device: Particle and Phytoplankton Sampler - [PPS]', 'Serial#: 90000-28', 'Firmware: 1.13.11 - [DO NOT Release!]', 'Instrument Date: Jun/21/2023', 'Instrument Time: 13:43:41', an 'Adjust Instrument Clock' button, and 'Connection: USB'. A navigation bar includes 'Schedule', 'Deployment', 'Offload', 'Manual Operation', 'Admin', 'SD Card', and 'Configuration'. The 'Schedule' tab is active, showing a 'Cancel' button. The 'Deployment Parameters' section has 'Available sample ports' set to 24 and 'Number of events' set to 24. Three tabs are visible: 'Start/Interval' (highlighted with a red box), 'Start/End', and 'Offset'. Below these, 'Start Date/Time' is set to 'Jun/22/2023 - 12:00:00', and 'Days', 'Hours', and 'Minutes' are set to 1, 0, and 0 respectively. A 'Populate Events' button is on the right. The 'Deployment Event Parameters' section has an 'Edit Event' dropdown set to 'All Events' and another 'Populate Events' button. At the bottom, the 'Water Flush' section shows 'Volume (mL)' as 100, 'Flow Rate (mL/Min)' as 200, and 'Min. Flow Rate (mL/Min)' as 50.

3. Click the **Start/Interval** tab.
4. Click the calendar next to the **Start/Interval** field to select a start time for the deployment.
5. Click **Populate Events** to apply the schedule to the deployment events.

McLanePro Port COM3 Refresh Connected Disconnect

Deployment Event Parameters

Edit Event All Events Populate Events

Water Flush

| | | | | | |
|-------------|-----|--------------------|-----|-------------------------|----|
| Volume (mL) | 100 | Flow Rate (mL/Min) | 125 | Min. Flow Rate (mL/Min) | 20 |
|-------------|-----|--------------------|-----|-------------------------|----|

Sample

| | | | | | | | | | | |
|-------------|------|--------------------|-----|-------------------------|----|------------|---|---|---|---|
| Volume (mL) | 1000 | Flow Rate (mL/Min) | 100 | Min. Flow Rate (mL/Min) | 20 | Time Limit | H | 0 | M | 0 |
|-------------|------|--------------------|-----|-------------------------|----|------------|---|---|---|---|

Fixative Flush

| | | | | | |
|-------------|----|--------------------|----|-------------------------|----|
| Volume (mL) | 75 | Flow Rate (mL/Min) | 75 | Min. Flow Rate (mL/Min) | 20 |
|-------------|----|--------------------|----|-------------------------|----|

Antifouling Flush

☐ Pre-Sample ☒ Post-Sample

| | | | | | |
|-------------|----|--------------------|----|-------------------------|----|
| Volume (mL) | 20 | Flow Rate (mL/Min) | 75 | Min. Flow Rate (mL/Min) | 20 |
|-------------|----|--------------------|----|-------------------------|----|

| <input checked="" type="checkbox"/> | Event | Start Date / Time | Flush Volume | Sample Volume | Sample Flow Rate | Sample Min. Flow Rate | Sample Time Limit (HH:MM) | Fixative Flush Volume | Fixative Flush Flow | Antifouling Volume |
|-------------------------------------|-------|---------------------|--------------|---------------|------------------|-----------------------|---------------------------|-----------------------|---------------------|--------------------|
| <input checked="" type="checkbox"/> | 1 | 03/06/2023 08:05:00 | 100 | 1000 | 100 | 20 | 00:00 | 75 | 75 | 20 |
| <input checked="" type="checkbox"/> | 2 | 03/06/2023 08:10:00 | 100 | 1000 | 100 | 20 | 00:00 | 75 | 75 | 20 |
| <input checked="" type="checkbox"/> | 3 | 03/06/2023 08:15:00 | 100 | 1000 | 100 | 20 | 00:00 | 75 | 75 | 20 |

6. Fill in the Deployment Event Parameters:

▪ *Water Flush*

- **Water flush volume** - set the target volume of water that will be pumped at the home port prior to collecting a sample.
- **Water flush flow rate** - define the target flow rate for the water flush procedure.
- **Water flush minimum flow rate** - define the minimum acceptable flow rate for the water flush procedure. This setting defines when the event will terminate due to a decreasing flow rate.

▪ *Sample*

- **Sample volume** - set the target volume of water that will be processed for a deployment event. Actual volume will depend on filter type, filter porosity and loading characteristics.
- **Sample flow rate** - define the target flow rate for sample collection. Flow rate may

be automatically adjusted lower if limited by filter loading or battery voltage at any time during the deployment.

- **Sample minimum flow rate** - define the minimum acceptable flow rate. The PPS will adjust the flow rate to preserve material on the filter and to prevent damage to the filter or the system. This setting defines when the event will terminate due to a decreasing flow rate.
- **Sample event time limit** - define a maximum sample collection time. If the desired volume has not been reached within this time limit, sample collection will terminate. Setting this value to zero disables the timeout function.
 - *Fixative (if equipped)*
 - **Fixative flush volume** - set the target volume of fixative that will be applied to the filter after collecting a sample.
 - **Fixative flush flow rate** - define the target flow rate for the fixative procedure.
 - **Fixative flush minimum flow rate** - define the minimum acceptable flow rate for the fixative procedure.
 - *Antifouling (if equipped)*
 - **Antifouling flush type** (pre-sample or post-sample) - defines whether the antifouling procedure will be run before or after collecting a sample.
 - **Antifouling flush volume** - define the target volume of antifouling fluid to be pumped during the antifouling procedure.
 - **Antifouling flush flow rate** - define the target flow rate for the antifouling procedure.
 - **Antifouling flush minimum flow rate** - define the minimum acceptable flow rate for the antifouling procedure.
 - **Antifouling flush soak time** - if the antifouling procedure is programmed to run before sample collection, this value defines the time that the antifouling fluid will remain in the PPS plumbing prior to collecting a sample. Be aware that this time will delay the start of sample collection with regard to the event start time. If antifouling is set to run after sample collection, antifoulant will remain in the intake line until the next scheduled event.

7. Once settings have been made for the Deployment Event Parameters, click **Populate Events**

to apply these settings to one or more events in the schedule.

8. Check the list of events to be sure that the schedule and event parameters are set correctly. Individual or groups of events may be further modified if necessary.

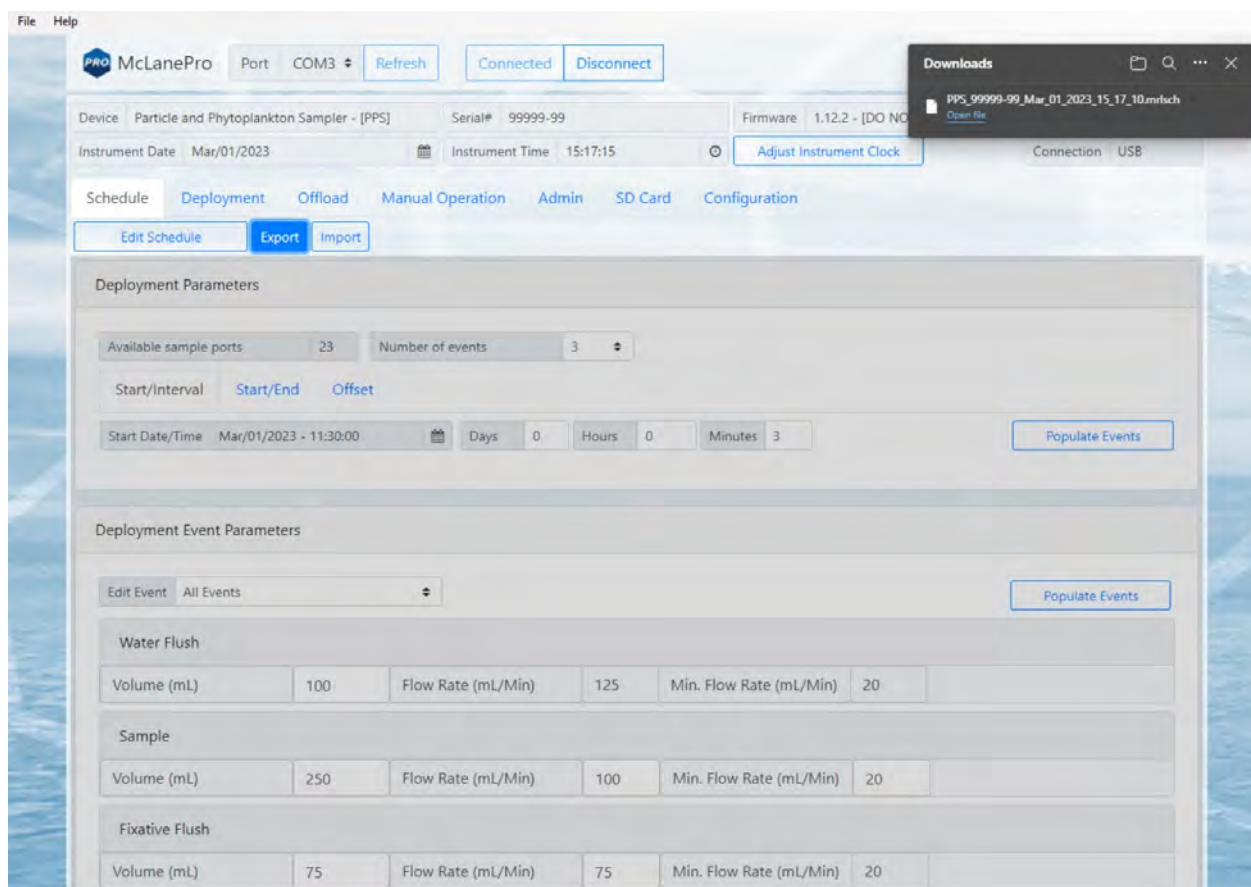
| <input checked="" type="checkbox"/> | Event | Start Date / Time | Flush Volume | Sample Volume | Sample Flow Rate | Sample Min. Flow Rate | Sample Time Limit (HH:MM) | Fixative Flush Volume | Fixative Flush Flow | Antifouling Volume |
|-------------------------------------|-------|---------------------|--------------|---------------|------------------|-----------------------|---------------------------|-----------------------|---------------------|---------------------------------|
| <input checked="" type="checkbox"/> | 1 | 03/06/2023 08:05:00 | 100 | 1000 | 100 | 20 | 00:00 | 75 | 75 | <input type="text" value="20"/> |
| <input checked="" type="checkbox"/> | 2 | 03/06/2023 08:10:00 | 100 | 1000 | 100 | 20 | 00:00 | 75 | 75 | <input type="text" value="20"/> |
| <input checked="" type="checkbox"/> | 3 | 03/06/2023 08:15:00 | 100 | 1000 | 100 | 20 | 00:00 | 75 | 75 | <input type="text" value="20"/> |

9. Click **Save changes**. The new settings are immediately applied to the PPS.

Exporting a Schedule

Schedules with start conditions may be saved locally by using the **Export** button. Exporting a schedule allows easy programming of multiple instruments, modification for later deployments or simply to keep as a record (highly recommended).

1. Create a new schedule, countdown, and/or change the start condition, using **Edit Schedule**.
2. Set the deployment parameters.
3. Click **Save changes** to load that schedule onto the PPS.
4. Click **Export** to save the current schedule. The schedule is saved as a *.mrlsch file to a local directory on the host computer.



The current schedule will be automatically downloaded when deploying the PPS. This file is useful for reviewing the deployment parameters and schedule after disconnecting from the PPS.

Importing a Schedule

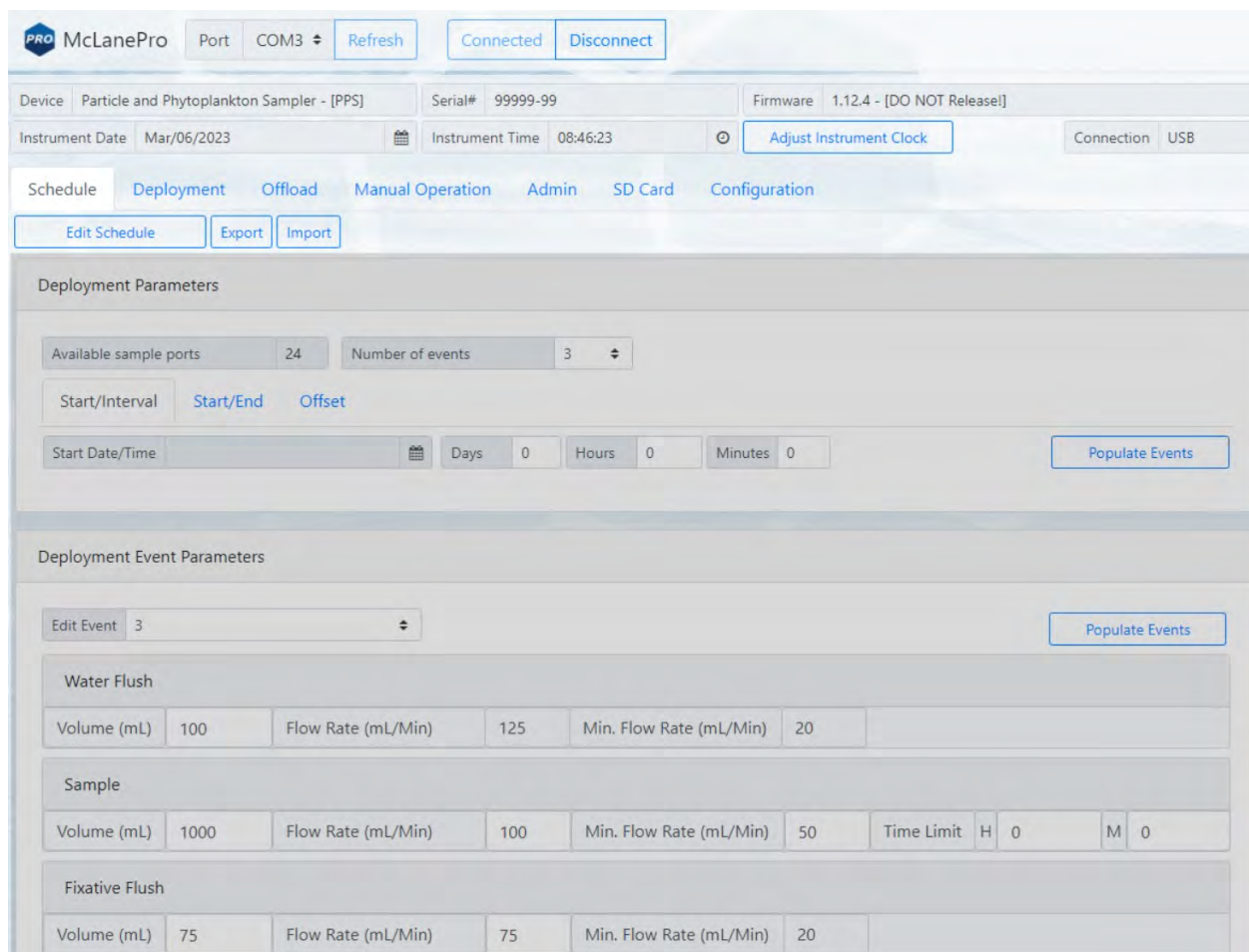
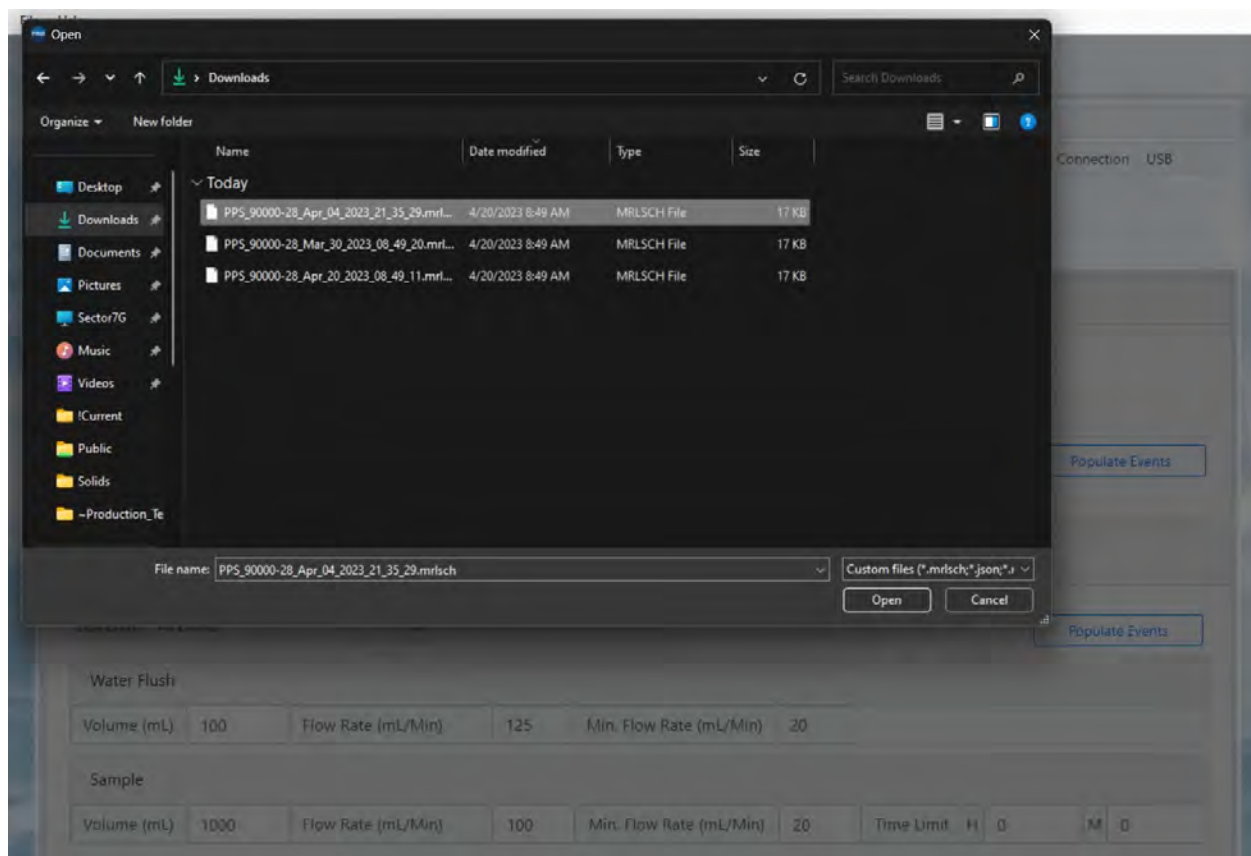
Schedules may be imported for deployment of multiple instruments or for modification and reuse.

1. Click **Import** to import a saved schedule.
2. A window will open in order to select the schedule to be imported.
3. Select a schedule file and click **Open**.

The PPS will check the schedule to confirm it is compatible with the installed hardware, model number and/or configuration. If it is compatible, the scheduler will load and display new values.



Importing a schedule immediately loads that schedule into memory on the PPS. This is the schedule that will be used when deploying the instrument. Always double check event times before proceeding to deployment preparation.



Schedule Errors

Schedules with errors (events in the past) will generate a warning when saving to the PPS.

McLanePro Port COM3 Refresh Connected Disconnect

Device Particle and Phytoplankton Sampler - [PPS] Serial# 99999-99 Firmware 1.12.2 - [DO NOT Release!]

Instrument Date Mar/01/2023 Instrument Time 15:28:25 Adjust Instrument Clock Connection USB

Schedule Deployment Offload Manual Operation Admin SD Card Configuration

Cancel Save changes

Deployment Parameters

Available sample ports 23 Number of events 3

Start/Interval Start/End Offset

Start Date/Time Jan/02/2023 - 06:00:00 Days 0 Hours 0 Minutes 3 Populate Events

The user can choose to ignore the warning and continue the schedule even if an event is in the past. These events will be run immediately when the deployment begins.

McLanePro Port COM3 Refresh Connected Disconnect

Device Particle and Phytoplankton Sampler - [PPS] Serial# 99999-99 Firmware 1.12.2 - [DO NOT Release!]

Instrument Date Mar/01/2023 Instrument Time 15:29:26 Adjust Instrument Clock Connection USB

Schedule Deployment Offload Manual Operation Admin SD Card Configuration

Cancel Save changes

Deployment Parameters

Available sample ports 23 Number of events 3

Start/Interval Start/End Offset

Start Date/Time Jan/02/2023 - 06:00:00 Days 0 Hours 0 Minutes 3 Populate Events

Deployment Event Parameters

Edit Event All Events

Water Flush

Volume (mL) 100 Flow Rate (mL/Min) 125 Min. Flow Rate (mL/Min) 20

Sample

Volume (mL) 250 Flow Rate (mL/Min) 100 Min. Flow Rate (mL/Min) 20

Event time warning

The current schedule contains events in the past.
These events will run immediately when the deployment begins.

☐ Don't show this message again. Cancel Continue

The Deployment Tab

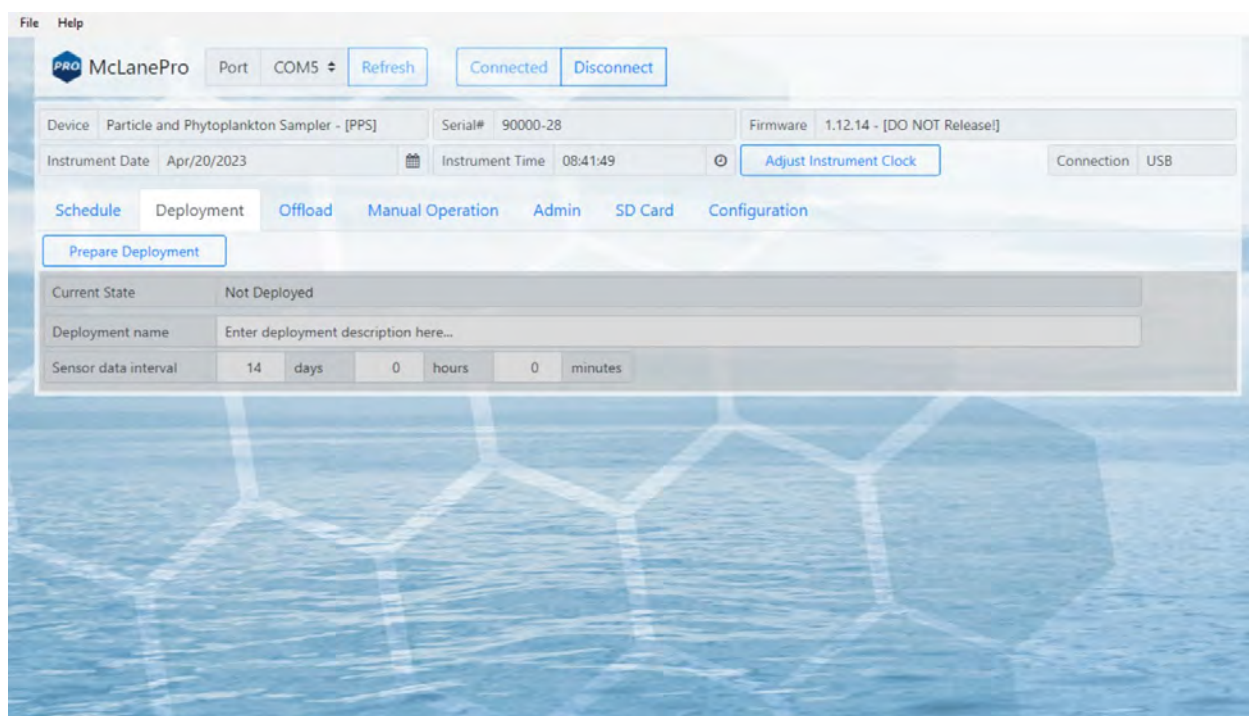
The **Deployment** tab is used to:

- Prepare for a deployment.
- Start a deployment.

- Monitor a deployment (if connected via USB).

Related topic

[Starting a Deployment](#)



Starting a Deployment

Follow these steps to start a deployment using the currently loaded schedule.

Before scheduling and deploying the PPS, make sure the instrument time is set!

Also, be sure to update the available [fixative](#) and/or [antifoulant](#) volumes, if the PPS is equipped with either of these options. Use the controls provided on the [Manual Operation tab](#) to set these volumes.

Until the sampler is deployed, the **Deployment tab** contains only the **Prepare Deployment** option.

1. On the **Deployment** tab, click **Prepare Deployment**.

Prepare Deployment will run checks to make sure the PPS is ready for the deployment. If a problem is detected, errors will be reported. The deployment will need to be canceled in order to fix the problems and attempt to deploy the PPS again. Warnings may also be generated at the time of deployment preparation, but do not prevent deployment.

McLanePro Port COM3 Refresh Connected Disconnect

Device Particle and Phytoplankton Sampler - [PPS] Serial# 99999-99 Firmware 1.12.2 - [DO NOT Release!]

Instrument Date Mar/01/2023 Instrument Time 15:52:35 Adjust Instrument Clock Connection USB

Schedule Deployment Offload Manual Operation Admin SD Card Configuration

Prepare Deployment

Current State Not Deployed

Deployment name MP 1.5.8 / PPS 1.12.2 IBE

Sensor data interval 0 days 4 hours 0 minutes

After passing checks, the PPS allows setting of the deployment name and the sensor data interval before deploying.

2. Enter a deployment name or description.
3. Enter a Sensor data interval. This sets the frequency at which the internal sensors will be recorded. These data may include voltage and temperature readings during the deployment.

McLanePro Port COM3 Refresh Connected Disconnect

Device Particle and Phytoplankton Sampler - [PPS] Serial# 99999-99 Firmware 1.12.2 - [DO NOT Release!]

Instrument Date Mar/01/2023 Instrument Time 15:55:22 Adjust Instrument Clock Connection USB

Schedule Deployment Offload Manual Operation Admin SD Card Configuration

Deploy Cancel

Current State Deployment Prep

Deployment name MP 1.5.8 / PPS 1.12.2 IBE

Sensor data interval 0 days 4 hours 0 minutes

Info Storing deployment parameters to EEPROM Mar/01/2023 15:54:12

Info Deployment preparation completed successfully. Mar/01/2023 15:54:13

After setting the deployment name and sensor data interval, the PPS may be deployed.

McLanePro Port COM3 Refresh Connected Disconnect

Device Particle and Phytoplankton Sampler - [PPS] Serial# 99999-99 Firmware 1.12.2 - [DO NOT Release!]

Instrument Date Mar/01/2023 Instrument Time 15:55:22 Adjust Instrument Clock Connection USB

Schedule Deployment Offload Manual Operation Admin SD Card Configuration

Deploy Cancel

Current State Deployment Prep

Deployment name MP 1.5.8 / PPS 1.12.2 IBE

Sensor data interval 0 days 4 hours 0 minutes

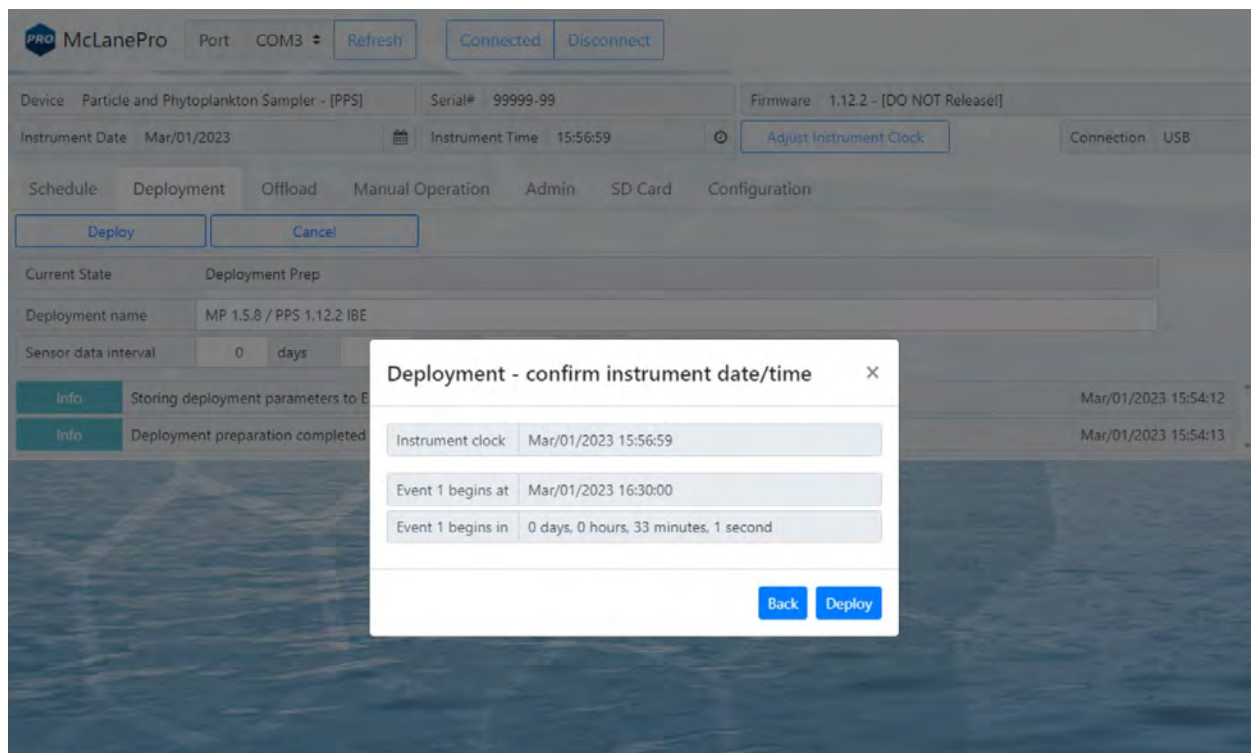
Info Storing deployment parameters to EEPROM Mar/01/2023 15:54:12

Info Deployment preparation completed successfully. Mar/01/2023 15:54:13

4. Click the **Deploy** button.

After clicking the **Deploy** button, McLanePro displays the scheduled time for the first event, the current time according to the instrument clock, and a countdown timer indicating the amount of time before the first event will start.

The PPS offers a final check of the current time and conditions for starting the deployment.

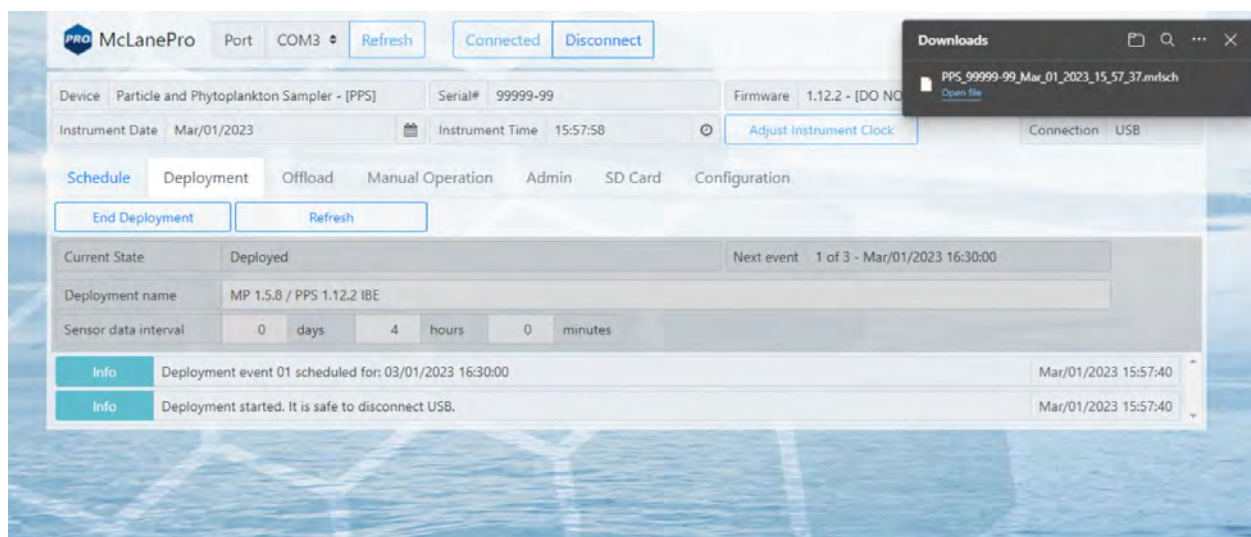


5. Verify the current time is correct and verify the event start time or delay. Click **Deploy** to continue.

*After clicking the **Deploy** button;*

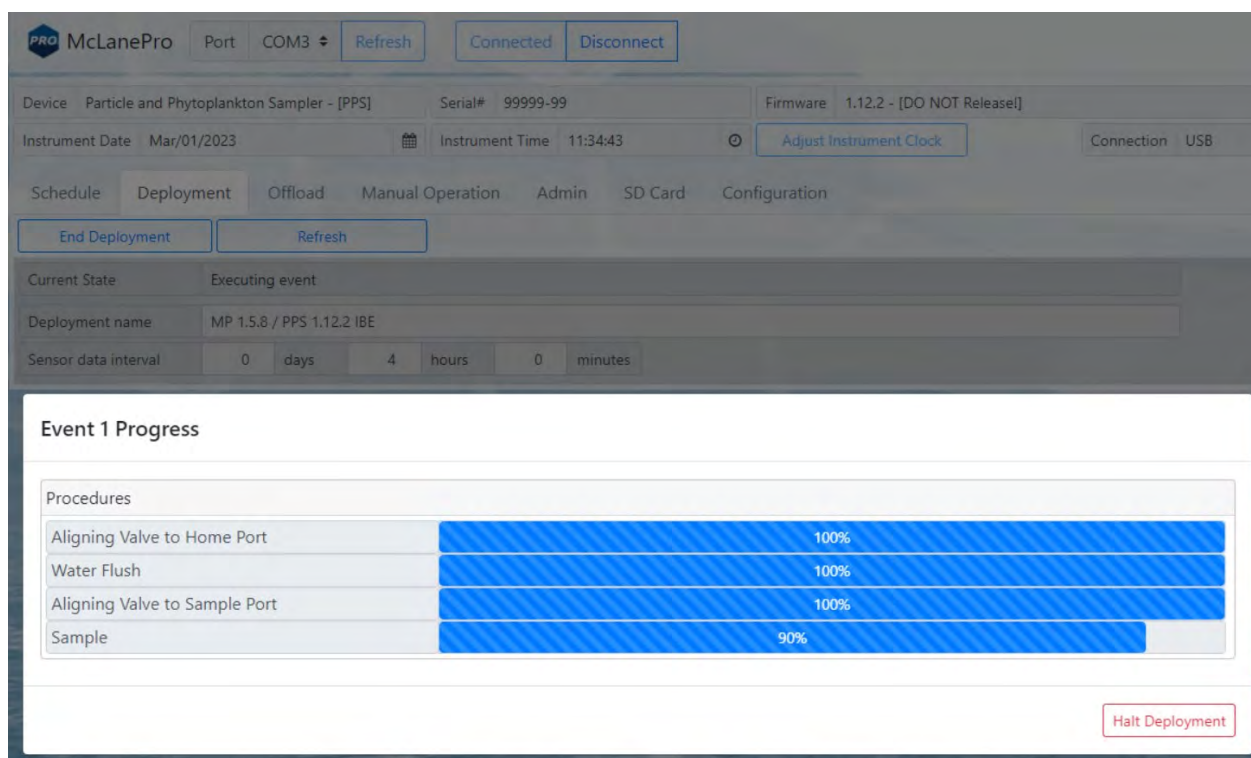
The PPS displays the scheduled time for the first event, and a message that confirms it is safe to disconnect the USB connection.

McLanePro will also automatically download a schedule file to the host computer for reference or archival purposes.



6. Remove the communication cable from the end cap and install the communications port dummy plug.

For testing or monitoring deployments, if USB is connected while running a test deployment, an event progress pop-up window reports the progress of the event that is being executed, and the deployment log will be updated as events are executed or completed.

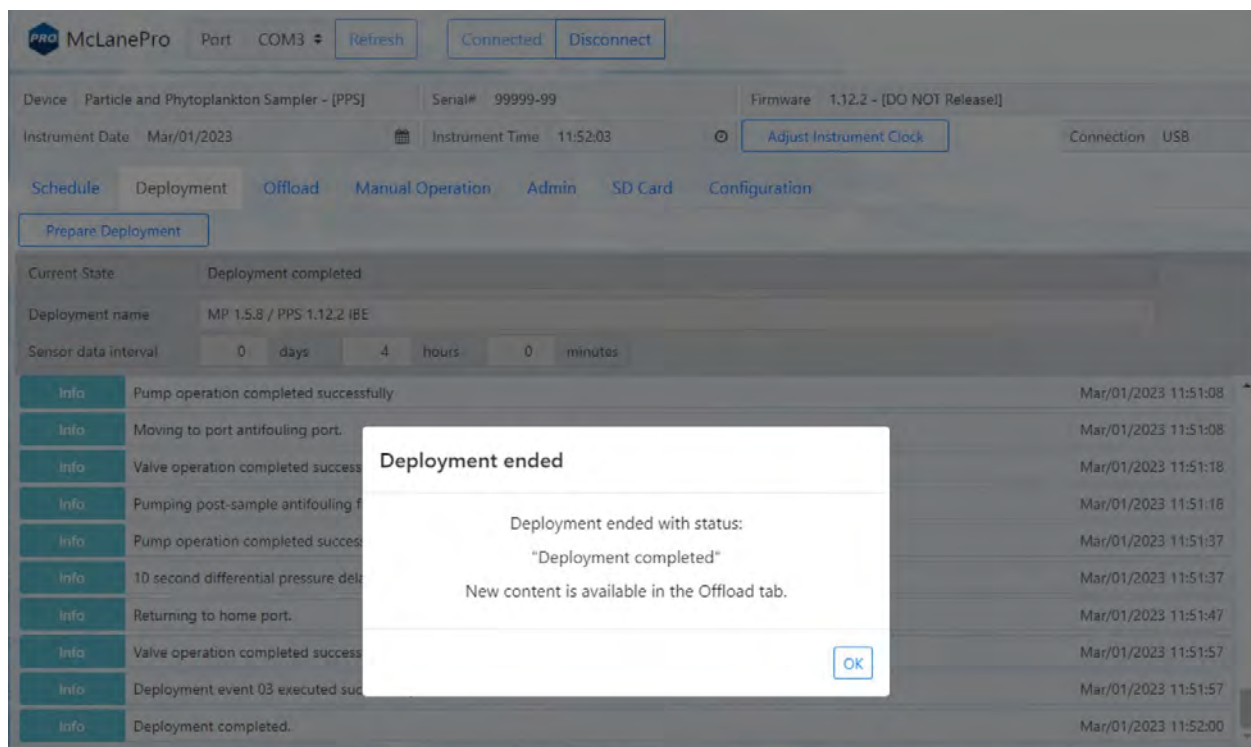


The Offload Tab

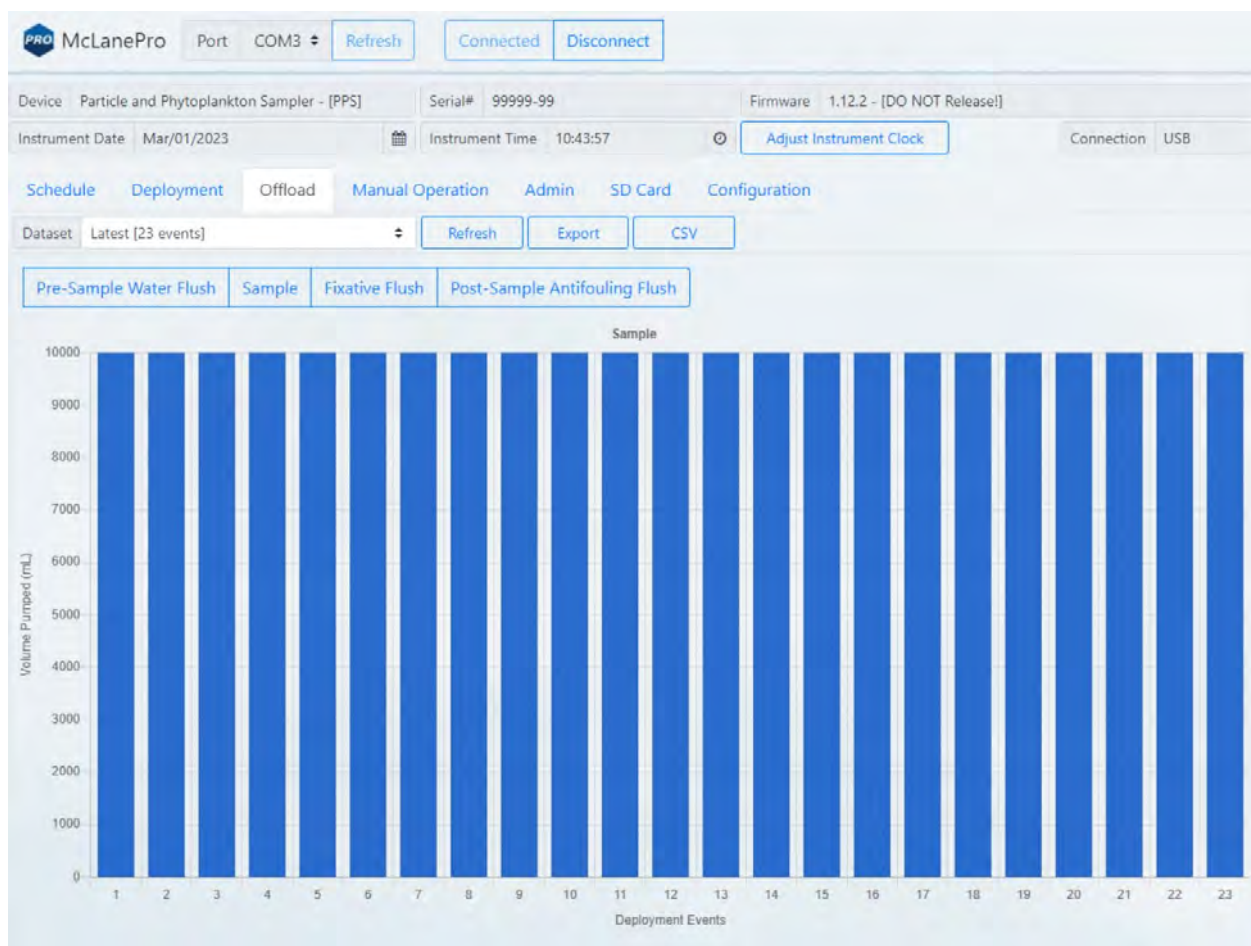
The **Offload** tab is used to view and export data collected during a deployment.

When connecting to a PPS that has recently completed a deployment, McLanePro loads the

Offload tab in order to review collected data.




The **Offload tab** displays a bar chart for all pumping events. This may include pre-sample water flushes, sample events, fixative flushes and pre- or post-sample antifouling flushes. Each bar will display the requested volume and the actual pumped volume. Use the mouse to hover over an event bar to see these data.



Event Data

Individual event data are displayed below the bar chart. Each event data panel will display sensor readings taken at the start and end of the event, as well as a listing of procedures performed, and the exit conditions (result) for these procedures.

| <div>  McLanePro </div> <div> Port COM3 Refresh </div> <div> Connected Disconnect </div> | | | |
|---|-----------------------|---------------------|-----------------------------|
| Event 1 | | | |
| Scheduled Start Time | 02/23/2023 14:15:00 | | |
| Start Time | 02/23/2023 14:15:00 | End Time | 02/23/2023 19:52:25 |
| Start Temperature (C) | 24.2 | End Temperature (C) | 30.3 |
| Start Battery (Vdc) | 36.1 | End Battery (Vdc) | 36.1 |
| Procedures | | | |
| Procedure | Volume Requested (mL) | Volume Pumped (mL) | Result |
| Water Flush | 100.0 | 100.0 | Volume reached |
| Sample | 10000.0 | 10000.0 | Volume reached |
| Fixative Flush | 75.0 | 75.0 | Volume reached |
| Post-Sample Antifouling Flush | 20.0 | 20.0 | Volume reached |
| Event 1 Details | | | |
| Event 1 Sensor Data | | | |
| Event 2 | | | |
| Scheduled Start Time | 02/23/2023 20:15:00 | | |
| Start Time | 02/23/2023 20:15:00 | End Time | 02/24/2023 01:52:34 |
| Start Temperature (C) | 22.6 | End Temperature (C) | 29.6 |
| Start Battery (Vdc) | 36.1 | End Battery (Vdc) | 36.1 |
| Procedures | | | |
| Procedure | Volume Requested (mL) | Volume Pumped (mL) | Result |
| Water Flush | 100.0 | 100.0 | Volume reached |
| Sample | 10000.0 | 10000.0 | Volume reached |
| Fixative Flush | 75.0 | 75.0 | Volume reached |
| Post-Sample Antifouling Flush | 20.0 | 20.0 | Volume reached |

Clicking on the **Event (#) Details** button will launch a new window where more detailed information on each procedure is available for viewing.

Event 1 Details

Event 1 Summary

| | | | | | |
|-----------------------|---------------------|-------------------|------|---------------------|---------------------|
| Scheduled Start Time | 02/23/2023 14:15:00 | | | End Time | 02/23/2023 19:52:25 |
| Start Time | 02/23/2023 14:15:00 | | | End Temperature (C) | 30.3 |
| Start Temperature (C) | 24.2 | End Battery (Vdc) | 36.1 | | |
| Start Battery (Vdc) | 36.1 | | | | |

Water Flush

Result

Volume reached

| | | | | |
|-----------------------|------------------------------|--------------------------------------|----------------------|----------------------|
| Requested Volume (mL) | Requested Flow Rate (mL/min) | Requested Minimum Flow Rate (mL/min) | Requested Time Limit | Elapsed Time (H:M:S) |
| 100.0 | 125.0 | 20.0 | 360 | 00:00:51 |
| Volume Pumped (mL) | Lowest Voltage (Vdc) | Highest Current (mA) | Start Time | End Time |
| 100.0 | 36.0 | 167.8 | 02/23/2023 14:15:01 | 02/23/2023 14:15:52 |

Pumping Data

Sample

Result

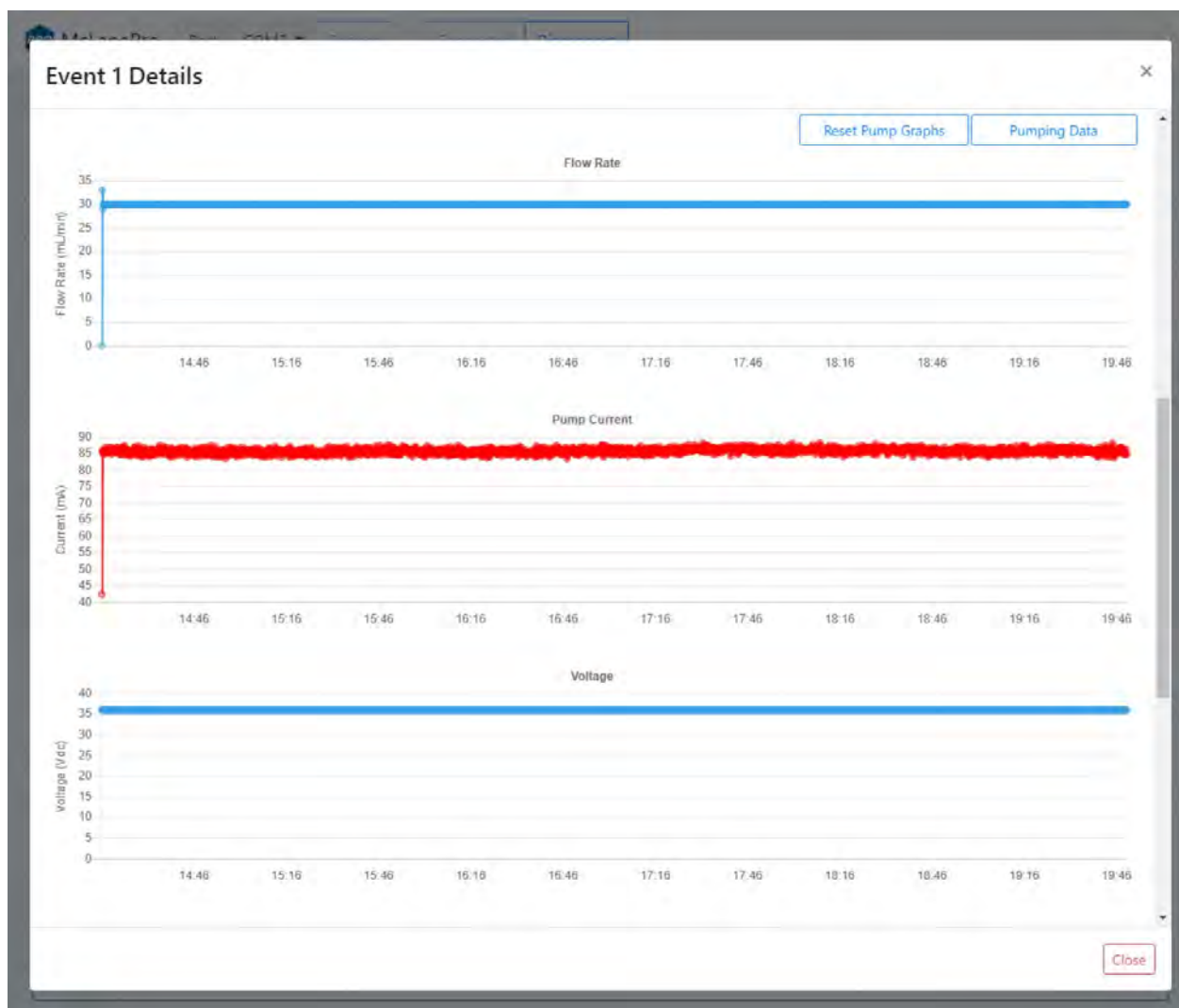
Volume reached

| | | | | |
|-----------------------|------------------------------|--------------------------------------|----------------------|----------------------|
| Requested Volume (mL) | Requested Flow Rate (mL/min) | Requested Minimum Flow Rate (mL/min) | Requested Time Limit | Elapsed Time (H:M:S) |
| 10000.0 | 30.0 | 20.0 | 30060 | 05:33:19 |
| Volume Pumped (mL) | Lowest Voltage (Vdc) | Highest Current (mA) | Start Time | End Time |
| 10000.0 | 36.0 | 89.5 | 02/23/2023 14:16:02 | 02/23/2023 19:49:21 |

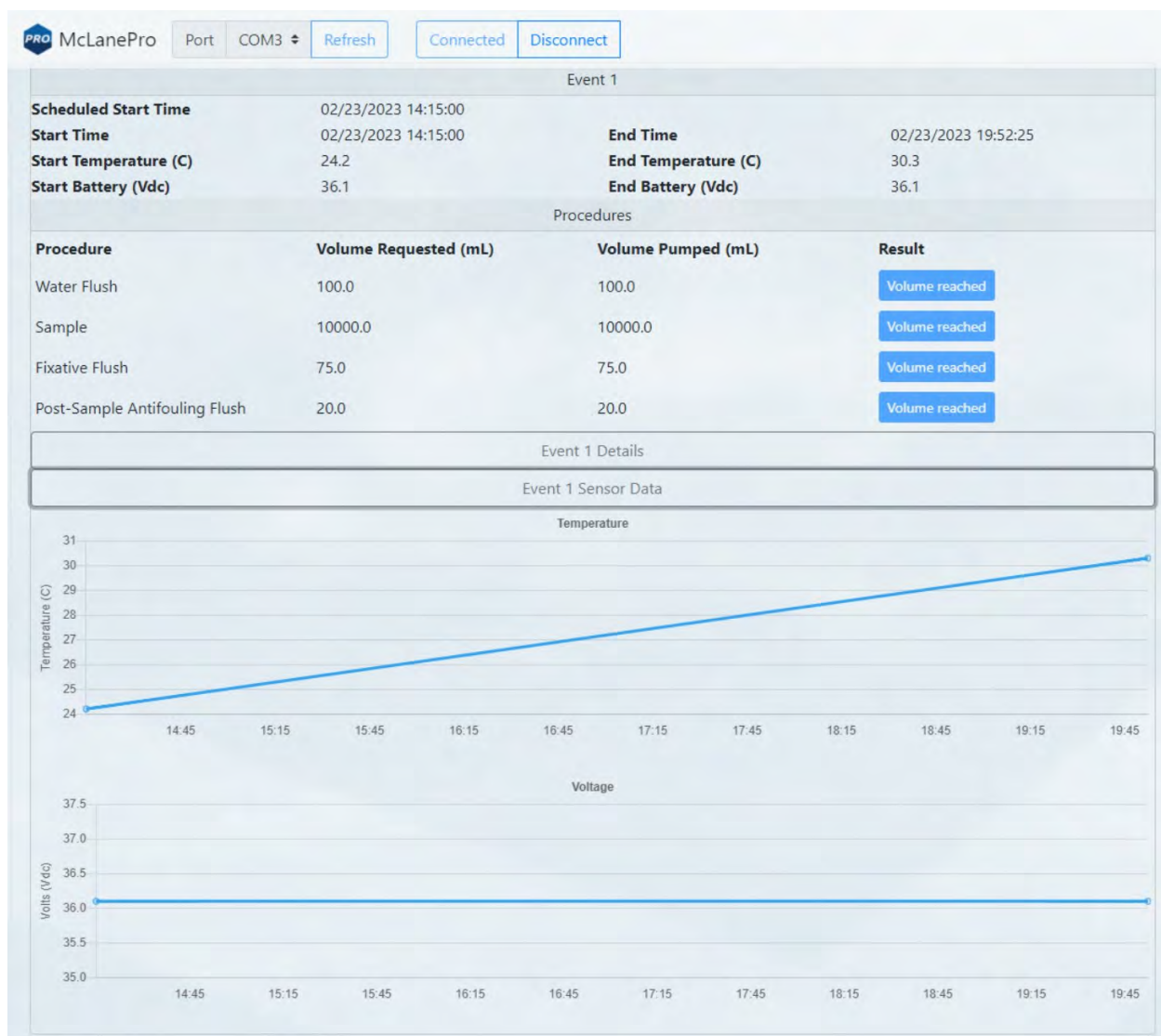
Pumping Data

Close

Clicking the **Pumping Data** button under the Sample heading displays Event 1 pumping data recorded while the PPS was collecting the sample. Clicking and dragging on a section of the pumping data will zoom in for a more detailed display of the data. Clicking **Reset Pump Graphs** returns the plots to the default view.



Additionally, from the **Offload tab**, clicking on **Event (#) Sensor Data** will expand to display charts of sensor data readings taken during the event. These data may include internal temperature and battery voltage.



Deployment Log

The deployment log shows a summary of deployment information. Errors and warnings are clearly marked with an error tag in the log, and the title bar is highlighted red if errors exist, or yellow if warnings exist in the log. A blue title bar indicates the deployment completed without any errors or warnings.

| Description: MP 1.5.8 / PPS 1.12.2 IBE, Log: | | | |
|--|------------|---|----------------------|
| Info | Deployment | Executing event 23 fixative flush. | Mar/01/2023 07:49:35 |
| Info | Deployment | Pumping fixative flush. | Mar/01/2023 07:49:35 |
| Info | Deployment | Pump operation completed successfully | Mar/01/2023 07:50:38 |
| Info | Deployment | Executing event 23 post-sample acid flush. | Mar/01/2023 07:50:38 |
| Info | Deployment | Moving to port 0 for mandatory water flush. | Mar/01/2023 07:50:38 |
| Info | Deployment | Valve operation completed successfully | Mar/01/2023 07:50:54 |
| Info | Deployment | Pumping mandatory water flush. | Mar/01/2023 07:50:54 |
| Info | Deployment | Pump operation completed successfully | Mar/01/2023 07:51:52 |
| Info | Deployment | Moving to port antifouling port. | Mar/01/2023 07:51:52 |
| Info | Deployment | Valve operation completed successfully | Mar/01/2023 07:52:02 |
| Info | Deployment | Pumping post-sample antifouling flush. | Mar/01/2023 07:52:02 |
| Info | Deployment | Pump operation completed successfully | Mar/01/2023 07:52:21 |
| Info | Deployment | 10 second differential pressure delay. | Mar/01/2023 07:52:21 |
| Info | Deployment | Returning to home port. | Mar/01/2023 07:52:31 |
| Info | Deployment | Valve operation completed successfully | Mar/01/2023 07:52:41 |
| Info | Deployment | Deployment event 23 executed successfully. | Mar/01/2023 07:52:42 |
| Info | Deployment | Deployment completed. | Mar/01/2023 07:52:44 |

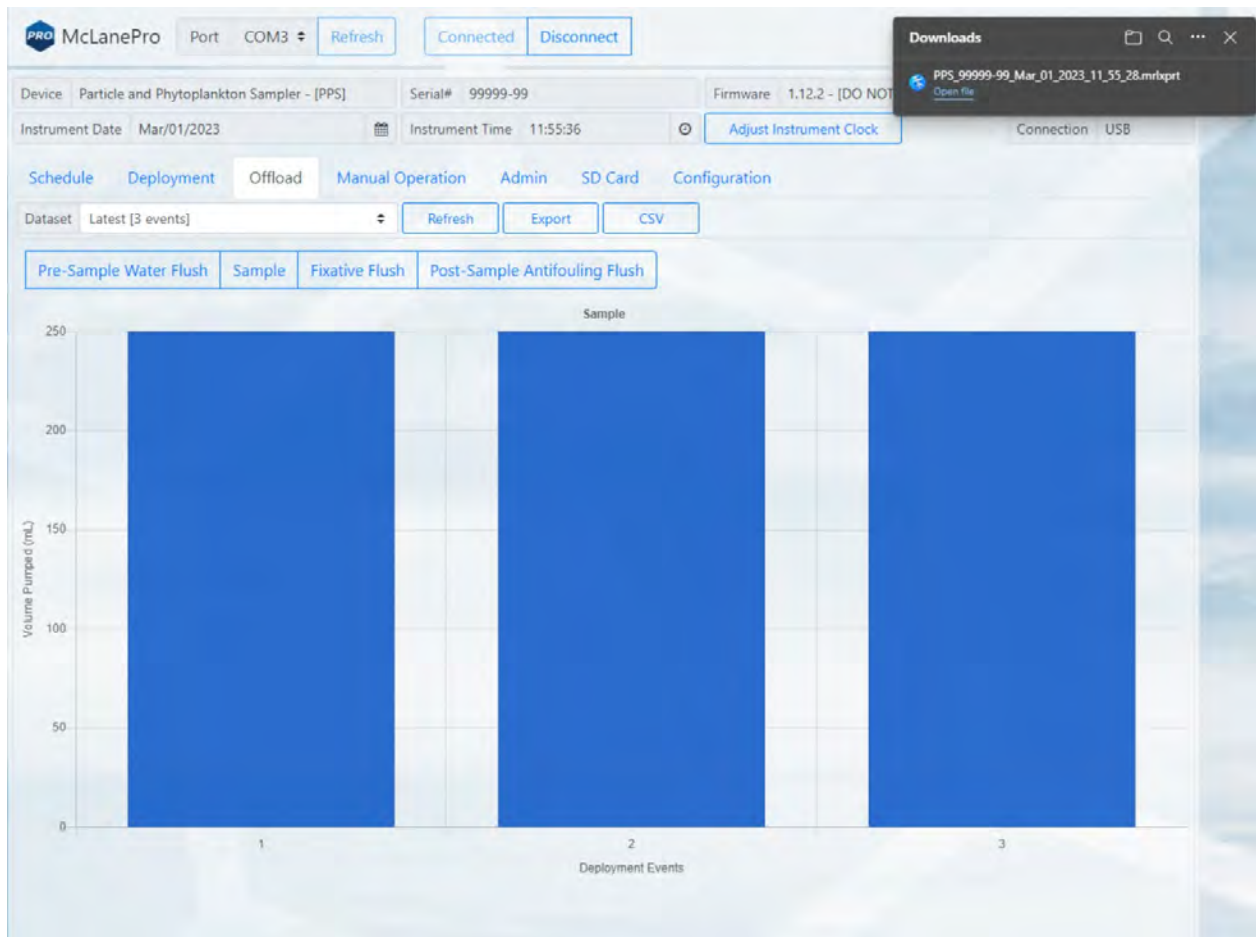
| Description: My deployment, Log [contains errors]: | | | |
|--|------------|---|----------------------|
| Info | Deployment | Deployment started. It is safe to disconnect USB. | Sep/07/2022 13:03:07 |
| Info | Deployment | Starting event 01. | Sep/07/2022 13:03:07 |
| Error | Deployment | Event 01 ended with errors. | Sep/07/2022 13:03:17 |
| Error | Deployment | Deployment halted with errors | Sep/07/2022 13:03:18 |

| Description: My deployment, Log [contains warning]: | | | |
|---|------------|--|----------------------|
| Warning | Prep | SYSTEM IS BEING DEPLOYED WITH A SIMULATED PUMP! | Sep/07/2022 12:06:01 |
| Warning | Prep | Deployment start time is in the past. Deployment will begin immediately. | Sep/07/2022 12:06:01 |
| Warning | Prep | Deployment preparation completed with warnings. | Sep/07/2022 12:06:01 |
| Info | Deployment | Deployment event 01 scheduled for: 09/07/2022 09:10:00 | Sep/07/2022 12:06:08 |

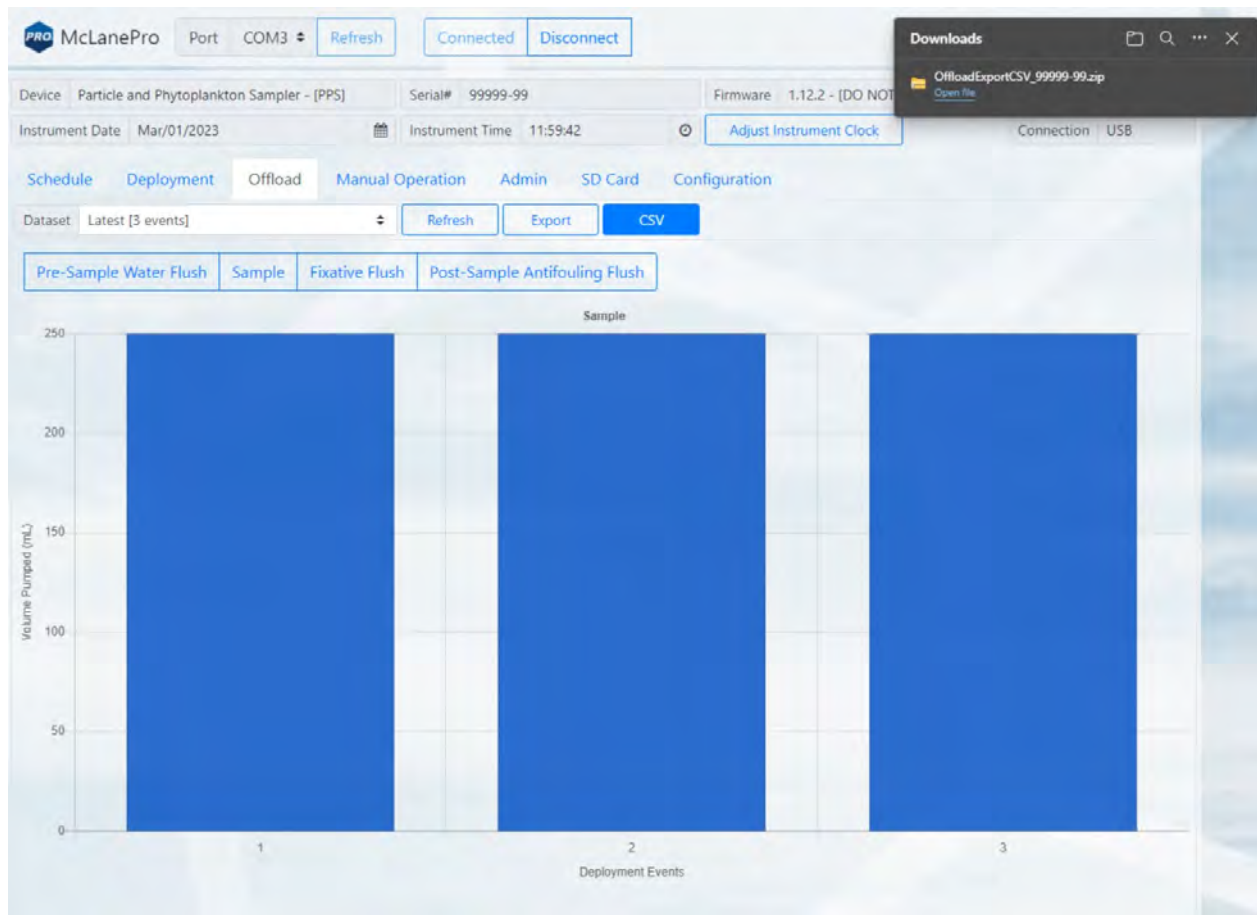
Exporting Deployment Data

Deployment data may be exported using the **Export** button and/or the **CSV** button. It is recommended to offload both file types after a deployment and retain these data in multiple locations.

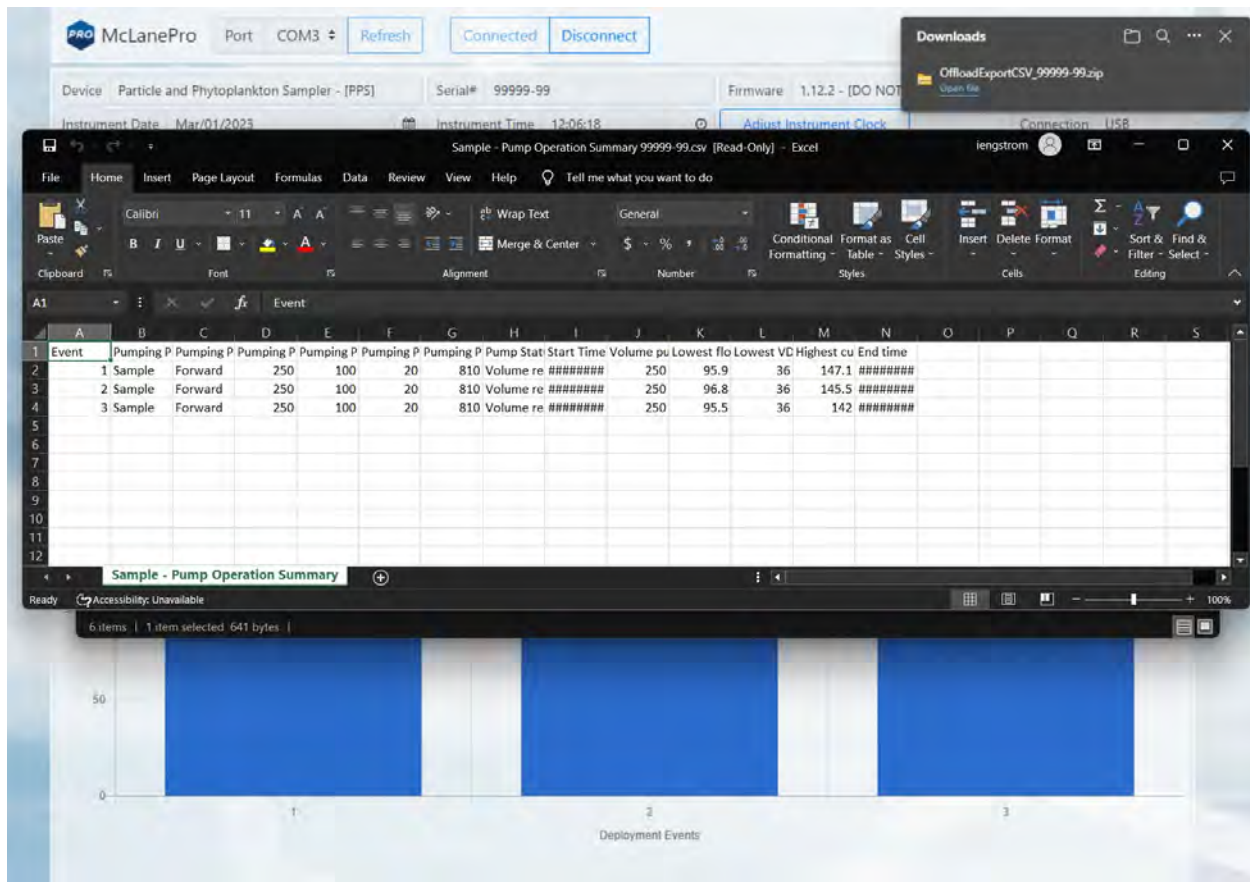
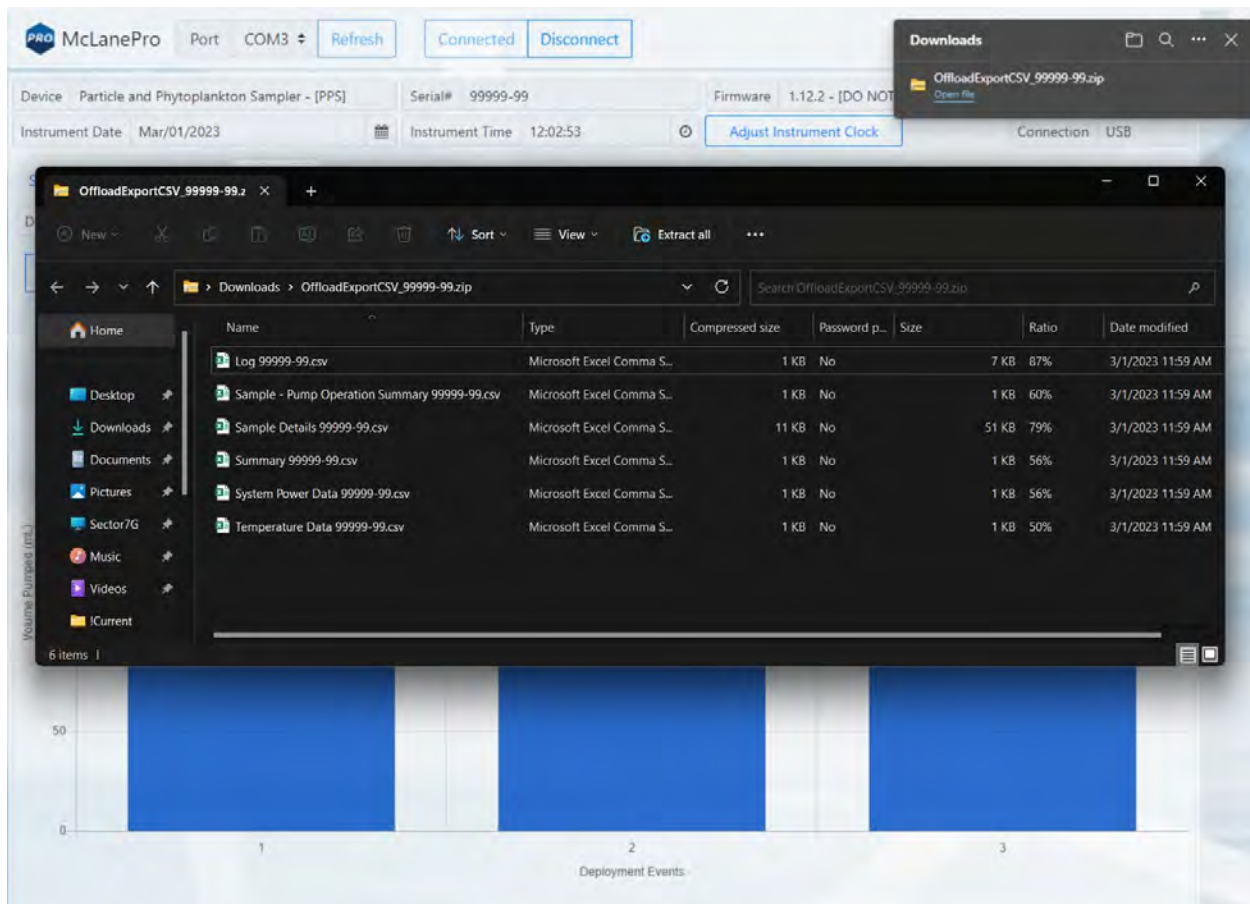
Clicking the **Export** button downloads schedule, configuration and device information in addition to the offload data from the deployment. These data are contained in a *.mrlxprt file that is viewable in McLanePro using [Offline Mode](#).



Deployment data may also be exported in CSV format by clicking the **CSV** button, automatically downloading the compressed files to the host computer.

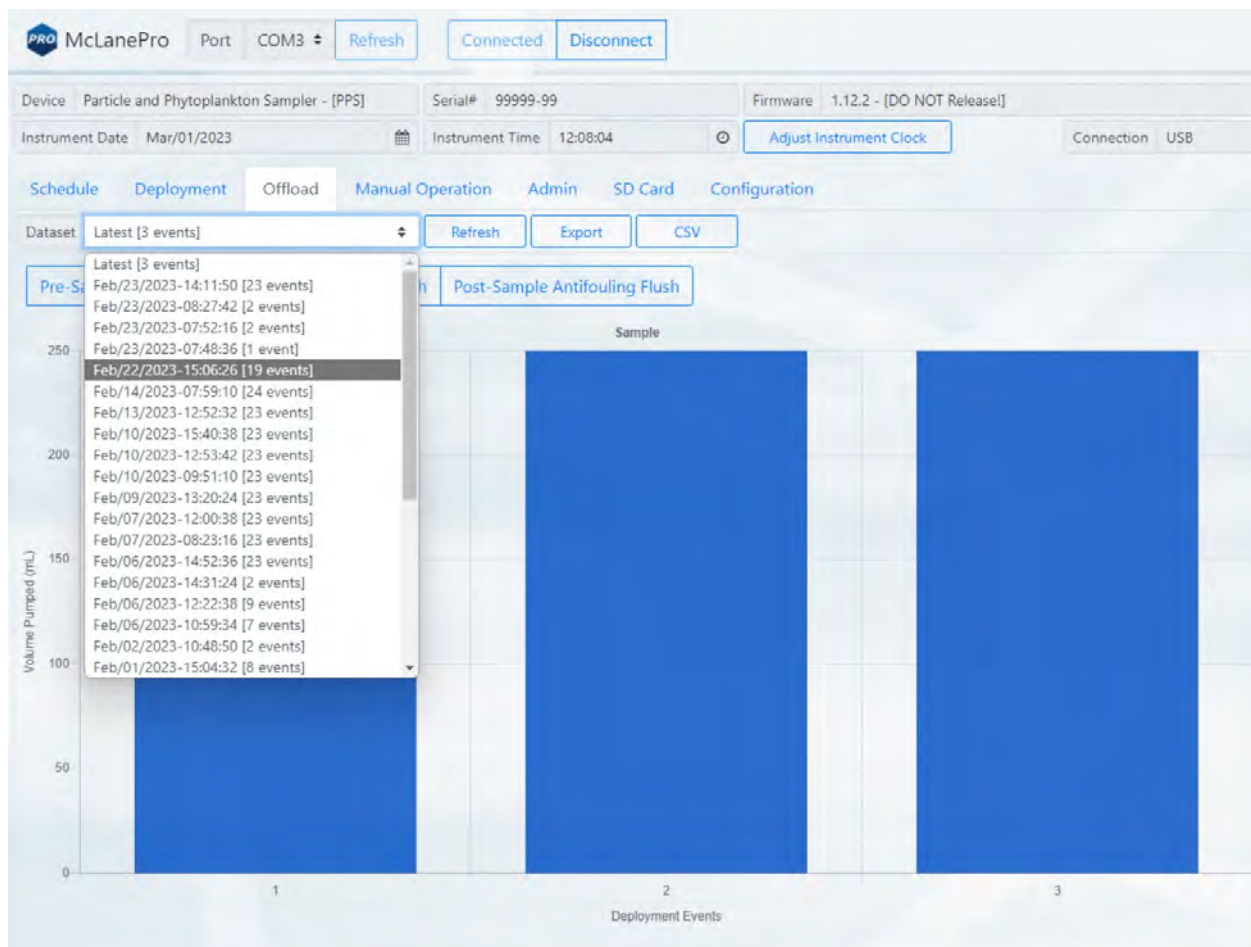


CSV files are compressed into a ZIP file and may be extracted for viewing or evaluation outside of McLanePro.



Viewing and Exporting Data From Previous Deployments

Data from previous deployments may be viewed by selecting a previous data set. To export the data, follow the instructions in [Exporting Deployment Data](#).



The Manual Operation Tab

The **Manual Operation** tab allows operation of the multi-port valve and pump. Additionally, if equipped, fixative and antifoulant volumes may be set on the **Manual Operation** tab.



Preparation for a deployment will require priming of the PPS plumbing with water. This is done using manual controls provided in the **Manual Operation** tab.

The screenshot displays the McLanePro software interface with the following sections:

- Top Bar:** Includes the McLanePro logo, a 'Port' dropdown menu set to 'COM3', a 'Refresh' button, and 'Connected' and 'Disconnect' status buttons.
- Valve Operation:**
 - Status: Stationary, Aligned
 - Direction: (empty field)
 - Progress: (empty field)
 - Current port: 0
 - Move to port: 0 (Home Port)
 - Buttons: Move, Previous Port, Next Port, Find Home
- Fixative Valve Operation:**
 - Available Fixative (mL): 1775
 - Buttons: Set, Activate Fixative Valve
- Antifouling Operation:**
 - Available Antifouling (mL): 440
 - Buttons: Set
- Pump Operation:**
 - Volume (mL): 200
 - Flow Rate (mL/Min): 100
 - Min Flow (mL/Min): 50
 - Time Limit: 0 H 0 M
 - Buttons: Pump Forward, Pump Reverse, Clear Charts
- Feedback:**
 - Elapsed Time, Pumped Amount, Time Spent (empty fields)
 - Pumping Status (empty field)
 - Volume Pumped (mL), Flow Rate (mL/Min), Vdc, Current (mA) (empty fields)
- Graphs:**
 - Flow Rate (mL/Min):** A line graph with the y-axis ranging from 0 to 150 and the x-axis labeled 'Seconds'.
 - Battery Voltage (Vdc) and Average Motor Current (mA):** A dual-axis graph. The left y-axis for Voltage ranges from 0 to 40 VDC, and the right y-axis for Current ranges from 0 to 2000 mA. The x-axis is labeled 'Seconds'.

Multi-port Valve Operation

All fluid flow within the PPS is routed through a multi-port (25-port) valve. The **Manual Operation** tab allows access to Valve Operation.

Valve Operation:

Move (to port) - clicking the move button will direct the valve to align to the chosen port in the drop-down menu.

Previous Port - moves the multi-port valve backward by a single port.

Next Port - moves the multi-port valve forward by a single port.

Find Home - commands the multi-port valve to find the home port, port 0.

The screenshot displays the McLanePro software interface. At the top, there's a header with the McLanePro logo, a Port dropdown set to COM3, a Refresh button, and Connected/Disconnect buttons. Below this is a status bar showing Device (Particle and Phytoplankton Sampler - [PPS]), Serial# (99999-99), Firmware (1.12.2 - [DO NOT Release!]), Instrument Date (Mar/02/2023), Instrument Time (10:54:10), and an Adjust Instrument Clock button. A navigation bar includes tabs for Schedule, Deployment, Offload, Manual Operation (selected), Admin, SD Card, and Configuration.

The **Valve Operation** section is highlighted with a red border. It contains:

- Status: Stationary, Aligned
- Direction: (empty field)
- Progress: 0%
- Current port: 0
- Move to port: 0 (Home Port)
- Buttons: Move, Previous Port, Next Port, Find Home

Below the Valve Operation section are:

- Fixative Valve Operation**: Available Fixative (mL) 1550, Set button, and Activate Fixative Valve button.
- Antifouling Operation**: Available Antifouling (mL) 360, Set button.
- Pump Operation**: Volume (mL) 200, Flow Rate (mL/Min) 100, Min Flow (mL/Min) 50, Time Limit 0 H 0 M. Buttons: Pump Forward, Pump Reverse, Clear Charts.
- Feedback**: Elapsed Time, Pumped Amount, Time Spent.
- Pumping Status**: Volume Pumped (mL), Flow Rate (mL/Min), Vdc, Current (mA).

Pump Operation

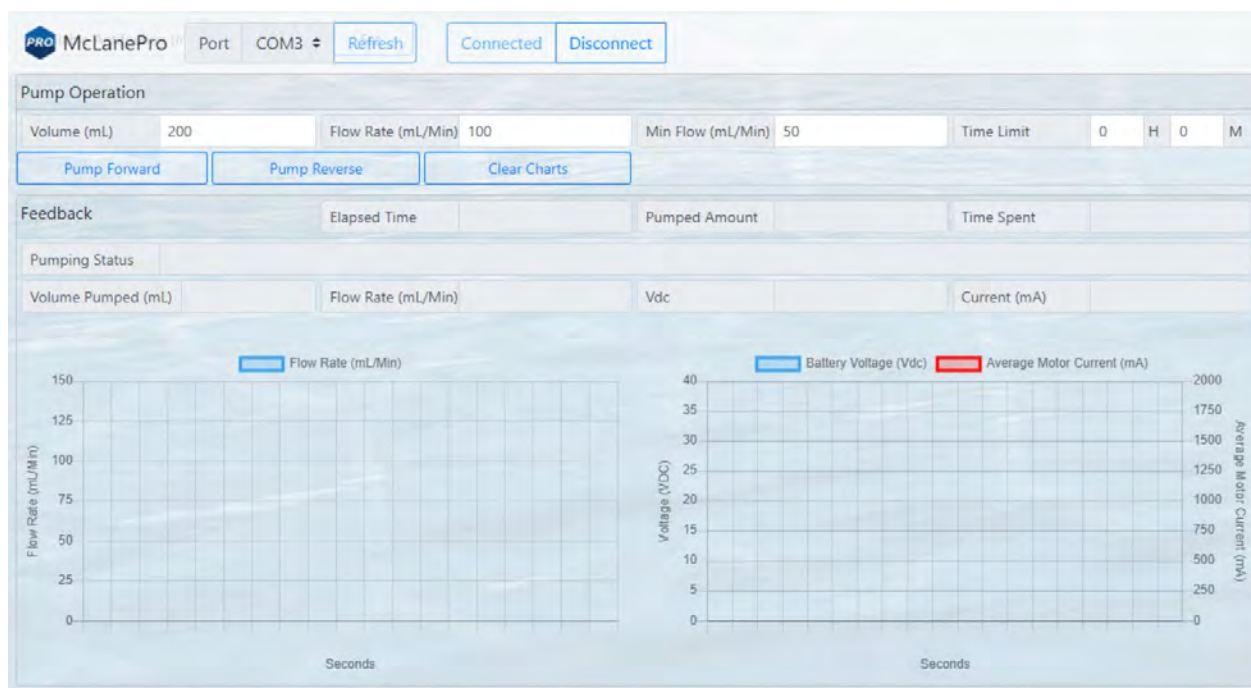
McLanePro provides controls for running the pump and viewing feedback data.

Pump Forward - starts a forward pumping routine according to parameters set in the [Pumping Parameters](#).

Pump Reverse - starts a reverse pumping routine according to parameters set in the [Pumping Parameters](#).

- Feedback values are graphed during pump operations. This includes one chart that displays the flow rate, and a second chart that displays battery voltage and the average system current.

Clear charts - clears the graphs of any existing feedback data.



Pumping Parameters and Feedback

Forward or reverse pumping will utilize values set in the **Pumping Parameters** fields.

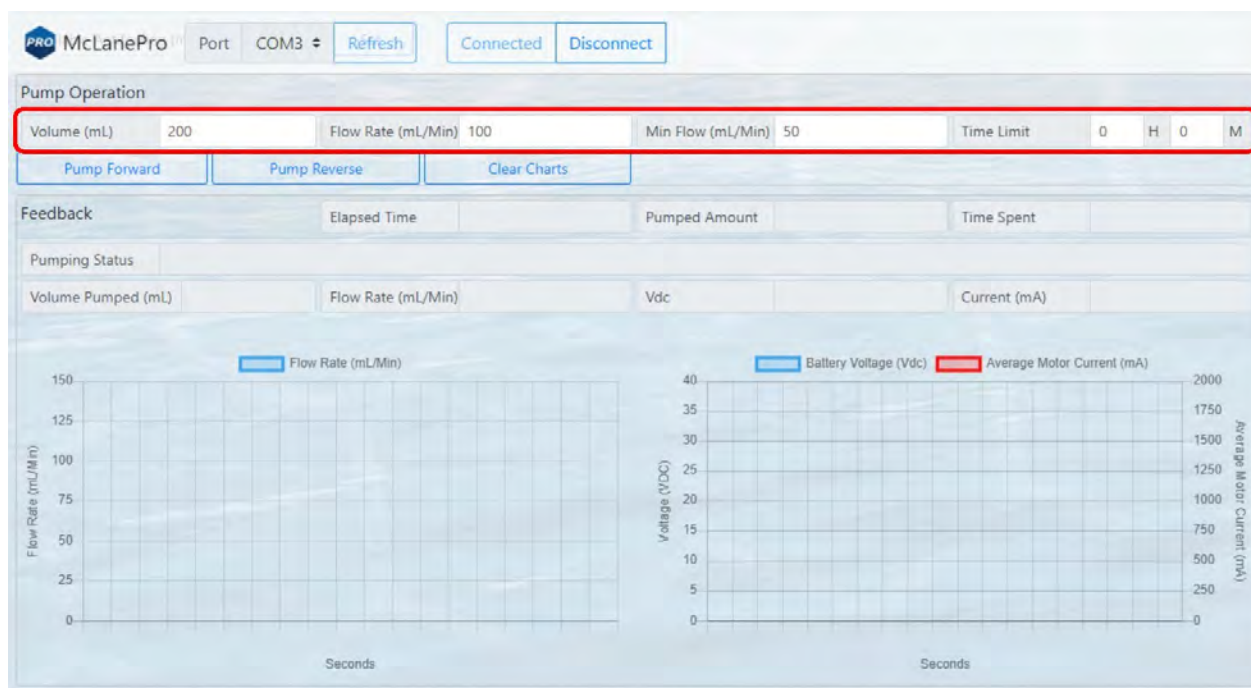
Pumping parameters:

Volume - defines the total requested volume for the manual pumping event.

Flow Rate - sets the target flow rate for the pumping event. Actual flow rate will be adjusted by the PPS based on feedback from the pump.

Min Flow Rate - sets the minimum acceptable flow rate, at which the pumping event will be terminated.

Time Limit - sets a maximum time limit for the pumping event. Setting this value to zero disables the time limit.



When the pump is operating, some or all of the following feedback data will be displayed.

Feedback:

Elapsed Time (HH:MM:SS) - the elapsed time for the current pumping event.

Pumped Amount (%) - the total volume percentage for the current pumping event.

Time Spent (%) - the elapsed time percentage (of the time limit, if used) for the current pumping event.

Pumping Status - the state of the pump and/or limiting conditions.

Volume Pumped - the total volume pumped.

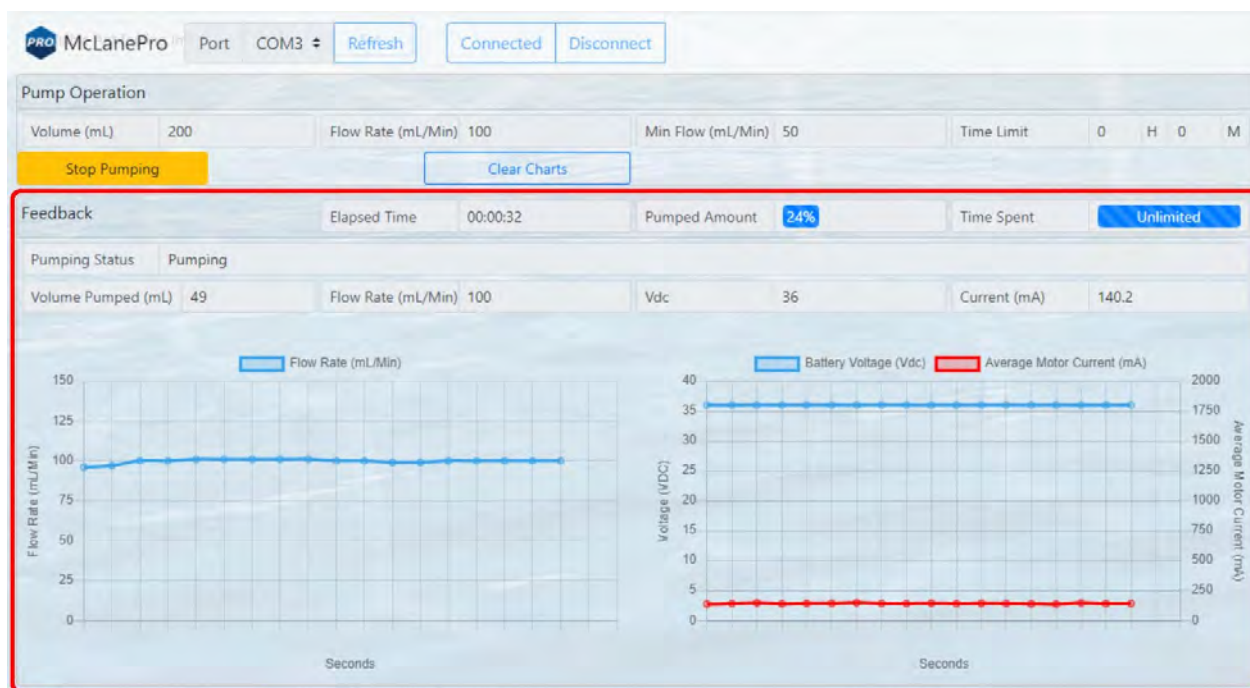
Flow Rate* - the estimated flow rate of the pump, calculated in the firmware.

- Actual flow rate varies due to filter selection, differential pressure and environmental conditions.

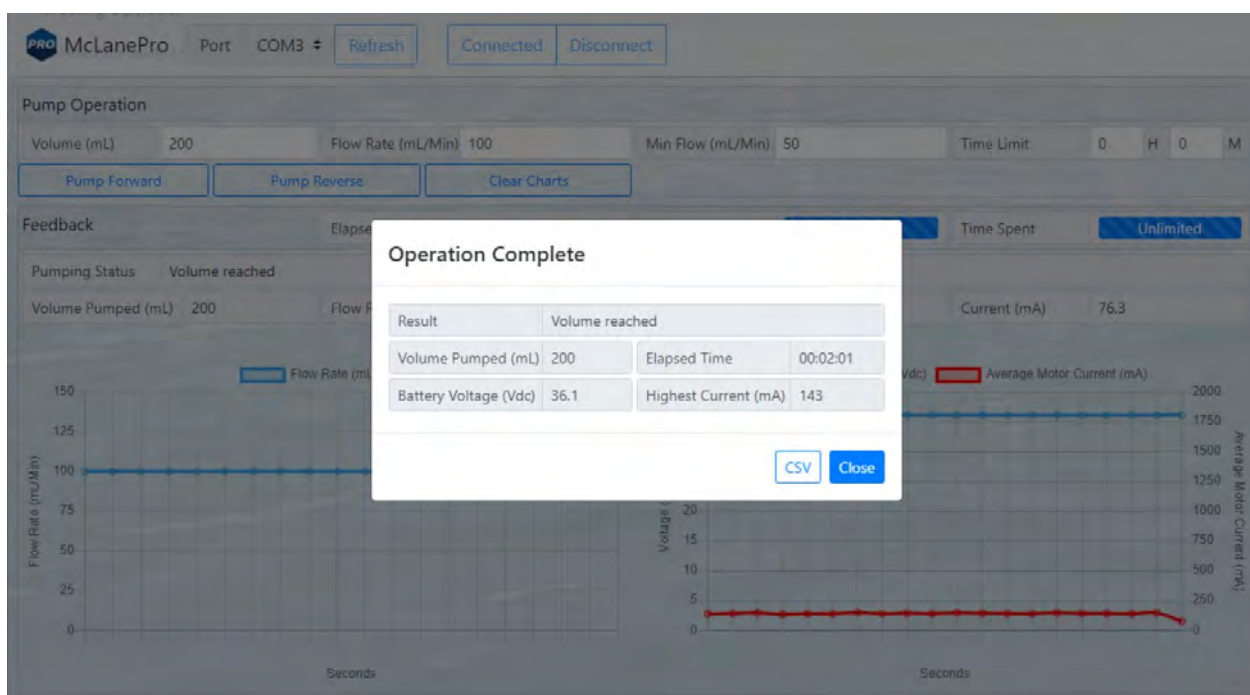
Vdc - the measured battery voltage while pumping.

Current (mA) - The measured current while pumping.

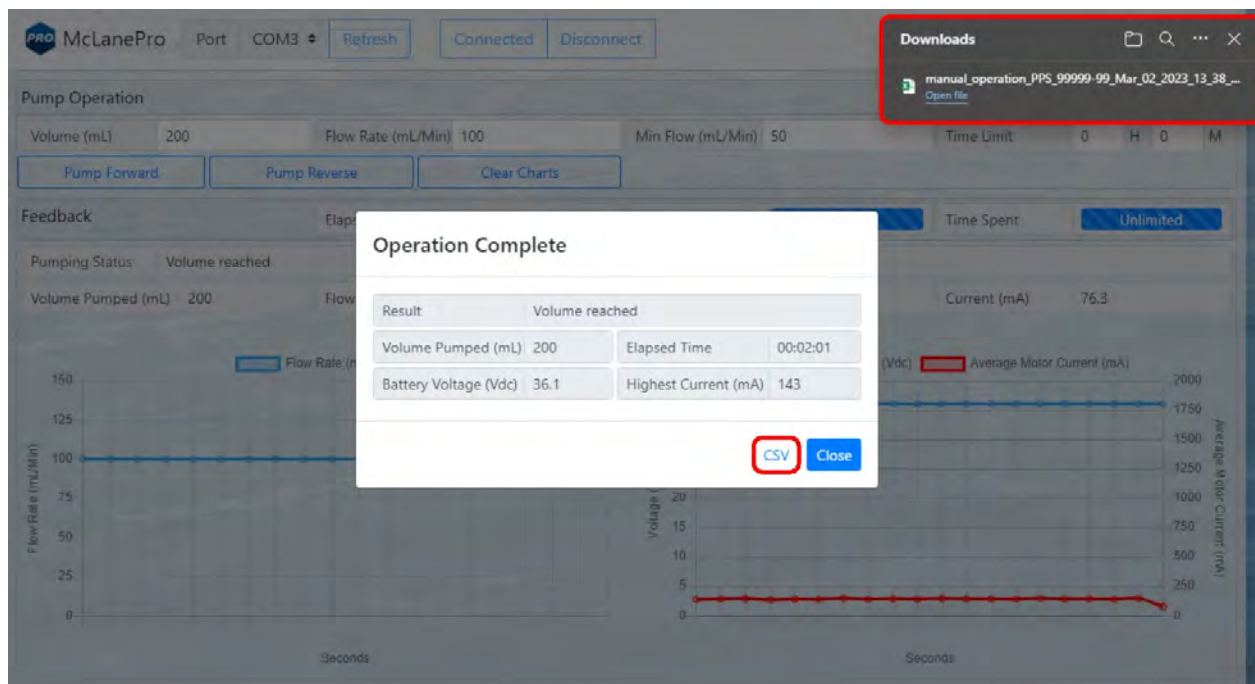
Flow rate, voltage and motor current data are plotted during manually operated pumping. Clicking **Clear Charts** will erase the existing data from the charts.



Upon finishing a manual pumping operation, a summary is provided and data from the operation may be offloaded as a CSV file.

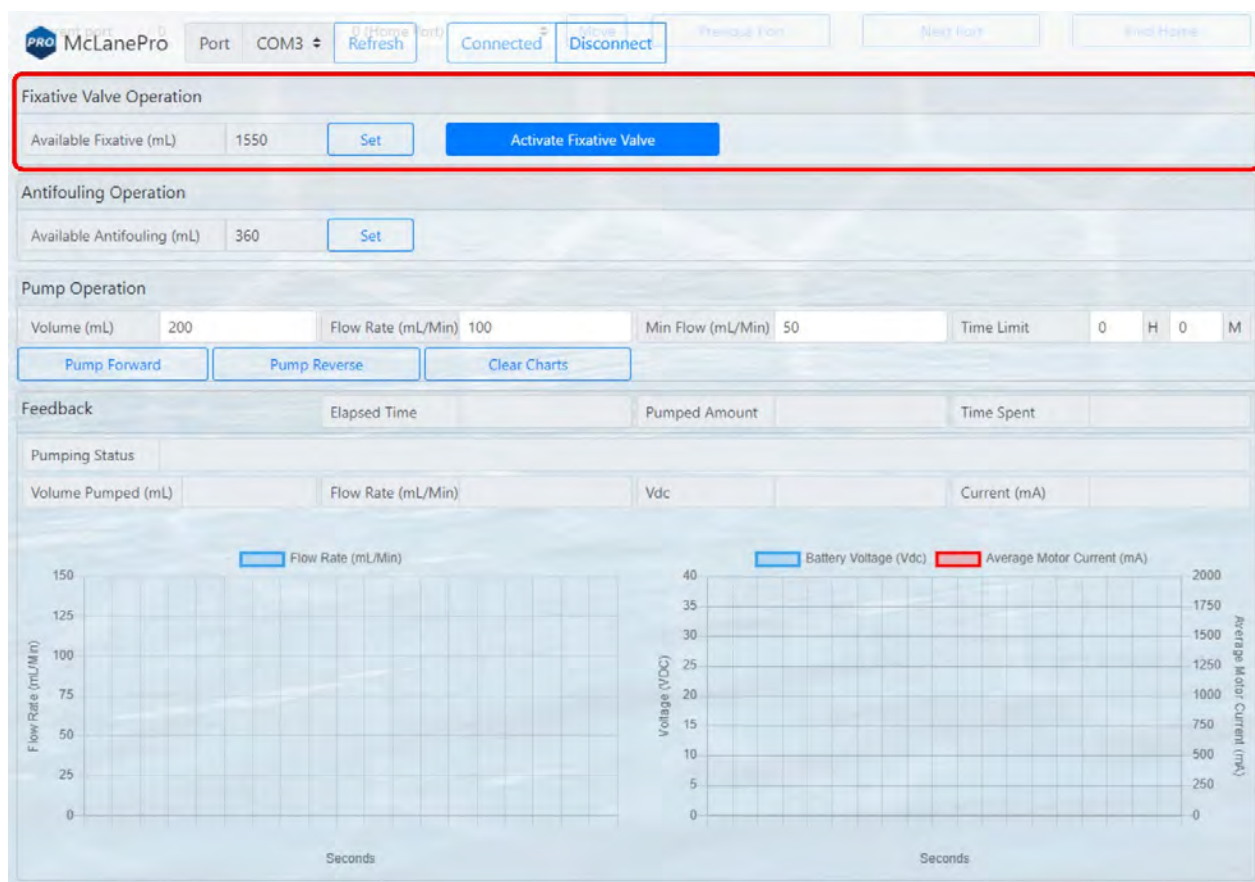


Clicking the CSV button downloads the file to a local computer for review and evaluation.



Fixative Valve Operation

The PPS may optionally be equipped with a fixative valve and reservoir used for preserving samples in situ. If this option is equipped, the **Manual Operation** tab allows for activation of the fixative valve as well as setting the available volume stored in the reservoir. Click **Activate** or **Deactivate** to direct the PPS intake to the environment or the fixative reservoir.

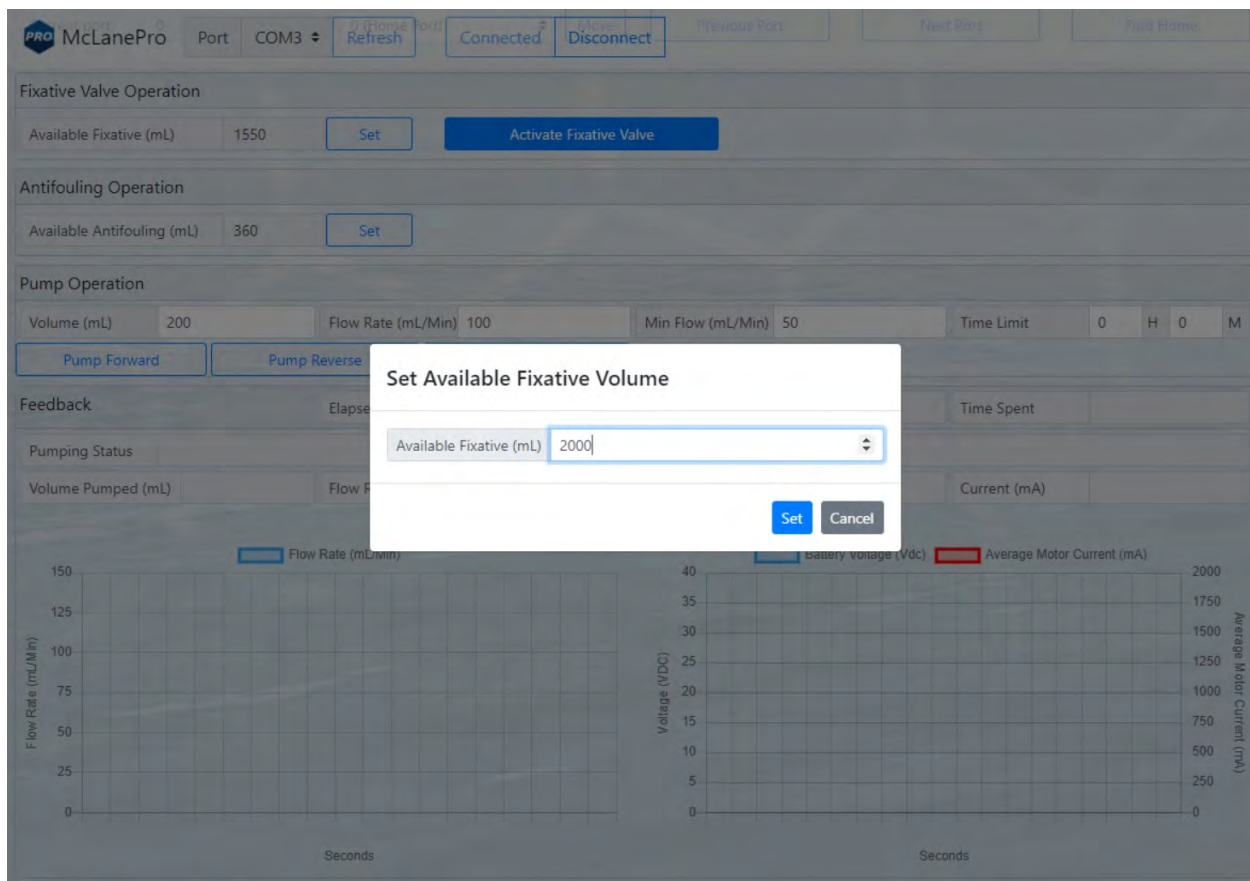


Available fixative is displayed for reference. When fixative is manually added to the reservoir (bag) this volume needs to be updated by the user. A full bag of fixative is typically 2000 mL. Click the set button to change the available volume.

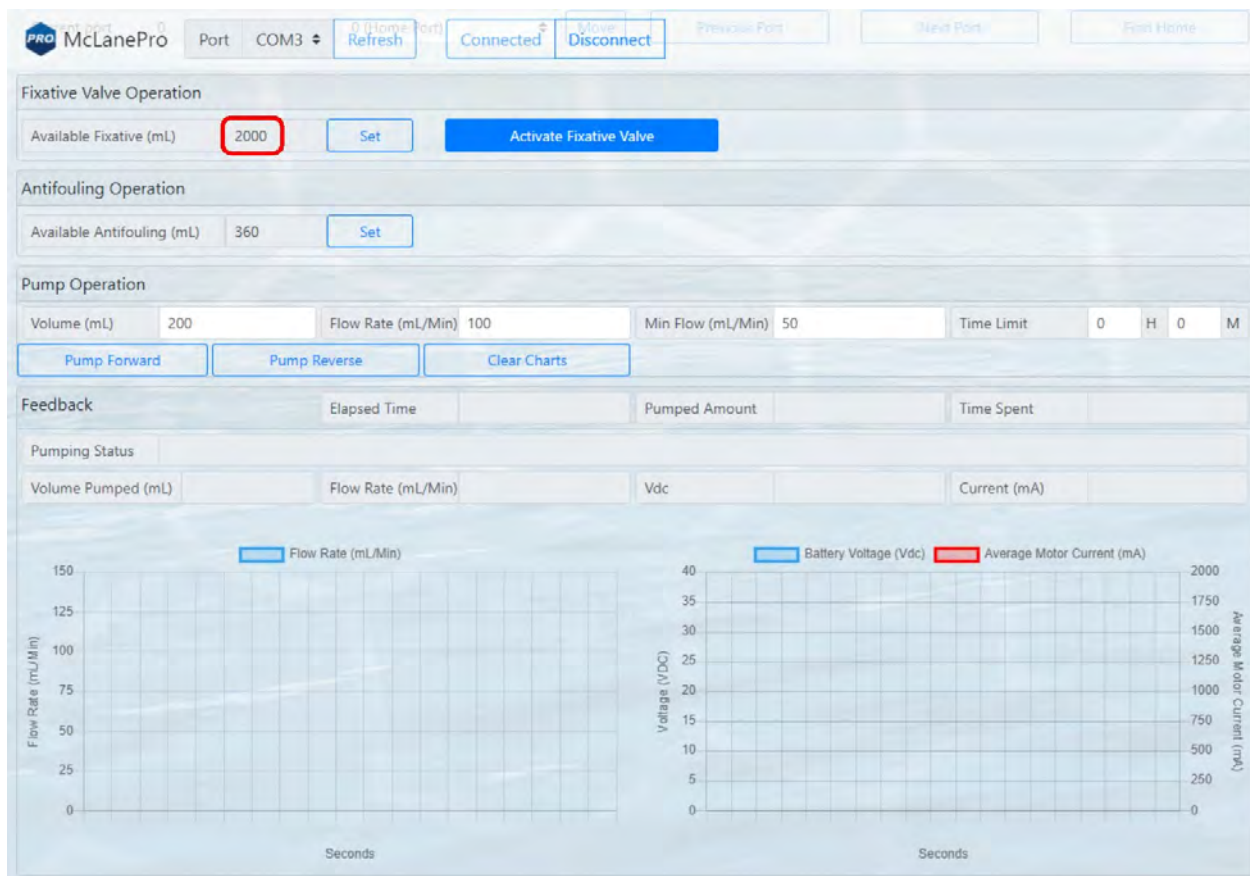
The screenshot displays the McLanePro software interface with the following sections:

- Header:** Includes the McLanePro logo, a port selection dropdown set to 'COM3', and status buttons for 'Refresh', 'Connected', and 'Disconnect'. Navigation buttons for 'Previous Port', 'Next Port', and 'Find Home' are also present.
- Fixative Valve Operation:** Shows 'Available Fixative (mL)' as 1550. A 'Set' button is highlighted with a red rectangle. An 'Activate Fixative Valve' button is also visible.
- Antifouling Operation:** Shows 'Available Antifouling (mL)' as 360 with a 'Set' button.
- Pump Operation:** Includes input fields for 'Volume (mL)' (200), 'Flow Rate (mL/Min)' (100), and 'Min Flow (mL/Min)' (50). A 'Time Limit' section shows '0' hours and '0' minutes. Control buttons for 'Pump Forward', 'Pump Reverse', and 'Clear Charts' are provided.
- Feedback:** A section with tabs for 'Elapsed Time', 'Pumped Amount', and 'Time Spent'.
- Pumping Status:** A table with columns for 'Volume Pumped (mL)', 'Flow Rate (mL/Min)', 'Vdc', and 'Current (mA)'.
- Charts:** Two real-time graphs are shown at the bottom. The left graph plots 'Flow Rate (mL/Min)' (0 to 150) against 'Seconds'. The right graph has two y-axes: 'Voltage (VDC)' (0 to 40) and 'Average Motor Current (mA)' (0 to 2000), both plotted against 'Seconds'. The legend indicates 'Flow Rate (mL/Min)' is blue, 'Battery Voltage (Vdc)' is blue, and 'Average Motor Current (mA)' is red.

Enter the volume of fixative available in the reservoir and click **Set**.

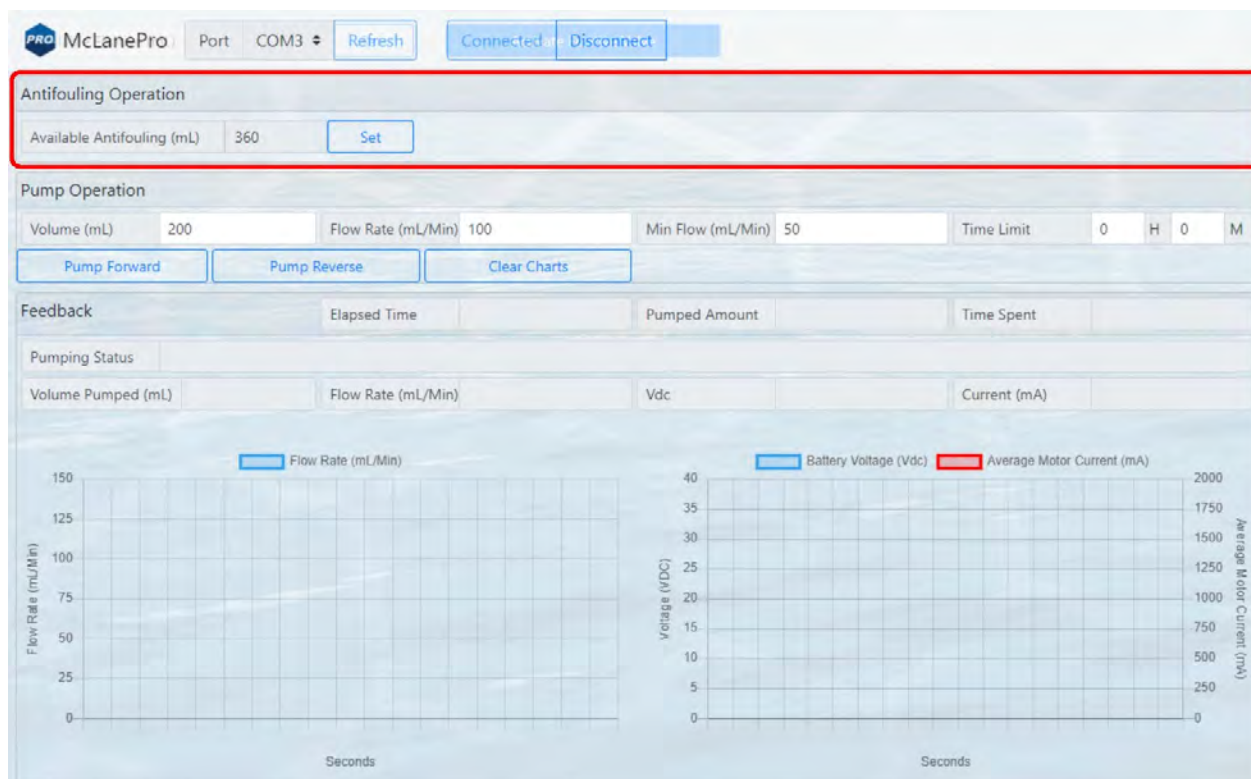


Available fixative will be updated and this value will be used when calculating deployment fixative usage during PPS deployment preparation.

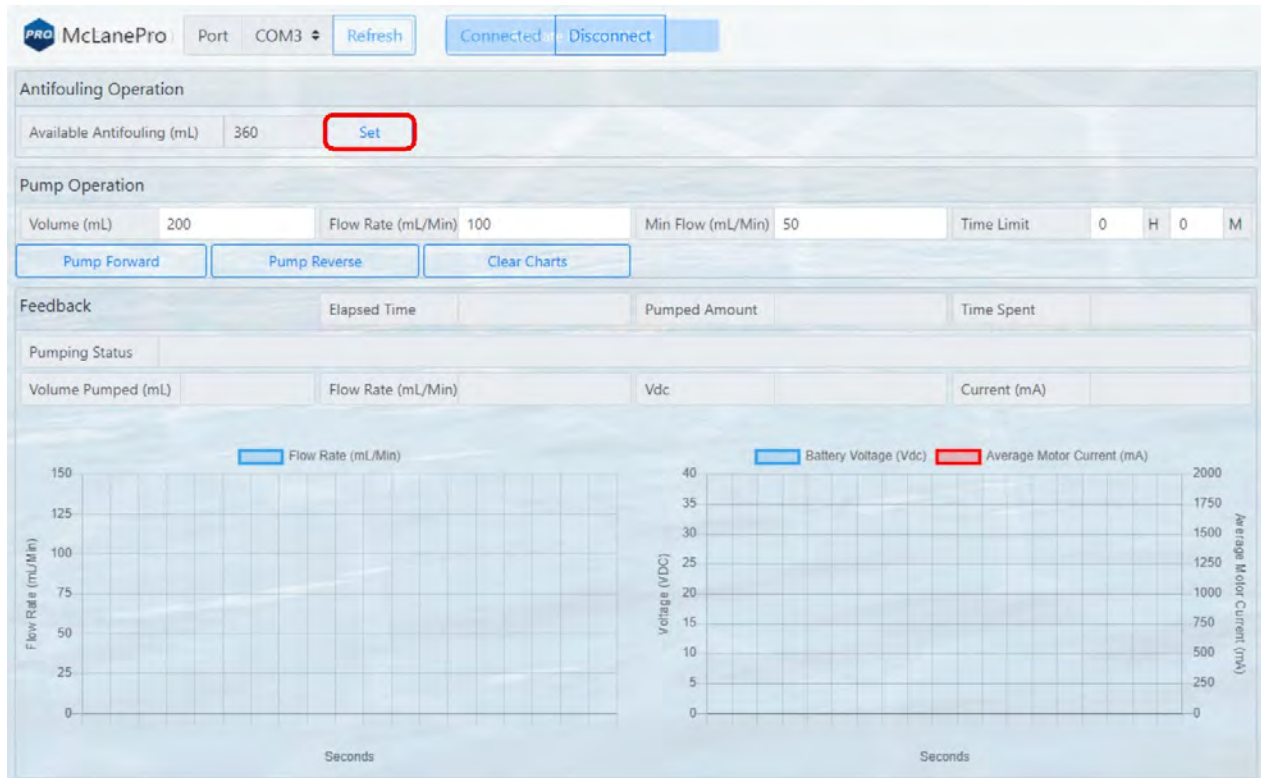


Antifouling Operation

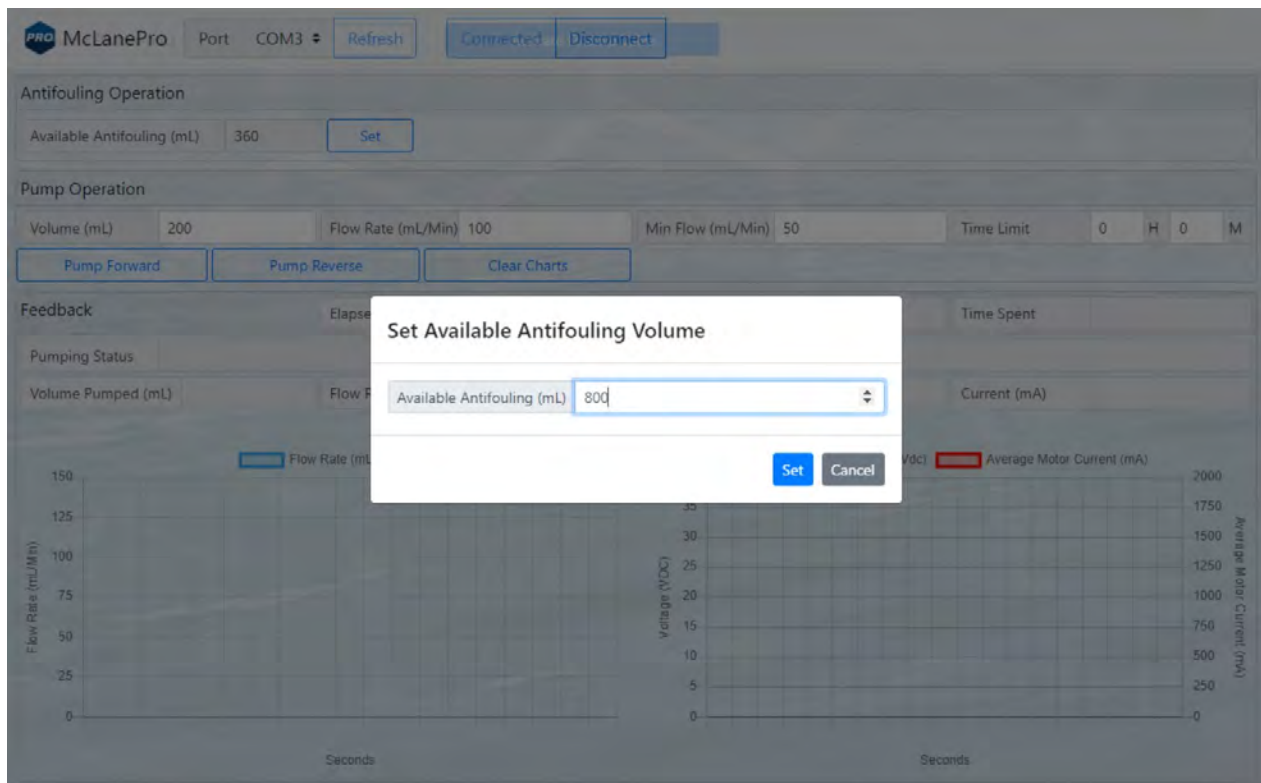
The PPS may optionally be equipped with an antifoulant reservoir for preventing contamination of the PPS intake. If this option is equipped, the **Manual Operation** tab allows for setting the available volume stored in the reservoir.



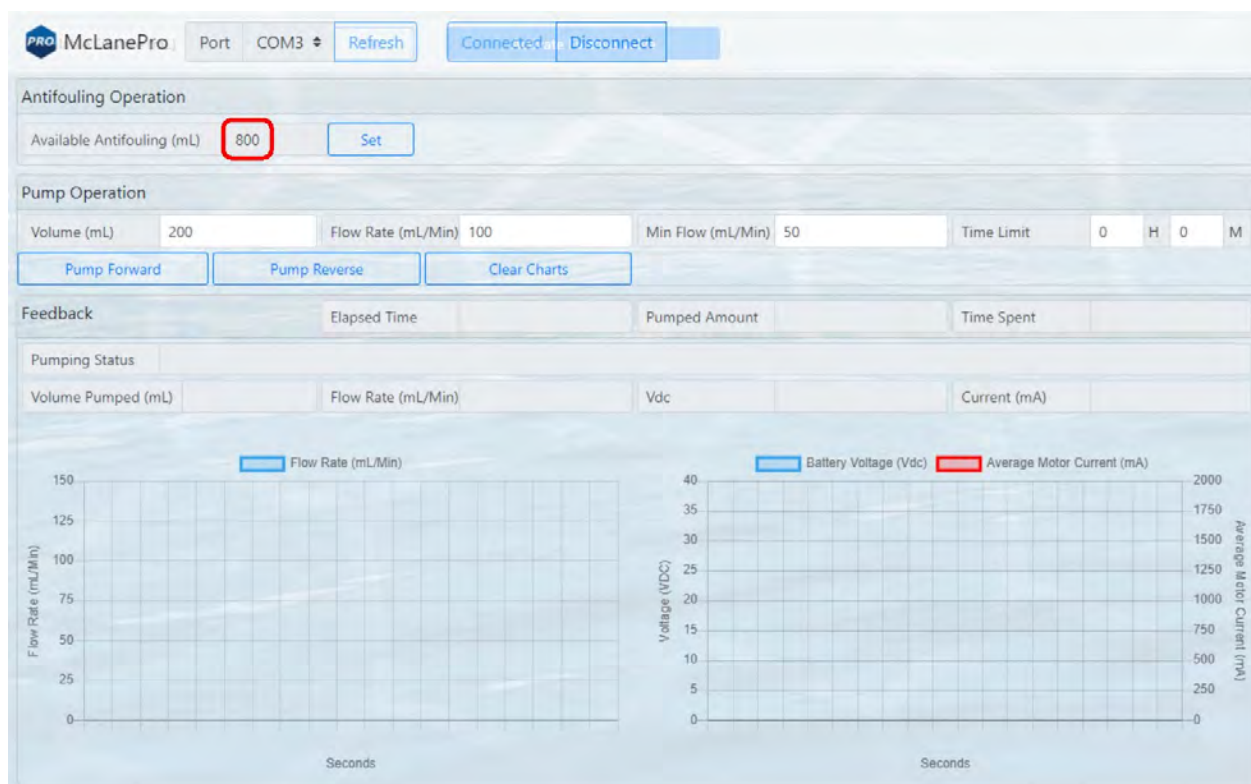
Available antifoulant is displayed for reference. When antifoulant is manually added to the reservoir (bag) this volume needs to be updated by the user. A full bag of antifoulant typically holds 800 mL. Click the set button to change the available volume.



Enter the volume of antifoulant available in the reservoir and click **Set**.



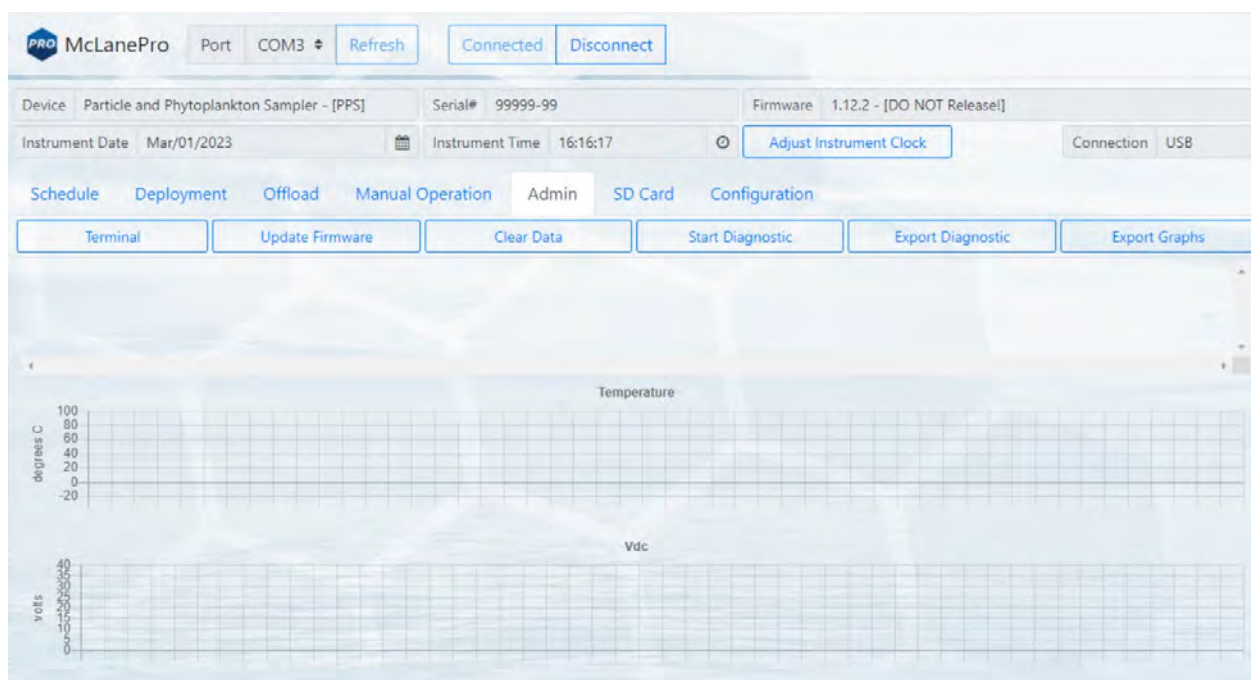
Available antifoulant will be updated and this value will be used when calculating deployment antifoulant usage during PPS deployment preparation.



The Admin Tab

The **Admin** tab is used to:

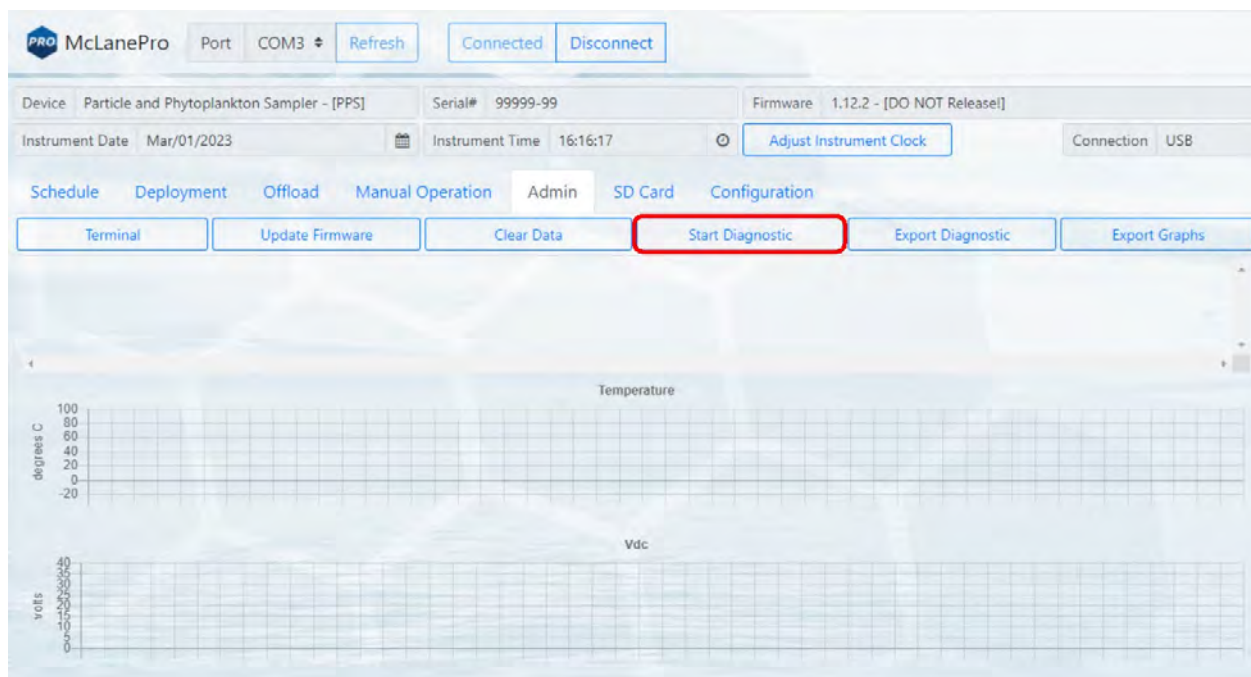
- [Run Diagnostics](#)
- [Update Firmware](#)
- [Communicate to the PPS Using the Terminal](#)



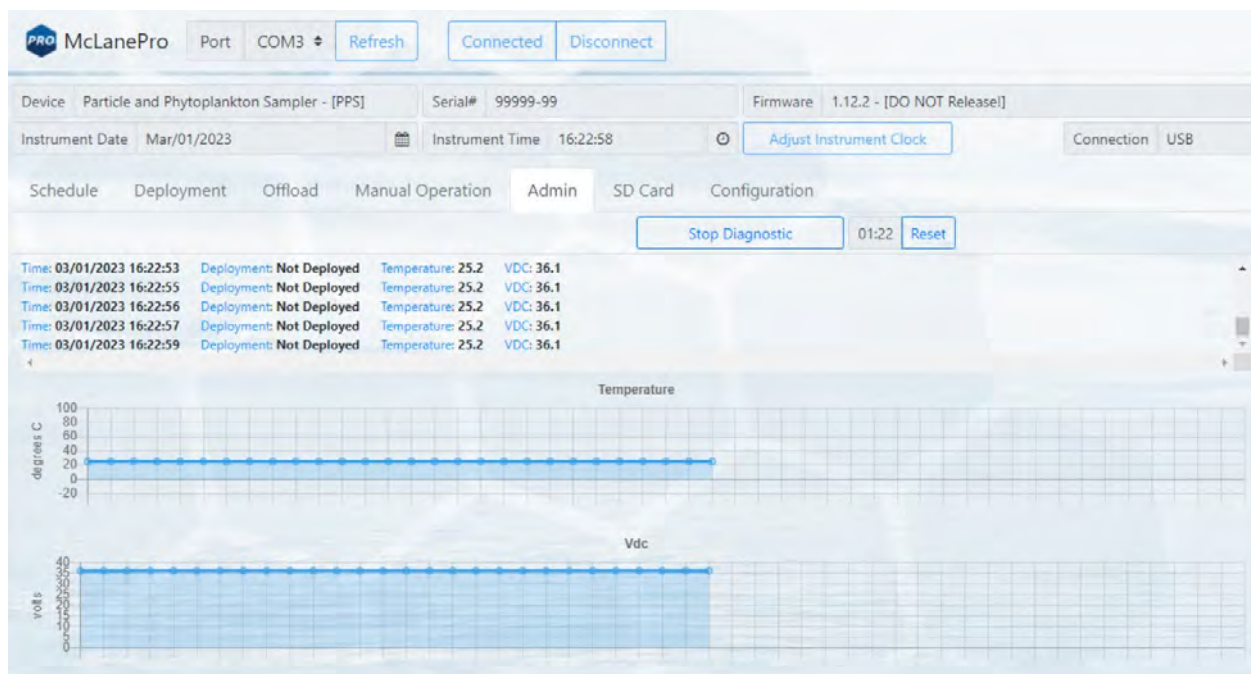
Running Diagnostics

The **Admin tab** contains a diagnostic utility that provides system state information.

To run diagnostics, click **Start diagnostic**. Data will begin to print to the screen, and graphs will begin to display data.



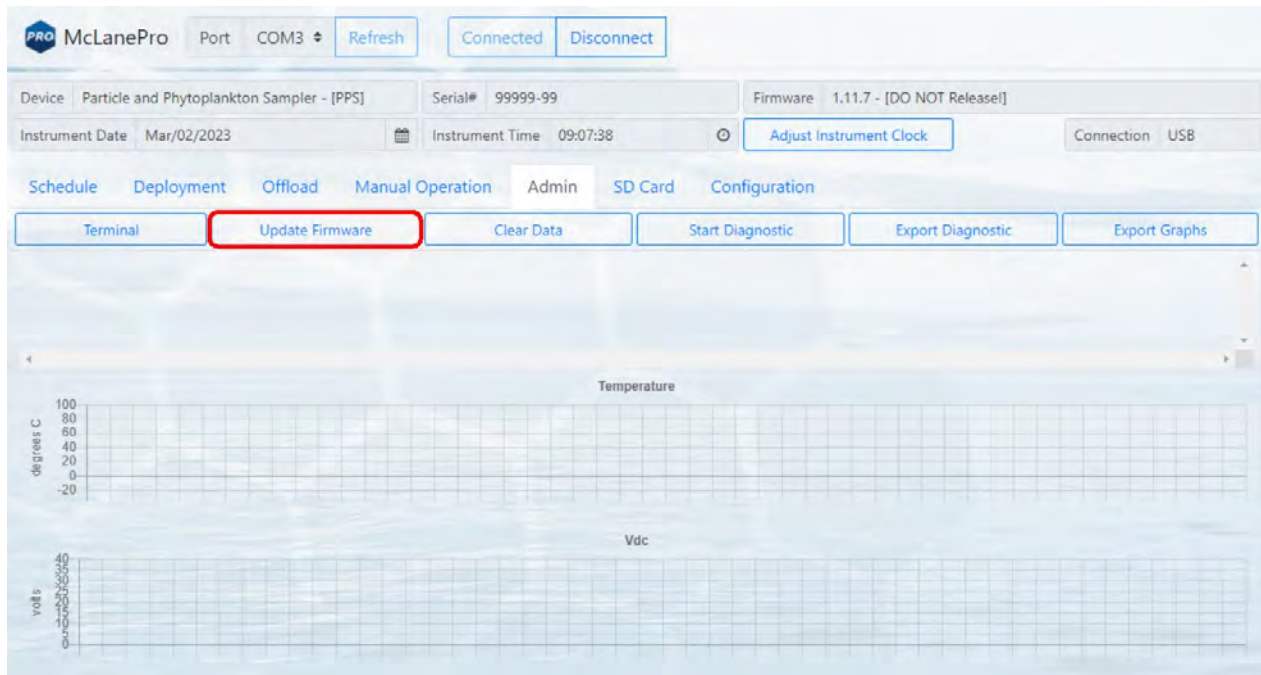
Diagnostics will run for two minutes, otherwise, click **Stop diagnostic**.



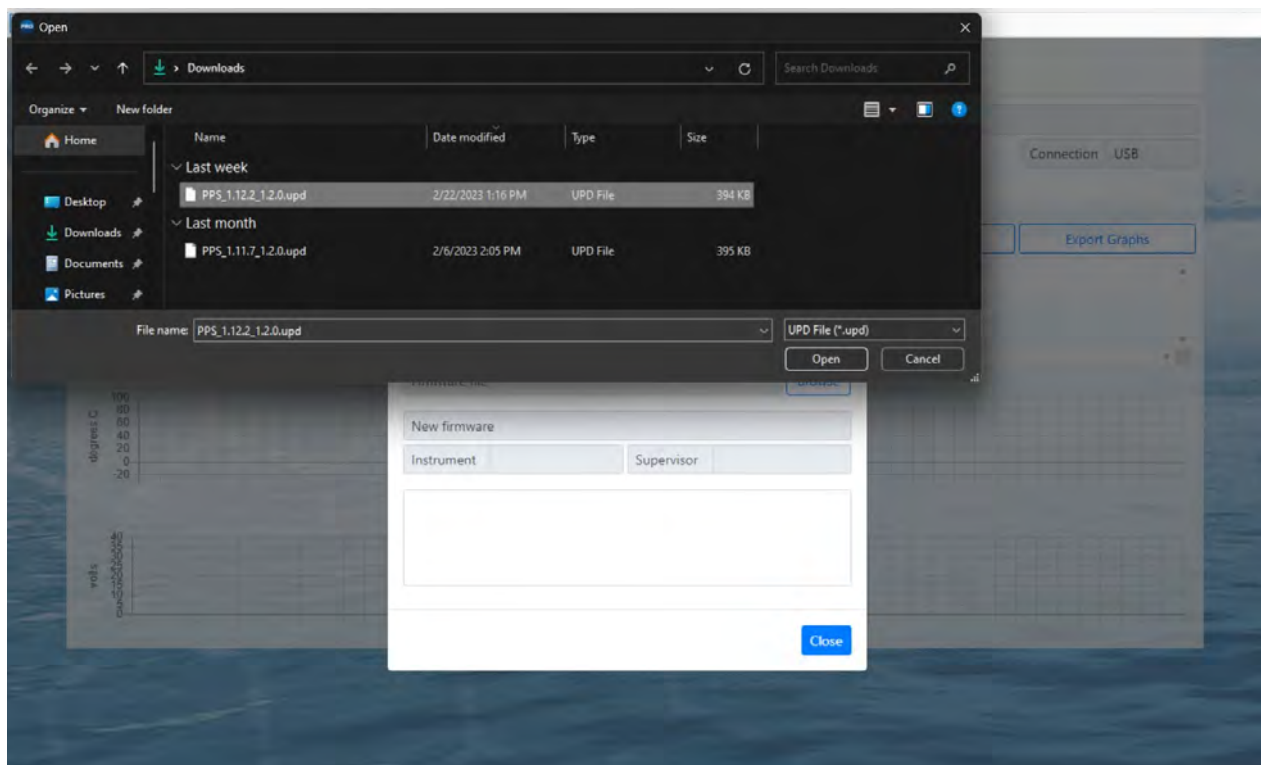
After running diagnostics, clear the data on the **Admin tab** by clicking the **Clear Data** button. Alternatively, diagnostic data and graphs may be exported using the buttons provided.

Update Firmware

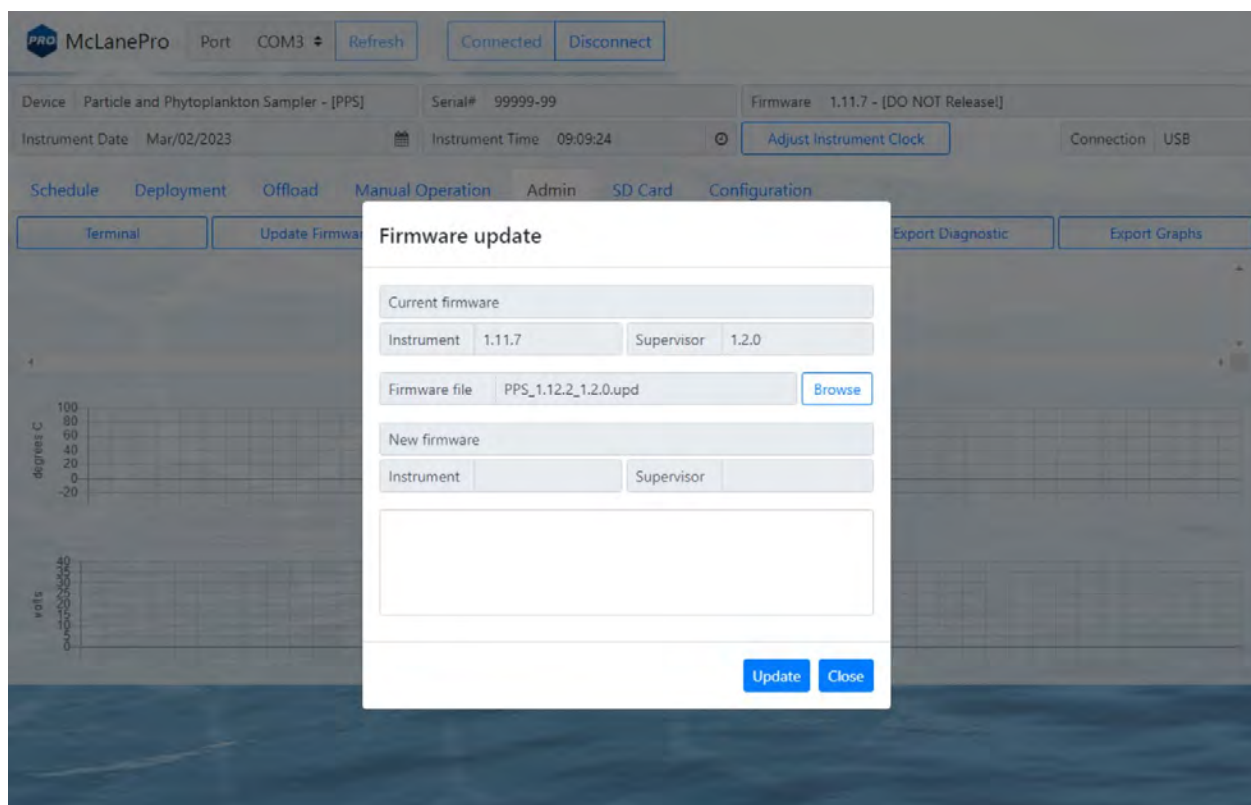
1. To update firmware click the **Update firmware** button on the **Admin** tab.



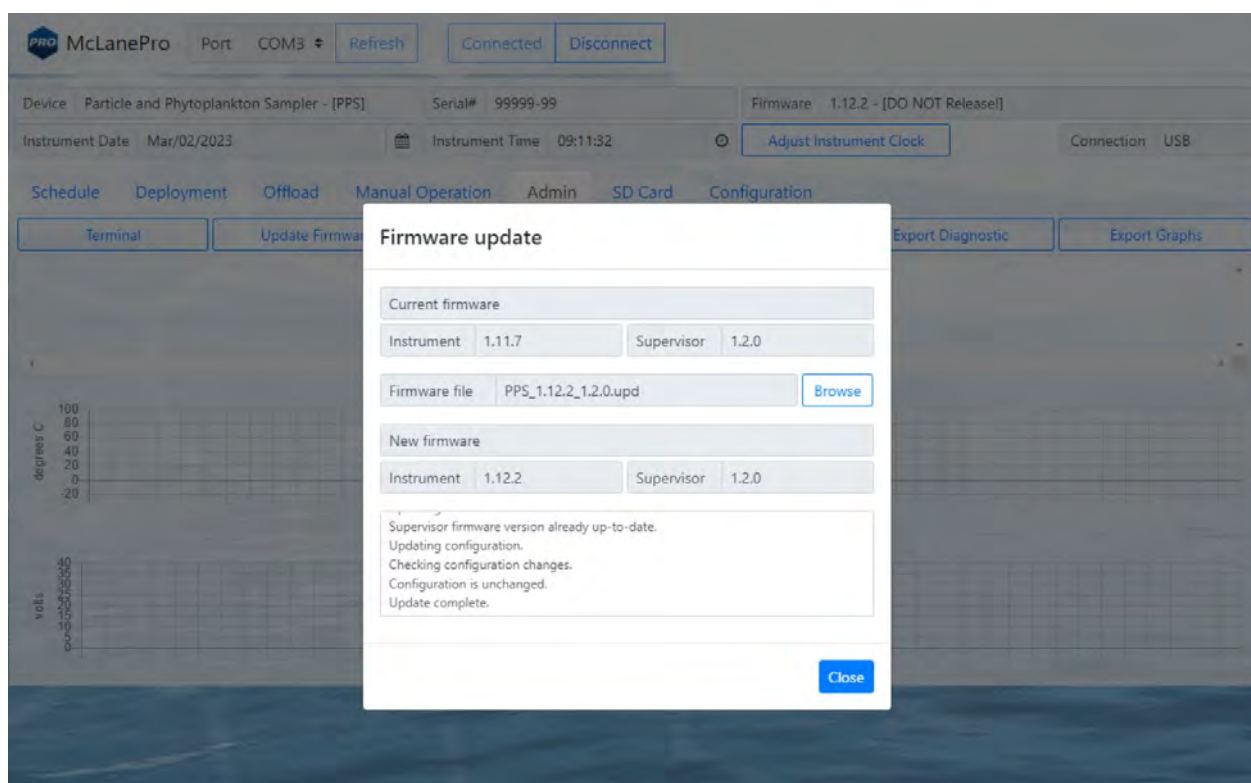
2. Click **Browse**, and select a McLane *.UPD file to upload.



3. Once a *.UPD file is selected, click **Update** to update the PPS firmware.

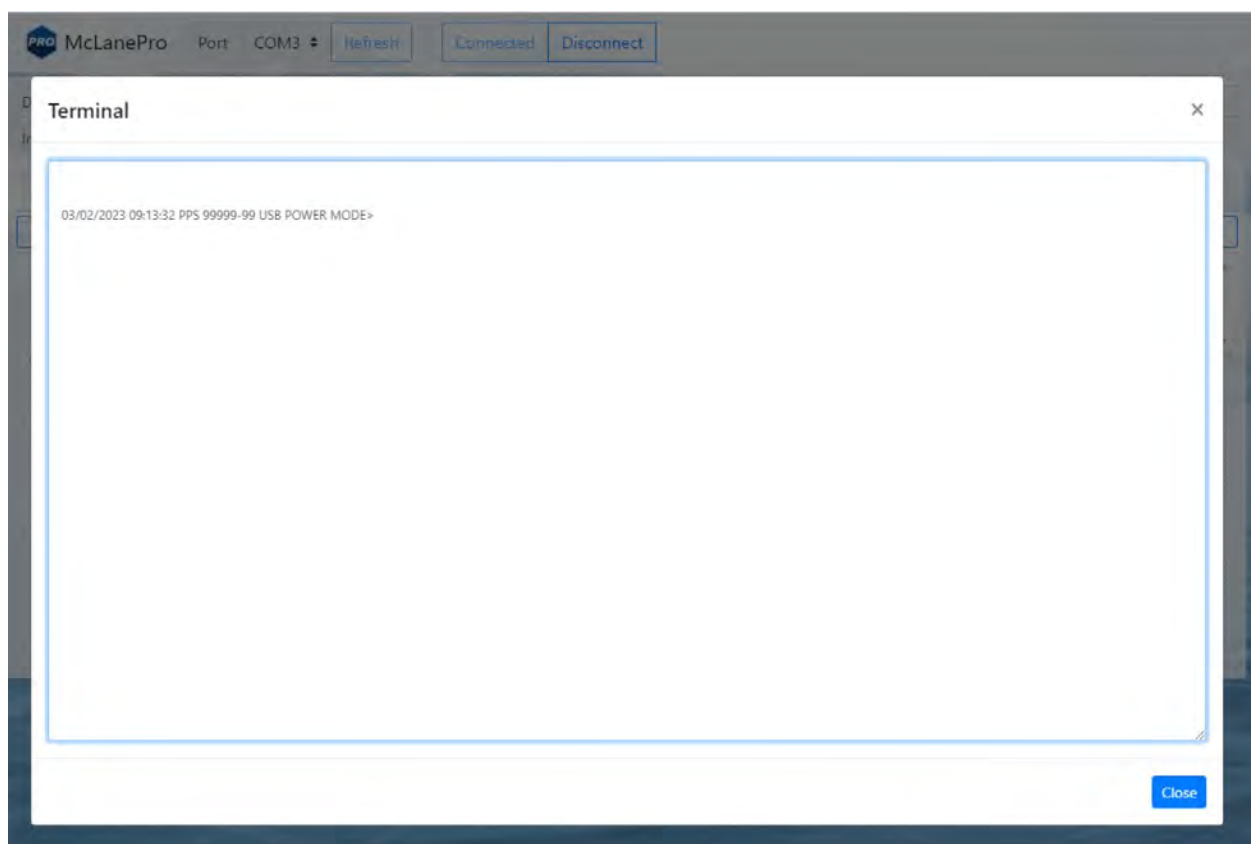


In some cases, a firmware update may revert the PPS configuration to default values. McLanePro detects when this happens, and loads the **Configuration** tab to allow reconfiguration of the instrument after the firmware update is complete. Otherwise, the update will complete and report that the configuration is unchanged.



The Terminal

A command-line interface provides an option for command-driven control over the PPS. Access the terminal interface through the **Admin tab**, or by typing **ALT+T**.



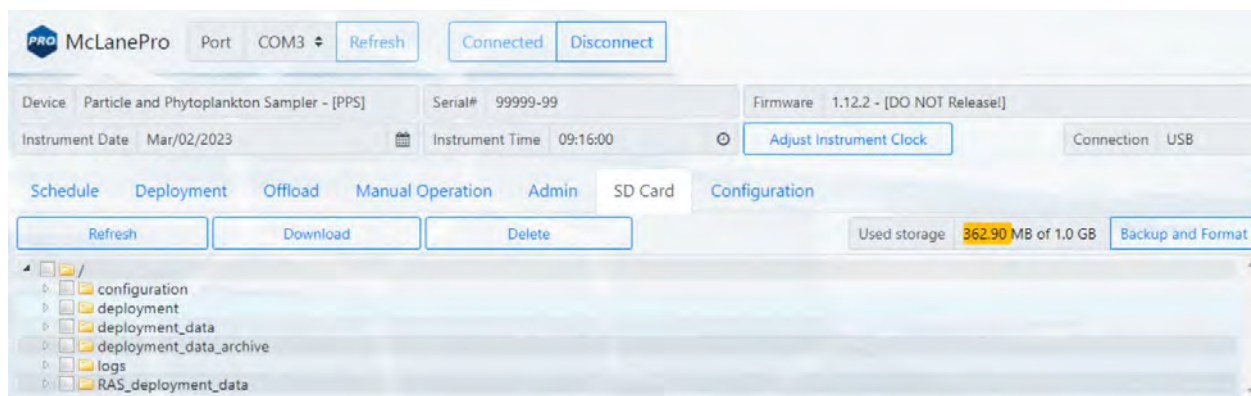
Whenever the terminal is closed, a log of that session is automatically downloaded. Contact mclane@mclanelabs.com for a list of available terminal commands.

The SD Card Tab

The **SD Card tab** allows for file operations on the PPS MicroSD® Card.

The entire card can be downloaded, deleted, or formatted.

Contact mclane@mclanelabs.com before deleting any files or formatting the card.



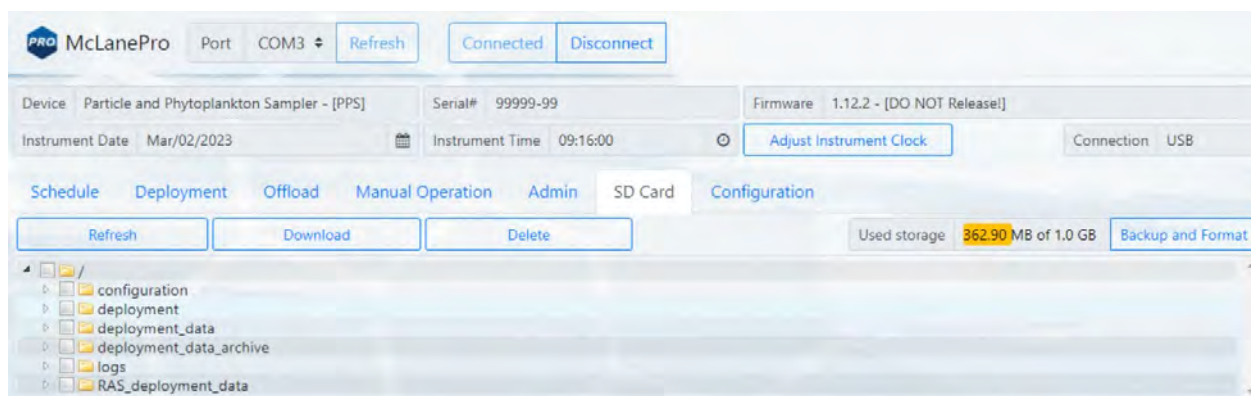
File Operations

The **SD card** tab provides buttons to execute commands relating to the data files on the installed SD card. Data files may be downloaded, deleted or uploaded. Please do not delete any files unless instructed to do so by the firmware or a McLane representative.

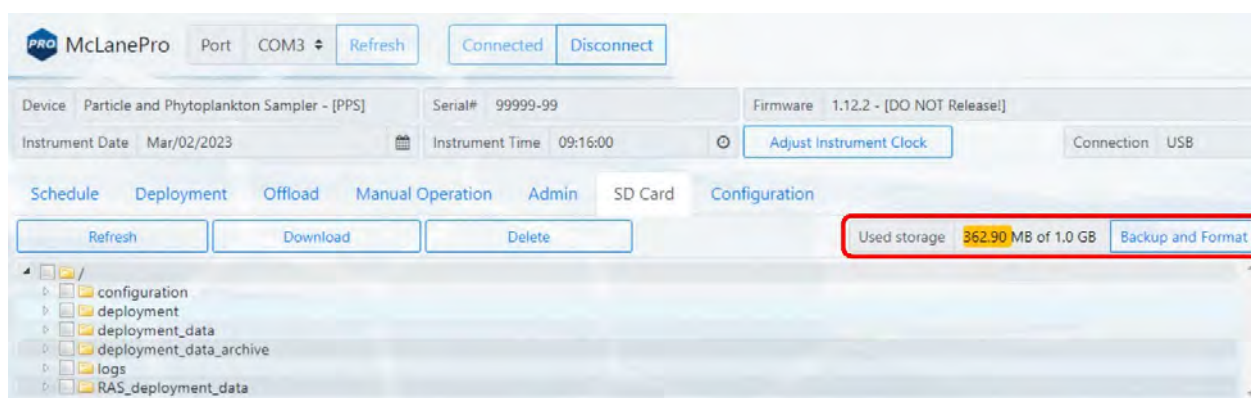
Refresh - clicking **Refresh** will scan the installed SD card and update the directory tree with new data.

Download - clicking **Download** will compress selected files into a ZIP file that is then downloaded to the connected computer.

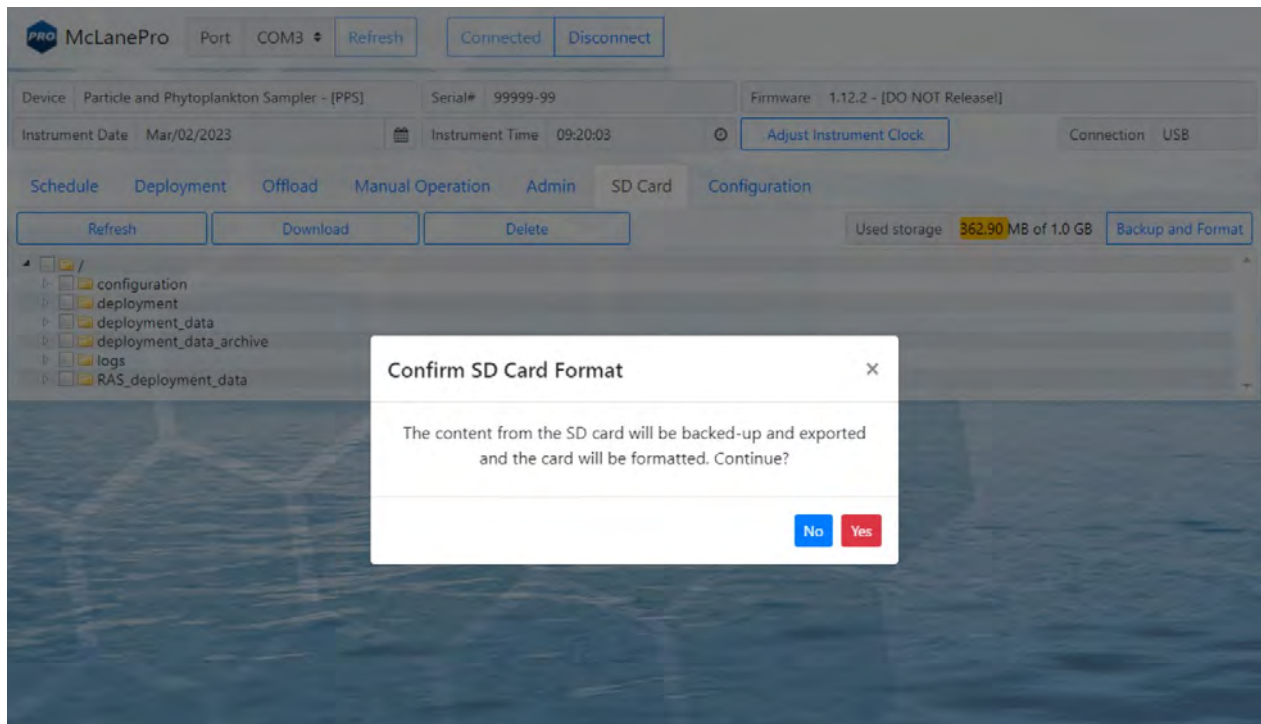
Delete - clicking **Delete** will remove the selected files and/or directories. Once data are deleted from the PPS they are not recoverable.



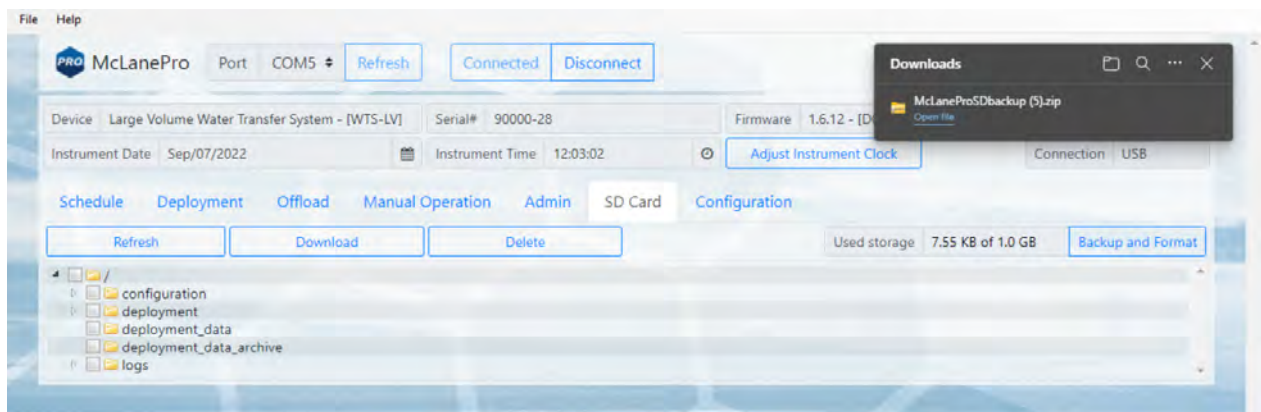
Status of the SD card is provided via the **Used storage** display. Additionally, a **Backup and Format** button is provided that allows for the user to download all the data from the SD card and then format the card.



The user must be aware that **Backup and Format** will delete all archived data sets and any deployment data on the SD card.

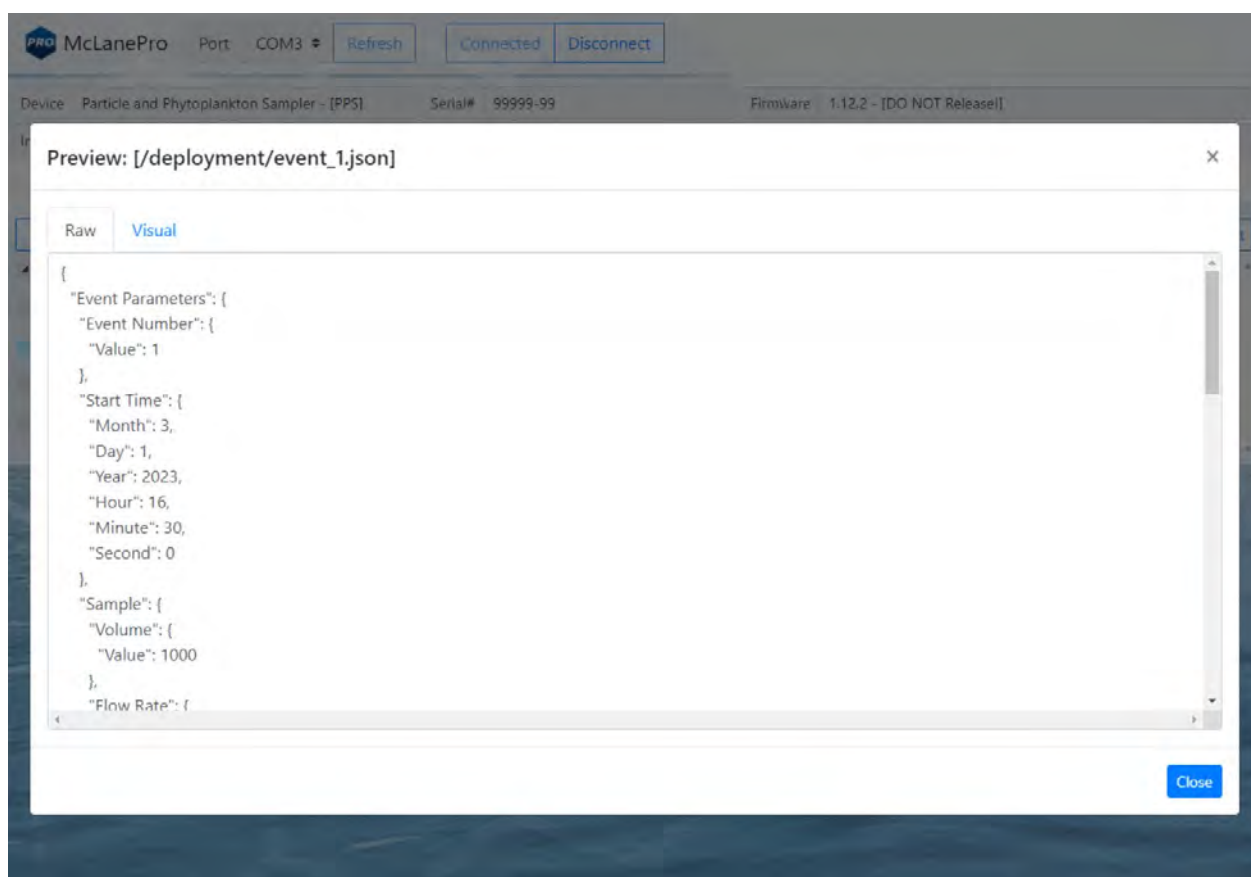
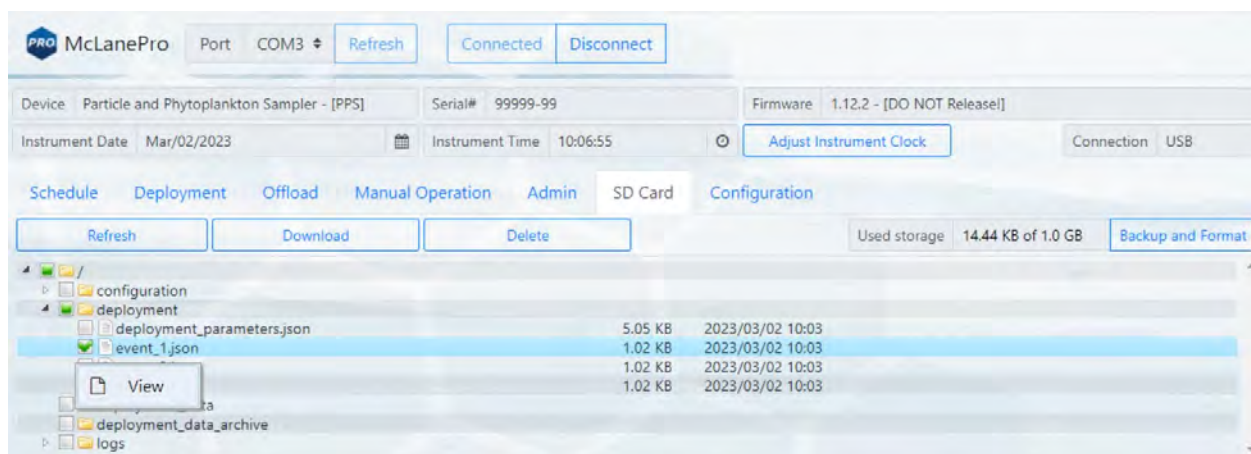


All data from the SD card are compressed into a ZIP file and downloaded before the SD card is formatted.



File preview

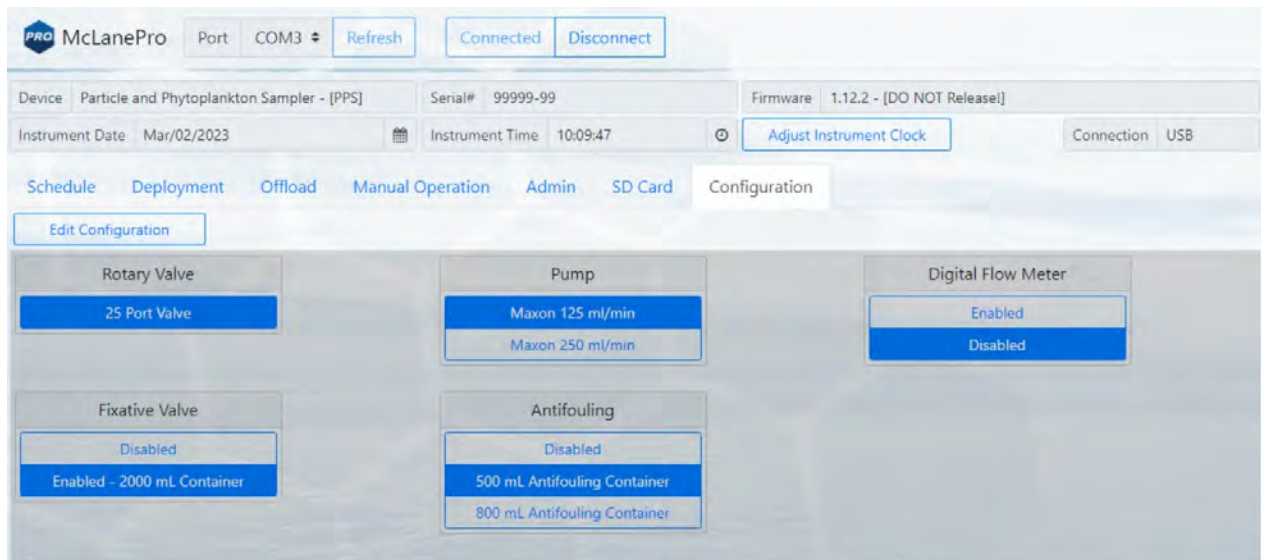
The **SD card** tab allows previewing of data files by right clicking a selected file, and then clicking **View**.



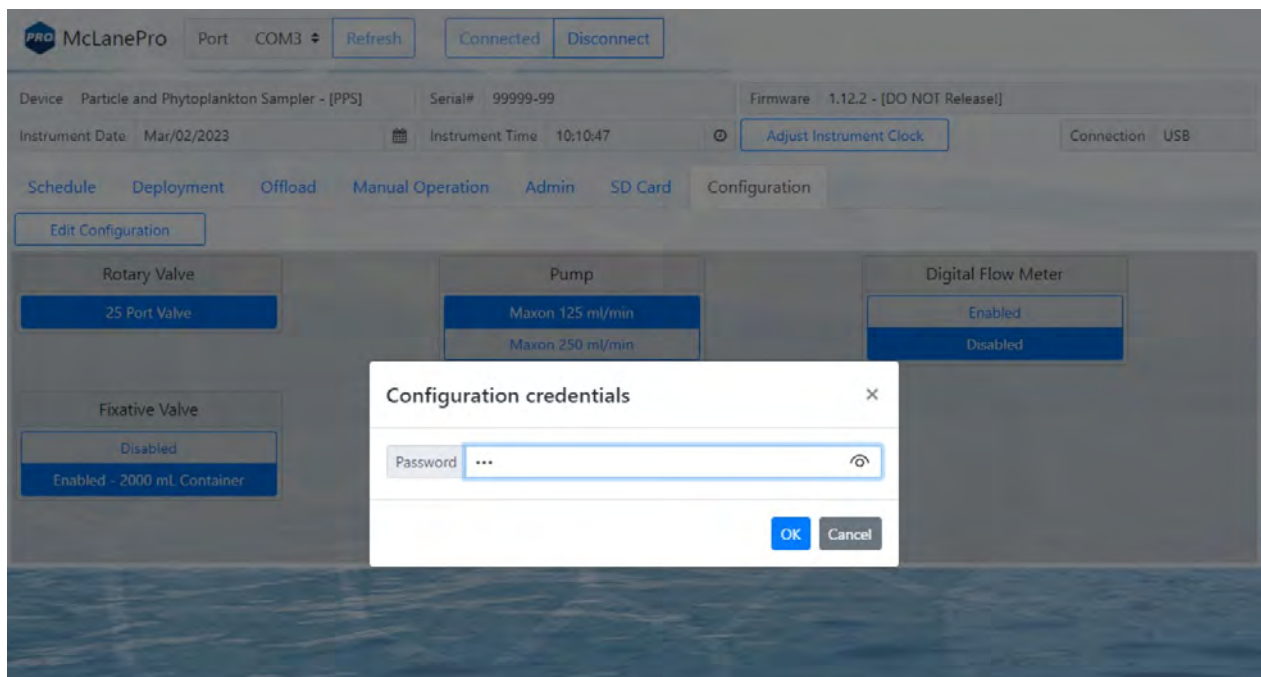
The Configuration Tab

PPS firmware is configured to match the pump head size (and/or additional options) before shipping. The **Configuration** tab is not used often. If a firmware update reverts the PPS to default values, the **Configuration** tab is used to change/restore the correct values.

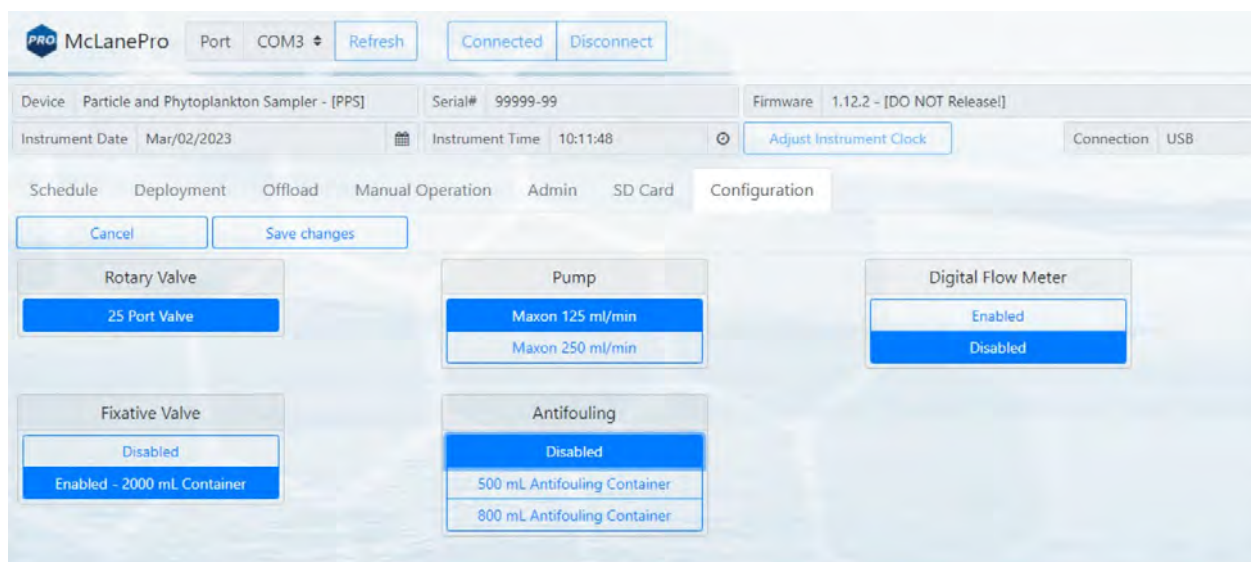
1. To change the PPS configuration, navigate to the **Configuration** tab and select **Edit Configuration**.



2. When prompted for a password, enter "con".

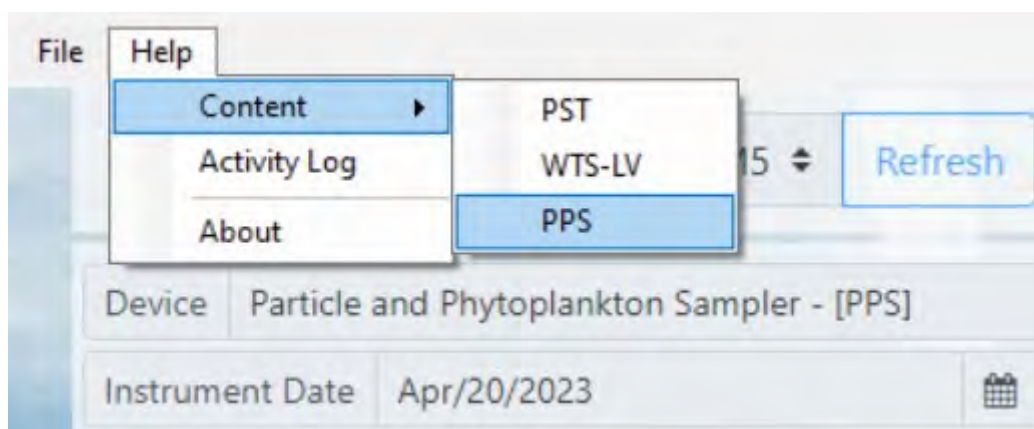


3. Confirm or change the PPS pump configuration, or other available options, and click **Save changes**.

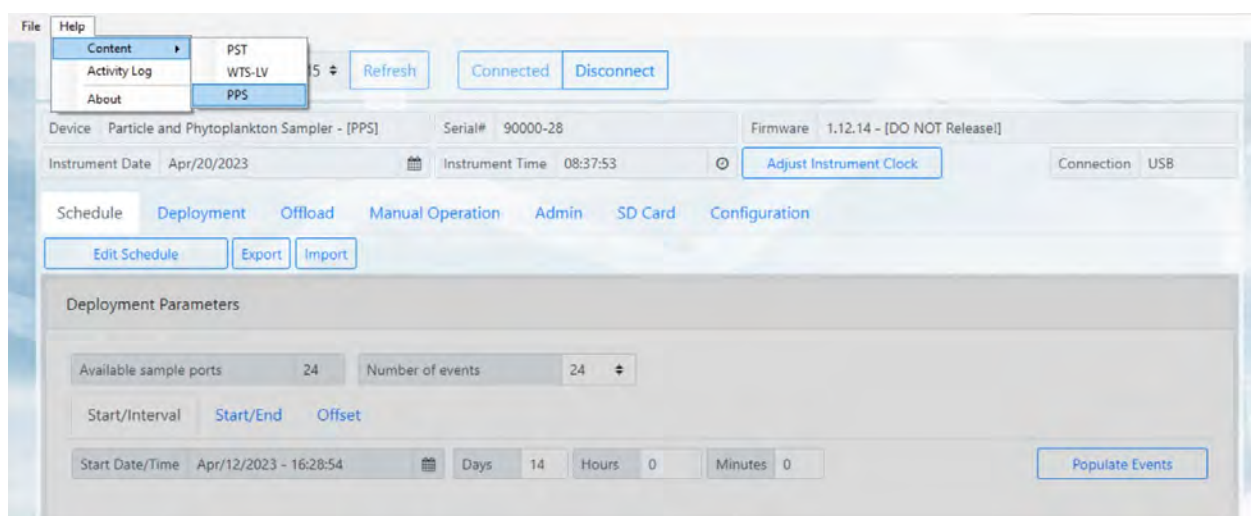


The Help Menu

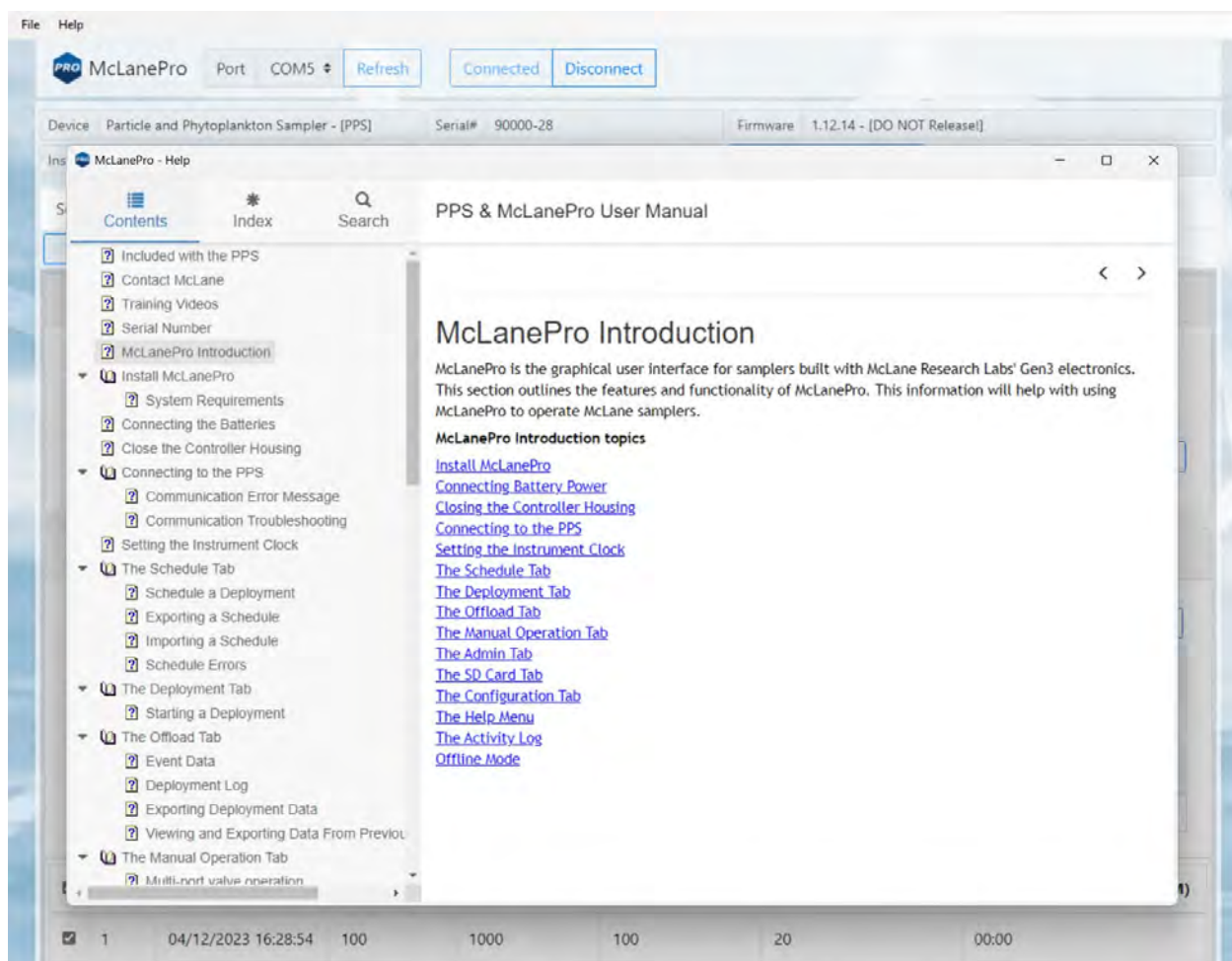
The McLanePro **Help Menu** contains links to device-specific user manuals, as well as McLanePro general information.



Select the appropriate help file for the device connected to McLanePro.

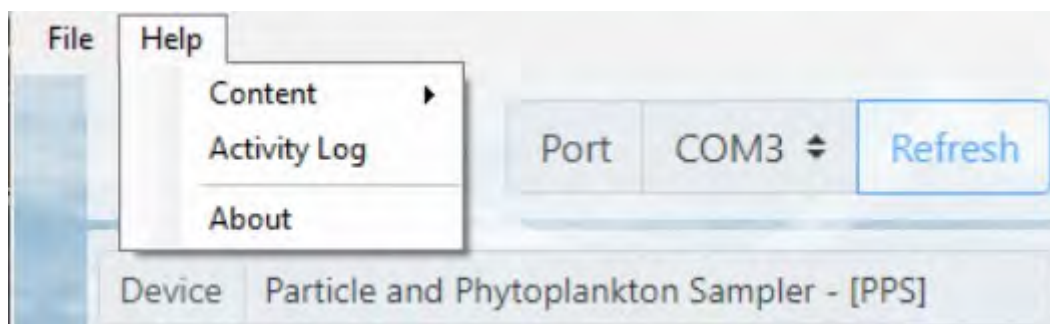


In this example, the device is a sampler with device code PPS. The help file contains user instruction and information on PPS.

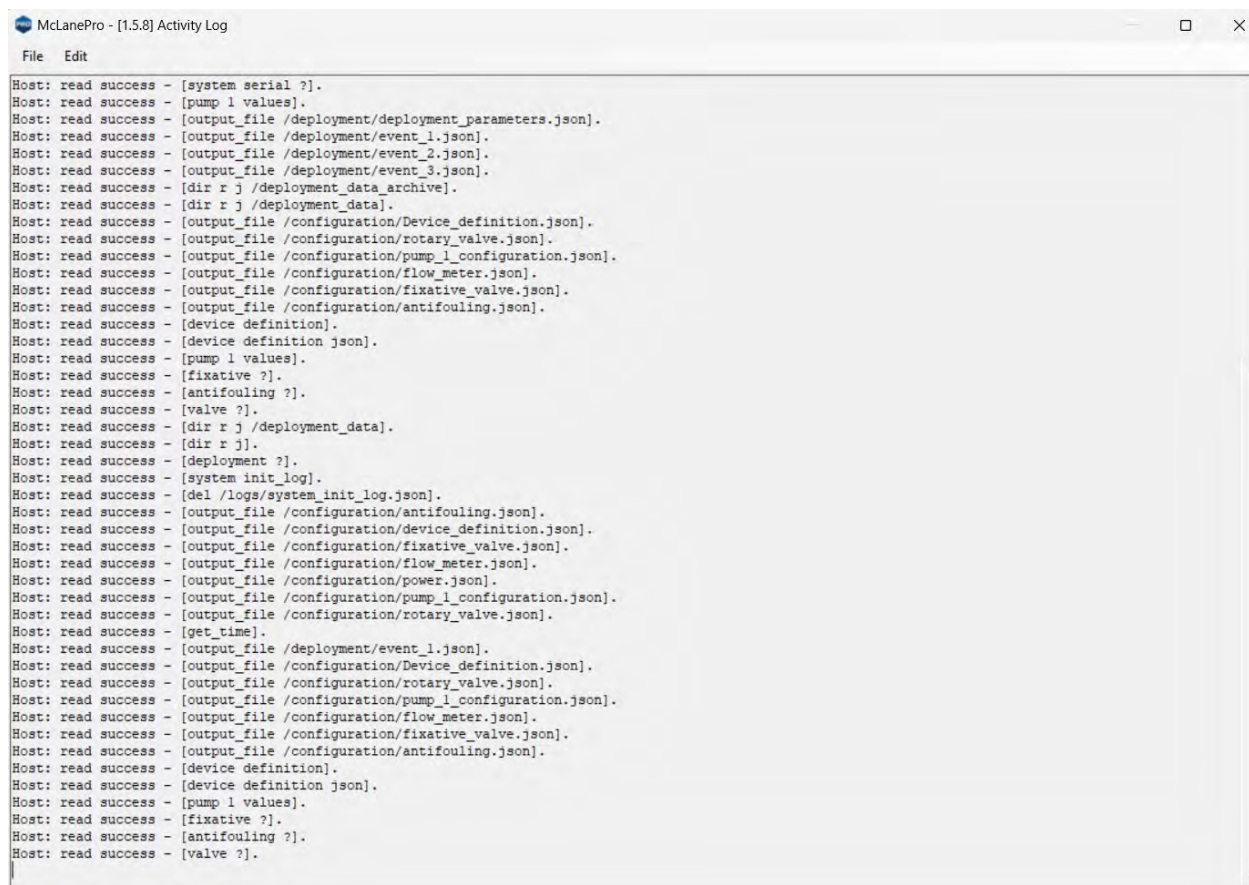


The Activity Log

Communications between McLanePro and the PPS are visible when entering the **Activity Log** from the **McLanePro Help Menu**.



Within the **Activity Log**, there are options to **Save** the log to a text file (using the **File Menu**), or to **Copy** a selection of the **Activity Log** to the clipboard (using the **Edit Menu**).



```

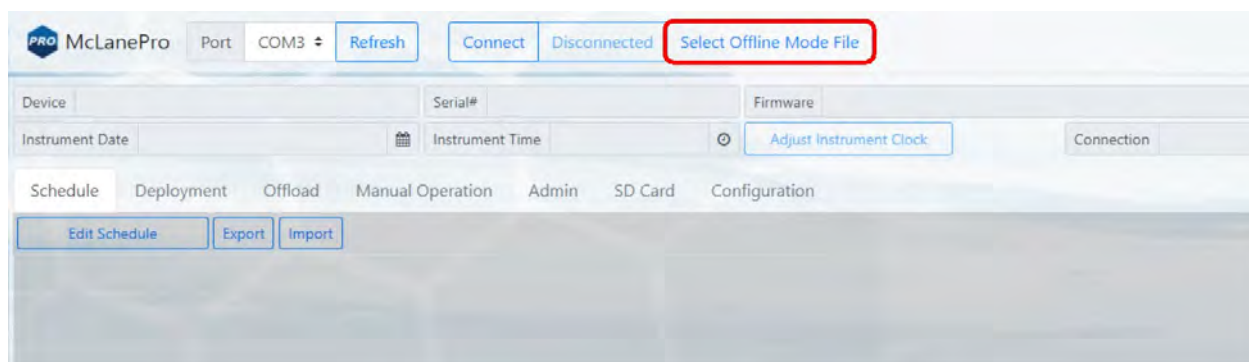
McLanePro - [1.5.8] Activity Log
File Edit

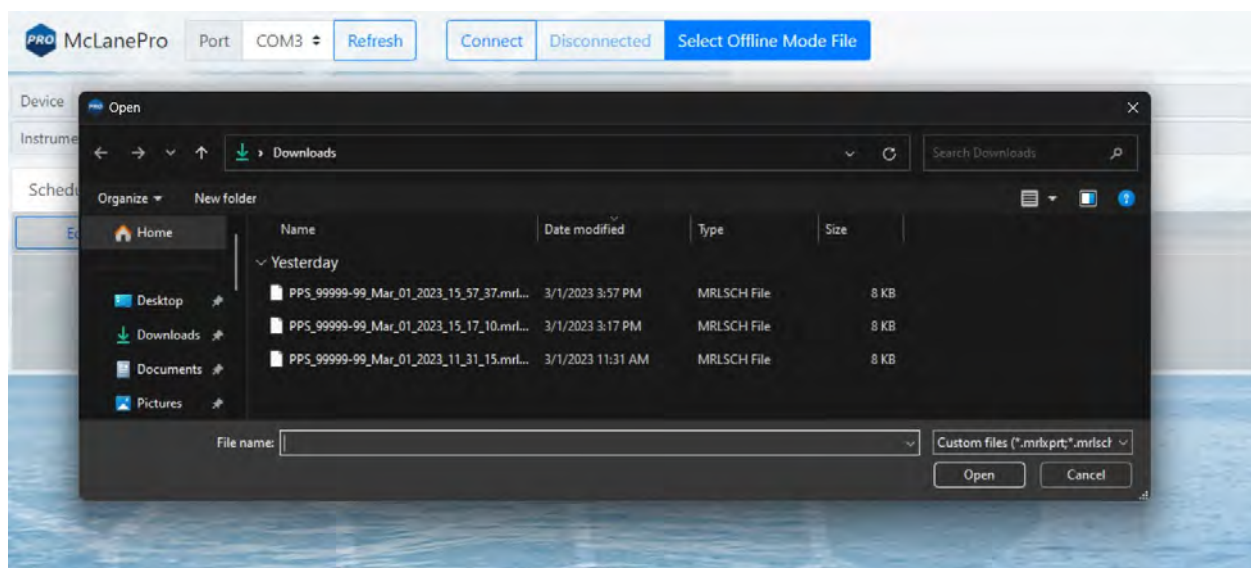
Host: read success - [system serial ?].
Host: read success - [pump 1 values].
Host: read success - [output_file /deployment/deployment_parameters.json].
Host: read success - [output_file /deployment/event_1.json].
Host: read success - [output_file /deployment/event_2.json].
Host: read success - [output_file /deployment/event_3.json].
Host: read success - [dir r ] /deployment_data_archive].
Host: read success - [dir r ] /deployment_data].
Host: read success - [output_file /configuration/Device_definition.json].
Host: read success - [output_file /configuration/rotary_valve.json].
Host: read success - [output_file /configuration/pump_1_configuration.json].
Host: read success - [output_file /configuration/flow_meter.json].
Host: read success - [output_file /configuration/fixative_valve.json].
Host: read success - [output_file /configuration/antifouling.json].
Host: read success - [device definition].
Host: read success - [device definition json].
Host: read success - [pump 1 values].
Host: read success - [fixative ?].
Host: read success - [antifouling ?].
Host: read success - [valve ?].
Host: read success - [dir r ] /deployment_data].
Host: read success - [dir r ]].
Host: read success - [deployment ?].
Host: read success - [system init_log].
Host: read success - [del /logs/system_init_log.json].
Host: read success - [output_file /configuration/antifouling.json].
Host: read success - [output_file /configuration/device_definition.json].
Host: read success - [output_file /configuration/fixative_valve.json].
Host: read success - [output_file /configuration/flow_meter.json].
Host: read success - [output_file /configuration/power.json].
Host: read success - [output_file /configuration/pump_1_configuration.json].
Host: read success - [output_file /configuration/rotary_valve.json].
Host: read success - [get_time].
Host: read success - [output_file /deployment/event_1.json].
Host: read success - [output_file /configuration/Device_definition.json].
Host: read success - [output_file /configuration/rotary_valve.json].
Host: read success - [output_file /configuration/pump_1_configuration.json].
Host: read success - [output_file /configuration/flow_meter.json].
Host: read success - [output_file /configuration/fixative_valve.json].
Host: read success - [output_file /configuration/antifouling.json].
Host: read success - [device definition].
Host: read success - [device definition json].
Host: read success - [pump 1 values].
Host: read success - [fixative ?].
Host: read success - [antifouling ?].
Host: read success - [valve ?].

```

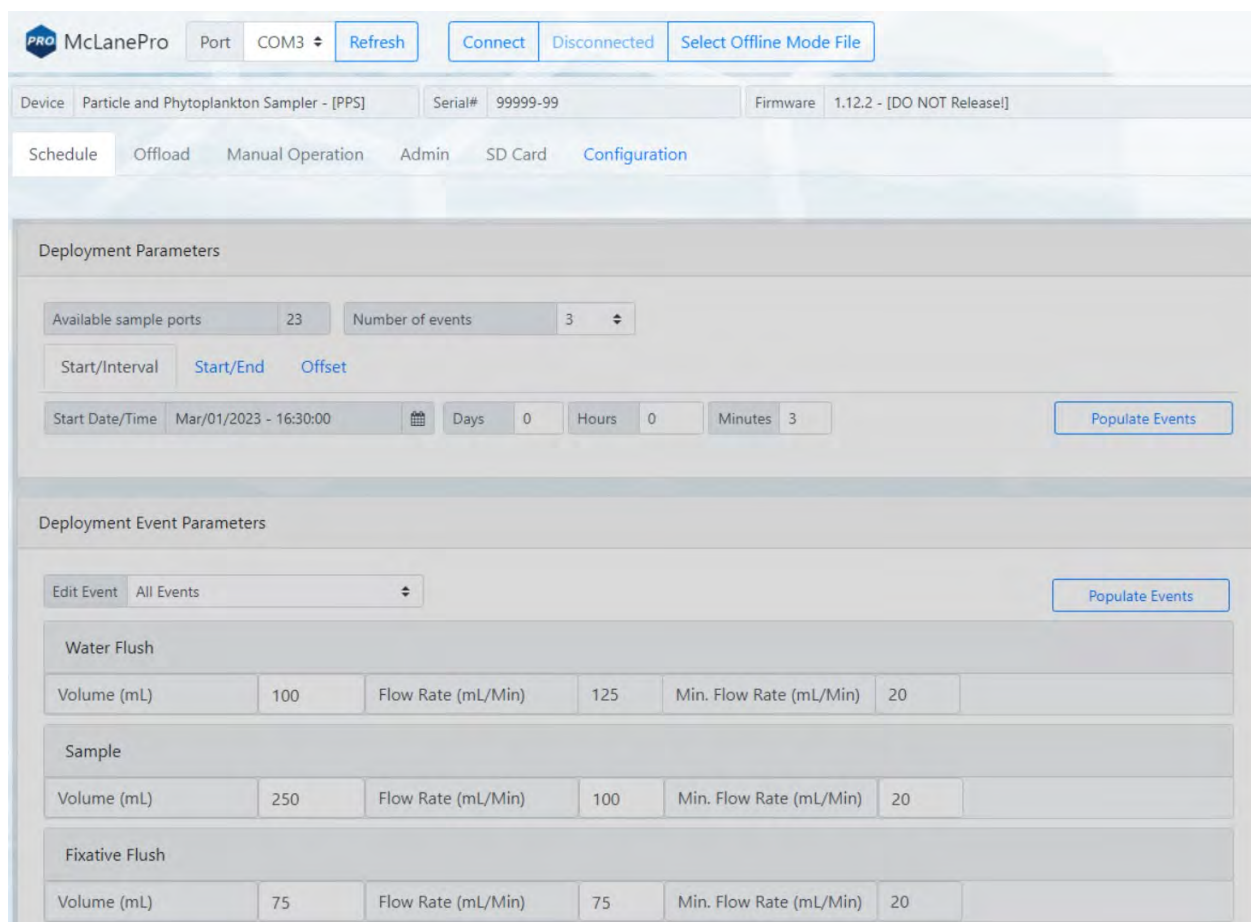
Offline Mode

Offline mode is available for browsing schedules or exported data files. A device is not required to be connected in order to view offline files. Click **Select Offline Mode File** to browse for available files. Supported file types are McLane *.mrlsch and *.mrlxprt.

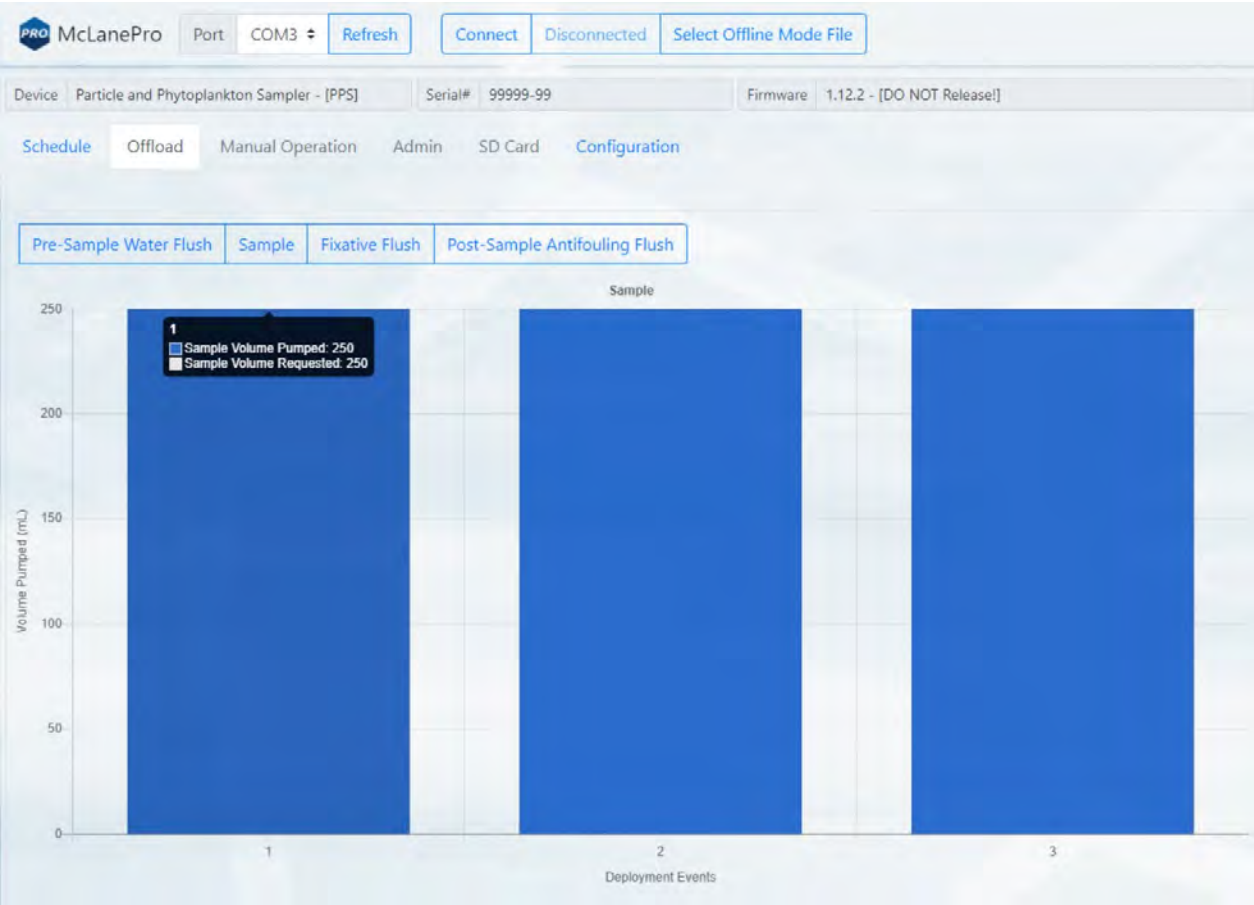




A *.mrlsch file will contain the schedule and device configuration along with the device, serial number and firmware information.



A *.mrlxprt file will contain schedule, configuration, device data, and additionally, offload data from a deployment.



PPS General Information

General information includes short descriptions of the PPS and available options. More detailed specification sheets are available on the McLane website, [PPS product page](#).

PPS General Information topics

[Description](#)

[Optional Fixative](#)

[Optional Antifouling Flush](#)

Description

The Particle and Phytoplankton Sampler (PPS) is an autonomous particulate sampler that filters up to 24 individual water samples in time-series with user-defined events. Particulate is collected onto user-supplied 47 mm polycarbonate or glass fiber filters (0.65 micron and greater).

Sample contamination by the pump is eliminated because the pump is downstream of the filter. The maximum volume per sample is 10 liters. Recorded deployment data are offloaded from the PPS after deployment and used for sample analysis.

Operating temperature ranges from 0° to +35°C water and maximum depth is 5,500 m.



Filter pore size is highly dependent on deployment depth and environmental conditions.



Optional Fixative Valve

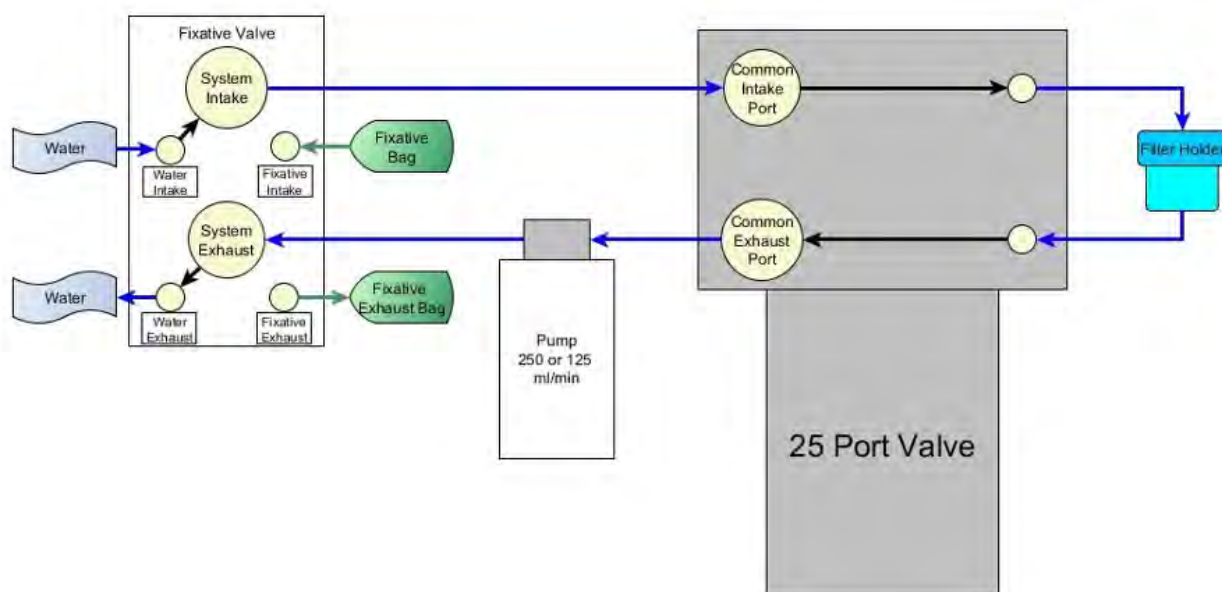
The optional fixative valve consists of a pair of three-way isolation solenoid valves that allow the PPS to switch the system intake and exhaust between the environment and a fixative solution. When the fixative valve is installed on a PPS, a post-sample fixative flush can be programmed to flood the filter holder with a fixative solution immediately after a sample is collected.

PPS systems with the fixative valve option have a two liter fixative bag and a two liter exhaust collection bag installed inside of a fixative box. Different fixative bag sizes can be configured in the firmware, although the exhaust bag must be the same size as the intake bag, or larger.



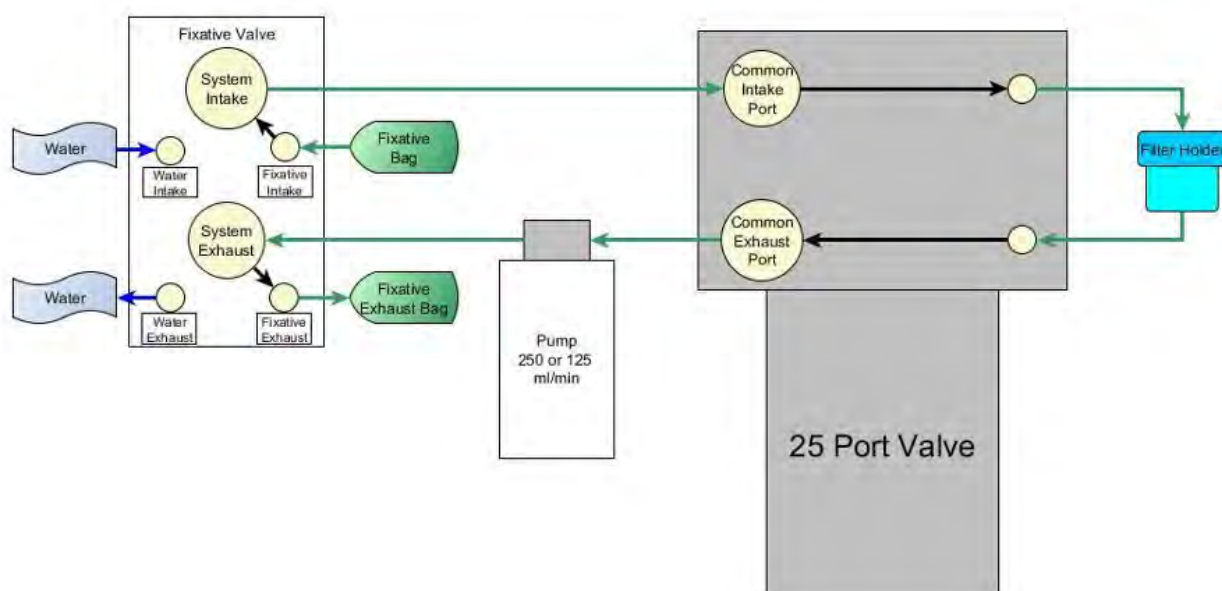
PPS Hydraulics w/Fixative Valve during Sample

During a sample, the Fixative Valve is de-energized and in the water position. Ambient water is pumped from the water intake port of the Fixative Valve, to the 25 Port Valve intake port, through the filter holder of the aligned port, out of the 25 port valve exhaust port, and out of the fixative valve water exhaust port.



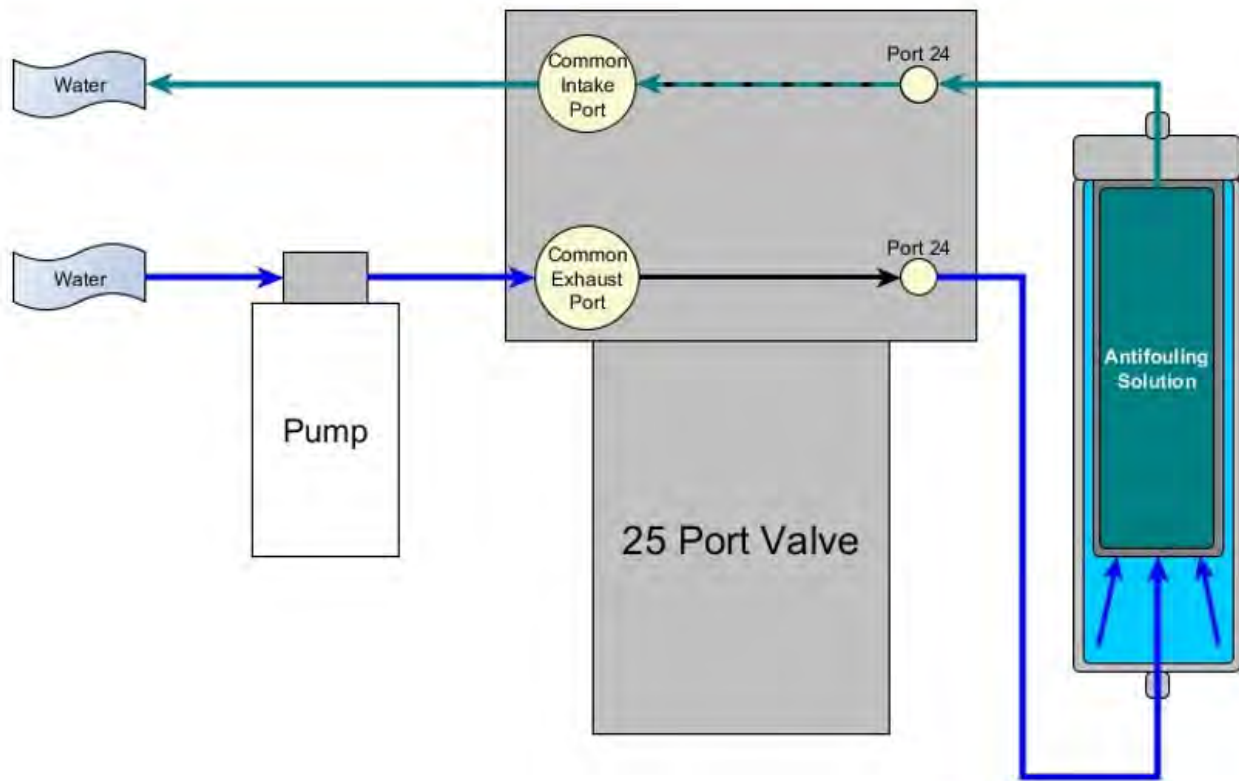
PPS System Hydraulics w/Fixative Valve during a Post-Sample Fixative Flush

Immediately after a sample is taken, the Fixative Valve is energized and switched to the fixative position. Fixative is pumped from the fixative bag through the fixative intake port of the fixative valve, to the 25 Port Valve intake port, through the filter holder of the aligned port, out of the 25 port valve exhaust port, and out of the fixative valve fixative exhaust port into the fixative exhaust bag.



Optional Antifouling Solution Reservoir

An 800 mL antifouling solution reservoir may be plumbed to port 24 of the multi-port valve, and is used to perform a pre- or post-sample antifouling flush. When an antifouling solution reservoir is installed on a PPS, a deployment is reduced to 23 events.



PPS Mechanical Information

Mechanical components of the PPS are described in the following sections.

PPS Mechanical Information topics

[Frame](#)

[Controller Housing](#)

[End Caps & O-rings](#)

[End Cap Bulkhead Connectors](#)

Frame

The PPS frame is an electro-polished, 316 stainless steel, welded frame (a titanium frame is optional).

The frame is designed as an inline component on a high-tension (up to 2,200 kg) ocean mooring and has a built-in top bridle and four mooring eyes at the bottom for a chain or cable bridle. Each mooring eye accommodates a 5/8" shackle, and has an insulator to protect the frame from corrosion.

Extra mounting space near the controller housing has room for other instruments. Zinc or steel anodes can be added to the frame when deploying the PPS in a highly corrosive environment

Controller Housing

The PPS controller housing is a heat-treated aluminum alloy cylinder. Pressure resistant to 5,500 meters, the controller housing holds a micro-controller, 3-phase pump-motor driver and a stepper-motor driver (for the multi-port valve). The controller housing has two sacrificial zinc anodes, one attached to each end for galvanic protection from corrosion.

This User Manual contains detailed instructions for [opening the controller housing](#). Follow these instructions and the recommended safety precautions when opening the controller housing.



End Caps & O-Rings

The top end cap seals the controller housing from water intrusion with a face O-ring seal and a radial O-ring seal (with a backup ring). O-ring maintenance and correct placement is critical to prevent water intrusion.

Each O-ring set includes three O-rings (2-246, 2-242, 8-242)

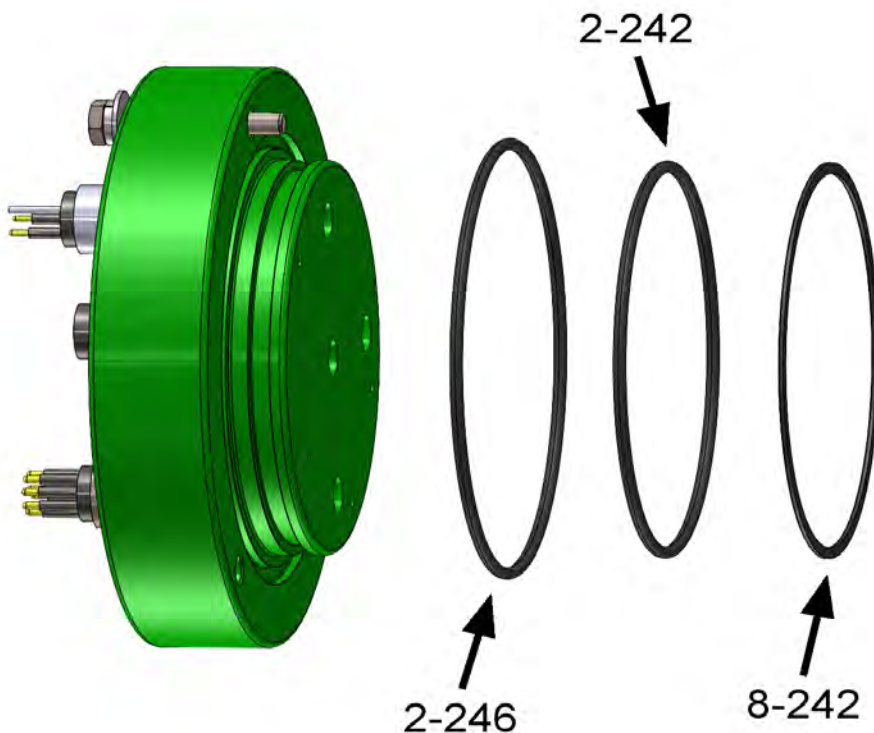
See [Maintenance and Storage](#) for details on cleaning the O-rings and proper O-ring positioning when inserting the end cap into the controller housing.

McLane uses O-rings that meet MIL-G 21569 Class 1 standards. We recommend that replacement O-rings meet this standard. Backup rings are Buna-N, Parker material NO300 or equal.

| O-RING | SPECIFICATION |
|--------|-------------------------------|
| 2-246 | 2-246, Buna-N, 70 A Durometer |
| 2-242 | 2-242, Buna-N, 70 A Durometer |
| 8-242 | 8-242, Buna-N, 90 A Durometer |



O-ring maintenance and correct placement is critical to keep the controller housing sealed from water intrusion. Incorrect o-ring placement results in cracks or splits that could affect the O-ring seal and cause water damage to the controller. Water damage from incorrectly placed or maintained O-rings could void the sampler warranty.



End Cap Bulkhead Connectors

All electrical connections are made through bulkhead connectors on the top end cap of the controller housing. Additionally, a pressure release valve is installed to vent pressure or vacuum before opening the controller housing. A zinc anode is attached to each end on the controller housing end cap to prevent corrosion. Spare zincs are included in the toolkit.

Do not over-tighten the end cap bolts and do not replace the stainless steel hardware with any

other hardware. The toolkit includes spare hardware, otherwise contact mclane@mclanelabs.com.



25-Port Valve

The PPS dual-head, 25-port rotary valve directs water through 24 individual filters at programmed times. The top head has a single intake port and 25 exhaust ports, and the bottom head has 25 intake ports and a single exhaust port. An internal optical sensor and slotted disk determine rotor position. The motor, gear head, and optical sensor are in a pressure compensated PVC plastic housing filled with Dow Corning PMX-200 (20 cSt.) silicone fluid. The valve top shows the port numbers, and the rotor position indicator points to the currently aligned port. The filter holders are connected between two valve heads. One port is open on each head at one time.

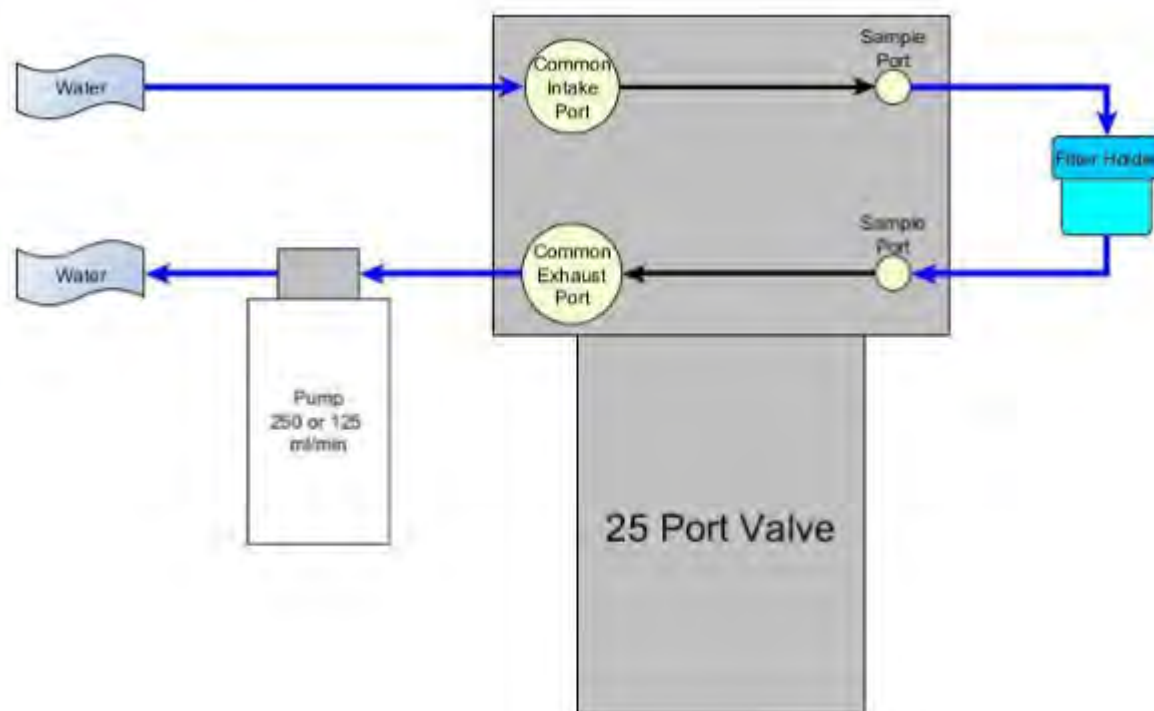


Sample flow

During sample collection, the PPS pump pulls water through the common intake at the top valve head, out a specific sample port to the filter holder, returns to the lower valve head and finally, through the pump and out the exhaust. The PPS may be configured with a 125 mL/minute or a 250 mL/minute pump.

- Standard PPS flow rate is 30 - 125 mL/min Standard (+/-5% error)
- Optional PPS flow rate is 60 - 250 mL/min Optional (+/-5% error)

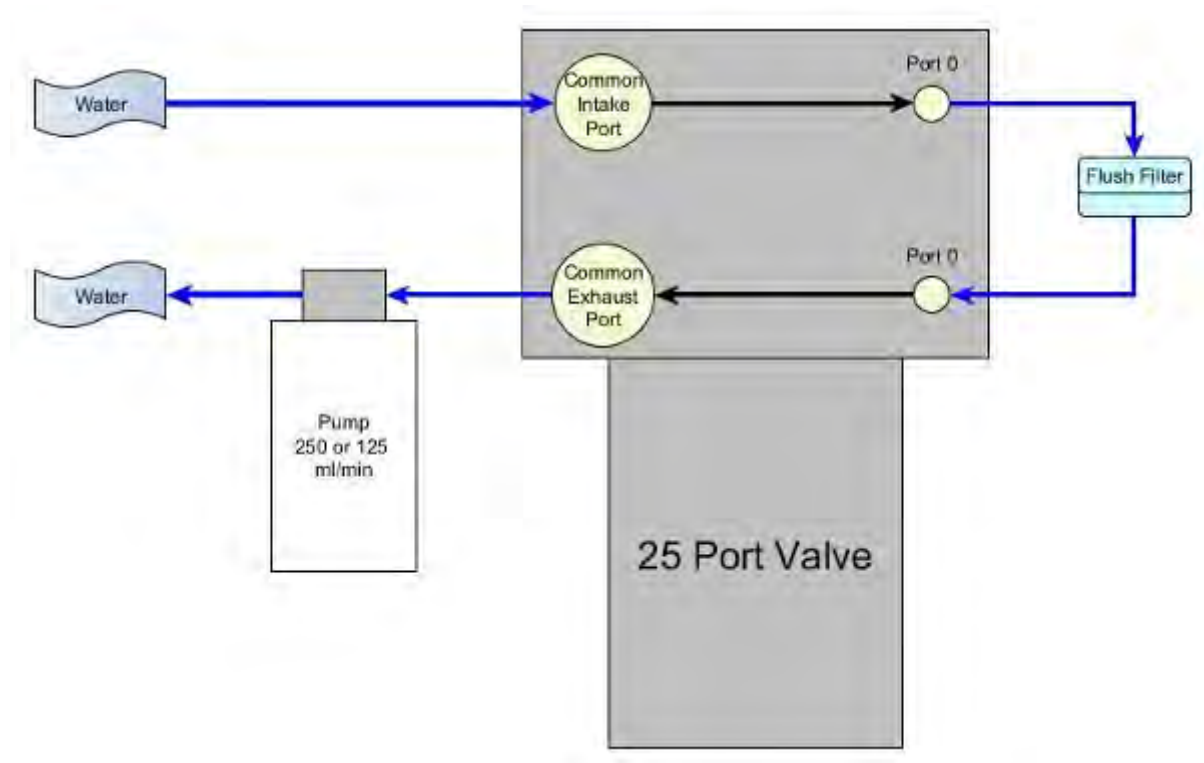
| Parameter | 125 mL / min pump | 250 mL / min pump |
|-------------------|--------------------------------|--------------------------------|
| Flow Rate | 30 - 125 mL / min. | 60 - 250 mL / min. |
| Minimum Flow Rate | 20 - (flow rate - 10) mL / min | 50 - (flow rate - 10) mL / min |
| Volume | 10-10,000 mL | 10-20,000 mL |



Water flush flow

The Home Port (Port 0) can be used to flush standing water from the valve intake tube and common plumbing before each sample is collected. This water flush prevents sample contamination and reduces accumulated bio-fouling.

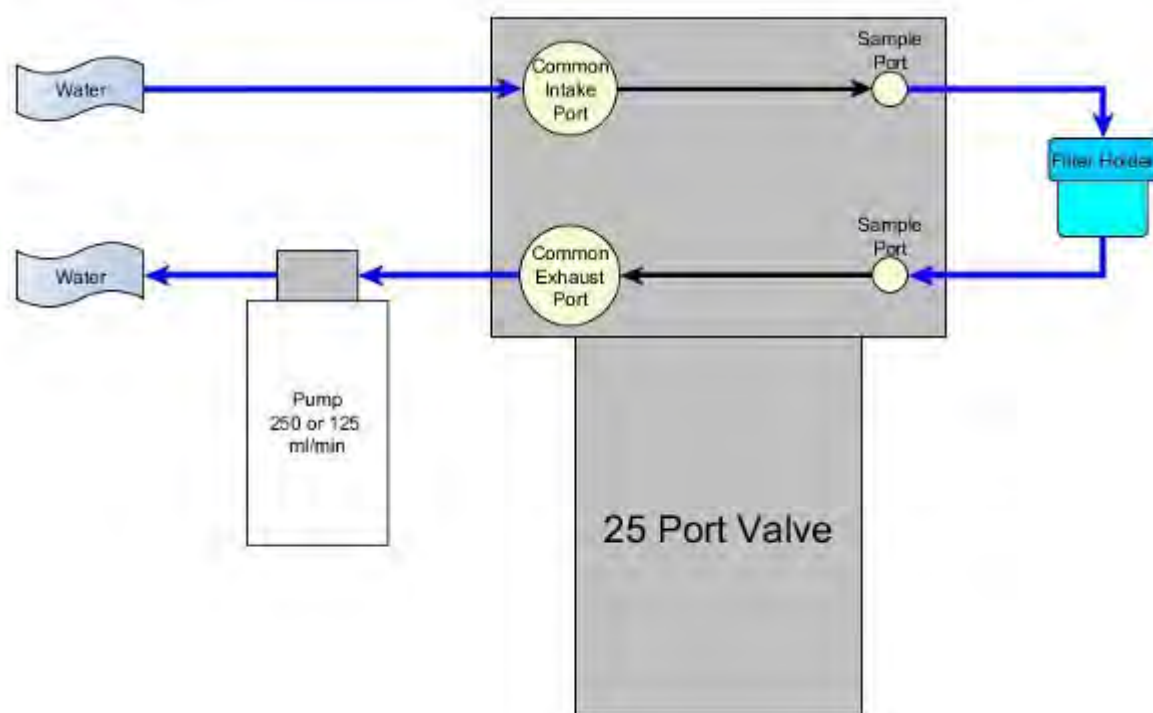
| Parameter | 125 mL / min pump | 250 mL / min pump |
|-----------|-------------------|-------------------|
| Flow Rate | 100 mL/min | 200 mL/min |
| Volume | 0 - 1000 mL | 0 - 1000 mL |



Fixative flush flow

If the PPS has the optional fixative valve installed, it can perform a fixative flush immediately after the sample to flood the filter with a fixative solution. Once a sample finishes pumping, the fixative valve is energized and it switches from its water position to its fixative position. The pump now draws from the fixative bag, and exhausts into the fixative exhaust collection bag.

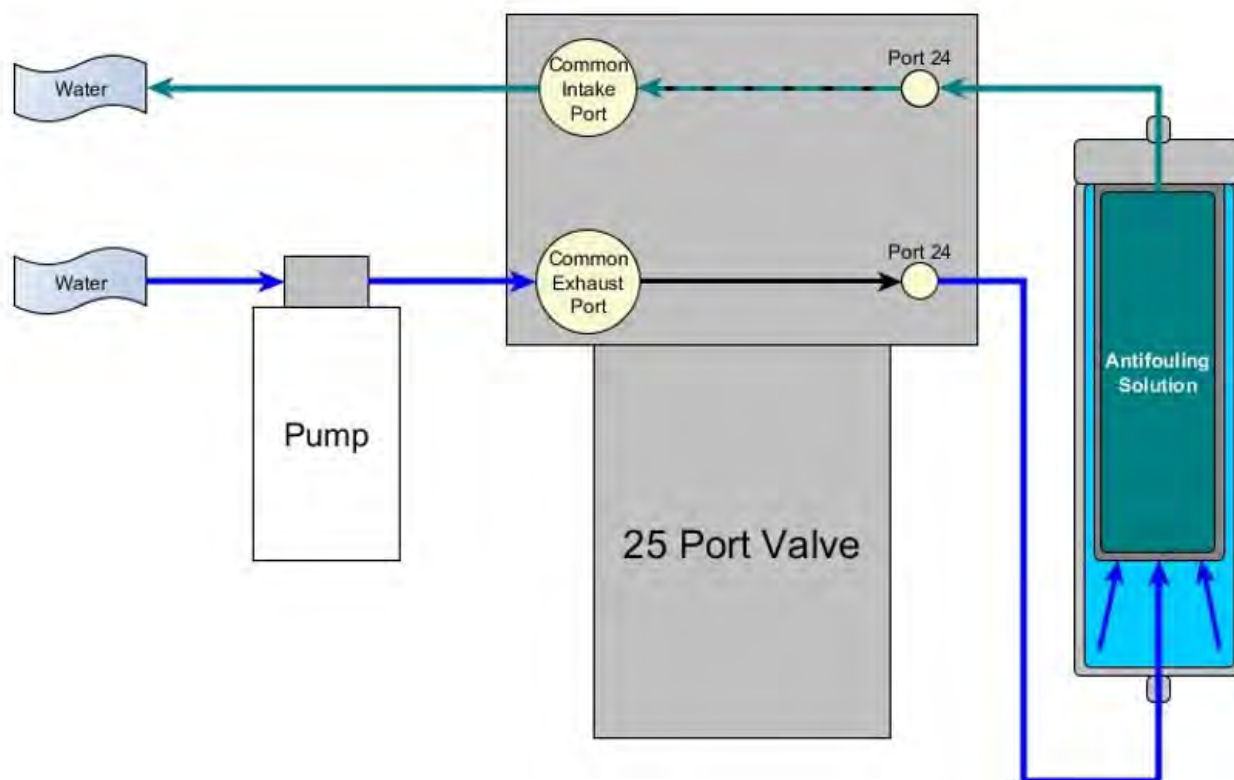
| Parameter | 125 mL / min pump | 250 mL / min pump |
|-----------|-------------------|-------------------|
| Flow Rate | 75 mL/min | 150 mL/min |
| Volume | 0 - 1000 mL | 0 - 1000 mL |



Antifouling flush flow

If the PPS has the optional antifouling reservoir it can start or finish an event with an antifouling flush. During an antifouling flush the PPS aligns the 25 port valve to port 24 and pumps in reverse into the antifouling reservoir. The water pumped into the reservoir squeezes a bag of antifouling solution, and an equal amount of cleaning solution is pushed through the PPS common plumbing. The cleaning solution remains in all common lines and prevents bio-fouling until the next scheduled event when it is flushed away during the pre-sample water flush.

| Parameter | 125 mL / min pump | 250 mL / min pump |
|-------------------|--|--|
| Flow Rate | 30 -125 mL / min. | 60 -250 mL / min. |
| Minimum Flow Rate | 20 - (flow rate - 10) mL / min | 50 - (flow rate - 10) mL / min |
| Volume | 0 - total antifouling solution / # of events | 0 - total antifouling solution / # of events |



Pump

The PPS may have a 125 or 250 mL/min positive displacement graphite gear pump installed. The pump head is type 316 stainless steel and has user replaceable carbon gears and magnet. A brushless DC 3-phase motor is magnetically coupled to the pump head, and driven by an algorithm designed to limit differential pressure at filters while maximizing battery life.



Filter Holders

The PPS collects samples on twenty-four 47 mm filter holders. Each filter holder is connected in series between the intake head (top half of the valve) and the exhaust head (lower half of the valve). The pump draws water out from the bottom of the filter creating a pressure gradient that pulls ambient seawater into the filter holder and through the filter. After each sample is taken,

the valve returns to Home Port (Port 0), and seals the sample in the filter holder. Filter holders use standard 70A Durometer silicone o-rings.



Home Port Flush Filter

The Home Port (Port 0) is used to flush standing water from the valve intake tube and valve heads before each sample is collected. This water flush prevents sample contamination and reduces accumulated bio-fouling. A filter assembly with a 25 mm filter holder holds a filter with a pore size between 5 and 20 microns to prevent large suspended particles from entering the pump while the valve is being flushed. Always replace this filter before every deployment.



Pump Calibration Fitting

The home port of the 25-Port valve has a precision orifice installed after the flush filter that is used by the PPS to automatically calibrate the pump flow estimate during the start of each deployment. The calibration orifice is installed in the lower barbed fitting of the home port. A replacement is provided in the toolkit if the original is broken or otherwise compromised.

PPS Electronics Information

The PPS operates on McLane Research Labs' Gen3 hardware consisting of a low-power micro-controller, motor controller, and connector interface board. Gen3 electronics interface with McLane's graphical user interface (GUI), called [McLanePro](#). Data are stored to a MicroSD® memory card, and are accessed using McLanePro software.

Related topic

[McLanePro Introduction](#)

PPS Electronics Information topics

[Opening the Controller Housing](#)

[Main Battery](#)

[Deployment Duration Estimate](#)

Opening the Controller Housing

Take care in maintaining, operating, and opening the pressure housing. A pressure relief valve (PRV) on the controller housing end cap releases automatically at a pressure differential greater than 10 psi. The PRV has a center hole. A pressure release valve screw is included in the toolkit.



WARNING - Turning the release valve adjusts release pressure.



Always use proper care and attention when handling high-pressure vessels after deployment!

Treat the controller housing as pressurized until manually vented by the pressure relief valve.

1. Slowly pull on the pressure relief valve using the supplied pressure release valve tool to release any vacuum or built-up pressure in the housing.
2. Loosen each end cap bolt a few turns at a time in a star pattern. If the end cap moves away from the housing, this indicates that the housing is still pressurized. In this case, continue venting using the PRV.
3. When pressure is equalized, remove and place the end cap hardware somewhere safe.

Typically plastic inserts have a snug fit and will remain in the end cap.

4. Grasp the end cap lip with fingertips and pull the end cap out of the housing. The end cap to housing seal is tight and sometimes difficult to open. Do not use a tool to pull open the housing. The end cap O-rings can be damaged if objects are used to separate the end cap from the housing.

Main Battery

The PPS has a battery holder that accepts 24 user replaceable, drop-in, alkaline "D" cell batteries, providing 10,000 mAh of battery capacity. The batteries do not come installed in a new PPS. New batteries are included either in the [toolkit](#) or in the shipping crate.



Always take standard electrostatic discharge (ESD) precautions when handling the electronics.

Install the batteries with the correct orientation in the holder terminals.

[Connecting the Batteries](#)

An instructional video showing drop-in battery replacement is shown on the PPS video pages at www.mclanelabs.com.

Deployment Duration Estimate

This deployment endurance estimate for PPS drop-in battery holders assumes:

- 24 new alkaline "D" cell batteries. Do not mix old and new batteries.
- A de-rated battery capacity of 10,000 mAh.
- Per-year self-discharge rate of 6%.

Battery life for a planned PPS deployment can be estimated using the instrument current consumption values provided here. These values apply to McLane's Gen3 electronics. The 24 alkaline "D" cells in the drop-in battery holder deliver approximately 10,000 mAh. In addition to pumping time, many other deployment conditions can affect the battery duration. Use this example for estimation only.

- Pre-deployment battery estimate assumes initial setup steps and does not include bench testing or running diagnostics.
- Pumping assumes unrestricted flow.

| | |
|--|---|
| Pre-deployment (system preparation) | |
| Controller Electronics (ON) - 3 hours | $3 \text{ h} \times 21.7 \text{ mA} = 65.1 \text{ mAh}$ |
| Moving Valve (25 ports, single port advance) | $25 \text{ ports} \times 0.0028 \text{ h} \times 192 \text{ mA} = 13.4 \text{ mAh}$ |

| | |
|---|---|
| Pumping - 0.5 hours | $0.5 \text{ h} \times 121 \text{ mA} = 60.5 \text{ mAh}$ |
| | Subtotal = 139 mAh |
| Deployment | |
| Controller Electronics (Low Power Sleep) - 1 year | $8760 \text{ h} \times 0.06 \text{ mA} = 525.6 \text{ mAh}$ |
| Moving Valve (24 port deployment) | $0.874 \text{ h} \times 192 \text{ mA} = 167.8 \text{ mAh}$ |
| Pump Water Flush (24 ports) | $24 \text{ ports} \times 0.0134 \text{ h} \times 141 \text{ mA} = 45.3 \text{ mAh}$ |
| Pump Sample (24 ports) | $24 \text{ ports} \times 1.667 \text{ h} \times 121 \text{ mA} = 4841 \text{ mAh}$ |
| Optional Fixative Flush (24 ports) | $24 \text{ ports} \times 0.0084 \text{ h} \times 292 \text{ mA} = 58.9 \text{ mAh}$ |
| | Subtotal = 5638.6 mAh |
| Recovery (offload data, remove samples) | |
| Controller Electronics (ON) - 2 hours | $2 \text{ h} \times 21.7 \text{ mA} = 43.4 \text{ mAh}$ |
| Moving Valve (25 ports, single port advance, once around) | $25 \text{ ports} \times 0.0028 \text{ h} \times 192 \text{ mA} = 13.4 \text{ mAh}$ |
| | Subtotal = 56.8 mAh |
| Total Battery Consumption | $139 + 5638.6 + 56.8 = 5834.4 \text{ mAh}$ |

This example shows that the total energy consumed is 5834 mAh, which will not exceed the 10,000 mAh battery life.

PPS Deployment Operations

This section provides guidance for operating the PPS.

PPS Operations topics

Prepare

[Deployment Preparation](#)

Prime

[Priming the PPS](#)

[Installing the Water Flush Filter](#)

[Preparing the optional Fixative Valve for deployment](#)

[Preparing the optional Antifouling Flush reservoir](#)

Deploy

[Programming a Deployment](#)

[Deploying the PPS](#)

Recover

[Recovery and Data Offload](#)

[Remove the Filters](#)

[Recover the PPS](#)

[Connect to the PPS](#)

[Download Deployment Data](#)

Deployment Preparation

The following steps will prepare the PPS for communication and operation when preparing to deploy the instrument.

1. Install the "D" cell alkaline batteries. (See [Connecting the Batteries](#))
2. [Connect battery power.](#)
3. [Close the controller housing.](#)
4. Remove the dummy plug from the communications bulkhead.
5. Connect the USB COM cable.
6. Confirm that McLanePro and the instrument are communicating.

Related topics

[Download McLanePro](#)

[Priming the PPS](#)

[Installing the Water Flush Filter](#)

[Preparing the Optional Fixative Flush](#)

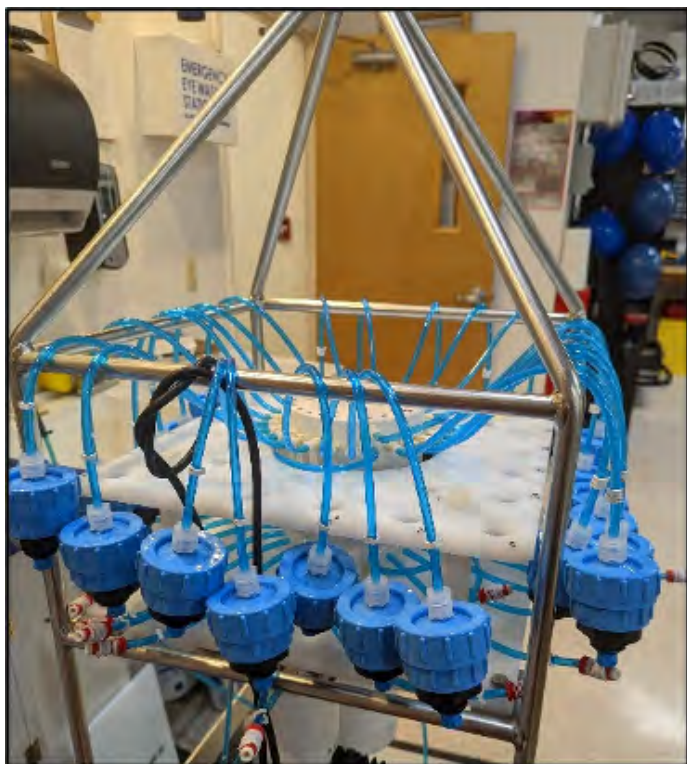
[Preparing the Optional Antifouling Flush Reservoir](#)

Priming the PPS

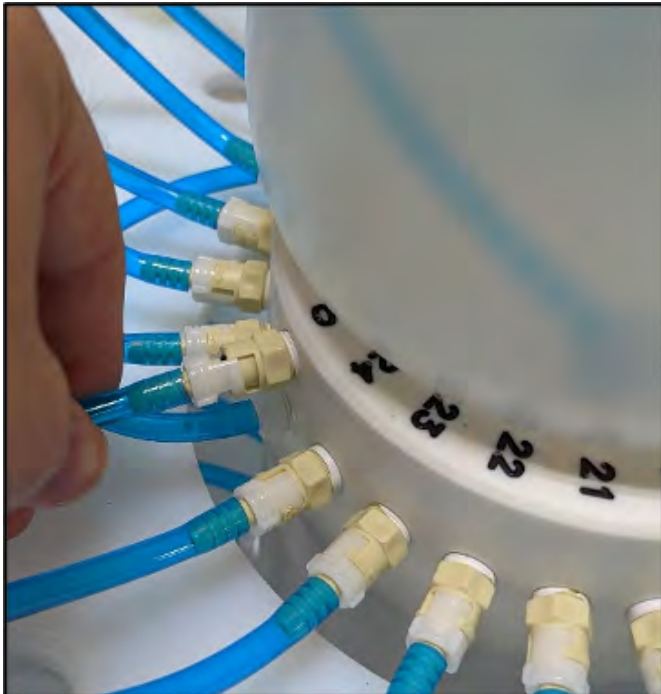
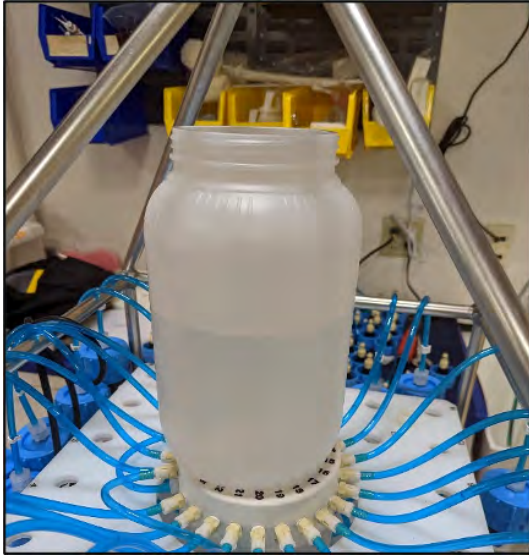
The ultimate goal of the priming procedure is to clear all fluid lines and valve ports of trapped

air. This is a wet process and should be completed by two people. These required tools are included in the tool kit:

- 7/16 hand driver (to open and close the enclosure)
 - Hose-A
 - Hose-B
 - Hose-C
 - Hose-G
 - Luer lock water syringe
 - Water container filled with neutral water.
1. Follow the steps in the Getting Started chapter of this User Manual to establish communications with the PPS.
 2. Close and seal the controller housing.
 3. From the **Manual Operation tab**, click the **Find Home** button to align the 25 port valve to the home port.
 4. Also on the **Manual Operation tab**, confirm the Fixative Valve is OFF (or deactivated, in the water position - if equipped).



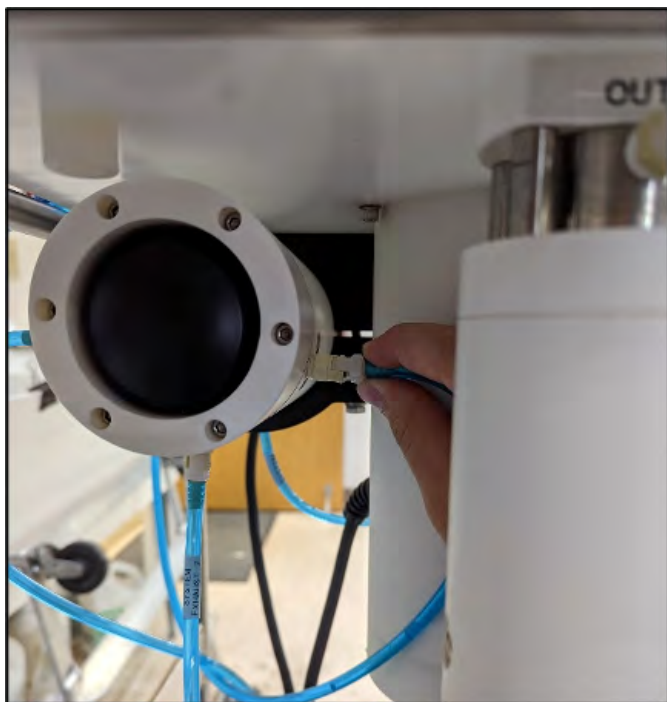
5. Disconnect bottom tubing from all of the filter bodies.
6. Disconnect filter bodies from the filter base plate, but keep the tops of the filter bodies connected to the 25 port valve.
7. Place a container of neutral water on top of the 25 port valve.





8. Connect Hose-A to the common intake on the 25 port valve. If the fixative valve is installed, connect Hose-A to the water intake port of the fixative valve instead.
9. Place the opposite end of Hose-A in the water container.





10. Connect Hose-B to the exhaust port of the micro-pump. If the fixative valve is installed, connect Hose-B to the exhaust port of the fixative valve instead. Place the opposite end of Hose-B in the water container.
11. Connect Hose-C to the syringe, fill the syringe with water, and remove air from the syringe.
12. Using the controls provided on the **Manual Operation tab**, click **Next Port** to advance to the next port (Port 1).
13. Open filter holder 1 by twisting the top half from the bottom half, and connect the bottom half of the filter to Hose-C which is connected to the syringe.



14. Use the syringe to inject water through the bottom half of the filter holder until all air is removed and water pools on the top.



15. Place a filter on the bottom half of the filter holder and allow it to soak up the pool of water. Continue to slowly inject water if the filter requires more to become completely saturated.
16. Reattach the bottom half to the top half of the filter body. The top filter ring of the filter holder must be fully engaged and tightened down to the filter holder body. To avoid introducing air back into the purged bottom half of the filter body, the syringe can be used to inject water very slowly while attaching the top and bottom halves.



17. Once the two halves of the filter body are connected, slowly inject the remaining contents of the syringe through the filter body to remove all air from the remaining plumbing. Lightly

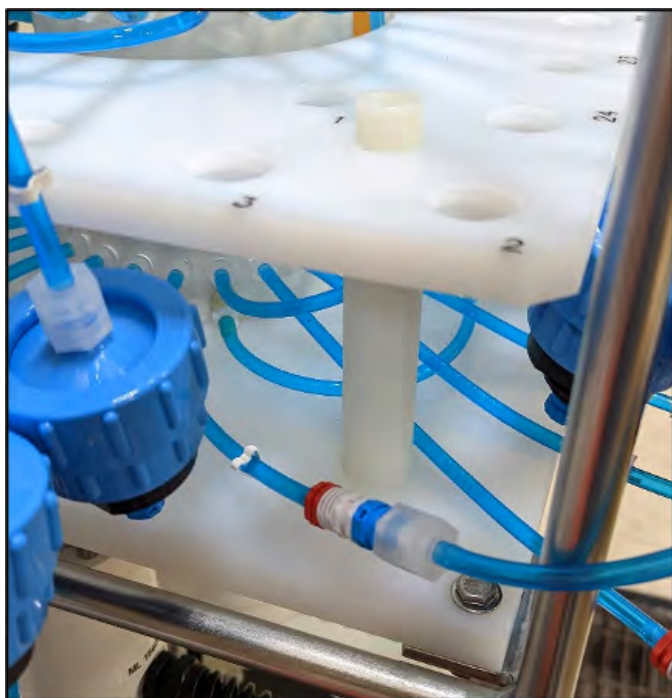
tapping the filter against the PPS frame while doing this will remove any trapped air. As water is injected, air bubbles should appear in the water container.

18. Continue injecting until air bubbles stop, the syringe may need to be refilled during this process.



The filter body has a valved connection and will seal immediately when disconnected. This seal will inhibit introducing air while refilling the syringe. Remember to remove all air from the syringe before reconnecting the syringe to the filter body

19. When all air has been purged from the filter position plumbing, disconnect the syringe from the filter body.
20. Connect Hose-G to port 1 bottom tubing, and place the other side of the hose in the water container.



21. Use the Pump Operation controls on the **Manual Operation tab** to pump 500 mL of water at 125 mL/minute in reverse. While the system pumps in reverse, air is pushed from the plumbing into the water container. Once all air has been removed from the filter position plumbing, cancel the pumping operation by clicking the **Stop Pumping** button.
22. Click the **Next Port** button to advance to the next port.
23. Disconnect Hose-G and reattach the filter body to port 1 of the filter base plate.
24. Attach bottom tubing for port 1 to filter body.

25. Repeat steps 11 - 24 for all filter positions.
26. Once priming is complete, disconnect Hose-A and Hose-B from the system, remove the water container from the top of the multi-port valve and move on to the next step, [Installing the Water Flush Filter](#).
27. Once all of the sample positions have been primed, return the valve to the home port (Port 0).

Installing the Water Flush Filter

The water flush filter installed in-line to Home Port (port 0) accepts a 25 mm filter with a pore size from 5 to 20 microns. The filter protects the pump head from damage by large particles when the water flush clears the fluid lines between samples.



Required tools:

- Hose-A
 - Hose-B
 - Hose-E
 - Luer lock water syringe
 - Water container filled with neutral water.
 - 5-20 micron 25 mm filter
1. From the **Manual Operation tab**, click the **Find Home** button to align the 25 port valve to the home port.
 2. Also on the **Manual Operation tab**, confirm the Fixative Valve is OFF (or deactivated, in the

water position - if equipped).

3. Connect Hose-E to the syringe, fill the syringe with water, and remove any air from the syringe.
4. Connect Hose-A to the common intake on the 25 port valve. If the fixative valve is installed, connect Hose-A to the water intake port of the fixative valve instead. Connect the other end to Hose-E and the syringe.
5. Connect Hose-B to the exhaust port of the micro-pump. If the fixative valve is installed, connect Hose-B to the water intake port of the fixative valve instead. Place the opposite end of Hose-B in the water container.
6. Find the 25 mm home port flush filter holder, install a 25 mm filter.
7. Slowly inject with the syringe until air bubbles stop coming out of Hose-A.

Preparing the optional Fixative Flush

Consider the following when determining the total amount of fixative for a deployment:

- Chemical Compatibility: The PPS and Fixative Valve are compatible with most fixative solutions. Before deploying the PPS with the Fixative Valve option, confirm fixative concentrations by running tests to determine sufficient fixative for your specific needs. Contact mclane@mclanelabs.com for questions about compatibility.
- The PPS with Fixative option includes 2000 mL bags. Contact mclane@mclanelabs.com for information about using bags of a different size.
- A Fixative Flush of 3X the internal volume of the filter holder should be sufficient for a fixative that requires a high ending concentration.
- The internal volume of each PPS filter holder and tubing is approximately 22 mL.
- The maximum allowable fixative flush volume for a single event is 95% of the available fixative volume divided by the number of events in the deployment.

Total Required Fixative = (Fixative Flush volume * number of events) + (0.05 * Fixative Reservoir Bag size)



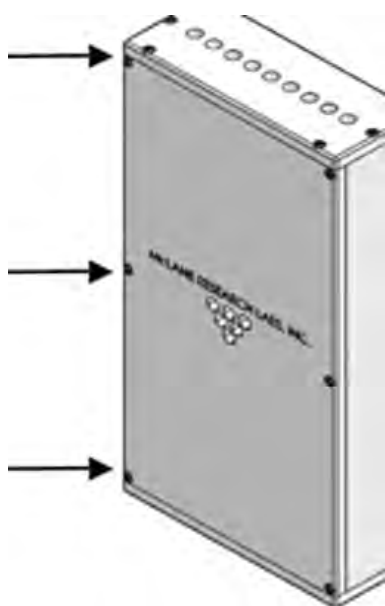
Follow the recommended chemical safety precautions for the Fixative being used.

Priming the Fixative Valve Plumbing

Required tools:

- 7/16" hand driver (to open and close the controller housing)
- Hose-A
- Hose-B
- Hose-E
- Hose-F
- Luer lock water syringe
- Water container filled with neutral water.

1. Open the Fixative Box by removing the six nylon ¼-20 fasteners on the cover of the box.



2. Remove the fixative bag and fixative exhaust collection bag from the fixative box.
3. Place a container of water on the floor near the PPS.
4. From the **Manual Operation tab**, click the **Activate Fixative Valve** button to toggle the Fixative Valve to the ON (fixative) position.
5. Check the 25 Port Valve position indicator in the **Manual Operation tab** to ensure it is aligned to port 0.
6. Connect Hose-A to the Fixative Exhaust-1 Hose inside of the Fixative Box, and place the other end in the water container. Use the nut attached to the hose as a weight to keep the hose submerged in the water container.
7. Connect Hose-E to the Fixative Syringe, and fill the syringe with Fixative.
8. Connect the Fixative Syringe and Hose-E to Fixative Intake-2 Hose inside the Fixative Box.

9. Use the Fixative Syringe to SLOWLY inject fixative through the fixative plumbing. This will cause air to exit Hose-A into the water container. If it is not very easy to push water through the fixative plumbing, stop and check the **Manual Operation tab** to make sure that the Fixative valve is in the ON position, and the 25 Port Valve is aligned to port 0.
10. When the air bubbles have stopped, click **Deactivate Fixative Valve** on the **Manual Operation tab** to switch the Fixative Valve to the OFF (Water) position. This will seal the fixative plumbing, to keep air out.
11. Disconnect Hose-A, and the Fixative Syringe from the fixative intake and exhaust plumbing.
12. Empty any remaining fixative out of the syringe and Hose-A.
13. Connect Hose-A to the water intake port of the fixative valve.
14. Connect Hose-B to the water exhaust port of the fixative valve.
15. Make sure the fixative valve is in the OFF position.
16. Use the Pump Operation controls on the **Manual Operation tab** to pump 100 mL forward at 100 mL / minute to flush fixative from the common plumbing.
17. When flushing is complete, disconnect Hose-A and Hose-B.

Filling the Fixative Bags

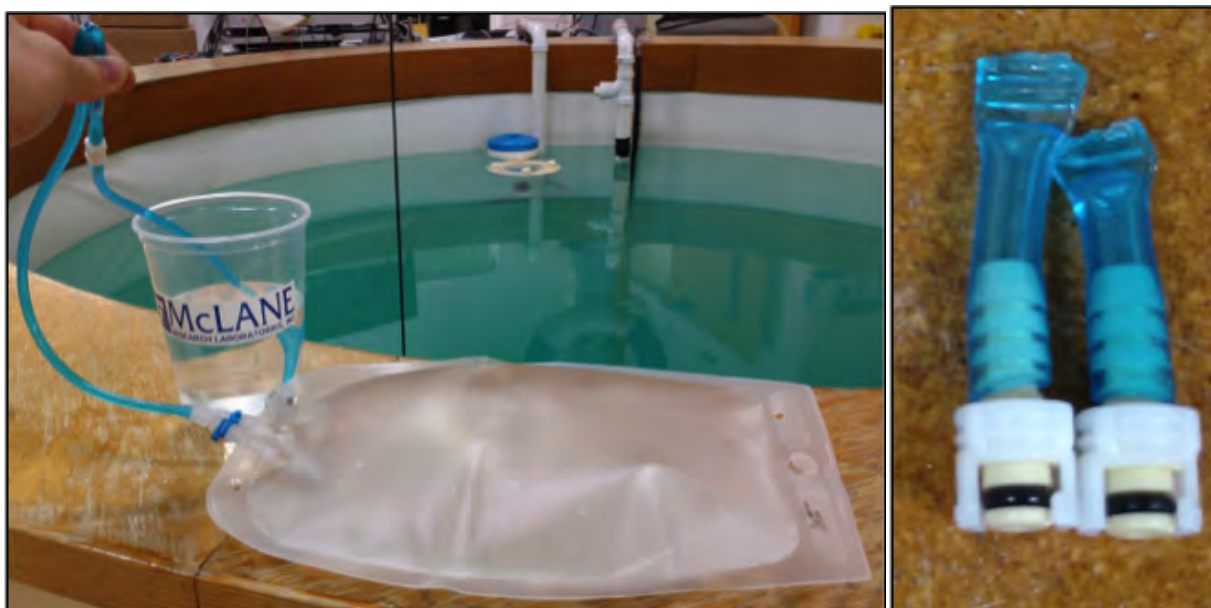
1. Weigh the Fixative Intake Bag, and record the weight.
2. Locate the Fixative Syringe, Hose-F, and the quick disconnect plugs in the toolkit.
3. Fill a container with fixative, place it on a surface with the fixative bags.
4. Connect the Fixative Syringe to Hose-F, and fill the syringe with fixative.
5. Inject the contents of the syringe into Fixative Intake Bag. Repeat this process until the amount of fixative required by the deployment is added to the Fixative Intake Bag.



6. When filling is complete, remove Hose-F from the syringe, while leaving Hose-F attached to the Fixative Intake Bag.
7. Place the free end of Hose-F into the fixative container using the nut attached to the hose as a weight to keep the hose submerged.



8. Squeeze the air out of the fixative intake bag, through the hose, into the container.
9. After air is removed, seal the Fixative Intake Bag by folding the end of the hose and pinching it shut. Disconnect Hose-F from the Fixative Intake Bag, and connect the quick disconnect plug.



10. Weigh the Fixative Intake Bag and record the weight. Subtract the empty bag weight from the filled bag weight to determine the total amount of fixative added.
11. Pinch the Fixative Intake Bag hose, disconnect the plug, and while continuing to pinch the hose, attach the bag to the Fixative Intake-2 hose inside of the Fixative Box. If done

correctly no air should have been introduced.

Filling the Fixative Exhaust Collection Bag

It is important to fill the collection bag with a volume of water equal to 5% of the bag's rated capacity. Without this water a differential pressure could build across the Fixative Valve O-ring seals at ocean depths, potentially damaging the fixative valve.

1. Locate the Fixative Syringe, Hose-E, a water container, and the quick disconnect plugs in the toolkit.
2. Connect Hose-E to the Fixative Syringe.
3. Fill the syringe with neutral water. The exhaust bag doesn't require fixative.
4. Inject approximately 5% of the Fixative Exhaust Bag's capacity into the bag. Typically 100 mL for a 2000 mL fixative bag.
5. When filling is complete, remove Hose-E from the syringe while leaving it attached to the Fixative Exhaust bag.
6. Place the free end of Hose-E into the container using the nut attached to the hose as a weight to keep the hose submerged.
7. Roll up the Fixative Exhaust Bag to force air from it into the water container.



8. Pinch the end of the Fixative Exhaust Bag hose, disconnect Hose-E. While continuing to pinch the hose, attach the bag to the Fixative Exhaust-1 hose inside of the Fixative Box. If

done correctly no air should have been introduced.

9. Attach the Fixative Intake Bag and Fixative Exhaust Bag to the fixative box using the nylon 1/4-20 fasteners. Keep the hose connections facing downward, and the Fixative Exhaust bag in front of the Fixative Intake bag.

Preparing the optional Antifouling Flush

If this is the last time the PPS pump and valve are used, there will be antifouling solution in the common plumbing until the next event.

Required tools:

- 7/16" hand driver (to open and close the enclosure)
 - Hose-A
 - Hose-B
 - Hose-E
 - Hose-F
 - Luer lock water syringe
 - Water container filled with neutral water.
1. From the **Manual Operation** tab, click the **Find Home** button to align the 25 port valve to the home port.
 2. Attach Hose-A to Water Intake port of the fixative valve.
 3. Attach Hose-B to Water Exhaust port of fixative valve.
 4. Put the opposite ends of both Hose-A and Hose-B in a container full of water placed on top of the 25 port valve.
 5. Detach the Antifoul-1 hose from the port 24 filter position quick disconnect on the filter baseplate.
 6. Attach Hose-C to the Antifoul-1 hose and place the opposite end of Hose-C in the water container.



7. Attach Hose-E to the Water Syringe.
8. Detach Antifoul-2 Hose from the luer lock fitting on the tube cap.
9. Remove the Antifouling Tube Cap and the connected bag from the Tube.
10. Attach Hose-F to the tube cap.
11. Attach the syringe to the tube cap by connecting Hose-E and Hose-F together.
12. Use the syringe to remove air and or fluid from the antifouling bag.
13. Pinch Hose-F using the small piece of black tubing included in the toolkit to prevent air from entering back into the bag.



14. Disconnect Hose-E from Hose-F and fill the syringe with cleaning solution.
15. Fill the antifouling tube to the brim with water.
16. Insert the bag into the tube and secure the cap.
17. Connect the syringe of cleaning solution to the antifouling bag by reconnecting Hose-E and Hose-F.
18. Remove the small piece of black tubing used to pinch Hose-F.
19. Slowly inject the cleaning solution into the antifouling bag with the syringe. This will fill the bag, which will displace water from the tube and out Antifoul-1 hose, through Hose-C, into the water container.
20. Repeat steps 13-19 until 820 mL of cleaning solution have been injected into the antifouling bag. Make sure to inject the final portion slowly.
21. Reconnect the Antifoul-1 hose back to the filter 24 position on the filter baseplate.
22. Reconnect the Antifoul-2 hose back to the tube cap luer lock connector.
23. Use the Pump Operation controls on the **Manual Operation tab** to pump 20 mL of cleaning solution at 100 mL / minute (pump in reverse). This will prime the antifouling plumbing with cleaning solution.

24. If these instructions were followed, there will be 800 mL of antifouling solution remaining in the bag after pumping 20 mL. Take note of this volume, as it will be entered into the configuration of the PPS during deployment setup.

Programming a Deployment

Using [McLanePro](#), follow the steps outlined in the [Schedule tab](#) descriptions to program a deployment schedule and to configure the deployment parameters.

If equipped, set the available volumes for fixative and/or antifouling solution on the [Manual Operation tab](#).

Ensure any intake or exhaust plugs are removed, and that the valve is aligned to the home port.

Related topics

[Deploying the PPS](#)

Deploying the PPS

1. Follow the steps in [Starting a Deployment](#) to begin the deployment process.
2. Once the PPS had been deployed, disconnect the communications cable and attach the dummy plug.



Remove the intake cap used during priming before deploying the PPS. Failure to remove this cap prevents proper sample collection.

3. Install the PPS into its deployment location, whether that is attached to a mooring, suspended by a winch cable, or otherwise installed at a location of interest.

Recovery and Data Offload

After the deployment is completed, the required steps are:

- Recover the PPS and prepare to communicate with the instrument.
- Connect to the PPS using McLanePro and download deployment data. See the instructions in the [Offload tab](#) section.
- Retrieve the filters for sample analysis.
- Clean PPS fluid paths, filter holders, fixative valve, and plumbing.

Related topics

[Recover the PPS](#)

[Connect to the PPS](#)

[Download Deployment Data](#)

[Retrieve Sample Filters](#)

Recover the PPS

Once the sampling events are completed, the PPS must be recovered in order to retrieve the filters, and to download the deployment data.

1. Recover the PPS from the mooring, wire or fixed deployment location.
2. If possible, rinse the entire exterior of the PPS with fresh water.
3. Move the instrument to a location that will allow for easy communication.

Connect to the PPS

1. Wipe away any excess water from the controller end cap, so that a connection to the instrument can be made safely.
2. Remove the dummy plug from the PPS communication bulkhead connector.
3. [Connect to the PPS](#) using [McLanePro](#) and prepare to download deployment data.

Related topic

[Download Deployment Data](#)

Download Deployment Data

It is the responsibility of the user to properly download the most recent deployment data in order to keep a record of the deployment. Deployment data will include useful information about the sample event and conditions during the deployment. These data may include event times, sample deployment parameters, pumping data during the event and any exit conditions related to the sample event.

1. Follow steps listed in [Connecting to the PPS](#) to initiate communication with the instrument.
2. Download the recent deployment data using tools available on the [Offload tab](#).
 - It is recommended to export data using both the **Export** and **CSV** buttons provided on the **Offload tab**.
3. Check downloaded data to ensure that the correct data set has been offloaded and that there are no problems reported.
4. Continue to [Removing the Filter](#) in order to retrieve the filter and prepare for another deployment or to prepare for storage.

Related topic

[Removing the Filter](#)

Retrieving Filters for Sample Analysis

After a deployment is complete and the system has been recovered, the filter holders can be removed for sample analysis. The quick disconnect connector on the bottom of the 47 mm filter holder is a valved connection and will close on disconnect, retaining the contents of the filter holder. Hose-C and a syringe can be used to remove the liquid contents of a filter holder. The details of processing the sample contained in a filter holder will vary from deployment to deployment, and will ultimately need to be decided by the scientist. If fixative was used during the deployment, make sure to follow all safety procedures while handling the filter holders and filters.

PPS Maintenance & Storage

Proper maintenance after every deployment is critical for ensuring smooth operation and long instrument life. This section provides guidance on the maintenance recommendations immediately following the recovery, when the instrument is back from sea, and when preparing for long-term storage or transport.

Steps may include:

- Rinse the PPS.
- Clean the PPS fluid paths and plumbing.
- Remove and dispose of expired batteries.
- Clean and inspect the controller housing.
- Clean and inspect the O-rings.
- Clean and inspect cables and connectors.
- Clean and inspect hardware.
- Reuse the shipping crate for storage and transport.

PPS Maintenance & Storage topics

[Immediately Following Recovery](#)

[Back from Sea](#)

[Storage and Transport](#)

Immediately Following Recovery

After the deployment is completed, the required steps are:

- Connect to the PPS using McLanePro and download deployment data. See the instructions in the [Offload tab](#) section.
- Remove the filter holders and retrieve the filters.
- Rinse the PPS.
- Clean PPS fluid paths and plumbing.
- Remove and dispose of expired batteries.

Rinse the PPS

Rinsing the PPS frame, controller housing, pump head and motor with fresh water immediately following recovery is extremely important for long-term sampler care. Poor or no rinsing directly following deployment affects the condition and future performance of the instrument.

Related topics

[Clear the fluid paths & plumbing](#)

[Flushing the pump head](#)

Dispose of Used Batteries

Batteries should never be left in the controller housing for extended periods of time. If redeploying the PPS, confirm whether new batteries will be required to achieve successful sample collection. If storing the instrument, remove any batteries and seal the controller housing as normal.

1. Dry the controller housing. Ensure that there is no water remaining on or above the controller housing that could enter the housing when opened.

2. Open the controller housing according to steps listed in [Opening the Controller Housing](#).
3. Disconnect the batteries from the electronics.
4. Open battery holder and remove "D" cells.
5. Recycle or dispose of used batteries according to local laws and regulations.
6. Replace batteries if redeploying.

Back from Sea

Several maintenance steps should be completed in the lab after a deployment and before long term storage.

- Clean and inspect the controller housing.
- Inspect the O-rings.
- Inspect the underwater cabling and connectors.
- Inspect and/or replace hardware.
- Backup deployment data.

Cleaning the PPS Fluid Paths & Filter Holders

Allowing the accumulation of bio-fouling and salt residue is detrimental to system performance and will shorten sampler life. Flushing the PPS is very important. The system flush procedure should pump a cleaning solution through each port at a flow rate of 75 mL/minute. Follow the steps in this section to clean the fluid pathways of the PPS after every deployment.



The recommended cleaning solution is a 1:10 hydrochloric acid water mixture or a 1:10 bleach water mixture.

Cleaning the PPS System Plumbing

1. Establish communication with the PPS.
2. After removing all filters from the filter holders (including the port 0 flush filter), reassemble and reinstall the filter holders.
3. Place a container of neutral water or a cleaning solution on top of the 25 port valve.
4. Connect Hose-A to the common system intake port on the top half of the 25 port valve. If the fixative valve is installed on the PPS attach Hose-A to the water intake port of the fixative valve.
5. Connect Hose-B to the exhaust port of the pump, and place the opposite end in a container to collect the system exhaust. If the fixative valve is installed on the PPS, connect Hose-B to the water exhaust port of the fixative valve instead of the pump exhaust port.

6. If the antifouling reservoir is installed on the PPS you will need to bypass the reservoir by disconnecting the Antifoul-1 and Antifoul-2 hoses from the tube, and connecting them both to Hose-E. This will allow cleaning of the port 24 plumbing.
7. Navigate to the **Manual Operation tab**. Confirm that the multi-port valve is aligned to the home port (port 0).
8. Using the Pump Operation controls provided on the **Manual Operation tab**, pump 100 mL to 200 mL of water (or cleaning fluid) from the container through the home port at a rate of 75 mL/min, forward.
9. When pumping completes, advance to the next port using the **Next Port** button.
10. Again, using the Pump Operation controls provided on the **Manual Operation tab**, pump 100 mL to 200 mL of water (or cleaning fluid) from the container through the current port at a rate of 75 mL/min, forward.
11. Keep an eye on the water container, and add more water if necessary.
12. Continue advancing ports and flushing until every sample position has been sufficiently cleaned.

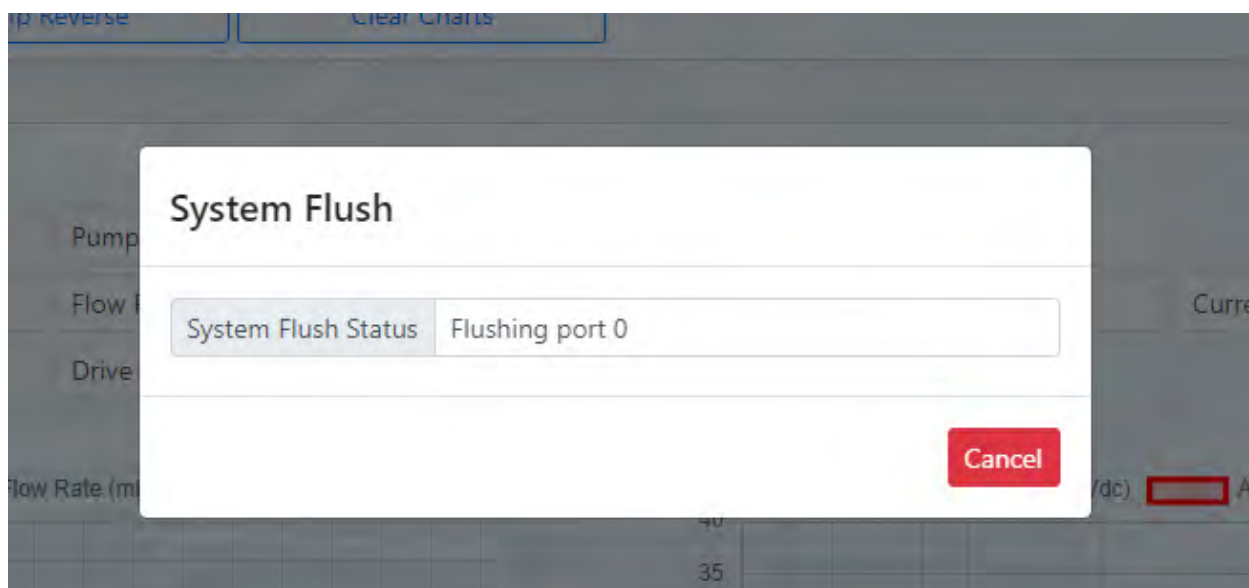


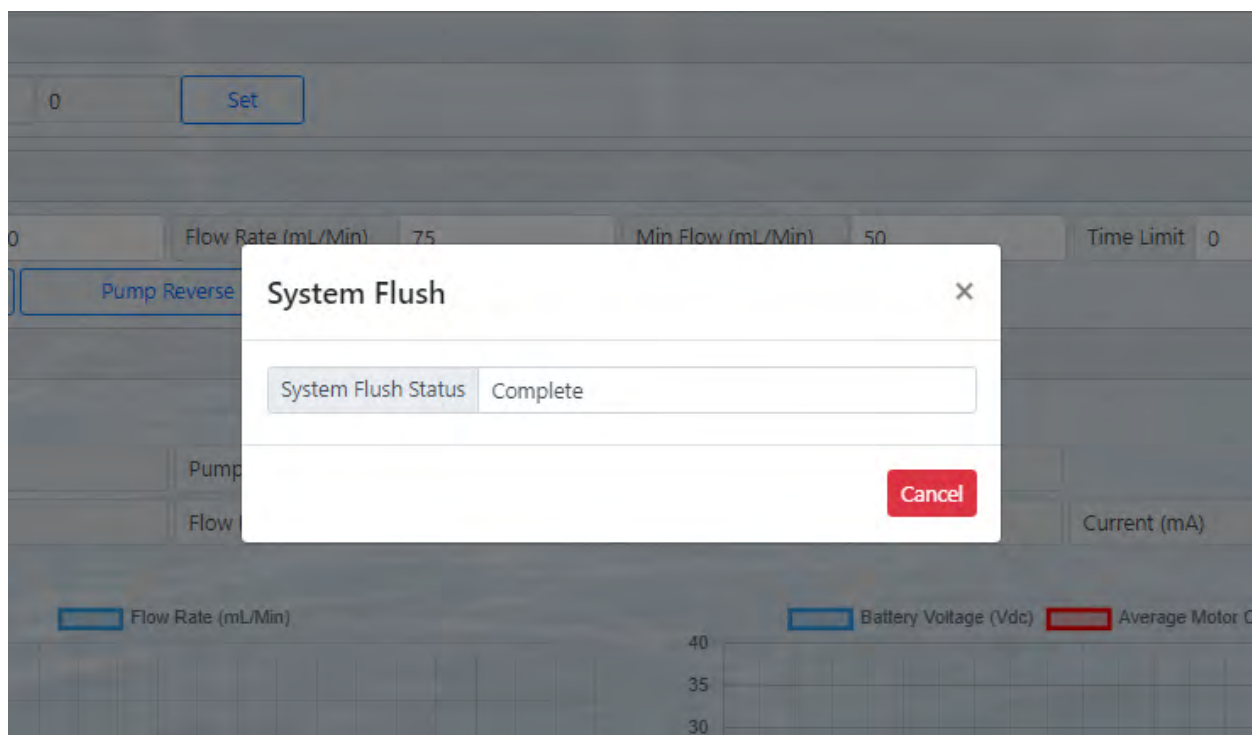
If a cleaning solution is used to flush the system, make sure to perform an additional flush with water to rinse the cleaning solution from the system.

McLanePro also offers an automated system flush function available on the **Manual Operation** tab.

The image shows the McLanePro software interface. At the top, there's a header with 'McLanePro', 'Port COM3', and buttons for 'Refresh', 'Connected', and 'Disconnect'. Below this is the 'Valve Operation' section with 'Valve Status', 'Direction', 'Progress', 'Current port -1', 'Move to port 0 (Home Port)', and buttons for 'Move', 'Previous Port', 'Next Port', and 'Find Home'. The 'Pump Operation' section includes input fields for 'Volume (mL)' (400), 'Flow Rate (mL/Min)' (200), 'Min Flow (mL/Min)' (100), and 'Time Limit' (0 H 0 M), with buttons for 'Pump Forward', 'Pump Reverse', and 'Clear Charts'. The 'Feedback' section has a table for 'Pumping Status' with columns for 'Elapsed Time', 'Pumped Amount', 'Time Spent', 'Volume Pumped (mL)', 'Flow Rate (mL/Min)', 'Voltage (Vdc)', and 'Current (mA)'. Below the table are two graphs: 'Flow Rate (mL/Min)' vs 'Seconds' and 'Battery Voltage (Vdc)' vs 'Seconds'. The 'System Flush' section at the bottom is highlighted with a red box, showing 'Flushing Period' (2 M 0 S) and a 'Start System Flush' button.

Define a time period (minutes/seconds) to spend flushing each port and then press **Start System Flush** to begin the automated flushing procedure. The routine will flush the home port and all 24 sample ports sequentially, so it is important to monitor the flushing fluid source to make sure it contains enough fluid to complete flushing at all ports. Status is reported in McLanePro throughout the flushing procedure.





Cleaning the Fixative Valve Plumbing

If the fixative valve is installed, perform the following steps to clean the fixative from the system plumbing.

1. Establish communication with the PPS.
2. Navigate to the **Manual Operation** tab. Confirm that the multi-port valve is aligned to the home port (port 0).
3. Remove the fixative bag and fixative exhaust bag from the system. Hose-D can be used to seal each bag until the fixative can be disposed of properly.
4. Connect Hose-A to the Fixative Intake hose in the fixative box and place the opposite end in a container of neutral water.
5. Connect Hose-B to the Fixative Exhaust hose in the fixative box and place the opposite end in a container of neutral water.
6. From the **Manual Operation** tab, click the **Activate Fixative Valve** button to toggle the Fixative Valve to the ON (fixative) position.
7. Use the Pump Operation controls to pump 300 mL at 125 mL/minute, forward. This will flush all of the fixative plumbing.
8. Click **Deactivate Fixative Valve** on the **Manual Operation** tab to switch the Fixative Valve to

the OFF (Water) position.

Cleaning & Inspecting the Filter Holders

After the lines have been cleaned and rinsed, open the filter holders and clean the threads and O-rings with alcohol and a lint-free wipe. Inspect the O-rings visually and feel them for wear. Make sure each filter holder has all three O-rings properly installed. No lubricant is used on filter holder O-rings.

Inspecting the Pump

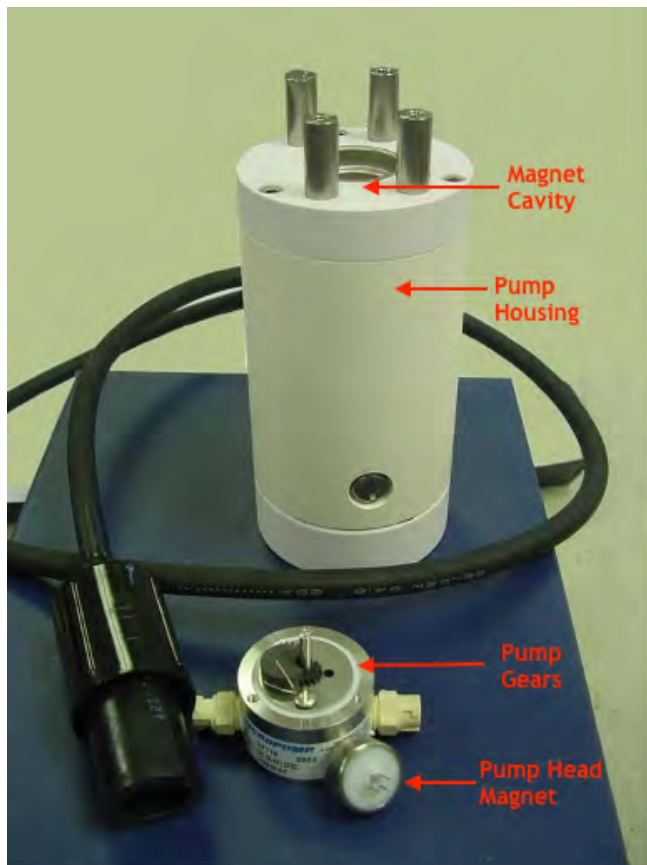
In addition to flushing, periodic inspection of the PPS pump will ensure optimal operation during deployment. Checking the volume accuracy is a good way to diagnose any issues that may come up during deployment.

1. Establish communication with the PPS.
2. Connect Hose-A to the pump intake and place the opposite end in a container of neutral water.
3. Connect Hose-B to the pump exhaust and place the opposite end in a graduated cylinder.
4. Using the Pump Operation controls provided on the **Manual Operation tab**, pump 100 mL of water, forward, at a rate of 125 mL/min from the container to the graduated cylinder.
5. The resulting volume should be around 100 mL (+/- 5%). If the volume is sufficiently below 100 mL, it is recommended to install a service kit with new graphite gears onto the pump.

Inspecting the Pump Gears

Periodically examine the graphite pump gears and replace them if there are any visible signs of wear or cracks. To inspect the gears, complete the following steps:

1. Remove the pump from the PPS and remove the four screws at the top, that secure the pump head to the pump housing.
2. Carefully remove the pump head from the pump housing (the gears are mounted on the bottom of the pump head). Invert the pump housing for easier removal.





Do not remove the magnet cavity from the pump motor housing (the area under the metal cavity is filled with oil).

3. Inspect the graphite gears and suction shoe for damage (chips, missing teeth, scratches).
 - Replace gears and shoe if necessary. Service kits are available from McLane.

Cleaning & Inspecting the Controller Housing

Before every deployment, inspect, and if necessary, replace the zinc anodes attached to the controller housing end caps and frame. When installing new zinc anodes, use 316 stainless steel hardware and install the included the O-ring.



Keep hard objects such as tools or shackles away from the anodized controller housing. Scratches from these objects will localize galvanic action and can cause deep crevices or pitting.



Use caution to avoid scratching the O-rings, end cap, or the sealing surface of the vessel where the o-rings sit. Scratches could cause leaks.

Related topic

[Controller Housing](#)

Cleaning & Inspecting the O-Rings

O-rings and surfaces should be regularly cleaned with isopropyl alcohol. Inspect O-rings for signs of wear and the presence of any foreign material (which can cause leaks). Look for small cracks and feel for grit, sand, or hair. Lubricate with a thin coating of provided Parker O-Lube as necessary. The toolkit has spare O-rings, and additional O-rings may be purchased from McLane.



Use caution to avoid scratching the O-rings, end cap, or the sealing surface of the vessel where the o-rings sit. Scratches could cause leaks.

Related topic

[O-rings](#)

Cleaning & Inspecting Cables & Connectors

Cables and connectors should be regularly cleaned with a mild detergent solution. Inspect cables for any cuts or scrapes that could cause a failure. Inspect connectors for bent or missing pins, corrosion or rubber delamination. Clean any corrosion off of pins and contacts with isopropyl alcohol. Lubricate connectors with a thin coating of provided connector lubricant as necessary. Replacement cables and connectors are available from McLane if necessary.

Related topic

[End Cap Bulkhead Connectors](#)

Cleaning & Inspecting Hardware

Some deployment environments will cause staining or rusting of fasteners if not rinsed well between uses. Inspect all fasteners for discoloration or signs of failure. Replace any damaged or corroded hardware with replacements provided in the toolkit. Clean and lubricate end cap screws with a thin coating of provided non-metal anti-seize as necessary.

Related topic

[Frame](#)

Backup Deployment Data

It is the responsibility of the user to properly download all recent deployment data in order to keep records of deployments. Deployment data will include useful information about sample events and conditions during the deployment. These data may include event times, sample deployment parameters, pumping data during events and any exit conditions.

The PPS will retain data for a certain number of deployments, but long term storage of data on the instrument is not recommended. It is always good practice to back up important deployment data before storing or transporting the instrument. McLane recommends keeping multiple copies of deployment data stored locally.

1. Follow steps listed in [Connecting to the PPS](#) to initiate communication with the instrument.
A battery is not required to communicate with the PPS for data retrieval purposes.
2. Download the deployment data using tools available on the [Offload tab](#).
3. Check downloaded data to ensure that the correct data set(s) have been offloaded, and that there are no problems reported.
4. Once data are retrieved, the PPS may be powered off, and placed in its shipping crate.

Storage and Transport

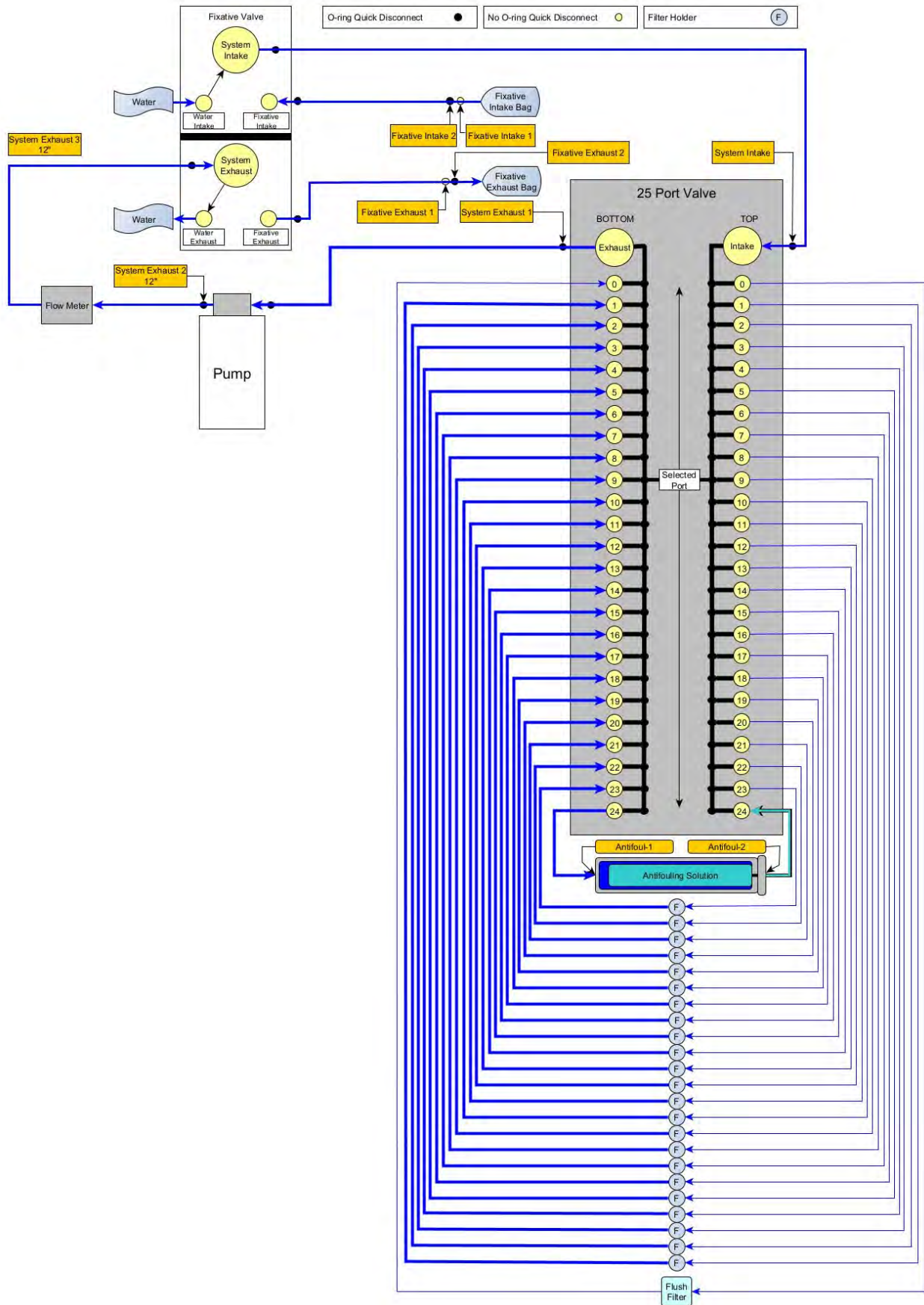
The shipping crate is a reusable international freight container that is ISPM-15 compliant for international transport. Always use the original shipping crate for transporting the PPS or when storing long term.



Always [disconnect and remove batteries](#) before long term storage or transport.

Digital Flow Meter

The Gen3 PPS may be equipped with a micro-gear, digital flow meter for accurate measurement of flow rates and volume during sample collection. The diagram below illustrates the fluid paths for a PPS with the flow meter, anti-fouling, and a fixative valve installed.



Pump Feedback Data Sources

When the PPS pump is operating, some or all of the following feedback data will be displayed.

The addition of the digital flow meter adds information related to how the PPS calculates flow rate and volume of collected samples.

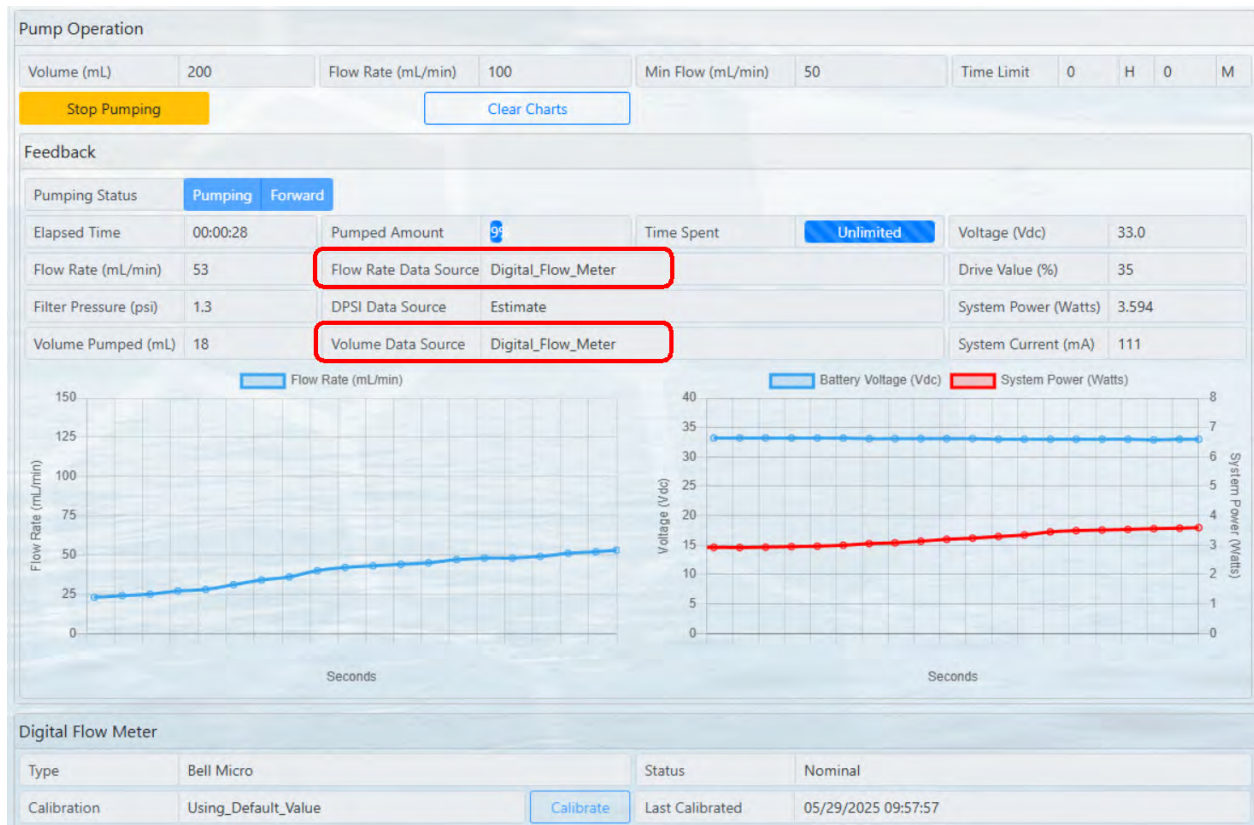
Additional Feedback:

Flow Rate Data Source - the PPS may meter flow directly using the digital flow meter, or, if not using flow meter feedback, flow is an estimate calculated in firmware.

Volume Data Source - the PPS may meter volume directly using the digital flow meter, or, if not using flow meter feedback, volume is an estimate calculated in firmware.

Flow rate, voltage, and system power data are plotted during manually operated pumping.

The new "Data Source" items will indicate whether a pumping operation is using an **Estimated** value, or the **Digital Flow Meter**.



Flow Meter Calibration

The PPS is equipped with a micro-gear flow meter that is used to accurately measure the flow rate during sample collection. The flow meter may be user-calibrated and should be checked prior to and after each mission. Controls for calibration are provided on the **Manual Operation** tab. The Digital Flow Meter section indicates the type of flow meter, the calibration type and date.

| Digital Flow Meter | | | | |
|--------------------|---------------------|---------------------------|-----------------|---------------------|
| Type | Bell Micro | Status | Nominal | |
| Calibration | Using_Default_Value | Calibrate | Last Calibrated | 05/29/2025 09:57:57 |

To perform calibration of the flow meter, a graduated cylinder or micro-gram scale is necessary to measure the volume pumped for calibration purposes. The calibration works best with at least 500 mL of clean water for calibration.

1. Power on the PPS, connect to it and, using controls on the Manual Operation tab, find the Home port of the valve.
2. Put the PPS's intake line into a container of clean water. 500 mL or more of water is recommended.
3. Put the PPS's exhaust line into the graduated cylinder (or into a container on a scale).
4. Briefly pump forward to prime the lines up to the graduated cylinder. Stop pumping when the line is primed.
5. Empty any water collected in the graduated cylinder and replace the exhaust tube into the cylinder.
6. Click the Calibrate button. This will launch a window with instructions for calibration.

| Digital Flow Meter | |
|---------------------------|---------------------|
| Type | Bell Micro |
| Calibration | Using_Default_Value |
| Calibrate | |

Flow Meter Calibration Routine

Volumetric Calibration Steps:

1. Select a **graduated cylinder** or a **container with a scale** (with gram accuracy).
2. Choose a **nominal volume** to be dispensed.
3. Start the calibration process.
4. Once the operation is complete, you will be prompted to measure and enter the **actual volume** in the container.
5. The system will automatically **self-calibrate** using the observed flow meter counts.

Enter Nominal Volume (mL)

CancelConfirm

7. Define a volume to collect during calibration. At least 500 mL is recommended.
8. Proceed with the calibration test and record the volume pumped and enter it when prompted at the end of the test.
9. Click **Save Calibration** to calculate the calibration value and apply it to the PPS.

Operation Complete

| | | | |
|-----------------------|------------------|------------------------|---------------------------------|
| End Condition | Canceled by user | Volumetric Calibration | |
| Volume Pumped (mL) | 88 | Elapsed Time | 00:01:26 |
| Battery Voltage (Vdc) | 33.2 | Highest Current (mA) | 167 |
| FM_Counts | 790 | Actual Volume | <input type="text" value="95"/> |

Save Calibration

CSVClose