Profilers Samplers Flotation

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Suspended Particulate Rosette Sampler (SuPR) & McLanePro

User Manual

2024 McLane Research Laboratories, Inc., Rev.24.K.07

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Included with the SuPR

A new SuPR 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 SuPR 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
SKYPE	MCLANE_RESEARCH
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 SuPR pages on the McLane website contain links to documentation including Technical Bulletins, and papers that describe the development and use of the SuPR.

Printable User Manual

Check the SuPR User Manual page on the McLane website for updates and a downloadable SuPR & McLanePro User Manual.

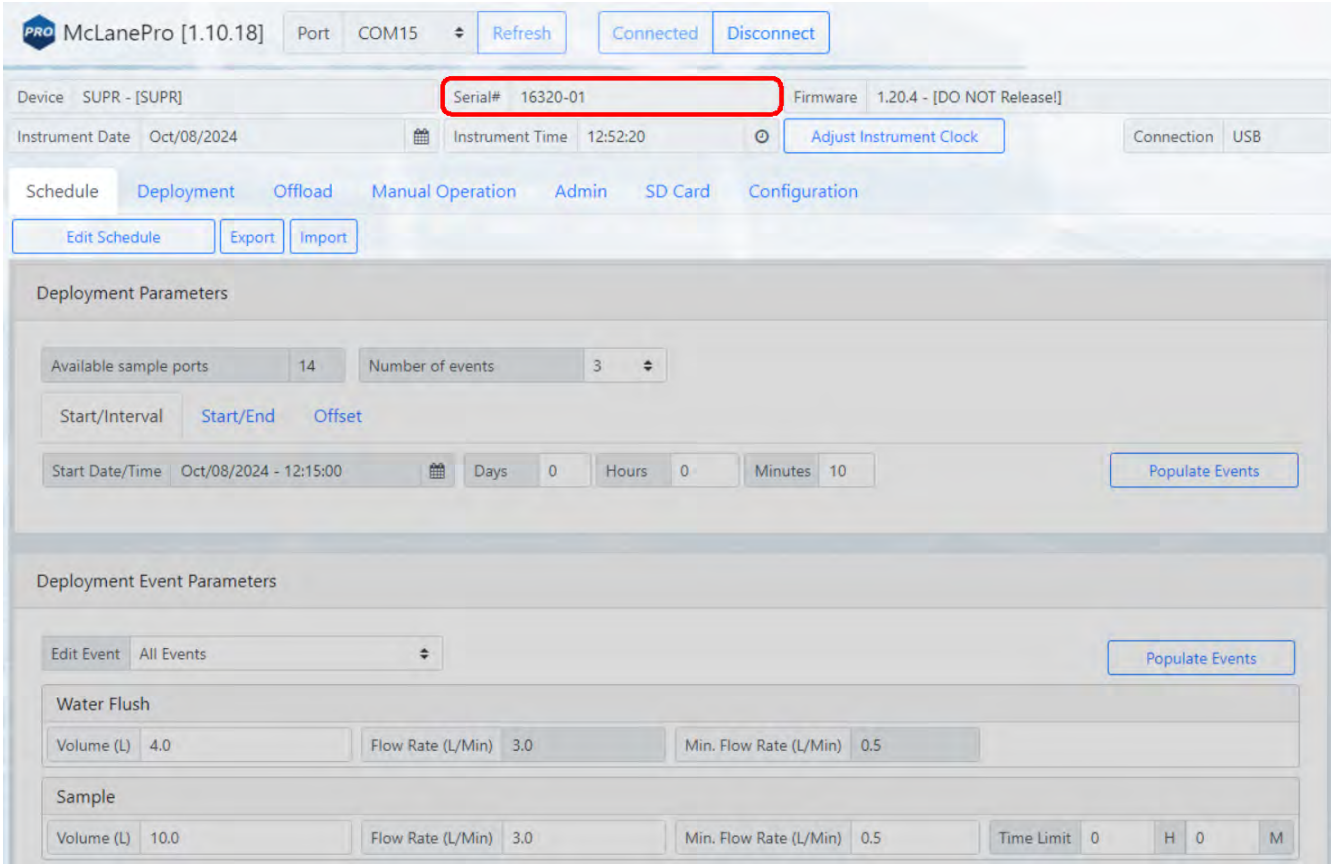
Serial Number

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 assembly
- Programmed into the electronics and reflected on the McLanePro main display.



McLanePro Introduction

McLanePro is the graphical user interface for samplers built with 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 SuPR
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

Connecting and disconnecting the A72-1000 batteries to the electronics powers the SuPR on and off. The firmware starts automatically when the batteries are connected.

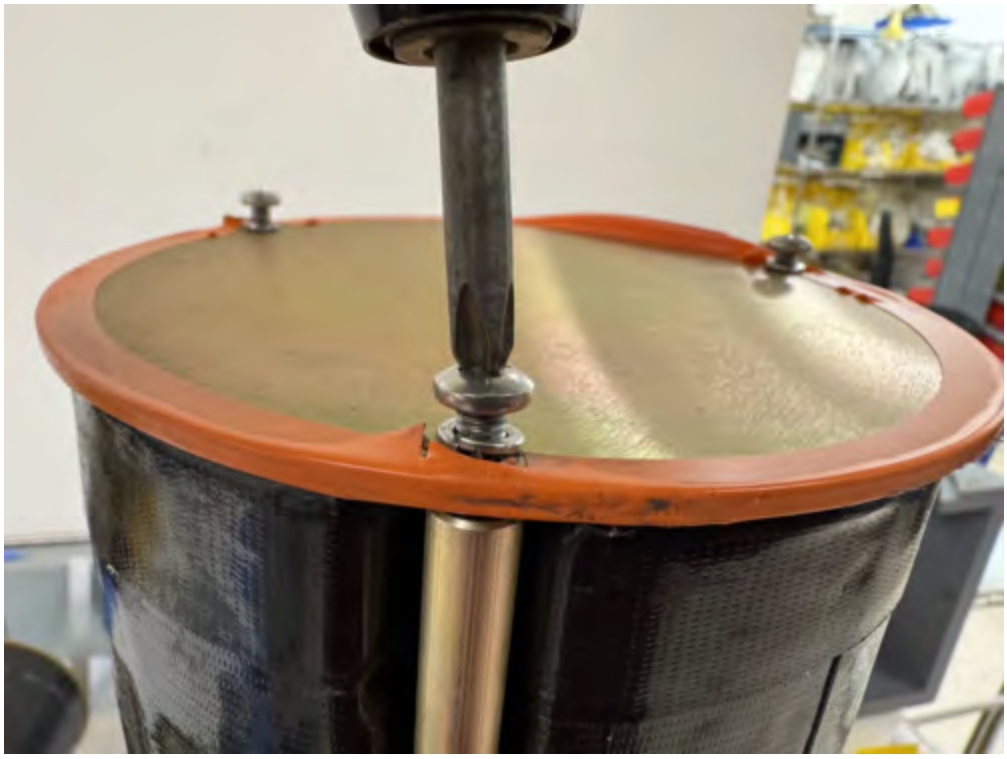
Related topics
Opening the controller housing

To install the battery and power on the sampler, complete the following steps:

1. Place the sampler in a dry area.
2. Disconnect all cables from the end cap.
3. Open the controller housing and remove the controller and battery holder assembly.

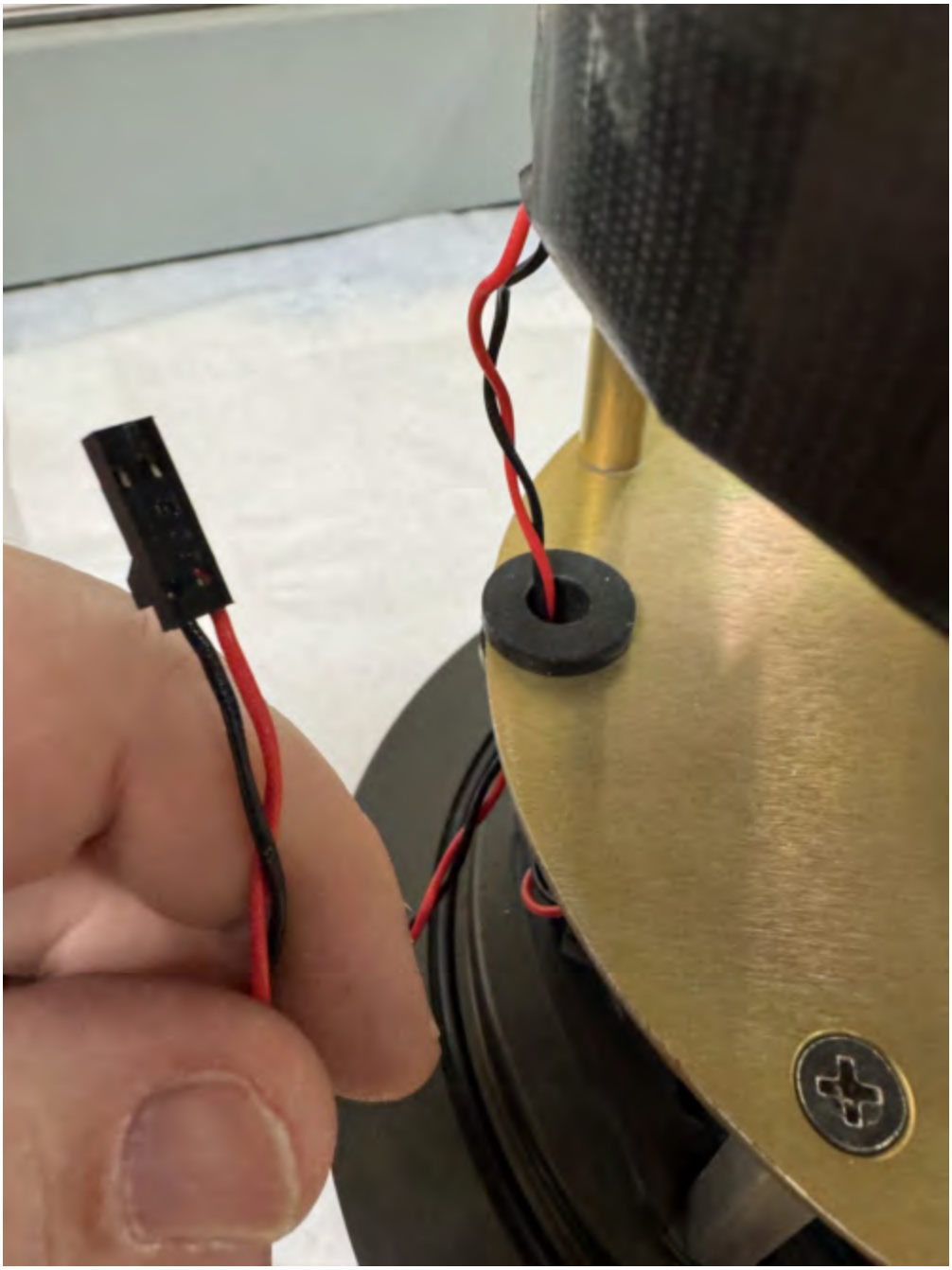
Follow standard electrostatic discharge (ESD) precautions when handling the electronics and work in a dry area.

4. Using a screwdriver, loosen the screws and remove the bottom plate.

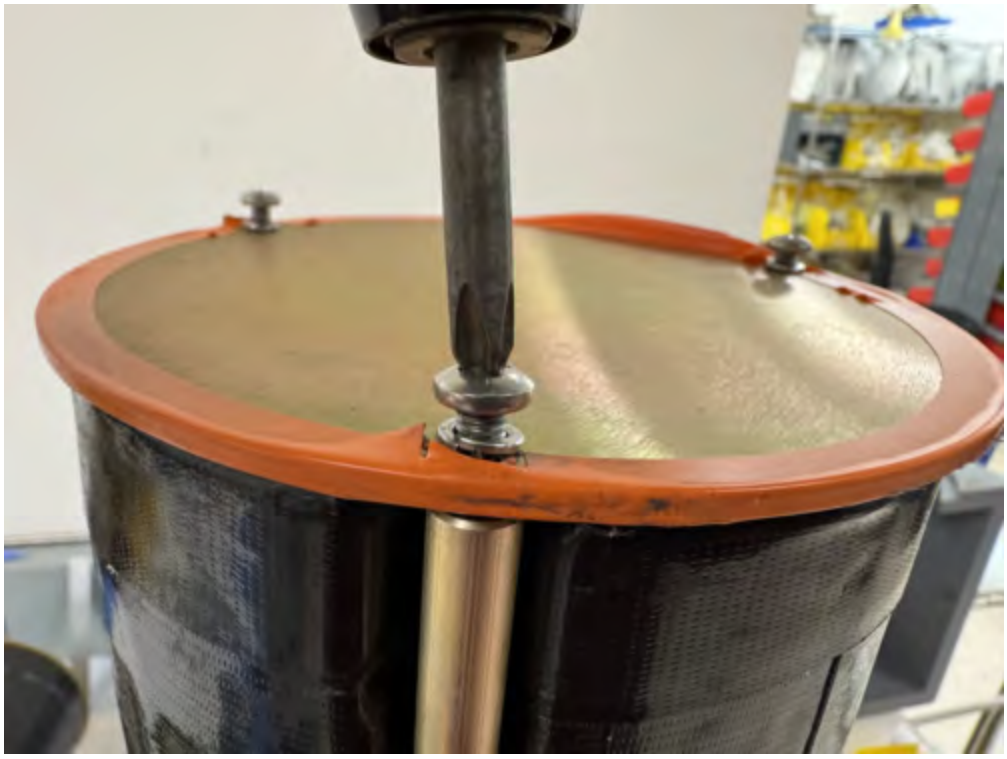


5. Align the battery so the output leads will pass through the hole cutout in the top plate. Begin sliding the battery toward the upper battery plate.

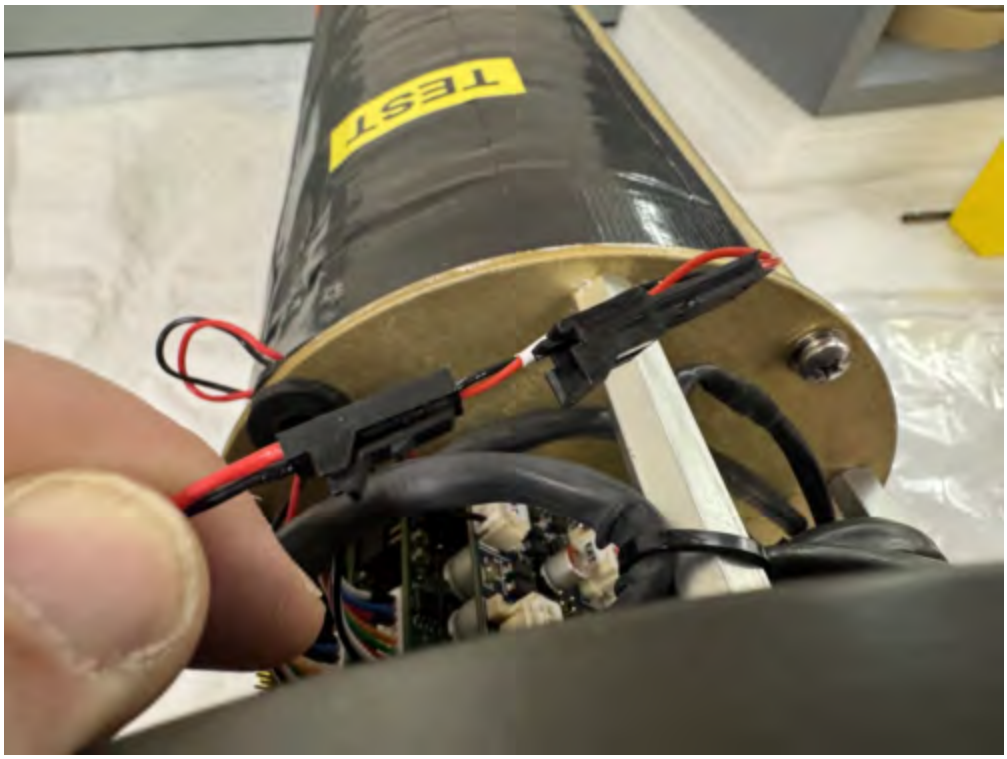
6. Feed the connector wires through the battery feed through hole in the battery holder frame plate.



7. Reinstall the bottom battery plate, and secure with three screws.



8. Connect the main battery to the A72-1000 Gen3 Battery Adapter, which plugs into the connector on the the electronics stack.



9. Slide the controller into the housing and then close the controller housing.

10. Confirm that the penetrators are well lubricated. Molykote lubrication is supplied in the toolkit.

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11. Connect each connector and tighten the locking sleeve for all the SuPR components. SeeEnd Cap Bulkhead Connectors for information on each connection.

ML16230-01
BAT
McLANE
RESEARCH LABORATORIES, INC.
PUMP

McLANE
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ML16230-01
BAT

ML16230-01
ML16230-01
8 LPM

Closing the Controller Housing

It is important to ensure that the controller housing is sealed correctly before performing operations with the SuPR. 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.

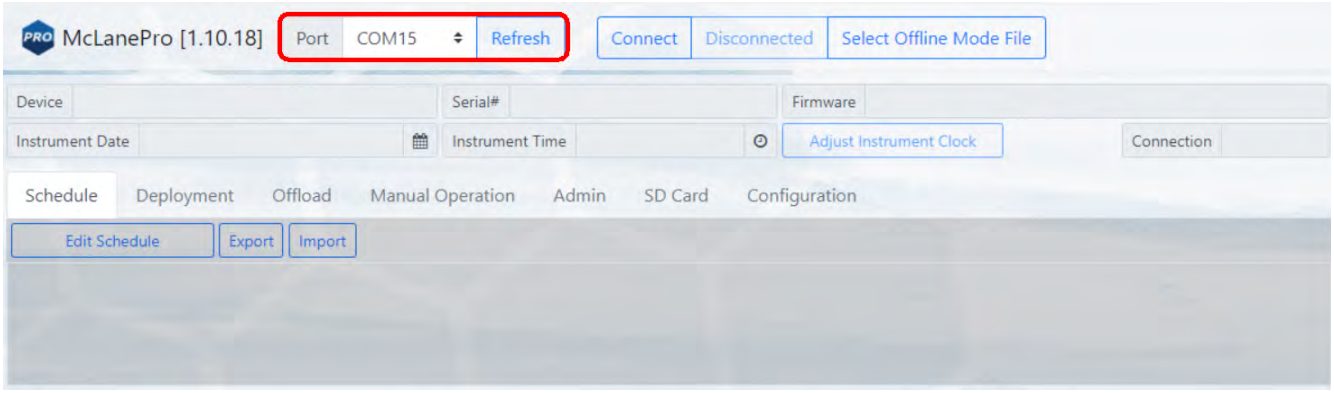
Once the battery packs have been installed and connected to the SuPR electronics:

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.

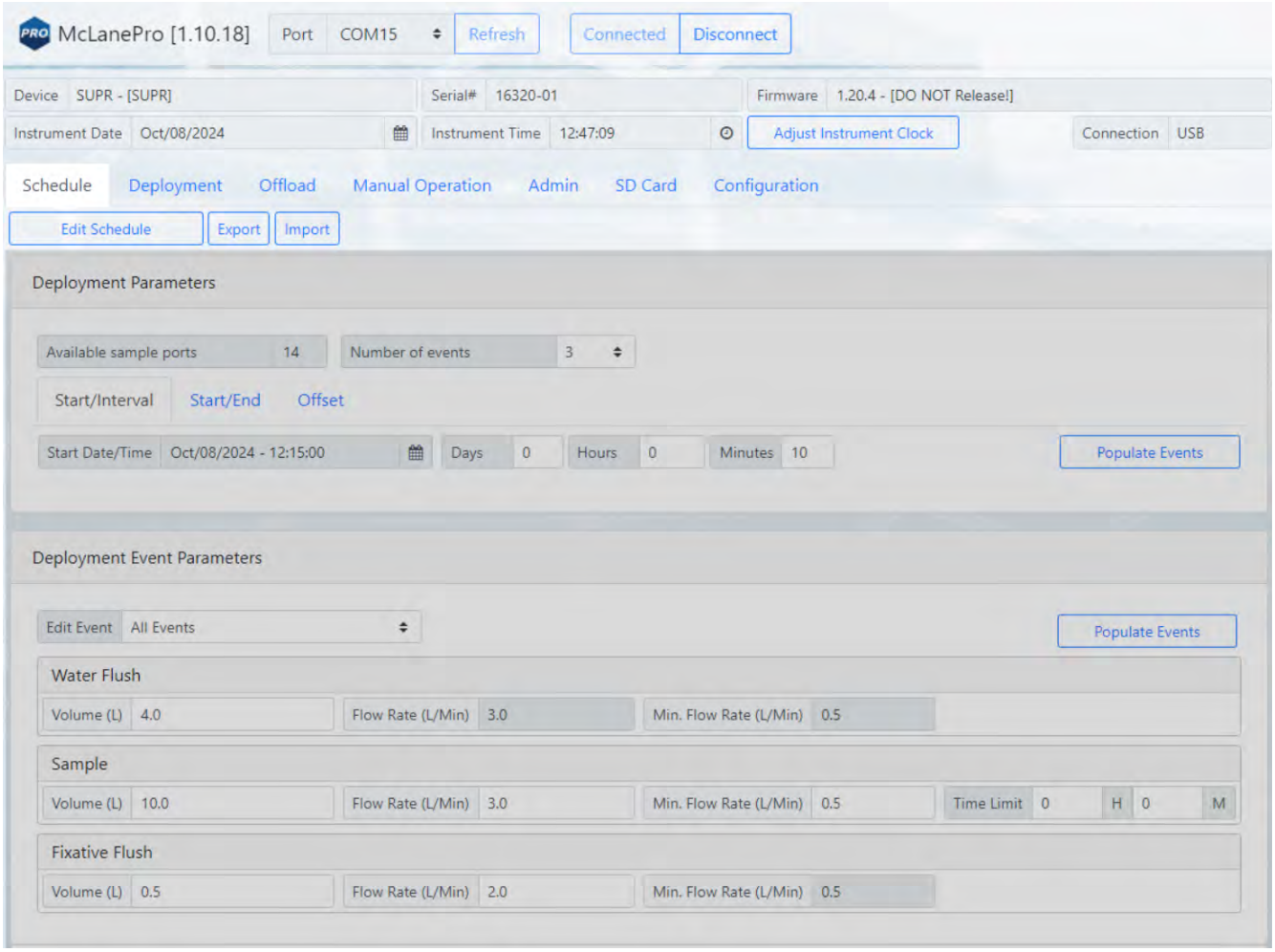
Connecting to the SuPR

McLanePro is used to communicate with the SuPR. 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 such as the valves and pump.

1. Remove the dummy plug from the communication port on the SuPR.
2. Plug the USB COM cable onto the COM bulkhead of the SuPR.
3. Plug the USB COM cable into a USB port on the host computer.
4. After plugging the USB cable, 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 SuPR in the **Port** window.
7. Click **Connect**.

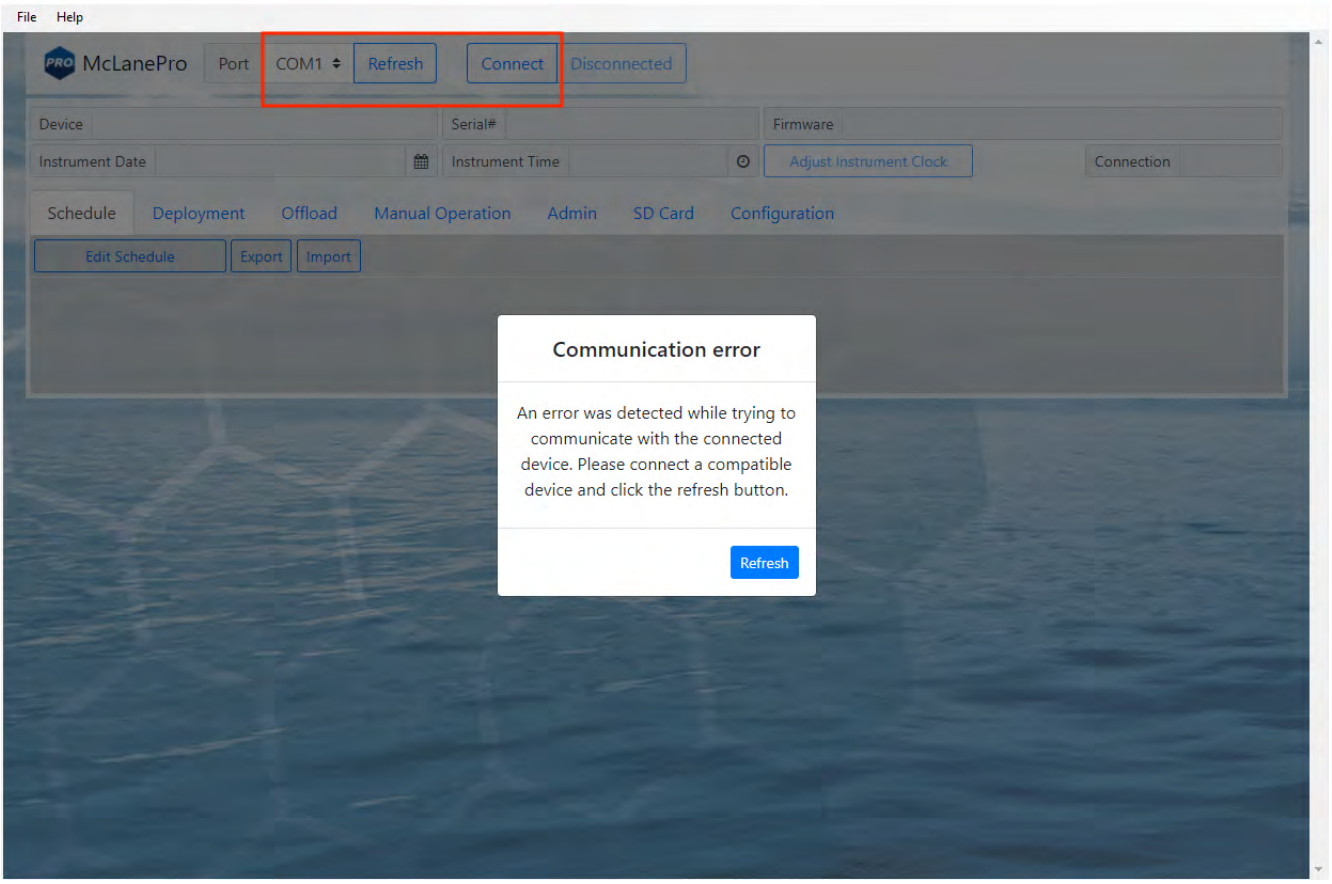


In the above example, the communication port associated with the SuPR is COM 15.
After successfully connecting to the SuPR, McLanePro tabs will display data stored on the instrument such as the schedule (in this example).



Communication Error Message

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

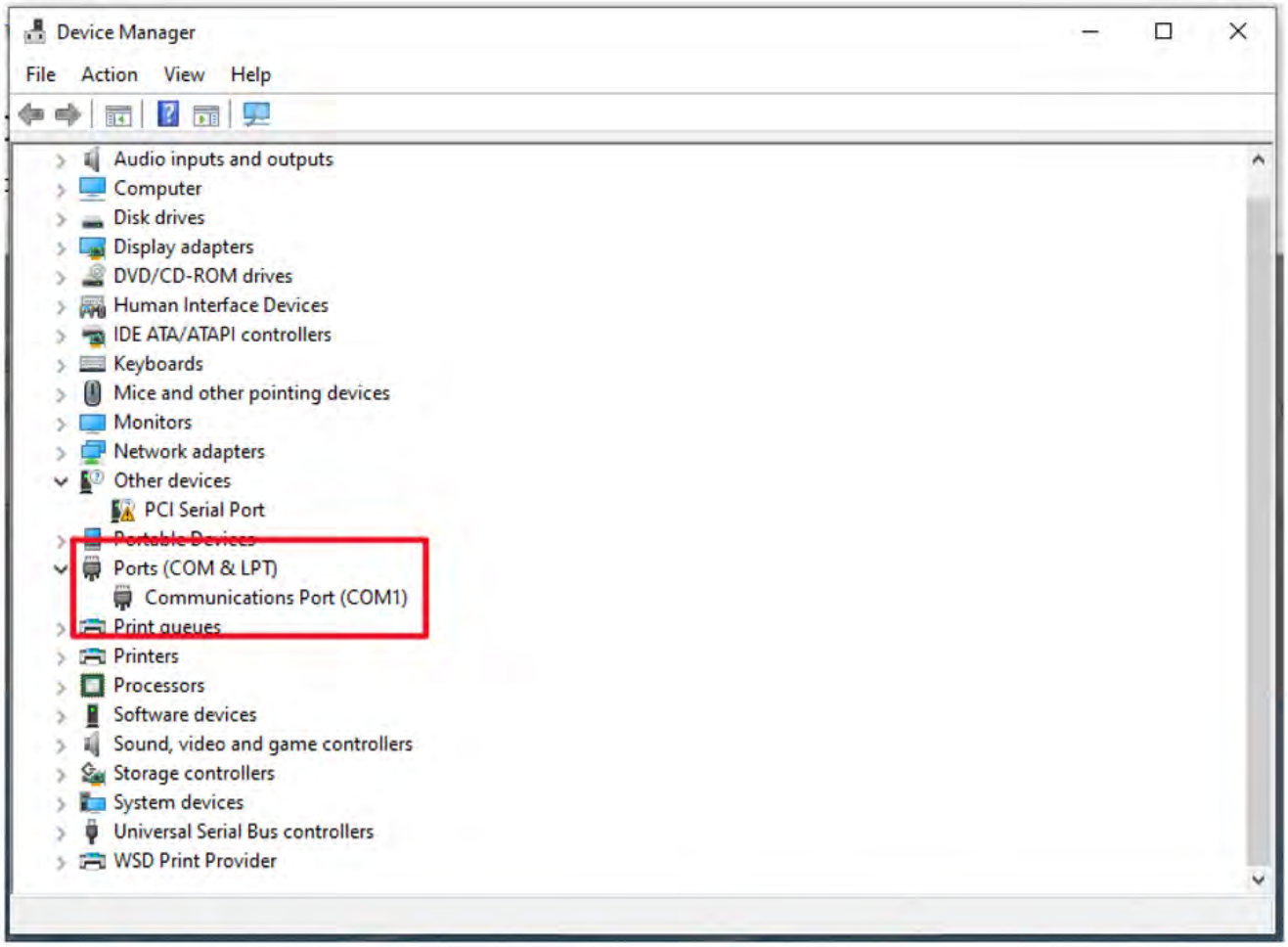


Communication Troubleshooting

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.

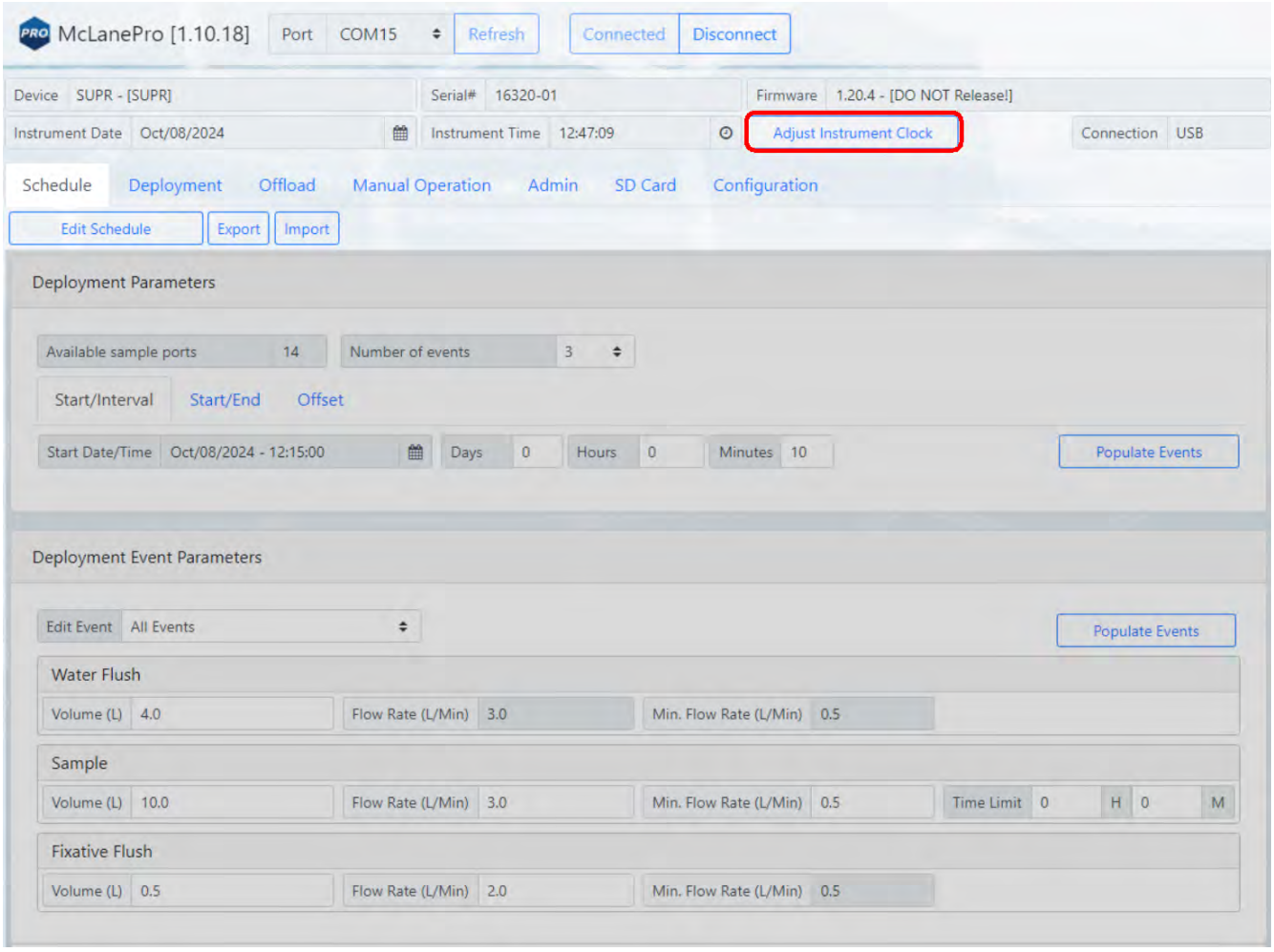
If the device remains unresponsive, try disconnecting the device, restarting the computer, and reconnecting.

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.

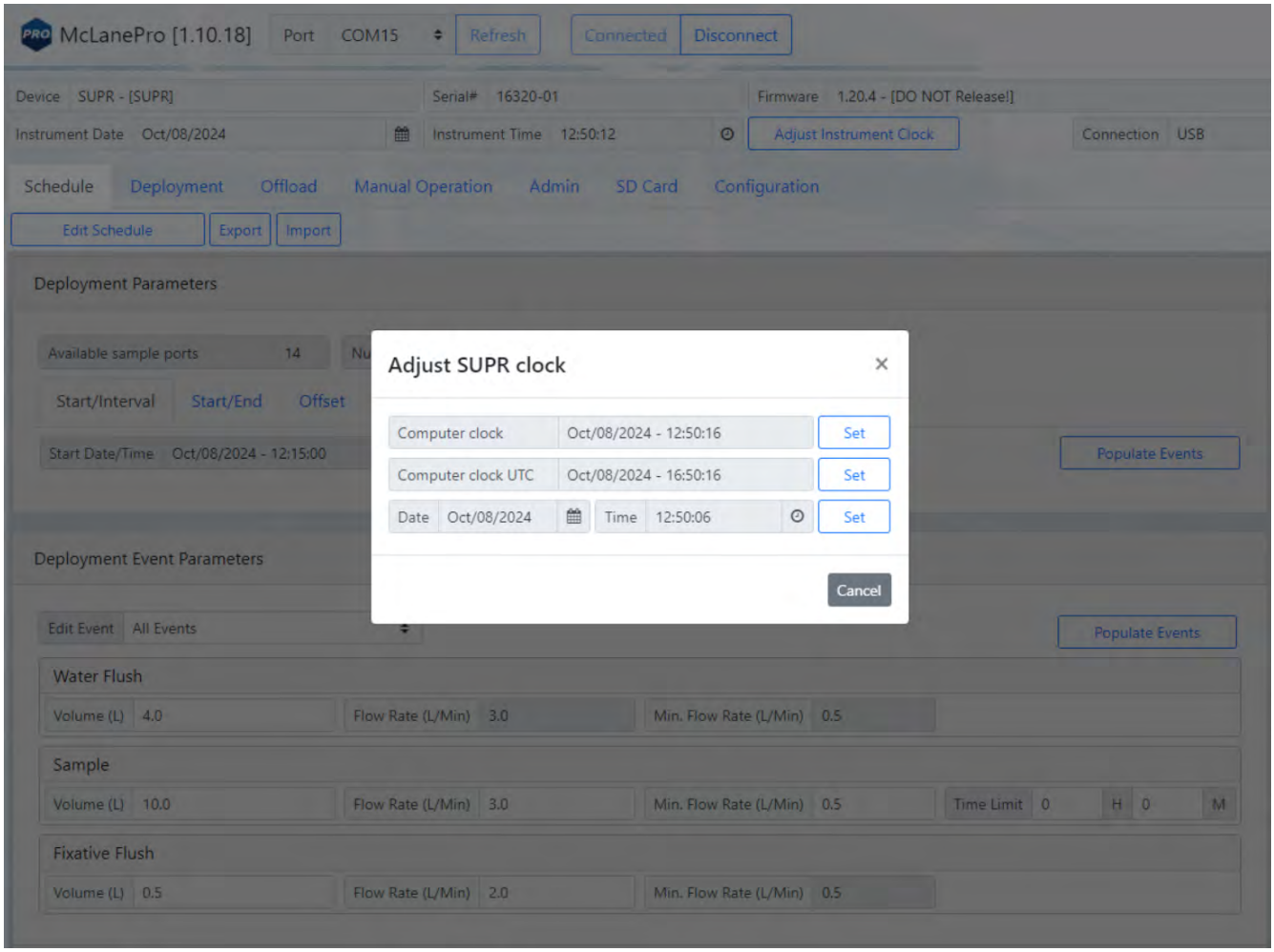
Setting the Instrument Clock

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.

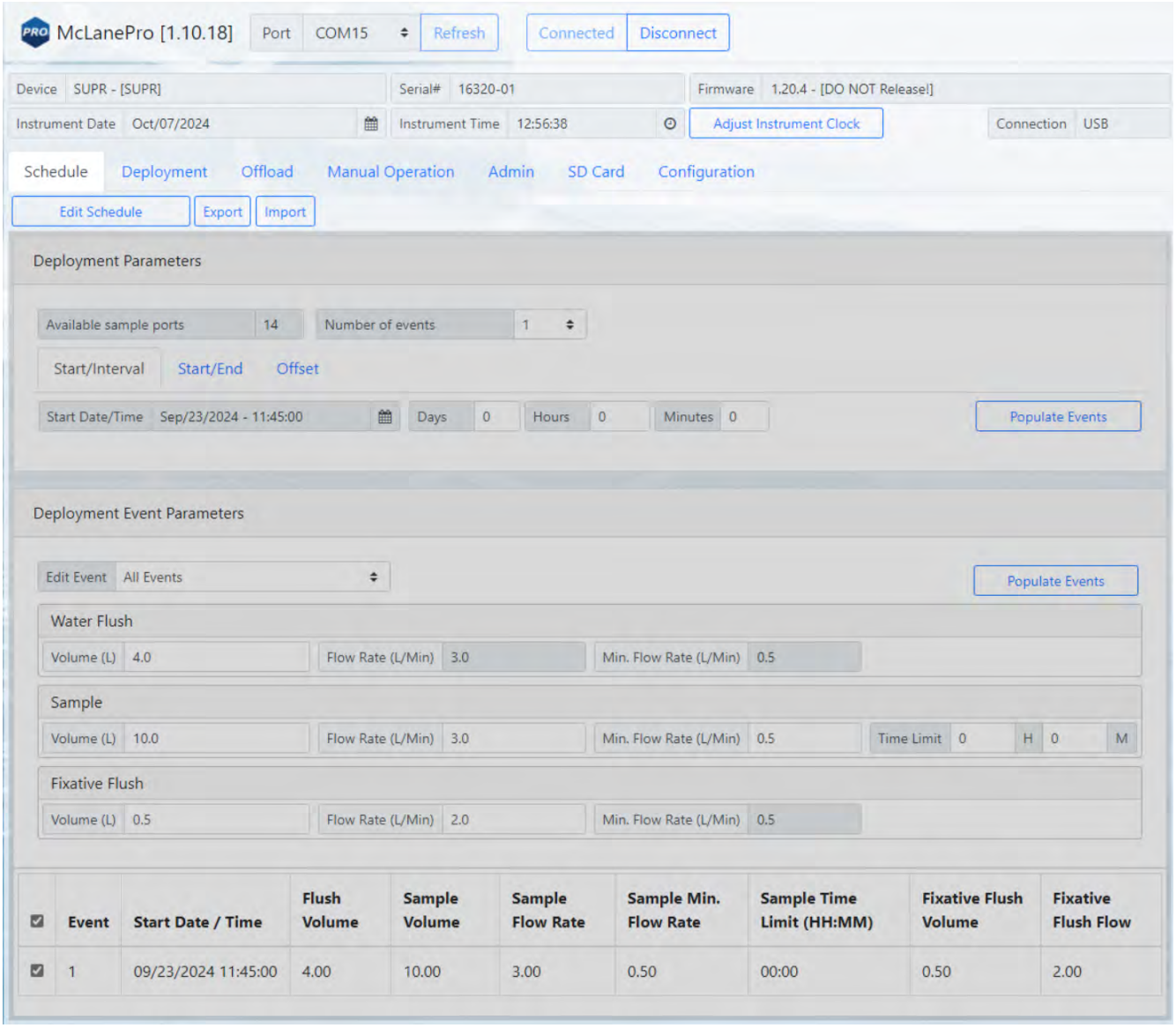


Click the **Set** button to set any of the available time values.


McLanePro [1.10.18]
Port COM15
Refresh
Connected
Disconnect
Device SUPR - [SUPR]
Serial# 16320-01
Firmware 1.20.4 - [DO NOT Release!]
Instrument Date Oct/08/2024
Instrument Time 12:50:12
Adjust Instrument Clock
Connection USB
Schedule
Deployment
Offload
Manual Operation
Admin
SD Card
Configuration
Edit Schedule
Export
Import
Deployment Parameters
Available sample ports 14
Start/Interval
Start/End
Offset
Start Date/Time Oct/08/2024 - 12:15:00
Populate Events
Adjust SUPR clock
Computer clock Oct/08/2024 - 12:50:16 Set
Computer clock UTC Oct/08/2024 - 16:50:16 Set
Date Oct/08/2024
Time 12:50:06 Set
Cancel
Deployment Event Parameters
Edit Event All Events
Populate Events
Water Flush
Volume (L) 4.0
Flow Rate (L/Min) 3.0
Min. Flow Rate (L/Min) 0.5
Sample
Volume (L) 10.0
Flow Rate (L/Min) 3.0
Min. Flow Rate (L/Min) 0.5
Time Limit 0 H 0 M
Fixative Flush
Volume (L) 0.5
Flow Rate (L/Min) 2.0
Min. Flow Rate (L/Min) 0.5

The Schedule Tab

The **Schedule Tab** is used to create, edit, export or import deployment event timing and parameters.



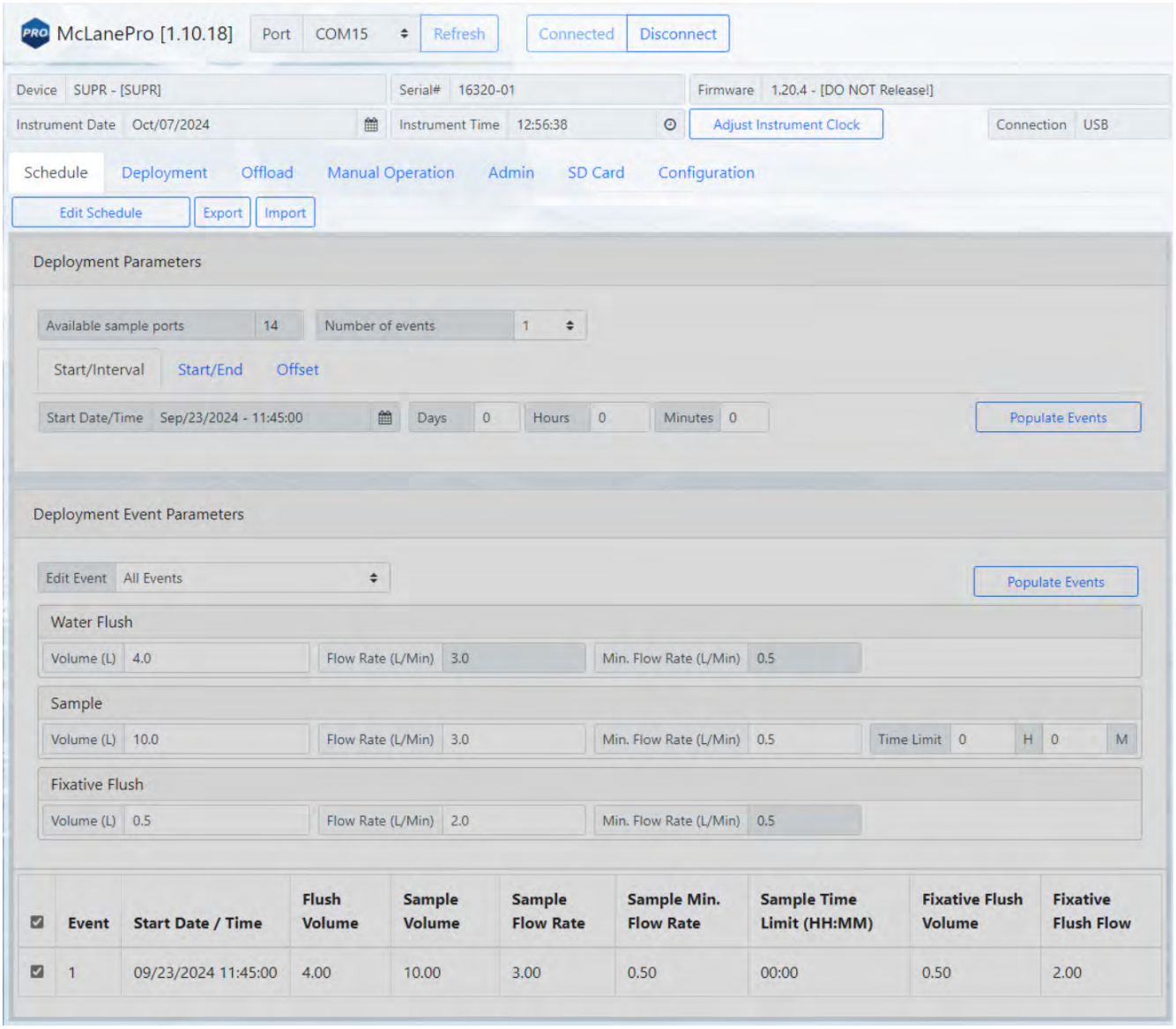
Schedule a Deployment

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

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

1. Click the **Schedule tab.**

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



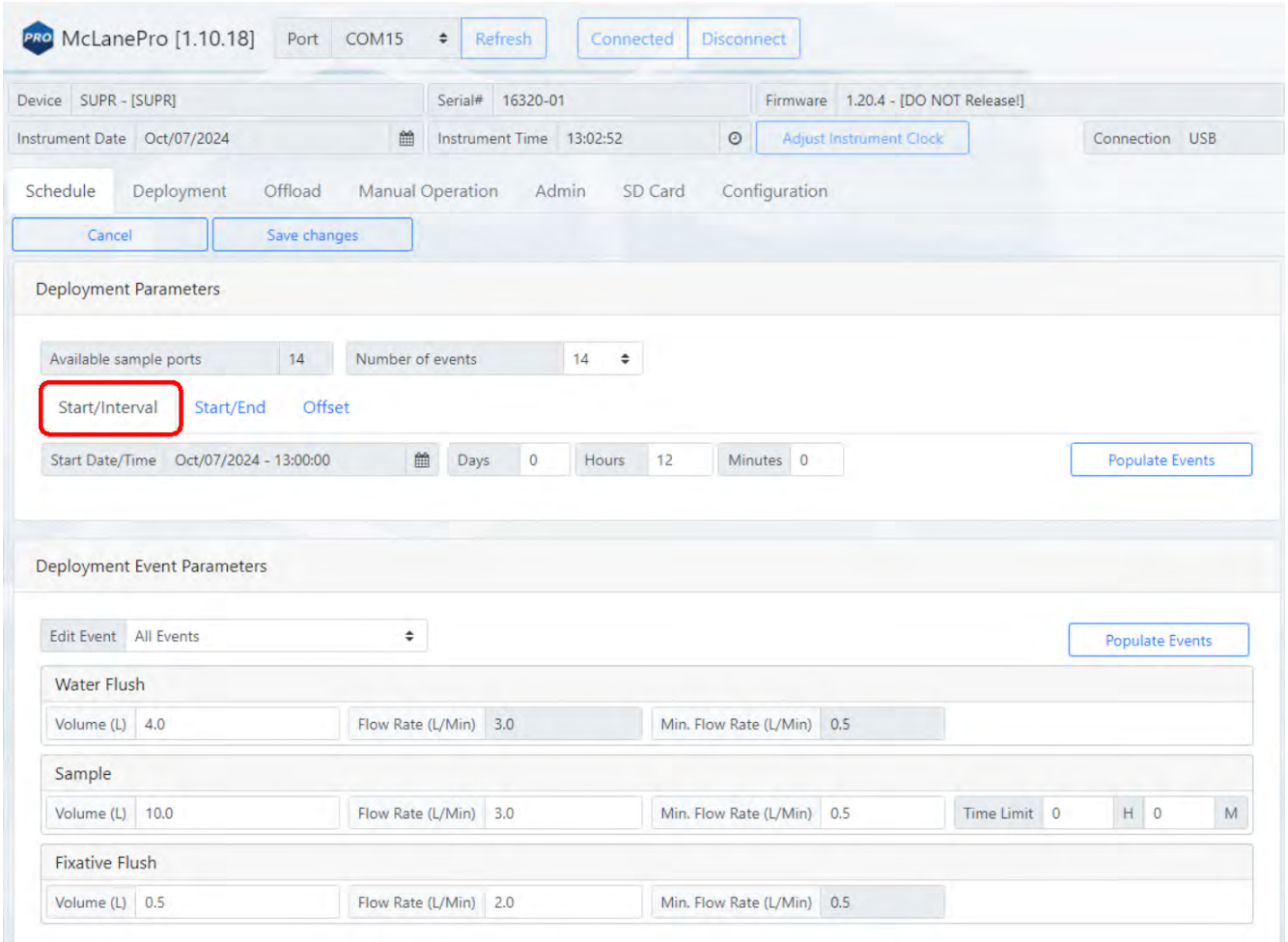
There are two sections used to set up a deployment. The first section, Deployment Parameters, allow for setting of the schedule type or modifying an existing schedule. The second section, Deployment Event Parameters, allows for setting all or individual event parameters related to SuPR sampling operations.

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. SuPR has a maximum of 14 available sample ports.
- **Number of events** - defines the number of SuPR samples to be collected during the

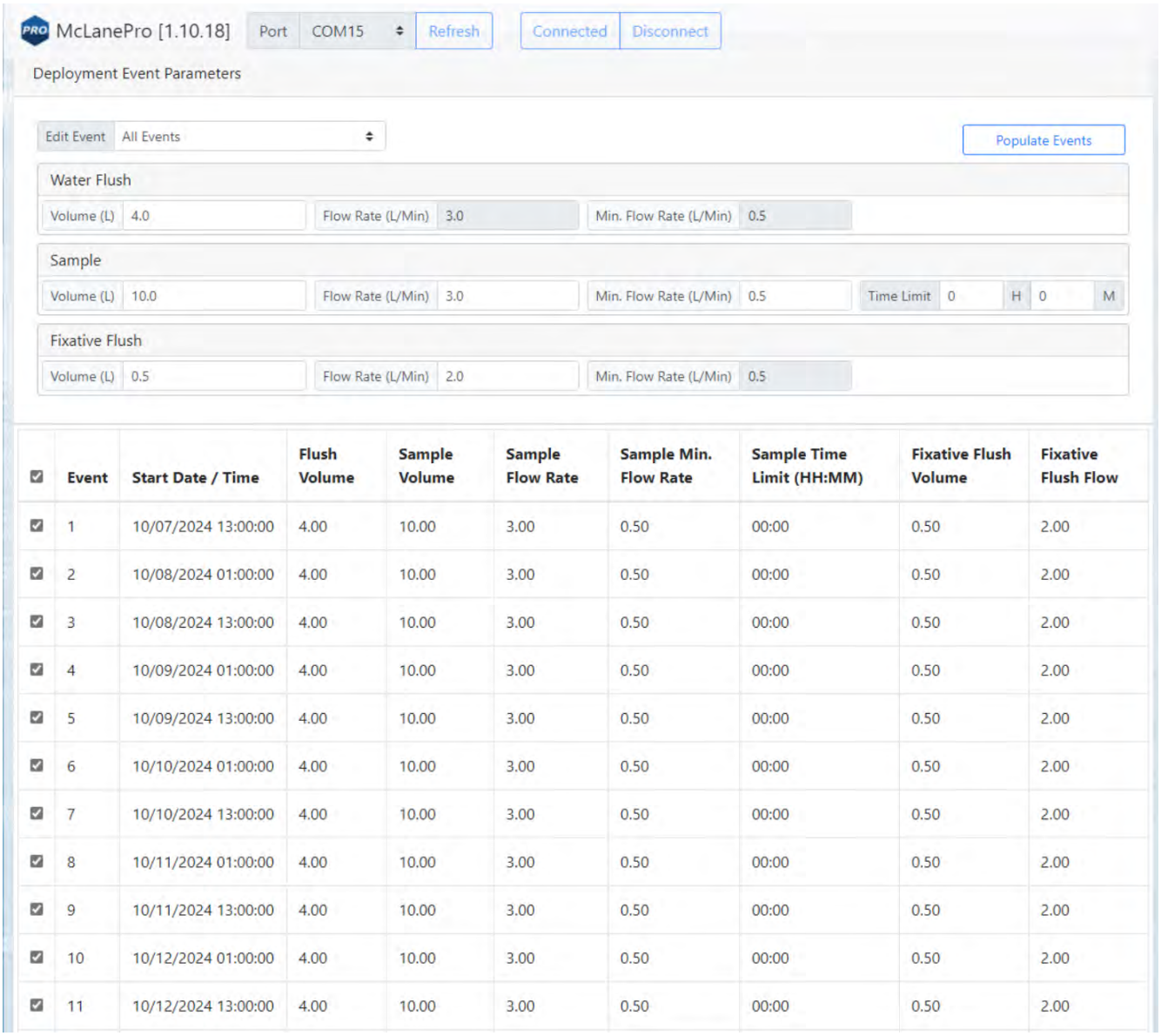
deployment. This may not exceed the available sample ports value. For shorter deployments, fewer events may be requested.

- **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.



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.



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
1	10/07/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
2	10/08/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
3	10/08/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
4	10/09/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
5	10/09/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
6	10/10/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
7	10/10/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
8	10/11/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
9	10/11/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
10	10/12/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
11	10/12/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00

6. Fill in the Deployment Event Parameters:

Water Flush

- **Water flush volume** - set the target volume of water that will be pumped at a flush 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** - (fixed) defines 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 SuPR 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

- **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.

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.

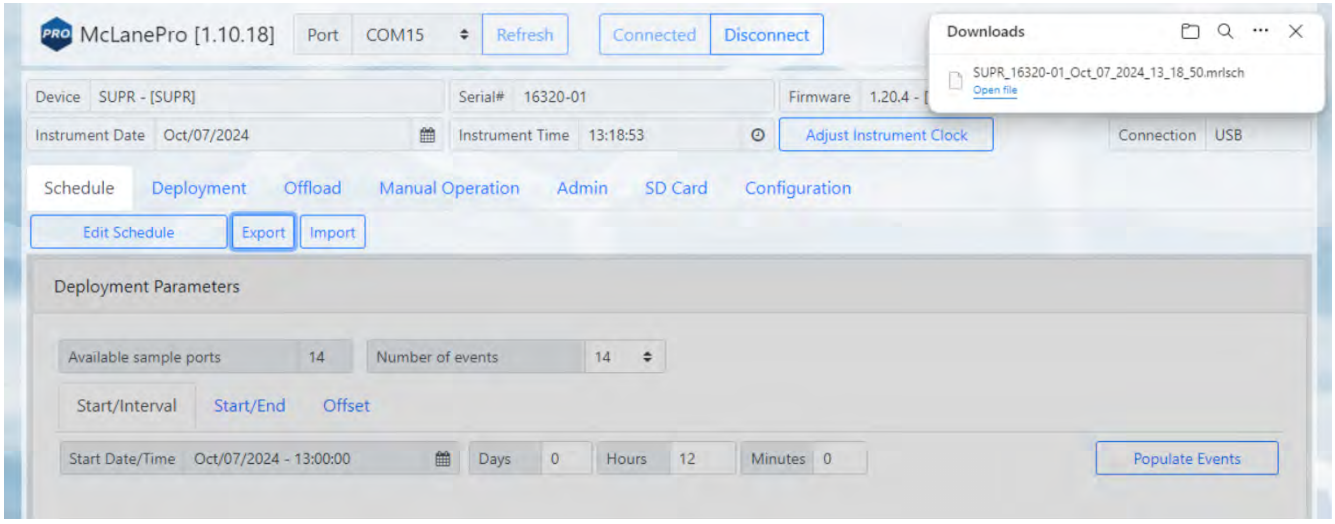
	Event	Start Date / Time	Flush Volume	Sample Volume	Sample Flow Rate	Sample Min. Flow Rate	Sample Time Limit (HH:MM)	Fixative Flush Volume	Fixative Flush Flow
☑	1	10/07/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
☑	2	10/08/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
☑	3	10/08/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
☑	4	10/09/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
☑	5	10/09/2024 13:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00
☑	6	10/10/2024 01:00:00	4.00	10.00	3.00	0.50	00:00	0.50	2.00

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

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 using **Edit Schedule**.
2. Set the deployment parameters.
3. Click **Save changes** to load that schedule onto the SuPR.
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 SuPR. This file is useful for reviewing the deployment parameters and schedule after disconnecting from the SuPR.

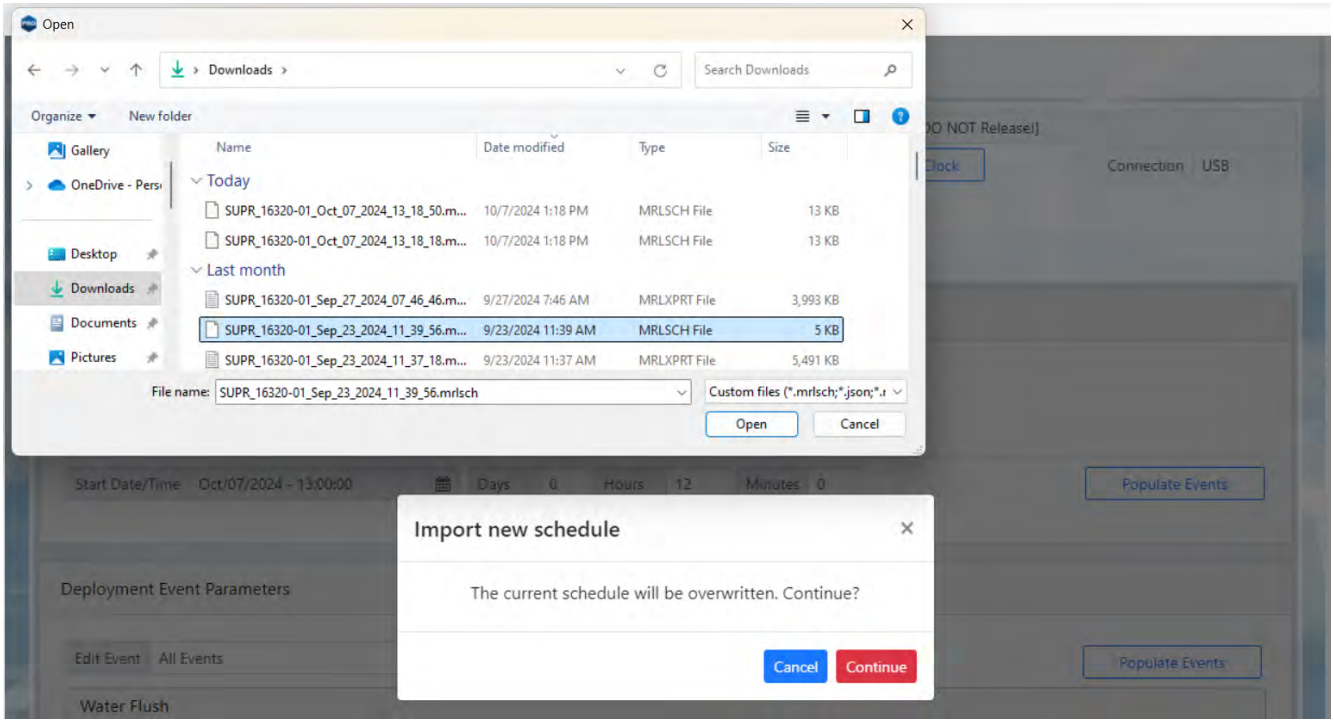
Importing a Schedule

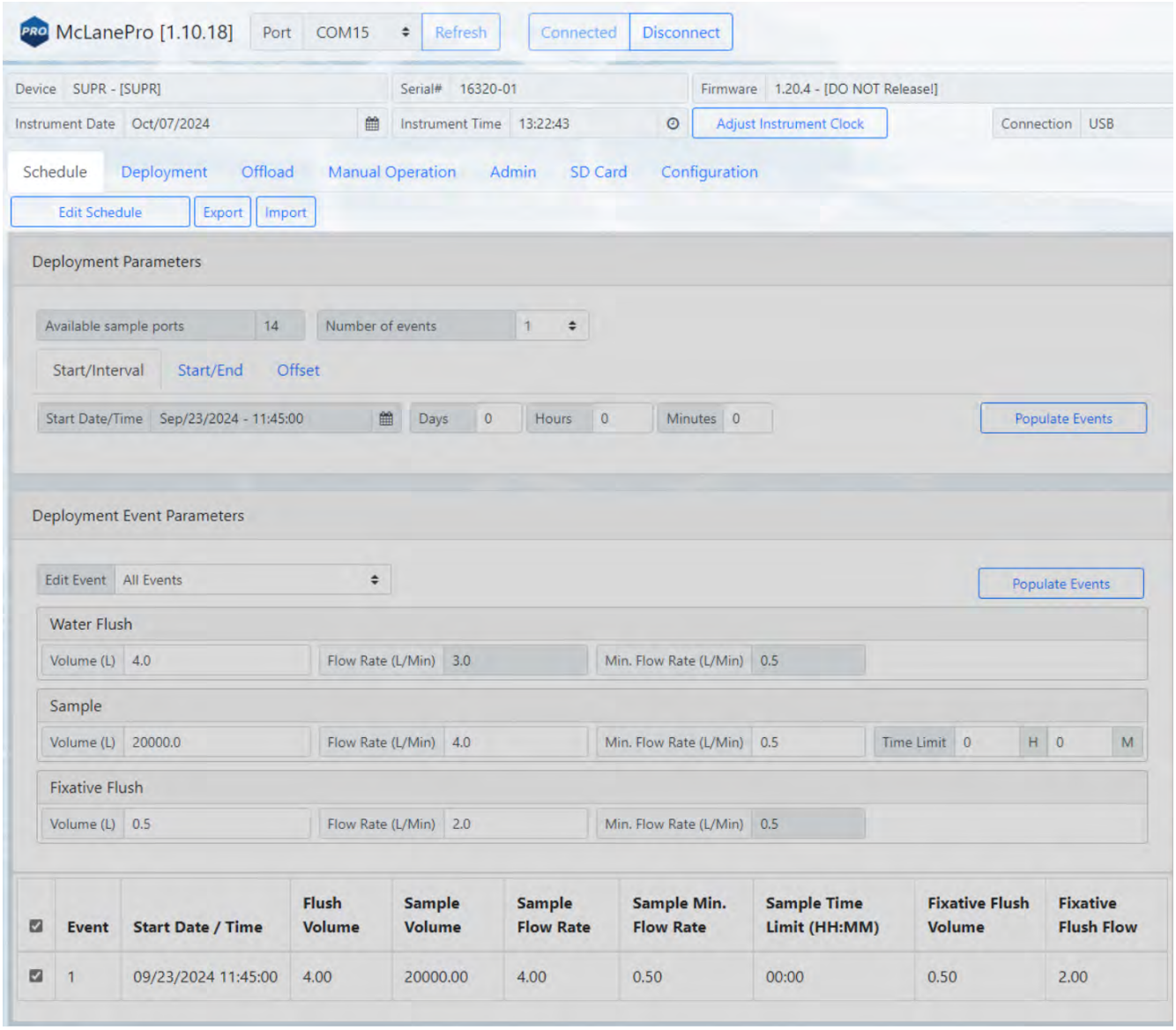
Schedules may be imported for deployment of multiple instruments or for modification and reuse.

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 (*.mrlsch) and click **Open**.

The SuPR 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.

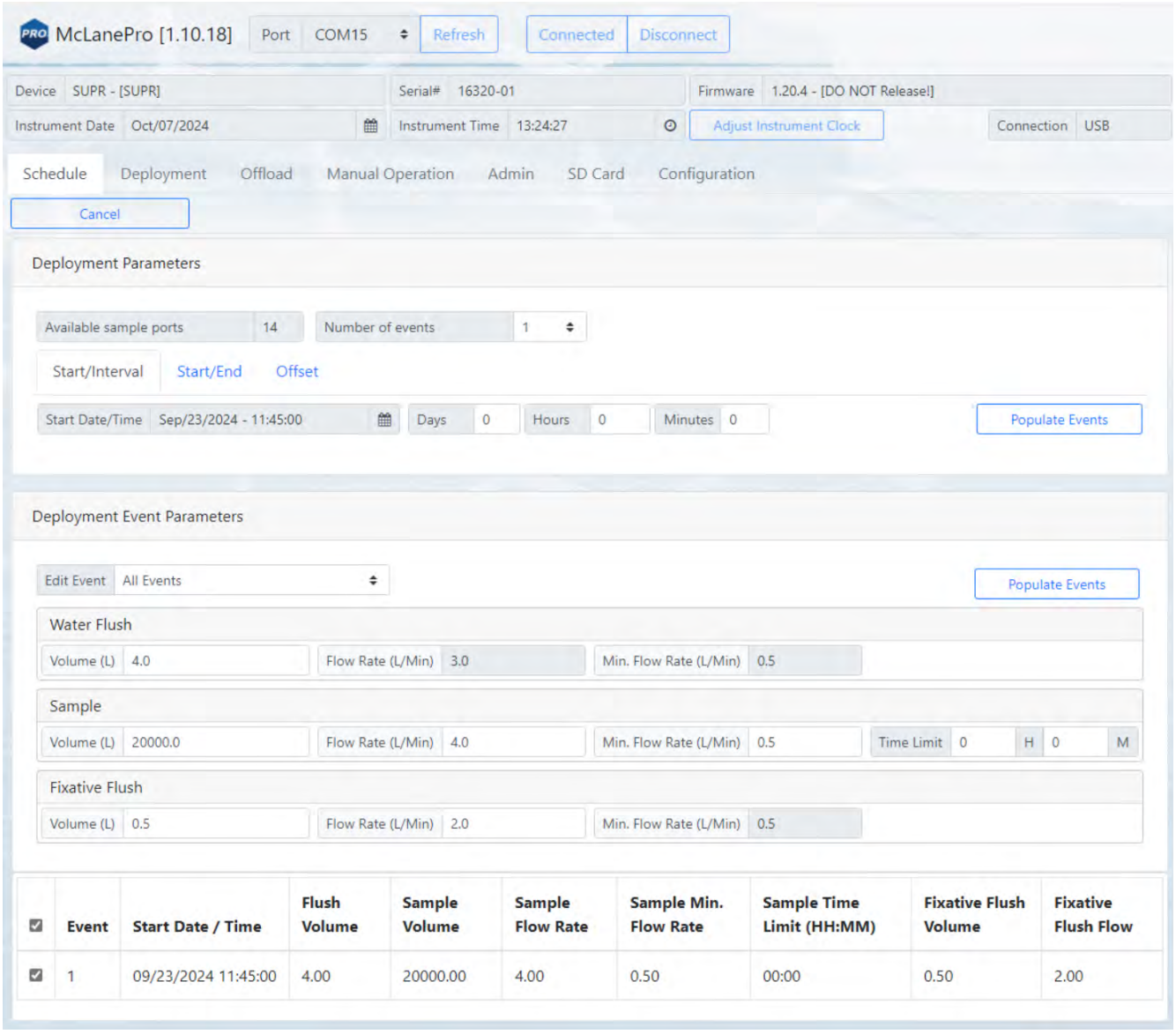
Importing a schedule immediately loads that schedule into memory on theSuPR. This is the schedule that will be used when deploying the instrument. Always double check event times before proceeding to deployment preparation.



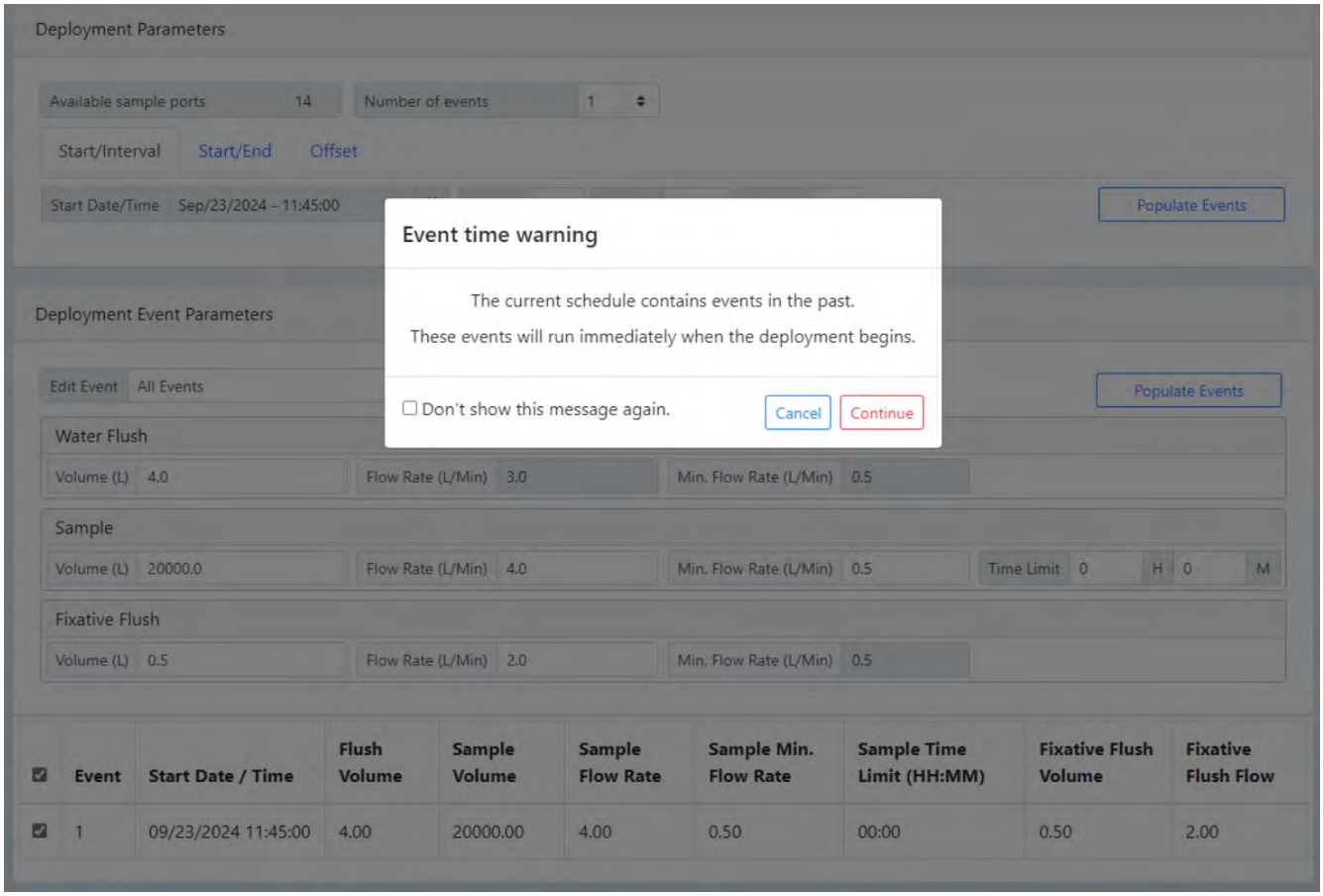


Schedule Errors

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

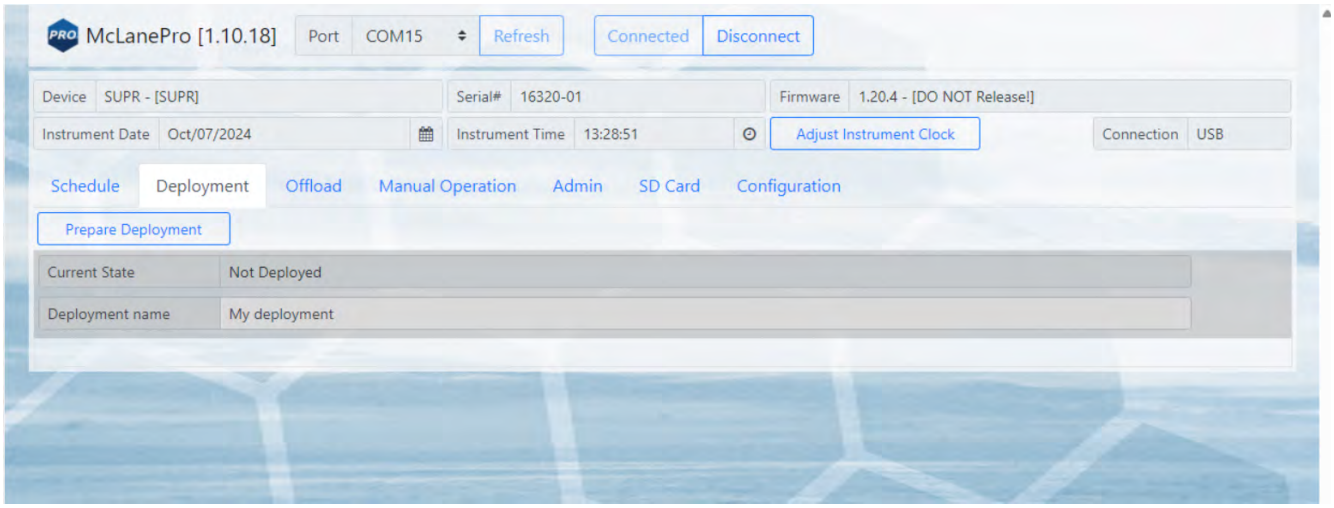


The user can choose to ignore the warning and continue the schedule even if an event is in the past. These events will be run immediately when the deployment begins.


Deployment Parameters
Available sample ports 14
Number of events 1
Start/Interval
Start/End
Offset
Start Date/Time Sep/23/2024 - 11:45:00
Populate Events
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
Deployment Event Parameters
Edit Event All Events
Populate Events
Water Flush
Volume (L) 4.0
Flow Rate (L/Min) 3.0
Min. Flow Rate (L/Min) 0.5
Sample
Volume (L) 20000.0
Flow Rate (L/Min) 4.0
Min. Flow Rate (L/Min) 0.5
Time Limit 0 H 0 M
Fixative Flush
Volume (L) 0.5
Flow Rate (L/Min) 2.0
Min. Flow Rate (L/Min) 0.5
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
1
09/23/2024 11:45:00
4.00
20000.00
4.00
0.50
00:00
0.50
2.00

The Deployment Tab

The **Deployment tab** is used to prepare for a deployment, start a deployment, or to monitor a deployment (if connected via USB, RS232 or RS485).



Starting a Deployment

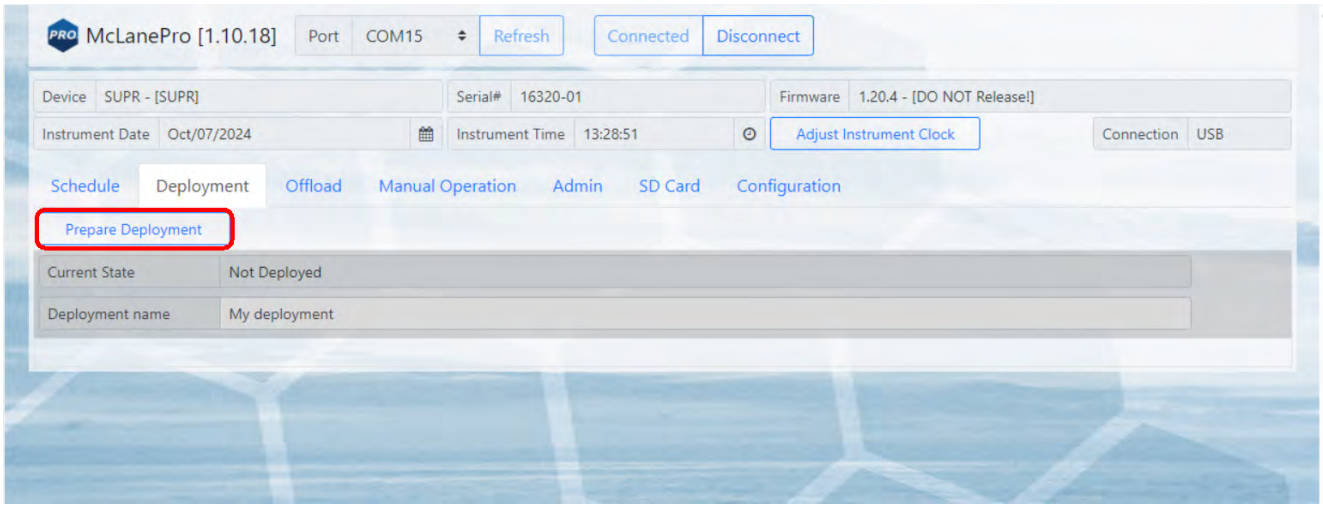
Follow these steps to start a deployment using the current schedule.

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

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

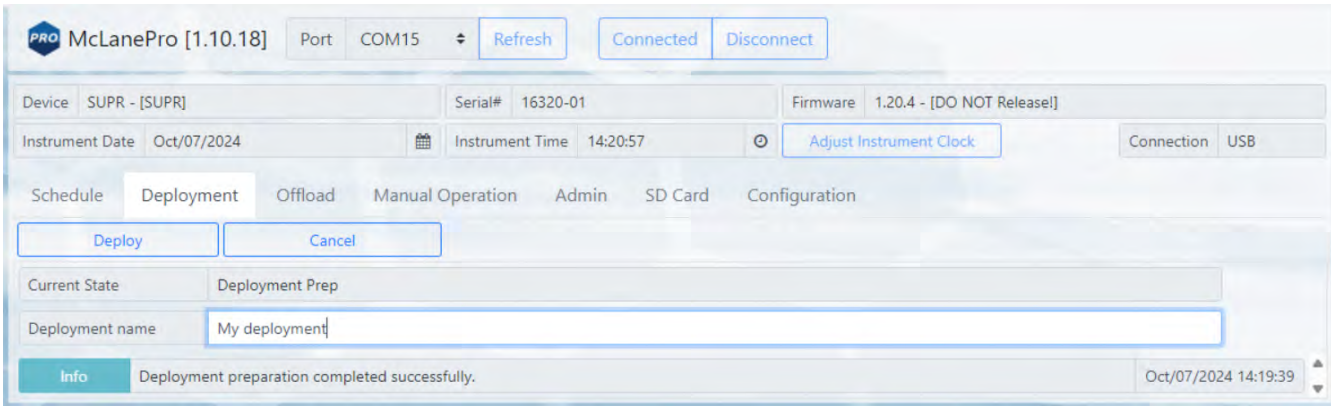
1. On the **Deployment** tab, click **Prepare Deployment**.

Prepare Deployment will run checks to make sure the SuPR is ready for the deployment. If a problem is detected, errors will be reported. The deployment may need to be canceled in order to fix the problems and attempt to deploy the SuPR again. Alternatively, some errors or warnings may be able to be fixed by pressing the "fix" button next to the message in the log. Warnings may also be generated at the time of deployment preparation, but do not prevent deployment.

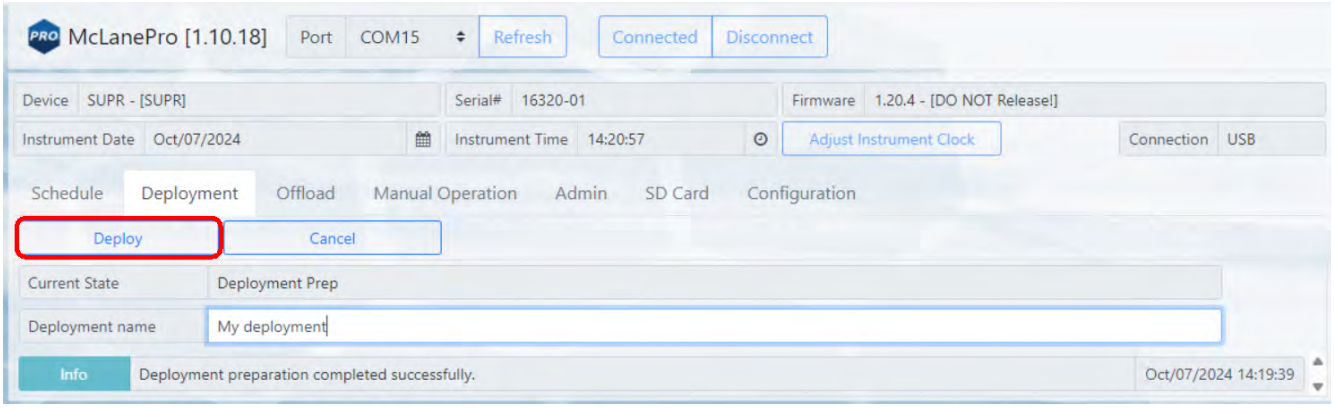


After passing checks, the SuPR allows setting of the deployment name before deploying.

2. Enter a deployment name or description.

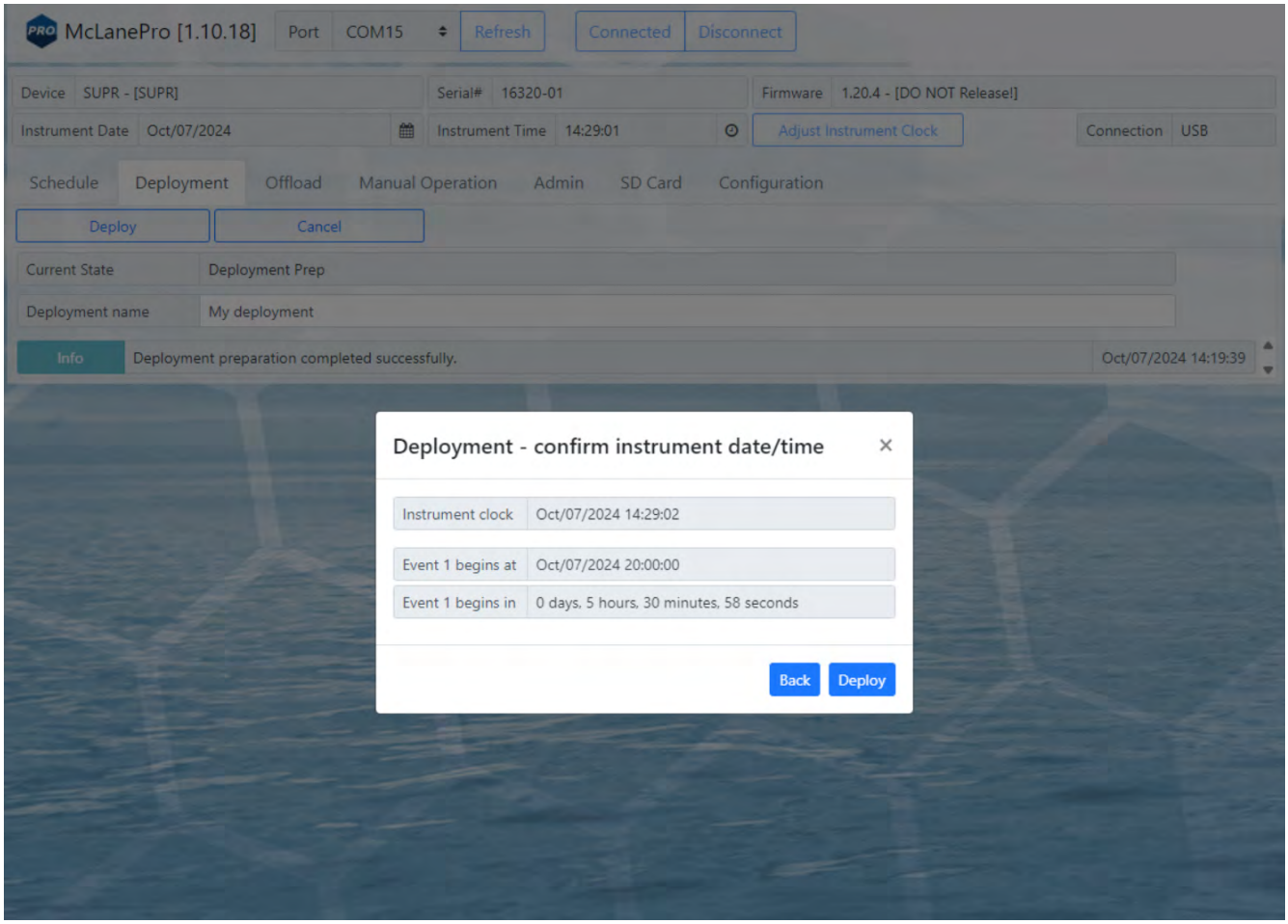


After setting the deployment name, the SuPR may be deployed.



3. 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.



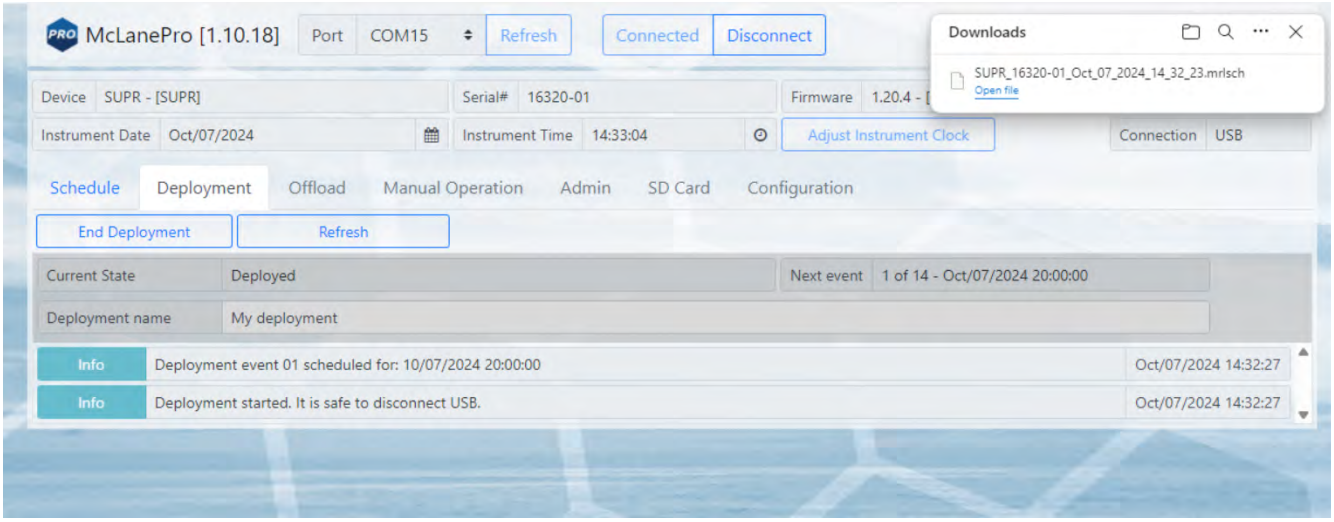
The SuPR offers a final check of the current time and conditions for starting the deployment.

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

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

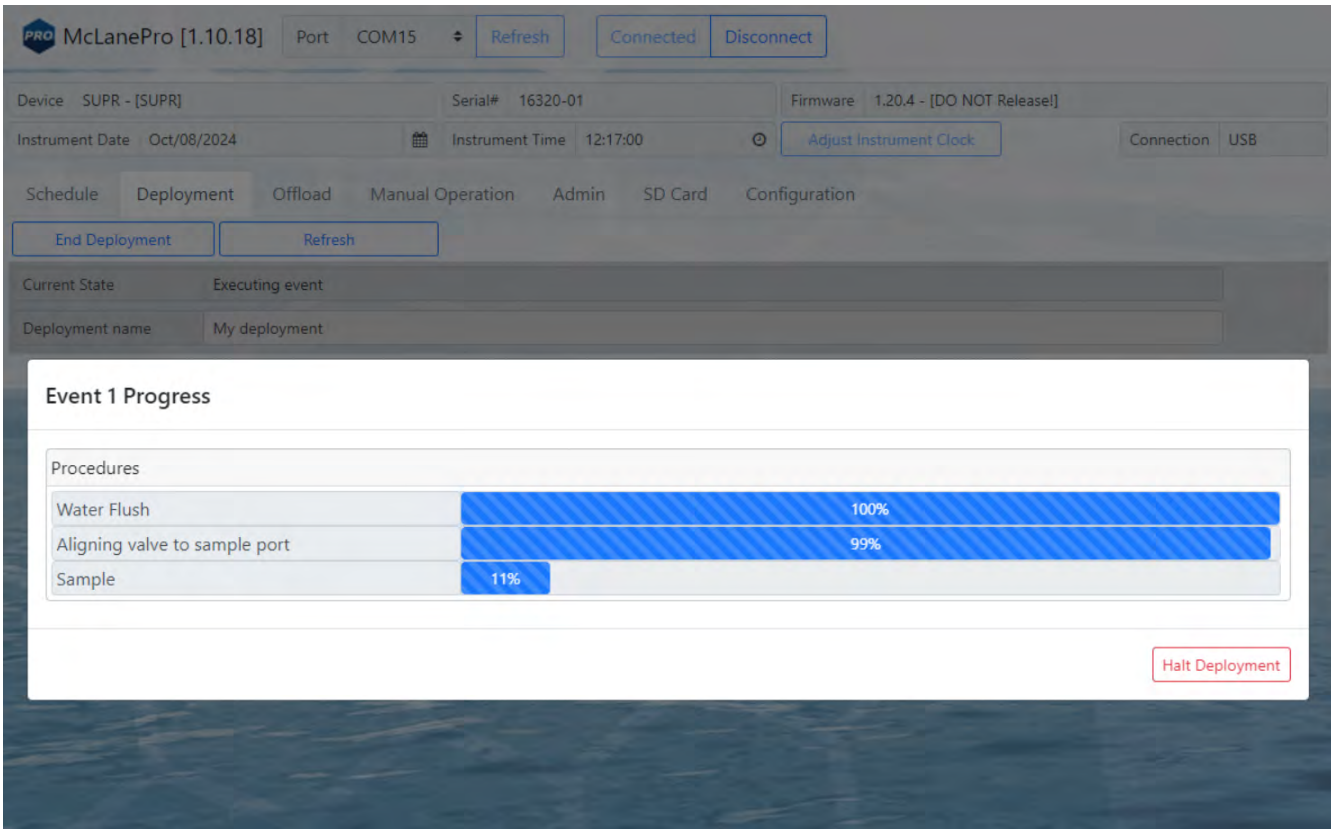
The SuPR displays the scheduled time for the first event, and a message that confirms it is safe to disconnect the USB connection.

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



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

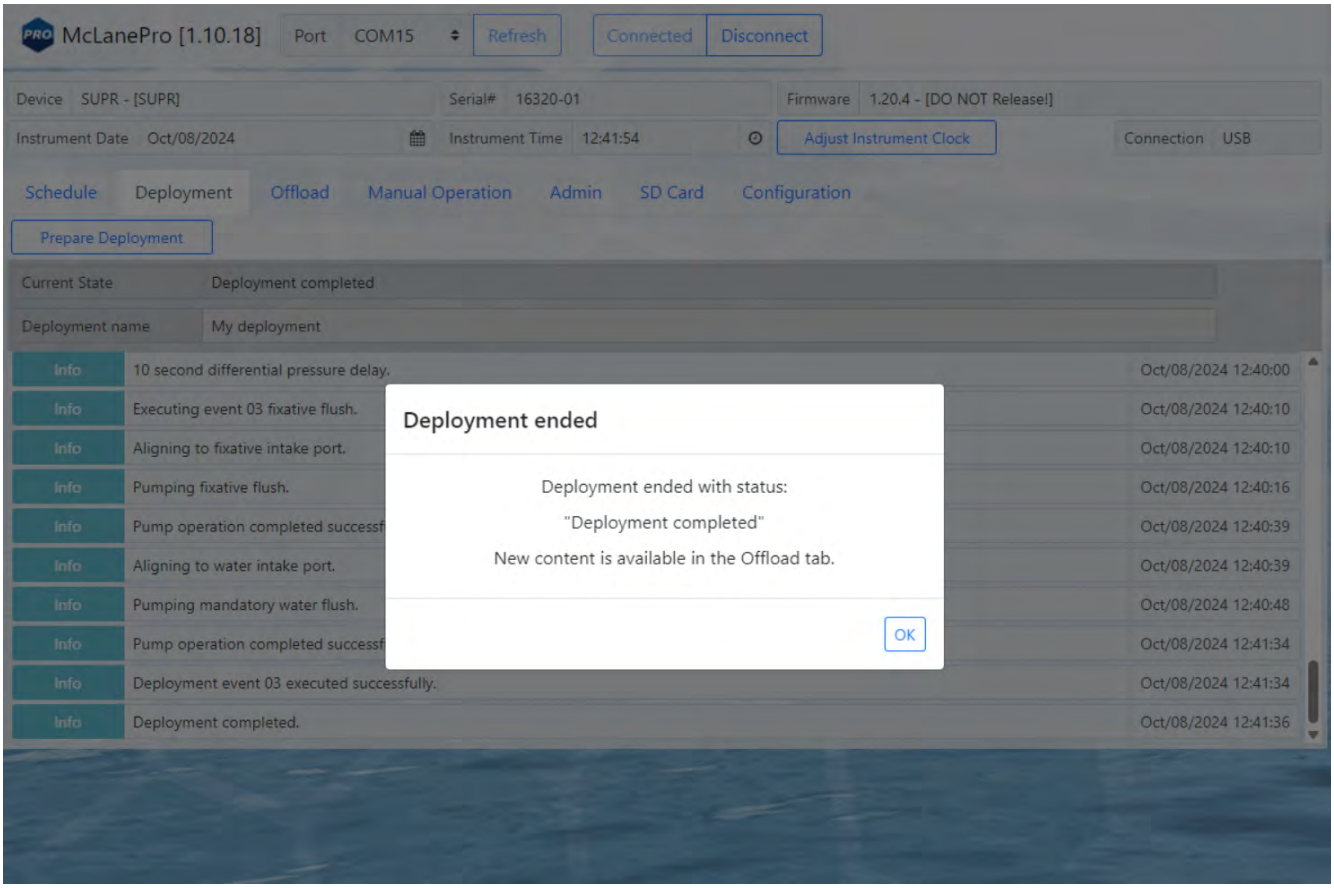
For testing or monitoring deployments, if USB (RS232, or RS485) is connected while running a test deployment, an event progress pop-up window reports the progress of the event that is being executed, and the deployment log will be updated as events are executed or completed.



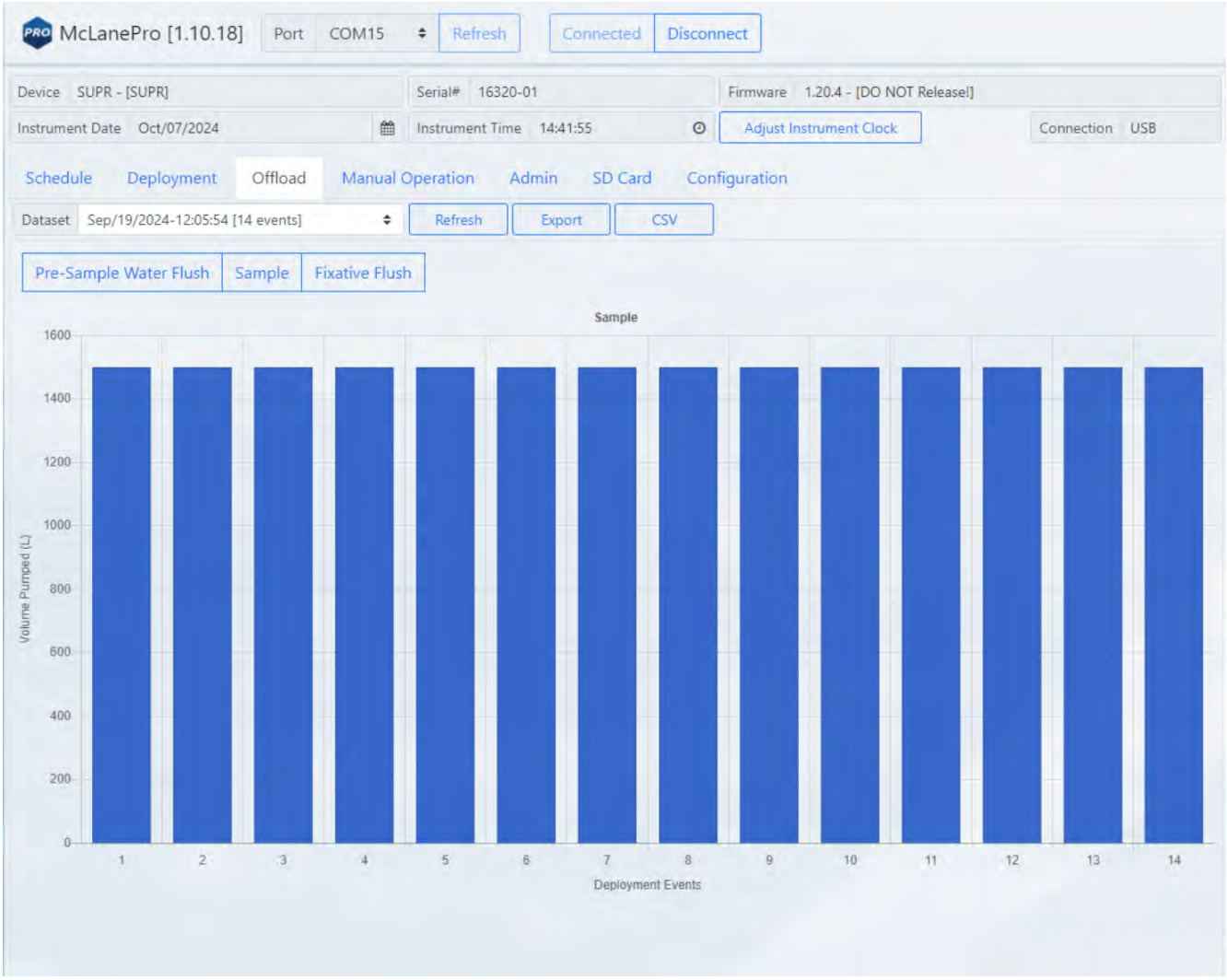
The Offload Tab

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

When connecting to a SuPR that has recently completed a deployment, McLanePro loads the **Offload tab** in order to review collected data.

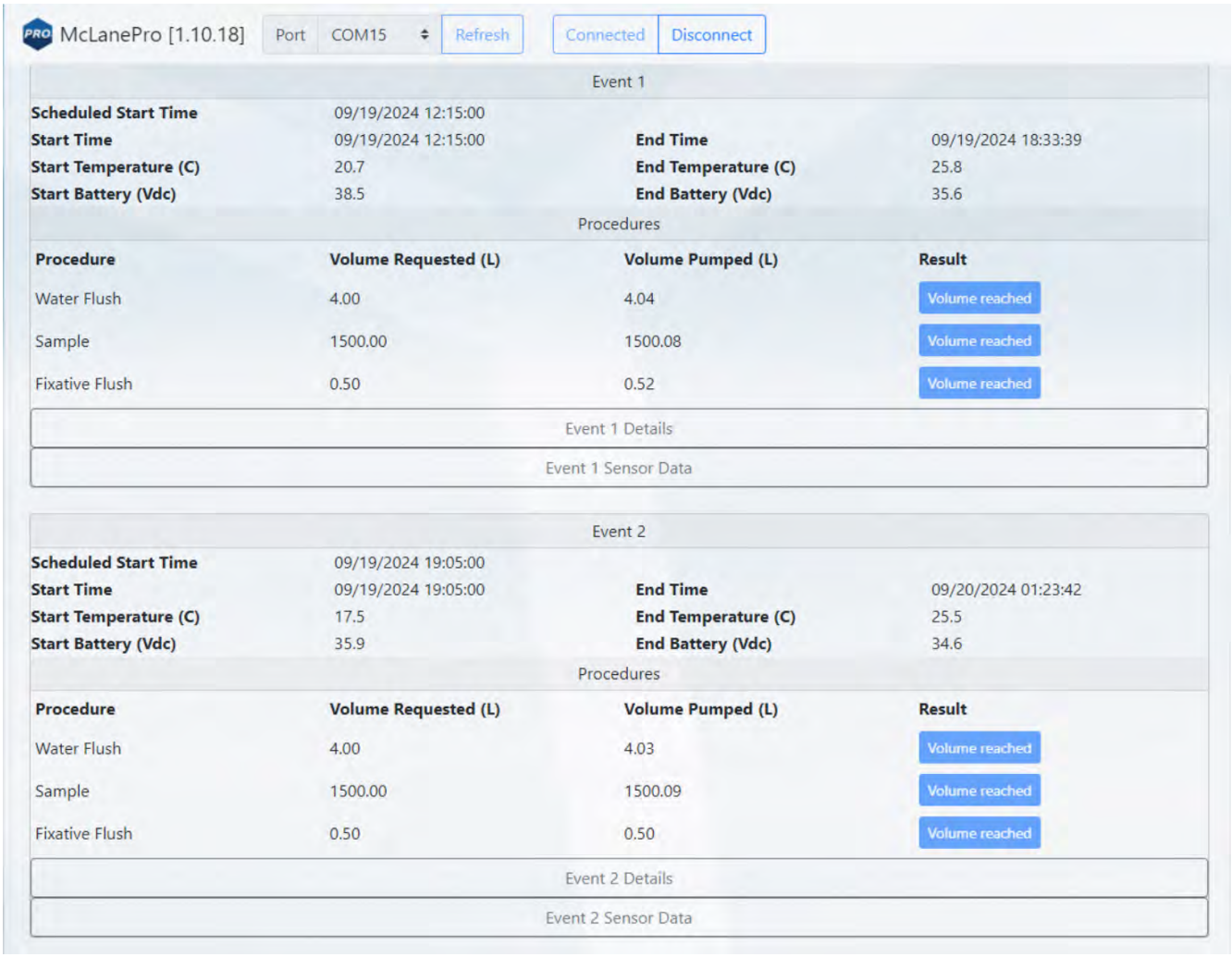


The **Offload tab** displays a bar chart for all pumping events. This may include pre-sample water flushes, sample events, and fixative flushes. Each bar will display the requested volume and the actual pumped volume. Use the mouse to hover over an event bar to see these data.

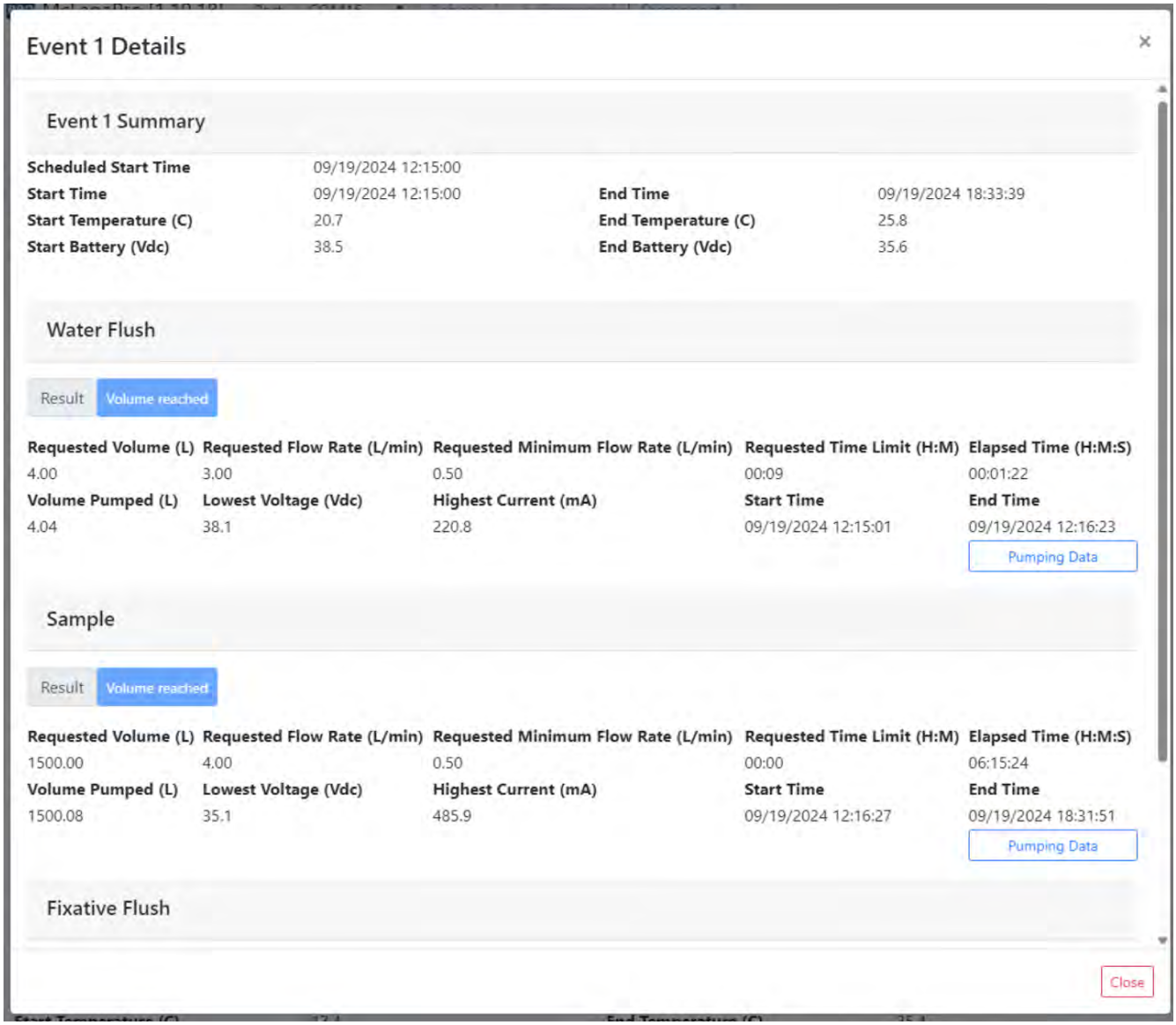


Event Data

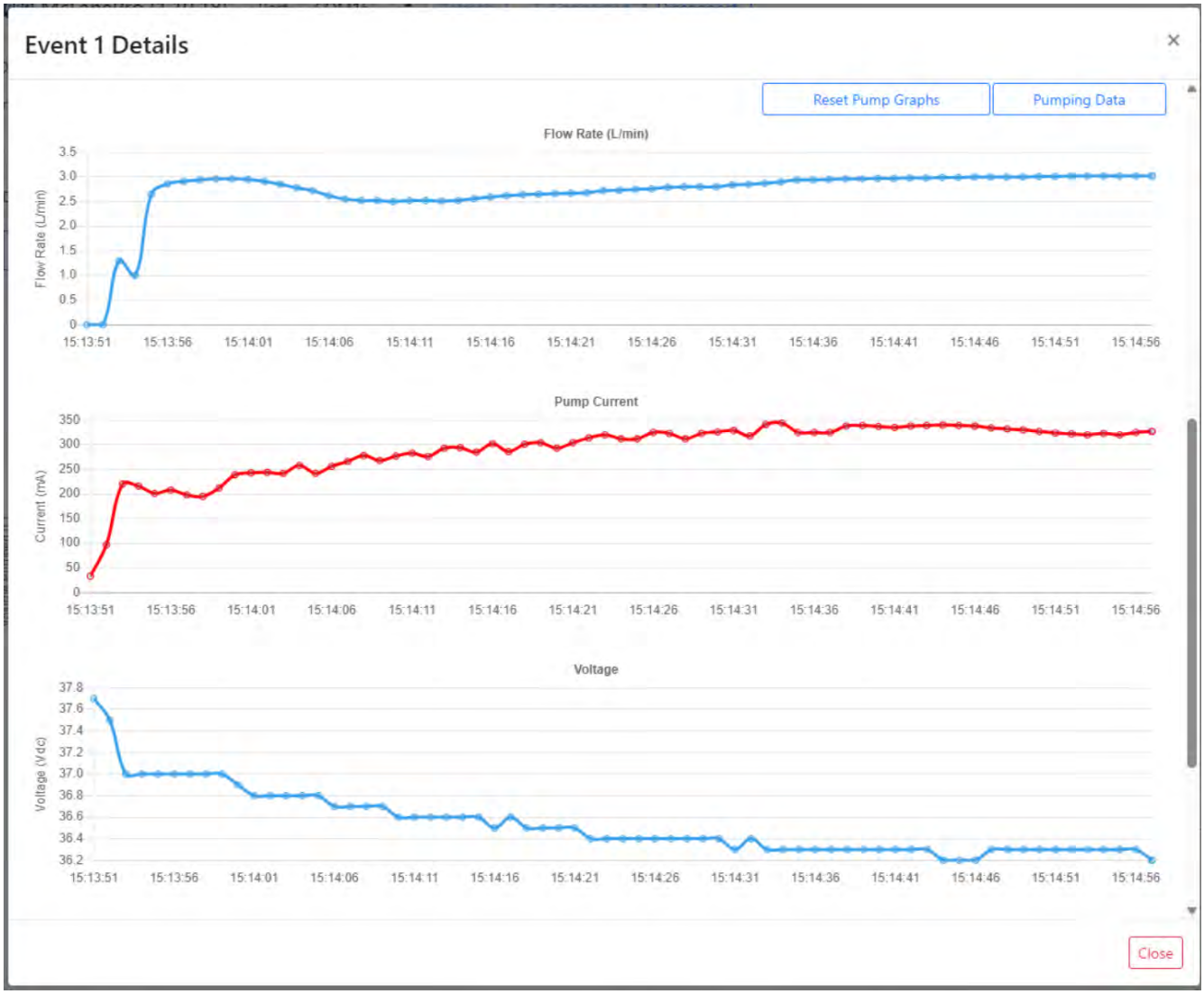
Individual event data are displayed below the bar chart. Each event data panel will display sensor readings taken at the start and end of the event, as well as a listing of procedures performed, and the exit conditions (results) for these procedures.



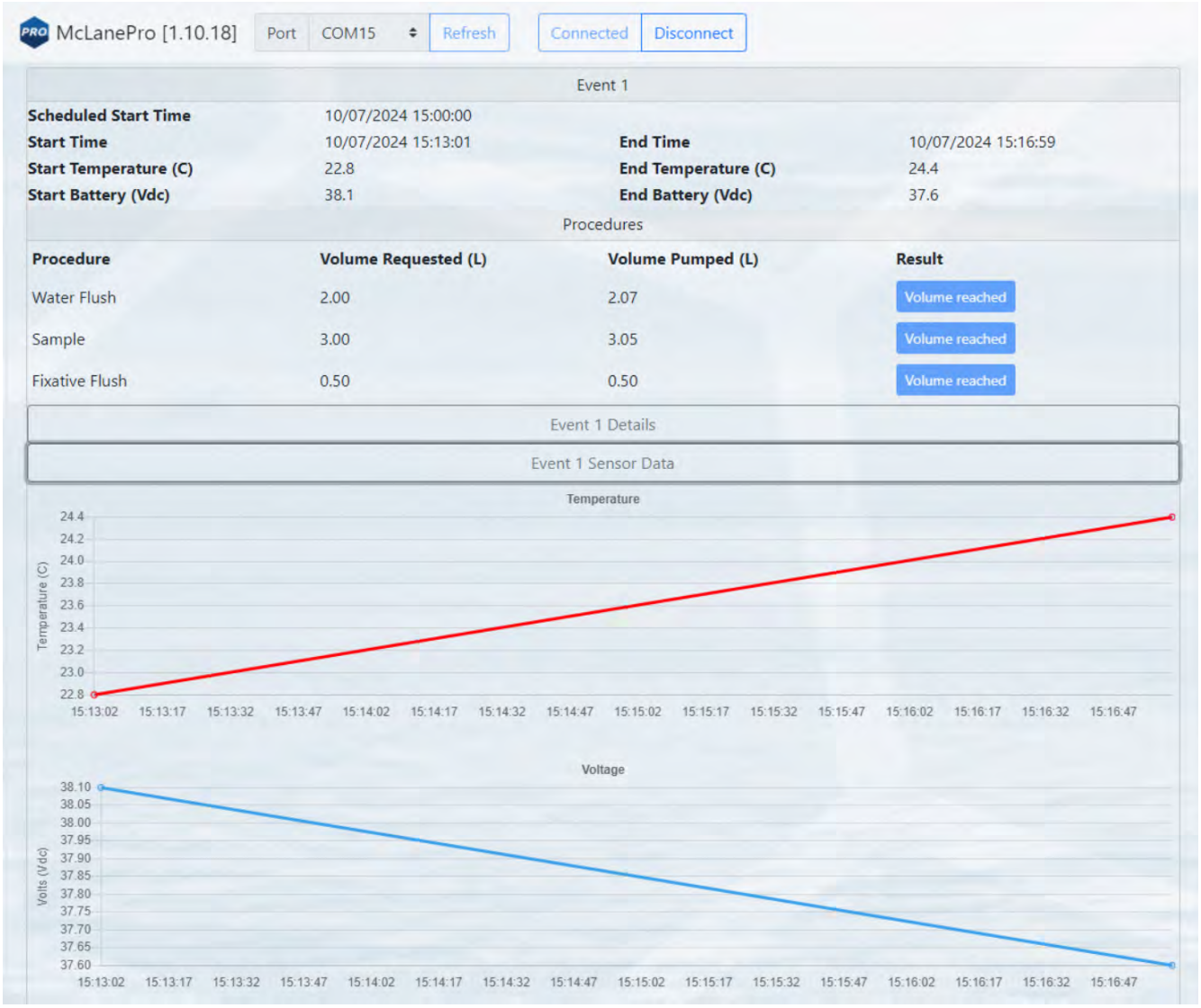
Clicking on the **Event (#) Details** button will launch a new window where more detailed information on each procedure is available for viewing.



Clicking the **Pumping Data** button under the Sample heading displays Event 1 pumping data recorded while the SuPR 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.

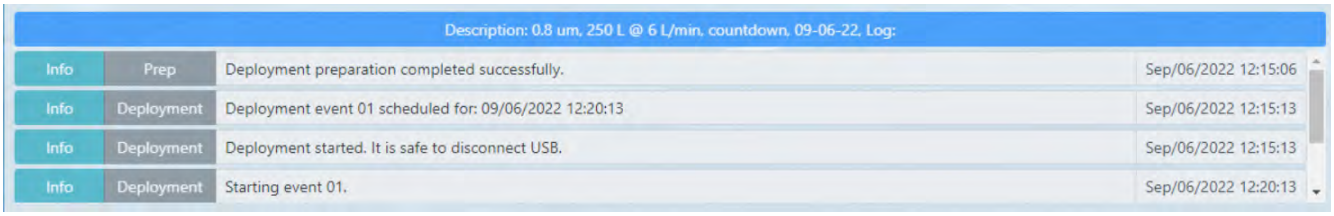


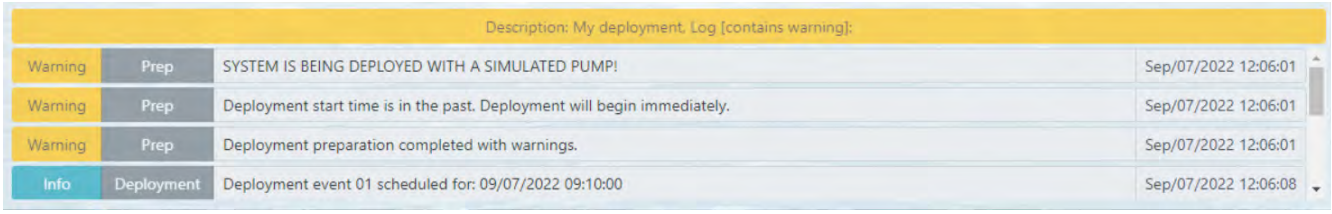
Additionally, from the **Offload tab**, clicking on **Event (#) Sensor Data** will expand to display charts of sensor data readings taken during the event. These data may include internal temperature and battery voltage.

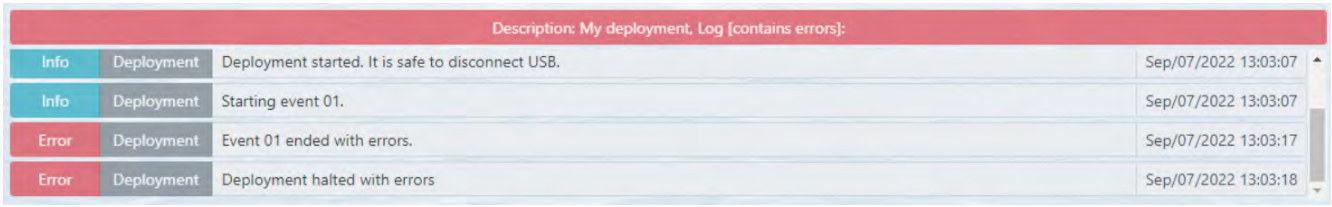


Deployment Log

The deployment log shows a summary of deployment information. Errors and warnings are clearly marked with a tag in the log, and the title bar is highlighted red if errors exist, or yellow if warnings exist in the log.



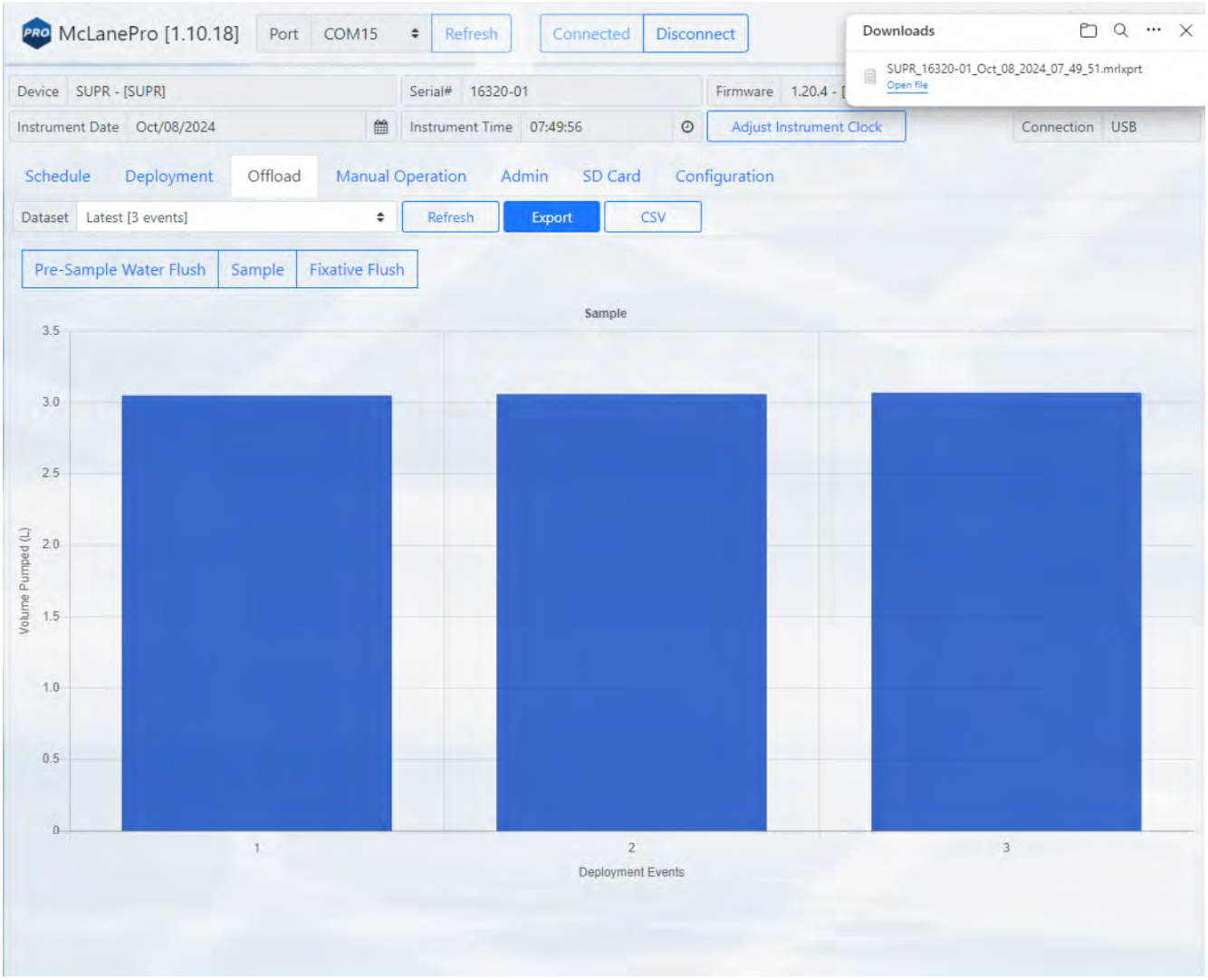




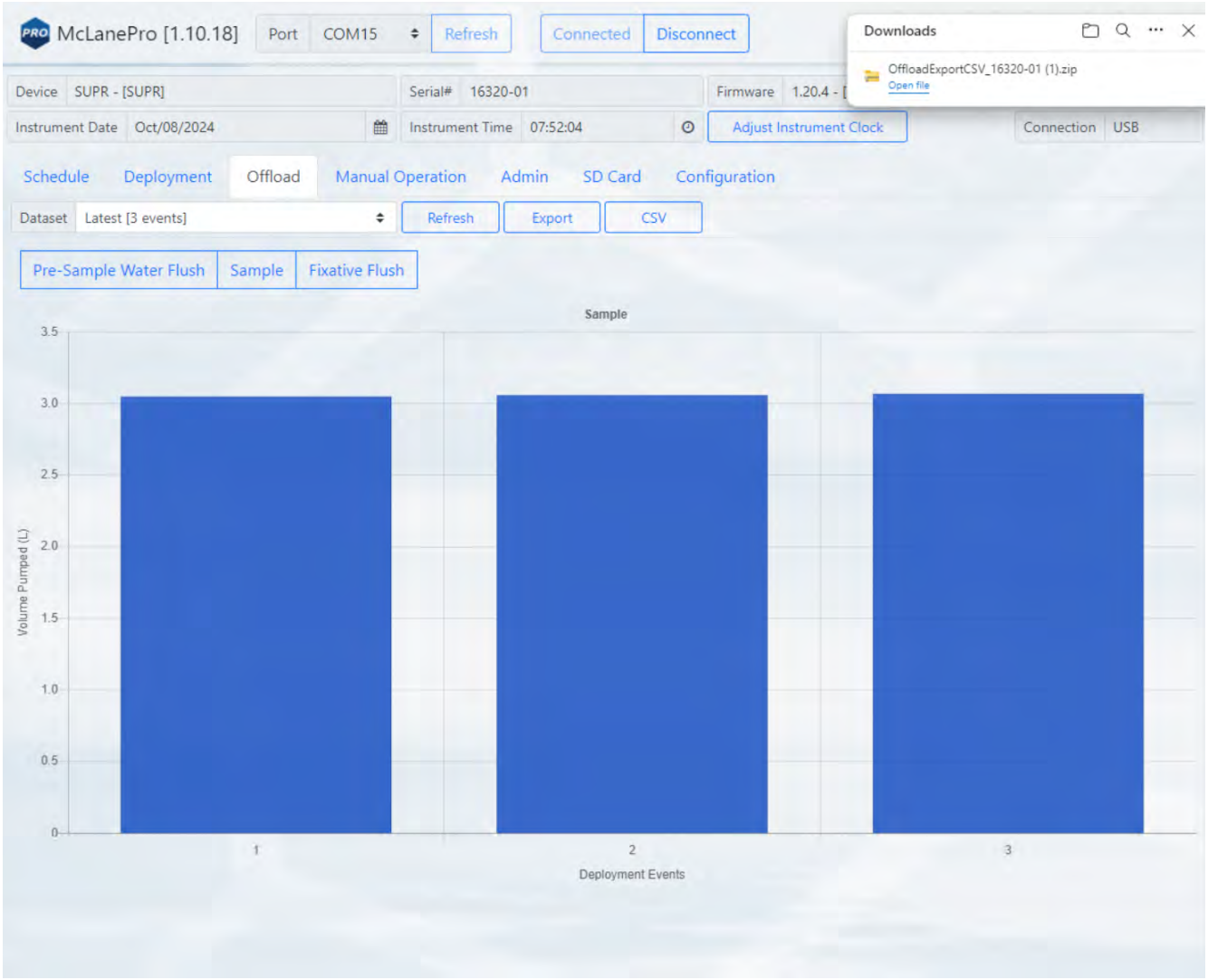
Exporting Deployment Data

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.

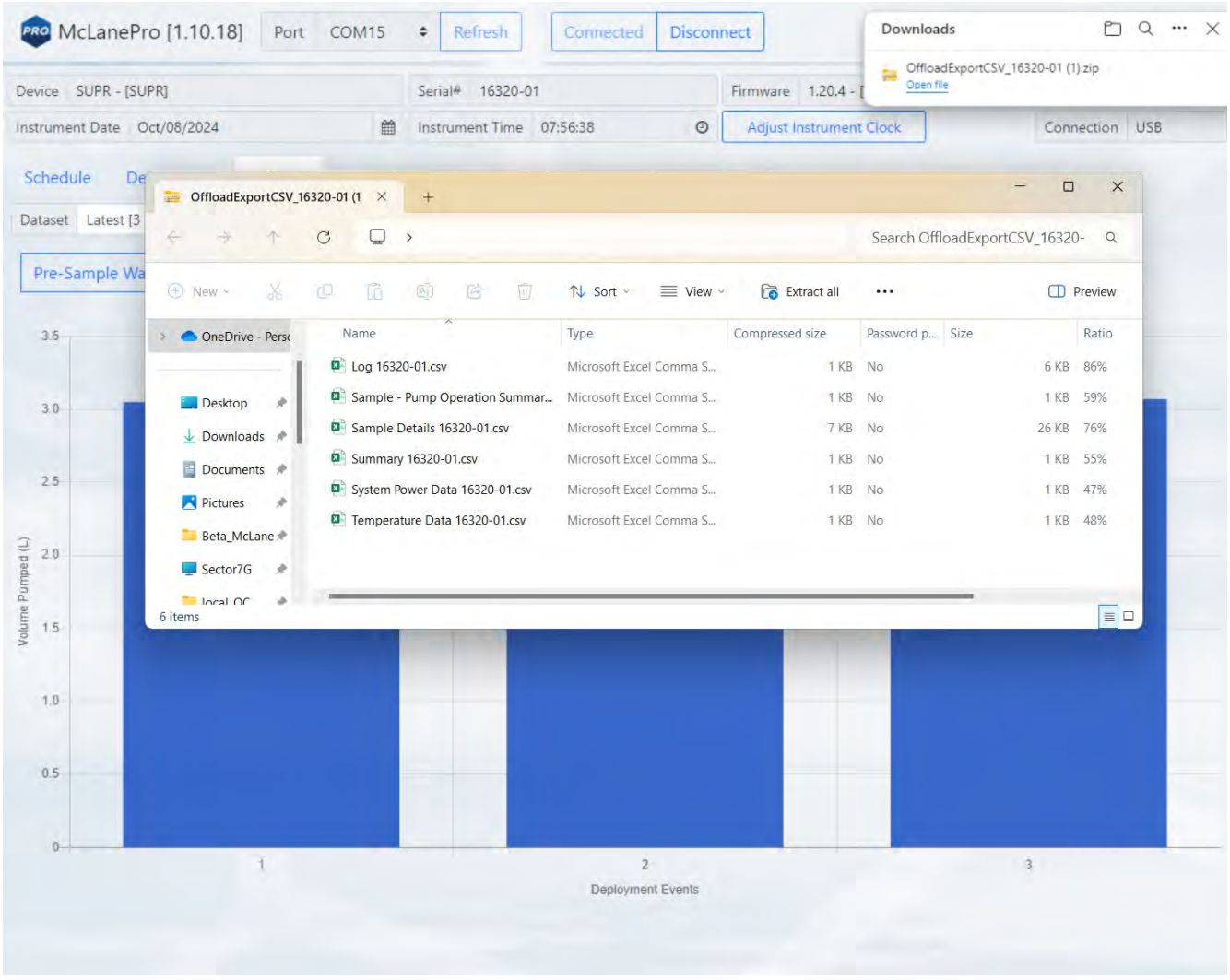
Clicking the **Export** button downloads schedule, configuration and device information in addition to the offload data from the deployment. These data are contained in a *.mrlxprt file that is viewable in McLanePro using Offline Mode.

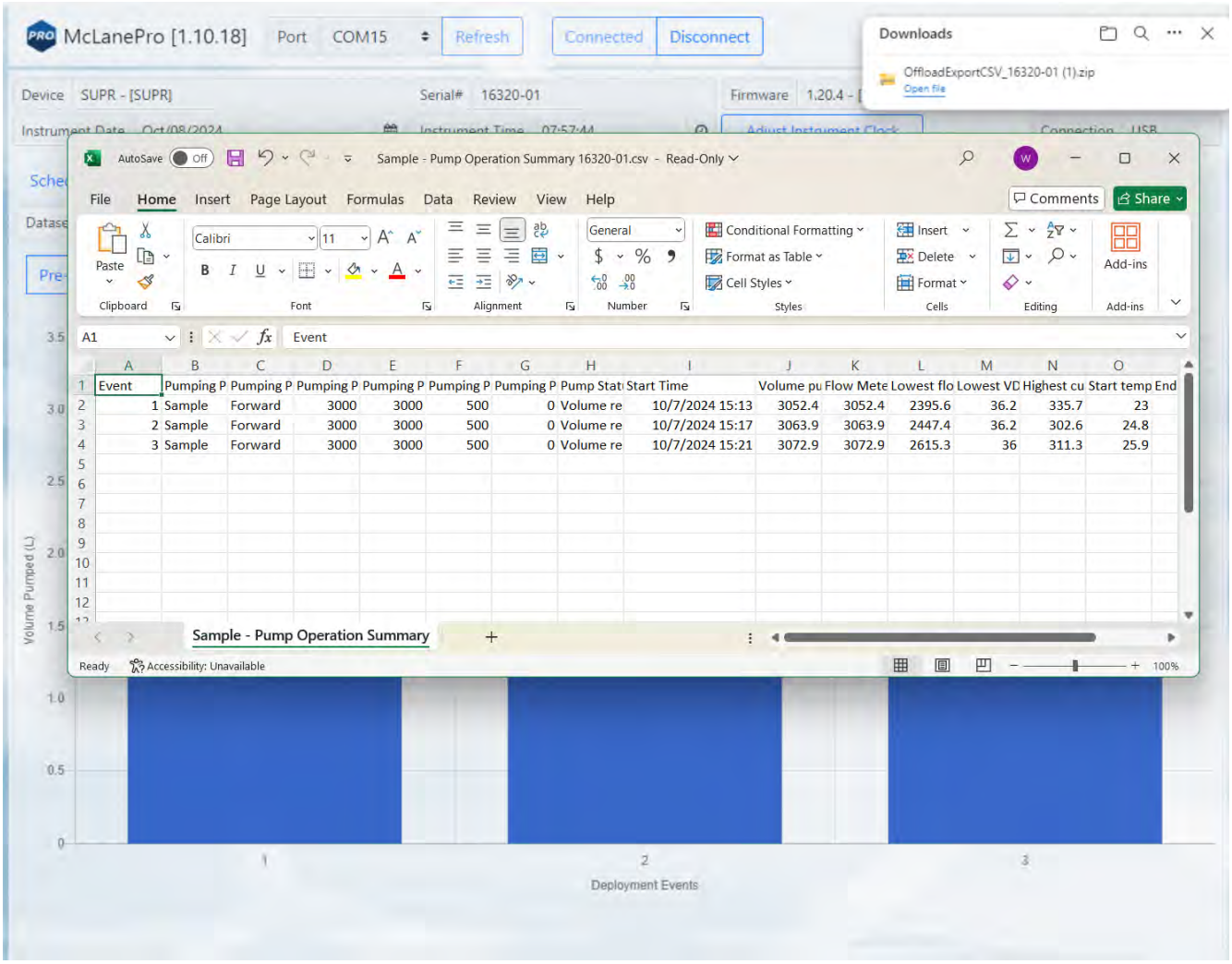


Deployment data may also be exported in CSV format by clicking the **CSV** button, and automatically downloading the compressed files to the host computer.



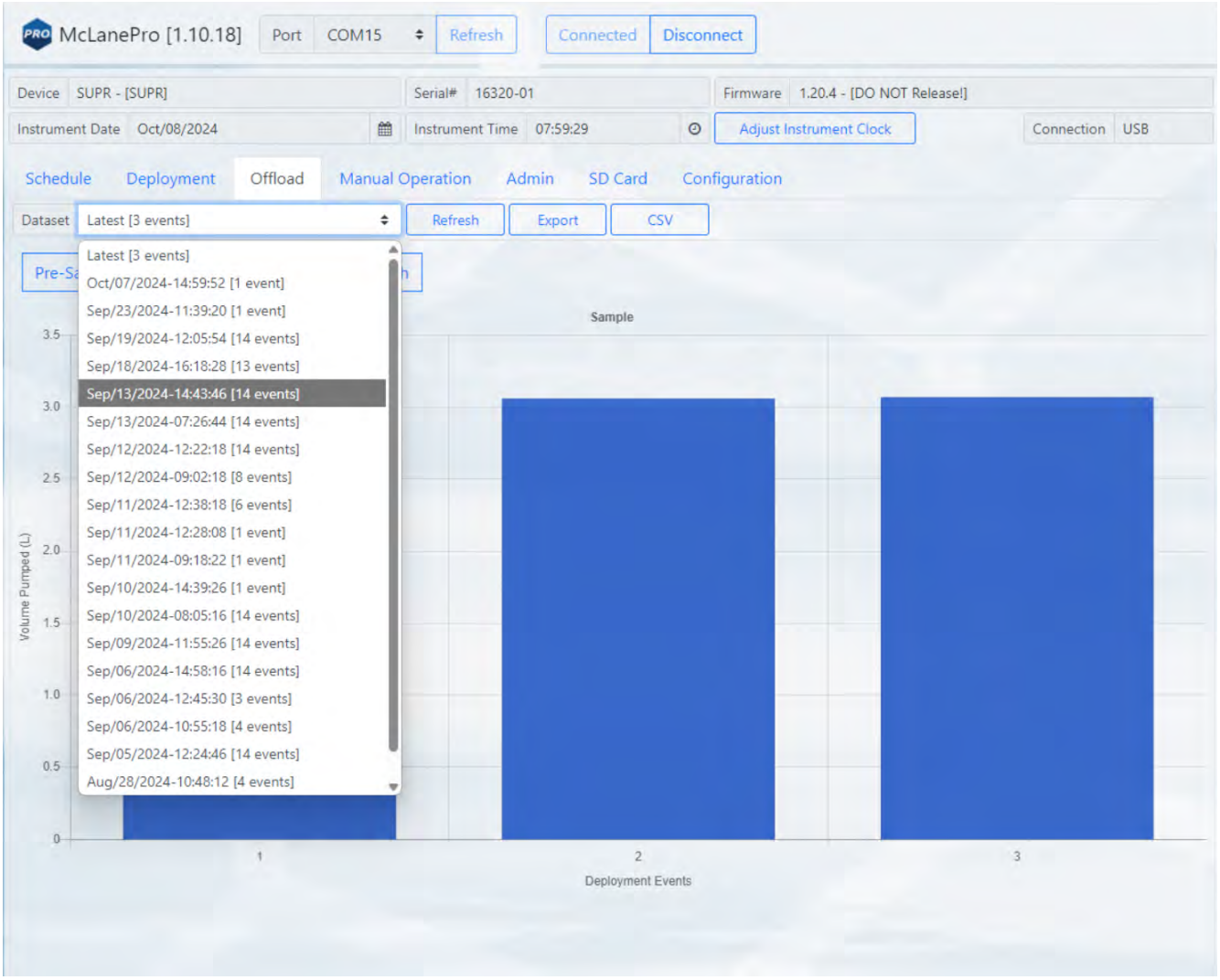
CSV files are compressed into a ZIP file and may be extracted for viewing or evaluation outside of McLanePro.


McLanePro [1.10.18]
Port COM15
Refresh
Connected
Disconnect
Downloads
OffloadExportCSV_16320-01 (1).zip
Open file
Device SUPR - [SUPR]
Serial# 16320-01
Firmware 1.20.4 - [
Instrument Date Oct/08/2024
Instrument Time 07:56:38
Adjust Instrument Clock
Connection USB
Schedule
Dataset
Pre-Sample Wa
OffloadExportCSV_16320-01 (1
Search OffloadExportCSV_16320-
New
Sort
View
Extract all
Preview
OneDrive - Perso
Desktop
Downloads
Documents
Pictures
Beta_McLane
Sector7G
Name
Type
Compressed size
Password p...
Size
Ratio
Log 16320-01.csv
Sample - Pump Operation Summar...
Sample Details 16320-01.csv
Summary 16320-01.csv
System Power Data 16320-01.csv
Temperature Data 16320-01.csv
Microsoft Excel Comma S...
1 KB
No
6 KB
1 KB
7 KB
26 KB
86%
59%
76%
55%
47%
48%
6 items
Volume Pumped (L)
Deployment Events



Viewing and Exporting Data From Previous Deployments

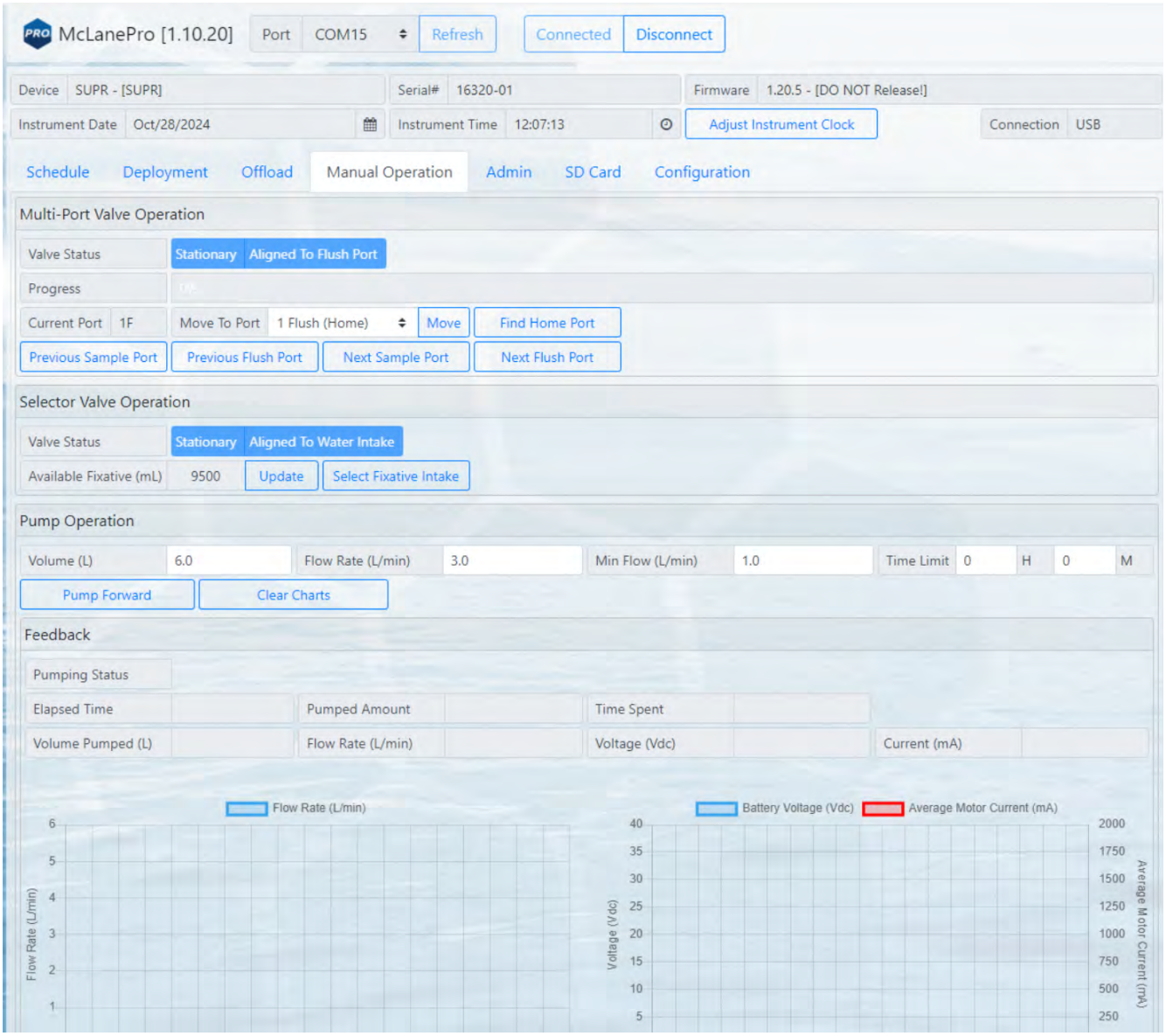
Data from previous deployments may be viewed by selecting a previous data set. To export the data, follow the instructions in Exporting Deployment Data.


McLanePro [1.10.18]
Port
COM15
Refresh
Connected
Disconnect
Device
SUPR - [SUPR]
Serial#
16320-01
Firmware
1.20.4 - [DO NOT Release!]
Instrument Date
Oct/08/2024
Instrument Time
07:59:29
Adjust Instrument Clock
Connection
USB
Schedule
Deployment
Offload
Manual Operation
Admin
SD Card
Configuration
Dataset
Latest [3 events]
Refresh
Export
CSV
Latest [3 events]
Oct/07/2024-14:59:52 [1 event]
Sep/23/2024-11:39:20 [1 event]
Sep/19/2024-12:05:54 [14 events]
Sep/18/2024-16:18:28 [13 events]
Sep/13/2024-14:43:46 [14 events]
Sep/13/2024-07:26:44 [14 events]
Sep/12/2024-12:22:18 [14 events]
Sep/12/2024-09:02:18 [8 events]
Sep/11/2024-12:38:18 [6 events]
Sep/11/2024-12:28:08 [1 event]
Sep/11/2024-09:18:22 [1 event]
Sep/10/2024-14:39:26 [1 event]
Sep/10/2024-08:05:16 [14 events]
Sep/09/2024-11:55:26 [14 events]
Sep/06/2024-14:58:16 [14 events]
Sep/06/2024-12:45:30 [3 events]
Sep/06/2024-10:55:18 [4 events]
Sep/05/2024-12:24:46 [14 events]
Aug/28/2024-10:48:12 [4 events]
Sample
Volume Pumped (L)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
1
2
3
Deployment Events

The Manual Operation Tab

The **Manual Operation tab** allows operation of the valves, pump and provides controls for system flushing.

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



Multi-Port Valve Operation

The SuPR contains a 14-port, multi-port valve used for fluid routing during the various flushing and sample operations. Each sample port is preceded by a flush port, allowing water flushing before and after each sample collection event. The first flush port (1F) is considered the home position. A magnetic position sensor embedded in the valve allows repeatable and accurate positioning of the valve.

Multi-Port Valve Operation

Valve Status - displays the current status of the multi-port valve. Status will change during valve moves and procedures.

Progress - displays the current progress percentage for the current procedure.

Current Port - displays the current valve port position.

Move to Port - allows moving directly to a specific flush or sample port.

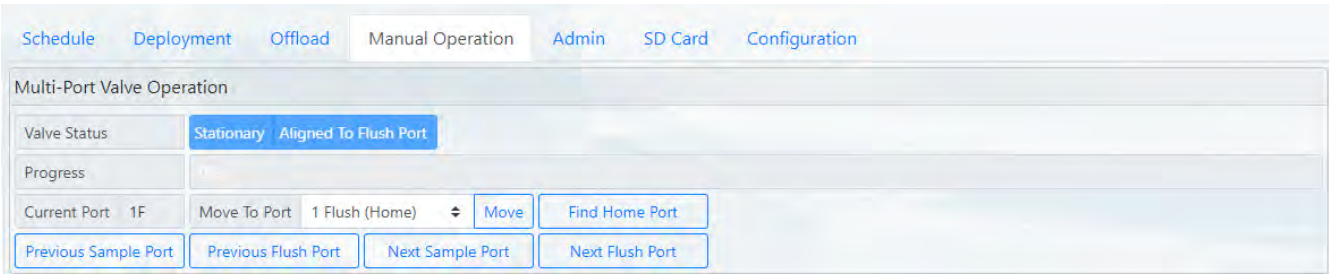
Find Home Port - if alignment or position is unknown, the **Goto Home Port** button is used to find the magnetic home position and sets the valve alignment.

Previous Sample Port - moves the valve to the previous sample position, passing over any flush ports.

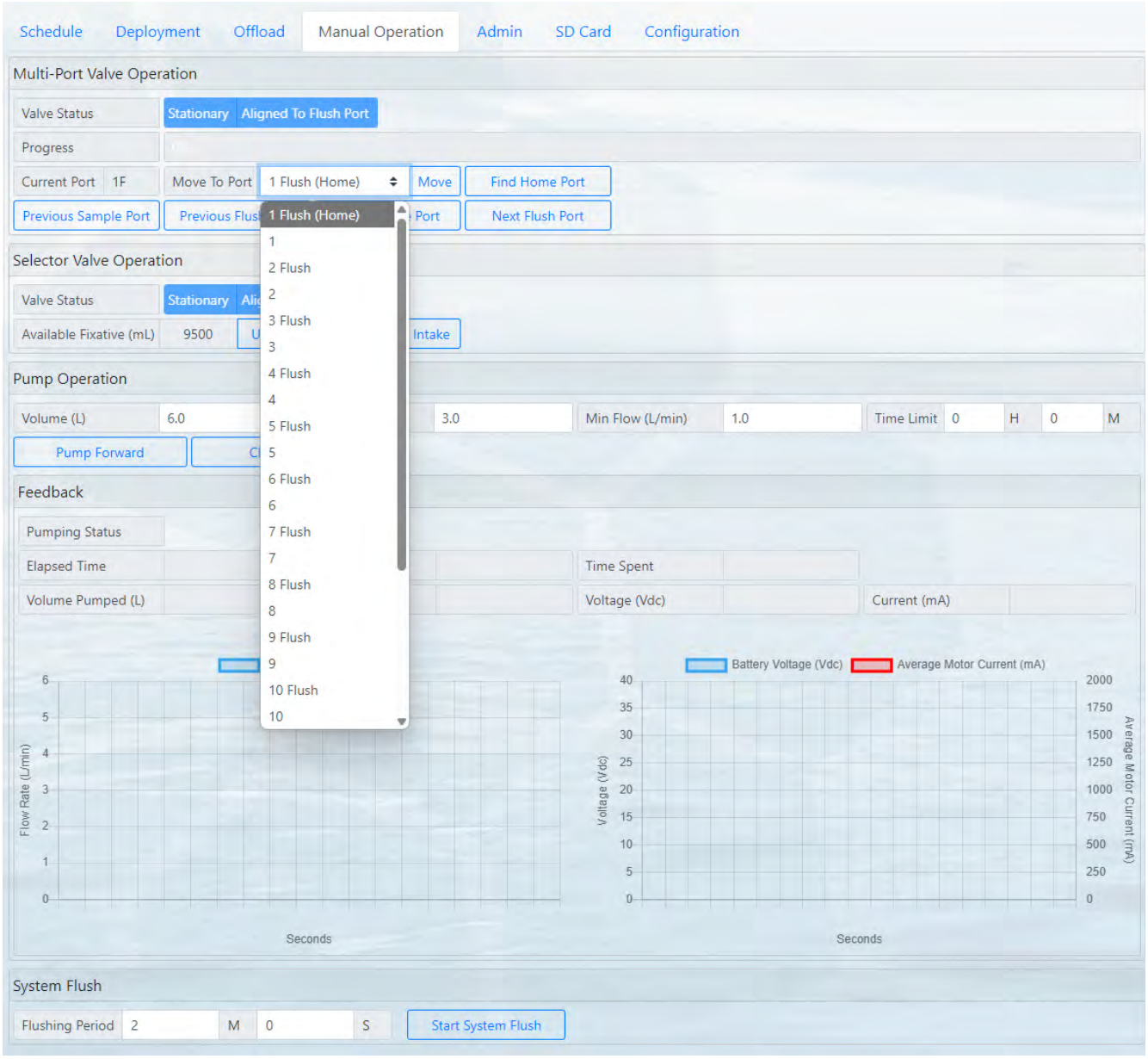
Previous Flush Port - moves the valve to the previous flush position, passing over any sample ports.

Next Sample Port - moves the valve to the next sample position, passing over any flush ports.

Next Flush Port - moves the valve to the next flush position, passing over any sample ports.



Note that the Move To Port drop-down box lists the ports in order, with each sample position preceded by a flush position.



Selector Valve Operation

The Selector Valve allows the system intake to be switched between the environment (sample water intake) and the fixative reservoir. Following sample collection, the SV is switched to the fixative reservoir, and stabilizer or preservative is applied to the sample.

Selector Valve Operation

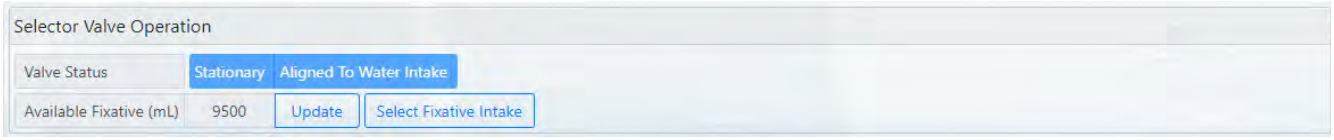
Valve Status - displays the current status of the multi-port valve. Status will change during valve

moves and procedures.

Available Fixative - displays the currently available volume of fixative in the reservoir. This value is updated during deployment to keep track of fixative remaining.

Update - allows the user to input the value of fixative in the reservoir after refilling. The maximum volume of the reservoir is approximately 9.5 liters.

Select Fixative Intake / Select Water Intake - this button is used to switch between the environmental intake (water intake) and the preservative reservoir (fixative intake).



Pump Operation

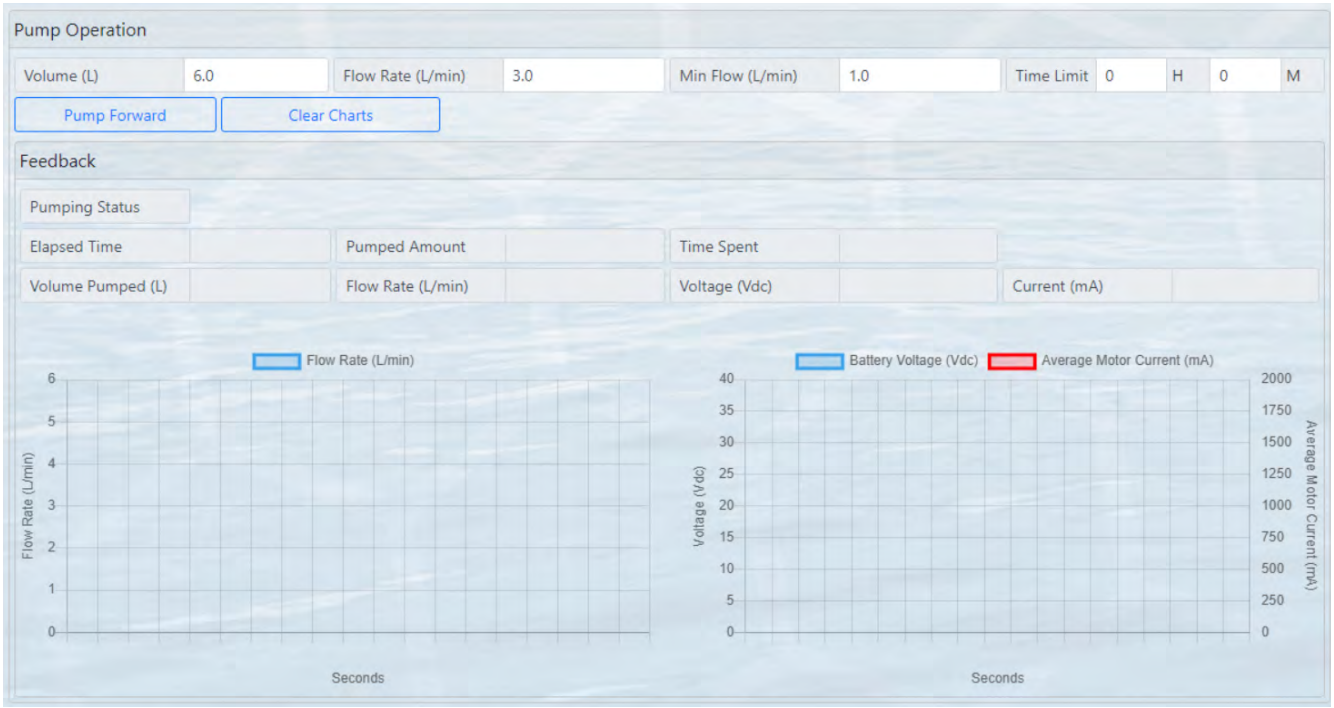
The large volume pump (LVP) is used to drive all fluid movement within the SuPR sampler. Flow rate is monitored using a digital flow meter at the system exhaust.

Pump Operation

Pump Forward - starts a forward 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 pumping will utilize values set in the **Pumping Parameters** fields.

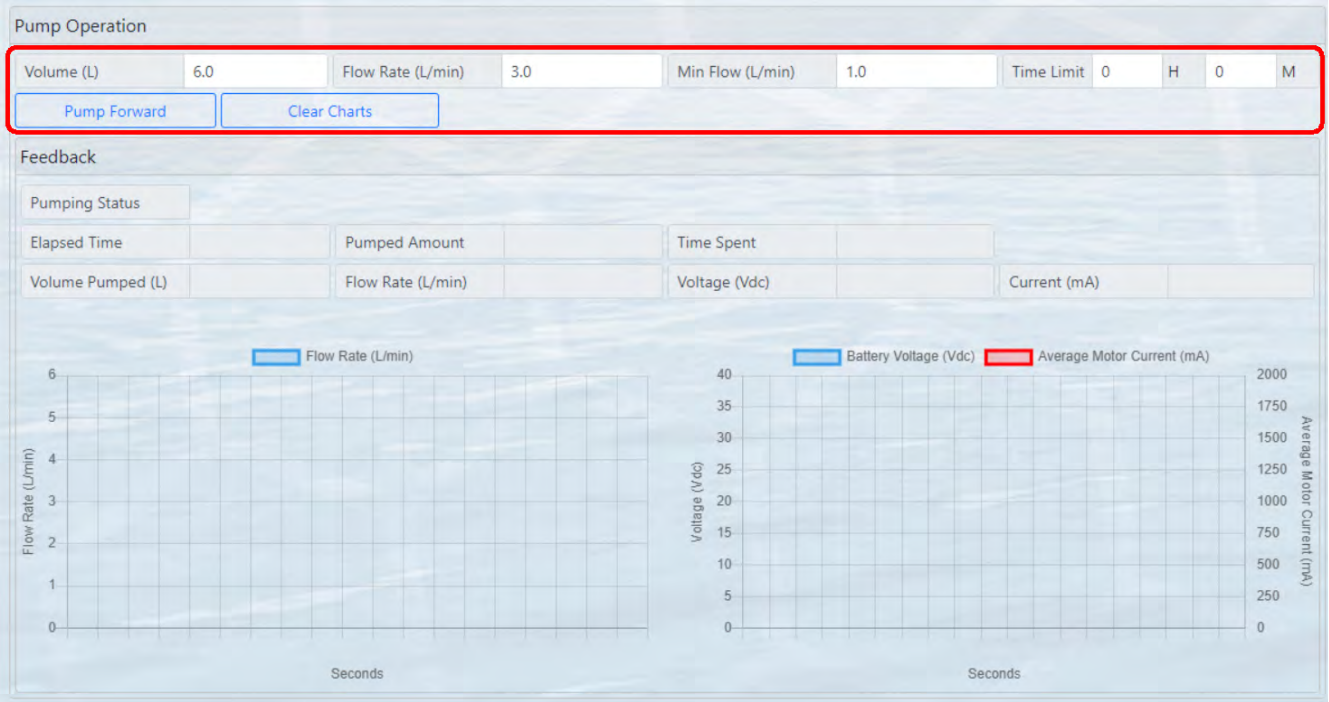
Pumping parameters:

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

Flow Rate - sets the target flow rate for the pumping event. Actual flow rate will be adjusted by the SuPR 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 event time limit for the pumping event. A value of zero disables the time limit function.



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

Feedback:

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

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 for the current pumping event.

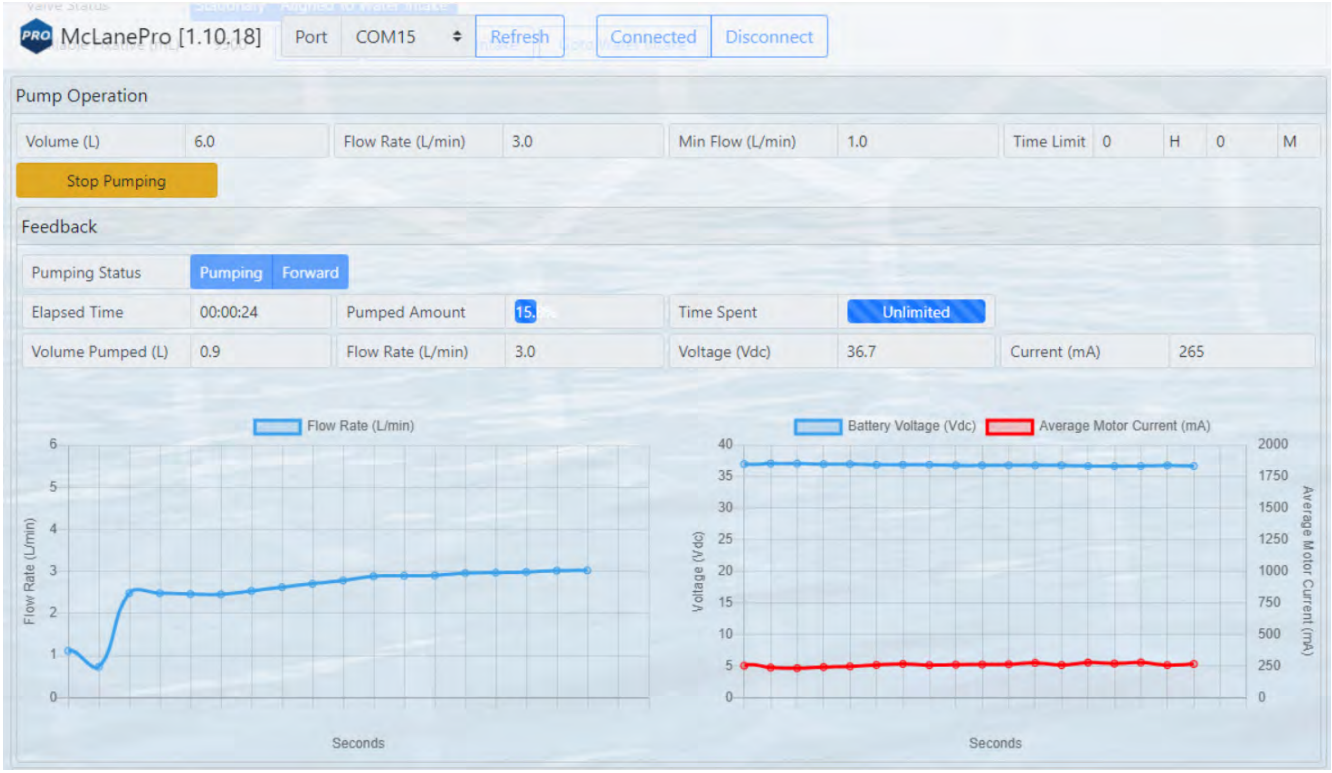
Volume Pumped - the total volume pumped.

Flow Rate - the flow rate of the pump, as measured by the digital flow meter.

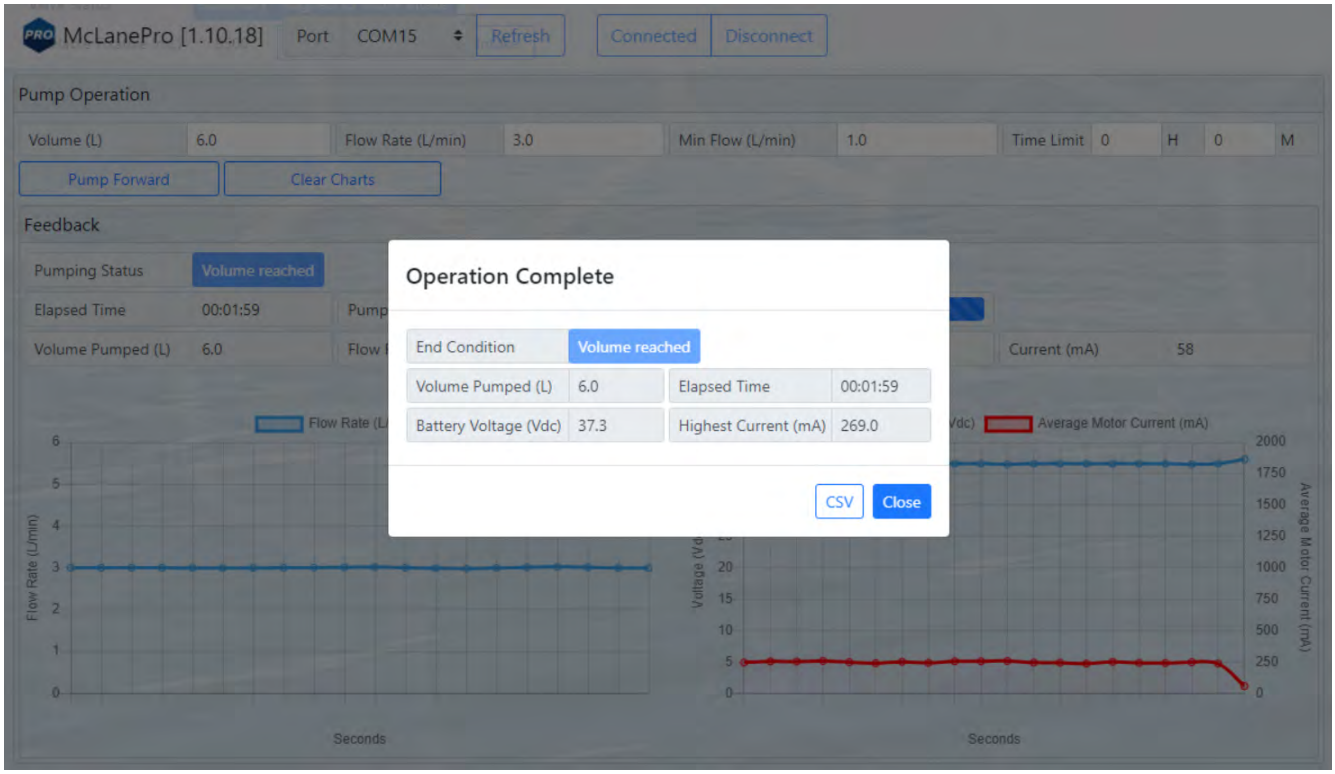
Vdc - the measured battery voltage while pumping.

Current (mA) - the measured current while pumping.

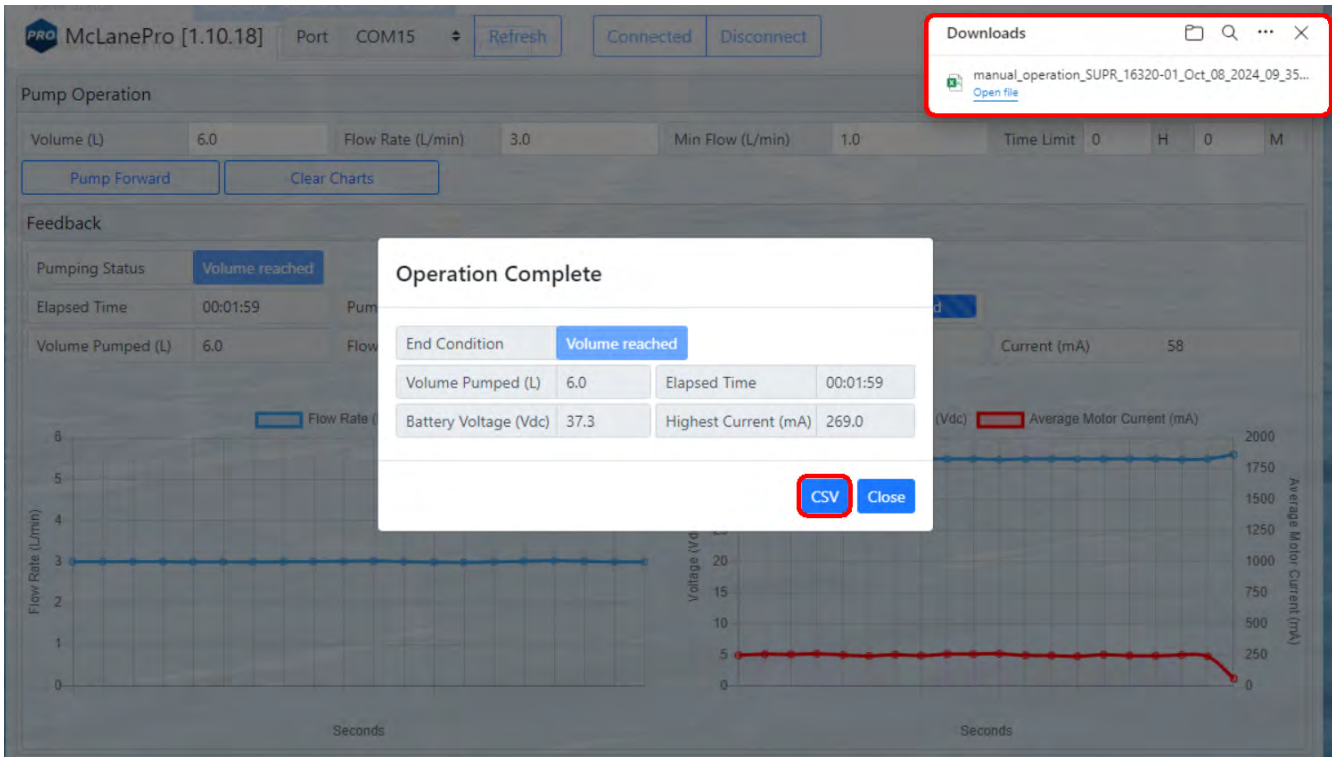
Flow rate, voltage and motor current data are plotted during manually operated pumping. Clicking **Clear Charts** will erase the existing data from the charts.



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.



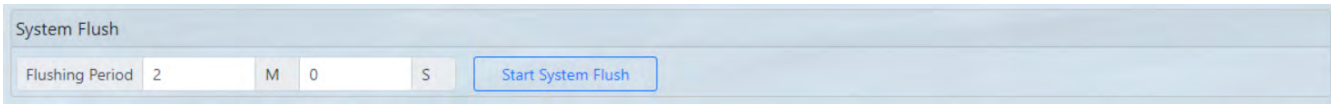
System Flush

The **System Flush** utility is available at the bottom of the **Manual Operation** tab. This utility is useful when priming or cleaning the SuPR before or after a deployment.

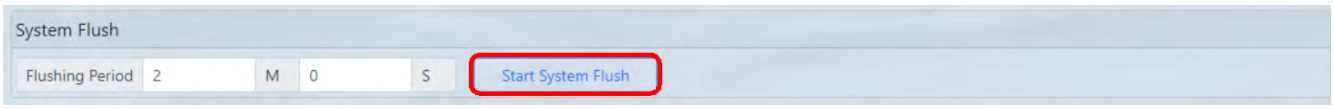
System Flush

Flushing Period - this is the amount of time the SuPR will spend flushing each port (all flush and sample ports).

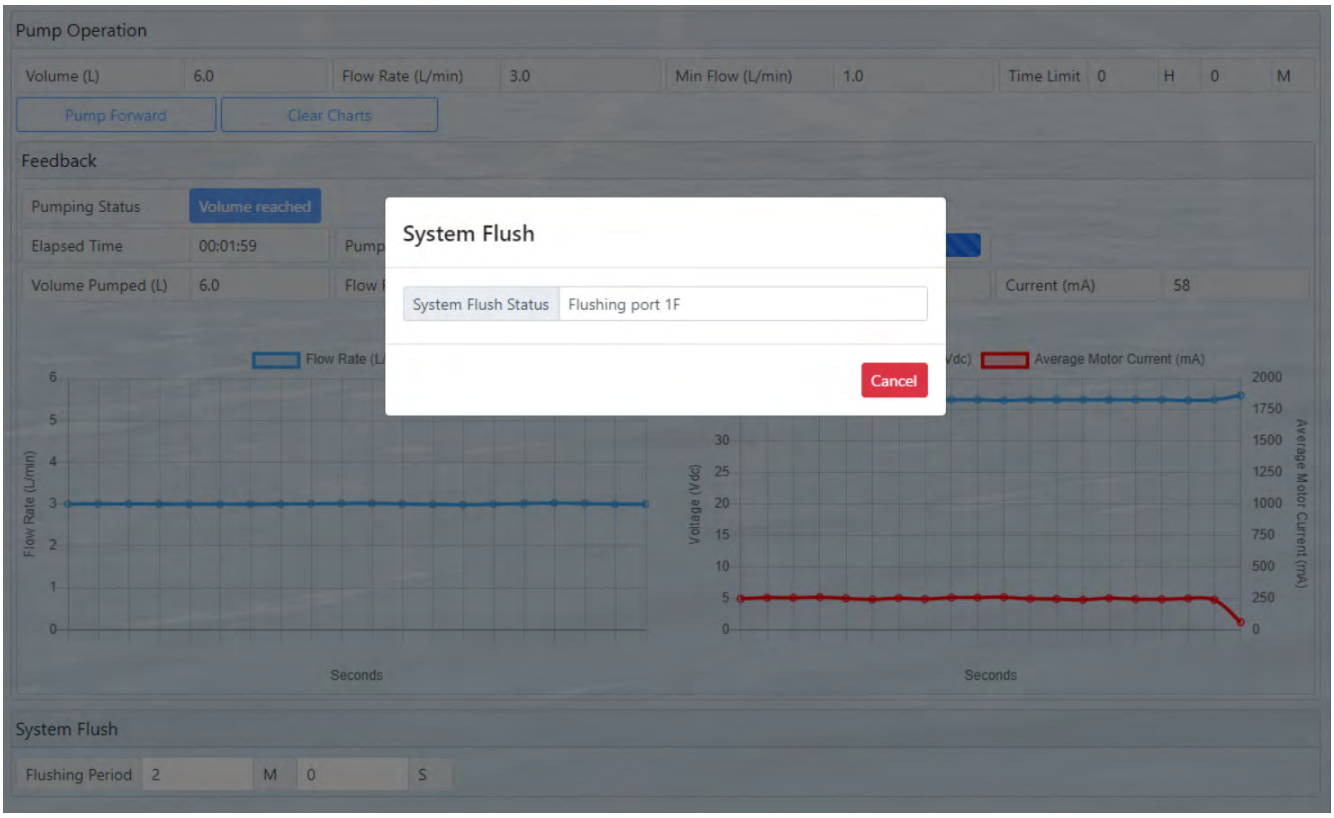
Start System Flush - this button is used to initiate the system flush procedure.



1. Press **Start System Flush** to begin the flushing procedure. Be sure that the intake and exhaust are placed in an appropriate container of clean water or cleaning agent.



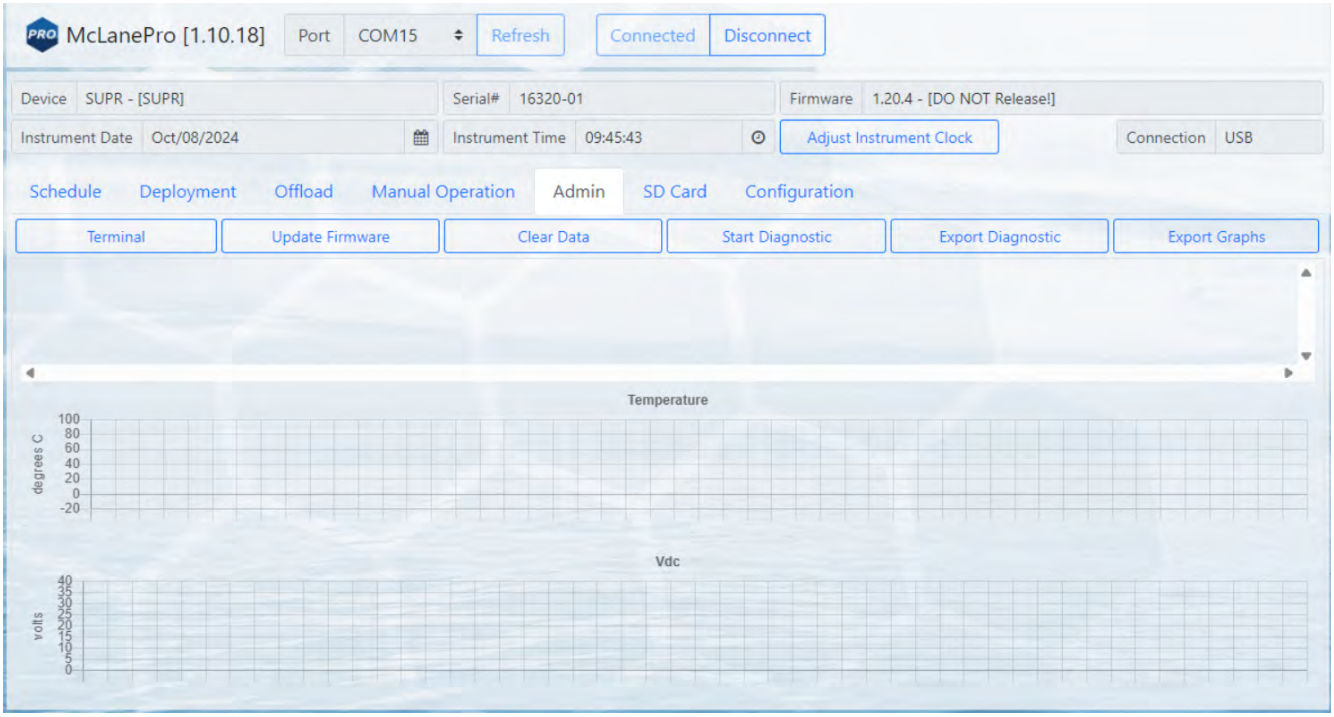
A popup window displays the current status of the System Flush procedure. It may be canceled at any time.



The Admin Tab

The **Admin tab** is used to:

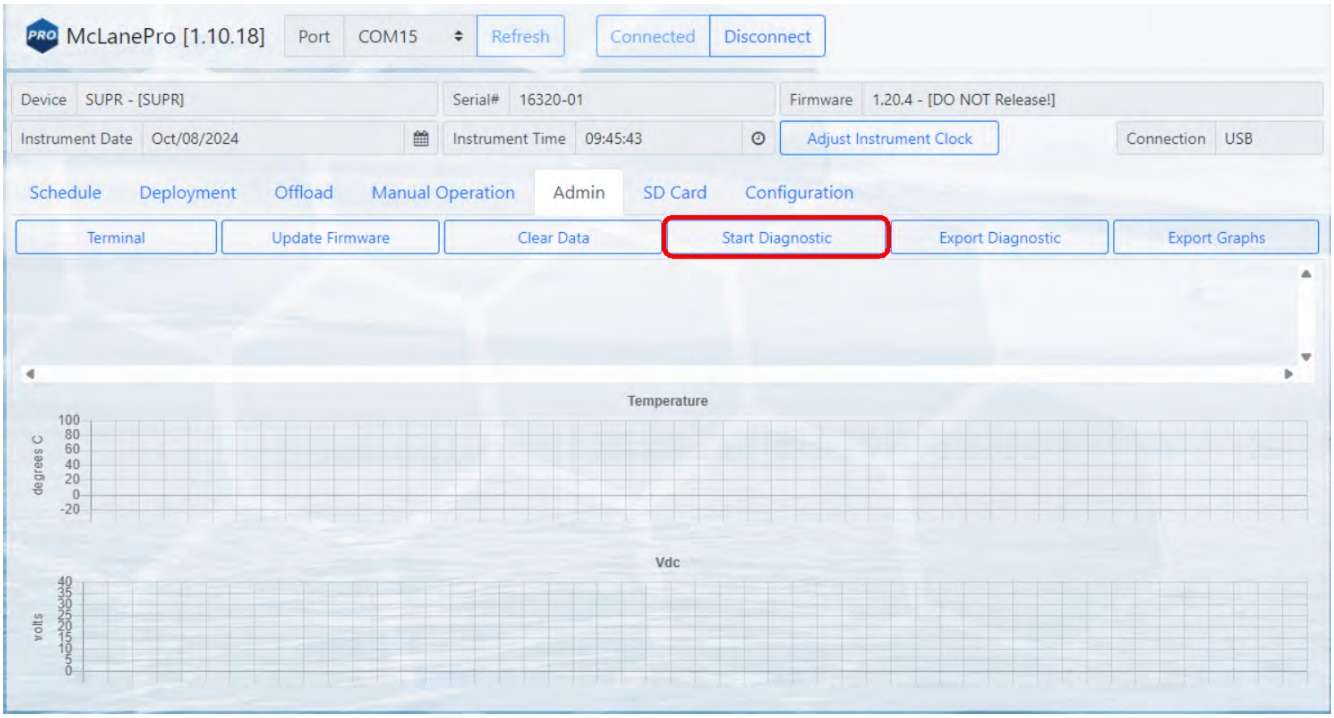
- Run Diagnostics
- Update Firmware
- Communicate to the SuPR Using the Terminal



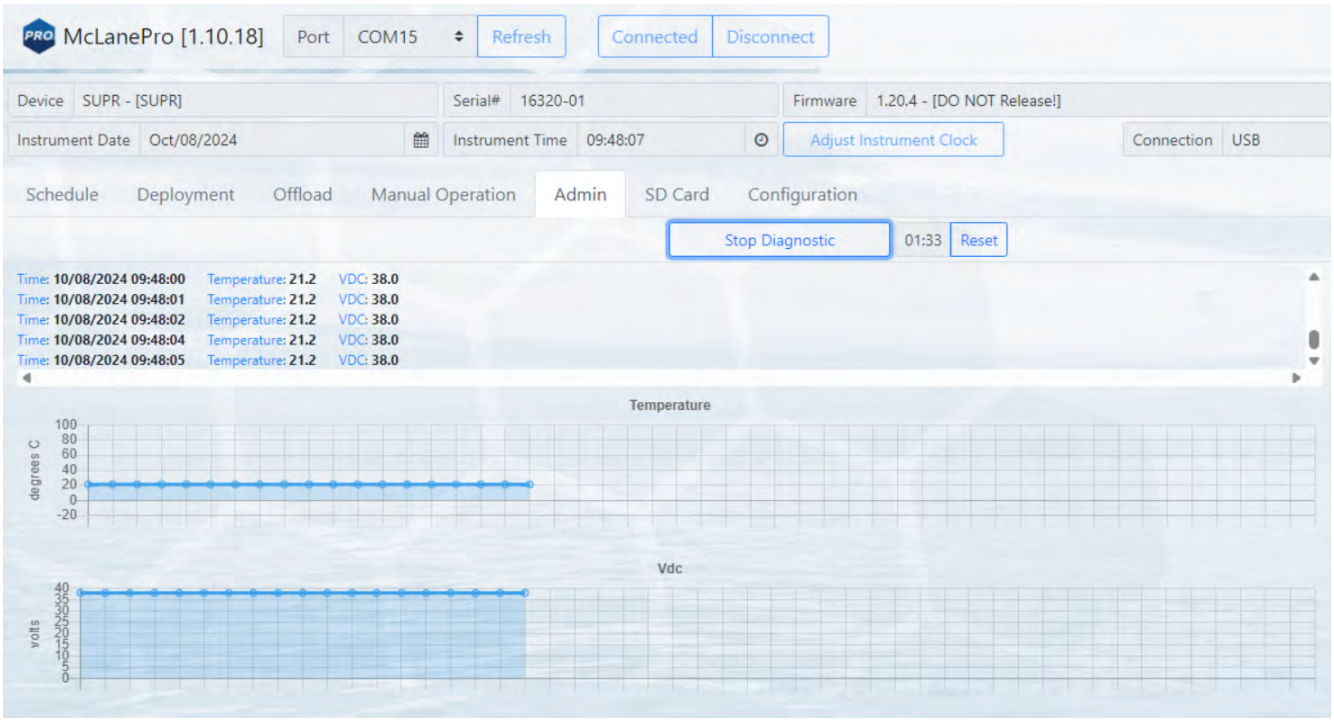
Running Diagnostics

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.



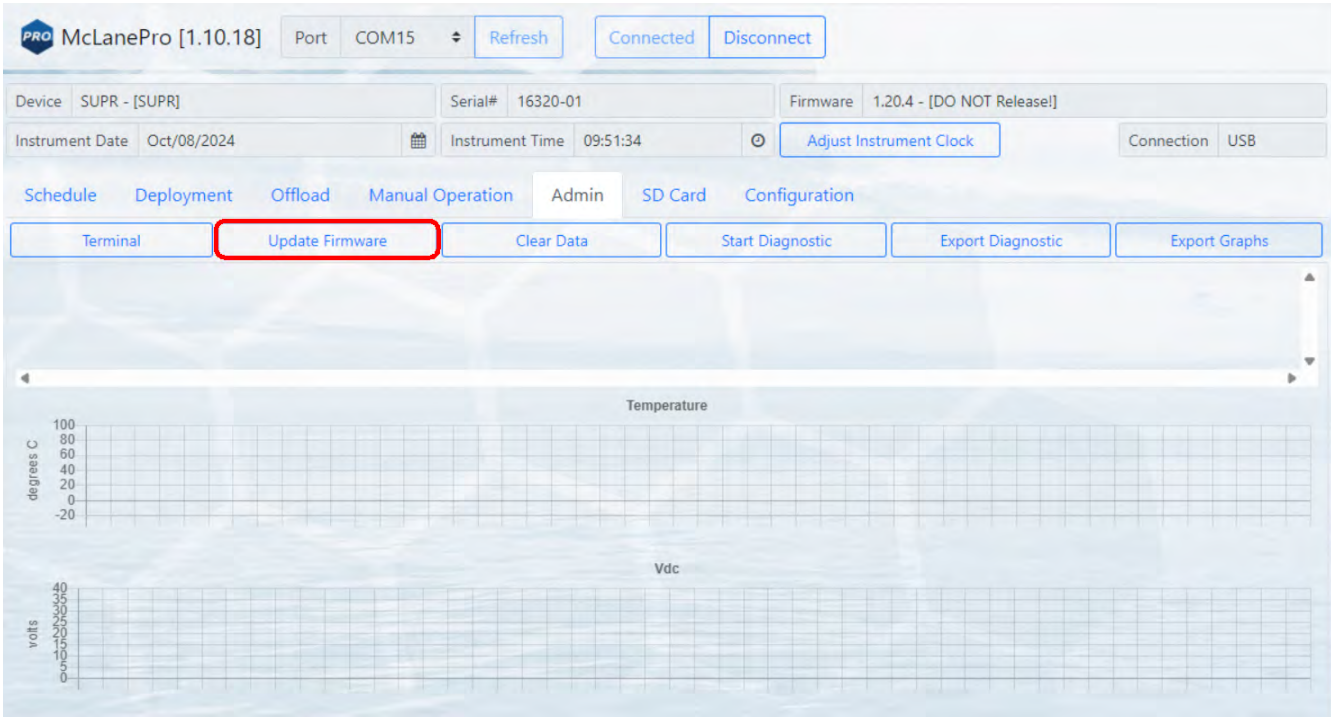
Diagnostics will run for two minutes, otherwise, click **Stop diagnostic.**



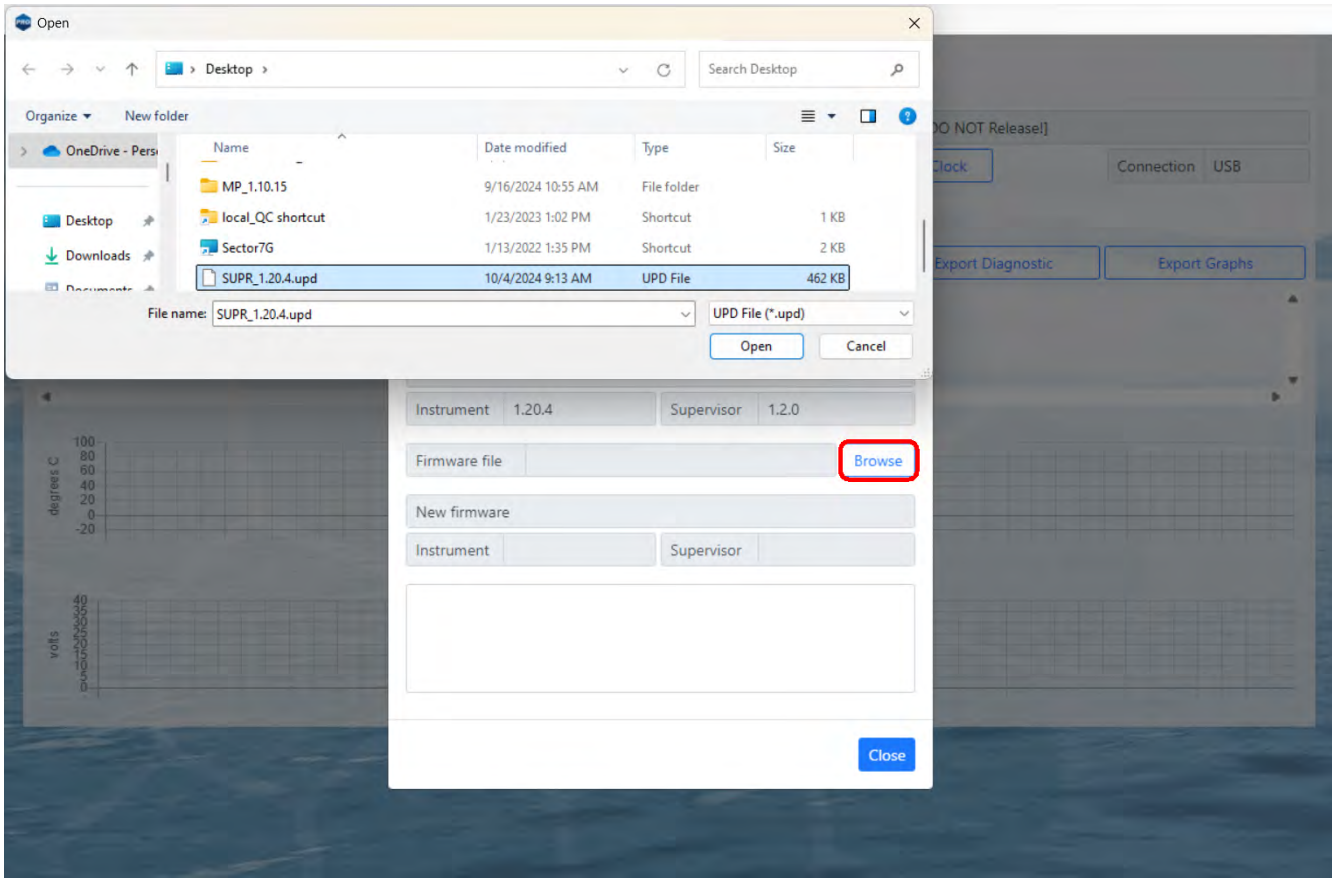
After running diagnostics, clear the data on the **Admin** tab by clicking the **Clear Data** button. Alternatively, diagnostic data and graphs may be exported using the buttons provided.

Update Firmware

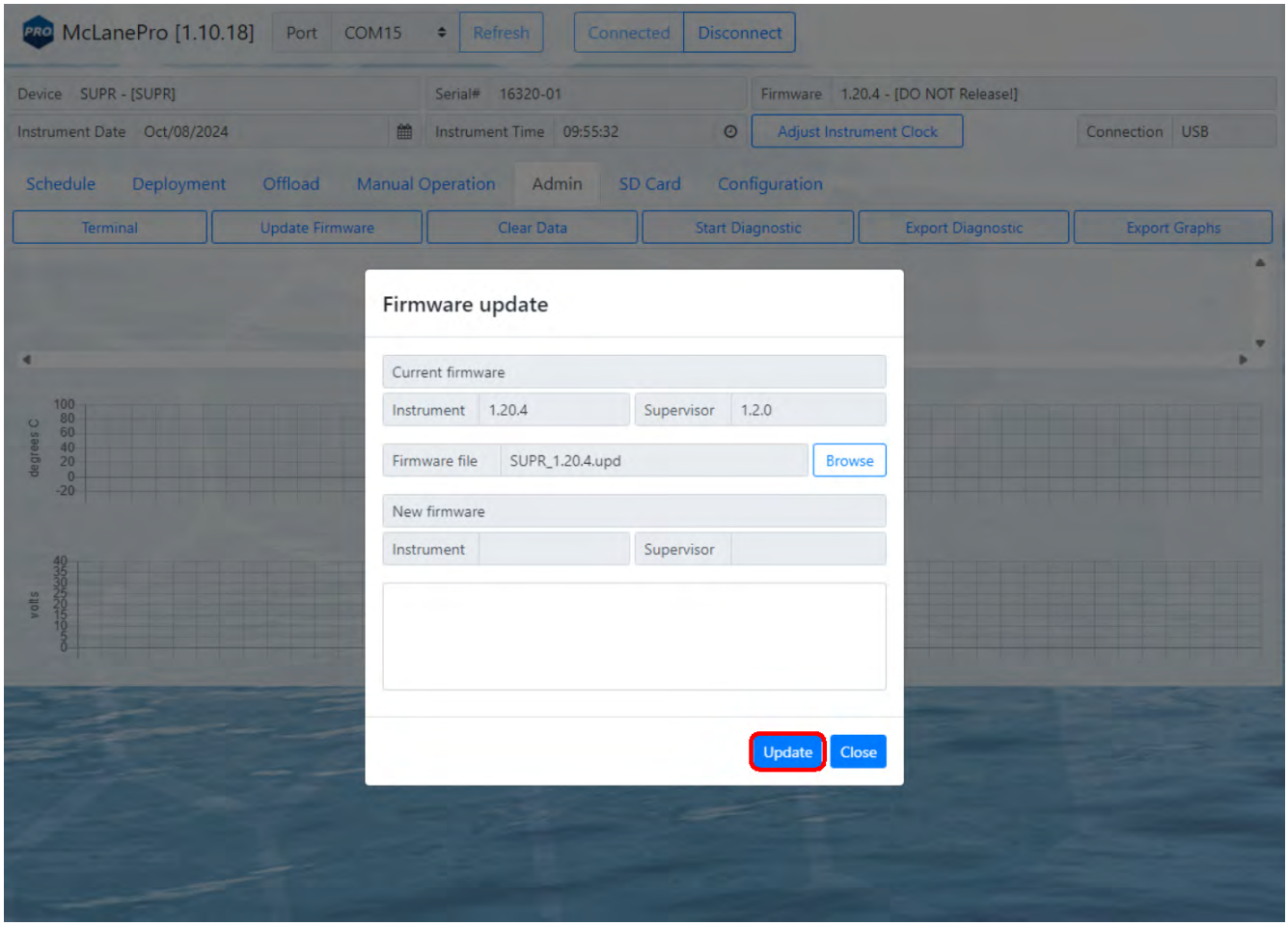
1. To update firmware click the **Update firmware** button on the **Admin tab.**



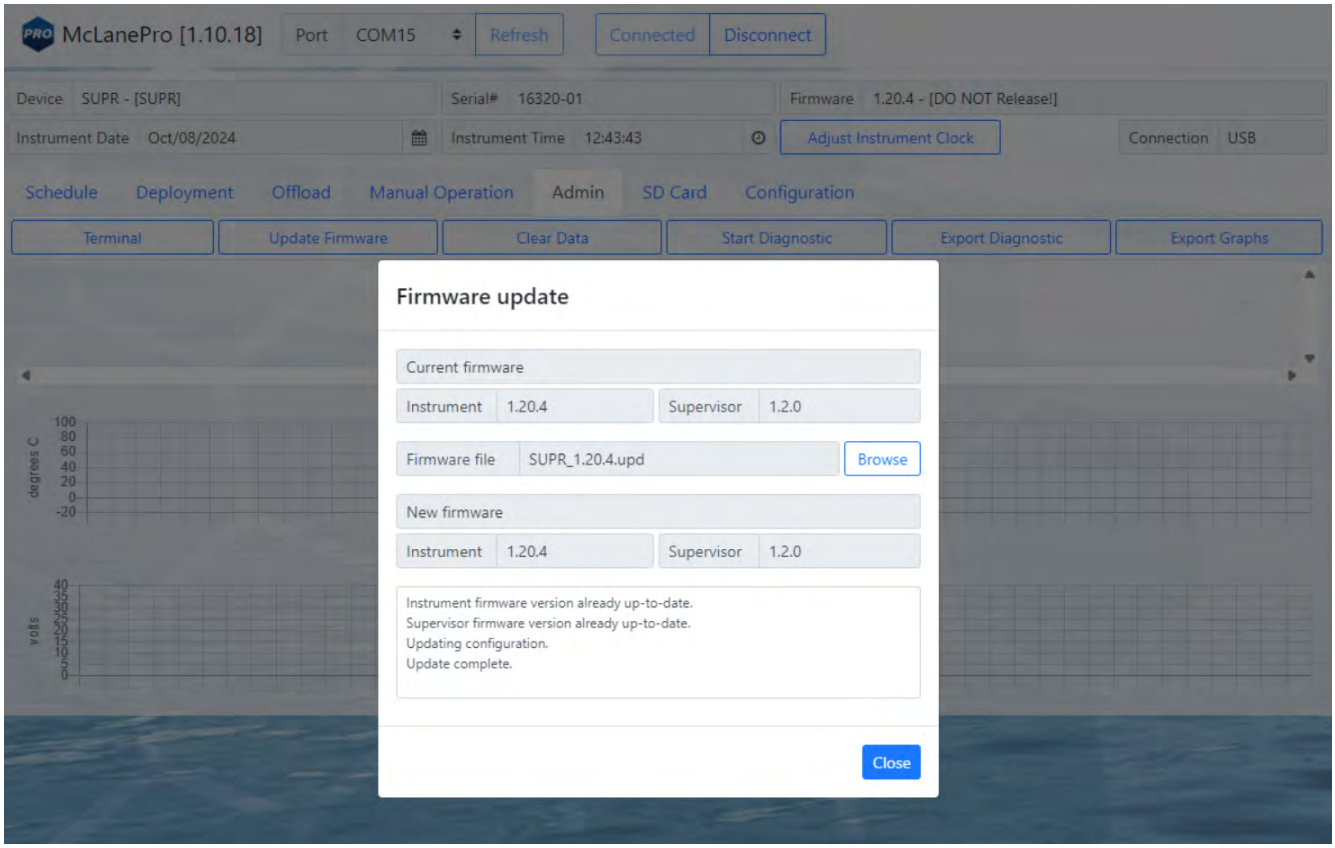
2. Click **Browse**, and select a McLane *.UPD file to upload.



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



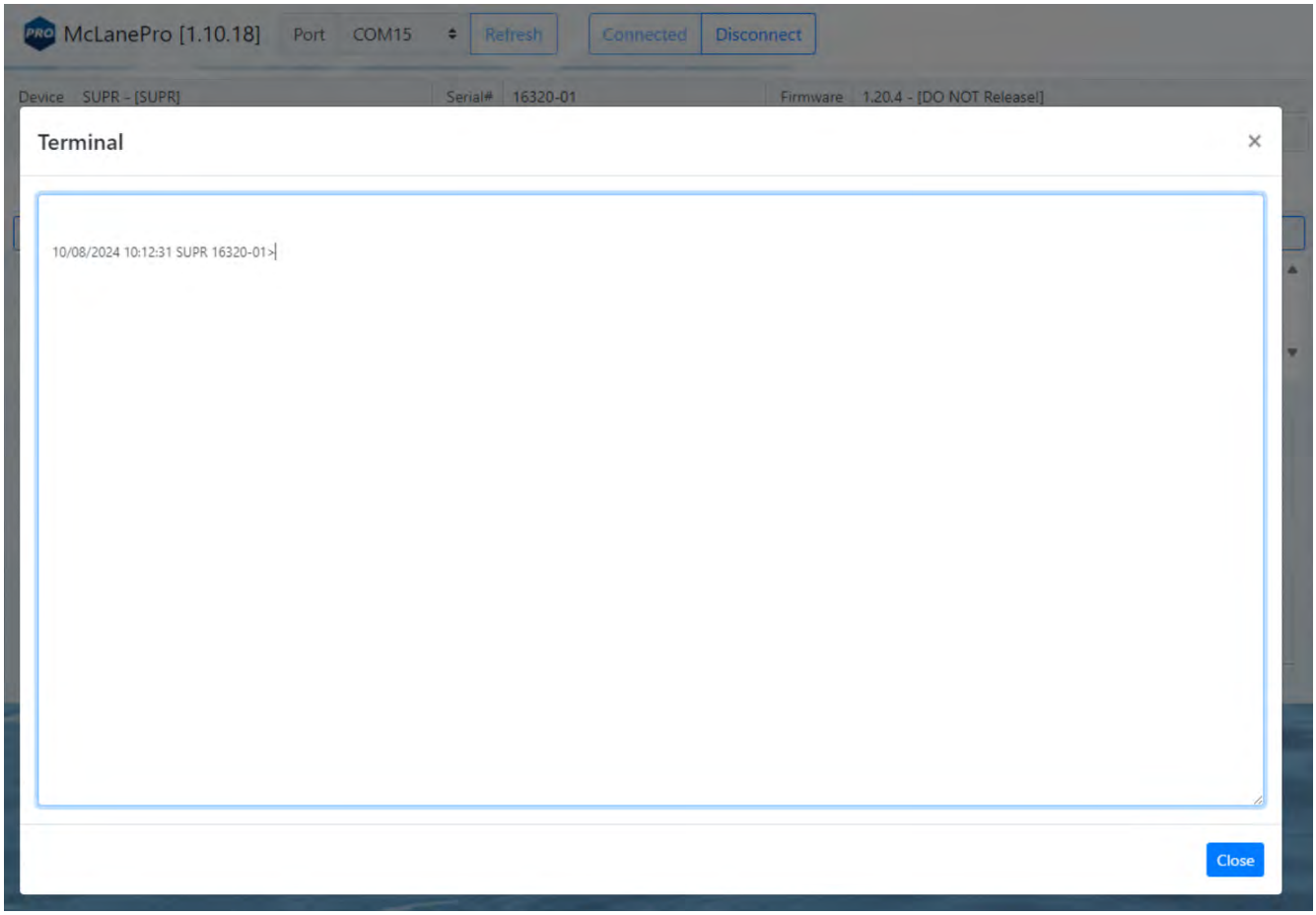
In some cases, a firmware update may revert the SuPR configuration to default values. McLanePro detects when this happens, and loads the **Configuration tab** to allow reconfiguration of the instrument after the firmware update is complete. Otherwise, the update will complete and report that the configuration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



The Terminal

A command-line interface provides an option for command-driven control over the SuPR.

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.

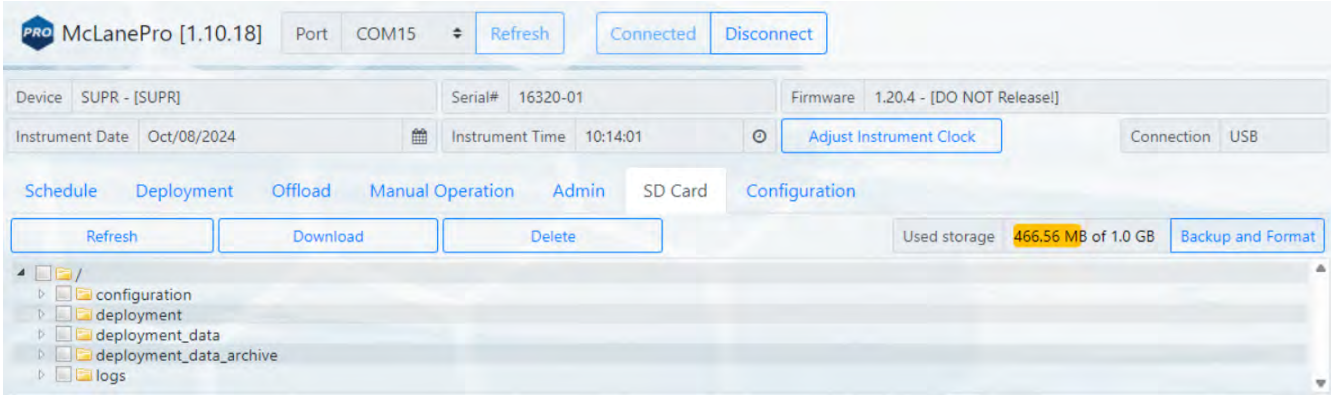
Contact mclane@mclanelabs.com for a list of available terminal commands.

The SD Card Tab

The **SD Card tab** allows for file operations on the SuPR MicroSD© Card.

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

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



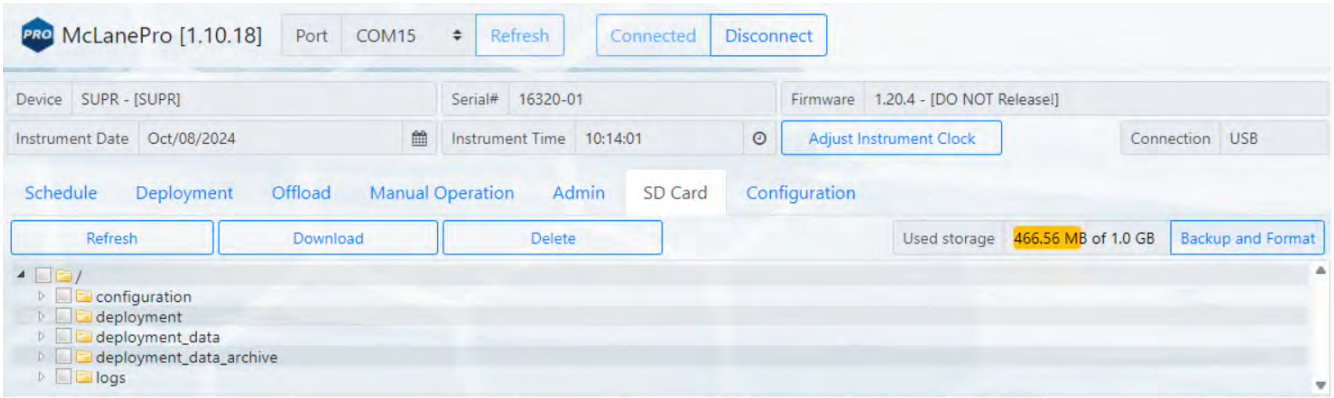
File Operations

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.

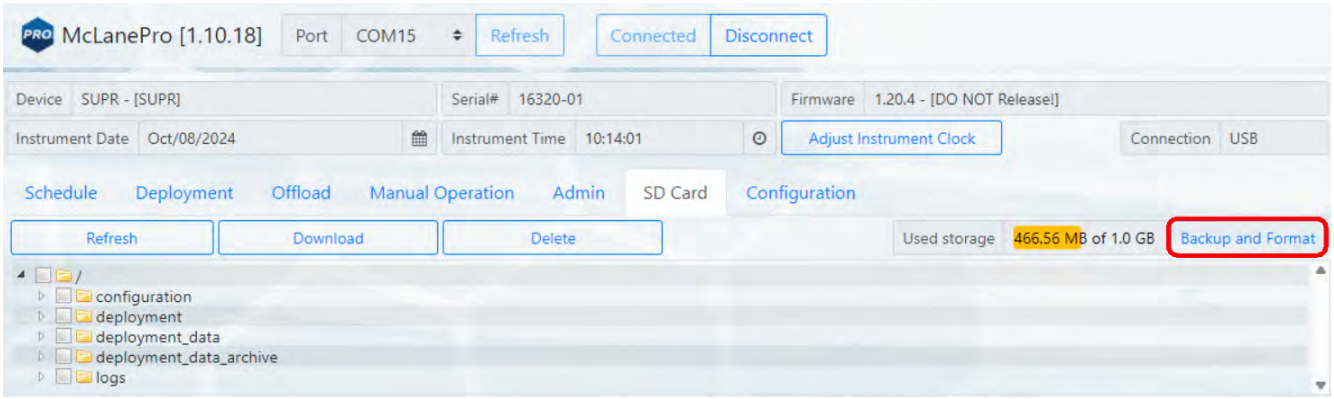
Download - clicking **Download** will compress selected files into a ZIP file that is then downloaded to the connected computer.

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

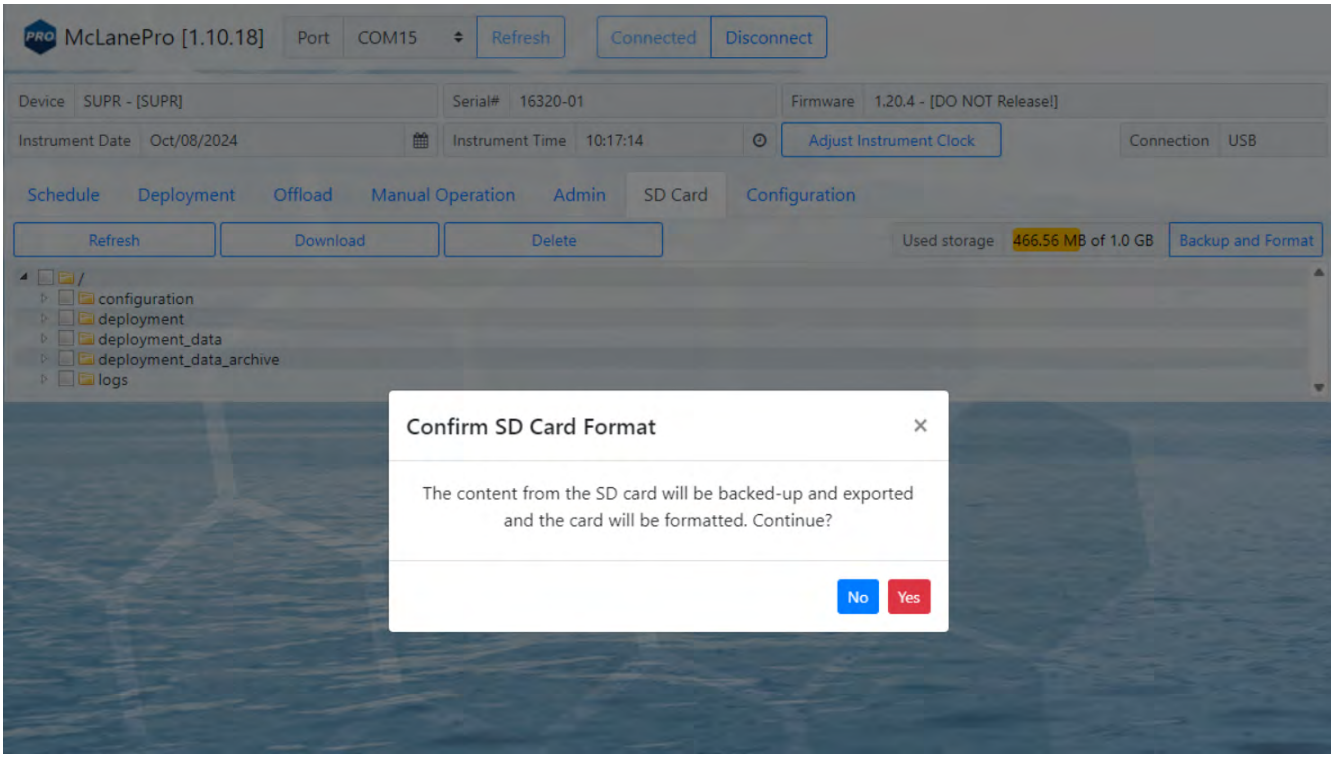


Status of the SD card is provided via the **Used storage** display. Additionally, a **Backup and Format** button is provided that allows for the user to download all the data from the SD card and then

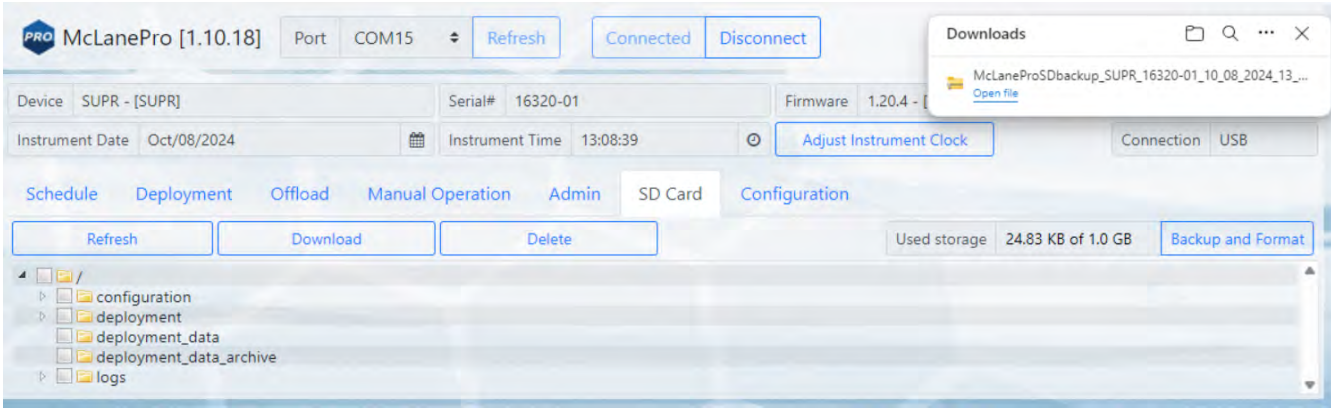
format the card.



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

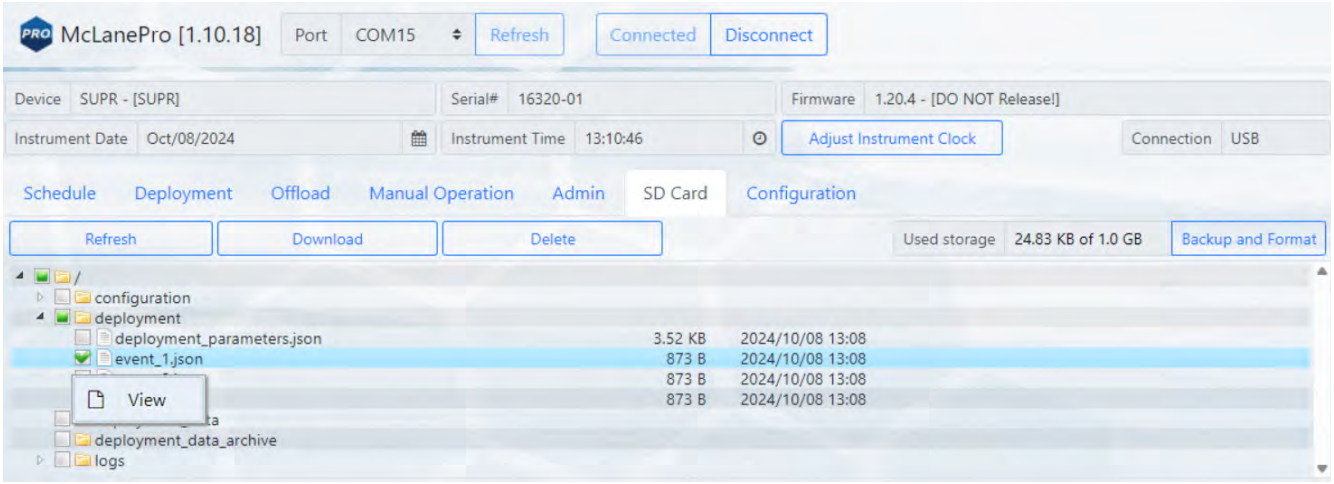


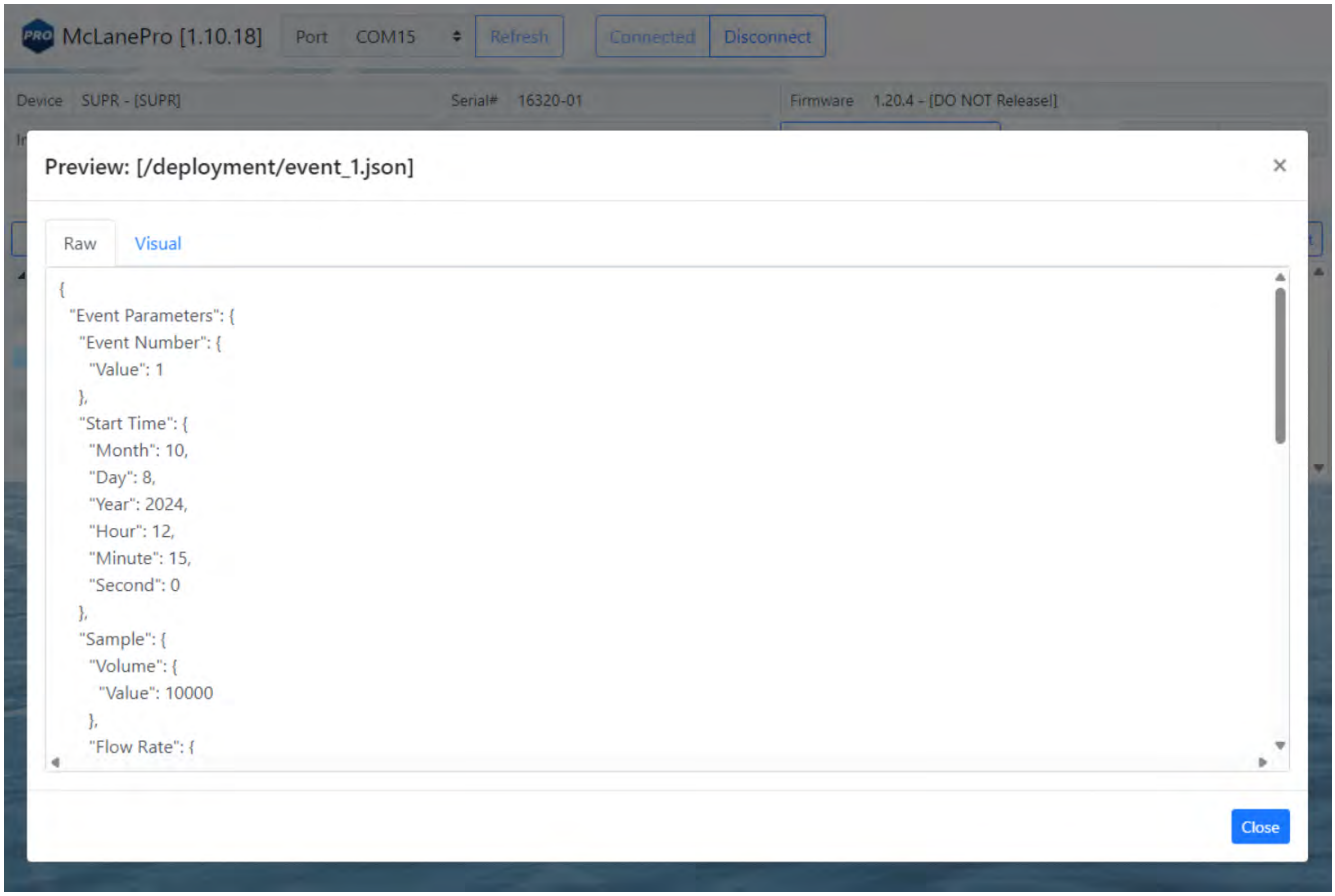
All data from the SD card are compressed into a ZIP file and downloaded before the SD card is formatted.



File preview

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

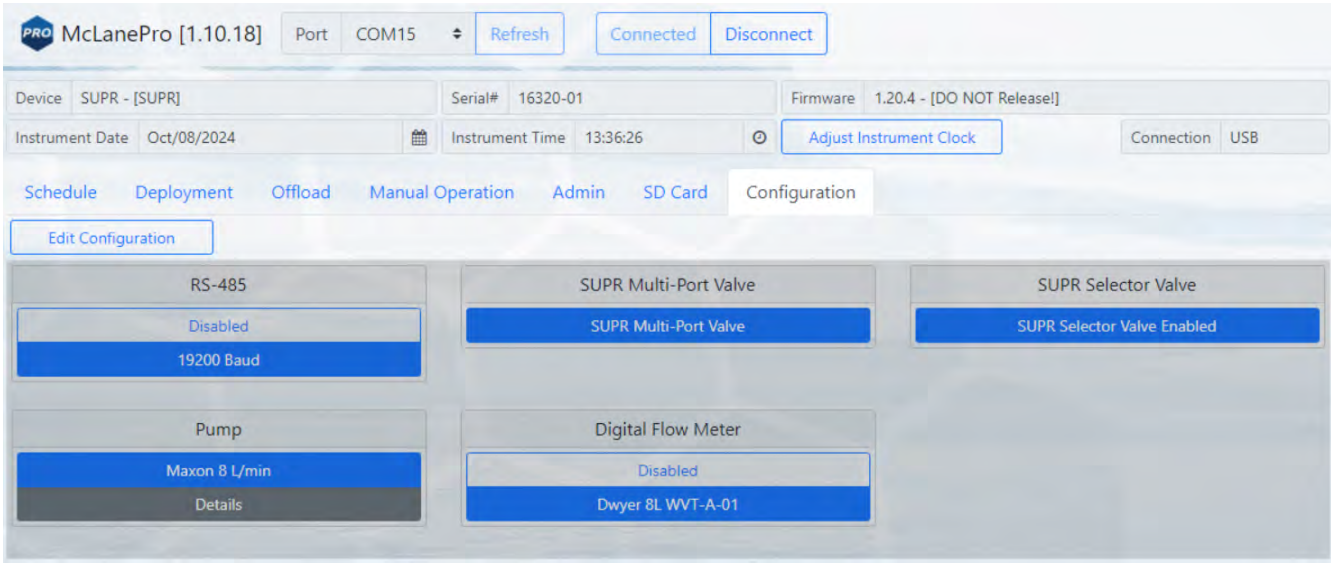



McLanePro [1.10.18]
Port COM15
Refresh
Connected
Disconnect
Device SUPR - [SUPR]
Serial# 16320-01
Firmware 1.20.4 - [DO NOT Release!]
Preview: [/deployment/event_1.json]
Raw
Visual
{
"Event Parameters": {
"Event Number": {
"Value": 1
},
"Start Time": {
"Month": 10,
"Day": 8,
"Year": 2024,
"Hour": 12,
"Minute": 15,
"Second": 0
},
"Sample": {
"Volume": {
"Value": 10000
},
"Flow Rate": {
Close

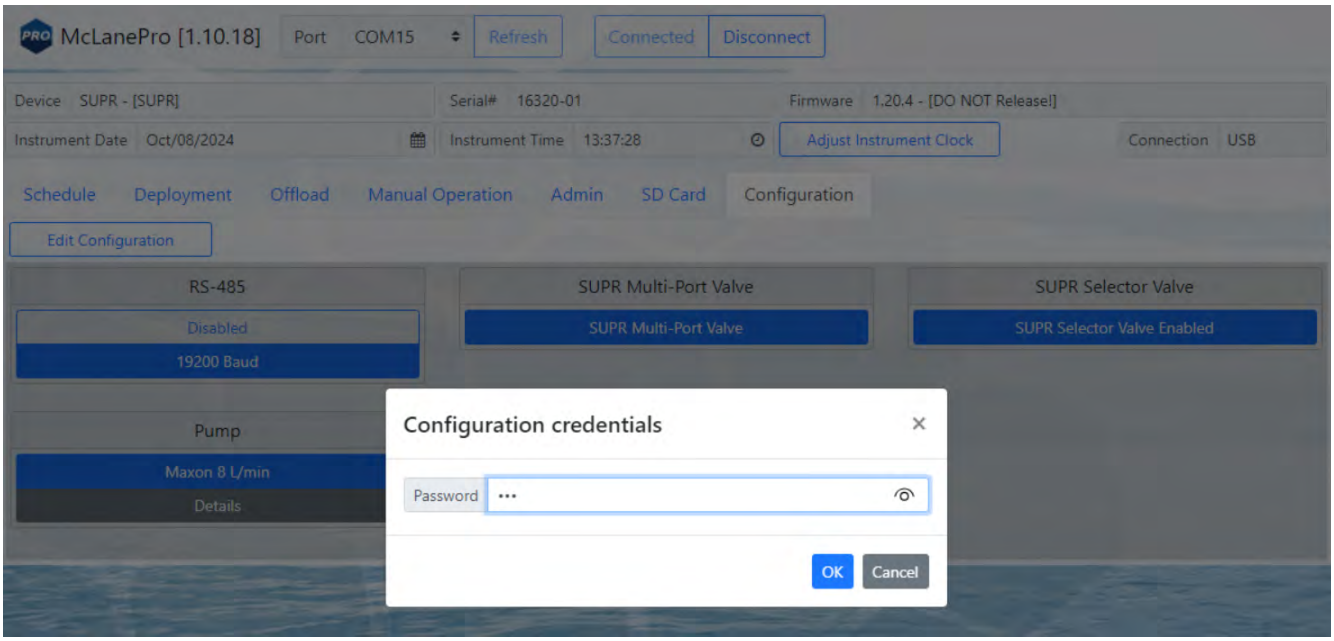
The Configuration Tab

SuPR 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 SuPR to default values, the **Configuration tab** is used to change the values.

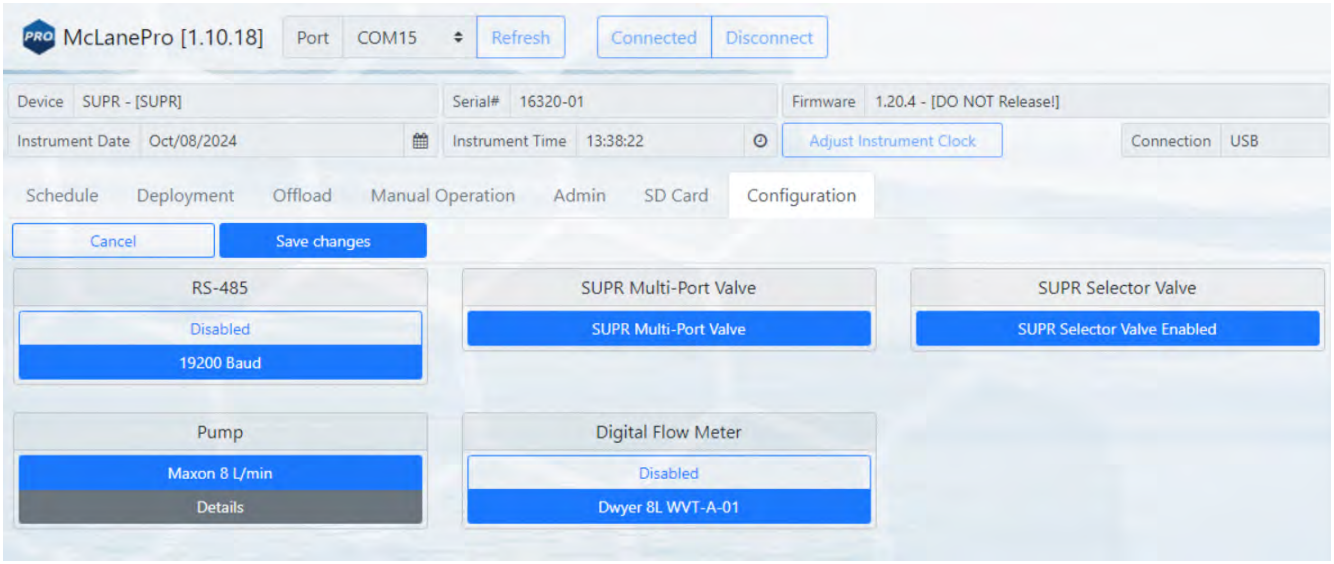
1. To change the SuPR configuration, navigate to the **Configuration tab** and select **Edit Configuration**.



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

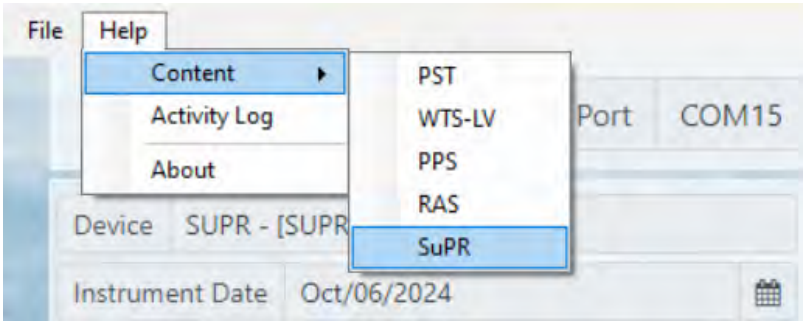


3. Confirm or change the SuPR pump configuration, or other available options, and click **Save changes**.

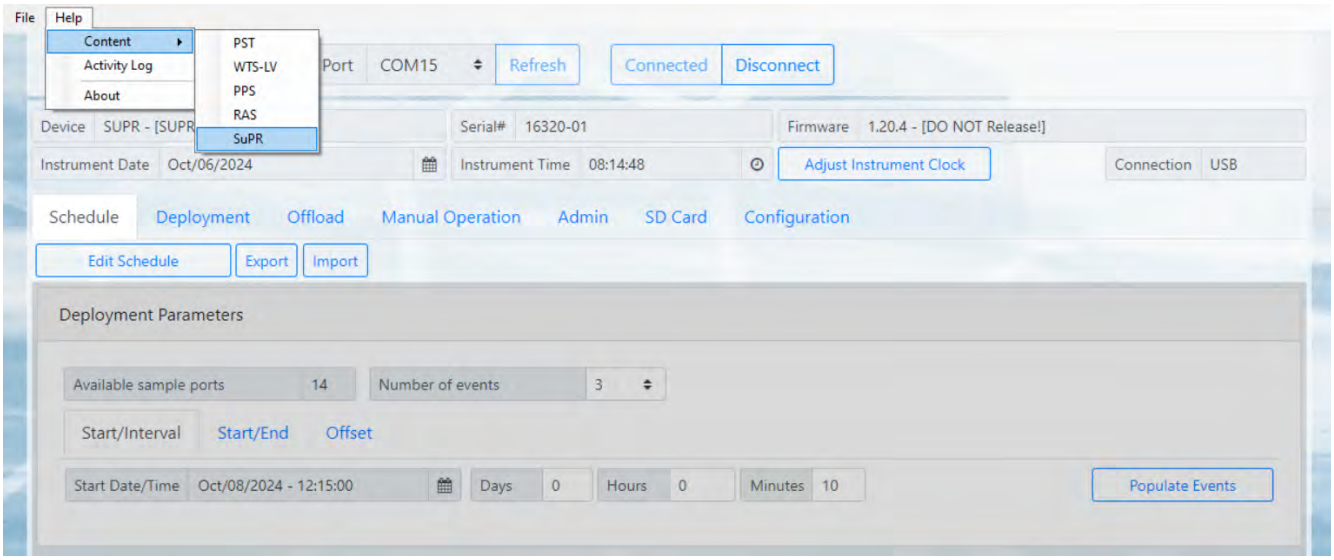


The Help Menu

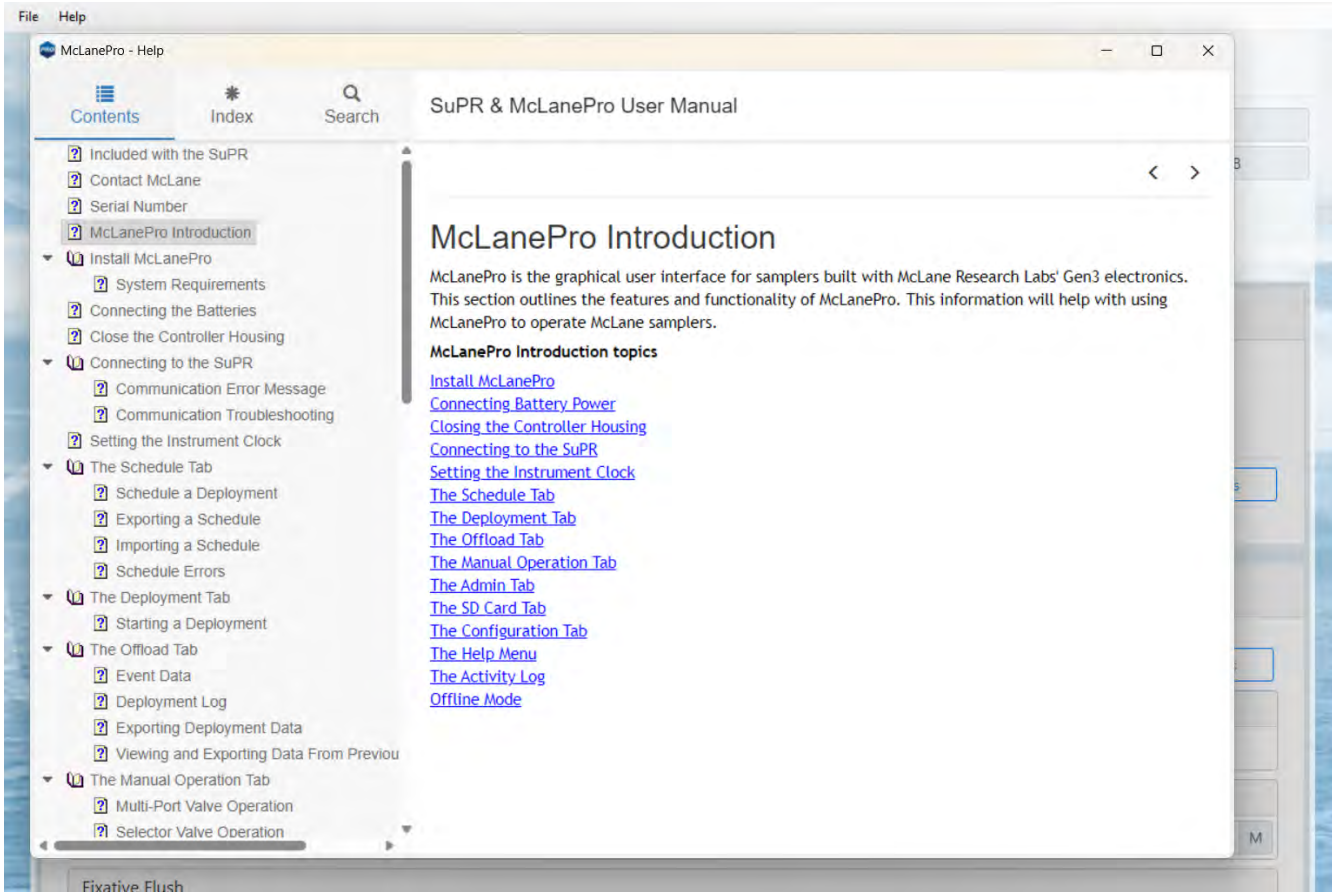
The McLanePro **Help Menu** contains links to device-specific user manuals, as well as McLanePro general information.



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

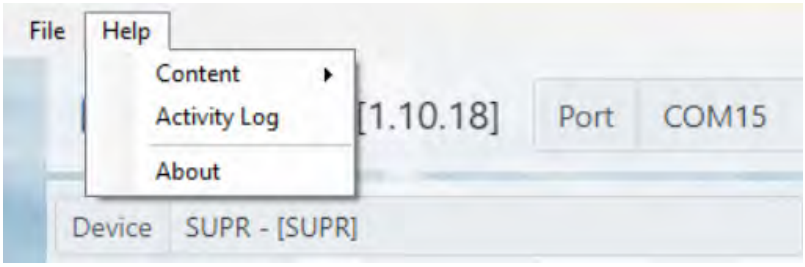


In this example, the device is a Suspended Particulate Rosette with device code SUPR. The help file contains user instruction and information on SuPR.

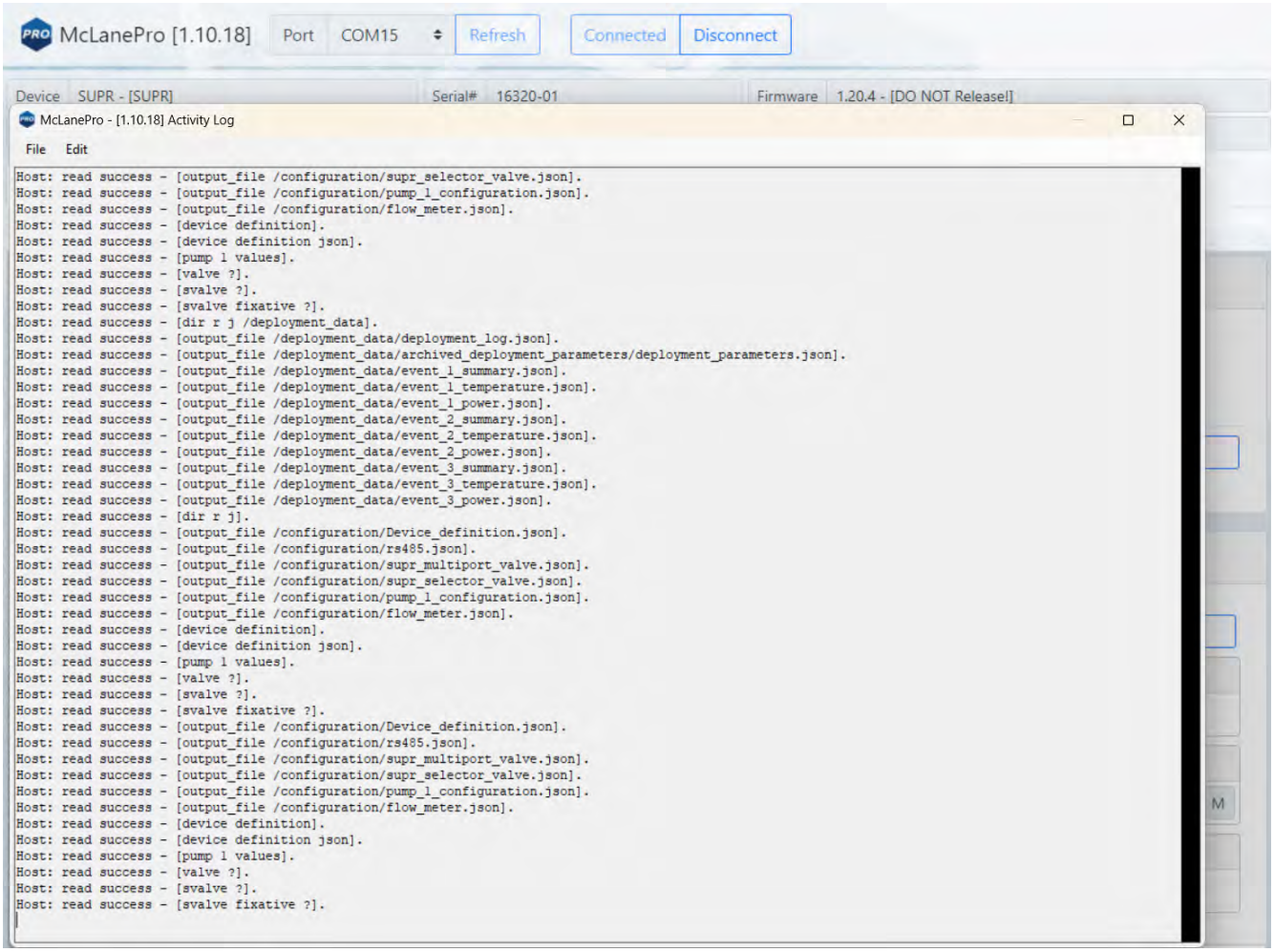

File
Help
McLanePro - Help
Contents
Index
Search
SuPR & McLanePro User Manual
Included with the SuPR
Contact McLane
Serial Number
McLanePro Introduction
Install McLanePro
System Requirements
Connecting the Batteries
Close the Controller Housing
Connecting to the SuPR
Communication Error Message
Communication Troubleshooting
Setting the Instrument Clock
The Schedule Tab
Schedule a Deployment
Exporting a Schedule
Importing a Schedule
Schedule Errors
The Deployment Tab
Starting a Deployment
The Offload Tab
Event Data
Deployment Log
Exporting Deployment Data
Viewing and Exporting Data From Previou
The Manual Operation Tab
Multi-Port Valve Operation
Selector Valve Operation
McLanePro Introduction
McLanePro is the graphical user interface for samplers built with 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 SuPR
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
Fixative Flush

The Activity Log

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

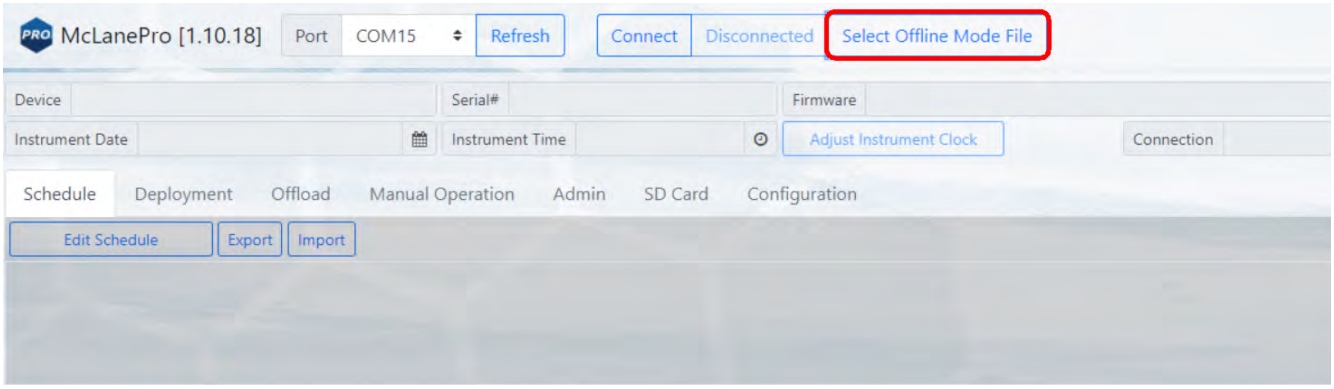


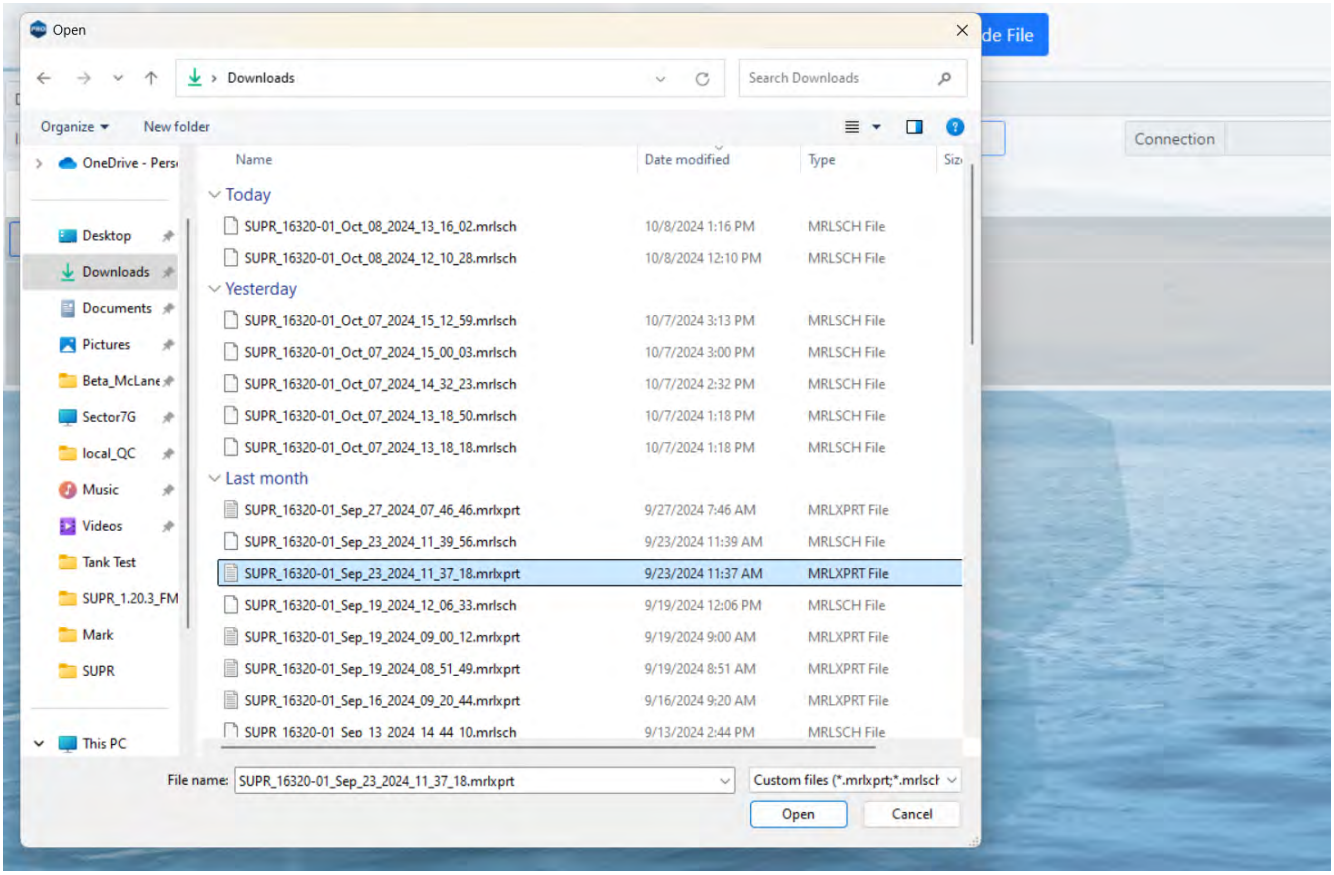
Within the **Activity Log**, there are options to **Save** the log to a text file (using the **File Menu**), or to **Copy** a selection of the **Activity Log** to the clipboard (using the **Edit Menu**).



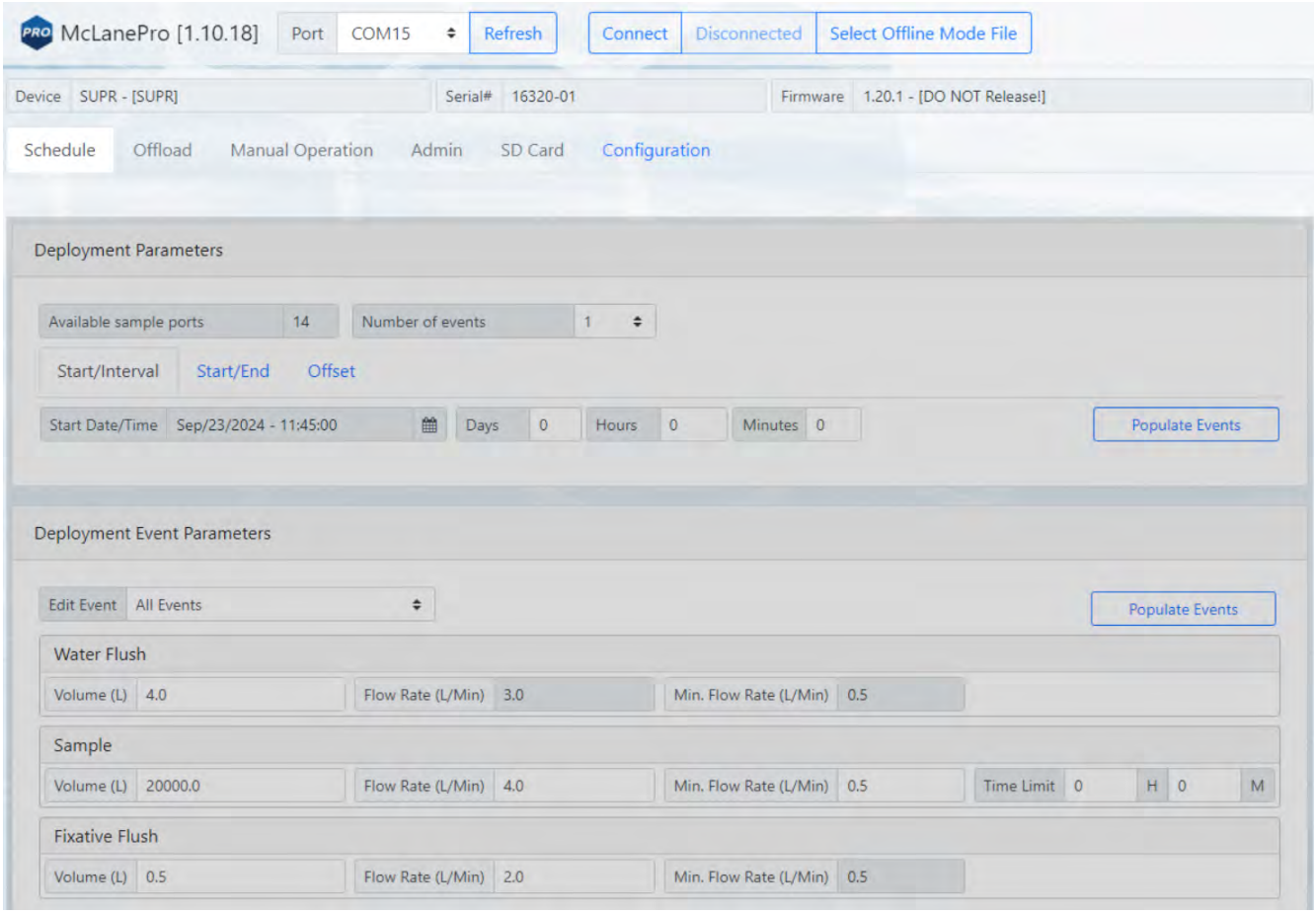
Offline Mode

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.

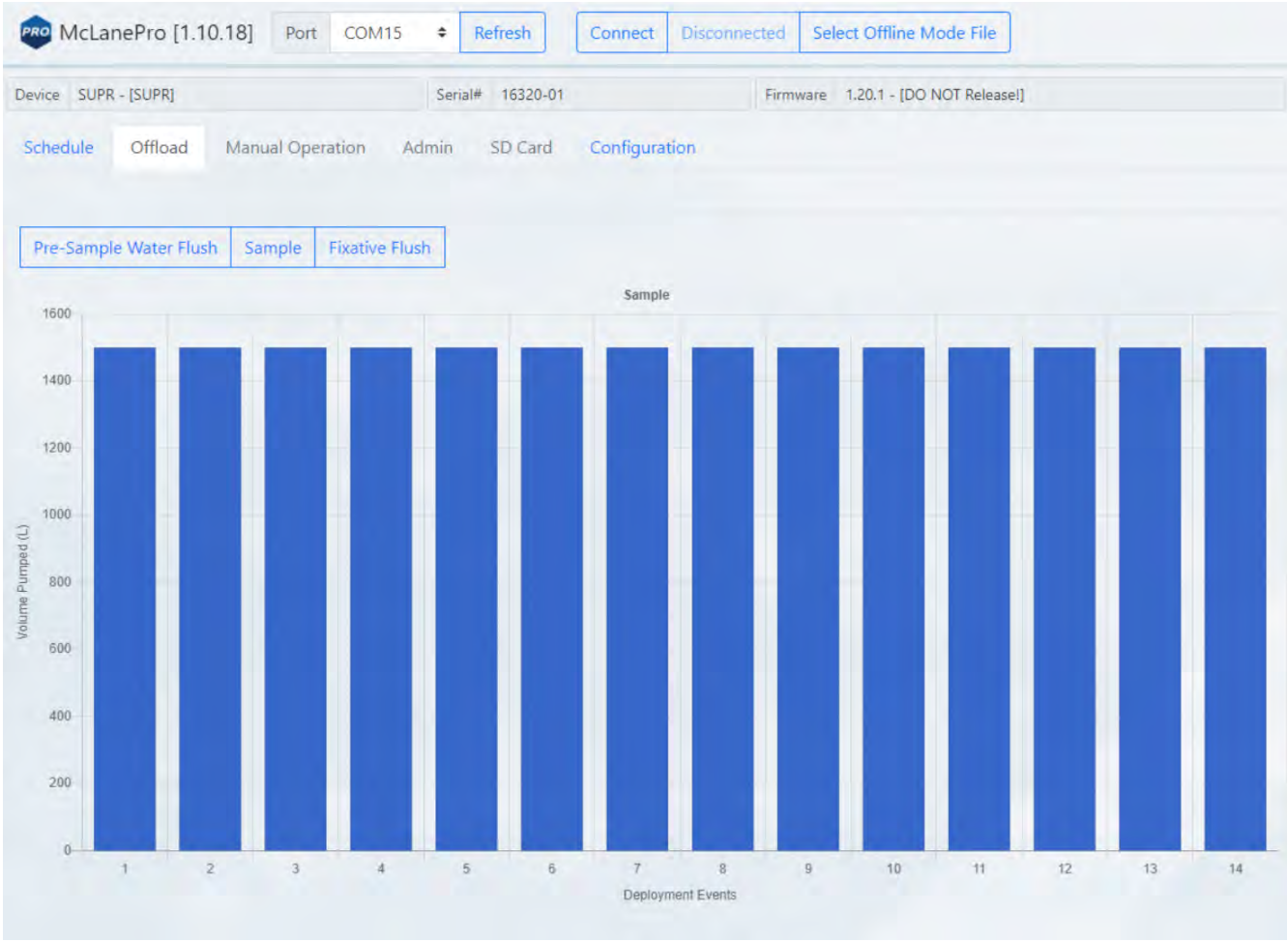




A ***.mrlsch** file will contain the schedule and device configuration along with the device, serial number and firmware information.



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


McLanePro [1.10.18]
Port
COM15
Refresh
Connect
Disconnected
Select Offline Mode File
Device
SUPR - [SUPR]
Serial#
16320-01
Firmware
1.20.1 - [DO NOT Release!]
Schedule
Offload
Manual Operation
Admin
SD Card
Configuration
Pre-Sample Water Flush
Sample
Fixative Flush
Sample
Volume Pumped (L)
1600
1400
1200
1000
800
600
400
200
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Deployment Events

SuPR General Information

General information includes a short description of SuPR and a list of system components. More detailed specification sheets are available on the McLane website, SuPR product page.

Specifications are subject to change without notice. Access the SuPR data sheet on-line for the most up-to-date specifications.

Specifications:

Depth Rating: 5000 m

Samples: 14 filter samples (142 mm membrane or mesh)

Fixation: 9.5-liter preservative reservoir

Flow Rate: Large-volume pump, 2 to 5 LPM typical (filter dependent)

Power: 36 Vdc, 2 x A72-1000 Battery Packs

Communication: USB / RS-232 / RS-485 (using McLanePro GUI)

Weights:

SuPR Sampler (Dry): 206 kg (454 lbs.)

SuPR Sampler (Dry/Primed): 219 kg (483 lbs.)

SuPR Sampler (Wet/Primed): 103 kg (228 lbs.)

Dimensions:

86.4 cm x 72.7 cm x 52.4 cm (34.01 in x 28.62 in x 20.62 in)

Materials:

Multi-Port Valve (MPV): PTFE, Acetal Copolymer, Polycarbonate, Polypropylene, Titanium

Selector Valve (SV): PTFE, Acetal Copolymer, Polycarbonate, Polypropylene, Titanium

Large-Volume Pump (LVP): Hydex 4101, Techtron PPS, Ferralium 255, Titanium Gr. 5

Controller Housings: Anodized Aluminum, Zinc Anodes

Tubing and connectors: Tygon E-3603, Acetal

Preservative reservoir: Low Density Polyethylene

Frame and mounts: 316 Stainless Steel, Acetal Homopolymer, High Density Polyethylene, Zinc Anodes

Hardware: Titanium Gr. 2,316 Stainless Steel

SuPR General Information topics

Description
Components

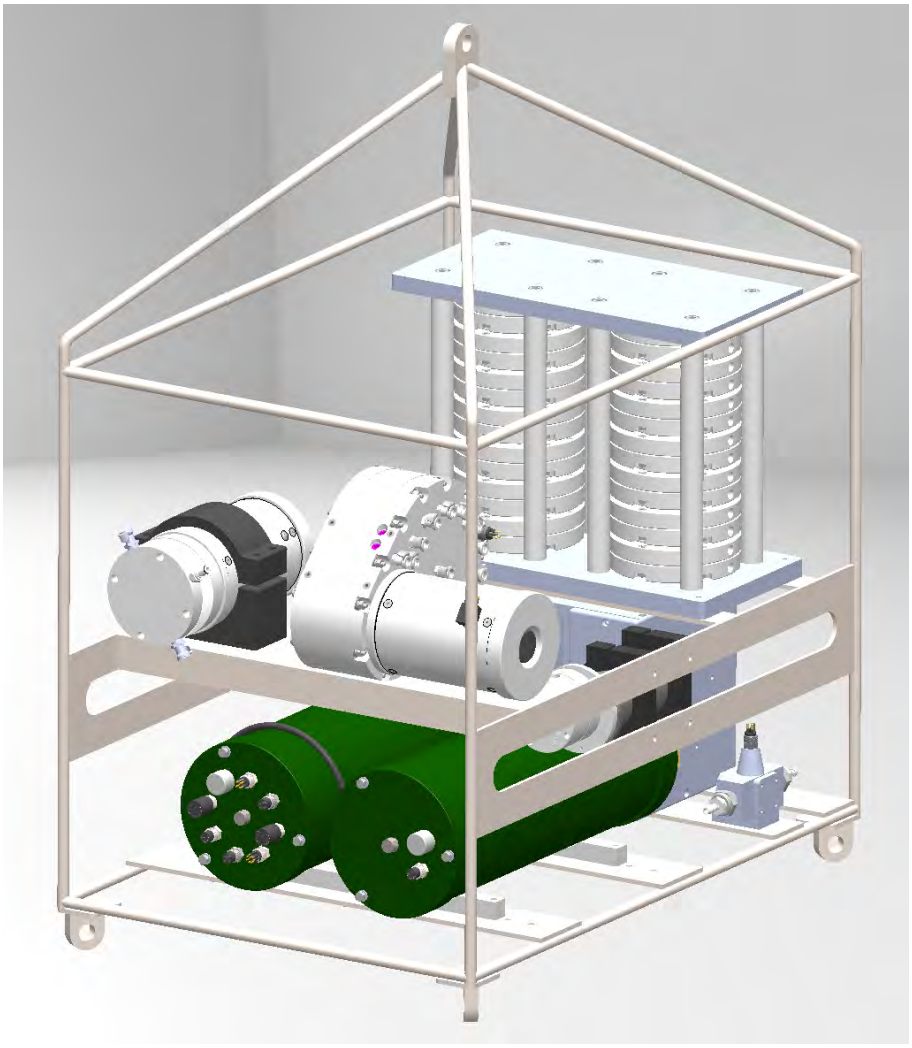
Description

The McLane Suspended Particulate Rosette Sampler (SuPR) is a deep-rated, multi-event particulate sampler used to collect various marine particles in a range of environments. SuPR has 14 filter holders that hold 142 mm mesh or membrane filters of porosities down to 0.2 µm. SuPR can process up to 2000 liters per sample depending on filter type and available sampling time. Samples can be stabilized in-situ after collection. Up to 9.5 liters of liquid stabilizer are stored on board.

Sampling is driven by a large-volume pump (LVP) connected to a large, multi-port valve (MPV) and a selector valve (SV). Water is directed to one of 14 filter positions by the multi-port valve and volume is monitored using a digital flowmeter at the pump exhaust.

Upon completion of an event, the selector valve is commanded to the secondary intake port connected to a preservative bladder containing up to 9.5 liters of user-defined preservative.

SuPR is designed to collect suspended particles from seawater but **does not** support collection of seafloor sediments or large particulates (greater than 5 mm); sampling of incompatible materials may result in damage to the valves or the pump.



Components

SuPR consists of:

- Multi-Port valve (MPV)
- Selector valve (SV)
- Large volume pump (LVP)
- Digital Flow Meter (FM)
- Filter holder(s) and rack (14 x 142 mm)
- Preservative reservoir box
- Main Controller Housing
- Additional Battery Housing

SuPR Mechanical Information

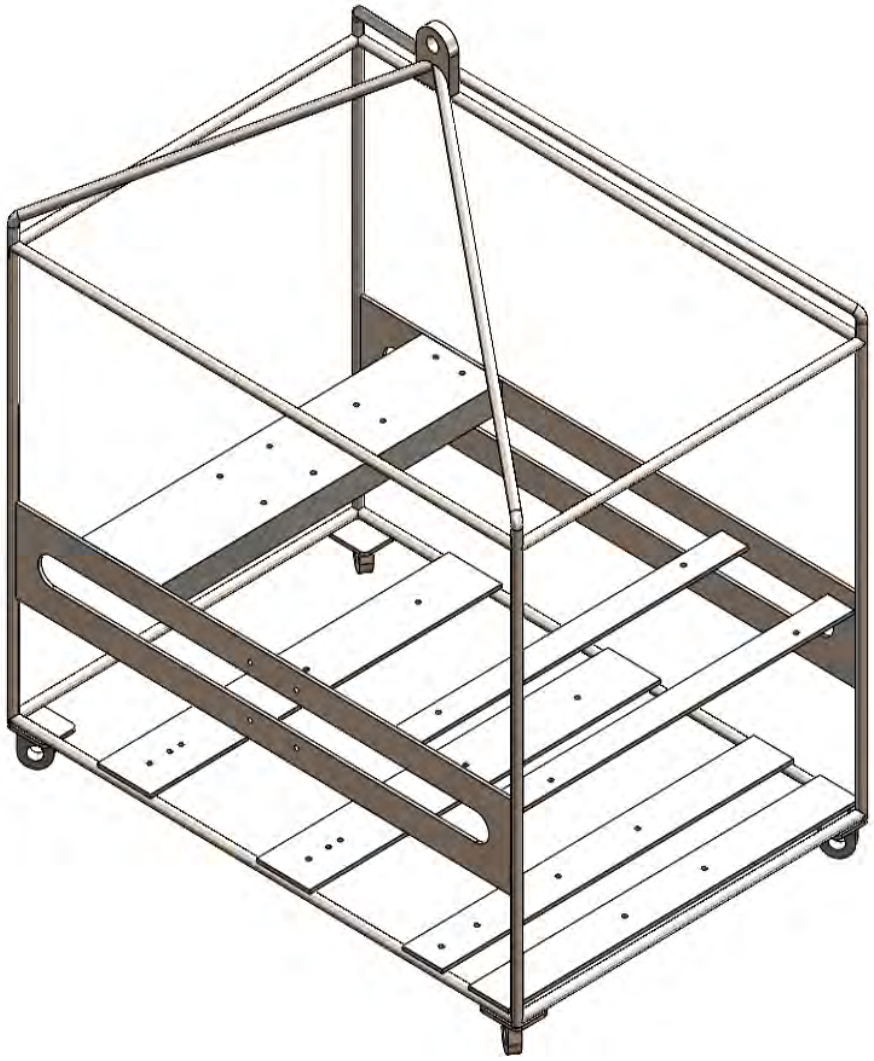
Mechanical components of the SuPR are described in the following sections.

SuPR **Mechanical Information topics**

Frame
Controller Housings
O-rings
End Cap Bulkhead Connectors
Pump
Multi-Port Valve
Selector Valve
Filter Holders
Filter Material
Flow Meter
Fluid Connections

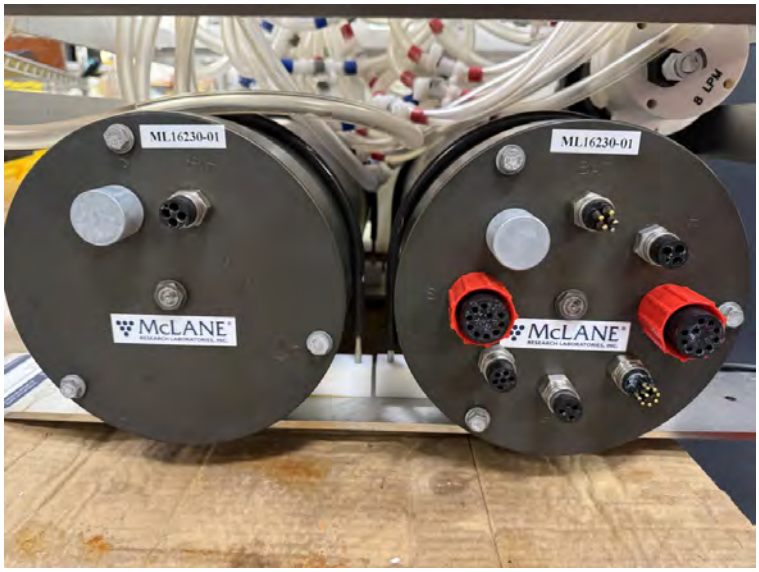
Frame

The SuPR frame is an electropolished 316 stainless steel welded frame designed to protect the valves and pump, and to provide easy access to the filter holders. The frame can be an inline part of a high-tension (up to 2,200 kg) ocean mooring. There are four zinc anodes attached to the frame that should be replaced when depleted.



Controller Housings

The SuPR controller housings are constructed from heat-treated aluminum alloy cylinders. The SuPR controller housing is rated to a depth of 5,000 meters. The housing holds the battery and electronics or the spare battery only. This User Manual contains detailed instructions foropening the controller housing. Follow these instructions and the recommended safety precautions when opening the controller housing.



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.

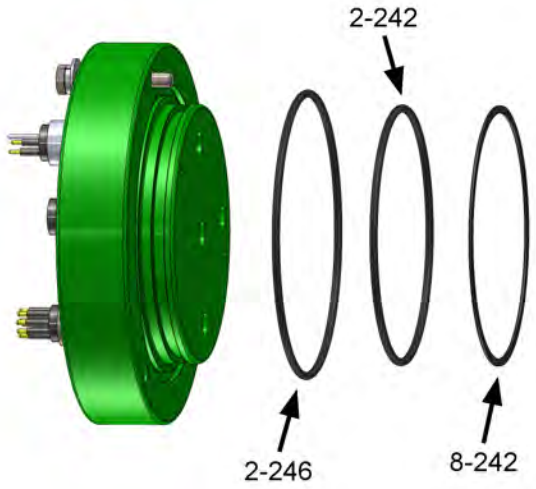
Each O-ring set includes three O-rings (2-246, 2-242, 8-242)

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 standard. 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

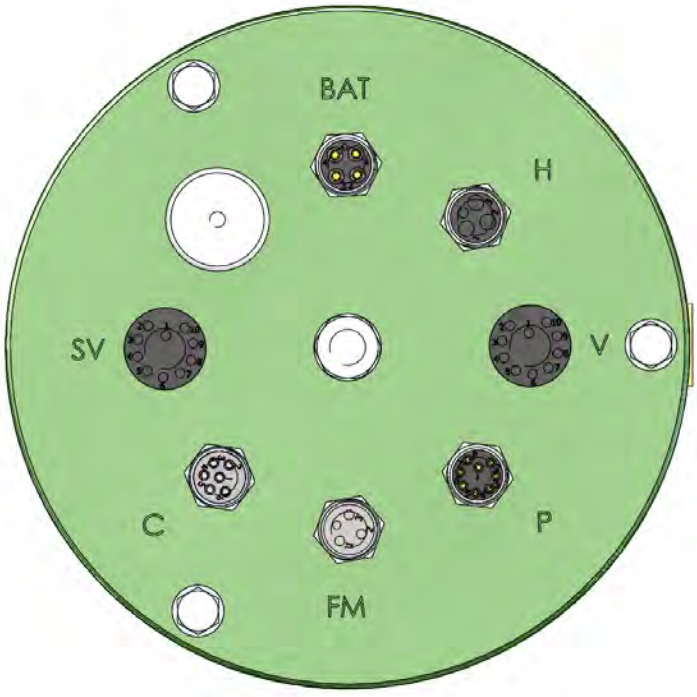
O-ring maintenance and correct placement is critical to keep the controller housing sealed from water intrusion. Incorrect O-ring placement results in cracks or splits that could affect the O-ring seal and cause water damage to the controller. Water damage from incorrectly placed or maintained O-rings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



End Cap Bulkhead Connectors

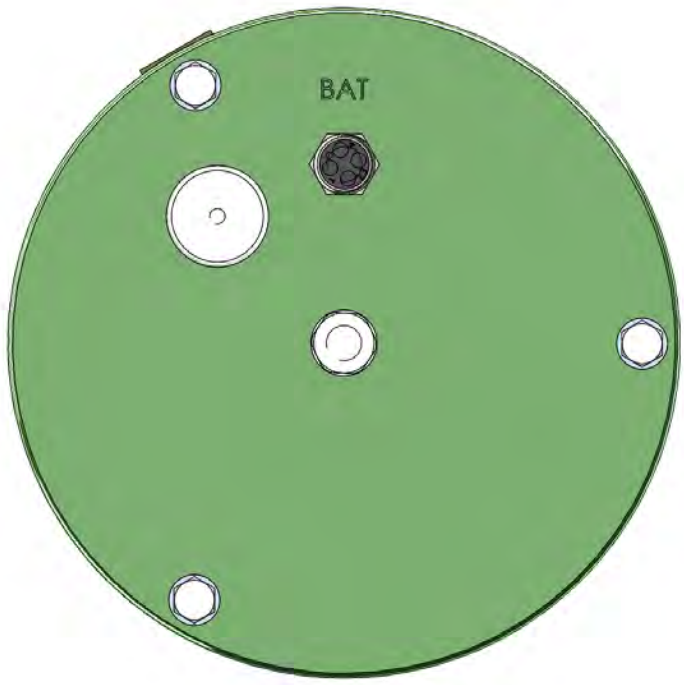
A zinc anode is attached to each end on the controller housing end cap to prevent corrosion. Spare zincs are included in the toolkit.

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.



* BAT - Battery Input (from second controller housing)
* H - Home Sensor (Multi-Port Valve)
* V - Multi-Port Valve

* P - Pump
* FM - Flow Meter
* C - Communication Port
* SV - Selector Valve

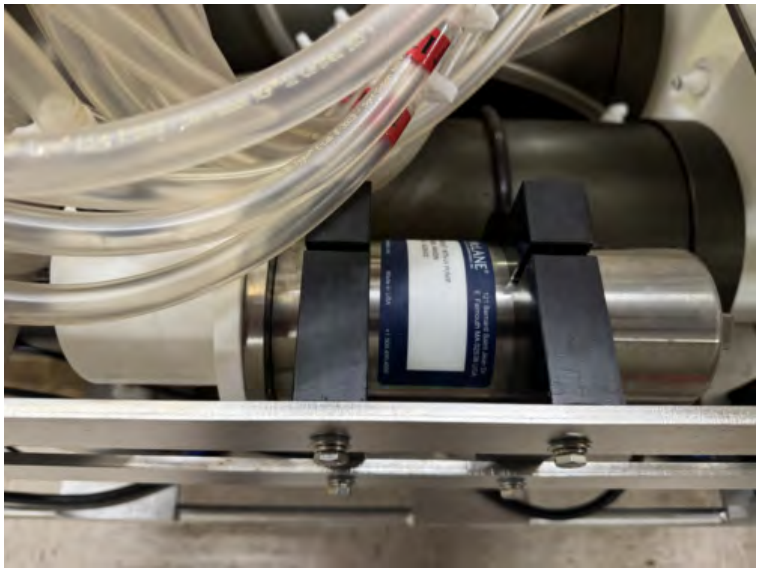


* BAT - Battery Output (to primary controller housing)

Pump

The SuPR pump assembly is located downstream from the filter holder to prevent sample contamination. A brushless DC 3-phase motor is magnetically coupled to the pump head.

A pump speed algorithm in the firmware adjusts flow rate to prevent sample or filter damage and to manage battery endurance. The algorithm adjusts in response to differential pressure as material collects on the filter.

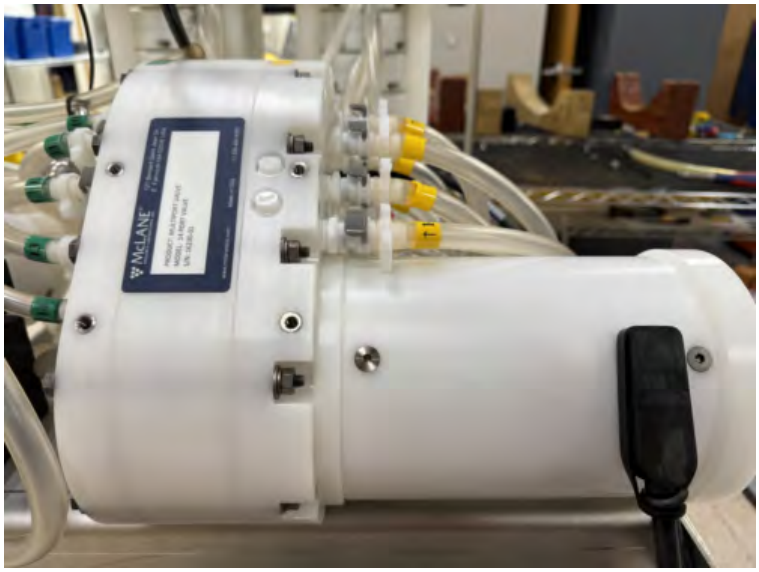


Multi-Port Valve

When the SuPR Multi-Port Valve (MPV) is located at one of the sample ports, water is directed out of the top side of the valve to the inlet of one of 14 filter holders (depending on the port position). Filter holders are typically prepared with a filter and primed manually.

Each filter holder's inlet and outlet are connected together to retain the prime and prevent loss of water during installation. Prior to final system purging or subsequent to system purging, each filter holder is connected to its corresponding sample loop at the MPV. The top tubing will have arrows indicating the flow direction (also noted in the drawing below), as does the return tubing from the filter holder outlet to the bottom half of the MPV.

Careful attention must be paid to the fluid connections. Always ensure that the tubing numbers and arrows are matched up to the appropriate positions on both the top and bottom tubing. Connections are color-coded to guide the user.



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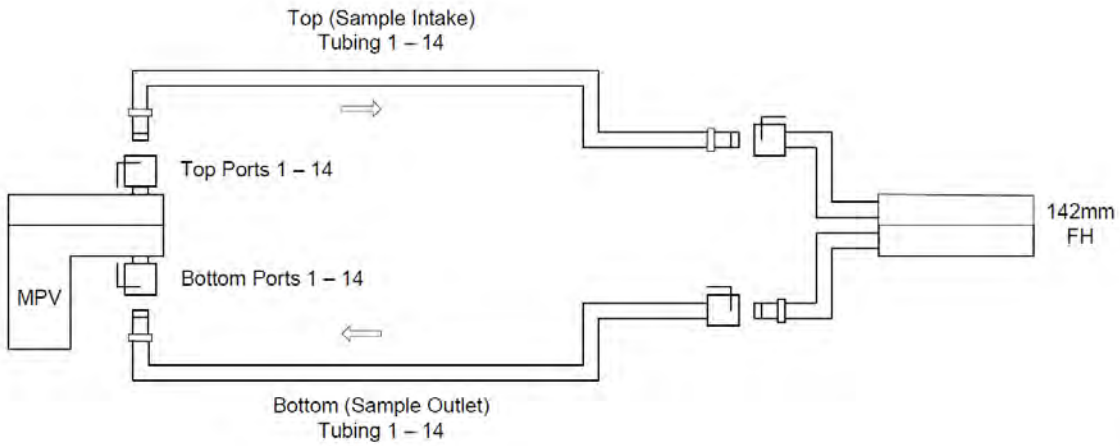
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	Initial Release	9-28-20	IBE

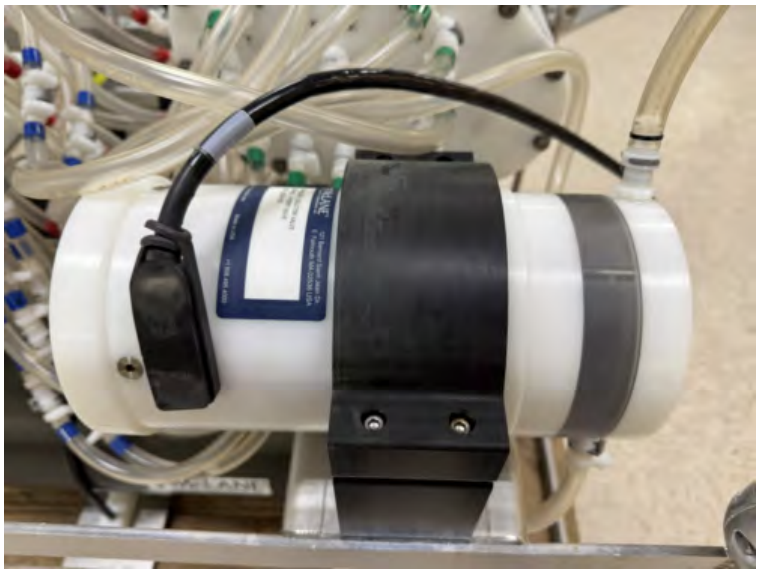


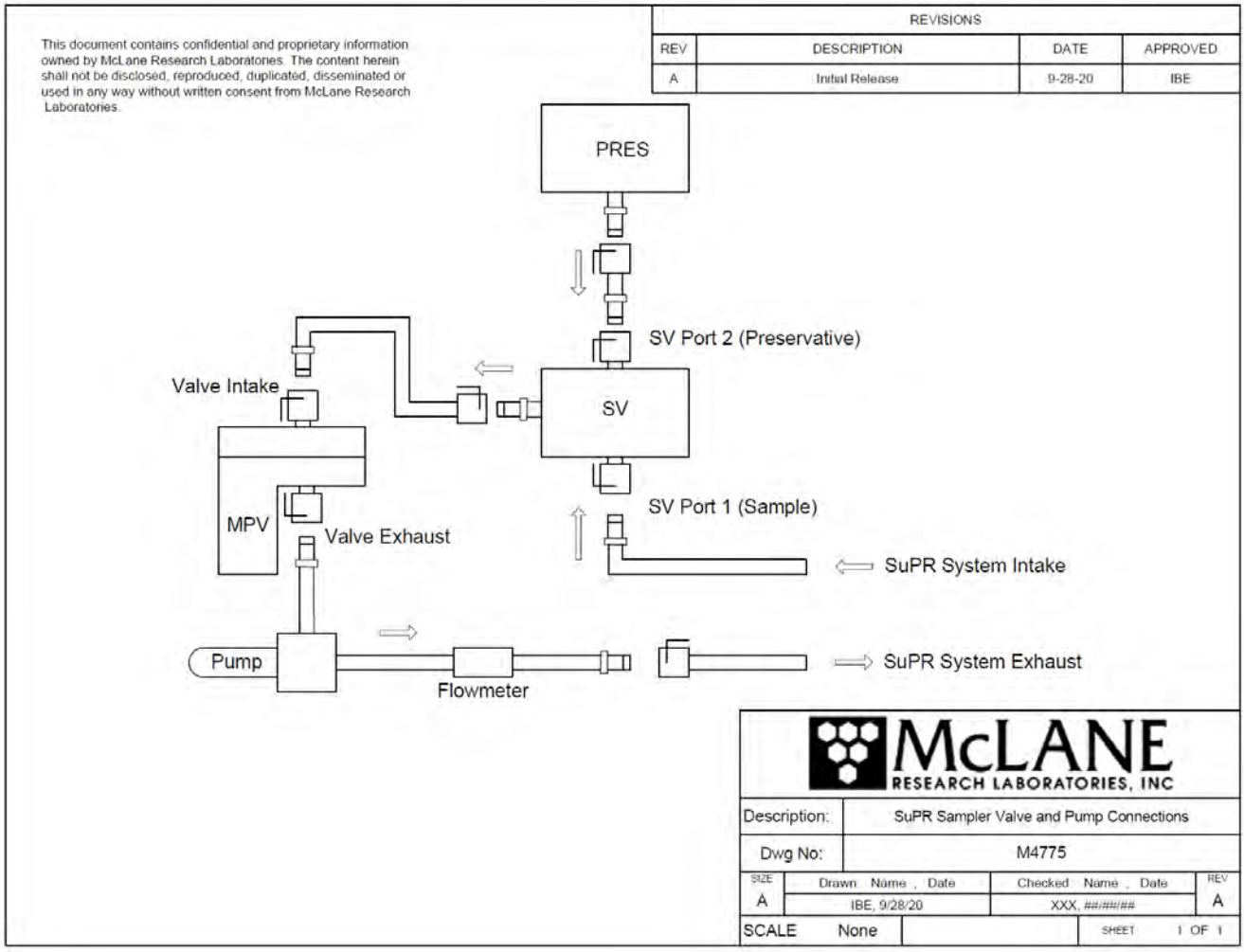
McLANE RESEARCH LABORATORIES, INC

Description:	SuPR Sampler Filter Holder Connections		
Dwg No:	M4765		
SIZE A	Drawn: Name , Date: IBE, 9/28/20	Checked: Name , Date: XXX, ##/##/##	REV A
SCALE None		SHEET 1 OF 1	

Selector Valve

The Selector Valve (SV) allows the system intake to be switched between the environment (sample water intake) and the fixative reservoir (fixative intake). Following sample collection, the SV is switched to the fixative reservoir, and stabilizer or preservative is applied to the sample.





Filter Holders

The SuPR has 14 modular, in-line, stackable 142 mm filter holders stored in a filter holder rack. Filter holders are prepared manually before installing into the filter holder rack and connection to the SuPR system. The illustration below shows the positions for the internal components. The lower filter housing has a cavity that accepts, in this order, two layers of mesh, one acrylic frit and finally a top layer of mesh on which the filter will be installed. The upper filter housing contains two sealing O-rings that secure the filter when the housing is closed. The assembly is secured using six titanium (or alternately nylon) socket cap screws and corresponding nuts.

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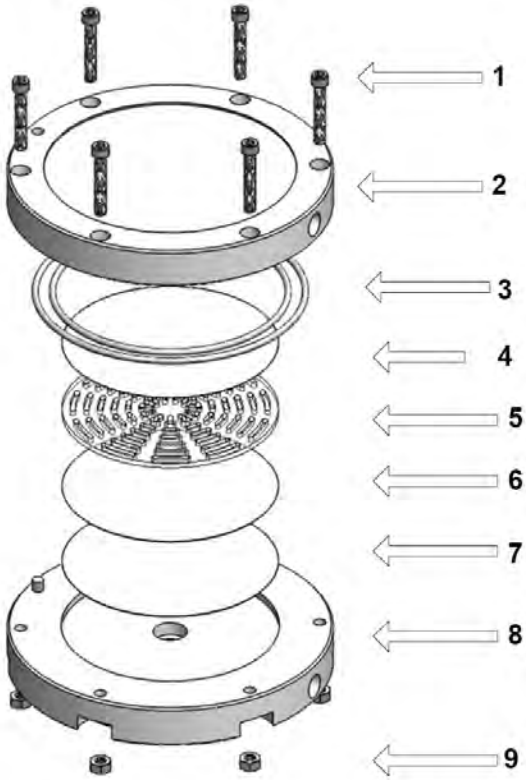
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	Initial Release	9-28-20	IBE



142mm Filter Holder Assembly

1) ¼-20 x 1-1/2" L, SHCS, Ti-Gr 2
2) Filter Housing – Upper Section
3) O-rings: 2-250, 2-256 70D Silicone
4) Mesh Layer (Top)
5) Acrylic Frit Support
6) Mesh Layer (Lower 1)
7) Mesh Layer (Lower 2)
8) Filter Housing – Lower Section
9) ¼-20 Hex Nut, Ti-Gr 2

Notes: Membrane filter (not pictured) is placed on top of upper Mesh Layer (4).

McLANE RESEARCH LABORATORIES, INC

Description:	SuPR Sampler Filter Holder Assembly		
Dwg No:	M4771		
SIZE A	Drawn: Name , Date: IBE, 9/28/20	Checked: Name , Date: XXX, ##/##/##	REV B
SCALE None		SHEET 1 OF 1	

Filter Material

The SuPR is capable of utilizing 142 mm diameter membrane filters with a porosity of 0.22 µm

or larger. Filters are supplied by the user.

Filter porosity greatly affects the amount of water that may be filtered. The SuPR is capable of pumping as much as 2000 liters per sample when utilizing large pore or mesh filters. When using filters of finer porosity, such as 0.22 µm, total volume and the capable flow rate are reduced significantly.

Flow Meter

A calibrated digital flow meter measures the SuPR pump exhaust to record flow rate during pump operations. The cumulative meter reading cannot be reset. To compare to the data recorded by the firmware, record the flow meter reading before deploying the SuPR and once again after recovery.

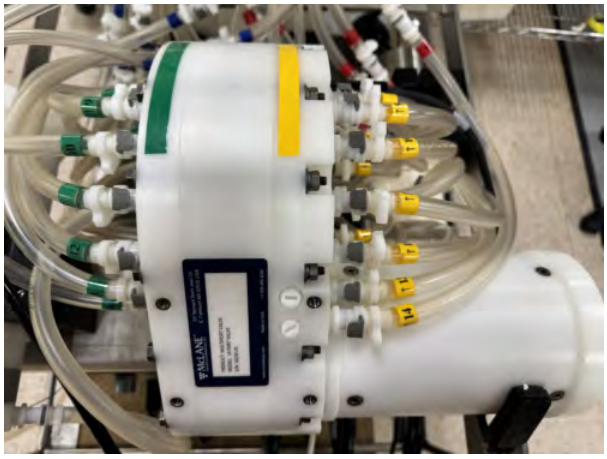
Flow meter units are listed on the flow meter above the readout window. Units may be liters or gallons.

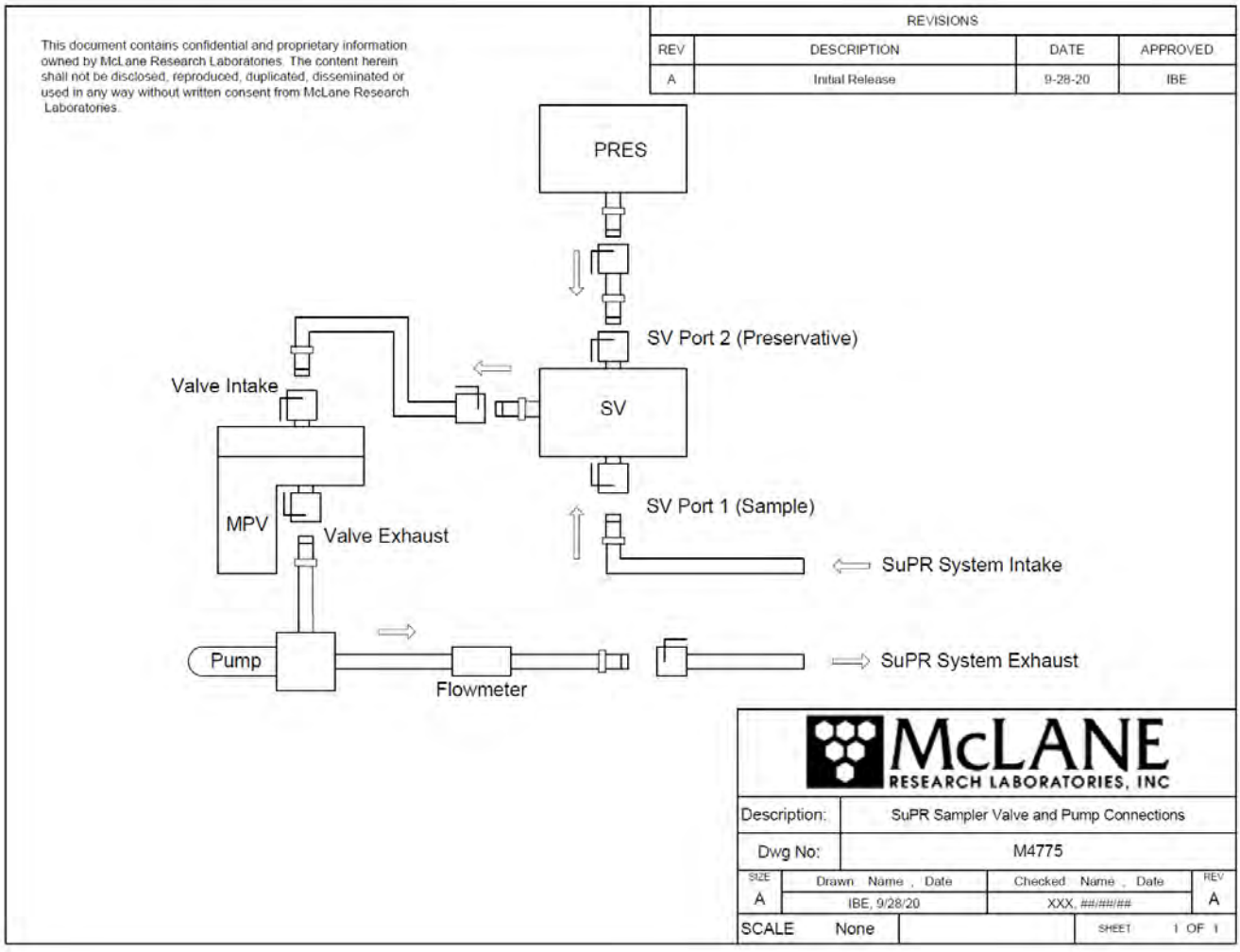
Fluid Connections

Sample water enters the system via the system intake tube which may be connected to a sampling wand or simply fixed in place. The intake tube is connected to the selector valve at port 1. Port 2 of the selector valve is connected directly to the preservative reservoir.

The common outlet of the selector valve is connected to the multi-port valve's common intake on the top side of the valve. If the valve is in one of the purge positions, water passes through the valve without disturbing the sample loops. Alternatively, if the valve is at a sample position, water is directed to one of the filter holders where a filter collects particulate and filtrate is returned to the bottom side of the multi-port valve. The valve exhaust (also on the bottom side) is connected to the large volume pump intake. Water

passes though the pump and the flow meter before it exits the system at the system exhaust.





SuPR Electronics Information

The SuPR operates on McLane Research Labs' Gen3 hardware consisting of a low-power micro-controller, motor controller, and connector interface board. Gen3 electronics interface with a McLane built graphical user interface (GUI), calledMcLanePro. Data are stored to a MicroSD© memory card, and are accessed using McLanePro software.

Related topic
McLanePro Introduction

SuPR **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. Confirm that the end cap is stationary and is not under pressure. If pressure still exists within the housing, the end cap will tend to push out as bolts are loosened.

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.

Batteries

The SuPR has two high capacity A72-1000 battery packs (30,000 mAh capacity each). The

batteries do not come installed in a new SuPR. New batteries are included either in the toolkit or in the shipping crate. Additional packs are available from McLane.

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

Connecting the Batteries

Deployment Duration Estimate

This deployment endurance estimate for SuPR assumes:

- 1 month deployment
- 14 samples, 1000 liters at 3 L/min.

- Nonrestrictive mesh filters
- Default flushing and fixative parameters

Battery life for a planned SuPR deployment can be estimated using the instrument current consumption values provided here. These values apply to electronics using the Gen3 microcontroller. A large volume pump operated at 3 L/min is used for the example. The two A72-1000 battery packs each deliver approximately 30,000 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	
Controller (1 hour)	1 h x 30 mA = 30 mAh
Pumping (0.5 hour)	0.5 h x 450 mA = 225 mAh
	Subtotal = 255 mAh
Deployment	
Controller (Low Power Sleep)	642 h x 0.06 mA = 38.5 mAh
Controller (On)	78 h x 30 mAh = 2,340 mAh
Pre-Sample Water Flush Valve Moves (14X)	14 x 0.5 mAh = 7 mAh
Pre-sample Water Flush Pumping (14X)	14 x 0.03 h x 300 mA = 126 mAh
Sample Valve Moves (14X)	14 x 0.67 mA = 9.4 mAh
Sample Pumping (14X)	14 x 5.6 h x 350 mA = 27,440 mAh
Fixative Flush Valve Moves (14X)	14 x 0.5 mAh = 7 mAh
Fixative Flush Pumping (14X)	14 x 0.0083 h x 160 mA = 18.6 mAh
Mandatory Post-Sample Water Flush Valve (14X)	14 x 0.89 mA = 12.5 mAh
Mandatory Post-Sample Water Flush Pump (14X)	14 x 0.0083 h x 250 mA = 29 mAh

	Subtotal = 30,028 mAh
Recovery	
Controller (1 hour)	1 h x 30 mA = 30 mAh
	Subtotal = 30 mAh
Total Current Consumption	**Total = 30,313 mAh**

This example shows that the total energy consumed is 30,313 mAh, which will not exceed the 60,000 mAh battery life.

The SuPR two A72-1000 battery packs each have a 30,000 mAh capacity. Use 60,000 mAh as the capacity rather than 30,000 mAh when utilizing both batteries.

SuPR Operations

This section provides guidance for operating the SuPR.

SuPR **Operations topics**

Prepare
Install New Batteries
Deployment Preparation
Filter Holder Preparation
Install the Filter Holders

Prime
Priming the Pump
Priming the SuPR Valve
Priming the Filter Holders
Priming the Preservative Line

Deploy
Programming a Deployment
Deploying the SuPR

Recover
Recover the SuPR
Connect to the SuPR
Download Deployment Data
Removing the Filters

Install the Battery Packs and Connect Power

1. Open the Controller Housings and install the two battery packs.

2. Connect battery power.

3. Close the controller housing.

Deployment Preparation

The following steps will ready the SuPR for communication and operation when preparing to deploy the instrument.

1. Check fasteners: Confirm that all components are secure in mounting clamps. If any fasteners appear damaged or degraded, replace as soon as possible. Check that the

MPV, SV, Pump, Flow Meter, Preservative Box and Controller Housing are all secure in each mount.

2. Make/check electrical connections: Disconnect all underwater electrical connections and inspect for corrosion or damage on pins or sockets. Lubricate with Silicone lubricant, reconnect and secure with locking sleeves. Also inspect cabling for cuts or abrasions and replace if damaged.

3. Make fluid connections (close sample loops): Connect the bottom and top tubing from the multi-port valve together for each sample position. This closes each sample loop and allows for priming without filter holders attached.

4. Fill preservative reservoir: Remove the rear plate of the preservative box. Disconnect the fluid line to the SV and remove the preservative bladder. Fill up to 9.5 liters with the preservative of choice leaving as little air in the bladder as possible. Insert bladder back into the box, connect fluid line to the SV and replace the rear panel.

5. Power the host computer, and start McLanePro.

6. Connect to the SuPR.

7. Move the selector valve to both ports, leave at port 1 (Water Intake).

8. Send the multi-port valve to Home port, using the **Goto Home Port** button.

9. Step through valve positions (flush/sample) to sample port 14 (forward valve movement).

10. Step back through valve positions (flush/sample) to sample port 1 (reverse valve movement).

11. Send the valve to Home port again again, this places it at flush position 1.

12. Place the system intake and exhaust tubes into a container of clean water. It is helpful to elevate the clean water container to aid in priming the pump when running dry. The pump may need priming if the system is completely dry, see Priming the Pump for

instructions.

13. Test the pump at the HOME/flush port 1; run forward for 15 seconds at 3 liters-per-minute.

14. The system is now ready to be purged of air and filled with clean water.

Related topics
Download McLanePro
Priming the SuPR

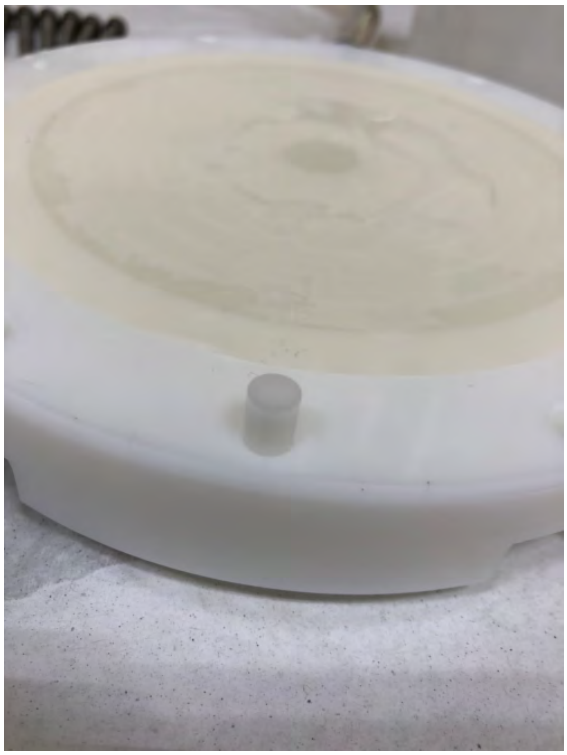
Filter Holder Preparation

This process assumes that all components of the filter holder have already been cleaned to a level appropriate for the deployment.

1. First, remove the six screws and nuts that secure the upper and lower filter housings and separate the halves.

2. Next, ensure that the filter support components are installed in the correct order. Install the membrane or mesh filter onto the lower filter housing; be sure that the filter is centered as much as possible to interface with the sealing O-rings correctly.

3. The lower section of the filter holder has an index pin that engages the upper filter holder section. When assembling the halves together, this pin must line up with the corresponding hole in the upper section.



4. Ensure that the sealing O-rings are clean and inserted into the corresponding grooves of the upper filter section.

5. Mate the upper and lower sections carefully such that the holes all line up (as well as the index pin) while lowering the upper section down onto the lower section.

6. While keeping the filter holder flat, insert and hand-tighten one of the securing screws and nuts.

7. Carefully rotate the filter holder (while keeping it flat) to a hole opposite the first secured screw and install another screw and nut (hand tighten).

8. Install the remaining screws and nuts and tighten enough to compress the sealing O-rings. Ensure all screws are secure and tight.

9. The filter holder is now ready to be primed with clean water. Fill a squeeze bottle with clean water for this process.

10. Tip the filter holder up so the connecting tubes are upright. Using the squeeze bottle, fill both halves of the filter housing until the connecting tubes are full and no more air bubbles are escaping the housing.

11. Once the tubing is full of clean water, connect both ends together to seal the filter holder for storage. The filter holder is now ready to be installed into the filter holder

rack and connected to the SuPR system.

Install the Filter Holders

1. Remove the top plate from the filter holder rack. Slide each filter holder down into place with the inlet and outlet tubes oriented toward the SuPR. In the following example, the rack is loaded from the bottom up such that filter holder #1 and #8 are the top most in each of two stacks.

2. Once both stacks are assembled, replace the top plate and secure with the four nylon bolts.

Priming the SuPR

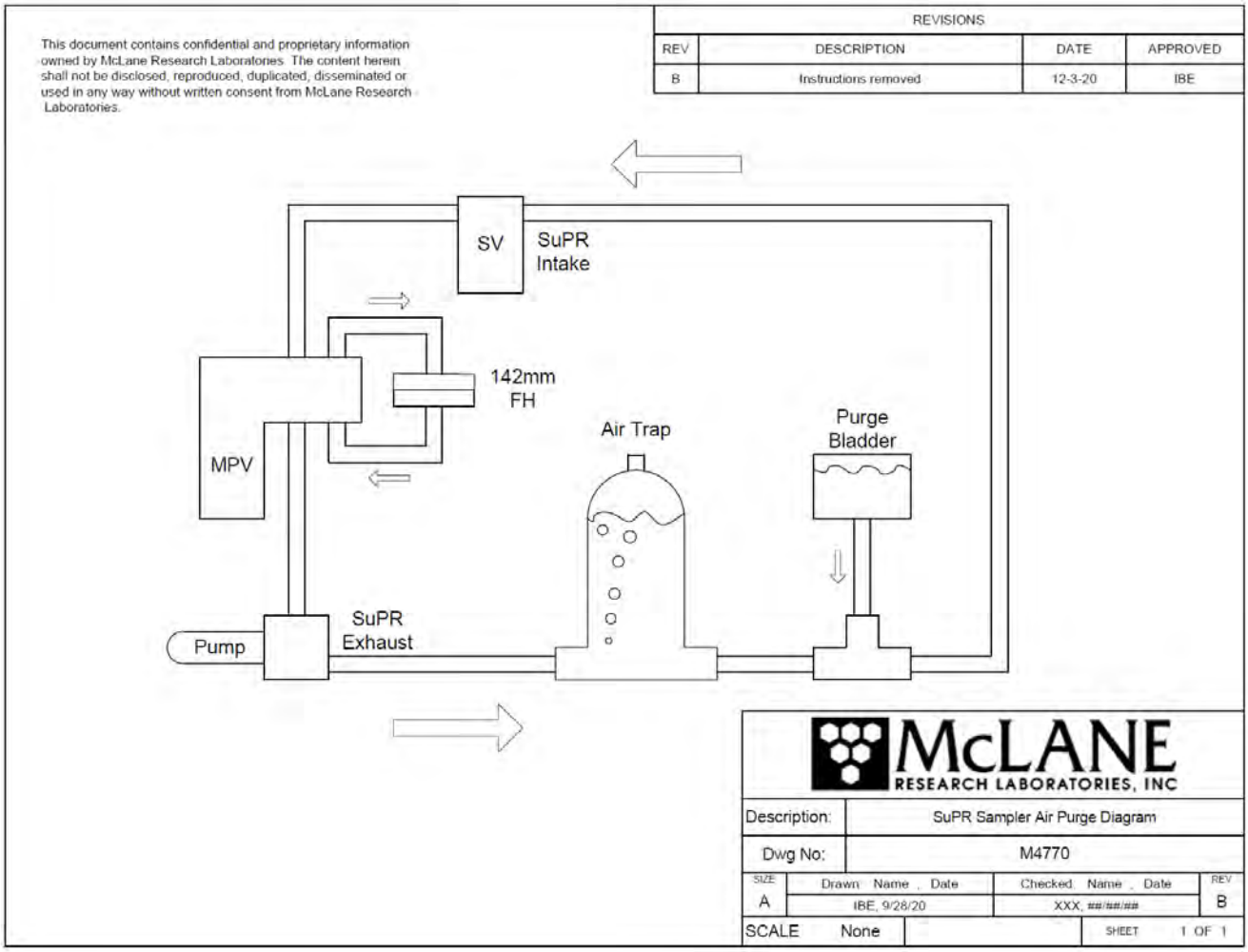
Priming is a critically important deployment preparation step. Incorrect or incomplete priming may risk damage to the valves or other system components.

Steps vary according to the choice of filter, and filter characteristics.

There are several steps required for priming a SuPR. The ultimate priming goal is to clear trapped air from the MPV and tubing between the pump and filter holders by flooding the tubing with water. Always prime when new filters are added. Replacing a filter can introduce air into the system. This step is especially important when using filters with small porosity. Use of an elevated intake and exhaust tube is recommended to retain a full system prime.

Priming is a wet process. Required tools for priming are included in the tool kit:

- Intake priming tube
- Exhaust tube
- Clean water container
- Air Trap
- Purge Tee
- Purge Bladder



Related topics

Priming the SuPR Valve

Priming the Filter Holders

Priming the Preservative Line

Priming the Pump

The SuPR pump is not able to pump water when dry. It is necessary to connect a water source directly to the pump in order to prime the pump before running normal operations with the system.

1. This procedure assumes that batteries are installed in the controller housings and the SuPR is communicating with a host computer. The controller housings must be closed prior to priming; this is a wet process.

2. Confirm that the filter holders are not connected, and that each sample loop is closed by connecting the intake and exhaust of each sample port.
3. Connect a tube from the SuPR exhaust (after the flow meter) to a common clean water container or separate waste container.
4. Disconnect the multi-port exhaust tube at the pump inlet.
5. Connect an intake tube directly into the pump inlet.
6. Place a clean water container above the SuPR system, gravity will help prime the pump. A useful place is on top of the filter holder rack, for example.
7. Place the free end of the intake tube into the elevated clean water container.
8. Navigate to the **Manual Operation tab** and move the multi-port valve to the home port.
9. Program the pump to operate at 5 liters-per-minute for a period of two minutes (10 liters requested volume). Click **Pump Forward**.
    a. While pumping, observe the fluid lines and confirm that the pump begins moving water. Bubbles should be swept through the pump and out the exhaust.
    b. When no more bubbles are evident in the fluid lines, click **Stop Pumping**.
    c. If the pumping routine finishes before all the air is purged, repeat the pumping operation.
10. Disconnect the intake line from the pump inlet and connect it to the water intake of the Selector Valve.
11. Reconnect the tube from the multi-port valve exhaust to the pump inlet.

Priming the SuPR Valve

The SuPR toolkit includes a length of tubing that can be connected to the flow meter exhaust. When the system is primed, the tubing fills with water. This prevents trapped air which can form bubbles on the underside of the filter holder prior to deployment. If these air bubbles ‘push up’ under the filter, the filter could be damaged, affecting sample collection.

Precisely installing and positioning this tubing is critical to minimizing flow resistance and preventing obstruction of the filter flow path. Do not add elbows, tees, check valves or other plumbing. It is recommended that both the intake and exhaust tubes are elevated and tied to the frame above the level of the filter holders. This helps the SuPR retain a prime while on deck prior to deployment.

1. This procedure assumes that batteries are installed in the controller housings and the SuPR is communicating with a host computer. The controller housings must be closed prior to priming; this is a wet process.
2. Confirm that the filter holders are not connected, and that each sample loop is closed by connecting the intake and exhaust of each sample port.
3. Connect a tube from the SuPR exhaust (after the flow meter) to the inlet of the air trap.
4. Prepare the purge bladder by filling it completely with priming fluid (clean water, filtered seawater, or otherwise).
5. Connect another tube from the air trap to the purge tee.
6. Connect a tube from the purge bladder to the purge tee. Elevate the purge bladder as much as possible with respect to the SuPR.
7. Connect a tube from the purge tee back to the SuPR water intake at the Selector Valve.
    a. This creates a closed loop whereas air will accumulate in the air trap and is replaced by clean water from the purge bladder.
8. Loosen or remove the air trap top plug and allow the fluid level to reach the top before reinstalling the plug.
9. Navigate to the **Manual Operation tab** and move the multi-port valve to the home port.
10. Confirm the valve is home and at port 1F (flush port).
11. Program the pump to operate at 4 liters-per-minute for a period of two minutes (8 liters requested volume). Click **Pump Forward**.

a. While pumping, observe the fluid path for the formation of bubbles. These bubbles should be captured by the air trap and replaced with clean water from the purge bladder.

b. If the air trap fills with air, stop pumping, release the plug at the top of the trap and allow the trap to fill with water again. Replace the plug.

c. When no more bubbles are evident in the fluid lines, click **Stop Pumping**.

d. If the pumping routine finishes before all the air is purged, repeat the pumping operation.

12. Advance to the next position; in this case, port 1 (sample).

13. Repeat the pumping operation for all 28 positions of the valve (14 flush ports, 14 sample ports).

    a. Refilling the purge bladder may be necessary to complete priming of all 28 positions.

Priming the Filter Holders

Filter holder priming is a two step process. Initially, as explained in the section Filter Holder Preparation, each filter holder should be intially primed by hand when installing filters. Final priming is similar to priming the valve and sample loops.

1. This procedure assumes that batteries are installed in the controller housings and the SuPR is communicating with a host computer. The controller housings must be closed prior to priming; this is a wet process.

2. Confirm that the 14 filter holders are connected.

3. Connect a tube from the SuPR exhaust (after the flow meter) to the inlet of the air trap.

4. Prepare the purge bladder by filling it completely with priming fluid (clean water, filtered seawater, or otherwise).

5. Connect another tube from the air trap to the purge tee.

6. Connect a tube from the purge bladder to the purge tee. Elevate the purge bladder as much as possible with respect to the SuPR.

7. Connect a tube from the purge tee back to the SuPR water intake at the Selector

Valve.

   a. This creates a closed loop whereas air will accumulate in the air trap and is replaced by clean water from the purge bladder.

8. Loosen or remove the air trap top plug and allow the fluid level to reach the top before reinstalling the plug.

9. Navigate to the **Manual Operation tab** and move the multi-port valve to the home port.

10. Confirm the valve is home and at port 1F (flush port).

11. Program the pump to operate at 4 liters-per-minute for a period of two minutes (8 liters requested volume). Click **Pump Forward**. Note that for small porosity filters, a lower flow rate may be necessary.

    a. While pumping, observe the fluid path for the formation of bubbles. These bubbles should be captured by the air trap and replaced with clean water from the purge bladder.

    b. If the air trap fills with air, stop pumping, release the plug at the top of the trap and allow the trap to fill with water again. Replace the plug. Then continue pumping.

    c. When no more bubbles are evident in the fluid lines, click **Stop Pumping**.

    d. If the pumping routine finishes before all the air is purged, repeat the pumping operation.

12. Advance to the next position; in this case, port 1 (sample).

13. Repeat the pumping operation for all 28 positions of the valve (14 flush ports, 14 sample ports).

    a. Refilling the purge bladder may be necessary to complete priming of all 28 positions.

Priming the Preservative Line

Once the sample loops, filter holders and valve are primed. The preservative line may be primed as well.

1. This procedure assumes that batteries are installed in the controller housings and the SuPR is communicating with a host computer. The controller housings must be closed prior to priming; this is a wet process.
2. Place the SuPR intake tube into a container of clean water. Ensure the exhaust tube is placed in a waste container or drain, if available.
3. Ensure that the preservative bladder is full and connected to the Fixative Intake port of the Selector Valve.
4. Navigate to the **Manual Operation tab** and move the multi-port valve to the home port.
5. Program the pump to operate at 1 liter-per-minute for a period of 10 seconds (1 liter requested volume). Click **Pump Forward**.
    a. Be prepared to click **Stop Pumping** very quickly. The volume of air or water in the preservative line is filled with preservative quickly.
    b. Observe the fluid as it travels the length of the preservative line, as soon as it reaches the Selector Valve, click **Stop Pumping**.
6. Once the preservative line has been filled, perform a clean water flush of the home port (1F). A liter or two of pumping is sufficient.

Programming a Deployment

Using McLanePro, follow the steps outlined in the Schedule tab to program the deployment parameters.

Related topics
Deploying the SuPR

Deploying the SuPR

The SuPR has now been prepared to deploy. The deployment will not start until the scheduled time for the first event.

1. Follow the steps in Starting a Deployment to start the deployment.
2. Install the SuPR onto it's mooring line, or other installation location.

Recovery and Data Offload

After the deployment is completed, the required steps are:

- Recover the SuPR and prepare to communicate with the instrument.
- Rinse the exterior of the sampler with clean, fresh water as soon as is practical.
- Connect to the SuPR using McLanePro and download deployment data. See the instructions in the **Offload tab** section.
- Retrieve the filters for sample analysis.

Related topics

Recover the SuPR

Connect to the SuPR

Download Deployment Data

Removing the Filters

Recover the SuPR

The SuPR is a 14-event sampler. Once the sampling events have completed, or as time dictates, the SuPR must be recovered in order to retrieve the filters and to download the deployment data.

1. Recover the SuPR and uninstall from the oceanographic wire or other deployment location.

If the SuPR is recovered while pumping, do not disconnect any cabling to the pump or flow meter. Disconnecting the pump while operating will damage the pump motor and require replacement. If still pumping when recovered, connect to the SuPR as usual using McLanePro. Use the **Cancel** button to terminate the deployment.

Related topic

Connect to the SuPR

Connect to the SuPR

1. Connect to the SuPR 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 events 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 SuPR 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 Filters in order to retrieve the filters and prepare for another deployment or to prepare for storage.

Related topic

Removing the Filter

Removing the Filters

After a deployment is complete and the system has been recovered, the filter holders can be removed to retrieve the filters for sample analysis. The filter holders may be removed with or without first purging sample water. Protocols for filter removal will vary according to customer requirements. In the following example, water is removed from the filter holders using the SuPR pump, before removing the filter holders from the system in order to retrieve the filters.

To remove the SuPR filters, complete the following steps:

1. Power on the computer, connect the communications cable to the controller housing, and then plug the USB COM cable into one of the computer's USB ports.
2. Start McLanePro and connect to the SuPR.
3. Navigate to the **Manual Operation** tab. The pump will be manually operated in order to draw excess water from the filter holder.
4. Move the valve to the first sample position.
5. To remove standing water from the filter holder, run the pump forward at the minimum flow rate for 3-5 seconds and click **Stop Pumping** when the standing water is gone.
    1. Set the **Pumping Parameters** to a low sample volume and flow rate. For example, set the parameters to 4 L volume, 2 L/min flow rate and no timeout.

    2. Be prepared to click **Stop Pumping** when there is no more water in the filter holder and/or system plumbing.
6. Disconnect the tubing from the filter holder and plug the inlet and outlet tubes together to seal the assembly.
7. Move the entire filter holder to a protected location for removal of the filter.
8. Unscrew the six nuts and bolts and remove the filter holder top.
9. Carefully remove the 142 mm filters and store/secure as necessary for analysis.
10. Wash or rinse the filter holder plates.
11. Replace the top section of the filter holders and secure with the filter holder bolts and nuts.
12. Set the filter holder aside.
13. Move to the next sample position and repeat steps 5 to 12 for each filter holder.
14. If the SuPR is not being immediately redeployed, perform any necessary maintenance before storage and replace the filter holders in the rack.

Related topic

SuPR Maintenance & Storage

SuPR 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 SuPR.
- Clean SuPR 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.
- Backup Deployment Data.
- Reuse the shipping crate for storage and transport.

SuPR **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 SuPR using McLanePro and download deployment data. See the instructions in the **Offload tab** section.
- Retrieve the filters for sample analysis.
- Rinse the SuPR.
- Clean SuPR fluid paths and plumbing.
- Remove and dispose of expired batteries.

Rinse the SuPR

Rinsing the SuPR frame, valves, controller housings, 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.

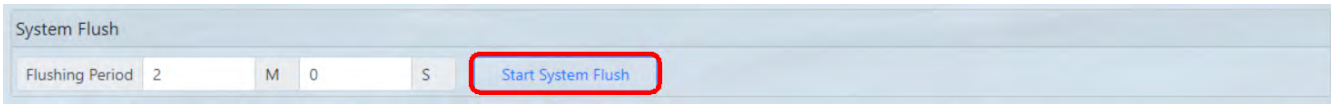
Related topics

Clear the fluid paths & plumbing
Flushing the pump head

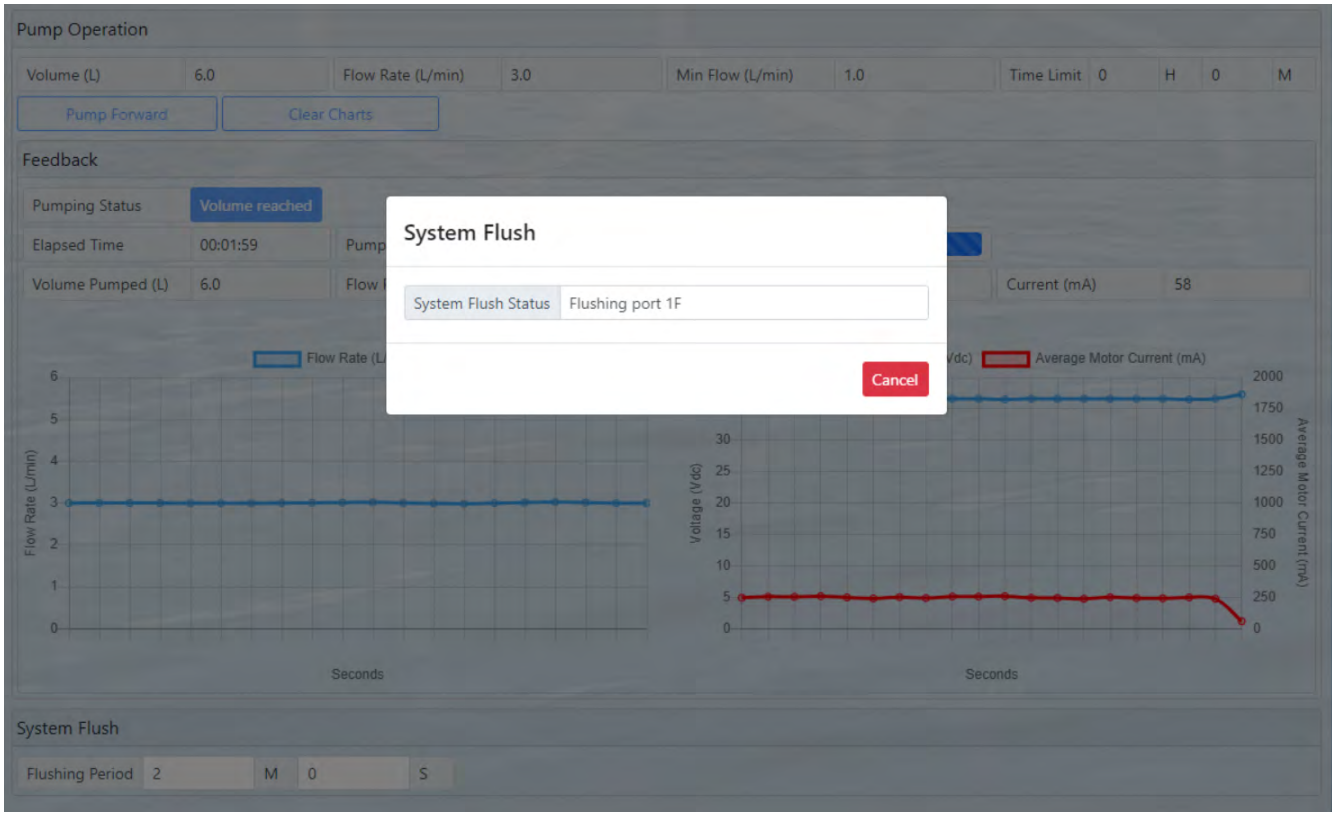
Flushing the System

The **Manual Operation** tab provides a way to flush the pump head interior with fresh water. Flushing the pump head after every deployment can prevent salt crystal formation. To flush the pump head, complete the following steps:

1. Ensure that the controller housing is sealed.
2. Establish communication with the SuPR.
3. After removing the filters from each filter holder, wash, dry, and reassemble the filter holder sections.
4. Set the clean filter holders aside.
5. Attach the intake tube to the selector valve water inlet.
6. Place the free end of the tube in a reservoir of fresh, clean water. Optionally, a mild detergent solution can be used for a first flush, followed by a clean water flush.
7. Navigate to the Manual Operation tab. The system flush utility will be used to clean the lines.
8. Set a period to spend flushing each port. Typically, a 2-minute flush is sufficient.
9. Press **Start System Flush** to begin the flushing procedure. Be sure that the intake is placed in an appropriate container of clean water or cleaning agent and that the exhaust is directed to a waste container or drain, if available.



A popup window displays the current status of the System Flush procedure. It may be canceled at any time.



10. Watch the water container, and make sure it does not run dry.

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

Clear the Fluid Paths & Plumbing

After removing filters and flushing the pump head, the SuPR should be purged of water.

1. Power on the computer, connect the communications cable to the controller housing and plug the USB cable end into one of the computer's USB ports.
2. Start McLanePro and connect to the SuPR.
3. Navigate to the **Manual Operation** tab. The pump will be manually operated in order to draw excess water from the filter holder.
4. Move the valve to the first flush position (1F).
5. To remove standing water from the valve run the pump at the minimum flow rate for 5-10 seconds and click **Stop Pumping** when the standing water is gone.
    1. Set the **Pumping Parameters** to a low sample volume and flow rate. For example, set the parameters to 4 L volume, 2 L/min flow rate and no timeout.
    2. Be prepared to click **Stop Pumping** when there is no more water in the flush port

and/or system plumbing.

6. Advance the valve to the next position (in this case, sample port 1) and repeat step 5 for each subsequent port.

Dispose of Used Batteries

Batteries should never be left in the controller housing for extended periods of time. If redeploying the instrument, 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 each battery holder and remove the A72-1000 battery packs.
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 longer 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 & Inspecting the Controller Housing

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

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.

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 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.

The SuPR 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 SuPR to initiate communication with the instrument. A battery is not required to communicate with the SuPR 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 SuPR 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 SuPR or when storing long term.

Always disconnect and remove batteries before long term storage or transport.